QLOGIC™

Simplify

SANbox 5000 Series Fibre Channel Switch

Installation Guide

Firmware Version 6.7

Document Revision History	
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Section 1
Introduction

This manual describes the features and installation of the SANbox® 5000 Series Fibre Channel switch, firmware version 6.7. Table 1-1 describes the SANbox 5000 Series switch models and their distinguishing features.

Table 1-1. SANbox 5000 Series Switch Models

Model	1-Gbps/2-Gbps	1/2/4-Gbps	Dual Replaceable Power Supplies
5200	✔		
5202	✔		✔
5600		✔	
5602		✔	✔

This manual is organized as follows:

- Section 1 describes the intended audience, related materials, safety notices, communications statements, laser safety information, electrostatic discharge sensitivity precautions, accessible parts, general program license, and technical support.
- Section 2 is an overview of the switch. It describes indicator LEDs and all user controls and connections.
- Section 3 describes the factors to consider when planning a fabric.
- Section 4 explains how to install and configure the switch.
- Section 5 describes the diagnostic methods and troubleshooting procedures.
- Section 6 describes the removal and replacement of field replaceable units. This includes media transceivers for all models and power supplies for switch models 5202 and 5602.
- Appendix A lists the switch specifications.

Please read the communications statements and laser safety information later in this section.

1.1 Intended Audience

This manual introduces users to the switch and explains its installation and service. It is intended for users who are responsible for installing and servicing network equipment.

1.2 Related Materials

The following manuals and materials are referenced in the text and/or provide additional information.

- *SANbox 5000 Series Enterprise Fabric Suite 2007 User Guide*, publication number 59097-04.
- *SANbox 5000 Series QuickTools Switch Management User Guide*, publication number 59235-01.
- *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide*, publication number 59183-01.
- *SANbox Fibre Channel Switch CLI Quick Reference Guide*, publication number 59261-00
- *SANbox Simple Network Management Protocol Reference Guide*, publication number 59047-07
- *CIM Agent Reference Guide*, publication number 59223-01
- *QLogic Switch Interoperability Guide v3.0*. This PDF document can be downloaded at http://www.qlogic.com/interopguide/info.asp#inter.
- Fibre Channel-Arbitrated Loop (FC-AL-2) Rev. 6.8.
- Fibre Channel-10-bit Interface Rev. 2.3.
- Definitions of Managed Objects for the Fabric Element in Fibre Channel Standard (draft-ietf-ipfc-fabric-element-mib-04.txt).

The Fibre Channel Standards are available from:

> Global Engineering Documents, 15 Inverness Way East, Englewood, CO
> 80112-5776   Phone: (800) 854-7179 or (303) 397-7956
> Fax: (303) 397-2740.

1.3 New in this Release

The following items are new in the current release:

- The switch is equipped with the QuickTools embedded graphical user interface. QuickTools is a web applet that provides basic switch management tools.
- Enterprise Fabric Suite 2007 is a workstation-based Java® application that provides a graphical user interface for fabric management. Enterprise Fabric Suite 2007 includes the mPort Technology feature by which you can move port licenses from active ports to inactive ports including 10-Gbps ports. Enterprise Fabric Suite 2007 comes with a free 30-day trial license – a permanent license is available for purchase from your authorized reseller.
- The following optional features are available in Enterprise Fabric Suite 2007 and the Command Line Interface (CLI) with the purchase and installation of a license key:
  - ❑ Fabric Security provides for Secure Socket Layer (SSL) and Secure Shell (SSH) connection security, device security using Challenge Handshake Authentication Protocol (CHAP), and remote authentication using a Remote Authentication Dial-In User Service (RADIUS) server.
  - ❑ SANdoctor provides tools for Fibre Channel connection verification, Fibre Channel route tracing, and transceiver diagnostic information.
  - ❑ Port Activation enables additional Fibre Channel ports up to the 20-port maximum.
- You can download firmware image files using Trivial File Transfer Protocol (TFTP) using the Firmware Install, Image Install, and Image TFTP commands.
- The switch supports hardware enforced hard zoning by default. If the zoning configuration exceeds the hardware limits; zones revert to soft zones.
- You can remove inactive zone sets and all zones and aliases not in the active zone set.
- Port binding establishes a list of port/devices that are permitted to log in to a switch port.
- Support for 5- and 6-switch stacks connected with 10-Gbps stacking cables.

1.4 Safety Notices

A **Warning** notice indicates the presence of a hazard that has the potential of causing personal injury.

4-4, 4-5, 4-11

4-4, 4-5, 4-11, 6-1

A **Caution** notice indicates the presence of a hazard that has the potential of causing damage to the equipment.

5-16

5-16, 6-2

1.5 Sicherheitshinweise

Ein **Warnhinweis** weist auf das Vorhandensein einer Gefahr hin, die möglicherweise Verletzungen zur Folge hat.

4-4, 4-5, 4-12

4-4, 4-5, 4-12, 6-1

Ein **Vorsichtshinweis** weist auf das Vorhandensein einer Gefahr hin, die möglicherweise Geräteschäden zur Folge hat.

5-16

5-16, 6-2

1.6 Notes informatives relatives à la sécurité

Une note informative **Avertissement** indique la présence d’un risque pouvant entraîner des blessures.

4-4, 4-5, 4-11

4-4, 4-5, 4-11, 6-1

Une note informative **Attention** indique la présence d’un risque pouvant entraîner des dégâts matériels.

5-16

5-16, 6-2

1.7 Communications Statements

The following statements apply to this product. The statements for other products intended for use with this product appear in their accompanying manuals.

1.7.1 Federal Communications Commission (FCC) Class A Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause unacceptable interference, in which case the user will be required to correct the interference at their own expense.

Neither the provider nor the manufacturer is responsible for any radio or television interference caused by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

1.7.2 Canadian Department of Communications Class A Compliance Statement

This equipment does not exceed Class A limits for radio emissions for digital apparatus, set out in Radio Interference Regulation of the Canadian Department of Communications. Operation in a residential area may cause unacceptable interference to radio and TV reception requiring the owner or operator to take whatever steps necessary to correct the interference.

1.7.3 Avis de conformité aux normes du ministère des Communications du Canada

Cet équipement ne dépasse pas les limites de Classe A d'émission de bruits radioélectriques por les appareils numériques, telles que prescrites par le Réglement sur le brouillage radioélectrique établi par le ministère des Communications du Canada. L'exploitation faite en milieu résidentiel peut entraîner le brouillage des réceptions radio et télé, ce qui obligerait le propriétaire ou l'opérateur à prendre les dispositions nécwssaires pour en éliminer les causes.

1.7.4 CE Statement

The CE symbol on the equipment indicates that this system complies with the EMC (Electromagnetic Compatibility) directive of the European Community (89/336/EEC) and to the Low Voltage (Safety) Directive (73/23/EEC). Such marking indicates that this system meets or exceeds the following technical standards:

- EN 60950-1, A11:2004 – “Safety of Information Technology Equipment”.
- EN 55022:1998, A1:2000, A2:2003 – “Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment”.
- EN 55024:1998, A1:2001, A2: 2003 – “Electromagnetic compatibility - Generic immunity standard Part 1: Residential commercial, and light industry.”
  - EN 61000-4-2: 1995, A1:1998, A2: 2001 – “Electrostatic Discharge Immunity Test”
  - EN 61000-4-3: 2002 – “Radiated, Radio-Frequency, Electromagnetic Field Immunity Test”
  - EN 61000-4-4: 1995, A1:2001, A2:2001 – “Electrical Fast Transient/Burst Immunity Test”
  - EN 61000-4-5: 1995, A1:2001 – “Surge Immunity Test”
  - EN 61000-4-6: 1996, A1:2001 – “Immunity To Conducted Disturbances, Induced By Radio-Frequency Fields”
  - EN 61000-4-8: 1993, A1:2001 – "Power Frequency Magnetic Field Immunity Test”
  - EN 61000-4-11 Second Edition: 2004 – “Voltage Dips, Short Interruptions And Voltage Variations Immunity Tests”
- EN 61000-3-2: 2000 – “Limits For Harmonic Current Emissions (Equipment Input Current Less Than/Equal To 16 A Per Phase)” Class A

- EN 61000-3-3: 1995, A1:2001 – “Limitation Of Voltage Fluctuations And Flicker In Low-Voltage Supply Systems For Equipment With Rated Current Less Than Or Equal To 16 A”

1.7.5

VCCI Class A 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。

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.

1.7.6

MIC Class A Statement (model 5200 only)

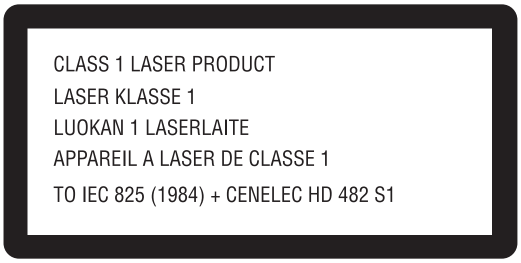
A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약 잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

As this equipment has undergone EMC registration for business purpose, the seller and/or the buyer is asked to beware of this point and in case a wrongful sale or purchase has been made, it is asked that a change to household use be made.

1.8
Laser Safety Information

This product uses Class 1 laser optical transceivers to communicate over the fiber optic conductors. The U.S. Department of Health and Human Services (DHHS) does not consider Class 1 lasers to be hazardous. The International Electrotechnical Commission (IEC) 825 Laser Safety Standard requires labeling in English, German, Finnish, and French stating that the product uses Class 1 lasers. Because it is impractical to label the transceivers, the following label is provided in this manual.



CLASS 1 LASER PRODUCT
LASER KLASSE 1
LUOKAN 1 LASERLAITE
APPAREIL A LASER DE CLASSE 1
TO IEC 825 (1984) + CENELEC HD 482 S1

The following warning applies to XPAK optical transceivers:

WARNING!! LASER RADIATION

DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS

CLASS 1M LASER PRODUCT

1.9
Electrostatic Discharge Sensitivity (ESDS) Precautions

The assemblies used in the switch chassis are ESD sensitive. Observe ESD handling procedures when handling any assembly used in the switch chassis.

1.10 Accessible Parts

The Field Replaceable Units (FRUs) for the SANbox 5000 Series switch are the following:

- Power supplies (models 5202 and 5602)
- Small Form-Factor Pluggable (SFP) optical transceivers
- XPAK optical transceivers

1.11 Pièces Accessibles

Les pièces remplaçables, Field Replaceable Units (FRU), du commutateur SANbox 5000 Series Fibre Channel Switch sont les suivantes:

- Alimentations de courant (5202, 5602)
- Interfaces aux media d’interconnexion appelés SFP transceivers.
- Interfaces aux media d’interconnexion appelés XPAK transceivers.

1.12 Zugängliche Teile

Nur die folgenden Teile im SANbox 5000 Series Fibre Channel Switch können kundenseitig ersetzt werden:

- Netzteile (5202, 5602)
- Schnittstellen für die Zwischenverbindungsträger, SFP transceivers genannt.
- Schnittstellen für die Zwischenverbindungsträger, XPAK transceivers genannt.

1.13
General Public License

QLogic® Fibre Channel switches are powered by the Linux operating system. A machine-readable copy of the Linux source code is available upon written request to the following address. A nominal fee will be charged for reproduction, shipping, and handling costs in accordance with the General Public License.

QLogic Corporation
6321 Bury Drive
Eden Prairie, MN 55346-1739
Attention: Technical Support - Source Request

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1.13.1
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>
> Also add information on how to contact you by electronic and paper mail.
>
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>
> > Gnomovision version 69, Copyright (C) *year name of author*
>
> Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'. This is free software, and you are welcome to redistribute it under certain conditions; type `show c' for details.
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1.14 Technical Support

Customers should contact their authorized maintenance provider for technical support of their QLogic switch products. QLogic-direct customers may contact QLogic Technical Support; others will be redirected to their authorized maintenance provider.

Visit the QLogic support Web site listed in Contact Information for the latest firmware and software updates.

1.14.1 Availability

QLogic Technical Support for products under warranty is available during local standard working hours excluding QLogic Observed Holidays.

1.14.2 Training

QLogic offers certification training for the technical professional for both the SANblade™ HBAs and the SANbox switches. From the training link at www.qlogic.com, you may choose Electronic-Based Training or schedule an intensive "hands-on" Certification course.

Technical Certification courses include installation, maintenance and troubleshooting QLogic SAN products. Upon demonstrating knowledge using live equipment, QLogic awards a certificate identifying the student as a Certified Professional. The training professionals at QLogic may be reached by email at tech.training@qlogic.com.

1.14.3
Contact Information

Support Headquarters	QLogic Corporation 12984 Valley View Road Eden Prairie, MN 55344-3657 USA
QLogic Web Site	www.qlogic.com
Technical Support Web Ste	support@qlogic.com
Technical Support Email	support@qlogic.com
Technical Training Email	tech.training@qlogic.com
North American Region	
Email	support@qlogic.com
Phone	+1-952-932-4040
Fax	+1 952-974-4910
Europe, Middle East, and Africa Region	
Email	emeasupport@qlogic.com
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Asia Pacific Region	
Email	apacsupport@qlogic.com
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Section 2
General Description

This section describes the features and capabilities of the SANbox 5000 Series Fibre Channel switches. This includes models 5200 and 5600 and the dual power supply models 5202 and 5602 as shown in Figure 2-1. The following topics are described:

- Chassis Controls and LEDs
- Fibre Channel Ports
- Ethernet Port
- Switch Management

Fabrics are managed with the Command Line Interface (CLI), the QuickTools web applet, or Enterprise Fabric Suite 2007™ (version 6.07).

- Refer to *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide* for more information about the CLI.
- Refer to the *SANbox 5000 Series QuickTools Switch Management User Guide* for information about QuickTools.
- Refer to the *SANbox 5000 Series Enterprise Fabric Suite 2007 User Guide* for information about using the Enterprise Fabric Suite 2007 application. Enterprise Fabric Suite 2007 comes with a 30-day trial license.

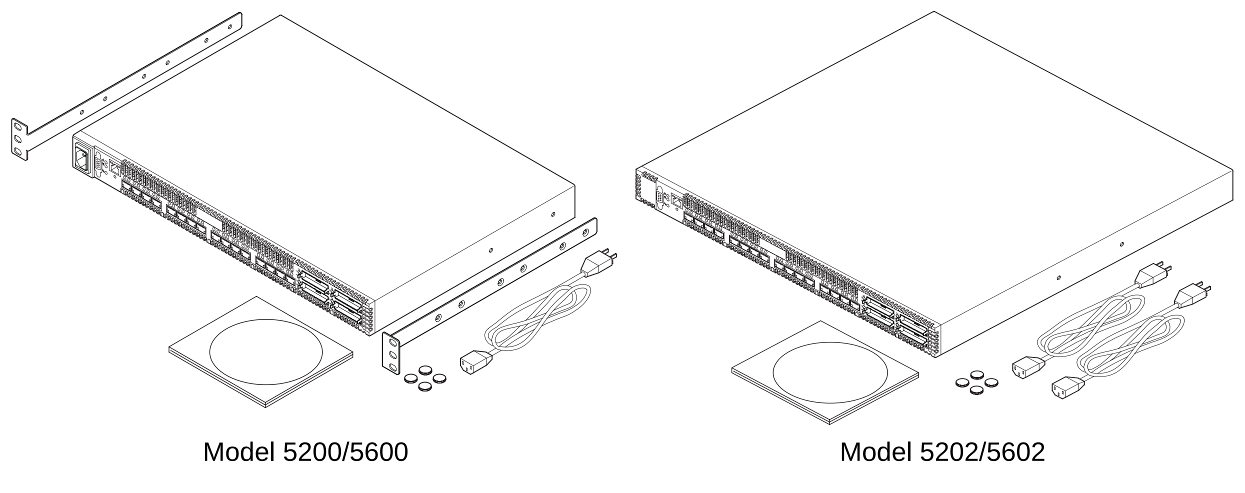


Figure 2-1. SANbox 5000 Series Fibre Channel Switch

2.1 Chassis Controls and LEDs

The Maintenance button shown in Figure 2-2 is the only chassis control and is used to reset a switch or to recover a disabled switch. The chassis LEDs provide information about the switch's operational status. These LEDS include the Input Power LED, Heartbeat LED, and the System Fault LED. To apply power to the switch, plug the power cord into the switch AC power receptacle and into a 100–240 VAC power source.

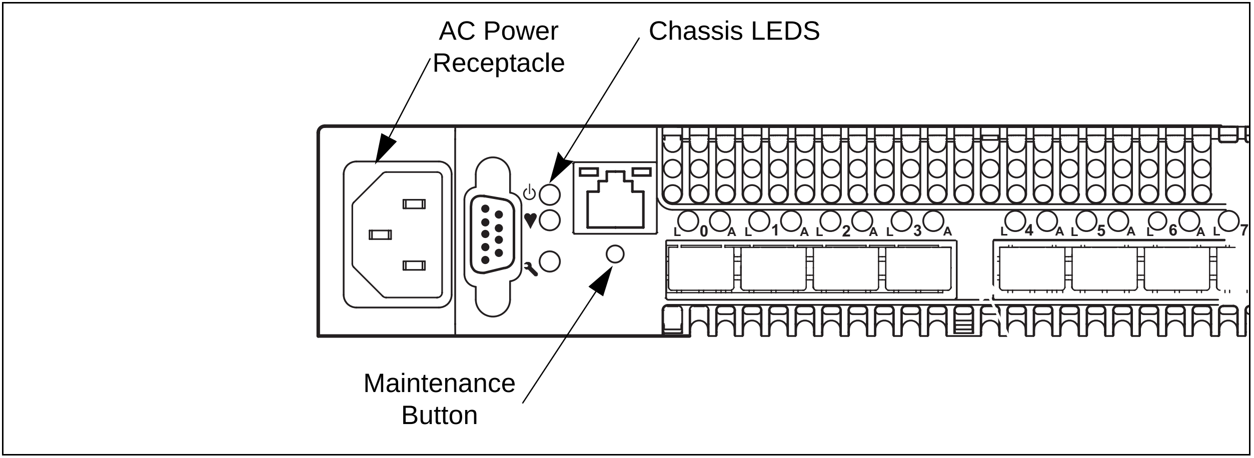


Figure 2-2. Chassis Controls and LEDS

2.1.1 Maintenance Button

The Maintenance button is a dual-function momentary switch on the front panel. Its purpose is to reset the switch or to place the switch in maintenance mode. Maintenance mode sets the IP address to 10.0.0.1 and provides access to the switch for maintenance purposes when flash memory or the resident configuration file is corrupted. Refer to "Recovering a Switch Using Maintenance Mode" on page 5-13 for more information about using maintenance mode.

2.1.1.1 Resetting a Switch

To reset the switch, use a pointed tool to momentarily press and release (less than 2 seconds) the Maintenance button. The switch will respond as follows:

1. All the chassis LEDs will illuminate except the System Fault LED.
2. After approximately 1 minute, the power-on self test (POST) begins, extinguishing the Heartbeat LED.
3. When the POST is complete, the Input Power LED is illuminated and the Heartbeat LED is flashing once per second.

2.1.1.2
Placing the Switch in Maintenance Mode

To place the switch in maintenance mode, do the following:

1. Isolate the switch from the fabric.
2. Press and hold the Maintenance button with a pointed tool for a few seconds until the Heartbeat LED alone is illuminated. Continue holding the maintenance button until the Heartbeat LED extinguishes, then release the button. The Heartbeat LED illuminates continuously while the switch is in maintenance mode.

To exit maintenance mode and return to normal operation, momentarily press and release the Maintenance button to reset the switch.

2.1.2
Chassis LEDs

The chassis LEDs provide status information about switch operation. Figure 2-3 identifies the chassis LEDS on a model 5200/5600 switch. The model 5202/5602 switch LED arrangement is the same. Refer to "Port LEDs" on page 2-6 for information about port LEDs.

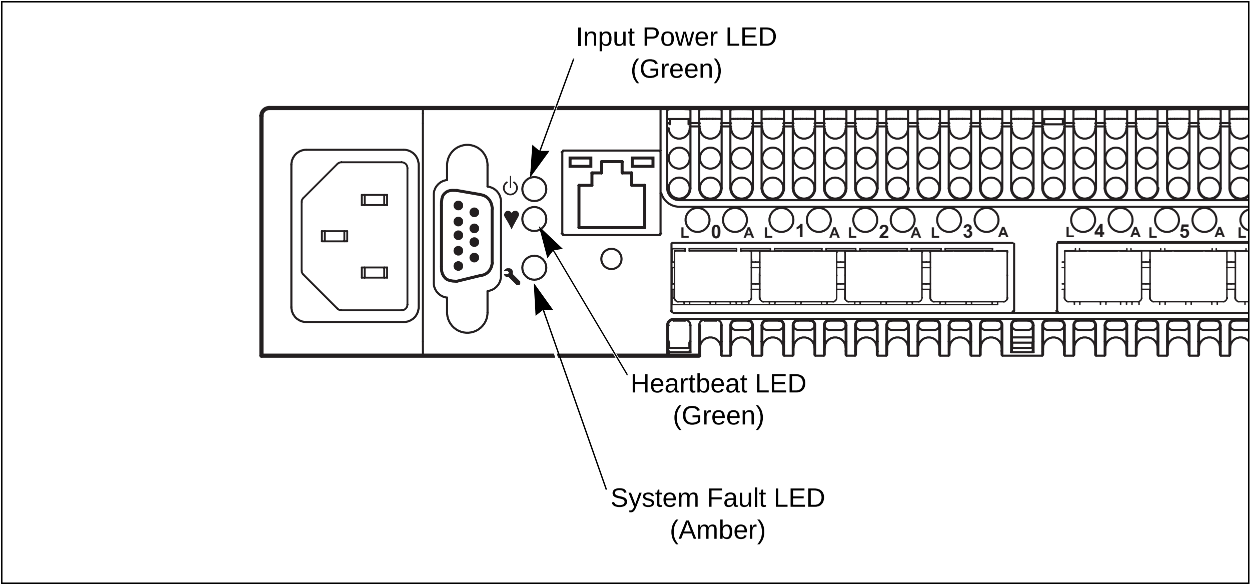


Figure 2-3. Chassis LEDs

2.1.2.1 Input Power LED (Green)

The Input Power LED indicates the voltage status at the switch logic circuitry. During normal operation, this LED illuminates to indicate that the switch logic circuitry is receiving the proper DC voltages. When the switch is in maintenance mode, this LED is extinguished.

2.1.2.2 Heartbeat LED (Green)

The Heartbeat LED indicates the status of the internal switch processor and the results of the POST. Following a normal power-up, the Heartbeat LED blinks about once per second to indicate that the switch passed the POST and that the internal switch processor is running. In maintenance mode, the Heartbeat LED illuminates continuously. Refer to "Heartbeat LED Blink Patterns" on page 5-3 for more information about Heartbeat LED blink patterns.

2.1.2.3 System Fault LED (Amber)

The System Fault LED illuminates to indicate a fault exists in the switch firmware or hardware. Fault conditions include POST errors, over temperature conditions, and power supply malfunctions. The Heartbeat LED shows a blink code for POST errors and over temperature conditions. Refer to "Heartbeat LED Blink Patterns" on page 5-3 for more information about Heartbeat LED blink patterns. On model 5202/5602 switches, the Power Supply Fault LED indicates power supply faults. Refer to "Power Supply Diagnostics" on page 5-12 for information about power supply faults.

2.2 Fibre Channel Ports

NOTE: This document refers to ports 0–15 as 1/2/4-Gbps ports for convenience though SANbox 5200 Series switches do not support 4-Gbps transmission.

The SANbox 5000 Series switch has sixteen 1/2/4-Gbps Fibre Channel ports and four 10-Gbps Fibre Channel ports. Ports are numbered 0–19 as shown in Figure 2-4. Each of the 1/2/4-Gbps ports is served by a Small Form-Factor Pluggable (SFP) transceiver and is capable of 1-Gbps, 2-Gbps, or 4-Gbps transmission. SFPs are hot-pluggable. User ports can self-discover both the port type and transmission speed when connected to devices or other switches. The 1/2/4-Gbps port LEDs are located above their respective ports and provide port login and activity status information.

Each 10-Gbps port is served by an XPAK optical transceiver or an XPAK switch stacking cable for connecting to other SANbox 5000 Series switches. The XPAK switch stacking cable is a passive cable and transceiver assembly that is hot-pluggable. The 10-Gbps ports come from the factory with covers that must be removed before installing transceivers or cables. 10-Gbps port LEDs are located to the left of their respective ports and provide port login and activity status.

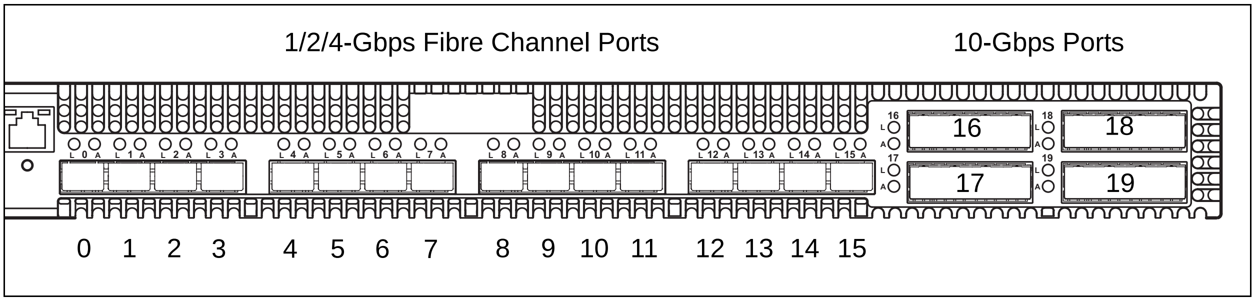


Figure 2-4. Fibre Channel Ports

The SANbox 5000 Series switch comes from the factory as an 8-, 12-, 16-, or 20-port switch, enabling ports 0–7, 0–11, 0–15, or 0–19 respectively. You can choose which ports are active using the mPort Technology feature in Enterprise Fabric Suite 2007, or enable additional ports up to the 20-port maximum through the purchase of a license key. Refer to “Installing Feature License Keys” on page 4-21 for more information.

2.2.1
Port LEDs

Each port has its own Logged-In LED (L) and Activity LED (A) as shown in Figure 2-5.

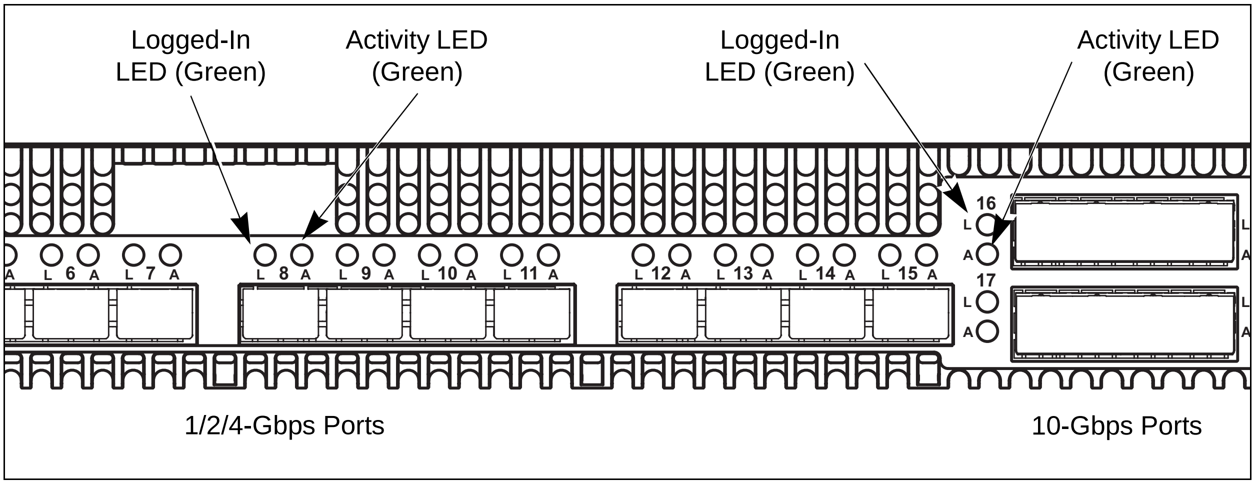


Figure 2-5. Port LEDs

2.2.1.1
Port Logged-In LED (Green)

The Logged-in LED indicates the logged-in or initialization status of the connected devices. After successful completion of the POST, the switch extinguishes all Logged-In LEDs. Following a successful port login, the switch illuminates the corresponding logged-in LED. This shows that the port is properly connected and able to communicate with its attached devices. The Logged-In LED remains illuminated as long as the port is initialized or logged in. If the port connection is broken or an error occurs that disables the port, the Logged-In LED is extinguished. Refer to “Logged-In LED Indications” on page 5-7 for more information about the Logged-In LED.

2.2.1.2
Port Activity LED (Green)

The Activity LED indicates that data is passing through the port. Each frame that the port transmits or receives causes this LED to illuminate for 50 milliseconds. This makes it possible to observe the transmission of a single frame. When extending credits, the Activity LED for a donor port will reflect the traffic of the recipient port. Refer to “Distance” on page 3-4 for more information about extended credits and donor ports.

2.2.2 Transceivers

The SANbox 5000 Series switch supports SFP optical transceivers for the 1/2/4-Gbps ports and XPAK optical transceivers for the 10-Gbps ports. A transceiver converts electrical signals to and from optical laser signals to transmit and receive data. Duplex fiber optic cables plug into the transceivers which then connect to the devices. A 1/2/4-Gbps port is capable of transmitting at 1-Gbps, 2-Gbps, or 4-Gbps; however, the transceiver must also be capable of delivering at these rates.

The SFP and XPAK transceivers are hot pluggable. This means that you can remove or install a transceiver while the switch is operating without harming the switch or the transceiver. However, communication with the connected device will be interrupted. Refer to "Install Transceivers" on page 4-6 for information about installing and removing SFP and XPAK optical transceivers.

2.2.3 Port Types

SANbox 5000 Series switches support generic ports (G_Port, GL_Port), fabric ports (F_Port, FL_Port), and expansion ports (E_Port). Switches come from the factory with all 1/2/4-Gbps ports configured as GL_Ports. The 10-Gbps ports come from the factory configured as G_Ports. Generic, fabric, and expansion ports function as follows:

- A GL_Port self-configures as an FL_Port when connected to a loop device, as an F_Port when connected to a single device, or as an E_Port when connected to another switch. If the device is a single device on a loop, the GL_Port will attempt to configure first as an F_Port, then if that fails, as an FL_Port.
- A G_Port self-configures as an F_Port when connected to a single device, or as an E_Port when connected to another switch.
- An FL_Port supports a loop of up to 126 devices. An FL_Port can also configure itself during the fabric login process as an F_Port when connected to a single device (N_Port).
- An F_Port supports a single device.

E_Ports enable you to expand the fabric by connecting SANbox 5000 Series switches. SANbox 5000 Series switches self-discover all inter-switch connections. Refer to "Multiple Chassis Fabrics" on page 3-7 for more information about multiple chassis fabrics.

2.3 Ethernet Port

The Ethernet port is an RJ-45 connector that provides a connection to a management workstation through a 10/100 Base-T Ethernet cable. Figure 2-6 shows the Ethernet port on a model 5200/5600; the model 5202/5602 is similar. A management workstation can be a Windows®, Solaris™, or a Linux® workstation that is used to configure and manage the switch fabric. You can manage the switch over an Ethernet connection using the CLI, QuickTools, Enterprise Fabric Suite 2007, or SNMP. The switch through which the fabric is managed is called the fabric management switch.

The Ethernet port has two LEDs: the Link Status LED (green) and the Activity LED (green). The Link Status LED illuminates continuously when an Ethernet connection has been established. The Activity LED illuminates when data is being transmitted or received over the Ethernet connection.

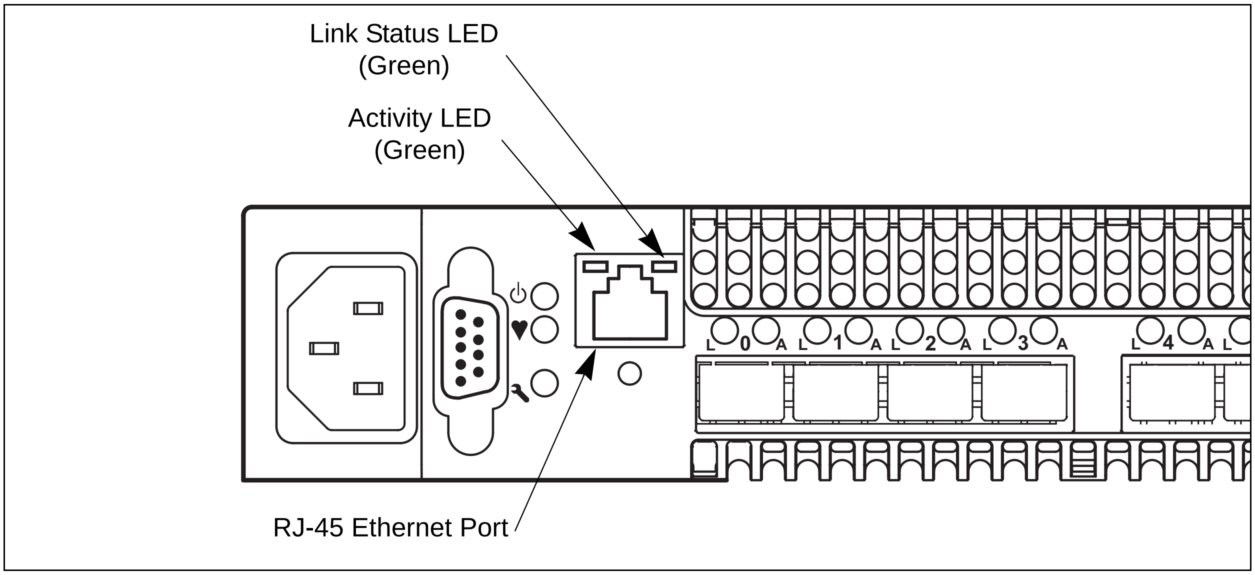


Figure 2-6. Ethernet Port

2.4
Serial Port

The SANbox 5000 Series switch is equipped with an RS-232 serial port for maintenance purposes. Figure 2-7 shows the serial port on a model 5200/5600 switch; the model 5202/5602 is similar. You can manage the switch through the serial port using the CLI.

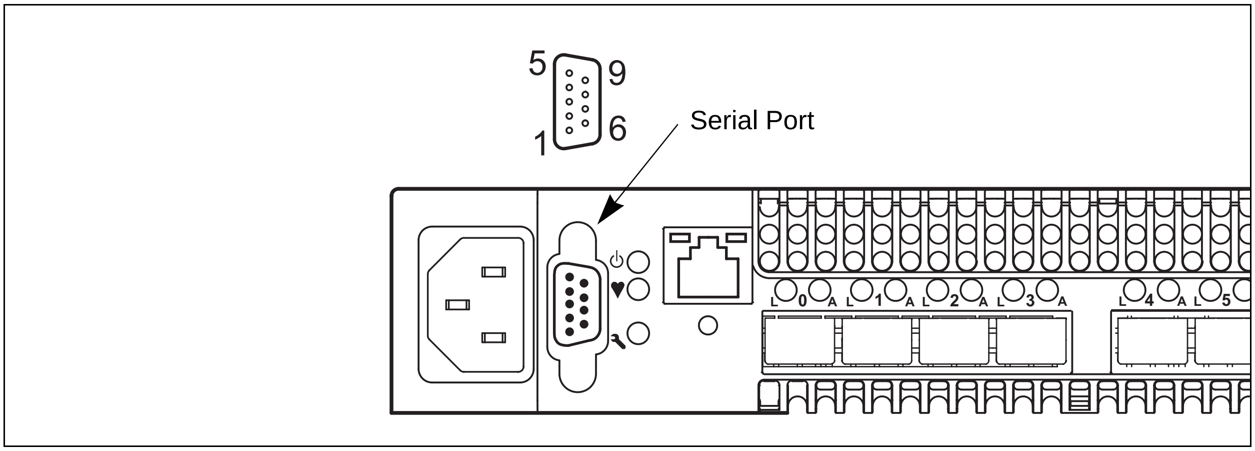


Figure 2-7. Serial Port and Pin Identification

The serial port connector requires a null-modem F/F DB9 cable. The pins on the switch RS-232 connector are shown in Figure 2-7 and identified in Table 2-1. Refer to “Connect the Workstation to the Switch” on page 4-10 for information about connecting the management workstation through the serial port.

Table 2-1. Serial Port Pin Identification

Pin Number	Description
1	Carrier Detect (DCD)
2	Receive Data (RxD)
3	Transmit Data (TxD)
4	Data Terminal Ready (DTR)
5	Signal Ground (GND)
6	Data Set Ready (DSR)
7	Request to Send (RTS)
8	Clear to Send (CTS)
9	Ring Indicator (RI)

2.5 Power Supplies and Fans

The model 5200/5600 switch has a single power supply that converts 100–240 VAC to DC voltages for the various switch circuits. Four internal fans provide cooling. The switch monitors internal air temperature, and therefore does not monitor or report fan operational status. Air flow is front-to-back. To energize the switch, plug the power cord into the switch AC receptacle and into a 100–240 VAC power source.

The model 5202/5602 switch has two, hot pluggable power supplies that convert standard 100–240 VAC to DC voltages for the various switch circuits. Each power supply has an AC power receptacle and two status LEDs as shown in Figure 2-8:

- The Power Supply Status LED (green) illuminates to indicate that the power supply is receiving AC voltage and producing the proper DC voltages.
- The Power Supply Fault LED (amber) illuminates to indicate that a power supply fault exists and requires attention.

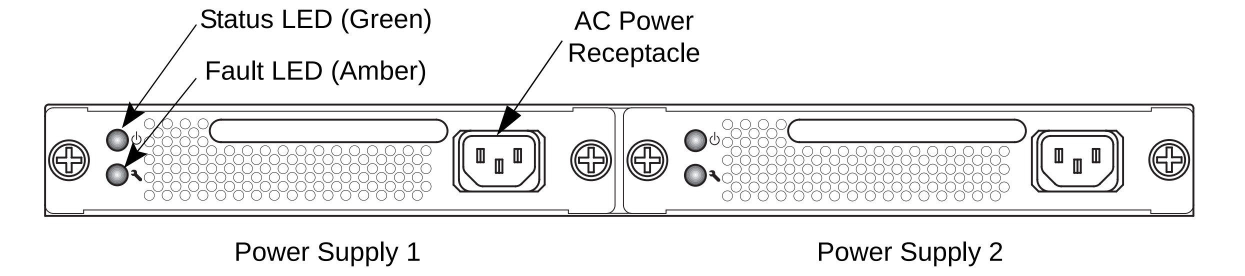


Figure 2-8. Model 5202/5602 Switch Power Supplies

Each power supply is capable of providing all of the switch’s power needs. During normal operation, each power supply provides half of the demand. If one power supply goes offline, the second power supply steps up and provides the difference.

The power supplies are hot swappable and interchangeable. Hot pluggable means that you can remove and replace one power supply while the switch is in operation without disrupting service. Refer to Section 6 for information about replacing the power supplies.

Connecting a power supply to an AC voltage source energizes the switch logic circuitry. Internal fans provide cooling. Air flow is front-to-back.

2.6 Switch Management

The switch supports the following management tools:

- QuickTools Web Applet
- Enterprise Fabric Suite 2007
- Command Line Interface
- Application Programming Interface
- Simple Network Management Protocol
- Storage Management Initiative–Specification (SMI-S)
- File Transfer Protocols

2.6.1 QuickTools Web Applet

To provide basic switch management tools in a graphical user interface and to make switch management less dependent on a particular platform, each switch contains a web applet called QuickTools. QuickTools is designed to provide switch management for fabrics with less than four switches. For larger fabrics, consider the optional management application, Enterprise Fabric Suite 2007.

You run QuickTools by opening the switch IP address with an internet browser. Refer to the *SANbox 5000 Series QuickTools Switch Management User Guide*. QuickTools provides the following management features:

- Faceplate device management
- Switch and port statistics
- Configuration wizard
- Zoning administration
- Fabric tree for fabric management
- User account configuration
- Switch and fabric events
- Operational and environmental statistics
- Global device nicknames
- Online help

2.6.2

Enterprise Fabric Suite 2007

Enterprise Fabric Suite 2007 is a separately licensed workstation-based Java® application that provides a graphical user interface for full fabric and switch management. Enterprise Fabric Suite 2007 is designed for managing fabrics of four or more switches and comes with a 30-day trial license. Enterprise Fabric Suite 2007 can run on a Windows, Solaris, Linux, or MacOS X workstation. Enterprise Fabric Suite 2007 provides all of the management features of QuickTools plus the following:

- Fabric tracker for monitoring fabric firmware versions
- Port threshold alarm configuration
- Topology display for fabric management
- Stack management
- Performance View for port performance
- Extended Credits Wizard
- Zoning Wizard
- mPort Technology for moveable port licenses

Refer to the *SANbox 5000 Series Enterprise Fabric Suite 2007 User Guide* for information about the Enterprise Fabric Suite 2007 application and its use.

2.6.3

Command Line Interface

The command line interface (CLI) provides monitoring and configuration functions by which the administrator can manage the fabric and its switches. The CLI is available over an Ethernet connection or a serial connection. Refer to *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide* for more information.

2.6.4

Application Programming Interface

The Application Programming Interface (API) enables an application provider to build a management application for QLogic switches. The library is implemented in ANSI standard C, relying only on standard POSIX run-time libraries. Contact your distributor or authorized reseller for information about the API.

2.6.5
Simple Network Management Protocol

SNMP provides monitoring and trap functions for the fabric. SANbox firmware supports SNMP versions 1 and 2, the Fibre Alliance Management Information Base (FA-MIB) version 4.0, and the Fabric Element Management Information Base (FE-MIB) RFC 2837. Traps can be formatted using SNMP version 1 or 2. Refer to the *SANbox Simple Network Management Protocol Reference Guide* for more information about using SNMP.

2.6.6
Storage Management Initiative–Specification (SMI-S)

SMI-S Provides for the management of the switch through third-party applications that use the SMI-S. Refer to the *CIM Agent Reference Guide* for more information.

2.6.7
File Transfer Protocols

FTP and TFTP provide the command line interface for exchanging files between the switch and the management workstation. These files include firmware image files, configuration files, and log files.

Notes

Section 3
Planning

Consider the following when planning a fabric:

- Devices
- Device Access
- Performance
- Feature Licensing
- Multiple Chassis Fabrics
- Switch Services
- Fabric Security
- Fabric Management

3.1
Devices

NOTE: This document refers to ports 0–15 as 1/2/4-Gbps ports for convenience though SANbox 5200 Series switches do not support 4-Gbps transmission.

When planning a fabric, consider the number of devices and the anticipated demand. This will determine the number of ports that are needed and in turn the number of switches. Consider how many and what types of switches are needed.

The switch uses SFP transceivers in the 1/2/4-Gbps ports, but the device host bus adapters you are using may not. Consider whether the device adapters use SFP or Gigabit Interface Converters (GBIC) transceivers, and choose fiber optic cables accordingly. Use LC-type cable connectors for SFP transceivers and SC-type cable connectors for GBIC transceivers. Also consider the transmission speed compatibility of your devices, HBAs, switches, and SFPs.

Consider the distribution of targets and initiators. An F_Port supports a single device. An FL_Port can support up to 126 devices in an arbitrated loop.

3.2 Device Access

Consider device access needs within the fabric. Access is controlled by the use of zoning. Some zoning strategies include the following:

- Separate devices by operating system.
- Separate devices that have no need to communicate with other devices in the fabric or have classified data.
- Separate devices into department, administrative, or other functional group.
- Reserve a path and its bandwidth from one port to another.

Zoning divides the fabric for purposes of controlling discovery and inbound traffic. A zone is a named group of ports or devices. Members of the same zone can communicate with each other and transmit outside the zone, but cannot receive inbound traffic from outside the zone. A port/device can be a member of up to eight zones whose combined membership does not exceed 64.

Zoning is hardware enforced on a switch port if the sum of the logged-in devices plus the devices zoned with devices on that port is 64 or less. If a port exceeds this sum, that port behaves as a soft zone member. The port continues to behave as a soft zone member until the sum of logged-in and zoned devices falls back to 64, and the port is reset.

A zone can be a component of more than one zone set. Several zone sets can be defined for a fabric, but only one zone set can be active at one time. The active zone set determines the current fabric zoning.

A zoning database is maintained on each switch. Table 3-1 describes the zoning database limits, excluding the active zone set.

Table 3-1. Zoning Database Limits

Limit	Description
MaxZoneSets	Maximum number of zone sets (256).
MaxZones	Maximum number of zones (2000).
MaxAliases	Maximum number of aliases (2500).
MaxTotalMembers	Maximum number of zone and alias members (10000) that can be stored in the zoning database. Each instance of a zone member or alias member counts toward this maximum.
MaxZonesInZoneSets	Maximum number of zones that are components of zone sets (2000), excluding the orphan zone set. Each instance of a zone in a zone set counts toward this maximum.
MaxMembersPerZone	Maximum number of members in a zone (2000).
MaxMembersPerAlias	Maximum number of members in an alias (2000)

3.3 Performance

NOTE: This document refers to ports 0–15 as 1/2/4-Gbps ports for convenience though SANbox 5200 series switches do not support 4-Gbps transmission.

The SANbox 5000 Series switch supports class 2 and class 3 Fibre Channel service at transmission rates of 1-, 2-, 4-, or 10-Gbps with a maximum frame size of 2148 bytes. A 1/2/4-Gbps port adapts its transmission speed to match that of the device to which it is connected prior to login when the connected device powers up. 10-Gbps ports transmit at 10-Gbps. Related performance characteristics include the following:

- Distance
- Bandwidth
- Latency

3.3.1
Distance

Consider the physical distribution of devices and switches in the fabric. Choose SFP transceivers that are compatible with the cable type, distance, Fibre Channel revision level, and the device host bus adapter. Refer to Appendix A for more information about cable types and transceivers.

Each Fibre Channel port is supported by a data buffer with a 16 credit capacity; that is, 16 maximum sized frames. For fibre optic cables, this enables full bandwidth over the following approximate distances:

- 26 kilometers at 1-Gbps (0.6 credits/Km)
- 13 kilometers at 2-Gbps (1.2 credits/Km)
- 6 kilometers at 4-Gbps (2.4 credits/km)

Longer distances can be spanned at full bandwidth on 1/2/4-Gbps ports by extending credits to G_Ports, F_Ports, and E_Ports. Each port can donate 15 credits to a pool from which a recipient port can borrow. However, 1/2/4-Gbps ports can borrow only from other 1/2/4-Gbps ports. 10-Gbps ports cannot borrow or donate credits. The recipient port also loses a credit in the process. For example, you can configure a 1/2/4-Gbps recipient port to borrow 15 credits from one donor port for a total of 30 credits (15+15=30).

Regardless of how many credits are borrowed, extending credits requires a minimum cable length that is dependent on transmission speed. Extending credits over short cables can result in excessive port resets. Table 3-2 describes the distances that are possible for a port with 30 credits and the minimum cable lengths.

Table 3-2. Extended Credit Distances and Cable Lengths

Transmission Speed	Range for 30 Credits	Minimum Cable Length
1-Gbps	50 Km (30÷0.6)	3 Km
2-Gbps	25 Km (30÷1.2)	1.5 Km
4-Gbps	12 Km (30÷2.4)	0.75 Km

You can configure recipient and donor ports using the Set Config Port CLI command.

3.3.2 Bandwidth

Bandwidth is a measure of the volume of data that can be transmitted at a given transmission rate. A 1/2/4-Gbps port can transmit or receive at nominal rates of 1-, 2-, or 4-Gbps depending on the device to which it is connected. This corresponds to full duplex bandwidth values of 212 MB, 424 MB, and 850 MB respectively. 10-Gbps ports transmit at a nominal rate of 10-Gbps which corresponds to a full duplex bandwidth value of 2550 MB. Multiple source ports can transmit to the same destination port if the destination bandwidth is greater than or equal to the combined source bandwidth. For example, two 1-Gbps source ports can transmit to one 2-Gbps destination port. Similarly, one source port can feed multiple destination ports if the combined destination bandwidth is greater than or equal to the source bandwidth.

In multiple chassis fabrics, each link between chassis contributes 212, 424, 850, or 2550 megabytes of bandwidth between those chassis depending on the speed of the link. When additional bandwidth is needed between devices, increase the number of links between the connecting switches. The switch guarantees in-order-delivery with any number of links between chassis.

3.3.3 Latency

Latency is a measure of how fast a frame travels from one port to another. The factors that affect latency include transmission rate and the source/destination port relationship as shown in Table 3-3.

Table 3-3. Port-to-Port Latency

	Destination Rate				
	Gbps	**1**	**2**	**4**	**10**
Source Rate	**1**	< 0.6 µsec	< 0.8 µsec[1]	< 0.8 µsec[1]	< 0.8 µsec[1]
	2	< 0.5 µsec	< 0.4 µsec	< 0.4 µsec[1]	< 0.4 µsec[1]
	4	< 0.4 µsec	< 0.3 µsec	< 0.3 µsec	< 0.3 µsec[1]
	10	< 0.4 µsec	< 0.3 µsec	< 0.3 µsec	< 0.2 µsec

[1] Based on minimum frame size of 36 bytes. Latency increases for larger frame sizes.

3.4 Feature Licensing

NOTE: License keys enable menu selections in Enterprise Fabric Suite 2007 and commands and keywords in the CLI. License keys do not affect the capabilities of the QuickTools web applet.

License keys provide a way to expand the capabilities of your switch and fabric as your needs grow. Consider your need for the following features and arrange to purchase license keys from your switch distributor or authorized reseller.

- Enterprise Fabric Suite 2007 provides access to the Enterprise Fabric Suite 2007 application which is included on the product CD with a 30-day trial license. Enterprise Fabric Suite 2007 is a graphical user interface designed to provide comprehensive fabric management for fabrics of four or more switches. This license enables you to install and use Enterprise Fabric Suite 2007 on an unlimited number of workstations.
- Fabric Security provides access to the following security tools:
  - Security for Ethernet connections using the Secure Socket Layer (SSL) protocol and Telnet connections using the Secure Shell (SSH) protocol
  - Device and switch authorization and authentication using the Challenge Handshake Authentication Protocol (CHAP).
  - Remote authentication of users and devices using the Remote Authentication Dial-In User Service (RADIUS)
- SANdoctor provides access to the following tools:
  - Fibre Channel connection verification (Fcping CLI command)
  - Fibre Channel route tracing (Fctrace CLI command)
  - Transceiver diagnostic information (Show Media CLI command).
- Port Activation activates additional Fibre Channel ports to 12, 16, or 20 ports.

Upgrading a switch is not disruptive, nor does it require a switch reset. To order a license key, contact your switch distributor or your authorized reseller. Refer to "Installing Feature License Keys" on page 4-21 for information about installing a license key.

3.5 Multiple Chassis Fabrics

By connecting switches together you can expand the number of available ports for devices. Each switch in the fabric is identified by a unique domain ID, and the fabric can automatically resolve domain ID conflicts. Because the Fibre Channel ports are self-configuring, you can connect SANbox 5000 Series switches together in a wide variety of topologies.

You can connect up to four SANbox 5000 Series switches together through the 10-Gbps ports, thus preserving the user ports for devices. This is called stacking. SANbox 5000 Series switches divide the 10-Gbps port buffer to balance traffic across the connection. The 10-Gbps ports operate with any standard XPAK interface. If the 10-Gbps ports are not active, you can connect SANbox 5000 Series switches with other switches through the 1/2/4-Gbps ports in a wide variety of topologies. Consider your topology and cabling requirements.

3.5.1 Optimizing Device Performance

When choosing a topology for a multiple chassis fabric, you should also consider the locality of your server and storage devices and the performance requirements of your application. Storage applications such as video distribution, medical record storage/retrieval or real-time data acquisition can have specific latency or bandwidth requirements.

The SANbox 5000 Series switch provides the lowest latency of any product in its class. Refer to “Performance” on page 3-3 for information about latency. However, the highest performance is achieved on Fibre Channel switches by keeping traffic within a single switch instead of relying on ISLs. Therefore, for optimal device performance, place devices on the same switch under the following conditions:

- Heavy I/O traffic between specific server and storage devices.
- Distinct speed mismatch between devices such as the following:
  - ❑ A 2-Gbps server and a slower 1-Gbps storage device
  - ❑ A high performance server and slow tape storage device

3.5.2
Domain ID, Principal Priority, and Domain ID Lock

The following switch configuration settings affect multiple chassis fabrics:

- Domain ID
- Principal priority
- Domain ID lock

The domain ID is a unique number from 1–239 that identifies each switch in a fabric. The principal priority is a number (1–255) that determines the principal switch which manages domain ID assignments for the fabric. The switch with the highest principal priority (1 is high, 255 is low) becomes the principal switch. If the principal priority is the same for all switches in a fabric, the switch with the lowest WWN becomes the principal switch.

The domain ID lock allows (False) or prevents (True) the reassignment of the domain ID on that switch. Switches come from the factory with the domain ID set to 1, the domain ID lock set to False, and the principal priority set to 254. Refer to the Set Config Switch command in the *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide* for information about changing the default domain ID, domain ID lock, and principal priority parameters.

An unresolved domain ID conflict means that the switch with the higher WWN will isolate as a separate fabric, and the Logged-In LEDs on both switches will flash green to show the affected ports. If you connect a new switch to an existing fabric with its domain ID unlocked, and a domain ID conflict occurs, the new switch will isolate as a separate fabric. However, you can remedy this by resetting the new switch or taking it offline then back online. The principal switch will reassign the domain ID and the switch will join the fabric.

NOTE: Domain ID reassignment is not reflected in zoning that is defined by domain ID/port number pair or Fibre Channel address. You must reconfigure zones that are affected by domain ID reassignment. To prevent zoning definitions from becoming invalid under these conditions, lock the domain IDs.

3.5.3 Stacking

You can connect up to six 20-port SANbox 5000 Series switches together through the 10-Gbps ports, thus preserving the user ports for devices. This is called stacking. The following 2-, 3-, 4-, 5-, and 6-switch stacking configurations are recommended for best performance and redundancy. Each 10-Gbps port contributes 1 GB of bandwidth between chassis with one chassis hop between any two ports. Figure 3-1 shows a two-switch stack of model 5000 switches using two 3-inch XPAK switch stacking cables. 32 1/2/4-Gbps ports are available for devices.

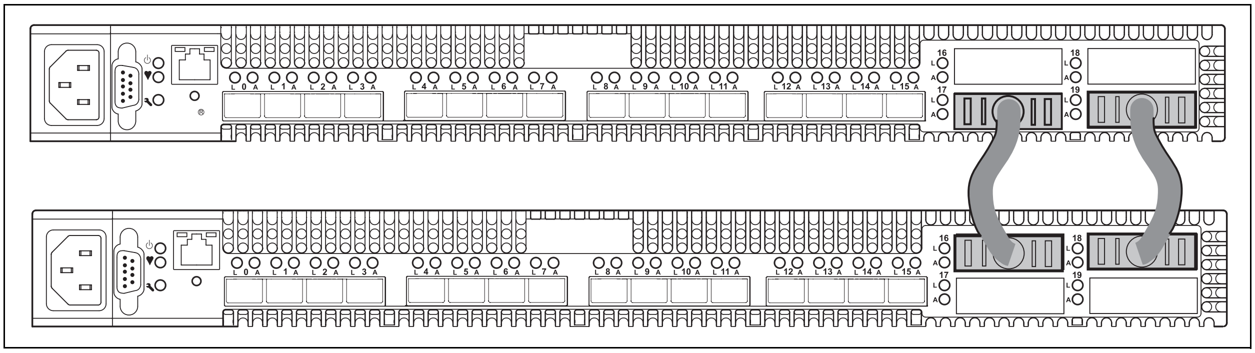


Figure 3-1. Two-Switch Stack

Figure 3-2 shows a three-switch stack of SANbox 5000 Series switches using two 3-inch and one 9-inch XPAK switch stacking cables. 48 1/2/4-Gbps ports are available for devices.

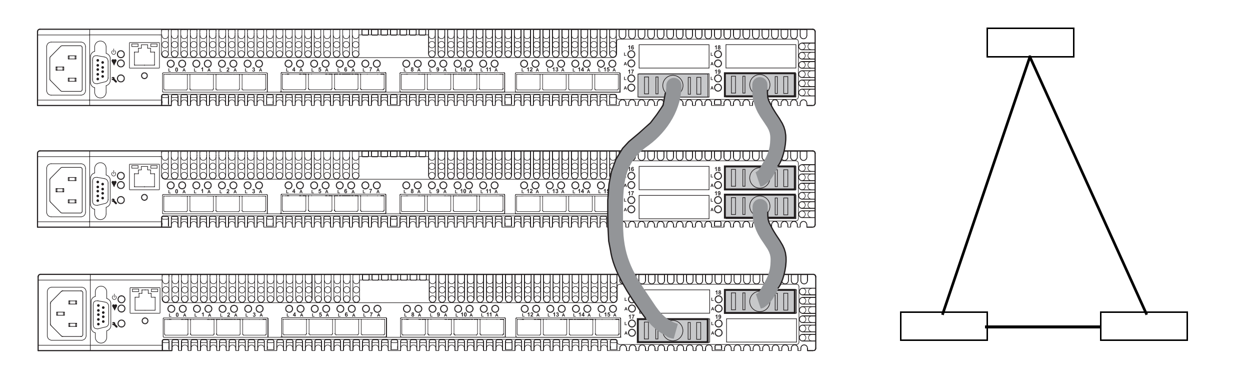


Figure 3-2. Three-Switch Stack

Figure 3-3 shows a four-switch stack of model 5000 switches using three 3-inch and three 9-inch XPAK switch stacking cables. 64 1/2/4-Gbps ports are available for devices.

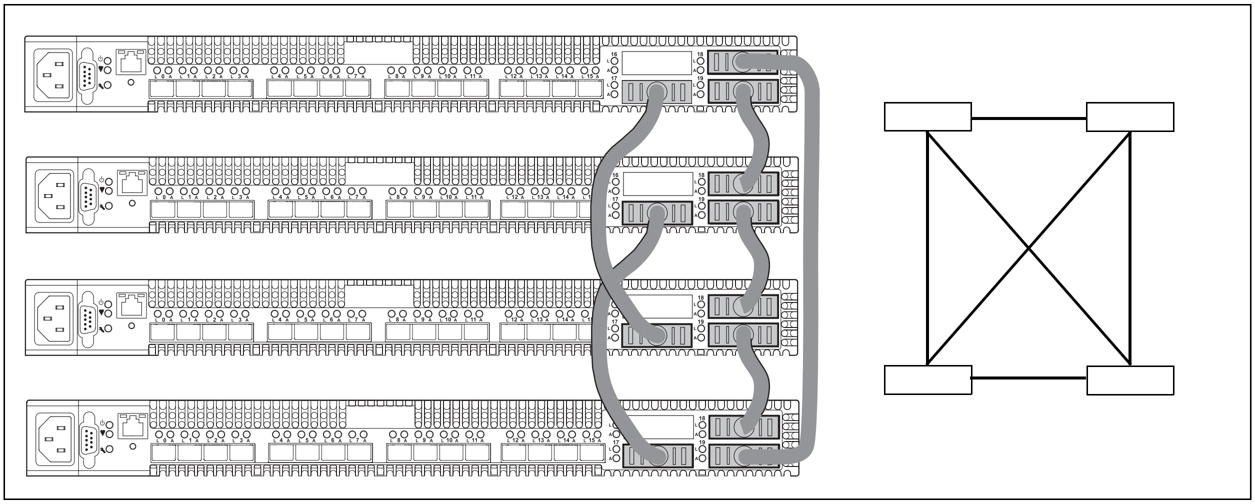


Figure 3-3. Four-Switch Stack

Figure 3-4 shows a five-switch stack of model 5000 switches using ten XPAK switch stacking cables. Eighty 1/2/4-Gbps ports are available for devices.

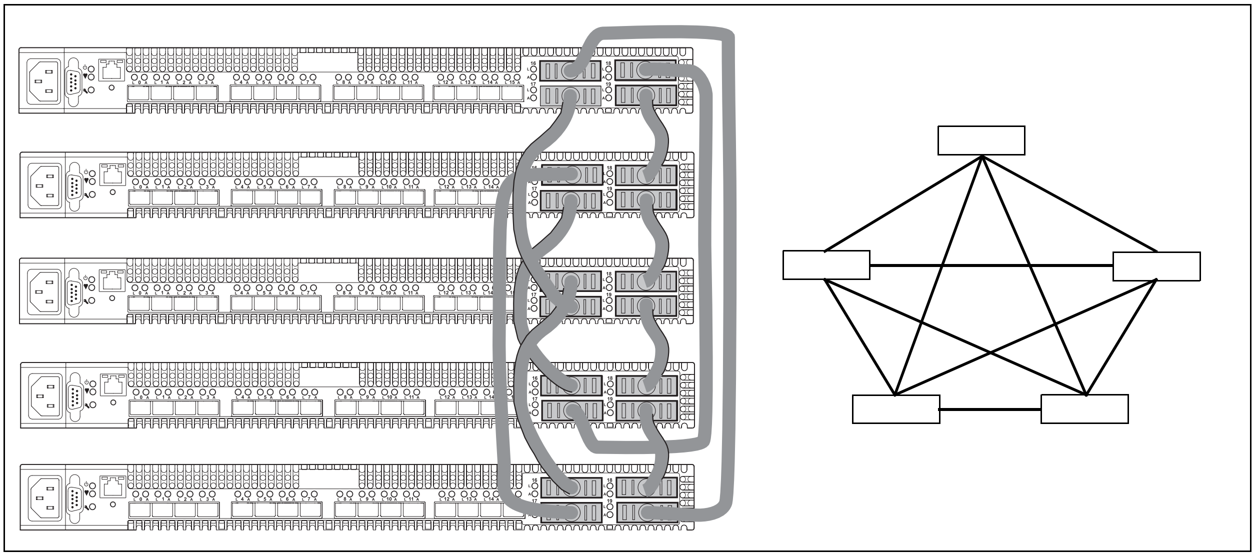


Figure 3-4. Five Switch Stack

Figure 3-5 shows a six-switch stack of model 5000 switches using eight XPAK switch stacking cables. Ninety-six 1/2/4-Gbps ports are available for devices.

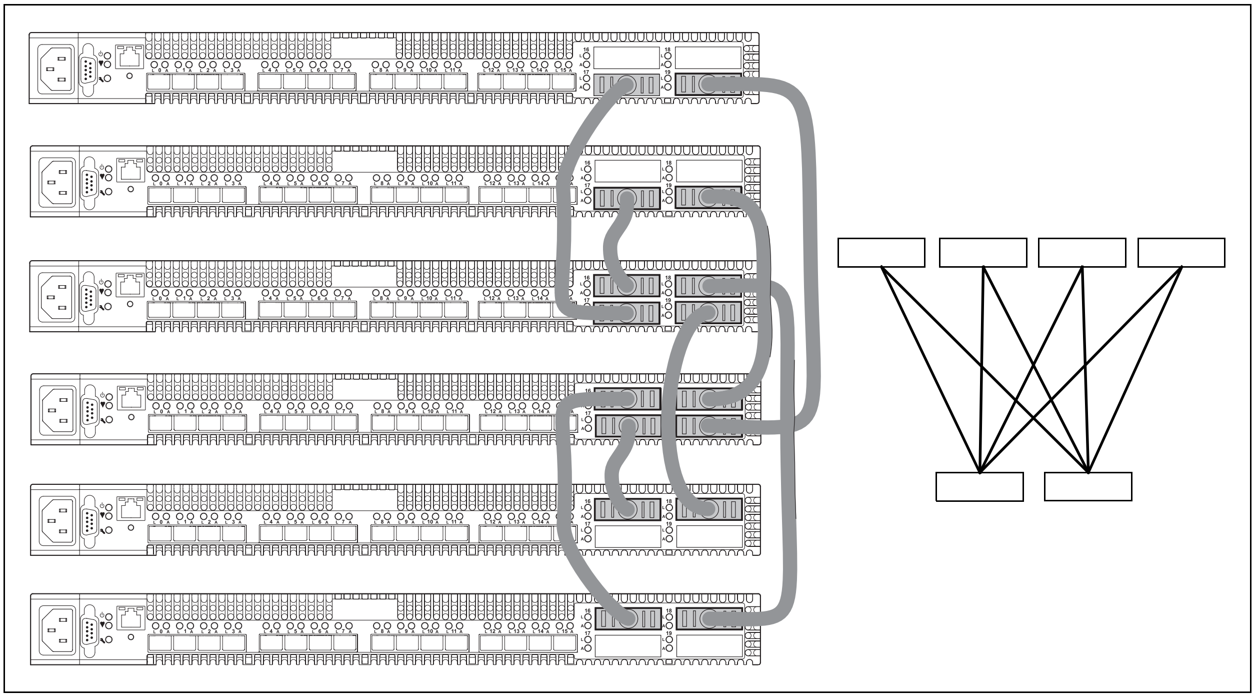


Figure 3-5. Six Switch Stack

3.5.4
Common Topologies

The SANbox 5000 Series switch supports the following topologies using the 1/2/4-Gbps Fibre Channel ports:

- Cascade Topology
- Mesh Topology
- MultiStage Topology

3.5.4.1
Cascade Topology

A cascade topology describes a fabric in which the switches are connected in series. If you connect the last switch back to the first switch, you create a cascade-with-a-loop topology as shown in Figure 3-6. The loop reduces latency because any switch can route traffic in the shortest direction to any switch in the loop. The loop also provides failover should a switch fail.

- Each chassis link contributes up to 425 MB of bandwidth between chassis, 850 MB in full duplex. However, because of the sequential structure, that bandwidth will be shared by traffic between devices on other chassis.
- Latency between any two ports is no more than two chassis hops.
- 48 1/2/4-Gbps Fibre Channel ports are available for devices.

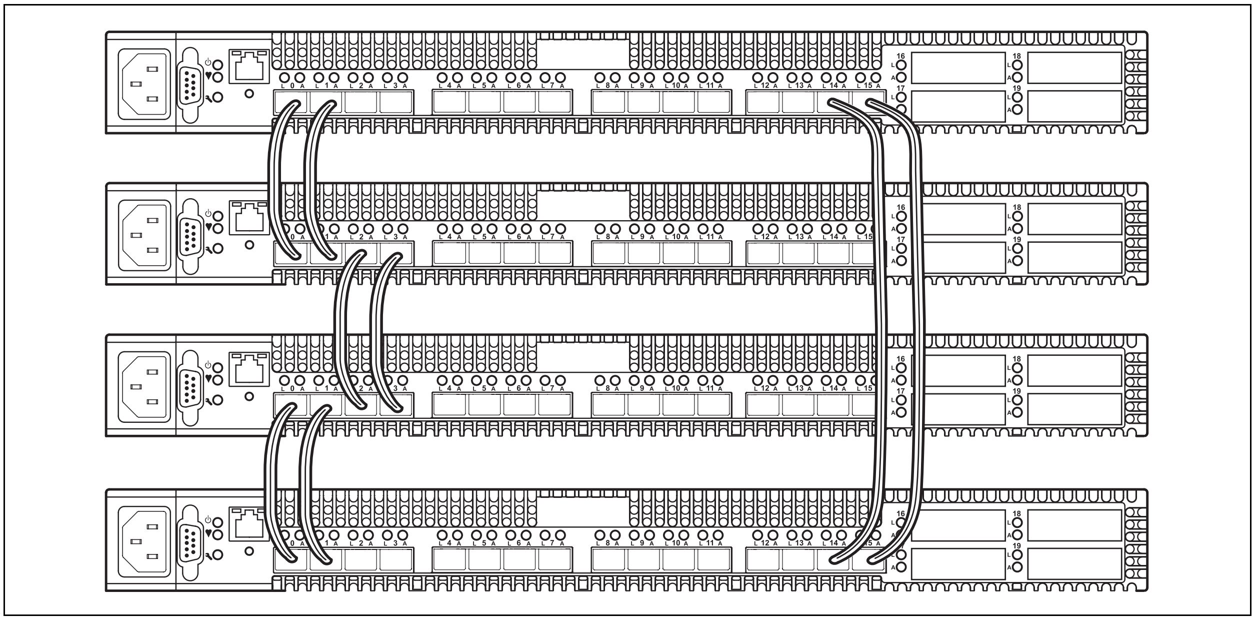


Figure 3-6. Cascade-with-a-Loop Topology

3.5.4.2
Mesh Topology

A mesh topology describes a fabric in which each chassis has at least one port directly connected to each other chassis in the fabric. Using 16-port SANbox 5000 Series switches the mesh fabric shown in Figure 3-7 has the following characteristics:

- Each link contributes up to 425 MB of bandwidth between switches, 850 MB in full duplex. Because of multiple parallel paths, there is less competition for this bandwidth than with a cascade or a Multistage topology.
- Latency between any two ports is one chassis hop.
- 40 1/2/4-Gbps Fibre Channel ports are available for devices.

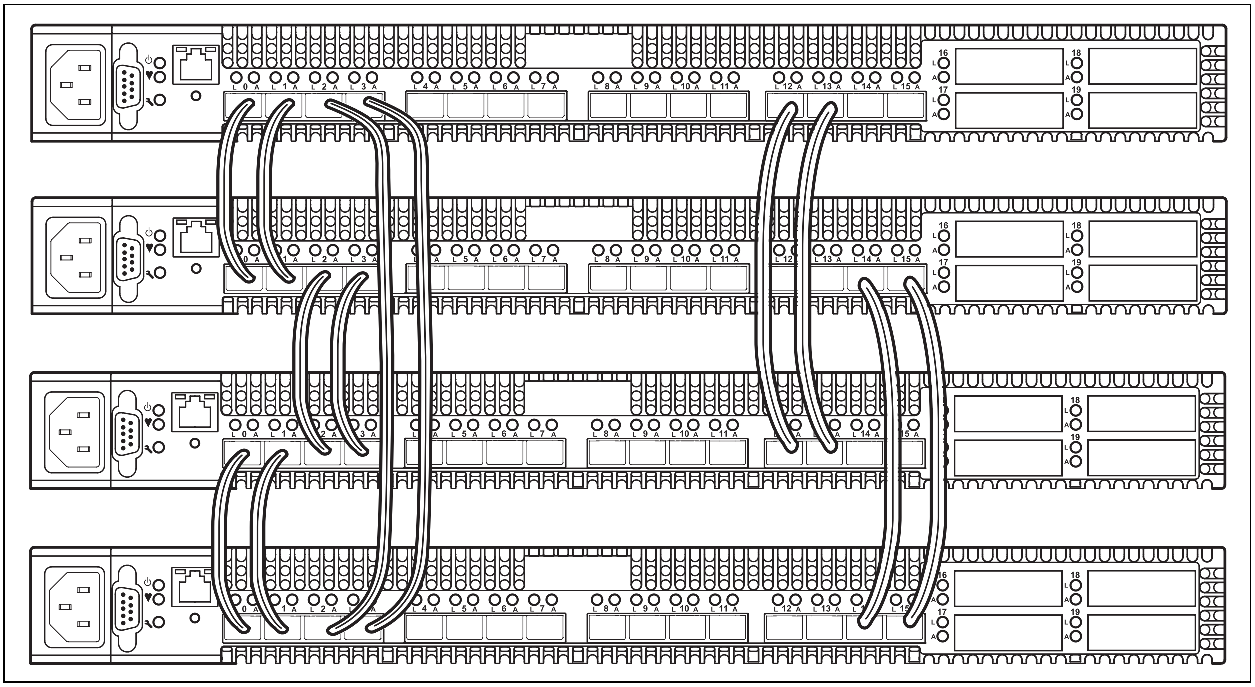


Figure 3-7. Mesh Topology

3.5.4.3
MultiStage Topology

- Each link contributes up to 425 MB of bandwidth between chassis. Competition for this bandwidth is less than that of a cascade topology, but greater than that of the mesh topology.
- Latency between any two ports is no more than two chassis hops.
- 52 1/2/4-Gbps Fibre Channel ports are available for devices.

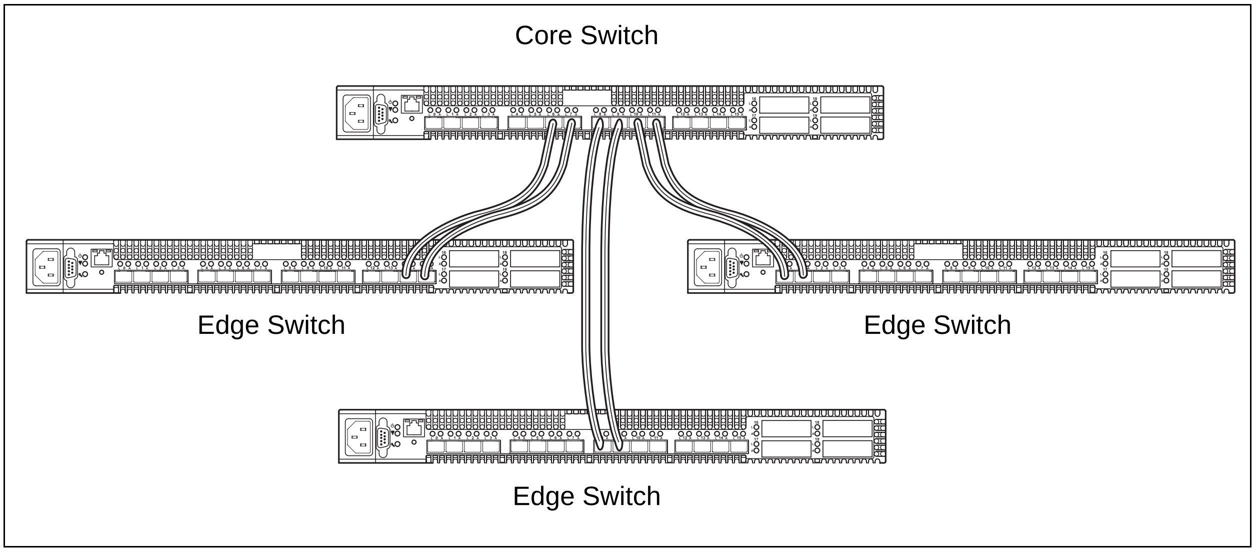


Figure 3-8. Multistage Topology

3.6
Switch Services

You can configure your switch to suit the demands of your environment by enabling or disabling a variety of switch services. Familiarize yourself with the following switch services and determine which ones you need. Notice that the SSH and SSL services require the Fabric Security license key.

- **Telnet**: Provides for the management of the switch over a Telnet connection. Disabling this service is not recommended. The default is enabled.
- **Secure Shell (SSH)**: Provides for secure remote connections to the switch using SSH. Your workstation must also use an SSH client. The default is disabled. This service requires the Fabric Security license key.
- **GUI Management**: Provides for out-of-band management of the switch with Enterprise Fabric Suite 2007, the Application Programming Interface (API), SNMP, and SMI-S. If this service is disabled, the switch can only be managed inband or through the serial port. The default is enabled.
- **Inband Management**: Provides for the management of the switch over an inter-switch link using Enterprise Fabric Suite 2007, SNMP, management server, or the API. If you disable inband management, you can no longer communicate with that switch by means other than an Ethernet or serial connection.The default is enabled.
- **Secure Socket Layer (SSL)**: Provides for secure SSL connections for Enterprise Fabric Suite 2007, the QuickTools web applet, the API, and SMI-S. This service must be enabled to authenticate users through a RADIUS server when using Enterprise Fabric Suite 2007. To enable secure SSL connections, you must first synchronize the date and time on the switch and workstation. Enabling SSL automatically creates a security certificate on the switch. The default is enabled. This service requires the Fabric Security license key.
- **QuickTools web applet (EmbeddedGUI)**: Provides for access to the QuickTools web applet. QuickTools enables you to point at a switch with an internet browser and manage the switch through the browser. The default is enabled.
- **Simple Network Management Protocol (SNMP)**: Provides for the management of the switch through third-party applications that use the Simple Network Management Protocol (SNMP). Security consists of a read community string and a write community string that serve as passwords that control read and write access to the switch. These strings are set at the factory to these well-known defaults and should be changed if SNMP is to be enabled. Otherwise, you risk unwanted access to the switch. The default is enabled.

- **Common Information Model (CIM)**: Provides for the management of the switch through third-party applications that use the Storage Management Initiative–Specification (SMI-S). The default is enabled.
- **File Transfer Protocol (FTP)**: Provides for transferring files rapidly between the workstation and the switch using FTP. The default is enabled.
- **Management Server (MS)**: Enables or disables the management of the switch through third-party applications that use GS-3 Management Server. The default is disabled.

3.7 Fabric Security

An effective security profile begins with a security policy that states the requirements. A threat analysis is needed to define the plan of action followed by an implementation that meets the security policy requirements. Internet portals, such as remote access and E-mail, usually present the greatest threats. Fabric security should also be considered in defining the security policy.

Most fabrics are located at a single site and are protected by physical security, such as key-code locked computer rooms. For these cases, security methods such as user passwords for equipment and zoning for controlling device access, are satisfactory.

Fabric security is needed when security policy requirements are more demanding: for example, when fabrics span multiple locations and traditional physical protection is insufficient to protect the IT infrastructure. Another benefit of fabric security is that it creates a structure that helps prevent unintended changes to the fabric.

Fabric security consists of the following:

- Connection Security
- User Account Security
- Port Binding
- Device Security

3.7.1 Connection Security

NOTE: You must install the Fabric Security license key to secure connections using SSH and SSL.

Connection security provides an encrypted data path for switch management methods. The switch supports the Secure Shell (SSH) protocol for the command line interface and the Secure Socket Layer (SSL) protocol for management applications such as Enterprise Fabric Suite 2007 and SMI-S.

The SSL handshake process between the workstation and the switch involves the exchanging of certificates. These certificates contain the public and private keys that define the encryption. When the SSL service is enabled, a certificate is automatically created on the switch. The workstation validates the switch certificate by comparing the workstation date and time to the switch certificate creation date and time. For this reason, it is important to synchronize the workstation and switch with the same date, time, and time zone. The switch certificate is valid 24 hours before its creation date and 365 days after its creation date. If the certificate should become invalid, create a new certificate using the Create Certificate CLI command. Refer to the *SANbox 5000 Series Fibre Channel Switch Installation Guide* for information about the Create Certificate CLI command.

Consider your requirements for connection security: for the command line interface (SSH), management applications such as Enterprise Fabric Suite 2007 (SSL), or both. Access to the device security menu selections in Enterprise Fabric Suite 2007 requires an SSL connection. If an SSL connection security is required, also consider using the Network Time Protocol (NTP) to synchronize workstations and switches.

3.7.2 User Account Security

User account security consists of the administration of account names, passwords, expiration date, and authority level. If an account has Admin authority, all management tasks can be performed by that account in the CLI, QuickTools, and Enterprise Fabric Suite 2007™. Otherwise only monitoring tasks are available. The default account name, Admin, is the only account that can create or add account names and change passwords of other accounts. All users can change their own passwords. Account names and passwords are always required when connecting to a switch.

Authentication of the user account and password can be performed locally using the switch’s user account database or it can be done remotely using a RADIUS server such as Microsoft® RADIUS. Authenticating user logins on a RADIUS server requires a secure management connection to the switch. Refer to “Connection Security” on page 3-17 for information about securing the management connection. A RADIUS server can also be used to authenticate devices and other switches as described in “Device Security” on page 3-19.

Consider your management needs and determine the number of user accounts, their authority needs, and expiration dates. Also consider the advantages of centralizing user administration and authentication on a RADIUS server.

NOTE: If the same user account exists on a switch and its RADIUS server, that user can login with either password, but the authority and account expiration will always come from the switch database.

3.7.3 Port Binding

Port binding provides authorization for a list of up to 32 switch and device WWNs that are permitted to log in to a particular switch port. Switches or devices that are not among the 32 are refused access to the port. Consider what ports to secure and the set of switches and devices that are permitted to log in to those ports.

3.7.4
Device Security

NOTE: You must install the Fabric Security license key to configure and activate device security and RADIUS servers. If you are upgrading your switch firmware to version 6.7 from version 5.x, you are granted a 30-day temporary license.

Device security provides for the authorization and authentication of devices that you attach to a switch. You can configure a switch with a group of devices against which the switch authorizes new attachments by devices, other switches, or devices issuing management server commands. Device security is configured through the use of security sets and groups.

A group is a list of device worldwide names that are authorized to attach to a switch. There are three types of groups: one for other switches (ISL), another for devices (port), and a third for devices issuing management server commands (MS).

A security set is a set of up to three groups with no more than one of each group type. The security configuration is made up of all security sets on the switch. The security database has the following limits:

- Maximum number of security sets is 4.
- Maximum number of groups is 16.
- Maximum number of members in a group is 1000.
- Maximum total number of group members is 1000.

In addition to authorization, the switch can be configured to require authentication to validate the identity of the connecting switch, device, or host. Authentication can be performed locally using the switch’s security database, or remotely using a Remote Dial-In User Service (RADIUS) server such as Microsoft® RADIUS. With a RADIUS server, the security database for the entire fabric resides on the server. In this way, the security database can be managed centrally, rather than on each switch. You can configure up to five RADIUS servers to provide failover.

You can configure the RADIUS server to authenticate just the switch or both the switch and the initiator device if the device supports authentication. When using a RADIUS server, every switch in the fabric must have a network connection. A RADIUS server can also be configured to authenticate user accounts as described in “User Account Security” on page 3-17. A secure connection is required to authenticate user logins with a RADIUS server. Refer to “Connection Security” on page 3-17 for more information.

Consider the devices, switches, and management agents and evaluate the need for authorization and authentication. Also consider whether the security database is to distributed on the switches or centralized on a RADIUS server and how many servers to configure.

The following examples illustrate how to configure a security database:

- Security Example: Switches and HBAs with Authentication
- Security Example: RADIUS Server
- Security Example: Host Authentication

3.7.4.1
Security Example: Switches and HBAs with Authentication

Consider the fabric shown in Figure 3-9. In this fabric, Switch_1, HBA_1, and Switch_2 support authentication while the JBOD and HBA_2 do not. The objective is to secure F_Ports and E_Ports in the fabric. To do this, configure security on the devices that support security: Switch_1, Switch_2, and HBA_1.

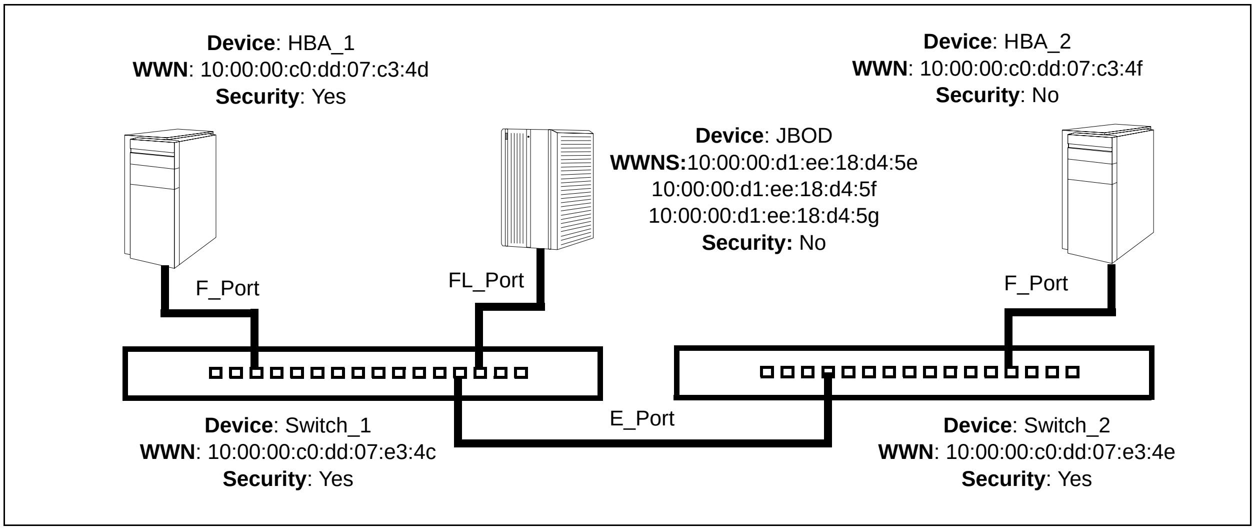


Figure 3-9. Security Example: Switches and HBAs

1. Create a security set (Security_Set_1) on Switch_1.
   a. Create a port group (Group_Port_1) in Security_Set_1 with Switch_1, HBA_1, and JBOD as members.

Port Group on Switch_1: Group_Port_1	
Switch_1	Node WWN: 10:00:00:c0:dd:07:e3:4c Authentication: CHAP Primary Hash: MD5 Primary Secret: 0123456789abcdef
HBA_1	Node WWN: 10:00:00:c0:dd:07:c3:4d Authentication: CHAP Primary Hash: MD5 Primary Secret: fedcba9876543210
JBOD	Node WWN: 10:00:00:d1:ee:18:d4:5e Authentication: None Node WWN: 10:00:00:d1:ee:18:d4:5f Authentication: None Node WWN: 10:00:00:d1:ee:18:d4:5g Authentication: None

- Switch_1 and all devices and switches connected to Switch_1 must be included in the group even if the switch or devices does not support authentication. Others wise, the Switch_1 port will isolate.
- You must specify HBAs by node worldwide name. Switches can be specified by port or node worldwide name. The type of switch worldwide name you use in the switch security database must be the same as that in the HBA security database. For example, if you specify a switch with a port worldwide name in the switch security database, you must also specify that switch in the HBA security database with the same port worldwide name.
- For CHAP authentication, create 32-character hexadecimal or 16-character ASCI secrets. The switch secret must be shared with the HBA security database.

b. Create an ISL group (Group_ISL_1) in Security_Set_1 with Switch_1, Switch_2, HBA1, and JBOD as members. The Switch_1 secret must be shared with the Switch_2 security database.

ISL Group on Switch_1: Group_ISL_1	
Switch_1	Node WWN: 10:00:00:c0:dd:07:e3:4c Authentication: CHAP Primary Hash: MD5 Primary Secret: 0123456789abcdef Binding: None
Switch_2	Node WWN: 10:00:00:c0:dd:07:e3:4e Authentication: CHAP Primary Hash: MD5 Primary Secret: abcdefabcdef012 Binding: None

2. Configure security on HBA_1 using the appropriate management tool. Logins between the Switch_1 and HBA_1 will be challenged for their respective secrets. Therefore, the secrets for Switch_1 and HBA_1 that you configured on Switch_1 must also be configured on HBA_1.
3. Save and activate Security_Set_1 on Switch_1.
4. Create a security set (Security_Set_2) on Switch_2. Create an ISL group (Group_ISL_2) in Security_Set_2 with Switch_2 and Switch_1 as members.

ISL Group on Switch_2: Group_ISL_2	
Switch_2	Node WWN: 10:00:00:c0:dd:07:e3:4e Authentication: CHAP Primary Hash: MD5 Primary Secret: 0123456789abcdef Binding: None
Switch_1	Node WWN: 10:00:00:c0:dd:07:e3:4c Authentication: CHAP Primary Hash: MD5 Secret: abcdefabcdef012 Binding: None

5. Save and activate Security_Set_2 on Switch_2.

3.7.4.2

Security Example: RADIUS Server

Consider the fabric shown in Figure 3-10. This fabric is similar to the one shown in Figure 3-9 with the addition of Radius_1 acting as a RADIUS server. Authorization and authentication is passed from the switch to Radius_1 in the following cases:

- HBA_1 login to Switch_1
- Switch_1 login to Switch_2
- Switch_2 login to Switch_1

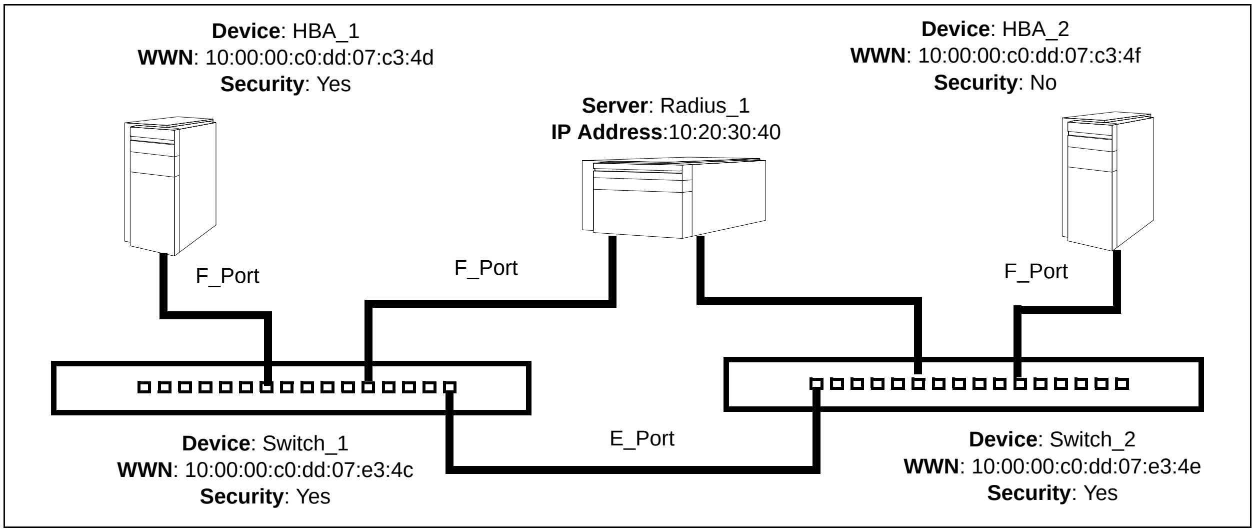


Figure 3-10. Security Example: RADIUS Server

1. Configure the Radius_1 host as a RADIUS server on Switch_1 and Switch_2 to authenticate device logins. Specify the server IP address and the secret with which the switches will authenticate with the server. Configure the switches so that devices authenticate through the switches only if the RADIUS server is unavailable.

Radius_1 Configuration on Switch_1 and Switch_2	
Device Authentication Order	RadiusLocal – Authenticate devices using the RADIUS server security database first. If the RADIUS server is unavailable, then use the local switch security database.
Total Servers	1 – Enables support for one RADIUS server
Device Authentication Server	True – Enables Radius_1 to authenticate device logins.
Server IP Address	10.20.30.40
Secret	1234567890123456 – 16-character ASCI string (MD5 hash). This is the secret that allows direct communication with the RADIUS server.

2. Create a security set (Security_Set_1) on Switch_1.

    a. Create a port group (Group_Port_1) in Security_Set_1 with Switch_1 and HBA_1 as members.

Port Group on Switch_1: Group_Port_1	
Switch_1	Node WWN: 10:00:00:c0:dd:07:e3:4c Authentication: CHAP Primary Hash: MD5 Primary Secret: 0123456789abcdef
HBA_1	Node WWN: 10:00:00:c0:dd:07:c3:4d Authentication: CHAP Primary Hash: MD5 Primary Secret: fedcba9876543210

- Switch_1 and all devices and switches connected to Switch_1 must be included in the group even if the switch or device does not support authentication. Others wise, the Switch_1 port will isolate.
- You must specify HBAs by node worldwide name. Switches can be specified by port or node worldwide name. The type of switch worldwide name you use in the switch security database must be the same as that in the HBA security database. For example, if you specify a switch with a port worldwide name in the switch security database, you must also specify that switch in the HBA security database with the same port worldwide name.
- For CHAP authentication, create 32-character hexadecimal or 16-character ASCI secrets. The switch secret must be shared with the HBA security database.

b. Create an ISL group (Group_ISL_1) in Security_Set_1 with Switch_1 and Switch_2 as members. The Switch_1 secret must be shared with the Switch_2 security database.

ISL Group on Switch_1: Group_ISL_1	
Switch_1	Node WWN: 10:00:00:c0:dd:07:e3:4c Authentication: CHAP Primary Hash: MD5 Primary Secret: 0123456789abcdef Binding: None
Switch_2	Node WWN: 10:00:00:c0:dd:07:e3:4e Authentication: CHAP Primary Hash: MD5 Primary Secret: abcdefabcdef012 Binding: None

3. Configure security on HBA_1 using the appropriate management tool. Logins between the Switch_1 and HBA_1 will be challenged (CHAP) for their respective secrets. Therefore, the secrets for Switch_1 and HBA_1 that you configured on Switch_1 must also be configured on HBA_1.
4. Save and activate Security_Set_1 on Switch_1.
5. Create a security set (Security_Set_2) on Switch_2. Create an ISL group (Group_ISL_2) in Security_Set_2 with Switch_1 and Switch_2 as members.

ISL Group on Switch_2: Group_ISL_2	
Switch_2	Node WWN: 10:00:00:c0:dd:07:e3:4e Authentication: CHAP Primary Hash: MD5 Primary Secret: abcdefabcdef0123 Binding: None
Switch_1	Node WWN: 10:00:00:c0:dd:07:e3:4c Authentication: CHAP Primary Hash: MD5 Primary Secret: 0123456789abcdef Binding: None

6. Save and activate Security_Set_2 on Switch_2.

3.7.4.3 Security Example: Host Authentication

Consider the fabric shown in Figure 3-11. In this fabric, only Switch_2 and HBA_2/APP_2 support security, where APP_2 is a host application. The objective is to secure the management server on Switch_2 from unauthorized access by an HBA or an associated host application.

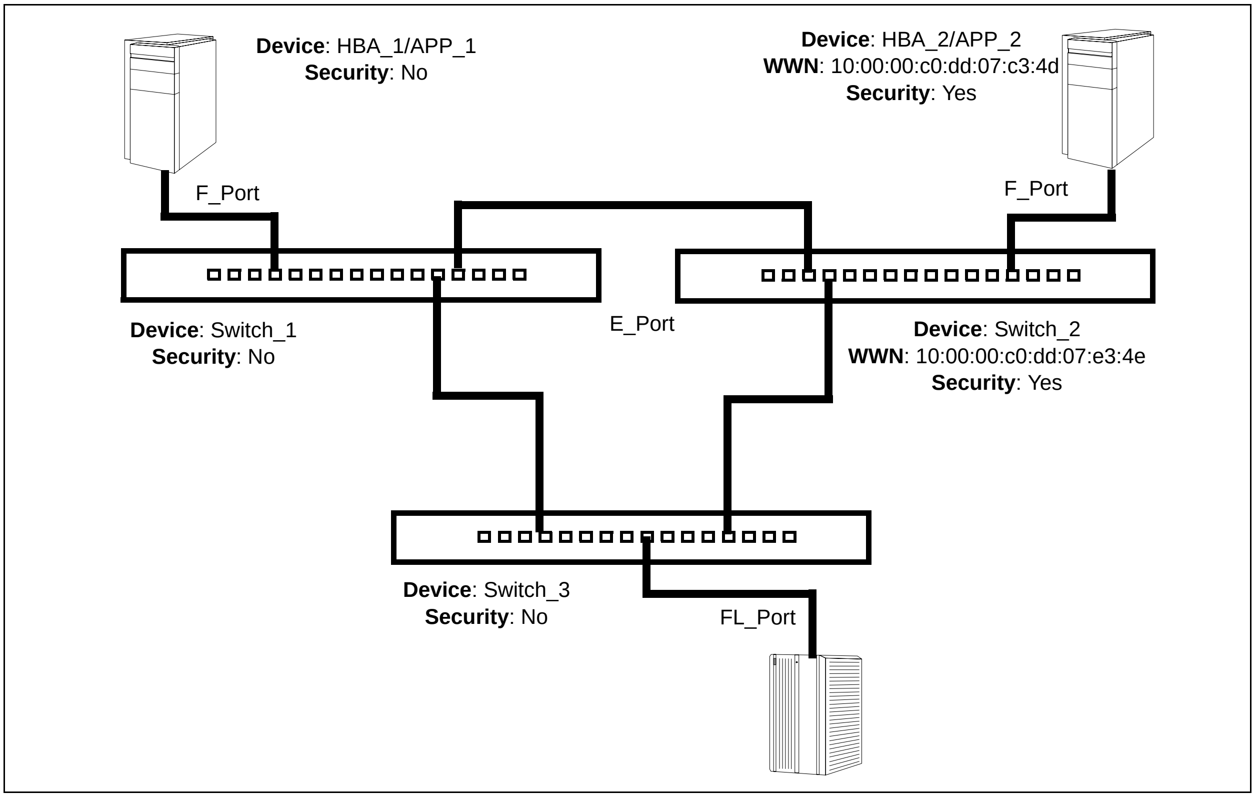


Figure 3-11. Security Example: Management Server

1. Create a security set (Security_Set_2) on Switch_2.
2. Create a Management Server group (Group_1) in Security_Set_2 with Switch_2 and HBA_2 or APP_2 as its member.
    - You must specify HBAs by node worldwide name. Switches can be specified by port or node worldwide name. The type of switch worldwide name you use in the switch security database must be the same as that in the HBA security database. For example, if you specify a switch with a port worldwide name in the switch security database, you must also specify that switch in the HBA security database with the same port worldwide name.
    - For MD5 authentication, create secrets.

MS Group: Group_1	
Switch_2	Node WWN: 10:00:00:c0:dd:07:c3:4e CT Authentication: True Hash: MD5 Secret: 9876543210fedcba9
HBA_2 or APP_2	Node WWN: 10:00:00:c0:dd:07:c3:4d CT Authentication: True Hash: MD5 Secret: fedcba9876543210

3. Configure security on HBA_2 or APP_2 using the appropriate management tool. Logins between the Switch_2 and HBA_2 or APP_2 will be challenged (MD5) for their respective secrets. Therefore, the secrets that you configured for HBA_2 or APP_2 on Switch_2 must also be configured on HBA_2 or APP_2.
4. Save and activate Security_Set_2.

3.8 Fabric Management

The Enterprise Fabric Suite 2007 application executes on a management workstation and provides for the configuration, control, and maintenance of multiple fabrics. Supported platforms include Windows, Solaris, Linux, and MacOS X. Enterprise Fabric Suite 2007 comes with a 30-day trial license – a permanent license is available for purchase from your authorized reseller.

The browser-based application, QuickTools, and the CLI reside in the switch firmware and provide for the management of individual switches in a single fabric.

Consider how many fabrics and switches will be managed, how many management workstations are needed, and whether the fabrics will be managed with Enterprise Fabric Suite 2007, QuickTools, or the CLI.

A switch supports a combined maximum of 19 logins reserved as follows:

- 4 logins or sessions for internal applications such as management server and SNMP
- 9 high priority Telnet sessions
- 6 logins or sessions for Enterprise Fabric Suite 2007 inband and out-of-band logins, Application Programming Interface (API) inband and out-of-band logins, and Telnet logins. Additional logins will be refused.

Notes

Section 4
Installation

This section describes how to install and configure the switch. The following topics are covered:

- Site Requirements
- Installing a Switch
- Installing Firmware
- Adding a Switch to an Existing Fabric
- Installing Feature License Keys

4.1
Site Requirements

Consider the following items when installing a SANbox 5000 Series switch:

- Fabric Management Workstation
- Switch Power Requirements
- Environmental Conditions

4.1.1
Fabric Management Workstation

The requirements for fabric management workstations are described in Table 4-1:

Table 4-1. Management Workstation Requirements

Operating System	■ Windows 2003 SP1/SP2, XP ■ Solaris 9, 10, 10 x86 ■ Red Hat® Enterprise Linux® 3, 4 ■ SUSE™ Linux Enterprise Server 9, 10 ■ Mac® OS X 10.4
Memory	256 MB or more
Disk Space	150 MB per installation (Enterprise Fabric Suite 2007)
Processor	1 GHz or faster
Internet Browser	Microsoft® Internet Explorer® 5.0 or later Netscape Navigator® 6.0 and later Mozilla™ 1.5 and later Safari® 1.0 and later Firefox 1.0 and later Java 2 Standard Edition Runtime Environment 1.4.2 for QuickTools

Telnet workstations require an RJ-45 Ethernet port or an RS-232 serial port and an operating system with a Telnet client.

4.1.2
Switch Power Requirements

Power requirements are 1 Amp at 100 VAC or 0.5 A at 240 VAC.

4.1.3
Environmental Conditions

Consider the factors that affect the climate in your facility such as equipment heat dissipation and ventilation. The switch requires the following operating conditions:

- Operating temperature range: 5–40°C (41–104°F)
- Relative humidity: 15–80%, non-condensing

4.2
Installing a Switch

Unpack the switch and accessories. The SANbox 5000 Series product is shipped with the components shown in Figure 4-1:

- SANbox 5000 Series Fibre Channel Switch (1) with firmware installed
- Power cords

  (1) –model 5200/5600

  (2) –model 5202/5602
- Rubber feet (4)
- Mounting brackets (2) – model 5200/5600
- CD-ROM containing a 30-day trial license for Enterprise Fabric Suite 2007 switch management application, release notes, and documentation.

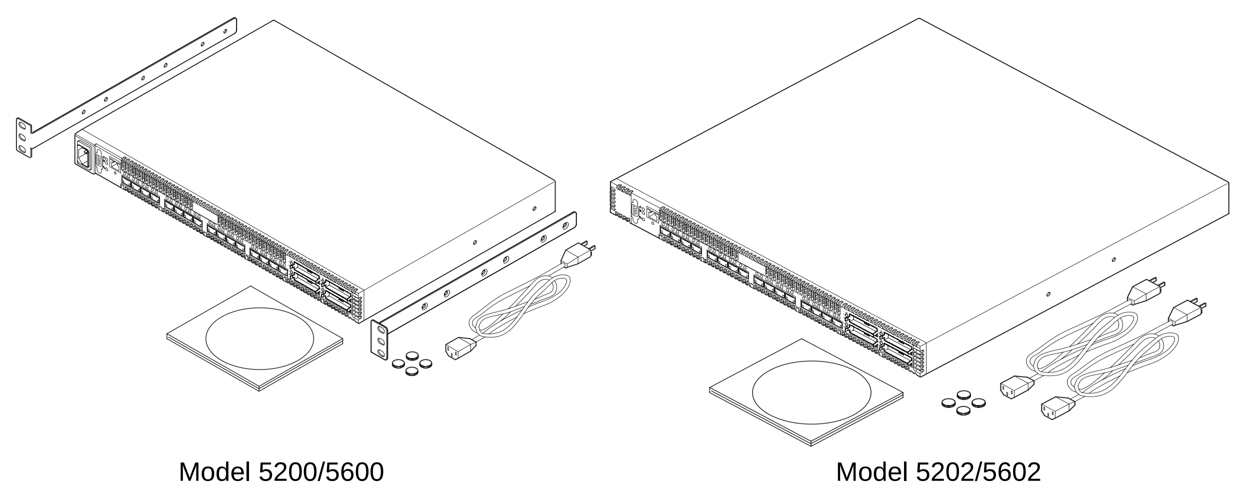


Figure 4-1. SANbox 5000 Series Fibre Channel Switch

Installing a SANbox 5000 Series switch involves the following steps:

1. Mount the Switch
2. Install Transceivers
3. Configure the Workstation
4. Connect the Workstation to the Switch
5. Connect the Switch to AC Power
6. Configure the Switch
7. Cable Devices to the Switch

4.2.1
Mount the Switch

The switch can be placed on a flat surface and stacked or mounted in a 19" EIA rack. Refer to "Dimensions" on page A-4 for weight and dimensional specifications. Adhesive rubber feet are provided for surface mounts. Without the rubber feet, the switch occupies 1U of space in an EIA rack.

- A model 5200/5600 switch can be rack mounted without rails, however, rail kits are available from General Devices™ Company, model number C-874:

  General Devices Company, LTD.
  P.O. Box 39100
  Indianapolis, IN 46239-0100
  317-897-7000
  www.generaldevices.com

- A model 5202/5602 switch requires a QLogic rail kit (part numbers SB5202-RACKKIT and SB5602-RACKKIT) for rack mounting.

WARNING!! Mount switches in the rack so that the weight is distributed evenly. An unevenly loaded rack can become unstable possibly resulting in equipment damage or personal injury.

AVERTISSEMENT!!

Installer les commutateurs dans l'armoire informatique de sorte que le poids soit réparti uniformément. Une armoire informatique déséquilibré risque d'entraîner des blessures ou d'endommager l'équipement.

WARNUNG!! Switches so in das Rack einbauen, dass das Gewicht gleichmäßig verteilt ist. Ein Rack mit ungleichmäßiger Gewichtsverteilung kann schwanken/umfallen und Gerätbeschädigung oder Verletzung verursachen.

WARNING!! If the switch is mounted in a closed or multi-rack assembly, the operating temperature of the rack environment may be greater than the ambient temperature. Be sure to install the chassis in an environment that is compatible with the maximum rated ambient temperature. Refer to "Environmental" on page A-5 for technical specifications.

Do not restrict chassis air flow. Allow 16 cm (6.5 in) minimum clearance at the front and rear of the switch (surface mount) or rack for service access and ventilation.

Multiple rack-mounted units connected to the AC supply circuit may overload that circuit or overload the AC supply wiring. Consider the power source capacity and the total power usage of all switches on the circuit. Refer to "Electrical" on page A-5.

Reliable grounding in the rack must be maintained from the switch chassis to the AC power source.

To mount a model 5200/5600 switch in a rack without the use of rails, fasten the brackets to the switch as shown in Figure 4-2. Choose the bracket screw holes to produce the setback you want. Place the switch in the rack and fasten the bracket flanges to the rack with two screws on each side.

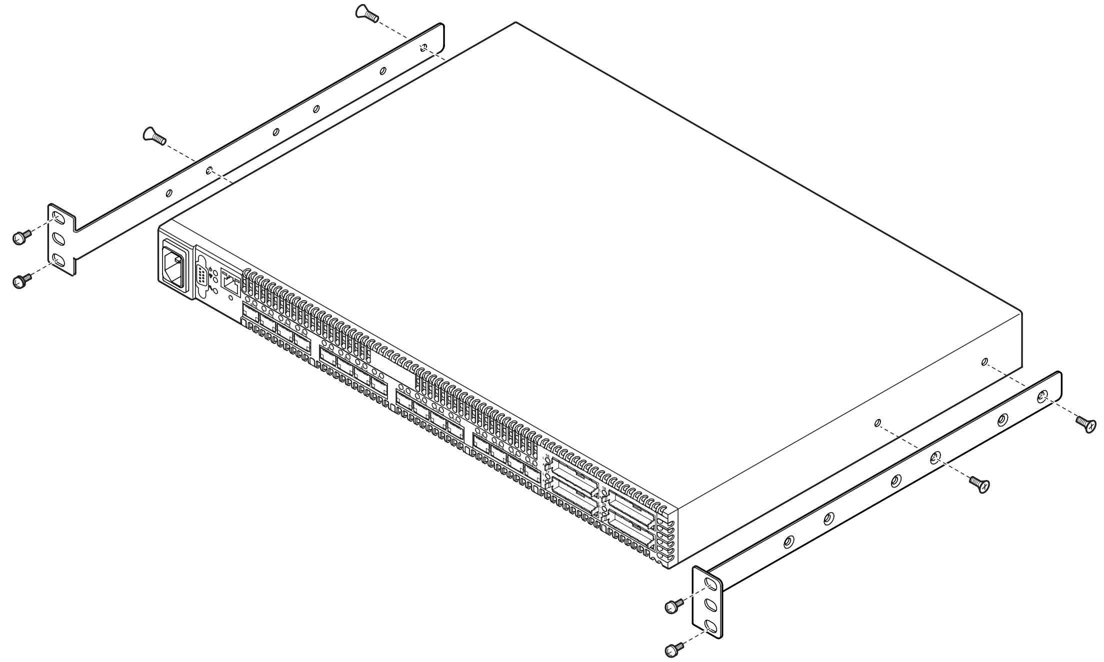
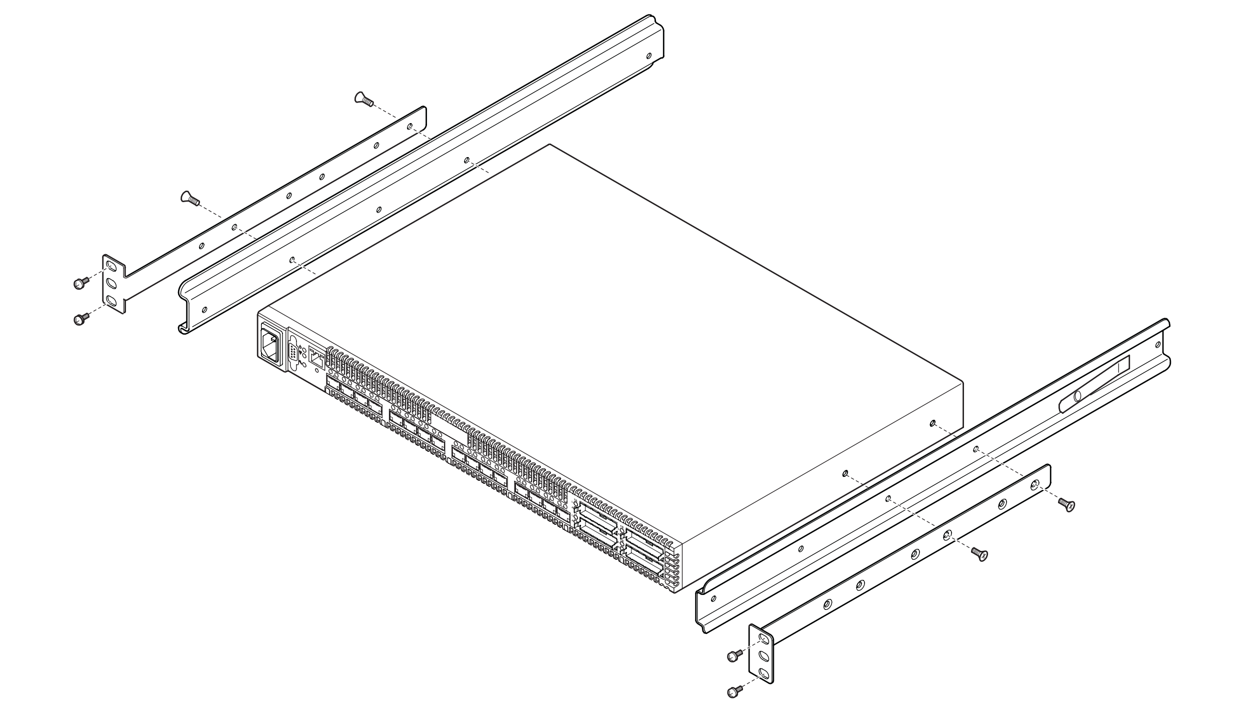


Figure 4-2. Mounting the Model 5200/5600 Switch in a Rack without Rails

To mount a model 5200/5600 switch in a rack using the General Devices C-874 rail kit, you must fasten the switch brackets and inner rails to the switch as shown in Figure 4-3. Use the screws that come with the rail kit. Refer to the rail kit instructions for complete information.

Figure 4-3. Mounting the Model 5200/5600 Switch in a Rack with a Rail Kit



4.2.2
Install Transceivers

The switch supports a variety of SFP and XPAK transceivers. To install a transceiver, insert the transceiver into the port and gently press until it snaps in place. To remove a transceiver, gently press the transceiver into the port to release the tension, then pull on the release tab or lever and remove the transceiver. Different transceiver manufacturers have different release mechanisms. Consult the documentation for your transceiver.

NOTE: The transceiver will fit only one way. If the transceiver does not install under gentle pressure, flip it over and try again.

CAUTION! To maintain proper air flow and prevent the switch from overheating, keep covers installed in unused 10-Gbps ports.

If you are using the 10-Gbps ports, remove the port covers by the cover tabs using your fingers or pliers as shown in Figure 4-4.

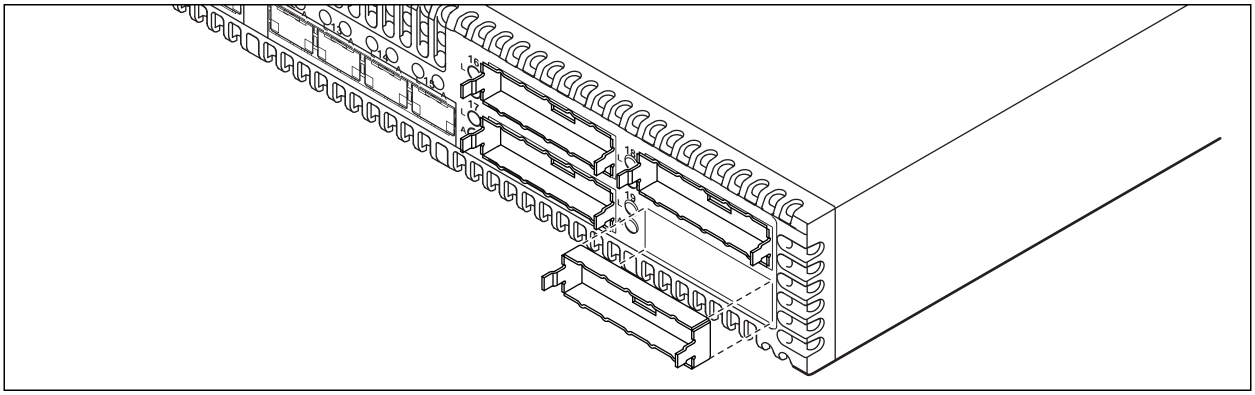


Figure 4-4. Removing 10-Gbps Port Covers

To install XPAK switch stacking cables, position the cable connectors with the circuit board toward the mid line of the respective switch faceplates as shown in Figure 4-5. When installing the 3-inch XPAK switch stacking cable, insert the cable connectors into the 10-Gbps ports at the same time.

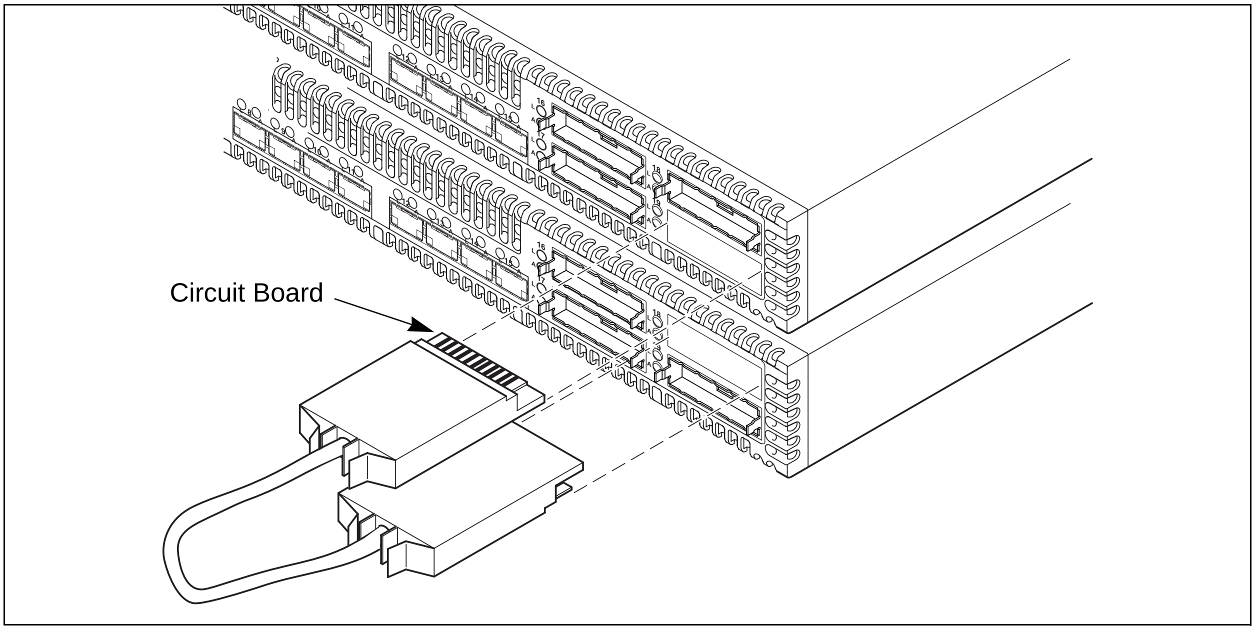


Figure 4-5. Installing XPAK Switch Stacking Cables

4.2.3

Configure the Workstation

If you plan to use the command line interface to configure and manage the switch, you must configure the workstation. This involves setting the workstation IP address for Ethernet connections, or configuring the workstation serial port. If you plan to use QuickTools or Enterprise Fabric Suite 2007 to manage the switch, the Configuration Wizard manages the workstation IP address for you – proceed to "Connect the Workstation to the Switch" on page 4-10.

4.2.3.1

Configuring the Workstation IP Address for Ethernet Connections

The default IP address of a new switch is 10.0.0.1. To ensure that your workstation is configured to communicate with the 10.0.0 subnet, refer to the following instructions for your workstation:

- For a Windows workstation, do the following:
  1. Choose the **Start** button. Choose **Settings**>**Control Panel**>**Network and Dial-Up Connections**.
  2. Choose **Make New Connection**.
  3. Click the **Connect to a private network through the Internet** radio button then click the **Next** button.
  4. Enter 10.0.0.253 for the IP address.
- For a Linux or Solaris workstation, open a command window and enter the following command where (interface) is your interface name:

```
ifconfig (interface) ipaddress 10.0.0.253 netmask 255.255.255.0 up
```

- For a MacOS X workstation, do the following:
  1. Choose **System Preferences>System Preferences>Network**.
  2. Double-click your network adapter.
  3. In the configuration dialog, select **Manually** from the Configure IPv4 drop down menu.
  4. Enter 10.0.0.253 in the IP Address field.
  5. Enter 255.255.255.0 in the Subnet Mask field.
  6. Click **Apply Now**.

4.2.3.2
Configuring the Workstation Serial Port

To configure the workstation serial port, do the following:

1. Connect a null modem F/F DB9 cable from a COM port on the management workstation to the RS-232 serial port on the switch.
2. Configure the workstation serial port according to your platform:
   - For Windows:
     a. Open the HyperTerminal application. Choose the **Start** button, select **Programs, Accessories, HyperTerminal,** and **HyperTerminal**.
     b. Enter a name for the switch connection and choose an icon in the Connection Description window. Choose the **OK** button.
     c. Enter the following COM Port settings in the COM Properties window and choose the **OK** button.
        - ❑ Bits per second: 9600
        - ❑ Data Bits: 8
        - ❑ Parity: None
        - ❑ Stop Bits: 1
        - ❑ Flow Control: None
   - For Linux:
     a. Set up minicom to use the serial port. Create or modify the /etc/minirc.dfl file with the following content.
     ```
     pr portdev/ttyS0
     pu minit
     pu mreset
     pu mhangup
     ```
     b. Verify that all users have permission to run minicom. Review the /etc/minicom.users file and confirm that the line "ALL" exists or that there are specific user entries.
   - For Solaris: Modify the /etc/remote file to include the following lines. /dev/term/a refers to serial port a. Choose the "dv" setting to match the workstation port to which you connected to the switch.

   ```
   hardwire:\:dv=/dev/term/a:br#9600:el=^C^S^Q^U^D:ie=%$:oe=^D:
   ```
3. Proceed to “Connect the Switch to AC Power” on page 4-11.

4.2.4 Connect the Workstation to the Switch

You can manage the switch using the CLI, QuickTools, or Enterprise Fabric Suite 2007. QuickTools and Enterprise Fabric Suite 2007 require an Ethernet connection to the switch. The CLI can use an Ethernet connection or a serial connection. Choose a switch management method, then connect the management workstation to the switch in one of the following ways:

- Indirect Ethernet connection from the management workstation to the switch RJ-45 Ethernet connector through an Ethernet switch or a hub. This requires a 10/100 Base-T straight cable as shown in Figure 4-6.
- Direct Ethernet connection from the management workstation to the switch RJ-45 Ethernet connector. This requires a 10/100 Base-T cross-over cable as shown in Figure 4-6.
- Serial port connection from the management workstation to the switch RS-232 serial port connector. This requires a null modem F/F DB9 cable as shown in Figure 4-6.

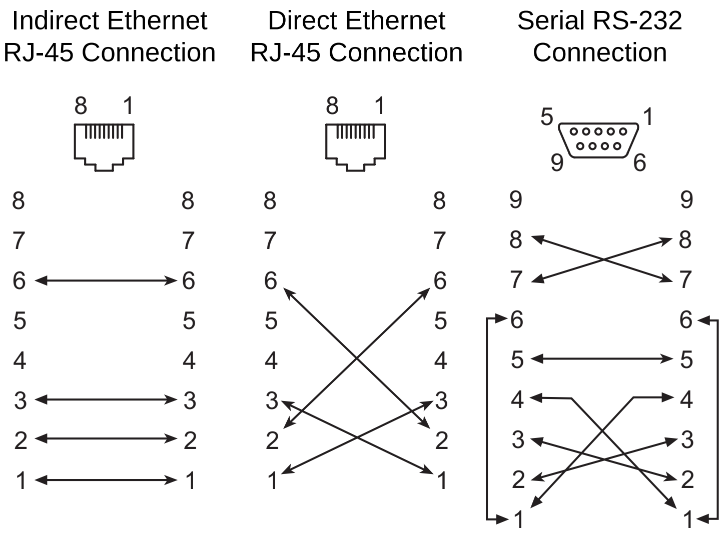


Figure 4-6. Workstation Cable Connections

4.2.5
Connect the Switch to AC Power

WARNING!! This product is supplied with a 3-wire power cable and plug for the user’s safety. Use this power cable in conjunction with a properly grounded outlet to avoid electrical shock. An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the switch chassis. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent electrical shock.

You may require a different power cable in some countries because the plug on the cable supplied with the equipment will not fit your electrical outlet. In this case, you must supply your own power cable. The cable you use must meet the following requirements:

- For 125 Volt electrical service, the cable must be rated at 10 Amps and be approved by UL and CSA.
- For 250 Volt electrical service: The cable must be rated at 10 Amps, meet the requirements of H05VV-F, and be approved by VDE, SEMKO, and DEMKO.

AVERTISSEMENT!!

Pour la sécurité de l’utilisateur, l’appareil est livré avec un câble d’alimentation trifilaire et une fiche. Pour éviter toute secousse électrique, enficher ce câble à une prise correctement mise à la terre.Une prise électrique dont les fils sont mal branchés peut créer une tension dangereuse dans les pièces métalliques du châssis switch. Pour éviter toute secousse électrique, s’assurer que les fils sont correctement branchés et que la prise est bien mise à la terre.

Dans certains pays les prises électriques sont de modèle différent; on ne peut y enficher le câble de l’appareil. On doit donc en utiliser un autre ayant les caractéristiques suivantes:

- Alimentation 125 V: Câble pour courant nominal de 10 A, agréé LAC et CSA.
- Alimentation 250 V: Câble pour courant nominal de 10 A, conforme au H05VV-F, et agréé VDE, SEMKO et DEMKO.

WARNUNG!! Dieses Produkt wird mit einem 3-adrigen Netzkabel mit Stecker geliefert. Dieses Kabel erfüllt die Sicherheitsanforderungen und sollte an einer vorschriftsmäßigen Schukosteckdose angeschlossen werden, um die Gefahr eines elektrischen Schlages zu vermeiden.Elektrosteckdosen, die nicht richtig verdrahtet sind, können gefährliche Hochspannung an den Metallteilen des switch-Gehäuses verursachen. Der Kunde trägt die Verantwortung für eine vorschriftsmäßige Verdrahtung und Erdung der Steckdose zur Vermeidung eines elektrischen Schlages.

In manchen Ländern ist eventuell die Verwendung eines anderen Kabels erforderlich, da der Stecker des mitgelieferten Kabels nicht in die landesüblichen Steckdosen paßt. In diesem Fall müssen Sie sich ein Kabel besorgen, daß die folgenden Anforderungen erfüllt:

- Für 125 Volt-Netze: 10 Ampere Kabel mit UL- und CSA-Zulassung.
- Für 250 Volt-Netze: 10 Ampere Kabel gemäß den Anforderungen der H05VV-F und VDE-, SEMKO- und DEMKO-Zulassung.

To power up a SANbox 5000 Series switch, do the following:

- For a model 5200/5600 switch, connect the power cord to the AC power receptacle on the front of the switch chassis and to a grounded AC outlet.
- For a model 5202/5602 switch, connect the power cords to the power supply receptacles on the back of the switch chassis and to a grounded AC outlet. To provide redundancy in the event of an AC power circuit failure, connect the switch power supplies to separate AC circuits.

The switch responds in the following sequence:

1. The chassis LEDs (Input Power, Heartbeat, System Fault) illuminate followed by all port Logged-In LEDs. The Logged-In LEDs that illuminate indicate the ports that are enabled.
2. After a couple seconds the System Fault LED is extinguished while the Input Power LED and Heartbeat LED remain illuminated.
3. After approximately one minute, the POST executes and the Heartbeat LED is extinguished.
4. After about another minute, the POST is complete, all LEDs are extinguished except the Input Power LED and the Heartbeat LED:
    - The Input Power LED remains illuminated indicating that the switch logic circuitry is receiving DC voltage. If not, contact your authorized maintenance provider.
    - The Heartbeat LED indicates the results of the POST. The POST tests the condition of firmware, memories, data-paths, and switch logic circuitry. If the Heartbeat LED blinks steadily about once per second, the POST was successful, and you can continue with the installation process. Any other blink pattern indicates that an error has occurred. Refer to "Heartbeat LED Blink Patterns" on page 5-3 for more information about error blink patterns.

4.2.6
Configure the Switch

You can configure the switch using the CLI, QuickTools, or Enterprise Fabric Suite 2007. Enterprise Fabric Suite 2007 is an optional, full fabric graphical user interface that comes with a 30-day trial license. Refer to the *SANbox 5000 Series Enterprise Fabric Suite 2007 User Guide* for information about installing Enterprise Fabric Suite 2007.

To log in and configure the switch using QuickTools, do the following:

1. Open an Internet browser and enter the default IP address 10.0.0.1 to start the QuickTools web applet.
2. Log in to the switch using the default user name (*admin*) and password (*password*).
3. Obtain the IP address and subnet mask from your network administrator.
4. Open the QuickTools Wizards menu and select **Configuration Wizard**. Follow the instructions to set network parameters and the password. Changing the IP address will terminate the QuickTools session.
5. Open an Internet browser again and log in with the new IP address.

The Configuration wizard prompts you for the following configuration information:

Table 4-2. Configuration Wizard Prompts

Temporary IP address	
Temporary subnet mask	
Archive template file	
Switch domain ID (1–-239)	
Domain ID Lock (Locked/Unlocked)	
Switch name	
Permanent IP address	
Permanent subnet mask	
Permanent gateway address	
Permanent network discovery method	
Date and time	
Admin account password	
Create a configuration archive?	

To configure the switch using the command line interface, do the following:

1. Open a command window according to the type of workstation and connection:

   - Ethernet (all platforms): Open a Telnet session with the default switch IP address and log in to the switch with default account name and password (admin/password).

     ```
     telnet 10.0.0.1
     Switch Login: admin
     Password:     *******
     ```

     NOTE: To insure fabric security, you should change the password for the Admin account name. Refer to the Passwd command in the *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide*

   - Serial – Windows: Open the HyperTerminal application on a Windows platform.

     a. Choose the **Start** button, select **Programs, Accessories, HyperTerminal,** and **HyperTerminal**.

     b. Select the connection you created earlier and choose the **OK** button.

   - Serial – Linux: Open a command window and enter the following command:

     ```
     minicom
     ```

   - Serial – Solaris: Open a command window and enter the following command:

     ```
     tip hardwire
     ```

2. Open an admin session and enter the Set Setup System command. Enter the values you want for switch IP address (EthNetworkAddress) and the network mask (EthNetworkMask). Refer to the *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide* for more information about the CLI commands.

   ```
   SANbox #> admin start
   SANbox (admin) #> set setup system
   ```

3. Open a Config Edit session and use the Set Config Switch command to modify the switch configuration.

4.2.7 Cable Devices to the Switch

Connect cables to the SFP transceivers and their corresponding devices, and then energize the devices. Device host bus adapters can have SFP (or SFF) transceivers or GigaBit Interface Converters (GBIC). LC-type duplex fiber optic cable connectors are designed for SFP transceivers, while SC-type connectors are designed for GBICs. Duplex cable connectors are keyed to ensure proper orientation. Choose the fiber optic cable with the connector combination that matches the device host bus adapter.

GL_Ports self configure as FL_Ports when connected to loop of devices or F_Ports when connected to a single device. G_Ports self configure as F_Ports when connected to a single device. Both GL_Ports and G_Ports self configure as E_Ports when connected to another switch.

4.3 Installing Firmware

The switch comes with current firmware installed. You can upgrade the firmware from the management workstation as new firmware becomes available. You can use the CLI, QuickTools, or Enterprise Fabric Suite 2007 to install new firmware. This guide describes how to install firmware using QuickTools and the CLI. Refer to the *SANbox 5000 Series Enterprise Fabric Suite 2007 User Guide* for information about installing firmware using Enterprise Fabric Suite 2007.

- Using QuickTools to Install Firmware
- Using the CLI to Install Firmware

NOTE: You can load and activate version 6.7 firmware on an operating switch without disrupting data traffic or having to re-initialize attached devices. If you attempt to perform a non-disruptive activation without satisfying the following conditions, the activation will fail. If the non-disruptive activation fails, you will usually be prompted to try again later. Otherwise, the switch will perform a disruptive activation.

- The current firmware version permits the installation and non-disruptive activation of 6.7 firmware. Refer to the *6.7 Firmware Release Notes* for previous compatible firmware versions.
- No changes are being made to switches in the fabric including powering up, powering down, disconnecting or connecting ISLs, changing switch configurations, or installing firmware.
- No port in the fabric is in the diagnostic state.
- No Zoning Edit sessions are open in the fabric.
- No changes are being made to attached devices including powering up, powering down, disconnecting, connecting, and HBA configuration changes.
- Install firmware on one switch at a time in the fabric. If you are installing firmware on one switch, wait 120 seconds after the activation is complete before installing firmware on a second switch.
- For a fabric in which all switches are running 6.7 firmware, no more than two Enterprise Fabric Suite 2007 sessions can be open.
- For a fabric in which one or more switches are running firmware prior to version 6.7, only one Enterprise Fabric Suite 2007 session can be open.

Ports that are stable when the non-disruptive activation begins, then change states, will be reset. When the non-disruptive activation is complete, Enterprise Fabric Suite 2007 sessions reconnect automatically. However, Telnet sessions must be restarted manually.

4.3.1
Using QuickTools to Install Firmware

To install firmware using QuickTools, do the following:

1. In the faceplate display, open the Switch menu and select Load Firmware.
2. In the Firmware Upload dialog, click the **Browse** button to browse and select the firmware file to be uploaded.
3. Click the **Start** button to begin the firmware load process. You will be shown a message warning you that the switch will be reset in order to activate the firmware.
4. QuickTools prompts you to activate the new firmware using a hot (non-disruptive) reset, if possible. Click the **OK** button to reset the switch and activate the new firmware.

4.3.2
Using the CLI to Install Firmware

The method you choose to install firmware using the CLI depends on the type of firmware activation you want.

- For a disruptive activation, enter the Firmware Install or Image Install command to download the firmware image file from an FTP or TFTP server, unpack it, and activate it in one step. Refer to "One-Step Firmware Installation" on page 4-18.
- For a non-disruptive activation, enter the Image Fetch command to download the firmware image file from an FTP or TFTP server. Enter the Image Unpack command to unpack the image file, then enter the Hotreset command to perform a non-disruptive activation. Refer to "Custom Firmware Installation" on page 4-20.

Refer to the *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide* for information about the CLI commands.

4.3.2.1
One-Step Firmware Installation

The Firmware Install and Image Install commands download the firmware image file from an FTP or TFTP server to the switch, unpacks the image file, and performs a disruptive activation in one step. The installation process prompts you to enter the following:

- The file transfer protocol (FTP or TFTP)
- IP address of the remote host
- An account name and password on the remote host (FTP only)
- Pathname for the firmware image file

Refer to the *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide* for information about the CLI commands.

1. Enter the following commands to download the firmware from a remote host to the switch, install the firmware, then reset the switch to activate the firmware.

   ```
   SANbox #> admin start
   SANbox #> firmware install
     The switch will be reset. This process will cause a
     disruption to I/O traffic.
     Continuing with this action will terminate all management
     sessions,including any Telnet sessions. When the firmware
     activation is complete, you may log in to the switch again.
     Do you want to continue? [y/n]: y
     Press 'q' and the ENTER key to abort this command.
   ```

2. Enter your choice for the file transfer protocol with which to download the firmware image file. FTP requires an user account and a password; TFTP does not.

   ```
     FTP or TFTP      : ftp
   ```

3. Enter your account name on the remote host (FTP only) and the IP address of the remote host. When prompted for the source file name, enter the path for the firmware image file.

   ```
     User Account     : johndoe
     IP Address       : 10.0.0.254
     Source Filename  : 6.7.00.11_mpc
     About to install image.  Do you want to continue? [y/n] y
   ```

4. When prompted to install the new firmware, enter Yes to continue or No to cancel. Entering Yes will disrupt traffic. This is the last opportunity to cancel.

   ```
   About to install image. Do you want to continue? [y/n] y
   Connected to 10.20.20.200 (10.20.20.200).
   220 localhost.localdomain FTP server (Version wu-2.6.1-18)
   ready.
   ```

5. Enter the password for your account name (FTP only).

   ```
   331 Password required for johndoe.
   Password:******
   230 User johndoe logged in.
   ```

6. The firmware will now be downloaded from the remote host to the switch, installed, and activated.

To install firmware using the CLI when a File Transfer Protocol (FTP) server is present on the management workstation, use the Firmware Install command.

4.3.2.2

Custom Firmware Installation

A custom firmware installation downloads the firmware image file from an FTP or TFTP server to the switch, unpacks the image file, and resets the switch in separate steps. This allows you to choose the type of switch reset and whether the activation will be disruptive (Reset Switch command) or nondisruptive (Hotreset command). The following example illustrates a custom firmware installation with a nondisruptive activation.

1. Download the firmware image file from the workstation to the switch.
   - If your workstation has an FTP server, you can enter the Image Fetch command:

   ```
   SANbox (admin) #> image fetch account_name ip_address filename
   ```

   - If your workstation has a TFTP server, you can enter the Image TFTP command to download the firmware image file.

     ```
     SANbox (admin) #> image tftp ip_address filename
     ```

   - If your workstation has neither an FTP nor a TFTP server, open an FTP session and download the firmware image file by entering FTP commands:

     ```
     >ftp ip_address or switchname
     user:images
     password: images
     ftp>bin
     ftp>put filename
     ftp>quit
     ```

2. Display the list of firmware image files on the switch to confirm that the file was loaded.

   ```
   SANbox (admin) $>image list
   ```

3. Unpack the firmware image file to install the new firmware in flash memory.

   ```
   SANbox (admin) $>image unpack filename
   ```

4. Wait for the unpack to complete.

   ```
   image unpack command result: Passed
   ```

5. A message will prompt you to reset the switch to activate the firmware. Use the Hotreset command to attempt a non-disruptive activation.

   ```
   SANbox (admin) $>hotreset
   ```

4.4
Adding a Switch to an Existing Fabric

If there are no special conditions to be configured for the new switch, simply plug in the switch and the switch becomes functional with the default fabric configuration. The default fabric configuration settings are as follows:

- Fabric zoning is sent to the switch from the fabric
- All ports will be GL_Ports
- The default IP address 10.0.0.1 is assigned to the switch without a gateway or boot protocol configured (RARP, BOOTP, and DHCP).

If you are adding a switch to a fabric and do not want to accept the default fabric configuration, do the following:

1. If the switch is not new from the factory, reset the switch to the factory configuration before adding the switch to the fabric.
2. If you want to manage the switch through the Ethernet port, you must first configure the IP address.
3. Plug in the inter-switch links (ISL), but do not connect the devices.
4. Configure the port types for the new switch. The ports can be G_Port, GL_Port, F_Port, FL_Port, or Donor.
5. Connect the devices to the switch.
6. Make any necessary zoning changes.

4.5
Installing Feature License Keys

Refer to “Feature Licensing” on page 3-6 for information about available license keys. To install a license key using QuickTools, do the following:

1. Open the Switch Menu and select **Features** to open the Feature Licenses dialog.
2. In the Feature Licenses dialog, click the **Add** button to open the Add License Key dialog.
3. In the Add License Key dialog, enter the license key in the Key field.
4. Click the **Get Description** button to display the upgrade description.
5. Click the **Add** button to upgrade the switch. Allow a minute or two for the upgrade to complete.

To upgrade a switch using the command line interface, refer to the Feature command in the *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide*.

Notes

Section 5
Diagnostics/Troubleshooting

Diagnostic information about the switch is available through the chassis LEDs and the port LEDs. Diagnostic information is also available through the CLI, QuickTools, or Enterprise Fabric Suite 2007 event logs and error displays. This section describes the following types of diagnostics:

- Chassis Diagnostics describes the Input Power LED and System Fault LED indications.
- Power-On Self Test Diagnostics describe the Heartbeat LED and the port Logged-In LED indications.
- Power Supply Diagnostics describes Power Supply Status LED and Power Supply Fault LED indications for model 5202/5602 switches.

This section also describes using maintenance mode to recover a disabled switch.

5.1
Chassis Diagnostics

Figure 5-1shows the chassis LEDs on a model 5200/5600 switch; the model 5202/5602 switch is similar.

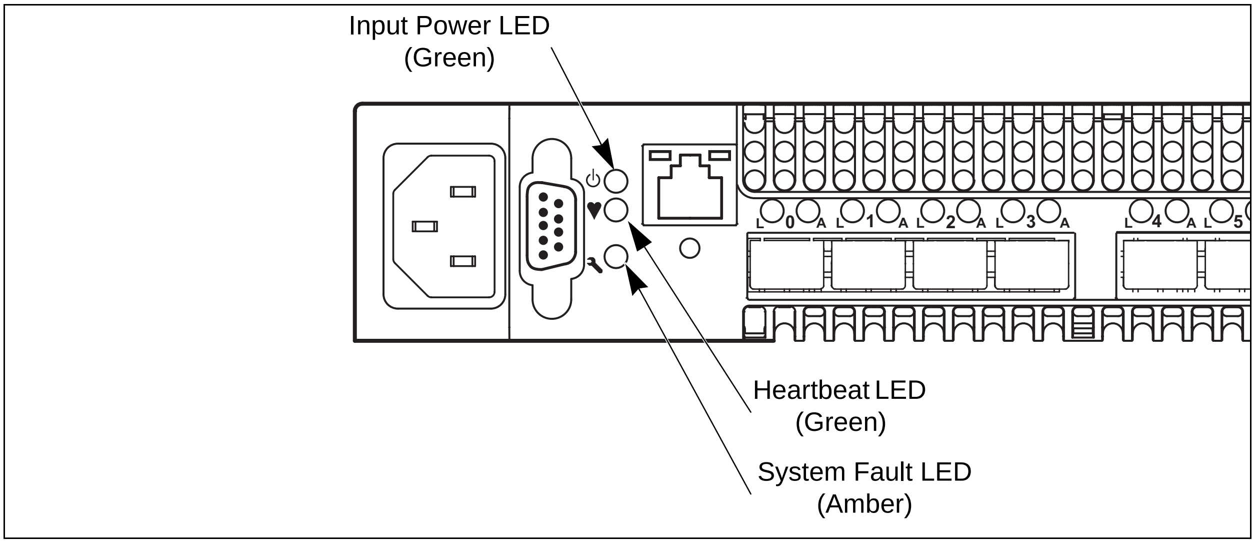


Figure 5-1. Chassis LEDs

The following conditions are described:

- Input Power LED Is Extinguished
- System Fault LED Is Illuminated

5.1.1
Input Power LED Is Extinguished

The Input Power LED illuminates to indicate that the switch logic circuitry is receiving proper voltages. If the Input Power LED is extinguished, do the following:

1. Inspect the power cords and connectors. Is the cord unplugged? Is the cord or connector damaged?
    - Yes - Make necessary corrections or repairs. If the condition remains, continue.
    - No - Continue.
2. Inspect the AC power source. Is the power source delivering the proper voltage?
    - Yes - Continue.
    - No - Make necessary repairs.
        - For a model 5200/5600 switch, if the condition remains, contact your authorized maintenance provider.
        - For a model 5202/5602 switch, if the condition remains, continue.
3. Inspect the power supplies. Are the power supplies fully seated in their bays?
    - Yes - Continue. Replace the power supplies.
    - No - Reinstall the power supplies. If the condition remains, replace the power supplies.

5.1.2
System Fault LED Is Illuminated

The System Fault LED illuminates to indicate that a fault exists in the switch firmware or hardware. If the System Fault LED illuminates, do the following:

- Check the Heartbeat LED for an error blink pattern and take the necessary actions. Refer to “Heartbeat LED Blink Patterns” on page 5-3.
- For a model 5202/5602 switch, check the power supply LEDs and take the necessary actions. Refer to “Power Supply Diagnostics” on page 5-12.

5.2
Power-On Self Test Diagnostics

The switch performs a series of tests as part of its power-up procedure. The POST diagnostic program performs the following tests:

- Checksum tests on the boot firmware in PROM and the switch firmware in flash memory
- Internal data loopback test on all ports
- Access and integrity test on the ASIC

During the POST, the switch logs any errors encountered. Some POST errors are critical, others are not. The switch uses the Heartbeat LED and the Logged-In LED to indicate switch and port status. A critical error disables the switch so that it will not operate. A non-critical error allows the switch to operate, but disables the ports that have errors. If two or more ports fail the POST, the entire switch is disabled. Whether the problem is critical or not, contact your authorized maintenance provider.

If there are no errors, the Heartbeat LED blinks at a steady rate of once per second. If a critical error occurs, the Heartbeat LED will show an error blink pattern and the System Fault LED will illuminate. If there are non-critical errors, the switch disables the failed ports and flashes the associated Logged-In LEDs. Refer to “Heartbeat LED Blink Patterns” on page 5-3 for more information about Heartbeat LED blink patterns.

5.2.1
Heartbeat LED Blink Patterns

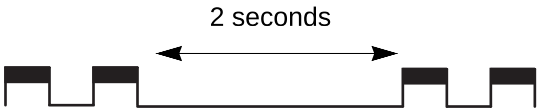
The Heartbeat LED indicates the operational status of the switch. When the POST completes with no errors, the Heartbeat LED blinks at steady rate of once per second. When the switch is in maintenance mode, the Heartbeat LED illuminates continuously. Refer to “Recovering a Switch Using Maintenance Mode” on page 5-13 for more information about maintenance mode. All other blink patterns indicate critical errors. In addition to producing a Heartbeat error blink patterns, a critical error also illuminates the System Fault LED.

The Heartbeat LED shows an error blink pattern for the following conditions:

- 1 blink - Normal operation
- 2 blinks - Internal Firmware Failure Blink Pattern
- 3 blinks - Fatal POST Error Blink Pattern
- 4 blinks - Configuration File System Error Blink Pattern
- 5 blinks - Over Temperature Blink Pattern

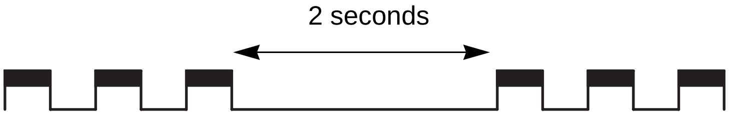
5.2.1.1 Internal Firmware Failure Blink Pattern

An internal firmware failure blink pattern is 2 blinks followed by a two second pause. The 2-blink error pattern indicates that the firmware has failed, and that the switch must be reset. Momentarily press and release the Maintenance button to reset the switch.



5.2.1.2 Fatal POST Error Blink Pattern

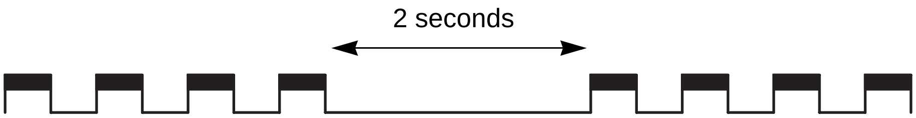
A system error blink pattern is 3 blinks followed by a two second pause. The 3-blink error pattern indicates that a POST failure or a system error has left the switch inoperable. If a system error occurs, contact your authorized maintenance provider. Momentarily press and release the Maintenance button to reset the switch.



5.2.1.3

Configuration File System Error Blink Pattern

A configuration file system error blink pattern is 4 blinks followed by a two second pause. The 4-blink error pattern indicates that a configuration file system error has occurred, and that the configuration file must be restored.



To restore the switch configuration, do the following:

1. Establish communications with the switch using Telnet. Enter one of the following on the command line:

   ```
   telnet xxx.xxx.xxx.xxx
   ```

   or

   ```
   telnet switchname
   ```

   where *xxx.xxx.xxx.xxx* is the switch IP address and *switchname* is the switch name associated with the IP address.
2. A Telnet window opens prompting you for a login. Enter an account name and password. The default account name and password are (admin, password).
3. Open an admin session to acquire the necessary authority.

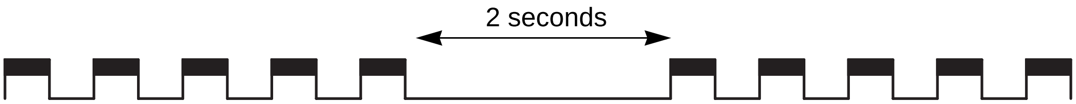
   ```
   SANbox $>admin start
   ```
4. Restore the configuration. When the restore is complete, the switch will reset.

   ```
   SANbox (admin) $>config restore
   ```

   If a configuration does not exist, enter the Config Backup command, then enter the Config Restore command.

5.2.1.4
Over Temperature Blink Pattern

An over temperature blink pattern is 5 blinks followed by a two second pause. The 5-blink error pattern indicates that the air temperature inside the switch has exceeded the failure temperature threshold.



If the Heartbeat LED shows the over temperature blink pattern, do the following:

1. Inspect the chassis vents. Are the intake and exhaust vents clear?
   - Yes - Continue.
   - No - Remove any debris from fan intake and exhaust if necessary. If the condition remains, continue.
2. For a model 5202/5602 switch, inspect the Power Supply Fault LED on both power supplies; otherwise continue. Is the Power Supply Fault LED illuminated on either power supply?
   - Yes - Replace the power supply. If the condition remains, continue.
   - No - Continue.
3. For a model 5202/5602 switch, observe the air flow direction from both power supplies; otherwise continue. Are the flow directions the same?
   - Yes - Continue.
   - No - Determine the proper air flow direction for the switch. Replace the power supply with the incorrect air flow direction with another having the correct air flow direction. Air flow direction is marked on the power supply part number label. If the condition remains, continue.
4. Consider the ambient air temperature near the switch and clearance around the switch. Make necessary corrections. If the condition remains, open a command line window and log on to the switch. Enter the Shutdown command, then power down the switch. Contact your authorized maintenance provider.

5.2.2
Logged-In LED Indications

Port diagnostics are indicated by the Logged-In LED for each port as shown in Figure 5-2.

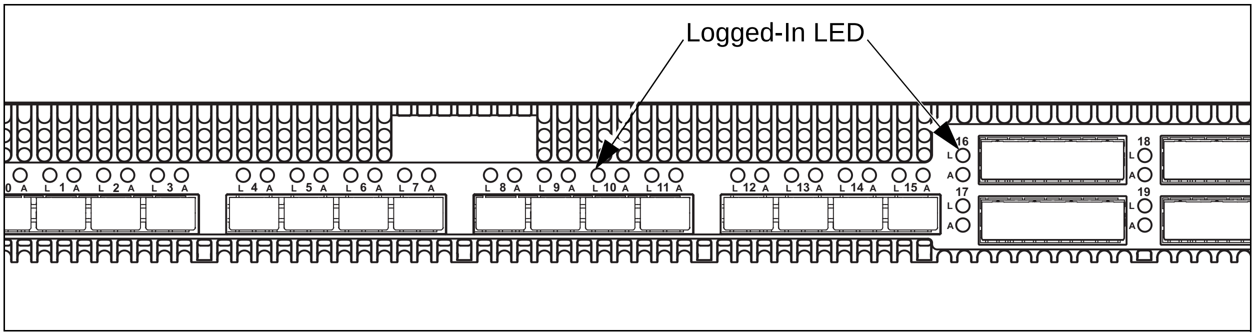


Figure 5-2. Logged-In LED

The Logged-In LED has three indications:

- Continuous illumination: A device is logged in to the port.
- Flashing once per second: A device is logging in to the port, or the port is in the diagnostics state.
- Flashing twice per second: The port is down, offline, or an error has occurred.

If a Logged-In LED is flashing twice per second, review the event browser for alarm messages regarding the affected port. You can also inspect the alarm log using the Show Alarm command. If there is an error, alarm messages may point to one or more of the following conditions:

- E_Port Isolation
- Excessive Port Errors

5.2.2.1

E_Port Isolation

A Logged-In LED error indication is often the result of E_Port isolation. E_Port isolation can be caused by the following:

- Security failure
- FL_Port is connected to another switch
- Conflicting domain IDs
- Conflicting timeout values
- Conflicting zone membership between active zone sets

Review the event browser and do the following to diagnose and correct an isolated E_Port:

1. Does the event browser show an alarm about an invalid attach on the affected port?
   - Yes - Review the ISL group in the active security set to ensure that the membership includes the necessary ports and that the secrets on all switches are correct.
   - No - Continue.
2. Does the event browser show a repeating alarm about an unsupported E_Port command on the affected port?
   - Yes - The port is configured as an FL_Port and connected to another switch. Correct the port connection or the port type.
   - No - Continue.
3. Display the fabric domain IDs using the Show Domains command. Are all domain IDs in the fabric unique?
   - Yes - Continue.
   - No - Correct the domain IDs on the offending switches using the Set Config Switch command. Reset the port. If the condition remains, continue.

4. Compare the RA_TOV and ED_TOV timeout values for all switches in the fabric using the Show Config Switch command. Is each timeout value the same on every switch?
   - Yes - Continue.
   - No - Correct the timeout values on the offending switches using the Set Config Switch CLI. Reset the port. If the condition remains, continue.
5. Display the active zone set on each switch using the Zoning Active command. Compare the zone membership between the two active zone sets. Are they the same?
   - Yes - Contact your authorized maintenance provider.
   - No - Deactivate one of the active zone sets or edit the conflicting zones so that their membership is the same. Reset the port. If the condition remains, contact your authorized maintenance provider.

     NOTE: This can be caused by merging two fabrics whose active zone sets have two zones with the same name, but different membership.

5.2.2.2
Excessive Port Errors

The switch can monitor a set of port errors and generates alarms based on user-defined sample windows and thresholds. These port errors include the following:

- CRC errors
- Decode errors
- ISL connection count
- Device login errors
- Device logout errors
- Loss-of-signal errors

Port threshold alarm monitoring is disabled by default. Refer to the *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide* for information about managing port threshold alarms.

If the count for any of these errors exceeds the rising trigger for three consecutive sample windows, the switch generates an alarm and disables the affected port, changing its operational state to “down”. Port errors can be caused by the following:

- Triggers are too low or the sample window is too small
- Faulty Fibre Channel port cable
- Faulty SFP
- Faulty port
- Faulty device or HBA

Review the event browser to determine if excessive port errors are responsible for disabling the port. Look for a message that mentions one of the monitored error types indicating that the port has been disabled, then do the following:

1. Examine the alarm configuration for the associated error using the Show Config Threshold command. Refer to the Show Config Threshold command in the *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide*. Are the thresholds and sample window correct?
    - Yes - Continue
    - No - Correct the alarm configuration. If the condition remains, continue.
2. Reset the port, then perform an external port loopback test to validate the port and the SFP. Refer to the *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide* for information about testing ports. Does the port pass the test?
    - Yes - Continue
    - No - Replace the SFP and repeat the test. If the port does not pass the test, contact your authorized maintenance provider. Otherwise continue.
3. Replace the Fibre Channel port cable. Is the problem corrected?
    - Yes - Complete.
    - No - Continue.
4. Inspect the device to which the affected port is connected and confirm that the device and its HBA are working properly. Make repairs and corrections as needed. If the condition remains, contact your authorized maintenance provider.

5.3 Transceiver Diagnostics

NOTE: Transceiver diagnostic information is available with purchase of the SANdoctor license key. To purchase a license key, contact your authorized maintenance provider.

You can display the following transceiver information using the Show Media CLI command:

- Port number
- Manufacturer
- Temperature (°C)
- Operating voltage (volts)
- Transmitter bias (milliamps)
- Transmitter power (milliwatts)
- Receiver power (milliwatts)

The display indicates warning and alarm conditions for both high and low values.

5.4
Power Supply Diagnostics

A model 5202/5602 switch power supply has a Status LED (Green) and a Fault LED (Amber) as shown in Figure 5-3. Under normal operating conditions, the Power Supply Status LED is illuminated and the Power Supply Fault LED is extinguished.

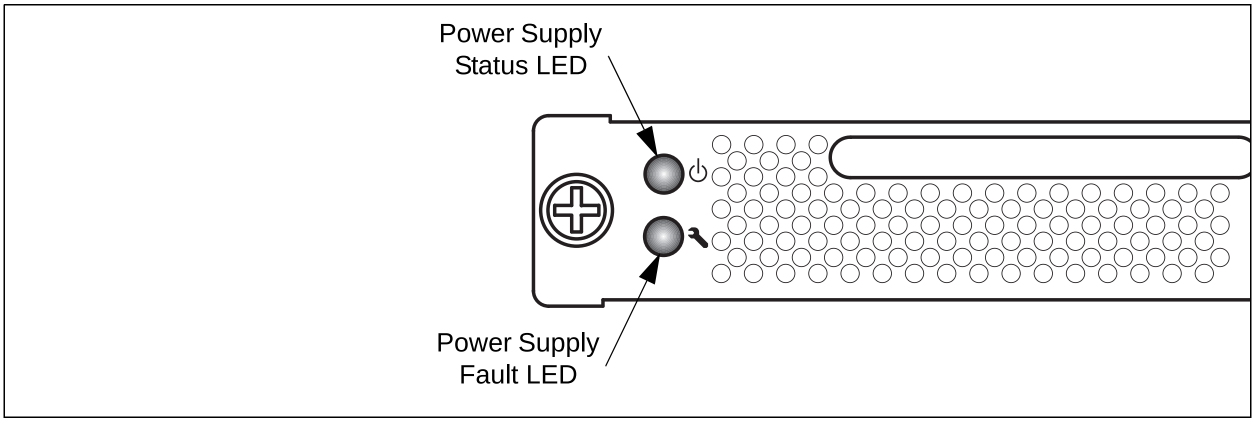


Figure 5-3. Model 5202/5602 Switch Power Supply LEDs

Consider the following indications:

- All power supply LEDs are normal, yet the System Fault LED is illuminated and the Heartbeat LED does not show a blink pattern. This means that the two power supplies have different air flow directions. Replace the power supply with the incorrect air flow direction with another having the correct air flow direction. Air flow direction is marked on the power supply part number label. Refer to “Power Supply Removal and Replacement” on page 6-2.
- Power Supply Fault LED is illuminated. This means that the power supply is failing or has failed. Replace the power supply with another having the same air flow direction. Air flow direction is indicated on the power supply part number label. Refer to “Power Supply Removal and Replacement” on page 6-2.

5.5 Recovering a Switch Using Maintenance Mode

A switch can become inoperable or unmanageable for the following reasons:

- Firmware becomes corrupt
- IP address is lost
- Switch configuration becomes corrupt
- Forgotten password

In these specific cases, you can recover the switch using maintenance mode. Maintenance mode temporarily returns the switch IP address to 10.0.0.1 and provides opportunities to do the following:

- Exiting the Maintenance Menu
- Unpacking a Firmware Image File in Maintenance Mode
- Resetting the Network Configuration in Maintenance Mode
- Resetting User Accounts in Maintenance Mode
- Copying Log Files in Maintenance Mode
- Removing the Switch Configuration in Maintenance Mode
- Remaking the File System in Maintenance Mode
- Resetting the Switch in Maintenance Mode
- Updating the Boot Loader in Maintenance Mode

To recover a switch, do the following:

1. Place the switch in maintenance mode. Press and hold the Maintenance button with a pointed tool until the Heartbeat LED alone is illuminated, then release the button. The Heartbeat LED illuminates continuously when the switch is in maintenance mode.
2. Establish a Telnet session with the switch using the maintenance mode IP address 10.0.0.1.
3. Enter the maintenance mode account name and password (prom, prom), and press the Enter key.

   ```
   Switch login: prom
   Password:xxxx
   ```

4. The maintenance menu displays several recovery options. To select a switch recovery option, press the corresponding number (displayed in option: field) on the keyboard and press the Enter key.

```
0)  Exit
1)  Image Unpack
2)  Reset Network Config
3)  Reset User Accounts to Default
4)  Copy Log Files
5)  Remove Switch Config
6)  Remake Filesystem
7)  Reset Switch
8)  Update Boot Loader
Option:
```

These options and their use are described in the following subsections.

5.5.1 Exiting the Maintenance Menu

This option closes the current Maintenance menu session. To log in again, enter the maintenance mode account name and password (prom, prom). To return to normal operation, momentarily press and release the Maintenance button or power cycle the switch.

5.5.2 Unpacking a Firmware Image File in Maintenance Mode

This option unpacks and installs new firmware when the current firmware has become corrupt. Before using this option, you must load the new firmware image file onto the switch. The steps to install new firmware using this option are as follows:

1. Place the switch in maintenance mode. Refer to the procedure for maintenance mode in “Recovering a Switch Using Maintenance Mode” on page 5-13.

2. Use FTP to load a new firmware image file onto the switch. Refer to “Custom Firmware Installation” on page 4-20 for an example of how to load the image file. Close the FTP session.

3. Establish a Telnet session with the switch using the default IP address 10.0.0.1.

```
telnet 10.0.0.1
```

4. Enter the maintenance mode account name and password (prom, prom), and press the Enter key.

```
Switch login: prom
Password:xxxx
```

5. Select option 1 from the maintenance menu. When prompted for a file name prompt, enter the firmware image file name.

```
Image filename: filename
Unpacking ’filename’, please wait...
Unpackage successful.
```

6. Select option 7 to reset the switch and exit maintenance mode.

5.5.3
Resetting the Network Configuration in Maintenance Mode

This option resets the network properties to the factory default values and saves them on the switch. Refer to *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide* for the default network configuration values.

5.5.4
Resetting User Accounts in Maintenance Mode

This option restores the password for the Admin account name to the default (password) and removes all other user accounts from the switch.

5.5.5
Copying Log Files in Maintenance Mode

This option copies all log file buffers to a file on the switch named *logfile*. You can use FTP to download this file to the management workstation. You must download the logfile before resetting the switch. Refer to the *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide* for information about downloading files from the switch.

5.5.6
Removing the Switch Configuration in Maintenance Mode

This option deletes all configurations from the switch except the default configuration. This restores switch configuration parameters to the factory defaults. Refer to Reset command in the *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide* for the factory default values.

5.5.7 Remaking the File System in Maintenance Mode

In the event of a loss of power, the switch configuration may become corrupt. The file system on which the configuration is stored must be re-created. This option resets the switch to the factory default values including user accounts and zoning. Refer to the Reset command in the *SANbox 5000 Series Fibre Channel Switch Command Line Interface Guide* for the factory default values.

CAUTION! If you choose the **Remake Filesystem** option, you will lose all changes made to the fabric configuration that involve that switch, such as password and zoning changes. You must then restore the switch from an archived configuration or reconfigure the portions of the fabric that involve the switch.

5.5.8 Resetting the Switch in Maintenance Mode

This option closes the Telnet session, exits maintenance mode and reboots the switch using the current switch configuration. All unpacked firmware image files that reside on the switch are deleted.

5.5.9 Updating the Boot Loader in Maintenance Mode

This option updates the system boot loader which loads the Linux kernel into memory. Use this option only at the direction of your authorized maintenance provider.

Section 6
Removal/Replacement

This section describes the removal and replacement procedures for the following field replaceable units (FRU):

- SFP transceivers
- Power supplies for model 5202/5602 switches

The switch is equipped with a battery that powers the non-volatile memory. This memory stores the switch configuration. The battery is not a field replaceable unit.

WARNING!! Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of the used battery according to the manufacturer’s instructions.

WARNUNG!! Bei unsachgemäß ausgetauschter Batterie besteht Explosionsgefahr. Die Batterie nur mit der gleichen Batterie oder mit einem äquivalenten, vom Hersteller empfohlenen Batterietyp ersetzen. Die gebrauchte Batterie gemäß den Herstelleranweisungen entsorgen.

AVERTISSEMENT!!

Danger d’explosion si le remplacement de la pile est incorrect. Ne remplacer que par une pile de type identique ou équivalent recommandé par le fabricant. Jeter la pile usagée en observant les instructions du fabricant.

6.1
SFP Transceiver Removal and Replacement

The SFP transceivers can be removed and replaced while the switch is operating without damaging the switch or the transceiver. However, transmission on the affected port will be interrupted until the transceiver installed.

To remove a transceiver, gently press the transceiver into the port to release the tension, then pull on the release tab or lever and remove the transceiver. Different transceiver manufacturers have different release mechanisms. Consult the documentation for your transceiver. To install, insert the transceiver into the port and gently press until it snaps in place.

NOTE: The SFP transceiver will fit only one way. If the SFP does not install under gentle pressure, flip it over and try again.

6.2
Power Supply Removal and Replacement

The SANbox 5202/5602 power supplies are hot pluggable. This means you can remove or install one of the power supplies while the switch is operating without disrupting service. The power supplies are also interchangeable; that is, the left and right power supplies are the same unit.

CAUTION!

- Both power supplies must have the same air flow direction to prevent the switch from overheating.
- To avoid overheating, do not operate the switch with one power supply any longer than necessary.

When removing or replacing a power supply, consider the following:

- The left and right power supplies are interchangeable. However, you must orient the power supply so that AC receptacle is on the right.
- Both power supplies must have the same air flow direction. The part number label on the power supply indicates the air flow direction.
- When removing or replacing a power supply on an operating switch, be sure the Heartbeat LED is showing the normal 1 blink per second. This allows the switch to correctly report power supply status.

To remove a power supply, unplug the power supply and loosen the two knurled fasteners with a cross-head screw driver as shown in Figure 6-1. Grasp the power supply handle and pull firmly to disengage the modular connector. Slide the power supply out of its bay.

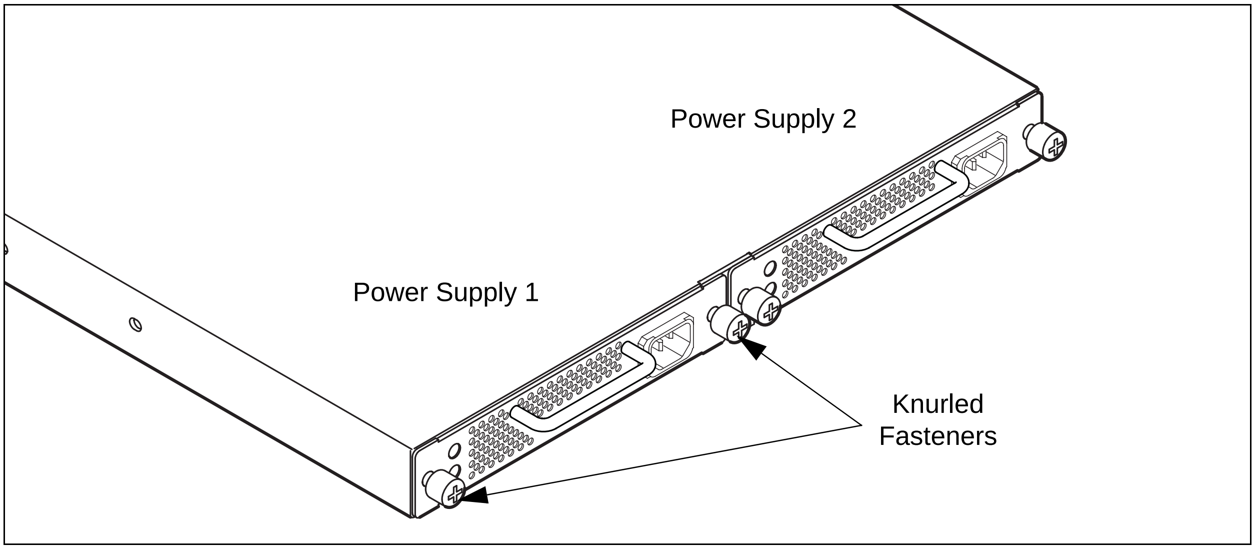


Figure 6-1. Power Supply Removal

1. Confirm that the Heartbeat LED is showing the normal 1 blink per second. This allows the switch to correctly report power supply status.
2. Confirm that the new power supply is compatible with the switch air flow direction. The part number label on the power supply indicates the air flow direction as shown in Figure 6-2.
3. With the AC receptacle on the right, slide the power supply into the bay until it is firmly seated. Secure the knurled fasteners by hand.
4. Plug the power cord into the AC receptacle and confirm that the air flow is correct.

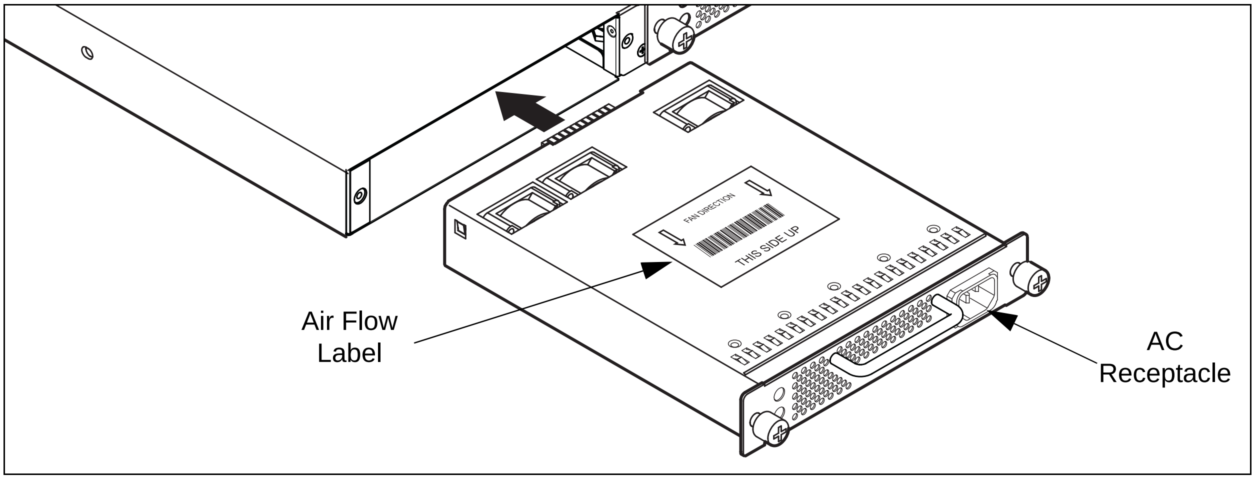


Figure 6-2. Power Supply Installation

Notes

Appendix A
Specifications

This appendix contains the specifications for the SANbox 5000 Series Fibre Channel switch. Refer to Section 2 for the location of all connections, switches, controls, and components.

A.1
Fabric Specifications

Fibre Channel Protocols	FC-PH Rev. 4.3 FC-PH-2 FC-PH-3 FC-AL Rev 4.6 FC-AL-2 Rev 7.0 FC-FLA FC-GS FC-GS-2 FC-GS-3 FC-FG FC-Tape FC-VI FC-SW-2 Fibre Channel Element MIB RFC 2837 Fibre Alliance MIB Version 4.0
Fibre Channel Classes of Service	Classes 2 and 3
Modes of Operation	Fibre Channel Classes 2 and 3, connectionless
Port Types	
■ 1/2/4-Gbps Ports	G_Port, GL_Port, F_Port, FL_Port, E_Port
■ 10-Gbps Ports	G_Port, F_Port, E_Port
Port Characteristics	All ports are auto-discovering and self-configuring.

Number of Fibre Channel Ports (5200 Series models do not support 4-Gbps)	Variable and can be upgraded in the following configurations: ■ Eight 1/2/4-Gbps FC ports ■ Twelve 1/2/4-Gbps FC ports ■ Sixteen 1/2/4-Gbps FC ports ■ Sixteen 1/2/4-Gbps FC ports plus four 10-Gbps FC ports
Scalability	Maximum 239 switches depending on configuration
Maximum User Ports	> 475,000 ports depending on configuration
Buffer Credits	16 buffer credits per port, ASIC embedded memory
Media Type	
Ports 0-15	SFP optical transceiver
Ports 16-19	XPAK switch stacking cables
Fabric Port Speed	
Ports 0-15 (5200 series)	1.0625 or 2.125
Ports 0-15 (5600 series)	1.0625, 2.125, or 4.250-Gbps
Ports 16-19	12.750 Gbps
Maximum Frame Size	2148 bytes (2112 byte payload)
System Processor	200 MHz Motorola® 8245 PowerPc®
Fabric Latency (intra-switch)	
1-Gbps to 1-Gbps	< 0.6 µsec
2-Gbps to 2-Gbps	< 0.4 µsec
4-Gbps to 4-Gbps	< 0.3 µsec (5600 series only)
10-Gbps to 10-Gbps	< 0.2 µsec

Bandwidth	
Point-to-Point	212 MB, Full Duplex @ 1-Gbps
	224 MB, Full Duplex @ 2-Gbps
	850 MB, Full Duplex @ 4-Gbps[1]
Aggregate (single switch)	2550 MB, Full Duplex @ 10-Gbps
	Up to 23.80 GB Full Duplex
Bandwidth	
Point-to-Point	212 MB, Full Duplex @ 1-Gbps
	224 MB, Full Duplex @ 2-Gbps
	850 MB, Full Duplex @ 4-Gbps[1]
	2550 MB, Full Duplex @ 10-Gbps
Aggregate (single switch)	Up to 23.80 GB Full Duplex

[1] 5600 series only

A.2 Maintainability

Diagnostics	Power-On Self Test (POST) tests all functional components except SFP transceivers. Port tests include online, internal, and external tests.
User Interface	LED indicators
Field Replaceable Units	Power supplies (model 5202/5602 only)

A.3
Fabric Management

Management Methods	Enterprise Fabric Suite 2007 graphical user interface QuickTools web applet Command Line Interface Application Programming Interface SMI-S GS-3 Management Server SNMP FTP TFTP
Maintenance Connection	RS-232 connector; null modem F/F DB9 cable
Ethernet Connection	RJ-45 connector; 10/100 BASE-T cable
Switch Agent	Allows a network management station to obtain configuration values, traffic information, and failure data pertaining to the Fibre Channels using SNMP through the Ethernet interface.

A.4
Dimensions

	Model 5200/5600	**Model 5202/5602**
Width	17” (432 mm), 19" rack	17” (432 mm), 19" rack
Height	1.70” (43.2 mm) (1U)	1.70” (43.2 mm) (1U)
Depth	12.0” (305 mm)	19.69” (500 mm)
Weight	9 lbs (4.08 Kg)	16 lbs (7.25 Kg)

A.5 Electrical

Operating voltage	100 to 240 VAC; 50 to 60 Hz
Power source loading (maximum)	1 A at 120 VAC 0.5 A at 240 VAC
Heat Output (maximum)	100 watts
Circuit Protection	Internally fused

A.6 Environmental

Temperature	
■ Operating	5 to 40°C (41 to 104°F)
■ Non-operating	-40 to 70°C (-40 to 158°F)
Humidity	
■ Operating	5% to 90%, non-condensing
■ Non-operating	5% to 93%, non-condensing
Altitude	
■ Operating	0 to 3048m (0 to 10,000 feet)
■ Non-operating	0 to 15,240m (0 to 50,000 feet)
Vibration	IEC 68-2
■ Operating	5-500 Hz, random, 0.21 G rms, 10 minutes
■ Non-operating	5-500 Hz, random, 2.09 G rms, 10 minutes
Shock	IEC 68-2
■ Operating	4 g, 11ms, 20 repetitions
■ Non-operating	30g, 292 ips, 3 repetitions, 3 axis
Air flow	Front-to-back

A.7
Regulatory Certifications

Safety Standards	UL60950:2000 CSA 22.2 No. 60950-00 (Canada) EN60950 (EC) CB Scheme-IEC 60950
Emissions Standards	FCC Part 15B Class A ICES-03 Issue 3 VCCI Class A ITE CISPR 22, Class A EN 55022, Class A
Voltage Fluctuations	EN 61000-3-3
Harmonics	EN 61000-3-2
Immunity	EN 55024
Marking	FCC Part 15 UL_{US} (United States) TUV_{US} (United States) cUL (Canada) cTUV (Canada) TUV Europe (Germany) VCCI CE

Glossary

Access Control List Zone

Access Control List zoning divides the fabric for purposes of controlling discovery and inbound traffic.

Active Zone Set

The zone set that defines the current zoning for the fabric.

Active Firmware

The firmware image on the switch that is in use.

Activity LED

A port LED that indicates when frames are entering or leaving the port.

Administrative State

State that determines the operating state of the port, I/O blade, or switch. The configured administrative state is stored in the switch configuration. The configured administrative state can be temporarily overridden using the command line interface.

Alarm

A message generated by the switch that specifically requests attention. Alarms are generated by several switch processes. Some alarms can be configured.

Alias

A named set of ports or devices. An alias is not a zone, and can not have a zone or another alias as a member.

AL_PA

Arbitrated Loop Physical Address

Arbitrated Loop

A Fibre Channel topology where ports use arbitration to establish a point-to-point circuit.

Arbitrated Loop Physical Address (AL_PA)

A unique one-byte value assigned during loop initialization to each NL_Port on a loop.

ASIC

Application Specific Integrated Circuit. A chip designed for a specific applications, such as a transmission protocol or a computer.

Auto Save

Zoning parameter that determines whether changes to the active zone set that a switch receives from other switches in the fabric will be saved to permanent memory on that switch.

BootP

Boot Strap Protocol. A type of network server.

Buffer Credit

A measure of port buffer capacity equal to one frame.

Cascade Topology

A fabric in which the switches are connected in series. If you connect the last switch back to the first switch, you create a cascade-with-a-loop topology.

Class 2 Service

A service which multiplexes frames at frame boundaries to or from one or more N_Ports wit h acknowledgment provided.

Chassis Hop

A measure of fabric latency represented by the ISL that any frame crosses when travelling from one switch to another. A frame that travels from one switch to another over an ISL experiences one chassis hop.

Class 3 Service

A service which multiplexes frames at frame boundaries to or from one or more N_Ports without acknowledgment.

Configured Zone Sets

The zone sets stored on a switch excluding the active zone set.

Default Visibility

Zoning parameter that determines the level of communication among ports/devices when there is no active zone set.

Device Security

A component of fabric security that provides for the authorization and authentication of devices that attach to a switch through the use of groups and security sets.

Domain ID

User defined number that identifies the switch in the fabric.

Event Log

Log of messages describing events that occur in the fabric.

Expansion Port

E_Port that connects to another FC-SW-2 compliant switch.

Fabric Database

The set of fabrics that have been opened during a SANsurfer Switch Manager session.

Fabric Device Management Interface

An interface by which device host bus adapters can be managed through the fabric.

Fabric Management Switch

The switch through which the fabric is managed.

Fabric Name

User defined name associated with the file that contains user list data for the fabric.

Fabric Port

An F_Port or FL_Port.

Fabric Security

The functions that provide security for fabric users and devices including user account security, and fabric services.

Fabric Services

A component of fabric security that provides for the control of inband management and SNMP on a switch.

Fabric View File

A file containing a set of fabrics that were opened and saved during a previous SANsurfer Switch Manager session.

FDMI

See Fabric Device Management Interface.

Flash Memory

Memory on the switch that contains the chassis control firmware.

Frame

Data unit consisting of a start-of-frame (SOF) delimiter, header, data payload, CRC, and an end-of-frame (EOF) delimiter.

FRU

Field Replaceable Unit

Group

A list of device worldwide names that are authorized to attach to a switch. There are three group types: one for other switches (ISL), another for devices (port), and a third for devices issuing management server commands (MS).

Heartbeat LED

A chassis LED that indicates the status of the internal switch processor and the results of the Power-On Self-Test.

Inactive Firmware

The firmware image on the switch that is not in use.

Inband Management

The ability to manage a switch through another switch over an inter-switch link.

Initiator

The device that initiates a data exchange with a target device.

In-Order-Delivery

A feature that requires that frames be received in the same order in which they were sent.

Input Power LED

A chassis LED that indicates that the switch logic circuitry is receiving proper DC voltages.

Inter-Switch Link

The connection between two switches using E_Ports.

IP

Internet Protocol

LIP

Loop Initialization Primitive sequence

Logged-In LED

A port LED that indicates device login or loop initialization status.

Maintenance Button

Formerly known as the Force PROM button. Momentary button on the switch used to reset the switch or place the switch in maintenance mode.

Maintenance Mode

Formerly known as force PROM mode. Maintenance mode sets the IP address to 10.0.0.1 and provides access to the switch for maintenance purposes.

Management Information Base

A set of guidelines and definitions for SNMP functions.

Management Workstation

PC workstation that manages the fabric through the fabric management switch.

Mesh Topology

A fabric in which each chassis has at least one port directly connected to each other chassis in the fabric.

MIB

Management Information Base

Multistage Topology

A fabric in which two or more edge switches connect to one or more core switches.

Network Time Protocol

A network protocol that enables a client to synchronize its time with a server.

NL_Port

Node Loop Port. A Fibre Channel device port that supports arbitrated loop protocol.

N_Port

Node Port. A Fibre Channel device port in a point-to-point or fabric connection.

NTP

Network Time Protocol

Pending Firmware

The firmware image that will be activated upon the next switch reset.

POST

Power-On Self Test

Power-On Self Test

Diagnostics that the switch chassis performs at start up.

Principal Switch

The switch in the fabric that manages domain ID assignments.

SANsurfer Switch Manager

Switch management application.

Simple Network Management Protocol

An application protocol that manages and monitors network communications and functions. It also controls the Management Information Base (MIB).

Security Set

A set of up to three groups with no more than one of each group type: ISL, Port, or MS. The active security set defines the device security for a switch.

SFP

Small Form-Factor Pluggable.

Small Form-Factor Pluggable

A transceiver device, smaller than a GigaBit Interface Converter, that plugs into the Fibre Channel port.

SNMP

Simple Network Management Protocol

Target

A storage device that responds to an initiator device.

User Account

An object stored on a switch that consists of an account name, password, authority level, and expiration date.

User Account Security

A component of fabric security that provides for the administration and authentication of account names, passwords, expiration dates, and authority level.

VCCI

Voluntary Control Council for Interference

Voluntary Control Council for Interference

A consortium of Japanese electronics industry associations that have established voluntary standards for controlling electromagnetic interference (EMI).

Worldwide Name (WWN)

A unique 64-bit address assigned to a device by the device manufacturer.

WWN

Worldwide Name

XPAK

A specification authored by a consortium of companies to govern the development of small form factor 10 Gigabit modules.

Zone

A set of ports or devices grouped together to control the exchange of information.

Zone Set

A set of zones grouped together. The active zone set defines the zoning for a fabric.

Zoning Database

The set of zone sets, zones, and aliases stored on a switch.

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