

IBM System Networking SAN96B-5



Installation, Service, and User Guide

MTM Service information: 2498-F96, 2498-N96

IBM System Networking SAN96B-5



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Read this first

Getting help

For the latest version of your product documentation, visit the IBM Publications Center at www.ibm.com/shop/publications/order. Search by form number or title.

For more information about IBM® System Networking products, go to www.ibm.com/systems/networking.

IBM Redbooks® often provide in depth information about product best practices, configurations, and more technical information. For redbooks associated with this product, enter search terms on the following Web site: www.redbook.ibm.com.

For support information for this and other IBM products, see the IBM Support Portal www.ibm.com/supportportal. Search for the product Machine type or product name.

For Fabric OS Release Notes® and access to Fabric OS firmware downloads, go to the IBM Support Portal www.ibm.com/supportportal. Search for the product Machine type or product name, and then follow links for **Downloads**. More detailed instructions are available through the **Accessing firmware updates and OS documentation updates** link on the product documentation CD that is shipped with this product.

You can also contact IBM within the United States at 1-800-IBMSERV (1-800-426-7378). For support outside the United States, you can find the service number through the IBM contacts directory web page at www.ibm.com/planetwide/.

Visit the IBM contact web page www.ibm.com/contact for contact information for your country or region.

For information about storage and networking industry standards, see the Storage Networking Industry Association (SNIA) Web site at www.snia.org/.

Accessibility features for the SAN96B-5

Accessibility features help users who have a disability, such as restricted mobility or limited vision, to use information technology products successfully.

Accessibility features

The following list includes the major accessibility features in this product:

- Light emitting diodes (LEDs) that flash at different rates, to represent the same information as the colors of the LEDs
- Industry-standard devices for ports and connectors
- Management of the product through management applications is available through Web and Graphical User Interface (GUI) options

Keyboard navigation

This product does not have an attached or integrated keyboard. Any keyboard navigation is provided through the management software and GUI.

Vendor software

This product includes certain vendor software that is not covered under the IBM license agreement. IBM makes no representation about the accessibility features of these products. Contact the vendor for the accessibility information about its products.

Related accessibility information

You can view the publications for this product in Adobe Portable Document Format (PDF) using the Adobe Acrobat Reader. The PDFs are provided on a product documentation CD-ROM that is packaged with the product. The CD-ROM also includes an accessible HTML version of this document.

IBM and accessibility

See the IBM Human Ability and Accessibility Center web site at www.ibm.com/able/ for more information about the commitment that IBM has to accessibility.

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- Page numbers to which you are referring

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Safety and environmental notices

This section contains information about:

- “Safety notices and labels”
- “Rack safety” on page xvii
- “Product recycling and disposal” on page xix

Safety notices and labels

When using this product, observe the danger, caution, and attention notices contained in this guide. The notices are accompanied by symbols that represent the severity of the safety condition. The danger and caution notices are listed in numerical order based on their IDs, which are displayed in parentheses, for example (D004), at the end of each notice. Use this ID to locate the translation of these danger and caution notices in the *IBM System Storage® SAN b-type Safety Notices* publication, which is shipped with this product.

The following notices and statements are used in IBM documents. They are listed below in order of increasing severity of potential hazards. Follow the links for more detailed descriptions and examples of the danger, caution, and attention notices in the sections that follow.

- **Note:** These notices provide important tips, guidance, or advice.
- **“Attention notices” on page xvi:** These notices indicate potential damage to programs, devices, or data.
- **“Caution notices” on page xiv:** These statements indicate situations that can be potentially hazardous to you.
- **“Danger notices”:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. Safety labels are also attached directly to products to warn of these situations.
- In addition to these notices, “Safety labels” on page xv may be attached to the product to warn of potential hazards.

Danger notices

A danger notice calls attention to a situation that is potentially lethal or extremely hazardous to people. A lightning bolt symbol accompanies a danger notice to represent a dangerous electrical condition. Read and comply with the following danger notices before installing or servicing this device.



DANGER

To prevent a possible shock from touching two surfaces with different protective ground (earth), use one hand, when possible, to connect or disconnect signal cables. (D001)



DANGER

Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch circuit protection requirements. Refer to the information that is provided with your device or the power rating label for electrical specifications. (D002)



DANGER

If the receptacle has a metal shell, do not touch the shell until you have completed the voltage and grounding checks. Improper wiring or grounding could place dangerous voltage on the metal shell. If any of the conditions are not as described, STOP. Ensure the improper voltage or impedance conditions are corrected before proceeding. (D003)



DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (D004)

A general electrical danger notice provides instructions on how to avoid shock hazards when servicing equipment. Unless instructed otherwise, follow the procedures in the following danger notice.



DANGER

When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:

- Connect power to this unit only with the IBM provided power cord. Do not use the IBM provided power cord for any other product.
- Do not open or service any power supply assembly.
- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.
- Connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate.
- Connect any equipment that will be attached to this product to properly wired outlets.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.
- Connect and disconnect cables as described below when installing, moving, or opening covers on this product or attached devices.

To disconnect:

1. Turn off everything (unless instructed otherwise).
2. Remove the power cords from the outlets.
3. Remove the signal cables from the connectors.
4. Remove all cables from the devices.

To connect:





1. Turn off everything (unless instructed otherwise).
2. Attach all cables to the devices.
3. Attach the signal cables to the connectors.
4. Attach the power cords to the outlets.
5. Turn on the devices.

(D005)

Caution notices

A caution notice calls attention to a situation that is potentially hazardous to people because of some existing condition. A caution notice can be accompanied by different symbols, as in the examples below:

Table 1. Sample caution notices

If the symbol is...	It means...
	A hazardous electrical condition with less severity than electrical danger.
	A generally hazardous condition not represented by other safety symbols.
 18-32 kg (39.7-70.5 lbs)	A specification of product weight that requires safe lifting practices. The weight range of the product is listed below the graphic, and the graphic and the wording of the caution varies, depending on the weight of the device.
 Class I	A hazardous condition due to the use of a laser in the product. Laser symbols are always accompanied by the classification of the laser as defined by the U. S. Department of Health and Human Services (for example, Class I, Class II, and so forth).

Read and comply with the following caution notices before installing or servicing this device.



CAUTION:

Energy hazard present. Shorting may result in system outage and possible physical injury. Remove all metallic jewelry before servicing. (C001)



CAUTION:

The battery contains lithium. To avoid possible explosion, do not burn or charge the battery. Do not:

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Exchange only with the IBM-approved part. Recycle or discard the battery as instructed by local regulations. In the United States, IBM has a process for the collection of this battery. For information, call 1-800-426-4333. Have the IBM part number for the battery unit available when you call. (C003)

CAUTION:

This part or unit is heavy but has a weight smaller than 18 kg (39.7 lb). Use care when lifting, removing, or installing this part or unit. (C008)



CAUTION:

The system contains circuit cards, assemblies, or both that contain lead solder. To avoid the release of lead (Pb) into the environment, do not burn. Discard the circuit card as instructed by local regulations. (C014)



CAUTION:

This product is equipped with a 3-wire (two conductors and ground) power cable and plug. Use this power cable with a properly grounded electrical outlet to avoid electrical shock. (C018)



CAUTION:

This product might contain one or more of the following devices: CD-ROM drive, DVD-ROM drive, DVD-RAM drive, or laser module, which are Class 1 laser products. Note the following information:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of the controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

(C026)



CAUTION:

The power-control button on the device does not turn off the electrical current supplied to the device. The device might also have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals. (C031)

Safety labels

As an added precaution, safety labels are often installed directly on products or product components to warn of potential hazards. These can be either danger or caution notices, depending upon the level of the hazard.

The actual product safety labels may differ from these sample safety labels:



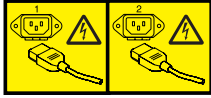
DANGER

Hazardous voltage, current, or energy levels are present inside any component that has this label attached. Do not open any cover or barrier that contains this label. (L001)



DANGER

Rack-mounted devices are not to be used as a shelf or work space. (L002)



DANGER

Multiple power cords. The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords. (L003)



DANGER

Hazardous voltage present. Voltages present constitute a shock hazard, which can cause severe injury or death. (L004)



CAUTION:

Hazardous moving parts nearby. (L008)

Attention notices

An attention notice indicates the possibility of damage to a program, device, or system, or to data. An exclamation point symbol may accompany an attention notice, but is not required. A sample attention notice follows:

Attention: Do not bend a fibre cable to a radius less than 5 cm (2 in.); you can damage the cable. Tie wraps are not recommended for optical cables because they can be easily overtightened, causing damage to the cable.

ESD precautions

Attention: Many of the field replaceable units (FRUs) are sensitive to electrostatic discharge (ESD), and can potentially be damaged by improper handling. When working with any FRU, use correct ESD precautions:

- Attach ground to the indicated area on the chassis
- Wear a wrist grounding strap connected to chassis ground (if the switch is plugged in) or a bench ground
- Store ESD-sensitive components in antistatic packaging

Rack safety

Rack installation

DANGER

Observe the following precautions when working on or around your IT rack system:

- Heavy equipment—personal injury or equipment damage might result if mishandled.
- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.
- Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.



- Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.
- Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.
- An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.

(R001 part 1 of 2)

CAUTION:

- Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.
- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.
- Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.
- *(For sliding drawers)* Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.
- *(For fixed drawers)* This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack.

(R001 part 2 of 2)

Rack relocation (19" rack)

CAUTION:

Removing components from the upper positions in the rack cabinet improves rack stability during relocation. Follow these general guidelines whenever you relocate a populated rack cabinet within a room or building:

- Reduce the weight of the rack cabinet by removing equipment starting at the top of the rack cabinet. When possible, restore the rack cabinet to the configuration of the rack cabinet as you received it. If this configuration is not known, you must do the following:
 - Remove all devices in the 32U position and above.
 - Ensure that the heaviest devices are installed in the bottom of the rack cabinet.
 - Ensure that there are no empty U-levels between devices installed in the rack cabinet below the 32U level.
 - If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.
 - Inspect the route that you plan to take when moving the rack to eliminate potential hazards.
 - Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that came with your rack cabinet for the weight of a loaded rack cabinet.
 - Verify that all door openings are at least 760 x 2030 mm (30 x 80 in.).
 - Ensure that all devices, shelves, drawers, doors, and cables are secure.
 - Ensure that the four leveling pads are raised to their highest position.
 - Ensure that there is no stabilizer bracket installed on the rack cabinet during movement.
 - Do not use a ramp inclined at more than 10 degrees.
 - Once the rack cabinet is in the new location, do the following:
 - Lower the four leveling pads.
 - Install stabilizer brackets on the rack cabinet.
 - If you removed any devices from the rack cabinet, repopulate the rack cabinet from the lowest position to the highest position.
 - If a long distance relocation is required, restore the rack cabinet to the configuration of the rack cabinet as you received it. Pack the rack cabinet in the original packaging material, or equivalent. Also, lower the leveling pads to raise the casters off of the pallet and bolt the rack cabinet to the pallet.

(R002)

Product recycling and disposal

Refer to the *IBM Systems Environmental Notices and User Guide (Z125-5823)* for translated environmental statements and information regarding product recycling and disposal. This document may be provided either in printed version or on the product documentation CD. A more current version may be available through this link ftp://public.dhe.ibm.com/systems/support/warranty/envnotices/environmental_notices_and_user_guide.pdf

See "Removing the battery" on page 38 for instructions on how to remove the battery.

About this document

This document is intended for use by systems administrators and technicians experienced with networking, Fibre Channel, and storage area network (SAN) technologies. It describes how to install, service, and use the IBM System Networking SAN96B-5 (machine type-models 2498-F96 and 2498-N96 Switch). Throughout this document, the product is referred to as the *SAN96B-5*, or simply the *switch*.

This document has been created to include information specific to SAN96B-5 switches running on Fabric OS version 7.1.0 or later. This document does not support all Fabric OS versions. It is specific to Fabric OS v7.1.0 or later. Refer to the Fabric OS Release Notes for more information.

Product documents

The following documents contain information related to this product. The documentation may be printed material or may be on the documentation CD that is shipped with the product.

- *IBM System Networking SAN96B-5 Installation, Service, and User Guide*, SC27-5434 (this document)
- *IBM System Networking SAN96B-5 Quick Start Guide*, GI13-2846
- *IBM System Storage SAN b-type Safety Notices*, 98Y1529
- *IBM Systems Environmental Notices and User Guide*, Z125-5823
- *Warranty Information*, 45W6626

Newer versions of product documentation may be available through the IBM Publications Center Web site www.ibm.com/shop/publications/order. Search by publication title or publication number.

Newer versions may also be available through the IBM Support Portal www.ibm.com/supportportal. Enter your product machine type (2498) or product name in the search field, and then select **Documentation** from the displayed page.

Brocade documents

IBM b-type switches use software licensed from Brocade Communications Systems, Inc. You can find information related to the software that supports the switch in the following documents on the CD-ROM supplied with this product:

Brocade Fabric OS

- *EZSwitchSetup Administrator's Guide*
- *Fabric OS Administrator's Guide*
- *Fabric OS Command Reference Manual*
- *Fabric OS MIB Reference Manual*
- *Fabric OS Message Reference Manual*
- *Fabric OS Troubleshooting and Diagnostics Guide*

Brocade Fabric OS optional features

- *Fabric Watch Administrator's Guide*

IBM and Brocade product matrix

The product matrix provides a cross-reference between the comparable IBM and Brocade product models.

When you use any of the Brocade documents, such as Fabric Operating System (FOS) publications, you will notice that the model numbers reflect the corresponding Brocade products. Table 2 provides a product matrix to correlate the Brocade products and models to the IBM product names and machine types and model numbers. Products withdrawn from marketing are not listed.

Table 2. Brocade and IBM product and model number matrix

Brocade product name	IBM product name	IBM machine type and model number
Brocade 6520	SAN96B-5	2498 Models F96 and N96
Brocade 6505	SAN24B-5	2498 Model F24, 249824G
Brocade 6510	SAN48B-5	2498 Model F48
Brocade DCX 8510-4	SAN384B-2	2499 Model 416
Brocade DCX 8510-8	SAN768B-2	2499 Model 816
Brocade DCX-4S	SAN384B	2499 Model 192
Brocade DCX	SAN768B	2499 Model 384
Brocade 7800	SAN06B-R	2498 Model R06
Brocade 5300	SAN80B-4	2498 Model B80
Brocade 300	SAN24B-4	2498 Models B24 and 24E

Chapter 1. Introducing the SAN96B-5 switch

The IBM System Networking SAN96B-5 is a 96-port auto-sensing 2, 4, 8, or 16 Gbps, as well as 10 Gbps, Fibre Channel (FC) switch that delivers the latest multi-chip architecture for Fibre Channel Storage Area Networks (SANs). The SAN96B-5 is an enterprise-class switch that is designed to handle the large-scale SAN requirements of an enterprise, and can also be used to address the SAN requirements of a small to medium-sized workgroup.

The switch provides up to 96 ports in a double height (2U) chassis that enables the creation of very dense fabrics in a relatively small space.

The SAN96B-5 offers scalability from the base models of 48 ports to 72 or 96 ports through activation of optional 24-port Ports on Demand (POD) licenses. Port activation works through the Dynamic Ports on Demand (DPOD) process. With DPOD, ports are licensed as they come online. For instance, with a base model 48 port license, the first 48 ports to come online are licensed regardless of the port numbering. Once all 48 licenses have been assigned, you can manually move those licenses from one port to another if you choose.

The first eight ports can be configured to run at 10 Gbps with the appropriate licensing.

The switch provides the Reliability, Availability, and Serviceability (RAS) performance and scalability requirements of an enterprise switch along with interoperability and ease-of-use advantages.

The SAN96B-5 is 61 cm (24 in) deep and offers an airflow direction option based on the model purchased. The 2498-F96 model has port side exhaust, while the 2498-N96 model has non-port side exhaust airflow to accommodate specific installation and configuration requirements.

This chapter provides the following information:

- “Switch features”
- “Switch components” on page 3
- “Port side of the switch” on page 3
- “Non-port side of the switch” on page 4

Switch features

The SAN96B-5 offers the following features and capabilities:

- Up to 96 auto-sensing ports of high-performance 16 Gbps technology in a single domain
- Ports on Demand scaling from 48 to 72 or 96 ports
- Port licensing through Dynamic Ports On Demand (DPOD)
- 2, 4, 8, and 16 Gbps auto-sensing Fibre Channel switch and router ports
 - 2, 4, and 8 Gbps performance is enabled by 8 Gbps SFP+ transceivers
 - 4, 8, and 16 Gbps performance is enabled by 16 Gbps SFP+ transceivers
- 10 Gbps manual set capability on FC ports on the first eight ports (requires the optional 10 Gigabit FCIP/Fibre Channel license)

- Ports can be configured for 10 Gbps for metro connectivity
- 10 Gbps performance is enabled by 10 Gbps Fibre Channel SFP+ transceivers
- FC ports will self-configure as E_ports and F_ports. EX_ports can be activated on a per-port basis with the optional Integrated Routing license.
 - Mirror ports (M_ports) and diagnostic ports (D_ports) must be manually configured
 - The Diagnostic Port (D_port) feature provides physical media diagnostic, troubleshooting, and verification services
- In-flight data compression and encryption on up to four ports provides efficient link utilization and security.
- Options for port side exhaust (2498-F96 model) or non-port side exhaust (2498-N96 model) airflow for cooling
- Virtual Fabric (VF) support to improve isolation between different VFs
- Fibre Channel Routing (FCR) service, available with the optional Integrated Routing license, provides improved scalability and fault isolation
- Inter-Switch Link (ISL) Trunking (licensable), which allows up to eight ports (at 2, 4, 8, or 16 Gbps speeds) between a pair of switches combined to form a single, logical ISL with a speed of up to 128 Gbps (256 Gbps full duplex) for optimal bandwidth utilization and load balancing. There is no limit to how many trunk groups can be configured.
- Dynamic Path Selection (DPS), which optimizes fabric-wide performance and load balancing by automatically routing data to the most efficient available path in the fabric
- SFP+ optical transceivers that support any combination of Short Wavelength (SWL) and Long Wavelength (LWL) or Extended Long Wavelength (ELWL) optical media among the switch ports
- Extended distance support enables native Fibre Channel extension up to 7,500 km at 2 Gbps
- Support for unicast data traffic types
- Fabric OS, which delivers distributed intelligence throughout the network and enables a wide range of value-added applications including Web Tools, Advanced Zoning, Full Fabric, Enhanced Group Management, Adaptive Networking, and Server Application Optimization (SAO). Optional Fabric Services include: Fabric Watch, Extended Fabrics, ISL Trunking, Advanced Performance Monitor, and Integrated Routing. (The optional SAN96B-5 Enterprise Package feature includes Fabric Watch, Extended Fabrics, ISL Trunking, and Advanced Performance Monitor.)
- Hardware zoning is accomplished at the port level of the switch and by World Wide Name (WWN). Hardware zoning permits or denies delivery of frames to any destination port address
- Extensive diagnostics and system-monitoring capabilities for enhanced high Reliability, Availability, and Serviceability (RAS)
- 10Gbps Fibre Channel integration on the same port provides for DWDM metro connectivity on the same switch (available on first eight ports only with appropriate licensing)
- EZSwitchSetup wizard that makes SAN configuration a three-step point-and-click task
- Real time power monitoring enables users to monitor real time power usage of the fabric at the switch level
- Local port latency minimized to 700 nanoseconds (ns) through the use of cut-through frame routing at 16 Gbps

- Switch latency of 2100 ns (L2 latency without forward error correction)

Attention: This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks nor to be used in a public services network. Further certification may be required by law prior to making any such connection. Please contact IBM for information.

Switch components

- A system board that features a primary CPU running at 1.20 GHz, with integrated peripherals
- One 2 GB DDR2 memory module running at 400 MHz
- Boot memory of 8 MB
- One 2 GB compact flash card
- Up to 96 16 Gbps Fibre Channel ports
- An RJ45 10/100 Base T Ethernet system management port, that in conjunction with EZSwitchSetup, supports switch IP address discovery and configuration, eliminating the need to attach a serial cable to configure the switch IP address
- One RS-232 console (serial) port with an RJ45 connector for initial switch setup (if not using EZSwitch Setup) and factory default restoration
- One USB 2.0 port providing connections for storage for firmware updates, output of the **supportSave** command and storage for configuration uploads and downloads
- Two hot-swappable, 80+ Platinum certified, redundant power supplies
- Three hot-swappable fan FRUs
- One LED (green/amber) per FC port to indicate status
- One LED (green) for system power
- One LED (green/amber) for system status
- Two Ethernet LEDs (integrated with RJ45 port) for speed and port activity status
- Two LEDs per power supply: one green for AC line in status and one green/amber for DC power out
- One LED (green/amber) per fan
- EEPROM for switch identification
- Voltage monitoring
- Fan monitoring, including flow direction
- Temperature monitoring
- Real-time clock (RTC) with battery

Port side of the switch

The port side (see Figure 1 on page 4) includes the system status LED, console port, Ethernet port and LEDs, USB port, and Fibre Channel ports and the corresponding port status LEDs.

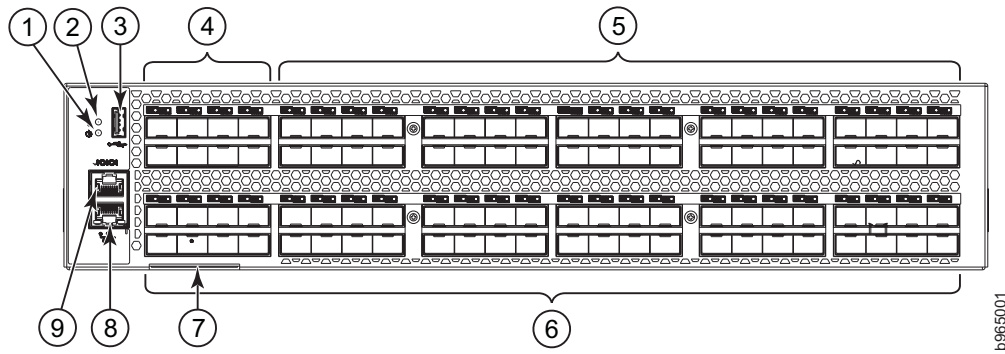


Figure 1. Port side view

- 1** - System power LED
- 2** - System status LED
- 3** - USB port
- 4** - FC ports 0-7 (all LEDs above)
- 5** - FC ports 8-47
- 6** - FC ports 48-95
- 7** - Switch ID pull-out tab
- 8** - Management Ethernet port with LEDs
- 9** - Serial console port

Non-port side of the switch

Figure 2 shows the non-port side of the switch, which contains the power supplies (including the AC power receptacles) and fan assemblies.

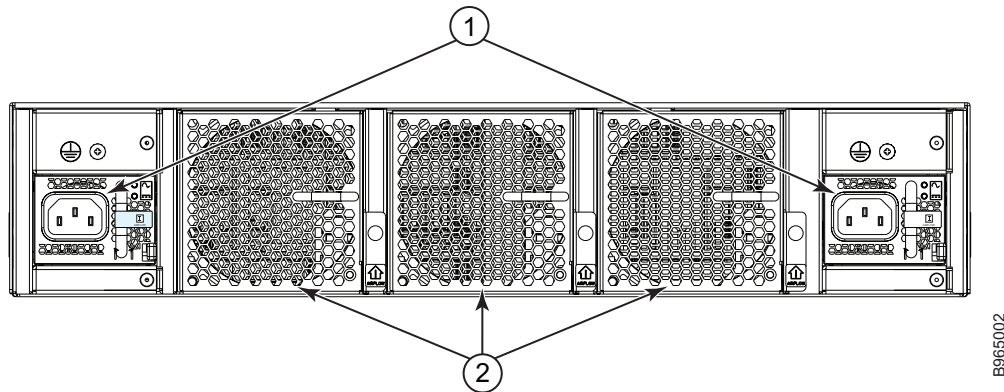


Figure 2. Non-port side of the switch

- 1** - Power supplies with integral fans
- 2** - Fans

Chapter 2. Installing and configuring the switch

You can install the SAN96B-5 switch in the following ways:

- As a stand-alone unit on a flat surface. For instructions and more information, see “Setting up the switch as a standalone unit” on page 8.
- In an Electronic Industries Association (EIA) cabinet using the fixed rack mount kit. For more information, see “Installing in an EIA cabinet” on page 8.

This chapter provides the following information:

- “Items included with the switch”
- “Site preparation and installation requirements” on page 6
- “Setting up the switch as a standalone unit” on page 8
- “Installing in an EIA cabinet” on page 8
- “Configuring the switch” on page 13



Attention: Read the “Safety notices and labels” on page xi before attempting any installation, maintenance, or service procedures.

Items included with the switch

The following items are included with the standard shipment of the switch. When you open the packaging, verify that these items are included in the package and that no damage occurred during shipping.

Note: If any items are damaged or missing, within the United States and Canada, contact the IBM Quality Hotline toll-free 1-800-442-6773 or direct dial in other locations: 770-858-8459.

- The SAN96B-5 switch, containing two power supplies and three fans (incorporating either non-port side exhaust or port side exhaust airflow depending on model ordered)
- 16 Gbps, 10 Gbps, or 8 Gbps SFP+ transceivers for the Fibre Channel ports (speed and quantity as ordered)
- One accessory kit, containing the following items:
 - *IBM System Networking SAN96B-5 Installation, Service, and User Guide* (this document)
 - *IBM System Networking SAN96B-5 Quick Start Guide*
 - IBM documentation CD
 - EZSwitch Setup CD
 - Safety notices
 - Warranty
 - Environmental notices
 - Fixed rack mount kit
 - Serial cable with an RJ45 connector
 - Two 6 ft. (1.8 m) country-specific power cords
 - Rubber feet, required for setting up the switch as a standalone unit

- Paperpack of optional features license and key activation information (if ordered)

Attention: Retain these paperpacks in a safe place. The transaction keys in the paperpacks are required for activation of optional features on the switch. Once a feature is activated, its activation key is associated with a specific product WWN and serial number.

Site preparation and installation requirements

The following conditions are required to ensure correct installation and operation of the switch.

Attention: Follow ESD precautions whenever handling the switch or components. See “ESD precautions” on page xvii.

Electrical requirements

For successful installation and operation of the switch, ensure that the following electrical requirements are met:

- The primary outlet is correctly wired, protected by a circuit breaker, and grounded in accordance with local electrical codes.
- The supply circuit, line fusing, and wire size are adequate, as specified by the electrical rating on the switch nameplate.
- The power supply standards are met. See “Power supply specifications” on page 41.

Attention: To maximize fault tolerance, connect each power cord to a separate power source.

Environmental considerations

For successful installation and operation of the switch, ensure that the following environmental requirements are met:

- At a minimum, adequate cooling requires that you install the switch with the intake side, as indicated by the airflow direction of the fan assemblies, facing the cool-air aisle. The **chassisShow** output indicates "Reverse" for non-port side intake and "Forward" for port side intake.
- All equipment in the rack should force air in the same direction to avoid intake of exhaust air.
- Airflow requirements outlined in “Environmental requirements” on page 42 must be met. Note that the requirements differ based on the direction of the airflow, which is determined by the model purchased.
- The ambient air temperature does not exceed 40° C (104° F) while the switch is operating.

Cabinet requirements

For successful installation and operation of the switch in a cabinet, ensure that the following cabinet requirements are met:

- The cabinet must be a standard EIA cabinet.
- A cabinet space that is two rack units (2U) high; 8.90 cm (3.50 inches) high and 48.3 cm (19 inches) wide.

- The rack kit option for the switch uses rails that are slimmer than standard rails to accommodate the slightly wider chassis. Be sure to use one of these kits. Do not use standard rails to install the switch in a rack, they will not fit with the switch.
- The equipment in the cabinet is grounded through a reliable branch circuit connection and maintain ground at all times. Do not rely on a secondary connection to a branch circuit, such as a power strip.
- Airflow and temperature requirements are met on an ongoing basis, particularly if the switch is installed in a closed or multi-cabinet assembly.
- The additional weight of the switch does not exceed the cabinet's weight limits or unbalance the cabinet in any way.
- The cabinet is secured to ensure stability in case of unexpected movement, such as an earthquake.

Planning for cable management

Attention: The minimum bend radius for a 50 micron cable is 5.1 cm (2 in.) under full tensile load and 3.0 cm (1.2 in.) with no tensile load.

Cables can be organized and managed in a variety of ways, for example, using cable channels on the sides of the cabinet or patch panels to minimize cable management. Following is a list of recommendations:

- Plan for rack space required for cable management before installing the switch.
- Leave at least 1 m (3.28 ft) of slack for each port cable. This provides room to remove and replace the switch, allows for inadvertent movement of the rack, and helps prevent the cables from being bent to less than the minimum bend radius.
- If you are using ISL Trunking, consider grouping cables by trunking groups. The cables used in trunking groups must meet specific requirements, as described in the *Fabric OS Administrator's Guide*.
- For easier maintenance, label the fiber optic cables and record the devices to which they are connected.
- Keep LEDs visible by routing port cables and other cables away from the LEDs.
- Use hook and loop style straps to secure and organize fiber optic cables. Do not use tie wraps with optical cables; they can be easily overtightened and can damage the optic fibers.
- Record port and cable connections using a table such as Appendix B, "Cable routing table," on page 47.

Items required for installation

The following items are required for installing, configuring and connecting the SAN96B-5 for use in a network and fabric:

- Workstation with an installed terminal emulator, such as HyperTerminal.
- Unused IP address and corresponding subnet mask and gateway address
- Items from the accessory kit that accompanies the switch
- Serial cable (provided) if not using EZSwitch Setup
- Ethernet cable
- Brocade-branded SFP+s and compatible cables (Brocade-branded 16 Gbps SFP+s are required for 16 Gbps performance), as required

- Access to an FTP server or the USB device for backing up the switch configuration (optional)

Setting up the switch as a standalone unit



Attention: Refer to “Safety notices and labels” on page xi before starting any installation procedure.

To install the switch as a standalone unit, use the following procedure:

1. Unpack the switch and verify that all items listed in “Items included with the switch” on page 5 are present and undamaged.
2. Clean the four corner depressions on the bottom of the switch enclosure, place an adhesive rubber foot in each one, and firmly press into place. The rubber feet on the switch help prevent the switch from sliding off the supporting surface.
3. Place the switch on a flat, sturdy surface.
4. Provide power to the switch as described in “Providing power to the switch” on page 14.

Attention: Do not connect the switch to the network until the IP address is correctly set. For instructions on how to cable and configure the switch, and how to set the IP address, see “Configuring the switch” on page 13.

Installing in an EIA cabinet



Attention: Refer to “Safety notices and labels” on page xi before starting any installation procedure.



Attention: Refer to “Rack safety” on page xvii for danger and caution notices related to rack and cabinet installations.



Attention: Install the switch with the airflow aligned with any other switches in the rack. Some switches have airflow running from port side to fan side and others have the opposite arrangement. Make sure that the airflow for all switches moves in the same direction to maximize cooling.

Time required

Allow 30 to 60 minutes to complete this procedure. Two people can make installation easier.

Items required

You need the following items to install the switch using the fixed rack mount kit:

- Clamps or other means of temporarily supporting the switch in the cabinet
- Phillips #2 torque screwdriver
- 1/4 in. straight slot screwdriver

- 2U of rack space
- Fixed rack mount kit

Attention: Use the screws specified for use with the switch. Longer screws can damage the switch. The different types of screws are listed in “Fixed rack mount kit parts list.”

Fixed rack mount kit parts list

Ensure that the items illustrated and listed in Figure 3 are included in the kit.

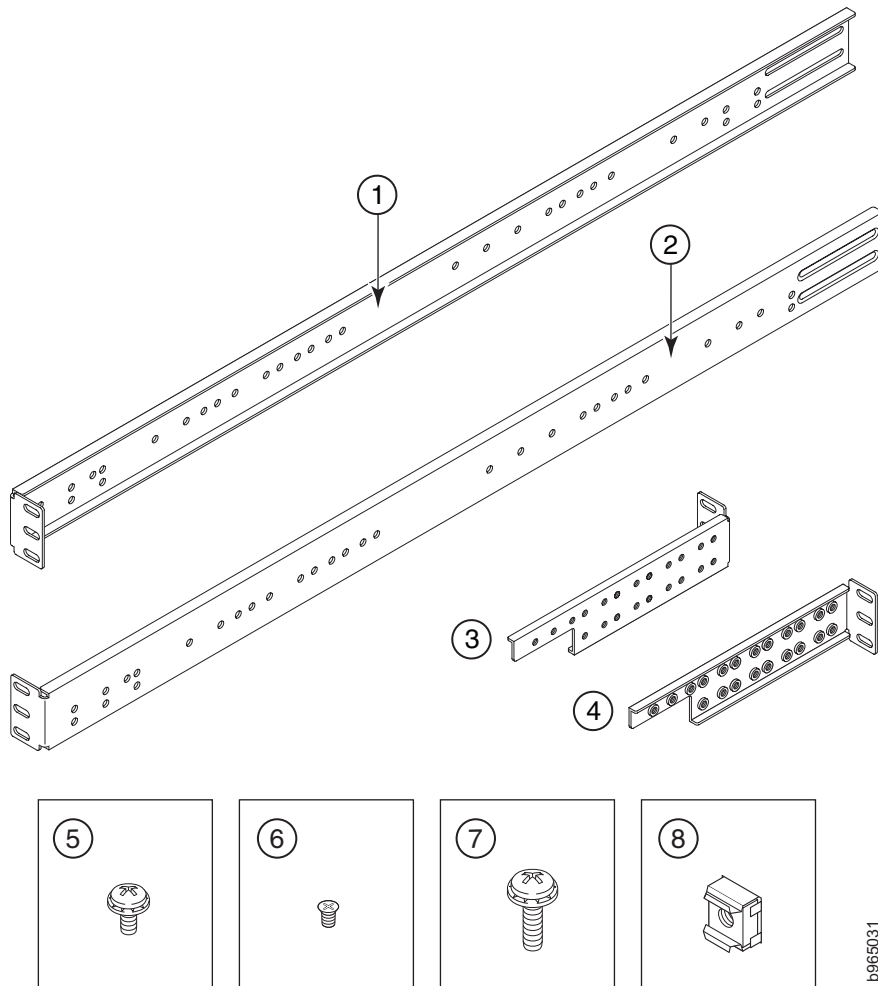


Figure 3. Items in the fixed rack mount kit

- 1** - Bracket, front right
- 2** - Bracket, front left
- 3** - Bracket, rear left
- 4** - Bracket, rear right
- 5** - Screw, 8-32 x 5/16-in., panhead Phillips (12)
- 6** - Screw, 6-32 x 1/4-in., flathead Phillips (8)
- 7** - Screw, 10-32 x 5/8-in., panhead Phillips (8)
- 8** - Retainer nut, 10-32 (8)

Installation instructions

To install the switch in a cabinet that meets EIA standards, use the following procedure.

Attention: The switch must be turned off and disconnected from the fabric during this procedure.

Complete these tasks to install the switch in a cabinet:

- “Attaching the front brackets to the switch”
- “Installing the switch in the cabinet” on page 11
- “Attaching rear brackets to front brackets” on page 11
- “Attaching the rear brackets to the cabinet posts” on page 12

Note: The illustrations depict a 1U switch. The procedures and positioning are the same for the 2U high SAN96B-5.

Attaching the front brackets to the switch

Complete the following steps to attach the front brackets to the switch.

1. Position the right front bracket (**1**) with the flat side against the right side of the switch, as shown in Figure 4

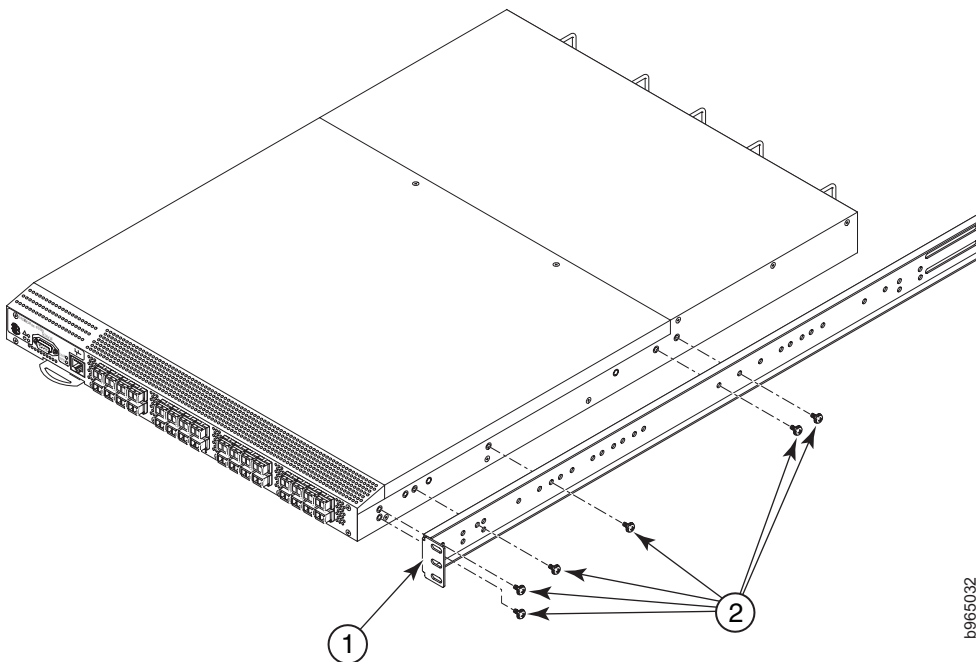


Figure 4. Attaching the front brackets

1 - Bracket, front right

2 - Screw, 8-32 x 5/16-in., panhead Phillips

2. Insert two 8-32 x 5/16-in. screws (**2**) into one of the pairs of vertically aligned holes in the bracket and then into the pair of holes on the side of the switch. To install the switch in a recessed position in the rack, use the bracket holes that are set back from the end of the bracket.
3. Insert additional 8-32 x 5/16-in. screws through the holes in the bracket and into the corresponding holes in the switch.

Note: The number of screws will vary depending on the switch model. Do not rely on the illustration for the exact number of screws used with the SAN96B-5.

4. Repeat steps 1 through 3 to attach the left front bracket to the left side of the switch.
5. Tighten the screws to a torque of 15 in-lbs (17 cm-kgs).

Installing the switch in the cabinet

Complete the following steps to install the switch in the cabinet.

1. Position the switch in the cabinet, as shown in Figure 5, providing temporary support under the switch until the rail kit is secured to the cabinet vertical posts.
2. Attach the right front bracket (**2**) to the right front cabinet post using two 10-32 x 5/8-in. screws (**4**) and two retainer nuts (**3**).

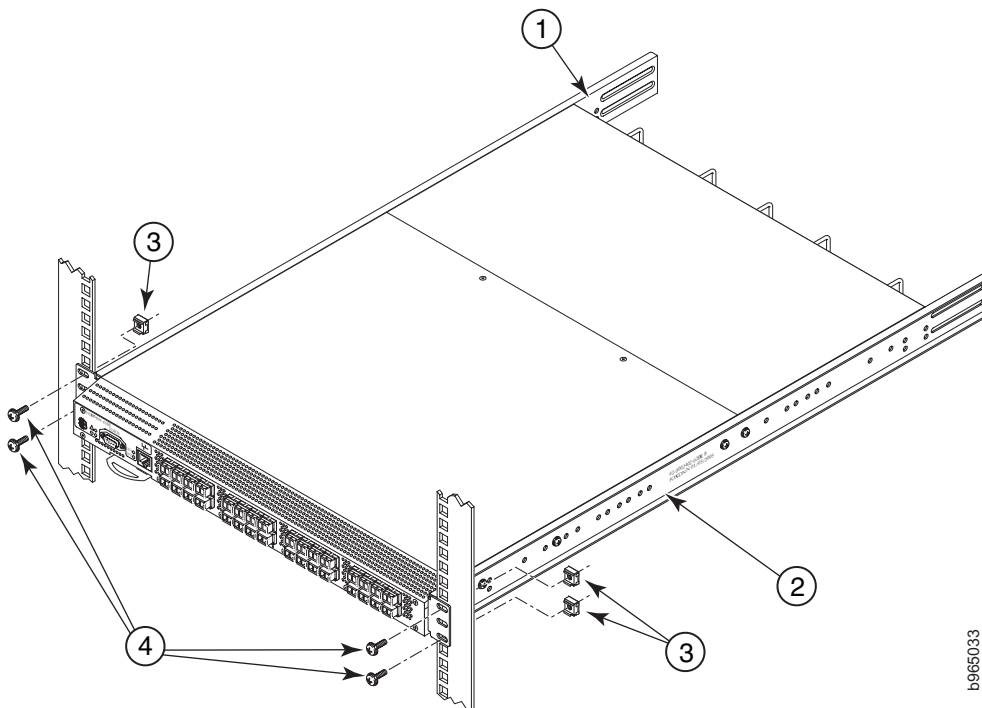


Figure 5. Positioning the switch in the cabinet

- 1** - Bracket, front left
- 2** - Bracket, front right
- 3** - Retainer nut, 10-32
- 4** - Screw, 10-32 x 5/8-in., panhead Phillips

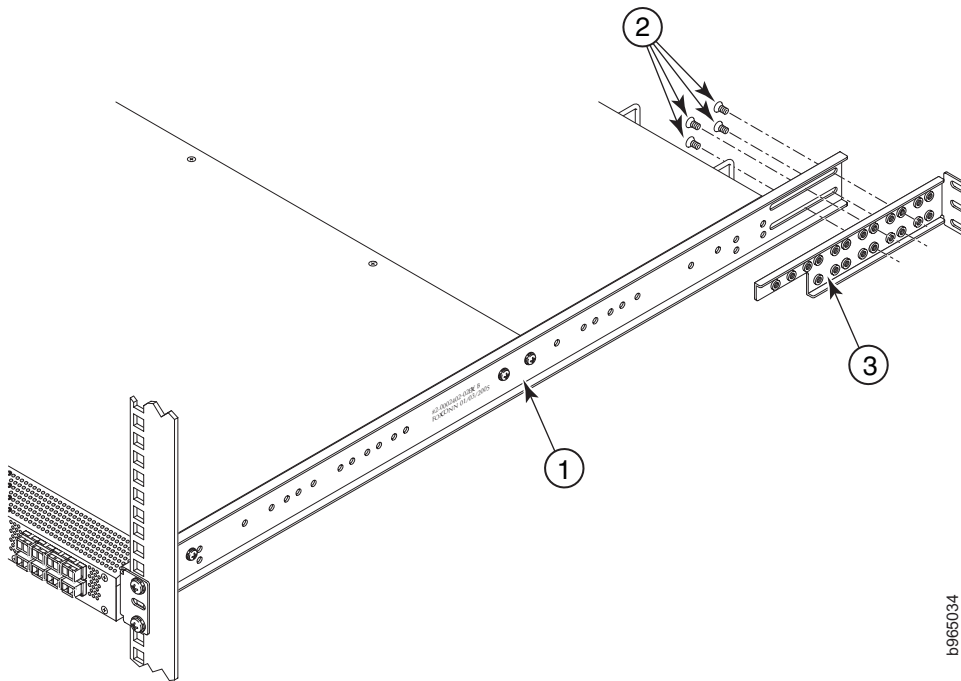
Note: The figure above is shown with a recessed mounting configuration on the left and a flush mounting configuration on the right. You can select either mounting option.

3. Attach the left front bracket (**1**) to the left front rack post using two 10-32 x 5/8-in. screws and two retainer nuts.
4. Tighten all the 10-32 x 5/8-in. screws to a torque of 25 in-lbs (29 cm-kgs).

Attaching rear brackets to front brackets

Complete the following steps to attach the rear brackets to the front brackets.

1. Slide the right rear bracket (**3**) inside the right front bracket (**1**) as shown in Figure 6.



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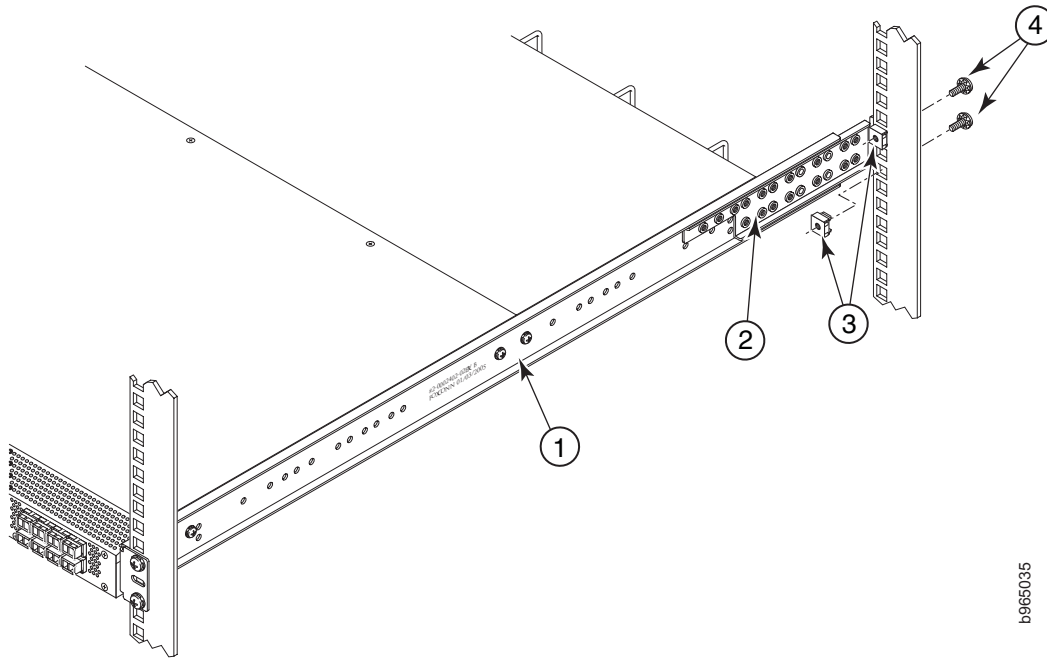
Figure 6. Attaching the rear brackets to the front brackets

- 1** - Bracket, front right
 - 2** - Screw, 6-32 x 1/4-in., flathead Phillips
 - 3** - Bracket, rear right
2. Attach the brackets using four 6-32 x 1/4-in. screws (**2**).
 3. Repeat step 1 and step 2 to attach the left rear bracket to the left front bracket.
 4. Adjust the brackets to the rack depth and tighten all the 6-32 x 1/4-in. screws to a torque of 9 in-lbs (10 cm-kgs).

Attaching the rear brackets to the cabinet posts

Complete the following steps to attach the rear brackets to the cabinet posts.

1. Attach the right rear bracket (**2**) to the right rear rack post using two 10-32 x 5/8-in. screws (**4**) and two retainer nuts (**3**), as shown in Figure 7 on page 13



b965035

Figure 7. Attaching the rear bracket to the cabinet post

- 1** - Bracket, front right
 - 2** - Bracket, rear right
 - 3** - Retainer nut, 10-32
 - 4** - Screw, 10-32 x 5/8-in., panhead Phillips
2. Attach the left rear bracket to the left rear rack post using two 10-32 x 5/8-in. screws and two retainer nuts.
 3. Tighten all the 10-32 x 5/8-in. screws to a torque of 25 in-lbs (29 cm-kgs).
 4. Remove any clamps or other temporary supports used during the switch installation.

Configuring the switch

Once you have set up the SAN96B-5 in a rack or as a standalone switch, it is time to attach power and set up a basic configuration. If you are going to use the SAN96B-5 in a single-switch setup, you can use EZSwitchSetup to complete the basic configuration.

See the *EZSwitchSetup CD*, included with the switch, for more information. You can also use the *SAN96B-5 Quick Start Guide*. If you do not want to use EZSwitch Setup, follow the instructions in this section.

To configure the switch, complete the following tasks.

- “Providing power to the switch” on page 14
- “Creating a serial connection” on page 14
- “Setting the switch IP address” on page 15
- “Setting the switch date and time” on page 16
- “Installing SFP+ transceivers and connecting cables” on page 19

Attention: Do not connect the switch to the network until the IP address is correctly set.

Providing power to the switch



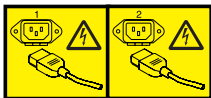
DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (D004)

Complete these steps to power on the switch:

1. Connect the power cords to both power supplies in the chassis.
2. Connect the other end of the power cords to power sources on separate circuits to protect against AC failure. Ensure that the cords have a minimum service loop of 15 cm (6 in.) available and are routed to avoid stress. The power supplies power up as soon as they are plugged in. The power supply LEDs display green. The power LED on the front of the switch turn green as well. The system status LED on the front panel will be amber until POST completes and then it will turn green. If a second power supply is installed but NOT plugged into a power source, the AC status light on the power supply will be out and the DC status light will be amber. If the second power supply IS plugged into a power source, then both LEDs will be green.

Attention: Power is supplied to the switch as soon as the first power supply is connected to a power source. There are no switches on the power supplies to turn the power on and off.



DANGER

Multiple power cords. The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords. (L003)

3. After POST is complete, verify that the switch power and status LEDs on the left of the port side of the switch are both green. See “Port side of the switch” on page 3 for the specific location of these LEDs.

Attention: Do not connect the switch to the network until the IP address is set.

Creating a serial connection

All basic configuration tasks in this guide are accomplished using a serial connection. If you need to know the serial port pinouts, refer to Table 15 on page 45.

Complete these steps to create a serial connection to the switch.

1. Connect the serial cable to the serial console port on the switch and to an RS-232 serial port on the workstation. If the serial port on the workstation is

RJ-45 instead of RS-232, remove the adapter from the end of the serial cable and insert the exposed RJ-45 connector into the RJ-45 serial port on the workstation.

2. Open a terminal emulator application (such as HyperTerminal on a PC, or TERM, TIP, or Kermit in a UNIX environment), and configure the application as follows:
 - In a Windows environment, use 9600 bits per second, 8 databits, no parity, 1 stop bit, and no flow control.
 - In a UNIX environment using TIP, enter the following string at the prompt:
tip /dev/ttyb -9600

If ttyb is already in use, then use ttya instead and enter the following string at the prompt:

```
tip /dev/ttya -9600
```

Setting the switch IP address

You can configure the SAN96B-5 with a static IP address, or you can use a Dynamic Host Configuration Protocol (DHCP) server to set the IP address of the switch. DHCP is enabled by default. The switch supports both IPv4 and IPv6. If you are using IPv6, see the *Fabric OS Command Reference* for details when issuing the **ipAddrSet** command.

Using DHCP to set the IP address

When using DHCP, the switch obtains its IP address, subnet mask, and default gateway address from the DHCP server. The DHCP client can only connect to a DHCP server that is on the same subnet as the switch. If your DHCP server is not on the same subnet as the switch, use a static IP address.

Setting a static IP address

Complete the following steps to configure the switch with a static IP address:

1. Log in to the switch using the default password, which is *password*.
2. Use the **ipAddrSet** command to set the Ethernet IP address.

If you are going to use an IPv4 IP address, enter the IP address in dotted decimal notation as prompted. As you enter a value and then press **Enter** for a line in the following example, the next line will appear.

For instance, the Ethernet IP Address appears first. When you enter a new IP address and then press **Enter** or simply press **Enter** to accept the existing value, the Ethernet Subnetmask line appears.

In addition to the Ethernet IP address itself, you can set the Ethernet subnet mask, the Gateway IP address, and whether to obtain the IP address through DHCP or not.

```
switch:admin> ipaddrset
Ethernet IP Address [192.168.74.102]:
Ethernet Subnetmask [255.255.255.0]:
Gateway IP Address [192.168.74.1]:
DHCP [Off]: off
```

If you are going to use an IPv6 address, enter the network information in semicolon-separated notation as a standalone command.

```
switch:admin> ipaddrset -ipv6 --add 1080::8:800:200C:417A/64
IP address is being changed...Done.
```

3. Optionally, verify that the address was correctly set by entering the **ipAddrShow** command at the prompt.
4. Optionally, record the IP address on the pull out tab provided for this purpose on the port side of the switch.

Setting the switch date and time

The SAN96B-5 maintains the current date and time inside a battery-backed real-time clock (RTC) circuit. The date and time settings are used for logging events. Switch operation does not depend on the date and time; a switch with an incorrect date and time value still functions properly. However, because the date and time are used for logging, error detection, and troubleshooting, you should set them correctly.

Complete the following steps to set the date and time of the switch.

Time zones

You can set the time zone for the switch by name. You can also set country, city, or time zone parameters.

If the time zone is not set with the named options, the switch retains the offset time zone settings. The **tsTimeZone** command includes an option to revert to the prior time zone format. For more information about the **--old** option, refer to the *Fabric OS Command Reference*.

You can set the time zone for a switch using the **tsTimeZone** command. The **tsTimeZone** command allows you to perform the following tasks:

- Display all of the time zones supported in the firmware
- Set the time zone based on a country and city combination or based on a time zone ID such as PST

The time zone setting has the following characteristics:

- You can view the time zone settings. However, only individuals with administrative permissions can set the time zones.
- The **tsTimeZone** setting automatically adjusts for Daylight Savings Time.
- Changing the time zone on a switch updates the local time zone setup and is reflected in local time calculations.
- By default, all switches are in the Greenwich Mean Time (GMT) time zone (0,0). If all switches in a fabric are in one time zone, it is possible for you to keep the time zone setup at the default setting.
- System services that have already started will reflect the time zone changes only after the next reboot.
- Time zone settings persist across failover for high availability.

Local time synchronization

You can synchronize the local time of the principal or primary Fabric Configuration Server (FCS) switch to a maximum of eight external Network Time Protocol (NTP) servers. To keep the time in your SAN current, it is recommended that the principal or primary FCS switch has its time synchronized with at least one external NTP server. The other switches in the fabric will automatically take their time from the principal or primary FCS switch.

All switches in the fabric maintain the current clock server value in nonvolatile memory. By default, this value is the local clock server of the principal or primary FCS switch. Changes to the clock server value on the principal or primary FCS switch are propagated to all switches in the fabric.

When a new switch enters the fabric, the time server daemon of the principal or primary FCS switch sends out the addresses of all existing clock servers and the time to the new switch. If a switch with Fabric OS 5.3.0 or later has entered the fabric, it will be able to store the list and the active servers; pre-Fabric OS 5.3.0 switches will ignore the new list parameter in the payload and will update only the active server address.

If the active NTP server configured is IPv6, then distributing the same information in the fabric will not be possible to switches earlier than Fabric OS 5.3.0 because IPv6 is supported for Fabric OS 5.3.0 and later. The default value LOCL will be distributed to pre-Fabric OS 5.3.0 switches.

The **tsClockServer** command accepts multiple server addresses in IPv4, IPv6, or DNS name formats. When multiple NTP server addresses are passed, **tsClockServer** sets the first obtainable address as the active NTP server. The rest are stored as backup servers that can take over if the active NTP server fails. The principal or primary FCS switch synchronizes its time with the NTP server every 64 seconds.

Setting the date and time

Complete the following steps to set the date and time.

1. Log in to the switch using the default password, which is *password*.
2. Enter the **date** command, using the following syntax (the double quotation marks are required).

```
date "mmddHHMMyy"
```

The following values are used in the date command:

- mm is the month; valid values are 01 through 12
- dd is the date; valid values are 01 through 31
- HH is the hour; valid values are 00 through 23
- MM is minutes; valid values are 00 through 59
- yy is the year; valid values are 00 through 99 (values greater than 69 are interpreted as 1970 through 1999, and values less than 70 are interpreted as 2000 through 2069). Refer to the following example to first display the date and time and then to change them.

```
switch:admin> date  
Fri Aug 26 12:29:46 UTC 2011  
switch:admin> date "0208123013"  
Fri Feb 08 12:30:00 UTC 2013  
switch:admin>
```

Setting the time zone

You must perform the procedure on *all* switches for which the time zone must be set. However, you only need to set the time zone once on each switch, because the value is written to nonvolatile memory. Use one of the two following procedures

to set the time zone. The first procedure requires you to select the actual time zone and the second requires you to select the country location of the switch.

The following procedure describes how to set the current time zone using **timezonename** mode. Make appropriate modifications for your particular time zone.

1. Log into the switch using the default password, which is *password*.
2. Enter the **tsTimeZone** command as follows. Use **timezonename** to set the time zone by time zone ID, such as PST or Country/City. The following example shows how to change the time zone from US/Pacific to US/Central. The **tsTimeZone** command by itself displays the current time zone.

```
switch:admin> tstimezone
Time Zone : US/Pacific
switch:admin> tstimezone US/Central
switch:admin> tstimezone
Time Zone : US/Central
```

The following procedure describes how to set the current time zone to Pacific Standard Time using interactive mode.

1. Enter the **tsTimeZone** command as follows:
switch:admin> **tstimezone --interactive**
2. You are prompted to select a general location from the list displayed.
Please identify a location so that time zone rules can be set correctly.
3. Enter the appropriate number from the list or **Ctrl+D** to quit.
4. At the prompt, select a country location from the list displayed.
5. At the prompt, enter the appropriate number to specify the time zone region from the list displayed or **Ctrl+D** to quit.

Synchronizing local time using NTP

Complete the following steps to synchronize the local time using NTP.

1. Log in to the switch using the default password (the default password is *password*).
2. Enter the **tsClockServer "ntp1;ntp2"** command where ntp1 is the IP address or DNS name of the first NTP server, which the switch must be able to access. The ntp2 value is the name of the second NTP server and is optional. The entire operand "<ntp1;ntp2 >" is optional; by default, this value is LOCL, which uses the local clock of the principal or primary switch as the clock server.

```
switch:admin> tsClockServer "132.163.135.131"
switch:admin> tsclockserver
132.163.135.131
switch:admin>
```

The following example shows how to set up more than one NTP server using a DNS name:

```
switch:admin> tsclockserver "10.32.170.1;10.32.170.2;ntp.localdomain.net"
Updating Clock Server configuration...done.
Updated with the NTP servers
```

Changes to the clock server value on the principal or primary FCS switch are propagated to all switches in the fabric

Inter-Switch Link (ISL) Trunking

Inter-Switch Link (ISL) Trunking is optional software requiring a license that allows you to create trunking groups of ISLs between adjacent switches. Up to

eight FC ports on the SAN96B-5 can be used as a trunking group to achieve speeds up to 128 Gbps (256 Gbps full duplex) for optimal bandwidth utilization and load balancing. For more information about ISL Trunking, refer to the *Fabric OS Administrator's Guide*.

Installing SFP+ transceivers and connecting cables

The SAN96B-5 only supports Brocade-branded 8 Gbps, 10 Gbps, and 16 Gbps SFP+ optical transceivers. For the Fibre Channel connections, the switch uses SFP+ transceivers that support any combination of Short Wavelength (SWL), Long Wavelength (LWL), and Extended Long Wavelength (ELWL) optical media. If the switch is shipped without SFP+ transceivers already installed, complete these steps to first install the transceivers and then to connect the cables.

Note: For a listing of transceivers compatible with this product:

- Go to the IBM SAN web page www.ibm.com/systems/networking/switches/san
- Select the **IBM System Networking SAN96B-5** product details link
- On the displayed product page, click the **Interoperability Matrix** link in the **Learn more** section.
- In the Interoperability matrix, click the **Transceivers** link.

If you use an unqualified transceiver, the **switchShow** command output shows the port in a Mod_Inv state. Fabric OS also logs the issue in the system error log.

The 16 Gbps SFP+ transceivers have an attached pull tab and no latching wire bail. To simplify insertion of the 16 Gbps SFP+ transceivers, it is recommended to connect the cables first, and then insert them as a unit into the port. Figure 8 on page 20 shows the installation of a 16 Gbps SFP+, and Figure 9 on page 20 shows the installation of an 8 Gbps SFP+ with a wire bail latching mechanism. All SFP+ transceivers are keyed so that they can only be inserted into the ports in the correct orientation. Transceivers should slide easily into the port if aligned correctly.



CAUTION:

This product might contain one or more of the following devices: CD-ROM drive, DVD-ROM drive, DVD-RAM drive, or laser module, which are Class 1 laser products. Note the following information:

- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of the controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

(C026)

Installing 16 Gbps SFP+ transceivers

Complete the following steps to install 16 Gbps SFP+ transceivers and cables.

1. Remove any protector plugs from the 16 Gbps SFP+ transceiver and the cable.
2. Position a cable so that the key (the ridge on one side of the cable connector) is aligned with the slot in the transceiver. Insert the cable into the transceiver until the latching mechanism clicks. Cables are keyed so that they can be inserted in only one way. If a cable does not slide in easily, ensure that it is correctly oriented.

Attention: Take care not to bend the SFP+ pull tab. Do not insert a cable intended for an mSFP transceiver into a regular SFP+ transceiver. You may damage the cable.

3. Transceivers are keyed so that they can only be inserted with the correct orientation. Insert the cable/transceiver into the port, using the pull tab to help push the transceiver into the port. If it does not slide in easily, ensure that it is correctly oriented.

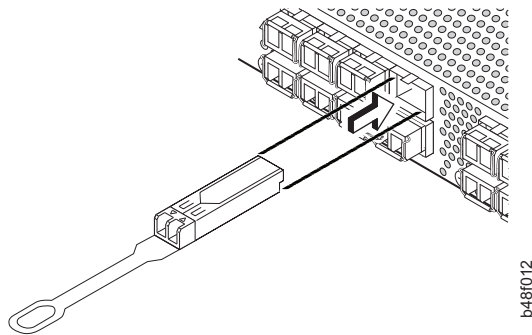


Figure 8. Installing a 16 Gbps SFP+ with pull tab (shown without cable attached)

Installing 8 Gbps and 10 Gbps SFP+ transceivers with wire bails

1. Making sure that the bail (wire handle) is in the unlocked open position, align the 8 Gbps or 10 Gbps SFP+ in the correctly oriented position on the port, as shown in Figure 9.
2. Slide the SFP+ into the port until you feel it click into place; then close the bail. If it does not slide in easily, ensure that it is correctly oriented.

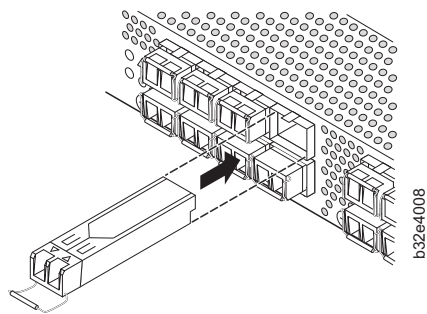


Figure 9. SFP+ with wire bail latch

3. Orient a cable connector so that the key (the ridge on one side of the connector) aligns with the slot in the transceiver (see Figure 10 on page 21). Then, insert the cable into the transceiver until the latching mechanism clicks. Cables are keyed so that they can be inserted in only one way. If a cable does not slide in easily, ensure that it is correctly oriented.

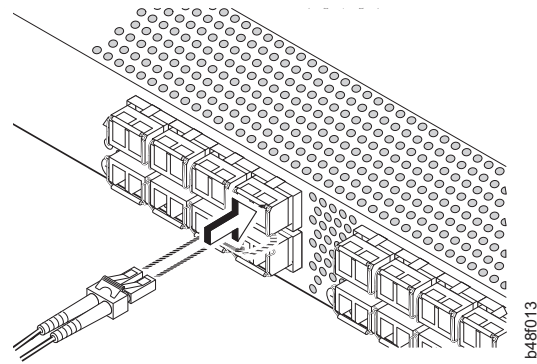


Figure 10. Installing a cable

4. Connect the other end of the cable to the appropriate device.
5. If needed, a cable extraction tool Figure 11 can be used with the 8 Gbps or 10 Gbps transceivers to assist in removing them from a port.

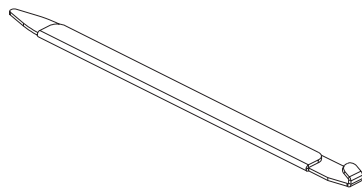


Figure 11. Optical transceiver extraction tool

Refer to “Planning for cable management” on page 7 for suggestions on organizing cables. A table for recording cable connections is provided in Appendix B, “Cable routing table,” on page 47.

Chapter 3. Using and maintaining the switch

This chapter provides information about operating and maintaining the switch and includes these topics. Refer to “Providing power to the switch” on page 14 for instructions on starting the switch.

- “Interpreting LED activity”
- “POST and boot-up specifications” on page 26
- “Interpreting POST results” on page 27
- “SAN96B-5 maintenance” on page 27
- “SAN96B-5 management” on page 28

Interpreting LED activity

System activity and status can be determined through the activity of the LEDs on the switch.

There are three possible LED states: no light, a steady light, and a flashing light. Flashing lights may be slow, fast, or flickering. The LED colors are either green or amber.

Sometimes, the LEDs flash either of the colors during boot, POST, or other diagnostic tests. This is normal; it does not indicate a problem unless the LEDs do not indicate a healthy state after all boot processes and diagnostic tests are complete.

LED locations

The port side of the switch has the following LEDs.

- One system status LED (above) on the left side
- One power LED (below) on the left side
- Two Ethernet Port LEDs for Ethernet port activity and speed
- One bicolor (green/amber) port status LED for each port on the switch. These LEDs are located above each pair of Fibre Channel ports.
- The serial console port LEDs do not light up at any time, even when a cable is inserted and the link is active

Figure 12 on page 24 shows the LEDs on port side of the switch. The port status LEDs for the FC ports are arranged left and right to correspond to the upper and lower ports respectively in each pair.

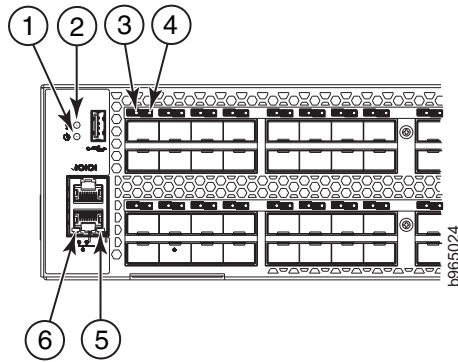


Figure 12. Port side LEDs

- 1** - System power LED
- 2** - System status LED
- 3** - FC port status LED (port 0)
- 4** - FC port status LED (port 4)
- 5** - Ethernet port activity LED
- 6** - Ethernet port speed LED

The non-port side of the switch has two power supply status LEDs and three fan status LEDs (see Figure 13).

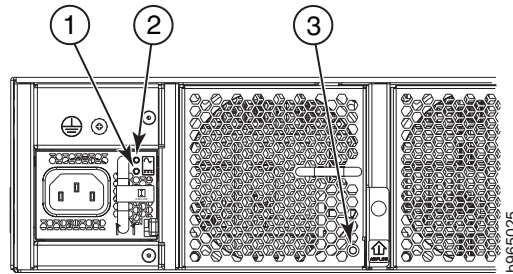


Figure 13. Non-port side LEDs

- 1** - Power supply DC status LED
- 2** - Power supply AC status LED
- 3** - Fan status LED

LED patterns

Table 3 describes the port side LEDs and their behavior.

Table 3. Port side LED patterns during normal operation

LED name	LED color	Status of hardware	Recommended action
Power status (green)	No light	System is off or there is an internal power supply failure	Verify that the power cable(s) are attached, and power source is live. The unit may be faulty. Contact IBM.
	Steady green	System is on and power supplies are functioning properly	No action required.

Table 3. Port side LED patterns during normal operation (continued)

LED name	LED color	Status of hardware	Recommended action
System status (bicolor)	No light	System is off or there is no power.	Verify the system is on and has completed booting.
	Steady green	System is on and functioning properly.	No action required.
	Steady amber (for more than five seconds)	A system fault has occurred. This LED displays steady amber during POST, this is normal and does not indicate a fault.	Power cycle the switch. Check the failure indicated on the system console. Contact IBM.
	Blinking amber	Attention is required. A number of factors can cause this status including single power supply failure, a fan failure, or one or more environmental ranges has been exceeded.	Check the management interface and the error log for details on the cause of status. Contact IBM.
Ethernet Speed (green)	No light	Port speed is 10 Mbps.	No action required.
	Steady green	Port speed is 100 or 1000 Mbps.	No action required.
Ethernet Activity/Link (green)	No light	There is no link.	Verify that the Ethernet cable is connected correctly.
	Steady green	There is a link.	No action required.
	Blinking green	There is link activity (traffic).	No action required.
Optical media port status (one bi-color LED for each FC port)	Off	There is no light or signal carrier (module or cable).	Verify that the transceiver is installed correctly and that the cable is connected correctly.
	Steady amber	The port is receiving light or carrier, but is not online.	No action required.
	Slow blinking amber (2 sec)	The port is disabled (by diagnostics or by portDisable command).	Verify that the diagnostic tests are not being run. Re-enable the port using the portEnable command.
	Fast blinking amber (1/2 sec)	The port has failed.	Check the management interface and the error log for details on the cause of the failure. Contact IBM Support if necessary.
	Steady green	The port is online.	No action required.
	Slow blinking green (2 sec)	The port is online but is segmented (loopback cable or incompatible switch).	Check the firmware level of the attached switch.
	Fast blinking green (1/2 sec)	There is an internal loopback (diagnostic).	No action required.
	Flickering green	The port is online and frames are flowing through the port.	No action required.

Table 4 on page 26 describes the non-port side LEDs and their behavior.

Table 4. Non-port side LED patterns during normal operation

LED name	LED color	Status of hardware	Recommended action
Power supply AC input status (one green LED)	No light	Power supply is not receiving AC input voltage or AC input voltage is below operational limit.	Verify that the power supply is properly seated and the power cord is connected to a functioning AC power source.
	Steady green	AC input voltage is within operational range.	No action required.
Power supply DC output status (one bi-color LED)	Flashing amber (1:1)	Output voltage is not enabled.	Verify that the power supply is fully seated and that the captive screw is secured.
	Flashing amber/green (2:1)	Over temperature warning.	Verify that ambient temperature is less than 40° C (104° F) and check for intake airflow blockage.
	Flashing amber/green (1:1)	Internal fan is out of regulation.	Replace the power supply.
	Steady amber	Power supply is faulty or not plugged in completely.	Check the power cord, current, voltage, and temperature to determine the problem.
	Steady green	DC output OK.	No action required.
Fan assembly status (one bi-color LED)	No light	Fan assembly is not receiving power.	Verify that the fan FRU is seated correctly.
	Steady green	Fan assembly is operating normally.	No action required.
	Steady amber (for more than 5 seconds)	Fan fault for one of the following reasons: <ul style="list-style-type: none"> • A fan assembly with mismatched airflow is present. • One or more of the fans in the fan assembly has failed. 	Try one of the following: <ul style="list-style-type: none"> • Replace the mismatched fan assembly with one that has the correct airflow direction. • Replace the faulty fan assembly.

POST and boot-up specifications

When the switch is turned on or rebooted, the switch performs a power-on self-test (POST). Total boot time with POST can be several minutes. POST can be omitted after subsequent reboots by using the **fastBoot** command or entering the **diagDisablePost** command to persistently disable POST.

For more information about these commands, refer to the *Fabric OS Command Reference*.

POST

The success or failure results of the diagnostic tests that run during POST can be monitored through LED activity, the error log, or the command line interface.

POST includes the following tasks:

- Conducts preliminary POST diagnostics
- Initializes the operating system
- Initializes hardware

- Runs diagnostic tests on several functions, including circuitry, port functionality, memory, statistics counters, and serialization

Boot-up

In addition to POST, boot includes the following tasks after POST is complete:

- Performs universal port configuration
- Initializes links
- Analyzes fabric. If any ports are connected to other switches, the switch participates in a fabric configuration
- Obtains a domain ID and assigns port addresses
- Constructs unicast routing tables
- Enables normal port operation

Interpreting POST results

POST is a system check that is performed each time the switch is powered on, rebooted, or reset. During POST, the LEDs flash either amber or green. Any errors that occur during POST are listed in the error log.

Complete the following steps to determine whether POST completed successfully and whether any errors were detected.

1. Verify that the switch LEDs indicate that all components are healthy.
See Table 3 on page 24 and Table 4 on page 26 for descriptions and interpretations of LED patterns. If one or more LEDs do not display a healthy state, verify that the LEDs on the switch are not set to "beacon" by entering the **switchShow** command to detect if beaconing is active.
2. Verify that the switch prompt displays on the terminal of a computer workstation connected to the switch.
If there is no switch prompt when POST completes, press **Enter**. If the switch prompt still does not display, try opening a Telnet session or accessing the switch through another management tool. If this is not successful, the switch did not successfully complete POST. Contact IBM.
3. Review the switch system log for errors. Any errors detected during POST are written to the system log, accessible through the **errShow** command.

For information about all referenced commands, and on accessing the error log, refer to the *Fabric OS Administrator's Guide*. For information about error messages, refer to the *Fabric OS Message Reference*.

SAN96B-5 maintenance

The SAN96B-5 is designed for high availability and low failure; it does not require any regular physical maintenance. It includes diagnostic tests and field-replaceable units, described in the following sections.

Diagnostic testing

In addition to POST, Fabric OS includes diagnostic tests to help you troubleshoot the hardware and firmware. This includes tests of internal connections and circuitry, fixed media, and the transceivers and cables in use.

The tests are implemented by command, either through a Telnet session or through a serial console connection to the switch. Some tests require the ports to be

connected by external cables, to allow diagnostics to verify the serializer/deserializer interface, transceiver, and cable. Some tests require loopback plugs.

Diagnostic tests run at link speeds of 2, 4, 8, 10, or 16 Gbps depending on the speed of the link being tested and the type of port.

Note: Diagnostic tests might temporarily lock the transmit and receive speed of the links during diagnostic testing.

For information about specific diagnostic tests, see the *Fabric OS Troubleshooting and Diagnostics Guide*.

SAN96B-5 management

You can use the management functions built into the SAN96B-5 to monitor the fabric topology, port status, physical status, and other information to help you analyze switch performance and to accelerate system debugging.

The switch automatically performs power-on self-test (POST) each time it is turned on. Any errors are recorded in the system error log. For more information about POST, see “POST and boot-up specifications” on page 26.

For information about upgrading the version of Fabric OS installed on your switch, see the *Fabric OS Administrator’s Guide*. You can manage the switch using any of the management options listed in Table 5. Refer to the *Fabric OS Command Reference* for more information on the CLI commands.

Table 5. Management options for the SAN96B-5

Management tool	Out-of-band support	In-band support
Command Line Interface (CLI) Up to two admin sessions and four user sessions simultaneously. For more information, refer to the <i>Fabric OS Administrator’s Guide</i> and the <i>Fabric OS Command Reference</i> .	Ethernet or serial connection	IP over Fibre Channel
Web Tools For information, refer to the <i>Web Tools Administrator’s Guide</i> .	Ethernet or serial connection	IP over Fibre Channel
Standard SNMP applications For information, refer to the <i>Fabric OS MIB Reference Manual</i> .	Ethernet or serial connection	IP over Fibre Channel
Management Server For information, refer to the <i>Fabric OS Administrator’s Guide</i> and the <i>Fabric OS Command Reference</i> .	Ethernet or serial connection	Native in-band interface (over HBA only)
Network Advisor (option to purchase) For information, refer to the Network Advisor documentation set.	Ethernet or serial connection	IP over Fibre Channel

Chapter 4. FRU replacement



Attention: Read “Safety notices and labels” on page xi before removing or installing any components. Follow ESD precautions (see “ESD precautions” on page xvii whenever handling FRUs.

The field replaceable units (FRUs) in the SAN96B-5 can be removed and replaced without special tools. The switch can continue operating during the FRU replacement if the conditions specified in the procedures are followed.

SFP+ transceiver FRU removal and replacement procedures are described in “Installing SFP+ transceivers and connecting cables” on page 19, as part of the initial switch installation and configuration. Power supply and fan FRU removal and replacement steps are described in the following procedures. The chassis replacement procedure is to be completed by IBM Service personnel only, and cannot be completed while the switch is operating.

Before beginning replacement

The two different models of the SAN96B-5 have different air flow patterns. The 2498-F96 model has port side exhaust (intake on the fan and power supply side), while the 2498-N96 model has non-port side exhaust airflow (exhaust on the fan and power supply side) to accommodate specific installation and configuration requirements.

Attention: These instructions describe how to change field-replaceable units (FRUs) for units with either a port-side air exhaust or a port-side air intake. You must replace a failed unit with the same type of unit. This applies to both power supplies and fans. A new FRU must have the same part number (P/N) as the FRU being replaced. The manufacturing P/N is located on the top of the FRU. All fans and power supplies must have the same airflow symbol (E or I) to be compatible with each other.

You can use external labels as a guide. Refer to Figure 14. Both the power supply and fan FRUs are labeled with an airflow symbol on the faceplate to indicate whether the assembly takes in or exhausts air. The label also appears on the top of the assembly.

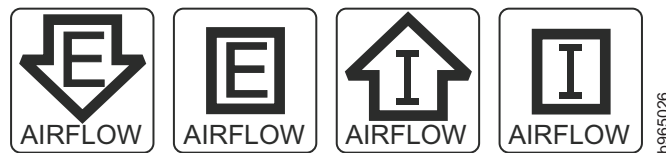


Figure 14. Airflow label examples

The I symbol indicates an intake unit. This unit pulls air in from the non-port side of the switch and exhausts it out the port side. This is also called back-to-front airflow or reverse airflow. This symbol should appear on FRUs for the 2498-F96 model.

The E symbol indicates an exhaust unit. This unit pulls air in from the port side of the switch and exhausts it out the non-port side. This is also called front-to-back airflow or forward airflow. This symbol should appear on FRUs for the 2498-N96 model.

The **chassisShow** command will indicate either "forward" or "reverse" airflow. If one fan fails, the remaining fans go to high speed to maintain proper cooling until the failed fan is replaced.

If a mismatched power supply or fan is installed by mistake, a critical error message is sent to the console. The message will be similar to the following:

```
CRITICAL HIL-1611 MISMATCH in PSU/FAN Air Flow direction.  
Replace PSU with fan air flows in same direction.  
System will be shut down in 2 minutes.
```

Power supply removal and replacement

The switch has two power supplies, as displayed in Figure 2 on page 4. The Fabric OS identifies the power supplies from left to right on the non-port side as power supply #2 and power supply #1.

Attention: Disassembling any part of the power supply voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the power supply. Because the cooling system relies on pressurized air, do not leave either of the power supply slots empty longer than two minutes while the switch is operating. If a power supply fails, leave it in the switch until it can be replaced. Maintain both power supplies in operational condition to provide redundancy.

Refer to Table 4 on page 26 for the power supply status LED colors, behaviors, and actions required, if any.

Determining the need to replace a power supply

Use one of the following methods to determine the status of the power supplies:

- Check the power supply AC status and DC status LEDs (see Figure 13 on page 24). Both LEDs should be green to indicate that the power supply is functioning correctly. If the DC status LED is amber, there is no power on the cord.
- In Web Tools, click the **Power Status** icon.
- At the command prompt, enter the **psShow** command to display power supply status as shown below:

```
2498:admin> psshow  
Power Supply #1 is OK  
Airflow Direction : Portside Intake (Forward)  
Power Supply #2 is OK  
Airflow Direction : Portside Intake (Forward)  
2498:admin>
```

Time and items required

Replacing a power supply in the switch should require less than two minutes to complete.

To replace a power supply in the switch, you need a new power supply that has the same part number and airflow indicator as the power supply being replaced. Refer to **6** in Figure 15 on page 31 for the location of the airflow label.

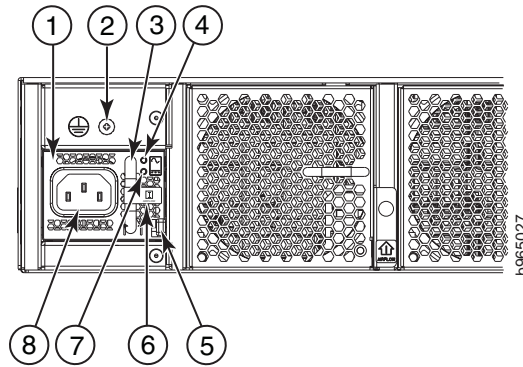


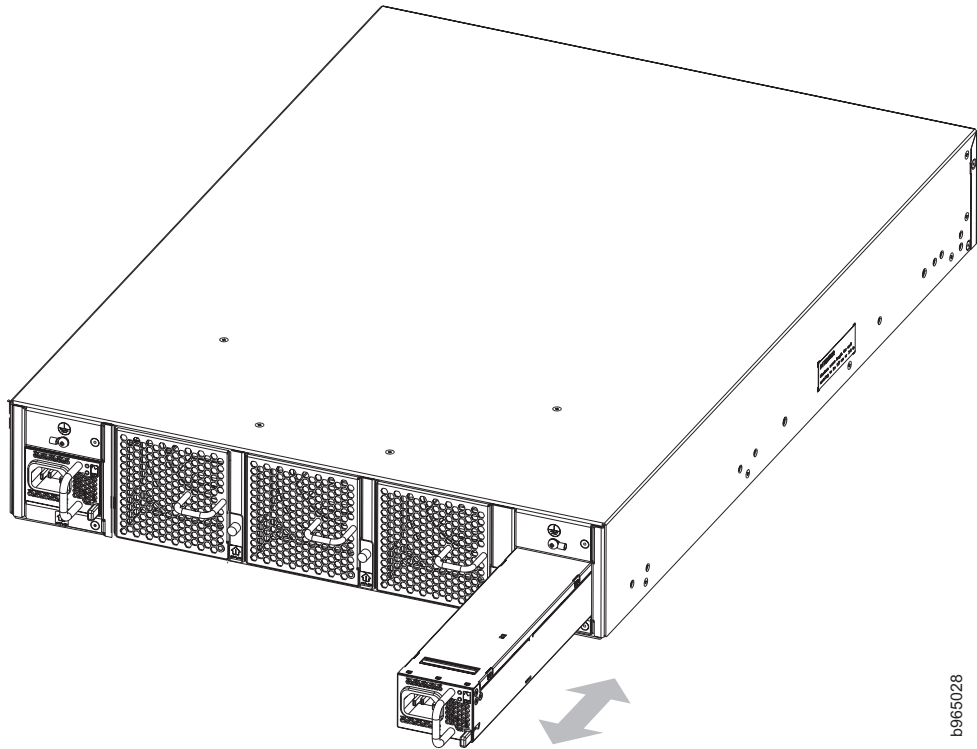
Figure 15. Switch power supply components

- 1** - Power supply #2
- 2** - Grounding screw
- 3** - Handle
- 4** - AC input status LED
- 5** - Locking tab
- 6** - Airflow label
- 7** - DC output status LED
- 8** - Power cord receptacle

Replacing a power supply

Complete the following steps to replace a power supply in the switch. Refer to Figure 15 and Figure 16 on page 32 for this procedure.

1. To leave the switch in service while replacing a power supply, verify that the other power supply (the one not being replaced) has been powered on for at least four seconds and has a steady green status LED.
2. Unplug the power cord from the power supply that is being replaced.
3. Push the locking tab (**5**) to the left and hold it there while using the handle (**3**) on the power supply to pull it straight out and away from the chassis. Pull the power supply out slowly to avoid catching a finger on the locking tab.



b965028

Figure 16. Removing and replacing a power supply in the switch

- Slide the new power supply into the chassis until the locking tab engages.
Attention: Do not force the installation. If the power supply does not slide in easily, ensure that the power supply is correctly oriented before continuing.
Attention: If you observe that the switch has powered down after two minutes after a power supply replacement, it is likely because the new power supply has a mismatched airflow.
- Plug the power cord into the power supply to power on the unit. If the power circuit was on before the replacement, the power supply will immediately attempt to power up.
- Verify that the LEDs on the new power supply display steady green while the switch is operating (refer to Table 4 on page 26). If the LEDs are not steady green, ensure that the power supply is securely installed and seated properly.
- Optionally, use the command line interface (CLI) to enter the **psShow** command to display the status. You can also use the **chassisShow** command. The power supply status can also be viewed using the Web Tools application.

Fan removal and replacement

The switch has three fans as displayed in Figure 2 on page 4. The Fabric OS identifies the fan locations from left to right as fan #3, fan #2, and fan #1.

Attention: Disassembling any part of the fan voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the fan. Because the cooling system relies on pressurized air, do not leave any of the fan slots empty longer than two minutes while the switch is operating. If a fan fails, leave it in the switch until it can be replaced. Maintain all three fans in operational condition to provide redundancy.

Refer to Table 4 on page 26 for the fan status LED colors, behaviors, and actions required, if any.

Determining the need to replace a fan

Use one of the following methods to determine the status of the fans:

- Check the fan status LEDs (see Figure 13 on page 24). Each fan LED should be steady green, indicating that the fans are functioning correctly.
- In Web Tools, click the **Fan** icon.
- At the command prompt, enter the **fanShow** command to display fan status as shown below:

Note: Fans 4 and 5 are the fans that are integral to the power supplies. These two fans normally operate at approximately 12000 RPM while the system fans typically operate at approximately 2000 RPM. Refer to “Power supply removal and replacement” on page 30 if there are any issues with those two fans.

```
2498:admin> fanshow
Fan 1 is Ok, speed is 1965 RPM
Fan 2 is Ok, speed is 2011 RPM
Fan 3 is Ok, speed is 2011 RPM
Fan 4 is Ok, speed is 12001 RPM
Fan 5 is Ok, speed is 11995 RPM
2498:admin>
```

Time and items required

Replacing a fan in the switch should require less than two minutes to complete.

To replace a fan in the switch, you need a #1 Phillips screwdriver and a new fan that has the same part number and airflow indicator as the fan being replaced. Refer to **4** in Figure 17 for the location of the airflow label.

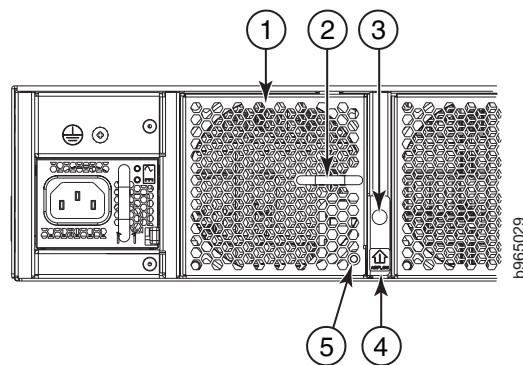


Figure 17. Fan components

- 1** - Fan #3
- 2** - Handle
- 3** - Captive screw
- 4** - Airflow label
- 5** - Status LED

Replacing a fan

Complete the following steps to replace a fan in the switch. Refer to Figure 17 on page 33 and Figure 18 for this procedure.

1. Using the Phillips screwdriver, unscrew the captive screw (**3**) on the fan.

CAUTION:

Be careful not to insert your fingers into the fan while removing it from the device. The fan may still be spinning at high speed.



CAUTION:

Hazardous moving parts nearby. (L008)

2. Remove the fan from the chassis by using the handle (**2**) on the fan to pull it straight out and away from the chassis.

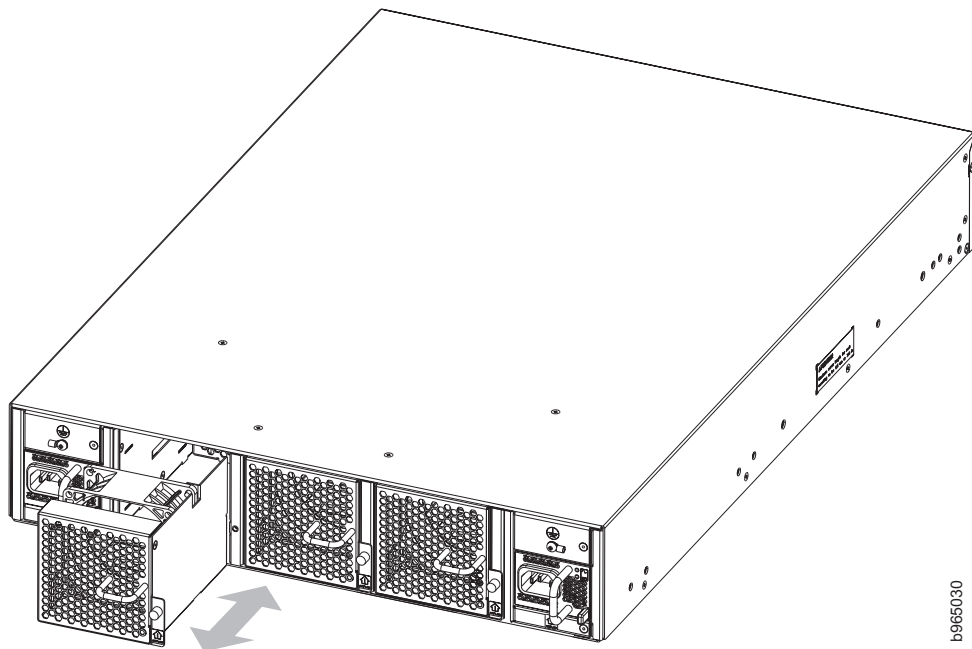


Figure 18. Removing and replacing a fan in the switch

3. Install the new fan in the chassis:
 - a. Check to see that the airflow direction is the same as the fan you are replacing.
 - b. Orient the new fan with the captive screw **3** on the right, as shown in Figure 18.
 - c. Gently push the fan into the chassis until it is firmly seated.

Attention: Do not force the installation. If the fan does not slide in easily, ensure that it is correctly oriented before continuing.

Attention: If you observe that the switch has powered down after two minutes after a fan replacement, it is likely because the new fan has a mismatched airflow.
 - d. Using the Phillips screwdriver, secure the fan to the chassis by tightening the captive screw **3**.

4. Verify that the fan status LED is steady green to indicate normal operation (refer to Table 4 on page 26). If the LED is not steady green, ensure that the fan is securely installed and seated properly.
5. Optionally, use the command line interface (CLI) to enter the **fanShow** command to display the status. You can also use the **chassisShow** command. The fan status can also be viewed using the Web Tools application.

Chassis replacement

The SAN96B-5 chassis is highly reliable and unlikely to fail. However, the chassis is available as a FRU and can be replaced following these instructions.

Determining the need to replace the chassis

Before replacing the chassis, verify that the replacement is necessary. Ensure that the components are firmly seated when troubleshooting. Contact IBM if you have any questions about whether the chassis should be replaced. Any of the following events might indicate that the chassis requires replacement:

- Visible mechanical damage to the chassis, including damage to sheet metal or guides that prevents correct installation of a component.
- Bent or damaged connectors on the main backplane (the surface inside the chassis to which the power supply and fan FRUs connect).
- One or more replaceable components (fan or power supply) do not function properly even after the component is replaced.
- The **psShow** or **fanShow** commands continue to show a faulty component even though the component has been replaced.

Preparing for a chassis replacement

Use the following information to help prepare for a chassis replacement. The power supplies and fans will be removed from the old chassis and installed in the new chassis. The SFP transceivers, power cords, and rack installation hardware will also be reused on the new chassis.

Attention: Refer to “Safety notices and labels” on page xi and “ESD precautions” on page xvii before performing any removal or installation procedures.

Time and items required

The chassis replacement procedure takes approximately 1 hour to complete, depending on number of SFPs and cables installed.

The following items are required for the chassis replacement procedure:

- Replacement chassis
- ESD grounding strap
- Transceiver extraction tool for transceivers with wire bails (applies to 8 Gbps and 10 Gbps transceivers only)
- Phillips #2 screwdriver
- 1/4 in. straight slot screwdriver

Powering down the switch and disconnecting cables

If the switch is functioning at all, it must be disconnected from the network and fabric. To disconnect the switch from the network and fabric complete these steps:

1. Shut down the system by entering the **sysShutdown** command.
2. Power off the chassis by disconnecting both power cords from the power supplies and the power sources. Set them aside for use with the new installation.
3. After ensuring that the cables are properly labeled, and the port connection information is recorded (see Appendix B, "Cable routing table," on page 47), disconnect the cables from the 8 Gbps or 10 Gbps SFP+ transceivers (see Figure 9 on page 20).

Attention: Because of port density, use the pull tab on the 16 Gbps SFP+ transceivers to remove the fiber cable and the attached SFP+ at the same time (see Figure 8 on page 20). Leave any 8 Gbps or 10 Gbps SFP+ transceivers (with wire bails) in the ports until you are ready to transfer them to the ports in the replacement chassis.

4. Group the cables together and position them safely away from the switch to avoid damage during the chassis replacement process.

Removing the power supplies from the chassis

The two power supplies must be removed from the chassis; they will be installed in the new chassis. Refer to Figure 15 on page 31 and Figure 16 on page 32 to complete these steps to remove each power supply.

1. Push the locking tab to the left and hold it there while using the handle on the power supply to pull it straight out and away from the chassis. Pull the power supply out slowly to avoid catching a finger on the locking tab.
2. Set the power supply aside for later installation in the new chassis.
3. Repeat steps 1 and 2 for the other power supply.

Removing the fans from the chassis

The three fans must be removed from the chassis; they will be installed in the new chassis. Refer to Figure 17 on page 33 and Figure 18 on page 34 to complete these steps to remove each fan.

1. Using the Phillips screwdriver, unscrew the captive screw on the fan.
2. Remove the fan from the chassis by using the handle on the fan to pull it straight out and away from the chassis.
3. Set the fan aside for later installation in the new chassis.
4. Repeat steps 1–3 for the other two fans.

Remove the switch chassis from the cabinet

Follow these steps to remove the switch chassis from the cabinet. The rack mount hardware from the old chassis will be used for installing the new chassis in the cabinet.

1. Attach clamps or other temporary supports to the cabinet posts or rails to support the switch chassis during the removal process. Alternatively, a second person can support the switch.

2. Remove the two 10-32 x 5/8-in. screws (**4** in Figure 7 on page 13) from the two rear brackets. Save the screws for attaching the new chassis to the cabinet posts.
3. Remove the four 6-32 x 1/4-in. screws (**2** in Figure 6 on page 12) from the two rear brackets to disconnect the rear brackets from the front brackets. Save the screws and the rear brackets for installing the new chassis.
4. Remove the two 10-32 x 5/8-in. screws (**4** in Figure 5 on page 11) from the two front brackets. Save the screws for attaching the new chassis to the cabinet posts.
5. Remove the switch chassis from the front of the cabinet, carefully supporting it, and avoiding any installed cables.
6. Remove the 8-32 x 5/16-in. screws (**2** Figure 4 on page 10) to remove both front brackets (**1**) from the old chassis. Save the screws and the front brackets for installing the new chassis in the cabinet.

Installing the new chassis

Follow these steps to install the new chassis in the cabinet, using the rack mount hardware and components from the old chassis.

1. Move any remaining SFP transceivers from the ports in the old chassis to corresponding ports in the new chassis. Fans and power supplies can be installed in the chassis now, or after the chassis is installed in the cabinet. The empty chassis is lighter and may be easier to install without the fans and power supplies. See steps 7 and 8 to install these components now.
2. Attach the front rail kit brackets to the new chassis, following the instructions in “Attaching the front brackets to the switch” on page 10, and using the screws saved during the removal of the old chassis.
3. Attach the front brackets to the front cabinet posts, following the instructions in “Installing the switch in the cabinet” on page 11, and using the screws saved during the removal of the old chassis.
4. Attach the rear brackets to the front brackets, following the instructions in “Attaching rear brackets to front brackets” on page 11, and using the screws saved during the removal of the old chassis.
5. Attach the rear brackets to the rear cabinet posts, following the instructions in “Attaching the rear brackets to the cabinet posts” on page 12, and using the screws saved during the removal of the old chassis.
6. Remove any clamps or temporary supports from the cabinet.
7. If not already done, install the three fans, following the instructions in “Fan removal and replacement” on page 32.
8. If not already done, install the two power supplies, following the instructions in “Power supply removal and replacement” on page 30. Do not connect the power cords at this time.
9. Reconnect all remaining SFP+ transceivers and fiber cables, using the information recorded in Table 16 on page 47 to ensure that connections are made to the correct ports.
10. Connect the two power cables to the power supplies and the power sources. The switch will begin to power up and start the POST as soon as the first power cable is connected.
11. Once POST has completed, the switch is ready to restore the saved configurations. Refer to the *Fabric OS Command Reference* for more information on the CLI commands.

Removing the battery

CAUTION:

The battery contains lithium. To avoid possible explosion, do not burn or charge the battery. Do not:

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Exchange only with the IBM-approved part. Recycle or discard the battery as instructed by local regulations. In the United States, IBM has a process for the collection of this battery. For information, call 1-800-426-4333. Have the IBM part number for the battery unit available when you call. (C003)

Local regulations may require removing the battery prior to disposing of or recycling this product. Complete these steps to remove the battery.

1. Disconnect all power and communication cables.
2. Remove all transceivers.
3. Remove the power supplies and fans.
4. Unscrew the fasteners and remove the sheetmetal cover from the chassis.
5. On the main circuit board, go to location **1** shown in Figure 19 and remove the BR1225 battery from the holder.

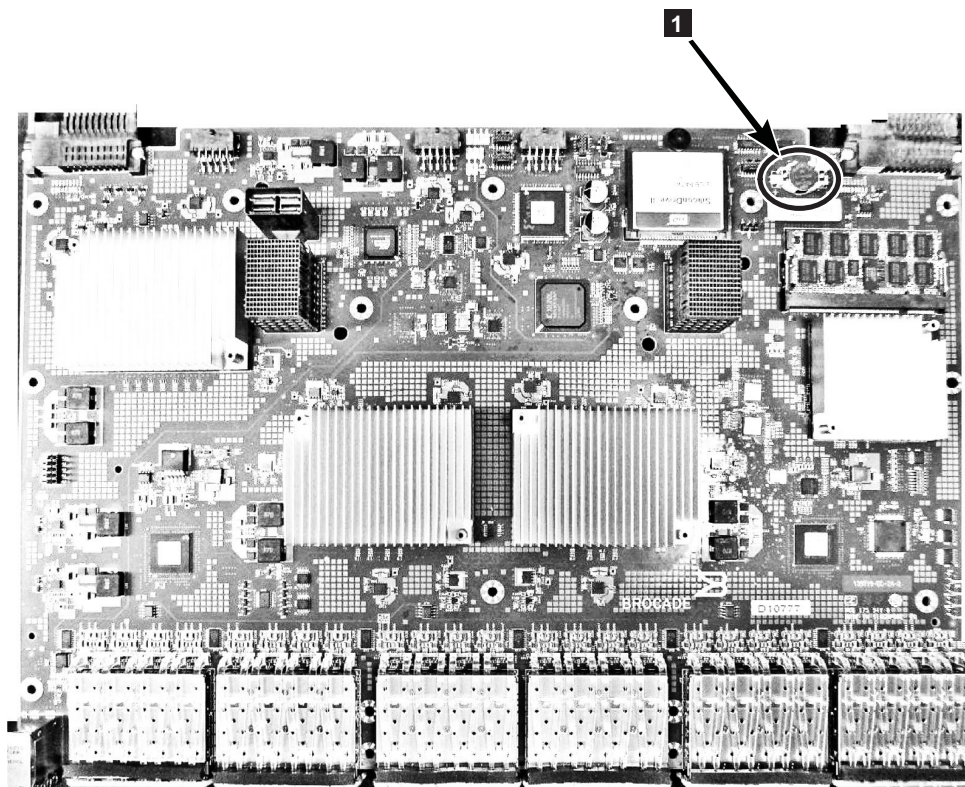


Figure 19. Location of battery holder

6. Recycle the battery as appropriate, following local regulations.

Refer to the *Environmental Notices and User Guide* shipped with the product for more information on battery recycling and disposal.

Appendix A. Product specifications

This appendix provides the specifications for the SAN96B-5 switch.

- “Weight and physical dimensions”
- “Power supply specifications”
- “Environmental requirements” on page 42
- “General specifications” on page 43
- “Data transmission ranges” on page 43\
- “Memory specifications” on page 44
- “Fibre Channel port specifications” on page 44
- “Serial port specifications” on page 45

Weight and physical dimensions

“Weight and physical dimensions” lists the dimensions and weight of the switch.

Table 6. Switch dimensions

Dimension	Value
Height	86.74 mm (3.415 in.)
Depth	609.75 mm (24.006 in.)
Width	429.25 mm (16.900 in.)
Weight (with two power supplies and three fan assemblies, but no SFP+ transceivers installed)	16.9 kg (37.3 lb)

Power supply specifications

The power supplies are universal and capable of functioning worldwide without voltage jumpers or switches. They meet IEC 61000-4-5 surge voltage requirements and are autoranging in terms of accommodating input voltages and line frequencies. Each power supply has built-in fans for cooling. Table 7 lists the power supply specifications for the switch.

Table 7. Power supply specifications

Specification	Value
Input voltage	Range: 90-264 VAC Auto-volt, Nominal: 100-240 VAC, ~12.0A - 5.0A; switch autosenses input voltage. Start-up: 80-87 VAC, Turn-off: 85-75 VAC
Input frequency	Range: 47-63 Hz; Nominal: 50-60 Hz.
Inrush current	Limited to 40A peak @ 240 VAC during cold start-up at 25°C ambient
Input line protection	Both AC lines are fused.
Maximum output (per power supply)	1080 watts @ 12V DC

Table 8 on page 42, Table 9 on page 42, and Table 10 on page 42, illustrate the power consumption of the switch as measured at idle, maximum, and typical states respectively.

Table 8. Power consumption - idle

IDLE, no Optics, C3 not initialized, Fan Speed normal(3030RPM),Room Temp								
AC Voltage	Input Current® (Amp)		Input Watts 1 PSU	Power Factor		BTU's/hr 1 PSU	Input Watts 2 PSU's	BTU's/hr 2PSU
	1 PSU	2 PSU		1 PSU	2 PSU			
			AC Measured				AC Measured	
100 VAC	1.78	1.85	179	0.998	0.993	610.94132	183	624.59364
120 VAC	1.49	1.59	178	0.996	0.968	607.52824	183	624.1764
200 VAC	0.92	1.08	174	0.949	0.847	593.87592	182	620.7656
240 VAC	0.79	1.04	174	0.917	0.739	593.87592	181	617.3548

Table 9. Power consumption - maximum

MAX: All ports configured with ELOAD, Traffic Running (mode 11), Fan Speed Max (8190 RPM), Room Temp								
AC Voltage	Input Current (Amp)		Input Watts 1 PSU	Power Factor		BTU's/hr 1 PSU	Input Watts 2 PSU's	BTU's/hr 2PSU
	1 PSU	2 PSU		1 PSU	2 PSU			
			AC Measured				AC Measured	
100 VAC	4.67	4.67	464	0.995	0.995	1582.6112	464	1582.6112
120 VAC	3.86	3.87	462	0.997	0.997	1575.7896	463	1579.2004
200 VAC	2.28	2.34	455	0.998	0.977	1551.914	457	1558.7356
240 VAC	1.92	1.99	453	0.998	0.953	1545.0924	456	1555.3248

Table 10. Power consumption - typical

Typical: All ports configured with 16G Avago optics, Traffic Running (mode 11), Fan Speed Nominal(3030 RPM), Room Temp								
AC Voltage	Input Current (Amp)		Input Watts 1 PSU	Power Factor		BTU's/hr 1 PSU	Input Watts 2 PSU's	BTU's/hr 2PSU
	1 PSU	2 PSU		1 PSU	2 PSU			
			AC Measured				AC Measured	
100 VAC	3.96	3.97	394	0.998	0.996	1343.8552	395	1347.266
120 VAC	3.26	3.29	391	0.997	0.995	1333.6228	394	1343.8552
200 VAC	1.94	2.02	387	0.997	0.963	1319.9796	390	1330.212
240 VAC	1.74	1.62	385	0.989	0.929	1313.158	388	1323.3904

Environmental requirements

Table 11 lists the acceptable environmental ranges for both operating and non-operating (such as during transportation or storage) conditions. Note that the requirements differ based on the direction of the airflow, which is determined by the model purchased.

Table 11. Environmental requirements

Condition	Acceptable range during operation	Acceptable range during non-operation
Ambient temperature	0° to +40° C (32° to 104° F)	-25° to 70° C (-13° to 158° F)
Humidity	10% to 85% RH non-condensing, at 40° C (104° F)	10% to 90% RH non-condensing, at 70° C (158° F)

Table 11. Environmental requirements (continued)

Condition	Acceptable range during operation	Acceptable range during non-operation
Altitude	0 to 3 km (9,842 ft) above sea level	0 to 12 km (39,370 ft) above sea level
Shock	20 G, 6 ms, half-sine wave	33 G, 11 ms, half-sine wave, 3/eg Axis
Vibration	0.5 G sine, 0.4 gms random, 5-500 Hz	2.0 G sine, 1.1 gms random 5-500 Hz
Air flow	Port side exhaust - Maximum - 176.7 cmh (104 cfm) - Nominal - 52.7 cmh (31 cfm) Port side intake - Maximum - 185.2 cmh (109 cfm) - Nominal - 56.1 cmh (33 cfm)	NA
Heat dissipation	1378.5 BTU/hr (no optics configuration) 1706.1 BTU/hr (fully populated port configuration)	NA

General specifications

Table 12 lists the general specifications for the switch.

Table 12. General specifications

Specification	Description
Configurable port types	E_Port, F_Port, M_Port, and D_Port; EX_Port with license
System architecture	Nonblocking shared-memory switch
System processor	PowerPC® family CPU @ 1.20 GHz
ANSI Fibre Channel protocol	FC-PH (Fibre Channel Physical and Signalling Interface standard)
Modes of operation	Fibre Channel Class 2 and Class 3
Fabric initialization	Complies with FC-SW-3 Rev. 6.6
FC-IP (IP-over-Fibre Channel)	Complies with FC-IP 2.3 of FCA profile
Aggregate switch I/O bandwidth	1,536 Gbps end-to-end full duplex
Local port latency	700 nanoseconds
Switching latency	2100 nanoseconds (2.1 microseconds with no Forward Error Correction)

Data transmission ranges

Table 13 on page 44 provides the data transmission ranges for different transceivers, port speeds, and cable types.

Table 13. Supported optics, speeds, cables, and distances

Transceiver type	Form factor	Speed	Multi-Mode Media Maximum Distance				Single Mode Media Maximum Distance
			62.5 microns (OM1)	50 microns (OM2)	50 microns (OM3)	50 microns (OM4)	9 microns
SWL	SFP+	2 Gbps	150 m (492 ft.)	300 m (984 ft.)	500 m (1640 ft.)	N/A	N/A
	SFP+	4 Gbps	70 m (229 ft.)	150 m (492 ft.)	380 m (1264 ft.)	400 m (1312 ft.)	N/A
	SFP+	8 Gbps	21 m (68 ft.)	50 m (164 ft.)	150 m (492 ft.)	150 m (492 ft.)	N/A
	SFP+	10 Gbps	33 m (108 ft.)	82 m (269 ft.)	300 m (984 ft.)	550 m (1804 ft.)	N/A
	SFP+	16 Gbps	15 m (49 ft.)	35 m (115 ft.)	100 m (328 ft.)	125 m (410 ft.)	N/A
LWL	SFP+	4 Gbps	N/A	N/A	N/A	N/A	30 km (18.6 mi)
	SFP+	8 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi.) or 40 km (24.8 mi.)
	SFP+	10 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi.)
	SFP+	16 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi.)
ELWL	SFP+	16 Gbps	N/A	N/A	N/A	N/A	25 km (15.5 mi.)

Up to 7500 km at 2 Gbps is supported when using long distance transport system such as DWDM.

Memory specifications

The switch has three types of memory devices, boot flash, compact flash, and main memory. The size of each is listed in Table 14.

Table 14. Memory specifications

Memory type	Amount
Boot flash	4 MB
Compact flash	2 GB
Main memory (DDR2 SODIMM)	2 GB, 400 MHz, 72-bit bus

Fibre Channel port specifications

The Fibre Channel ports in the switch are compatible with SWL, LWL, and ELWL SFP+ (for 16 Gbps performance) transceivers. The strength of the signal is determined by the type of transceiver in use.

The ports meet all required safety standards. For more information about these standards, see “Electronic emission notices” on page 52.

The ports are capable of operating at 2, 4, 8, or 16 Gbps depending on SFP+ transceiver models and are able to autonegotiate to the maximum link speed.

The first eight ports on the switch can be configured to run at 10 Gbps with the appropriate license and transceivers.

Serial port specifications

The serial port is located on the port side of the switch. The switch uses an RJ45 connector for the serial port. An RJ45 to RS-232 adapter is also provided with the switch.

Note: To protect the serial port from damage, keep the cover on the port when not in use.

The serial port can be used to connect to a workstation to configure the switch IP address before connecting the switch to a fabric or IP network. The serial port’s parameters are fixed at 9600 baud, 8 data bits, and no parity, with flow control set to None.

Table 15 lists the serial cable pinouts.

Table 15. Serial cable pinouts

Pin	Signal	Description
1	Not supported	N/A
2	Not supported	N/A
3	UART1_TXD	Transmit data
4	GND	Logic ground
5	GND	Logic ground
6	UART1_RXD	Receive data
7	Not supported	N/A
8	Not supported	N/A

Appendix B. Cable routing table

If the information is not already available, have the customer use Table 16 to record cable routing information.

Table 16. Cable routing table for SAN96B-5

Port	Cable labels		Connected device	Slot/Port of the device
	Switch end	Device end		
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				

Table 16. Cable routing table for SAN96B-5 (continued)

Port	Cable labels		Connected device	Slot/Port of the device
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				
61				
62				
63				
64				
65				
66				
67				
68				
69				
70				

Table 16. Cable routing table for SAN96B-5 (continued)

Port	Cable labels		Connected device	Slot/Port of the device
71				
72				
73				
74				
75				
76				
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92				
93				
94				
95				

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ВНИМАНИЕ! Настоящее изделие относится к классу А. В жилых помещениях оно может создавать радиопомехи, для снижения которых необходимы дополнительные меры

rusemi

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