

IBM System Storage SAN24B-5



Installation, Service, and User Guide

Service information: 2498-X24

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IBM System Storage SAN24B-5



Installation, Service, and User Guide

Service information: 2498-X24

Note:

Before using this information and the product it supports, read the information in "Notices" on page 49.

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Read this first

Summary of changes

This is the second edition of the *IBM System Storage® SAN24B-5 Installation, Service, and User Guide*. The content changes since the last edition of this publication are noted by a vertical line placed in the left margin beside each change. Minor edits are not identified by this mark. A summary of the changes for each edition are listed below.

Third edition

The following changes were made in the third edition:

- Minor changes including model number and product marketing name.

Second edition

The following changes were made in the second edition:

- Addition of information regarding the need for clean optics with higher transmission speeds.
- Addition of information for link troubleshooting
- Other minor content updates

Getting help

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

For more information about IBM® SAN products, see the following website: www.ibm.com/servers/storage/san/

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 website: www.redbooks.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 at: www.ibm.com/planetwide/.

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

For detailed information about the Fibre Channel standards, see the Fibre Channel Industry Association (FCIA) website at: www.fibrechannel.org/

For information about storage industry standards, see the Storage Networking Industry Association (SNIA) website at: www.snia.org/

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12-c010780

Accessibility features for the SAN24B-5

Accessibility features help users with restricted mobility or limited vision successfully use information technology products. IBM strives to provide products with usable access for everyone, regardless of age or ability. This product uses standard Windows navigation keys.

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. This product uses standard Microsoft Windows navigation keys. You can navigate the software and the product documentation from the keyboard by using the shortcut keys for your browser or screen-reader software. See your browser or screen-reader software Help for a list of shortcut keys that it supports.

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 website at www.ibm.com/able/ for more information about the commitment that IBM has to accessibility.

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- Exact publication title
- Form number (for example, GC27-2270-00)
- Page numbers to which you are referring

You can also mail your comments to:

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Safety and environmental notices

This section contains information about:

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

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 Safety Notices publication that 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 xviii:** These notices indicate potential damage to programs, devices, or data.
- **“Caution notices” on page xvi:** 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 xvii 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.
 <small>18-32 kg (39.7-70.5 lbs) svc00167</small> 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:

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

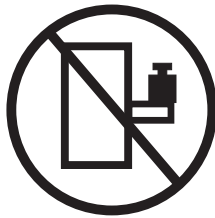
As an added precaution, safety labels are often installed directly on products or product components to warn of potential hazards. These can be either danger or caution notices, depending upon the level of the hazard.

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



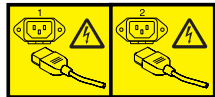
DANGER

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)

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.

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. See “Removing the battery” on page 37 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 Storage SAN24B-5 (machine type-model 2498-X24) switch. Throughout this document, the product is referred to as the *SAN24B-5*, or simply the *switch*.

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. Newer versions of product documentation may be available through the IBM Publications Center website 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.

- *IBM System Storage SAN24B-5 Installation, Service, and User Guide, GA32-2213* (this document)
- *IBM System Storage SAN24B-5 Quick Start Guide, GA32-2214*
- *IBM Environmental Notices and User Guide, Z125-5823*

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 director 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*
- *Fabric OS Message Reference Manual*
- *Fabric OS Fibre Channel over IP Administrator's Guide*
- *Fabric OS Troubleshooting and Diagnostics Guide*
- *Fabric OS Access Gateway Administrator's Guide*

Brocade Fabric OS optional features

- *Fabric Watch Administrator's Guide*
- *Web Tools Administrator's Guide*

IBM and Brocade product matrix

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 on page xxiv provides a product matrix for you to use to correlate the Brocade products and models to the IBM product names and machine types and model numbers.

Table 2. Brocade and IBM product and model number matrix

Brocade product name	IBM product name	IBM machine type and model number
Brocade 7840	SAN42B-R	2498 Model R42
Brocade 6520	SAN96B-5	2498 Models F96 and N96
Brocade 6505	SAN24B-5	2498 Model F24, 249824G, X24
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 5100	SAN40B-4	2498 Model B40
Brocade 300	SAN24B-4	2498 Models B24 and 24E

Chapter 1. Introducing the SAN24B-5

The IBM System Storage SAN24B-5 is a 24-port auto-sensing 2, 4, 8, or 16 Gbps switch for Fibre Channel Storage Area Networks (SANs). The SAN24B-5 is a small-to-midsize business-class switch that is designed to handle the smaller-scale SAN requirements.

The switch's 24 ports in a one rack-unit (1U) height enable the creation of very dense fabrics in a relatively small space.

The SAN24B-5 offers either 12 or 24 ports.. Base models of the switch contain 12 ports, and an additional 12-port port activation license can also be ordered. The base model also offers a single power supply and fan module with a second module available as an upgrade for redundancy.

The SAN24B-5 supplies Reliability, Availability, and Serviceability (RAS) performance and scalability requirements of an business-class switch along with interoperability and ease-of-use advantages.

The switch can also be configured in Access Gateway mode that lets you configure your Enterprise fabric to handle additional N_Ports instead of domains. By reducing the number of domain IDs and ports you simplify configuration and management in a large fabric. Switches in AG mode are logically transparent to the host and the fabric. You can increase the number of hosts that have access to the fabric without increasing the number of switches.

This chapter provides the following information:

- “Switch features”
- “Switch components” on page 2
- “Port side of the switch” on page 3
- “Nonport side of the switch” on page 3

Switch features

The SAN24B-5 offers the following features and capabilities:

- Up to 24 auto-sensing ports of high-performance 16 Gbps technology in a single domain
- Ports on Demand scaling from 12 to 24 ports
- 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
- Universal ports self-configure as E, F, M, or D ports. EX_Ports can be activated on a per port basis with the optional Integrated Routing license. D-port functionality is also available for diagnostics.
- 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. The base model permits one eight-port trunk plus one four-port trunk.

- 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 traffic
- Fabric OS, which delivers distributed intelligence throughout the network and enables a wide range of value-added applications including Web Tools, Advanced Zoning, Fabric Watch, Full Fabric, and Enhanced Group Management. Optional Fabric Services include: Adaptive Networking with QoS, Extended Fabrics, ISL Trunking, Server Application Optimization (SAO), and Advanced Performance Monitor
- Support for Access Gateway configuration where server ports connected to the fabric core will be virtualized
- 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)
- 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
- Port-to-port latency minimized to 800 nanoseconds through the use of cut-through frame routing at 16 Gbps

Attention: This product is not intended to be connected directly or indirectly by any means whatsoever to interfaces of public telecommunications networks.

Switch components

- An RJ45 10/100 Base T Ethernet system management port, in conjunction with EZSwitchSetup, that supports switch IP address discovery and configuration, eliminating the need to attach a serial cable to configure the switch IP address and greatly increasing the ease of use
- One RS-232 serial port with RJ45 connector for initial switch setup (if not using EZSwitch Setup) and factory default restoration.
- A USB 2.0 port providing connections for firmware updates, output of the **supportSave** command, and configuration uploads and downloads
- One power supply and fan assembly in the base model. There are two fans per assembly. A second assembly is available for redundancy and hot-swap capability.
- 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) for speed and port activity (A green LED for port speed and an amber LED for port activity.)
- SEEPROM for switch identification

- Voltage monitoring
- Fan monitoring
- Temperature monitoring
- Real-time clock (RTC) with battery

Port side of the switch

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

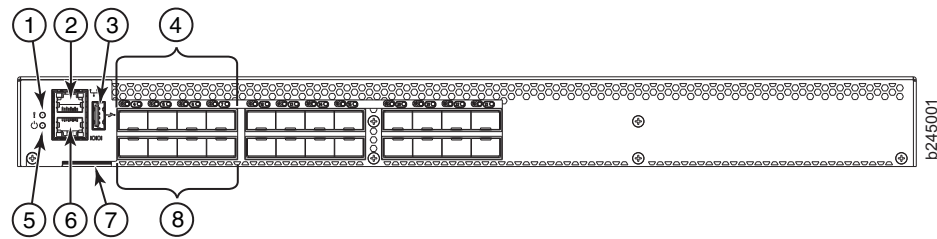


Figure 1. Port side view

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

Note: The two LEDs on the serial console port are nonfunctional.

Nonport side of the switch

Figure 2 shows the non-port side of the switch, which contains the power supply (including the AC power receptacle and AC power switch) and fan assemblies. The base model configuration with a single assembly is shown.

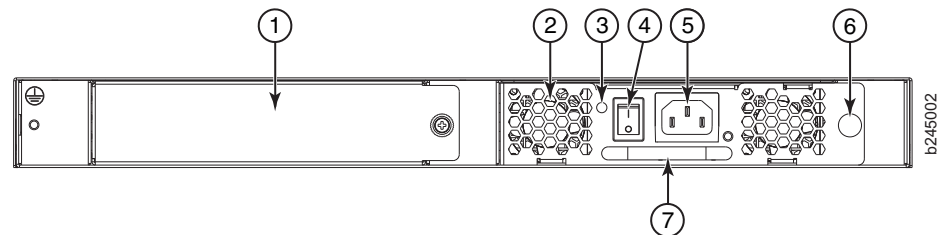


Figure 2. Non-port side of the switch

1	Power supply filler panel	4	On/off power switch	7	Handle
2	Power supply/fan assembly #1	5	Power plug receptacle		

3 Power supply
and fan assembly
LED

6 Captive screw

Chapter 2. Installing and configuring the switch

You can install the SAN24B-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 7.
- In an Electronic Industries Association (EIA) cabinet using the fixed rack mount kit, slide rack mount kit, or the mid-mount rack kit. For more information, see “Installing in an EIA cabinet” on page 9.

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 7
- “Installing in an EIA cabinet” on page 9
- “Configuring the switch” on page 14



Attention: Read the “Safety notices and labels” on page xiii 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 SAN24B-5 switch, containing one integrated power and fan assembly (optional second power and fan assembly)
- 16 Gbps or 8 Gbps SFP+ modules for the Fibre Channel ports (speed and quantity as ordered)
- One accessory kit, containing the following items:
 - *SAN24B-5 Installation, Service, and User Guide* (this document).
 - IBM documentation CD
 - Safety notices
 - Slim rail rack mount kit
 - Serial cable with an RJ45 connector
 - One 6 ft. (1.8 m) country-specific power cord (two if second power supply is ordered)
 - Rubber feet, required for setting up the switch as a standalone unit
 - *SAN24B-5 Quick Start Guide*
 - EZSwitch Setup CD
 - Warranty
 - Environmental notices

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

Attention: Retain this paperpack in a safe place. The transaction keys in the paperpack 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.

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 40.

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

Environmental requirements

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 facing the cool-air aisle. Exhaust is through the port side of the switch.
- All equipment in the rack should force air in the same direction to avoid intake of exhaust air.
- A maximum of 71.36 cubic meters/hour (42 cubic feet/minute) and a minimum of 59.47 cubic meters/hour (35 cubic feet/minute) of air flow is available to the air intake (with two power supplies).
- 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 one rack unit (1U) high; 4.45 cm (1.75 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 multicabinet 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.

Items required for installation

The following items are required for installing, configuring and connecting the SAN24B-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
- 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 xiii 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 14.

Installing in an EIA cabinet

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

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

Time required

Allow 15 to 30 minutes to complete this procedure.

Items required

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

- Clamps or other means of temporarily supporting the switch in the cabinet
- Phillips #2 screwdriver
- 1/4 in. straight slot screwdriver
- 1U of rack space
- Slim rail rack mount kit

Attention: Use the exact screws specified in the procedure for use with the switch chassis. Using screws longer than 3/16 in. can damage the switch. The different types of screws are listed in Table 3. Make sure that you tighten all screws used in this procedure.

Parts list

Ensure that the items listed in Table 3 and illustrated in Figure 3 on page 10 are included in the kit.

Table 3. Parts list for slim rail rack mount kit

Item	Description	Quantity
1	Bracket, front right	1
2	Bracket, front left	1
3	Bracket, rear left	1
4	Bracket, rear right	1
5	Screw, 8-32 x 5/16 in., panhead Phillips (torque to 15 in-lb, 17 cm-kG)	10
6	Screw, 6-32 x 1/4 in., flathead Phillips (torque to 9 in-lb, 10 cm-kG)	8
7	Screw, 10-32 x 5/8 in., panhead Phillips (torque to 25 in-lb, 29 cm-kG)	8
8	Retainer nut, 10-32, (for round-hole rack rails)	8
9	Retainer nut, 10-32, (for square-hole rack rails)	8

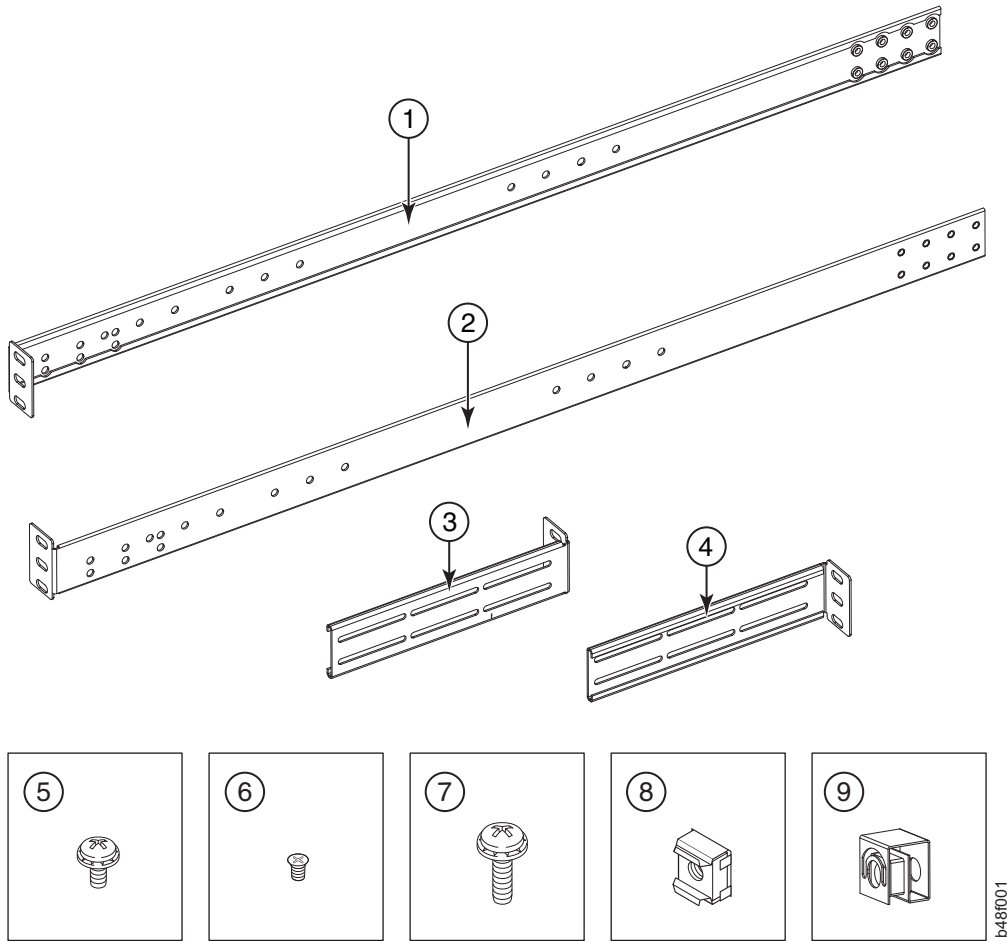


Figure 3. Items in the slim rail rack mount kit

Installation instructions

To install the switch in a slide-rail rack 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:

1. "Attaching the front brackets to the switch"
2. "Installing the switch in the cabinet" on page 11
3. "Attaching the rear brackets to the front brackets" on page 12
4. "Attaching the rear brackets to the cabinet rails" on page 13

Note: The illustrations in this section show the SAN48B-5 switch. Procedures and positioning are the same for the SAN24B-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 on page 11.

2. Insert two 8-32 x 5/16 in. screws **3** 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 cabinet, use the bracket holes that are set back from the end of the bracket.
3. Insert each 8-32 x 5/16 in. screw through the holes in the bracket and into the corresponding hole in the switch and tighten all 8-32 x 5/16 in. screws to a torque of 15 in-lb (17 cm-kg).
4. Repeat step 1 through step 3 to attach the left front bracket **2** to the left side of the switch.

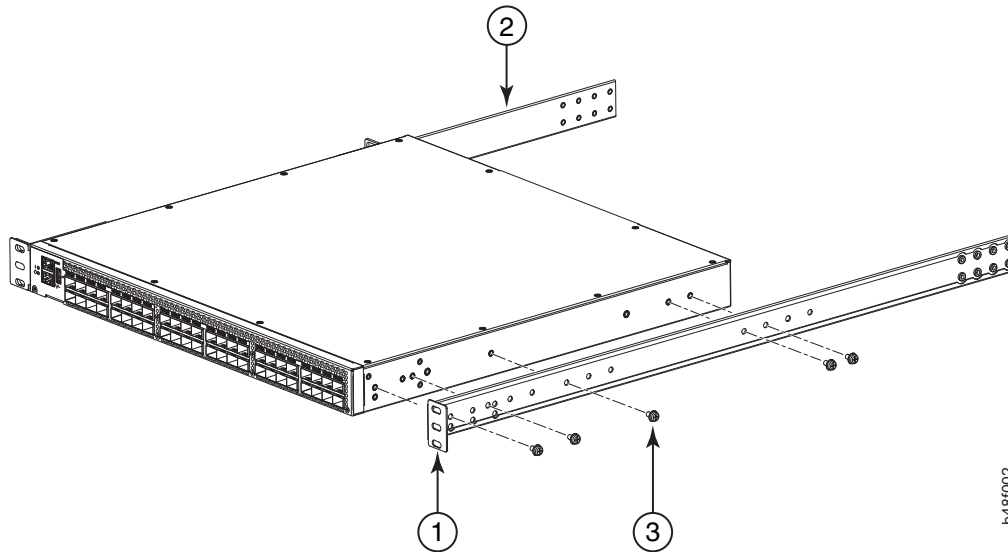
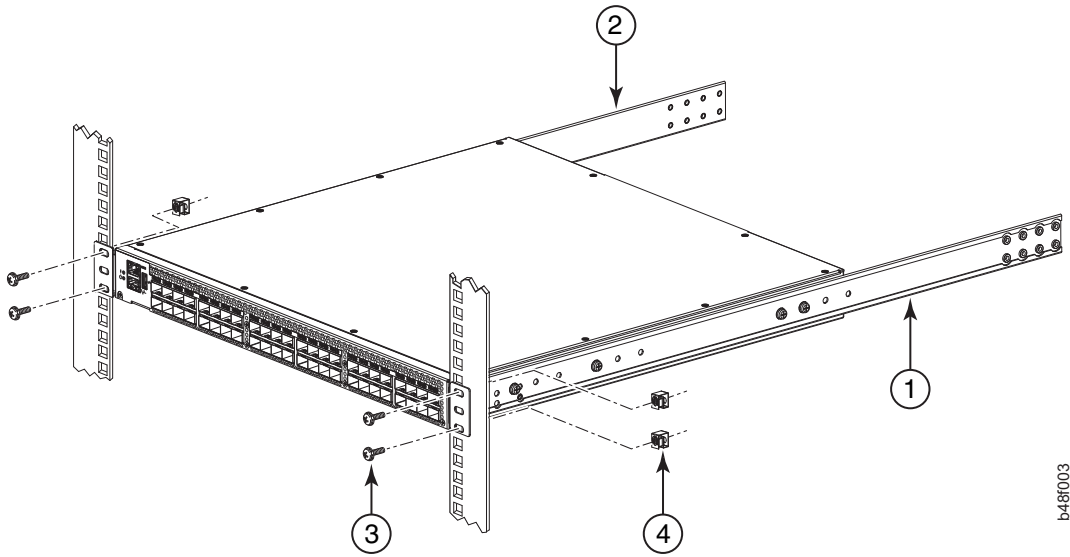


Figure 4. Position the front bracket

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 on page 12, providing temporary support under the switch until the rail kit is secured to the cabinet.
2. Attach the right front bracket **1** to the right front rack rail using two 10-32 x 5/8 in. screws **3** and two retainer nuts **4**.
3. Repeat step 2 to attach the left front bracket **2** to the left front rack rail and tighten all 10-32 x 5/8 in. screws to a torque of 25 in-lb (29 cm-kg).



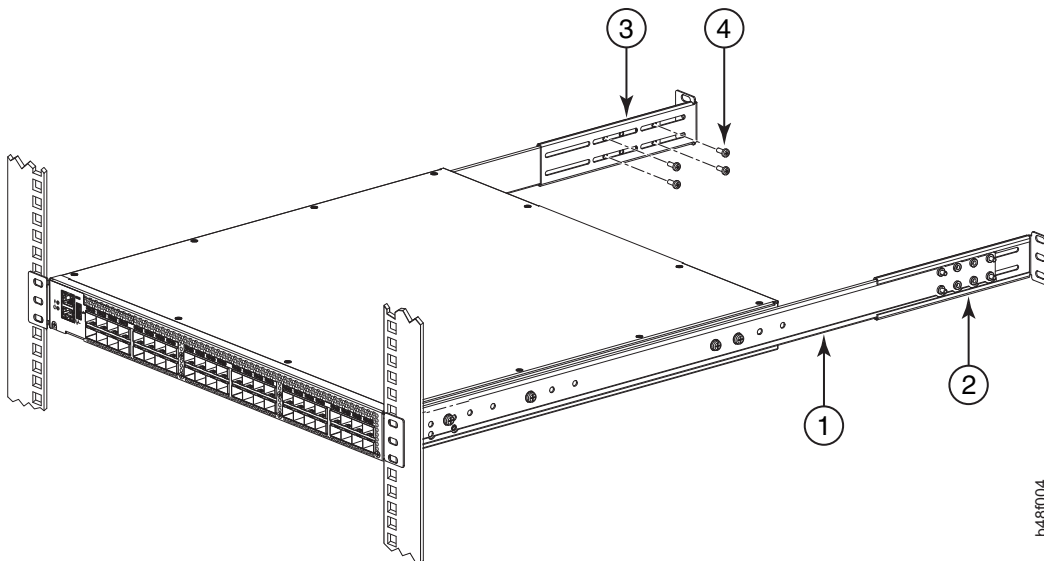
b48f003

Figure 5. Position the switch in the cabinet

Attaching the rear brackets to the front brackets

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

1. Position the right rear bracket **2** inside the right front bracket **1**, as shown in Figure 6.
2. Attach the brackets using four 6-32 x 1/4 in. screws **4**.
3. Adjust the brackets to cabinet depth and tighten the screws to a torque of 9 in-lb (10 cm-kg).
4. Repeat step 1 through step 3 to attach the left rear bracket **3** to the left front bracket.



b48f004

Figure 6. Position the rear and front brackets

Attaching the rear brackets to the cabinet rails

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

1. Attach the right rear bracket **2** to the right rear cabinet rail using two 10-32 x 5/8 in. screws **4** and two retainer nuts **3**, as shown in Figure 7.
2. Repeat step 1 to attach the left rear bracket to the left rear cabinet rail and tighten all the 10-32 x 5/8 in. screws to a torque of 25 in-lb (29 cm-kg).

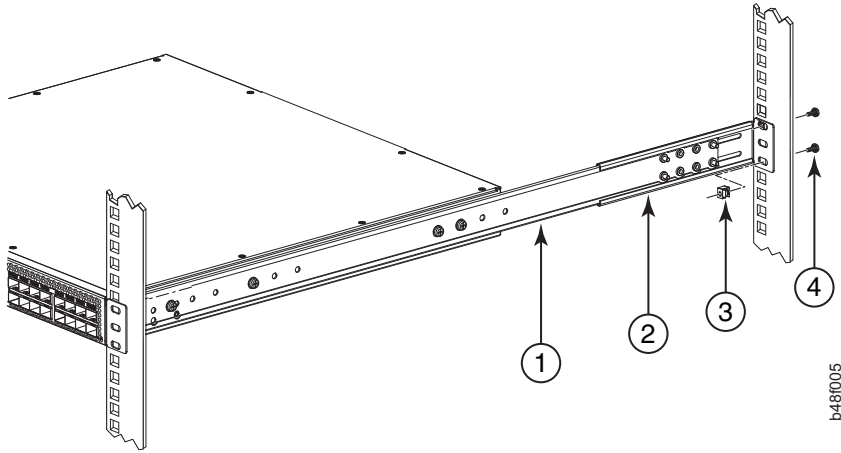


Figure 7. Attach the rear bracket to the cabinet rail

Configuring the switch

Once you have set up the SAN24B-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 SAN24B-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 *SAN24B-5 Quick Start Guide*. If you do not want to use EZSwitch Setup, follow the instructions in this section.

To configure the switch, perform the following tasks.

- “Providing power to the switch”
- “Creating a serial connection” on page 15
- “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)

Follow these steps to power on the switch:

1. Connect the power cord to the power supply. Repeat if a second power supply is installed.
2. Connect the other end of the power cord(s) to a power source. If using two power supplies, be sure to connect the cords on separate circuits to protect against AC failure. Ensure that the cords have a minimum service loop of 6 in. available and are routed to avoid stress.
3. Power on the power supplies by flipping the AC switches to the “I” symbol. The power supply LED will display amber until POST is complete, and then change to green. The switch usually requires several minutes to boot and complete POST.

Attention: Power is supplied to the switch as soon as the first power supply is connected and turned on.

4. 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 performed using a serial connection. Complete the following 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 SAN24B-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 SAN24B-5 supports both IPv4 and IPv6.

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 into 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 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 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 SAN24B-5 maintains the current date and time inside a battery-backed real-time clock (RTC) circuit. The date and time settings are used for timestamping log 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 select continent, country, or time zone region names.

If the time zone is not set with the named options, the switch retains the offset time zone settings. This is a number of hours offset from Greenwich Mean Time (GMT). If you have set the time zone with a name, you can revert to the offset format if you choose. For more information about the **tsTimeZone** command, 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 those 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 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 IP address in non-volatile memory. By default, this value is LOCL, the local clock server of the Principal (when FCS is not enabled) or Primary (when FCS is enabled) switch. Changes to the clock server value on the Principal or Primary 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 v5.3.0 or later has entered the fabric it will be able to store the list and the active servers; switches running Fabric OS versions earlier than v5.3.0 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 IP address in the fabric will not be possible to switches earlier than Fabric OS v5.3.0 because IPv6 is supported for Fabric OS v5.3.0 and later. The default value LOCL will be distributed to switches earlier than Fabric OS v5.3.0.

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

1. Log into the switch using the default password, which is *password*.
2. Enter the **date** command, using the following syntax:

```
date "mmddHHMMyy"
```

The values represent the following information:

- 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 2000-2069)

```
switch:admin> date  
Fri Aug 26 12:29:46 UTC 2011  
switch:admin> date "0826123011"  
Fri Aug 26 12:30:00 UTC 2011  
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 to Central Standard time using **timezonename** mode.

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.
Please identify a location so that time zone rules can be set correctly.
3. Enter the appropriate number or enter **Ctrl+D** to quit.
4. At the prompt, select a country location from the list.
5. At the prompt, enter the appropriate number to specify the time zone region or **Ctrl+D** to quit.

Synchronizing local time using NTP

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

1. Log into the switch using the default password, which is *password*.
2. Enter the **tsClockServer** command.

```
switch:admin> tsclockserver "<ntp1;ntp2>"
```

In the syntax *ntp1* is the IP address or DNS name of the first NTP server, which the switch must be able to access. The value *ntp2* 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
LOCL
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

ISL Trunking is optional software that allows you to create trunking group of ISLs between adjacent switches. Up to eight FC ports on the SAN24B-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, see the *Fabric OS Administrator's Guide*.

Switch Status Policy

Switch status policy is a feature that monitors different switch parameters such as power supplies, fan units, and so forth and provides switch status based on their health. The switch status policy configuration can be updated using the **switchStatusPolicySet** command. The example shows the default settings of 2 and 0 for DOWN and MARGINAL units for both Bad PowerSupplies and Bad Fans.

```
switch:admin>switchstatuspolicyset
<some output skipped>
The minimum number of
Bad PowerSupplies contributing to DOWN status: (0..2) [2]
Bad PowerSupplies contributing to MARGINAL status: (0..2) [0]
<some output skipped>
Bad Fans contributing to DOWN status: (0..2) [2]
Bad Fans contributing to MARGINAL status: (0..2) [0]
<output truncated>
```

If a second power supply and fan assembly unit is installed in the switch, IBM recommends changing the configuration to 2 and 1 for DOWN and MARGINAL for both the Bad PowerSupplies and Bad Fans. You can use the **switchStatusPolicyShow** command to see the results of your changes.

Installing SFP+ transceivers and connecting cables

The SAN24B-5 only supports Brocade-branded 8 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.

Attention: Use only transceivers that are supported for this product. Only transceivers purchased from IBM are supported. The use of transceivers that are not supported may cause data loss or cause the product to malfunction. For a listing of transceivers compatible with this product:

- Go to the IBM Support Portal www.ibm.com/supportportal.
- In the **Search** field, enter **b-type supported transceiver**.
- Alternatively, use this direct link: <http://www-01.ibm.com/support/docview.wss?uid=ssg1S1004421>.

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.

Attention: With increasing speeds of optical connections, the cleanliness of the connections assumes greater importance in ensuring maximum performance and error free transmission. Due to the tighter tolerances associated with state of the art optics, levels of contamination that were acceptable at lower speeds may not be at higher speeds. While IEC Standard 61300-3-35 specifies a set of guidelines for trouble free performance, most issues can be avoided by adhering to the following best practices:

- When cables or connectors are not in use for extended periods of time, use the dust covers provided.
- Ensure that the cable length and type that is used are suitable for the speed and application.
- Inspect and clean optical connections and fiber cables before you connect or reconnect components.
- Ensure that cables are properly seated within the connector.

Kits are commercially available for cleaning and inspecting these connections. IBM also offers services that will ensure optimal condition of the network.

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 21 shows the installation of a 16 Gbps SFP+, and Figure 9 on page 21 shows the installation of an 8 Gbps SFP+ with a wire bail latching mechanism.

Installing 16 Gbps SFP+ transceivers

Note: Each SFP+ has a 10-pad gold-plated PCB-edge connector on the bottom. The correct position to insert an SFP+ into the upper row of ports is with the gold edge down. The correct position to insert an SFP+ into the lower row of ports is with the gold edge up.

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. Ensure that both cable and transceiver are clean prior to installation.
3. 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.

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.

4. 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.

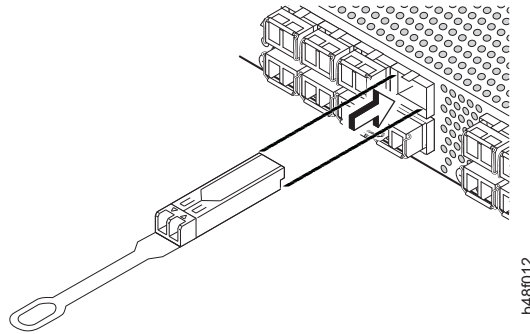


Figure 8. Installing a 16 Gbps SFP+ with pull tab (shown without cable attached)

Installing 8 Gbps SFP+ transceivers with wire bails

1. Ensure that both cable and transceiver are clean prior to installation.
2. Making sure that the bail (wire handle) is in the unlocked position, place the 8 Gbps SFP+ in the correctly oriented position on the port, as shown in Figure 9.
3. Slide the SFP+ into the port until you feel it click into place; then close the bail.

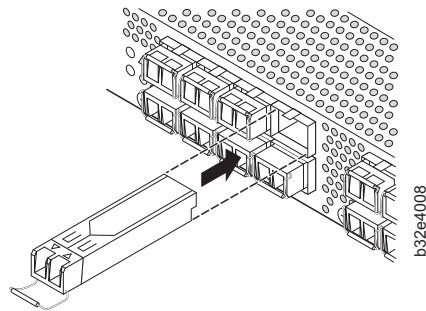


Figure 9. SFP+ with wire bail latch

4. 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). Then, insert the cable into the transceiver until the latching mechanism clicks.

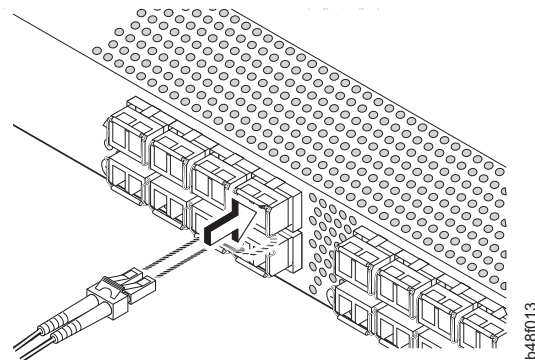


Figure 10. Installing a cable

5. Connect the other end of the cable to the appropriate device.

Refer to “Planning for cable management” on page 7 for suggestions on organizing cables.

Fabric OS Native and Access Gateway modes

The SAN24B-5 can function in either Fabric OS Native mode or Access Gateway mode. The switch is shipped in Fabric OS Native mode by default.

- You can enable Access Gateway mode using Fabric OS commands or Web Tools.
Attention: You must install the license for any additional port activations before enabling the Access Gateway mode.
- When you enable Access Gateway, you can use the default F_Port-to-N_Port mappings or change this mapping using command line interface (CLI) or Web Tools, after you configure an IP address using instructions in “Setting the switch IP address” on page 15.
- Access Gateway simplifies SAN deployment by using N_Port ID Virtualization (NPIV). NPIV provides Fibre Channel switch functions that improve switch scalability, manageability, and interoperability. For more information on Access Gateway, refer to the following information:
 - For a list of F_Ports mapped to N_Ports by default, refer to “Access Gateway default port mapping” on page 43.
 - For general information and details on using Access Gateway, refer to the *Access Gateway Administrator’s Guide*.
 - For specific instructions to prepare the edge fabric before connecting it to Access Gateway (since Access Gateway relies on NPIV technology for its connection to the edge fabric), refer to the *Access Gateway Administrator’s Guide*

Note: Access Gateway cannot be connected directly into an array. It requires a fabric to support NPIV.

- Fabric OS features available to the switch depend on whether the switch is configured in Access Gateway or Fabric OS Native mode. For a list of available features for each mode, refer to the *Access Gateway Administrator’s Guide*.
- In Access Gateway mode, cascading is not available for the SAN24B-5. Refer to the latest *Access Gateway Administrator’s Guide* for details on any other restrictions specific to the SAN24B-5.
- In Fabric OS Native mode, the switch provides up to 24 external Fibre Channel ports. These universal and self-configuring ports are capable of becoming one of the following port types:
 - F_Port (fabric enabled)
 - FL_Port (fabric loop enabled)
 - E_Port (expansion port)
 - M_Port (mirror port)
- In Access Gateway mode, the switch also provides up to 24 external Fibre Channel ports. However, these ports are configured as N_Ports, and you cannot reconfigure these as any other port type.

Enabling and disabling Access Gateway mode

This section provides steps to enable and disable Access Gateway mode using Fabric OS commands. For more information on using these commands, refer to the “Enabling and disabling Access Gateway mode” section in the *Access Gateway Administrator’s Guide* or the *Fabric OS Administrator’s Guide*.

Note: You can also enable and disable Access Gateway mode using Web Tools. See the *Web Tools Administrator’s Guide* for more information.

Enabling Access Gateway mode

Note the following information when enabling Access Gateway mode:

- After you enable Access Gateway mode, some fabric information is erased, such as the zone and security databases.
- Enabling Access Gateway mode is disruptive because the switch is disabled and rebooted.
- Ensure that no zoning or Admin Domain (AD) transaction buffers are active. If any transaction buffer is active, enabling Access Gateway mode will fail with the error, "Failed to clear Zoning/Admin Domain configuration."

Use the following steps to enable Access Gateway mode using Fabric OS commands.

1. Before disabling a switch to enable Access Gateway mode, save the current configuration file using the **configUpload** command in case you need this configuration at a later time.
2. Enter the **switchShow** command to verify the switch mode.
 - **Access Gateway Mode** displays for switchMode if the switch is in Access Gateway mode.
 - **Native** displays for switchMode if the switch is in Fabric OS Native mode.
3. Enter **switchDisable** to disable the switch. Access Gateway mode can only be enabled or disabled when the switch is in a disabled state.
4. Enter **ag --modeEnable** to enable Access Gateway mode.
5. Enter the **ag --modeShow** command to verify that AG mode is enabled.

```
switch:admin> ag --modeshow
Access Gateway mode is enabled.
```

Disabling Access Gateway mode

When you disable Access Gateway mode, the switch automatically reboots and comes back online using the fabric switch configuration. The Access Gateway parameters, such as F_Port-to-N_Port mapping, Failover, and Failback are automatically removed. When the switch reboots, it starts in Fabric OS Native mode. To re-join the switch to the core fabric, refer to the *Access Gateway Administrator's Guide*.

Use the following steps to disable Access Gateway mode using Fabric OS commands.

1. Enter the **switchShow** command to verify the switch mode.
 - **Access Gateway Mode** displays if the switch is in Access Gateway mode.
 - **Native** displays if the switch is in Fabric OS Native mode.
2. Enter **switchDisable** to disable the switch. Access Gateway mode can only be disabled or enabled when the switch is in a disabled state.
3. Enter **ag --modeDisable** to disable Access Gateway mode.
4. Enter the **ag --modeShow** command to verify that Access Gateway mode is disabled.

```
switch:admin> ag --modeshow
Access Gateway mode is NOT enabled
```

Chapter 3. Using and maintaining the switch

This chapter provides information about operating and maintaining the switch and includes these topics.

- “Powering the switch on and off”
- “Interpreting LEDs”
- “POST and boot specifications” on page 28
- “Interpreting POST results” on page 29
- “SAN24B-5 maintenance” on page 29
- “SAN24B-5 management” on page 30

Powering the switch on and off

Complete the following steps to power the switch on. These steps apply to the base model of the switch which has a single power supply. Repeat any steps for a second power supply, if installed.

1. Connect the power cord to the power connector on the power supply and to the power source.
2. Set the AC power switch to “I”.

Power is supplied to the switch as soon as the first power supply is connected and powered on.

The switch runs POST by default each time it is powered on; it can take several minutes to boot and complete POST. .

To power the switch off, complete the following steps.

1. Enter the **sysShutDown** command.

```
switch:admin> sysshutdown
This command will shutdown the operating systems on your
switch. You are required to power-cycle the switch in
order to restore operation.
Are you sure you want to shutdown the switch [y/n]? y
Broadcast message from root (ttyS0) Mon Mar 12 17: \
52:12 2012...
The system is going down for system halt NOW !!
INIT: Switching to runlevel:
INIT: Sending processes the TERM signal
switch:root> Unmounting all filesystems.
The system is halted
flushing ide devices: hda
Power down.
```

2. Set the AC power switches to **O**.
All devices are returned to their initial state the next time the switch is powered on.

Attention: Power is still supplied to the switch if any power cord is connected. To fully remove power from the switch, all power cords must be disconnected.

Interpreting LEDs

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 (see Figure 11).

- One system status LED (above) on the left side
- One power LED (below) on the left side
- Two Ethernet Port LEDs (one amber, one green)
- 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 11 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.

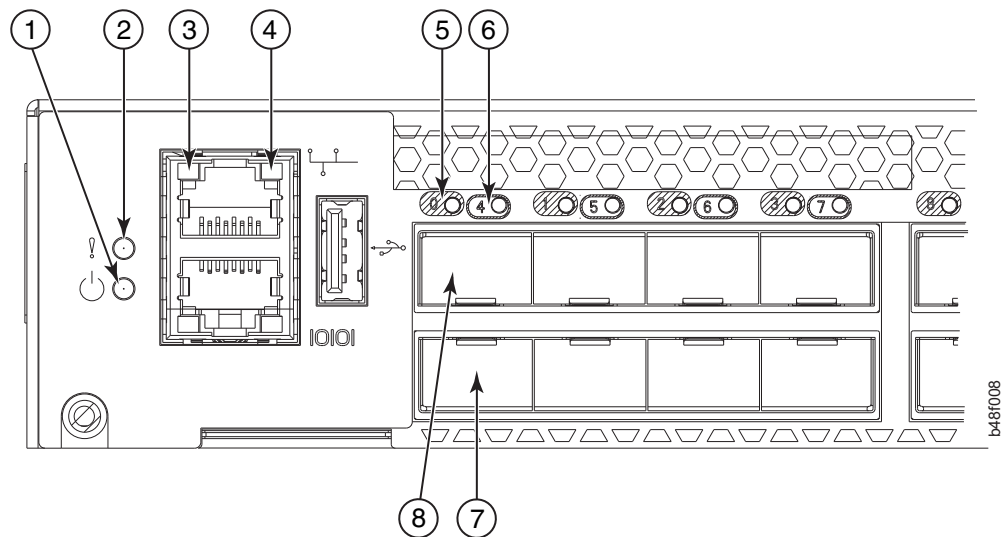


Figure 11. Port side LEDs

- | | |
|-------------------------------------|--------------------------------------|
| 1 System power LED | 5 FC port status LED (port 0) |
| 2 System status LED | 6 FC port status LED (port 4) |
| 3 Ethernet port activity LED | 7 FC port 0 |
| 4 Ethernet port speed LED | 8 FC port 4 |

Note: The two LEDs on the serial console port are nonfunctional.

The non-port side of the switch has two power supply/fan assembly status LEDs (see Figure 12).

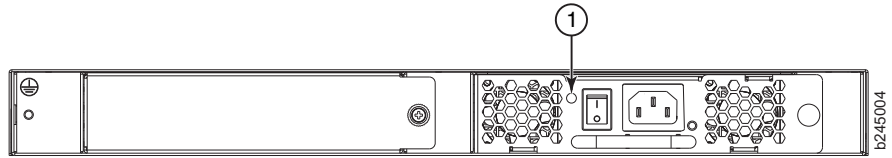


Figure 12. Non-port side LEDs

1 Power supply/fan assembly #1 status LED

LED patterns

Table 4 describes the port side LEDs and their behavior.

Table 4. 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 the system is powered on (power supply switch to I), the power cable 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.
System status (bicolor)	No light	System is off or there is not 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.	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 Mbps	No action required.
Ethernet Activity/Link (amber)	No light	There is no link.	Verify that the Ethernet cable is connected correctly.
	Steady amber	There is a link.	No action required.
	Blinking amber	There is link activity (traffic).	No action required.

Table 4. Port side LED patterns during normal operation (continued)

LED name	LED color	Status of hardware	Recommended action
Optical media port status (one bi-color LED for each FC port)	Off	No light or signal carrier on media interface	Verify that the transceiver is installed correctly and that the cable is connected correctly.
	Steady amber	Receiving light or carrier, but not online.	No action required.
	Slow blinking amber (2 sec)	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)	Port failure.	Check the management interface and the error log for details on the cause of the failure. Contact IBM Support if necessary.
	Steady green	Online.	No action required.
	Slow blinking green (2 sec)	Online but segmented (loopback cable or incompatible switch)	No action required.
	Fast blinking green (1/2 sec)	Internal loop-back (diagnostic)	No action required.
	Flickering green	Online, frames flowing through port.	No action required.

Table 5 describes the non-port side LEDs and their behavior.

Table 5. Non-port side LED patterns during normal operation

LED name	LED color	Status of hardware	Recommended action
Power supply / fan assembly status (green)	No light	Power supply/fan is not receiving power or is off.	Verify that the power supply/fan is on and seated and the power cord is connected to a functioning power source.
	Steady green	Power supply/fan is operating normally.	No action required.
	Flashing green	Power supply/fan is faulty. Note: When the switch is first powered on the PS/fan status LED will show flashing green until POST has completed.	Check the power cable connection. Verify that the power supply/fan is powered on. Replace the power supply/fan FRU.

POST and boot 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

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 4 on page 27 and Table 5 on page 28 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 Manual*.

SAN24B-5 maintenance

The SAN24B-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, the 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 console set up through a serial 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 are run at link speeds of 2, 4, 8, or 16 Gbps (FC) 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*.

SAN24B-5 management

You can use the management functions built into the SAN24B-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 specifications" on page 28.

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 6. Refer to the *Fabric OS Command Reference* for more information on the CLI commands.

Table 6. Management options for the SAN24B-5

Management tool	Out-of-band support	In-band support
Command Line Interface (CLI) 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 Administrator's Guide</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)

Table 6. Management options for the SAN24B-5 (continued)

Management tool	Out-of-band support	In-band support
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 xiii before removing or installing any components.

The field replaceable units (FRUs) in the SAN24B-5 can be removed and replaced without special tools. The switch can continue operating during many of the FRU replacements if the conditions specified in the procedure are followed.

Replacing a power supply and fan assembly

The SAN24B-5 fans are fixed inside the combined power supply and fan FRU to provide necessary airflow to cool the whole system. There are two fans located in each FRU. The system software sets fan speed and measures their speeds through the tachometer interface.

The base model switch has a single power supply and fan assembly. A second power supply and fan assembly is an optional feature for redundancy. The power supply and fan assembly FRU units are hot-swappable only if replaced one at a time and two are installed. They are identical and fit into either slot. Fabric OS identifies the assemblies from right to left on the nonport side. Even though they are contained within a single unit, the power supply and fan components are identified separately. In the `chassisShow` command they are identified as Power Supply Unit:1 and Fan Unit:1.

The SAN24B-5 base model has one power supply and fan assembly, as shown in Figure 13. If installed, power supply unit 2 would be located where the filler panel **1** is shown.

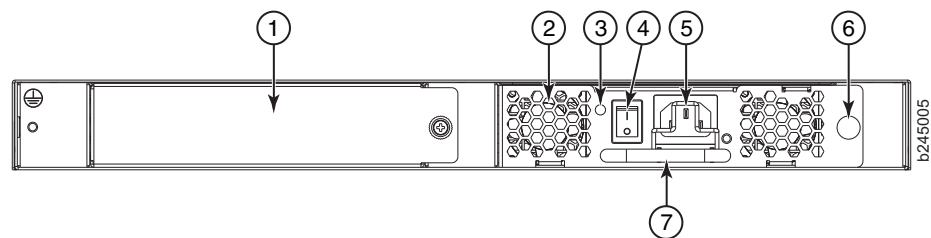


Figure 13. Switch power supply and fan assembly components on the non-port side

- | | |
|--|---|
| 1 Filler panel | 5 Power plug receptacle (with plug retainer) |
| 2 Power supply and fan assembly 1 | 6 Thumbscrew |
| 3 Power supply and fan assembly LED | 7 Handle |
| 4 On/off switch | |

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 and fan assembly. The cooling system relies on pressurized air; if you are using redundant power supply and fan assemblies, do not leave either of the power supply and fan assembly slots empty longer than two minutes. If a power supply and fan assembly fails, leave the power supply and fan assembly in the switch until it can be replaced. If you are using only one power supply and fan assembly, be sure that the slot filler panel is in place. If that power supply fails, the switch will turn off.

Table 7 describes the power supply and fan assembly status LED colors, behaviors, and actions required, if any.

Table 7. Power supply and fan assembly status LED behavior

LED color	Description	Action required
No light	Power supply and fan assembly is not receiving power, or is off.	Verify that the power supply and fan assembly is on and seated and the power cord is connected to a functioning power source.
Steady green	Power supply and fan assembly is operating normally.	No action is required.
Flashing green (for more than 5 seconds)	Power supply and fan assembly is faulty for one of the following reasons: <ul style="list-style-type: none"> • The assembly is switched off - flashing for ~ 5 seconds, then off • The power cable is disconnected - flashing for ~ 5 seconds, then off • The power supply and fan assembly has failed <p>Note: When the switch is first powered on, the power supply and fan assembly status LED will flash until POST has completed</p>	Check the power cable connection. Verify that the assembly is powered on Replace the power supply and fan assembly FRU.

Determining the need to replace a power supply and fan assembly

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

- Check the power supply and fan assembly status LED next to the On/Off switch (see **3** in Figure 13 on page 33)
- In Web Tools, click the **Power Status** icon.
- Enter the **psShow** command at the prompt to display power supply and fan assembly status as shown below:

```
br6505:admin> psshow
Power Supply #1 is OK
Power Supply #2 is absent
br6505:admin>
```

Alternatively, you can enter the **fanShow** or **chassisShow** commands to determine the status of the power supply and fan assembly:

```

br6505:admin> fanshow
Fan 1 is OK, speed is 8653 RPM
Fan 2 is absent
br6505:admin>

br6505:admin> chassisshow
FAN Unit: 1
Fan Direction: Forward
Time Awake: 0 days

POWER SUPPLY Unit: 1
Power Source: AC
Time Awake: 0 days
Power Supply #1 is OK
Power Supply #2 is absent
<additional output truncated>
br6505:admin>

```

Time required

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

Items required

The following items are required to replace a power supply and fan assembly:

- New power supply and fan assembly
- A #1 Phillips-head screwdriver

Removing a power supply and fan assembly

Refer to Figure 14 for this procedure.

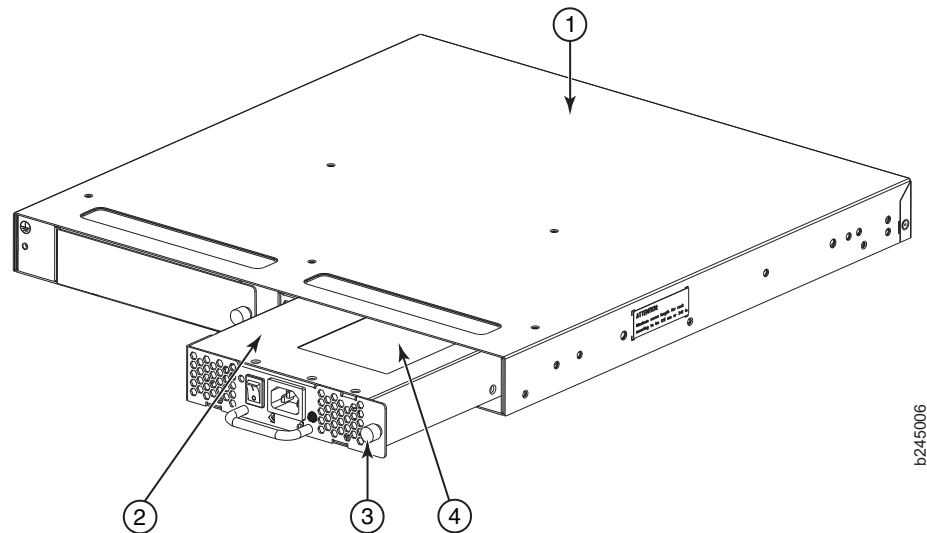


Figure 14. Removing the power supply and fan assembly

- | | |
|--|---------------------------------|
| 1 Switch chassis | 3 Captive screw |
| 2 Power supply and fan assembly | 4 Label with part number |

Complete the following steps to remove a combined power supply and fan assembly from the switch.

1. If the switch has only one power supply and fan assembly, then the switch must be powered off prior to replacing the assembly. If the switch has two power supply and fan assemblies installed, verify that the other power supply and fan assembly (the one not being replaced) has been powered on for at least four seconds and has a steady green LED.
2. If the switch has two power supply and fan assemblies, skip to **step 3**. If the switch has only one power supply and fan assembly, enter the **sysShutDown** command before powering off the assembly to maintain the reliability of the system.
3. Power off the power supply to be replaced by pressing the AC power switch to the **O** symbol.

Note: If the switch has two power supply and fan assemblies, the fans in the second power supply will automatically switch to high speed to maintain adequate cooling.

4. Unplug the power cord from the power supply and fan assembly that is being replaced.
5. Using a Phillips-head screwdriver, unscrew the captive screw **3**.
6. Remove the power supply and fan assembly **2** from the chassis by pulling the handle out and away from the chassis **1**.
7. Note the part number **4** on the assembly just removed.

Replacing a power supply and fan assembly

Refer to Figure 14 on page 35 for this procedure.

Complete the following steps to replace a combined power supply and fan assembly in the switch

CAUTION:

The power supply switch must be in the off position (switched to the O symbol) when inserting it in the chassis. Damage to the switch could result if a live power supply is installed.

1. Ensure that the new power supply and fan assembly has the same part number as the power supply and fan assembly being replaced
2. Orient the new power supply and fan assembly with the captive screw on the right, as shown in Figure 14 on page 35.

CAUTION:

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

3. Gently push the power supply and fan assembly into the chassis until it is firmly seated.
4. Using the Phillips screwdriver, secure the power supply and fan assembly to the chassis by tightening in the captive screw **3**.
5. Plug the power cord in to the power supply and fan assembly and power on the unit by moving the AC power switch to the **I** symbol.
6. Verify that the LED on the new power supply and fan assembly displays a steady green light while the switch is operating. If the LED is not a steady green, ensure that the power supply is securely installed and seated properly.
7. Optionally, if using the Command Line Interface (CLI), enter the **psShow** command at the command line prompt to display the status. Power supply and fan assembly status can also be viewed using the Web Tools application.

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. Unscrew captive screws and remove the power supplies and fan assemblies.
4. Unscrew the fasteners and remove the sheetmetal cover.
5. On the circuit board, go to the B1 location (**1** in Figure 15) and remove the BR1225 battery from the holder.

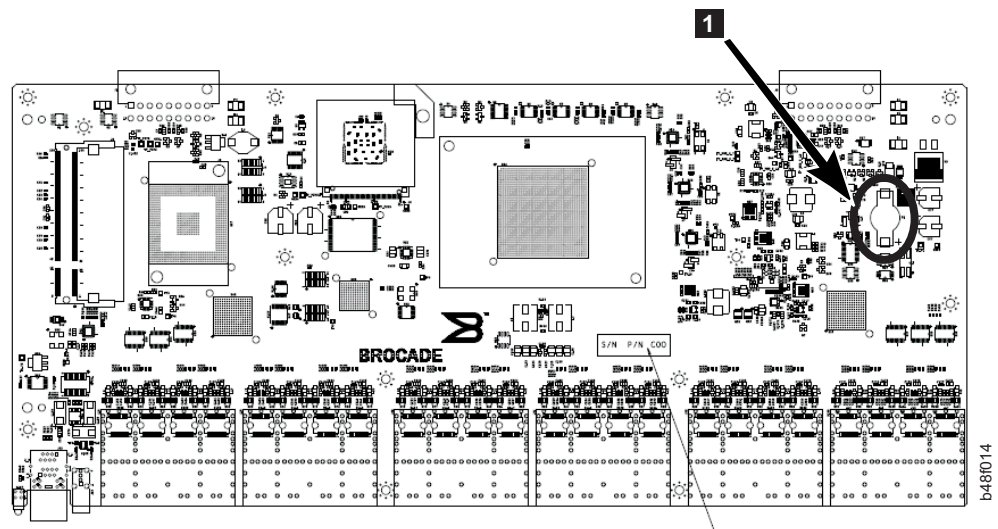


Figure 15. Location of battery holder

6. Recycle the battery as appropriate.

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 SAN24B-5 switch.

- “Weight and physical dimensions”
- “Facility requirements”
- “Power supply specifications” on page 40
- “Environmental requirements” on page 40
- “General specifications” on page 41
- “Data transmission ranges” on page 42
- “Memory specifications” on page 42
- “Fibre Channel port specifications” on page 42
- “Serial port specifications” on page 43

Weight and physical dimensions

Table 8 lists the dimensions and weight of the switch.

Table 8. Switch dimensions

Dimension	Value
Height	1U = 4.3 cm (1.7 in)
Depth	44.3 cm (17.4 in)
Width	43.8 cm (17.2 in) Note the slightly increased width, which requires a slim rail rack mount kit for mounting.
Weight (with one power supply and fan assembly, and no SFP+s installed)	7.82 kg (17.25 lb)

Facility requirements

Table 9 provides the facility requirements that must be met for the switch.

Table 9. Facility requirements

Type	Requirement
Electrical	<ul style="list-style-type: none">• Adequate supply circuit, line fusing, and wire size, as specified by the electrical rating on the switch nameplate• Circuit protected by a circuit breaker and grounded in accordance with local electrical codes Refer to Table 10 on page 40 for complete power supply specifications.
Thermal	<ul style="list-style-type: none">• A minimum air flow of 79.8 cubic meters/hour (47 cubic ft/min.) available in the immediate vicinity of the switch• Ambient air temperature not exceeding 40° C (104° F) while the switch is operating

Table 9. Facility requirements (continued)

Type	Requirement
Cabinet (when rack-mounted)	<ul style="list-style-type: none"> • One rack unit (1U) in a 48.3 cm (19-inch) cabinet—must use the slim-rail rack kits designed for the extra width of the switch to mount in standard cabinets/racks • All equipment in cabinet grounded through a reliable branch circuit connection • Additional weight of switch not to exceed the cabinet’s weight limits • Cabinet secured to ensure stability in case of unexpected movement

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 10 lists the power supply specifications for the switch.

Table 10. Power supply specifications

Specification	Value
Maximum output (per power supply)	150 watts, 12 VDC
AC input power draw	Idle, no optics: 60 W Maximum, fully populated with 16 Gbps SWL optics: 80 W
AC input voltage	85-264 VAC, nominal 100-240 VAC
AC input line frequency	47-63 Hz, nominal 50-60 Hz
AC inrush current	Maximum of 35A @ 240 VAC for 10 ms or less
Input line protection	AC lines are fused.

Environmental requirements

Table 11 lists the acceptable environmental ranges for both operating and non-operating (such as during transportation or storage) conditions.

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)
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

Table 11. Environmental requirements (continued)

Condition	Acceptable range during operation	Acceptable range during non-operation
Air flow	Maximum - 71.36 cmh (42 cfm) Nominal - 59.47 cmh (35 cfm) (two power supplies) Note: Airflow is port side exhaust	NA
Heat dissipation	338 BTU/hr (24 port configuration)	NA

General specifications

Table 12 lists the general specifications for the switch.

Table 12. General specifications

Specification	Description
Configurable port types	F_Port, E_Port, M_Port, EX_Port, and D_Port
System architecture	Nonblocking shared-memory switch
System processor	PowerPc 440Epx @ 667 MHz
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	384 Gbps
FC Port-to-port latency	800 nanoseconds with no contention (destination port is free)
Switching capacity	An aggregate switching capacity of 210 million frames per second (for Class 2, Class 3, and Class F frames for the 24 port chassis)

Data transmission ranges

Table 13 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+	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.)	190 m (623 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+	4Gbps	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+	16 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi.)

Up to 7500 km at 2G 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 (expandable to 8 MB)
Compact flash	1 GB
Main memory (DDR2 SDRAM)	1 GB, 64-bit bus operating at 166 MHz with 8-bit ECC

Fibre Channel port specifications

The Fibre Channel ports in the SAN24B-5 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.

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 DB9 adaptor cable 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

Access Gateway default port mapping

Table 16 lists the port mappings of F_Ports to N_Ports.

Table 16. Access Gateway default port mapping

Total Ports	F_Ports	N_Ports	Default port mapping
24	0-15	16-23	0, 1 mapped to 16 2, 3 mapped to 17 4, 5 mapped to 18 6, 7 mapped to 19 8, 9 mapped to 20 10, 11 mapped to 21 12, 13 mapped to 22 14, 15 mapped to 23

Appendix B. Link troubleshooting

IBM SAN b-type directors and switches use the latest high bandwidth Fibre Channel technology and auto-negotiate to 16 Gbps, 8 Gbps, 4 Gbps, or 2 Gbps based on the link data rate capability of the attached transceiver and the speed supported by the switches and directors. Negotiation to 1 Gbps is not supported unless 4 Gbps FC transceivers are used. As the 8 and 16 Gbps channel is more sensitive to the condition of the existing multimode and single mode cable plant, it is very important to minimize connector reflections and maintain an acceptable link loss budget.

This section provides link troubleshooting advice on fault isolation and provides guidance in the following areas:

- Dust and dirt contamination
- Link loss
- Attenuation on LWL connections

Fault isolation

Since a job loss issue can be caused by a variety of problems, it is important to employ a systematic fault isolation process to remedy the issue. Note that job losses do not necessarily result from link errors. They may also be due to:

- Configuration issues
- Networking overload
- Failures on storage device, switch, or server

Assume for these procedures that the observed errors originate from link errors and are not the result of configuration issues, network overload or network equipment failures.

Whenever CRC errors are discovered on a particular link, it is easy to jump to the conclusion that the link is causing the network issue. This might not be the case. Since CRC errors are just symptoms of a link issue, we need to trace the propagated error to where it originated.

Figure 16 shows a simplified network involving a server, a switch, and a storage device. In this example, assume that the server experienced an error at port 1. This observable error can potentially originate from links 1, 2, 3 or 4 and/or SFP 1, 2, 3 or 4.

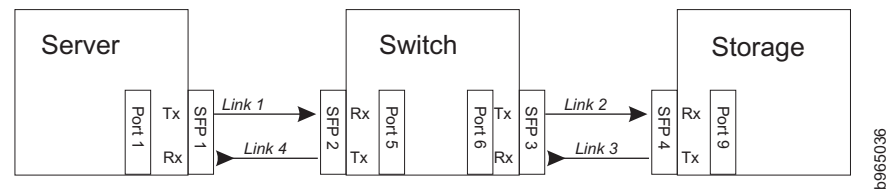


Figure 16. Identifying the origin of failure

To determine the original failing link, the observable CRC error needs to be tracked back to the first occurrence of the CRC error. By following this process, it

is discovered in this example that CRC errors observed in link 4 were propagated from link 3, which in turn originated from link 2.

Once the original failing link (link 2) has been determined, the two connecting ports of that link need to be checked for the following errors:

- Encoder errors
- Disparity errors
- Invalid transmission words

The port that displays any of the above errors is the cause of the link issue, which can be caused by dust or dirt in the connectors or fiber, an insufficient link loss budget, and/or incompatible SFPs.

Dust, dirt, or other contaminants

One of the most common optical link problems is caused by dust, dirt, or oil in the connectors and fiber. 8 and 16 Gbps links are more prone to such issues while lower link data rates, such as 1, 2, or 4 Gbps may be unaffected.

Once the failing port has been identified by following the above fault isolation process, the receive power of the transceiver sitting in that port needs to be determined. An abnormally low receive power usually means that the physical link is dirty.

The receive power can be checked by querying the SFP diagnostics data via the command line interface. This information will provide a rough gauge whether the receive power is abnormally lower than the minimum receive specification of the transceiver. It is also prudent to compare this receive power with those of neighboring transceivers.

For better accuracy, it is advisable to use a power meter to measure the actual receive power of the link. If you are experiencing excessive bit errors and the receive power of the transceiver is abnormally low, it is recommended that you:

- Re-seat the transceivers for the failing link
- Clean the connector and optical fiber

Most link issues are solved by completing these steps.

Best practices for minimizing link loss

The "link margin" or the "power budget" of the link is a measure of signal power gain or loss expressed in decibels (dB). Maintaining a healthy link budget is critical to establishing a reliable and stable network.

Follow these best practices for minimizing link loss:

- Stay well within the maximum cable distance calculated for the link.
- Apply typical or worst-case values during loss calculations.
- Use the highest grade cabling components for the application to be supported.
- Match the cable type with the wavelength, bandwidth, and distance to be supported; do not mix cable types within a link.
- Inspect loss ratings of all cabling components during the selection process.
- Record loss measurements for horizontal and vertical cable runs during installation.

- Become familiar with how to quickly determine the link budget and link loss of selected sections of the cabling.
- Account for power loss associated with future repairs and expansion.
- Do not stress the cables.
- Prototype a link with anticipated maximum cable distance and selected components—and then take measurements to calculate the actual link loss

Attenuation on LWL connections

In the datacenter environment, there may be 8 Gbps or 4 Gbps LWL transceivers that are connected to 2 Gbps LWL transceivers using single-mode fiber over short distances. Such connections need to be optically engineered because there is a possibility that the transmit power of the 8 Gbps / 4 Gbps LWL transceivers may saturate the receiver of 2 Gbps LWL transceivers and cause CRC errors.

Attention: This discussion does not apply to 16 Gbps transceivers since connections between 16 Gbps and 2 Gbps transceivers is *not* supported.

Refer to Table 17 for the typical specifications of maximum transmit and receive power of LWL transceivers. This information is also available in the information technology industry standard "Fibre Channel – Physical Interface-4 (FC-PI-4)" document.

Table 17. Specifications of LWL 10km transceivers

LWL SFP/SFP+	2GFC	4GFC	8GFC
Power, Tx (max) dB	-3	-1	+0.5
Power, Rx (max) dB	0 or -3 ¹	N/A	N/A
¹ The maximum receive power specifications of some 2 Gbps LWL 10km transceivers can vary from 0dB to -3dB. However, most 2 Gbps 10km transceivers specify a maximum receive power of 0dB.			

It is important to check the maximum receive power of the 2 Gbps LWL transceiver in the manufacturer's datasheet.

Without taking into account connector and fiber losses, the transmit power of 8 Gbps / 4 Gbps LWL transceivers may be observed to overdrive the -3dB maximum receive power of 2 Gbps LWL transceivers. If the maximum receive power of the 2 Gbps LWL transceiver is 0dB, a 4 Gbps LWL transceiver with a -1dB transmit power will not overdrive the 2 Gbps transceiver. Although some 8 Gbps LWL transceivers may reduce their transmit power to 4 Gbps levels, this may still overdrive a 2 Gbps LWL transceiver.

Best Practice for LWL connections – Optically engineer a long-distance connection

It is always a good practice to optically engineer a long-distance connection. Most link issues caused by SFP incompatibility can be solved either by use of 4 Gbps LWL transceivers or use of 8 Gbps LWL transceivers that employ rate select.

2G LWL SFP maximum receive power

The IBM SAN b-type 8 Gbps and 16 Gbps directors and switches use the latest high bandwidth Fibre Channel technology and auto-negotiate to 16 Gbps, 8 Gbps, 4 Gbps, or 2 Gbps based on the link data rate capability of the attached transceiver.

Negotiation to 1 Gbps is *not* supported. Since 8 and 16 Gbps equipment is more sensitive, the existing cable plant may require additional attention to cable care after upgrading from 2 or 4 Gbps fibre. In a few cases, the Tx power of the switch can be higher than the connected equipment. In nearly all of those cases, there is enough attenuation in the existing cable plant so as not to require additional attenuation. The common 2 Gbps SFP Rx maximum power levels are listed in Table 18 and can be used as a quick method to relieve concerns of over saturation.

Table 18. Maximum receive power of 2 Gbps LWL SFPs

Vendor	Part number	Description	Max Receive Power (dB)
Avago	AFCT-57M5ATPZ	2 Gbps 10 km SFP	-3 dB
Finisar	FTLF1319P1xTL	2 Gbps 10 km SFP	0 dB
Finisar	FTRJ1319P1xTL	2 Gbps 10 km SFP	0 dB
JDSU	JSH-12L1DD1	2 Gbps 10 km SFP	1 dB
Hitachi Cable	HTR6517	2 Gbps 10 km SFP	-3 dB
Optoway	SPS-9110FG	2 Gbps 10 km SFP	-3 dB
Optoway	SPS-9110AFG	2 Gbps 10 km SFP	-3 dB
JDSU	JSH-21L3AR3	2 Gbps 10 km SFP	1 dB
E20	ES212-LP3TA	2 Gbps 10 km SFP	-3 dB

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