IBM System Storage SAN48B-5

IBM

Installation, Service, and User Guide

Service information: 2498-F48

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> **Note:**
> Before using this information and the product it supports, read the information in "Notices" on page 41.

Read this first

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 Web site: 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 Web site: 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) Web site at: www.fibrechannel.org/

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

Taiwan Contact Information

IBM Taiwan Product Service Contact Info:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd., Taipei Taiwan
Tel: 0800-016-888

台灣IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

Accessibility features for the SAN48B-5

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

Accessibility features

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

Keyboard navigation

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

Vendor software

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

Related accessibility information

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

IBM and accessibility

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

How to send your comments

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Contents

Figures

Tables

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 *IBM System Storage b-type Switch and Router Safety Notices* publication, which is shipped with this product.

The following notices and statements are used in IBM documents. They are listed below in order of increasing severity of potential hazards. Follow the links for more detailed descriptions and examples of the danger, caution, and attention notices in the sections that follow.
- **Note:** These notices provide important tips, guidance, or advice.
- **"Attention notices" on page 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.
18-32 kg (39.7-70.5 lbs) 18-32 kg (39.7-70.5 lbs) svc00167	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)
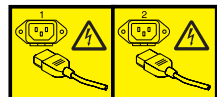
DANGER

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 33 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® SAN48B-5 (machine type-model 2498-F48) Switch. Throughout this document, the product is referred to as the *SAN48B-5*, or simply the *switch*.

This document has been created to include information specific to SAN48B-5 switches running on Fabric OS version 7.0 or later. This document does not support all Fabric OS versions. It is specific to Fabric OS v7.0 or later.

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 Web site www.ibm.com/shop/publications/order. Search by publication title or publication number. Newer versions may also be available through the IBM Support Portal www.ibm.com/supportportal. Enter your product machine type (2498) or name in the search field, and then select **Documentation** from the displayed page.

- *IBM System Storage SAN48B-5 Installation, Service, and User Guide*, GA32-0798 (this document)
- *IBM System Storage SAN48B-5 Quick Start Guide*, GC27-2271
- *IBM System Storage b-type Switch and Router Safety Notices*
- *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 Manual*
- *Fabric OS MIB Reference Manual*
- *Fabric OS Message Reference Manual*
- *Fabric OS Fibre Channel over IP Administrator's Guide*
- *Fabric OS Troubleshooting and Diagnostics Guide*
- *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 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. Products withdrawn from marketing are not listed.

Table 2. Brocade and IBM product and model number matrix

Brocade product name	IBM product name	IBM machine type and model number
Brocade 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 Encryption Switch	SAN32B-E4	2498 Model E32
Brocade 8000	IBM Converged Switch B32	3758 Models B32 and L32
Brocade 7800	SAN06B-R	2498 Model R06
Brocade 5300	SAN80B-4	2498 Model B80
Brocade 5100	SAN40B-4	2498 Models B40 and 40E
Brocade 300	SAN24B-4	2498 Models B24 and 24E

Chapter 1. Introducing the SAN48B-5

The IBM System Storage SAN48B-5 is a 48-port auto-sensing 2, 4, 8, or 16 Gbps as well as 10 Gbps Fibre Channel (FC) switch for Fibre Channel Storage Area Networks (SANs). The SAN48B-5 is an enterprise-class switch that is designed to handle the large-scale SAN requirements of an enterprise, and can also be used to address the SAN requirements of small to medium-sized workgroups.

The switch's 48 ports in a one rack-unit (1U) height enable the creation of very dense fabrics in a relatively small space.

The SAN48B-5 offers Ports on Demand (POD) licensing as well. Base models of the switch contain 24 ports, and up to two additional 12-port POD licenses can be purchased. The switch provides excellent overall value as the foundation of a SAN with the ability to grow with an organization's SAN needs.

The SAN48B-5 supplies Reliability, Availability, and Serviceability (RAS) performance and scalability requirements of an enterprise 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.

The switch's depth of less than 18 inches allows for greater installation flexibility.

This chapter provides the following information:
- "Switch capabilities"
- "Switch components" on page 2
- "Port side of the switch" on page 3
- "Nonport side of the switch" on page 4

Switch capabilities

The SAN48B-5 offers the following features and capabilities:
- Up to 48 auto-sensing ports of high-performance 16 Gbps technology in a single domain
- Ports on Demand scaling from 24 to 36 or 48 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
- 10 Gbps manual set capability on FC ports (requires the optional 10 Gigabit FCIP/Fibre Channel license)
  - 10 Gbps performance is enabled by 10 Gbps SFP+ transceivers
  - Ports can be configured for 10 Gbps for metro connectivity (on the first eight ports only)

- 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
  - Diagnostic Port (D-Port) feature provides physical media diagnostic, troubleshooting and verification services
- In-flight data compression and encryption on up to two ports provides efficient link utilization and security
- Virtual Fabric support to improve isolation between different VFs
- Fibre Channel Routing (FCR) service, available with the optional Integrated Routing license provides improved scalability and fault isolation
- Inter-Switch Link (ISL) Trunking (licensable), which allows up to eight ports (at 2, 4, 8, or 16 Gbps speeds) between a pair of switches combined to form a single, logical ISL with a speed of up to 128 Gbps (256 Gbps full duplex) for optimal bandwidth utilization and load balancing
- 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, multicast (255 groups), and broadcast data traffic types
- Fabric OS, which delivers distributed intelligence throughout the network and enables a wide range of value-added applications including Advanced Web Tools and Zoning. Optional Fabric Services include: Adaptive Networking with QoS, Extended Fabrics, Enhanced Group Management, Fabric Watch, ISL Trunking, and End-to-End Performance Monitoring (APM)
- 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)
- 10G Fibre Channel integration on the same port provides for DWDM metro connectivity on the same switch (available on the first eight ports only)
- 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. (The integral LEDs remain unlit at all times.)
- A USB port providing connections for storage for firmware updates, output of the **supportSave** command and storage for configuration uploads and downloads
- Two hot-swappable, redundant power supply and fan FRUs. There are two fans per FRU
- Rack-mount design (1U form factor) in a 19-inch EIA rack
- 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 activity status
- SEEPROM for switch identification
- Voltage monitoring
- Fan monitoring
- Temperature monitoring
- Real-time clock (RTC) with battery
- The EZSwitchSetup wizard, which makes SAN configuration a three-step point-and-click task

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.
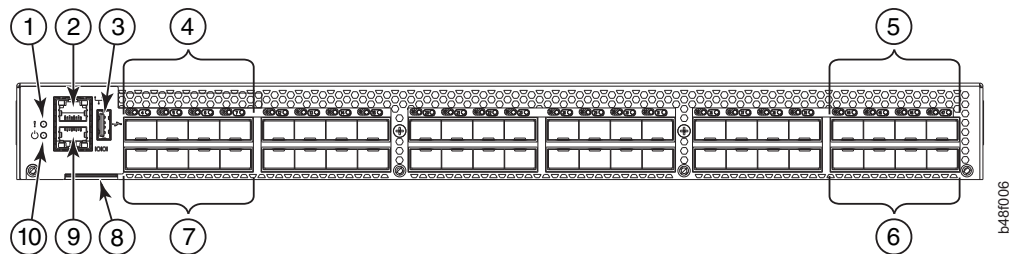
Figure 1. Port side view

1	System status LED	**6**	FC ports 44-47
2	Management Ethernet port with LEDs	**7**	FC ports 4-7
3	USB port	**8**	Switch ID pull-out tab
4	FC ports 0-3 (all LEDs above)	**9**	Serial console port
5	FC ports 40-43	**10**	System power LED

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 combination power supply / fan assemblies. These assemblies include the AC power receptacle and AC power switch.
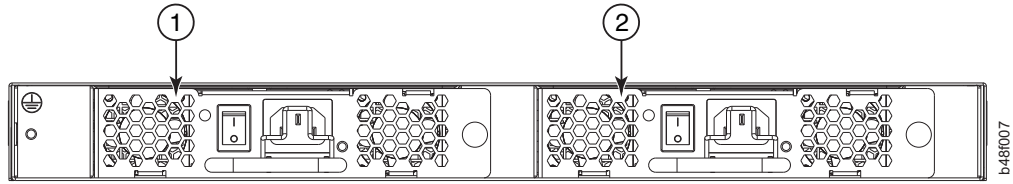
Figure 2. Non-port side of the switch

| **1** | Power supply/fan assembly #2 | **2** | Power supply/fan assembly #1 |

Chapter 2. Installing and configuring the switch

You can install the SAN48B-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 SAN48B-5 switch, containing two integrated power and fan assemblies
- 16 Gbps or 8 Gbps SFP+ modules for the Fibre Channel ports (speed and quantity as ordered)
- One accessory kit, containing the following items:
  - *SAN48B-5 Installation, Service, and User Guide* (this document).
  - IBM documentation CD
  - Safety notices
  - Slim rail rack mount kit
  - Serial cable with an RJ45 connector
  - Two 6 ft. (1.8 m) country-specific power cord
  - Rubber feet, required for setting up the switch as a standalone unit
  - SAN48B-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 36.

   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.
- All equipment in the rack should force air in the same direction to avoid intake of exhaust air.
- A maximum of 102 cubic meters/hour (60 cubic feet/minute) and a minimum of 74..8 cubic meters/hour (44 cubic feet/minute) of air flow is available to the air intake.
- 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 2 inches under full tensile load and 1.2 inches 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 SAN48B-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
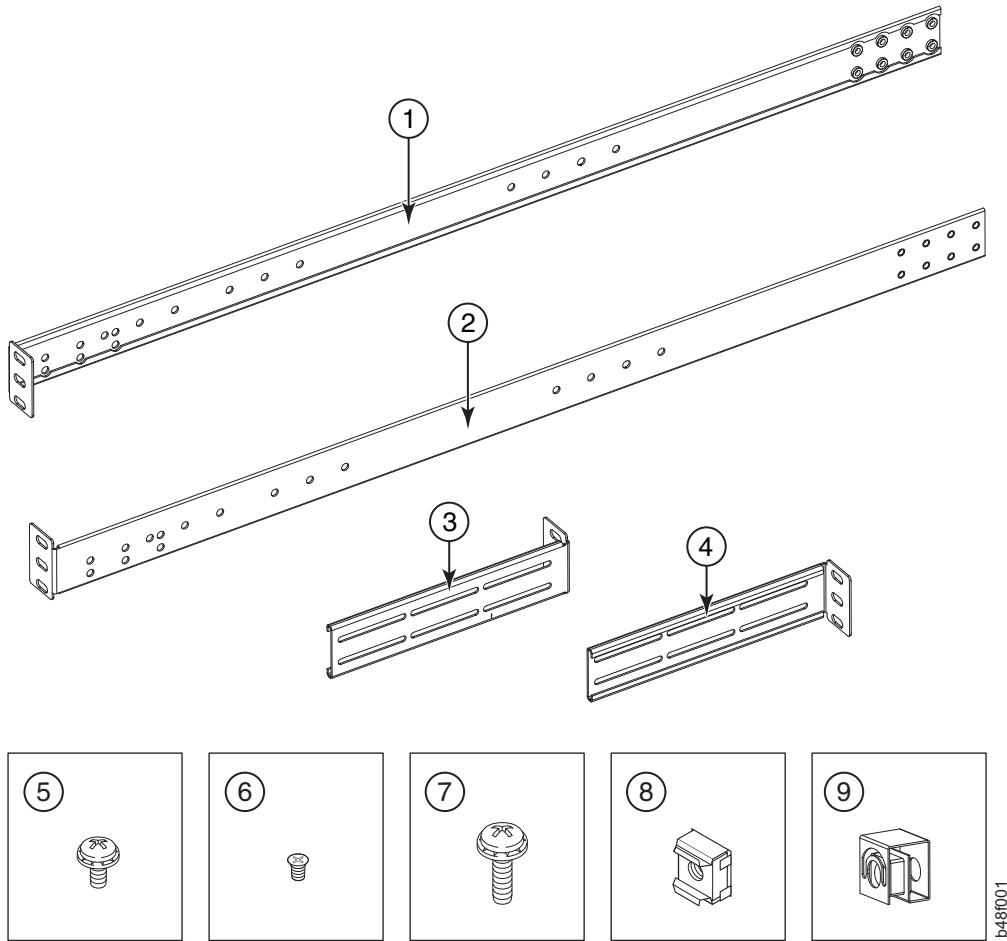
Figure 3. Items in the slim rail rack mount kit

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

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.
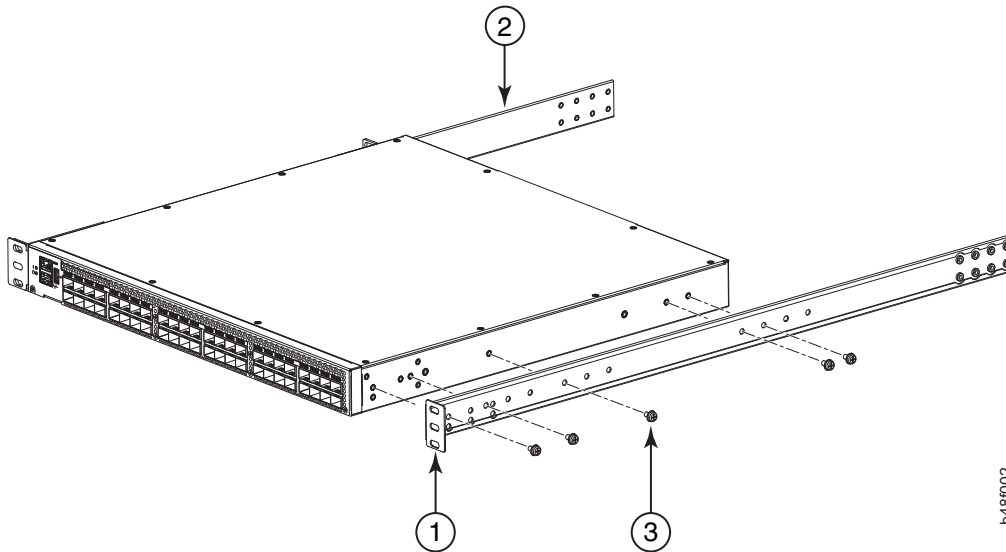
Figure 4. Position the front bracket

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).
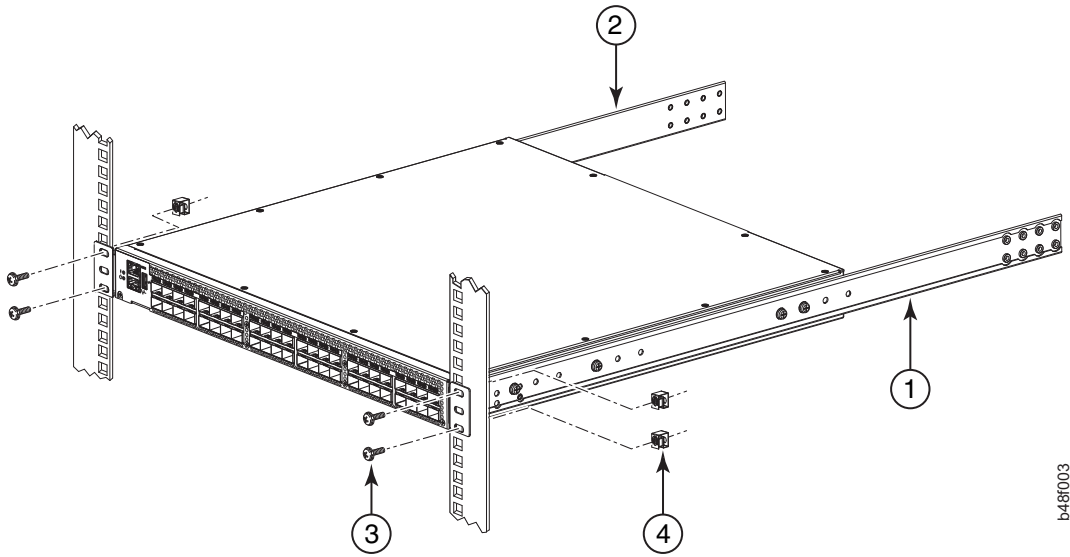
Figure 5. Position the switch in the cabinet

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.
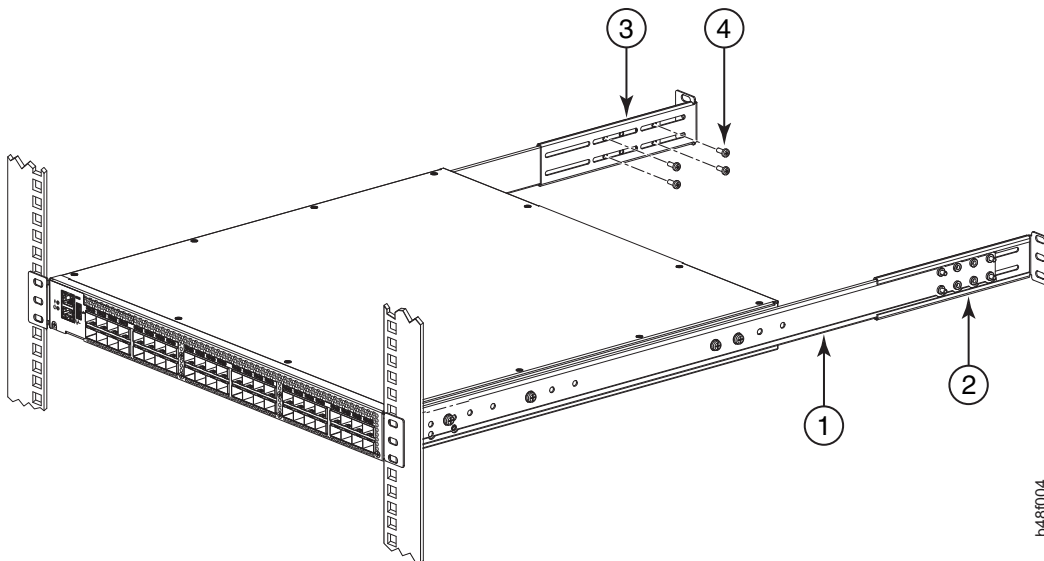
Figure 6. Position the rear and front brackets

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).
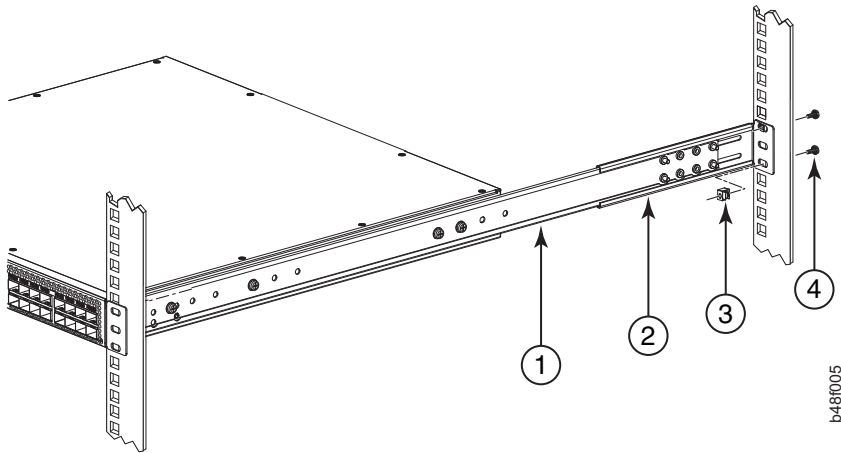
Figure 7. Attach the rear bracket to the cabinet rail

Configuring the switch

Once you have set up the SAN48B-5 in a rack or as a standalone switch, it is time to give it power and a basic configuration. If you are going to use the SAN48B-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 *SAN48B-5 Quick Start Guide*. If you do not want to use EZSwitch Setup, follow the instructions in the rest of this section.

To configure the switch, perform the following tasks.
- "Providing power to the switch"
- "Creating a serial connection"
- "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 cords to both power supplies
2. Connect the other end of the power cords to power sources on separate circuits to protect against AC failure. Ensure that the cords have a minimum service loop of 6 in. available and are routed to avoid stress.
3. Power on the power supplies by flipping both AC switches to the "l" symbol. The power supply LEDs 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 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 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:

Parameter	Value
Bits per second	9600
Databits	8
Parity	None
Stop bits	1
Flow control	None

   - 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 SAN48B-5 with a static IP address, or you can use a DHCP (Dynamic Host Configuration Protocol) server to set the IP address of the switch. DHCP is enabled by default. The SAN48B-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 using an IPv4 IP address, enter the IP address in dotted decimal notation as prompted.

   ```
   Ethernet IP Address: 192.168.74.102
   ```

   If you are using an IPv6 address, enter the network information in colon-separated notation as prompted.

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

3. Complete the rest of the network information as prompted.

   ```
   Ethernet Subnetmask: 255.255.255.0
   Ethernet IP Address: 192.168.74.102
   Ethernet Subnetmask: 255.255.255.0
   ```

4. Enter **off** to disable DHCP when prompted.

```
DHCP [OFF]: off
```

5. Optionally, verify that the address was correctly set by entering the **ipAddrShow** command at the prompt.

6. 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 SAN48B-5 maintains the current date and time inside a battery-backed real-time clock (RTC) circuit. The date and time settings are used for logging events. Switch operation does not depend on the date and time; a switch with an incorrect date and time value still functions properly. However, because the date and time are used for logging, error detection, and troubleshooting, you should set them correctly.

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

Time zones

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

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

For more detailed information about the parameters of the **tsTimeZone** command, refer to the *Fabric OS Command Reference*.

Local time synchronization

You can synchronize the local time of the principal or primary fabric configuration server (FCS) switch to a maximum of eight external network time protocol (NTP) servers. To keep the time in your SAN current, it is recommended that the principal or primary FCS switch has its time synchronized with at least one

external NTP server. The other switches in the fabric will automatically take their time from the principal or primary FCS switch.

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

When a new switch enters the fabric, the time server daemon of the principal or primary FCS switch sends out the addresses of all existing clock servers and the time to the new switch. If a switch with v5.3.0 or later has entered the fabric it will be able to store the list and the active servers; pre-5.3.0 Fabric OS switches will ignore the new list parameter in the payload and will update only the active server address.

If the active NTP server configured is IPv6, then distributing the same in the fabric will not be possible to switches earlier than v5.3.0 because IPv6 is supported for Fabric OS version 5.3.0 and later. The default value LOCL will be distributed to pre-5.3.0 switches.

The **tsClockServer** command accepts multiple server addresses in either 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:
   - 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

To set the time zone, follow these steps.

1. Log into the switch using the default password, which is *password*.
2. Enter the **tsTimeZone** command as follows:
   ```
   switch:admin> tstimezone [--interactive]/ [, timezone_fmt]
   ```

Use **timezone_fmt** to set the time zone by Country/City or by time zone ID, such as MST.

The following example shows how to change the time zone to US/Mountain.

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

The following procedure describes how to set the current time zone 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 **Ctrl+D** to quit.

4. At the prompt, select a country location.

5. At the prompt, enter the appropriate number to specify the time zone region or **Ctrl+D** to quit.

Synchronizing local time using NTP

Complete the following steps to synchronize the local time of the principal or primary switch with that of an external NTP server.

1. Log into the switch using the default password, which is *password*.

2. Enter the **tsClockServer** command.

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

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

   The **tsClockServer** command accepts multiple server addresses in either 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 others will be 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.

   ```
   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 SAN48B-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 Brocade ISL Trunking, see the *Fabric OS Administrator's Guide*.

Installing SFP+ transceivers and connecting cables

The SAN48B-5 only supports Brocade-branded 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. This switch will accept both 16 Gbps and 8 Gbps SFP+ transceivers.

Note: For a listing of transceivers compatible with this product:
- Go to the IBM SAN web page www.ibm.com/systems/storage/san
- Select the **IBM System Storage SAN48B-5** product link
- On the displayed product page, click the **Interoperability Matrix** link in the **Learn more** section.
- In the Interoperability matrix, click the **Transceivers** link.

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

The 16 Gbps SFP+ transceivers have an attached pull tab and no latching wire bail. To simplify insertion of the 16 Gbps SFP+ transceivers, it is recommended to connect the cables first, and then insert them as a unit into the port. Figure 8 on page 20 shows the installation of a 16 Gbps SFP+, and Figure 9 on page 20 shows the installation of an 8 Gbps SFP+ with a wire bail latching mechanism.

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. 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.
3. Transceivers are keyed so that they can only be inserted with the correct orientation. Insert the cable/transceiver into the port, using the pull tab to help push the transceiver into the port. If it does not slide in easily, ensure that it is correctly oriented.
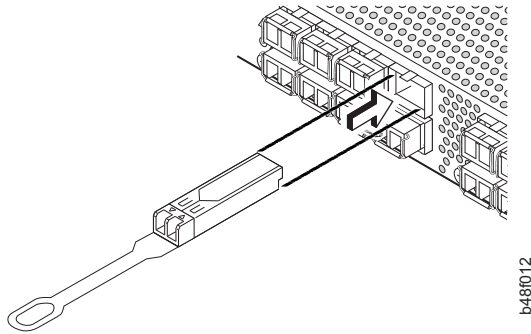
Figure 8. Installing a 16 Gbps SFP+ with pull tab (shown without cable attached)

Installing 8 Gbps SFP+ transceivers with wire bails

1. 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.
2. Slide the SFP+ into the port until you feel it click into place; then close the bail.
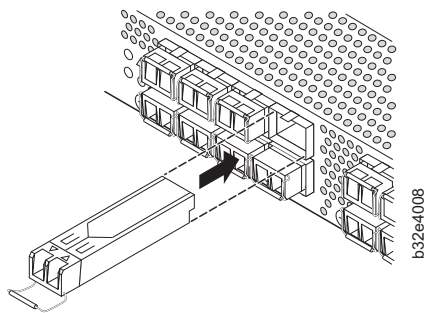
Figure 9. SFP+ with wire bail latch

3. Orient a cable connector so that the key (the ridge on one side of the connector) aligns with the slot in the transceiver (see Figure 10). Then, insert the cable into the transceiver until the latching mechanism clicks.
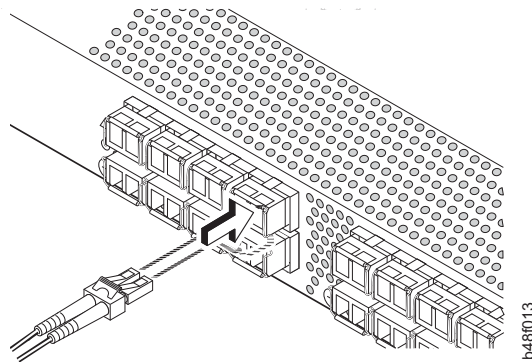
Figure 10. Installing a cable

4. 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 SAN48B-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.
- 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:
  - For a list of F_Ports mapped to N_Ports by default, refer to "Access Gateway default port mapping" on page 40.
  - 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 SAN48B-5. Refer to the latest *Access Gateway Administrator's Guide* for details on any other restrictions specific to the SAN48B-5.
- In Fabric OS Native mode, the switch provides up to eight 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 eight external Fibre Channel ports. However, these ports are configured as N_Ports, and you cannot reconfigure these as any other port type.

Disabling and enabling Access Gateway mode

This section provides steps to disable and enable 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 disable and enable Access Gateway mode using Web Tools. See the *Web Tools Administrator's Guide* for more information.

Enabling Access Gateway mode

Note the following when enabling Access Gateway (AG) mode:

- After you enable AG mode, some fabric information is erased, such as the zone and security databases.
- Enabling AG 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. For more information on enabling Access Gateway mode, refer to "Enabling and disabling Access Gateway mode" in the *Access Gateway Administrator's Guide*.

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 again.

2. 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. For more information, refer to the "Enabling and disabling Access Gateway mode" section in the *Access Gateway Administrator's Guide*.

1. Enter the **switchShow** command to verify the switch mode.
   - "Access Gateway Mode" displays if the switch is in Access Gateway mode.
   - Interopmode "0" or "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 AG 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 26
- "Interpreting POST results" on page 27
- "SAN48B-5 maintenance" on page 27
- "SAN48B-5 management" on page 28

Powering the switch on and off

Complete the following steps to power the switch on.

1. Connect both power cords to the power connectors on the power supplies and to separate power sources.

2. Set the AC power switches 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, power off both power supplies by setting each AC power switch 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 either of the two power cords are connected. To fully remove power from the switch, both 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 lights are 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 on page 24).

- One system status LED (above) on the left side
- One power LED (below) on the left side
- Two Ethernet Port LEDs (both green)

• The serial console port LEDs do not light up at any time, even when a cable is inserted and the link is active
• One bicolor (green/amber) port status LED for each port on the switch. These LEDs are arrayed above each pair of Fibre Channel ports.

Figure 11 shows the LEDs on port side of the switch.
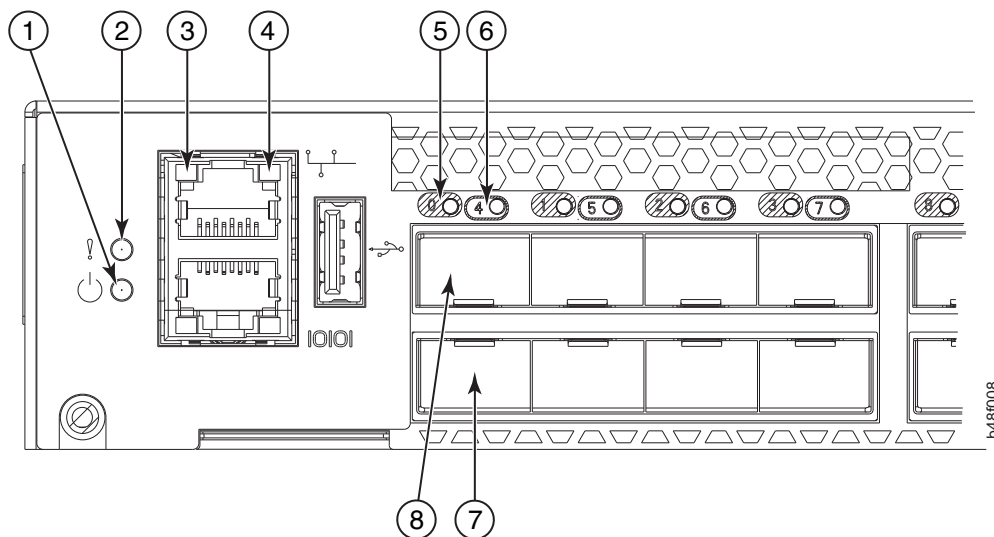
Figure 11. Port side LEDs

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 4	
4 Ethernet port speed LED		**8** FC port 0	

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 #2 status LED	**2** 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

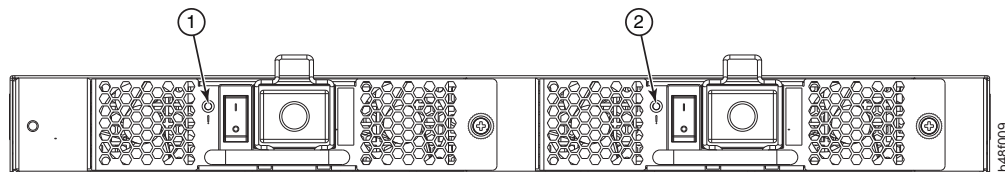| LED name	LED color	Status of hardware	Recommended action
Power status	No light	System is off or there is an internal power supply failure	Verify the system is powered on (power supply switches to 1), the power cables attached, and power source is live. The unit may be faulty. Contact IBM.
	Steady green	System is on and power supplies are functioning properly	No action required.
System status	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 variables 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	No light	Port speed is 10 Mbps.	No action required.
	Steady green	Port speed is 100 Mbps	No action required.
Ethernet Activity/Link	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.
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	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	No light	PS/fan is not receiving power or is off.	Verify the PS/fan is on and seated and the power cord is connected to a functioning power source.
	Steady green	PS/fan is operating normally.	No action required.
	Flashing green	PS/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 PS/fan is powered on. Replace the PS/fan FRU.

POST and boot specifications

When the switch is turned on or rebooted, the switch performs 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 Manual*.

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:

1. Conducts preliminary POST diagnostics.
2. Initializes the operating system.
3. Initializes hardware.
4. 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:

1. Performs universal port configuration.
2. Initializes links.
3. Analyzes fabric. If any ports are connected to other switches, the switch participates in a fabric configuration.
4. Obtains a domain ID and assigns port addresses.
5. Constructs unicast routing tables.
6. 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 25 and Table 5 on page 26 for descriptions and interpretations of LED patterns. If one or more LEDs do not display a healthy state, verify that the LEDs on the switch are not set to "beacon" by entering the **switchShow** command to detect if beaconing is active.

2. Verify that the switch prompt displays on the terminal of a computer workstation connected to the switch.

   If there is no switch prompt when POST completes, press **Enter**. If the switch prompt still does not display, try opening a Telnet session or accessing the switch through another management tool. If this is not successful, the switch did not successfully complete POST. Contact IBM.

3. Review the switch system log for errors. Any errors detected during POST are written to the system log, accessible through the **errShow** command.

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

SAN48B-5 maintenance

The SAN48B-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 troubleshoot the hardware and firmware. This includes tests of internal connections and circuitry, fixed media, and the transceivers and cables.

The tests are implemented by command, either through a Telnet session or through a terminal set up for 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, 10 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*.

SAN48B-5 management

You can use the management functions built into the SAN48B-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 26.

For information about upgrading the version of Fabric OS installed on your switch, see the *Fabric OS Administrator's Guide*. You can manage the switch using any of the management options listed in Table 6. Please refer to the *Fabric OS Command Reference Manual* for more information on the CLI commands. **NTD: are all these valid for IBM version switch?**

Table 6. Management options for the SAN48B-5

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

Chapter 4. FRU replacement

Attention: Read "Safety notices and labels" on page xiii before removing or installing any components.

The field replaceable units (FRUs) in the SAN48B-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 SAN48B-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 airflow in the SAN48B-5 is from the port side (intake) through the switch to the non-port side (exhaust).

The two power supply and fan assembly FRU units are hot-swappable if replaced one at a time. They are identical and fit into either slot.

Attention: A new FRU must have the same part number (P/N) as the FRU being replaced. The manufacturing P/N is located on the top of the FRU. If a mismatched power source or fan assembly is installed by mistake, a warning is sent to the console. The warning messages will be similar to the following:[WARNING, BR6510, MISMATCH in PSU-FAN FRUS Air Flow direction. Replace PSU with fan air flows in same direction.

Each power supply/fan assembly has an exhaust airflow label on the faceplate to indicate that the assembly exhausts air (see Figure 13) out the non-port side of the switch.
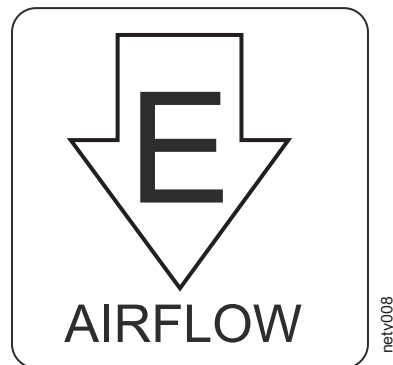

Figure 13. Exhaust airflow label

The E symbol indicates an exhaust FRU. This unit pulls air in from the port side of the switch and exhausts it out the non-port side. This is generally referred to as non-port side exhaust airflow. This is reported as Reverse airflow by the **chassisShow** command.

See the samples below for the Fan Direction values in the **chassisShow** output

```
ras222:FID128:root> chassisshow
FAN Unit: 1
Fan Direction: Reverse
Time Awake: 0 days
FAN Unit: 2
Fan Direction: Reverse
Time Awake: 0 days
POWER SUPPLY Unit: 1
Power Source: DC
Time Awake: 0 days

(output truncated)
```

The SAN48B-5 has two power supply and fan assemblies, as shown in Figure 14.
Fabric OS identifies the assemblies from right to left on the non-port side as
assembly 1 and assembly 2. (The actual appearance of the switch may differ from
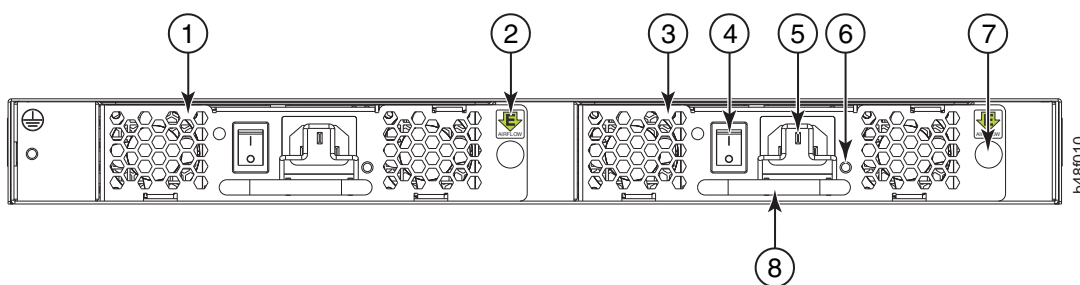this illustration but the locations are correct.)

Figure 14. Switch power supply and fan assemblies on the non-port side

1	Power supply/fan assembly #2	**5**	Power plug receptacle (with plug retainer)
2	Airflow label	**6**	Power supply/fan LED
3	Power supply/fan assembly #1	**7**	Thumbscrew
4	On/off switch	**8**	Handle

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, do not leave
either of the power supply and fan assembly slots empty longer than two minutes
when the switch is operating. If a power supply and fan assembly fails, leave the
power supply and fan assembly in the switch until it can be replaced. Maintain
both power supply and fan assembly in operational condition to provide
redundancy.

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.

Table 7. Power supply and fan assembly status LED behavior (continued)

LED color	Description	Action required
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: • 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 **Note:** When the switch is first powered on, the power supply and fan assembly status LED will show flashing until POST has completed	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 Figure 12 on page 24)
- 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:

```
br6510:admin> psshow
Power Supply #1 is OK
V10529, TQ2H0000030 ,60-0300031-01,X2, ,SP640
,2X,TQ2H0000
Power Supply #2 is OK
V10541, TQ2H0000189 ,60-0300031-01,X3, ,SP640-2P ,A
,TQ2H0000
br6510: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 (must have the same airflow as the FRU being replaced)
- Phillips-head screwdriver #1

Removing a power supply and fan assembly

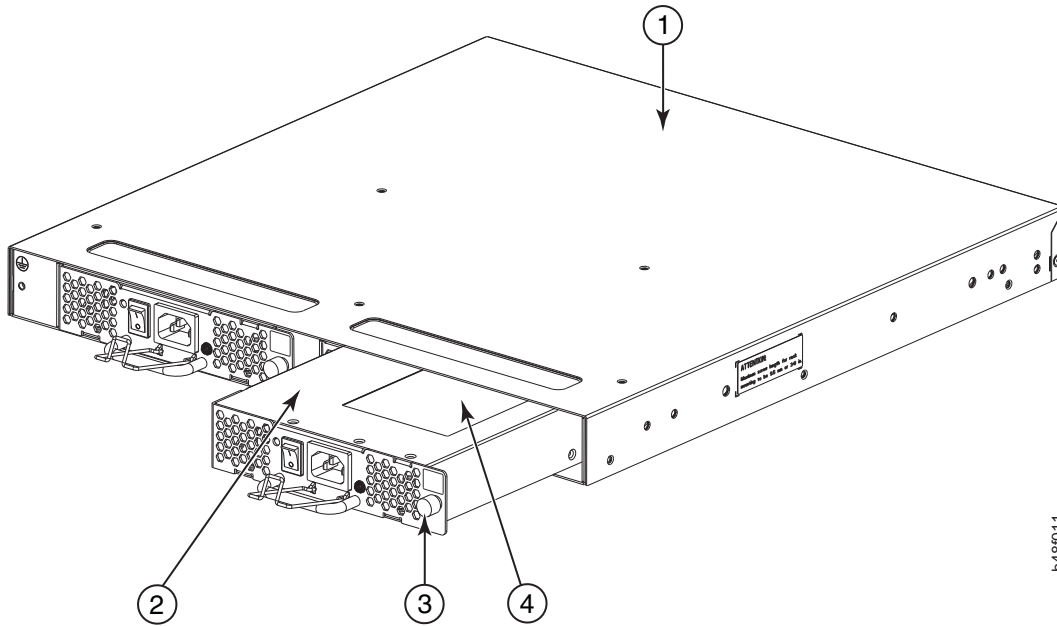Refer to Figure 15 on page 32 for this procedure.

Figure 15. 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. To leave the switch in service while replacing a power supply and fan assembly, 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. Power off the power supply to be replaced by pressing the AC power switch to the **O** symbol. The fans in the other power supply will automatically switch to high speed to maintain adequate cooling.

3. Unplug the power cord from the power supply and fan assembly that is being replaced.

4. Using a Phillips-head screwdriver, unscrew the captive screw **3** .

5. Remove the power supply and fan assembly **2** from the chassis by pulling the handle out and away from the chassis **1** .

6. Note the part number and airflow label **4** on the assembly just removed.

Replacing a power supply and fan assembly

Refer to Figure 15 for this procedure.

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

DANGER

> **The power supply switch must be in the off position 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 and airflow label as the power supply and fan assembly being replaced, then install the new power supply and fan assembly in the chassis:

   a. Orient the new power supply and fan assembly with the captive screw on the right, as shown in the figure.

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

   b. Gently push the power supply and fan assembly into the chassis until it is firmly seated.

   c. Using the Phillips screwdriver, secure the power supply and fan assembly to the chassis by tightening in the captive screw **3** .

2. Plug the power cord in to the power supply and fan assembly and power on the unit by pressing the AC power switch to the | symbol.

3. 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.

4. 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 16 on page 34) and remove the BR1225 battery from the holder.
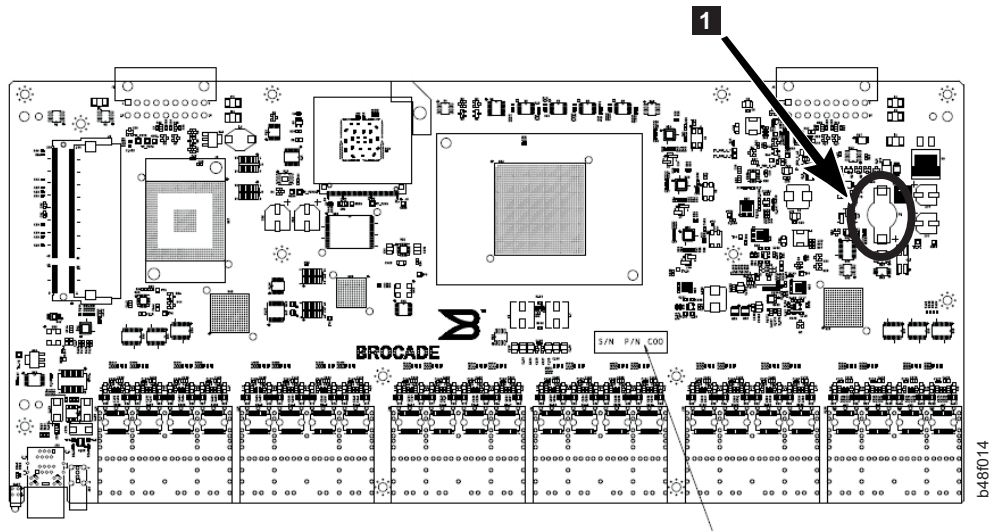
Figure 16. Location of battery holder

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. Product specifications

This appendix provides the specifications for the SAN48B-5 switch.
- "Weight and physical dimensions"
- "Facility requirements"
- "Power supply specifications" on page 36
- "Environmental requirements" on page 36
- "General specifications" on page 37
- "Data transmission ranges" on page 38
- "Memory specifications" on page 38
- "Fibre Channel port specifications" on page 39
- "Serial port specifications" on page 39

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 two power supply and fan assemblies, and no SFP+s installed)	9.2 kg (20.2 lb)

Facility requirements

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

Table 9. Facility requirements

Type	Requirement
Electrical	• 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 36 for complete power supply specifications.
Thermal	• 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)	• 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
Input voltage	Range: 85-264 VAC Auto-volt, Nominal: 100-240 VAC, 2.0A, 47-63 Hz; switch autosenses input voltage.
Input frequency	Range: 47-63 Hz; Nominal: 50-60 Hz.
Inrush current	Limited to 50A peak @ 240Vac for any initial current surge or spike of 10ms or less at cold start-up. Any additional inrush current surges or spikes in the form of AC cycles or multiple AC cycles greater than 10ms, and less than 150ms, must not exceed 15A peak.
Power supply output (each)	150 watts @ 12V DC
Maximum current	12.5A @ 12V DC.
Input line protection	Both AC lines are fused.
System power consumption	110 W with all 48 ports populated with 16 Gbps SWL optics 72 W with empty chassis and no optics.

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)

Table 11. Environmental requirements (continued)

Condition	Acceptable range during operation	Acceptable range during non-operation
Altitude	0 to 3 km (9,842 ft) above sea level	0 to 12 km (39,370 ft) above sea level
Shock	20 G, 6 ms, half-sine wave	33 G, 11 ms, half-sine wave, 3/eg Axis
Vibration	0.5 G sine, sine, 0.4 gms random, 5-500 Hz	2.0 G sine, 1.1 gms random 5-500 Hz
Air flow	Maximum - 71.36 cmh (42 cfm) Nominal - 59.47 cmh (35 cfm)	NA
Heat dissipation	338 BTU/hr (32 port configuration) 375 BTU/hr (48 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	768 Gbps
FC Port-to-port latency	Less than 700 nanoseconds with no contention (destination port is free)
Switching capacity	An aggregate switching capacity of 420 million frames per second (for Class 2, Class 3, and Class F frames for the 48 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+	2 Gbps	150 m (492 ft.)	300 m (984 ft.)	500 m (1640 ft.)	N/A	N/A
	SFP+	4 Gbps	70 m (229 ft.)	150 m (492 ft.)	380 m (1264 ft.)	400 m (1312 ft.)	N/A
	SFP+	8 Gbps	21 m (68 ft.)	50 m (164 ft.)	150 m (492 ft.)	190 m (623 ft.)	N/A
	SFP+	10 Gbps	33 m (108 ft.)	82 m (269 ft.)	300 m (984 ft.)	550 m (1804 ft.)	N/A
	SFP+	16 Gbps	15 m (49 ft.)	35 m (115 ft.)	100 m (328 ft.)	125 m (410 ft.)	N/A
LWL	SFP+	8 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi.)
	SFP+	10 Gbps	N/A	N/A	N/A	N/A	10 km (6.2 mi)
ELW	SFP+	2 Gbps	N/A	N/A	N/A	N/A	30 km (18.6 mi)
	SFP+	4 Gbps	N/A	N/A	N/A	N/A	30 km (18.6 mi)
	SFP+	8 Gbps	N/A	N/A	N/A	N/A	25 km (15.53 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
Compact flash	1 GB
Main memory (DDR2 SDRAM)	1 GB, 64-bit with 8-bit ECC

Fibre Channel port specifications

The Fibre Channel ports in the SAN48B-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 44.

The ports are capable of operating at 2, 4, 8, or 16 Gbps depending on SFP+ 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
48	0-39	40-47	0-4 mapped to 40 5-9 mapped to 41 10-14 mapped to 42 15-19 mapped to 43 20-24 mapped to 44 25-29 mapped to 45 30-34 mapped to 46 35-39 mapped to 47

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41

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IBM Deutschland GmbH
Technical Regulations, Department M456
IBM-Allee 1, 71139 Ehningen, Germany

Germany Electromagnetic Compatibility Directive

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rusemi

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Index

A

Access Gateway mode
    disabling 22
    enabling 21
accessibility iv
    features iv
    IBM commitment iv
    keyboard navigation iv
    vendor software iv
address
    IBM iv
attention notices
    definition xviii
    example xviii

B

battery removal 33
boot
    tasks 26
Brocade
    documents xxiii

C

cabinet
    installation 9
    requirements 6
cable
    management 7
    planning 7
    routing 7
caution notices
    definition xvi
    examples xvi
comments
    sending to IBM iv
configuring
    switch 5, 14
connecting
    switch and host 14
creating a serial connection 14

D

danger notices xiii
data transmission ranges 38
date
    setting 16, 17
diagnostic tests 27
dimensions 35
director of licensing, address 41
disabling
    Access Gateway mode 22
disposal xxi
documentation
    Brocade xxiii
    Fabric Operating System (FOS) xxiii
    IBM xxiii

E

edition notice ii
electrical requirements 6
electronic emission notices 44
enabling
    Access Gateway mode 21
environmental
    notices xiii, xxi
    product recycling and disposal xxi
    requirements 6, 36
Ethernet activity
    LED 25
Ethernet speed
    LED 25

F

Fabric Operating System (FOS)
    documents xxiii
facility requirements 35
fan assembly
    location 4
Fibre Channel
    port specifications 39
    port status
        LED 25
Fibre Channel ports
    location 3
Field replaceable units 29
FRUs
    See Field replaceable units

G

getting help iii

H

help iii

I

IBM
    accessibility commitment iv
    address iv
    notices 41
    trademarks 43
installation
    instructions 10
    options 5
    requirements 6
    slide-rail rack 9
    stand-alone unit 7
    time required 9
installing
    rack-mount kit 10
    SFP/SFP+ 19
    switch 5
intellectual property 41

Inter-Switch Link Trunking 19
interpreting
    POST results 27
IP address
    setting 15
    static 15
    using DHCP 15
ISL Trunking
    See Inter-Switch Link Trunking

K

keyboard navigation iv

L

labels, safety xvii
LED
    power supply/fan assembly 30
LEDs
    activity 23
    interpreting 23
    location 23, 24
    non-port side 24
    patterns 25
    port side 23
license
    agreement iv
    keys
        paperpack 5
license, for patents 41
local time 16, 18
location 3

M

management Ethernet port 3
management tools 28
memory specifications 38

N

network time protocol 16, 18
non-port side
    components 4
    features 4
    LEDs 24
notices
    attention xviii
    caution xvi
    danger xiii
    edition ii
    environmental xiii, xxi
    general 41
    IBM 41
    patents 41
    safety xiii
    types xiii
NTP time synchronization 16, 18

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