

IBM System Storage SAN768B



# Installation, Service, and User's Guide

*Service information: 2499-384*

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IBM System Storage SAN768B



# Installation, Service, and User's Guide

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## Read this first

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### Summary of changes

This is the third edition of the *IBM System Storage SAN768B Installation, Service, and User's Guide*. The content changes since the last edition of this publication are noted by a vertical line placed in the left margin beside each change. Minor edits are not identified by this mark. A summary of the changes for each edition are listed below.

### Third edition

The following changes were made in the this edition:

- FICON® Accelerator functionality was added
- Data Center Fabric Manager was added as an additional management software option
- An additional Web site was added to the environmental notices
- The IBM® trademark information was updated

### Second edition

The following changes were made in the second edition:

- The section on power cords was corrected.
- The rack installation instructions were modified to reflect a new rack installation kit.
- The Integrated Routing feature was added.
- Minor changes were made to the environmental, safety, and other notices.
- Minor changes to Fabric OS publication titles.

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## Getting help

For the latest version of your product documentation, visit the web at <http://www.elink.ibm.link.ibm.com/public/applications/publications/cgibin/pbi.cgi>. Search by form number or title.

For more information about IBM SAN products, see the following Web site: <http://www.ibm.com/servers/storage/san/>

For support information for this product and other SAN products, see the following Web site: <http://www.ibm.com/servers/storage/support/san>

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: <http://www.ibm.com/planetwide/>.

Visit [www.ibm.com/contact](http://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/](http://www.fibrechannel.org/)

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

## Taiwan Contact Information

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# Contents

<b>Read this first</b> . . . . .	iii
Summary of changes . . . . .	iii
Third edition . . . . .	iii
Second edition . . . . .	iii
Getting help . . . . .	iii
Taiwan Contact Information. . . . .	iv
How to send your comments . . . . .	iv
<b>Figures</b> . . . . .	ix
<b>Tables</b> . . . . .	xi
<b>Safety and environmental notices</b> . . . . .	xiii
Safety notices and labels . . . . .	xiii
Danger notices . . . . .	xiii
Caution notices. . . . .	xvi
Safety labels . . . . .	xvii
Attention notices . . . . .	xviii
Rack safety . . . . .	xix
Rack installation . . . . .	xix
Rack relocation (19" rack) . . . . .	xx
Safety inspections . . . . .	xxi
Removing ac power . . . . .	xxi
External machine checks . . . . .	xxi
Internal machine checks . . . . .	xxi
Product recycling and disposal . . . . .	xxii
Battery return program . . . . .	xxiii
For the European Union: . . . . .	xxiii
<b>About this document</b> . . . . .	xxv
Who should read this document . . . . .	xxv
Product documents . . . . .	xxv
Brocade documents. . . . .	xxv
IBM and Brocade product matrix . . . . .	xxv
<b>Chapter 1. Introduction</b> . . . . .	1
Overview of the SAN768B . . . . .	1
Hardware components . . . . .	2
SAN768B blades . . . . .	4
High availability . . . . .	6
Reliability . . . . .	6
Serviceability . . . . .	6
Software features . . . . .	7
Security . . . . .	7
Network Manageability . . . . .	8
Port numbering . . . . .	8
Managing cables. . . . .	9
<b>Chapter 2. Installing and removing a SAN768B</b> . . . . .	11
Ordering the lift tool . . . . .	12
World trade locations . . . . .	12
United States locations . . . . .	12
Installation guidelines . . . . .	13

Installing a SAN768B in a cabinet . . . . .	14
Time required . . . . .	14
Tools required . . . . .	14
Parts list . . . . .	14
Unpacking the SAN768B . . . . .	15
Attaching the shelf brackets . . . . .	16
Removing the chassis door . . . . .	17
Using the lift tool, the 24–inch load plate, and the bridge tool . . . . .	17
Removing a SAN768B from the cabinet. . . . .	23
<b>Chapter 3. Starting and configuring the SAN768B . . . . .</b>	<b>25</b>
Providing power to the SAN768B . . . . .	26
Establishing a serial connection and logging on to the SAN768B . . . . .	26
Configuring the SAN768B IP addresses. . . . .	27
Establish an Ethernet connection . . . . .	29
Customize a switch name . . . . .	30
Set the Domain ID . . . . .	30
Verifying the PID mode and connecting to the fabric . . . . .	30
Enabling software licenses . . . . .	31
Backing up the configuration . . . . .	32
<b>Chapter 4. Monitoring system components . . . . .</b>	<b>33</b>
Control processor blade (CP8) . . . . .	33
Core switch blade (CR8) . . . . .	35
FR4-18i router blade . . . . .	37
Port or application blades . . . . .	40
Power supply . . . . .	45
Blower assembly . . . . .	46
WWN bezel and WWN card . . . . .	48
<b>Chapter 5. Removing and installing components . . . . .</b>	<b>51</b>
Removing and installing the chassis door . . . . .	51
Time and items required . . . . .	51
Removing the chassis door . . . . .	51
Removing and installing a cable management comb . . . . .	52
Time and items required . . . . .	52
Removing a cable management comb . . . . .	52
Installing a cable management comb . . . . .	53
Removing and installing port blades . . . . .	53
Time and items required . . . . .	54
Removing a port blade . . . . .	54
Installing a port blade . . . . .	55
Removing and installing port blade filler panels . . . . .	56
Removing a filler panel . . . . .	56
Installing a filler panel . . . . .	57
Removing and installing a control processor blade (CP8) . . . . .	57
Time and items required . . . . .	58
Verifying the necessity of installation . . . . .	58
Recording critical SAN768B information . . . . .	58
Removing a control processor blade (CP8) . . . . .	60
Installing a control processor blade (CP8) . . . . .	61
Verifying operation of the new CP blade . . . . .	62
Removing and installing a core switch blade (CR8) . . . . .	63
Time and items required . . . . .	64
Verifying the necessity of installation . . . . .	64
Removing a core switch blade (CR8). . . . .	64



Installing a core switch blade (CR8) . . . . .	65
Removing and installing an FR4-18i router blade . . . . .	66
Time required . . . . .	66
Items required . . . . .	66
Removing a router blade . . . . .	66
Installing a router blade . . . . .	67
Configuring FCIP and Fibre Channel routing services and enabling the ports	68
Cabling the FR4-18i router blade . . . . .	68
Removing and installing a power supply . . . . .	69
Time and items required . . . . .	69
Removing a power supply . . . . .	69
Installing a power supply . . . . .	70
Removing and installing a blower assembly . . . . .	71
Time and items required . . . . .	71
Removing a blower assembly . . . . .	71
Installing a blower assembly . . . . .	72
Removing and installing a WWN bezel and WWN card . . . . .	72
Time and items required . . . . .	72
Verifying necessity of installation . . . . .	73
Removing the WWN bezel and WWN card . . . . .	74
Installing the WWN bezel and WWN card . . . . .	75
Installing and removing FC transceivers in a port blade . . . . .	76
<b>Chapter 6. Installing new features . . . . .</b>	<b>79</b>
FC3816, FC3832, FC3848 - Installing a 8-Gb port blade (16, 32, or 48 ports)	79
Time required . . . . .	79
Items required . . . . .	79
Procedures . . . . .	79
FC3850 - Installing an FR4-18i routing blade . . . . .	80
Time required . . . . .	81
Items required . . . . .	81
Procedures . . . . .	81
FC3870 - Installing an FC10-6 10 Gb blade . . . . .	82
Time required . . . . .	82
Items required . . . . .	82
Procedures . . . . .	82
<b>Chapter 7. Installing the chassis. . . . .</b>	<b>83</b>
Verifying necessity of replacement. . . . .	83
Preparing for a chassis installation. . . . .	84
Time required . . . . .	84
Items required . . . . .	84
Recording critical SAN768B and SAN information . . . . .	84
Chassis critical information checklist . . . . .	87
Disconnecting the SAN768B from the network and fabric . . . . .	88
Removing components from the chassis . . . . .	88
Removing and replacing the chassis . . . . .	89
Installing components into the new chassis . . . . .	90
Verifying the correct operation of hardware . . . . .	90
Verifying the correct operation of the system . . . . .	91
Reconnecting the system to the network and fabric . . . . .	92
Verifying the correct configuration of the fabric . . . . .	93
Cable routing tables . . . . .	93
<b>Appendix A. Product specifications . . . . .</b>	<b>95</b>
System architecture . . . . .	95

Physical dimensions . . . . .	97
Facility requirements . . . . .	97
Power specifications . . . . .	98
Environmental requirements . . . . .	99
Data transmission ranges . . . . .	99
Fibre channel port specifications . . . . .	100
FR4-18i router Fibre channel port specifications . . . . .	100
FR4-18i router GbE port specifications. . . . .	100
Power cords . . . . .	101
<b>Appendix B. Diagnostics and troubleshooting . . . . .</b>	<b>103</b>
Obtaining chassis and component status . . . . .	103
Interpreting POST and boot results . . . . .	104
POST . . . . .	104
Boot . . . . .	105
Diagnostics . . . . .	105
Validating the installation of port blades . . . . .	105
Troubleshooting . . . . .	106
Powering off the SAN768B . . . . .	109
<b>Appendix C. Port numbering templates . . . . .</b>	<b>111</b>
<b>Notices . . . . .</b>	<b>117</b>
Trademarks. . . . .	119
Electronic emission notices . . . . .	120
Federal Communications Commission (FCC) Class A Statement . . . . .	120
Industry Canada Class A Emission Compliance Statement . . . . .	120
Avis de conformité à la réglementation d'Industrie Canada . . . . .	120
European Union (EU) Electromagnetic Compatibility Directive . . . . .	120
Germany Electromagnetic Compatibility Directive . . . . .	121
Japan VCCI Class A ITE Electronic Emission Statement . . . . .	122
People's Republic of China Class A Electronic Emission Statement . . . . .	122
Korea Class A Electronic Emission Statement . . . . .	122
<b>Index . . . . .</b>	<b>123</b>

---

## Figures

1. Port side of the SAN768B (sample configuration)	3
2. Blower (non-port) side of the SAN768B (sample configuration)	4
3. Parts in the 14U rack mount kit	15
4. Left and right shelf brackets installed on the cabinet rails	16
5. Installing clip or retainer nuts on the vertical cabinet rails	17
6. Chassis installation from rear (exhaust aisle side) of the cabinet	19
7. Locking the shelf into position	20
8. Attaching the port side of the chassis to the cabinet rails	21
9. Aligning the chassis door with the ball studs on the chassis	22
10. Details of the chassis and door, showing the ball studs on the chassis and the mounting hardware on the door	22
11. Control processor blade (CP8) LEDs	34
12. Core switch blade (CR8) LEDs	36
13. FR4-18i router blade	38
14. FC8-16 port blade	41
15. FC8-32 port blade	42
16. FC8-48 port blade	43
17. FC10-6 port blade	44
18. Power supply LEDs	46
19. Blower assembly LEDs and other parts	47
20. LEDs on the WWN card and bezel	49
21. Chassis door	52
22. Cable management comb	53
23. Port blade removal and installation (16-port blade shown as example)	55
24. Port blade removal and installation (16-port blade shown as example)	57
25. Removing the control processor (CP) blade	61
26. Removing the core switch blade	65
27. Removing and installing a power supply	70
28. Blower assembly LEDs and other parts	72
29. WWN bezel and card removal and installation	75
30. SFP extraction tool	77
31. Port side populated with eight FC8-48 port blades, two CR8 blades, and two CP8 blades	112
32. Port side populated with eight FC8-32 port blades, two CR8 blades, and two CP8 blades	113
33. Port side populated with eight FC8-16 port blades, two CR8 blades, and two CP8 blades	114
34. FC10-6 port blade	115
35. FC4-18IP port blade	116



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## Tables

1. Brocade and IBM product and model number matrix . . . . .	xxvi
2. Blades available for the SAN768B . . . . .	4
3. Security features . . . . .	7
4. Port blades available on the SAN768B . . . . .	8
5. Items supplied with the 14U rack mount kit . . . . .	14
6. Configuration parameters . . . . .	27
7. Example login without changing the password . . . . .	27
8. Example of viewing enabled licenses . . . . .	31
9. CP blade LED descriptions . . . . .	34
10. CR blade LED descriptions . . . . .	36
11. FR4-18i router blade LED patterns during normal operation . . . . .	39
12. Port and application blade LED descriptions . . . . .	45
13. Power supply LED descriptions . . . . .	46
14. Blower assembly LED descriptions . . . . .	47
15. Messages that may indicate WWN card failure . . . . .	48
16. WWN bezel LED descriptions . . . . .	49
17. WWN LED patterns . . . . .	73
18. Commands identifying the WWN card status . . . . .	73
19. WWN card related system log messages . . . . .	74
20. Critical information checklist example . . . . .	87
21. Sample cable routing table for SAN768B (Switch Name: swDir) . . . . .	93
22. Cable routing table for SAN768B . . . . .	93
23. System architecture . . . . .	95
24. System sizes and weights . . . . .	97
25. System FRU weights . . . . .	97
26. Power specifications . . . . .	98
27. Environmental requirements . . . . .	99
28. Data transmission ranges by cable type and port speed . . . . .	99
29. Environmental status and maintenance commands . . . . .	104
30. Commands for validating installation of port blades . . . . .	106
31. Troubleshooting . . . . .	106



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## Safety and environmental notices

This section contains information about:

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

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### 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 Systems Safety Notices (G229–9054)* publication, which is on the CD-ROM that accompanies 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)

The weight of the SAN cabinet (2109-C36) with two SAN768Bs is greater than 227 kg (500 lb), and has a fully loaded capacity of 816 kg (1795 lb). Under these conditions, the following statement and notice apply.

## Delivery and subsequent transportation of the equipment

The customer should prepare his environment to accept the new product based on the installation planning information provided, with assistance from an IBM Installation Planning Representative (IPR) or IBM authorized service provider. In anticipation of the equipment delivery, the final installation site should be prepared in advance such that professional movers/riggers can transport the equipment to the final installation site within the computer room. If for some reason, this is not possible at the time of delivery, the customer will need to make arrangements to have professional movers/riggers return to finish the transportation at a later date. Only professional movers/riggers should transport the equipment. The IBM authorized service provider will only perform minimal frame repositioning within the computer room, as needed, to perform required service actions. The customer is also responsible for using professional movers/riggers in the case of equipment relocation or disposal.









### DANGER

Heavy equipment—personal injury or equipment damage might result if mishandled. (D006)

## 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:

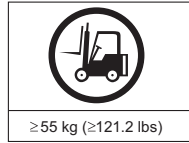
If the symbol is...	It means....
	A hazardous electrical condition with less severity than electrical danger.
	A generally hazardous condition not represented by other safety symbols.
 >55kg (121.2 lb)	A specification of product weight that requires safe lifting practices. The weight range of the product is listed below the graphic, and the wording of the caution varies, depending on the weight of the device.
	A potential hazard of pinching the hand or other body parts between parts.
	A hazardous condition due to moving parts nearby.
	A hazardous condition due to the use of a laser in the product. Laser symbols are always accompanied by the classification of the laser as defined by the U. S. Department of Health and Human Services (for example, Class I, Class II, and so forth).

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



**CAUTION:**

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



**CAUTION:**

The weight of this part or unit is more than 55 kg (121.2 lb). It takes specially trained persons, a lifting device, or both to safely lift this part or unit. (C011)

>55kg (121.2 lb)



**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:**

Servicing of this product or unit is to be performed by trained service personnel only. (C032)

## Safety labels

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

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



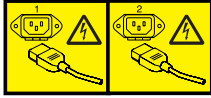
**DANGER**

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



**DANGER**

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



#### DANGER

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



#### DANGER

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



#### CAUTION:

Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in splattered metal, burns, or both. (L005)



#### CAUTION:

Hazardous moving parts nearby (L008)



#### CAUTION:

Pinch hazard. (L012)

P/N 18P5850-B  
SJ000752

## 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)

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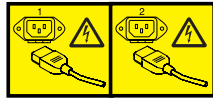
## Safety inspections

Perform the following safety checks to identify unsafe conditions. Be cautious of potential safety hazards that are not covered in the safety checks. If unsafe conditions are present, determine how serious the hazards are and whether you should continue before you correct the problem.

### Removing ac power

Perform the following steps to remove the alternating current (ac) power:

1. Perform a controlled system shutdown.
2. Set the power switch on the product to the off position.
3. Disconnect the power cables from the power source.



#### DANGER

Multiple power cords. (L003)

### External machine checks

Perform the following external machine checks:

1. Verify that all external covers are present and are not damaged.
2. Ensure that all latches and hinges are in correct operating condition.
3. Check the power cable for damage.
4. Check the external signal cable for damage.
5. Check the cover for sharp edges, damage, or alterations that expose the internal parts of the device.
6. Check that any unused serial ports are covered for dust and ESD protection. The cover should be kept on the serial port whenever it is not being used.
7. Correct any problems that you find.

### Internal machine checks

Perform the following internal machine checks:

1. Check for any non-IBM changes that might have been made to the machine. If any are present, obtain the “Non-IBM Alteration Attachment Survey” form, number R009, from the IBM branch office. Complete the form and return it to the branch office.
2. Check the condition of the inside of the machine for:
  - Metal or other contaminants
  - Indications of water or other fluid
  - Fire
  - Smoke damage
3. Check for any obvious mechanical problems, such as loose components.
4. Check any exposed cables and connectors for wear, cracks, or pinching.

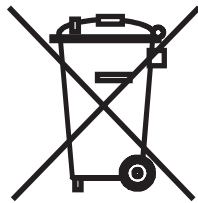
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## Product recycling and disposal

This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet sites at <http://www.ibm.com/ibm/recycle/us/index.shtml> and <http://www.ibm.com/ibm/environment/products/index.shtml>

Esta unidad debe reciclarse o desecharse de acuerdo con lo establecido en la normativa nacional o local aplicable. IBM recomienda a los propietarios de equipos de tecnología de la información (TI) que reciclen responsablemente sus equipos cuando éstos ya no les sean útiles. IBM dispone de una serie de programas y servicios de devolución de productos en varios países, a fin de ayudar a los propietarios de equipos a reciclar sus productos de TI. Se puede encontrar información sobre las ofertas de reciclado de productos de IBM en los sitios web de IBM

<http://www.ibm.com/ibm/recycle/us/index.shtml> y <http://www.ibm.com/ibm/environment/products/index.shtml>.



**Note:** This mark applies only to countries within the European Union (EU) and Norway.

Appliances are labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

注意：このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

Remarque : Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'étiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown above, must not dispose of end of life EEE as unsorted



municipal waste, but use the collection framework available to customers for the return, recycling and recovery of WEEE. Customer participation is important to minimize any potential effects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

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## Battery return program

This product may contain sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to <http://www.ibm.com/ibm/environment/products/index.shtml> or contact your local waste disposal facility.

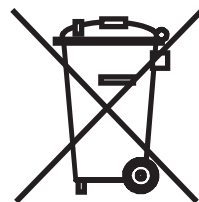
In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and other battery packs from IBM equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Please have the IBM part number listed on the battery available prior to your call.

For Taiwan:



Please recycle batteries.

## For the European Union:



**Note:** This mark applies only to countries within the European Union (EU).

Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

Les batteries ou emballages pour batteries sont étiquetés conformément aux directives européennes 2006/66/EC, norme relative aux batteries et accumulateurs en usage et aux batteries et accumulateurs usés. Les directives déterminent la marche à suivre en vigueur dans l'Union Européenne pour le retour et le recyclage des batteries et accumulateurs usés. Cette étiquette est appliquée sur diverses

batteries pour indiquer que la batterie ne doit pas être mise au rebut mais plutôt récupérée en fin de cycle de vie selon cette norme.

バッテリーあるいはバッテリー用のパッケージには、EU 諸国に対する廃電気電子機器指令 2006/66/EC のラベルが貼られています。この指令は、バッテリーと蓄電池、および廃棄バッテリーと蓄電池に関するものです。この指令は、使用済みバッテリーと蓄電池の回収とリサイクルの骨子を定めているもので、EU 諸国にわたって適用されます。このラベルは、使用済みになったときに指令に従って適正な処理をする必要があることを知らせるために種々のバッテリーに貼られています。

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances. For proper collection and treatment, contact your local IBM representative.

This notice is provided in accordance with Royal Decree 106/2008 of Spain: The retail price of batteries, accumulators and power cells includes the cost of the environmental management of their waste.

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## About this document

This document describes how to install and service the IBM System Storage™ SAN768B fabric backbone. Throughout this document, the product is referred to as the *SAN768B*.

The sections that follow provide information about:

- “Who should read this document”
- “Product documents”
- “Brocade documents”

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## Who should read this document

This document is intended for trained service representatives who are responsible for installing and servicing the SAN768B, and for network administrators responsible for maintaining and using the SAN768B.

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## Product documents

The following documents contain information related to this product:

- *IBM System Storage SAN768B Installation, Service, and User's Guide*, GA32-0574 (this document)
- *IBM Systems Safety Notices*, G229–9054
- *IBM System Storage SAN 2499 Statement of Limited Warranty*, GA32-0575

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## Brocade documents

IBM switches use software licensed from Brocade Communications Systems, Inc. You can find information related to the software that supports the SAN768B in the following documents on the CD-ROM supplied with this product:

### **Brocade Fabric OS**

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

### **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, you will notice that the model numbers reflect the original Brocade products. Table 1 on page xxvi provides a product matrix for you to use to correlate the Brocade model numbers to the IBM product names and machine types and model numbers.

Table 1. Brocade and IBM product and model number matrix

<b>Brocade product name</b>	<b>IBM product name</b>	<b>IBM machine type and model number</b>
Brocade DCX	SAN768B	2499 Model 384
Brocade 48000	SAN256B Director	2109 Model M48
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
Brocade 7500E	SAN04B-R	2005 Model R04
Brocade 5000	SAN32B-3	2005 Models B5K and 5KB
Silkworm 7500	SAN18B-R	2005 Model R18
Silkworm 200E	SAN16B-2	2005 Models B16 and 16B
Silkworm 4900	SAN64B-2	2005 Model B64

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## Chapter 1. Introduction

This chapter introduces the features and components of the IBM System Storage SAN768B fabric backbone. Throughout the remainder of this document, the product will be referred to as the SAN768B. This chapter contains the following information:

- “Overview of the SAN768B”
- “Hardware components” on page 2
- “High availability” on page 6
- “Reliability” on page 6
- “Serviceability” on page 6
- “Software features” on page 7

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### Overview of the SAN768B

The SAN768B represents the next generation of advanced Fibre Channel directors used to intelligently interconnect storage devices, hosts, and servers in a Storage Area Network (SAN). It satisfies the most demanding Reliability, Availability, and Serviceability (RAS), performance, and scalability requirements, while delivering investment protection, interoperability, and fabric-based intelligence advantages found only in the IBM SAN product family.

Key features of the SAN768B include:

- Up to 384 ports in a single chassis, providing high port density for a scalable solution to drive high-port-count SAN configurations.
- Support for high-performance port blades running at 1-, 2-, 4-, 8-, or 10-Gbps, enabling flexible system configuration.
- Supports 1-, 2-, 4-, and 8-Gbps auto-sensing Fibre Channel ports. Trunking technology groups up to eight ports to create high performance 64-Gbps ISL trunks between switches. (10 Gbps ports (FC10-6) are 10 Gbps only.)
- Dual-redundant control processor blades (CP8) and core switch blades (CR8) provide high availability and enable nondisruptive software upgrades.
- Redundant and hot-swappable CP8 and CR8 blades, power supplies, blower assemblies, and WWN cards enable a high availability platform for mission critical SAN applications.
- Inter-chassis linking (ICL) through CR8 blades.
- Universal ports self-configure as E\_ports, F\_ports, FL\_ports, Ex\_ports, and M\_ports (mirror ports).
  - 10 Gbps ports (FC10-6) are E-Ports only.
  - Ex\_ports are supported only on the FR4-18i application blade.
  - FL\_ports are not supported on the FC8-48 port blade.

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## Hardware components

The SAN768B features a modular and scalable mechanical construction that allows a wide range of flexibility in installation, fabric design, and maintenance. The chassis may be mounted with the cables facing the front of the equipment rack or to the rear, and consists of the following:

- Up to eight hot-swappable port blade assemblies can be configured in a single chassis, delivering up to 384 Fibre Channel ports.
- Two slots for control processor blades (CP8):
  - A single active CP8 blade can control all 384 ports in the chassis.
  - The standby CP8 blade assumes control of the SAN768B if the active CP fails.
- Two slots for core switch blades (CR8):
  - CR8 blade interconnects all port blades
  - Two inter-chassis link (ICL) connectors per blade to connect to another chassis
  - Both CR8 blades are active
- Modular hot-swappable port blades:
  - 16-port, 8-Gbps blades (FC8-16)
  - 32-port, 8-Gbps blades (FC8-32)
  - 48-port, 8-Gbps blades (FC8-48)
  - 6-port, 10-Gbps blades (FC10-6)
- Modular hot-swappable application blades:
  - FR4-18i: 18-port (16 FC + 2 GbE), up to 4 blades per chassis, supporting Fibre Channel Routing Services and FCIP
- Modular hot-swappable field replaceable units (FRUs):
  - Three blower assemblies
  - Up to four power supplies
  - Two WWN cards
  - Small Form-factor Pluggable (SFP) optical transceivers (4- and 8-Gbps)
  - Extended Form-factor Pluggable (XFP) optical transceivers (10-Gbps)
  - 1 GbE copper SFP transceivers for the IP ports on the routing blade
- All blades are serviced from the port side of the SAN768B. Blowers, power supplies, and power cables are serviced from the nonport side.
- Improved cable management using a redesigned cable management comb and chassis door
- Constant intake and FRU temperature monitoring
- World Wide Name (WWN) cards on the nonport side, to maintain chassis-specific information such as WWNs, IP addresses, and summary status information of each port blade and power supply through LEDs
- Redundant AC primary power connections to ensure high availability. Each power supply has its own connector

**Note:** Airflow in the SAN768B is from the non-port (non-cable) side to the port (cable) side and out the exhaust vent.

Figure 1 on page 3 shows a sample configuration of the port side of the SAN768B.

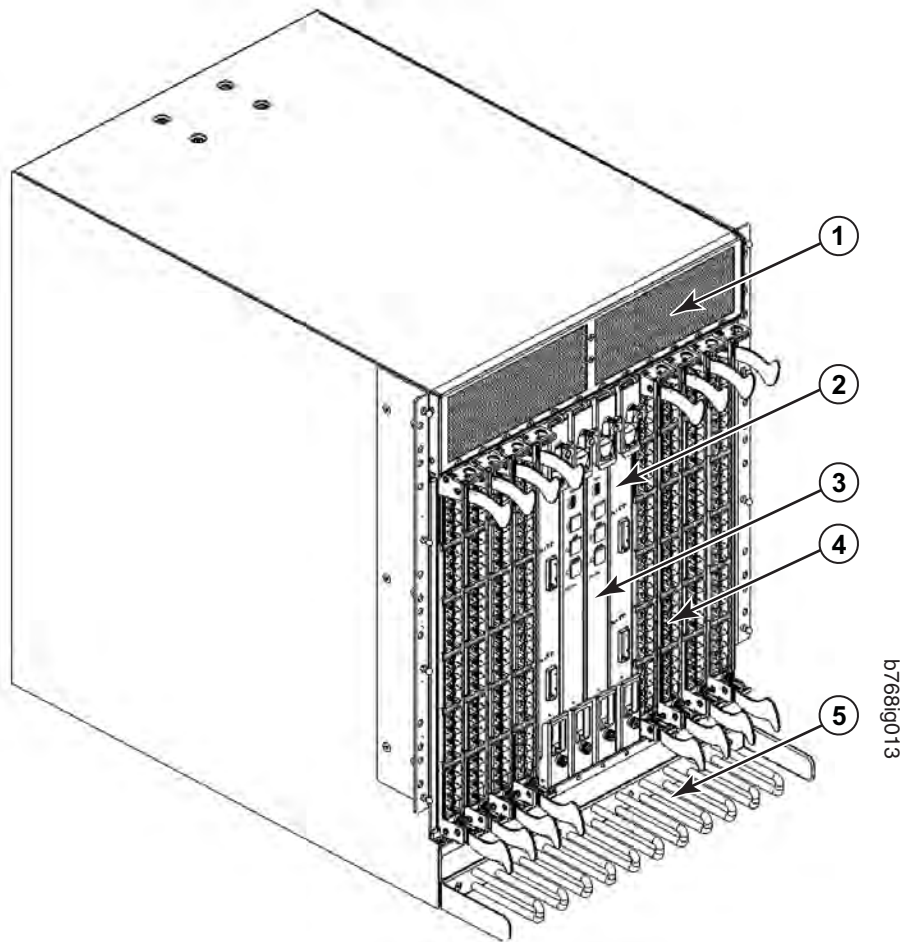


Figure 1. Port side of the SAN768B (sample configuration)

- |          |                         |          |                               |
|----------|-------------------------|----------|-------------------------------|
| <b>1</b> | Exhaust vent            | <b>3</b> | Control processor blade (CP8) |
| <b>2</b> | Core switch blade (CR8) | <b>4</b> | FC8-48 port blade             |
|          |                         | <b>5</b> | Cable management comb         |

Figure 2 on page 4 shows a sample configuration of the non-port side of the SAN768B.

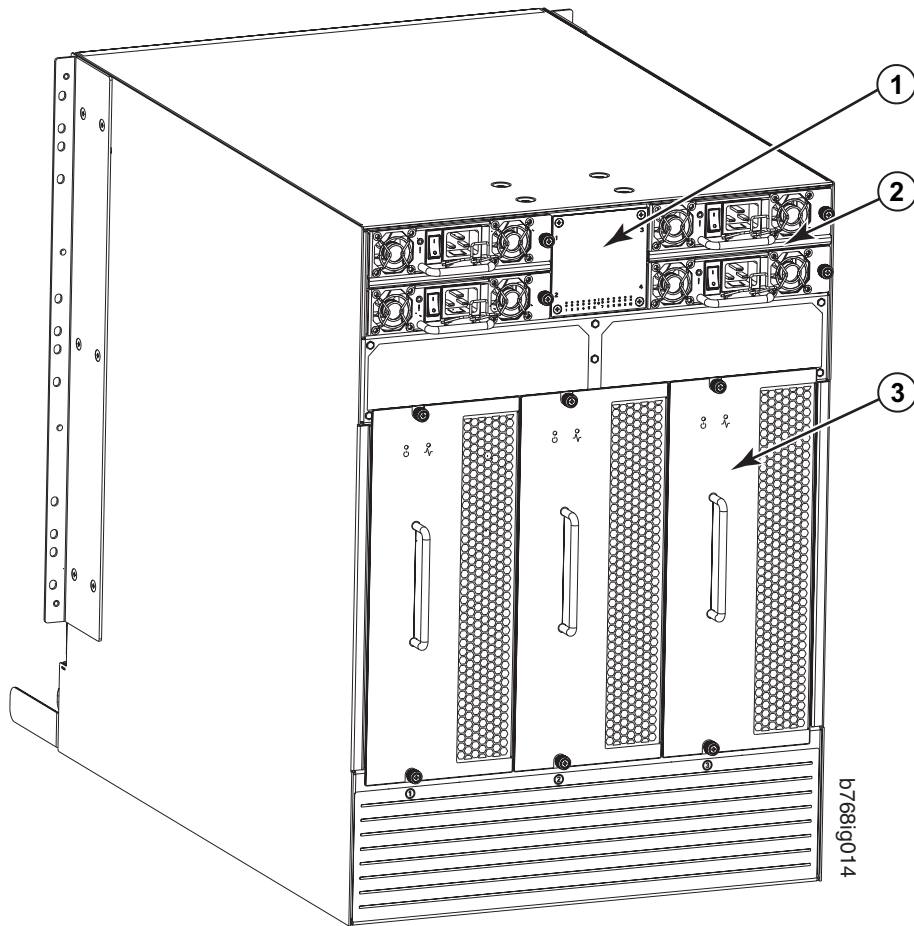


Figure 2. Blower (non-port) side of the SAN768B (sample configuration)

- 1** WWN bezel
- 3** Blower assembly
- 2** Power supply

## SAN768B blades

Table 2 summarizes the port, application, control processor, and core switch blades that are available for the SAN768B.

Table 2. Blades available for the SAN768B

Description	Feature Code	Name	Function
Control processor blade	N/A	CP8	The CP8 blade contains the control plane for the chassis. There are two CP8 blades for redundancy.



Table 2. Blades available for the SAN768B (continued)

Description	Feature Code	Name	Function
Core switch blade	N/A	CR8	The CR8 blade contains the ASICs for switching between port blades. Every port blade connects to every core switch blade. There are 384 total ports for port blades. Each core switch blade connects to 192 backplane ports. Core switch blades have additional front port connectivity to connect multiple chassis and backplane connections for the storage server blade.
16-port 8-Gbps port blade	FC3816	FC8-16	A 16-port blade supporting 1-, 2-, 4-, and 8-Gbps port speeds.
32-port 8-Gbps port blade	FC3832	FC8-32	A 32-port blade supporting 1-, 2-, 4-, and 8-Gbps port speeds.
48-port 8-Gbps port blade	FC3848	FC8-48	A 48-port blade supporting 1-, 2-, 4-, and 8-Gbps port speeds.
6-port 10-Gbps port blade	FC3870	FC10-6	A 6-port blade supporting 10-Gbps port speed. Blade provides 10-Gbps ISLs.
Fibre Channel router blade	FC3850	FR4-18i	The FR4-18i blade has 16 4-Gbps physical Fibre Channel SFP ports supporting Fibre Channel Routing Services and two physical Gigabit Ethernet (GbE) SFP ports supporting Fibre Channel Over IP (FCIP). The two physical GbE ports can support up to 16 virtual E_ports.

---

## High availability

The following features contribute to the SAN768B's high-availability design:

- Redundant, hot-swappable blades and FRUs
- Enhanced data integrity on all data paths
- Fabric Shortest Path First (FSPF) rerouting around failed links
- Integration with Simple Network Management Protocol (SNMP) managers
- Automatic control processor failover
- Nondisruptive "hot" software code loads and activation
- Easy configuration, save, and restore
- Hot-swappable World Wide Name (WWN) cards

The high-availability software architecture of the SAN768B provides a common framework for all applications that reside on the system, allowing global and local status to be maintained through any component failure. High-availability elements consist of the High Availability Manager, the heartbeat, the fault/health framework, the replicated database, initialization, and software upgrade.

The High Availability Manager controls access to the standby control processor, facilitates software upgrades, prevents extraneous switchover activity, closes and flushes streams as needed, provides flow control and message buffering, and supports a centralized active and standby state.

---

## Reliability

The SAN768B uses the following error detection and correction mechanisms to ensure reliability of data:

- Data is protected by the Error Detection and Correction mechanism, which checks for encoder errors and fault isolation, such as cyclic redundancy checking (CRC), parity checking, checksum, and illegal address checking
- Power-on self test (POST)
- Dual control processors that enable hot, nondisruptive fast firmware upgrades
- Each control processor contains one serial port and two Ethernet ports, for management and for service. Offline control processor diagnostics and remote diagnostics simplify troubleshooting. The standby control processor monitors diagnostics to ensure it is operational, should a failover be necessary
- Bus monitoring and control of blades and other field-replaceable units (FRUs).

---

## Serviceability

The SAN768B provides the following features to enhance and ensure serviceability:

- Modular design with hot-swappable components
- Flash memory that stores two firmware images per control processor
- Nonvolatile random-access memory (NVRAM), containing the OEM serial number, IBM serial number, revision information, and part number information
- Background health-check daemon
- Memory scrubber, self test, and bus ping to determine if a bus is not functioning
- RASlog messages
- SMI-S compliant
- Watchdog timers

- Status LEDs
- Predictive diagnostics analysis through Fabric Watch
- SNMP (including version 3) integration with higher-layer managers

---

## Software features

The Fabric OS allows any Fibre Channel-compliant device to attach to the switches as long as it conforms to the device login, name service, and related Fibre Channel standards. Each operating environment requires that a Fibre Channel host bus adapter (HBA) be available with a standards-compliant driver for correct interface to the fabric.

Fabric OS consists of a set of embedded applications running on top of an embedded Linux<sup>®</sup> operating system kernel. These applications include:

- Name server
- Alias server
- Zone server
- Simple Network Management Protocol (SNMP) agent
- SMI-S compliant API
- Syslog auditing
- RCS (Reliable Commit Service)
- NTP
- Tasks to manage address assignment, routing, link initialization, fabric initialization, link shutdown, shutdown, and the user interface.
- Integrated Routing—This feature allows any port in a SAN768B, SAN80B-4, and SAN40B-4 to be configured as an EX\_port supporting Fibre Channel (FC) routing. This eliminates the need to add a routing blade or use of the SAN18B-R for FC routing (FCR) purposes, and this also provides double the bandwidth for each FC router connection when connected to another 8 Gbps-capable port.
- FICON Accelerator, which is designed to support secure high-speed data movement between multiple locations (optional feature requiring FOS 6.1.1)

## Security

Table 3 highlights some of the key security features available for the SAN768B and for other switches running Fabric OS 5.2.0 or newer.

*Table 3. Security features*

Security Feature	Description
DH-CHAP	Login banner
SSHv2 (using AES, 3DES, RSA)	Monitoring of attempted security breaches (via audit logging)
HTTPS (using AES)	Monitoring of attempted security breaches (via Fabric Watch Security Class)
SNMPv3	Fibre Channel security policies: DCC and SCC
FC-SP	Trusted Switch (FCS) for central security management
Secure RPC	Management access controls (SNMPv3, Telnet, FTP, serial port, front panel)

Table 3. Security features (continued)

Security Feature	Description
Secure file copy (SCP)	Hardware-enforced zoning by WWN and/or domain/port ID
Telnet disable	Default zoning
Telnet timeout	RSCN suppression and aggregation
IP filters (block listeners)	Configurable RSCN suppression by port
Secure passwords (centralized control via RADIUS/CHAP)	NTPv3 (to synchronize timestamps)
Multiple user accounts (MUAs). Up to 255.	Event auditing
Role-based access controls (RBACs)	Change tracking
Administrative domains/Virtual fabrics	Firmware change alerts in Fabric Manager
Boot PROM password reset	Persistent port disable
Password hardening policies	Persistent domain ID
Upfront login in Web Tools	E_port disable

## Network Manageability

The SAN768B has a single domain and is managed as a single element with the Data Center Fabric Manager, Enterprise Fabric Connectivity Manager (EFCM), or Fabric Manager. The SAN768B responds to its own IP address and appears as a separate entity to the Telnet protocol and SNMP.

All management interfaces, such as Telnet, Web Tools, standards compliant SMI-S, and Management Server, support a “port N within blade M” naming scheme.

The SAN768B supports SNMPv1 and SNMPv3. When SNMP devices send SNMP messages to a management console running SAN management software, the information is stored in a management information base (MIB). Fabric OS v6.0.0 and later supports the latest Fibre Alliance Fibre Channel Management (FCMGMT) and Storage Management Initiative (SMI) MIBs, which allow common information necessary for management software to provide information to a SAN administrator. Fabric OS v6.1.1 and later is required for the optional feature, FICON Accelerator.

**Note:** Refer to the *Fabric OS MIB Reference* for additional MIB information.

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## Port numbering

Table 4 has a list of available port blades for the SAN768B.

Table 4. Port blades available on the SAN768B

Blade label	IBM blade name	Feature code
FC8-16	16 port 8Gb Switch Blade	3816
FC8-32	32 port 8Gb Switch Blade	3832
FC8-48	48 port 8Gb Switch Blade	3848
FC10-6	10Gb Fibre Channel Blade	3870
FR4-18i	FC Routing Blade	3850

The SAN768B uses the following port numbering scheme:

- FC8-16 port blade - Ports are numbered from 0 through 15 from bottom to top.
- FC8-32 port blade - Ports are numbered from 0 through 15 from bottom to top on the left set of ports and 16 through 31 from bottom to top on the right set of ports.
- FC8-48 port blade - Ports are numbered from 0 through 23 from bottom to top on the left set of ports and 24 through 47 from bottom to top on the right set of ports.
- FC10-6 port blade - Ports are numbered from 0 through 5 from bottom to top.
- FR4-18i router blade - The 16 physical Fibre Channel ports are numbered from 0 through 15 from bottom to top. The two GbE ports, numbered GE0 and GE1, are located below the Fibre Channel ports. these ports, when fully configured, enable 16 VE\_ports or VEX\_ports and appear in the **switchShow** command as ports 16 through 31.

Slots are numbered 1 through 12, from left to right when facing the port side of the SAN768B. Control processor blades (CP8) can be installed only in slots 6 and 7. Core switch blades (CR8) can be installed only in slots 5 and 8.

See Appendix C, “Port numbering templates,” on page 111 for port numbering templates for different SAN768B configurations and optional blades.

---

## Managing cables

The cable management comb (shown in Figure 1 on page 3) is attached to the chassis under the chassis door and allows for simple cable management. The comb can be installed without service disruption.

Route cables down in front of the blades to keep LEDs visible. Leave at least one meter of slack for each fiber optic cable to provide room to remove and replace blades.

**Attention:** Do not route the cables in front of the air exhaust vent, which is located at the top of the port side of the chassis.

If ISL Trunking is in use, group the cables by trunking group. The ports are color-coded to indicate which ports can be used in the same ISL Trunking group: eight ports marked with solid black ovals alternate with eight ports marked with oval outlines.



## Chapter 2. Installing and removing a SAN768B

The SAN768B is only available for installation in the IBM TotalStorage® 2109 SAN Switch Cabinet C36. This SAN768B is to be installed and serviced only by qualified IBM service representatives. The SAN768B can be ordered pre-installed in the cabinet, or the SAN768B can be added to an existing C36 cabinet. The cabinet is designed to support a total of two SAN256Bs or SAN768Bs.

**Attention:** The SAN768B is only available for installation in the IBM TotalStorage 2109 SAN Switch Cabinet C36. The SAN768B can be pre-installed in the cabinet, or it can be added to an existing IBM C36 cabinet. For installation into an existing C36 cabinet, a special bridge tool ships with the SAN768B which is designed to attach to the IBM C36 cabinet. This bridge tool supports the weight of the director as it is moved into the cabinet. This tool may not attach to non-IBM cabinets. There is a real risk of personal injury or machine damage during installation into any cabinet other than the approved IBM cabinets .

This chapter describes how to install the SAN768B into a C36 cabinet, and how to remove the SAN768B from the cabinet in the event you need to move or replace the SAN768B. One SAN768B is installed in the cabinet at the factory. If the SAN768B is already installed in the cabinet, continue on to Chapter 3, “Starting and configuring the SAN768B,” on page 25.

**Note:** Some illustrations in this chapter display different models of IBM SAN directors. Details, such as the cable management comb and blades may differ, but the procedures remain the same for the SAN768B.

**Attention:** Refer to “Safety and environmental notices” on page xiii for general safety instructions, and “Rack safety” on page xix before performing any installation or service procedures.



**CAUTION:**

The weight of this part or unit is more than 104 kg (228 lb). It takes specially trained persons with a lifting device to safely lift this part or unit. (C011)

**CAUTION:**

A fully populated SAN768B weighs approximately 104 kg (228 lb). Before you install it, verify that the additional weight of the chassis does not exceed the cabinet’s weight limit or unbalance the cabinet. When you calculate the additional weight, include the weights of all components that can potentially be added, to avoid overloading in the future.

Before you install a SAN768B into the cabinet, perform the following tasks:

- To ensure adequate cooling, plan to install the chassis with the port side facing the aisle where exhaust air is released (usually called the service aisle). This prevents the fans from pulling in heated exhaust air.
- Plan for managing the cables before you install the chassis. A fully populated SAN768B will have a large number of cables that must be carefully routed to minimize problems with installation and replacement of components, and in order

to maintain the minimum bend radius required for optical cables. Refer to “Managing cables” on page 9 for more specific information. You can manage the cables in a variety of ways, such as:

- Routing the cables down through the cable management tray
- Routing the cables out either side of the chassis
- Routing the cables through the cable channels on the sides of the cabinet
- Using patch panels
- Ensure that the airflow in the vicinity of the SAN768B is a minimum of 595 cubic meters per hour (350 cubic feet per minute).
- Ensure that the air temperature that is measured at the blower inlet does not exceed 40°C (104°F ) during operation.

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## Ordering the lift tool

### Important

The lift tool is required only when you install an additional SAN768B or when you install or remove the SAN768B from the cabinet.

The ordering procedures for the lift tool vary depending on your location. You should direct questions about these procedures to your regional representative.

**Note:** The bridge tool (PN 18P5855), which is required for installation, is shipped with a new or a replacement SAN768B. The bridge tool, when installed, serves as a temporary ramp between the lift tool and the SAN768B rails that are installed in a C36 cabinet. You do not need to return the bridge tool when you are finished with it.

## World trade locations

The following ordering procedures are for world trade locations:

- Order the lift tool by using the parts order system, like any other part.
- Use the following part numbers when you order:
  - Lift tool: PN 09P2481
  - 24–inch load plate: PN 11P4369
- You do not record parts usage.
- Return the lift tool and the 24–inch load plate to the parts center after you complete the installation or removal of the SAN768B.

## United States locations

In the United States, call UPS Logistics at 800–528–6070 to order the lift tool and the 24–inch load plate.

**Note:** For the SSR branch and territory, the United States cannot order the lift tool or 24–inch load plate through the parts order system. UPS Logistics are used to ship and return the lift tool and 24–inch load plate.

Use the following part numbers when you order:

- Lift tool: PN 09P2481
- 24–inch load plate: PN 11P4369



**Note:** When you order the lift tool, you will receive an 18–inch load plate. Do not use the 18–inch load plate. You must order and use a 24–inch load plate when you install the SAN768B.

You must provide the following information when you order the lift tool. This information is necessary to ensure that the lift tool is delivered when you need it. Failure to provide this information might delay the completion of the order request and the shipping request. It might also result in a time and date to return the tool that is different from what you need.

- Phone number and customer contact
- Account code: 98577
- Time and date of delivery
- Accurate destination address with zip code
- Time and date of return pickup

You must return the lift tool at the time that was scheduled with UPS Logistics. If you need to change the scheduled return time or date, contact UPS Logistics.

You are responsible for ensuring that all of the paperwork and components are packed and restored in the arbocrate (shipping container) of the lift tool. Ensure that the lift tool is functioning properly before you release the tool to UPS Logistics for return. You are accountable for the lift tool until UPS Logistics picks up the lift tool for return delivery to their parts storage facility.

Contact your branch office tools coordinator or your region specialist if you have any questions or concerns.

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## Installation guidelines

Follow these general installation guidelines:

1. Provide a space that is 14 rack units (14U) high, 61.29 cm (24.09 in.) deep, and 43.74 cm (17.22 in.). 1U is equal to 4.45 cm (1.75 in.).
2. Plan to install the SAN768B with the non-port side facing the air-intake aisle. The SAN768B can be installed facing either direction, if serviceability and cooling requirements are met.
3. Plan for cable management before installing the chassis. See “Managing cables” on page 9.

Cables can be managed in a variety of ways, such as by routing cables below the chassis, to either side of the chassis, through cable channels on the sides of the cabinet, or by using patch panels.

4. Ensure that dedicated electrical branch circuits with the following characteristics are available:
  - 200 – 240 VAC, 50–60 Hz (two branch circuits)
  - Two cables for 200 - 240 VAC service
  - Protected by a circuit breaker in accordance with local electrical codes
  - Supply circuit, line fusing, and wire size adequate to the electrical rating on the chassis nameplate
  - Location close to the chassis and easily accessible
  - Grounded outlets installed by a licensed electrician, compatible with the power cords

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

5. Ensure that the air intake and exhaust vents have a minimum of 2 in. of airspace.
6. Ensure that the air temperature on the air intake side is less than 40 degrees Celsius (104 degrees Fahrenheit) during operation.

**CAUTION:**

**Use safe lifting practices when moving the product. (C015)**

**Note:** A fully populated SAN768B (eight FC8-48 port cards, 384 ports) weighs approximately 104 kg (228 lbs) and requires the specified lift tool to install it.

## Installing a SAN768B in a cabinet

This section describes how to install the SAN768B in the Model C36 cabinet. These procedures use parts that are included in the 14U rack mount kit.

### Time required

Allow approximately 3 hours to complete this procedure. This includes unpacking, assembling, and repacking the lift tool. This is for the physical installation of the SAN768B only. It does not include installing Ethernet cables, SFPs, attaching and routing the fiber optic cables, or completing the initial configuration.

**Note:** Assembly instructions for the lift tool are in the shipping container.

### Tools required

You will require the following items to install the SAN768B in the cabinet:

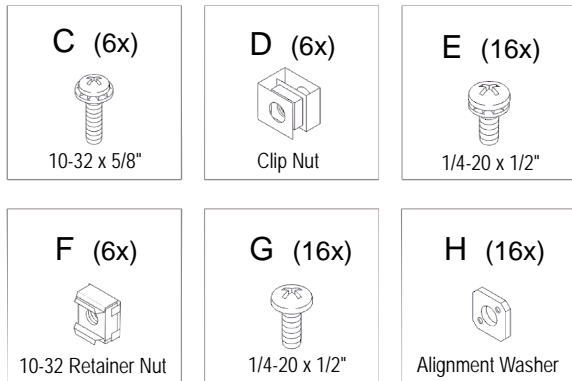
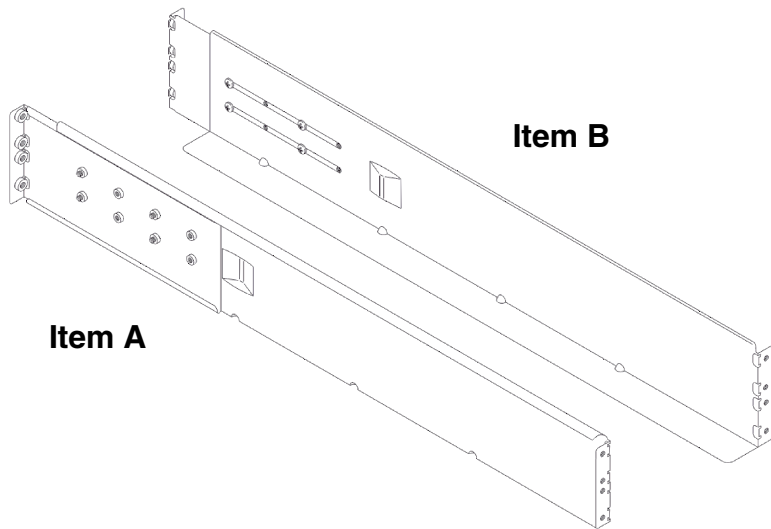
- Torque wrench with #2 Phillips screwdriver tip
- Flathead screwdriver
- Lift tool

### Parts list

The following parts list refers to items illustrated in Figure 3 on page 15

*Table 5. Items supplied with the 14U rack mount kit*

Item	Description	Quantity
For all types of installations		
A	Left rack mount shelf bracket (rail brackets may differ from the illustration)	1
B	Right rack mount shelf bracket (rail brackets may differ from the illustration)	1
C	10-32 x 5/8 inch (1.58 cm) panhead Phillips screw, washer	6
For cabinets that have vertical rails with round holes		
D	10-32 clip nut	6
E	1/4-20 x 1/2 in. (1.27 cm) panhead Phillips screw, with lock washer	16
For cabinets that have vertical rails with square holes		
F	10-32 retainer nut	6
G	1/4-20 x 1/2 in. (1.27 cm) panhead Phillips screw, with glue	16
H	0.375 in. (0.953 cm) alignment washer	16



B7686g027

Figure 3. Parts in the 14U rack mount kit

## Unpacking the SAN768B

To unpack the SAN768B, follow these steps:

1. Cut the bands that encircle the packaging.
2. Remove the lid, the 14U rack mount kit, the accessory kit, and the packing foam from the top of the chassis. Set the kits aside for later use.
3. Lift the cardboard box off the chassis and remove the plastic bag from around the chassis. Save the packing materials if you are returning an old chassis.
4. Leave the chassis on top of the plastic shipping tray if the chassis must be transported to the installation location.

**Note:** The standard packaging does not incorporate a wood pallet and pallet brackets. The chassis sits on top of a plastic shipping tray.

5. Use the lift tool to transport the new chassis to the installation area. Doorways must be wider than 91 cm (36 in.) to accommodate the chassis on the shipping tray.

## Attaching the shelf brackets

Complete the following steps to install the shelf brackets to the cabinet rails:

1. Find the left and right rack mount shelf brackets ( **A** and **B** in Figure 4) in the 14U rack mount kit. These brackets are adjustable to allow for different cabinet depths.
2. Loosen the adjusting screws on both brackets enough to allow the brackets to slide easily to adjust the length.

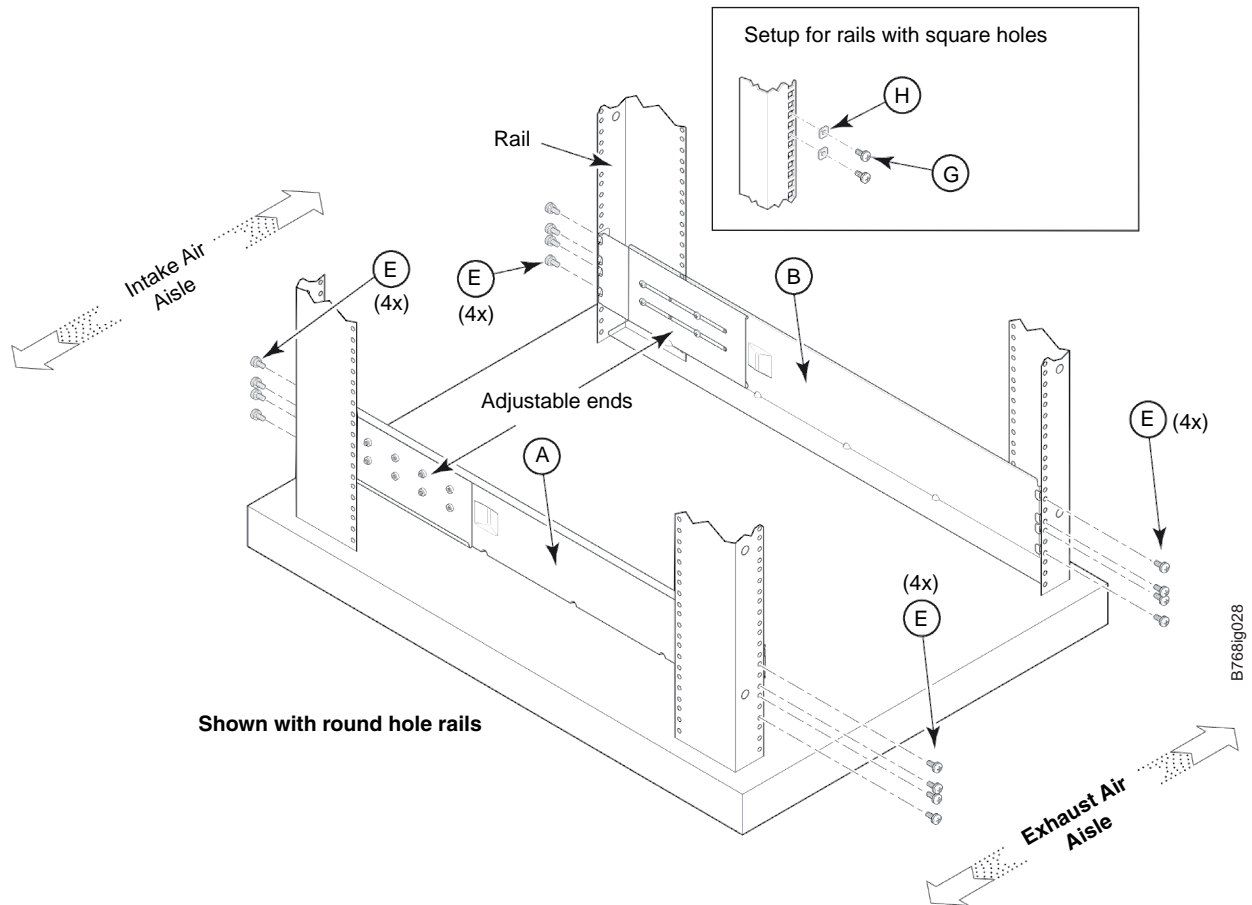


Figure 4. Left and right shelf brackets installed on the cabinet rails

3. Position the shelf brackets ( **A** and **B** ) with the adjustable ends at the intake aisle side of the cabinet (see Figure 4) and attach them to the cabinet rails.
  - For rails with round holes: Use eight screws with lock washers ( **E** ) for each bracket, four at each end. Tighten the screws to a torque of 92 cm·kg (80 in.-lb).
  - For rails with square holes: Use eight screws ( **G** ) eight alignment washers ( **H** ) for each bracket, four at each end. Tighten the screws to a torque of 92 cm·kg (80 in.-lb).

**Note:** Standard EIA rails have holes in sets of three; spaces between the holes are 1.58 cm, 1.58 cm, 1.27 cm (5/8 in., 5/8 in., and 1/2 in.). If cables are to be routed down through the cable management comb, allow at least 1U space below the brackets for cable management.

4. Tighten the adjusting screws on the shelf brackets to a torque of 37 cm·kg (32 in.-lb).

- Attach the clip nuts **D** (for rails with round holes) or retainer nuts **F** (for rails with square holes) to the vertical rails on the exhaust aisle side of the cabinet (see Figure 5). These nuts are used for securing the port side of the chassis to the rack rails using 10-32 x 5/8-inch screws. Use three nuts on each rail. Place the nuts in optimum locations for securing the chassis to the rails. See Figure 6 on page 19 for approximate positions.

**Note:** Do not align the clip or retainer nuts with the top or bottom holes of the SAN768B mounting brackets because the door will interfere with the screw heads.

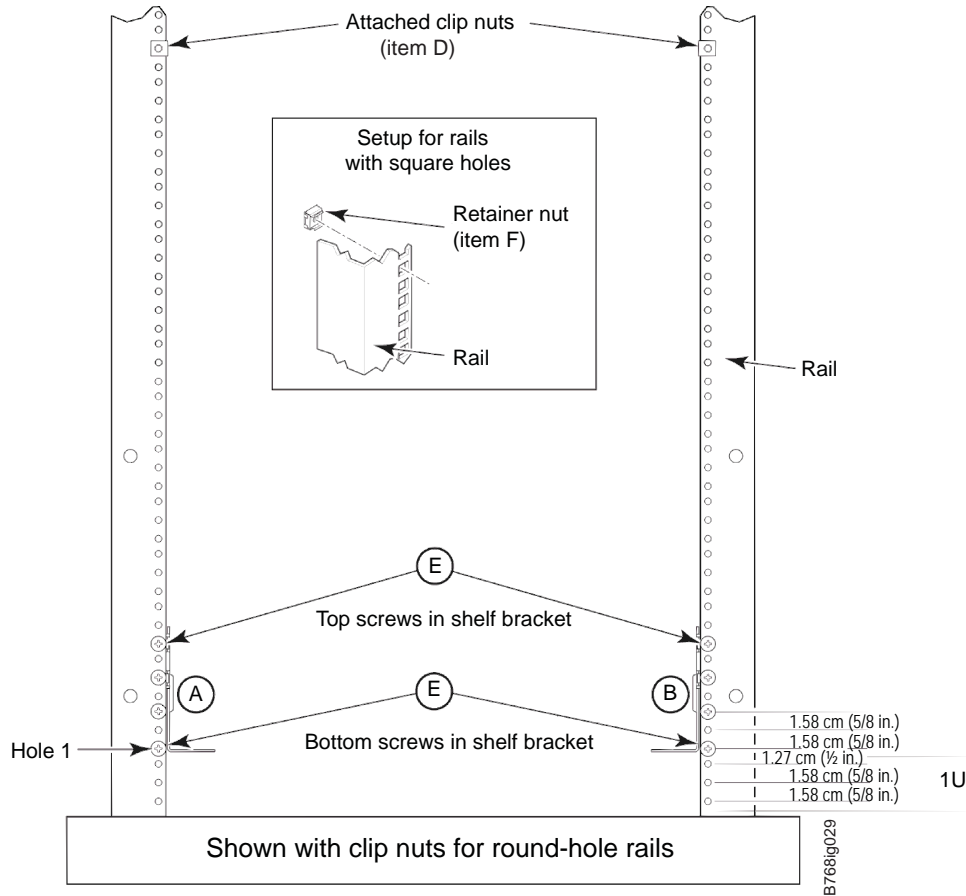


Figure 5. Installing clip or retainer nuts on the vertical cabinet rails

## Removing the chassis door

The chassis door must be removed before the chassis can be installed into the cabinet. The door is not hinged. It is held to the chassis by mounting hardware on the door that snaps onto eight ball studs on the chassis. To remove the door, grip both sides of the door, and gently pull the door straight out until it releases from the ball studs on the chassis.

## Using the lift tool, the 24-inch load plate, and the bridge tool

Step 1 on page 18 through step 9 on page 19 describe how to use the lift tool (PN 09P2481) and the 24-inch load plate (PN 11P4369) to install a SAN768B in the cabinet. Step 10 on page 19 through step 21 on page 21 describe how to install the bridge tool (PN 18P5855) in the cabinet for the lower SAN768B or the upper

SAN768B. This procedure uses parts from the 14U chassis mount kit. See “Items required” on page 84 for a list of these parts.



**CAUTION:**

**A fully populated SAN768B weighs approximately 105 kg (231 lb) and requires a minimum of two people and a lift tool to install it. (C011)**

**Attention:** Before you install it, verify that the additional weight of the chassis does not exceed the cabinet’s weight limits or unbalance the cabinet. When you calculate the additional weight, include the cards or power supplies that partially extend out of the chassis.



**CAUTION:**

**A pinch point exists between the load plate and the bridge tool.**

Perform the following steps to install the SAN768B:

1. Assemble the lift tool if it is not assembled. The assembly and disassembly instructions are included with the lift tool.
2. Attach the 24-inch load plate to the lift tool.
3. Although not required, you can remove the power supplies and blower assemblies from the SAN768B to reduce the weight. This can reduce the weight by up to 27 kg (60 lb).
4. Move the lift tool next to the pallet that contains the SAN768B.
  - a. Adjust the load platform to the same height.
  - b. Slide the SAN768B from the pallet onto the load platform.
  - c. Center the switch on the load platform.
5. Attach the retention straps around the drawer.
6. If the load platform is not at its lowest position, lower the load platform to its lowest position.
7. Move the lift tool to a position near the rear of the cabinet. See Figure 6 on page 19.

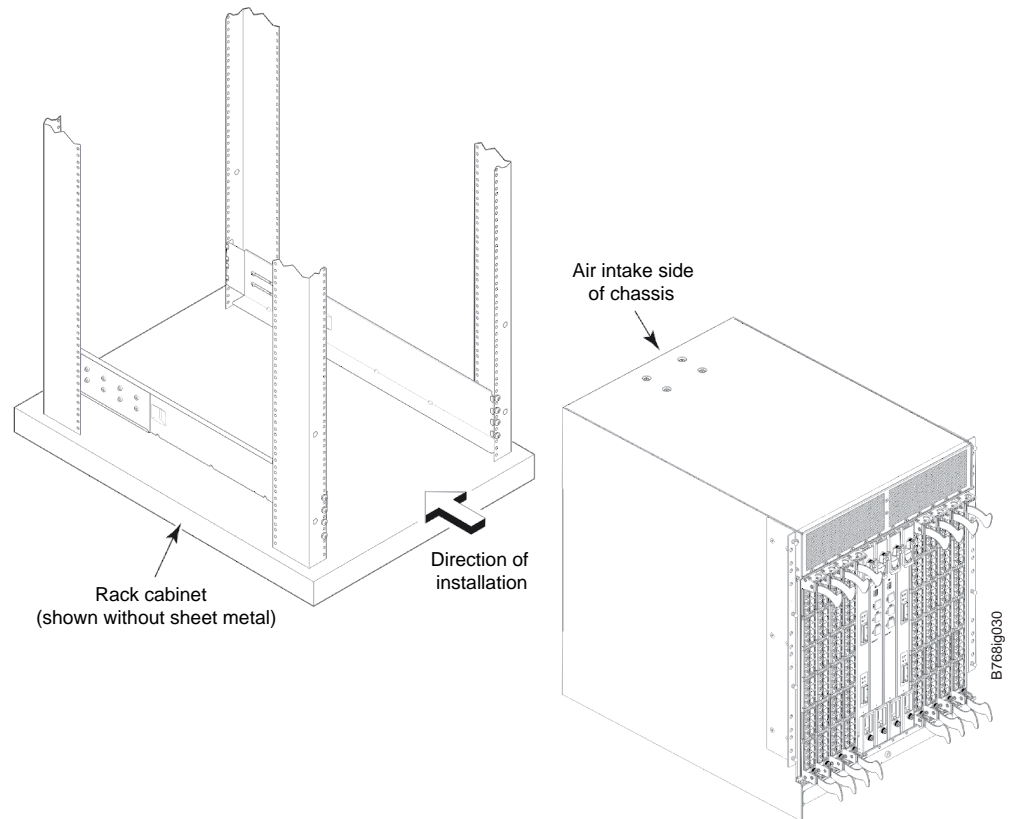


Figure 6. Chassis installation from rear (exhaust aisle side) of the cabinet

**Note:** If you are passing through a narrow passage or door, it might be necessary to rotate the drawer on the load platform.

8. Set the wheel brake by pressing down on the wheel brake pedal.
9. Locate the anti-tips bars. If they are not attached, attach them to the lift tool by performing step 9a through step 9d. If the anti-tip bars were previously attached, go to step 10.
  - a. Pull up on the leg lock pins and insert the anti-tip bars inside the legs.
  - b. Pull on the legs and anti-tip bars to ensure that they are locked into position.
  - c. Raise the platform to allow enough room to attach the anti-tip bracket.
  - d. Secure the anti-tip bars by using the anti-tip bracket and bolt.
10. If you are installing the lower SAN768B, go to step 11. If you are installing the upper SAN768B, go to step 12 on page 20.
11. For the lower SAN768B, install the bridge tool by completing the following steps:
  - a. Remove the bridge tool from the box and adjust the two supports 45°.
  - b. Hold the bridge tool between the two vertical supports near EIA unit 3, and move the two supports another 45°. Make sure that the following conditions are met:
    - The two-pin section of the support is on the back of the vertical support.
    - The one-pin section of the support is on the front of the vertical support.
  - c. Align the two-pin section of the support on the back of the vertical rail with the bottom and middle holes in EIA unit 3.

- d. Align the one-pin section of the support on the front of the vertical rail with the middle hole in EIA unit 1.

**Note:** Tilt the bridge tool towards the back of the cabinet approximately 45° to make it easier to align the two-pin and the one-pin sections with the vertical support.

- e. Lock the shelf into position. See Figure 7.

**Note:** The shelf in the picture below is shown with a different director.



Figure 7. Locking the shelf into position

12. For the upper SAN768B, install the bridge tool by completing the following steps:
  - a. Remove the bridge tool from the box and adjust the two supports 45°.
  - b. Hold the bridge tool between the two vertical supports near EIA unit 20, and move the two supports another 45°. Make sure that the following conditions are met:
    - The two-pin section of the support is on the back of the vertical support.
    - The one-pin section is on the front of the vertical support.
  - Note:** Tilt the bridge tool towards the back of the cabinet approximately 45° to make it easier to align the two-pin and one-pin sections with the vertical support.
  - c. Align the two-pin section of the support on the front of the vertical rail with the bottom hole and the middle hole in EIA unit 20.
  - d. Align the one-pin section of the support on the front of the vertical rail with the middle hole in EIA unit 18.
13. Turn the winch crank counterclockwise, 1/4 turn, to set the winch brake.



14. Set the wheel brake and place the wheel chocks around the wheels.
15. Remove the retention straps.
16. Slide the SAN768B into the cabinet until it rests securely on the shelf brackets.
17. Remove the wheel chocks, release the wheel brake, and move the lift tool away from the cabinet.
18. Uninstall the bridge tool and return it to its original box.
19. Reinstall the power supplies and blower assemblies if any were removed.
20. Fasten the port side of the chassis to the cabinet rails. Use three 10–32 x 5/8-in. Phillips panhead screws with washers **C** on each side to attach to the clip nuts (**D**) or retainer nuts (**F**) installed on the rails earlier. Tighten the screws to a torque of 37 cm·kg (32 in·lb). See Figure 8 for the approximate location of the screws.

**Note:** Do not use the top or bottom holes of the SAN768B mounting brackets because the screw heads will interfere with the chassis door.

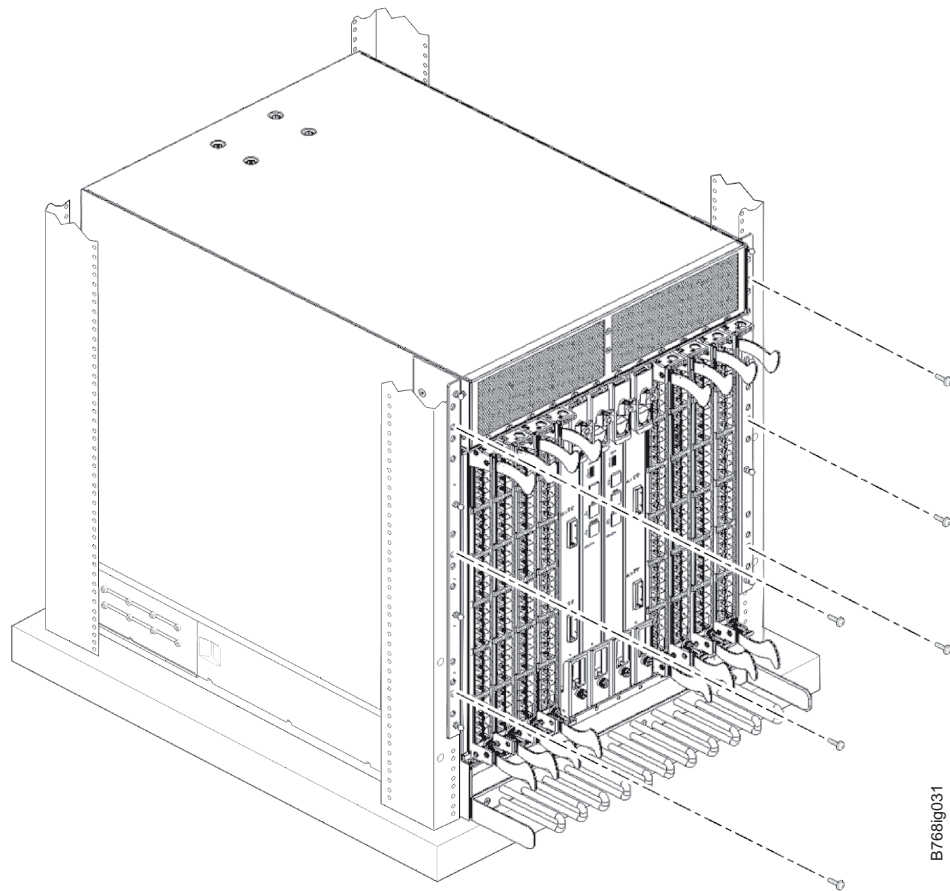


Figure 8. Attaching the port side of the chassis to the cabinet rails

21. Reinstall the chassis door. Align the door with the chassis and push it into place, as shown in Figure 9 on page 22 and Figure 10 on page 22.

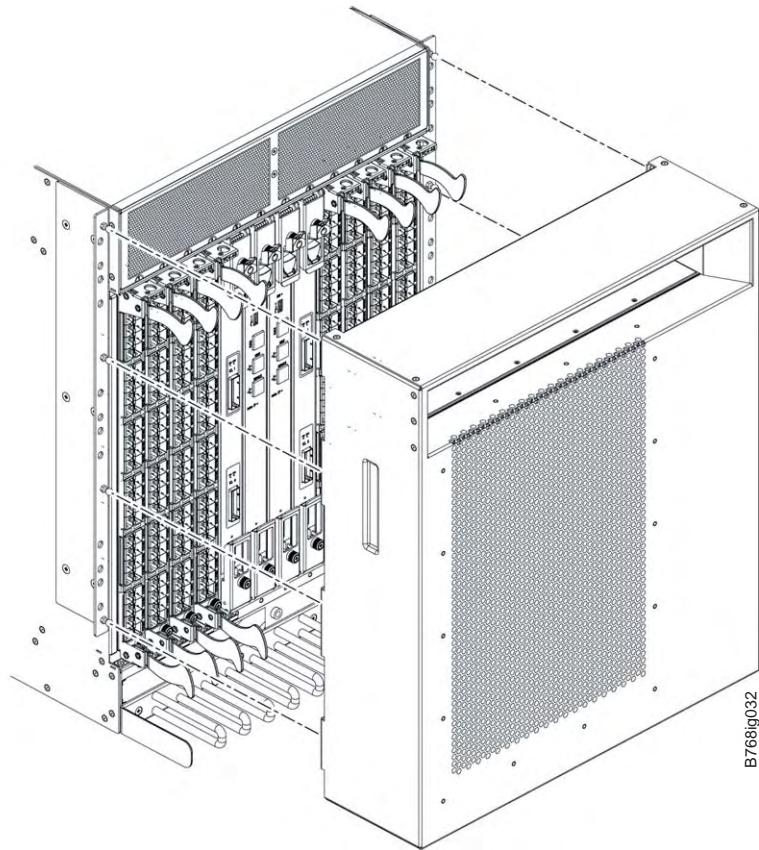


Figure 9. Aligning the chassis door with the ball studs on the chassis

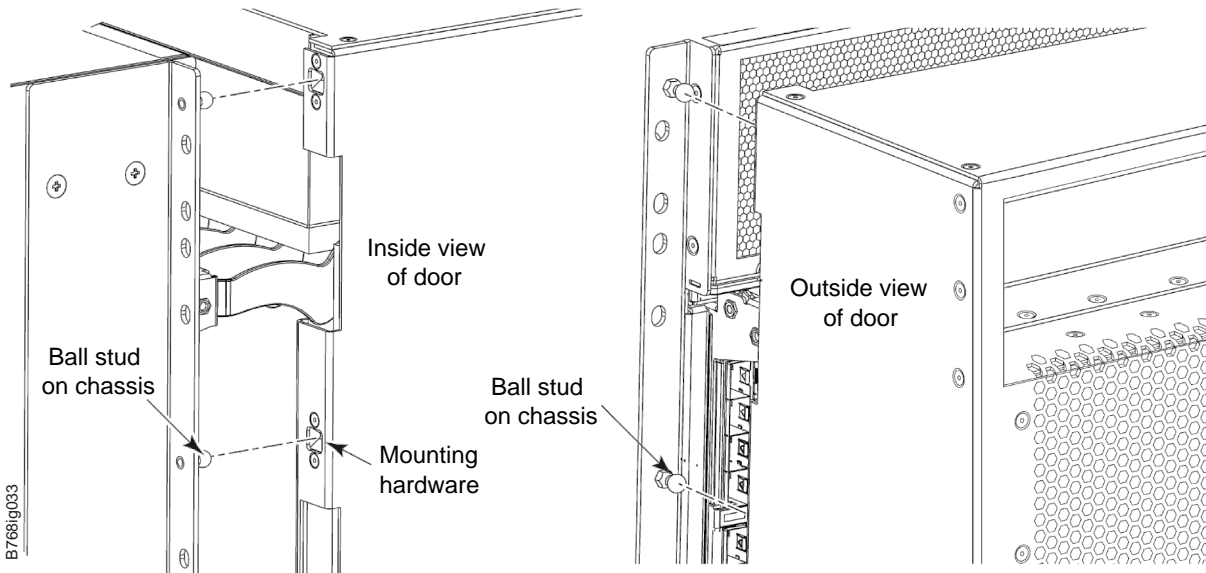


Figure 10. Details of the chassis and door, showing the ball studs on the chassis and the mounting hardware on the door

**Note:** For turning on the power and for the configuration instructions, see Chapter 3, “Starting and configuring the SAN768B,” on page 25.

**Attention:** Do not connect the SAN768B to the network until the IP addresses are correctly set.

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## Removing a SAN768B from the cabinet

Step 1 through step 5 describes how to use the lift tool (PN 09P2481) and the 24-inch load plate (PN 11P4369) to remove a SAN768B from the cabinet. Step 6 through step 17 on page 24 describes how to remove the bridge tool (PN 18P5855) from the cabinet.

Perform the following steps to remove a SAN768B:

1. Assemble the lift tool if it is not assembled. The assembly and disassembly instructions are included with the lift tool.
2. Remove both power cords from the SAN768B.
3. Optionally, remove the power supplies and blower assemblies to reduce the weight.
4. Remove the chassis door from the chassis. See “Removing the chassis door” on page 17.
5. Remove the three 10-32 x 5/8 in. Phillips panhead screws with washers on each side. See Figure 8 on page 21 for the location of the screws.
6. If you are replacing the lower SAN768B, go to step 7. If you are replacing the upper SAN768B, go to step 8.
7. Install the bridge tool by completing the following steps:
  - a. Remove the bridge tool from its box and adjust the two supports 45°.
  - b. Hold the bridge tool between the two vertical supports near EIA unit 3.
  - c. Move the two supports another 45°. Make sure that the following conditions are met:
    - The two-pin section of the support is on the back of the vertical support.
    - The one-pin section of the support is on the front of the vertical support.
  - d. Align the two-pin section of the support on the back of the vertical rail with the bottom and middle holes in EIA unit 3.
  - e. Align the one-pin section of the support on the front of the vertical rail with the middle hole in EIA unit 1.

**Note:** Tilt the bridge tool towards the back of the cabinet approximately 45° to make it easier to align the two-pin and one-pin sections with the vertical support.

- f. Lock the shelf into position.
8. For the upper SAN768B, install the bridge tool by completing the following steps:
  - a. Remove the bridge tool from its box and adjust the two supports 45°.
  - b. Hold the bridge tool between the two vertical supports near EIA unit 20.
  - c. Move the two supports another 45°. Make sure that the following conditions are met:
    - The two-pin section of the support is on the back of the vertical support.
    - The one-pin section of the support is on the front of the vertical support.
  - d. Align the two-pin section of the support on the back of the vertical rail with the bottom and middle holes in EIA unit 20.
  - e. Align the one-pin section of the support on the front of the vertical rail with the middle hole in EIA unit 18.

- f. Lock the shelf into position.
9. Locate the anti-tip bars and if they are not attached, attach them to the lift tool. If anti-tip bars were previously attached, go to step 10.
  - a. Pull up on the leg-lock pins and insert the anti-tip bars inside the legs.
  - b. Pull on the legs and anti-tip bars to ensure that they are locked into position.
  - c. Raise the platform to allow enough room to attach the anti-tip bracket.
  - d. Secure the anti-tip bars with the anti-tip bracket and bolt.
10. Move the lift tool to a position near the rear of the cabinet.
11. Turn the winch crank clockwise to raise the switch. Move the lift tool into position in front of the cabinet while you align the 24-inch load plate with the line on the bridge tool.
12. Turn the winch crank counterclockwise 1/4 turn to set the winch brake.
13. Set the wheel brake. Place the wheel chocks around the wheels.



**CAUTION:**

**A fully populated SAN768B weighs approximately 104 kg (228 lb) and requires a minimum of two people and a lift tool to install it. (C011)**



**CAUTION:**

**A pinch point exists between the load plate and the bridge tool.**

14. Slide the SAN768B from the cabinet onto the 24-inch load plate. Center the SAN768B on the platform.
15. Install the retention straps.
16. Remove the wheel chocks, release the wheel brake, and move the lift tool away from the cabinet.
17. Lower the load platform to its lowest position.
18. Remove the bridge tool.

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## Chapter 3. Starting and configuring the SAN768B

**Attention:** Refer to the latest Fabric OS Release Notes or Interoperability Matrix (see <http://www.ibm.com/servers/storage/support/san>) for information regarding Fabric OS compatibility. This is particularly important for fabrics with 1-Gbps switches using earlier Fabric OS versions.

The SAN768B must be configured before it is connected to the fabric, and all of the configuration commands must be entered through the active CP blade. The SAN768B configuration includes the following parameters:

- IP address and subnet mask for the SAN768B
- IP addresses (or "native" IP address), host names, subnet masks, and gateway addresses for both CP blades
- Switch name
- Domain ID for the SAN768B (optional)
- WWN for the SAN768B

**Note:** The SAN768B WWN is initially set by the factory to match the license ID (which is based on the chassis serial number). The WWN can be changed, but the license ID cannot be modified.

The configuration information is mirrored to the standby CP blade, which allows the most current configuration to remain available even if the active CP blade fails. The configuration information for the SAN768B is stored in the WWN blade and the flash memory of the CP blades. The configuration can be backed up to a workstation (uploaded) and then downloaded to the active CP blade if necessary.

The initial physical hardware installation continues with the following steps:

- "Providing power to the SAN768B" on page 26
- "Establishing a serial connection and logging on to the SAN768B" on page 26
- "Configuring the SAN768B IP addresses" on page 27

The following additional steps are customer responsibilities required for the initial configuration:

1. Establish an Ethernet connection. See "Establish an Ethernet connection" on page 29.
2. Specify a switch name. See "Customize a switch name" on page 30.
3. Specify a domain ID for the SAN768B. See "Set the Domain ID" on page 30.
4. Upgrade the Fabric OS (optional). See the *Fabric OS Administrator's Guide*.
5. Verify the PID mode and connect the SAN768B to the fabric. See "Verifying the PID mode and connecting to the fabric" on page 30.
6. Enable software licenses. See "Enabling software licenses" on page 31.
7. Back up the configuration. See "Backing up the configuration" on page 32.

---

## Providing power to the SAN768B

### DANGER

**Use the supplied power cords. Ensure the facility power receptacle is the correct type, supplies the required voltage, and is properly grounded. (D004)**

To provide power to the SAN768B:

1. Connect the AC power cords to the power supply assemblies. One to four power cords are required depending on electrical service.
2. Connect the power cords to a power source with voltage of 200 to 240 VAC, 47 to 63 Hz (normally two power cords).
3. Turn the AC power switches on the power supplies to ON (I). The AC power switches light green when switched on and power is supplied.
4. The SAN768B performs a power-on self-test (POST) each time it is powered on. POST takes approximately 10 minutes and is complete when indicator light activity indicates the operational state. For information about LED patterns, see Chapter 4, "Monitoring system components," on page 33.

You can bypass POST by using the **fastBoot** command. You can also disable POST for successive reboots on the SAN768B using the **diagDisablePost** command.

**Attention:** To prevent a potential IP address conflict, do not connect the SAN768B to the network until the IP addresses are configured.

**Note:** To power off the SAN768B, see "Powering off the SAN768B" on page 109.

---

## Establishing a serial connection and logging on to the SAN768B

**Note:** The preferred method of establishing a connection to the SAN768B is via the serial port. However, if a serial connection is not possible (for example, if a serial cable is not available), then an Ethernet connection can be established using an Ethernet crossover cable. To establish an Ethernet connection, you must know the IP address of the control processor.

To establish a serial connection and log on to the SAN768B:

1. Verify that the SAN768B is powered on and that POST is complete by verifying that all power LED indicators on the port, control processor, and core switch blades display a steady green light.
2. Remove the shipping cap from the SERVICE port on the active CP. The active CP blade is indicated by an illuminated (blue) LED. Use the serial cable provided with the SAN768B to connect the SERVICE port on the active CP to a computer workstation.

**Attention:** The SERVICE port is intended primarily for the initial setting of the IP address and for service purposes.
3. Access the SAN768B using a terminal emulator application (such as HyperTerminal in a Windows® environment or TERM in a UNIX® environment).
4. Disable any serial communication programs running on the workstation (such as synchronization programs).
5. Open the terminal emulator application and configure as follows:

- For most Microsoft® Windows systems, use the configuration parameters shown in Table 6.

Table 6. Configuration parameters

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

- For most UNIX systems, type the string at the prompt:

```
tip /dev/ttyb -9600
```

When the terminal emulator application stops reporting information, press Enter. You will receive the following login prompt:

CP0 Console Login:

6. Log in to the SAN768B as admin. The default password is “password.” At the initial login, the user is prompted to enter new admin and user passwords. Make sure to write down the new passwords and keep this information in a secure location.

Table 7. Example login without changing the password

```
Fabric OS (swDir)

swDir login: admin
Password:
Please change your passwords now.
Use Control-C to exit or press 'Enter' key to proceed.

Password was not changed. Will prompt again at next login
until password is changed.
swDir:admin>
```

7. (Optional) Modify passwords. Passwords can be 8 to 40 characters long. They must begin with an alphabetic character. They can include numeric characters, the dot (.), and the underscore (\_). Passwords are case-sensitive, and they are not displayed when you enter them on the command line. To skip modifying the password, press Ctrl-C. For more information on passwords, refer to the *Fabric OS Administrator's Guide*.

---

## Configuring the SAN768B IP addresses

The SAN768B requires three IP addresses; one for the single logical switch in the SAN768B chassis (shown as SWITCH in the **ipAddrShow** command), and one for each of the CP blades (CP0 and CP1). These IP addresses are set using the **ipAddrSet** command through the serial or Ethernet connection to the active CP blade.

### Notes:

1. The default IP addresses and host names for the SAN768B are as follows:
  - 10.77.77.75 for CP0 (the CP blade in slot 6 at the time of configuration)
  - 10.77.77.74 for CP1 (the CP blade in slot 7 at the time of configuration)

2. The default password is "password."

**Attention:** Resetting an IP address while the SAN768B has active IP traffic such as Fabric Manager, Fabric Watch, SNMP, or other applications can cause traffic to be interrupted or stopped. Changing the IP address causes a domain address format RSCN to be issued.

Follow these steps to configure the IP addresses for both CP blades (from the active CP blade):

1. Log in to the active CP as admin using the serial or Ethernet connection.
2. Set up the SAN768B IP address by entering the **ipaddrset -sw 0** command at the prompt.

```
swDir:admin> ipAddrSet -sw 0
```

Enter the requested information at the prompts. Specify the **-sw 0** IP address. There is no **-sw 1** IP address.

**Note:** The addresses 10.0.0.0 through 10.0.0.255 are reserved and used internally by the SAN768B. External IPs cannot use these addresses either.

3. Set up the CP0 blade IP address by entering the **ipaddrset -cp 0** command at the prompt.

```
swDir:admin> ipAddrSet -cp 0
```

Enter the requested information at the prompts.

4. Set up the CP1 blade IP address by entering the **ipaddrset -cp 1** command at the prompt.

```
swDir:admin> ipAddrSet -cp 1
```

Enter the requested information at the prompts.

The following is a sample IP configuration for the SAN768B (sw -0) and the two CP blades (cp0 and cp1).



```

swDir:admin> ipaddrset -sw 0
Ethernet IP Address [0.0.0.0]: 123.123.123.120
Ethernet Subnetmask [0.0.0.0]: 123.123.123.123
Fibre Channel IP Address [0.0.0.0]:
Fibre Channel Subnetmask [0.0.0.0]:
Issuing gratuitous ARP...Done.
Committing configuration...Done.
swDir:admin> ipaddrset -cp 0
Host Name [cp0]:
Ethernet IP Address [10.77.77.75]: 123.123.123.121
Ethernet Subnetmask [0.0.0.0]: 123.123.123.123
Gateway IP Address [0.0.0.0]: 123.123.123.124
IP address is being changed...Done.
Committing configuration...Done.
swDir:admin> ipaddrset -cp 1
Host Name [cp1]:
Ethernet IP Address [10.77.77.74]: 123.123.123.122
Ethernet Subnetmask [0.0.0.0]: 123.123.123.123
Gateway IP Address [0.0.0.0]: 123.123.123.124
IP address of remote CP is being changed...Done.
Committing configuration...Done.
swDir:admin> reboot

```

5. Reboot the SAN768B by typing **reboot** at the prompt.

The serial port can be used to monitor error messages through a serial connection. It is not recommended as a command interface during normal operations. If this port is not going to be in ongoing use, remove the serial cable and protect the port from dust by replacing the shipping cap.

---

## Establish an Ethernet connection

After using a serial connection to configure the IP addresses for the SAN768B, you can connect the active CP blade to the local area network (LAN) if desired.

**Note:** Connecting the CP blades to a private network/VLAN is recommended.

By establishing an Ethernet connection, you can complete the SAN768B configuration using either the serial session or a Telnet session, or through the graphical management interfaces: Web Tools and Fabric Manager. However, you must ensure that the SAN768B is not modified from other connections at the same time.

To establish an Ethernet connection to the SAN768B, follow these steps:

1. Remove the shipping plug from the Ethernet port on the active CP blade.
2. Insert one end of an Ethernet cable into the Ethernet port.
3. Connect the other end to an Ethernet 10/100 Base-T LAN.

The SAN768B can now be accessed by remote connection using any of the available management tools, such as Telnet, Web Tools, or Fabric Manager.

4. To complete any additional SAN768B configuration procedures through a Telnet session, log in to the SAN768B by Telnet, using the admin login. The default password is password.

---

## Customize a switch name

The *switch* name of the SAN768B can be up to 15 characters long; can include alpha, numeric, and underscore characters; and must begin with an alpha character.

**Note:** Changing the name causes a domain address format RSCN to be issued.

To customize the name, follow these steps:

1. Enter the **switchName** command with the new name in quotes.

```
swDir:admin> switchName "swDirector5"  
Committing configuration...  
Done.  
swDirector5:admin
```

2. Record the new name for future reference.

---

## Set the Domain ID

Each switch in the fabric must have a unique Domain ID. The Domain ID can be set using the **configure** command. You can also allow the Domain ID to be automatically set. The default Domain ID for the SAN768B is "1".

To set the Domain ID, follow these steps:

1. Enter the **fabricshow** command to determine the already assigned Domain IDs.
2. Enter the **switchdisable** command to disable the SAN768B.
3. Enter the **configure** command.
4. Enter **y** at the "Fabric parameters" prompt:

```
Fabric parameters (yes, y, no, n): [no] y
```

5. Enter a unique Domain ID:

```
Domain: (1..239) [1] 3
```

6. Complete the remaining prompts or press **Ctrl+D** to accept the other settings and to exit.
7. Enter the **switchEnable** command to reenable the SAN768B.

---

## Verifying the PID mode and connecting to the fabric

Before connecting the SAN768B to the fabric, verify that the port identifier (PID) mode on the SAN768B matches the other switches in the fabric. This parameter must be set identically on all switches in the fabric. This parameter is set using the **configure** command.

For information on PID mode, refer to the *Fabric OS Administrator's Guide*. Before starting, also refer to "Managing cables" on page 9 for more information on how to organize and route cables to minimize potential problems with large numbers of fiber optic cables.

To connect the SAN768B to the fabric, follow these steps:

1. Add SFP transceivers and cables to the fibre channel ports, as required.

The ports are color-coded to indicate which ones can be used in the same port group for trunking. Trunking port groups can be up to eight ports. Trunk groups

are displayed by shaded or nonshaded ports. The ports and cables used in trunking groups must meet specific requirements.

For a list of these requirements, refer to the *Fabric OS Administrator's Guide*.

2. Position one of the SFP transceivers so that the key is oriented correctly to the port. Insert the transceiver into the port until it is firmly seated and the latching mechanism clicks.

Transceivers are keyed so that they can only be inserted with the correct orientation. If a transceiver does not slide in easily, ensure that it is correctly oriented. For instructions that are specific to the transceiver model, refer to the transceiver manufacturer's documentation.

3. Position a cable so that the key (the ridge on one side of the cable connector) is aligned with the slot in the transceiver; then, insert the cable into the transceiver until the latching mechanism clicks.

Cables are keyed so that they can only be inserted with the correct orientation. If a cable does not slide in easily, ensure that it is correctly oriented.

4. Repeat step 1 on page 30 through step 3 for the remaining ports.
5. Organize the cables as required. For recommendations regarding cable management, refer to "Managing cables" on page 9.
6. Verify the SAN768B for switch and port status by entering the **switchshow** command.

The **switchshow** command provides detailed information about the SAN768B.

7. Verify fabric connectivity by entering the **fabricshow** command.

The **fabricshow** command provides general information about the fabric.

---

## Enabling software licenses

To determine which licenses are currently enabled, enter the **licenseShow** command.

*Table 8. Example of viewing enabled licenses*

```
swDir:admin> licenseshow
AAbbccDDeeFFeeGG:
    Web license
    Zoning license
    Extended Fabric license
    Fabric Watch license
    Performance Monitor license
    Trunking license
    Security license
```

In the example above, the license key is AAbbccDDeeFFeeGG. Make sure you keep a hardcopy of your license key in a secure location for emergency reference.

The 64-bit chassis ID is required to obtain and activate licenses for the SAN768B. The chassis ID is available through the **licenseldShow** command.

Both the **licenseShow** and **licenseldShow** commands must be entered through the active CP blade.

For information about activating licenses, refer to the *Fabric OS Administrator's Guide*.

---

## Backing up the configuration

Save all key configuration data for the SAN768B, including license key information, and upload it to a host for emergency reference. Routine backups of the configuration are recommended to ensure the current configuration is available if needed.

After all zoning configurations and other changes are complete, back up the configuration by entering the **configUpload** command at the prompt.

The **configUpload** command uploads the SAN768B configuration to the server so that it is available for downloading to a replacement SAN768B, if necessary.

An easy way to backup configuration information is to enable logging on your Telnet session and then running the following commands and saving the output in a file on a secure host. Once you enable logging, run the following commands:

- **configShow**
- **ipAddrShow**
- **licenseShow**
- **switchShow**

Keep hardcopy versions of key data such as passwords, license keys, and IP addresses. This is sensitive information and should be kept in a secure location.

**Note:** Passwords are not saved in the configuration file, and are not uploaded during a **configUpload**. Password information should be saved in hardcopy in a secure location for emergency reference, subject to your security and password management policy.

---

## Chapter 4. Monitoring system components

The SAN768B is engineered for reliability and requires no routine operational steps or maintenance. This chapter provides information about determining the status of the following components using LEDs and CLI commands.

- “Control processor blade (CP8)”
- “Core switch blade (CR8)” on page 35
- “FR4-18i router blade” on page 37
- “Port or application blades” on page 40
- “Power supply” on page 45
- “Blower assembly” on page 46
- “WWN bezel and WWN card” on page 48

Refer to the *Web Tools Administrator's Guide* and the *Fabric OS Administrator's Guide* for additional information.

---

### Control processor blade (CP8)

To determine the status of a CP blade:

1. Check the LED indicators on the CP blade (see Figure 11 on page 34). The LED patterns may temporarily change during POST and other diagnostic tests. For information about how to interpret the LED patterns, see Table 9 on page 34.
2. Check port blade status by typing **slotShow** and **haShow**.

Figure 11 on page 34 identifies the control processor blade (CP8).

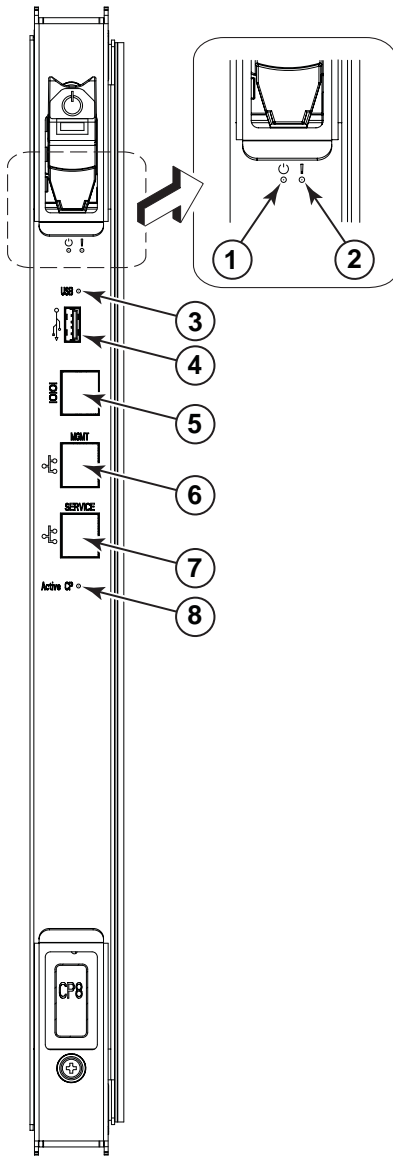


Figure 11. Control processor blade (CP8) LEDs

- |          |            |          |                         |
|----------|------------|----------|-------------------------|
| <b>1</b> | Status LED | <b>5</b> | Console port (10101)    |
| <b>2</b> | Power LED  | <b>6</b> | Ethernet port (MGMT)    |
| <b>3</b> | USB LED    | <b>7</b> | Ethernet port (SERVICE) |
| <b>4</b> | USB port   | <b>8</b> | Active CP LED           |

Table 9. CP blade LED descriptions

LED purpose	Color	Status	Recommended Action
Power	Steady green	CP blade has valid power.	No action required.
	No light (LED is off)	CP blade does not have incoming power.	Ensure blade is firmly seated and has power.

Table 9. CP blade LED descriptions (continued)

LED purpose	Color	Status	Recommended Action
Status	No light (LED is off)	CP blade is either healthy or does not have power.	Verify that the power LED is on.
	Steady amber	CP blade is faulty or the switch is still booting.	Ensure blade is firmly seated and switch has completed booting. If LED remains yellow, contact IBM.
	Slow-flashing amber (on 2 seconds; then off 2 seconds)	CP blade is not seated correctly or is faulty.	Pull blade out and reseal it. If LED continues to flash, replace blade.
	Fast-flashing amber (on 1/2 second; then off 1/2 second)	Environmental range exceeded.	Check for out-of-bounds environmental condition and correct it.
Ethernet Link Status	No light (LED is off)	Either an Ethernet link is not detected, or it does not have incoming power.	Ensure the blade has power, Ethernet cable is firmly seated, and connected device is functioning.
	Flickering green/amber	Ethernet link is healthy and traffic is flowing through port.	No action required.
Ethernet Link Speed	No light (LED is off)	Ethernet link speed is 10 Mb/s or CP blade does not have incoming power.	Ensure CP has power. <b>Note:</b> To force a persistent Ethernet link speed, type the <b>ifModeSet</b> command.
	Steady green	Ethernet link speed is 100/1000 Mb/s.	No action required.
Active CP	Steady blue	Active CP blade.	No action required.
	No light (LED is off)	Standby CP blade.	No action required.

## Core switch blade (CR8)

To determine the status of a CR blade:

1. Check the LED indicators on the core switch blade (Figure 12 on page 36). The LED patterns may temporarily change during POST and other diagnostic tests; for information about how to interpret the LED patterns, see Table 10 on page 36.
2. Check core switch blade status by typing **slotShow** and **haShow**.

Figure 12 on page 36 identifies the core switch blade.

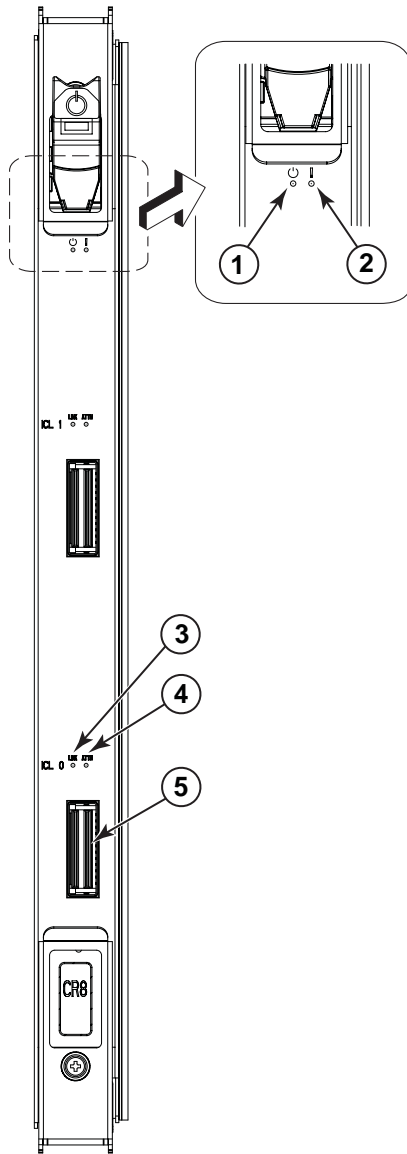


Figure 12. Core switch blade (CR8) LEDs

- |          |            |          |               |
|----------|------------|----------|---------------|
| <b>1</b> | Status LED | <b>4</b> | ATTN LED      |
| <b>2</b> | Power LED  | <b>5</b> | ICL Connector |
| <b>3</b> | LINK LED   |          |               |

Table 10. CR blade LED descriptions

LED purpose	Color	Status	Recommended Action
Power	Steady green	CP blade has valid power.	No action required.
	No light (LED is off)	CP blade does not have incoming power.	Ensure blade is firmly seated and has power.



Table 10. CR blade LED descriptions (continued)

LED purpose	Color	Status	Recommended Action
Status	No light (LED is off)	CP blade is either healthy or does not have power.	Verify that the power LED is on.
	Steady amber	CP blade is faulty or the switch is still booting.	Ensure blade is firmly seated and switch has completed booting. If LED remains yellow, contact IBM..
	Slow-flashing amber (on 2 seconds; then off 2 seconds)	CP blade is not seated correctly or is faulty.	Pull blade out and reset it. If LED continues to flash, replace blade.
	Fast-flashing amber (on 1/2 second; then off 1/2 second)	Environmental range exceeded.	Check for out-of-bounds environmental condition and correct it.
LINK LED	No light (LED is off)	No ICL or ICL cable present, but no connection.	Ensure ICL cable is correctly installed.
	Steady green	ICL connected	No action required.
ATTN LED	No light (LED is off)	No ICL	No action required.
	Blinking amber	Attention required	Ensure ICL cable is correctly installed.

## FR4-18i router blade

Power on the router blade by setting the slider switch at the top of the blade to the On position (see Figure 13 on page 38). If the router blade is operational, powering off the blade is disruptive to traffic across the blade.

**Attention:** All ports on the router blades are by default, persistently disabled to avoid unintentional merging of fabrics. Before you can successfully configure FCIP tunnels, you must enable the ports. When the blade is first powered up, all port status LEDs will continue to flash amber. This is normal. Use the **portCfgShow** command to view the status of the ports. Use the **portCfgPersistentEnable** command to enable a port. Refer to the *Brocade Fabric OS Administrator's Guide* and the *Brocade Fabric OS Command Reference Manual* for more information on these commands.

Perform the following to determine the status of a FR4-18i router blade:

1. The FR4-18i router blade must be installed in a SAN768B in order to be powered on.
2. Power is supplied to the blade once it is installed in the SAN768B and the power switch on the blade is moved to the On position. The router blade runs POST by default each time it is powered on. It typically requires from 1 to 3 minutes to boot and complete POST.
3. Log in to the SAN768B as admin and run the **slotShow** command. The status of the FR4-18i blade is displayed in the output.

4. Run the **errShow** command to determine if any errors detected during POST are written to the system log. For information about this command, see the *Fabric OS Command Reference Manual*. For information about specific error messages, see the *Fabric OS System Error Message Reference Manual*.
5. Check the LED indicators on the power supply (see Figure 13.) The LED patterns may temporarily change during POST and other diagnostic tests; for information about how to interpret the LED patterns and verify that all components are healthy, refer to Table 11 on page 39.
6. If any of the LEDs appear to indicate a problem, verify that the LEDs are not set to "beacon" (this can be determined through the **switchShow** command or Web Tools). For information about how to turn beaconing on and off, see the *Brocade Fabric OS Administrator's Guide* or the *Brocade Web Tools Administrator's Guide*. Follow the recommended action for the observed LED behavior, as listed in Table 11 on page 39.

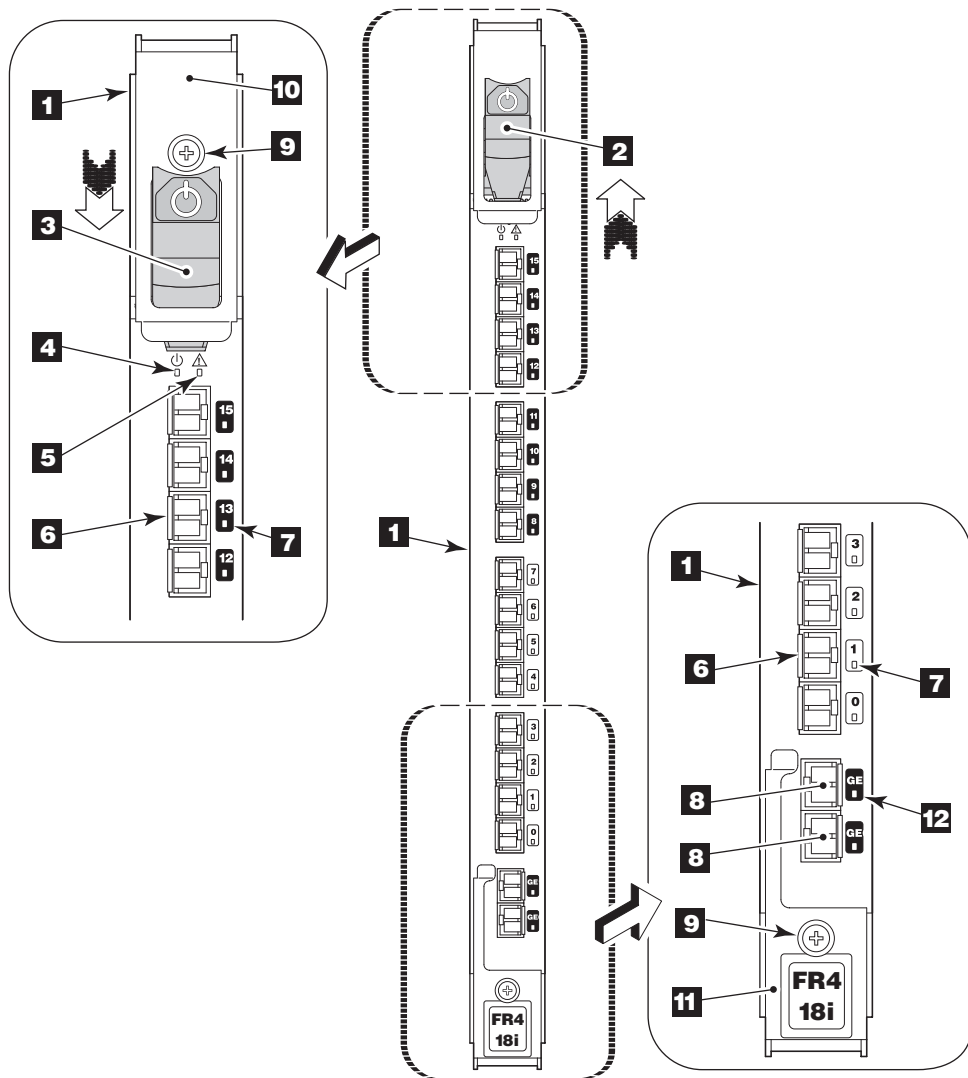


Figure 13. FR4-18i router blade

**1** FR4-18i router blade

**7** Fiber Channel port status LED

- |          |                                 |           |                     |
|----------|---------------------------------|-----------|---------------------|
| <b>2</b> | On/Off switch (in On position)  | <b>8</b>  | GbE ports (x2)      |
| <b>3</b> | On/Off switch (in Off position) | <b>9</b>  | Thumb screw         |
| <b>4</b> | Power LED                       | <b>10</b> | Upper ejector       |
| <b>5</b> | Status LED                      | <b>11</b> | Lower ejector       |
| <b>6</b> | Fibre Channel port (16)         | <b>12</b> | GbE Port Status LED |

Table 11 describes the FR4-18i router blade LED patterns. It lists the name, reference number, and possible colors of each LED. It also lists the status of the component that is associated with each LED color and action that you can take in response to that status.

Table 11. FR4-18i router blade LED patterns during normal operation

LED name, location	Color of LED	Status of hardware	Action
Power LED <b>4</b>	No light	Blade does not have incoming power.	Perform the following steps: <ul style="list-style-type: none"> <li>Verify that the SAN768B is operational.</li> <li>Verify that the router blade is seated correctly.</li> <li>Verify that the power slider switch is in the up position.</li> <li>Verify that all power supplies are operational.</li> </ul> If the unit still does not power up, the unit may be faulty. Contact IBM.
	Steady green	Blade has valid power.	No action required
Status LED <b>5</b>	No light	Blade is either functioning correctly or does not have power.	Verify that the power status LED is green
	Steady amber (for more than five seconds)	Boot failed, the blade is faulty. The blade displays a steady amber during boot or POST, this is normal and does not indicate a fault.	Perform the following steps: <ul style="list-style-type: none"> <li>Reboot the blade.</li> <li>Check the error logs for information on the failure.</li> <li>Contact IBM, if necessary.</li> </ul>
	Slow-flashing amber (on 2 seconds; then off 2 seconds)	Attention is required. The Blade is not seated correctly or is faulty.	Perform the following steps: <ul style="list-style-type: none"> <li>Check the error log for details on the cause of the status.</li> <li>Pull the blade out and reseal it.</li> </ul> If the LED continues to flash, contact IBM.
	Fast-flashing amber (on 1/2 second; then off 1/2 second)	Attention is required. Environmental range exceeded.	Perform the following steps: <ul style="list-style-type: none"> <li>Check the error log for details on the cause of the status.</li> <li>Check for out-of-bounds environmental condition and correct it.</li> </ul> If the LED continues to flash, contact IBM.

Table 11. FR4-18i router blade LED patterns during normal operation (continued)

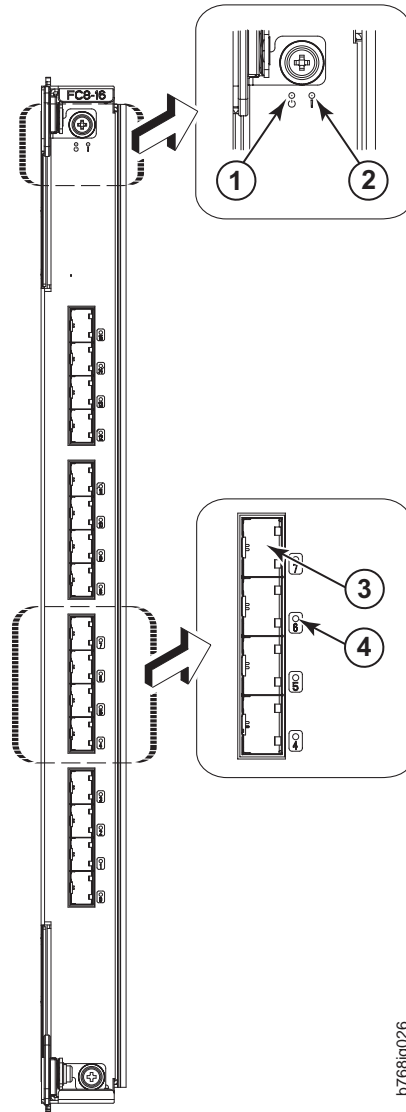
LED name, location	Color of LED	Status of hardware	Action
Fiber Status Channel Port Status <b>7</b> GbE Port Status LEDs <b>12</b>	No light	Indicates one of the following: <ul style="list-style-type: none"> <li>No signal or light carrier (media or cable) detected.</li> <li>Blade may be currently initializing.</li> <li>Connected device is configured in an offline state.</li> </ul>	Perform the following steps: <ul style="list-style-type: none"> <li>Verify the power LED is on, and check the SFP and cable.</li> <li>Verify the blade is not currently being initialized.</li> <li>Verify the status of the connected device.</li> </ul>
	Steady green	Port is online (connected to external device) but has no traffic.	No action required.
	Slow-flashing green (on 1 second; then off 1 second)	Port is online but segmented because of a loopback cable or incompatible switch connection.	Verify that the correct device is attached to the blade.
	Fast-flashing green (on 1/4 second; then off 1/4 second)	Port is online and an internal loopback diagnostic test is running.	No action required.
	Flickering green	Port is online and frames are flowing through the port.	No action required.
	Steady amber	Port is receiving light or signal carrier, but it is not online yet.	No action required.
	Slow-flashing amber (on 2 seconds; then off 2 seconds)	Port is disabled because of diagnostics or the <b>portDisable</b> or <b>portCfgPersistentDisable</b> commands.	Reset the port. <b>Note:</b> The <b>portCfgPersistentDisable</b> command is persistent across reboots in the Fabric OS v6.0.0.
	Fast-flashing amber (on 1/2 second; then off 1/2 second)	SFP or port is faulty.	Perform the following steps: <ul style="list-style-type: none"> <li>Replace the SFP</li> <li>Reset the port.</li> </ul>

## Port or application blades

To determine the status of a port or application blade:

- Check the LEDs on the blade.
  - Figure 14 on page 41 illustrates the FC8-16 port blade.
  - Figure 15 on page 42 illustrates the FC8-32 port blade.
  - Figure 16 on page 43 illustrates the FC8-48 port blade.
  - Figure 17 on page 44 illustrates the FC10-6 port blade.
  - Figure 13 on page 38 illustrates the FR4-18i routing blade.
- The LED patterns may temporarily change during POST and other diagnostic tests. For information about how to interpret the LED patterns, see Table 12 on page 45.
- Check the blade status by typing **slotShow**.

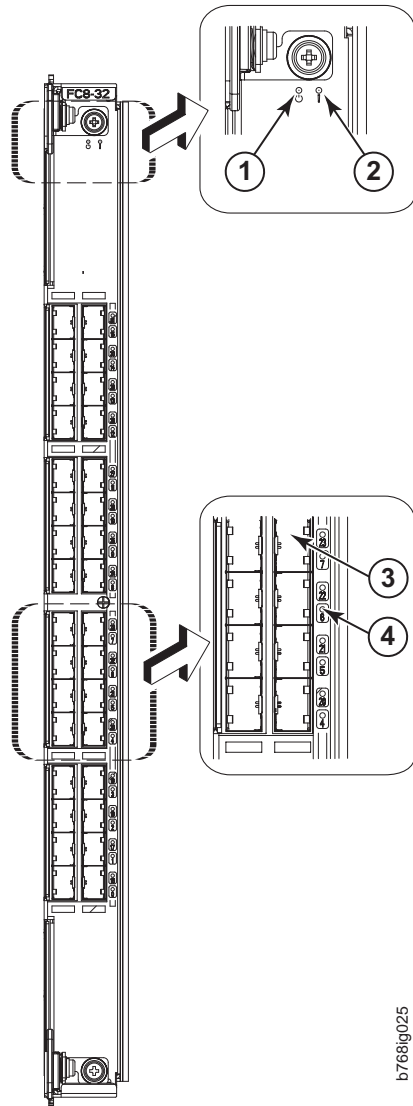
Table 12 on page 45 describes the port and routing blade LED patterns and the recommended actions for those patterns.



b7681g026

- |          |            |          |                    |
|----------|------------|----------|--------------------|
| <b>1</b> | Power LED  | <b>3</b> | Fibre Channel port |
| <b>2</b> | Status LED | <b>4</b> | Port Status LED    |

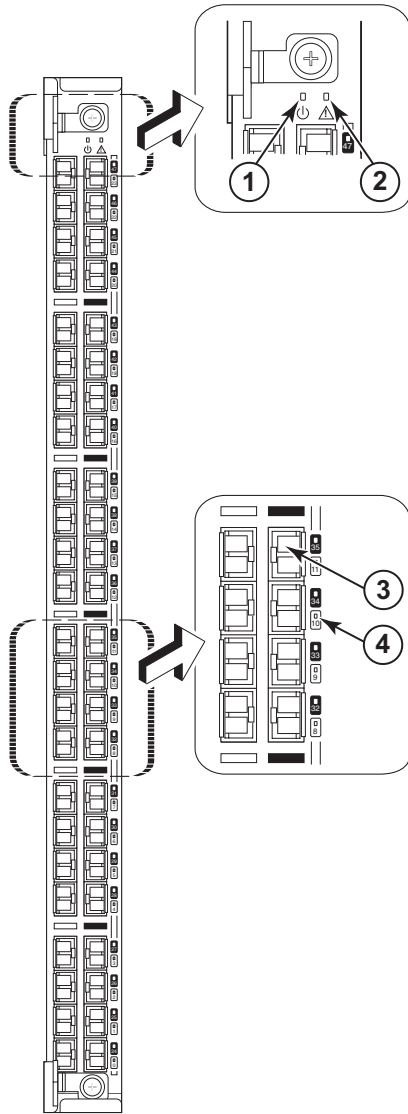
Figure 14. FC8-16 port blade



b768ig025

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li><b>1</b> Power LED</li> <li><b>2</b> Status LED</li> </ul> | <ul style="list-style-type: none"> <li><b>3</b> Fibre Channel port</li> <li><b>4</b> Port Status LED</li> </ul> |
|---|---|

Figure 15. FC8-32 port blade



b768ig024

- 1** Power LED
- 2** Status LED

- 3** Fibre Channel port
- 4** Port Status LED

Figure 16. FC8-48 port blade

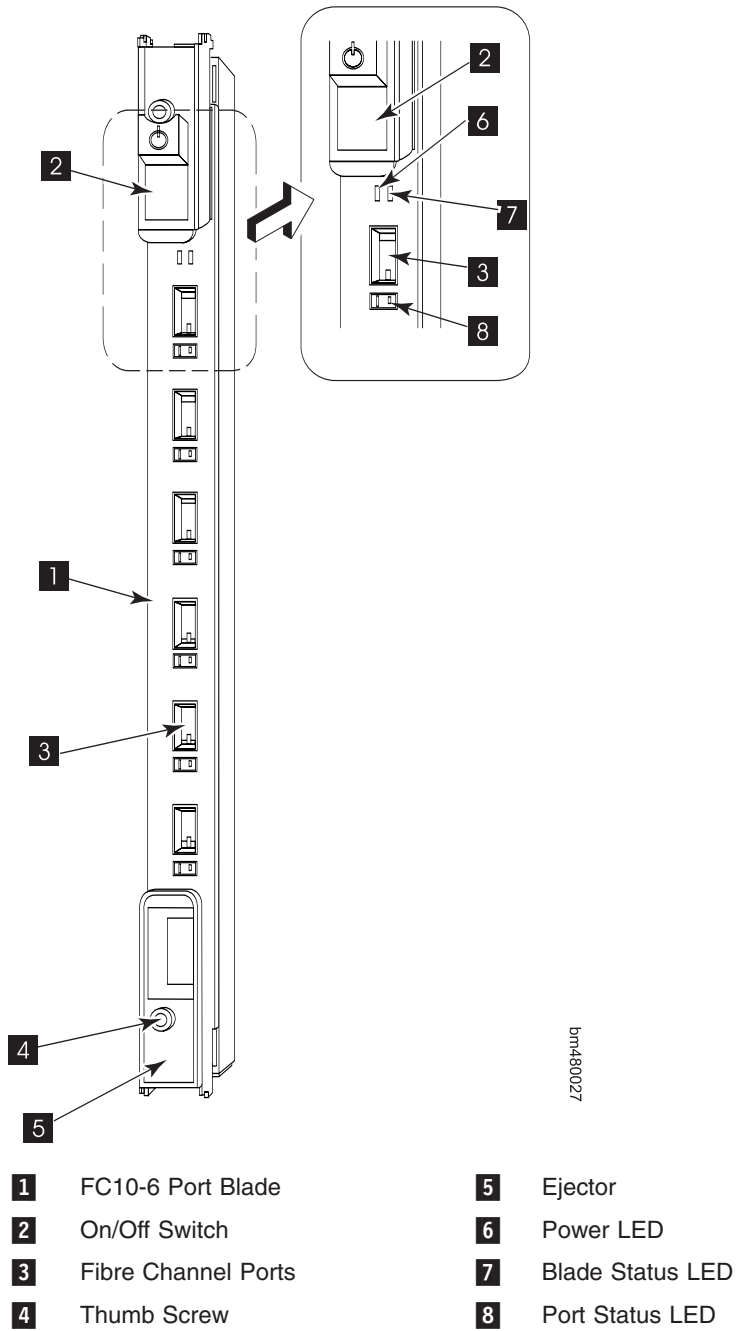


Figure 17. FC10-6 port blade



Table 12. Port and application blade LED descriptions

LED purpose	Color	Status	Recommended Action
Power LED	Steady green	Blade has been enabled.	No action required.
	No light (LED is off)	Blade has not been enabled.	Ensure blade is firmly seated.
Status LED	No light (LED is off)	Blade is either healthy or does not have power.	Verify that the power LED is on.
	Steady amber	Blade is faulty.	Ensure blade is firmly seated and check status with <b>slotShow</b> command. If LED remains amber, contact IBM.
	Slow-flashing amber (on 2 seconds, then off 2 seconds)	Blade is not seated correctly or is faulty.	Pull blade out and reseal it. If LED continues to flash, replace blade.
	Fast-flashing amber (on 1/2 second, then off 1/2 second)	Environmental range exceeded.	Check for out-of-bounds environmental condition and correct it.
Port Status	No light (LED is off)	Port has no incoming power, or there is no light or signal carrier detected.	Verify that the power LED is on, check the transceiver and cable.
		Polling is in progress.	Allow 60 seconds for polling to complete.
		Connected device is configured in an offline state.	Verify the status of the connected device.
	Steady green	Port is online (connected to an external device) but has no traffic.	No action required.
	Slow-flashing green (on 1 second, then off 1 second)	Port is online but segmented, indicating a loopback plug or cable or an incompatible switch.	Verify that the correct device is attached to the SAN768B.
	Fast-flashing green (on 1/4 second, then off 1/4 second)	Port is in internal loopback (diagnostic).	No action required.
	Flickering green	Port is online, with traffic flowing through port.	No action required.
	Steady amber	Port is receiving light or signal carrier, but it is not online yet.	Reset port from workstation using the <b>portEnable</b> or <b>portCfgPersistentEnable</b> command.
	Slow-flashing amber (on 2 seconds, then off 2 seconds)	Port is disabled due to diagnostic tests or portDisable or portCfgPersistentEnable command.	Reset port from workstation using the <b>portEnable</b> or <b>portCfgPersistentEnable</b> command.
	Fast-flashing amber (on 1/2 second, then off 1/2 second)	Transceiver or port is faulty.	Change transceiver or reset switch from workstation.
Alternating green/amber	Port is bypassed	Reset port from workstation using the <b>portEnable</b> or <b>portCfgPersistentEnable</b> command.	

## Power supply

To determine the status of a power supply:

1. Check the LED indicator on the power supply (see Figure 18 on page 46). The LED patterns may temporarily change during POST and other diagnostic tests; for information about how to interpret the LED patterns, see Table 13 on page 46.

2. Check power supply status by typing **psShow**.  
The power supply status displays OK, Absent, or Faulty. If a power supply is absent or faulty, contact IBM.

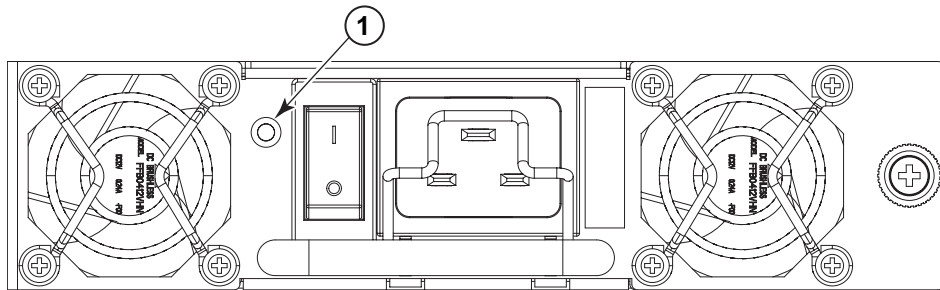


Figure 18. Power supply LEDs

- 1 Power LED

Table 13. Power supply LED descriptions

LED purpose	Color	Status	Recommended Action
Power	No light (LED is off)	Power supply does not have incoming power and is not providing power to the SAN768B.	Ensure power supply is firmly seated, SAN768B has incoming power, both power cables are connected, and AC power switches are on.
	Steady green	Power supply has incoming power and is providing power to the SAN768B.	No action required.
	Flashing green	Power supply is about to fail.	Replace power supply.

## Blower assembly

To determine the status of a blower assembly:

1. Check the LED indicators on the blower assembly (see Figure 19 on page 47).  
The LED patterns may temporarily change during POST and other diagnostic tests; for information about how to interpret the LED patterns, see Table 14 on page 47.
2. Check the blower assembly status using the **fanShow** command.

The status for each blower assembly displays OK, Absent, or Faulty. The RPM of each fan in the assembly is also provided. If a blower assembly is absent or faulty, contact IBM.

Figure 19 displays the blower assembly.

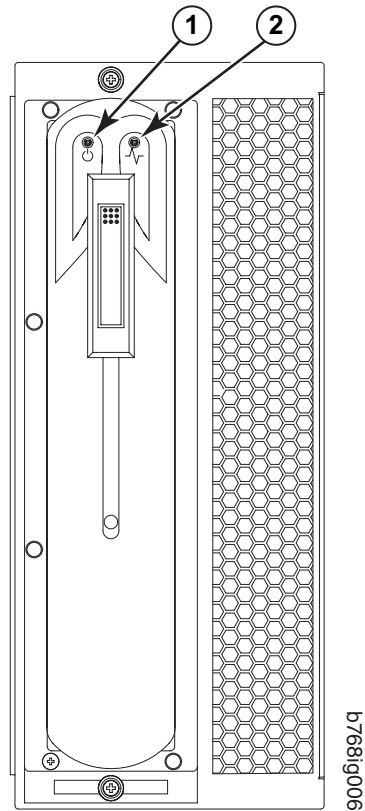


Figure 19. Blower assembly LEDs and other parts

**Item Description**

- 1** Power LED
- 2** Fault LED

Table 14. Blower assembly LED descriptions

LED purpose	Color	Status	Recommended action
Power	No Light (LED is off)	Blower assembly does not have incoming power.	Ensure that the blower assembly is firmly seated and has power.
	Steady green	Blower assembly has incoming power.	No action required.

Table 14. Blower assembly LED descriptions (continued)

LED purpose	Color	Status	Recommended action
Fault	No Light (LED is off)	Blower assembly is either healthy or does not have incoming power.	Ensure that the blower assembly has incoming power.
	Steady amber	Blower assembly has a failure (full or partial).	Replace blower assembly.
	Slow-flashing amber (on 2 sec, then off 2 sec)	Blower assembly is not seated correctly or is faulty.	Pull unit out and reseal. If LED continues to flash, replace unit.
	Flashing amber (on 1/2 sec, then off 3.5 sec)	Fan is disabled.	Run fanEnable to enable the fan.
	Fast-flashing amber (on 1/2 sec, then off 1/2 sec)	Environmental range exceeded.	Check for out-of-bounds environmental condition, resolve any problems, and reseal unit. If LED continues to flash, replace unit.

## WWN bezel and WWN card

To determine the status of the WWN card:

**Note:** The WWN bezel covers the WWN cards. The LEDs on the WWN cards are not visible unless the bezel is removed.

1. WWN units correspond to information specific to the WWN card (see Figure 29 on page 75) and are displayed by typing the **chassisShow** command. Error messages that may indicate problems with a WWN card are summarized in Table 15.

Table 15. Messages that may indicate WWN card failure

Type of Message	Sample error message
WWN unit fails its FRU (field replaceable unit) header access.	0x24c (fabos): Switch: switchname, error EM-I2C_TIMEOUT, 2, WWN 1 I2C timed out: state 0x4
WWN unit is being faulted.	0x24c (fabos): Switch: switchname, Critical EM-WWN_UNKNOWN, 1, Unknown WWN #2 is being faulted
WWN unit is not present or is not accessible.	0x24c (fabos): Switch: switchname, Error EM-WWN_ABSENT, 2, WWN #1 not present
Writing to the FRU history log (hilSetFruHistory) has failed.	0x24c (fabos): Switch: switchname, Error EM-HIL_FAIL, 2, HIL Error: hilSetFruHistory failed, rc=-3 for SLOT 3

Figure 20 on page 49 displays the WWN bezel.

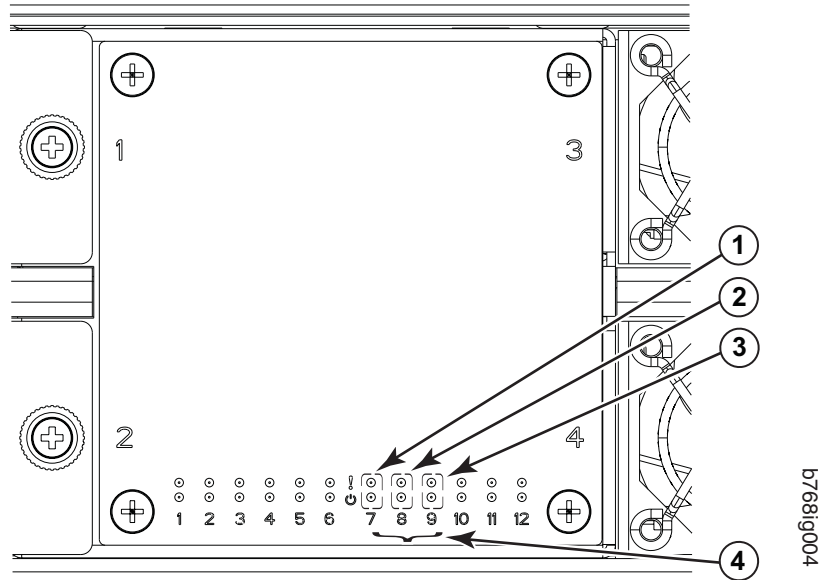


Figure 20. LEDs on the WWN card and bezel

- 1** CP blade Status (above) and Power (below) LEDs

**2** CR blade Status (above) and Power (below) LEDs
- 3** Port blade Status (above) and Power (below) LEDs

**4** Slot numbers

The WWN card LED patterns and the recommended actions for those patterns are described in Table 16.

Table 16. WWN bezel LED descriptions

LED purpose	Color	Status	Recommended action
Port blade/CP blade/CR blade Power	Steady green	Power is OK.	No action required.
Port blade/CP blade/CR blade Status	Steady amber	Blade is faulty.	Check blade.
	No light (LED is OFF)	Blade is OK.	No action required.
<b>Note:</b> If a blade slot or power supply bay has a filler panel installed, the corresponding LEDs on the WWN blade do not light up.			



---

## Chapter 5. Removing and installing components

**Note:** Read the safety notices before servicing (see “Safety notices and labels” on page xiii).

The field replaceable units (FRUs) in the SAN768B can be removed and installed without special tools. The SAN768B can continue operating during many of the FRU replacements if the conditions specified in the procedure are followed.

The following sections contain FRU removal and installation procedures.

---

### Removing and installing the chassis door

**Note:** The chassis door must be installed to ensure the SAN768B meets EMI and other regulatory certifications.

#### Time and items required

The replacement procedure for the chassis door takes less than 5 minutes.

#### Removing the chassis door

To remove a chassis door:

1. Support the door to prevent it from falling.
2. Pull and remove the door.

To install a chassis door:

1. Align the door and push it into place. See Figure 21 on page 52.

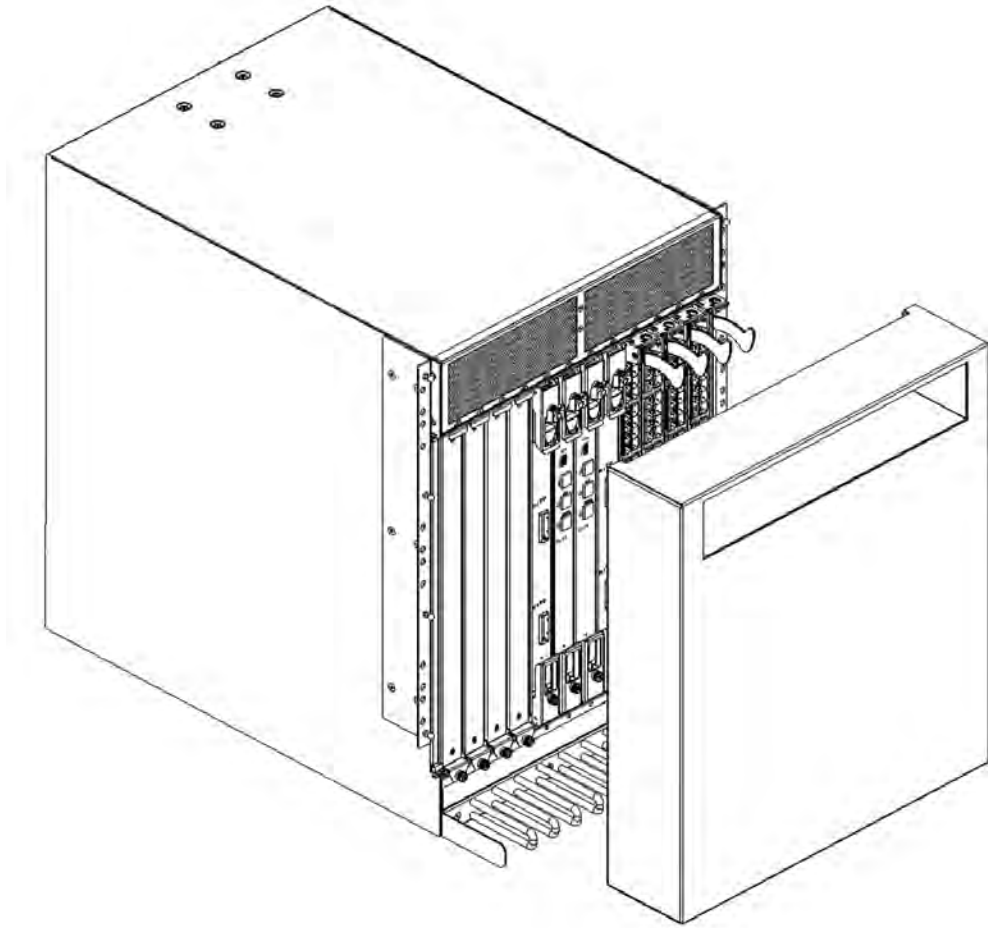


Figure 21. Chassis door

---

## Removing and installing a cable management comb

The SAN768B can continue to operate during the replacement of the cable management comb.

### Time and items required

The replacement procedure for the cable management comb takes less than 5 minutes. A #1 Phillips screwdriver is required.

### Removing a cable management comb

To remove the cable management comb, do the following:

1. Rearrange the cables around the cable management comb.
2. Unscrew and save the four screws holding the comb to the chassis (see Figure 22 on page 53). Support the comb to prevent it from falling.
3. Remove the cable management comb.



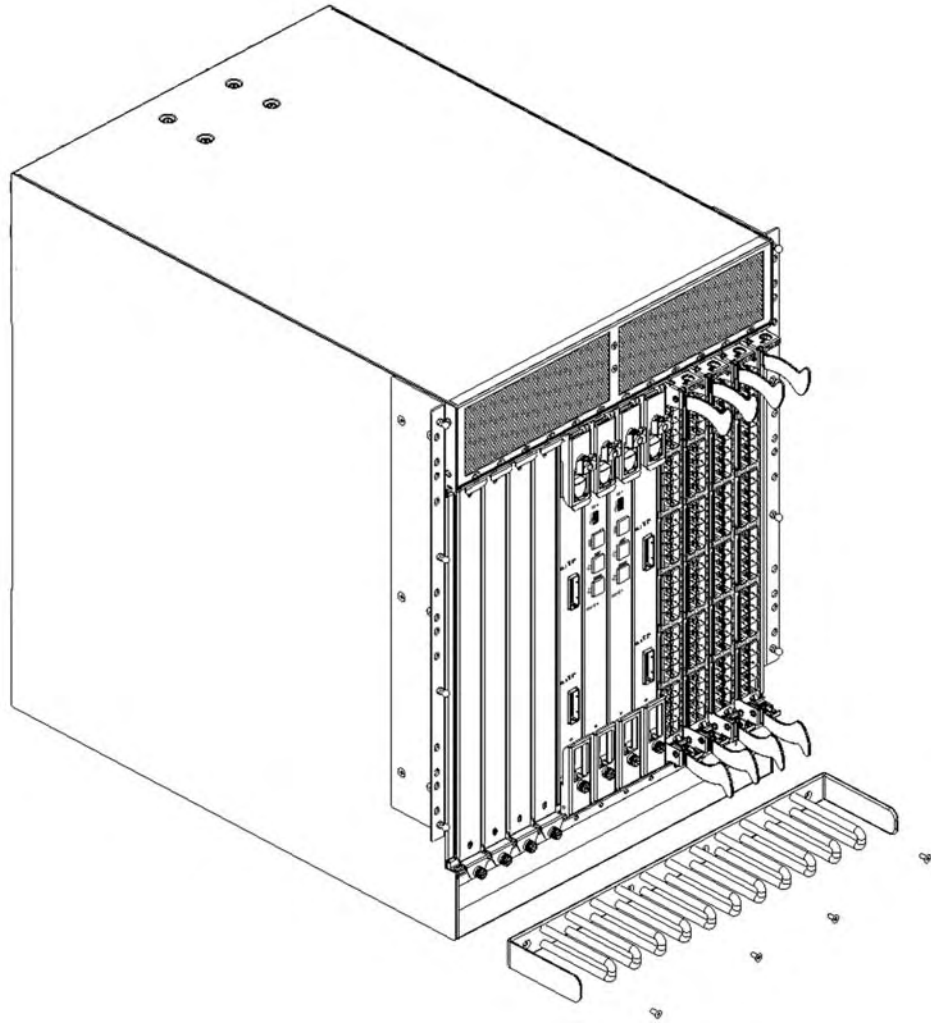


Figure 22. Cable management comb

## Installing a cable management comb

To install a cable management comb, do the following:

1. Position and tighten the four screws to secure the cable management comb to the chassis.
2. Arrange the cables along the cable management comb.

---

## Removing and installing port blades

This section describes how to remove and install port blades.

**Attention:** A filler panel should be removed only when being replaced with a port blade, or a filler panel. Any slot that is not occupied by a blade should be occupied by a filler panel to ensure correct cooling of the chassis and protection from dust.

Slots are numbered from 1 through 12, from left to right when facing the port side of the SAN768B. Port blades can be installed in slots 1 through 4 and 9 through 12.

## Time and items required

The installation procedure for each port blade takes less than 10 minutes. The following items are required for the blade and filler panel installation:

- ESD (electrostatic discharge) grounding strap
- Workstation computer
- Installation blade or filler panel
- Phillips screwdriver
- Small form-factor pluggable (SFP) or extended form-factor pluggable (XFP, FC10-6 blade only) transceivers (as needed)
- Optical cables (as needed)

## Removing a port blade

To remove a port blade, do the following:

**Attention:** Follow ESD precautions.

1. Remove the chassis door. (See “Removing and installing the chassis door” on page 51.)
2. A failed port or application blade can be identified by inspecting the LEDs on the front panel of each blade. Check the power LED, status LED, and port status LED to identify any possible problems. See Figure 14 on page 41 to Figure 13 on page 38 for LED locations.
3. Establish a Telnet or console session.  
Before installing a blade, establish a Telnet or console connection to determine a failure and verify operation after installation. Use the **switchShow** command to view the status of blades.
4. Check for adequate cable slack. Ensure there is plenty of cable slack to remove a blade without cable obstruction.
5. Ensure that the part number on the unit being installed matches the replacement part number. The **chassisShow** command displays information about the blades, including part numbers, serial numbers, and additional status.
6. Ensure that traffic is not flowing through the blade (port status LED should be off) prior to disconnecting cables.

**Note:** Before removing any cables from a blade, note the cable order (identify each cable by its physical port). If multiple blades are being installed, install one blade at a time.

7. Ensure that traffic is not flowing through the blade.
8. Disconnect all cables and SFP or XFP transceivers from the blade.
9. For FC8-16, FC8-32, FC8-48, and FC10-6 port blades: Adjust the ejectors to the open position. (See Figure 23 on page 55.) Unscrew the two thumb screws from the top and bottom ejectors on the blade using the Phillips screwdriver. Unscrew the top thumb screw until it pops out. This initiates a hot-swap request.
10. Wait for the power LED to turn off in response to the hot-swap request before removing the blade.
11. Open the ejectors. Pull the blade out of the chassis using the ejectors.
12. If the blade is not being replaced by another blade, install a filler panel. See “Removing and installing port blade filler panels” on page 56.

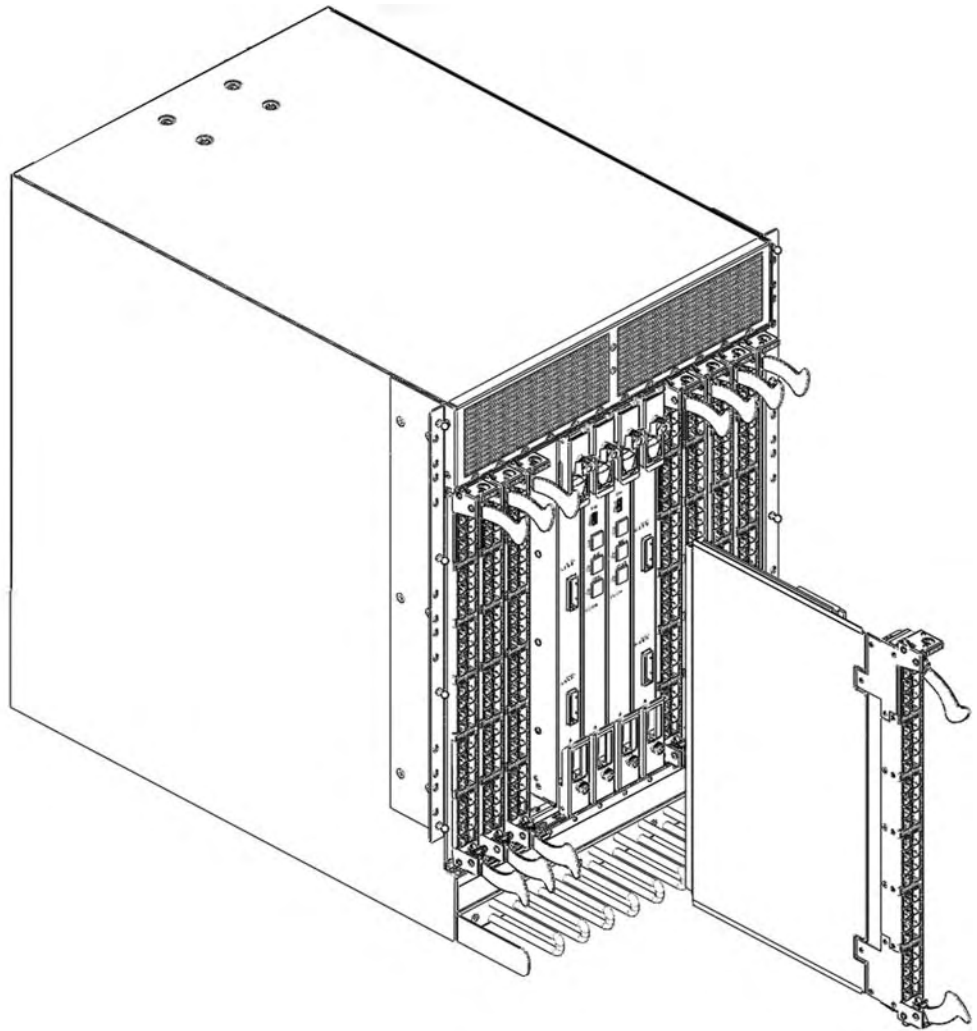


Figure 23. Port blade removal and installation (16-port blade shown as example)

## Installing a port blade

To install a port blade, do the following:

**Attention:** Follow ESD precautions.

1. Orient the blade so that the ports are at the front of the chassis and the flat side of the blade is on the left.
2. Adjust the ejectors to the open position, align the flat side of the blade inside the upper and lower rail guides in the slot, and slide the blade into the slot until it is firmly seated.
3. Adjust the ejectors to the closed position by pulling them away from the center of the blade.
4. Tighten the two thumb screws near the top and bottom ejectors. The top thumb screw must be tightened for the blade to power on.
5. Verify that the power LED on the blade displays a steady green light (it might require a few seconds to turn on). If it does not turn on, ensure that the blade is firmly seated.

6. Install SFP or XFP (FC10-6 only) transceivers and cables in the blade.
7. Group and route the cables.
8. Install the chassis door.

---

## Removing and installing port blade filler panels

This section describes how to remove and install port blade filler panels.

### Removing a filler panel

**Attention:** A filler panel should be removed only when being replaced with a port blade, or new filler panel. Any slot that is not occupied by a blade should be occupied by a filler panel to ensure correct cooling of the chassis and protection from dust.

To remove a filler panel, do the following:

1. Remove the chassis door.
2. Unscrew the thumb screw at the bottom of the panel using the Phillips screwdriver.
3. Pull the filler panel out of the chassis. (See Figure 24 on page 57.)

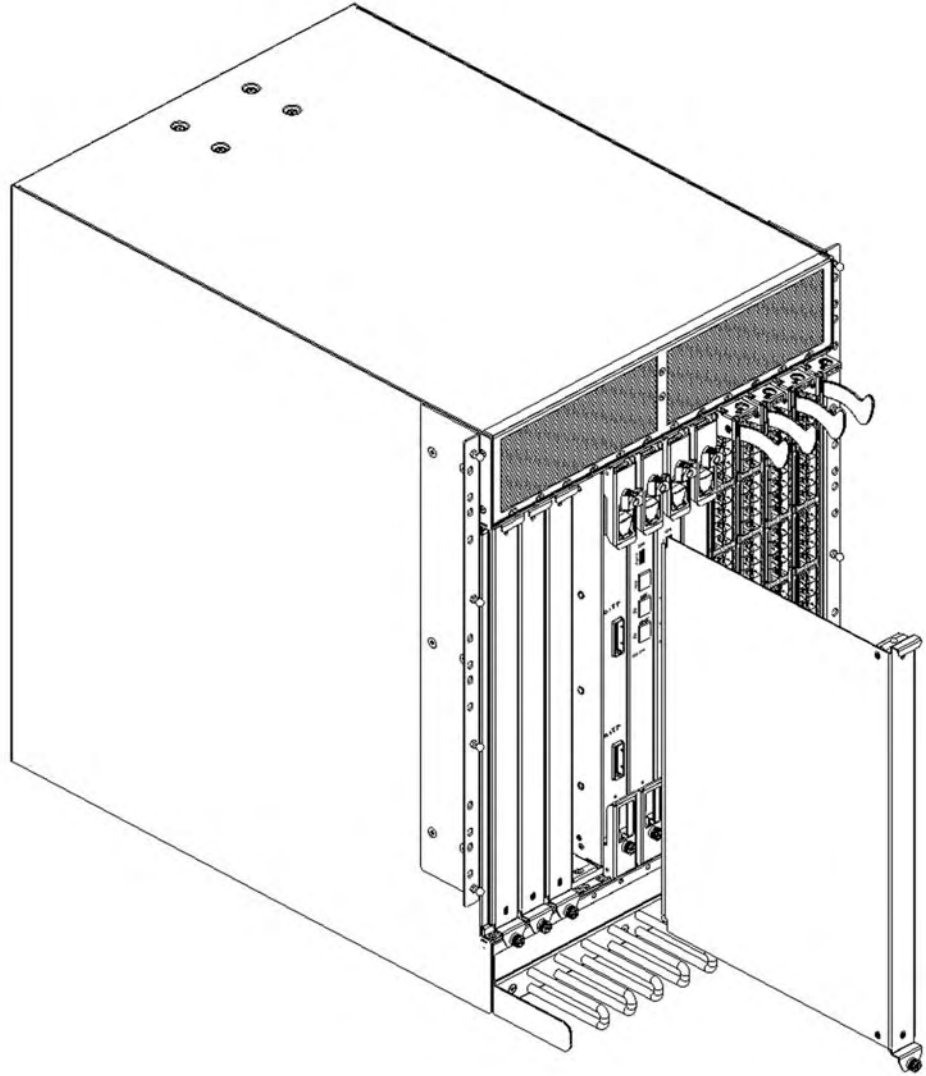


Figure 24. Port blade removal and installation (16-port blade shown as example)

## Installing a filler panel

To install a filler panel, do the following:

1. Orient the filler panel.
2. Slide the filler panel into the slot until it is firmly seated.
3. Tighten the thumb screw at the bottom of the panel.
4. Install the chassis door.

---

## Removing and installing a control processor blade (CP8)

This section describes how to remove and install a control processor (CP8) blade. Each SAN768B has two CP8 blades located in slot 6 and slot 7.

**Note:** If the new CP blade does not have the same firmware as the active CP blade, you must upgrade the new blade to the same firmware version.

Firmware downloads require that Ethernet connections be made to both CP blades. Procedures for loading firmware are described in the *Brocade Fabric OS Administrator's Guide*.

## Time and items required

The installation procedure for the CP blade takes approximately 30 minutes. The following items are required for the CP blade installation:

- ESD (electrostatic discharge) grounding strap
- Workstation computer
- Serial cable
- IP address of an FTP server for backing up the SAN768B configuration
- Phillips #2 screwdriver
- Replacement CP blade. SAN768B requires the CP blade (CP8).

## Verifying the necessity of installation

Confirm that you need to install the CP blade. The following events might indicate that a CP blade is faulty:

- The status LED on the CP blade is lit amber, or the power LED is not lit.
- The CP blade does not respond to Telnet commands, or the serial console is not available.
- The **slotShow** command does not show that the CP blade is enabled.
- The **haShow** command indicates an error.
- The clock is inaccurate, or the CP blade does not boot up or shut down normally.
- Any of the following messages display in the error log:
  - “Slot unknown” message relating to a CP slot
  - CP blade errors or I<sup>2</sup>C timeouts
  - FRU: FRU\_FAULTY messages for a CP blade
  - Configuration loader messages or “Sys PCI config” messages
  - Generic system driver messages (“FABSYS”)
  - Platform system driver messages (“Platform”)
  - EM messages that indicate a problem with a CP blade
  - Function fail messages for the CP master

For more information about error messages, refer to the *Fabric OS Message Reference*.

## Recording critical SAN768B information

Back up the SAN768B configuration before you replace a CP blade. Refer to the *Fabric OS Administrator's Guide* for backup information.

To record critical SAN768B information, do the following:

1. Login to the functioning CP blade as admin, using either a Telnet or a serial console connection.
2. Type **haShow** to determine which CP blade is active:

```
swDir:admin> haShow
Local CP (Slot 7, CP1) : Active
Remote CP (Slot 6, CP0) : Standby, Healthy
HA Enabled, Heartbeat Up, HA State Synchronized
```

3. Enter all remaining commands from the serial console for the active CP blade, unless otherwise indicated. For more information about commands, refer to the *Fabric OS Command Reference*.
4. If the functioning CP blade is performing as the active CP blade, go to step 5. If the faulty CP blade is performing as the active CP blade, failover the blades:
  - a. Login to the faulty CP blade as admin, using either a Telnet or a serial console connection.  
If you connect successfully to the faulty CP, continue to step b.  
If you cannot connect to the faulty CP, remove the faulty CP blade for repair as follows:
    - 1) Turn the CP blade off and notify the SAN768B of a hot swap request by sliding the slider switch in the top ejector down to the off position (see Figure 25 on page 61).
    - 2) Wait until the active CP LED on the functioning CP blade is lit. Remove the CP blade.
  - b. Type **haFailover**. The functioning CP blade becomes the active CP blade.
  - c. Wait until the status LED on the functioning CP blade is no longer lit.
  - d. Type **haShow** from the functioning CP blade (the new active CP blade) to verify the failover.

This is an example of failing over a CP blade:

```
Fabric OS (cp1)
```

```
cp1 login: admin
Password:
swDir:admin> hashow
Local CP (Slot 7, CP1): Active
Remote CP (Slot 6, CP0): Standby, Healthy
HA enabled, Heartbeat Up, HA State synchronized
swDir:admin> hafailover
Local CP (Slot 7, CP1): Active
Remote CP (Slot 6, CP0): Standby, Healthy
HA enabled, Heartbeat Up, HA State synchronized
```

```
Warning: This command is being run on a redundant control
processor(CP) system. If the above status does not indicate
'HA State synchronized', then the CPs are not synchronized
and this operation will cause the active CP to reset. This
will cause disruption to devices attached to both switch 0
and switch 1 and will require that existing Telnet sessions
be restarted. To reboot a single logical switch on this
system, use the switchreboot command while logged in to
that logical switch.
```

```
Are you sure you want to fail over to the standby CP [y/n]?
```

```
swDir:admin> haShow
Local CP (Slot 7, CP1) : Standby, Healthy
Remote CP (Slot 6, CP0) : Active
HA Enabled, Heartbeat Up, HA State Synchronized
```

5. Type **firmwareShow** to note the firmware version of the active CP blade.
6. Type **haDisable** from the active CP blade to prevent failover or communication between the CP blades during the replacement.
7. Logged into the active CP, use the **configUpload** command to upload the SAN768B configuration to a specified FTP server. Enter information at the prompts.

This is a sample of backing up the configuration files:

```
swDir:admin> configUpload
Protocol (scp or ftp) [ftp]: ftp
Server Name or IP Address [host]: 123.456.78.90
User Name [None]: user
File Name [config.txt]: config.txt
Password: xxxxxxxx
upload complete
```

## Removing a control processor blade (CP8)

The SAN768B continues to operate while a CP blade is being installed if the redundant CP blade is active and a failover does not occur. You can prevent failover by entering the **haDisable** command.

To remove a CP blade, do the following:

1. Remove the chassis door. (See “Removing and installing the chassis door” on page 51.)
2. Login to the active CP as the admin user. You can use a serial cable or Telnet, Web Tools, or Fabric Manger. Determine which CP is active using the **haShow** command or view the active LED on the front of the CP.
3. If the faulty CP is the active CP, issue the **haFailover** command. Wait until the failover has completed. Use the **haShow** command to verify the CPs are synchronized and the failover is complete.
4. Power off the blade by sliding the slider switch in the top ejector down to the off position (see Figure 25 on page 61).
5. Disconnect all cables from the faulty (standby) CP.
6. Unscrew the thumb screw from both ejectors using the Phillips screwdriver.
7. Lever open both ejector handles simultaneously to approximately 45 degrees and pull the CP blade out of the chassis (see Figure 25 on page 61).



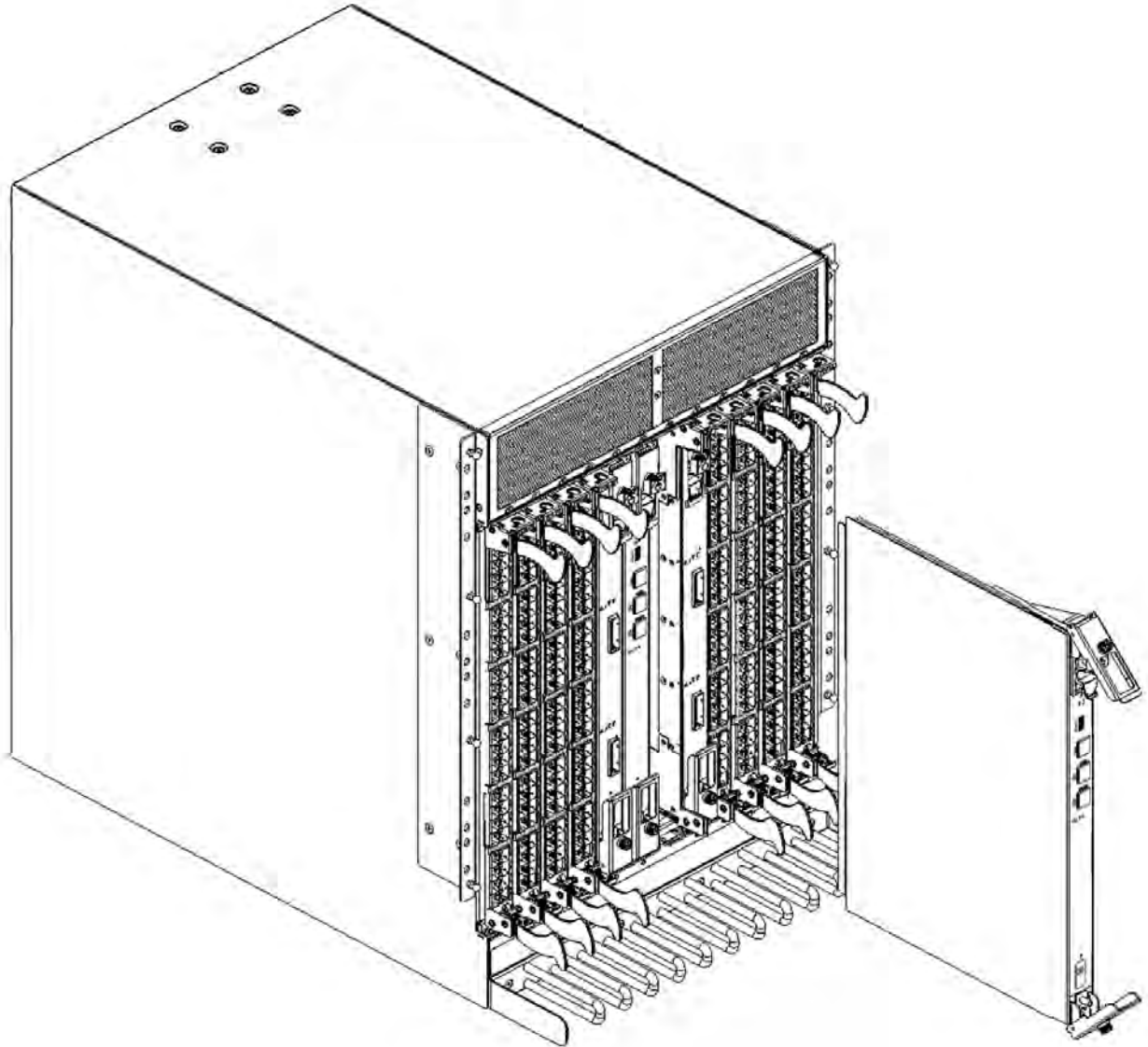


Figure 25. Removing the control processor (CP) blade

## Installing a control processor blade (CP8)

**Attention:** Follow ESD precautions.

To install a CP blade (slot 6 or 7):

1. Open the ejector handles to approximately 45 degrees. Orient the CP blade so that the handles are toward you and the flat metal side is on your left.
2. Align the flat metal side of the CP blade inside the lower and upper blade guides in the slot. Slide the CP blade into the slot until it is firmly seated.
3. Tighten the thumb screw inside each handle using the Phillips screwdriver.
4. Turn the CP blade on by sliding the ON/OFF switch in the top handle up, to cover the thumb screw.
5. Verify that the power LED is green. If not, ensure that the CP blade has power and is firmly seated and that the ejectors are in the locked position.

6. Connect the cables to the new CP blade.
7. Verify the installation. (See “Verifying operation of the new CP blade.”)
8. Install the chassis door. (See “Removing and installing the chassis door” on page 51.)

## Verifying operation of the new CP blade

To verify that boot and POST are complete on the new CP blade and that the CP blade has achieved failover redundancy:

1. Log into the active CP as admin.
2. Enable the redundancy feature using the **haEnable** command.
3. Verify HA is enabled using the **haShow** command. The command output includes “HA Enabled Heartbeat Up” and “HA-state in sync.”

If not, POST is not complete or the CP blades have not achieved redundancy. Wait one or two minutes and re-enter the command until you can verify that redundancy has been achieved.

4. Type **slotShow**. The command output shows the new CP blade as “enabled”:

```
swDir:admin> slotShow
```

Slot	Blade Type	ID	Status
1	SW BLADE	16	ENABLED
2	SW BLADE	16	ENABLED
3	SW BLADE	16	ENABLED
4	SW BLADE	16	ENABLED
5	CR BLADE	17	ENABLED
6	CP BLADE	18	ENABLED
7	CP BLADE	18	ENABLED
8	CR BLADE	17	ENABLED
9	SW BLADE	16	ENABLED
10	SW BLADE	16	ENABLED
11	SW BLADE	16	ENABLED
12	SW BLADE	16	ENABLED

```
swDir:admin>
```

5. Determine the version by typing **firmwareShow**.

This example shows sample output for the **firmwareShow** command:

```
swDir:admin> firmwareShow
Local CP (Slot 7, CP1): Active
    Primary partition:    v6.0.0
    Secondary Partition:  v6.0.0
Remote CP (Slot 6, CP0): Standby
    Primary partition:    v6.0.0
    Secondary Partition:  v6.0.0
```

Note: If Local CP and Remote CP have different versions of firmware, please retry **firmwaredownload** command.

```
swDir:admin>
```

6. If the firmware version on the replacement blade does not match that on the active CP blade, bring the replacement blade to the same firmware level as the active blade.

**Note:** Firmware downloads require that Ethernet connections be made to both CP blades. Procedures for loading firmware are described in the *Fabric OS Administrator's Guide*.

7. Type **firmwareDownload -s** to download the firmware to one of the CP blades.

To download firmware, go to <http://www.ibm.com/servers/storage/support/san> and select your product, then click on the download tab. Select the appropriate firmware version and release notes version. Enter all requested information (use default values):

```
swDir:admin> firmwaredownload -s
Server Name or IP Address: 192.168.100.1
User Name: user
File Name: /software/v6.0.0/release.plist
Password: *****
Do Auto-Commit after Reboot [Y]:
Reboot system after download [N]:
Firmwaredownload has started.
2007/07/03-14:59:21, [SULB-1001], 923,, WARNING, SAN768B,
Firmwaredownload command has started.
Start to install packages.....
dir #####
ldconfig #####
glibc #####
bash #####
readline #####
terminfo #####
termcap #####
setup #####

<output_truncated="">
tz #####
mtracer-tool #####
lkcd #####
sysstat #####
Removing unneeded files, please wait ...
Finished removing unneeded files.

All packages have been downloaded successfully.
Firmwaredownload has completed successfully.
2007/07/03-15:05:56, [SULB-1002], 924,, INFO, SAN768B,
Firmwaredownload command has completed successfully.
```

8. Type **firmwareDownloadStatus** to verify that the firmware has been updated.
9. Type **haEnable** to enable HA again on the active CP blade.
10. Type **reboot**.
11. Verify that the reboot is complete and the CP blades have achieved failover redundancy:
  - a. Wait until the status LEDs on both CP blades are not lit.
  - b. Type **haShow** and verify that the command output includes “HA Enabled Heartbeat Up”. If not, reenter the command until you have verified that redundancy is achieved.
12. Type **firmwareShow** to verify that the firmware version has been updated.
13. Pack the faulty CP blade in the packaging provided with the new CP blade for return to IBM, following local procedures.
14. Install the chassis door. (See “Removing and installing the chassis door” on page 51.)

---

## Removing and installing a core switch blade (CR8)

This section describes how to remove and install a core switch blade. Each SAN768B has two core switch blades located in slot 5 and slot 8.

## Time and items required

The installation procedure for the core switch blade takes approximately 30 minutes. The following items are required for the core switch blade installation:

- ESD (electrostatic discharge) grounding strap
- Phillips #2 screwdriver
- Replacement core switch blade (SAN768B requires the core switch blade (CR8)).

## Verifying the necessity of installation

Confirm that you need to replace the core switch blade before continuing. The following events might indicate that a core switch blade is faulty:

- The status LED on the core switch blade is lit amber, or the power LED is not lit.
- The **slotShow** command does not show that the core switch blade is enabled.
- The **haShow** command indicates an error.
- Any of the following messages display in the error log:
  - “Slot unknown” message relating to a core switch blade slot
  - core switch blade errors or I2C timeouts
  - FRU: FRU\_FAULTY messages for a core switch blade
  - Configuration loader messages or “Sys PCI config” messages
  - Generic system driver messages (“FABSYS”)
  - Platform system driver messages (“Platform”)
  - EM messages that indicate a problem with a core switch blade
  - Function fail messages for the core switch blade master

For more information about error messages, refer to the *Fabric OS Message Reference*.

## Removing a core switch blade (CR8)

The SAN768B continues to operate while a core switch blade is being replaced.

**Attention:** Follow ESD precautions.

To remove a CR blade, do the following:

1. Remove the chassis door (see “Removing and installing the chassis door” on page 51).
2. Power off the blade by sliding the slider switch in the top ejector down to the off position (see Figure 26 on page 65).
3. Disconnect cables from the faulty core switch blade.
4. Unscrew the thumb screw from both ejectors using the Phillips screwdriver.
5. Lever open both ejector handles simultaneously to approximately 45 degrees and pull the core switch blade out of the chassis (see Figure 26 on page 65).

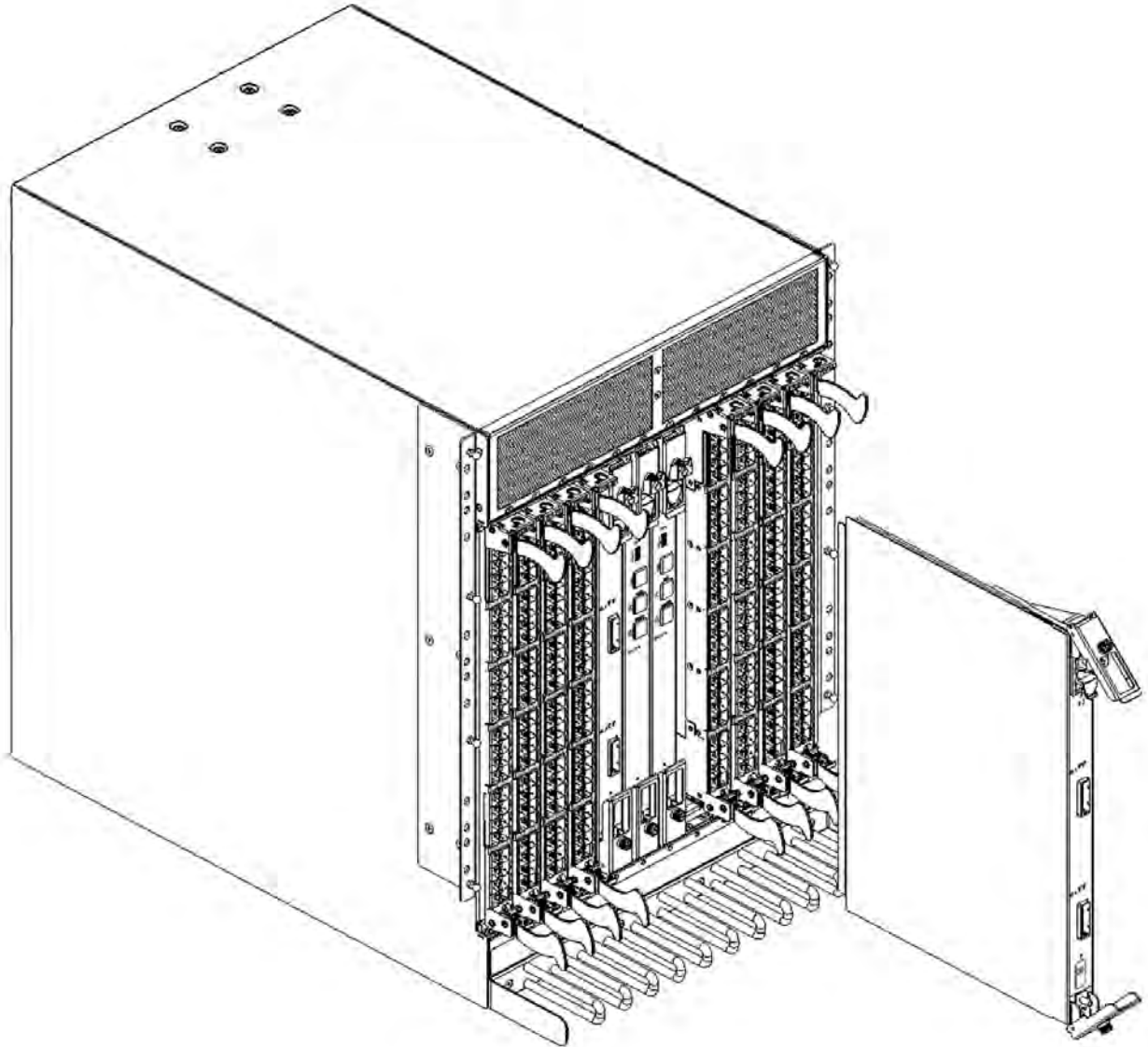


Figure 26. Removing the core switch blade

## Installing a core switch blade (CR8)

**Attention:** Follow ESD precautions.

To install a CR blade (slot 5 or 8), do the following:

1. Open the ejector handles to approximately 45 degrees; then, orient the CR blade so that the handles are toward you and the flat metal side is on your left.
2. Align the flat metal side of the core switch blade inside the lower and upper blade guides in the slot; then, slide the core switch blade into the slot until it is firmly seated.
3. Tighten the thumb screw inside each handle using the Phillips screwdriver.
4. Turn the core switch blade on by sliding the ON/OFF switch in the top handle up, to cover the thumb screw.

5. Verify that the power LED is green (might require a few seconds). If not, ensure that the core switch blade has power and is firmly seated and that the ejectors are in the locked position.
6. Connect to the new core switch blade.
7. Pack the faulty core switch blade in the packaging provided with the new core switch blade for return to IBM, following local procedures.
8. Install the chassis door. (See “Removing and installing the chassis door” on page 51.)

---

## Removing and installing an FR4-18i router blade

This section describes how to remove and install an FR4-18i router blade in the SAN768B. You can install up to two router blades in any of slots 1-4 and 9-12. To ensure proper cooling, install only one router blade in each slot grouping. See Figure 13 on page 38, for blade removal and installation, as an example of how to remove a router blade.

**Attention:** Follow these precautions for all procedures in this section to avoid damaging the router blades or chassis:

- Wear a grounded ESD strap when handling the router blade.
- To ensure adequate system pressure for cooling purposes, leave the faulty router blade in the slot until you are ready to perform the installation or replacement procedure.
- Do not force the router blade into the chassis. If the blade does not slide in easily, ensure that it is correctly aligned inside the rail guides before continuing. Installing a router blade with incorrect alignment can damage both the chassis and the router blade.
- Hold the router blade by the edges of the metal pan. Do not use the ejectors to hold a router blade.
- Disassembling any part of a router blade voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the router blade.

### Time required

Approximately 10 minutes

### Items required

- ESD (electrostatic discharge) grounding strap
- Workstation computer
- Replacement router blade
- Phillips screwdriver

### Removing a router blade

A failed router blade can be identified by inspecting its LEDs and by using CLI commands to verify status. Refer to Figure 13 on page 38, for a description of the router blade LEDs. See the *Fabric OS Administrator's Guide* for information about how to check the status of hardware components using the CLI.

Perform the following steps to remove a router blade:

1. Check the power LED, status LEDs, port speed LEDs, and port status LEDs to identify any possible problems with the router blade.

2. Establish a Telnet or console session before removing an router blade to determine a failure and verify operation before removal. Use the **switchShow** command to view the status of blades on the SAN768B.
3. Check for adequate cable slack.  
Make sure there is plenty of cable slack to remove a router blade without optical, power, or Ethernet cable obstruction. Refer to “Managing cables” on page 9 for cabling guidelines.
4. Ensure that you have the proper spare part (filler panel or replacement router blade).  
Make sure that the part numbers match for the unit being replaced. The **chassisShow** command displays information about the router blades, including part numbers, serial numbers, and additional status.
5. Ensure that traffic is not flowing through the router blade (all port status LEDs should be off) prior to disconnecting cables.  
  
**Note:** Before removing any cables from the faulty router blade, label the cables or make a note of the cable order by identifying each cable by the physical port it attaches to. This will reduce confusion when you reattach cables. If two router blades are being replaced, install one blade at a time.
6. Disconnect all cables and remove the SFP transceivers from the Fibre Channel and GbE ports as required.
7. Turn the router blade off by sliding the on/off switch in the top ejector down, to the off position (see **3** in Figure 13 on page 38 as an example). This initiates a hot-swap request.
8. Wait for the power LED to turn off in response to the hot-swap request before removing the router blade.
9. Unscrew the captive screws from the top and bottom ejectors on the blade using a Phillips screwdriver.
10. Lever both ejectors open simultaneously to approximately 45 degrees, and pull the router blade out of the chassis.
11. If the blade is not being replaced by another router blade, install a filler panel to ensure correct cooling of the chassis and protection from dust. See “Installing a filler panel” on page 57 for instructions.

## Installing a router blade

You can install up to two FR4-18i router blade in slots 1–4 or 9-12. If you are installing two router blades, install one in one of the slots 1–4, and the other in one of the slots 9-12 to maintain proper cooling. The control processor (CP) blades occupy slots 6 and 7. The core switch (CR) blades occupy slots 5 and 8. Any slots that are not occupied by a port blade, router blade, or CP blade must have a filler panel installed to ensure proper cooling of the chassis and protection from dust. If you are performing a new installation of a router blade, you must either remove the filler panel or a port blade from the slot where you will install the router blade.

**Attention:** All ports on the router blades are by default, persistently disabled to avoid unintentional merging of fabrics. Before you can successfully configure FCIP tunnels, you must enable the ports. When the blade is first powered up, all port status LEDs will continue to flash amber. This is normal. Use the **portCfgShow** command to view the status of the ports. Use the **portCfgPersistentEnable** command to enable a port. Refer to the *Fabric OS Administrator’s Guide* and the *Fabric OS Command Reference Manual* for more information on these commands.

To install an FR4-18i router blade, complete these steps:

1. Enter the **chassisConfig** command, and verify that it is in mode 5. If the chassisConfig mode is 5, this step is complete. If not, enter the **chassisConfig 5** command.

**Attention:** Changing the **chassisConfig** mode requires a reboot, and is disruptive to SAN768B operation.

2. Select an empty slot from slots 1-4 or 9-12 to install the router blade.
3. Make sure the latches on the router blade are unscrewed and open. If you are performing a new installation of a router blade, you must either remove the filler panel or a port blade from the slot where you will install the router blade.
4. Orient the router blade so that the ports are at the front of the chassis and the router blade power switch is at the top.
5. Make sure the latches on the router blade are unscrewed and open.
6. Slide the router blade into the open slot until it is fully seated.
7. Close the latches and tighten the screws on the latches.
8. Power on the blade using the power switch at the top of the blade. Keep the blade in an offline (disabled) state until the ports are configured.

**Note:** The router blade will begin POST as soon as the power is turned on. After POST is complete the firmware version on the blade will autolevel with the firmware version on the active CP.

9. Verify that the blade power and blade status LEDs are green after the blade has completed booting up.
10. Verify the installation. For information about how to check the status of hardware components using the CLI, See the *Fabric OS Administrator's Guide*.
11. Log into the SAN768B as the admin user.

## Configuring FCIP and Fibre Channel routing services and enabling the ports

Refer to the *Fabric OS Administrator's Guide* or the *Web Tools Administrator's Guide* for detailed information on configuring the router blade. The following steps provide only a brief overview of the procedure.

1. Verify that the FR4-18i router blade is in an offline (disabled) state until the ports are configured.

**Attention:** The ports on the FR4-18i router blade are initially set to persistently disabled. They will flash amber until they are enabled. This is normal. If you want to use the FC ports and EX\_Ports, you must configure the Fibre Channel Routing Services feature prior to enabling the ports.

2. Use the **portCfgPersistentEnable** command to enable standard E\_ports or F\_ports.

**Note:** The GbE ports can only be used once you have configured FCIP and enabled VE\_Ports. See the *Fabric OS Administrator's Guide* for detailed instructions on configuring the Fibre Channel Router ports and GbE ports on the FR4-18i router blade.

## Cabling the FR4-18i router blade

Complete the router blade configuration by installing the SFP transceivers in the Fibre Channel and GbE ports.



1. Install the SFP transceivers in the Fibre Channel and GbE ports, as required. Refer to “Installing and removing FC transceivers in a port blade” on page 76 for more detailed instructions.
2. Remove the rubber plugs from the ports to be used.
3. Position a transceiver so that it is oriented correctly and insert it into a port until it is firmly seated and the latching mechanism clicks. For instructions specific to the type of transceiver, see the transceiver manufacturer’s documentation.

**Note:** The transceivers are keyed to ensure correct orientation. If a transceiver does not install easily, ensure that it is correctly oriented.

4. Repeat Steps 2 and 3 for the remaining ports, as required.
5. Connect the cables to the transceivers.

**Attention:** A 50-micron cable should not be bent to a radius less than 2 inches under full tensile load and 1.2 inches with no tensile load. Tie wraps are not recommended for optical cables because they are easily overtightened.

6. Orient a cable connector so that the key (the ridge on one side of connector) aligns with the slot in the transceiver. Then, insert the cable into the transceiver until the latching mechanism clicks. For instructions specific to cable type, see the cable manufacturer’s documentation.
7. Repeat Step 6 for the remaining cables as required.
8. Check the LEDs to verify that all components are functional. For information about LED patterns, see “FR4-18i router blade” on page 37.
9. Log in to the SAN768B as **admin**.
10. Verify the correct operation of the FR4-18i router blade ports by typing the **switchShow** command from the SAN768B command prompt. This command provides information about switch and port status.

Once the FR4-18i router blade is installed and fully configured in a SAN768B, the **switchShow** command displays 32 Fibre Channel ports (port numbers 0 through 31) and 2 GbE ports. The first 16 Fibre Channel ports are physical ports on the FR4-18i router blade, Ports 16-23 are virtual ports associated with the GE0 physical GbE link and ports 24-31 are virtual ports associated with GE1 physical GbE links. The GbE ports are displayed as ge0 and ge1 and are not assigned port numbers or area numbers.

---

## Removing and installing a power supply

Use this procedure to remove and install a power supply. The SAN768B can continue operating during the replacement if at least one power supply continues operating.

### Time and items required

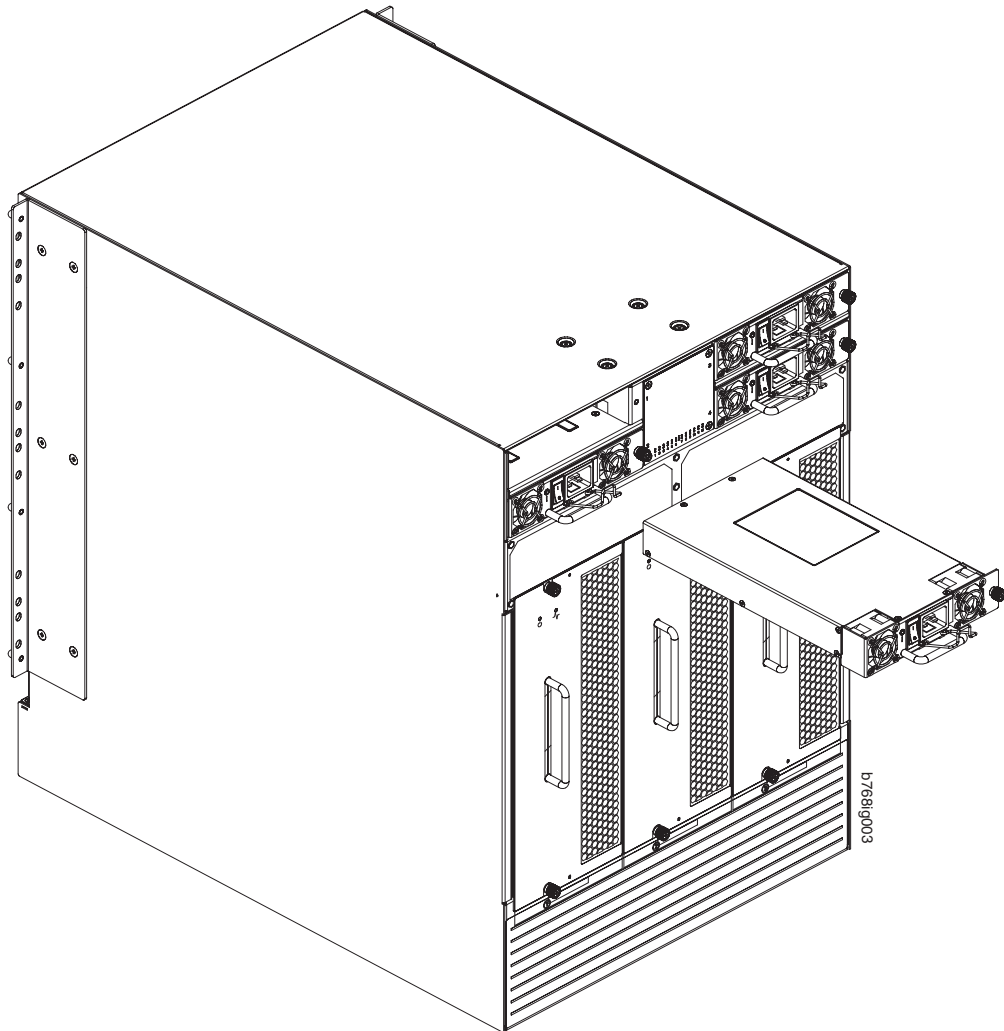
The installation procedure for each power supply takes less than 5 minutes. A power supply unit or filler panel is required for the power supply installation.

### Removing a power supply

To remove a power supply, do the following:

1. If the SAN768B is not operating during the replacement procedure, go to step 2. If the SAN768B is going to continue operating during the replacement, check the power LEDs to verify that the minimum number of power supplies is functioning. A fully populated SAN768B requires a minimum of one power supply slot at all times to ensure power to the SAN768B.

2. Pull the handle out and down (see Figure 27).
3. Support the power supply from beneath. Use the handle to remove the power supply out of the chassis.
4. If you are not replacing the power supply, insert a filler panel into the slot.



*Figure 27. Removing and installing a power supply*

## **Installing a power supply**

To install a power supply, do the following:

1. Remove any filler panels.
2. Insert the power supply into the slot and push the handle up. Verify that the power supply is seated by gently pulling on the handle.
3. Verify that the power LED on the power supply displays a steady green light.

---

## Removing and installing a blower assembly

This procedure provides instructions for removing and installing a blower assembly.

**Attention:** To ensure continuous adequate cooling, maintain three operating blower assemblies at all times except for the brief period when replacing a blower assembly.

### Time and items required

The installation procedure for each blower assembly takes less than 5 minutes. The following items are required for the blower assembly installation:

- Replacement blower assembly
- Phillips #2 screwdriver

### Removing a blower assembly

To remove a blower assembly, do the following:

1. Before removing a blower assembly, verify that the other blower assemblies are functioning correctly. The power LEDs should be steady green.
2. Use the screwdriver to loosen the captive screws at the top and bottom of blower assembly (see Figure 28 on page 72).
3. Support the blower assembly from beneath. Use the handle to remove the blower assembly.

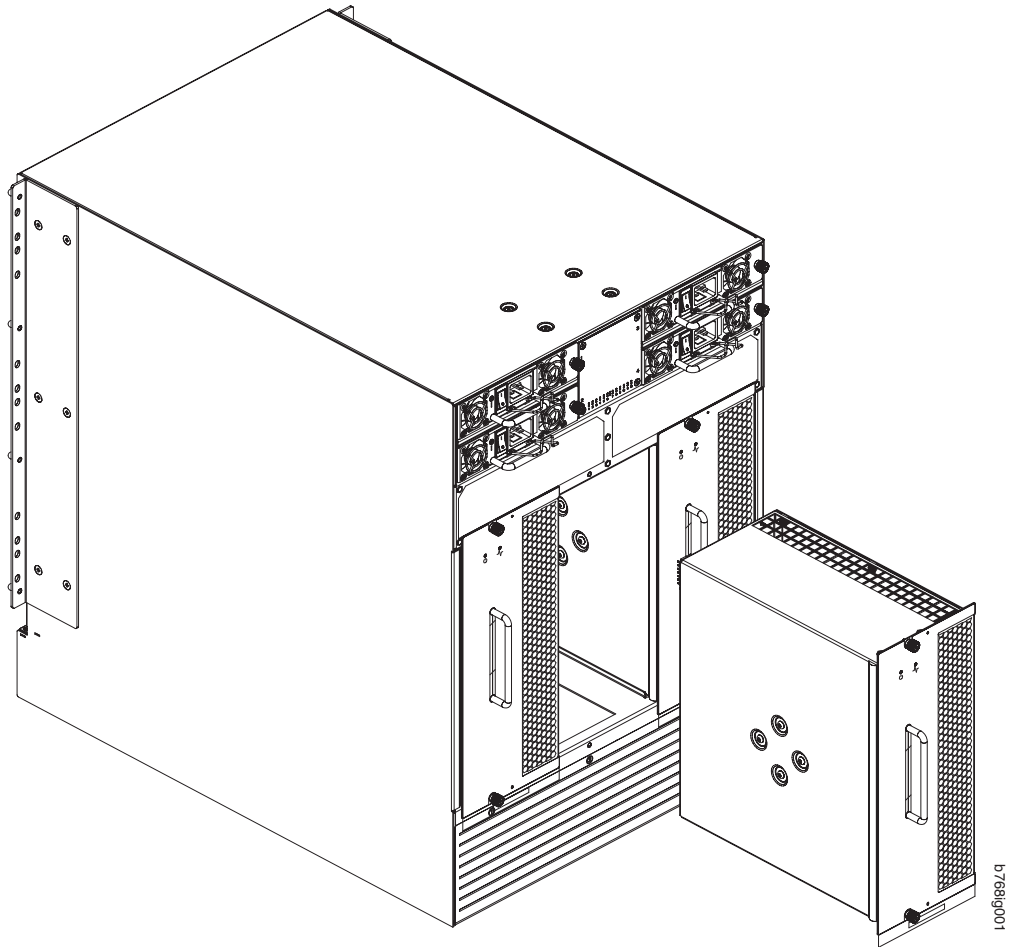


Figure 28. Blower assembly LEDs and other parts

## Installing a blower assembly

To install a blower assembly, do the following:

1. Orient the blower assembly and slide it into the chassis, pushing firmly to ensure that it is seated.
2. Verify that the power LED displays a green light.
3. Use the screwdriver or your fingers to tighten the captive screws.

---

## Removing and installing a WWN bezel and WWN card

**Note:** The World Wide Name (WWN) cards contain fully redundant circuits and normally do not require installation. Two WWN cards are located beneath the WWN bezel.

## Time and items required

Allow approximately 20 minutes to install a WWN card. The following items are needed to install a WWN card:

- Electrostatic discharge (ESD) grounding strap
- #2 Phillips screwdriver (required only for some versions of the WWN card)

- If a serial console session is used: serial cable and a workstation computer with a terminal emulator application (such as HyperTerminal for Windows systems or TIP for Solaris systems)

## Verifying necessity of installation

Before installing a WWN card, verify that the installation is necessary. Any of the following events can indicate that the card requires installation:

- Status LEDs on the WWN bezel not reflecting the actual status of the components
- Power or Status LEDs on WWN card indicate a problem.
- Problems viewing or modifying the data stored on the WWN card (see Table 18).
- Error messages regarding WWN units #1 or #2 (see Table 19 on page 74).

To determine the status of a WWN card, do the following:

1. Check the LED indicators on the WWN bezel and verify that they reflect the actual status of the components. The WWN bezel covers the WWN cards and allows its LEDs to shine through. The LEDs on the WWN bezel provide a consolidated view of the port, CP, and CR blade status, see Table 17.

Table 17. WWN LED patterns

LED location/purpose	Color	Status	Recommended action
Port blade/CP/CR blade power	Steady green	Power is okay.	No action required.
Port blade/CP/CR blade status	Steady amber	Card is faulty.	Check card.
	No light (LED is off)	Card is okay.	No action required.
<b>Note:</b> If a blade slot has a filler panel installed, the corresponding LEDs on the WWN card do not light up.			
<b>Note:</b> If a status LED on the WWN bezel flashes, the power LED on the WWN bezel also flashes, for increased visibility.			

2. Check the WWN card status using the commands listed in Table 18. Difficulty retrieving or modifying this data could indicate a WWN card failure.

Table 18. Commands identifying the WWN card status

Data	Related commands
WWN values	<b>wwn, chassisShow</b>
Data about the chassis and WWN card	<b>chassisShow</b>
Ethernet and Fibre Channel IP address information for the CP blades	<b>ipAddrShow, ipAddrSet</b>
History log information	<b>historyShow, historyLastShow</b>
Name of switch	<b>switchName</b>

3. An error message is logged that indicates the status of the WWN unit (see Table 19 on page 74). WWN units correspond to information specific to the WWN card and are displayed by the **chassisShow** command.

Table 19. WWN card related system log messages

Type of message	System message (errshow or errdump)
WWN unit removal was detected	<timestamp>, [EM-1050], <sequence-number>, INFO, <system-name>, FRU WWN # removal detected.
WWN unit insertion was detected	<timestamp>, [EM-1049], <sequence-number>,, INFO, <system-name>, FRU WWN # insertion detected.
WWN unit fails to power on	<timestamp>, [EM-1004], <sequence-number>,, CRITICAL, <system-name>, WWN # failed to power on
WWN unit is being faulted	<timestamp>, [EM-1034], <sequence-number>,, ERROR, <system-name>, WWN # set to faulty, rc=<return code>

## Removing the WWN bezel and WWN card

To remove the WWN bezel and WWN card, do the following:

**Attention:** Follow ESD precautions.

1. Open a Telnet session to the SAN768B and log in to the active CP as admin. The default password is "password".
2. Verify you are logged into the active CP. Run the **haShow** command to determine the active CP.
3. Type `fruReplace wwn` from the active CP blade and wait for Do you wish to continue [y/n]? to display; then type `y`.
4. Wait until the WWN card data is backed up. Do not type continue until the mechanical replacement is complete (see "Installing the WWN bezel and WWN card" on page 75).

```
switch:admin> frureplace wwn
This is the WWN card hot swap interface.
Continuing from this point will require
the whole process to be completed.
If this process is not complete due to a
power cycle, or CP failover, please follow
the recovery procedure in
Core Switch WWN Card Removal and
Replacement document.
Do you wish to continue [y/n]?
```

Backing up WWN card data, please wait about 25 seconds for further instruction. Please install the new FRU now.

If this session lost for any reason, please re-enter the `frureplace` command and follow the instructions to complete the operation.

Please enter the word 'continue' after the new WWN card has been installed:

5. Wait until all the LEDs on the WWN bezel turn off.
6. Remove the four screws from the WWN bezel (see Figure 29 on page 75). Pull the bezel away from chassis and set it aside. The WWN cards are visible.
7. Remove a WWN card as follows:
  - To remove a WWN card that has handles: Use the handles to remove the card.

- To remove a WWN card that does not have handles: Use a Phillips screwdriver to unscrew the two screws which secure the WWN card to the chassis. Hold the card by the edges and remove it.
8. Set the WWN card on a static-free surface, such as a grounding pad.

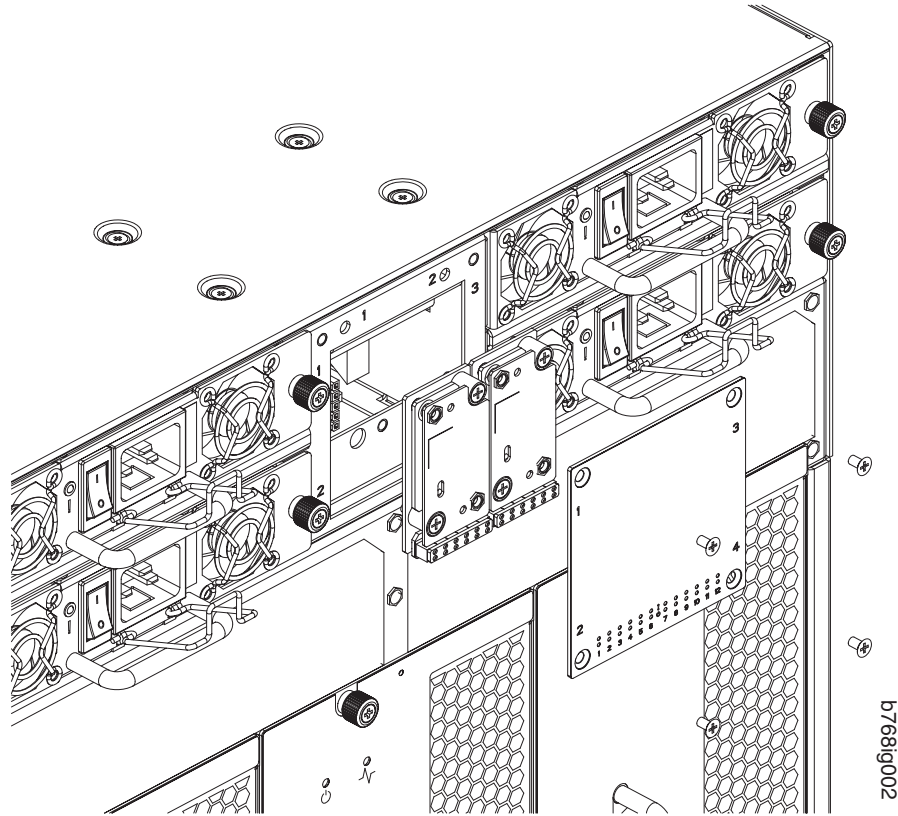


Figure 29. WWN bezel and card removal and installation

## Installing the WWN bezel and WWN card

To install the WWN bezel and WWN card, do the following:

**Attention:** Follow ESD precautions.

1. Unpack the new WWN card and save the packaging for the faulty WWN card.
2. Install the WWN card as follows:
  - **To install a WWN card that has handles:** Hold the card by the handles and orient with the LEDs at the bottom. Align the connector on the card with the connector on the chassis (the connectors are keyed to ensure correct installation) and use the “push pad” to press the card onto the connector until it is seated.
  - **To install a WWN card that does not have handles:** Hold the card by the edges and press the card onto the connector until it is fully seated. Use the Phillips screwdriver and the two screws to attach the WWN card to the chassis.
3. Install the WWN bezel. Orient the bezel on the chassis (see Figure 29). Insert and tighten the four screws.

**Note:** If a serial console session is active, several “removal detected” and “insertion detected” messages display on the console because of the installation.

4. In the CLI session, type `continue` to indicate that the replacement has been completed.

Please enter the word `continue` after the new WWN card has been installed: `continue`

```
Restoring the information to the replacement FRU now, please
wait about 20 seconds to complete
Verifying the replacement FRU now...
WWN card hot swap is now complete.
FRU replacement completed successfully!
```

5. Verify that the WWN card is correctly connected by checking the LEDs on the WWN card to see if they reflect the status of the components.

**Note:** The LEDs might take up to 2 minutes after WWN card installation to begin functioning.

6. Pack the faulty WWN card in the packaging provided with the new card for return to IBM, following local procedures.

---

## Installing and removing FC transceivers in a port blade

**Note:** For a listing of SFPs compatible with this product:

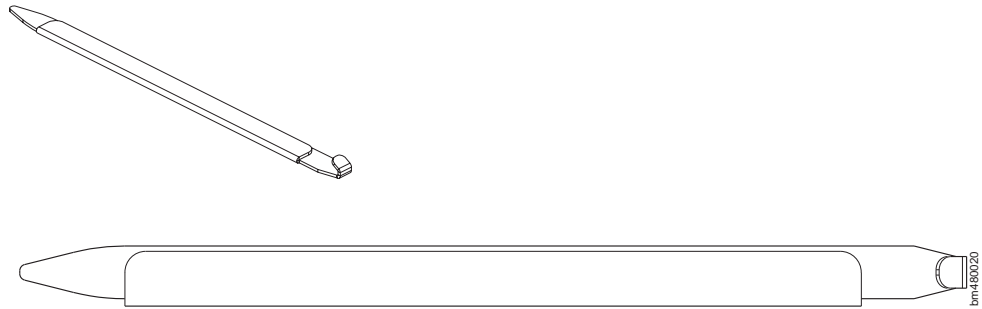
- Go to the IBM SAN b-type family web page [http://www.ibm.com/servers/storage/san/b\\_type](http://www.ibm.com/servers/storage/san/b_type)
- Select the **Product details** link under the individual product name
- On the **Product details** tab, click the **Interoperability** link.

To remove an SFP or XFP (FC10-6 blade only) transceiver, pull the bale down and out, sliding the transceiver out of the port or application blade.

To install an SFP or XFP, position one of the transceivers so that the key is oriented correctly to the port. Insert the transceiver into the port until it is firmly seated and the latching mechanism clicks. Transceivers are keyed so that they can only be inserted with the correct orientation. If a transceiver does not slide in easily, ensure that it is correctly oriented.

The SAN768B comes with a transceiver extraction tool (see Figure 30 on page 77) and holster. The extraction tool is designed to remove transceivers from blades where the space is limited. To use the extraction tool, slide the tool on to the bale of the transceiver and pull it out.





*Figure 30. SFP extraction tool*

**Note:** This tool is part of the SAN768B ship group and should be kept with the SAN768B.



---

## Chapter 6. Installing new features

**Attention:** Refer to “Safety and environmental notices” on page xiii before performing any service or installation procedures.

The SAN768B can be upgraded with any of the following hot-pluggable features while the SAN768B is operational. Refer to the individual feature installation instructions for any possible exceptions.

Use this chapter as a starting point when installing new features on an existing SAN768B. Installation instructions link from here to the appropriate sections.

- “FC3816, FC3832, FC3848 - Installing a 8-Gb port blade (16, 32, or 48 ports)”
- “FC3850 - Installing an FR4-18i routing blade” on page 80
- “FC3870 - Installing an FC10-6 10 Gb blade” on page 82

---

### FC3816, FC3832, FC3848 - Installing a 8-Gb port blade (16, 32, or 48 ports)

These features can be installed while the SAN768B is operational.

**Attention:** Follow these precautions for all procedures in this section to avoid damaging the port blades or chassis:

- Wear a grounded ESD strap when handling a port blade.
- Carefully remove the protective strip (if any) covering the blade connectors before installing any blades.
- Do not force the port blade installation. If the port blade does not slide in easily, ensure that it is correctly aligned inside the rail guides before continuing. Installing a port blade with incorrect alignment damages both the chassis and the replacement part.
- Hold the port blade by the edges of the metal pan. Do not use the ejectors to hold a port blade.
- Disassembling any part of a port blade voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the port blade.

These instructions cover installing a new FC3816, FC3832, or FC3848 in the SAN768B chassis.

#### Time required

10 minutes or less per port blade

#### Items required

- ESD (electrostatic discharge) grounding strap
- Workstation computer
- Port blade
- Phillips screwdriver
- Small form factor pluggable (SFP) transceivers (as needed)
- Optical cables (as needed)

#### Procedures

Follow the links in the steps below to complete this installation:

1. Verify that the port blade is the correct part: 21R9996 for the 16-port blade, and 21R9997 for the 32-port blade, and 21R9998 for the 48-port blade.
2. Verify which slot to install the blade. Slots are numbered from one through ten, from left to right, when facing the port side of the SAN768Bs. Port blades can be installed in any of the slots 1-4 and 9-12.
3. We recommend having the latest firmware version on the CP blade. If the firmware is not at the latest level, obtain new code from the code download website, and install it prior to installing the port blade. See “Removing and installing port blades” on page 53.

**Note:** Firmware downloads require that Ethernet connections be made to both CP blades. Procedures for loading firmware are described in the *Fabric OS Administrator's Guide*.

**Attention:** A filler panel should be removed only when being replaced with a port blade or new filler panel. Any slot that is not occupied by a port blade should be occupied by a filler panel to ensure correct cooling of the chassis and protection from dust.

4. Remove the filler panel or port blade. Refer to “Removing a port blade” on page 54 or “Removing a filler panel” on page 56.
5. Follow the instructions for “Installing a port blade” on page 55.
6. Follow the instructions for “Installing and removing FC transceivers in a port blade” on page 76. Because of port density, it may be easier to remove and install the SFPs while the 32-port or 48-port blade is out of the chassis. However, you must handle the blade carefully while it is out of the chassis to avoid damaging it.
7. Install, group and route the cables as desired. See “Managing cables” on page 9 for additional cabling instructions.

**Attention:** Do not route cables in front of the exhaust vent, which is located at the top on the port side of the chassis.

8. Verify the installation. See “Validating the installation of port blades” on page 105. For information about how to check the status of hardware components using the CLI, see the *Fabric OS Administrator's Guide*, which is located on the product documentation CD.

---

## FC3850 - Installing an FR4-18i routing blade

This feature can be installed while the SAN768B is operational.

**Attention:** Follow these precautions for all procedures in this section to avoid damaging the blades or chassis:

- Wear a grounded ESD strap when handling a blade.
- Carefully remove the protective strip (if any) covering the blade connectors before installing any blades.
- Do not force the blade installation. If the blade does not slide in easily, ensure that it is correctly aligned inside the rail guides before continuing. Installing a blade with incorrect alignment can damage both the chassis and the blade.
- Hold the blade by the edges of the metal pan. Do not use the ejectors to hold a blade.
- Disassembling any part of a blade voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the blade.

These instructions cover installing a new FC3850 in the SAN768B chassis.

## Time required

Approximately 20 minutes per blade

## Items required

- ESD (electrostatic discharge) grounding strap
- Workstation computer
- Router blade
- Phillips screwdriver
- Small form factor pluggable (SFP) transceivers (as needed)
- Optical cables (as needed)

## Procedures

Follow the links in the steps below to complete this installation

1. Verify that the router blade is the correct part: 23R1646.
2. Verify which slot to install the blade. Slots are numbered from one through ten, from left to right, when facing the port side of the SAN768Bs. A maximum of two router blades can be installed in a single SAN768B chassis. Router blades can be installed in any slot 1-4 and 9-12. If there are two router blades, to ensure proper cooling install one router blade in one of the slots 1-4, and the other in one of the slots 9-12.

**Attention:** A filler panel should be removed only when being replaced with a blade or new filler panel. Any slot that is not occupied by a blade should be occupied by a filler panel to ensure correct cooling of the chassis and protection from dust.

3. Remove the filler panel. Store the filler panel in a location for possible future use.
4. Install the router blade. Remove the protective strip from the blade contacts (if any) before installing the blade.
5. Repeat steps 1-4 for the second router blade, if any.
6. Configure the router blade. Configuration instructions are provided in the *Fabric OS Administrator's Guide* in the "Using the FC-FC Routing Service" chapter.
7. Install SFPs and cables to the router blade, and confirm the proper operation of the blade.

---

## FC3870 - Installing an FC10-6 10 Gb blade

This feature can be installed while the SAN768B is operational.

**Attention:** Follow these precautions for all procedures in this section to avoid damaging the port blades or chassis:

- Wear a grounded ESD strap when handling a port blade.
- Carefully remove the protective strip (if any) covering the blade connectors before installing any blades.
- Do not force the port blade installation. If the port blade does not slide in easily, ensure that it is correctly aligned inside the rail guides before continuing. Installing a port blade with incorrect alignment damages both the chassis and the replacement part.
- Hold the port blade by the edges of the metal pan. Do not use the ejectors to hold a port blade.
- Disassembling any part of a port blade voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the port blade.

### Time required

Less than 20 minutes.

### Items required

- ESD (electrostatic discharge) grounding strap
- Workstation computer
- Port blade
- Phillips screwdriver
- Small form factor pluggable (SFP) transceivers (as needed)
- Optical cables (as needed)

### Procedures

Follow the links in the steps below to complete this installation.

1. Verify that the port blade is the correct part: 17P9651.  
**Attention:** A filler panel should be removed only when being replaced with a port blade or new filler panel. Any slot that is not occupied by a port blade should be occupied by a filler panel to ensure correct cooling of the chassis and protection from dust.
2. Remove the filler panel or port blade. Refer to “Removing and installing port blades” on page 53.
3. Install, group, and route the cables as desired. See “Managing cables” on page 9 for additional cabling instructions.  
**Attention:** Do not route cables in front of the exhaust vent, which is located at the top on the port side of the chassis.
4. Verify the installation. See “Validating the installation of port blades” on page 105. For information about how to check the status of hardware components using the CLI, see the *Fabric OS Administrator's Guide*, which is located on the product documentation CD.

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## Chapter 7. Installing the chassis

The SAN768B chassis is highly reliable and unlikely to fail. This chapter describes how to remove and replace a chassis in the unlikely event of a failure. The SAN768B must be removed from the fabric and powered off to perform this procedure. Contact IBM if you have any questions about whether the SAN768B chassis requires installation. This procedure is to be completed only by a qualified IBM service representative.

Refer to the following sections of this chapter for specific information:

- “Verifying necessity of replacement”
- “Preparing for a chassis installation” on page 84
  - “Time required” on page 84
  - “Items required” on page 84
  - “Recording critical SAN768B and SAN information” on page 84
- “Disconnecting the SAN768B from the network and fabric” on page 88
- “Removing components from the chassis” on page 88
- “Removing and replacing the chassis” on page 89
- “Installing components into the new chassis” on page 90
- “Verifying the correct operation of hardware” on page 90
- “Verifying the correct operation of the system” on page 91
- “Reconnecting the system to the network and fabric” on page 92
- “Verifying the correct configuration of the fabric” on page 93

---

### Verifying necessity of replacement

Before replacing the chassis, verify that the replacement is necessary. Ensure that the components are firmly seated when troubleshooting. Contact IBM if you have any questions about whether the chassis should be replaced.

Any of the following events might indicate that the chassis requires replacement:

- Visible mechanical damage to the chassis, including damage to sheet metal or blade guides that prevents correct installation of a component.
- Bent or damaged connectors on the main backplane (the surface inside the chassis to which the various blades connect) or on the blower backplane (the surface to which the blower assemblies connect).
- One or more SAN768B components (such as a power supply, blower assembly, port blade, CP blade, or WWN card) do not function properly even after the component is replaced.
- An ac power switch shuts off automatically even though all power supplies are removed from the chassis.
- The **psShow** or **fanShow** commands continue to show a faulty component even though the component has been replaced.
- The **slotShow** command continues to show a faulty CP blade or port blade even though the blade has been replaced.

---

## Preparing for a chassis installation

Use the following information to help prepare for a chassis installation.

**Attention:** Refer to “Safety and environmental notices” on page xiii before performing any removal or installation procedures.

### Time required

The chassis installation procedure takes approximately 3 hours to complete.

### Items required

The following items are required for the chassis installation procedure:

- Electrostatic discharge (ESD) grounding strap.
- ESD grounding pads for protecting control processor (CP) cards, port cards, and the WWN card.
- Serial cable and workstation computer with a terminal emulator application (such as HyperTerminal for Windows systems or TIP for Solaris systems), required only if serial console session used.
- Lifting tool (see “Ordering the lift tool” on page 12).
- A surface to place the old chassis on, such as a second lift or the pallet originally provided with the old chassis.
- 1/2 inch socket wrench to remove the pallet bolts.
- Torque wrench with #2 Phillips screwdriver tip (if switch is installed in a cabinet).
- #2 slotted screwdriver.

## Recording critical SAN768B and SAN information

All commands must be entered from a CLI session (Telnet or serial) to the active CP card unless otherwise indicated. For detailed information about Fabric OS commands, refer to the *Fabric OS Command Reference Manual*. Use a checklist to ensure that all required information is recorded (see “Chassis critical information checklist” on page 87).

To record critical switch and SAN information:

1. Open a Telnet session and login to the SAN768B as `admin`. The default password is `password`. Enable the logging function on your Telnet or serial console connection.
2. Back up the current configuration. Type **configUpload** then enter the requested information at the prompts.

**Note:** The **configUpload** command can be entered through a Telnet or serial session, but you must have an Ethernet connection between the SAN768B and the server name or IP of the host to complete the upload process. For more information, refer to the **help configUpload** command or the *Fabric OS Command Reference Manual*.

**Note:** Newer examples are needed here. Get examples from *Fabric OS Command Reference Manual*.

This command uploads the switch configuration to the customer-defined FTP server, making it available for downloading later, if required.



```

swDir:admin> configupload
Server Name or IP Address [host]: 123.123.123.123
User Name [None]: Admin24
File Name [config.txt]: config-switch0.txt
Password: xxxxxxxx
upload complete
swDir:admin>

```

3. Record the SAN768B values on a workstation, following steps 4 through 9 below.
4. Record the WWN value: Type **wwn**, then copy the command output into a file named configmiscinfo.txt.

```

swDir:admin> wwn
10:00:00:60:69:00:00:0a

```

5. Record the IP address information. Type **ipAddrShow -sw**, then copy the command output into the config-miscinfo.txt file.

```

swDir:admin> ipaddrshow

SWITCH
Ethernet IP Address: 10.32.50.12
Ethernet Subnetmask: 255.55.0.0
Fibre Channel IP Address: 1.2.3.4
Fibre Channel Subnetmask: 255.255.255.0

CP0
Ethernet IP Address: 10.32.50.10
Ethernet Subnetmask: 255.55.0.0
HostName : cp0
Gateway Address: 10.32.40.1

CP1
Ethernet IP Address: 10.32.50.11
Ethernet Subnetmask: 255.55.0.0
HostName : cp1
Gateway Address: 10.32.40.1

Backplane IP address of CP0 : 10.0.0.5
Backplane IP address of CP1 : 10.0.0.6
swDir:admin>swDir:admin>

```

6. Display and record the manufacturer serial numbers. Type **chassisShow**, then copy the command output into the config-miscinfo.txt file.  
 "Factory Serial Num" and "Serial Num" are listed under "Chassis/WWN Unit 1."  
 If the current WWN card is the original card, the factory serial number listed is the same as the chassis serial number provided on the bar code sticker inside the door of the chassis. If a "Serial Num" value displays, contact IBM to determine whether this serial number should be modified after the new WWN card is installed.

```

swDir:admin> chassisshow

Chassis Backplane Revision: 1F

SW BLADE Slot: 1
Header Version:          2
Power Consume Factor:    -50
Factory Part Num:        60-0001532-03
Factory Serial Num:      KP000000195
Manufacture:             Day: 1 Month: 1 Year: 2004
Update:                  Day: 14 Month: 3 Year: 2005
Time Alive:              187 days
Time Awake:              3 days

<output truncated>

CHASSIS/WWN Unit:        1 (in same assembly as WWN Unit: 2)
Header Version:          2
Power Consume Factor:    -3
Factory Part Num:        60-0001501-07
Factory Serial Num:      FT02X805BE2
Manufacture:             Day: 26 Month: 3 Year: 2004
Update:                  Day: 14 Month: 3 Year: 2005
Time Alive:              207 days
Time Awake:              3 days

<output truncated>

swDir:admin>

```

7. Create a SAN profile by entering and recording the information provided by the following commands:

- **nsShow**
- **nsAllShow**
- **switchShow**
- **fabricShow**

Copy the command output into a text file named SANbefor.txt. This information can be used after the SAN768B is restored to the fabric, to verify that no unintentional changes have occurred to the fabric.

```

swDir:admin> nsshow
Type Pid COS PortName NodeName TTL
<output truncated>

swDir:admin> nsallshow
12 Nx_Ports in the Fabric
<output truncated>

swDir:admin> switchshow
switchName: switch
<output truncated>

swDir:admin> fabricshow
Switch ID Worldwide Name Enet IP Addr FC IP Addr Name
<output truncated>

swDir:admin>

```

- Type **supportShow**, then copy the command output into a text file named `sptshow.txt`.

**Note:** The **supportShow** command has very long output and can take several minutes to complete.

This file provides a backup of all the information that might be required by Technical Support. The information can be used after the switch is restored to the fabric, to verify that no unintentional changes have occurred to the fabric.

```
swDir:admin> supportshow
version: 6.0.0
<output truncated>

swDir:admin>
```

- Record the cable connections between the SAN768B and the target device and ports. (See “Cable routing tables” on page 93).

## Chassis critical information checklist

Use the table below, or a similar structure to record critical information when replacing a SAN768B chassis.

*Table 20. Critical information checklist example*

Configuration information	
	Location of "config-switch.txt" file:
	Location of "config-miscinfo.txt" file:
	IP address, subnet mask:
	WWN for SAN768B:
SAN profile	
	Location of "SANbefor.txt" file:
	Notes regarding <b>nsshow</b> output:
	Notes regarding <b>nsallshow</b> output:
	Notes regarding <b>switchshow</b> output:
	Notes regarding <b>fabricshow</b> output:
Output from "supportshow" command	
	Location of "sptshow.txt" file:
	Notes regarding <b>supportshow</b> output:
Information about the new chassis	
	New factory serial number:
	New serial number (if available):

**Note:** Copying the individual switch configurations, miscellaneous configuration information, SAN profile, and **supportShow** output into text files is recommended. Recommended file names are "configswitch. txt," "config-miscinfo.txt," "SANbefor.txt," and "sptshow.txt," respectively.

---

## Disconnecting the SAN768B from the network and fabric

To disconnect the SAN768B from the network and fabric:

1. Type **switchShutdown** to ensure a graceful shutdown.

```
swDir:admin> sysshutdown
This command will shutdown the operating systems on your switch.
You are required to power-cycle the switch in order to restore operation.
Are you sure you want to shutdown the switch [y/n]? y
HA is disabled
Stopping blade 1
Shutting down the blade....
Stopping blade 4
Shutting down the blade....
Stopping blade 10
Shutting down the blade....
Broadcast message from root (pts/1) Tue Jul 18 14:23:06 2006...
The system is going down for system halt NOW!!
```

2. Power off the chassis by flipping both ac power switches to "0" (the LEDs inside the clear plastic ac power switches should turn off). To maintain the ground connection, leave both power cords connected to the chassis and to an electrical outlet.
3. Label the cables connected to the port blades, CP blades, and router blades, if not already labeled, to indicate how to reconnect them, and record the connections in the "Cable routing tables" on page 93.
4. Disconnect all cables from the port and router blades and set them aside. The SFP transceivers can be left in the blades or removed. If you are using any, save the cable management pillars and hook-and-loop cable straps for later use.
5. Disconnect all cables from both CP blades.

---

## Removing components from the chassis

**Attention:** Before removing any components, refer to "Safety and environmental notices" on page xiii, and particularly to "Rack safety" on page xix to ensure that any component removals and installations do not affect the stability of the cabinet.

**Attention:** To prevent damage to the equipment from ESD:

- Ensure that the SAN768B is grounded when removing or installing static-sensitive components. This can be accomplished by leaving the power cords attached to the chassis and a power source or by implementing standard ESD precautions, such as placing the chassis on a grounded bench.
- Wear an ESD grounding strap when handling the CP cards, port cards, and WWN card.
- Protect the CP blades, port blades, router blades, and WWN card with static bags or grounding pads while they are out of the chassis.

You must remove the field replaceable units (FRUs) from the SAN768B chassis in the order listed below. Refer to the instructions in Chapter 5, "Removing and installing components," on page 51 for component-specific removal instructions.

1. Remove the chassis door as described in "Removing and installing the chassis door" on page 51.

2. Remove the power supply units or filler panels as described in “Removing and installing a power supply” on page 69.
3. Remove the port blades or filler panels as described in “Removing and installing port blade filler panels” on page 56.
4. Remove the FR4-18i router blade as described in “Removing and installing an FR4-18i router blade” on page 66.
5. Remove the CP blade as described in “Removing and installing a control processor blade (CP8)” on page 57.
6. Remove the blower assemble as described in “Removing and installing a blower assembly” on page 71.
7. Remove the WWN bezel and card as described in “Installing the WWN bezel and WWN card” on page 75.
8. Remove power cords.
9. Remove the cable management comb as described in “Removing and installing a cable management comb” on page 52.

---

## Removing and replacing the chassis

Although the empty chassis is lighter than a fully populated chassis, a lifting device is still required to move it. Refer to Chapter 2, “Installing and removing a SAN768B,” on page 11 for more detailed instructions on removing a SAN768B from a cabinet. The instructions below only provide an outline of the steps required to complete this process.



**CAUTION:**

**The weight of this part or unit is approximately 47 kg (104 lb). It takes specially-trained persons and/or a lifting device to safely lift this part or unit. (C011)**

**Attention:** Do not place a SAN768B chassis directly on the floor. It cannot be easily moved from the floor back onto a lift or pallet.

1. Uninstall the chassis from the cabinet (see Chapter 2, “Installing and removing a SAN768B,” on page 11 for detailed steps) and place it onto an extra lift or on the shipping pallet originally provided with the chassis. Remove the rack mount hardware, and set the hardware aside for use with the new chassis.
2. Unpack the new chassis:
  - a. Use scissors to cut the two bands that encircle the packaging.
  - b. Lift off the lid and remove the kits and foam from the top of the chassis.
  - c. Lift the cardboard box off the chassis and remove the plastic bag from around the chassis. Save packing materials for use when returning the old chassis.
  - d. Leave chassis attached to pallet if chassis must be transported to the installation location.
3. Transport the new chassis to the installation area, using a pallet jack or the IBM approved lift tool. If a pallet jack is available, place the tines into the gaps under the chassis. Doorways must be wider than 36 inches (91 cm) to accommodate the chassis on the pallet.
4. Remove the pallet brackets and bolts:
  - a. Remove the four bolts holding the chassis to the pallet, using the 1/2 inch socket wrench.

- b. Remove the four brackets from bottom of the chassis.
  - c. Save the pallet, pallet brackets, and pallet bolts for use when returning the faulty chassis, if required.
5. Install the chassis in the cabinet, using a lift tool to raise the chassis to the correct level. See Chapter 2, “Installing and removing a SAN768B,” on page 11 for detailed steps.

**Attention:** To ensure adequate cooling, install the chassis with the cable side, which contains the air intake vents, facing the cool air aisle.

---

## Installing components into the new chassis

Install the components into the new SAN768B chassis in the order listed below. Refer to Chapter 5, “Removing and installing components,” on page 51 for more specific installation information.

**Attention:** Do not force the installation of any of the components. If the component does not slide in easily, ensure that it is correctly aligned and positioned before continuing.

**Attention:** Do not turn on the power until it is time to verify hardware operation

1. Put on an ESD grounding strap and follow proper ESD procedures.
2. Install the WWN card and bezel in the new chassis as described in “Installing the WWN bezel and WWN card” on page 75.
3. Install the blower assemblies in the new chassis as described in “Removing and installing a blower assembly” on page 71.
4. Install the CP blades in the new chassis as described in “Removing and installing a control processor blade (CP8)” on page 57.
5. Install the port blades or filler panels in the new chassis as described in “Installing a port blade” on page 55 or “Installing a filler panel” on page 57.
6. Install the FR4-18i router blades in the new chassis as described in “Removing and installing an FR4-18i router blade” on page 66
7. Install the power supplies or filler panels in the new chassis as described in “Removing and installing a power supply” on page 69.
8. Reinstall the chassis door as described in “Removing and installing the chassis door” on page 51.

---

## Verifying the correct operation of hardware

Follow these steps to power on the system and verify that the hardware is operating correctly.

1. Turn on all ac power switches on the power supplies by flipping them to “I”. The LEDs next to the ac power switches light up green when power is being supplied.

By default, the SAN768B automatically performs a power-on self-test (POST) each time it is powered on. POST takes a minimum of three minutes and is complete when LED activity returns to standard state.

2. Verify that the SAN768B is powered on and POST is complete (all power LED indicators on the port blades, CP blades, and router blades should be a steady green).
3. Verify that all components are functioning correctly by checking the LEDs for each component. If the LEDs do not indicate a standard healthy state, try reinstalling the corresponding component.

---

## Verifying the correct operation of the system

To verify that the SAN768B is operating correctly, follow the steps below.

1. Log in to the SAN768B as admin.

```
swDir:root> login
login: admin
password: xxxxxxxx
swDir:admin>
```

2. Enter **slotShow** and verify that all the installed cards are detected and that their status is operational.
3. Verify that the SAN768B is functioning correctly by typing **switchshow**. This command displays switch and port status information.

```
swDir:admin> switchshow
switchName:      swDir
switchType:      42.0
switchState:     Online
switchMode:      Native
switchRole:      Principal
switchDomain:    2
switchId:        fffc02
switchWwn:       10:00:00:60:69:80:5b:e2
zoning:          ON (c3)
switchBeacon:    OFF
blade1 Beacon:   OFF
blade3 Beacon:   OFF
blade9 Beacon:   OFF

Area Slot Port Media Speed State
=====
1 1 0 id N4 Online F-Port 10:00:00:00:c9:29:0e:77
<output truncated>

swDir:admin>
```

4. Verify that all the IP address information is correct by typing **ipaddrshow** and checking the results against the IP information recorded in the "config-miscinfo.txt" file.

```
swDir:admin> ipaddrshow

SWITCH
Ethernet IP Address: 10.32.50.12
Ethernet Subnetmask: 255.55.0.0
Fibre Channel IP Address: 1.2.3.4
Fibre Channel Subnetmask: 255.255.255.0

CP0
Ethernet IP Address: 10.32.50.10
Ethernet Subnetmask: 255.55.0.0
HostName : cp0
Gateway Address: 10.32.40.1

CP1
Ethernet IP Address: 10.32.50.11
Ethernet Subnetmask: 255.55.0.0
HostName : cp1
Gateway Address: 10.32.40.1

Backplane IP address of CP0 : 10.0.0.5
Backplane IP address of CP1 : 10.0.0.6
swDir:admin>swDir:admin>
```

---

## Reconnecting the system to the network and fabric

**Attention:** Refer to “Managing cables” on page 9 for information on how to physically manage the arrangement of the cables within the SAN768B chassis, and cautions on handling and routing the cables.

Refer to the cable routing information recorded in “Cable routing tables” on page 93 to ensure the correct cable connections in the steps below.

1. Connect the CP blades to the local area network, one blade at a time.
  - a. Refer to the cable routing information recorded earlier and insert the appropriate Ethernet cables into each Ethernet port.
  - b. Connect the other ends to an Ethernet 10/100 Base-T LAN, if not already connected.

**Note:** The SAN768B can be accessed by remote connection using any of the available management tools, such as Telnet or Web Tools. Ensure that the SAN768B is not modified from other connections during the rest of this procedure.

2. Reconnect the transceivers and cables to the port blades, as required.
  - a. Install a transceiver into each port, if not already installed (see “Installing and removing FC transceivers in a port blade” on page 76).
  - b. Select the cable that corresponds to the port and position it 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.
  - c. Repeat step b for each remaining port on the blade.



**Attention:** Do not route cables in front of the air exhaust vent (located on the upper port side of the chassis.)

The minimum bend radius for a 50-micron cable is 2 in. under full tensile load and 1.2 in. with no tensile load.

Tie wraps are not recommended for optical cables because they are easily overtightened and can unknowingly break the cable causing connectivity problems.

- d. Repeat steps a through c for each of the remaining port blades.
3. Organize the cables as required (see “Managing cables” on page 9).
4. Reconnect the transceivers and cables to the router blades, as required.

## Verifying the correct configuration of the fabric

Details on configuring the fabric are included in the *Fabric OS Administrator's Guide* and the *Fabric OS Command Reference Manual*, which are included on the product documentation CD shipped with the product.

## Cable routing tables

Table 21 provides a sample of cable routing information. Create your own table, or use Table 22 to record this information, if it is not already available.

Table 21. Sample cable routing table for SAN768B (Switch Name: swDir)

Slot/Port	Cable labels		Device connected to	Slot/Port of device
	Switch end	Device end		
Slot 1 Port 0	North 24 - 1/0	East 26 - 0	SANB32 East 26	0
Slot 5 Serial	North 24 - 5 / Serial	Work 5 - 2	Workstation 5	Com 2
Slot 8 Port 15	North 24 - 8/15	RAID 16 - 4	RAID 16	4

Table 22. Cable routing table for SAN768B

Slot/Port		Cable labels		Connected device	Slot/Port of device
Slot	Port	Switch end	Device end		
	0				
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				

Table 22. Cable routing table for SAN768B (continued)

Slot/Port		Cable labels		Connected device	Slot/Port of device
Slot	Port	Switch end	Device end		
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24				
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				
	36				
	37				
	38				
	39				
	40				
	41				
	42				
	43				
	44				
	45				
	46				
	47				
	48				

## Appendix A. Product specifications

This section provides product specifications for the SAN768B.

### System architecture

Table 23 lists the system architecture for the SAN768B.

Table 23. System architecture

Fibre Channel Ports	Up to 384 ports, universal (E_Port, F_Port, FL_port, Ex_port, and M_port)
Control Processor	Redundant (active/standby) control processor modules
Scalability	Full fabric architecture: 239 switches maximum
Performance	1.063 Gbit/sec line speed, full duplex 2.125 Gbit/sec line speed, full duplex 4.25 Gbit/sec line speed, full duplex 8.50 Gbit/sec line speed, full duplex 10.51875 Gbit/sec line speed, full duplex (with FC10-6 blade)  Autosensing of 1, 2, 4, and 8 Gbit/sec port speeds optionally programmable to fixed port speed, speed matching between 1, 2, 4, and 8 Gbit/sec port speeds
ISL Trunking	Can use up to 8 ports in a trunk group to form a 64 Gbit/sec trunk
Aggregate bandwidth	6144 Gbit/sec, end-to-end, when using eight FC8-48 port blades
Switch latency	FC8-16 blade: <2.1 msec any port to any port at 8 Gbit/sec, cut-through routing.  For the FC8-32 blade: <2.1 msec any port to any port at 8 Gbit/sec, cut-through routing.  For the FC8-48 blade: <2.1 msec any port to any port at 8 Gbit/sec, cut-through routing.  For the FR4-18i blade: <3.6 msec any port to any port at 4 Gbit/sec, cut-through routing.
Maximum frame size	2112-byte payload
Frame buffers	2048 per ASIC, dynamically allocated.
Classes of service	Class 2, Class 3, Class F (interswitch frames)

Table 23. System architecture (continued)

<p>Port types</p>	<p>FC8-16 and FC8-32 support these port types: FL_Port, F_Port, E_Port, and M_Port</p> <p>FC8-48 supports these port types: E_Port, F_Port, and M_Port</p> <p>FC10-6 supports these port types: E_Port and M_Port</p> <p>FR4-18i supports these port types: FL_Port, F_Port, E_Ports, M_Port, VE_Port, EX_Port, and VEX_Port</p> <p><b>Note:</b> Self-discovery is based on switch type (U_Port) with an optional port type control.</p>
<p>Data traffic types</p>	<p>Fabric switches supporting unicast, multicast (255 groups), and broadcast</p>
<p>Media types</p> <p><b>Note:</b> Only Brocade-branded SFPs operate on the 16, 32, and 48 port blades.</p>	<p>Hot-pluggable, industry-standard small form factor pluggable (SFP) or extended form factor pluggable (XFP, FC10-6 only), LC connector;</p> <ul style="list-style-type: none"> <li>• short-wave laser (SWL), up to 500 m (1,640 ft)</li> <li>• long-wave laser (LWL), up to 10 km (6.2 mi)</li> <li>• extended long-wave laser (ELWL), up to 80 km (49.6 mi) distance depends on fiber optic cable and port speed</li> <li>• copper 1 GbE connections on the FR4-18i routing blade</li> </ul>
<p>Fabric services</p>	<p>Simple Name Server; Registered State Change Notification (RSN); Brocade Advanced Zoning; Web Tools; Fabric Watch; Extended Fabrics; ISL Trunking; End-to-End Performance Monitoring, FICON CUP, ACL (Access Control Lists), Admin Domains, Reliable Commit Service, NTP, Syslog, RASlog, auditing</p>
<p>Data traffic types</p>	<p>Fabric switches supporting unicast, multicast (255 groups), and broadcast</p>
<p>Inter-chassis linking (ICL)</p>	<p>Chassis-to-chassis linkage through connectors on the core switch blade (CR8)</p>

---

## Physical dimensions

Table 24 lists the system sizes and weights.

*Table 24. System sizes and weights*

<b>System size</b>	<b>Size and weight</b>
Width	43.74 cm (17.22 in.)
Height	61.24 cm (24.11 in./14U)
Depth	61.29 cm (24.09 in.)
Depth (with door)	73.20 cm (28.82 in.)
SAN768B: 384-port configuration with eight FC8-48 port blades	103.6 kg (228 lb.)
Empty chassis: <ul style="list-style-type: none"><li>• No blades</li><li>• No CPs</li><li>• No CRs</li><li>• No power supplies</li><li>• No fan assemblies</li></ul>	39.64 kg (87.2 lb.)

Table 25 lists the System FRU weights.

*Table 25. System FRU weights*

<b>FRU</b>	<b>Weight</b>
CP blade (CP8)	3.0 kg (6.6 lb.)
CR blade (CR8)	3.27 kg (7.2 lb.)
FC8-16 port blade	3.0 kg (6.6 lb.) without media
FC8-32 port blade	3.27 kg (7.2 lb.) without media
FC8-48 port blade	3.36 kg (7.4 lb.) without media
FC10-6 port blade	3.1 kg (6.8 lb) without media
FR4-18i router blade	3.36 kg (7.4 lb) without media
Port card filler panel	1.5 kg (3.2 lb)
Power supply	2.45 kg (5.4 lb.)
Blower assembly	5.73 kg (12.6 lb.)
WWN bezel	0.3 kg (0.6 lb)
Cable management comb	0.45 kg (1.0 lb.)
Chassis door	2.09 kg (4.6 lb.)

---

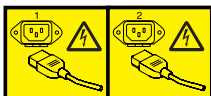
## Facility requirements

The facility where the SAN768B is in use must meet the following requirements to provide for correct operation:

- Adequate supply circuit, line fusing, and wire size, as specified by the electrical rating on the chassis nameplate
- An air flow of at least 595 cubic meters per hour (350 cubic feet per minute), available in the immediate vicinity of the SAN768B
- The power specifications listed in Table 26 on page 98

- The environmental specifications listed in Table 27 on page 99
- If the SAN768B will be installed in an EIA rack, ensure the following:
  - All equipment installed in the rack has a reliable branch circuit ground connection, and does not rely on a connection to a branch circuit, such as a power strip.
  - The rack is balanced and mechanically secured to provide stability in the event of an earthquake.
  - Additional equipment does not exceed the rack's weight limits.

## Power specifications



### DANGER

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

The power subsystem is a redundant +48 V dc power distribution system with a provision for up to four 2000-watt, 48V dc bulk power supplies. Bulk power supplies produce the intermediate distribution voltage in the distributed power system.

The power specifications listed in Table 26 are calculated for fully-loaded systems with four power supplies. For these calculation purposes, a fully-loaded system has two FR4-18i router blades, six FC4-32 port blades, two CP blades, and three blower assemblies.

Table 26. Power specifications

Specification	Value
Input voltage	A fully loaded switch requires a maximum of 750 Volt-Amps.  This results in a main current of 3.2 amps at 240V AC line voltage or 3.6 amps at 208V AC line voltage.  The rated AC input range is 180 to 264V AC.
Supported power range	Nominal: 200 to 240 VAC, single phase
Input frequency range	47-63 Hz
Power supplies (each)	Output voltages: 48V at 20 amps; 12V at 4 amps Maximum output power: 2000 watts
Ac inrush current	40A maximum, peak
Ride through	The supply outputs remain within specified regulation for a minimum of 20 msec after the AC mains are disconnected.
Under voltage protection	The SAN768B power supply self-protects from any input voltage, static or dynamic, from zero volts to its operating ranges. It recovers to normal operation upon returning to its operating range.

## Environmental requirements

Table 27 lists the environmental operating ranges for the SAN768B. The requirements for non-operating conditions are also provided for acceptable storage and transportation environments.

Table 27. Environmental requirements

Condition	Acceptable range during operation	Acceptable range during nonoperation
Ambient temperature	10° to 40° C outside switch (50° to 104° F)	-40° to +70° C outside switch (-40° to 158° F)
Humidity	20% to 85% RH noncondensing, at 40° Celsius, with maximum gradient of 10% per hour	10% to 93% RH noncondensing, at 70° Celsius
Altitude	Up to 3 km (10,000 ft.) above sea level	0 to 12 km (40,000 ft.) above sea level
Shock	20G, 11ms duration, half-sine wave	33G, 11ms duration, half-sine wave
Vibration	1G p-p, 5-500 Hz at 1.0 octave/minute	2.4G p-p, 5-500 Hz at 1.0 octave/minute
Air flow	350 cu ft/min. (0.00059 cu m/hr)	None required.
Heat dissipation	1440 Watts or 4914 BTU (Eight FC8-48 blades and two CP8 blades)	Not applicable.

**Note:** The 10° to 40° Celsius range applies to the ambient air temperature at the air intake vents on the nonport side of the SAN768B. The temperature inside the SAN768B can be up to 75° Celsius during SAN768B operation. If the internal temperature range exceeds the operating ranges of the components, the LEDs, error messages, and Fabric Watch alerts will indicate a problem. Use the **tempShow** command or Fabric Watch commands to view temperature status.

## Data transmission ranges

Table 28 provides the data transmission ranges for different cable types and port speeds.

Table 28. Data transmission ranges by cable type and port speed

Cable type	Cable size (microns)	Speed	Minimum distance	Maximum distance
Single mode	9	2 Gbit/sec	2 m	10,000 m
		4 Gbit/sec	2 m	10,000 m
		8 Gbit/sec	2 m	10,000 m

Table 28. Data transmission ranges by cable type and port speed (continued)

Multi mode	50	2 Gbit/sec	0.5 m	300 m (OM2) 500 m (OM3)
		4 Gbit/sec	0.5 m	150 m (OM2) 380 m (OM3)
		8 Gbit/sec	0.5 m	50 m (OM2) 150 m (OM3)
	62.5	2 Gbit/sec	0.5 m	150 m
		4 Gbit/sec	0.5 m	70 m
		8 Gbit/sec	0.5 m	21 m

---

## Fibre channel port specifications

The Fibre channel ports in the SAN768B support full duplex link speeds at 10.51875, 8.50, 4.25, 2.125, or 1.0625 Gbit/sec inbound and outbound, automatically negotiating to the highest common speed of all devices connected to the port.

The ports are compatible with optical SWL (short wavelength: approximately 850 nm), optical LWL (long wavelength: approximately 1310 nm), and Extended Long Wavelength (ELWL) laser transmitter SFPs and XFPs (FC10-6 only) (approximately 1550 nm). The strength of the signal is determined by the type of SFP or XFP in use.

The ports are universal and self-configuring, capable of becoming F\_Ports (fabric ports), FL\_Ports (fabric loop enabled), or E\_Ports (expansion ports).

The ports meet all required safety standards.

---

## FR4-18i router Fibre channel port specifications

The Fibre Channel ports in the FR4-18i router blade are compatible with SWL, LWL, and ELWL SFP 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, refer to the Federal Communications Commission (FCC) Class A Statement, "Federal Communications Commission (FCC) Class A Statement" on page 120. The ports are capable of operating at 1-, 2-, or 4-Gbit/sec and are able to auto-negotiate to the maximum link speed.

---

## FR4-18i router GbE port specifications

The GbE ports in the FR4-18i router blade are compatible with SWL, LWL, and ELWL SFP transceivers. A copper SFP is also available. 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, refer to the Federal Communications Commission (FCC) Class A "Federal Communications Commission (FCC) Class A Statement" on page 120. The GbE ports are capable of operating at 1-Gbit/sec. The eight virtual FCIP Fibre Channel links over each physical GbE connection share this bandwidth.



---

## Power cords

Two power cords for connecting between the SAN768B and the power distribution units on the 2109 C36 cabinet are shipped with the product. Two additional power cords are provided if the optional upgrade power supply feature is ordered (Feature Code 7880). See the *IBM TotalStorage SAN Cabinet 2109 Model C36 Installation and Service Guide* for information on connecting the cabinet to the facility power source. If the stand-alone feature is ordered for the SAN768B, then you must also order the country-specific power cords.



---

## Appendix B. Diagnostics and troubleshooting

For information about troubleshooting the entire fabric, refer to the *Fabric OS Administrator's Guide*.

The SAN768B includes a number of diagnostic tools to assist with troubleshooting, including LEDs on the hardware, commands that display current status, diagnostic tests for hardware and software, and error messages. In addition, a number of managing and monitoring features are available, such as Fabric Manager, Web Tools, Fabric Watch, and Advanced Performance Monitoring.

If the SAN768B does not operate as expected, the following steps can be taken to diagnose the problem:

- Check the LEDs and refer to the LED tables (see Chapter 4, “Monitoring system components,” on page 33) for interpretation and recommended actions.
- Review the results of the last POST run by the SAN768B (see “Interpreting POST and boot results” on page 104).
- Review the error logs (refer to the *Fabric OS System Error Messages Reference Manual* and the *Fabric OS Administrator's Guide* for more information).
- Enter the **sensorShow** command to determine the status of the hardware components.
- Run diagnostic tests (see “Diagnostics” on page 105).
- Reboot the SAN768B or power the entire chassis off and then back on.

If the problem is still unresolved after these steps, contact technical support. The information required by technical support in order to provide assistance is listed under “Getting help” on page iii

This appendix provides the following information:

- “Obtaining chassis and component status”
- “Interpreting POST and boot results” on page 104
- “Diagnostics” on page 105
- “Validating the installation of port blades” on page 105
- “Troubleshooting” on page 106
- “Powering off the SAN768B” on page 109

---

### Obtaining chassis and component status

The CLI commands listed in Table 29 on page 104 provide status and environmental information about the chassis and its components. These commands provide information only, and they do not interrupt traffic flow. For more information about these commands, refer to the *Fabric OS Command Reference Manual*.

Table 29. Environmental status and maintenance commands

Command	Information Displayed
<b>sensorShow</b>	<ul style="list-style-type: none"> <li>• Temperature readings for the port blades</li> <li>• Temperature readings for the CP blades</li> <li>• Status and RPM of all operational fans</li> <li>• Status of all operational power supplies</li> </ul>
<b>tempShow</b>	<ul style="list-style-type: none"> <li>• Temperature readings for the port blades</li> <li>• Temperature readings for the CP blades</li> </ul>
<b>psShow</b>	Status of all operational power supplies
<b>fanShow</b>	Status and RPM of all operational fans
<b>chassisShow</b>	Serial number, time awake, and additional information about each component
<b>slotShow</b>	Slot occupancy
<b>errShow</b> <b>errDump</b>	Switch error log. Refer to the <i>Brocade Fabric OS System Error Messages Reference Manual</i> for more information on the messages in this log.

## Interpreting POST and boot results

The SAN768B performs power on self test (POST) by default each time the chassis is powered on or the SAN768B is rebooted or reset. The SAN768B can be rebooted using the **switchReboot**, **reboot** (to reboot each CP individually), or **fastBoot** commands. The **fastBoot** command reboots the SAN768B without running POST. If the active CP blade is rebooted, it fails over to the standby CP blade.

## POST

Each time the SAN768B is powered on or reset, the SAN768B automatically performs POST, a system check during which LED patterns might vary.

To verify that POST has completed without error:

- Verify that all LEDs return to a normal state after POST completes (see Chapter 4, “Monitoring system components,” on page 33).  
If one or more LEDs do not return to a normal state, and this is not due to the SAN768B being set to beacon, refer to the relevant LED table to identify and correct the problem. For port blades, router blades, and CP blades, the **slotShow** command can be used to check the status of the slots. For information about turning beaconing on/off, refer to the *Fabric OS Administrator’s Guide*.
- Verify that the switch prompt displays when POST completes.  
If it does not display, POST was not successfully completed. Contact IBM for support.
- Review the system error log using the **errShow** or **errDump** commands.
- Any errors detected during POST are written to the system log, which is accessible through the **errShow** command. For information about error messages, refer to the *Fabric OS System Error Message Reference Manual*.

POST includes the following steps:

1. Preliminary POST diagnostics are run.
2. Operating system is initialized.

3. Hardware is initialized.
4. Diagnostic tests are run on several functions, including circuitry, port functionality, ability to send and receive frames, all aspects of memory, parity, statistics counters, and serialization.

## Boot

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

1. Universal port configuration is performed.
2. Links are initialized.
3. Fabric is analyzed. If any ports are connected to other switches, the SAN768B participates in a fabric configuration.
4. The SAN768B obtains a domain ID and assigns port addresses.
5. Unicast routing tables are constructed.
6. Normal port operation is enabled.

---

## Diagnostics

Diagnostic tests are automatically run during POST to check the status of the SAN768B. Any error messages generated during POST are sent to the error logs and to the serial console, if connected.

Diagnostic tests can also be run manually to test and troubleshoot the hardware and the firmware, including internal connections and circuitry, transceivers, and port cables. However, diagnostic tests are generally intended for use by support personnel.

**Note:** Diagnostic error messages do not necessarily indicate that the SAN768B requires maintenance.

Each diagnostic test can be implemented by entering the related command through a Telnet or serial session. For a list of diagnostic tests and commands, refer to the *Fabric OS Administrator's Guide*.

All diagnostic tests are run at link speeds of 1, 2, 4, and 8 Gb/sec. They might temporarily lock the transmit and receive speeds to a specific speed. Some diagnostic tests require interconnecting the ports to each other or using loopback plugs. If ports are interconnected, the media (cables and transceivers) at each end of the connection must be of the same type. For example, short wavelength media must be connected to short wavelength media, and likewise with long wavelength media and copper media.

For more information about diagnostic tests and how to run them, refer to the *Fabric OS Administrator's Guide* and the *Fabric OS Command Reference Manual*. For information about diagnostic error messages (**errShow** or **errDump**), refer to the *Fabric OS System Error Message Reference Manual*.

---

## Validating the installation of port blades

This section provides information on validating the installation of port blades. Validate the installation by running the following commands: **nsShow**, **nsAllShow**, and **fabricShow**. All of your connected servers, storage, and switches should be present in the output of these commands. If there is a discrepancy, it is possible that a device or switch is not able to connect to the fabric and further troubleshooting is necessary.

Table 30. Commands for validating installation of port blades

Command	Description
<b>nsShow</b>	Displays all devices directly connected to the switch that have logged into the Name Server. Make sure that the number of attached devices after the installation is exactly the same as the number of attached devices prior to the installation.
<b>nsAllShow</b>	Displays all devices connected to a fabric. Make sure that the number of attached devices after the installation is exactly the same as the number of attached devices prior to the installation.
<b>fabricShow</b>	Displays all switches in a fabric. Make sure that the number of switches in the fabric after the installation is exactly the same as the number of attached devices prior to the installation. There may be one less domain in your fabric if during the installation you went from dual domain to a single domain in your SAN768B.

## Troubleshooting

Table 31 provides a list of issues, possible causes, and recommended actions.

Table 31. Troubleshooting

Issue	Possible Cause	Recommended Action
Entire chassis powers off automatically.	Power supplies are inadequate to support the installed components.	Add an additional power supply.
Several or all components are not operating.	One or both power cables may not be connected to a live source.	Ensure that both power cables are connected to live outlets.
	One or both ac power switches might be off.	Ensure that both ac power switches are on (ac switches light up green when on).
Serial connection is faulty or serial port logs have incorrect or missing information.	Serial cable is not connected correctly.	Ensure that the cable is firmly connected to workstation computer and to the SAN768B.
	Terminal emulator application parameters are not set correctly.	Ensure that the terminal emulator application is configured as follows: 9600 bits per second, 8 databits, no parity, 1 stop bit, no flow control.
	Serial port might be incompatible (only RS-232 is supported).	Ensure that the SAN768B is connected to an RS-232 port. RS-423 serial ports might experience difficulties due to corner-case incompatibilities of the standards.
	Pins on the serial cable or serial port might be damaged.	Remove the cable and inspect the pins on the cable and in the serial port. Do not reinstall if the pins on either component have any visible damage, as this could damage the pins on the other component. Replace components as required.

Table 31. Troubleshooting (continued)

Modems are not detected by SAN768B.	Modems were connected after the SAN768B was powered on.	Reboot the CP blade(s) to which the modem(s) are connected.
	Modems are connected to the wrong ports on the CP blades.	Ensure that the modem cables are connected to the ports labeled "RS232" (the serial ports intended for terminal use are labeled 10101).
	Modems are not correctly configured.	Verify that the modems are configured correctly.
	Pins on the modem cable or modem port might be damaged.	Remove the cable and inspect the pins on the cable and in the port. Do not reinstall if the pins on either component have any visible damage, as this could damage the pins on the other component. Replace components as required.
CP Ethernet link speed is different than expected or a link cannot be established.	There might be a conflict with the CP Ethernet link speed negotiation set up by the network.	Specify the CP Ethernet link speed by entering the <b>ifModeSet</b> command.
Configuration data is inaccurate or cannot be accessed.	Chassis was powered off/on while the WWN card was uninstalled or failed.	Install an operational WWN card and power the system off/on again.
	The SAN768B was rebooted while the WWN card was uninstalled or failed.	
Initial set up results in IP address/Domain ID conflict.	The SAN768B was connected to the fabric before being configured.	Refer to Chapter 3, "Starting and configuring the SAN768B," on page 25 and the <i>Fabric OS Administrator's Guide</i> for configuration information.
LEDs on one or more components are changing rapidly or do not indicate a healthy state.	The SAN768B might be booting or running POST.	Verify that boot and POST are complete. The SAN768B requires a minimum of 3 minutes, usually, after power-on to complete POST.
	Beaconing might be on for the entire SAN768B or for individual components.	Determine whether beaconing is on by entering the <b>switchshow</b> command and determine whether switch beaconing or blade beaconing are on.
	Individual components might have failed.	Refer to the LED tables in Chapter 4, "Monitoring system components," on page 33 for interpretation and recommended actions.
	Pins on the components might be damaged.	Remove component from chassis and inspect pins on component and inside chassis. Do not reinstall if pins on either component are visibly damaged, as this could damage pins on other component. Replace parts as required.
None of the LEDs on an individual component are on.	Component might not be seated correctly.	Ensure that the SAN768B has power and component is firmly seated. If problem continues, run the <b>sensorShow</b> command to determine component status. If component is a CP blade or port blade, enter the <b>slotShow</b> command to determine status.
	Component might have failed.	Replace component as necessary.

Table 31. Troubleshooting (continued)

CP blades are failing over frequently.	A third-party application has a memory leak.	Check application for memory leaks.
	There is excessive serial port activity.	Ensure that serial port activity remains below specified amount.
	CP blade is attached to an Ethernet with high traffic loads.	Ensure that Ethernet traffic remains below specified amount.
	Chassis is overheated.	Enter <b>sensorShow</b> command to check internal temperature. If components are overheating, shut down port blades as necessary to return the temperature to operating range.
One or more port or router blades have either shut down or failed POST as indicated by the error log.	Blades might be overheated.	Enter the <b>sensorShow</b> command to check the internal temperature readings. If components are overheating, shut down port blades as necessary to return the temperature readings to the operating ranges.
	Blades might be faulty.	Enter the <b>slotShow</b> command to determine status. For more information, enter the <b>diagDisablePost</b> command; then, the <b>slotPowerOff [slot number]</b> and <b>slotPowerOn [slot number]</b> command. Resolve the source of the problem or replace the blade as required.
	Pins on the blade or on the backplane (inside the slot) might be damaged.	Remove blade from chassis and inspect pins on blade and on backplane inside slot. Do not reinstall if pins on either component are visibly damaged, as this could damage pins on other component. Replace components as required.
An individual component is not operating as expected.	Component may not have power or may not be firmly seated.	Ensure component is receiving power (power LED should be on) and component is firmly seated.
	Pins on the component or the backplane might be damaged.	Remove component from chassis and inspect pins on blade and inside chassis. Do not reinstall if pins on either component are visibly damaged, as this could damage pins on other component. Replace parts as required.
	The component might have failed.	Enter the <b>sensorShow</b> command to determine component status. If component is a CP blade or port blade, enter the <b>slotShow</b> command to determine status. Replace component as necessary.



---

## Powering off the SAN768B

To power off the SAN768B:

1. Shut down the SAN768B using the **sysShutdown** command.

```
swDir::admin> sysshutdown
This command will shutdown the operating systems on your switch.
You are required to power-cycle the switch in order to restore operation.
Are you sure you want to shutdown the switch [y/n]?y
HA is disabled
Stopping blade 1
Shutting down the blade...
Stopping blade 4
Shutting down the blade...
Stopping blade 10
Shutting down the blade...
Broadcast message from root (pts/1) Tue Jul 18 14:23:06 2006...
The system is going down for system halt NOW !!
```

2. Power off the chassis by flipping both AC power switches to 0 (LEDs inside AC power switches should turn off). To maintain the ground connection, leave both power cords connected to the chassis and to an electrical outlet.

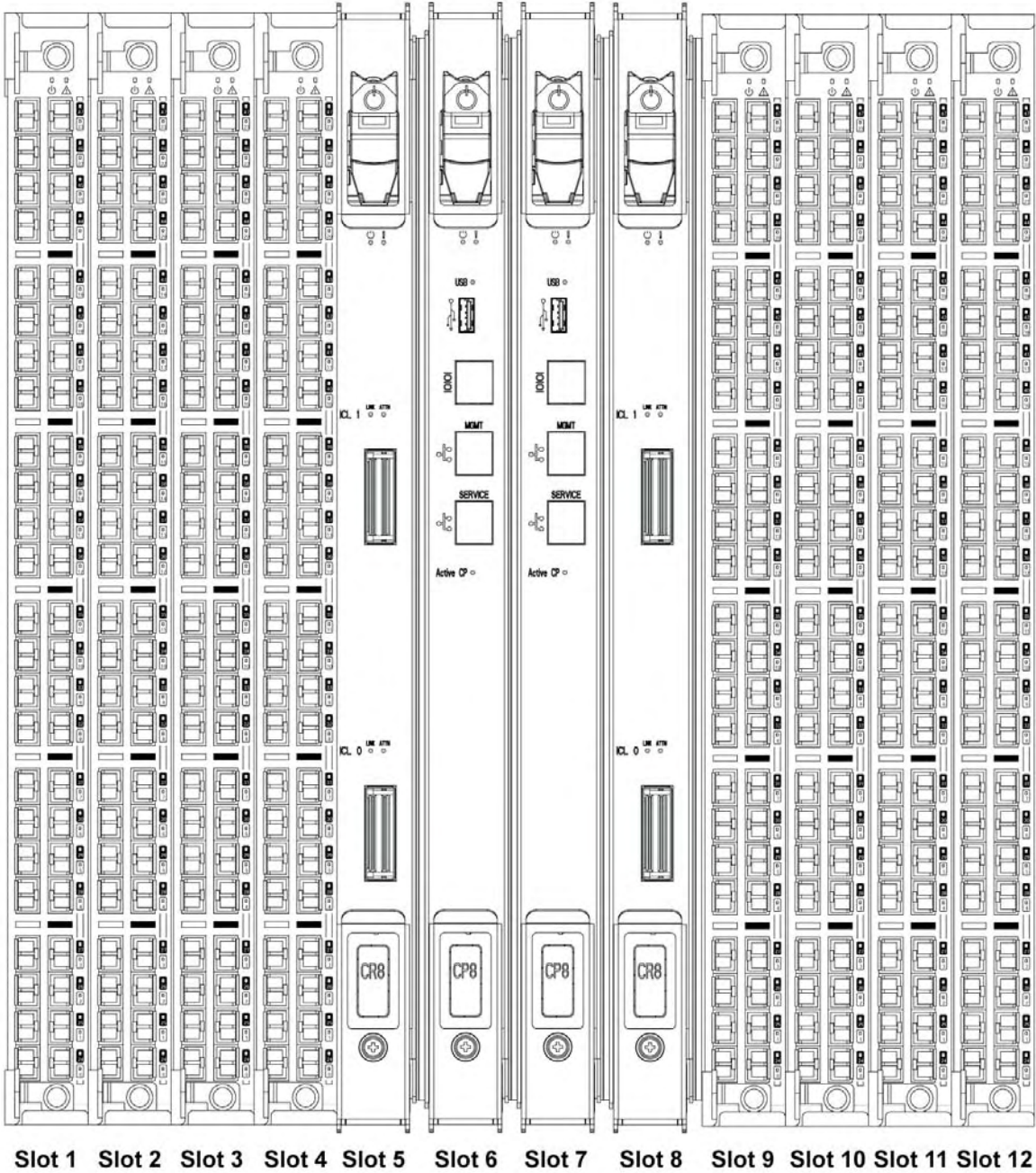


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## Appendix C. Port numbering templates

Print or copy the templates on the following pages and use them to record the port numbering scheme for your SAN768B.

- Figure 31 on page 112
- Figure 32 on page 113
- Figure 33 on page 114
- Figure 34 on page 115
- Figure 35 on page 116



b768g017

Figure 31. Port side populated with eight FC8-48 port blades, two CR8 blades, and two CP8 blades

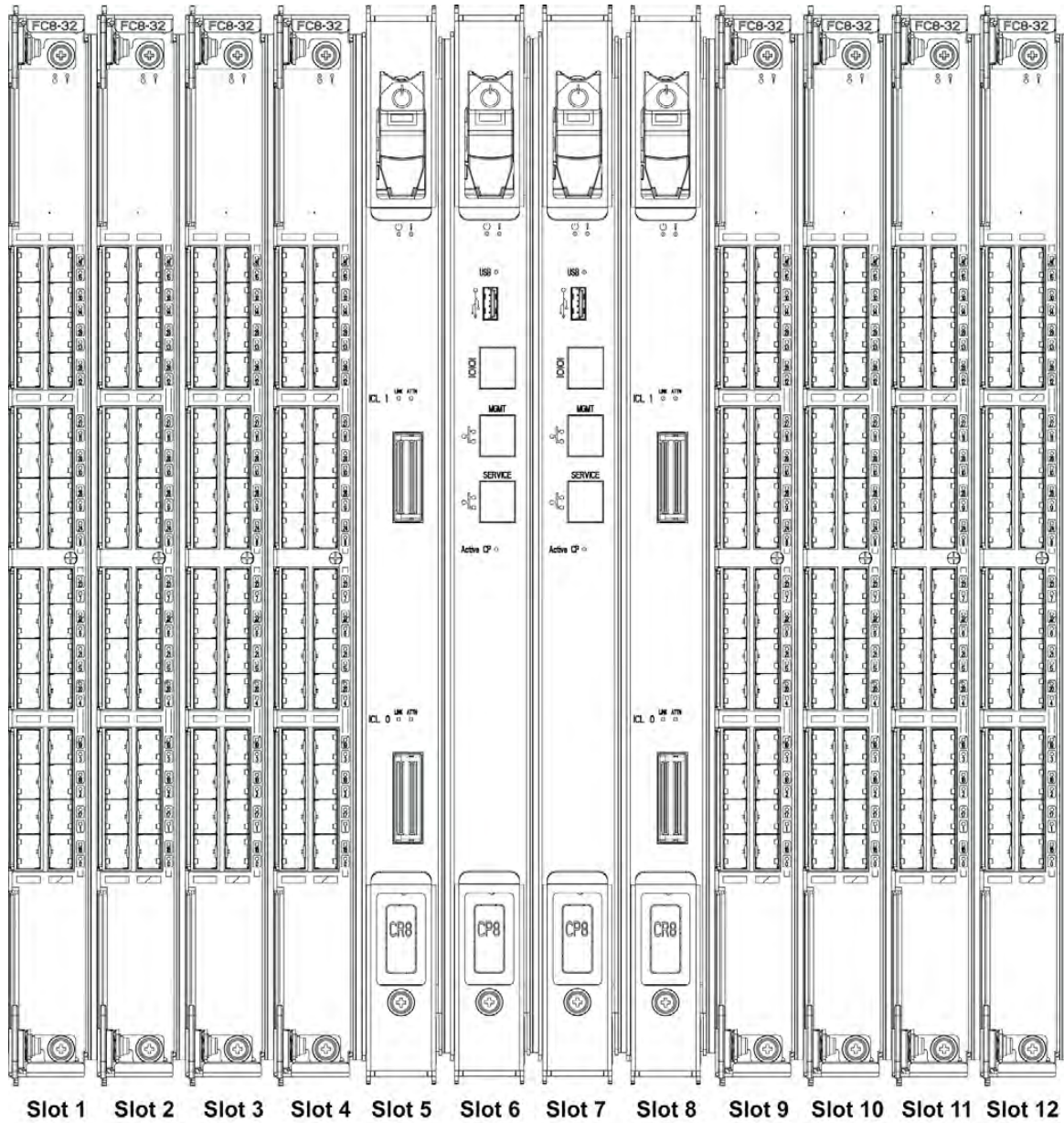
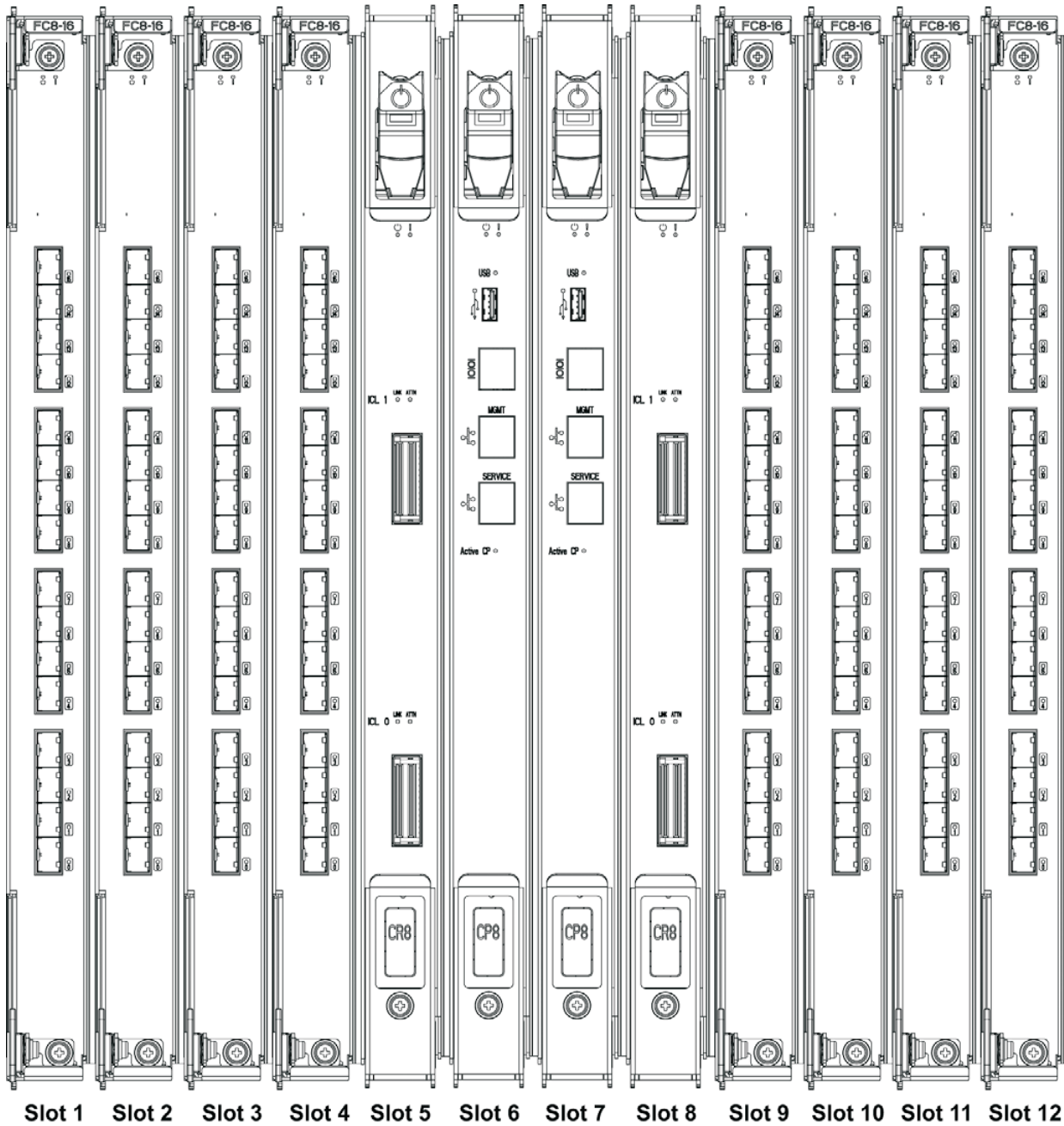


Figure 32. Port side populated with eight FC8-32 port blades, two CR8 blades, and two CP8 blades

b7681g008



b7681g009

Figure 33. Port side populated with eight FC8-16 port blades, two CR8 blades, and two CP8 blades

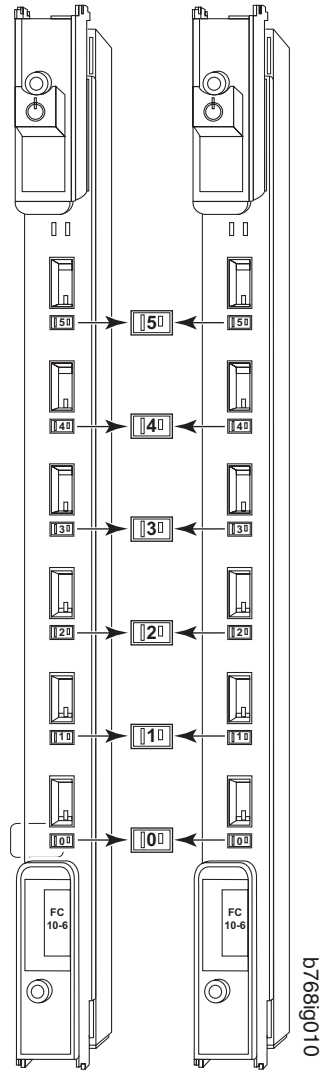


Figure 34. FC10-6 port blade

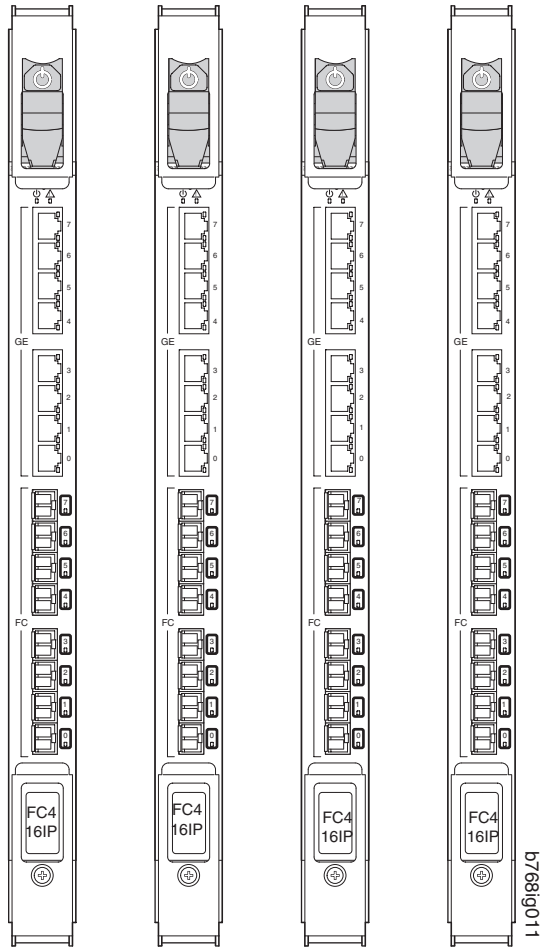


Figure 35. FC4-18IP port blade



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# Index

## Numerics

- 24-inch load plate
  - part number 12
  - using 17
- 3870 port blades 82

## A

- about this document xxv
  - how to send your comments iv
- ac power
  - removing xxi
- address, IBM iv
- attention notice
  - definition xviii
  - example xviii
- attention notices xviii

## B

- backing up the configuration 32
- battery
  - disposal xxiii
  - return program xxiii
- battery disposal xxiii
- battery return xxiii
- blades
  - 3870 82
  - FC8-16 56, 79
  - FC8-32 56, 79
- blower assembly
  - installing 71
  - removing 71, 72
- brackets, installing 16
- bridge tool 12
  - ordering 12
  - using 17
- Brocade
  - documents xxv
- Brocade documents xxv

## C

- C36
  - cabinet 11
- cabinet
  - C36 11
  - installing a SAN768B 14
- cable management comb
  - high density 52
  - installing 52
  - lower density 52
  - removing 52
- cable management tray
  - removing 53
- cable routing tables 93

- cabling
  - FR4-18i 68
  - router blade 68
- caution notices xvi
  - definition xvi
  - examples xvii
- chassis
  - critical information checklist 87
  - installing components 90
  - removing 89
  - replacing 89
- chassis door 51
  - installing 51
  - removing 51
- chassis replacement, preparation 84
- chassis replacement, verifying need 83
- chassis, installing components 90
- chassis, replacing 83
- checklist
  - chassis critical information 87
- comments
  - sending iv
- components
  - installing 51
  - removing 51
- configuration
  - backing up 32
  - parameters 27
- configuration parameters, initial 27
- configuring
  - IP addresses 27
  - SAN768B 25
- configuring FCIP
  - FR4-18i 68
  - router blade 68
- configuring Fibre channel routing services
  - FR4-18i 68
  - router blade 68
- connecting to the fabric 30
- connection
  - serial 26
- connection, Ethernet 29
- cords, power 101
- CP blade
  - installing 57
  - removing 57
- CR blade
  - installing 63, 65
  - removing 63, 64
- critical information checklist, chassis 87
- critical SAN information
  - recording 84
- critical SAN768B information
  - recording 84

## D

- danger notices xiii
  - definitions xiii
  - examples xiii
- data, key 32
- diagnostics 103
- director of licensing
  - address 117
- disconnecting
  - SAN768B from network and fabric 88
- documents
  - Brocade xxv
  - product xxv
- documents, Brocade xxv
- documents, product xxv
- Domain ID 30
- door, chassis 51

## E

- edition notice ii
- electronic emission notices 120
- enabling ports
  - FR4-18i 68
- enabling software licenses 31
- environmental notices xiii, xxii
- environmental requirements 99
- ESD 79, 81
- ESD grounding strap 88
- ESD strap 79, 80, 82
- Ethernet connection 29
  - establishing 29
- external machine checks xxi

## F

- fabric
  - connecting to 30
- fabric configuration 93
- fabric configuration, verifying 93
- fabric, connecting to 30
- fabric, reconnecting 92
- facility requirements 97
- FC3816
  - installing 16-port blade 79
- FC3832
  - installing 32-port blade 79
- FC3848
  - installing 48-port blade 79
- FC3850
  - installing routing blade 80
- FC3870
  - installing 48-port blade 82
- FC8-16 port blades 56, 79
- FC8-32 port blades 56, 79
- FC8-48 port blades 56
- features
  - high availability 6
- features and components 1
- features, Installing new 79

- features, software 7
- filler panel 56
- form, reader comment iv
- FR4-18i
  - cabling 68
  - configuring FCIP 68
  - configuring Fibre channel routing services 68
  - enabling ports 68
  - installing 67
  - removing 66
- FR4-18i router blade 37
  - installing 66
  - removing 66
- FR4-18i router blade status 37
- FR4-18i routing blade 80
- FRU
  - weights 97

## G

- getting help iii
- grounding strap, ESD 88

## H

- hardware, verifying 90
- help iii
- high availability 6
  - features 6
- how to send your comments iv

## I

- IBM
  - address iv
  - notices 117
  - trademarks 119
- ID, Domain 30
- initial configuration parameters 27
- inspections, safety xxi
- installation
  - planning 11
  - preparation 11
- installation guidelines 13
- installing
  - blower assembly 71
  - brackets 16
  - chassis door 51
  - components 51, 90
  - CP blade 57
  - CR blade 63, 65
  - filler panel 56
  - FR4-18i 67
  - FR4-18i router blade 66
  - port blade 56, 79, 82
  - power supply 69
  - router blade 66, 67
  - routing blade 80
  - SAN768B 11, 14, 17
    - time required 14
    - tools required 14



- installing (*continued*)
  - SFPs 76
  - WWN bezel and card 72
- installing components 51
- Installing new features 79
- intellectual property 117
- internal machine checks xxi
- introduction 1
- IP addresses 32
  - SAN768B 27
- IP addresses, SAN768B 27

## K

- key data 32
  - IP addresses 32
  - license keys 32
  - passwords 32

## L

- labels, safety xvii
- LEDs
  - router blade 39
- license keys 32
- license, for patents 117
- licenses, software 31
- licensing
  - Web address 117
- lift tool 12, 14
  - ordering procedure 12
  - part number 12
  - United States ordering procedure 12
  - using 17, 23
  - world trade ordering procedure 12

## M

- machine checks
  - external xxi
  - internal xxi
- modem 25

## N

- network manageability 8
- Network Management System 8
- network, reconnecting 92
- new features, Installing 79
- notice, edition ii
- notices
  - attention xviii
  - battery xxiii
  - caution xvi
  - danger xiii
  - environmental xiii, xxii
  - IBM 117
  - safety xiii
  - safety and environmental xiii
  - types xiii

- notices ,danger xiii
- notices and labels
  - safety xiii
- notices, attention xviii
- notices, caution xvi

## O

- ordering the lift tool and the 24-inch load plate 12
- overview 1

## P

- parameters
  - configuration 27
- parameters, initial configuration 27
- part number
  - 24-inch load plate 12
  - lift tool 12
- parts
  - power cords 101
- password 27
  - changing 27
- passwords 32
- patents 117
- PID mode, verifying 30
- port blade
  - installing 56, 79, 82
  - removing 56
- port blades
  - 3870 82
  - FC8-16 56, 79
  - FC8-32 56, 79
  - FC8-48 56
- port blades, 3470 82
- port blades, FC10-6 56
- port blades, FC8-16 56, 79
- port blades, FC8-32 56, 79
- port blades, FC8-48 56
- port numbering 8
  - fully populated (256 ports) 9
- power
  - cords 101
  - SAN768B 26
- power specifications 98
- power supply
  - filler panel 69
  - installing 69
  - removing 69
- preparing for chassis replacement 84
- product
  - components 2
  - disposal xxii
  - features 2
  - features and components 1
  - hardware components 2
  - introduction 1
  - overview 1
  - recycling xxii
  - reliability 6
  - serviceability 6

- product (*continued*)
  - software features 7
  - specifications 95
- product disposal xxii
- product documents xxv
- product recycling xxii
- product specifications 95
- providing power to the SAN768B 26

## R

- rack
  - safety xix
- rack relocation safety xx
- rack safety xix
- read this first iii
- reader comment form processing iv
- reconnecting to the fabric 92
- reconnecting to the network 92
- recording
  - critical SAN information 84
  - critical SAN768B information 84
- recycling and disposal xxii
- reliability 6
- removing
  - ac power xxi
  - blower assembly 71, 72
  - cable management tray 53
  - chassis 89
  - chassis door 51
  - components 51, 88
  - CP blade 57
  - CR blade 63, 64
  - filler panel 56
  - FR4-18i 66
  - FR4-18i router blade 66
  - port blade 56
  - power supply 69
  - router blade 66
  - SAN768B 11, 23
  - SFPs 76
  - WWN bezel and card 72
- removing components 51
- replacing
  - chassis 83, 89
  - WWN card 72
- requirements
  - environmental 99
  - facility 97
- return program
  - battery xxiii
- router blade 39
  - installing 66
  - LED descriptions 39
  - removing 66
  - status 37

## S

- safety xiii
  - inspections xxi

- safety (*continued*)
  - labels xiii, xvii
    - examples xvii
  - notices xiii
  - rack xix
  - rack installation xix
  - rack relocation xx
- safety inspection
  - external machine checks xxi
  - internal machine checks xxi
- safety inspections xxi
- safety labels xvii
- safety notices xiii
- safety, rack xix
- safety, rack installation xix
- safety, rack relocation xx
- SAN Switch Cabinet C36 11
- SAN768B
  - configuring 25
  - installation guidelines 13
  - installing 11
  - IP addresses 27
  - library xxv
  - physical dimensions 97
  - providing power 26
  - removing 11, 23
  - size 97
  - starting 25
  - switch name 30
  - weight 97
- security 7
- security features 7
- security features table 7
- serial connection 26
- serial connection, establishing 26
- serviceability 6
- setting
  - Domain ID 30
- SFP 30
- SFP transceivers 30
- SFPs
  - installing 76
  - removing 76
- SNMP 8
- software features 7
- software licenses
  - enabling 31
- specifications
  - power 98
- specifications, product 95
- standard features
  - software
    - Advanced Zoning 7
    - Fabric Watch 7
    - ISL Trunking 7
    - Performance Monitoring 7
    - Web Tools 7
- standard software features 7
- starting
  - SAN768B 25
- strap, ESD 79, 80, 82

switch name 30  
system architecture 95  
system operation, verifying 91

## T

tables, cable routing 93  
time required  
    installing a SAN768B 14  
tools required  
    installing a SAN768B 14  
trademarks 119  
transceivers 30  
transceivers, SFP 30

## V

verifying  
    chassis replacement need 83  
    fabric configuration 93  
    system operation 91  
verifying hardware 90  
verifying PID mode 30  
VLAN 29

## W

Web sites iii  
WEEE directive xxii  
weights, FRUs 97  
who should read this document xxv  
WWN bezel 72  
WWN card 72  
WWN card, replacing 72



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