IBM Storage Networking SAN192C-6, SAN384C-6 and SAN768C-6 MTM Service information: 8978-E04, 8978-E08, 8978-E16

Installation, Service, and User Guide



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Before you use the information in this publication, be sure to read the general information under "Notices" on page 163.

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Read this first

Summary of changes

This is the first edition of the IBM[®] Storage Networking SAN192C-6, SAN384C-6 and SAN768C-6 Installation, Service, and User Guide.

Getting help

For the latest version of your product documentation, visit the web at http://www.elink.ibmlink.ibm.com/public/applications/publications/cgibin/pbi.cgi.

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

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

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

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/.

Accessibility features

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

Accessibility features

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

• This product follows WCAG 2.0 Guidelines but has limited accessibility support.

Keyboard navigation

This product does not have an attached or integrated keyboard. Any keyboard navigation is provided through the Data Center Network Manager (DCNM) software and GUI.

Interface information

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

Vendor software

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

Related accessibility information

In addition to standard IBM help desk and support websites, IBM has a TTY telephone service for use by deaf or hard of hearing customers to access sales and support services:

TTY service 800-IBM-3383 (800-426-3383) (within North America)

IBM and accessibility

For more information about the commitment that IBM has to accessibility, see <u>IBM Accessibility</u> (www.ibm.com/able).

How to send your comments

Your feedback is important in helping us provide the most accurate and high-quality information. If you have comments or suggestions for improving this document, send us your comments by email to starpubs@us.ibm.com. Be sure to include the following information:

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

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Safety and environmental notices

This section contains information about:

- "Safety notices and labels" on page xvii
- "Rack safety" on page xxii
- "Product recycling and disposal" on page xxiv

Safety notices and labels

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

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

- Note: These notices provide important tips, guidance, or advice.
- <u>"Attention notices" on page xxi</u>: These notices indicate potential damage to programs, devices, or data.
- **"Caution notices" on page xvii:** These statements indicate situations that can be potentially hazardous to you.
- <u>"Danger notices" on page xix</u>: 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, <u>"Safety labels" on page xxi</u> may be attached to the product to warn of potential hazards.

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:

Example symbol	Symbol meaning
4	A hazardous electrical condition with less severity than electrical danger.
	A generally hazardous condition not represented by other safety symbols.
≥55 kg (≥121.2 lbs) >55 kg (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.

Example symbol	Symbol meaning
PN 18P9850-B 5.000752	A potential hazard of pinching the hand or other body parts between parts.
	A hazardous condition due to moving parts nearby.
Class T	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)



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



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



Class 1



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

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

(C026)



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



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



CAUTION : For CA residents only: IBM recommends installing this product in a room size of 62 cubic meters (2190 cubic feet) or larger at 0.4 ACH ventilation rate to reduce the concentrations of any chemicals emitted by the product.

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 these 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 this danger notice.





DANGER : When working on or around the system, observe the 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)

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,

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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)

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)



DANG shock

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



CAUTION: Hazardous moving parts nearby. (L008)

Attention notices

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



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

ESD precautions



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

- · Attach ground to the indicated area on the chassis
- Wear a wrist grounding strap connected to chassis ground (if the switch is plugged in) or a bench ground.

Note : For safety reasons, the ESD wrist strap should contain a series 1 megaohm resistor.

Store ESD-sensitive components in antistatic packaging

Rack safety

Be sure to follow all safety guidelines when installing the device.

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

equivalent. Also, lower the leveling pads to raise the casters off of the pallet and bolt the rack cabinet to the pallet.

(R002)

Product recycling and disposal

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

About this document

This document is intended for use by systems administrators and technicians experienced with networking, Fibre Channel, and storage area network (SAN) technologies. It describes how to install, service, and use the IBM Storage Networking IBM SAN192C-6, SAN384C-6, and SAN768C-6 (machine type-models 8978 director). Throughout this document, the product is referred to as the *IBM SAN192C-6, SAN384C-6, and SAN768C-6*, or simply the *director*.

This document has been created to include information specific to IBM SAN192C-6, SAN384C-6, and SAN768C-6 switches running on NX-OS version 8.4(1) or later. This document does not support all NX-OS versions. It is specific to NX-OS version 8.4(1) or later. Refer to the NX-OS version 8.4(1) Release Notes for more information.

Product documentation

The following documents contain information related to this product:

- IBM Storage Networking SAN192C-6, SAN384C-6 and SAN768C-6 Installation, Service, and User Guide , (this document)
- IBM Systems Safety Notices, G229–9054

IBM and Cisco product matrix

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

When you use any of the Cisco documents, such as the Fabric Configuration Guide, you will notice that the model numbers reflect the corresponding Cisco products. <u>Table 1 on page xxv</u> provides a product matrix to correlate the Cisco products and models to the IBM product names and machine types and model numbers. Products withdrawn from marketing are not listed.

Table 1. Cisco and IBM product and model number matrix		
Cisco product name	IBM product name	IBM machine type and model number
9148T Fabric Switch	SAN48C-6	8977 Model T48
9396T Fabric Switch	SAN96C-6	8977 Model T96
9132T Fabric Switch	SAN32C-6	8977 Model T32
9250i Multi-service Switch	SAN50C-R	8977 Model R50
9706 Multilayer Director	SAN192C-6	8978 Model E04
9710 Multilayer Director	SAN384C-6	8978 Model E08
9718 Multilayer Director	SAN768C-6	8978 Model E16

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Chapter 1. Introducing the IBM c-type SAN Directors

The IBM c-type SAN directors include the SAN768C-6, the SAN384C-6, and the SAN192C-6.

The IBM c-Type Series of Multilayer Directors elevate the standard for director-class switches. It allows a deployment of high-performance SANs with low cost of ownership, layering a rich set of intelligent features onto a high-performance, protocol-agnostic switch fabric. The IBM c-Type SAN Directors address the stringent requirements of large data-center storage environments — Providing high availability, security, scalability, ease of management, and transparent integration of new technologies.

The IBM c-Type SAN Directors provide the following feature capabilities:

- High SAN performance
- High availability with full redundant components, including fabric cards, supervisors, and power supplies
- Industry-leading scalability
- Intelligent network features such as virtual SAN technology, ACLs, intelligent frame processing, and fabric-wide QoS
- Multiprotocols support, including Fibre Channel, Fibre Channel over IP (FCIP), and NVMe over Fabric

This chapter has the following topics:

- "IBM SAN768C-6" on page 1
- "IBM SAN384C-6" on page 2
- "IBM SAN192C-6" on page 2
- "Supported Components " on page 3
- "Chassis Description" on page 4
- <u>"Supervisor Modules" on page 12</u>
- "Fibre Channel Switching Modules" on page 32
- "SAN Extension Modules" on page 34
- "Fan Modules" on page 36
- "Power Supplies" on page 39
- "Supported Transceivers" on page 43

IBM SAN768C-6

Key product features for the IBM SAN768C-6 device.

The IBM SAN768C-6 is a high-port density switch that is designed to meet the requirements of a largescale enterprise data center storage environment. It provides a superior performance, scalability, redundancy, multiprotocol convergence, and enterprise-grade availability in a data center network

The SAN768C-6 includes the following components:

- An 18 slot chassis
- Two supervisor modules
- 6 crossbar fabric switching modules
- Support for 1 to 16 I/O modules
- Three fan modules
- 12 Power Supply Units are included and support for up to 16 PSUs is available.

The SAN768C-6 delivers the following features:

• Up to 6 x 512 x 16 slots = 49.152-Tbps per chassis Fibre Channel switching bandwidth.

- Up to 6 x 256 x 16 slots = 24.576-Tbps per chassis Fibre Channel switching, full duplex-bandwidth.
- Comprehensive security features.
- Intelligent network services, including VSAN technology, IVR, and smart zoning.
- SAN management tools including Data Center Network Manager (DCNM) and the command-line interface (CLI).
- Online diagnostics (GOLD, Call Home, and so on).
- Multiprotocol architecture, including Fibre Channel.

IBM SAN384C-6

Key product features for the IBM SAN384C-6 device.

The SAN384C-6 is a high-performance SAN switch that is designed to meet the requirements of enterprise data center storage environments. The SAN384C-6 includes the following components that are designed specifically for deployment in the IBM c-type SAN switches and directors:

- A ten-slot chassis
- 3 crossbar switching fabric modules are included and up to 6 are supported
- Two supervisor modules
- Three fan modules
- 6 power supply units are included and up to 8 are supported
- Support for a 48 Port 32 Gbps Fibre Channel Switching Module
- Support for a 24/10 port SAN Extension module

Director supports up to 384 ports in a 10-slot modular chassis, with up to 1152 ports in a single rack. The 384 ports can be configured as 4/8/16/32-Gbps Fiber Channel ports.

The SAN384C-6 delivers the following features:

- Up to 6 x 512 x 8 slots = 24.576-Tbps per chassis Fibre Channel switching bandwidth
- · Comprehensive security features
- Intelligent network services, including VSAN technology, IVR, and smart zoning
- SAN management tools including Data Center Network Manager (DCNM) and the command-line interface (CLI)
- Online diagnostics (GOLD, Call Home, and so on)
- Multiprotocol architecture, including Fibre Channel

IBM SAN192C-6

Key features for the IBM SAN192C-6 device.

The SAN192C-6 is designed for deployment in small- to medium-sized storage networks that can support enterprise clouds and business transformation.

The SAN192C-6 includes the following components:

- A 6-slot chassis
- 3 crossbar switching fabric modules and up to 6 are supported
- Two supervisor modules
- Support for a 48 Port 32 Gbps Fibre Channel Switching Module
- Support for a 24/10 port SAN Extension module
- Three fan modules
- Four power supply units

The SAN192C-6 supports up to 192 ports in a 6-slot modular chassis, with up to 768 ports in a single rack. The ports can be configured as Fibre Channel (4/8/16 Gbps, or 8/16/32 Gbps). The SAN192C-6 supports the same Fibre Channel switching modules as the SAN768C-6 and SAN384C-6 for a high degree of system commonality.

The following are the major features offered by SAN192C-6.

- Up to 6 x 512 x 4 slots = 12.288-Tbps per chassis Fibre Channel switching bandwidth
- · Comprehensive security features
- Intelligent network services, including VSAN technology, IVR, and smart zoning
- SAN management tools including Data Center Network Manager (DCNM) and the command-line interface (CLI)
- Online diagnostics (GOLD, Call Home, and so on)
- Multiprotocol architecture, including Fibre Channel

Supported Components

- "Supported Components on the SAN768C-6" on page 3
- "Supported Components on the SAN384C-6" on page 3
- "Supported Components on the SAN192C-6" on page 4

Supported Components on the SAN768C-6

The SAN768C-6 director supports the following components:

- SAN768C-6 Chassis
- IBM c-type SAN Director Supervisor-4 Module
- IBM c-type SAN switches and directors Supervisor-1E Module
- IBM c-type SAN switches and directors Fabric-1 Switching Module
- IBM c-type SAN Director 48 Port 32 Gbps Fibre Channel Switching Module
- IBM c-type SAN Director 24/10 port SAN Extension module
- SAN768C-6 Crossbar Switching Fabric-1 Module
- SAN768C-6 Crossbar Switching Fabric-3 Module
- SAN768C-6 Fan Module
- IBM c-type SAN Director 3000W AC power supply
- SAN768C-6 Accessory Kit

Supported Components on the SAN384C-6

The SAN384C-6 Director supports the following components:

- SAN384C-6 Chassis
- IBM c-type SAN Director Supervisor-4 Module
- IBM c-type SAN Director Supervisor-1 Module
- IBM c-type SAN Director 48 Port 32 Gbps Fibre Channel Switching Module
- IBM c-type SAN Director 24/10 port SAN Extension module
- SAN384C-6 Crossbar Switching Fabric-1 Module
- SAN384C-6 Crossbar Switching Fabric-3 Module
- SAN384C-6 Fan Module
- IBM c-type SAN Director 3000W AC power supply
- SAN384C-6 Accessory Kit

Supported Components on the SAN192C-6

The SAN192C-6 director supports the following components:

- SAN192C-6 Chassis
- IBM c-type SAN Director Supervisor-4 module
- IBM c-type SAN Director Supervisor-1 module
- IBM c-type SAN Director 48 Port 32 Gbps Fibre Channel Switching Module
- IBM c-type SAN Director 24/10 port SAN Extension module
- SAN192C-6 Crossbar Switching Fabric-1 Module
- SAN192C-6 Crossbar Switching Fabric-3 Module
- SAN192C-6 Fan Module
- IBM c-type SAN Director 3000W AC power supply
- SAN192C-6 Accessory Kit

Chassis Description

This section describes the chassis in the IBM c-type SAN directors:

- "SAN768C-6 Chassis" on page 4
- "SAN384C-6 Chassis" on page 7
- "SAN192C-6 Chassis" on page 10

SAN768C-6 Chassis

The SAN768C-6 is an 18-slot chassis with two supervisor modules and up to 16 I/O modules. The chassis holds up to six crossbar fabric switching modules, up to 16 AC power supplies, and three fan modules. Airflow is front-to-back (port-side intake) in the SAN768C-6 chassis.

Note : The base configuration of the SAN768C-6 ships with two supervisor modules, six crossbar fabric switching modules, and 12 power supplies.

To group the networking cables for each I/O module on this chassis, you can install cable management frames on the chassis.

Figure 1 on page 5 shows the standard hardware features seen from the front of the chassis.



Figure 1. SAN768C-6 Chassis Front View

- 1. I/O modules (slots 1-8 and 11-18 from top to bottom)
- 2. Supervisor modules in slots 9 and 10 from left to right
- 3. Power supply unit bays numbered 1-16 starting from the top left and increasing from left to right and top to bottom
 - The top row has bays 1-4, numbered left to right.
 - The second row has bays 5-8, numbered left to the right.
 - The third row has bays 9-12, numbered left to the right.
 - The fourth row has bays 13-16, numbered left to the right.

4. Chassis mounting brackets

Note : Handles are to be used only for positioning an empty chassis

- 5. Chassis handles
- 6. System LEDs
- 7. Ground point
- 8. Grid A PSU bays (1, 2, 5, 6, 9, 10, 13, 14)
- 9. Grid B PSU bays (3, 4, 7, 8, 11, 12, 15, 16)

Note : Handles are to be used only for positioning empty chassis.

Figure 2 on page 6 shows the standard hardware features seen from the rear of the chassis.



Figure 2. SAN768C-6 Chassis Rear View

- 1. Fan modules (Three fan modules) 1-3 are numbered left to the right. When the fan modules are installed, they cover the crossbar fabric switching modules. Only two fan modules are shown in the figure. One fan module is removed to show the crossbar fabric switching module in the back.
- 2. Crossbar fabric switching modules (up to six crossbar fabric switching modules with two modules behind each fan module). The crossbar fabric switching modules are installed vertically in slots 21 through 26, numbered from left to right, at the back of the chassis behind the fan modules.
- 3. Fan module handle

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- 4. Fan module exhaust
- 5. Fan power connector
- 6. Fan and Crossbar fabric switching module LEDs
- 7. Ground point
- 8. PSU exhaust

SAN384C-6 Chassis

The SAN384C-6 is a 10-slot chassis with two supervisor modules and up to 8 I/O modules. The chassis holds up to six crossbar fabric switching modules, up to 8 AC power supplies, and three fan modules. Airflow is front-to-back (port-side intake) in the SAN384C-6 chassis.

Note : The base configuration of the SAN384C-6 ships with two supervisor modules, three crossbar fabric switching modules, and six power supplies.

The slots on the front of the chassis are numbered as follows:

- Line card slots 1 to 4 and 7 to 10 are numbered top to bottom. Each slot can hold one 48 port 32 Gbps Fibre Channel switching module.
- Slots 5 and 6 are side-by-side and numbered left to right. Each slot is half the width of the chassis and each slot can hold one supervisor module.
- There are two rows of power supply bays at the bottom of the chassis. The top row has bays 1 to 4, numbered left to right. The bottom row has bays 5 to 8, numbered left to the right. Each bay can hold one power supply.

The slots on the rear of the chassis are numbered as follows:

- Fan modules 1 to 3 are numbered left to the right. When the fan modules are installed, they cover the fabric modules.
- Fabric module slots 21 to 26 are numbered left to the right. Slots 21 and 22 hold fabric modules 1 and 2; slots 23 and 24 hold fabric modules 3 and 4; and slots 25 and 26 hold fabric modules 5 and 6. The slots for the fabric modules are behind the fan modules.

Figure 3 on page 8 shows the front view of the SAN384C-6 chassis.



Figure 3. SAN384C-6 Chassis Front View

- 1. System LEDs
- 2. Rack-mount bracket
- 3. I/O modules lots numbered 104 and 7-10 from top to bottom
- 4. Supervisor modules in slots numbered 5 and 6 from left to right.

Each slot is half the width of the chassis and each slot can hold one supervisor module.

- 5. Power supply modules (up to 8 bays)
 - There are two rows of power supply bays at the bottom of the chassis. Each bay can hold one power supply.
 - The top row has bays 1-4, numbered left to right.
 - The second row has bays 5-8, numbered left to right.
- 6. Chassis handles

Note : Handles are to be used only for positioning the empty chassis.

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- 7. Handles used for adjusting the chassis placement
- 8. Grid A PSU bays (1, 2, 5, 6)
- 9. Grid B PSU bays (3, 4, 7, 8)

Figure 4 on page 9 shows the rear view of the SAN384C-6 chassis.



Figure 4. SAN384C-6SAN384C-6 Chassis Rear View

- 1. Fan modules (Three fan modules) 1-3 are numbered left to the right. When the fan modules are installed, they cover the crossbar fabric switching modules. Only two fan modules are shown in the figure. One fan module is removed to show the crossbar fabric switching module in back.
- 2. Crossbar Fabric Switching Modules (up to six crossbar fabric switching modules with two modules behind each fan module). The crossbar fabric switching modules 1 and 2 are behind the fan module slot 1, modules 3 and 4 are behind the fan module slot 2, and modules 5 and 6 are behind the fan module slot 3.
- 3. Midplane
- 4. Crossbar Fabric Switching Modules and fan LEDs

The SAN384C-6 chassis can be mounted on a standard 19-inch EIA equipment rack by using the standard rack-mount hardware, or mounted on a standard two-post Telco rack, with mounting rails.

SAN192C-6 Chassis

The SAN192C-6 is a six-slot chassis with two supervisor modules, and up to four I/O modules. The chassis holds up to six crossbar fabric switching modules, up to four AC power supplies and three fan modules. Airflow is front-to-back (port-side intake) in the SAN192C-6 chassis.

Note : The base configuration of the SAN192C-6 ships with two supervisor modules, three cross bar fabric modules, and four power supplies.

Figure 5 on page 10 shows the front view of the SAN192C-6 chassis.



Figure 5. SAN192C-6 Chassis Front View

- 1. System LEDs
- 2. Rack-mount brackets
- 3. Cable management frame
- 4. I/O modules slots numbered 1-2 and 4-5 from top to bottom.
- 5. Supervisor module in slots numbered 5 and 6 from left to right.

Each slot is half the width of the chassis and each slot can hold one supervisor module.

6. Power supply modules (up to 4 bays)

The last row has 4 bays of power supply at the bottom of the chassis. Each bay can hold one power supply.

7. Handles used for adjusting the chassis placement

Note : Handles are to be used only for positioning an empty chassis.

- 8. Gid A PSU bays (1, 2 slots)
- 9. Grid B PSU bays (3,4 slots)

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Figure 6 on page 11 shows the rear view of the SAN192C-6 chassis.



Figure 6. SAN192C-6 Chassis Rear View

- 1. Fan modules (Three fan modules) 1-3 are numbered left to the right. When the fan modules are installed, they cover the crossbar fabric switching modules. Only two fan modules are shown in the figure. One fan module is removed to show the crossbar fabric switching module in back.
- 2. Crossbar modules (up to six crossbar fabric switching modules with two modules behind each fan module). The crossbar fabric switching modules 1 and 2 are behind the fan module slot 1, modules 3 and 4 are behind the fan module slot 2, and modules 5 and 6 are behind the fan module slot 3.
- 3. LEDs for fan module and crossbar switching fabric modules
- 4. Handles used for adjusting the chassis placement
- 5. Vertical mounting brackets

System LEDs

Table 2 on page 11 describes the System LEDs for the IBM c-type SAN directors.

Table 2. IBM c-type SAN switches and directors System LEDs		
LED	Status	Description
PSU	Green	Power supply units are operational.

Table 2. IBM c-type SAN switches and directors System LEDs (continued)		
LED	Status	Description
	Amber	One of the following problems has occurred:
		• Any power supply unit LED is red.
		• Any power supply unit is down.
FAN	Green	Fan modules are operational.
	Amber	At least one I/O module has a red STATUS LED.
SUP	Green	Supervisor modules are operational.
	Amber	At least one I/O module has a red STATUS LED.
FAB	Green	Fabric modules are operational.
	Amber	At least one I/O module has a red STATUS LED.
ІОМ	Green	Switching modules are operational.
	Amber	At least one I/O module has a red STATUS LED.

Supervisor Modules

This section describes supervisor modules supported by different IBM c-type SAN switches and directors:

- "IBM Supervisor-4 Module" on page 12
- "IBM Supervisor-1E Module" on page 16
- "IBM Supervisor-1 Module" on page 20

IBM Supervisor-4 Module

The Supervisor-4 Module is designed specifically for the SAN768C-6, SAN384C-6 and SAN192C-6 directors. This supervisor module delivers the latest advanced switching technology and resources.

The IBM c-type SAN director Supervisor-4 Module provides control and management functions for the IBM c-type SAN Directors and enables intelligent, resilient, scalable, and high-performance multilayer SAN switching. The IBM c-type SAN director Supervisor-4 Module is supported on the SAN768C-6, SAN384C-6 and SAN192C-6 Multilayer Directors. The IBM c-type SAN director Supervisor-4 Module is supported from NX-OS Release 8.4(1) or later on the IBM SAN384C-6 and the IBM SAN192C-6, and NX-OS Release 8.4(2a), or later, on the IBM SAN768C-6.

This supervisor module supports the following features:

• Supports up to 768 4/8/16/32-Gbps Fibre Channel ports in a single SAN768C-6 Multilayer Director chassis

- Supports up to 384 4/8/16/32-Gbps Fibre Channel ports in a single SAN384C-6 Multilayer Director chassis
- Supports up to 192 4/8/16/32-Gbps Fibre Channel ports in a single SAN192C-6 Multilayer Director chassis
- Supports up to 48-Tbps in a single SAN768C-6 Multilayer Director chassis
- Supports up to 24-Tbps in a single SAN384C-6 Multilayer Director chassis
- Supports up to 12-Tbps in a single SAN192C-6 Multilayer Director chassis
- Supports Crossbar Fabric-3 switching module on the SAN768C-6 (AJND), SAN384C-6 (AJNB) and SAN192C-6 (AJN9) Multilayer Directors respectively
- Multipathing based on Fabric Shortest Path First (FSPF)
- Nondisruptive software upgrades
- Provides high availability. The IBM c-type SAN directors Supervisor-4 Module can automatically restart failed processes, making it exceptionally robust. In the rare event that a supervisor module is reset, complete synchronization between the active and standby supervisor modules helps ensure a stateful failover with no disruption of traffic.
- Supports Secure Boot capabilities
- Supports two USB 3.0 ports
- Network management through the command-line interface (CLI) and through Data Center Network Manager (DCNM)
- Extensive security features including RADIUS and TACACS+, Fibre Channel Security Protocol (FC-SP), Secure File Transfer Protocol (SFTP), Secure Shell (SSH) Protocol, and Simple Network Management Protocol Version 3 (SNMPv3) implementing Advanced Encryption Standard (AES), VSANs, hardwareenforced zoning, ACLs, and per-VSAN role-based access control
- Integrated hardware-based virtual SAN (VSAN) technology and inter-VSAN routing (IVR)
- Network services such as access control lists (ACLs) and quality of service (QoS)
- Smart zoning
- Power-on self-test (POST) and diagnostics
- Switched Port Analyzer (SPAN) and Remote Switched Port Analyzer (RSPAN)

"IBM Supervisor-4 Module" on page 12 shows the IBM c-type SAN switches and directors.



Figure 7. IBM Supervisor-4 Module

- 1. Module retaining screw 11 Eject Request: eject request button for a slot0 device
- 2. Active: supervisor redundancy status LED
- 3. PWR MGMT: system power status LED
- 4. ACT: management port packet activity LED
- 5. Link: management port link status LED
- 6. ACT: management port packet activity LED
- 7. Eject Request: eject request button for USB3 device
- 8. USB3: usb3 status LED 18 MGMT Ethernet0: MGMT0 Ethernet out of band management port.
- 9. USB Slot 0: USB ports 19 Console Serial Port: module RS232 serial console port
- 10. USB Slot0: slot0 status LED
- 11. Eject Request: eject request button for slot0 device
- 12. Reset: module reset button
- 13. Module lock release button
- 14. Status: system diagnostic test status LED
- 15. ID: locator LED
- 16. System: system environment status LED
- 17. MGMT Ethernet1: MGMT1 Ethernet out of band management port
- 18. MGMT Ethernet 0: MGMT0 Ethernet out of band management port
- 19. Console Serial Port: module RS232 serial console port
- 20. USB Slot 1: USB port

Table 3 on page 14 describes the LEDs on the IBM c-type SAN switches and directors Supervisor-4 Module.

Table 3. IBM Supervisor-4 Module LEDs		
LED	Status	Description
ID	Flashing blue	A user has activated this LED to allow a person to find this module in the chassis.
	Off	Location identification is deactivated for this module.
Status	Green	All module diagnostics passed. The module is operational.
	Red	The module has detected an error and cannot power on or boot up.
		The module is not properly inserted.
		A bootup or runtime diagnostic test has failed.

Table 3. IBM Supervisor-4 Module LEDs (continued)		
LED	Status	Description
	Flashing Red	Indicates one of the following conditions:
		The temperature of the module has exceeded the safe operating temperature limits (a major temperature alarm has occurred). The module has been shut down to prevent permanent damage. The system will be shut down after two minutes if this condition is not cleared.
		The module is resetting.
		The ejector lever is open.
	Off	The module is not receiving power.
System	Green	All environmental sensors in the system are within operational bounds.
	Amber	At least one power supply has failed or the power supply fan has failed.
	Red	The temperature of the supervisor module exceeded the major threshold.
Active	Green	The supervisor is operational and in HA active state.
	Amber	The supervisor module is in HA standby state.
Power Management	Green	There is sufficient power available for all installed modules.
	Amber	There is insufficient power for all installed modules.
MGMT Ethernet	Green	The mgmt0 interface is administratively active and the supervisor is in HA active state.

Table 3. IBM Supervisor-4 Module LEDs (continued)		
LED	Status	Description
	Amber	The mgmt0 interface is administratively active and the supervisor is in the HA standby state.
	Off	The mgmt0 interface is uninitialized. No signal is detected.
АСТ	Green	Frames are being transmitted or received by the interface.
	Off	There is no activity on the interface.
Link	Green	The management port link is operational.
	Amber	The management port link has been disabled by the software.
	Off	No link signal received.
USB3	Green	The flash device is mounted.
	Red	The device is a valid device type, but failed to be mounted. This can be due to an invalid file system format.
	Off	The flash device is not mounted and can be safely removed.
Slot0	Green	The flash device is mounted.
	Red	The device is a valid device type, but failed to be mounted. This can be due to an invalid file system format.
	Off	The flash device is not mounted and can be safely removed.

IBM Supervisor-1E Module

The Supervisor-1E Module is designed specifically for the SAN768C-6. This supervisor module delivers the latest advanced switching technology and resources to support the 18 slot chassis.

This supervisor module supports the following features:

- Nondisruptive software upgrades
- Stateful process restart and failover
- Fully redundant operation

- Support for up to 768 4/8/16 Gbps, or 8/16/32 Gbps full line-rate autosensing Fibre Channel ports in a single chassis
- Support for up to 48 Tbps of Fibre Channel system bandwidth
- Multipathing based on Fabric Shortest Path First (FSPF)
- Ability to dynamically reroute traffic in the event of a switch failure
- Network management through the command-line interface (CLI) and through Data Center Network Manager (DCNM)
- Extensive security features including RADIUS and TACACS+, Fibre Channel Security Protocol (FC-SP), Secure File Transfer Protocol (SFTP), Secure Shell (SSH) Protocol, and Simple Network Management Protocol Version 3 (SNMPv3) implementing Advanced Encryption Standard (AES), VSANs, hardwareenforced zoning, ACLs, and per-VSAN role-based access control (RBAC)
- Support for virtual SAN (VSAN) technology and inter-VSAN routing (IVR)
- Network services such as access control lists (ACLs) and quality of service (QoS)
- Smart zoning
- Power-on self-test (POST) and diagnostics
- Switched Port Analyzer (SPAN) and Remote Switched Port Analyzer (RSPAN)

Figure 8 on page 17 shows the IBM c-type SAN Supervisor-1E Module.



Figure 8. IBM Supervisor-1E Module

- 1. Module retaining screw
- 2. ID: locator LED
- 3. Link: management port link status LED
- 4. MGMT Ethernet: system out of band Ethernet management port
- 5. ACT: management port packet activity LED
- 6. Console Serial Port: module serial console port
- 7. Eject Request: eject request button for USB1 device
- 8. USB1: usb1 status LED
- 9. USB1 USB port
- 10. Slot0: slot0 status LED
- 11. Eject Request: eject request button for slot0 device
- 12. Reset: module reset button
- 13. Module lock release button

- 14. Status: system diagnostic test status LED
- 15. System: system environment status LED
- 16. Active: supervisor redundancy status LED
- 17. PWR MGMT: system power status LED
- 18. Management port operational status LED
- 19. Module ejection lever
- 20. Slot0 USB port

Table 4 on page 18 describes the LEDs on the IBM c-type SAN Supervisor-1E Module.

Table 4. IBM Supervisor-1E Module LEDs		
LED	Status	Description
ID	Flashing blue	A user has activated this LED to allow a person to find this module in the chassis.
	Off	Location identification is deactivated for this module.
Status	Green	All module diagnostics passed. The module is operational.
	Red	The module has detected an error and cannot power on or boot up.
		The module is not properly inserted.
		A bootup or runtime diagnostic test has failed.
	Flashing Red	Indicates one of the following conditions:
		The temperature of the module has exceeded the safe operating temperature limits (a major temperature alarm has occurred). The module has been shut down to prevent permanent damage. The system will be shut down after two minutes if this condition is not cleared.
		The module is resetting.
		The ejector lever is open.
	Off	The module is not receiving power.

Table 4. IBM Supervisor-1E Module LEDs (continued)		
LED	Status	Description
System	Green	All environmental sensors in the system are within operational bounds.
	Amber	At least one power supply has failed or the power supply fan has failed.
	Red	The temperature of the supervisor module exceeded the major threshold.
	Off	The slot has detected a slot ID parity error
Active	Green	The supervisor is operational and in HA active state.
	Amber	The supervisor module is in HA standby state.
Power Management	Green	There is sufficient power available for all installed modules.
	Amber	There is insufficient power for all installed modules.
MGMT Ethernet	Green	The mgmt0 interface is administratively active and the supervisor is in HA active state.
	Amber	The mgmt0 interface is administratively active and the supervisor is in the HA standby state.
	Flashing amber	The management port link is bad and has been disabled due to a hardware failure.
	Off	The mgmt0 interface is uninitialized. No signal is detected.
АСТ	Flashing Green	Frames are being transmitted or received by the interface.
	Off	There is no activity on the interface.

Table 4. IBM Supervisor-1E Module LEDs (continued)		
LED	Status	Description
Link	Green	The management port link is operational.
	Off	No link signal received.
LOG FLASH	Green	The log flash CompactFlash or USB disk is being accessed. Do not remove the media until the LED is off
	Off	The expansion flash CompactFlash or USB disk is not being accessed. You can remove the media while this LED is off.
Slot0	Green	The log flash CompactFlash or USB disk is being accessed. Do not remove the media until the LED is off.
	Off	The expansion flash CompactFlash or USB disk is not being accessed. You can remove the media while this LED is off.

IBM Supervisor-1 Module

The IBM Supervisor-1 Module is designed specifically for the SAN192C-6 and SAN384C-6 chassis. This supervisor module provides control and management functions for the switch and enables high-performance switching.

This supervisor module supports the following features:

- Nondisruptive software upgrades
- Stateful process restart and failover
- Fully redundant operation
- Support for up to 384 Fibre Channel ports in a single chassis and 1152 Fibre Channel ports in a single rack
- Support for up to 24 Tbps of Fibre Channel system bandwidth
- Multipathing based on Fabric Shortest Path First (FSPF)
- · Ability to dynamically reroute traffic in the event of a switch failure
- Network management through the command-line interface (CLI) and through Data Center Network Manager (DCNM)
- Extensive security features including RADIUS and TACACS+, Fibre Channel Security Protocol (FC-SP), Secure File Transfer Protocol (SFTP), Secure Shell (SSH) Protocol, and Simple Network Management Protocol Version 3 (SNMPv3) implementing Advanced Encryption Standard (AES), VSANs, hardwareenforced zoning, ACLs, and per-VSAN role-based access control
- Support for virtual SAN (VSAN) technology and inter-VSAN routing (IVR)
- Network services such as access control lists (ACLs) and quality of service (QoS)
- Smart zoning

- Power-on self-test (POST) and diagnostics
- Switched Port Analyzer (SPAN) and Remote Switched Port Analyzer (RSPAN)

Figure 9 on page 21 shows the IBM c-type SAN switches and directors Supervisor-1 module.



Figure 9. IBM Supervisor-1 Module

- 1. Module retaining screw
- 2. ID: locator LED
- 3. Link: management port link status LED
- 4. MGMT Ethernet: system out of band Ethernet management port
- 5. ACT: management port packet activity LED
- 6. Console Serial Port: module serial console port
- 7. Eject Request: eject request button for USB1 device
- 8. USB1: usb1 status LED
- 9. USB1 USB port
- 10. Slot0: slot0 status LED
- 11. Eject Request: eject request button for slot0 device
- 12. Reset: module reset button
- 13. Module lock release button
- 14. Status: system diagnostic test status LED
- 15. System: system environment status LED
- 16. Active: supervisor redundancy status LED
- 17. PWR MGMT: system power status LED
- 18. Management port operational status LED
- 19. Module ejection lever
- 20. Slot0 USB port

<u>Table 5 on page 22</u> describes the LEDs on the IBM c-type SAN switches and directors Supervisor-1 Module.

Table 5. IBM Supervisor-1 Module LEDs		
LED	Status	Description
ID	Flashing blue	A user has activated this LED to allow a person to find this module in the chassis.
	Off	Location identification is deactivated for this module.
Status	Green	All module diagnostics passed. The module is operational.
	Red	Indicates one of the following conditions:
		The module has detected an error and cannot power on or boot up.
		The module is not properly inserted.
		A bootup or runtime diagnostic test has failed.
	Flashing Red	Indicates one of the following conditions:
		The temperature of the module has exceeded the safe operating temperature limits (a major temperature alarm has occurred). The module has been shut down to prevent permanent damage. The system will be shut down after two minutes if this condition is not cleared.
		The module is resetting.
		The ejector lever is open.
	Off	The module is not receiving power.
System	Green	All environmental sensors in the system are within operational bounds.
	Amber	At least one power supply has failed or the power supply fan has failed.
	Red	The temperature of the supervisor module exceeded the major threshold.

Table 5. IBM Supervisor-1 Module LEDs (continued)			
LED	Status	Description	
Active	Green	The supervisor is operational and in HA active state.	
	Amber	The supervisor module is in HA standby state.	
Power Management	Green	There is sufficient power available for all installed modules.	
	Amber	There is insufficient power for all installed modules.	
MGMT Ethernet	Green	The mgmt0 interface is administratively active and the supervisor is in HA active state.	
	Amber	The mgmt0 interface is administratively active and the supervisor is in the HA standby state.	
	Off	The mgmt0 interface is uninitialized. No signal is detected.	
ACT	Green	Frames are being transmitted or received by the interface.	
	Off	There is no activity on the interface.	
Link	Green	The management port link is operational.	
	Amber	The management port link has been disabled by software.	
	Flashing amber	The management port has been disabled by a hardware fault.	
	Off	No link signal received.	
USB1	Green	The flash device is mounted.	
	Red	The device is a valid device type, but failed to be mounted. This can be due to an invalid file system format.	
	Off	The flash device is not mounted and can be safely removed.	

Table 5. IBM Supervisor-1 Module LEDs (continued)		
LED	Status	Description
Slot0	Green	The flash device is mounted.
	Red	The device is a valid device type, but failed to be mounted. This can be due to an invalid file system format.
	Off	The flash device is not mounted and can be safely removed.

Crossbar Fabric Modules

This section describes the crossbar fabric modules supported by different IBM c-type SAN director switches:

- "SAN768C-6 Crossbar Fabric Modules" on page 24
- "SAN384C-6 Crossbar Fabric Modules" on page 26
- "SAN192C-6 Crossbar Fabric Modules" on page 29

SAN768C-6 Crossbar Fabric Modules

The SAN768C-6 supports up to six crossbar fabric modules. There is a crossbar fabric module designed specifically for the SAN768C-6. The crossbar fabric modules are installed vertically in slots 21 through 26, numbered from left to right, at the back of the chassis behind the fan modules.

Crossbar fabric switching module slots 1 and 2 are behind the fan module slot 1, the crossbar fabric switching module slots 3 and 4 are behind the fan module slot 2, and crossbar fabric switching module slots 5 and 6 are behind the fan module slot 3.

The IBM c-type SAN 48-Port 32-Gbps Fiber Channel Switching Module with Crossbar Fabric-1, needs a minimum of 6 crossbar fabric switching modules to deliver full bandwidth to all the modules in the switch. Each Crossbar Fabric-1 Switching Module provides 256-Gbps of fiber channel bandwidth.

The IBM c-type SAN 48-Port 32-Gbps Fiber Channel Switching Module with Crossbar Fabric-3, needs a minimum of 3 crossbar fabric switching modules to deliver full bandwidth to all the modules in the switch. Each Crossbar Fabric-3 Switching Module provides 512-Gbps of fiber channel bandwidth. A fourth crossbar fabric switching module is required for N+1 protection.

The Crossbar Fabric-1 switching module is supported from NX-OS Release 6.2(1) or later. It is supported only with Supervisor-1 Module.

The Crossbar Fabric-3 switching module is supported from NX-OS Release 8.4(2a) or later. It is supported only with Supervisor-4 Module.



Figure 10. SAN768C-6 Crossbar Fabric Module

- 1. Locking lever
- 2. Unlocking button
- 3. Fabric module LEDs
- 4. Connector pins

The fan modules cover the fabric modules in the back of the chassis. Fan module 1 must be removed to access fabric modules 1 and 2, fan module 2 must be removed to access fabric modules 3 and 4, and fan module 3 must be removed to access fabric modules 5 and 6.

The LEDs on the crossbar fabric modules indicate the status of the modules. <u>Table 6 on page 26</u> describes the LEDs.

Table 6. SAN768C-6 Crossbar Modules LEDs		
LED	Status	Description
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).
	Red	Indicates one of the following: The diagnostic test has failed. The module is not operational because a fault has occurred during the initialization sequence.
		The inlet air temperature of the system has exceeded the safe operating temperature limits of the card (a major environmental warning). The card has been shut down to prevent permanent damage.
	Blinking Red	Indicates one of the following: The fabric module has just been inserted and is booting up.
		An over temperature condition has occurred and the module has powered down.
		The power was turned off with a CLI command.
		1. The module is resetting and both ejector levers are out.
	Off	The module is not receiving power.
Locator ID	Blinking Blue	The operator has activated this LED to identify this module in the chassis.
	Off	Operator has not flagged this card for identification.

SAN384C-6 Crossbar Fabric Modules

The SAN384C-6supports up to six crossbar (xbar) fabric switching modules. The Crossbar Fabric-1 and Crossbar Fabric-3 switching modules are supported. The crossbar fabric switching modules are installed vertically at the back of the chassis behind the fan modules.

Crossbar fabric switching module slots 1 and 2 are behind the fan module slot 1, the crossbar fabric switching module slots 3 and 4 are behind the fan module slot 2, and crossbar fabric switching module slots 5 and 6 are behind the fan module slot 3.

The IBM c-type SAN 48-Port 32-Gbps Fiber Channel Switching Module with Crossbar Fabric-1, needs a minimum of 6 crossbar fabric switching modules to deliver full bandwidth to all the modules in the switch. Each Crossbar Fabric-1 Switching Module provides 256-Gbps of fiber channel bandwidth.

The IBM c-type SAN 48-Port 32-Gbps Fiber Channel Switching Module with Crossbar Fabric-3, needs a minimum of 3 crossbar fabric switching modules to deliver full bandwidth to all the modules in the switch. Each Crossbar Fabric-3 Switching Module provides 512-Gbps of fiber channel bandwidth. A fourth crossbar fabric switching module is required for N+1 protection.

The Crossbar Fabric-1 switching module is supported from NX-OS Release 6.2(1) or later. It is supported only with Supervisor-1 Module.

The Crossbar Fabric-3 switching module is supported from NX-OS Release 8.4(1) or later. It is supported only with Supervisor-4 Module.



Figure 11. SAN384C-6 Crossbar Fabric Module

- 2. Unlocking button
- 3. Crossbar Fabric Switching Module LEDs
- 4. Connector pins

The LEDs on the crossbar fabric modules indicate the status of the modules. <u>Table 7 on page 28</u> describes the LEDs.

Table 7. SAN384C-6 Crossbar Modules LEDs		
LED	Status	Description
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).
	Orange	One of the following occurs: The module is booting or running diagnostics (normal initialization sequence). An over-temperature condition occurred (a minor threshold was exceeded during environmental monitoring).
	Blinking Red	One of the following occurs: The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence. An over-temperature condition occurred (a major threshold was exceeded during environmental monitoring). Fabric module has been manually powered off.
	Red	Bad slot ID parity.
	Off	The module is not receiving power.
Locater ID	Blinking Blue	Operator has flagged this card for identification.
	Off	Operator has not flagged this card for identification.

Since the crossbar fabric switching modules are located behind the fan modules in the chassis, the LEDs on the crossbar fabric switching modules are not easily visible from the back of the chassis. So, crossbar fabric switching module status LEDs are provided on the fan modules as well. Each fan module covers two crossbar fabric switching modules, the status LEDs for the two crossbar fabric switching modules are present on each fan module. If the fan module is removed, the status and locator LEDs on the crossbar fabric switching modules will be visible.

When a fabric module needs to be located, the locator LED of the corresponding fan module must be activated, followed by the locator LED of the crossbar fabric switching module, using the CLIs locator-led fan <fan module number> and locator-led xbar <xbar slot number>. For example, to locate the crossbar fabric switching module in slot 4, the locator LED of the fan module 2 needs to be activated followed by the locator LED of the crossbar fabric switching module 4.

SAN192C-6 Crossbar Fabric Modules

The SAN192C-6 supports up to six crossbar (xbar) fabric switching modules. The crossbar fabric switching modules Crossbar Fabric-1 and Crossbar Fabric-3 are supported. The crossbar fabric switching modules are installed vertically at the back of the chassis behind the fan modules. Crossbar fabric switching module slots 1 and 2 are behind the fan module slot 1, crossbar fabric switching module slots 3 and 4 are behind the fan module slot 2, and crossbar fabric switching module slots 5 and 6 are behind the fan module slot 3.

The IBM c-type SAN 48-Port 32-Gbps Fiber Channel Switching Module with Crossbar Fabric-1, needs a minimum of 6 crossbar fabric switching modules to deliver full bandwidth to all the modules in the switch. Each Crossbar Fabric-1 Switching Module provides 256-Gbps of fiber channel bandwidth.

The IBM c-type SAN 48-Port 32-Gbps Fiber Channel Switching Module with Crossbar Fabric-3, needs a minimum of 3 crossbar fabric switching modules to deliver full bandwidth to all the modules in the switch. Each Crossbar Fabric-3 Switching Module provides 512-Gbps of fiber channel bandwidth. A fourth crossbar fabric switching module is required for N+1 protection.

The Crossbar Fabric-1 switching module is supported from NX-OS Release 6.2(1) or later. It is supported only with Supervisor-1 Module.

The Crossbar Fabric-3 switching module is supported from NX-OS Release 8.4(1) or later. It is supported only with Supervisor-4 Module.



Figure 12. SAN192C-6 Crossbar Fabric Module

- 1. Locking lever
- 2. Unlocking button
- 3. Crossbar fabric switching module LEDs
- 4. Connector pins

The LEDs on the crossbar fabric modules indicate the status of the modules. <u>Table 8 on page 31</u> describes the LEDs.

Table 8. SAN192C-6 Crossbar Modules LEDs			
LED	Status	Description	
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).	
	Orange	One of the following occurs:	
		The module is booting or running diagnostics (normal initialization sequence).	
		An over-temperature condition occurred (a minor threshold was exceeded during environmental monitoring).	
	Blinking Red	One of the following occurs:	
		The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence.	
		An over-temperature condition occurred (a major threshold was exceeded during environmental monitoring).	
		Fabric module has been manually powered off.	
	Red	Bad slot ID parity.	
	Off	The module is not receiving power.	
Locater ID	Blinking Blue	Operator has flagged this card for identification.	
	Off	Operator has not flagged this card for identification.	

The crossbar fabric switching modules are located behind the fan modules in the chassis, the LEDs on the crossbar fabric switching module are not easily visible from the back of the chassis. So, the crossbar fabric switching module status LEDs are provided on the fan modules as well. Each fan module covers two crossbar fabric switching modules, the status LEDs for two crossbar fabric modules are present on each fan module. If the fan module is removed, the status and locator LEDs on the crossbar fabric switching module is removed.

When a crossbar fabric switching module needs to be located, the locator LED of the corresponding fan module must be activated, followed by the locator LED of fabric module, using the CLIs locator-led fan <fan module number> and locator-led xbar <xbar slot number>. For example, to

locate the crossbar fabric switching module in slot 4, the locator LED of the fan module 2 needs to be activated followed by the locator LED of the crossbar fabric switching module 4.

Fibre Channel Switching Modules

This section describes <u>"IBM 48 port 32 Gbps Fibre Channel Switching Module" on page 32</u> supported by the IBM c-type SAN director switches.

IBM 48 port 32 Gbps Fibre Channel Switching Module

The IBM 48 port 32 Gbps Fibre Channel switching module is designed specifically for the IBM c-type SAN directors.

With 768 line-rate 32 Gbps Fibre Channel ports per director, the 32 Gbps 48 port Fibre Channel switching module meets the high-performance needs for flash-memory and Non-Volatile Memory Express (NVMe) over Fibre Channel workloads. The switching module is hot swappable and compatible with 4 Gbps, 8 Gbps, 16 Gbps, and 32 Gbps Fibre Channel interfaces. This module also supports hot swappable Enhanced Small Form-Factor Pluggable (SFP+) transceivers.

Individual ports can be configured with 32 Gbps, 16 Gbps, 8 Gbps and 4 Gbps SFP+ transceivers. Each port supports 500 buffer credits for exceptional extensibility without the need for additional licenses. With the Enterprise Package license, up to 8191 buffer credits can be allocated to an individual port, enabling full link bandwidth over long distances with no degradation in link utilization.

Figure 13 on page 32 shows the IBM 48 port 32 Gbps Fibre Channel Switching Module.



Figure 13. IBM 48 port 32 Gbps Fibre Channel Switching Module

- 1. Captive screw
- 2. Unlock button
- 3. Unlocking lever
- 4. Status LED
- 5. ID LED
- 6. Fibre Channel ports
- 7. Link LEDs
- 8. Fibre Channel port group

LEDs on the 48 port 32 Gbps Fibre Channel Switching Modules

Table 9 on page 32 describes the LEDs for the 48 port 32 Gbps Fibre Channel switching module.

Table 9. IBM 48 Port 32 Gbps Fibre Channel Switching Module LEDs		
LED	Status	Description
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).

Table 9. IBM 48 Port 32 Gbps Fibre Channel Switching Module LEDs (continued)		
LED	Status	Description
	Orange	One of the following occurs or occurred:
		The module is booting or running diagnostics (normal initialization sequence).
		An over temperature condition has occurred. (A minor temperature threshold has been exceeded during environmental monitoring.)
	Blinking Red	One of the following occurs:
		The module is resetting. The switch has been powered on or the module has been hot inserted during the normal initialization sequence.
		An over temperature condition has occurred. (A major temperature threshold has been exceeded during environmental monitoring.)
		If the module fails to download code and configuration information successfully during the initial reset, the LED stays blinking red; the module does not come online.
	Solid Red	The module has detected a slot ID parity error on the mid plane. The module cannot determine its slot number and will not respond to the supervisor.
	Off	The module is not receiving power.
ID	Flashing blue	Identifier LED. The operator has selected this module for service from the CLI.
	Off	This module is not selected.
Link	Green	The port is active (the link is connected and operational).
	Orange	The module or port is disabled through the CLI command or the module is initializing.

Table 9. IBM 48 Port 32 Gbps Fibre Channel Switching Module LEDs (continued)		
LED	Status	Description
	Blinking Orange	The port is faulty and has been disabled.
	Off	The port is not active or the link is not connected.

SAN Extension Modules

This section describes the SAN Extension modules supported by the IBM c-type SAN director switches:

- "IBM 24/10 port SAN Extension Module" on page 34
- "LEDs on the 24/10 Port SAN Extension Module" on page 35

IBM 24/10 port SAN Extension Module

The IBM 24/10 port SAN Extension Module provides a high performance, flexible, unified platform for deploying enterprise class disaster recovery and business continuance SAN extension solutions. The 24/10 port SAN Extension Module is supported on IBM c-type SAN directors. With 24 line rate 2-, 4-, 8-, and 16 Gbps Fibre Channel ports and eight 1 and 10GE or two 40GE Fibre Channel over IP (FCIP) ports, this module enables large and scalable deployment of SAN extension solutions. The SAN extension module has two independent service engines that can each be individually and incrementally enabled to scale as business requirements expand. The SAN extension module supports the full range of services available on other IBM c-type SAN Director Fibre Channel switching modules, including virtual SAN (VSAN), security, and traffic management services. The FCIP module uses IBM expertise and knowledge of IP networks to deliver outstanding SAN extension performance, reducing latency for disk and tape operations with FCIP acceleration features, including FCIP write acceleration and FCIP tape write and read acceleration. Hardware-based encryption helps secure sensitive traffic with IP Security (IPsec), and hardware-based compression dramatically enhances performance for both high and low speed links, enabling immediate cost savings in expensive WAN infrastructure. Multiple FCIP interfaces within a single engine or across service engines can be grouped into a port channel of up to 16 links for high availability and increased aggregate throughput.

Note: In NX-OS Release 7.3(0)DY(1), 40GE IP Storage interfaces are not supported.

Figure 14 on page 34 shows a IBM 24/10 Port SAN Extension Module.



Figure 14. IBM 24/10 Port SAN Extension Module

- 1. Captive screw
- 2. Unlock button
- 3. Unlocking lever

- 4. Status LED
- 5. ID LED
- 6. Link LEDs
- 7. Fibre Channel port group. A port group consists of four ports. 16-Gbps ports
- 8. 10-GIPS port group. A port group consists of four ports.
- 9. 10-GIPS port group. A port group consists of four ports.
- 10. 40-GIPS port group. A port group consists of two ports.

Note : The 40-GIPS ports are not supported.

LEDs on the 24/10 Port SAN Extension Module

Table 10 on page 35 describes the LEDs for the 24/10 port SAN Extension module.

Table 10. IBM 24/10 Port SAN Extension Module LEDs		
LED	Status	Description
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).
	Orange	One of the following occurs or occurred: The module is booting or running diagnostics (normal initialization sequence). An over temperature condition has occurred. (A minor temperature threshold has been exceeded during environmental
	Blinking Red	Monitoring.) One of the following occurs: The module is resetting. The switch has just been powered on or the module has been hot inserted during the normal initialization
		sequence. An over temperature condition has occurred (a major temperature threshold has been exceeded during environmental monitoring). If the module fails to download the code and configuration information successfully during the initial reset, the LED stays blinking red; the module does not come online.

Table 10. IBM 24/10 Port SAN Extension Module LEDs (continued)		
	Solid Red	The module has detected a slot ID parity error on the mid plane. The module can not determine its slot number and hence will not respond to the Supervisor.
ID	Flashing blue	The operator has activated this LED to identify this module in the chassis.
	Off	This module is not being identified.
Link	Solid green	Link is up.
	Steady Flashing Green	Port Beacon On (beacon is used to identify port).
	Intermittent Flashing Green	Link is up (traffic on port).
	Solid Orange	SFP not present or admin is down.
	Flashing Orange	A fault condition exists.
	Off	The port is not active or the link is not connected.

Fan Modules

This section describes the fan modules present in the IBM c-type SAN directors.

One fan can fail without affecting the thermal performance of the system. Redundant fan controllers and other internal mechanisms are in place to ensure that any single fan module does not go down.

Any single fan can fail and the system continues to operate under all conditions. Two fan failures might cause alarms from ASIC when temperature exceeds the threshold. At 86 degrees F (30° C) or less, a single fan module can be removed and the system can continue to operate up to 72 hours to allow for replacement of a failed fan module. When the temperature exceeds the threshold, the device automatically shuts down in 3 minutes.

SAN768C-6 Fan Modules

The SAN768C-6 has three fan modules, each with six fans, that are installed vertically at the back of the chassis. Each fan module can be removed while the other two fan modules continue to move air through the chassis.

The fan modules cover the fabric modules in the back of the chassis. Fan module 1 must be removed to access fabric modules 1 and 2, fan module 2 must be removed to access fabric modules 3 and 4, and fan module 3 must be removed to access fabric modules 5 and 6.



Figure 15. SAN768C-6 Fan Modules External and Internal View

- 1. Fan handles
- 2. Fan module status LED
- 3. Fan module ID LED
- 4. Left crossbar fabric switching module status LED
- 5. Right crossbar fabric switching module status LED
- 6. Fans (6)
- 7. Fan module connectors

SAN384C-6 Fan Modules

The SAN384C-6 has three fan modules, each with four fans, that are installed vertically at the back of the chassis. Each fan module can be removed while the other two fan modules continue to move air through the chassis.

The fan modules cover the fabric modules in the back of the chassis. Fan module 1 must be removed to access fabric modules 1 and 2, fan module 2 must be removed to access fabric modules 3 and 4, and fan module 3 must be removed to access fabric modules 5 and 6.

Figure 16 on page 38 shows the front and rear view of a SAN384C-6 fan module.



Figure 16. SAN384C-6 Fan Modules External and Internal View

- 1. Left crossbar fabric switching module status LED
- 2. Fan module status LED
- 3. Fan module ID LED
- 4. Right crossbar fabric switching module status LED
- 5. Fans (4)
- 6. Fan module connectors

SAN192C-6 Fan Modules

The SAN192C-6 has three fan modules, each with two fans, that are installed vertically at the back of the chassis. Each fan module can be removed while the other two fan modules continue to move air through the chassis.

The fan modules cover the fabric modules in the back of the chassis. Fan module 1 must be removed to access fabric modules 1 and 2, fan module 2 must be removed to access fabric modules 3 and 4, and fan module 3 must be removed to access fabric modules 5 and 6.



Figure 17. SAN192C-6 Fan Modules External and Internal View

- 1. Left crossbar fabric switching module status LED
- 2. Fan module status LED
- 3. Fan module ID LED
- 4. Right crossbar fabric switching module status LED
- 5. Fans (4)
- 6. Fan module connectors

Power Supplies

The IBM c-type SAN directors support the 3000 W AC power supply (AC input and DC output).

The SAN768C-6 supports up to 16 hot-swappable 3000 W AC power supplies. The SAN384C-6 supports up to eight hot-swappable 3000 W AC power supplies (AC input). The SAN192C-6 supports up to four hot-swappable 3000 W AC power supplies (AC input).

The 3000 W AC power supply unit may be connected to either 220 V or 110 V AC power sources. When connected to 220 V each PSU has a maximum output capacity of 3000 W. When connected to 110 V each PSU has a maximum output capacity of 1450 W.

Each power supply module monitors its output voltage and provides the status to the supervisor. In addition, the power supply modules provide information about local fans, power, shutdown control, and E2PROM to the supervisor.

Note :

- The minimum number of AC PSUs required to achieve grid redundancy on each of the IBM c-type SAN switches and directors differ. For more information see the AC Power Supply Requirements for Grid Redundancy section.
- When PSUs are in 1450 W mode and the system is configured in redundant power mode, the total power available to the system may not be sufficient to power all modules installed in the chassis. For more information, refer to the *Cisco NX-OS Fundamentals Configuration Guide*.



Figure 18. 3000 W AC Power Supply

- 1. Power supply switch
- 2. Power module handle
- 3. AC power connection
- 4. Unlocking lever
- 5. Power cable retainer
- 6. Input power module LED
- 7. Output power module LED
- 8. ID power module LED

Table 11 on page 40 describes the power supply LEDs for the IBM c-type SAN directors.

Table 11. Power Supply LEDs		
LED	Status	Description
Input 1	Green	The input voltage is within the valid range.
	Off	The input voltage is outside the valid range.
Output	Green	The output power is within the valid range.
	Off	The output power is outside the valid range.
Fault	Red, blinking (The blinking stops when the fault condition is cleared.)	Self-diagnostic tests have failed or another power supply failure has occurred.
	Off	The output voltage and power supply unit tests are okay.

Table 11. Power Supply LEDs (continued)		
LED	Status	Description
ID	Blue, blinking	The operator has activated this LED to identify this module in the chassis.
	Off	This module is not being identified.

Power Modes

A c-type SAN Director has a flexible power system.

Any operational power supply provides power to the system power bus. This allows the power load of the system to be shared equally across all operational power supplies.

Power supply output can be allocated to one of two pools. The available pool is available to bring up system components. The reserve pool is kept in reserve and not counted towards the available power.

The system can be configured in one of several modes which vary the size of the available and reserve power pools, according to user requirements.

Combined mode

This mode allocates the output power of all power supplies to available power for switch operations. This mode does not reserve any output power in case of power outages or power supply failures.

Power supply redundancy mode (N+1)

In this mode one power supply's output is allocated to the reserve power pool. This provides the system with enough reserve power in case a single power supply fails. The remaining power supplies are allocated to the available power pool. The reserve power supply must be at least as powerful as the most powerful power supply in the available pool to potentially replace the full power output of the failed power supply in the worst case. Because it is impossible to predict which power supply may fail, we recommend provisioning the system with power supplies of equal rating. This way the output of any power supply that fails can be replaced by the remaining power supplies.

For example, a system with four 3 kW power supplies in N+1 redundancy mode has a total of 12 kW. 9 kW are allocated to the available power pool and 3 kW are reserved. If any of the power supplies fail enough power is reserved that the remaining power supplies can still meet the 9 kW commitment.

Input grid redundancy mode (grid redundancy)

In this mode half of the power supply's output is allocated to the reserve power pool and half to the available power pool. This provides the system with enough reserve power in the case of 50% of the power supplies failing, as when a power grid fails. The system logically allocates the left two columns of PSU bays to Grid A and sums the output power of operational PSUs. It does the same for the right two columns (Grid B) and uses the minimum of the two as the available power pool. To utilize maximum power the sum of power supply outputs of Grid A and Grid B PSU bays must be equal.

For example, a system with four 3 kW PSUs in Grid A bays and three 3 kW PSUs in Grid B bays and in grid redundancy mode has 12 kW available from Grid A and 9 kW from Grid B. The minimum of the two grids is 9 kW so 9 kW is allocated to the available power pool and 9 kW are reserved. If either grid fails enough power is reserved that the remaining power supplies can still meet the 9 kW commitment. The output of the fourth PSU in Grid A is not considered in the calculations even though it provides power.

Full redundancy mode

This mode supports both grid redundancy or N+1 redundancy. 50% of the power supply output is allocated to the reserve pool and the other 50% of the power supply outputs are allocated to the available power pool. The reserved power may be used to backup either single power supply failures or a grid failure.

For example, a system with six 3 kW power supplies in grid redundancy mode has a total of 18 kW. 9 kW are allocated to the available power pool and 9 kW are allocated to the reserve pool. If a grid failure occurs (half of the power supplies loose power) the full reserve power pool is available to meet the 9 kW commitment. Otherwise, as single power supplies fail power is allocated to the available pool from the remaining reserve power pool until the reserve power pool is exhausted.

Note : Once a single power supply has failed in this mode, grid redundancy is no longer available.

Figure 19 on page 42 shows how to connect power supplies in a SAN768C-6 for grid redundancy



Figure 19. SAN768C-6 Grid-PSU Connections

Figure 20 on page 42 shows how to connect power supplies in a SAN384C-6 for grid redundancy



Figure 20. SAN384C-6 Grid-PSU Connections

Figure 21 on page 42 shows how to connect power supplies in a SAN192C-6 for grid redundancy



Figure 21. SAN192C-6 Grid-PSU Connections

Supported Transceivers

The SAN384C-6 supports the Fibre Channel SFP+ transceivers in either SWL or LWL.

Fibre Channel SFP+ Transceivers

The transceivers are field-replaceable and hot-swappable. You can use any combination of SFP+ transceivers that are supported by the switch. The only restrictions are that SWL transceivers must be paired with SWL transceivers, and LWL transceivers with LWL transceivers, and the cable must not exceed the stipulated cable length for reliable communications.

For more information about a specific SFP+ transceiver, see the <u>"SFP+ Transceiver Specifications" on</u> page 144. SFP+ transceivers can be ordered separately or with the IBM c-type SAN switches and directors.

Note : Use only IBM provided transceivers in the IBM c-type SAN directors. Each transceiver is encoded with model information that enables the switch to verify that the transceiver meets the requirements for the switch.

Chapter 2. Rack Installation

This chapter provides information on the rack installation and includes the following sections:

- "Rack Requirements" on page 45
- "Rack-Mounting Guidelines" on page 49
- "Installing and Removing the Brackets" on page 49
- "Installing the Switch on the Brackets" on page 50

Humidity Requirements

Altitude Requirements

Dust and Particulate Requirements

Minimizing Electromagnetic and Radio Frequency Interference

Shock and Vibration Requirements

Grounding Requirements

Planning for Power Requirements

Rack Requirements

This section provides the requirements for the following type of racks, assuming an external ambient air temperature range of 32 to 104 degrees F (0 to 40 degrees C):

- "General Requirements for Open Four-Post Racks" on page 45
- "General Rack and Cabinet Requirements for IBM c-type SAN switches and directors" on page 46
- "Rack and Cabinet Requirements for the SAN768C-6 Chassis" on page 46
- "Rack and Cabinet Requirements for the SAN384C-6 Chassis" on page 46
- <u>"Rack and Cabinet Requirements for the SAN192C-6 Chassis" on page 47</u>
- <u>"Clearance Requirements for IBM c-type SAN switches and directors" on page 47</u>

General Requirements for Open Four-Post Racks

The rack must be a standard 19-inch four-post EIA rack, with mounting rails that conform to English universal hole spacing per section 1 of ANSI/EIA-310-D-1992. See the <u>"Clearance Requirements for IBM c-type SAN switches and directors" on page 47</u> section.

General Rack and Cabinet Requirements for IBM c-type SAN switches and directors

You can install the following types of racks or cabinets for your switch:

- Standard perforated-doors cabinets
- Solid-walled cabinets with a roof fan module (bottom to top cooling)
- Standard open four-post Telco racks
- Standard open two post Telco racks

Note: IBM c-type SAN switches and directors are compatible with IBM racks and PDUs.

Use a standard 19 inch, four post Electronic Industries Alliance (EIA) cabinet or rack with mounting rails that conform to English universal hole spacing per section 1 of the ANSI/EIA-310-D-1992 standard.

The depth of a four post rack or a cabinet must be 24 to 32 inches (61.0 to 81.3 cm) between the front and rear mounting vertical rails.

Ensure that the airflow and cooling are adequate and there is sufficient clearance around the air vents on the switch, as described in Appendix A, "Product Specifications," on page 135.

The rack must have sufficient vertical clearance for the chassis along with 2 RU for the shelf brackets, and any desired clearance for the installation process.

The front and rear doors of enclosed racks must have at least 60% open area perforation pattern.

Additionally, you must consider the following site requirements for the rack:

- Power receptacles must be located within reach of the power cords used with the switch.
- AC power supplies
- Power cords for 3-kW AC power supplies are 8 to 12 feet (2.5 to 4.3 m) long.
- Where necessary, have a seismic rating of Network Equipment Building Standards (NEBS) Zone 3 or Zone 4, per GR-63-CORE.

Rack and Cabinet Requirements for the SAN768C-6 Chassis

To correctly install the switch in a cabinet located in a hot-aisle/cold-aisle environment, you should fit the cabinet with baffles to prevent exhaust air from recirculating into the chassis air intake. Work with your cabinet vendors to determine which of their cabinets meet the following requirements or see the IBM Support for recommendations:

- The height of the rack or cabinet must accommodate the 25 RU (43.75 inches or 111.1 cm) height of the switch and its bottom support bracket.
- Minimum gross load rating of 2000 lb (907.2 kg) (static load rating) if supporting two switches.

Rack and Cabinet Requirements for the SAN384C-6 Chassis

The rack must meet the following requirements:

- The minimum vertical rack space per chassis is 24.5 inches (62.2 cm) or 14 RU.
- The width between the mounting rails must be at least 17.75 inches (45.1 cm). For four-post EIA racks, this is the distance between the two front rails and rear rails.

To correctly install the switch in a cabinet located in a hot-aisle/cold-aisle environment, you should fit the cabinet with baffles to prevent exhaust air from recirculating into the chassis air intake. Work with your cabinet vendors to determine which of their cabinets meet the following requirements or see the IBM Support for recommendations:

- The height of the rack or cabinet must accommodate the 14-RU (24.5 inches or 62.2 cm) height of the switch and its bottom support bracket.
- Minimum gross load rating of 2000 lb (907.2 kg) (static load rating) if supporting three switches.
Rack and Cabinet Requirements for the SAN192C-6 Chassis

To correctly install the switch in a cabinet located in a hot-aisle/cold-aisle environment, you should fit the cabinet with baffles to prevent exhaust air from recirculating into the chassis air intake. Work with your cabinet vendors to determine which of their cabinets meet the following requirements or see the IBM Support for recommendations:

- The height of the rack or cabinet must accommodate the 9 RU (15.75 inches or 40.0 cm) height of the switch and its bottom support bracket. The bottom support bracket ships as a part of the accessory kit for the switch.
- Minimum gross load rating of 2000 lb (907.2 kg) (static load rating) if supporting four switches.

Clearance Requirements for IBM c-type SAN switches and directors

You must provide adequate clearance between the chassis and any other rack, device, or structure so that you can properly install the chassis, route cables, provide airflow, and maintain the switch. Ensure that the following clearance requirements are met:

- 7 inches (17.78 cm) between the front of chassis and inside of cabinet.
- 34 inches (86.36 cm) [40 inches recommended (101 cm)] in front of the cabinet so that a fully loaded 34 inches (86.36 cm) chassis box can be moved.
- 2 inches (5.08 cm) for module handles.
- 3 inches (7.62 cm) between the rear of the chassis and the inside of the cabinet, that is, the perforated rear door (required for airflow in the cabinet if used).
- 25 inches (63.5 cm) outside of the cabinet to remove fabric modules.
- No clearance is required between the chassis and the sides of the rack or cabinet (no side airflow).
- Clearance required for cables that connect to as many as 400 ports (in addition to the cabling required for other devices in the same rack). These cables must not block access to any removable chassis modules or block airflow into or out of the chassis. Route the cables through the cable management frames on the left and right sides of the chassis.

Figure 22 on page 48 illustrates the front, rear, and side clearance requirements for IBM c-type SAN switches and directors:



Figure 22. Clearance Requirements for IBM c-type SAN switches and directors (Top View)

- 1. Chassis
- 2. Cable Management Frames
- 3. Vertical rack-mount posts and rails
- 4. Area used for fan tray handles at the rear of the chassis (allow 2 inches [5 cm])
- 5. Nearest object or inside of cabinet (no side clearance required)
- 6. Fibre Channel ports. Air intake from the cold aisle for all modules and power supplies
- 7. Air exhaust to the hot aisle for all modules and power supplies
- 8. No left side clearance required (no airflow on left side)
- 9. Chassis width
- 10. No right side clearance required (no airflow on right side)
- 11. Rear service clearance required to replace fan trays and fabric modules
- 12. Airflow clearance area required at the rear of the chassis within the cabinet (if a cabinet is used)
- 13. Chassis depth
- 14. Clearance required between the front of the chassis and the inside of the cabinet (if used) or the edge of the cold aisle (if no cabinet) for the cable management frames and the optional front doors
- 15. Front service clearance required for installing the chassis and replacing the modules on the front of the chassis

Rack-Mounting Guidelines



CAUTION : If the rack is on wheels, ensure that the brakes are engaged or the rack is otherwise stabilized.

CAUTION : If installing this kit in an EIA rack, attach the switch to all four rack-mounting rails; the EIA rails may not be thick enough to prevent flexing of the shelf brackets if only two rails are used.

Before Installing the Rack-Mount Support Brackets

Before installing the rack-mount support brackets for the IBM c-type SAN switches and directors, check the contents of your kit. Table 12 on page 49 lists the contents of the shelf bracket kit.

Table 12. Contents of Rack-Mount Support Brackets Kit		
Quantity	Part Description	
2	Bottom support brackets	
20	12-24 x 3/4-in. Phillips screws	
20	M6 x 19 mm Phillips binder-head screws	
20	10-32 x 3/4-inch screws	

Installing and Removing the Brackets

This section provides information on how to install and remove brackets.

Before installing the shelf brackets, check the contents of your kit. <u>Table 13 on page 49</u> lists the contents of the shelf bracket kit.

Table 13. Contents of Shelf Bracket Kit		
Quantity	Part Description	
2	Slider brackets	
2	Shelf brackets	
1	Crossbar	
2	10-32 x 3/8-in. Phillips pan-head screws	
16	12-24 x 3/4-in. Phillips screws	
16	10-24 x 3/4-in. Phillips screws	

Required Equipment

You need the following equipment for this installation:

- Number 2 Phillips screwdriver
- Tape measure and level (to ensure shelf brackets are level)

Installing the IBM c-type SAN Director Shelf Bracket Kit into a Rack

About this task

Figure 23 on page 50 shows the installation of the IBM c-type SAN Director Shelf Bracket Kit into a four-post rack.



Figure 23. Installing the Shelf Bracket Kit into a Rack

Use this procedure to install the shelf brackets in a rack.

Procedure

- 1. Position a shelf bracket inside the rack-mounting rails. Align the screw holes at the front of the shelf bracket with the holes in the front rack-mounting rail, and then attach the shelf bracket to the front rack-mounting rail using a minimum of three (M6, 12-32 or 12-24) screws.
- 2. Align the screw holes at the back of the shelf bracket with the holes in the back rack-mounting rail, and then attach the shelf bracket to the back rack-mounting rail using a minimum three (M6, 12-32 or 12-24) screws.
- 3. Verify that the shelf brackets are at the same height (using the level or tape measure as desired).

Installing the Switch on the Brackets

This section provides information on how to install the switch on the rack-mount support brackets and on the shelf brackets and includes the following subsections:

- "Installing the Switch on the Rack-Mount Support Brackets" on page 50
- "Installing the Switch on the Shelf Brackets" on page 51

Installing the Switch on the Rack-Mount Support Brackets

About this task

This topic provides general instructions for installing the switch on top of the rack-mount support brackets.



Warning : This unit is intended for installation in restricted access areas. A restricted access area can be accessed only by using a special tool, lock and key, or other means of security.

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Warning : Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

Note : Before you install, operate, or service the system, see the *IBM Systems Safety Notices* for important safety information.

Use this procedure to install the switch on top of the rack-mount support brackets.

Procedure

- 1. Verify that the rack-mount support brackets are level and securely attached to the rack-mounting rails, the support rack-mount support brace is securely attached to the brackets, and the rack is stabilized.
- 2. Slide a mechanical lift under the switch and lift the switch up onto the rack-mount support brackets, ensuring it is squarely positioned.
- 3. Attach the switch to the rack-mounting rails. See the <u>"Required Equipment" on page 49</u>.



CAUTION : We recommend grounding the chassis, even if the rack is already grounded. There is a grounding pad with two threaded M4 holes on the chassis for attaching a grounding lug.

Installing the Switch on the Shelf Brackets

This section provides general instructions for installing the switch on top of the shelf brackets.

About this task

For detailed information about the items required for installation, see the <u>"Required Equipment" on page</u> 49.

The IBM c-type SAN Director Shelf Bracket Kit can be used to support the switch in a non-threaded rack. This shelf bracket kit can be used as a permanent support when installing a IBM c-type SAN Director in a rack that meets the requirements listed in the "Rack Requirements" on page 45.



Warning : This unit is intended for installation in restricted access areas. A restricted access area can be accessed only by using a special tool, lock and key, or other means of security.



Warning : Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

Note : Before you install, operate, or service the system, see the *IBM Systems Safety Notices* for important safety information.

Use this procedure to install the switch on top of the shelf brackets.

Procedure

- 1. Verify that the shelf brackets are level and securely attached to the rack-mounting rails, the crossbar is securely attached to the shelf brackets, and the rack is stabilized.
- 2. Slide the switch onto the shelf brackets, ensuring that it is squarely positioned.
- 3. Attach the IBM c-type SAN director switch to the rack-mounting rails.
 - a) Slide the clip nuts over the holes on the non threaded rails on the rack. These clip nuts provide the threading for the screws that will secure the chassis to the rack.
 - b) Use the 12 10-32 x 1/2 inch screws provided in this shelf bracket kit to secure the chassis to the rack. See "Required Equipment" on page 49.



CAUTION : We recommend that grounding the chassis, even if the rack is already grounded. There is a grounding pad with two threaded M4 holes on the chassis for attaching a grounding lug.

Removing the Shelf Bracket Kit

About this task

The shelf bracket kit can be removed after the IBM c-type SAN director switch has been installed in a two-post telco (only SAN192C-6 Director) or four-post EIA rack, and the front rack-mount brackets are securely attached to the rack-mounting rails. For additional support in an EIA rack, ensure that the C brackets on the SAN384C-6 Switch are attached to the rear rack-mounting rails.

Use this procedure to remove the shelf bracket kit.

Procedure

- 1. Remove the screws fastening the slider brackets to the rear rack-mounting rails. Then slide the slider brackets out of the shelf brackets.
- 2. Remove the screws fastening the crossbar to the shelf brackets and remove the crossbar.
- 3. Remove the screws fastening the shelf brackets to the front rack-mounting rails. Then remove the shelf brackets from the rack.

Chapter 3. Installing the IBM c-type SAN Device

This chapter describes how to install the IBM c-type SAN Device chassis and its components, and includes the following information:

- "Attaching Bottom-Support Rails to a Four-Post Rack" on page 57
- "Attaching Bottom-Support Rails to a Four-Post Rack" on page 57
- "Attaching Bottom-Support Rails to a Two-Post Rack for the SAN192C-6 Director" on page 55
- "Installing the SAN384C-6 or SAN768C-6 Device on a Four-Post Rack or Cabinet" on page 66
- "System Grounding" on page 75
- "Installing, Removing and Verifying Field Replaceable Units" on page 78
- "Installing and Removing a Power Supply" on page 121
- "Installing and Removing Fan Modules" on page 123

Precautions for Installation

Note : Before you install, operate, or service the system, read the *IBM Systems Safety Notices* for important safety information.



Warning: IMPORTANT SAFETY INSTRUCTIONS

This warning symbol indicates danger. You are in a situation that could cause physical injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.

SAVE THESE INSTRUCTIONS



Warning : This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.



Warning : Only trained and qualified personnel should be allowed to install, replace, or service this equipment.



Warning : A readily accessible two-poled disconnect device must be incorporated in the fixed wiring.

Preparing for Installation

This section provides the following topics:

- "Unpacking and Inspecting the Switch" on page 54
- "Required Equipment" on page 54
- "Installation Guidelines" on page 55

Unpacking and Inspecting the Switch

Before you install a new chassis, you need to unpack and inspect it to be sure that you have all the items that you ordered and verify that the switch was not damaged during shipment. If anything is damaged or missing, contact your customer representative immediately.

About this task



CAUTION : We recommend that you use a mechanical lift when the chassis is being moved or lifted. Fully loaded, SAN192C-6 chassis can weigh up to 325 lb (147.5 kg), SAN384C-6 chassis can weigh up to 449.5 lb (203.8 kg), and SAN768C-6 chassis can weigh up to 923 lb (419 kg).



CAUTION : When handling switch components, wear an ESD strap and handle modules by the carrier edges only. An ESD socket is provided on the chassis. For the ESD socket to be effective, the chassis must be grounded either through the power cable, the chassis ground, or metal-to-metal contact with a grounded rack.

Tip : Keep the shipping container for use when moving or shipping the chassis in the future. The shipping carton can be flattened and stored with the pallet.

Note : The switch was thoroughly inspected before shipment. If any damage occurred during transportation or any items are missing, contact your customer service representative immediately.

To inspect the shipment, follow these steps:

Procedure

Compare the shipment to the equipment list provided by your customer service representative and ensure that you have received all items, including the following:

- 1 or 2 supervisor modules
- 1 to 4, 8, or 16 switching modules depending on the IBM c-type SAN Device
- Up to six crossbar fabric modules
- 3 fan modules
- 1 to 4, 8, or 16 power supplies depending on the IBM c-type SAN Device
- Grounding lug kit
- Mounting kit
- ESD wrist strap
- Cables and connectors
- Cable management frames
- Left and right side frames
- Top frame
- M4 x 12 mm flat-head Phillips screws (12)
- M3X8 mm pan-head screws (2)

Required Equipment

You need to obtain the following items before beginning the installation:

- Number 1 and number 2 Phillips screwdrivers with torque capability
- 3/16-inch flat-blade screwdriver
- Tape measure and level
- ESD wrist strap or other grounding device
- Antistatic mat or antistatic foam

In addition to the grounding items provided in the accessory kit, you need the following items: **54** IBM Storage Networking SAN192C-6, SAN384C-6 and SAN768C-6: SAN192C-6, SAN384C-6 and SAN768C-6 Installation, Service, and User Guide

- Grounding cable (6 AWG recommended), sized according to local and national installation requirements; the required length depends on the proximity of the IBM c-type SAN Device to proper grounding facilities.
- Wire-stripping tool
- For the IBM c-type SAN Device, you need a mechanical lift to handle the weight of the fully-loaded chassis.

Installation Guidelines

Follow these guidelines when installing the IBM c-type SAN Device.

- Plan your site configuration and prepare the site before installing the chassis. We recommend that you use the site planning tasks listed in <u>Appendix C</u>, "Site Planning and Maintenance Records," on page <u>159</u>.
- Ensure that there is adequate space around the switch to allow for servicing the switch and for adequate airflow. Airflow requirements are listed in <u>Appendix A</u>, "Product Specifications," on page 135.
- Ensure that the air-conditioning meets the heat dissipation requirements listed in <u>Appendix A</u>, "Product <u>Specifications</u>," on page 135.
- Ensure that the rack meets the requirements listed in "Rack Requirements" on page 45.
- Ensure that the site power meets the power requirements listed in <u>Appendix A</u>, "Product <u>Specifications</u>," on page 135. You can use an uninterruptible power supply (UPS) to protect against power failures.



CAUTION : Avoid UPS types that use ferroresonant technology. These UPS types can become unstable with systems such as the IBM c-type SAN Director series, which can have substantial current draw fluctuations because of fluctuating data traffic patterns.

- Ensure that circuits are sized according to local and national codes. For North America:
- The 3000-W AC power supplies require a 20-A circuit.
- If you are using 200/240 VAC power sources in North America, the circuits must be protected by twopole circuit breakers.



CAUTION : To prevent loss of input power, ensure that the total maximum loads on the circuits supplying power are within the current ratings of the wiring and breakers.

• Record your installation and configuration information as you work. See <u>Appendix C, "Site Planning and</u> Maintenance Records," on page 159.

Use the following screw torques when installing the switch:

- Captive screws: 4 in-lb
- M3 screws: 4 in-lb
- M4 screws: 12 in-lb
- M6 screws: 20 in-lb
- 12-24 screws: 30 in-lb
- 10-20 screws: 22 in-lb

Attaching Bottom-Support Rails to a Two-Post Rack for the SAN192C-6 Director

Use this procedure to attach the bottom support rails to a two-post rack for the SAN192C-6 Director.

Before you begin

Before you can install the bottom support rails for the chassis, you must do the following:

- Verify that a two-post rack is installed and secured to the concrete subfloor (see Installing a Rack or Cabinet).
- If any other devices are stored in the rack or cabinet, verify that they are located below where you plan to install the switch. Also, verify that lighter devices in the same rack are located above where you plan to install this switch.
- Verify that the two-post bottom-support rails kit was ordered and shipped with the chassis.

About this task

The bottom-support rails support the weight of the switch chassis in the rack or cabinet. To maximize the stability of the rack, you must attach these rails at the lowest possible rack unit (RU).



Warning : To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Procedure

1. Position one of the two bottom-support rails at the lowest possible RU in the rack or cabinet. Be sure there is at least 9 RU of vertical space above the rails to install the chassis.

2. Use a manual Phillips torque screwdriver to attach the bottom-support rail to the rack using four M6 x 19 mm or 12-24 x 3/4 inch screws and tighten each screw to 40 in. lbs (4.5 N.m) of torque.



Figure 24. Attaching Bottom-Support Rails to a Rack

- 1. Adjustable bottom-support rails
- 2. M6 x 19 mm (or 12-24 x 3/4 in.) Phillips screws 3(6 to 8 per rail)
- 3. Cross bar aligned to the lower back of both rails
- 4. M4 x 8 mm screws (1 for each of two ends of the cross bar)
- 3. Repeat Steps 1 and 2 to attach the other bottom-support rail to the rack.

Note : Make sure that the two bottom-support rails are level with one another. If they are not level, adjust the higher rail down to the level of the lower rail.

4. Align the crossbar to the lower back of the two bottom-support rails and use two M4 x 8 mm screws to attach it to each rail (one screw for each rail). See Callouts 3 and 4 in Figure 24 on page 57 for the placement of the crossbar and its screws.

When the bottom-support rails are installed at the lowest possible RU and are level, you are ready to install the chassis in the rack or cabinet.

Attaching Bottom-Support Rails to a Four-Post Rack

Before you begin

Before you can install the bottom support rails for the chassis, you must do the following:

- Verify that a four-post rack or cabinet is installed and secured to the concrete subfloor.
- If any other devices are stored in the rack or cabinet, verify that they are located below where you plan to install the switch. Also, verify that lighter devices in the same rack are located above where you plan to install this switch.
- Verify that the bottom-support rails kit is included in the switch accessory kit (Unpack and inspect the chassis shipment for completeness and damage).

About this task

The bottom-support rails support the weight of the switch chassis in the rack or cabinet. To maximize the stability of the rack, you must attach these rails at the lowest possible rack unit (RU).



Warning : To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Procedure

1. Position one of the two adjustable bottom-support rails at the lowest possible RU in the rack or cabinet and adjust the length of the rail so that it stretches from the outer edges of the front and rear vertical mounting rails. Be sure there is at least 9 RU of vertical space above the rails to install the chassis.

You can expand the rail so that its mounting brackets are spaced between 24 to 32 inches (61.0 to 81.3 cm).



Figure 25. Positioning Bottom-Support Rail - SAN384C-6 Chassis

- 1. Position two bottom-support rails at the lowest RU on the rack.
- 2. Allow at least 24.5 inches (62.2 cm) (14 RU) for each chassis.



Figure 26. Positioning Bottom-Support Rail - SAN768C-6 Chassis

- 1. Position two bottom-support rails at the lowest RU on the rack.
- 2. Allow at least 45.5 inches (115.6 cm) (26 RU) for each chassis.
- 2. Use a manual Phillips torque screwdriver to attach the bottom-support rail to the rack using at least three or four M6 x 19 mm or 12-24 x 3/4 inch screws for each end of the rail (using a total of 6 to 8

screws for the rail as shown Figure 27 on page 61) and tighten each screw to 40 in. lbs (4.5 N.m) of torque.



Figure 27. Attaching Bottom-Support Rails to a Rack - SAN384C-6 Chassis

1. Adjustable bottom-support rails (2)

2. M6 x 19 mm (or 12-24 x 3/4 in.) Phillips screws (6 to 8 per rail).



Figure 28. Attaching Bottom-Support Rails to a Rack - SAN768C-6 Chassis

- 1. M6 x 19 mm (or 12-24 x 3/4 in.) Phillips screws (8 per rail)
- 2. Adjustable bottom-support rails (2)
- 3. Repeat Steps 1 and 2 to attach the other bottom-support rail to the rack.

The other rail/bracket need to be flipped 180 degrees and installed to the other side of the rack because both the left and right sides are the same rail/bracket.

Make sure that the two bottom-support rails are level with one another. If they are not level, adjust the higher rail down to the level of the lower rail.

When the bottom-support rails are installed at the lowest possible RU and are level, you are ready to install the chassis in the rack or cabinet.

Before you begin

- Verify that the chassis shipment is complete and undamaged.
- Verify that a two-post rack is installed and secured to the subfloor.



Warning : Stability hazard. The rack stabilizing mechanism must be in place, or the rack must be bolted to the floor before you slide the unit out for servicing. Failure to stabilize the rack can cause the rack to tip over.



Warning : Stability hazard. The rack stabilizing mechanism must be in place, or the rack must be bolted to the floor before you slide the unit out for servicing. Failure to stabilize the rack can cause the rack to tip over.

- Verify that the bottom-support rails have been attached to the lowest possible RU in the rack or cabinet and there is 9 RU (15.75 inches [40.0 cm]) of space above the rails to install the chassis.
- If there are other devices in the rack, verify that the devices that are heavier than this chassis are installed below where you are going to install the chassis and lighter devices are installed above where you are going to install the chassis.
- Verify that the data center ground is accessible where you are installing the chassis.
- Verify that you have the following tools and equipment:
 - Mechanical lift capable of lifting the full weight of the chassis and its installed modules

Note : Fully loaded, the SAN192C-6 chassis can weigh up to 325 lb (147.5 kg). You can lighten the chassis for easier moving by removing its power supplies, fan modules, and fabric modules. To determine the full weight of the chassis and the appropriate weight rating for the mechanical lift, see Appendix A, "Product Specifications," on page 135.



CAUTION : You must use a mechanical lift or floor jack to elevate a switch weighing over 120 pounds (55 kg).

- Manual Phillips-head torque screwdriver

Note : You should also have at least two persons to push the chassis when you slide it onto the rack.



Warning : To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Procedure

1. If you need to make the chassis as light as possible for moving, you can optionally remove the fabric modules, fan modules, and power supplies.

To remove a power supply, follow these steps:

- a) Push and hold the release handle on the power supply to the left.
- b) Pull the power supply about two inches (about 5 cm) out of the chassis.
- c) Place one hand under the power supply to support its weight and pull the power supply out of the chassis.
- d) Place the power supply on an antistatic surface.

To remove a fan module, follow these steps:

- a) Unscrew the four captive screws on the front of the fan module (one captive screw in each corner of the front of the fan module).
- b) Hold both handles on the fan module with both of your hands and pull the fan module out of the chassis.
- c) Place the fan module on an antistatic surface.

To remove a fabric module, follow these steps:

Note : Before you can remove a fabric module, you must remove the fan module that is installed in front of it.

- a) Press the lever eject button found in the middle of the front of the module.
- b) Rotate both of the levers away from the fabric module.
- c) When the other end of each lever is no longer holding onto the chassis, pull the two levers to slide the module a couple inches out of the chassis.
- d) Rotate the two levers back to the fabric module. Each lever will click when locked in place.
- e) Place one hand on the front of the module and place your other hand under the module to support its weight.
- f) Slide the module out of the chassis and place the module on an antistatic surface.
- 2. Load the chassis onto a mechanical lift or floor jack as follows:
 - a) Position the mechanical lift next to the shipping pallet that holds the chassis.
 - b) Elevate the lift platform to the level of the bottom of the chassis (or no more than 1/4 inch [0.635 cm] below the bottom of the chassis).
 - c) Use two persons to slide the chassis fully onto the lift so that the side of the chassis touches or is close to the vertical rails on the lift. Make sure that the front and rear of the chassis are unobstructed so you can easily push the chassis into the rack.



Warning : To prevent personal injury or damage to the chassis, never attempt to lift or tilt the chassis using the handles on modules (such as power supplies, fans, or cards); these types of handles are not designed to support the weight of the unit.



CAUTION : To lift the chassis, use a mechanical lift. Do not use the handles on the side of the chassis (the handles are not rated for lifting over 200 pounds [91 kg]). Use the side handles for only repositioning the chassis after it is already on the mechanical lift or in the rack or cabinet.

- 3. Use the mechanical lift to move and align the rear of the chassis to the front of the rack or cabinet. Make sure that the bottom of the chassis is elevated to the height of the bottom-support rails or no more than 1/4 inch (0.6 cm) above the rails.
- 4. Push the chassis halfway onto the rack or cabinet.

Use two persons to push the chassis onto the bottom-support rails. Push the lower half of the front side of the chassis so that the back side enters the rack first, and push until the chassis is halfway

onto the rack (see the following figure). Ensure that the chassis does not get caught on any of the expansion edges of the bottom-support rail.



Figure 29. Moving a Chassis onto a Rack or Cabinet

1. Push the sides of the lower half of the front side of the chassis.

2. Push the chassis into the rack until its mounting bracket touches the vertical mounting rails on the rack.

Tip : To adjust the placement of the chassis on the bottom-support rails, you can use the handles on the sides of the chassis.

5. If the mechanical lift is raised above the height of the bottom-support rails, gently lower it to the level of the rails or no more than 1/4 inch (0.6 cm) below the rails.

This action helps to prevent the bottom of the chassis from getting caught on the bottom expansion edges of the bottom-support rails.

6. Push the chassis all the way onto the rack so that the vertical mounting brackets on the chassis come in contact with the vertical mounting rails on the rack.

7. Use seven M6 x 19 mm or 24 x 3/4-inch screws to attach each of the two vertical mounting brackets on the chassis to the two vertical mounting rails on the rack (total of 14 screws). See Figure 30 on page 65.



Figure 30. Attaching the Chassis to the Rack

- 1. Vertical mounting rails on the rack.
- 2. Mounting brackets for two post racks

3. Six M6 x 19 mm or 10-24 x 3/4 in. Phillips screws used to attach each side bracket to a front mounting rail (use a total of 12 screws)

4. Eight M6 x 10 mm screws used to attach each bottom support rail to the chassis (use a total of 16 screws for both rails)

- 8. Use eight M6 x 10 mm screws to attach the bottom-support rails to the chassis (use a total of 16 screws for both bottom support rails). See Figure 30 on page 65.
- 9. If you removed any fabric modules before moving the chassis, replace each one in the chassis as follows:
 - a) Holding the front of the fabric module (the side with the LEDs), turn the module so that the front side is vertical.

Note : The top of the module has an alignment bracket running from the rear to the front. The electrical connectors will be at the bottom.

b) Align the rear of the fabric module to an open fabric slot and insert the bracket on top of the module into the track at the top of the slot.

Note : If there are only three fabric modules to install, install them in fabric slots 1, 3, and 5, and be sure that there are blank filler plates installed in the open slots.

- c) Slide the module part way into the slot.
- d) Press the ejector button on the front of the module, to release the levers from the front of the module.
- e) Rotate the levers away from the front of the module and hold them while sliding the module all the way into the slot.
- f) Simultaneously rotate both levers to the front of the module. They click when locked to the front of the module.

- 10. If you removed any fan modules before moving the chassis, reinstall each one in the chassis as follows:
 - a) Holding each of the two handles on the fan module with your two hands, align the fan module to an open fan module slot.

Note : The two alignment brackets on top of the fan module should align to two tracks at the top of the slot.

b) Slide the fan module into the slot until the front of the fan module comes in contact with the rear of the chassis.

Note : The two alignment pins on the fan module (on the top and one on the bottom) should go into holes in the chassis and the four captive screws on the fan module should align to screw holes in the chassis.

- c) Screw in the four captive screws to the chassis and tighten each screw to 8 in-lb (0.9 N-m).
- 11. If you removed any power supplies before moving the chassis, reinstall each one as follows:
 - a) Determine which power supply slots to fill and ensure that each of those slots is open.
 - b) If you are using the combined or power supply redundancy mode, you can use any slot for the power supply that you are installing.
 - c) If you are using the input-source or full redundancy mode, you must group the power supplies that are to be connected to the same grid on either the left or right power supply slots in the chassis (that is, place the power supplies for grid A in slots 1 or 2 or both slots and place the power supplies for grid B in slots 3 or 4 or both slots). For information on the power supplies supported by SAN c-type family switches, see "Power Supplies" on page 39.
 - d) Place one hand on the front of the power supply and place your other hand under it to support its weight.
 - e) Align the power supply to an open power supply slot.

Note : The alignment bracket on top of the power supply should align to a track at the top of the slot and a bar at the bottom of the power supply should be guided by a track at the bottom of the slot.

12. Slide the power supply all the way into the slot until its release handle clicks and the module stops.

Installing the SAN384C-6 or SAN768C-6 Device on a Four-Post Rack or Cabinet

This section is applicable to the SAN384C-6 and SAN768C-6 switches.

Before you begin

Before installing the device into a rack or cabinet, verify the following:

- Verify that the chassis shipment is complete and undamaged.
- Verify that a rack or cabinet is installed and secured to the subfloor.



Warning : Stability hazard. The rack stabilizing mechanism must be in place, or the rack must be bolted to the floor before you slide the unit out for servicing. Failure to stabilize the rack can cause the rack to tip over.

- Verify that the bottom-support rails have been attached to the lowest possible RU in the rack or cabinet and there is 14 RU (24.5 inches [62.2 cm]) of space above the rails to install the chassis.
- For SAN768C-6 chassis, verify that the bottom-support rails have been attached to the lowest possible RU in the rack or cabinet and there is 25 RU (43.75 inches [111 cm]) of space above the rails to install the chassis.
- If there are other devices in the rack, verify that the devices that are heavier than this chassis are installed below where you are going to install the chassis and lighter devices are installed above where you are going to install the chassis.

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- Verify that the data center ground is accessible where you are installing the chassis.
- Verify that you have the following tools and equipment:
 - Mechanical lift capable of lifting the full weight of the chassis and its installed modules



CAUTION : If the rack is on wheels, ensure that the brakes are engaged or that the rack is otherwise stabilized. If connecting a IBM c-type SAN Device to a 110-VAC power system, ensure that sufficient power is provided to meet the chassis power requirements for the number of modules installed.



CAUTION : All power supplies must be grounded. The receptacles of the AC power cables used to provide power to the chassis must be the grounding type, and the grounding conductors should connect to protective earth ground at the service equipment. For a IBM c-type SAN Device with a DC power supply, a grounding cable must be connected to the terminal block.

When connected to 220 VAC, the 3000-W AC power supplies for the IBM c-type SAN Device are designed to provide an output power of 3000 W to power the modules and fans. When connected to a 110 VAC power system, the power supply provides approximately 1450 W. In this case, and if the power supplies are used in redundant rather than combined mode, they might not provide adequate power, depending on the number of modules loaded in the chassis.

If a 110-VAC input is chosen, a 110-VAC power cord must be ordered separately.



Warning: When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046

Note : Fully loaded, the SAN384C-6 chassis can weigh up to 449.5 lb (203.8 kg), and the SAN768C-6 chassis can weigh up to 923 lb (419 kg). You can lighten the chassis for easier moving by removing its power supplies, fan modules, and fabric modules. To determine the full weight of the chassis and the appropriate weight rating for the mechanical lift, see Appendix A, "Product Specifications," on page 135, "Fan Modules" on page 36, and "Power Supplies" on page 39.



CAUTION: You must use a mechanical lift or floor jack to elevate a switch weighing over 120 pounds (55 kg).

- Phillips-head torque screwdriver
- Bottom-support rails kit (shipped with the accessory kit)

Part of this kit has already been used to install the bottom-support rails. You should still have 14 12-24 x 3/4-inch or M6 x 19 mm Phillips screws, which are required for attaching the chassis to the rack.

Note : You should also have at least two persons to push the chassis when you slide it onto the rack.



Warning : To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack

About this task

Use this procedure to install the IBM SAN384C-6 or SAN768C-6 device on a Four-Post Rack or Cabinet.

Procedure

1. If you need to make the chassis as light as possible for moving, you can optionally remove the fabric modules, fan modules, and power supplies.

To remove a power supply, follow these steps:

- a) Slide the handle in the middle of the ejector lever towards the end of the lever and rotate the lever away from the power supply.
- b) Pull the power supply a couple of inches (about 5 cm) out of the chassis.
- c) Place one hand under the power supply to support its weight and pull the power supply out of the chassis.
- d) Place the power supply on an antistatic surface.
- To remove a fan module, follow these steps:
- a) Unscrew the four captive screws on the front of the fan module (one captive screw in each corner of the front of the fan module).
- b) Hold both handles on the fan module with both of your hands and pull the fan module out of the chassis.
- c) Place the fan module on an antistatic surface.

To remove a fabric module, follow these steps:

Note : Before you can remove a fabric module, you must remove the fan module that is installed in front of it.

- a) Press the lever eject button found in the middle of the front of the module.
- b) Rotate both of the levers away from the fabric module.
- c) When the other end of each lever is no longer holding onto the chassis, pull the two levers to slide the module a couple inches out of the chassis.
- d) Rotate the two levers back to the fabric module. Each lever will click when locked in place.
- e) Place one hand on the front of the module and place your other hand under the module to support its weight.
- f) Slide the module out of the chassis and place the module on an antistatic surface.
- 2. Load the chassis onto a mechanical lift or floor jack as follows:
 - a) Position the mechanical lift next to the shipping pallet that holds the chassis.
 - b) Elevate the lift platform to the level of the bottom of the chassis (or no more than 1/4 inch [0.635 cm] below the bottom of the chassis).
 - c) Use two persons to slide the chassis fully onto the lift so that the side of the chassis touches or is close to the vertical rails on the lift. Make sure that the front and rear of the chassis are unobstructed so you can easily push the chassis into the rack.



Warning : To prevent personal injury or damage to the chassis, never attempt to lift or tilt the chassis using the handles on modules (such as power supplies, fans, or cards); these types of handles are not designed to support the weight of the unit.



CAUTION : To lift the chassis, use a mechanical lift. Do not use the handles on the side of the chassis (the handles are not rated for lifting over 200 pounds [91 kg]). Use the side handles for only repositioning the chassis after it is already on the mechanical lift or in the rack or cabinet.

3. Use the mechanical lift to move and align the rear of the chassis to the front of the rack or cabinet. Make sure that the bottom of the chassis is elevated to the height of the bottom-support rails or no more than 1/4 inch (0.6 cm) above the rails.

Note : The IBM c-type SAN Device has the front-to-back cold-aisle and hot-aisle air flow design. We recommend that you maintain a minimum air space of 7 inches (30.5 cm) at the chassis front and back air vents.

4. Push the chassis halfway onto the rack or cabinet.

Use two persons to push the chassis onto the bottom-support rails. Push the lower half of the front side of the chassis so that the back side enters the rack first, and push until the chassis is halfway

onto the rack. See Figure 31 on page 70. Ensure that the chassis does not get caught on any of the expansion edges of the bottom-support rail.



Figure 31. Chassis onto a Rack or Cabinet - SAN384C-6 Chassis

- 1. Push the sides of the lower half of the front side of the chassis.
- 2. Chassis mounting brackets.
- 3. Rack vertical mounting rails.



Figure 32. Moving a Chassis onto a Rack or Cabinet - SAN768C-6 Chassis

1. Push the sides of the lower half of the front side of the chassis (do not push on any of the modules or module handles).

- 2. Chassis mounting brackets.
- 3. Rack vertical mounting rails.
- 4. Bottom support rails

Tip : To adjust the placement of the chassis on the bottom-support rails, you can use the handles on the sides of the chassis.

5. If the mechanical lift is raised above the height of the bottom-support rails, gently lower it to the level of the rails or no more than 1/4 inch (0.6 cm) below the rails.

This action helps to prevent the bottom of the chassis from getting caught on the bottom expansion edges of the bottom-support rails.

6. Push the chassis all the way onto the rack so that the vertical mounting brackets on the chassis come in contact with the vertical mounting rails on the rack.

7. Use seven M6 x 19 mm or 24 x 3/4-inch screws to attach each of the two vertical mounting brackets on the chassis to the two vertical mounting rails on the rack (total of 14 screws). See Figure 33 on page 72.



Figure 33. Attaching the Chassis to the two vertical the Chassis to the Rack - SAN384C-6 Chassis

1. Handles used to adjust the chassis placement

2. Seven M6 x 19 mm or 10-24 x 3/4 in. Phillips screws used to attach each side bracket to a front mounting rail (use a total of 12 screws)



Figure 34. Attaching the Chassis to the Rack - SAN768C-6 Chassis

1. Handles used to adjust the chassis placement

2. Nine M6 x 19 mm or $10-24 \times 3/4$ in. Phillips screws used to attach each side bracket to a front mounting rail (use a total of 18 screws)

- 8. If you removed any fabric modules before moving the chassis, replace each one in the chassis as follows:
 - a) Holding the front of the fabric module (the side with the LEDs), turn the module so that the front side is vertical.

Note : The top of the module has an alignment bracket running from the rear to the front. The electrical connectors will be at the bottom.

b) Align the rear of the fabric module to an open fabric slot and insert the bracket on top of the module into the track at the top of the slot.

Note : If there are only three fabric modules to install, install them in fabric slots 1, 3, and 5, and be sure that there are blank filler plates installed in the open slots.

- c) Slide the module part way into the slot.
- d) Press the ejector button on the front of the module, to release the levers from the front of the module.
- e) Rotate the levers away from the front of the module and hold them while sliding the module all the way into the slot.
- f) Simultaneously rotate both levers to the front of the module. They click when locked to the front of the module.
- 9. If you removed any fan modules before moving the chassis, reinstall each one in the chassis as follows:
 - a) Holding each of the two handles on the fan module with your two hands, align the fan module to an open fan module slot.

Note : The two alignment brackets on top of the fan module should align to two tracks at the top of the slot.

b) Slide the fan module into the slot until the front of the fan module comes in contact with the rear of the chassis.

Note : The two alignment pins on the fan module (on the top and one on the bottom) should go into holes in the chassis and the four captive screws on the fan module should align to screw holes in the chassis.

- c) Screw in the four captive screws to the chassis and tighten each screw to 8 in-lb (0.9 N-m).
- 10. If you removed any power supplies before moving the chassis, reinstall each one as follows:
 - a) Determine which power supply slots to fill and ensure that each of those slots is open.
 - b) If you are using the combined or power supply redundancy mode, you can use any slot for the power supply that you are installing.

If you are using input-source or full redundancy mode, you must group the power supplies that are to be connected to the same grid on either the left or right power supply slots in the chassis (that

is, place the power supplies for grid A in slots 1 or 2 or both slots and place the power supplies for grid B in slots 3 or 4 or both slots).

- c) Place one hand on the front of the power supply and place your other hand under it to support its weight.
- d) Align the power supply to an open power supply slot.

Note : The alignment bracket on top of the power supply should align to a track at the top of the slot and a bar at the bottom of the power supply should be guided by a track at the bottom of the slot.

- e) Slide the power supply all the way into the slot until it stops.
- f) Slide the handle in the middle of the ejector lever toward the end of the lever and rotate the lever to the front of the power supply. Release the middle handle.

Note :

- The lever should grab the inside of the slot and push the power supply onto its mid-plane connectors.
- If you are using the combined power or power-supply redundancy mode, you can fill any power supply slot with the power supplies. If you are using input-source or full redundancy modes, you must place half of the power supplies in slots 1 and 2, and you must place the other half of the power supplies in slots 3 and 4 (half will be used for available power and the other half will be used for redundant power).
- g) Screw in the two captive screws on the front of the power supply to the chassis. Tighten each screw to 8 in-lb (0.9 N-m)

System Grounding

This section describes the need for system grounding and explains how to prevent damage from electrostatic discharge.

Proper Grounding Practices

Grounding is one of the most important parts of equipment installation. Proper grounding practices ensure that the buildings and the installed equipment within them have low-impedance connections and low-voltage differentials between chassis. When you properly ground systems during installation, you reduce or prevent shock hazards, equipment damage due to transients, and data corruption. Table 14 on page 75 lists grounding best practices.

Table 14. Best practices	able 14. Best practices		
Environment	Electromagnetic Noise Severity Level	Grounding Recommendations	
Commercial building is subjected to direct lightning strikes. For example, some places in the United States, such as Florida, are subject to more lightning strikes than other areas.	High	All lightning protection devices must be installed in strict accordance with manufacturer recommendations. Conductors carrying lightning current should be spaced away from power and data lines in accordance with applicable recommendations and codes. Appropriate grounding practices must be closely followed.	

Table 14. Best practices (continued)		
Environment	Electromagnetic Noise Severity Level	Grounding Recommendations
Commercial building is located in an area where lightning storms frequently occur but is not subject to direct lightning strikes.	High	Appropriate grounding practices must be closely followed.
Commercial building contains a mix of information technology equipment and industrial equipment, such as welding.	Medium to high	Appropriate grounding practices must be closely followed.
Existing commercial building is not subject to natural environmental noise or man- made industrial noise. This building contains a standard office environment. This installation has a history of malfunction due to electromagnetic noise.	Medium	Appropriate grounding practices must be closely followed. Determine source and cause of noise if possible, and mitigate as closely as possible at the noise source or reduce coupling from the noise source to the victim equipment.
New commercial building is not subject to natural environmental noise or man-made industrial noise. This building contains a standard office environment.	Low	Appropriate grounding practices should be followed as closely as possible. Electromagnetic noise problems are not anticipated, but installing a best practice grounding system in a new building is often the least expensive route and the best way to plan for the future.
Existing commercial building is not subject to natural environmental noise or man- made industrial noise. This building contains a standard office environment.	Low	Appropriate grounding practices should be followed as much as possible. Electromagnetic noise problems are not anticipated, but installing a best practice grounding system is always recommended.

Note : In all situations, grounding practices must comply with local National Electric Code (NEC) requirements or local laws and regulations.

Note : Always ensure that all of the modules are completely installed and that the captive installation screws are fully tightened. In addition, ensure that all I/O cables and power cords are properly seated. These practices are normal installation practices and must be followed in all installations.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when modules or other Field Replaceable Units (FRU - a circuit board, part, or an assembly which can be easily removed and replaced without having to send the entire product to a repair facility.) are improperly handled, results in intermittent or complete failures. Modules consist of printed circuit boards that are fixed in metal carriers. Electromagnetic

interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps protect the board from ESD. Always wear an ESD grounding strap when handling modules.

Follow these guidelines for preventing ESD damage:

- Always wear an ESD wrist strap and ensure that it makes maximum contact with bare skin. ESD grounding straps are available with banana plugs, metal spring clips, or alligator clips. All IBM c-type SAN devices are equipped with a banana plug connector (identified by the ground symbol next to the connector) somewhere on the front panel. We recommend that you use a personal ESD grounding strap equipped with a banana plug.
- If you choose to use the disposable ESD wrist strap supplied with most FRUs or an ESD wrist strap equipped with an alligator clip, you must attach the system ground lug to the chassis in order to provide a proper grounding point for the ESD wrist strap.

Note : This system ground is also referred to as the network equipment building system (NEBS) ground.

• If your chassis does not have the system ground attached, you must install the system ground lug. For installation instructions and location of the chassis system ground pads, see <u>"Establishing the System</u> Ground" on page 77.

Note : You do not need to attach a supplemental system ground wire to the system ground lug; the lug provides a direct path to the bare metal of the chassis.

Establishing the System Ground

This section describes how to connect a system ground to the SAN c-type switch.

Note : This system ground is also referred to as the network equipment building system (NEBS) ground.

Note : You must use the system (NEBS) ground on both AC- and DC-powered systems if you are installing this equipment in a U.S. or European Central Office.

The system (NEBS) ground provides additional grounding for EMI shielding requirements and grounding for the low-voltage supplies (DC-DC converters) on the modules and is intended to satisfy the Telcordia Technologies NEBS requirements for supplemental bonding and grounding connections. You must observe the following system grounding guidelines for your chassis:

You must install the system (NEBS) ground connection with any other rack or system power ground connections that you make. The system ground connection is required if this equipment is installed in a U.S. or European Central Office.

You must connect both the system (NEBS) ground connection and the power supply ground connection to an earth ground. The system (NEBS) ground connection is required if this equipment is installed in a U.S. or European Central Office.

For IBM c-type SAN devices that are equipped with DC-input power supplies, you must install the system (NEBS) ground before you attach the source DC power cables to the DC PEM. If the chassis is powered up, you must power down the chassis before attaching the system (NEBS) ground. If you are installing the system (NEBS) ground on models of the IBM c-type SAN Device chassis that are equipped with either AC-input or DC-input power supplies, you do not need to power down the chassis.

Note : The system (NEBS) ground serves as the primary safety ground for the IBM c-type SAN Directors that are equipped with DC-input PEMs. The DC-input power supplies for these chassis do not have a separate ground.

Connecting to the Ground System

About this task

To connect the ground system, you need the following tools and materials:

• Grounding lug-A two-hole standard barrel lug. Supports up to 6 AWG wire. Supplied as part of accessory kit.

- Grounding screws-Two M4 x 8mm (metric) pan-head screws. Supplied as part of the accessory kit.
- Grounding wire-Not supplied as part of accessory kit. The grounding wire should be sized according to local and national installation requirements. Depending on the power supply and system, a 6 AWG copper conductor is required for U.S. installations. Commercially available 6 AWG wire is recommended. The length of the grounding wire depends on the proximity of the switch to proper grounding facilities.

Note : For safety on a ground fault, we recommend that you should avoid using a grounding wire that is smaller than the power wire. The grudging wire must be sized to meet local and national standard for installation requirements.

- No. 1 Phillips screwdriver.
- Crimping tool to crimp the grounding wire to the grounding lug.
- Wire-stripping tool to remove the insulation from the grounding wire.

After you install the system ground lug, follow these steps to correctly attach the ESD wrist strap:

Procedure

- 1. Attach the ESD wrist strap to bare skin as follows:
 - a) If you are using the ESD wrist strap supplied with the FRUs, open the wrist strap package and unwrap the ESD wrist strap. Place the black conductive loop over your wrist and tighten the strap so that it makes good contact with your bare skin.
 - b) If you are using the ESD wrist strap supplied with the FRUs, open the wrist strap package and unwrap the ESD wrist strap. Place the black conductive loop over your wrist and tighten the strap so that it makes good contact with your bare skin.
 - c) If you are using an ESD wrist strap equipped with an alligator clip, open the package and remove the ESD wrist strap. Locate the end of the wrist strap that attaches to your body and secure it to your bare skin.
- 2. Grasp the spring or alligator clip on the ESD wrist strap and momentarily touch the clip to a bare metal spot (unpainted surface) on the rack. It is recommended that you touch the clip to an unpainted rack rail so that any built-up static charge is then safely dissipated to the entire rack.
- 3. To plug the strap into the port (and alternatively clip an alligator clip onto the grounding lug screws) attach either the spring clip or the alligator clip to the ground lug screw.
 - a) If you are using the ESD wrist strap that is supplied with the FRUs, squeeze the spring clip jaws open, position the spring clip to one side of the system ground lug screw head, and slide the spring clip over the lug screw head so that the spring clip jaws close behind the lug screw head.

Note : The spring clip jaws do not open wide enough to fit directly over the head of the lug screw or the lug barrel.

- b) If you are using an ESD wrist strap that is equipped with an alligator clip, attach the alligator clip directly over the head of the system ground lug screw or to the system ground lug barrel.
- c) Follow these additional guidelines when handling modules:
 - Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
 - Place a removed component board-side-up on an antistatic surface or in a static shielding container. If you plan to return the component to the factory, immediately place it in a static shielding container.
 - Never attempt to remove the printed circuit board from the metal carrier.



CAUTION : For safety reasons, check the resistance value of the antistatic strap periodically. The measurement should be between 1 and 10 megohm (Mohm).

Installing, Removing and Verifying Field Replaceable Units

This section provides the following information:

78 IBM Storage Networking SAN192C-6, SAN384C-6 and SAN768C-6: SAN192C-6, SAN384C-6 and SAN768C-6 Installation, Service, and User Guide

- "Installing Supervisor Modules" on page 79
- "Removing Supervisor Modules" on page 80
- "Installing a Switching Module" on page 113
- "Removing a Switching Module" on page 114
- "Verifying Installation of the Supervisor and Switching Modules" on page 114
- "Installing and Removing a Crossbar Fabric Module" on page 114
- "Installing and Removing a Power Supply" on page 121
- "Installing and Removing Fan Modules" on page 123



Warning: Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.



Warning: Use of controls, adjustments, or performing procedures other than those specified may result in hazardous radiation exposure.



Warning: Hazardous voltage or energy is present on the backplane when the system is operating. Use caution when servicing.



CAUTION: To prevent ESD damage, wear grounding wrist straps during these procedures and handle modules by the carrier edges only.



CAUTION : Make sure that you do not accidentally press one or more of the ejector release buttons on a switching, supervisor, and fabric modules. These buttons and their mechanical levers are designed so that you can easily power down and remove these modules when you need to replace them. If you press one of these buttons, the lever for that button releases from the front of the module, but the module remains operational and connected to the system. If you press the other ejector button on the same module at the same time as you press the first button or while the lever for the first button is released, the lever for the second button releases, and the module powers down and disconnects from the system.

This behavior can be disabled with the no hardware ejector enable command. To minimize the chance of accidentally disconnecting a module with a released lever, press the lever back toward the module until it clicks. If both levers are released, the system has disconnected and powered down the module, and the STATUS LED will be unlit. To reconnect and power up the module, either remove and reinsert the module in the chassis or close the lever and use these system commands: out-of-service module and no poweroff module.

Note: Install the IBM c-type SAN Device chassis in the rack before installing modules. See the Wirestripping tool to remove the insulation from the grounding wire.

Note : In systems with redundant supervisor modules, you can replace the faulty supervisor while the system is operating, provided that one supervisor is always operating.

Installing Supervisor Modules

About this task

Note: You need a flat-blade or number 2 Phillips-head screwdriver to loosen or tighten the captive screw on the supervisor module.

Use this procedure to install a supervisor module on a IBM c-type SAN Device.

Procedure

- 1. Before installing any modules in the chassis, we recommend that you install the chassis in the rack. See the "Installing the SAN384C-6 or SAN768C-6 Device on a Four-Post Rack or Cabinet" on page 66.
- 2. Verify that there is enough clearance to accommodate any cables or interface equipment that you want to connect to the module.

- 3. Verify that the captive screws are tightened to 8 in-lb on all modules already installed in the chassis. This ensures that the EMI gaskets are fully compressed and maximizes the opening space for the module being installed.
- 4. If a filler panel is installed, remove the Phillips pan-head screw from the filler panel and remove the panel. To remove a currently installed module, see the <u>"Removing Supervisor Modules"</u> on page 80.
- 5. Open the ejector lever on the new or replacement module by pressing on the ejector button. Allow the ejector to open fully.
- 6. Position the module in the chassis as follows:
 - a) Slide the module carefully into the desired slot until its rear connectors touch the mid-plane surface and the ejector levers swing inward about 25 degrees. This indicates that the ejector lever jaw is now inside the chassis jaw cutout and the module is ready to close the ejector lever.
 - b) After visually confirming that both the ejector lever is swung inward about 25 degrees, push in the ejector lever to fully insert the supervisor module into the chassis until the ejector levers are in mechanically locked position. The ejector lever should be parallel to the face plate when locked.

Note : Ensure that the ejector lever is fully closed before tightening the captive screw. Failure to fully seat the module in the backplane connector can result in error messages.

c) Tighten the captive screw on the supervisor module to 8 in-lb.

Removing Supervisor Modules

Before you begin

Note : You need a flat-blade or number 2 Phillips-head screwdriver to loosen or tighten the captive screws on the supervisor module.

About this task

Use this procedure to remove a supervisor module from the chassis.

Procedure

- 1. Failover to the standby supervisor if the switch has two supervisor modules and the supervisor you are removing is currently active. For information on how to failover a supervisor module, see the *Cisco NX-OS Fundamentals Configuration Guide*.
- 2. Disconnect any network interface cables attached to the module.
- 3. Loosen the captive screw on the module being removed.
- 4. Remove the module from the chassis as follows:
 - a) Press the ejector release button on the left of the module to push out the ejector lever and to disconnect the module.
 - b) Rotate the ejector lever outward to unseat the supervisor module from the midplane connector.
 - c) Grasp the front edge of the module and slide the module partially out of the slot. Place your other hand under the module to support the weight of the module. Do not touch the module circuitry.
- 5. Place the module on an antistatic mat or antistatic foam, or immediately reinstall it in another slot.
- 6. Install a filler panel on an empty slot to keep the chassis dust-free and to maintain proper airflow through the chassis.



Warning : Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.

Nondisruptive Migration from a Supervisor-1 Module to a Supervisor-4 Module

This topic describes the steps that are required to migrate both Supervisor-1 Modules to Supervisor-4 Modules for the SAN384C-6, SAN192C-6 and Supervisor-1E Modules to Supervisor-4 Modules for the SAN768C-6 Multilayer Director.

This topic includes the following sections:

- "Requirements" on page 81
- <u>"Components used" on page 81</u>
- "Guidelines and limitations" on page 81
- "Prerequisites" on page 83
- "Migration procedures" on page 84
- "Verification" on page 99
- "Troubleshooting" on page 103
- "Migration cleanup" on page 109

Note : Before you install, operate, or service the system, read the *IBM Systems Safety Notices* for important safety information.

Requirements

We recommend that you have knowledge of the NX-OS operating system CLI.

Components used

The information in this document is based on the following hardware versions:

- IBM SAN768C-6
- IBM SAN384C-6
- IBM SAN192C-6
- IBM Storage Networking SAN c-type Family Supervisor-4 Module
- IBM Storage Networking SAN c-type Family Supervisor-1 Module
- IBM Storage Networking SAN c-type Family Supervisor-1E Module
- IBM Storage Networking SAN c-type Family Crossbar Switching Fabric 3 Module
- 48 Port 32 Gbps Fibre Channel Switching Module
- Fan Modules
- Power Supply Modules

Guidelines and limitations

Guidelines and limitations for a nondisruptive migration of both the Supervisor-1 Modules to Supervisor-4 Modules :

- The migrate sup kickstart <supervisor4-kickstart-image > system <supervisor4system-image > command used for initiating the nondisruptive migration process is available only in global config mode.
- Ensure that the Supervisor-4 Module is not inserted in the standby slot before initiating the migrate sup kickstart <supervisor4-kickstart-image > system <supervisor4-system-image > command. If the Supervisor-4 Module is already inserted in the standby slot, the migration process will be aborted and the Supervisor-4 Module will be powered down.

- Insert the standby Supervisor-4 Module into the chassis only when you are prompted to insert theSupervisor-4 Module during the migration by a mes sage on the system console.
- After the Supervisor-4 Module has been inserted during the migration process, do not remove or manually reload the standby Supervisor-4 Module.
- Back up all the licenses, configurations, boot flash files before starting the migration process. In case of any failure or loss of licenses and configuration in the Supervisor-4 Module, disruptive migration has to be done to upgrade to Supervisor-4 Module. In such a scenario, all the configurations and licenses have to be applied or installed again. For more information on how to back up the licenses and configurations, see the "Prerequisites" on page 83.
- Use the show environment power command to display the actual power usage information for the entire switch.
- Ensure that the current system is running Cisco MDS NX-OS Release 8.4(1) or later on IBM SAN192C-6 or SAN384C-6 Director switches. Ensure that the current system is running Cisco MDS NX-OS Release 8.4(2a) or later on IBM SAN786C-6 Multilayer Director. Use the **show version** command to view the current image on the system.
- The migration procedure must be performed during a schedule maintenance period only.
- Nondisruptive backward migration procedure (migrating from a Supervisor-4 Module to a Supervisor-1 Module) is not supported. Backward migration is disruptive (power off and power on the switch).
- In a dual supervisor module scenario, ensure that the standby supervisor module is in the HA-standby state. If the standby supervisor does not come up in the HA-standby state, then physically remove the standby supervisor module and initiate the migration on the active supervisor module. Use the show module command to view the active and standby supervisor modules.
- Do not reload or manually insert or remove any I/O or crossbar fabric switching modules after initiating the **migrate sup kickstart <supervisor4-kickstart-image> system <supervisor4-system-image>** command. Any removal or insertion of I/O or Crossbar Fabric-1 Switching Modules must be done before initiating the migration process or after the migration is completed.
- Configuration mode is blocked during the migration procedure to prevent any changes. You cannot
 press Control+C to cancel the migration procedure until 45 minutes have elapsed after issuing the
 migrate sup kickstart <supervisor4-kickstart-image> system<supervisor4system-image> command.
- Use the show logging onboard migration status command on any management session to display the status of the migration. You can use this command during the migration or after the migration is complete.
- In the system messages (system messages displayed on the console during the migration process) and the show module command output, Supervisor-1 Module and Supervisor 1E are displayed as Supervisor-3 Module.
- Perform the Crossbar Fabric-1 to Crossbar Fabric-3 module migration after the Supervisor-1/ Supervisor-1E to Supervisor-4 Module migration is completed. A mix of Crossbar Fabric-1 with Supervisor-4 Modules or Crossbar Fabric-3 with Supervisor-1/Supervisor-1E Modules is not supported.
- Ensure that the switch release version and the targeted migration release version is same. Use the show version command to view the version of the Cisco MDS NX-OS software on the switch.
- If you are using a Supervisor-4 Module for migration that has been already used in a previous MDS setup, ensure that the Supervisor-4 module has sufficient space on boot flash for copying both the system and kickstart images before the migration.
- The following table lists the supported release versions for migrating to Supervisor-4 Modules on the IBM SAN c-type family of switches.

•	Product Name	Supported MDS NX-OS Release Version
	Cisco MDS 9718 Director	Cisco MDS NX-OS Release 8.4 (2a) and later
	Cisco MDS 9710 Director	Cisco MDS NX-OS Release 8.4 (1) and later
	Cisco MDS 9710 Director	Cisco MDS NX-OS Release 8.4 (1) and later
• The following table lists the supported combinations for supervisor modules with crossbar fabric modules on the IBM c-type family switches in a production environment. In the table:- The term, "Yes" indicates the supported combinations.

Combination	Supervisor-1 Module	Supervisor-1E Module	Supervisor-4 Module	Cross Fabric - 1 Switching Module	Cross Fabric - 3 Switching Module
Supervisor-1 Module	Yes	-	_	Yes	_
Supervisor-1E Module	-	Yes	_	Yes	_
Supervisor-4 Module	-	-	Yes	—	Yes
Cross Fabric - 1 Switching Module	Yes	Yes	_	Yes	_
Cross Fabric - 3 Switching Module	-	-	Yes	_	Yes

• The "-" symbol indicates the unsupported combinations.

• Do not:

- insert or remove any transceivers from any modules while the migration is in progress.
- alter any connections while the migration is in progress.
- remove any power supply modules or fan modules during the migration process.
- attempt any configuration changes or network changes while the migration is in progress.
- copy any configurations using the copy running-config startup-config command while the migration is in progress.
- trigger any EPLD or BIOS upgrades during the migration.
- trigger any ISSU during the migration.
- perform migration from Crossbar Fabric-1 Switching Modules to Crossbar Fabric-3 Switching Modules during the Supervisor-1 Module to Supervisor-4 Module migration.

Prerequisites

• Ensure that you have network-admin role privileges to migrate the supervisor modules.

```
switch# show user-account admin
user:admin
this user account has no expiry date
roles:network-admin
```

- The minimum supported release for this procedure is NX-OS Release 8.4(1). If you are using an image older than NX-OS Release 8.4(1), upgrade to NX-OS Release 8.4(1), and then perform the nondisruptive migration from a Supervisor-1 Module to aSupervisor-4 Module. To upgrade an image version on the switch, refer the 9000 NX-OS Software Upgrade and Downgrade Guide, Release 8.x guide.
- We recommend that you use a console connection to perform the migration procedure. In case you do not have a console connection and are using an SSH/Telnet connection, use the terminal monitor command to display all the syslogs mentioned in the below procedures.
- Back up the running configuration from the current active supervisor module to the FTP/SFTP/TFTP server, or a USB flash drive.

```
ftp:[//[username[:password]@]server][/path]
```

Or.

copy running-config usb1:runningconfiguration.txt
Copy complete, now saving to disk (please wait)...

Note : runningconfiguration.txt is a filename variable.

 Back up the required files from the bootflash of the current active supervisor module to the FTP/SFTP/ TFTP/SCP server, or a USB flash drive.

```
switch(config)# copy bootflash:userfile.txt scp://root@x.x.x.x/root/userfile.txt
```

Note : userfile.txt is a filename variable.

• Back up the installed licenses from the switch to a USB drive by using the copy licenses command. To view the current licenses installed on the switch, use the show license command.

```
switch# show license
license.lic:
SERVER this_host ANY
VENDOR cisco
INCREMENT ENTERPRISE_PKG cisco 1.0 permanent uncounted \
VENDOR_STRING=MDS HOSTID=VDH=REG070201 \
NOTICE="<LicFileID>ent_ips_main_fm.lic</LicFileID><LicLineID>0</LicLineID> \
<PAK>dummyPak</PAK>" SIGN=FB454F0A0D40
INCREMENT MAINFRAME_PKG cisco 1.0 permanent uncounted \
VENDOR_STRING=MDS HOSTID=VDH=REG070201 \
NOTICE="<LicFileID>ent_ips_main_fm.lic</LicFileID><LicLineID>1</LicLineID> \
<PAK>dummyPak</PAK>" SIGN=0DAE1B086D9E
INCREMENT SAN_EXTN_OVER_IP cisco 1.0 permanent 7 VENDOR_STRING=MDS \
HOSTID=VDH=REG070201 \
NOTICE="<LicFileID>ent_ips_main_fm.lic</LicFileID><LicLineID>2</LicLineID> \
<PAK>dummyPak</PAK>" SIGN=0336330C76A6
INCREMENT FM_SERVER_PKG cisco 1.0 permanent uncounted \
VENDOR_STRING=MDS HOSTID=VDH=REG070201 \
NOTICE="<LicFileID>ent_ips_main_fm.lic</LicFileID><LicLineID>3</LicLineID> \
<PAK>dummyPak</PAK>" SIGN=AEAEA04629E8
switch()# copy licenses usb1:licenses_archive_file_name.tar
```

Note : You must use the tar extension for the archive file. This file contains all the license files that are installed on the Supervisor-1 Module.

• Back up the outputs of the show tech-support details command, and redirect the file to a remote server using an FTP, TFTP, SFTP, SCP, or a USB flash drive.

```
switch# show tech-support details> scp://root@x.x.x.x/root/showtechsupport.txt
Or
```

switch# show tech-support details> usb1:showtechsupport.txt

- Replacement supervisor modules
- Supervisor-4 Module. Two Supervisor-4 Modules for the dual supervisor migration.
- Ensure that there is enough memory on the boot flash of Supervisor-1 Modules to copy the new software image. To check the boot flash memory, use the **dir bootflash:** command.

Migration procedures

About this task

The next sections describe two scenarios:

- "Scenario 1: Dual supervisor migration" on page 85
- "Scenario 2: Switch with Only Active Supervisor Module" on page 93

Scenario 1: Dual supervisor migration

About this task

To perform a nondisruptive migration from both Supervisor-1 Modules to Supervisor-4 Modules in a switch that has both the active and standby supervisor modules installed, follow these steps:

Note :

In the following procedure, all show outputs, system messages, and image file names are displayed for the SAN384C-6 Director Switch. The show outputs, system messages, and image file names will vary based on the IBM c-type Director Switch selected.

Procedure

1. Use the show module command to view the active and standby supervisor modules.

swit Mod	ch # sho Ports	w module Module-Type			Model		Status
1 2 3 4 5 6 7 8 10	48 48 24 48 0 0 34 48 48	1/10 Gbps Eth 2/4/8/10/16 G 40 Gbps FCoE 4/8/16/32 Gbp Supervisor Mo Supervisor Mo 1/10/40G IPS, 4/8/16/32 Gbp 2/4/8/10/16 G	./10 Gbps Ethernet Module D !/4/8/10/16 Gbps Advanced FC Module D !/8/16/32 Gbps Advanced FC Module D !/8/16/32 Gbps Advanced FC Module D Supervisor Module-3 D !/10/40G IPS,2/4/8/10/16G FC Module D !/8/16/32 Gbps Advanced FC Module D !/8/16/32 Gbps Advanced FC Module D !/4/8/10/16 Gbps Advanced FC Module D		DS-X9848-48 DS-X9448-76 DS-X9824-96 DS-X9648-15 DS-X97-SF1- DS-X97-SF1- DS-X9734-K9 DS-X9648-15 DS-X9648-76	0K9 8K9 0K9 36K9 K9 K9 36K9 8K9	ok ok ok k ha-standby active * ok ok ok
Mod	Sw		Hw				
1 2 3 4 5 6 7 8 10	8.4(8.4(8.4(8.4(8.4(8.4(8.4(8.4(1) 1) 1) 1) 1) 1) 1) 1) 1) 1)	1.1 1.3 1.0 1.0 1.3 1.1 1.0 1.0 1.0 1.1				
Mod	MAC-	Address(es)			Serial-Num		
1 2 3 4 5 6 7 8 10	84-7; f4-c: 04-6 00-7 9c-5 e8-e 00-d 74-8 3c-0	B-ac-1b-3d-58 f-e2-7c-cd-30 c-9d-32-36-aa 5-86-bf-58-23 7-ad-fd-0d-cb d-f3-e5-9a-4d a-55-a2-25-00 5-0b-33-c6-70 e-23-c5-53-d0	to 84-78-ac- to f4-cf-e2- to 04-6c-9d- to 00-76-86- to 9c-57-ad- to e8-ed-f3- to 00-da-55- to 74-86-0b- to 3c-0e-23-	JAF1718AAAD JAE1847038X JAE19330ASN JAE203901ZG JAE194005JC JAE17440HVB JAE195004XM JAE213101Q3 JAE180605X3			
Mod	Onli	ne Diag Status	;				
1 2 3 4 5 6 7 8 10 Xbar	Pass Pass Pass Pass Pass Pass Pass Pass	ts Module-T	уре	Model		Status	
1	0	Fabric Mo	dule 1	DS-X97	10-FAB1	ok	
3	0	Fabric Mo	dule 1	DS-X97 DS-X97	10-FAB1	ok	
4	0	Fabric Mo Fabric Mo	dule 1	DS-X97	10-FAB1 10-FAB1	ok	
6	0	Fabric Mo	dule 1	DS-X97	10-FAB1	ok	
Xbar	Sw	Hw					
1	NA	1.0					

2	NA	1.0	
3	NA	1.0	
4	NA	1.0	
5	NA	1.0	
6	NA	1.0	
Xbar	MAC-Address(e	s)	Serial-Num
1	NA		JAE222305VS
2	NA		JAE2217096>
3	NA		JAE222305V5
4	NA		JAE2217096L
5	NA		JAE22170963
6	NA		JAE222305V8

- 2. Ensure that the required space is available in the bootflash: directory for the image files to be copied using the **dir bootflash:** command. Use the **delete bootflash: filename** command to remove any unnecessary files.
- 3. Copy the Supervisor-4 Module NX-OS kickstart and system images to the active Supervisor-1 module boot flash, using an FTP, TFTP, SCP, SFTP, or a USB flash drive.

Note : The Supervisor-4 images contain the string **sf4** to identify them. Do not rename the images, use the standard image names.

```
switch#
copy tftp://tftpserver.cisco.com/MDS/m9700-sf4ek9-kickstart-mz.8.4.1.bin
bootflash:m9700-sf4ek9-kickstart-mz.8.4.1.bin
```

switch# copy tftp://tftpserver.cisco.com/MDS/m9700-sf4ek9-mz.8.4.1.bin bootflash:m9700-sf4ek9-mz.8.4.1.bin

4. Initiate the migration process on the active Supervisor-1 Module, using the migrate sup kickstart <supervisor4-kickstart-image> system <supervisor4-system-image> command in global config mode.

Note: The migrate **sup kickstart < supervisor4-kickstart-image> system < supervisor4-system-image>** command is supported on NX-OS Release 8.4(1) or later. Invalid command message is displayed, if this command is executed on the other versions of the NX-OS release.

Note : This command verifies if the images are compatible with the current system and the kickstart image. If the images are not compatible, the following error message is displayed:

```
ERROR !! Version of kickstart image provided (8.x.x) does not match running
version.
swithc# configure terminal
switch(config)# migrate sup kickstart m9700-sf4ek9-kickstart-mz.8.4.1.bin
system m9700-sf4ek9-mz.8.4.1.bin
Kickstart image file is /bootflash/m9700-sf4ek9-kickstart-mz.8.4.1.bin
```

- System image file is /bootflash/m9700-sf4ek9-kickstart-mz.8.4.1.bin
- 5. During the migration, enter y when prompted to do so.

Note : After this point, the migration process will be locked and you cannot cancel the migration process. The **migrate sup kickstart < supervisor4-kickstart-image> system** < **supervisor4-system-image>** command checks if it has to initiate a single supervisor or dual supervisor migration process by checking if there is a standby Supervisor-1 Module that is installed in the switch.

Note: In the following system message, Supervisor-1 Module is listed as Supervisor-4 Module.

```
This will start the Supervisor-1 to Supervisor-4 migration. Configuration will be locked until migration is complete.
```

Do you wish to continue (y/n) [n] **y**

The following syslog is displayed:

<Tue Jun 25 15:06:56 2019> Starting migration, Please do not remove any linecards or fabric cards until migration is complete 2019 Jun 25 15:06:56 switch %PLATFORM-2-MOD_PWRDN: Module 5 powered down (Serial number JAE194005JC) 2019 Jun 25 15:06:56 switch %PLATFORM-5-MOD_STATUS: Module 5 current-status is MOD_STATUS_CONFIGPOWERED_DOWN 2019 Jun 25 15:06:56 switch %PLATFORM-5-MOD_STATUS: Module 5 current-status is MOD_STATUS_POWERED_DOWN

6. After the standby supervisor module is powered down, replace the standby supervisor module with the new Supervisor-4 Module, as explained in <u>"Installing Supervisor Modules" on page 79</u> and <u>"Removing Supervisor Modules" on page 80</u>. When the Supervisor-4 Module is detected in the standby supervisor slot, a netboot is initiated with the image that is provided by using the **migrate sup kickstart <supervisor4-kickstart-image> system <supervisor4-system-image>** command.

<Tue Jun 25 15:06:57 2019> Manual-boot is enabled for Standby Supervisor <Tue Jun 25 15:06:57 2019> Please remove Supervisor-3 module from slot 5 and insert Supervisor-4 module within 30 minutes 2019 Jun 25 15:06:57 switch %PLATFORM-2-MOD_REMOVE: Module 5 removed (Serial number JAE194005JC)

Note: In the following system message, Supervisor-1 Module is listed as Supervisor Module-4.

2019 Jun 25 15:07:33 switch %PLATFORM-2-SINGLE_EJECTOR_STAT_CHANGED: Ejector's status in slot 5 has changed, Ejector is OPEN 2019 Jun 25 15:07:34 switch %PLATFORM-2-MOD_REMOVE: Module 5 removed (Serial number JAE194005JC)

Note: You have to insert the Supervisor-4 Module into the switch within a period of 30 minutes after initiating the **migrate sup kickstart < supervisor4-kickstart-image> system < supervisor4-system-image>** command. In case you have not inserted the Supervisor-4 Module within 30 minutes after executing the commands, perform the Step <u>"4" on page 86</u> to Step <u>"6" on page 87 again and continue the migration process.</u>

Note : After the Supervisor-4 Module is inserted in the slot 5, a timeout of 45 minutes is triggered for the Supervisor-4 Module to power up and come online. If the Supervisor-4 Module fails to power up and come online at the first attempt, a retry is initiated every 15 minutes. If the Supervisor-4 Module fails to come online after three retries or 45 minutes, you have to remove the Supervisor-4 Module and restart the migration process by using the **migrate sup kickstart <supervisor4 kickstart-image> system <supervisor4-system-image>** command.

Once the standby module is physically replaced, the following syslog message is displayed on the active Supervisor-1 Module syslogs:

2019 Jun 25 15:07:57 switch %PLATFORM-2-MODULE_EJECTOR_POLICY_ENABLED: All Ejectors closed for module 5. Ejector based shutdown enabled 2019 Jun 25 15:07:57 switch %PLATFORM-2-MOD_DETECT: Module 5 detected (Serial number:unavailable) Module-Type Supervisor Module-4 Model:unavailable

The following system message is displayed:

<Tue Jun 25 15:08:07 2019> Supervisor-4 is detected in slot 5 <Tue Jun 25 15:08:12 2019> Reloading standby. This might take up to 15 minutes. Please wait ... 2019 Jun 25 15:08:13 sw9710-SUP3-101 %PLATFORM-2-PFM_STANDBY_MODULE_RESET_MIGRATION: Reloading Standby Supervisor as part of Supervisor migration

7. Wait for approximately 20 minutes for the new Supervisor-4 Module to come up in the HA-standby state.

The following messages are displayed on the active Supervisor-1 Module:

<Tue Jun 25 15:10:13 2019> Standby supervisor not yet online. This might take some time, Please wait ... <Tue Jun 25 15:12:13 2019> Standby supervisor not yet online. This might take some time, Please wait ... 2019 Jun 25 15:12:18 switch %SYSMGR-2-ACTIVE_LOWER_MEM_THAN_STANDBY: Active supervisor in slot 6 is running with less memory than standby supervisor in slot 5. 2019 Jun 25 15:12:27 switch %USBHSD-STANDBY-2-MOUNT: logflash: online 2019 Jun 25 15:12:27 switch %USBHSD-STANDBY-2-MOUNT: USB1: online 2019 Jun 25 15:12:32 switch %BOOTVAR-5-NEIGHBOR_UPDATE_AUTOCOPY: auto-copy supported by neighbor supervisor, starting... 2019 Jun 25 15:14:05 switch %PLATFORM-1-PFM_ALERT: Disabling ejector based shutdown on sup in slot 5 <Tue Jun 25 15:14:13 2019> Standby supervisor not yet online. This might take some time, Please wait ...

Note : If you see the following failure message, ignore the message, the active Supervisor-1 Module will bring up the standby Supervisor-4 Module to the HA-standby supervisor state in some time.

Tue Jun 25 15:14:13 2019 switch %SYSMGR-2-STANDBY_BOOT_FAILED: Standby supervisor failed to boot up. The following message is displayed when the standby module (Supervisor-4 Module in slot 5) is online: 2019 Jun 25 15:15:06 switch %MODULE-5-STANDBY_SUP_OK: Supervisor 5 is standby 2019 Jun 25 15:15:07 switch %PLATFORM-1-PFM_ALERT: Enabling ejector based shutdown on sup in slot 6 <Tue Jun 25 15:15:33 2019> Standby Supervisor-4 has come online, configs will be copied

8. System will automatically do a copy running-config to startup-config.

The following message is displayed:

9. Once the standby module comes online, a system switchover happens and the new Supervisor-4 Module becomes the current active. This process moves the Supervisor-4 Module from the HAstandby mode to active mode. The SSH/telnet session is disconnected during the switchover. You have to reconnect to the SSH/telnet session. Also, ensure that the console link and the management link are connected to the Supervisor-4 Module.

The following syslog message is displayed on the active Supervisor-4 Module:

```
Supervisor-4 Module syslogs
switch(standby) login: 2019 Jun 25 15:15:47 switch %KERN-2-SYSTEM_MSG:
[ 377.107557]
Switchover started by redundancy driver - kernel
2019 Jun 25 15:15:47 switch %SYSMGR-2-HASWITCHOVER_PRE_START:
This supervisor is becomingactive (pre-start phase)
2019 Jun 25 15:15:47 switch %SYSMGR-2-HASWITCHOVER_START:
Supervisor 5 is becoming active.
User Access Verification
switch login: 2019
Jun 25 15:15:48 switch %SYSMGR-2-SWITCHOVER_OVER:
Switchover completed.
2019 Jun 25 15:15:48 switch %ASCII-CFG-6-INFORMATION:
Reading ACFG Runtime information
2019 Jun 25 15:15:48 switch %IM-5-IM_MGMT_INTF_STATE: mgmt0 is DOWN
2019 Jun 25 15:15:48 switch %FC-REDIRECT-5-IVR_SUPPORT_ENABLED:
IVR Support Enabled in
FC_Redirect. Source: Local Switch - 20:00:84:78:ac:09:35:00
2019 Jun 25 15:15:50 switch %PLATFORM-1-PFM_ALERT:
Disabling ejector based shutdown on sup
in slot 5
2019 Jun 25 15:15:52 switch %BOOTVAR-2-SUP MIGRATION CONFIG STARTED:
Setting boot parameters for supervisor migration process.
It might take some time. Please do not set
any config parameters during this time or do not replace standby.
2019 Jun 25 15:15:56 switch %IM-5-IM_MGMT_INTF_STATE: mgmt0 is UP
User Access Verification
switch login: 2019 Jun 25 15:16:39
switch %BOOTVAR-2-SUP_MIGRATION_CONFIG_COMPLETE:
```

Migration process is complete now. Supervisor-3 in standby slot can now be replaced with Supervisor-4. 2019 Jun 25 15:18:00 switch %SYSMGR-2-SBY_SUP_LESS_MEMORY_SLOT: Supervisor in slot 6 is running with less memory than active supervisor in slot 5 2019 Jun 25 15:18:00 switch %SYSMGR-2-CONVERT_STARTUP_ABORTED: Conversion of startup-config failed. 2019 Jun 25 15:18:00 switch %PLATFORM-2-MOD_PWRDN: Module 6 powered down (Serial number JAE17440HVB) 2019 Jun 25 15:18:00 switch %PLATFORM-5-MOD_STATUS: Module 6 current-status is MOD_STATUS_CONFIGPOWERED_DOWN 2019 Jun 25 15:18:00 switch %PLATFORM-5-MOD_STATUS: Module 6 current-status is MOD_STATUS_POWERED_DOWN 2019 Jun 25 15:18:00 switch %PLATFORM-2-MOD_REMOVE: Module 6 removed (Serial number JAE17440HVB)

Note : The old active Supervisor-1 Module will be powered down. The supervisor Status LED will be blinking red, when the supervisor module is powered down by the migration command. If the Status LED is not blinking red, then check the migration status using the show logging onboard migration status command on any management session.

10. After the successful completion of the system switchover, the following syslog message is displayed:

```
2019 Jun 25 15:18:0 switch %BOOTVAR-2-SUP_MIGRATION_CONFIG_COMPLETE:
Migration process is complete now. Supervisor-3 in standby slot can now be
replaced with Supervisor-4.
Warning A mix of different Supervisor-4 Modules and
Supervisor-1 Modules outside a maintenance window is
not supported.
This mix of modules is supported only while you are migrating
from a Supervisor-1
Module to a Supervisor-4 Module.
```

11. After the switchover to the Supervisor-4 Module is completed, the boot parameters are set for the supervisor migration process.

Do not set any configuration parameters until the boot parameters are set. After the boot parameters are set, the migration process is complete. Use the show boot command to display the current boot variables and the show module command to display the modules installed in the switch.

```
Supervisor-4 module outputs
switch# show boot
kickstart variable = bootflash:/m9700-sf4ek9-kickstart-mz.8.4.1.bin
system variable = bootflash:/m9700-sf4ek9-mz.8.4.1.bin
Boot POAP Disabled
switch# show module
Mod Ports Module-Type
                                                    Model
                                                                        Status
                                                                        - - - - - - - - - -
1
    48
                                                    DS-X9848-480K9
           1/10 Gbps Ethernet Module
                                                                        ok
2
    48
           2/4/8/10/16 Gbps Advanced FC Module
                                                    DS-X9448-768K9
                                                                        ok
3
    24
           40 Gbps FCoE Module
                                                    DS-X9824-960K9
                                                                        ok
           4/8/16/32 Gbps Advanced FC Module
4
   48
                                                    DS-X9648-1536K9
                                                                        ok
5
    0
           Supervisor Module-4
                                                    DS-X97-SF4-K9
                                                                        active *
6
                                                    DS-X97-SF1-K9
    0
           Supervisor Module-3
                                                                        powered-dn
7
    34
           1/10/40G IPS,2/4/8/10/16G FC Module
                                                    DS-X9334-K9
                                                                        ok
8
    48
           4/8/16/32 Gbps Advanced FC Module
                                                    DS-X9648-1536K9
                                                                        ok
                                                    DS-X9448-768K9
10
   48
           2/4/8/10/16 Gbps Advanced FC Module
                                                                        ok
Mod Power-Status Reason
                    Policy trigger initiated reset:
Stdby has lower mem than active
     powered-dn
6
Mod
       Sw
                Ηw
                 ----
1
       8.4(1)
                1.1
2
       8.4(1)
                1.3
3
       8.4(1)
                 1.0
4
       8.4(1)
                 1.0
5
       8.4(1)
                 1.0
6
       8.4(1)
                 1.1
7
       8.4(1)
                1.0
8
       8.4(1)
                1.0
10
       8.4(1)
                 1.1
```

Mod MAC-Address(es) Serial-Num 1 84-78-ac-1b-3d-58 to 84-78-ac-1b-3d-8b JAF1718AAAE 2 f4-cf-e2-7c-cd-30 to f4-cf-e2-7c-cd-33 JAE1847038>) (
1 84-78-ac-1b-3d-58 to 84-78-ac-1b-3d-8b JAF1718AAAD 2 f4-cf-e2-7c-cd-30 to f4-cf-e2-7c-cd-33 JAE1847038>) (
3 04-6c-9d-32-36-aa to 04-6c-9d-32-37-1b JAE19330ASM 4 00-76-86-bf-58-23 to 00-76-86-bf-58-57 JAE20390120 5 00-2f-5c-fc-54-0a to 00-2f-5c-fc-54-1d JAE22440CB1 6 00-00-00-00-00 to 00-00-00-00-00 NA 7 00-da-55-a2-25-00 to 00-da-55-a2-25-0f JAE195004XM 8 74-86-0b-33-c6-70 to 3c-0e-23-c5-53-d0 to 3c-0e-23-c5-53-d3 JAE180605X3	1 3 3 3
ModOnline Diag Status1Pass2Pass3Pass4Pass5Pass7Pass8Pass10Pass	
XbarPortsModule-TypeModelStatu10Fabric Module 1DS-X9710-FAB1ok20Fabric Module 1DS-X9710-FAB1ok30Fabric Module 1DS-X9710-FAB1ok40Fabric Module 1DS-X9710-FAB1ok50Fabric Module 1DS-X9710-FAB1ok60Fabric Module 1DS-X9710-FAB1ok	IS
Xbar Sw Hw	
1 NA 1.0 2 NA 1.0 3 NA 1.0 4 NA 1.0 5 NA 1.0 6 NA 1.0	
Xbar MAC-Address(es) Serial-Num	
1 NA JAE222305VS	
2 NA JAE2217096X 3 NA JAE222305V5	
4 NA JAE2217096L	
5 NA JAE2217096J 6 NA JAE222305V8	

12. (Optional) If the standby Supervisor-1 Module is not in the **powered-dn** state, then put the standbySupervisor-1 Module to out of service, using the **out-of-service module** *slot* command

Where a slot indicates the chassis slot number in which the standby supervisor module resides.

switch(config)# out-of-service module 6

13. Physically replace the standby Supervisor-1 Module (slot 6) with the second Supervisor-4 Module. To replace the supervisor module, follow the steps explained in <u>"Installing Supervisor Modules" on page</u> 79 and "Removing Supervisor Modules" on page 80.

The following message is displayed:

2019 Jun 25 15:21:13 switch %PLATFORM-2-SINGLE_EJECTOR_STAT_CHANGED: Ejector's status in slot 6 has changed, Ejector is OPEN 2019 Jun 25 15:21:15 switch %PLATFORM-2-MOD_REMOVE: Module 6 removed (Serial number JAE17440HVB)

After inserting the new standby Supervisor-4 Module, the following message is displayed:

2019 Jun 25 15:21:27 switch %PLATFORM-2-MODULE_EJECTOR_POLICY_ENABLED: All Ejectors closed for module 6. Ejector based shutdown enabled

2019 Jun 25 15:21:27 switch %PLATFORM-2-MOD_DETECT: Module 6 detected (Serial number :unavailable) Module-Type Supervisor Module-4 Model :unavailable

14. Wait for approximately 20 minutes for the new Supervisor-4 Module to come up in the HA-standby state. Once the standby supervisor module is in the HA-standby state, the supervisor Status LED will be green.

Note : If you see the following failure message, ignore the message, the active Supervisor-4 Module will bring up the standby Supervisor-4 Module to the HA-standby supervisor state in some time.

2019 Jun 25 15:36:45 switch %SYSMGR-2-STANDBY_BOOT_FAILED: Standby supervisor failed to boot up.

After inserting the new standby Supervisor-4 Module, the following message is displayed:

```
2019 Jun 25 15:36:45 switch %USBHSD-STANDBY-2-MOUNT: logflash: online
2019 Jun 25 15:36:49 switch %BOOTVAR-5-NEIGHBOR_UPDATE_AUTOCOPY:
auto-copy supported by neighbor supervisor, starting...
2019 Jun 25 15:38:30 switch %PLATFORM-1-PFM_ALERT:
Disabling ejector based shutdown on sup in slot 6
2019 Jun 25 15:39:38 switch %MODULE-5-STANDBY_SUP_OK:
Supervisor 6 is standby
2019 Jun 25 15:39:39 switch %PLATFORM-1-PFM_ALERT:
Enabling ejector based shutdown on sup in slot 5
```

15. Reinstall the license files on the new Supervisor-4 Modules.

```
switch(config)#
   copy usb1:licenses_archive_file_name.tar bootflash:switch_license.tar
Copy progress 100% 10KB
Copy complete, now saving to disk (please wait)...
switch(config)# copy bootflash:switch_license.tar bootflash:switch_license.lic
Copy progress 100% 10KB
Copy complete, now saving to disk (please wait)...
switch(config)# install license bootflash:switch_license.lic
Installing license .....done
switch# show license usage
Feature Ins Lic Status
                                 Expiry Date Comments
                      Count
  IOA_X9334NoOIn useFM_SERVER_PKGNo-UnusedMAINFRAME_PKGNo-UnusedENTERPRISE_PKGYes-UnusedSAN_ANALYTICS_PKGNo-In useSAN_TELEMETRY_PKGNo-Unused
                                                          Grace 115D 2H
                                                        Grace 119D 20H
                                                          Grace 109D 1H
```

Refer the <u>"Verification" on page 99</u> to verify that the Supervisor-1 Module configurations are successfully applied to the Supervisor-4 Module.

switch# show module

Mod	Ports	Module-Type	Model	Status
1 2 3 4 5 6	48 48 24 48 0 0	1/10 Gbps Ethernet Module 2/4/8/10/16 Gbps Advanced FC Module 40 Gbps FCoE Module 4/8/16/32 Gbps Advanced FC Module Supervisor Module-4 Supervisor Module-4	DS-X9848-480K9 DS-X9848-768K9 DS-X9824-960K DS-X9648-1536K9 DS-X97-SF4-K9 DS-X97-SF4-K9	ok ok ok active * ha-
star	ndby			
7 8 10 Mod	34 48 48 Sw	1/10/40G IPS,2/4/8/10/16G FC Module 4/8/16/32 Gbps Advanced FC Module 2/4/8/10/16 Gbps Advanced FC Module Hw	DS-X9334-K9 DS-X9648-1536K9 DS-X9448-768K9	ok ok ok
1	8 4(1)	1 1		
23	8.4(1) 8.4(1)	1.3 1.0		

4 8 5 8 6 8 7 8 8 8 10 8	.4(1) .4(1) .4(1) .4(1) .4(1) .4(1)	1 1 1 1 1 1	L.0 L.0 L.0 L.0 L.0			
Mod	MAC-A	ddress(e	es)			Serial-Num
1 2 3 4 5 6 7 8 10	84-78 £4-c1 04-6c 00-76 00-21 00-21 00-da 74-86 3c-06	B-ac-1b-3 -e2-7c-c -9d-32-3 -86-bf-5 -5c-fc-5 -5c-fc-8 -55-a2-2 -0b-33-c -23-c5-5	3d-58 t 3d-30 t 3d-aa t 5d-aa t 5d-0a t 5d-0a t 31-b4 t 25-00 t 53-d0 t	<pre>0 84-78 0 f4-cf 0 04-6c 0 00-76 0 00-2f 0 00-2f 0 00-da 0 74-86 0 3c-0e</pre>	-ac-1b-3d-8b -e2-7c-cd-33 -9d-32-37-1b -86-bf-58-57 -5c-fc-54-1d -5c-fc-81-c7 -55-a2-25-0f -0b-33-c6-a4 -23-c5-53-d3	JAF1718AAAD JAE1847038X JAE19330ASN JAE203901ZG JAE22440CB1 JAE22490XKJ JAE195004XM JAE213101Q3 JAE180605X3
Mod	Online	e Diag St	atus			
1 2 3 4 5 6 7 8 10	Pass Pass Pass Pass Pass Pass Pass Pass					
Xbar	Ports	Module-1	уре		Mode	Status
1 2 3 4 5 6	0 0 0 0 0 0	Fabric Fabric Fabric Fabric Fabric Fabric	Module Module Module Module Module Module	1 1 1 1 1 1	DS-X9710-FAE DS-X9710-FAE DS-X9710-FAE DS-X9710-FAE DS-X9710-FAE DS-X9710-FAE	31 ok 31 ok 31 ok 31 ok 31 ok 31 ok 31 ok
Xbar	Sw	Hw				
1 2 3 4 5 6	NA NA NA NA NA	1.0 1.0 1.0 1.0 1.0 1.0				
Xbar	MAC-Ac	ldress(es	s) S	erial-N	um	
1 2 3 4 5 6	NA NA NA NA NA NA		JA JA JA JA JA JA	E222305 E221709 E222305 E221709 E221709 E221709 E222305	VS 6X V5 6L 6J V8	

To view the inventory information for modules from the DCNM Web UI, Choose **Inventory** > **View** > **Modules**. The **Modules** window is displayed with a list of all the switches and its details for a selected scope.

For more information, see the DCNM SAN Management Configuration Guide.

What to do next

Migrate the Crossbar Fabric-1 Switching Modules to Crossbar Fabric-3 Switching Modules. For more information, see the <u>"Nondisruptive Migration from Crossbar Fabric-1 Switching Modules to Crossbar Fabric-3 Switching Modules</u>" on page 117

Scenario 2: Switch with Only Active Supervisor Module

About this task

To perform a nondisruptive migration from a Supervisor-1 Module to a Supervisor-4 Module in a switch that has only the active supervisor module installed and there is no standby supervisor module, or the standby module is not in the HA-standby state, follow these steps:

Procedure

1. Use the **show module** command to view the active and standby supervisor modules.

Note: In the following system message, Supervisor-1 Module is listed as Supervisor-4 Module.

switch# show module

Mod	Ports	Module-Type	Mode	Status
1 2 3 4 5 7 8 10	48 48 24 48 0 34 48 48	1/10 Gbps Ethernet Module 4/8/10/16 Gbps Advanced FC Module 40 Gbps FCoE Module 4/8/16/32 Gbps Advanced FC Module Supervisor-4 Module 1/10/40G IPS, 4/8/10/16G FC Module 4/8/16/32 Gbps Advanced FC Module 4/8/10/16 Gbps Advanced FC Module	DS-X9848-480K9 DS-X9448-768K9 DS-X9824-960K9 DS-X9648-1536K9 DS-X97-SF1-K9 active DS-X9334-K9 DS-X9648-1536K9 DS-X9448-768K9	ok ok ok ok ok ok ok ok
Mod	Sw	Hw		
1 2 3 4 5 6 7 8 10	8.4(2 8.4(2 8.4(2 8.4(2 8.4(2 8.4(2 8.4(2 8.4(2 8.4(2 8.4(2	1.1 1.3 1.0 1.0 1.10 1.10 1.10 1.10 1.10 1.10 1.10 1.10 1.10 1.10 1.11 1.10 1.10 1.11 1.10 1.10 1.10 1.11		
Mod	MAG	C-Address(es)	Serial-Num	
1 2 3 4 5 6 7 8 10	84-78 f4-c: 04-60 9c-55 e8-e0 00-da 74-86 3c-06	3-ac-1b-3d-58 to $84-78-ac-1b-3d-8bE-e2-7c-cd-30$ to $f4-cf-e2-7c-cd-33c-9d-32-36-aa$ to $04-6c-9d-32-37-1b5-86-bf-58-23$ to $00-76-86-bf-58-577-ad-fd-0d-cb$ to $9c-57-ad-fd-0d-ddd-f3-e5-9a-4d$ to $e8-ed-f3-e5-9a-5fa-55-a2-25-00$ to $00-da-55-a2-25-0f5-0b-33-c6-70$ to $74-86-0b-33-c6-a4e-23-c5-53-d0$ to $3c-0e-23-c5-53-d3$	JAF1718AAAD JAE1847038X JAE19330ASN JAE203901ZG JAE194005JC JAE17440HVB JAE195004XM JAE213101Q3 JAE180605X3	
Mod	Online [Diag Status		
1 2 3 4 5 6 7 8 10	Pass Pass Pass Pass Pass Pass Pass Pass			

Xbar	Ports	Module-Type		Model	Status
1 2 3 4 5 6	0 0 0 0 0 0	Fabric Module Fabric Module Fabric Module Fabric Module Fabric Module Fabric Module	 1 1 1 1 1	DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1	ok ok ok ok ok ok ok
Xbar	Sw	Hw			
1 2 3 4 5 6	NA NA NA NA NA NA	1.0 1.0 1.0 1.0 1.0 1.0			
Xbar	MAC-Ad	dress(es)	Seria	al-Num	
1 2 3 4 5 6	NA NA NA NA NA NA		JAE22 JAE22 JAE22 JAE22 JAE22 JAE22 JAE22	22305VS 217096X 22305V5 217096L 217096J 22305V8	

- 2. Ensure that the required space is available in the bootflash: directory for the image files to be copied using the **dir bootflash:** command. Use the **delete bootflash: filename** command to remove any unnecessary files.
- 3. Copy the Supervisor-4 Module NX-OS kickstart and system images to the active supervisor module bootflash, using an FTP, TFTP, SCP, SFTP, or a USB flash drive.

The Supervisor-4 images contain the string **sf4** to identify them. Do not rename the images, use the standard image names.

```
switch# copy
tftp://tftpserver.cisco.com/MDS/m9700-sf4ek9-kickstart-mz.8.4.1.bin
bootflash:m9700-sf4ek9-kickstart-mz.8.4.1.bin
switch# copy tftp://tftpserver.cisco.com/MDS/m9700-sf4ek9-mz.8.4.1.bin
bootflash:m9700-sf4ek9-mz.8.4.1.bin
```

4. Initiate the migration process of the active Supervisor-1 Module, using the migrate sup kickstart <supervisor4-kickstart-image> system <supervisor4-system-image> command in global config mode.

Note: The migrate sup kickstart **< supervisor4-kickstart-image> system < supervisor4-system-image>** command is supported on NX-OS Release 8.4(1) or later. Invalid command message is displayed, if this command is executed on other versions of NX-OS release.

Note : This command will verify if the images are compatible with the current system and the kickstart images. If the images are not compatible, the following error message is displayed:

```
ERROR !! Version of kickstart image provided (8.x.x) does not
match running version.
switch# configure terminal
switch(config)# migrate sup kickstart m9700-sf4ek9-kickstart-mz.8.4.1.bin
system m9700-sf4ek9-mz.8.4.1.bin
Kickstart image file is /bootflash/m9700-sf4ek9-kickstart-mz.8.4.1.bin
System image file is /bootflash/m9700-sf4ek9-kickstart-mz.8.4.1.bin
```

5. During the migration, enter y when prompted.

Note : After this point, the migration process will be locked and you cannot cancel the migration process. The **migrate sup kickstart < supervisor4-kickstart-image> system < supervisor4-system-image>** command will then check if it has to initiate a single supervisor or

dual supervisor migration process by checking if there a standby Supervisor-1 Module is installed in the switch.

Note : In the following system message, Supervisor-1 Module is listed as Supervisor-4 Module.

```
This will start the Supervisor-1 to Supervisor-4 migration. Configuration will be locked until migration is complete. Do you wish to continue (y/n) [n] y
```

The following syslog is displayed:

<Tue Jun 25 15:06:56 2019> Starting migration, Please do not remove any linecards or fabric cards until migration is complete

6. Insert the new Supervisor-4 Module, as explained in <u>"Installing Supervisor Modules" on page 79</u> and <u>"Removing Supervisor Modules" on page 80</u>. When the Supervisor-4 Module is detected in the standby supervisor slot, a boot from a network (TFTP) server is initiated with the image that is provided by using the **migrate sup kickstart <supervisor4-kickstart-image> system <supervisor4-system-image>** command.

Note : You have to insert the Supervisor-4 Module into the switch within a period of 30 minutes after initiating the **migrate sup kickstart < supervisor4-kickstart-image> system < supervisor4-system-image>** command. In case you have not inserted the Supervisor-4 Module within the 30 minutes after executing the command, you have to execute the command again and re-initiate the migration process.

<Tue Jun 25 15:06:57 2019> Manual-boot is enabled for Standby Supervisor <Tue Jun 25 15:06:57 2019> Please insert Supervisor-4 in slot number: 6 within 30 minutes

Note : After the Supervisor-4 Module is inserted in the slot, a timeout of 45 minutes is triggered for the Supervisor-4 Module to power up and come online. If the Supervisor-4 Module fails to power up and come online at the first attempt, a retry is initiated every 15 minutes. In case the Supervisor-4 Module fails to come online after three retries or 45 minutes, you have to remove the Supervisor-4 Module and restart the migration process by using the **migrate sup kickstart <supervisor4-kickstart-image> system <supervisor4-system-image>** command

The following system message is displayed:

<Tue Jun 25 15:08:07 2019> Supervisor-4 detected in slot 6. <Tue Jun 25 15:08:12 2019> Reloading standby. This might take up to 15 minutes. Please wait.. 2019 Jun 25 15:08:13 switch %PLATFORM-2-PFM_STANDBY_MODULE_RESET_MIGRATION: Reloading Standby Supervisor as part of Supervisor migration

7. Wait for approximately 20 minutes for the new Supervisor-4 Module to come up in HA-standby state.

The following messages are displayed on the active Supervisor-1 Module:

```
<Tue Jun 25 15:10:13 2019> Standby supervisor not yet online.
This will take some time
Please wait
<Tue Jun 25 15:12:13 2019> Standby supervisor not yet online.
This will take some time
Please wait
2019 Jun 25 15:12:18 switch %SYSMGR-2-ACTIVE_LOWER_MEM_THAN_STANDBY:
Active supervisor in
slot 5 is running with less memory than standby supervisor in slot 6
2019 Jun 25 15:12:18 switch %USBHSD-STANDBY-2-MOUNT: logflash: online
2019 Jun 25 15:12:18 switch %BOOTVAR-5-NEIGHBOR_UPDATE_AUTOCOPY:
auto-copy supported by
neighbor supervisor, starting...
<Tue Jun 25 15:14:13 2019> Standby supervisor not yet online.
This will take some time.
Please wait
2019 Jun 25 15:14:05 switch %PLATFORM-1-PFM_ALERT:
Disabling ejector based shutdown on sup
in slot 6
<Tue Jun 25 15:14:13 2019> Standby supervisor not yet online.
```

This will take some time. Please wait ...

Note : If you see the following failure message, ignore the message, the active Supervisor-1 Module will bring up the standby Supervisor-4 Module to HA-standby supervisor state in some time.

2019 Jun 25 15:15:06 switch %SYSMGR-2-STANDBY_BOOT_FAILED: Standby supervisor failed to boot up.

System will automatically do a copy running-config to startup-config.

The following message is displayed:

9. Once the standby module comes online, a system switchover happens and the new Supervisor-4 Module becomes the current active supervisor. This process moves the Supervisor-4 Module from the HA-standby mode to active mode. The SSH/telnet session is disconnected during the switchover. You have to reconnect to the SSH/telnet session. Also, ensure that the console link and the management link are connected to the newly inserted Supervisor-4 Module.

The following syslog message is displayed on the active Supervisor-4 Module:

```
Supervisor-4 Module syslogs
```

```
2019 Jun 25 15:15:47 switch %SYSMGR-2-HASWITCHOVER_PRE_START:
This supervisor is becoming
active (pre-start phase). 2019 Jun 25 15:15:48 switch %SYSMGR-2-HASWITCHOVER_START:
Supervisor 6 is becoming active.
2019 Jun 25 15:15:48 switch %IPS-5-IPS_MGR_FEATURE_ENABLE:
Restore cond runtime ips:0
iscsi:0 fcip:0 iscsi-intf-vsan:0 ips-lc:1
2019 Jun 25 15:15:48 switch %ASCII-CFG-6-INFORMATION:
Reading ACFG Runtime information
2019 Jun 25 15:15:48 switch %SYSMGR-2-SWITCHOVER_OVER:
Switchover completed.
2019 Jun 25 15:15:48 switch %PLATFORM-1-PFM ALERT:
Disabling ejector based shutdown on
sup in slot 6
2019 Jun 25 15:15:50 switch %BOOTVAR-2-SUP_MIGRATION_CONFIG_STARTED:
Setting boot parameters for supervisor migration process.
It might take some time.
Please do not set any config parameters during this time.
```

```
2019 Jun 25 15:15:52 switch %PLATFORM-2-SUP_UNSUPPORTED:
Unsupported card detected in
supervisor slot 5 powered down
2019 Jun 25 15:15:52 switch %PLATFORM-2-MOD_PWRDN:
Module 5 powered down (Serial number )
2019 Jun 25 15:15:52 switch %PLATFORM-5-MOD_STATUS:
Module 5 current-status is
MOD_STATUS_CONFIGPOWERED_DOWN
2019 Jun 25 15:15:53 switch %PLATFORM-5-MOD_STATUS:
Module 5 current-status is
MOD_STATUS_POWERED_DOWN
```

Note : The old active Supervisor-1 Module will be powered down. The supervisor Status LED will be blinking red, when the supervisor module is powered down by the migration command. If the Status LED is not blinking red, then check the migration status using the **show logging onboard migration status** command on any management session.

10. After the successful completion of the system switchover, the following syslog message is displayed:

```
2019 Jun 25 15:16:39 switch %BOOTVAR-2-SUP_MIGRATION_CONFIG_COMPLETE:
Migration process is complete now.
Supervisor-3 in standby slot can now be replaced with Supervisor-4.
2019 Jun 25 15:18:00 switch %SYSMGR-2-SBY_SUP_LESS_MEMORY_SLOT:
Supervisor in slot 6 is running with less memory than
active supervisor in slot 5
2019 Jun 25 15:18:00 switch %SYSMGR-2-CONVERT_STARTUP_ABORTED:
Conversion of startup-config failed.
2019 Jun 25 15:18:00 switch %PLATFORM-2-MOD_PWRDN: Module 6 powered down
(Serial number JAE17440HVB)
```

2019 Jun 25 15:18:00 switch %PLATFORM-5-MOD_STATUS: Module 6 current-status is MOD_STATUS_CONFIGPOWERED_DOWN 2019 Jun 25 15:18:00 switch %PLATFORM-5-MOD_STATUS: Module 6 current-status is MOD_STATUS_POWERED_DOWN 2019 Jun 25 15:18:00 switch %PLATFORM-2-MOD_REMOVE: Module 6 removed (Serial number JAE17440HVB)



Warning : A mix of different Supervisor-4 Modules and Supervisor-1 Modules outside a maintenance window is not supported. This mix of modules is supported only while you are migrating from a Supervisor-1 Module to a Supervisor-4 Module.

11. After the switchover to the Supervisor-4 Module is completed, the boot parameters are set for the supervisor migration process. Do not set any configuration parameters until the boot parameters are set. After the boot parameters are set, the migration process is complete. Use the **show boot** command to display the current boot variables and the **show module** command to display the modules installed in the switch.

Supervisor-4 module outputs

switch# show boot

```
kickstart variable = bootflash:/m9700-sf4ek9-kickstart-mz.8.4.1.bin
system variable = bootflash:/m9700-sf4ek9-mz.8.4.1.bin
Boot POAP Disabled
```

switch# show module

Mod	Ports	Modul	е-Туре		Mode	l Sta	ıtus	
1 2 3 4 5 6 7 8 10	48 48 48 48 0 0 48 48 48 34	4/8/1 4/8/1 4/8/1 4/8/1 Super Super 4/8/1 1/10 1/10/	6/32 Gbps Ad 6/32 Gbps Ad 0/16 Gbps Ad 6/32 Gbps Ad visor Module visor Module 0/16 Gbps Ad Gbps Etherne 40G IPS, 4/8	Ivanced FC Ivanced FC Ivanced FC Ivanced FC Ivanced FC Ivanced FC Ivanced FC Ivanced FC	2 Module 2 Module 2 Module 2 Module 2 Module 5 Module	DS-X9648-1 DS-X9648-1 DS-X9448-7 DS-X9648-1 DS-X97-SF1 DS-X97-SF4 DS-X9748-7 DS-X9848-4 DS-X9334-k	.536K9 .536K9 268K9 .536K9 K9 I-K9 268K9 180K9 (9	ok ok ok powered-dn active * ok ok ok
Mod	Power	-Statu	s Reason					
6	power	ed-dn	Policy tr Stdby has	igger ini lower me	tiated res m than act	et: ive		
Mod	Sw		Hw					
1 2 3 4 5 6 7 8 10	8. 8. 8. 8. 8. 8. 8. 8.	$\begin{array}{c} 4(1) \\ 4(1) \\ 4(1) \\ 4(1) \\ 4(1) \\ 4(1) \\ 4(1) \\ 4(1) \\ 4(1) \\ 4(1) \end{array}$	1.1 1.3 1.0 1.0 1.0 1.1 1.0 1.1 1.0 1.1					
Mod	MAC	-Addre	ss(es)			Serial-N	lum	
1 2 3 4 5 6 7 8 10	84- f4- 04- 00- 00- 00- 00- 74- 3c-	78-ac- cf-e2- 6c-9d- 76-86- 2f-5c- 00-00- da-55- 86-0b- 0e-23-	1b-3d-58 to 7c-cd-30 to 32-36-aa to bf-58-23 to fc-54-0a to 00-00-00 to a2-25-00 to 33-c6-70 to c5-53-d0 to	84-78-ac- f4-cf-e2- 04-6c-9d- 00-76-86- 00-2f-5c- 00-00-00- 00-da-55- 74-86-0b- 3c-0e-23-	1b-3d-8b 7c-cd-33 32-37-1b bf-58-57 fc-54-1d 00-00-00 a2-25-0f 33-c6-a4 c5-53-d3	JAF1718A JAE18470 JAE19330 JAE20390 JAE22440 NA JAE19500 JAE19500 JAE18060	AAD 138X DASN D1ZG DCB1 D4XM D1Q3 D5X3	
Mod	Onlin	e Diag	Status					

1 2 3 4 5 7 8 10	Pass Pass Pass Pass Pass Pass Pass Pass					
Xbar	Ports	Module	e-Type	Ν	lodel	Status
1 2 3 4 5 6	0 0 0 0 0 0 0	Fabric Fabric Fabric Fabric Fabric Fabric	Module 1 Module 1 Module 1 Module 1 Module 1 Module 1	[[[[[DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1	ok ok ok ok ok ok ok
Xbar 1 2 3 4 5 6	Sw NA NA NA NA NA NA	Hw 1.0 1.0 1.0 1.0 1.0 1.0				
Xbar 1 2 3 4 5 6	MAC-Addre NA NA NA NA NA NA	ess(es)	Seria JAE22 JAE22 JAE22 JAE22 JAE22 JAE22 JAE22 JAE22	l-Num 2305VS 17096X 2305V5 17096L 17096J 2305V8		

12. Reinstall the license files on the new Supervisor-4 Module.

```
switch(config)#
   copy usb1:licenses_archive_file_name.tar bootflash:switch_license.tar
Copy progress 100% 10KB
Copy complete, now saving to disk (please wait)...
switch(config)#
   copy bootflash:switch_license.tar bootflash:switch_license.lic
Copy progress 100% 10KB
Copy complete, now saving to disk (please wait)...
switch(config)# install license bootflash:switch_license.lic
Installing license .....done
switch# show license usage
                Ins Lic Status Expiry Date
Count
Feature Ins
                                                                    Comments
IOA_X9334No0In useFM_SERVER_PKGNo-UnusedMAINFRAME_PKGNo-UnusedENTERPRISE_PKGYes-UnusedSAN_ANALYTICS_PKGNo-In useSAN_TELEMETRY_PKGNo-Unused
                                                                   Grace 115D 2H
                                                                  Grace 119D 20H
                                                                   Grace 109D 1H
```

13. (Optional) If the standby Supervisor-1 Module is not in the powered down state, then put the standby Supervisor-1 Module to out of service, using the **out-of-service module slot** command .

Where a *slot* indicates the chassis slot number in which the standby supervisor module resides.

switch(config)# out-of-service module 6

Refer the <u>"Verification" on page 99</u> to verify that the Supervisor-1 Module configurations are successfully applied to the Supervisor-4 Module.

To view the inventory information for modules from the DCNM Web UI, select **Inventory** > **View** > **Modules**. The **Modules** window is displayed with a list of all the switches and its details for a selected scope.

For more information, see the DCNM SAN Management Configuration Guide.

What to do next

Migrate the Crossbar Fabric-1 Switching Modules to Crossbar Fabric-3 Switching Modules. For more information, see the <u>"Nondisruptive Migration from Crossbar Fabric-1 Switching Modules to Crossbar Fabric-3 Switching Modules</u>" on page 117

Verification

Use the following show commands to verify the migration procedure for the Supervisor-4 Module:

- show version
- show module
- show interface brief
- show interface status
- show system redundancy status

The following is a sample output for the show version command on the Supervisor-4 Module:

switch# show version

```
Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
Documents:
http://www.cisco.com/en/US/products/ps9372/tsd_products_support_serie s_home.html
Copyright (c) 2002-2019, Cisco Systems, Inc. All rights reserved.
The copyrights to certain works contained in this software are
owned by other third parties and used and distributed under
License. Certain components of this software are licensed under
the GNU General Public License (GPL) version 2.0 or the GNU
Lesser General Public License (LGPL) Version 2.1. A copy of each
such license is available at
http://www.opensource.org/licenses/gpl-2.0.php and
http://www.opensource.org/licenses/lgpl-2.1.php
Software
BIOS:
            version 2.6.0
kickstart: version 8.4(1)
           version 8.4(1)
system:
BIOS compile time:
                          05/17/2019
kickstart image file is: bootflash:///m9700-sf4ek9-kickstart-mz.8.4.1.bin
kickstart compile time: 6/30/2019 23:00:00 [06/15/2019 14:49:08]
system image file is:
   bootflash:///m9700-sf4ek9-mz.8.4.1.bin system compile time:
                         6/30/2019 23:00:00 [06/15/2019 16:15:18]
Hardware
SAN384C-6 (10 Slot) Chassis ("Supervisor Module-4")
Intel(R) Xeon(R) CPU D-1548 with 14270332 kB of memory.
Processor Board ID JAE22440CB1
Device name: switch
```

bootflash: 3932160 kB slot0: 0 kB (expansion flash) Kernel uptime is 0 day(s), 0 hour(s), 36 minute(s), 9 second(s) Last reset Reason: Unknown System version: 8.4(1) Service: plugin Core Plugin, Ethernet Plugin Active Package(s)

The following is a sample output for the **show module** command on the Supervisor-4 Module for a dual supervisor migration:

swit	ch ≉ show	module			
Mod	Ports Moc	lule-Type		Model	Status
1 2 3 4 5 6 7 8 10 Mod	48 1/1 48 2/4 24 40 48 4/8 0 Sup 0 Sup 34 1/1 48 4/8 48 2/4 48 2/4 5w	0 Gbps Ethernet /8/10/16 Gbps Ad Gbps FCoE Module 8/16/32 Gbps Adva pervisor Module-4 pervisor Module-4 0/40G IPS,2/4/8/ 8/16/32 Gbps Adva Hw	Module Ivanced FC Module Inced FC Module 10/16G FC Modul Inced FC Module Ivanced FC Modul	DS-X9848-480K9 DS-X9448-768K9 DS-X9824-960K9 DS-X9648-1536K9 DS-X97-SF4-K9 DS-X97-SF4-K9 DS-X9334-K9 DS-X9648-1536K9 Le DS-X9448-768K9	ok ok ok active * ha-standby ok ok ok
1 2 3 4 5 6 7 8 10	$\begin{array}{c} 8.4(1) \\ 8.4(1) \\ 8.4(1) \\ 8.4(1) \\ 8.4(1) \\ 8.4(1) \\ 8.4(1) \\ 8.4(1) \\ 8.4(1) \\ 8.4(1) \end{array}$	1.1 1.3 1.0 1.0 1.0 1.0 1.0 1.0 1.0			
Mod	MAC	C-Address(es)		Serial-Num	
1 2 3 4 5 6 7 8 10	84 - £4 - 00 - 00 - 00 - 00 - 74 - 3c -	78-ac-1b-3d-58 t cf-e2-7c-cd-30 t 6c-9d-32-36-aa t 76-86-bf-58-23 t 2f-5c-fc-54-0a t 2f-5c-fc-81-b4 t da-55-a2-25-00 t 86-0b-33-c6-70 t 0e-23-c5-53-d0 t	0 84-78-ac-1b-3 0 f4-cf-e2-7c-0 0 04-6c-9d-32-3 0 00-76-86-bf-5 0 00-2f-5c-fc-5 0 00-2f-5c-fc-5 0 00-da-55-a2-2 0 74-86-0b-33-0 0 3c-0e-23-c5-5	3d-8b JAF1718AAAD :d-33 JAE1847038X :7-1b JAE19330ASN :8-57 JAE203901ZG :4-1d JAE22440CB1 :1-c7 JAE22440CB1 :1-c7 JAE22490XKJ :5-of JAE195004XM :6-a4 JAE213101Q3 :3-d3 JAE180605X3	
Mod	Online	e Diag Status			
1 2 3 4 5 6 7 8 10	Pass Pass Pass Pass Pass Pass Pass Pass				
Xbaı	Ports	Module-Type	Model	Status	
1 2 3 4 5 6 Xbai	0 0 0 0 0 0 0 5 5 8	Fabric Module 1 Fabric Module 1 Fabric Module 1 Fabric Module 1 Fabric Module 1 Hw	DS-X9710 DS-X9710 DS-X9710 DS-X9710 DS-X9710 DS-X9710	0-FAB1 ok 0-FAB1 ok 0-FAB1 ok 0-FAB1 ok 0-FAB1 ok 0-FAB1 ok	
1 2 3 4 5	NA NA NA NA NA	1.0 1.0 1.0 1.0 1.0			

6	NA	1.0	
Xbar	MAC-A	ddress(es)	Serial-Num
1 2 3 4 5 6	NA NA NA NA NA		JAE222305VS JAE2217096X JAE222305V5 JAE2217096L JAE2217096J JAE2217096J JAE222305V8

The following is a sample output for the **show inventory** command on the Supervisor-4 Module:

switch# show inventorv

NAME: "Chassis", DESCR: "SAN384C-6 (10 Slot) Chassis " PID: DS-C9710, VID: V00 , SN: JAF1647AQTL NAME: "Slot 1", DESCR: "1/10 Gbps Ethernet Module" PID: DS-X9848-480K9, VID: V01 , SN: JAF1718AAAD NAME: "Slot 2", DESCR: "2/4/8/10/16 Gbps Advanced FC Module" PID: DS-X9448-768K9, VID: V02 , SN: JAE1847038X NAME: "Slot 3", DESCR: "40 Gbps FCoE Module" PID: DS-X9824-960K9, VID: V00, SN: JAE19330ASN NAME: "Slot 4", DESCR: "4/8/16/32 Gbps Advanced FC Module" PID: DS-X9648-1536K9, VID: V01 , SN: JAE203901ZG NAME: "Slot 5", DESCR: "Supervisor Module-3" PID: DS-X97-SF1-K9, VID: V02 , SN: JAE194005JC NAME: "Slot 6", DESCR: "Supervisor Module-3" PID: DS-X97-SF1-K9, VID: V02 , SN: JAE17440HVB NAME: "Slot 7", DESCR: "1/10/40G IPS, 4/8/10/16G FC Module" PID: DS-X9334-K9, VID: V00 , SN: JAE195004XM NAME: "Slot 8", DESCR: "4/8/16/32 Gbps Advanced FC Module" PID: DS-X9648-1536K9, VID: V01 , SN: JAE213101Q3 NAME: "Slot 10", DESCR: "4/8/10/16 Gbps Advanced FC Module" PID: DS-X9448-768K9, VID: V01 , SN: JAE180605X3 NAME: "Slot 11", DESCR: "Fabric card module" PID: DS-X9710-FAB3, VID: V00 , SN: JAE222305VS NAME: "Slot 12", DESCR: "Fabric card module" PID: DS-X9710-FAB3, VID: V00 , SN: JAE2217096X NAME: "Slot 13", DESCR: "Fabric card module" PID: DS-X9710-FAB3, VID: V00 , SN: JAE222305V5 NAME: "Slot 14", DESCR: "Fabric card module" PID: DS-X9710-FAB3, VID: V00, SN: JAE2217096L NAME: "Slot 15", DESCR: "Fabric card module" PID: DS-X9710-FAB3, VID: V00 , SN: JAE2217096J NAME: "Slot 16", DESCR: "Fabric card module" PID: DS-X9710-FAB3, VID: V00 , SN: JAE222305V8 NAME: "Slot 35", DESCR: "SAN384C-6 (10 Slot) Chassis Power Supply" PID: DS-CAC97-3KW, VID: V01 , SN: DTM164602XH NAME: "Slot 37", DESCR: "SAN384C-6 (10 Slot) Chassis Power Supply" PID: DS-CAC97-3KW, VID: V01 , SN: DTM1649022W NAME: "Slot 38", DESCR: "SAN384C-6 (10 Slot) Chassis Power Supply" PID: DS-CAC97-3KW, VID: V01 , SN: DTM16490239 NAME: "Slot 39", DESCR: "SAN384C-6 (10 Slot) Chassis Power Supply" PID: DS-CAC97-3KW, VID: V01 , SN: DTM164602ZP NAME: "Slot 41", DESCR: "SAN384C-6 (10 Slot) Chassis Fan Module" PID: DS-C9710-FAN, VID: V00 , SN: JAF1647ADCE NAME: "Slot 42", DESCR: "SAN384C-6 (10 Slot) Chassis Fan Module"

PID: DS-C9710-FAN, VID: V00 , SN: JAF1647ADCN

NAME: "Slot 43", DESCR: "SAN384C-6 (10 Slot) Chassis Fan Module" PID: DS-C9710-FAN, VID: V00 , SN: JAF1647ACHH

The following is a sample output for the **show interface brief** command on the Supervisor-4 Module:

switch# show interface brief									
Interface Type	Vsan	Admin	Admin	Status	SFP	Oper	Oper	Port Logical	
		Mode	Trunk Mode			Mode	Speed (Gbps)	Channel	
fc1/1 fc1/2 fc1/3 fc1/4 fc1/5 fc1/6 fc1/7 fc1/8	1 1 1 1 1 20 20	E E E E auto F	on on on on on off off	trunking trunking trunking trunking trunking notConnected up up	swl swl swl swl swl swl swl swl	TE TE TE TE TE TE F F	16 16 16 16 16 16 8 16	1 1 1 1 1 	core core core core core edge edge

The following is a sample output for the **show interface status** command on the Supervisor-4 Module:

```
switch# show interface status
fc1/1 is trunking
   Hardware is Fibre Channel, SFP is short wave laser w/o OFC (SN)
   Port WWN is 20:01:54:7f:ee:eb:7a:00
   Peer port WWN is 20:41:00:2a:6a:5b:da:80
   Admin port mode is E, trunk mode is on
   snmp link state traps are enabled
   Port mode is TE
   Port vsan is 1
   Admin Speed is auto max 32 Gbps
   Operating Speed is 16 Gbps
Rate mode is dedicated
   Port flow-control is R_RDY
   Transmit B2B Credit is 500
   Receive B2B Credit is 500
   B2B State Change: Admin(on), Oper(up), Negotiated Value(14)
   Receive data field Size is 2112
   Beacon is turned off
   Logical type is core
Belongs to port-channel1
   Trunk vsans (admin allowed and active) (1,20-25,102)
Trunk vsans (up) (1,20)
Trunk vsans (isolated) (21-25,102)
   Trunk vsans (initializing) ()
   5 minutes input rate 1568 bits/sec,196 bytes/sec, 2 frames/sec
   5 minutes output rate 576 bits/sec,72 bytes/sec, 5 frames/sec
   5716 frames input, 355028 bytes
        0 discards,0 errors
        0 invalid CRC/FCS,0 unknown class
0 too long,0 too short
   10924 frames output, 971836 bytes
        0 discards,0 errors
     0 input OLS,0 LRR,0 NOS,0 loop inits
   0 output OLS,0 LRR, 0 NOS, 0 loop inits
500 receive B2B credit remaining
   500 transmit B2B credit remaining
   500 low priority transmit B2B credit remaining
Last clearing of "show interface" counters : n
```

The following is a sample output for the **show system redundancy status** command on the Supervisor-4 Module:

switch# show system redundancy status

HA

Redundancy mode administrative:

```
operational: HA

This supervisor (sup-6)

Redundancy state: Active

Supervisor state: Active

Internal state: Active with HA standby

Other supervisor (sup-5)

Redundancy state: Standby

Supervisor state: HA standby

Internal state: HA standby
```

Troubleshooting

This section lists the error messages that may come up on the console during the migration along with the recommended action to be performed.

Problem

Setting boot parameters for supervisor migration process returned error:

switch %BOOTVAR-2-SUP_MIGRATION_CONFIG_ERROR: Setting boot parameters for supervisor migration process returned error.

Action to be performed

Set the boot variables manually using the **boot kickstart <kickstart_image> command and boot system<system_image>** on the Supervisor-4 Module

Problem

The kickstart or system image is not present on the bootflash of the active Supervisor-4 Module. The following syslog message is displayed:

switch %BOOTVAR-2-SUP_MIGRATION_IMAGE_DOES_NOT_EXIST: System image doesn't exist on bootflash of the supervisor. Please clear some space in bootflash, copy the Supervisor-4 images manually, set the boot variables and save configs before replacing Standby Supervisor-1

Action to be performed

Clear space on the bootflash and then copy the Supervisor-4 module images manually, as shown in Step <u>"3" on page 86</u> in Scenario 1 of the migration procedures given above. Set the boot variables and save the configuration before replacing the standby Supervisor-1 module. Use the **boot kickstart <kickstart_image>** command and the **boot system <system_image>** command on the active Supervisor-4 Module when it becomes active after the migration is completed.

Problem

The newly inserted Supervisor-4 Module cannot take over as the active supervisor. The following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Supervisor-4 cannot take over as active Supervisor ...

Action to be performed

Wait for the next retry attempt by the switch to bring up the Supervisor-4 Module.

Problem

The migration logging file is already present in the Supervisor-1 Module. The following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> WARNING!!! Migration logging file already exists in Supervisor-4, continuing migration ...

Action to be performed

None. The **show logging onboard migration status** command is used to monitor the migration progress. There is no impact on the migration process

Problem

The switch cannot initiate migration logging due to insufficient file permissions. The following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> WARING!!! Migration logging cannot be done due to file permission error, continuing migration ...

Action to be performed

None. The **show logging onboard migration status** command is used to monitor the migration progress. This error message is displayed if the appropriate file permissions have not been provided.

Problem

The active Supervisor-1 Module is using the redundant secondary EOBC link instead of the primary EOBC link. The following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Active Supervisor-4 is using Redundant EOBC link, this indicates some problem with Primary EOBC link, aborting migration ...

Action to be performed

Replace the active Supervisor-1 Module with another Supervisor-1 Module.

Problem

Unable to extract the image header from the kickstart or system images. The following syslog messages are displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Image header extraction failed for Kickstart image <kickstart_image> of Supervisor-4, aborting migration ... <Tue Apr 30 10:02:47 2019> ERROR!!! Image header extraction failed for System image <system_image> of Supervisor-4, aborting migration ...

Action to be performed

Use the **migrate sup kickstart < supervisor4-kickstart-image> system** <**supervisor4-system-image>** command again.

Problem

Unable to retrieve the kickstart or system image information. The following syslogs are displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Failed to get Kickstart image info, aborting migration... <Tue Apr 30 10:02:47 2019> ERROR!!! Failed to get System image info, aborting migration...

Action to be performed

Use the **migrate sup kickstart < supervisor4-kickstart-image> system** <**supervisor4-system-image>** command again.

Problem

The kickstart or system images provided are not valid images for the Supervisor-4 Modules. The following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Kickstart image provided '<kickstart_image>' is not a valid Supervisor-4 image, aborting migration ... <Tue Apr 30 10:02:47 2019> ERROR!!! System image provided '<system_image>' is not a valid Supervisor-4 image, aborting migration ...

Action to be performed

Use a valid Supervisor-4 Module image and use the **migrate sup kickstart < supervisor4kickstart-image> system < supervisor4-system-image>** command again.

Problem

The release versions of the Supervisor-4 Module kickstart and system images provided are not the same as the existing Supervisor-1 Module kickstart and system images. The following syslog messages are displayed:

<TueApr 30 10:02:47 2019> ERROR!!! Running kickstart version : <running_version>,?version of kickstart image provided : <Supervisor-1_image_version> <Tue Apr 30 10:02:47 2019> ERROR!!! Version of kickstart image provided ('<sup3_image_version>') does not match running version, aborting migration ... <Tue Apr 30 10:02:47 2019> ERROR!!! Running System version: <running_version>, version of system image provided : <Supervisor-1_image_version>

<Tue Apr 30 10:02:47 2019> ERROR!!! Version of system image provided ('<sup1_image_version>') does not match running version, aborting migration ...

Action to be performed

Check the image version. The release versions of the Supervisor-4 Module kickstart and system images provided should be the same as the existing Supervisor-1 Module kickstart and system images.

Problem

Unable to retrieve the chassis information. The following syslog message is displayed:

```
<Tue Apr 30 10:02:47 2019> ERROR!!! Chassis information retrieve failed, aborting migration ...
```

Action to be performed

```
Use the migrate sup kickstart < supervisor4-kickstart-image> system < supervisor4-system-image> command again.
```

Problem

Unable to retrieve the slot number of the supervisor module. The following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Supervisor slot information retrieve failed, aborting migration ...

Action to be performed

```
Use the migrate sup kickstart < supervisor4-kickstart-image> system <supervisor4-system-image> command again.
```

Problem

Unable to retrieve the slot number of the standby supervisor module. The following syslog message is displayed:

```
<Tue Apr 30 10:02:47 2019> ERROR!!! Standby Supervisor slot
information retrieve failed,
aborting migration ...
```

Action to be performed

Use the **migrate sup kickstart < supervisor4-kickstart-image> system** <**supervisor4-system-image>** command again.

Problem

In case the **migrate sup kickstart** <*supervisor4-kickstart-image>* **system** <*supervisor4-system-image>* command cannot read the stored Supervisor-1 Module image links, the migration process fails. The following syslog messages are displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Kickstart image link for Active Supervisor-1 could not be found, aborting migration ... <Tue Apr 30 10:02:47 2019> Please set the boot parameters using 'boot kickstart <kickstart_image>' and 'boot system <system_image>' <Tue Apr 30 10:02:47 2019> ERROR!!! System image link for Active Supervisor-1 could not be found, aborting migration ... <Tue Apr 30 10:02:47 2019> Please set the boot parameters using 'boot kickstart <kickstart_image>' and 'boot system <system_image>'

Action to be performed

Set the Supervisor-1 Module image links using the **boot kickstart <kickstart_image>** command and the **boot system <system_image>** command before re-inserting the standby Supervisor-4 Module.

Problem

The Supervisor-4 Module is already present in the standby slot before initiating the migration procedure. The following syslog message is displayed:

```
<Tue Apr 30 10:02:47 2019> ERROR!!! Supervisor-4 is already
inserted in standby slot <slot_number> before starting migration.
Please remove Standby supervisor and start single
Supervisor migration, aborting migration ...
```

Action to be performed

Remove the standby Supervisor-4 Module and start the migration process again.

Problem

The standby Supervisor-1 Module is not in the HA-standby state. The following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Standby Supervisor-1 is not yet in ha-standby state, aborting migration ... <Tue Apr 30 10:02:47 2019> Please wait for Standby supervisor in slot <slot_number> to become ha-standby or physically remove standby and start migration

Action to be performed

Wait until the standby Supervisor-1 Module comes up in the HA-standby state or remove the standby Supervisor-1 Module and perform a single supervisor migration.

Problem

In case of a dual supervisor migration, the standby Supervisor-1 Module is powered down by using the **out-of-service <slot-number>** command. If the standby Supervisor-1 Module does not power down after using this command, the following syslog message is displayed:

```
<Tue Apr 30 10:02:47 2019> ERROR!!! Failed to power down
Standby Supervisor-1 in slot <slot_number>,
aborting migration ...
```

Action to be performed

Use the **migrate sup kickstart < supervisor4-kickstart-image> system** <**supervisor4-system-image>** command again.

Problem

Unable to lock the configuration. The following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Failed to lock config, aborting migration ...

Action to be performed

```
Use the migrate sup kickstart < supervisor4-kickstart-image> system <supervisor4-system-image> command again.
```

Problem

After powering down the Supervisor-1 module, the switch will check for the presence of a module in the slot from which the Supervisor-1 Module was removed. This check happens every 30 minutes after the Supervisor-1 Module has been removed. In case this check to detect the presence of the supervisor module fails, the following syslog message is displayed:

```
<Tue Apr 30 10:02:47 2019> ERROR!!!
Module information retrieve failed
```

Action to be performed

None. There is no impact on the migration process.

Problem

A Supervisor-1 Module is inserted instead of a Supervisor-4 Module. The following syslog message is displayed:

```
<Tue Apr 30 10:02:47 2019> ERROR!!! Supervisor-1 is
inserted in slot <slot_number> instead of Supervisor-4,
aborting migration ...
```

Action to be performed

Restart migration and ensure that the newly inserted supervisor module is the Supervisor-4 Module.

Problem

In case the Supervisor-4 Module is not inserted into the standby slot within 30 minutes after the Supervisor-1 Module has been powered down, the following syslog message is displayed:

module

<Tue Apr 30 10:02:47 2019> ERROR!!! Timeout waiting for Supervisor-4 to be inserted in slot <slot_number>, aborting migration ...

Action to be performed

Use the migrate sup kickstart <supervisor4-kickstart-image> system

<supervisor4-system-image> command again and ensure that the Supervisor-4 Module is inserted into the standby slot within 30 minutes after the Supervisor-1 Module has been powered down.

Problem

Unable to create image links for the supervisor-4 module images. The following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Supervisor-4 image links could not be created for Standby Supervisor bootup, aborting migration ...

Action to be performed

Use the **migrate sup kickstart < supervisor4-kickstart-image> system** <**supervisor4-system-image>** command again.

Problem

Unable to reload the Supervisor-4 Module after the Supervisor-4 Module is detected in the switch. The following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Failed to reload Standby Supervisor-4, aborting migration ...

Action to be performed

Remove the Supervisor-4 Module from the standby slot and restart migration by using the **migrate sup kickstart <supervisor4-kickstart-image> system <supervisor4-system-image>**

Problem

The Supervisor-4 Module is stuck in loader prompt due to a boot failure. The following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Standby Supervisor-4 is stuck in loader prompt due to boot-up failure ...

Action to be performed

None. A retry attempt to bring up the Supervisor-4 Module is initiated by the switch every 15 minutes for 3 times.

Problem

The Supervisor-4 Module is unable to come online. The following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Standby Supervisor-4 could not come online ...

Action to be performed

None. A retry attempt to bring up the supervisor-4 module is initiated by the switch every 15 minutes.

Problem

The supervisor module fails to come online. The following syslogs are displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Timeout waiting for Supervisor-4 to come online, aborting migration ... <Tue Apr 30 10:02:47 2019> Powering down Supervisor-4 in slot <slot_number>

Action to be performed

Use the **migrate sup kickstart < supervisor4-kickstart-image> system** <**supervisor4-system-image>** command again.

Problem

The Supervisor-1 Module image links are not restored on the active Supervisor-1 Module before the switchover to Supervisor-4 Module is initiated. The following syslogs are displayed before saving configuration:

<Tue Apr 30 10:02:47 2019> WARNING!!! Error resetting original Supervisor-1 image links, continuing migration ... <Tue Apr 30 10:02:47 2019> WARNING!!! Please set the boot variables manually before inserting back Supervisor-1 in standby slot <slot_number>, continuing migration ...

Action to be performed

Use the **migrate sup kickstart < supervisor4-kickstart-image> system** <**supervisor4-system-image>** command again.

Problem

The **copy r s** command fails on the active Supervisor-1 Module before the switchover to the Supervisor-4 Module is initiated. The following syslog is displayed:

<Tue Apr 30 10:02:47 2019> ERROR!!! Failed to save configuration, aborting migration ...

Action to be performed

Use the **migrate sup kickstart < supervisor4-kickstart-image> system** <**supervisor4-system-image>** command again.

Problem

The switchover fails on the active Supervisor-1 Module before the switchover to the Supervisor-4 Module is initiated. The following syslog is displayed:

<Tue Apr 30 10:02:47 2019> ERROR !! Switchover failed, aborting migration ...?

Action to be performed

Use the **migrate sup kickstart < supervisor4-kickstart-image> system** <**supervisor4-system-image>** command again.

Problem

In case the Supervisor-4 Module is not inserted within 30 minutes after using the **migrate sup kickstart<supervisor4-kickstart-image> system <supervisor4-system-image>** command, the switch will try to power up the powered down Supervisor-1 Module in the standby slot on reaching the timeout of 30 minutes. If the standby Supervisor-1 Module fails to power up, the following syslog message is displayed before aborting migration:

<Tue Apr 30 10:02:47 2019> ERROR !!! Failed to power up Standby Supervisor, Please power up manually using "no poweroff module <slot_num>" from config mode

Action to be performed

Use the **no poweroff module <slot_number>** command on the active Supervisor-4 Module to bring up the powered down standby Supervisor-4 Module in case the Supervisor-4 Module has not been inserted within 30minutes after using the **migrate sup kickstart<supervisor4**-**kickstart-image>** system **<supervisor4-system-image>** command.

Problem

Setting of the boot variable parameters fails after migration when the Supervisor-4 Module becomes active supervisor. The following syslog is displayed:

BOOTVAR-2- SUP_MIGRATION_CONFIG_ERROR Setting boot parameters for supervisor migration process returned error. Please set the boot variables manually using 'boot kickstart <kickstart_image>' and 'boot system <system_image>' and save configs"

Action to be performed

Use the **boot kickstart <kickstart_image>** and the **boot system <system_image>** on the active Supervisor-4 Module when it becomes active after the migration has been completed.

Problem

Migration fails on Supervisor-4 Module because of insufficient boot flash memory on the Supervisor-4 Module. The following syslog is displayed:

2019 Apr 2 08:47:43 switch %FS-STANDBY-DAEMON-2-FSD_ENOSPC_BOOTFLASH: Due to insufficient space, system image could not be copied to standby boot flash. system image is not present on standby. Please copy 'm9700-sf4ek9-mz.8.4.1.bin' manually. Standby supervisor not yet online. This might take sometime. Please wait ...

Action to be performed

Use the migrate standby_bootup command on the active Supervisor-4 Module when it becomes active and manually copy the image file and boot parameters.

Migration cleanup

• In case any migration clean-up errors have been detected on the Supervisor-1 Module, the following syslog message is displayed:

<Tue Apr 30 10:02:47 2019> Please run 'migrate clean' before doing any operation.

In such a scenario, use the **migrate clean** command to resolve the errors.

```
switch# migrate clean
<Tue May 28 03:34:58 2019> Manual-boot is disabled for Standby Supervisor
<Tue May 28 03:34:58 2019> Migration clean up done
```

In case any migration clean-up errors have been detected on the Supervisor-4 Module, the following syslog message is displayed:

```
BOOTVAR-2- MIGRATION_CONFIG_CLEAN_ERROR: Please run 'migrate clean' command from active Supervisor before replacing the standby Supervisor.
```

In such a scenario, use the **migrate clean** command to resolve the errors.

```
switch# migrate clean
<Tue May 28 03:34:58 2019> Migration clean up done
```

• In case the **migrate clean** command is used on a Supervisor-1 Module or a Supervisor-4 Module for which migration has not been initiated, the following syslog is displayed:

```
switch# migrate clean
<Tue May 28 03:34:58 2019> Migration was not done on this Supervisor
```

Disruptive Migration from Supervisor-1 Modules to Supervisor-4 Modules

Before you begin

Before migrating from a Supervisor-1 Module to a Supervisor-4 Module, please note that you cannot mix Supervisor-1 Module and Supervisor-4 Module in a production environment.

About this task

To perform a disruptive migration from Supervisor-1 Modules to Supervisor-4 Modules, follow these steps.

Note :

In the following procedure, all show outputs, system messages, and image file names are displayed for the SAN384C-6 Director Switch. The show outputs, system messages, and image file names will vary based on the IBM c-type Director Switch selected.

Procedure

- 1. Insert a USB drive in the usb1 or the slot0 USB port on the active Supervisor-1 Module. We will use the usb1 port for the steps given below.
- 2. Format the drive by using the format command.

switch(config)# format usb1

3. Back up the running configuration from the current active supervisor module to the FTP/SFTP/TFTP server, or a USB flash drive.

```
switch# copy running-config
ftp:[//[username[:password]@]server][/path]
Or
```

switch# copy running-config usb1:runningconfiguration.txt
Copy complete, now saving to disk (please wait)...

Note : runningconfiguration.txt is a filename variable.

4. Back up the installed licenses from the switch to a USB drive by using the copy licenses command. To view the current licenses installed on the switch, use the show license command.

```
switch# show license
license.lic:
SERVER this host ANY
VENDOR cisco
INCREMENT ENTERPRISE_PKG cisco 1.0 permanent uncounted \
VENDOR_STRING=MDS HOSTID=VDH=REG070201
NOTICE="<LicFileID>ent_ips_main_fm.lic</LicFileID><LicLineID>0</LicLineID> \
<PAK>dummyPak</PAK>" SIGN=FB454F0A0D40
INCREMENT MAINFRAME_PKG cisco 1.0 permanent uncounted \
VENDOR_STRING=MDS HOSTID=VDH=REG070201 \
NOTICE="<LicFileID>ent_ips_main_fm.lic</LicFileID><LicLineID>1</LicLineID> \
<PAK>dummyPak</PAK>" SIGN=0DAE1B086D9E
INCREMENT SAN_EXTN_OVER_IP cisco 1.0 permanent 7 VENDOR_STRING=MDS \
HOSTID=VDH=REG070201
NOTICE="<LicFileID>ent_ips_main_fm.lic</LicFileID><LicLineID>2</LicLineID> \
<PAK>dummyPak</PAK>" SIGN=D336330C76A6
INCREMENT FM_SERVER_PKG cisco 1.0 permanent uncounted \
VENDOR_STRING=MDS HOSTID=VDH=REG070201
NOTICE="<LicFileID>ent_ips_main_fm.lic</LicFileID><LicLineID>3</LicLineID> \
<PAK>dummyPak</PAK>" SIGN=AEAEA04629E8
```

```
switch# copy licenses usb1:licenses_archive_file_name.tar
```

Note : You must use the tar extension for the archive file. This file will contain all the license files that were installed on the Supervisor-1 Module.

5. Back up the outputs of the show tech-support details command, and redirect the file to a remote server using an FTP, TFTP, SFTP, SCP, or a USB flash drive.

```
switch# show tech-support details> scp://root@x.x.x.x/root/showtechsupport.txt
```

or

switch# show tech-support details> usb1:showtechsupport.txt

6. Physically turn off the power to the switch, using the power switch, on each of the power supplies. The Output LED turns off on each power supply and the Status LEDs turn off on all the supervisor and I/O modules.



CAUTION : If any of the supervisor or I/O module Status LEDs is turned on (showing any color), stop at this step until you are able to turn off those modules.

7. For each Supervisor-1 Module installed in the switch, remove the module and replace it with a Supervisor-4 Module as explained in Installing a Supervisor Module, page 3-66 and <u>"Removing Supervisor Modules"</u> on page 80.



CAUTION : If the switch has two supervisor modules, ensure that both the supervisors are of the same type. Do not mix Supervisor-1 Module with Supervisor-4 Modules.

8. Power up the switch, using the power switch, on each of its power supplies. The Output LED on each power supply turns on and eventually turns green when the power supply is sending power to the switch. The Status LED on each installed supervisor module also turns on when the module begins to turn on. The supervisor that becomes active has a green ACTIVE LED (the standby supervisor module has an amber ACTIVE LED).

- Remove the USB drive from the Supervisor-1 Module (this drive has copies of the Supervisor-1 Module configuration, license, and software images) and insert it in the USB port on the active Supervisor-4 Module (ACTIVE LED is green).
- 10. Connect a console to the active supervisor module as explained in Connecting a Console to the Switch.
- 11. If you are setting up the initial configuration for the supervisor module, the initial setup script will ask you if you want to enforce the secure password standard. Make your selection, enter your password, and then confirm the password by entering it again.

---- System Admin Account Setup ----Do you want to enforce secure password standard (yes/no) [y]: Enter the password for "admin": Enter the password for "admin":

12. When you are asked to enter the basic configuration, enter no.

```
---- Basic System Configuration Dialog VDC: 1 ----
This setup utility will guide you through the basic configuration of
the system. Setup configures only enough connectivity for management
of the system. Please register Cisco Nexus7000 Family devices promptly
with your supplier. Failure to register may affect response times
for initial service calls. Nexus7000 devices must be registered to
receive entitled support services. Press Enter at anytime to skip a
dialog. Use ctrl-c at anytime to skip the remaining dialogs.
```

Would you like to enter the basic configuration dialog (yes/no): \mathbf{no}

13. When asked to log in, enter the login and password that you specified in step "11" on page 111.

```
User Access Verification
switch login:
Password:
```

14. Verify that the switch is running the required version of the NX-OS software by using the **show version** command.

switch(config)# show version

Note : If the version of the NX-OS is not the same as you intended to use, perform an upgrade to the appropriate version (NX-OS Release 8.4(1) or later). To upgrade an image version on the switch, refer the 9000 NX-OS Software Upgrade and Downgrade Guide, Release 8.x guide.

15. Reinstall the license files on the new Supervisor-4 Module.

```
switch(config)#
   copy usb1:licenses_archive_file_name.tar bootflash:switch_license.tar
Copy progress 100% 10KB
Copy complete, now saving to disk (please wait)...
switch(config)# copy bootflash:switch_license.tar bootflash:switch_license.lic
Copy progress 100% 10KB
Copy complete, now saving to disk (please wait)..
switch(config)# install license bootflash:switch_license.lic
Installing license .....done
switch# show license usage
Feature Ins Lic
                                  Status Expiry Date Comments
                          Count
    _____
IOA_X9334No0In useFM_SERVER_PKGNo-UnusedMAINFRAME_PKGNo-UnusedENTERPRISE_PKGYes-UnusedSAN_ANALYTICS_PKGNo-In useSAN_TELEMETRY_PKGNo-Unused
                                                        Grace 115D 2H
                                  Unused
Unused never
In use
                                                         Grace 119D 20H
                                                         Grace 109D 1H
```

16. Make sure that all I/O modules are online and that the standby supervisor is in HA-standby mode by using the show module command.

The following is a sample output for the show module command on the Supervisor-4 Module:

switch Mod Po	# show module orts Module- ⁻	Гуре	Model	Status
1 41 2 41 5 0 6 0 7 24 8 41 9 41 Mod	8 4/8/16/32 Gbps Ad 8 2/4/8/10/16 Gbps Supervisor Module Supervisor Module 4 40 Gbps FCoE Module 8 1/10 Gbps Etherne 8 1/10 Gbps Etherne Sw Hw	dvanced FC Module Advanced FC Module e-4 ule et Module et Module	DS-X9648-1536K9 DS-X9448-768K9 DS-X97-SF4-K9 DS-X97-SF4-K9 DS-X9824-960K9 DS-X9848-480K9 DS-X9848-480K9	ok ok ha-standby active * ok ok ok ok
1 2 5 6 7 8 9 Mod	8.4(1) 1.0 8.4(1) 2.0 8.4(1) 1.0 8.4(1) 1.0 8.4(1) 1.0 8.4(1) 1.1 8.4(1) 1.1 MAC-Address(es)		Serial-Num	
1 2 3 4 5 6 7 8 10 Mod	78-ba-f9-c4-c9-88 to f0-78-16-c6-20-6c to f0-78-16-c6-73-6c to 1c-df-0f-78-4e-88 to 00-b8-b3-ee-60-bc to 00-b8-b3-ee-67-d8 to 80-e8-6f-f8-1a-84 to 28-52-61-d6-30-20 to 00-d6-fe-b1-c0-aa to 0nline Diag Status	<pre>0 78-ba-f9-c4-c9-8b 0 f0-78-16-c6-20-6f 0 f0-78-16-c6-73-6f 0 1c-df-0f-78-4e-8b 0 00-b8-b3-ee-60-cf 0 00-b8-b3-ee-67-eb 0 80-e8-6f-f8-1a-87 0 28-52-61-d6-30-54 0 00-d6-fe-b1-c0-de</pre>	JAE192008R8 JAE192008S9 JAE192901GT JAE170407ZK JAE22350LYE JAE22350LY2 JAE192901GS JAE204207SM JAE2234039S	
1 2 3 4 5 6 7 8 10 Yhar P	Pass Pass Pass Pass Pass Pass Pass Pass	Model	Status	
	ype		5Lalus	
1 0 2 0 3 0 4 0 5 0 6 0 Xbar S	Fabric module 1 Fabric module 1 Fabric module 1 Fabric Module 1 Fabric module 1 Fabric module 1 Sw Hw	DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1 DS-X9710-FAB1	ok ok ok ok ok ok	
1 2 3 4 5 6 Xbar	NA 1.0 NA 1.0 NA 1.0 NA 1.0 NA 1.0 NA 1.0 NA 1.0 MAC-Address(es)	Serial-Num		
1 2 3 4 5 6	NA NA NA NA NA NA	JAE1644063E JAE1644063I JAE16410AS2 JAE182408ZW JAE1644061K JAE1710088N		

17. Restore the previously saved configurations by using the **copy** command to copy the configuration file in the USB drive to the running configuration.

switch(config)# opy usb1:configuration_file_name running-config

Note : If you have not inserted the standby supervisor module until now, do not insert it during this step. Instead, wait until you complete this procedure before installing the standby supervisor module.

18. Save the configuration in the startup configuration by using the **copy running-config startupconfig** command.

```
switch(config)# copy running-config startup-config
```

Installing a Switching Module

About this task

Use this procedure to install a switching module in the chassis.

Procedure

- 1. Before installing any modules in the chassis, we recommend installing the chassis in the rack. See the Installing the <u>"Installing the SAN384C-6 or SAN768C-6 Device on a Four-Post Rack or Cabinet" on page 66</u>.
- 2. Before installing any switching modules, install at least one supervisor module.
- 3. Choose a slot for the module and verify that there is enough clearance to accommodate any cables or interface equipment that you want to connect to the module. If possible, place modules between empty slots that contain filler panels.
- 4. Verify that the captive screws are tightened to 8 in-lb on all modules already installed in the chassis. This ensures that the EMI gaskets are fully compressed and maximizes the opening space for the module being installed.
- 5. If a filler panel is installed, remove the two Phillips pan-head screws from the filler panel and remove the panel. To remove a currently installed module, see the <u>"Removing a Switching Module" on page</u> 114.
- 6. Press line card ejector buttons to open both side levers to fully open position.
- 7. Position the module in the chassis as follows:
 - a) Align the line card into the chassis card cage slots and push it in slowly. It is recommended to push the center of line card face plate to push the line card in.
 - b) Continue to push in the line card slowly into the chassis until its rear connectors touch the midplane surface and both ejector levers swing inward about 25 degrees. This indicates that the both ejector lever jaws are now inside the chassis jaw cutouts and the card is ready to close the ejector levers.
 - c) Once visually confirmed that both ejector levers are swung inward about 25 degrees, push in both ejector levers simultaneously to fully insert the line card into the chassis until they are in a mechanically locked position. Both ejector levers should be parallel to the line card face plate when locked.

Note : Ensure that the ejector levers are fully closed before tightening the captive screws. Failure to fully seat the module in the backplane connector can result in error messages.

d) Tighten the two captive screws on the supervisor module or switching module to 8 in-lb.

Removing a Switching Module

Before you begin

Note : You need a flat-blade or number 2 Phillips-head screwdriver to loosen or tighten the captive screws on the switching module.

About this task

You can remove one of these modules at a time while the switch is operating. Use this procedure to remove a switching module from the chassis.

Procedure

- 1. Disconnect any network interface cables attached to the module.
- 2. Loosen the two captive screws on the module being removed.
- 3. Press ejector release buttons on the left and right ends of the module to push out the ejector levers and to disconnect the module.
- 4. Simultaneously rotate the two ejector levers outward to unseat the module from the mid-plane connector.
- 5. With a hand on each ejector, pull the module part way out of its slot in the chassis.
- 6. Grasp the front edge of the module and slide the module partially out of the slot. Place your other hand under the module to support the weight of the module. Do not touch the module circuitry.
- 7. Place the module on an antistatic mat or antistatic foam, or immediately reinstall it in another slot.
- 8. If the slot will remain empty, install a filler panel to keep the chassis dust-free and to maintain proper airflow through the chassis.

Verifying Installation of the Supervisor and Switching Modules

About this task

To verify the module installation, complete the following steps:

Procedure

- 1. Verify that the ejector levers of each module are fully closed (parallel to the front of the module) to ensure that the supervisor module and all switching or services modules are fully seated in the backplane connectors.
- 2. Check the captive screws of each module, the power supply, and the fan module. Tighten any loose captive screws to 8 in-lb.
- 3. Verify that any empty module slots have filler panels installed and that the screws holding the panels in place are tight.
- 4. Turn on the power supply switches to power up the system and check the LEDs on the modules.

Note : For information about how to check connectivity of modules, see the *Cisco NX-OS Fundamentals Configuration Guide*.

Installing and Removing a Crossbar Fabric Module

This section includes the following topics:

- "Installing and Removing a Crossbar Fabric Module" on page 114
- "Installing a Crossbar Fabric Module" on page 115
- "Removing a Crossbar Fabric Module" on page 116

Guideline for Installing a Cross Bar Fabric Module

Note : We recommend that you follow this guideline while installing the cross bar fabric module.

Depending on the number of the crossbar fabric modules in the chassis configuration, the following slot number should be assigned on the IBM c-type SAN Device :

Number of Crossbar Fabric Modules	Slots Number
2	1 and 2
3	1, 3, and 5
4	1, 2, 3, and 5
5	1, 2, 3, 4, and 5
6	1, 2, 3, 4, 5, and 6

Note :

In an IBM c-type chassis with the 24/10-Port SAN Extension Module, the chassis must have at least one online crossbar fabric switching module in the slots 1 to 5 at any point of time

In an IBM c-type chassis with the 24/10-Port SAN Extension Module, if crossbar (xbar) fabric switching modules 5 and 6 are online, and you want to power down or replace module 6 nondisruptively, you have to power down/out-of-service xbar module 5 first, followed by power down/out-of-service and replace the xbar module 6.

Installing a Crossbar Fabric Module

Before you begin

You must follow ESD protocols, including the following:

- 1. You must wear a grounded ESD wristband (or other personal grounding device) whenever you handle the electronic modules outside the grounded chassis.
- 2. You must carry electronic modules by only their covered edges or handles. Do not touch their electronic components.
- 3. Whenever a module is outside a grounded chassis, place it flat on an antistatic surface or in an antistatic bag. Never lean the module on anything nor place anything else on top of the module nor lean anything on the module.
 - Verify that the chassis is grounded.
 - Verify that you have the following tools and equipment:
 - a. ESD wrist strap (or other personal grounding device).
 - b. Number 1 Phillips torque screwdriver.
 - c. Manual torque screwdrivers are recommended. Be sure to never exceed the recommended torque setting for the screw that you are working with.
 - Ensure that sufficient quantity of Crossbar Fabric-3 Switching Modules (6 modules are supported in a IBM SAN c-type Director switches) are available for replacing the current Crossbar Fabric Switching Modules in the switch.

About this task

To install a crossbar module in the IBM c-type SAN Device, follow these steps:



Warning :

It is not supported to mix different crossbar fabric switching modules (Crossbar Fabric-1 Switching Module and Crossbar Fabric-3 Switching Module) outside a maintenance window. This mix of modules is supported only while you are migrating from Fabric-1 modules to Fabric-3 modules. After a reboot of the switch, if there is a mix of Fabric-1 and Fabric-3 modules, only the Fabric-3 modules will be powered on.



Warning :

Ensure that there is no loose debris (such as paper, ties, dust) around the back of the chassis when the crossbar switching modules are being removed. When the crossbar switching modules are pulled, the vacuum created can be strong enough to pull the loose debris into the chassis.

Procedure

- 1. Before installing any modules, install at least one Supervisor-1 module.
- 2. Remove the fan module that is over the crossbar fabric module to be removed. For more information on how to remove a fan module, see "Removing a Crossbar Fabric Module" on page 116
- 3. Open both ejector levers on the new or replacement module completely by pressing on the ejector release buttons located at the middle of the module.



CAUTION : You must allow enough space for the ejector levers to open 90 degrees to avoid potential injury.

- 4. Position the module in the chassis as follows:
 - a) Position the module in the slot. Rest the module on the chassis and ensure that the module is within the slot guides.
 - b) Push the center of module face plate to slide the module inside the slot.
 - c) Keep pushing in the module slowly into the chassis until its rear connectors touch the mid-plane surface. Visually inspect if the ejector claw is within the U channel bracket inside the chassis.
 - d) After the ejector jaw is in the correct position, grasp the ejector levers and rotate them simultaneously inward until the ejector levers are flush with the face plate.



CAUTION : Be careful not to pinch your fingers as the ejector levers are rotating into locking position.

- e) While pressing down, simultaneously close the ejector levers to completely seat the module in the midplane connector. The ejector levers are completely closed when they are flush with the front of the module.
- 5. Install the fan module that you removed earlier. For more information on how to install a fan module, see "Installing and Removing Fan Modules" on page 123.

Removing a Crossbar Fabric Module

About this task

To remove a crossbar module from the IBM c-type SAN Device without compromising the integrity and availability of SANs, follow these steps:

Procedure

- 1. Shut down the crossbar fabric module by using the out-of-service xbarslot command (where *slot* refers to the external crossbar fabric module slot number).
- 2. Remove the fan module that is over the crossbar fabric module to be removed. For more information on how to remove a fan module, see "Installing and Removing Fan Modules" on page 123.

3. Press ejector release buttons located at the center of the crossbar module to push out the ejector levers and to disconnect the module from the backplane.



Warning : You must be cautious when the ejector levers swing open and stay open during installation and removal process.

- 4. With a hand on each ejector, pull the module part way out of its slot in the chassis.
- 5. Grasp the front edge of the module and slide the module partially out of the slot. Place your other hand under the module to support the weight of the module. Do not touch the module circuitry.
- 6. Place the module on an antistatic mat or antistatic foam, or immediately reinstall it in another slot.

Nondisruptive Migration from Crossbar Fabric-1 Switching Modules to Crossbar Fabric-3 Switching Modules

This section describes the steps required to migrate all the Crossbar Fabric-1 Switching Modules to Crossbar Fabric-3 Switching Modules for the IBM SAN384C-6 and SAN768C-6 Directors.

This section includes the following topics:

- <u>"Requirements" on page 117</u>
- "Components used" on page 117
- "Prerequisites" on page 117
- "Migration procedure" on page 118
- <u>"Verification" on page 120</u>
- "Recovery procedure" on page 120
- <u>"Troubleshooting" on page 121</u>

Note : Before you install, operate, or service the system, read the *IBM Systems Safety Notices* for important safety information.

Requirements

It is recommended that you have knowledge of the NX-OS operating system CLI.

Components used

The information in this document is based on the following software and hardware versions:

- SAN384C-6 Director or a SAN192C-6 Director with NX-OS Release 8.4(1)
- SAN384C-6 Crossbar Fabric-3 Switching Module. For SAN192C-6, it is SAN192C-6 Crossbar Fabric-3 Switching Module.
- SAN384C-6 Crossbar Fabric-1 Switching Module. For SAN192C-6, it is SAN192C-6 Crossbar Fabric-1 Switching Module.

Prerequisites

- Ensure that the switch (SAN192C-6 and SAN384C-6 Switch) has software release version Cisco NX-OS Release 8.4(1) or later. On SAN768C-6 Multilayer Director Switch, ensure that the switch is running on Cisco NX-OS Release 8.4(2a) or later. To upgrade an image version on the switch, refer the Cisco 9000 NX-OS Software Upgrade and Downgrade Guide, Release 8.x guide.
- When the SAN384C-6 or SAN192C-6 chassis has 6 x Crossbar Fabric-1 Switching Modules installed, you must migrate a minimum of 3 x Crossbar Fabric-1 Switching Modules to Crossbar Fabric-3 Switching Modules, and remove the remaining 3 x Crossbar Fabric-1 Switching Modules to support full bandwidth to 32-Gbps fiber channel switching modules.

- You must follow ESD protocols, including the following:
 - You must wear a grounded ESD wristband (or other personal grounding device) whenever you handle the electronic modules outside the grounded chassis.
 - You must carry electronic modules by only their covered edges or handles. Do not touch their electronic components.
 - Whenever a module is outside a grounded chassis, place it flat on an antistatic surface or in an antistatic bag. Never lean the module on anything nor place anything else on top of the module nor lean anything on the module.
- Verify that the chassis is grounded.
- Verify that you have the following tools and equipment:
 - ESD wrist strap (or other personal grounding device).
 - Number 1 Phillips torque screwdriver.
 - Manual torque screwdrivers are recommended. Be sure to never exceed the recommended torque setting for the screw being used.
- Ensure that sufficient quantity of Crossbar Fabric-3 Switching Modules (6 modules are supported in a SAN384C-6, or SAN192C-6 Multilayer Director) are available for replacing the current Crossbar Fabric-1 Switching Modules in the switch.



Warning : Mixing different crossbar fabric switching modules (Crossbar Fabric-1 Switching Module and Crossbar Fabric-3 Switching Module) outside a maintenance window, is not supported. This mix of modules is supported only while you are migrating from Crossbar Fabric-1 Switching Modules to Crossbar Fabric-3 Switching Modules. After a reboot of the switch, if there is a mix of crossbar Fabric-1 Switching Modules and Crossbar Fabric-3 Switching Modules, only the Crossbar Fabric-3 Switching Modules will be powered on.

Migration procedure

About this task

The migration process should be performed during schedule maintenance period only.

Notes :

- Backward migration procedure (migrating from Crossbar Fabric-3 Switching Module to Crossbar Fabric-1 Switching Module) will be disruptive.
- Perform the Crossbar Fabric-1 Switching Module to Crossbar Fabric-3 Switching Module migration after the Supervisor-1 to Supervisor-4 Module migration is completed. A mix mode of Crossbar Fabric-1 Switching Modules with Supervisor-4 Modules and Crossbar Fabric-3 Switching Modules with Supervisor-1 Modules is not supported.
- Once the crossbar fabric switching modules migration process is initiated, wait for the migration process to complete, do not abort the process midway.

To migrate a SAN384C-6 or SAN192C-6 chassis from Crossbar Fabric-1 Switching Modules to Crossbar Fabric-3 Switching Modules, follow these steps:

Procedure

1. Shut down the crossbar fabric switching module by using the out-of-service xbar slot command (where slot refers to the external crossbar fabric switching module slot number).

Note : If the Crossbar Fabric-1 Switching Modules are not installed in the recommended slots, when you migrate to the Crossbar Fabric-3 Switching Modules, install the new modules in the recommended
slots as described in the Guidelines for Crossbar Fabric Switching Module Installation, page 3-110, section.

For example, if you are migrating the Crossbar Fabric-1 Switching Modules from the slots 1, 2, 3 and 4, insert the Crossbar Fabric-3 Switching Modules in slots 1, 2, 3, and 5.

The following example lists the sequence to replace the Crossbar Fabric-1 Switching Modules with the Crossbar Fabric-3 Switching Modules, when the existing modules are not in the recommended slots:

switch# show module xbar

Xbar	Ports	Module-Type	Model	Status
1	0	Fabric Module 1	DS-X9710-FAB1	ok
2	0	Fabric Module 1	DS-X9710-FAB1	ok
3	0	Fabric Module 1	DS-X9710-FAB1	ok
4	0	Fabric Module 1	DS-X9710-FAB1	ok

- a) Shut down the Crossbar Fabric-1 Switching Module in slot 1, using the out-of-service xbar slot command.
- b) Remove the fan module 1 over the Crossbar Fabric-1 Switching Module in the slot 1.
- c) Physically remove and replace the Crossbar Fabric-1 Switching Module in slot 1 with the Crossbar Fabric-3 Switching Module in the slot 1.
- d) Install the fan module 1 over the Crossbar Fabric-3 Switching Module in slot 1.
- e) Shut down the Crossbar Fabric-1 Switching Module in slot 3, using the out-of-service xbar slot command.
- f) Remove the fan module 2 over the Crossbar Fabric-1 Switching Module in the slot 3.
- g) Physically remove and replace the Crossbar Fabric-1 Switching Module in slot 3 with the Crossbar Fabric-3 Switching Module in the slot 3.
- h) Install the fan module 2 over the Crossbar Fabric-3 Switching Module in slot 1.
- i) Remove the fan module 3 over the slot 5.
- j) Insert the Crossbar Fabric-3 Switching Module in slot 5.
- k) Install the fan module 3 over the Crossbar Fabric-3 Switching Module in slot 5.
- l) Follow Steps <u>"1.a" on page 119</u> to <u>"1.d" on page 119</u> to replace the Crossbar Fabric-1 Switching Module in slot 2.
- m) Shut down the Crossbar Fabric-1 Switching Module in slot 4, using the out-of-service xbar slot command.
- n) Remove the fan module 2 over the Crossbar Fabric-1 Switching Module in the slot 4.
- o) Remove the Crossbar Fabric-1 Switching Module in slot 4.
- p) Install the fan module 2 over the slot 4.
- 2. Remove the fan module that is over the crossbar fabric switching module to be removed. Fan modules 1 to 3 are numbered left to the right. When the fan modules are installed, they cover the crossbar fabric switching modules.

Crossbar fabric switching modules are numbered 1-6, from left to right, when facing the rear of the chassis. If the system is running, remove only one fan module at a time to access the required crossbar fabric switching module. You can use the **locator-led xbar xbar-number** command to turn on the locator LED to assist in the fabric module identification. The positioning of the fan modules and respective crossbar fabric switching modules is as follows: For more information on how to remove a fan module, see "Removing a Fan Module " on page 124

- 3. Remove the Crossbar Fabric-1 Switching Module from the chassis and replace it with the Crossbar Fabric-3 Switching Module. For more information on how to remove and install a crossbar fabric switching module, see "Installing and Removing a Crossbar Fabric Module" on page 114.
- 4. Reinstall the fan module that you removed in Step 2. For more information on how to install a fan module, see <u>"Installing a Fan Module" on page 124</u>.

5. Wait till the first replaced crossbar fabric switching module is up, follow the same procedure for all the remaining crossbar fabric switching modules. Ensure that the temperature of the chassis is normal, after each crossbar fabric module replacement. Use the show environment temperature command to view the current temperature. Perform this task sequentially for all the modules (1,2, 3, 4, 5 and 6). Perform Step 1 to Step 4 for the other modules. The latest inserted crossbar fabric switching modules will come up.

Note : If a Crossbar Fabric-3 Switching Module migration fails, we recommend that you continue the migration process with the remaining other Crossbar Fabric-3 Switching Modules. Ensure to replace the faulty Crossbar Fabric-3 Switching Module immediately with a new one to achieve full line rate bandwidth.

Verification

.

Use the **show module xbar** command to verify the module type and module status.

switch # Xbar	Ports	Module-Type	Model	Status
1 2 3 4 5 6	0 0 0 0 0 0 0	Fabric Module 3 Fabric Module 3 Fabric Module 3 Fabric Module 3 Fabric Module 3 Fabric Module 3 Fabric Module 3	DS-X9710-FAB3 DS-X9710-FAB3 DS-X9710-FAB3 DS-X9710-FAB3 DS-X9710-FAB3 DS-X9710-FAB3 DS-X9710-FAB3	ok ok ok ok ok ok ok
Xbar	Sw	Hw		
1 2 3 4 5 6	NA NA NA NA NA NA	1.0 1.0 1.0 1.0 1.0 1.0 1.0		
Xbar	MAC-A	Address(es)	Serial-Num	
1 2 3 4 5 6	NA NA NA NA NA		JAE1710088N JAE2217096Y JAE222305V1 JAE222305VE JAE222305V9 JAE222305V8	

To view the inventory information for modules from the DCNM Web UI, **Choose Inventory** > **View** > **Modules**. The Modules window is displayed with a list of all the switches and its details for a selected scope.

For more information, see the DCNM SAN Management Configuration Guide.

Recovery procedure

This section describes the steps needed to downgrade from Crossbar Fabric-3 Switching Modules to Crossbar Fabric-1 Switching Modules if there are issues with the Crossbar Fabric-3 Switching Modules upgrade.

Scenario 1

If a chassis is running in a mixed mode (both Crossbar Fabric-1 Switching Modules and Crossbar Fabric-3 Switching Modules in OK state), then reverse the installation process and replace the Crossbar Fabric-3 Switching Modules one-by-one with Crossbar Fabric-1 Switching Modules. As long as at least one Crossbar Fabric-1 Switching Module is online, replacing Crossbar Fabric-3 Switching Modules with Crossbar Fabric-1 Switching Modules can be done nondisruptively. Do not remove any further Crossbar Fabric-1 Switching Modules. If all the Crossbar Fabric-1 Switching Modules are removed or are in powered down state, then the downgrade will be disruptive.

Scenario 2

If a chassis is loaded with all six Crossbar Fabric-3 Switching Modules, then reinstalling the Crossbar Fabric-1 Switching Modules will be disruptive. Power down the switch and manually replace the Crossbar Fabric-3 Switching Modules with Crossbar Fabric-1 Switching Modules, and then power up the switch.

Troubleshooting

If the migration procedure fails, downgrade the Crossbar Fabric-3 Switching Modules to Crossbar Fabric-1 Switching Modules.

Installing and Removing a Power Supply

You can follow the same steps to install AC and DC power supplies into the switch, but you ground them differently. For an AC power supply, you automatically ground it when you connect its power cable to the power supply and the power source. For a 3-kW DC power supply, you do not directly connect the power supply to the earth ground.

For more information on the supported power modes, power slots and power redundancy for IBM c-type Family Switches, <u>"Power Supplies" on page 39</u>.

This section provides the following information:

- "Installing an AC Power Supply" on page 121
- "Connecting an AC Power Supply to an AC Power Source" on page 122
- "Removing an AC Power Supply" on page 123

The switch chassis must be installed in a cabinet or rack that is secured to the data center.

You need the following tools and equipment:

- Nut driver attachment for Number 1 Phillips-head screwdriver or ratchet wrench with torque capability (used only for DC power supplies).
- Crimping tool.
- For 3-kW DC power supplies, you need four power cables sized to reach the DC power source or power interface unit (PIU).
- Grounding wire—Size this wire to meet local and national installation requirements. For U.S.installations, you must use a 6 AWG copper conductor. For installations outside the U.S., consult your local and national electrical codes. The length of the grounding wire depends on the proximity of the switch to proper grounding facilities.
- A flat-blade or number 2 Phillips-head screwdriver is required to perform these procedures.



Warning : Voltage is present on the backplane when the system is operating. To reduce risk of an electric shock, keep hands and fingers out of the power supply bays and backplane areas.



Warning : Power supply captive installation screws must be tight to ensure protective grounding continuity.



CAUTION: Each AC power supply for the IBM c-type SAN Device weighs 6 lb (2.7 kg).

Installing an AC Power Supply

About this task



CAUTION : Use both hands to install and remove power supplies. Each AC power supply weighs up to 6 lb (2.7 kg).

To install an AC power supply in the IBM c-type SAN Device, follow these steps:

Procedure

- 1. Ensure that the system (earth) ground connection has been made. See the <u>"System Grounding" on page 75</u>.
- 2. If a filler panel is installed, remove the filler panel from the power supply bay by loosening the captive screw.
- 3. Ensure that the power switch is in the off (0) position on the power supply you are installing.
- 4. Grasp the power supply handle with one hand, place your other hand underneath the power supply, and slide the power supply into the power supply bay. Ensure that the power supply is fully seated in the bay.
- 5. Plug the power cable into the power supply, and place the cable retention device to ensure that the cable cannot be pulled out.
- 6. Connect the other end of the power cable to an AC power source.
- 7. Turn the power switch to the on (|) position on the power supply. Turning the power switch on also locks the power supply in the bay.
- 8. Verify power supply operation by checking that the power supply LEDs are in the following states:
 - Input OK LED is IN.
 - Output Fail LED is Fault.
 - ID LED is blue.

Connecting an AC Power Supply to an AC Power Source

Use one power cord to connect a 3-kW power supply to an AC power source and to ground the power supply. Depending on the software power mode configured on the switch, either connect all of the power supplies to one AC power source (grid) or half of the power supplies to the first independent AC power source (Grid A) and the other half to a second independent AC power source (Grid B). A summary of the grid requirements of each software power mode is shown in the <u>Table 15 on page 122</u>.

Table 15. Software Power Mode Grids Required			
Combined	Power Supply Redundancy	Input Source Redundancy	Full Redundancy
1	1	2	2

For information about the software power configuration modes, refer to the "Supported Transceivers".

For information about the location of Grid A and Grid B power supply slots for each type of MDS 9700 Director chassis, refer to the chassis specific information at:

- Cisco MDS 9718 Chassis Front View
- Cisco MDS 9710 Chassis Front View
- Cisco MDS 9706 Chassis Front View

Before you connect a chassis power supply to an AC power source, ensure all of the following:

- There is a vacant receptacle on the AC power source within reach of the chassis power supply cable.
- The power supply is already installed in the chassis.
- The chassis is connected to an earth ground.

Note :

In a single phase AC power supply unit, connection of multiple phases from the same three-phase source is supported and direct connection of three-phase is not supported.

To connect a 3-kW AC power supply directly to an AC power source, follow these steps:

1. Ensure that the power supply switch located on the front of the power supply is set at standby (labeled as 0).

- 2. Plug one AC power cable into the power supply, and pull down the retention clip over the plug on the power cable.
- 3. Plug the other end of the power cable into a AC power source supplied by the data center.



Warning : To reduce risk of electric shock and fire, take care when connecting units to the supply circuit so that wiring is not overloaded. Statement 1018.



Warning : This product relies on the building's installation for short-circuit (over current) protection. To reduce risk of electric shock or fire, ensure that the protective device is rated not greater than: 250V, 20 A. Statement 1005.

- 4. Turn the power supply switch from standby to on (from 0 to 1 as labeled on the power switch).
- 5. Verify that the power supply is receiving AC power and outputting DC power by making sure that the INPUT and OUTPUT power supply LEDs are lit and the FAULT LED is not lit or flashing. For an explanation of all the power supply LEDs and the conditions that they indicate

Note : When you first activate the power supply, you can verify the functionality of the LEDs by checking that each LED turns on for a couple of seconds.

If the Fault LED is flashing red, turn the power switch to standby (labeled as 0), check the AC power connections on the power supply and the AC power source, and then turn the power switch back on (labeled as 1). The Input and Output LEDs for the connected power supplies should be green and the Fault LED should be off.

Removing an AC Power Supply

About this task

Warning : Voltage is present on the backplane when the system is operating. To reduce risk of an electric shock, keep hands and fingers out of the power supply bays and backplane areas.

To remove an AC power supply from the IBM c-type SAN Device, follow these steps:

Procedure

- 1. Turn the power switch on the power supply to the off (0) position.
- 2. Disconnect the power cable from the power source.
- 3. Press the release lever latch on the power module.
- 4. Release the power cable spring latch retainer.
- 5. Grasp the power supply handle with one hand, and slide the power supply partially out of the chassis. Place your other hand underneath the power supply, and slide the power supply completely out of the chassis.

Note: Each AC power supply weighs between 6 lb (2.7 kg).

6. If the power supply bay is to remain empty, install a power supply filler panel over the opening, and tighten the captive screw to 8 in-lb.

Installing and Removing Fan Modules

The fan module is designed to be removed and replaced while the system is operating without presenting an electrical hazard or damage to the system, provided the replacement is performed promptly.

The IBM c-type SAN Devices have three fan modules. Each fan module for the SAN384C-6 Director has four individual fans and each fan module for the SAN192C-6 Director has two individual fans with an abrupt stop-to-fan rotation safety feature after power is disconnected or the fan module is removed from the mid-plane.



CAUTION : The IBM c-type SAN switches and devices have internal temperature sensors that can shut down the system if the temperature at different points within the chassis exceed certain safety thresholds. To be effective, the temperature sensors require the presence of airflow;

therefore, if a fan module is removed from the chassis, the IBM c-type SAN switches and devices will be shut down to prevent potentially undetectable overheating. However, the switches will be shut down sooner if the higher-level temperature threshold is exceeded. In normal data center conditions, if one fan module fails or needs to be removed, the other two fan modules can cool the system effectively for up to 72 hours.

This section includes the following topics:

- "Installing a Fan Module" on page 124
- "Removing a Fan Module " on page 124

Installing a Fan Module

About this task

To install a fan module on the IBM c-type SAN Device, follow these steps:

Procedure

- 1. Hold the fan module so that the Fan Status LED is at the bottom.
- 2. Place the fan module into the rear chassis cavity so that it rests on the chassis. Gently push the fan module into the chassis and the guide pin will self-align to the top and bottom chassis matching slots. After fully engaged, tighten the captive screws to 5 in-lb to secure fan module to chassis. The fan module will just snap in.
- 3. If the switch is powered on, listen for the fans; you should immediately hear them operating. If you do not hear them, ensure that the fan module is inserted completely in the chassis and the outside surface of the fan module is flush with the outside surface of the chassis.
- 4. Verify that the Fan Status LED is green. If the LED is not green, one or more fans are faulty. If this occurs, contact your customer service representative for a replacement part.

Removing a Fan Module

About this task

Warning : When removing the fan module, keep your hands and fingers away from the spinning fan blades. Let the fan blades completely stop before you remove the fan module.

To remove the fan module from the IBM c-type SAN Device, follow these steps:

Procedure

- 1. Loosen the four captive screws on the module being removed.
- 2. Grasp the handles of the fan module with both hands and pull it outward to unseat the power connector from the backplane.
- 3. Pull the fan module fully out of the chassis.

Starting Up the Switch

This section provides the following information:

- "Verifying Component Installation" on page 125
- "Powering Up the Switch" on page 125



Warning : Hazardous voltage or energy is present on the backplane when the system is operating. Use caution when servicing.



CAUTION : During this procedure, wear grounding wrist straps to avoid ESD damage to the switch.

Note : The 3000-W power supplies provide power according to the input voltage. If they are in redundant rather than combined mode at 110 VAC, they may be unable to provide adequate power to all modules present in the system. See Appendix A, "Product Specifications," on page 135.

Verifying Component Installation

About this task



Warning : Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.

Note : Do not connect the MGMT 10/100 Ethernet port to the LAN until the initial switch configuration has been performed. For instructions on configuring the switch, see the *NX-OS Fundamentals Configuration Guide*.

For instructions on connecting to the console port, see "Connecting to the Console Port" on page 127.

To verify hardware operation, follow these steps:

Procedure

- 1. Verify that the face plates of all modules are flush with the front of the chassis, and the ejector levers are fully closed and approximately parallel to the faceplate of the module.
- 2. Verify that any empty module slots have filler panels installed.
- 3. Verify that power supplies and the fan module are installed.
- 4. Check the power cable retainer of the power supplies, captive screws of fan module, and all supervisor, switching, or services modules, and tighten any retaining screws to specification.
- 5. Ensure that the switch is adequately grounded as described in <u>"System Grounding" on page 75</u>, and that the power cables are connected to outlets that have the required AC power voltages. See <u>Appendix A</u>, "Product Specifications," on page 135, for the required voltages.
- 6. Power on the switch by turning the power switches on the power supplies or PEMs to the on (|) position or restoring power to the DC circuit, as required. The switch boots automatically.

Powering Up the Switch

Before you begin

Complete the steps in "Verifying Component Installation" on page 125 before powering up the switch.

About this task

To power up the switch, follow these steps:

Procedure

- 1. Power on the switch by turning the power switches on the power supplies or PEMs to the on (|) position or restoring power to the DC circuit, as required. The switch boots automatically.
- 2. Listen for the fans; they should begin operating as soon as the switch is powered on.



CAUTION : Do not operate the switch without a functioning fan module except during the brief fan module replacement procedure. The IBM c-type SAN switches and devices can operate for only a few minutes without a functioning fan module before they begin to overheat.

- 3. After the switch has finished booting, verify that the LED operations is as follows:
 - Fan module Status LED is green.
 - Power supplies:
 - Input OK LED is IN.
 - Output Fail LED is Fault.
 - Supervisor and switching modules:
 - The System LED on the supervisor module is green, indicating that all chassis environmental monitors are reporting that the system is operational. If this LED is orange or red, one or more environmental monitor is reporting a problem.
 - The Status LED on the switching modules flashes orange once, remains orange during diagnostic boot tests, and then turns green when the module is operational (online). If the system software cannot start up, this LED remains orange or turns red.

Note : Contact IBM Support for technical support.

- 4. Verify that the system software has booted and the switch has initialized without error messages. If you cannot resolve an issue, contact your customer service representative.
- 5. Complete the worksheets provided in <u>Appendix C, "Site Planning and Maintenance Records," on page</u> 159, for future reference.

Note : A setup utility automatically launches the first time you access the switch and guides you through the basic configuration. For instructions about how to configure the switch and check module connectivity, see the *Cisco NX-OS Fundamentals Configuration Guide* or the *Cisco Fundamentals Configuration Guide for DCNM SAN*.

Chapter 4. Connecting the IBM c-type SAN Director

This chapter includes the following sections:

- "Connection Guidelines" on page 127
- "Preparing for Network Connections" on page 127
- "Connecting to the Console Port" on page 127
- "Connecting to the MGMT 10/100/1000 Ethernet Port" on page 128
- "Connecting to a Fibre Channel Port" on page 129

Connection Guidelines

The IBM c-type SAN Director provides the following types of ports:

- Console port (supervisor modules) An RS-232 port that you can use to create a local management connection.
- MGMT 10/100/1000 Ethernet port (supervisor module) An Ethernet port that you can use to access and manage the switch by IP address, such as through the Data Center Network Manager (DCNM).
- Fibre Channel ports (switching modules) Fibre Channel (FC) ports that you can use to connect to the SAN or for in-band management.

The IBM c-type SAN Director has two USB drives (in each Supervisor-1 module). A simple USB interface that allows you to connect to different devices supported by NX-OS. In the supervisor module, there are two USB drives, Slot 0 and LOG FLASH. The LOG FLASH and Slot 0 USB ports use different formats for their data.



CAUTION :

When running power and data cables in overhead or sub floor cable trays, we strongly recommend that power cables and other potential noise sources be located as far away as is practical from network cabling that terminates on IBM equipment. In situations where long parallel cable runs cannot be separated by at least 3.3 ft (1 m), we recommend shielding any potential noise sources by housing them in a grounded metallic conduit.

Preparing for Network Connections

When preparing your site for network connections to the IBM c-type SAN Director, consider the following for each type of interface, and obtain all of the required equipment before connecting the ports:

- Cabling required for each interface type
- Distance limitations for each signal type
- · Additional interface equipment required

Connecting to the Console Port

About this task

The console port, labeled Console, is an RS-232 port with an RJ-45 interface. It is an asynchronous (async) serial port; any device connected to this port must be capable of asynchronous transmission.

This port must be used to initially configure the management IP address and other parameters before connecting the switch to the network for the first time.



CAUTION : The console port can be used to connect to a modem, however, we recommend using the COM1 port for this purpose. If you decide to connect the console port to a modem, do not

connect it while the switch is booting; connect either before powering the switch on or after the switch has completed the boot process.

You can use the console port to perform the following functions:

- Configure the SAN384C-6 from the CLI.
- Monitor network statistics and errors.
- Configure SNMP agent parameters.
- Download software updates.

Note : To connect the console port to a computer terminal, the computer must support VT100 terminal emulation. The terminal emulation software frequently an application such as HyperTerminal or Procomm Plus makes communication between the switch and computer possible during setup and configuration.

Use this procedure to connect the console port to a computer terminal.

Procedure

- 1. Configure the terminal emulator program to match the following default port characteristics: 9600 baud, 8 data bits, 1 stop bit, no parity.
- 2. Connect the supplied RJ-45 to DP-25 female adapter. We recommend that you use the adapter and cable provided with the switch.
- 3. Connect the console cable (a rollover RJ-45 to RJ-45 cable) to the console port or the RJ-45 to DP-25 adapter (depending on your computer) at the computer serial port.

Connecting to the MGMT 10/100/1000 Ethernet Port

About this task



CAUTION : To prevent an IP address conflict, do not connect the MGMT 10/100/1000 Ethernet port to the network until the initial configuration is complete. For more information, see the *Cisco NX-OS Fundamentals Configuration Guide*.

The Supervisor-1 module supports an auto-sensing MGMT 10/100/1000 Ethernet port (labeled MGMT 10/100/1000) and has an RJ-45 interface. You can use this port to access and manage the switch by IP address, such as through DCNM.

Follow these steps to connect the MGMT 10/100/1000 Ethernet port to an external hub, switch, or router.

Procedure

1. Connect the appropriate modular cable to the MGMT 10/100/1000 Ethernet port:

- Use a modular, RJ-45, straight-through UTP cable to connect the MGMT 10/100/1000 Ethernet port to an Ethernet switch port or hub.
- Use a cross-over cable to connect to a router interface.
- 2. Connect the other end of the cable to the device.

Note : For high availability, connect the MGMT 10/100/1000 Ethernet port on the active Supervisor-1 module and on the standby Supervisor-1 module to the same network or VLAN. The active supervisor module owns the IP address used by both Ethernet connections. On a switchover, the newly activated supervisor module takes over this IP address. This process requires an Ethernet connection to the newly activated supervisor module.

Connecting to a Fibre Channel Port

The Fibre Channel ports on the switching modules are compatible with LC-type fiber-optic. For information about configuring the switch for in-band management, see the *Cisco NX-OS Fundamentals Configuration Guide.*

The IBM SAN c-type Directors support both Fibre Channel protocols for SFP+ and QSFP+ transceivers. Each transceiver must match the transceiver on the other end of the cable, and the cable must not exceed the stipulated cable length for reliable communication. For information on how to get the list of supported SFP+ transceivers for your software release, see the *Release Notes for NX-OS*.



Warning : Class 1 laser product.



Warning : Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.



CAUTION : Wear an ESD wrist strap connected to the chassis when handling transceivers. Keep optical connectors covered when not in use, and do not touch connector ends. The fiber-optic connectors must be free of dust, oil, and other contaminants.

This section provides the following topics:

- "Removing and Installing SFP+ and QSFP+ Transceivers" on page 129
- "Maintaining SFP+ and QSFP+ Transceivers and Fiber-Optic Cables" on page 133

Removing and Installing SFP+ and QSFP+ Transceivers



CAUTION : Removing and installing an SFP+ or QSFP+ transceiver can shorten its useful life. Do not remove and insert SFP+ or QSFP+ transceivers more often than necessary. We recommend disconnecting cables before installing or removing these transceivers to prevent damage to the cable or transceiver.

Note : Use only Cisco SFP+ or QSFP+ transceivers on the IBM c-type SAN switches and directors. Each SFP+ or QSFP+ transceiver is encoded with model information that enables the switch to verify that the SFP+ or QSFP+ transceiver meets the requirements for the switch. For instructions specific to the transceiver type, see the <u>"SFP+ Transceiver Specifications" on page 144</u>

The IBM c-type SAN switches and directors support SFP+ and QSFP+ transceivers with the following two types of latching devices:

- Mylar tab latch (Figure 35 on page 129)
- Bale-clasp latch (Figure 36 on page 130)



Figure 35. SFP+ Transceiver with Mylar Tab Latch



Figure 36. SFP+ Transceiver with Bale-Clasp Latch

Removing an SFP+ or QSFP+ Transceiver

About this task

Use this procedure to remove an SFP+ or QSFP+ transceiver.

Procedure

1. Attach an ESD-preventive wrist strap and follow its instructions for use.

- 2. If a cable is installed in the transceiver:
 - a. Record the cable and port connections for later reference.
 - b. Press the release latch on the cable, grasp the connector near the connection point, and gently pull the connector from the transceiver.

c. Insert a dust plug into the cable end of the transceiver.



CAUTION : If the transceiver does not remove easily in the next step, push the transceiver all the way back in and then ensure that the latch is in the correct position before continuing.

- 3. Remove the transceiver from the port:
 - If the transceiver has a Mylar tab latch, gently pull the tab straight out (do not twist), and then pull the transceiver out of the port.
 - If the transceiver has a bale clasp latch, open the clasp by pressing it downwards, and then pull the transceiver out of the port.

Note : If you have difficulty removing a bale clasp SFP+ or QSFP+ transceiver, you should reseat the SFP+ or QSFP+ by returning the bale clasp in the up position. Then press the SFP+ or QSFP+ inward and upward into the cage. Next, lower the bale clasp and pull the SFP+ or QSFP+ straight out with a

slight upward lifting force (see Figure 37 on page 131). Be careful not to damage the port cage during this process.



Figure 37. Alternate Removal Method for Bale Clasp SFP+ or QSFP+ Transceivers

- 4. Insert a dust cover into the port end of the transceiver and place the transceiver on an antistatic mat or into a static shielding bag if you plan to return it to the factory.
- 5. If another transceiver is not being installed, protect the optical cage by inserting a clean cover.

Installing an SFP+ Transceiver

About this task

To install an SFP+ or QSFP+ transceiver, follow these steps:

Procedure

- 1. Attach an ESD-preventive wrist strap and follow its instructions for use.
- 2. Remove the dust cover from the port cage.
- 3. Remove the dust cover from the port end of the transceiver.
- 4. Insert the transceiver into the port:
 - If the transceiver has a Mylar tab, orient the transceiver with the tab on the bottom, and then gently insert the transceiver into the port until it clicks into place.
 - If the transceiver has a bale clasp, orient the transceiver with the clasp on the bottom, close the clasp by pushing it up over the transceiver, and then gently insert the transceiver into the port until it clicks into place.



CAUTION : If the transceiver does not install easily, ensure that it is correctly oriented and the tab or clasp are in the correct position before continuing.

Note : If you cannot install the cable into the transceiver, insert or leave the dust plug in the cable end of the transceiver.

Removing and Installing Cables into SFP+ or QSFP+ Transceivers



CAUTION : To prevent damage to the fiber-optic cables, do not place more tension on them than the rated limit and do not bend to a radius of less than 1 inch if there is no tension in the cable, or 2 inches if there is tension in the cable.

Removing a Cable from an SFP+ or QSFP+ Transceiver

About this task



CAUTION : When pulling a cable from a transceiver, grip the body of the connector. Do not pull on the jacket sleeve, because this can compromise the fiber-optic termination in the connector.

CAUTION : If the cable does not remove easily, ensure that any latch present on the cable has been released before continuing.

Use this procedure to remove the cable.

Procedure

- 1. Attach an ESD-preventive wrist strap and follow its instructions for use.
- 2. Press the release latch on the cable, grasp the connector near the connection point, and gently pull the connector from the transceiver.
- 3. Insert a dust plug into the cable end of the transceiver.
- 4. Insert a dust plug onto the end of the cable.

Installing a Cable into an SFP+ or QSFP+ Transceiver

About this task



CAUTION : To prevent possible damage to the cable or transceiver, install the transceiver in the port before installing the cable in the transceiver.

Use this procedure to install a cable into a transceiver.

Procedure

- 1. Attach an ESD-preventive wrist strap and follow its instructions for use.
- 2. Remove the dust cover from the connector on the cable.
- 3. Remove the dust cover from the cable end of the transceiver.
- 4. Align the cable connector with the transceiver and insert the connector into the transceiver until it clicks into place (see Figure 38 on page 132).



Figure 38. Connecting the LC-Type Cable to a Fibre Channel Port

CAUTION : If the cable does not install easily, ensure that it is correctly oriented before continuing.

For instructions on verifying connectivity, see the Cisco NX-OS Fundamentals Configuration Guide.

Maintaining SFP+ and QSFP+ Transceivers and Fiber-Optic Cables

SFP+ and QSFP+ transceivers and fiber-optic cables must be kept clean and dust-free to maintain high signal accuracy and prevent damage to the connectors. Attenuation (loss of light) is increased by contamination and should be below 0.35 dB.

Follow these maintenance guidelines:

- SFP+ and QSFP+ transceivers are static sensitive. To prevent ESD damage, wear an ESD-preventive wrist strap that is connected to the chassis.
- Do not remove and insert a transceiver more often than is necessary. Repeated removals and insertions can shorten its useful life.
- Keep all optical connections covered when not in use. If they become dusty, clean before using to prevent dust from scratching the fiber-optic cable ends.
- Do not touch ends of connectors to prevent fingerprints and other contamination.
- Clean regularly; the required frequency of cleaning depends upon the environment. In addition, clean connectors if they are exposed to dust or accidentally touched. Both wet and dry-cleaning techniques can be effective; refer to your site's fiber-optic connection cleaning procedure.
- Inspect routinely for dust and damage. If damage is suspected, clean and then inspect fiber ends under a microscope to determine if damage has occurred.

Appendix A. Product Specifications

This appendix provides technical specifications and includes the following sections:

- "Switch Specifications" on page 135
- "Power Specifications for the IBM c-type SAN Director" on page 138
- "SFP+ Transceiver Specifications" on page 144

Note : Specifications for cables and connectors are provided in <u>Appendix B</u>, "Cable and Port Specifications," on page 151.

Switch Specifications

- "SAN768C-6 Director Specification" on page 135
- "SAN384C-6 Director Specification" on page 135
- "SAN192C-6 Director Specification" on page 136

Table 16 on page 135 lists the environmental specifications for the IBM c-type SAN Directors.

Table 16. Specifications for the IBM c-type SAN Directors		
Description	Specification	
Temperature, certified for operation	32 to 104° F (0 to 40° C)	
Temperature, ambient non-operating and storage	40 to 158° F (û40 to 70° C)	
Humidity (RH), ambient (non-condensing) operating	10 to 90%	
Humidity (RH), ambient (non-condensing) non- operating and storage	10 to 95%	
Altitude, certified for operation	197 to 6500 ft (60 to 2000 m)	

SAN768C-6 Director Specification

Table 17 on page 135 lists the physical specifications for the SAN768C-6 Director Director.

Table 17. Specifications for the SAN768C-6 Director Director		
Description	Specification	
Dimensions (HxWxD)	26 rack units (26 RU) 45.25 x 17.3 x 35 in. (114.9 x 43.9 x 88.9 cm)	
Weight	Chassis (includes fans): 300 lb (136 kg)	
Airflow	700 (LFM) average system velocity and between 40 and 160 cubic feet per minute (CFM) total flow through each line-card slot depending on the line-card type and fan-speed setting	

SAN384C-6 Director Specification

Table 18 on page 136 lists the physical specifications for the SAN384C-6 Director.

Table 18. Specifications for the SAN384C-6 Director		
Description	Specification	
Dimensions (HxWxD)	14 rack units (14 RU) 24.35 x 17.3 x 34.0 in. (61.9 x 43.9 x 86.4 cm)	
Weight	Chassis (includes fans): 185.5 lb (84.2 kg)	
Airflow	700 (LFM) average system velocity and between 40 and 160 cubic feet per minute (CFM) total flow through each line-card slot depending on the line-card type and fan-speed setting	

SAN192C-6 Director Specification

Table 19 on page 136 lists the physical specifications for the SAN192C-6 Director.

Table 19. Specifications for the SAN192C-6 Director		
Description	Specification	
Dimensions (HxWxD)	9 rack units (9 RU) 15.6 x 17.3 x 32.0 in. (39.62 x 43.9 x 81.3 cm)	
Weight	Chassis (includes fans): 145 lb (65.8 kg)	
Airflow	700 (LFM) average system velocity and between 40 and 160 cubic feet per minute (CFM) total flow through each line-card slot depending on the line-card type and fan-speed setting	

Module Specifications

Table 20 on page 136 lists the specifications for the SAN c-type Supervisor-4 module.

Table 20. Supervisor-4 Module Specifications		
Description	Specification	
Environmental Requirements		
Temperature, certified for operation (module intake of ambient)	32 to 104° F (0 to 40° C)	
Temperature, ambient nonoperating and storage	-40 to 158° F (-40 to 70° C)	
Humidity (RH), ambient (noncondensing) operating	10 to 90%	
Altitude, designed and tested for operation	-197 to 6500 ft (-60 to 2000 m)	
Physical Characteristics		
Dimensions	2.04 x 8.07 x 23.5 in. (5.18 x 20.49 x 59.69 cm)	
Weight	7.7 lb (3.5 kg)	

Table 21 on page 136 lists the specifications for the SAN c-type Supervisor-1 module.

Table 21. Supervisor-1 Module Specifications		
Description Specification		
Environmental Requirements		

Table 21. Supervisor-1 Module Specifications(continued)		
Description	Specification	
Temperature, certified for operation (module intake of ambient)	32 to 104° F (0 to 40° C)	
Temperature, ambient nonoperating and storage	-40 to 158° F (-40 to 70° C)	
Humidity (RH), ambient (noncondensing) operating	to 80%	
Altitude, certified for operation	0 to 6500 ft (0 to 2000 m)	
Altitude, designed and tested for operation	-197 to 6500 ft (-60 to 2000 m)	
Physical Characteristics		
Dimensions	2.04 x 7.5 x 21.8 in. (5.18 x 19.05 x 55.37 cm)	
Weight	7 lb (3.2 kg)	

Table 22 on page 137 lists the specifications for the SAN c-type Supervisor-1E modules.

Table 22. Supervisor-1E Module Specifications		
Description	Specification	
Environmental Requirements		
Temperature, certified for operation (module intake of ambient)	32 to 104° F (0 to 40° C)	
Temperature, ambient nonoperating and storage	-40 to 158° F (-40 to 70° C)	
Humidity (RH), ambient (noncondensing) operating	10 to 90%	
Altitude, designed and tested for operation	-197 to 6500 ft (-60 to 2000 m)	
Physical Characteristics		
Dimensions	2.04 x 7.94 x 21.85 in. (5.18 x 20.17 x 55.5 cm)	
Weight	8.5 lb (3.86 kg)	

Table 23 on page 137 lists the specifications for the SAN c-type fabric switching modules.

Table 23. Fabric Switching Module Specifications		
Description	Specification	
Environmental Requirements		
Temperature, certified for operation (module intake of ambient)	32 to 104° F (0 to 40° C)	
Temperature, ambient nonoperating and storage	-40 to 158° F (-40 to 70° C)	
Humidity (RH), ambient (noncondensing) operating	10 to 90%	
Altitude, certified for operation	0 to 6500 ft (0 to 2000 m)	
Altitude, designed and tested for operation	-197 to 6500 ft (-60 to 2000 m)	
Physical Characteristics		
Dimensions	1.75 x 15.9 x 21.8 in. (4.4 x 40.39 x 55.37 cm)	
Weight	17lb (7.7kg)	

Table 24. Extension Module Specifications			
Description	Specification		
Environmental Requirements			
Temperature, certified for operation (module intake of ambient)	32 to 104° F (0 to 40° C)		
Temperature, ambient nonoperating and storage	-40 to 158° F (-40 to 70° C)		
Humidity (RH), ambient (noncondensing) operating	5 to 90%		
Altitude, designed and tested for operation	-197 to 6500 ft (-60 to 2000 m)		
Physical Characteristics	-		
Dimensions	1.75 x 15.9 x 21.8 in. (4.4 x 40.39 x 55.37 cm)		
Weight	17 lb (7.7 kg)		

Table 25 on page 138 lists the specifications for the IBM c-type SAN 48-Port 32-Gbps FC Switching Module.

Table 25. IBM c-type SAN 48-Port 32-Gbps Fibre Channel Switching Module Specifications				
Description	Specification			
Environmental Requirements				
Temperature, certified for operation (module intake of ambient)	32 to 104° F (0 to 40° C)			
Temperature, ambient nonoperating and storage	-40 to 158° F (-40 to 70° C)			
Humidity (RH), ambient (noncondensing) operating	10 to 90%			
Altitude, designed and tested for operation	-197 to 6500 ft (-60 to 2000 m)			
Physical Characteristics				
Dimensions	1.75 x 15.9 x 21.8 in. (4.4 x 40.39 x 55.37 cm)			
Weight	17.5 lb (7.94 kg)			

Power Specifications for the IBM c-type SAN Director

This section includes the following topics:

- "Power Supply Specifications" on page 138
- "Component Power Requirements and Heat Dissipation" on page 140
- "AC Power Consumption for the SAN768C-6 Director" on page 141
- "AC Power Consumption for the SAN384C-6 Director" on page 142
- "AC Power Consumption for the SAN192C-6 Director" on page 142
- "AC Power Supply Requirements for Grid Redundancy" on page 143

Power Supply Specifications

Table 26 on page 139 lists the specifications for the SAN c-type Director power supplies.

Table 26. SAN c-type Director Power Supplies			
Description	Specification		
3000-W AC Power Supply			
Туре	Autoranging input with power factor corrector.		
Voltage	100 to 240 VAC (+ or - 10%).		
Current rating	16 A maximum at 100 to 120 VAC and 1451-W output. 16 A maximum at 200 to 240 VAC and 3051- W output.		
	For current ratings of plugs, see Figure 6-3 on page 6-154 .		
Frequency	50 to 60 Hz (nominal) (+ or - 3 Hz for full range).		
Output capacity	1451 W maximum (100 to 120 VAC, 1400W available to chassis)		
	3051 W maximum (200 to 240 VAC, 3000W available to chassis)		
Output voltage at 110/120	3.4V (+/- 4%) at 15A; 50V(+/- 4%) at 28A.		
Output voltage at 200/240	3.4V (+/- 4%) at 15A; 50V(+/- 4%) at 28A		
Efficiency	>94% at 50% load		
ITHD	<5.1% at 50% load		
3500-W High Voltage AC/DC Power Supply (SAN192C-6	6 and SAN384C-6)		
Туре	Autoranging input with power factor corrector.		
Input Voltage Range	 120 VAC nominal low-line mode (85 to 132 VAC) 240 VAC nominal high-line mode (170 to 264 VAC) 277 VAC nominal high line mode (188 to 305 VAC) 240 VDC nominal high-line mode (192 to 288 VDC) 380 VDC nominal high-line mode (260 to 400 VDC) 		
Input Current	20A service, 16A maximum at nominal line voltage (240 or 277 VAC) 20A service, 16A maximum at nominal line voltage (240 or 380 VDC)		
Input Frequency	47 to 63 Hz		

Table 26. SAN c-type Director Power Supplies (continued)			
Description Specification			
Output capacity	1500 W maximum (100 to 120 VAC) 3100 W maximum (200 to 210 VAC)		
3500 W maximum (215 to 240 and 277 VAC)			
	3100 W maximum (200 to 215 VDC)		
	3500 W maximum (220 to 380 VDC)		

Component Power Requirements and Heat Dissipation

When sizing the air-conditioning requirements for an installation, consider heat dissipation. The power and heat associated with an IBM SAN c-type Directors varies based upon the following considerations:

- Power supply type
- Switching module type and number of switching modules installed
- Average switching traffic levels

Table 27 on page 140 lists the power requirements for the components of the SAN c-type Director.

Note : Unless noted otherwise, the power requirement data listed under the Maximum Power Required column in <u>Table 27 on page 140</u> is based on the worst-case conditions that are unlikely in a data center environment.

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Table 27. Requirements for 5000 wher ower supplies			
Module Type/ Product	Quantity	Power Required (watts)	
Number		Maximum	Typical
SAN c-type Director 48 port 32Gbps Switching Module	4 (SAN192C-6) 8 (SAN384C-6)	350	260
24/10 port SAN Extension Module	16 (SAN768C-6)	480	450
SAN c-type Supervisor-4 Module	2	120	110
SAN c-type Director Supervisor-1E Module		265	160
SAN c-type Director Supervisor-1 Module		190	110
SAN768C-6 Crossbar Switching Fabric1 Module	6	300	160
SAN384C-6 Crossbar Switching Fabric1 Module		150	135
SAN192C-6 Crossbar Switching Fabric1 Module		85	64
SAN384C-6 Crossbar Switching Fabric3 Module		150	135
SAN192C-6 Crossbar Switching Fabric3 Module		85	64

Table 27. Requirements for 3000 W AC Power Supplies

Table 27. Requirements for 3000 W AC Power Supplies (continued)			
Module Type/ Product	Quantity	s (continued) Power Required (watts) Maximum 900 75 600 50 300 40	
Number		Maximum	Typical
SAN768C-6 Fan Module	3	900	75
SAN384C-6 Crossbar Switching Fabric1 Module		600	50
SAN192C-6 Fan Module		300	40

Table 28. Dissipation for 3000 W AC Power Supplies for Different Solutions with 32-G Fibre Channel ports using IBM c-type SAN 48 port 32Gbps Switching Module and six Fabric Modules.

Normalian of		Power Required (watts)		
Switching Modules	Number of Ports	Typical	Total Worst Case	(BTU/hr)
1	48	1440	3430	12861
2	96	1700	3780	14173
3	144	1960	4130	15486
4	192	2220	4480	16798
5	240	2480	4830	18111
6	288	2740	5180	19423
7	336	3000	5530	20735
8	384	3260	5880	22048

AC Power Consumption for the SAN768C-6 Director

Table 29 on page 141 shows the typical AC power consumption for the SAN768C-6 Director.

Table 29. Consumption for SAN768C-6 Director					
Crossed /Mandrula	Number of	Typical AC Power Consumption (Watts)			
Туре	Fabric Modules	192 ports	288 ports	384 ports	768 ports
32-G Fibre Channel ports with SAN c-type 48-port 32- Gbps Switching Module	6	2545	3065	3585	5665

Table 29. Consumption for SAN768C-6 Director (continued)					
	Numberof	Typical AC Power			
туре Туре	Fabric Modules	192 ports	288 ports	384 ports	768 ports
16-G Fibre Channel ports with SAN c-type 48-port 32- Gbps Switching Module		2545	3065	3585	5665

AC Power Consumption for the SAN384C-6 Director

Table 30 on page 142 shows the typical AC power consumption for the SAN384C-6 Director.

Table 30. Consumption for SAN384C-6 Director					
		Typical AC Power Consumption (Watts)			
Speed/Module Type	Modules	192 ports	288 ports	384 ports	
32-G Fibre Channel ports with SAN c- type 48-port 32- Gbps Switching Module	6	2220	2740	3260	
16-G Fibre Channel ports with SAN c- type 48-port 32- Gbps Switching Module	3	1815	2335	2855	

AC Power Consumption for the SAN192C-6 Director

Table 31 on page 142 shows the typical AC power consumption for the SAN192C-6 Director.

Table 31. Consumption for SAN192C-6 Director			
	Number of Fabric	Typical AC Power Consum	ption (Watts)
Speed/Module Type	Modules	96 ports	192 ports
32-G Fibre Channel ports with SAN c-type 48- port 32 Gbps Switching Module	6	1244	1764
16-G Fibre Channel ports with SAN c-type 48- port 32-Gbps Switching Module	3	1052	1572

AC Power Supply Requirements for Grid Redundancy

The minimum number of AC PSUs required to achieve grid redundancy on each of the SAN c-type Directors differ. This number is irrespective of the optics configured (See Table 5-20). Modifications made to the configurations may require additional PSUs as per Table 32 on page 143.

Note : The minimum number of AC PSUs required to achieve grid redundancy is based on the maximum reserved power per chassis for any given configuration. The actual power consumption will be lower.

Table 32. AC PSU Requirements for Grid Redundancy				
Platform	Configurations	Minimum PSUs Required for Grid Redundancy		
SAN192C-6	Up to 3 x SAN c-type 48 Port 32 Gbps Fibre Channel Switching Modules	2		
	 Any other supported module or a combination of supported modules: 48 Port 32 Gbps Fibre Channel Switching Module 24/10 port SAN Extension Module 	4		
SAN384C-6	Up to 8 x SAN c-type 48 Port 32 Gbps Fibre Channel Switching Modules	4		
	 Any other supported module or a combination of supported modules: 48 Port 32 Gbps Fibre Channel Switching Module 24/10 port SAN Extension Module 	6		
SAN768C-6	Up to 16 x SAN c-type 48 Port 32 Gbps Fibre Channel Switching Modules	8		
	Up to 12 x SAN c-type 48 Port 32 Gbps Fibre Channel Switching Modules and up to 4 x 24/10 port SAN Extension Module	8		
	 Any other supported module or a combination of supported modules: 48 Port 32 Gbps Fibre Channel Switching Module 24/10 port SAN Extension Module 	12		

SFP+ Transceiver Specifications

The IBM SAN c-type Directors are compatible with SFP+ transceivers and cables that have LC connectors. The wavelength of each transceiver must match the transceiver on the other end of the cable, and the cable must not exceed the stipulated cable length for reliable communications.

SFP+ transceivers provide the uplink interfaces, laser transmit (Tx) and laser receive (Rx), and support 850 to 1610 nm nominal wavelengths, depending upon the transceiver.

Use only Cisco SFP+ transceivers on the SAN c-type Directors. Each SFP+ transceiver is encoded with model information that enables the switch to verify that the SFP+ transceiver meets the requirements for the switch.

This section provides the following topics:

• "Fibre Channel SFP+ Transceivers" on page 144

Fibre Channel SFP+ Transceivers

Table 33 on page 144 lists the Fibre Channel transceivers.

Table 33. Fibre Channel transceivers	
Description	Туре
32 Gbps Fibre Channel SW SFP+	Short wavelength
32 Gbps Fibre Channel LW SFP+	Long wavelength
16 Gbps Fibre Channel SW, SFP+	Short wavelength
16 Gbps Fibre Channel LW, SFP+	Long wavelength
8 Gbps Fibre Channel SW, SFP+	Short wavelength
8 Gbps Fibre Channel LW, SFP+	Long wavelength
8 Gbps Fibre Channel ER SFP+	Extended Reach
8-Gbps Fibre Channel CWDM SFP+	Coarse Wavelength-Division Multiplexing (CWDM)
10GBASE-SR SFP Module	Short Reach
10GBASE-LR SFP Module	Long Reach
10GBASE-ER SFP Module	Extended Reach
10GBASE-DWDM SFP+	Dense Wavelength- Division Multiplexing (DWDM). 40 different wavelengths are offered ^[1] (Technical Specifications).
32 Gbps Fibre Channel ELW SFP+	Extended Long wavelength
16 Gbps Fibre Channel ELW SFP+	Extended Long wavelength
1000BASE-SX SW SFP	GbE MMF Short wavelength

General Specifications for 32 Gbps Fibre Channel SFP+ Transceivers

Table 34 on page 145 provides the general specifications for Fibre Channel SFP+ transceivers.

Table 34. Gener	Table 34. General Specifications for 32 Gbps Fibre Channel SFP+ Transceivers								
SFP+	Wavelength (nanometer)	Fiber Type	Core Size (micron)	Baud Rate (GBd)	Cable Distance				
FC 32Gb SW	850	MMF	50.0	28.05	65 ft (20m) (OM2)				
			50.0	28.05	230 ft (70m) (OM3)				
			50.0	28.05	328 ft (100m) (OM4)				
			50.0	28.05	328 ft (100m) (OM5)				
			62.5	14.025	49 ft (15m) (OM1)				
			50.0	14.025	115 ft (35m) (OM2)				
			50.0	14.025	328 ft (100m) (OM3)				
			50.0	14.025	410 ft (125m) (OM4)				
			50.0	14.025	410 ft (125m) (OM5)				
			62.5	8.5	69 ft (21m) (OM1)				
			50.0	8.5	164 ft (50m) (OM2)				
			50.0	8.5	492 ft (150m) (OM3)				
			50.0	8.5	623 ft (190m) (OM4)				
			50.0	8.5	623 ft (190m) (OM5)				
FC 32Gb 10km	1310	SMF	9.0	28.05	6.2 mi (10 km)				
			9.0	14.025	6.2 mi (10 km)				
			9.0	8.5	6.2 mi (10 km)				
FC 32 Gbps	1310	SMF	9.0	28.05	15.5 mi (25 km)				
ELW SFP+			9.0	14.025	15.5 mi (25 km)				

Table 34. General Specifications for 32 Gbps Fibre Channel SFP+ Transceivers (continued)							
SFP+	Wavelength (nanometer)Fiber TypeBaud Rate Core Size (micron)Cable Distan						
			9.0	4.25	15.5 mi (25 km)		

Environmental and Power Requirements for 32 Gbps Fibre Channel SFP+ Transceivers

Table 35 on page 146 provides the power specification for the 32 Gbps Fibre Channel SFP+ transceivers.

Table 35. Specification for 32 Gbps Fibre Channel SFP+ Transceivers									
	Average Transm Power (e it dBm)	Average Receive (dBm)	Power	Fiber Loss Budget (dBm)				
SFP+	Max	Min	Max	Min	0М2	0М3	ОМ4	0М5	
FC 32Gb SW SFP+ FC 32Gb 10km IW	2.0	-6.2	2.0	-8.2	1.68 (8 Gbps) 1.63 (16 Gbps) 2.02 (32 Gbps) 6.4 (8 Gbps) 6.4 (16 Gbps) 6.4 (32 Gbps)	2.04 (8 Gbps) 1.86 (16 Gbps) 1.86 (32 Gbps)	2.04 (8 Gbps) 1.95 (16 Gbps) 1.86 (32 Gbps)	2.04 (8 Gbps) 1.95 (16 Gbps) 1.86 (32 Gbps)	
SFP+									
FC 32Gbps Fibre Channel ELW SFP+	2.0	-5.0	2.0	-11.4	10 (16 Gbps)				

Table 36 on page 146 provides the environment specification for the 32 Gbps Fibre Channel SFP+ transceivers.

Table 36. Environmental Specifications for 32 Gbps Fibre Channel SFP+ Transceivers							
	Operating		Storage				
SFP+	Maximum	Minimum	Maximum	Minimum			
FC 32Gb SW SFP+	40° C	0° C	70° C	-40° C			
FC 32Gb 10km LW SFP+	40° C	0° C	70° C	-40° C			
FC 32 Gbps Fibre Channel ELW SFP +	40° C	0° C	70° C	-40° C			

For information about safety, regulatory, and standards compliance, refer to IBM Systems Safety Notices.

General Specifications for 16 Gbps Fibre Channel SFP+ Transceivers

Table 37 on page 147 provides the general specifications for Fibre Channel SFP+ transceivers.

Table 37. General Specifications for 16 Gbps Fibre Channel SFP+ Transceivers								
SFP+	Wavelength (nanometer)	Fiber Type	Core Size (micon)	Baud Rate (GBd)	Cable Distance			
FC 16Gb SW SFP+	850	MMF	62.5	14.025	15 m (49 ft) (OM1)			
			50.0	14.025	35 m (115 ft) (OM2)			
			50.0	14.025	100 m (328 ft) (OM3)			
			50.0	14.025	125 m (410 ft) (OM4)			
			50.0	14.025	125 m (410 ft) (OM5)			
			62.5	8.5	21 m (69 ft) (OM1)			
			50.0	8.5	50 m (164 ft) (OM2)			
			50.0	8.5	150 m (492 ft) (OM3)			
			50.0	8.5	190 (623 ft) (OM4)			
			50.0	8.5	190 (623 ft) (OM5)			
			62.5	4.25	70 m (230 ft) (OM1)			
			50.0	4.25	150 m (492 ft) (OM2)			
			50.0	4.25	380 m (1247 ft) (OM3)			
			5.0	4.25	400 m (1312 ft) (OM2)			
FC 16Gb 10km LW SFP+	1310	SMF	9.0	14.025	10 km (6.2 miles)			
	`	·	9.0	8.5	10 km (6.2 miles)			
			90	4.25	10 km (6.2 miles)			
FC 16 Gbps Fibre Channel ELW SFP+	1310	SMF	9.0	14.025	25 km (15.5 miles)			
			9.0	8.5	25 km (15.5 miles)			
			90	4.25	25 km (15.5 miles)			

Environmental and Power Requirements for 16 Gbps Fibre Channel SFP+ Transceivers

Table 38 on page 148 provides the power specification for the 16 Gbps Fibre Channel SFP+ transceivers.

Table 38. Specification for 16 Gbps Fibre Channel SFP+ Transceivers									
	Average Transm	nit Power (dBm)	Average Receive	Power (dBm)	Fiber Loss Budget (dBm)				
SFP+	Maximum	Minimum	Maximum	Minimum	(62.5 microns [OM1])	(50.0 microns [OM2])	(50.0 microns [OM3])		
FC 16Gb SW SFP+	-1.3	-7, 8	0	-10.3	2.08 (4 Gbps) 1.68 (8 Gbps) 1.63 (16 Gbps)	2.08 (4 Gbps) 1.68 (8 Gbps) 1.63 (16 Gbps)	2.88 (4 Gbps) 1.04 (8 Gbps) 1.86 (16 Gbps)		
FC 16Gb 10km LW SFP +	1.3	-5.0	2.0	-10.0	7.8 (4 Gbps) 6.4 (8 Gbps) 6.4 (16 Gbps)	-	-		
FC 16Gbps Fibre Channel ELW SFP+	5	-2.0	2.0	-14.0	10 (16 Gbps)	-	-		

Table 39 on page 148 provides the environment specification for the 16 Gbps Fibre Channel SFP+ transceivers.

Table 39. Environmental Specifications for 16 Gbps Fibre Channel SFP+ Transceivers								
	Operating		Storage					
SFP+	Maximum	Minimum	Maximum	Minimum				
FC 16Gb SW SFP+	40° C	0° C	85° C	-40° C				
FC 16Gb 10km LW SFP+	40° C	0° C	85° C	-40° C				
FC 16 Gbps Fibre Channel ELW SFP +	40° C	0° C	85° C	-40° C				

For information about safety, regulatory, and standards compliance, refer to *IBM Systems Safety Notices*.

General Specifications for 8 Gbps Fibre Channel SFP+ Transceivers

Table 40 on page 148 provides the general specifications for Fibre Channel SFP+ transceivers.

Table 40. General Specifications for 8 Gbps Fibre Channel SFP+ Transceivers								
SFP+	Wavelength (nanometer)	Fiber Type	Core Size (micon)	Baud Rate (GBd)	Cable Distance (meter)			
FC 8Gb SW	850	MMF	62.5	2.125	150 m (492 ft) (OM1)			
			62.5	4.250	70 m (230 ft)			
			62.5	8.500	21 m (69 ft)			
			50.0 (OM2)	2.125	300 m (984 ft)			

Table 40. General Specifications for 8 Gbps Fibre Channel SFP+ Transceivers (continued)							
SFP+	Wavelength Fiber (nanometer) Type		Core Size (micon)	Baud Rate (GBd)	Cable Distance (meter)		
			50.0 (OM2)	4.250	150 m (492 ft)		
			50.0(OM2)	8.500	50 m (164 ft)		
			50. 0 (OM3)	2.125	500 m (1640 ft)		
			50. 0 (OM3)	4.250	380 m (1246 ft)		
			50. 0 (OM3)	8.500	150 m (492 ft)		
FC 8Gb LW	1310	SMF	9.0	2.125	6.2 miles (10 km)		
			9.0	4.250	6.2 miles (10 km)		
			9.0	8.500	6.2 miles (10 km)		
FC 8 Gb LC 40 Km SFP+	1550	SMF	9.0	2.125	40 km (24.85 miles)		
			90	4.250	40 km (24.85 miles)		
			90	8.500	40 km (24.85 miles)		

Environmental and Power Requirements for 8 Gbps Fibre Channel SFP+ Transceivers

Table 41 on page 149 provides the power specification for the 8 Gbps Fibre Channel SFP+ transceivers.

Table 41. Specification for 8 Gbps Fibre Channel SFP+ Transceivers								
	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dBm)			
SFP	Maximum	Minimum	Maximum	Minimum	62.5 microns	50.0 microns [OM2]	50.0 microns [OM3]	
FC 8Gb SW SFP+	-1.3	-10 (2 Gbps) -9 (4 Gbps) -8.2 (8 Gbps)	0	-	2.10 (2 Gbps) 1.78 (4 Gbps) 1.58 (8 Gbps)	2.62 (2 Gbps) 2.06 (4 Gbps) 1.68 (8 Gbps)	3.31 (2 Gbps) 2.88 (4 Gbps) 2.04 (8 Gbps)	

Table 41. Specification for 8 Gbps Fibre Channel SFP+ Transceivers (continued)							
	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dBm)		
SFP	Maximum	Minimum	Maximum	Minimum	62.5 microns	50.0 microns [OM2]	50.0 microns [OM3]
FC 8Gb LW SFP+	û3 (2 Gbps) û1 (4 Gbps) +0.5 (8 Gbps)	û11.7 (2 Gbps) û8.4 (4 Gbps) û8.4 (8 Gbps)	û3 (2 Gbps) û1 (4 Gbps) +0.5 (8 Gbps)	-	7.8 (2 Gbps) 7.8 (4 Gbps) 6.4 (8 Gbps)		
FC 8 Gb LC 40 Km SFP+	4	- 47	14.1	-	10.9	-	-

Table 42 on page 150 provides the environment specification for the 8 Gbps Fibre Channel SFP+ transceivers.

Table 42. Specifications for 8 Gbps Fibre Channel SFP+ Transceivers				
	Operating		Storage	
SFP+	Maximum	Minimum	Maximum	Minimum
FC 8Gb SW SFP+	40° C	0° C	85° C	-40° C
FC 8Gb LW SFP+	40° C	0° C	85° C	-40° C
FC 8 Gb LC 40 Km SFP+	40° C	0° C	85° C	-40° C

For information about safety, regulatory, and standards compliance, refer to IBM Systems Safety Notices.

Maximum Environmental and Electrical Ratings for Fibre Channel SFP+ Transceivers

Table 43 on page 150 provides the maximum environmental and electrical ratings for Fibre Channel SFP + transceivers.

Table 43. Maximum Environmental and Electrical Ratings for Fibre Channel SFP+ Transceivers					
Parameter	Symbol	Min.	Max.)	Unit	Notes
Storage temperature	Τ _S	-40	85	°C	1
Case temperature	Т _С	0	70	° C	1, 2
Relative humidity	RH	5	95	%	1

For information about safety, regulatory, and standards compliance, refer to IBM Systems Safety Notices

Appendix B. Cable and Port Specifications

This appendix provides the cable and port specifications, and includes the following sections:

- x"Cables and Adapters Provided" on page 151
- <u>"Console Port" on page 151</u>
- "MGMT 10/100/1000 Ethernet Port" on page 152
- "Supported Power Cords and Plugs" on page 153

Cables and Adapters Provided

The IBM c-type director accessory kit includes the following items:

- RJ-45 rollover cable
- RJ-45/DSUB F/F adapter RJ-45 to DB-25 female DTE adapter (labeled Terminal)
- RJ-45/DSUB R/P adapter RJ-45 to DB-25 male DCE adapter (labeled Modem)

Note : Additional cables and adapters can be ordered from your customer service representative.

Console Port

The console port is an asynchronous RS-232 serial port with an RJ-45 connector. You can use the RJ-45 rollover cable and the RJ-45/DSUB F/F adapter or the RJ-45F PC terminal adapter to connect the console port to a computer running terminal emulation software.

Console Port Pinouts

Table 44 on page 151 lists the pinouts for the console port on the IBM c-type director.

Table 44. Console Port Pinouts		
Pin	Signal	
1	RTS	
2	DTR	
3	TxD	
4	GND	
5	GND	
6	RxD	
7	DSR	
8	CTS	

Connecting the Console Port to a Computer Using the DB-25 Adapter

You can use the RJ-45 rollover cable and RJ-45/DSUB F/F adapter (labeled Terminal) to connect the console port to a computer running terminal emulation software. Table 45 on page 152 lists the pinouts for the console port, the RJ-45 rollover cable, and the RJ-45/DSUB F/F adapter.

Table 45. Port Mode Signaling and Pinouts with the DB-25 Adapter				
Console Port	RJ-45 Rollover Cable		RJ4-5/DSUB F/F Terminal Adapter	Console Device
Signal	RJ-45 Pin	RJ-45 Pin	DB-25 Pin	Signal
RTS	1	8	5	CTS
DTR	2	7	6	DSR
TxD	3	6	3	RxD
GND	4	5	7	GND
GND	5	4	7	GND
RxD	6	3	2	TxD
DSR	7	2	20	DTR
стѕ	8	1	4	RTS

MGMT 10/100/1000 Ethernet Port

The MGMT 10/100/1000 Ethernet port is an Ethernet port with an RJ-45 connector. You can use a modular, RJ-45, straight-through UTP cable to connect the management port to an external hub, switch, or router (see Figure 39 on page 152).



Figure 39. RJ-45 Interface Cable Connector

1. Pin 1

2. Pin 8

Table 46 on page 152 lists the connector pinouts and signal names for a 10/100/1000BASE-T management port (MDI) cable.

Note: The RJ-45 interface only uses pins 1, 2, 3, and 6.

Table 46. 10/100/1000BASE-T Management Port Cable Pinout (MDI)		
Pin	Signal	
1	TD+	
2	TD-	
3	RD+	
6	RDû	

Table 46. 10/100/1000BASE-T Management Port Cable Pinout (MDI)(continued)			
Pin	Signal		
4	Not used		
5	Not used		
7	Not used		
8	Not used		

Figure 40 on page 153 shows a schematic of the 10/100/1000BASE-T cable required to connect the management port to a switch or hub (not provided with the switch).

MGN	IMI 10/100 Switch/Hu		tch/Hu	b
1	TXD+	→ 1	RXD+	
2	TXD-	→ 2	RXD-	
3	RXD+ 🗲	3	TXD+	
6	RXD- <	6	TXD-	
4	NC	4	NC	
5	NC	5	NC	0.2
7	NC	7	NC	0040
8	NC	8	NC	00E

Figure 40. Twisted-Pair 10/100/1000BASE-T Cable Schematic

Supported Power Cords and Plugs

Each power supply has a separate power cord. Standard power cords or jumper power cords are available for connection to a power distribution unit having IEC 60320 C19 outlet receptacles.

Power Cords

The standard power cords have an IEC C19 connector on the end that plugs into the switch. The optional jumper power cords have an IEC C19 connector on the end that plugs into the switch, and an IEC C20 connector on the end that plugs into an IEC C19 outlet receptacle.

Note : Only the regular power cords or jumper power cords provided with the switch are supported.

Note : If you do not order the optional power cord with the system, you are responsible for selecting the appropriate power cord for the product. Using a non-compatible power cord with this product can result in electrical safety hazard. Orders delivered to Argentina, Brazil, and Japan must have the appropriate power cord ordered with the system.

Table 47 on page 153 lists the power cords for the IBM c-type Directors and provides their lengths in feet and meters.

Table 47. Power Cords for the IBM c-type Director			
Description		Length	
	Feet	Meters	
SAN384C-6 - 3000W Power Supply			

Table 47. Power Cords for the IBM c-type Director (continued)			
Description		Length	
	Feet	Meters	
Power Cord, 250VAC 20A NEMA, 6-20 Plug, USA	13.12	4	
Power Cord, 250VAC 20A NEMA L6-20 Twist Lock Plug, USA	13.58	4.14	
Power Cord, 250VAC 16A CEE 7/7 Plug, EU	13.12	4	
Power Cord, 250VAC 16A IEC 309 Plug, International	13.58	4.14	
Power Cord, 250VAC 16A SEV 1011 Plug, Switzerland	8	2.44	
Power Cord, 250VAC SABS 1661 Plug, South Africa	14	4.27	
Power Cord, 250VAC 16A SI16S3 Plug, Israel	14	4.27	
Power Cord 250VAC 16A, Src Plug EL224-C19, Brazil,	14	4.27	
Power Cord 250VAC 16A, Src Plug IR2073-C19, Argentina,	14	4.27	

Supported Plugs for 3000 W AC Power Supplies

Figure 41 on page 154 shows the supported plugs for the 3000 W AC power supplies.



Figure 41. 3000-W AC Power Supply Plugs

- 1. International (3000 W) IEC 309 (20 A)
- 2. Europe (3000 W) CEE 7/7 (16 A)
- 3. North America (non-locking)(3000)NEMA 6-20 plug (20 A)
- 4. North America (locking)(3000 W)NEMA L6-20 plug (2 0A)
- 5. Switzerland (3000 W) 23 G SEV 1011 (16 A)
- 6. South Africa (3000 W) EL 208, SABS 164-1 (16 A)

Figure 42 on page 155 shows an additional plug that is supported for the 3000 W and 2500 W power supply, using 110 VAC.

Note : Using the plug in Figure 42 on page 155 at 110 VAC results in 1450 W available to the system.



Figure 42. Additional Power Supply Plug Supported for 3000 W 110 VAC Only

1. NEMA 5-20P North American power cord product ID: CAB-7513AC 110 VAC (20 A)

Power Supply AC Power Cords

Table 48 on page 155 lists the specifications for the 3000 W AC power cords that are available for the AC-input power supply. Included in the table are references to illustrations of the power cords.

Table 48. Power Supply AC Power Cords						
Locale	Power Cord Part Number	Source Plug Type	Cordset Rating	Power Cord Reference Illustration		
North America/ Japan	CAB-9K2A-NA	NEMA 5-20	20 A, 125 VAC	Figure 43 on page 156		
US/Japan	CAB-9K16A-US2	NMEA L6-20	16 A, 250 VAC	Figure 44 on page 156		
Australia	CAB-9K16A-AUS	AU20S3	16 A, 250 VAC	Figure 45 on page 156		
China	CAB-9k16A-CH	GB16C	16 A, 250 VAC	Figure 46 on page 156		
Switzerland	CAB-9K16A-SW	SEV 5934	16 A 250 VAC	Figure 47 on page 157		
Continental Europe	CAB-9K16A-EU	CEE7/7	16 A 250 VAC	Figure 48 on page 157		

AC Power Cord Illustrations

This section contains the AC power cord illustrations. An AC power cord can be used with several power supplies. See the power supply specifications tables for the correct AC power cord illustrations for your power supply.









Figure 48. AJJY





Figure 49. AJJV

Appendix C. Site Planning and Maintenance Records

This appendix provides a Site Planning list and includes the following records to use when installing the IBM c-type SAN switches and directors.

- "Contacting Customer Service" on page 159
- "Site Preparation Checklist" on page 159
- "Finding the Chassis Serial Number" on page 159

Note : For information on how to query the switch for configuration information, see *Cisco NX-OS Fundamentals Configuration Guide* or the *Cisco Configuration Guide for DCNM SAN*.

Contacting Customer Service

If you are unable to solve a startup problem after using the troubleshooting suggestions in this appendix, contact your customer service representative for assistance and further instructions. Before you call, have the following information ready to help your service provider assist you as quickly as possible:

- · Date you received the switch.
- Chassis serial number. See the "Finding the Chassis Serial Number" on page 159.
- Type of software and release number.
- · Maintenance agreement or warranty information.
- Brief description of the problem.
- Brief explanation of the steps you have already taken to isolate and resolve the problem.

Finding the Chassis Serial Number

You can find the chassis serial number label of the IBM c-type SAN switches and directors on the chassis.

If you have CLI access, enter the show sprom backplane 1 command to display the backplane contents, including the switch serial number.

Site Preparation Checklist

Planning the location and layout of your equipment rack or wiring closet is essential for successful switch operation, ventilation, and accessibility.

Consider heat dissipation when sizing the air-conditioning requirements for an installation. See <u>"SFP+</u> <u>Transceiver Specifications" on page 144</u> for the environmental requirements. See the <u>"Environmental</u> and Power Requirements for 32 Gbps Fibre Channel SFP+ Transceivers" on page 146, the <u>"Maximum</u> <u>Environmental and Electrical Ratings for Fibre Channel SFP+ Transceivers" on page 150</u> for power and heat ratings.

Appendix D. IBM c-type SAN Director Accessory Kit Contents

This appendix lists and illustrates the IBM c-type SAN Director accessory kit contents. (See <u>Table 49 on</u> page 161)

Table 49. IBM c-type SAN Director Accessory Kit Contents				
Illustration	Description	Quantity		
	Support rack-mount bracket kit (includes the following parts)	1 kit		
	12-24 x 3/4-in. Phillips screws	20 per kit		
	M6 x19-mm Phillips screws	20 per kit		
	10-32 x 3/4-inch screws	20 per kit		
	Support rack-mount bracket	2 per kit		
Console cable connector kit	Console cable connector kit (includes the following parts)	2 kits		
	RJ-45 rollover cable	1 per kit		
	DB-9F/RJ-45F PC terminal	1 per kit		
	RJ-45/DSUB F/F adapter	1 per kit		
	R-J45/DSUB R/P adapter	1 per kit		
	DSUB screw lock kit	1 per kit		
Ground lug kit (二、(100) 愛愛	Ground lug kit (includes the following parts)	1 kit		
	Two-hole lug	1 per kit		
	M4 x 8-mm Phillips pan- head screws	2 per kit		
ESD wrist strap	ESD wrist strap	1 per kit		

Table 49. IBM c-type SAN Director Accessory Kit Contents(continued)				
Illustration	Description	Quantity		
Descripter	SFP Extractor	1 per kit		
Not applicable	Product Documentation Pointer Card	1 per kit		
Not applicable	China Management Methods Hazardous Substances Content Table	1 per kit		

Note : If you do not receive any part listed in this document, contact IBM Support.

If you purchased this product through an IBM Business Partner, you may receive additional contents in your kit, such as documentation, hardware, and power cables.

Each new switch ships with country-specific power cords. The shipped cords depend on your specification when placing a switch order. The available power cords for the IBM c-type Directors are as follows:

- AJK4 power cord, 250-VAC 16-A, Src Plug A, Australia
- AJK2 power cord 250-VAC 16-A, Src Plug GB16C, China
- AJJY power cord 250-VAC 16-A, Src Plug CEE, Europe
- AJJZ power cord 250-VAC 16-A, Src Pl, International
- AJK6 power cord 250-VAC 16-A, Src Plug SI16, Israel
- AJK0 power cord 250-VAC 16-A, Src Plug EL, South Africa
- AJK1 power cord 250-VAC 16-A, Src Plug SEV 5, Switzerland
- AJJW power cord 250-VAC 16-A, Src Plug NE, US and Japan
- AJJX power cord 250-VAC 16-A, Src Plug NE, US and Japan
- AJK3 power cord 250-VAC 16-A, Korea, Src Plug
- AJK5 power cord 125VAC 20A NEMA 5-20 Plug, North America/Japan
- AJK7 power cord 250VAC 16A, Argentina, Src Plug IR2073-C19
- AJK8 power cord 250VAC 16A, Brazil, Src Plug EL224-C19
- AJJV cabinet jumper power cord, 250 VAC 16A, C20-C19 Connector

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European community contact:

IBM Deutschland GmbH Technical Regulations, Department M372 IBM-Allee 1, 71139 Ehningen, Germany Tele: +49 (0) 800 225 5423 or +49 (0) 180 331 3233 Email: halloibm@de.ibm.com

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Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 / EN 55032 Klasse A.

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse B EU-Richtlinie zur Elektromagnetischen Verträglichkeit

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Taiwan Contact Information

This topic contains the product service contact information for Taiwan.

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Japan Electronics and Information Technology Industries Association Statement

This statement explains the Japan JIS C 61000-3-2 product wattage compliance.



This statement explains the Japan Electronics and Information Technology Industries Association (JEITA) statement for products less than or equal to 20 A per phase.

高調波電流規格 JIS C 61000-3-2 適合品

This statement explains the JEITA statement for products greater than 20 A, single phase.

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NSSM

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