

IBM TotalStorage SAN Switch



2109 Model M12 Installation and Service Guide

Read Before Using

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IBM TotalStorage SAN Switch



2109 Model M12 Installation and Service Guide

Note:

Before using this information and the product it supports, read the information in “Notices” on page 101.

First Edition (May 2004)

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Safety and environmental notices

This section contains information about:

- “Safety notices and labels”
- “Safety inspections” on page xiv
- “Laser safety” on page xxi
- “Rack Safety” on page xxii
- “Environmental notices and statements” 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 *IBM® eServer™ Safety Notices* (G229–9054) publication, which is on the CD-ROM that accompanies this product. See the following examples of danger and caution notices for the location of the ID number.

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. A sample danger notice follows:



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 comprehensive danger notice provides instructions on how to avoid shock hazards when servicing equipment. Unless instructed otherwise, follow the procedures in the danger notice below:



DANGER

Electrical voltage and current from power, telephone, and communication cables are hazardous.

To avoid a shock hazard:

- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- Connect all power cords to a properly wired and grounded electrical outlet. Ensure 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 everything OFF (unless instructed otherwise).
2. Remove power cords from the outlet.
3. Remove signal cables from connectors.
4. Remove all cables from devices.

To Connect:

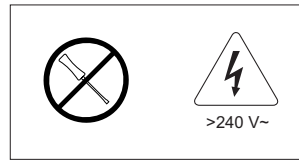
1. Turn everything OFF (unless instructed otherwise).
2. Attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlet.
5. Turn device ON.

(D005)

Labels

As an added precaution, safety labels are often installed directly on products or product components to warn of potential hazards.

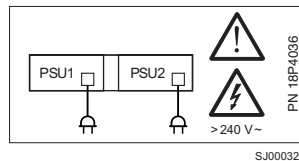
The actual product safety labels may differ from these sample safety labels:



DANGER

Hazardous voltage, current, or energy levels are present inside any component that has this label attached. (L001)

Do not service, there are no serviceable parts.



DANGER

Multiple power cords (L003)

To remove all power to the device, disconnect all power cords.

Caution notices

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

If the symbol is...	It means....
	A hazardous electrical condition with less severity than electrical danger.
	A generally hazardous condition not represented by other safety symbols.
	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).

Sample caution notices:



CAUTION:

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



CAUTION:
This product contains a Class 1M laser. Do not view directly with optical instruments. (C028)

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 use screws longer than 3/16 in.; you can damage the switch.

Safety inspections

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

Removing ac power

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

1. Perform a controlled system shutdown.
2. Set the power switch on the Model M12 to the off position.
3. Disconnect the power cables from the power source.



DANGER

Multiple power cords. (L003)

External machine checks

Perform the following external machine checks:

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

Internal machine checks

Perform the following internal machine checks:

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

Safety label checks

Perform the following safety label checks:

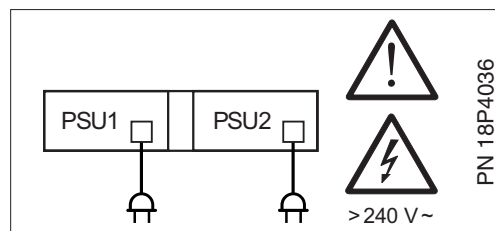
1. Verify that the safety label shown in Figure 1 is installed on the switch.



SJ000623

Figure 1. Safety label on the Model M12

2. Verify that the linecord safety label shown in Figure 2 is installed on the Model M12 power supply.



SJ000325

Figure 2. Linecord caution label

3. Verify that the power supply cover caution label shown in Figure 3 on page xvi is installed on the Model M12 power supply.

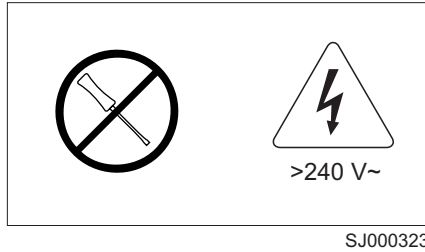


Figure 3. Power supply cover caution label

- Verify that the fusing caution label shown in Figure 4 is installed on the Model M12 power supply.

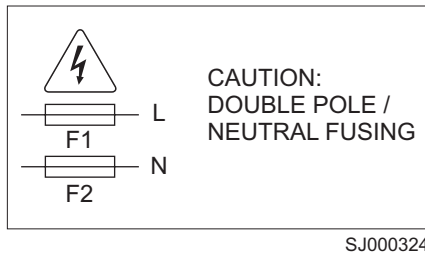


Figure 4. Fusing caution label

- Verify that the heavy load label shown in Figure 5 is installed on the back of the switch.

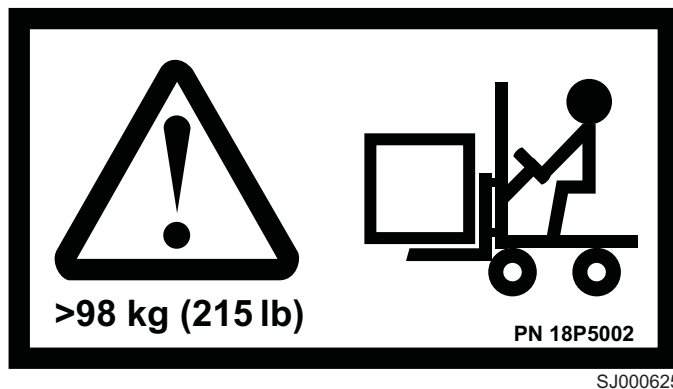


Figure 5. Heavy load label

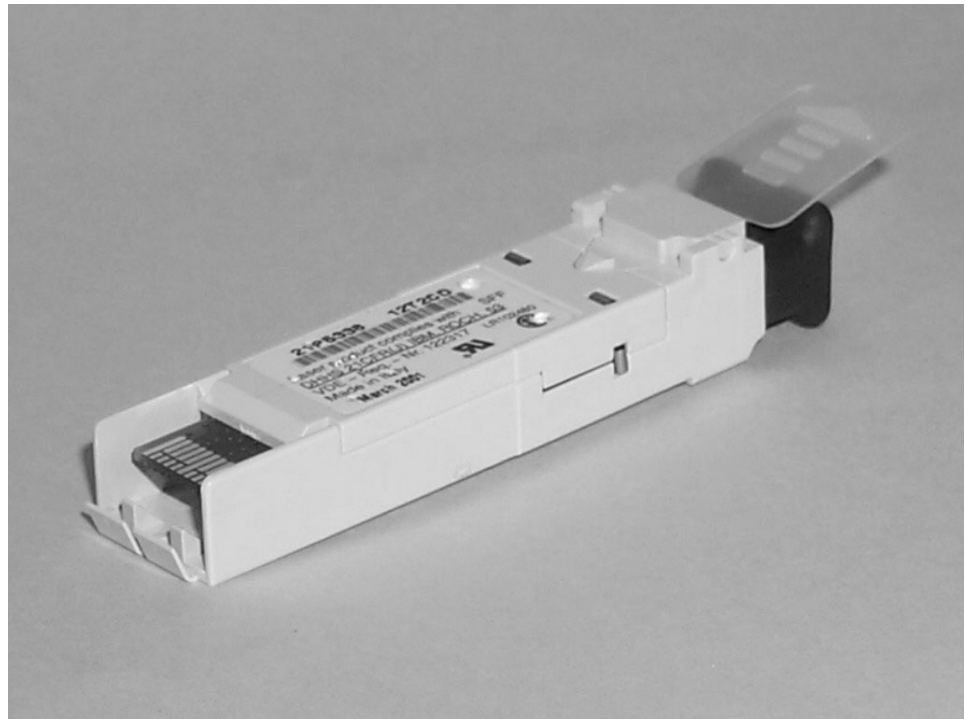
- Verify that the SFP labels shown in Figure 6 on page xvii and Figure 7 on page xvii are installed on all SFP transceivers.

Note: The following SFP illustrations may differ from the SFPs included or installed with your particular switch, depending upon the SFP manufacturer. The labels shown below may vary by manufacturer.



SJ000317

Figure 6. SFP label (front view)



SJ000314

Figure 7. SFP label (back view)

AC grounding



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)

Check the voltage label on the bottom of the device to ensure that it matches the voltage at the power source.

1. Check the voltage level at the power source.
2. Check for proper grounding.

Attention: Always use an analog meter, never a digital meter, to perform the ground check of the power outlet. A digital meter can give the wrong reading if ground current is present.

3. With the power cable connected to the switch, verify that there is 0.1 ohm or less resistance between the ground lug on the power cable plug and the metal frame.
4. If the switch passes the test in steps 1 to 3, connect the power cable to the power source.

Inspecting the bridge tool

Note: The bridge tool (PN 18P5855) is only shipped with a replacement 2109 Model M12 and is not part of the normal ship group. Inspect the bridge tool and ensure that the two adjustable supports are securely fastened and are rotated 90° from the base plate.

Perform the following safety label checks for the bridge tool:

1. Verify that the bridge tool alignment label shown in Figure 8 on page xix is installed on the load plate.



SJ000749

Figure 8. Bridge tool alignment label

- Verify that the tilt warning label shown in Figure 9 on page xx is installed on the load plate.



Figure 9. Tilt warning label

3. Verify that the genie tool and load plate label shown in Figure 10 is installed on the load plate.

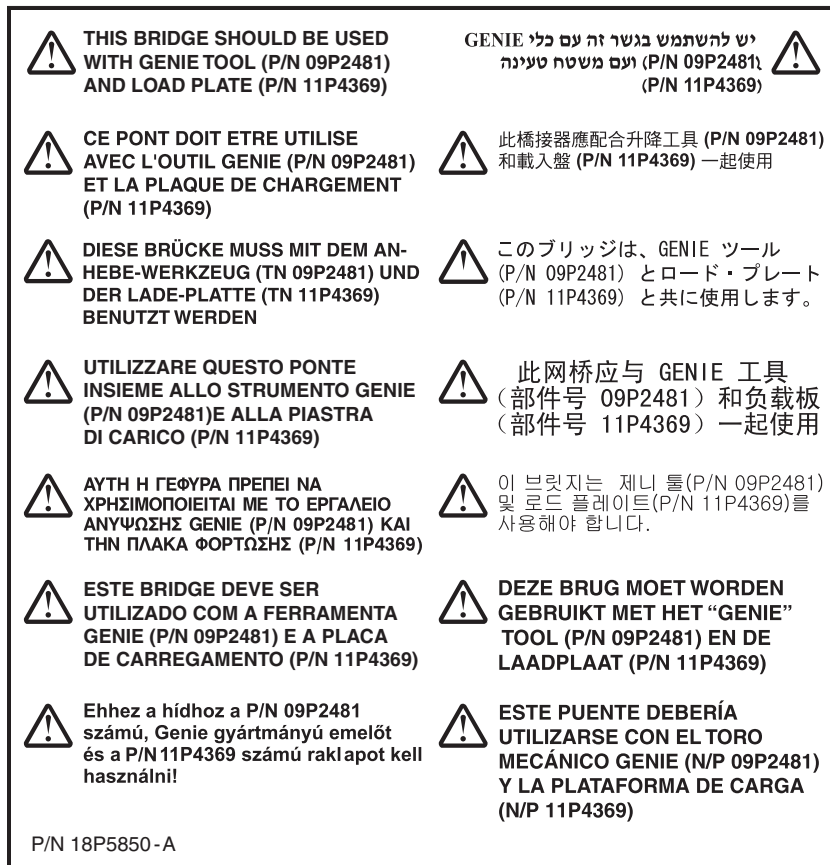


Figure 10. Genie tool and load plate label

4. Verify that the pinch point label shown in Figure 11 on page xxi is installed on the load plate.



Figure 11. Pinch point label

Laser safety

This equipment contains Class 1 laser products, and complies with FDA radiation Performance Standards, 21 CFR Subchapter J and the international laser safety standard IEC 825-2.



CAUTION:

This product contains a Class 1M laser. Do not view directly with optical instruments. (C028)

Attention: In the United States, use only SFP or GBIC optical transceivers that comply with the FDA radiation performance standards, 21 CFR Subchapter J. Internationally, use only SFP or GBIC optical transceivers that comply with IEC standard 825-1. Optical products that do not comply with these standards may product light that is hazardous to the eyes.

Usage restrictions

The optical ports of the modules must be terminated with an optical connector or with a dust plug.

Rack Safety

Rack Installation



DANGER

- 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 cabinets.
- Rack-mounted devices are not to be used as a shelf or work space. Do not place any object 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 before servicing any device in the rack cabinet.
- 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.

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 may become unstable if you pull out more than one drawer at a time.
- *(For fixed drawers.)* This drawer is a fixed drawer and should not be moved for servicing unless specified by manufacturer. Attempting to move the drawer partially or completely out of the rack may cause the rack to become unstable or cause the drawer to fall out of the rack.

(R001)

Rack Relocation (19" Rack)

CAUTION:

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

- Reduce the weight of the rack cabinet by removing equipment starting at the top of the rack cabinet. When possible, restore the rack cabinet to the configuration of the rack cabinet as you received it. If this configuration is not known, you must do the following:
 - Remove all devices in the 32U position and above.
 - Ensure that the heaviest devices are installed in the bottom of the rack cabinet.
 - Ensure that there are no empty U-levels between devices installed in the rack cabinet below the 32U level.
 - If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.
 - Inspect the route that you plan to take when moving the rack to eliminate potential hazards.
 - Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that came with your rack cabinet for the weight of a loaded rack cabinet.
 - Verify that all door openings are at least 760 x 2030 mm (30 x 80 in.).
 - Ensure that all devices, shelves, drawers, doors, and cables are secure.
 - Ensure that the four leveling pads are raised to their highest position.
 - Ensure that there is no stabilizer bracket installed on the rack cabinet during movement.
 - Do not use a ramp inclined at more than ten 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)

Environmental notices and statements

This section describes the environmental notices and statements.

Battery notice



CAUTION:

Only trained service personnel may replace this battery. The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.

Do Not:

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

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

Fire suppression systems

A fire suppression system is the responsibility of the customer. The customer's own insurance underwriter, local fire marshal, or a local building inspector, or both, should be consulted in selecting a fire suppression system that provides the correct level of coverage and protection. IBM designs and manufactures equipment to internal and external standards that require certain environments for reliable operation. Because IBM does not test any equipment for compatibility with fire suppression systems, IBM does not make compatibility claims of any kind nor does IBM provide recommendations on fire suppression systems.

Product recycling

This unit contains recyclable materials. These materials should be recycled where processing sites are available and according to local regulations. In some areas, IBM provides a product take-back program that ensures proper handling of the product. Contact your IBM representative for more information.

Product disposal

This unit might contain batteries. Remove and discard these batteries, or recycle them, according to local regulations.

About this document

This document describes how to install and service the IBM TotalStorage[®]™ SAN Switch 2109 Model M12. Throughout this document, the product is referred to as the Model M12. The term *switch* also applies to the Model M12.

The sections that follow provide information about:

- “Who should read this document”
- “Model M12 library”
- “Related documents”
- “Web sites” on page xxvi
- “Getting software updates” on page xxvi
- “Getting help” on page xxvii
- “How to send your comments” on page xxvii

Who should read this document

This document is intended for clients who are responsible for installing and servicing the M12.

Model M12 library

The following documents contain information related to this product:

- *IBM TotalStorage SAN Switch 2109 Model M12 Installation and Service Guide*, GC26-7633 (this document)
- *IBM TotalStorage SAN Switch 2109 Model M12 and Model M14 User's Guide*, GC26-7636
- *IBM eServer Safety Notices*, G229–9054
- *IBM TotalStorage SAN Switch Statement of Limited Warranty*, GC26–7638
- *IBM TotalStorage SAN Cabinet 2109 Model C36 Installation and Service Guide*, GC26–7632

Related documents

You can find information related to the software that supports the M12 in the following documents:

- *Brocade Advanced Performance Monitoring User's Guide*
- *Brocade Advanced Web Tools User's Guide*
- *Brocade Advanced Zoning User's Guide*
- *Brocade Diagnostic and System Error Message Reference*
- *Brocade Design, Deployment, and Management Guide*
- *Brocade Fabric Manager User's Guide*
- *Brocade Fabric OS Procedures Guide*
- *Brocade Fabric OS Reference*
- *Brocade Fabric Watch User's Guide*
- *Brocade ISL Trunking User's Guide*
- *Brocade MIB Reference*
- *Brocade SAN Migration Guide*

- *Brocade Secure Fabric OS User's Guide*

When you use any of the Brocade documents, you will notice that the model numbers reflect the original Brocade switches. Table 1 provides a product matrix for you to use to correlate the Brocade model numbers to the IBM product and model numbers.

Table 1. Brocade and IBM product and model number matrix

Brocade model number	IBM product and model number
Silkworm 3250	2005 Model H08
Silkworm 3800	2109 Model F16
Silkworm 3850	2005 Model H16
Silkworm 3900	2109 Model F32
Silkworm 12000	2109 Model M12
Silkworm 24000	2109 Model M14

Web sites

You can find additional information related to the software for this and other switches at the following Web site:

<http://www.ibm.com/servers/storage/support/san>

To get specific details about models and firmware that the switch supports, see the following Web site:

<http://www.storage.ibm.com/ibmsan/>

For detailed information about the Fibre Channel standards, see the Fibre Channel Industry Association (FCIA) Web site at:

www.fibrechannel.org/

For a directory of worldwide contact information, including technical support, see the following Web site:

www.ibm.com/contact/

Getting software updates

Contact your software vendor for software updates and maintenance releases.

For utility programs to facilitate loading firmware, sample Fabric Watch configurations, and management information base (MIB) files for switch management by simple network management protocol (SNMP), see the following Web site: <http://www.storage.ibm.com/ibmsan/index.html>

Getting help

Contact your switch supplier for technical support. This includes hardware support, all product repairs, and ordering of spare components.

Be prepared to provide the following information to support personnel:

- The switch serial number
- The switch worldwide name (**licenseidshow** command)
- The configuration (**topologyshow** command)
- Any output from the **supportShow** Telnet command
- A detailed description of the problem
- Any troubleshooting steps that you have already performed

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, you can send us comments electronically by using the following addresses:

- Internet: starpubs@us.ibm.com
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Chapter 1. Introduction

This chapter introduces the IBM TotalStorage SAN Switch 2109 Model M12 switch (hereafter referred to as the Model M12 or the M12) and contains the following information:

- “Overview”
- “Monitoring and managing the M12” on page 4

Overview

The Model M12 is a high-performance core switch for storage area networks (SANs), available in 16–port increments from 32 to 128 ports. It can operate as a single switch in a fabric or in a fabric that contains multiple switches.

High-availability features of the M12 include:

- Two redundant hot-swappable control processor (CP) cards with automatic failover
- Up to eight hot-swappable 16–port cards
- Four hot-swappable power supplies
- Three hot-swappable blower assemblies (two are required for adequate cooling)
- Two redundant ac inputs
- Non-disruptive upgrades for Fabric OS v4.1 and later
- Worldwide name (WWN) card that is hot-swappable in Fabric OS v4.1 and later

The M12 also includes the optional Advanced Security feature, which enables policy-based security mechanisms integrated with certain versions of the Fabric OS. The optional Advanced Security feature has the following capabilities:

- Centralized security management
- Fabric-wide security policies to control access
- Port and switch level access control
- Management access controls (Telnet, SNMP, HTTP, API)
- Encryption of management data such as passwords
- Strong and non-reputable authentication between switches

The Fibre Channel ports support link speeds of 1 Gbps and 2 Gbps (inbound and outbound). They also automatically negotiate to the highest common speed of all the devices that are connected to the port and are:

- Compatible with short wavelength (SWL) and long wavelength (LWL) small form factor pluggable (SFP) transceivers
- Universal and self-configuring
- Capable of individually becoming fabric loop ports (FL_ports), fabric ports (F_ports), or expansion ports (E_ports)

For the M12 specifications, see Appendix A, “Product specifications,” on page 85.

Software features

Fabric OS version 4.1 supports the M12. Fabric OS includes all the basic switch and fabric support software as well as optionally licensed software that is enabled by using license keys. Fabric OS is made up of two major software components: firmware that initializes and manages the switch hardware, and diagnostics.

Optionally licensed and separately priced features include:

- Extended Fabrics (Feature code 7603)
Provides up to 80 km (49.7 mi) of switched fabric connectivity at full bandwidth over long distances
- Remote Switch (Feature code 7602)
Enables switches to interconnect over wide area network (WAN) using third-party gateway solutions that support Fibre Channel (FC) over IP, FC over asynchronous transfer mode, and FC over SONET
- Advanced Security (Feature code 7623)
Enables policy-based security mechanisms that are integrated within Fabric OS

Note: To activate these features, go to the following Web site:

www.ibm.com/storage/key/

The following licensed software provides a graphical user interface from a standard workstation:

- Fabric Manager 4
Administers, configures, and maintains fabric switches and SANs with host-based software
The following licensed products are included with the M12:
- Performance Monitoring
Comprehensive tool for monitoring the performance of network storage resources
- ISL Trunking
Connects up to four ISLs between two switches through an expansion port (E_port) to merge logically into one link
- Fabric Watch
Monitors mission-critical fabric parameters
- Advanced Zoning
Segments a fabric into virtual private SANs
- Web Tools
Administers, configures, and maintains fabric switches and SANs

See the following documents for more information about Fabric Watch, Fabric Manager, Web Tools, Secure Fabric OS, and high availability:

- *Brocade Advanced Zoning User's Guide*
- *Brocade Fabric Watch User's Guide*
- *Brocade Advanced Performance Monitoring User's Guide*
- *Brocade Distributed Fabrics User's Guide*
- *Brocade ISL Trunking User's Guide*
- *Brocade Secure Fabric OS User's Guide*
- *Brocade Advanced Web Tools User's Guide*

Port side of chassis

Figure 12 on page 3 shows the port side of the M12, which provides access to the following components:

- The 16-port cards, which contain 16 fibre channel SFP ports
- Two CP cards, each with a modem serial port, a terminal serial port, and 10 Mbps or 100 Mbps Ethernet port

- Four power supplies that are hot swappable and have built-in fans
- Two ac power connectors. Each ac power connector has an on or off ac power switch

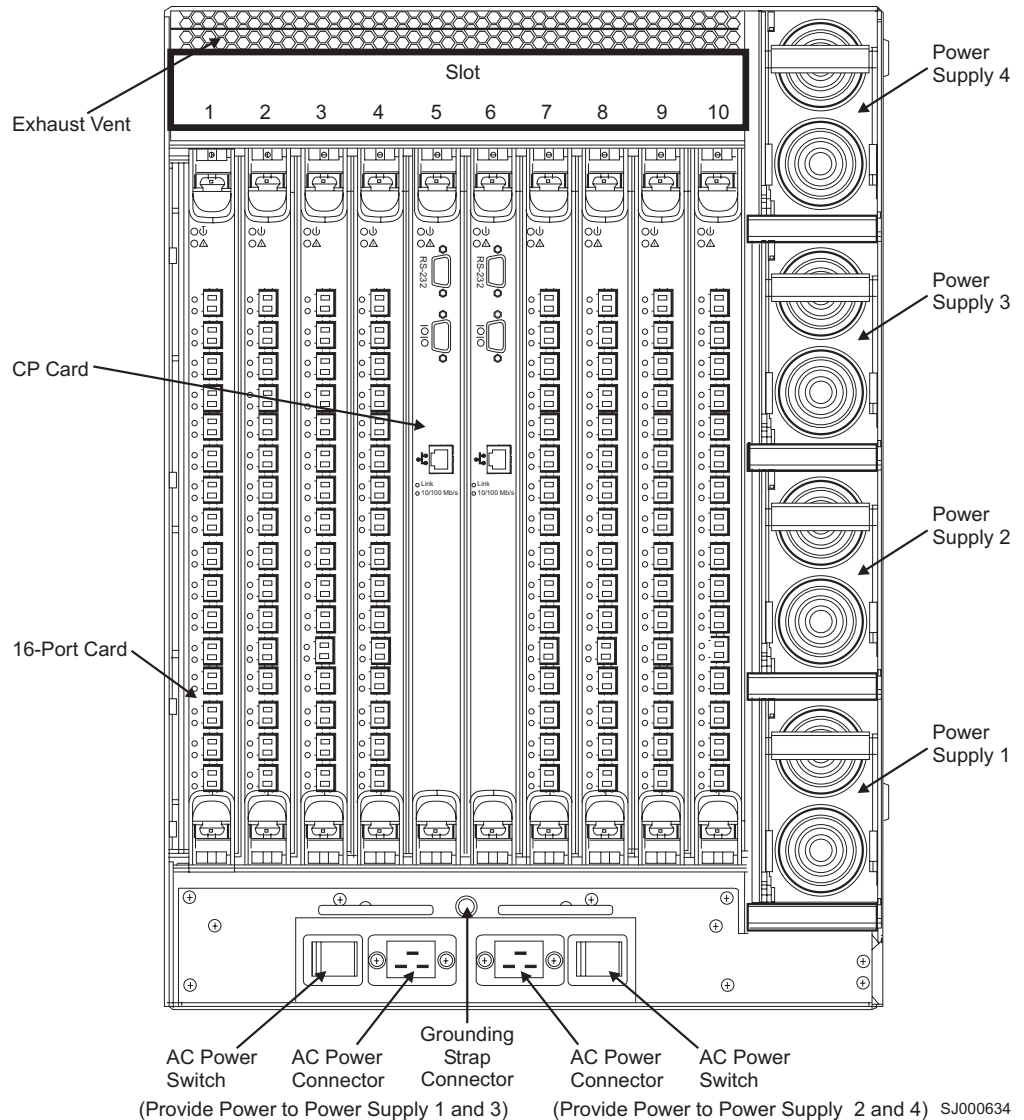


Figure 12. Port side of the 2109 Model M12

For information about how to operate the components of the M12, see Chapter 3, “Operating the M12,” on page 15.

Blower assembly side of chassis

Figure 13 on page 4 shows the blower assembly side of the M12, which provides access to the following components:

- A WWN card and bezel. The WWN card and bezel provide light-emitting diodes (LEDs) for monitoring the switch from the blower assembly side and store WWN and IP address information, switch name, and serial number.
- Three blower assemblies. Each blower assembly is individually hot swappable.

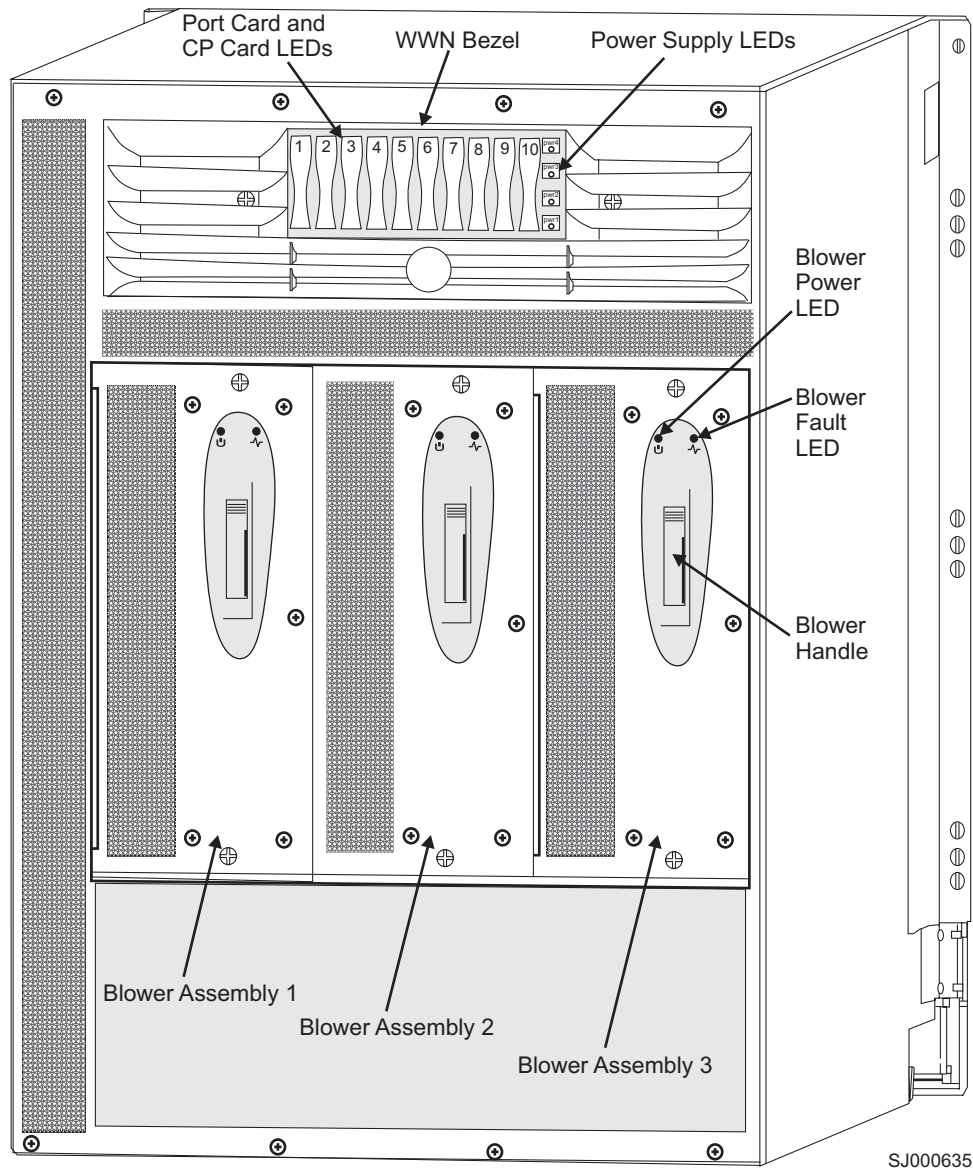


Figure 13. Blower assembly side of the 2109 Model M12

Monitoring and managing the M12

You can manage the M12 in-band by using Fibre Channel protocol or out-of-band by connecting to the Ethernet port. The management functions allow the administrator to monitor fabric topology, port status, physical status, and other information to aid in performance analysis and system debugging.

Note: The M12 automatically performs power-on self-test (POST) diagnostics each time it is turned on. Any errors are recorded in the error log. For more information about POST, see “Interpreting POST” on page 30.

The Model M12 is compatible with the following management interfaces:

- Command line interface through a Telnet connection
- Fabric Manager

- Web Tools
- SNMP applications
- Management server

For more information about these management interfaces, see the *Brocade Fabric Manager User's Guide* and the *Brocade Advanced Web Tools User's Guide*.

Chapter 2. Starting and configuring the M12

You must configure the M12 appropriately in order for it to operate correctly within the network and fabric.

Note: The switch only detects modems during power on or restart. If you connect a modem to an operating switch, you must restart the switch for it to detect the modem.

This chapter describes how to start and configure the M12 and includes the following information:

- “Providing initial power to the switch”
- “Configuring the M12”

Providing initial power to the switch

Perform the following steps to provide ac power to the switch:

1. Connect the cabinet power distribution units (PDUs) to separate power sources of 200–240 V ac, 50–60 Hz.
2. Make sure that the internal power cords are connected to the separate PDUs and that the other ends are connected to the M12 circuit breakers.
3. Route the power cord so that it is not exposed to stress.
4. Flip both green ac power switches to “I”. The ac power switches light up green when switched on, and power is being supplied.

The switch automatically performs a POST by default each time you power on. A POST takes a minimum of 3 minutes. A POST is complete when light-emitting diode (LED) activity returns to a standard state. For information about LED light patterns, see “Interpreting LED activity” on page 20.

Attention: Do not connect the switch to the network until you configure the IP addresses.

Configuring the M12

The M12 can contain up to two logical switches, each with its own configuration:

- One logical switch for any 16–port cards in slots 1–4
- One logical switch for any 16–port cards in slots 7–10

The configuration information for both logical switches is stored in the WWN card and in the flash memory of the CP cards. The configuration is automatically mirrored to the standby CP card, so that the most current configuration remains available even if the active CP card fails. You can back up the configuration to a workstation by using the **configUpload** command. You can download the configuration to the active CP card by using the **configDownload** command. For information about commands and whether you can enter them through the active or standby CP card, see the *Brocade Fabric OS Reference*.

Note: You should routinely back up the configuration to ensure that the current configuration is available if needed.

You can modify the configuration only through a login session to the active CP card. The switch supports up to two Telnet sessions with administrative privileges at the same time.

The same administrative login account applies to both logical switches. If the password is changed on switch 0, it automatically changes on switch 1.

The M12 configuration includes the following parameters:

- General system parameters
You can modified these parameters with the **configure** command. For more information, see the *Brocade Fabric OS Reference*.
- WWNs for both logical switches
You cannot modify the two WWNs. Both of them are preconfigured and are usually based on the chassis-serial number.
- Domain ID
The default domain ID for both logical switches is 1. You can modify it by using the **configure** command.
- One domain ID for any of the 16–port cards in slots 1–4 and one for any of the 16–port cards in slots 7–10
You can modify domain IDs with the **configure** command.
- Native IP addresses
A native IP address, host name, subnetmask, and gateway address for both CP card slots. You can modify it by using the **ipAddrSet** command.
- Logical IP addresses
A logical IP address and subnetmask for both logical switches. You can modify it by using the **ipAddrSet** command.

Note: If you reset a logical IP address while the switch has active IP traffic, you can cause the IP traffic to be interrupted or stopped. IP traffic might include Web Tools, Fabric Watch, SNMP, and other applications.

Items required

You will need the following items to configure and connect the M12:

- An M12 that is powered on and is not connected to a network or fabric
- A workstation computer with a terminal emulator application, such as HyperTerminal
- The serial cable that is provided with the switch
- Two Ethernet cables
- SFP transceivers and cables, as required
- Two IP addresses for the native IP addresses that are assigned to the CP slots, with the corresponding native host names, subnetmasks, and gateway addresses. The default native IP addresses and host names are as follows:
 - 10.77.77.75 CP0 (the CP card in slot 5 at the time of configuration)
 - 10.77.77.74 CP1 (the CP card in slot 6 at the time of configuration)
- Two IP addresses for the logical IP addresses of the switch, with the corresponding subnetmasks. These IP addresses correspond to “switch 0”, which contains any 16–port cards in slots 1–4, and “switch 1”, which contains any 16–port cards in slots 7–10. The default logical IP addresses are as follows:
 - 10.77.77.77 sw0
 - 10.77.77.76 sw1

- Two switch names, if the default switch names are not going to be used. Switch names can be up to 15 characters long. Switch names can include alphabetical, numerical, and underscore characters, and must begin with an alphabetical character. The default switch name for the logical switches is:
 - sw0 for the switch that contains the 16–port cards in slots 1–4
 - sw1 for the switch that contains the 16–port cards in slots 7–10

Configuration procedure

Note: The following procedure uses various Telnet commands. For information about these commands, see the *Brocade Fabric OS Reference*.

Perform the following steps to configure the M12:

1. Verify that the M12 is on. Verify that the POST is complete by verifying that all power LEDs on the 16–port cards and CP cards display a steady green light. For a description of the LED patterns, see “Interpreting LED activity” on page 20.
2. Login to the CP card that is installed in slot 5 by establishing a serial connection to a workstation that has a terminal emulator application, such as a HyperTerminal in a Microsoft[®] Windows[®] 95, Windows 2000, or Windows NT[®] environment, or TERM in a UNIX[®] environment.
 - a. Disable any serial communication programs that are running on the workstation, such as synchronization programs for a PDA.
 - b. Remove the shipping cap from the terminal serial port on the CP card in slot 5 and insert the serial cable. The terminal serial port is the second serial port from the top of the CP card.
 - c. Connect the other end of the serial cable to a serial port on the workstation.
 - d. Open the terminal emulator application and configure as follows:
 - For Windows 95, 98, 2000, or NT, use the configuration parameters shown in Table 2.

Table 2. Configuration parameters

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

- In a UNIX environment, type the following command:

```
tip /dev/ttyb -9600
```
- e. When the terminal emulator application stops reporting information, press Enter. The following login prompt displays:

CP Console Login:

- f. Type the logon information.
 The default administrative logon is admin, and the default password is password.

- g. At the prompt, type 0 to log in to switch 0.

```
Enter switch number to login <0 or 1>:0
```

Note: At the initial login, the user is prompted to type a new admin password and a new user password. The same administrative account applies to both logical switches. If the password is changed on switch 0, it automatically changes on switch 1.

- h. Change the passwords if desired. Passwords must be a total of 8 to 40 characters long and should include a combination of numbers, uppercase, and lowercase letters. To skip changing the password, press CTRL+C.
3. Type the following command to determine which CP card is active:

```
haShow
```

Information about the card displays.

```
switch:admin> haShow
Local CP (Slot 5, CP0): Active
Remote CP (Slot 6, CP1): Standby, Healthy
HA Enabled, Heartbeat Up, HA State not in sync
```

4. Configure the IP addresses for both CP cards.

You can make configuration changes only through a login session with the active CP card. However, you can assign IP addresses to either CP card from a login session with the active CP card.

- a. If the CP card in slot 5 is not the active CP card, disconnect the serial cable from the CP card, connect it to the CP card in slot 6, and login as admin.
- b. At the prompt, type ipAddrSet 2 for the CP card in slot 5, or type ipAddrSet 3 for the active CP card in slot 6.
- c. Type the requested information at the prompts, as the following example shows. The default information for the CP card in slot 5 is shown.

```
Ethernet IP Address [10.77.77.75]:
Ethernet Subnetmask [255.0.0.0]:
Host Name [CP0]:
Gateway Address [0.0.0.0]:
```

The host name is the native name that is assigned to the CP card. You must use the same gateway address for both CP cards. These gateway addresses are referenced for the logical IP addresses.

The native IP address of the active CP card is updated immediately. The native IP address of the standby CP card is updated at the next restart.

- d. Repeat step 4a - step 4c for the other CP card.
5. Configure the two logical IP addresses.

Note: Resetting a logical IP address while the switch has active IP traffic can cause the IP traffic to be interrupted or stopped. IP traffic might include Web Tools, Fabric Watch, SNMP, and other applications.

If you change the IP address, you can cause a domain address format registered state change notification (RSCN) to be issued.

- a. To configure the first logical IP address, type the following command at the prompt:


```
ipAddrSet 0
```

- b. Type the requested information for this IP address at the prompt:

```
Ethernet IP Address [10.77.77.77]:  
Ethernet Subnetmask [0.0.0.0]:  
Fibre Channel IP Address [none]:  
Fibre Channel Subnet Mask [none]:
```

The logical IP address is updated immediately.

- c. To configure the second logical IP address, type the following command at the prompt:

```
ipAddrSet 1
```

- d. Type the requested information for this IP address at the prompt.
- e. At the prompt, type the following command to restart the CP card:

```
reboot
```

Note: You can use the terminal serial port to monitor error messages through a serial connection. Do not use the terminal serial port as a command line interface during normal operations because it only modifies one switch at a time (switch 0 by default).

- f. If this port is not used continuously, remove the serial cable. Replace the shipping cap to protect the port from dust.
6. Optional: Connect the active CP card by Ethernet cable to the local area network (LAN).
 - a. Remove the shipping plug from the Ethernet port on the active CP card.
 - b. Insert one end of an Ethernet cable into the Ethernet port.
 - c. Connect the other end to an Ethernet 10/100BASE-T LAN.

You can now access the switch remotely by using any of the available management tools, such as Telnet or Web Tools. Be sure that the switch is not modified from other connections during the rest of this procedure.

7. Optional: Login to either of the logical switches by using Telnet and the administrative logon. The default administrative logon name is `admin`, and the default password is `password`.

You can now access the switch remotely using Telnet or Web Tools. Be sure that the switch is not being modified from any other connections during the remaining steps. The M12 supports up to two Telnet sessions with administrative privileges at the same time. You can accomplish the remaining steps in this procedure with either a serial connection or a Telnet session.

8. Optional: Customize the switch names for the logical switches, if desired. If possible, use the default switch names.

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

- a. Type `switchName`, with the new switch name enclosed in double quotation marks. In the following example, "sw10" is the new switch name.

```
switchName "sw10"
```

- b. Record the new switch name for future reference.
- c. To customize the switch name for the other logical switch, perform the following steps:
 - 1) Log out from the CP session.
 - 2) Connect the serial cable to the other CP card.

- 3) Log in as admin.
 - 4) Repeat step 8a on page 11 and step 8b on page 11 for the other logical switch.
9. Optional: Modify the domain IDs, if desired.
Type `fabricShow` to see a list of the current domain IDs.

Note: The default domain ID for both switches is 1. To prevent a domain ID conflict, make the domain IDs unique before you connect the switches to the fabric.

- a. Type the following command to disable the switch:
`switchDisable`
- b. Type the following command:
`configure`
- c. Type `y` at the Fabric parameters prompt:

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

- d. Type a unique domain ID at the Domain prompt:

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

- e. Complete the remaining prompts or press CTRL+D to accept the other settings and exit.
 - f. Type the following command to re-enable the switch:
`switchEnable`
10. Optional: Specify any custom status policies.
- a. To access the status policy, type the following command at the prompt:
`switchStatusPolicySet`
 - b. Complete the prompts to specify the status policies. To completely deactivate the alarm for a particular condition, type `0` at the prompt for that condition.
11. Add SFPs and cables to the Fibre Channel ports, as required.

Note: The ports are color-coded to indicate which ones can be used in the same trunking groups. Four ports that are marked with black solid ovals alternate with four ports that are marked with oval outlines. The ports and cables that are used in trunking groups must meet specific requirements. For a list of these requirements, see the *IBM TotalStorage SAN Switch 2109 Model M12 User's Guide* and the *Brocade ISL Trunking User's Guide*.

- a. Position one of the SFPs so that the key is oriented correctly to the port. Insert the SFP into the port until it is firmly seated. Ensure that the latching mechanism clicks.

Note: SFPs are keyed so that you can only insert them with the correct orientation. If an SFP does not slide in easily, ensure that it is correctly oriented. For instructions that are specific to the SFP model, see the documentation of the SFP manufacturer.

- b. Position a cable so that the key (the ridge on one side of the cable connector) aligns with the slot in the SFP. Insert the cable into the SFP until the latching mechanism clicks.

Note: Cables are keyed so that you can only insert them with the correct orientation. If a cable does not slide in easily, ensure that it is correctly oriented.

- c. Repeat step 11a on page 12 and step 11b on page 12 for the remaining ports.
 - d. Organize the cables as required.
12. Check the M12 switch and port status. Type the following command at the Telnet prompt:
`switchShow`
This command provides detailed information about the switch.
 13. Check the fabric for ISLs, switch names, or other status. Type the following command at the Telnet prompt:
`fabricShow`
This command provides general information about the fabric.
 14. After all zoning configurations and other changes are complete, back up the configuration. Type the following command at the Telnet prompt:
`configUpload`
This command uploads the switch configuration to the server, so that it is available for downloading to a replacement switch if necessary.

Note: You should routinely back up the configuration.

Chapter 3. Operating the M12

This chapter describes how to operate the M12 and includes the following information:

- “Turning the switch on and off”
- “Interpreting LED activity” on page 20
- “Interpreting POST” on page 30
- “Maintaining the switch” on page 31

Note: Throughout this chapter, the term *switch* refers to the M12.

Turning the switch on and off

To turn the switch on, verify that both power cords connect to the ac power connectors on the front of the chassis. Flip both green ac power switches to “I”. The green ac power switches illuminate when they are on.

To turn off the switch, flip both ac power switches to “O”. To remove all sources of power from the switch, disconnect both power cords from the power source.

Note: Removing all power from the switch triggers a system reset. When you restore the power, all devices return to the initial state, and the switch runs a POST.

Attention: After you power on the switch, run it for a minimum of 10 minutes before you power off again.

Switch components

The switch includes the following components:

- 16–port cards
- CP cards
- Power supplies
- ac power input connection
- ac power switches
- Blower assemblies
- WWN card and bezel
- Cable management tray

16–port cards

Attention: Wear an electrostatic discharge (ESD) grounding strap when you work with a 16–port card to prevent damage to the electrical components.

To ensure correct cooling of the chassis and protection from dust, install a filler panel in any slots that do not contain a 16–port card.

Disassembling any part of a 16–port card voids the part warranty and regulatory certifications.

CAUTION:

No user-serviceable parts are inside the 16–port card.

Each 16–port card provides 16 auto-sensing Fibre Channel ports that are capable of auto-sensing data transmission speeds of 1 Gbps and 2 Gbps.

You can install 16–port cards in any combination of slots 1–4 (switch 0) and 7–10 (switch 1), with one exception. If there are one or more 16–port cards in slots 7–10, there must be at least one 16–port card in slots 1–4.

The ports on each of the 16–port cards are color-coded. The color code indicates which ports to use in the same ISL Trunking group. Four ports that are marked with black solid ovals alternate with four ports that are marked with oval outlines.

Note: ISL Trunking is a Fabric OS feature. ISL Trunking enables distribution of traffic over the combined bandwidth of up to four ISLs between two directly adjacent switches, while preserving in-order delivery. For more information about ISL Trunking, see the *Brocade ISL Trunking User's Guide*.

The switch can continue to operate while you replace a 16–port card, but you must disconnect any devices that are connected to the 16–port card. To ensure correct air circulation inside the switch and protection from dust, you can order filler panels for any empty slots.

Perform the following steps to determine the status of a 16–port card:

1. Check the LEDs on the 16–port card. See Table 3 on page 22 for information about how to interpret the LEDs.
2. Check the 16–port card status by using the **slotShow** command. For additional information about this command, see the *Brocade Fabric OS Reference*.

Control processor cards

Attention: Wear an ESD grounding strap when you work with a CP card to prevent damage to the electrical components.

To ensure correct cooling of the chassis and protection from dust, install a filler panel in any slot that does not contain a CP card.

Disassembling any part of a CP card voids the part warranty and regulatory certifications. No user-serviceable parts are inside the CP card.

High availability is provided through redundant CP cards: An active CP card and a standby CP card. The active CP card is the one that is actively controlling the switch. If the active CP card failed or is uninstalled, the standby CP card automatically becomes the new active CP card. Failover occurs as soon as the active CP card is detected to be faulty or uninstalled.

Information about both CP cards, including which card is active, is available by using the **haShow** command. For information about commands and whether you can enter them through the active or standby CP card, see the *Brocade Fabric OS Reference*.

Each CP card provides the following ports:

- Modem serial port

The modem serial port has an RS-232 connector that is wired as a data terminal equipment (DTE) device. It is designed to connect to a distributed computing environment (DCE) device, such as a modem.

- Terminal serial port (also known as a console port)

The terminal serial port has an RS-232 signal subset connector that you can use to connect to a PC serial port or dumb terminal.

- Ethernet port

The Ethernet port has an RJ-45 connector and is capable of speeds of 10 Mbps or 100 Mbps.

You can connect a separate modem to each modem serial port, and then connect to the same or separate telephone lines for redundancy.

Note: The switch only detects modems during power on or restart. If a modem is connected to an operating switch, you must restart the switch in order to detect the modem.

The switch can continue to operate while a CP card is being replaced. To ensure correct air circulation inside the switch and protection from dust, you can order filler panels for any empty slots.

The active CP card controls the following services:

- System initialization
- High availability and switch drivers
- Name server
- SNMP
- Fabric OS
- Extended Fabrics
- Fabric Watch
- Remote Switch
- Web Tools
- Zoning

Perform the following steps to determine the status of a CP card:

1. Check the LEDs on the CP card. See Table 4 on page 25 for information about how to interpret the LEDs.
2. Check the CP card status by using the **slotShow** and **haShow** commands.
For additional information about these commands, see the *Brocade Fabric OS Reference*.

Power supplies

The switch uses four power supplies. A minimum of two power supplies is required to power a completely loaded chassis.

The switch can continue operating while a power supply is being replaced if at least one power supply continues operating for every four 16-port cards that are installed. You must have a minimum of two power supplies.

Attention: To protect against ac failure, you must have a minimum of one power supply in slot 1 or slot 3 and one in slot 2 or slot 4. If you install only two power supplies and you install both of them in slots that correspond to the same power cable, unplugging a single power cable will power down the entire chassis.

Attention: Disassembling any part of the power supply voids the part warranty and regulatory certifications.

Attention: Before you replace a power supply, determine whether adequate power will be available to keep the chassis operating throughout the replacement. If not, shut down both switches before you continue. If adequate power is abruptly lost, such as through removal of a power supply, the entire switch is powered down. The power off order that the **powerOffListSet** command designates does not work.

CAUTION:

No user-serviceable parts are inside the power supply.

Perform the following steps to determine the status of a power supply:

1. Check the LEDs on the power supply. See Table 5 on page 27 for information about how to interpret the LEDs.
2. Check the power supply status by using the **psShow** command. The power supply status displays OK, absent, or faulty. For additional information about the **psShow** command, see the *Brocade Fabric OS Reference*.

AC power input connectors and ac power switches (circuit breaker)

The switch has two ac power input connectors, each with a green ac power switch (circuit breaker). The left power input connector provides power to the power supplies in slot 1 and slot 3. The right power input connector provides power to the power supplies in slot 2 and slot 4. The power input connectors and their associated power supplies are color-coded. The ac power switches light up green when they are on.

Attention: Unplugging a single power cable can power down the entire switch, depending on which power supply slots contain power supplies.

Two detachable power cords are provided with the cabinet and are customized for the country or region in which the cabinet is installed.

Blower assemblies

Three blower assemblies that are located in the back of the chassis cool the switch. The air enters through the vents in the blower assembly side of the chassis. The air exits from the top vent on the port side of the chassis. Each switch requires a minimum airflow of 350 cubic feet per minute.

The blower assemblies are hot-swappable if two blower assemblies remain operating. If you remove more than one blower assembly at the same time, turn off the switch to prevent overheating.

Note: The switch requires a minimum of two functioning blower assemblies during operation. To ensure continuous adequate cooling, maintain three operating blower assemblies at all times except for the brief period when replacing a blower assembly. The 16-port cards automatically shut down if the temperature range is exceeded.

Attention: Disassembling any part of the blower assembly voids the part warranty and regulatory certifications.

CAUTION:

No user-serviceable parts are inside the blower assembly.

Perform the following steps to determine the status of a blower assembly:

1. Check the LEDs on the blower assembly.
2. Check the blower assembly status by using the **fanShow** command. The status for each blower assembly displays OK, absent, or faulty. For additional information about the **fanShow** command, see the *Brocade Fabric OS Reference*.

WWN card and bezel

The WWN card and bezel are located at the top of the chassis on the blower assembly side. The WWN card has LEDs that you use to monitor the switch. The WWN card also stores the following information:

- The chassis serial number (used when installing software licenses)
- The two native IP addresses that are assigned to the CP card slots
- The logical switch names, IP addresses, and WWNs for the two logical switches

The bezel protects the card and identifies each of the LEDs on the WWN card. Together, the WWN card and bezel assembly provides a consolidated view of the LEDs for the two CP cards, eight 16–port cards, and four power supplies. If a slot contains a filler panel, the corresponding LEDs on the WWN card are not illuminated.

Note: There are two types of WWN cards. One type is attached to the chassis by screws and the other type is held on by the pressure of the bezel against a pad on the card face.

Attention: Although the information that is stored in the WWN card is also stored in the flash memory of the CP cards, do not restart the switch while the WWN card is uninstalled. Restarting the switch can cause the switch to start incorrectly.

Attention: Wear an ESD grounding strap when you work with the WWN card to prevent damage to the electrical components.

Cable management items

Two items are provided to assist with cable management:

- Cable management tray

The cable management tray is attached to the bottom of the chassis. You can use it to route the power cables and other cables down below the chassis or out the sides of the chassis.

- Cable guides

A set of 16 cable guides is provided with the cabinet. You can use the guides to organize the port cables into logical groups, such as port quads (sets of four neighboring ports). The cable guides are free-floating and do not attach to the chassis. The cable guides keep the cables evenly spaced and hold them away from the 16–port cards. This makes card replacement easier and prevents the cables from bending to less than the minimum bend radius.

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

The minimum bend radius for a 50-micron cable is 3.05 cm (2 in.) under full tensile load, and 3.048 cm (1.2 in.) with no tensile load.

Do not use tie wraps for optical cables because they are easily overtightened.

Interpreting LED activity

You can determine system activity and status by monitoring the activity of the LEDs on the switch.

There are four possible LED states:

- No light
- Steady light in one of the following colors:
 - Green
 - Amber
 - Yellow (displays when both green and amber LED elements are lit)
- Slow-flashing light (green, amber, or yellow)
- Fast-flashing light (green, amber, or yellow)

The LEDs can flash green, yellow, or amber while the switch is starting or while a POST or other diagnostic tests are running. This is normal. It does not indicate a problem unless the LEDs do not indicate that all components are operational after the switch is started, after a POST, or after any diagnostic tests are complete.

See the error log for any errors. For information about the error log, see the *Brocade Diagnostic and System Error Message Reference*.

LEDs on the 16-port card

The following LEDs are on the 16-port card:

- Power LED
- Status LED
- Port speed LED for each port
- Port status LED for each port

Note: The LED patterns can temporarily change during a POST and other diagnostic tests.

Figure 14 on page 21 shows the location of the LEDs on the 16-port card.

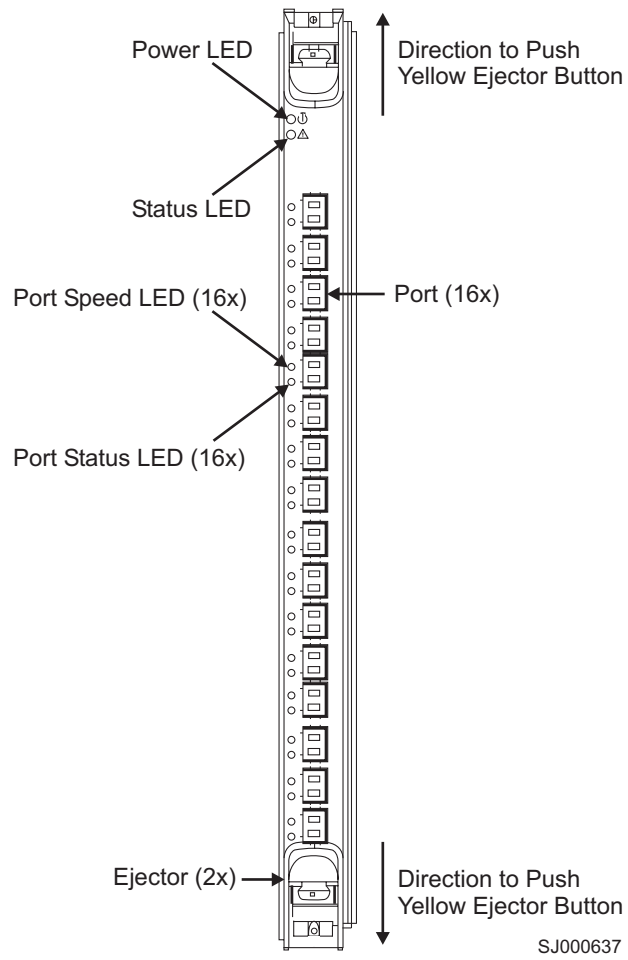


Figure 14. 16-port card LEDs

Table 3 describes the 16–port card LED patterns. It lists the name, location, and possible colors of each LED. It also lists the status of the switch that is associated with each LED color and the action that you can take in response to that status.

Table 3. 16–port card LED patterns

Name of LED	Location of LED	Color of LED	Status of hardware	Action
Power	Uppermost LED	No light (LED is off)	The 16–port card does not have incoming power.	Ensure that the card is firmly seated and has power.
		Steady green	The 16–port card has incoming power.	No action is required.
Status	Below the Power LED	No light (LED is off)	The 16–port card is either healthy or does not have power.	Verify that the Power LED is lit.
		Steady yellow	The 16–port card is faulty.	Ensure that the card is firmly seated and check the status with the slotShow command. If the LED still displays yellow, contact IBM.
		Slow-flashing yellow (on 2 seconds; off 2 seconds)	The 16–port card is not seated correctly, or is faulty.	Pull the card out and reseal it. If the LED continues to flash, replace the card.
		Fast-flashing yellow (on 1/2 second; off 1/2 second)	The environmental range is exceeded.	Check for out-of-bounds environmental condition.
Port Speed	Uppermost of the two LEDs to the left of each port	No light (LED is off)	The port is either set to 1 Gbps mode, or does not have incoming power.	Verify that the Power LED is lit. To change the mode, see the <i>Brocade Fabric OS Procedures Guide</i> .
		Steady green	The port is set to 2 Gbps mode.	No action is required.

Table 3. 16-port card LED patterns (continued)

Name of LED	Location of LED	Color of LED	Status of hardware	Action
Port Status and Activity	To the left of each port, below the Port Speed LED	No light (LED is off)	<ul style="list-style-type: none"> • Either the 16-port card does not have incoming power or there is no light or signal carrier detected. • Polling is in progress. • The connected device is configured in an offline state. 	Verify that the Power LED is lit and check the transceiver and the cable.
		Steady green	The port is online (connected to an external device) but has no traffic.	No action is required.
		Slow-flashing green (on 1 second; off 1 second)	The port is online but segmented, indicating a loopback plug or cable, or an incompatible switch.	Verify that the correct device is connected to the port.
		Fast-flashing green (on 1/4 second; off 1/4 second)	The port is in internal loopback (diagnostic).	No action is required.
		Flickering green	The port is online, with traffic flowing through the port.	No action is required.
		Steady yellow	The port is receiving light or signal carrier, but is not yet online.	No action is required.
		Slow-flashing yellow	The port is disabled (from diagnostic tests or the portDisable command).	Reset the port from the workstation.
		Fast-flashing yellow (on 1/2 second; off 1/2 second)	The SFP or the port is faulty.	Change the SFP or reset the switch from workstation
		Alternating green and yellow	The port is bypassed.	Reset the port from the workstation.

LEDs on the CP card

The following LEDs are on the CP card:

- Power LED
- Status LED
- Link status and activity LED
- Link speed LED

Note: The LED patterns can temporarily change during a POST and other diagnostic tests.

Figure 15 shows the location of the LEDs on the CP card.

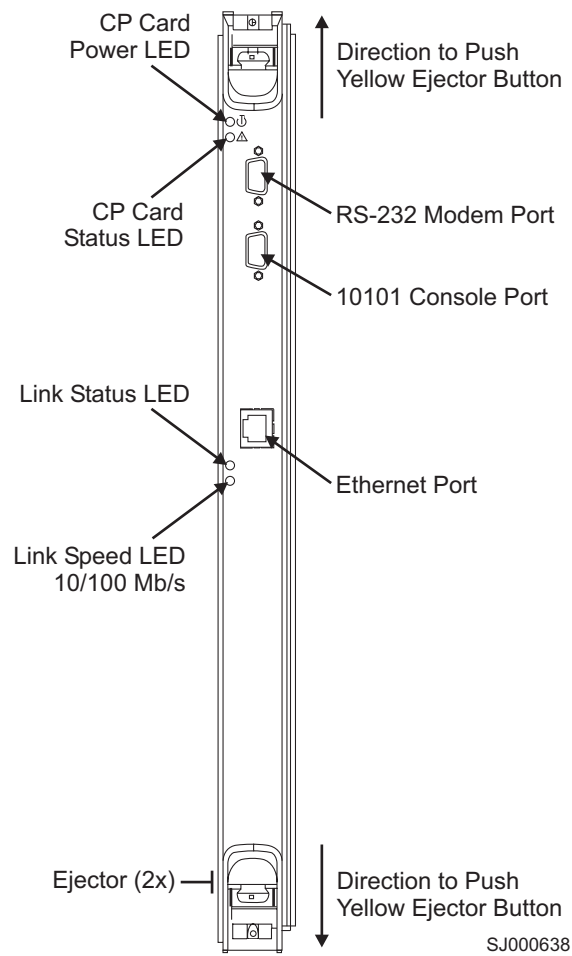


Figure 15. CP card LEDs

Table 4 describes the CP card LED patterns. It lists the name, location, and possible colors of each LED. It also lists the status of the switch that is associated with each LED color and action that you can take in response to that status.

Table 4. CP card LED patterns

Name of LED	Location of LED	Color of LED	Status of hardware	Action
Power	Uppermost LED	No light (LED is off)	The CP card does not have incoming power.	Ensure that the CP card is firmly seated and has power.
		Steady green	The CP card has incoming power.	No action is required.
Status	Below the Power LED	No light (LED is off)	The CP card is either healthy or does not have incoming power.	Verify that the Power LED is lit.
		Steady yellow	The CP card is faulty.	Ensure that the CP card is firmly seated. If the LED still displays yellow, contact IBM.
		Slow-flashing yellow (on 2 seconds; off 2 seconds)	The CP card is not seated correctly, or is faulty.	Pull the CP card out and reseat it. If the LED continues to flash, replace the CP card.
		Fast-flashing yellow (on 1/2 second; off 1/2 second)	The environmental range is exceeded.	Check for out-of-bounds environmental condition.
Link status and activity (labeled "Link" on the CP card)	Uppermost of the two LEDs below and to the left of the Ethernet port	No light (LED is off)	Either the CP card does not have incoming power or no link is detected.	Ensure that the CP card has power. Verify that the Ethernet cable is firmly seated and the device at the other end of the link is functioning.
		Flickering green and yellow	The link is healthy, with traffic flowing through the port.	No action is required.
Link speed (labeled "10/100 Mb/s" on the CP card)	To the left of the Ethernet port, below the Link status and activity LED	No light (LED is off)	Either the link speed is 10 Mbps or the CP card does not have incoming power.	Ensure that the CP card has power.
		Steady green	The link speed is 100 Mbps.	No action is required.

LEDs on the power supply

The following LEDs are on each power supply:

- Power LED
- Predictive Failure LED
- Fail LED

If only one ac power switch is turned on, the fail LED on each of the two power supplies without power lights up.

Note: The LED patterns can temporarily change during a POST and other diagnostic tests.

Figure 16 shows the location of the LEDs on the power supply.

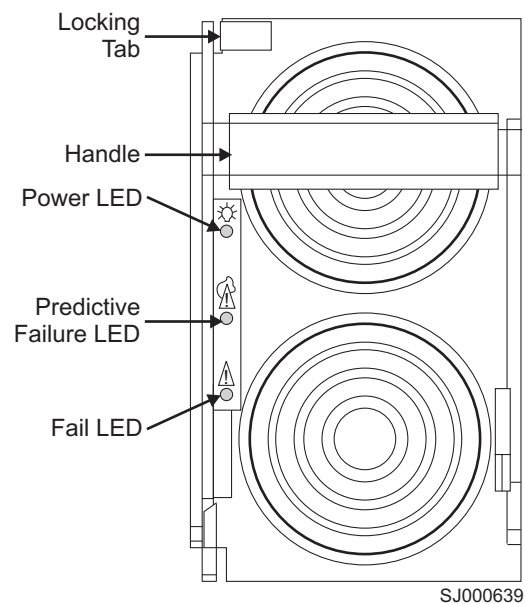


Figure 16. Power supply LEDs

Table 5 on page 27 describes the power supply LED patterns. It lists the name, location, and possible colors of each LED. It also lists the status of the switch that is associated with each LED color and action that you can take in response to that status.

Table 5. Power supply LED patterns

Name of LED	Location of LED	Color of LED	Status of hardware	Action
Power	Uppermost LED	No light (LED is off)	The power supply does not have incoming power.	Ensure the following states: <ul style="list-style-type: none"> • The power supply is firmly seated. • The switch has incoming power. • Both power cables are connected. • The ac power switches are on.
		Steady green	The power supply has incoming power and is providing power to the switch.	No action is required.
Predictive Failure	Below the Power LED	No light (LED is off)	The power supply is either healthy or does not have incoming power.	Check the Power LED.
		Flashing amber	The power supply is about to fail because there is a failing fan inside the power supply.	Replace the power supply.
Fail	Below the Predictive Failure LED	No light (LED is off)	The power supply is either healthy or does not have incoming power.	Check the Power LED.
		Steady amber	Either the switch has power but this power supply does not (ac switch might be off), or the power supply has failed.	Ensure that the correct ac power switch is on and the power supply is seated. If the LED still displays, replace the power supply.
		Flashing amber	The power supply is unable to supply power.	Verify that the incoming power meets the requirements listed in "Power specifications" on page 89.

LEDs on the blower assembly

The following LEDs are on each blower assembly:

- Power LED
- Fault LED

Figure 17 shows the location of the LEDs on the blower assembly.

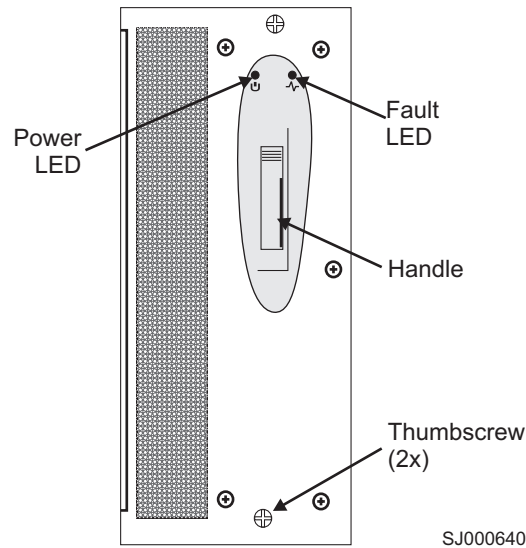


Figure 17. Blower assembly LEDs

Table 6 describes the blower assembly LED patterns. It lists the name, location, and possible colors of each LED. It also lists the status of the switch that is associated with each LED color and action that you can take in response to that status.

Table 6. Blower assembly LED patterns

Name of LED	Location of LED	Color of LED	Status of hardware	Action
Power	Above and to the left of the blower assembly handle	No light (LED is off)	The blower assembly does not have incoming power.	Ensure that the blower assembly is firmly seated and has power.
		Steady green	The blower assembly has incoming power.	No action is required.

Table 6. Blower assembly LED patterns (continued)

Name of LED	Location of LED	Color of LED	Status of hardware	Action
Fault	Above and to the right of the blower assembly handle	No light (LED is off)	The blower assembly is either healthy or does not have incoming power.	Ensure that the blower assembly has incoming power.
		Steady amber	The blower assembly has fully or partly failed.	Replace the blower assembly.
		Slow-flashing amber (on 2 seconds; off 2 seconds)	The blower assembly is not seated correctly or is faulty.	Pull out the blower assembly and reseal it. If the LED continues to flash, replace the blower assembly.
		Fast-flashing amber (on 1/2 second; off 1/2 second)	The environmental range is exceeded.	Check for an out-of-bounds environmental condition, resolve any problems, then reseal unit. If the LED continues to flash, replace the unit.

LEDs on the WWN card and bezel

The WWN card and bezel are located at the top of the chassis on the blower assembly side. The bezel covers the WWN card, allowing the LEDs to shine through. The WWN card and bezel provide a consolidated LED view of:

- The incoming power to and status of the 16-port cards in slots 1–4 and 7–10
- The incoming power to and status of the CP cards in slots 5 and 6
- The incoming power to the four power supplies

If a slot has a filler panel in place of a 16-port card, a CP card, or a power supply, the LEDs for that slot on the WWN card and bezel do not light up.

If a Status or Fail LED on the power supply flashes, the Power LED on the WWN card also flashes for increased visibility.

Note: The LED patterns can temporarily change during a POST and other diagnostic tests.

Figure 18 on page 30 shows the location of the LEDs on the WWN card and bezel.

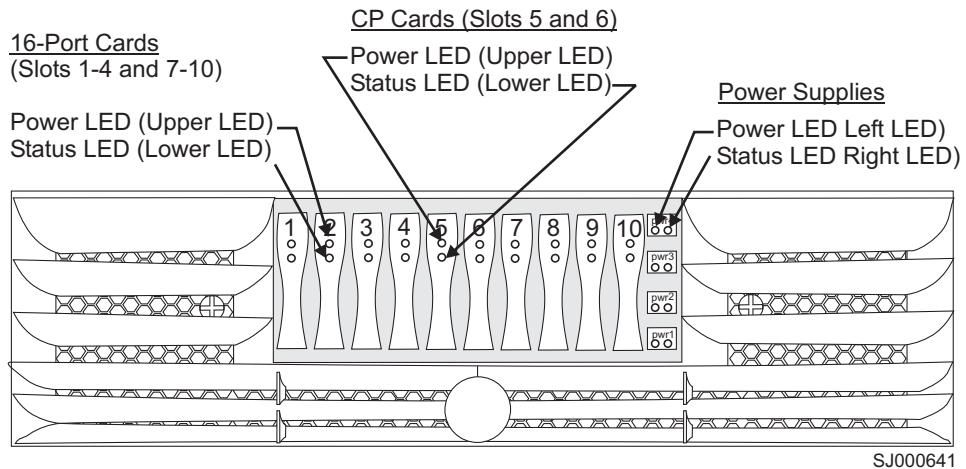


Figure 18. LEDs on the WWN card and bezel

Interpreting POST

The switch performs a POST by default each time that you power on (cold start) the chassis. You can restart the switch with the **switchReboot**, **reboot**, or **fastboot** commands. The **fastboot** command restarts the switches without running a POST. A CP card failover event results in a restart for the affected CP card.

POST includes a number of diagnostic tests. You can monitor the test results through LED activity, the error log, or the command line interface. POST requires a minimum of 3 minutes to complete (the time varies and depends on the devices that are connected to the switch).

POST includes the following steps:

1. Running preliminary POST diagnostics
2. Initializing the operating system
3. Initializing the hardware
4. Running diagnostic tests on a number of functions, including:
 - Internal connections and circuitry
 - Port function
 - Ability to send and receive frames
 - All aspects of memory, parity, and statistics counters
 - Correct serialization

The following switch initialization steps are performed whether or not a POST runs:

1. Configures the universal port.
2. Initializes the links.
3. Analyzes the fabric. If any ports connect to other fabric elements (switches), the switch participates in a fabric configuration.
4. Obtains a domain ID and assigns port addresses.
5. Constructs unicast routing tables.
6. Enables normal port operation.

Perform the following steps to verify that a POST completes without errors:

1. Verify that all LEDs return to a normal state after a POST completes. If one or more LEDs do not return to a normal state, and this is not due to the switch being set to beacon, see “Interpreting LED activity” on page 20. Run the **slotShow** command to check the status of the slots.
2. Verify that the switch prompt displays when a POST completes. If it does not display, a POST did not successfully complete. Contact IBM for support.
3. Review the system log. Any errors that are detected during a POST are written to the system log. You can view this error log by running the **errShow** command.

For information about error messages or how to set a switch to beacon, see the *Brocade Diagnostic and System Error Message Reference* and the *Brocade Fabric OS Reference*.

Maintaining the switch

The switch does not require any regular physical maintenance. It is designed to minimize the chance of failure by using diagnostic tests and field replaceable units (FRUs).

Diagnostic tests

Diagnostic tests are provided to help you to identify problems in the hardware and the firmware. The diagnostic tests include tests of internal connections and circuitry, SFPs, and fiber-optic cables in use. You can run the tests either by using Telnet or through a terminal that is set up for a serial connection to the switch. Some tests require that external cables connect the ports to each other. This allows diagnostics to verify the serializer or deserializer interface and to test the attached SFP and cable.

All diagnostic tests run at link speeds of 1 Gbps and 2 Gbps. For information about diagnostic tests and how to run them, see the *Brocade Fabric OS Reference*.

Note: The diagnostic tests temporarily lock the transmit and receive speed of the links to a specific speed.

Field replaceable units

You can replace the 16-port cards, CP cards, power supplies, and blower assemblies in the field without special tools. In most cases, the switch can continue to operate while you replace a FRU. See Chapter 6, “Servicing the M12,” on page 57 for the procedures for how to replace these FRUs and other components.

You can configure Fabric Watch alarms for each FRU. For information about Fabric Watch alarms, see the *Brocade Fabric Watch User’s Guide*.

You can determine the status of the individual FRU by visually checking the LEDs on the hardware components (see “Interpreting LED activity” on page 20) or by using Telnet commands. For information about Telnet commands, see the *Brocade Fabric OS Reference*.

Environmental status and maintenance commands

You can also view environmental information and switch status by using Telnet commands. See the *Brocade Fabric OS Reference* for a complete description of these commands.

Chapter 4. Installing modems

Note: Throughout this chapter, the term *switch* refers to the M12.

Each CP card in the switch contains a modem serial port that allows you to connect to a Hayes-compatible modem. The modem serial port is wired as a standard DTE port. You do not need any additional software on the switch to use the modems.

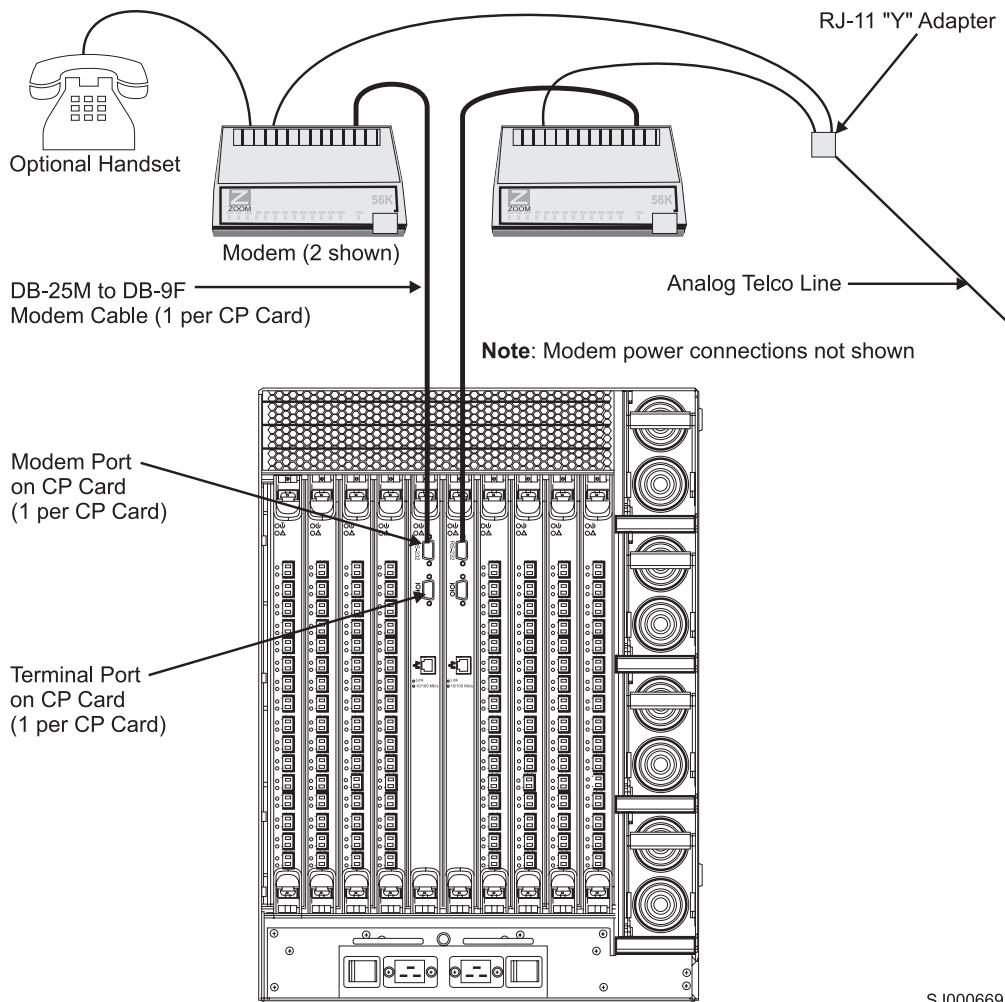
The modem serial port has the same command, login capabilities, and operational behavior as the terminal serial port. However, asynchronous informational messages and other unsolicited text are not sent to the modem ports.

Connecting a separate modem to each CP card and then connecting both modems to a shared telephone line ensures the high availability of the modem connection. This ensures that one telephone line is used to access the active CP card when a failover occurs. You must log in again if a failover occurs. If both CP cards connect to a shared telephone line, callers automatically dial into the active CP card. The active CP card answers on the first ring. If the active CP card cannot answer for any reason, the standby CP card answers on the seventh ring and allows a login to proceed.

Note: The switch detects modems only during power on, restart, or a CP card failover sequence.

After you connect the modems, you can use a Telco system to dial in to the modems and verify that they answer and dialogue as expected. If a dial-out modem facility is not available, you can use a terminal emulation program on a computer workstation (or laptop) that has an attached modem. See “Setting up a remote modem system (optional)” on page 34 for instructions on how to set up a remote modem for testing purposes. For security reasons, the modem session is automatically disconnected if the modem cable is detached while a session is active.

Figure 19 on page 34 shows two modems that are connected to a switch.



SJ000669

Figure 19. 2109 Model M12 with two modems connected

Setting up a remote modem system (optional)

Note: You should set up the modems before you power on the switch and connect it to the fabric.

This section provides information about how to set up a remote modem for testing the switch modems.

Perform the following steps to set up the optional remote modem system:

1. Connect the remote modem to a computer workstation that has a terminal emulator application such as HyperTerminal on Windows 95, 98, 2000, ME, or NT, or TERM in a UNIX environment.
2. Disable any serial communication programs that are running on the workstation, such as synchronization programs for a personal digital assistant.
3. Start the terminal emulator application and if needed, configure as follows:
 - Enter the parameters in Table 7 on page 35 for Windows 95, 98, 2000, ME, or NT, or TERM in a UNIX environment.

Table 7. Modem parameters for Windows 95, 98, 2000, ME, or NT, or TERM in a UNIX environment

Parameter	Value
Port speed (bits per second)	115200. This value usually defaults to the highest speed that the modem supports and then possibly negotiates for a slower speed.
Data protocol	Standard EC
Compression	Enabled
Flow control	Hardware
Databits	8
Parity	None
Stop bits	1
Modulation	Standard

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

```
tip /dev/ttyb -9600
```
4. Follow the instructions from the modem manufacturer for setting up and verifying the modem operation.

Installing the modems on the switch

Note: You should set up the modems before you power on the switch and connect it to the fabric.

The switch detects modems only during power on, restart, or CP card failover. Set up the modems before you connect the switch to the fabric.

You need the following items to set up two modems to work with the switch:

- Two Hayes-compatible modems, such as the Zoom/Modem V.92 EXT Model 3049
- Two standard modem cables, DB25 (male) to DB9 (female)
- One RJ-11 Y adapter for standard Telco wiring or equivalent circuitry (a total of three connections)
- One analog telephone line

CAUTION:

For normal installation, the switch and attached modems are powered off before cabling them. The modems are automatically detected during a power-on sequence.

Perform the following steps to install the modems:

1. Verify that the power to the switch is off.
2. Set up the two modem units and the required power connections. Do not turn on the power to the modems until all cables are attached.
3. Connect the modem cables to the modems and to the switch modem ports. See Figure 19 on page 34.
4. Connect the telephone line inputs on the modems to the RJ-11 Y adapter. This effectively places both modems on a single telephone line.

5. Optional: Connect a telephone handset to one of the telephone connections on the modem. See Figure 19 on page 34.
6. Connect the RJ11 Y adapter to an appropriate analog telephone line.

Note: Write down the dial-in number. You will use this number later.

7. Turn on the power to the modems. Verify that the modem-ready (MR) indicators light on both modems.
8. Power on the switch, or restart it if you did not power off during the previous steps. Performing this step allows the switch to recognize the modems.

Verifying modem installation

Perform the following steps to verify that the modems are installed correctly:

1. Verify that both modem cables are connected at the modem and the CP card.
2. Turn on the power to the modems if not already on.
3. Turn on the power to the switch if not already on.
4. Verify that both modems are ready by checking the following LEDs:
 - Clear to send (CS)
 - Terminal ready (TR)
 - Modem ready (MR)

If the LEDs do not light, ensure that the modems are connected to a power source and have the power turned on. Also recheck the modem cable connections on the modem and the modem port of the switch.

5. Wait until a POST completes on the switch (a minimum of 3 minutes).
6. Using a remote client dialing facility (as described in “Setting up a remote modem system (optional)” on page 34), dial in to the customer telephone number for the switch.
7. Observe the modem LEDs. The ring indicator (RI) LED should flash briefly as the telephone rings. If the RI LED does not flash on both modems, recheck the incoming telephone lines to the modems.
8. After one ring, the off hook (OH) LED on the modem that is associated with the active CP card (usually in slot 5) should light. A login prompt displays to the remote client. Login normally.

Note: If the OH LED on the standby CP card (usually in slot 6) lights after seven rings, recheck the active modem cable connections of the CP.

9. Disconnect the modem session of the active CP card that is using the remote client software.
10. Remove the Telco connector from the active CP card modem. Leave the Telco line of the standby CP card connected to the RJ-11 Y adapter. See Figure 19 on page 34.
11. Using the remote client dialing facility, dial in to the customer telephone number for the switch.
12. Observe the modem LEDs carefully. The RI LED should now flash only on the modem that is connected to the standby CP card.
13. After seven rings, the OH LED on the modem that is associated with the standby CP card should light. A login prompt displays to the remote client. A message confirms that the standby CP card is being logged into. Login normally, if desired, or disconnect the session.
14. Restore the Telco connector to the active CP card modem.

The switch modems are now ready to use.

Notes:

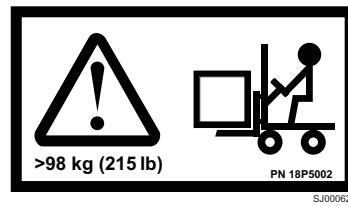
1. Experienced users can use the **haFailover** command to further evaluate the attached modems. It is important to wait approximately 5 minutes after a failover (or restart) to allow the system to correctly set up the modems.
2. For security reasons, the modem session is disconnected if the modem cable is detached while a session is active.

Chapter 5. Installing and removing Model M12 switches

This chapter describes how to install the 2109 Model M12 switch into a 2109 Model C36 cabinet, and how to remove an M12 from the cabinet.

One M12 is installed in the cabinet at the factory. The cabinet is designed to support one additional 2109 Model M12, which can be added on site.

Before you install additional switches into the cabinet, be familiar with the following installation considerations and safety guidelines. Also refer to “Safety and environmental notices” on page xi for additional safety information and notices.



CAUTION:

The weight of this part or unit is more than 115 kilograms (250 pounds). It takes specially trained persons with a lifting device to safely lift this part or unit. (C011)

CAUTION:

A fully populated M12 weighs approximately 115 kg (250 lbs). Before you install it, verify that the additional weight of the chassis does not exceed the cabinet's weight limit or unbalance the cabinet. When you calculate the additional weight, include the cards or power supplies that partially extend out of the chassis.

Attention: To ensure adequate cooling, install the chassis with the port side facing the aisle where exhaust air is released (usually called the service aisle). This prevents the fans from pulling in heated exhaust air.

Before you install an additional M12 into the cabinet, perform the following tasks:

- Ensure that a space that is 14U high, 74 cm (29 in.) deep, and 48 cm (19 in.) wide is available in the cabinet.
- Ensure that there is a minimum distance of 71.75 cm (28.25 in.) between the front and back rails of the cabinet.
- Verify that the additional weight of the chassis does not exceed the weight limit of the cabinet.
- Ensure that all equipment that is installed in the cabinet is grounded through a reliable branch circuit connection. Do not rely on a secondary connection to a branch circuit, such as a power strip.
- Plan for managing the cables before you install the chassis. You can manage the cables in a variety of ways, such as:
 - Routing the cables below the chassis
 - Routing the cables to either side of the chassis
 - Routing the cables through the cable channels on the sides of the cabinet
 - Using the patch panels
- Ensure that the power directors have two dedicated electrical branch circuits with the following characteristics available for use:
 - 200–40 V ac, 30 amps
 - 50–60 Hz

- Ensure that the two dedicated electrical branch circuits are protected with a circuit breaker that is in accordance with the local electrical codes.
- Ensure that the supply circuit, line fusing, and wire size are adequate according to the electrical rating on the chassis nameplate.
- Ensure that a licensed electrician installs the grounded outlets and that they are compatible with the power cords.
- Ensure that the M12 has access to a minimum airflow of 350 cubic feet per minute.
- Ensure that the air temperature that is measured at the blower inlet does not exceed 40°C (104°F) during operation.

Ordering the lift tool

Important

The lift tool is required only when you install an additional M12 switch.

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

Note: The bridge tool (PN 18P5855), which is required for installation, is shipped with a new or a replacement M12. The bridge tool, when installed, serves as a temporary ramp between the lift tool and the M12 rails that are installed in a Model C36 cabinet. You do not need to return the bridge tool when you are done with it.

World trade locations

The following ordering procedures are for world trade locations:

- Order the lift tool by using the parts order system, like any other part.
- Use the following part numbers when you order:
 - Lift tool: PN 09P2481
 - 24-inch load plate: PN 11P4369
- You do not record parts usage.
- Return the lift tool and the 24-inch load plate to the parts center after you complete the installation or removal of the M12.

United States locations

In the United States, call UPS Logistics at 800-528-6046 to order the lift tool and the 24-inch load plate.

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

Use the following part numbers when you order:

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

Note: When you order the lift tool, you will receive an 18–inch load plate. Do not use the 18–inch load plate. You must order and use a 24–inch load plate when you install the M12.

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

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

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

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

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

2109 Model M12 standard shipment

An M12 is shipped with the following items:

- The M12, which includes:
 - Four to eight 16–port cards (customer-specified configuration)
 - Two CP cards
 - Four power supplies
 - Three blower assemblies
- One accessory kit that contains the following items:
 - *IBM TotalStorage SAN 2109 Model M12 Installation and Service Guide*
 - 2109 Model M12 documentation CD-ROM
 - ESD grounding strap
 - One serial cable
 - The 14U chassis mount kit with installation instructions
 - Bridge tool: PN 18P5855

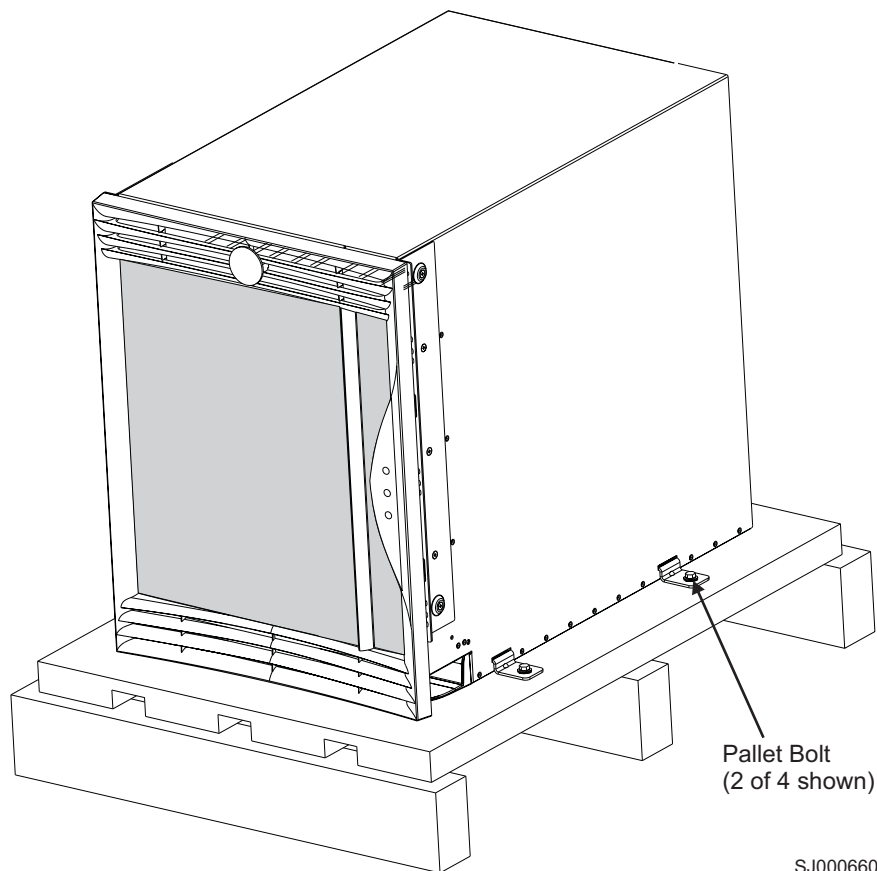
Note: You can order SFP transceivers separately from IBM. The 2109 Model M12 supports both SWL and LWL transceivers.

Unpacking the M12

Perform the following steps to unpack the M12.

Note: This procedure requires a 1/2 in. socket wrench to remove the pallet bolts.

1. Remove the upper portion of the packing crate while the switch is still in the shipping area to reduce clutter at the installation site.
 - a. Open the latches that hold the top of the crate to the pallet. To open a latch, pull the handle out, turn it to the left, then slide the latch open.
 - b. Lift the top of the crate off the pallet.
 - c. Leave the foam on top of the chassis to hold the kits in place during transportation to the installation area.
 - d. Do not move the chassis off the pallet until the door is removed.
2. Open the shipping crate by pulling the handle of the latch and turning it counterclockwise. Slide the latch open.
3. Remove the packing foam, antistatic plastic, 14U chassis mount kit, and accessory kit.
4. Unscrew the four bolts that hold the Model M12 to the pallet. See Figure 20. Remove the brackets.



SJ000660

Figure 20. 2109 Model M12 on a pallet

Attention: Remove the chassis door before you move the chassis.

5. Remove the chassis door from the chassis.
 - a. Open the door 90°.

- b. Support the door to prevent it from falling. Pull the door away from the chassis.
- c. Push the spring-loaded lever on the upper hinge up and into the notch in the hinge. See Figure 21.
- d. Push the spring-loaded lever on the lower hinge down and into the notch in the hinge. Pull the door out, towards you.
- e. Pull the door away from the chassis.

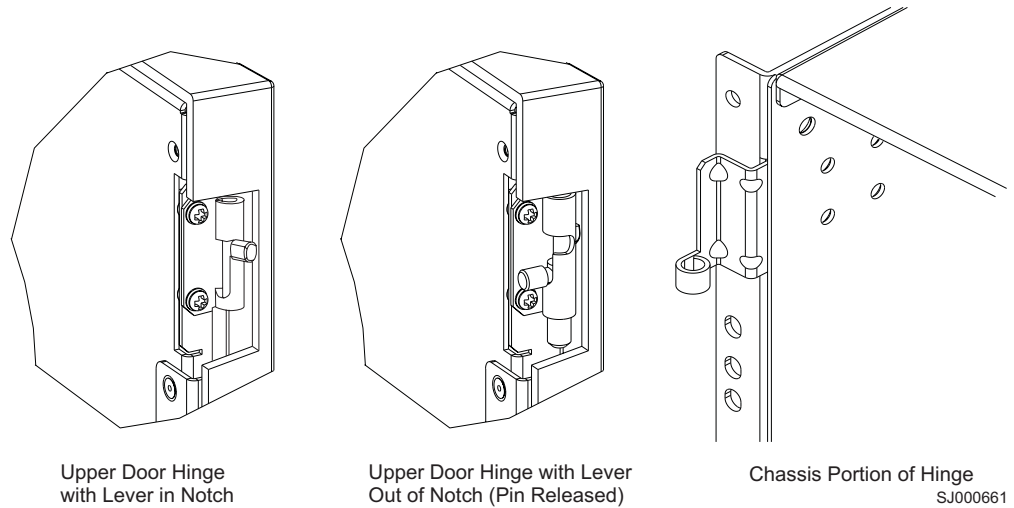


Figure 21. Removing the chassis door

Installing an additional M12 in a cabinet

Important

The 2109 Model C36 cabinet is designed to support one additional Model M12 switch. If you plan to install an additional M12, you cannot install any 2109 Model F16 or Model F32 switches in the cabinet.

This section describes how to install the M12 in the Model C36 cabinet. These procedures use parts that are included in the 14U chassis mount kit.

Time required

Allow approximately 2.5 hours to complete this procedure. This includes unpacking, assembling, and repacking the lift tool.

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

Tools required

You will require the following items to install the M12 in the cabinet:

- #2 Phillips screwdriver
- Lift tool

Installing the brackets

Perform the following steps to install the brackets:

1. Loosen the adjusting screws on the left and right mount shelf brackets to allow for adjustment to the cabinet depth.
2. Attach the left and right mount shelf brackets to the rails in the cabinet. Standard EIA rail spacing of holes is sets of three, separated by 5/8 in., 5/8 in., and 1/2 in. See Figure 22.

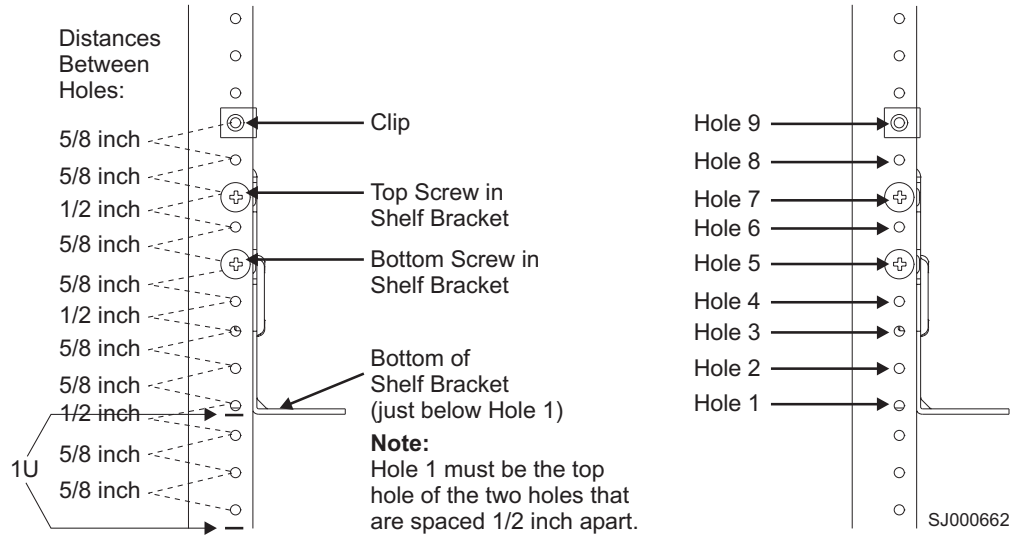
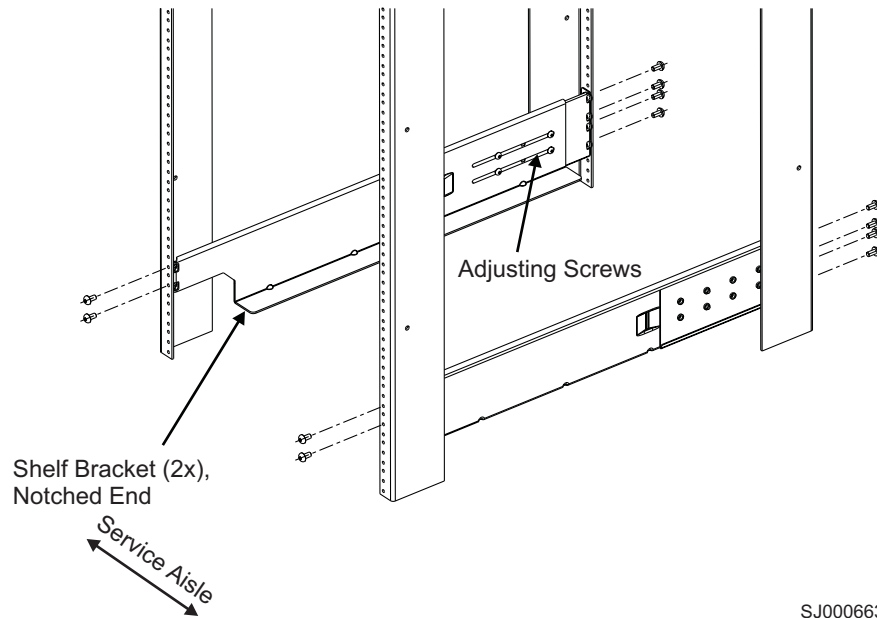


Figure 22. Placement of the shelf brackets and clip nuts on the cabinet rails

Note: If you are installing a 2109 Model M12 into the bottom of the rack, go to step 2a for the location of the rail. If you are installing a 2109 Model M12 into the top of the rack, go to step 2b for the location of the rail.

- a. Locate the screws in the middle of EIA unit 5 and the bottom of EIA unit 6 for the back of the cabinet. Locate the screws in the middle of EIA unit 4, the bottom of EIA unit 5, the middle of EIA unit 5, and the bottom of EIA unit 6 for the front of the cabinet.
- b. Locate the screws in the middle of EIA unit 22 and the bottom of EIA unit 23 for the back of the cabinet. Locate the screws in the middle of EIA unit 21, the bottom of EIA unit 22, the middle of EIA unit 23, and the bottom of EIA unit 23 for the front of the cabinet.
- c. You can route the cables down through the cable management tray or through the holes in the sides of the chassis. If you route the cables down through the cable management tray, allow adequate space below the chassis for cable management.

Orient the left and right mount shelf brackets with the notched portion toward the service aisle. Attach the shelf brackets to the cabinet rails, by using six 1/4–20 x 1/2-in. Phillips panhead screws with lock washers per bracket. Tighten the screws. See Figure 23 on page 45.



SJ000663

Figure 23. Shelf brackets are installed on the rails (cabinet walls are not shown)

3. Tighten the adjusting screws on the shelf brackets.
4. Attach four 10–32 clip nuts to the two rails at the front of the cabinet (service aisle side). See Figure 24 on page 46.

Note: If you are installing an M12 into the bottom of the rack, go to step 4a for the location of the clip. If you are installing an M12 into the top of the rack, go to step 4b for the location of the clip.

- a. Attach the lower clip nuts to the top of EIA unit 6. Attach the upper clip nuts to the middle of EIA unit 17.
- b. Attach the lower clip nuts to the top of EIA unit 23. Attach the upper clip nuts to the middle of EIA unit 34.

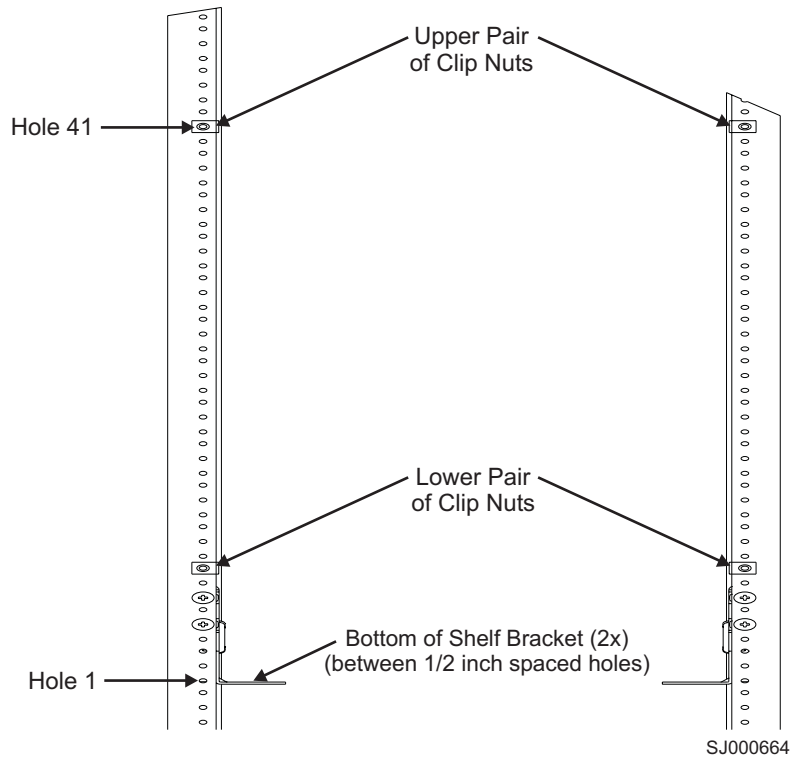


Figure 24. Placing the clip nuts on the rear rails (service aisle side)

5. Disassemble the left and right upper mount bracket assemblies. Save the screws for later use.
6. **Attention:** When you insert screws into the chassis, use the exact screws specified in the procedure. Use of longer screws might damage the chassis. Attach the right and left flat upper mount brackets (see Figure 25 on page 47, items 3a and 4a) to the chassis by using four of the 10-32 x 5/16-in. Phillips-flathead screws (item 5) per bracket. Tighten the screws. Orient the slotted holes in the brackets towards the blower side of the chassis. See Figure 25 on page 47 for orientation.

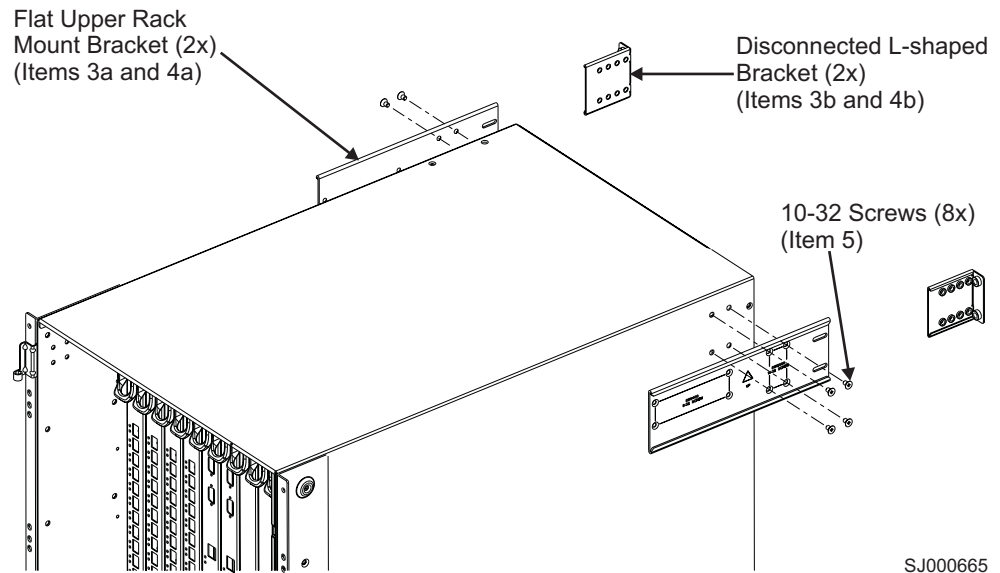


Figure 25. Attaching the right and left flat upper mount brackets to the chassis

- Attach the two L-shaped upper mount brackets (items 3b and 4b) to the cabinet rails. See Figure 26 for orientation. Use two of the 1/4–20 x 1/2 in. Phillips panhead screws with lock washers per bracket. Tighten the screws.

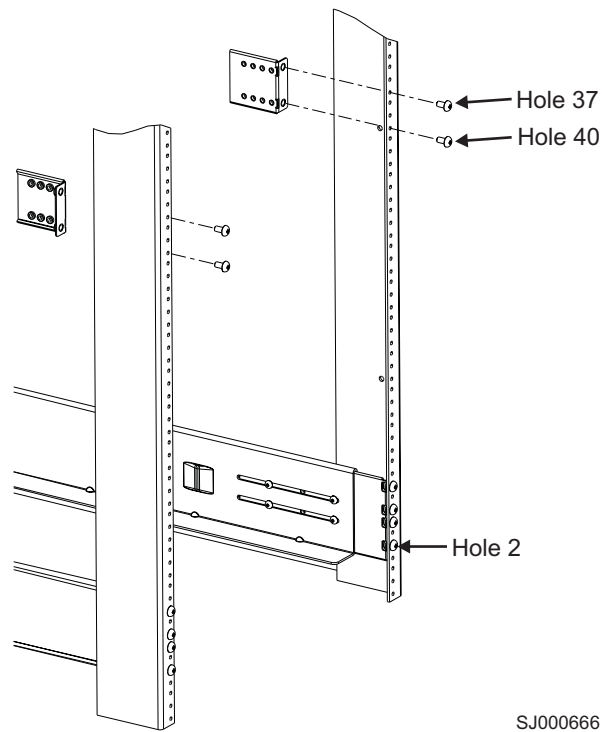


Figure 26. Attaching the L-shaped upper mount brackets to the rails

Note: If you are installing an M12 into the bottom of the rack, go to step 7a on page 48 for the location of the bracket. If you are installing an M12 into the top of the rack, go to step 7b on page 48 for the location of the bracket.

- a. Attach the lower clip nuts to the top of EIA unit 6. Attach the upper clip nuts to the middle of EIA unit 17.
 - b. Attach the lower clip nuts to the top of EIA unit 23. Attach the upper clip nuts to the middle of EIA unit 34.
8. Route the cables or cords through the cabinet or along any other route that is difficult to reach after you install the chassis.

Using the lift tool, the 24–inch load plate, and the bridge tool

Step 1 through step 9 on page 49 describe how to use the lift tool (PN 09P2481) and the 24–inch load plate (PN 11P4369) to install a 2109 Model M12 in the cabinet. Step 10 on page 49 through step 21 on page 52 describe how to install the bridge tool (PN 18P5855) in the cabinet for the lower M12 or the upper M12. This procedure uses parts from the 14U chassis mount kit. See Appendix B, “Model M12 Parts information,” on page 95 for a list of these parts.



CAUTION:

A fully populated 2109 Model M12 weighs approximately 115 kg (250 lbs) and requires a minimum of two people and a lift tool to install it. (C011)

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



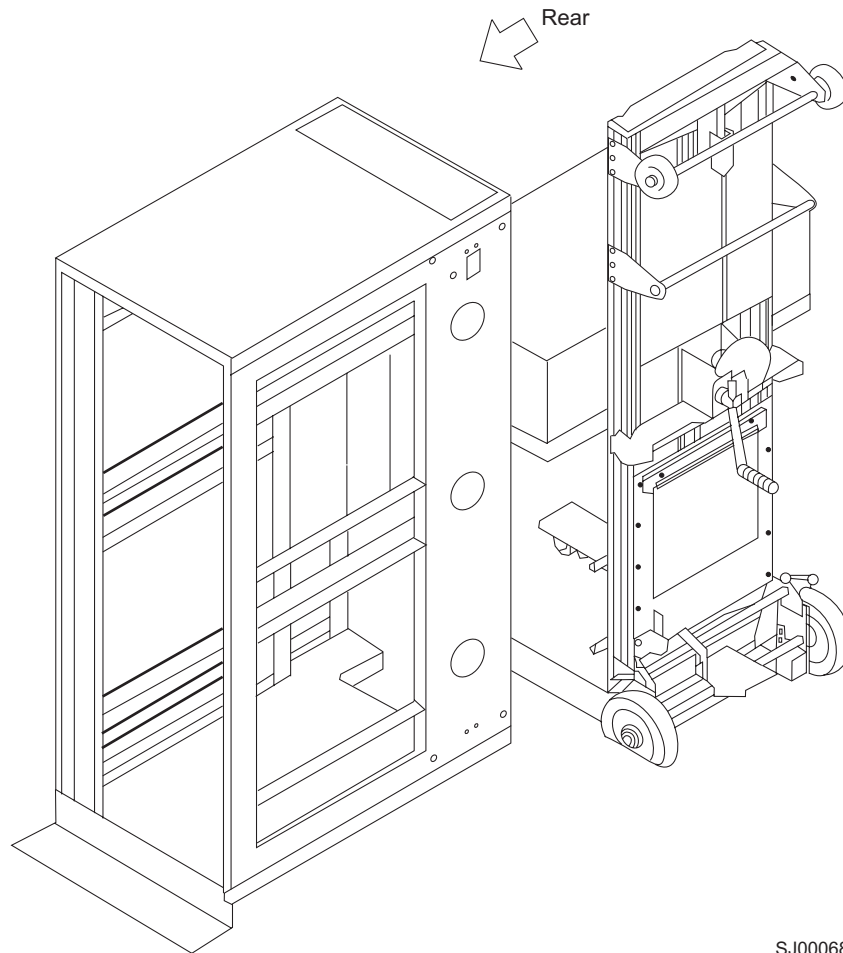
CAUTION:

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

P/N 18P5850-B
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Perform the following steps to install an M12:

1. Assemble the lift tool if it is not assembled. The assembly and disassembly instructions are included with the lift tool.
2. Attach the 24–inch load plate to the lift tool.
3. Remove the power supplies and blower assemblies from the M12 to reduce the weight.
4. Move the lift tool next to the pallet that contains the M12.
 - a. Adjust the load platform to the same height.
 - b. Slide the M12 from the pallet onto the load platform.
 - c. Center the switch on the load platform.
5. Attach the retention straps around the drawer.
6. If the load platform is not at its lowest position, lower the load platform to its lowest position.
7. Move the lift tool to a position near the rear of the cabinet. See Figure 27 on page 49.



SJ000682

Figure 27. Rear view of cabinet and lift tool

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

8. Set the wheel brake by pressing down on the wheel brake pedal.
9. Locate the anti-tips bars. If they are not attached, attach them to the lift tool by performing step 9a through step 9d. If the anti-tip bars were previously attached, go to step 10.
 - a. Pull up on the leg lock pins and insert the anti-tip bars inside the legs.
 - b. Pull on the legs and anti-tip bars to ensure that they are locked into position.
 - c. Raise the platform to allow enough room to attach the anti-tip bracket.
 - d. Secure the anti-tip bars by using the anti-tip bracket and bolt.
10. If you are installing the lower M12, go to step 11. If you are installing the upper M12, go to step 12 on page 50.
11. For the lower M12, install the bridge tool by completing the following steps:
 - a. Remove the bridge tool from the box and adjust the two supports 45°.
 - b. Hold the bridge tool between the two vertical supports near EIA unit 3, and move the two supports another 45°. Make sure that the following conditions are met:
 - The two-pin section of the support is on the back of the vertical support.
 - The one-pin section of the support is on the front of the vertical support.

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

- c. Align the two-pin section of the support on the back of the vertical rail with the bottom and middle holes in EIA unit 3.
- d. Align the one-pin section of the support on the front of the vertical rail with the middle hole in EIA unit 1.

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

- e. Lock the shelf into position. See Figure 28.



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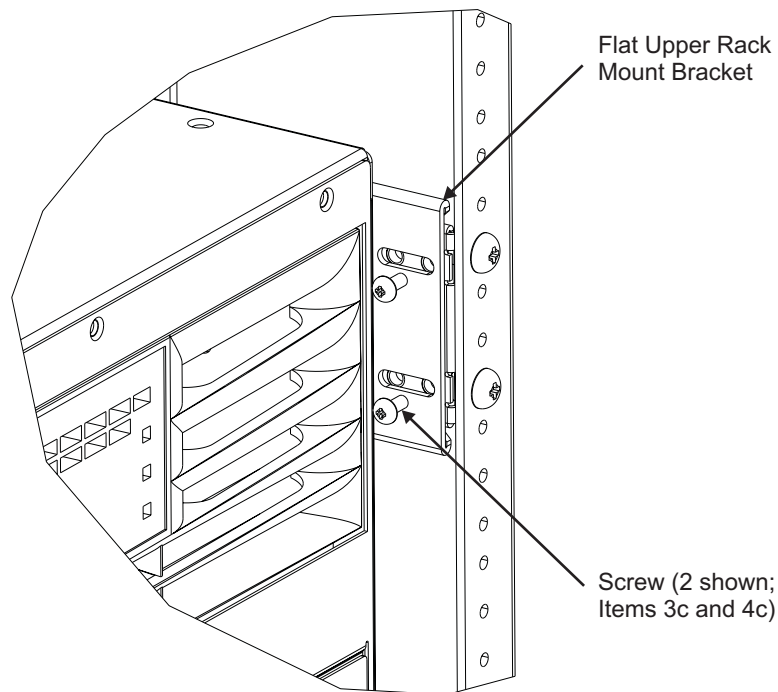
Figure 28. Locking the shelf into position

12. For the upper M12, install the bridge tool by completing the following steps:
 - a. Remove the bridge tool from the box and adjust the two supports 45°.
 - b. Hold the bridge tool between the two vertical supports near EIA unit 20, and move the two supports another 45°. Make sure that the following conditions are met:
 - The two-pin section of the support is on the back of the vertical support.
 - The one-pin section is on the front of the vertical support.

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

- c. Align the two-pin section of the support on the front of the vertical rail with the bottom hole and the middle hole in EIA unit 20.

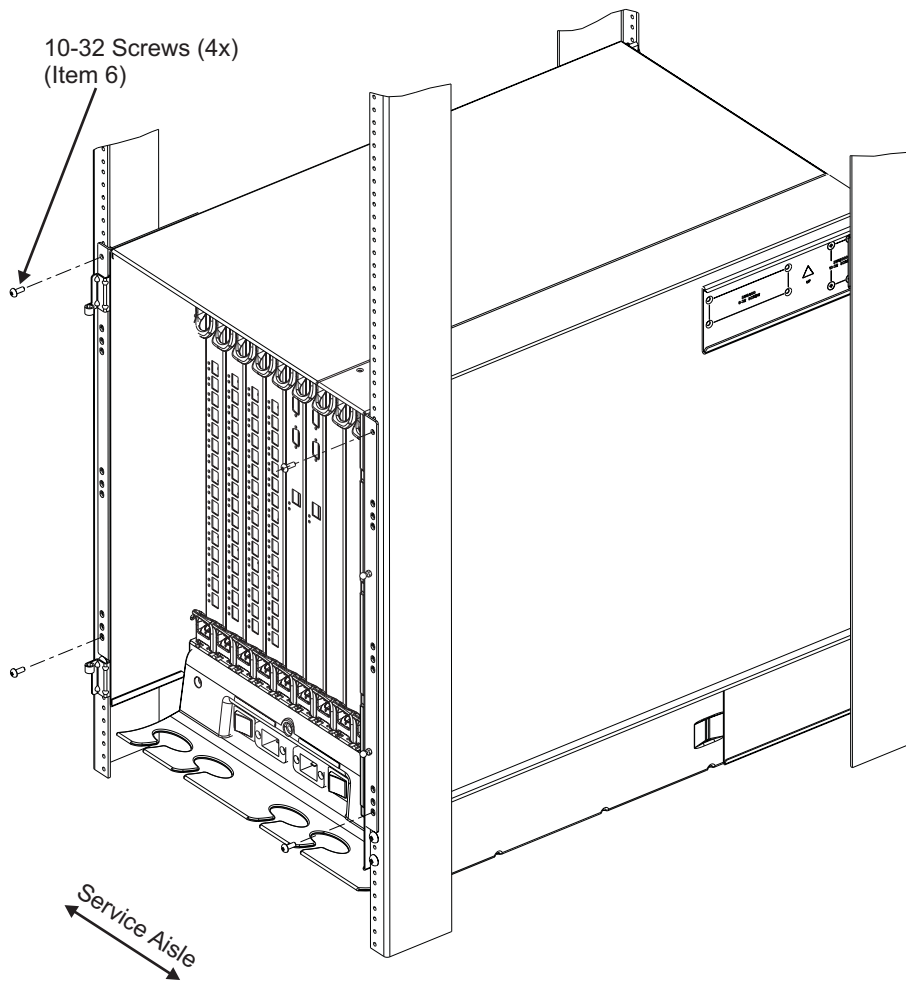
- d. Align the one-pin section of the support on the front of the vertical rail with the middle hole in EIA unit 18.
13. Turn the winch crank counterclockwise, 1/4 turn, to set the winch brake.
14. Set the wheel brake and place the wheel chocks around the wheels.
15. Remove the retention straps.
16. Slide the switch into the cabinet.
17. Remove the wheel chocks, release the wheel brake, and move the lift tool away from the cabinet.
18. Reinstall the power supplies and blower assemblies.
19. Fasten the two flat left and right upper mount brackets that are on the chassis to the two L-shaped upper left and right cabinet mount brackets. Use the two screws that were set aside in step 5 on page 46. Tighten the screws. See Figure 29.



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Figure 29. Attaching the mount brackets to the cabinet rails

20. Fasten the port side of the chassis to the cabinet rails. Use two of the 10–32 x 5/8-in. Phillips panhead screws with washers on each side. Tighten the screws. See Figure 30 on page 52 for the location of the screws.



SJ000668

Figure 30. Attaching the port side of the chassis to the cabinet rails

21. Reinstall the door after you put the chassis in place. See Figure 31 on page 53.
 - a. Ensure that the spring-loaded pins that are on both door hinges are retracted. Push the levers into the notches.
 - b. Align the door hinges with the chassis portion of the hinges.
 - c. Release the pins by pushing the levers out of the notches.

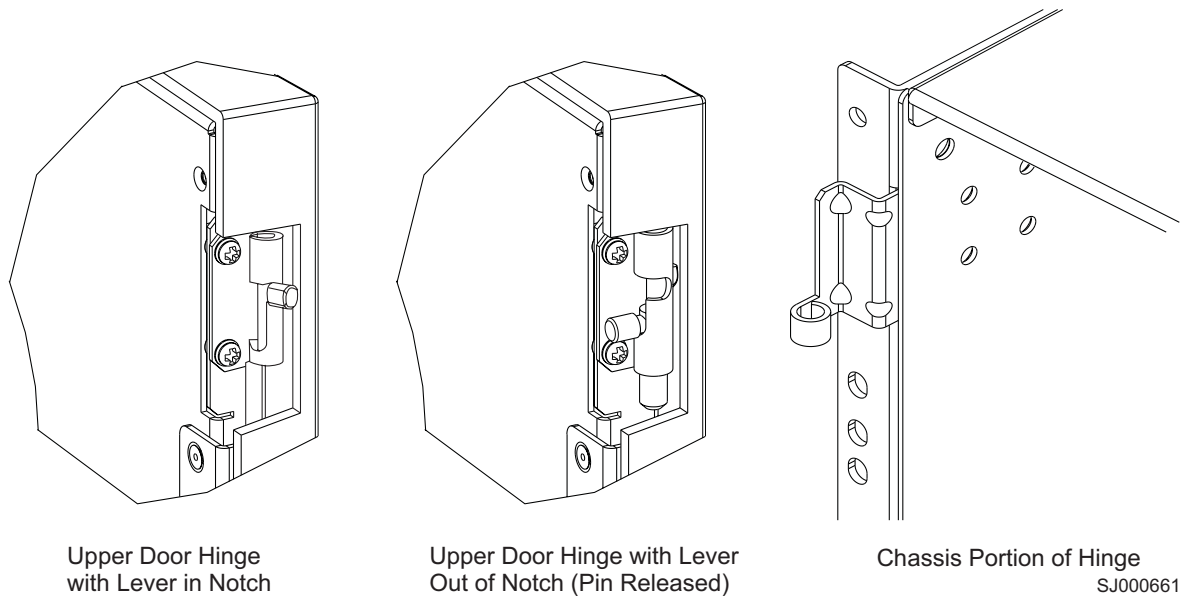


Figure 31. Removing the chassis door

22. Uninstall the bridge tool and return it to its original box.

Note: For turning on the power and for the configuration instructions, see Chapter 2, “Starting and configuring the M12,” on page 7.

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

Removing an M12 from the cabinet

Step 1 through step 5 describes how to use the lift tool (PN 09P2481) and the 24–inch load plate (PN 11P4369) to remove an M12 from the cabinet. Step 6 on page 54 through step 17 on page 55 describes how to remove the bridge tool (PN 18P5855) from the cabinet.

Perform the following steps to remove an M12:

1. Assemble the lift tool if it is not assembled. The assembly and disassembly instructions are included with the lift tool.
2. Remove both power cords from the M12.
3. Remove the power supplies and blower assemblies to reduce the weight.
4. Remove the chassis door from the chassis.
 - a. Open the door 90°.
 - b. Support the door to prevent it from falling.
 - c. Push the spring-loaded lever on the upper hinge up and into the notch in the hinge. See Figure 21 on page 43.
 - d. Push the spring-loaded lever on the lower hinge down and into the notch in the hinge. Pull the door out and towards you.
 - e. Pull the door away from the chassis.
5. Remove the two 10-32 x 5/8 in. Phillips panhead screws with washers on each side. See Figure 29 on page 51 for the location of the screws.

6. If you are replacing the lower M12, go to step 7. If you are replacing the upper M12, go to step 8.
7. Install the bridge tool by completing the following steps:
 - a. Remove the bridge tool from its box and adjust the two supports 45°.
 - b. Hold the bridge tool between the two vertical supports near EIA unit 3.
 - c. Move the two supports another 45°. Make sure that the following conditions are met:
 - The two-pin section of the support is on the back of the vertical support.
 - The one-pin section of the support is on the front of the vertical support.
 - d. Align the two-pin section of the support on the back of the vertical rail with the bottom and middle holes in EIA unit 3.
 - e. Align the one-pin section of the support on the front of the vertical rail with the middle hole in EIA unit 1.

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

 - f. Lock the shelf into position.
8. For the upper M12, install the bridge tool by completing the following steps:
 - a. Remove the bridge tool from its box and adjust the two supports 45°.
 - b. Hold the bridge tool between the two vertical supports near EIA unit 20.
 - c. Move the two supports another 45°. Make sure that the following conditions are met:
 - The two-pin section of the support is on the back of the vertical support.
 - The one-pin section of the support is on the front of the vertical support.
 - d. Align the two-pin section of the support on the back of the vertical rail with the bottom and middle holes in EIA unit 20.
 - e. Align the one-pin section of the support on the front of the vertical rail with the middle hole in EIA unit 18.
 - f. Lock the shelf into position.
9. Locate the anti-tip bars and if they are not attached, attach them to the lift tool. If anti-tip bars were previously attached, go to step 10.
 - a. Pull up on the leg-lock pins and insert the anti-tip bars inside the legs.
 - b. Pull on the legs and anti-tip bars to ensure that they are locked into position.
 - c. Raise the platform to allow enough room to attach the anti-tip bracket.
 - d. Secure the anti-tip bars with the anti-tip bracket and bolt.
10. Move the lift tool to a position near the rear of the cabinet.
11. Turn the winch crank clockwise to raise the switch. Move the lift tool into position in front of the cabinet while you align the 24-inch load plate with the line on the bridge tool.
12. Turn the winch crank counterclockwise 1/4 turn to set the winch brake.

13. Set the wheel brake. Place the wheel chocks around the wheels.



CAUTION:

A fully populated 2109 Model M12 weighs approximately 115 kg (250 lbs) and requires a minimum of two people and a lift tool to install it. (C011)

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



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CAUTION:

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

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

Chapter 6. Servicing the M12

Note: Throughout this chapter, the term *switch* refers to the M12.

This chapter contains information about how to power off the switch and how to remove and replace field replaceable units (FRUs) and other system components.

Safety notices

The following safety notices apply to all the procedures in this chapter. Review this section carefully before you perform any power-related operations.



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)



DANGER

Electrical voltage and current from power, telephone, and communication cables are hazardous.

To avoid a shock hazard:

- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- Connect all power cords to a properly wired and grounded electrical outlet. Ensure 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.

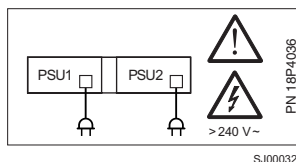
To Disconnect:

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

To Connect:

1. Turn everything OFF (unless instructed otherwise).
2. Attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlet.
5. Turn device ON.

(D005)



DANGER

Multiple power cords (L003)

To remove all power to the device, disconnect all power cords.

CAUTION:

“Norway only:” This product is designed for an IT power system with phase-to-phase voltage of 230V. After operation of the protective device, the equipment is still under voltage if it is connected to an IT power system.

Power-off procedure

Perform the following steps to power off the switch:

1. Open the rear door of the cabinet.
Check the power cabling from the M12 that is attached to the PDU that you are servicing. These switches have dual power cords and are plugged into PDUs with independent ac sources.
2. Removing power to a mounted M12 has an adverse affect on the customer's systems and networks if they are not properly prepared. Inform the customer before you power off the M12.
Before you power off switches, make sure that the customer has removed, dismounted, or taken them offline from their systems.
3. Turn off the ac power switches (circuit breaker) to the M12 that are connected to the PDU that you are servicing.
4. Unplug the power cord from the customer's ac power outlet.
5. Unplug all power cords from the PDU that you are servicing.

Removing and replacing a 16–port card or filler panel

Use this procedure to remove and replace a 16–port card or filler panel. The switch can continue to operate during this procedure. However, if you are removing a 16–port card, any cables that are connected to that 16–port card must be disconnected.

You can notify the switch of a hot-swap request in two ways. You can either run the **slotPowerOff** and **slotPowerOn** commands, or click the ejector handles on the 16–port card.

Attention: Do not remove the 16–port card during diagnostic tests. Wait for the status LED to turn off in response to the hot-swap request before you remove a 16–port card.

Attention: No user-serviceable parts are inside the 16–port card or filler panel. Disassembling any part of a 16–port card or filler panel voids the part warranty and regulatory certifications.

Attention: To ensure correct cooling of the chassis and protection from dust, install a filler panel in any empty slots.

Time required

Approximately 10 minutes or less

Removing a 16–port card or filler panel

Attention: Wear a grounded ESD strap when handling a 16–port card. The chassis has a grounding connection above the power connectors. Hold the 16–port card by the edges of the metal pan (do not hold by ejectors).

Note: If you are replacing multiple cards, replace one card at a time. Before you replace a port card, determine if it is the entire card or the SFPs that are faulty.

Perform the following steps to remove a 16–port card:

1. Ensure that traffic is not flowing through the port card (port LEDs should be off) before you disconnect the cables.
2. Disconnect any cables and SFP transceivers from the port card.
3. Notify the switch of a hot-swap request by pushing in the yellow tab on each ejector and clicking the black handles slightly open. See Figure 32.

Note: You can also send hot-swap notification from the command line interface by using the **slotpoweroff** and **slotpoweron** commands. See the *Brocade Fabric OS Procedures Guide* for additional command line instructions.

4. Wait for the Power LED to turn off in response to the hot-swap request before you uninstall the port card.
5. Lever both ejectors open to approximately 45° and pull the port card out of the chassis.

Note: If you inadvertently re-latch the ejectors before you remove the card, wait at least one second before you unlatch the ejectors again.

6. If you are not replacing the card by another port card, install a filler panel to ensure correct cooling of the chassis and protection from dust. For more information, see “Replacing a 16–port card or filler panel” on page 62.

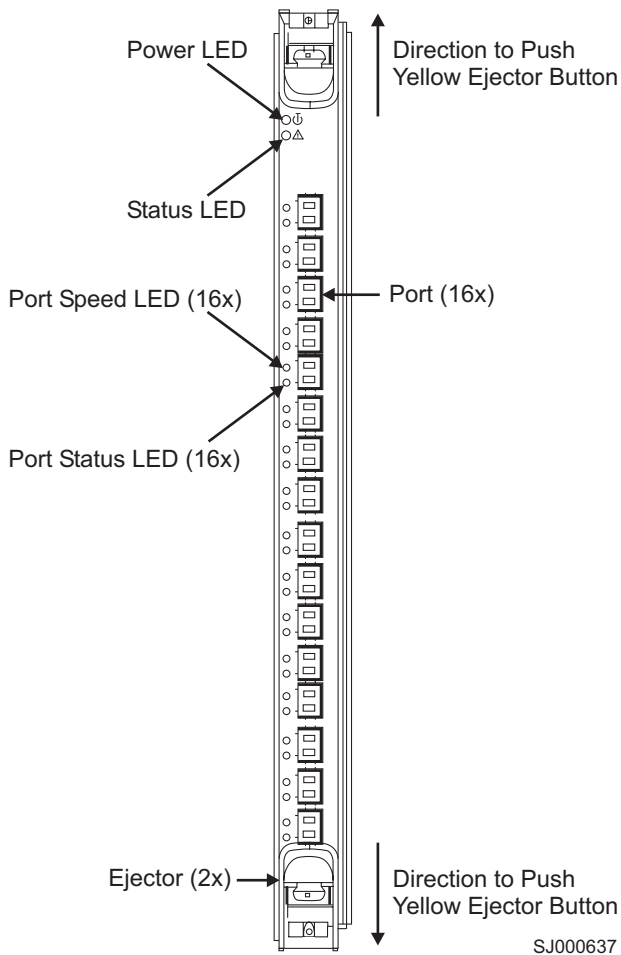


Figure 32. 16–port card showing ejectors

Removing a filler panel

The switch accommodates the following two types of filler panels:

- A filler panel with ejectors
- A filler panel without ejectors

Perform the following steps to remove a filler panel with ejectors:

1. Push the yellow tab in on each ejector. See Figure 33.
2. Lever both ejectors all the way open.
3. Slide the filler panel out of the chassis. See Figure 34 on page 62.

Note: Filler panels without ejectors are equipped with a handle. Remove the two captive screws, grasp the handle, and slide the filler panel out.

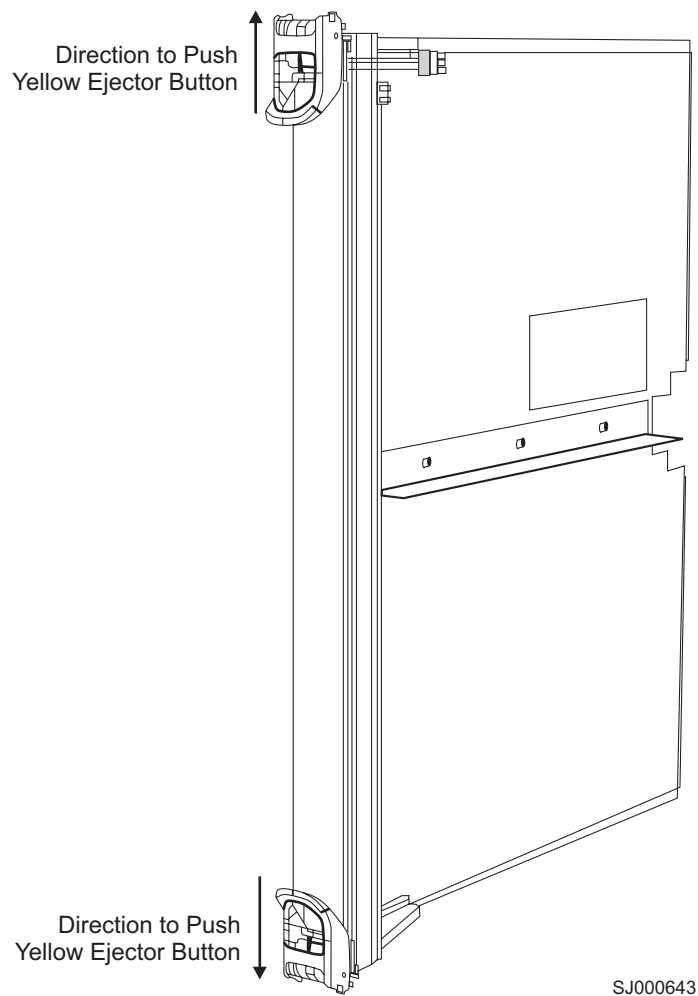
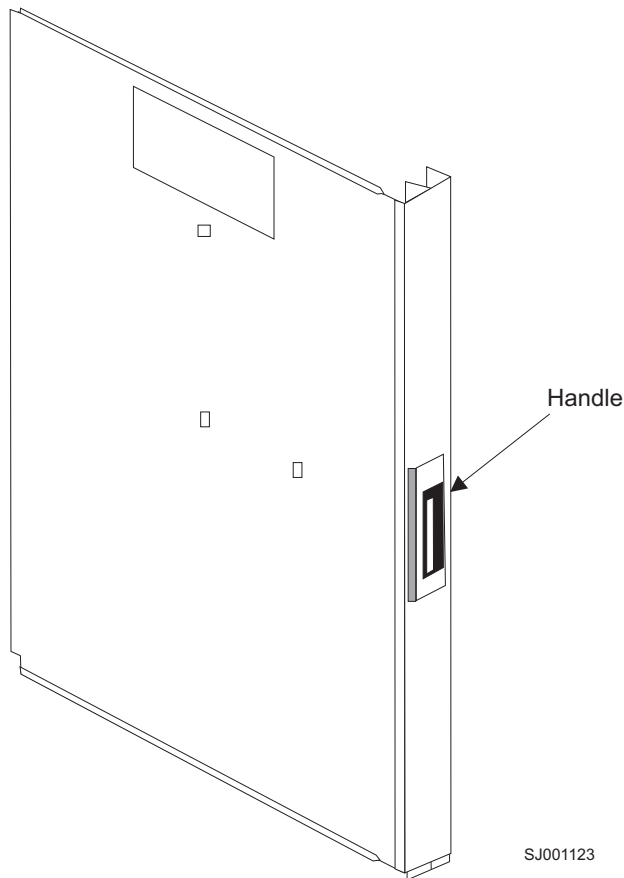


Figure 33. 16-port card filler panel



SJ001123

Figure 34. CP card filler panel with one handle

Replacing a 16–port card or filler panel

Attention: Do not force the installation. If the 16–port card or filler panel does not slide in easily, ensure that it is correctly aligned inside the rail guides before you continue.

Perform the following steps to replace a 16–port card or filler panel:

1. Orient the 16–port card or filler panel so that the ejectors are at the front of the chassis and the flat side of the 16–port card or filler panel is on the left.
2. Align the flat side of the 16–port card or filler panel inside the upper rail guides and the lower rail guides in the slot. See Figure 35 on page 63. Slide the 16–port card or filler panel into the slot, with slight pressure to the left, until it is firmly seated.
3. Close the ejectors by rotating the black handles toward the center of the 16–port card or filler panel until the ejectors lock. You will hear a slight audible click. The levering action of the handles seats the 16–port card or filler panel in the slot.

Figure 35 on page 63 shows the alignment guides in the card slots.

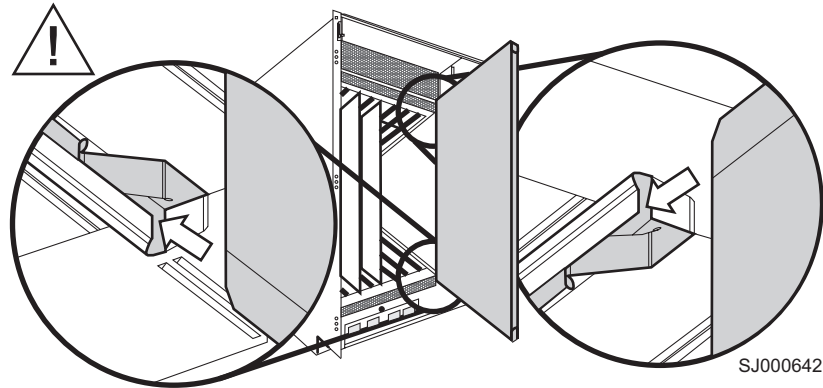


Figure 35. Alignment guides in the card slots

Perform these additional steps if you are installing a new 16–port card:

1. Verify that the power LED on the 16–port card is displaying a steady green light (it might require a few seconds to turn on). If it does not turn on, ensure that the 16–port card has power and is firmly seated. The front of the 16–port card should be flush with any adjacent 16–port cards or filler panels.

Note: The LED patterns can temporarily change during a POST and other diagnostic tests.

2. Install SFPs and cables in the 16–port card, as required.
3. Group and route the cables as desired. See “Guidelines for managing cables” for more information.

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

Guidelines for managing cables

The following guidelines are for managing cables:

- You can manage cables in a variety of ways. You can route them down through the cable management tray or route them out either side of the chassis. You can also manage them by using patch panels or cable channels on the sides of the cabinet.
- To keep the LEDs visible and to prevent having to disconnect the cables when removing neighboring cards, route fiber-optic cables and other cables directly downwards, instead of across adjacent cards or in front of the power supplies.
- Leave at least 1 m (3.28 ft) of slack for each fiber-optic cable, which:
 - Provides room to remove and replace the 16–port card
 - Allows for inadvertent movement of the cabinet
 - Prevents the cables from being bent to less than the minimum bend radius

The minimum bend radius for a 50–micron cable is 3.05 cm (2 in.) under full tensile load and 3.048 cm (1.2 in.) with no tensile load.

- Use the cable guides that are provided with the switch to group the cables by trunking ports (groups of four neighboring ports). These guides help to keep individual ports accessible by keeping the cables evenly spaced. They also help to provide clearance when removing a neighboring card.

Removing and replacing a CP card or filler panel

Use this procedure to remove and replace a CP card or filler panel.

The switch can continue to operate during this procedure if at least one CP card remains installed and functioning throughout the procedure. However, if the CP card that is being replaced is currently the active CP card, traffic over the fabric stops temporarily until failover to the standby CP card is complete. Failover takes less than 1 minute and occurs automatically as soon as the active CP card is uninstalled. If there is no standby CP card, the switch stops functioning until at least one CP card is installed.

Note: The **haShow** command provides information about which CP card is the active CP card. For information about this command, see the *Brocade Fabric OS Reference*.

When you replace a CP card, it automatically assumes the native IP address and host name that is assigned to that slot. The default IP address and host name are 10.77.77.75 CP0, for slot 5 and 10.77.77.74 CP1 for slot 6.

Attention: Disassembling any part of a CP card or filler panel voids the part warranty and regulatory certifications. No user-serviceable parts are inside a CP card or filler panel. To ensure correct cooling of the chassis and protection from dust, install a filler panel in any slots that do not contain a CP card.



CAUTION:

Only trained service personnel may replace this battery. The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.

Do Not:

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

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

Attention: Use the same version of Fabric OS on both CP cards and logical switches. Using different versions might cause malfunctioning. If the replacement CP card has a different version of the Fabric OS, bring both cards to the same firmware version.

Time required

30 minutes or less

Items required

- ESD grounding strap
- Workstation computer
- Serial cable provided with the switch
- IP address of an FTP server for backing up the switch configuration

Confirming a failed CP card

Before you replace the CP card, verify the necessity of the replacement. Any of the following events might indicate that a CP card is faulty:

- The Status LED on the CP card is orange, or the Power LED is not lit.
- The **slotshow** command does not show that the CP card is enabled.
- The CP card does not respond to commands or private Ethernet activities, or the serial console is not available.
- The **hashow** command indicates that the CP card has not achieved redundancy.
- The calendar clock is inaccurate, or the CP card does not start or shut down normally.
- Any of the following messages display in the error log:
 - Slot unknown message that relates to a CP slot
 - CP card errors
 - FRU: FRU_FAULTY messages for a CP card
 - Configuration loader messages or Sys PCI config messages
 - Generic system driver messages (FABSYS)
 - Platform system driver messages (Platform)
 - EM messages that indicate a problem with a CP card
 - Function fail messages for the CP master

For more information about diagnostic and error messages, see the *Brocade Diagnostic and System Error Message Reference* and the *Brocade Fabric OS Procedures Guide*.

Recording critical switch information for a CP card

Perform the following steps to record critical switch information:

1. Create a serial connection to the healthy CP card:
 - a. Disable any serial communication programs that are running on the workstation (such as synchronization programs).
 - b. Insert one of the serial cables into the terminal serial port. See the second port from the top in Figure 36 on page 68.
 - c. Connect the other end of the serial cable to a serial port on the workstation.
 - d. Open the terminal emulator application and configure as follows:
 - For most UNIX systems, type the following string at the prompt:

```
tip /dev/ttyb -9600
```
 - For Windows 95, 98, 2000, or NT, see the following table for parameters and values.

Table 8. Parameters and values

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

- e. When the terminal emulator application stops reporting information, press Enter.

2. Log into the healthy CP card as Admin, then type 0 to log into switch 0. The default password is password.

See the following example for possible output.

```
Fabric OS (cp0)
cp0 Console Login: admin
Password:
Enter Switch Number to Login <0 or 1>: 0
SW0:admin>
```

3. Run the **haShow** command to determine which CP card is active. Do this from the serial console for the healthy CP card to verify the failover.

Note: Enter all the remaining commands from the serial console for the active CP card, unless otherwise indicated.

4. If the healthy CP card is performing as the active CP card, go to step 7 on page 67. If the faulty CP card is performing as the active CP card, fail over the cards as steps 4a through 4e describe:
 - a. Create a serial connection to the faulty CP card (repeat step 1 on page 65).
 - b. Log into the serial console as Admin and type 0 to log into logical switch 0.
 - c. Run the **hafailover** command. The healthy CP card becomes the active CP card.
 - d. Wait until the Status LED on the healthy CP card is no longer lit, which indicates that failover is complete.
 - e. Run the **hashow** command from the serial console for the healthy CP card to verify the failover.

See the following example for possible output.

```
Fabric OS (cp1)
cp1 Console Login: admin
Password:
Enter Switch Number to Login <0 or 1>: 0
SW0:admin> hashow
Local CP (Slot 6, CP1) : Active
Remote CP (Slot 5, CP0) : Standby
HA Enabled, Heartbeat Up
SW0:admin>
SW0:admin> hafailover
Warning: This command is being run on a control processor(CP)
based system and will cause the active CP to reset. This will
cause disruption to devices attached to both switch 0 and switch 1
and will require that existing telnet sessions be restarted.
To just reboot a logical switch on this system, use command
switchreboot(1M) on the logical switch you intend to reboot.
Are you sure you want to reboot the active CP [y/n]? y
SW0:admin>
SW0:admin> hashow
Local CP (Slot 6, CP1) : Standby, Healthy
Remote CP (Slot 5, CP0) : Active
HA Enabled, Heartbeat Up
SW0:admin>
```

5. Run the **version** command to record the version of the active CP card.
6. Run the **hadisable** command from the active CP card to prevent failover or communication between the CP cards during the replacement.

7. From the serial console for the healthy (and active) CP card, back up the current configuration for logical switch 0. See the possible output from the **configupload** command in step 8.
 - a. Run the **configupload** command.
 - b. Enter the requested information at the prompts.
8. Log into logical switch 1 and back up the current configuration for switch 1.
 - a. From the serial console for the healthy CP card, enter the **login** command.
 - b. Log into the switch as Admin and enter 1 to log into Switch 1.
 - c. Enter the **configupload** command.
 - d. Enter the requested information at the prompts.
See the following example for possible output.

```

SW0:admin> configupload
Server Name or IP Address [host]: 123.456.78.90
User Name [None]: user
File Name [config.txt]: config.txt
Password: xxxxxx
upload complete
SW0:admin>
SW0:admin> login
cp0 login: admin
Password: xxxxxx
Enter Switch Number to Login <0 or 1>: 1
SW1:admin>
SW1:admin> configupload
Server Name or IP Address [host]: 123.456.78.90
User Name [None]: user
File Name [config.txt]: config.txt
Password: xxxxxx
upload complete
SW1:admin>

```

Removing a CP card or filler panel

Attention: Wear an ESD grounding strap when handling a CP card. The chassis has a grounding connection above the power connectors.

Attention: Hold the CP card by the edges of the metal pan (not by the ejectors).

Note: To allow the current configuration to be copied to the new CP card, you must install a new CP card while the other CP card is still operating.

Perform the following steps to remove a CP card:

1. Ensure that the other CP card is healthy and functioning as the active CP. See “Confirming a failed CP card” on page 65 for more information. Run the **haShow** command to determine which is the active CP card.
2. If the card that you are replacing is the standby CP card, continue with step 3. If the card that is being replaced is the active CP card, verify that the standby CP card is healthy. The power LED should be green, and the status LED should not be lit. Run the **haFailover** command to make the standby CP card act as the new active CP card.
3. Remove the CP card that you are replacing.
 - a. Disconnect the following cables if they are present:

- Modem cable from the modem serial port
 - Serial cable from the terminal serial port
 - Ethernet cable from the Ethernet port
- b. Notify the switch of a hot-swap request by pushing the yellow tab on each ejector and clicking the black handles until they are slightly open. See Figure 36. Wait for the status LED to turn off.
- Attention:** If you are removing a CP card, wait for the status LED to turn off in response to the hot-swap request before you uninstall the card.
- c. Lever both ejectors all the way open, and slide the CP card out of the chassis.

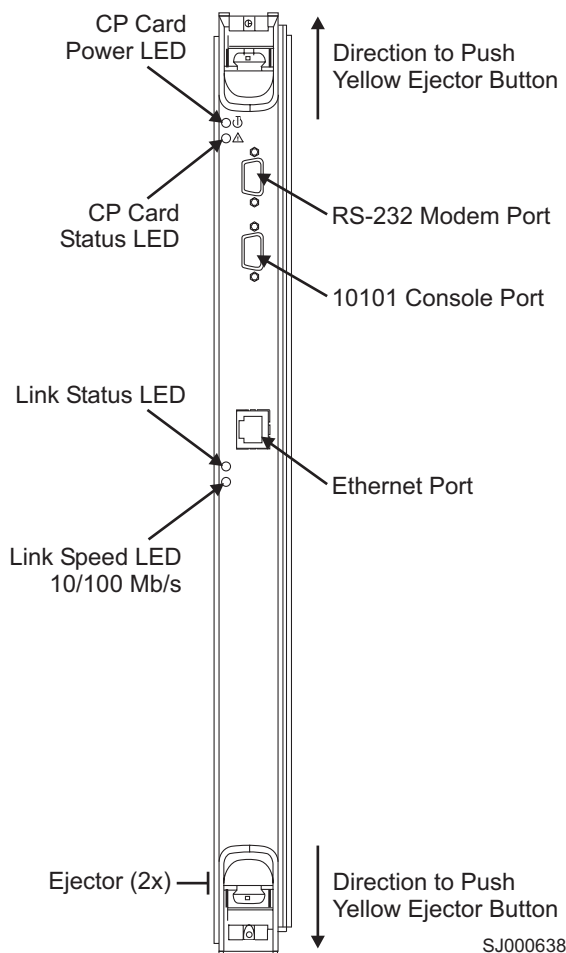


Figure 36. CP card showing ejectors

Perform the following steps to remove a filler panel:

1. Push in the yellow tab on each ejector. See Figure 37 on page 69.
2. Lever both ejectors all the way open.
3. Slide the filler panel out of the chassis.

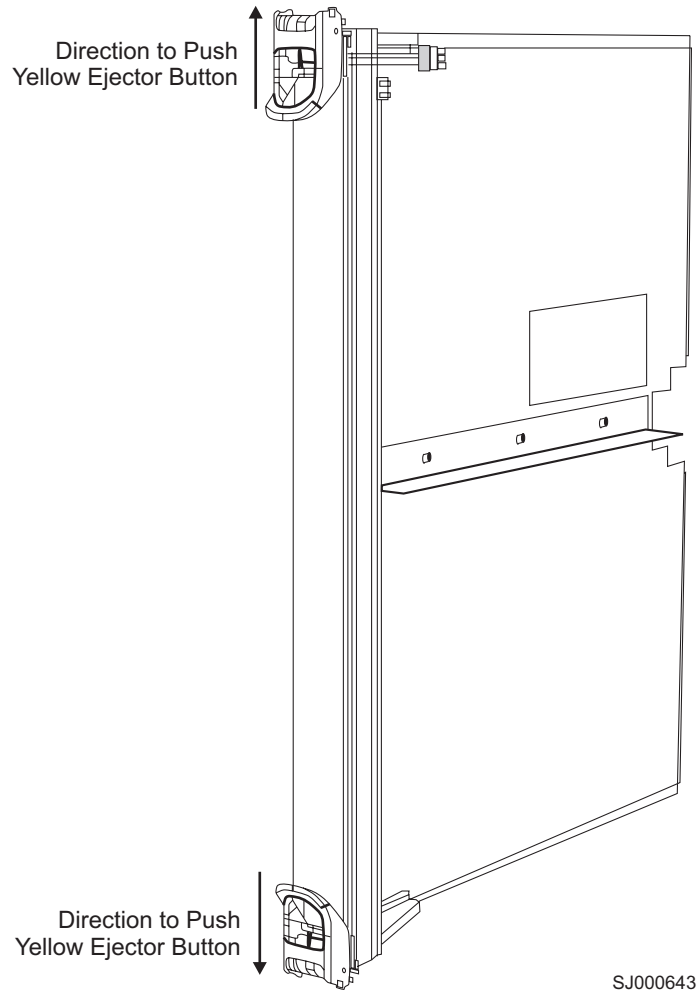


Figure 37. CP card filler panel with two ejectors

Replacing a CP card or filler panel

Attention: Do not force the installation. If the CP card or filler panel does not slide in easily, ensure that it is correctly oriented and aligned in the rail guides before you continue.

Figure 38 on page 70 shows the alignment guides in the card slots.

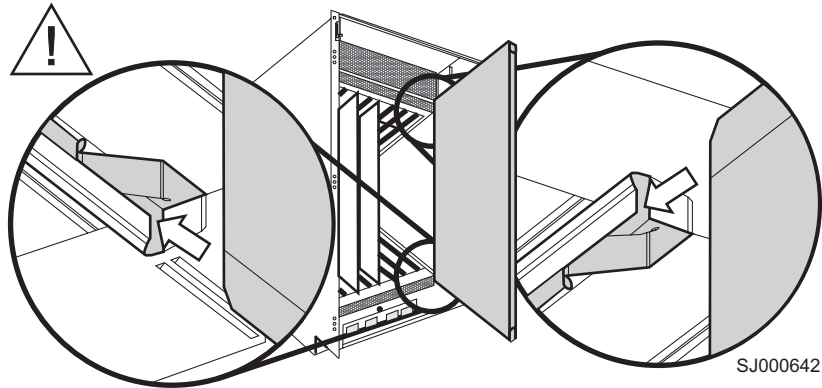


Figure 38. Alignment guides in the card slots

Perform the following steps to replace a CP card or filler panel:

1. Orient the CP card or filler panel so that the ejectors are at the front of the chassis and the metal pan is on the left.
2. Align the flat-metal side of the CP card or filler panel inside the upper and lower rail guides in the slot. See Figure 38. Slide the CP card or filler panel into the slot until it is firmly seated.
3. Close the ejectors by pressing in the black handles toward the CP card or filler panel, until the ejectors lock. You will hear a slight audible click. The levering action of the handles seats the CP card or filler panel in the chassis.

Perform these additional steps if you are installing a new CP card:

1. Verify that the power LED on the CP card displays a steady green light. It might require a few seconds to turn on. If it does not turn on, ensure that the CP card has power and is firmly seated. The front of the CP card should be flush with the adjacent cards or filler panels.

Note: The LED patterns can temporarily change during a POST and other diagnostic tests.

2. Connect the cables as required to the CP card.

Attention: Do not route the cables in front of the exhaust vent (located at the top of the port side of the chassis).

- Modem cable to the modem serial port
- Serial cable to the terminal serial port
- Ethernet cable to the Ethernet port

Verifying the operation of the new CP card

Perform the following steps to verify that the new CP card is operational:

1. Verify that startup and POST are complete on the new CP card (a minimum of 3 minutes), and that the CP cards have achieved failover redundancy.
 - a. Wait until the Status LEDs on both CP cards are not lit.
If Fabric OS v4.0.2 or later firmware is installed on both CP cards, the Status LED for the active CP card displays orange until the active CP card is fully operational. The Status LED for the standby CP card displays orange until the CP cards have achieved failover redundancy.
 - b. From the serial console for the active CP card (the CP card that was not replaced), run the **hashow** command and verify that the command output includes HA Enabled Heartbeat Up.

The message HA-state in sync also displays. If not, POST is not complete or the CP cards have not yet achieved redundancy. Wait a minute and re-run the command until you can verify that redundancy has been achieved. See the sample output from the **hashow** command before redundancy is achieved.

```
SW1:admin> haShow
Local CP (Slot 5, CP0): Active
Remote CP (Slot 6, CP1): Standby, Healthy
HA enabled, Heartbeat Up, HA State not in sync
SW1:admin>
```

2. Run the **slotshow** command. The command output should show the new CP card as enabled, as the following output shows.

```
SW1:admin> slotShow
Slot Blade Type ID Status
-----
1 SW BLADE 2 ENABLED
2 SW BLADE 2 ENABLED
3 SW BLADE 2 ENABLED
4 SW BLADE 2 ENABLED
5 CP BLADE 1 ENABLED
6 CP BLADE 1 ENABLED
7 SW BLADE 2 ENABLED
8 SW BLADE 2 ENABLED
9 SW BLADE 2 ENABLED
10 SW BLADE 2 ENABLED
SW1:admin>
```

3. Determine the firmware version. For Fabric OS v4.0 and earlier, run the **version** command. For Fabric OS v4.0c and later firmware, run the **firmwareshow** command. Sample output for the **version** command and the **firmwareshow** command follows.

```
SW1:admin> version
Kernel: 2.4.2
Fabric OS: v4.0.0
Made on: Fri Feb 1 23:02:08 2002
Flash: Fri Feb 1 18:03:35 2002
BootProm: 3.1.13b
SW1:admin>
```

```
SW1:admin> firmwareshow
Local CP (Slot 5, CP0): Active
Primary partition: v4.0.2
Secondary Partition: v4.0.2
Remote CP (Slot 6, CP1): Standby
Primary partition: v4.0.2
Secondary Partition: v4.0.2
SW1:admin>
```

4. If the firmware versions on the replacement card do not match the active CP card, bring the replacement card to the same firmware level as the active card.
 - a. Download the firmware from the following Web site:
www.ibm.com/servers/storage/support/san/2109m12.html

- b. When the firmware is unzipped, it creates a folder and a set of firmware files. Use the following directory and file name when you download this firmware to the switch:
/v4.x.x/release.plist
- c. Download the firmware by using either of the following command options:
 - Run the **firmwaredownload** command to download the firmware to both CP cards at the same time. Enter all requested information and choose the reboot option. If the switch is running Fabric OS v4.0.2 and later firmware, a message displays that warns you that this command causes the active CP card to reset. If this message displays, type Y to continue.
 - If the firmware version of the replacement card is v4.1 or earlier, run the **firmwaredownload -s** command to download the firmware to only one of the CP cards. Enter all requested information and choose the reboot option. See the following sample output for the **firmwaredownload** command.

```

SW1:admin> firmwaredownload
Server Name or IP Address: 123.456.78.90
User Name: user
File Name: /v4.0.2/release.plist
Password: xxxxxx
Full Install (Otherwise upgrade only) [Y]:
Do Auto-Commit after Reboot [Y]:
Reboot system after download [N]: y
Start to install packages.....
dir #####
terminfo #####
...
glibc #####
sin #####
Write kernel image into flash.
file verification SUCCEEDED
Firmwaredownload completes successfully.
SW1:admin>

```

5. Verify that the restart is complete and that the CP cards have achieved failover redundancy.
 - a. Wait until the Status LEDs on both CP cards are not lit.
 - b. Run the **hashow** command and verify that the command output includes HA Enabled Heartbeat Up. If not, wait a minute and then rerun the command until you can verify that redundancy is achieved.
6. Run the **version** or **firmwareshow** command to verify that the firmware version has been updated.
7. Create a serial connection to the new CP card, as shown in step 1 on page 70.
8. Log into the new CP card as Admin and type 0 to log into logical switch 0. See the following sample output.

```

Fabric OS (cp1)
cp1 Console Login: admin
Password:
Enter Switch Number to Login <0 or 1>: 0
SW0:admin>

```

9. From the serial console for the new CP card, run the **hafailover** command to fail the active CP card over to the new CP card.

10. Verify that the configuration has successfully propagated to the new CP card by checking any configuration parameters for which you specified non-default values. To do this, run the **configshow** command, followed by a text string (in quotation marks) that relates to the parameter, for example, **configshow "fabric"**. This limits the command output to entries that contain that text string.

Note: If you run the **configshow** command without a filter, it prints out approximately 1000 lines. For more information, see the *Brocade Fabric OS Reference*.

See the following sample output for the **configshow** command with **"fabric"** as a filter.

```
SW0:admin> configshow "fabric"
fabric.domain:5
fabric.ops.BBCredit:16
fabric.ops.E_D_TOV:2000
fabric.ops.R_A_TOV:10000
fabric.ops.dataFieldSize:2112
fabric.ops.mode.fcpProbeDisable:0
fabric.ops.mode.isolate:0
fabric.ops.mode.longDistance:0
fabric.ops.mode.noClassF:0
fabric.ops.mode.tachyonCompat:0
fabric.ops.mode.unicastOnly:0
fabric.ops.mode.useCsCtl:0
fabric.ops.mode.vcEncode:0
...
SW0:admin>
```

11. Run the **haenable** command.
12. If the switch configuration does not replicate correctly, download the switch configurations that were backed up in step 8 on page 67.
 - a. Run the **switchdisable** command to disable the current logical switch, which should still be switch 1.
 - b. Run the **configdownload** command and enter the requested information.

Note: If the switch is running Fabric OS v4.0.2, a message displays that cautions you about downloading the correct configuration file. If this message displays, type Y to continue.

- c. After the configuration is downloaded, run the **switchenable** command.
- d. Log into switch 0 and repeat steps 12a through 12c. See the following sample output for downloading the configuration to both logical switches.

```

SW0:admin> switchdisable
SW0:admin> configdownload
Server Name or IP Address [host]: 123.456.78.90
User Name [None]: user
File Name [config.txt]: config.txt
Password: xxxxxx
Committing configuration...done.
download complete
SW0:admin>
SW0:admin> switchenable
10 9 8 7 6 5 4 3 2 1
fabric: Principal switch
fabric: Domain 1
SW0:admin> login
cpl login: admin
Password:
Enter Switch Number to Login <0 or 1>: 1
SW1:admin>
SW1:admin> switchdisable
SW1:admin> configdownload
Server Name or IP Address [host]: 123.456.78.90
User Name [None]: user
File Name [config.txt]: config.txt
Password: xxxxxx
Committing configuration...done.
download complete
SW1:admin> switchenable
10 9 8 7 6 5 4 3 2 1
fabric: Principal switch
fabric: Domain 1
SW1:admin>

```

13. Pack the old CP card in the packaging that is provided with the new card. Return the old CP card by using your local return policy.

Replacing the CP card battery

Each CP card has a lithium carbon-monoflouride coin cell battery that has a 10-year life expectancy. If the real-time clock (RTC) loses time, you might need to replace the battery. Contact IBM if the RTC begins to lose time.



CAUTION:

Only trained service personnel may replace this battery. The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.

Do Not:

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

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

Removing and replacing a power supply or filler panel

Use this procedure to remove and replace a power supply. The switch can continue to operate during the replacement if at least one power supply continues operating for every four 16–port cards that are installed. You need a minimum of two power supplies.

Note: You do not need to notify the switch of a hot-swap request before you remove a power supply. Power supply filler panels are not required to ensure correct air flow.

The left power connector provides power to the power supplies in slots 1 and 3. The right power connector provides power to the power supplies in slots 2 and 4. The power connectors and the power supply slots are color-coded to identify which power connectors provide power to which power supply slots. See Figure 12 on page 3 for the location of the power supplies.

Attention: To protect against ac failure, you need a minimum of one power supply in slot 1 or slot 3, and one power supply in slot 2 or slot 4. If only two power supplies are installed and they are both installed in slots corresponding to the same power cable, unplugging a single power cable will power down the entire chassis.

Attention: If adequate power is abruptly lost, such as through removal of a power supply, the entire switch is powered down. The power off order that the **powerOffListSet** command designates is not followed.

Attention: Disassembling any part of the power supply voids the part warranty and regulatory certifications.

CAUTION:

No user-serviceable parts are inside the power supply.

Time required

Less than 5 minutes

Removing a power supply or filler panel

Perform the following steps to remove a power supply or filler panel:

1. If the switch is going to operate during the replacement procedure, check the LEDs to verify that the minimum of two power supplies are functioning before you uninstall the power supply.
2. Remove the power supply or filler panel from the chassis. See Figure 39 on page 76 for the location of the power supply.

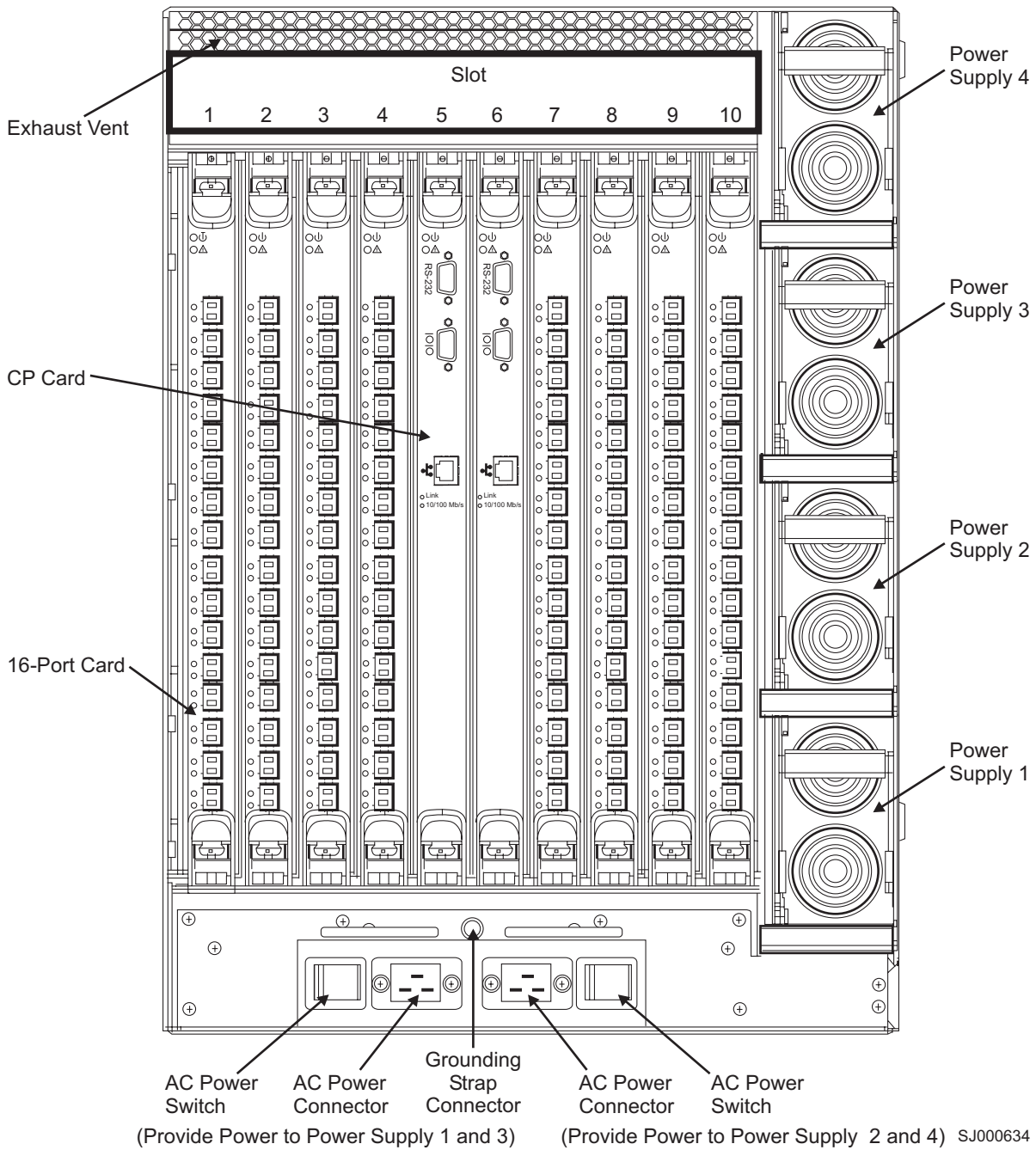


Figure 39. Location of the power supplies

Attention: Support the power supply from underneath while removing it from the chassis.

- a. Remove the power supply by pushing the locking tab in towards the power supply then pull the handle out and down, and use the handle to pull the power supply out of the chassis. See Figure 40 on page 77.
- b. Remove the filler panel by pulling it out by the handle.

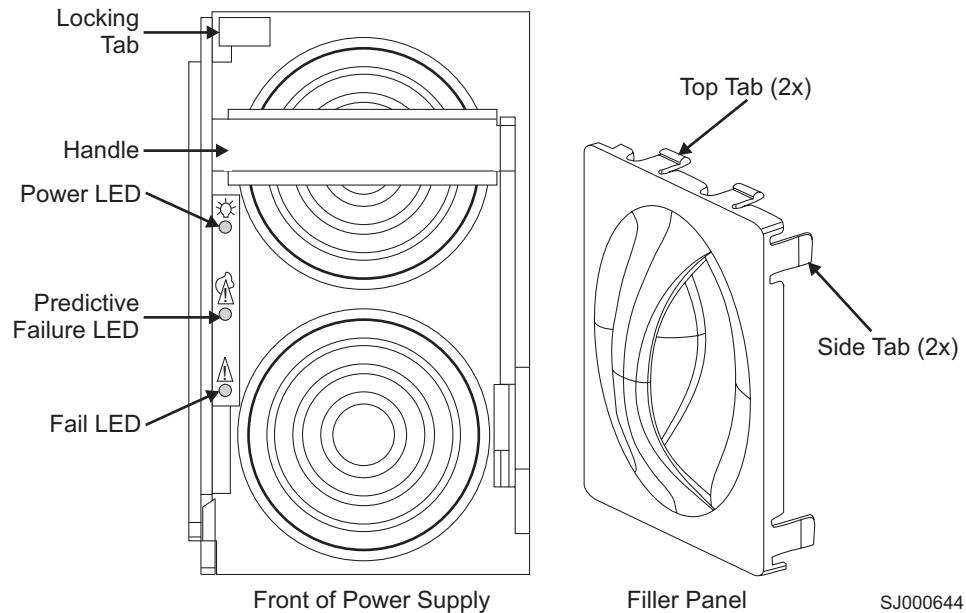


Figure 40. Power supply and filler panel

Replacing a power supply or filler panel

Attention: Do not force the installation of the power supply or filler panel. If the part does not install easily, ensure that it is properly oriented.

Perform the following steps to replace a power supply:

1. Orient the power supply so that the handle is toward the front of the chassis and the LEDs are on the left.
2. Unlock the handle and insert the power supply all the way into the slot.
3. Push the handle up until it clicks.
4. Verify that the power supply is seated by pulling gently on the handle.

Perform the following steps to replace a filler panel:

1. Orient the filler panel so that the handle is vertical and side tabs are on the right.
2. Push the filler panel into the slot.

Perform these additional steps if you are installing a new power supply:

1. Verify that the top LED on the power supply displays a steady green light.
2. If a green light does not display, ensure that both power cables are plugged in and that both ac switches are flipped to "I" (the ac switch lights up green).

Removing and replacing a blower assembly

Use this procedure to remove and replace the blower assembly. The switch requires that a minimum of two of the three blower assemblies are operating. It can continue to operate during the replacement only if the other two blower assemblies continue to operate. If more than one blower must be turned off at the same time, you should turn off the switch to prevent overheating.

Note: You do not need to notify the switch of a hot-swap request before you remove a blower assembly.

Attention: The switch requires a minimum of two operating blower assemblies at all times. To ensure continuous adequate cooling, maintain three operating blower assemblies at all times except for the brief period when replacing a blower assembly. The 16-port cards automatically shut down if the temperature range is exceeded.

Attention: Disassembling any part of the blower assembly voids the part warranty and regulatory certifications.

CAUTION:
No user-serviceable parts are inside the blower assembly.

Time required

Less than 5 minutes

Items required

#2 straight screwdriver

Removing a blower assembly

Perform the following steps to remove a blower assembly:

1. Before you remove the blower assembly, verify that the other two blower assemblies are functioning correctly. The blower assembly power LED should be steady green, and the fault LEDs should not be lit (see Figure 41 on page 79 for LED locations). For information about how to check the status of the blower assembly by using Telnet, see the *Brocade Fabric OS Reference*.
2. Remove the blower assembly from the chassis.

CAUTION:

Support the blower assembly from underneath while removing it from the chassis.

- a. Use the screwdriver to loosen the thumbscrews at the top and bottom of the blower assembly. See Figure 41 on page 79.
- b. Push in the top part of the handle. Pull out the lower part of the handle and pull the blower assembly out of the chassis.

Replacing a blower assembly

Attention: Do not force the installation. If the blower assembly does not slide in easily, ensure that it is properly oriented before you continue with the installation.

Perform the following steps to replace a blower assembly:

1. Orient the blower assembly. See Figure 41 on page 79.
2. Slide the blower assembly into the chassis, pushing firmly to ensure that it is seated.
3. Verify that the power LED displays a green light. If a green light is not displayed, ensure that the blower assembly is seated correctly.
4. Push the top of the handle into the recess.
5. Tighten the thumbscrews on the blower assembly to finger-tight.

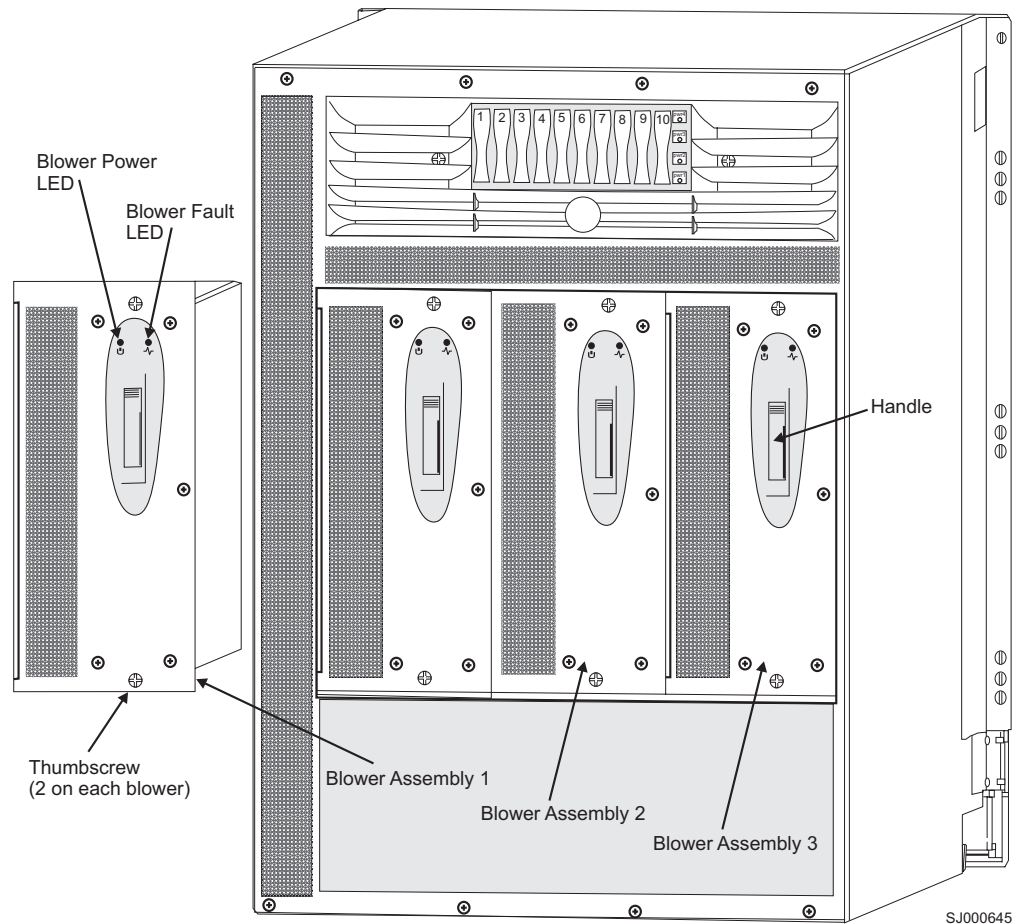


Figure 41. Blower assembly side of the 2109 Model M12 shown with one blower assembly uninstalled

Removing and replacing the cable management tray

Use this procedure to remove and replace the cable management tray. The switch can continue to operate during the replacement.

Attention: Do not use a power screwdriver on the cable management tray.

Time required

Less than 5 minutes

Items required

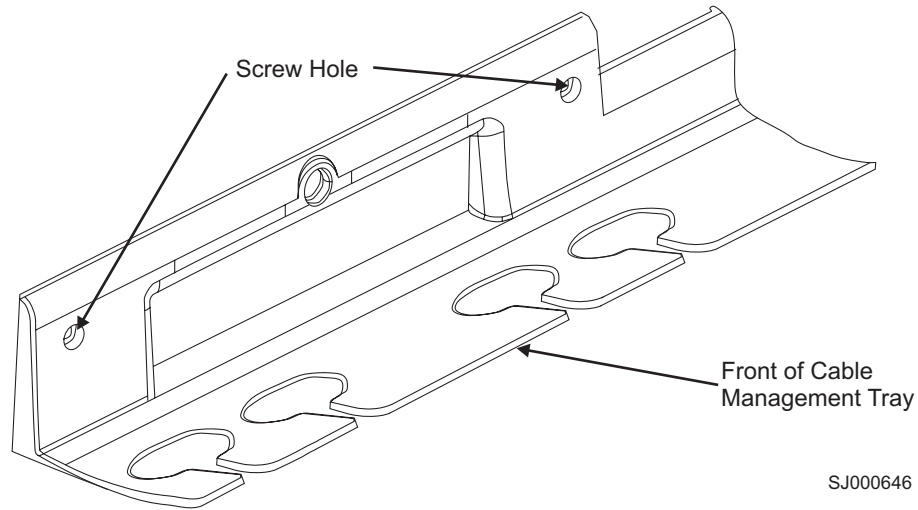
#2 Phillips screwdriver

Removing a cable management tray

Perform the following steps to remove a cable management tray:

1. Pull any cables out of the cable management tray.
2. Unscrew the two screws that hold the tray to the chassis. See Figure 42 on page 80 for the location of the screws. Save the screws for reuse when you replace the cable management tray.

3. Rotate the front of the tray down, then lift the back to disengage the tabs on the back of the tray from the chassis.



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Figure 42. Cable management tray

Replacing a cable management tray

Perform the following steps to replace the cable management tray:

1. Orient the tray. See Figure 43 on page 81.
2. Insert the two tabs on the underside of the tray into the two slots at the bottom of the ac panel. Rotate the front of the tray up until it locks into place.
3. Position and tighten the two screws that you previously removed.
4. Arrange the cables through or along the tray as required.

Note: Route the power cables out each side of the chassis.

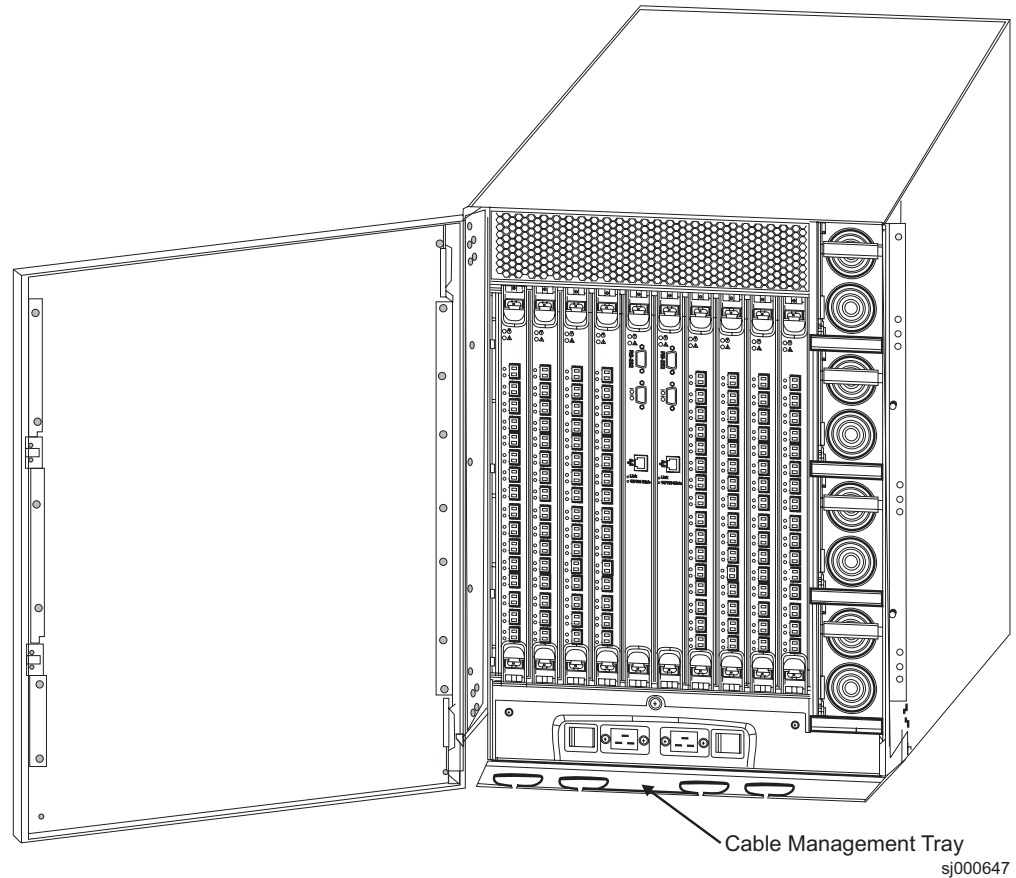


Figure 43. 2109 Model M12 with the cable management tray

Removing and replacing the WWN card

The WWN card is highly reliable. Before you replace the WWN card, verify that a replacement is necessary. If you are installing a new WWN card, the installation instructions are included with the product.

If you are going to replace a WWN card for Fabric OS earlier than v4.1.0, you must power down the switch. Do not remove the WWN card until you have received the replacement card. Do not restart the switch with a failed or missing WWN card.

Note: You must consult with Technical Support before you replace the WWN card.

Verifying if the WWN needs replacing

Ensure that the current card is firmly seated when you perform troubleshooting steps.

Any of the following events might indicate that the WWN card needs to be replaced:

- Visible mechanical damage to the WWN card
- Any of the Status LEDs on the WWN card do not reflect the actual status of the components
- Problems viewing or modifying the data that is stored on the WWN (see “Data that is stored on the WWN card” on page 82)

- Error messages regarding WWN unit 1 or unit 2 (see Messages that might indicate WWN card failure)

Data that is stored on the WWN card

Table 9 shows the data that is stored on the WWN card. The WWN card might need to be replaced if you have difficulty retrieving or modifying this data.

Table 9. Data that the WWN card stores

Data	Related Commands
WWN values	wwn, chassisshow
License keys	licenseshow, licenseadd, licenseremove
Data about the chassis and the WWN card	chassisshow
Ethernet and Fibre Channel IP address information for the CP cards	ipaddrshow, ipaddrset
History log information	historyshow, historylastshow
Names of logical switches	switchname

Messages that might indicate WWN card failure

If the error log or serial console display error messages that indicate problems with WWN unit 1 or unit 2, the WWN card might have failed. WWN unit 1 and unit 2 correspond to information that is specific to the WWN card, and are displayed by the **chassisshow** command. Table 10 shows messages that might indicate WWN card failure. For more information about error messages, see the *Brocade Diagnostics and System Error Message Reference*.

Note: WWN unit 1 and unit 2 do not correspond to the WWNs for logical switches 0 and 1.

Table 10. Sample error messages

Type of Message	Sample Error Message
WWN unit 1 or unit 2 fails its field replaceable unit (FRU) header access	0x24c (fabos): Switch: 0, error EM-I2C_ TIMEOUT, 2, WWN 1 I2C timed out: state 0x4
WWN unit 1 or unit 2 is being faulted	0x24c (fabos): Switch: 0, Critical EM-WWN_ UNKNOWN, 1, Unknown WWN #2 is being faulted
WWN unit 1 or unit 2 is not present or is not accessible	0x24c (fabos): Switch: 0, Error EM-WWN_ ABSENT, 2, WWN #1 not present
Writing to the FRU history log (hilSetFruHistory) has failed	0x24c (fabos): Switch: 0, Error EM- HIL_FAIL, 2, HIL Error: hilSetFruHistory failed, rc=-3 for SLOT 3

Reference information for the fruinfo command

You must run the **fruinfo** command through the active CP card by using root access. For more information, see Table 11.

Table 11. Reference information for the fruinfo command

Name	fruinfo
Syntax	fruinfo
Availability	Factory or root only

Table 11. Reference information for the fruinfo command (continued)

Description	This command provides for the setting of the four externally modifiable fields in the header that is associated with each FRU. After the new data is written, the final contents of the fields are printed. No other fields can be modified. Some FRUs might not contain customer data or might not be programmable, in which case an error message displays.												
Operands	<p>FRU ID and number are the required operands.</p> <p>FRU ID</p> <p>Type of FRU:</p> <ul style="list-style-type: none"> • Slot (port card or CP card in a slot) • Fan (blower assembly) • Ps (power supply) • Chassis (chassis or WWN card) <p>number</p> <p>Physical slot or unit number for which the information will be input. For chassis information, type chassis 1. For WWN card information, type chassis 2.</p>												
Usage	<p>The modifiable fields and their maximum field sizes are as follows:</p> <table border="1" data-bbox="446 835 1105 1010"> <thead> <tr> <th>Field name</th> <th>Maximum number of characters</th> </tr> </thead> <tbody> <tr> <td>ID</td> <td>10 characters</td> </tr> <tr> <td>PN (part number)</td> <td>20 characters</td> </tr> <tr> <td>SN (OEM serial number)</td> <td>20 characters</td> </tr> <tr> <td>RV (revision code)</td> <td>4 characters</td> </tr> <tr> <td>Chassis SN (serial number)</td> <td>12 characters</td> </tr> </tbody> </table> <p>(This field displays only when the chassis 1 parameter is used.)</p> <p>These fields might not display for all FRUs. For each field that displays, the existing value displays followed by a > prompt for the new value. If more than the allowed number of characters are entered, the extra characters at the end are ignored, and a warning message displays. Leading blanks are also ignored. The chassis SN prompt displays only if the chassis 1 parameter is entered after the command. The usage rules are the same as for other values. The chassis serial number is identified by the chassisShow command as the Serial Num for Chassis/WWN: Unit 1</p>	Field name	Maximum number of characters	ID	10 characters	PN (part number)	20 characters	SN (OEM serial number)	20 characters	RV (revision code)	4 characters	Chassis SN (serial number)	12 characters
Field name	Maximum number of characters												
ID	10 characters												
PN (part number)	20 characters												
SN (OEM serial number)	20 characters												
RV (revision code)	4 characters												
Chassis SN (serial number)	12 characters												

Upgrading an M12 to an M14

Refer to the *Brocade SAN Migration Guide* for instructions to upgrade an existing 2109 Model M12 to an M14.

Appendix A. Product specifications

This chapter contains the specifications for the 2109 Model M12 only. For specifications for the IBM TotalStorage Cabinet 2109 Model C36, see the *IBM TotalStorage SAN Cabinet 2109 Model C36 Installation and Service Guide*.

2109 Model M12 components

The M12 contains the following components:

- A 14U chassis, designed to be mounted in a 48.26 cm (19 in.) rack. Two M12 switches can be mounted in a 2109 Model C36 cabinet.
- 16–port cards in configurations up to eight cards per chassis, with 16 optical ports per card, compatible with SFPs
- Two CP cards, each with:
 - One modem serial port with a DB–9 connector (full RS–232)
 - One terminal serial port with a DB–9 connector (RS–232 signal subset)
 - One IEEE compliant RJ–45 connector for use with a 10 Mbps or 100 Mbps Ethernet connection
 - A real-time clock (RTC) with a 10-year battery and 56 bytes of NVRAM
- Four power supplies with built-in fans. The power supplies plug into internal blind-mate connectors when installed in the chassis.
- Two ac power inlet connectors with ac power switches (power panel)
- A WWN card and bezel
- Three blower assemblies for forced-air cooling of the 16–port cards and the CP cards

Air enters inlet vents on the blower assembly side of the chassis and exits through vents on the port side of the chassis. The blower speed is governed by inlet air temperature. The blowers go into high speed when the inlet air temperature exceeds 33° C (91° F).

Physical dimensions

The dimensions of the M12 are listed in Table 12.

Table 12. Physical dimensions of the 2109 Model M12

Dimension	Value
Height	14U (24.11 in.)
Depth	70.9 cm (27.9 in.)
Depth with door	72.9 cm (28.7 in.)
Width	43.7 cm (17.2 in.)

M12 component weights

The weight of a fully loaded M12, as well as the weights of individual components, are listed in Table 13.

Table 13. Component weights

Component	Weight
Fully loaded chassis	Approximately 114 kg (250.0 lb)
Empty chassis	47.1 kg (104.0 lb)
Door	3.4 kg (7.6 lb)
Blower assembly	4 kg (8.8 lb)
Power supply	3.2 kg (7.0 lb)
WWN bezel	0.27 kg (0.6 lb)
CP card	2.5 kg (5.6 lb)
16-port card	3.9 kg (8.6 lb)
Card filler panel	1.6 kg (3.2 lb)
Cable management tray	0.27 kg (0.6 lb)

16-port card specifications

The ports in the M12 support full duplex link speeds at 2.125 Gbps or 1.0625 Gbps, inbound and outbound, automatically negotiating to the highest common speed of all the devices that are connected to the port. Each port has a serializer/deserializer (SERDES) which accepts 10-bit wide parallel data and serializes it into a high-speed serial stream. The parallel data is expected to be 8B/10B encoded data or equivalent.

The ports are compatible with optical SWL (780–850 nm), and optical LWL (1270–1350 nm), SFPs, and SFP-compatible cables. The strength of the signal is determined by the type of SFP that is being used.

The ports are universal and self-configuring, and are capable of becoming F_ports, FL_ports, or E_ports.

The ports meet all required safety standards. For more information about these standards, see Table 21 on page 92.

CP card specifications

This section describes the specifications for the CP card.

Memory specifications

The centralized memory maximizes switch throughput by guaranteeing full transmit and receive bandwidth to all fibre channel ports at all times.

Each CP card contains the type and specification of memory listed in Table 14.

Table 14. Memory specifications

Memory type	Amount
Main memory	256 MB of SDRAM (32 bits wide)

Table 14. Memory specifications (continued)

Memory type	Amount
Flash memory	<ul style="list-style-type: none"> User flash: 16 MB of 16-bit wide memory, stored in two 8 MB banks Compact flash: 256 MB, partitioned in two 128 MB sections
Boot flash memory	512 KB of 8-bit wide memory for system startup

Battery specifications

The CP card has a lithium carbon-monofluoride coin cell battery.

Table 15 lists the battery specifications.

Table 15. Battery specifications

Type	Specification
Rayovac BR1225	3.0 volt, 50 mAh



CAUTION:

Only trained service personnel may replace this battery. The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.

Do Not:

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

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

Terminal serial port specifications

Each CP card provides a terminal serial port with a DB-9 connector with an RS-232 signal subset.

Note: For dust and ESD protection, a cover is provided for the serial port and should be kept on the port whenever the serial port is not being used.

The terminal serial port is intended primarily for use during the initial setting of the IP address and for service purposes.

A 3.0 m (10 ft) serial cable is provided with the switch. You can convert it from a DB-9 serial cable to an RJ-45 style serial cable by removing the adapter on the end of the cable.

You can use the terminal serial port to connect to a computer workstation or terminal without connecting to the fabric. The terminal device should be configured to 9600 baud, 8 data bits, no parity, 1 stop bit, with no flow control.

The terminal serial port requires a straight through serial cable with a female 9-pin D-SUB connector. Use the pinouts listed in Table 16 on page 88.

Table 16. Pinouts with signal and description

Pin	Signal	Description
1		
2	TxData	Transmit data
3	RxData	Receive data
4		
5	GND	Logic ground
6		
7		
8		
9		

Modem serial port specifications

Each CP card has a modem serial port (labeled RS-232) with a fully RS-232 compliant DB-9 connector.

Note: For dust and ESD protection, a cover is provided for the serial port and should be kept on the port whenever the serial port is not being used.

You can use the modem serial port to attach a modem to each CP card. The M12 detects modems only during the power-on or restart sequences, and automatically initializes them for operation. If modems are connected to an operating switch, a power on and off cycle, restart, or fast restart is required in order to detect the modems.

Customers should connect a “Y” cable on the telephone line to each modem. The active CP card answers on the first ring. The standby CP card answers on the seventh ring if the active CP card fails to answer.

The modem serial port pinouts are listed in Table 17.

Table 17. Modem serial port pinouts

Pin	Signal	Description
1	DCD	Data carrier detect
2	RxData	Receive data
3	TxData	Transmit data
4	DTR	Data term ready
5	GND	Logic ground
6	DSR	Data set ready
7	RTS	Request to send
8	CTS	Clear to send
9	RI	Ring indicator

Fibre-channel port specifications

The fibre-channel ports in the M12 support full duplex link speeds at 2.125 Gbps or 1.0625 Gbps inbound and outbound. The ports automatically negotiate to the highest common speed of all devices that are connected to the port. Each port has

a SERDES that accepts 10-bit wide parallel data and serializes it into a high-speed serial stream. The parallel data is expected to be 8B/10B encoded data or equivalent.

The ports are compatible with the following SFPs and SFP-compatible cables:

- Optical SWL: 780–850 nm
- Optical LWL: 1270–1350 nm

The strength of the signal is determined by the type of SFP in use.

The ports are universal and self-configuring, and are capable of becoming F_ports, FL_ports, or E_ports. These ports meet all the required safety standards.

Facility specifications

To ensure correct operation of the M12, ensure that the facility meets the following specifications:

- Power requirements for a physical inlet:
 - Input power requirements: 200–240 V ac, 24A, 50–60 Hz
 - Recommended power connector
- An adequate supply circuit, line fusing, and wire size, according to the electrical rating on the switch nameplate.
- An air flow of at least 350 cubic feet per minute per switch, available in the immediate vicinity of the M12.
- The power specifications listed in “Power specifications.”
- The environmental specifications listed in “Environmental requirements” on page 90.
- Interference less than the standard levels listed in Table 20 on page 90, under Immunity.

Power specifications

CAUTION:

To remove power to the M12, disconnect both power cables.

The M12 supports F_port, FL_port, and E_port connections and distributed name server (DNS). It is electro-magnetic compatibility (EMC) compliant.

The power supplies are universal and capable of functioning worldwide without using voltage jumpers or switches. They meet IEC 61000–4–5 surge voltage requirements and are autoranging in terms of accommodating input voltages and line frequencies. Each power supply has its own built-in fan for cooling. The fans push the air towards the port side of the chassis.

The power specifications listed in Table 18 on page 90 are calculated for fully-loaded systems with four power supplies. A fully-loaded system has eight 16-port cards, two CP cards, and three blower assemblies.

Table 18 lists the power specifications for the M12.

Table 18. Power specifications

Specification	Value
Total power available from each power supply	1 KW
Input voltage	200–240 V ac
Input line frequency	50–60 Hz
Harmonic distortion	Active power factor correction per IEC1000–3–2
Heat output (BTU rating)	<ul style="list-style-type: none"> • 64 ports: 1080 Watts, 3690 BTU per hour • 128 ports : 1960 Watts, 6700 BTU per hour
Maximum inrush current per power cord	40 amps peak
Input line protection	Thermal circuit breaker
Power supply dimensions	6.96 cm (2.74 in.) wide, 12.34 cm (4.86 in.) high, 34.29 cm (13.50 in.) long

Environmental requirements

Table 19 lists the environmental operating ranges for the M12. The requirements for non-operating conditions are also provided for acceptable storage and transportation environments.

Table 19. Environmental requirements

Condition	Acceptable range during operation	Acceptable range during nonoperation
Temperature (See Note)	0°–40°C (40°–104°F)	0°–40°C (40°–104°F)
Humidity	20%–80% RH noncondensing, at 40°C	0%–90% RH noncondensing, at 40°C
Altitude	0–3 km (0–10 000 ft) above sea level	0–12 km (0–39 370 ft) above sea level
Shock	4G, 11 MS duration, half-sine wave	0G, 11 MS duration, sq wave
Vibration	5G, 0–3 kHz at 1.0 octave per minute	10G, 0–5 kHz at 1.0 octave per minute
Heat dissipation	<ul style="list-style-type: none"> • 64 ports: 3690 BTU per hour • 128 ports: 6700 BTU per hour 	Not applicable
Note: Temperature measured at the air inlets on the blower assembly side of the chassis.		

General specifications

Table 20 lists the general specifications for the M12.

Table 20. General specifications

Specification	Description
Configurable port types	The M12 supports F_port, FL_port, and E_port connections.

Table 20. General specifications (continued)

Specification	Description
EMI rating	An operating M12 conforms to the EMI radiation levels specified by the following regulations: <ul style="list-style-type: none"> • FCC Rules and Regulations, Part 15B, Class A level • CISPR22 Class A • EN55022 Class A • VCCI Class A ITE • AS/NZS 3548 Class A • CNS13438 Class A • ICES-003 Class A
System architecture	Nonblocking shared-memory switch
System processor	IBM Power PC 405GP, 200 MHz CPU
ANSI fibre channel protocol	FC-PH (Fibre Channel Physical and Signaling Interface standard)
Modes of operation	Fibre Channel Class 2, Class 3, and Class F
Fabric initialization	Complies with FC-SW 5.0
Internet protocol (IP) over Fibre Channel (FC-IP)	Complies with FC-IP 2.3 of the FCA profile
Aggregate switch input/output (I/O) bandwidth	Per port: 4 Gbps, running at 2 Gbps, full duplex Per 16-port card: 64 Gbps, all 16 ports at 2 Gbps, full duplex
Port-to-port latency	Less than 2 microseconds with no contention (destination port is free)
Data transmission range	<ul style="list-style-type: none"> • Up to 500 m (1625 ft) for short wavelength optical link • Up to 10 km (32 820 ft) for long wavelength optical link
Immunity	<ul style="list-style-type: none"> • IEC 61000-4-2 Severity Level 3 for Electrostatic Discharge • IEC 61000-4-3 Severity Level 3 for Radiated Fields • IEC 61000-4-4 Severity Level 3 for Fast Transients • IEC 61000-4-5 Severity Level 3 for Surge Voltage • IEC 61000-4-6 Conducted Emissions • IEC 61000-4-11 Voltage Variations
Acoustics	When measured in EIA 4 of a 36 EIA TotalStorage rack, with front cover, and rear cover with acoustic baffle, declared sound power is LwAd = 7.5 B, average bystander sound pressure is LpA = 59 dBA.
Routing capacity	A minimum aggregate routing capacity of four million frames per second is provided for Class 2, Class 3, and Class F frames in a 64-port switch.

Regulatory specifications

The M12 is certified for the regulatory specifications that are listed in Table 21.

Table 21. Regulatory specifications

Country or region	Safety specification	EMC specification
Canada	CSA 22.2 No. 60950 Third Ed.	ICES-003 Class A
United States	UL 60950 Third Ed., Info. Tech. Equip.	FCC Part 15, Subpart B, (CFR title 47) Class A
Japan	IEC 60950+A1+A2+A3+A4+A11	VCCI V-3/2000.04, Class A
International	IEC 60950+A1+A2+A3+A4+A11	CISPR22 Class A
Norway	Nemko IEC 60950+A1+A2+A3+A4+A11 (CB Report)	
European Union (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom)	73/23/EEC based on compliance to EN 60950:92 +A1:93+A2:93+A3:95+A4:96+A11:97 (CB report inclusive of county deviations); TUV-GS (Germany)	89/336/EEC EN 55022:1998 Class A EN 55024 (Immunity) EN 60825-1:1994/A11, -2 EN 61000-4-2 Severity Level 3 for Electro Static Discharge EN 61000-4-3 Severity Level 3 for Radiated Fields EN 61000-4-4 Severity Level 3 for Electrical Fast Transients EN 61000-4-5 Severity Level 3 for Surge Voltage EN 61000-4-6 Conducted Emissions EN 61000-4-8 Magnetic Fields EN 61000-4-11 Line Interruption
Taiwan		BSMI Certification CNS 13438
Australia and New Zealand		AS/NZS 3548:1995 Class A (radio interference)

POST and Boot specifications

The M12 performs a POST by default each time that you power on (cold boot) or restart or reset the chassis. You can restart the M12 with the **switchreboot** command, the **reboot** command, or the **fastboot** command. The **fastboot** command restarts the switches without running POST. If you restart the active CP card, it fails over to the standby CP card.

Monitoring POST results

You can monitor the success and failure of the diagnostic tests that are run during POST through LED activity, the error log, or a command line interface. POST requires a minimum of 3 minutes to complete, however the time might vary depending on the devices that are connected to the M12.

POST performs the following steps:

1. Runs preliminary POST diagnostics
2. Initializes the operating system
3. Initializes the hardware
4. Runs diagnostic tests on several functions, including circuitry, port functionality, ability to send and receive frames, all aspects of memory, parity, statistics counters, and serialization

Boot

Boot completes in a minimum of 3 minutes if you run a POST. In addition to POST, boot includes the following steps after the POST completes:

1. Configures the universal port
2. Initializes the links
3. Analyzes the fabric. If any ports are connected to other switches, the switch participates in a fabric configuration.
4. Obtains a domain ID for the switch and assigns port addresses
5. Constructs unicast routing tables
6. Enables normal port operation

Appendix B. Model M12 Parts information

This section contains FRU part numbers and part descriptions for a 2109 Model M12 only. For information regarding parts for the 2109 Model C36 Cabinet, see the *IBM TotalStorage SAN Cabinet 2109 Model C36 Installation and Service Guide*.

2109 Model M12 parts list

FRU part number	Units per assembly	Description
18P5017	4 each	Switch blade, 16 port, 2 GB
18P5032	1 each	Chassis door
18P5034	4 each	Filler panel, switch blade, 16 port, 2 GB
18P5035	2 each	Blade, control processor
18P5037	3 each	Power supply, 180 - 264 V ac, 1000 watts
18P5039	3 each	Blower assembly
18P5126	1 each	Rear LED status panel card
18P5128	1 each	Chassis (including the backplane, blower and power supply backplane, ac and blower harness)
18P5130	1 each	Rear WWN bezel
18P5131	1 each	Tray, cable management

Appendix C. Blank planning worksheets

This chapter contains the following blank worksheets that you can use when you plan the installation of a 2109 Model M12:

- Planning worksheet
- Port configuration worksheet
- Zone definition worksheet
- Zone configuration worksheet

Make as many copies of the blank worksheets as you need to plan the installation of your switches. Give your system administrator copies of the completed worksheets.

Planning worksheet

Table 22. Planning worksheet

Item	Description
Firmware level	
Firmware location:	
Server name	
Username	
Directory	
Switch name	
Domain ID	
FCnetID (Fibre Channel IP address)	
FC netmask	
WWN	
Role	
Syslog daemon IP address	
Users defined - access level	
SNMP information:	
System description	
System contacts	
System location	
Event trap level 0–5	
Enable authentication traps	
RW community string	
RO community string	
Trap recipients IP address	
License keys	

Port configuration worksheet

Table 23. Port configuration worksheet

Port number	Device name	Device port	Cable length	Port type	Notes	Cable number
0						
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Zone definition worksheet

Table 24. Zone definition worksheet

Zone member type (switch, port, WWN)	Zone member	Zone configuration name	Comments
Port (ID, P)			
Port (ID, P)			
Port (ID, P)			
Port (ID, P)			
Port (ID, P)			
Port (ID, P)			

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The following statements apply to this product. The statements for other products intended for use with this product will appear in their accompanying manuals.

Federal Communications Commission (FCC) Class A Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

IBM is not responsible for any radio or television interference caused by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A Emission Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

European Union (EU) Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any

failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Germany Electromagnetic Compatibility Directive

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 18. September 1998 (bzw. der EMC EG Richtlinie 89/336)

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die: IBM Deutschland Informationssysteme GmbH 70548 Stuttgart.

Informationen in Hinsicht EMVG Paragraph 4 Abs. (1) 4:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

EN 55022 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden: "Warnung: dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen."

Anmerkung: Um die Einhaltung des EMVG sicherzustellen, sind die Geräte wie in den IBM Handbüchern angegeben zu installieren und zu betreiben.

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Glossary

This glossary provides definitions for Fibre Channel and switch terminology used for IBM TotalStorage SAN switches and related products. It also provides additional definitions of technical terms and abbreviations. If you do not find the term you are looking for, see the *IBM Glossary of Computing Terms* located at <http://www.ibm.com/ibm/terminology/>

This glossary includes terms and definitions from:

- *Information Technology Vocabulary* by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1). Definitions are identified by the symbol (I) after the definition; definitions taken from draft international standards, committee drafts, and working papers by ISO/IEC JTC1/SC1 are identified by the symbol (T) after the definition, indicating that final agreement has not yet been reached among the participating National Bodies of SC1.
- *IBM Glossary of Computing Terms*. New York: McGraw-Hill, 1994.

The following cross-reference conventions are used in this glossary:

See Refers you to (a) a term that is the expanded form of an abbreviation or acronym, or (b) a synonym or more preferred term.

See also
Refers you to a related term.

Numerics

8b/10b encoding. An encoding scheme that converts each 8-bit byte into 10 bits. Used to balance ones and zeros in high-speed transports

16-port card. The Fibre Channel port card provided with SAN switch directors. Contains 16 ports and the corresponding light-emitting diodes (LEDs). See also *port card*.

A

access control list (ACL). Enables an organization to bind a specific worldwide name (WWN) to a specific switch port or set of ports, preventing a port in another physical location from assuming the identity of a real

WWN. Can also refer to a list of the read/write access of a particular community string. See also *device connection controls*.

account level switches. Switches that have four login accounts into the operating system (in descending order): root, factory, admin, and user. See also *admin account*.

ACL. See *access control list*.

address identifier. A 24-bit or 8-bit value used to identify the source or destination of a frame.

admin account. A login account intended for use by the customer to control switch operation. See also *account level switches*.

alias. An alternate name for an element or group of elements in the fabric. Aliases can be used to simplify the entry of port numbers and worldwide names (WWNs) when creating zones.

alias address identifier. An address identifier recognized by a port in addition to its standard identifier. An alias address identifier can be shared by multiple ports.

alias AL_PA. An arbitrated loop physical address (AL_PA) value recognized by a loop port (L_port) in addition to the AL_PA assigned to the port. See also *arbitrated loop physical address*.

alias server. A fabric software facility that supports multicast group management.

AL_PA. See *arbitrated loop physical address*.

American National Standards Institute (ANSI). The governing body for Fibre Channel standards in the U.S.A.

ANSI. See *American National Standards Institute*.

API. See *application programming interface*.

application programming interface (API). A defined protocol that allows applications to interface with a set of services.

application-specific integrated circuit (ASIC). In computer chip design, an integrated circuit created by first mounting an array of unconnected logic gates on a substrate and later connecting these gates in a particular configuration for a specific application. This design approach allows chips for a variety of applications to be made from the same generic gate array, thereby reducing production costs

ARB. See *arbitrate primitive signal*.

arbitrate primitive signal (ARB). A primitive signal that is transmitted as the fill word by a loop port (L_port) to indicate that the L_port is arbitrating to access to the loop. Applies only to the arbitrated loop topology.

arbitrated loop. A shared 100 MBps Fibre Channel transport structured as a loop and supporting up to 126 devices and one fabric attachment. A port must successfully arbitrate before a circuit can be established.

arbitrated loop physical address (AL_PA). An 8-bit value used to uniquely identify an individual port within a loop. A loop can have one or multiple AL_PAs.

arbitration wait timeout value (AW_TOV). The minimum time an arbitrating loop port (L_port) waits for a response before beginning loop initialization.

area number. A number that is assigned to each potential port location in the switch. Used to distinguish ports that have the same port number but are on different port cards.

ASIC. See *application-specific integrated circuit*.

asynchronous transfer mode (ATM). A broadband technology for transmitting data over local area networks (LANs) or wide area networks (WANs), based on relaying cells of fixed size. Provides any-to-any connectivity, and nodes can transmit simultaneously.

ATM. See *asynchronous transfer mode*.

auto-negotiate speed. Process that allows two devices at either end of a link segment to negotiate common features, speed (for example, 1 Gbps or 2 Gbps) and functions.

autoranging. A power supply that accommodates different input voltages and line frequencies.

autosense. Process during which a network device automatically senses the speed of another device.

AW_TOV. See *arbitration wait timeout value*.

B

backup FCS switch. The switch or switches assigned as backup in case the primary fabric configuration server (FCS) switch fails. See also *fabric configuration server switch* and *primary FCS switch*.

bandwidth. (1) The total transmission capacity of a cable, link, or system. Usually measured in bits per second (bps). (2) The range of transmission frequencies available to a network. See also *throughput*.

basic input/output system (BIOS). Code that controls basic hardware operations, such as interactions with diskette drives, hard disk drives, and the keyboard.

BB_credit. See *buffer-to-buffer credit*.

beacon. When all the port light-emitting diodes (LEDs) on a switch are set to flash from one side of the switch to the other, to enable identification of an individual switch in a large fabric. A switch can be set to beacon by Telnet command or through Web Tools.

beginning running disparity. The disparity at the transmitter or receiver when the special character associated with an ordered set is encoded or decoded. See also *disparity*.

BER. See *bit error rate*.

BIOS. See *basic input/output system*.

BISR. Built-in self-repair.

bit error rate (BER). The rate at which bits are expected to be received in error. Expressed as the ratio of error bits to total bits transmitted. See also *error*.

blade. One component in a system that is designed to accept some number of components (blades). Blades could be individual servers that plug into a multiprocessing system or individual port cards that add connectivity to a switch. A blade is typically a hot swappable hardware device. See *16-port card*.

blind-mate connector. A two-way connector used in some switches to provide a connection between the system board and the power supply.

block. As applies to fibre channel, upper-level application data that is transferred in a single sequence.

bloom. Application-specific integrated circuit (ASIC) technology that the 2109 Model M12 is based on.

boot flash. Flash memory that stores the boot code and boot parameters. The processor runs its first instructions from boot flash. Data is cached in random access memory (RAM).

boot monitor. Code used to initialize the control processor (CP) environment after powering on. Identifies the amount of memory available and how to access it, and retrieves information about system buses.

British thermal unit (BTU). A measurement of heat produced in one hour.

broadcast. The transmission of data from a single source to all devices in the fabric, regardless of zoning. See also *multicast* and *unicast*.

BTU. See *British thermal unit*.

buffer-to-buffer credit. The number of frames that can be transmitted to a directly-connected recipient or within an arbitrated loop. Determined by the number of receive buffers available. See also *buffer-to-buffer flow control*.

buffer-to-buffer flow control. Management of the frame transmission rate in either a point-to-point topology or in an arbitrated loop. See also *buffer-to-buffer credit*.

C

CAM. Content addressable memory.

cascade. Two or more interconnected Fibre Channel switches that can build large fabrics. Switches can be cascaded up to 239 switches, with a recommended maximum of seven inter-switch links (no path longer than eight switches). See also *fabric* and *inter-switch link*.

central processing unit (CPU). A part of a computer that includes the circuits that control the interpretation and execution of instructions. A CPU in the circuitry and storage that executes instructions. Traditionally, the complete processing unit was often regarded as the CPU, whereas today the CPU is often a microchip. In either case, the centrality of a processor or processing unit depends on the configuration of the system or network in which it is used.

chassis. The metal frame in which the switch and switch components are mounted.

circuit. An established communication path between two ports. Consists of two virtual circuits capable of transmitting in opposite directions. See also *link*.

class 1. Service that provides a dedicated connection between two ports (also called connection-oriented service), with notification of delivery or nondelivery.

class 2. Connectionless service between ports with notification of delivery or nondelivery.

class 3. Connectionless service between ports without notification of delivery. Other than notification, the transmission and routing of class 3 frames is the same as class 2 frames.

class F. Connectionless service for inter-switch control traffic. Provides notification of delivery or nondelivery between two expansion ports (E_ports).

class of service. A specified set of delivery characteristics and attributes for frame delivery.

CLI. See *command line interface*.

CMI. Control message interface.

comma. A unique pattern (either 1100000 or 0011111) used in 8b/10b encoding to specify character alignment within a data stream. See also *K28.5*.

command line interface (CLI). Interface that depends entirely on the use of commands, such as through

Telnet or simple network management protocol (SNMP), and does not involve a graphical user interface.

community (SNMP). A relationship between a simple network management protocol (SNMP) agent and a set of SNMP managers that defines authentication, access control, and proxy characteristics.

compact flash. Flash memory that stores the run-time operating system and is used like hard disk storage. Not visible within the memory space of the processor. Data is stored in file system format. Also called user flash.

control processor (CP). The central processing unit that provides all control and management functions in a switch.

control processor card (CP card). The central processing unit of the director/switch, which contains two control processor (CP) card slots to provide redundancy. Provides Ethernet, serial, and modem ports with the corresponding light-emitting diodes (LEDs).

core switch. A switch whose main task is to interconnect other switches. Also referred to as a backbone switch. See also *edge switch*.

CP. See *control processor*.

CP card. See *control processor card*.

CPLD. Complex programmable logic device.

CPU. See *central processing unit*.

CRC. See *cyclic redundancy check*.

credit. When applied to a switch, the maximum number of receive buffers provided by a fabric port (F_port) or fabric loop port (FL_port) to its attached node port (N_port) or node loop port (NL_port), respectively, such that the N_port or NL_port can transmit frames without over-running the F_port or FL_port.

CSA. Canadian Standards Association.

cut-through. A switching technique that allows the route for a frame to be selected as soon as the destination address is received. See also *route*.

cyclic redundancy check (CRC). A check for transmission errors included in every data frame.

D

data communications equipment (DCE) port. A port that is capable of interfacing between a data terminal equipment (DTE) port and a transmission circuit. DCE devices with an RS-232 (or EIA-232) port interface transmit on pin 3, and receive on pin 2. See also *data terminal equipment (DTE) port*.

data rate. The rate at which data is transmitted or received from a device. Interactive applications tend to require a high data rate, while batch applications can usually tolerate lower data rates.

data terminal equipment (DTE) port. A port that is capable of interfacing to a transmission circuit through a connection to a data communications equipment (DCE) port. DTE devices with an RS-232 (or EIA-232) port interface transmit on pin 3, and receive on pin 2 in a 9-pin connector (reversed in 25-pin connectors). See also *data communications equipment (DCE) port*.

DB-9 connector. A 9-pin version of the RS-232C port interface.

DCC. A dc converter.

DCE port. See *data communications equipment (DCE) port*.

DDR. Double data rate. See *data rate*.

defined zone configuration. The complete set of all zone objects that are defined in the fabric. The defined configuration can include multiple zone configurations. See also *enabled zone configuration* and *zone configuration*.

device. Hosts and storage that connect to a switch. Example devices are servers, redundant array of independent disks (RAID) arrays, and tape subsystems.

device connection controls. Enables organizations to bind an individual device port to a set of one or more switch ports. Device ports are specified by a worldwide name (WWN) and typically represent host bus adapters (HBAs) (servers). See also *access control lists*.

DID. The 3-byte destination ID of the destination device, in the 0xDomainAreaALPA format.

direct memory access (DMA). The transfer of data between memory and an input/output device without processor intervention.

disparity. The relationship of ones and zeros in an encoded character. *Neutral disparity* means an equal number of each, *positive disparity* means a majority of ones, and *negative disparity* means a majority of zeros.

DLS. See *dynamic load sharing*.

DMA. See *direct memory access*.

DNS. Distributed name server.

domain_ID. Unique identifier for the switch in a fabric. Usually automatically assigned by the switch, but can also be assigned manually. Can be any value between 1–239.

DRAM. See *dynamic random access memory*.

DTE port. See *data terminal equipment (DTE) port*.

dual fabric. Two identical fabrics that allow redundancy in the event that one fabric fails. Use a dual fabric for mission critical applications.

dual-fabric SAN. A storage area network (SAN) that is composed of two independent fabrics. Synonymous with multi-fabric SAN. The two-fabric architecture makes dual-fabric SANs redundant.

DWDM. Dense wavelength digital multiplexing.

dynamic load sharing (DLS). Dynamic distribution of traffic over available paths. Allows for recomputing of routes when a fabric port or fabric loop port (Fx_port) or expansion port (E_port) changes status.

dynamic random access memory (DRAM). A storage in which the cells require repetitive application of control signals to retain stored data.

E

edge fabric. A single fabric that uses two or more switches as a core to interconnect multiple edge switches. Synonymous with dual-core fabric. See also *resilient core*.

edge switch. A switch whose main task is to connect nodes into the fabric. See also *core switch*.

E_D_TOV. See *error detect timeout value*.

EE_credit. See *end-to-end credit*.

effective zone configuration. The particular zone configuration that is currently in effect. Only one configuration can be in effect at once. The effective configuration is built each time a zone configuration is enabled.

EIA. Electronic Industries Alliance.

EIA rack. A storage rack that meets the standards set by the Electronics Industries Alliance (EIA).

electromagnetic compatibility (EMC). The design and test of products to meet legal and corporate specifications dealing with the emissions and susceptibility to frequencies in the radio spectrum. Electromagnetic compatibility is the ability of various electronic equipment to operate properly in the intended electromagnetic environment.

electromagnetic interference (EMI). Waves of electromagnetic radiation, including but not limited to radio frequencies, generated by the flow of electric current.

electrostatic discharge (ESD). The flow of current that results when objects having a static charge come into close enough proximity to discharge.

ELP. Extended link parameters.

ELWL. See *extra long wavelength*.

EMC. See *electromagnetic compatibility*.

EMI. See *electromagnetic interference*.

enabled zone configuration. The currently enabled configuration of zones. Only one configuration can be enabled at a time. See also *defined zone configuration* and *zone configuration*.

end port. A port on an edge switch that connects a device to the fabric.

end-to-end credit (EE_credit). The number of receive buffers allocated by a recipient port to an originating port. Used by class 1 and class 2 services to manage the exchange of frames across the fabric between source and destination. See also *end-to-end flow control* and *buffer-to-buffer credit*.

end-to-end flow control. Governs flow of class 1 and class 2 frames between node ports (N_ports). See also *end-to-end credit*.

E_port. See *expansion port*.

error. As applies to fibre channel, a missing or corrupted frame, timeout, loss of synchronization, or loss of signal (link errors). See also *loop failure*.

error detect timeout value (E_D_TOV). The time that the switch waits for an expected response before declaring an error condition. Adjustable in 1 microsecond increments from 2—10 seconds.

ESD. See *electrostatic discharge*.

exchange. The highest level Fibre Channel mechanism used for communication between node ports (N_ports). Composed of one or more related sequences, and can work in either one or both directions.

expansion port (E_port). A port is designated an expansion port (E_port) when it is used as an inter-switch expansion port to connect to the E_port of another switch, to build a larger switch fabric.

Extended Fabrics. A feature that runs on Fabric operating system (OS) and allows creation of a Fibre Channel fabric interconnected over distances of up to 100 km (62.14 mi).

extra long wavelength (ELWL). Laser light with a periodic length greater than 1300 nm (for example, 1420 or 1550). ELWL lasers are used to transmit Fibre Channel data over distances greater than 10 km. Also known as XLWL.

F

fabric. A network that uses high-speed fibre connections to connect switches, hosts, and devices. A fabric is an active, intelligent, nonshared interconnect scheme for nodes.

Fabric Access. Allows the application to control the fabric directly for functions such as discovery, access (zoning) management, performance, and switch control. Consists of a host-based library that interfaces the application to switches in the fabric over an out-of-band TCP/IP connection or in-band using an IP-capable host bus adapter (HBA).

Fabric Assist. A feature that enables private and public hosts to access public targets anywhere on the fabric, provided they are in the same Fabric Assist zone.

fabric configuration server (FCS) switch. One or more designated switches that store and manage the configuration and security parameters for all switches in the fabric. FCS switches are designated by worldwide name (WWN), and the list of designated switches is communicated fabric-wide. See also *backup FCS switch*, *primary FCS switch*.

fabric login (FLOGI). The process by which a device gains access to the fabric.

fabric loop port (FL_port). A fabric port that is loop capable. Used to connect node loop ports (NL_ports) to the switch in a loop configuration.

Fabric Manager. A feature that allows the storage area network (SAN) manager to monitor key fabric and switch elements, making it easy to quickly identify and escalate potential problems. It monitors each element for out-of-boundary values or counters and provides notification when defined boundaries are exceeded. The SAN manager can configure which elements, such as error, status, and performance counters, are monitored within a switch.

fabric mode. One of the modes for a loop port (L_port). An L_port is in fabric mode when it is connected to a port that is not loop capable and is using fabric protocol. See also *loop port* and *loop mode*.

fabric name. The unique identifier assigned to a fabric and communicated during login and port discovery.

Fabric OS. An operating system made up of two software components: the firmware that initializes and manages the switch hardware, and diagnostics.

fabric port (F_port). A port that is able to transmit under fabric protocol and interface over links. Can be used to connect a node port (N_port) to a switch. See also *fabric loop port* and *Fx_port*.

Fabric Watch. A feature that runs on Fabric operating system (OS) and allows monitoring and configuration of fabric and switch elements.

failover. The act that causes control to pass from one redundant unit to another.

FAN. Fabric address notification.

FC. See *fibre channel*.

FCA. See *Fibre Channel arbitrated loop*.

FC-AL. See *Fibre Channel arbitrated loop*.

FC-AL-3. The Fibre Channel Arbitrated Loop standard defined by ANSI. Defined on top of the FC-PH standards.

FCC. Federal Communications Commission.

FC-FLA. The Fibre Channel Fabric Loop Attach standard defined by ANSI.

FCMGMT. Fibre Alliance Fibre Channel Management.

FCP. See *Fibre Channel protocol*.

FC-PDLA. The Fibre Channel Private Loop Direct Attach standard defined by ANSI. Applies to the operation of peripheral devices on a private loop.

FC-PH-1,2,3. The Fibre Channel Physical and Signaling Interface standards defined by ANSI.

FC-PI. The Fibre Channel Physical Interface standard defined by ANSI.

FCS switch. See *fabric configuration server switch*.

FC-SW-2. The second generation of the Fibre Channel Switch Fabric standard defined by ANSI. Specifies tools and algorithms for the interconnection and initialization of Fibre Channel switches in order to create a multiswitch Fibre Channel fabric.

fibre channel (FC). A technology for transmitting data between computer devices at a data rate of up to 4 Gbps. It is especially suited for attaching computer servers to shared storage devices and for interconnecting storage controllers and drives.

Fibre Channel arbitrated loop (FC-AL). A standard defined on top of the FC-PH standard. It defines the arbitration on a loop where several FC nodes share a common medium.

Fibre Channel protocol (FCP). The protocol for transmitting commands, data, and status using Fibre Channel FC-FS exchanges and information units. Fibre channel is a high-speed serial architecture that allows either optical or electrical connections at data rates from 265 Mbps up to 4-Gbps.

Fibre Channel service (FS). A service that is defined by Fibre Channel standards and exists at a well-known address. For example, the Simple Name Server is a Fibre Channel service. See also *Fibre Channel service protocol*.

Fibre Channel service protocol (FSP). The common protocol for all fabric services, transparent to the fabric type or topology. See also *Fibre Channel service*.

Fibre Channel shortest path first (FSPF). A routing protocol used by Fibre Channel switches.

Fibre Channel transport. A protocol service that supports communication between Fibre Channel service providers. See also *Fibre Channel service protocol*.

field replaceable unit (FRU). An assembly that is replaced in its entirety by a service representative when any one of its components fails. In some cases, a field replaceable unit can contain other field replaceable units.

File Transfer protocol (FTP). In Transmission Control protocol/Internet protocol (TCP/IP), an application protocol used for transferring files to and from host computers.

fill word. An IDLE or ARB ordered set that is transmitted during breaks between data frames to keep the Fibre Channel link active.

firmware. The basic operating system provided with the hardware.

FLA. Fabric loop attach.

flash partition. Two redundant usable areas, called *partitions* into which firmware can be downloaded in the director/switch.

FLOGI. See *fabric login*.

FL_port. See *fabric loop port*.

F_port. See *fabric port*.

frame. The Fibre Channel structure used to transmit data between ports. Consists of a start-of-frame delimiter, header, any optional headers, the data payload, a cyclic redundancy check (CRC), and an end-of-frame delimiter. There are two types of frames: link control frames (transmission acknowledgements, and so on) and data frames.

frame delimiter. A part of an ordered set that marks frame boundaries and describes frame contents. See also *ordered set*.

FRU. See *field replaceable unit*.

FS. See *Fibre Channel service*.

FSP. See *Fibre Channel service protocol*.

FSPF. See *Fibre Channel shortest path first*.

FTP. See *File Transfer protocol*.

full duplex. A mode of communication that allows the same port to simultaneously transmit and receive frames. See also *half duplex*.

Fx_port. A fabric port that can operate as either a fabric port (F_port) or fabric loop port (FL_port). See also *fabric port* and *fabric loop port*.

G

gateway. Hardware that connects incompatible networks by providing the necessary translation for both hardware and software.

GBIC. See *gigabit interface converter*.

Gbps. Gigabits per second.

GBps. Gigabytes per second.

generic port (G_port). A generic port that can operate as either an expansion port (E_port) or a fabric port (F_port). A port is defined as a G_port when it is not yet connected or has not yet assumed a specific function in the fabric.

gigabit interface converter (GBIC). A removable serial transceiver module designed to provide gigabaud capability for fibre channel (FC) and other products that use the same physical layer.

gigabit switch. A 16-port, Fibre Channel gigabit switch.

G_port. See *generic port*.

H

half duplex. A mode of communication that allows a port to either transmit or receive frames at any time, but not simultaneously (with the exception of link control frames, which can be transmitted at any time). See also *full duplex*.

hard address. The arbitrated loop physical address (AL_PA) that a node loop port (NL_port) attempts to acquire during loop initialization.

hardware translative mode. Method for achieving address translation. The two hardware translative modes that are available to a QuickLoop-enabled switch are standard translative mode and QuickLoop mode. See also *standard translative mode* and *QuickLoop mode*.

HBA. See *host bus adapter*.

heartbeat. Through clustering software, the application server continually communicates with the clustered

spare using network heartbeats to indicate to the other machines that everything is operating correctly. This heartbeat is typically carried over a dedicated network for clustering traffic. In cases of a problem (for example, a software crash on the operational server or a hardware component failure), a heartbeat link indicates to the other server that something has failed or is otherwise inoperative. If that heartbeat is lost, the spare server takes over the function provided by the application service. Depending on the clustering software, either the entire server or only specific services on the server can be failed over or failed back.

high availability. An attribute of the switch that identifies it as being capable of operating well in excess of 99 percent of the time. High Availability is typically identified by the number of nines in that percentage. For example, a switch that is rated at five nines would be capable of operating 99.999 percent of the time without failure.

high port count fabric. A fabric containing 100 or more ports.

host bus adapter (HBA). The interface card between a server or workstation bus and the Fibre Channel network.

hot pluggable. A field replaceable unit (FRU) capability that indicates it can be extracted or installed while customer data is otherwise flowing in the chassis.

hub. A Fibre Channel wiring concentrator that collapses a loop topology into a physical star topology. Nodes are automatically added to the loop when active and removed when inactive.

I

IC bus. A serial, 2-wire bus used to monitor field replaceable unit (FRU) temperatures and control the system including blade power control.

ID. Identification.

IDB. Interface descriptor block.

IDLE. Continuous transmission of an ordered set over a Fibre Channel link when no data is being transmitted, to keep the link active and maintain bit, byte, and word synchronization.

IEC. International Electrotechnical Commission.

IETF. Internet Engineering Task Force.

information unit (IU). A set of information as defined by either upper-level process protocol definition or upper-level protocol mapping.

initiator. A server or workstation on a Fibre Channel network that initiates communications with storage devices. See also *target*.

in-order delivery (IOD). A parameter that, when set, guarantees that frames are either delivered in order or dropped.

integrated fabric. The fabric created by six switches cabled together and configured to handle traffic as a seamless group.

Internet protocol (IP). In the Internet suite of protocols, a connectionless protocol that routes data through a network or interconnected networks and acts as an intermediary between the higher protocol layers and the physical network.

inter-switch link (ISL). A Fibre Channel link that connects two switches (a link from the expansion port (E_port) of one switch to the E_port of another).

IOD. See *in-order delivery*.

IP. See *internet protocol*.

IPA. Initial process associator.

ISL. See *inter-switch link*.

ISL Trunking. A feature that enables distribution of traffic over the combined bandwidth of up to four inter-switch links (ISLs) (between adjacent switches), while preserving in-order delivery. A set of trunked ISLs is called a *trunking group*; each port employed in a trunking group is called a *trunking port*. See also *master port*.

isolated E_port. An expansion port (E_port) that is online but not operational between switches due to overlapping domain ID or nonidentical parameters such as error delay timeout values (E_D_TOVs). See also *expansion port*.

IU. See *information unit*.

J

JBOD. Just a bunch of disks.

K

K28.5. A special 10-bit character used to indicate the beginning of a transmission word that performs fibre channel control and signaling functions. The first seven bits of the character are the comma pattern. See also *comma*.

kernel flash. Flash memory that stores the bootable kernel code and is visible within the memory space of the processor. Data is stored as raw bits.

key pair. In public key cryptography, a pair of keys consisting of a public and private key of an entity. The public key can be publicized, but the private key must be kept secret.

L

LAN. See *local area network*.

latency. The period of time required to transmit a frame, from the time it is sent until it arrives.

LED. See *light-emitting diode*.

light-emitting diode (LED). A semiconductor chip that gives off visible or infrared light when activated. It is used to indicate the status of elements on a switch.

link. As applies to fibre channel, a physical connection between two ports, consisting of both transmit and receive fibers. See also *circuit*.

link services. A protocol for link-related services.

LIP. See *loop initialization primitive*.

LM_TOV. See *loop master timeout value*.

local area network (LAN). A computer network located on a user's premises within a limited geographical area. (T)

logical unit number (LUN). An identifier used on a small computer systems interface (SCSI) bus to distinguish among up to eight devices (logical units) with the same SCSI ID.

long wavelength (LWL). A type of fiber optic cabling that is based on 1300 nm lasers and supports link speeds of 1.0625 Gbps. Can also refer to the type of GBIC or SFP. See also *short wavelength*.

loop. A configuration of devices that are connected to the fabric by way of a fabric loop port (FL_port) interface card.

loop circuit. A temporary bidirectional communication path established between loop ports (L_ports).

loop failure. Loss of signal within a loop for any period of time, or loss of synchronization for longer than the timeout value.

loop_ID. A hexadecimal value representing one of the 127 possible arbitrated loop physical address (AL_PA) values in an arbitrated loop.

loop initialization. The logical procedure used by a loop port (L_port) to discover its environment. Can be used to assign arbitrated loop physical address (AL_PA) addresses, detect loop failure, or reset a node.

loop initialization primitive (LIP). The signal used to begin initialization in a loop. Indicates either loop failure or resetting of a node.

looplest. A set of devices connected in a loop to a port that is a member of another loop.

loop master timeout value (LM_TOV). The minimum time that the loop master waits for a loop initialization sequence to return.

loop mode. One of the modes for a loop port (L_port). An L_port is in loop mode when it is in an arbitrated loop and is using loop protocol. An L_port in loop mode can also be in participating mode or nonparticipating mode. See also *loop port*, *fabric mode*, *participating mode*, and *nonparticipating mode*.

loop port (L_port). A node port (NL_port) or fabric port (FL_port) that has arbitrated loop capabilities. An L_port can be either in fabric mode or loop mode. See also *fabric mode*, *loop mode*, *nonparticipating mode*, and *participating mode*.

loop port state machine (LPSM). The logical entity that performs arbitrated loop protocols and defines the behavior of loop ports (L_ports) when they require access to an arbitrated loop.

L_port. See *loop port*.

LPSM. See *loop port state machine*.

LSR. Link state record.

LSU. Link state update.

LUN. See *logical unit number*.

LWL. See *long wavelength*.

M

MAC. Media access controller.

MAC address. See *Media Access Controller address*.

management information base (MIB). A simple network management protocol (SNMP) structure to help with device management, providing configuration and device information.

master port. As relates to trunking, the port that determines the routing paths for all traffic flowing through the trunking group. One of the ports in the first inter-switch link (ISL) in the trunking group is designated as the master port for that group. See also *ISL Trunking*.

Media Access Controller address. The hardware address of a device connected to a shared network medium.

MIB. See *management information base*.

modem serial port. The upper serial port on the control processor card (CP card). Can be used to connect the CP card to a modem with a standard 9-pin modem cable. Consists of a DB-9 connector wired as an RS-232 device, and can be connected by serial

cable to a data communications equipment (DCE) device. A Hayes-compatible modem or Hayes-emulation is required. The device name is ttyS1. See also *data communications equipment port* and *terminal serial port*.

multicast. The transmission of data from a single source to multiple specified node ports (N_ports), as opposed to all the ports on the network. See also *broadcast* and *unicast*.

multimode. A fiber optic cabling specification that allows up to 500 m (1640.5 ft) between devices.

N

name server. Frequently used to indicate Simple Name Server. See also *simple name server*.

NEMA. National Electrical Manufacturers Association.

NL_port. See *node loop port*.

NMS. Network Management System.

node. A Fibre Channel device that contains a node port (N_port) or node loop port (NL_port).

node loop port (NL_port). A node port that is loop capable. Used to connect an equipment port to the fabric in a loop configuration through a fabric loop port (FL_port).

node name. The unique identifier for a node, communicated during login and port discovery.

node port (N_port). A node port that is not loop capable. Used to connect an equipment port to the fabric.

nonparticipating mode. A mode in which a loop port (L_port) in a loop is inactive and cannot arbitrate or send frames, but can retransmit any received transmissions. This mode is entered if there are more than 127 devices in a loop and an arbitrated loop physical address (AL_PA) cannot be acquired. See also *participating mode*.

nonvolatile random access memory (NVRAM). Random access memory (storage) that retains its contents after the electrical power to the machine is shut off. A specific part of NVRAM is set aside for use by the system ROS for the boot device list.

N_port. See *node port*.

NVRAM. See *nonvolatile random access memory*.

Nx_port. A node port that can operate as either a node port (N_port) or node loop port (NL_port). See also *node port* and *node loop port*.

O

operating system (OS). A collection of system programs that control the overall operation of a computer system.

ordered set. A transmission word that uses 8b/10b mapping and begins with the K28.5 character. Ordered sets occur outside of frames, and include frame delimiters, primitive signals, and primitive sequences. Ordered sets are used to differentiate Fibre Channel control information from data frames and to manage the transport of frames. See also *frame delimiter*, *primitive signal*, and *primitive sequence*.

OS. See *operating system*.

P

packet. A set of information transmitted across a network. See also *frame*.

participating mode. A mode in which a loop port (L_port) in a loop has a valid arbitrated loop physical address (AL_PA) and can arbitrate, send frames, and retransmit received transmissions. See also *nonparticipating mode*.

path selection. The selection of a transmission path through the fabric. Switches use the Fibre Channel shortest path first (FSPF) protocol.

PCI. Peripheral control interconnect.

PDU. Power distribution unit.

Performance Monitoring. A feature that provides error and performance information to the administrator and user for use in storage management.

phantom address. An arbitrated loop physical address (AL_PA) value that is assigned to a device that is not physically in the loop. Also known as phantom AL_PA.

phantom device. A device that is not physically in an arbitrated loop, but is logically included through the use of a phantom address.

PLDA. See *private loop direct attach*.

PLOGI. See *port login*.

PMC. PCI mezzanine card.

P/N. Part number.

point-to-point. A Fibre Channel topology that employs direct links between each pair of communicating entities. See also *topology*.

port cage. The metal casing extending out of the optical port on the switch, and in which the gigabit

interface converter (GBIC) or small form-factor pluggable (SFP) can be inserted.

port card. A Fibre Channel card that contains optical or copper port interfaces, and acts like a switch module. See also *16-port card*.

port login (PLOGI). The port-to-port login process by which initiators establish sessions with targets. See also *fabric login*.

port module. A collection of ports in a switch.

port_name. The unique identifier assigned to a Fibre Channel port. Communicated during login and port discovery.

POST. See *power-on self-test*.

power-on self-test (POST). A series of diagnostics that are automatically run by a device when the power is turned on.

primary FCS switch. Primary fabric configuration server switch. The switch that actively manages the configuration and security parameters for all switches in the fabric. See also *backup FCS switch* and *FCS switch*.

primitive sequence. A part of an ordered set that indicates or initiates port states. See also *ordered set*.

primitive signal. A part of an ordered set that indicates events. See also *ordered set*.

principal switch. The switch that assumes the responsibility to assign domain IDs. The role of principal switch is negotiated after a “build fabric” event.

private device. A device that supports arbitrated loop protocol and can interpret 8-bit addresses, but cannot log into the fabric.

private loop. An arbitrated loop that does not include a participating fabric loop port (FL_port).

private loop direct attach (PLDA). A subset of fibre channel standards for the operation of peripheral devices.

private NL_port. A node loop port (NL_port) that communicates only with other private NL_ports in the same loop and does not log into the fabric.

protocol. A defined method and a set of standards for communication.

public device. A device that supports arbitrated loop protocol, can interpret 8-bit addresses, and can log into the fabric.

public loop. An arbitrated loop that includes a participating fabric loop port (FL_port), and can contain both public and private node loop ports (NL_ports).

public NL_port. A node loop port (NL_port) that logs into the fabric, can function within either a public or private loop, and can communicate with either private or public NL_ports.

Q

quad. A group of four adjacent ports that share a common pool of frame buffers.

QuickLoop. (1) A feature that makes it possible to allow private devices within loops to communicate with public and private devices across the fabric through the creation of a larger loop. (2) The arbitrated loop created using this software. A QuickLoop can contain a number of devices or looplets; all devices in the same QuickLoop share a single arbitrated loop physical address (AL_PA) space.

QuickLoop mode. A hardware translative mode that allows private devices to communicate with other private devices across the fabric. See also *hardware translative mode* and *standard translative mode*.

R

RAID. See *redundant array of independent disks*.

RAM. See *random access memory*.

RAN. Remote Asynchronous Notification.

random access memory (RAM). A temporary storage location in which the central processing unit (CPU) stores and executes its processes.

R_A_TOV. See *resource allocation timeout value*.

read only memory (ROM). Memory in which stored data cannot be changed by the user except under special conditions.

receiver ready (R_RDY). A primitive signal indicating that the port is ready to receive a frame.

reduced instruction set computer (RISC). A computer that uses a small, simplified set of frequently used instructions for rapid processing.

redundant array of independent disks (RAID). A collection of disk drives that appear as a single volume to the server and are fault tolerant through mirroring or parity checking.

registered state change notification (RSCN). A switch function that allows notification of fabric changes to be sent from the switch to specified nodes.

remote fabric. A fabric that spans across wide area networks (WANs) by using protocol translation (a process also known as tunneling) such as fibre channel

over asynchronous transfer mode (ATM) or fibre channel over Internet protocol (IP).

remote procedure call (RPC). A facility that a client uses to request the execution of a procedure call from a server.

Remote Switch. A feature that runs on Fabric operating system (OS) and enables two fabric switches to be connected over an asynchronous transfer mode (ATM) connection. This requires a compatible Fibre Channel to ATM gateway, and can have a distance of up to 10 km (6.214 mi) between each switch and the respective ATM gateway.

request rate. The rate at which requests arrive at a servicing entity. See also *service rate*.

resilient core. A single fabric that uses two or more switches as a core to interconnect multiple edge switches. Synonymous with dual-core fabric.

resource allocation timeout value (R_A_TOV). Used to time out operations that depend on the maximum possible time that a frame can be delayed in a fabric and still be delivered. This value is adjustable in one microsecond increments from 10—120 seconds.

resource recover timeout value (RR_TOV). The minimum time a target device in a loop waits after a loop initialization primitive (LIP) before logging out a small computer systems interface (SCSI) initiator. See also *error detect timeout value* and *resource allocation timeout value*.

RISC. See *reduced instruction set computer*.

RLS probing. Read link status of the arbitrated loop physical addresses (AL_PAs).

ro. Read only.

ROM. See *read only memory*.

route. As applies to a fabric, the communication path between two switches. Can also apply to the specific path taken by an individual frame, from source to destination. See also *Fibre Channel shortest path first*.

routing. The assignment of frames to specific switch ports, according to frame destination.

RPC. See *remote procedure call*.

R_RDY. See *receiver ready*.

RR_TOV. See *resource recovery timeout value*.

RS-232 port. A port that conforms to a set of Electrical Industries Association (EIA) standards. Used to connect data terminal equipment (DTE) and data communications equipment (DCE) devices for

communication between components, terminals, and modems. See also *DB-9 connector*, *DCE port*, and *DTE port*.

RSCN. See *registered state change notification*.

RSH. Remote shell.

RTC. Real time clock.

rw. Read-write.

S

SAN. See *storage area network*.

SAN island. A group of storage devices and servers connected to switches in a fabric.

SC. Standard connector.

SCSI. See *small computer systems interface*.

SCSI Enclosure Services (SES). A subset of the small computer systems interface (SCSI) protocol used to monitor temperature, power, and fan status for enclosure devices.

SDRAM. See *synchronous dynamic random access memory*.

Secure Fabric OS. An optionally-licensed software product that runs on top of the Fabric OS and provides customizable security restrictions through local and remote management channels on a switch.

secure sockets layer (SSL). A security protocol that provides communication privacy. SSL enables client/server applications to communicate in a way that is designed to prevent eavesdropping, tampering, and message forgery.

sequence. A group of related frames transmitted in the same direction between two node ports (N_ports).

SERDES. Serializer/deserializer.

service rate. The rate at which an entity can service requests. See also *request rate*.

SES. See *SCSI Enclosure Services*.

SFP. See *small form-factor pluggable*.

short wavelength (SWL). A type of fiber optic cabling that is based on 850 nm lasers and supports 1.0625 Gbps link speeds. Can also refer to the type of gigabit interface converter (GBIC) or small form-factor pluggable (SFP). See also *long wavelength*.

SID. The 3-byte source ID of the originator device, in the 0xDomainAreaALPA format.

SID-DID. Source identifier-destination identifier.

SIMMS. Single in-line modules.

simple name server (SNS). A switch service that stores names, addresses, and attributes for up to 15 minutes, and provides them as required to other devices in the fabric. SNS is defined by Fibre Channel standards and exists at a well-known address. Can also be referred to as directory service. See also *Fibre Channel service*.

simple network management protocol (SNMP). In the Internet suite of protocols, a network management protocol that is used to monitor routers and attached networks. SNMP is an application layer protocol. Information on devices managed is defined and stored in the application's Management Information Base (MIB).

single mode. The fiber optic cabling standard that corresponds to distances of up to 10 km (6.214 mi) between devices.

small computer systems interface (SCSI). A parallel bus architecture and a protocol for transmitting large data blocks up to a distance of 15–25 m (49–82 ft).

small form-factor pluggable (SFP). An optical transceiver used to convert signals between optical fiber cables and switches.

SMI. Special memory interface.

SNIA. Storage Network Industry Association.

SNMP. See *simple network management protocol*.

SNMPv1. The original standard for SNMP, now labeled v1.

SNS. See *simple name server*.

SOF. Start-of-frame.

SSL. See *secure sockets layer*.

standard translatable mode. A hardware translatable mode that allows public devices to communicate with private devices across the fabric. See also *hardware translatable mode* and *QuickLoop mode*.

storage area network (SAN). A network of systems and storage devices that communicate using Fibre Channel protocols. See also *fabric*.

subordinate switch. All switches in the fabric other than the principal switch. See also *principal switch*.

switch. Hardware that routes frames according to Fibre Channel protocol and is controlled by software.

switch name. The arbitrary name assigned to a switch.

switch port. A port on a switch. Switch ports can be expansion ports (E_ports), fabric ports (F_ports), or fabric loop ports (FL_ports).

SWL. See *short wavelength*.

synchronous dynamic random access memory (SDRAM). The main memory for the switch. Used for volatile storage during switch operation.

T

Tachyon. A type of host bus adapter.

target. A storage device on a Fibre Channel network. See also *initiator*.

TCP. See *transmission control protocol*.

tenancy. The time from when a port wins arbitration in a loop until the same port returns to the monitoring state. Also referred to as loop tenancy.

terminal serial port. The lower serial port on the control processor card (CP card) of the director switch. This port sends switch information messages and can receive commands. Can be used to connect the CP card to a computer terminal. Has an RS-232 connector wired as a data terminal equipment (DTE) device, and can be connected by serial cable to a data communications equipment (DCE) device. The connector pins 2 and 3 are swapped so that a straight-through cable can be used to connect to a terminal. The device name is ttyS0. Can also be referred to as the console port. See also *DCE port*, *DTE port*, and *modem serial port*.

throughput. The rate of data flow achieved within a cable, link, or system. Usually measured in bits per second (bps). See also *bandwidth*.

topology. As applies to fibre channel, the configuration of the Fibre Channel network and the resulting communication paths allowed.

translative mode. A mode in which private devices can communicate with public devices across the fabric.

transmission character. A 10-bit character encoded according to the rules of the 8b/10b algorithm.

Transmission control protocol (TCP). A communications protocol used in the Internet and in any network that follows the Internet Engineering Task Force (IETF) standards for Internet protocol.

transmission word. A group of four transmission characters.

trap (SNMP). The message sent by a simple network management protocol (SNMP) agent to inform the SNMP management station of a critical error. See also *simple network management protocol*.

tunneling. A technique for enabling two networks to treat a transport network as though it were a single communication link or local area network (LAN).

Tx. Transmitted.

U

U. Unit of measure for rack-mounted equipment.

UART. Universal Asynchronous Receiver Transmitter.

UDP. See *user datagram protocol*.

ULP. See *upper-level protocol*.

ULP_TOV. See *upper-level timeout value*.

unicast. The transmission of data from a single source to a single destination. See also *broadcast* and *multicast*.

universal port (U_port). A switch port that can operate as a generic port (G_port), expansion port (E_port), fabric port (F_port), or fabric loop port (FL_port). A port is defined as a U_port when it is not connected or has not yet assumed a specific function in the fabric.

U_port. See *universal port*.

upper-level protocol (ULP). The protocol that runs on top of Fibre Channel. Typical upper-level protocols are small computer system interface (SCSI), Internet protocol (IP), HIPPI, and IPI.

upper-level timeout value (ULP_TOV). The minimum time that a small computer system interface (SCSI) upper-level protocol (ULP) process waits for SCSI status before initiating ULP recovery.

user datagram protocol (UDP). A protocol that runs on top of Internet protocol (IP) and provides port multiplexing for upper-level protocols.

user flash. See *compact flash*.

V

VC. See *virtual circuit*.

VCCI. Voluntary Control Council for Interference

virtual circuit (VC). A one-way path between node ports (N_ports) that allows fractional bandwidth.

W

WAN. See *wide area network*.

WDM. Wave[®] division multiplexing.

well-known address. As pertaining to fibre channel, a logical address defined by the Fibre Channel standards as assigned to a specific function, and stored on the switch.

wide area network (WAN). A network that provides communication services to a geographic area larger than that served by a local area network or a metropolitan network, and that can use or provide public communications facilities. (T)

workstation. A computer used to access and manage the fabric. Can also be referred to as a management station or host.

worldwide name (WWN). Uniquely identifies a switch on local and global networks.

World Wide Web (WWW). A network of servers that contain programs and files. Many of the files contain hypertext links to other documents available through the network.

WWN. See *worldwide name*.

WWW. See *World Wide Web*.

X

XLWL. See *extra long wavelength*.

Z

zone. A set of devices and hosts attached to the same fabric and configured as being in the same zone. Devices and hosts within the same zone have access permission to others in the zone, but are not visible to any outside the zone. See also *zoning*.

zone alias. An alias for a set of port numbers or worldwide names (WWNs). Zone aliases can be used to simplify the entry of port numbers and WWNs. For example, "host" could be used as an alias for a WWN of 110:00:00:60:69:00:00:8a.

zone configuration. A set of zones designated as belonging to the same zone configuration. When a zone configuration is in effect, all valid zones in that configuration are also in effect.

zone member. A port, node, worldwide name (WWN), or alias, which is part of a zone.

zone scheme. The level of zoning granularity selected. For example, zoning can be done by switch or port, worldwide name (WWN), arbitrated loop physical address (AL_PA), or a mixture. See also *zone configuration*.

zone set. See *zone configuration*.

Zoning. A feature that runs on Fabric operating system (OS) and allows partitioning of the fabric into logical groupings of devices. Devices in a zone can only access and be accessed by devices in the same zone. See also *zone*.

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