

IBM TotalStorage SAN Switch



2109 Model M14 Installation and Service Guide

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IBM TotalStorage SAN Switch



2109 Model M14 Installation and Service Guide

Note:

Before using this information and the product it supports, read the information in “Notices” on page 113.

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:

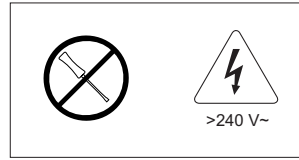
1. Turn everything OFF (unless instructed otherwise).
2. Attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlet.
5. Turn device ON.

(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:

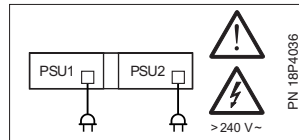


SJ000323

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.



SJ000325

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 M14 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 certification label shown in Figure 1 is installed on the switch.

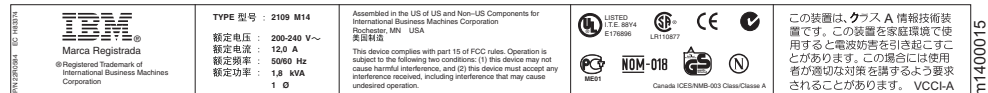


Figure 1. Safety certification label on the Model M14

2. Verify that the linecord safety label shown in Figure 2 is installed on the switch's power supply.

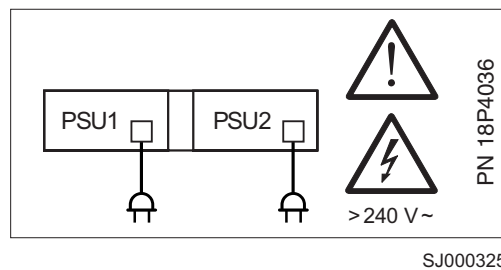


Figure 2. Linecord caution label

3. Verify that the power supply cover caution label shown in Figure 3 on page xvi is installed on the switch's power supply.

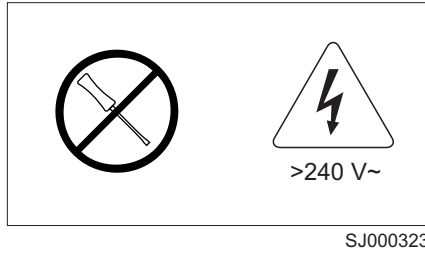


Figure 3. Power supply cover caution label

4. Verify that the fusing caution label shown in Figure 4 is installed on the switch's power supply.

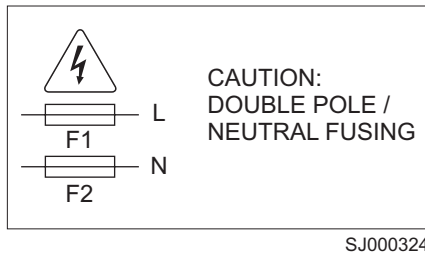


Figure 4. Fusing caution label

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

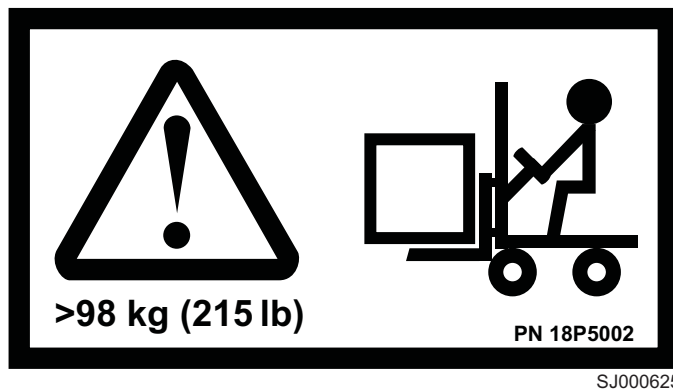


Figure 5. Heavy load label

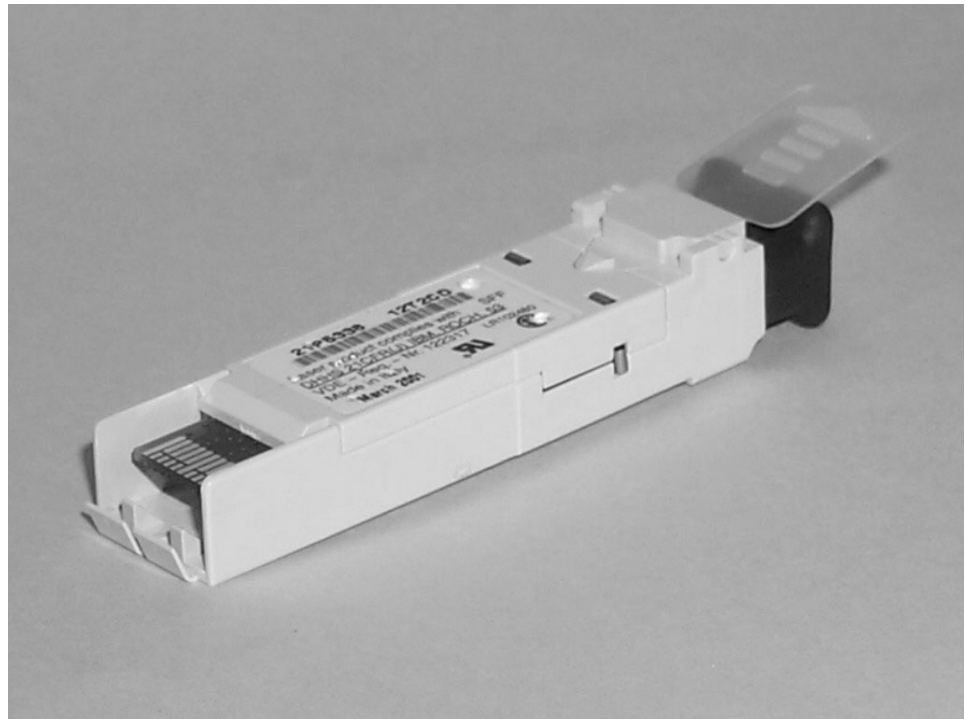
6. Verify that the SFP labels shown in Figure 6 on page xvii and Figure 7 on page xvii are installed on all SFP transceivers.

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 M14 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.

	Állítsa szintbe a P/N 11P4369 számú raklapot, mielőtt a kapcsolóegységet vagy a kapcsolóegység szereződobozát kivenné a szekrényből, vagy betenné a szekrénybe	
	ALINHAR A PLACA DE CARREGAMENTO (P/N 11P4369) COM A LINHA ANTES DE MOVER A CHAVE OU O CHASSI DA CHAVE PARA DENTRO OU FORA DO GABINETE	
	ΕΥΘΥΡΑΜΜΙΣΤΕ ΤΗΝ ΠΛΑΚΑ ΦΟΡΤΩΣΗΣ (P/N 11P4369) ΜΕ ΤΗ ΓΡΑΜΜΗ ΠΡΙΝ ΜΕΤΑΚΙΝΗΣΕΤΕ ΤΟ SWITCH Η ΤΟ ΠΕΡΙΒΛΗΜΑ ΤΟΥ SWITCH ΜΕΣΑ ΣΤΟ ΕΡΜΑΡΙΟ Η ΕΞΩ ΑΠΟ ΤΟ ΕΡΜΑΡΙΟ	
	ALIGNER LA PLAQUE DE CHARGEMENT (P/N 11P4369) AVEC LE TRAIT AVANT DE PLACER LE COMMUTATEUR OU SON CHASSIS DANS L'ARMOIRE OU DE L'EN RETIRER	
	ALLINEARE LA PIASTRA DI CARICO (P/N 11P4369) E LA RIGA PRIMA DI SPOSTARE L'INTERRUTTORE O IL TELAIO DELL'INTERRUTTORE ALL'INTERNO O ALL'ESTERNO DELL'ARMADIETTO	
	스위치를 옮기거나 스위치 샷시를 캐비닛에 넣거나 빼기 전에 로드 플레이트(P/N 11P4369)를 정렬하십시오.	
	将开关或开关座移入或移出机柜之前，请将负载板（部件号 11P4369）与基线对齐	
	スイッチまたはスイッチ・シャシーをキャビネットの内外に移動する前に、ロード・プレート (P/N 11P4369) を線に合わせてください。	
	請在移動開關或將底盤移出/移入機櫃前，將載入盤 (P/N 11P4369) 與線對齊	
	BRENG DE LAADPLAAT (P/N 11P4369) OP 1 LIJN MET DEZE LIJN VOÓR VERPLAATSING VAN DE SCHAKELAAR OF HET SCHAKELAARCHASSIS IN OF UIT DE KAST	
	COLOQUE LA PLATAFORMA DE CARGA (N/P 11P4369) FRENTE A LA LÍNEA ANTES DE EXTRAER O COLOCAR EL CONMUTADOR O LA CARCASA DEL CONMUTADOR EN EL ARMARIO	
	יש ליישר את משטח הטעינה (P/N 11P4369) עם הקו לפני הזזת המתג או מרכיב המתג פנימה או החוצה מהארמון	
	LADEPLATTE (TN 11P4369) VOR EIN- ODER AUSBAU VON SWITCH ODER SWITCH-GEHÄUSE IN ODER AUS SCHRANK MIT LINIE AUSRICHTEN	
	ALIGN LOAD PLATE (P/N 11P4369) WITH LINE BEFORE MOVING SWITCH OR SWITCH CHASSIS IN OR OUT OF CABINET	

SJ000749

Figure 8. Bridge tool alignment label

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



Figure 9. Tilt warning label

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

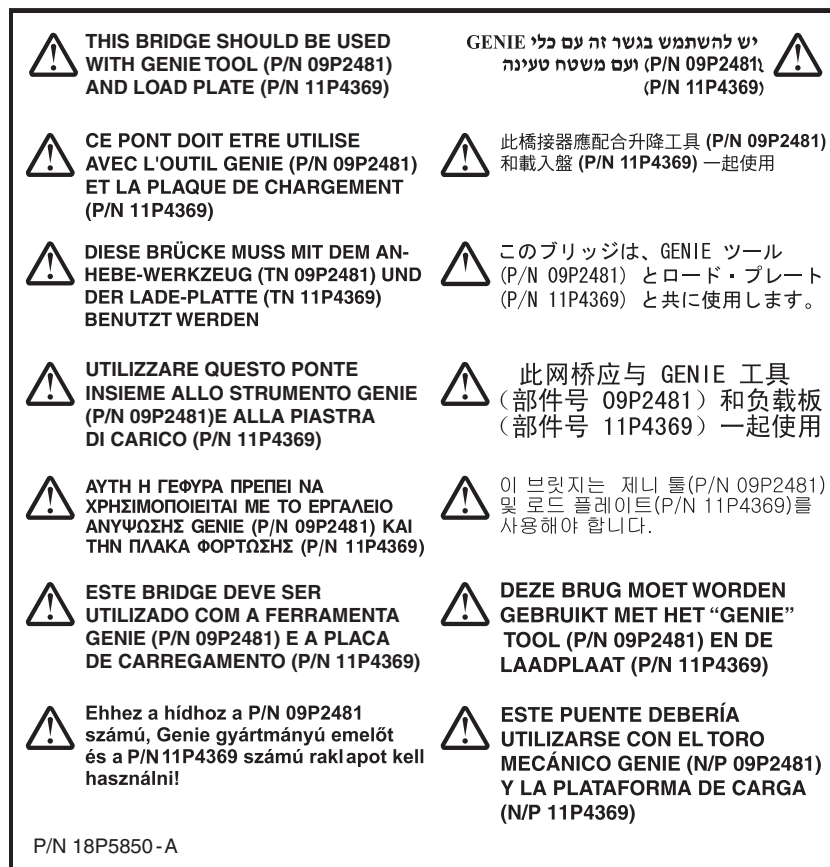


Figure 10. Genie tool and load plate label

- 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:

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 M14. Throughout this document, the product is referred to as the Model M14. The term *switch* also applies to the Model M14.

The sections that follow provide information about:

- “Who should read this document”
- “Model M14 library”
- “Related documents”
- “Web sites” on page xxvi
- “Getting help” on page xxvi
- “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 M14.

Model M14 library

The following documents contain information related to this product:

- *IBM TotalStorage SAN Switch 2109 Model M14 Installation and Service Guide*, GC26-7631 (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

Related documents

You can find information related to the software that supports the M14 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 on page xxvi 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 IBM 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
- IBMLink™ from U.S.A.: STARPUBS at SJEVM5
- IBMLink from Canada: STARPUBS at TORIBM
- IBM Mail Exchange: USIB3VVD at IBMMAIL

You can also mail your comments by using the Reader Comment Form in the back of this manual or direct your mail to:

International Business Machines Corporation
Information Development
Department GZW
9000 South Rita Road
Tucson, Arizona 85744-0001 U.S.A.

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Chapter 1. Introduction

This chapter introduces the features and components of the 2109 Model M14 Director. Throughout the remainder of this document, the 2109 Model M14 Director will be referred to as the Model M14 or the M14, or more commonly, as the switch. This chapter contains the following information:

- “Overview of the Model M14”
- “Hardware Components” on page 2
- “High Availability” on page 4
- “Reliability” on page 5
- “Serviceability” on page 5
- “Software Features” on page 5

Overview of the Model M14

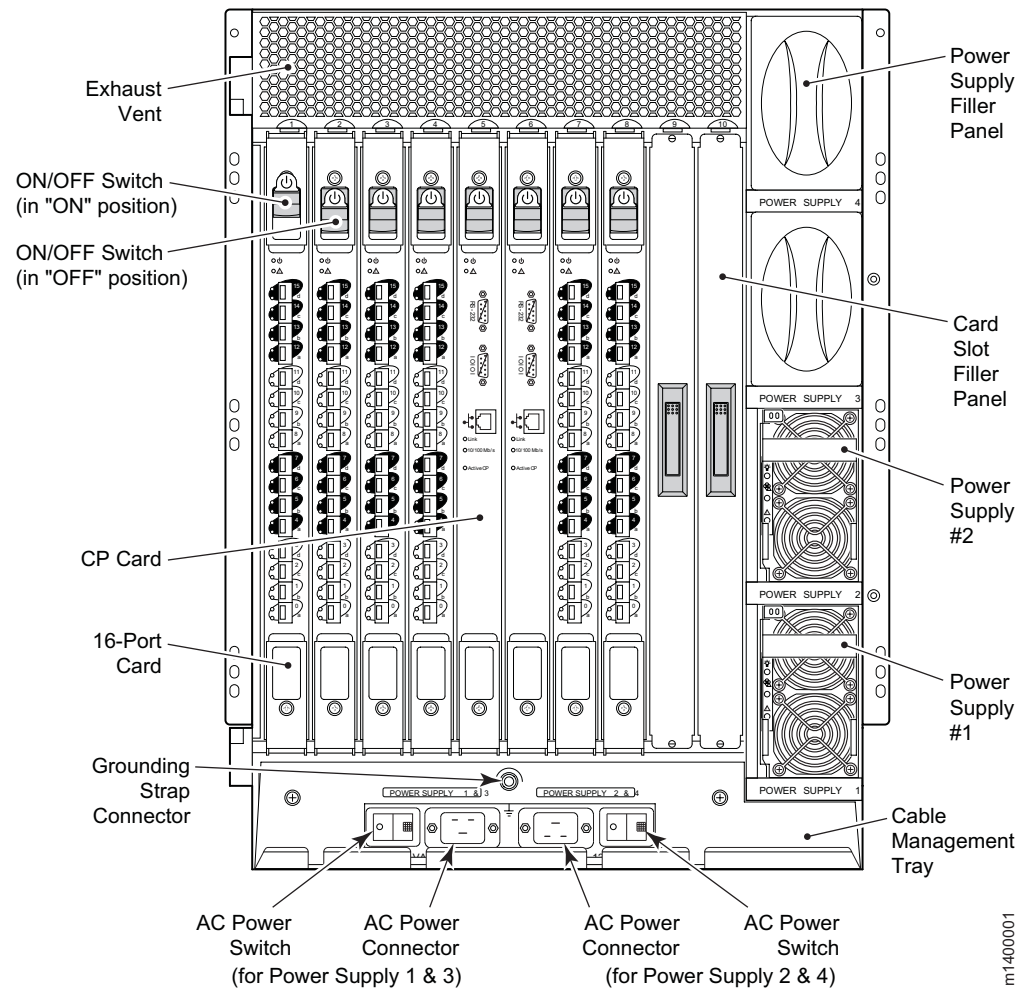
The 2109 Model M14 Director represents the next generation of advanced Fibre Channel directors used to interconnect storage devices, hosts, and servers intelligently in a storage area network (SAN). The 128–port Fibre Channel director delivers performance, scalability, flexibility, functionality, reliability, and availability. Key features of the M14 include the following:

- 128 ports in a single chassis provides a high-density, scalable, rack-ready solution for SAN backbones.
- High-availability platform for mission-critical SAN-designed applications.
- Dual, redundant control processors (CP) provide high availability and enable nondisruptive software upgrades.
- Nonblocking architecture enables all 128 ports to operate at full 2 Gb speed simultaneously.
- Universal ports self-configure as E–ports, F–ports, or FL–ports.
- Small form-factor pluggable (SFP) optical transceivers support any combination of short wavelength (SWL), long wavelength (LWL), and extended long wavelength (ELWL) optical media on a single switch module (the 16–port card).
- Forward and backward compatibility with all IBM SAN switches.
- High availability redundant design, extensive diagnostics, and system monitoring capabilities integrated with Fabric OS management tools deliver unprecedented reliability, availability, and serviceability (RAS).
- Multiprotocol design supports additional blades, such as application platform blades and blades that provide iSCSI and FCIP capabilities.
- Support for 1 and 2 Gb/sec autosensing Fibre Channel ports (trunking technology groups up to four ports together to create high-performance 8 Gb/sec ISL trunks between switches).

Hardware Components

The M14 features a modular and scalable mechanical construction that allows a wide range of flexibility in switch installation, fabric design, and maintenance. Using a 2109 Model C36 cabinet, up to two 2109 Model M14 Directors can be mounted, supporting as many as 256 Fibre Channel ports in a single rack. The modular multicard assembly chassis of the switch (see Figure 12 on page 3 and Figure 13 on page 4) consists of the following:

- Up to eight hot-swappable 16–port cards, delivering up to 128 Fibre Channel ports in a single chassis
- Two slots for control processor (CP) cards (slots 5 and 6):
 - A single active CP card can control all 128 ports in the chassis.
 - The standby CP card assumes control of the switch if the active CP fails.
- Modular hot-swappable field replaceable units (FRUs):
 - 16–port cards (1–8)
 - CP cards (2)
 - Small form-factor pluggable (SFP) optical transceivers
 - Blower assemblies (3)
 - Power supplies (2)
- Cables, cards (16–port and CP), and power supplies are serviced from the port side of the M14 and blowers are serviced from the non-port side.
- Cable management is simplified through the use of a cable management tray and cable guides (pillars).
- Three blowers provide cooling, allowing continuous operation even if one blower fails.
- Constant intake and FRU temperature monitoring is provided.
- World Wide Name (WWN) card on the nonport side maintains chassis-specific information such as WWNs, IP addresses, and summary status information of each card (16–port and CP) and power supply through LEDs.



m1400001

Figure 12. Port side of the 2109 Model M14

Note: Card slots are numbered 1 through 10 (left to right). Slots 1–4 and 7–10 accommodate the 16–port cards, and slots 5–6 accommodate the CP cards.

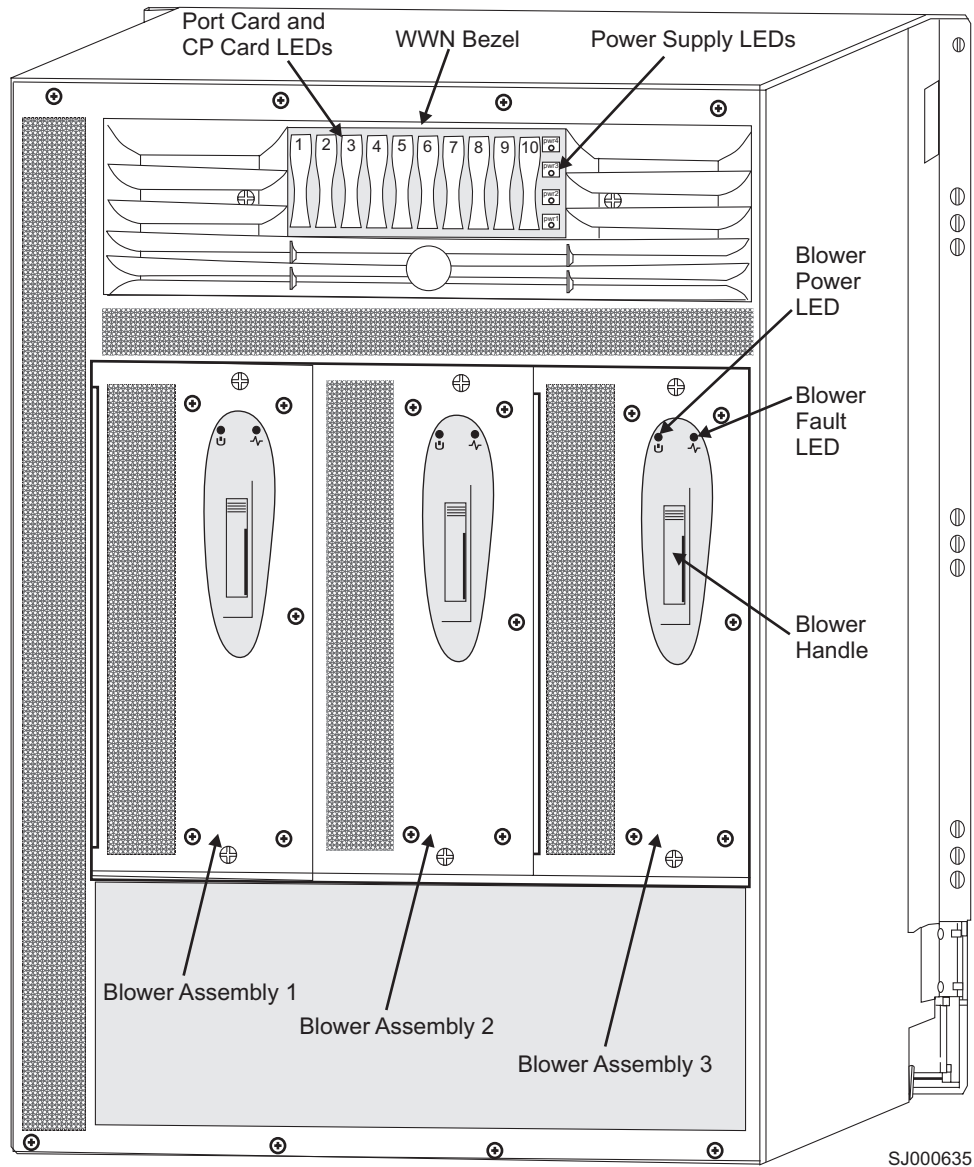


Figure 13. Blower (non-port) side of the 2109 Model M14

High Availability

The following features contribute to the M14 high-availability design:

- Redundant, hot-swappable components
- Redundant power and cooling subsystems
- Enhanced data integrity on all data paths
- Fabric Shortest Path First (FSPF) rerouting around failed links
- Integration with SNMP managers
- Automatic control processor fail over
- Nondisruptive "hot" software code loads and activation
- Easy configuration, save, and restore

The high-availability software architecture of the M14 provides a common framework for all applications that reside on the system, allowing global and local states to be maintained enough to manage any component failure. High-availability elements consist of the High Availability Manager, the heartbeat, the fault/health framework, the replicated database, initialization, and software upgrade.

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

Reliability

The M14 uses the following error detection and correction mechanisms to ensure the reliability of all data inside the chassis:

- Power-on self test (POST)
- Error detection and fault isolation (EDFI), such as cyclic redundancy checking (CRC), parity checking, checksum, and illegal address checking
- Dual control processors that enable hot, nondisruptive fast firmware upgrades
Each control processor contains two serial ports and one Ethernet port. Offline control processor diagnostics and remote diagnostics simplify troubleshooting. The standby control processor continuously runs diagnostics to ensure it is operational, should a failover be necessary.
- I²C monitoring and control

Serviceability

The M14 provides the following features to enhance and ensure serviceability:

- Modular design with hot-swappable components
- Redundant flash memory that stores two firmware images per control processor
- Extensive diagnostics and status reporting, along with a serial port to support an external, country-specific modem for remote diagnostics and status monitoring
- Nonvolatile random-access memory (NVRAM), containing the IBM serial number, Brocade serial number, revision information, and part number information
- Background health-check daemon
- Memory scrubber, self test, and bus ping to determine if a bus is not functioning
- Watchdog timers
- Status LEDs
- Predictive diagnostics analysis through Fabric Watch
- SNMP integration with higher-layer managers

Software Features

The M14 is supported by Brocade Fabric OS v4.2.0. The Fabric OS allows any Fibre Channel-compliant device to attach to the switches as long as it conforms to the device login, name service, and related Fibre Channel standards. Each operating environment requires that a Fibre Channel host bus adapter (HBA) be available with a standards-compliant driver for proper interface to the fabric.

Fabric OS consists of a set of embedded applications running on top of an embedded real-time Linux operating system kernel. These applications are the name server, alias server, Simple Network Management Protocol (SNMP) agent,

and several tasks to manage address assignment, routing, link initialization, fabric initialization, link shutdown, switch shutdown, and the user interface.

Standard features include:

- Fabric Watch
Monitors mission-critical fabric parameters.
- Advanced Web Tools
Administers, configures, and maintains fabric switches and SANs.
- Advanced Zoning
Segments a fabric into virtual private SANs.
- ISL Trunking
Allows up to four ISLs between the same pair of switches to be grouped and to act as a single, high-speed "pipe" or trunk with a capacity of up to 8 Gb/sec. In-order delivery of frames is guaranteed and allows ISLs to be added to or removed from the trunking group seamlessly.
- Advanced Performance Monitoring
Provides SAN performance management through an end-to-end monitoring.

Optional features include:

- Extended Fabrics
Provides up to 80 km of switched fabric connectivity at full bandwidth over long distances.
- Remote Switch
Enables IBM switches to interconnect over a wide area network (WAN) using third-party gateway solutions that support FC over IP, FC over ATM, and FC over SONET.
- Advanced Security
Provides a comprehensive, policy based security system for IBM SAN Switch fabrics.
- Fabric Manager
Administers, configures, and maintains fabric switches and SANs with host-based software.

Security

Secure telnet access is available using Secure Shell (SSH), a network security protocol for secure remote login and other secure network services over an insecure network.

Web tools management is available via a secure browser using Secure Sockets Layer (SSL). The SSL security protocol provides data encryption, server authentication, message integrity, and optional client authentication for a TCP/IP connection. Because SSL is built into all major browsers and Web servers, installing a digital certificate turns on the SSL capabilities.

Network Manageability

The M14 is managed as a single element and appears as a single element to a Network Management System (NMS). The director responds to its own IP address and appears as a separate entity to the Telnet protocol and SNMP.

The management interfaces include blade assemblies as intermediate components between switches and ports. In addition, all management interfaces, such as telnet, Web Tools, the Fabric Access Layer API, and Management Server, support a "port N within blade M" naming scheme.

When SNMP devices send SNMP messages to a management console running SAN management software, the information is stored in a management information base (MIB). Fabric OS v4.2.0 supports the latest Fibre Alliance Fibre Channel Management (FCMGMT) and Storage Management Initiative (SMI) MIBs, which allow common information necessary for management software to provide information to a SAN administrator.

Note: Refer to the Brocade MIB Reference Manual for additional MIB information.

Chapter 2. Starting and configuring the M14

You must configure the M14 appropriately in order for it to operate correctly within the network and fabric. Complete the configuration before you connect the switch to the fabric by entering the configuration commands through the active CP card. You must first provide power to the chassis, CP cards and 16-port cards before you can configure the switch (see “Providing initial power to the switch” on page 10 for details).

The switch configuration includes the following parameters:

- IP addresses (or “native” IP address), host names, subnet masks, and gateway addresses for both CP cards
- IP address and subnet mask for the switch
- Director name
- Switch status policies
- Domain ID for the switch (optional)
- WWN for the switch

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

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

The basic steps required for the initial configuration are:

1. Provide power to the M14 chassis and cards (see “Providing initial power to the switch” on page 10)
2. Log in to the switch (see “Establish a serial connection” on page 12)
3. Set up IP addresses (see “Configure IP Addresses for CP cards” on page 13 and “Configure IP Address for the Switch” on page 14)
4. Establish an Ethernet connection (optional). See “Establish an Ethernet Connection” on page 14
5. Specify switch name (see “Customize a switch name” on page 15)
6. Set up switch status policies (see “Specify status policies” on page 15)
7. Specify domain ID for the switch (see “Set the Domain ID” on page 15)
8. Connect to the fabric and establish fabric parameters, including PID settings (see “Connecting to the fabric and configuring fabric parameters” on page 16)
9. Enable software licenses, as necessary (see “Enable software licenses” on page 17)
10. Back up the configuration (see “Back up the configuration” on page 17)

Refer to the Fabric OS Reference Manual for additional information about these commands.

Providing initial power to the switch

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

1. Verify that the ON/OFF switches for each 16-port card and CP card are in the on position (see Figure 14)

Note: The ON/OFF switch for CP cards is identical to the ON/OFF switch on the 16-port card shown in Figure 14)

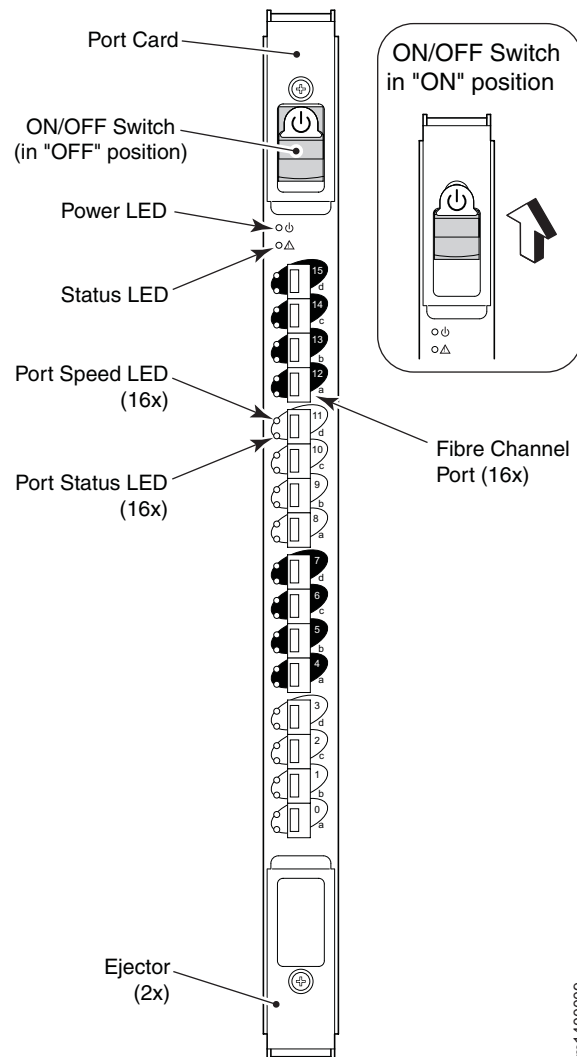


Figure 14. ON/OFF Switch for a 16-Port Card

2. Verify that the ac switch covers are installed over the ac switches. These clear plastic covers fit over the ac switches with their edges tucked underneath the outlet covers, preventing the ac switches from being powered on or off accidentally (see Figure 15 on page 11).

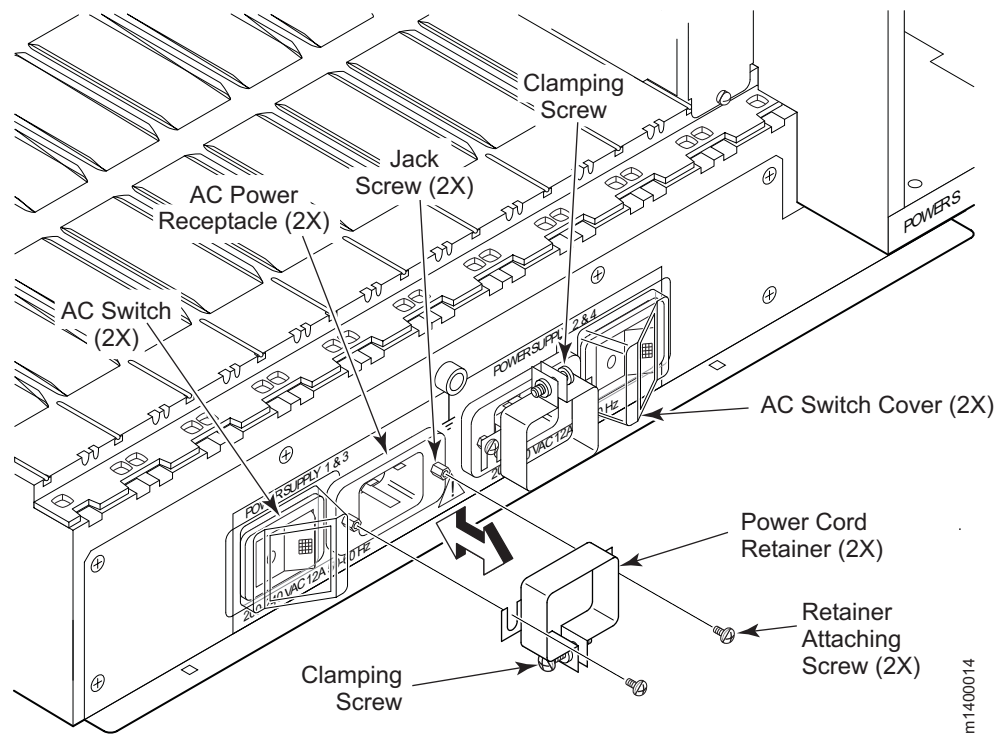


Figure 15. AC panel and power cord retainers

3. Connect the ac power cord retainers to the chassis: orient a retainer against the ac panel as shown in Figure 15, place the retainer tabs under the two jack screws on either side of the power receptacle, and tighten the screws. Repeat for the other retainer (note that the power cord retainers are oriented in the same direction as the power receptacles).
4. Loosen the clamping screw on each retainer, insert the power cords through the retainers into the power receptacles on the M14, and tighten the clamping screws. The power cords are designed with left bends, so each should route to opposite sides of the chassis.
5. Ensure that the power cord has a minimum service loop of 15 cm (6 in.) available at the connection to the switch and is routed so that it is not exposed to stress.
6. Connect the cabinet power distribution units (PDUs) to separate power sources of 200–240 V ac, 50–60 Hz.
7. Make sure that the internal power cords are connected to the separate PDUs and that the other ends are connected to the M14 circuit breakers.
8. Route the power cord so that it is not exposed to stress.
9. 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 approximately 10 minutes, and is complete when light-emitting diode (LED) activity returns to a standard state. For information about LED light patterns, see “CP card status” on page 23.

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

Establish a serial connection

The initial communication to an M14 switch requires a serial connection. Follow these steps to establish a serial connection and log in to the switch:

1. Verify that the M14 is powered on and that POST is complete by verifying that all power LED indicators on the 16-port cards and CP cards are displaying a steady green light.
2. Use the serial cable provided with the M14 to connect the console port on the active CP card to a computer workstation.

Note: The console port is the second serial port from the top of the CP card (see Figure 17 on page 23); the active CP card is indicated by an illuminated (blue) Active CP LED. This LED on the standby CP card should be off (not illuminated).

3. Access the switch using a terminal emulator application (such as HyperTerminal on Windows[®] 95, 2000, or NT, or TERM in a UNIX[®] environment).

Note: The M14 supports up to two telnet sessions with administrative privileges at the same time.

4. Disable any serial communication programs running on the workstation (such as synchronization programs).
5. Open the terminal emulator application and configure as follows:
 - For 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
```

6. When the terminal emulator application stops reporting information, press **Enter**.
7. Log in to the switch as admin. The default password is "password".

Note: At the initial login, the user is prompted to enter new admin and user passwords.

8. Change passwords, if desired. Passwords can be 8 to 40 characters long and should include a combination of numbers and upper/lowercase letters. To skip modifying the password, press Ctrl- C.

Table 3. Example changing password

```
Fabric OS (swDir) swDir
login: admin
Password:
Please change your passwords now.
Use Control-C to exit or press 'Enter' key to proceed.
Password was not changed. Will prompt again at next login until password is changed.
swDir:admin>
```

9. Check the "Active CP" LED on the CP cards in slots 5 and 6 (see Figure 17 on page 23), or enter the hashow command to verify which CP card is active. The configuration can be modified only through a login session to the active CP card.

Table 4. Example screen, verifying active CP card

```
swDir: admin> haShow
Local CP (Slot 6, CP1): Active
Remote CP (Slot 5, CP0): Standby
HA Enabled, Heartbeat Up, State Synchronized
```

Configure IP Addresses for CP cards

The M14 director requires three IP addresses, which are configured using the ipAddrSet command. IP addresses are required for both CP cards (CP0 and CP1) and the M14.

Note: Use a block of three IP addresses that are consecutively numbered in the last octet. The IP and gateway addresses must reside on the same subnet.

Resetting an IP address while the switch is online breaks any connections to that IP address and forces a restart of any HTTP, SNMP, and API daemons.

The addresses 10.0.0.0 - 10.0.0.255 are reserved and used internally by the switch.

The default IP addresses and host names for the M14 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)

Configuration changes can only be made via the active CP card. If the CP card in slot 5 is not the active CP card, disconnect the serial cable and connect it to the CP card in slot 6; then, log in as admin.

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

1. Enter the ipaddrset command at the prompt, including "0" for the CP card in slot 5 or "1" for the CP card in slot 6.

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

2. Enter the requested information at the prompts. The default information for the CP card in slot 5 is displayed.

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

Note: The host name is the name assigned to the CP card. The same gateway address must be used for both CP cards (these gateway addresses are referenced for the IP addresses).

3. Press Enter to update the IP address of the active CP card immediately.

- Repeat step 1 on page 13 to step 3 on page 13 to configure the IP address of the standby CP card.

Note: The IP address of the standby CP card is updated at the next reboot.

Configure IP Address for the Switch

The M14 has its own IP address and corresponding subnet mask. The default IP address is 10.77.77.77.

Attention: Resetting an IP address while the M14 has active IP traffic such as Fabric Manager, Fabric Watch, SNMP, or other applications can cause traffic to be interrupted or stopped. Changing the IP address causes a domain address format RSCN to be issued.

Follow these steps to configure the IP address for the M14 (from the active CP card):

Attention: Configuration changes can only be made via the active CP card. If the CP card in slot 5 is not the active CP card, disconnect the serial cable and connect it to the CP card in slot 6, then log in as admin.

- Enter the `ipaddrset` command at the prompt, including "0" for the switch IP address.

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

- Enter the requested information for this IP address at the prompts.

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

The IP address is updated immediately.

- Reboot the CP card by entering the `reboot` command at the prompt.

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

Establish an Ethernet Connection

After using a serial connection to configure the IP addresses for the M14 (see "Configure IP Addresses for CP Cards" on page 3-2 and "Configure IP Address for the Switch" on page 3-3), you can connect the active CP card to the local area network (LAN) if desired.

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

By establishing an Ethernet connection, you can complete the M14 configuration using either the serial session or a telnet session. However, you must ensure that the M14 is not modified from other connections at the same time.

To establish an Ethernet connection to the M14, follow these steps:

- Remove the shipping plug from the Ethernet port on the active CP card.

2. Insert one end of an Ethernet cable into the Ethernet port.
3. Connect the other end to an Ethernet 10/100 Base-T LAN.
The M14 can now be accessed by remote connection using any of the available management tools, such as telnet, Web Tools, or Fabric Manager.
4. To complete any additional M14 configuration procedures through a telnet session, log in to the switch by telnet, using the admin login. The default password is "password".

Customize a switch name

The switch name of the M14 director can be up to 15 characters long; can include alpha, numeric, and underscore characters; and must begin with an alpha character. The default name for the M14 is "swDir". Including "swDir" in the name is recommended to allow easy identification.

To customize the name, follow these steps:

1. Enter the `switchname` command with the new name in quotes.

```
swDir:admin> switchName "sw10"
```

For details about the `switchname` command, refer to the Fabric OS Reference Manual.

2. Record the new name for future reference.

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

Specify status policies

To specify custom status policies, follow these steps:

1. Enter the `switchstatuspolicyset` command at the prompt.

For more information about the `switchstatuspolicyset` command, refer to the Fabric OS Reference Manual.

2. Complete the prompts to specify the desired policies.

Note: To completely deactivate an alarm for a particular condition, enter "0" at the corresponding prompt.

Set the Domain ID

Each switch in the fabric must have a unique Domain ID. The Domain ID can be set using the `configure` command. It is also possible to allow the Domain ID to be automatically set.

Note: The default Domain ID for the M14 is "1".

To set the Domain ID, follow these steps:

1. Enter the `fabricshow` command to determine the current Domain IDs available.
2. Enter the `switchdisable` command to disable the M14.
3. Enter the `configure` command.
4. Enter `y` at the "Fabric parameters" prompt:

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

5. Enter a unique Domain ID:

Domain: (1..239) [1] 3
6. Complete the remaining prompts or press Ctrl+D to accept the other settings and exit.
7. Enter the **switchenable** command to reenble the M14.

Connecting to the fabric and configuring fabric parameters

Before connecting the M14 to the fabric, verify that all the switches in the fabric use the correct port identifier (PID) settings. For information on setting the PIDs, refer to the Fabric OS Procedures Manual.

To connect the M14 to the fabric, follow these steps:

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

The ports are color-coded to indicate which ones can be used in the same trunking groups: four ports marked with solid black ovals alternate with four ports marked with oval outlines. The ports and cables used in trunking groups must meet specific requirements. For a list of these requirements, refer to the "ISL Trunking" section of the Brocade Features Guide.
2. Position one of the SFP transceivers so that the key is oriented correctly to the port. Insert the transceiver into the port until it is firmly seated and the latching mechanism clicks.

Transceivers are keyed so that they can only be inserted with the correct orientation. If a transceiver does not slide in easily, ensure that it is correctly oriented. For instructions that are specific to the transceiver model, refer to the transceiver manufacturer's documentation.
3. Position a cable so that the key (the ridge on one side of the cable connector) is aligned with the slot in the transceiver; then, insert into the transceiver until the latching mechanism clicks.

Cables are keyed so that they can only be inserted with the correct orientation. If a cable does not slide in easily, ensure that it is correctly oriented.
4. Repeat step 1 through step 3 for the remaining ports.
5. Organize the cables as required. For recommendations regarding cable management, refer to "Managing cables" on page 50.
6. Check the M14 for switch and port status by entering the **switchshow** command at the prompt.

The **switchshow** command provides detailed information about the switch. For more information about this command, refer to the Fabric OS Reference Manual.
7. Check the fabric for ISLs, switch names, or other status by entering the **fabricshow** command at the prompt.

The **fabricshow** command provides general information about the fabric. For details about this command, refer to the Fabric OS Reference Manual.
8. To establish additional system parameters, use the **configure** command. For details about this command, refer to the Fabric OS Reference Manual.

Enable software licenses

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

The 64-bit chassis ID is required to obtain and activate licenses for the M14. The chassis ID is available through the command `licenseidShow`.

Both the **licenseShow** and **licenseidShow** commands must be entered through the active CP card.

For information about activating licenses, refer to the Fabric OS Procedures Guide.

Back up the configuration

Save all key configuration data for the M14, including license key information, and upload it to a host for emergency reference. Routine backups of the configuration are recommended to ensure the current configuration is available if needed.

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

The **configupload** command uploads the M14 configuration to the server so that it is available for downloading to a replacement switch, if necessary. For more information about this command, refer to the Fabric OS Reference Manual.

Note: Refer to the Fabric OS Procedures Guide for information about using the `configdownload` command.

Chapter 3. Monitoring system components

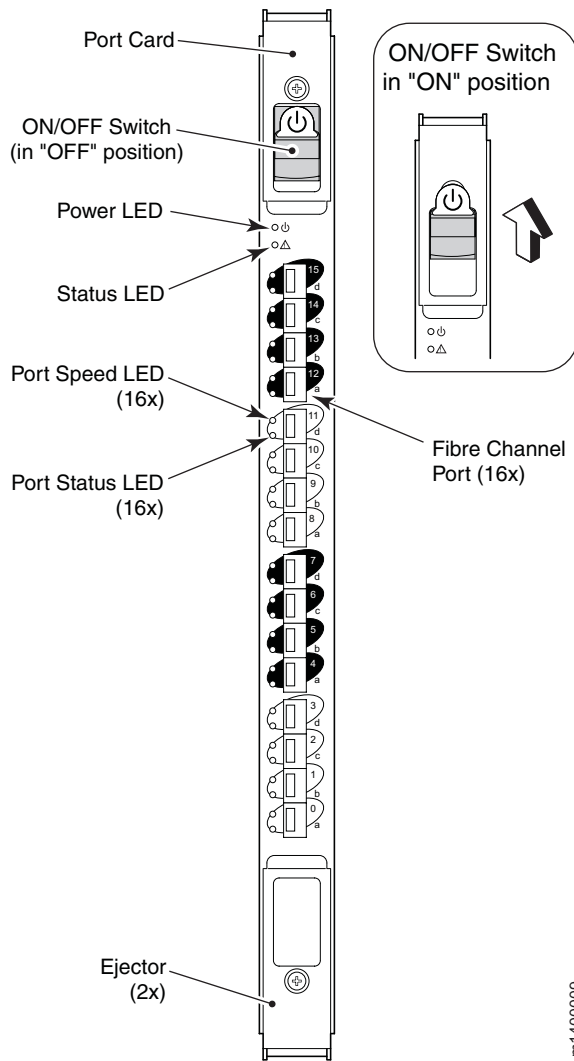
The M14 is engineered for reliability and requires no routine operational steps or maintenance. This chapter provides information about determining the status of each component (using LEDs and CLI commands).

Note: Refer to the *Fabric Watch User's Guide*, *Advanced Web Tools Administrator's Guide*, and *Brocade Features Guide* (includes Advanced Performance Monitoring) for additional information.

16–port card status

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

1. Check the LED indicators on the port card (see Figure 16 on page 20). The LED patterns may temporarily change during POST and other diagnostic tests; for information about how to interpret the LED patterns, refer Table 5 on page 21.
2. Check the 16–port card status using the **slotshow** command (see “Obtaining Chassis and Component Status” on page 97 for an example). For additional information about this command, refer to the *Fabric OS Reference Manual*.



m1400009

Figure 16. Front of 16-port card

Table 5. 16-port card LED patterns

LED name, location	Color of LED	Status of hardware	Action
Power (Uppermost LED)	Steady green	The 16-port card has incoming power.	No action is required.
	No light (LED is off)	The 16-port card does not have incoming power.	Ensure that the card is firmly seated and has power.
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. Use portcfigspeed command to change mode.
	Steady green	The port is set to 2 Gbps mode.	No action is required.

Table 5. 16-port card LED patterns (continued)

LED name, location	Color of LED	Status of hardware	Action
Port Status (To the left of each port, below the Port Speed LED)	No light (LED is off)	16-port card does not have incoming power or there is no light or signal carrier detected.	Verify that the Power LED is lit and check the transceiver and the cable.
		Polling is in progress.	Allow 60 seconds for polling to complete
		The connected device is configured in an offline state.	Verify the status of the connected device
	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 M14.
	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 orange	The port is receiving light or signal carrier, but is not yet online.	No action is required.
	Slow-flashing orange (on 2 seconds; off 2 seconds)	The port is disabled due to diagnostic tests or the portdisable command.	Reset the port from the workstation. Note: The portcftpersistentdisable command is persistent across reboots of Fabric OS v4.2.0
	Fast-flashing orange (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 orange	The port is bypassed.	Reset the port from the workstation.	

CP card status

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

1. Check the LED indicators on the CP card (see Figure 17). The LED patterns may temporarily change during POST and other diagnostic tests; for information about how to interpret the LED patterns, see Table 6 on page 24.
2. Check port card status using the slotshow command (see “Obtaining Chassis and Component Status” on page 97 for an example) and hashow command. For additional information about these commands, refer to the *Fabric OS Reference Manual*.

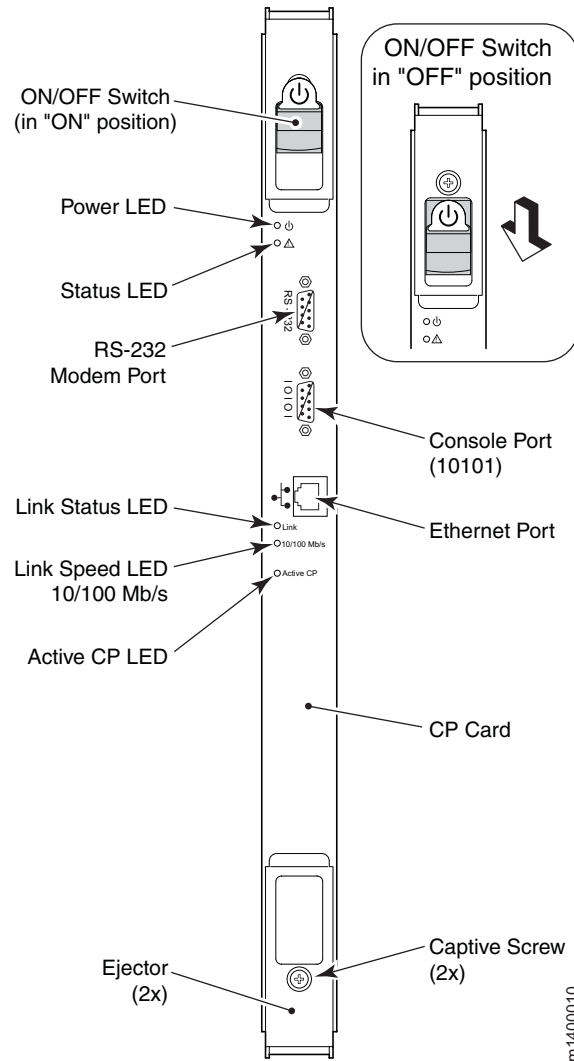


Figure 17. Front of CP card

Table 6 on page 24 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 6. CP card LED patterns

LED name, location	Color of LED	Status of hardware	Action
Power (Uppermost LED, below the ON/OFF switch)	Steady green	The CP card has incoming power.	No action is required.
	No light (LED is off)	The CP card does not have incoming power.	Ensure that the CP card is firmly seated and has power.
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 or the switch is still booting.	Ensure that the CP card is firmly seated and the switch has completed booting. 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 reseal 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 and correct it.
Ethernet Link Status (labeled "Link" on the CP card) (Uppermost of the three 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 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.
Active CP (Below the Link status and Link Speed LEDs)	Steady blue	Active CP card	No action is required.
	No light (LED is off)	Standby CP card	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 18 shows the location of the LEDs on the power supply.

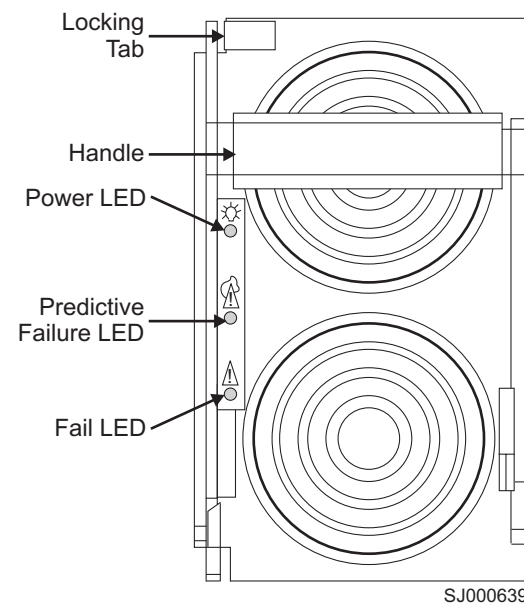


Figure 18. Power supply LEDs

Table 7 on page 26 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 7. Power supply LED patterns

LED Name, location	Color of LED	Status of hardware	Action
Power (Uppermost LED)	No light (LED is off)	The power supply does not have incoming power and is not providing power to the switch.	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 (Center LED, 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 orange	The power supply is about to fail because there is a failing fan inside the power supply.	Replace the power supply.
Fail (Lower LED, 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 orange	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 orange	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 19 on page 27 shows the location of the LEDs on the blower assembly.

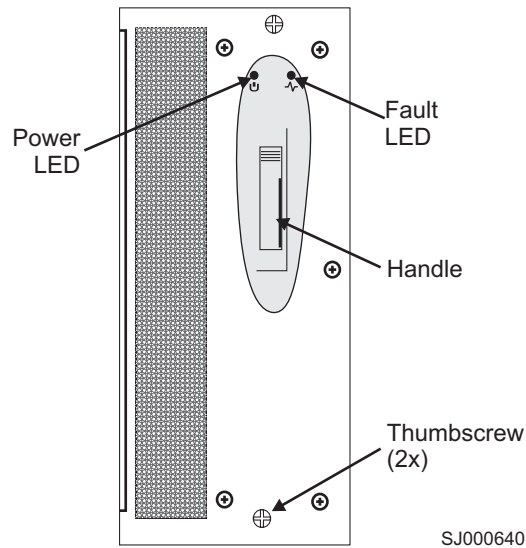


Figure 19. Blower assembly LEDs

Table 8 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 8. Blower assembly LED patterns

LED name, location	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.
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 orange	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 20 shows the location of the LEDs on the WWN card and bezel.

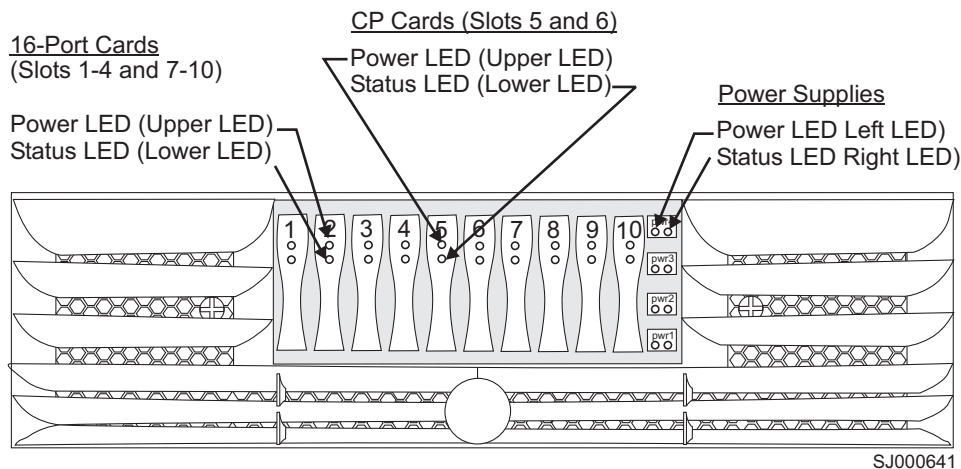


Figure 20. LEDs on the WWN card and bezel

The WWN bezel display provides a summary of the power and status of the 16–port cards, the CP cards, and the power supplies. Table 9 describes the WWN card LED patterns (see “Removing and replacing the WWN bezel and card” on page 76 for the locations of the LEDs).

Table 9. WWN bezel LED patterns

LED location/type	Color	Status	Action
16-Port card/CP card Power	Steady green	Power is OK.	No action is required.
16-Port card/CP card Status	Steady amber	Card is faulty.	Check card.
	No light (LED is off)	Card is OK.	No action is required.
Note: If a card slot or power supply bay has a filler panel installed, the corresponding LEDs on the WWN card do not light up.			
Power supply Power/Status	Steady green	Power is OK.	No action required.
	Steady amber	Power supply is faulty.	Check power supply.

Check the WWN card status using the commands listed in Table 10 if you have problems viewing or modifying the data stored on the WWN card. Difficulty retrieving or modifying this data could indicate a WWN card failure.

Table 10. Data stored on the WWN card

Data	Related Commands
WWN values	wwn, chassishow
Data about the chassis and WWN card	chassishow
Ethernet and fibre channel IP address information for the CP cards	ipaddrshow, ipaddrset
History log information	historyshow, historylastshow
Names of switch	switchname

Note: For additional information about these commands, refer to the *Fabric OS Reference Manual*.

If the error log or serial console display error messages that indicate problems with WWN units, such as in Table 11, the WWN card might have failed.

Table 11. Messages that can indicate a WWN card failure

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

Note: For more information about error messages, refer to the *Diagnostic and System Error Messages Reference Manual*.

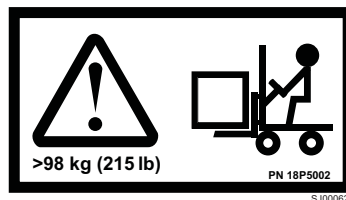
Chapter 4. Installing and removing Model M14 switches

This chapter describes how to install the 2109 Model M14 switch into a 2109 Model C36 cabinet, and how to remove an M14 from the cabinet.

One M14 is installed in the cabinet at the factory. The cabinet is designed to support one additional M12 or M14, which can be added on site.

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

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 M14 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.

Refer to “Rack Safety” on page xxii for more complete cautions related to installing and removing equipment from a rack or cabinet.

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 M14 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 M14 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 or M14 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 M14. The bridge tool, when installed, serves as a temporary ramp between the lift tool and the M14 rails that are installed in a Model C36 cabinet. You do not need to return the bridge tool when you are finished with it.

World trade locations

The following ordering procedures are for world trade locations:

- Order the lift tool by using the parts order system, like any other part.
- Use the following part numbers when you order:
 - Lift tool: PN 09P2481
 - 24–inch load plate: PN 11P4369
- You do not record parts usage.
- Return the lift tool and the 24–inch load plate to the parts center after you complete the installation or removal of the M14.

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 M14.

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 M14 standard shipment

An M14 is shipped with the following items:

- The M14, 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 M14 Installation and Service Guide*
 - 2109 Model M14 documentation CD-ROM
 - ESD grounding strap
 - One 3.05 m (10 ft) RS-232 serial cable with an RJ-45 style adapter on the end of the cable
 - The 14U chassis mount kit with installation instructions
 - Bridge tool: PN 18P5855

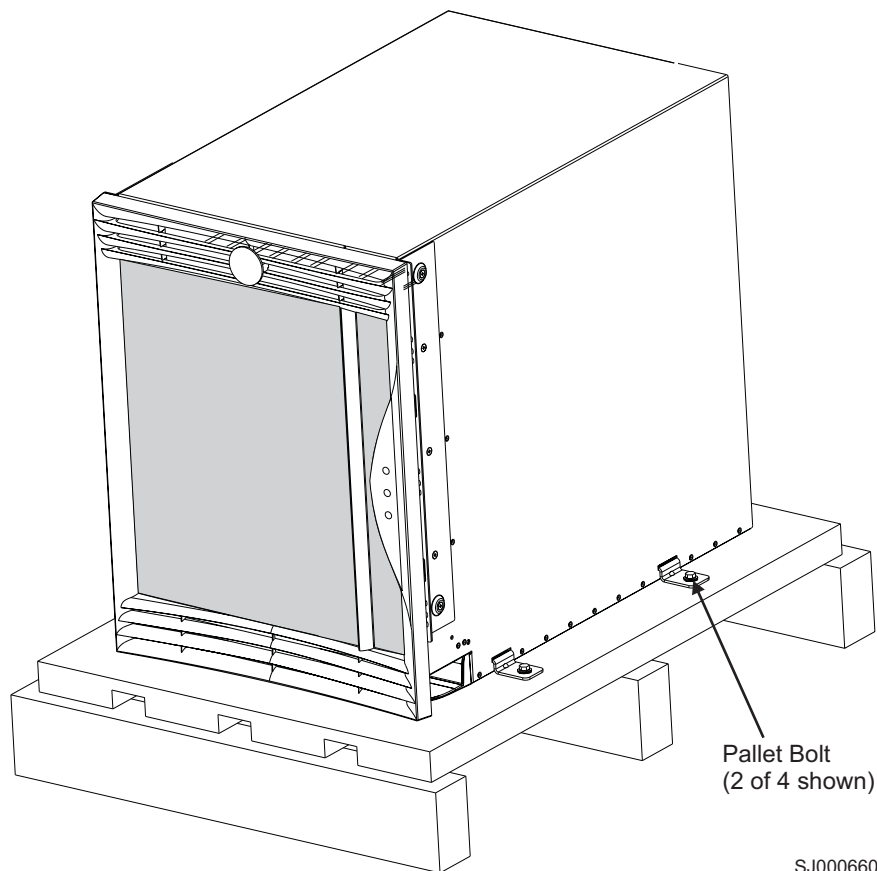
Note: You can order SFP transceivers separately from IBM. The M14 supports both SWL and LWL transceivers.

Unpacking the M14

Perform the following steps to unpack the M14.

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 M14 to the pallet. See Figure 21. Remove the brackets.



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Figure 21. 2109 Model M14 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 22.
- 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.

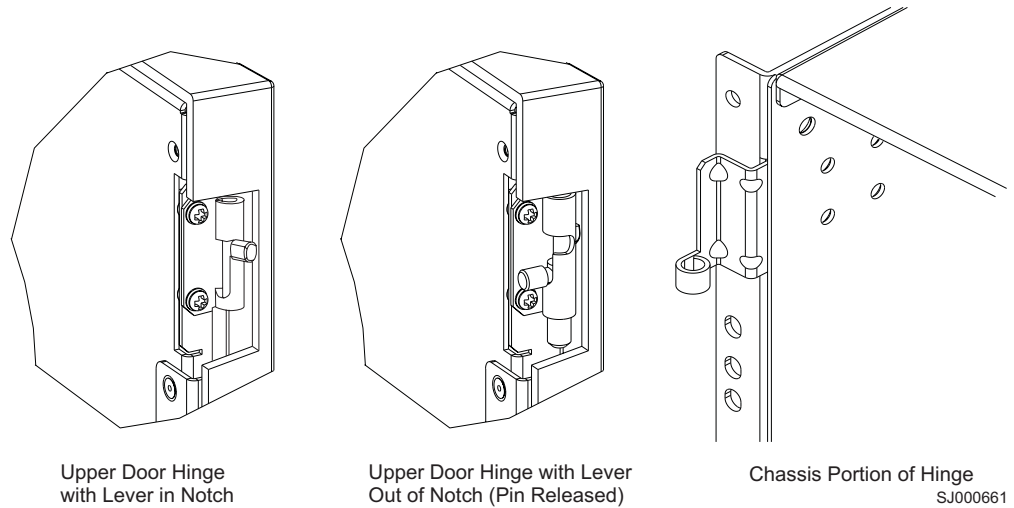


Figure 22. Removing the chassis door

Installing an additional M14 in a cabinet

Important

The 2109 Model C36 cabinet is designed to support one additional Model M14 switch. If you plan to install an additional M14, you cannot install any 2109 Model F16 or Model F32 switches in the cabinet.

This section describes how to install the M14 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 M14 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 23.

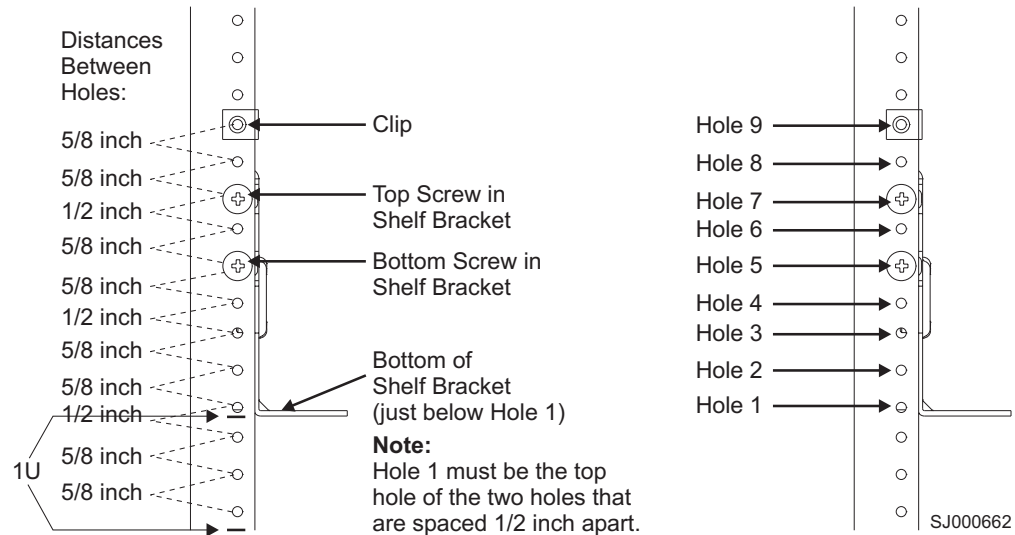
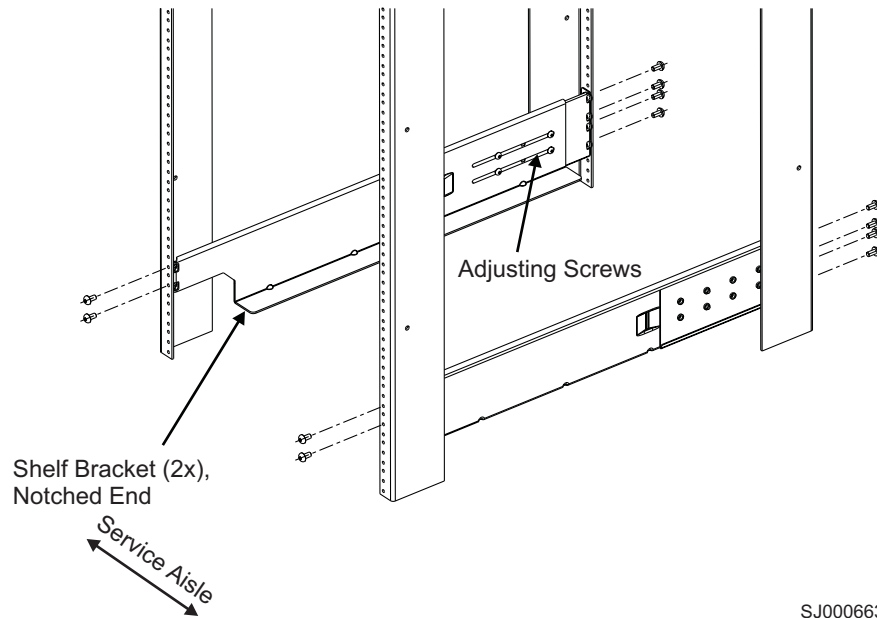


Figure 23. Placement of the shelf brackets and clip nuts on the cabinet rails

Note: If you are installing a 2109 Model M14 into the bottom of the rack, go to step 2a for the location of the rail. If you are installing a 2109 Model M14 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 24 on page 37.



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Figure 24. 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 25 on page 38.

Note: If you are installing an M14 into the bottom of the rack, go to step 4a for the location of the clip. If you are installing an M14 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.

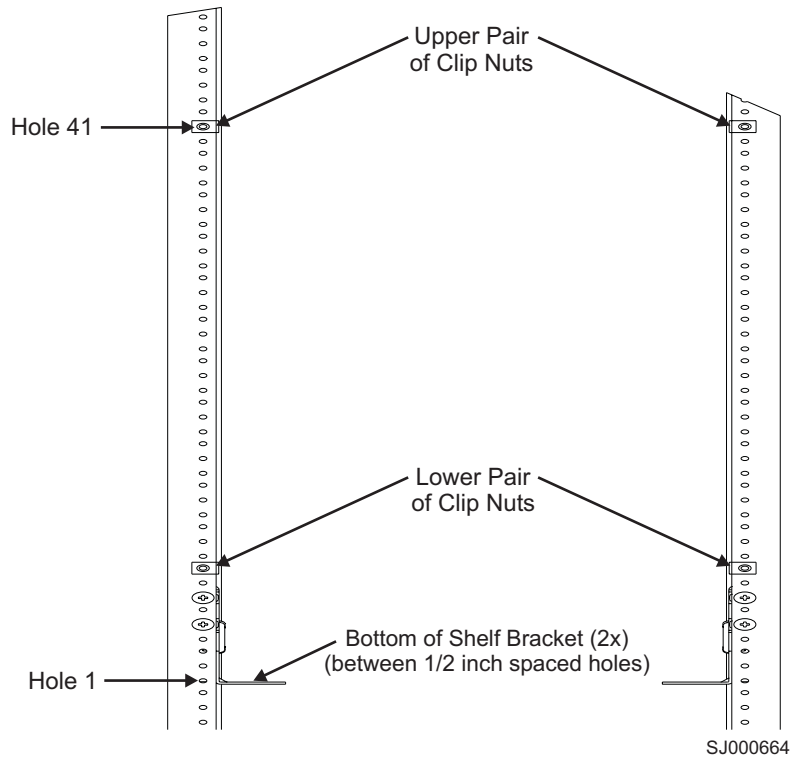


Figure 25. Placing the clip nuts on the rear rails (service aisle side)

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 26 on page 39, 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 26 on page 39 for orientation.

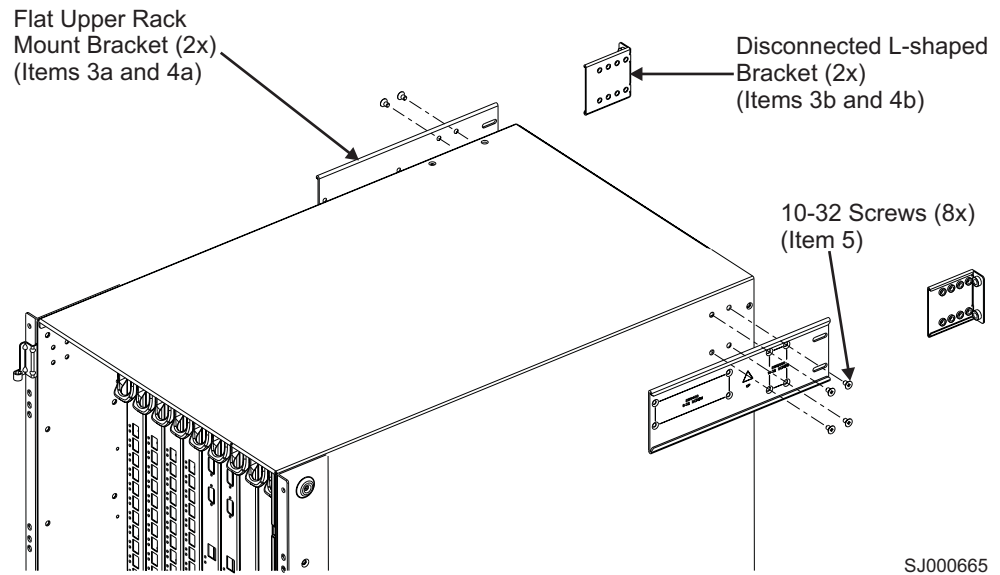


Figure 26. Attaching the right and left flat upper mount brackets to the chassis

7. Attach the two L-shaped upper mount brackets (items 3b and 4b) to the cabinet rails. See Figure 27 for orientation. Use two of the 1/4–20 x 1/2 in. Phillips panhead screws with lock washers per bracket. Tighten the screws.

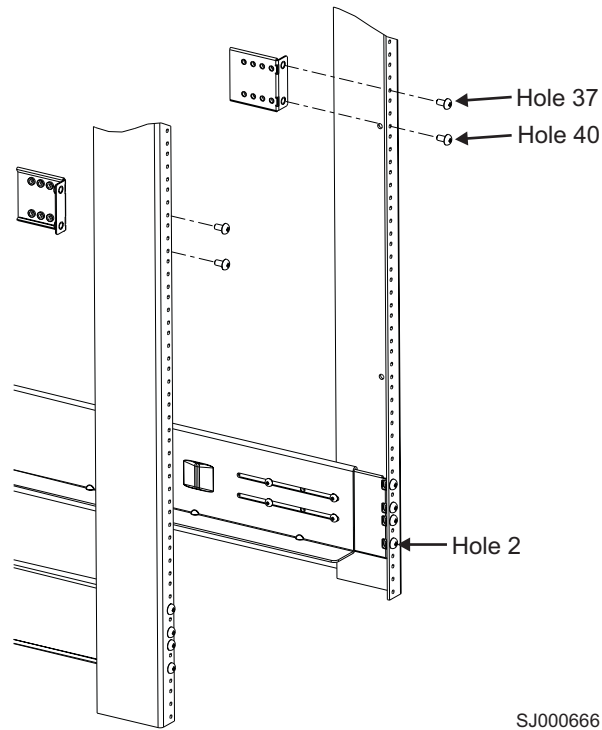


Figure 27. Attaching the L-shaped upper mount brackets to the rails

Note: If you are installing an M14 into the bottom of the rack, go to step 7a on page 40 for the location of the bracket. If you are installing an M14 into the top of the rack, go to step 7b on page 40 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 41 describe how to use the lift tool (PN 09P2481) and the 24–inch load plate (PN 11P4369) to install a 2109 Model M14 in the cabinet. Step 10 on page 41 through step 21 on page 44 describe how to install the bridge tool (PN 18P5855) in the cabinet for the lower M14 or the upper M14. This procedure uses parts from the 14U chassis mount kit. See “Cabinet parts list” on page 85 for a list of these parts.



CAUTION:

A fully populated 2109 Model M14 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.



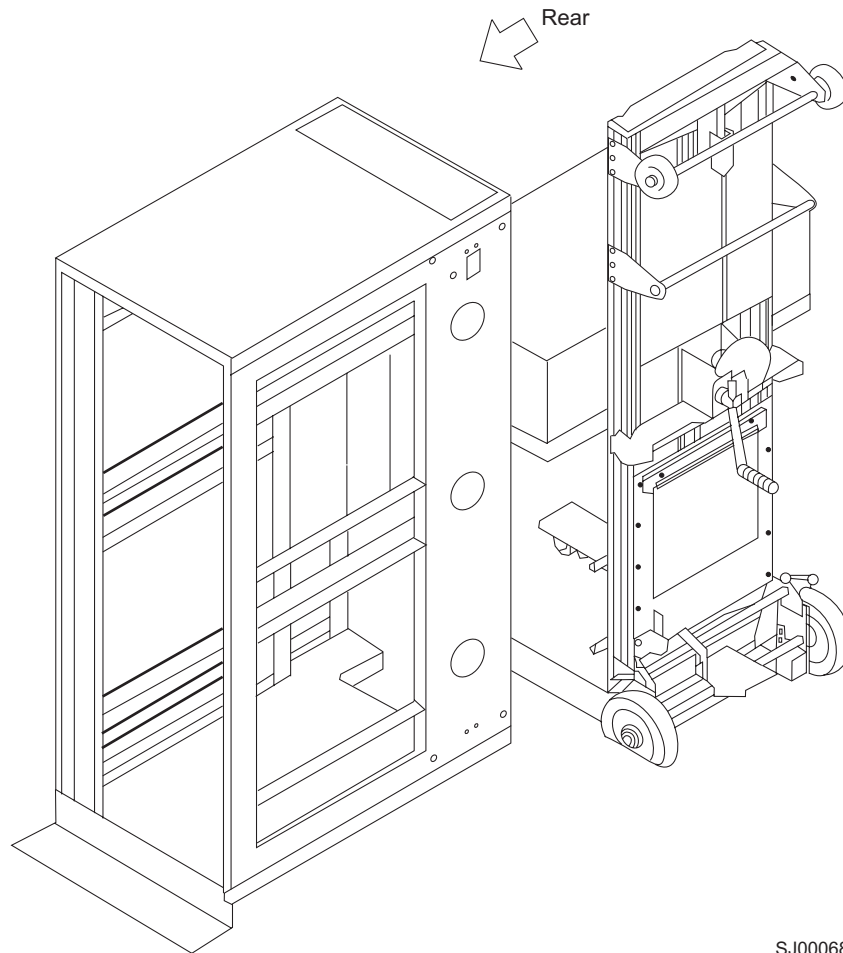
CAUTION:

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 M14:

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 M14 to reduce the weight.
4. Move the lift tool next to the pallet that contains the M14.
 - a. Adjust the load platform to the same height.
 - b. Slide the M14 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 28 on page 41.



SJ000682

Figure 28. 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 M14, go to step 11. If you are installing the upper M14, go to step 12 on page 42.
11. For the lower M14, 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 29.



SJ000680

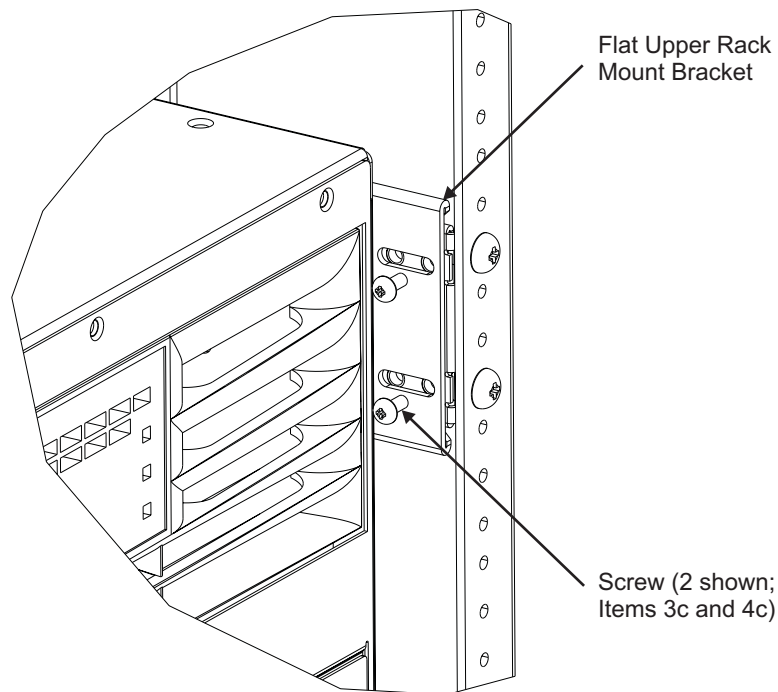
Figure 29. Locking the shelf into position

12. For the upper M14, 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.

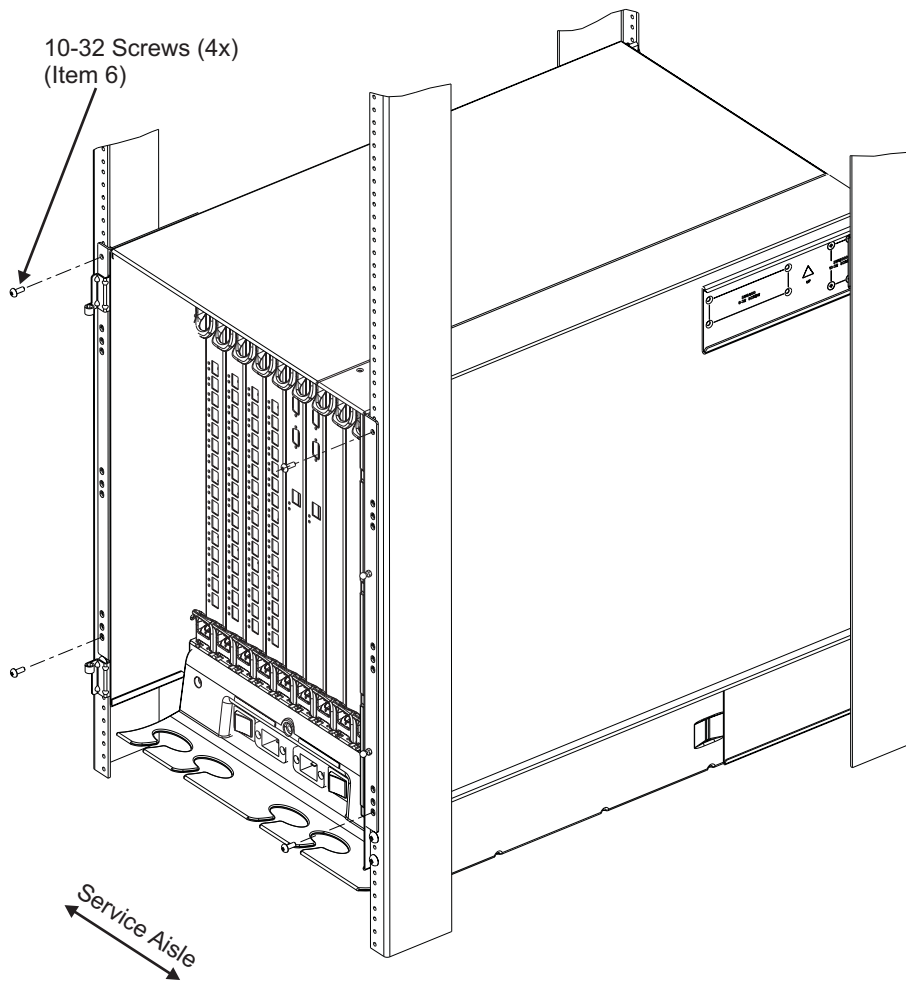
- d. Align the one-pin section of the support on the front of the vertical rail with the middle hole in EIA unit 18.
13. Turn the winch crank counterclockwise, 1/4 turn, to set the winch brake.
14. Set the wheel brake and place the wheel chocks around the wheels.
15. Remove the retention straps.
16. 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 38. Tighten the screws. See Figure 30.



SJ000667

Figure 30. 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 31 on page 44 for the location of the screws.



SJ000668

Figure 31. Attaching the port side of the chassis to the cabinet rails

21. Reinstall the door after you put the chassis in place. See Figure 32 on page 45.
 - 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.

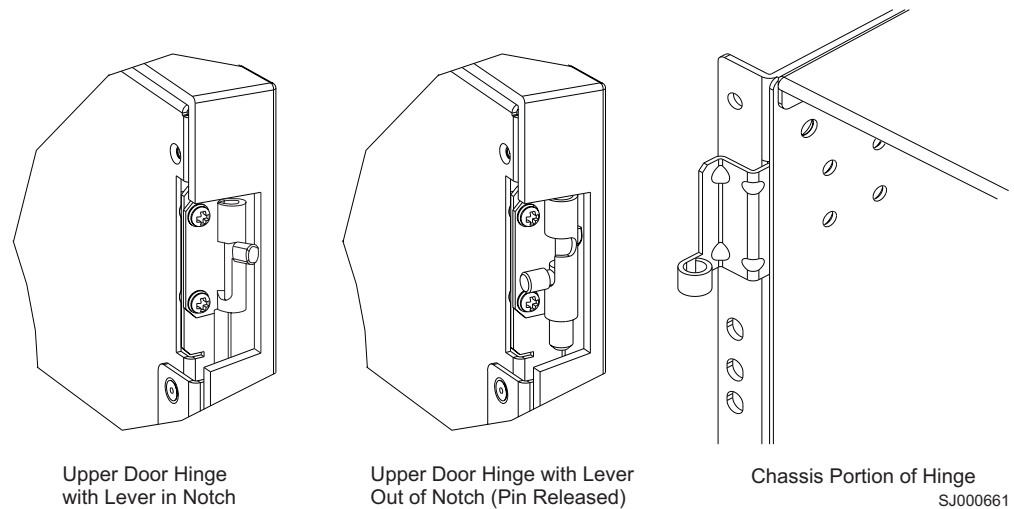


Figure 32. Reinstalling the chassis door

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 M14,” on page 9.

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

Removing an M14 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 M14 from the cabinet. Step 6 through step 17 on page 47 describes how to remove the bridge tool (PN 18P5855) from the cabinet.

Perform the following steps to remove an M14:

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 M14.
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 22 on page 35.
 - 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 30 on page 43 for the location of the screws.
6. If you are replacing the lower M14, go to step 7. If you are replacing the upper M14, go to step 8 on page 46.
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 M14, 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 M14 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.



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 5. Removing and replacing components

Use this procedure to remove and replace all of the field replaceable units (FRUs) in the 2109 Model M14 Director without special tools. Replacement instructions are provided with each replacement unit ordered. The M14 continues to operate during many of the FRU replacements when you follow the conditions specified in the procedure.

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

Removing and replacing the chassis door

Use this procedure to remove and replace the chassis door.

Time required

Less than 5 minutes.

Removing the chassis door

Note: The chassis door is required to ensure the M14 meets electromagnetic interference (EMI) and other regulatory certifications.

Perform the following steps to replace the chassis door:

1. Remove the chassis door from the M14 director:
2. Open the door to an angle of approximately 90 degrees.
3. Support the door to prevent it from falling.
 - a. Push the spring-loaded pin on the upper hinge up and into the notch in the hinge. See Figure 33.
 - b. Push the spring-loaded pin on the lower hinge down and into the notch.
 - c. Pull the door away from the chassis.

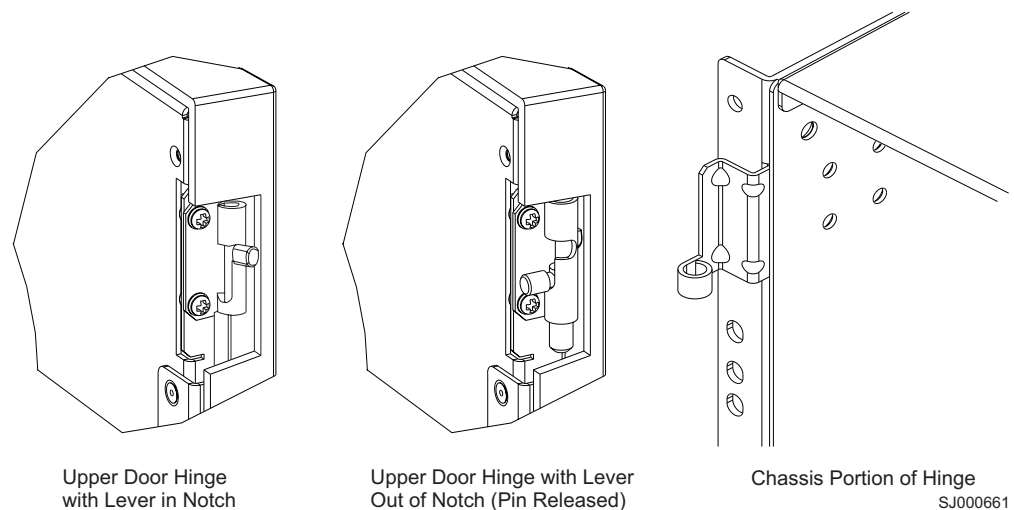


Figure 33. Upper door hinge

Replacing the chassis door

Perform the following steps to replace a new door in the chassis (see Figure 33 on page 49 for illustrations of the upper hinge):

1. Ensure that the levers on the spring-loaded pins on both hinges are pushed into the notches.
2. Align the spring-loaded pins with the chassis portion of the hinges.
3. Release the pins by pushing the levers out of the notches.

Managing cables

Use the following guidelines for managing cables:

- You can manage the M14 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. This slack:
 - 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.

Figure 34 on page 51 shows an orderly organization of the cables on the port side of the M14.

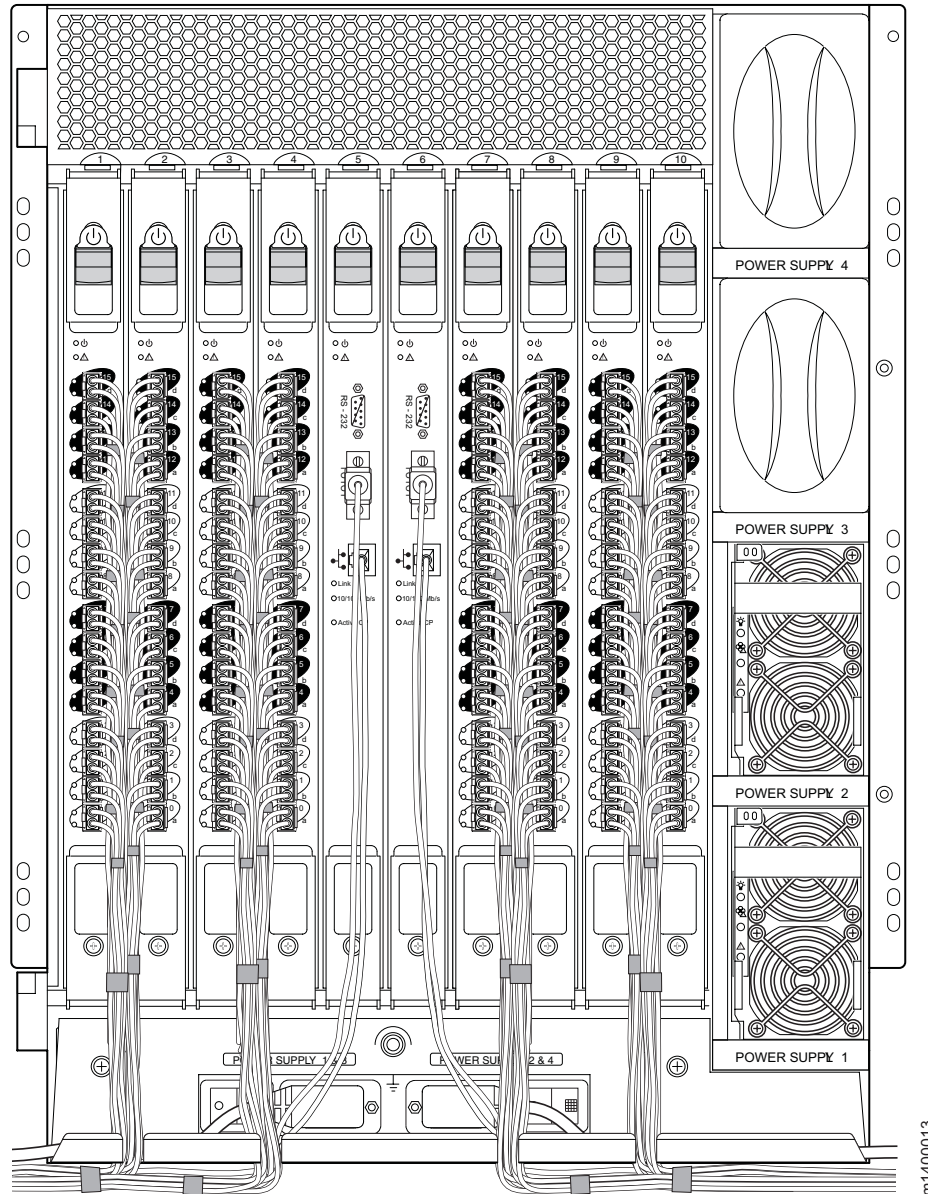


Figure 34. Effective cable management

Two items are provided to assist with cable management:

- Cable management tray
 - The cable management tray is attached to the bottom of the chassis (see Figure 36 on page 52) and can be used to route the power cables and other cables down below the chassis or out the sides of the chassis. Routing the cables down through the holes in the management tray requires minimum of 3U (rack units) below the switch.
- Cable guides
 - A set of 16 cable guides (see Figure 35 on page 52) are provided with the M14, and can be used to organize the port cables into logical groups. The cable guides do not attach to the chassis.

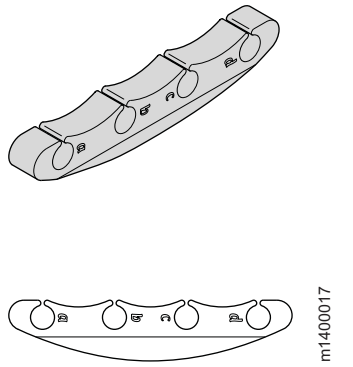


Figure 35. Cable guides (pillars)

Removing and replacing the cable management tray

Use this procedure to replace the cable management tray (see Figure 36). The M14 can continue to operate during the installation.

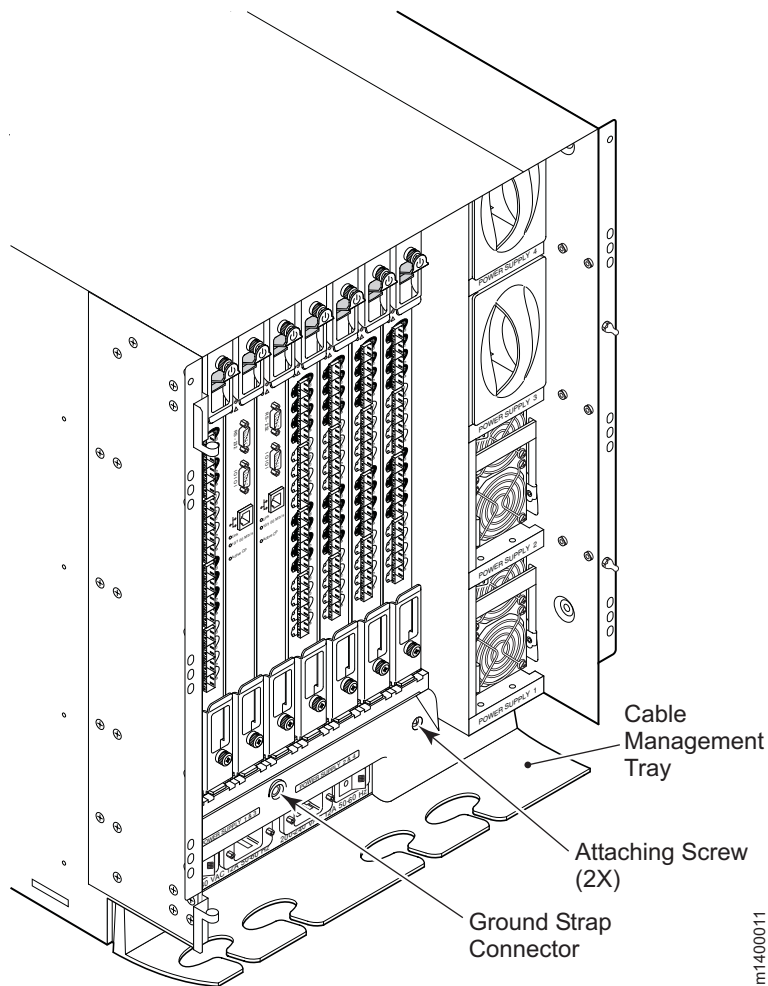


Figure 36. Cable management tray

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

Time required

Less than 5 minutes.

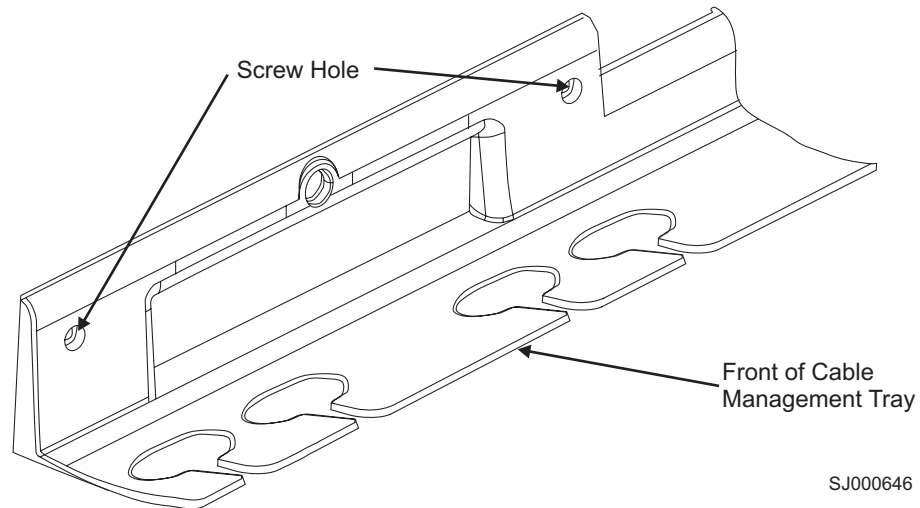
Items required

No. 2 Phillips screwdriver

Removing a cable management tray

Perform the following steps to remove a cable management tray:

1. Remove the existing cable management tray:
2. Move the cables carefully out of the tray.
3. Unscrew the two screws holding the tray to the chassis and save for reuse. See Figure 36 on page 52 for the general location and Figure 37 for a more detailed view.
4. Rotate the front of the tray down; then, lift the back to disengage the tabs on the back from the chassis.



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Figure 37. Cable management tray detail

Replacing the cable management tray

Perform the following steps to replace the cable management tray:

1. Orient the tray. See Figure 36 on page 52 and Figure 37.
2. Insert the two tabs beneath the tray into the two slots at the bottom of the ac panel. Rotate the front of the tray upward until it locks into place.
3. Position and tighten the two attaching screws.
4. Arrange the cables through or along the tray, as required.

Replacing the cable guides (pillars)

Use the cable guides (pillars) (see Figure 35 on page 52) to organize the port cables into logical groups, such as according to port quads (sets of four neighboring ports). The cable pillars do not attach to the chassis.

The cable pillars also serve to keep the cables evenly spaced and to hold them away from the 16-port card, to prevent the cables from bending to less than the minimum bend radius.

Attention: Do not route the cables in front of the air exhaust vent.

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

Tie wraps are not recommended for optical cables, because they are easily overtightened.

To use the cable pillars, orient them horizontally and insert the cables into the holes, using a separate hole for each cable. See Figure 35 on page 52.

Removing and replacing a 16-port card or filler panel

Use this procedure to remove and replace 16-port cards (see Figure 38 on page 55) and 16-port card filler panels (see Figure 39 on page 57) from the M14. Perform the following steps before removing and replacing a 16-port card:

1. Check the LEDs.

The LEDs are located on the front panel of each 16-port card. See Figure 16 on page 20. See “16-port card status” on page 19 for a description of the 16-port card LEDs.

Note: The WWN bezel on the nonport side of the M14 also displays a power and status LED for each 16-port card. See “Removing and replacing the WWN bezel and card” on page 76 for additional information about the WWN bezel and LEDs.

2. Establish a Telnet or console session.

Before replacing a 16-port card, establish a Telnet or console connection to determine a failure and verify operation after replacement. See the Fabric OS Procedures Guide for information about how to check the status of hardware components using the CLI.

3. Check the cable slack.

Make sure there is plenty of cable slack to remove a 16-port card without any optical, power, or Ethernet cable obstructions. See “Managing cables” on page 50 for cabling guidelines.

4. Ensure that you have a valid spare part.

Make sure that the part numbers match for the unit being replaced. The **chassisShow** command displays information about the 16-port cards, including part numbers (xx-000xxx-xx), serial numbers, and additional status. The part number of each 16-port card is also printed on a sticker on the front panel of the card.

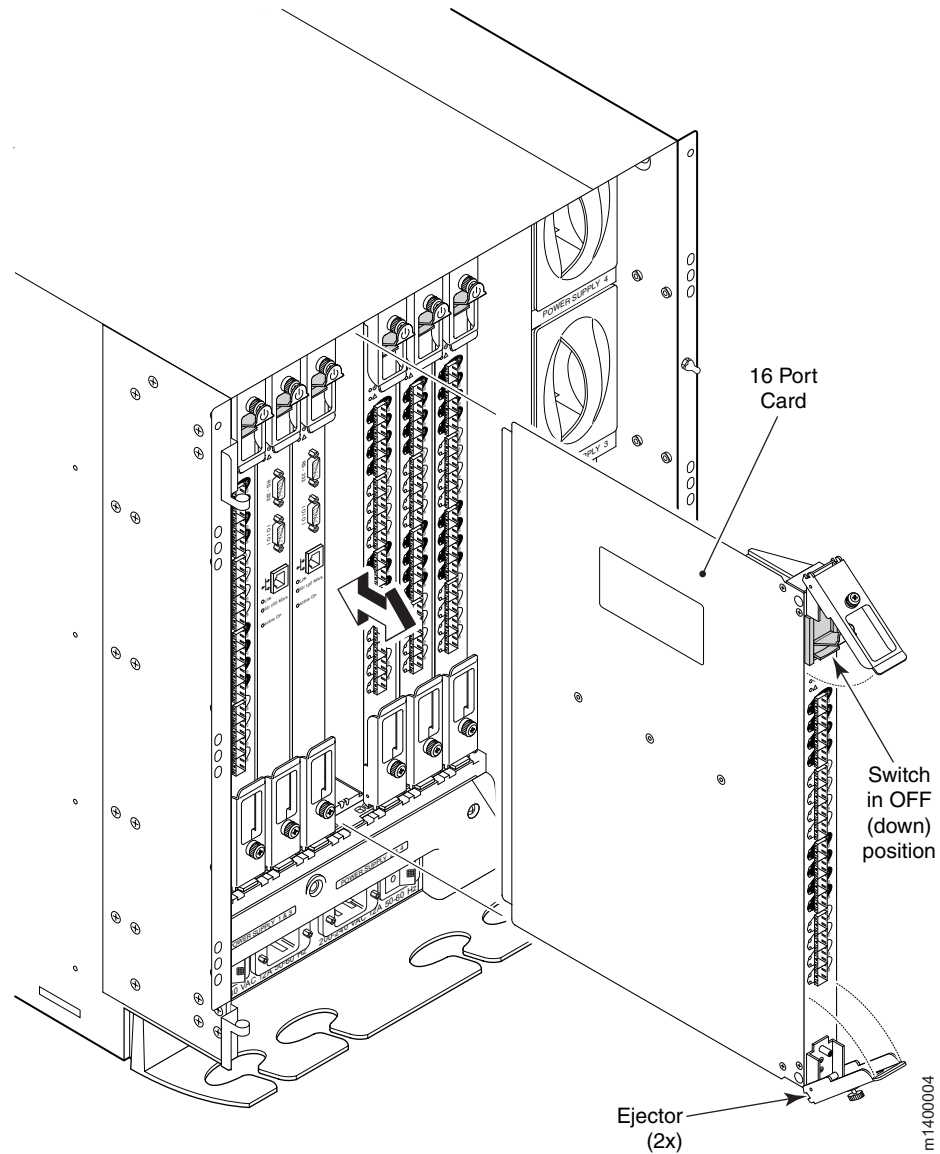


Figure 38. 16-port card removal and replacement

Time required

10 minutes or less

Items required

- ESD (electrostatic discharge) grounding strap
- Workstation computer
- Replacement port card or filler panel
- Small form factor pluggable (SFP) transceivers (as needed)
- SFP cables (as needed)

Removing a 16–port card

A failed 16–port card can be identified by inspecting its LEDs and by using CLI commands to verify status. See “16–port card status” on page 19 for a description of the LEDs. See the Fabric OS Procedures Guide for information about how to check the status of hardware components using the CLI.

Attention: Wear a grounded ESD strap when handling a 16–port card. The chassis has a grounding connection above the power connectors. See Figure 36 on page 52.

Attention: Hold the 16–port card by the edges of the metal pan. Do not use the ejectors to hold or carry a 16–port card.

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

Note: Before removing any cables from the faulty 16–port card, make note of the cable order by referring a cable to the physical port; this reduces confusion during recabling. If multiple 16–port cards are being replaced, replace one card at a time. Before replacing a 16–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 16–port card (port LEDs should be off) prior to disconnecting cables.
2. Disconnect any cables and SFP transceivers from the 16–port card.
3. Turn the 16–port card off by sliding the on/off switch in the top handle down.

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

4. Wait for the power LED to turn off in response to the hot-swap request before uninstalling the 16–port card.
5. Unscrew the captive screws from both handles.
6. Lever both ejectors open to approximately 45 degrees, and pull the 16–port card out of the chassis.

Note: If you inadvertently relatch the ejectors prior to the 16–port card being removed, wait at least 1 second prior to unlatching the ejectors again.

7. If the card is not being replaced by another 16–port card, install a filler panel to ensure correct cooling of the chassis and protection from dust. See “Installing a filler panel” on page 59 for instructions.

Removing a filler panel

Perform the following steps to remove a filler panel:

1. Remove the two captive screws. See Figure 39 on page 57.
2. Grasp the handle in the middle of the faceplate.
3. Slide the filler panel out of the chassis.

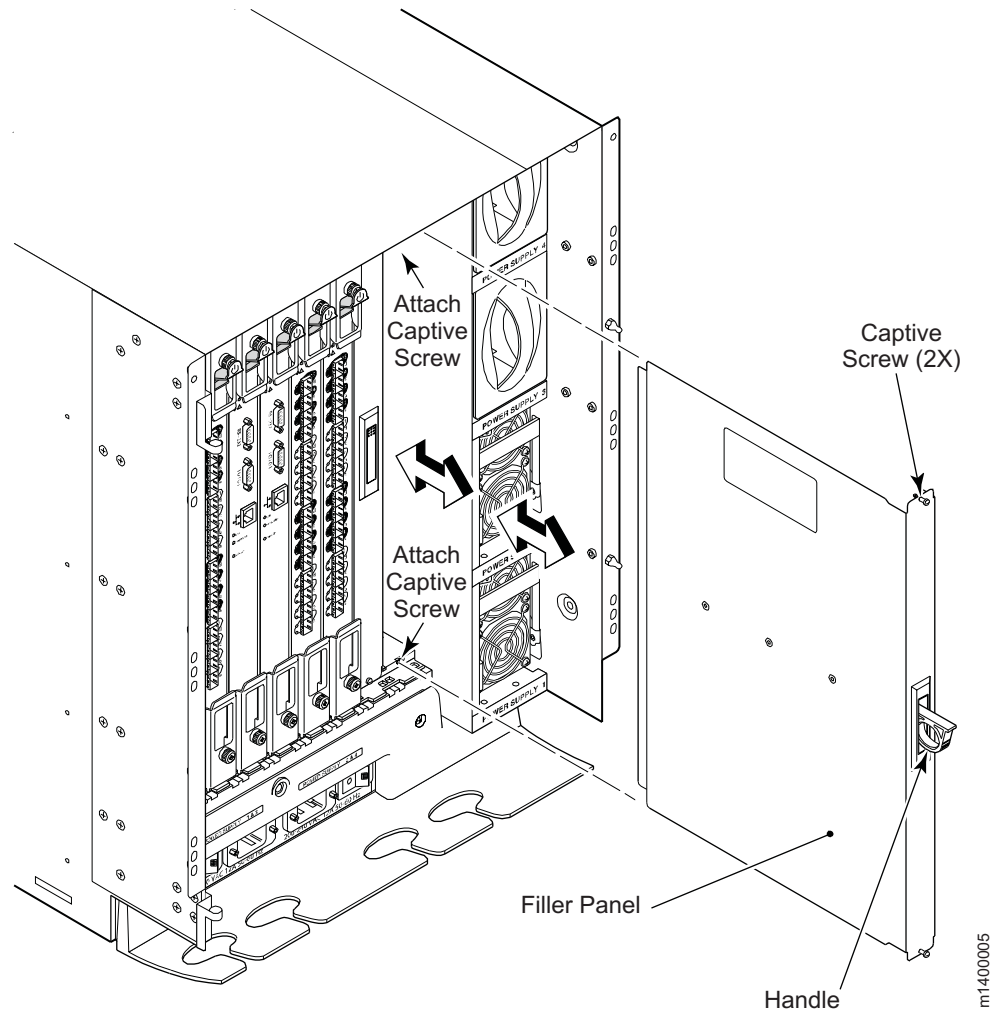


Figure 39. Removing and replacing a filler panel

Replacing a 16–port card

You can install a 16–port card in any combination of slots 1–4 and 7–10. The control processor (CP) cards occupy slots 5–6. Any slots that are not occupied by a 16–port card (or CP card) should have a filler panel installed to ensure correct cooling of the chassis and protection from dust.

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 continuing. Installing a 16–port card or filler panel with incorrect alignment damages both the chassis and the replacement part.

Attention: Wear a grounded ESD strap when handling a 16–port card. The chassis has a grounding connection above the power connectors. See Figure 36 on page 52.

Attention: Hold the 16–port card by the edges of the metal pan. Do not use the ejectors to hold or carry a 16–port card. (See Figure 38 on page 55)

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

Perform the following to replace the 16-port card.

1. Orient the 16-port card so that the ejectors are at the front of the chassis and the flat side of the card is on the left.
2. Open the ejectors to approximately 45 degrees. Align the flat side of the 16-port card inside the upper and lower rail guides in the slot. See Figure 40, which shows the alignment groove detail with a filler panel installation. Slide the 16-port card into the slot, with slight pressure to the left, until it is firmly seated.

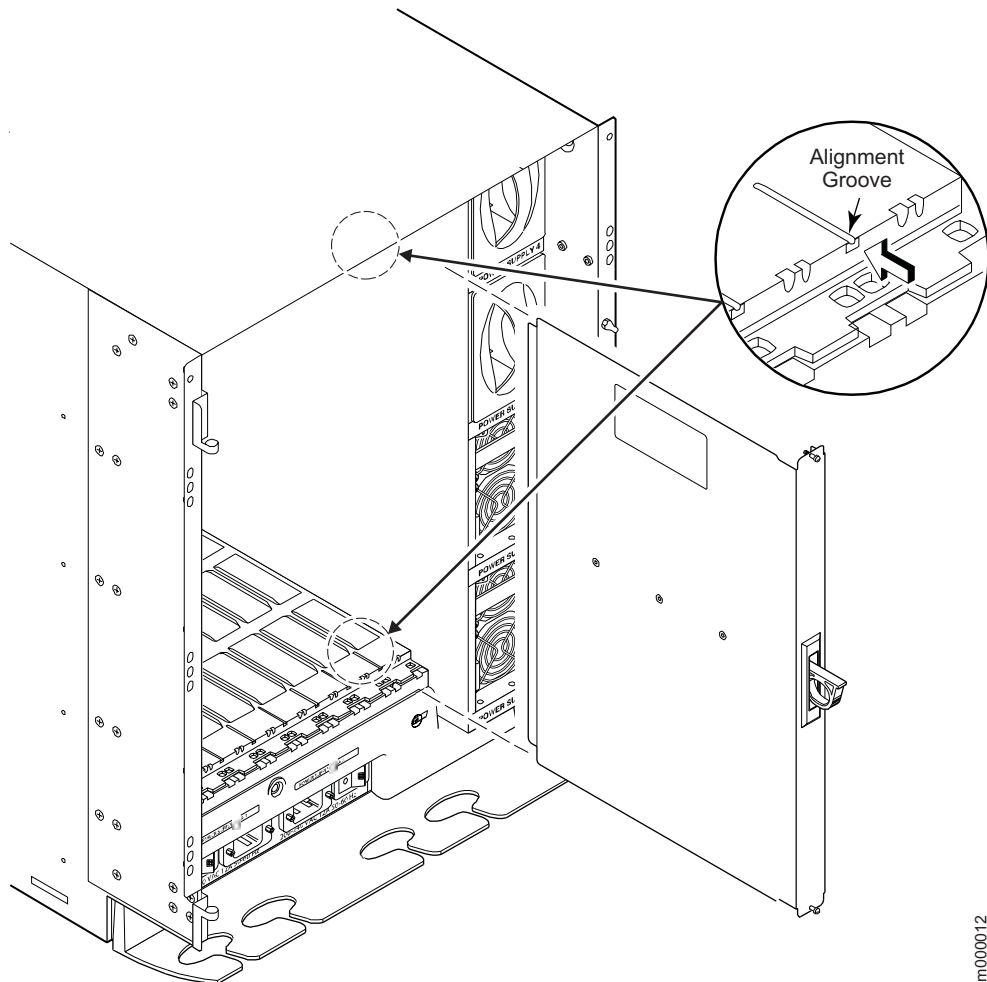


Figure 40. Card guides inside each card slot

3. Close the ejectors by pushing the black handles toward the center of the port card until the ejectors lock. The levering action of the handles seats the 16-port card in the slot.
4. Verify that the power LED on the 16-port card is displaying a steady green light (it can take a few seconds to turn on). If it does not turn on, ensure that the 16-port card has power and is firmly seated.

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

5. Install SFP transceivers and cables in the 16–port card, as required.
6. Group and route the cables as desired. See “Managing cables” on page 50 for additional cabling instructions.

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

7. Verify the installation. For information about how to check the status of hardware components using the CLI, See the *Fabric OS Procedures Guide*.

Installing a filler panel

Perform the following procedure to install a filler panel.

1. Align the flat side of the filler panel inside the upper and lower rail guides in the slot (see Figure 40 on page 58). Slide the filler panel into the slot (with slight pressure to the left) until it is firmly seated.
2. Tighten the two captive screws.

Removing and replacing a CP card

Use this procedure to remove and replace a control processor (CP) card from the M14. See Figure 41. Each M14 has two CP cards: one located in slot 5 and the other in slot 6.

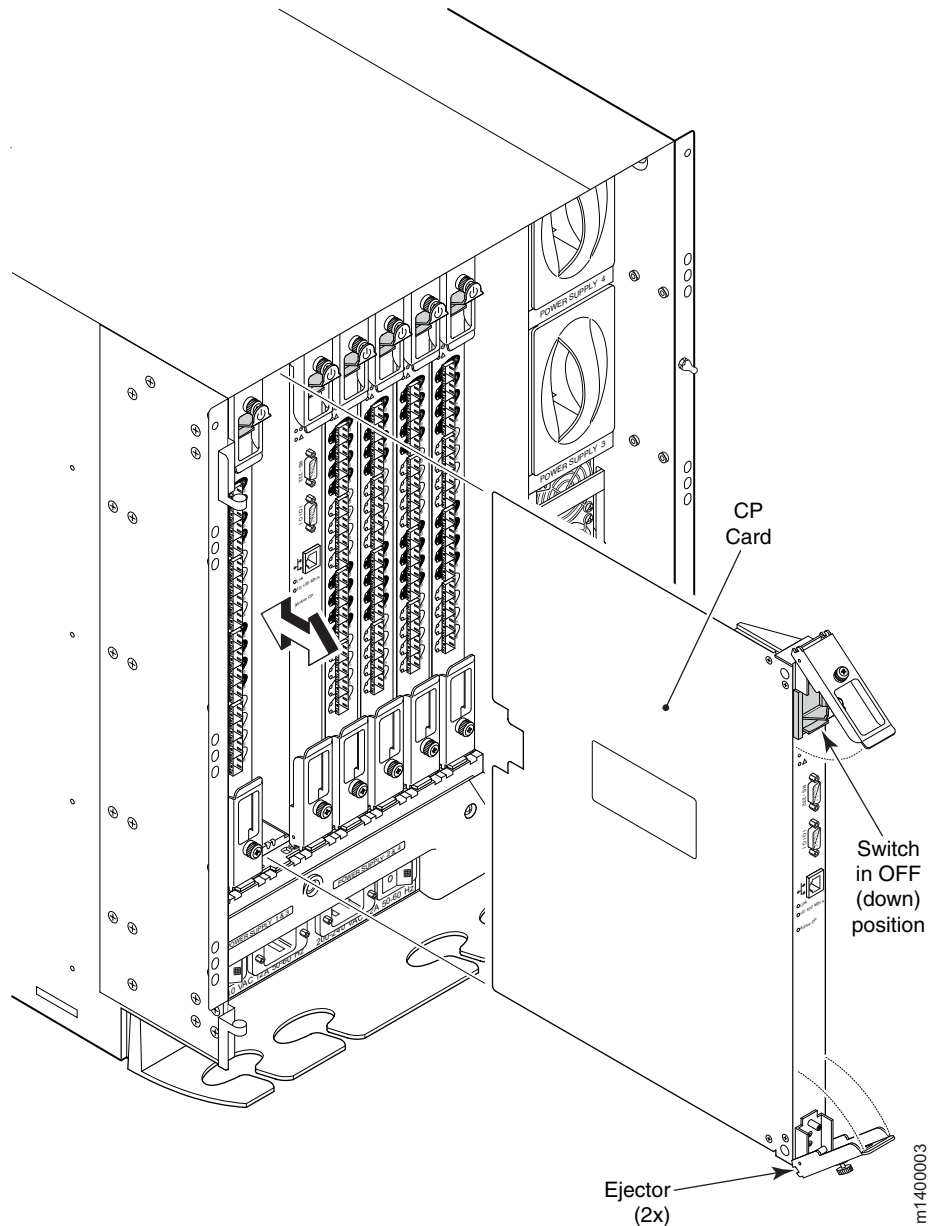


Figure 41. CP card removal and replacement

The M14 can continue to operate while one CP card is replaced if the other CP card continues to operate and no failover occurs. You can prevent failover by entering the **hadisable** command. The active CP card is determined by the most recent failover.

The configuration on the active CP card is automatically mirrored to the standby CP card; this section includes steps to ensure that the new CP card boots up as the standby CP card.

The new CP card automatically assumes the IP address and host name assigned to the slot. If the new CP card does not have the same firmware as the active CP card, it must be upgraded or downgraded to the same firmware version.

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

Attention: To ensure adequate system pressure for cooling purposes, leave the faulty CP card in the slot until you are ready to perform the replacement procedure.

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



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)

Time required

Approximately 30 minutes

Items required

- ESD (electrostatic discharge) grounding strap
- Workstation computer
- Serial cable provided with the M14
- IP address of an FTP server for backing up the M14 configuration

Confirming a failed CP card

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

- The Status LED on the CP card is yellow, or the Power LED is not on.
- The **slotshow** command does not show that the CP card is enabled.
- The CP card does not respond to Telnet commands, or the serial console is not available.
- The **hashow** command indicates that the CP cards have not achieved redundancy (after 30 minutes).
- The calendar clock is inaccurate, or the CP card does not boot up or shut down normally.
- Any of the following messages display in the error log:
 - Slot unknown message relating to a CP slot

- CP card errors or I2C time-outs
- 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 Diagnostics and System Error Messages Reference*.

If none of the these items are true and you have not already confirmed the CP card failure with your switch supplier, contact your switch supplier before continuing.

Recording critical switch information

The switch configuration should be backed up before you replace 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 running on the workstation (such as synchronization programs).
 - b. Connect a serial cable to the terminal serial port (10101 Console Port). See Figure 17 on page 23.
 - c. Connect the other end of the serial cable to a serial port on the workstation. If necessary, the adapter on the serial cable can be removed to allow for a serial RJ-45 connection.
 - d. Open the terminal emulator application and configure as follows:
 - For most UNIX systems, type the following string at the prompt:
`tip /dev/ttby -9600`
 - For Windows 95, 98, 200, or NT, see the Table 12.

Table 12. 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. The default password is password. See the following example for possible output.

```
Fabric OS (swDir)
swDir login: admin
Password:
swDir:admin>
```

3. Check the active LED on the CP cards. See Figure 17 on page 23 to determine which one is active.

4. Run the **hashow** command to confirm the active CP card. See the following example for possible output.

```
swDir:admin> haShow
Local CP (Slot 5, CP0): Active
Remote CP (Slot 6, CP1): Standby
HA Enabled, Heartbeat Up, State Synchronized
swDir:admin>
```

Enter all of the remaining commands from the serial console for the active CP card, unless otherwise indicated. For more information about the commands, See the *Brocade Fabric OS Reference*.

5. If the healthy CP card is also the active CP card, continue with 6, otherwise, fail over the cards as follows:
 - a. Create a serial connection to the faulty CP card.
 - b. Log in to the serial console as admin.
 - 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 on (indicates failover is complete).
 - e. Run the **hashow** command from the serial console for the healthy CP card (the new active CP card) to verify the failover. See the following example for possible output.

```
Fabric OS (swDir)
swDir login: admin
Password:
swDir:admin>hashow
Local CP (Slot 5, CP0): Active
Remote CP (Slot 6, CP1): Standby
HA Enabled, Heartbeat Up, State Synchronized
swDir:admin>

swDir:admin> hafailover

Forcing Failover...

swDir:admin>

swDir:admin> hashow
Local CP (Slot 5, CP0): Standby
Remote CP (Slot 6, CP1): Active
HA Enabled, Heartbeat Up, State Synchronized
swDir:admin>
```

6. Run the **version** command to record the version of the active CP card.
7. Run the **hadisable** command from the active CP card to prevent failover or communication between the CP cards during the replacement.
8. From the serial console for the healthy (and active) CP card, back up the current configuration:
 - a. Run the **configupload** command.

Note: The **configupload** command uploads the switch configuration to a specified FTP server.

- b. Enter the requested information at the prompts. See the following example for possible output.

```
swDir:admin> configupload
Server Name or IP Address [host]: 123.456.78.90
User Name [None]: user
File Name [config.txt]: config.txt
Password:
upload complete
swDir:admin>
```

9. Log into the M14 and back up the current configuration:
 - a. From the serial console for the healthy CP card, enter the **login** command.
 - b. Log in as admin.
 - c. Enter the **configupload** command.
 - d. Enter the requested information at the prompts.

Removing a CP card

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

The M14 continues to operate while a CP card is being replaced if the redundant CP card continues to operate and a failover does not occur. You can prevent failover by entering the **hadisable** command.

Attention: The core section within the M14 CP cards provide internal routing bandwidth that are always active on both CP cards. Removing a CP card might impact user performance, and should not occur until the replacement CP card is ready to be installed.

To ensure adequate system pressure for cooling purposes, leave the faulty CP card in the slot until you are ready to perform the replacement procedure.

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

Perform the following to remove a CP card See Figure 41 on page 60.

1. Disconnect all cables (modem, serial, Ethernet) from the faulty CP card.

Attention: Wear an ESD grounding strap when handling a CP card. The chassis has a grounding connecton above the power connection. See Figure 36 on page 52.
2. Turn the CP card off by sliding the on/off switch in the top handle down. See Figure 41 on page 60.
3. Wait for the Power LED to turn off in response to the hot-swap request before uninstalling the CP card.

Attention: Do not remove the CP card until the Power LED is off.

Hold CP cards by the edges of the metal pans, not by the ejector handles.

4. Unscrew the captive screw from both handles.
5. Lever both ejector handles open simultaneously to approximately 45 degrees and pull the CP card out of the chassis.

Attention: Disassembling any part of a CP card voids the part warranty and regulatory certifications. There are no user-serviceable parts inside 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)

Replacing a CP card

Attention: Do not force the installation. If the CP card does not slide in easily, ensure that it is correctly oriented and aligned in the card guides before continuing. See Figure 40 on page 58.

Perform the following steps to replace a CP card:

1. Open the ejector handles to approximately 45 degrees. Orient the CP card so that the handles are towards you and the flat metal side is on the left.
2. Align the flat metal side of the CP card inside the lower and upper card guides in the slot. See Figure 40 on page 58. Slide the CP card into the slot until it is firmly seated.
3. Close the ejectors by pressing the handles in toward the CP card.
4. Tighten the captive screws.
5. Slide the CP card on/off switch in the upper handle up (covering the captive screw).
6. Verify that the Power LED is green (might require a few seconds). If not, ensure that the CP card has power, is firmly seated, and the ejectors are in the locked position.
7. Connect the modem, serial, and Ethernet cables as required to the new CP card.

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

Verifying the operation of the new CP card

Perform the following steps to verifying the operation of the new CP card:

1. Verify that startup and POST are complete on the new CP card (a minimum of 3 minutes) and that the new CP cards have achieved failover redundancy:
 - a. Wait until the Status LEDs on both CP cards are not lit.

Note: The Status LED on the active CP card displays yellow until the active CP card is fully operational, and the Status LED on the standby CP card displays yellow until the CP cards have achieved failover redundancy.

- b. Enable the redundancy feature by entering the **haenable** command from the serial console for the active CP card
- c. From the serial console for the active CP card (which should still be the CP card that was not replaced), run the **hashow** command and verify that the

command output includes HA Enabled, Heartbeat Up, State Synchronized. See the following example for possible output.

```
swDir:admin> hashow
Local CP (Slot 5, CP0): Active
Remote CP (Slot 6, CP1): Standby
HA Enabled, Heartbeat Up, State Synchronized
swDir:admin>
```

Note: If the command output does not include HA Enabled, Heartbeat Up, State Synchronized, POST is not complete or the CP cards have not yet achieved redundancy. Wait 1 or 2 minutes and reenter the command, until you can verify that redundancy has been achieved.

Note: If **hashow** command indicates any errors after redundancy is achieved, contact the switch supplier.

2. Run the **slotshow** command. The command output should show the new CP card as enabled. See the following example for possible output.

```
swDir:admin> slotShow
Slot  Blade Type      ID  Status
-----
   1   SW BLADE  4   FAULTY
   2   SW BLADE  4   DISABLED
   3   SW BLADE  4   ENABLED
   4   SW BLADE  4   DIAG RUNNING POST2
   5   CP BLADE  5   ENABLED
   6   CP BLADE  5   ENABLED
   7   UNKNOWN      VACANT
   8   SW BLADE  4   DIAG RUNNING POST1
   9   SW BLADE  4   INSERTED, NOT POWERED ON
  10   UNKNOWN      VACANT
swDir:admin>
```

3. Enter the **firmwreshow** to determine the firmware version. See the following example for possible output.

```
swDir:admin> firmwreshow
Primary partition:      v4.2.0meteor_pit_02_031204_0722
Secondary Partition:    v4.2.0meteor_pit_02_031204_0722
swDir:admin>
```

4. If the firmware version of the replacement card does not match that of the active CP card, bring the replacement card to the same firmware level as the active card. Check with the switch supplier for supported versions.

Download the firmware, 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.
- 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 example for possible output.


```

SW0:admin> firmwaredownload
Server Name or IP Address: 123.456.78.90
User Name: user
File Name: /v4.2.0/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 #####
<some output not shown>glibc #####
sin #####
Write kernel image into flash.
file verification SUCCEEDED
Firmwaredownload completes successfully.
SW0:admin>

```

For more information about the **firmwaredownload** command, See the *Brocade Fabric OS Reference Manual*.

5. Verify that the reboot is complete and 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 to verify that the command output includes HA Enabled, Heartbeat Up, State Synchronized. If not, wait a minute and rerun the command, until you have verified 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:
 - a. Disable any serial communication programs running on the workstation (such as synchronization programs).
 - b. Connect a serial cable to the terminal serial port (10101 Console Port). See Figure 17 on page 23.
 - c. Connect the other end of that serial cable to a serial port on the workstation.

Note: If necessary, remove the adapter on the serial cable to allow for a serial RJ-45 connection.

- d. Open the terminal emulator application and configure as follows:
 - For most UNIX systems, type the following string at the prompt:
tip /dev/ttby -9600
 - For Windows 95, 98, 200, or NT, see the Table 13.

Table 13. 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.
8. Log in to the new CP card as admin. See the following example for possible output.

```
Fabric OS (swDir)
swDir login: admin
Password:
swDir: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 have specified nondefault 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 about this command, See the *Brocade Fabric OS Reference*.

See the following example for possible output.

```
swDir:admin> configshow "fabric"
fabric.domain:2
fabric.ficonmode:0
fabric.ididmode:0
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.pidFormat:1
fabric.ops.mode.tachyonCompat:0
fabric.ops.mode.unicastOnly:0
fabric.ops.mode.useCsCtl:0
fabric.ops.mode.vcEncode:0
<remaining output not shown>
swDir:admin>
```

11. If the M14 configuration does not replicate correctly, download the backup configuration:
 - a. Run the **switchdisable** command to disable the switch.
 - b. Run the **configdownload** command and enter the requested information.
 - c. After the configuration has been downloaded, run the **switchenable** command. See the following example for possible output.

```
swDir:admin> switchdisable

swDir: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
swDir:admin>

10 9 8 7 6 5 4 3 2 1
fabric: Principal switch
fabric: Domain 1
```

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

Removing and replacing a power supply and filler panel

Use this procedure to remove and replace a power supply. The M14 can continue to operate during the replacement if at least one power supply continues operating. You need a minimum of two power supplies.

Note: You do not need to notify the M14 of a hot-swap request for a power supply before you remove a power supply. The power supply bays are isolated. 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, and 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 42 on page 70 for power supply and power supply filler panel locations.

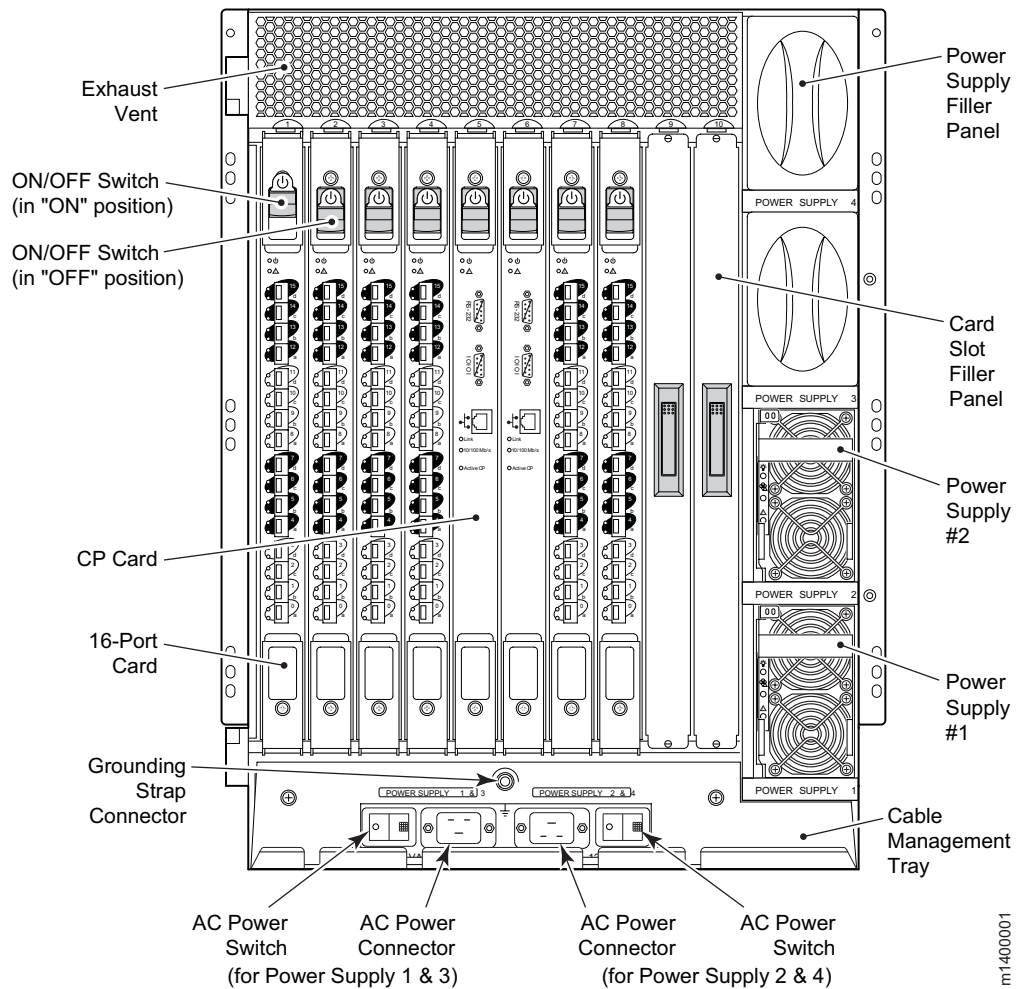




Figure 42. Model M14 power supply locations

For information about how to check the status of hardware components using the CLI, See the *Brocade Fabric OS Procedures Guide*.

Attention: To protect against ac failure, a minimum of one power supply in slot 1 or slot 3 and one in slot 2 or 4 is recommended. 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. If adequate power is abruptly lost such as through removal of a power supply, the entire switch is powered down; the power off order designated by the **powerOffListSet** command is not followed.

  <small>SJ000323</small>	<p>DANGER</p> <p>Hazardous voltage, current, or energy levels are present inside any component that has this label attached. (L001)</p>
--	---

Attention: There are no user-serviceable parts inside the power supply. Disassembling any part of the power supply voids the part warranty and regulatory certifications.

Time required

Less than 5 minutes

Items required

None

Removing a power supply or filler panel

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

1. Determine whether power adequate to keep the chassis operating will be available throughout the replacement.

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. Go to step 2.

If adequate power will not be consistently available, shut down the M14 gracefully, as follows:

- a. Open a Telnet session to the active CP card and log in to the switch as `admin`
 - b. Run the **switchshutdown** command.
 - c. Turn off the chassis by flipping both ac power switches to the off position (the 0 on the ac switch).
2. Remove the power supply from the chassis. See Figure 43 on page 72.
 - a. Push the locking tab in toward the power supply, then pull the handle out and down. Use the handle to pull the power supply out of the chassis.
 - b. Support the power supply from underneath while removing it from the chassis.

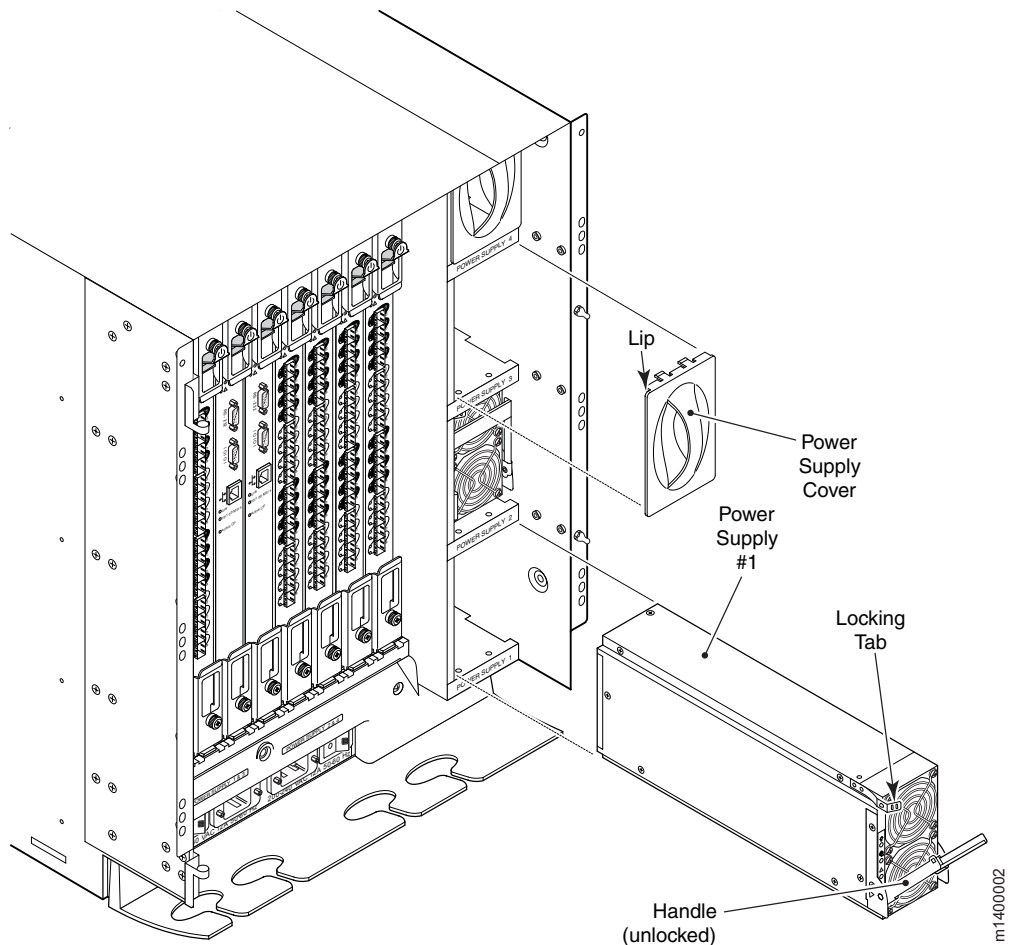


Figure 43. Power supply removal and replacement

Replacing a power supply or filler panel

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

Perform the following steps to replace the new 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 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).
3. If the chassis was powered down, flip both ac power switches to "I".

The ac power switches light up green when power is being supplied and the M14 performs POST by default.

Removing and replacing a blower assembly

Use this procedure to replace the blower assembly. The M14 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 port cards automatically shut down if the internal temperature range is exceeded.



DANGER

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

Attention: There are no user-serviceable parts inside the blower assembly. Disassembling any part of the blower assembly voids the part warranty and regulatory certifications.

Time required

Less than 5 minutes

Item required

No. 2 flathead screwdriver

Removing a blower assembly

Perform the following steps to remove a blower assembly:

1. Before removing the blower assembly, verify the other two assemblies are functioning correctly. The blower assembly power LED should be steady green and the fault LEDs should not be lit. See Figure 44 on page 74 for LED locations. For information about how to check the status of hardware components using the CLI, See the *Brocade Fabric OS Procedures Guide*.

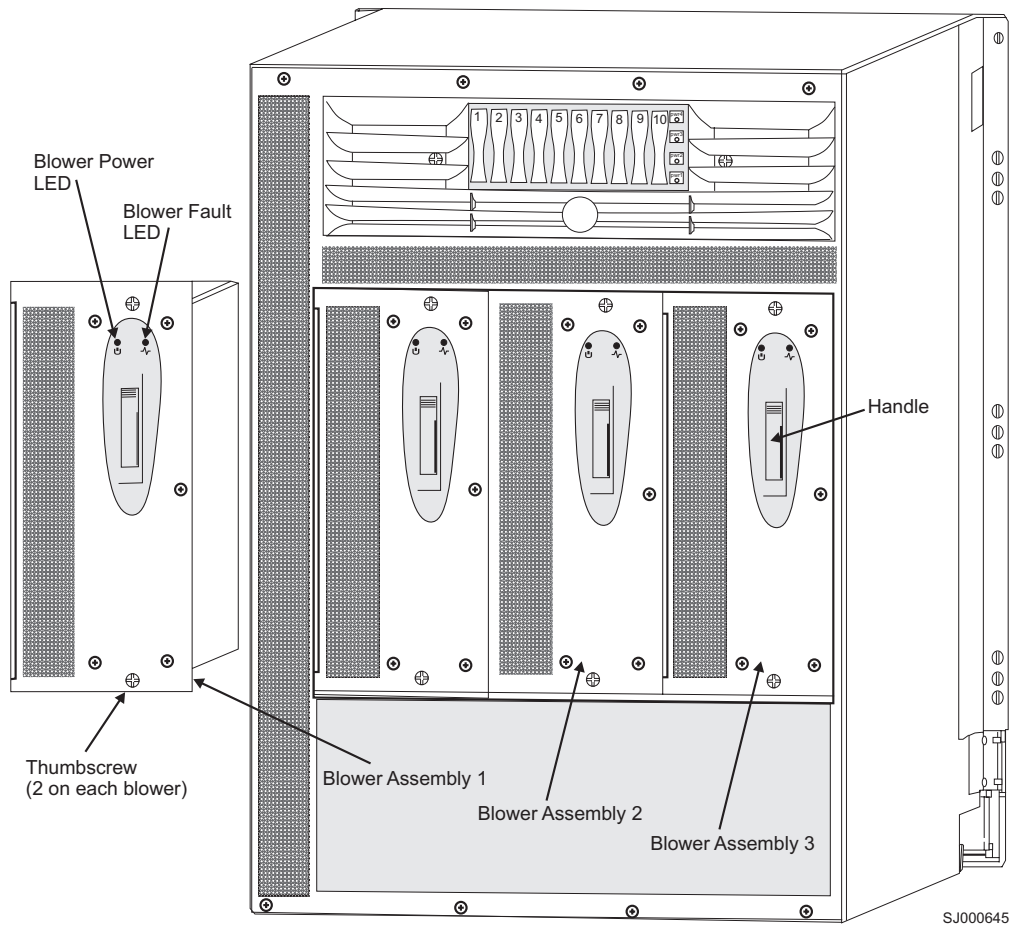


Figure 44. Blower assembly LED locations

2. Remove the blower assembly from the chassis.
 - a. Use the screwdriver to loosen the self-retaining screws at the top and bottom of the blower assembly. See Figure 45 on page 75.
 - b. Push in the top of the handle.
 - c. **Attention:** Support the blower assembly from underneath while removing it from the chassis.
Pull out the lower part of the handle, and pull the blower out of the chassis.

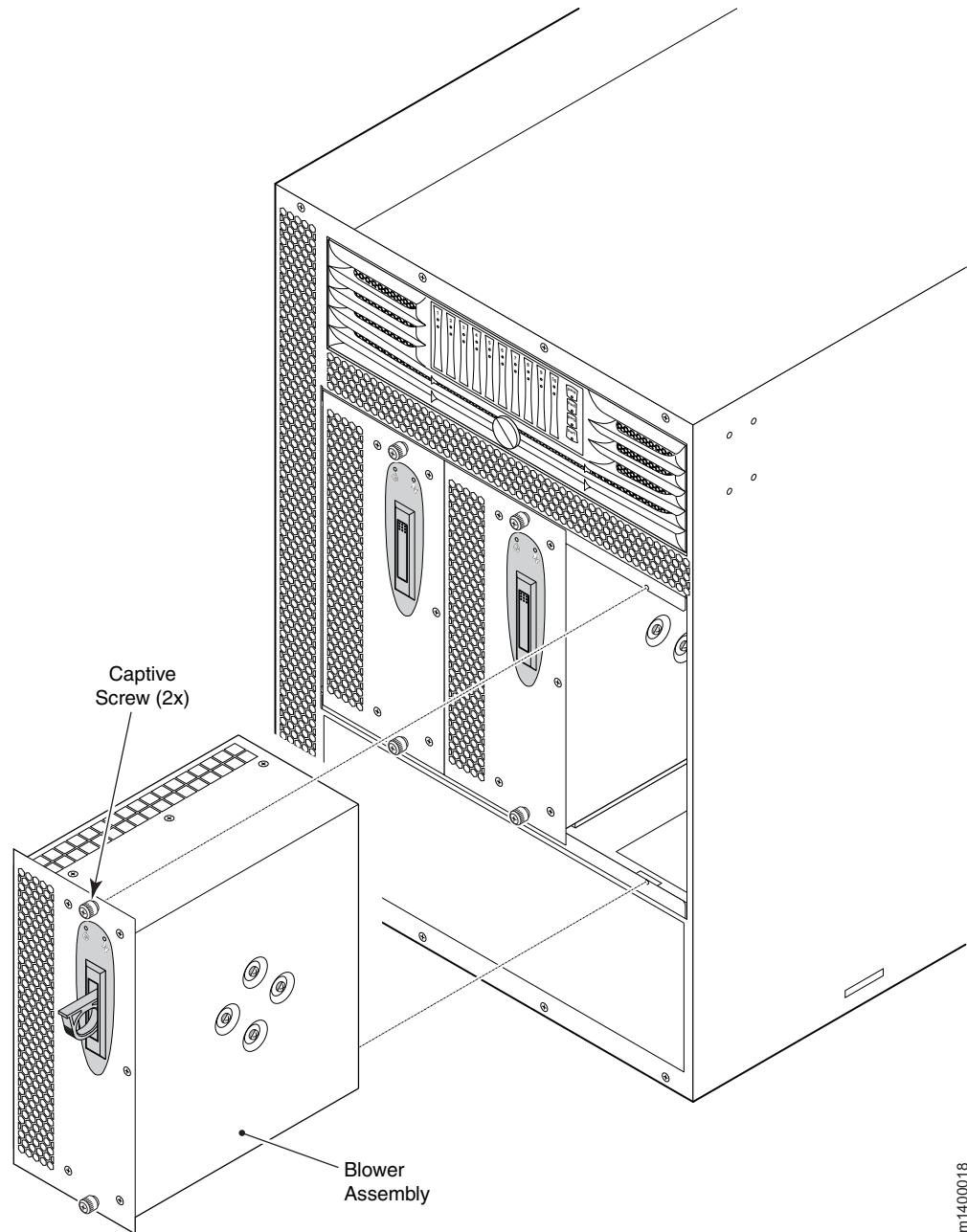


Figure 45. Blower assembly removal

m1400018

Replacing the blower assembly

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

Perform the following steps to replace the blower assembly:

1. Install the new blower assembly in the chassis.
 - a. Orient the blower assembly as shown in Figure 45.
 - b. Slide it into the chassis, pushing firmly to ensure that it is seated.

- c. Verify that the power LED displays a green light; if not, ensure that the blower assembly is correctly seated.
- d. Push the top of the handle into the recess.
- e. Tighten the self-retaining screws to finger-tight.

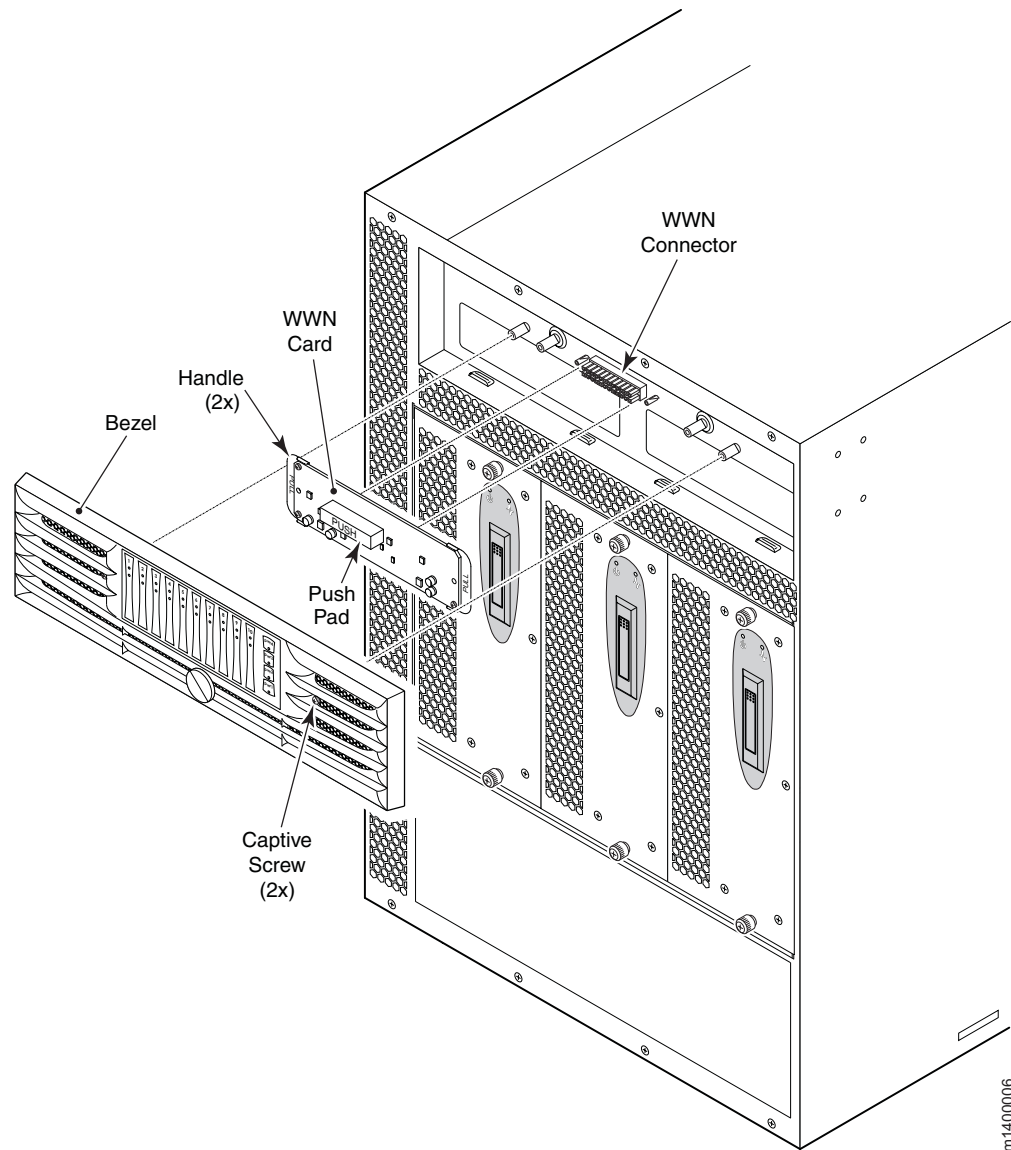
Removing and replacing the WWN bezel and card

The M14 World Wide Name (WWN) card is highly reliable and contains fully redundant circuits. The WWN card does not usually require replacement under normal operating conditions.

Before you replace a WWN card, verify that a replacement is necessary by referring to the “Verifying if a WWN needs replacing” on page 78. Contact Technical Support if you have any questions about whether the WWN card requires replacement.

If the WWN card does fail, the M14 can continue operating until the new WWN card is installed if the configuration is not modified, no hardware components are replaced, and the M14 is not restarted.

The WWN card is located on the nonport side of the chassis underneath the WWN bezel. See Figure 46 on page 77.



m1400006

Figure 46. Location of WWN card

This procedure requires a command line interface (CLI) to the M14. The CLI can be either a Telnet session or a serial console session. Instructions are provided here for both.

Note: If a serial console is used, all commands must be entered through the active CP card unless otherwise indicated. For command details, See the *Brocade Fabric OS Reference*.

Attention: Do not power cycle or restart the M14 or replace the CP cards or port cards until the WWN card is verified as functional or a replacement WWN card is installed. If any of these events happen while the WWN card is failed or uninstalled, the configuration information is lost. It will be necessary to reconfigure the M14 after installing the new WWN card.

Attention: Disassembling any part of the WWN card voids the part warranty and regulatory certifications. The WWN card contains no user-serviceable parts.

Basic instructions for replacing the WWN card are provided in this document. Additional related information can be found in the M14 WWN Bezel and Card Replacement Procedure.

Time required

20 minutes to replace the WWN card.

Items required

The following items are needed to replace the WWN card:

- ESD (electrostatic discharge) grounding strap
- If a serial console session is used, a serial cable and a workstation computer with a terminal emulator application (such as HyperTerminal for Windows systems or TIP for Solaris systems).

Figure 46 on page 77 shows the nonport side of the M14, which contains the WWN bezel and card.

Verifying if a WWN needs replacing

Before replacing a WWN card, verify that the replacement is necessary. Ensure that the current card is firmly seated when performing troubleshooting steps. Contact Technical Support if you have any questions about whether the card should be replaced.

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

- Visible mechanical damage to the WWN.
- Any of the Status LEDs on the WWN card do not reflect the actual status of the components
- Problems viewing or modifying the data stored on the WWN card. See Table 10 on page 29.
- Error messages regarding WWN units 1 or 2 See Table 15 on page 79.

To determine the status of the WWN card:

1. Check the LED indicators on the WWN bezel. See Table 10 on page 29. Verify that the LEDs reflect the actual status of the components. The WWN bezel covers the WWN card and allows its LEDs to shine through. The LEDs on the WWN bezel provide a consolidated view of the 16-port card status, CP card status, and power supply status. For information about how to interpret the LED patterns, see Chapter 3, “Monitoring system components,” on page 19.

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

2. Check the WWN card status using the commands listed in Table 14 if you have problems viewing or modifying the data stored on the WWN card. Difficulty retrieving or modifying this data could indicate a WWN card failure.

Table 14. Data stored on the WWN card

Data	Related commands
WWN values	wwn, chassisshow
Data about the chassis and WWN card	chassisshow
Ethernet and fibre channel IP address information for the CP cards	ipaddrshow, ipaddrset

Table 14. Data stored on the WWN card (continued)

Data	Related commands
History log information	historyshow , historylastshow
Name of switch	switchname
Note: For additional information about these commands, See the <i>Brocade Fabric OS Reference</i> .	

- If the error log or serial console display error messages that indicate problems with the WWN unit, the WWN card might have failed. See Table 15.
WWN units correspond to information specific to the WWN card and are displayed by the **chassisshow** command. For additional information about this command, See the *Brocade Fabric OS Reference*.

Table 15. Messages that might indicate a WWN card failure

Type of Message	Sample Error Message
WWN unit fails its FRU (field replaceable unit) header access.	0x24c (fabos): Switch: switchname, error EM-I2C_TIMEOUT, 2, WWN I2C timed out: state 0x4
WWN unit is being faulted.	0x24c (fabos): Switch: switchname, Critical EM-WWN_UNKNOWN, 1, Unknown WWN is being faulted
WWN unit is not present or is not accessible.	0x24c (fabos): Switch: switchname, Error EM-WWN_ABSENT, 2, WWN not present
Writing to the FRU history log (hilSetFruHistory) has failed.	0x24c (fabos): Switch: switchname, Error EM-HIL_FAIL, 2, HIL Error: hilSetFruHistory failed, rc=-3 for SLOT 3
Note: For more information about error messages, See the <i>Diagnostic and System Error Messages Reference</i> .	

Removing the WWN card

Attention: Do not power cycle or restart the M14 or replace the CP cards or 16-port cards until the WWN card is verified as functional or a replacement WWN card is installed. If any of these events happen while the WWN card is failed or uninstalled, the configuration information is lost, and it will be necessary to reconfigure the M14 after installing the new WWN card.

Attention: Disassembling any part of the WWN card voids the part warranty and regulatory certifications. The WWN card contains no user-serviceable parts.

This procedure requires a command line interface (CLI) to the M14. The CLI can be either a Telnet session or a serial console session.

- Open a CLI session (Telnet or serial) to the M14 and log in as admin. The default password is password.
 - Login by Telnet. See the following example for possible output.

```
Fabric OS (swDir)
swDir login: admin
Password:
swDir:admin>
```

- Login by serial console

Note: If a serial console is used, all commands must be entered through the active CP card unless otherwise indicated. For command details, See the *Brocade Fabric OS Reference*.

To log in by serial console, you must first determine which CP card is active. Check the Active CP LED (see Figure 17 on page 23) or enter the **hashow** command through either a serial or Telnet session, then connect to the active card.

- a. Connect the serial cable to the active CP card.
- b. Disable any serial communication programs running on the workstation (such as synchronization programs).
- c. Insert one of the serial cables into the terminal serial port on the active CP card (the terminal serial port is the second serial port from the top of the CP card). See Figure 17 on page 23.
- d. Connect the other end of the serial cable to a serial port on the workstation. If necessary, remove the adapter on the serial cable to allow for a serial RJ45 connection.
- e. Open the terminal emulator application and configure as follows:
 - For most UNIX systems, type the following string at the prompt:

```
tip /dev/tty -9600
```
 - For Windows 95, 98, 200, or NT, see the Table 16.

Table 16. Parameters and values

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

- f. When the terminal emulator application stops reporting information, press Enter.
- g. Log in as admin (the default password is password). See the following example for possible output.

```
<initial text printed on console not shown>
Fabric OS (swDir)
swDir login: admin
Password:
swDir:admin>
```

- h. Run the **hashow** command to determine which CP card is active. See the following example for possible output.

```
swDir:admin> hashow
Local CP (Slot 5, CP0): Active
Remote CP (Slot 6, CP1): Standby
HA Enabled, Heartbeat Up, State Synchronized
swDir:admin>
```

2. Enter `frureplace wwn` from the active CP card and wait for the phrase Do you wish to continue [y/n]? to display, then Enter y.
3. Verify that the following has occurred:

- a. The phrase Please enter the word 'continue' ... displays in the CLI. Do not enter continue until the mechanical replacement is complete.
- b. All the LEDs on the WWN bezel turn off. See the following example for possible output.

```
swDir>admin>frureplace wwn
This is the WWN card hot swap interface.
Continuing from this point will require the whole process to be
completed.
If this process is not complete due to system fails-over, or CP power
cycled, Please follow the recovery procedure in Core Switch WWN Card
Removal and Replacement document.

Do you wish to continue [yN]? y

Backing up WWN card data, please wait about 25 seconds for further
instruction.

Ready to restore WWN card data, please make sure you have a replacement
FRU now.

If this session lost due to user aborted, please reinitiate the invoking
command and follow the instructions to complete the operation.

Please enter the word `continue' when done: continue
Restoring the replacement FRU now, please wait about 20 seconds to
complete

Please enter the word `continue' when done: continue
Restoring the replacement FRU now, please wait about 20 seconds to
complete
```

These events indicate that data has been backed up and the card can be replaced.

4. Unscrew both captive screws on the WWN bezel. See “Removing and replacing the WWN bezel and card” on page 76. Pull the bezel away from chassis and set it aside. The WWN card is visible.

Attention: To protect the WWN card components, wear an ESD grounding strap and prepare an antistatic bag or grounding pad on which to place the WWN card. Do not place anything on top of the card. See Figure 47 on page 82 for the location of the grounding connector on the chassis.

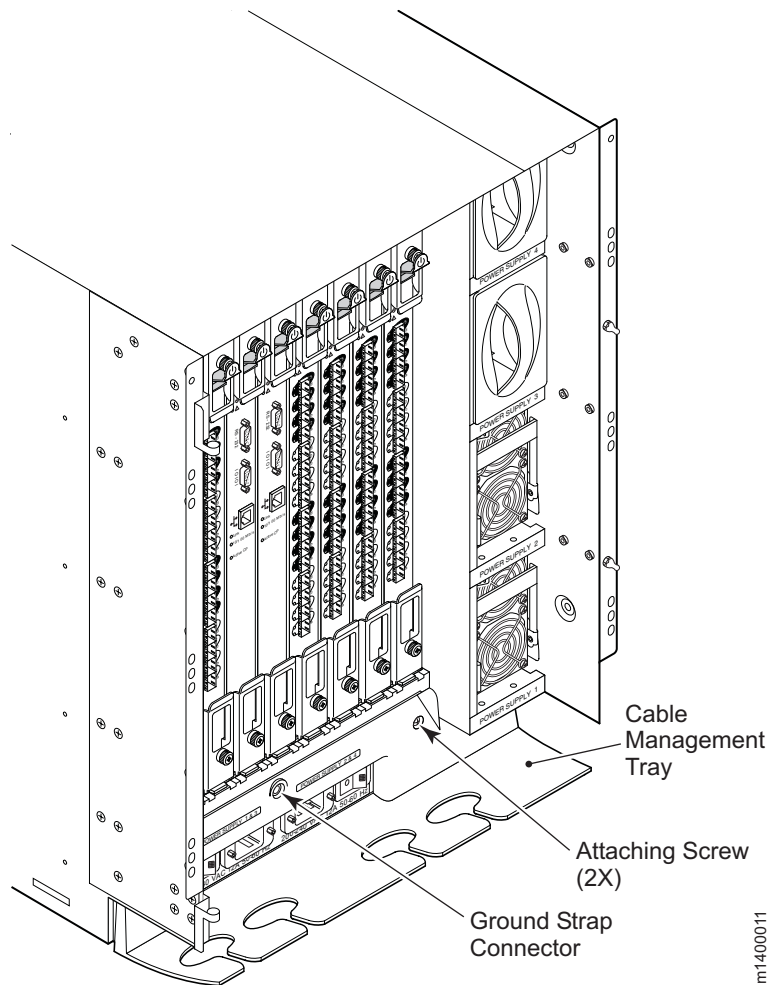


Figure 47. Position of ground

5. Use the handles to gently pull the card away from the chassis. See “Removing and replacing the WWN bezel and card” on page 76.
6. Set the WWN card on a static free surface, such as a grounding pad.

Replacing a WWN Card

Perform the following to install a new WWN card:

1. Unpack the new WWN card and save the packaging for returning the faulty WWN card.
2. Hold the card by the handles and orient with the LEDs at the top. See “Removing and replacing the WWN bezel and card” on page 76.
3. Align the connector on the card with the connector on the chassis (the connectors are keyed to ensure correct installation) and use the Push Pad to press the card onto the connector gently, until it is fully seated.

Attention: Do not force the installation; if the card does not install easily, ensure that it is correctly oriented.
4. Perform the following to reinstall the WWN bezel:
 - a. Orient the bezel on the chassis. See “Removing and replacing the WWN bezel and card” on page 76.
 - b. Insert both retaining screws into the standoffs on the chassis and tighten to finger-tight.

Note: If a serial console session is active, several removal detected and insertion detected messages display on the console as a result of the replacement.

- c. In the CLI session, type `continue` to indicate that the replacement has been completed. See the following example for possible output.

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

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

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

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

6. Pack the faulty WWN card in the packaging provided with the new card and return it to the switch supplier.
- 7.

Replacing the chassis

The M14 chassis is highly reliable. Before replacing the chassis, verify that the replacement is necessary.

Instructions are provided with the replacement chassis.

Replacing the chassis requires powering off the M14, disconnecting all cables, and gaining root access to the M14.

Attention: Disassembling any part of the chassis voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the chassis.

Verifying necessity of replacement

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

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

- Visible mechanical damage to the chassis, including damage to sheet metal or card guides that prevents correct installation of a component
- Bent or damaged connectors on the main backplane (the surface inside the chassis to which CP cards and port cards connect) or on the blower backplane (the surface to which the blower assemblies connect)
- One or more M14 components (such as a power supply, blower assembly, port card, CP card, or WWN card) do not function properly even after the component is replaced
- An ac power switch shuts off automatically even though all power supplies are removed from the chassis

- The **psshow** or **fanshow** commands continue to show a faulty component even though the component has been replaced
- The **slotshow** command continues to show a faulty CP card or port card even though the card has been replaced

Appendix A. Parts information

This appendix provides parts information for the Model M14. The quantity (units per assembly) represents the number of each FRU in a minimum configuration.

FRU part number	Units per assembly	Description
PN22R0598	1	Chassis—switch backplane, blower backplane, blowers, power supplies
PN22R0767	1	Chassis door
PN22R0600	2	Control Processor (CP) blades
PN22R0597	2	16-port switch blade
PN18P5034	6	Blade filler panels
PN18P5037	2	Power supply
PN22R0601	2	Power supply filler panels
PN18P5039	3	Blower assembly (blower + blower interface card)
PN18P5040	1 (pkg of 16)	Cable management pillars
PN18P5131	1	Cable management tray
PN18P5126	1	WWN card
PN18P5130	1	WWN bezel assembly

Cabinet parts list

Table 17 lists the items that are supplied with the 14U chassis mount kit (PN18P5015).

Table 17. Items supplied with the 14U chassis mount kit

Item No.	Description	Quantity
1	Left mount shelf bracket	1
2	Right mount shelf bracket	1
3	Left upper mount bracket assembly, containing:	1
3a	Left upper mount bracket (flat)	1
3b	Left upper mount bracket (L-shaped)	1
3c	Screw	2
4	Right upper mount bracket assembly, containing:	1
4a	Right upper mount bracket (flat)	1
4b	Right upper mount bracket (L-shaped)	1
4c	Screw	2
5	10-32 x 5/16-in. Phillips flathead screw	8

Table 17. Items supplied with the 14U chassis mount kit (continued)

Item No.	Description	Quantity
6	10-32 x 5/8 in. Phillips panhead screw with washer	4
7	10-32 clip nut (package of 20; only four are required)	20
8	1/4-20 x 1/2 in. Phillips panhead screws, with lock washer	16
Discard the following		
9	10-32 retainer nuts	4
10	1/4-20 x 1/2 in. Phillips panhead screws with glue	16
11	0.375 in. square washers	16
12	8-32 x 5/16 in. Phillips flathead screws	8

Appendix B. Product specifications

This section provides product specifications for the Model M14.

System architecture

Table 18 lists the system architecture for the Model M14.

Table 18. System architecture

Fibre channel ports	128 ports, universal (E, F, and FL) Up to eight 16–port cards
Control Processor	Redundant (active/standby) control processor modules
Scalability	Full fabric architecture: 239 switches maximum
Performance	1.063 Gbps line speed, full duplex; 2.125 Gbps line speed, full duplex; Autosensing of 1 Gbps and 2 Gbps port speeds; optionally programmable to fixed port speed; speed matching between 1 Gbps and 2 Gbps ports
ISL Trunking	Up to four 2.125 Gbps ports per ISL trunk; up to 8.5 Gbps per ISL trunk
Aggregate bandwidth	512 Gbps, end-to-end
Switch latency	<2.1 microsecond any port to any port at 2 Gbps, cut-through routing
Maximum frame size	2112–byte payload
Frame buffers	108 per 4–port group, dynamically allocated
Classes of service	Class 2, Class 3, Class F (interswitch frames)
Port types	FL_port, F_port, and E_port; self-discovery based on switch type (U_port); optional port type control
Data traffic types	Fabric switches supporting unicast, multicast (255 groups), and broadcast
Media types	Hot-pluggable, industry-standard small form factor pluggable (SFP), LC connector; short-wave laser (SWL), up to 500 m (1,640 ft); long-wave laser (LWL), up to 10 km (6.2 mi); extended long-wave laser (ELWL), up to 80 km (49.6 mi); distance depends on fiber optic cable and port speed
Fabric services	Simple Name Server; Registered State Change Notification (RSN); Alias Server (multicast); Brocade Advanced Zoning; Web Tools; Fabric Watch; Extended Fabrics; Remote Switch; ISL Trunking; End-to-End Performance Monitoring

Physical dimensions

Table 19 lists the system size and weight.

Table 19. System size and weight

System size		Weight	
Width	43.74 cm (17.22 in.)	128–port configuration	96 kg (212 lb)
Height	61.24 cm (24.11 inches/14U)	32–port configuration	88 kg (193 lb)
Depth	70.90 cm (27.90 inches)	Empty chassis	47 kg (104 lb)
Depth (with door)	74.20 cm (29.20 inches)		

Table 20 lists the FRU weights.

Table 20. FRU weights

FRU	Weight
Chassis (empty)	47 kg (104 lb)
CP card	3.3 kg (7.2 lb)
16–port card	3.0 kg (6.7 lb)
Filler panel (16–port card)	1.5 kg (3.2 lb)
Power supply	3.2 kg (7.0 lb)
Blower assembly	4.0 kg (8.8 lb)
Chassis door	3.5 kg (7.6 lb)
Cable management tray	0.3 kg (0.6 lb)
WWN bezel	0.3 kg (0.6 lb)

Facility requirements

The facility where the Model M14 is in use must meet the following requirements to provide for correct operation:

- Power requirements for a physical inlet:
 - Input power requirements: 200–240 V ac, 12A, 50–60 Hz
 - Recommended power connector: IEC 320, EN60320 C19–Angled, 16A/250V ac
- Adequate supply circuit, line fusing, and wire size, as specified by the electrical rating on the chassis nameplate
- An air flow of at least 350 cubic feet per minute, available in the immediate vicinity of the Model M14
- The power specifications listed in Table 21 on page 89
- The environmental specifications listed in Table 22 on page 89
- Electrical interference less than the levels stated in the standards listed in Table 23 on page 90
- If the Model M14 will be installed in an EIA rack, ensure the following:

- All equipment installed in the rack has a reliable branch circuit ground connection, and does not rely on a connection to a branch circuit, such as a power strip.
- The rack is balanced and mechanically secured to provide stability in the event of an earthquake.
- Additional equipment does not exceed the rack's weight limits.

Power specifications

CAUTION:

To remove all power from the Model M14, you must disconnect both power cables.

The power subsystem is a redundant +48 V dc power distribution system with a provision for up to four 1000-watt, 48V dc bulk power supplies. Bulk power supplies produce the intermediate distribution voltage in the distributed power system.

The power specifications listed in 89 are calculated for fully-loaded systems with two power supplies. A fully-loaded system has eight 16-port cards, two CP cards, and three blower assemblies.

Table 21. Power specifications

Specification	Value
Input voltage	A fully loaded switch requires a maximum of 750 Volt-Amps This results in a main current of 3.2 amps at 240 V ac line voltage or 3.6 amps at 208 V ac line voltage. The rated ac input range is 180 to 264 V ac.
Supported power range	Nominal: 200 to 240 V ac, single phase
Input frequency range	47–63 Hz
Power supplies (each)	Output voltages: 48 V at 20 amps; 12 V at 4 amps Maximum output power: 1000 watts
AC inrush current	40 amps maximum, peak
Ride through	The supply outputs remain within specified regulation for a minimum of 20 msec after the ac mains are disconnected.
Under voltage protection	The M14 power supply self-protects from any input voltage, static or dynamic, from zero volts to its operating ranges. It recovers to normal operation upon returning to its operating range.

Environmental requirements

Table 22 lists the environmental operating ranges for the Model M14. The requirements for nonoperating conditions are also provided for acceptable storage and transportation environments.

Table 22. Environmental requirements

Condition	Acceptable range during operation	Acceptable range during nonoperation
Ambient temperature	0° to 40°C outside switch (32° to 104°F)	-25° to +70°C outside switch (-13° to 158°F)

Table 22. Environmental requirements (continued)

Humidity	20%—85% RH noncondensing, at 40°C (104°F), with a maximum gradient of 10% per hour	10% to 85% RH noncondensing, at 70°C (158°F)
Altitude	Up to 3 km (10,000 ft) above sea level	0—12 km (40,000 ft.) above sea level
Shock	4G, 11 MS duration, half-sine wave	20G, 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 min.
Air flow	350 cu. ft. per min. (0.00059 cu. meter per hr)	None required.
Heat dissipation	64 ports: 3690 BTU per hr 128 ports: 6700 BTU per hr	Not applicable.

General specifications

The Model M14 is compliant with United States and International safety and EMC (Electromagnetic Compatibility) standards. Table 23 lists the general specifications for the Model M14.

Table 23. Model M14 general specifications

Specification	Description
Specification Description Configurable port types	F_port, FL_port, and E_port
EMC (electromagnetic compatibility) Emissions:	<p>Emissions: An operating Model M14 conforms to the emissions requirements specified by the following regulations:</p> <ul style="list-style-type: none"> • FCC Rules & Regulations, Part 15 subpart B, Class A • CISPR22 Class A • EN55022 Class A • VCCI Class A ITE • AS/NZS 3548 Class A • CNS13438 Class A • ICES-003 Class A <p>Immunity:</p> <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
System architecture	Nonblocking shared memory
System processor	IBM Power PC 405GP, 200 MHz CPU

Table 23. Model M14 general specifications (continued)

ANSI fibre channel protocol	FC-PH (Fibre Channel Physical and Signalling Interface standard)
Modes of operation	Fibre Channel Class 2, Class 3, and Class F
Fabric initialization	Complies with FC-SW 5.0
FC-IP (IP over fibre channel)	Complies with FC-IP 2.3 of the FCA profile
Aggregate I/O bandwidth	Per port: 4 Gbps, running at 2 Gbps, full duplex per 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)
Routing capacity	A minimum aggregate routing capacity of four million frames per second (for Class 2, Class 3, and Class F frames in a 64-port switch)

Data transmission ranges

Table 24 provides the data transmission ranges for different cable types and port speeds.

Table 24. Data transmission ranges by cable type and port speed

Port speed	Cable size (microns)	Short wavelength	Long wavelength
1 Gbps	50	500 meters (1,640 ft)	N/A
1 Gbps	62.5	300 meters (984 ft)	N/A
1 Gbps	9	N/A	6.2 miles (10 km)
2 Gbps	50	300 meters (984 ft)	N/A
2 Gbps	62.5	150 meters (492 ft)	N/A
2 Gbps	9	N/A	10 km (6.2 mi.) without an Extended Fabrics license; 50–100 km with an Extended Fabrics license

Fibre channel port specifications

The fibre channel ports in the Model M14 support full duplex link speeds at 2.125 or 1.0625 Gbps inbound and outbound, automatically negotiating to the highest common speed of all devices connected to the port. Each port has a SerDes (serializer/deserializer) 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 optical SWL (short wavelength: 780– 850 nm) and optical LWL (long wavelength: 1270–1350 nm) SFPs (small form factor pluggable media) and SFP-compatible cables. The strength of the signal is determined by the type of SFP in use.

The ports are universal and self-configuring, capable of becoming F_ports (fabric ports), FL_ports (fabric loop enabled), or E_ports (expansion ports).

The ports meet all required safety standards. For information about these standards, see “Notices” on page 113.

CP card specifications

This section describes the specifications for the CP card.

Memory specifications

The centralized memory maximizes the 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 25.

Table 25. CP card memory specifications

Main memory	256 MB of SDRAM (32-bits wide)
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	512 KB of 8-bit wide memory for system startup
Memory type	Amount

Battery specifications

The CP card has a lithium carbon-monofluoride coin cell battery type Rayovac BR1225, specification 3.0 volt, 50 mAh.



CAUTION:

The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.

Do Not:

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

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

Terminal serial port specifications

Each CP card provides a three-wire terminal serial port (labeled 10101) that has a DB-9 male connector and an RS-232 signal subset.

Note: To provide dust and ESD protection, keep the cover on the serial port whenever the port is not in use. The terminal serial port is intended primarily for use during the initial setting of the IP address and for service purposes.

The terminal serial port can be used 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.

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

The terminal serial port requires a straight-through serial cable with a female 9-pin subminiature-D connector. Use the pinouts listed in Table 26.

Table 26. Terminal serial port pinouts

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. See Figure 17 on page 23 for the location of the port.

Note: For dust and electrostatic discharge (ESD) protection, keep the cover on the serial port whenever the port is not in use.

The modem port can be used for attaching a modem to each CP card. The Model M14 detects modems only during the power-on or reboot sequences, and automatically initializes them for operation. If modems are connected to an operating switch, a power on/off cycle, restart, or fast restart is required to detect the modems.

If both modems are connected to the telephone line by a “Y” cable, the active CP card answers on the first ring; if the active CP card fails to answer, the standby CP card answers on the seventh ring.

Table 27 lists the pinouts for the modem serial port.

Table 27. Terminal 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

Table 27. Terminal serial port pinouts (continued)

Pin	Signal	Description
9	RI	Ring Indicator

Regulatory specifications

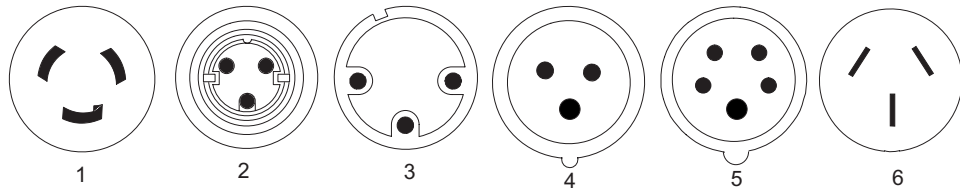
The Model M14 is certified for the safety and EMC (electromagnetic compatibility) specifications listed in Table 28.

Table 28. M14 safety and EMC certifications

Country	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	IEC 60950+A1+A2+A3+A4+A11 (NEMKO CB Report)	

Power cords

Figure 48 shows the power cords for the country or region listed in Table 29.



mlt_sj000675

Figure 48. Power cords

Table 29. M14 power cord part numbers by country or region

Index number	FRU part number	Units per assembly	Country or region
1	11F0113	1	U.S. Standard, type 12 plug, L6-30P twist-lock connector, 14 ft cord 30 A, single phase U.S.A., Canada Anguilla, Antigua, Cape Verde Islands, Cayman Islands, French Polynesia, Honduras, Montserrat, St. Kitts and Nevis, Tortola

Table 29. M14 power cord part numbers by country or region (continued)

1	11F0114	1	U.S., Chicago, type 12 plug, L6-30P twist-lock connector, 6 ft cord 30 A, single phase Chicago, Illinois, U.S.A.
1	11F0115	1	AFE, type 12 plug, L6-30P twist-lock connector, 14 ft cord 30 A, single phase Argentina, Bahamas, Bangladesh, Barbados, Bermuda, Bolivia, Chile, China, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Hong Kong S.A.R. of China, India, Indonesia, Jamaica, Japan, Macau S.A.R. of China, Malaysia, Mexico, Myanmar, Netherlands Antilles, Panama, Peru, Philippines, Singapore, Sri Lanka, Suriname, Taiwan, Thailand, Trinidad, Venezuela
N/A	18P2257	1	Universal without wall plug connector (non-US or Canada)
3	11F0106	1	30 A, single phase, PDL connector Wilco WP, type PDL plug, 14 ft cord Australia
3	11F0107	1	30 A, single phase, PDL connector Wilco WP, type PDL plug, right angle, 14 ft cord New Zealand

Table 29. M14 power cord part numbers by country or region (continued)

4	31F4466	1	32 A, single phase, three pin connector IEC 309, type 46 connector (2 power + ground), 14 ft cord Belgium, Bahrain, Botswana, Brazil, Egypt, Ethiopia, France, Ghana, Germany, Greece, Iceland, Iraq, Ireland, Italy, Jordan, Kenya, Kuwait, Lebanon, Malawi, Nigeria, Norway, Oman, Qatar, Saudi Arabia, Spain, Sudan, Tanzania, Uganda, United Kingdom, United Arab Emirates, Zaire, Zambia, Zimbabwe
N/A (See Note)	18P2257	1	Switzerland
6	87G6067	1	30 A, single phase Type KP connector, right angle, 14 ft cord Korea
Note: Install according to the national electrical code of the specific country or region.			

Appendix C. Diagnostics and troubleshooting

For information about troubleshooting the entire fabric, refer to the Fabric OS Procedures Guide.

The M14 includes a number of diagnostic tools to assist with troubleshooting, including LEDs on the hardware, commands that display current status, diagnostic tests for hardware and software, and error messages. In addition, a number of managing and monitoring features are available, such as Fabric Manager, Web Tools, Fabric Watch, and Advanced Performance Monitoring.

If the M14 does not operate as expected, the following steps can be taken to diagnose the problem:

- Check the LEDs and refer to the LED tables (see Chapter 3, “Monitoring system components,” on page 19) for interpretation and recommended actions.
- Review the results of the last POST run by the M14 (see “Interpreting POST and Boot Results” on page 98).
- Review the error logs (refer to the Diagnostic and System Error Messages Reference Manual and the Fabric OS Procedures Guide for more information).
- Enter the `sensorshow` command to determine the status of the hardware components.
- Run diagnostic tests (see “Diagnostics” on page 99).
- Reboot the switch or power the entire chassis off and then back on.

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

This appendix provides the following information:

- “Obtaining Chassis and Component Status”
- “Interpreting POST and Boot Results” on page 98
- “Diagnostics” on page 99
- “Troubleshooting” on page 100

Obtaining Chassis and Component Status

The CLI commands listed in Table 30 on page 98 provide status and environmental information about the chassis and its components. These commands provide information only, and they do not interrupt traffic flow. For more information about these commands, refer to the Fabric OS Reference Manual.

Note: The environmental commands report internal temperatures within the chassis. The 16–port cards can withstand internal temperatures of up to 75°C (167°F), and the CP cards can continue to operate up to 80°C (176°F). However, the ambient temperature outside the chassis must be 40°C (104°F) or less.

Table 30. Environmental status and maintenance commands

Command	Information Displayed
sensorshow	<ul style="list-style-type: none"> • Temperature readings for the port cards • Temperature readings for the CP cards • Status and RPM of all operational fans • Status of all operational power supplies
tempshow	<ul style="list-style-type: none"> • Temperature readings for the port cards • Temperature readings for the CP cards
psshow	Status of all operational power supplies
fanshow	Status and RPM of all operational fans
chassisshow	Serial number, time awake, and additional information about each component
slotshow	Slot occupancy
errshow	Switch error log (lists status of any marginal/failed components)

Note: Enter CLI commands with all lowercase characters.

Interpreting POST and Boot Results

The M14 switch performs power on self test (POST) by default each time the chassis is powered on or the switch is rebooted or reset. The M14 can be rebooted using the switchreboot, reboot, or fastboot commands. The fastboot command reboots the switches without running POST. If the active CP card is rebooted, it fails over to the standby CP card.

POST

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

To verify that POST has completed without error:

- Verify that all LEDs return to a normal state after POST completes (see Chapter 3, “Monitoring system components,” on page 19).

If one or more LEDs do not return to a normal state, and this is not due to the switch being set to beacon, refer to the relevant LED table to identify and correct the problem. For port cards and CP cards, the slotshow command can be used to check the status of the slots. For information about turning beaconing on/off, refer to the Fabric OS Procedures Guide.

- Verify that the switch prompt displays when POST completes.

If it does not display, POST was not successfully completed. Contact the switch supplier for support.

- Review the system log.

Any errors detected during POST are written to the system log, which is accessible through the errshow command. For information about error messages, refer to the Diagnostic and System Error Messages Reference Manual.

POST includes the following steps:

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

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

Boot

Boot completes in a minimum of three minutes if POST is run.

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

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

Diagnostics

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

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

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

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

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

For more information about diagnostic tests and how to run them, refer to the Fabric OS Procedures Guide and the Fabric OS Reference. For information about diagnostic error messages, refer to the Diagnostic and System Error Message Reference.

Troubleshooting

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

Table 31. Troubleshooting the M14

Issue	Possible Cause	Recommended Action
Entire chassis powers off automatically.	Power supplies are inadequate to support the installed components.	Add an additional power supply.
Several or all components are not operating.	One or both power cables may not be connected to a live source.	Ensure that both power cables are connected to live outlets.
	One or both ac power switches might be off.	Ensure that both ac power switches are on (ac switches light up green when on).
Serial connection is faulty or serial port logs have incorrect or missing information.	Serial cable is not connected correctly.	Ensure that the cable is firmly connected to workstation computer and to the M14.
	Terminal emulator application parameters are not set correctly.	Ensure that the terminal emulator application is configured as follows: 9600 bits per second, 8 databits, no parity, 1 stop bit, no flow control.
	Serial port might be incompatible (only RS-232 is supported).	Ensure that the M14 is connected to an RS-232 port. RS-423 serial ports might experience difficulties due to corner-case incompatibilities of the standards.
	Pins on the serial cable or serial port might be damaged.	Remove the cable and inspect the pins on the cable and in the serial port. Do not reinstall if the pins on either component have any visible damage, as this could damage the pins on the other component. Replace components as required.
Modems are not detected by switch.	Modems were connected after the M14 was powered on.	Reboot the CP card(s) to which the modem(s) are connected.
	Modems are connected to the wrong ports on the CP cards.	Ensure that the modem cables are connected to the ports labeled "RS232" (the serial ports intended for terminal use are labeled 10101).
	Modems are not correctly configured.	Verify that the modems are configured as specified in Appendix D, "Setting up and installing the modems," on page 103.
	Pins on the modem cable or modem port might be damaged.	Remove the cable and inspect the pins on the cable and in the port. Do not reinstall if the pins on either component have any visible damage, as this could damage the pins on the other component. Replace components as required.

Table 31. Troubleshooting the M14 (continued)

Ethernet link speed is different than expected or a link cannot be established.	There might be a conflict with the Ethernet link speed negotiation set up by the network.	Specify the Ethernet link speed by entering the ifmodeset command.
Configuration data is inaccurate or cannot be accessed.	Chassis was powered off/on while the WWN card was uninstalled or failed.	Install an operational WWN card and power the system off/on again.
	The switch was rebooted while the WWN card was uninstalled or failed.	
Initial set up results in IP address/Domain ID conflict.	The switch was connected to the fabric before being configured.	Refer to Chapter 2, "Starting and configuring the M14," on page 9 and the Fabric OS Procedures Guide for configuration information.
LEDs on one or more components are changing rapidly or do not indicate a healthy state.	The switch might be booting or running POST.	Verify that boot and POST are complete. The switch requires a minimum of 3 minutes, usually, after power-on to complete POST.
	Beaconing might be on for the entire switch or for individual components.	Determine whether beaconing is on by entering the switchshow command and determine whether switch beaconing or blade beaconing are on.
	Individual components might have failed.	Refer to the LED tables in Chapter 3, "Monitoring system components," on page 19 for interpretation and recommended actions.
None of the LEDs on an individual component are on.	Component might not be seated correctly.	Ensure that the switch has power and component is firmly seated. If problem continues, run the sensorshow command to determine component status (see Table 30 on page 98). If component is a CP card or port card, enter the slotshow command to determine status.
	Component might have failed.	Replace component as necessary.
CP cards are failing over frequently.	A third-party application has a memory leak.	Check application for memory leaks.
	There is excessive serial port activity.	Ensure that serial port activity remains below specified amount.
	CP card is attached to an ethernet with high traffic loads.	Ensure that ethernet traffic remains below specified amount.
	Chassis is overheated.	Enter sensorshow command (see Table 30 on page 98) to check internal temperature. If components are overheating, shut down port cards as necessary to return the temperature to operating range.

Table 31. Troubleshooting the M14 (continued)

One or more 16-port cards have either shut down or failed POST as indicated by the error log.	16-port cards might be overheated.	Enter the sensorshow command (see Table 30 on page 98) to check the internal temperature readings. If components are overheating, shut down port cards as necessary to return the temperature readings to the operating ranges.
	16-port card might be faulty.	Enter the slotshow command to determine status. For more information, enter the diagdisablepost command; then, the slotpoweron [slot number] command. Resolve the source of the problem or replace the card as required.
	Pins on the card or on the backplane (inside the slot) might be damaged.	Remove card from chassis and inspect pins on card and on backplane inside slot. Do not reinstall if pins on either component are visibly damaged, as this could damage pins on other component. Replace components as required.
An individual component is not operating as expected.	Component may not have power or may not be firmly seated.	Ensure component is receiving power (power LED should be on) and component is firmly seated.
	Pins on the component or the backplane might be damaged.	Remove component from chassis and inspect pins on card and inside chassis. Do not reinstall if pins on either component are visibly damaged, as this could damage pins on other component. Replace parts as required.
	The component might have failed.	Enter the sensorshow command to determine component status (see Table 30 on page 98). If component is a CP card or port card, enter the slotshow command to determine status. Replace component as necessary

Appendix D. Setting up and installing the modems

Each CP card in the Model M14 contains a modem serial port for connection to a Hayes-compatible modem. The modem serial ports are wired as standard DTE ports and have the same commands, log in capabilities, and operational behavior as the terminal serial ports. However, asynchronous informational messages and other unsolicited text are not sent to the modem ports. No additional software is required to use modems with the Model M14.

Note: The Model M14 detects modems only during power-on, reboot, or a CP card failover sequence. Setting up the modems before powering on the Model M14 is recommended.

For increased security, any active modem sessions are automatically disconnected if the modem cable is disconnected.

For optimal security, disconnect the modem cable when it is not in use.

Using high availability connectivity

High availability of the modem connection can be ensured by connecting a separate modem to each CP card and then connecting both modems to a shared telephone line (see Figure 49 on page 104). This ensures an available telephone connection to the active CP card even if a failover occurs; however, it is necessary to log back in after a failover. When both CP cards are connected to a shared telephone line, callers are automatically dialed in to the active CP card, which 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 login to proceed.

Note: If a modem connection is set up, connect a modem to each CP card. See Figure 49 on page 104

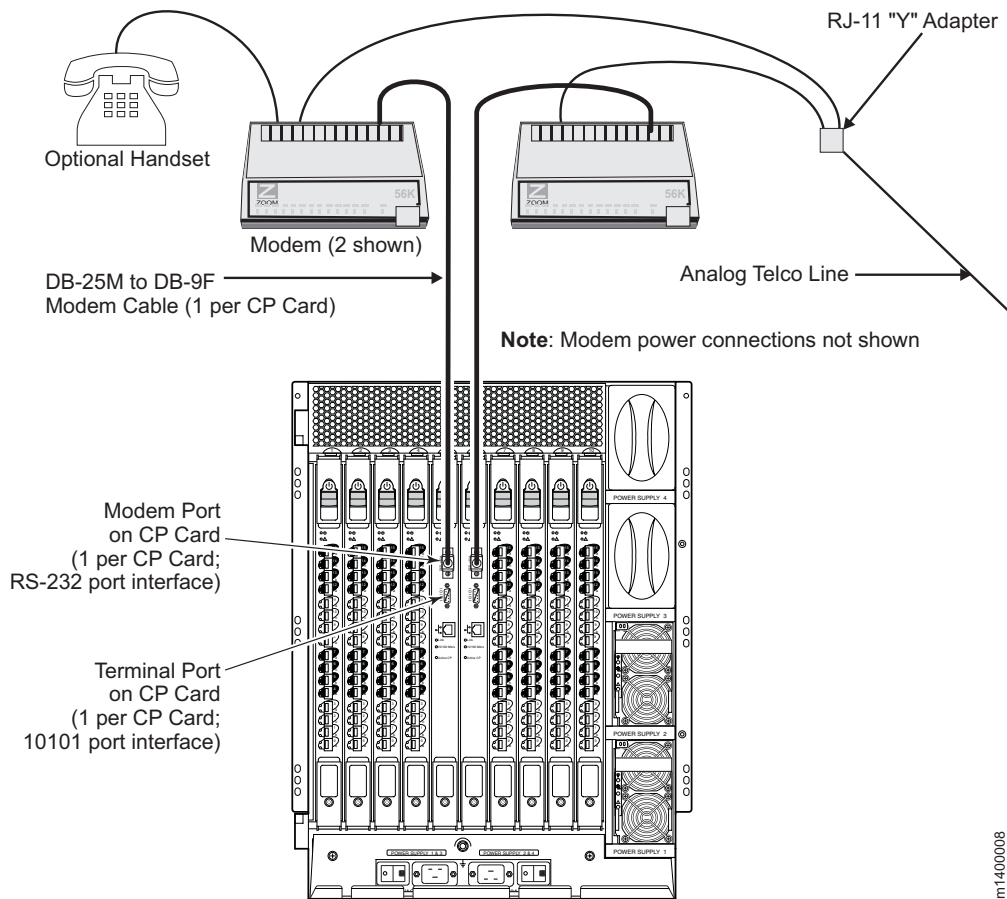


Figure 49. Two modems attached for high availability

Connecting modems

Note: Set up the modems before powering on the Model M14 and connect it to the fabric.

The following items are required to set up two modems to work with the Model M14:

- 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 (three total connections)
- One analog telephone line

Attention: Power off the Model M14 before connecting cables to the modem ports.

Perform the following to connect the modems to the Model M14:

- Optionally power off the Model M14.
- Set up the two modem units and corresponding power connections, but do not power on the modems until all cables are attached.

- Connect the modem cables to the modems and to the Model M14 RS–232 modem ports. See Figure 49 on page 104.
- Connect the telephone line inputs on the modems to the RJ–11 “Y” connector. This effectively places both modems on a single telephone line.
- Optionally connect a telephone handset to one of the “phone” connections on the modems. See Figure 49 on page 104.
- Connect the “Y” adapter to an appropriate analog telephone line and document the dial-in number for later use.
- Power on the modems and verify that the Modem Ready indicator illuminates on both units.
- Power on the Model M14, or restart if it was not powered off in step 104. This allows the Model M14 to recognize the modems.

Setting up a remote modem system

After the modems are connected, you can use a telco system to dial in to the modems and verify that they answer and communicate 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.

This procedure is only required if a dial-out modem facility is not already available for testing the Model M14 modem connections.

Perform the following to set up the optional remote modem:

1. Connect the remote modem to the workstation, as shown in Figure 50.
2. Disable any serial communication programs running on the workstation (such as a synchronization program for a PDA).

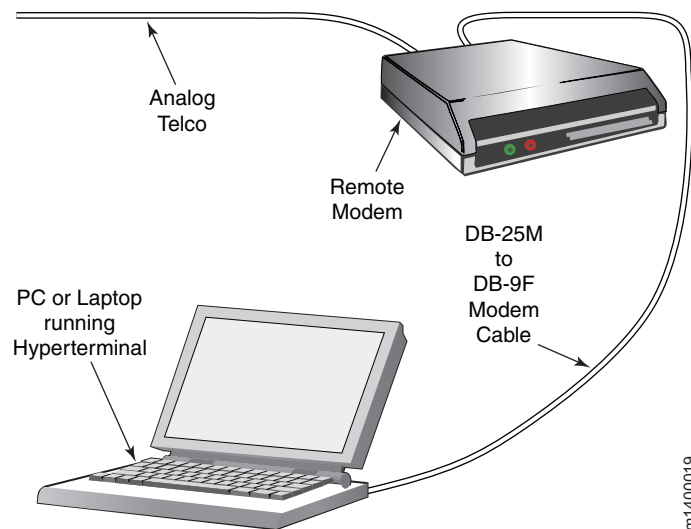


Figure 50. Remote modem setup

3. Launch the terminal emulator application and configure as described in Table 32 on page 106.

Table 32. Configuration parameters

Parameter	Value
Port speed (bits per second)	115200*
Data protocol	Standard EC
Compression	Enabled
Flow control	Hardware
Databits	Databits
Parity	None
Stop bits	1
Modulation	Modulation
*Port usually defaults to highest speed supported by modem; might negotiate for slower speed.	

4. Follow the instructions from the modem manufacturer to set up and verify modem operation.

Verifying the modem connection

This section provides information about how to verify that the modems are correctly connected.

Note: This procedure requires either a telco system to dial in to the modems or a terminal emulation program on a laptop or workstation that has an attached modem. See “Setting up a remote modem system” on page 105 for instructions on setting up a remote modem with a terminal emulation program.

Perform the following steps to verify the modem connection:

1. Verify that both modem cables are firmly connected.
2. Power on the modems, if not already on.

Note: The modems must be powered on and operational before the Model M14 is powered on, to allow the Model M14 to detect the modems during boot.

3. Verify that both modems indicate they are ready by illuminating their Clear to Send (CS), Terminal Ready (TR), and Modem Ready (MR) indicators. If this does not occur, ensure that the modems are connected to a power source and are powered on. Check all modem cable connections.
4. Verify that POST is complete on the Model M14 (a minimum of 3 minutes).
5. Dial in to the telephone number assigned to the Model M14, using a Telco system to dial-in to the modems or the setup described in “Setting up a remote modem system” on page 105.
6. Observe the modem lamps: the Ring indicator should flash briefly as the telephone rings. If the Ring indicator does not flash on both units, recheck the incoming telephone lines to the modems.
7. Verify that after one ring, the modem associated with the active CP card (usually in slot 5), illuminates the Off Hook (OH) indicator on the modem and a login prompt is presented to the remote client.
8. Log in to the switch from the remote client as admin. The default password is password.

Note: If the Off Hook indicator illuminates on the standby CP card modem, recheck the modem cable connection to the active CP card.

9. Log out of the modem session.
10. Remove the Telco connector from the active CP card modem, leaving the Telco line from the standby CP card connected to the “Y” connector. See Figure 49 on page 104.

Note: The modem session is automatically disconnected if the modem cable is detached while a session is active.

11. Dial in to the telephone number assigned to the Model M14, as described in “Setting up a remote modem system” on page 105.
12. Observe the modem lamps: the Ring indicator should flash only on the modem connected to the standby CP card.
13. Verify that after seven rings, the Off Hook indicator on the standby CP card modem is illuminated. A login prompt is presented to the remote client, and a message confirms that the standby CP card is being logged in to. You can log in or disconnect the session, as desired.
14. Reconnect the Telco connector to the active CP card modem. The Model M14 modems are ready for use.

Note: Advanced users can use the **hafailover** command to further evaluate the attached modems. The Model M14 requires approximately 5 minutes after a failover or restart to set up the modems.

Appendix E. 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 33. 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 34. 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 35. 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)			

Zone configuration worksheet

Table 36. Zone configuration worksheet

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

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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/>

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- *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 translative mode. A hardware translative mode that allows public devices to communicate with private devices across the fabric. See also *hardware translative 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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