

IBM TotalStorage™ SAN Fibre Channel Switch



# 3534 Model F08 Installation Guide

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IBM TotalStorage™ SAN Fibre Channel Switch



# 3534 Model F08 Installation Guide

**Note:**

Before using this information and the product it supports, read the information in “Safety and environmental notices” on page ix and “Notices” on page 39.

**First Edition (May 2002)**

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## Safety and environmental notices

This section contains information about:

- Safety notices used in this book
- Safety inspection for this product
- Environmental guidelines for this product

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### Safety notices and their translations

Safety notices are printed in English throughout this book.

- A *Danger* notice warns you of conditions or procedures that can result in death or severe personal injury.
- A *Caution* notice warns you of conditions or procedures that can cause personal injury that is neither lethal nor extremely hazardous.
- An *Attention* notice warns you of conditions or procedures that can cause damage to machines, equipment, or programs.

For translations of danger and caution notices, see *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 Translated Safety Notices*, GC26-7459-00. The notices are listed in numeric order based on their IDs, which are displayed in parentheses at the end of each notice. See the following examples for the location of the ID numbers.

#### **DANGER**

**An electrical outlet that is not correctly wired could place a hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (1)**

#### **CAUTION:**

**The 3534 Model F08 switch is designed to be installed by the customer, and is certified as "customer setup". Make sure that the system or rack into which the switch will be installed is also designed and certified for customer setup; if it is not, then the switch must be installed by a CE. (1)**

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### Safety inspection

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 correcting the problem.

#### **CAUTION:**

**The 3534 Model F08 switch is designed to be installed by the customer, and is certified as "customer setup". Make sure that the system or rack into which the switch will be installed is also designed and certified for customer setup; if it is not, then the switch must be installed by a CE. (1)**

### Checking the machine

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. If the 3534 Model F08 is not installed in a rack cabinet, check for loose or broken feet.
4. Check the power cord for damage.
5. Check the external signal cable for damage.
6. Check the cover for sharp edges, damage, or alterations that expose the internal parts of the device.
7. Correct any problems that you find.

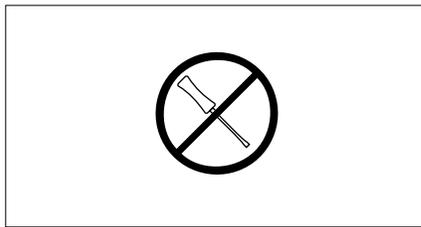
## Checking the safety labels

Perform the following safety label checks:

1. Verify that the power supply cover caution label shown in Figure 1 is installed on the power supply of the 3534 Model F08.

**CAUTION:**

**Do not remove cover, do not service, no serviceable parts. (2)**



SJ000337

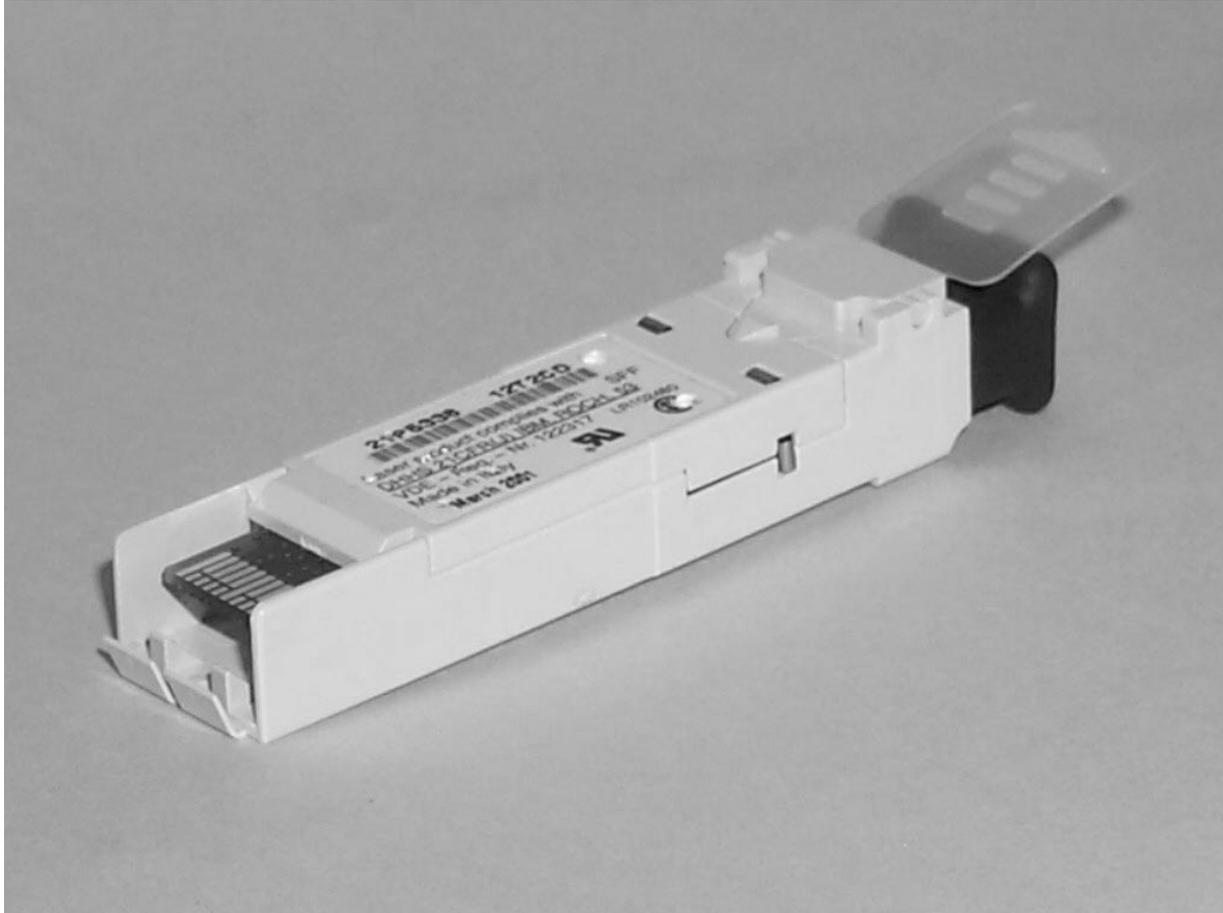
Figure 1. Power supply cover caution label

2. Verify that the small form-factor pluggable device (SFP) label shown in Figure 2 and Figure 3 on page xi is installed on the 3534 Model F08.



SJ000317

Figure 2. SFP label (front view)



SJ000314

Figure 3. SFP label (back view)

3. Verify that the safety label shown in Figure 4 is installed on the 3534 Model F08, and that the voltage specified on the label matches the voltage at the power source.

	©Registered Trademark of International Business Machines Corporation IBM Canada Ltd. Registered User	This device complies with part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
	Type: 3534 V ~ 100-240 Model: F08 A 1,0 kVA 0,2 Hz 47-63 Ø 1	この装置は、クラス A 情報技術装置です。 この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A
This machine is manufactured from new parts, or new and used parts. Assembled in the US of US and Non-US Components for International Business Machines Corporation Armonk, NY Canada ICES/NMB-003 Class/Classe A	警告使用者: 這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。	 P/N 18P4393

SJ000347

Figure 4. Safety label on the 3534 Model F08

## Checking ac grounding

### DANGER

An electrical outlet that is not correctly wired could place a hazardous voltage on the metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (1)

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## Environmental notices and statements

This section describes the environmental notices and statements.

### Battery notice

#### CAUTION:

A lithium battery can cause fire, explosion, or a severe burn. Do not recharge, disassemble, heat above 100°C (212°F), solder directly to the cell, incinerate, or expose cell contents to water. Keep away from children. Replace only with the part number specified for your system. Use of another battery may present a risk of fire or explosion. The battery connector is polarized; do not attempt to reverse the polarity. Dispose of the battery according to local regulations. (3)

### Laser safety

#### CAUTION:

In the United States use only GBIC units or Fibre-Optic products that comply with FDA radiation performance standards, 21 CFR Subchapter J. Internationally use only GBIC units or Fibre-Optic products that comply with IEC standard 825-1. Optical products that do not comply with these standards may produce light that is hazardous to the eyes. (4)



SJ000338

This unit might contain a single-mode or a multimode transceiver Class 1 laser product. The transceiver complies with IEC 825-1 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated under the recommended operating conditions.

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.

#### Usage restrictions

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

### 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.



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## About this book

This book describes how to plan for and install the IBM TotalStorage™ SAN Fibre Channel Switch 3534 Model F08, hereafter referred to as the 3534 Model F08.

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## Who should read this book

This book is intended for hardware service personnel who are responsible for installing the 3534 Model F08 in a SAN fabric.

Throughout this book, the term *switch* applies to any IBM 3534 switch, unless the reference is to a specific model.

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## Additional information

This section contains information about the 3534 Model F08 library, Web sites, and how to get help and software updates.

### 3534 Model F08 library

Information related to this product can be found in the following publications:

- *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 Installation Guide*, SY27-7631
- *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 User's Guide*, GC26-7454
- *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 Command Reference*, GC26-7455
- *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 Translated Safety Notices*, GC26-7459

### Web sites

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

[www.ibm.com/storage/fcswitch/](http://www.ibm.com/storage/fcswitch/)

For detailed information about the fibre-channel standards, see the Fibre Channel Association Web site at:

[www.fibrechannel.com/](http://www.fibrechannel.com/)

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

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

### Getting help

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

Be prepared to provide the following information to the support personnel:

- The switch serial number
- The switch worldwide name
- The topology configuration

- Any output from the **supportShow** Telnet command
- A detailed description of the problem
- Any troubleshooting steps that have already been performed

## Getting software updates

Contact your switch supplier for software updates and maintenance releases. New switch firmware can be installed from the following host operating systems:

- UNIX<sup>®</sup>
- Microsoft<sup>®</sup> Windows NT<sup>®</sup>
- Windows 98
- Windows 95

For utility programs to facilitate loading firmware, sample Fabric Watch configurations, and MIB files for switch management by SNMP, see the following Web site:

[www.storage.ibm.com/ibmsan/products/sanfabric.htm](http://www.storage.ibm.com/ibmsan/products/sanfabric.htm)

## How to send your comments

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- Mail or fax

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## Chapter 1. Introduction

This chapter introduces the 3534 Model F08 and includes the following information:

- Overview of the 3534 Model F08
- System components
- Managing the 3534 Model F08

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### Overview of the 3534 Model F08

The 3534 Model F08 is an 8-port, dual-speed, auto-sensing fibre-channel switch. It supports link speeds up to 2 Gbps, includes the Fabric Operating System (Fabric OS), and is compatible and interoperable with the current series of 2109 and 3534 switches. It can operate as the only switch in the fabric or in a fabric that contains multiple switches.

The 3534 Model F08 has an air-cooled chassis and can be installed either as a stand-alone unit or mounted in a 1U 48.26 cm (19 in.) rack. It includes the following features:

- Eight optical ports, each with two light-emitting diodes (LEDs). One LED indicates port status and the other indicates link speed.
- Automatic negotiation to the highest common speed of all devices that are connected to a particular port. The ports are:
  - Compatible with small form-factor pluggable media (SFP)
  - Universal and self-configuring
  - Capable of individually becoming a fabric enabled port (F\_port), a fabric loop enabled port (FL\_port), or an expansion port (E\_port)
- One serial port with an RS-232 connector.
- One 10 Mbps or 100 Mbps Ethernet port with an RJ-45 connector and two LEDs. One LED indicates port status and the other indicates link speed.
- Two switch status LEDs, one on the front panel and one on the back, which indicate the overall status of the switch.
- One power supply without an ac switch.
- Five fan assemblies.

**Note:** The 3534 Model F08 contains no serviceable parts except the SFPs; see Chapter 5, “Replacing an SFP” on page 25.

In addition, each 3534 Model F08 package includes:

- One 3.048 m (10 ft) RS-232 serial cable, which you can convert to an RJ-45 connector by removing the adapter on the end of the cable.
- One 1.8288 m (6 ft) power cable.
- Four rubber mounting feet, which you can use if you are installing the switch as a stand-alone unit.
- One power cable extender.
- One rack mount kit, which you can use if you are installing the switch in a rack. See Table 6 on page 11 for a list of the parts included in the kit.
- One documentation CD-ROM.
- One copy of this book, the *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 Installation Guide*.

See Appendix A, "Product specifications" on page 27 for the 3534 Model F08 specifications.

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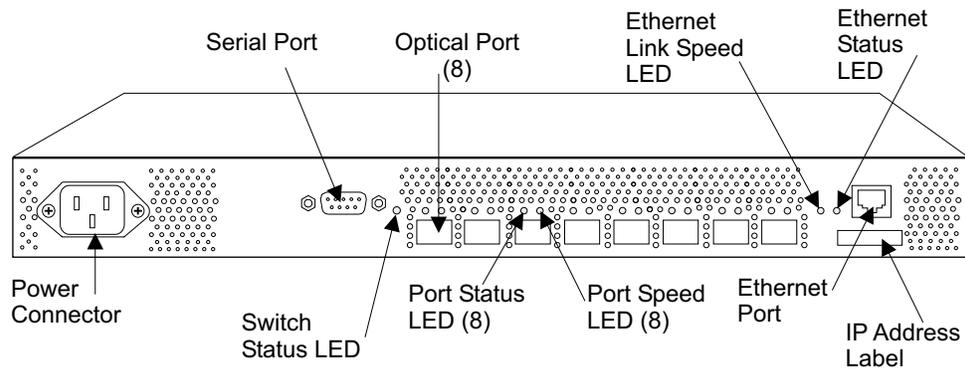
## System components

This section describes the front and back panels of the 3534 Model F08.

### Front panel

Figure 5 shows the front panel of the 3534 Model F08. The front panel contains the following components:

- Power connector
- IP address label
- Serial port
- Switch status LED
- Fiber optic ports and their corresponding LEDs
- Ethernet port and its corresponding LEDs



SJ000334

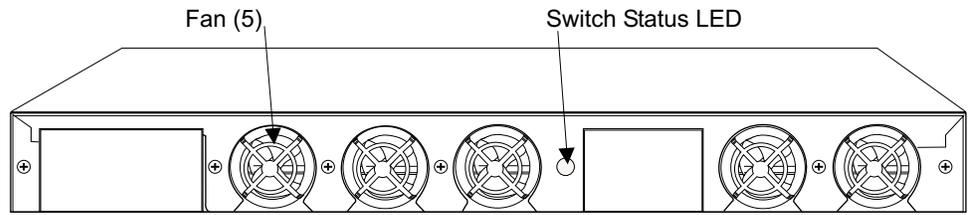
Figure 5. Front panel of the 3534 Model F08

The ports on the front panel are color-coded in groups, indicating which ports can be used in the same inter-switch link (ISL) Trunking group.

**Note:** ISL Trunking enables traffic to be distributed over the combined bandwidth of up to four ISLs between two adjacent switches, while preserving in-order delivery. It is managed through the software. For information about ISL Trunking, see the *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 User's Guide*.

### Back panel

Figure 6 on page 3 shows the back panel of the 3534 Model F08. The back panel contains fans and the switch status LED.



SJ000336

Figure 6. Back panel of the 3534 Model F08

## Managing the 3534 Model F08

For system debugging and performance analysis, you can manage the 3534 Model F08 using either the in-band or the out-of-band management method. In-band uses fibre-channel protocol and out-of-band connects to the Ethernet port. You can monitor attributes such as the following:

- Fabric topology
- Port status
- Physical status

**Note:** The switch automatically performs power-on self-test (POST) diagnostics each time it is turned on and records any detected errors in the error log. For more information about POST, see “Interpreting POST” on page 22.

Table 1 shows the management interfaces that are compatible with the 3534 Model F08 and whether those interfaces can be used in-band, out-of-band, or both.

Table 1. Management interfaces compatible with the 3534 Model F08

Management interface	In-band	Out-of-band
Command-line interface through a Telnet connection	X	X
TotalStorage Specialist	X	X
Standard simple network management protocol (SNMP) applications	X	X
SCSI Enclosure Services (SES)	X	

For more information about these management interfaces, see the *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 User's Guide*.

In addition, the 3534 Model F08 supports the following applications:

- Zoning
- QuickLoop
- Fabric Watch
- Performance Monitoring
- Extended Fabrics
- Remote Switch
- ISL Trunking

**Note:** An additional license may be required.

For more information about these applications, see the *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 User's Guide*.

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## Chapter 2. Planning the installation

This chapter describes how to plan the installation of the 3534 Model F08 in an operational environment and provides examples of completed planning worksheets. For your convenience, blank planning worksheets have been provided for your use in Appendix B, "Blank planning worksheets" on page 33. 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.

Table 2 shows an example of a completed planning worksheet for an installed switch. An explanation of each item in the worksheet follows the table.

*Table 2. Example of a completed planning worksheet*

Item	Description
Firmware level	V 3.1.0
Firmware location:	
Server name	C02STOR01
Username	sanman
Directory	G:\sanman\3534\firmware\v3.1
Switch name	3534SW1
Domain ID	1
FCnetID (Fibre-channel IP address)	
FC netmask	
WWN	Supplied when the box is turned on
Role	Principal switch
Syslog daemon IP address	192.20.236.4
Users defined - access level	admin - admin, petuser - none
SNMP information:	
System description	TestSANlet1_3534SW1
System contacts	(Contact name)
System location	B/003-3 Col C-4
Event trap level 0 - 5	5
Enable authentication traps	No
RW community string	dingo
RO community string	pet
Trap recipients IP address	192.20.236.3
License keys	Required for optional features

The following is a description of the items in the planning worksheet.

### **Firmware level**

The firmware levels for the 3534 and the required code for installation on a Microsoft Windows NT TotalStorage Specialist workstation.

**Firmware location**

The directory on the TotalStorage Specialist server where the firmware for the 3534 is located. IBM recommends that a different directory be used for each level of firmware that is loaded.

**Server name**

The network name of the server where the TotalStorage Specialist is run.

**Username**

The username on the TotalStorage Specialist server that owns the firmware for the 3534. IBM recommends that this not be a username with administrative or security privileges on the server.

**Directory**

The location where the firmware files are located.

**Switch name**

The name of this particular fibre-channel switch.

**Domain ID**

The domain ID that identifies this switch in the SAN configuration.

**FCnetID**

The fibre-channel IP address for this switch.

**FC netmask**

The netmask for the fibre-channel IP network.

**WWN** The worldwide name of the switch that is assigned by the manufacturer.

**Role** The role this switch is assigned (principal switch, subordinate switch, or disabled switch).

**Syslog daemon IP address**

The IP address of the host to which the syslog daemon messages are forwarded.

**Users defined - access level**

A list of users in SAN administration network and their roles.

**SNMP** The SNMP information that is supplied by the network administrator.

**License keys**

The required license keys for optional features.

See the *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 User's Guide* for information about trap levels.

Table 3 shows an example of a completed port configuration worksheet.

*Table 3. Example of a completed port configuration worksheet*

Port number	Device name	Device port	Cable length	Port type	Notes	Cable number
0	2108-1	PMC1-1	2 m (6 ft)	SW		200
1	2108-1	PMC2-2	2 m (6 ft)	SW		201
2	2108-1	PMC3-3	2 m (6 ft)	SW		202
3	3534-4	Port 5	2 m (6 ft)	SW		203
4	3534-4	Port 4	2 m (6 ft)	SW		204
5	Open		2 m (6 ft)	SW		205
6	s1411201e0	P2-I3	25 m (82 ft)	SW		206
7	s1411203e0	P2-I3	25 m (82 ft)	SW		207

Table 4 shows an example of a completed zone definition worksheet.

*Table 4. Example of a completed zone definition worksheet*

Zone member type (switch, port, WWN)	Zone member	Zone configuration name	Comments
Port (ID, P)	1, 5	Test_Zone_Config_1	K38 node 1
Port (ID, P)	1, 0	Same	2108-1 PMC1-1
Port (ID, P)	3, 3	Same	2108-2 PMC1-4
Port (ID, P)	3, 4	Same	K38 node 2
Port (ID, P)	1, 7	Same	EMC-1 dir 5 port 0
Port (ID, P)	3, 7	Same	EMC-1 dir 5 port 0

Table 5 shows an example of a completed zone configuration worksheet.

*Table 5. Example of a completed zone configuration worksheet*

<b>Zone member type</b> (switch, port, WWN)	<b>Zone member</b>	<b>Zone configuration name</b>	<b>Connects to</b>
Port (ID, P)	1, 1	Test_Zone_Config_1	2108-1 PMC2-2
Port (ID, P)	1, 2	Same	2108-1 PMC3-3
Port (ID, P)	1, 3	Same	2108-1 PMC1-1
Port (ID, P)	1, 4	Same	2108-2 PMC2-2
Port (ID, P)	1, 5	Same	2108-2 PMC3-3
Port (ID, P)	1, 6	Same	s1411201e0 P2-I3
Port (ID, P)	1, 7	Same	s1411203e0 P2-I3
Port (ID, P)	15, 0	Same	2108-1 PMC2-5
Port (ID, P)	15, 1	Same	2108-1 PMC1-4
Port (ID, P)	15, 2	Same	3534-7 port 6
Port (ID, P)	15, 3	Same	2108-1 PMC3-6
Port (ID, P)	15, 4	Same	2108-2 PMC2-5
Port (ID, P)	15, 5	Same	2108-2 PMC3-6
Port (ID, P)	15, 6	Same	s1411201e0 P3-I3

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## Chapter 3. Installing and configuring the 3534 Model F08

You can install the 3534 Model F08 as a stand-alone unit or in a rack that meets Electronic Industries Association (EIA) standards.

This chapter describes how to install and configure the 3534 Model F08 and includes the following information:

- Installation and safety considerations
- Installing the 3534 Model F08 as a stand-alone unit
- Installing the 3534 Model F08 in an EIA rack
- Configuring, connecting, and accessing the 3534 Model F08

For information about the features of the 3534 Model F08 and what is included in each 3534 Model F08 package, see “Overview of the 3534 Model F08” on page 1.

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### Installation and safety considerations

The following guidelines must be followed when installing the switch:

- Verify that the supply circuit, line fusing, and wire size that will be used are adequate according to the electrical rating on the switch nameplate.
- The switch is designed for an IT power system with phase-to-phase 230 V. The power supply might still be energized, even if internal power supply over current protection devices have opened.

#### **DANGER**

**When powering the unit with a line-to-line connection greater than 200 V ac, a potential shock hazard can arise during a fault condition. Therefore, double-pole protection is required. (5)**

- Ensure the ambient air temperature does not exceed 40°C (104°F). This is particularly important if the switch is to be installed in a closed or multi-rack assembly.
- Ensure the volume of air flow available to the switch is at least 300 cubic feet per minute, and that the front and rear air vents are not blocked.

If the switch is being installed in a rack:

- Ensure the ambient air temperature does not exceed 40°C (104°F). This is particularly important if the switch is to be installed in a closed or multi-rack assembly.
- Ensure the volume of air flow available to the switch is at least 300 cubic feet per minute, and that the front and rear air vents are not blocked.
- The switch requires a rack space that is 1 unit high, 48.26 cm (19 in.) wide, and 60.96 cm (24 in.) deep.
- Verify that all equipment installed in the rack has a reliable branch circuit ground connection. Do not rely on a connection to a branch circuit, such as a power strip.
- Verify that the additional weight of the switch does not unbalance the rack or exceed the weight limits of the rack.
- IBM recommends that you mechanically secure the rack to ensure stability in the event of an earthquake.

---

## Installing the 3534 Model F08 as a stand-alone unit

Follow this procedure to install the switch as a stand-alone unit on a flat surface.

### Time required

Approximately 10 minutes.

### Installation instructions

Complete the following steps to install the switch as a stand-alone unit:

1. Unpack the 3534 Model F08 and verify that all ordered items are present.
2. Turn the switch upside down and lay it on its top.
3. Apply the adhesive rubber feet.

**Attention:** Installing the rubber feet on the switch is recommended to minimize the chance of the switch sliding off the supporting surface.

- a. Clean the four depressions on the chassis bottom to ensure that they are free of dust.
  - b. Place one rubber foot in each depression with the adhesive side against the chassis.
  - c. Press the rubber feet firmly into place.
4. Return the switch to its normal upright position and place it on a sturdy flat surface.
  5. When you are ready to supply power to the switch, connect the power cable to the 3534 Model F08 power supply and to a power outlet. (The power supply does not have an ac switch.)

The 3534 Model F08 automatically runs a POST each time power is supplied to it.

#### **DANGER**

**An electrical outlet that is not correctly wired could place a hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (1)**

**Attention:** Ensure that the power cable is routed so that it is not pinched or exposed to stress.

**Note:** Do not connect the switch to the network until the internet protocol (IP) address is correctly set. For more information, see "Configuring, connecting, and accessing the 3534 Model F08" on page 15.

---

## Installing the 3534 Model F08 in an EIA rack

Follow this procedure to install the 3534 Model F08 in a rack that meets EIA standards.

#### **CAUTION:**

**The 3534 Model F08 switch is designed to be installed by the customer, and is certified as "customer setup". Make sure that the system or rack into which the switch will be installed is also designed and certified for customer setup; if it is not, then the switch must be installed by a CE. (1)**

## Time required

Approximately 30 minutes.

## Items required

The following items are required to install the 3534 Model F08 in an EIA rack:

- Straight slot screwdriver
- Rack space: 1 rack unit high, 48.26 cm (19 in.) wide, and 60.96 cm (24 in.) deep
- Rack mount kit; see Table 6 for a list of the parts that are included in the kit
- Power cable, provided with the switch
- Power outlet

**Attention:** Use the exact screws specified in the procedure for use with the switch chassis. Using screws longer than 3/16 in. can damage the switch. The different types of screws are listed in Table 6.

**Note:** Firmly tighten all the screws that are used in this procedure.

## Installation instructions

This section describes the basic procedure of installing the 3534 Model F08 in an EIA rack, and then provides detailed steps.

**Note:** To ensure that the switch is adequately cooled, IBM recommends that you install it with the port side (the side with the SFP) facing the aisle where exhaust air is released (usually referred to as the service aisle). This prevents the fans from pulling in heated exhaust air.

### Basic procedure

The basic rack-mount installation procedure consists of the following four steps:

1. Mount the moving slide and the lock mounting ears to the switch.
2. Mount the fixed portion of the slide in the rack.
3. Insert the switch and move a portion of the slide into the fixed portion on the rack.
4. Lock the switch in the rack using the mounting ears installed in step 1.

### Detailed steps

To complete the rack-mount installation procedure, follow these detailed steps:

1. Unpack the 3534 Model F08 and verify that all ordered items and parts are present. See Table 6 for a list of parts and the quantities supplied in each rack mount kit.

Table 6. Parts supplied with the rack mount kit

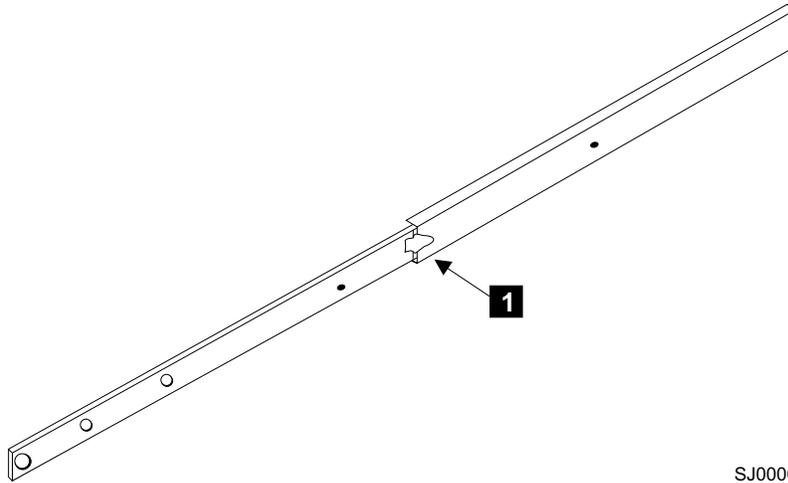
Item	Description	Quantity
<b>1</b>	Rack mount slide (inner and outer slide)	2
<b>2</b>	Right rack mount bracket (optional bracket for the front of the switch)	1
<b>3</b>	Left rack mount bracket (optional bracket for the front of the switch)	1
<b>4</b>	Rack mounting bracket (3-hole)	4
<b>5</b>	Nut clip, M5	11
<b>6</b>	Screw, 8-32 x 3/16 in., zinc	11

Table 6. Parts supplied with the rack mount kit (continued)

Item	Description	Quantity
<b>7</b>	Screw, M5 x 12	11
<b>8</b>	Bracket to slide rack kit (contains items 9 - 12)	1
<b>9</b>	Screw, 8-32 x 3/8 in., zinc	5
<b>10</b>	Washer, flat, No. 8	5
<b>11</b>	Washer, lock, No. 8	5
<b>12</b>	Nut, hex, 8-32	5

**Note:** Because this rack mount kit is distributed with various switches, you might end up with extra parts that are not needed for the installation of your switch into your rack assembly.

2. Separate the inner and outer slides.
  - a. Open one of the slides until the lock engages.
  - b. Press the lock release lever and remove the inner rail from the outer rail, as shown in Figure 7.



SJ000046

Figure 7. Moving slide

- c. Repeat steps 2a - 2b for the other rail.

**Note:** For racks with flush-mount doors such as the 9306 Netfinity® racks, you can eliminate the installation of the ears. Instead, use the rack-mount slides by attaching the 3534 Model F08 to the set of mounting holes, which are offset 2.62 cm (3 in.) into the rack.

3. Install the inner (smaller) slide on the 3534 Model F08 chassis.
  - a. Position the flat side of the inner rail along one side of the switch, aligning the holes in the rail with the threaded holes in the side of the switch chassis. The chamfered end of the inner rail should face toward the rear of the switch (away from the ports) as shown in Figure 8 on page 13.
  - b. Attach the inner rail using two of the 8-32 x 3/16 in. zinc screws **6**.
 

**Attention:** Using screws longer than 3/16 in. can damage the switch.
  - c. Repeat steps 3a - 3b for the second inner rail on the other side of the switch chassis.

4. Optional step: If desired, install the right rack mount bracket **2** and the left rack mount bracket **3** on the switch chassis. These brackets secure the switch to the rack as shown in Figure 8.

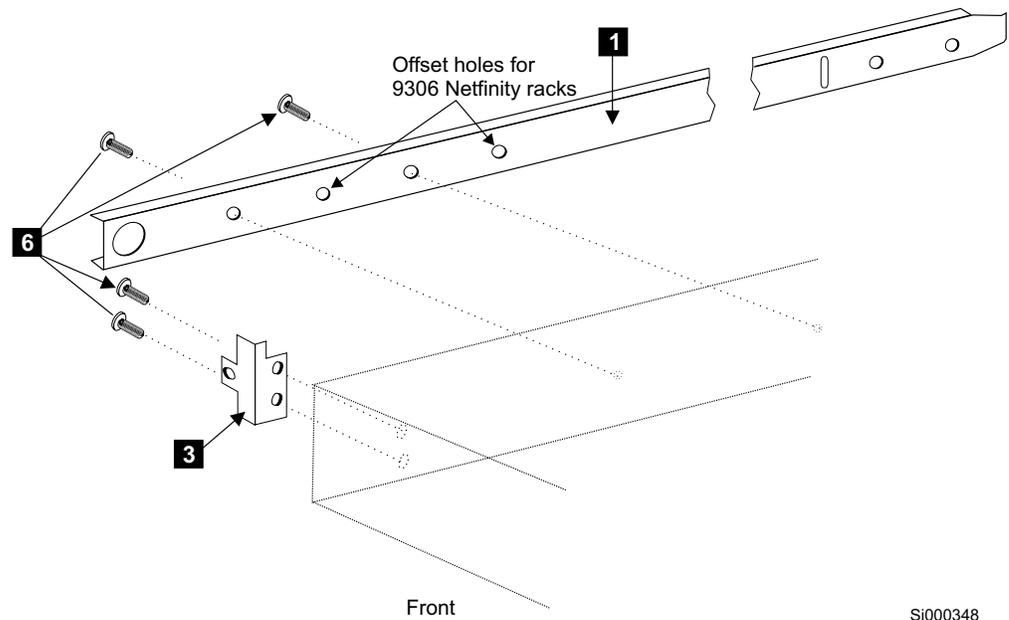
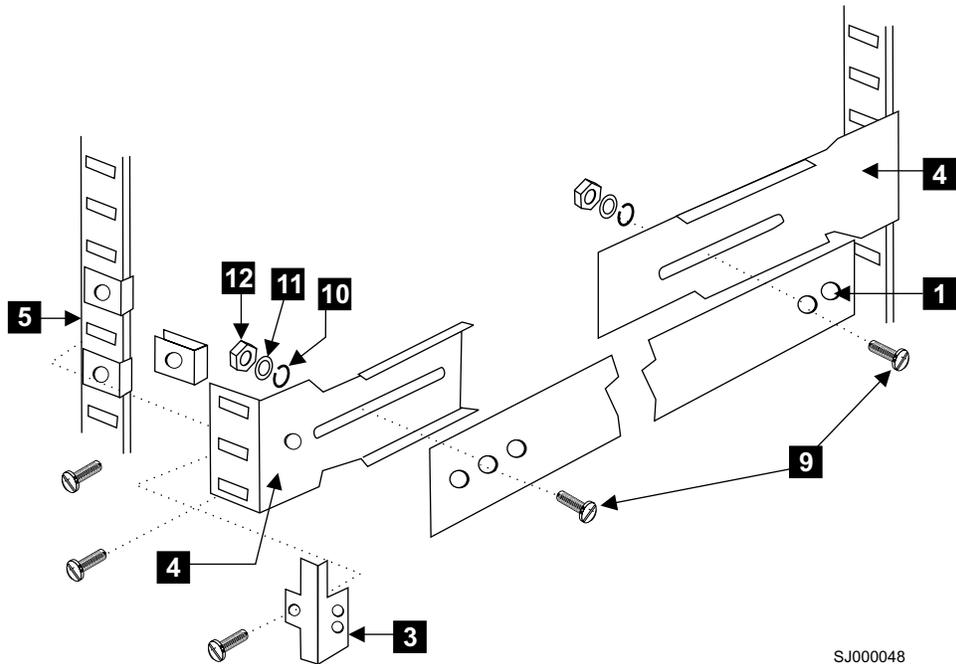


Figure 8. Mounting the moving portion of the slide and the mounting brackets to the switch

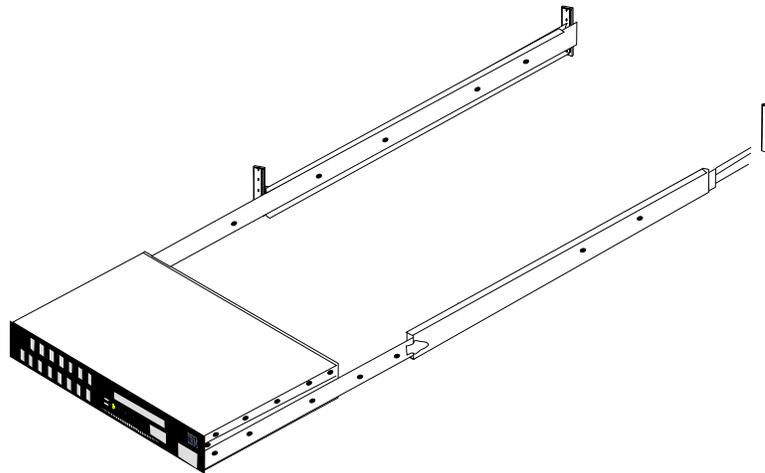
- a. Position the left rack mount bracket at the left front corner of the switch chassis, so that the two holes in the bracket align with the two threaded holes in the switch chassis.
  - b. Attach the bracket using two of the 8-32 x 3/16 in. zinc screws **6**.  
**Attention:** Using screws longer than 3/16 in. can damage the switch.
  - c. Repeat steps 4a - 4b for the right rack mount bracket on the right front corner of the switch chassis.
5. Attach all four of the 3-hole rack mounting brackets **4** as shown in Figure 9 on page 14.



SJ000048

Figure 9. Mounting the fixed portion of the rail and the locking ears to the rack

- a. Position a 3-hole bracket **4** at the end of one of the outer slides.
- b. Attach the bracket using the 8-32 x 3/8 in. zinc screws **9**. Make sure that the screw heads are inside the slides.
- c. Place one of each of the following items on the outer end of the screw in the order listed:
  - 1) Washer flat No. 8 **10**
  - 2) Washer, lock No. 8 **11**
  - 3) Nut, hex, 8-32 **12**
- d. Repeat steps 5a - 5b for the three remaining rail ends.
6. Install the outer (larger) slides in the rack, as shown in Figure 9.
  - a. At the desired height, install the five M5 nut clips **5**; put three in the front of the rack and two in the back. The middle clip in the front of the rack is for the locking ears.
  - b. Attach the slides using four M5 x 12 screws **7**.
  - c. Repeat steps 6a - 6b for the other rail.
7. Install the switch in the rack.
  - a. Position the switch in front of the rack and insert it into the rack by sliding the inner slides on the switch into the outer slides on the rack. See Figure 10 on page 15.



SJ000049

Figure 10. Inserting slides into the rack rails

- b. Verify the alignment of the slides by sliding the switch in and out of the rack. Any difficulty moving the switch indicates lateral stress or misalignment; if this occurs, adjust the slide positions until the movement is smooth.
8. Optional step: If the right rack mount bracket and the left rack mount bracket were installed on the front corners of the switch (see step 4 on page 13), attach both brackets to the cabinet rack using M5 x 12 screws **7**.

**DANGER**

**An electrical outlet that is not correctly wired could place a hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (1)**

9. When you are ready to supply power to the switch, connect the power cable to the 3534 Model F08 power supply and to a power outlet. (The power supply does not have an ac switch.)

The 3534 Model F08 automatically runs a POST each time power is supplied to it.

**Attention:** Ensure that the power cable is routed so that it is not pinched or exposed to stress when the switch is moved on the slides.

**Note:** Do not connect the switch to the network until the IP address is correctly set or the default IP address is verified as not conflicting with the existing IP addresses in the same network. For more information, see "Configuring, connecting, and accessing the 3534 Model F08".

---

## Configuring, connecting, and accessing the 3534 Model F08

Follow this procedure to configure, connect, and access the 3534 Model F08 for use in a network fabric.

### Time required

Approximately 15 minutes.

## Items required

The following items are required to configure, connect, and access the 3534 Model F08:

- A 3534 Model F08, installed and connected to a power source
- A workstation that has a terminal emulator application (such as HyperTerminal)
- The serial cable provided with the switch, for connecting the switch to the workstation
- An unassigned IP address
- An Ethernet cable for connecting the switch to the workstation or to a network containing the workstation
- Short wavelength (SWL) or long wavelength (LWL) SFPs and fiber optic cables, as required

## Configuring the switch

To configure the 3534 Model F08, replace the factory IP address and related information with the IP information that is provided by your network administrator. Follow these steps:

1. Remove the shipping plug from the serial port and insert the serial cable that is provided with the 3534 Model F08.
2. Connect the other end of the serial cable to an RS-232 serial port on the workstation. If no RS-232 serial port is available on the workstation, the adapter on the end of the serial cable can be removed. This enables you to use the RJ-45 connector to create a serial connection.
3. Verify that the switch is on and that a POST has completed.
4. Disable any serial communication programs that are running on the workstation.
5. Open a terminal emulator application (such as HyperTerminal on a PC or TERM in a UNIX environment) and configure the switch. For a Windows® 95, 98, 2000, or NT environment, use the configuration parameters shown in Table 7.

Table 7. Configuration parameters

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

In a UNIX environment, type the following command:

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

6. From the terminal emulator application, log on to the switch through the serial connection. The default administrative logon is *admin*, and the default password is *password*.
7. Type the following command:  

```
ipAddrSet
```
8. Type the appropriate information at the following prompts:

**Note:** The variables within brackets represent the default settings that your information replaces.

- Ethernet IP Address [10.77.77.77]:  
Type the new Ethernet IP address.
  - Ethernet Subnetmask [0.0.0.0]:  
Type the new Ethernet subnetmask.
  - Fibre Channel IP Address [none]:  
Type the new fibre-channel IP address, if desired.
  - Fibre Channel Subnetmask [none]:  
Type the new fibre-channel subnetmask if desired.
  - Gateway Address [172.17.1.1]:  
Type the new gateway address.
  - Set IP address now? [y = set now, n = next reboot]:  
Type y to set the IP address now.
9. Type the following command to verify that the address was set correctly:  
ipAddrShow
  10. After you verify the IP address, remove the serial cable and replace the shipping plug in the serial port.

**Note:** Use the serial port only during the initial setting of the IP address and for service purposes. Do not use the serial port during normal switch operation or for regular maintenance.

11. Record the IP address for future reference.

## Connecting and accessing the switch

Complete the following steps to connect the switch to the workstation using an Ethernet cable (this can be a direct connection or through a network), and to access the switch:

1. Remove the shipping plug from the Ethernet port.
2. Insert one end of an Ethernet cable in the Ethernet port.
3. Connect the other end of the Ethernet cable to the workstation or to an Ethernet network that contains the workstation.

**Note:** You can now access the switch remotely, using Telnet or TotalStorage Specialist. Ensure that the switch is not being modified simultaneously from any other connections during the remaining steps.

4. Log on to the switch using Telnet. The default administrative logon is *admin*, and the default password is *password*.
5. Modify the domain IDs if desired.

**Note:** The default domain ID is 1. If the domain ID is already in use when the switch is connected to the fabric, the domain ID for the new switch is automatically reset to a unique value. You can determine the domain IDs that are currently in use by issuing the Telnet **fabricShow** command. For more information about Telnet commands, see the *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 Command Reference*.

- a. Type the following command to disable the switch:  
switchDisable
- b. Type the following command:

configure

- c. Type `y` at the Fabric parameters prompt. For example:  
Fabric parameters (yes, y, no, n): [no] y
  - d. Type a unique domain ID (such as the domain ID used by the previous switch, if still available) at the Domain prompt. For example:  
Domain: (1..239) [1] 3
  - e. Complete the remaining prompts, or press CTRL+D to accept the remaining settings without completing all the prompts.
  - f. Type the following command to enable the switch:  
switchEnable
6. Optional step: Specify any custom status policies for the fabric.
    - a. Type the following command at the prompt:  
switchStatusPolicySet
    - b. Specify the desired status policies. To completely deactivate the alarm for a particular condition, type `0` at the prompt for that condition.
  7. Add SFPs and fiber optic cables to the ports as required.

**Note:** The ports and cables that are used in trunking groups must meet specific requirements. For information about these requirements, see the *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 User's Guide*.

- a. Remove the shipping plug from the ports to be used.
- b. Position the SFP so that the key (the tab near the cable end of the SFP) is on top. Insert the SFP into the port until it is firmly seated and the latching mechanism makes a clicking sound.

**Note:** The SFP is keyed so that it can only be correctly inserted into the port. If the module does not slide in easily, try turning it over. Do not force the module.

- c. Connect the fiber-optic cables to the SFPs as appropriate to the fabric topology. Position each cable so that the key (the ridge on one side of the cable connector) is aligned with the slot in the SFP. Then insert the cable into the SFP until it is firmly seated and the latching mechanism makes a clicking sound.

**Note:** The cable is keyed so that it can only be correctly inserted into the SFP. If the cable does not slide in easily, try turning it over. Do not force the cable.

8. Verify the correct operation of the 3534 Model F08. Type the following command at the Telnet prompt:

```
switchShow
```

This command provides information about the status of the switch and the ports. For more information about this and other commands, see the *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 Command Reference*.

**Note:** IBM recommends that you back up the configuration after any initial changes and periodically thereafter. This ensures that a complete configuration is available if you need to install a replacement switch. For information about backing up the configuration, see the *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 User's Guide*.

---

## Chapter 4. Operating the 3534 Model F08

This chapter describes how to operate the 3534 Model F08 and includes the following information:

- Turning the 3534 Model F08 on and off
- Interpreting LED activity
- Interpreting POST
- Maintaining the switch

---

### Turning the 3534 Model F08 on and off

To turn the 3534 Model F08 on, plug it into a power outlet. (The power supply does not have an ac switch.) To turn the switch off, unplug it from the power outlet.

**Note:** Unplugging the switch triggers a system reset. When the switch is plugged in, all devices are returned to the initial state and the switch runs a POST. For information about the POST, see “Interpreting POST” on page 22.

---

### Interpreting LED activity

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

**Note:** The LEDs might flash yellow during diagnostic tests and green, orange, or yellow during a POST. This is normal, and does not indicate a problem unless the LEDs do not return to a normal pattern after the POST is complete.

The 3534 Model F08 has the following LEDs:

#### **Port status LED**

These LEDs indicate the status of each port. There are eight port status LEDs, located above and to the left of each port on the front panel.

#### **Port speed LED**

These LEDs indicate the speed of each port. There are eight port speed LEDs, located above and to the right of each port on the front panel.

#### **Switch status LED**

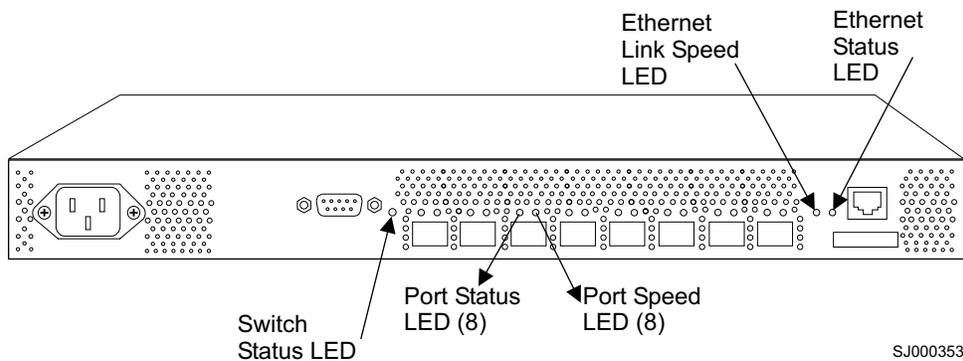
These LEDs indicate whether the switch is on and has successfully started. There are two switch status LEDs, one on the front panel and one on the back.

#### **Ethernet port LED**

These LEDs indicate the speed and status of the Ethernet link. There are two Ethernet port LEDs, located to the left of the Ethernet port on the right side of the front panel.

### LEDs on the front panel

Figure 11 on page 20 shows the front panel with the different LEDs identified.



SJ000353

Figure 11. Front panel LEDs

Table 8 describes the front panel LEDs. It lists the name, location, and possible colors of each LED. It then lists the status of the switch that is associated with each LED color and recommends actions that you can take in response to that status.

Table 8. Front panel LED patterns during normal operation

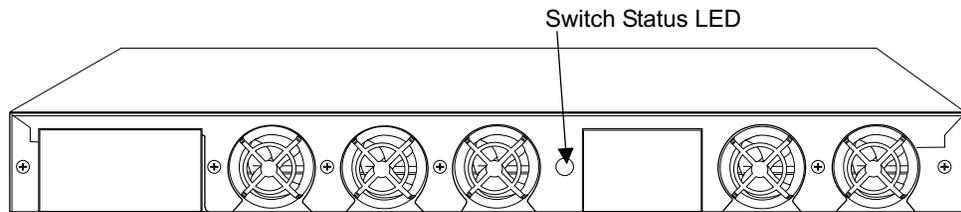
Name of LED	Location of LED	Color of LED	Status of hardware	Recommended action
Switch Status	To the right of the serial port	No light	Either the switch is off, the startup process is not complete, or the startup has failed.	Verify that the switch has power and that the startup process has had time to complete. If there is still no light, contact IBM.
		Steady green	The switch is on and startup has successfully completed.	No action is required.
		Slow-flashing green	One or more ports has failed its diagnostic check.	Verify that the correct device is connected to the port.

Table 8. Front panel LED patterns during normal operation (continued)

Name of LED	Location of LED	Color of LED	Status of hardware	Recommended action
Port Status	Above and to the left of each port	No light	No light or signal carrier (media or cable) is detected.	Verify that the media and the cable are both firmly seated and functional.
		Steady green	The port is online (it is 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 is segmented, indicating a loopback cable or an incompatible switch.	Verify that the correct device is connected to the port.
		Fast-flashing green (on 1/4 second; off 1/4 second)	The port is in an internal loopback (diagnostic).	No action is required.
		Flickering green	The port is online and traffic is flowing through it.	No action is required.
		Steady orange	The port is receiving light or a signal carrier is detected, but it is not yet online.	No action is required.
		Slow-flashing orange (on 1 second; off 1 second)	The port is disabled as a result of diagnostics or a <b>portDisable</b> command.	Reset the port from a management station.
		Fast-flashing orange (on 1/4 second; off 1/4 second)	The port is faulty.	Reset the switch from a management station.
		Alternating green and yellow	The port is bypassed.	Reset the port from a management station.
Port Speed	Above and to the right of each port	No light	The port is transmitting or receiving at 1 Gbps.	No action is required.
		Steady green	The port is transmitting or receiving at 2 Gbps.	No action is required.
Ethernet Link Speed	Leftmost of the two LEDs to the left of the Ethernet port	No light	The port is transmitting or receiving at 10 Mbps.	No action is required.
		Steady green	The port is transmitting or receiving at 100 Mbps.	No action is required.
Ethernet Status	Rightmost of the two LEDs to the left of the Ethernet port	No light	No Ethernet traffic is flowing through the RJ-45 port.	Verify that the switch is on and that the Ethernet cable is firmly seated.
		Flickering green	Ethernet traffic is flowing through the RJ-45 port.	No action is required.

## LEDs on the back panel

Figure 12 on page 22 shows the back panel of the switch with the Switch Status LED identified.



SJ000354

Figure 12. Back panel LED

Table 9 describes the back panel LED. It lists the name, location, and possible colors of the LED. It then lists the status of the switch that is associated with each LED color and recommends actions that you can take in response to that status.

Table 9. Back panel LED patterns during normal operation

Name of LED	Location of LED	Color of LED	Status of hardware	Recommended action
Switch Status	Center of back panel	No light	Either the switch is off, the startup process is not complete, or the startup has failed.	Verify that the switch is on and that the startup process has had time to complete. If there is still no light, contact IBM.
		Steady green	The switch is on and startup has successfully completed.	No action is required.
		Steady yellow	A diagnostic test is in progress, or one or more ports are faulty.	If no diagnostic tests are running, check the Port Status LEDs for fault indicators (see Table 8 on page 20).
		Slow-flashing yellow	A diagnostic failure has occurred on one or more ports.	Errors might be listed in the error log. Refer to the <i>IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 User's Guide</i> for more information.

## Interpreting POST

The 3534 Model F08 automatically performs a POST when the switch is plugged in, restarted, or the system is reset. A POST includes a number of diagnostic tests. Test results can be monitored through the LED activity, error log, Telnet command, from a terminal screen, and so on.

A POST completes in 4.5 minutes. A slightly longer version of the memory test is performed after cold starts. A cold start occurs after a complete power cycle, when the switch is unplugged, then plugged back in. A warm start is any other type of startup, such as an operating system restart or switch panic.

A POST consists of the following steps:

1. Preliminary POST diagnostics are run.
2. The operating system is initialized.
3. The hardware is initialized.

4. Diagnostic tests are run on a number of functions, including:
  - Internal connections and circuitry
  - Port functionality
  - Ability to send and receive frames
  - Ability to implement QuickLoop functionality
  - All aspects of memory, parity, statistics counters, and correct serialization
5. A universal port configuration is performed.
6. The links are initialized.
7. The fabric is analyzed. If ports are connected to other fabric elements, the principal switch in the fabric is identified.
8. The port addresses are assigned. The switch attempts to keep any previously assigned port addresses.
9. The unicast routing tables are constructed.
10. The port is enabled.

To determine whether a POST has completed without errors, verify that all LEDs return to a normal state after the POST is complete. If one or more LEDs continue to flash, see “Interpreting LED activity” on page 19. Verify that the flashing is not due to the switch being configured to beacon.

**Note:** The **switchBeacon** command sets the switch beaoning mode on or off if the operand is 1 or 0 respectively. When beaoning mode is turned on, the port LEDs flash orange in a running pattern from port 0 - port 7, port 7 - port 0, and then back to port 7 again.

For more information about beaoning, see the *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 User's Guide*.

**Note:** When POST completes, verify that the switch prompt displays on a computer terminal that is connected to the switch. If the prompt does not display, press the Enter key. If the prompt still does not display, contact IBM.

If errors are detected during a POST, error messages are written to the system error log. You can view this error log by using the **errShow** command. For information about error messages, see the *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 User's Guide*.

---

## Maintaining the switch

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

All diagnostic tests are run at link speeds of 1 Gbps and 2 Gbps. As a result, the transmit and receive speed of the links can be temporarily locked at one speed or the other while the diagnostic tests are running. For information about the specific diagnostic tests and how to run them, see the *IBM TotalStorage SAN Fibre Channel Switch 3534 Model F08 User's Guide*.



---

## Chapter 5. Replacing an SFP

To replace a small form-factor pluggable (SFP) device, you first remove the existing SFP, and then install a new one. This chapter contains these procedures.

**Note:** Simple network management protocol (SNMP) traps are generated when you remove and install an SFP. You do not need to unplug the switch to replace an SFP.

Figure 13 shows an IBM SFP.



SJ000317

Figure 13. IBM SFP

---

### Time required

Approximately 20 seconds to remove and install an SFP.

---

### Items required

None.

**Note:** This is a hands-only operation.

---

### Removing an SFP

Complete the following steps to remove an SFP:

1. Pull forward on the tab on the front of the SFP.
2. Pull out the SFP.
3. Carefully move the SFP from side to side to unseat it.

---

## Installing an SFP

Complete the following steps to install a new SFP:

1. Insert the SFP into the port.
2. Seat the connector firmly into the appropriate port slot. The latch prong locks and prevents the SFP from being removed accidentally.

**Note:** The SFP is keyed so that it can only be correctly inserted into the port. If the module does not slide in easily, try turning it over. Do not force the module.

---

## Appendix A. Product specifications

This appendix contains the 3534 Model F08 specifications.

---

### Switch components

The 3534 Model F08 contains the following components:

- A 1U chassis, designed to be mounted in a 48.26 cm (19 in.) rack, with forced-air cooling that flows from the fan side of the switch to the cable side. You can also install the switch as a stand-alone unit.
- Eight ports, compatible with SFP optical media that are capable of operating at 2.125 Gbps or 1.0625 Gbps. Each port has a serializer/deserializer (SERDES) that accepts 10-bit wide parallel data and serializes it into a high-speed serial stream. The parallel data must be 8-bit to 10-bit encoded data, or the equivalent.
- One RS-232 serial port (DB9 connector) on the front panel.
- One IEEE-compliant RJ-45 connector on the front panel for use with 10 Mbps or 100 Mbps Ethernet or in-band.
- Human-readable and bar code labels on the front and back panels.
- 20 LEDs:
  - One LED on the front panel to indicate the overall switch status.
  - Two LEDs for each of the eight ports to indicate port status and link speed.
  - Two LEDs for the Ethernet port to indicate port status and link speed.
  - One LED in the center of the back panel to indicate the overall switch status.
- One universal input power supply without an ac switch.
- Five fans:
  - Two to cool the power supply.
  - Three to cool the system board.

Air is pulled in through the rear intake and pushed out through the vents in the front panel. The fans are controlled automatically to run at the same speed: 5800 RPM for normal operation; 9700 RPM if the ambient temperature inside the switch exceeds the upper threshold (see “Environmental specifications” on page 29 for the temperature specifications of the 3534 Model F08).

---

### Facility specifications

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

- An adequate supply circuit, line fusing, and wire size, according to the electrical rating on the switch nameplate.
- An air flow of at least 300 cubic feet per minute available to the switch.
- The power specifications listed in “Power supply specifications” on page 30.
- The environmental specifications listed in “Environmental specifications” on page 29.
- Interference less than the standard levels listed in Table 10 on page 28, under Immunity.

Additionally, if you are installing the switch in an EIA rack:

- Ensure that all equipment has a reliable branch-circuit ground connection. Do not rely on a connection to a branch circuit, such as a power strip.
- Ensure that the rack is balanced and within the specified weight limits. Secure the rack mechanically to ensure stability in the event of an earthquake.

## General specifications

The 3534 Model F08 is an 8-port, dual-speed, auto-sensing fibre-channel switch. It supports multiple F\_port and FL\_port connections, a single E\_port connection, and distributed name server (DNS). It is electro-magnetic compatibility (EMC) compliant.

Table 10 lists the general specifications for the 3534 Model F08.

Table 10. General specifications

Specification	Description
Configured port types	The 3534 Model F08 supports multiple F_port and FL_port connections, and one E_port connection.
EMI rating	An operating 3534 Model F08 conforms to the EMI radiation levels specified by the following regulations: <ul style="list-style-type: none"> <li>• FCC Rules and Regulations, Part 15B, Class A level</li> <li>• CISPR22 Class A</li> <li>• EN55022 Class A</li> <li>• VCCI Class A ITE</li> <li>• AS/NZS 3548 Class A</li> </ul>
System architecture	Nonblocking shared-memory switch
System processor	Intel® 80960VH, 100 MHz CPU
ANSI fibre-channel protocol	FC-PH (Fibre Channel Physical and Signaling Interface standard)
Modes of operation	Fibre Channel Class 2 and Class 3
Fabric initialization	Complies with FC-SW 5.0
Internet protocol (IP) over fibre-channel (FC-IP)	Complies with FC-IP 2.3 of the FCA profile
Aggregate switch input/output (I/O) bandwidth	32 Gbps if all eight ports are running at 2 Gbps, full duplex
Frame buffers	26 buffers per E_port and 16 buffers per F_port at 2112 bytes per frame
Port-to-port latency	Less than 2 microseconds with no contention (destination port is free)
Data transmission range	<ul style="list-style-type: none"> <li>• Up to 13 m (42.65 ft) for passive copper</li> <li>• Up to 33 m (108.27 ft) for active copper</li> <li>• Up to 300 m (975 ft) for short wavelength optical link</li> <li>• Up to 10 km (32 820 ft) for long wavelength optical link</li> </ul>

Table 10. General specifications (continued)

Specification	Description
Immunity	<ul style="list-style-type: none"> <li>• IEC 61000-4-2 Severity Level 3 for Electrostatic Discharge</li> <li>• IEC 61000-4-3 Severity Level 3 for Radiated Fields</li> <li>• IEC 61000-4-4 Severity Level 3 for Fast Transients</li> <li>• IEC 61000-4-5 Severity Level 3 for Surge Voltage</li> <li>• IEC 61000-4-6 Conducted Emissions</li> <li>• IEC 61000-4-11 Voltage Variations</li> </ul>

## Physical specifications

Table 11 lists the physical specifications for the 3534 Model F08.

Table 11. Physical specifications

Dimension	Value
Height	4.2 cm (1.69 in.)
Depth	26.4 cm (10.4 in.)
Width	42.8 cm (16.9 in.)
Weight	3.9 kg (8.5 lbs)

## Environmental specifications

Table 12 lists the environmental ranges that are acceptable when the 3534 Model F08 is operating and when it is nonoperating.

Table 12. Environmental specifications

Condition	Switch state	Acceptable range
Temperature	Operating	10° - 40°C (50° - 104°F)
	Nonoperating	-25° - 70°C (-13° - 158°F)
Humidity	Operating	20% - 85% RH noncondensing, at 40°C (104°F)
	Nonoperating	0 - 90% RH noncondensing, at 40°C (104°F)
Altitude	Operating	0 - 3 km (0 - 9843 ft) above sea level
	Nonoperating	0 - 12 km (0 - 39 372 ft) above sea level
Shock	Operating	150G, 2.7 MS duration, half sine
	Nonoperating	60G, 13 MS duration, trapezoid
Vibration	Operating	0.5G, 5-500-5 Hz
	Nonoperating	2G, 5-500-5 Hz

---

## Power supply specifications

The 3534 Model F08 has a universal power supply that is capable of functioning worldwide without voltage jumpers or switches. The power supply meets IEC 61000-4-5 surge voltage specifications and is *autoranging*, meaning that it accommodates different input voltages and line frequencies.

Table 13 lists the power supply specifications.

Table 13. Power supply specifications

Specification	Value
Outlet	Correctly wired, earth-grounded
Maximum output	75 watts
Maximum system power consumption	50 watts
Input voltage	90 - 264 V ac
Input line frequency	47 - 63 Hz
Harmonic distortion	Active power factor correction per IEC 1000-3-2
BTU rating	60 watts x 3.412 BTUs per hour per watt = 204.72 BTUs per hour
Inrush current	40 amps maximum, cold start 25°C (77°F)
Input line protection	Fused in hot line

---

## Memory specifications

The 3534 Model F08 contains the types and amounts of memory listed in Table 14.

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

Table 14. Memory specifications

Memory type	Amount
Main memory	32 MB of SDRAM
Flash memory	Dual 8 MB
Boot flash memory	512 KB of 8-bit wide memory for system startup

---

## Optical port specifications

The optical ports in the 3534 Model F08 are compatible with short wavelength (SWL) and long wavelength (LWL) transceivers and fiber-optic cables. The type of SFP in use determines the strength of the light signal.

The optical ports meet all the required safety standards. For details, see "Regulatory specifications" on page 31.

---

## Serial port specifications

The serial port is on the front panel of the switch and uses an RS-232 connector.

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

You can use the serial port to connect to a terminal to set the switch IP address without connecting to the fabric. You can also use it to reinitialize the switch defaults, which restores the factory configuration and returns the switch passwords to a known state. The serial ports parameters are 9600 baud, 8 data bits, no parity, 1 stop bit, and no flow control.

The switch requires a straight serial cable with a female 9-pin subminiature-D connector. Only pins 2, 3, and 5 are supported. If pin 7 is used, this signal must always be driven high, using the pinouts listed in Table 15.

*Table 15. Cabling pinouts if pin 7 is used*

Pin	Signal	Description
1		
2	TxDATA	Transmit data
3	RxDATA	Receive data
4		
5	GND	Logic ground
6		
7	CTS	Clear to send
8		
9		

---

## Regulatory specifications

The 3534 Model F08 is certified for the regulatory specifications that are listed in Table 16.

*Table 16. Regulatory specifications*

Country or region	Safety specification	EMC specification
Canada	CSA 22.2 No. 60950 Third Ed.	CSA C108.8 Class A
United States	UL 60950 Third Ed., Info. Tech. Equip.	FCC Part 15, Subpart B, (CFR title 47) Class A
Japan	IEC 60950+A1+A2+A3+A4+A11	VCCI V-3/2000.04, Class A
International	IEC 60950+A1+A2+A3+A4+A11	CISPR22 Class A
Norway	Nemko IEC 60950+A1+A2+A3+A4+A11 (CB Report)	

Table 16. Regulatory specifications (continued)

Country or region	Safety specification	EMC specification
European Union (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom)	73/23/EEC based on compliance to EN 60950:92 +A1:93+A2:93+A3:95+A4:96+A11:97 (CB report inclusive of county deviations); TUV-GS (Germany)	89/336/EEC EN 55022:1998 Class A EN 60825-1:1994/A11, -2 EN 61000-4-2 Severity Level 3 for Electro Static Discharge EN 61000-4-3 Severity Level 3 for Radiated Fields EN 61000-4-4 Severity Level 3 for Electrical Fast Transients EN 61000-4-5 Severity Level 3 for Surge Voltage EN 61000-4-6 Conducted Emissions EN 61000-4-8 Magnetic Fields EN 61000-4-11 Line Interruption
Australia and New Zealand		AS/NZS 3548:1995 Class A (radio interference)

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## Appendix B. Blank planning worksheets

This appendix contains the following blank worksheets that you can use when you plan the installation of a 3534 Model F08 in an operational environment:

- 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.

For information about planning your installation, including examples of how to use these worksheets, see Chapter 2, “Planning the installation” on page 5.

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## Planning worksheet

Table 17. 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 18. Port configuration worksheet

Port number	Device name	Device port	Cable length	Port type	Notes	Cable number
0						
1						
2						
3						
4						
5						
6						
7						

---

## Zone definition worksheet

Table 19. Zone definition worksheet

<b>Zone member type</b> (switch, port, WWN)	<b>Zone member</b>	<b>Zone configuration name</b>	<b>Comments</b>
Port (ID, P)			

---

## Zone configuration worksheet

Table 20. Zone configuration worksheet

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



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- EN50082-2/EN55024:1998 (European Immunity Requirements)
  - EN61000-3-2
  - EN61000-3-3/JEIDA (European and Japanese Harmonics Specification)
- Ring wave test

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# Glossary

This glossary provides definitions for the fibre-channel and switch terminology used for the IBM 3534 Model F08.

This glossary defines technical terms and abbreviations used in this book. If you do not find the term you are looking for, see the *IBM Glossary of Computing Terms* located at [www.ibm.com/networking/nsg/nsgmain.htm](http://www.ibm.com/networking/nsg/nsgmain.htm)

This glossary also includes terms and definitions from:

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

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

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

## See also

Refers you to a related term.

**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

**ACL.** Access control list.

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

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

**alias AL\_PA.** An AL\_PA value recognized by an 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.

**ARB.** See *arbitrate primitive signal*.

**arbitrate primitive signal.** A primitive signal that is transmitted as the fill word by an 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 may have one or multiple AL\_PAs.

**ARP.** Address resolution protocol.

**ASIC.** Application-specific integrated circuit.

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

**ATM.** See *asynchronous transfer mode*.

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

**arbitration wait timeout value (AW\_TOV).** The minimum time an arbitrating L\_port waits for a response before beginning loop initialization.

**AW\_TOV.** See *arbitration wait timeout value*.

**bandwidth.** The total transmission capacity of a cable, link, or system. Usually measured in bits per second (bps). May also refer to 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.** Buffer-to-buffer.

**BB\_Credit.** See *buffer-to-buffer credit*.

**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.** 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*.

**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 3534 Model F08 is based on.

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

**BTU.** 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*, *end-to-end credit*.

**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*.

**CAM.** Content addressable memories.

**cascade.** Two or more interconnected fibre-channel switches. 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*, *inter-switch link*.

**cascading switches.** Switches that are interconnected to build large fabrics.

**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 F.** Connectionless service for inter-switch control traffic. Provides notification of delivery or nondelivery between two E\_ports.

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

**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*.

**CPLD.** Complex programmable logic device.

**community (SNMP).** A relationship between an SNMP agent and a set of SNMP managers that defines authentication, access control, and proxy characteristics.

**CPU.** See *central processing unit*.

**CRC.** See *cyclic redundancy check*.

**credit.** When applied to a switch, the maximum number of receive buffers provided by an F\_port or FL\_port to its attached N\_port or NL\_port, respectively, such that the N\_port or NL\_port may transmit frames without over-running the F\_port or FL\_port.

**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.

**data word.** A type of transmission word that occurs within frames. The frame header, data field, and CRC all consist of data words. See also *frame*, *ordered set*, *transmission word*.

**DDR.** Double data rate.

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

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

**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.** Direct memory access.

**DNS.** Distributed name server.

**domain\_ID.** Unique identifier for the switch in a fabric. Usually automatically assigned by the switch, but may also be assigned manually. May be any value between 1- 239.

**DOS.** Disk operating system.

**DRAM.** Dynamic random access memory.

**DWDM.** Dense wavelength digital multiplexing.

**dynamic load sharing (DLS).** Dynamic distribution of traffic over available paths. Allows for recomputing of routes when an Fx\_port or E\_port changes status.

**E\_D\_TOV.** See *error detect timeout value*.

**EE\_Credit.** See *end-to-end credit*.

**effective 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 Industry Association.

**EIA rack.** A storage rack that meets the standards set by the Electronics Industry Association.

**ELP.** Extended link parameters.

**EMC.** Electro-magnetic compatibility.

**EMI.** 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*, *zone configuration*.

**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*, *buffer-to-buffer credit*.

**end-to-end flow control.** Governs flow of class 1 and class 2 frames between 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.** Electrostatic discharge.

**EVPD.** Enable Vital Product Data.

**exchange.** The highest level fibre-channel mechanism used for communication between 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 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 product that runs on Fabric OS and allows creation of a fibre-channel fabric interconnected over distances of up to 100 km (62.14 mi).

**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 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. This feature is available only when both QuickLoop and zoning are installed on the 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 NL\_ports to the switch in a loop configuration.

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

**fabric port (F\_port).** A port that is able to transmit under fabric protocol and interface over links. Can be used to connect an N\_port to a switch. See also *fabric loop port*, *Fx\_port*.

**Fabric Watch.** A product that runs on Fabric OS and allows monitoring and configuration of fabric and switch elements.

**FAN.** Fabric address notification.

**FC.** Fibre channel.

**FCA.** See *fibre-channel arbitrated loop*.

**FC-AL.** The Fibre Channel Arbitrated Loop standard. Defined on top of the FC-PH standard. Defines the arbitration on a loop where several FC nodes share a common medium.

**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.

**FCP.** See *fibre-channel protocol*.

**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.

**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-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 multi-switch fibre-channel fabric.

**fibre-channel arbitrated loop.** 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 when any one of its components fails. In some cases, a field replaceable unit may contain other field replaceable units.

**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.

**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.

**FRU.** See *field replaceable unit*.

**FS.** See *fibre-channel service*.

**FSP.** See *fibre-channel service protocol*.

**FSPF.** See *fibre-channel shortest path first*.

**FTP.** 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 an F\_port or FL\_port. See also *fabric port*, *fabric loop port*.

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

**GBIC.** See *gigabit interface converter*.

**GBps.** Gigabytes per second.

**Gbps.** Gigabits per second.

**generic port (G\_port).** A generic port that can operate as either an E\_port or an 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*.

**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 AL\_PA that an NL\_port attempts to acquire during loop initialization.

**hardware translative mode.** Method for achieving address translation. The following two hardware translative modes are available to a QuickLoop-enabled switch:

- Standard Translative Mode: Allows public devices to communicate with private devices across the fabric.
- QuickLoop Mode: Allows private devices to communicate with other private devices across the fabric.

**HBA.** See *host bus adapter*.

**host bus adapter (HBA).** The interface card between a server or workstation bus and the fibre-channel network.

**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.

**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.

**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 link between two switches.

**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 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 E\_port that is online but not operational between switches due to overlapping domain ID or nonidentical parameters such as E\_D\_TOVs. See also *expansion port*.

**IU.** See *information unit*.

**JBOD.** See *just a bunch of disks*.

**just a bunch of disks (JBOD).** Indicates a number of disks connected in a single chassis to one or more controllers. See also *redundant array of independent disks*.

**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*.

**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.

**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 actions.

**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)

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

**loop.** A configuration of devices (for example, JBODs) connected to the fabric by way of an FL\_port interface card.

**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 hex value representing one of the 127 possible AL\_PA values in an arbitrated loop.

**loop initialization.** The logical procedure used by an L\_port to discover its environment. Can be used to assign 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.

**looplet.** 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.

**L\_port.** See *loop port*.

**loop port (L\_port).** A node port (NL\_port) or fabric port (FL\_port) that has arbitrated loop capabilities. An L\_port can be in one of two modes:

- Fabric mode, connected to a port that is not loop capable, and using fabric protocol.
- Loop mode, in an arbitrated loop and using loop protocol. An L\_port in loop mode can also be in participating mode or nonparticipating mode.

See also *non-participating mode*, *participating mode*.

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

**LPSM.** See *loop port state machine*.

**LSA.** Link state acknowledgement.

**LSR.** Link state record.

**LSU.** Link state update.

**LUN.** Logical unit number.

**LWL.** See *long wavelength*.

**MAC.** Media access controller.

**management information base (MIB).** An SNMP structure to help with device management, providing configuration and device information.

**MAP.** Maintenance action plan.

**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 ISL in the trunking group is designated as the master port for that group. See also *ISL Trunking*.

**MIB.** See *management information base*.

**multicast.** The transmission of data from a single source to multiple specified N\_ports (as opposed to all the ports on the network). See also *broadcast*, *unicast*.

**multimode.** A fiber optic cabling specification that allows up to 500 m (1640.5 ft) between devices.

**name server.** Frequently used to indicate Simple Name Server. See also *simple name server*.

**NL\_port.** See *node loop port*.

**node.** A fibre-channel device that contains an N\_port or 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 an 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.

**non-participating mode.** A mode in which an 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 AL\_PA cannot be acquired. See also *participating mode*.

**N\_port.** See *node port*.

**NVRAM.** Nonvolatile RAM.

**Nx\_port.** A node port that can operate as either an N\_port or NL\_port. See also *node port, node loop port*.

**OFC.** Open fibre control.

**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 the following items:

- *Frame delimiters* mark frame boundaries and describe frame contents.
- *Primitive signals* indicate events.
- *Primitive sequences* indicate or initiate port states.

Ordered sets are used to differentiate fibre-channel control information from data frames and to manage the transport of frames.

**packet.** A set of information transmitted across a network. See also *frame*.

**participating mode.** A mode in which an L\_port in a loop has a valid AL\_PA and can arbitrate, send frames, and retransmit received transmissions. See also *non-participating mode*.

**path selection.** The selection of a transmission path through the fabric. Switches use the FSPF protocol.

**PCB.** Printed circuit board.

**PCI.** Peripheral control interconnect.

**Performance Monitoring.** A product that provides error and performance information to the administrator and end user for use in storage management.

**PCV.** Page code valid.

**PF.** Page format.

**phantom address.** An 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 login (PLOGI).** The port-to-port login process by which initiators establish sessions with targets. See also *fabric login*.

**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.

**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 FL\_port.

**private loop direct attach (PLDA).** A subset of fibre channel standards for the operation of peripheral devices.

**private NL\_port.** An 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 FL\_port, and may contain both public and private NL\_ports.

**public NL\_port.** An NL\_port that logs into the fabric, can function within either a public or a private loop, and can communicate with either private or public NL\_ports.

**QuickLoop.** (1) A product 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 AL\_PA space.

**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 CPU stores and executes its processes.

**R\_A\_TOV.** See *resource allocation timeout value*.

**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. See also *just a bunch of disks*.

**registered state change notification (RSCN).** A switch function that allows notification of fabric changes to be sent from the switch to specified nodes.

**remote procedure call (RPC).** A facility that a client uses to request the execution of a procedure call from a server.

**Remote Switch.** A product that runs on Fabric 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*.

**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 recovery timeout value (RR\_TOV).** The minimum time a target device in a loop waits after a LIP before logging out a SCSI initiator. See also *error detect timeout value*, *resource allocation timeout value*.

**RISC.** Reduced Instruction Set Computer.

**ro.** Read only.

**ROM.** Read only memory.

**route.** As applies to a fabric, the communication path between two switches. May 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*.

**RR\_TOV.** See *resource recovery timeout value*.

**RSCN.** See *registered state change notification*.

**RSH.** Remote shell.

**rw.** Read-write.

**SAN.** See *storage area network*.

**SC.** Standard connector.

**SCSI.** See *small computer systems interface*.

**SCSI Enclosure Services (SES).** A subset of the SCSI protocol used to monitor temperature, power, and fan status for enclosure devices.

**SDR.** Single data rate.

**sequence.** A group of related frames transmitted in the same direction between two 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*.

**SESD.** An SES device.

**SFF.** Bidirectional devices (transceivers) that can receive serial optical signals and convert them into electrical signals or receive electrical signals and retransmit them as optical signals.

**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. May also refer to the type of GBIC or SFP. See also *long wavelength*.

**SI.** Sequence initiative.

**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. May 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.

**SPC.** SCSI-3 Primary Command.

**storage area network.** A network of systems and storage devices that communicate using fibre-channel protocols. See also *fabric*.

**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 E\_ports, F\_ports, or FL\_ports.

**SWL.** See *short wavelength*.

**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.

**topology.** As applies to fibre channel, the configuration of the fibre-channel network and the resulting communication paths allowed. There are three possible topologies:

- **Point to point:** A direct link between two communication ports.
- **Switched fabric:** Multiple N\_ports linked to a switch by F\_ports.
- **Arbitrated loop:** Multiple NL\_ports connected in a loop.

**throughput.** The rate of data flow achieved within a cable, link, or system. Usually measured in bits per second (bps). See also *bandwidth*.

**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 an 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 LAN.

**Tx.** Transmitted.

**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*, *multicast*.

**universal port (U\_port).** A switch port that can operate as a G\_port, E\_port, F\_port, or 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 SCSI, IP, HIPPI, and IPI.

**upper-level timeout value (ULP\_TOV).** The minimum time that a SCSI ULP process waits for SCSI status before initiating ULP recovery.

**user datagram protocol.** A protocol that runs on top of IP and provides port multiplexing for upper-level protocols.

**VCCI.** Voluntary Control Council for Interference

**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 may use or provide public communications facilities. (T)

**workstation.** A computer used to access and manage the fabric. May 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*.

**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 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.

**zoning.** A product that runs on Fabric 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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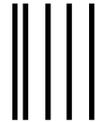


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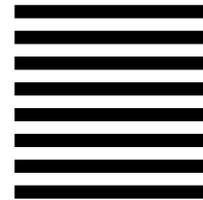
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