IBM TotalStorage SAN n-type Director Family

Site Planning Guide

GC26-7715-00

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GC26-7715-00

First Edition (November 2004)

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About this document

This guide provides information on site planning for the IBM TotalStorage SAN Switch SAN256N Director 2045-N16.

The intended audience for this document is anyone who is responsible for preparing a customer site for the installation of the SAN256N director.

The sections that follow provide information about:

- “IBM TotalStorage SAN256N Director 2045-N16”
- “Web sites”
- “Getting software updates”
- “Getting help”
- “How to send your comments”

IBM TotalStorage SAN256N Director 2045-N16

The following documents contain information related to this product:

- IBM TotalStorage SAN256N Director 2045-N16 Installation and Maintenance Guide (GC26-7714)
- IBM TotalStorage SAN256N Director 2045-N16 Release Notes (GC26-7716)
- IBM TotalStorage SAN Director 2045 Statement of Limited Warranty (GC26-7718)
- IBM TotalStorage SAN n-type Director Family Enterprise Manager Installation and Operator Guide (GC26-7720)
- IBM TotalStorage SAN n-type Director Series Site Planning Guide (GC26-7715) - this document
- IBM TotalStorage Translated Safety Notices (GC26-7717)

Web sites

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

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

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

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

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

www.fibrechannel.org/

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

www.ibm.com/contact/

Getting software updates

Contact IBM for software updates and maintenance releases.

Select the SAN support link at the following Web site:

http://www.storage.ibm.com/ibmsan/index.html

Getting help

Before contacting technical support, check for solutions in this guide or check with the network administrator.

Online

Contact technical support at the following Web site:

http://www.ibm.com/servers/storage/support/san/index.html

Telephone

Within the United States, call 1-800-IBM-SERV (1-800-426-7378).

Outside the United States, go to the following Web site to find the appropriate service number:

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

How to send your comments

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Chapter 1. IBM TotalStorage SAN256N director Overview

This chapter provides an introductory description of the IBM TotalStorage SAN256N director 2045-N16. In the body of this Guide, The IBM TotalStorage SAN256N director 2045-N16 is referred to as the SAN256N director, or simply the SAN256N.

Introducing the IBM TotalStorage SAN256N director

The IBM TotalStorage SAN256N director 2045-N16 provides IT managers with an expandable and scalable fibre channel switching platform for migrating Storage Area Networks (SANs) into true-enterprise-class environments for data center applications. The SAN256N director provides a high-speed backbone infrastructure for controlling server and/or storage connectivity and a centralized point from which to manage and expand storage networks efficiently.

The SAN256N director may be configured up to 256 ports via sixteen (16) 16-port I/O blades. with a port speed of 2 Gbps, and a maximum frame size of 2148 bytes.

Figure 1. IBM TotalStorage SAN256N director

The SAN256N provides for the seamless translation of data between the following modes:

- Point-to-Point
- Fabric

The SAN256N supports storage and communications switching networking applications worldwide by meeting the requirements of these fiber channel standards:

- FC-PH (Physical and Signaling Interface) Rev 4.3
- FC-PH-2 (Physical and Signaling Interface 2) Rev 7.4
- FC-PH-3 (Physical and Signaling Interface 3) Rev 9.4
- FC-GS-2 (Fabric Generic Services 2) Rev 5.3
- FC-GS-3 (Fabric Generic Services 3) Rev 7.01
- FC-GS-4 (Fabric Generic Services 4) Rev 7.91
- FC-FG (Fabric Generic) Rev 3.5
- FC-SW-2 (Fibre Channel Switch 2) Rev 5.3
- FC-SW-3 (Fibre Channel Switch 3) Rev 6.6
- FC-VI Rev 1.84
- FCP Rev 12
- FCP-2 Rev 7a
- FC-SB-2 (FICON) Rev 2.1
- FC-SB-3 Rev 1.6
- FC-BB Rev 4.7
- FC-FS Rev 1.9
- FC-PI Rev 13
- FC-MI Rev 1.92
- FC-Tape Rev 1.17
- IP over Fibre Channel (RFC 2625)
- Fibre Channel Element MIB
- FICON CUP (Host Control)

Supported port types include:

- F_Port
- E_Port
- Fibre Channel Connectivity (FICON)

The SAN256N is part of a family of storage networking solutions that enable IT planners to build an infrastructure on which storage networks can run. The SAN256N interoperates with industry-leading enterprise management suites from Tivoli.

Product Structure Block Diagram

The following diagram provides an overall view of the product structure for the SAN256N director.

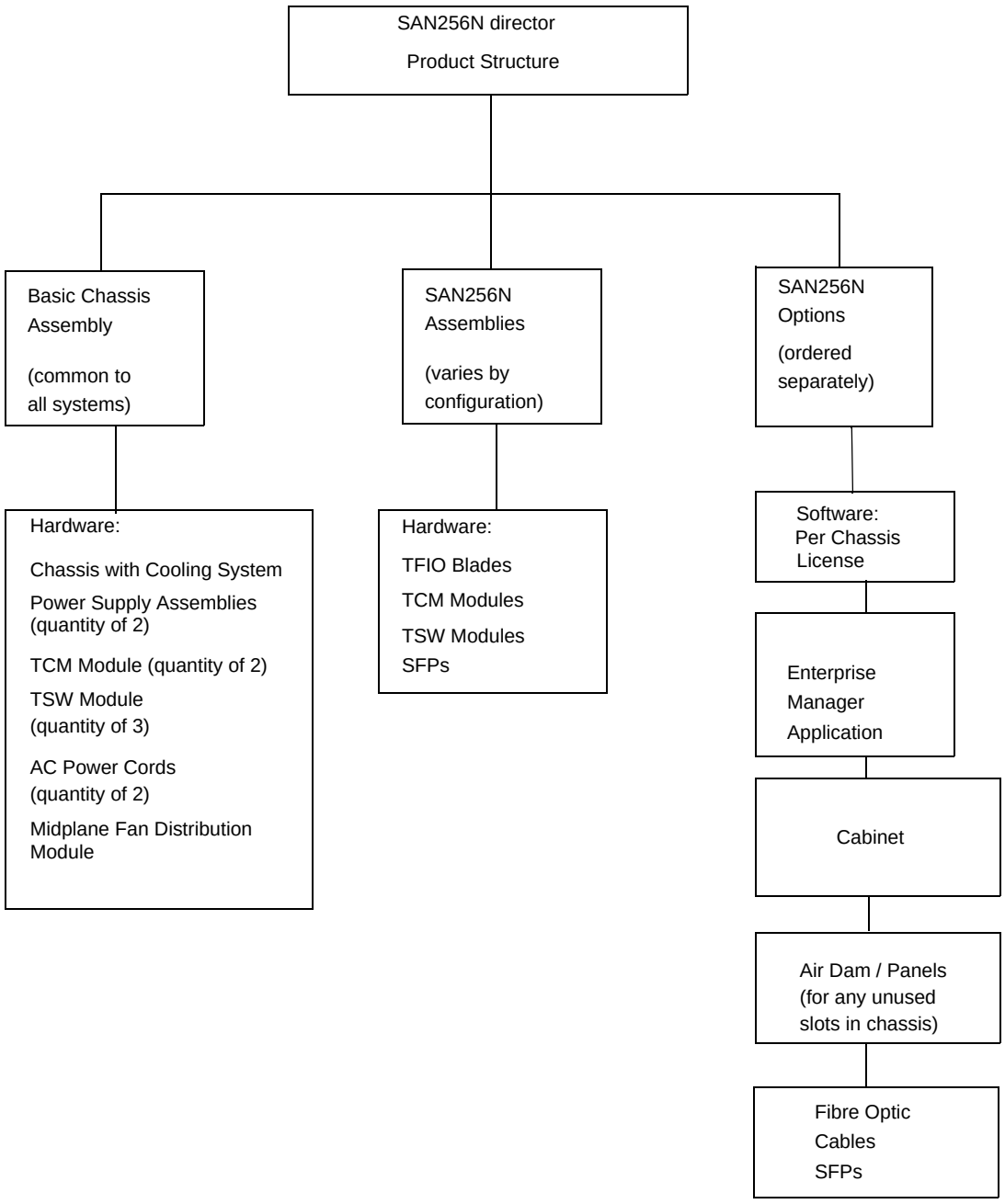

Figure 2. SAN256N Product Structure.

SAN256N director Configuration Block Diagram

The SAN256N has several hardware configurations options, including choice of cabinets, various printed circuit board modules, and port configurations. The following configuration block diagram provides an overview of those options.

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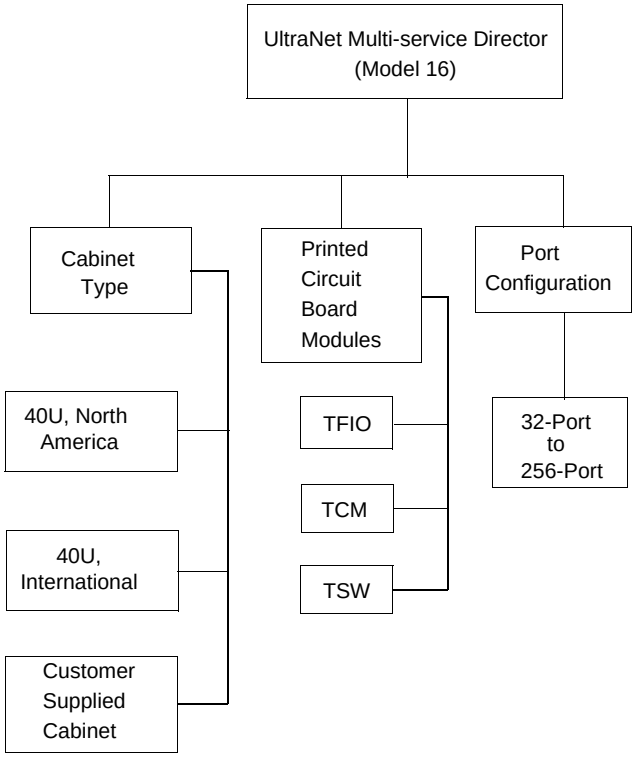


Figure 3. SAN256N Configuration Block Diagram.

SAN256N Components

The major components of the SAN256N system are listed below.

- TCM Control Module
- TFIO 16-Port I/O Blade
- TSW Switch Module
- TMF/TFD Midplane Fan Distribution Module
- Power Supply Assemblies
- Upper Fan Assemblies
- Side Fan Assemblies
- System Cabinet
- Small Form Factor Pluggable (SFP) Transceivers
- Enterprise Manager Control software

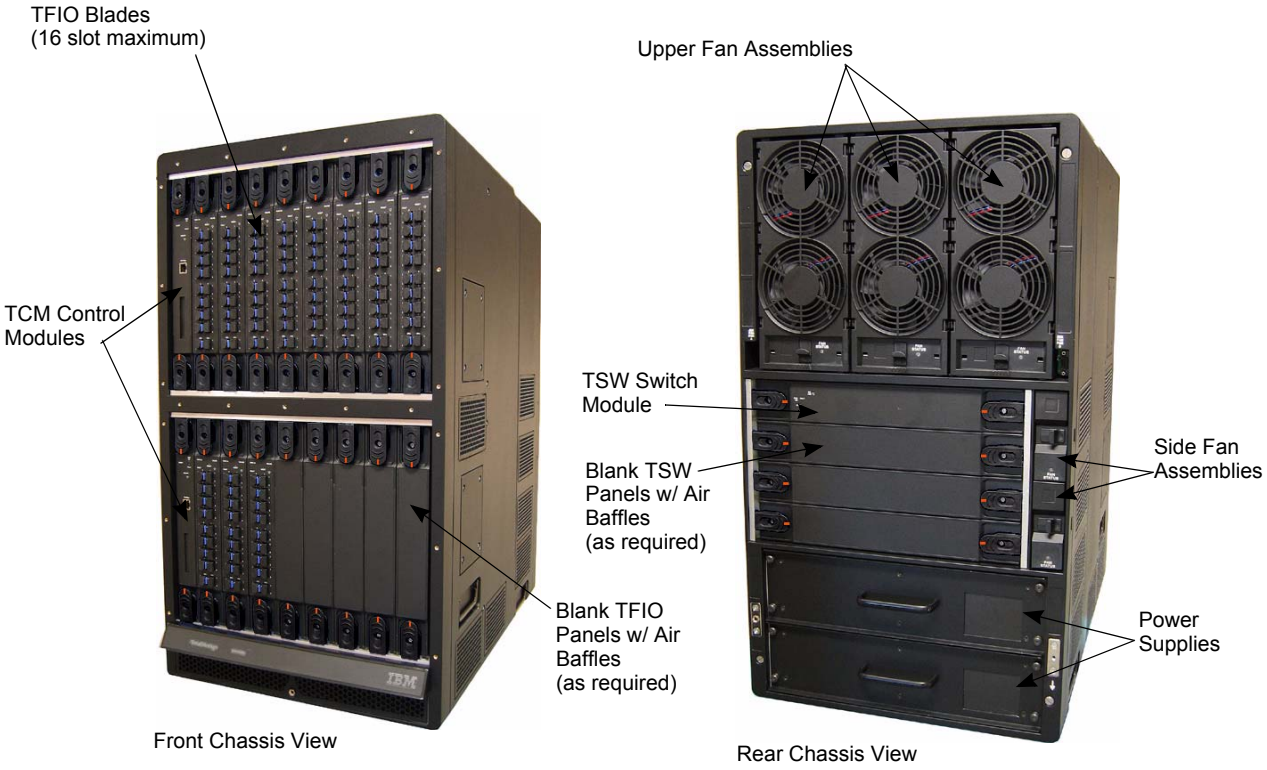


Figure 4. IBM TotalStorage SAN256N director; Basic Components

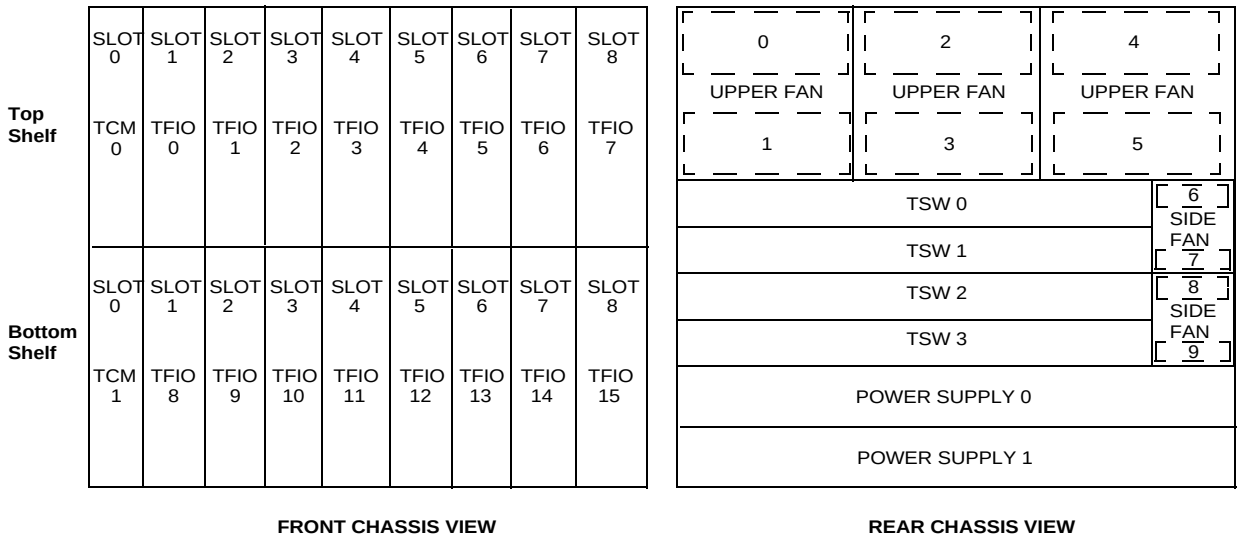


Figure 5. Component Locations and Designations, SAN256N Chassis

The following diagram illustrates the interaction between the TCM, TFIO, and TSW with the Enterprise Manager.

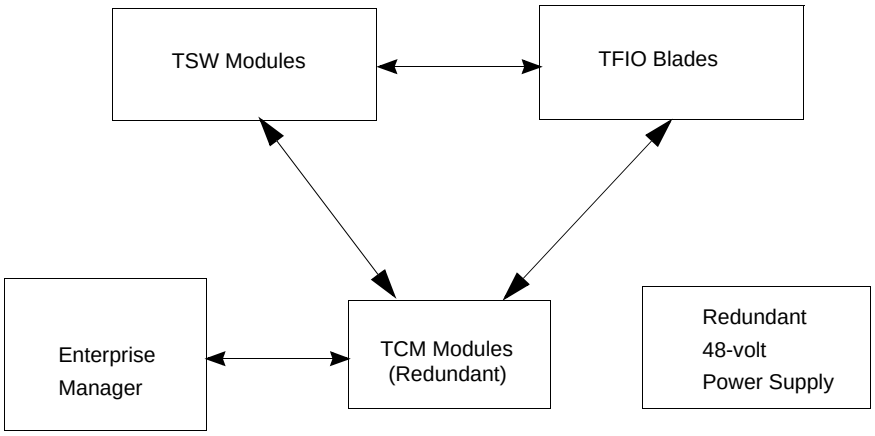


Figure 6. Component Interaction.

The EM workstation and the TCM modules communicate with each other, while the TCM maintains communicates with the TSWs and TFIOs. The TSWs and TFIOs in turn communicate with each other, developing the internal fabric.

TCM Control Module

The SAN256N Control Module (TCM) provides a control interface for the SAN256N system. The module is responsible for monitoring the general health of the system and acting as a proxy for all external communications destined for other modules in the system. The TCM also provides control and management of communications, between itself and the TFIO and TSW modules, as well as the system clock. The TCM is a critical module in the SAN256N system, requiring a redundant module in the system acting as a standby.

The TCM monitors the following components:

- TFIO Blades
- TSW Modules
- TCM Module
- Power Supply Assemblies
- Fans, Upper and Side Assemblies

Figure 7. TCM Control Module

Characteristics of the TCM module include the following:

- The TCM modules are hot swappable (when two TCM modules are installed in the SAN256N chassis).
- Each TCM module has seven LED indicators on the front panel to indicate the status of the following:
  - TCM module
  - Power supplies (primary and secondary)
  - Cooling fans
- Each TCM module has an 16-character alphanumeric LCD display on the front panel to show system information, such as:
  - Switch Name
  - IP Address
  - Status of the SAN256N system components:
- TFIO Blades
- TSW Modules
- TCM Modules
- Power Supply Assemblies
- Fans, Upper and Side Assemblies

- Each TCM module has an RJ-45 connector on the front panel to provide a 100 Base-TX Ethernet network connection between the SAN256N and the Enterprise Manager workstation. Two LEDs integrated into the RJ-45 connector provide Link Status and Data Rate information.

TFIO 16-Port I/O Blade

The Fibre Channel I/O blade (TFIO) is a 16-port input/output line card that plugs into a slot in the front of the chassis. The chassis is capable of accepting up to sixteen TFIO blades, providing a total port count of 256 ports per chassis.

The TFIO blade has sixteen Fibre Channel ports to accept certified SFP Shortwave (850 nm) and Longwave (1310-1550 nm) modules. Depending on what devices they are connected to, the SFP modules can auto negotiate at either 1.0625 Gbps or 2.125 Gbps.

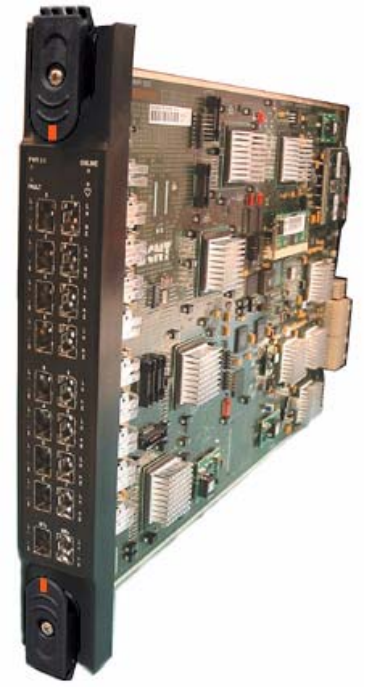


Figure 8. TFIO Blade

Characteristics of the TFIO include the following:

- The TFIOs are hot swappable.
- Each TFIO has four (4) LED indicators on the front panel to indicate module status. Additionally, each I/O port has two LED indicators to show the condition of the individual port.
- Each TFIO has two additional ports (MTx and MRx) to accommodate Mirror Port functionally. Each mirror port has two individual port status LED indicators showing the status and activity of the port.

TSW Switch Module

The Switch Module (TSW) provides the physical and logical connectivity between the TFIO blades installed in the SAN256N chassis. The TSWs provide non-blocking any-to-any switching capabilities between the switch fabric ports and to the TFIO blades.

A typical switch fabric, supporting up to 256 Fibre Channel user ports (at 2.125 Gbps, per port) uses three TSW modules to provide the switch fabric. Only two TSWs are required for full bandwidth, 256-port any-to-any connectivity.

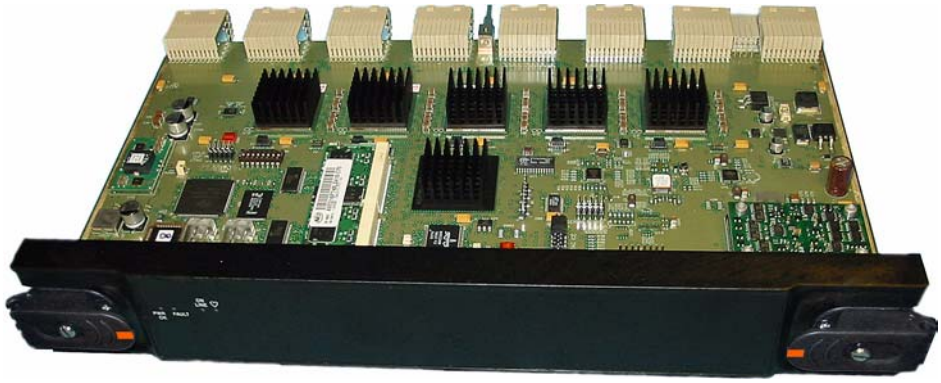


Figure 9. TSW Switch Module

Characteristics of the TSW module include the following:

- The TSWs are hot swappable.
- The TSWs employ an active-active design.
- Each TSW module has four LED indicators, located on the front panel, to indicate TSW module status.

Midplane Fan Distribution Module

The Midplane Fan Distribution Module (TMF/TFD) provides power and signal I/O for the Upper Fan assemblies and connectors for attaching optional external cooling fans that are mounted on the top of the cabinet. The TMF/TFD is connected to the chassis midplane at the rear of the chassis. Three 8-pin connectors (one per upper fan assembly) support the fan assemblies; two DB9F connectors support the optional external cabinet fans.

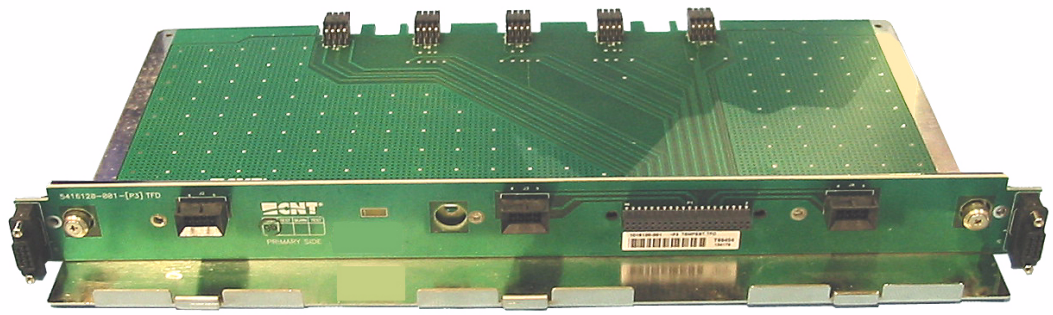


Figure 10. TMF/TFD Module

Power Supply Assemblies

Two power supply assemblies are located in the lower rear of the chassis. Each power supply assembly is a removable, integrated subchassis and is a hot-swappable unit. The two power supply assemblies provide the SAN256N with full DC redundancy (load sharing) for a single chassis system.

Integrated fans are contained within each power supply assembly. The fans draw air through the entire length of each power supply assembly. The fan assembly air flow is isolated from the system air flow (chassis fan assemblies).

The electrical specifications of the power supply assembly are:

- Input voltage is 220 VAC nominal; VAC input range is from 200 VAC to 240 VAC.
- Input frequency is 50/60 Hz nominal; frequency range is 47 Hz to 63 Hz.
- Output voltage is 48 VDC nominal, plus/minus 5%

AC input power is supplied to each power supply via a separate line cord (IEC-320-C19 Plug to L6-20P Plug; line cord rated 16A @ 250VAC). Each supply also has its own DC Power On/Off switch.

Each power supply assembly has two front panel LED indicators, that indicate whether the VAC input voltage and the DC voltage output are within specification.

Figure 11. Power Supply Assembly

Upper Fan Module Assemblies

Three fan module assemblies, located in the upper rear of the chassis, provide the cooling capability for the SAN256N and airflow around the PCB modules (in particular, the TFIO blades) by pushing air out of the chassis. The upper portion of the chassis is cooled by a push-pull airflow drawn from the lower air inlets, located at the front and sides of the chassis, and exhausted at the top of the chassis rear.

Each of the upper fan assemblies are powered by 48 Volts DC and provide up to 380 cfm per fan assembly. As a universal fan assembly, any of the three fan modules can be replaced with the same fan module. In the event of a single fan failure, the remaining fans increase speed to a higher operating RPM to compensate for the single fan failure. Fan Status LEDs indicate proper operation, under-speed condition, and marginal fan under-speed fault.

Each upper fan module consists of two fans mounted vertically in a pull-out module. The fan modules are interchangeable.

Figure 12. Upper Fan Assembly, Front and Rear Views

Side Fan Module Assemblies

Two fan module assemblies (located in the right-hand side, middle rear of the chassis), are used to pull air into the chassis to aid in cooling the chassis components (in particular, the TSW modules) by pushing air out of the chassis. The middle portion of the chassis is cooled by a push-pull airflow drawn from the middle side air inlets, located at the rear portion of the chassis, and exhausted at the right-hand side of the rear chassis.

Each of the side fan assemblies are powered by 48 Volts DC and provide up to 70 cfm per fan assembly. As a universal fan assembly, any of the two fan modules can be replaced with the same type fan module. In the event of a single fan failure, the remaining fans increase speed to a higher operating RPM to compensate for the single fan failure. Fan Status LEDs indicate proper operation, under-speed condition, and marginal fan under-speed fault.

Each side fan module consists of two fans mounted horizontally in a pull-out module. The fan modules are interchangeable.

Figure 13. Side Fan Assembly

System Cabinet

The system cabinet provides the capability to install two chassis in a single cabinet along with providing fiber cable management for each chassis.

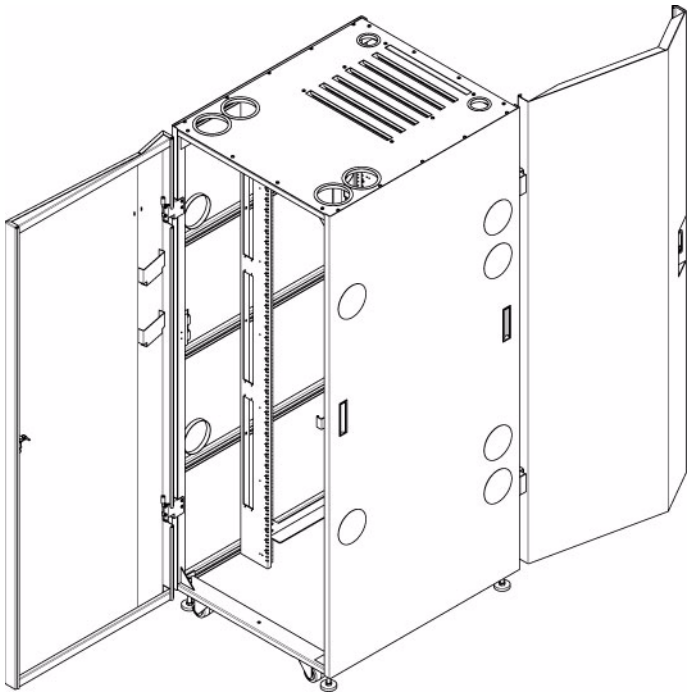


Figure 14. SAN256N Cabinet

Small Form Factor Pluggable (SFP) Transceivers

The SAN256N Fibre Channel interface and mirror ports on the TFIO blades are served by fiber optic SFPs. An SFP contains a transmitter and a receiver that sends and receives electronic data to and from other switches and devices. The fiber optic SFP converts the electrical signals to and from laser signals. With an SFP of matching capacity, a port is capable of transmitting data at 1 Gbps or 2 Gbps.

SFPs plug into the TFIO blade ports, using keyed guides to ensure proper insertion. Fiber optic cables from other devices plug into LC connectors on the SFPs.

The SFPs are hot swappable, allowing the removal or installation of an SFP while the switch is operating without harming the switch or the SFP. However, communication with the connected device will be interrupted.

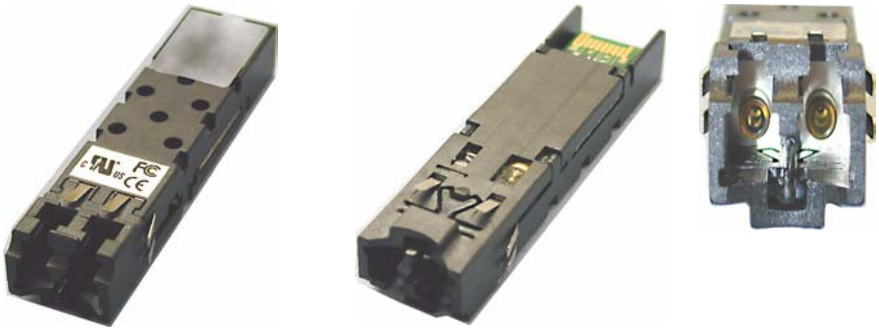


Figure 15. SFP LC Type Transceivers

SFPs currently available for the SAN256N include the following:

Table 1. SFP Transceivers

Part Number	Description
10-069	SFP, 2 Gbps, 850 nm, short wave, small form factor pluggable, non-OFC
10-545 (4-pack)	SFP, 2 Gbps, 850 nm, short wave, small form factor pluggable, non-OFC
10-170	SFP, 2 Gbps, 1310 nm, long wave, small form factor pluggable, non-OFC
10-546 (4-pack)	SFP, 2 Gbps, 1310 nm, long wave, small form factor pluggable, non-OFC
10-320	SFP, 2 Gbps, 1310 nm, 35 km extended distance, small form factor pluggable
10-321	SFP, 2 Gbps, 1550 nm, 80 km extended distance, small form factor pluggable

Enterprise Manager

The SAN256N configuration and connectivity management is controlled by a graphical user interface (GUI) called Enterprise Manager. The management system control application provides the following capabilities:

- Define module and port configurations
- Define zoning parameters
- Monitor alarms and system performance
- Invoke system diagnostics and security
- Call home improvements with new default call home events, and e-mail home
- E_Port zoning improvements, such as zoning with WWN nicknames, separating zoning windows, draging and droping zone members to create zones; each director is associated with its own zoning database
- SN-API support
- Additional fabric security, also known as FICON Cascading (users can specify which directors can join the fabric via ISLs)
- Dynamic fabric discovery
- One button code load

One or more SAN256Ns can be controlled from the same control node if they have Fibre Channel connectivity to the SAN256N that has the Ethernet connection to the control node (EM server).

Basic Control and Display Features

The Control software operates on a Windows XP Professional / Windows 2000 Professional platform and provides the graphical user interface. Basic control and display features include:

- Graphical overview of system configuration
- Graphical overview of port configuration
- Fabric utilization statistics
- Port utilization statistics
- Multiple user security levels
- Individual module status
- Error log
- Event log
- Hard zone control
- Name server zone control
- Port configuration
- Module control
- System diagnostics

Enterprise Manager Workstation Requirements

Before installing Enterprise Manager software, determine if the platform meets the following requirements.

- It is listed on the Microsoft® certified solutions web page (http://www.microsoft.com/whdc/hcl/default.mspx) under SERVER solution
- It has the "Designed For Windows 2003® or Windows 2000®" or "Certified for Windows 2003® or Windows 2000®" stamp of approval
- O/S support has not been discontinued (http://support.microsoft.com/default.aspx?scid=fh;[ln];LifeWin)
- It meets the minimum resource requirements identified below:
  - Operating System: Windows 2000 Professional® or Windows XP Professional®
  - Processor: One Intel Pentium 4 (1.8 GHz +)
  - Memory: 512 MB
  - 4 MB Video RAM
  - One 40 GB hard drive
  - One 1.44 MB diskette drive
  - One CD-ROM
  - One parallel port
  - Two Ethernet 10Base-T/100 Base-TX
  - One IBM or equivalent mouse
  - One external serial com port (external modem)
  - One internal com port (internal modem)
  - One 17-inch 1280 x 1024 x 256 SVGA monitor
  - Internal and external modem compatibility; analog, protocol support: V.90 5 6kbps ITU Standard

Note: Multi-Tech™ hardware compatible modems recommended (do not use Winmodem® software controlled modems)

Maintenance of a customer supplied Enterprise Manager platform and Windows 2000 Professional or Windows XP Professional Operating System is a customer responsibility.

When the PerformanceVSN client is co-resident on the EM workstation, the following requirements must be met:

- A minimum of 512 MB of memory is required
- Netscape 6.x or Internet Explorer 5.x browser and Adobe Acrobat Reader 6.0 or greater installed on the PC when used in conjunction with PerformanceVSN

Technical support is provided for the EM software package.

SAN256N Basic/Maximum Configurations

The following table describes the basic and maximum configurations for a 2Gbps SAN256N system.

Table 2. SAN256N 2 Gbps System

Component	Basic Configuration	Maximum Configuration
Chassis	1	1
I/O blade (TFIO)	2	16
Switching module (TSW)	3	4
Control module (TCM)	2	2
Fan distribution module (TMF/TFD)	1	1
Upper fan module assembly	3	3
Side fan module assembly	2	2
Power supply assembly	2	2
Enterprise Manager software	1	1

Chapter 2. SAN256N Site Planning and Preparation

This chapter describes SAN256N site planning requirements and procedures.

Planning Activities

The first activity that must be performed before delivering and installing the SAN256N is site installation planning. A good, coordinated site installation planning effort minimizes the number of questions and problems that may occur when the equipment is delivered and installed.

Site installation planning consists of three phases:

- Planning the Fibre Channel networking system
- Reviewing the site requirements
- Creating a preliminary floor plan

Fibre Channel Networking System Planning

Prior to installation planning for any single site, a Fibre Channel network-wide system plan should be developed by contacting your authorized service representative. A Fibre Channel network system blueprint, an individual site requirement, and a preliminary cabinet layout worksheet should be defined as part of the network planning activity to form the basis for your individual site planning effort.

Site Planning Considerations

In order to properly install and maintain the SAN256N, the site must meet specific physical, environmental, and power requirements. Before completing a preliminary floor plan for the site, the following factors need to be considered.

Site considerations include, but are not limited to:

- Location and relationship of walls, doors, windows, partitions, furniture, and telephones
- Necessary floor tile cutouts
- Required access, operator, and service clearances
- Telephone line accessibility
- Placement of existing equipment at the site
- Dimensions of the SAN256N
- Weight of the SAN256N
- Air flow for cooling the SAN256N
- Temperature stability of equipment after shipment
- AC power sources
- The logistics of transporting the SAN256N from the loading dock to the data center

The SAN256N is installed into a supplied cabinet. If the SAN256N chassis is to be installed in a cabinet other than the one supplied, the Account Executive and Technical Support representatives must review and approve the customer's supplied cabinet(s) to certify that the cabinet(s) meets all air flow and mechanical requirements/specifications.

If the SAN256N is to be installed in a customer-supplied rack, the rack must be an EIA standard 19-inch rack. The rack must meet the requirements as specified in the following standards:

- ANSI/EIA RS-230 standard, entitled "Cabinets, Racks, Panels, and Associated Equipment"
- MIL-STD- 189 standard, entitled "Racks, Electrical Equipment, 19-Inch and Associated Panels"

Rack-mounting Considerations

The following conditions should be considered when planning a SAN256N installation into a rack system or other enclosure:

Elevated Operating Ambient - If the SAN256N is installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.

Reduced Air Flow - Installation of the SAN256N in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.

Mechanical Loading - Mounting of the SAN256N in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.

Circuit Overloading - Consideration should be given to the connection of the SAN256N and associated equipment to the supply circuit and the effect that overloading of the circuits might have on over-current protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.

Reliable Earthing - Reliable earth grounding of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g., use of power strips).

Lifting Device Requirements

A hydraulic, electrical, or mechanical lifting device is required to lift the chassis from the wooden shipping skid and install it in a cabinet.

DANGER: The SAN256N weighs approximately 167 pounds or 75.9 kilograms. The use of an approved lift tool is recommended to safely lift the device. Failure to observe this may result in injury to personnel or damage to the SAN256N.

Ordering the Approved Genie Lift Tool

Important: The lift tool is required when you install or remove a SAN256N. The ordering procedures for the lift tool vary depending on your location. You should direct questions about these procedures to your regional specialist.

World Trade Locations

The following ordering procedures are for world trade locations:

- Order the lift tool by using the parts order system, like any other part.
- Use the following part numbers when you order:
- Lift tool: PN 09P2481
- 24-inch load plate: PN 11P4369
- You do not record parts usage.

Return the lift tool and the 24-inch load plate to the parts center after you complete the installation or removal.

United States Locations

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

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

Use the following part numbers when you order:

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

Gather the following information to ensure that the lift tool is delivered when you need it. Failure to provide this information might delay the completion of the order request and the shipping request, or result in an inconvenient or inappropriate return date.

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

You must return the lift tool at the time that was scheduled with UPS Logistics. If you need to change the scheduled return time or date, contact UPS Logistics. You are responsible for ensuring that all of the paperwork and components are packed and restored in the arbocrate (shipping container) of the lift tool. Ensure that the lift tool is functioning properly before you release the tool to UPS Logistics for return. You are accountable for the lift tool until UPS Logistics picks up the lift tool for return delivery to their parts storage facility. Contact your branch office tools coordinator or your region specialist if you have any questions or concerns.

Physical Factors

The following physical factors must be taken into consideration for your site plan:

- Chassis and cabinet dimensions
- Chassis and cabinet weight, including weights for possible equipment future expansion
- Front, back, side, and top clearances for servicing of equipment and air flow
- Equipment accessibility during emergency situations

Environmental Factors

The following environmental factors must be taken into consideration for your site plan:

- Air conditioning exhaust and intake vent locations
- Heat dissipation (BTU output) from all equipment
- Temperature and humidity

When the SAN256N is shipped in conditions of extreme (high/low) temperature and/or humidity, allow 24 hours for environmental stabilization at room temperature. Space must be made available to allow the SAN256N chassis and/or cabinet to stabilize in the actual room/area where the installation will take place.

AC Power Factors

The AC power features of the site play an integral part in the site planning process. The following factors need to be considered:

- Types of power sources, protection, cables, and plugs to meet all electrical requirements
- Lengths of power cables
- Electrical receptacles that have the proper phase, voltage, and ampere ratings
- Accessibility for emergency shut down of AC power to equipment; AC input power connectors must be accessible

Two separate dedicated customer-supplied AC power sources are recommended, and that at least one AC power source should be attached to an Uninterruptible Power Supply (UPS).

Port Interface Cable Factors

The types of port interface cables to be connected to the SAN256N are an integral part of the site planning process. The following factors must be considered:

- Types and appropriate lengths of interface cables to meet all interface connection requirements (i. e., fiber optic or copper)
- Placement of interface cables (appropriate cable lengths and distances)
- Placement of cables (right-of-way for cable runs)

SAN256N Director Specifications

The following topics describe product specifications for the SAN256N.

Physical Characteristics

Table 3. SAN256N Chassis Physical Dimensions

Chassis Physical Dimensions	
Width:	4.45 cm (17.5 inches)
Depth:	68.74 cm (27.062 inches) - No cable troughs installed 82.55 cm (32.5 inches) - With front cable troughs installed
Height:	79.38 cm (31.25 inches)

Table 4. IBM TotalStorage SAN256N Cabinet 2045-C40 Physical Dimensions

SANC40N Cabinet	
Width:	76.84 cm (30.25 inches)
Depth:	97.79 cm (38.5 inches)
Height:	193.04 cm (76 inches) with stationary feet retracted 200.66 cm (79 inches) with stationary feet extended

If the chassis is to be installed in a customer-supplied cabinet, the cabinet must be an EIA standard 19-inch rack. The rack must meet the requirements as specified in the following standards:

- ANSI/EIA RS-230 standard, entitled “Cabinets, Racks, Panels, and Associated Equipment”
- MIL-STD- 189 standard, entitled “Racks, Electrical Equipment, 19-Inch and Associated Panels”

Table 5. Recommended Front and Rear Service Access Distances

Cabinet installation:	81.4 cm (36 inches)
Stand-alone Chassis Installation:	81.4 cm (36 inches)

Table 6. Chassis Configuration Weights

SAN256N	79.38 kg (175 lbs) - One chassis with modules installed (basic configuration) 235.87 kg (520 lbs) - One chassis installed (maximum configuration) in 40U cabinet

Environmental Characteristics

Table 7. SAN256N Environmental Characteristics

Temperature:	10 - 40 degrees C (60 -105 degrees F)
Relative Humidity:	10 to 80%, non-condensing
Heat Dissipation:	6.82 kBTU/hr

AC Power Specifications

Table 8. SAN256N Power Specifications

Each Chassis:	Two separate customer-supplied AC power sources: 200 to 240 VAC, 50 to 60 Hz, single phase, 20 Amp (domestic), 16 Amp (international)
Amps (A):	16 Amp; domestic use) 16 Amp; international use)
Kilo Volt Amps (kVA):	All 2 Gbps configurations: 2.0 KVA
AC Power Receptacles (North American installations only):	Two separate, independent sources are recommended. At least one source should be an uninterruptible power source with independent circuit breakers. The ends of these two power lines must have the NEMA L6-20 receptacles.
AC Power Receptacles (International installations only):	Two separate, independent, uninterruptible power sources are recommended, using independent circuit breakers. IEC 309/CEE 17 receptacle rated at 220/240 V, 16A, 2 poles plus earth ground.

Enterprise Manager Workstation PC

Table 9. Enterprise Manager Workstation PC Power Specifications

Domestic Use:	One separate customer-supplied AC power source: 100 to 127 VAC, 50 to 60 Hz, single phase 15 Amps, 125 V; maximum 4.0 A input
International Use:	200-240, 50 to 60 Hz, single phase 15 Amps, 250 V; maximum 2.0 A input
Dimensions	Width: 31 cm (12.2 inches) Depth: 35.8 cm (14.1 inches) Height: 8.4 cm (3.3 inches) Weight: 9 kg (20 lbs)

Table 10. Enterprise Manager Workstation Monitor Specifications

Domestic Use:	One separate customer-supplied AC power source: 100 to 240 VAC, 50 to 60 Hz, single phase maximum 2.0 A input
International Use:	200-240, 50 to 60 Hz, single phase 15 Amps, 250 V; maximum 2.0 A input
Power Consumption:	Maximum 30 W
Dimensions:	Width: 39.88 cm (15.7 inches) Depth: 21.85 cm (8.6 inches) Height: 41.15 cm (16.2 inches) Weight: 5.99 kg (13.2 lbs)

Table 11. Network Hub Specifications

Power:	100 to 240 VAC, 50 to 60 Hz, 0.3 A input
Environmental:	Temperature: 0 - 40 degrees C (32 -104 degrees F) operating; -25 - 70 degrees C (-13 -158 degrees F) storage Relative Humidity: 5 to 95%, non-condensing Altitude: Up to 3,048 m (10,000 feet)
Dimensions:	Width: 24.92 cm (9.825 inches) Depth: 11.63 cm (4.58 inches) Height: 3.36 cm (1.44 inches) Weight: 890 g (1.95 lbs)
Cabling:	100 Base TX: STP/UTP Category 5 100 Ohm impedance

External Modem

Table 12. Multitech MT5634ZBA *Modem Specifications*

Modem Type:	Multitech MT5634ZBA (global, North America, and international)
Power:	100 - 130 VAC, 50 - 60 Hz, 5 Watts (North America) 230 Volts, 50 Hz (international)
Environmental:	Temperature: 0 - 50 degrees C (32 -120 degrees F) operating Relative Humidity: 20 to 90%, non-condensing
Dimensions:	Width: 10.8 cm (4.25 inches) Depth: 14.8 cm (5.8 inches) Height: 2.9 cm (1.15 inches) Weight: 224 g (8 oz)
Cabling:	RJ-11 phone cable
Interface:	EIA RS-232C/ITU-T V.24/V.28

Table 13. Multitech MT5600BA-V.92 Modem Specifications

Modem Type:	Multitech MT5600BA-V.92 (global, North America, and international)
Power:	100 - 130 VAC, 50 - 60 Hz, 16 Watts (North America) 230 Volts, 50 Hz (international)
Environmental:	Temperature: 0 - 50 degrees C (32 -120 degrees F) operating Relative Humidity: 20 to 90%, non-condensing
Dimensions:	Width: 15.8 cm (6.2 inches) Depth: 22.9 cm (9.0 inches) Height: 3.6 cm (1.4 inches) Weight: 0.9 kg (2 lb)
Cabling:	RJ-11 phone cable
Interface:	EIA RS-232C/ITU-T V.24/V.28

AC Power Cable Wiring Diagram and Plugs

This section describes the AC power wiring requirements. A listing of North American and international AC power cable wire color code comparisons and an illustration of recommended AC power cables are also provided.

The power service required at each chassis AC power cable connector must be a minimum 20 Amp, 200 to 240 Volt AC rated circuit.

Pre-wired chassis AC power cables available. Refer to Figure 16.

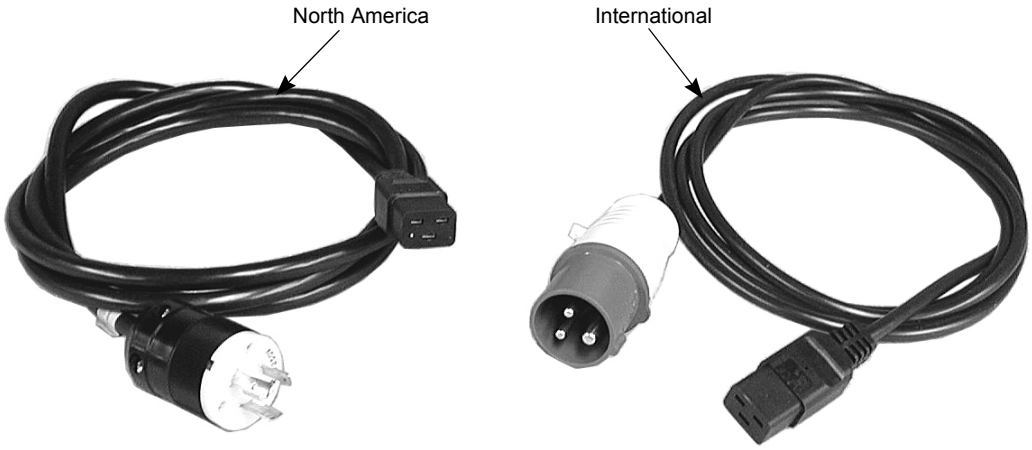


Figure 16. North America and International AC Power Cables

The SAN256N chassis AC power cable wiring diagram (Figure 17.) illustrates the wire lead colors, names, and destinations.

If the AC power cable and plug received with the SAN256N chassis is not compatible with the electrical requirements in your region, consult a technician trained in the electrical wiring requirements and codes in your region.

Note: Both AC power cables with the SAN256N chassis use the white, black, and green color-coded wires when shipped from the factory, as shown in the following figure.

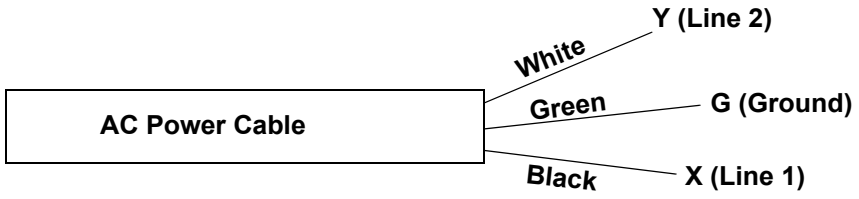


Figure 17. AC Power Cable Wire Diagram

If the AC power plug must be converted to meet your region's electrical requirements, refer to the following table for wiring guidence.

Table 14. AC Power Wire Color Code Comparison

		North America Only	International and North America
X	Hot (Line 1)	Black	Brown
Y	Neutral (Line 2)	White	Blue
G	Earth Ground	Green	Green/Yellow

The following table describes the plugs and receptacles for the SAN256N chassis.

Table 15. Plug/Receptacle for SAN256N Chassis

	Plug	Receptacle
North American	NEMA L6-20P attached to AC power cable (installed at factory, shipped with chassis) to be connected to customer's power source.	Customer supplied (NEMA L6-20R).
International	This power cord is harmonized cable with a plug compliant with the requirements of a specified country. A universal cable equipped with an IEC 309 connector, rated at 16 Amps, is also available.	Customer supplied. IEC 309/ CEE 17 Receptacle rated at 220/240 V, 16A, 2 poles plus earth ground.

Link Specifications

Table 16. Link Specifications

Specification	Definition
Fibre Channel Protocols:	FC-PH, Revision 4.3 FC-PH-2, Revision 7.4 FC-PH-3, Revision 9.4 FC-GS-2, Revision 5.3 FC-GS-3, Revision 7.01 FC-GS- 4 , Revision 7.91 FC-FG, Revision 3.5 FC-SW-2, Revision 5.3 FC-SW-3, Revision 6.6 FC-VI, Revision 1. 84 FCP, Revision 12 FCP-2, Revision 7a FC-SB-2, Revision 2.1 FC-SB-3, Revision 1.6 FC-BB, Revision 4.7 FC-FS, Revision 1. 9 FC-PI, Revision 13 FC-MI, Revision 1.92 FC-Tape, Revision 1.17 IP over Fibre Channel (RFC 2625)
Fibre Channel Classes of Service:	Class 3, Class 2
Modes of Operation:	Connectionless Only: Class 2 and/or Class 3 Mixed Mode: Simultaneous use of Class 2 and/or Class 3
Fabric Port Types:	F_Ports, E_Ports (100% of all Director ports can be F_Ports or E_Ports)
Number of Fibre Channel Ports:	32 to 256 ports

Table 16. Link Specifications (Continued)

Media Type:	Industry-standard Small Form Factor Pluggable (SFP): Hot swappable Media supported by the standard: Short wave: 200-M5-SN-I 200-M6-SN-I 100-M5-SN-I 100-M6-SN-I Long wave: 200-SM-LC-L 100-SM-LC-L Any type in any fabric port
Media Transmission Ranges:	See SFP specifications later in this section
Fabric Port Speed:	2 Gbps
System Processor:	Superscalar 40-MHz Intel i960HA

Fabric Management

Table 17. Fabric Management Specifications

Fabric Management:	Simple name server, alias server, SNMP, Windows-based switch management utilities, and an optional web-based Java application
User Interface:	LED indicators, chassis switch panel
Maintenance Interfaces:	Ethernet RJ-45 connector
Ethernet Connector:	Ethernet 100 Base-TX
Switch Agent:	SNMP through the Ethernet interface
Network File Management:	Trivial File Transfer Protocol (TFTP)

Transceivers: SFP

Table 18. 2 Gbps, Short Wave Laser SFP (Multi-Mode); 10-169 and 10-545 (4-pack)

Connector:	Duplex LC
Color Coding:	Beige or black exposed connector surfaces
Cable:	Fibre Channel 100-M5-SN-I or 100-M5-SL-I (50 mm multi-mode) Fibre Channel 100-M6-SN-I or 100-M6-SL-I (62.5 mm multi-mode)
Operating Wavelength:	830 - 860 nm
Transmit Power:	-9 dBm minimum -4 dBm maximum
Received Power:	-22 dBm average at 1 Gbps -20 dBm average at 2 Gbps
Receiver Threshold:	-18.5 dBm typical
Distance:	500 meters maximum using 50 mm fiber, at 1 Gbps 300 meters maximum using 50 mm fiber, at 2 Gbps 300 meters maximum using 62.5 mm fiber, at 1 Gbps 150 meters maximum using 62.5 mm fiber, at 2 Gbps
Safety:	Class 1 devices per FDA/CDRH and IEC-825-1 laser safety regulations

Table 19. 2 Gbps, Long Wave Laser SFP (Single-Mode); 10-170 and 10-546 (4-pack)

Connector:	Duplex LC
Color Coding:	Blue exposed connector surfaces
Cable:	Fibre Channel 100-SM-LC-L (9 mm single-mode)
Operating Wavelength:	1310 nm (nominal)
Transmit Output Power:	-9.5 dBm minimum -3 dBm maximum
Receiver Sensitivity:	-24 dBm average at 1 Gbps -22 dBm average at 2 Gbps
Receiver Threshold:	-22 dBm
Distance:	2 meters to 10 kilometers (using 9um single-mode)
Safety:	Class 1 devices per FDA/CDRH and IEC-825-1 laser safety regulations

Table 20. 2 Gbps, 35 km Extended Distance SFP (Single-Mode); 10-320

Connector:	Duplex LC
Color coding:	Blue exposed connector surfaces
Cable:	Fibre Channel 100-SM-LC-L (9 mm single-mode)
Operating Wavelength:	1310 nm (nominal)
Transmit Output Power:	0 dBm minimum +5 dBm maximum
Receiver Sensitivity:	-21 dBm minimum, at 2 Gbps -22 dBm maximum, at 1 Gbps
Required Attenuation:	5 dB
Distance:	35 kilometers maximum 12 kilometers minimum (based on 0.4 dB/km loss)
Safety:	Class 1 devices per FDA/CDRH and IEC-825-1 laser safety regulations

Table 21. 2 Gbps, 80 km Extended Distance SFP (Single-Mode); 10-321

Connector:	Duplex LC
Color coding:	Green exposed connector surfaces
Cable:	Fibre Channel 100-SM-LC-L (9 μm single-mode)
Operating Wavelength:	1550 nm (nominal)
Transmit Output Power:	-2 dBm minimum +3 dBm maximum
Receiver Sensitivity:	-28 dBm minimum -9 dBm maximum
Required Attenuation:	12 dB
Distance:	80 kilometers maximum 48 kilometers minimum (based on 0.25 dB/km loss)
Safety:	Class 1 devices per FDA/CDRH and IEC-825-1 laser safety regulations

Multimode Cable Specifications (Cable Type: 50 Microns)Multimode

Table 22. Optical Specifications (1310 nm Wavelength)

Core Diameter:	50 ± 3.0 um
Cladding Diameter:	125 ± 3.0 um
Numerical Aperture:	0.20 (typical)
Minimum Modal Bandwidth:	400 MHz/km
Attenuation:	1.5 dB/km maximum

Table 23. Optical Specifications (850 nm Wavelength)

Core Diameter:	50 ± 3.0 um
Cladding Diameter:	125 ± 3.0 um
Numerical Aperture:	0.20 (typical)
Minimum Modal Bndwidth:	400 MHz/km
Attenuation:	3.5 dB/km maximum

Multimode Cable Specifications (Cable Type: 62.5 Microns)

Table 24. Optical Specifications (1300 nm Wavelength)

Core diameter:	62.5 ± 3.0 um
Cladding Diameter:	125 ± 3.0 um
Numerical aperture:	0.275 ± 0.015
Minimum modal bandwidth:	500 MHz/km
Optical loss:	1.75 dB/km maximum

Multimode Cable Physical Specifications

Table 25. Multimode Cable Specifications

Connector Color:	Black
Jacket Color:	Orange
Jacket Outside Diameter:	4.8 mm (0.189 inches)
Weight (cable only, no connector):	20 grams per meter (0.13 pound/foot)
Installation Tensile Strength (cable only, no connector):	1000 newtons (225 lbs) maximum
Minimum Bend Radius (during installation):	4.0 mm (0.157 inches); 5 seconds maximum at 400 newtons (90 lbs)
Minimum Installed Bend Radius:	No load: 12 mm (approx. 0.5 inches) Long-term residual: 25 mm (approx. 1.0 inches) at 89 newtons (20 lbs) maximum
Flammability:	Underwriters Laboratory-rated OFNR (Optical Fiber Nonconductive, Riser). UL-1666 (Plenum UL-910) is also acceptable.
Crush Resistance:	500 newtons per centimeter (286 lbs per inch) maximum
Maximum Unsupported Vertical Rise:	100 meters (328 feet)

Table 26. Environmental Specifications

Operating Environment:	Inside buildings only
Operating Temperature:	10° to 40° C (50° to 105° F)
Operating Relative Humidity:	5% to 95%
Storage and Shipping Temperature:	-40° to 60° C (-40° to 140° F)
Lightning Protection:	None required
Grounding:	None required

Single-Mode Cable Specifications (Cable Type: 9 Microns)

Table 27. Optical Specifications (1300 nm Wavelength)

Core Diameter:	9 - 10 um ± 10%
Cladding Diameter:	125 ± 2.0 um
Optical Loss:	0.8 dB/km maximum

Table 28. Single-Mode Cable Physical Specifications

Connector Color:	Gray
Jacket Color:	Yellow
Jacket Outside Diameter:	4.8 mm (0.189 inches)
Weight (cable only, no connector):	20 grams per meter (0.13 pound/foot)
Installation Tensile Strength (cable only, no connector):	1000 newtons (225 lbs) maximum
Minimum Bend Radius (during installation):	4.0 mm (0.157 inches); 5 seconds maximum at 400 newtons (90 lbs)
Minimum Installed Bend Radius:	No load: 12 mm (approx. 0.5 inches) Long-term residual: 25 mm (approx. 1.0 inches) at 89 newtons (20 lbs) maximum
Flammability:	Underwriters Laboratory-rated OFNR (Optical Fiber Nonconductive, Riser). UL-1666 (Plenum UL-910) is also acceptable.
Crush Resistance:	500 newtons per centimeter (286 lbs per inch) maximum
Maximum Unsupported Vertical Rise:	100 meters (328 feet)

Table 29. Environmental Specifications

Operating Environment:	Inside buildings only
Operating Temperature:	0 ° C to +60 ° C (+32 ° F to +140 ° F)
Operating Relative Humidity:	8% to 95%
Storage and Shipping Temperature:	-40 ° C to +60 ° C (-40 ° F to +140 ° F)
Lightning Protection:	None required
Grounding:	None required

Miscellaneous Considerations

In addition to the physical, environmental, and power considerations previously described, the following should also be considered when planning the site layout:

- SAN256N proximity to other SAN256N units
- Location requirements for the SAN256N Enterprise Manager designated workstation (if applicable)
- Distances between SAN256N equipment and connecting equipment
- Daisy-chaining of network hubs between SAN256N chassis
- Future expansion of physical and logical connectivity of the equipment
- Non-disruptive growth of configuration and ports
- Security requirements (as applicable) to protect the site integrity

Creating a Preliminary Floor Plan

The physical layout is one of the most critical parts of the site survey. Prior to the site survey and delivery of the SAN256N equipment, a detailed site floor plan needs to be submitted for approval. The physical layout represents a visual picture of the physical storage networking environment site drawn to scale. The physical layout should illustrate all of the cabinets/assemblies involved in the networking environment, detailing their location and proximity to power sources and communications lines. Essentially, the physical layout should represent an overhead snapshot of the SAN256N site drawn to scale. If equipment is located on several floors, a physical layout should be prepared for each floor, detailing the various cabinets/assemblies and cable (power, communications) runs.

- Use the Site Planning Grid to define the physical layout site. Make additional copies as required.
- Represent each different floor where equipment, or associated equipment involved with connecting to the SAN256N, is located.
- Draw in all equipment involved in the connection to the SAN256N, including power and communications cable runs. Monitor and test locations should also be shown.
- Represent each chassis or cabinet and port with a number. This number can then be transferred to other configuration drawings, which will indicate exactly what complement of equipment resides a specific cabinet.

Customer Address Information

Customer:_____

Address: _____

_____

City/State/ZipCode:_____

Site Contact: _____

Phone:_____

This Site Planning Grid is for:

Site Location Address:

_____

Building Number: _____ Floor Number: _____

- Data Center Name (if Applicable): _____

Figure 18. Customer Address Information

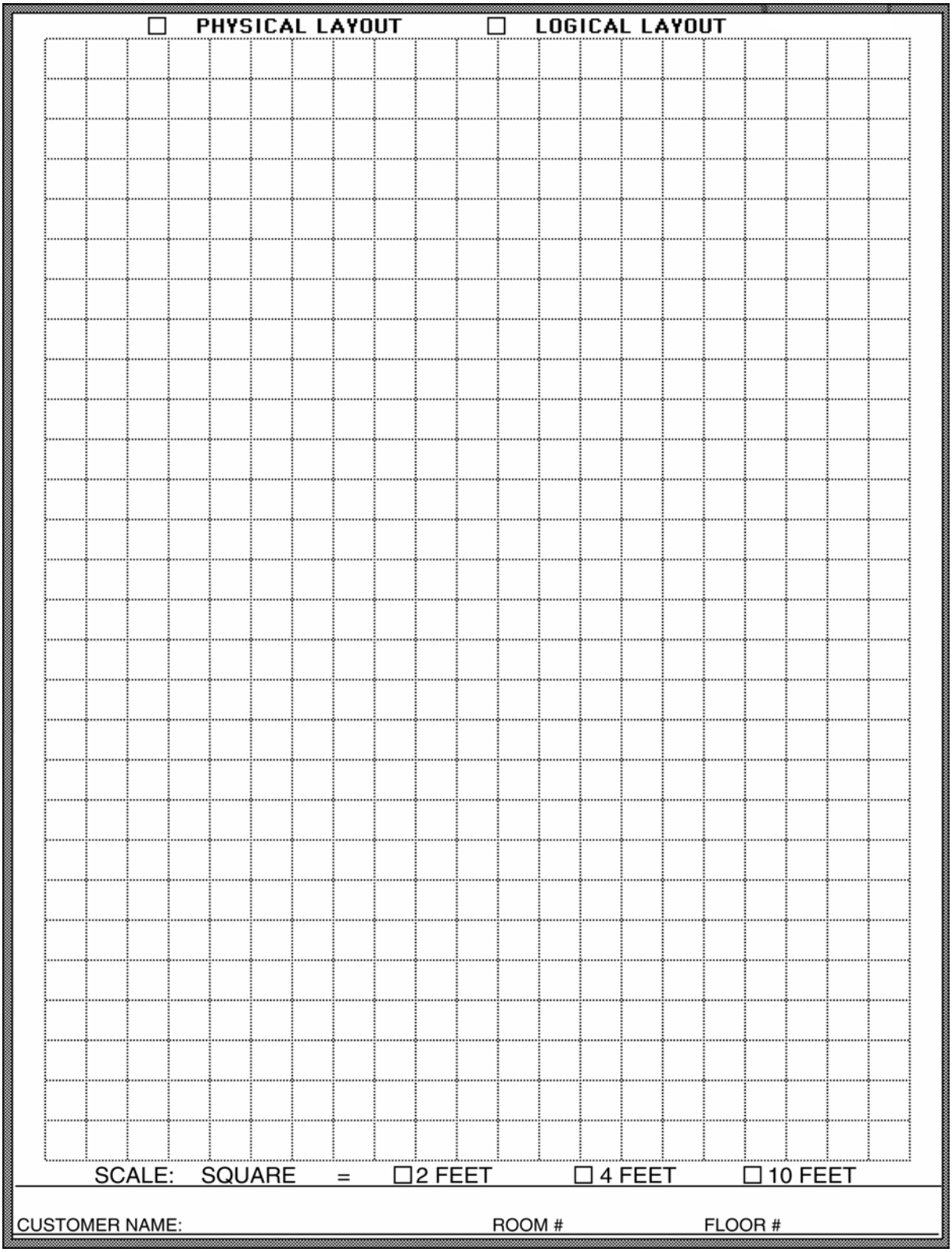


Figure 19. Site Planning Grid

Security and Customer Service via Remote Diagnostics

Remote diagnostics provide the ability to dial into a customer's SAN256N and perform basic non-disruptive troubleshooting from a PC. This method of initial problem determination can occur very quickly, and in cases where the Phone Home capability has announced an alarm, before the customer may become aware of the problem. This means faster resolution of that problem. The benefit is a fast resolution to what may be a potential problem.

Remote diagnostics is performed using Symantec pcAnywhere (pcAnywhere), an off-the-shelf program that allows Technical Support to perform remote non-disruptive diagnostics and data collection. The customer must provide a phone line into the Enterprise Manager/Server, and can choose between the level of security and level of response service, which may be required by their network.

pcAnywhere Remote/Host Structure

The program is organized with a remote and host user structure. The operation is a remote session, initiated either by the customer or customer service engineer (CSE), which awaits a call from a host session. Before a host session can connect, it must be first registered in the client's user list with strict security options available to the customer. This means that both ends of the system must have pcAnywhere open for it to work; therefore those without pcAnywhere will not be able to establish contact with the customer's system.

Password Protection

Passwords are defined by in the pcAnywhere host profile. Customers have the option of defining and managing additional passwords.

Balancing Security with Customer Service through Remote Diagnostics

As the level of security increases in data centers, the capability of Technical Support to respond is reduced. The following defines what a customer may choose to balance the levels of security and the level of responsive service they require.

- The EM Server ships with default security parameters installed.
- The vendor is allowed to define and internally manage the customer's specific usernames and passwords.
- The customer defines and manages thesecurity protocols. If required, the customer can gather and escalate diagnostic information. If it is necessary for to allow remote access, the customer will be asked to provide access to their system.

Site Location Preparation Customer Responsibilities

It is the customer's responsibility to have the site location meet all the requirements for the installation and operation of the SAN256N. Work on the physical location should be scheduled and completed prior to delivery of the equipment. The following items should be prepared and ready:

- Floor cut-outs (as required)
- Ample space (for placement and maintenance access)
- Associated equipment locations

- Connections to other equipment
- AC power source, circuit breakers, and receptacles
- Certified protective earth ground connections
- Wire and fiber optic link cables
- Room temperature control or adequate room cooling
- Sufficient lighting
- ESD requirements, as applicable
- Equipment and personnel required to move cabinet and associated shipping boxes to final destination. If delivery is left at shipping dock,Field Service personnel are not responsible for the movement of the cabinet to its final destination.

Physical Preparations

- The SAN256N requires a minimum 61.0 cm (24 inch) clearance at both the front and rear for service access. A front and rear service access distance of 81.4cm (36 inches) is recommended.
- The SAN256N, requires a minimum 25.4 kg (10-inch) clearance from the top of the cabinet to the ceiling or ceiling tiles to allow for a cooling and servicing area.
- To accommodate future expansion, floor strength should be sufficient enough to support the rack maximum configuration, even if the rack(s) is not fully loaded at the time of installation.
- A fully loaded chassis weighs 97.5 kg (215 lbs); when minimally loaded (basic configuration), the chassis weighs approximately 79.38 kg (175 lbs).
  - A chassis installed in the supplied cabinet weighs 235.87 kg (520 lbs).

Floor Tile Cutouts

Raised flooring with tile cutouts to accommodate forced air flow and cable access (power cables, ground strap and fiber optic cables) requirements are preferred and recommended. For cooling requirements of the SAN256N, raised floor tile positioning requirements and measurements should be followed for each cabinet to be installed.

Cabinet floor tile cutouts for cabling should be in accordance with the measurements shown in Figure 20.; a 27.94 cm by 15.24 cm (11 inch by 6 inch) cutout in the front center of one floor tile is for the AC power and fiber optic cables. The second floor tile must be a checkerboard perforated pattern, allowing a 60% open air flow area.

Enlarged View of Standard 61 by 61 cm (24 by 24 inch) Floor Tiles

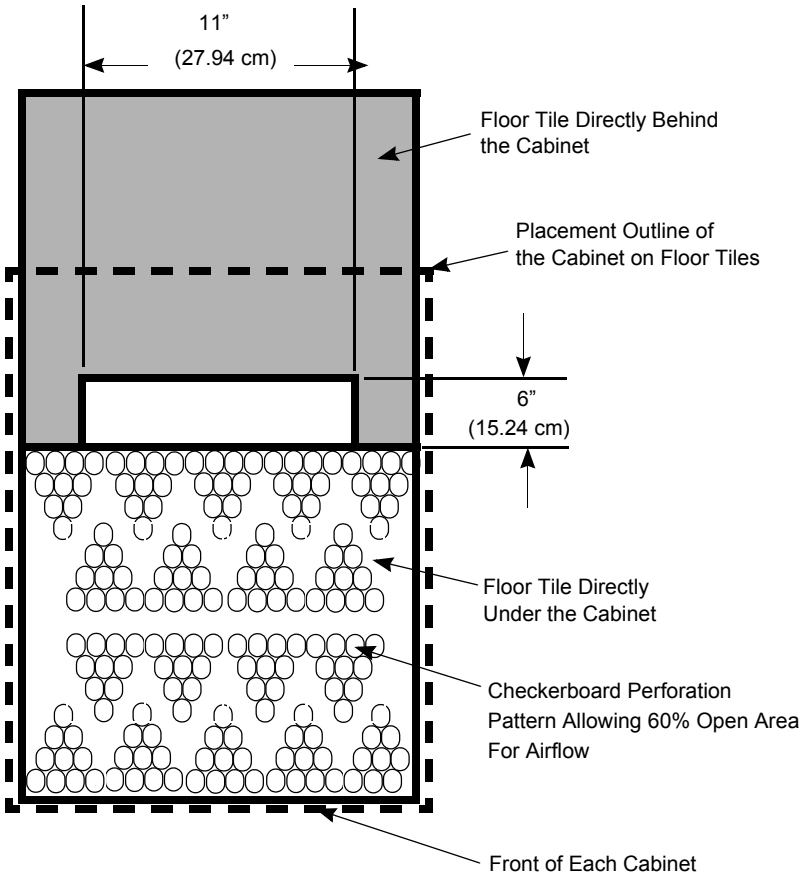


Figure 20. Floor Tile Layout for the Cabinet

Environmental Preparations

Adequate air flow and proper operation lighting are environmental preparations that must be completed prior to installation. However, the room temperature must be maintained.

Electrical Preparations

The electrical preparation requirements that must be met by the customer are defined in three areas: AC power; Cabling (power cable, signal cables, fiber optic cables); and Electrostatic Discharge (ESD) sensitive equipment precautions.

AC Power Servicing Requirements

The SAN256N has a dual AC power input capability to avoid power outages due to a possible AC power failure on one of the two power inputs. Two separate, independent AC power lines should be provided from two independent power sources and circuit breakers. An uninterruptible power supply (UPS) should be connected to each redundant power source to ensure uninterrupted power.

110 VAC, 50/60 Hz service must also be provided for the Enterprise Manager PC workstation/monitor and the hub devices.

Access to the customer's inlet AC power receptacles must be provided so that the field service technicians can easily disconnect the AC power cords, if necessary, to perform maintenance procedures.

During servicing of the SAN256N, when it is not required to have AC power applied, disconnect both power cords at rear of chassis before servicing.


C032

DANGER: High energy levels are present in the rear of the chassis and system backplane, and whenever a vacant module slot or power supply assembly slot is exposed. Possible electrical injury could occur to personnel. Therefore, only trained service personnel or Certified Third Party Field Service Organization personnel should access these areas.

Grounding Requirements

Supplemental 10-32 UNF-23 grounding terminals are provided at the bottom of each rail for proper grounding of the cabinet. The installer should refer to local electrical codes for grounding requirements.

Link Interface Cables

The types of interface cables that the customer supplies are Fibre Channel fiber optic cables.

Fiber Optic Link Cable

Single-mode (SM) and multi-mode (MM) are terms used to describe the optical fiber and cable types. SM fiber is used to transfer information in one light dispersion path over greater distances; while MM fiber provides multiple light dispersion paths to transfer information at a lower bandwidth over shorter distances.

The typical fiber optic cable sizes are:

- MM: 50/125 microns or 62.5/125 microns.
- SM: 8/125, 9/125 or 10/125 microns.


C026

DANGER: *Do not look directly into the laser beam or into a reflection of the beam.* The single mode/multimode lasers will cause serious eye injury if they are not handled properly: *Always* connect a fiber to the output of the device before power is applied. *Never* look in the end of a fiber to see if light is coming out! *Never* look into the end of a fiber on a powered device with any sort of magnifying device. Keeping the process plugs on the uncabled transceiver connectors will help to prevent an accident and to protect the interfaces. Most fiber optic wavelengths (850 nm and 1310 nm) are totally invisible to the unaided eye and will cause permanent damage to ones vision. Always use instrumentation, such as an optical power meter to verify the light output. The single mode/multimode laser output is 1310 nm.

Electrostatic Discharge (ESD) Precautions

Static electricity can be very damaging to certain types of equipment in the work place. Static has been known to cause computer equipment to become inoperable, and in some cases destroyed.

To help understand Electrostatic Discharge (ESD) and ESD Sensitive (ESDS) devices, the following definitions are provided:

- *ESD* - a sudden transfer of a charge between two objects.
- *ESDS* - term used to describe devices that, because of designs, are damaged from electrostatic discharge.
- *Charge* - an excess or deficiency of electrons on the surface of material.
- There are two methods for static to reach sensitive devices:
- Through a worker's fingertips - which is the most common method.
- Through induction, which is when static is transferred from types of material (plastic cups, synthetic fabrics) onto sensitive devices without physically touching those devices.

You can prevent ESD damage by handling all static sensitive devices in a static-safe work place, and by using the following static control materials:

- Wrist straps
- Dissipative work mats
- Ground cords
- Air ionizers
- Conductive bags, tote boxes, or tote trays whenever handling ESDS modules

The SAN256N contains the following ESDS components:

- TFIO blades
- TSW modules
- TCM modules
- TMF/TFD module
- Upper Fan assemblies
- Side Fan assemblies
- Power supply assemblies
- SFPs

Each of the ESDS components contained inside the SAN256N rack have yellow and black ESD labels placed in high-visible areas to identify the component as an ESDS component. Refer to the following ESD label example.

Figure 21. Example of the ESD Label

Chapter 3. Site Survey

This chapter provides worksheets for collecting and recording site planning data.

Site Survey Purpose

Once a preliminary floor plan has been submitted and has been approved, a System Engineer or Customer Service Engineer will conduct a site survey. The site survey is designed to:

- Review the physical, environmental, and power requirements at the installation site
- Confirm the approved floor plan
- Develop a detailed system installation plan, including a timetable of events
- Confirm the equipment necessary for the installation and prepare all sales, customer, and transportation data required for the placement/confirmation of the order

A detailed Site Survey Check List is included in this chapter. This check list indicates the customer and vendor responsibilities for each phase of the planning process.

Site Survey Data Sheets

As part of the site survey, there are data sheets that must be prepared. These data sheets include:

- Site Configuration Worksheet; page 48
- Director Port Server/Device Configuration Worksheet; page 66
- Codeset Upgrade Configuration Worksheet; page 71
- Customer Information Data Sheet; page 75
- Transportation Carrier Data Sheet; page 78
- Site Survey Check List; page 82

Site Configuration Worksheet

The Site Configuration Worksheet asks specific questions about the customer's site configuration for the SAN256N. This information includes:

- Background information
- Customer information
- Hardware configuration information
- Customer responsibility information
- Vendor responsibility information
- Additional responsibilities (International customers only)

SAN256N Component Locations, Serial Numbers

This section of the Site Configuration Worksheet is filled out by the Customer Service Engineer during the actual installation of a SAN256N system. The serial numbers must be obtained and recorded for future reference. Serial numbers are required for the following:

- Verification of the shipping manifest vs. the actual modules in the chassis
- Warranty coverage verification in case of required replacement of the module
- Maintenance contracts (new or renewal of services)

Two serial numbers (located on stick-on labels on the inside rear cabinet door) constitute the overall SAN256N system:

- Model serial number
- Cabinet type serial number

The serial number(s) of the SAN256N chassis can be obtained from the stick-on labels on each chassis.

The serial numbers of the various modules (TFIO, TSW, TCM) are obtained by selecting **Version** from the director view of the Enterprise Manager (EM) display screen to acquire the serial numbers of each module in the SAN256N chassis.

The serial numbers of the power supply modules in each chassis are found on the white bar code labels on the front panel of each power supply module.

A cabinet number field is also included on the worksheet. This number is used for identification of multiple cabinets at the installation site.

Domain Identification Assignment Considerations

Identification (ID) assignments for the domain ID numbering scheme are crucial to configuration setups. This ID numbering scheme must be understood prior to assigning and entering the ID numbers on the EM **System Configuration** display screen, via the **System Configuration** menu on the **Switch View** screen.

The E_Port configuration addressing scheme, which is the Fibre Channel industry standard addressing scheme, is supported by the SAN256N. In the E_Port addressing scheme, the domain, which refers to the fabric, and domain IDs are used to configure the fabric.

Domain ID Assignment Concepts For E_Port Configurations

The domain ID is a unique Fibre Channel identifier for the switch. *The domain ID must be unique for each switch in the fabric.* In a SAN configuration with redundant paths, the domain IDs have to be unique even if the two fabrics are not linked together by an Interswitch Link (ISL). The chart below summarizes domain ID numbering for E_Port configurations.

The numeric ID values can be any value within a range of 1 to 239. The number of domains that can be specified for an SAN256N is model dependent. The following chart summarizes domain ID numbering concepts and requirements for E_port configurations.

E_Port SAN256N System	ID Value Range
Domain ID	1 - 239
Domain ID range recommended for interoperability	97 -127
Fabric with at least one switch (Director) ID	
SAN256N	xx total domains (any ID value within the 1 - 239 value range)
One Director ID per logical domain	

Note: Fabric and switch IDs are not required/not used in E_Port fabrics.

E_Port TFIO System ID Assignments

Examples of SAN256N domain ID assignment for the TFIO fabric groups are as follows:

- First SAN256N, domain ID = 97
- Second SAN256N, domain ID = 98
- Third SAN256N, domain ID = 101
- Fourth SAN256N, domain ID = 120
- Fifth SAN256N, domain ID = 38
- Sixth SAN256N, domain ID = 24

239 domains are the FC-SW2 maximum number supported.

World Wide Name Zone Assignment Considerations

Zoning by World Wide Name (WWN) is used to group individual devices into zones. These devices communicate with other devices on the SAN that are included in the same World Wide Name Zone.

Site Configuration Worksheet

Background Information

Date:_____

Prepared By: _____

Account Exec: _____

System Engineer: _____

CSE Responsible For Installation:_____

Customer Information

Customer: _____

Address: _____

City: _____ State: _____ Country: _____

Site Contact: _____ Phone: _____

Hardware Configuration

Total Number of Chassis _____

S/N _____ S/N _____ S/N _____ S/N _____

Are the chassis to be installed in a cabinet? Yes ❑ No ❑

If Yes, then specify the total number of cabinets and the cabinet serial numbers below:

Standard Supplied Cabinets: _____ Customer Supplied Cabinets: _____ Total Cabinets: _____

S/N _____ S/N _____ S/N _____ S/N _____

Module Quantities:

TFIOs: _____ TCMs: _____ TSWs: _____

Number of Power Supplies: _____

Is the chassis to be installed in a customer supplied EIA standard 19-inch cabinet? Yes ❑ No ❑

Software Management System for this Installation

Enterprise Manager Software Server Application with PC: Yes ❑ No ❑

Enterprise Manager Software Server Application without PC: Yes ❑ No ❑

Enterprise Manager Software Client Application with PC: Yes ❑ No ❑

System Firmware Level

Firmware	Version	Date
AFMFT_FB	_____._____._____._____	_____/_____/_____
AFMFT_FPGA	_____._____._____._____	_____/_____/_____
AFMFT_TCM	_____._____._____._____	_____/_____/_____
AFMFT_TFIO	_____._____._____._____	_____/_____/_____
AFMFT_TSW	_____._____._____._____	_____/_____/_____
AFMFT_TFIO FPGA	_____._____._____._____	_____/_____/_____

TCM Ethernet Port Configurations

IP Address	Subnet Mask	Gateway Address
_____._____._____._____	_____._____._____._____	_____._____._____._____
_____._____._____._____	_____._____._____._____	_____._____._____._____
_____._____._____._____	_____._____._____._____	_____._____._____._____
_____._____._____._____	_____._____._____._____	_____._____._____._____
_____._____._____._____	_____._____._____._____	_____._____._____._____
_____._____._____._____	_____._____._____._____	_____._____._____._____
_____._____._____._____	_____._____._____._____	_____._____._____._____
_____._____._____._____	_____._____._____._____	_____._____._____._____

Cable Assignments

TCM Location	Ethernet Cable Number
PB1 (lower chassis)/TCM0-TR0 (Top Row 0)	_____
PB1 (lower chassis)/TCM1-BR0 (Bottom Row 0)	_____
PB2 (upper chassis)/TCM0-TR0 (Top Row 0)	_____
PB2 (upper chassis)/TCM1-BR0 (Bottom Row 0)	_____

EM Workstation Server Port Configurations

IP Address	Subnet Mask	Gateway Address
_____._____._____._____	_____._____._____._____	_____._____._____._____
_____._____._____._____	_____._____._____._____	_____._____._____._____
_____._____._____._____	_____._____._____._____	_____._____._____._____
_____._____._____._____	_____._____._____._____	_____._____._____._____
_____._____._____._____	_____._____._____._____	_____._____._____._____

_____.____.____.____ _____.____.____.____ _____.____.____.____

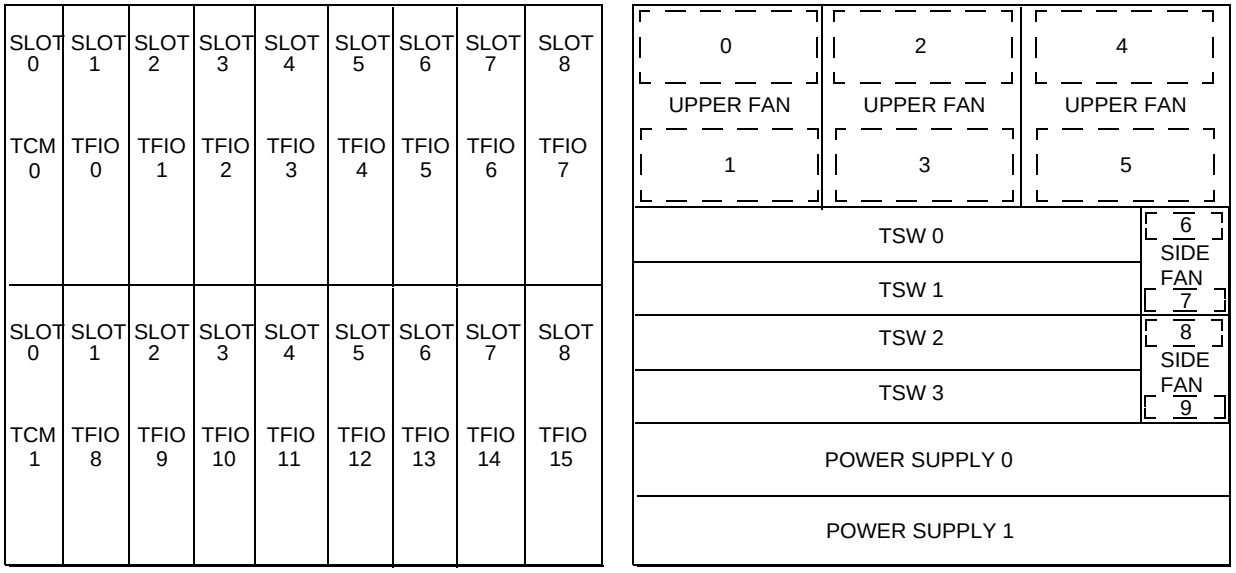
_____.____.____.____ _____.____.____.____ _____.____.____.____

_____.____.____.____ _____.____.____.____ _____.____.____.____

SAN256N Component Locations, Serial Numbers

Model Serial Number: _____ Cabinet Number: _____ Cabinet Serial Number: _____

Chassis Serial Number: _____



FRONT CHASSIS VIEW **REAR CHASSIS VIEW**

SAN256N Component Locations, Serial Numbers (Continued)

TFIO	Serial Number	TCM	Serial Number	TSW	Serial Number	Fans	Serial Number
TFIO 0	_____	TCM 0	_____	TSW 0	_____	Upper Fan 0/1	_____
TFIO 1	_____	TCM 1	_____	TSW 1	_____	Upper Fan 2/3	_____
TFIO 2	_____			TSW 2	_____	Upper Fan 4/5	_____
TFIO 3	_____			TSW 3	_____	Side Fan 6/7	_____
TFIO 4	_____					Side Fan 8/9	_____
TFIO 5	_____						
TFIO 6	_____						
TFIO 7	_____						
TFIO 8	_____						
TFIO 9	_____						
TFIO 10	_____						
TFIO 11	_____						
TFIO 12	_____						
TFIO 13	_____						
TFIO 14	_____						
TFIO 15	_____						

Power Supply Modules	Serial Number
Power Supply 0	_____
Power Supply 1	_____

Server/Device Configuration: SAN256N, Top Shelf

	TFIO/Slot Number							
	1	2	3	4	5	6	7	8
Port	**Cable Number**							
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								

Server/Device Configuration: SAN256N, Bottom Shelf

	TFIO/Slot Number							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Port #	**Cable Number**							
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								

UMD-16 (Bottom Shelf)

FICON Link Address Configuration: SAN256N, Top Shelf

	TFIO/Slot Number							
	1	2	3	4	5	6	7	8
Port #	FICON Address Assignments							
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								

Top Shelf

FICON Link Address Configuration: SAN256N, Bottom Shelf

	TFIO/Slot Number							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Port #	**FICON Address Assignments**							
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								

Bottom Shelf

Domain and Chassis Identification Assignments

Domain ID Number: ______________

Type and Quantity of SAN256N System(s) in Fabric Group

SAN256N Switch(es): ______________________

CID = Chassis ID

System Type:	______________________	CID:	______________________
System Type:	______________________	CID:	______________________
System Type:	______________________	CID:	______________________
System Type:	______________________	CID:	______________________
System Type:	______________________	CID:	______________________
System Type:	______________________	CID:	______________________
System Type:	______________________	CID:	______________________
System Type:	______________________	CID:	______________________
System Type:	______________________	CID:	______________________
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System Type:	______________________	CID:	______________________
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System Type:	______________________	CID:	______________________
System Type:	______________________	CID:	______________________
System Type:	______________________	CID:	______________________
System Type:	______________________	CID:	______________________
System Type:	______________________	CID:	______________________

Domain and Chassis Identification Assignments

Domain ID Number: _______________

Type and Quantity of SAN256N System(s) in Fabric Group

SAN256N Switch(es): ___________________________

CID = Chassis ID

System Type:	___________________________	CID:	____________________________
System Type:	___________________________	CID:	____________________________
System Type:	___________________________	CID:	____________________________
System Type:	___________________________	CID:	____________________________
System Type:	___________________________	CID:	____________________________
System Type:	___________________________	CID:	____________________________
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System Type:	___________________________	CID:	____________________________
System Type:	___________________________	CID:	____________________________
System Type:	___________________________	CID:	____________________________
System Type:	___________________________	CID:	____________________________
System Type:	___________________________	CID:	____________________________
System Type:	___________________________	CID:	____________________________

Port Configurations, Top Shelf, TFIO Boards 1 - 8, Ports 1 - 8

For each port, indicate the mode and check whether Short wave or Long Wave SFPs are used.

- Modes should be indicated by using: **F (F_Port)** or **E (E_Port)**
- For each SFP, indicate one of the following for each TFIO port: **SW** (Short wave) or **LW** (Long wave)

Top Shelf

	TFIO #1	TFIO #2	TFIO #3	TFIO #4	TFIO #5	TFIO #6	TFIO #7	TFIO #8
Port 1								
Mode:								
SFP Mode:								
Port 2								
Mode:								
SFP Mode:								
Port 3								
Mode:								
SFP Mode:								
Port 4								
Mode:								
SFP Mode:								
Port 5								
Mode:								
SFP Mode:								
Port 6								
Mode:								
SFP Mode:								
Port 7								
Mode:								
SFP Mode:								
Port 8								
Mode:								
SFP Mode:								

Port Configurations: Top Shelf, TFIO Boards 1 - 8, Ports 9 - 16

For each port, indicate the mode and check whether Short wave or Long Wave SFPs are used.

- Modes should be indicated by using: **F (F_Port)** or **E (E_Port)**
- For each SFP, indicate one of the following for each TFIO port: **SW** (Short wave) or **LW** (Long wave)

Top Shelf

	TFIO #1	TFIO #2	TFIO #3	TFIO #4	TFIO #5	TFIO #6	TFIO #7	TFIO #8
Port 9								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 10								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 11								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 12								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 13								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 14								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 15								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 16								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____

Port Configurations: Bottom Shelf, TFIO Boards 1 - 8, Ports 1 - 8

For each port, indicate the mode and check whether Short wave or Long Wave SFPs are used.

- Modes should be indicated by using: **F (F_Port)** or **E (E_Port)**
- For each SFP, indicate one of the following for each TFIO port: **SW** (Short wave) or **LW** (Long wave)

Bottom Shelf

	TFIO #1	TFIO #2	TFIO #3	TFIO #4	TFIO #5	TFIO #6	TFIO #7	TFIO #8
Port 1								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 2								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 3								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 4								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 5								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 6								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 7								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 8								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____

Port Configurations: Bottom Shelf, TFIO Boards 1 - 8, Ports 9 - 16

For each port, indicate the mode and check whether Short wave or Long Wave SFPs are used.

- Modes should be indicated by using: **F (F_Port)** or **E (E_Port)**
- For each SFP, indicate one of the following for each TFIO port: **SW** (Short wave) or **LW** (Long wave)

Bottom Shelf

	TFIO #1	TFIO #2	TFIO #3	TFIO #4	TFIO #5	TFIO #6	TFIO #7	TFIO #8
Port 9								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 10								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 11								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 12								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 13								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 14								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 15								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____
Port 16								
Mode:	_____	_____	_____	_____	_____	_____	_____	_____
SFP Mode:	_____	_____	_____	_____	_____	_____	_____	_____

Zone Configuration Assignments

Zone Number:_____

Port Number	Device WWN	Device Type	Device Name

Zone Configuration Assignments (Continued)

Zone Number:_____

Port Number	Device WWN	Device Type	Device Name

Power Requirements

For international shipments, power cords are shipped with the appropriate plugs. The local office must coordinate receptacle installation with the customer.

- SAN256N power specifications: 220-240 VAC/single phase/15-20 Amps/50-60 Hz. The customer must provide two independent L6-20R receptacles per chassis. Two L6-20P plugs are provided per chassis for North American shipments.
- EM Workstation power specifications: 110-125 VAC/single phase/15 Amps/ 50-60 Hz. The customer must provide an independent L5-15R receptacle per Enterprise Manager workstation, monitor, and network hub.

Number of receptacles provided by the customer: _____

Type of power cords with plug:

North America _____

Universal _____

Europe _____

South Africa _____

Israel _____

Protective earth termination may be required to meet telecom network safety requirements. The protective earth termination point is located on the rear of the cabinet.

International Power Plugs

Power receptacles are installed locally. The customer must know the type of power plug installed so they can install the matching power receptacle.

- SAN256N power specifications: 200 - 240 VAC/single phase/15-20 Amps/50-60 Hz
- EM Workstation power specifications: 110 - 125 VAC/single phase/15 Amps/50-60 Hz (for Enterprise Manager workstation, monitor, and hub)

Power plugs are supplied and installed locally.

Type: _____ Quantity: _____

Type: _____ Quantity: _____

Type: _____ Quantity: _____

Protective earth termination may be required to meet telecom network safety requirements. The protective earth termination point is located on the rear of the cabinet.

Telephone Lines

Remote dial-in and phone-home support is critical. The installation cannot be supported without phone lines. One dedicated phone line per Enterprise Manager server is required at each site. Two phone lines are recommended:

- One line for dial-in support for remote diagnostics
- One line for the phone-home feature

The customer will provide ____ telephone lines at the local location.

The customer will provide ____ telephone lines at the remote location.

Customer-supplied remote dial-in support telephone number: (____)_____

Port Server/Device Configuration Worksheet

This worksheet is used in conjunction with the Site Configuration Worksheet. It allows you to configure the ports and servers, indicating the configuration for a specific SAN256N.

Order #:_____ Original Date:_____

Quote #:_____ Revised Date:_____

Background Information

Date:_____

Prepared By:_____

Account Exec:_____

System Engineer: _____

CSE Responsible for Installation:_____

Customer Information

Customer: _____

Address: _____

City:_____ State: _____

Country: _____

Site Contact: _____

Phone: _____

Port Server/Device Configuration

TFIO # _____	Host Device	Model Number	O/S Code Application	Interface Type	HBA	HBA Model	HBA Interface	Driver/ FW
Port 1								
Port 2								
Port 3								
Port 4								
Port 5								
Port 6								
Port 7								
Port 8								
Port 9								
Port 10								
Port 11								
Port 12								
Port 13								
Port 14								

Port Server/Device Configuration

Port 15								
Port 16								

Port Server/Device Configuration

TFIO # _____	Host Device	Model Number	O/S Code Application	Interface Type	HBA	HBA Model	HBA Interface	Driver/ FW
Port 1								
Port 2								
Port 3								
Port 4								
Port 5								
Port 6								
Port 7								
Port 8								
Port 9								
Port 10								
Port 11								

Port Server/Device Configuration (Continued)

Port 12								
Port 13								
Port 14								
Port 15								
Port 16								

Port Server/Device Configuration Worksheet Example

The following is an example of a partially-completed second page of the Fibre Channel Director Port Server/Device Configuration Worksheet.

Port Server/Device Configuration

TFIO # _____	Host Device	Model Number	O/S Code Application	Interface Type	HBA	HBA Model	HBA Interface	Driver/ FW
Port 1	HP	HP9000D	HPUNIX 10 20 W/ S800	SCSI				
Port 2	SUN	E3000	Solaris 2.6	FC	EMULEX	LP6000	FC	2.21
Port 3	DELL	PV12	NT Workstation		Jaycor		FC	FCASCSI.SYS 2.11
Port 4	EMC	5300		FC				5265.23.17
Port 5	UNISYS	Seagate JBOD		SCSI				
Port 6								
Port 7								
Port 8								
Port 9								
Port 10								
Port 11								
Port 12								

Codeset Upgrade Configuration Worksheet

The Codeset Upgrade Configuration Worksheet is used when a SAN256N system code is to be upgraded, i.e., CS1.0.x to 1.1.x. This form must be filled out and returned to Technical Support prior to scheduling an upgrade at the customer's site.

Site Information

Customer Name: _____

Site Address:

_____

_____

_____

_____

_____

Special Access Information (after hours access, security issues, etc.):

_____

_____

_____

_____

Customer Contacts	Name	Phone Number	Add'l. Contact Info

OnSite Upgrade Team	Name	Phone Number	Add'l. Contact Info

Contacts	Name	Phone Number	Add'l. Contact Info
SAE			
Account Sales Rep			
Technical Support Specialist			
Escalation Contact			

Partner Contacts	Name	Phone Number	Add'l. Contact Info
Account Service Rep			
Account Sales Rep			
Technical Support Specialist			
Escalation Contact			

SAN256N Information

Model	Number of Ports Installed	System Serial #	Cabinet Serial #	Port Block Serial #	Partner System Serial #	Current Code Set	Current EM

	Storage Attached			CPU/Server Information		
Model	Vendor	Model	Software Level	Vendor	Model	Software Level

Serial number of the Enterprise Manager (EM) Workstation: _____
Will this system be FICON only, Open Systems, or Protocol Intermix?_____

After Completing the Upgrade:

From the EM Client, select the Versions tab, click the Export button, and save the information in a file with the SAN256N serial number. Send the exported file with this completed worksheet after the upgrade is completed.

Attach topology drawings and any additional configuration information that is available. Include any available port diagrams and ISL information.

Codeset Upgrade Checklist

For “Yes/No” questions, blank fields are included for you to provide additional information if needed.

SR Number: _____

Scheduled activity date, window, and start time:

_____

_____

Assigned SAE: _____

Assigned Technical Support Specialist: _____

Is this a partner-supported account? Yes ❑ No ❑

If yes, will the partner be performing the upgrade? Yes ❑ No ❑

_____

_____

Order Required Code (EM and Firmware):
___Qty 1 – Set of EM and Firmware CDs
or
___Qty 1 – Enterprise Manager
___Qty 1 – Firmware Codeset

Is this an NDCL upgrade? Yes ❑ No ❑

Are TSWs and/or TFIO boards required for the upgrade? Yes ❑ No ❑

- Have boards been ordered? Yes ❑ No ❑
- If yes, indicate the order date. _____
- Have boards been delivered? Yes ❑ No ❑
- If yes, indicate the delivery date._____
- Has the shipment been audited? Yes ❑ No ❑ If yes, is it correct? Yes ❑ No ❑

_____

_____

Is this an In-Band or Out-of-Band code upgrade? Yes ❑ No ❑

Are Dial-In and Phone Home set up and operational? Yes ❑ No ❑

Are there “Remote Clients” that need to be deleted? Yes ❑ No ❑

_____

_____

Customer Information Data Sheet Overview

The Customer Information Data Sheet asks specific questions about the customer and the location of the site. This information is required to set up a customer data file for the sales and field service personnel. The information requested on this data sheet is:

- Customer's name and complete address
- Primary and alternate customer contact personnel, their phone numbers, and/or their pager numbers
- Directions to the site
- Site survey, order, shipment, and installation dates
- Hotel recommendations and addresses
- Any notes or special instructions

Customer Information Data Sheet

Order #:_____ Original Date:_____

Quote #:_____ Revised Date:_____

Background Information

Date:_____

Prepared By: _____

Account Exec: _____

System Engineer: _____

CSE Responsible for Installation:_____

Customer Information

Customer:_____

Address:_____

City:_____ State: _____

Country: _____

Site Contact: _____

Phone: _____

Primary Contact: _____ Phone No.: _____ Ext.:_____

Alternate Contact: _____ Phone No.: _____ Ext.:_____

Directions To Site Location: _____

_____

_____

Hotel Recommendation(s):_____

_____

Hotel Address(es):_____

_____

Hotel Phone(s):_____

Travel Arrangements Made: Yes____ No____ Date Reservations Made: _____

Date Ordered: _____ Sales Representative: _____

Verified: Yes____ No____ Addition: Yes___ No___

Site Survey: Yes___ No___ Scheduled Date: _____ Date Performed: _____

Date To Be Shipped: _____ Shipping Method:_____

Installation Scheduled: Yes____ No___ Date Scheduled: _____

Installation Representative(s) Scheduled: _____

NOTES

Transportation Carrier Data Sheet Overview

The Transportation Carrier Data Sheet develops the information concerning the shipping, transportation, delivery of the equipment to the customer's site, and the customer's responsibilities for receiving the equipment delivery from the carrier. This ship-to information includes:

- The customer's delivery address
- Receiving dock hours of operation and delivery acceptance
- Any special type of equipment needed to move the cabinet (i. e., fork lift, certain maintenance elevator use, etc.)
- Any special instructions for the truck driver
- The name and phone number of the customer's primary and alternate contacts

Transportation Carrier Data Sheet

Order #:_____ Original Date:_____

Quote #:_____ Revised Date:_____

Background Information

Date:_____

Prepared By: _____

Account Exec: _____

System Engineer: _____

CSE Responsible for Installation:_____

Customer Information

Customer:_____

Address:_____

City:_____ State: _____

Country: _____

Site Contact _____

Phone: _____

Customer Specified Carrier Address Information (see note below)

Carrier's Name:_____

Address:_____

City:_____ State: _____

Country: _____

Carrier's Contact: _____

Phone: _____

Note: This address information must be completed if the customer requests a transportation carrier other than the standard carrier.

Will the transportation carrier be responsible for delivering equipment to:

- Receiving dock only? Yes _____ No ____
- Final destination location within your company? Yes _____ No ____
- Is final destination address the same as the shipping dock?

Yes _____ No ____

If no, what is the address for equipment to be delivered? Is this address indicated on the sales order? Yes _____ No_____ N/A ____

Building/Floor No./Room No.:_____

Street Address: _____

City/State/Zip Code: _____

If this is an inside delivery to final destination location, *this must be specified on the sales order.* Is this inside delivery marked on the sales order? Yes _____

Note: There is an additional shipping charge for the carrier to deliver the equipment to its final destination from your receiving dock.

Are there any special rigging requirements?

Yes _____ No _____

If Yes, use the space provided below for those requirements:

_____

_____

Who are the contact personnel at the customer's site?

Primary Contact: _____ Phone No.: _____ Ext.: _____

Alternate Contact: _____ Phone No.:_____ Ext.: _____

What are the normal hours of your receiving dock for delivery?

- Monday through Friday: _____A.M. to _____P.M.
- Saturday: _____A.M. to _____P.M.
- Sunday: _____A.M. to _____P.M.

Does your receiving dock require any special type of truck for delivery? Yes_____ No _____

If your receiving dock requires a special truck for delivery, please explain what type of special equipment, i. e. elevator tail gate, truck size, etc., is required.

_____

_____

Are there any special or additional instructions for the transportation carrier?

Yes _____ No _____

If Yes, use the space provided below for those instructions:

_____

_____

_____

Site Survey Check List Overview

The Site Survey Check List on the following pages summarizes the tasks and responsibilities involved during the site planning and installation of the SAN256N.

This check list is organized in three sections:

- Preliminary Activities
- Site Survey
- Site Preparation

As you review this check list, keep in mind that all the steps might not be necessary or applicable, or additional steps might be required. The chronological order of tasks suggested by this check list might not always apply. Modify this list as applicable.

Use the **Check-Off Box** column to mark the activity or task as being completed. It is also recommended that you indicate the date when the activity or task is completed.

Order #:_____ Original Date:_____

Quote #:_____ Revised Date:_____

Background Information

Date:_____

Prepared By: _____

Account Exec: _____

System Engineer: _____

CSE Responsible for Installation:_____

Customer Information

Customer:_____

Address:_____

City:_____ State: _____

Country: _____

Site Contact: _____

Phone: _____

Site Survey Check List

Site Survey Check List

Activity	Planned Complete Date	Customer	System Engineer and/ or Field Service Rep	Check-Off Box
Preliminary Activities				
Prepare a Fibre Channel solutions application blueprint.		X		o
Prepare a preliminary site plan.		X		o
Assess and define the physical cabling migration from the existing installation to the SAN256N installation.		X		o
Review the Fibre Channel solutions application blueprint, the preliminary site plan, and cabling migration with an authorized Service Representative for approval.			X	o
Site Survey Activities				
Verify width, depth, and height requirements for transporting the SAN256N chassis or cabinet to the final install site. Check the following areas to allow SAN256N equipment, transport, especially the supplied cabinet:		X	X	
Doorways		X	X	o
Elevators		X	X	o
Walkways		X	X	o
Review environmental operating conditions/requirements for the SAN256N and optional equipment.		X	X	o
Verify AC power wiring requirements; check if any electrical work is required to meet power requirements. Schedule the applicable vendor to perform any necessary electrical work.		X	X	o
200 - 240 VAC, 50 - 60 Hz for the SAN256N				o
110 - 125 VAC, 50 - 60 Hz for the workstation, monitor, and the hub device				o
Verify that adequate access space is available for AC power cord(s) disconnection from the rear of the chassis/cabinet.			X	o
Verify that a safety earth ground terminal, if required by local electric codes, is installed and available for connection to the cabinet.		X		o
If local electric codes require a grounding cable, ensure that one is ordered, and is of the proper length, with a terminal end to fit on a 10-32 grounding stud locatred on the cabinet.		X		o
Verify that power and interface cables (as applicable) will be routed to the bottom of the cabinet.		X	X	o

Site Survey Check List (Continued)

Activity	Planned Complete Date	Customer	System Engineer and/ or Field Service Rep	Check-Off Box
SNMP Management Connectivity Considerations:				
Review the requirements for a customer-supplied router.		X	X	o
Check if any conflicts exist between assigned IP addresses (XXX.XXX.X.X) and the customer's existing network.		X	X	o
Verify that IP addresses of any SNMP management stations to which SNMP traps should be sent are supplied. **Note:** These addresses must be reviewed by installation personnel prior to equipment being shipped.		X	X	o
Verify that the IP addresses (or subnets) of any management stations (SNMP, web access, or FTP access) requiring access to the SAN256N have been supplied. **Note:** These addresses must be reviewed by installation personnel prior to equipment being shipped.		X	X	o
Review and discuss each planning form with your Sales Engineer and Customer Service Representative:				
System Site Planning Grid		X	X	o
Site Configuration Worksheet		X	X	o
Director Port Server/Device Configuration Worksheet		X	X	o
Codeset Upgrade Configuration Worksheet		X	X	o
Ordering Information		X	X	o
Customer Information Data Sheet		X	X	o
Transportation Carrier Data Sheet		X	X	o
Verify if union workers are to be used for moving/installing the SAN256N and associated equipment.		X	X	o
If union help is required, have the appropriate Unions been notified?		X	X	o
Verify that the equipment installation date has been determined or finalized.		X	X	o
Schedule training times for:				
Customer Operators		X	X	o
Third Party Field Service Organizations		X	X	o
Any other applicable personnel		X	X	o
Site Preparation Activities				
Check that all equipment vendors required to perform necessary tasks prior to installation have been notified.		X	X	o

Site Survey Check List (Continued)

Activity	Planned Complete Date	Customer	System Engineer and/ or Field Service Rep	Check-Off Box
Check the progress of site location preparations and address any items that need to be completed.		X	X	o
Verify that Electrostatic Discharge (ESD) requirements have been met.		X	X	o
Verify that floor tiles for cabling and cooling have been ordered/ installed for the cabinets as described in "Floor Tile Cutouts" on page 2-33 (as applicable).		X	X	o
Verify that telephone numbers have been assigned to modem(s) at site(s) and are active lines. For International Customers Only: List the manufacturer name and model number of modem(s) with telephone number(s).		X X	X X	o o
Review pcAnywhere security access options with the customer to determine appropriate security levels required for remote access during troubleshooting by customer service personnel.		X	X	o
Verify that a hydraulic, electrical, or mechanical lifting device (lifting device requirements are listed in "Lifting Device Requirements" on page 2-3) is available and/or on-site. The lifting device is required to lift the chassis from the shipping skid and position the chassis into a cabinet.		X		o
Verify that a waiting area is available in the room where the SAN256N will be installed. This is to allow a 24-hour environmental stability period for the SAN256N chassis/cabinet prior to installation.		X	X	o
Notify the Customer Service Engineer that the equipment has arrived, the site location preparations have been completed, and you are ready to install the SAN256N(s).		X		o
Verify that the shipment arrived with every item that was ordered. Also check for any external damage or discrepancies that may have occurred during shipment.		X	X	o

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

Federal Communications Commission (FCC) Class A Statement

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

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

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

Industry Canada Class A Emission Compliance Statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

European Union (EU) Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

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

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

The standards compliance label contains the CE mark, which indicates that this system conforms to the provisions of the following European Council Directives, laws, and standards:

- Electro Magnetic Compatibility (EMC) Directive 89/336/EEC and the Complementary Directives 92/31/EEC and 93/68/EEC.
- Low Voltage Directive (LVD) 73/23/EEC and the Complementary Directive 93/68/EEC.
- EN50082–2/EN55024:1998 (European Immunity Requirements)
  - EN61000–3–2
  - EN61000–3–3/JEIDA (European and Japanese Harmonics Specification)

Germany Electromagnetic Compatibility Directive

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

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

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

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

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

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

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

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vcci

Director Regulatory Certifications

Safety Standards:	UL1950
	CSA 22.2 No. 950
	EN60950
Emissions Standards:	FCC Part 15B Class A
	VCCI Class A ITE
	CISPR 22, Class A
	EN 55022, Class A
	CNS 13438 (Taiwan)

Voltage Fluctuations and Flicker: EN 61000-3-3

AC Power Harmonic Emissions:EN61000-3-2

Immunity:	EN 55024/1998 — “Electromagnetic compatibility - Generic immunity standard Part 1: Residential commercial, and light industry.”
Marking:	FCC Part 15
	UL (United States)
	CUL (Canada)
	CE
	TUV/GS (Germany)
	VCCI (Japan)
	NOM (Mexico)
	BSMI (Taiwan)
	GOST (Russia)

Laser Safety Information

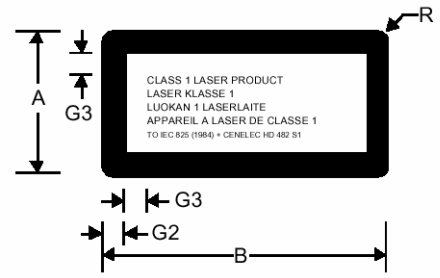
The CNT UltraNet Multi-service Director (UMD) may use Class 1 lasers to communicate over the fiber optic conductors. The U.S. Department of Health and Human Services (DHHS) does not consider Class 1 lasers to be hazardous. The International Electro technical Commission (IEC) requires labeling information that states that the lasers are Class 1. The following notices are given so you understand the laser's certification and classification, the laser type and their use in the fiber optic transmitters, their usage restrictions, and labeling requirements.

Certification and Classification Information

The CNT UltraNet Multi-service Director may contain fiber optic interfaces known as Small Form Factor Pluggable (SFP) optical transceivers. Within each system, the optical component assemblies are located on the front of the chassis. In the U.S., all models of the optical SFP product family and are certified as Class 1 laser products that conform to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR Subchapter J. The certification is indicated by a label located on the plastic retainer of the optical SFP assembly. Outside of the U.S., all models of the optical SFP product family are certified as Class 1 laser component assemblies that conform to the requirements contained in the International Electro technical Commission (IEC) standard IEC 825-1 (11/1993) and the CENELEC (European Committee for Electro technical Standardization) European Normalization standard EN 60825-1 (1994). The German testing institute VDE assigned the regulation number 3642* to the certificate of conformity for the product family. The VDE conformity mark is also located on the plastic retainer of the optical SSFPFP assembly. The DHHS conformity label and the VDE conformity mark may not be visible when the optical SFP is installed in the system level product. Another Class 1 information label is supplied with the equipment. This label is installed by the user during the installation procedure. The user is to install the label where it is clearly visible whenever access to the optical ports is possible.

Labeling Requirements

There are no caution or danger labels required for use of the optical SFP since it is a Class 1 laser component assembly. Within the U.S., the only laser safety label required is the certification label that already appears on the plastic retainer of the optical SFP assembly. Outside of the U.S., the IEC 825 laser safety standard requires that the system level product have a Class 1 information label permanently attached and clearly visible whenever access to the optical ports is possible. This label is supplied with the equipment and applied by the user during the installation procedure. An example of the IEC Class 1 information label and its dimensions, suitable for use in most European countries, is shown below. The label consists of black printing on a yellow background. The languages represented on this example label are English, German, Finnish, and French and represent the minimum set for acceptance of a Class 1 product in most European countries.



Dimensions in mm			
A x B	G2	G3	R
26 x 52	4	4	2
52 x 105	5	5	3.2
74 x 148	6	7.5	4

Optical SFPs

Each optical SFP is a single communications port. Each communications port consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains internally a semiconductor laser diode of either: 1) the gallium aluminum arsenide (GaAlAs) type emitting in the wavelength range of 770 to 860 nanometers (commonly referred to as Shortwave (SW)) or 2) indium gallium arsenide phosphide (InGaAsP) type emitting in the wavelength range of 1270 to 1355 nanometers (commonly referred to as Long wave (LW)). Both SW and LW discrete laser diodes are classified as Class 3B laser products rated at 5.0 milliwatts peak power. Once they are incorporated into the optical SFP, the product's automatic power control and power monitoring system maintains the average power that exits from an open fiber at a value below the Class 1 limit for either SW or LW laser link products. In addition, for those SFP products that contain Open Fiber Control (OFC) the optical fiber link between two SFP ports is continuously monitored by the open fiber link detection and laser control safety system; in the event of a break anywhere in the path, this control system prevents laser emissions from exceeding Class 1 levels. For the non-OFC links, the optical power from the laser transmitter is controlled and maintained at a lower power level such that the power emitted from either an open fiber or an open laser transmitter is guaranteed to be below the Class 1 limit. Class 1 laser products are not considered to be hazardous. There are no user maintenance or service operations or adjustments to be performed on any optical SFP.

Usage Restrictions

Failure to comply with these usage restrictions may result in incorrect operation of the system and possibly points of access that may emit laser radiation above Class 1 limits established by the IEC and the U.S. DHHS.

Optical SFPs are designed and certified for applications using point-to-point optical fibre links only. Use of the product with multiple input or multiple output optical links (for example, star couplers) is prohibited since it is incompatible with the product's design and function and may require that the user certify the laser product again for conformance to the laser safety regulations.

An optical SFP that contains OFC will not allow normal data transmission on the optical link unless it is connected to another SFP that also contains OFC with the same OFC timings.

California Proposition 65 Polyvinyl Chloride Warning Statement

Handling the cord or data cables on this product may, dependant on materials used by the supplier of such cables, expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. ***Wash hands after handling.***

Glossary

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

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

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

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

See also Refers you to a related term.

Numerics

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

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

A

access control list (ACL). Enables an organization to bind a specific worldwide name (WWN) to a specific switch port or set of ports, preventing a port in another physical location from assuming the identity of a real WWN. Can also refer to a list of the read/write access of a particular community string. See also *device connection controls*.

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

ACL. See *access control list.*

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

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

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

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

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

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

AL_PA. See *arbitrated loop physical address*.

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

ANSI. See *American National Standards Institute*.

API. See *application programming interface*.

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

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

ARB. See *arbitrate primitive signal*.

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

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

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

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

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

ASIC. See *application-specific integrated circuit*.

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

ATM. See *asynchronous transfer mode*.

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

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

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

AW_TOV. See *arbitration wait timeout value*.

B

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

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

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

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

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

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

BER. See *bit error rate*.

BIOS. See *basic input/output system*.

BISR. Built-in self-repair.

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

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

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

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

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

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

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

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

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

BTU. See *British thermal unit*.

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

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

C

CAM. Content addressable memory. cascade. Two or more interconnected Fibre Channel switches that can

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

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

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

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

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

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

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

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

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

CLI. See *command line interface*.

CMI. Control message interface.

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

command line interface (CLI). Interface that depends entirely on the use of commands, such as through Telnet or simple network management protocol (SNMP), and does not involve a graphical user interface.

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

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

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

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

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

CP. See *control processor*.

CP card. See *control processor card*.

CPLD. Complex programmable logic device.

CPU. See *central processing unit*.

CRC. See *cyclic redundancy check*.

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

CSA. Canadian Standards Association.

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

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

D

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

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

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

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

DCC. A dc converter.

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

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

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

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

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

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

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

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

DLS. See *dynamic load sharing*.

DMA. See *direct memory access*.

DNS. Distributed name server.

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

DRAM. See *dynamic random access memory.*

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

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

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

DWDM. Dense wavelength digital multiplexing.

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

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

E

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

edge switch. A switch whose main task is to connect nodes into the fabric. See also *core switch*. **E_D_TOV.** See *error detect timeout value*.

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

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

EIA. Electronic Industries Alliance.

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

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

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

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

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F

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

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

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

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

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

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

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

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

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

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

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

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

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

FAN. Fabric address notification.

FC. See *fibre channel*.

FCA. See *Fibre Channel arbitrated loop*.

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

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

FCC. Federal Communications Commission.

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

FCMGMT. Fibre Alliance Fibre Channel Management.

FCP. See *Fibre Channel protocol*.

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

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

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

FCS switch. See *fabric configuration server switch.*

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

Fibre Channel (FC). A technology for transmitting data between computer devices at a data rate of up to 4 Gbps. It is especially suited for attaching computer servers to

shared storage devices and for interconnecting storage controllers and drives.

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

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

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

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

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

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

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

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

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

firmware. The basic operating system provided with the hardware.

FLA. Fabric loop attach.

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

FLOGI. See *fabric login*.

FL_port. See *fabric loop port*.

F_port. See *fabric port*.

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

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

FRU. See *field replaceable unit*.

FS. See *Fibre Channel service*.

FSP. See *Fibre Channel service protocol*.

FSPF. See *Fibre Channel shortest path first*.

FTP. See *File Transfer protocol*.

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

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

G

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

GBIC. See *gigabit interface converter*.

Gbps. Gigabits per second.

GBps. Gigabytes per second.

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

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

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

G_port. See *generic port*.

H

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

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

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

HBA. See *host bus adapter*.

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

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

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

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

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

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

I

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

ID. Identification.

IDB. Interface descriptor block.

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

IEC. International Electrotechnical Commission.

IETF. Internet Engineering Task Force.

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

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

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J

JBOD. Just a bunch of disks.

K

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

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

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

L

LAN. See *local area network*.

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

LED. See *light-emitting diode*.

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

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

link services. A protocol for link-related services.

LIP. See *loop initialization primitive*.

LM_TOV. See *loop master timeout value*.

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

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

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

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

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

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

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

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

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

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.

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

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

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

L_port. See *loop port*.

LPSM. See *loop port state machine*.

LSR. Link state record.

LSU. Link state update.

LUN. See *logical unit number*.

LWL. See *long wavelength*.

M

MAC. Media access controller.

MAC address. See *Media Access Controller address*.

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

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

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

MIB. See *management information base*.

modem serial port. The upper serial port on the control processor card (CP card). Can be used to connect the CP card to a modem with a standard 9–pin modem cable. Consists of a DB–9 connector wired as an RS–232 device, and can be connected by serial cable to a data communications equipment (DCE) device. A Hayes-compatible modem or Hayes-emulation is required. The device name is ttyS1. See also *data communications equipment port* and *terminal serial port*.

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

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

N

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

NEMA. National Electrical Manufacturers Association.

NL_port. See *node loop port*.

NMS. Network Management System.

node. A Fibre Channel device that contains a node port (N_port) or node loop port (NL_port).

node loop port (NL_port). A node port that is loop capable. Used to connect an equipment port to the fabric in a loop configuration through a fabric loop port (FL_port).

node name. The unique identifier for a node, communicated during login and port discovery.

node port (N_port). A node port that is not loop capable. Used to connect an equipment port to the fabric.

nonparticipating mode. A mode in which a loop port (L_port) in a loop is inactive and cannot arbitrate or send frames, but can retransmit any received transmissions. This mode is entered if there are more than 127 devices in a loop and an arbitrated loop physical address (AL_PA) cannot be acquired. See also *participating mode*.

nonvolatile random access memory (NVRAM). Random access memory (storage) that retains its contents after the electrical power to the machine is shut off. A specific part of NVRAM is set aside for use by the system ROS for the boot device list.

N_port. See *node port*.

NVRAM. See *nonvolatile random access memory*.

Nx_port. A node port that can operate as either a node port (N_port) or node loop port (NL_port). See also *node port* and *node loop port*.

O

operating system (OS). A collection of system programs that control the overall operation of a computer system.

ordered set. A transmission word that uses 8b/10b mapping and begins with the K28.5 character. Ordered sets occur outside of frames, and include frame delimiters, primitive signals, and primitive sequences. Ordered sets are used to differentiate Fibre Channel control information from data frames and to manage the transport of frames. See also *frame delimiter*, *primitive signal*, and *primitive sequence.*

OS. See *operating system*.

P

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

participating mode. A mode in which a loop port (L_port) in a loop has a valid arbitrated loop physical address (AL_PA) and can arbitrate, send frames, and retransmit received transmissions. See also *nonparticipating mode*.

path selection. The selection of a transmission path through the fabric. Switches use the Fibre Channel shortest path first (FSPF) protocol.

PCI. Peripheral control interconnect.

PDU. Power distribution unit.

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

phantom address. An arbitrated loop physical address (AL_PA) value that is assigned to a device that is not physically in the loop. Also known as phantom AL_PA.

phantom device. A device that is not physically in an arbitrated loop, but is logically included through the use of a phantom address.

PLDA. See *private loop direct attach*.

PLOGI. See *port login*.

PMC. PCI mezzanine card.

P/N. Part number.

point-to-point. A Fibre Channel topology that employs direct links between each pair of communicating entities. See also *topology*.

port cage. The metal casing extending out of the optical port on the switch, and in which the gigabit interface converter (GBIC) or small form-factor pluggable (SFP) can be inserted.

port card. A Fibre Channel card that contains optical or copper port interfaces, and acts like a switch module. See also *16-port card*.

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

port module. A collection of ports in a switch.

port_name. The unique identifier assigned to a Fibre Channel port. Communicated during login and port discovery.

POST. See *power-on self-test*.

power-on self-test (POST). A series of diagnostics that are automatically run by a device when the power is turned on.

primary FCS switch. Primary fabric configuration server switch. The switch that actively manages the configuration and security parameters for all switches in the fabric. See also *backup FCS switch* and *FCS switch*.

primitive sequence. A part of an ordered set that indicates or initiates port states. See also *ordered set*.

primitive signal. A part of an ordered set that indicates events. See also *ordered set*.

principal switch. The switch that assumes the responsibility to assign domain IDs. The role of principal switch is negotiated after a “build fabric” event.

private device. A device that supports arbitrated loop protocol and can interpret 8-bit addresses, but cannot log into the fabric.

private loop. An arbitrated loop that does not include a participating fabric loop port (FL_port).

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

private NL_port. A node loop port (NL_port) that communicates only with other private NL_ports in the same loop and does not log into the fabric.

protocol. A defined method and a set of standards for communication.

public device. A device that supports arbitrated loop protocol, can interpret 8-bit addresses, and can log into the fabric.

public loop. An arbitrated loop that includes a participating fabric loop port (FL_port), and can contain both public and private node loop ports (NL_ports).

public NL_port. A node loop port (NL_port) that logs into the fabric, can function within either a public or private loop, and can communicate with either private or public NL_ports.

Q

quad. A group of four adjacent ports that share a common pool of frame buffers.

QuickLoop. (1) A feature that makes it possible to allow private devices within loops to communicate with public and private devices across the fabric through the creation of a larger loop. (2) The arbitrated loop created using this software. A QuickLoop can contain a number of devices or looplets; all devices in the same QuickLoop share a single arbitrated loop physical address (AL_PA) space.

QuickLoop mode. A hardware translative mode that allows private devices to communicate with other private devices across the fabric. See also *hardware translative mode* and *standard translative mode*.

R

RAID. See *redundant array of independent disks*.

RAM. See *random access memory.*

RAN. Remote Asynchronous Notification.

random access memory (RAM). A temporary storage location in which the central processing unit (CPU) stores and executes its processes.

R_A_TOV. See *resource allocation timeout value*.

read only memory (ROM). Memory in which stored data cannot be changed by the user except under special conditions.

receiver ready (R_RDY). A primitive signal indicating that the port is ready to receive a frame.

reduced instruction set computer (RISC). A computer that uses a small, simplified set of frequently used instructions for rapid processing.

redundant array of independent disks (RAID). A collection of disk drives that appear as a single volume to the server and are fault tolerant through mirroring or parity checking.

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

remote fabric. A fabric that spans across wide area networks (WANs) by using protocol translation (a process also known as tunneling) such as fibre channel over asynchronous transfer mode (ATM) or fibre channel over Internet protocol (IP).

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

Remote Switch. A feature that runs on Fabric operating system (OS) and enables two fabric switches to be connected over an asynchronous transfer mode (ATM) connection. This requires a compatible Fibre Channel to ATM gateway, and can have a distance of up to 10 km (6.214 mi) between each switch and the respective ATM gateway.

request rate. The rate at which requests arrive at a servicing entity. See also *service rate*.

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

resource allocation timeout value (R_A_TOV). Used to time out operations that depend on the maximum possible time that a frame can be delayed in a fabric and still be

delivered. This value is adjustable in one microsecond increments from 10—120 seconds.

resource recover timeout value (RR_TOV). The minimum time a target device in a loop waits after a loop initialization primitive (LIP) before logging out a small computer systems interface (SCSI) initiator. See also *error detect timeout value* and *resource allocation timeout value*.

RISC. See *reduced instruction set computer*.

RLS probing. Read link status of the arbitrated loop physical addresses (AL_PAs).

ro. Read only.

ROM. See *read only memory*.

route. As applies to a fabric, the communication path between two switches. Can also apply to the specific path taken by an individual frame, from source to destination. See also *Fibre Channel shortest path first*.

routing. The assignment of frames to specific switch ports, according to frame destination.

RPC. See *remote procedure call*.

R_RDY. See *receiver ready*.

RR_TOV. See *resource recovery timeout value*.

RS-232 port. A port that conforms to a set of Electrical Industries Association (EIA) standards. Used to connect data terminal equipment (DTE) and data communications equipment (DCE) devices for communication between components, terminals, and modems. See also *DB–9 connector*, *DCE port,* and *DTE port*.

RSCN. See *registered state change notification*.

RSH. Remote shell.

RTC. Real time clock.

rw. Read-write.

S

SAN. See *storage area network*.

SAN island. A group of storage devices and servers connected to switches in a fabric.

SC. Standard connector.

SCSI. See *small computer systems interface*.

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

SDRAM. See *synchronous dynamic random access memory.*

Secure Fabric OS. An optionally-licensed software product that runs on top of the Fabric OS and provides customizable security restrictions through local and remote management channels on a switch.

secure sockets layer (SSL). A security protocol that provides communication privacy. SSL enables client/server applications to communicate in a way that is designed to prevent eavesdropping, tampering, and message forgery.

sequence. A group of related frames transmitted in the same direction between two node ports (N_ports).

SERDES. Serializer/deserializer.

service rate. The rate at which an entity can service requests. See also *request rate*.

SES. See *SCSI Enclosure Services*.

SFP. See *small form-factor pluggable*.

short wavelength (SWL). A type of fiber optic cabling that is based on 850 mm lasers and supports 1.0625 Gbps link speeds. Can also refer to the type of gigabit interface converter (GBIC) or small form-factor pluggable (SFP). See also *long wavelength*.

SID. The 3–byte source ID of the originator device, in the 0xDomainAreaALPA format.

SID-DID. Source identifier-destination identifier.

SIMMS. Single in-line modules.

simple name server (SNS). A switch service that stores names, addresses, and attributes for up to 15 minutes, and provides them as required to other devices in the fabric. SNS is defined by Fibre Channel standards and exists at a well-known address. Can also be referred to as directory service. See also *Fibre Channel service*.

simple network management protocol (SNMP). In the Internet suite of protocols, a network management protocol that is used to monitor routers and attached networks. SNMP is an application layer protocol. Information on devices managed is defined and stored in the application's Management Information Base (MIB).

single mode. The fiber optic cabling standard that corresponds to distances of up to 10 km (6.214 mi) between devices.

small computer systems interface (SCSI). A parallel bus architecture and a protocol for transmitting large data blocks up to a distance of 15—25 m (49—82 ft).

small form-factor pluggable (SFP). An optical transceiver used to convert signals between optical fiber cables and switches.

SMI. Special memory interface.

SNIA. Storage Network Industry Association.

SNMP. See *simple network management protocol*.

SNMPv1. The original standard for SNMP, now labeled v1.

SNS. See *simple name server*.

SOF. Start-of-frame.

SSL. See *secure sockets layer*.

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

storage area network (SAN). A network of systems and storage devices that communicate using Fibre Channel protocols. See also *fabric*.

subordinate switch. All switches in the fabric other than the principal switch. See also *principal switch*.

switch. Hardware that routes frames according to Fibre Channel protocol and is controlled by software.

switch name. The arbitrary name assigned to a switch.

switch port. A port on a switch. Switch ports can be expansion ports (E_ports), fabric ports (F_ports), or fabric loop ports (FL_ports).

SWL. See *short wavelength*.

synchronous dynamic random access memory (SDRAM). The main memory for the switch. Used for volatile storage during switch operation.

T

Tachyon. A type of host bus adapter.

target. A storage device on a Fibre Channel network. See also *initiator*.

TCP. See *transmission control protocol*.

tenancy. The time from when a port wins arbitration in a loop until the same port returns to the monitoring state. Also referred to as loop tenancy.

terminal serial port. The lower serial port on the control processor card (CP card) of the director switch. This port sends switch information messages and can receive commands. Can be used to connect the CP card to a computer terminal. Has an RS–232 connector wired as a data terminal equipment (DTE) device, and can be connected by serial cable to a data communications equipment (DCE) device. The connector pins 2 and 3 are swapped so that a straight-through cable can be used to connect to a terminal. The device name is ttyS0. Can also be referred to as the console port. See also *DCE port, DTE port,* and *modem serial port*.

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

topology. As applies to fibre channel, the configuration of the Fibre Channel network and the resulting communication paths allowed.

translative mode. A mode in which private devices can communicate with public devices across the fabric.

transmission character. A 10–bit character encoded according to the rules of the 8b/10b algorithm.

Transmission control protocol (TCP). A communications protocol used in the Internet and in any network that follows the Internet Engineering Task Force (IETF) standards for Internet protocol.

transmission word. A group of four transmission characters.

trap (SNMP). The message sent by a simple network management protocol (SNMP) agent to inform the SNMP management station of a critical error. See also *simple network management protocol*.

tunneling. A technique for enabling two networks to treat a transport network as though it were a single communication link or local area network (LAN).

Tx. Transmitted.

U

U. Unit of measure for rack-mounted equipment.

UART. Universal Asynchronous Receiver Transmitter.

UDP. See *user datagram protocol*.

ULP. See *upper-level protocol*.

ULP_TOV. See *upper-level timeout value*.

unicast. The transmission of data from a single source to a single destination. See also *broadcast* and *multicast*.

universal port (U_port). A switch port that can operate as a generic port (G_port), expansion port (E_port), fabric port (F_port), or fabric loop port (FL_port). A port is defined as a U_port when it is not connected or has not yet assumed a specific function in the fabric.

U_port. See *universal port*.

upper-level protocol (ULP). The protocol that runs on top of Fibre Channel. Typical upper-level protocols are small computer system interface (SCSI), Internet protocol (IP), HIPPI, and IPI.

upper-level timeout value (ULP_TOV). The minimum time that a small computer system interface (SCSI) upper-level protocol (ULP) process waits for SCSI status before initiating ULP recovery.

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

user flash. See *compact flash*.

V

VC. See virtual circuit.

VCCI. Voluntary Control Council for Interference

virtual circuit (VC). A one-way path between node ports (N_ports) that allows fractional bandwidth.

W

WAN. See wide area network.

WDM. Wave® division multiplexing.

well-known address. As pertaining to fibre channel, a logical address defined by the Fibre Channel standards as assigned to a specific function, and stored on the switch.

wide area network (WAN). A network that provides communication services to a geographic area larger than that served by a local area network or a metropolitan network, and that can use or provide public communications facilities. (T)

workstation. A computer used to access and manage the fabric. Can also be referred to as a management station or host.

worldwide name (WWN). Uniquely identifies a switch on local and global networks.

World Wide Web (WWW). A network of servers that contain programs and files. Many of the files contain hypertext links to other documents available through the network.

WWN. See *worldwide name*.

WWW. See *World Wide Web*.

X

XLWL. See *extra long wavelength*.

Z

zone. A set of devices and hosts attached to the same fabric and configured as being in the same zone. Devices and hosts within the same zone have access permission to others in the zone, but are not visible to any outside the zone. See also *zoning*.

zone alias. An alias for a set of port numbers or worldwide names (WWNs). Zone aliases can be used to simplify the entry of port numbers and WWNs. For example, “host” could be used as an alias for a WWN of 110:00:00:60:69:00:00:8a.

zone configuration. A set of zones designated as belonging to the same zone configuration. When a zone configuration is in effect, all valid zones in that configuration are also in effect.

zone member. A port, node, worldwide name (WWN), or alias, which is part of a zone.

zone scheme. The level of zoning granularity selected. For example, zoning can be done by switch or port, worldwide name (WWN), arbitrated loop physical address (AL_PA), or a mixture. See also *zone configuration*.

zone set. See *zone configuration*.

Zoning. A feature that runs on Fabric operating system (OS) and allows partitioning of the fabric into logical groupings of devices. Devices in a zone can only access and be accessed by devices in the same zone. See also *zone*.

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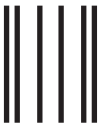

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