



SANnet® II 200 FC, SATA, and SATA SE Array Installation, Operation, and Service Manual

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Preface

This manual provides instructions for installing, initially configuring, and operating the SANnet II 200 Fibre Channel (FC), SANnet II 200 SATA, and the SANnet II 200 SATA Special Edition (SE) arrays; hereafter referred to as FC, SATA, and SATA SE arrays for ease of reading.

This guide is written for experienced system administrators who are familiar with Dot Hill hardware and software products.



Caution – Read the *SANnet II Family Safety, Regulatory, and Compliance Manual* before beginning any procedure in this manual.

How This Book Is Organized

This book covers the following topics:

Chapter 1 provides an overview of the array's features.

Chapter 2 covers site planning and basic safety requirements.

Chapter 3 provides general procedures for unpacking and inspecting the array.

Chapter 4 provides procedures for connecting your array to power and to the network.

Chapter 5 provides an overview of the array configuration.

Chapter 6 describes the array's front and back-panel LEDs.

Chapter 7 describes maintenance procedures.

Chapter 8 describes troubleshooting procedures.

Appendix A provides the SANnet II 200 FC, SATA, and SATA SE array specifications.

Appendix B provides information about standalone JBOD arrays.

Appendix C provides information about failed component alarm codes.

Appendix D provides pinout identification for each connector.

Appendix E provides instructions on configuring a Sun™ server.

Appendix F provides instructions on configuring a Windows 2000 or Windows 2000 Advanced server.

Appendix G provides instructions on configuring a Linux server.

Appendix H provides instructions on configuring a IBM AIX server.

Appendix I provides instructions on configuring an HP-UX server.

Typographic Conventions

Typeface ¹	Meaning	Examples
AaBbCc123	The names of commands, files, and directories; on-screen computer output	Edit your .login file. Use ls -a to list all files. % You have mail.
text	Computer menu	Click Start .
<i>AaBbCc123</i>	Book titles, new words or terms, words to be emphasized. Replace command-line variables with real names or values.	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be a superuser to do this. To delete a file, type rm filename .

1. The settings on your browser might differ from these settings.

Related Documentation

Title	Part Number
<i>SANnet II 200 FC, SATA, and SATA SE Array Release Notes</i>	83-00003262
<i>SANnet II 200 FC and SATA Array Best Practices Manual</i>	83-00003263
<i>SANnet II Family RAID Firmware 4.1x User's Guide</i>	83-00003435
<i>SANnet II Family FRU Installation Guide</i>	83-00002708
<i>SANnet II Family Rack Installation Guide for 2U Arrays</i>	83-00002365
<i>SANnet II Family Safety, Regulatory, and Compliance Manual</i>	83-00002666

Technical Support

For late-breaking *Release Notes* and all manuals for this product, go to the SANnet II SCSI array section, or the SANnet II 200 FC array section, depending on which array you have, at:

<http://www.dothill.com/manuals>

The following information may be required when contacting Technical Support: Dot Hill serial number and part number of hardware; version of Dot Hill supplied software; host computer platform and operating system version; description of the problem and any related error messages.

Supply the following information to facilitate our tracking system and improve our response time: customer name, company name; state and country; telephone number with area code; Internet mail address; maintenance contract number, if applicable.

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Corporate Headquarters Contacts

United States (California) Corporate Headquarters

Tel: 1-760-931-5500 or 1-800-872-2783

Fax: 1-760-931-5527

E-mail: support@dothill.com

Netherlands: European Headquarters

Dot Hill Systems Corp., B.V. (Netherlands)

Tel: 31 (0) 53 428 4980; Fax: 31 (0) 53 428 0562

E-mail: bv@dothill.com

Japan: Japanese Headquarters

Nihon Dot Hill Systems Corp., Ltd.

Tel: 81-3-3251-1690; Fax: 81-3-3251-1691

E-mail: nihon@dothill.com

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CHAPTER 1

Product and Architecture Overview

This manual describes the SANnet II 200 FC, SATA, and SATA Special Edition (SE) arrays.

The FC, SATA, and SATA SE arrays are rack-mountable, Network Equipment Building System (NEBS) Level 3-compliant, Fibre Channel mass storage subsystems. NEBS Level 3 is the highest level of NEBS criteria used to assure maximum operability of networking equipment in mission-critical environments such as telecommunications central offices.

SANnet II 200 FC Array. The SANnet II 200 FC array is a Fibre Channel (FC) array designed for high availability, high performance, and high capacity.

SANnet II 200 SATA and SATA SE Array. The SANnet II 200 SATA and SATA SE arrays are designed for high availability, and employs Serial ATA (SATA) technology for high-density storage, with a Fibre Channel front end. This provides high capacity with a small footprint, making this array ideal for content management archiving applications.

This chapter provides a brief overview of the FC, SATA, and SATA SE arrays. Topics covered in this chapter are:

- “Comparison of FC, SATA, and SATA SE Arrays” on page 1-2
- “Field-Replaceable Units” on page 1-8
- “Interoperability” on page 1-11
- “Fibre Channel Technology Overview” on page 1-11
- “Fibre Channel Architecture” on page 1-14
- “Additional Software Tools” on page 1-15

Note – Unless otherwise indicated, all features and procedures apply to the FC, SATA, and SATA SE arrays.

1.1 Comparison of FC, SATA, and SATA SE Arrays



Figure 1-1 SANnet II 200 FC, SATA, and SATA SE Array Front View

The SANnet II 200 FC array is a next-generation Fibre Channel storage system designed to provide direct attached storage (DAS) to entry-level, mid-range, and enterprise servers, or to serve as the disk storage within a storage area network (SAN). This solution features powerful performance and reliability, availability, and serviceability (RAS) features using modern FC technology. As a result, the SANnet II 200 FC array is ideal for performance-sensitive applications and for environments with many entry-level, mid-range, and enterprise servers, such as:

- Internet
- Messaging
- Database
- Technical
- Imaging

The SANnet II 200 SATA and SATA SE arrays are best suited for inexpensive secondary storage applications that are not mission-critical where higher-capacity drives are needed, and where lower performance and less than 7/24 availability is an option. These include near-line applications such as:

- Information lifecycle management
- Content addressable storage
- Backup and restore
- Secondary SAN storage
- Near-line DAS storage
- Static reference data storage

It is possible, though not always desirable, to combine both FC expansion units and SATA expansion units connected to a SANnet II 200 FC RAID array. For instance, you might want to use two SANnet II 200 SATA expansion units for near-line backup and archival storage while the Fibre Channel drives in your RAID array and other expansion units are used for real-time, mission-critical information processing and input/output (I/O) operations.

For an example of such a configuration, refer to the *SANnet II 200 FC and SATA Array Best Practices Manual*.

1.1.1 Fibre Channel and SATA Array Architectures

The FC, SATA, and SATA SE share many architectural elements. This section discusses those elements, making note of the few ways in which the architecture is implemented differently in the two arrays.

The SANnet II 200 FC array, SATA array, and SATA SE array RAID controllers have six FC channels. RAID controller channels 0, 1, 4, and 5 are normally designated for connection to hosts or Fibre Channel switches. RAID controller channels 2 and 3 are dedicated drive channels that connect to disks. Each channel has a single port connection, except the SANnet II 200 SATA array, which has two extra ports (two connections for channels 0 and 1).

In a dual RAID controller configuration, the architecture of the loops within the chassis provides both RAID controllers the same host channel designators. Each host channel of the top RAID controller shares a loop with the matching host channel on the bottom RAID controller. For example, channel 0 of the top RAID controller shares the same loop as channel 0 of the bottom RAID controller. This provides four distinct loops for connectivity. The individual loops provide logical unit number (LUN) failover without causing host bus adapter (HBA) path failover in the event of a controller failure.

In a single RAID controller configuration, the lower I/O board has drive channels but does not have host channels. Overall, the same number of loops are available, but with only half as many host channel ports. All six fibre channels in a SANnet II 200 FC array's I/O controller module support 1-Gbit or 2-Gbit data transfer speeds.

1.1.1.1 SANnet II 200 FC Array Features

On the SANnet II 200 FC array, RAID controller channels 0, 1, 4, and 5 are normally designated host channels. Any host channel can be configured as a drive channel. In a dual-controller configuration, each host loop includes two ports per loop, one port on the top controller and one port on the bottom controller.

SANnet II 200 FC RAID controller channels 2 and 3 are dedicated drive channels that connect to expansion units. Each I/O board has two ports designated as disk drive loops. These ports connect to the internal dual-ported FC disk drives and are used to add expansion units to the configuration.

The two drive loop ports on the upper I/O board form FC loop 2 (channel 2) while the two drive ports on the lower I/O board form FC loop 3 (channel 3). FC loop 2 provides a data path from both RAID controllers to the A loop of the internal disk drives, while FC loop 3 provides a data path from both RAID controllers to the B loop of the internal disk drives.

1.1.1.2 SANnet II 200 SATA and SATA SE Array Features

On the SANnet II 200 SATA and SATA SE arrays, RAID controller channels 0 and 1 are dedicated host channels. Channels 4 and 5 are host channels by default but can be configured as drive channels. RAID controller channels 2 and 3 are dedicated drive channels that connect to expansion units.

Unlike the SANnet II 200 FC array, on the SANnet II 200 SATA RAID controller host channels 0 and 1 include four ports per loop (two ports on the upper controller, and two ports on the lower controller). Channels 0 and 1 support 1-Gbit or 2-Gbit data transfer rates.

SANnet II 200 SATA RAID controller channels 4 and 5 provide two ports per loop (one port on each controller). Channels 4 and 5 support only a 2-Gbit data transfer rate.

Each SANnet II 200 SATA RAID controller has two ports designated as disk drive loops. The drive ports support only a 2-Gbit data transfer rate. These ports connect to the internal SATA disk drives using internal FC-SATA routing technology. These drive ports are also used to add expansion units to the configuration.

Like the host channels, each drive channel of the top RAID controller shares a loop with the matching drive channel on the bottom RAID controller. For example, drive channel 2 of the top RAID controller shares the same loop as channel 2 of the bottom RAID controller.

1.1.2 Differences Between SANnet II 200 FC Arrays and SANnet II 200 SATA Arrays

SANnet II 200 FC arrays use Fibre Channel (FC) disk drives and are supported by Dot Hill in primary online applications as well as secondary and near-line applications. SANnet II 200 SATA arrays use serial ATA (SATA) disk drives and are supported by Dot Hill in either near-line applications such as backup and restore, or in secondary applications, such as static storage. SANnet II 200 SATA arrays can be used in multipath and multi-host configurations. They are not designed to be used in primary online applications.

SANnet II 200 SATA expansion units can be connected to SANnet II 200 FC arrays, either alone or in combination with SANnet II 200 FC expansion units. Up to five expansion units can be used in this configuration.

Before installing and configuring your array, review the key differences between the FC, SATA, and SATA SE arrays in Table 1-1.

Note – Although the products are very similar in appearance and setup, the configurations have very important differences. While the FC array can be used for all applications, the SATA and SATA SE arrays cannot. Inappropriate use of the SATA arrays in applications for which the FC array was designed might result in loss of data and/or loss of data access.

Table 1-1 Comparison of SANnet II 200 FC, SATA, and SATA SE Array Features

	SANnet II 200 FC Array	SANnet II 200 SATA Array	SANnet II 200 SATA SE Array
Applications	Best suited for production applications where the superior features of FC technical characteristics and performance are required. This includes online applications such as: <ul style="list-style-type: none"> • Database • Decision support • Data warehousing • Electronic commerce • Enterprise resource planning • Messaging, file, and print 	Best suited for inexpensive secondary storage applications that are not mission critical where higher capacity drives are needed, and where lower performance and less than 7/24 availability is an option. This includes near-line applications such as: <ul style="list-style-type: none"> • Information lifecycle management • Content addressable storage • Backup and restore • Secondary SAN storage • Near-line DAS storage • Static reference data storage 	Best suited for inexpensive secondary storage applications that are not mission critical where higher capacity drives are needed, and where lower performance and less than 7/24 availability is an option. This includes near-line applications such as: <ul style="list-style-type: none"> • Information lifecycle management • Content addressable storage • Backup and restore • Secondary SAN storage • Near-line DAS storage • Static reference data storage
Disks	Fibre Channel disks: 36, 73, or 146 GB at 10K RPM 36 or 73 GB at 15K RPM	SATA disks: 250 GB at 7200 RPM 400 GB at 7200 RPM	SATA disks: 250 GB at 7200 RPM 400 GB at 7200 RPM
Maximum FC Host Ports per I/O Controller Module	4 (one SFP port each for channels 0, 1, 4, and 5)	6 (two SFP ports each for channels 1 and 0; one SFP port each for channels 4 and 5)	6 (two SFP ports each for channels 1 and 0; one SFP port each for channels 4 and 5)
Maximum Number of Expansion Units Connected to a RAID Array	15	15	0

Table 1-1 Comparison of SANnet II 200 FC, SATA, and SATA SE Array Features (*Continued*)

	SANnet II 200 FC Array	SANnet II 200 SATA Array	SANnet II 200 SATA SE Array
Maximum Number of Disks per Configuration	192 (1 RAID array + 15 expansion units)	192 (1 RAID array + 15 expansion units)	12 (1 RAID array)
Maximum Number of Logical Drives	32 logical drives	32 logical drives	32 logical drives
Direct host-attached JBOD Support	One JBOD per server	Not supported	Not supported



Caution – In FC and SATA configurations with large drive capacities, the size of the logical drive might exceed the device capacity limitation of your operating system. Be sure to check the device capacity limitation of your operating system before creating the logical drive. If the logical drive size exceeds the capacity limitation, you must partition the logical drive.

Note – For information about the maximum usable storage capacity for the SANnet II 200 FC, SATA, and SATA SE arrays, refer to the *SANnet II 200 FC and SATA Array Best Practices Manual*.

1.1.3 SANnet II 200 FC, SATA, and SATA SE Array Configurations

The FC, SATA, and SATA SE arrays can be used in the following configurations:

- **Single-controller configuration.** A RAID array can be configured with a single controller in a non-redundant configuration.
- **A RAID array with two controllers.** A RAID array can be configured with two controllers to provide full redundancy.
- **An expansion unit.** An expansion unit consists of a chassis with disk drives and I/O expansion modules. The expansion unit does not include an I/O controller module. The expansion unit connects to and is managed by a RAID array. The SANnet II 200 SATA Special Edition (SE) does not support expansion units.
- **A Just a Bunch of Disks (JBOD) array.** The JBOD array connects to, and is managed by, a host server. Only the SANnet II 200 FC JBOD is supported.

See Appendix B for detailed information about using SANnet II 200 FC JBOD arrays.

Table 1-2 shows the configuration options for SANnet II 200 FC, SATA, and SATA SE arrays.

Table 1-2 SANnet II 200 FC, SATA, and SATA SE Array Configuration Options

Internal RAID controllers	1 or 2
2-Gbit/sec Fibre Channel disks (SANnet II 200 FC array) ¹	Up to 12 per array or per expansion unit, with a minimum of 4 plus 1 spare
1.5-Gbit/sec serial ATA disks (SANnet II 200 SATA array)	
FC expansion units ²	Up to 8 for a SANnet II 200 FC array. Up to 5 for a SANnet II 200 SATA array
FC JBOD arrays ³ (SANnet II 200 FC array only)	1
Connection options	<ul style="list-style-type: none"> • Serial port • Ethernet • Fibre Channel Small Form-Factor Pluggable (SFP)
Supported RAID levels	0, 1, 3, 5, 1+0, 3+0, and 5+0
Redundant field-replaceable units (FRUs)	<ul style="list-style-type: none"> • Power supply and fan modules • I/O controller modules and I/O expansion modules • I/O expansion modules • Battery board module • Disk drive modules
Configuration management and enclosure event reporting options ⁴	<ul style="list-style-type: none"> • In-band Fibre Channel ports • Out-of-band 10/100BASE-T Ethernet port • RS-232 connectivity • Enclosure monitoring by SCSI Enclosure Services (SES)

1. 1-GHz drives are not supported.

2. A disk array with no controller. Each expansion unit has two Fibre Channel loops that can provide redundant data paths back to the RAID array.

3. A disk array with no controller that is connected directly to a host computer, with no RAID array in the loop. Only SANnet II 200 FC arrays support the JBOD configuration.

4. The host-based SANscape software provides a graphical user interface (GUI) and additional event-reporting capabilities.

A label on the bottom lip of an array chassis, underneath the front bezel, indicates whether the array is a JBOD array or a RAID array. For instance, “SANnet II 200 AC JBOD” refers to an alternating-current version of a SANnet II 200 JBOD array, “SANnet II 200 DC JBOD” refers to a direct-current version of a JBOD array, and “SANnet II 200 AC RAID” refers to an alternating-current version of a RAID array. Similarly, using a OBP command such as `probe-scsi-a11` provides similar information, using an “A” designator for RAID arrays and a “D” designator for disks

in a JBOD array. For example, “SANnet II 200 D1000” identifies a JBOD array with SES firmware version 1000 and “SANnet II 200F A1000” identifies a SANnet II 200 FC RAID array with firmware version 1000.

For a list of supported racks and cabinets, refer to the *SANnet II Family Rack Installation Guide for 2U Arrays*.

Reliability, availability, and serviceability (RAS) are supported by:

- Redundant components
- Notification of failed components
- Components that are replaceable while the unit is online

For information about specifications and agency approvals, see “*SANnet II 200 FC, SATA, and SATA SE Array Specifications*” on page A-1.

1.2 Field-Replaceable Units

This section describes the field replaceable units (FRUs) contained in the SANnet II 200 FC, SATA, and SATA SE arrays.

1.2.1 RAID I/O Controller Modules

A dual-controller configuration offers increased reliability and availability because it eliminates a single point of failure, the controller. In a dual-controller configuration, if the primary controller fails, the array automatically fails over to the second controller without an interruption of data flow.

The FC, SATA, and SATA SE array I/O controller modules are hot-serviceable. *Hot-serviceable* means that the module can be replaced while the array and hosts are powered on, but the connected hosts must be inactive.

- SANnet II 200 FC array RAID controller modules provide six Fibre Channel ports.
- SANnet II 200 SATA array I/O controller modules provide eight Fibre Channel ports.
- SANnet II 200 SATA SE array I/O controller modules provide six Fibre Channel ports.

Single- and dual-controller models are available, with the dual-controller version supporting active/passive and active/active configurations. Each RAID controller is configured with 1 Gbyte of cache.

In the unlikely event of an I/O controller module failure, the redundant RAID controller immediately begins servicing all I/O requests. The failure does not affect application programs.

Each RAID I/O controller module can support up to 1 Gbyte of Synchronous Dynamic Random Access Memory (SDRAM) with Error Control Check (ECC) memory. In addition, each controller supports 64 Mbyte of on-board memory. Two Application-

Specific Integrated Circuit (ASIC) controller chips handle the interconnection between the controller bus, DRAM memory, and Peripheral Component Interconnect (PCI) internal buses. They also handle the interface between the on-board 2-Mbyte flash memory, 32-Kbyte nonvolatile random access memory (NVRAM), RS-232 port chip, and 10/100 BASE-T Ethernet chip.

The RAID I/O controller module is a multifunction board. I/O controller modules include Small Form-Factor Pluggable (SFP) ports, SCSI Enclosure Services (SES) logic, and the RAID controller. The SES logic monitors various temperature thresholds, fan speed from each fan, voltage status from each power supply, and the FRU ID.

Each RAID I/O controller module incorporates SES direct-attached Fibre Channel capability to monitor and maintain enclosure environmental information. The SES controller chip monitors all internal +12 and +5 voltages, various temperature sensors located throughout the chassis, and each fan. The SES also controls the front-panel and back-panel LEDs and the audible alarm. Both the RAID chassis and the expansion chassis support dual SES failover capabilities for fully redundant event monitoring.

1.2.2 I/O Expansion Modules

The hot-serviceable I/O expansion modules provide four (SANnet II 200 FC array) or eight (SANnet II 200 SATA array), or six (SANnet II 200 SATA SE array) SFP ports but do not have battery modules or controllers. I/O expansion modules are used with I/O controller modules in non-redundant FC arrays, SATA arrays, and SATA SE arrays and in expansion units and JBODs.

You can connect SANnet II 200 SATA expansion units to SANnet II 200 FC arrays. However, certain restrictions and limitations apply to mixed Fibre Channel and SATA environments.

1.2.3 Disk Drives

Each disk drive is mounted in its own sled assembly. Each sled assembly has electromagnetic interference (EMI) shielding, an insertion and locking mechanism, and a compression spring for maximum shock and vibration protection.

Each disk drive is slot independent, meaning that once a logical drive has been initialized, the system can be shut down and the drives can be removed and replaced in any order. In addition, disk drives are field upgradeable to larger drives without interruption of service to user applications. The drive firmware is also field upgradeable, but the firmware upgrade procedure requires interruption of service.



Caution – You can mix disk drive capacity in the same chassis, but not spindle speed (RPM). For instance, you can use 36-Gbyte and 73-Gbyte drives with no performance problems if both are 10K RPM drives. Violating this configuration guideline leads to poor performance.

In the event of a single disk drive failure, with the exception of RAID 0, the system continues to service all I/O requests. Either mirrored data or parity data is used to rebuild data from the failed drive to a spare drive, assuming one is assigned. If a spare is not assigned, you must manually rebuild the array.

In the unlikely event that multiple drive failures occur within the same logical drive, data that has not been replicated or backed up might be lost. This is an inherent limitation of all RAID subsystems and could affect application programs.

An *air management sled* FRU is available for use when you remove a disk drive and do not replace it. Insert an air management sled into the empty slot to maintain optimum airflow through the chassis.

1.2.3.1 SANnet II 200 FC Array Disk Drives

The drives can be ordered in 36-Gbyte, 73-Gbyte, and 146-Gbyte sizes. 36-Gbyte drives have a rotation speed of 15,000 RPM, 146-Gbyte drives have a rotation speed of 10,000 RPM, and 73-Gbyte drives are available with rotation speeds of 10,000 RPM and 15,000 RPM.

1.2.3.2 SANnet II 200 SATA and SATA SE Array Disk Drives

The disk drives incorporate Serial ATA (SATA) technology. They are optimized for capacity, but have performance levels approaching Fibre Channel performance levels. The drives can be ordered in 250-Gbyte and 400-Gbyte sizes and have a rotation speed of 7200 RPM.

1.2.4 Battery Module

The battery module is designed to provide power to system cache for 72 hours in the event of a power failure. When power is reapplied, the cache is purged to disk. The battery module is hot-swappable. *Hot-swappable* means that a live upgrade can be performed. The FRU can be removed and replaced while the RAID array is powered on and operational. The battery module is mounted on the I/O board with guide rails and a transition board. It also contains the EIA-232 and DB9 serial interface (COM) ports.

1.2.5 Power and Fan Modules

Note – The SATA arrays can only be ordered in an AC configuration. However, DC power supplies can be ordered in an x-option kit, and the SATA arrays can be reconfigured using the DC power supplies. For details, refer to the *SANnet II Family FRU Installation Guide*.

Each array contains two redundant power and fan modules. Each module contains a 420-watt power supply and two radial 52-cubic-feet-per-minute (CFM) fans. Power module autoranging capabilities range from 90 volts alternating current (VAC) to 264 VAC for AC power supplies, and from –36 volts direct current (VDC) to –72 VDC for DC power supplies.

A single power and fan module can sustain an array.

1.3 Interoperability

The array is designed for heterogeneous operation and supports multiple host operating systems. Refer to the *SANnet II 200 FC, SATA, and SATA SE Array Release Notes* to see the current list of supported hosts, operating systems, and application software.

The array does not require any host-based software for configuration, management, and monitoring, which can be handled through the built-in firmware application. The console window can be accessed via the DB9 communications (COM) port using the Solaris `tip` command or equivalent means for other operating systems, or with the Ethernet port using the `telnet` command. Management and monitoring software is available and shipped with the array. See “Additional Software Tools” on page 1-15 for more information.

1.4 Fibre Channel Technology Overview

As a device protocol capable of high data transfer rates, Fibre Channel simplifies data bus sharing and supports not only greater speed than SCSI, but also more devices on the same bus. Fibre Channel can be used over both copper wire and optical cable. It can be used for concurrent communications among multiple workstations, servers, storage systems, and other peripherals using SCSI and IP protocols. When a Fibre Channel hub or fabric switch is employed, it provides flexible topologies for interconnections.

1.4.1 FC Protocols

Two common protocols are used to connect Fibre Channel (FC) nodes together:

- Point-to-point—The point-to-point protocol is straightforward, doing little more than establishing a permanent communication link between two ports.
- Arbitrated loop—The arbitrated loop protocol creates a simple network featuring distributed (arbitrated) management between two or more ports, using a circular (loop) data path. Arbitrated loops can support more nodes than point-to-point connections can.

The FC, SATA, and SATA SE arrays support point-to-point and arbitrated loop protocols. Select the protocol you prefer by setting the desired Fibre Channel Connection Option in the Configuration parameters of the firmware application. For more information, see “Summary of Array Configuration” on page 5-1.

1.4.2 FC Topologies

The presence or lack of switches establishes the topology of an FC environment. In a direct attached storage (DAS) topology, servers connect directly to arrays without switches. In a storage area network (SAN) topology, servers and arrays connect to an FC network created and managed by switches.

Refer to the *SANnet II 200 FC and SATA Array Best Practices Manual* to see information about optimal configurations for site requirements.

1.4.3 Fibre Hubs and Switches

A storage network built on a Fibre Channel architecture might employ several of the following components: Fibre Channel host adapters, hubs, fabric switches, and fibre-to-SCSI bridges.

- Fibre hubs

An arbitrated loop hub is a wiring concentrator. “Arbitrated” means that all nodes communicating over this fibre loop share a 100-megabits-per-second (Mbps) segment. Whenever more devices are added to a single segment, the bandwidth available to each node is further reduced.

A loop configuration allows different devices in the loop to be configured in a token ring style. With a fibre hub, a fibre loop can be rearranged in a star-like configuration because the hub itself contains port bypass circuitry that forms an internal loop inside. Bypass circuits can automatically reconfigure the loop once a device is removed or added without disrupting the physical connection to other devices.

- Fabric switches.

A fabric switch functions as a routing engine, which actively directs data transfers from source to destination and arbitrates every connection. Bandwidth per node via a fabric switch remains constant when more nodes are added, and a node on a switch port uses a data path with speed up to 100 Mbps to send or receive data.

1.4.4 Data Availability

Data availability is one of the major requirements for today's mission-critical applications. Highest availability can be accomplished with the following functionality:

- Hot-plug capabilities
With proper hardware and software configuration in dual-controller mode, a failed controller can be replaced online while the existing controller is actively serving I/O.
- Dual-loop configurations
Dual loop provides path redundancy and greater throughput.
- Controller communications over Fibre Channel
- This option is selectable either through dedicated loops or all drive loops. It allows a more flexible configuration of redundant controllers.

1.4.5 Scalability

The Fibre Channel architecture brings scalability and easier upgrades to storage. Storage expansion can be as easy as cascading another expansion unit to a configured RAID array without powering down the running system. The maximum number of expansion units supported by a single SANnet II 200 Fibre Channel or SATA array is:

- Up to eight SANnet II 200 FC expansion units connected to a SANnet II 200 FC array.
- Up to five SANnet II 200 SATA expansion units connected to a SANnet II 200 SATA array.
- Up to five SANnet II 200 FC expansion units and SANnet II 200 SATA expansion units, in any combination, can be connected to a SANnet II 200 FC RAID array.

Note – The SANnet II 200 SATA SE array does not support expansion units.

Up to 125 devices can be configured in a single FC loop. By default, the array provides two drive loops and four host loops, and operates in Fibre Channel-Arbitrated Loop (FC-AL) and fabric topologies.

1.5 Fibre Channel Architecture

Each RAID array has six Fibre Channels with the following defaults:

- Channels 0, 1, 4, and 5 are host channels connected to servers. Any SANnet II 200 FC array host channels can be reassigned as drive channels to connect to expansion units. SANnet II 200 SATA array channels 3 and 4 can also be reassigned as drive channels.
- Channels 2 and 3 are dedicated drive channels that connect the internal 12-disk drives in the RAID chassis, and can also be used to add expansion units to the configuration.

Note – SANnet II 200 SATA SE devices do not support expansion units. Use the SANnet II 200 SATA device if your array requires expansion units.

- FC-AL is the default mode. Point-to-point is also available.

The SANnet II 200 FC expansion unit has a total of four FC-AL ports. The SANnet II 200 SATA expansion unit has a total of eight FC-AL ports. The SANnet II 200 SATA SE has a total of six FC-AL ports.

Note – Throughout this manual, Fibre Channel-Arbitrated Loops are referred to simply as *loops*.

1.5.1 Redundant Configuration Considerations

This section provides information about setting up redundant configurations for increased reliability. For more detailed information about configuration requirements, refer to the *SANnet II 200 FC and SATA Array Best Practices Manual*.

1.5.1.1 Host Bus Adapters

Fibre Channel is widely applied to storage configurations with topologies that aim to avoid loss of data due to component failure. As a rule, the connections between source and target should be configured in redundant pairs.

The recommended host-side connection consists of two or more host bus adapters (HBAs). Each HBA is used to configure a Fibre Channel loop between the host computer and the array.

1.5.1.2 Active-to-Active Redundant Controller

In active-to-active redundant controller mode, the primary loop serves the I/O traffic directed to the primary controller, and its pair loop serves the I/O traffic to the secondary controller. The host-side management software directs I/O traffic to the pair loop if one of the redundant loops fails.

Since each fibre interface supports only a single loop ID, two HBAs are necessary for active-to-active redundant controller operation. Using two HBAs in each server ensures continued operation even when one data path fails.

In active-to-active mode, the connection to each host adapter should be considered a data path connecting the host to either the primary or the secondary controller. One adapter should be configured to serve the primary controller and the other adapter to serve the secondary controller. Each target ID on the host channels should be assigned either a primary ID or a secondary ID. If one controller fails, the remaining controller can inherit the ID from its counterpart and activate the standby channel to serve host I/O.

1.5.1.3 Host Redundant Paths

The controller passively supports redundant fibre loops on the host side, provided that the host has implemented software support for this feature.

In the unlikely event of controller failure, the standby channels on the remaining controller become an I/O route serving the host I/O originally directed to the failed channel on its pair of controllers. Application failover software should be running on the host computer to control the transfer of I/O from one HBA to another in case either data path fails.

1.6 Additional Software Tools

The following additional software tools are available:

- SANscape, a management and monitoring program
- SANscape Alert, a monitoring utility
- SANscape CLI, a command-line utility to monitor and manage the array.

Refer to the *SANscape Software Installation Guide* for information about installing these tools.

For additional information, refer to the release notes in the SANnet II 200 array hardware section at the following web site: <http://www.dothill.com/manuals>.

CHAPTER 2

Site Planning

This chapter outlines the site planning requirements and basic safety requirements for the installation and use of the FC arrays, SATA arrays, and SATA Special Edition (SE) arrays. Complete a preinstallation worksheet and prepare the site for installation according to the worksheet details and the specified site planning requirements.

Review the details of this chapter before installing an array. Topics covered in this chapter are:

- “Customer Obligations” on page 2-1
- “Safety Precautions” on page 2-2
- “Environmental Requirements” on page 2-3
- “Electrical and Power Specifications” on page 2-3
- “Physical Specifications” on page 2-4
- “Layout Map” on page 2-4
- “Console and Other Requirements” on page 2-5
- “Preinstallation Worksheets” on page 2-6

Note – The *SANnet II 200 FC, SATA, and SATA SE Array Release Notes* list the supported operating systems, host platforms, and software.

2.1 Customer Obligations

The customer is obliged to inform Dot Hill, Inc. of any and all ordinances and regulations that would affect installation.



Caution – When selecting an installation site for the FC, SATA, or the SATA SE arrays, choose a location that avoids excessive heat, direct sunlight, dust, or chemical exposure. Such exposure greatly reduces the product’s longevity and might void your warranty.

The customer is responsible for meeting all government codes and regulations concerning facilities. The customer is also responsible for compliance with the following requirements:

- Meeting all local, national, and international codes covered in Appendix A. The subjects covered include fire and safety, building, and electrical codes.
- Documenting and informing Dot Hill, Inc. of any deviations from Appendix A.

2.2 Safety Precautions

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all safety precautions and requirements specified in the *SANnet II Family Safety, Regulatory, and Compliance Manual*.
- A fully loaded array weighs over 59 pounds (27 kilograms). To avoid injury, use two people to lift the array.
- Follow all cautions and instructions marked on the equipment.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label.
- Never push objects of any kind through openings in the equipment. Dangerous voltages might be present. Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to your equipment.
- Dot Hill products are designed to work with single-phase power systems having a grounded neutral conductor. To reduce the risk of electric shock, do not plug Dot Hill products into any other type of power system. Contact your facilities manager or a qualified electrician if you are not sure what type of power is supplied to your building.
- Your Dot Hill product is shipped with a grounding-type (three-wire) power cord. To reduce the risk of electric shock, always plug the cord into a grounded power outlet.
- Do not use household extension cords with your Dot Hill product. Not all power cords have the same current ratings. Household extension cords do not have overload protection and are not meant for use with computer systems.
- Do not block or cover the openings of your Dot Hill product. Never place a Dot Hill product near a radiator or heat register. Failure to follow these guidelines can cause overheating and affect the reliability of your Dot Hill product.

2.3 Environmental Requirements

Table 2-1 Environmental Specifications

	Operating	Nonoperating
Altitude	To 9000 feet (3000 meters)	To 36,000 feet (12,000 meters)
Humidity	10% to 90% RH at 80° F (27° C) max wet bulb (noncondensing)	93% RH, 100° F (38° C) max wet bulb temperature (noncondensing)
<i>Temperature</i>		
Standalone	41° F (5° C) to 104° F (40° C)	–40° F (–40° C) to +149° F (+65° C)
Rack	41° F (5° C) to 95° F (35° C)	–40° F (–40° C) to +149° F (+65° C)

2.3.1 Electromagnetic Compatibility

The following is required for all installations:

- All AC mains and supply conductors to power distribution boxes for both the rack-mounted array and the desktop array must be enclosed in a metal conduit or raceway when specified by local, national, or other applicable government codes and regulations.
- The supply conductors and power distribution boxes (or equivalent metal enclosure) must be grounded at both ends.
- The supplied arrays require voltages within minimum fluctuation. The facilities voltage supplied by the customer must maintain a voltage with not more than (+/–) 5 percent fluctuation. The customer facilities must provide suitable surge protection.

2.4 Electrical and Power Specifications

The FC, SATA, and SATA SE arrays require two independent power sources. Each array has two power supply and two fan modules for redundancy.

Each AC array requires two 115 VAC/15A or two 240 VAC service outlets. All AC power supplies are autoranging and are automatically configured to a range of 90–264 VAC and 47–63 Hz. There is no need to make special adjustments.

Each DC array requires two –48 VDC service outlets and has an input voltage range of –36 VDC to –72 VDC.

Note – To ensure power redundancy, connect the two array power modules to two separate circuits (for example, one commercial circuit and one UPS).

Table 2-2 Power Specifications

AC power	Voltage and frequency 90 to 264 VAC, 47 to 63 Hz
Input current	5A max
Power supply output voltage	+5 VDC and +12 VDC
DC power	-48 VDC (-36 VDC to -72 VDC)

2.5 Physical Specifications

Use the physical specifications in Table 2-3 to plan the location of your array.

Table 2-3 Physical Specifications

Category	Description
Dimensions	2U 3.45 inches (8.76 cm.) height 21 inches (53.34 cm.) chassis depth 17.5 inches (44.6 cm.) width 19 inches (48.26 cm.) width with ears
Installation clearances	For FRU component removal and replacement, 15 inches (37 cm) is required front and back.
Cooling clearances	6 inches (15 cm) is required front and back. No cooling clearance is required on the sides or the top and bottom of the array.

2.6 Layout Map

It is helpful to create a sketch or layout map to indicate the exact location of the array as well as the location of the hosts, console, and Ethernet connections that will be connected to it.

As you lay out the components, consider the cable lengths that will be used.

2.6.1 Rack Placement

Follow these guidelines when preparing a rackmount placement for your system:

- Ensure that the floor surface is level.
- Leave enough space in front of the rack to access components for servicing.
- Leave enough space in back of the rack to access components for servicing.
- Keep power and interface cables clear of foot traffic. Route cables inside walls, under the floor, through the ceiling, or in protective channels or raceways.

- Route interface cables away from motors and other sources of magnetic or radio frequency interference.
- Stay within the cable length limitations.
- Provide two separate power sources for the array. These power sources must be independent of each other, and each must be controlled by a separate circuit breaker at the power distribution point.

2.6.2 Tabletop Placement

SANnet II 200 FC, SATA, and SATA SE arrays can be positioned on a desk or a table. Follow these guidelines when preparing a tabletop placement for your system:

- Choose a desk or a table that can support 60 pounds (27 kg) for each fully configured array you plan to place on it.
- Do not place the arrays on the edge of the table. Set the array so that at least 50 percent of the array is inside the table or desk leg support area. Failure to do this might cause the table to tip over.
- Leave enough space in front and in back of the array to access components for servicing. To remove the components requires a clearance of 15 inches (37 cm) in front and in back of the array.
- Provide a minimum space of 6 inches (15 cm) in front and in back of the array for adequate airflow.
- Keep power and interface cables clear of foot traffic. Route cables inside walls, under the floor, through the ceiling, or in protective channels or raceways.
- Route interface cables away from motors and other sources of magnetic or radio frequency interference.
- Stay within the cable length limitations.
- Ensure that the operating system for the array does not exceed the specifications.
- Use two people to lift the array to avoid injury. The array can weigh over 60 pounds (27 kg).
- Do not place the array in a vertical position. Place the array horizontally.
- If you are installing more than one array, you can stack up to five arrays on top of each other. Do not stack more than five arrays together.
- Provide two separate power sources for the array. These power sources must be independent of each other, and each must be controlled by a separate circuit breaker at the power distribution point.

2.7 Console and Other Requirements

A console with at least one serial port connection is necessary for installation and configuration of your FC, SATA, or SATA SE array. Once you have configured your array with an IP address, an Ethernet port can also be useful for configuring the array.

Note – SANnet II family arrays require at least CAT-5 Ethernet cable.

See the following preinstallation worksheet for additional preparation details.

2.8 Preinstallation Worksheets

Before ordering an FC, SATA, or SATA SE array, complete the preinstallation worksheets on the following pages and then prepare the site for installation according to the site planning requirements.

Note – If you are connecting to several hosts or fabric switches, make as many copies of Table 2-5 as you need and label them appropriately.

- You are responsible for ensuring that the site consistently conforms to all stipulated standards and that necessary peripherals are made available to the engineer during installation.
- Review the details of your specific survey before installing your array.
- If necessary, attach or sketch a network diagram to the survey.

Table 2-4 Site Preparation Worksheet

Rackmounting	Customers must ensure that the appropriate service outlets are available for installation. Requirements vary. <ul style="list-style-type: none">• Will the array be rackmounted? Yes / No• Is the rack supplied by Dot Hill, Inc.? Yes / No• If yes, include Dot Hill model number: _____• If not, make/model: _____ / _____• Does the rack mount have:<ul style="list-style-type: none">• Front and back? If so, depth? _____• Center/Telco? _____• What cable lengths are required? _____• Are there any power strips or power sequencers in the rack? Yes / No• Are they supplied by Dot Hill, Inc.? Yes / No<ul style="list-style-type: none">• If yes, part number: _____• If not, quantity of plugs/outlets required: _____ / _____
IP address	Array IP address: _____. Array network mask: _____.
Cabling	Fiber-optic cable lengths to connect to hosts: _____

Table 2-5 Host and Fabric Switch Connectivity Summarized

Host or Fabric Switch Connectivity - Host or Fabric Switch #1

Host or fabric switch name: _____

Host or fabric switch make/model: _____

HBA connector types: _____

Cable distance from the array to the hosts: _____

Operating system: _____

Patches installed: _____

IP addresses:

- Network _____

- Host or switch _____

Host or Fabric Switch Connectivity - Host or Fabric Switch #2

Host or fabric switch name: _____

Host or fabric switch make/model: _____

HBA connector types: _____

Cable distance from the array to the hosts: _____

Operating system: _____

Patches installed: _____

IP addresses:

- Network _____

- Host or switch _____

CHAPTER 3

Unpacking Your Array

This chapter describes the procedure for unpacking your FC, SATA, or SATA SE array package. The following topics are covered in this chapter:

- “Opening Your Package” on page 3-1
- “Checking the Package Contents” on page 3-2
- “Field-Replaceable Units” on page 3-3
- “Customer-Provided Cables” on page 3-3
- “Mounting Your Array in a Rack or Cabinet” on page 3-3

3.1 Opening Your Package

Follow these guidelines for unpacking the equipment.



Caution – To avoid personal injury or damage to the equipment during installation, always use two people to remove the unit from its container. This unit weighs approximately 60 pounds (27 kg).

1. Select a suitable area for unpacking.
2. Store all packing material and boxes for possible equipment returns.
3. Check the contents sheet in your product package.

The contents sheet summarizes the standard contents for your product. See “Checking the Package Contents” on page 3-2 for more information.
4. Compare the packing slip and the list of parts with the items you received.

If the list of parts on your packing slip does not match the items you received, or if any items appear damaged, immediately notify your carrier agent and the supplier who prepared your shipment.
5. Carefully examine the cables provided in the package.

If any cable appears to be damaged, contact the technical service department for an immediate replacement.

6. Check the list of “Customer-Provided Cables” on page 3-3.

These are required to complete your installation.

Note – You must purchase or provide fiber-optic cables for connecting FC, SATA, and SATA SE arrays to host servers.

3.2 Checking the Package Contents

Inspect the array package for standard items as well as purchased options before you begin installation. If any parts are missing or damaged, contact your sales representative immediately.

3.2.1 Standard Array Packages

Table 3-1 Contents of SANnet II 200 Array Packages

Quantity	Item
1	One or more of the following arrays: <ul style="list-style-type: none">• SANnet II 200 FC array, SANnet II 200 SATA array, or SANnet II 200 SATA SE array with single controller• SANnet II 200 FC array, SANnet II 200 SATA array, or SANnet II 200 SATA SE array with dual controllers• SANnet II 200 FC JBOD, SANnet II 200 FC expansion unit, or SANnet II 200 SATA expansion unit
1	<ul style="list-style-type: none">• Contents Sheet for your array• Quick installation guide for your array• To download and print the latest release notes, go to the SANnet II 200 FC, SATA, or SATA SE array section and to the software section at the following location: http://www.dothill.com/manuals
1	CD for user documentation
1	Serial null modem cable
1 or 2	25-foot (7.5 m) shielded CAT-5 Ethernet cable (one per controller)
1	Cable adapter, DB9 to DB25
2	DC power cables if you ordered a DC-powered array
2	AC cord locks in a plastic bag if you ordered an AC-powered array
1	AC cable country kit if the array is AC powered
2	Front bezel keys in a plastic bag, to secure the front bezel onto the chassis
Various	Purchased options. These options are ordered at the time of purchase and are integrated into or added to the unit prior to delivery.

3.3 Field-Replaceable Units

Check that you received all field-replaceable units (FRUs) ordered with your array. For additional FRUs, consult your sales representative. For instructions on how to install or replace FRUs, review the following manuals located on the product web site or on your documentation CD:

- *SANnet II Family Rack Installation Guide for 2U Arrays*
- *SANnet II Family FRU Installation Guide*

All FRUs are hot-swappable except the I/O controller and I/O expansion modules, which are hot-serviceable. *Hot-swappable* means that a live upgrade can be performed—the FRU can be removed and replaced while the RAID array is powered on and operational. *Hot-serviceable* means that the module can be replaced while the array and hosts are powered on but the connected hosts must be inactive.



Caution – You can mix capacity in the same chassis, but not spindle speed revolutions per minute (RPM) on the same SCSI bus. For instance, you can use 36-Gbyte and 73-Gbyte drives with no performance problems if both are 10K RPM drives. Violating this configuration guideline leads to poor performance.

For a list of the FRU part numbers, refer to the *SANnet II Family FRU Installation Guide*.

3.4 Customer-Provided Cables

Customers must provide a minimum of one fiber-optic cable per host to connect a host to a RAID array. Two fiber-optic cables are required for a redundant path configuration.

To obtain qualified cables, consult your Dot Hill sales representative.

3.5 Mounting Your Array in a Rack or Cabinet

Refer to *SANnet II Family Rack Installation Guide for 2U Arrays* for instructions on how to install and prepare a rack or cabinet for mounting your array.

CHAPTER 4

Connecting Your Array

This chapter describes procedures for cabling a FC, SATA, or SATA SE array and for connecting an array to power and to network devices.

The following topics are covered in this chapter:

- “Converting Your Front Bezel Locks So the Keys Cannot Be Removed” on page 4-2
- “RAID Array Connections” on page 4-4
 - “SANnet II 200 FC Array Connections” on page 4-4
 - “SANnet II 200 SATA Array Connections” on page 4-5
 - “SANnet II 200 SATA SE Array Connections” on page 4-7
- “Connecting the Chassis to AC Power Outlets” on page 4-7
- “Connecting the Chassis to DC Power Outlets” on page 4-9
- “Cabling to Expansion Units” on page 4-11
- “Setting Loop IDs on Expansion Units” on page 4-13
- “Powering Up and Checking LEDs” on page 4-16
- “Reviewing Channels, Ports, and SFPs” on page 4-16
 - “Drive Port Connectivity in a Dual-Controller Array” on page 4-17
 - “Host Port Connectivity in a Dual-Controller Array” on page 4-19
 - “Default SFP Placement” on page 4-21
 - “Changing Your SFP Configuration” on page 4-24
- “Establishing Communications With An Array” on page 4-25
- “Configuring a Host COM Port to Connect to a RAID Array” on page 4-26
- “Manually Setting a Static IP Address” on page 4-27
- “Setting Up Out-of-Band Management Over Ethernet” on page 4-28
- “Scaling a SANnet II 200 Fibre Channel Array Into a High-Capacity Configuration” on page 4-29
- “Adding an Expansion Unit to an Existing RAID Array” on page 4-30
- “Connecting Ports to Hosts” on page 4-31
- “Power-On Sequence” on page 4-32
- “Powering Off the Array” on page 4-33

Before you connect the array to the network, position the array in the rack, cabinet, or other location where it will be used.



Caution – When positioning the array, do not block the air vents at the front or back of the unit. Follow all safety precautions specified in the *SANnet II Family Safety, Regulatory, and Compliance Manual*.



Caution – When you power off an array, wait five seconds before you power it back on. If you power the array off and on too quickly, unexpected results can occur. See “Powering Off the Array” on page 4-33.

4.1 Converting Your Front Bezel Locks So the Keys Cannot Be Removed

The bezel on your array has two locks whose keys can be removed when the locks are in either the locked or open position. It is possible to reconfigure the locks so that the keys cannot be removed.

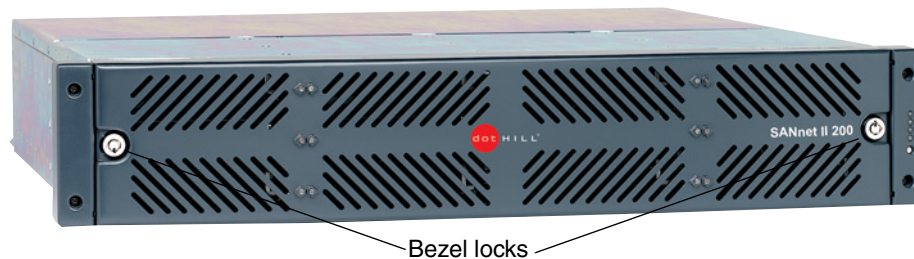


Figure 4-1 Front Bezel and Front Bezel Locks of an Array

To change the locks so the keys cannot be removed, perform the following steps.

1. Remove the bezel by gently pivoting the swing arms out of their ear sockets. See “Removing the Front Bezel and Ear Caps” on page 7-9 for step-by-step instructions on how to remove the bezel.
2. Make sure the key is in the locked position, with the pawl extending horizontally past the edge of the bezel.
3. Hold the key in place and use a 3/8-inch (12-mm) nut driver to remove the locking nut that holds the pawl in place, as shown in the first panel of Figure 4-2.



Caution – Be sure to hold the key in place. Otherwise there is a risk of breaking the small tab on the lock that serves as a stop.

4. Lift the pawl off the threaded part of the lock body, as shown in the second panel of Figure 4-2.

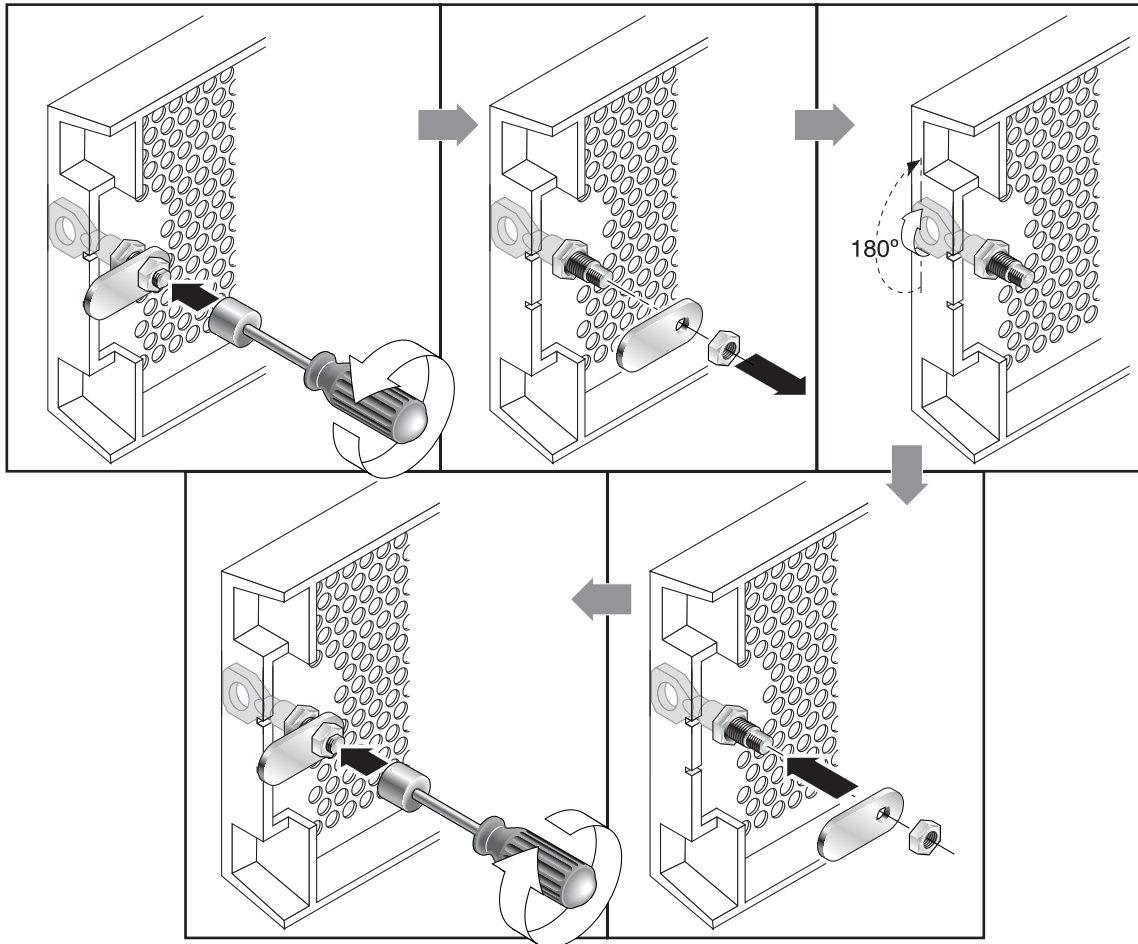


Figure 4-2 Sequence of Steps to Change Front Bezel Locks So Keys Cannot Be Removed

5. Set the pawl aside, face up, so that you can remember its orientation when you replace it.
6. Use the key to turn the lock 180 degrees, as shown in the third panel of Figure 4-2.
7. Replace the pawl in the same orientation as before, as shown in the fourth panel of Figure 4-2.
8. Hold the key in place and use the nut driver to refasten the locking nut that holds the pawl in place, as shown in the fifth panel of Figure 4-2. Be careful not to cross-thread the nut.



Caution – Be sure to hold the key in place. Otherwise there is a risk of breaking the small tab on the lock that serves as a stop.

9. Replace the bezel.

Note – To convert your bezel locks so that the keys can be removed, repeat this procedure.

4.2 RAID Array Connections

Management is in-band through fibre host connections and out-of-band through the serial port and Ethernet port on the back of each controller.

4.2.1 SANnet II 200 FC Array Connections

Figure 4-3 identifies the hardware connections on the back of a dual-controller SANnet II 200 FC array.

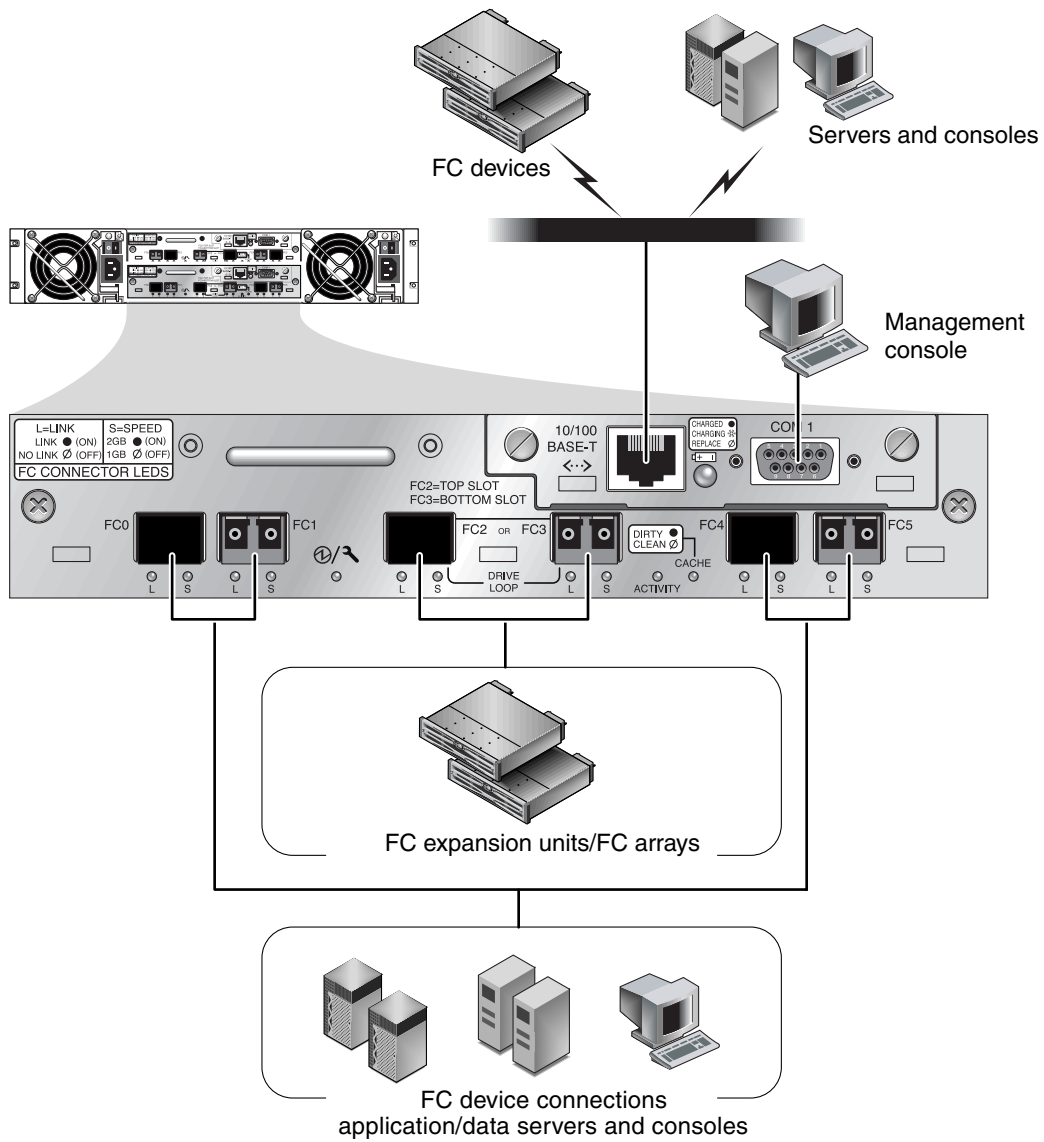


Figure 4-3 Hardware Connections on the Back of a Dual-Controller SANnet II 200 FC Array

4.2.2 SANnet II 200 SATA Array Connections

Figure 4-4 identifies the hardware connections on the back of a dual-controller SANnet II 200 SATA array.

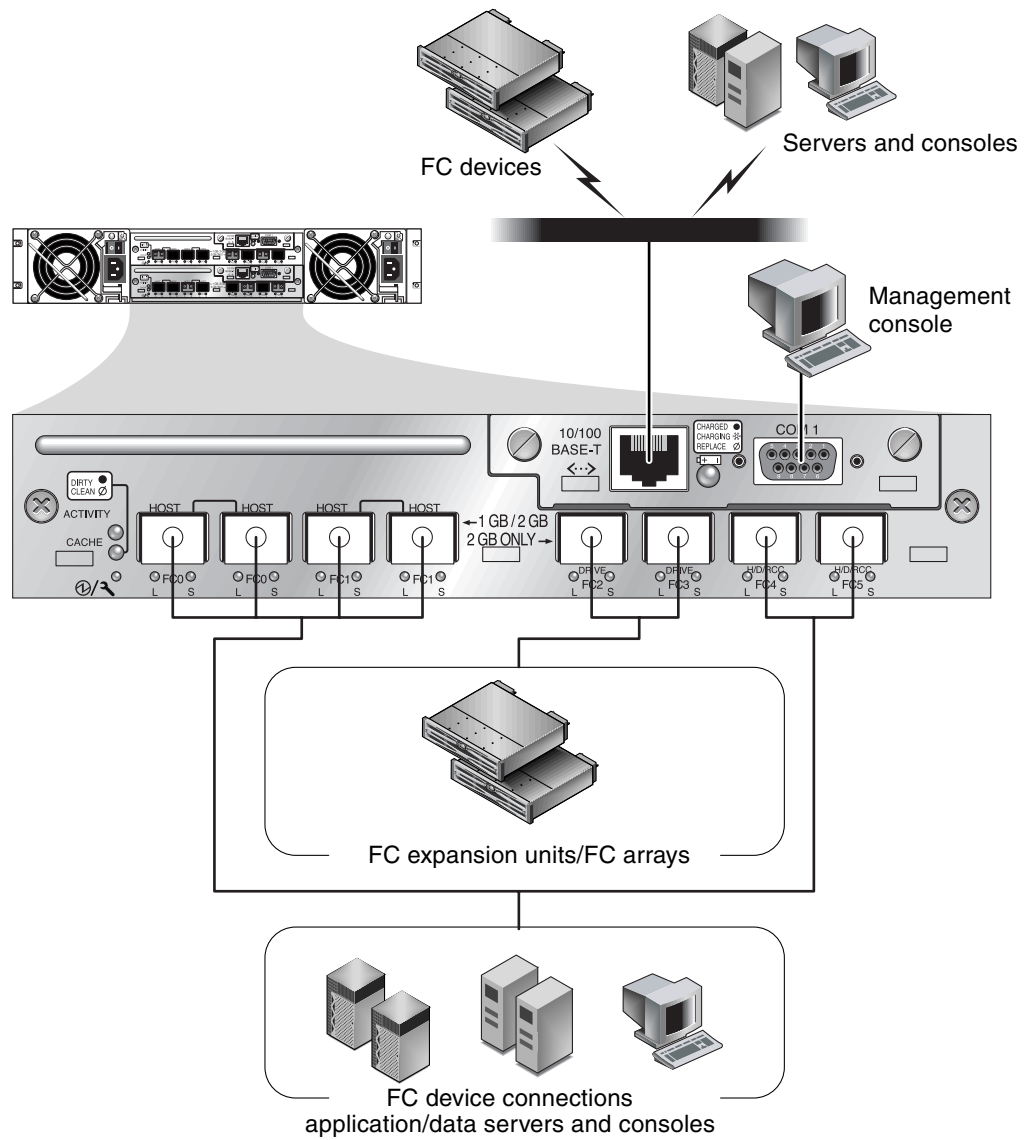


Figure 4-4 Hardware Connections on the Back of a Dual-Controller SANnet II 200 SATA Array

4.2.3 SANnet II 200 SATA SE Array Connections

Figure 4-5 identifies the hardware connections on the back of a dual-controller SANnet II 200 SATA SE array.

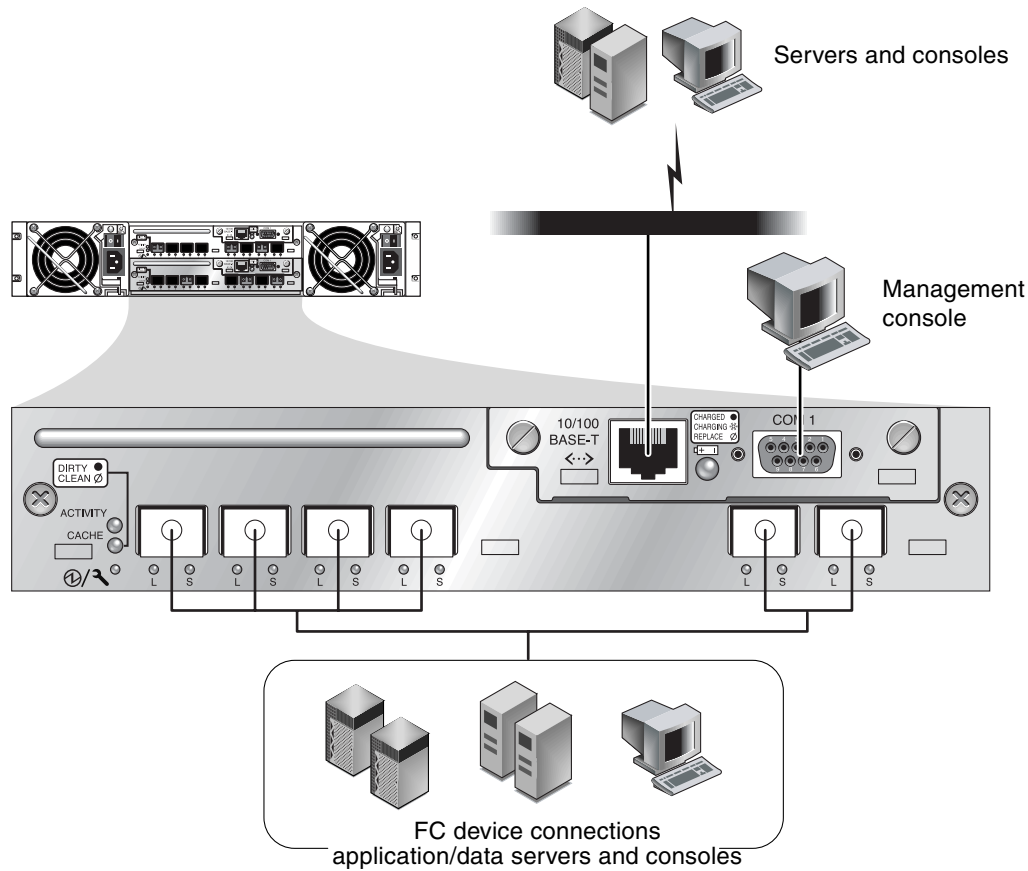


Figure 4-5 Hardware Connections on the Back of a Dual-Controller SANnet II 200 SATA SE Array

4.3 Connecting the Chassis to AC Power Outlets

When you connect the AC power cords, install the two provided cord locks at the same time. The AC cord locks are used to securely fasten the AC cable connectors.



Caution – If the array is connected to AC power sources not within the designated 90–135 or 180–264 VAC range, the unit might be damaged.

Note – To ensure power redundancy, be sure to connect the two power supply modules to two separate circuits (for example, one commercial circuit and one UPS).

To connect the AC power cords, perform the following procedure.

1. Use a Phillips screwdriver to remove the screw and cylindrical standoff from one of the two provided cord locks.
Set them aside for reassembly later.
2. Slide the cord lock over the AC power connector.
3. Hold the cylindrical standoff between the two screw holes on the flanges of the cord lock.
4. Insert the screw into the first screw hole, through the standoff, and then into the threaded screw hole on the other flange.
5. Tighten the screw with a screwdriver until the flanges bottom out on the cylindrical standoff.
6. Push the power cord into the power supply receptacle until it is firmly seated.
7. Push the green ejector handle forward until it is seated against the power supply.
8. Turn the thumbscrew of the green ejector handle clockwise until it is finger-tight to secure the handle and the cord lock.

Note – To ensure that a thumbscrew is finger-tight, tighten it with a screwdriver and then loosen the thumbscrew counterclockwise a quarter turn.

9. Repeat Step 1 through Step 8 for the second cord lock and second power cable.

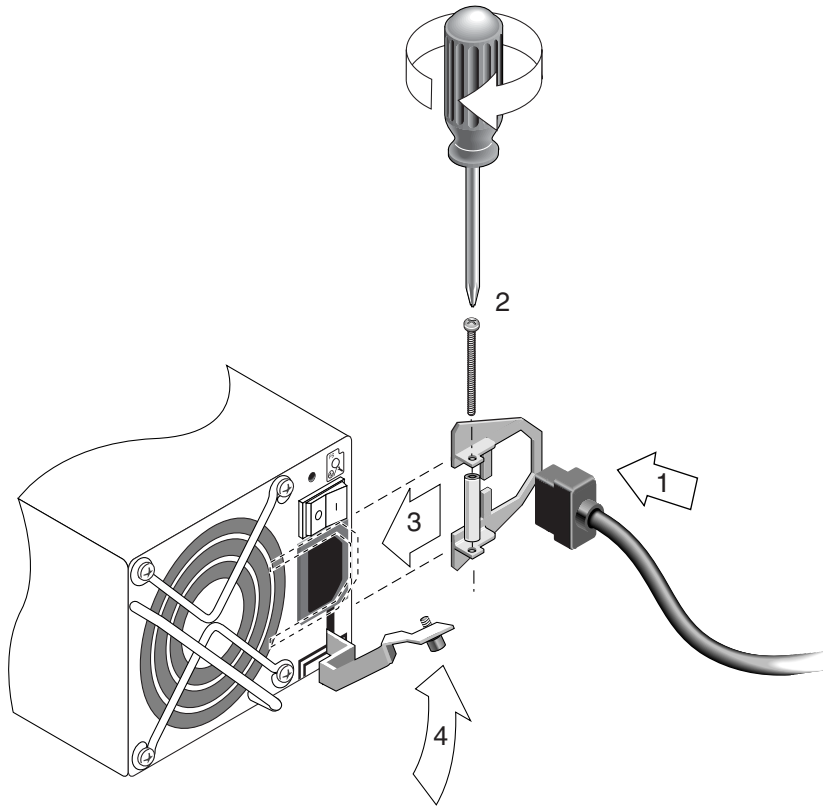


Figure 4-6 Installing a Cord Lock

4.4 Connecting the Chassis to DC Power Outlets

Note – The SANnet II 200 SATA array can only be ordered in an AC configuration. However, DC power supplies can be ordered in an x-option kit, and a SANnet II 200 SATA array can be reconfigured using the DC power supplies. Refer to the *SANnet II Family FRU Installation Guide* for a procedure for removing and replacing power supplies.

Two DC power cords are packaged with each DC array. To connect the DC power cords, perform the following procedure.

1. Check the DC cable part number and wire labels carefully before connecting the cable to the source.

Table 4-1 DC Cable Wiring for Cable 35-00000148

Pin Number	Voltage	Color
A3	Return	Red
A2	GND (Chassis Ground)	Green/Yellow
A1	-48 VDC	Black

Table 4-2 DC Cable Wiring for Cable 35-00000156

Pin Number	Voltage	Color
A3	L+	Red
A2	GND (Chassis Ground)	Green/Yellow
A1	L-	White

2. Connect a DC power cable to the first power supply and to a power outlet.

Note – Use only the DC power cables provided with the array.



Caution – If the array is connected to DC power sources not within the designated –48V DC (–36 VDC to –72 VDC) range, the unit might be damaged.

Note – To ensure power redundancy, be sure to connect the two power supply modules to two separate circuits (for example, one commercial circuit and one UPS).

Note – To extend the length of the DC power cable as needed, strip the last 1/4 inch of the cable, insert the stripped end into a provided Panduit tube, and crimp the tube.

3. Tighten the cable-locking screws to attach the cable securely to the power supply power outlet.
4. Connect the second power cable to the second power supply and to a second power outlet. Tighten the cable-locking screws.
If one power supply fails, the second power supply automatically takes the full load.

4.5 Cabling to Expansion Units

The instructions in this section apply to the SANnet II 200 FC and the SANnet II 200 SATA arrays only. The SANnet II 200 SATA SE array does not support expansion units.



Caution – When connecting expansion units to a RAID array, always connect channel 2 of the RAID array to the A channel of the expansion units, and connect channel 3 of the RAID array to the B channel of the expansion units. Otherwise, unexpected behavior might occur.

Several cabling configurations are possible, each with its own advantages and disadvantages. Refer to the *SANnet II 200 FC and SATA Array Best Practices Manual* for more information about the suitability of various configurations for various application requirements, as well as for information about high-capacity configurations.

The maximum number of expansion units attached to a RAID array are:

- up to eight SANnet II 200 FC expansion units attached to a SANnet II 200 FC array
- up to five SANnet II 200 SATA expansion units attached to a SANnet II 200 SATA array
- up to five SANnet II 200 FC expansion units and SANnet II 200 SATA expansion units, in any combination, attached to a SANnet II 200 FC array

These configurations are described in the *SANnet II 200 FC and SATA Array Best Practices Manual*.

The examples in Figure 4-7 and Figure 4-8 show RAID arrays connected to two expansion units. Connections to expansion units are designed to keep all A drive ports on the same loop and all B drive ports on the same loop.



Caution – To avoid drive assignment conflicts, make sure that each connected array and expansion unit uses a different loop ID, as described in “Setting Loop IDs on Expansion Units” on page 4-13.

In the RAID array, two of the unused SFP host ports can be used to provide redundant pathing to the two servers, and the remaining unused SFP host ports can be connected to two more servers in a redundant configuration.

Similarly, you can connect expansion units to other channels (which are separate from channels 2 and 3) if you configure them as drive channels. For details, refer to the *SANnet II Family RAID Firmware User’s Guide*.

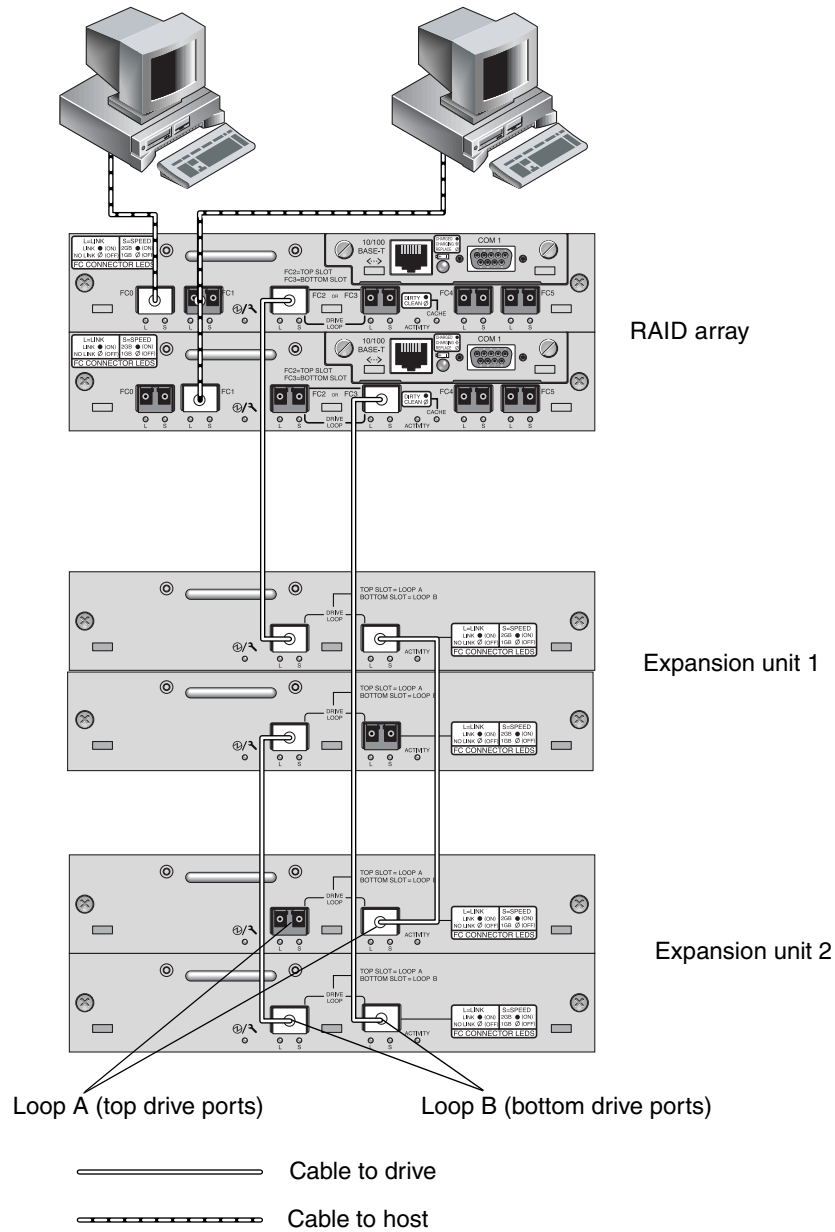


Figure 4-7 SANnet II 200 FC Array Attached to Two Hosts and Two Expansion Units

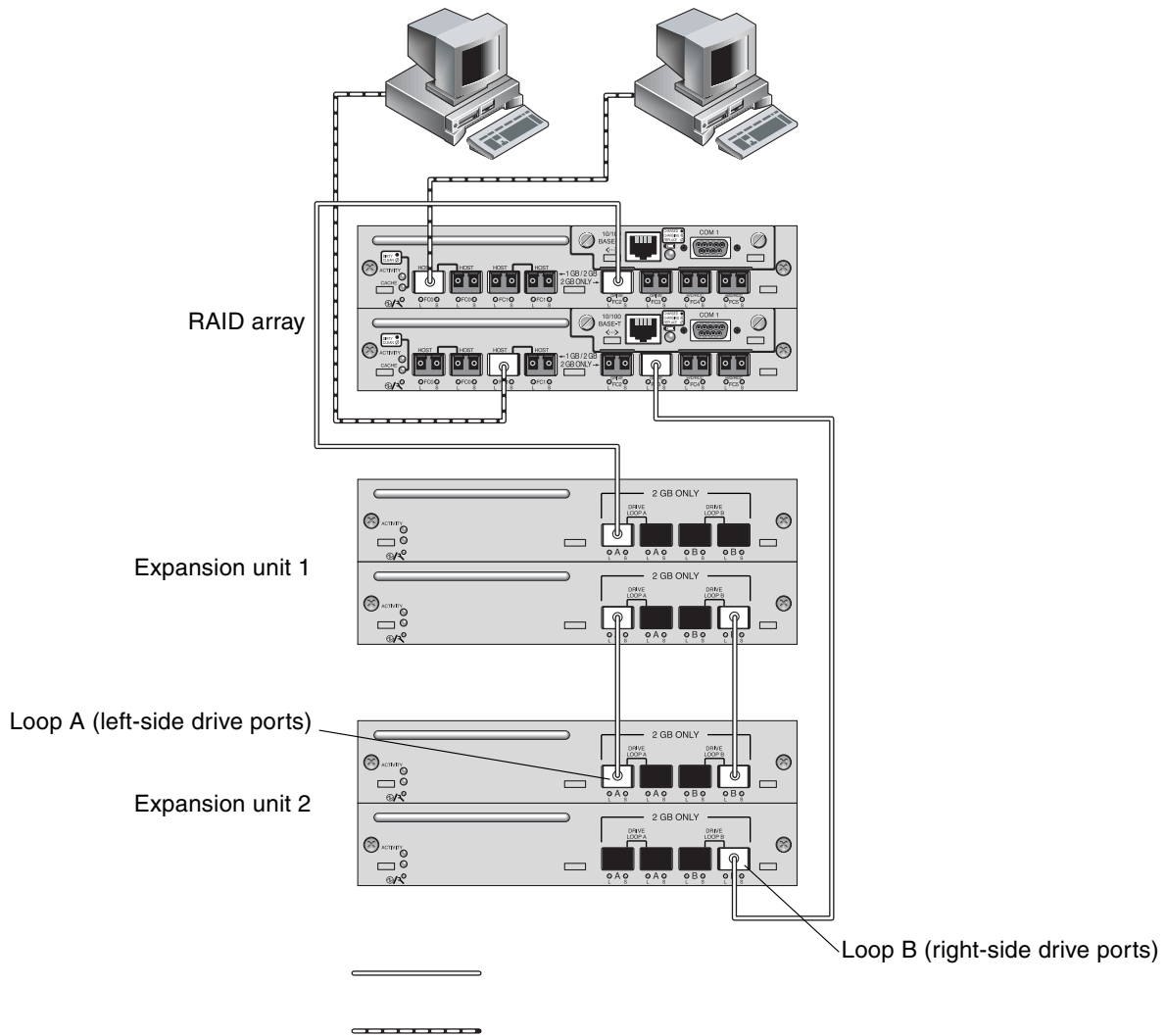


Figure 4-8 SANnet II 200 SATA Array Attached to Two Hosts and Two Expansion Units

4.6 Setting Loop IDs on Expansion Units

When an expansion unit is attached to a RAID array, unique, hard-assigned loop IDs are assigned to each expansion unit drive. A loop ID is the decimal version of an arbitrated loop physical address (AL_PA). The lowest number loop ID is the lowest priority address on the loop.

On the left front side of an expansion unit, an ID switch is used to set the loop IDs for the disk drives to a different range of values so that the same IDs are not repeated by RAID units and expansion units on the same loop.

Setting the loop ID on an array or expansion unit requires dropping the front bezel out of the way and removing the small vertical plastic cap on the left side of the bezel that covers the left rackmount tab. Rackmount tabs are also referred to as “ears.”

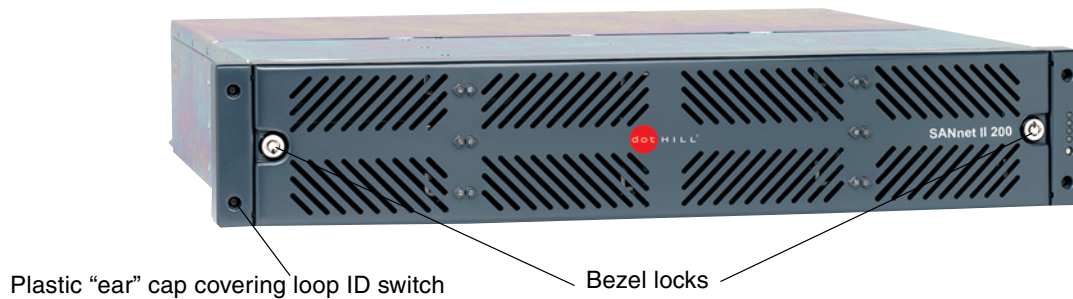


Figure 4-9 Front Bezel and Front Bezel Locks of an Array

1. Use the provided key to unlock both bezel locks.
2. Grasp the front bezel cover on both sides and pull it forward and then down.
3. Remove the plastic cap from the left ear of the array.
 - a. Squeeze both sides of the cap at the top and the bottom.
 - b. Turn the cap toward the center of the array until it disengages and pull it free.



Caution – To avoid damage to the cap, do not pull the cap forward directly or pull from only its top or bottom.

The ID switch is exposed when you remove the plastic cap.

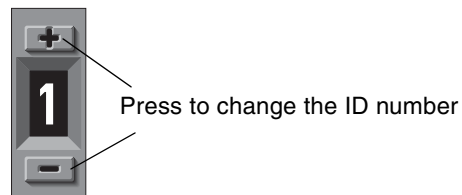


Figure 4-10 ID Switch Located on the Left Front Side of Arrays and Expansion Units

4. Press the upper or lower switch button to change the ID number so that each connected RAID array and expansion unit uses a different loop ID.



Caution – The loop ID should only be changed while the expansion unit is powered off or not in use. After changing the loop ID, a power cycle is required to make the ID switch change take effect. Failure to cycle the power following a loop ID change can lead to unexpected results.

The default ID switch setting for RAID arrays is 0. The default range of available drive IDs for RAID arrays is 0 to 11 for 12 drives (the IDs 12–15 are ignored). The default ID switch setting for expansion units and JBODs is 1.

Ensure that the loop IDs of expansion units do not duplicate the loop IDs of other connected expansion units or RAID arrays.

The ID switch offers eight ID ranges. Each range contains 16 IDs (the last four IDs in each range are ignored). These ranges are shown in Table 4-3.

Table 4-3 ID Switch Settings for Expansion Units

ID Switch Setting	Range of IDs
0	0–15
1	16–31
2	32–47
3	48–63
4	64–79
5	80–95
6	96–111
7	112–125

For an example of properly configured loop IDs, consider the configurations shown in Figure 4-7 and Figure 4-8. You must make sure the RAID array and each of the two expansion units have been assigned different loop IDs. Set the loop ID switches so that the RAID array is assigned loop ID 0, expansion unit 1 has loop ID 1, and expansion unit 2 has loop ID 2. The range of IDs assigned to the drives is shown in Table 4-4.

Table 4-4 Sample Array and Expansion Units With Different Loop IDs and Drive IDs

Fibre Channel Device	Loop ID Switch Setting	Range of Drive IDs
RAID array	0	0–15
Expansion unit 1	1	16–31
Expansion unit 2	2	32–47

5. Prepare the plastic left ear cap for replacement by aligning the inside round notches of the cap with the round cylindrical posts (ball studs) on the ear.
6. Push the top and bottom of the ear cap onto the ear, pressing in on the top side toward the center of the array first.
7. Continue pushing the top and bottom of the ear cap onto the ear, pressing on the side toward the outside of the array.

Do not use force when placing a cap on an ear.

8. Lift the bezel into position and press it onto the front of the chassis until it is flush with the front.
9. Use the key to lock both bezel locks.

4.7 Powering Up and Checking LEDs

Perform the initial check of the array according to the following procedure.

1. Connect two AC or DC power cables to the power and fan modules on the back of the array.
2. Power on the array by turning on each power switch.
See “Power-On Sequence” on page 4-32 for the power-up sequence to use when operating RAID arrays and expansion units. See “Connecting SANnet II 200 FC JBOD Arrays” on page B-6 for the power-up sequence to use when operating standalone SANnet II 200 FC JBODs directly attached to hosts.
3. Check for the following LED activity:
All front-panel LEDs turn solid green to indicate good operation.

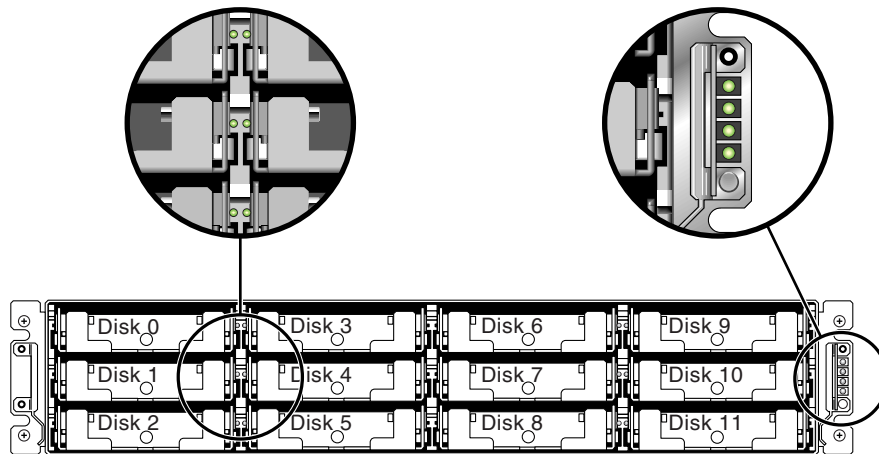


Figure 4-11 Front Panel of the SANnet II 200 FC, SATA, and SATA SE Array With LEDs Displayed

See Chapter 6 for more information about your array’s LEDs.

4.8 Reviewing Channels, Ports, and SFPs

I/O controller modules have ports that accept small form-factor pluggable (SFP) transceivers. The SANnet II 200 FC and SATA arrays have ports labeled FC0 through FC5, to indicate channels 0 through 5. The SANnet II 200 SATA SE array has ports

labeled FC0, FC1, FC4, and FC5 to indicate channels 0, 1, 4, and 5. Default configurations do not include an SFP connector in every SFP port. To add or change SFP connectors, see to “Changing Your SFP Configuration” on page 4-24.

The channels and associated ports for the SANnet II 200 FC, SATA, and SATA SE arrays are summarized in Table 4-5.

Table 4-5 Number of Ports in SANnet II 200 FC, SATA, and SATA SE Arrays

Item	SANnet II 200 FC Array	SANnet II 200 SATA Array	SANnet II 200 SATA SE Array
Total number of ports	6	8	6
Channel 0	1 FC0 host or drive port; default: host port	2 FC0 dedicated host ports ³	2 FC0 dedicated host ports *
Channel 1	1 FC1 host or drive port; default: host port	2 FC1 dedicated host ports ³	2 FC1 dedicated host ports *
Channel 2 ¹	1 FC2 dedicated drive port	1 FC2 dedicated drive port	None
Channel 3 ²	1 FC3 dedicated drive port	1 FC3 dedicated drive port	None
Channel 4	1 FC4 host or drive port; default: host port	1 FC4 host or drive port; default: host port	1 FC4 host port
Channel 5	1 FC5 host or drive port; default: host port	1 FC5 host or drive port; default: host port	1 FC5 host port

1. Channel 2 drive ports connect to drive loop A ports on expansion units.

2. Channel 3 drive ports connect to drive loop B ports on expansion units.

3. Only one host port connection per channel is allowed when connecting to a fabric switch.

4.8.1 Drive Port Connectivity in a Dual-Controller Array

Drive channels connect to the internal drives in the array and can also connect to drives in external expansion units. The key difference between the SANnet II 200 FC and SATA array drive channels is the assignment of two ports for each channel:

- **The SANnet II 200 FC array has a drive channel assigned to two ports on each I/O controller module.** Each drive channel is a pair of ports on a single I/O controller module. In a dual-controller configuration, the top controller has two ports for drive channel 2, and the lower I/O controller module has two ports for drive channel 3.
- **The SANnet II 200 SATA array has a drive channel assigned to one port on each I/O controller module in a dual-controller configuration.**

Note – The SANnet II 200 SATA SE array configuration does not include drive ports.

4.8.1.1 SANnet II 200 FC Array Drive Ports

Configured for redundancy, each controller in a dual-controller RAID array has two *adjacent* dedicated drive channels on one loop to load balance I/O operations (see Figure 4-12). Each drive channel has two SFP ports that can be connected to expansion units. Drive channels 2 and 3 access all the disk drives and are interconnected to load-balance I/O operations. Each drive channel has an upper and lower port.

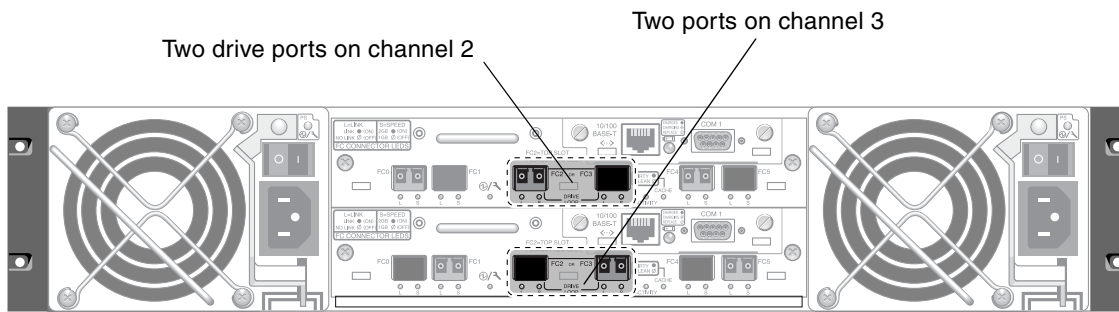
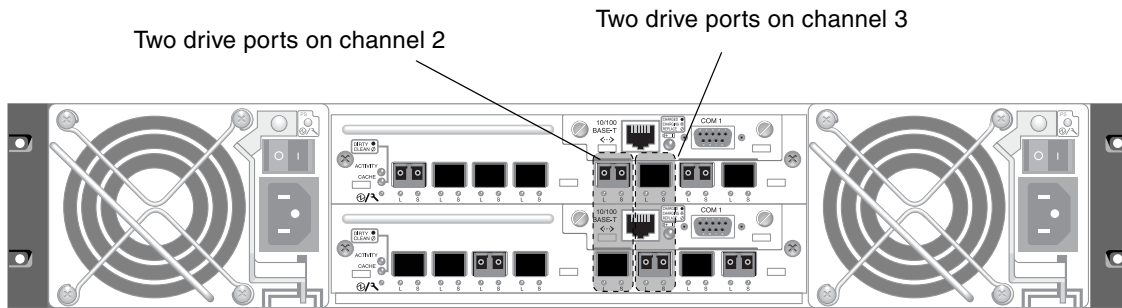


Figure 4-12 Dedicated Drive Channels 2 on the Upper Controller and 3 on the Lower Controller in a Dual-Controller SANnet II 200 FC Array

The I/O controller module in slot A (the upper slot) houses drive channel 2, which connects to the 12 internal disk drives through their A ports. The I/O controller module in slot B (the lower slot) houses drive channel 3, which connects to the 12 internal disk drives through their B ports.

4.8.1.2 SANnet II 200 SATA Array Drive Ports

Drive channels 2 and 3 are dedicated drive channels. Configured for redundancy, each drive channel of the top I/O controller module shares a loop with the matching drive channel on the bottom I/O controller module. For example, drive channel 2 of the top I/O controller module shares the same loop as channel 2 on the bottom I/O controller module (see Figure 4-13). Each drive channel has two SFP ports that can be connected to expansion units. Drive channels 2 and 3 access all the disk drives using internal FC-SATA routing technology and are interconnected to load balance I/O operations.



An upper port and a lower port are on each drive channel.

Figure 4-13 Dedicated Drive Channels 2 and 3 (on Both Controllers) in a Dual-Controller SANnet II 200 SATA Array

4.8.2 Host Port Connectivity in a Dual-Controller Array

Host channels connect to host computers either directly or through storage switches or other devices. In a default dual-controller RAID configuration, each controller has four host channels, channels 0, 1, 4, and 5. Port bypass circuits connect each pair of host SFP ports on a host channel; as a result, each host channel accesses both controllers.

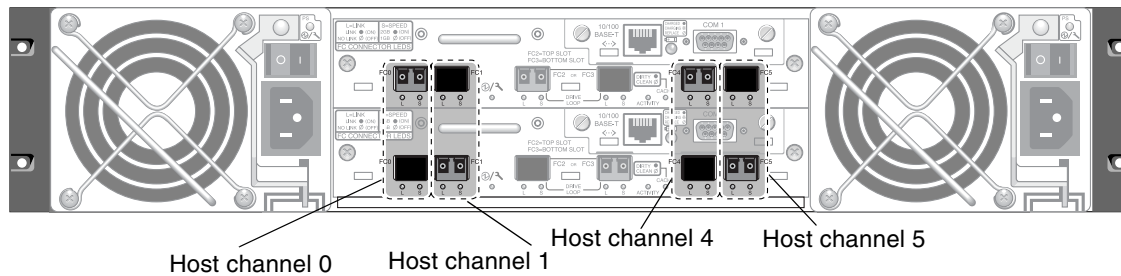
The main differences between the SANnet II 200 FC, SATA, and SATA SE arrays are the number of host ports and the supported speed for each port (see Table 4-6).

Table 4-6 Number of Host Ports and Supported Host Port Speeds

Data Transfer Speed	SANnet II 200 FC Array	SANnet II 200 SATA and SATA SE Array
1 Gbit or 2-Gbit	Maximum of 4 host ports per I/O controller module	Maximum of 4 host ports (FC 0 and FC 1) per I/O controller module
2 Gbit only	N/A	Maximum of 2 host ports (FC 4 and FC 5) per I/O controller module

4.8.2.1 SANnet II 200 FC Array

In a default dual-controller RAID configuration, each controller has four host ports. Each port connects to one host channel, channels 0, 1, 4, and 5 (see Figure 4-14). All four host channels support 1-Gbit or 2-Gbit data transfer speeds. Each host channel has an upper port and a lower port.



An upper port and a lower port are on each host channel.

Figure 4-14 Host Channels on a Dual-Controller SANnet II 200 FC Array

4.8.2.2 SANnet II 200 SATA and SATA SE Arrays

In a default dual-controller SANnet II 200 SATA and SATA SE RAID configuration, each controller has six host ports, as shown in Figure 4-15:

- Two host ports connect to channel 0 (FC 0)
- Two host ports connect to channel 1 (FC 1)
- One host port connects to channel 4 (FC 4)
- One host port connects to channel 5 (FC 5)

Channels 0 and 1 support 1-Gbit or 2-Gbit data transfer speeds. Channels 4 and 5 support 2-Gbit data transfer speeds only.

If a fabric switch is connected to one port of channel 0 or channel 1, no connections can be made with the other three ports of that channel. If channel 0 (FC 0) is connected to a fabric switch, for example, the second port for channel 0 on that controller, and both ports on a redundant controller cannot be used. Similarly, if channel 1 (FC 1) is connected to a fabric switch, the second port on that controller and the two FC 1 ports on a redundant controller cannot be used.

Two hosts can be directly connected to either channel 0 (ports FC 0) or channel 1 (ports FC 1), but in that configuration, host filters are required if you want to control host access to storage. Each host channel has an upper port and a lower port.

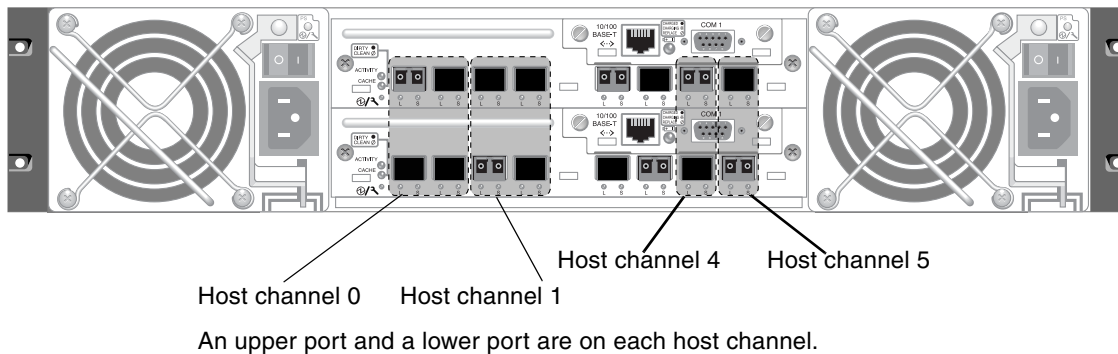


Figure 4-15 Host Channels on a Dual-Controller SANnet II 200 SATA Array

The following figure shows the host channels for a SANnet II 200 SATA SE array.

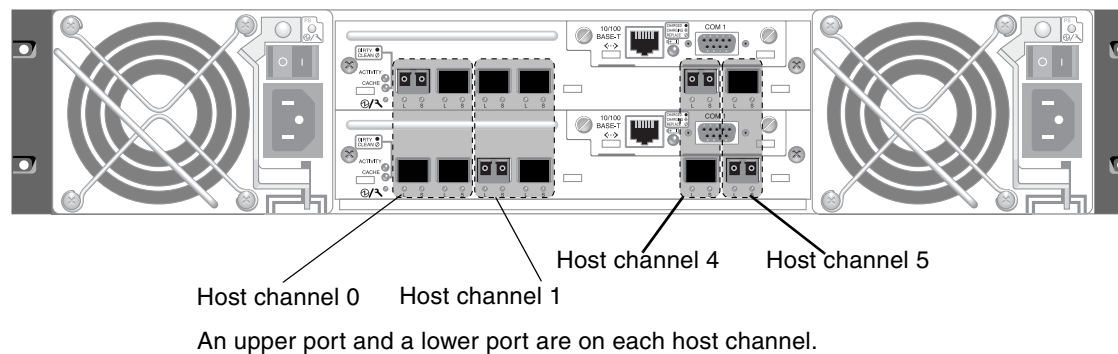


Figure 4-16 Host Channels on a Dual-Controller SATA SE Array

4.8.3 Default SFP Placement

Default configurations do not include an SFP connector in every SFP port. You might want to add or rearrange SFPs, depending on the configuration mode (loop or point-to-point), the number of planned host connections, the necessary number of redundant connections to hosts, and the number of expansion units needed.

The supported SFP is a single-port, optical SFP transceiver for multimode (short wave) or single-mode (long wave) use. It is compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA, Sep. 2000), and 1x and 2x Fiber Channel. The optical connector used is the low-profile LC connector.

SFPs are field-replaceable units (FRUs) and can be ordered from Dot Hill. These SFPs have been selected and tested to provide the necessary reliability and performance. SFPs from other vendors are not supported.

To review various configuration options, see the discussions following “Summary of Array Configuration” on page 5-1. Refer also to the configuration options presented in the *SANnet II 200 FC and SATA Array Best Practices Manual*.

In dual-controller arrays, SFPs are initially plugged into one of each pair of host and drive ports. The default port connections are:

- The upper I/O controller module has SFPs in the FC0, FC2, and FC4 ports.
- The lower I/O controller module has SFPs in the FC1, FC3, and FC5 ports.

This configuration provides connections to all six host channels as well as to both drive channels (see Figure 4-17 and Figure 4-18).

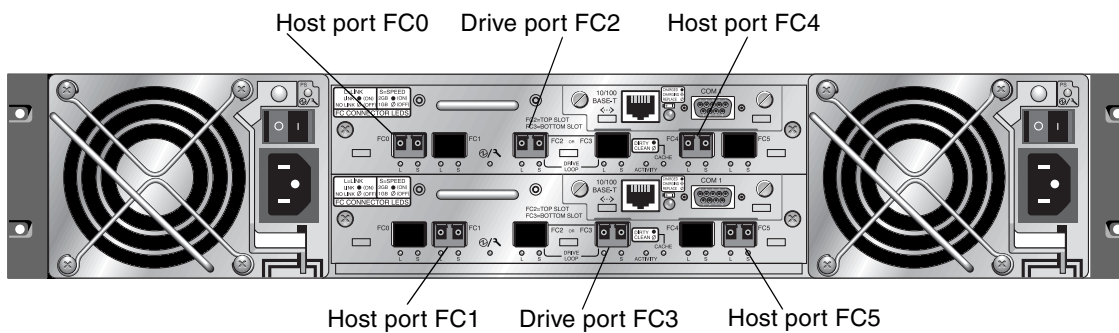


Figure 4-17 Default Dual-Controller SANnet II 200 FC Array SFP Placement

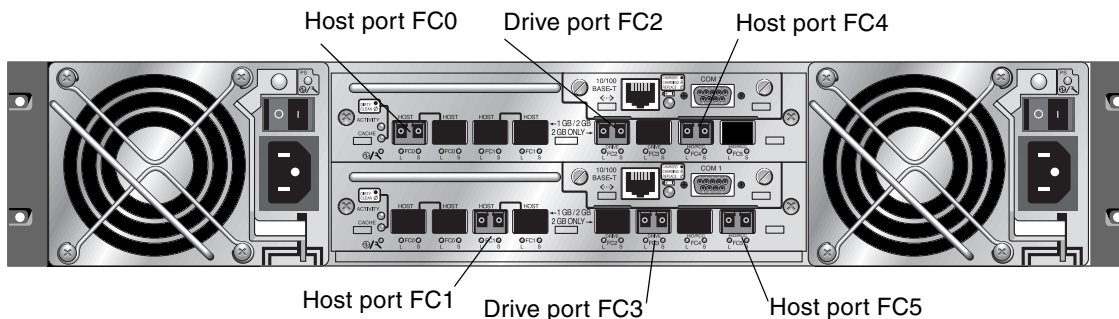


Figure 4-18 Default Dual-Controller SANnet II 200 SATA Array SFP Placement

Note – The SANnet II 200 SATA SE array configuration does not include SFPs. SFPs must be ordered separately.

In the default single-controller array, SFPs are initially plugged into the following ports:

- FC0
- FC1
- FC4
- FC5

No SFPs are plugged into the drive channels. This configuration is appropriate for connecting to up to four hosts or fibre switches, with no connection to expansion units (see Figure 4-19 and Figure 4-20).

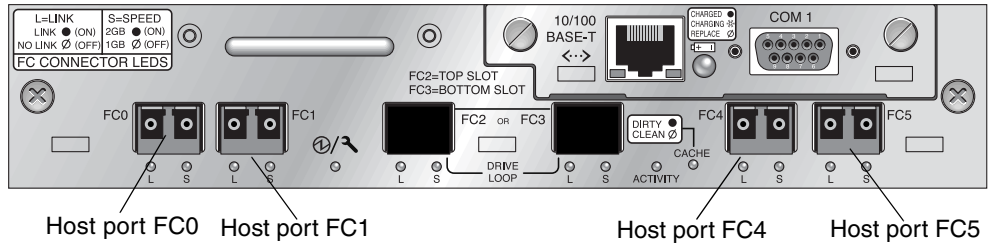


Figure 4-19 SANnet II 200 FC Array Default Single Controller SFP Placement

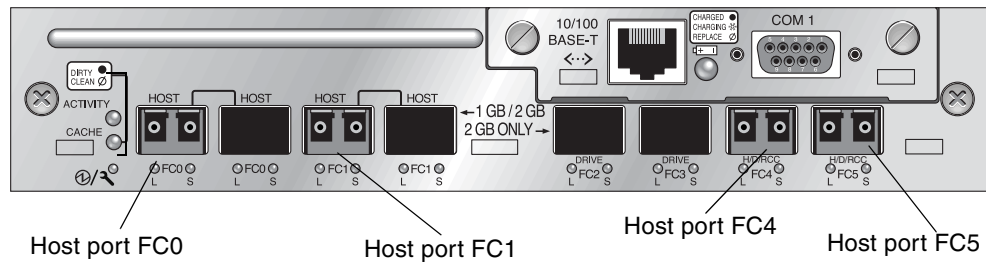


Figure 4-20 SANnet II 200 SATA Array Default Single-Controller SFP Placement

Note – The SANnet II 200 SATA SE array configuration does not include SFPs. SFPs must be ordered separately.

In a default SANnet II 200 FC expansion unit, SFPs are initially plugged into the left-most port of the upper I/O expansion module and right-most port of the lower I/O expansion module (see Figure 4-21).

Note – The SANnet II 200 SATA SE array does not support this configuration.

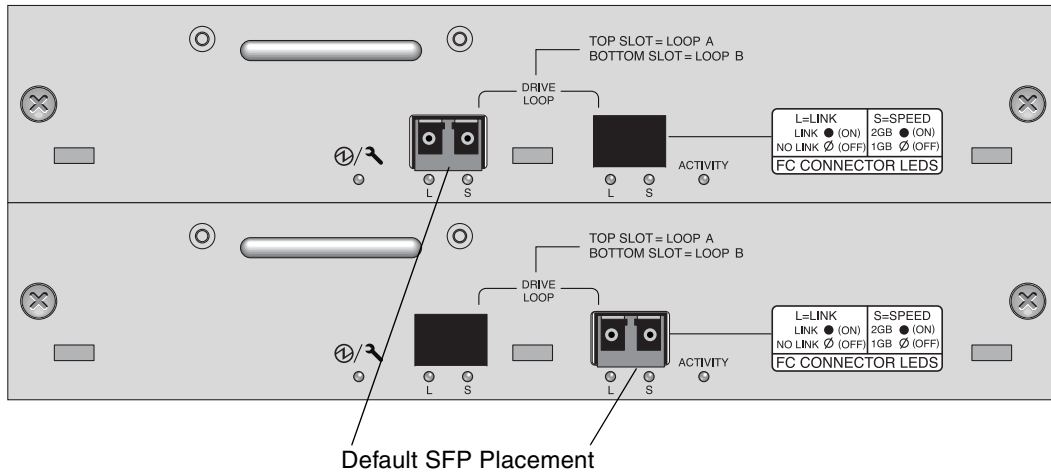


Figure 4-21 SANnet II 200 FC JBOD/Expansion Unit Default SFP Placement

In a default SANnet II 200 SATA expansion unit, SFPs are initially plugged into the left-most Loop A port in the upper I/O expansion module and in the left-most Loop B port in the lower I/O expansion module (Figure 4-22).

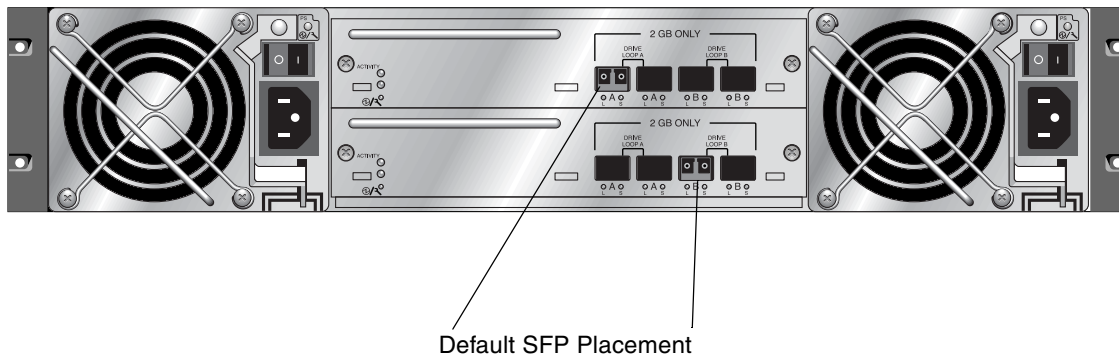


Figure 4-22 SANnet II 200 SATA Expansion Unit Default SFP Placement

4.8.4 Changing Your SFP Configuration

The FC and SATA arrays use SFP connectors to attach to hosts and expansion units. SATA SE arrays use SFP connectors to attach to hosts. These SFP connectors resemble the one shown in Figure 4-23, with a single connector at the end that plugs into an SFP port on the array or expansion unit chassis, and a duplex jack into which you insert a cable to make the connection.

- To connect to an empty port, first slide the SFP connector into the port so that it connects firmly with the chassis. Then plug the fiber-optic cable's SFP connector into the duplex jack at the end of the SFP.
- To remove an SFP connector, remove the cable if one is connected to it, and then slide the SFP out from the port.

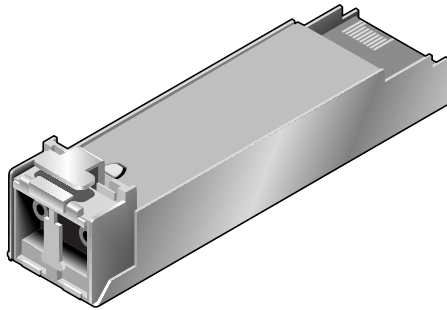


Figure 4-23 Typical SFP Connector Used to Connect Cables to Chassis SFP Ports

4.9 Establishing Communications With An Array

Before you can configure an array, you must establish one or more communication links between at least one host and an array. You can use any combination of the array's RS-232 COM (serial) port, the Ethernet port, and the in-band data connection between the host and the array.

- A direct RS-232 port connection guarantees that a host can communicate with a RAID array even if the array's IP address changes or is unknown, or if the TCP/IP network suffers a temporary outage. See "Configuring a Host COM Port to Connect to a RAID Array" on page 4-26 for more information.
- SANnet II 200 FC, SATA, and SATA SE arrays ship with the Dynamic Host Configuration Protocol (DHCP) TCP/IP network support protocol enabled. If your network uses a DHCP server to dynamically and automatically allocate IP addresses to attached devices, as soon as the RAID array is powered up an IP address is assigned to it. You can use this IP address to monitor and manage the array's firmware through telnet sessions. See "Setting Up Out-of-Band Management Over Ethernet" on page 4-28 for information about setting up a telnet session.
- A fixed IP address enables you to use telnet or other out-of-band management sessions to manage the array with no risk of a DHCP server changing its IP address. See "Setting Up Out-of-Band Management Over Ethernet" on page 4-28 for information.

When the array is first powered up, the default IP address setting uses the IP address assigned by a DHCP server. If the RAID array is connected to a network with an active DHCP server, you can determine the IP address assigned to the array in several ways:

- If you have access to the controller firmware, from the Main Menu choose **Configuration Parameters** → **Communication Parameters** → **Internet Protocol (TCP/IP)**. If the RAID controller is not on a network connected to an active DHCP server, "DHCP Client" is displayed rather than a DHCP-assigned IP address. Refer to the "Configuration Parameters" chapter in the *SANnet II Family RAID Firmware User's Guide* for more information.

- Use the **show network-parameters** CLI command. Refer to the *SANscape CLI User's Guide* for more information. If the RAID controller is not on a network connected to an active DHCP server, an IP address of 0.0.0.0 is displayed. Refer to the *SANscape CLI User's Guide* for more information.
- Use the Change Network Settings window in SANscape. Refer to the “Updating the Configuration” chapter in the *SANscape User's Guide* for more information.
- Enable the controller firmware to send event messages using SNMP. Event messages sent as SNMP traps to the email address you specify contain the IP address of the array from which it is sent. Refer to the “Configuration Parameters” chapter in the *SANnet II Family RAID Firmware User's Guide* for more information.

Once you have determined the RAID controller's IP address using one of these methods, you can establish a telnet session to that IP address. However, because of the dynamic nature of DHCP-assigned IP addresses, the RAID array's IP address might change in the event of a controller reset, a network outage, or if the DHCP server is rebooted. If this happens, telnet sessions to the previous IP address can no longer communicate with the array, and it is necessary to use one of the methods described above to determine the new IP address.

If you do not have an active DHCP server on the same network as the RAID array, or if you prefer to have a fixed IP address, use the procedures in “Setting Up Out-of-Band Management Over Ethernet” on page 4-28.

4.10 Configuring a Host COM Port to Connect to a RAID Array

The RS-232 COM (serial) port on either controller module can be used to configure and monitor the RAID array using the controller firmware. It can be connected to a VT100 terminal, terminal emulation program, terminal server, or the serial port of a server.

1. Use a null modem serial cable to connect the COM port of the RAID array to the serial port on a host workstation.

A null modem serial cable is included in your package.

2. Set the serial port parameters on the workstation as follows:
 - 38,400 baud
 - 8 bit
 - 1 stop bit
 - No parity

If your host uses the Solaris operating system, see “Using the **tip** Command for Local Access to the Array” on page E-2 for instructions about setting up a **tip** session to communicate using the COM port.

To see platform-specific details for other operating systems, see the appendix that describes the operating system your server uses.

4.11 Manually Setting a Static IP Address

You can manually set an array's IP address using the controller's firmware by typing values for the IP address, the subnet mask, and IP address of the gateway. If your network uses a Reverse Address Resolution Protocol (RARP) server or a Dynamic Host Configuration Protocol (DHCP) server to automatically configure IP information for devices on the network, you can specify the appropriate protocol instead of typing the information manually.

Note – If you assign an IP address to an array to manage it out-of-band, for security reasons consider using an IP address on a private network rather than a publicly routable network.

To set the IP address, subnet mask, and gateway address of the RAID controller, perform the following steps.

1. Access the array through the COM port on the I/O Controller module or through a telnet session to the existing IP address.
2. From the controller firmware's Main Menu, choose **view and edit Configuration parameters** → **Communication Parameters** → **Internet Protocol (TCP/IP)**.
3. Select the chip hardware address and MAC address that is displayed.
4. Choose **Set IP Address** → **Address**.
5. Type in the desired IP address, subnet mask (if it is not automatically supplied), and gateway address, choosing each menu option in turn, backspacing over any existing entries.

If your network sets IP addresses using a RARP server and you prefer using it to using a fixed IP address, type **RARP** rather than an IP address, and do not type in a subnet mask or gateway address. If your network sets IP addresses using a DHCP server and you prefer using it to using a fixed IP address, type **DHCP** rather than an IP address, and do not type a subnet mask or gateway address.

6. Press **Esc** to continue.
A confirmation prompt is displayed.

Change/Set IP Address ?

7. Choose **Yes** to continue.

Note – You must reset the controller for the configuration to take effect.

You are prompted to reset the controller.

8. Choose **Yes** to reset the controller.

The controller takes a few minutes to format a small storage sector on each physical drive before logical drives can be successfully initialized.

4.12 Setting Up Out-of-Band Management Over Ethernet

The controller Ethernet port offers interactive out-of-band management through the following interfaces:

- The SANscape application. Refer to the *SANscape User's Guide* for details.
- The SANscape Command-Line Interface (CLI). Refer to the *SANscape CLI User's Guide* for details.
- The firmware application you access when you use the `telnet` command to connect to the IP address of the controller.

Using an Ethernet connection, you can configure and monitor RAID arrays and expansion units remotely by using the `telnet` command to access the firmware application on the array and by using the SANscape or SANscape CLI software.



Caution – If you assign an IP address to an array to manage it out-of-band, for security reasons consider using an IP address on a private network rather than a publicly routable network. Using the controller firmware to set a password for the controller limits unauthorized access to the array. Changing the firmware's Network Protocol Support settings can provide further security by disabling the ability to remotely connect to the array using individual protocols such as HTTP, HTTPS, telnet, FTP, and SSH. Refer to the “Communication Parameters” section of the *SANnet II Family RAID Firmware User's Guide* for more information.

1. To access the RAID array over an Ethernet connection, first connect the RAID array's Ethernet port on each controller to the network.

Note – SANnet II family arrays require at least CAT-5 Ethernet cable.

Note – In a dual-controller RAID array, be sure to connect both Ethernet ports to the network. This provides failover if one controller fails.

2. Establish the IP address of the RAID array, as described in “Establishing Communications With An Array” on page 4-25.
3. To use the firmware application program from the host server, connect to the IP address of the RAID array controller with the following command:

```
# telnet IP-address
```

Note – Alternatively, you can use the Solaris operating system `tip` command or a terminal emulation program to access the firmware application program. See “Configuring a Host COM Port to Connect to a RAID Array” on page 4-26 for more information.

4. Press **Ctrl-L** to refresh the screen and view the Main Menu.

Note – If you reset the controller during a `telnet` session, you are disconnected from the RAID array. Use the `telnet` command to login to the array again.

To connect the SANscape program (on a host server) to a RAID array that has an IP address, refer to the out-of-band management instructions in the *SANscape User's Guide*.

The same document's “Email and SNMP” appendix provides information about configuring SANscape software to use Simple Network Management Protocol (SNMP) traps and Management Information Bases (MIBs) to provide information to other out-of-band enterprise management software. The “Monitoring the Array” chapter explains the use of SANscape agents to redirect event messages into host system logs.

You can also enable the controller firmware to send event messages using SNMP. Refer to the “Configuration Parameters” chapter in the *SANnet II Family RAID Firmware User's Guide* for more information.

4.13 Scaling a SANnet II 200 Fibre Channel Array Into a High-Capacity Configuration

Note – High-capacity SANnet II 200 FC and SATA array configurations are supported, with certain limitations. A SANnet II 200 FC array with more than two expansion units is a high-capacity configuration. A SANnet II 200 SATA array with one expansion unit is a high-capacity configuration.

SANnet II 200 FC arrays typically allow the connection of up to two expansion units to support a maximum of 36 disks. However, you can create larger configurations that support as many as eight expansion units and up to 108 disks if you use the guidelines in this section. You can also create larger configurations of SANnet II 200 SATA arrays that support from one to five expansion units and up to 72 disks.

Carefully consider the following limitations of special high-capacity configurations. Using multiple SANnet II 200 FC arrays connected to the same SAN normally provides significantly better performance than one high-capacity configuration.

- Maximize the size of each logical drive (up to 1908 Gbyte) before creating another logical drive in order to allow for maximum storage capacity.
- SANnet II 200 FC arrays can be connected to SANnet II 200 FC expansion units. They can also be connected to a maximum of five SANnet II 200 SATA expansion units and SANnet II 200 FC expansion units, in any combination.
- SANnet II 200 SATA arrays can only be connected with SANnet II 200 SATA expansion units.

Refer to the *SANnet II 200 FC and SATA Array Best Practices Manual* for more information and sample cabling diagrams.

Note – Large configurations might require the use of one or more optional extended-length cables, part number X9732A. Other items might also be required. Refer to the *SANnet II Family FRU Installation Guide* for information about supported cables, SFPs, and other user-replaceable items.

4.14 Adding an Expansion Unit to an Existing RAID Array

To install an expansion unit to an existing, configured RAID array, perform the following steps.

1. Stop I/O and shut down the controller to ensure that all data in the cache is written to disk.

For details on shutting down the controller, see “Powering Off the Array” on page 4-33.

2. Verify that the loop ID of the expansion unit is set to a different ID than the RAID unit and any expansion units already attached.

For details on loop IDs, see “Setting Loop IDs on Expansion Units” on page 4-13.

3. Physically cable the new expansion unit to the array using a valid cabling configuration.

Refer to the *SANnet II 200 FC and SATA Array Best Practices Manual* for more information on expansion unit cabling configurations.

4. Power on the expansion units.

For details on the power-on sequence, see “Power-On Sequence” on page 4-32.

5. Power on the RAID array.

6. Verify the SES/PLD (programmable logic device) version of the expansion unit and the RAID array.

To review the version information, using the SANscape CLI, type `show ses`. Or, using SANscape, open the View Enclosure window.

7. If the SES/PLD version is not the same for the RAID array and the expansion unit, download the latest SES/PLD firmware from the Dot Hill web site:
<http://www.dothill.com>.
 - a. Choose **Support** → **Downloads**.
 - b. Click **Firmware Downloads**.
 - c. Enter the required information, and click **Submit**.
 - d. Choose and download the appropriate SES/PLD firmware.

4.15 Connecting Ports to Hosts

In a default array configuration, channels 0, 1, 4, and 5 are host channels, so you can directly connect an array to four host computers. SFP connectors are plugged into channels 0 and 4 on the upper controller and channels 1 and 5 on the lower controller for this purpose.

You can connect two additional host computers to channels 0 and 1 of a SANnet II 200 SATA array or SATA SE array. To support six host computers, however, you need to insert SFPs in the four unpopulated host ports. Except for some clustering configurations, when you connect two hosts to channel 0 or channel 1 on a SANnet II 200 SATA or SATA SE array, you must use host filtering if you want to control host access in this configuration. Refer to the user documentation for your clustering software to determine whether the clustering software can manage host access in this configuration.

If you want to connect a SANnet II 200 FC array to more than four host computers, or connect a SATA or SATA SE array to more than six host computers, without changing the default configuration, you can connect these four host channels to ports on storage switches in a storage area network (SAN) configuration.

When a fabric switch is connected to one port of channel 0 or channel 1 of a SATA or SATA SE array, no connections can be made with the other three ports of that channel. If channel 0 (port FC0) is connected to a fabric switch, for example, the second port of channel 0 on that controller and the FC0 ports on a redundant controller cannot be used.

Note – The connection of a FC, SATA, or SATA SE array to Fibre Channel HBAs that use different speeds (1 Gbit and 2 Gbit) on the same channel is not supported. You can, however, mix 1-Gbit and 2-Gbit Fibre Channel HBAs on different channels. This limitation is due to the design of SANnet II 200 Fibre Channel array port bypass circuitry and the inability of Fibre Channel to support auto-negotiation in a multi-drop loop configuration.

Use fiber-optic cables to connect host channels to Fibre Channel HBAs on your host computers or to other devices such as storage switches.

1. Connect a fiber-optic cable to an HBA or FC port on each host or storage switch you want to connect to the array.
2. Connect the SFP connector at the other end of each of these fiber-optic cables to host channel SFP connectors on the back of the array.

If there is no SFP connector in the port you want to use, first insert an SFP connector into the port as described in “Changing Your SFP Configuration” on page 4-24.

4.16 Power-On Sequence

Power on the equipment in the following order so the host computer discovers all connected arrays:

1. Expansion units
2. RAID array
3. Host computers

If an array is connected to a host using a serial port connection and powered on, the host terminal window displays a series of messages, as shown in the following example.

```
SANnet II FC Array is installed with 1024MBytes SDRAM
Total channels: 6
Channel: 0 is a host channel, id: 40
Channel: 1 is a host channel, id: 41
Channel: 2 is a drive channel, id: 14, 15
Channel: 3 is a drive channel, id: 14, 15
Channel: 4 is a host channel, id: 70
Channel: 5 is a host channel, id: 71
Scanning channels. Please wait a few moments!
Preparing to restore saved persistent reservations. Type
'skip' to skip:
```

Do not use the `skip` option shown at the bottom of the example. This option is reserved for support personnel performing testing.

4.17 Powering Off the Array

You might need to power off the array (both power supplies) if you relocate the array or perform certain maintenance procedures with associated servers. Always shut down the array's controller before powering off the array.



Caution – If controllers are not shut down from the firmware application or the SANscape CLI before an array is powered off, data that is written to cache and that has not been completely written to the disks will be lost.

To power off an array, perform the following steps.

1. Stop all I/O activity to the array.
2. Shut down the controller with one of the following commands:
 - Firmware application **Shutdown Controller** command (**system Functions** → **Shutdown controller**)
 - SANscape CLI **shutdown controller** command

These commands first halt all I/O activity, and then write the contents of cache to the drives.

3. Power off both power supply/fan modules.

See “Power-On Sequence” on page 4-32 for information about turning the array back on.

CHAPTER 5

Configuration Overview

This chapter highlights the tools and the important limitations and guidelines which must be understood prior to configuring your array.

This chapter covers the following topics:

- “Summary of Array Configuration” on page 5-1
 - “Point-to-Point Configuration Guidelines” on page 5-3
 - “A Sample SAN Point-to-Point Configuration” on page 5-5
 - “A Sample DAS Loop Configuration” on page 5-10
 - “Connecting Two Hosts to One Host Channel (SATA Only)” on page 5-14
- “Larger Configurations” on page 5-14

Subsequent chapters in this manual describe further procedures used to complete the installation and configuration of the arrays. The flexible architecture of the SANnet II 200 FC, SATA, and SATA SE arrays makes many configurations possible.

5.1 Summary of Array Configuration

SANnet II 200 FC, SATA, and SATA SE arrays are preconfigured with a single RAID 0 logical drive mapped to LUN 0, and no spare drives. This is not a usable configuration, but it enables in-band connections with management software. You must delete this logical drive and create new logical drives.

All configuration procedures can be performed by using the COM port. You can also perform all procedures except the assignment of an IP address through an Ethernet port connection to a management console.

The following steps describe the typical sequence of steps for completing a first-time configuration of the array.

1. Mount the array on a rack, cabinet, desk, or table.
2. Set up the serial port connection.
See “Configuring a Host COM Port to Connect to a RAID Array” on page 4-26.

3. Set up an IP address for the controller.

See “Establishing Communications With An Array” on page 4-25.

Note – For detailed information in performing steps 4–14, refer to the *SANnet II Family RAID Firmware User's Guide* for optimization mode guidelines.

4. Check the status of the available physical drives.
5. Determine whether sequential or random optimization is more appropriate for your applications and configure your array accordingly.
6. Confirm or change the Fibre Connection Option (point-to-point or loop).
7. Revise or add host IDs on host channels.
The IDs assigned to controllers take effect only after the controller is reset.
8. Delete default logical drives and create new logical drives.

Note – While the ability to create and manage logical volumes remains a feature of arrays for legacy reasons, the size and performance of physical and logical drives have made the use of logical volumes obsolete. Logical volumes are unsuited to some modern configurations, such as Sun Cluster environments, and do not work in those configurations. Avoid using logical volumes and use logical drives instead. For more information about logical drives, refer to the *SANnet II Family RAID Firmware User's Guide*.

9. (Optional) In dual-controller configurations only, assign logical drives to the secondary controller to load balance the two controllers.



Caution – In single-controller configurations, do not disable the Redundant **Controller** setting and do not set the controller as a secondary controller. The primary controller controls all firmware operations and must be the assignment of the single controller. If you disable the Redundant Controller Function and reconfigure the controller with the Autoconfigure option or as a secondary controller, the controller module becomes inoperable and will need to be replaced.

10. (Optional) Partition the logical drives.
11. Map each logical drive partition to an ID on a host channel, or apply a host LUN filter to the logical drives.

Note – Each operating system has a method for recognizing storage devices and LUNs and might require the use of specific commands or the modification of specific files. Be sure to check the information for your operating system to ensure that you have performed the necessary procedures.

For information about different operating system procedures, see:

- Appendix E, “Configuring a Sun Server Running the Solaris Operating System” on page E-1
- Appendix F, “Configuring a Microsoft Windows Server” on page F-1
- Appendix G, “Configuring a Linux Server” on page G-1
- Appendix H, “Configuring an IBM Server Running the AIX Operating System” on page H-1
- Appendix I, “Configuring an HP Server Running the HP-UX Operating System” on page I-1

12. Reset the controller.

Configuration is complete.

Note – Resetting the controller can result in occasional host-side error messages such as parity error and synchronous error messages. No action is required and the condition corrects itself as soon as reinitialization of the controller is complete.

13. Save the configuration to a disk.

14. Make sure that the cabling from the RAID array to the hosts is complete.

Note – You can reset the controller after each step or at the end of the configuration process.



Caution – Avoid using in-band and out-of-band connections at the same time to manage the array. Otherwise, conflicts between multiple operations can cause unexpected results.

5.1.1 Point-to-Point Configuration Guidelines

Remember the following guidelines when implementing point-to-point configurations in your array and connecting to fabric switches:

- The default mode is “Loop only.” You must change the Fibre Channel Connection mode to “Point-to-point only” with the firmware application. Refer to the *SANnet II Family RAID Firmware User's Guide* for more information.



Caution – If you keep the default loop mode and connect to a fabric switch, the array automatically shifts to public loop mode. As a result, communication between the array and the switched fabric runs in half duplex (send or receive) instead of providing the full duplex (send and receive) performance of point-to-point mode.

- Check the host IDs on all the channels to ensure that there is only one ID per channel (on the primary controller or on the secondary controller) for point-to-point mode. When viewing the host IDs, there should be one primary controller ID (PID) or one secondary controller ID (SID); the alternate port ID should display N/A. Proper point-to-point mode allows only one ID per channel.
- On the SANnet II 200 SATA or SATA SE array, if one of the dual-ports of channel 0 is connected to a switch (port FC 0), the other FC 0 port on that controller and the two FC0 ports on a redundant controller cannot be used. Similarly, if one of the channel 1 ports is connected with a switch (port FC 1), the other FC 1 port on that controller, and the two FC 1 port on a redundant controller cannot be used.
- If you change the mode to **Point-to-point only** and attempt to add a second ID, the controller does not allow you to add an ID to the same controller and channel. For example, if you have ID 40 on CH 0 PID, and N/A on CH 0 SID, the controller does not allow you to add another PID to CH 0.

The controller displays a warning if the user is in point-to-point mode and tries to add an ID to the same channel but on the *other controller*. The warning is displayed because you have the ability to disable the internal connection between the channels on the primary and secondary controller using the SANscape CLI `set inter-controller link` command and, by doing this, you can have one ID on the primary and another ID on the secondary as a legal operation.

However, if you ignore this warning and add an ID to the other controller, the RAID controller does not allow a login as a Fabric Loop (FL) port because this would be illegal in a point-to-point configuration.

- The firmware application allows you to add up to eight IDs per channel (four IDs on each controller), which forces the fabric switch port type to become fabric loop. To ensure F-port behavior (full fabric/full duplex) when attaching to a switch, only one ID must be present on each channel and the array port must be set to point-to-point mode.
- Do not connect more than one port per channel on an array to a fabric switch.



Caution – In point-to-point mode or in public loop mode, only one switch port is allowed per channel. Connecting more than one port per channel to a switch can violate the point-to-point topology of the channel, force two switch ports to “fight” over an AL_PA (arbitrated loop physical address) value of 0 (which is reserved for loop-to-fabric attachment), or both.

- With four host channels and four host IDs, you should load balance the host ID setup so that half the IDs are on the primary controller and half the IDs are on the secondary controller. When setting up LUNs, map each LUN to either two PIDs or two SIDs. The hosts are in turn dual-pathed to the same two switched fabrics. When

attaching the cables for a LUN-mapped channel pair, make sure that the first channel is connected to the upper port and the second channel is connected to the lower port of the second channel.

For example, to provide redundancy, map half of the LUNs across Channel 0 (PID 40) and Channel 4 (PID 42), and then map the other half of your LUNs across Channel 1 (SID 41) and Channel 5 (SID 43).

- Point-to-point mode allows a maximum of 128 LUNs per array. In a redundant configuration, 32 LUNs are dual-mapped across two channels on the primary controller, and another 32 LUNs are dual-mapped across the secondary controller, for a total of 64 distinct LUNs.
- To use more than 64 LUNs, you must change to loop only mode, add host IDs to one or more channels, and add 32 LUNs for each additional host ID.

Note – When in loop mode and connected to a fabric switch, each host ID is displayed as a loop device on the switch so that, if all 16 IDs are active on a given channel, the array looks like a loop with 16 nodes attached to a single switch FL port.

In public loop mode, the array can have a maximum of 1024 LUNs, where 512 LUNs are dual-mapped across two channels, primary and secondary controller respectively.

5.1.2 A Sample SAN Point-to-Point Configuration

A point-to-point configuration has the following characteristics:

- In SAN configurations, the switches communicate with the SANnet II 200 Fibre Channel array host ports using a fabric point-to-point (F_port) mode.
- When you use fabric point-to-point (F_port) connections between a FC, SATA, or SATA SE array and fabric switches, the maximum number of LUNs is limited to 128 LUNs for a nonredundant configuration and 64 LUNs for a redundant configuration.
- Fibre Channel standards allow only one ID per port when operating point-to-point protocols, resulting in a maximum of four IDs with a maximum of 32 LUNs for each ID, and a combined maximum of 128 LUNs.
- The working maximum number of LUNs is actually 64 LUNs in a configuration where you configure each LUN on two different channels for redundancy and to avoid a single point of failure.

In a dual-controller array, one controller automatically takes over all operation of a second failed controller in all circumstances. However, when an I/O controller module needs to be replaced and a cable to an I/O port is removed, the I/O path is broken unless multipathing software has established a separate path from the host to the operational controller. Supporting hot-swap servicing of a failed controller requires the use of multipathing software, such as SANpath software, on the connected servers.

Note – Multipathing for FC, SATA, and SATA SE arrays is provided by SANpath software.

Remember these important rules:

- A single logical drive can be mapped to only one controller, either the primary controller or the secondary controller.
- In a point-to-point configuration, only one host ID per channel is allowed. The host ID can be assigned to the primary controller and be a PID, or it can be assigned to the secondary controller and be a SID.
- If you have two switches and set up multipathing (to keep all logical drive connections operational for any switch failure or the removal of any I/O controller module), ensure that each logical drive is mapped to two ports, one on each I/O controller module, and on two channels. The cables from the two ports mapped to each logical drive must be cabled to two separate switches. See Figure 5-1 and Figure 5-2 for examples of this configuration.

The following figures (Figure 5-1 and Figure 5-2) show the channel numbers (0, 1, 4, and 5) of each host port and the host ID for each channel. N/A means that the port does not have a second ID assignment. The primary controller is the top I/O controller module, and the secondary controller is the bottom I/O controller module.

The dashed lines between two ports indicate a port bypass circuit that functions as a mini-hub. The port bypass circuit on each channel connects the upper and lower ports on the same channel and provides access to both controllers at the same time. If there are two host connections to the upper and lower ports on Channel 0, and one host connection is removed, the other host connection remains operational. Therefore, if you have a redundant multipathing configuration in which you have two host connections to each logical drive and one connection fails, the remaining path maintains a connection to the logical drive.

In Figure 5-1 and Figure 5-2, with multipathing software to reroute the data paths, each logical drive remains fully operational when the following conditions occur:

- One switch fails or is disconnected, and the logical drive is routed to the second switch. For example, if switch 0 fails, switch 1 automatically accesses logical drive 0 through the cabling to the lower port on PID 41.
- One I/O controller module fails, and all the host IDs for that controller are reassigned (moved) to the second I/O controller module. For example, if the upper I/O controller module is removed, host IDs 40 and 41 are automatically moved to the lower module and are managed by the second controller.
- An I/O controller module fails or one cable is removed from an I/O controller module, and all I/O traffic to the disconnected channel is rerouted through the second port/host LUN assigned to the logical drive. For example, if you remove the cable to channel 4, the data path for logical drive 1 switches to the port on channel 5.

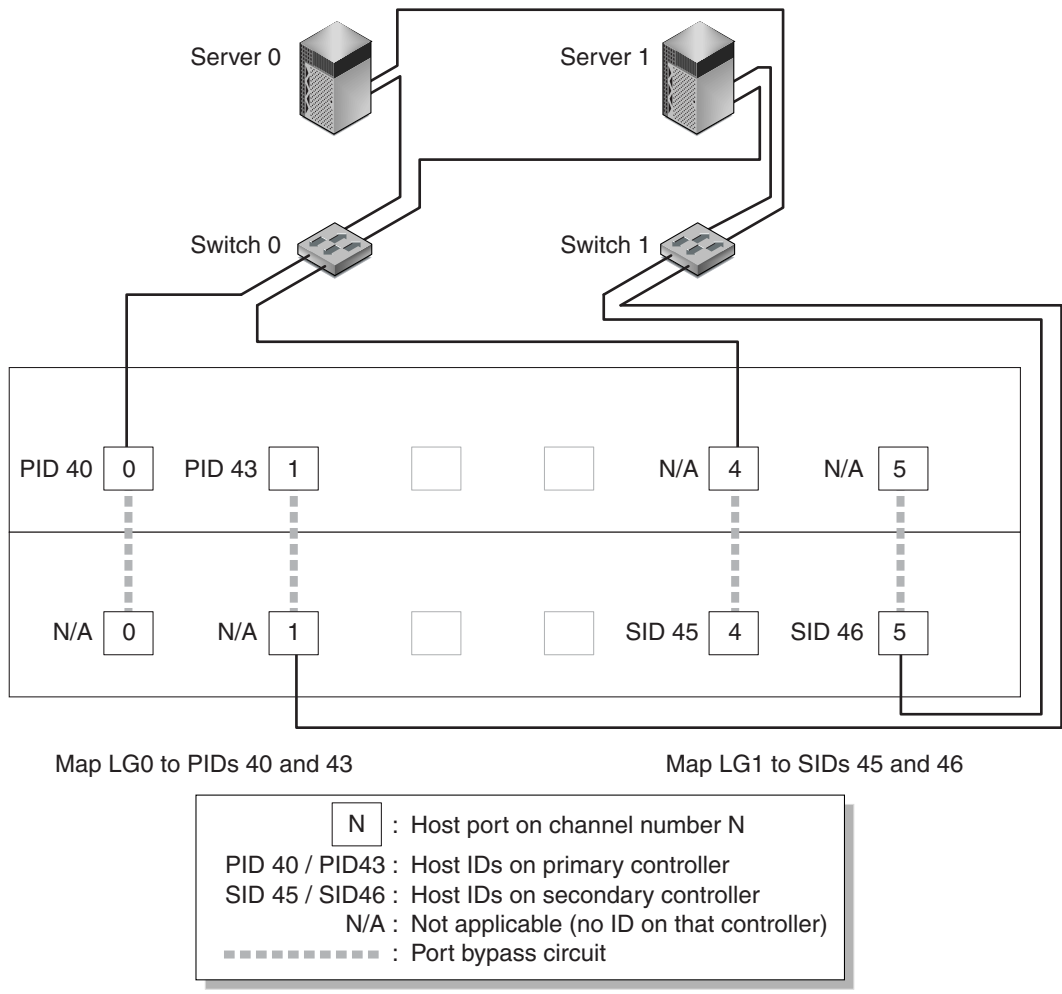


Figure 5-1 A Point-to-Point Configuration with a Dual-Controller SANnet II 200 FC Array and Two Switches

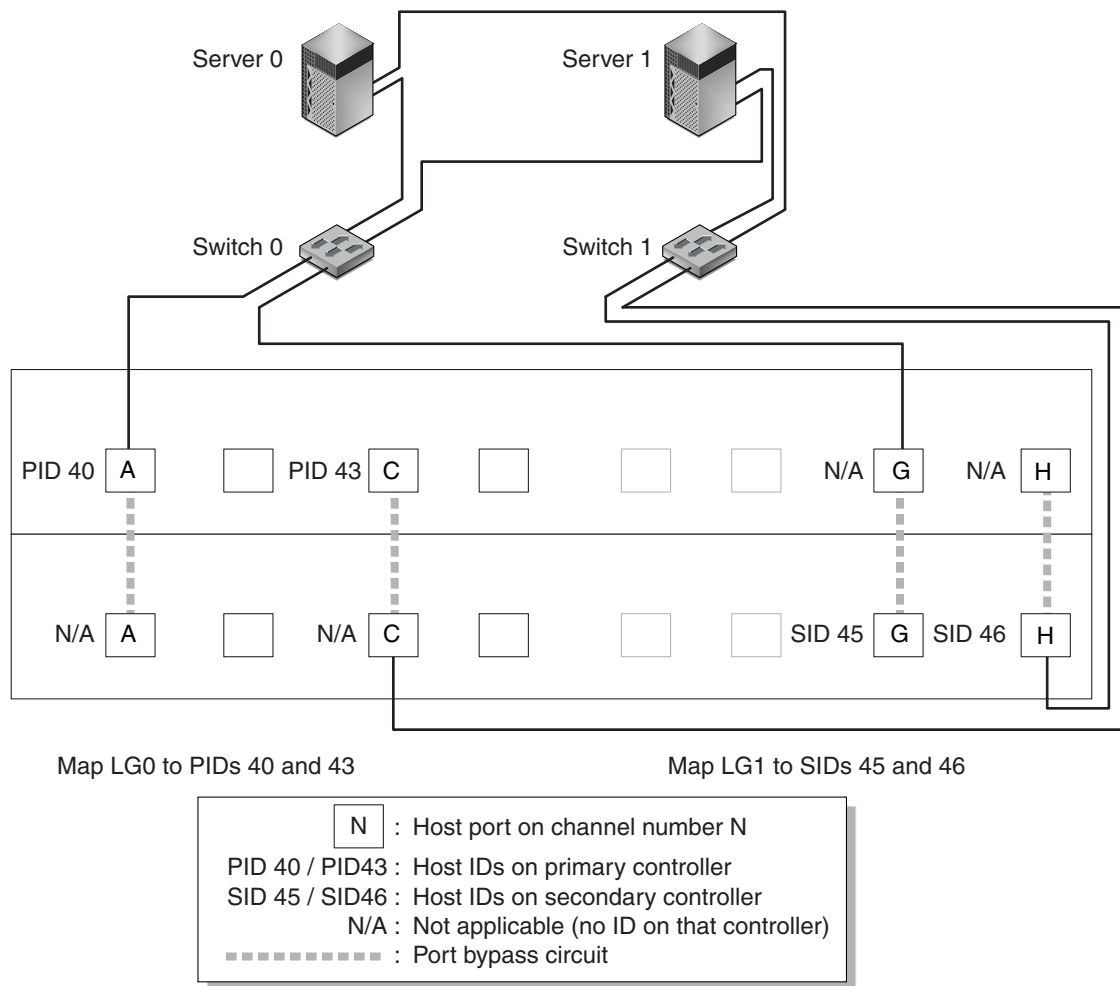


Figure 5-2 A Point-to-Point Configuration With a Dual-Controller SANnet II 200 SATA Array and Two Switches

Note – These illustrations show the default controller locations; however, the primary controller and secondary controller locations can occur in either slot and depend on controller resets and controller replacement operations.

Table 5-1 summarizes the primary and secondary host IDs assigned to logical drives 0 and 1, as shown in Figure 5-1 and Figure 5-2.

Table 5-1 Example Point-to-Point Configuration With Two Logical Drives in a Dual-Controller Array

Task	Logical Drive	LUN IDs	Channel Number	Primary ID Number	Secondary ID Number
Map 32 partitions of LG 0 to CH 0	LG 0	0-31	0	40	N/A
Duplicate-map 32 partitions of LG 0 to CH 1	LG 0	0-31	1	41	N/A
Map 32 partitions of LG 1 to CH 4	LG 1	0-31	4	N/A	50
Duplicate-map 32 partitions of LG 1 to CH 5	LG 1	0-31	5	N/A	51

Perform the following steps to set up a typical point-to-point SAN configuration based on Figure 5-1 and Figure 5-2.

1. Check the position of installed SFPs. Move them as necessary to support the connections needed.
2. Connect expansion units, if needed.
3. Create at least two logical drives (logical drive 0 and logical drive 1) and configure spare drives.
Leave half of the logical drives assigned to the primary controller (default assignment). Assign the other half of the logical drives to the secondary controller to load-balance the I/O.
4. Create up to 32 partitions (LUNs) in each logical drive.
5. Change the Fibre Connection Option to **Point to point only (view and edit Configuration parameters →Host-side SCSI Parameters →Fibre Connections Option)**.
6. For ease of use in configuring LUNs, change the host IDs on the four channels to the following assignments:
Channel 0: PID 40 (assigned to the primary controller)
Channel 1: PID 41 (assigned to the primary controller)
Channel 4: SID 50 (assigned to the secondary controller)
Channel 5: SID 51 (assigned to the secondary controller)



Caution – Do not use the command, **Loop preferred, otherwise point to point**. This command is reserved for special use and should be used only if directed by technical support.

7. Map logical drive 0 to channels 0 and 1 of the primary controller.
Map LUN numbers 0 through 31 to the single ID on each host channel.
8. Map logical drive 1 to channels 4 and 5 of the secondary controller.
Map LUN numbers 0 through 31 to the single ID on each host channel. Since each set of LUNs is assigned to two channels for redundancy, the total working maximum number of LUNs is 64 LUNs.

Note – The LUN ID numbers and the number of LUNs available per logical drive can vary according to the number of logical drives and the ID assignments you want on each channel.

9. Connect the first switch to ports 0 and 4 of the upper controller.
10. Connect the second switch to ports 1 and 5 of the lower controller.
11. Connect each server to each switch.
12. Install and enable multipathing software on each connected server.
The multipathing software prevents path failure but does not alter the controller redundancy through which one controller automatically takes over all functions of a second failed controller.

5.1.3 A Sample DAS Loop Configuration

The typical direct attached storage (DAS) configuration shown in Figure 5-3 and Figure 5-4 includes four servers, a dual-controller array, and two expansion units. Expansion units are optional.

Note – The SATA SE array does not support expansion units.

Servers, as shown in Figure 5-3 and Figure 5-4, are connected to the following channels:

Table 5-2 Connection for Four Servers in a DAS Configuration

Server Number	Upper I/O Controller Module	Lower I/O Controller Module
1	0	5
2	4	1
3	5	0
4	1	4

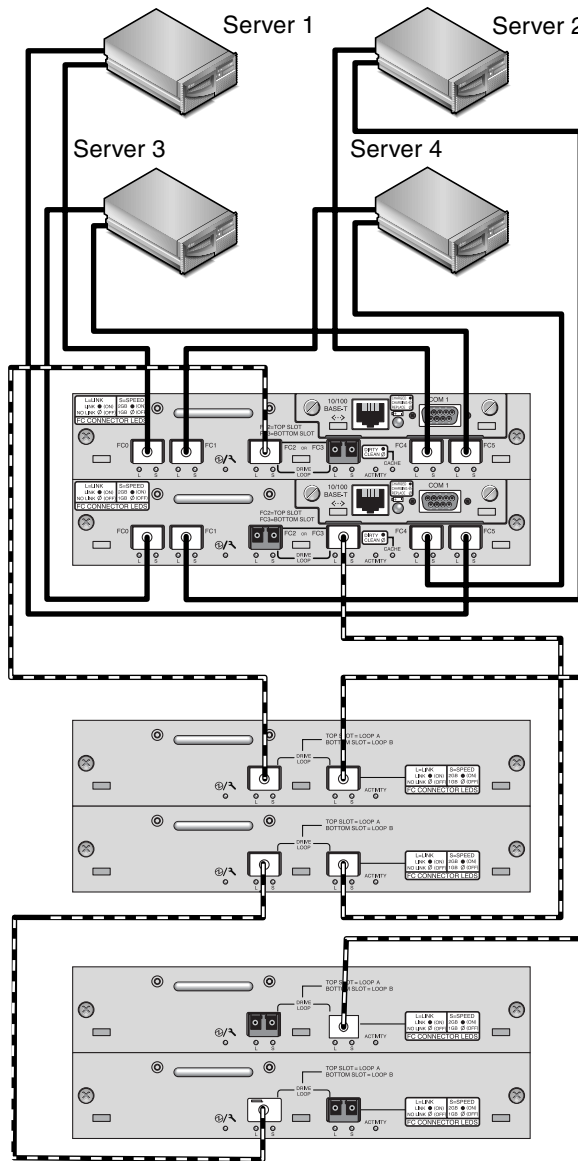


Figure 5-3 A DAS Configuration With Four Servers, a Dual-Controller SANnet II 200 FC Array, and Two Expansion Units

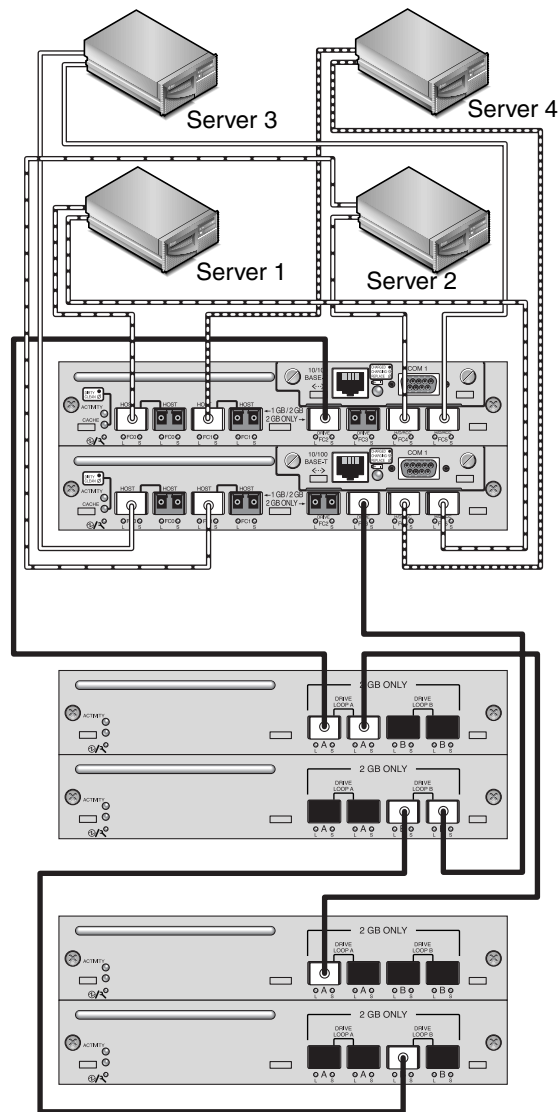


Figure 5-4 A DAS Configuration With Four Servers, a Dual-Controller SANnet II 200 SATA Array, and Two Expansion Units

Establishing complete redundancy and maintaining high availability requires the use of multipathing software such as SANpath software. To configure for multipathing:

1. Establish two connections between each server and the array.
2. Install and enable multipathing software on the server.
3. Map the logical drive each server is using to the controller channels that the server is connected to.

DAS configurations are typically implemented using a fabric loop (FL_port) mode. A loop configuration example is described in “A Sample DAS Loop Configuration” on page 5-10.

FL_port connections between a FC, SATA, or SATA SE arrays and multiple servers allow up to 1024 LUNs to be presented to servers. For guidelines on how to create 1024 LUNs, refer to the *SANnet II Family RAID Firmware User's Guide*.

Perform the following steps to set up a DAS loop configuration as shown in Figure 5-3 and Figure 5-4.

1. Check the location of installed SFPs. Move them as necessary to support the connections needed.
You must add SFP connectors to support more than four connections between servers and a FC or SATA array. For example, add two SFP connectors to support six connections and add four SFP connectors to support eight connections.
2. Connect expansion units, if needed.
3. Create at least one logical drive per server, and configure spare drives as needed.
4. Create one or more logical drive partitions for each server.
5. Confirm that the Fibre Connection Option is set to **Loop only**.



Caution – Do not use the command, “Loop preferred, otherwise point to point.” This command is reserved for special use and should be used only if directed by technical support.

6. Set up to eight IDs on each channel, if needed. For more information, see Table 5-3.

Table 5-3 Example Primary and Secondary ID Numbers in a Loop Configuration With Two IDs per Channel

Channel Number	Primary ID Number	Secondary ID Number
0	40	41
1	43	42
4	44	45
5	47	46

7. Map logical drive 0 to channels 0 and 5 of the primary controller.
8. Map logical drive 1 to channels 1 and 4 of the secondary controller.
9. Map logical drive 2 to channels 0 and 5 of the primary controller.
10. Map logical drive 3 to channels 1 and 4 of the secondary controller.

11. Connect the first server to port FC 0 of the upper controller and port FC5 of the lower controller.
12. Connect the second server to port FC 4 of the upper controller and port FC1 of the lower controller.
13. Connect the third server to port FC 5 of the upper controller and port FC0 of the lower controller.
14. Connect the fourth server to port FC 1 of the upper controller and port FC4 of the lower controller.
15. Install and enable multipathing software on each connected server.

5.1.4 Connecting Two Hosts to One Host Channel (SATA Only)

Except in some clustering configurations, if you connect more than one host to channel 0 or channel 1 in a DAS loop configuration, you must use host filtering when you want to control host access to storage. Refer to the *SANnet II Family RAID Firmware User's Guide* for information about host filters. Refer to the user documentation for your clustering software to determine whether the clustering software can manage host access in this configuration.

5.2 Larger Configurations

Larger configurations are possible using additional expansion units connected to FC arrays or SATA arrays:

- Up to eight expansion units are supported when connected to a SANnet II 200 FC array.
- Up to five expansion units are supported when connected to a SANnet II 200 SATA array.
- Up to five SANnet II 200 FC expansion units and SANnet II 200 SATA expansion units can be combined when connected to a SANnet II 200 FC array. This enables you to use FC drives for primary online applications and SATA drives for secondary or near-line applications within the same RAID array.

Note – The SANnet II 200 SATA SE array does not support expansion units.

Certain limitations and considerations apply to these mixed configurations:

- Connect SANnet II 200 SATA expansion units only to host channels (channels 0, 1, 4, or 5) on the SANnet II 200 FC array that have been converted to drive channels. For information about converting host channels to drive channels, refer to the *SANnet II Family RAID Firmware User's Guide*.

- Do not combine SANnet II 200 FC drives and SANnet II 200 SATA drives on the same Fibre Channel loop. Use them only on separate loops.
- Do not connect SANnet II 200 SATA expansion units to SANnet II 200 FC arrays in single-controller configurations.
- Make sure at least one additional logical drive is available before adding a SANnet II 200 SATA expansion unit. It is preferable to make sure a minimum of one available logical drive per SANnet II 200 SATA expansion unit is available.
- Consider managing and monitoring SATA arrays and expansion units out-of-band, balancing performance requirements against security issues. Because of the slower performance of SATA drives, managing and monitoring SANnet II 200 SATA arrays and expansion units using in-band connections might result in contention between I/O operations and monitoring operations.

See “Comparison of FC, SATA, and SATA SE Arrays” on page 1-2 for information about appropriate uses of these products to make sure the solutions you choose suit your applications and requirements.

For more detailed information, and for suggestions about the most appropriate configurations for your applications and environment, refer to the *SANnet II 200 FC and SATA Array Best Practices Manual*.

CHAPTER 6

Checking LEDs

This chapter describes the front and back-panel LEDs, which display the operating status of all drives and modules. Topics covered in this chapter are:

- “LEDs When The Array Is First Powered On” on page 6-1
- “Front-Panel LEDs” on page 6-2
 - “Drive LED Status” on page 6-4
 - “Correcting SES or PLD Firmware Version Conflicts” on page 6-4
- “Back-Panel LEDs” on page 6-5
 - “I/O Controller Module LEDs” on page 6-5
 - “I/O Expansion Module LEDs” on page 6-8
 - “Power Supply and Fan Module LEDs” on page 6-9

For troubleshooting flowcharts related to LEDs, see “Troubleshooting Flowcharts” on page 8-11.

6.1 LEDs When The Array Is First Powered On

With the array powered up but not connected to a server, you should see the LED conditions described in Table 6-1.

Table 6-1 Front-Panel LED Status When Array Is First Powered On

Drive LEDs	Blinking green
Chassis ear LEDs	Solid green

Note – Whenever media scan is running on a drive, its front-panel LED flashes green. It is normal for almost all front-panel drive LEDs to flash green unless media scanning is terminated. For more information, refer to the *SANnet II Family RAID Firmware User’s Guide*.

6.2 Front-Panel LEDs

The drive LEDs are located between the rows of drives on the front-panel, as shown in Figure 6-1. The system operation LEDs are located on the right ear of the chassis and shown in Figure 6-2.

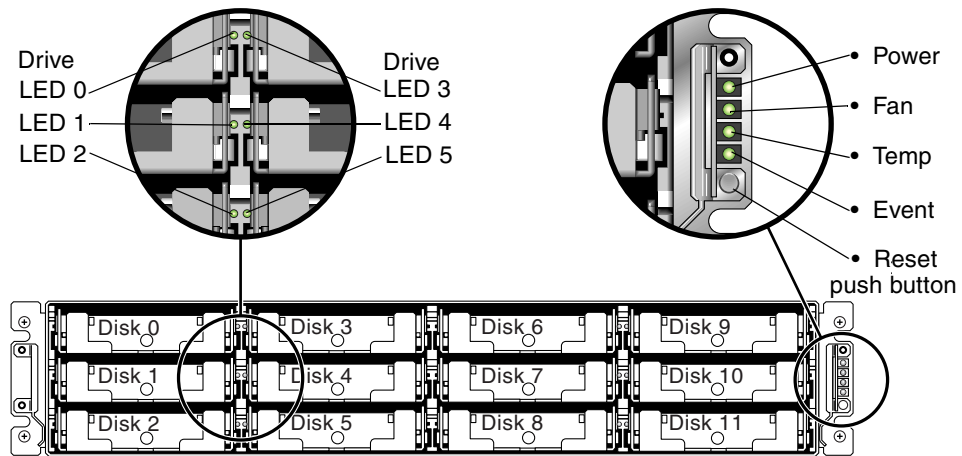


Figure 6-1 Front-Panel LEDs

Figure 6-2 shows the chassis ear LEDs and reset push button. Use a paper clip to push the Reset button to silence a failed component alarm. See “Silencing Audible Alarms” on page 8-5 for more information about silencing audible alarms.

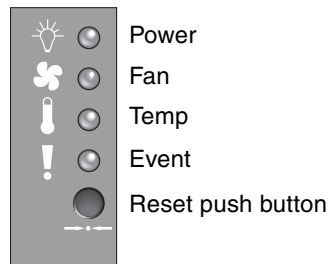


Figure 6-2 Chassis Ear LEDs and Reset Button on Front Panel

Table 6-2 lists the front-panel LEDs and describes LED activity.

Table 6-2 Front-Panel LEDs

LED	LED Color	Description
Drive	Solid green	Good: Drive power-up and spin-up OK.
	Blinking green	Good: Indicates drive activity.
	Solid amber	Failed: Drive failure.
Power (Light bulb icon) Monitors the DC output voltage within tolerance specification. Overcurrent protection shutting down any voltage output is also displayed. Voltage thresholds: +5 VDC +/- .25 VDC +12 VDC +/- .6 VDC Current thresholds: +5 VDC 35A +12 VDC 25A	Solid green	Good: Power supply good.
	Solid amber	Failed: One or more output voltages out of range.
Fan (Fan icon) Monitors the fan speed within nominal operational RPM specification of 5000 RPM.	Solid green	Good: Both fans are rotating at 4000 RPM or higher.
	Solid amber	Faulty/Failed: One or both fans is rotating at less than 4000 RPM.
Temp (Thermometer icon) Monitors the temperature level and indicates violations of the internal temperature threshold of 131° F (55° C).	Solid green	Good: Under temperature threshold.
	Solid amber	Failed: Over temperature threshold.
Event (Caution icon) Indicates any abnormal or failure event in the I/O board.	Solid green	Normal operation of I/O board.
	Solid amber	Failed I/O board.
	Blinking amber	Indicates that the version of the SES firmware or associated hardware PLD code on one controller does not match that on the other controller.

Note – To test that the LEDs work, using a paper clip, press and hold the Reset button for 5 seconds. All the LEDs should change from green to amber when you perform this test. Any LED that fails to light indicates a problem with the LED. When you release the Reset button, the LEDs return to their initial state.

6.2.1 Drive LED Status

The drive LED color changes based on array events. For example, when a media scan is performed, to indicate an event is taking place, the drive LEDs blink green for the physical drives that compose the logical drive that is being scanned. The following table lists the events that influence the drive LED status.

Table 6-3 Drive LED Status

LED Status	Event	Description
Solid green	No error	A drive is working as expected.
Blinking green	Media scan	A logical drive is created, or the controller is reset, and the default media scan command, which automatically starts and runs continuously, has not been stopped.
Blinking green	Drive activity	A drive is processing I/O.
Amber	Drive fault	A drive fails.
Amber	Identify	The SANscape CLI <code>set led</code> command is run, or the firmware application, “Flash All Drives” option is used.

Note – The media scan feature sequentially checks each physical drive in a selected logical drive, block by block, for bad blocks. Whenever media scan is running on a drive, its front-panel LED flashes green. It is normal for almost all front-panel drive LEDs to flash green unless media scanning is terminated. For more information about the media scan feature, refer to the *SANnet II Family RAID Firmware User’s Guide*.

6.2.2 Correcting SES or PLD Firmware Version Conflicts

When you replace an I/O controller, the new controller might have a version of SES or PLD firmware different from the other controller in your array. If this mismatch occurs, when you install a controller you hear an audible alarm and see a blinking amber event LED, and an SES event message is sent.

A similar situation occurs when you add an expansion unit or JBOD and there is a mismatch between the SES or PLD firmware of the RAID array and that of the expansion unit, or between two expansion units.

See “Upgrading SES and PLD Firmware” on page 7-8 for information about upgrading SES and PLD firmware.

6.3 Back-Panel LEDs

The back-panel LED colors indicate the conditions described in the following figures and tables.

Note – To test that the LEDs work, using a paper clip, press and hold the Reset button for 5 seconds. All the LEDs should change from green to amber when you perform this test. Any LED that fails to light indicates a problem with the LED. When you release the Reset button, the LEDs return to their initial state.

6.3.1 I/O Controller Module LEDs

Figure 6-3 shows the SANnet II 200 FC array I/O controller module and the LEDs on its back panel.

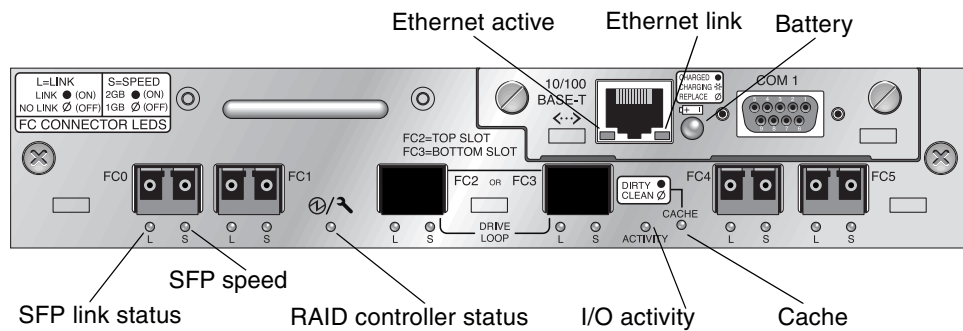


Figure 6-3 SANnet II 200 FC Array I/O Controller Module and Battery Module LEDs

Figure 6-4 shows the SANnet II 200 SATA array I/O controller module and the LEDs on its back panel.

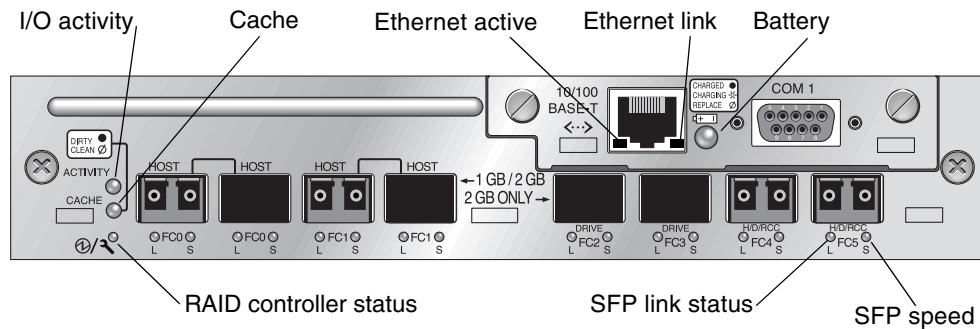


Figure 6-4 SANnet II 200 SATA Array I/O Controller Module and Battery Module LEDs

Note – Although an amber light on the back panel often indicates a faulty component, a steady amber light on the Ethernet link LED indicates normal Ethernet activity. See Table 6-4 for more information.

Figure 6-5 shows the SANnet II 200 SATA SE array RAID controller I/O and battery modules and the LEDs on its back panel.

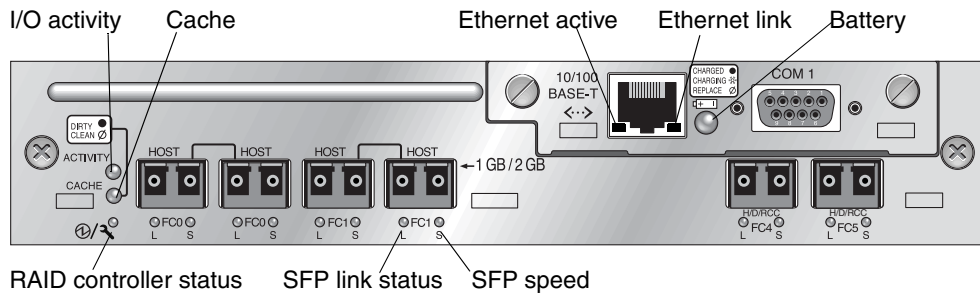


Figure 6-5 SANnet II 200 SATA SE Array RAID Controller I/O and Battery Module LEDs

The I/O controller module LEDs and their color definitions are shown in Table 6-4.

Table 6-4 I/O Controller Module and Battery Module LEDs

LED	Purpose	LED Color Definition
Battery	Status of battery	Solid green – Battery charged Blinking green – Battery charging Solid amber – Battery failed
Activity	I/O activity of host and disk ports	Off – Not busy (no I/O activity) Blinking green – Busy (active I/O)
Cache	Status of memory cache	Off – Clean cache Blinking green – Dirty cache; data is in memory and is not written to disk yet
Ethernet link (active controller)	Status of Ethernet link	Solid amber – Active link Off – Inactive connection
Ethernet link (inactive controller)	Status of Ethernet link	Off – Active connection on inactive controller, or inactive connection
Ethernet active	Status of Ethernet activity	Blinking green – Busy
RAID controller	Status of controller on I/O controller module	Blinking green – Good (primary controller) Solid green – Good (secondary controller) Solid amber – Failed RAID controller or I/O module
SFP link (L)	SFP link status	Solid green – Active good FC Connection Off – Empty or failed FC connection
SFP speed (S)	SFP speed status	Solid green – 2 Gbit Off – 1 Gbit

Note – Ethernet link LEDs on SANnet II 200 FC, SATA, and SATA SE arrays differ from the Ethernet link LEDs found on SANnet II 200 SCSI arrays and SANnet II 220 SCSI arrays. On SANnet II 200 FC, SATA, and SATA SE arrays, a connected port’s Ethernet link LED glows solid amber only on the active controller, because the Ethernet port on an FC array is considered active only if its controller is active. On an inactive controller, a port’s Ethernet link LED is off whether the port is connected or not. The absence of a solid amber light on a connected port’s Ethernet link LED indicates that this controller is not the active controller.

Note – An SFP link status (L) LED is off if there is no connection or a failed connection to this SFP. This does not apply to SATA SE arrays because they do not include SFPs.

6.3.2 I/O Expansion Module LEDs

Figure 6-6 and Figure 6-7 show I/O expansion modules and their LEDs for the SANnet II 200 FC expansion unit and the SANnet II 200 SATA expansion unit.

Note – This does not apply to the SANnet II 200 SATA SE array.

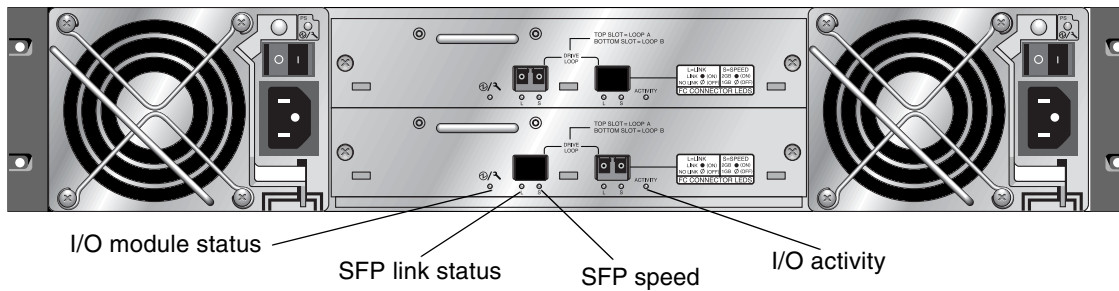


Figure 6-6 I/O Expansion Module for a SANnet II 200 FC Expansion Unit

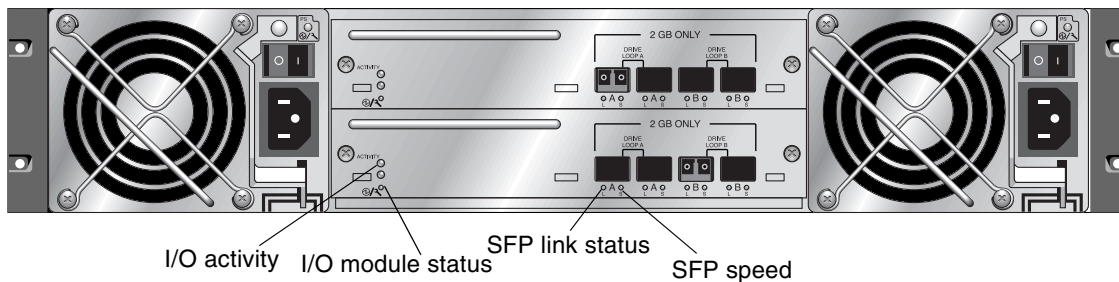


Figure 6-7 I/O Expansion Module for a SANnet II 200 SATA Expansion Unit

The I/O expansion module LEDs and their color definitions are shown in Table 6-5.

Table 6-5 I/O Expansion Module LEDs

LED	Purpose	LED Color Definition
Activity	I/O activity of host and disk ports	Off – Not busy (no I/O activity) Blinking green – Busy (active I/O)
I/O module	Status of I/O module	Solid green – Power-up successful and SES chip has successfully read on-board temperature and voltage sensors Amber – Expansion unit powering up, or failed voltage or temperature sensor Off - Expansion unit is not powered up
SFP link (L)	SFP link status	Solid green – Active good FC Connection Off – Empty or failed FC connection
SFP speed (S)	SFP speed status	Solid green – 2 Gbit Off – 1 Gbit

Note – An SFP link status (L) LED is off if there is no connection or a failed connection to this SFP.

6.3.3 Power Supply and Fan Module LEDs

Table 6-6 Power Supply LEDs

Purpose	LED	LED Color Definition
Monitors the DC output voltage within tolerance specification. Overcurrent protection shutting down any voltage output is also displayed.	Solid green	Power supply and fans are good.
Voltage thresholds: +5 VDC +/- .25 VDC +12 VDC +/- .6 VDC Current thresholds: +5 VDC 35A +12 VDC 25A	Solid amber	Failed: One or more output voltages out of range or one or both fans is rotating at less than 4000 RPM.

The following figure shows the AC power supply and fan module.

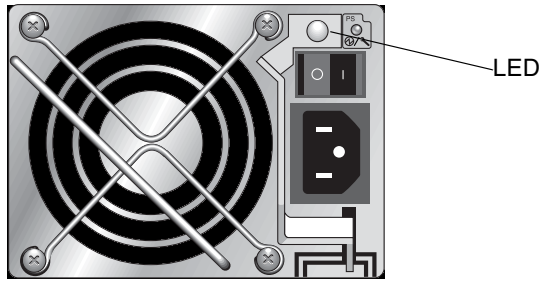


Figure 6-8 AC Power Supply and Fan Module

The following figure shows the DC power supply and fan module.

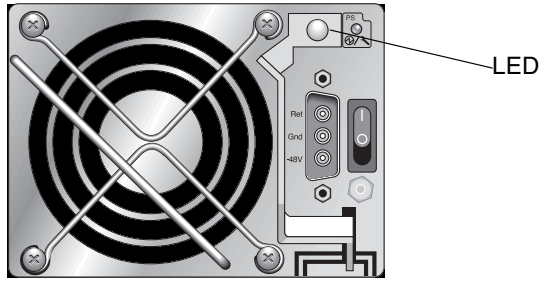


Figure 6-9 DC Power Supply and Fan Module

CHAPTER 7

Maintaining Your Array

This chapter covers the following maintenance and troubleshooting topics:

- “Using Software to Monitor and Manage the Array” on page 7-1
 - “Out-of-Band Connections” on page 7-2
 - “In-Band Connections” on page 7-2
 - “Other Supported Software” on page 7-2
 - “Enabling VERITAS DMP” on page 7-3
 - “The VERITAS Volume Manager ASL” on page 7-4
- “Battery Operation” on page 7-4
- “Viewing Event Logs on the Screen” on page 7-5
- “Upgrading Firmware” on page 7-7
 - “Installing Firmware Upgrades” on page 7-7
 - “Controller Firmware Upgrade Features” on page 7-7
 - “Upgrading SES and PLD Firmware” on page 7-8
- “Replacing the Front Bezel and Ear Caps” on page 7-8

7.1 Using Software to Monitor and Manage the Array

This section describes the software management tools available for monitoring and managing the FC, SATA, or SATA SE array with in-band connections.

Note – The SANscape CLI and the SANscape software can also be accessed through the Ethernet port for out-of-band management of the array. See “Setting Up Out-of-Band Management Over Ethernet” on page 4-28.

The following software management tools are provided with your array. The documentation CD provides the related user guides.

- SANscape provides centralized storage configuration, maintenance, and monitoring functions. Refer to the *SANscape User's Guide* for in-band setup procedures.

- SANscape Alert provides event monitoring and notification. Refer to the *SANscape Alert User's Guide* for information.
- SANscape Command-Line Interface (CLI) provides script-based management. Refer to the *SANscape CLI User's Guide* for SANscape CLI information.

For details on how to install SANscape, SANscape Alert, or SANscape CLI software, refer to the *SANscape Software Installation Guide*.

The documentation CD provides the related user guides, with detailed installation and configuration procedures for SANscape and SANscape Alert.

7.1.1 Out-of-Band Connections

With the out-of-band serial port connection, you can use a Solaris `tip` session or a Microsoft Windows terminal emulation program to access the firmware application. For details, see “Setting Up the Serial Port Connection” on page E-1.

With the out-of-band Ethernet port connection, you can use the `telnet` command to access the firmware application. For details, see “Setting Up Out-of-Band Management Over Ethernet” on page 4-28.

You can also configure an array over the Ethernet connection with the SANscape CLI and the SANscape software.



Caution – If you assign an IP address to an array to manage it out-of-band, for security reasons consider using an IP address on a private network rather than a publicly routable network.

7.1.2 In-Band Connections

With in-band host connections, you can use SANscape software or the SANscape Command-Line Interface (CLI).

- Refer to the *SANscape User's Guide* for the in-band setup procedures.
- Refer to the *SANscape CLI User's Guide* for in-band and out-of-band commands.
- Refer to the *SANscape Software Installation Guide* for all SANnet II 200 installation instructions for all host-based software.

7.1.3 Other Supported Software

Multipathing for FC, SATA, and SATA SE arrays is provided by SANpath software. Multipathing software is required when you have multiple connections from a server to an array (directly or through a switch), want to avoid a single point of failure, and are

setting up a configuration with redundant pathing. Multipathing software makes multiple paths between the server and the storage system and provides full services on each path for path failover.

Refer to the appendix for your host and to the *SANnet II 200 FC, SATA, and SATA SE Array Release Notes* for information about which versions of SANpath software are supported on your platform. Refer to these release notes for information about additional supported or provided software.

7.1.4 Enabling VERITAS DMP

To enable VERITAS Dynamic Multi-Pathing (DMP) support on VERITAS Volume Manager in the Solaris operating system, perform the following steps.

Note – To see instructions for enabling VERITAS DMP on other supported platforms, refer to your VERITAS user documentation.

1. Configure at least two channels as host channels (channels 1 and 3 by default) and add additional host IDs, if needed.
2. Connect host cables to the I/O host ports configured in Step 1.
3. Map each LUN to two host channels to provide dual-pathed LUNs.
4. Add the correct string to `vxddladm` so VxVM can manage the LUNs as a multipathed JBOD.

```
# vxddladm addjbod vid=Dot Hill pid="SANnet II FC"
# vxddladm listjbod
VID          PID          Opcode      Page      Code      Page Offset SNO
length
=====
=====
SEAGATE ALL          PIDs        18      -1         36         12
Dot Hill   SANnet II FC    18       -1         36         12
```

5. Reboot the hosts. System reboot is required to implement these changes.

Note – JBOD arrays require a license from VERITAS to enable any of its advanced features. Refer to VERITAS Volume Manager Release Notes or contact VERITAS Software Corporation for licensing terms and information.

7.1.5 The VERITAS Volume Manager ASL

VERITAS has provided an Array Software Library (ASL) that must be installed on the same host system as the Volume Manager 3.2 or 3.5 software to enable the software to recognize a FC or SATA array.

7.2 Battery Operation

The battery LED (on the far right side of the I/O controller module) is amber if the battery is bad or missing. The LED blinks green if the battery is charging and is solid green when the battery is fully charged.

7.2.1 Battery Status

Battery status is displayed at the top of the initial firmware screen. BAT: status displays somewhere in the range from BAD to ----- (charging) to +++++ (fully charged).

For maximum life, lithium ion batteries are not recharged until the charge level is very low, indicated by a status of -----. Automatic recharging at this point takes very little time.

A battery module whose status shows one or more + signs can support cache memory for 72 hours. As long as one or more + signs are displayed, your battery is performing correctly.

Table 7-1 Battery Status Indicators

Battery Display	Description
-----	Discharged; the battery is automatically recharged when it reaches this state.
+-----	Adequately charged to maintain cache memory for 72 hours or more in case of power loss. Automatic recharging occurs when the battery status drops below this level.
++---	90% charged; adequate to maintain cache memory for 72 hours or more in case of power loss.
+++--	92% charged; adequate to maintain cache memory for 72 hours or more in case of power loss.
++++-	95% charged; adequate to maintain cache memory for 72 hours or more in case of power loss.
+++++	Over 97% charged; adequate to maintain cache memory for 72 hours or more in case of power loss.

Your lithium ion battery should be changed every two years if the unit is continuously operated at 77° F (25° C). If the unit is continuously operated at 95° F (35° C) or higher, the battery should be changed every year. The shelf life of your battery is three years.

Note – The RAID controller has a temperature sensor which shuts off battery charging when the temperature reaches 129° F (54° C). When this happens, the battery status might be reported as BAD, but no alarm is written to the event log because no actual battery failure has occurred. This behavior is normal. As soon as the temperature returns to the normal range, battery charging resumes and the battery status is reported correctly. It is not necessary to replace or otherwise interfere with the battery in this situation.

For more information, see “Environmental Requirements” on page 2-3 for the acceptable operating and nonoperating temperature ranges.

For information about the date of manufacture and how to replace the battery module, refer to the *SANnet II Family FRU Installation Guide*.

7.3 Viewing Event Logs on the Screen

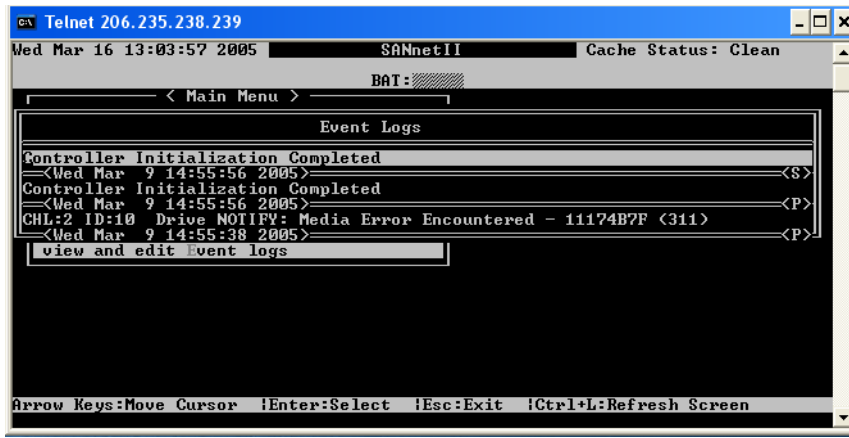
A controller event log records events and alarms that occur after the system is powered on. The controller can store up to 1000 event log entries. The event log records configuration and operation events as well as error messages and alarm events.

Note – The SES logic in each array sends messages to the event log, which report problems and the status of the fans, temperatures, and voltages.



Caution – Powering off or resetting the controller automatically deletes all recorded event log entries.

1. From the Main Menu, choose **view and edit Event logs** to view the event logs.

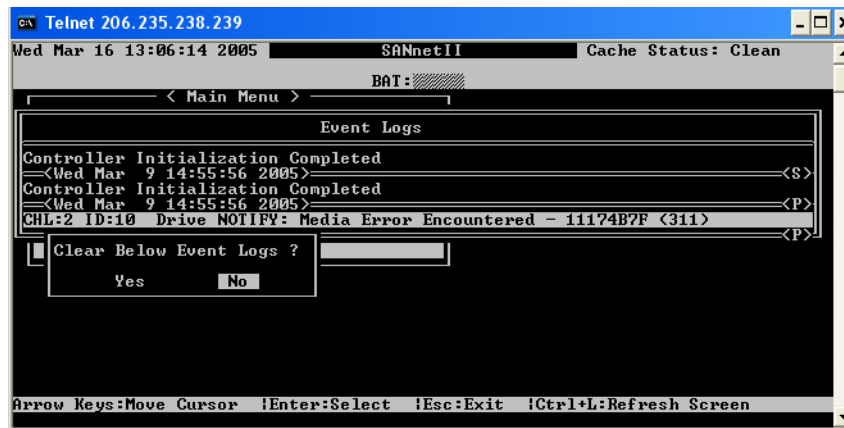


A log of recent events is displayed.

Note – The controller can store up to 1000 event log entries. The event log records configuration and operational events as well as error messages and alarm events.

2. Use your arrow keys to move up and down through the list.
3. To clear events from the log after you have read them, use your arrow keys to move down to the last event you want to clear and press **Return**.

A **Clear Below Event Logs?** confirmation message is displayed.



4. Choose **Yes** to clear the recorded event log entries.

Note – Resetting the controller clears all recorded events. To retain event log entries after controller resets, you can install and use the SANscape program.

7.4 Upgrading Firmware

Caution – Be particularly careful about downloading and installing PLD firmware. If the wrong firmware is installed, or the firmware is installed on the wrong device, your controller might be rendered inoperable. Always be sure to upgrade your SES firmware first before trying to determine if you need a PLD upgrade.

7.4.1 Installing Firmware Upgrades

It is important that you run a version of firmware that is supported by your array.



Caution – Before updating your firmware, make sure that the version of firmware you want to use is supported by your array.

To download new versions of controller firmware, or SES and PLD firmware, use one of the following tools:

- SANscape CLI (with an in-band connection, for Linux and Microsoft Windows hosts, and for servers running the Solaris operating environment)
- SANscape program (with an in-band connection, for Solaris and Microsoft Windows hosts)
- Firmware application (for controller firmware download only from a Microsoft Windows host with an out-of-band serial port connection)



You should not use both in-band and out-of-band connections at the same time to manage the array. You might cause conflicts between multiple operations.

7.4.2 Controller Firmware Upgrade Features

The following firmware upgrade features apply to the controller firmware:

- Redundant Controller Rolling Firmware Upgrade

When downloading is performed on a dual-controller system, firmware is flashed onto both controllers without interrupting host I/O. When the download process is complete, the primary controller resets and lets the secondary controller take over the service temporarily. When the primary controller comes back online, the secondary controller hands over the workload and then resets itself for the new firmware to take effect. The rolling upgrade is automatically performed by controller firmware, and the user's intervention is not necessary.
- Automatically Synchronized Controller Firmware Versions

A controller that replaces a failed unit in a dual-controller system often has a newer release of the firmware installed than the firmware in the controller it replaced. To maintain compatibility, the surviving primary controller automatically updates the firmware running on the replacement secondary controller to the firmware version of the primary controller.

Note – When you upgrade your controller firmware in the Solaris operating system, the `format(1M)` command still shows the earlier revision level. To correct this, you must update the drive label using the `autoconfigure` option (option 0) of the `format(1M)` command. When you select `label`, the drive is labelled with the updated firmware version.

7.4.3 Upgrading SES and PLD Firmware

When you replace an I/O controller, the new controller might have a version of SES or PLD firmware different from the other controller in your array. If this mismatch occurs, when you install a controller you hear an audible alarm and see a blinking amber Event LED.

To synchronize the SES firmware and hardware PLD versions, you must download new SES firmware through SANscape software or the SANscape Command-Line Interface (CLI).

If you have not installed this software, you must install it from the software CD that shipped with your array.

- Refer to the *SANscape User's Guide* to see instructions for downloading firmware for devices.
- Refer to the *SANscape CLI User's Guide*, or the `sccli(1M)` man page for similar instructions using the SANscape CLI.
- Refer to the *SANnet II 200 FC, SATA, and SATA SE Array Release Notes* for instructions about where to obtain the firmware that you need to download.

When you open the SANscape software or the SANscape CLI and connect to the array, an error message alerts you to the mismatched version problem.

7.5 Replacing the Front Bezel and Ear Caps

Some procedures require that you remove the front bezel and the small vertical plastic caps on either side of the bezel that cover the rackmount tabs. These rackmount tabs are referred to as “ears.”

7.5.1 Removing the Front Bezel and Ear Caps

1. Use the provided key to unlock both bezel locks.
2. Grasp the front bezel cover on both sides and pull it forward and then down.

Note – For many operations, including replacing disk drives, it is not necessary to further detach the bezel, because dropping it down moves it sufficiently out of the way.

3. Press the right bezel arm (hinge) toward the left side to release it from the chassis hole. The left hinge also disengages.
4. Note the location of the chassis bezel holes on each ear.
5. Remove the plastic caps from the front left and right ears of the array.
Both plastic caps are removed in the same way.
 - a. Squeeze both sides of the cap at the top and the bottom.
 - b. Turn the cap toward the center of the array until it disengages and pull it free.

7.5.2 Placing the Bezel and Ear Caps Back Onto the Chassis

Each plastic cap is replaced in the same way, but be sure to place the cap with LED labels on the right ear.

1. Align the inside round notches of the cap with the round cylindrical posts (ball studs) on the ear.
2. Push the top and bottom of the ear cap onto the ear, pressing in on the top side toward the center of the array first.
3. Continue pushing the top and bottom of the ear cap onto the ear, pressing on the side toward the outside of the array.

Do not use force when placing a cap on an ear.



Caution – Be careful to avoid compressing the **Reset** button under the plastic cap when you replace the plastic cap on the chassis.

4. Insert the bezel arms into the chassis holes.
5. Lift the bezel into position and press it onto the front of the chassis until it is flush with the front.
6. Use the key to lock both bezel locks.

CHAPTER 8

Troubleshooting Your Array

This chapter covers the following maintenance and troubleshooting topics:

- “Sensor Locations” on page 8-1
- “Silencing Audible Alarms” on page 8-5
- “RAID LUNs Not Visible to the Host” on page 8-7
- “Controller Failover” on page 8-7
- “Recovering From Fatal Drive Failure” on page 8-8
- “Using the Reset Push Button” on page 8-10
- “Troubleshooting Flowcharts” on page 8-11
 - “Power Supply and Fan Module” on page 8-11
 - “Drive LEDs” on page 8-13
 - “Front-Panel LEDs” on page 8-16
 - “I/O Controller Module” on page 8-21

For more troubleshooting tips, refer to the *SANnet II 200 FC, SATA, and SATA SE Array Release Notes*. See “Related Documentation” on page -xviii for more information. Product documentation can also be found at this Dot Hill web site: <http://www.dothill.com/manuals>.

8.1 Sensor Locations

Monitoring conditions at different points within the array enables you to avoid problems before they occur. Cooling element, temperature, voltage, and power sensors are located at key points in the enclosure. The SCSI Enclosure Services (SES) processor monitors the status of these sensors. Refer to the *SANnet II Family RAID Firmware User’s Guide* for details.

The following tables describe each element and its sensors.

8.1.1 Cooling Element Sensors

There are two fans in each power supply module. The normal range for fan speed is 4000 to 6000 RPM. Cooling element failure occurs when a fan's speed drops below 4000 RPM.

Table 8-1 Cooling Element Sensors for FC, SATA, and SATA SE Arrays

Element ID	Description	Location	Alarm Condition
0	Cooling Fan 0	Power Supply 0	< 4000 RPM
1	Cooling Fan 1	Power Supply 0	< 4000 RPM
2	Cooling Fan 2	Power Supply 1	< 4000 RPM
3	Cooling Fan 3	Power Supply 1	< 4000 RPM

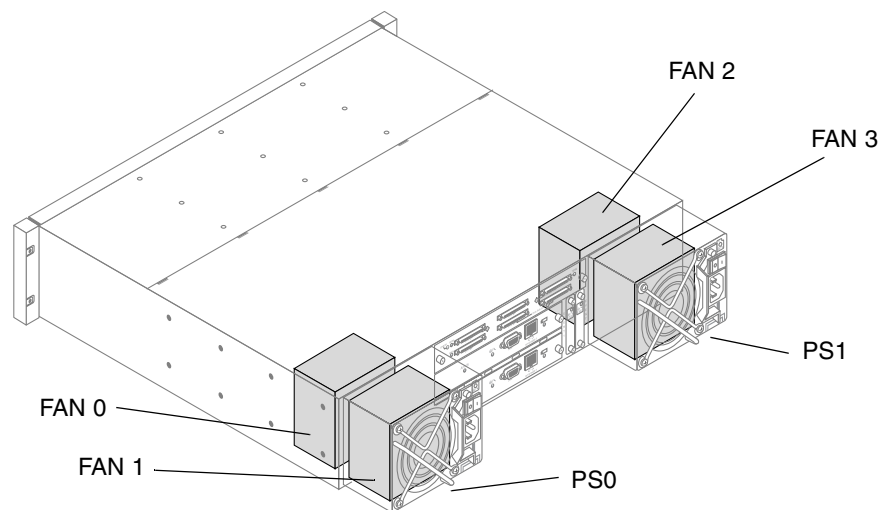


Figure 8-1 Cooling Fan Locations

8.1.2 Temperature Sensors

Extreme high and low temperatures can cause significant damage if they go unnoticed. There are twelve temperature sensors at key points in the enclosure.

Table 8-2 Temperature Sensors for FC, SATA, and SATA SE Arrays

Element ID	Description	Location	Alarm Condition
0	Temperature Sensor 0	Drive Midplane Left	< 32° F (0° C) or > 131° F (55° C)
1	Temperature Sensor 1	Drive Midplane Left	< 32° F (0° C) or > 131° F (55° C)
2	Temperature Sensor 2	Drive Midplane Center	< 32° F (0° C) or > 131° F (55° C)
3	Temperature Sensor 3	Drive Midplane Center	< 32° F (0° C) or > 131° F (55° C)
4	Temperature Sensor 4	Drive Midplane Right	< 32° F (0° C) or > 131° F (55° C)
5	Temperature Sensor 5	Drive Midplane Right	< 32° F (0° C) or > 131° F (55° C)
6	Temperature Sensor 6	Upper I/O Module	< 32° F (0° C) or > 140° F (60° C)
7	Temperature Sensor 7	Upper I/O Module	< 32° F (0° C) or > 140° F (60° C)
8	Temperature Sensor 8	Lower I/O Module	< 32° F (0° C) or > 140° F (60° C)
9	Temperature Sensor 9	Lower I/O Module	< 32° F (0° C) or > 140° F (60° C)
10	Temperature Sensor 10	Power Supply 0	< 32° F (0° C) or > 140° F (60° C)
11	Temperature Sensor 11	Power Supply 1	< 32° F (0° C) or > 140° F (60° C)

8.1.3 Voltage Sensors

Voltage sensors make sure that the array's voltage is within normal ranges. The voltage components differ for the SANnet II 200 FC, SATA, and SATA SE arrays. The following tables describe each voltage sensor.

Table 8-3 Voltage Sensors for FC Arrays

Element ID	Description	Location	Alarm Condition
0	Voltage Sensor 0	Left Power Supply (5V)	< 4.00V or > 6.00V
1	Voltage Sensor 1	Left Power Supply (12V)	< 11.00V or > 13.00V
2	Voltage Sensor 2	Right Power Supply (5V)	< 4.00V or > 6.00V
3	Voltage Sensor 3	Right Power Supply (12V)	< 11.00V or > 13.00V
4	Voltage Sensor 4	Upper I/O Module (2.5V Local)	< 2.25V or > 2.75V
5	Voltage Sensor 5	Upper I/O Module (3.3V Local)	< 3.00V or > 3.60V
6	Voltage Sensor 6	Upper I/O Module (Midplane 5V)	< 4.00V or > 6.00V
7	Voltage Sensor 7	Upper I/O Module (Midplane 12V)	< 11.00V or > 13.00V
8	Voltage Sensor 8	Lower I/O Module (2.5V Local)	< 2.25V or > 2.75V
9	Voltage Sensor 9	Lower I/O Module (3.3V Local)	< 3.00V or > 3.60V
10	Voltage Sensor 10	Lower I/O Module (Midplane 5V)	< 4.00V or > 6.00V
11	Voltage Sensor 11	Lower I/O Module (Midplane 12V)	< 11.00V or > 13.00V

Table 8-4 Voltage Sensors for SATA and SATA SE Arrays

Element ID	Description	Location	Alarm Condition
0	Voltage Sensor 0	Left Power Supply (5V)	< 4.86V or > 6.60V
1	Voltage Sensor 1	Left Power Supply (12V)	< 11.20V or > 15.07V
2	Voltage Sensor 2	Right Power Supply (5V)	< 4.86V or > 6.60V
3	Voltage Sensor 3	Right Power Supply (12V)	< 11.20V or > 15.07V

Table 8-4 Voltage Sensors for SATA and SATA SE Arrays (*Continued*)

Element ID	Description	Location	Alarm Condition
4	Voltage Sensor 4	Upper I/O Module (1.8V)	< 1.71V or > 1.89V
5	Voltage Sensor 5	Upper I/O Module (2.5V)	< 2.25V or > 2.75V
6	Voltage Sensor 6	Upper I/O Module (3.3V)	< 3.00V or > 3.60V
7	Voltage Sensor 7	Upper I/O Module (1.812V) ¹	< 1.71V or > 1.89V
8	Voltage Sensor 8	Upper I/O Module (Midplane 5V)	< 4.00V or > 6.00V
9	Voltage Sensor 9	Upper I/O Module (Midplane 12V)	< 11.00V or > 13.00V
10	Voltage Sensor 10	Lower I/O Module (1.8V)	< 1.71V or > 1.89V
11	Voltage Sensor 11	Lower I/O Module (2.5V)	< 2.25V or > 2.75V
12	Voltage Sensor 12	Lower I/O Module (3.3V)	< 3.00V or > 3.60V
13	Voltage Sensor 13	Lower I/O Module (1.812V) ¹	< 1.71V or > 1.89V
14	Voltage Sensor 14	Lower I/O Module (Midplane 5V)	< 4.00V or > 6.00V
15	Voltage Sensor 15	Lower I/O Module (Midplane 12V)	< 11.00V or > 13.00V

1. 5V on Rev 28 boards.

8.1.4 Power Supply Sensors

Each SANnet II 200 FC, SATA, and SATA SE array has two fully redundant power supplies, with load sharing capabilities. The sensors monitor the voltage, temperature, and fan units in each power supply.

Table 8-5 Power Supply Sensors for FC, SATA, and SATA SE Arrays

Element ID	Description	Location	Alarm Condition
0	Left Power Supply 0	Left viewed from the rear	Voltage, temperature, or fan fault
1	Right Power Supply 1	Right viewed from the rear	Voltage, temperature, or fan fault

8.2 Silencing Audible Alarms

An audible alarm indicates that either a component in the array has failed or a specific controller event has occurred. Error conditions and controller events are reported by event messages and event logs. Component failures are also indicated by LED activity on the array.

Note – It is important to know the cause of the error condition because how you silence the alarm depends on the cause of the alarm.

To silence the alarm, perform the following steps:

1. Check the error messages, event logs, and LED activity to determine the cause of the alarm.

Component event messages include but are not limited to the following:

- SES/PLD firmware mismatch
- Temperature
- Cooling element
- Power supply
- Battery
- Fan
- Voltage sensor



Caution – Be particularly careful to observe and rectify a temperature failure alarm. If you detect this alarm, shut down the controller. Shut down the server as well if it is actively performing I/O operations to the affected array. Otherwise, system damage and data loss can occur.

See Appendix C for more information about component alarms.

Controller event messages include but are not limited to the following:

- Controller
- Memory
- Parity
- Drive SCSI Channel
- Logical drive
- Loop connection

Refer to the “Event Messages” appendix in the *SANnet II Family RAID Firmware User’s Guide* for more information about controller events.

- Depending on whether the cause of the alarm is a failed component or a controller event and which application you are using, silence the alarm as specified in the following table.

Table 8-6 Silencing Alarms

Cause of Alarm	To Silence Alarm
Failed Component Alarms	Use a paper clip to push the Reset button on the right ear of the array.
Controller Event Alarms	<p>Using the controller firmware: From the Main Menu, choose system Functions → Mute beeper. Refer to the <i>SANnet II Family RAID Firmware User's Guide</i> for more information.</p> <p>Using SANscape: Refer to “Updating the Configuration” in the <i>SANscape User's Guide</i> for information about the Mute beeper command.</p> <p>Using the SANscape CLI: Run mute [controller]. Refer to the <i>SANscape CLI User's Guide</i> for more information.</p>

Pushing the Reset button has no effect on controller event alarms and muting the beeper has no effect on failed component alarms.

8.3 RAID LUNs Not Visible to the Host



Caution – When mapping partitions to LUN IDs, there must be a LUN 0. Otherwise, none of the LUNs will be visible.

By default, all RAID arrays are preconfigured with one or two logical drives. For a logical drive to be visible to the host server, its partitions must be mapped to host LUNs. To make the mapped LUNs visible to a specific host, perform any steps required for your operating system. For host-specific information about different operating systems, see:

- Appendix E for the Solaris operating system
- Appendix F for Windows 200x Server or Windows 200x Advanced Server
- Appendix G for a Linux server
- Appendix H for an IBM server running the AIX operating system
- Appendix I for an HP server running the HP-UX operating system

8.4 Controller Failover

Controller failure symptoms are as follows:

- The surviving controller sounds an audible alarm.
- The RAID Controller Status LED on the failed controller is amber.

- The surviving controller sends event messages announcing the controller failure of the other controller.

A “Redundant Controller Failure Detected” alert message is displayed and written to the event log.

If one controller in the redundant controller configuration fails, the surviving controller takes over for the failed controller until it is replaced.

A failed controller is managed by the surviving controller, which disables and disconnects from its counterpart while gaining access to all the signal paths. The surviving controller then manages the ensuing event notifications and takes over all processes. It remains the primary controller regardless of its original status, and any replacement controller afterward assumes the role of the secondary controller.

The failover and failback processes are completely transparent to the host.

Controllers are hot-swappable if you are using a redundant configuration, and replacing a failed unit takes only a few minutes. Since the I/O connections are on the controllers, you might experience some unavailability between the times when the failed controller is removed and a new one is installed in its place.

To maintain your redundant controller configuration, replace the failed controller as soon as possible. For details, refer to *SANnet II Family FRU Installation Guide*.

8.5 Recovering From Fatal Drive Failure

With a redundant RAID array system, your system is protected with the RAID parity drive and a global spare or spares.

A FATAL FAIL occurs when more drives fail than your RAID redundancy can accommodate. The redundancy of your RAID array depends on your configuration. In a RAID 3 or RAID 5 configuration, two or more drives than the number of spares available must fail for a FATAL FAIL status. In a RAID 1 configuration, you can lose multiple drives without fatal failure if all the failed drives consist of no more than one drive from a mirrored pair.

It might be possible to recover the RAID from a FATAL FAIL. However, it might be impossible to do a full data recovery, depending on the circumstances of the failure. It is important to check your recovered data using the data application or host-based tools following a FATAL FAIL recovery.

It is rare for two or more drives to fail at the same time. To minimize the chance of this happening, regular RAID integrity checks should be performed. For RAID 3 and RAID 5, this can be done using the firmware application “regenerate Parity” option, or using the SANscape CLI command-line utility `check parity`. Refer to the *SANnet II Family RAID Firmware User’s Guide* for details on the “regenerate Parity” option. Refer to the *SANscape CLI User’s Guide* for details on the `check parity` command-line utility.

If a double drive failure has occurred, it might be possible to recover by performing the following steps:

1. Discontinue all I/O activity immediately.
2. To cancel the beeping alarm, from the controller firmware's Main Menu, choose **system Functions** →**Mute beeper**.
See "Silencing Audible Alarms" on page 8-5 for more information about silencing audible alarms.
3. Physically check that all the drives are firmly seated in the array and that none have been partially or completely removed.
4. In the firmware Main Menu, choose **view and edit Logical drives**, and look for:
Status: FAILED DRV (one failed drive)
Status: FATAL FAIL (two or more failed drives)
5. Highlight the logical drive, press **Return**, and choose **view scsi drives**.
If two physical drives have a problem, one drive has a BAD status and one drive has a MISSING status. The MISSING status is a reminder that one of the drives might be a "false" failure. The status does not tell you which drive might be a false failure.



Caution – Resetting the controller invalidates the data still in write cache. Since it is impossible to know whether data is in cache or has been written to disk, you should not reset the controller. Instead, use the "Shutdown Controller" menu option and choose Yes when the "Reset Controller?" prompt is displayed.

Note – Shutting down the controller does not guarantee absolute data integrity. It can, however, restore most of the data, excluding whatever remains in cache when you reset the controller.

6. From the Main Menu, choose **system Functions** →**Shutdown Controller** and then choose **Yes** to confirm that you want to shut down the controller.
A status and confirmation message tells you that the controller shutdown is complete and asks if you want to reset the controller.
7. Choose **Yes** to reset the controller.
8. Repeat Steps 4 and 5 to check the logical drive and physical drive status.
After resetting the controller, if there is a false bad drive, the array automatically starts rebuilding the failed logical drive.
If the array does not automatically start rebuilding the logical drive, check the status under **view and edit Logical drives**.
 - If the status is "FAILED DRV," manually rebuild the logical drive. Refer to the *SANnet II Family RAID Firmware User's Guide* for more information.

- If the status is still “FATAL FAIL,” you might have lost all data on the logical drive, and it might be necessary to re-create the logical drive. Proceed with the following procedures:
 - a. Replace the failed drive.
Refer to the *SANnet II Family FRU Installation Guide* for more information.
 - b. Delete the logical drive.
Refer to the *SANnet II Family RAID Firmware User’s Guide* for more information.
 - c. Create a new logical drive.
Refer to the *SANnet II Family RAID Firmware User’s Guide* for more information.

Note – As physical drives fail and are replaced, the rebuild process regenerates the data and parity information that was on the failed drive. However, the NVRAM configuration file that was present on the drive is not re-created. For details on restoring the NVRAM configuration file to the drive, refer to the *SANnet II Family RAID Firmware User’s Guide*.

Rebuilding the logical drive restores the RAID integrity to a self-consistent state. This does not guarantee that the data has not been corrupted. All possible application checks should be performed to ensure that the data is not corrupted before it is used for business or production purposes.

For additional troubleshooting tips, refer to the *SANnet II 200 FC, SATA, and SATA SE Array Release Notes*. See “Related Documentation” on page -xviii for more information.

8.6 Using the Reset Push Button

The Reset push button serves several purposes:

- Tests that LEDs work
To test that the LEDs work, use a paper clip to press and hold the Reset button for 5 seconds. All the LEDs should change from green to amber when you perform this test. Any LED that fails to light indicates a problem with the LED. When you release the Reset button, the LEDs return to their initial state. See “Front-Panel LEDs” on page 6-2 for more information.
- Silences audible alarms caused by component failures
To silence audible alarms that are caused by component failures, use a paper clip to push the Reset button. See “Silencing Audible Alarms” on page 8-5 for more information about silencing audible alarms.
- Resets the array

8.7 Troubleshooting Flowcharts

This section provides troubleshooting flowcharts to illustrate common troubleshooting methods.

The flowcharts included in this section are:

- “Power Supply and Fan Module” on page 8-11
- “Drive LEDs” on page 8-13
- “Front-Panel LEDs” on page 8-16
- “I/O Controller Module” on page 8-21

For the JBOD and expansion unit flowchart, see “Troubleshooting SANnet II 200 FC JBOD Arrays” on page B-12.

For overview information about LEDs, see Chapter 6.

For information about replacing modules, refer to the *SANnet II Family FRU Installation Guide*.



Caution – Whenever you are troubleshooting and replacing components, there is an increased possibility of data loss. To prevent any possible data loss, it is a good idea to back up user data to another storage device prior to troubleshooting your array.

8.7.1 Power Supply and Fan Module

The following flowchart provides troubleshooting procedures for the power supply and fan module.

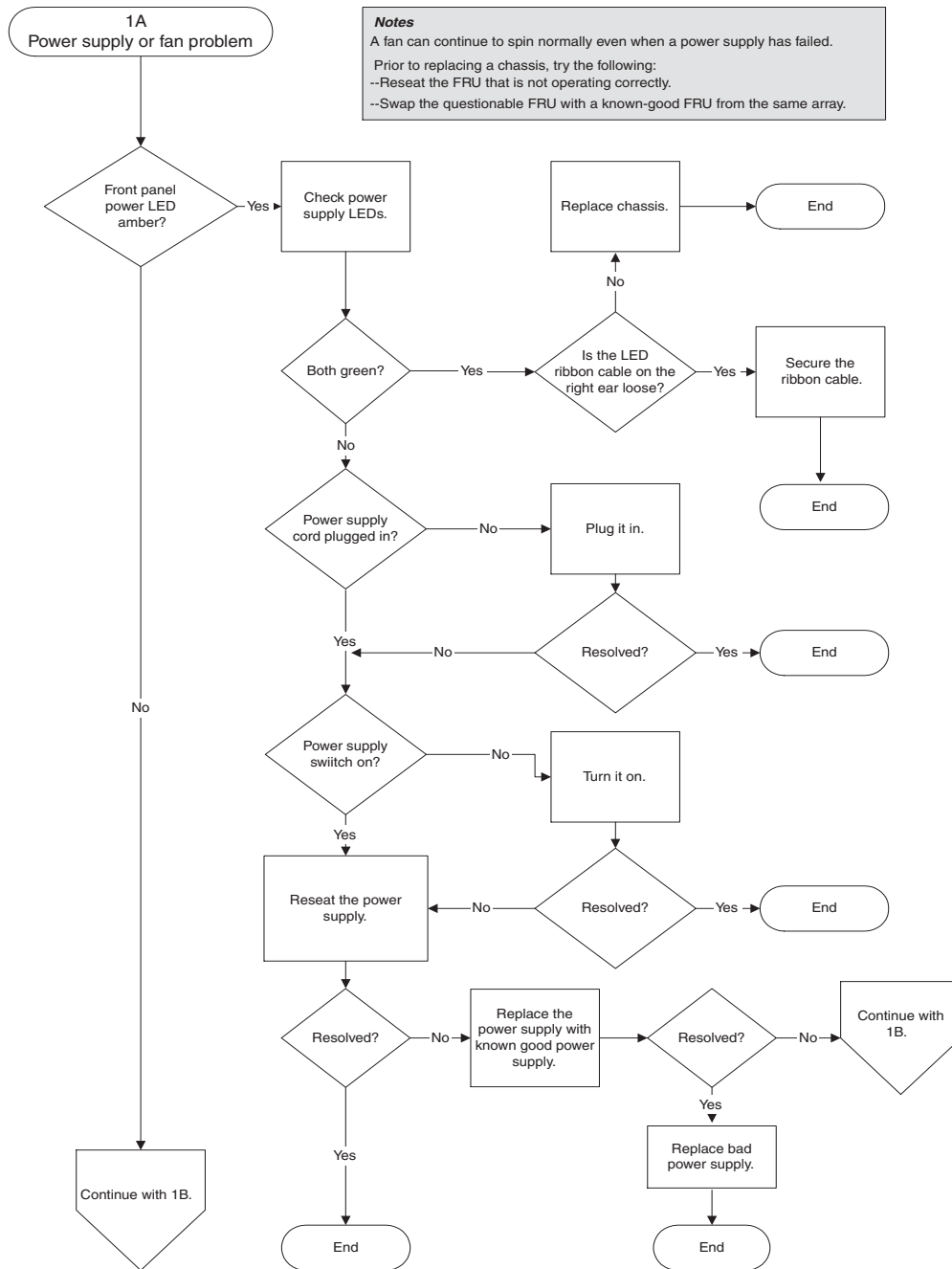


Figure 8-2 Power Supply or Fan Module Flowchart, 1 of 2

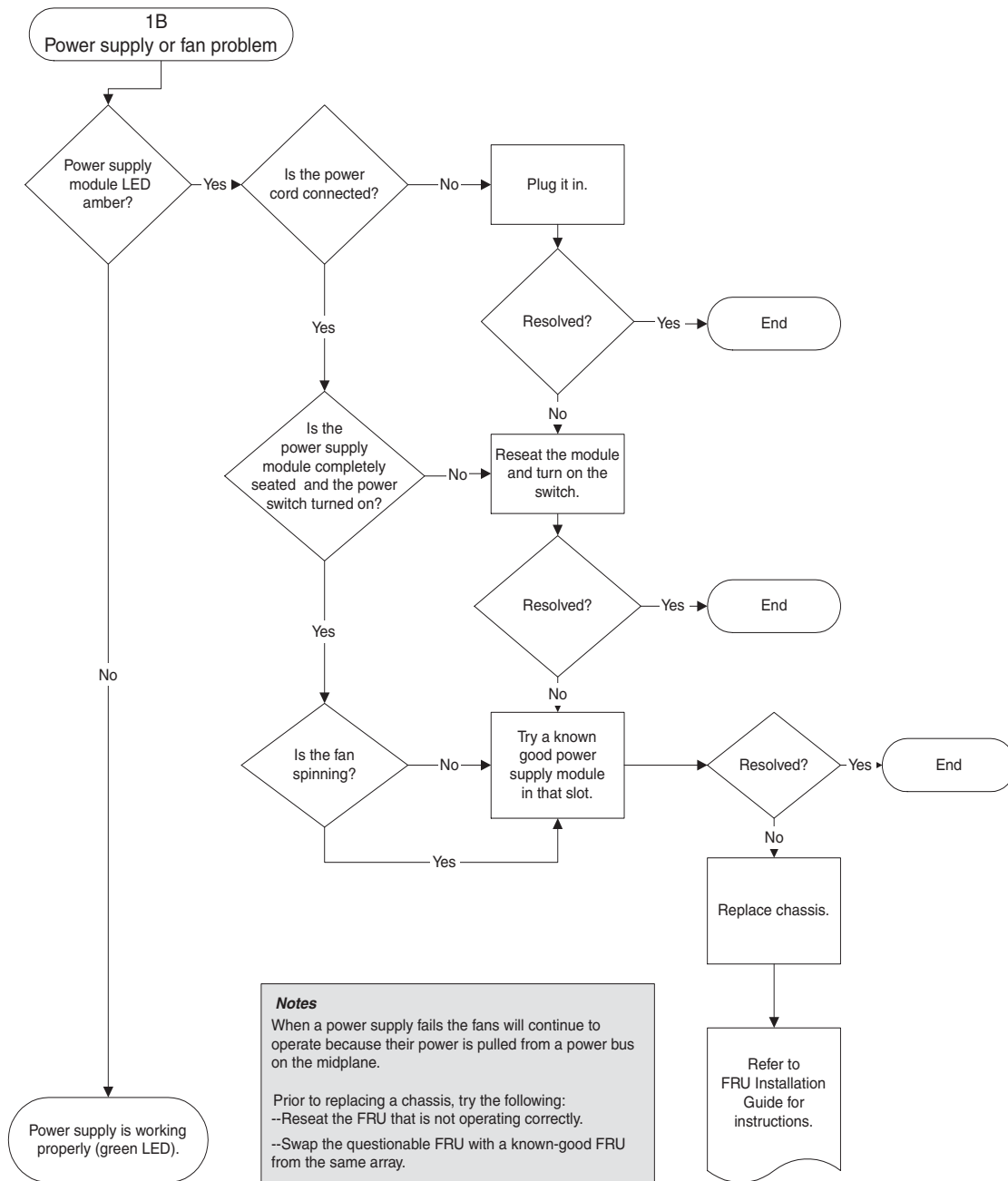


Figure 8-3 Power Supply or Fan Module Flowchart, 2 of 2

8.7.2 Drive LEDs

Before you perform the drive LED troubleshooting procedures, you might want to use the firmware application to identify a failed drive. Refer to the *SANnet II Family RAID Firmware User's Guide* for more details.

For overview information about drive LEDs and how they work, see “Front-Panel LEDs” on page 6-2.

You can check physical drive parameters using the firmware application. From the firmware Main Menu, choose **view and edit scsi drives**. For more information about the firmware application, refer to the *SANnet II Family RAID Firmware User's Guide*.



Caution – When you rotate or replace drives, make sure that:

- All I/O is stopped.
 - The “Periodic Drive Check Time” setting in the firmware application is set to disabled (this is the default setting). This prevents automatic drive rebuild, which is not recommended for live systems or troubleshooting.
-

To disable the Periodic Drive Check Time

1. From the Main Menu, choose **view and edit Configuration parameters →Drive-side SCSI Parameters →Periodic Drive Check Time**.

A list of Periodic Drive Check Time intervals is displayed.

2. Select **Disable**.

A confirmation message is displayed.

3. Choose **Yes** to confirm.



Caution – To prevent any possible data loss, back up user data to another storage device prior to replacing a disk drive.

The following flowchart provides troubleshooting procedures for the FC drive LEDs.

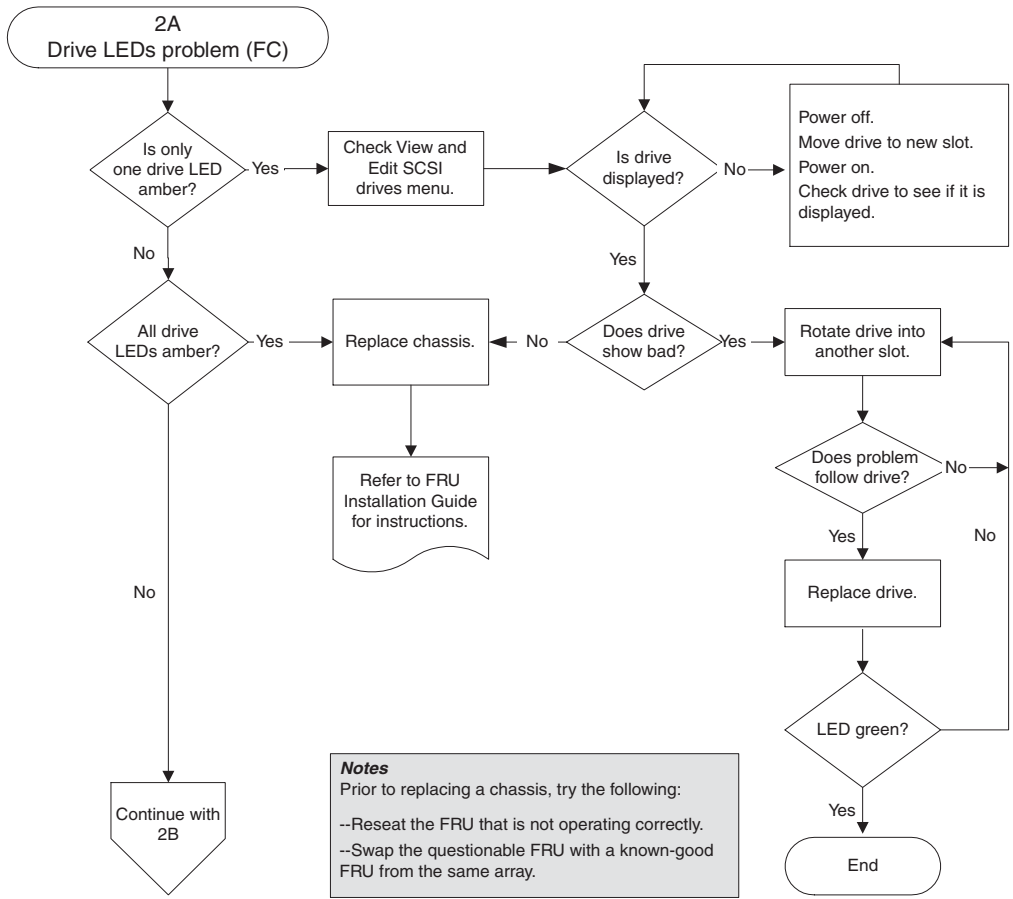


Figure 8-4 Drive LEDs Flowchart, 1 of 2

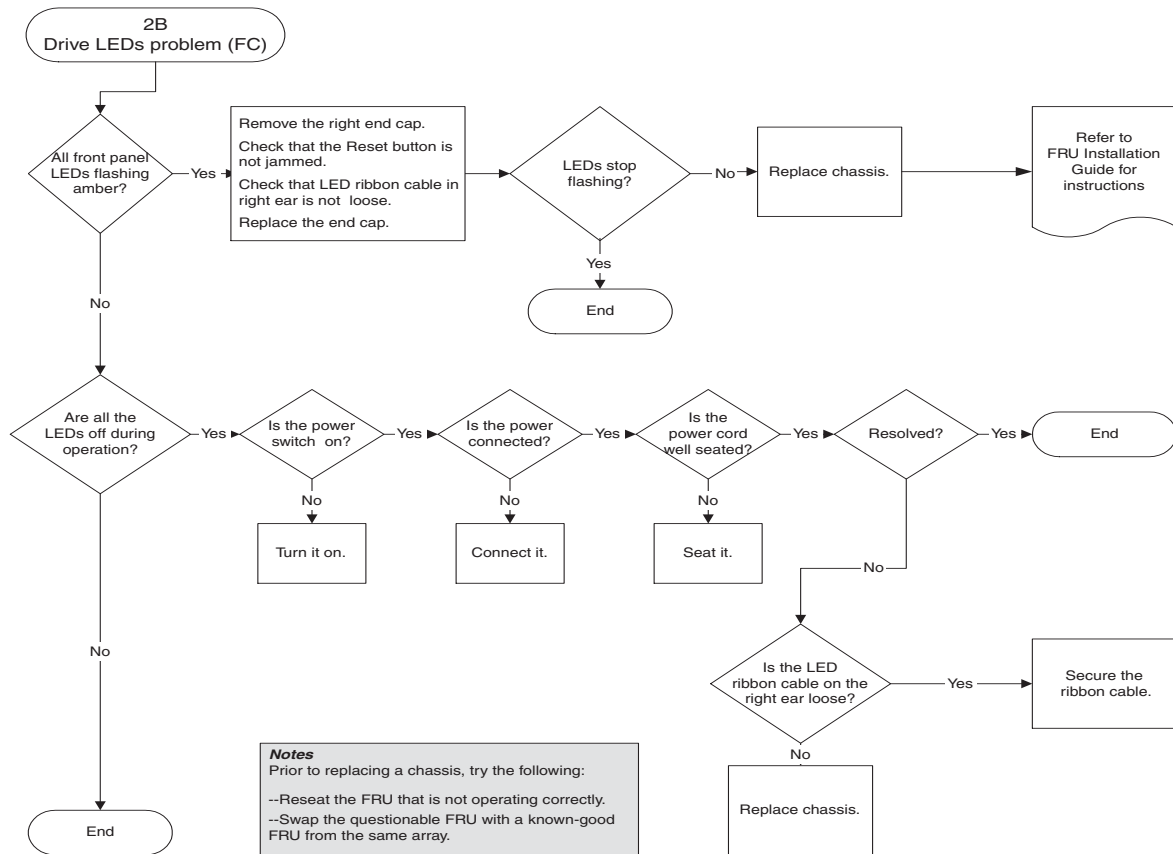


Figure 8-5 Drive LEDs Flowchart, 2 of 2

For more information about checking and replacing drive modules, refer to the *SANnet II Family FRU Installation Guide*.

8.7.3 Front-Panel LEDs

The following flowchart provides troubleshooting procedures for the SANnet II 200 FC, SATA, and SATA SE array front-panel LEDs.

Note – The LED ribbon cable referred to in this flowchart is the white cable that connects the front-panel LEDs to the midplane. It is located on the right front-panel ear and is directly attached to the LEDs.

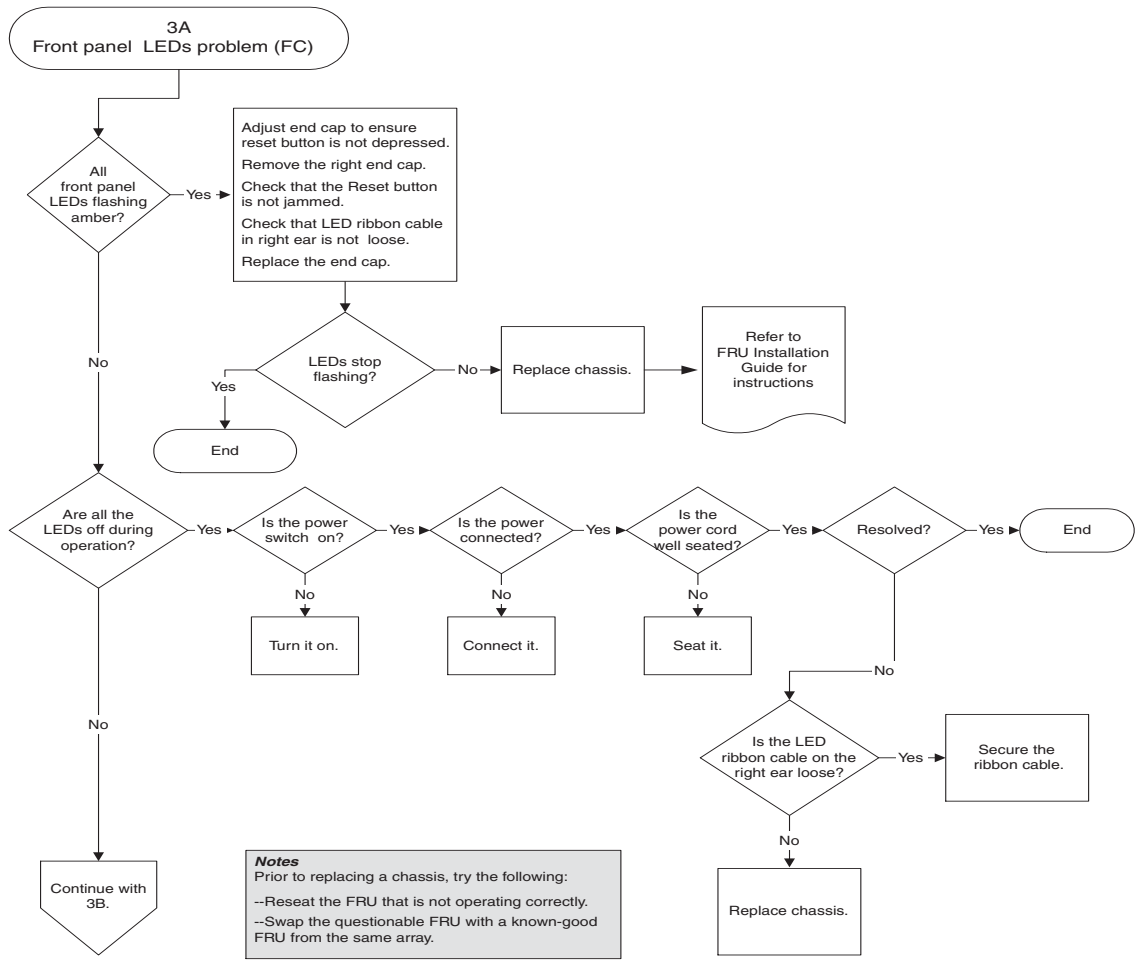


Figure 8-6 Front-Panel LEDs Flowchart, 1 of 4

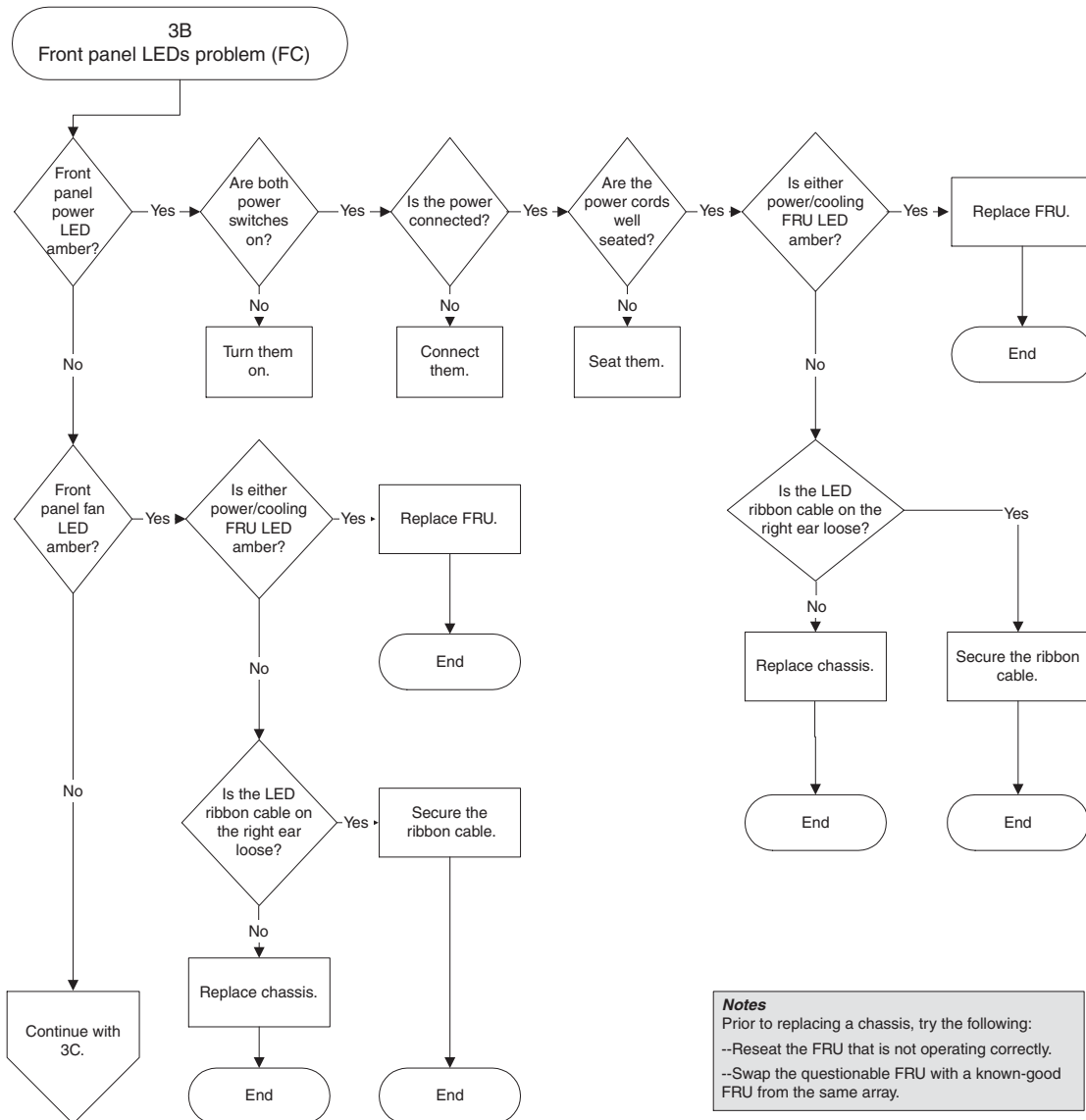
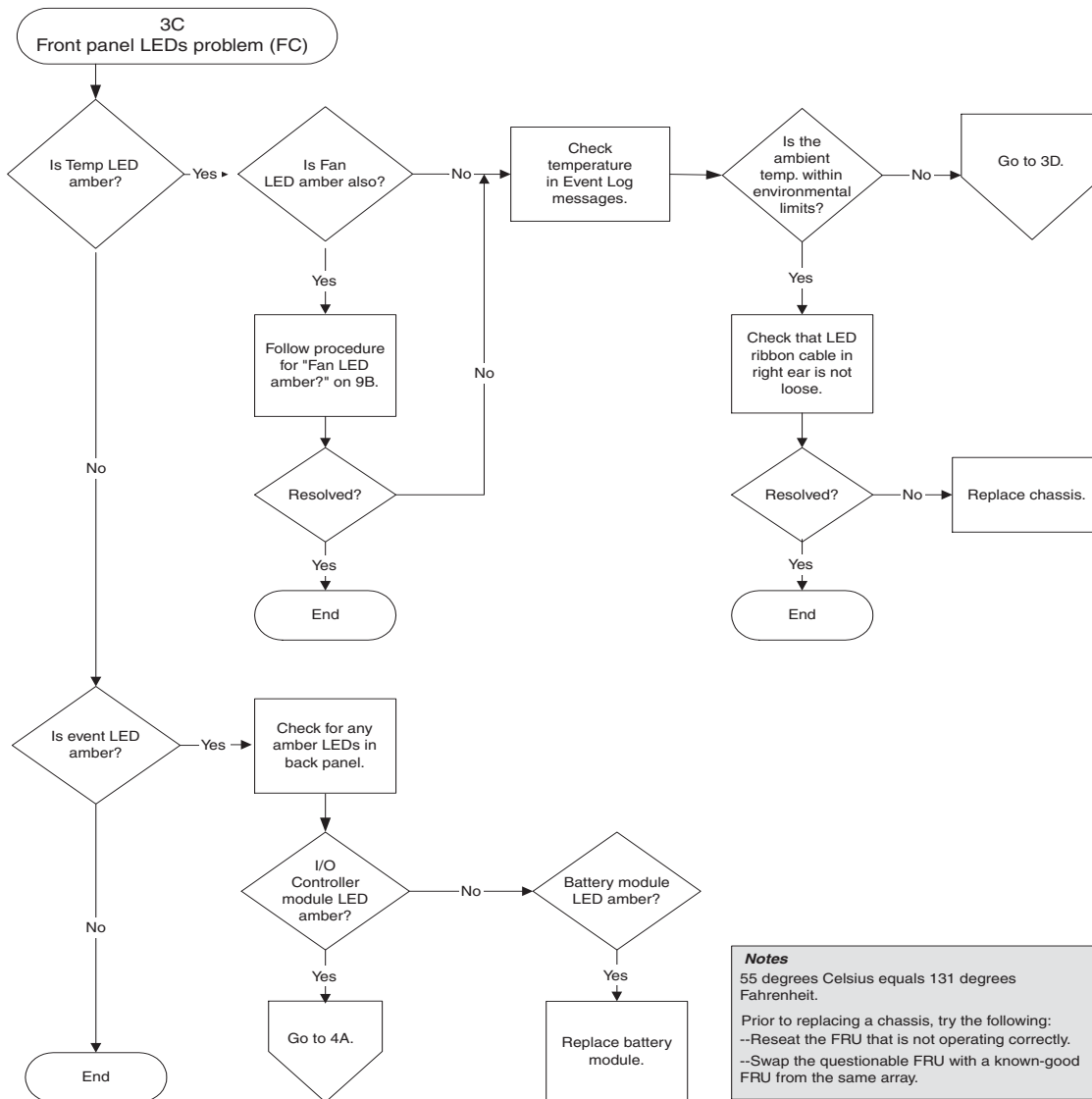
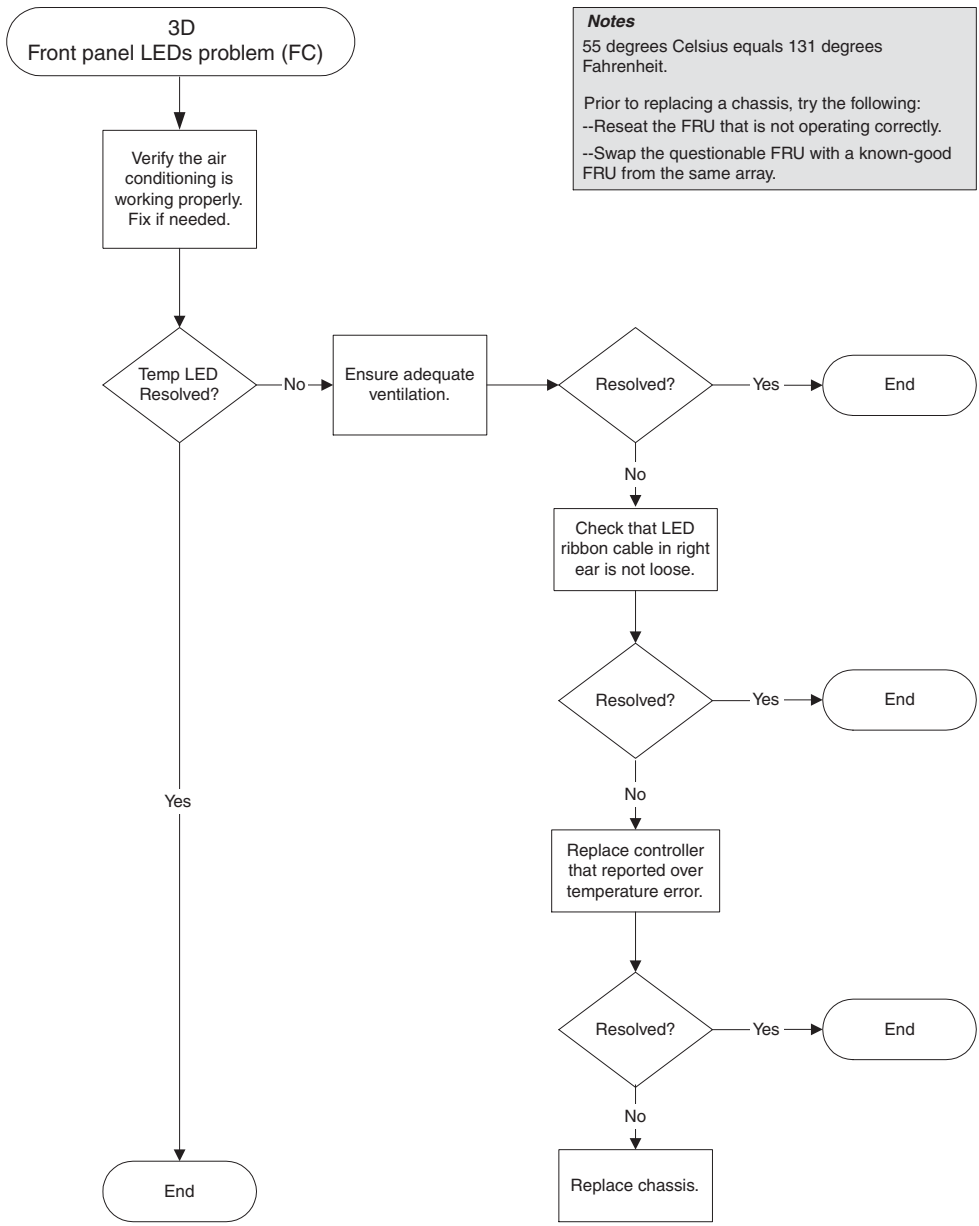


Figure 8-7 Front-Panel LEDs Flowchart, 2 of 4



Notes
 55 degrees Celsius equals 131 degrees Fahrenheit.
 Prior to replacing a chassis, try the following:
 --Reset the FRU that is not operating correctly.
 --Swap the questionable FRU with a known-good FRU from the same array.

Figure 8-8 Front-Panel LEDs Flowchart, 3 of 4



Notes
 55 degrees Celsius equals 131 degrees Fahrenheit.
 Prior to replacing a chassis, try the following:
 --Reset the FRU that is not operating correctly.
 --Swap the questionable FRU with a known-good FRU from the same array.

Figure 8-9 Front-Panel LEDs Flowchart, 4 of 4

8.7.4 I/O Controller Module

The following flowchart provides troubleshooting procedures for the I/O controller module.

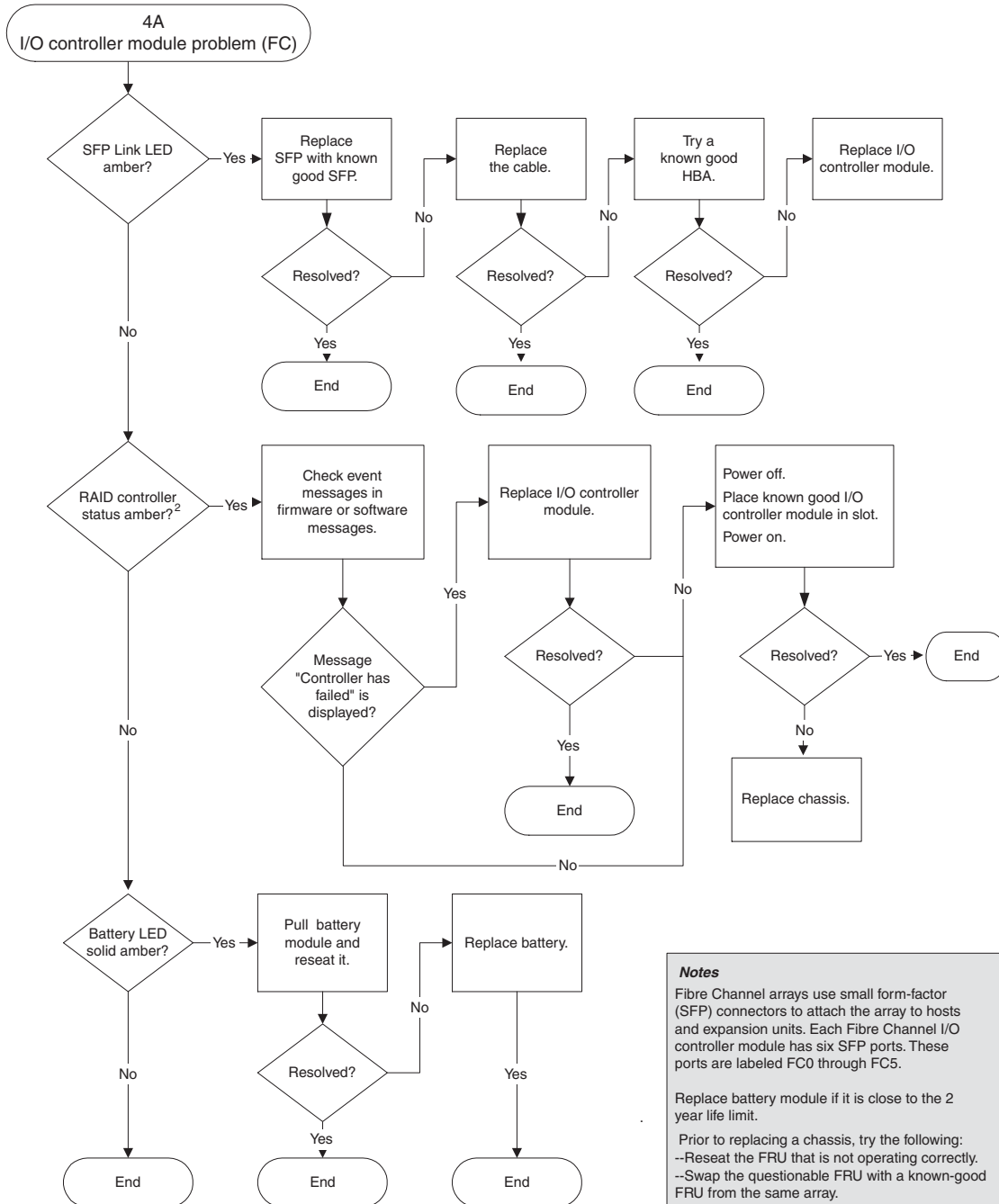


Figure 8-10 I/O Controller Module Flowchart

APPENDIX A

SANnet II 200 FC, SATA, and SATA SE Array Specifications

This appendix provides the specifications for the SANnet II 200 FC, SATA, and SATA SE arrays. The topics covered are:

- “Physical Specifications” on page A-1
- “SANnet II 200 FC, SATA, and SATA SE Array Highlights” on page A-2
- “Agency Approvals and Standards” on page A-4

A.1 Physical Specifications

Table A-1 SANnet II 200 FC, SATA, and SATA SE Array Physical Specifications

Description	Desktop	Rackmount
Height	3.64 in. / 9.25 cm	2U (3.45 in. / 8.76 cm)
Width	19 in. / 48.26 cm	17.56 in. / 44.60 cm (body)
Depth	Main chassis 18 in. / 45.72 cm To back of power supply: 20 in. / 50.8 cm To back of power supply handle: 21 in. / 53.34 cm	Main chassis 18 in. / 45.72 cm To back of power supply: 20 in. / 50.8 cm To back of power supply handle: 21 in. / 53.34 cm
Weight (fully loaded FC array)	63 lb / 28.6 kg with 36-GB drives 60.3 lb / 27.4 kg with 73-GB drives 61.3 lb / 27.8 kg with 146-GB drives	67 lb / 30.4 kg with 36-GB drives 64.3 lb / 29.2 kg with 73-GB drives 65.3 lb / 29.6 kg with 146-GB drives

Table A-1 SANnet II 200 FC, SATA, and SATA SE Array Physical Specifications *(Continued)*

Description	Desktop	Rackmount
Weight (fully loaded FC expansion unit)	56.6 lb / 25.7 kg with 36-GB drives	60.6 lb / 27.5 kg with 36-GB drives
	53.9 lb / 24.4 kg with 73-GB drives	57.9 lb / 26.3 kg with 73-GB drives
	54.9 lb / 24.9 kg with 146-GB drives	58.9 lb / 26.7 kg with 146-GB drives
Weight (fully loaded SATA array)	59 lb / 26.8 kg with 250-GB drives	63 lb / 28.6 kg with 250-GB drives
	61.6 lb / 27.9 kg with 400-GB drives	65.6 lb / 29.8 kg with 400-GB drives
Weight (fully loaded SATA expansion unit)	52.6 lb / 23.9 kg with 250-GB drives	56.6 lb / 25.7 kg with 250-GB drives
	55.2 lb / 25 kg with 400-GB drives	59.2 lb / 26.9 kg with 400-GB drives

Note – Add 12.75 lb (5.8 kg) for packaging if you want to know the shipping weight of an array or expansion unit.

A.2 SANnet II 200 FC, SATA, and SATA SE Array Highlights

Table A-2 SANnet II 200 FC, SATA, and SATA SE Array Highlights

Feature	Description
General	<ul style="list-style-type: none">• Up to 12 hot-pluggable drives in a 2U (3.45 in. / 8.76 cm high) chassis• Autosensing AC or DC power supplies• Dual-host access in certain configurations

Table A-2 SANnet II 200 FC, SATA, and SATA SE Array Highlights (*Continued*)

Feature	Description
Density	<ul style="list-style-type: none">• Up to 1752 GB in a RAID array (with 146-GB drives)• Up to 4800 GB in a RAID array (with 400-GB drives)• 21 in. (53.34 cm) chassis depth• SANnet II 200 FC RAID supports up to eight expansion units• SANnet II 200 SATA RAID supports up to five expansion units• SANnet II 200 SATA SE RAID does not support expansion units
Reliability	<ul style="list-style-type: none">• Redundant hot-swappable FRUs• Single or redundant active/active hot-swappable RAID controllers• N+1 hot-swappable power and cooling• NEBS Level 3 and HALT test certified; designed to meet 99.999% reliability
RAID System Storage Resource Management	<ul style="list-style-type: none">• Web-based 10/100BASE-T Ethernet support• Serial port out-of-band support with modem control• RAID Levels 0, 1, 1+0, 3, 3+0, 5, and 5+0• Up to 1024 LUNs• SNMP traps and MIB in firmware• 1-GB cache memory standard• 256-GB cache memory standard for SANnet II 200 SATA SE arrays• SANnet II 200 FC arrays include four channels that are user configurable as drive or host channels and two channels are dedicated drive channels• SANnet II 200 SATA arrays include two channels that are user configurable as drive or host channels, two channels that are dedicated drive channels, and two channels that are dedicated host channels• SANnet II 200 SATA SE arrays include six channels that are dedicated host channels• Support for SANscape and Diagnostic Reporter management software

The following topics briefly describe specific hardware and firmware features.

A.2.1 Hardware Loop ID

Each device communicating on an arbitrated loop requires an AL_PA, the Arbitrated Loop Physical Address. The host Fibre Channel supports a single hard loop ID in the range from 0 to 125. The drive channel allows up to 125 devices to be connected to a single loop.

The controller supports automatic loop ID assignment on the drive channel. A hard loop address ID is assigned to the disk drives by setting the radial switch.

A.2.2 Firmware Host-Side Connection Mode

The controller default is **Loop Only** in **Host-side Parameters**.

A.2.3 Firmware LUN Filtering (RAID-Based Mapping)

LUN filtering is a method used for separating and controlling access to data from the RAID controller. One major benefit of Fibre Channel is the capability to share a common storage pool with multiple servers or workstations. However, allocation becomes an issue when every server in a network can access the data in a logical drive. LUN filtering provides a means for controlling data access if data is not allowed for every server.

When you map a logical drive to a host LUN through the firmware application, you can create a mapping according to the worldwide port names (WWPN) that are specific to each host adapter. A LUN mask can then be created as an access filter for including or excluding host adapters from addressing specific storage unit. A host map is composed of an ID range that is configured to include one or more IDs. A host adapter can be identified by its ID (device-specific port names) as included or excluded from range. The LUN mask is also defined with a filter type as read only or read/write.

A.2.4 Firmware Redundant Loops

The selection of “drive-side dual-loop” is fixed. Since two channels are used to connect a group of physical drives, the two channels automatically assume the same ID address and operate in duplex mode.

A.2.5 Firmware Dynamic Load Balancing

The controller provides a mechanism to equally distribute I/O loads between channels in a redundant loop configuration.

A.3 Agency Approvals and Standards

Table A-3 SANnet II 200 FC, SATA, and SATA SE Array Product Safety & Electromagnetic Standards

Product Safety	Standard
Country	
U.S.	UL Listed to UL60950:2000, 3rd Edition
Canada	CSA Standard CAN/CSA-C22.2 No. 60950-00 3rd Edition
Germany	TÜV
European Union	EN 60950:2000
Japan	Part of World-wide CB Scheme

Table A-3 SANnet II 200 FC, SATA, and SATA SE Array Product Safety & Electromagnetic Standards (*Continued*)

Product Safety	Standard
Australia	Part of World-wide CB Scheme
Argentina	Resolution 92-98 (S-Mark)
Germany	GS mark (ergonomics) (Rheinland)
Russia	Part of World-wide CB Scheme (GOST-R mark)
Russia	Hygienic Mark (ergonomics)
Electromagnetic Compatibility	
Country	Standard
U.S.	FCC #47, Part 15, Subpart B, Class B
Canada	ICES-003
Japan	VCCI Class B
European Union	EN 55022:1998 Class B
Australia/New Zealand	AS/NZS 3548:1996
Taiwan	BSMI CNS 13438 Class B
Russia	GOST-R mark
Germany	Same as European Union
Argentina	S mark
Electromagnetic Interference	
Test	Standard
Harmonics Emissions	EN 61000-3-2:2000 (No Limits)
Voltage Flicker	EN 61000-3-3:1995/A1:2001 (No Limits)
ESD	EN 55024 (8kV Contact, 15kV Air)
RF Field	EN 55024 (10V/m)
Electrical Fast Transient Burst	EN 55024 (1kV I/O, 2kV Power)
Surge	EN 55024 (1kV I/O, 1kV Power L-L, 2kV Power L-G)
RF Conducted	EN 55024 (3V I/O and Power)
Power Frequency Magnetic Field	EN 55024 (N/A monitors only)
Voltage Dip and Interruption	EN 55024 (0V/0.5cycle, 70%V/0.5sec, 0V/5sec)

APPENDIX B

Using a Standalone JBOD Array (SANnet II 200 FC Array Only)

A single SANnet II 200 FC JBOD array can be connected directly to certain Solaris operating system hosts. This appendix describes the use of SANnet II 200 FC JBOD arrays.

Note – SANnet II 200 SATA and SATA SE configurations do not support the use of JBOD arrays.

The topics covered in this appendix are:

- “Supported Configurations (JBOD Arrays)” on page B-1
- “Supported Operating Systems (JBOD Arrays)” on page B-2
- “Supported Host Platforms and Connection Methods (JBOD Arrays)” on page B-2
- “Known Limitations Affecting SANnet II 200 FC JBOD Arrays” on page B-2
- “Using SANnet II Family Software Monitoring and Management Tools with JBOD Arrays” on page B-3
- “Setting the Loop ID on a SANnet II 200 FC JBOD Array” on page B-4
- “Connecting SANnet II 200 FC JBOD Arrays” on page B-6
- “Enabling SANnet II 200 FC JBOD Array Support” on page B-10
- “Downloading Firmware to Disk Drives in a JBOD” on page B-11
- “Resizing LUNs Greater Than 1 Tbyte” on page B-12
- “Troubleshooting SANnet II 200 FC JBOD Arrays” on page B-12
- “Converting a JBOD to a RAID array” on page B-16

B.1 Supported Configurations (JBOD Arrays)

A SANnet II 200 FC JBOD array can be attached directly to a single host computer using either single-port or dual-port configurations. See “Single-Port Connection to a SANnet II 200 FC JBOD Array” on page B-6 and “Dual-Port Connections to a SANnet II 200 FC JBOD Array” on page B-7 for more information.

B.2 Supported Operating Systems (JBOD Arrays)

The SANnet II 200 FC JBOD array can be used with currently released versions of the Solaris 8, Solaris 9, and Solaris 10 operating systems.

B.3 Supported Host Platforms and Connection Methods (JBOD Arrays)

Table B-1 lists the Sun systems that are supported by the JBOD array. The table also shows the connection methods supported for each of the supported Sun systems.

Supported HBAs include (X)6767A 2-Gbit PCI Single FC HBA and (X)6768A 2-Gbit PCI Dual FC HBA.

Table B-1 Supported Sun Servers and Connection Methods (JBOD Arrays)

Server	HBA
Sun Enterprise™ 220R server	Yes
Sun Enterprise 250 server	Yes
Sun Enterprise 420R server	Yes
Sun Enterprise 450 server	Yes
Sun Fire™ V120 server	Yes
Sun Fire V280 server	Yes
Sun Fire V880 server	Yes

B.4 Known Limitations Affecting SANnet II 200 FC JBOD Arrays

Limitations affecting the FC JBOD array are listed below.

- Booting from a JBOD disk is not supported in this release.
- The `mpxio` functionality of Sun StorEdge SAN Foundation Suite 4.2 software is not supported with FC JBOD arrays.
- Only Sun hosts running the Solaris operating system are supported in this release.
- Sun Cluster software is not supported in this release.
- VERITAS Cluster Server (VCS) software is not supported in this release.
- Only direct-attached single-host connections to a single JBOD are supported in this release. There is no multihost support in this release. Fibre Channel switches are not supported in this release. Daisy-chaining is not supported in this release.
- The `luxadm` utility should not be used to diagnose or manage FC JBOD arrays.

- SANscape software supports FC JBOD arrays. However, since FC JBOD arrays do not have a RAID controller to manage the disks, this software support is necessarily limited. Monitoring functionality that does not require a RAID controller works the same way it does for RAID arrays. See “Using SANnet II Family Software Monitoring and Management Tools with JBOD Arrays” on page B-3 for more specific information.
- Similarly, SANscape Alert support for standalone JBOD arrays is limited to functionality that can work without a RAID controller.
- The SANscape CLI supports SANnet II 200 FC JBOD arrays. However, because SANnet II 200 FC JBOD arrays do not have a RAID controller to manage the disks, this support is limited.

Refer to the “Monitoring JBODs” appendix in the *SANscape CLI User’s Guide* for more information about using these commands.

B.5 Using SANnet II Family Software Monitoring and Management Tools with JBOD Arrays

The following software management tools are provided with your array. The documentation CD provides the related user guides.

- **SANscape.** Provides centralized storage configuration, maintenance, and monitoring functions. Refer to the *SANscape User’s Guide* for in-band setup procedures.
- **SANscape Alert.** Provides event monitoring and notification. Refer to the *SANscape Alert User’s Guide* for more information.
- **SANscape Command-Line Interface (CLI).** A command-line interface utility that provides script-based management. Refer to the *SANscape CLI User’s Guide* for more information.

For details on how to install SANscape, SANscape Alert, or SANscape CLI software, refer to the *SANscape Software Installation Guide*.

B.5.1 SANscape

SANscape supports all SANnet II arrays. It also supports, to a limited degree, standalone SANnet II 200 FC JBOD arrays. Since standalone JBOD arrays do not have a RAID controller to manage the disks, this software support for JBODs is limited to the following functions:

- viewing component and alarm characteristics
- upgrading firmware on hard drives
- upgrading firmware on SAF-TE devices

Refer to the “Monitoring JBODs” appendix in the *SANscape User’s Guide* for information about using these functions with JBOD arrays.

B.5.1.1 Enabling JBOD Support

To monitor peripheral device conditions and events on a SANnet II 200 FC JBOD array from SANscape, you first need to enable JBOD support. See “Enabling SANnet II 200 FC JBOD Array Support” on page B-10 for the procedure for enabling JBOD support.

B.5.2 SANscape Alert

SANscape Alert supports standalone JBOD arrays. However, triggered event notification is limited to environmental failures and hard drive failures.

B.5.3 SANscape CLI

The SANscape CLI supports JBOD arrays. However, because JBOD arrays do not have a RAID controller to manage the disks, this support is limited to the following commands:

- `about`
- `download pld-firmware`
- `download ses-firmware`
- `exit`
- `help`
- `quit`
- `select`
- `show access-mode`
- `show configuration`
- `show enclosure-status`
- `show frus`
- `show inquiry-data`
- `show pld-revision`
- `show ses-devices`
- `version`

Refer to the *SANscape CLI User's Guide* for information about using these commands.

B.6 Setting the Loop ID on a SANnet II 200 FC JBOD Array

When a SANnet II 200 FC JBOD array is directly attached to a host, unique, hard-assigned loop IDs are assigned to each drive in the JBOD array. A loop ID is the decimal version of an AL_PA. The lowest number loop ID is the lowest priority address on the loop.

An ID switch on the left front side of a SANnet II 200 FC JBOD array, underneath the left chassis ear, is used to set loop IDs for the disk drives to different ranges of values.

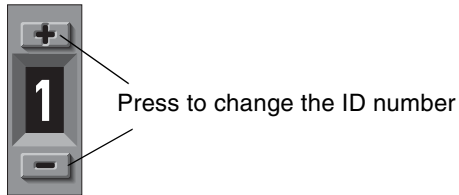


Figure B-1 ID Switch

By default, the ID switch on all SANnet II 200 FC JBOD arrays is set to 1 so the range of IDs is automatically 16 to 31. You can leave the ID switch set to 1, or set it for whichever range of IDs you prefer.

The ID switch offers eight ID ranges. Each set contains 16 IDs. The last 4 IDs in each range are ignored. These ranges are shown in Table B-2.

Table B-2 ID Switch Settings for SANnet II 200 FC JBOD Arrays

ID Switch Setting	Range of IDs
0	0–15
1	16–31
2	32–47
3	48–63
4	64–79
5	80–95
6	96–111
7	112–125

B.6.1 Changing Your ID Switch Setting

Perform the following steps to change your ID switch setting:

1. Remove the bezel (the front faceplate).
See “Replacing the Front Bezel and Ear Caps” on page 7-8 for step-by-step instructions for removing and replacing the front bezel and ear caps.



Caution – The plastic ear covers are snap-on parts that require care when you remove them. If you remove the right plastic ear cap, take care to avoid breaking the Reset push button directly below the ear cap.

2. Remove the left plastic ear cap from the front of the chassis.
3. Use the buttons to change the ID number.



Caution – The loop ID should only be changed while the JBOD array is powered off or not in use. After changing the loop ID, a power cycle is required to make the ID switch change take effect. Failure to cycle the power following an ID switch change can lead to unexpected results.

4. Reattach the plastic ear cap and the bezel on the front of the chassis.

B.7 Connecting SANnet II 200 FC JBOD Arrays

You can connect a SANnet II 200 FC JBOD array directly to a host server. Use your standard host system disk management utilities for management of disks in a SANnet II 200 FC JBOD array, such as partitioning and formatting. Refer to your host system documentation for more information about disk management.

There are two ways to verify that you have a SANnet II 200 FC JBOD array (or expansion unit) rather than a SANnet II 200 FC RAID array:

- Check the back panel. The back panel of the SANnet II 200 FC JBOD resembles the back panel shown in Figure B-2. See Figure 4-3 for an illustration of the back panel of the SANnet II 200 FC RAID array.
- Remove the front bezel and look at the labels on the bottom lip of the chassis. If you have a SANnet II 200 FC JBOD array, one label contains this designation:
3510 AC JBOD (alternating current model) or 3510 DC JBOD (direct current model).

B.7.1 Single-Port Connection to a SANnet II 200 FC JBOD Array

You can connect a SANnet II 200 FC JBOD array to an FC port, a port on a single-port HBA, or a single port on a dual-port HBA. Figure B-2 shows an example of a SANnet II 200 FC JBOD array with 12 drives, connected to a host computer over a single loop to a single FC port. In this example, the port is one of a pair of ports on a dual-port HBA.

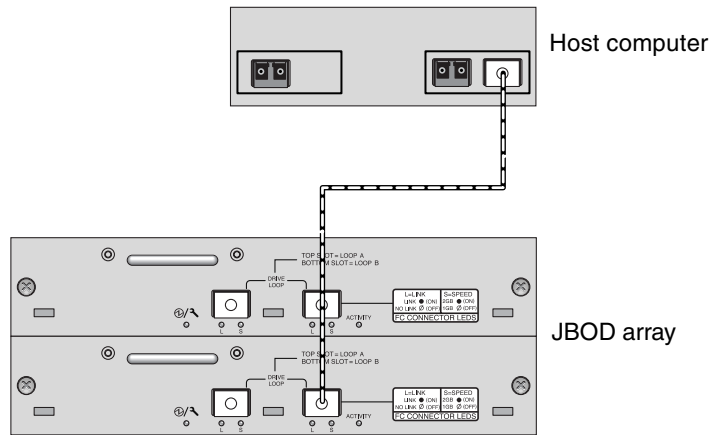


Figure B-2 SANnet II 200 FC JBOD Array Attached to a Single HBA Port

In this example, if the loop ID switch is set to 0, the `format` command shows 12 drives on this loop, ranging from `c1t0d0` to `c1t11d0`.

Table B-3 Example of 12 Drives Shown on a 12-Disk SANnet II 200 FC JBOD Array Connected to a Host Over a Single FC Loop

Drive Identifier			
<code>c1t0d0</code>	<code>c1t3d0</code>	<code>c1t6d0</code>	<code>c1t9d0</code>
<code>c1t1d0</code>	<code>c1t4d0</code>	<code>c1t7d0</code>	<code>c1t10d0</code>
<code>c1t2d0</code>	<code>c1t5d0</code>	<code>c1t8d0</code>	<code>c1t11d0</code>

The drive identifiers are arranged in four columns of three drives each to reflect the physical location of these drives in the JBOD. They correspond to the locations of Disk 0 through Disk 11.

B.7.2 Dual-Port Connections to a SANnet II 200 FC JBOD Array

You can also connect a SANnet II 200 FC JBOD array to both ports on a dual-port HBA, ports on two single-port HBAs, or a port on a single-port HBA and a single port on a dual-port HBA.

Use host-based multipathing software such as VERITAS DMP 3.2 or 3.5 software to manage SANnet II 200 FC JBOD arrays connected to a host over more than one loop. Multipathing software provides full services on multiple paths between the server and the storage system.

Figure B-3 shows an example of a SANnet II 200 FC JBOD array with 12 drives, connected to a host computer over two loops to two FC ports. In this example, both ports are on dual-port HBAs.

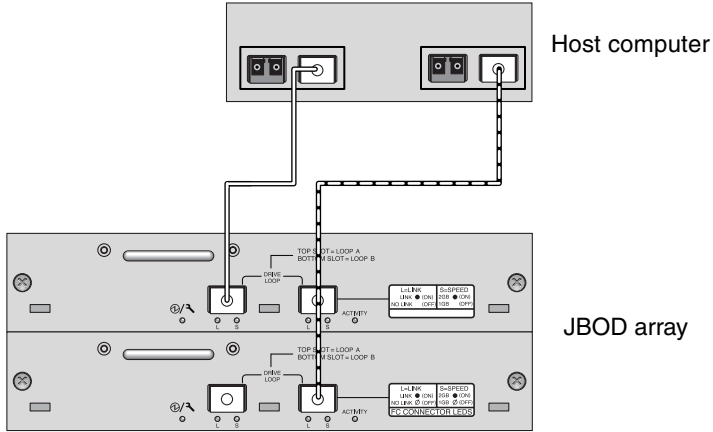


Figure B-3 SANnet II 200 FC JBOD Array Attached to Two HBA Ports

When you connect your SANnet II 200 FC JBOD array to a host over two loops, the `format` command shows 24 drives, 12 on each loop, because the host sees a device entry for each path. If the loop switch ID is set to 0, these drives are identified as ranging from `c1t0d0` to `c1t11d0` and from `c2t0d0` to `c2t11d0`, as shown in Table B-4. However there are, of course, still only 12 physical drives in the JBOD array. These drives are arranged in four columns of three drives each, as shown in Table B-3.

Table B-4 Example of 24 Drives Shown on a 12-Disk SANnet II 200 FC JBOD Array Connected to a Host Over Two FC Loops

Drive Identifier (First Loop)	Drive Identifier (Second Loop)
c1t0d0	c2t0d0
c1t1d0	c2t1d0
c1t2d0	c2t2d0
c1t3d0	c2t3d0
c1t4d0	c2t4d0
c1t5d0	c2t5d0
c1t6d0	c2t6d0
c1t7d0	c2t7d0
c1t8d0	c2t8d0
c1t9d0	c2t9d0
c1t10d0	c2t10d0
c1t11d0	c2t11d0



Caution – Be careful not to mount the same drive twice if you are not using multipathing software.

B.7.3 Changing Your SFP Configuration on JBOD Arrays

SANnet II 200 FC JBOD arrays use SFP connectors to attach to Fibre Channel ports on your host computer. You might need to move or add one or more SFP connectors to your SANnet II 200 FC JBOD array to connect it to your host computer.

- To make connections to an empty port, first slide the SFP connector into the port so that it connects firmly with the chassis. Then plug the fiber-optic cable's SFP connector into the duplex jack at the end of the SFP.
- To remove an SFP connector, make sure no cable is connected to it and then slide it out from the port.

B.7.4 Connecting the SANnet II 200 FC JBOD Array to a Host Computer

Use fiber-optic cables to connect one or two HBA ports on the host computer to the SANnet II 200 FC JBOD array, as shown in Figure B-2 and Figure B-3.

1. Connect a fiber-optic cable to an HBA.
2. Set your loop IDs using the ID switch on the JBOD array.



Caution – The loop ID should only be changed while the JBOD array is powered off or not in use. After changing the loop ID, a power cycle is required to make the ID switch change take effect. Failure to cycle the power following an ID switch change can lead to unexpected results.

3. Connect the SFP connector at the other end of each of these fiber-optic cables to host channel SFP connectors on the back of the JBOD array.
4. Power up the equipment in the following order, so that the host computer discovers all connected arrays:
 - a. SANnet II 200 FC JBOD array
 - b. Host computer
5. Use your host system disk management utilities to prepare the disks in the SANnet II 200 FC JBOD array for use.

Refer to your host system documentation for more information about disk management utilities available to you.

B.8 Enabling SANnet II 200 FC JBOD Array Support

For SANnet II 200 FC JBOD arrays, configure JBOD support only when you have a JBOD array connected directly to a host. This enables you to monitor peripheral device conditions and events. If you have an expansion unit connected to a RAID array, the RAID controllers monitor the expansion unit's conditions and events for you.

Note – Enabling JBOD support can impact I/O performance.

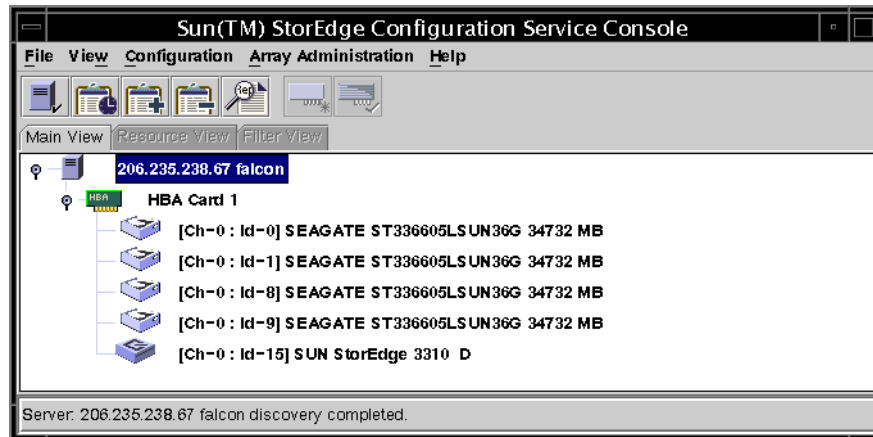
To monitor peripheral device conditions and events on a SANnet II 200 FC JBOD array from the SANscape console, you first must enable JBOD support.

1. Choose **View** → **Agent Options Management**.
The Agent Options Management window is displayed.
2. Select the **Enable JBOD Support** checkbox.
3. To immediately display the JBOD array in the main window, choose **View** → **View Server** and click **Probe** to probe for new inventory.

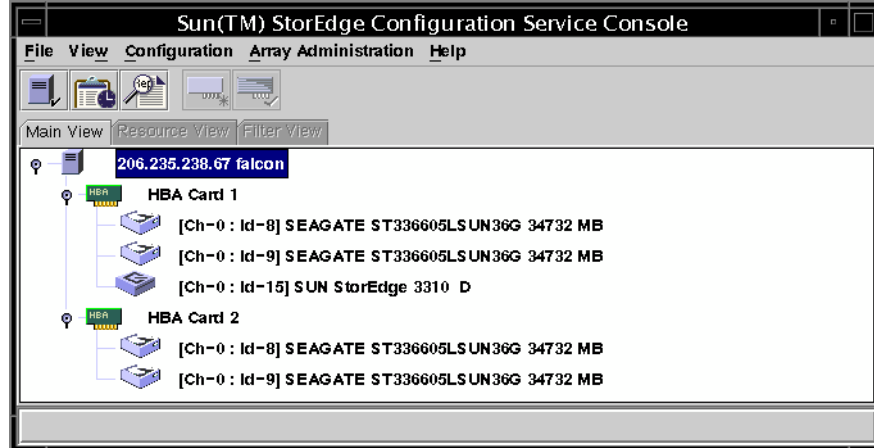
4. Click **OK**.

The JBOD array is displayed in the main window.

In a single-bus configuration, both ports of the JBOD array are connected to one HBA on the server, as shown in the following example:.



In a split-bus configuration, each port is connected to its own HBA, as shown in the following example:



B.9 Downloading Firmware to Disk Drives in a JBOD

For instructions on how to download firmware to disk drives in a JBOD directly attached to a host, refer to the README file in the patch that contains the firmware.

B.10 Resizing LUNs Greater Than 1 Tbyte

When a LUN is created larger than 1 Tbyte, the Solaris operating system identifies the LUN as an EFI drive. If the LUN is later rebuilt to less than 1 Tbyte, it retains the EFI label. If you want the LUN to revert back to SMI labeling, the `format -e | label` command is required.

To relabel a LUN to less than 1 Tbyte, perform these steps:

Note – In this example, the LUN being relabeled is `c1t2d3`.

1. Type the `format` command in a terminal window:.

```
# format -e devicename
```

2. At the `format>` prompt, type `label`.

```
# format -e c1t2d3
format> label
```

Two menu items are displayed and you are prompted to choose between them:

```
# format -e c1t2d3
format> label
[0] SMI Label
[1] EFI Label
Specify Label type[0]:
```

3. Select option 0 (SMI).

```
Specify Label type[0]: 0
```

4. Respond to the on-screen prompts to relabel the device.

B.11 Troubleshooting SANnet II 200 FC JBOD Arrays

This section describes troubleshooting procedures and error messages you can use to isolate configuration and hardware problems. For additional troubleshooting information see “Troubleshooting Your Array” on page 8-1.

B.11.1 Troubleshooting Configuration Issues

Follow this sequence of general steps to isolate software and configuration issues.

1. Look for storage-related messages in `/var/adm/messages` and identify any suspect SANnet II 200 FC JBOD arrays and fibre loops.
2. Check your SANscape console for alerts or messages.
3. Check revisions of software package, patches, and hardware.
4. Verify correct device file paths.

B.11.2 Troubleshooting Hardware Issues

When a problem is not otherwise reproducible, suspect hardware might need to be replaced. Always make only one change at a time and carefully monitor results. When possible, it is best to restore the original hardware before replacing another part to eliminate the introduction of additional unknown problem sources.

After hardware replacement, a problem can usually be considered solved if it does not resurface during a period equal to twice its original frequency of occurrence. For example, if a problem was occurring once a week on average before a potential fix was made, running two weeks without seeing the problem again suggests a successful fix took place.

Troubleshooting hardware problems is usually accomplished by an FRU isolation sequence that uses the process of elimination. Set up a minimal configuration that shows the problem and then replace elements in this order, testing after each replacement until the problem is solved:

1. Replace the cables.
2. Replace the SFPs.
3. Replace the drives.
4. Replace the HBAs.

Often you can also find out what does cause a hardware problem by determining the elements that do not cause it. Start out by testing the smallest configuration that does work, and then keep adding components until a failure is detected.

To view error messages reported by JBODs or expansion units, use any of the following:

- Message log in the operating system
 - For Solaris, `var/adm/messages`
 - For Linux, `var/log/messages`
 - For Microsoft Windows, use the `event viewer`
- SANscape event log

- SANscape CLI event log
- For expansion units, the RAID firmware event log

For more information about replacing the chassis, I/O module, or controller, refer to the *SANnet II Family FRU Installation Guide*.



Caution – When you rotate or replace drives, make sure that:

- All I/O is stopped.
 - The **Periodic Drive Check Time** setting in the firmware application is set to disabled (this is the default setting). This prevents automatic drive rebuild, which is not recommended for live systems or troubleshooting.
-

To disable the Periodic Drive Check Time:

1. From the Main Menu, choose **view and edit Configuration parameters** → **Drive-side SCSI Parameters** → **Periodic Drive Check Time**.

A list of Periodic Drive Check Time intervals is displayed.

2. Select **Disable**.

A confirmation message is displayed.

3. Select **Yes** to confirm.



Caution – Whenever you are troubleshooting your array or replacing components, there is an increased possibility of data loss. To prevent any possible data loss, back up user data to another storage device prior to replacing a disk drive or any other component.

Before you begin troubleshooting a JBOD or expansion unit, check the cables that connect the host to the JBOD or expansion unit. Look for bent pins, loose wires, loose cable shields, loose cable casing, and any FC cables with 90 degree or more bends in them. If you find any of these conditions, replace the cable.

The Figure B-4 flowchart provides troubleshooting procedures specifically for JBODs and expansion units. For additional troubleshooting flowcharts, see “Power Supply and Fan Module” on page 8-11 and “Drive LEDs” on page 8-13.

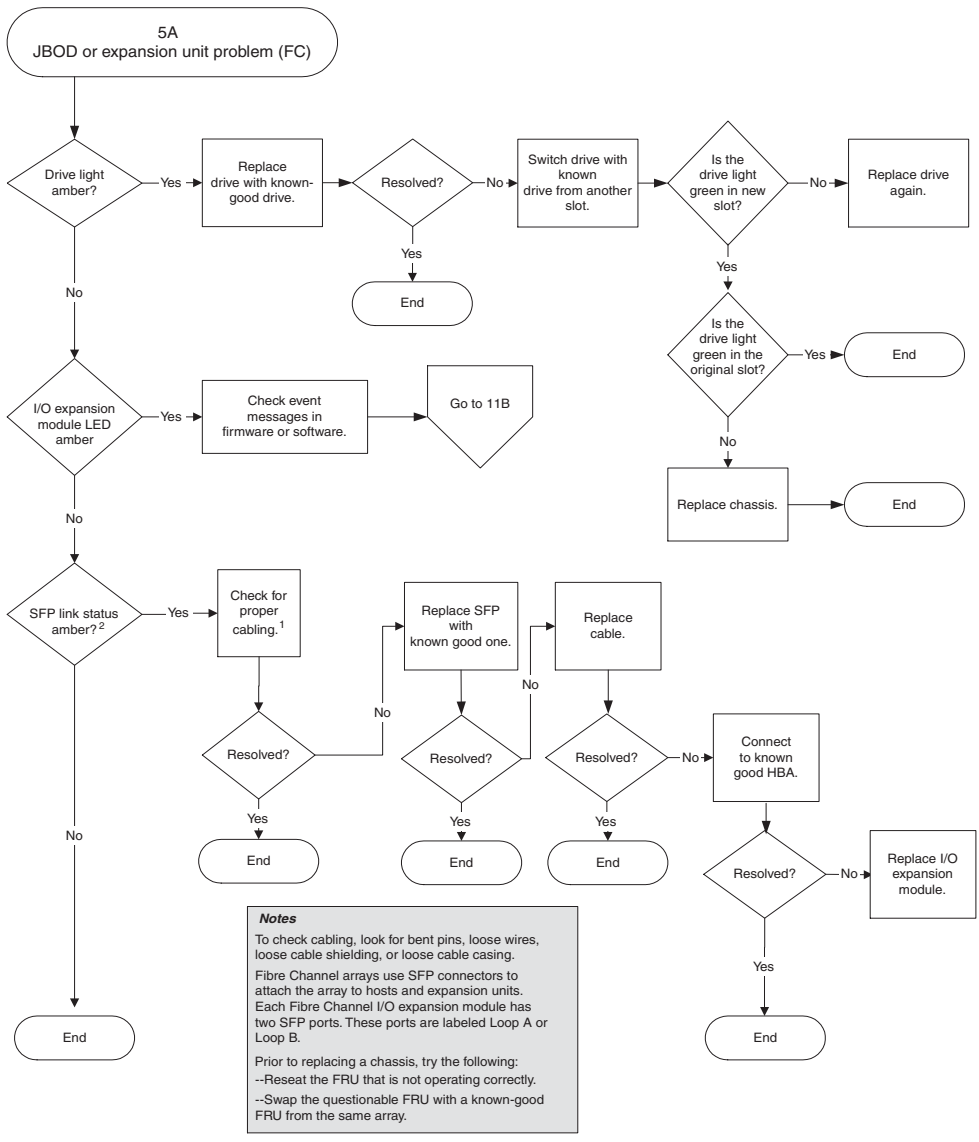


Figure B-4 JBOD or Expansion Unit Troubleshooting Flowchart, 1 of 2

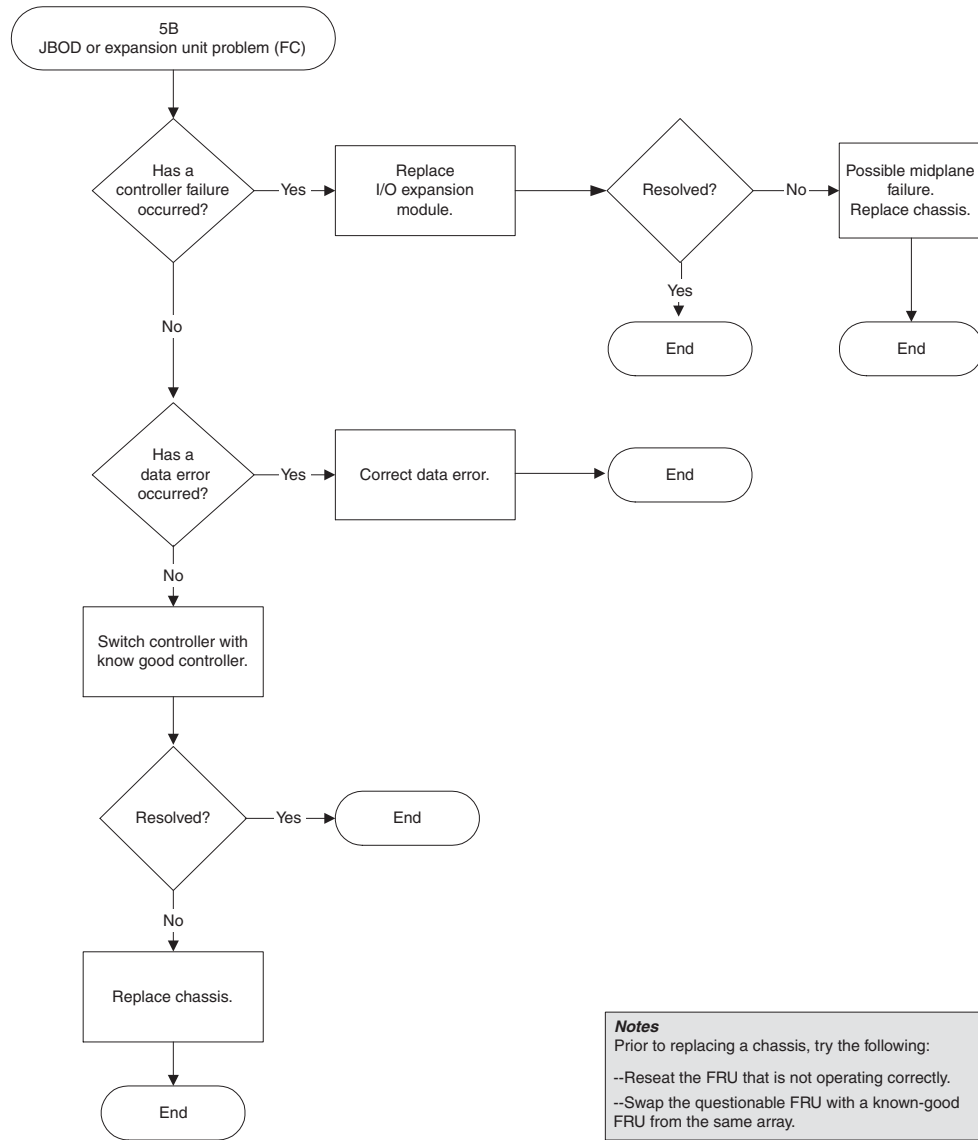


Figure B-5 JBOD or Expansion Unit Troubleshooting Flowchart, 2 of 2

B.12 Converting a JBOD to a RAID array

You can convert an FC JBOD (or expansion unit) into a single-controller or dual-controller FC RAID array. For instructions on how to do this, refer to the *SANnet II Family FRU Installation Guide*.

APPENDIX C

Failed Component Alarm Codes

This appendix describes failed component alarm codes.

Failed component alarm codes use Morse code dot and dash characters. The dot “.” is a short tone sounding for one unit of time. The dash “-” is a long tone sounding for three units of time.

Alarms, also referred to as beep codes, are presented in a sequence, starting with the critical component failure alarm, which alerts you to a component problem or failure or a firmware mismatch. This alarm is then followed by alarms for whichever components or assemblies have failed. Once the beep code sequence is complete, it repeats. To understand the beep codes, listen to the sequence of codes until you can break down the sequence into its separate alarms. You can also check your software or firmware for alarms, error messages, or logs to isolate and understand the cause. For example, in the case of a fan failure in a power supply, you might first hear the critical component failure alarm, followed by a power supply failure alarm from power supply 0 or power supply 1, followed by a fan failure event alarm. This sequence continues to repeat.

Table C-1 Failed Component Alarm Codes

Failure	Morse Code Letter	Morse Code Sound Pattern
Critical component failure or mismatch	8 dashes	-----
Power supply 0 failure	P0	. -- . ----
Power supply 1 failure	P1	. -- . . ----
Event alarm	E	.
Fan failure	F	. . - .
Voltage failure	V	. . . -
Temperature failure	T	-
SES/PLD firmware mismatch	R	. - .

See “Front-Panel LEDs” on page 6-2 for more information about the SES/PLD firmware mismatch mentioned in Table C-1.



Caution – Be particularly careful to observe and rectify a temperature failure alarm. If you detect this alarm, shut down the controller and the server as well if it is actively performing I/O operations to the affected array. Otherwise, system damage and data loss can occur.

APPENDIX D

Cable Pinouts

This appendix identifies the pinouts for each connector used in the SANnet II 200 FC, SATA, and SATA SE arrays. Topics covered are:

- “RJ-45 Connector” on page D-1
- “DB9 COM Port” on page D-2

D.1 RJ-45 Connector

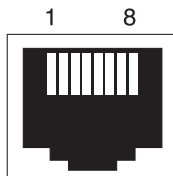


Figure D-1 Ethernet RJ-45 Socket 10/100BASE-T

Table D-1 Ethernet RJ-45 Pin Description

Pin No.	Description	Color
1	TX +	White with orange
2	TX –	Orange
3	RX +	White with green
4	Not connected	Blue
5	Not connected	White with blue

Table D-1 Ethernet RJ-45 Pin Description (*Continued*)

Pin No.	Description	Color
6	RX –	Green
7	Not connected	White with brown
8	Not connected	Brown

D.2 DB9 COM Port

The COM port is a female DB9 connector that requires a male DB9 null modem cable.

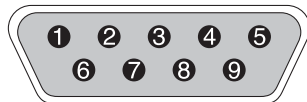


Figure D-2 RS-232 DB9 (EIA/TIA 574) View of the Male End

Table D-2 Pin Names

Pin No.	Name	Notes/Description
1	DCD	Data Carrier Detect
2	RD	Receive Data (also called RxD, Rx)
3	TD	Transmit Data (also called TxD, Tx)
4	DTR	Data Terminal Ready
5	GND	Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	RI	Ring Indicator

APPENDIX E

Configuring a Sun Server Running the Solaris Operating System

This appendix provides access information and LUN setup information needed when you connect a FC or SATA array to a server running the Solaris operating system. For a list of supported adapters, refer to the *SANnet II 200 FC, SATA, and SATA SE Array Release Notes*.

This information supplements the configuration steps presented in this manual and covers the following topics:

- “Setting Up the Serial Port Connection” on page E-1
- “Using the `tip` Command for Local Access to the Array” on page E-2
- “Determining the WWN in the Solaris Operating System” on page E-3

E.1 Setting Up the Serial Port Connection

The RAID controller can be configured by means of a Solaris workstation running a VT100 terminal emulation program, or by a Microsoft Windows terminal emulation program such as HyperTerminal.

Note – You can also monitor and configure a RAID array over an IP network with the SANscape program once you have assigned an IP address to the array. For details, see “Configuring a Host COM Port to Connect to a RAID Array” on page 4-26 and refer to the *SANscape User’s Guide*.

1. Use a null modem serial cable to connect the COM port of the RAID array to an unused serial port on a Solaris workstation.

A DB9-to-DB25 serial cable adapter is included in your package contents for connecting the serial cable to a DB25 serial port on a workstation.

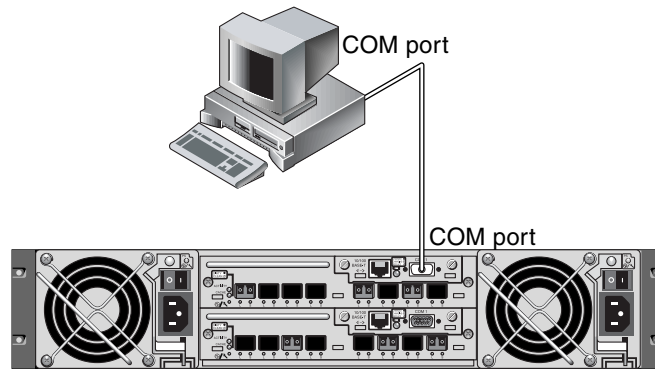


Figure E-1 RAID Array COM Port Connected Locally to the Serial Port of a Workstation

2. Power up the array.

It can take two or three minutes for both controllers to be initialized before communication is possible over the connection.

3. Set the serial port parameters on the workstation.

See “Configuring a Host COM Port to Connect to a RAID Array” on page 4-26 for the parameters to use.

E.2 Using the `tip` Command for Local Access to the Array

You can access the RAID COM port (DB9 connector on the controller module) locally with the following steps.

1. Connect the RAID array COM port to the serial port of a Solaris workstation, as shown in Figure E-1. Use the `tip` command to access the array locally:

```
# tip -38400 /dev/ttyn
```

where *n* is the COM port identifier. For instance, if you have connected the array to the COM port identified as `ttyb`, use this command:

```
# tip -38400 /dev/ttyb
```

2. Refresh your screen by holding down the **Control** key on your keyboard and pressing the letter **L** key on your keyboard.

E.3 Determining the WWN in the Solaris Operating System

Perform the following steps to determine the world wide name (WWN) of a newly installed HBA device.

1. Reboot the computer.
2. Type the following the command:

```
# luxadm probe
```

3. Scroll down the listing to see the Fibre Channel devices and the related WWNs.

A terminal window titled "Terminal" with a menu bar containing "Window", "Edit", "Options", and "Help". The terminal shows the command "falcon# luxadm probe" and its output:

```
falcon# luxadm probe
Found Fibre Channel device(s):
Node WWN:200000c0ff100010 Device Type:Disk device
Logical Path:/dev/rdisk/c6t220000C0FF100010d0s2
Node WWN:201000c0ff000010 Device Type:Disk device
Logical Path:/dev/rdisk/c6t221000C0FF000010d0s2
```

Figure E-2 Worldwide Name Information Displayed by the `luxadm` command.

APPENDIX F

Configuring a Microsoft Windows Server

This appendix provides platform-specific host installation and configuration information to use when you connect a FC, SATA, or SATA SE array to a host running the Windows 2000 Server, Windows 2000 Advanced Server, Windows 2003 Server, or Windows 2003 Advanced Server operating system. For convenience, these platforms will be referred to collectively in this document as “Windows Windows Server.”

The information in this appendix covers the following steps:

- “Setting Up the Serial Port Connection” on page F-1
- “Accessing the Firmware Application From a Microsoft Windows Server” on page F-4
- “Enabling a Microsoft Windows Server to Recognize New Devices and LUNs” on page F-4
- “Determining the Worldwide Name for Microsoft Windows Servers” on page F-8

F.1 Setting Up the Serial Port Connection

The RAID controller can be configured by means of a host system running a VT100 terminal emulation program such as HyperTerminal in Microsoft Windows.

Note – You can also monitor and configure a RAID array over an IP network using the RAID firmware or SANscape software after you assign an IP address to the array. For details, see “Setting Up Out-of-Band Management Over Ethernet” on page 4-28, and refer to the *SANscape User’s Guide*.

1. Use a null modem serial cable to connect the COM port of the RAID array to an unused serial port on your host system.

A null modem cable has serial signals swapped for connecting to a standard serial interface.

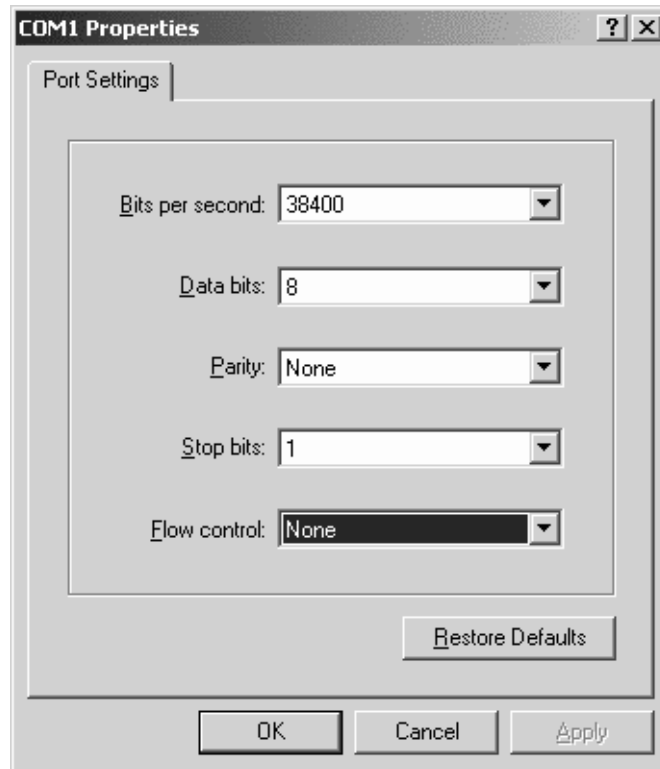
Note – A DB9-to-DB25 serial cable adapter is included in your package contents for connecting the serial cable to a DB25 serial port on your host if you do not have a DB9 serial port.

2. Power up the array.
3. On the server, choose **Start** → **Programs** → **Accessories** → **Communications** → **HyperTerminal**.
4. Type a name and choose an icon for the connection.
5. In the Connect To window, select the COM port from the **Connect using:** drop-down menu for that array.



6. Click **OK**.
7. In the Properties window, set the serial port parameters using the drop-down menus.
Set serial port parameters to:
 - 38,400 baud
 - 8 data bits

- 1 stop bit
- No parity



8. To save the connection and its settings, choose File → Save.
The connection file name is *connection-name* where *connection-name* is the name you gave this HyperTerminal connection in Step 4.
9. To make a connection shortcut on your desktop:
 - a. Choose **Start** → **Find** → **For Files or Folders**.
 - b. Enter *connection-name* and click the **Search Now** button.
 - c. Highlight and right-click on the file name in the Search Results window.
 - d. Choose **Create Shortcut** and click **Yes**.You are now ready to configure your array.

F.2 Accessing the Firmware Application From a Microsoft Windows Server

To access the array from a Microsoft Windows Server through a serial port, use the HyperTerminal connection you configured in “Setting Up the Serial Port Connection” on page F-1 or install a VT100 terminal emulation program and use the parameters described there.

To access the array through an Ethernet connection, follow the procedures in “Setting Up Out-of-Band Management Over Ethernet” on page 4-28. To access the command prompt described there from a Microsoft Windows Server, perform this step:

- Choose **Programs** → **Accessories** → **Command Prompt**.

F.3 Enabling a Microsoft Windows Server to Recognize New Devices and LUNs

Before beginning this procedure, make sure that you are using a supported FC host bus adapter (HBA) such as a QLogic QLA2310 or QLogic QLA2342. Refer to the *SANnet II 200 FC, SATA, and SATA SE Array Release Notes* for current information about which HBAs are supported.

Also make sure that you are using a supported driver for your HBA. For the QLA2310 or QLA2342, use driver version 8.1.5.13 or later.

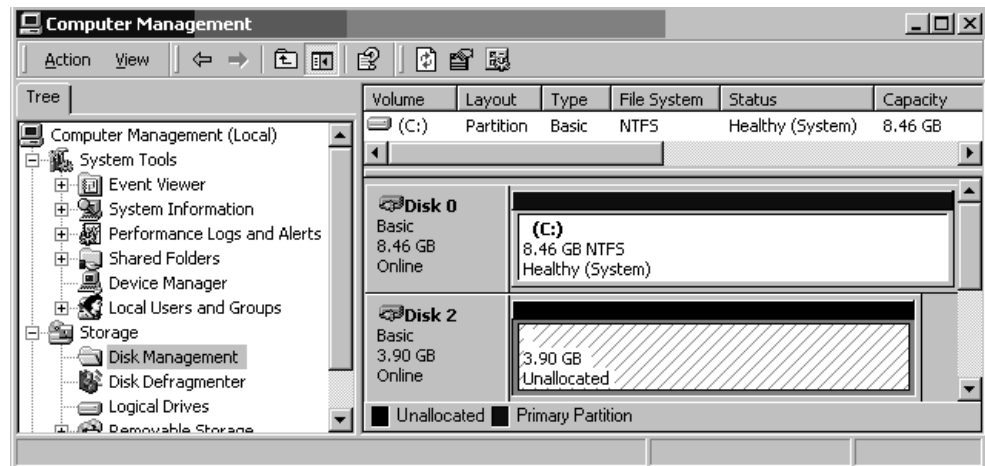
Note – When the Microsoft Windows operating system recognizes the array’s SCSI Enclosure Services (SES) processor and identifies it as a FC or SATA Enclosure, it might prompt you to supply a driver. This is standard plug-and-play behavior when unknown devices are encountered, but no device driver is necessary. If you see this prompt, simply click **Cancel**. If you have multiple arrays, you might see this prompt more than once. Each time you see this prompt, click **Cancel**.

1. Boot your system and verify that the HBA basic input/output system (BIOS) recognizes your new FC device.

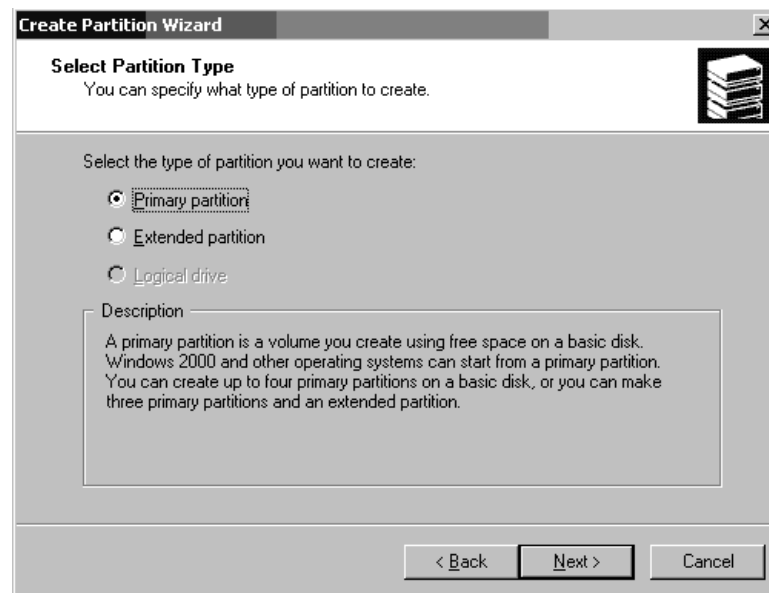
Note – While your system is starting up, you should see your new Fibre Channel devices.

2. If a Found New Hardware Wizard is displayed, click **Cancel**.
You are now ready to partition and format your new devices.
3. Open the **Disk Management** folder.
 - a. Right-click on the **My Computer** icon to display a pop-up menu.
 - b. Choose **Manage**.

- c. Select the **Disk Management** folder.
 - d. If a Write Signature and Upgrade Disk Wizard is displayed, click Cancel.
A “Connecting to Logical Disk Manager Server” status message is displayed.
4. Select your new device when it is displayed.

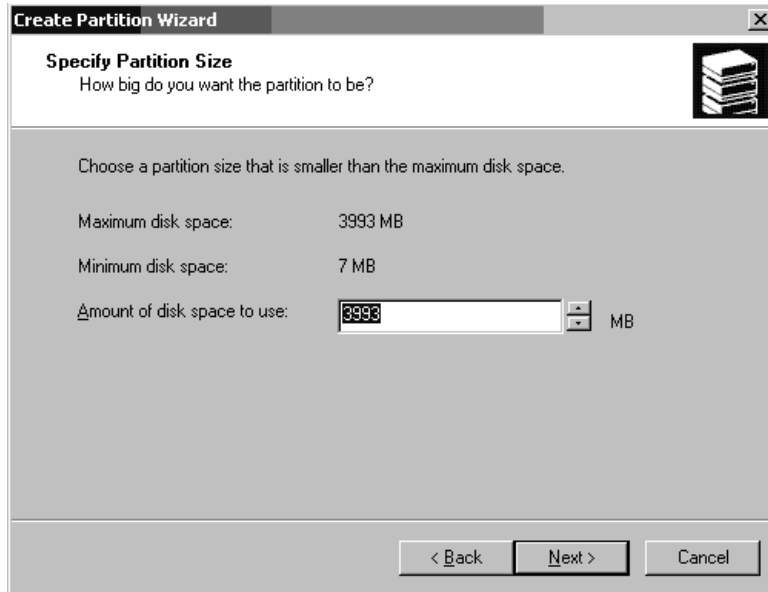


5. Right-click in the Unallocated partition of your device to display a pop-up menu.
6. Choose **Create Partition** from the pop-up menu.
The Create Partition wizard is displayed.

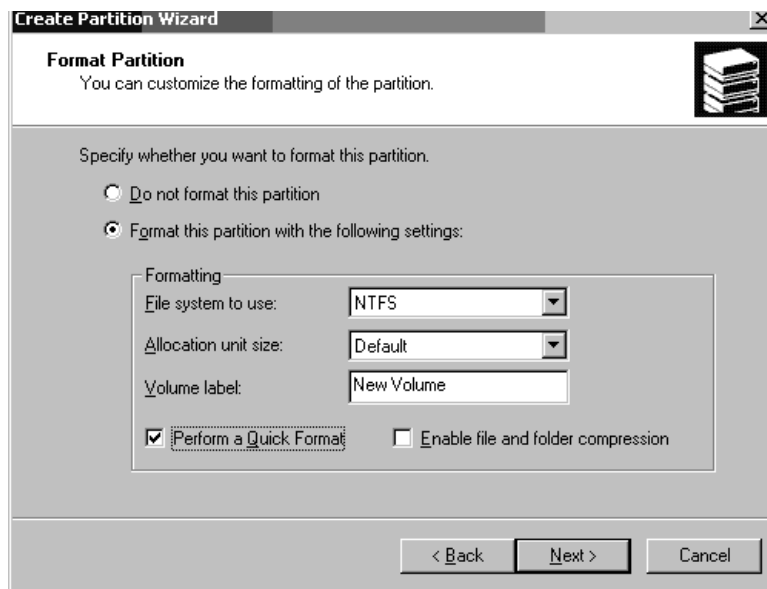


7. Select **Primary partition** and click **Next**.

8. Specify the amount of disk space to use or accept the default value, and click **Next**.

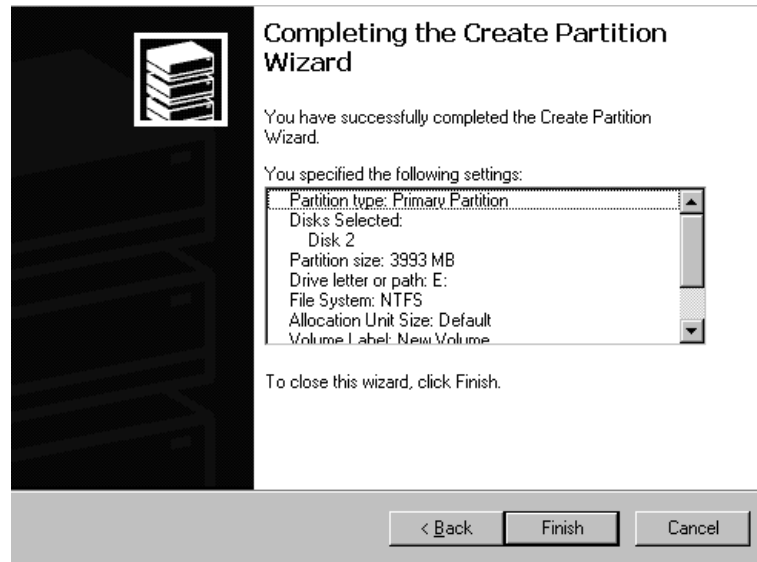


9. Assign a drive letter, if desired, and click **Next**.
10. Select **Format this partition with the following settings**.
 - a. Specify NTFS as the “File system to use.”
 - b. Make sure the **Perform a Quick Format** checkbox is selected.



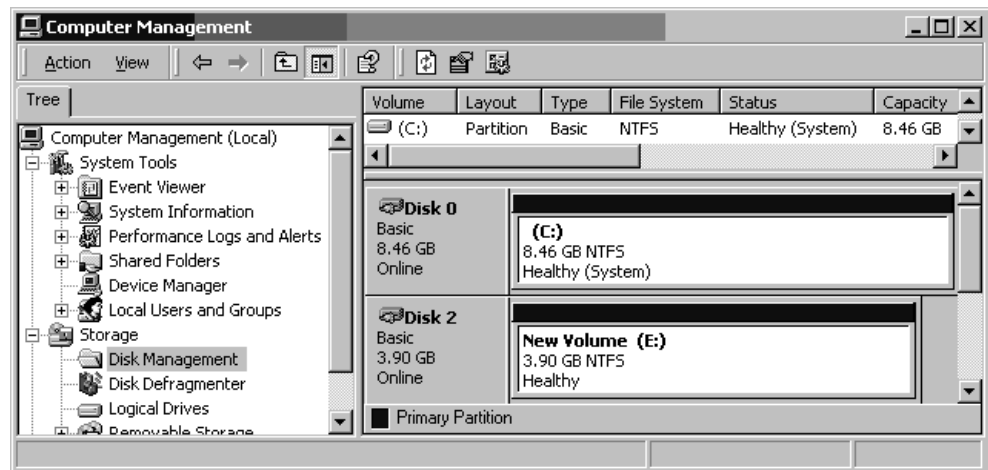
c. Click **Next**.

A confirmation dialog box displays the settings you have specified.



11. Click **Finish**.

The new partition is formatted and the formatted partition is identified as NTFS in the Computer Management window.



12. Repeat Step 5 through Step 11 for any other new partitions and devices you want to format.

F.4 Determining the Worldwide Name for Microsoft Windows Servers

Before you can create host filters, you need to know the worldwide name (WWN) for the FC HBA that connects your host to your FC array.

1. Boot a specific host system and note the BIOS version and HBA card models connected to your host.
2. Access the HBA card's BIOS with the appropriate command (**alt-q** or **control-a** are commonly used).
If the host has multiple HBA cards, select the card that is connected to the storage.
3. Scan the card to look for devices attached to it (usually with the Scan Fibre Devices or the Fibre Disk Utility).

The node name (or similar label) is the WWN. The following example shows the node name for a Qlogic card.

ID	Vendor	Product	Rev	Node Name	Port ID
0	Qlogic	QLA22xx Adapter	B	210000E08B02DE2F	0000EF

Refer to the *SANnet II Family RAID Firmware User's Guide* for more information about creating host filters.

APPENDIX G

Configuring a Linux Server

This appendix provides access information and LUN setup information needed when you connect a FC, SATA, or SATA SE array to a server running the Linux operating system. For a list of supported adapters, refer to the *SANnet II 200 FC, SATA, and SATA SE Array Release Notes*.

This information supplements the configuration steps presented in this manual and covers the following topics:

- “Setting Up the Serial Port Connection” on page G-1
- “Accessing the Firmware Application From a Linux Server” on page G-3
- “Checking the Adapter BIOS” on page G-4
- “Multiple LUN Linux Configuration” on page G-5
- “Making an ext3 File System for Linux” on page G-5
- “Creating a File System” on page G-6
- “Creating a Mount Point and Mounting the File System Manually” on page G-7
- “Mounting the File System Automatically” on page G-7
- “Determining the Worldwide Name for Linux Hosts” on page G-8

G.1 Setting Up the Serial Port Connection

The RAID controller can be configured by means of a host system running a VT100 terminal emulation program or running a terminal emulation program such as Minicom.

Note – You can also monitor and configure a RAID array over an IP network with the SANscape program after you assign an IP address to the array. For details, see “Setting Up Out-of-Band Management Over Ethernet” on page 4-28 and refer to the *SANscape User’s Guide*.

To access the controller firmware through the serial port, perform the following steps:

1. Use a null modem cable to communicate via the serial port of the array.

Connect the serial null modem cable to the array and to ttyS0 (COM1), ttyS1 (COM2), ttyS2 (COM3), or ttyS3 (COM4).

Note – A DB9-to-DB25 serial cable adapter is included in your package contents for connecting the serial cable to a DB25 serial port on your host if you do not have a DB9 serial port.

2. Power on the array.
3. After the array is powered up, power on the Linux server and log in as **root** (or become **superuser** if you logged in as a user).
4. Open a terminal session and type:

```
minicom -s
```

Press **Return**. The setup menu is displayed, where you define which serial ports to use, baud rate, hand shake settings, and flow control.

5. Set serial port parameters on the server.

Set serial port parameters to:

- 38,400 baud
 - 8 bit
 - 1 stop bit
 - No parity
- a. At the configuration screen, use the arrow keys to highlight Serial Port Settings and press **Return**.
 - b. If A is not correct, press the letter **A** and the cursor goes to line A.
 - c. Backspace and edit to select the correct serial port:

```
/dev/ttyS(x)
```

where *x* is the proper serial port connecting the server to the array.

After you edit the line, press Return and the cursor goes back to the line **Change which Settings?**

- d. If E is not correct, press the letter **E** and the cursor goes to line E. Backspace and change the line to:

```
38400 8N1
```

After you edit the line, press **Return** and the cursor goes back to the line **Change which Settings?**

- e. Set F to **no**. When pressing F, toggle from **yes** to **no**.
- f. Set G to **no**. When pressing G, toggle from **yes** to **no**.
- g. Press the **Escape** key to return to the configuration screen.
- h. In the configuration menu, use the arrow keys to highlight **Save setup as dfl** and press **Return**.
A “configuration saved” confirmation message is displayed.
- i. Highlight **Exit from Minicom** in the configuration menu, and press **Return**.

G.2 Accessing the Firmware Application From a Linux Server

After you have set the Minicom serial port parameters, use the Minicom utility to access the controller firmware with the following steps:

1. To start the Minicom program from the terminal window, type:

```
minicom
```

A pop-up window stating “Initializing Modem” is displayed. When initialization is complete, the following banner is displayed:

```
Welcome to Minicom 2.00.0
Options: History Buffer, F-Key Macros, Search History
Buffer, I18n
Compiled on Jun 23 2002, 16:14:20
Press "CTRL-A" Z for help on special keys.
```

2. Press **Ctrl-I** to connect to the array and access the firmware application.
3. In the main screen, choose **Terminal (VT100 Mode)** and view the Main Menu commands used to configure the array.

G.3 Checking the Adapter BIOS

When booting the server, watch for the HBA card BIOS message line to be displayed. Then press the proper sequence of keys to get into the HBA BIOS (<Alt-Q> for FC Qlogic HBAs).

The keystrokes are listed on the screen when the adapter is initializing. If your HBA has multiple interfaces on it, they will all show up in the main screen of the BIOS software. You must make the same changes on every interface unless one of the interfaces is going to be bootable.

After you enter the Qlogic HBA BIOS, perform the following steps.

1. If you have more than one interface, highlight the top interface listed under Adapter Type and press Return.
2. If you only have one interface, it is already highlighted; press **Return**.
3. Highlight **Configuration Setting** and press **Return**.
4. Highlight **Host Adapter Settings** and press **Return**.
5. Move down to Host Adapter BIOS and make sure it is enabled; if not, press the **Return** key and it toggles from disabled to enabled.

The setting should be enabled.

6. Press **Escape** and go back to Configuration Settings. Highlight **Selectable Boot Settings** and press **Return**.
This is where you can make the interface bootable or not bootable.
7. Highlight **Select Boot Device**. Press the **Return** key to toggle from disabled to enabled.
 - Select **Disabled** if this is not going to be a bootable device.
 - Select **Enabled** if this is going to be bootable device.
8. Press **Escape** until you get back to Configuration Settings.
9. Highlight **Extended Firmware Settings** and press **Return**.
10. On the Extended Firmware Settings menu, highlight **Connection Option** and press **Return**.

A screen lists three types of connection:

- 0 – Loop only - - - for connecting to loop type devices
- 1 – Point to point only - - - for connecting to fabric switches
- 2 – Loop preferred, otherwise point to point

11. Select a connection type.
 - If you are connecting to a loop device, select **0** and press **Return**.
 - If you are connecting to a fabric device or switch, select **1** and press **Return**.Do not select 2.

12. Press **Escape** until a screen is displayed that says “Configuration setting modified.” Highlight **Save changes** and press **Return**.
13. Return to the Fast!UTIL Options. Highlight **Scan Fibre Devices** and press **Return**.
This menu option scans all 126 channels to see if there are any devices attached; the devices are displayed after the scan. If there are no devices attached, it takes some time to scan. If there are devices attached, the scan usually finds them right away.
14. If you are satisfied with the configuration, press **Escape** until you get to **Configuration Settings**.
15. Highlight **Exit Fast!UTIL** and press **Return**.
A screen is displayed that says Exit Fast!UTIL.
16. Highlight **Reboot System** and press **Return**.
The server reboots.

G.4 Multiple LUN Linux Configuration

By default, the Linux kernel does not support multiple LUNs. To support multiple LUNs, modify the kernel with the following steps:

1. Log in as **root**, or become a **superuser** if you are logged in as a user.
2. Add this line to the end of the `/etc/modules.conf` file and save the file:

```
options scsi_mod max_scsi_luns=255
```

3. At the system prompt, enter this command and press Return:

```
mkinitrd -f /boot/initrd-2.4.9-e.3.img 2.4.9-e.3
```

The 2.4.9-e.3 entries refer to the current kernel. To find out your current kernel, type `uname -r` and substitute your kernel information in place of the 2.4.9-e.3 entries.

4. Reboot the server.
 - To halt the server completely, use **shutdown -h now**.
 - To reboot automatically after the shutdown is complete, use **shutdown -r now**.

G.5 Making an ext3 File System for Linux

The following procedure for labeling and partitioning drives using **fdisk** applies to an ext3 file system. To discover which disk you want to label, you need to determine what device it is.

1. To list all devices and their paths, start a terminal session and type:

```
fdisk -l
```

Record the device names and paths that you plan to use.

2. Type:

```
fdisk /dev/sd(x) x= a,b,c,...
```

A banner is displayed for the specified array device. The last statement displays a prompt.

3. Type **m** to display the menu.
4. On the displayed menu, select “n” for the command action and press **Return**.
Two choices are displayed:

```
e extended  
p primary partition (1-4)
```

Note – Only four primary partitions are allowed per array. All additional partitions must be added as extended LUNs under one primary partition. Only one primary partition is allowed to have extended LUNs.

5. For the first partition, select **p**.
When several options appear, keep the defaults. You can reconfigure this after you understand the process and see what it looks like. Add additional primary partitions and extended partitions as needed.
6. After you have completed accepting the defaults and are back at the “Command (m or help):” screen, press **W** to save the configuration and exit **fdisk**.
Your partition is ready for a file system now.

G.6 Creating a File System

1. Log in as **root**, or become **superuser** if you are logged in as a user.

2. Take the device that you ran **fdisk** on and run the following command to create an ext3 file system:

```
mkfs -t ext3 /dev/sdb(x)
```

where *x* is the partition on which you are creating a file system. Replace *x* with **1** because there is only one partition.

G.7 Creating a Mount Point and Mounting the File System Manually

1. Go to the directory where you want to create a directory that will be the mount point. Then type the following command:

```
mkdir name
```

where *name* is the name of the new directory.

2. To mount your file system, type the following:

```
mount /dev/sdb(x) / directory-path
```

where *x* is 1 for this partition and the *directory-path* is the directory that was created and its location.

G.8 Mounting the File System Automatically

You can label the partition so that it can be entered in the **fstab** file for mounting the partition automatically at bootup. The use of the label and **fstab** file is a faster operation than mounting the file system manually with a device path.

1. Type the following command to add a label to the partition:

```
e2label /dev/sdb(x) / directory-path
```

where *x* is 1 for this partition and *directory-path* is the directory that was created and its location.

2. Edit the **/etc/fstab** file and add the following line:

```
LABEL=/mount/point /mount/point ext3 1 2
```

3. Save the file.
4. To verify that `fstab` was set up correctly, type:

```
mount -a
```

If the mount point and the `fstab` file are correctly set up, no errors are displayed.

5. To verify that the file system is mounted and list all mounted file systems, type:

```
df -k
```

6. To unmount the file system, type:

```
umount /filesystem-name
```

G.9 Determining the Worldwide Name for Linux Hosts

Before you can create host filters, you need to know the worldwide name (WWN) for the FC HBA that connects your host to your FC array.

1. Boot a specific host system and note the BIOS version and HBA card models connected to your host.
2. Access the HBA card's BIOS with the appropriate command (Alt-Q or Control-A are commonly used).

If the host has multiple HBA cards, select the card that is connected to the array.

3. Scan the card to look for devices attached to it (usually with the Scan Fibre Devices or the Fibre Disk Utility).

The node name (or similar label) is the WWN. The following example shows the node name for a Qlogic card.

ID	Vendor	Product	Rev	Node Name	Port ID
0	Qlogic	QLA22xx Adapter	B	210000E08B02DE2F	0000EF

Refer to the *SANnet II Family RAID Firmware User's Guide* for more information about creating host filters.

APPENDIX H

Configuring an IBM Server Running the AIX Operating System

This appendix provides platform-specific host installation and configuration information to use when you connect an FC or SATA array to an IBM server running the AIX operating system.

The SANnet II 200 FC, SATA, and SATA SE arrays support versions 4.3.3 and 5.1L of the IBM AIX operating system in dual-path configurations using SANpath failover drivers for IBM AIX.

The information in this appendix covers the following steps:

- “Setting Up a Serial Port Connection” on page H-1
- “Accessing the Firmware Application From an IBM Server Running AIX” on page H-2
- “Identifying the Device on Which You Will Create a Logical Volume” on page H-4
- “Using SMIT to Enable an AIX Host to Recognize New LUNs” on page H-4
- “Creating a Volume Group” on page H-5
- “Creating a Logical Volume” on page H-6
- “Creating a File System” on page H-6
- “Mounting the New File System” on page H-7
- “Verifying That the New File System Is Mounted” on page H-7
- “Determining the Worldwide Name for IBM Servers Running AIX” on page H-8

H.1 Setting Up a Serial Port Connection

The RAID controller can be configured by means of a host system running a VT100 terminal emulation program or by a Microsoft Windows terminal emulation program such as HyperTerminal.

If you are planning to access your array over an IP network or through a terminal server and only want to connect through a serial port for the initial configuration of the array, it is not necessary to configure a serial port connection from your IBM host. For convenience, installers frequently perform the initial array configuration using a serial port on a portable computer.

If you want to use a Microsoft Windows portable computer for this initial array configuration, see “Setting Up the Serial Port Connection” on page F-1 for Windows 2000 systems.

If you prefer to connect through a serial port on your IBM server, consult the hardware information for your IBM host system to locate a serial port you can use for configuring the array. The system documentation also tells you what device file to use to access that port. Then set the serial port parameters on the server. See “Configuring a Host COM Port to Connect to a RAID Array” on page 4-26 for the parameters to use.

Note – The next section also shows how to use the Kermit utility to set these parameters.

H.2 Accessing the Firmware Application From an IBM Server Running AIX

The RAID controller can be configured from the host system by means of terminal emulators such as Kermit.

Note – You can also monitor and configure a RAID array over an IP network with the SANscape program after you assign an IP address to the array. For details, see “Setting Up Out-of-Band Management Over Ethernet” on page 4-28 and refer to the *SANscape User's Guide*.

To access the controller firmware through the serial port, perform the following steps:

1. Connect the serial null modem cable to the disk array and to the serial port on the IBM server.

Note – A DB9-to-DB25 serial cable adapter is shipped with the disk array for connecting the serial cable to a DB25 serial port on your host if you do not have a DB9 serial port.

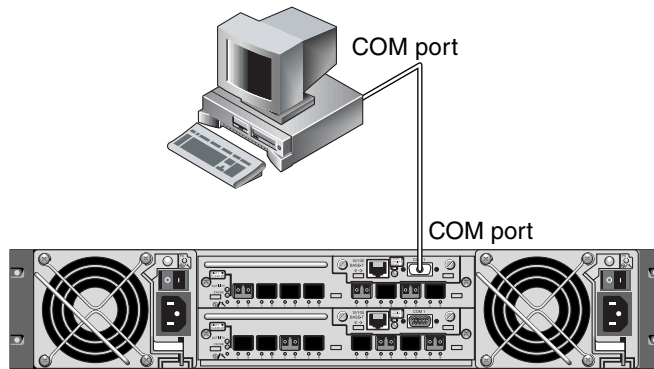


Figure H-1 RAID Array COM Port Connected Locally to the Serial Port of a Host System

2. Power on the array.
3. After the array is powered up, power on the IBM server and log in as **root**, or become **superuser** if you are currently logged in as a user.
4. Start the Kermit program and set the parameters as shown.
Use the device-specific name for the serial port you are using. In the example, the serial port being configured is **/dev/tty0p1**.

```
# kermit
Executing /usr/share/lib/kermit/ckermite.ini for UNIX...
Good Morning!
C-Kermit 7.0.197, 8 Feb 2000, for HP-UX 11.00
Copyright (C) 1985, 2000,
Trustees of Columbia University in the City of New York.
Type ? or HELP for help.
(/) C-Kermit>set line /dev/tty0p1
(/) C-Kermit>set baud 38400
/dev/tty0p1, 38400 bps
(/) C-Kermit>set term byte 8
(/) C-Kermit>set carrier-watch off
(/) C-Kermit>C
Connecting to /dev/tty0p1, speed 38400.
The escape character is Ctrl-\ (ASCII 28, FS)
Type the escape character followed by C to get back,
or followed by ? to see other options.
-----
```

Note – To return to the Kermit prompt type **Ctrl ** and then **C**. To exit Kermit, first return to the Kermit prompt and then type **exit**.

H.3 Identifying the Device on Which You Will Create a Logical Volume

1. Display all the defined disk devices on your system.

```
# lsdev -Cc disk
```

A list of defined disk devices is displayed along with information about those devices.

2. Identify the name of the device on which you want to create a logical volume, for example, `hdisk7`.
3. Verify that the disk you've identified is the one you want.

```
# lspcfg -v -l device-name
```

Detailed information about the device you specified is displayed.

4. Examine the manufacturer information and model information to make sure you have specified the device you want.

H.4 Using SMIT to Enable an AIX Host to Recognize New LUNs

The simplest way to configure your IBM AIX host to use your array is to use the System Management Interface Tool (SMIT). SMIT can be used with a graphical user interface (GUI) if your host is configured with a graphics card or if you want to export your display to an X-Windows terminal. SMIT can also be used with an ASCII interface that can be accessed through an ASCII terminal or console window on another system on the network. Because the ASCII interface is available on all systems, it is used as an example in the remainder of this appendix, but either interface can be used to perform the procedures described here. In addition, the same operations can be performed directly from the command line using standard AIX system administration commands.

Note – Use the Enter key when you have finished filling out a screen to advance to the next screen. Use the keystroke combinations shown on the screen to move back to previous screens.

1. Start SMIT using the ASCII interface to display the System Management screen.

```
# smit -a
```

2. Choose **System Storage Management (Physical and Logical Storage)** from the System Management menu.
3. Choose **Logical Volume Manager** from the System Storage Management menu.
The Logical Volume Manager menu is displayed on the Logical Volume Manager screen. You will be using menu options from this menu to create a volume group and then a logical volume within this volume group.

Logical Volume Manager
Volume Groups
Logical Volumes
Physical Volumes
Paging Space

Volume groups are a way of dividing and allocating disk storage capacity. Volume groups can be used to subdivide a large partition of storage into smaller units of usable space called *logical volumes*.

Each volume group is divided into logical volumes, which are seen by applications as individual disks. Logical volumes can contain their own file systems.

The underlying physical storage in a volume group consists of one or more physical volumes. A physical volume can be a single physical disk or a partition of a disk array. In this appendix, the physical volume is the disk device you identified in “Identifying the Device on Which You Will Create a Logical Volume” on page H-4.

H.5 Creating a Volume Group

1. Choose **Volume Group** from the Logical Volume Manager menu.
2. Choose **Add a Volume Group** from the Volume Groups menu.
3. Type the name you want to give the volume group next to **VOLUME GROUP** name.
4. Next to **PHYSICAL VOLUME** name, type the name of the disk device you identified in “Identifying the Device on Which You Will Create a Logical Volume” on page H-4.
An “ARE YOU SURE” confirmation screen is displayed.
5. Confirm this message to display a status screen.
When the volume group is created, a status screen displays “Command: OK.”
6. Return to the Volume Groups screen to activate the new volume group.

7. Choose **Activate a Volume Group** from the Volume Groups menu.
8. Next to VOLUME GROUP name, type the name you gave the volume group.
When the volume group is activated, a status screen displays “Command: OK.”

H.6 Creating a Logical Volume

1. Return to the Logical Volume Manager screen.
2. Choose **Logical Volumes** from the Logical Volume Manager menu to display the Logical Volumes screen.
3. Choose **Add a Logical Volume** from the Logical Volumes menu to display the Add a Logical Volume screen.
4. Type the name you gave the volume group next to VOLUME GROUP name.
The Add a Logical Volume screen is displayed.
5. Type the name you want to give the new logical volume next to LOGICAL VOLUME (new).
6. Type the number of partitions you want to create on the new logical volume next to Number of LOGICAL PARTITIONS.
7. Type the values you want to use for the other parameters on the Add a Logical Volume screen or accept the default values.
When the logical volume is created, a status screen displays “Command: OK” and displays the name of the new logical volume.

H.7 Creating a File System

The following steps create a file system on the new logical volume.

1. Return to the System Storage Management (Physical and Logical Storage) screen.
The System Storage Management screen is displayed.
2. Choose **File Systems** from the System Storage Management menu to display the File Systems screen.
3. Choose **Add →Change →Show →Delete File Systems** from the File Systems menu.
4. Choose **Journalized File System** to display the Journalized File System screen.
5. Choose **Add a Journalized File System** from the Journalized File System menu.
6. Choose **Add a Standard Journalized File System** to display the Volume Group Name screen.
The Volume Group Name screen displays the names of available volume groups.

7. Move the cursor to highlight the name of the volume group you created in “Creating a Volume Group” on page H-5.

The Add a Standard Journaled File System screen is displayed.

8. Specify the size of the file system you want to create by typing the number of blocks you want next to SIZE of file system (in 512-byte blocks).
9. Next to MOUNT POINT, type the directory name (and path, if desired) on which you want to mount the new file system.

Note – If the mount point directory does not exist, it is created.

When the file system is created, a status screen displays “Command: OK,” the Journaled File System, the mount point, and the size of the file system.

H.8 Mounting the New File System

1. Return to the File Systems screen.
2. Choose **List All File Systems** from the File Systems menu to see the names of all file systems.
3. Identify the name of the file system you created in the Name column, for example, **ldev/lv00**.
4. Choose **Mount a File System** from the File Systems menu to display the Mount a File System screen.
5. Type the name of the file system you identified in Step 3 next to FILE SYSTEM name.
6. Type the name of the mount point you specified next to DIRECTORY over which to mount.

When the file system is mounted, a status screen displays “Command: OK.”

7. Exit SMIT.

H.9 Verifying That the New File System Is Mounted

1. Use the mount command to verify that the logical volume is mounted correctly.

```
# mount
```

The mounted file systems and directories are displayed.

2. Examine the list to make sure your new file system is mounted at the mount point you specified.

3. Display the attributes of the new file system.

```
# df -k mount-point
```

H.10 Determining the Worldwide Name for IBM Servers Running AIX

Before you can create host filters, you need to know the worldwide name (WWN) for the FC HBA that connects your host to your FC array.

For supported IBM HBAs, perform these steps:

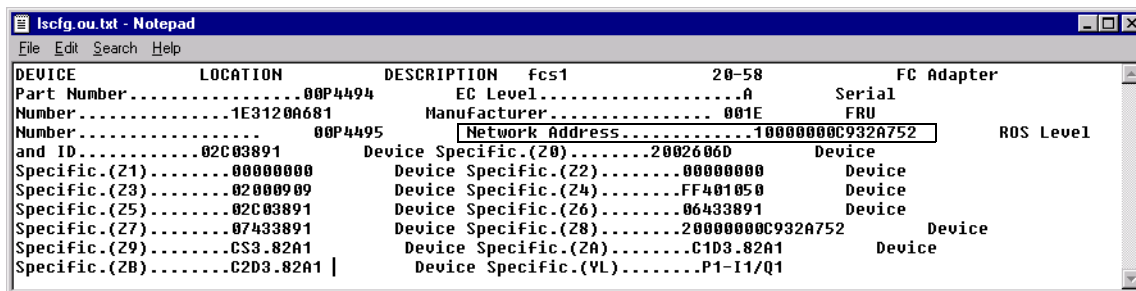
1. Determine the device name by typing the command:

```
# lspcfg | grep fc
```

2. Type the following command:

```
# lspcfg -vl device-name
```

Output similar to the following is displayed. The network address is the WWN.



```
lspcfg.ou.txt - Notepad
File Edit Search Help
DEVICE          LOCATION      DESCRIPTION  fcs1          20-58        FC Adapter
Part Number.....00P4494      EC Level.....A          Serial
Number.....1E3120A681      Manufacturer.....001E      FRU
Number.....00P4495      Network Address.....1000000C932A752      ROS Level
and ID.....02C03891      Device Specific.(Z0).....2002606D      Device
Specific.(Z1).....00000000      Device Specific.(Z2).....00000000      Device
Specific.(Z3).....02000909      Device Specific.(Z4).....FF401050      Device
Specific.(Z5).....02C03891      Device Specific.(Z6).....06433891      Device
Specific.(Z7).....07433891      Device Specific.(Z8).....2000000C932A752      Device
Specific.(Z9).....CS3.82A1      Device Specific.(ZA).....C1D3.82A1      Device
Specific.(ZB).....C2D3.82A1 |      Device Specific.(VL).....P1-I1/Q1
```

Figure H-2 Network Address Corresponding to WWN

APPENDIX I

Configuring an HP Server Running the HP-UX Operating System

This appendix provides platform-specific host installation and configuration information to use when you connect a FC or SATA array to an HP server running the HP-UX operating system.

The FC, SATA, and SATA SE arrays support the HP-UX operating system Level 11.0 and Level 11.i in dual-path configurations using multipath failover drivers for the HP-UX operating system.

The information in this appendix covers the following steps:

- “Setting Up a Serial Port Connection” on page I-1
- “Accessing the Firmware Application From an HP Server Running HP-UX” on page I-2
- “Attaching the Disk Array” on page I-4
- “Logical Volume Manager” on page I-4
- “Definitions of Common Terms” on page I-5
- “Creating a Physical Volume” on page I-5
- “Creating a Volume Group” on page I-6
- “Creating a Logical Volume” on page I-7
- “Creating an HP-UX File System” on page I-8
- “Mounting the File System Manually” on page I-8
- “Mounting the File System Automatically” on page I-8
- “Determining the Worldwide Name for HP-UX Hosts” on page I-9

I.1 Setting Up a Serial Port Connection

The RAID controller can be configured by means of a host system running a VT100 terminal emulation program or by a Microsoft Windows terminal emulation program such as Hyperterminal.

If you are planning to access your array over an IP network or through a terminal server and only want to connect through a serial port for the initial configuration of the array, it is not necessary to configure a serial port connection from your HP host. For convenience, installers frequently perform the initial array configuration using a serial port on a portable computer.

If you want to use a Microsoft Windows portable computer for this initial array configuration, see “Setting Up the Serial Port Connection” on page F-1 for Windows 2000 systems.

If you prefer to connect through a serial port on your HP server, consult the hardware information for your HP host system to locate a serial port you can use for configuring the disk array. The system documentation also tells you what device file to use to access that port. Then set the serial port parameters on the server. See “Configuring a Host COM Port to Connect to a RAID Array” on page 4-26 for the parameters to use.

Note – The next section also shows how to use the Kermit utility to set these parameters.

Once you have configured your serial port, follow the instructions in the next section.

I.2 Accessing the Firmware Application From an HP Server Running HP-UX

The RAID controller can be configured from the host system by means of terminal emulators such as `cu` or Kermit. These instructions show the use of Kermit. For information about `cu`, refer to `cu(1)`.

Note – You can also monitor and configure a RAID array over an IP network with the SANscape program after you assign an IP address to the array. For details, see “Setting Up Out-of-Band Management Over Ethernet” on page 4-28 and refer to the *SANscape User's Guide*.

To access the controller firmware through the serial port, perform the following steps:

1. Use a null modem serial cable to connect the COM port of the RAID array to an unused serial port on your host system.

A null modem cable has serial signals swapped for connecting to a standard serial interface.

Note – A DB9-to-DB25 serial cable adapter is included in your package contents for connecting the serial cable to a DB25 serial port on your host if you do not have a DB9 serial port.

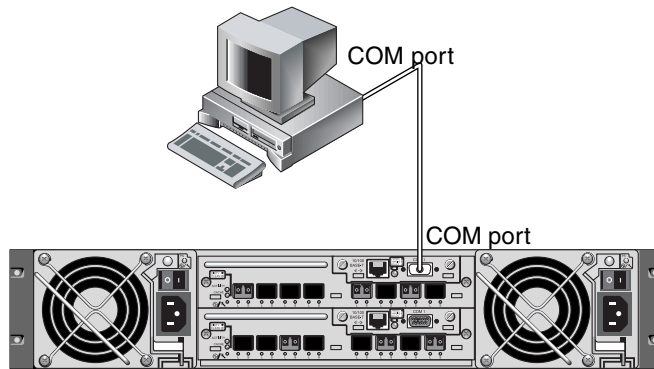


FIGURE I-1 RAID Array COM Port Connected Locally to the Serial Port of a Host System

2. Power on the array.
3. After the array is powered up, power on the HP server and log in as **root**, or become **superuser** if you are logged in as a user.
4. Start the Kermit program and set the parameters as shown.

Use the device-specific name for the serial port you are using. In the example, the serial port being configured is `/dev/tty0p1`.

```
# kermit
Executing /usr/share/lib/kermit/ckermite.ini for UNIX...
Good Morning!
C-Kermit 7.0.197, 8 Feb 2000, for HP-UX 11.00
Copyright (C) 1985, 2000,
Trustees of Columbia University in the City of New York.
Type ? or HELP for help.
(/) C-Kermit>set line /dev/tty0p1
(/) C-Kermit>set baud 38400
/dev/tty0p1, 38400 bps
(/) C-Kermit>set term byte 8
(/) C-Kermit>set carrier-watch off
(/) C-Kermit>C
Connecting to /dev/tty0p1, speed 38400.
The escape character is Ctrl-\ (ASCII 28, FS)
Type the escape character followed by C to get back,
or followed by ? to see other options.
```

Note – To return to the Kermit prompt, type **Ctrl ** and then **C**. To exit Kermit, first return to the Kermit prompt and then type **exit**.

I.3 Attaching the Disk Array

The simplest way to configure a disk array is to use System Administration Manager (SAM), HP-UX's system administration tool. If SAM is not installed on your system, or if you prefer to use the command-line interface, the following procedures guide you through the task. For more information, consult the HP document, *Configuring HP-UX for Peripherals*:

1. Use the **ioscan** command to determine what addresses are available on the HBA to which you will be attaching the array.
2. Access the firmware application on the array and set the SCSI IDs of the host channels you will be using.
3. Map the partitions containing storage that you want to use to the appropriate host channels.
Partitions must be assigned to LUNs in sequential order, beginning at LUN 0.
4. Halt the operating system using the **shutdown** command.
5. Turn off all power to peripheral devices and then to the server.
6. Attach one or more host channels of the FC or SATA array to the SCSI interface cards in the host using the supplied SCSI cables.
7. Turn on the power to the FC or SATA array and all other peripheral devices. After they are initialized, power on the server and boot HP-UX. During the boot process, the operating system recognizes the new disk devices and builds device files for them.
8. Verify that you can see the new storage resources by running the **ioscan** command. You are now ready to use the storage.

Note – If you create and map new partitions to the array, you can have them recognized by the operating system without rebooting. Run the **ioscan** and the **insf** commands to discover the resources and to create their device files.

I.4 Logical Volume Manager

The Logical Volume Manager (LVM) is a disk management system provided by HP in all versions of HP-UX 11. The LVM allows you to manage storage as logical volumes. This section describes some concepts used by the LVM and explains how to create logical volumes on your SANnet II 200 Fibre Channel Array. For more detailed information about the LVM, consult `lv(7)` and the HP publication *Managing Systems and Workgroups: Guide for HP-UX System Administration* (HP part number B2355-90742).

As with many system administration tasks, you can use SAM to create and maintain logical volumes. However, some functions can only be performed with HP-UX commands. The procedures in this appendix are performed using the command-line interface rather than SAM.

I.5 Definitions of Common Terms

Volume groups are HP-UX's method for dividing and allocating disk storage capacity. Volume groups can be used to subdivide a large partition of storage into smaller units of usable space called *logical volumes*.

Each volume group is divided into logical volumes, which are seen by the applications as individual disks. They can be accessed as either character or block devices and can contain their own file systems.

The underlying physical storage in a volume group consists of one or more *physical volumes*. A physical volume can be a single physical disk or a partition of a disk array.

Each physical volume is divided into units called *physical extents*. The default size of these units is 4 Mbyte, but can range in size from 1 Mbyte to 256 Mbyte. The maximum number of physical extents that a volume group can contain is 65,535. With the default size of 4 Mbyte, this limits the size of the volume group to 255 Gbyte.

To create a volume group larger than 255 Gbyte, you must increase the size of the physical extents when creating the volume group. Refer to `vgcreate(1m)` for further information.

I.6 Creating a Physical Volume

To use a storage resource in the LVM, it must first be initialized into a physical volume (also called an *LVM disk*).

1. Log in as **root**, or become **superuser** if you are not logged in with root user privileges.
2. Select one or more partitions on the array that you want to use. The output of `ioscan(1M)` shows the disks attached to the system and their device names:

```
# ioscan -fnC disk
Class I  H/W Path      Driver  S/W State  H/W Type  Description
-----
disk  1  0/12/0/0.6.0  sdisk   CLAIMED  DEVICE   SANnet II 200F R
/dev/dsk/c12t6d2 /dev/rdisk/c12t6d2
```

3. Initialize each partition as an LVM disk with the **pvcreate** command. For example, type:

```
# pvcreate /dev/rdisk/c12t6d2
```



Caution – This process results in the loss of any data that resides on the partition.

I.7 Creating a Volume Group

The volume group contains the physical resources that you can use to create usable storage resources for your applications.

1. Create a directory for the volume group and a device file for the group in that directory:

```
# mkdir /dev/vgmynewvg
# mknod /dev/vgmynewvg/group c 64 0x060000
```

The name of the directory is the name of the volume group. By default, HP-UX uses names of the format *vgNN*, but you can choose any name that is unique within the list of volume groups.

In the preceding example, the **mknod** command has the following arguments:

- The fully qualified path name of the new device file *group*
- The letter *c* indicating a character device file
- The major number 64 (used for all volume groups)
- A minor number of the form **0xNN0000**, where *NN* is the two-digit hexadecimal representation of the volume group number (06 in the example)

To associate the physical volume with a volume group, use the **vgcreate** command:

```
# vgcreate /dev/vgmynewvg /dev/dsk/c12t6d2
```

To verify the creation and view the volume group properties, use the **vgdisplay** command:

```
# vgdisplay vg02
--- Volumegroups ---
--
VG Name                /dev/vg02
```

VG Write Access	read/write
VG Status	available
Max LV	255
Cur LV	0
Open LV	0
Max PV	16
Cur PV	1
Act PV	1
Max PE per PV	2167
VGDA	2
PE Size (Mbytes)	4
Total PE	2167
Alloc PE	0
Free PE	2167
Total PVG	0

In the output of **vgdisplay**, the Total PE field displays the number of physical extents in the volume group.

The size of each physical extent is displayed in the PE Size field (the default is 4 Mbyte), so the total capacity of this volume group is 2167 x 4 Mbyte = 8668 Mbyte.

The Alloc PE field shows the number of physical extents allocated to logical volumes. At this point, the Alloc PE field is zero because we have not assigned any of this volume group's capacity to logical volumes.

I.8 Creating a Logical Volume

To create a logical volume within the volume group, use the **lvcreate** command with the **-L** option to specify the size of the logical volume in megabytes. The logical volume size should be a multiple of the physical extent size. In this example, a logical volume of 4092 Mbyte is created:

```
# lvcreate -L 4092 /dev/vg02
```

Both character and block device files for the new logical volume are created in the volume group directory:

```
# ls /dev/vg02  
  
group   lvoll   rlvoll
```

Applications should use these names to access the logical volumes. Unless you specify otherwise, HP-UX creates names in the form shown in the example. To specify custom names for logical volumes refer to `vgcreate(1M)`.

I.9 Creating an HP-UX File System

The following command creates a file system on the logical volume created in the previous steps.

```
# /sbin/newfs -F vxfs /dev/vgmynewvg/rlvoll
```

I.10 Mounting the File System Manually

The process of incorporating a file system into the existing directory structure is known as “mounting the file system.” The files, although present on the disk, are not accessible to users until they are mounted.

1. Create a directory to be the mount point for your new file system:

```
# mkdir /usr/local/myfs
```

2. To mount your file system, type the following:

```
# mount /dev/vgmynewvg/lvoll /usr/local/myfs
```

I.11 Mounting the File System Automatically

By placing information about your file system in the `fstab` file, you can have HP-UX mount the file system automatically during bootup. You can also use the name of the mount point in mount commands that you issue from the console.

1. Make a copy of the existing `fstab` file:

```
# cp /etc/fstab /etc/fstab.orig
```

2. To include the file system created in the example, add the following line to the file `/etc/fstab`:

```
/dev/vg0mynewvg/lvol1 /usr/local/myfs vxfs delaylog 0 2
```

Refer to the entry for `fstab(4)` for details about creating `/etc/fstab` entries.

3. To check to see if `fstab` was set up correctly, type:

```
# mount -a
```

If the mount point and the `fstab` file are correctly set up, no errors are displayed.

4. To verify that the file system is mounted and list all mounted file systems, type:

```
# bdf
```

5. To unmount the file system, type:

```
# umount /usr/local/myfs
```

I.12 Determining the Worldwide Name for HP-UX Hosts

Before you can create host filters, you need to know the worldwide name (WWN) for the FC HBA that connects your host to your FC array.

For supported HP-UX host HBAs, follow these steps:

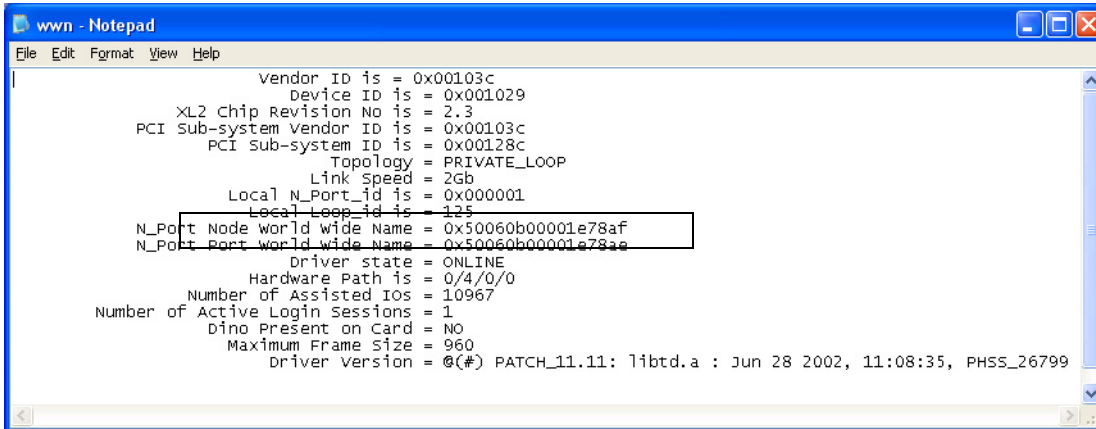
1. Determine the device name by typing the command:

```
# ioscan -fnC fc
```

2. Type:

```
# fcmsutil/device-name/
```

Output similar to the following is displayed:



```
wwn - Notepad
File Edit Format View Help
Vendor ID is = 0x00103c
Device ID is = 0x001029
XL2 Chip Revision No is = 2.3
PCI Sub-system Vendor ID is = 0x00103c
PCI Sub-system ID is = 0x00128c
Topology = PRIVATE_LOOP
Link Speed = 2Gb
Local N_Port_id is = 0x000001
Local Loop_id is = 125
N_Port Node world wide Name = 0x50060b00001e78af
N_Port Port world wide Name = 0x50060b00001e78af
Driver state = ONLINE
Hardware Path is = 0/4/0/0
Number of Assisted Ios = 10967
Number of Active Login Sessions = 1
Dino Present on Card = NO
Maximum Frame Size = 960
Driver version = @(#) PATCH_11.11: libtd.a : Jun 28 2002, 11:08:35, PHSS_26799
```

The Node worldwide name shown is the WWN you use when configuring the RAID controller.

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