Sun StorageTek™ 2500 Series Array Hardware Installation Guide

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Contents

Before You Begin

Refer to the following documents to make sure physical dimensions, service clearances, and power connections are ready for the installation of your Sun StorageTek 2500 Series array.

- *Sun StorageTek 2500 Series Array Regulatory and Safety Compliance Manual*
- *Sun StorageTek 2500 Series Array Site Preparation Guide*

About this Guide

This *Sun StorageTek 2500 Series Array Hardware Installation Guide* describes how to install rack-mounting rails and array trays in a cabinet. This document also provides information to physically setup and connect your array to a host. Afterwards, information is provided to apply power and to add network functionality, including storage management (multipath/failover), IP addressing, iSCSI, and DHCP.

The terminology used in this document refers to the Sun StorageTek 2500 Series arrays. There are three styles of controller trays, each with different host interface ports (iSCSI, SAS, or FC). There is also the drive expansion tray, which enables the Sun StorageTek 2500 Series arrays to have more disk drives attached. The components that slide into the trays are called CRUs or modules. The terms you might see in this document are: controller (or controller module), power-fan module, I/O module, and disk drive.

Array management, data host management, and remote command line interface (CLI) functions are performed by the Sun StorageTek Common Array Manager (CAM) software. For installation and initial configuration of the Sun StorageTek 2500 Series array, including firmware upgrades, initial array setup, partitioning domains, configuring storage, and configuring IP addressing, see the *Sun StorageTek Common Array Manager Software Installation Guide*.

Related Documentation

Application	Title	Part Number
Site planning information	*Sun StorageTek 2500 Series Array Site Preparation Guide*	820-0024-*nn*
Late-breaking information not included in the information set	*Sun StorageTek 2500 Series Array Release Notes*	820-3511-*nn*
	Sun StorageTek Common Array Manager Release Notes	820-2935-*nn*
Instructions for installing the CAM host management software	*Sun StorageTek Common Array Manager Software Installation Guide*	819-2934-*nn*
Quick reference information for the CLI	*Sun StorageTek 6130, 2500 Series, and 6540 Arrays sscs(1M) CLI Quick Reference*	820-2932-*nn*
Regulatory and safety information	*Sun StorageTek 2500 Series Array Regulatory and Safety Compliance Manual*	820-0025-*nn*
Instructions for installing an expansion cabinet	*Sun StorageTek Expansion Cabinet Installation and Service Manual*	805-3067-*nn*
Instructions for installing the Sun Rack 900/1000 cabinets	*Sun Rack Installation Guide*	816-6386-*nn*

In addition, the Sun StorageTek 2500 Series Array includes the following online documentation:

- Sun StorageTek Common Array Manager online help contains system overview and configuration information.
- Service Advisor provides guided FRU replacement procedures with system feedback. You can access Service Advisor from the Sun StorageTek Common Array Manager software.
- sscs man page commands for the CLI provides help on man page commands available on a management host or on a remote CLI client.

Documentation, Support and Training

You can view, print, or purchase a broad selection of other Sun documentation, including localized versions, at:

http://www.sun.com/documentation

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Sun StorageTek 2500 Series Array Hardware Installation Guide, part number 820-0015-12.

Tray Overviews

This chapter describes the process of installing the Sun StorageTek 2500 Series Array. It contains the following sections:

Sun StorageTek 2500 Series Array Overview

The Sun StorageTek 2540 Array, the Sun StorageTek 2530 Array, the Sun StorageTek 2510 Array, and the Sun StorageTek 2501 Expansion Tray are a family of storage products that provide high-capacity, high-reliability storage in a compact configuration.

The Sun StorageTek 2500 Series Array is a modular, rack-mountable controller tray. It is scalable from a single controller tray configuration to a maximum configuration of one controller tray and three additional drive expansion trays. This would create a storage array configuration with a total of 48 drives attached behind the controllers (one controller tray and three drive expansion trays).

All four of the trays can be installed in the following cabinets:

■ Sun Rack 900/1000 cabinet

■ Sun StorageTek Expansion cabinet

■ Any 19-inch wide, 4-post, EIA-compatible rack or cabinet with a front-to-back depth between vertical cabinet rails of 61cm to 91cm (24 in. to 36 in.). The cabinet can have threaded or un-threaded cabinet rails.

The Sun StorageTek 2540 Array, the Sun StorageTek 2530 Array and the Sun StorageTek 2510 Array contains disk drives for storing data. The controller tray, typically with two controller modules, provides the interface between a data host and the disk drives. The Sun StorageTek 2540 Array provides a Fibre Channel connection between the data host and the controller tray. The Sun StorageTek 2530 Array provides a Serial Attached SCSI (SAS) connection between the data host and the controller tray. The Sun StorageTek 2510 Array provides iSCSI connections using Ethernet between the data host and the controller tray.

The Sun StorageTek 2501 drive expansion tray provides additional storage. You can attach the drive expansion tray to any of the 2500 series arrays.

You manage the array with the Sun StorageTek Common Array Manager software.

FIGURE 1-1   Sun StorageTek 2500 Series Array Connection Example Using Fibre Channel
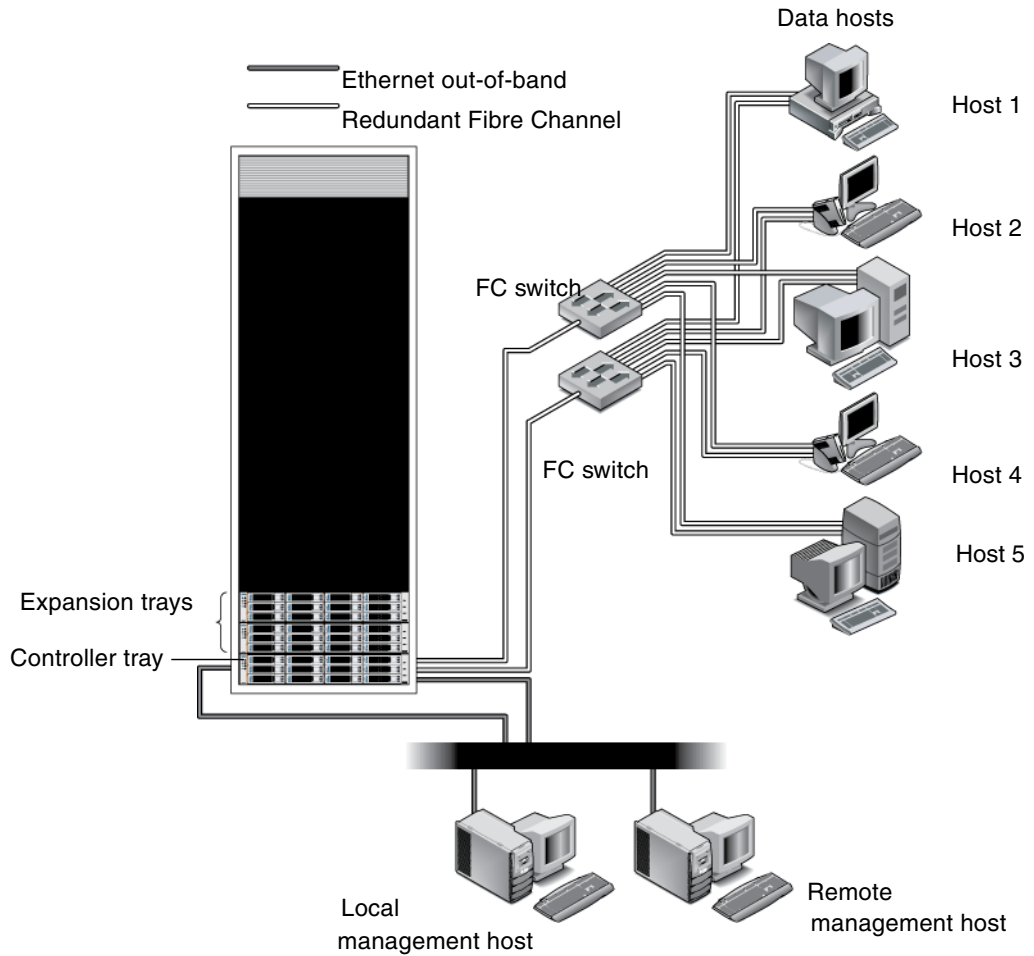
Installation Tasks Checklist

The following checklist (TABLE 1-1) outlines the tasks required for installing the Sun StorageTek 2500 Array hardware and tells you where you can find detailed procedures. To ensure a successful installation, perform the tasks in the order in which they are presented.

Before you begin to install the array, do the following:

- Read the *Sun StorageTek 2500 Series Array Release Notes* for any late-breaking information related to the installation of the array.
- Prepare the site as described in these books:
  - *Sun StorageTek 2500 Series Array Regulatory and Safety Compliance Manual*
  - *Sun StorageTek 2500 Series Array Site Preparation Guide*

The *Sun StorageTek 2500 Series Array Site Preparation Guide* has information about the physical dimensions of the trays as well as the service clearance and the power requirements of the cabinet. This document should be used to prepare your site layout prior to the installation.

TABLE 1-1   Sun StorageTek 2500 Series Array Hardware Installation Checklist

Step	Installation Task	Where to Find Procedure
1.	Review the hardware overview in this chapter.	
2.	Unpack the cabinet and move it into position.	Unpacking guide attached to the outside of the shipping carton
3.	Install and secure the cabinet.	• *Sun StorageTek Expansion Cabinet Installation and Service Manual* • *Sun Rack Installation Guide*
4.	Unpack the rackmounting kit and check its contents.	"Preparing the Universal Rail Kit" on page 28
5.	Unpack the tray box and check its contents.	"Preparing the Tray" on page 29
6.	Prepare the cabinet for installation.	"Preparing the Cabinet" on page 30
7.	Attach the rails to the cabinet.	"Attaching the Rails to a Cabinet" on page 31
8.	Mount the controller tray and expansion trays in the cabinet.	"Installing a Tray in a Cabinet" on page 40
9.	Attach the power cables.	"Connecting the Power Cables" on page 45

TABLE 1-1 Sun StorageTek 2500 Series Array Hardware Installation Checklist

Step	Installation Task	Where to Find Procedure
10.	Cable the controller tray and expansion trays.	"Inter-tray Cabling" on page 45
11.	Connect the management host.	"Connecting the Management Host" on page 55
12.	Connect the data hosts.	"Connecting Data Hosts to the 2510 Array" on page 59
		"Connecting Data Hosts to the 2530 Array" on page 63
		"Connecting Data Hosts to the 2540 Array" on page 69
13.	Turn on the power.	"Powering On the Storage Array" on page 78

When the tasks in TABLE 1-1 are complete, you can install the Common Array Manager software on an external management host, install and upgrade firmware from the management host, and perform initial array setup and system configuration. See the *Sun StorageTek Common Array Manager Software Installation Guide* for complete information on software-related tasks. For iSCSI configuration, see Appendix A.

Front-Access Components of the Trays

Components that are accessed through the front of the Sun StorageTek 2540 Array, the Sun StorageTek 2530 Array, and the Sun StorageTek 2510 Array are identical in appearance.

The front-access components include the following:

- **End caps** – Plastic, removable caps on the right and left side of the tray. Numbers on the side of the right end cap indicate the numbering of the drives.
- **Disk drives** – Twelve removable disk drives
- **LEDs (light emitting diodes)** – Four LEDs located on the left-side end cap

1. End Caps
2. Disk Drives
3. Tray LEDs
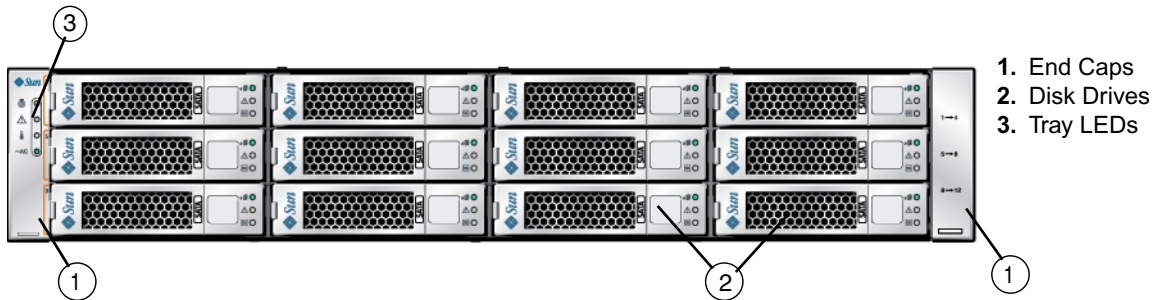
LEDs on the Front of the Trays

The four LEDs on the front of the Sun StorageTek 2540 Array, the Sun StorageTek 2530 Array, the Sun StorageTek 2510 Array, and the Sun StorageTek 2501 Expansion tray are identical in appearance and function. The LEDs are located on the left-side endcap of the tray.

FIGURE 1-3 Location of the LEDs on the Front of the Trays
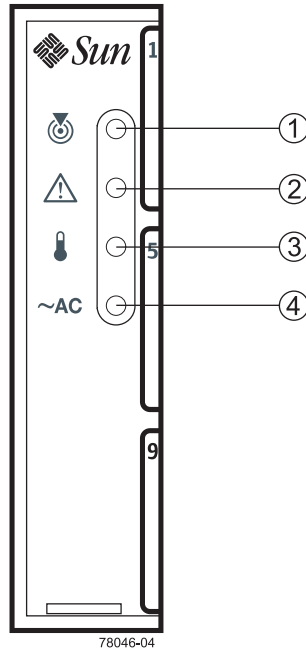
TABLE 1-2 Description of the LEDs on the Front of the Trays

Location	LED	Color	On	Off
1	Locate	White	The locate light is turned on manually by CAM to help you find the tray that requires attention.	Normal condition
2	Service Action Required (Fault)	Amber	A component within the tray requires attention.	The components in the tray are operating normally.
3	Over Temperature	Amber	The tray temperature has reached the high-end of its operating range and requires attention.	The tray temperature is within operational range.
4	Power	Green	Tray is powered on.	Tray is not powered on.

Rear-Access Components of the Trays

This section reviews the components that can be accessed from the back of a:

- Sun StorageTek 2500 Series controller tray
- Sun StorageTek 2501 drive expansion tray

Sun StorageTek 2500 Series Array

Components that are accessed from the rear of the Sun StorageTek 2500 Series Array controller trays include:

- **Controller Modules –** Two removable controller modules (controllers), typically identified as Controller A (on the left) and Controller B (on the right).
- **Power-fan assemblies** – Two removable power supply modules with cooling fans. The power-fan assembly is identical and interchangeable to the power-fan assemblies used for Sun StorageTek 2501 drive expansion tray.

FIGURE 1-4 Controller Tray Rear-Access Components

1. Controller Modules
2. Power-Fan Assemblies
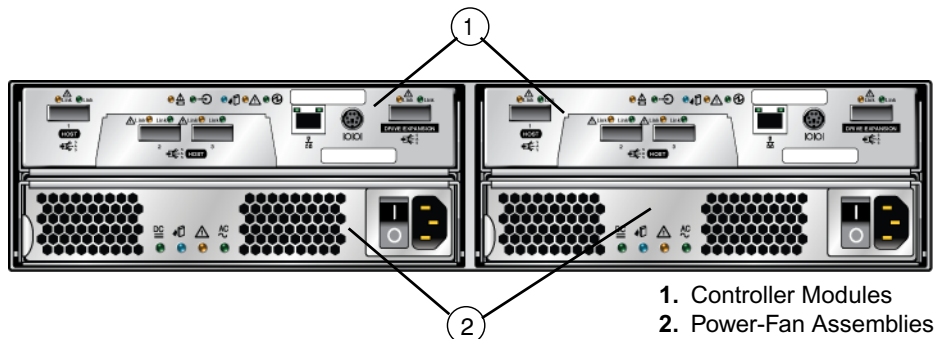
Sun StorageTek 2501 Drive Expansion Tray

Components that are accessed from the rear of the Sun StorageTek 2501 Drive Expansion Tray are:

- **I/O Modules (IOMs)** – Two removable input/output modules

- **Power-fan assemblies** – Two removable power supply modules with cooling fans. The power-fan assembly is identical and interchangeable with all power-fan assemblies used in the 2500 Series trays.

FIGURE 1-5   Drive Expansion Tray Rear-Access Components

1. I/O Modules
2. Power-Fan Assemblies
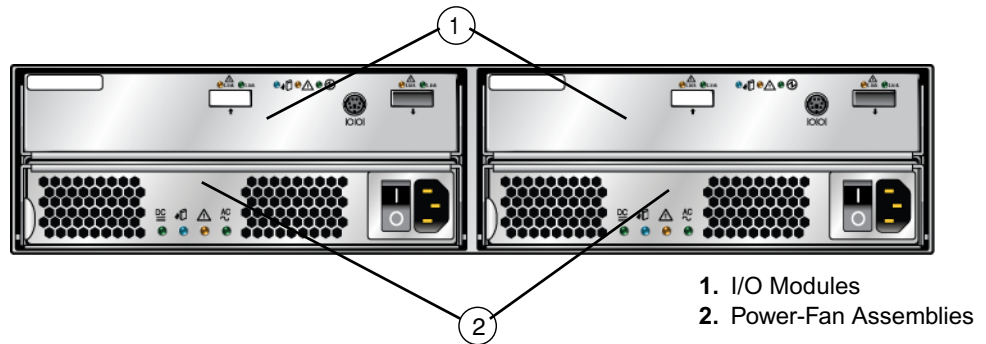
Controllers

The Sun StorageTek 2540, 2530, and 2510 Arrays usually have two controllers (single-controller configurations are available, but are not recommended). The controllers manage the input/output (I/O) between the volumes and the data host. The controllers have an Ethernet connection to the management host for out-of-band management and contain a battery that provides backup power to the cache memory for up to three days in the event of a power loss.

Because each controller tray contains two controllers, the data path through one controller can fail and the other controller provides a redundant data path to all of the disk drives. If a controller fails, you can replace the failed controller while the power is applied and the storage array is processing data (a hot swap).

Note – Replacement controllers might not be at the same level of firmware. If necessary, use CAM to upgrade the firmware for the new controller so that it matches the configuration database (baseline firmware release level or later).

Each controller has a media access control (MAC) address that identifies it on the network. The MAC address for a controller is on a label on the controller. The MAC address label is attached to the controller at the rear of the tray near the serial port.

The tray ID numbers are set by the trays themselves on first power on. However, you can change the setting through the Common Array Manager software. The tray ID numbers on both of the controllers in one controller tray are identical under optimal operating conditions.

Sun StorageTek 2540 Array

This Fibre Channel (FC) controller tray provides the following capabilities:

- Two Fibre Channel data host ports per controller with 1, 2, or 4 Gb/s data host connection speed
- One drive expansion tray Serial Attached SCSI (SAS) port with 3 Gb/s drive expansion tray connection speed
- 512-MB or 1-GB mirrored cache
- Maximum connection of 48 disk drives (one controller tray and three drive expansion trays)

When fiber-optic cables are used to connect to the data host, a Small Form-factor Pluggable (SFP) transceiver is required to make the connection.

FIGURE 1-6 Sun StorageTek 2540 Array Ports

1. Drive Expansion Tray Port (SAS Out)
2. Ethernet Management Host Port
3. Fibre Channel Data Host Ports
4. RS-232 Port (Serial Port)
5. Not Used
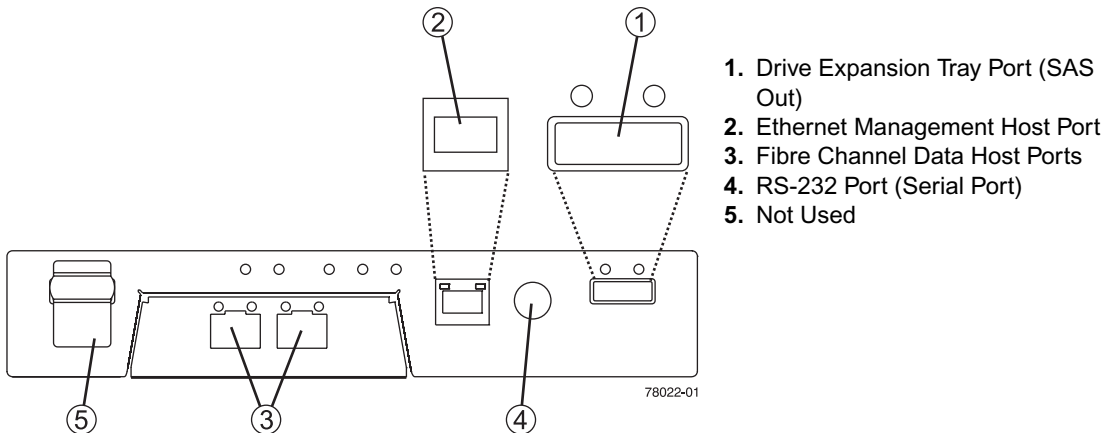
SFP Transceivers

You can connect the Sun StorageTek 2540 Array to either copper host interface cables or fiber optic host interface cables. If you use fiber-optic cables, you must install an SFP transceiver in each interface port on the controller where a fiber-optic cable is to be installed. The SFP transceiver is required to translate the optical signals from the fiber-optic cable into digital signals for the controller.

Note – The SFP transceiver shown might look different from those that are shipped with your controller tray. The difference does not affect transceiver performance.

FIGURE 1-7   SFP Transceiver for the Sun StorageTek 2540 Array

1. Data Host Port
2. SFP Transceiver
3. Fiber-Optic Cable
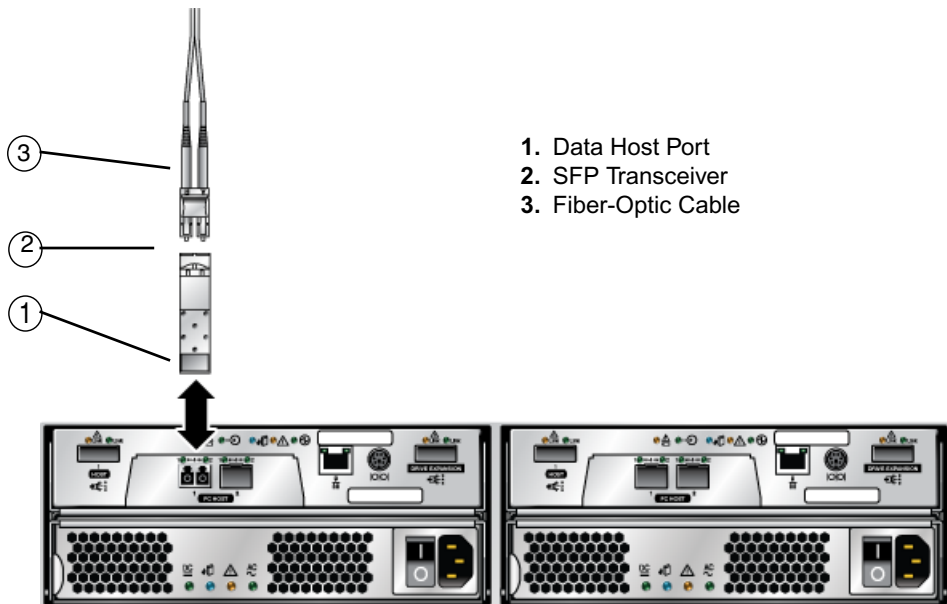
Sun StorageTek 2530 Array

This SAS controller tray provides the following capabilities:

- Three SAS host ports with 3 Gb/s host connection speed
- One drive expansion tray SAS port for the drive channel with 3 Gb/s drive expansion tray connection speed
- 512-MB or 1-GB mirrored cache
- Maximum connection of 48 disk drives (one controller tray and three drive expansion trays)

FIGURE 1-8   Sun StorageTek 2530 Array Controller Ports

1. Drive Expansion Tray Port (SAS Out)
2. Ethernet Management Host Port
3. SAS Data Host Ports
4. RS-232 Port (Serial Port)

78022-20
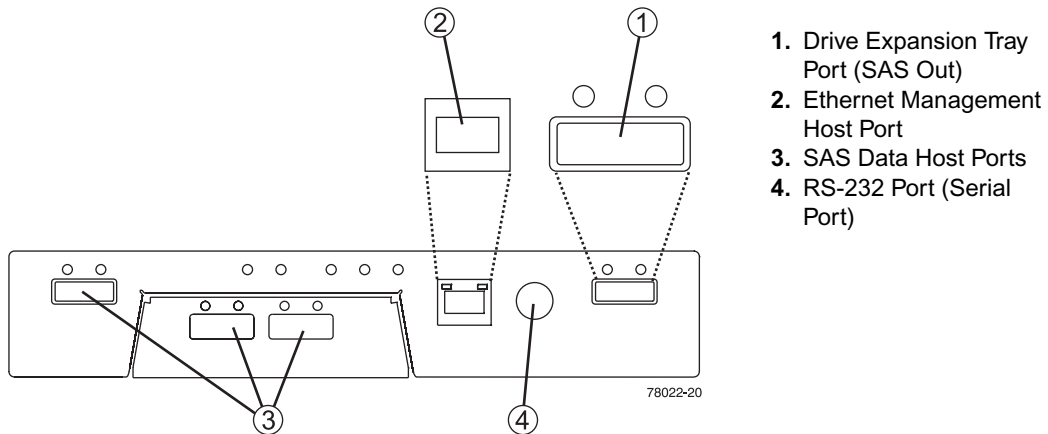
Sun StorageTek 2510 Array

This iSCSI controller tray provides the following capabilities:

- Two iSCSI Ethernet host ports with 1 Gigabit per second host connection speed
- One drive expansion tray SAS port for the drive channel with 3 Gb/s drive expansion tray connection speed
- 512-MB or 1-GB cache on each controller
- Maximum connection of 48 disk drives (one controller tray and three drive expansion trays)

FIGURE 1-9   Sun StorageTek 2510 Array Ports

1. Drive Expansion Tray Port (SAS Out)
2. Ethernet Management Host Port
3. Ethernet Data Host Ports
4. RS-232 Port (Serial Port)
5. Not Used
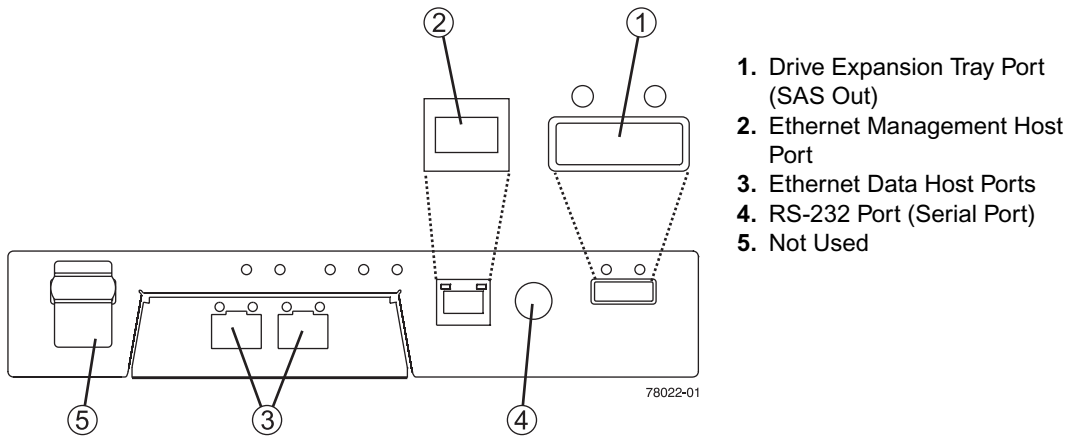
Controller Tray and Drive Expansion Tray Power-Fan Assembly

The power-fan assembly for the Sun StorageTek 2540 Array, the Sun StorageTek 2530 Array, and the Sun StorageTek 2510 Array is identical and interchangeable.

Note – A minimum of two disk drives must be operating in a controller tray or in a drive expansion tray to avoid generating a power-fan assembly error.

The power-fan assembly contains an integrated cooling fan. The power supply provides power to the internal components by converting incoming AC voltage to DC voltage. The fan circulates air inside of the tray by pulling air in through the vents on the front of the assembly and pushing the air out of the vents on the back of each fan.

Each tray contains two power-fan assemblies. If one power supply is turned off or malfunctions, the other power supply maintains electrical power to the tray. Likewise, the fans provide redundant cooling. If one of the fans in either fan housing fails, the remaining fan continues to provide sufficient cooling to operate the tray. The remaining fan runs at a higher speed until the failed fan is replaced. Replace the failed fan as soon as possible.

Sun StorageTek 2501 Expansion Tray

The drive expansion tray expands the storage capacity of a storage array. The controllers in the controller tray can connect to the drive expansion tray and access the disk drives in the drive expansion tray for additional storage. A drive expansion tray contains both physical components (disk drives, Input/Output Modules (IOMs), and power-fan assemblies) and logical components (virtual disks and volumes).

Expansion Tray IOM

The expansion tray contains two IOMs that provide the interface between the disk drives in the expansion tray and the controllers in the controller tray. Each controller in the controller tray connects to an IOM.

If one IOM fails, the other IOM provides a redundant data path to the disk drives. You can replace a failed IOM while the power to the storage array is turned on and the storage array is processing data (a hot swap).

Drive Expansion Tray IOM Ports

The IOM uses SAS cables to enable the controller tray to communicate with the disk drives in the drive expansion trays. Each IOM in a drive expansion tray has two SAS expansion ports. One port shows an up arrow, and the other port shows a down arrow.

FIGURE 1-10 SAS Ports on the Expansion Tray IOM

1. SAS Port (Up Arrow)
2. SAS Port (Down Arrow)
3. Serial Port
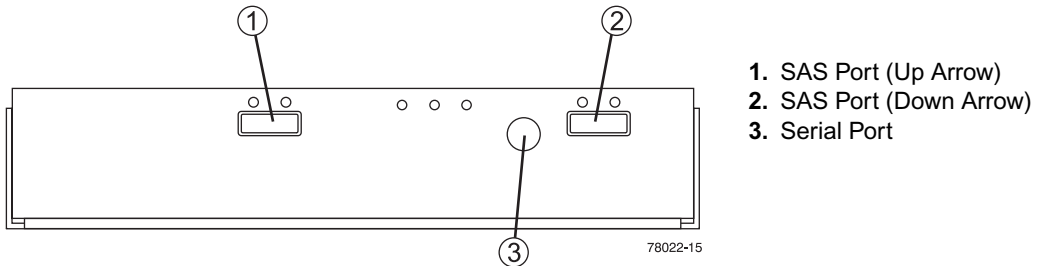
When connecting the SAS cable from an IOM in one drive expansion tray to an IOM in another drive expansion tray, connect from a port with a down arrow to a port with an up arrow.

Note – If the cable is plugged into two ports with arrows of the same direction, communication between the two drive expansion trays is lost.

LEDs on the Rear of the Trays

Controller LEDs on the Sun StorageTek 2540 and Sun StorageTek 2510 Arrays

FIGURE 1-11 Locations of the Controller LEDs on the Sun StorageTek 2540 and 2510 Arrays
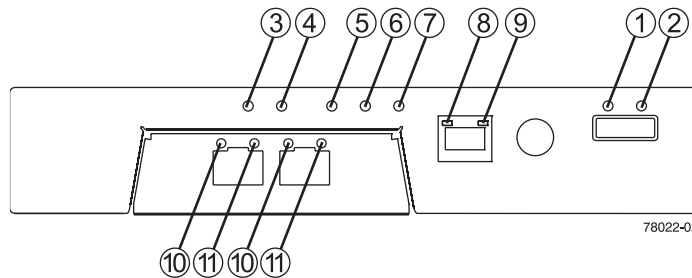
TABLE 1-3 Descriptions of the Controller LEDs on the 2540 and 2510 Arrays

Location	LED	Color	On	Off
1	Link Fault	Amber	At least one link has an error.	Normal condition
2	Drive Link	Green	At least one link is active.	At least one link has an error
3	Battery Fault	Amber	Indicates a fault within the battery backup unit.	Normal condition
4	Cache Active	Green	Steady green indicates that data is in the cache.	Indicates that all data has been written to the disk and the cache is empty.
5	Service Action Allowed	Blue	The controller can be removed from the controller tray.	The controller cannot be removed from the controller tray.
6	Service Action Required (Fault)	Amber	Indicates a fault within the controller.	Normal condition
7	Power	Green	Tray is powered on.	Tray is not powered on.
8	Ethernet Link	Green	The connection is active.	The connection is not active.
9	Ethernet 100BASE-TX	Green	100BASE-TX connection is active.	The 100BASE-TX connection is not active.

TABLE 1-3   Descriptions of the Controller LEDs on the 2540 and 2510 Arrays

Location	LED	Color	On	Off
10 and 11	Host Link (2540)	Green	Both LEDs on indicate a 4-Gb/s data rate from the management software host. Left LED on and right LED off indicate a 1-Gb/s data rate from the management software host. Right LED on and left LED off indicate a 2-Gb/s data rate from the management software host.	Both LEDs off indicate no link to the management software host.
10	Ethernet Link (2510)	Green	The connection is active.	The connection is not active.
11	Ethernet 1000BASE-TX (2510)	Green	1000BASE-TX connection is active.	The 1000BASE-TX connection is not active.

Controller LEDs on the Sun StorageTek 2530 Array

FIGURE 1-12 Locations of the Controller LEDs on the Sun StorageTek 2530 Array
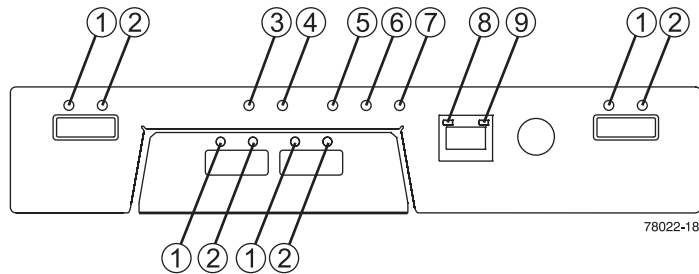
TABLE 1-4   Descriptions of the Controller LEDs on the Sun StorageTek 2530 Array *(1 of*

Location	LED	Color	On	Off
1	Link	Green	At least one link is active.	All links have failed.
2	Link Fault	Amber	At least one link has an error.	Normal condition.
3	Battery Fault	Amber	Indicates a fault within the battery backup unit.	Normal condition.

Location	LED	Color	On	Off
4	Cache Active	Green	Steady green indicates that data is in the cache.	Indicates that all data has been written to the disk and the cache is empty.
5	Service Action Allowed	Blue	The controller can be removed from the controller tray.	The controller cannot be removed from the controller tray.
6	Service Action Required (Fault)	Amber	Indicates a fault within the controller.	Normal condition
7	Power	Green	Tray is powered on.	Tray is not powered on.
8	Ethernet Link	Green	The connection is active.	The connection is not active.
9	Ethernet 100BASE-TX	Green	100BASE-TX connection is active.	The 100BASE-TX connection is not active.

Controller Tray and Drive Expansion Tray Power-Fan Assembly LEDs

The power-fan assembly LEDs for the Sun StorageTek 2540 Array, the Sun StorageTek 2530 Array, the Sun StorageTek 2510 Array, and the Sun StorageTek 2501 drive expansion tray are identical.

FIGURE 1-13 Locations of the Power-Fan Assembly LEDs
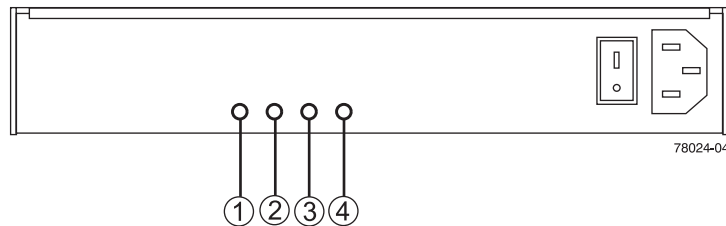
TABLE 1-5   Descriptions of the Power-Fan Assembly LEDs

Location	LED	Color	On	Off
1	DC Power (DC Good)	Green	DC power from the power-fan assembly is available.	DC power from the power-fan assembly is not available.
2	Service Action Allowed	Blue	The power-fan assembly can be removed from the tray.	The power-fan assembly cannot be removed from the tray.
3	Fault	Amber	A fault exists within the power-fan assembly.	Normal condition
4	Power (AC Good)	Green	The assembly is powered on.	The assembly is not powered on.

IOM LEDs on the Sun StorageTek 2501 Expansion Tray

FIGURE 1-14 Locations of the IOM LEDs
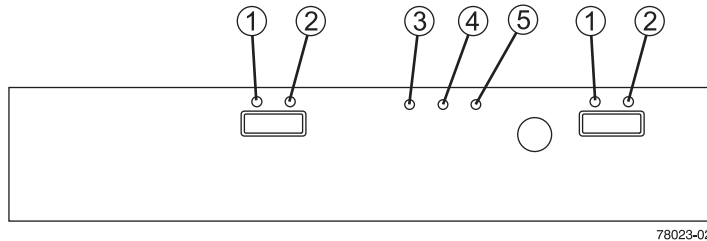
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TABLE 1-6 Descriptions of the IOM LEDs

Location	LED	Color	On	Off
1	IOM Link Fault	Amber	A link error occurred.	No errors have occurred.
2	IOM Link	Green	The link is active.	A link error occurred.
3	Service Action Allowed	Blue	The IOM can be removed from the drive expansion tray.	The IOM cannot be removed from the drive expansion tray.
4	Service Action Required (Fault)	Amber	A fault exists within the IOM.	Normal condition
5	Power	Green	The IOM tray is powered on.	The IOM is not powered on.

Service Action LEDs

Each controller, power-fan assembly, IOM, and disk drive has a Service Action Allowed LED. The Service Action Allowed LED indicates when you can remove a component safely. See "LEDs on the Rear of the Trays" on page 16 for the locations and descriptions of the Service Action Allowed LEDs on a controller tray and a drive expansion tray, and see "LEDs on the Disk Drives" on page 24 for disk drive Service Allowed LEDs.

Caution – **Potential loss of data access** – Never remove a power-fan assembly, a controller module, or a disk drive unless the Service Action Allowed LED is turned on or you are given specific instructions to do so by the Service Advisor feature of the Common Array Manager software.

If a CRU or module fails and must be replaced, the Service Action Required LED on that module turns on to indicate that a service action is required. The Service Action Allowed LED turns on if it is safe to remove the CRU or module. If there are data availability dependencies or other conditions that dictate that a CRU or module should not be removed, the Service Action Allowed LED remains off.

The Service Action Allowed LED automatically turns on or turns off as conditions change. In most cases, the Service Action Allowed LED turns on when the Service Action Required (Fault) LED is turned on for a CRU or module.

Note – If the Service Action Required (Fault) LED is turned on but the Service Action Allowed LED is turned off for a particular CRU or module, you might have to service another component first. Check the Service Advisor feature of the Common Array Manager software to determine the action you should take.

Disk Drives

Disk drives for the Sun StorageTek 2500 Series Array have three components:

- Hard drive
- Hard drive carrier
- Adapter card for connecting the disk drive to the mid-plane

The disk drives can be Serial Advance Technology Attachment (SATA) disk drives, Fibre Channel (FC) disk drives, or SAS disk drives.

Controller trays or drive expansion trays hold up to 12 disk drives, for a maximum of 48 disk drives in a storage array. To reach the maximum of 48 disk drives, the storage array must consist of one controller tray and three drive expansion trays.

Access to disk drives is from the front of the tray.

Refer to the storage array release notes for supported drives.

Disk drives can be mixed, provided you adhere to these additional rules:

- Use the same drive types within a virtual disk
- Assign hot spares to cover any disk drive failure

FIGURE 1-15 Disk Drives
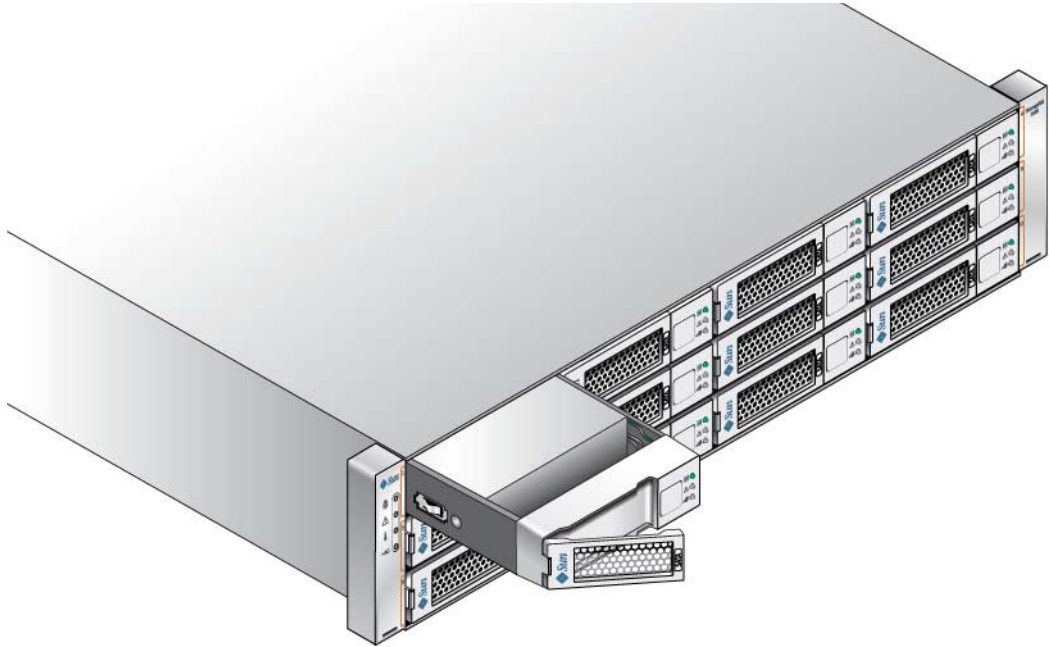
The physical locations of the disk drives are numbered 1 through 12, from left to right, and from top to bottom. The right end cap has numbers on the side showing the numbers of the adjacent drives. The Service Advisor feature of the Common Array Manager software automatically detects a disk drive's tray ID and slot designation.

LEDs on the Disk Drives

FIGURE 1-16 Locations of the Disk Drive LEDs

TABLE 1-7 Descriptions of the Disk Drive LEDs

Location	LED	Color	General Behavior
1	Service Action Allowed	Blue	On – The disk drive can be removed from the tray.
			Off – The disk drive cannot be removed from the tray.
2	Fault	Amber	On – The disk drive has a problem.
			Off – Normal condition.
3	Power	Green	Off – The power is turned off.
			On – The power is on and the disk drive is operating normally.
			On and blinking (0.5 s on, 0.5 s off) –Disk drive I/O activity is taking place.

TABLE 1-8   Disk Drive States Represented by the LEDs

Disk Drive State	Power (Green LED)	Fault (Amber LED)
Power is not applied.	Off	Off
Normal operation, power is turned on, no disk drive I/O activity is occurring.	On, solid	Off
Normal operation, disk drive I/O activity is occurring.	On, blinking	Off
Service action required, a fault condition exists, and the disk drive is offline.	On, solid	On, solid

Common Array Manager Software

The Sun StorageTek 2500 Series Array is managed by the Sun StorageTek Common Array Manager software. The Common Array Manager provides web browser–based management and configuration from an external management host, data host software that controls the data path between the data host and the array, and a remote command-line interface (CLI) client that provides the same control and monitoring capability as the web browser, and is scriptable for running frequently performed tasks.

The Common Array Manager software includes Service Advisor, an online reference full of hardware and software configuration and troubleshooting information and procedures.

For information about installing the Common Array Manager software and configuring and managing the array, see the *Sun StorageTek Common Array Manager Software Installation Guide*.

Service Advisor and Customer-Replaceable Units

The majority of replaceable units are designed to be replaceable by customers.

To see a list of the hardware components that can be replaced at the customer site refer to Service Advisor in the Sun StorageTek Common Array Manager software.

The Service Advisor also provides information and procedures for replacing array components.

Note – The replaceable components inside your controller tray or drive expansion tray are referred to as either customer replaceable units (CRUs) or as modules.

Installing Trays

Use the procedures in this chapter to install trays in a cabinet. The number of trays you need to install depends on your overall storage requirements. You can install a maximum of four trays, one controller tray and up to three drive expansion trays for each array.

This chapter describes the process of installing the Sun StorageTek 2500 Series Array. It contains the following sections:

The installation procedures in this chapter require the following items:

- #2 Phillips screwdriver (minimum 4-inch length recommended)
- #3 Phillips screwdriver (minimum 4-inch length recommended)
- Antistatic protection

Caution – Electrostatic discharge can damage sensitive components. Touching the array or its components without using a proper ground might damage the equipment. To avoid damage, use proper antistatic protection before handling any components.

Preparing for the Installation

Use the following procedures to prepare for installation:

-
-
-
-

Preparing the Universal Rail Kit

Use the universal rail kit, ordered separately, to mount the Sun StorageTek 2500 Series Array trays in any of the following cabinets:

- Any standard Sun cabinet, such as the Sun Rack 900/1000 cabinet
- Any 19-inch wide, 4-post, EIA-compatible rack or cabinet with a front-to-back depth between vertical cabinet rails of 24-36 inches (with threaded or un-threaded cabinet rails).
- The Sun StorageTek Expansion cabinet

Unpacking the Universal Rail Kit

Unpack the universal rail kit and check the contents.

The universal rail kit (part number 594-2489-02) comes with pre-assembled rails and contains the following items:

- Left rail assembly
- Right rail assembly
- 10 8-32x3/8" pinhead screws with lock washers
- 4 M4 flathead screws
- 4 cabinet rail adapter plates (used for un-threaded cabinet rails only)

Loosening the Rail Adjustment Screws

To loosen the adjustment screws on the left and right rails:

Use a flathead screwdriver to loosen the two rail adjustment screws on each rail to allow adjustment of each rail length ().

FIGURE 2-1

Note – The rails are pre-configured to adjust to cabinet rail depths of between 24 inches (609.6mm) and 34 inches (863.6mm).

Preparing the Tray

Caution – Two people are needed to lift and move the tray. Use care to avoid injury. A tray can weigh up to 54.3 pounds (24.6 kg).

1. **Unpack the tray.**

2. **Check the contents of the box for the following items:**

- Sun StorageTek 2500 Series Array trays (controller or drive expansion)
- Ship kit for the controller tray
  - One pair left and right end caps (plastic bezels)
  - Four 4Gbps FC SFPs (2 per FC controller module - ST2540 Array only)
  - One 6-meter RJ45 -RJ45 Ethernet cables
  - One RJ45-DIN9 cable
  - One RJ45-DB9 adapter
  - One RJ45-DB9 null modem adapter
  - Sun StorageTek Common Array Manager Software CD
  - *Sun StorageTek Common Array Manager Software Installation Guide* (on the software CD)
  - *Common Array Manager sscs CLI Quick Reference Card*
  - *Sun StorageTek 2500 Series Array Hardware Installation Guide* (Hardcopy)
  - *Accessing Documentation* guide
  - Premium feature license cards (ordered optionally)
- Ship kit for each expansion tray
  - Two 1-meter copper SAS cables (one per I/O module)
  - *Accessing Documentation* guide

AC power cords are shipped separately with each tray.

Preparing the Cabinet

Select the cabinet in which you will be installing the array. Be sure the cabinet is installed as described in the installation instructions provided with it.

1. **Stabilize the cabinet as described in the cabinet documentation.**

2. **If the cabinet has casters, make sure the casters are locked to prevent the cabinet from rolling.**

3. **Remove or open the front panel.**

4. **Remove or open the vented back panel.**

Planning the Order of the Tray Installation

Install the trays starting with the controller tray at the lowest available 2U tray slot in the cabinet. Next, install the expansion trays for the first controller tray. If room remains in the cabinet, repeat for the next controller tray and expansion trays.

Starting at the bottom distributes the weight correctly in the cabinet.

Tip – If you plan on adding hosts to the cabinet, make sure that you have cables of sufficient length to reach their controller tray.

Attaching the Rails to a Cabinet

Depending on the type of cabinet in which you will install the tray, use one of the following procedures to attach the rails:

- "Attaching the Universal Rail Kit to a Standard Sun or 19-Inch Cabinet With Threaded Cabinet Rails" on page 31
- "Attaching the Universal Rail Kit to a Standard 19-Inch Cabinet With Un-threaded Cabinet Rails" on page 35

Each tray requires two standard mounting rack units (2RU) of vertical space in the cabinet. Most cabinets have a "U" mark on their vertical rail with three mounting holes in the left cabinet vertical rail and in the right cabinet vertical rail. The top mounting hole of the lower RU is always closest to the bottom mounting hole of the upper RU, hence the division between RUs on a cabinet rail is between the two closest mounting holes in a grouping.

The universal rails have an adjustable depth of 24" to 34".

Attaching the Universal Rail Kit to a Standard Sun or 19-Inch Cabinet With Threaded Cabinet Rails

This procedure describes the steps to attach the universal rail kit to:

- All standard Sun cabinets, including the Sun Rack 900/1000 cabinets
- Sun StorageTek Expansion cabinets
- All 19-inch wide, 4-post EIA-compatible racks and cabinets with the following cabinet rail types:
  - M5 threaded
  - M6 threaded
  - 10-32 threaded
  - 12-24 threaded
  - circular un-threaded

1. To attach the universal rail kit to a cabinet with these cabinet rail types, **position the front flange of the left universal rail behind the left front cabinet rail** (FIGURE 2-2**).**

Note – The U marks are not labeled on all racks, as they are on the Sun cabinets. The rule of thumb to remember is that the division of RUs passes between the two closest rail holes in each set of holes (see FIGURE 2-2**).**

FIGURE 2-2 Positioning the Front of the Left Rail Behind the Left Front Cabinet Rail
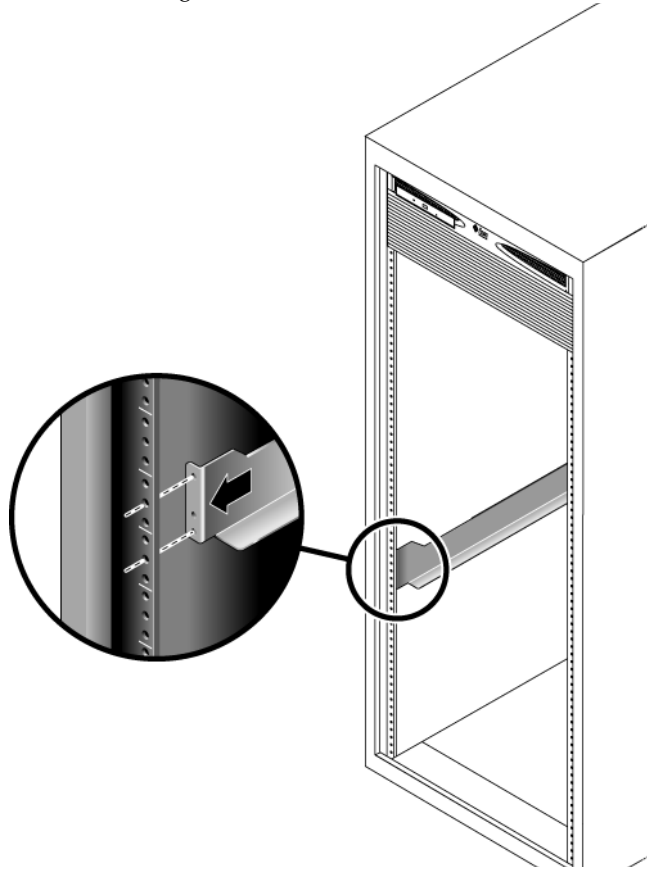
2. **Insert the 8-32 screws through the center holes in each RU of the rack into the top and bottom holes in the Universal rail ().**

   These screws pass through the cabinet rail holes and screw into threaded holes in the Universal rail.

FIGURE 2-3

3. **Repeat** Step 1 **and** Step 2 **for the right rail.**

4. **At the back of the cabinet, adjust the length of the left rail as needed to fit the cabinet, and position the rail flange behind the face of the cabinet rail (**FIGURE 2-4**).**

FIGURE 2-4 Adjusting the Length of the Left Rail at the Back of the Cabinet
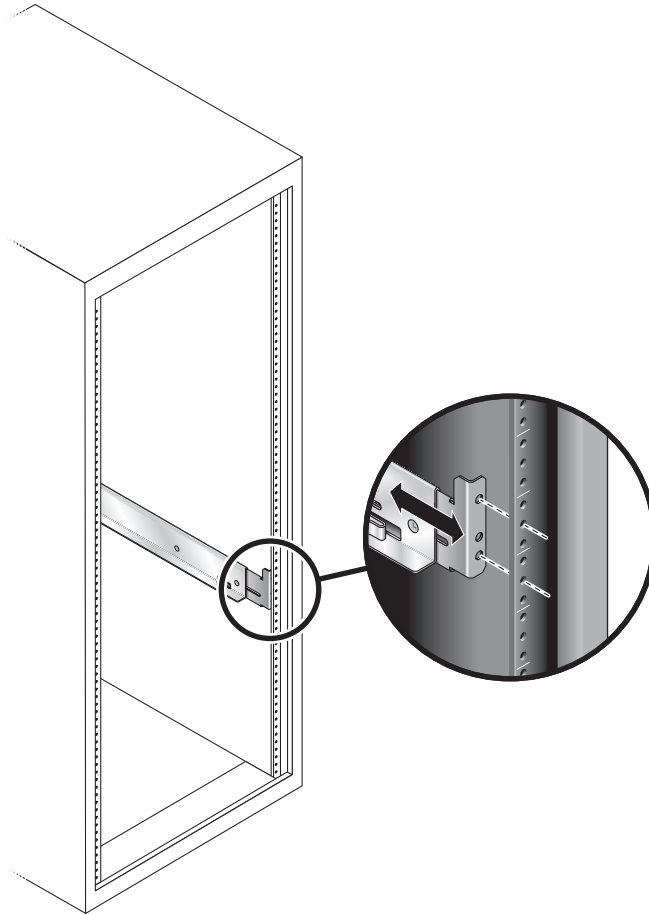
5. **Align the rail flange so that the top and bottom mounting holes match the center holes in the RUs corresponding to those used on the front of the cabinet.**

6. **Insert the 8-32 screws through the center holes of the rack into the top and bottom mounting holes on the universal rail (**FIGURE 2-5**).**

FIGURE 2-5   Securing the Left Rail to the Back of the Cabinet
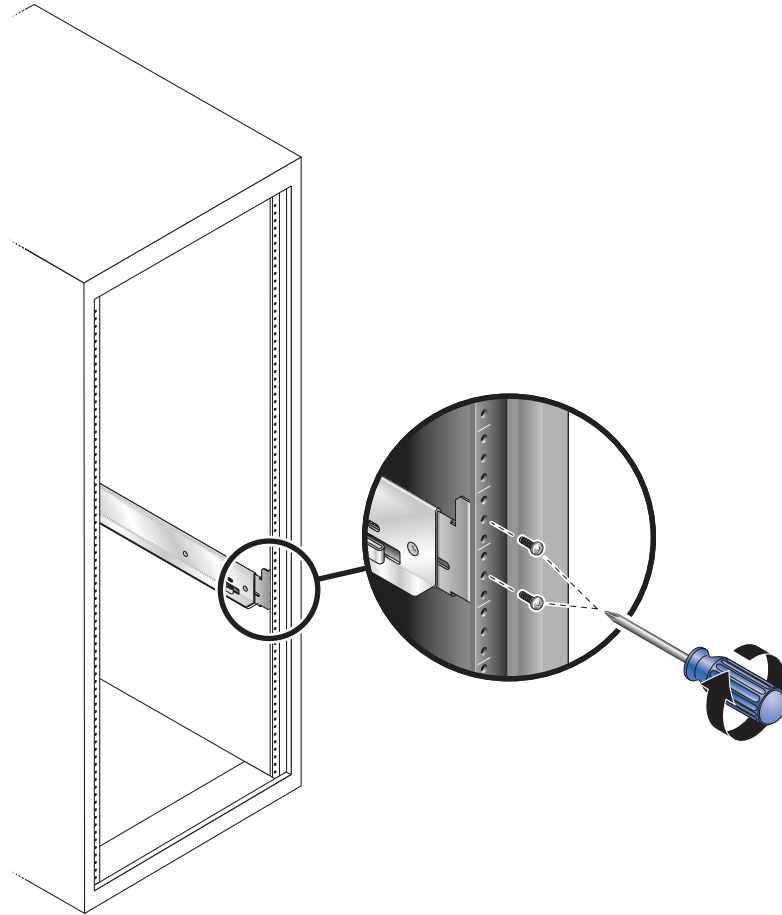
7. **Repeat** Step 4, Step 5, **and** Step 6 **for the right rail.**

Attaching the Universal Rail Kit to a Standard 19-Inch Cabinet With Un-threaded Cabinet Rails

This procedure describes the steps to attach the universal rail kit to:

- All 19-inch wide, 4-post EIA-compatible racks and cabinets with un-threaded cabinet rails (square hole racks).

To attach the universal rail kit to a cabinet with un-threaded cabinet rails, follow these steps first for the left rail and then for the right rail:

1. **Hook a cabinet rail adapter plate over the front of the cabinet rail. (**FIGURE 2-6**)**

FIGURE 2-6   Inserting the Cabinet Rail Adapter Plate on the Cabinet Rail
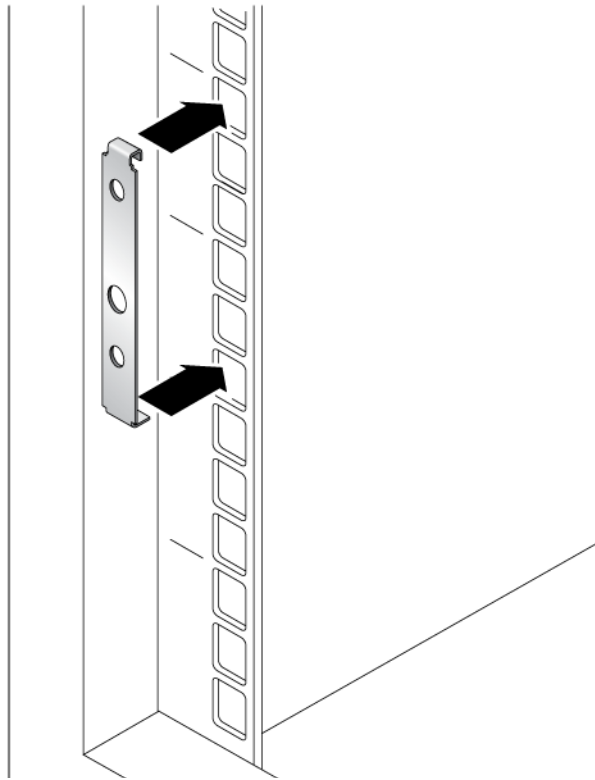
Position the adapter plate over of the 2RU slot in which the tray is to be mounted. The hook on the top of the adapter plate hooks into the top hole of the upper RU. The flat flange on the bottom of the adapter plate fits into the bottom hole of the lower RU (FIGURE 2-7).

FIGURE 2-7   Adapter Plate in Place on the Cabinet Rail
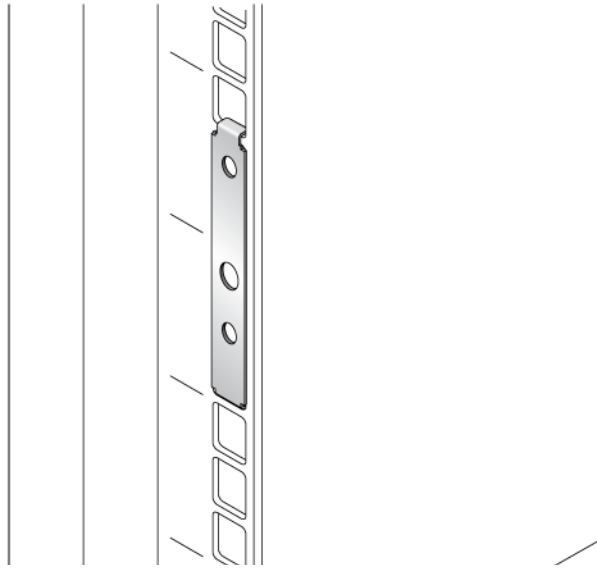
2. **Slide the front flange of the universal rail between the front cabinet rail and the top hook of the rail adapter plate (**FIGURE 2-8**).**

FIGURE 2-8   Sliding the Flange of the Universal Rail Behind the Cabinet Rail
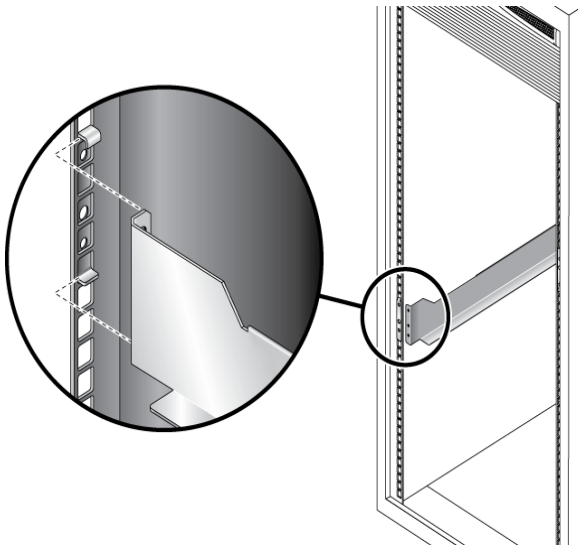
3. **Insert and tighten two 8-32 screws through the top and bottom holes in the adapter plate, through the cabinet rail, and into the top and bottom threaded holes in the universal rail mounting flange (**FIGURE 2-9**).**

FIGURE 2-9   Securing the Rail to the Front left of the Cabinet
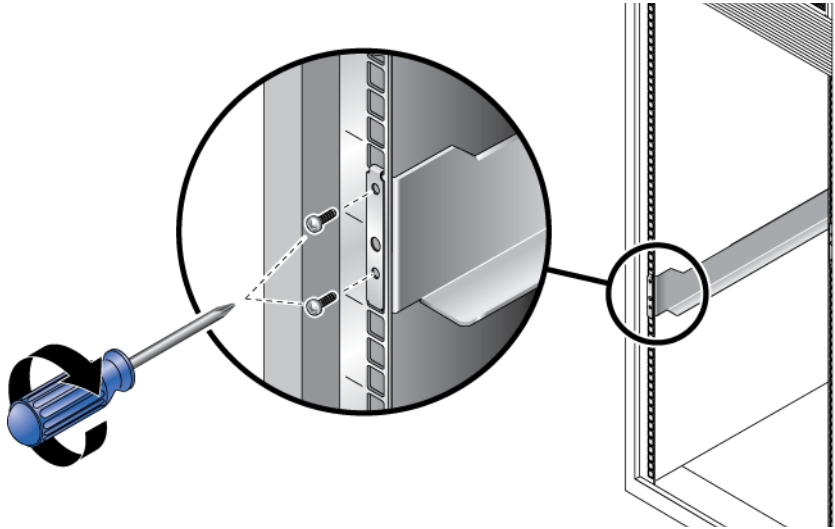
4. **Repeat** Step 1 **through** Step 3 **on the corresponding cabinet rail at the back of the cabinet (**FIGURE 2-10**).**

Mounting the rail on the back of the cabinet is the same as mounting it to the front, after you extend the rail the necessary length to reach the rear cabinet rail.

FIGURE 2-10 Adjusting the Length of the Rail at the Back of the Cabinet
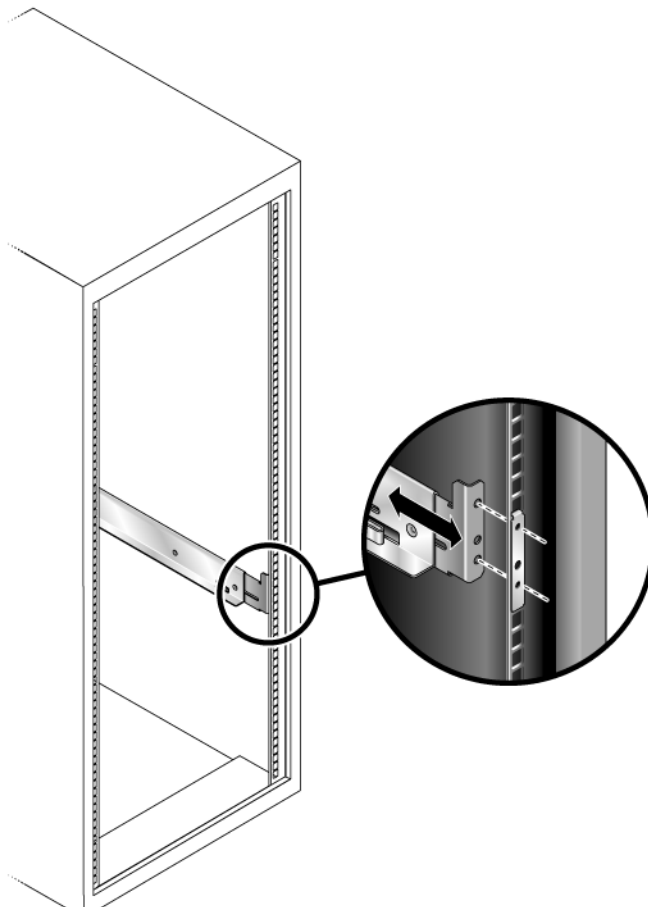
5. **Insert and tighten two 8-32 screws through the top and bottom holes in the adapter plate, back cabinet rail, and universal rail mounting flange (**FIGURE 2-11**).**

   The screws passes through the unthreaded holes of the adapter plate and cabinet rail mounting rail and screw into the threaded holes of the rail mounting flange.

FIGURE 2-11 Securing the Rail to the Back of the Cabinet
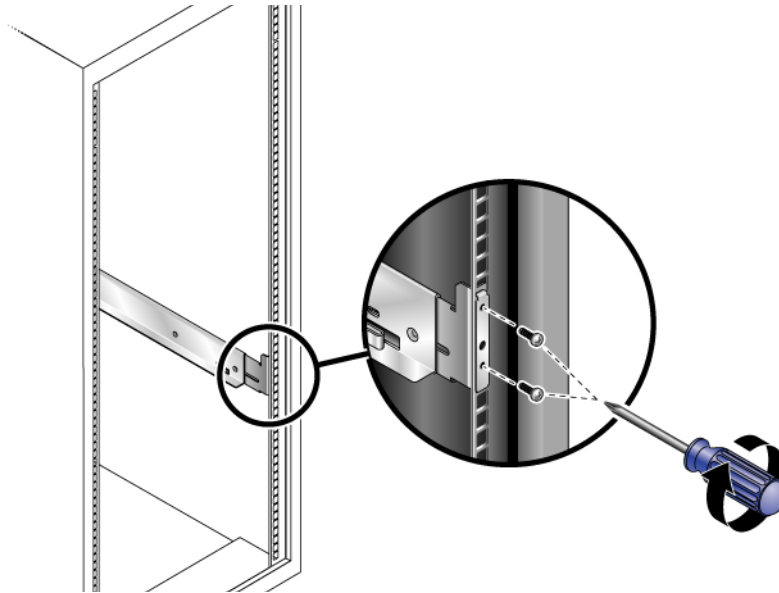
For extra stability, you can tighten the rail screws as in .

6. **Repeat** Step 1 **through** Step 5 **to install the right rail.**

Installing a Tray in a Cabinet

Install the controller tray in the first empty 2RU slot at the bottom of the cabinet. If you are installing expansion trays, continue installing the trays from the bottom up.

1. **Using two people, one at each side of the tray, carefully lift and rest the tray on the bottom ledge of the left and right rails (**FIGURE 2-12**).**

Caution – Use care to avoid injury. A tray can weigh up to 55 pounds (25 kg).

FIGURE 2-12 Positioning the Controller Tray in the Cabinet

2. **Carefully slide the tray into the cabinet until the front mounting flanges on the tray touch the vertical face of the cabinet (**FIGURE 2-13**).**

FIGURE 2-13 Controller Tray Installed
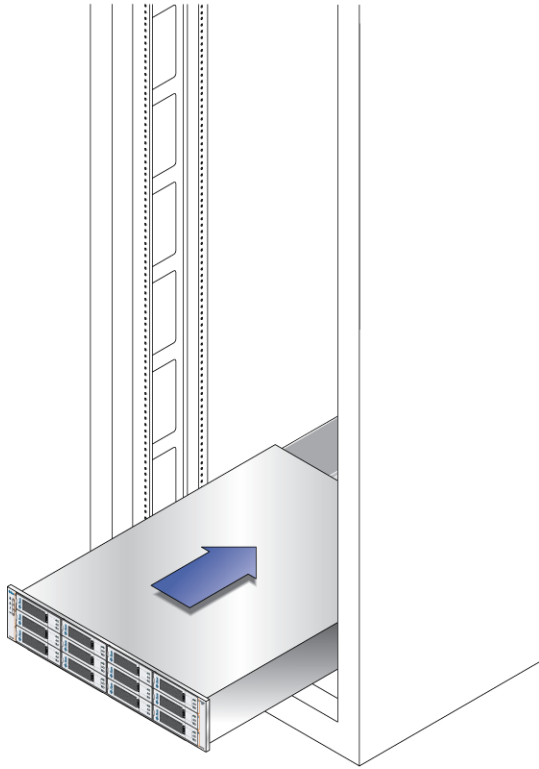
The tray has mounting flanges on both sides with three mounting holes in them. The top and bottom holes are large enough to fit over the heads of the screws already in the cabinet rails used to mount the universal rails. If the tray was shipped with end caps (bezels) clipped on the tray mounting flanges, remove them before sliding the tray all the way in over the mounting screw heads.

To remove an end cap, place your thumb on the lower front face of the cap and reach your forefinger underneath to the back bottom edge of the cap, then pull the cap towards you and slightly upwards.

On the rear of the controller tray, a flat metal tab on each side corner slides into a special mounting clip on the rear of each universal rail, securing the back of the tray. This eliminates the need for rear mounting screws to secure the tray. For racks that might move or be shipped, Sun recommends that you install M4 screws through the hole in the tab and into the corresponding threaded hole in the rail as shown in .

FIGURE 2-14 Rail Clip and Rear Mounting Hole on Rear of Tray
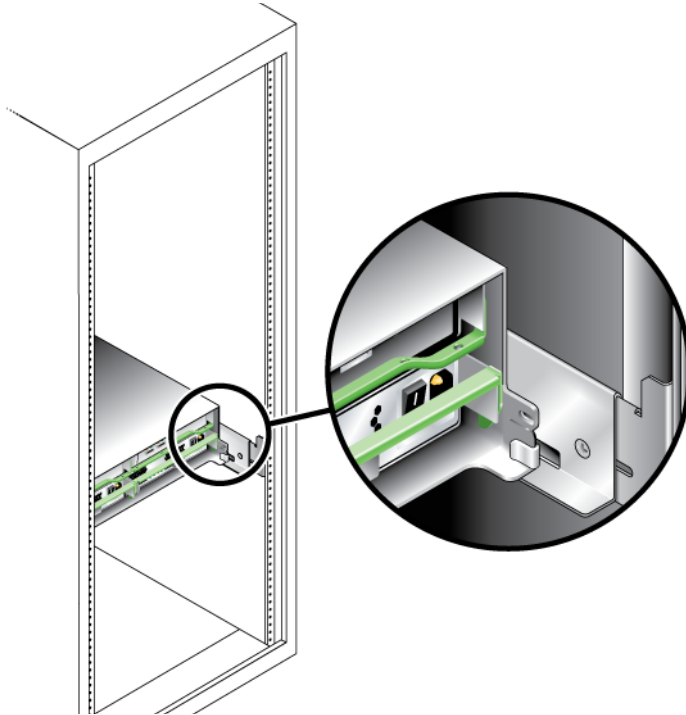
3. **Insert a single 8-32 pan head screw through the center hole in each front mounting flange and tighten (**FIGURE 2-15**).**

FIGURE 2-15 Securing the Tray to the Front of a Sun Rack 900/1000 Cabinet
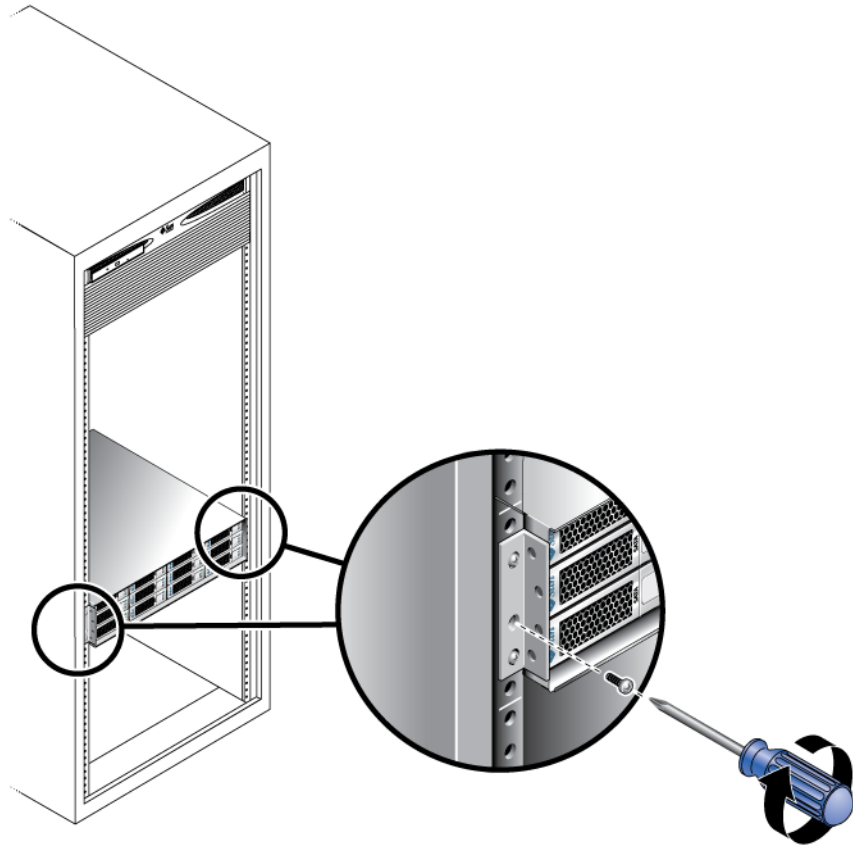
4. **Replace the end caps (bezels) that cover the mounting flanges on the front of the array tray.**

   On each front mounting flange, there is a small tab over which the end caps fit. The end caps have a slot on top for this tab.

   a. **Place the end cap over the tab so the tab can go into the slot.**

   b. **Snap the bottom of the end cap into place.**

Connecting the Power Cables

1. Verify that both power switches are turned off.

2. Verify that the circuit breakers in the cabinet are turned off.

3. Connect each power supply in the tray to a separate power source in the cabinet.

4. Connect the primary power cables from the cabinet to the external power source.

Note – Do not power on the storage array until you complete the procedures in this chapter. The power-on sequence is described in detail in Chapter 7.

Inter-tray Cabling

This section describes how to cable a controller tray to the drive expansion trays for several different configurations. Each controller has one expansion port (FIGURE 2-16). Controller A controls drive channel 1 through the A-side modules; Controller B controls drive channel 2 through the B-side modules. Each drive channel provides a separate path for data transfer from the controller tray to the expansion trays; the two channels provide redundancy.

FIGURE 2-16 Expansion Ports on the Controller Tray

SAS Expansion Ports to the Expansion Tray
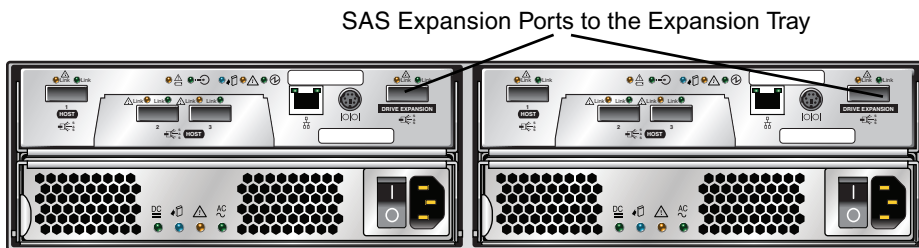
Each expansion tray has two SAS port connectors, one marked with an up arrow and the other marked with a down arrow (FIGURE 2-17). You use SAS cables to connect drive expansion trays to the controllers in the controller tray.

Note – Perform all SAS connections from an Out (down arrow) port to an In (up arrow) port. If the cable is connected to two connectors with the same arrows, communication between the two drive trays will be lost.

1. SAS Expansion In Port
2. SAS Expansion Out Port
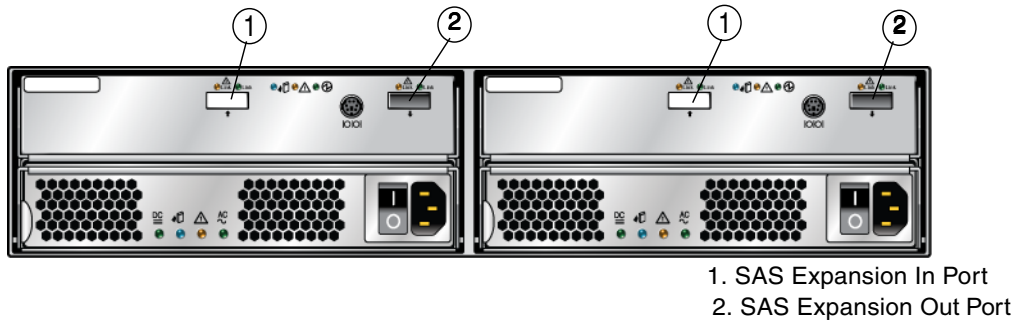
Array Configuration Naming Convention

The configuration naming convention is "controller trays x trays" where the first number is the controller tray and the second is the sum of the controller tray and the number of drive expansion trays. For example, 1x1 is a standalone controller tray, 1x2 is the controller tray and one expansion tray, 1x3 is the controller tray and 2 expansion trays (TABLE 2-1).

TABLE 2-1   Controller Tray and Drive Expansion Tray Configurations

Configuration Identifier	Controller Tray	Number of Expansion Trays
1x1	1	0
1x2	1	1
1x3	1	2
1x4	1	3

Note – Do not add more expansion trays than the storage array supports.

Use the following instructions to connect the controller tray to one or more drive expansion trays.

Connecting Drive Expansion Trays

Keep the following points in mind when adding expansion trays to your storage array:

- Once the drive expansion tray is physically installed, the expansion trays should be turned on and connected to the array with power on. The array must be at an optimal status with I/O data transfer turned off. If you need to add an expansion tray to a storage array that cannot be taken off-line, contact your Sun Technical Support representative before attempting to connect the new tray.

- Controller trays and expansion trays are shipped with protective plastic plugs in the SAS expansion ports. You must remove these before connecting cables.

- Expansion trays are added serially, in a chain (actually two chains: channel one through the A-side controller and I/O modules, and channel two through the B-side controller and I/O modules). The SAS cable from the expansion port on a controller connects to the In port (Up arrow) on an expansion tray I/O module. The SAS cable from an I/O module on expansion tray 1 to a corresponding I/O module on expansion tray 2 connects from the Out port on expansion tray 1 to the corresponding In port on expansion tray 2. This pattern repeats for each additional drive expansion tray on a channel. See FIGURE 2-20 for an illustration of this reverse cabling pattern.

- To connect cables for maximum redundancy, *controller* B must be cabled to the expansion tray B-side I/O modules in the opposite order as the expansion tray A-side I/O modules. That means the last I/O module in the A-side chain from *controller* A must be the first I/O module in the B-side chain from *controller* B. See FIGURE 2-20 for an illustration of cabling for maximum tray level redundancy.

- On all SAS cables, affix a label to each end of the cable. See "Tray Interconnect Cable Labeling" on page 52 for labeling tips.

Cabling an Expansion Tray to a Controller Tray

A Controller tray has two expansion ports, one on Controller A and one on Controller B. To connect a drive expansion tray, connect an SAS cable from each expansion port on the controller to each In port on the expansion tray. FIGURE 2-18 shows a 1x2 array configuration consisting of one controller tray and one drive expansion tray. Two SAS cables are required.

FIGURE 2-18 1x2 Array Configuration Cabling Example

Expansion Tray

Controller Tray

A   B
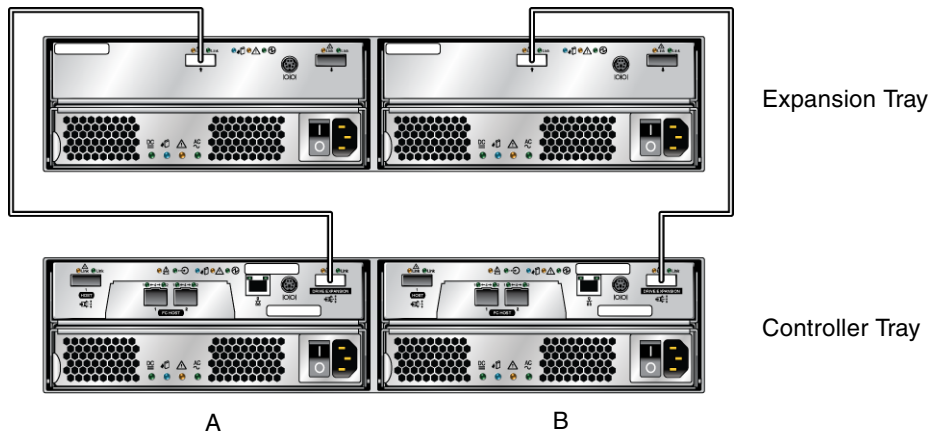
To cable a 1x2 array configuration:

1. **Locate the Controller A and Controller B expansion ports at the back of the controller tray (**FIGURE 2-16**).**

2. **Locate the In and Out expansion ports at the A-side and B-side back of the expansion tray (**FIGURE 2-17**).**

3. **Connect one SAS cable between the Controller A expansion port and the A-side In port on the expansion tray (**FIGURE 2-18**).**

4. **Connect one SAS cable between the Controller B expansion port and the B-side In port on the expansion tray (**FIGURE 2-18**).**

Cabling an Expansion Tray to Another Expansion Tray

Each additional expansion tray is added to the preceding expansion tray by connecting SAS cables from the Out ports of the first tray to the In ports of the next tray. FIGURE 2-19 illustrates a 1x3 storage array configuration consisting of one controller tray and two expansion trays. The cable connections on the B-side are reversed (the cable from the controller A expansion port goes to the In port of expansion tray 1; the cable from the controller B expansion port goes to the In port on expansion tray 2) for maximum redundancy. This pattern continues for each additional tray you add. Two more SAS cables are required for each additional tray.

FIGURE 2-19 1x3 Storage Array Configuration Cabling

Expansion Tray 2

Expansion Tray 1

Controller Tray

A   B
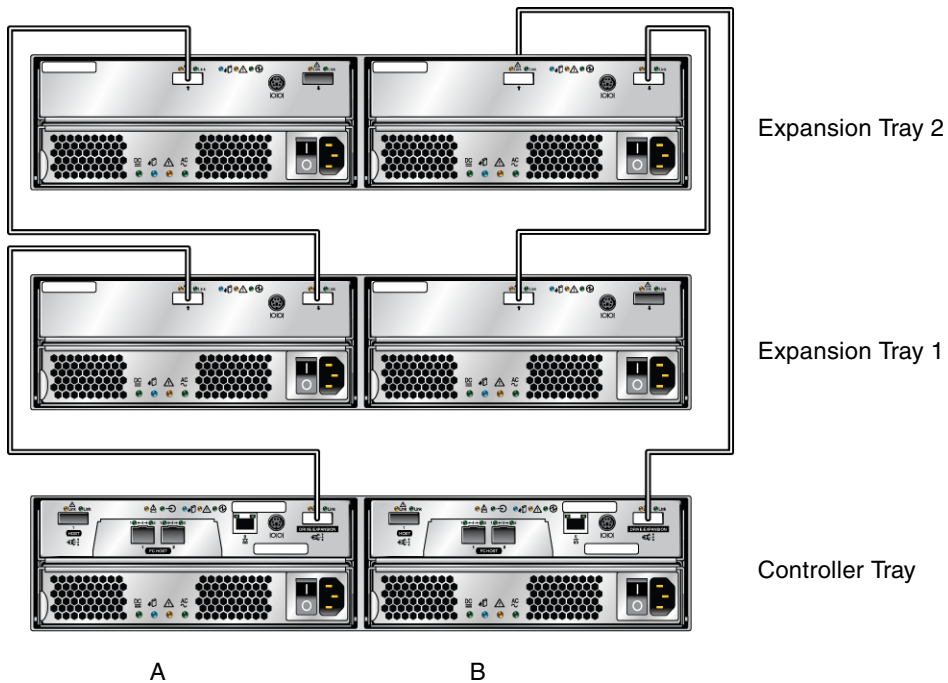
To cable a 1x3 array configuration for maximum redundancy:

1. **Locate the Controller A and Controller B expansion ports at the back of the controller tray (**FIGURE 2-16**).**

2. **Locate In and Out expansion ports at the A-side and B-side back of the expansion tray (**FIGURE 2-17**).**

3. **Connect one SAS cable between the Controller A expansion port and the A-side expansion In port of expansion tray 1 (**FIGURE 2-19**).**

4. **Connect one SAS cable between the Controller B expansion Out port and the B-side expansion In port of expansion tray 2 (**FIGURE 2-19**).**

5. **Connect one SAS cable between the expansion tray 1 Out port and the A-side expansion In port of expansion tray 2 (**FIGURE 2-19**).**

6. **Connect one SAS cable between the expansion tray 2 B-side Out port and the B-side In port of expansion tray 1 (**FIGURE 2-19**).**

Cabling a Third Drive Expansion Tray

Each additional expansion tray is added to the preceding expansion tray by connecting two additional SAS cables from the Out ports of the preceding tray to the In ports of the next tray in the loop. FIGURE 2-20 illustrates a 1x4 storage array configuration consisting of one controller tray and three expansion trays.

The cable connections on the B-side are reversed (the cable from the controller A expansion port goes to the In port of expansion tray 1; the cable from the controller B expansion port goes to the In port on expansion tray 3) for maximum redundancy.

FIGURE 2-20 1x4 Storage Array Configuration Cabling

Expansion Tray 3

Expansion Tray 2

Expansion Tray 1

Controller Tray

A   B

To cable a 1x4 array configuration for maximum redundancy:

1. **Locate the Controller A and Controller B expansion ports at the back of the controller tray (**FIGURE 2-16**).**

2. **Locate In and Out expansion ports at the A-side and B-side back of the expansion tray (**FIGURE 2-17**).**

3. **Connect one SAS cable between the Controller A expansion port and the A-side expansion In port of expansion tray 1 (**FIGURE 2-20**).**

4. **Connect one SAS cable between the Controller B expansion Out port and the B-side expansion In port of expansion tray 3 (**FIGURE 2-20**).**

5. **Connect one SAS cable between the expansion tray 1 Out port and the A-side expansion In port of expansion tray 2 (**FIGURE 2-20**).**

6. **Connect one SAS cable between the expansion tray 2 Out port and the A-side expansion In port of expansion tray 3 (**FIGURE 2-20**).**

7. **Connect one SAS cable between the expansion tray 3 B-side Out port and the B-side In port of expansion tray 2 (**FIGURE 2-20**).**

8. **Connect one SAS cable between the expansion tray 2 B-side Out port and the B-side In port of expansion tray 1 (**FIGURE 2-20**).**

Tray Interconnect Cable Labeling

Labels for the drive-side interface cables identify which controller ports and which I/O module ports in an expansion tray you use when you attach cables between a controller tray and the drive expansion tray. Cable labels are useful if you need to disconnect cables to service a controller.

Attach a label to each end of the cable. Use this design to create labels for drive cables:

- Controller ID (for example, Controller A)
- Drive expansion tray ID (for example, Tray A)
- Expansion port ID (for example, In or Out)
- I/O module ID

Example Label Abbreviation

In this example, the storage configuration has the following characteristics:

- Drive channel 1
- Controller A, drive channel 1
- IO module 1
- Expansion Tray A-Left Out port (left I/O module out port)

Using this design, the label includes the following information:

CtA-Dch1, Dm1-Tray_A (left), Out

Single-Controller Configurations

This configuration has a single controller and a single back-end channel. By definition, there is a single path connection to the data host, and no redundancy is available. There can be drive expansion trays on the single back-end channel.

The cabling is the same as the cabling on a single channel of an ordinary array, such as that shown on the A-side in FIGURE 2-18. CRU removal and replacement procedures in a single-controller configuration are the same as those for a dual-controller configuration with a failed controller (with the exception of the service procedures targeted at the failed controller). These procedures are available in Service Advisor. Maintenance procedures such as firmware updates or servicing of the controller tray or drive expansion trays will cause loss of access to the storage array during the performing of the procedure, since there is no backup channel.

Performance and default behavior are the same as a dual-controller configuration with a failed or missing controller. Write cache is by nature in write-through mode because there is no cache mirroring possible.

Next Steps

Now You Are Ready To Connect The Management Host, As Described In Chapter 3.

Connecting the Management Host

This chapter describes Sun StorageTek 2500 Series Array cable connections for hosts. It contains the following sections:

Connecting the Management Host

The management host directly manages Sun StorageTek 2500 Series Arrays over an out-of-band network. This section describes how to setup an out-of-band connection between the Ethernet port of a controller (FIGURE 3-1) and the management host.

FIGURE 3-1   Ethernet Ports for Controller A and Controller B
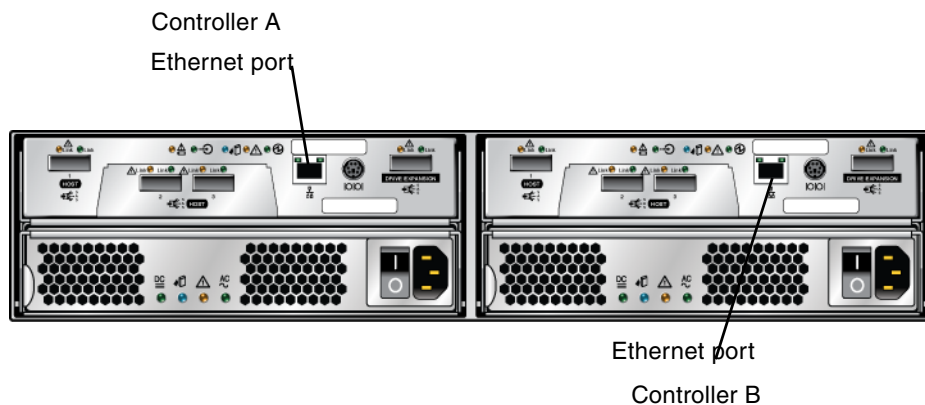
Note – Before you begin, ensure that the two required Ethernet cables are available. These requirements are outlined in the *StorageTek 2500 Series Array Site Preparation Guide*.

There are three ways to establish a connection between the management host and Ethernet port 1 of a controller module:

- "Attaching the Ethernet Ports to the LAN of the Management Host" on page 56
- "Attaching the Ethernet Ports to the Management Host Using an Ethernet Hub" on page 56
- "Attaching the Ethernet Ports Directly to the Management Host With a Cross-Over Cable" on page 57

Attaching the Ethernet Ports to the LAN of the Management Host

To attach the Ethernet ports to the local area network (LAN) of the management host:

1. **Locate the Ethernet port for Controller A and Controller B at the back of the controller tray (**FIGURE 3-1**).**

2. **Connect Ethernet cables to the Ethernet ports of each controller.**

3. **Connect the other end of each Ethernet cable to the LAN on which your management host resides (preferably on the same subnet).**

Attaching the Ethernet Ports to the Management Host Using an Ethernet Hub

To attach the Ethernet ports and the management port Ethernet interface to an Ethernet hub on a private subnet:

1. **Locate Ethernet ports on Controller A and Controller B at the back of the controller tray (**FIGURE 3-1**).**

2. **Connect Ethernet cables to the Ethernet ports of each controller module.**

3. **Connect the other end of each Ethernet cable to an Ethernet hub.**

4. **Connect an Ethernet port on the management host to the Ethernet hub.**

Attaching the Ethernet Ports Directly to the Management Host With a Cross-Over Cable

Note – This method would typically be used only to establish temporary IP connectivity between the management host and the controller's Ethernet ports.

To attach the Ethernet ports directly to the management host using cross-over cables:

1. **Locate the Ethernet ports for Controller A and Controller B at the back of the controller tray (**FIGURE 3-1**).**

2. **Obtain and connect Ethernet cross-over cables to the Ethernet port of each controller module.**

3. **Connect the other end of each Ethernet cable directly to your management host Ethernet ports.**

Next Steps

Now You Are Ready To Connect The Data Host To Your Array, As Described In Chapters 4 to 6.

Connecting Data Hosts to the 2510 Array

This chapter describes cabling data hosts to the Sun StorageTek 2510 Array using iSCSI. It contains the following sections:

Connecting Data Hosts to the 2510 Array

The Sun StorageTek 2510 Array is an Internet Small Computer System Interface (iSCSI) system that communicates with hosts over an Ethernet data path.

The hosts that initiate data need a NIC as noted in "iSCSI Concepts" on page 98.

For initial iSCSI configuration information, go to Appendix C.

Note – For maximum hardware redundancy, each host must have a minimum of two Ethernet NICs for dual paths. Dual-port NICs give you two paths into the storage array, but do not ensure redundancy if the NIC fails. Single controller and single path configurations are supported, but are not recommended.

As shown in FIGURE 4-1, each 2510 controller has two Ethernet host ports for data path transmission with the hosts.

FIGURE 4-1 Ethernet Host Ports on the Controllers

1. Not used
2. Ethernet Host Port
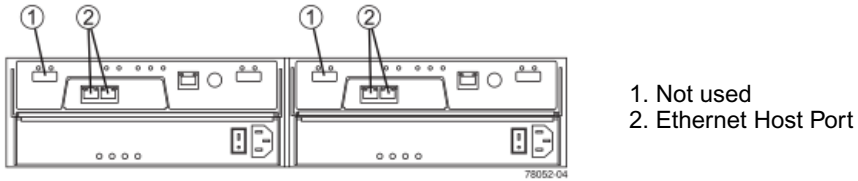
The most common topologies to connect from the host to the controllers are:

- **Direct topology** – Connecting directly from the hosts to the controllers.
- **Network topology** – Connecting from the hosts to the controllers through a switch or other network components. Also called a fabric or switched topology.

Alternate topologies such as single-controller configurations and mixed configurations are described in Appendix D.

FIGURE 4-2 Direct Topology – Two Hosts Connected to Each Controller
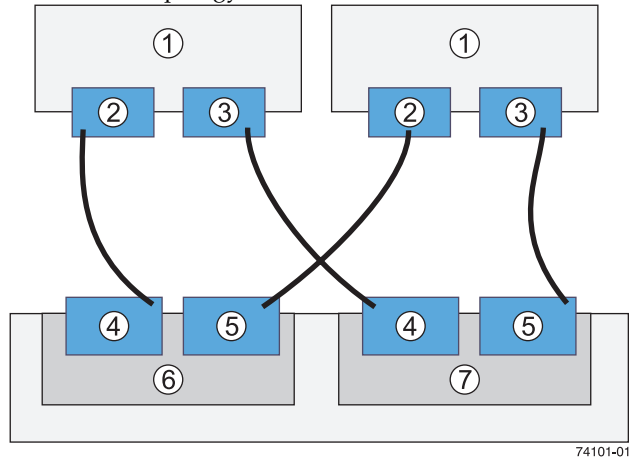
1. Hosts
2. NIC 1
3. NIC 2
4. Host Port 1
5. Host Port 2
6. Controller A
7. Controller B

FIGURE 4-3   Network Topology – Two Hosts Connected to the Controllers Through a Switch
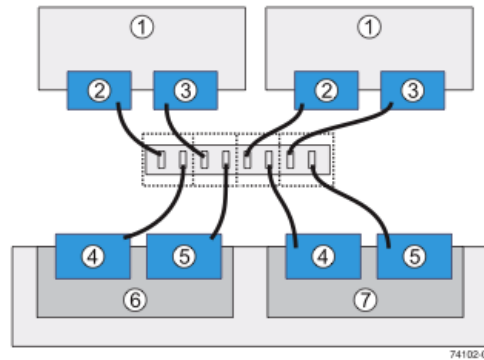
1. Hosts
2. NIC 1
3. NIC 2
4. Host Port 1
5. Host Port 2
6. Controller A
7. Controller B

▼ To Connect Host Cables

1. **Insert one end of the Ethernet cable into a host port on the controller.**

2. **If direct topology, insert the other end of the Ethernet cable into the port on the NIC on the data host.**

3. **If network topology, insert the other end of the Ethernet cable into a switch port.**

   a. **Connect a second cable from the switch to the port on the NIC.**

4. **Repeat steps 1 to 3 for each host-to-controller connection.**

Relocation Cautions

Use the following guidelines when relocating trays or drives from one storage array to another.

Caution – Potential data loss – Moving a storage array or array components that are configured as part of a volume group can result in data loss. To prevent data loss, always consult a Customer Support representative before relocating configured drives, controller trays, or drive expansion trays.

Do not move controller trays or drive expansion trays that are part of a volume group configuration. If you must move array components, contact a Customer Support representative for procedures. A Customer Support representative might direct you to complete several tasks prior to undertaking the relocation. These tasks might include:

- Creating, saving, and printing an array profile of each storage array that is affected by the relocation of a drive or tray.
- Performing a complete backup of all data on the drives that you intend to move.
- Verifying that the volume group and each of its associated volumes on the affected storage array have an Optimal status.
- Determining the location and status of any global hot spares associated with the affected storage array.

Next Steps

After You Connect The Management And Data Hosts, You Can Power On The Trays, As Described In .

Connecting Data Hosts to the 2530 Array

This chapter describes Sun StorageTek 2500 Series Array cable connections for hosts. It contains the following sections:

Connecting Data Hosts to the 2530 Array

Data transmission between the host and the controllers in the array module is through Serial Attached SCSI (SAS) cables. All connections from the host to the **controllers** are direct connections. FIGURE 5-1 shows an example of a direct host connection from a single data host with dual HBAs.

FIGURE 5-1   Direct Connection From a Single Host With Dual HBAs

1. Host
2. HBA 1
3. HBA 2
4. Host Connectors on the
   Controllers
5. Controller A
6. Controller B

74100-02
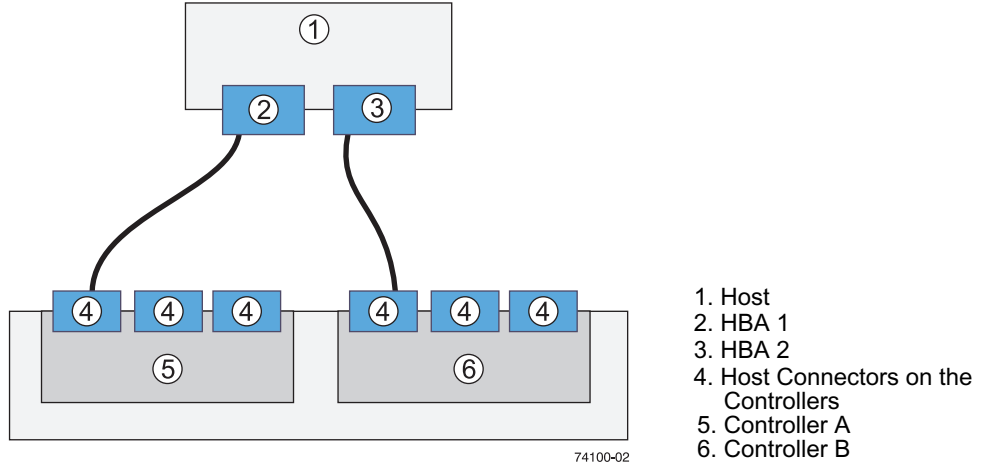
FIGURE 5-2 shows an example of direct host connections from two data hosts, each with dual HBAs.

FIGURE 5-2   Direct Connections from Two Data Hosts with Dual HBAs.

1. Host
2. HBA 1
3. HBA 2
4. Host Port
5. Controller A
6. Controller B
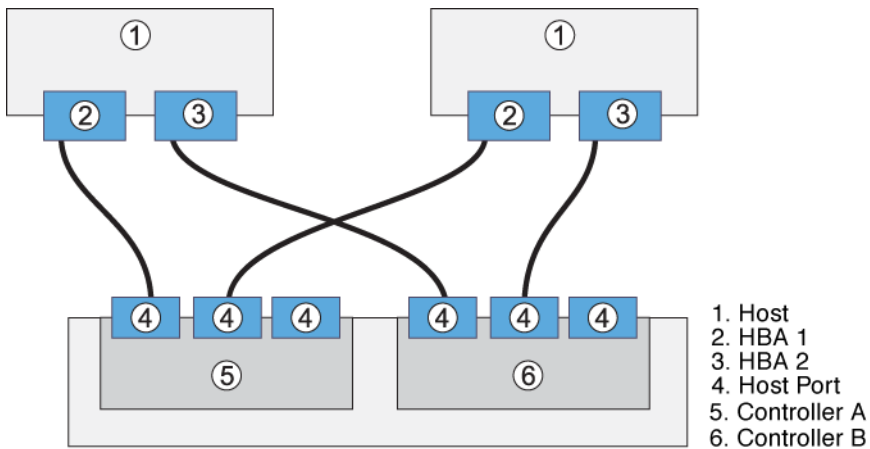
FIGURE 5-3 shows an example of direct host connections from three data hosts, each with dual HBAs.

FIGURE 5-3   Direct Connections from Three Data Hosts with Dual HBAs
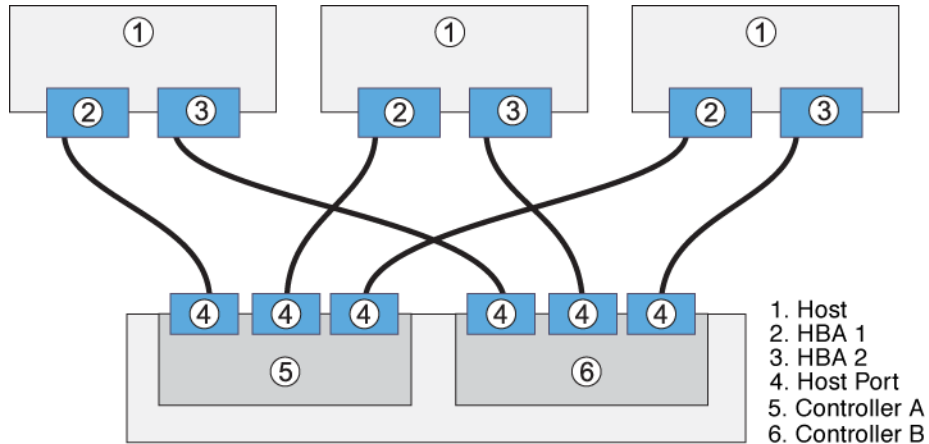
1. Host
2. HBA 1
3. HBA 2
4. Host Port
5. Controller A
6. Controller B

Note – For maximum hardware redundancy, you must install a minimum of two HBAs in each host. Dual-port HBAs give you two paths into the storage array but do not ensure redundancy if the HBA fails.

Before you connect data hosts directly to the array, check that the following prerequisites have been met:

- Interface cables are connected and between the HBAs and the array controllers.
- SAS cables (1-, 3-, or 6-meters) are available to connect the controller's host ports to the data host HBAs.

Each controller module on a controller tray has three SAS host ports (FIGURE 5-4).

FIGURE 5-4 SAS Data Host Ports (on Back of Tray)

Controller A   Controller B

1. SAS Host Port 1
2. SAS Host Port 2
3. SAS Host Port 3
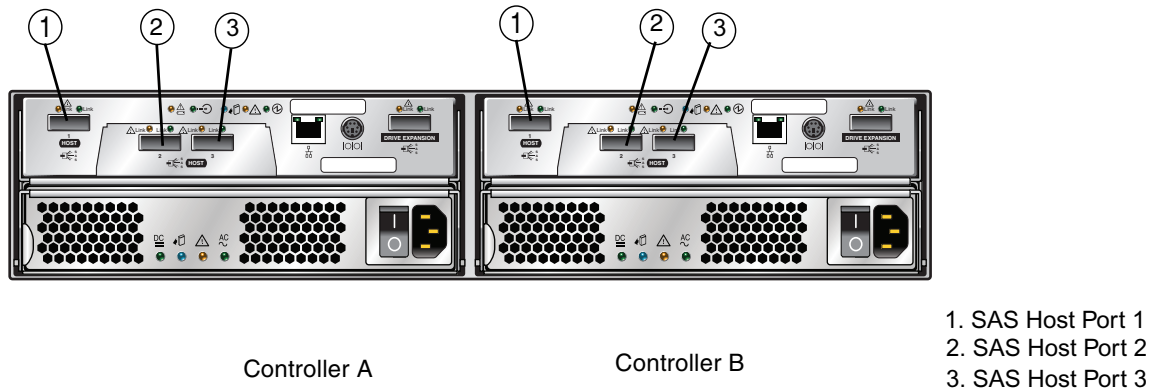
▼ To Connect Data Hosts to a 2530 Array

1. **Locate the host ports at the back of the controller tray (**FIGURE 5-4**).**

2. **Connect one end of the SAS cable to a host port on a controller module.**

   Host ports are numbered from left to right: host port 1, host port 2, and host port 3.

3. **Connect the other end of each SAS cable to a data host HBA.**

4. **Repeat these steps for each host-to-controller connection.**

Relocation Cautions

Use the following guidelines when relocating trays or drives from one storage array to another.

Caution – Potential data loss – Moving a storage array or array components that are configured as part of a volume group can result in data loss. To prevent data loss, always consult a Customer Support representative before relocating configured drives, controller trays, or drive expansion trays.

Do not move controller trays or drive expansion trays that are part of a volume group configuration. If you must move array components, contact a Customer Support representative for procedures. A Customer Support representative might direct you to complete several tasks prior to undertaking the relocation. These tasks might include:

- Creating, saving, and printing an array profile of each storage array that is affected by the relocation of a drive or tray.
- Performing a complete backup of all data on the drives that you intend to move.
- Verifying that the volume group and each of its associated volumes on the affected storage array have an Optimal status.
- Determining the location and status of any global hot spares associated with the affected storage array.

Next Steps

After You Connected The Management And Data Hosts, You Can Power On The Trays, As Described In .

Connecting Data Hosts to the 2540 Array

This chapter describes Sun StorageTek 2500 Series Array cable connections for hosts. It contains the following sections:

- "Connecting Data Hosts to the 2540 Array" on page 69
- "Next Steps" on page 75

Connecting Data Hosts to the 2540 Array

The Sun StorageTek 2540 Array connects to data hosts through Fibre Channel (FC) cables.

Note – For maximum hardware redundancy, you must install a minimum of two HBAs in each host. Dual-port HBAs give you two paths into the storage array but do not ensure redundancy if the HBA fails. Single controller and single path configurations are supported but are not recommended.

2540 Array Data Host Connection Topologies

You can connect data hosts to access the Sun StorageTek 2540 Array directly to the array, or through Fibre Channel (FC) switches to the array. The following figures illustrate four possible host connection topologies for the 2540 Array:

- Direct connection from a single data host server (FIGURE 6-1)
- Direct connection from two data host servers (FIGURE 6-2)
- Data host connection through Fiber Channel switch fabric (FIGURE 6-3)
- Mixed connection, direct and through switch (FIGURE 6-4)

FIGURE 6-1   Direct Connection from a Single Data Host Server

1. Host
2. HBA 1
3. HBA 2
4. Host Port
5. Controller A
6. Controller B
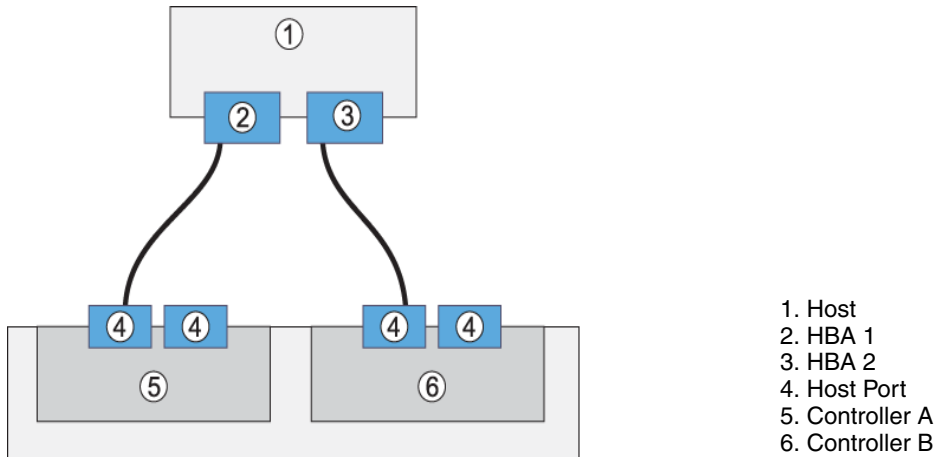
FIGURE 6-2   Direct Connection from Two Data Host Servers

FIGURE 6-3   Data Host Connection Through a Fibre Channel Switch

1. Host
2. HBA 1
3. HBA 2
4. Host Port 1
5. Host Port 2
6. Controller A
7. Controller B
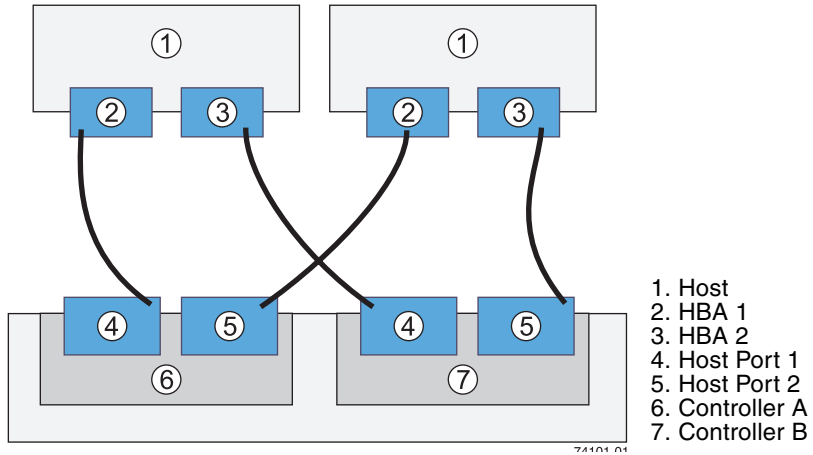
FIGURE 6-4 Mixed Topology of Data Hosts Connected Directly and Through FC Switches

1. Host
2. HBA 1
3. HBA 2
4. Host Port 1
5. Host Port 2
6. Controller A
7. Controller B

74102-01
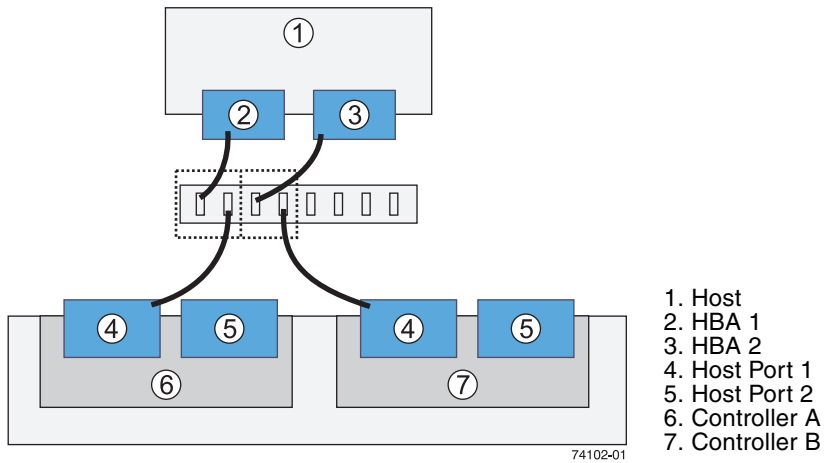
FIGURE 6-5 Connecting the SFP and Fiber-optic Cable to a 2540 Controller

1. Fibre Channel Host Port
2. SFP is Inserted into the Host Port
3. Fiber-optic Cable is inserted into the SFP

1. Host 1
2. HBA 1
3. HBA 2
4. Host 2
5. Host 3
6. Host Port 1
7. Host Port 2
8. Controller A
9. Controller B

74104-01
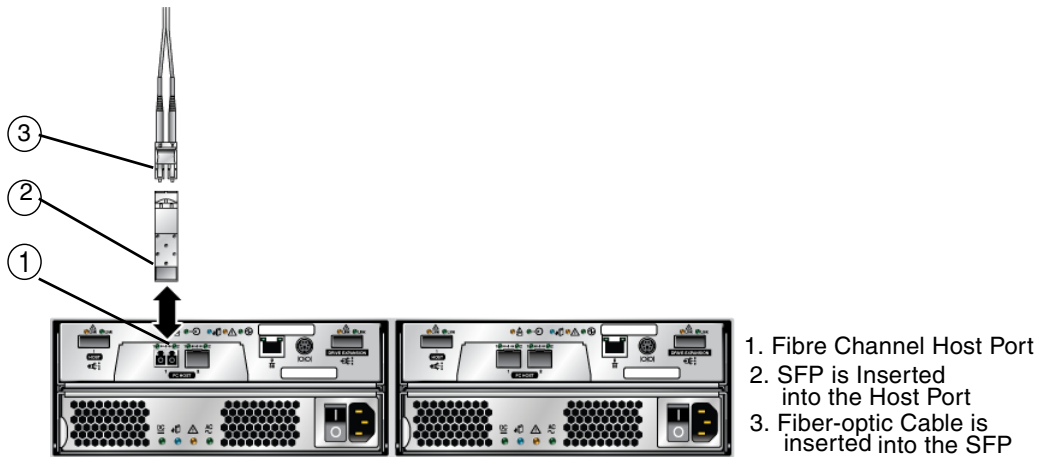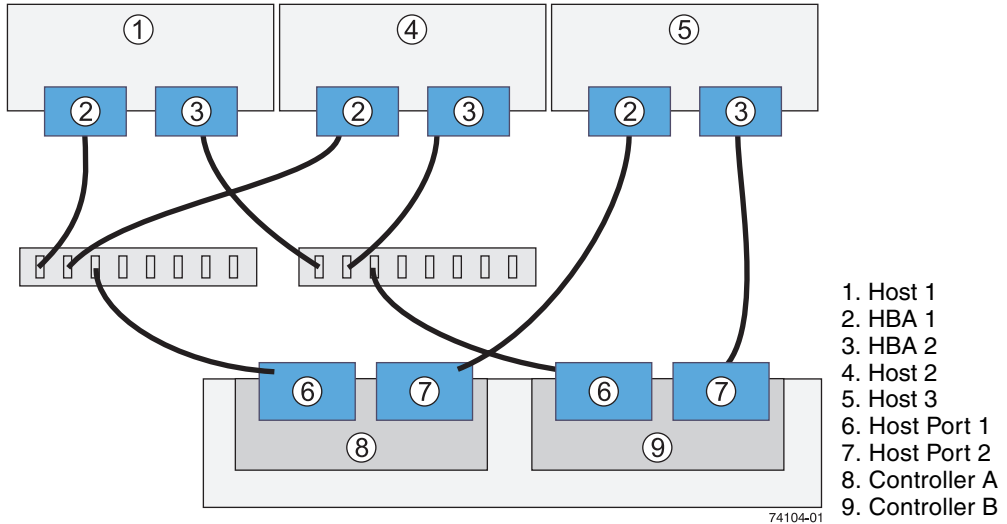
2540 Array Data Host Connections

Data transmission from the host to the array controller modules is through fiber-optic cables. The fiber-optic cables connect to the controllers through Small Form-factor Pluggable (SFP) transceivers (FIGURE 6-5).

The Sun StorageTek 2540 Array controller tray has four FC host ports, two per controller module. To maintain redundancy, connect two data paths from each host, one to each controller.

FIGURE 6-6 FC host Connectors on the 2540 Controller

1. not used
2. Fibre Channel data
   host port 1
3. Fibre Channel data
   host port 2
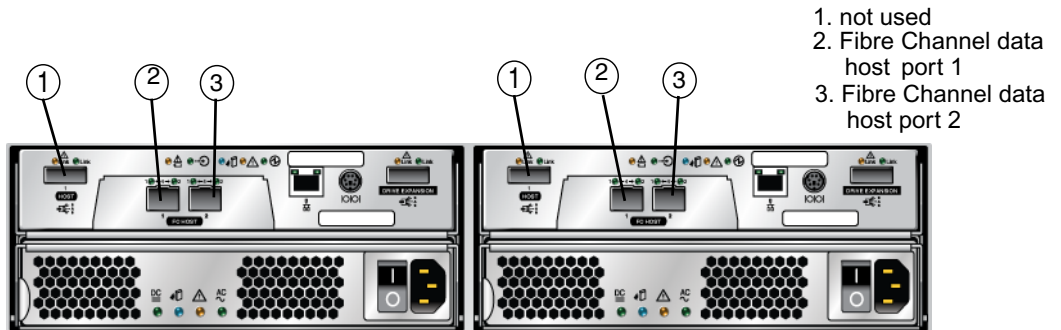
▼ To Connect Data Hosts Using Fibre Channel

1. **Locate the host ports at the back of the controller tray (**FIGURE 6-6**).**

2. **Plug one SFP transceiver into a host port.**

3. **Plug one end of the fiber-optic cable into the SFP transceiver.**

4. **Plug the other end of the fiber-optic cable into one of the HBAs in the host (direct topology) or into a switch (fabric topology).**

5. **Repeat these steps for each host-to-controller connection.**

Relocation Cautions

Use the following guidelines when relocating trays or drives from one storage array to another.

Caution – Potential data loss – Moving a storage array or array components that are configured as part of a volume group can result in data loss. To prevent data loss, always consult a Customer Support representative before relocating configured drives, controller trays, or drive expansion trays.

Do not move controller trays or drive expansion trays that are part of a volume group configuration. If you must move array components, contact a Customer Support representative for procedures. A Customer Support representative might direct you to complete several tasks prior to undertaking the relocation. These tasks might include:

- Creating, saving, and printing an array profile of each storage array that is affected by the relocation of a drive or tray.
- Performing a complete backup of all data on the drives that you intend to move.
- Verifying that the volume group and each of its associated volumes on the affected storage array have an Optimal status.
- Determining the location and status of any global hot spares associated with the affected storage array.

Next Steps

After You Connected The Management And Data Hosts, You Can Power On The Trays, As Described In .

Powering On the Array

This chapter describes initial tray power-on procedures in the following sections:

- "Before Powering On" on page 77
- "Powering On the Storage Array" on page 78
- "Powering Off the Array" on page 79
- "Next Steps" on page 80

Before Powering On

You should decide on a IP address method before powering on. The controllers will obtain IP addresses from DHCP if it is available on the network. If DHCP is not available, the controller tray defaults to internal static IP addresses. (See the *Sun StorageTek Common Array Manager Software Installation Guide* for information about configuring IP addresses on controller modules.)

For instructions on configuring IP addresses on the controllers using the serial interface, see "Configuring the IP Address of the Controller Modules" on page 89. For an example of how to set up the DHCP server, see "Configuring a DHCP Server" on page 133.

Powering On the Storage Array

Use this procedure to turn power on for all trays installed in the cabinet (FIGURE 7-1).

Note – The order in which you power up the trays is important. Be sure to power on the controller tray last in order to ensure that the disks in the drive expansion trays have enough time to spin completely before being scanned by the controllers in the controller tray.

FIGURE 7-1   Tray Power Connectors and Switches

Controller A   Controller B

1. Controller A power switch
2. Controller B power switch
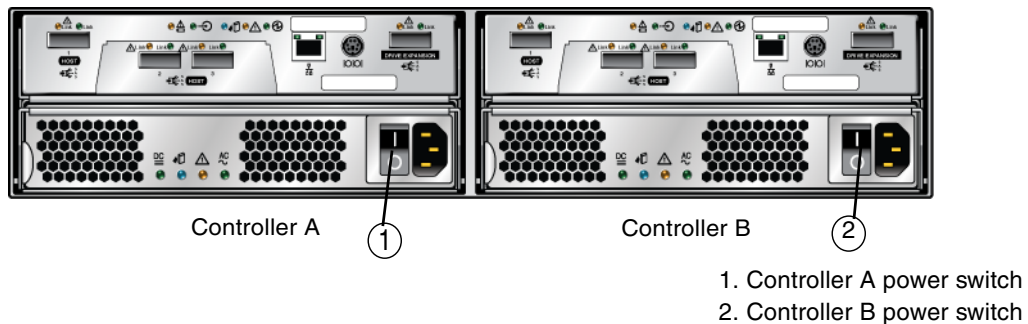
1. **Prepare the power cables as specified in** "Connecting the Power Cables" on page 45.

2. **Turn on the cabinet circuit breakers, if applicable.**

3. **Press the power switches at the back of each expansion tray to the On position.**

   While the tray powers on, the green and amber LEDs on the front and back of the controller tray turn on and off intermittently. Depending on your configuration, it can take several minutes for the tray to power on. When the power-on sequence is complete, the LEDs are steady green.

   Wait until all the disk drive indicator lights on the expansion trays are steady green before proceeding to the next step.

4. **Press each power switch at the back of the controller tray to the On position.**

5. **Check the status of each tray.**

   After the power-on sequence is complete, confirm the following:

   ■ The green OK/Power LEDs on each drive in the tray are steady on.

- The green OK/Power LED on the tray is steady on.

  If all tray and drive OK/Power LEDs are steady green and the amber Service Required LEDs are off, the power-on sequence is complete and no faults have been detected.

Powering Off the Array

The array rarely needs to be powered off. You remove power only when you plan to physically move the storage array to another location or are adding additional trays to a controller tray.

To power off the storage array, do the following:

1. **Stop all I/O from the hosts, if connected, to the storage array.**

2. **Wait approximately 2 minutes until all disk drive LEDs have stopped flashing.**

Note – If Disk Scrubbing is enabled, the disk drive LEDs will continue to flash after the 2-minute period has elapsed. By waiting the 2-minute period, you ensure that the data residing in cache has been written to disk. The LED flash rate during disk scrubbing (slow, periodic blink) is different from the flash rate of I/O (fast, random).

   After the 2-minute period, data residing in cache is written to disk and the battery mechanisms are disengaged.

3. **Check the Cache Active LED on the controller (**FIGURE 1-11**) to determine if any outstanding cache needs to be written.**

   If the LED is on, there is still data that needs to be flushed and written to disk.

4. **Ensure that the Cache Active LED is no longer flashing before powering off the storage array.**

5. **Press each power switch at the back of the controller tray to the Off position.**

6. **Press the power switches at the back of each drive expansion tray to the Off position.**

Next Steps

After you have connected the management host and data hosts, you are ready to install the management host software as described in the *Sun StorageTek Common Array Manager Software Installation Guide* and the data host software as described in Chapter 8. For iSCSI, proceed to Appendix A.

Data Host HBAs and Software for the 2540 and 2530 Arrays

This chapter describes how to install data host software, HBAs, and other software on different host platforms. It contains the following sections:

- "Data Host Software" on page 81
- "Setting Up a Data Host On a Solaris System" on page 82
- "Installing Data Host Software for Operating Systems Other Than Solaris" on page 85
- "Enabling Solaris Multipathing Software" on page 86
- "Next Steps" on page 88

Data Host Software

The data host software contains tools that manage the data path I/O connections between the data host and the storage array. This includes drivers and utilities that enable storage management hosts to connect to, monitor, and transfer data in a storage area network (SAN).

Note – Some management hosts can also be used as data hosts.

For information on configuring iSCSI and data hosts, refer to "Configuring iSCSI on the Sun StorageTek 2510 Array" on page 97.

HBAs and Drivers

A Host Bus Adapter (HBA) enables communications between the host and the controller tray (or other devices in-between). It also manages all data I/O on your data host. The specific HBAs you need depend on the host server platform, operating system, data transport (SAS, FC, or iSCSI) aka host interface, and data transfer rates used in your storage area network. HBAs must be ordered separately, from Sun or their respective manufacturers. Sun HBAs can be ordered from:

http://www.sun.com/storagetek/networking/

The required versions of HBA drivers must be installed on the data host before you can set up a data host. The *Sun StorageTek 2500 Series Array Release Notes* lists the data host requirements for HBAs and drivers. Get the release notes at:

http://doc.sun.com/app/docs/prod/st2500.array#hic

Refer to the specific vendor HBA documentation for instructions on installing HBA drivers.

Multipathing

Data host software controls the data path between the data host and the storage array. If there is more than one path between the host and the storage array for redundancy, this function is called multipathing.

Install data host software (including multipathing) on each data host that communicates with the Sun StorageTek 2500 Series Array. The multipathing software you need depends on the host platform, HBA, and the data transport (SAS, FC, or iSCSI) in your storage area network. This information is listed in the latest version of the *Sun StorageTek 2500 Series Array Release Notes*.

Setting Up a Data Host On a Solaris System

The Sun StorageTek 2500 Series Array provides data path support for data hosts running Solaris, Windows 2000, Windows Server 2003, Red Hat Linux, HP-UX, and IBM AIX operating systems. This section applies to hosts running Solaris 9 and 10.

See the *Sun StorageTek 2500 Series Array Release Notes* for the latest supported operating system versions.

> **Note –** To install data host software on systems that are not running the Solaris OS, see "Installing Data Host Software for Operating Systems Other Than Solaris" on page 85.

Multipathing is included in the Solaris 10 OS. For Solaris 9 data hosts, you need the SAN Foundation Kit software (which includes the multipathing software).

To install data host software on Solaris OSs, see the following sections:

- "To Obtain Sun Solaris 9 Data Host Software" on page 83
- "To Install the SAN 4.4 Data Host Software" on page 84

▼ To Obtain Sun Solaris 9 Data Host Software

Obtain Sun Solaris 9 data host software:

1. **Go to the Sun Microsystems web page (sun.com).**

   The Sun home page is displayed.

2. **Select Downloads from the home page navigation bar.**

   The Downloads page is displayed (it is not labeled).

3. **On the View by Category tab, select System Administration >> Storage Management.**

   The Storage Management page is displayed, showing a list of downloadable storage-related products.

4. **Select the SAN 4.4 product.**

   The login page is displayed.

5. **Login using your Sun account ID.**

   The SAN 4.4.x Download page is displayed.

6. **Accept the License Agreement and select the SAN 4.4 version required for your operating system.**

   The data host software version you need depends on your operating system. See the *Sun StorageTek 2500 Series Array Release Notes* for the current data host software requirements. Download the Solaris *x* (9) Base Package (if you do not already have it installed), and then the Install_it Script SAN 4.4.x version as recommended in the release notes.

   There is a README file available on the SAN 4.4.x Download page with instructions for unpacking and installing the download file on your data host computer.

▼ To Install the SAN 4.4 Data Host Software

To launch the host software installer:

1. **Log in to the host as** `root`**.**

2. **Change to the** `SAN_4.4.`*xx_install_it* **directory in which the compressed installation file was unpacked:**

   `cd` *<user-specified location>*`/SAN_4.4.`*xx_install_it*

3. where *xx* is the software version number of the installed files. **Start the host software installer by typing the following command:**

   `./install_it`

   When the installation is complete, the root prompt returns.

Note – It might be required that the host be rebooted into single user, and then rebooted right afterward to multiuser.

---

4. **Enable the Sun StorageTek Traffic Manager multipathing software (see** "Enabling Solaris Multipathing Software" on page 86**).**

▼ To Obtain Software for Operating Systems Other Than Solaris

1. **Go to the Sun Microsystems web page (sun.com).**

   The Sun home page is displayed.

2. **Select Downloads from the home page navigation bar.**

   The Downloads page is displayed.

3. **On the View by Category tab, scroll down to select System Administration >> Storage Management.**

   The Storage Management page is displayed, showing a list of downloadable storage-related products.

4. **Scroll down and select the StorageTek 2500 Series multipath/failover option for your particular operating system.**

   The login page is displayed.

5. **Login using your Sun account ID.**

   The product Download page is displayed.

6. **Accept the License Agreement and select the software version required for your operating system.**

   The data host software version you need depends on your operating system. See the *Sun StorageTek 2500 Series Array Release Notes* for the current data host software requirements.

   There is a README file available on the download page with instructions for unpacking and installing the download file on your data host computer.

Installing Data Host Software for Operating Systems Other Than Solaris

To install data host software for operating systems other than Solaris, see the following sections:

- "About Data Host Software For Non-Solaris Platforms" on page 85
- "Downloading and Installing Sun RDAC Software" on page 86

Note – To download software from the Sun Download Center, you must register as a Sun customer. The first time you click Download to download a software product, click the Register Now link on the Login page, complete the required fields, and click Register.

About Data Host Software For Non-Solaris Platforms

The data host software for Red Hat Linux, HP-UX, AIX, and Windows platforms is Sun Redundant Dual Array Controller (RDAC), also known as MPP, and is available from the Sun Download Center (SDLC).

See the *Sun StorageTek 2500 Series Array Release Notes* for a list of supported operating systems, patches, and HBAs.

Downloading and Installing Sun RDAC Software

1. **To download the latest version of Sun RDAC software (support for Windows and Linux multipathing), go to:**

   http://www.sun.com/download/index.jsp

   and select Hardware Drivers >> Storage.

2. **Select the link for the RDAC driver for the Operating System you have.**

   An RDAC Driver download page is displayed.

3. **Click Download.**

4. **Log in using your SDLC user name and password.**

5. **Read and accept the license agreement.**

6. **Select the link for the data host platform that you want to install.**

7. **Save the install package to a temporary directory.**

8. **Uncompress and untar the install package.**

9. **When the download is finished, log out of the SDLC.**

A `readme` file is provided as part of the installation package. To install the software, refer to the `readme` file for platform-specific instructions.

Enabling Solaris Multipathing Software

Sun StorageTek SAN Foundation software includes the Sun StorageTek Traffic Manager multipathing software.

The procedure you use to enable multipathing software depends on the version of Solaris OS running on the host:

- "Enabling Multipathing Software for Solaris 9 OS" on page 87
- "Enabling Multipathing Software for Solaris 10 OS" on page 87

For information on configuring iSCSI, refer to:

"Configuring iSCSI on the Sun StorageTek 2510 Array" on page 97.

▼ Enabling Multipathing Software for Solaris 9 OS

To enable the multipathing software on hosts running Solaris OS 9:

1. **Open the** `/kernel/drv/scsi_vhci.conf` **file with a text editor.**

2. **Set** `mpxio-disable="no";` **in the file.**

3. **Set** `load-balance="round-robin";` **in the file.**

4. **Set** `auto-failback="enable";` **in the file.**

5. **Save the updated file.**

6. **Reboot the host.**

7. **Use the** `cfgadm` **command to configure HBA paths.**

   How you configure paths depends on how you are using your storage arrays in a SAN or direct-attach environment.

   See the *Sun StorEdge SAN Foundation Software 4.4 Configuration Guide* at:

   `http://www.sun.com/products-n-solutions/hardware/docs/Network_Storage_Solutions/SAN/san_software/`

   for information about configuring paths.

▼ Enabling Multipathing Software for Solaris 10 OS

To enable multipathing software for all Fibre Channel (FC) ports on hosts running Solaris OS 10:

1. **Type the following command:**

   `# stmsboot -e`

   Note – See the `stmsboot`(1M) man page for complete details.

   You are prompted to confirm the command:

   `WARNING: This operation will require a reboot.`

   `Do you want to continue? [y/n] (default: y)`

2. **Press Return to reboot the host.**

Next Steps

After you have installed and enabled multipathing on the data hosts, configure IP addressing on the controller modules as described in Chapter 9.

Configuring IP Addressing

In order for there to be an out-of-band Ethernet connection between the local management host and the controller modules, the management host and the controllers must have valid IP addresses.

This chapter describes how to configure IP addressing on the local management host and on the controller modules. It contains the following sections:

- "About IP Addressing" on page 89
- "Configuring the IP Address of the Controller Modules" on page 89

About IP Addressing

The Sun StorageTek 2500 Series Array is managed out-of-band by way of a standard Ethernet connection between the controller modules and your management host.

Perform the following procedures to ensure that the local management host and the controllers have valid IP addresses:

- Configure IP addresses for the controller modules (see "Configuring the IP Address of the Controller Modules" on page 89)
- Configure an IP address for the management host (see the *Sun StorageTek Common Array Manager Software Installation Guide*)

Configuring the IP Address of the Controller Modules

You can configure two types of IP addressing for the Ethernet port of each controller:

- Dynamic Host Configuration Protocol (DHCP) IP addressing – IP addresses for the Ethernet port are assigned dynamically from a DHCP server running bootstrap protocol (BOOTP) services. An IP address assigned to an Ethernet port is held only as long as needed. By default, DHCP is enabled at initial power-on.

- Static IP Addressing – You assign a specific IP address to the Ethernet port of each controller. Static IP addresses remain in effect until you modify or remove them or you change the method of IP addressing for the Ethernet port to DHCP.

  By default, if the controllers cannot find a DHCP server upon initial power-on, an internal IP address is assigned to Ethernet port 1 of each controller:

- The Ethernet port of Controller A is assigned IP address `192.168.128.101`

- The Ethernet port of Controller B is assigned IP address `192.168.128.102`

- The default subnet mask for each port is `255.255.255.0`

To configure the Ethernet port on a controller with either dynamic or static IP addressing, see one of the following sections:

- "Configuring Dynamic (DHCP) IP Addressing" on page 90
- "Configuring Static IP Addressing" on page 91

Configuring Dynamic (DHCP) IP Addressing

If BOOTP services are available on the DHCP server at initial power on of the storage array, this server assigns a dynamic IP address for the Ethernet port on each controller.

If a DHCP server is not available, the controller tray defaults to internal static IP addresses as described in "Configuring the IP Address of the Controller Modules" on page 89.

If you want to set up a DHCP server, refer to Appendix F for a description of how to configure BOOTP services in Sun Solaris or Microsoft Windows environments.

You can restore DHCP IP addressing to Ethernet port 1 of either controller in either of three ways:

- Start a DHCP server on the same subnet, then reboot the 2500 Series Array.

- Using the serial port interface (see "Using the Serial Port Interface to Assign IP Addresses" on page 91).

- Using the Sun StorageTek Common Array Manager (see the *Sun StorageTek Common Array Manager Software Installation Guide*).

Configuring Static IP Addressing

There are two methods of assigning static IP addresses to the Ethernet ports of a controller:

■ The serial port interface (see "Using the Serial Port Interface to Assign IP Addresses" on page 91)

■ The Common Array Manager (see the *Sun StorageTek Common Array Manager Software Installation Guide*).

Using the Serial Port Interface to Assign IP Addresses

You can use the serial port interface on a controller to set the IP address for the Ethernet port on the controller.

To use the serial port interface to configure IP addressing for the Ethernet port of each controller, you must complete the tasks described in the following sections:

■ "To Connect a Terminal to the Serial Port" on page 91

■ "To Set Up the Terminal Emulation Program" on page 92

■ "To Establish a Connection With the Serial Port" on page 92

■ "To Configure the IP Addresses" on page 94

▼ To Connect a Terminal to the Serial Port

You will establish a serial connection to each controller, Controller A and Controller B. One mini-DIN to RJ45 serial port cables are supplied with each controller tray.

To connect a terminal to the serial port of a controller:

1. **Connect the 6-pin mini-DIN connector of the serial cable to the serial port on the controller (**"Controller Tray Rear-Access Components" on page 8**).**

2. **Connect the RJ-45 connector of the serial cable to the serial port on the terminal. It may be necessary to use the RJ45-DB9 adapter between the serial cable RJ-45 connector and the serial port of the terminal.**

3. **For PC and laptop serial connections, you will also need to use a null modem. Connect the RJ45-DB9 null modem adapter between the serial cable RJ-45 connector and the PC serial port.**

Note – If your PC does not have a serial port, you can use a USB–Serial Port adapter (separately available from third-party vendors; not included with 2500 Series Array ship kits).

Serial Cable Pinouts

TABLE 9-1 shows the pinouts for the RJ45-DIN serial cable (Sun part number 530-3544) included with the 2500 Series Array ship kit.

TABLE 9-1 RJ45 to DIN Serial Cable Pinouts

RJ45 ---------->	PS2-miniDin
1 Tx	6 Rx
2	
3 Rx	1 Rx
4,5,7	3, 5 GRD
6 Rx	2 Tx
8	4

▼ To Set Up the Terminal Emulation Program

To set up a terminal emulation program to connect to the serial port:

1. Select VT100 emulation.

2. Remove any modem strings from the connection profile.

3. Set up the connection profile with the following communication settings:

- Data Rate: 38400
- Data Bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None

▼ To Establish a Connection With the Serial Port

To establish a connection with the serial port and display the Service Interface menu:

1. Send a Break. Repeat until text appears.

Note – The storage array serial port requires that the break character be received. Use the appropriate escape sequence for your terminal setup to send the required break character to the controller, For example, you generate the Break character on some terminals by pressing the Control and Break keys simultaneously.

The serial port responds with a request to synchronize with the baud rate of the terminal:

```
Set baud rate: press <space> within 5 seconds
```

2. **Press the space bar within five seconds.**

The serial port confirms the established baud rate for the connection:

```
Baud rate set to 38400
```

3. **Press Break (see Note above)**

The serial port responds with the following message:

```
Press within 5 seconds: <S> for Service Interface, <BREAK>
for baud rate
```

4. **Press S to access the Service Interface menu.**

Note – Send Break to synchronize the serial port to a different terminal port rate (see Note above).

The serial port requests the serial port password:

```
Enter Password to access Service Interface (60 sec timeout):
->
```

5. **Type the serial port password,** `kra16wen`**, and press Enter.**

The Service Interface menu is displayed.

```
Service Interface Main Menu
 =============================
1) Display IP Configuration
2) Change IP Configuration
3) Reset Storage Array (SYMbol) Password
Q) Quit Menu


Enter Selection:
```

▼ To Configure the IP Addresses

The serial port Service Interface menu enables you to set up the IP address configuration for the Ethernet port on the controller.

To set up the IP address configuration for the Ethernet port on each controller:

1. Select option 2, Change IP Configuration:

```
Service Interface Main Menu
 ==============================
1) Display IP Configuration
2) Change IP Configuration
3) Reset Storage Array (SYMbol) Password
Q) Quit Menu


Enter Selection: 2
```

2. Specify that you do not want dynamic IP addressing, using a DHCP server, used for this port:

```
Configure using DHCP? (Y/N): n
```

The current or default IP configuration for the selected Ethernet port is displayed.

3. Enter the static IP address and, optionally, a subnet mask for the Ethernet port:

Note – If you are not using DHCP IP addressing and have a gateway IP address on your subnet, you must also specify a gateway IP address for the Ethernet port. This option displays only if the serial interface detects a gateway.

```
Press '.' to clear the field;
Press '-' to return to the previous field;
Press <ENTER> and then ^D to quit (Keep Changes)


            Current Configuration          New Configuration
IP Address       if1 : 192.168.128.101     IP-address
Subnet Mask      if1 : 255.255.255.0       <ENTER>
Gateway IP Address if1:                    <ENTER>
```

4. When prompted, confirm the specified IP addressing.

The Service Interface menu is redisplayed.

5. Select option 1, Display IP Configuration, to confirm the IP address changes.

```
Service Interface Main Menu
 ==============================
1) Display IP Configuration
2) Change IP Configuration
3) Reset Storage Array (SYMbol) Password
Q) Quit Menu


Enter Selection: 1
```

The IP address configuration of the Ethernet port is displayed, and the Service Interface menu displays again.

6. Press Q to quit the Service Interface menu.

7. Switch the serial cable to the serial port on the other controller and repeat these steps to set the IP address on that controller as well.

8. Power cycle the controllers off and on again to reset them with the new IP address.

When you have completed the IP address configuration for the Ethernet port on both controllers and power cycled them, see the *Sun StorageTek Common Array Manager Software Installation Guide* for instructions on registering and configuring the storage array.

Configuring iSCSI on the Sun StorageTek 2510 Array

This appendix describes initial configuration of iSCSI on the Sun StorageTek 2510 Array. It contains the following sections:

- *"Configuring iSCSI Overview" on page 97*
- *"iSCSI Concepts" on page 98*
- *"Configuring iSCSI - Detailed" on page 99*
- *"Preparing for iSCSI and Installing Hardware" on page 99*
- *"Configuring iSCSI Tasks" on page 100*
- *"Configuring Other iSCSI Features" on page 104*

Configuring iSCSI Overview

The following overview lists the major steps to configure the data host and target storage after setting up the array and installing the management software.

For the full procedure go to *"Configuring iSCSI - Detailed" on page 99*

1. **Configure an iSCSI port for each controller on the storage array.**

2. **On the data host:**

    a. **Note its iSCSI Qualified Name (IQN) of the host.**

    b. **Configure static discovery of the target ports.**

3. **In the** Sun StorageTek Common Array Manager **software:**

    a. **Configure an initiator with the data host IQN.**

b. **Create a volume**

   c. **Map the volume to the initiator through the host or host group.**

4. **On the data host:**

   a. **Link the initiator and target volume, if needed.**

   b. **Verify that you see the created volume.**

5. **Use system administration commands in the OS to mount/read/write to the volume.**

iSCSI Concepts

Configuring iSCSI requires an understanding of the following concepts.

- iSCSI target - a storage device accessed over an Ethernet connection while still using the SCSI infrastructure. One iSCSI target is supported per array. The Target Details page appears in the software when supporting a Sun StorageTek 2510 array.

- iSCSI session - consists of up to four connections between an iSCSI initiator and the iSCSI target. The iSCSI initiator and target send and receive data over an Ethernet connection while still using the SCSI protocol. Across all connections within a session, an initiator sees one and the same target. Multiple initiators may be connected to the iSCSI Target.

- Authentication - Communication between the initiator and the target array can be protected using CHAP authentication.

- iSCSI ports - used for communication between the iSCSI initiator and the iSCSI target. The storage array supports two iSCSI ports per controller, for a total of four iSCSI ports per array.

- Ethernet Network Interface Card (NIC) - you connect an Ethernet data path from the data host to the storage using a NIC on the host side.

  A NIC is an input/output (I/O) adapter that connects a host to a computer network. The host central processing unit (CPU) must process the Small Computer System Interface (SCSI) information in Ethernet frames.

  Ethernet NICs require a software initiator. The iSCSI initiator runs on the data host and converts SCSI commands into iSCSI commands to send and receive data over the Ethernet connection to a target storage system. iSCSI initiators are operating system specific. Examples are provided for configuring initiators in Solaris and Windows. Consult your operating system documentation for Linux.

Configuring iSCSI - Detailed

The following sections detail the steps in planning, cabling, and configuring iSCSI:

- "Preparing for iSCSI and Installing Hardware" on page 99
- "Configuring iSCSI Tasks" on page 100
- "Configuring Other iSCSI Features" on page 104

The first two sections contain tables listing each step in configuring iSCSI:

- "iSCSI Preparation and Hardware Steps" on page 100
- "iSCSI Configuration Steps" on page 101

You can use the procedures in conjunction with examples for Solaris and Windows.

For an example of configuring iSCSI on a Solaris host, go to "iSCSI Configuration Example Using Solaris" on page 107.

For an example of configuring iSCSI on a Windows host, go to "iSCSI Configuration Example Using Windows" on page 111.

For an example of configuring iSCSI on a Linux host, consult your Linux OS documentation.

The RDAC driver for LINUX supports the Sun StorageTek 2510 Array. To download:

1. Go to www.sun.com

2. Select Download

3. Select View by Category

4. Select Systems Administration >> Storage Management, and scroll down to the StorageTek 2500 Series offerings.

Preparing for iSCSI and Installing Hardware

This section details the steps to prepare for iSCSI and complete the hardware installation before beginning configuration.

TABLE A-1 iSCSI Preparation and Hardware Steps

Step	For more Information, refer to:
1. Identify the required OS, iSCSI software packages, and patches.	OS documentation. *Sun StorageTek 2500 Series Array Release Notes*, 6.1 or higher. Download from http://docs.sun.com/app/docs/coll/st2500arrays
2. Select a topology and if a network topology, provide a suitable Ethernet network.	"Connecting Data Hosts to the 2510 Array" on page 59
3. Set up the storage array, trays, cabling, and networking, as noted in earlier chapters. .	"Installing Trays" on page 27 "Connecting the Management Host" on page 55 "Connecting Data Hosts to the 2510 Array" on page 59
4. Power on the storage array.	"Powering On the Array" on page 77
5. If needed, change the array management default IP addresses using the serial port interface.	"Configuring IP Addressing" on page 89
6. Install the Sun StorageTek Common Array Manager software. 7. In the software, register the storage array and perform the basic administration setup. Note: for storage array configuration, use the iSCSi steps that follow.	Refer to *Sun StorageTek Common Array Manager Software Installation Guide* (sent with the controller tray).

Configuring iSCSI Tasks

This section describes the steps to configure iSCSI on the data host and in the Common Array Manager software. It contains the following sections:

- TABLE A-2,"iSCSI Configuration Steps" on page 101
- "Identifying the Target Port IP Address" on page 101
- "Adding Initiator Information" on page 103
- "Additional iSCSI Topics in the Online Help" on page 104
- "Configuring Mutual Authentication for an iSCSI Session" on page 105

For an example of configuring iSCSI on a Solaris host, go to "iSCSI Configuration Example Using Solaris" on page 107.

For an example of configuring iSCSI on a Windows host, go to "iSCSI Configuration Example Using Windows" on page 111.

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TABLE A-2   iSCSI Configuration Steps

Step	For more Information, refer to:
1. In the Common Array Manager software: A. Go to the Ports Summary page. B. Verify that the target ports (minimum one for each controller) are up. C. Note the target IP addresses and ports. D. Change the port IP addresses from the default, if needed, on the Port Detail page.	"Identifying the Target Port IP Address" on page 101
2. On the data host: A. Note the iSCSI Qualified Name (IQN) of the initiator on the data host. B. Set the discovery method of the target as static. C. Discover the target ports (minimum one for each controller) from the initiator. D. List and verify the discovered static targets and their iSCSI Qualified Name (IQN).	OS Documentation "iSCSI Configuration Example Using Solaris" on page 107 "iSCSI Configuration Example Using Windows" on page 111
3. In the Common Array Manager software: A. Run the Create New Initiator wizard and add the IQN of the initiator as the unique identifier. B. Add each initiator to a host or host group. C. Create the volumes. D. Map each initiator to a volume using the host or host group.	"Adding Initiator Information" on page 103 Refer to the *Sun StorageTek Common Array Manager Installation Guide* or online help for the configuration of volumes, hosts, and mappings.
4. On the data host: A. If needed, create a device link. (Example for Solaris: `#devfsadm -i iscsi`.) B. Verify that you can see the created volume. C. Optional - create and mount the file system.	OS Documentation "iSCSI Configuration Example Using Solaris" on page 107 "iSCSI Configuration Example Using Windows" on page 111

Identifying the Target Port IP Address

Step 1 requires you to identify the target ports IP address (minimum one for each controller) on the Port Summary page noted below.

Port Summary on Storage System dpl1500b

Name	Controller	Link Status	Type	Speed	Unique Identifier
Ports (4)					
A/1	A	Down	iSCSI	Unknown	00:A0:B8:20:36:05
A/2	A	Up	iSCSI	1 Gbps	00:A0:B8:20:36:07
B/1	B	Down	iSCSI	Unknown	00:A0:B8:20:34:1D
B/2	B	Up	iSCSI	1 Gbps	00:A0:B8:20:34:1F

.

If you need to configure the iSCSI ports to change the IP address or the listening port, display the Port Summary and select a port to display the Port Details page. Consult the online help for configuration help.

Port Summary > Port Details

Port Details - A/1 on Storage System dpl1500b

⌄ Details   ⌄ IPv4 Configuration

Details

Name:	A/1
Controller:	A
Port WWN:	00:A0:B8:20:36:05
Type:	iSCSI
Speed:	Unknown
Maximum Speed:	Unknown
Link Status:	Down
Listening Port:	3260
	Default port is 3260; otherwise, specify in the range 49152 to 65535.
Maximum Transmission Unit (MTU):	1500 Bytes Per Frame
	Default value is 1500; otherwise, specify in the range 1501 to 9000, which enables Jumbo Frames Support.

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Adding Initiator Information

After creating an initiator on a data host, you need to add information about the initiator to the management software.

Selecting Create New Initiator launches a wizard.

Add the following information:

- Initiator Name - can be up to 30 characters. Valid characters are 'A-Z', 'a-z', '0-9', hyphen('-') and underscore('_').
- Unique Identifier - enter the IQN of the iSCSI initiators found on the data host (See Step 2A on page 95). The identifier is used like a WWN in FC storage.

  (The identifier can also be in EUI or NAA format. See the online help for the syntax of these formats.)

  IQN syntax example: `iqn.2001-04.com.example:storage:diskarrays-sn-a8675309`:

  - `iqn` - specifies the type of address
  - `2001-04` - the date in yyyy-mm format
  - com.example:storage - the naming authority
  - `diskarrays-sn-a8675309` - is the string defined by the naming authority.
- Host type - specifies the OS and failover method of the data host.

- Initiator's Host - select from a list of existing hosts or create a new one.

The wizard will allow you to assign the initiator to a host or host group. You use the host or host group to map the initiator to a volume.

- Authentication - enable Challenge-Handshake Authentication Protocol (CHAP) authentication, if needed. (The example does not enable this). Enter a unique password consisting of 12 to 57 alphanumeric characters.

   You will also have to enter a CHAP secret on the Target Details page.

   For more information about authentication, go to"Configuring Mutual Authentication for an iSCSI Session" on page 105 for reference the online help.

Configuring Other iSCSI Features

This section describes additional features for configuring iSCSI on the Sun StorageTek 2510 Array. It contains the following sections:

Additional iSCSI Topics in the Online Help

In addition to the initial iSCSI configuration discussed in this guide, the Common Array Manager has online help to document modifying every feature and the fields on every iSCSI page.

iSCSI topics in the online help include:

- Configuring an iSCSI Session
- Configuring Ports
- Create Initiator Wizard
- Configuring Mutual Authentication for an iSCSI Session
- Configuring an Unnamed Discovery Session
- Configuring an Internet Storage Name Service (iSNS)
- Enabling and Disabling ICMP Ping Responses
- Ending an iSCSI Session
- Viewing iSCSI Performance Statistics

Page help in the online help includes:

- iSCSI Ethernet-MAC Performance Page

- iSCSI Ethernet - TCP/IP Performance Page
- iSCSI Session Details Page
- iSCSI Ethernet-MAC Performance Page
- iSCSI Ethernet - TCP/IP Performance Page
- iSCSI Session Details Page
- iSCSI Session Summary Page
- iSCSI Target Details Page

Configuring Mutual Authentication for an iSCSI Session

In a secure environment, authentication is not required because only trusted initiators can access the targets.

In a less secure environment, the target cannot determine if a connection request is truly from a given host. In that case, the target can authenticate an initiator by using the Challenge-Handshake Authentication Protocol (CHAP).

CHAP authentication uses the notion of a challenge and response, which means that the target challenges the initiator to prove its identity. For the challenge/response method to work, the target must know the initiator's secret key and the initiator must be set up to respond to a challenge.

You can configure mutual authentication for an iSCSI session so that both the iSCSI initiator and iSCSI target use a CHAP secret.

For security purposes, Sun Microsystems recommends that the initiator and CHAP secrets be unique.

You can add CHAP secrets when creating an initiator or add it later to an initiator and target.

▼ To Configure Mutual Authentication

1. Click Sun StorageTek Common Array Manager.

   The navigation pane and the Storage System Summary page are displayed.

2. In the navigation pane, expand the storage array you want to work with.

   The navigation tree is expanded for that array.

3. Expand Physical Devices and choose Initiators.

The Initiator Summary page is displayed.

4. Select the initiator for which you want to configure mutual authentication.

   The Initiator Details page is displayed.

5. In the Authentication field, select CHAP and enter a CHAP secret.

6. Enter the CHAP secret again in the validation field.

7. Click Save.

8. In the navigation pane, expand the storage array you want to work with.

   The navigation tree is expanded for that array.

9. Expand Physical Devices and choose iSCSI Target.

   The iSCSI Target Details page is displayed.

10. In the iSCSI Target Authentication section, select CHAP and enter the CHAP secret.

11. Click Save.

iSCSI Configuration Example Using Solaris

This appendix shows an example of iSCSI configuration on a Solaris data host in the following sections:

▼ To Prepare for the iSCSI Configuration

1. **Log into the data host as super user.**

2. **Identify the minimum required OS, software packages, and patches by referring to the** *Sun StorageTek 2500 Series Array Release Notes,* **6.1 or higher.**

   Download from http://docs.sun.com/app/docs/coll/st2500arrays

   You can also apply the latest patches from:
   http://sunsolve.sun.com/show.do?target=patchpage

   a. **Verify that you are running the required Solaris OS:**

      # cat /etc/release

   b. **Verify that iSCSI software packages are installed**

      # pkginfo SUNWiscsiu SUNWiscsir

      system SUNWiscsiu Sun iSCSI Device Driver (root)

      system SUNWiscsir Sun iSCSI Management Utilities (usr)

   c. **Verify that you have the latest patches applied for the iSCSI packages. For example:**

      On a SPARC system:

showrev -p | grep 119090

On an x86 system:

showrev -p | grep 119091

3. **Install the Common Array Manager software on the management host and register the target array.**

Follow the instruction in the *Sun StorageTek Common Array Manager Installation Guide*.

▼ To Configure iSCSI

1. **In the Common Array Manager software, go to the Port Summary page and verify that the target ports (one for each controller) are in an** up **status and note there IP addresses and ports.**

If you need to change the port IP addresses, use the Port Details page. You can enter a new IP address or set DHCP.

2. **From the data host:**

   a. **List and note the IQN of each initiator.**

   ```
   # iscsiadm list initiator-node

   Initiator node name: iqn.1986-03.com.sun:01:0003babc0401.46f806dd

   Initiator node alias: -

         ...
   ```

   b. **Enable the discovery method of the targets as static.**

   ```
   #iscsiadm modify discovery --static enable
   ```

   c. **Ping the target ports IP addresses to confirm they can be reached.**

   ```
   #ping  ip_address

   #ping 192.168.1.1

   192.168.1.1 is alive
   ```

   d. **Discover the targets (one port for each controller) from the iSCSI initiator using the isciadm command and the IP addresses of the ports.**

   ```
   #iscsiadm add discovery-address 192.168.1.1:3260
   #iscsiadm add discovery-address 192.168.2.1:3260
   ...
   ```

e. **Verify that discovered targets are listed on the data host.**

```
#iscsiadm list discovery-address

Discovery Address: 192.168.1.1:3260
...
```

f. **List the IQNs of the targets using the** `iscsiadm` **command and the IP addresses you noted on the Port Summary page.**

```
>iscsiadm list discovery-address -v 192.168.1.1

Discovery Address: 192.168.1.1:3260

Target name:
iqn.1986-03.com.sun:2510.600a0b80003487e400000000474c6e0b

             Target address:     192.168.1.1:3260, 1
Target name:
iqn.1986-03.com.sun:2510.600a0b80003487e400000000474c6e0b

             Target address:     192.168.1.2:3260, 1

Target name:
iqn.1986-03.com.sun:2510.600a0b80003487e400000000474c6e0b

             Target address:     192.168.2.1:3260, 2

Target name:
iqn.1986-03.com.sun:2510.600a0b80003487e400000000474c6e0b

             Target address:     192.168.2.2:3260, 2
```

g. **Add the IQNs of the targets discovered in the last steps to the discovery table.**

```
#iscsiadm add static-config iqn.1986-
03.com.sun:2510.600a0b80003487e400000000474c6e0b,192.168.1.1
```

This adds a target to the list of statically configured targets. Repeat for each target port.

h. **List the statically configured targets and verify that the new targets have been added.**

```
# iscsiadm list static-config

Static Configuration Target:
iqn.1986-03.com.sun:2510.600a0b80003487e400000000474c6e0b,
192.168.1.1:3260
...
```

i. **Note the number of disks (volumes) before you configure new volumes.**

```
#format

AVAILABLE DISK SELECTIONS:

       0. c3t0d0 <SUN72G cyl 14087 alt 2 hd 24 sec 424>

          /pci@8,600000/SUNW,qlc@4/fp@0,0/ssd@w500000e010483de1,0

...
```

3. **In the CAM software:**

   a. **Create each initiator with its IQN from the data host noted in** Step 2a.

      Refer to "Adding Initiator Information" on page 103 for details.

   b. **Follow CAM documentation to:**
   - Create a volume
   - Map the volume to a host or host group linked to the initiator.

4. **On the data host:**

   a. **Create the iSCSI device link on the data host.**

   ```
   #devfsadm -i iscsi
   ```

   b. **Issue the format command and verify that more disk (volumes) were created than what you noted in** Step 2i.

```
#format
```

The system is ready for you to use system administrator commands to create and mount a file system.

iSCSI Configuration Example Using Windows

This appendix shows an example of configuring iSCSI on a Windows data host (Windows 2003 Server is the recommended platform) in the following sections:

-
-

▼ To Prepare for the iSCSI Configuration

1. **Download the latest iSCSI initiator tool from Microsoft**

   http://www.microsoft.com/downloads/details.aspx?FamilyID=12cb3c1a-15d6-4585-b385-befd1319f825&DisplayLang=en

2. **Click the downloaded .exe file to launch the install wizard.**

3. **Follow the instructions in the wizard until you click Finish on the last screen.**

   This installs the Microsoft iSCSI initiator.

4. **Verify that you see the iSCSI initiator tool in the Control Panel (Start >> Control Panel).**

5. **Install the Sun StorageTek Common Array Manager software on the management host and register the target array.**

   Follow the instruction in the Sun StorageTek Common Array Manager Installation Guide.

▼ To Configure iSCSI on Windows

1. **Review the port settings in the Common Array Manager software and change the IP addresses if necessary.**

   The IP address are on the Port Summary page. The addresses can be changed or set to DHCP on the Port Details Page.

Port Summary on Storage System OBE-ST2510

Ports (4)

Name	Controller	Link Status	Type	Speed	MAC Address	IP Address
A/1	A	Up	iSCSI	100 Mbps	00:A0:B8:20:5B:41	192.168.130.101
A/2	A	Down	iSCSI	Unknown	00:A0:B8:20:5B:43	192.168.131.101
B/1	B	Down	iSCSI	Unknown	00:A0:B8:20:5A:51	192.168.130.102
B/2	B	Down	iSCSI	Unknown	00:A0:B8:20:5A:53	192.168.131.102

Port Details - A/1 on Storage System OBE-ST2510

≍ Details   ≍ IPv4 Configuration

Details

Name:	A/1
Controller:	A
MAC Address:	00:A0:B8:20:5B:41
Type:	iSCSI
Speed:	100 Mbps
Maximum Speed:	1 Gbps
Link Status:	Up

Listening Port: 3260

Default port is 3260; otherwise, specify in the range 49152 to 65535.

Maximum Transmission Unit (MTU):   1500   Bytes Per Frame

Default value is 1500; otherwise, specify in the range 1501 to 9000, whic|

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IPv4 Configuration

IP Address: ○ Use DHCP
                     ● Configure Manually

                           IP Address: 192.168.130.101
                           Subnet Mask: 255.255.255.0
                           Gateway: 0.0.0.0
                                           Enter values in the form xxx.xxx.xxx.xxx

Virtual LAN Support: ☐ Enable VLAN Support

                           VLAN ID: 0
                                      ID in the range 1 to 4096.

Ethernet Priority: ☐ Enable Ethernet Priority

                           Priority: 0 ▼

2. **Configure the iSCSI initiator tool to be able to map the volume created on the storage array.**

   a. **Launch the iSCSI initiator tool from the control panel.**

   By default, the installation places the shortcut to the iSCSI initiator applet on the desktop.

   b. **Note the IQN (iSCSI Qualified Name) of the iSCSI initiator.**
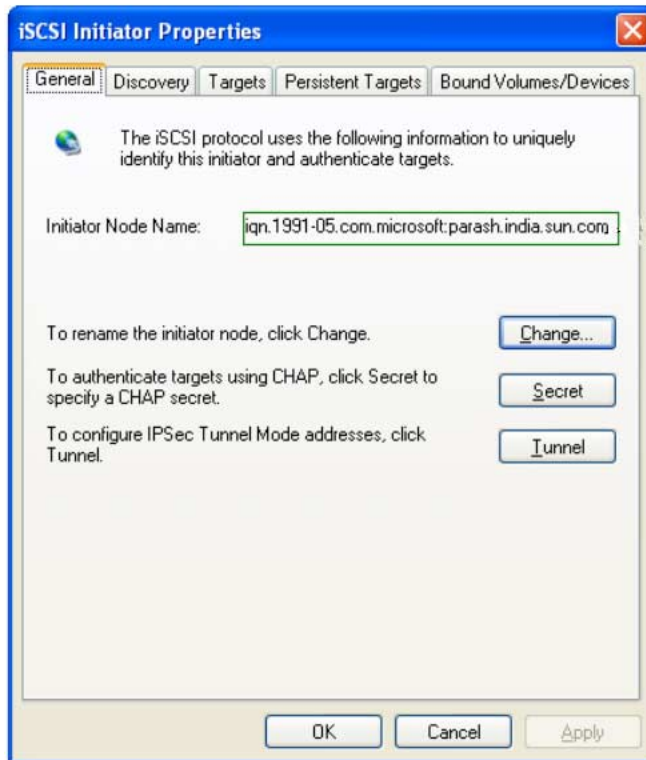
3. **In the CAM software, create the initiator with the IQN of the data host.**

   Refer to "Adding Initiator Information" on page 103 for details.

4. **In the iSCSI initiator tool, go to the Discovery tab. In the Target Portals section, add the IP address of one of the iSCSI ports on your storage array for the target discovery.**
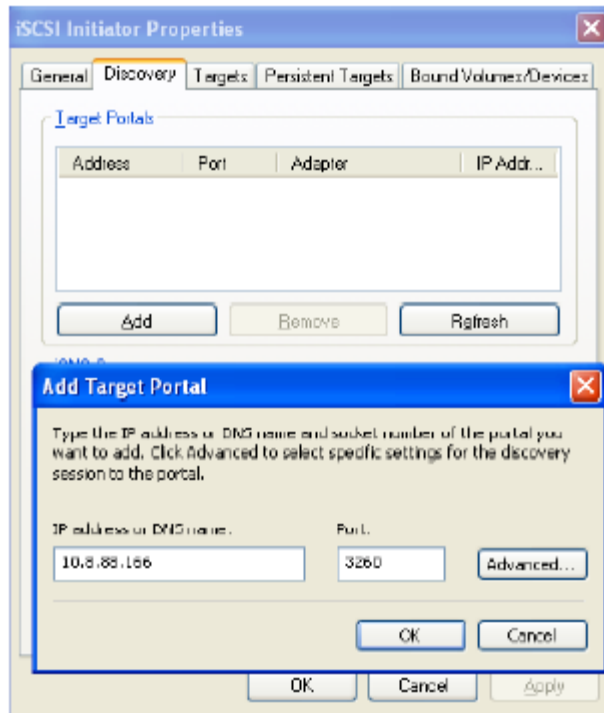
5. **Note that the Link status of the port you are adding should be UP.**

6. **In the Add Target Portal pop up above, click on the Advanced button and select the Local adapter as Microsoft iSCSI Initiator and in the Source IP. Then select the IP of the system where the initiator is installed.**
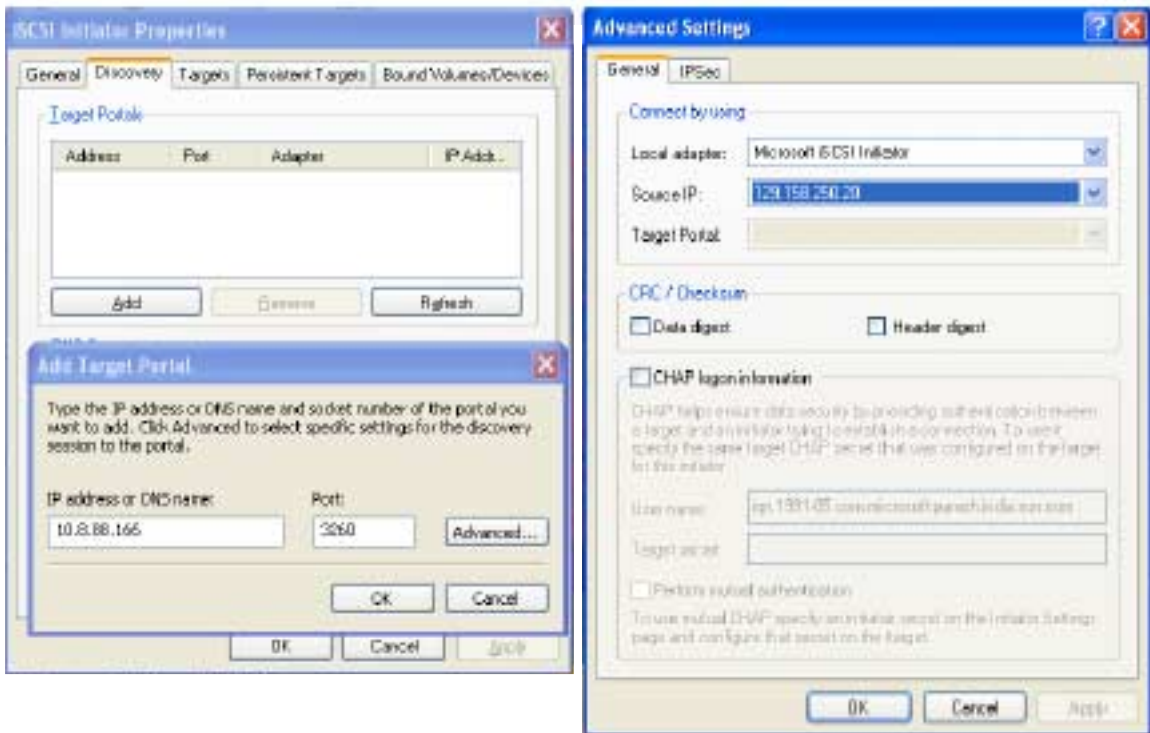
7. **Click OK.**

8. The target should get discovered as seen in the screen shot below.
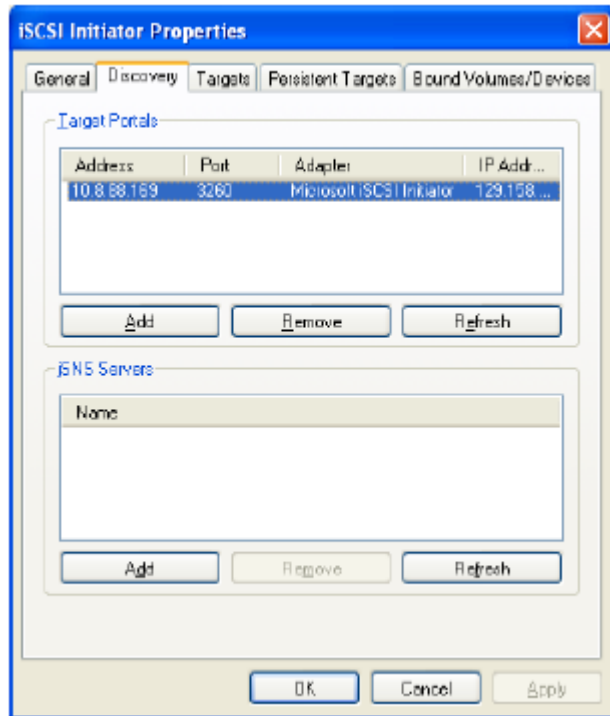
9. **Go to the Targets tab, click on the target listed there and press Log on button.**
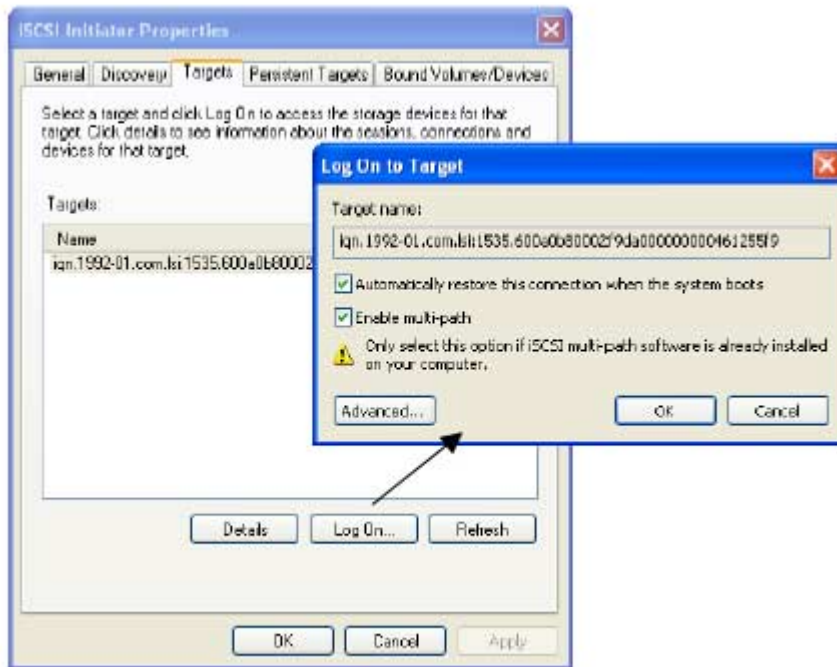
10. **Enable both the check boxes and click on the Advanced button in the pop up.**

11. **In the Advanced settings tab, select local adapter as the Microsoft iSCSI Initiator.**
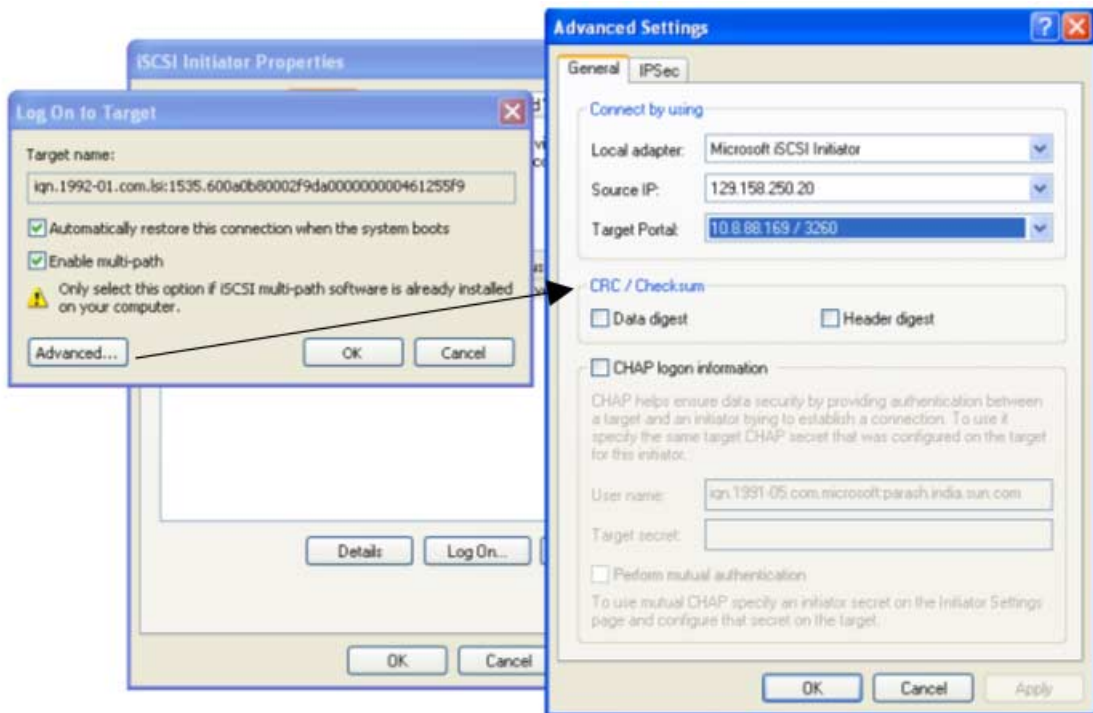
12. **For source IP, enter the system IP where the initiator is running.**

13. **For target portal enter the IP address you have discovered in the previous step.**

14. **Click OK.**

    After this, the status of the target should be shown as Connected.

15. **Repeat Steps 7 to 14 for each target (minimum one target per controller).**

16. **In the Common Array Management software, configure the following using the Common Array Management documentation (Install Guide or online help) to:**

    ■ Create volumes

    ■ Map each volume to a host or host group linked to an initiator.

17. **Launch the Computer Management application in Windows and open Disk Management.**

    You should be able to see the mapped volume on your host.
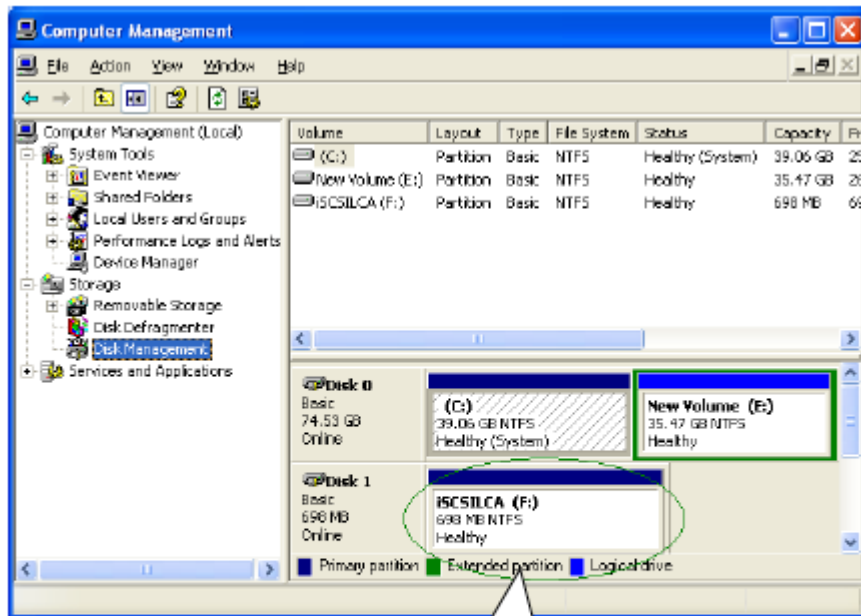
See the mapped volume present here

Connecting to the 2510 Array with Other Topologies

This appendix describes connecting data hosts to the Sun StorageTek 2510 Array with topologies other than the basic ones listed in Chapter 4. It contains the following section:

- "Connecting to the 2510 Array with Other Topologies" on page 121

Connecting to the 2510 Array with Other Topologies

Chapter 5 showed the two most common duplex cabling topologies:

- Direct topology
- Network topology

This section shows more examples of the above and adds:

- Single-controller topology (not recommended)
- Mixed topology

Host Cabling Configurations – Single Controller

FIGURE D-1   Direct Connection– One Host Connected to a Single Controller
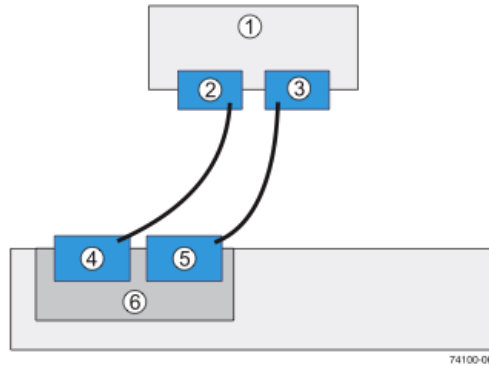
1. Host
2. NIC 1
3. NIC 2
4. Host Port 1
5. Host Port 2
6. Controller A

FIGURE D-2   Direct Topology – Two Hosts Connected in a Single Path
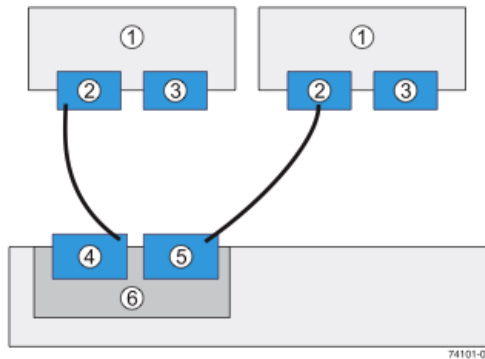
1. Hosts
2. NIC 1
3. NIC 2
4. Host Port 1
5. Host Port 2
6. Controller A

You can connect one or more hosts to a controller tray. The hosts can run the same operating system or each host can run a different type of operating system.

FIGURE D-3 Fabric Topology – Two Hosts Connected to the Controller Through a Switch
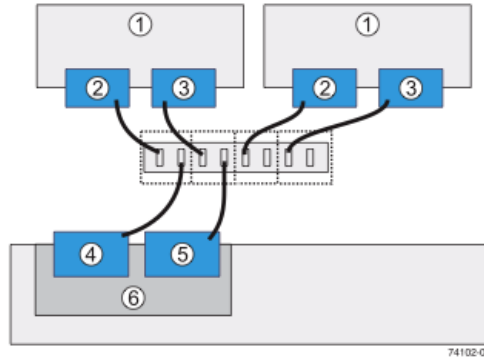
1. **Hosts**
2. **NIC 1**
3. **NIC 2**
4. **Host Port 1**
5. **Host Port 2**
6. **Controller A**

FIGURE D-4 Mixed Topology – Three Hosts Connected Through a Switch or Connected Directly
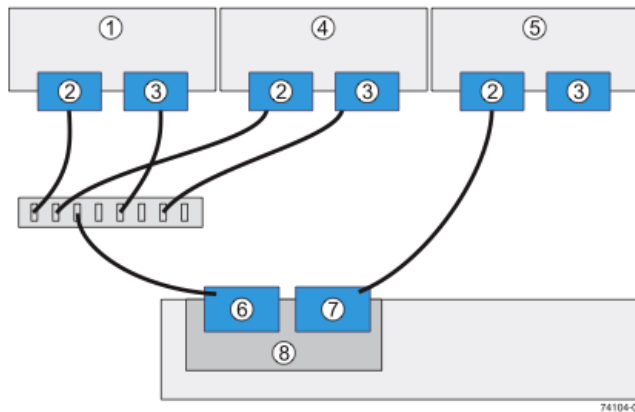
1. **Host 1**
2. **NIC 1**
3. **NIC 2**
4. **Host 2**
5. **Host 3**
6. **Host Port 1**

7. Host Port 2
8. Controller A

Host Cabling Configurations – Dual Controller

FIGURE D-5   Direct Topology – One Host Connected to Each Controller
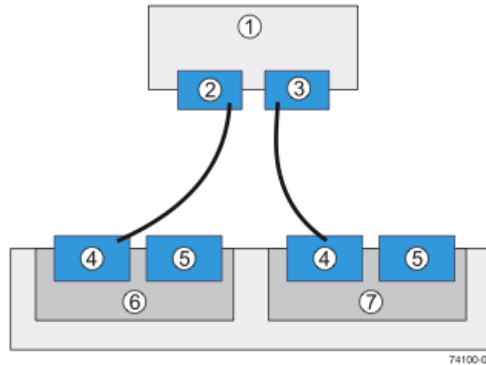
1. Host
2. NIC 1
3. NIC 2
4. Host Port 1
5. Host Port 2
6. Controller A
7. Controller B

FIGURE D-6　Mixed Topology – Three Hosts Connected Through a Switch or Connected Directly

74104-01
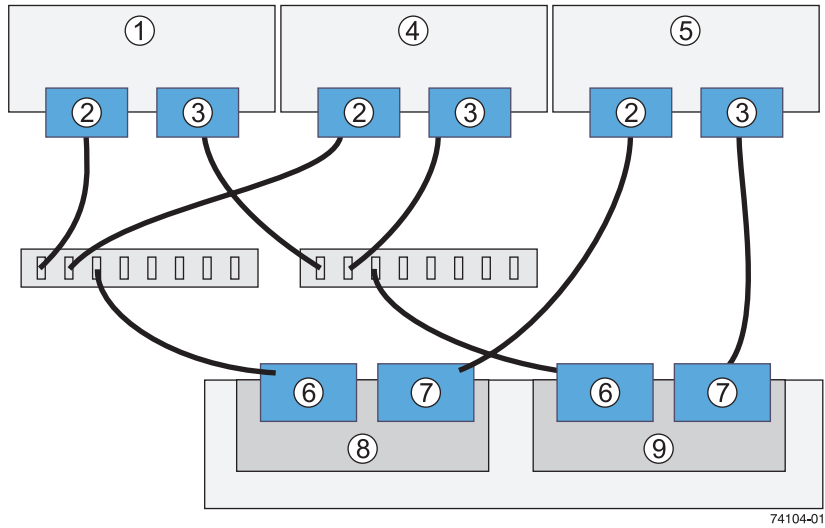
1. Host 1
2. NIC 1
3. NIC 2
4. Host 2
5. Host 3
6. Host Port 1
7. Host Port 2
8. Controller A
9. Controller B

Using DC Power

This appendix describes using the DC Power Source option for the Sun StorageTek 2500 Series Arrays in the following sections:

- "DC Power Overview" on page 127
- "Installation Notes for DC Power" on page 128
  - "Ship Kit Changes" on page 129
  - "DC Power LEDS" on page 129
  - "Connecting Power Cables" on page 130
  - "Turning Off the DC Power During an Emergency" on page 131
  - "Relocation Cautions" on page 131

DC Power Overview

The Sun StorageTek 2500 Series Arrays can be ordered with a DC power connection and connector cables.

Caution – A qualified service person is required to make the DC power connection per NEC and CEC guidelines. A two-pole 20-amp circuit breaker is required between the DC power source and the trays for over-current and short-circuit protection. Before turning off any power switches on a DC-powered CRU or module, you must disconnect the two-pole 20-amp circuit breaker.

Caution – Electrical grounding hazard – This equipment is designed to permit the connection of the D.C. supply circuit to the earthing conductor at the equipment.

FIGURE E-1 shows the locations of the power-fan assemblies.

FIGURE E-1   Power Fan Assembly Locations.

FIGURE E-2   DC Power Connector Cable and Source Wires

1. Supply (Negative), Brown Wire, −48 VDC
2. Return (Positive), Blue Wire
3. Ground, Green/Yellow Wire
4. DC Power Connector
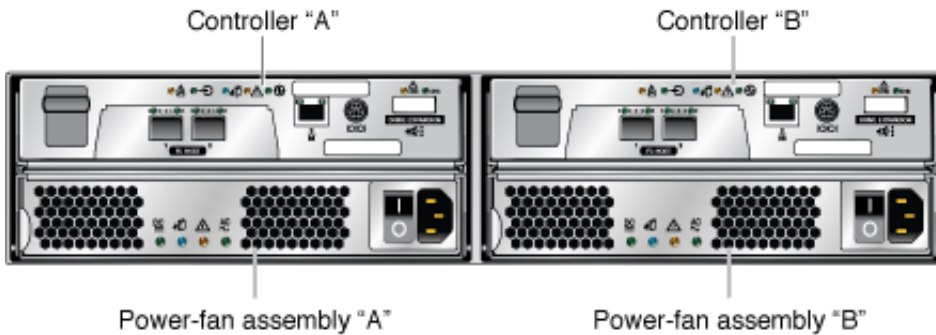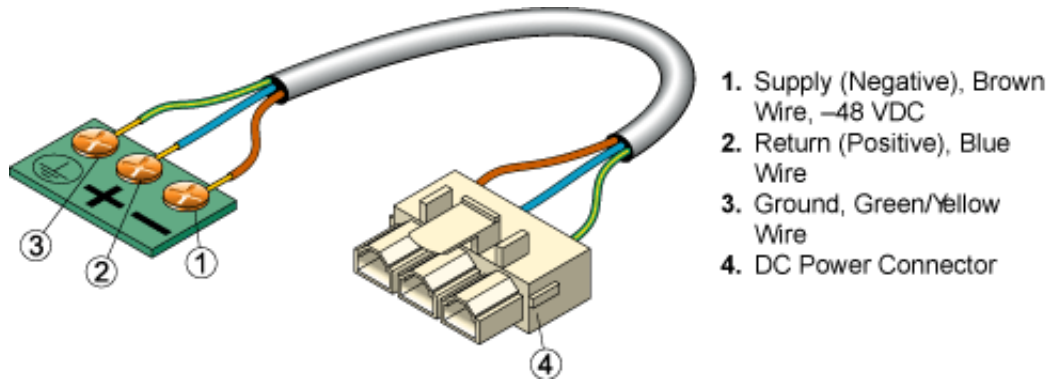
The power-fan assemblies above are shown with AC power connectors. The DC power connector can be seen in FIGURE E-3.

Caution – Risk of electrical shock – The tray has more than one power source. To remove all power from the tray, all DC MAINS must be disconnected by removing all power connectors (item 4 in Appendix E) from the power-fan assemblies.

Installation Notes for DC Power

The sections that follow provide hardware information about DC power.

- "Ship Kit Changes" on page 129
- "DC Power LEDS" on page 129

Ship Kit Changes

If the DC power option is ordered, two DC power connector cables are provided with each controller tray for connection to centralized DC power plant equipment.

Caution – A qualified service person is required to make the DC power connection per NEC and CEC guidelines. A two-pole 20-amp circuit breaker is required between the DC power source and the tray for over-current and short-circuit protection. Before turning off any power switches on a DC-powered CRU or module, you must disconnect the two-pole 20-amp circuit breaker.

DC Power LEDS

FIGURE E-3 shows the LEDs, on/off power switch, and power cable receptacle on the back of the DC power-fan assembly.

FIGURE E-3 DC Power-Fan Assembly LEDs, Power Switch, and Power Cable Receptacle.
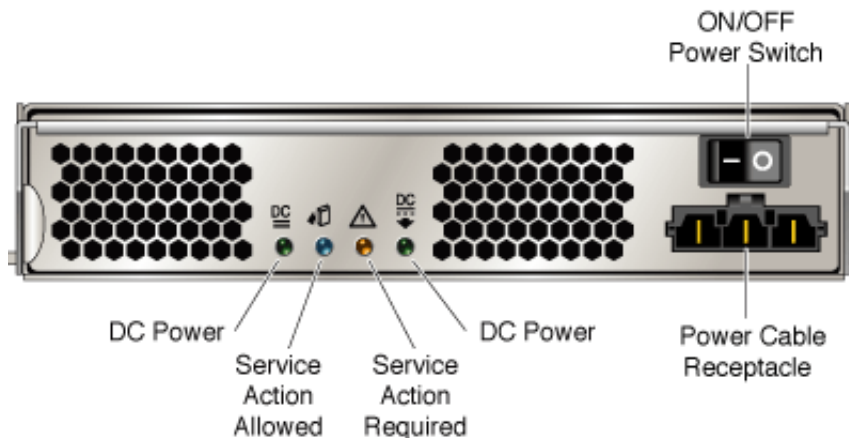
TABLE E-1 lists the LEDs for DC power.

TABLE E-1 DC Power-Fan Assembly LEDs

LED	Color	On	Off
DC Power (DC Good)	Green	DC power from the power-fan assembly is available.	DC power from the power-fan assembly is not available.
Service Action Allowed	Blue	The power-fan assembly can be removed from the tray.	The power-fan assembly cannot be removed from the tray.
Service Action Required (Fault)	Amber	A fault exists within the power-fan assembly.	Normal condition
Power (DC Good)	Green	Power is present	Power is not present

Connecting Power Cables

Caution – **A qualified service person is required to make the DC power connection per NEC and CEC guidelines.** A two-pole 20-amp circuit breaker is required between the DC power source and the tray for over-current and short-circuit protection. Before turning off any power switches on a DC-powered CRU or module, you must disconnect the two-pole 20-amp circuit breaker.

Caution – Ensure that you do not turn on power to the controller tray or the connected drive expansion trays until this guide instructs you to do so. For the proper procedure for turning on the power, see ""Connecting Power Cables" on page 130."

Caution – **Electrical grounding hazard** – This equipment is designed to permit the connection of the D.C. supply circuit to the earthing conductor at the equipment.

▼ Connecting the Cables

1. **Disconnect the two-pole 20-amp DC circuit breaker for the storage array.**

2. **Ensure that all DC power switches on the DC-powered controller tray and all DC power switches on any connected, DC-powered drive expansion trays are turned off.**

3. **Connect the DC power connector cable to the DC power connector on each power-fan assembly on the back of the controller tray.**

> **Caution –** The three source wires on the DC power connector cable (–48 VDC) connect the trays to centralized DC power plant equipment, typically through a bus bar located above the cabinet.

4. **A qualified service person is required to make the DC power connection per NEC and CEC guidelines. A two-pole 20-amp circuit breaker is required between the DC power source and DC-powered trays for over-current and short-circuit protection. Connect the DC power source wires on the other end of the DC power connector cable to the centralized DC power plant equipment as follows (see** "DC Power Connector Cable and Source Wires" on page 128**).**

   a. **Connect the brown –48-VDC supply wire to the negative terminal.**

   b. **Connect the blue return wire to the positive terminal.**

   c. **Connect the green/yellow ground wire to the ground terminal.**

5. **If applicable, connect a DC power cable to each power-fan assembly on each DC-powered drive expansion tray in the storage array.**

Turning Off the DC Power During an Emergency

> **Caution –** Potential loss of data – An emergency shutdown of the storage array might not allow the server to complete its I/O to the storage array.

> **Note –** Before turning off the power switches on a DC-powered tray you must disconnect the two-pole 20-amp circuit breaker.

Relocation Cautions

Use the following guidelines when relocating trays or drives from one storage array to another.

> **Caution –** Potential data loss – Moving a storage array or array components that are configured as part of a volume group can result in data loss. To prevent data loss, always consult a Customer Support representative before relocating configured drives, controller trays, or drive expansion trays.

> **Note –** Trays in storage arrays can be connected to the DC power supply (–48 VDC). Before turning off any power switches on a DC-powered tray, you must disconnect the two-pole 20-amp circuit breaker.

Do not move controller trays or drive expansion trays that are part of a volume group configuration. If you must move array components, contact a Customer Support representative for procedures. A Customer Support representative might direct you to complete several tasks prior to undertaking the relocation. These tasks might include:

- Creating, saving, and printing an array profile of each storage array that is affected by the relocation of a drive or tray.
- Performing a complete backup of all data on the drives that you intend to move.
- Verifying that the volume group and each of its associated volumes on the affected storage array have an Optimal status.
- Determining the location and status of any global hot spares associated with the affected storage array.

Configuring a DHCP Server

This appendix describes how to configure bootstrap protocol (BOOTP) services in a Sun Solaris and Microsoft Windows environment. It contains the following sections:

Dynamic IP addresses are assigned through dynamic host control protocol (DHCP) server BOOTP services.

Before You Begin

You need each controller's media access control (MAC) address to configure the DHCP server. The MAC address is located on the bar code label at the back of each controller. Since there are two controller modules per controller tray, you need two MAC addresses.

Setting Up a Solaris DHCP Server

The following procedure provides an example of how to set up a DHCP server with the BOOTP option for the Solaris 8, 9, and 10 Operating Systems. Your environment may require different steps.

1. Modify the `netmasks` **line of the** `/etc/nsswitch.conf` **file as shown here:**

```
#netmasks:    nis [NOTFOUND=return] files
```

```
netmasks:    files nis [NOTFOUND=return]
```

2. Start the DHCP wizard by issuing the following command at the command line:

/usr/sadm/admin/bin/dhcpmgr &

The following window is displayed:
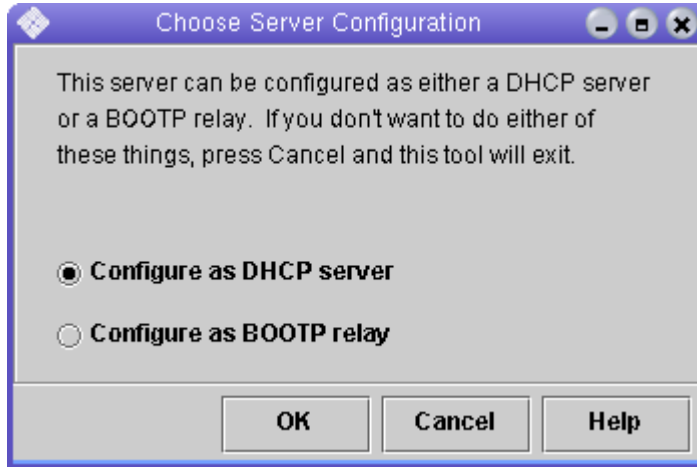
The wizard will prompt you for information related to the configuration, network address, and subnet mask of the controller tray. Select or enter the following information:

- Data storage format: **Text files**
- Name service to store host records: **Do not manage hosts records**
- Length of lease:
- Network Address: *Network address of Controller A*
- Subnet Mask: For example, 255.255.255.0
- Network Type: **Local-Area (LAN)**
- Router: **Use router discovery protocol**

Your summary page should look similar to the following example:
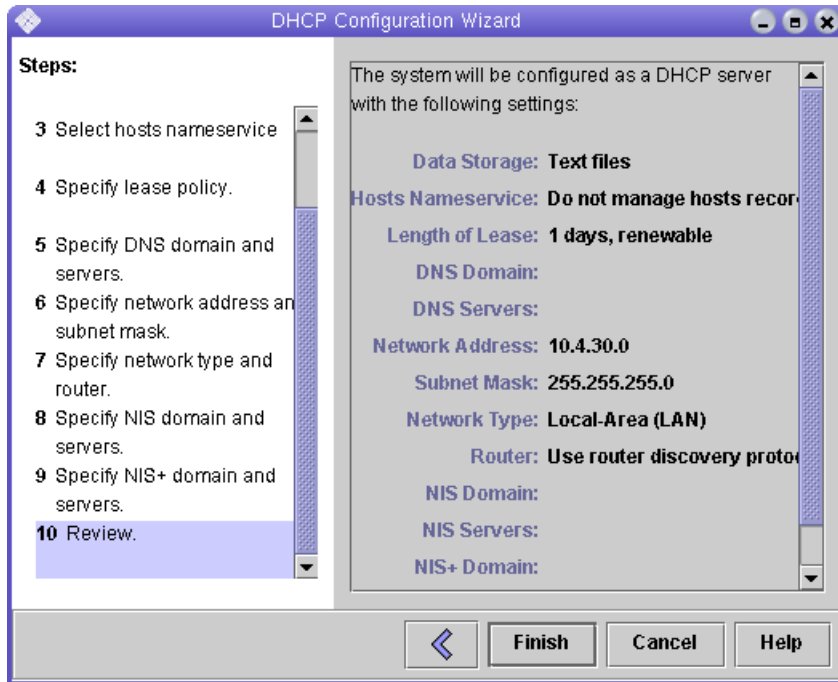
3. **Verify your configuration information, and click Finish.**

4. **When you are prompted to configure addresses for the server, click Yes.**
   The Add Address to Network wizard is displayed.

5. **Enter the following information:**
   - Number of IP addresses
   - Name of managing server
   - Starting IP address
   - Configuration macro to be used for configuring the clients
   - Lease type

Your summary page should look similar to the following example:
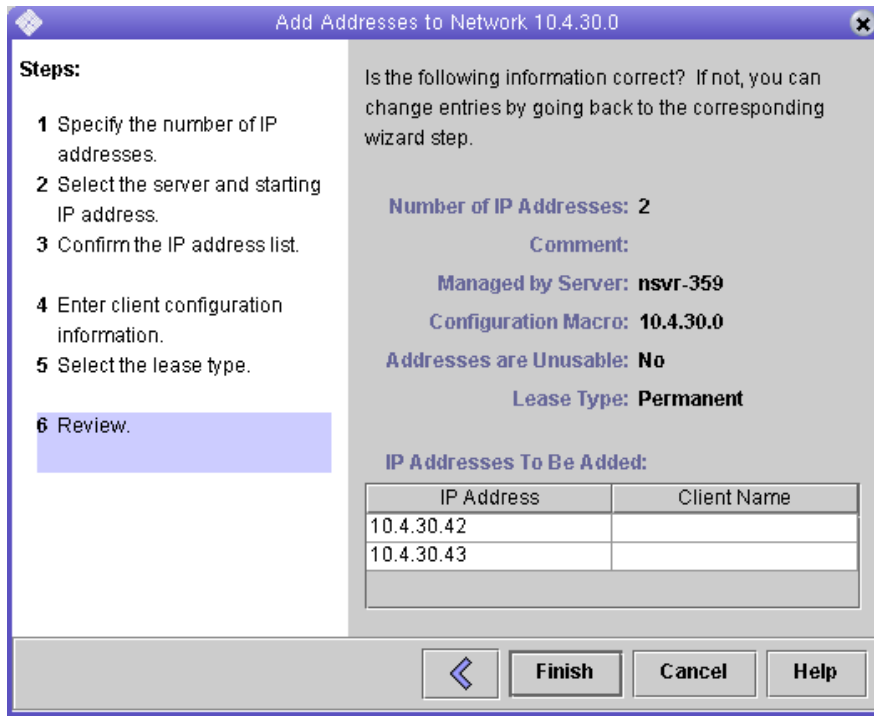
6. **Verify your configuration information and click Finish.**

   The DHCP Manager displays the following:
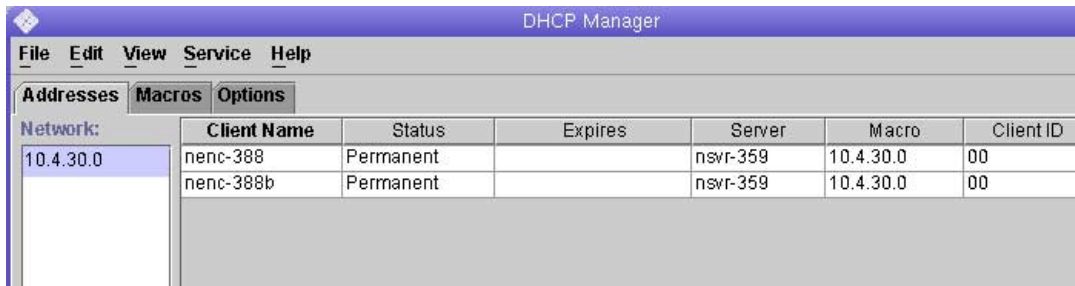
7. **In the Address Properties window, do the following:**

   a. **In each Client ID field, enter** `01` **followed by the MAC address that is printed on the back of the controller. For example:**

      `0100A0E80F924C`

   b. **Toward the bottom of the window, select "Assign only to BOOTP clients."**

Address Properties

Address **Lease**

Client ID: 0100A0B80F928B   ☐ **Reserved**

Lease Policy

○ **Dynamic assignment expiring:**

◉ **Permanent assignment**

☑ **Assign only to BOOTP clients**

☐ **Address is unusable**

OK   Reset   Cancel   Help
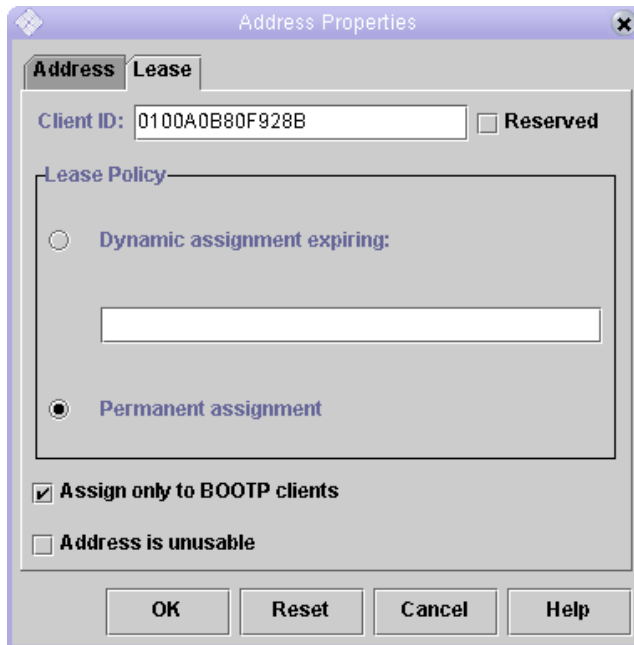
c. Click OK.

The DHCP manager updates the status and client ID, as shown in the following example:

DHCP Manager

File   Edit   View   Service   Help

Addresses **Macros** **Options**

Network:	Client Name	Status	Expires	Server	Macro	Client ID
10.4.30.0	nenc-388	Bootp		nsvr-359	10.4.30.0	0100A0B80F928B
	nenc-388b	Bootp		nsvr-359	10.4.30.0	0100A0B80F924C

8. **Go to Modify Service Options, and do the following:**

   a. **Select Detect Duplicate IP addresses.**

   b. **Under BOOTP Compatibility, select Automatic.**

   c. **Select Restart Server, as shown in the following example.**
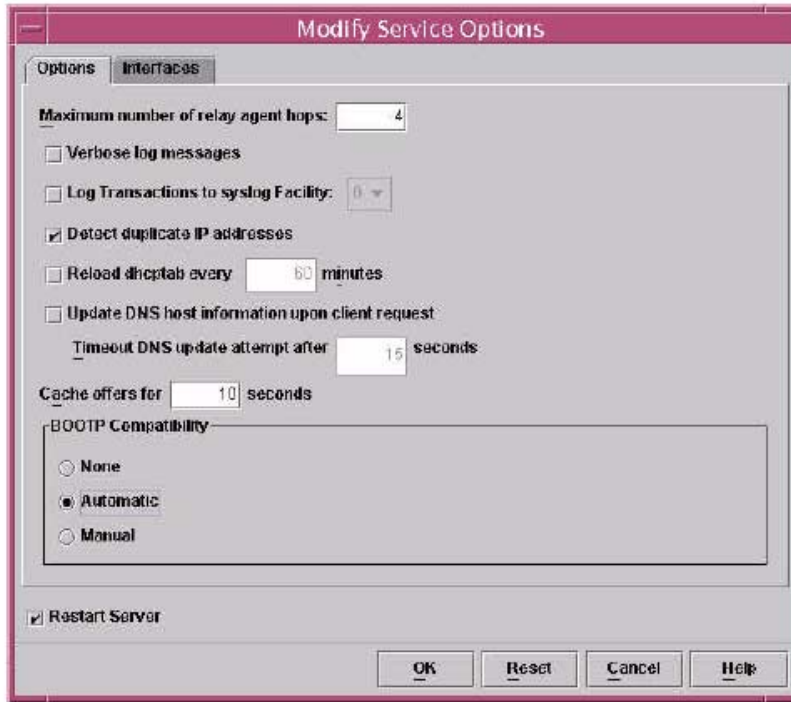
d. Click OK.

After the configuration process has finished, the DHCP server provides BOOTP services to the MAC address you entered for each controller.

9. **To verify that the BOOTP service is running, go to Service >> Restart.**

10. **After you power on the storage array, ping the address.**

If the ping responds with 'alive', the DHCP server BOOTP operation was successful.

Setting Up a Windows 2000 Advanced Server

Before you begin, make sure the following requirements are met:

- Windows 2000 server and the storage array are both on the same subnet.
- IP addresses that are assigned to the controllers do not conflict.

- The array is in BOOTP IP addressing mode (the default setting for a new array).
- The Windows 2000 Server setup CD is available.

The following procedure provides an example of how to set up DHCP with the BOOTP option on the Windows 2000 Advanced Server. Your environment might require different steps.

Installing the DHCP Server

To install DHCP server on the Windows 2000 Advanced Server:

1. **From the Control Panel, go to Administrative Tools >> Configure Your Server.**

2. **Select DHCP from the Networking drop-down menu on the left.**

   The wizard instructs you to use the Windows Components wizard to add the DHCP component.

3. **Start the Windows Components wizard and double-click Networking Services.**

4. **Select Dynamic Host Configuration Protocol (DHCP), click the check box to its left, and click OK.**

   The Windows Components wizard is displayed.

5. **Click Next.**

6. **If Terminal Services Setup is displayed, select Remote administration mode. Click Next.**

   If your server has obtained an address from a DHCP server for its own address, a warning is displayed.

7. **Click OK to accept the warning.**

   Local Area Connection Properties is displayed.

8. **Assign a static IP address to the server, or click Server to keep DHCP addressing for the server. Click OK.**

9. **Click Finish to exit the Windows Components wizard.**

   The DHCP server is now installed. The next step is to configure the server.

Configuring the DHCP Server

To configure the DHCP server:

1. **From the Control Panel, go to Administrative Tools >> Computer Management >> Services and Application >> DHCP.**

2. **From the Action menu, select New Scope.**

   The New Scope wizard is displayed.

3. **Enter the following information as prompted:**
   - Scope name and description:
   - IP address range (for example, `192.168.0.170` to `192.168.0.171`)
   - Subnet mask (for example, `255.255.255.0`)
   - Add exclusions (do not exclude any IP addresses)
   - Lease duration (accept the default of 8 days)
   - Router (default gateway) of your subnet (for example, `192.168.0.1`)
   - Domain name, WINS server (these are not needed)
   - Activate Scope? (select "Yes, I want to activate this scope now")

4. **Click Finish to exit the wizard.**

   The contents of the DHCP server are listed.

5. **Right-click Scope [*ipaddress*] *scope-name* and select Properties.**

6. **In the Scope Properties box, click the Advanced tab.**

7. **Select BOOTP only, set the lease duration to Unlimited, and click OK.**

8. **Right-click Reservations.**

   The Controller A Properties box is displayed.

9. **Enter the IP address and the MAC address for Controller A. Click Add.**

   The Controller B Properties box is displayed.

10. **Enter the IP address and the MAC address for Controller B. Click Add.**

    The controllers are added to the right of the Reservations listing.

11. **Right-click Scope [*ipaddress*] *scope-name* to disable the scope.**

12. **Click Yes to confirm disabling of the scope.**

13. **Right-click Scope and select Activate.**

    The DHCP server is now configured with the BOOTP option for the array network.

14. **Power on or power cycle the array modules.**

15. **Click Address Leases in the left pane to check the DHCP server leases.**

    The lease expiration displays the following status for each controller:

```
Reservation (active)
```

If the lease expiration for the controllers is inactive, try refreshing the list. If the lease is still inactive, check the following:

- Are the IP addresses allocated for BOOTP conflicting?
- Were the correct MAC addresses added to the DHCP server for the controllers?
- Are the DHCP server and storage array on the same subnet?
- Is the gateway configured correctly on the DHCP server?

  The controllers can gain a lease and an IP address, but they cannot respond out of the subnet for the software if the gateway is not configured properly.

- Are the controllers set up for BOOTP access?

  It is possible that they were previously configured to have static IP addresses. You must be sure when you move an array that you change the array's IP addresses to IP addresses on the new subnet before setting up BOOTP services.

Glossary

Definitions obtained from the Storage Networking Industry Association (SNIA) Dictionary are indicated with "(SNIA)" at the end. For the complete SNIA Dictionary, go to:

http://www.snia.org/education/dictionary

agent

The component of the system monitoring and diagnostic software that collects health and asset information about the array.

alarm

A type of event that requires service action. See also event.

alert

A subtype of an event that requires user intervention. The term *actionable event* often describes an alert. See also event.

array

Multiple disk drives that function as a single storage device. A high-availability (HA) array configuration has redundant controllers and expansion trays of disk drives.

array hot-spare

A disk that serves as a hot-spare within an array as part of the storage pool; a reserve disk that can be made available to all virtual disks within an array. See also hot-spare.

block

The amount of data sent or received by the host per I/O operation; the size of a data unit.

capacity

The amount of storage you must allocate to storage elements, including volumes, pools, and virtual disks. Capacity planning should include allocations for volume snapshots and volume copies.

CLI

Command-line interface. The SSCS command-line interface is available from the remote CLI client or through an SSCS directory on the Solaris Operating System management software station.

controller tray

A tray with an installed redundant RAID controller pair. In a Sun StorageTek 2500 Series array, 1x1, 1x2, 1x3, and 1x4 array types are available.

control path

The route used for communication of system management information, usually an out-of-band connection.

customer LAN

See site LAN.

DAS

See direct attached storage (DAS).

data host

Any host that uses the system for storage. A data host can be connected directly to the array (direct attach storage, or DAS) or can be connected to an external switch that supports multiple data hosts (storage area network, or SAN). See also host.

data path

The route taken by a data packet between a data host and the storage device.

direct attached storage (DAS)

A storage architecture in which one or two hosts that access data are connected physically to a storage array.

disk

A physical drive component that stores data.

event

A notification of something that happened on a device. There are many types of events, and each type describes a separate occurrence. See also alarm and alert.

expansion tray

A tray that does not have a RAID controller, used to expand the capacity of an array. This type of tray must be attached to a controller tray to function.

extent

A set of contiguous blocks with consecutive logical addresses on a physical or virtual disk.

failover and recovery

The process of changing the data path automatically to an alternate path.

fault coverage

The percentage of faults detected against all possible faults or against all faults of a given type.

FC

See Fibre Channel (FC).

Fibre Channel (FC)

A set of standards for a serial I/O bus capable of transferring data between two ports at up to 100 megabytes/second, with standards proposals to go to higher speeds. Fibre Channel supports point to point, arbitrated loop, and switched topologies. Fibre Channel was completely developed through industry cooperation, unlike SCSI, which was developed by a vendor and submitted for standardization after the fact.

Fibre Channel switch

A networking device that can send packets directly to a port associated with a given network address in a Fibre Channel storage area network (SAN). Fibre Channel switches are used to expand the number of servers that can connect to a particular storage port. Each switch is managed by its own management software.

field-replaceable unit (FRU)

An assembly component that is designed to be replaced on site, without the system having to be returned to the manufacturer for repair.

FRU

See field-replaceable unit (FRU).

HBA

See host bus adapter (HBA).

host

As a function of the Sun StorageTek 2500 Series array configuration, a representation of a data host that is mapped to initiators and volumes to create a storage domain. See also data host, initiator.

host bus adapter (HBA)

An I/O adapter that connects a host I/O bus to a computer's memory system. Abbreviated HBA. Host bus adapter is the preferred term in SCSI contexts. Adapter and NIC are the preferred terms in Fibre Channel contexts. The term NIC is used in networking contexts such as Ethernet and token ring. See also initiator.

host group

A group of hosts with common storage characteristics that can be mapped to volumes. See also host.

hot-spare

The drive used by a controller to replace a failed disk. See also array hot-spare.

in-band traffic

System management traffic that uses the data path between a host and a storage device. See also out-of-band traffic.

initiator

A system component that initiates an I/O operation over a Fibre Channel (FC) or iSCSI Ethernet network. If so configured, each host connection within the network has the ability to initiate transactions with the storage array. Each host in the network represents a separate initiator, so if a host is connected to the system through two host bus adapters (HBAs) or NICs, the system identifies two different initiators (similar to multi-homed, Ethernet-based hosts). In contrast, when multipathing is used in round-robin mode, multiple HBAs or NICs are grouped together, and the multipathing software identifies the group as a single initiator.

IOPS

A measure of transaction speed, representing the number of input and output transactions per second.

iSCSI

iSCSI is an acronym for internet SCSI (Small Computer System Interface). This storage networking standard transports block level data and SCSI commands as IP packets over Ethernet as described in RFC 3720.

LAN

Local area network.

logical unit number (LUN)

The SCSI identifier for a volume as it is recognized by a particular host. The same volume can be represented by a different LUN to a different host.

LUN

See logical unit number (LUN).

MAC address

See media access control (MAC) address.

management host

A Solaris host serving the configuration, management, and monitoring software for the Sun StorageTek 2500 Series array. The software on the station can be accessed with a browser to run the browser interface or with a remote scripting command-line interface (CLI) client to access the SSCS CLI commands.

master / alternate master

A design for reliability that uses redundant configuration. Array configurations share master/alternate master configurations: each array configuration has two controller trays that are grouped as one host. In each case, the master component uses the IP address and name. If the master fails, the alternate master assumes the IP address and name and takes over the master's functions.

media access control (MAC) address

The physical address identifying an Ethernet controller board. The MAC address, also called an Ethernet address, is set at the factory and must be mapped to the IP address of the device.

mirroring

A form of storage – also called RAID Level 1, independent copy, and real-time copy – whereby two or more independent, identical copies of data are maintained on separate media. Typical mirroring technologies enable the cloning of data sets to provide redundancy for a storage system.

multipathing

A design for redundancy that provides at least two physical paths to a target.

out-of-band traffic

System management traffic outside of the primary data path that uses an Ethernet network. See also in-band traffic.

PDU

See power distribution unit (PDU).

pool

See storage pool.

power distribution unit (PDU)

The assembly that provides power management for the system. The redundant design uses two PDUs in each system so that the system's data path continues to function if one of the PDUs fails.

profile

See storage profile.

provisioning

The process of allocation and assignment of storage to hosts.

RAID

An acronym for Redundant Array of Independent Disks, a family of techniques for managing multiple disks to deliver desirable cost, data availability, and performance characteristics to host environments. Also, a phrase adopted from the 1988 SIGMOD paper A Case for Redundant Arrays of Inexpensive Disks.

remote monitoring

Monitoring of the functions and performance of a hardware system from a location other than where the hardware resides.

remote scripting CLI client

A command-line interface (CLI) that enables you to manage the system from a remote management host. The client communicates with the management software through a secure out-of-band interface, HTTPS, and provides the same control and monitoring capability as the browser interface. The client must be installed on a host that has network access to the system.

SAN

See storage area network (SAN).

site LAN

The local area network at your site. When the system is connected to your LAN, the system can be managed through a browser from any host on the LAN.

snapshot

An copy of a volume's data at a specific point in time.

SSCS

Sun Storage Command System. The command-line interface (CLI) that can be used to manage the array.

storage area network (SAN)

An architecture in which the storage elements are connected to each other and to a server that is the access point for all systems that use the SAN to store data.

storage domain

A secure container that holds a subset of the system's total storage resources. Multiple storage domains can be created to securely partition the system's total set of storage resources. This enables you to organize multiple departments or applications into a single storage management infrastructure.

storage pool

A container that groups physical disk capacity (abstracted as virtual disks in the browser interface) into a logical pool of available storage capacity. A storage pool's characteristics are defined by a storage profile. You can create multiple storage pools to segregate storage capacity for use in various types of applications (for example, high throughput and online transaction-processing applications).

storage profile

A defined set of storage performance characteristics such as RAID level, segment size, dedicated hot-spare, and virtualization strategy. You can choose a predefined profile suitable for the application that is using the storage, or you can create a custom profile.

storage tray

An enclosure containing disks. A tray with dual RAID controllers is called a controller tray; a tray without controllers is called an expansion tray.

stripe size

The number of blocks in a stripe. A striped array's stripe size is the stripe depth multiplied by the number of member extents. A parity RAID array's stripe size is the stripe depth multiplied by one less than the number of member extents. See also striping.

striping

Short for data striping; also known as RAID Level 0 or RAID 0. A mapping technique in which fixed-size consecutive ranges of virtual disk data addresses are mapped to successive array members in a cyclic pattern. (SNIA).

target

The system component that receives a SCSI I/O command. (SNIA).

thin-scripting client

See remote scripting CLI client.

tray

See storage tray.

virtual disk

A set of disk blocks presented to an operating environment as a range of consecutively numbered logical blocks with disk-like storage and I/O semantics. The virtual disk is the disk array object that most closely resembles a physical disk from the operating environment's viewpoint.

volume

A logically contiguous range of storage blocks allocated from a single pool and presented by a disk array as a logical unit number (LUN). A volume can span the physical devices that constitute the array, or it can be wholly contained within a single physical disk, depending on its virtualization strategy, size, and the internal array configuration. The array controller makes these details transparent to applications running on the attached server system.

volume snapshot

See snapshot.

WWN

World Wide Name. A unique 64-bit number assigned by a recognized naming authority such as the Institute of Electrical and Electronics Engineers (IEEE) that identifies a connection (device) or a set of connections to the network. The World Wide Name (WWN) is constructed from the number that identifies the naming authority, the number that identifies the manufacturer, and a unique number for the specific connection.

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