

NetApp® StorageShelf 2 Hardware Guide

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- To reduce the risk of personal injury or damage to the equipment, ensure that the equipment is properly supported or braced when installing options.
- This equipment is designed for connection to a grounded outlet. The grounding type plug is an important safety feature. To avoid the risk of electrical shock or damage to the equipment, do not disable this feature.
- This equipment is furnished with one or more lithium batteries. There is a danger of explosion and risk of personal injury if the battery is incorrectly replaced or mistreated. Do not attempt to recharge the battery, disassemble it, or dispose of it in a fire.

Table of contents

Chapter 1:	
Introduction	1
Overview of the NetApp StorageShelf 2.....	1
Features	2
Installation requirements	3
Environmental and space requirements	3
Space requirements	3
Electrical requirements	4
Power consumption and thermal ratings	5
Chapter 2:	
Installing the disk shelves.....	7
Mounting a disk shelf in a rack	8
Installing devices in the disk shelf.....	10
Attaching the SCSI cable in a single-shelf configuration	11
SCSI ID settings on a single-shelf configuration	12
Attaching the disk shelf to a power source	13
Verifying the installation	13
Removing a disk from a shelf	15
Removing a disk shelf from a rack	15
Chapter 3:	
Disk shelf LEDs	17
LED indicators on disk drive carriers.....	19
LED indicators on the power supply carrier.....	21

Chapter 4:	
Replacing units in the disk shelf	23
Replacing a disk	23
Replacing a power supply	23
Removing a power supply	23
Installing a power supply.....	24
Replacing a shelf fan.....	25
Removing a fan.....	25
Installing a fan	26
Replacing an EFB card	27
Removing an EFB card	27
Installing an EFB card.....	27
Index.....	29

List of figures

Figure 1-1.	NetApp StorageShelf 2	1
Figure 2-1.	19-in. equipment rack for the disk shelf	8
Figure 2-2.	Attaching the shelf grounding strap	9
Figure 2-3.	Devices in a single-shelf configuration	10
Figure 2-4.	Device carrier orientation	10
Figure 2-5.	Attaching cables on a single-shelf configuration	12
Figure 2-6.	Default SCSI ID settings	12
Figure 2-7.	SCSI IDs on a single-shelf configuration	13
Figure 3-1.	Alarm LEDs and silencer button	18
Figure 3-2.	LEDs on disk device carrier	19
Figure 3-3.	LEDs on the disk shelf power supply	21
Figure 4-1.	Removing a fan assembly	25
Figure 4-2.	Installing EFB card	27

List of tables

Table 1-1. . . . Environmental requirements	3
Table 1-2. . . . Disk shelf dimensions	4
Table 1-3. . . . Disk shelf and component weights	4
Table 1-4. . . . Power requirements	4
Table 1-5. . . . Power consumption and thermal ratings	5
Table 3-1. . . . Disk drive LED definitions	20
Table 3-2. . . . Power supply LEDs	21

Preface

About this guide

This guide describes how to install, setup, and manage the Network Appliance™ NetApp® StorageShelf 2. The information in this guide covers all NetApp appliance models.

Audience

This guide is intended for system administrators who are familiar with operating systems that run on the Network Appliance filer's clients such as UNIX, Windows 95, and Windows NT. It is also intended for system administrators who are familiar with how the NFS, CIFS, and HTTP protocols are used to share and transfer files.

This guide emphasizes the characteristics of the Network Appliance filer. It doesn't discuss basic system administration topics such as network topology, IP addressing, and routing.

Terminology

When the term “filer” is used by this guide, the information applies to all Network Appliance filer models.

This guide uses the term “FDDI adapter” when the cable supported is a twisted-pair or fiber-optic cable. To distinguish between FDDI adapters with different media types, this guide uses the terms “FDDI-TP” and “FDDI-fiber.”

Command conventions

You can enter filer commands on the system console or from any client that can obtain access to the filer using `telnet`. In examples of commands run on a UNIX workstation, this guide uses the command syntax and output of SunOS 4.1x. (The command syntax and output may be different depending on your version of UNIX.)

Formatting conventions

In this guide, the following kinds of formatting in the text identify special information.

Formatting convention	Type of information
<i>Italic type</i>	Words or characters that require special attention. File names. Placeholders for information you must supply. For example, if the guide says to enter the <code>arp -d hostname</code> command, you enter the characters “arp -d” followed by the actual name of the host. Man page names. Book titles in cross-references.
Monospaced font	Command and daemon names. Information displayed on the system console or other computer monitors. The contents of files.
Bold monospaced font	Words or characters you type. What you type is always shown in lowercase letters, unless it must be typed in uppercase letters to work properly.

Keyboard conventions

This guide uses capitalization and some abbreviations to refer to the keys on the keyboard. (The keys on your keyboard may not be labeled exactly as they are in this guide.)

When describing key combinations, this guide uses the hyphen (-) to separate individual keys. For example, Ctrl-D means holding down the Ctrl key while pressing the D key. In addition, this guide uses the term Enter to refer to the key that generates a carriage return, although the key is named Return on some keyboards.

This guide uses the term “type” to mean pressing one or more keys on the keyboard. It uses the term “enter” to mean pressing one or more keys and then Enter.

Special messages

This guide contains special messages that are denoted by icons in the margin. They are described as follows:



NOTE: A note contains important information that helps you install or operate the system efficiently.



CAUTION: A caution contains instructions that you must follow to avoid damage to the equipment, a system crash, or loss of data.



WARNING: A warning contains instructions that you must follow to avoid personal injury.

Chapter 1: Introduction

This chapter provides you with information about the NetApp® StorageShelf 2 SCSI disk shelves, and describes the environmental, space, and electrical requirements for installing the disk shelves.

Overview of the NetApp StorageShelf 2

The NetApp StorageShelf 2 (see [Figure 1-1](#)) is a fast, wide SCSI disk shelf that supports single-ended SCSI disk drives for Network Appliance filers.

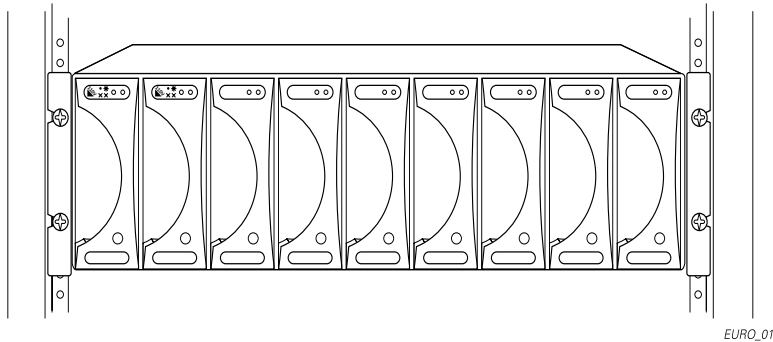


Figure 1-1. NetApp StorageShelf 2

Each device in the disk shelf is installed in a device carrier that enables you to install disk drives and power supplies easily into the shelf.

On a filer that supports a single-ended SCSI adapter, there is a single shelf for each SCSI bus. The shelf has nine bays in which you can install up to seven disk drives and two power supplies.

Features

The NetApp StorageShelf 2 has the following features:

- Device carriers — Front loading components (such as disk drives, power supplies, and the differential converter) are housed in easily removable device carriers. The metal construction and color of the device carriers allows for rapid heat dissipation.

Each carrier has an ejection button to disengage the device from the shelf for easy removal.

Each carrier has LEDs to indicate operational status.

A blank cover for an empty bay has a molded ejection button.

- Two fans — The fans mounted on the back of the shelf provide air flow and cooling for the devices. If one of the fans fails, either fan alone can cool the entire shelf.
- Environmental FaultBus(EFB) card — The EFB card, located on the back of the shelf, monitors the environmental conditions of the shelf, the fans, power supply voltage outputs, and temperature. It also detects the presence of SCSI devices. The EFB card responds to changes in the environment and impending component failure, and reports the changes or failure through LEDs and an audible alarm.
- Power supplies — Each disk shelf can have two power supplies. Each power supply is rated at 180 watts. You can remove and replace a power supply in a disk shelf while the filer is running (*hot-swapping*).
- Standard size rack — The disk shelf can be mounted into a standard 19-in. rack.

Installation requirements

Before installing a disk shelf, make sure the location that you select meets the environmental, space, and electrical requirements described in this section.

Environmental and space requirements

The environmental requirements for a disk shelf are identical to those of the filer, as shown in [Table 1-1](#).

Table 1-1. Environmental requirements

	Operating	Nonoperating
Temperature	50°F - 104°F (10°C - 40°C)	-40°F - 151°F (-40°C - 66°C)
Relative humidity	10% - 90 (noncondensing)	8% - 95% in original shipping container (noncondensing) Otherwise, 50% (noncondensing)

The maximum operating temperature of the disk shelf is 40 degrees centigrade (104 degrees Fahrenheit), but the shelf should not continuously run at the maximum temperature.

Space requirements

Make sure that the air flow from the front to the back of the disk shelves is not blocked and that the shelf is a least 39.37 inches (1 meter) from a solid surface, such as a wall or partition.



CAUTION: Equipment can be mounted directly on the unvented area on the top cover of the filer as long as that equipment does not extend over and block the ventilation holes on the filer.

[Table 1-2](#) lists the dimensions of the disk shelf. [Table 1-3](#) lists the weight of the disk shelf and the components.

Table 1-2. Disk shelf dimensions

Height	5.24 in.	(13.3 cm)
Width	17.72 in.	(45 cm)
Depth (without fans)	12 in.	(30.48 cm)
Depth (with fans)	13.31 in.	(33.8 cm)

Table 1-3. Disk shelf and component weights

Disk shelf (bays empty)	13.6 lbs.	(6 kg)
Power supply in the device carrier	2.4 lbs.	(1.1 kg)
9-GB disk drives in device carriers	3.4 lbs.	(1.5 kg)

Electrical requirements

Use the power cord supplied in your shipment to attach the disk shelf to a properly grounded power source. [Table 1-4](#) describes the power requirements for the disk shelf. Make sure that the current does not exceed the rating of the AC power source.

Table 1-4. Power requirements

Amps	Volts
1.5	200 to 240
3.0	100 to 120

To arrive at the total power consumption, you must add these requirements to the power demands of any of the electrical devices installed in the shelf enclosure.

Power consumption and thermal ratings

The power consumption (in watts) and the number of BTUs per hour produced by a disk shelf depend on the number and type of devices (for example, power supplies, disk drives, and so on) installed in the disk shelf. [Table 1-5](#) lists the maximum power consumption and the maximum output for two typical disk shelf configurations.

Table 1-5. Power consumption and thermal ratings

Configuration	Watts	BTUs/hr.
Single-shelf	155 W (seven 9-GB disks with two fans)	529

Chapter 2: **Installing the disk shelves**

This chapter provides you with instructions for installing the NetApp® StorageShelf 2 disk shelves. The installation procedure varies, depending on the disk shelf configuration you are installing. Refer to “Overview of the NetApp StorageShelf 2” on page 1 for available disk shelf configurations.



NOTE: This chapter does not provide information specific to the connectors on the filer. Refer to the hardware guide that comes with your filer for information about the filer back panel and the number and type of disk shelves it supports.

You will need the following tools and equipment to install a disk shelf:

- #1 and #2 Phillips screwdrivers
- antistatic wrist strap and grounding leash

Mounting a disk shelf in a rack

The disk shelves can be mounted in a 19-in. (48.26 centimeters) equipment rack with the four #10-32 screws that are shipped with the shelves. The rack must have a front panel width of 19 inches and have mounting rails. [Figure 2-1](#) illustrates part of a 19-in. equipment rack.

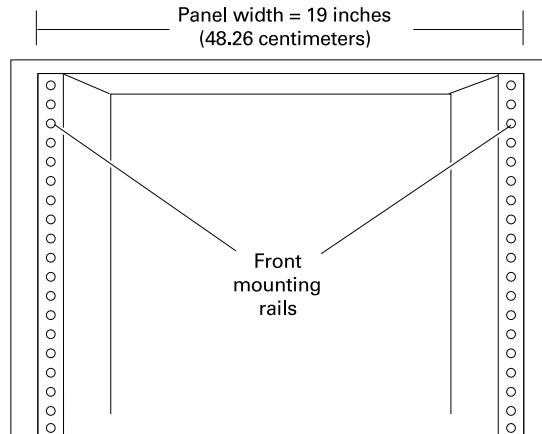


Figure 2-1. 19-in. equipment rack for the disk shelf

The only tool you need for mounting the disk shelf is a #2 Phillips screwdriver. However, if the screws provided in your shipment do not fit the holes on your rack, you need to replace them with the appropriate screws.



NOTE: This guide assumes that the rack you use to mount the disk shelf has threaded holes. If the rack does not, then you need to provide clip nuts or nut bars for fastening the screws.

If you are mounting a pair of shelves in a dual-shelf configuration, mount the first shelf (the shelf with the differential SCSI converter) on top, and the second shelf (the shelf without the differential SCSI converter) directly under the first shelf.

If you are installing multiple disk shelves (up to 8) for one filer, stack them all on the same side of the filer (either all above or below the filer).

Follow these steps to mount an empty disk shelf in a rack:

1. On each front mounting rail of your rack, select four holes that are spaced appropriately for the mounting holes on the disk shelf.
2. Align the holes on the flanges of the disk shelf with the holes you selected in Step 1.
3. Insert two screws into the mounting holes on the bottom flanges of the disk shelf and the mounting rails of the rack.

These screws provide the most leverage for the disk shelf.

4. Insert two screws in the disk shelf top flanges of the disk shelf and mounting rails.
5. Tighten the screws.
6. Mount the shelf grounding straps on the back of the drive unit to the left with #10-32 screws and tighten (see [Figure 2-2](#)).

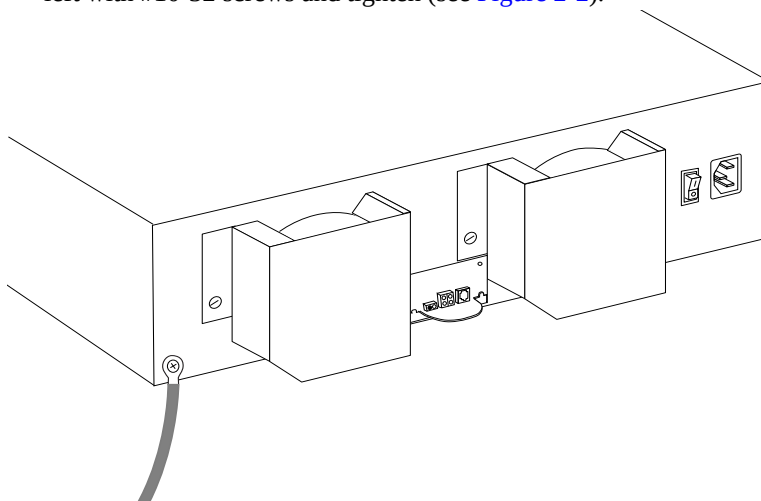


Figure 2-2. Attaching the shelf grounding strap

The procedure for rack-mounting the disk shelf is now complete. Next, you need to install the devices in the disk shelf.

Installing devices in the disk shelf

After mounting the disk shelf in a rack, install the disk drives, power supplies, and the differential SCSI converter (if your shelf configuration requires a differential converter) in the shelf. You can place the disk drives in any order in the bays allocated for drives. Refer to [Figure 2-3](#) for an example of where to place devices in a single-shelf configuration. Blank covers are shipped with the disk shelf to cover any empty bay.

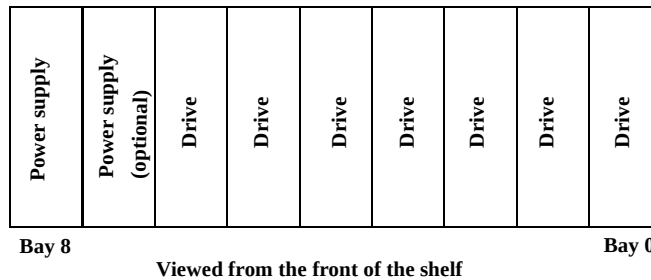
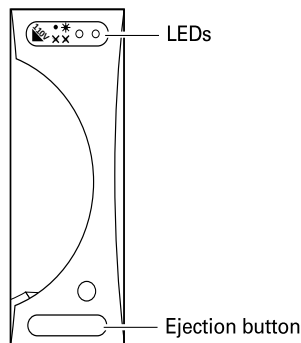


Figure 2-3. Devices in a single-shelf configuration

To install a device, follow these steps:

1. Orient the device carrier so that the LEDs are at the top and the ejection button is at the bottom (see [Figure 2-4](#)). Always use two hands to support the weight of the device.



EURQ_07a

Figure 2-4. Device carrier orientation

2. Slide the disk into the slot in the shelf until you feel the device engage the back plane and the ejection button on the device carrier is fully extended.

If the button is not fully extended, apply additional pressure to the front of the device carrier.



CAUTION: Do not slam the drive into place.

3. Install a blank cover over any empty bay in the shelf by pushing the spring-loaded cover into the slot.

Attaching the SCSI cable in a single-shelf configuration

For the single-shelf configuration, the disk shelf is shipped with a ribbon cable attached to the SE1 and SE2 connectors and a single-ended SCSI terminator installed on the connector labeled **SE terminator**. Do not remove or change these connections. The only cable you need to attach to the shelf is the 6.56-ft. (2-m) SCSI cable that connects the shelf to the filer. The SCSI cable has a color-coded label that indicates to which SCSI card connector on the filer to attach it. [Figure 2-5](#) shows the cable and terminator connections for a single-shelf configuration as they are labeled.

Attach the right-angle connector on the SCSI cable to the connector labeled **To filer**. The other end of the SCSI cable connects to the filer connector indicated on the cable color-coded label. For information about connectors on the filer, refer to the hardware guide that came with your filer.

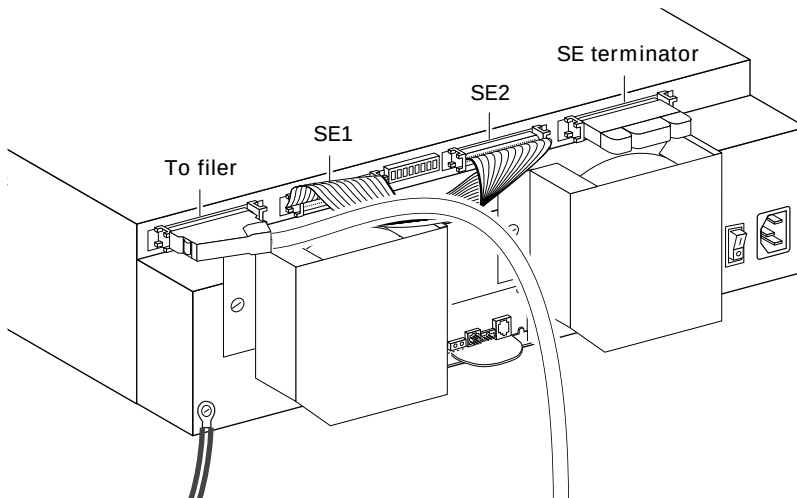


Figure 2-5. Attaching cables on a single-shelf configuration

SCSI ID settings on a single-shelf configuration

A DIP-switch pack on the back of the shelf sets the disk drive SCSI IDs. The switches are set at the factory. Do not change the settings on the shelf. This section describes how to verify the switch settings.

A label above the switches indicates the correct positions for a single-shelf configuration (see [Figure 2-6](#)).

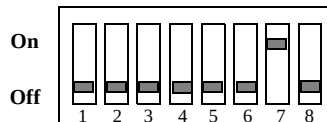


Figure 2-6. Default SCSI ID settings

The switch sets the SCSI IDs for the drives in bays 0 through 6 to SCSI ID 0 through 6, respectively (see [Figure 2-7](#)).

Power supply	Power supply (optional)	Drive	Drive	Drive	Drive	Drive	Drive	Drive
		ID 6	ID 5	ID 4	ID 3	ID 2	ID 1	ID 0

Viewed from the front of the shelf

Figure 2-7. SCSI IDs on a single-shelf configuration

Attaching the disk shelf to a power source

Follow these steps to plug the disk shelf into a power source:

1. Make sure that the power switch next to the power receptacle on the back of the disk shelf is turned off (see [Figure 2-5](#)).
2. Attach the socket end of the provided power cord to the receptacle on the disk shelf.
3. Plug the other end of the power cord into a grounded electrical outlet.
4. Turn the power on by pressing the switch on the back of the disk shelf to the **ON** position.



CAUTION: Static electricity can damage the SCSI card installed in the filer. To avoid damaging the card, shut down the filer and power off the disk shelf before you disconnect the disk shelf SCSI cable from the filer. In addition, wear an antistatic wrist strap and grounding leash when you disconnect the shelf from the filer.

Verifying the installation

Use the `shelfchk` command at your filer console to verify that all the cables and drives are connected and properly seated.

To use the `shelfchk` command, follow these steps:

1. On the filer console, enter **shelfchk**. It displays the following message:

```
toaster> shelfchk
Only shelf number 8a should have all LEDs ON.
Are all shelf 8a LEDs ON now?
```

The command turns on all the device carrier LEDs on the disk shelf.

Shelf 8a in the message refers to the shelf connected to SCSI 8a on the filer.

2. Check the LEDs on the shelf identified in the message.

All the LEDs on the device carriers should be lit. This means that the connections in the shelf and to the shelf are good.

3. If all the LEDs are lit, enter **Y** at the filer's console.

If you have additional shelves installed, the message for the next shelf will be displayed.

If all the LEDs are not lit, enter **N** at your console. The command logs a kernel warning and returns to the console. When the `shelfchk` command completes, no matter what the result, all shelf LEDs should be off.

The following example shows what happens with two shelves if you answer **y**:

```
toaster> shelfchk
Only shelf 8a should have all LEDs ON.
Are all shelf 8a LEDs ON now? y
Only shelf 8b should have all LEDs ON.
Are all shelf 8b LEDs ON now? y
toaster> Thu May 8 15:42:13 GMT [rc]: Disk
Configuration - No Errors Identified
```

The following example shows what happens with two shelves if you answer **n** to even one:

```
toaster> shelfchk
Only shelf 8a should have all LEDs ON.
Are all shelf 8a LEDs ON now? n
*** Your system may not be configured properly. Please
check cable connections.
toaster> Thu May 8 15:42:23 GMT [rc]: Disk
Configuration - Failure Identified by Operator
```

Removing a disk from a shelf

Before removing a disk drive from a shelf, make sure that the drive has fully spun down. Refer to the *System Administrator's Guide* for the commands to use when hot swapping a disk drive.

To remove a disk from the shelf, press the ejection button on the lower part of the device carrier with one hand while grasping the carrier handle with the other hand and pulling the carrier out of the shelf. Always use two hands to support the weight of the disk.

Removing a disk shelf from a rack



WARNING: Because of the weight of the disk shelf and the disks, you must work with at least one other person when you remove the disk shelf from the equipment rack. This step is necessary to avoid injuring yourself or damaging the disk shelf.

If you need to move the disk shelf to another location or remove the disk shelf from the rack for service, follow these steps:

1. Halt the filer and turn off power to it.
2. Turn off the power switch on the back of the disk shelf.
3. Disconnect the disk shelf power cord from the disk shelf.
4. Disconnect the SCSI cable that connects the disk shelf to the filer.

If you are disconnecting cables from a dual-shelf configuration, remove the SCSI cables that connect the two shelves together.

5. Use a Phillips screwdriver to remove the screws from the flanges of the disk shelf mounting bracket.
6. Disconnect the grounding strap from the back of the disk shelf.
7. Carefully remove the disk shelf from the equipment rack.

Chapter 3: **Disk shelf LEDs**

The Environment FaultBus (EFB) card on the StorageShelf 2 is located on the rear of the shelf and has five LEDs: the LED beside the silence button (see [Figure 3-1](#)) is to indicate shelf faults and the other four LEDs indicate fan status. These LED indicators provide information about the operational status of the devices.

Device carriers and power supplies have LEDs on the front face plate to indicate the state of the disk drive or power supply. This chapter describes all the LEDs on the disk shelf and the EFB alarm.

The EFB card has five LEDs which can be seen from the rear of the shelf (see [Figure 3-1](#)).

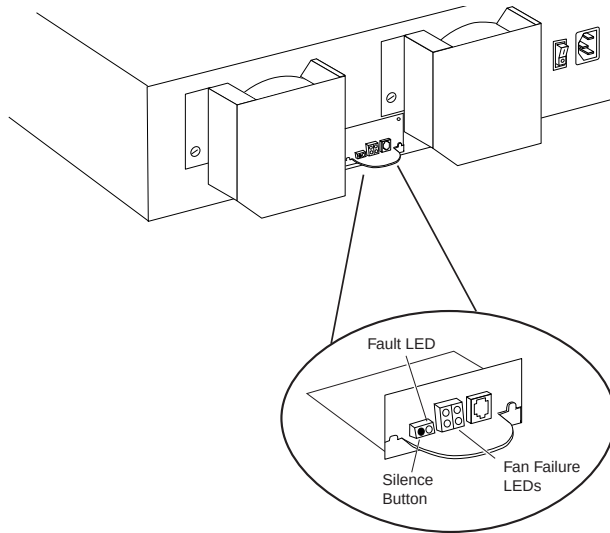


Figure 3-1. Alarm LEDs and silencer button

Of the four fan failure LEDs two are inactive for the single shelf. The inactive fan failure LEDs are shown in [Figure 3-1](#) above. The two active fan failure LEDs correspond to the two fans on the rear of the shelf.

If a fan fails, the corresponding fan failure LED lights to indicate the failure. The fault LED also lights and the alarm buzzer sounds. You can stop the alarm buzzer by pressing the alarm silence button.

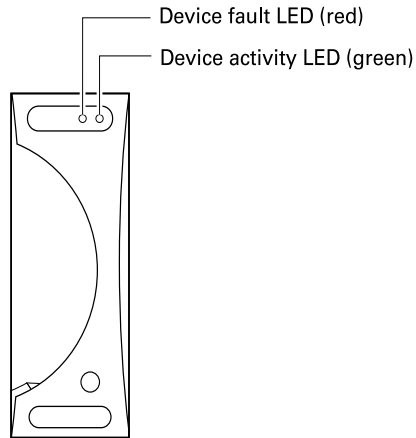


NOTE: The alarm silence button, next to the fault LED, temporarily silences the alarm buzzer; it does not turn off the fault LED.

If a temperature condition exists, the fault LED lights and the alarm buzzer sounds. The alarm buzzer can be silenced by pressing the silence button (see [Figure 3-1](#)).

LED indicators on disk drive carriers

Each disk device carrier in a disk shelf has two LED indicators on the front (see [Figure 3-2](#)).



EURO_06

Figure 3-2. LEDs on disk device carrier

The disk device carrier LEDs function as follows:

- The green LED on the right is the device activity indicator. It is on or flashing when the disk is active.
- The red LED on the left is the device fault indicator. The LED is steadily on when the disk has failed. The LED flashes when the disk is spinning down or up.

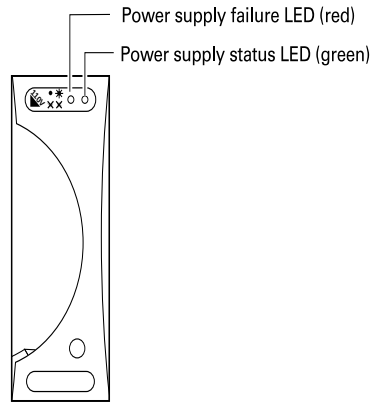
Table 3-1 describes both LEDS.

Table 3-1. Disk drive LED definitions

Device fault LED	Device activity LED	Meaning
Off	On	Disk operates normally.
Off	Flashing	Disk operates normally.
Off	Off	Disk is inactive and there is no fault.
On	On	Fault status. Disk may not be responding to control signals and may be bad, or may only need a power-off reset. Use the <code>sysconfig -r</code> command to determine whether the filer detects the disk and can access it. If the filer detects the disk and can access it, perform a power-off reset. If the problem persists, replace the disk.
On	Off	Fault status. Disk is inactive and spun down. Replace the disk.
Flashing	On	Disk is spinning up or down during a hot swap, or spinning down because of an error.
Flashing	Off	Fault status. Disk has failed. Replace the disk.

LED indicators on the power supply carrier

The power supply for the disk shelf has two LED indicators (see [Figure 3-3](#)).



EURO_07

Figure 3-3. LEDs on the disk shelf power supply

These power supply status LEDs function as follows:

- The green LED on the right is the power supply status indicator.
- The red LED on the left is the power supply failure LED. It is normally off. If a failure has occurred, the LED turns on steadily or flashes at regular intervals. See [Table 3-2](#) for the meanings of the LED interval patterns.

Table 3-2. Power supply LEDs

LED color/location	LED activity	Meaning
Green - right side	On	Power supply is functioning properly.
	Off	An input power problem exists or the power supply is not functioning properly.

Table 3-2. Power supply LEDs

LED color/location	LED activity	Meaning
Red - left side	Off	Power supply and fan are functioning properly.
	On	Power supply malfunction or input power problem exists.

Chapter 4: **Replacing units in the disk shelf**

This chapter describes how to replace units in a disk shelf.

Replacing a disk

You can remove a disk drive from a disk shelf or install a disk drive in a disk shelf while the filer is running, with minimal interruption to the file system; this capability is called “hot-swapping.”

For more information about removing disks, refer to “Removing a disk from a shelf” on page 15 in Chapter 2; for more information about installing disks, refer to “Installing devices in the disk shelf” on page 10 in Chapter 2.

Replacing a power supply

This section describes the steps to remove and replace power supplies in a disk shelf.

Removing a power supply

To remove a power supply, follow these steps:

1. If your disk shelf is equipped with a single power supply:
 - a. Halt the filer and power the filer down.
 - b. Turn off the power switch on the disk shelf.

- c. Unplug the disk shelf power cord from the AC outlet.
 - d. Go to Step 3.
2. If your disk shelf is equipped with a redundant power supply, you can leave the filer and the disk shelf powered on.
 3. Press the ejection button on the lower part of the power supply carrier with one hand, grasp the carrier handle with the other hand, and pull the carrier out of the shelf.

Always use two hands to support the weight of the power supply.

Installing a power supply

To install a power supply, follow these steps:

1. Orient the power supply carrier so that the LEDs are on the top and the ejection button is on the bottom.
2. Insert the power supply carrier into the guide slot on the shelf and push the carrier in until you feel the device engage the backplane and the ejection button on the device carrier is fully extended.

If the button is not fully extended, apply additional pressure to the front of the device carrier.

3. Turn on the power switch on the back of the disk shelf.

If your disk shelf is equipped with a redundant power supply, the filer and the disk shelf are already powered on.

4. Turn on the power to the filer.

Replacing a shelf fan

Each disk shelf contains two fans mounted on the back of the shelf. These fans take their power from the shelf backplane.



CAUTION: Never attempt to lift a disk shelf by grasping the fans. The fans may detach from the disk shelf, causing you to drop the disk shelf, damaging the disk shelf and any installed components, such as power supplies and disks.



NOTE: The fans are hot-swappable, which means that you can leave the disk shelf powered on while you are removing or installing one of the fans.

Removing a fan

To remove a fan, follow these steps:

1. Loosen the captive thumbscrew that secures the fan to the disk shelf (see [Figure 4-1](#)).

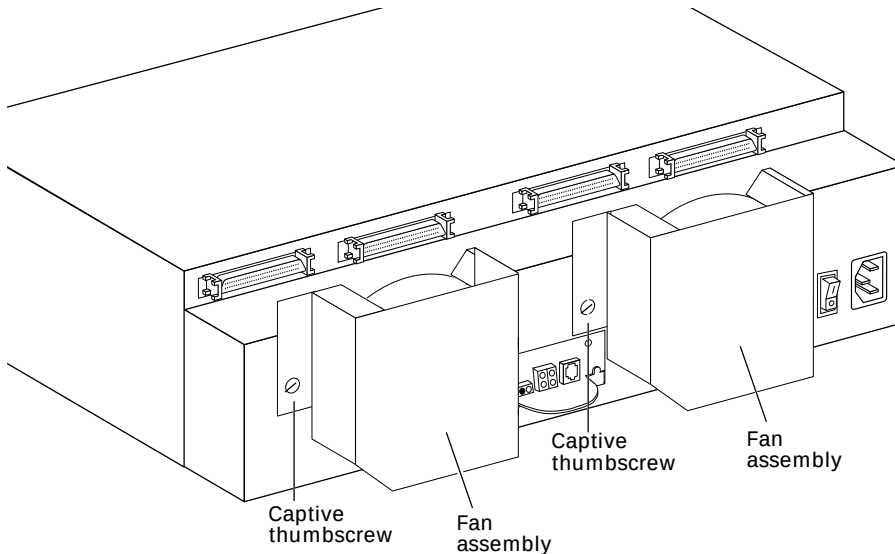


Figure 4-1. Removing a fan assembly

2. Swing the fan assembly away from the shelf, but do not pull the tabs on the right side of the assembly out of the shelf.
3. Detach the cable from the connector.
4. Pull the fan away from the assembly by disengaging the two tabs on the right side of the fan from the shelf.



WARNING: Once you have removed a fan from the disk shelf you must block the resulting hole within 3 minutes. Failure to do so can seriously restrict airflow and cooling within the shelf assembly.

Installing a fan

To install a fan, follow these steps:

1. Hold the fan assembly at 90 degrees to the shelf. Align the two tabs on the right side of the assembly with the cutouts on the back of the shelf.
2. Insert the tabs into the cutouts.
3. Attach the fan cable to the connector.
4. Align the captive thumbscrew on the fan assembly with the threaded hole on the shelf.
5. Tighten the thumbscrew.
6. Turn on the power to the filer, if it is not already powered on.
7. Check the LEDs on the disk shelf power supply to verify that the disk shelf is operating properly.

For information about LED indicators, refer to [Disk shelf LEDs](#) in Chapter 3.

Replacing an EFB card

This section describes the steps to remove and replace an Environmental FaultBus (EFB) card from the shelf. The EFB card is located at the rear of the shelf (see [Figure 4-2](#)).

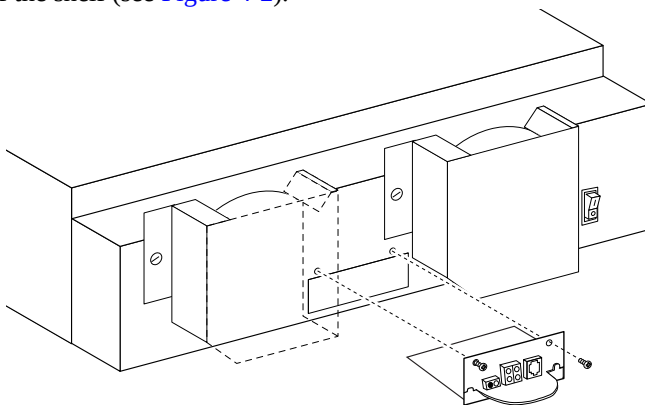


Figure 4-2. Installing EFB card



NOTE: When replacing an EFB card, ensure that antistatic precautions have been observed.

Removing an EFB card

To remove the EFB card, follow these steps:

1. Using a Phillips screwdriver, remove the two screws from the metal plate on the card (refer to [Figure 4-2](#)).
2. Grasp the handle on the card and slowly pull it out of the shelf.

Installing an EFB card

To install an EFB card (refer to [Figure 4-2](#)), follow these steps:

1. Orient the card so that the connectors on the card align with the connectors on the backplane.

2. Insert the card into the slot on the rear of the shelf and push it in firmly until the metal plate sits flat against the rear of the shelf.
3. Insert the two screws through the fixing holes in the card's metal plate and the rear of the disk shelf.
4. Tighten the screws using a Phillips screwdriver.

The procedure for replacing an EFB card is now complete.

Index

A

- alarm silence button 18
- attaching SCSI cable
 - in a single-shelf configuration 11
- attaching shelf to power source 13

B

- blank cover for empty bay 2

D

- device carrier
 - installation of 10
- device carriers
 - features
 - device carriers 2
- device installation 10
- disk drive LEDs 19
- disk removal
 - from a rack 15
 - from a shelf 15
- disk shelf
 - attaching to a power source 13
 - moving to another location 15

E

- EFB card
 - installing 27
 - location 17
 - removing 27
 - replacing 27
- ejection button 2
- electrical requirements 4
- environmental and space requirements 3

- environmental condition monitoring 2
- Environmental FaultBus (EFB) card 2

F

- fan installation 26
- fan LEDs 18
- fans 2
 - hot swapping 25
- features
 - blank cover for empty bay 2
 - EFB card 2
 - ejection button 2
 - fans 2
 - hot-swapping 2
 - LED operational status 2
 - power supplies 2
 - standard size rack 2
- features of StorageShelf 2

H

- hot swapping disk shelf fans 25
- hot-swapping 2, 23

I

- installation
 - of a fan 26
 - of a power supply 24
 - of a shelf 9
 - of an EFB card 27
 - of devices 10
 - of the device carrier 10
 - requirements 3, 7
 - verifying connection 13

L

- LED indicators
 - shelf faults 17
- LED operational status 2
- LEDs
 - disk drive 19
 - fan 18
 - power supply 21
- location of EFBcard 17

M

- moving disk shelf 15

O

- operational status, LEDs 2

P

- power consumption 5
- power requirements 4
- power source, attaching the disk shelf 13
- power supplies 2
- power supply
 - hot-swappable 2
 - installing 24
 - LEDs 21
 - removing 23

R

- removing
 - a disk
 - from a rack 15
 - from a shelf 15
 - a power supply 23
 - a shelf fan 25
 - an EFB card 27

replacing

- a shelf fan 25
- an EFB card 27

requirements

- electrical 4
- environmental and space 3
- for installation 7
- installation 3
- power 4

S

- SCSI adapter
 - single-ended 2
- SCSI ID settings
 - on a single-shelf configuration 12
- SE terminator 11
- SE1 and SE2 connectors 11
- shelf fan
 - removing 25
 - replacing 25
- shelf fault LED indicators 17
- shelfchk command 13
- single-ended SCSI adapter 2
- single-shelf
 - attaching SCSI cables 11
 - SCSI ID settings 12
- standard size rack 2
- StorageShelf
 - features of 2
 - introduction to 1

T

- thermal ratings 5

V

- verify installation 13