

NetApp® Disk Shelves

Fibre Channel StorageShelf

Hardware Installation Guide

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- ◆ 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.

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Translation:

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

- ◆ This documentation package applies to the following products:
- ◆ NetApp® Filers: F720, F740, and F760
- ◆ NetCache™ Appliances: C720, C720s, C720s2, and C760
- ◆ NetApp System Cabinets: P/N 110-01981
- ◆ Disk shelves: P/Ns XL401R-FJC-02D, XL401R-S-02Z, and XL401R-R-02N

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Preface

About this guide

What this guide contains

This guide describes how to install, set up, and manage the 9-GB NetApp® Fibre Channel StorageShelf FC7 and the 18-GB NetApp Fibre Channel StorageShelf FC8. It also describes how to add disk shelves to an existing cluster installation.

Audience

This guide is for system administrators who are familiar with Network Appliance™ filers and how the Network File System (NFS), Common Internet File System (CIFS), and Hypertext Transfer Protocol (HTTP) protocols are used to share and transfer files.

Terminology

This guide uses the following terms:

- ◆ *9-GB disk shelf* refers to the Fibre Channel StorageShelf FC7 that contains only 9-GB disks.
- ◆ *18-GB disk shelf* refers to the Fibre Channel StorageShelf FC8 that contains only 18-GB disks.
- ◆ *Disk shelf* refers to both fibre channel disk shelf models.
- ◆ *Filer/NetCache Appliance* refers to those NetApp filers and NetCache™ Appliances that support the disk shelves.
- ◆ *Device carrier* refers to the container that encases a power supply or disk.
- ◆ *Disk* applies to a 9-GB or 18-GB fibre channel disk encased in its device carrier.

Command conventions

You can enter filer/NetCache Appliance commands on the system console or from any client that can obtain access to the filer/NetCache Appliance using telnet. In examples of commands run on a UNIX workstation, this guide uses the command syntax and output of SunOS 4.1x. If you use a different version of UNIX, the command syntax and output might be different.

Formatting conventions

The following table lists the kinds of formatting this guide uses to identify special information.

Formatting convention	Type of information
<i>Italic type</i>	◆ Words or characters that require special attention. ◆ File names and path names. ◆ Placeholders for information you must supply. For example, if the guide requires you to enter the fctest <i>adapternam</i>e command, you enter the characters “fctest” followed by the actual name of the adapter. ◆ 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 you must type it in uppercase letters for it 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 might not be labeled exactly as they are in this guide.

What is in this guide...	What it means...
hyphen (-)	Used to separate individual keys. For example: Ctrl-D means holding down the Ctrl key while pressing the D key.
<i>Enter</i>	Used to refer to the key that generates a carriage return, although the key is named Return on some keyboards.
<i>type</i>	Used to mean pressing one or more keys on the keyboard.
<i>enter</i>	Used to mean pressing one or more keys and then pressing the <i>Enter</i> key.

Special messages

This guide contains special messages that 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.

About this chapter

Chapter contents

This chapter discusses the following topics:

- ◆ [“Overview of the disk shelves”](#) on [page 14](#)
- ◆ [“Installation requirements”](#) on [page 19](#)

Overview of the disk shelves

About the disk shelves

Network Appliance offers two fibre channel disk shelf models for F700 series filers, F630 filers, F520 filers, and the C760 and C720 NetCache Appliances—the Fibre Channel StorageShelf FC7 and the Fibre Channel StorageShelf FC8.

The disk shelves are described in the following table.

Disk shelf model	Contains and supports	Disk label
Fibre Channel StorageShelf FC7	Up to seven 9-GB disks; supports only 9-GB disks	9F
Fibre Channel StorageShelf FC8	Up to seven 18-GB disks; supports only 18-GB disks	18F

Because these two disk shelves are largely the same, this guide uses the term *disk shelf* to refer to both models. When differences occur, this guide uses the terms *9-GB disk shelf* and *18-GB disk shelf* to refer to the individual models.

Features

The disk shelf has the following features.

Feature	Explanation
Fibre Channel Arbitrated Loop (FC-AL) protocol support	
Hot-swappable fibre channel disks	The fibre channel disks are <i>hot swappable</i> ; that is, you can add, remove, and replace a disk while the disk shelf is active.
No internal cabling or active components on the backplane.	This reduces the risk of failure.

Feature	Explanation	
Power supplies	On 9-GB disk shelf	On 18-GB disk shelf
	One power supply; second is optional. Hot swappable and load sharing when two are installed. You use the appropriately labeled power supply from the following three: 110 VF, 220 VF, or 110/220V. The power supply labeled 110/220V automatically determines and adjusts to the power source (autoranging). Rated at 200W.	Two power supplies. Hot swappable and load sharing. Labeled 110/220V—unit is autoranging. Rated at 260W.
Two fans	Hot swappable, mounted on the back of the disk shelf, providing air flow and cooling for the devices. If one fan fails, the other fan cools the entire disk shelf.	
Enclosure Data Manager (EDM) card	At the request of the filer/NetCache Appliance, the EDM card in the disk shelf collects data related to disk presence, fan status, power supply voltage outputs, environmental conditions, and temperature. The card also responds through its LEDs and an audible alarm to impending component failure and changes in disk shelf environment.	
Standard size rack	You install the disk shelf in a standard 19-in. (48.26 cm) equipment rack (rack).	
Device carriers	The disks and power supplies are housed in easily removable device carriers. The aluminum construction of the device carriers allows for rapid heat dissipation and emission reduction. Each device carrier has LEDs that indicate operational status and an Ejection button for disengaging the device from the disk shelf.	

Ejection button colors: The colors of the Ejection buttons on the fibre channel disk shelves are different from the Ejection buttons on the SCSI disk shelves. The different colors also help you to distinguish the power supplies from the disks.

The following table describes the functions of the different Ejection buttons.

Ejection button color	Description
9-GB disk shelf—Bronze 18-GB disk shelf—Gold	Ejection button on the power supplies.
Black	Ejection button on the disks.
Charcoal	Ejection button on the empty drive shuttles used to fill empty bays.

Possible configurations

You can connect one disk shelf or up to eight daisy-chained disk shelves to a filer/NetCache Appliance.

About combining 9-GB and 18-GB disk shelves in a loop: If you connect 9-GB and 18-GB disk shelves in the same loop, the disk shelf connected to the filer/NetCache Appliance must be a 9-GB disk shelf.

WARNING

When using more than eight disk shelves in a Fibre Channel Arbitrated Loop, you must install the entire system in a NetApp System Cabinet to meet FCC emission requirements. Network Appliance does not guarantee the performance of a system with more than eight disk shelves if it is not installed in a NetApp System Cabinet.

About a cluster configuration: For information about a cluster configuration, refer to *First-Time Configuration Using the Setup Command*.

Note

The configuration information in this guide reflects the configurations supported as of April, 1999. NetApp periodically adds to and enhances the configuration options. To obtain information about the current configurations, go to the Configuration Guide on the NOW Web page at <http://now.netapp.com>.

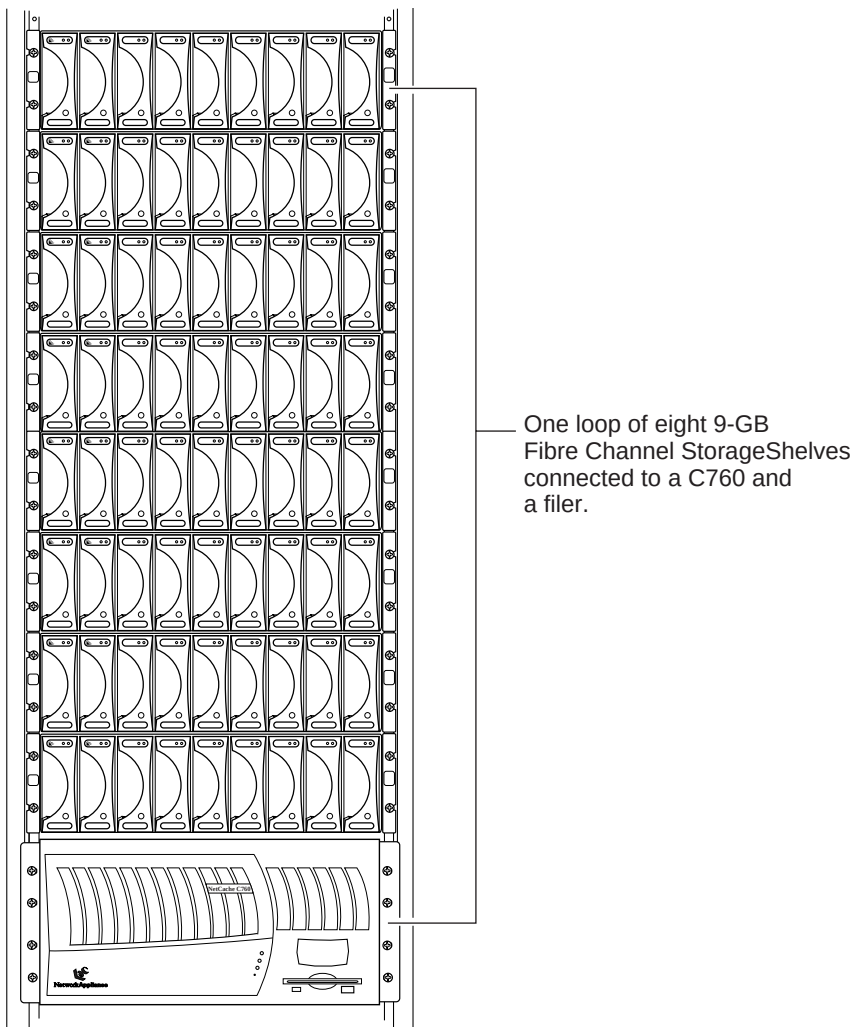
The following table lists the current support for multiple disk shelves.

Filer/NetCache Appliance	Max. number of loops	Max. storage
F700 series/ C760, C720	Three	F720—0.5 terabytes (TB) F740—1.0 TB F760—1.5 TB
F630	Three	F630—1.5 TB
F520	One ^a	F520—0.25 TB

a. The F520 has up to four disk shelves in a loop.

The following illustration shows a system installed in a 19-in. (48.26 cm) rack. The system consists of eight daisy-chained 18-GB disk shelves connected to an F760 filer.

Each disk shelf in this illustration has two power supplies and seven 18-GB fibre channel disks.



Installation requirements

About this section

This section describes the environmental, spatial, electrical, and other requirements that you must meet before you can install a disk shelf and a filer/NetCache Appliance.

About installing more than eight disk shelves

If you have more than eight disk shelves connected to a filer, you must install the entire system in a NetApp System Cabinet. For more information, refer to the *System Cabinet Installation Guide*.

Firmware requirements

The system firmware requirements are listed in the following table.

Filer/NetCache Appliance	System firmware version
F520	2.0_a1 or later
F630	2.0_a2 or later
F700 series	2.0_a2 or later
C760, C720	2.0_a2 or later

Environmental requirements

The environmental requirements for the disk shelf and filer/NetCache Appliance are the same.

The following table lists the environmental and spatial conditions along with the requirements.

Environmental condition	Operating condition	Nonoperating condition
Temperature range	50° F to 104° F (10° C to 40° C)	-40° F to 151° F (-40° C to 66° C)
Relative humidity	10% to 90% (noncondensing)	10% to 90% in original shipping container (noncondensing) Otherwise, 50% (noncondensing)
Distance from a partition	39.37 in. (1m)	

Caution

The top cover of the filer/NetCache Appliance has ventilation holes in the back section. When installing a disk shelf or other equipment on top of the filer/NetCache Appliance, make sure that you do not block the ventilation holes. Leave at least 1.5 in. (3.81 cm) of space for air circulation directly above the ventilation holes. You can install equipment directly on top of the unventilated area of the top cover as long as it does not extend over and block the ventilation holes.

Electrical requirements

A power cord is provided for each power supply for connecting the 9-GB and 18-GB disk shelves to a properly grounded power source.

The following table describes the power requirements for the 9-GB disk shelf. Make sure that the current does not exceed the rating of the AC power source. The table also lists how many disk shelves a 15A and 20A circuit can support based on a maximum PSU load at 110V.

	9-GB disk shelf	18-GB disk shelf
Volts	Amps	
200–240	1.5	2.0
92–120	3.0	4.0

Circuit	Maximum number of disk shelves ^a	
15A	4	4
20A	6	5

a. Exceeding the allowed maximum number of disk shelves can lead to power brownouts.

Inrush current of the power supply at power on: The inrush current of one and two power supplies at power on is as follows.

- ◆ Single power supply—45 to 50A.
- ◆ Two power supplies—65A.

Power consumption and thermal rating

The power consumption (in watts) and the number of BTUs per hour produced by the disk shelf depend on the number and type of devices (for example, power supplies, disks, and so on) installed in the disk shelf.

The following table gives an example of nominal or average power consumption for one disk shelf with seven disks, one power supply, two fans, one Loop Resiliency Circuit (LRC) card, and one EDM card.

	9-GB disk shelf	18-GB disk shelf
Power consumption	200W	260W
Thermal rating	683 BTUs/hr	890 BTUs/hr

To arrive at the total power consumption, you must add the power requirements from the table in “Electrical requirements” to the power demands of the devices in the disk shelf.

Dimensions and weight

The following table lists the dimensions and weight of a single disk shelf in U.S. linear measure, metric, and U-metric, where applicable.

Dimensions and weight	Measurements
Height	5.12 in. (13.1 cm) or 3U (1U = 1.75 in.)
Width	17.5 in. (44.5 cm)
Depth	13.8 in. (35.3 cm)
Disk shelf weight:	
◆ When empty	15.24 lbs (6.86 kg)
◆ With 7 drives and 1 power supply	41.18 lbs (18.72 kg)

About this chapter

What this chapter covers

This chapter provides instructions for installing the fibre channel disk shelf. The installation procedure varies, depending on the configuration.

Note

This chapter assumes that you have secured the filer/NetCache Appliance to a rack or NetApp System Cabinet. This chapter does not provide information specific to the connectors on the filer/NetCache Appliance. Refer to your filer/NetCache Appliance hardware guide and the *System Cabinet Installation Guide* for more information.

Chapter contents

This chapter discusses the topics listed in the following table:

- ◆ [“Preparing for the installation”](#) on [page 12](#)
- ◆ [“Installing the disk shelf in a rack”](#) on [page 21](#)
- ◆ [“Connecting the disk shelf to the filer/NetCache Appliance”](#) on [page 23](#)
- ◆ [“Verifying the installation from a console”](#) on [page 33](#)
- ◆ [“Adding a second or third loop of disk shelves”](#) on [page 31](#)

Preparing for the installation

Before you begin

The disk shelf is shipped with two power supplies and the fibre channel disks you ordered installed in the disk shelf. (On the 9-GB disk shelf, the second power supply is optional.)

Before you begin the installation, you need to

- ◆ Verify the contents of your shipment.
- ◆ Assemble the required tools and equipment.
- ◆ Understand the drive bay requirements for SCSI Enclosure Services (SES) monitoring and clusters.
- ◆ Understand how the disk shelves and disks are numbered.
- ◆ Know the rules for installing multiple disk shelves.

Verifying shipment contents

Each disk shelf package shipment contains the following items:

- ◆ A disk shelf containing the power supplies and fibre channel disks you ordered
- ◆ FC-AL cables, as ordered
- ◆ Four #10-32 screws for mounting the disk shelf in a rack
If the #10-32 screws cannot be used in your environment, purchase four 6 mm screws. At present, these screws are not supplied in the shipment.
- ◆ One or more NetApp System Cabinets if your system order has more than eight disk shelves
- ◆ This *Fibre Channel StorageShelves Hardware Guide*

Assembling required tools and equipment

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

- ◆ #1 and #2 Phillips screwdrivers
- ◆ Antistatic wrist strap and grounding leash

If the provided screws do not fit the holes in your rack, you need to obtain appropriate screws.

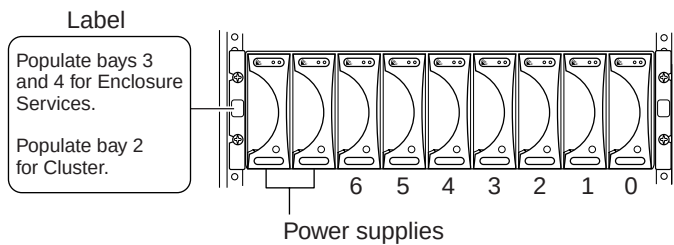
Important drive bay requirements

The seven drive bays in the disk shelf are numbered 0 through 6 from right to left, as shown in the following illustration.

Drive bays 3 and 4 must contain disks for SES monitoring: For SES monitoring to work, drive bays 3 and 4 must contain disks.

Drive bay 2 must contain a disk for clusters: In addition, for clusters to work, drive bay 2 must contain a disk.

If you do not observe the preceding requirements, the reliability and functionality of the system can be compromised. These requirements are posted on the label on the left flange of the disk shelf (shown in the following illustration).



The requirements for populating specific drive bays are actually less restrictive. They were simplified so that they could fit on a small label. A more accurate explanation of the requirements is provided in “About fibre channel signaling” on page 14.

About fibre channel signaling: The disk shelf has a fibre channel loop, called loop A, with an inbound and outbound portion. In a cluster system, it has a second loop, called loop B. The fibre channel signal is retimed, or regenerated, through both portions of the loop. That means that the inbound and outbound portions of loop A (and loop B for clusters) must always contain at least one disk. If this requirement is not met, the signal cannot be retimed and the system logs an error message.

The following table defines the inbound and outbound portions of loops A and B. You must have a disk installed in both portions of loop A. For clusters, you must also have a disk installed in both portions of loop B.

Loop portion	Drive bays
Loop A inbound	0-3
Loop A outbound	4-6
Loop B outbound	0-2
Loop B inbound	3-6

About SES monitoring: The filer/NetCache Appliance uses the SES monitoring method to monitor the disk shelf.

The following table describes the five stages in the SES monitoring method.

Stage	Device	What it does...
1	Filer/ NetCache Appliance	Uses a subset of SCSI-3 commands to monitor the disk shelf for data related to disk presence, temperature, power supply units, and fan status.
2	Filer/ NetCache Appliance	Sends the commands through its fibre channel interface to drive bay 3 or 4 on the disk shelf.
3	Drive bay 3 or 4	Communicates the request to the EDM card.
4	EDM card	Collects the requested data and sends it to drive bay 3 or 4. Note _____The EDM card responds to impending component failure and changes in disk shelf environment through its LEDs and an audible alarm. _____
5	Drive bay 3 or 4	Sends the data to the filer/NetCache Appliance.

How disk shelves are numbered

Before you install one or more disk shelves in a rack, you need to understand how disk shelves are numbered.

Disk shelf IDs are set by Network Appliance: The maximum number of disk shelves connected to a filer or NetCache Appliance is eight. The daisy-chained disk shelves connected to the filer form a loop. Each disk shelf in a loop must have a unique ID. The IDs start at 0 and go to 7, with disk shelf 0 connected to the filer/NetCache Appliance. (If you have additional loops, the disk shelf IDs in each loop start from 0 and go to 7.) The ID of a single disk shelf is 0.

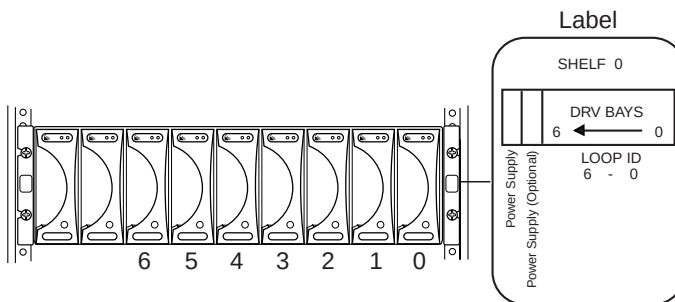
Network Appliance sets the IDs on the disk shelves at the factory using an ID switch on the back panel. (For information about setting the disk shelf ID, go to page 28.)

Each disk shelf is shipped with a label on its right flange, specifying its assigned disk shelf ID.

How loop IDs are assigned to disks

Each disk in a disk shelf is automatically assigned a unique loop ID according to its disk ID.

The enlarged label in the following illustration shows that the given disk shelf is SHELF 0 (or disk shelf ID 0) and its seven disks are assigned loop IDs 0 through 6 from right to left.

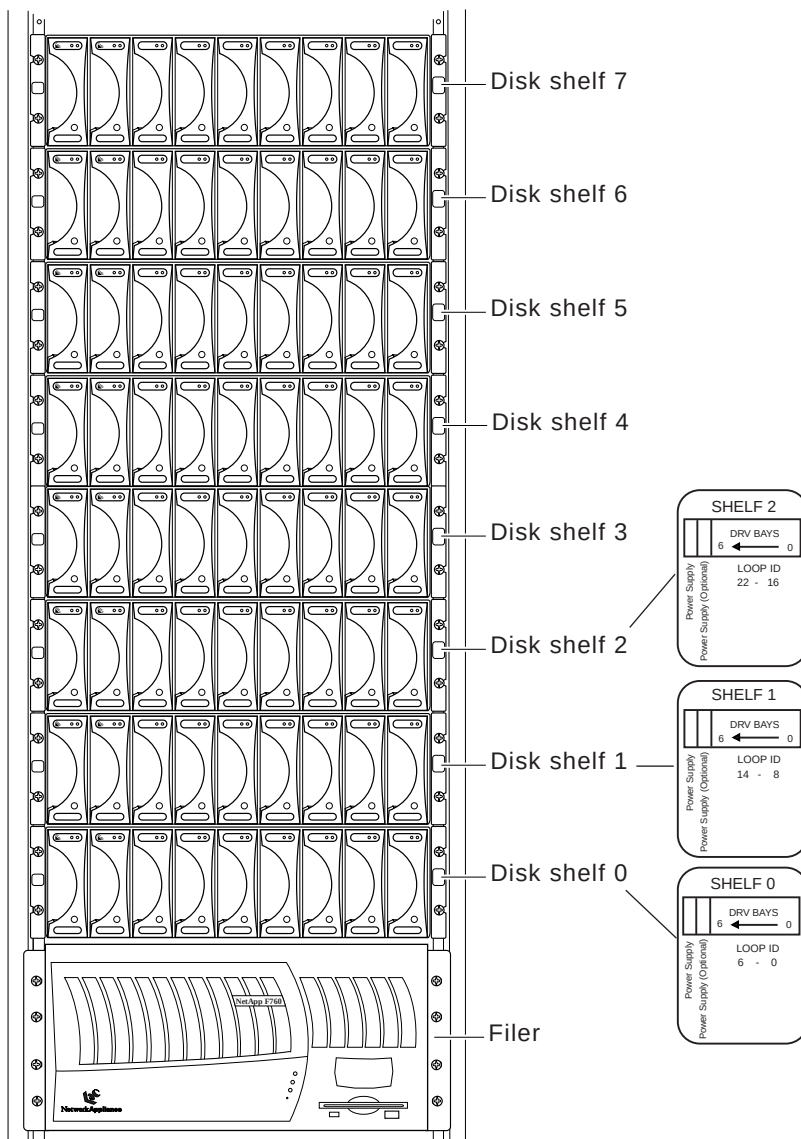


Eight disk shelves in a loop can contain up to 56 disks. The label on the right flange on each disk shelf shows the assigned loop IDs of the disks.

The following table lists the eight shelf IDs and their corresponding loop IDs. (Note that odd numbers 7, 15, 23, 31, 39, 47, and 55 are not used as loop IDs.)

Shelf ID	Loop ID
0	6–0
1	14–8
2	22–16
3	30–24
4	38–32
5	46–40
6	54–48
7	62–56

The following illustration shows a loop of eight daisy-chained disk shelves connected to a filer. An enlarged image of the labels on the first three disk shelves appears on the right. Disk shelf 0 is connected to the filer, the other disk shelf IDs are in consecutive order.



Rules for installing multiple disk shelves

When you install multiple disk shelves in a rack, you must adhere to the following rules:

- ◆ Connect up to eight disk shelves in one loop.
- ◆ Install the filer/NetCache Appliance at the bottom or top of the freestanding rack.
- ◆ With a filer system, if you have more than eight disk shelves, install the entire system in a NetApp System Cabinet with the filer in the middle.
- ◆ Install disk shelf 0 above or below the filer/NetCache Appliance.
- ◆ Install the other disk shelves in consecutive order, according to the IDs on their labels.
- ◆ Do not install empty disk shelves.
- ◆ Make sure that the ID on the back panel of each disk shelf matches the ID specified on its label.
- ◆ If you install a second or third loop of disk shelves, the disk shelf IDs in each loop start at 0.

About mixing 9-GB and 18-GB disk shelves: When mixing 9-GB and 18-GB disk shelves in the same loop, make sure that the disk shelf connected to the filer/NetCache Appliance is a 9-GB disk shelf.

When ordering disk shelves after the initial order: When you order additional disk shelves after your initial order, the ID labels for the disk shelves are shipped in a separate envelope. You select the correct label and attach it to each new disk shelf and set the disk shelf IDs.

How disk shelf IDs and loop IDs are used: You use the disk shelf IDs and loop IDs in such procedures as monitoring, removing, and replacing disks. For more information about these procedures, refer to the *System Administrator's Guide*.

Overview of the installation

**Procedures
required**

The disk shelf is shipped with the power supplies and disks you ordered installed in the drive bays. You need to complete the following procedures to install and start up the disk shelf.

Stage	Procedure	Reference
1	Install the disk shelf in a rack.	page 21
2	To connect a single disk shelf: Connect the disk shelf to the filer/NetCache Appliance.	page 24
	To connect a daisy-chain of disk shelves: Connect the disk shelves in a daisy chain, then connect disk shelf ID 0 to the filer/NetCache Appliance.	page 26
3	Set the disk shelf IDs, if needed.	page 28
4	Connect the disk shelf to a power source.	page 29
5	Verify the installation from a console.	page 33

The procedure for connecting a second or third loop of disk shelves to the filer/NetCache Appliance is described on page 32.

Installing the disk shelf in a rack

About the rack

Install the disk shelf in a rack using the four #10-32 screws shipped with the disk shelf. The rack must have mounting rails and a 19-in. (48.26 cm) wide front panel.

Note

This guide assumes that the rack has threaded holes. If it does not, you need to provide clip nuts or nut bars for fastening the screws.

Caution

Wear an antistatic wrist strap and grounding leash.

About the NetApp System Cabinet

The NetApp System Cabinet has rails assigned for the filer/NetCache Appliance to be in the middle and for four disk shelves to be above and for four disk shelves to be below the filer/NetCache Appliance. An expansion NetApp System Cabinet can accommodate up to ten disk shelves.

How to install the disk shelf

WARNING

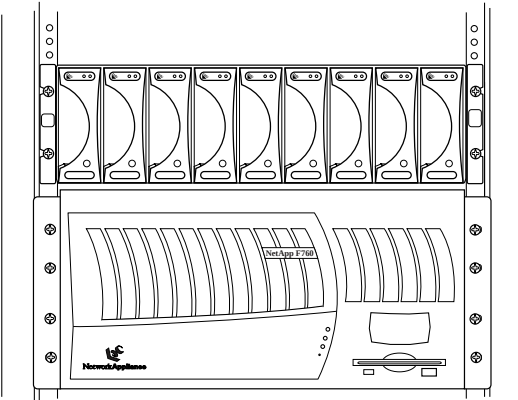
Because the disk shelf is very heavy when loaded with disks, you can remove the disks and install the empty disk shelf in the rack.

For instructions about how to remove and install disks, refer to “How to remove a disk” and “How to install a disk” on pages 43 and 44.

Because the empty disk shelf is still heavy, you must work with at least one other person when you install it.

Do not attempt to lift the disk shelf by grasping the fans. The fans might detach from the disk shelf, causing you to drop the disk shelf. This might cause you injury or damage the disk shelf and any installed devices.

To install the disk shelf in a rack, follow these steps.

Step	Action
1	Select four holes on the rack's front mounting rails that are appropriately spaced for the mounting holes on the disk shelf.
2	Align the holes on the disk shelf flanges with the holes you selected on the front rails.
3	Insert two screws into the bottom mounting holes on the disk shelf flanges and the mounting rails.
4	Insert two screws into the top mounting holes on the disk shelf flanges and the mounting rails. The following illustration shows a disk shelf installed above an F760. 
5	Tighten the screws.

Connecting the disk shelf to the filer/NetCache Appliance

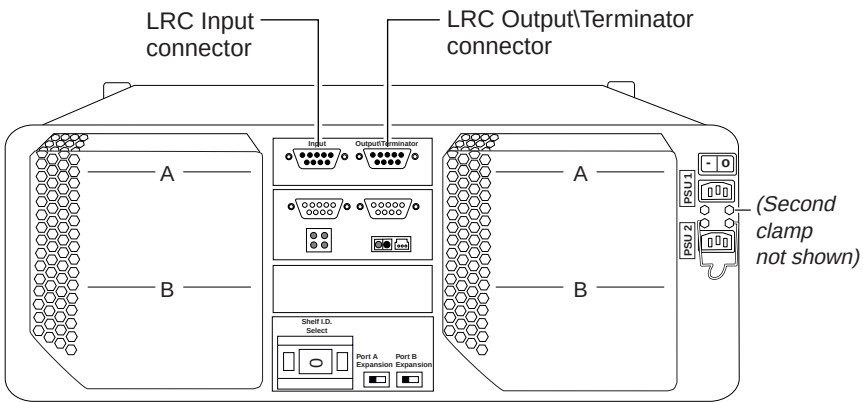
About the LRC card on the back panel

The port bypass circuit, called the Loop Resiliency Circuit (LRC), is a card in the rear of the disk shelf. It provides the following connectors.

LCR connector	Function
Input	Provides the interface between the disk shelf and the filer/NetCache Appliance.
Output\Terminator	Provides the interface between disk shelves to create a loop of daisy-chained disk shelves. You place a terminator on this connector if the disk shelf is the last disk shelf in a daisy-chain or a single disk shelf.

The following illustration shows the back panel of the disk shelf.

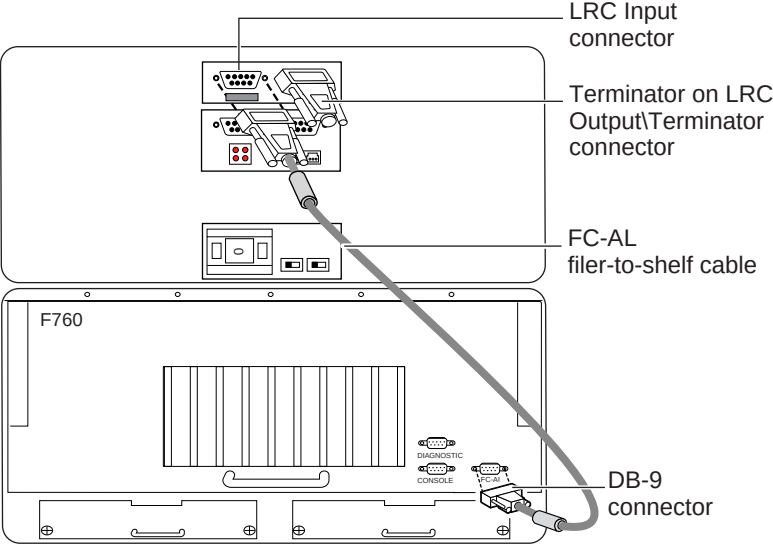
(Some older versions of the 9-GB disk shelf do not have power supply and channel A and B labels.)



How to connect a single disk shelf to a filer/NetCache Appliance

The F700 series filers and C760 and C720 NetCache Appliances have a built-in FC-AL (DB-9) interface for connecting a fibre channel disk shelf.

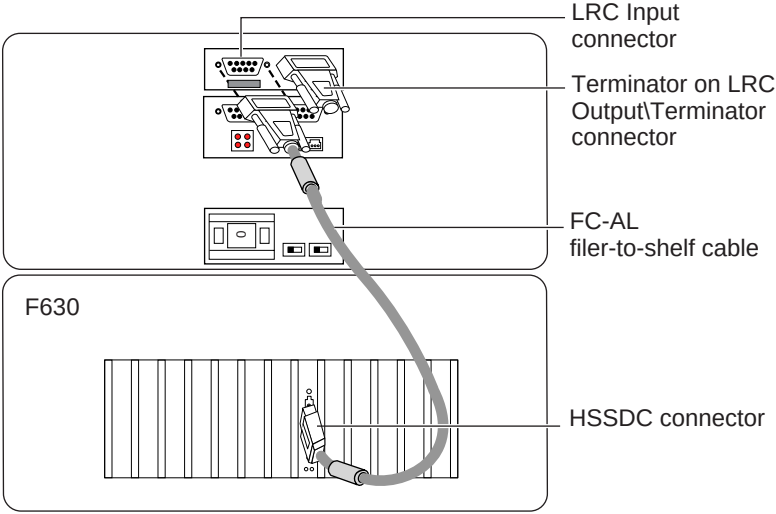
To connect a single disk shelf to a filer/NetCache Appliance, follow these steps.

Step	Action	Description
1	Connect one end of the FC-AL filer-to-shelf cable to the LRC Input connector on disk shelf 0.	Tighten the locking screws on the cable's DB-9 connector.
2	Plug the other end of the cable into the filer/NetCache Appliance DB-9 socket connector, labeled FC-AL0.	FC-AL0—Fibre Channel Arbitrated Loop 0 (zero). You use an FC-AL cable with two DB-9 connectors. This cable carries all data, including data from the EDM card. The following illustration shows the FC-AL cable connecting the disk shelf to an F760 filer.
3	Put a terminator on the LRC Output\Terminator connector on the disk shelf.	 The diagram illustrates the connection of an FC-AL cable between a disk shelf and an F760 filer. The cable has two DB-9 connectors. One end is connected to the LRC Input connector on the disk shelf. The other end is connected to the DB-9 connector on the F760. A terminator is shown on the LRC Output\Terminator connector on the disk shelf. Labels in the diagram include: LRC Input connector, Terminator on LRC Output\Terminator connector, FC-AL filer-to-shelf cable, F760, DIAGNOSTIC CONSOLE, and DB-9 connector.
4	Proceed to set the disk shelf ID.	Go to page 28.

How to connect a single disk shelf to an F520 or F630 filer

To connect the disk shelf to an F520 or F630, follow these steps.

Caution—————
Make sure that the filer/NetCache Appliance is turned off before you connect it to the disk shelf.

Step	Action	Description
1	Connect the DB-9 end of the FC-AL filer-to-shelf cable to the LRC Input connector on disk shelf 0.	Tighten the locking screws on the cable's DB-9 connector.
2	Connect the HSSDC end of the cable to the FC-AL adapter in slot 8 on the filer.	You use an FC-AL cable with a black DB-9 connector on one end and a High Speed Serial Data Connector (HSSDC) on the other end. This cable carries all data, including data from the EDM card.
3	Place a terminator on the LRC Output\Terminator connector on the disk shelf.	The following illustration shows a single disk shelf connected to an F630. 
4	Proceed to set the disk shelf ID.	Go to page 28.

Connecting disk shelves in a daisy chain and to a filer/NetCache Appliance

To connect two or more disk shelves in a daisy chain and then to a filer/NetCache Appliance, follow these steps.

Note

If you are installing more than eight disk shelves, you must use a NetApp System Cabinet instead of a freestanding rack.

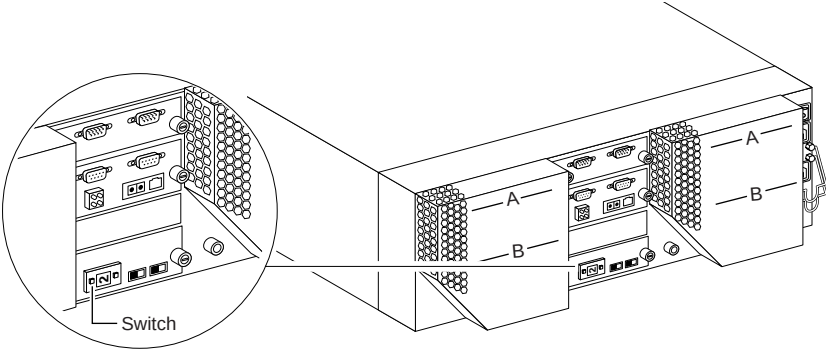
Step	Action	Description
1	Install disk shelf 0 above or below the filer/NetCache Appliance.	
2	Install the other disk shelves in the correct order.	Follow the rules for installing multiple disk shelves on page 19.
3	Connect one end of the cable to the LRC Output\Terminator connector on disk shelf 0.	Use the provided FC-AL shelf-to-shelf cable.
4	Connect the other end to the LRC Input connector on disk shelf 1.	You are connecting disk shelf 1 to disk shelf 0.
5	Connect the other disk shelves following the same pattern.	The illustration on page 27 shows the pattern for creating a daisy-chain loop. A shelf-to-shelf cable connects the Output\Terminator connector of one disk shelf to the Input connector of the next disk shelf.
6	Put a terminator on the LRC Output\Terminator connector on the last disk shelf.	
7	To connect disk shelf 0 to an F700 series filer, or a C720 or C760 NetCache Appliance follow the procedure on page 24. To connect disk shelf 0 to an F630 or F520, follow the procedure on page 25.	The following illustration shows a loop of four daisy-chained disk shelves connected to an F700 series filer.

Step	Action	Description
	The diagram illustrates the connection of a Fibre Channel Storage Shelf (F760) to a series of four disk shelves. The connection is made using an LRC Input connector, a Terminator, an LRC Output/Terminator connector, an FC-AL daisy-chain cable, an FC-AL filer-to-shelf cable, and a DB-9 connector. The F760 unit is shown at the bottom, with the LRC Input connector and DB-9 connector labeled. The FC-AL filer-to-shelf cable connects the F760 to the first disk shelf. The FC-AL daisy-chain cable connects the first disk shelf to the second, and so on, up to the fourth disk shelf. The Terminator is connected to the LRC Output/Terminator connector on the fourth disk shelf. The LRC Input connector is connected to the LRC Output/Terminator connector on the first disk shelf.	
8	Make sure that each disk shelf has the ID specified on its label.	For instructions about setting the disk shelf ID, go to page 28.

Setting the disk shelf ID

How to set the disk shelf ID Each disk shelf is shipped with its assigned ID set on its back panel. You need to make sure the disk shelf has the correct ID.

If you need to set the disk shelf ID, follow these steps.

Step	Action	Description
1	Press the thumbwheel switch on the rear of the disk shelf. Use the + button on the right to increase the number. Use the - button on the left to lower the number.	The example in the following illustration shows the disk shelf ID set to 2. 
2	Proceed to connect the disk shelf to two power sources on separate circuit breakers.	Go to page 29.

Note If you change the disk shelf ID at a later time, you must halt the filer/NetCache Appliance and power-cycle (turn power off, then restart) the disk shelf.

Connecting the disk shelf to a power source

About disk shelf power supplies

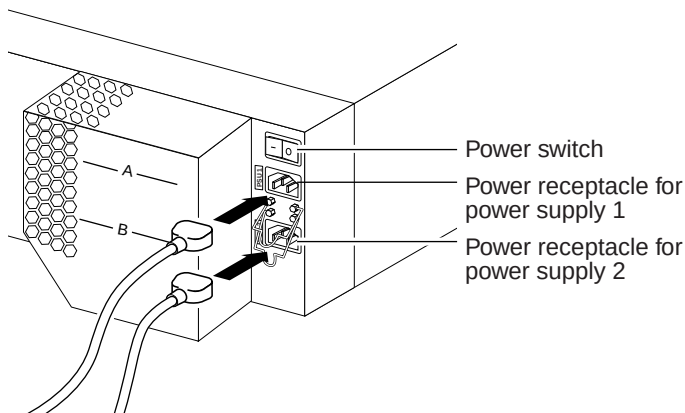
The disk shelf is shipped with two power supplies installed. (On the 9-GB disk shelf, the second power supply is optional.) A power cord is provided for each power supply.

How to connect the disk shelf to power

To connect the disk shelf to a power source, follow these steps.

Step	Action	Description
1	Make sure that the filer/NetCache Appliance is turned off.	
2	For the first power supply ◆ Plug the AC power cord into the top power receptacle. ◆ Plug the other end of the cord into a grounded AC power source. ◆ Fasten the power cord with the clamp.	You must have separate circuit breakers for each power supply. The top power receptacle corresponds to the first power supply.

Step	Action	Description
3	For the second power supply ◆ Plug the second AC power cord into the bottom power receptacle. ◆ Plug the other end of the cord into a grounded AC power source. ◆ Fasten the power cord with the clamp.	The bottom power receptacle corresponds to the second power supply. The top and bottom power receptacles are labeled PSU 1 and PSU 2, respectively, on the 18-GB disk shelf.
4	Turn the power switch to the On position.	The mechanical installation of the disk shelf is now complete.



Adding a second or third loop of disk shelves

Requirements for a second loop

Before you add a second or third loop of disk shelves, make sure that you meet the following requirements for your filer:

F700 series filers: You need to install an FC-AL disk adapter in the filer to add an additional loop of daisy-chained disk shelves. The F720 and F760 support two and three loops, respectively.

F630 filer: To support up to two loops of daisy-chained disk shelves, you must set up the F630 for a multiloop configuration. For more information, refer to the *F630 Multiloop Fibre Channel Upgrade Guide*.

F520 filer: The F520 supports up to four disk shelves in a loop. A standard FC-AL daisy-chain cable is provided for each disk shelf connection in the loop. The maximum distance between disk shelves is 20 inches (0.5 m).

About installing more than eight disk shelves

If you have more than eight disk shelves, you must install the entire system in a NetApp System Cabinet. The cabinet can accommodate up to ten disk shelves.

About installing an FC-AL disk adapter

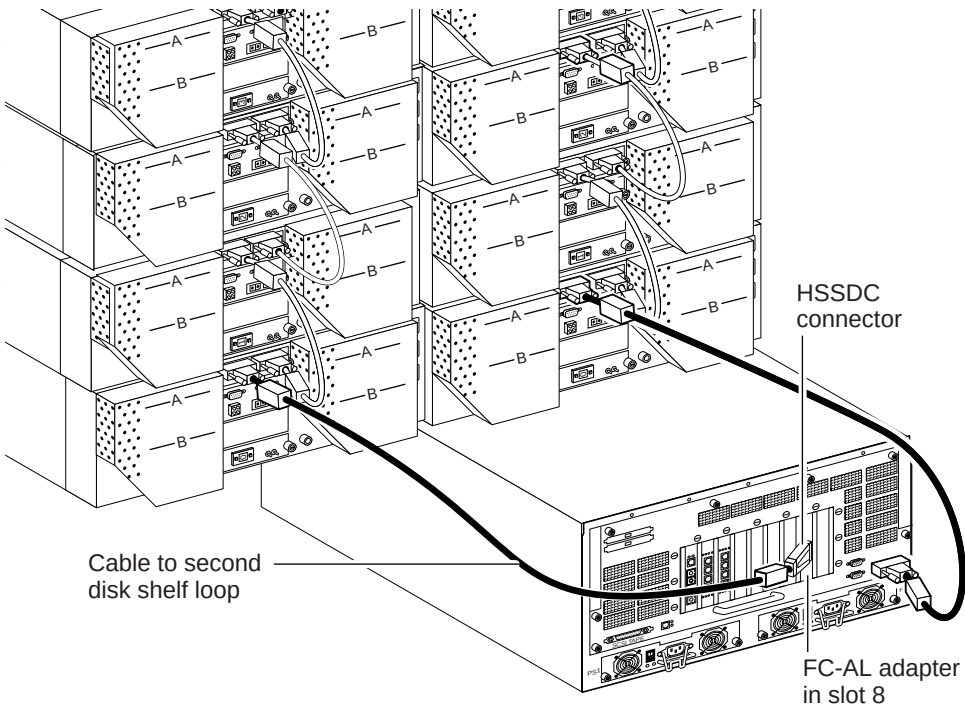
You need an FC-AL disk adapter installed in your filer for each additional loop of FC-AL disk shelves. A cable is shipped with the adapter for connecting disk shelf 0 in the second or third loop to the filer.

For instructions about how to install an FC-AL disk adapter in the filer, refer to the hardware guide for the specific filer.

Connecting a second or third loop

To connect a second or third loop of daisy-chained disk shelves to a filer, follow these steps.

Step	Action	Result
1	Connect one end of the FC-AL filer-to-shelf cable to the LRC Input connector on disk shelf 0.	Disk shelf 0 is in the second or third loop.
2	Connect the HSSDC end of the FC-AL filer-to-shelf cable to the FC-AL adapter connector in slot 8.	In the following illustration, the first daisy chain is connected to the FC-AL0 interface of an F760. The second daisy chain is connected to the FC-AL adapter in slot 8 on the filer. If you have more than eight disk shelves connected to the filer, you must install the entire system in a NetApp System Cabinet.
3	To connect a third daisy chain, repeat Steps 1 and 2.	The FC-AL adapter for the third loop should be in slot 7.



Verifying the installation from a console

How to verify the installation

To connect a console to the filer/NetCache Appliance and verify the installation of one or more disk shelves, follow these steps.

Step	Action	Result
1	Connect a console to the connector labeled CONSOLE on the filer/NetCache Appliance.	
2	Insert the diskette labeled <i>System Boot Disk 1</i> into the diskette drive and turn on the filer/NetCache Appliance.	You received system boot diskettes for your specific filer/NetCache Appliance model. If you have different models, be sure to check the diskette labels to make sure that you're using the correct boot diskettes for the filer/NetCache Appliance.
3	When the LCD prompts, remove the diskette and insert the diskette labeled <i>System Boot Disk 2</i> into the diskette drive.	
4	Press the Enter key.	The filer/NetCache Appliance boots and, if it can, displays the boot menu, shown below, on the console screen: 1) Normal Boot 2) Boot without /etc/rc 3) Change Password 4) Initialize all disks 5) Maintenance mode boot Selection (1-5)?

Step	Action	Result
5	Press the 5 key, then press the Enter key for Maintenance boot mode.	The filer/NetCache Appliance displays the following information and menu: You have selected the maintenance boot option. The system has booted in maintenance mode allowing the following operations to be performed. 1) disk_list 2) disk_check 3) disk_erase_label 4) vol 5) halt
6	Enter the disk_list command.	The filer/NetCache Appliance displays all the disk devices.
7	Enter the fctest command if you have a filer system (the C760 and C720 NetCache Appliances do not support the fctest command).	The fctest command tests all fibre channel adapters (for Loop A only) in the filer and the fibre channel disks in the disk shelves. It provides a report of the integrity of the fibre channel environment. To test a specific adapter and its connected disks, enter the adapter number after the command. Example—fctest 8, with 8 referring to host adapter 8 on the filer. The fctest command prints a report of the following: ◆ Loss of synchronization—Number of occurrences ◆ CRC errors—Number found in the packets ◆ Inbound and outbound frames—Total number ◆ Confidence factor—Indicates, on a scale of 0 to 1, the health of the fibre channel system: 1—Indicates no significant errors - Less than 1—Indicates problems in the loop that are likely to interfere with normal operation
8	After verifying the adapters and their connected disks, enter the halt command from the console.	The filer/NetCache Appliance performs a clean shutdown.
9	Reboot the filer/NetCache Appliance and press the 1 key, then the Enter key for Normal Boot.	

Step	Action	Result
10	From the console, enter the shelfchk command.	The following message appears: <pre>>shelfchk</pre> Only shelves attached to ha 8 should have all LEDs ON. Are these LEDs all ON now? <i>ha 8</i> in this example refers to host adapter 8 on the filer/NetCache Appliance. The shelfchk command turns on all red disk LEDs on all installed disk shelves connected to the indicated host adapter.
11	Check the disk LEDs on all disk shelves.	All disk LEDs should be lit. This means that the connections in and to the disk shelves are good. Note— If most, but not all, disk LEDs on a disk shelf or loop are lit, this might indicate malfunctioning individual LEDs. Call Network Appliance Technical Support for help.
12	If all disk LEDs are lit, enter y .	The next section, “Examples,” shows the possible results.
	If all disk LEDs are not lit, enter n .	The shelfchk command logs a kernel warning and returns to the console. When the shelfchk command is completed, all disk LEDs should be off no matter what the result.

Examples

The following is a sample output for two disk shelves if you enter **y**:

```
>shelfchk
Only shelves attached to ha 7 should have all LEDs ON.
Are these LEDs all ON now? y
> Wed Jan 11 13:31:51 GMT [rc]: Disk Configuration -
No Errors Identified
```

The following is sample output if you answer **n**:

```
>shelfchk
Only shelves attached to ha 7 should have all LEDs ON.
Are these LEDs all ON now? n
*** Your system may not be configured properly. Please check cable
connections.
> Wed Jan 21 00:39:44 GMT [rc]: Disk Configuration -
Failure Identified by Operator.
```

About this chapter

Chapter contents	This chapter describes the LEDs on the fibre channel disk, power supplies, and EDM card.
LEDs on the 9-GB and 18-GB disk shelves	The LEDs on the fibre channel disks and the power supplies are exactly the same on the 9-GB and 18-GB disk shelves.

Types of LEDs

About the LEDs

Each power supply and fibre channel disk is encased in a device carrier that has two LEDs on the front.

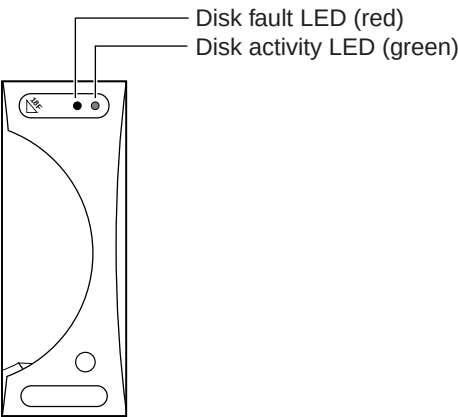
The LEDs provide information about the operational status of the power supply or disk contained in the device carrier.

The LEDs on the EDM card are visible from the back of the disk shelf. They provide information about the two fans and the temperature in the disk shelf. This chapter describes how to interpret the LEDs.

Fibre channel disk LEDs

The device carrier of each fibre channel disk has two LED indicators on the front.

Location of LEDs: The following illustration shows the location of these LEDs and indicates their specific function.

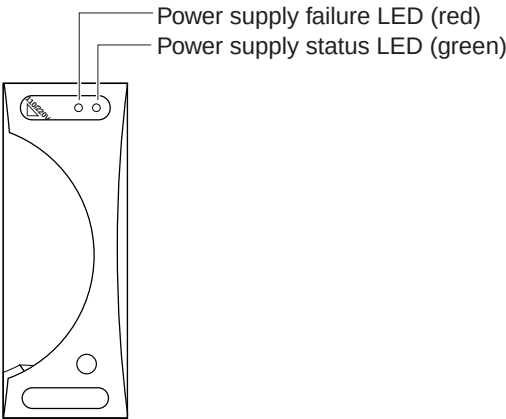


Interpreting LEDs: The following table describes how to interpret both LEDs.

Red fault LED	Green status LED	Description
Off	On	Disk is idle.
Off	Flashing	Disk is operating normally or is spinning down or up.
On		Disk has stopped and requires replacement.

Power supply LEDs The device carrier of each power supply has two LED indicators on the front.

Location of LEDs: The following illustration shows the location of these LEDs and indicates their specific function.



Interpreting LEDs: The following table describes how to interpret the LEDs.

Red failure LED	Green disk activity LED	Description
Off	On	Power supply is operating normally.
On	Off	An input power problem exists or the power supply is not functioning properly.

EDM card LEDs

The EDM card has a fault LED and two fan LEDs.

The two LEDs above the fan LEDs are used only during the Power-on test.

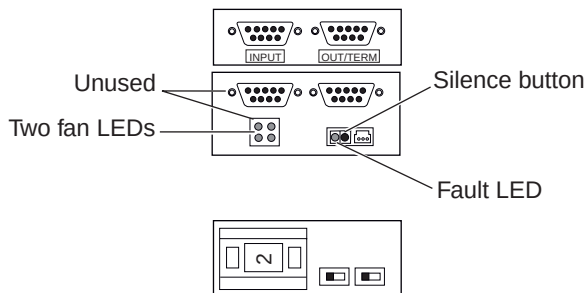
Note

When you turn on the power to the disk shelf, the EDM fault LED momentarily flashes and a buzzer sounds. If it does not do this, the EDM card has failed.

If the EDM card detects a fan failure or temperature violation, a buzzer sounds and the fan or fault LED illuminates. If a fault occurs on the EDM card, a buzzer sounds and the fault LED illuminates.

The buzzer sounds for up to 10 seconds until SES monitoring silences it. To silence the buzzer manually, press the Silence button. The fault LED remains illuminated.

Location of LEDs: The following illustration shows the location of these LEDs.



About this chapter

Chapter contents

This chapter describes how to remove and replace units in the disk shelf and how to remove a disk shelf from a rack.

Caution

You need an antistatic wrist strap and grounding leash to remove and replace units in the disk shelf.

This chapter discusses the following topics:

- ◆ “[Replacing a disk](#)” on [page 42](#)
- ◆ “[Replacing a power supply](#)” on [page 45](#)
- ◆ “[Replacing a disk shelf fan](#)” on [page 47](#)
- ◆ “[Replacing an EDM card](#)” on [page 49](#)
- ◆ “[Replacing an LRC card](#)” on [page 51](#)
- ◆ “[Removing a disk shelf](#)” on [page 53](#)

Replacing a disk

Make note of what disks are installed

Before you remove a disk from the disk shelf, it is important that you first check the disk shelf. Make sure that after you remove the disk you still have enough disks installed to meet the fibre channel signal requirements.

Caution—————
You must have a least one disk in the inbound portion and one disk in the outbound portion of loop A. In a cluster configuration, in addition to the disks in loop A, you must have at least one disk in the inbound portion and one disk in the outbound portion of loop B. If the disks are not installed properly, the fibre channel signal cannot be retimed and the system halts.

The following table defines the inbound and outbound portions of loops A and B.

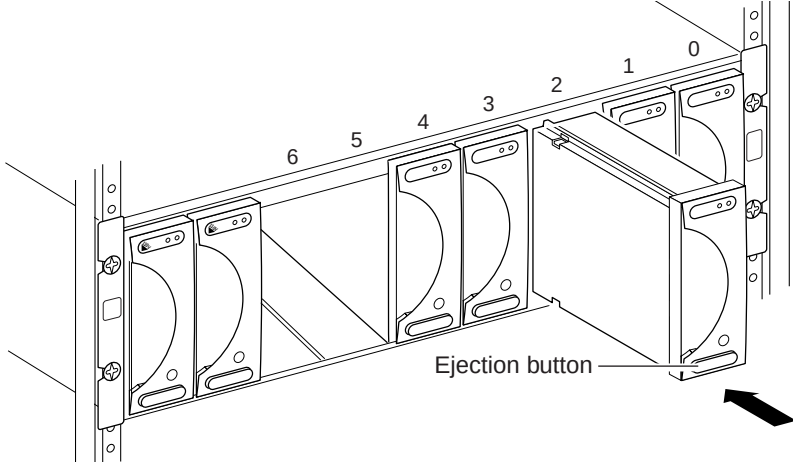
Loop portion	Drive bays
Loop A inbound	0-3
Loop A outbound	4-6
Loop B outbound	0-2
Loop B inbound	3-6

How to remove a disk

To remove a disk, follow these steps.

Step	Action	Result
1	Make sure that after you remove the disk, both portions of loop A (and loop B if using clusters) are still populated.	
2	From the console, bring the disk to a stop using the disk fail or disk remove command, as appropriate.	The red fault LED illuminates.
3	To remove the disk, press its Ejection button with one hand while grasping the curved handle of the device carrier with the other hand, and pull the disk out of the disk shelf. Caution_____ Always use two hands to support the weight of the disk. _____	

How to install a disk To install a disk in the disk shelf, follow these steps.

Step	Action	Description
1	If you are replacing an old disk, enter the disk swap command.	Note _____ In Data ONTAP 5.2 or later, the disk swap command is not required.
2	Orient the device carrier so that the LEDs are at the top and the Ejection button is at the bottom.	Caution _____ You can install only 9-GB disks in the 9-GB disks shelf and only 18-GB disks in the 18-GB disk shelf.
3	Insert the device carrier into the guide slot in the disk shelf and firmly push it in until it engages the backplane and you see the Ejection button click into place.	Note _____ If the Ejection button does not click into place, apply additional pressure to the front of the device carrier. Caution _____ Do not slam the device carrier into place.
4	Make sure that you have disks installed in drive bays 3 and 4. For clusters, you must also install a disk in drive bay 2.	In the example in the following illustration, a disk is being inserted in drive bay 2.
5	If you have any empty drive bays, fill them with the provided empty drive shuttles.	

Replacing a power supply

About this section

The section describes how to remove and install a power supply.

Caution

If you are removing both power supplies, you must first turn off the power on the filer/NetCache Appliance and disk shelf before you remove the power supplies. For information about how to turn off the power on the filer/NetCache Appliance, refer to the *System Administrator's Guide*.

How to remove a power supply

To remove a power supply, follow this step.

Step	Action	
1	Press the Ejection button with one hand while grasping the curved carrier handle of the device carrier with the other hand, and pull the power supply out of the disk shelf.	Caution Always use two hands to support the weight of the power supply.

How to install a power supply

To install a power supply, follow these steps.

Step	Action	Description				
1	Verify the label on the power supply.	The power supply must be labeled as follows. <table><tr><td>9-GB disk shelf</td><td>18-GB disk shelf</td></tr><tr><td>Use the appropriately labeled power supply from the following three: 110 VF, 220 VF, or 110/220V.</td><td>110/220V</td></tr></table>	9-GB disk shelf	18-GB disk shelf	Use the appropriately labeled power supply from the following three: 110 VF, 220 VF, or 110/220V.	110/220V
9-GB disk shelf	18-GB disk shelf					
Use the appropriately labeled power supply from the following three: 110 VF, 220 VF, or 110/220V.	110/220V					
2	Orient the power supply so that the LEDs are on the top and the bronze Ejection button is on the bottom, as shown.					
3	Insert the power supply into the guide slot in the disk shelf and firmly push it in until it engages the backplane and you see the Ejection button click into place.	Note_____ If the Ejection button does not click into place, apply additional pressure to the front of the device carrier. _____ Caution_____ Do not slam the device carrier into place. _____				
4	If you have installed two new power supplies, turn on the power on the filer/NetCache Appliance and disk shelf.					

Replacing a disk shelf fan

About this section

This section describes how to remove and install a disk shelf fan.

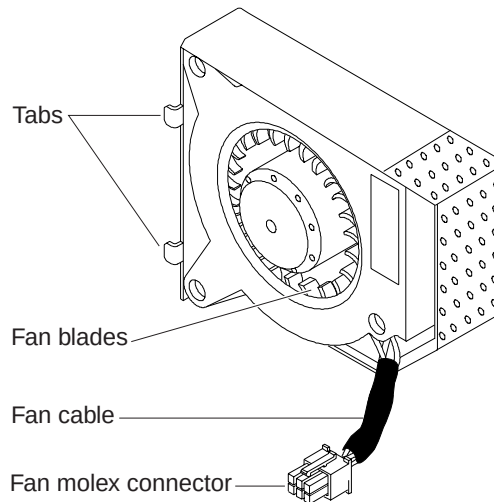
The 9-GB and 18-GB disk shelves contain two hot swappable fans mounted on the back. These fans take their power from the disk shelf backplane.

About removing a disk shelf fan

The power on the disk shelf can remain on.

WARNING

If you leave the disk shelf power on, do not let your fingers come close to the fan blades (see the following illustration).



How to remove a disk shelf fan

To remove a disk shelf fan, follow these steps.

Step	Action
1	Loosen the captive thumbscrew that secures the fan.
2	Swing the fan assembly away from the disk shelf. Do not pull the tabs on the left side of the assembly out of the disk shelf.
3	Detach the fan cable from the 6-wire molex connector.
4	Pull the fan away from the assembly by disengaging its two tabs.

How to install a disk shelf fan

To install a disk shelf fan, follow these steps.

Step	Action
1	Hold the fan by its edges at 90° to the disk shelf. Align the two tabs on the left side with the cutouts on the back of the disk shelf.
2	Insert the tabs into the cutouts.
3	Attach the fan cable to the 6-wire molex connector. Caution ————— If the shelf power is on, the fan starts immediately. —————
4	Align the captive thumbscrew on the fan assembly with the threaded hole on the disk shelf.
5	Tighten the captive thumbscrew.
6	Turn on the power to the disk shelf if it is not already on.
7	Check the appropriate fan LED on the EDM card to verify that the fan is operating properly.

Replacing an EDM card

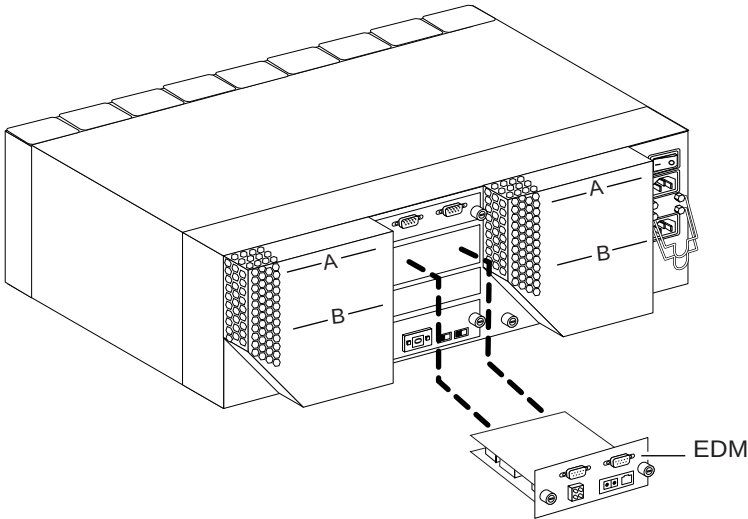
How to remove an EDM card

To remove an EDM card, follow these steps.

Step	Action
1	Put on an antistatic wrist strap and grounding leash.
2	Halt the filer/NetCache Appliance, then turn it and the disk shelf off.
3	Remove the two thumbscrews holding the EDM card plate in position.
4	Gently pull out the EDM card.

How to install an EDM card

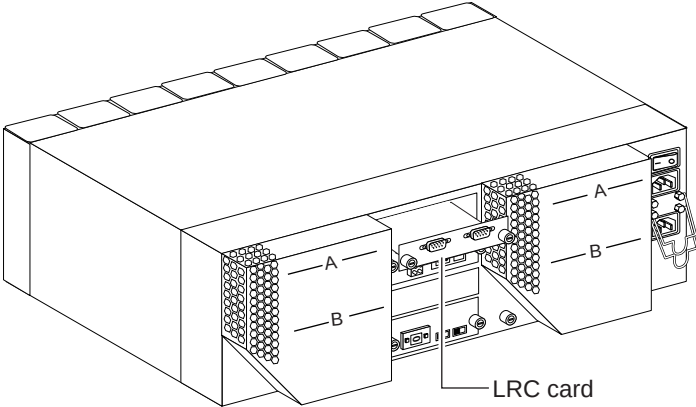
To install an EDM card, follow these steps.

Step	Action
1	Turn off the disk shelf.
2	If you have difficulty installing the EDM card, remove the disk shelf fan on the left. Refer to “How to remove a disk shelf fan” on page 48 for the procedure.
3	Orient the EDM card so that its connectors are aligned with the connectors on the backplane, as shown. 
4	Insert the EDM card into the slot in the rear of the disk shelf and push it in firmly until the metal plate sits flat against the disk shelf.
5	Insert the two thumbscrews through the holes in the EDM card plate.
6	Hand-tighten the thumbscrews.
7	If you removed the disk shelf fan, reinstall it. Refer to “How to install a disk shelf fan” on page 48 for the procedure.

Replacing an LRC card

How to remove an LRC card

To remove an LRC card, follow these steps.

Step	Action
1	Put on an antistatic wrist strap and grounding leash
2	Halt the filer/NetCache Appliance, then turn it and the disk shelf off.
3	Disconnect the fibre channel cables.
4	Remove the two thumbscrews holding the LRC card plate. 
5	Gently pull out the LRC card.

How to install an LRC card

To install an LRC card, follow these steps.

Step	Action
1	Turn off the disk shelf.
2	If you have difficulty installing the LRC card, remove the disk shelf fan on the left. Refer to “How to remove a disk shelf fan” on page 48 for the procedure.
3	Orient the LRC card so that its connectors are aligned with the connectors on the disk shelf backplane.
4	Insert the LRC card into the LRC slot in the rear of the disk shelf and push it in firmly until the metal plate sits flat against the disk shelf.
5	Insert the two thumbscrews through the fixing holes in the LRC card plate.
6	Hand-tighten the thumbscrews.
7	Reconnect the cables to the LRC connectors.
8	If you removed the disk shelf fan, reinstall it. Refer to “How to install a disk shelf fan” on page 48 for the procedure.

Removing a disk shelf

Required tools and equipment

You need the following tools and equipment to remove a disk shelf from a rack:

- ◆ #2 Phillips screwdrivers
- ◆ Antistatic wrist strap and grounding leash

WARNING

Because the disk shelf is very heavy when loaded with disks, you can remove the disks and install the empty disk shelf in the rack.

For instructions about how to remove and install disks, refer to “How to remove a disk” and “How to install a disk” on pages 43 and 44.

Because the empty disk shelf is still heavy, you must work with at least one other person when you install it.

Do not attempt to lift the disk shelf by grasping the fans. The fans might detach from the disk shelf, causing you to drop the disk shelf. This might cause you injury or damage the disk shelf and any installed devices.

How to remove a disk shelf in a single disk shelf configuration

To remove a disk shelf in a single disk shelf configuration from a rack, follow these steps.

Step	Action
1	Halt the filer/NetCache Appliance, then turn off the power.
2	Turn off the power on both power supplies on the disk shelf using the power switches in the back.
3	Disconnect the two disk shelf power cords from the disk shelf.
4	Disconnect the fibre channel cable connecting the disk shelf and filer/NetCache Appliance.
5	Use a Phillips screwdriver to remove the screws from the flanges of the disk shelf mounting bracket.
6	With the help of another person, remove the disk shelf from the rack.

How to remove a disk shelf in a daisy-chain configuration

To remove a disk shelf that is in a daisy-chain configuration from a rack, follow these steps.

Step	Action
1	Halt the filer/NetCache Appliance, then turn off the power.
2	On each disk shelf in the daisy chain, turn off the power using the power switch in the back.
3	On each disk shelf in the daisy chain, disconnect the two power cords.
4	If the disk shelf is connected to the filer/NetCache Appliance, disconnect the fibre channel cable connecting it to the filer/NetCache Appliance. If the disk shelf is connected to one or two disk shelves, disconnect the FC-AL daisy-chain cables that connect it.
5	Use a Phillips screwdriver to remove the screws from the flanges of the disk shelf mounting bracket.
6	With the help of another person, remove the disk shelf from the rack.

Overview of this appendix

- About this appendix** This appendix is only relevant to the following people:
- ◆ Those who are converting their disk shelves for use in a cluster
 - ◆ Those who have an existing cluster

Note

Any reference to filers in this appendix is a reference to an F630, an F740, or an F760.

For a description about clusters, refer to the *System Administrator's Guide* (5.2 or later).

- Appendix contents** This appendix discusses the following topics:
- ◆ [“Installing a second LRC card”](#) on [page 68](#)
 - ◆ [“Adding disk shelves to a cluster”](#) on [page 70](#)

Installing a second LRC card

Why install a second LRC card?

A Fibre Channel StorageShelf comes with one LRC card installed. This LRC card provides the Channel A loop interface between the disk shelf and the filer. When converting your disk shelves for use in a cluster, you need to install a second LRC card below the disk shelf EDM (Enclosure Data Manager) card. This second LRC card provides the Channel B loop interface between the disk shelf and the partner filer.

Note_____

The *System Administrator’s Guide* (5.2 or later) provides more information about clusters, Channel A, and Channel B.

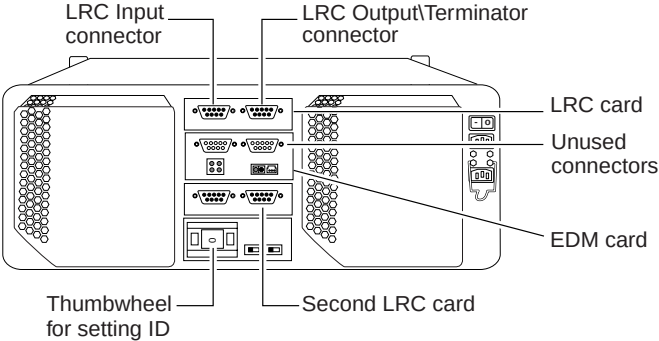
Procedures required

You need to complete the following procedures to successfully install the second LRC card.

Stage	Procedure
1	Remove one of the disk shelf fans. Refer to “Replacing a disk shelf fan” on page 47. Note_____ Removing the disk shelf fan helps you to look into the disk shelf and verify that the LRC card aligns with the internal backplane connectors. _____
2	Install the second LRC card.
3	Reinstall the disk shelf fan. Refer to “Replacing a disk shelf fan” on page 47.

How to install the second LRC card

To install the second LRC card on a disk shelf, follow these steps.

Step	Action
1	Use a Phillips screwdriver to remove the screws from the sheet metal cover over the LRC card slot.
2	Orient the LRC card so that its connectors are aligned with the connectors on the disk shelf backplane.
3	Insert the LRC card into the LRC slot in the rear of the disk shelf and push it in firmly until the metal plate sits flat against the disk shelf.
4	Use a flashlight to verify that the LRC card is properly connected to the disk shelf backplane.
5	Insert the two thumbscrews through the fixing holes in the LRC card plate.
6	Hand-tighten the thumbscrews. Proceed to Step 7 if this installation was in an older disk shelf. Note _____ Older disk shelves do not have Channel A and Channel B etched on the fans. _____
7	Label this LRC card as Channel B. Label the LRC card above the EDM card as Channel A.  Note _____ The figure reflects an older disk shelf that does not have Channel A and Channel B etched on the fans. _____

Adding disk shelves to a cluster

About adding disk shelves

If you run out of disk space, you can add disk shelves to a cluster. An FC-AL interface can connect to a maximum of eight daisy-chained disk shelves. Before adding a disk shelf to a cluster configuration that currently has eight disk shelves in each loop, you need to add an additional FC-AL adapter on each filer. A filer with two or more FC-AL interfaces can connect to disk shelves with a storage capacity of 1.5 TB. The distribution of the 1.5 TB storage capacity for a filer with two or more FC-AL interfaces is left to your discretion.

Note

Each filer that is in a cluster can have four FC-AL adapters.

The *Cluster Conversion Guide* provides information about where and how to install the FC-AL adapters.

Required materials

For each disk shelf you want to add, you must have the following parts:

- ◆ Two fibre channel shelf-to-shelf (DB-9-to-DB-9) cable
- ◆ Two power supplies

Note

Disk shelves have one power supply and a bay for an optional power supply. For a cluster, Network Appliance recommends that you have two power supplies.

- ◆ Two Fibre Channel StorageShelf power cords
- ◆ Two power outlets, on independent circuits if possible

Procedures required

Adding a disk shelf to a cluster involves connecting the disk shelf to a Channel A loop on one filer and a Channel B loop on the partner filer. You need to complete the following procedures to successfully add a disk shelf to the cluster.

Note

This procedure assumes that the disk shelf that you are adding to the cluster has one LRC card above the EDM card and one below the EDM card. If you purchased a disk shelf that only has one LRC card above the EDM card, refer to [“Installing a second LRC card”](#) on [page 68](#).

Stage	Procedure
1	Connect a disk shelf to Channel A. Refer to “How to connect the disk shelf to Channel A” on page 72.
2	Connect a disk shelf to Channel B. Refer to “How to connect the disk shelf to Channel B” on page 74.

How to connect the disk shelf to Channel A

To connect a disk shelf to Channel A, follow these steps.

Step	Action	
1	Set the power switches on the disk shelf you are adding to Off.	
2	Determine which filer will own the disk shelf. The disk shelf is connected to a Channel A loop on the filer.	
3	From the partner filer, perform a takeover of the filer that owns the disk shelf by entering cf takeover . The <i>System Administrator's Guide</i> (5.2 or later) provides more information about this command.	
	If you are connecting the disk shelf to another disk shelf...	If you are connecting the disk shelf to a new FC-AL adapter on the filer that will own the disk shelf...
4	Move the terminator on the last disk shelf in the loop to the Output/Terminator port of the Channel A LRC card of the disk shelf you are adding.	On the filer that will own the disk shelf, label the FC-AL adapter Channel A. Note _____The assumption made here is that you installed an FC-AL adapter according to the instructions in the <i>Cluster Conversion Guide</i> ._____
5	Connect the DB-9 connector of the FC-AL shelf-to-shelf cable to the Output/Terminator connector of the LRC card labeled Channel A on the last disk shelf in the chain.	Connect the HSSDC end of the FC-AL filer-to-shelf cable to the FC-AL adapter labeled Channel A on the filer.
6	Connect the other DB-9 connector of the FC-AL shelf-to-shelf cable to the Input connector of the LRC card labeled Channel A on the disk shelf that you are adding.	Connect the DB-9 end of the FC-AL filer-to-shelf cable to the Input connector of the LRC card labeled Channel A on the disk shelf.

Step	Action
7	On the last disk shelf that you are adding, put a terminator in the Output/Terminator connector of the LRC card labeled Channel A.
8	Give the disk shelf a disk ID that is unique to the loop (Channel A or Channel B) that is connected to the FC-AL adapter. Refer to “Setting the disk shelf ID” on page 28 for the procedure. Note_____ The disk shelf ID that you set is recognized by Channel A and Channel B. _____
9	Turn on the power to the added disk shelf.
10	Perform a giveback by entering cf giveback from the filer that took over. The <i>System Administrator's Guide</i> (5.2 or later) provides more information about this command.
11	Enter sysconfig -v at the console of the filer that owns the disk shelf to verify ◆ The filer can see the added disk shelf ◆ The disk firmware version A disk firmware update is requested if the output generated by the sysconfig -v command indicates that the disk firmware version is other than the minimum required version. Proceed to Step 12 if this happens; if not proceed to “How to connect the disk shelf to Channel B” on page 74.
12	Enter disk_fw_update from the console of the filer that owns the disk shelf to update the disk firmware. Note_____ The disk_fw_update command only upgrades disks that require a firmware upgrade. It does not affect the contents of other disks. _____

How to connect the disk shelf to Channel B

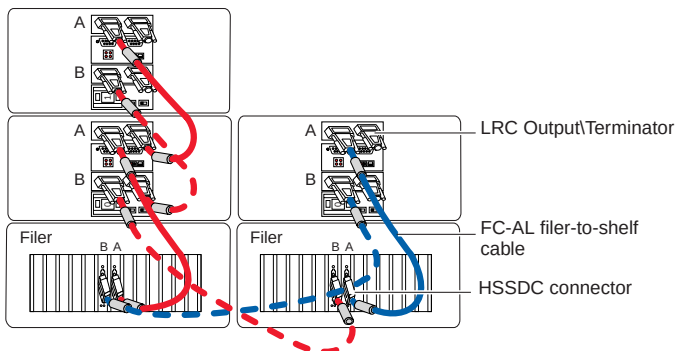
To connect a disk shelf to Channel B, follow these steps.

1	From the filer that owns the disk shelf, perform a takeover of the partner filer by entering cf takeover .	
	If you are connecting the disk shelf to another disk shelf...	If you are connecting the disk shelf to a new FC-AL adapter on the partner filer...
2	Move the terminator on the last disk shelf in the chain to the Output/Terminator connector of the Channel B LRC card of the disk shelf you are adding.	Label the FC-AL adapter on the partner filer Channel B.
3	Connect the DB-9 connector of the FC-AL shelf-to-shelf cable to the Output/Terminator connector of the LRC card labeled Channel B on the last disk shelf in the chain.	Connect the HSSDC end of the FC-AL filer-to-shelf cable to the FC-AL adapter labeled Channel B on the partner of filer that will own the disk shelf.
4	Connect the other DB-9 connector of the FC-AL shelf-to-shelf cable to the Input connector of the LRC card labeled Channel B on the disk shelf that you are adding.	Connect the DB-9 end of the FC-AL filer-to-shelf cable to the Input connector of the LRC card labeled Channel B on the disk shelf.
5	On the last disk shelf that you are adding, put a terminator in the Output/Terminator connector of the LRC card labeled Channel B.	

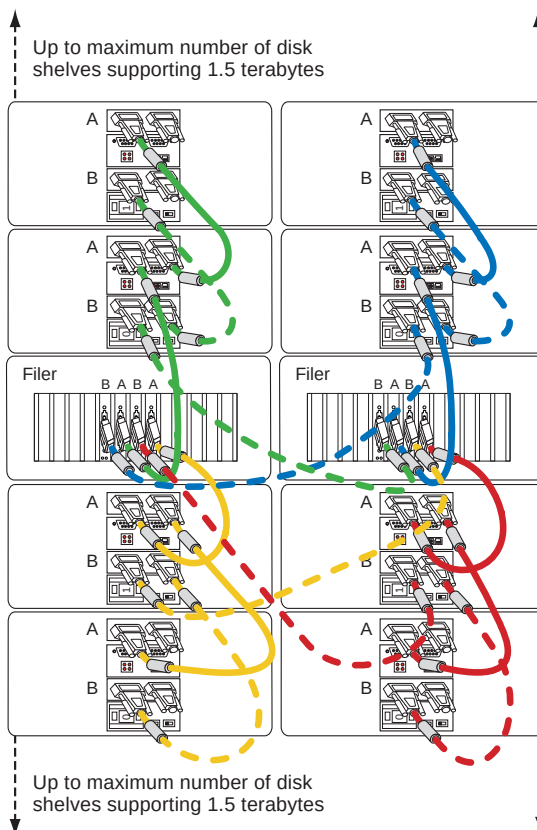
6	Check the cabling visually. For an F630: Refer to “Sample cable connections to Channel A and Channel B on an F630 cluster” on page 76” for illustrations. For an F740: Refer to “Sample cable connections to Channel A and Channel B on an F740 cluster” on page 77” for illustrations. For an F760: Refer to “Sample cable connections to Channel A and Channel B on an F760 cluster” on page 78” for illustrations. Note_____ To reduce the possible confusion resulting from the number of cables involved, the illustrations do not show the cabling between the cluster interconnect adapters in both filers. _____
7	To return the cluster to normal operation, perform a giveback by entering cf giveback from the filer that took over.
8	Verify that the filer can see the added disk shelf and disks by entering sysconfig -v.

Sample cable connections to Channel A and Channel B on an F630 cluster

For a minimum configuration: A sample of the cabling on an F630 is as follows.

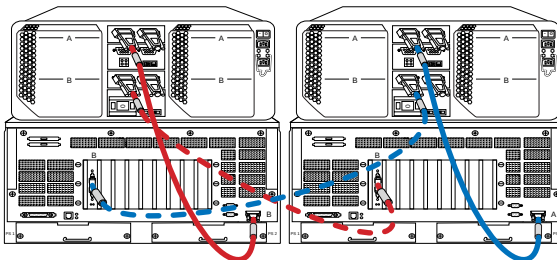


For a maximum configuration: A sample of the cabling on an F630 is as follows.

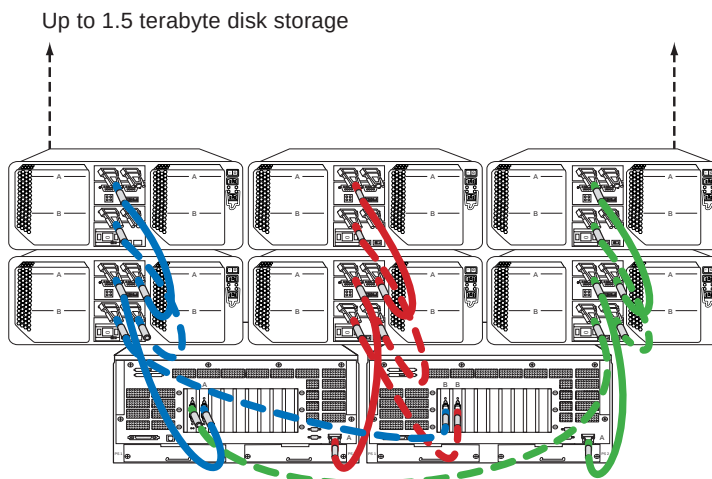


Sample cable connections to Channel A and Channel B on an F740 cluster

For a minimum configuration: A sample of the cabling on an F740 is as follows.

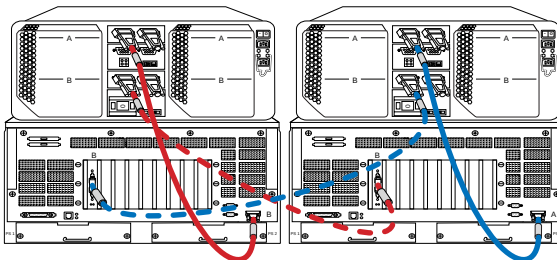


For a maximum configuration: A sample of the cabling on an F740 is as follows.



Sample cable connections to Channel A and Channel B on an F760 cluster

For a minimum configuration: A sample of the cabling on an F760 is as follows.



For a maximum configuration: A sample of the cabling on an F760 is as follows.



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