

NetApp® Filers

F630

Cluster Conversion Guide

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Preface

About this guide This guide describes how to convert existing F630 filers and Fibre Channel StorageShelves into clusters. This guide does not cover basic system or network administration topics, such as IP addressing, routing, and network topology.

Audience This guide is for system administrators who are familiar with operating a NetApp® F630 filer and a Fibre Channel StorageShelf.

Terminology This guide uses the following terms:

- ◆ *Filer* refers to an F630 filer.
- ◆ *Disk shelf* refers to a Fibre Channel StorageShelf.

Command conventions You can enter filer commands on the system console or from any client that has 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. 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 arp -d <i>hostname</i> command, you enter the characters “arp -d” followed by the actual name of the host. ◆ Man page names. ◆ Book titles in cross-references.

Formatting convention	Type of information
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.

Cluster conversion requirements and procedures

What do you need to know about clusters?

Before proceeding with the conversion process, you need to know about the cluster concept. Refer to *Start Here* for a description of the type and sources of information about clusters. For a description about clusters, refer to the *Data ONTAP 5.2 System Administrator's Guide*.

About cluster conversion

Converting to a cluster involves upgrades to software, firmware, and hardware. Software conversion includes updating your F630 filer software to Data ONTAP™ 5.2 software. Firmware conversions include updating your filer firmware to 2.1_a1 and updating your fibre channel disk firmware to FB37. Hardware conversions include upgrades to the filers and the disk shelves.

Note

Before proceeding with the conversion process, use the “[Checklist](#)” on page 5 to make sure that you have gathered everything that you need.

Overview of the conversion process

The following table lists the order of the procedures you must follow for a successful cluster conversion.

Caution

You must follow the order of the procedures listed below. If you fail to follow the specific order described, you can cause permanent damage to your file systems.

Stage	Process	Purpose
1	Enter sysconfig -r at the consoles of each filer.	Use the resulting output with the “ Checklist ” on page 5 to determine the hardware configuration of your filers.
2	Enter sysconfig -v at the consoles of each filer.	Verify the filer and disk firmware versions.
3	Enter ifconfig -a at the consoles of each filer.	Determine the IP addresses of each filer.

Stage	Process	Purpose
4	Back up all your data.	This is an advisable precaution in any conversion process.
5	Verify that both filers have network connections.	The software is on a CD-ROM. You need access to a UNIX or PC system to download the software to the filers.
6	Update each filer to Data ONTAP 5.2 software. Refer to the <i>Software and Firmware Upgrade Guide</i> for more information.	
7	At the consoles of each filer, enter halt to shut them down.	You need to do this to upgrade the filer firmware.
8	Update each filer to Firmware 2.1_a1. Refer to the <i>Software and Firmware Upgrade Guide</i> for more information.	
9	Reboot the filers and verify the software and filer firmware upgrades.	You need to verify software and firmware upgrades before proceeding to Stage 11.
10	Verify that the disk firmware is FB37. If not, update the disk firmware by entering disk_fw_update from the console of the filer that owns the disk shelf. Then, shut down each filer by entering halt at the consoles of each filer. Note_____ The disk_fw_update command only upgrades the firmware on disks. It does not affect the contents of the disks. _____	You need to verify firmware upgrades before proceeding to converting the hardware configuration of the filers.

Stage	Process	Purpose
11	Update the hardware on the filers and disk shelves. ◆ You need to add the following adapters to each of your filers: ❖ one or up to three FC-AL adapters Note _____ If you have a differential wide SCSI adapter in expansion slot 6, you must move it to expansion slot 4 if you are adding three FC-AL adapters. ❖ one cluster interconnect adapter Note _____ Before adding the cluster interconnect adapter, you must change a cable connecting the system backplane to the daughter card ◆ You might need to add additional NVRAM SIMMs or main memory DIMMs ◆ You need to add a second LRC card to each disk shelf. Refer to the <i>Fibre Channel Storage Shelf Hardware Guide</i> for more information about this procedure. Refer to Chapter 2 “Hardware Upgrade Process” on page 9 for more information about the required procedures.	

Stage	Process	Purpose
The following figure shows where the adapters go on the system backplane. Diagram illustrating the system backplane slots and their corresponding adapter types: - Slot 1: Network Interface Adapters (NIA) - Slot 2: Network Interface Adapters (NIA) - Slot 3: Network Interface Adapters (NIA) - Slot 4: Network Interface Adapters (NIA) - Slot 5: NIA or SCSI Adapter for tape drive - Slot 6: FC-AL Adapters - Slot 7: FC-AL Adapters - Slot 8: FC-AL Adapters - Slot 9: NVRAM Adapter - Slot 10: Cluster Interconnect Adapter - Slot 11: Console - Slot 12: Diagnostic - Slot 13: Environment Adapter (Not used) (Not used)		
12	If you have multiple FC-AL adapters labeled Channel A, cable them as Channel A loops. Refer to “Cabling the Channel A loops” on page 22.	You need to cable the Channel A loops to perform a <code>cf status</code> on each filer.
13	Cable the Channel B loops on the disk shelves but do not complete the loop to the filer. Refer to “Cabling the Channel B loops on the disk shelves” on page 25.	Cabling the Channel B loop cards on the disk shelves is a convenience in the clustering process.
14	Turn the filers on and boot them.	The filers are turned on so that you can perform a <code>cf status</code> on each filer.

Stage	Process	Purpose
15	Cable the X ports on the cluster interconnect adapter in each filer and perform a cf status on each filer.	You perform a cf status on each filer to verify that the connection between the X ports is established.
16	Cable the Y ports on the cluster interconnect adapter in each filer and perform a cf status on each filer.	You perform a cf status on each filer to verify that the connection between the X and Y ports is established.
17	Enter halt at the consoles of each filer to shut down the system.	You need to do this to complete the Channel B loops.
18	Complete the Channel B loops by using the filer-to-shelf cables to connect the disk shelves to each partner filer and booting the filers. Refer to “ Clustering the filers ” on page 29 .	When you boot both filers, you should be able to see the disks ‘owned’ by the local filer and those ‘owned’ by its partner.
19	Enter boot at the consoles of each filer.	
20	You can now license the cluster. Refer to “ How to license clusters ” on page 36 for more information.	You need to license the cluster to enable takeover.

Checklist

The following checklist provides a list of cluster conversion requirements. If your answer to the second column is No, write your requirements in the third column. Before proceeding with the conversion process, make sure that you have gathered everything that you need.

Requirements	Yes/ No	What do you need?
Do the filers have a network connection?		

Requirements	Yes/ No	What do you need?
Do you have Data ONTAP 5.2?		
Do you have Firmware 2.1_a1?		
Do you have the <i>Software and Firmware Upgrade Guide</i> ?		
Do you have the recommended amount of main memory?		
◆ 256 MB for each filer that has two FC-AL adapters		
◆ 512 MB for each filer that has three or four FC-AL adapters		
Do you have 32 MB of NVRAM?		
Do you have an FC-AL adapter in expansion slot 8 of your filers?		
Do you have a differential wide SCSI adapter for external tape devices in expansion slot 6 of your filers? Refer to “ Removing the differential wide SCSI adapter ” on page 53 for what you need to do.		
Do you have the following hardware components for the conversion? Refer to “ Account for and assemble the additional required hardware ” on page 11 for exact requirements.		
◆ Main memory DIMMs, if necessary		
◆ NVRAM SIMMs, if necessary		
◆ Cluster interconnect adapters		
◆ Cluster interconnect cables		
◆ Miscellaneous interface ribbon cables		

Requirements	Yes/ No	What do you need?
◆ Additional FC-AL adapters		
◆ Filer-to-shelf (HSSDC-to-DB-9) cables		
◆ Shelf-to-shelf (DB-9-to-DB-9) cables		
◆ Terminators		
◆ Fibre Channel StorageShelves		
◆ LRC cards		
Do you have the following equipment and tools?		
◆ #1 and #2 Phillips screwdrivers		
◆ Antistatic wrist strap and grounding strap		
Do you have the following labels that were provided for converting your cluster?		
◆ Solid-colored labels that you use to label cables for all Channel A loops		
◆ Striped labels matching the solid-colored labels that you use to label cables for all Channel B loops		

Converting your filers

About this chapter

This chapter describes the hardware upgrades that you need to perform to convert your filers for a cluster. The following optional procedures might be required for your cluster and are described in [Appendix A, “Optional Hardware Procedures,”](#) on page 45.

- ◆ [“Adding main memory DIMMs”](#) on page 46
- ◆ [“Adding NVRAM”](#) on page 50
- ◆ [“Removing the differential wide SCSI adapter”](#) on page 53

Note

The appendix in the *Fibre Channel StorageShelf Hardware Guide* describes the hardware upgrade that you need to perform to convert your disk shelves for a cluster.

Chapter contents

The following table lists the hardware upgrades that you must perform for a successful conversion.

Task	Read...	To learn about...
1	“Preparing for the conversion” on page 11	The following information: ◆ Assumptions about your existing hardware ◆ Assembling the additional required hardware
2	“Replacing the miscellaneous interface ribbon cable” on page 12	The following information: ◆ The need for this procedure ◆ Replacing the miscellaneous interface ribbon cable in your filers

Task	Read...	To learn about...
3	“Installing a cluster interconnect adapter” on page 14	The following information: ◆ The purpose of a cluster interconnect adapter ◆ Installing a cluster interconnect adapter in your filers ◆ Upgrading your filers to Data ONTAP 5.2
4	“Installing an FC-AL adapter” on page 16	The following information ◆ The assumptions made about your filers ◆ Installing one or more FC-AL adapters in your filers
5	“Cabling the Channel A loops” on page 22	The following information: ◆ The assumption made about your existing fibre channel loop ◆ Cabling the other Channel A loops in a maximum cluster configuration
6	“Cabling the Channel B loops on the disk shelves” on page 25	The following information: ◆ Cabling the Channel B loops for a ❖ Minimum configuration ❖ Maximum configuration
7	“Clustering the filers” on page 29	The following information: ◆ Connecting your filers into a cluster ◆ Licensing clusters on your filers

Preparing for the conversion

Assumptions about existing hardware

The section is based on the assumption that you have two working F630 filers.

Account for and assemble the additional required hardware

The following table lists all the hardware required to set up a cluster (including the existing hardware).

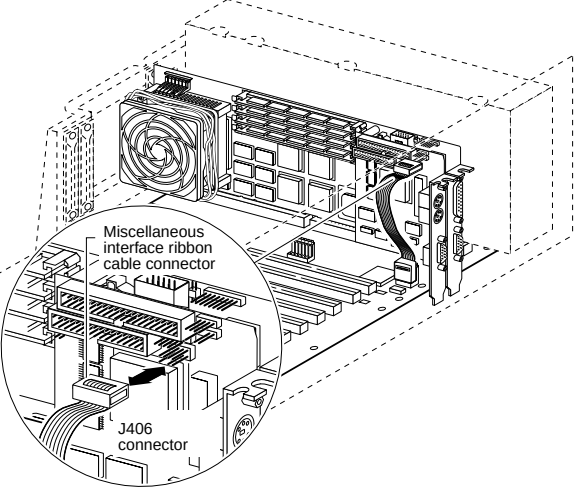
Required hardware	For a minimum configuration...	For a maximum configuration...
Cluster interconnect adapters	2	2
4m cluster interconnect cables	2	2
Miscellaneous interface ribbon cables	2	2
FC-AL adapters	4	8
1m filer-to-shelf (HSSDC-to-DB-9) cables	4	8
Fibre Channel StorageShelves	2	up to 24
LRC cards	4	up to 48
0.5m shelf-to-shelf (DB-9-to-DB-9) cables	0	up to 20
terminators	2	4

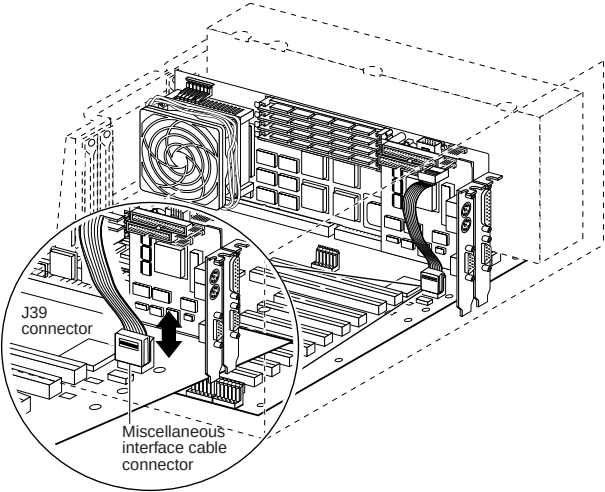
Replacing the miscellaneous interface ribbon cable

About this process The current miscellaneous interface ribbon cable connector makes it difficult to insert the cluster interconnect adapter in backplane expansion slot 10. The replacement miscellaneous interface ribbon connector corrects this problem.

Caution—————
When replacing the miscellaneous interface ribbon cable connector, be careful not to dislodge any other connectors.

How to replace the miscellaneous interface ribbon cable To replace the miscellaneous interface ribbon cable, follow these steps.

Step	Action
1	Unplug the miscellaneous interface ribbon cable connector from the J406 connector on the daughter card, as shown. A technical diagram of a server chassis. A circular callout provides a magnified view of a daughter card. On the daughter card, a 'Miscellaneous interface ribbon cable connector' is shown being unplugged from a 'J406 connector'. The ribbon cable is shown as a multi-colored flat cable. The daughter card is populated with various electronic components and other connectors.

Step	Action
2	Unplug the miscellaneous interface ribbon cable connector from the J39 connector on the system backplane, as shown. 
3	Plug the replacement miscellaneous interface ribbon cable connector into the J406 connector on the daughter card, as shown in Step 1.
4	Plug the replacement miscellaneous interface ribbon cable connector into the J39 connector on the system backplane, as shown in Step 2.
5	Verify that all cables in close proximity to the J406 connector are still connected.
6	Proceed with “Installing a cluster interconnect adapter” on page 14.

Installing a cluster interconnect adapter

Purpose of a cluster interconnect adapter

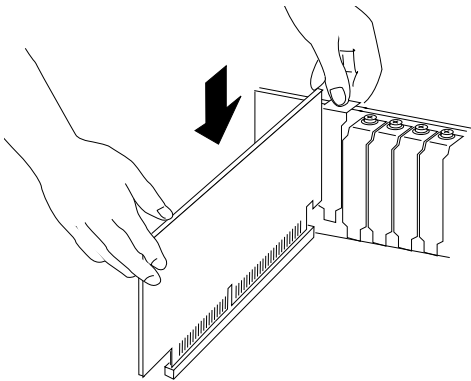
A cluster interconnect adapter provides an interface between two filers through two external ports: the X port and the Y port. When two filers with cluster interconnect interfaces are connected using a cluster interconnect cable, they form a cluster.

Note

The cluster interconnect adapter must be installed in expansion slot 10.

How to install a cluster interconnect adapter

To install a cluster interconnect adapter, follow these steps.

Step	Action
1	Identify backplane expansion slot 10.
2	Remove the faceplate screw holding the slot cover to the back panel of the backplane carrier and save the screw for installing the cluster interconnect adapter.
3	Hold the adapter by its top edge, with the faceplate near your left hand.
4	Lower the adapter into backplane expansion slot 10 until the faceplate is in position against the back panel and covers the endplate slot on the back panel. 

Step	Action
5	Press carefully on the top edge of the adapter until the edge connector is seated in backplane expansion slot 10.
6	Repeat Steps 1 through 5 for the partner filer.
7	If you have a differential wide SCSI adapter for external tape devices installed in expansion slot 6, proceed with “ Removing the differential wide SCSI adapter ” on page 53 . If not, proceed with “ Installing an FC-AL adapter ” on page 16 .

Installing an FC-AL adapter

How to install an FC-AL adapter

To install an FC-AL adapter, follow these steps.

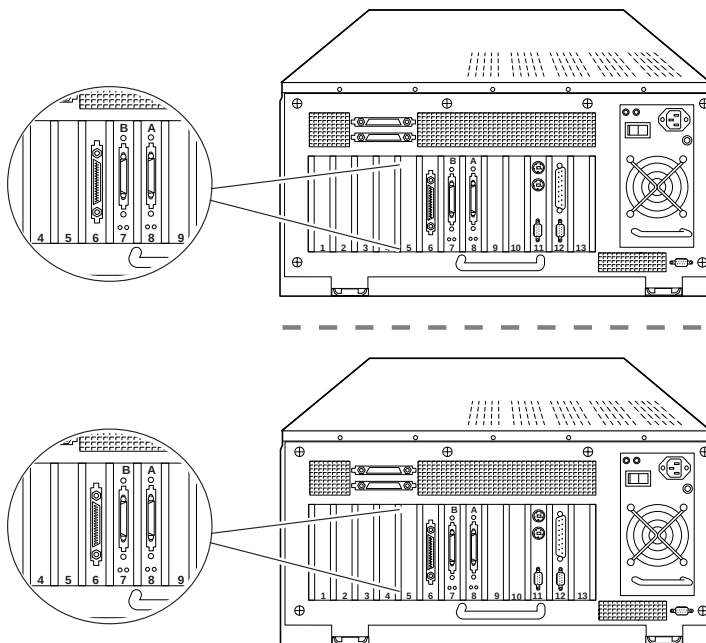
Step	Action
1	For a minimum configuration: Identify backplane expansion slot 7. For a maximum configuration: Identify backplane expansion slots 7, 6, and 5.
2	Remove the screw holding the slot cover to the back panel of the backplane carrier and save the screw for installing the FC-AL adapter.
3	Hold the adapter by its top edge, with the faceplate near your left hand.
4	For a minimum configuration: Lower the adapter into slot 7 until the faceplate of the adapter is in position against the back panel and covers the endplate slot on the back panel. For a maximum configuration: Lower the adapter into slot 7 until the faceplate of the adapter is in position against the back panel and covers the endplate slot on the back panel. Repeat the process for slots 6 and 5.
5	Press carefully on the top edge of the adapter until the edge connector is seated in the backplane expansion slot.
6	Insert and tighten the faceplate screw to secure the adapter to the back panel of the backplane carrier.
7	Push in the backplane carrier and tighten the six thumbscrews on the back panel.
8	Repeat Steps 1 through 7 for the partner filer.
9	Determine how you plan to set up your cluster based on what you have read about clustering in the <i>Data ONTAP 5.2 System Administrator's Guide</i> .

Step	Action
10	Label the following as Channel A. If you have ◆ two FC-AL adapters in each filer, the one in expansion slot 8 ◆ three FC-AL adapters in each filer, two FC-AL adapters on one filer and one FC-AL adapter on the partner filer ◆ four FC-AL adapters in each filer, two FC-AL adapters on each filer or three FC-AL adapters on one filer and one FC-AL adapter on the partner filer Note_____ Choose a different solid-colored label for each FC-AL adapter that you label Channel A. You apply labels of the respective colors on every cable in the loop connected to each FC-AL adapter. _____
11	Label the following as Channel B. If you have ◆ two FC-AL adapters in each filer, the one in expansion slot 7 ◆ three FC-AL adapters in each filer, the remaining two FC-AL adapters on one filer and the remaining one FC-AL adapter on the partner filer ◆ four FC-AL adapters in each filer, the remaining two FC-AL adapters on each filer or the remaining three FC-AL adapters on one filer and the remaining one FC-AL adapter on the partner filer
12	Leave the power turned off on both filers until after cabling the Channel A loops and the Channel B loops on the disk shelves.

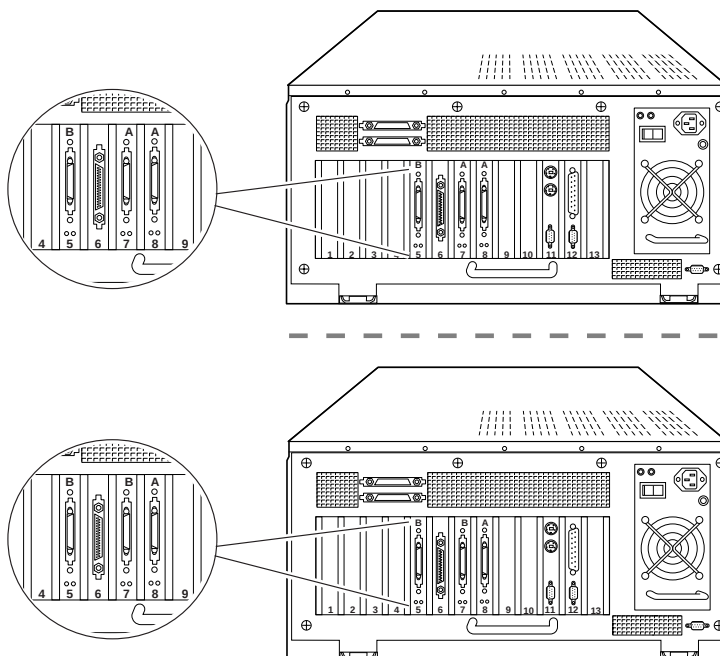
Cluster configuration possibilities

The following cluster configurations are possible:

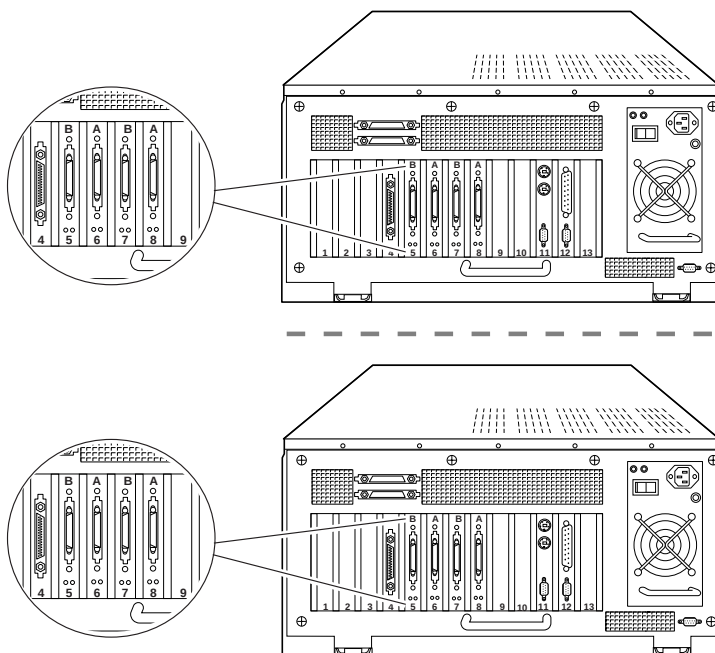
- ◆ Two FC-AL adapters in each filer, with one labeled Channel A and the other labeled Channel B. The following figure is an example of how you can label a minimum cluster configuration.



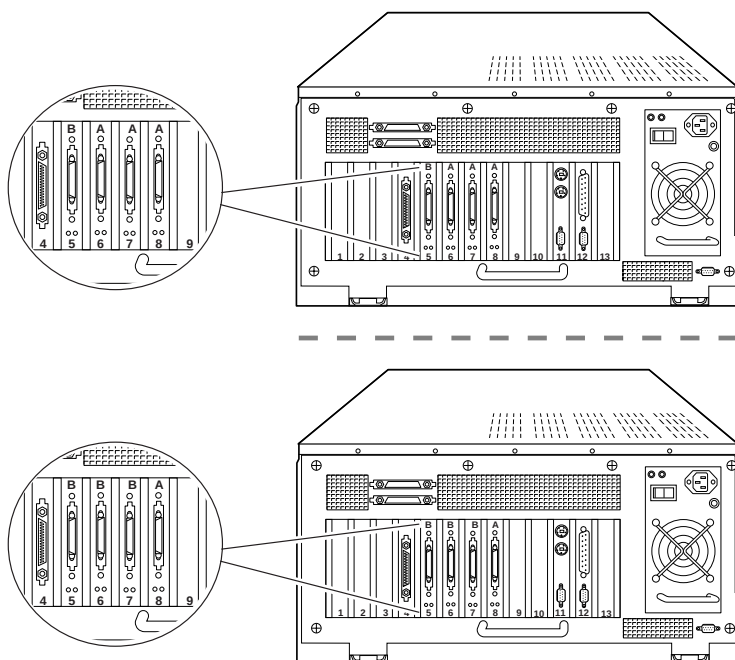
- ◆ Three FC-AL adapters in each filer, with two labeled Channel A and one labeled Channel B in one filer, and one labeled Channel A and two labeled Channel B in the partner filer. The following figure is one example of how you can label a maximum cluster configuration.



- ◆ Four FC-AL adapters in each filer, with two labeled Channel A and two labeled Channel B in each filer. The following figure is another example of how you can label a maximum cluster configuration.



- ◆ Four FC-AL adapters in each filer, with three labeled Channel A and one labeled Channel B in one filer, and one labeled Channel A and three labeled Channel B in the partner filer. The following figure is a final example of how you can label a maximum cluster configuration.



Cabling the Channel A loops

About this section

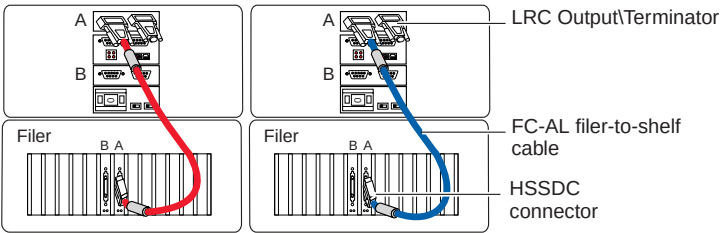
This section describes how to connect the Channel A loops on the filers and disk shelves.

Note

The total number of disk shelves that can be connected to each adapter is 8. However, the total number of disk shelves for a maximum configuration is 24. The distribution of the 24 disk shelves between the four adapters in a maximum configuration is left to your discretion.

What about the existing fibre channel loop?

The existing fibre channel loop on your filers is the Channel A loop in a minimum cluster configuration. The cabling for the minimum configuration should be as shown in the following figure.



In a maximum configuration, this is one of the Channel A loops in your cluster.

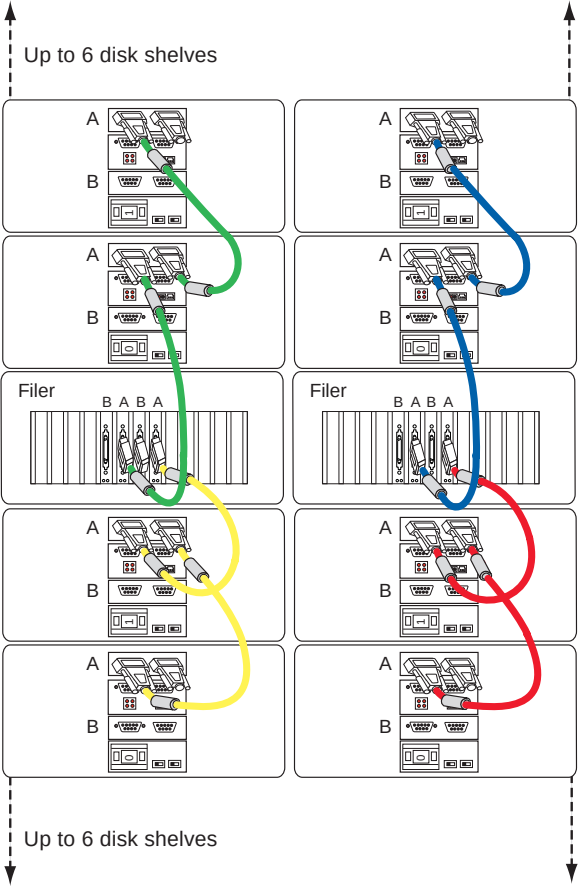
How to cable the other Channel A loops in a maximum configuration

This section provides you with the steps required to cable the Channel A loops if you have a maximum cluster configuration.

For a maximum configuration: To cable the Channel A connections of your cluster, follow these steps.

Step	Action
1	Label the LRC card above the EDM card in each disk shelf as Channel A.

Step	Action
2	Choose a different solid-colored label for each FC-AL adapter that you label Channel A. You apply labels of the respective colors on every cable in the loop connected to each FC-AL adapter.
3	Connect the filer to disk shelf 0 by ◆ Connecting the HSSDC end of the FC-AL filer-to-shelf cable to one of the FC-AL adapters labeled Channel A on the filer ◆ Connecting the DB-9 end of the FC-AL filer-to-shelf cable to the Input connector of the LRC card labeled Channel A on disk shelf 0 Note_____ Apply a label on each end of the cable.
4	Connect disk shelf 0 to disk shelf 1 by ◆ Connecting 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 disk shelf 0 ◆ Connecting 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 disk shelf 1 Note_____ Apply a label in the middle of the cable.
5	Repeat Step 4 by connecting disk shelf 1 to disk shelf 2, and so on, for the number of disk shelves that you have in this loop.
6	Terminate the daisy-chain by putting a terminator on the LRC card Output/Terminator connector on the last disk shelf.
7	Repeat Steps 3 through 6 for all FC-AL adapters labeled Channel A on the filer.

Step	Action
8	Repeat Steps 3 through 7 for the partner filer. The cabling for one possible example of a maximum configuration appears as shown in the following figure.  Up to 6 disk shelves Up to 6 disk shelves
9	Proceed to “How to cable the Channel B loop on the disk shelves” on page 25.

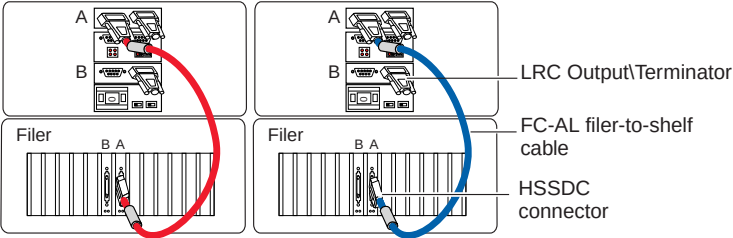
Cabling the Channel B loops on the disk shelves

About this section

This section describes how to cable the Channel B LRC loops on the disk shelves.

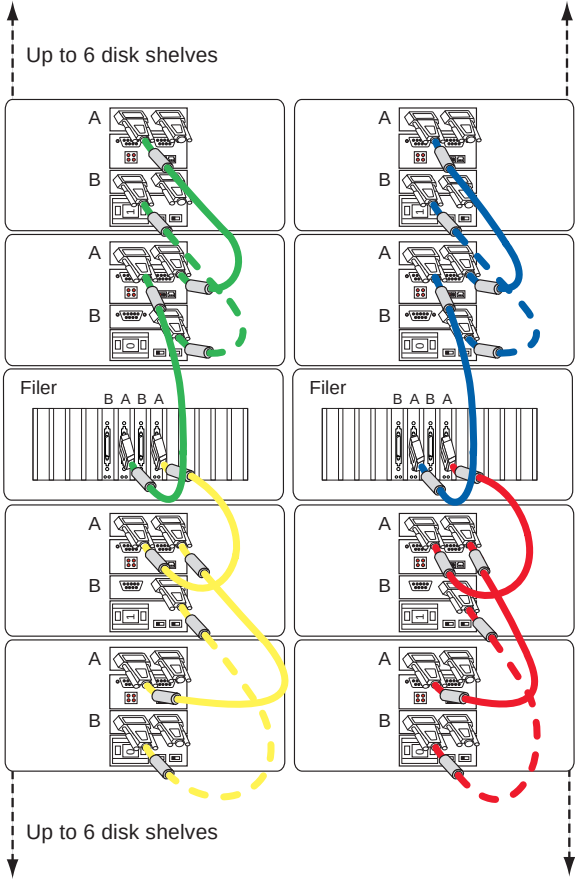
How to cable the Channel B loop on the disk shelves

For a minimum configuration: To cable the Channel B connections of the disk shelves in your cluster, follow these steps.

Step	Action
1	Label the LRC card below the EDM card in each disk shelf as Channel B.
2	Place a terminator on the LRC Output/Terminator connector of the Channel B LRC card. Caution_____ Do NOT complete the Channel B loop to the partner filer. If you complete the Channel B loop to the partner filer and reboot, the filers try to take ownership of both sets of disks and cause permanent damage to your file systems.
3	Repeat Step 2 for the partner filer. The result appears as shown in the following figure. (The Channel A cabling that you have is also shown). 
4	Proceed to “ How to cluster the filers ” on page 29 .

For a maximum configuration: To cable the Channel B connections of your cluster, follow these steps.

Step	Action
1	Label the LRC card below the EDM card in each disk shelf as Channel B.
2	Connect disk shelf 0 to disk shelf 1 by ◆ Connecting 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 disk shelf 0 ◆ Connecting 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 disk shelf 1 Note————— Identify the color of the label that you applied in the middle of each shelf-to shelf cable for each Channel A loop. For each Channel B loop, choose the striped label matching the solid-colored label. Apply a label in the middle of every cable. For example, if you applied a red label in the middle of all shelf-to-shelf cables of one Channel A loop, use the red striped label for the Channel B loop. Caution————— Do NOT complete the Channel B loop to the partner filer. If you complete the Channel B loop to the partner filer and reboot, the filers try to take ownership of both sets of disks and cause permanent damage to your file systems.
3	Repeat Step 2 by connecting disk shelf 1 to disk shelf 2, and so on, for the number of disk shelves that you have in this loop.
4	Terminate the daisy-chain by putting a terminator on the LRC Output/Terminator connector on the last disk shelf.
5	Repeat Steps 2 through 4 for all FC-AL adapters labeled Channel B on the filer.

Step	Action
6	Repeat Steps 1 through 5 for the partner filer. The cabling for one possible example of a maximum configuration appears as shown in the following figure. (The Channel B cabling is shown as dashed lines. The Channel A cabling you did previously is also shown.) 

Step	Action
7	Turn on the filers and the disk shelves. Among the system messages are the following: <pre> Loop on adapter 7 is open. If adapter is in use, check cabling and seating of LRC cards in FC shelves. isp2100_init: Initialization failed on FC adapter in slot 7. Only 1 Fibre Channel adapter was detected with attached disks, but there are 2 Fibre Channel adapters on the system. Check the cables and the connections for the adapters and disks. No disks were detected on Fibre Channel port B; this node will be unable to takeover correctly. Note_____ These messages occur because the Channel B loop has not been completed. </pre>
8	Proceed to “ Clustering the filers ” on page 29 .”

Clustering the filers

About this section

In a cluster, one cluster interconnect cable connects the X port of one filer to the X port of the other filer. A second cluster interconnect cable connects the Y port of one filer to the Y port of the other filer.

How to cluster the filers

To cluster the filers, follow these steps.

Step	Action
1	Enter cf status at the console of each filer. The resulting output should be as follows: cluster monitor not initialized. Interconnect is down.
2	Using the 4m cluster interconnect cable, connect the X port of the cluster interconnect adapter on one filer to the X port on the partner filer. Enter cf status at the console of each filer. The resulting output should be as follows: cluster monitor not initialized. Y link is down. Note_____ The cluster interconnect adapter has two ports; the X port is above the Y port. Caution_____ Verify that you connected the cable to the X port. Connecting to the wrong port disables the takeover feature.

Step	Action
3	Using the other 4m cluster interconnect cable, connect the Y port of the cluster interconnect adapter on one filer to the Y port on the partner filer. Enter cf status at the console of each filer. The resulting output should be as follows: <pre>cluster monitor not initialized.</pre> Note_____ The cluster interconnect adapter has two ports; the Y port is below the X port. _____ Caution_____ Verify that you connected the cable to the Y port. Connecting to the wrong port disables the takeover feature. _____
4	Enter halt at the console of each filer to shut down the system.
5	Connect the filer to the Channel B LRC card on disk shelf 0 of the partner filer by ◆ Connecting the HSSDC end of the FC-AL filer-to-shelf cable to one of the FC-AL adapters labeled Channel B on the filer ◆ Connecting the DB-9 end of the FC-AL filer-to-shelf cable to the Input connector of the LRC card labeled Channel B on disk shelf 0 of the partner filer Note_____ Identify the striped label that you applied in the middle of each shelf-to-shelf cable for the Channel B loop. Apply a label on each end of the filer-to-shelf cable. _____ Repeat this step for the partner filer. The section “How to cable the Channel B loop between the filer and disk shelf 0” on the next page illustrates how to complete the Channel B loops to the partner filer.
6	At the console of each filer, enter boot to run the filers.
7	From one filer, run the sysconfig command with all its options and verify that all your disks and devices appear in the displays.

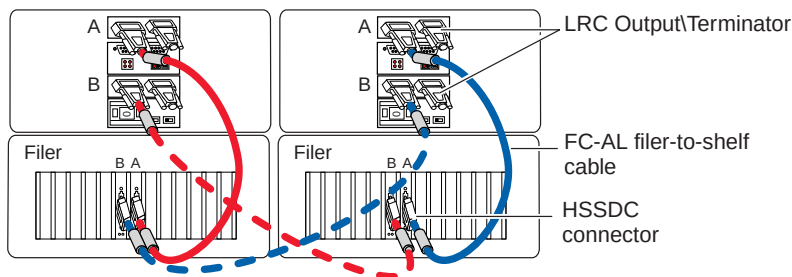
How to cable the Channel B loop between the filer and disk shelf 0

The following figures illustrate how to complete the Channel B loop to the partner filer. The assumption is that the cabling between the cluster interconnect adapters in both filers is complete.

Note

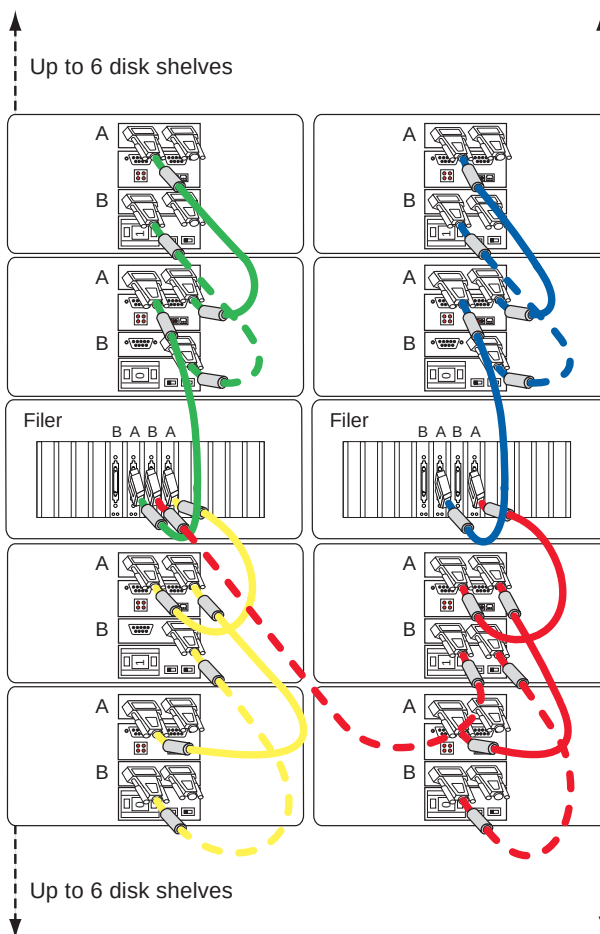
These figures only show how to complete the Channel B loop to the partner filer; they do not show the cabling between the cluster interconnect adapters in both filers. The cabling between the cluster interconnect adapters is not shown in these figures to reduce the possible confusion resulting from the number of cables involved.

For a minimum cluster configuration: The following figure illustrates the completed cabling for the Channel B loops in a minimum configuration.

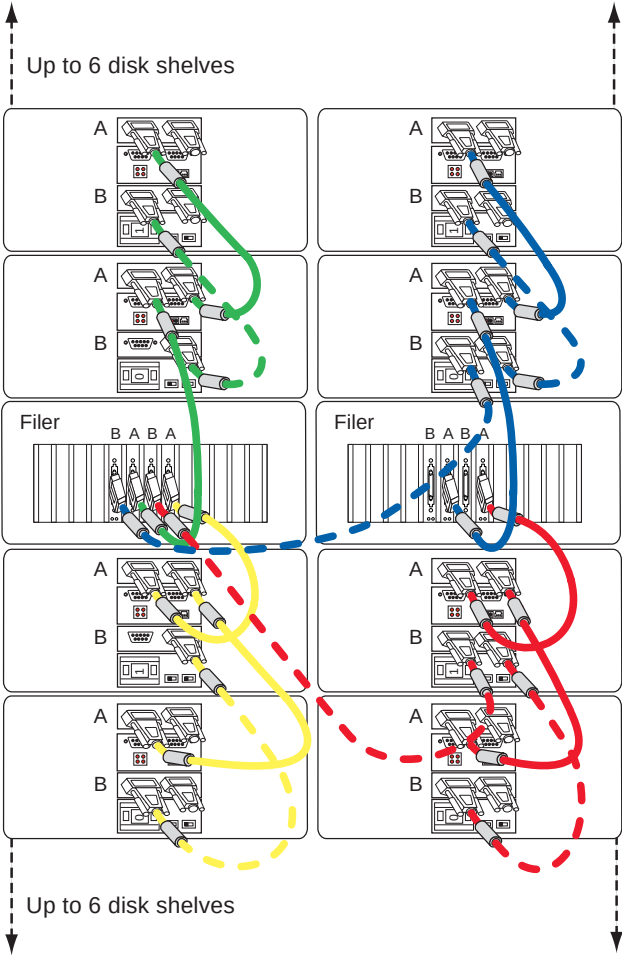


For a maximum cluster configuration: The following series of figures illustrates how to complete the Channel B loops to the partner filer for one possible example of a maximum configuration. This configuration has four FC-AL adapters in each filer, with two FC-AL adapters on each filer labeled Channel A and two FC-AL adapters on each filer labeled Channel B.

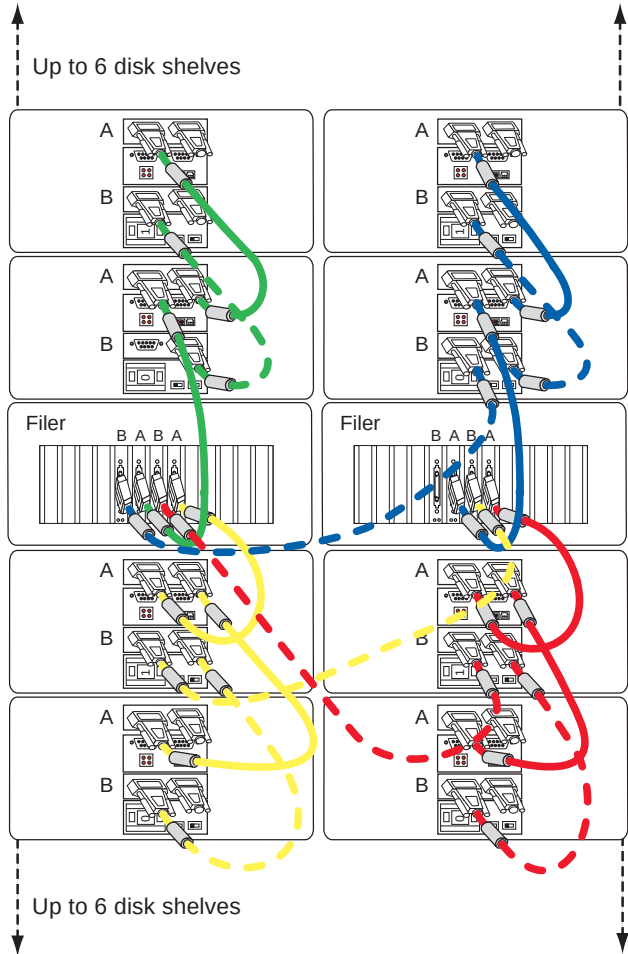
The dashed red line in this figure between the disk shelf on the lower right and the filer on the left illustrates the first completed Channel B loop in this cluster.



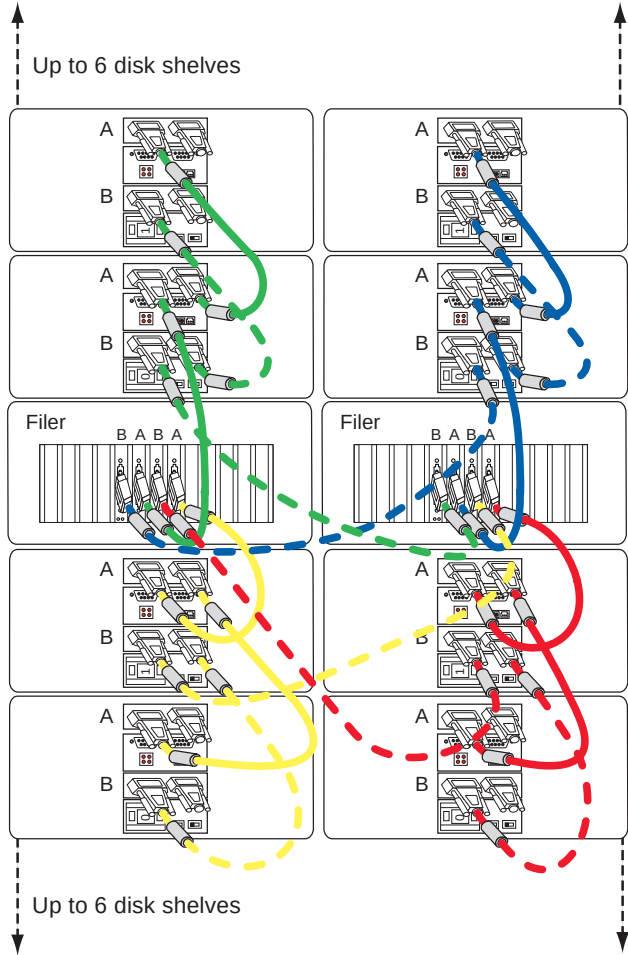
The dashed blue line in this figure between the disk shelf on the upper right and the filer on the left illustrates the second completed Channel B loop in this cluster.



The dashed yellow line in this figure between the disk shelf on the lower left and the filer on the right illustrates the third completed Channel B loop in this cluster.



The dashed green line in this figure between the disk shelf on the upper left and the filer on the right illustrates the fourth completed Channel B loop in this cluster.



How to license clusters

To license clusters on each filer, follow these steps.

Step	Action
1	At the command-line interface, enter license cluster=<i>code</i> where <i>code</i> is the license code you received for the cluster feature.
2	Reboot the filer.
3	Repeat Steps 1 and 2 for the partner filer.

Cluster filer configuration

About filer configuration in a cluster

You must configure some parameters, configuration files, and network interfaces and all licenses in such a way that when one filer takes over the partner filer, it appears as if it were the partner filer; otherwise, the following consequences can result:

- ◆ If some options or configuration files have different values, the values used in takeover are unpredictable.
- ◆ If a feature such as CIFS is licensed on one filer but not on the partner filer, after a takeover, CIFS clients cannot access their files on the filer that has taken over from the failed filer.
- ◆ If network interface configurations do not match, users of the failed filer see broken network connections.

In general, the more similar the configuration of a filer is to that of its partner, the more it behaves like its partner in a takeover.

Chapter contents

The contents of this chapter are described in the following table.

Read...	To learn about...
“Making parameters, licenses, and configuration files match” on page 38	How to set parameters, licenses, and configuration files.
“Making network interfaces match” on page 40	How to configure network interfaces for takeover.

Making parameters, licenses, and configuration files match

Parameter matching The parameters listed in this section for one filer must match those on the other filer in the cluster.

Options that must match: Compare the output of the `options` command for both filers in the cluster and make sure that each option in the following list has the same value in both filers.

```
cifs.show_snapshot
dns.domainname
dns.enable
http.admin.enable
httpd.timeout
httpd.timewait.enable
vol.copy.throttle
ip.path_mtu_discovery.enable
nfs.per_client_stats.enable
nfs.v2.df.2gb.lim
nfs.v3.enable
nis.domainname
nis.enable
pcnfsd.enable
raid.reconstruct_speed
raid.timeout
wafl.maxdirsize
wafl.root_only_chown
```

Other parameters that must match: Make sure that the parameters in the following table match on each filer.

Parameter	Command
date	date, rdate
NDMP (on/off)	ndmpd {on, off}
NFS enabled	nfs
route table published	route
routed enabled	routed {on,off}
Time zone	timezone

License matching

Licenses must match on both filers. For each feature you want, you must purchase a separate license for each filer.

Configuration file matching

The following files must have identical contents:

- ◆ */etc/resolv.conf*
- ◆ */etc/httpd.mimetypes*
- ◆ */etc/nsswitch.conf*

The */etc/rc* file on both filers must either have the same value for the `nfs` command (`On` or `Off`), or the command should be absent from the file in both filers.

Making network interfaces match

Matching interfaces

Each filer in a cluster must be configured in such a way that if one filer fails, the other can take over its IP and MAC (media access control) addresses. Each filer must meet the following requirements:

- ◆ Each filer must be attached to the same networks and subnetworks as its partner.
- ◆ Each local interface must have a local address and a partner address; that is, each must have an address on the partner that the partner can use if it takes over the local filer.

In general, it is a good idea to have pairs of addresses, where local and partner addresses reflect each other. For example, address *n.n.n.n* is the local address for interface *x* on Filer 1 and the partner address on Filer 2, address *m.m.m.m* is the local address for interface *x* on Filer 2 and the partner address on Filer 1, and both addresses are on the same subnetwork. This ensures that a filer's partner can provide the same services that the filer can.

Types of interfaces

On a filer in a cluster, interfaces can play three roles, as described in the following table.

Role	Description	Has local IP address?	Has partner IP address?
Dedicated network interface	Connects only the local filer. That is, if the partner filer fails, it is not available to the partner.	Yes	No
Shared network interface	Connects both the local filer and the partner. That is, if the partner fails, the network interface assumes the identity of a network interface on the partner but works on behalf of both the takeover filer and the partner.	Yes	Yes

Role	Description	Has local IP address?	Has partner IP address?
Standby network interface	Connects only the partner. That is, if the partner fails, the network interface works on behalf of the partner. When the filer is not in takeover mode, the network interface is idle.	No	Yes

In addition to assuming the partner IP address in takeover mode, a shared or standby interface assumes the MAC address of the partner. This enables the clients of the partner to continue using their address resolution protocol (ARP) tables after the takeover.

Configuring interfaces

You configure an interface using `setup` as described in the *First-Time Configuration Guide*, or manually using the `ifconfig` command.

Note

The partner netmask is inferred from the partner IP address.

Using setup: During `setup`, the following questions appear for each interface:

```
Please enter IP address for Network Interface ns0 [n.n.n.n]:
Please enter netmask [255.255.0.0]:
Should interface ns0 take over a partner IP address during
failover? [y]:
Please enter the IP address to take over: [m.m.m.m]:
```

Substitute the local address for *n.n.n.n* and the partner address for *m.m.m.m*.

Using ifconfig: How you use the `ifconfig` command depends on whether you are configuring a shared network interface or are configuring a standby interface for takeover:

- ◆ To configure a dedicated network interface, put the following command in the filer's `/etc/rc` file:

```
ifconfig e0 local_IP_address
```

- ◆ To configure a shared network interface, put the following command in the filer's */etc/rc* file:

```
ifconfig e0 local_IP_address partner partner_IP_address
```

- ◆ To configure a separate interface to be used only if the local filer is taken over, put the following command in the filer's */etc/rc* file:

```
ifconfig e0 partner partner_IP_address
```

The *Data ONTAP 5.2 System Administrator's Guide* provides more information on using the `ifconfig` command.

Dual-MAC address cards: The following types of network interface cards that support dual-MAC addresses are supported:

- ◆ Single-port 10/100 Base-T Ethernet
- ◆ Quad-port 10/100 Base-T Ethernet
- ◆ FDDI

The *Data ONTAP 5.2 System Administrator's Guide* provides more information about the types of network interface cards that support dual-MAC addresses.

Testing the conversion

About this section

This section specifies the filer commands you need to enter from your console to test the successful conversion of your filers and disk shelves to a cluster.

How to test the conversion

To test the conversion, follow these steps.

Step	Action	Result
1	From one filer, enter ifconfig -a and verify the network addresses.	The network connections are verified.
2	For each protocol you have licensed, verify that you can create and retrieve files on both filers.	The protocols are tested on the filer.
3	From the same filer, enter cf enable .	Takeover of the partner filer is enabled.
4	From the same filer, enter cf takeover .	The local filer takes over the partner. A successful takeover ends with the following message: takeover completed
5	From the same filer, enter cf giveback .	The partner filer functions normally. A successful giveback ends with the following message: giveback completed
6	Repeat Steps 1 through 5 from the other filer.	Takeover has been tested.

Overview of this appendix

About this appendix This appendix provides information about optional procedures in the cluster conversion process.

Appendix contents This appendix discusses the following topics.

Read...	To learn about...
“Adding main memory DIMMs” on page 46	The following information: ◆ The main memory configuration in an F630 filer ◆ Removing and adding main memory DIMMs to your filers
“Adding NVRAM” on page 50	The following information: ◆ The NVRAM configuration in an F630 filer ◆ Adding NVRAM SIMMs to your filers
“Removing the differential wide SCSI adapter” on page 53	The following information: ◆ The need for this optional procedure ◆ Removing the differential wide SCSI adapter for external tape devices from your filers ◆ Reinstalling the differential wide SCSI adapter for external tape devices in your filers

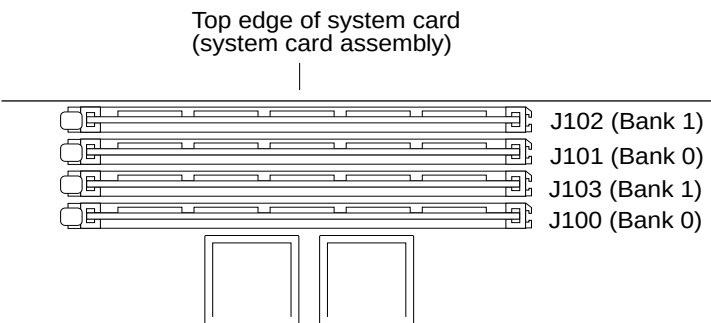
Adding main memory DIMMs

About this section

This is an optional section that provides the procedures for adding or replacing the DRAM DIMMs on the system board of an F630 that has less than 512 MB of main memory. These procedures are not required if your F630 has 512 MB of main memory.

About the F630 main memory configuration

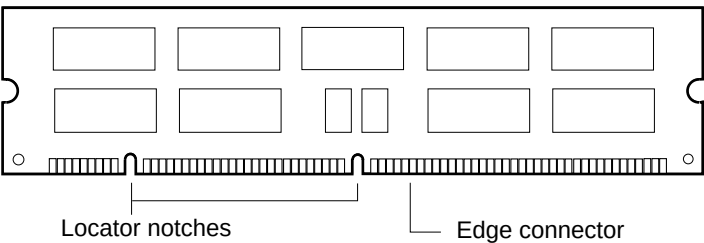
The following figure shows the location of the DRAM DIMM slots.



The DRAM DIMMs must meet the following requirements:

- ◆ 3.3-volt, 72-bit, fast page mode ECC DIMMs. All DIMMs must be listed on the Network Appliance™ Approved Parts List. Contact Network Appliance Sales to obtain this list. Do not use unapproved DIMMs.
- ◆ All DIMMs must have the same number of bytes.

The following figure illustrates a typical DRAM DIMM.



How to configure the system memory

A filer in a cluster requires

- ◆ 256 MB of main memory for each filer that has two FC-AL adapters
- ◆ 512 MB of main memory for each filer that has three or four FC-AL adapters

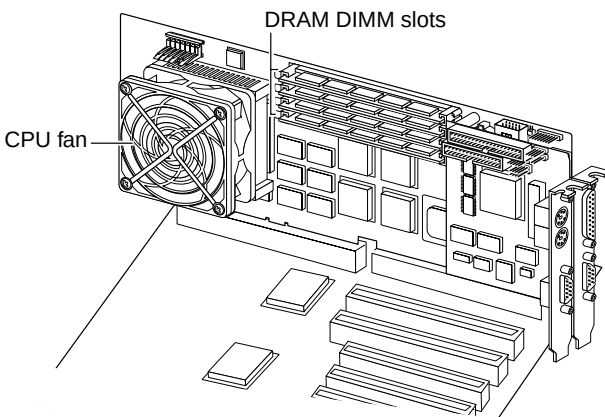
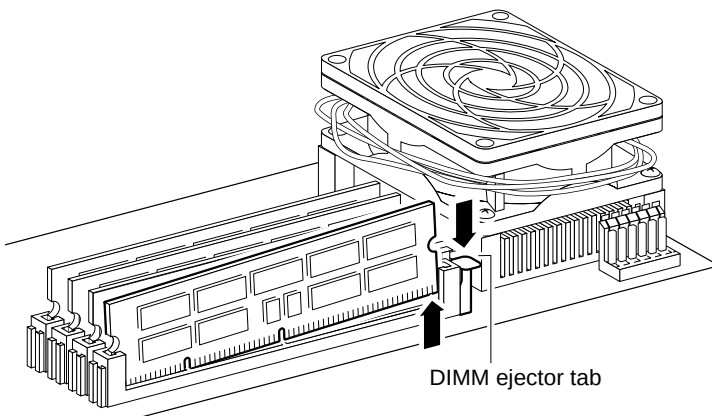
Install the DIMMs in pairs (one bank). Install Bank 0 first (J100, then J101); install Bank 1 second (J102, then J103). The only possible DRAM DIMM configuration is listed in the following table.

Memory	Bank 0 (slots J100 and J101)	Bank 1 (slots J102 and J103)
256 MB	two 64-MB DIMMs	two 64-MB DIMMs
256 MB	two 128-MB DIMMs	none
512 MB	Two 128-MB DIMMs	Two 128-MB DIMMs

How to remove DRAM DIMMs

Follow these steps to remove DRAM DIMMs.

Step	Action
1	Shut down the filer and turn off power to the filer. Caution— Always use the halt command to perform a clean shutdown.
2	Put on the antistatic wrist strap and attach the grounding leash to an acceptable grounding unit.
3	Remove the power supply and cables, if necessary. Caution— Always use the grounding strap before replacing or installing hardware components.
4	Loosen the six thumbscrews on the back panel and pull out the backplane carrier.

Step	Action
5	Locate the DRAM DIMM that you want to remove. 
6	Press the DIMM ejector tab to push the DIMM part way out of its slot, as shown in the figure. 
7	Pull the DIMM out of the slot.
8	Set the DIMM aside in an antistatic bag.
9	Repeat Steps 1 through 8 for the partner filer.

How to install DRAM DIMMs

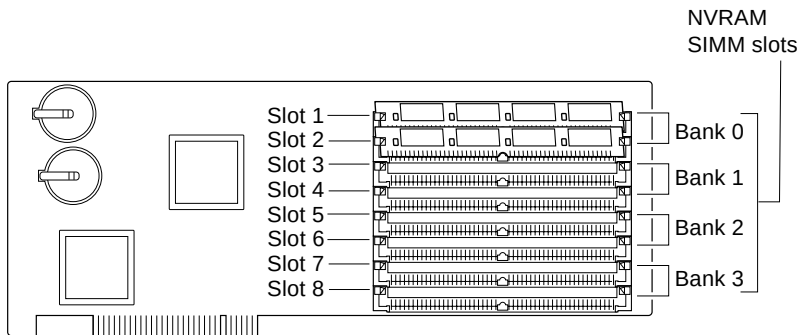
Follow these steps to install DRAM DIMMs.

Step	Action
1	Locate the DIMM slots for the DIMMs you are installing. Refer to the figure on page 48.
2	Holding the DIMM by the top corners to avoid damaging the components or the edge connector, turn the DIMM so that the locator notches on the edge connector are away from the DIMM ejector tab on the side of the slot.
3	Insert the DIMM straight into the slot, following the configuration directions in “How to configure the system memory” on page 46. The DIMM fits tightly in the slot, but should go in easily. If not, realign the DIMM with the slot and try again. Caution_____ Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot; otherwise, the edge connector on the DIMM does not make complete contact with the slot. _____
4	Push carefully, but firmly on the top edge of the DIMM until you hear an audible “click” and the DIMM snaps into place.
5	Repeat Steps 1 through 4 for the partner filer.

Adding NVRAM

About the NVRAM configuration in an F630

The standard NVRAM configuration on an F630 filer is 8 MB with two 4-MB NVRAM SIMMs (8 MB) installed in Bank 0. The following figure shows slots 1 and 2 of Bank 0 filled with 4-MB NVRAM SIMMs.

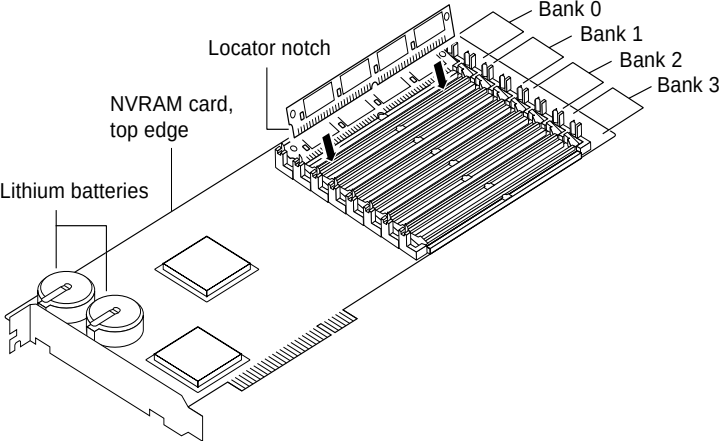


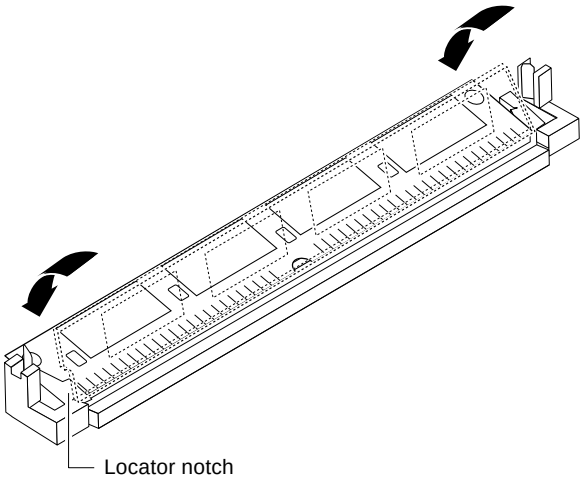
The maximum configuration supported by an F630 NVRAM adapter is 32 MB. A cluster requires 32 MB of NVRAM on each filer. You might have to add NVRAM SIMMs to one or both filers to meet this requirement. You can expand the NVRAM capacity to 32 MB by installing additional pairs of 4-MB NVRAM SIMMs in Banks 1 through 3.

How to install NVRAM SIMMs

To install NVRAM SIMMs, follow these steps.

Step	Action
1	Remove the NVRAM adapter from expansion slot 9 and set the adapter aside on an antistatic surface.
2	Hold the SIMM at the top corners to avoid damaging the components or the edge connector and turn the SIMM so that its locator notch is toward the lithium batteries.

Step	Action
3	Starting with the first unoccupied slot closest to the top edge of the NVRAM adapter, align the SIMM over the slot and then tilt the top edge of the SIMM at a slight angle toward the top edge of the NVRAM adapter. The following figure illustrates how to align a SIMM to insert it in a slot.  The diagram shows an NVRAM card with a top edge and lithium batteries. A locator notch is indicated on the card. The SIMM is shown being inserted into a slot, with labels for Bank 0, Bank 1, Bank 2, and Bank 3.
4	Insert the SIMM at an angle into the slot. The SIMM should slide into the slot easily if you wiggle the SIMM into position. If not, realign the SIMM with the slot and try again.

Step	Action
5	Push downward on the top edge of the SIMM until the mounting tabs close over the SIMM to lock it in place. The following figure illustrates how to lock an NVRAM SIMM in place in its slot.  Locator notch Caution Visually inspect the SIMM to verify that it is evenly aligned and fully inserted into the slot; otherwise, the SIMM could bend or break when pushed to the locked position.
6	When banks 0 through 3 are filled, reinstall the NVRAM adapter into its original slot.
7	Repeat Steps 1 through 6 for the partner filer.

Removing the differential wide SCSI adapter

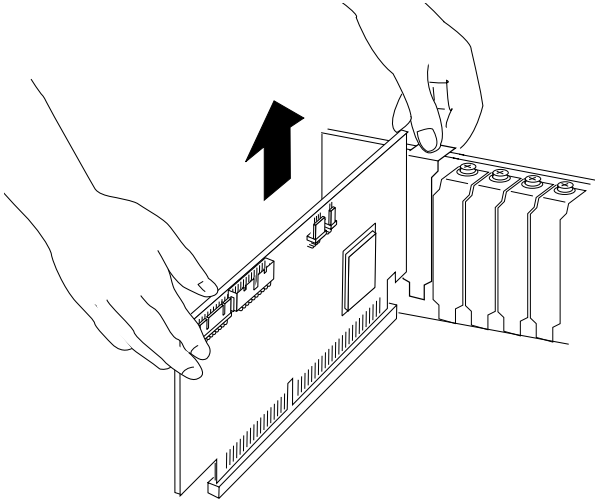
About removing the differential wide SCSI adapter

If you have a differential wide SCSI adapter for external tape devices installed in expansion slot 6, and if you are setting up a maximum cluster configuration, you need to move the adapter to expansion slot 4. This is to accommodate the installation of an FC-AL adapter in expansion slot 6.

How to remove the differential wide SCSI adapter

To remove the differential wide SCSI adapter, follow these steps.

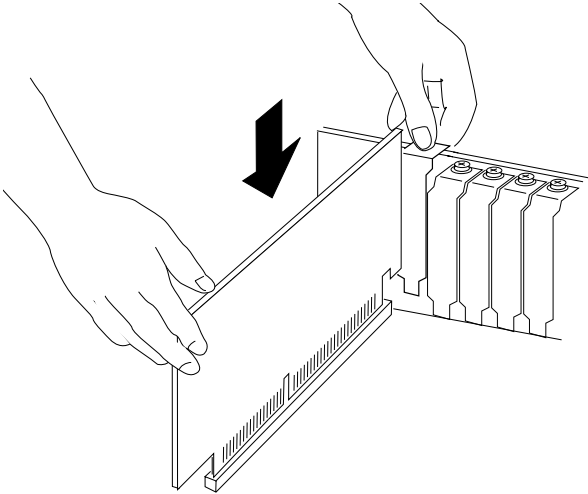
Step	Action
1	Note which cables, if any, are connected to the connectors on the faceplate of the differential wide SCSI adapter in expansion slot 6, and then disconnect the cables. Caution————— Do not disconnect or connect cable-to-filer SCSI connectors while the filer is powered up. You could cause permanent damage to the SCSI cards in the filer. —————
2	Loosen the six thumbscrews on the back panel and pull out the backplane carrier.
3	Remove the screw holding the differential wide SCSI adapter faceplate to the back panel bracket and save it for installing the FC-AL adapter. Refer to “Installing an FC-AL adapter” on page 16 for more information.

Step	Action
4	Pull upward on the top edge of the differential wide SCSI adapter and lift it out of the chassis, as shown. 
5	Repeat Steps 1 through 4 for the partner filer.

How to reinstall a differential wide SCSI adapter

To reinstall a differential wide SCSI adapter in backplane expansion slot 4, follow these steps.

Step	Action
1	Identify backplane expansion slot 4.
2	Remove the screw holding the slot cover to the back panel of the backplane carrier and save the screw for installing the differential wide SCSI adapter.

3	Holding the differential wide SCSI adapter by its top edge, with the faceplate near your left hand, lower the adapter into the slot until its connector edge meets the grooves in the system backplane expansion slot, as shown.  The faceplate of the adapter should be in position against the back panel, and should cover the endplate slot on the back panel.
4	Press carefully on the top edge of the differential wide SCSI adapter until the edge connector is seated in the system backplane expansion slot.
5	Replace the faceplate screw to secure the adapter to the back panel bracket of the system backplane carrier.
6	Repeat Steps 1 through 5 for the partner filer.

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