

Hardware Guide for the Digital Disk Shelves

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Preface

About this guide

This guide provides you with instructions for installing disk shelves manufactured by Digital Equipment Corporation (Digital). It covers all versions of disk shelves made by Digital that are supported by various filer models. The disk shelf version depends on the type of SCSI card used in the filer:

- single-ended narrow SCSI
- single-ended wide SCSI
- differential wide SCSI

This guide is organized as follows:

Chapter	Provides information about
1	Disk shelf overview and installation requirements
2	Installing disk shelves
3	LEDs on the disk shelves
4	Replacing units in the disk shelves
A	DIP switch settings on personality modules

Use this guide in conjunction with the Network Appliance documentation that shipped with your filer.

Audience

This guide is for system administrators who are familiar with computer networks, distributed file systems, and NFS, CIFS, or HTTP service. It doesn't cover basic system administration topics such as IP addressing, routing, and network topology. It emphasizes the characteristics of the Network Appliance filer.

Terminology

When the term “filer” is used, the information applies to all NetApp filer models.

Command conventions

You can enter filer commands on the system console or on an administration host, which is a client computer that accesses the filer using telnet. When describing commands entered on an administration host, this guide assumes that the host runs the SunOS operating system. The administration host, however, is not required to run SunOS. Refer to the *System Administrator's Guide* for more information about the administration host.

Formatting conventions

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

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

Keyboard conventions

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

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

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

Special messages

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



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



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



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

Chapter 1: Introduction

This chapter provides you with information about disk shelves manufactured by Digital Equipment Corporation (Digital). This chapter also describes the environmental, space, and electrical requirements for installing Digital disk shelves.

Overview of the Digital disk shelves

Digital disk shelves come in narrow SCSI or wide SCSI versions, depending on the type of SCSI card used in your filer. The possible types of SCSI cards are:

- single-ended narrow SCSI
- single-ended wide SCSI
- differential wide SCSI

The single-ended narrow SCSI card uses Digital narrow SCSI disk shelves.

The differential wide SCSI card and the single-ended wide SCSI card both use Digital wide SCSI disk shelves.

Narrow SCSI disk shelves

The narrow SCSI disk shelf contains nine slots (see Figure 1-1). Eight slots are used for power supplies and disk drives. The rightmost slot is for cables to the SCSI connectors on the disk shelf backplane.

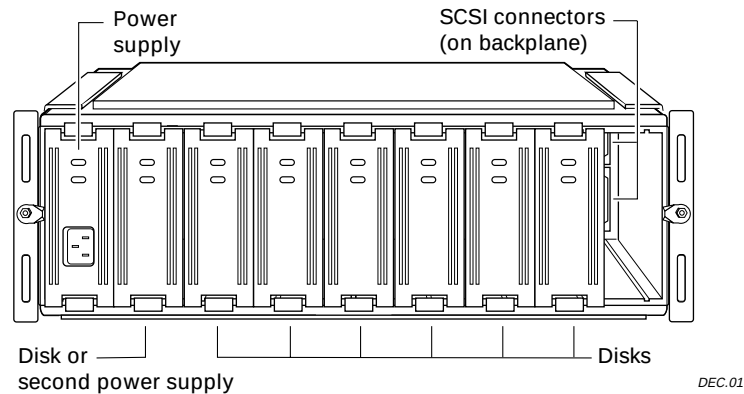


Figure 1-1. Narrow SCSI disk shelf

If you install one power supply in the disk shelf, you can install a maximum of seven disks in the shelf. If you install a redundant power supply, it occupies the slot adjacent to the first power supply and you can install a maximum of six disks.

Single-ended wide SCSI disk shelves

The wide disk shelf contains nine device slots (see Figure 1-2). Eight slots are used for power supplies and disk drives. The rightmost slot is reserved for the personality module.

If you install one power supply in the disk shelf, you can install a maximum of seven disks in the shelf. If you install a redundant power supply, it occupies the slot adjacent to the first power supply and you can install a maximum of six disks.

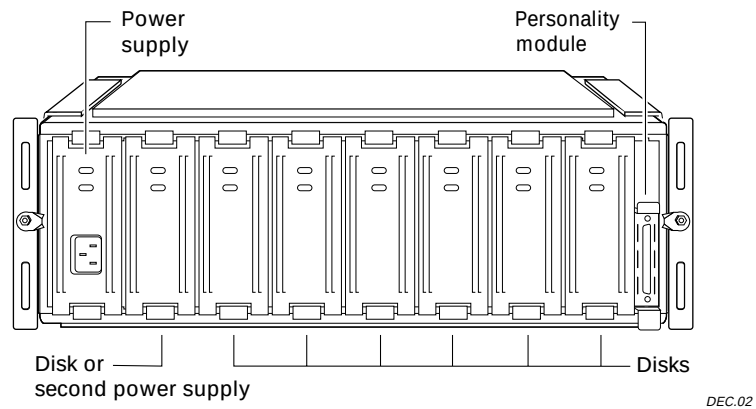


Figure 1-2. Wide SCSI disk shelf

The personality module provides two SCSI connectors (see Figure 1-3): one connector is located on the outside of the module and one is located on the inside of the module. When a wide SCSI shelf is connected to a single-ended wide SCSI card in the filer, the SCSI cable is attached to the inside SCSI connector.

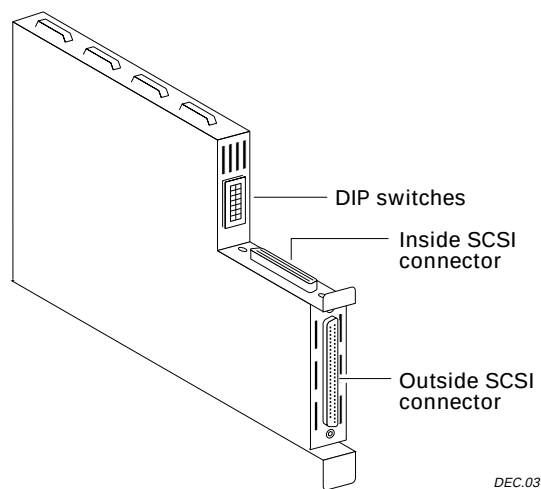


Figure 1-3. Disk shelf personality module

The personality module also contains DIP (Dual In-line Package) switches that set the SCSI IDs of the disks in the shelf (see Figure 1-3). The DIP switches on the personality module were set at the factory. Do not change the switch settings. The DIP switch settings are described on a label fixed to the personality module (only visible when the module is out of the shelf) and in Appendix A, “Personality Module DIP Switch Settings.”

Differential wide SCSI disk shelves

If your filer uses a differential wide SCSI card, each of the filer's SCSI interfaces supports a “daisy chain” of two disk shelves. In a daisy chain, the first disk shelf is attached to the SCSI interface on the filer and the second disk shelf is attached to one of the SCSI connectors on the first disk shelf.

The disk shelf for differential fast wide SCSI operation contains different modules depending whether it is the *first* disk shelf in the daisy chain or the *second* disk shelf in the daisy chain.

The first shelf in the daisy chain (see Figure 1-4) contains a differential converter, which converts differential SCSI signals used by the SCSI card in the filer to single-ended SCSI signals used by the disks.

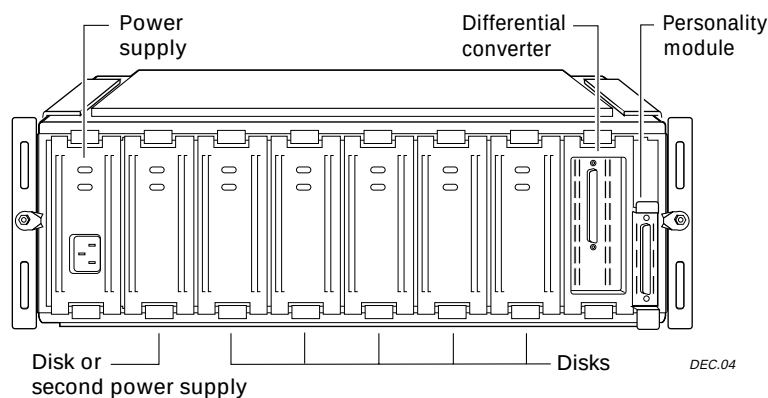


Figure 1-4. First disk shelf in the daisy chain

The second shelf in the daisy chain does not contain a differential converter. Figure 1-5 illustrates the second shelf in the daisy chain.

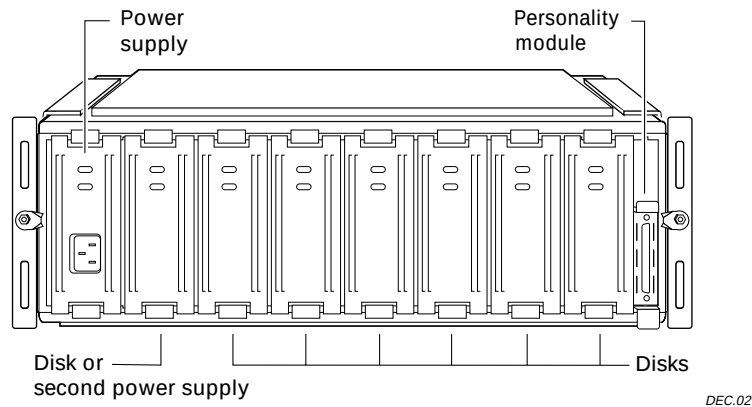
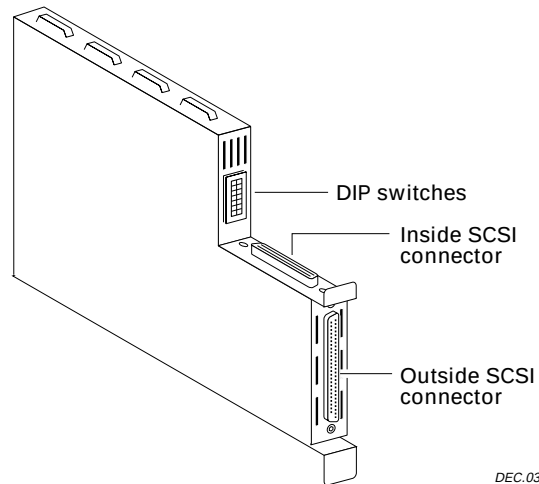


Figure 1-5. Second disk shelf in the daisy chain

Because the differential converter takes up one slot in the first disk shelf, the disk shelf pair supports a maximum of 13 disks (six in the first disk shelf; seven in the second disk shelf).

Both disk shelves in the daisy chain contain a personality module installed in the rightmost slot as you face the front of the shelf. The personality module provides two SCSI connectors (see Figure 1-6): one connector is located on the outside of the module and one is located on the inside of the module. The inside connector is for the cable that connects the disk shelf pair. The outside connector on the personality module in the first disk shelf is for the cable that connects the disk shelf pair to the SCSI card in the filer. The outside connector on the personality module in the second disk shelf is not used.



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Figure 1-6. Disk shelf personality module

The personality module also contains DIP (Dual In-line Package) switches that set the SCSI IDs of the disks in the shelf (see Figure 1-6). The DIP switches on the personality module were set at the factory. Do not change the switch settings. The DIP switch settings are described on a label fixed to the personality module (only visible when the module is out of the shelf) and in Appendix A, “Personality Module DIP Switch Settings.”

Installation requirements

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

Environmental requirements

The environmental requirements for a disk shelf are identical to the ones for the filer. Refer to the hardware guide for the filer for the information about the temperature and humidity requirements.

Space requirements

When installing the filer and a disk shelf in the same equipment rack, Network Appliance recommends that you leave at least 1.5 inches (3.81 centimeters) between the disk shelf and the filer. If you are installing more than one disk shelf in the same rack, leave at least one inch (2.54 centimeters) between disk shelves. This space allows you to route cables from the disk shelf to the filer back panel and to the AC outlet.



CAUTION: Do not block the ventilation holes on the top cover of the filer. Leave at least 1.5 inches (3.81 centimeters) of space directly above the ventilation holes for air circulation. Equipment can be mounted directly on the unvented area on the top cover of the filer as long as that equipment does not extend over and block the filer's ventilation holes.

Table 1-1 lists the dimensions of the disk shelf; Table 1-2 lists the weights of the disk shelves and their components.

Table 1-1. Dimensions of the disk shelf

Height	5.9 in. (15 cm)
Width	17.5 in. (44.5 cm)
Depth	13.8 in. (35 cm)

Table 1-2. Weights of the disk shelves and their components

Narrow SCSI shelf (Weight includes one disk shelf, one 150-watt power supply, two fans, and a SCSI cable.)	17.2 lbs. (7.8 kg)
Wide SCSI shelf (Weight includes one disk shelf, one 150-watt power supply, two fans, a personality module, and a SCSI cable.)	18.8 lbs. (8.5 kg)
Differential converter (for wide SCSI shelf)	0.6 lbs. (0.3 kg)
Disk (Nominal weight for all disk models)	3.0 lbs. (1.36 kg)
Power supply	1.5 lbs. (0.7 kg)

Electrical requirements

Use the power cord supplied in your shipment to attach the disk shelf to a properly grounded power source. Table 1-3 describes the electrical requirements for the disk shelf.

Table 1-3. Electrical requirements for the disk shelf

Power supply	100 – 240 VAC
Maximum current	2 A at 115 VAC or 1 A at 230 VAC
Frequency	47 – 63 Hz

Power dissipation and thermal ratings

The power dissipation (in watts) and BTUs per hour for a disk shelf depends on the number and types of devices (for example, power supplies and disk drives) installed in the disk shelf. As an example, a wide SCSI disk shelf with one 150-watt power supply, seven 4-GB disks, two fans, and a personality module dissipates approximately 214 watts and produces approximately 732 BTUs per hour. Your actual usage may be less, depending on your disk shelf type and how it is equipped.

Chapter 2: **Installing Disk Shelves**

This chapter provides you with instructions for installing a narrow or wide SCSI disk shelf. The first part of the chapter provides general information that applies to all shelf models:

- mounting a disk shelf in a rack
- removing a disk from a shelf
- installing a disk in a shelf
- attaching a disk shelf to a power source
- removing a disk shelf from a rack

The second part of the chapter provides information about specific disk shelf types, and is divided into three procedures, one per disk shelf type. Use one of the following sections, depending on the type of SCSI card used in your filer:

- “Installing a single-ended narrow SCSI disk shelf” on page 2-12
- “Installing a single-ended wide SCSI disk shelf” on page 2-16
- “Installing differential wide SCSI disk shelves” on page 2-21



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

You need the following equipment to install a disk shelf:

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



CAUTION: Static electricity can damage the SCSI card installed in the filer. To avoid damaging the card, shut down the filer and power off the disk shelf before you disconnect the disk shelf SCSI cable from the filer or attach the disk shelf SCSI cable to the filer. Because the disk shelf does not have an On/Off power switch, you must detach the power cord from the power supply module to turn off the power. In addition, wear an antistatic wrist strap and grounding leash when you disconnect the shelf from the filer.

Mounting a disk shelf in a rack

The disk shelf is shipped with a mounting bracket attached to it as illustrated in Figure 2-1.

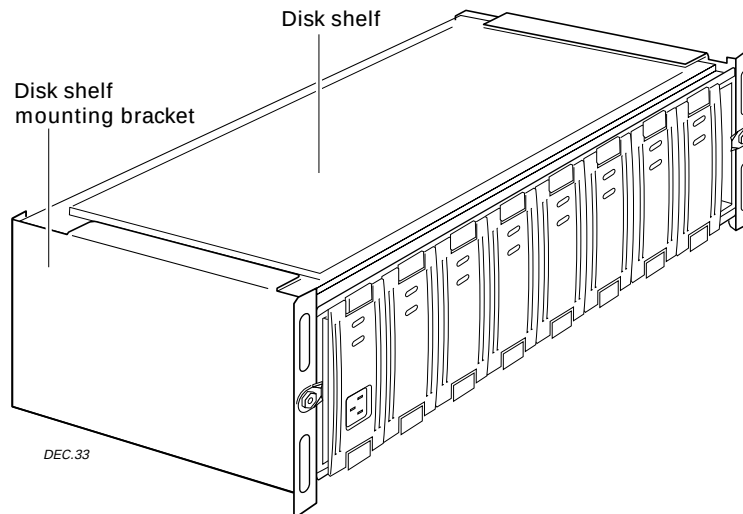


Figure 2-1. Disk shelf with attached mounting bracket



NOTE: This section uses illustrations of a narrow SCSI disk shelf to show how a disk shelf is mounted in a rack. The information provided in the figures and descriptions in this section applies to all of the Digital disk shelf versions unless otherwise noted.

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

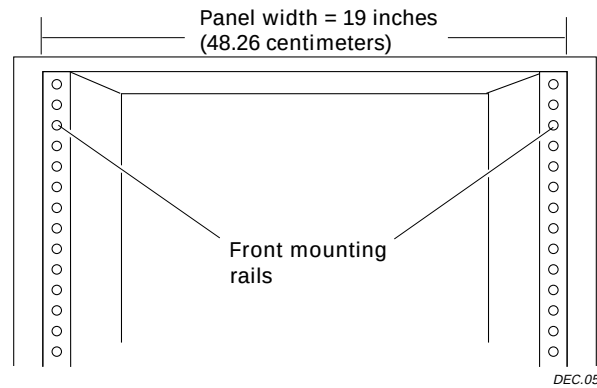


Figure 2-2. 19-in. equipment rack for the disk shelf

The only equipment that you need for mounting the disk shelf is a #2 Phillips screwdriver. However, if the screws provided in your shipment do not fit the holes on your rack, you need to provide screws of an appropriate size.



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



WARNING: Because of the weight of the fully-loaded disk shelf, you should work with at least one other person when mounting it to avoid injury. You can reduce the weight of the disk shelf by removing the power supply and disks.

Follow these steps to mount the disk shelf in a rack:

1. If you are mounting the disk shelf in an enclosed equipment rack with a front door and a back panel, remove the back panel of the rack and open the front door.
2. On each front mounting rail of your rack, select four holes that are spaced appropriately for the mounting holes on the disk shelf.

3. Align the holes on the flanges of the disk shelf with the holes you selected in step 2.

The person assisting should stand behind the rack and help support the weight of the disk shelf.

4. Insert screws into the mounting holes on the flanges of the disk shelf and the mounting rails of the rack as shown in Figure 2-3.



NOTE: Install two screws in the bottom holes first. These screws provide the most leverage for the disk shelf and will assist the person supporting its weight.

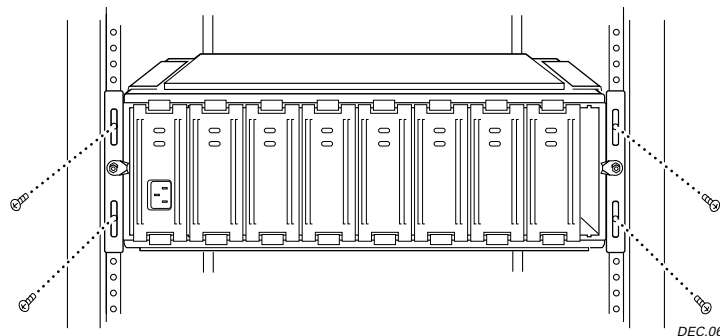


Figure 2-3. Attaching a disk shelf to the equipment rack

Occasionally, the metal on the mounting bracket is flexed such that the holes on the mounting bracket flanges and the holes on the rack rails cannot be aligned horizontally.

If you cannot push the screw through the holes due to this problem, loosen the nut on the flange of the disk shelf mounting bracket (using an 11/32-inch wrench or nut driver) and turn the cleat downward before inserting the screws. Refer to Figure 2-4 on page 2-6 for the locations of the nut and the cleat.

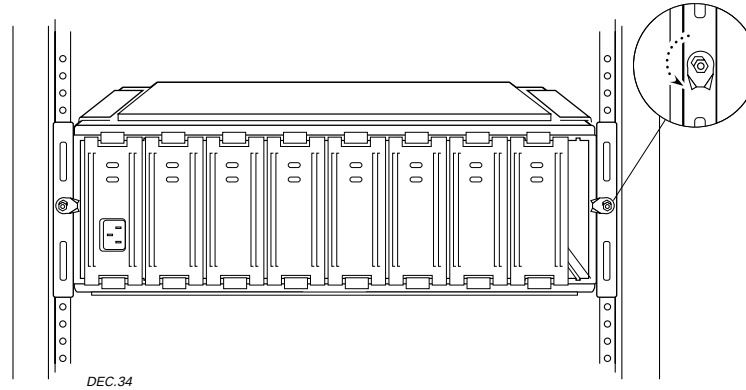


Figure 2-4. Turning the cleats downward on the mounting bracket

5. Use a Phillips screwdriver to tighten all the screws.

The procedure for rack-mounting a disk shelf is now complete.

Removing a disk from a shelf

To remove a disk from the shelf, use both hands to press the mounting tabs on the disk carrier toward each other to disengage the disk. Then carefully slide the disk out of the shelf. Always use two hands to support the weight of the disk. Figure 2-5 illustrates how to remove a disk.

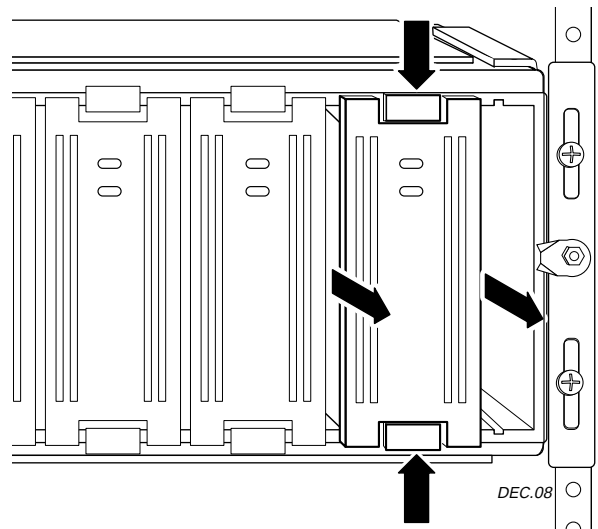


Figure 2-5. Removing a disk from the disk shelf

Installing a disk in a shelf

Disks are installed in the disk shelf at the factory prior to shipment. You need to install disks in the shelf if you removed disks before attaching the SCSI cable or if you purchased disks separately from your purchase of the shelf.

If you are installing disks into a narrow SCSI disk shelf, you can install the disks in any order. Also, no configuration on the disk is necessary because the disk shelf automatically sets the SCSI ID for each disk.

If you are installing disks into a wide SCSI disk shelf attached to a single-ended wide SCSI card in the filer, you must fill the slots of the disk shelf from right to left, as you face the disk shelf.

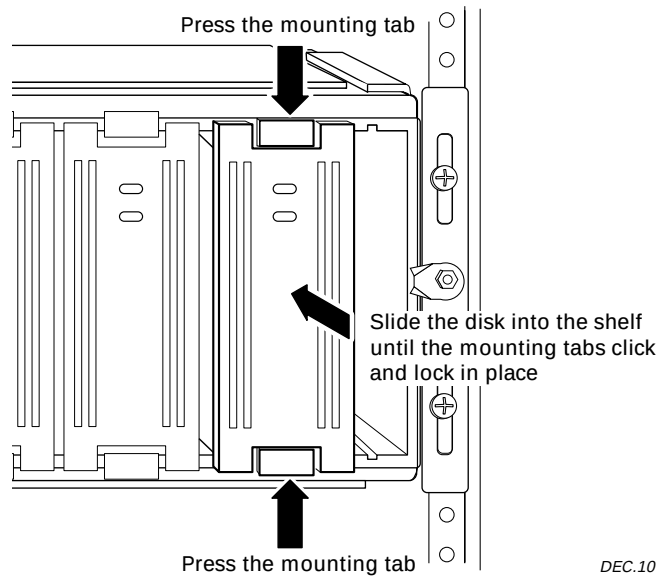
If you are installing disks into a wide SCSI disk shelf attached to a differential wide SCSI card in the filer, you must fill the slots of the first disk shelf before installing disks in the second disk shelf. Also, as you face the slots on the shelf, fill the slots from right to left.



NOTE: You can install a narrow SCSI disk into a wide SCSI disk shelf attached to a single-ended wide SCSI card, or into a wide SCSI disk shelf that is the first disk shelf attached to a differential wide SCSI card. Do not install a narrow SCSI disk into the second disk shelf in a differential daisy chain because the narrow SCSI disk will have a SCSI ID conflict with one of the disks in the first disk shelf.

An empty disk slot might be covered by a plastic slot cover. If you are adding a new disk, you first have to remove the cover by pressing the mounting tabs toward each other. After the mounting tabs are disengaged, pull the cover out from the shelf.

To install a disk, orient the disk so that the LEDs on the carrier are on the top. Then insert the disk into the guide slot on the shelf and push it in until the mounting tabs lock in place. Always use two hands to support the weight of the disk. Figure 2-6 on page 2-9 illustrates how to install a disk.



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Figure 2-6. Installing a disk in the disk shelf

Repeat this process until you have installed all the disks that you want to be configured in the shelf.

Attaching the disk shelf to a power source

Each disk shelf is shipped with a power supply installed in the leftmost slot as you face the front of the shelf. Follow these steps to plug in the power supply:

1. Attach the socket end of the provided power cord to the receptacle in the disk shelf power supply.
2. Plug the other end of the power cord into a grounded electrical outlet.

Because the disk shelf has no power switch, it turns on immediately.

If your disk shelf is equipped with an optional redundant power supply, repeat the same procedure for the optional redundant power supply.

Removing a disk shelf from a rack

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

1. Shut down the filer and turn off power to the filer.
2. Disconnect the disk shelf power cord from the disk shelf.
3. Disconnect the SCSI cable that connects the disk shelf to the filer.



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

4. Use a Phillips screwdriver to remove the screws from the flanges of the disk shelf mounting bracket.
5. Remove the disk shelf from the equipment rack (see Figure 2-7).

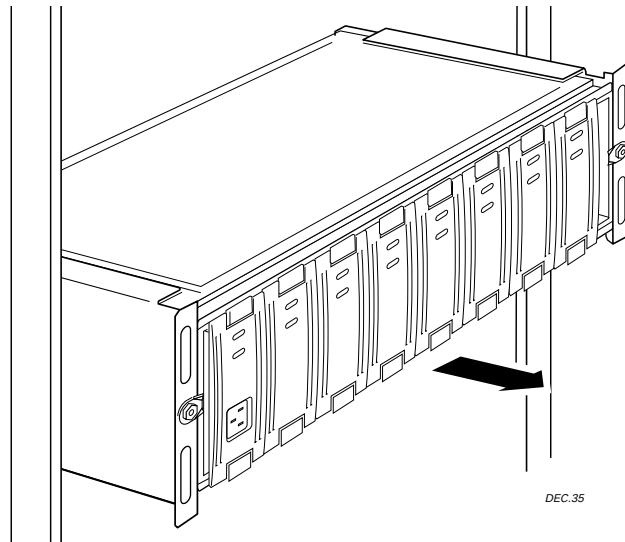


Figure 2-7. Removing the disk shelf from the equipment rack

Installing a single-ended narrow SCSI disk shelf

Installing a narrow SCSI disk shelf involves these main steps:

1. Mount the disk shelf in an equipment rack.
2. Attach the SCSI cable to the disk shelf, if it is not already attached.
3. Install disks in the disk shelf, if necessary.
4. Attach the disk shelf to the filer.
5. Attach the disk shelf to a power source.

Repeat these steps for each additional disk shelf used in your system configuration. The following sections describe the installation steps in greater detail.

Mounting a disk shelf in a rack

To accomplish this step, refer to the instructions in “Mounting a disk shelf in a rack” on page 2-3.

Attaching the SCSI cable to the disk shelf

Figure 2-8 shows the locations of the SCSI connectors on the disk shelf. If you cannot access the SCSI connectors because they are blocked by one or more disks, you need to remove one or more disks from the shelf. To accomplish this step, refer to the instructions in “Removing a disk from a shelf” on page 2-7.

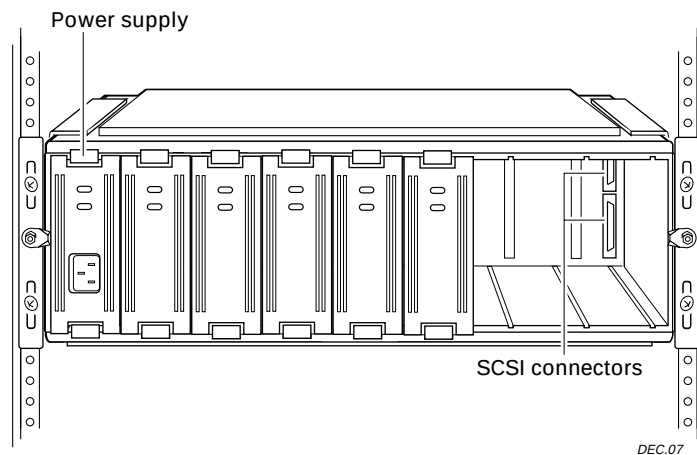


Figure 2-8. SCSI connectors on the disk shelf



NOTE: The disk shelf has two SCSI connectors. You can use either connector to attach the provided SCSI cable to the disk shelf.

Attach one end of the provided SCSI cable to a SCSI connector on the backplane of the disk shelf. Figure 2-9 shows how to attach the SCSI cable to one of the SCSI connectors.

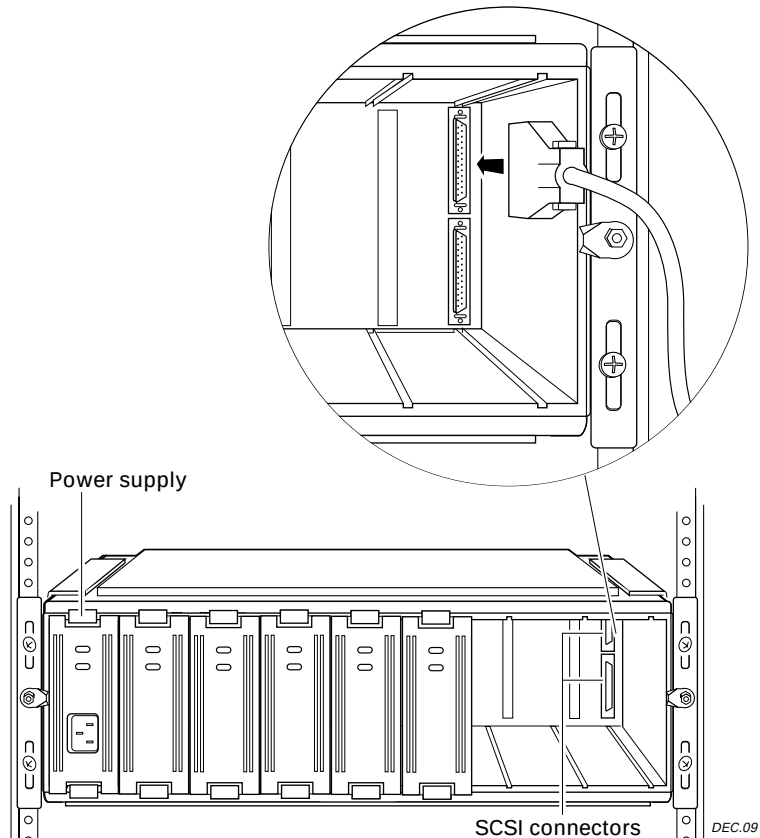


Figure 2-9. Attaching the SCSI cable to the disk shelf

Installing disks in the disk shelf

Disks are installed in the disk shelf at the factory prior to shipment. You need to install disks in the shelf if you removed disks before attaching the SCSI cable or if you purchased disks separately from your purchase of the shelf.



NOTE: You can install the disks in any order. Also, no configuration on the disk is necessary because the disk shelf automatically sets the SCSI ID for each disk.

To accomplish this step, refer to the instructions in “Installing a disk in a shelf” on page 2-8.

Attaching the disk shelf to the filer

For information about how to attach the SCSI cable to the filer, refer to the hardware guide that comes with your filer.

Attaching the disk shelf to a power source

For information about how to attach the disk shelf to a power source, refer to “Attaching the disk shelf to a power source” on page 2-10.

The installation of single-ended narrow disk shelves is now complete.

Installing a single-ended wide SCSI disk shelf

Installing a single-ended wide SCSI disk shelf involves these main steps:

1. Mount the disk shelf in an equipment rack.
2. Attach the SCSI cable to the personality module in the disk shelf (if it isn't already attached).
3. Install disks in the disk shelf (if necessary).
4. Attach the disk shelf to the filer.
5. Attach the disk shelf to a power source.

Repeat these steps for each additional disk shelf used in your system configuration. The following sections describe the installation steps in greater detail.

Mounting a disk shelf in a rack

To accomplish this step, refer to the instructions in “Mounting a disk shelf in a rack” on page 2-3.

Attaching the SCSI cable to the disk shelf

The SCSI cable attaches to the personality module installed in the rightmost slot of the disk shelf (see Figure 2-10).

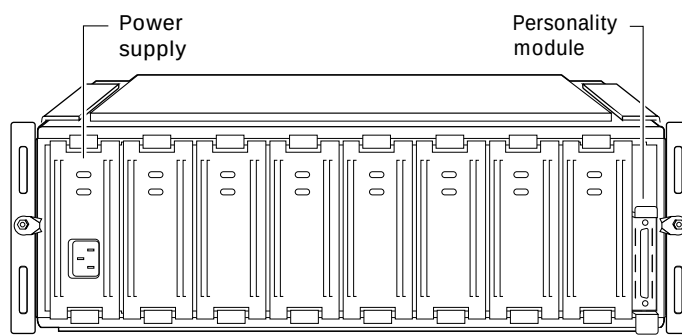


Figure 2-10. Personality module in a single-ended wide disk shelf

Each single-ended wide shelf ships with a 6.56-ft (2-m) SCSI cable that attaches the shelf to the filer. Figure 2-11 illustrates the SCSI cable.

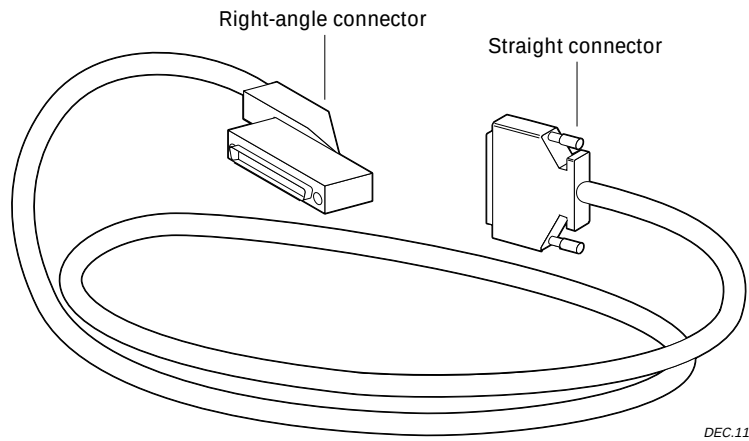


Figure 2-11. SCSI cable that attaches the disk shelf to the filer



NOTE: The SCSI cable ships with color-coded filer connector identification labels for your convenience. Apply matching labels to the connectors on the cable that indicate to which SCSI connector on the filer back panel the cable is attached. For example, if you attach the cable to SCSI connector 9a on the filer, apply a label marked “SCSI PORT #9a” to both connectors on the cable. These labels help you locate the disk shelf for each SCSI channel after system installation.

Follow these steps to connect the SCSI cable to the personality module in the disk shelf:

1. Slide the personality module far enough out of the disk shelf to gain access to the inside SCSI connector:
 - a. Press the mounting tab on the personality module to disengage it as shown in Figure 2-12.
 - b. Carefully slide the personality module out until the inside SCSI connector is exposed.

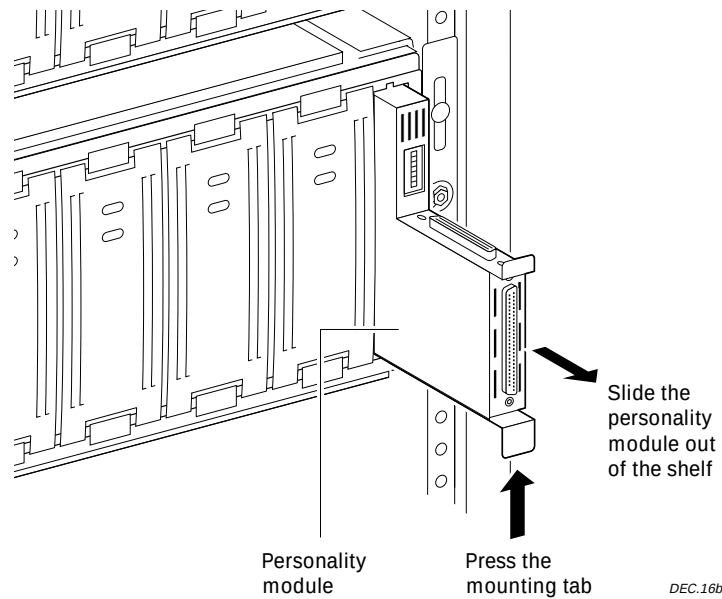


Figure 2-12. Inside SCSI connector on the personality module

2. Attach the right-angle connector of the SCSI cable to the inside SCSI connector on the personality module as shown in Figure 2-13.



CAUTION: When attaching the SCSI cable, make sure that you do not bend the pins in the cable connector. To avoid bending the pins, insert the connector so that all pins engage at the same time and then tighten the captive screws securely for complete pin mating.

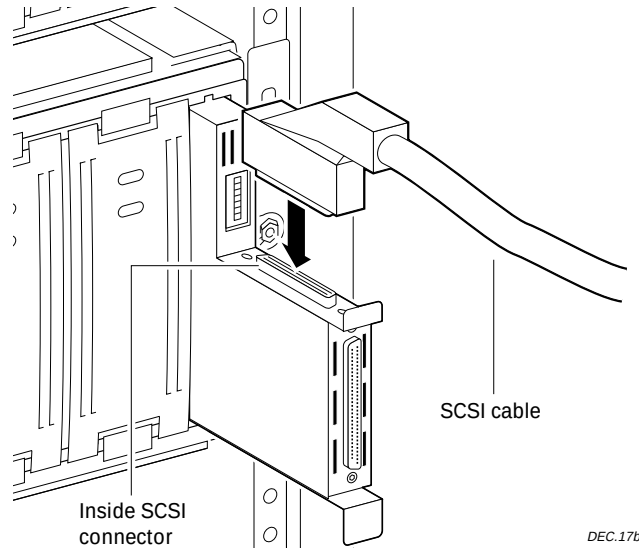


Figure 2-13. Attaching the SCSI cable to the disk shelf

3. Use a #1 Phillips screwdriver to tighten the two captive screws that secure the cable to the personality module.
4. Attach the SCSI cable from the shelf to the SCSI connector on the filer. Refer to the hardware guide that comes with your filer for information about the connector on the filer's back panel.

Installing disks in the disk shelf

Disks are installed in the disk shelf at the factory prior to shipment. You need to install disks in the shelf if you removed disks before attaching the SCSI cable or if you purchased disks separately from your purchase of the shelf.



CAUTION: If you are installing disks into a disk shelf attached to a single-ended wide SCSI card in the filer, you must fill the slots of the disk shelf from right to left, as you face the disk shelf.

To accomplish this step, refer to the instructions in “Installing a disk in a shelf” on page 2-8.

Attaching the disk shelf to a power source

To accomplish this step, refer to the instructions in “Attaching the disk shelf to a power source” on page 2-10.

The installation of single-ended wide disk shelves is now complete.

Installing differential wide SCSI disk shelves

Attach the differential wide disk shelves to the filer in pairs. Installing a pair of disk shelves involves these main steps:

1. Mount a pair of disk shelves in an equipment rack.
2. Install disks in each disk shelf, if necessary.
3. Connect the pair of disk shelves with a short SCSI cable.
4. Attach the first disk shelf in the daisy chain to the filer.
5. Attach each disk shelf to a power source.

Repeat these steps for each additional pair of disk shelves that you use for your system configuration. The following sections describe these steps in greater detail.

Mounting a pair of disk shelves in a rack

To accomplish this step, refer to the instructions in “Mounting a disk shelf in a rack” on page 2-3 and observe the special installation requirements described in the following paragraphs.

Each SCSI connector on the dual-channel differential SCSI card supports two disk shelves. A long SCSI cable attaches the first disk shelf in the daisy chain directly to the SCSI connector on the filer; a short SCSI cable attaches the second disk shelf to the first shelf.

Because of cabling requirements, the first shelf in the daisy chain must be mounted above the second shelf with at least one inch (2.54 centimeters) between the two shelves for routing cables. The cable for connecting the two shelves is 16 inches (40.64 centimeters) long. Figure 2-14 illustrates the disk shelf pair mounted in an equipment rack.

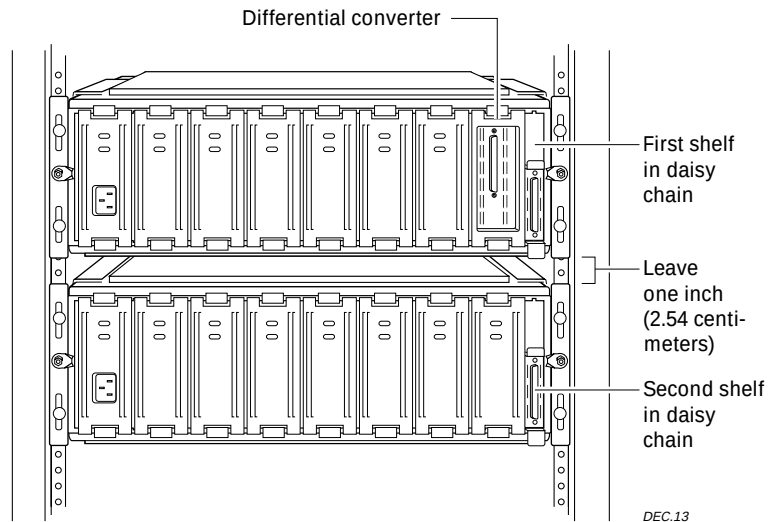


Figure 2-14. Pair of disk shelves mounted in an equipment rack

As Figure 2-14 illustrates, the first shelf in the daisy chain contains a differential converter, while the second shelf in the daisy chain does not.

Installing disks in each disk shelf

Disks are installed in the disk shelf at the factory prior to shipment. If you purchased disks separately from your purchase of the shelf, then you need to install the disks in the shelf.



CAUTION: When you install a disk, you must fill the slots of the first disk shelf in the daisy chain before installing disks in the second shelf. Also, as you face the slots on the shelf, fill the slots from right to left.

To accomplish this step, refer to the instructions in “Installing a disk in a shelf” on page 2-8.

Connecting the pair of disk shelves

This section describes how to cable two disk shelves that are on the same differential SCSI channel. The only equipment you need for cabling the two shelves is a #1 Phillips screwdriver. Each shelf is shipped with a SCSI cable that attaches to it.

The disk shelf that contains a differential converter must be the first shelf in the daisy chain. The disk shelf that does not contain a differential converter must be the second shelf in the daisy chain. This shelf is shipped with a 16-in. (40.64-cm) SCSI cable that connects the two disk shelves. In sections where disk shelves are described, the SCSI cable that connects the two disk shelves is referred to as the “short SCSI cable.” Figure 2-15 illustrates the short SCSI cable.

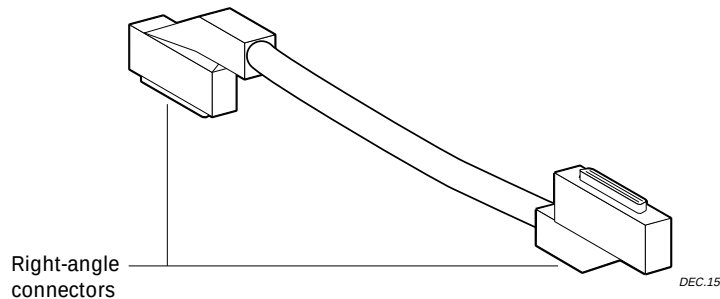
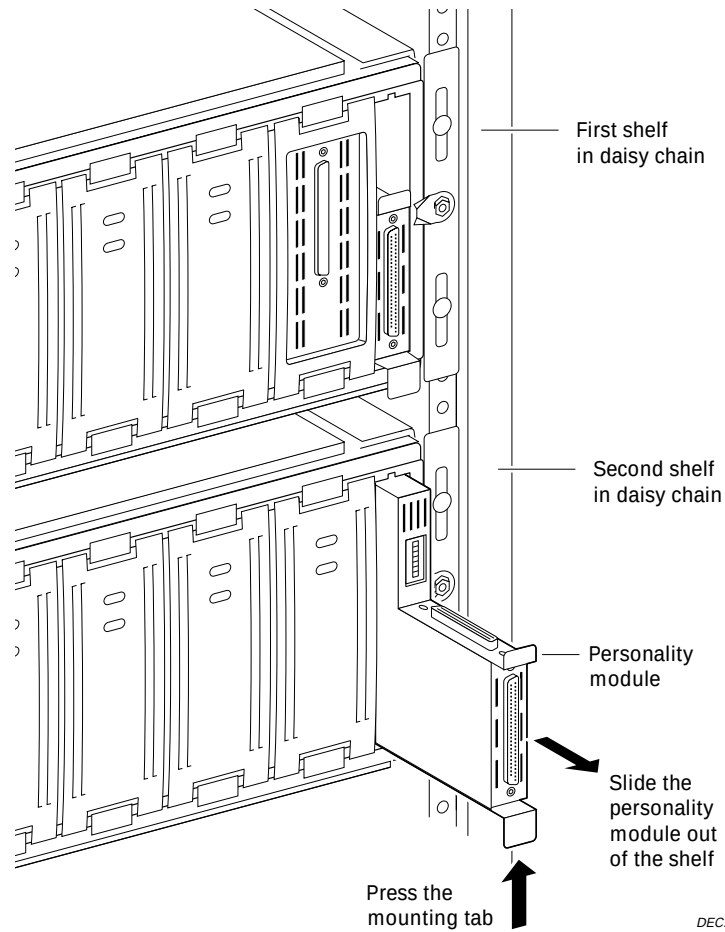


Figure 2-15. Short SCSI cable that connects the two disk shelves

Follow these steps to connect the disk shelf pair using the short SCSI cable:

1. Slide the personality module far enough out of the second shelf to gain access to the inside SCSI connector.
 - a. Press the mounting tab on the personality module to disengage it (see Figure 2-16).
 - b. Carefully slide the personality module out until the inside connector is exposed.



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Figure 2-16. Removing the personality module from the second disk shelf



CAUTION: You don't need to remove the personality module from the shelf to attach the SCSI cable to it. If you do, make sure you put the personality module back into its original shelf and slot after connecting the cable; otherwise, the SCSI ID assignments for both shelves will be wrong. A label on the personality module identifies the module's shelf. You can also compare the DIP switch settings on the modules with the information in Appendix A, "Personality Module DIP Switch Settings."

2. Locate the inside SCSI connector on the personality module that you just removed.
3. Attach one end of the short SCSI cable to the inside SCSI connector (see Figure 2-17).



CAUTION: When attaching the SCSI cable, make sure that you do not bend the pins in the cable connector. To avoid bending the pins, insert the connector so that all pins engage at the same time and then tighten the captive screws securely for complete pin mating.

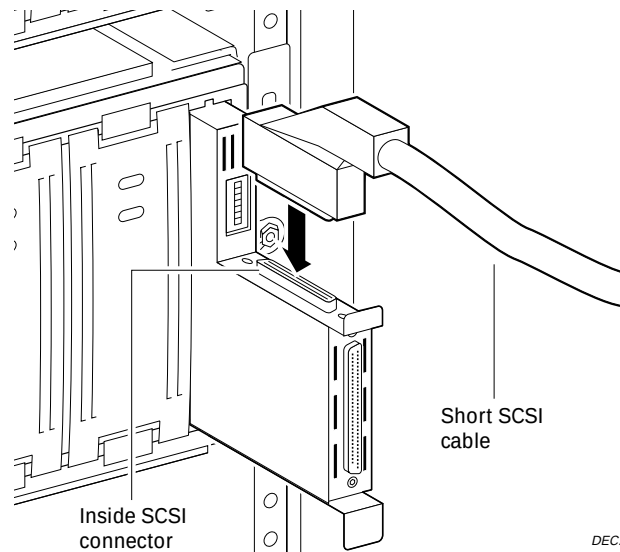


Figure 2-17. Attaching the short SCSI cable to the second disk shelf

4. Use a #1 Phillips screwdriver to tighten the two captive screws that secure the cable.
5. Slide the personality module in the first disk shelf far enough out of the shelf to attach the other end of the short SCSI cable to the inside SCSI connector.
6. Use a #1 Phillips screwdriver to tighten the two captive screws that secure the cable.
7. Insert the personality modules into the disk shelves.



NOTE: The length of the short SCSI cable makes it necessary to install both personality modules into the disk shelves at the same time.

- a. Orient each personality module so that the attached short SCSI cable is on the top.
- b. Insert each personality module into the guide slot on the shelf and push it in until the mounting tab locks in place.

The second disk shelf is now daisy-chained to the first disk shelf.

Attaching the long SCSI cable to the first disk shelf

Use the 2-m (6.56-ft.) SCSI cable that comes with the first disk shelf (a differential converter is installed in this shelf) to attach the first shelf to the filer. In sections where differential wide SCSI disk shelves are described, the SCSI cable that attaches the first disk shelf to the filer is referred to as the “long SCSI cable.” Figure 2-18 illustrates the long SCSI cable.

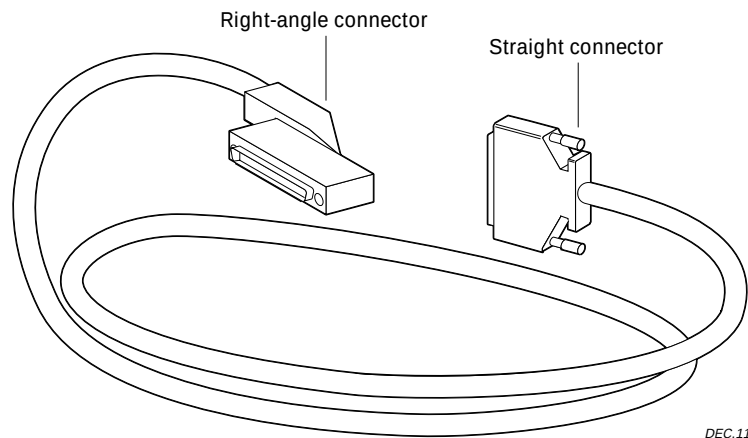


Figure 2-18. Long SCSI cable that attaches the first disk shelf to the filer

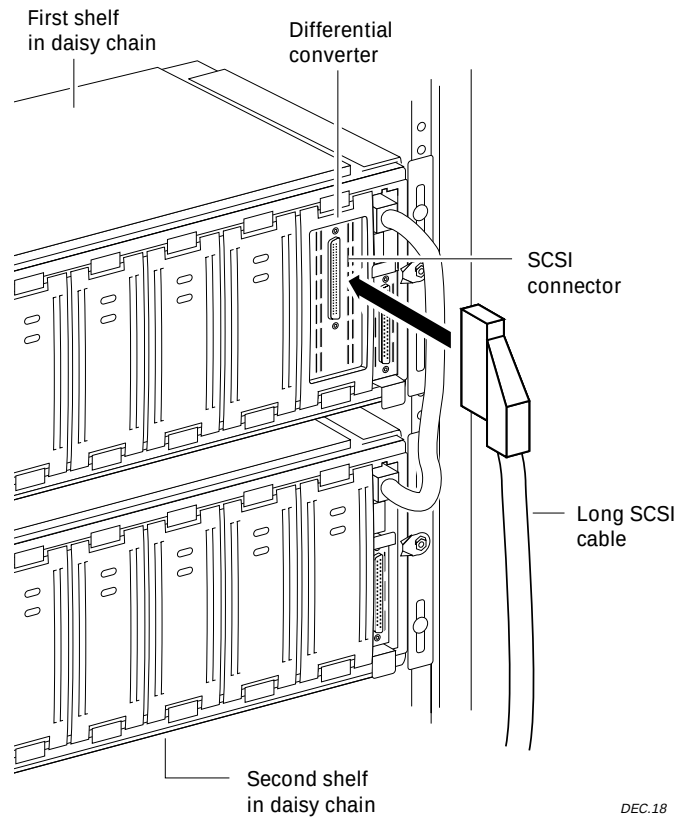


NOTE: The long SCSI cable is shipped with color-coded filer connector identification labels for your convenience. Apply matching labels to the connectors on the cable that indicate to which SCSI connector on the filer back panel the cable is attached. For example, if you attach the cable to SCSI connector 8a on the filer, apply a label marked “SCSI PORT #8a” to both connectors on the cable. These labels help you locate the first disk shelf for each SCSI channel after system installation.

To attach the first disk shelf in the daisy chain to the filer, follow these steps:

1. Locate the SCSI connector on the differential converter of the first shelf.
2. Attach the right-angle connector of the long SCSI cable to the SCSI connector.

Figure 2-19 shows the location of the SCSI connector on the differential converter and how to attach the cable to it.



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Figure 2-19. Attaching the long SCSI cable to the first disk shelf

3. Use a #1 Phillips screwdriver to tighten the two captive screws that secure the cable to the differential converter.

As an example of daisy chain cabling to a filer, Figure 2-20 shows how to attach the first disk shelf to the SCSI connector on a filer in the NetApp F500 series. (The back panel of your filer might look different depending on the series.)

Refer to the hardware guide that comes with your filer for more information about attaching a SCSI cable to the SCSI card.

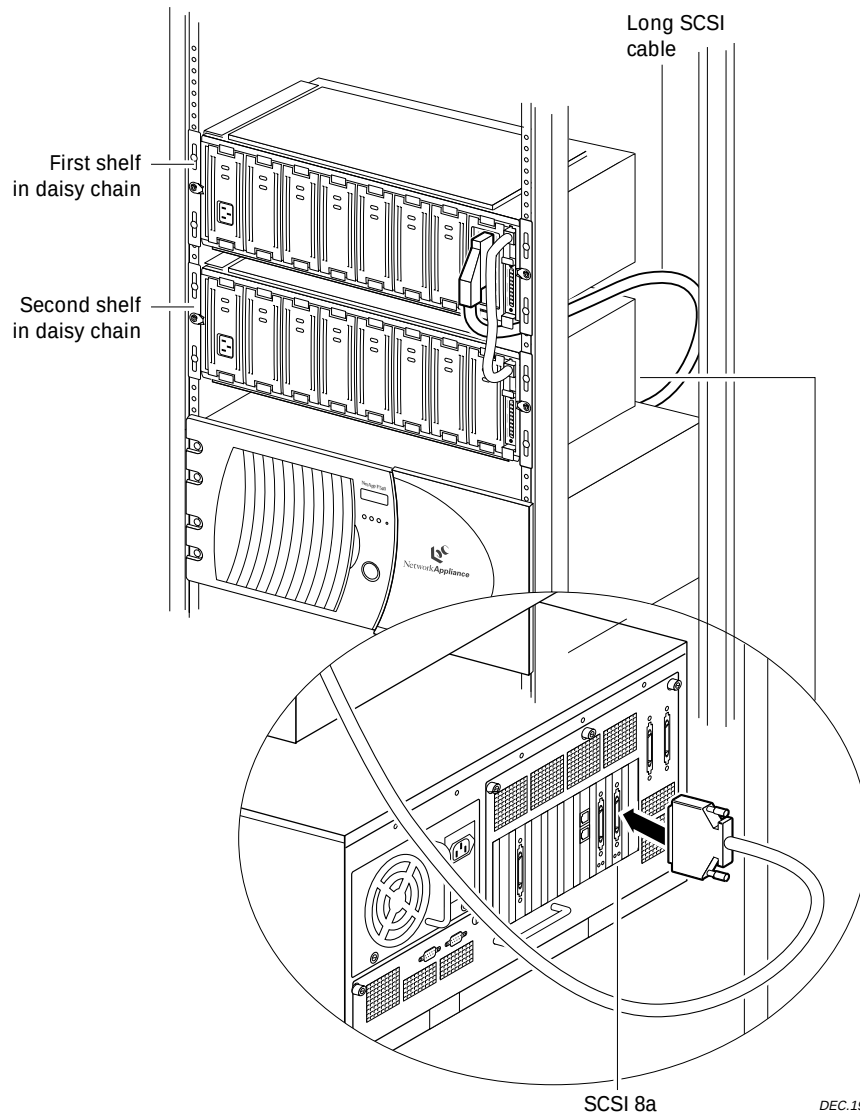


Figure 2-20. Attaching the first disk shelf to the SCSI 8a connector on a NetApp F500 series filer

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Attaching each disk shelf to a power source

To accomplish this step, refer to the instructions in “Attaching the disk shelf to a power source” on page 2-10.

The installation of the differential wide disk shelves is now complete.

Chapter 3: **LEDs on the Disk Shelves**

The disk drives, power supply, and personality module all have LED indicators that provide information on the operational status of the units. This chapter describes how to interpret the LEDs.

LED indicators on disk drives

Each disk in the disk shelf has two LED indicators on its front panel (see Figure 3-1).

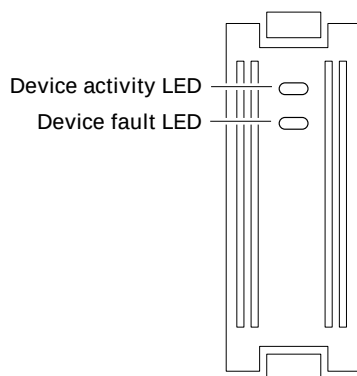


Figure 3-1. LEDs on the disk drive

These LEDs function as follows:

- The upper LED (green) is the device activity LED. It is on or flashing when the disk is active.
- The lower LED (amber) is the device fault LED. When the LED is flashing, it indicates that the disk is spinning up or down during a hot swap procedure, or spinning down because of an error condition. When the LED is on solid, it indicates that the disk has failed.

Table 3-1 describes how to interpret both LEDs.

Table 3-1. LEDs for the disk drive

LEDs	Status	Meaning
Device activity Device fault	On Off	Disk operates normally.
Device activity Device fault	Flashing Off	Disk operates normally.
Device activity Device fault	Off Off	Disk is inactive and there is no fault.
Device activity Device fault	On On	Fault status. Disk may not be responding to control signals and may be bad, or may need to be reset by powering it off and then on again. Use the <code>sysconfig -r</code> command at the system console to determine whether the system detects the disk and can access it. If the system detects the disk and can access it, do a power-off reset. If the problem persists, replace the disk.
Device activity Device fault	Off On	Fault status. Disk is inactive and spun down. Replace the disk.

Table 3-1. LEDs for the disk drive (Continued)

LEDs	Status	Meaning
Device activity Device fault	On Flashing	Disk is spinning up or down during a hot swap procedure, or spinning down because of an error condition.
Device activity Device fault	Off Flashing	Fault status. Disk has been identified by the controller as failed. Replace the disk.

LED indicators on the disk shelf power supply

As Figure 3-2 illustrates, the power supply for the disk shelf contains two green LED indicators.

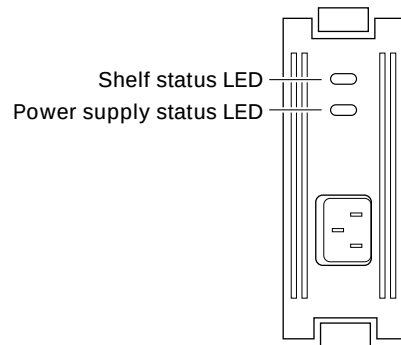


Figure 3-2. LEDs on the disk shelf power supply

These LEDs function as follows:

- The upper LED is the shelf status LED. When it is on, the shelf fans and the power supply are functioning properly. When it is off, either a shelf fan or a power supply is not functioning properly.
- The lower LED is the power supply status LED. It is normally on. When it is off, either there is an input power problem or the power supply is not functioning properly.

Table 3-2 describes how to interpret both LEDs.

Table 3-2. LEDs for the disk shelf power supply

LEDs	Status	Meaning
Shelf status Power supply status	On On	System operates normally.
Shelf status Power supply status	Off On	Fault status. There is a shelf fault; there is no power supply fault. See the disk shelf personality module LEDs to determine which fan has failed, and replace the faulty fan.
Shelf status Power supply status	Off Off	Fault status. There is both a shelf and power supply fault. Replace the power supply.

If your disk shelf is equipped with a redundant power supply, you must observe the LEDs on both power supplies to determine the status of the shelf. Refer to Table 3-3 to interpret LEDs when using two power supplies.

Table 3-3. LEDs for dual power supplies

LEDs	PS 1 ^a	PS 2 ^b	Meaning
Shelf status Power supply status	On On	On On	System operates normally.
Shelf status Power supply status	Off On	Off On	Fault status. There is a shelf fault; there is no power supply fault. See the disk shelf personality module LEDs to determine which fan has failed, and replace the faulty fan.
Shelf status Power supply status	Off On	Off Off	Fault status. Power supply 1 is operational. Replace power supply 2.

Table 3-3. LEDs for dual power supplies (Continued)

LEDs	PS 1 ^a	PS 2 ^b	Meaning
Shelf status	Off	Off	Fault status. Power supply 2 is operational. Replace power supply 1.
Power supply status	Off	On	
Shelf status	Off	Off	Fault status. Possible power supply 1 and power supply 2 fault, or input power problem.
Power supply status	Off	Off	

a. Power supply 1, which is installed in the leftmost slot.

b. Power supply 2 (redundant power supply), which is installed in the second slot from the left.

LED indicators on the personality module

The personality module for the fast, wide SCSI disk shelf contains two amber LED indicators that indicate a fan failure or overtemperature condition. An ambient temperature above $90 \pm 3^{\circ}\text{F}$ ($32 \pm 2^{\circ}\text{C}$) causes both fans to operate at high speed. The LEDs function as follows:

- The upper LED is the fan 2 status LED. It indicates the status of the fan on the right side of the disk shelf, as you face the back of the shelf.
- The lower LED is the fan 1 status LED. It indicates the status of the fan on the left side of the disk shelf, as you face the back of the shelf.

Figure 3-3 illustrates the locations of the LEDs on the disk shelf personality module, and Table 3-4 describes how to interpret both LEDs.

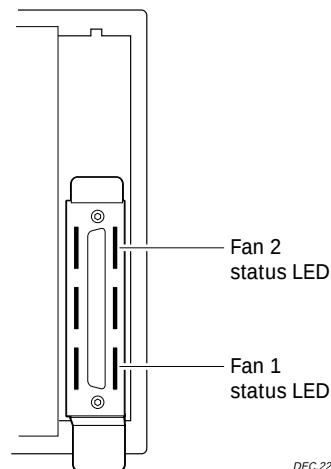


Figure 3-3. LEDs on the disk shelf personality module



NOTE: You must observe the shelf status LED on the disk shelf power supply to determine the status of the shelf fans. For more information about the shelf status LED, refer to “LED indicators on the disk shelf power supply” on page 3-4.

If your disk shelf is equipped with a redundant power supply, the shelf status LEDs on the two power supplies should have the same status and the information in Table 3-4 should apply.

Table 3-4. LEDs for the disk shelf personality module

LEDs	Status	Meaning
Fan 2 status Fan 1 status Shelf status	Off Off On	Both fans operate normally.
Fan 2 status Fan 1 status Shelf status	On On On	Overtemperature condition. Both fans operate at high speed.
Fan 2 status Fan 1 status Shelf status	On Off Off	Fan 2 has failed. Fan 1 operates at high speed. Replace fan 2.
Fan 2 status Fan 1 status Shelf status	Off On Off	Fan 1 has failed. Fan 2 operates at high speed. Replace fan 1.
Fan 2 status Fan 1 status Shelf status	On On Off	Both fans have failed. Replace both fans.

Chapter 4: **Replacing Units in a Disk Shelf**

This chapter describes how to replace units in a disk shelf. It also provides you with information about how to locate disks by their SCSI ID numbers. Before you replace a disk, you usually need to locate it by its SCSI ID as shown in the filer message.



NOTE: Disk shelf slots are labeled to show SCSI ID numbers. The labels are affixed to the top edge of the disk shelf, immediately above each slot.

This chapter does not describe how to replace disks. Refer to “Removing a disk from a shelf” on page 2-7 and “Installing a disk in a shelf” on page 2-8 for the disk removal and installation procedures.

Determining the disk’s SCSI ID number

The disk’s SCSI ID number depends on where the disk is located in the disk shelf. If the shelf is a wide SCSI disk shelf connected to a differential SCSI card in the filer, the SCSI ID number of the disk also depends on the position of the shelf in the daisy chain.



NOTE: You don’t have to set SCSI ID jumpers on disks because the disk shelf automatically sets the SCSI ID depending on the disk’s location.

Single-ended SCSI disk shelves

The disk closest to the shelf's SCSI connectors is assigned SCSI ID 0 and the disk closest to the power supply is assigned SCSI ID 6. Figure 4-1 illustrates the SCSI IDs in a single-ended narrow SCSI disk shelf; Figure 4-2 illustrates the SCSI IDs in a single-ended wide SCSI disk shelf.

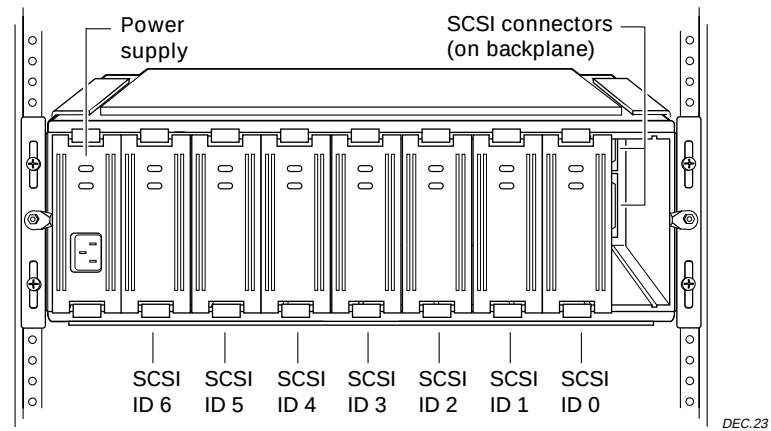


Figure 4-1. SCSI IDs in a single-ended narrow SCSI disk shelf

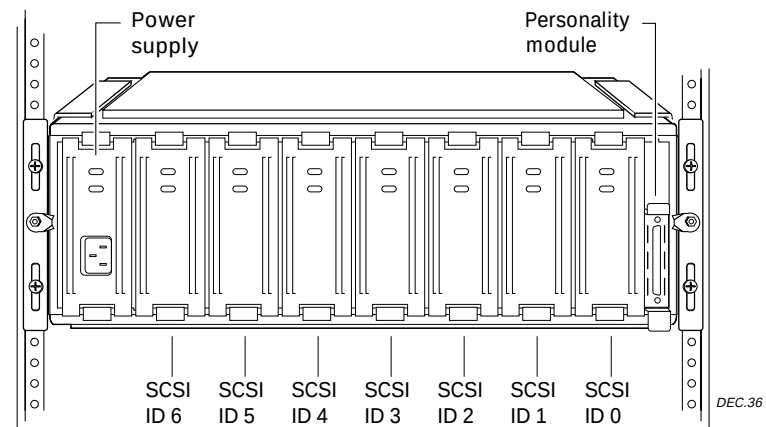


Figure 4-2. SCSI IDs in a single-ended wide SCSI shelf

If the shelf contains an optional redundant power supply, it is installed in the slot adjacent to the first power supply, and the disk closest to the power supply is assigned SCSI ID 5.

Differential wide SCSI disk shelves

In the first disk shelf in the daisy chain, the disk closest to the shelf's differential converter is assigned SCSI ID 1 and the disk closest to the power supply is assigned SCSI ID 6. (If the shelf contains an optional redundant power supply, the disk closest to the power supply is assigned SCSI ID 5.)

Figure 4-3 illustrates the SCSI IDs for disks installed in the first disk shelf in the daisy chain.

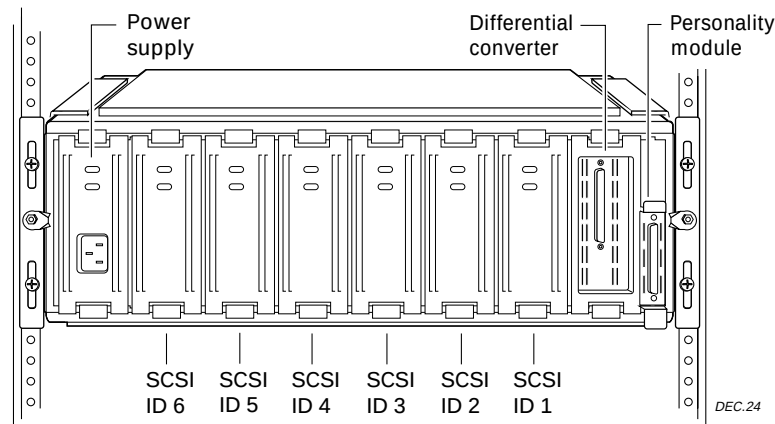


Figure 4-3. SCSI IDs for disks installed in the first disk shelf

In the second disk shelf in the daisy chain, the disk closest to the shelf's personality module is assigned SCSI ID 8 and the disk closest to the power supply is assigned SCSI ID 14. (If the shelf contains an optional redundant power supply, the disk closest to the power supply is assigned SCSI ID 13.)

Figure 4-4 illustrates the SCSI IDs for disks installed in the second disk shelf in the daisy chain.

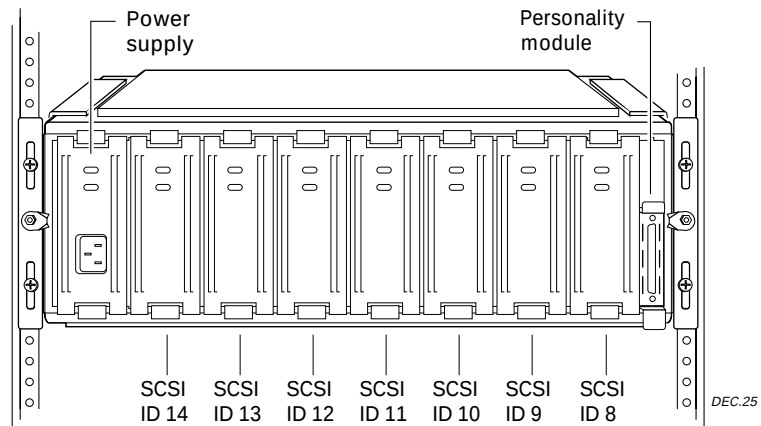


Figure 4-4. SCSI IDs for disks installed in the second disk shelf

Replacing a power supply

This section applies to all Digital disk shelves.

Removing a power supply

Follow these steps to remove a power supply:

1. If your disk shelf is equipped with a single power supply, power off the filer before replacing the power supply.

If your disk shelf is equipped with a redundant power supply, you can leave the filer and the disk shelf powered on, and go to step 5.

2. Shut down the filer.
3. Unplug the power cord of the disk shelf from the AC outlet.
4. Unplug the power cord of the disk shelf from the power supply.
5. Remove the power supply:
 - a. Use both hands to press the mounting tabs on the power supply toward each other to disengage the power supply.
 - b. Slide the power supply out of the shelf.

Installing a power supply

Follow these steps to install a power supply:

1. Orient the power supply so that the LEDs are on the top.
2. Insert the power supply into the guide slot on the shelf and push it in until the mounting tabs lock in place.

Replacing a differential converter

This section applies to wide disk shelves attached to differential wide SCSI cards only. The differential converter is installed in the slot adjacent to the personality module in the first disk shelf of the daisy chain. Figure 4-3 illustrates the location of the differential converter in the first disk shelf.



CAUTION: Static electricity can damage the SCSI card installed in the filer. To avoid damaging the card, shut down the filer and power off the disk shelf before you disconnect the SCSI cable from the differential converter. Because the disk shelf doesn't have an On/Off power switch, you must detach the power cord from the power supply module to turn off the power. In addition, wear an antistatic wrist strap and grounding leash when you disconnect the shelf from the filer.

Removing the differential converter

Follow these steps to remove the differential converter:

1. Shut down the filer.
2. Unplug the disk shelf's power cord from the AC outlet.
3. Detach the SCSI cable from the differential converter.
4. Remove the differential converter from the shelf:
 - a. Use both hands to press the mounting tabs on the differential converter toward each other to disengage the converter.
 - b. Slide the converter carefully out of the shelf.

Installing the differential converter

Follow these steps to install a differential converter:

1. Orient the new differential converter so that the SCSI connector on the front panel is nearest the top edge of the converter.
2. Insert the converter into the guides in the shelf and push the converter into the shelf until the mounting tabs lock in place.



NOTE: The differential converter must be installed in the slot adjacent to the personality module.

3. Attach the SCSI cable to the differential converter.
4. Plug the disk shelf's power cord into the AC outlet.
5. Power up the filer.

Replacing a personality module

This section applies to wide SCSI disk shelves only. The replacement method depends on whether the disk shelf is used with a single-ended or a differential wide SCSI card.

Single-ended wide SCSI

This section describes how to replace a personality module in a wide SCSI disk shelf attached to a single-ended wide SCSI card in the filer.

Removing the personality module

Follow these steps to remove the personality module:

1. Shut down the filer.
2. Unplug the disk shelf's power cord from the AC outlet.
3. Detach the SCSI cable from the personality module.
4. Remove the personality module:
 - a. Press the mounting tab on the personality module to disengage it.
 - b. Carefully slide the module out of the shelf.

Installing the personality module

Follow these steps to install a personality module:

1. Verify that the DIP switches on the new personality module are set exactly the same as on the module you are replacing.



NOTE: The DIP switch settings are described on a label on the personality module (only visible when the module is out of the shelf) and in Appendix A, “Personality Module DIP Switch Settings,” in this guide.

2. Orient the new personality module so that the DIP switches are nearest the top edge of the personality module.

3. Insert the personality module into the guide slot in the shelf and push it into the shelf until the mounting tab locks in place.
4. Attach the SCSI cable to the outside SCSI connector on the personality module.
5. Plug the disk shelf's power cord into the AC outlet.
6. Power up the filer.

Differential wide SCSI

This section describes how to replace a personality module in a wide SCSI disk shelf attached to a differential wide SCSI card in the filer.



NOTE: The personality modules in the two disk shelves are joined by the short SCSI cable. To detach the short SCSI cable from either personality module, you must slide both modules at least part of the way out of the shelf to loosen the two captive screws that secure the cable. If you completely remove both personality modules, make sure that you put each personality module back into its original shelf and slot; otherwise, the SCSI ID assignments for both shelves will be wrong. A label on the personality module indicates whether the personality module belongs in shelf 1 or shelf 2.

Removing the personality module

Follow these steps to remove the personality module:

1. Shut down the filer.
2. Unplug the disk shelf's power cord from the AC outlet.
3. Detach the SCSI cable from the personality module.
4. Remove the personality module:
 - a. Press the mounting tabs on the personality modules to disengage them.

- b. Carefully slide both modules out of the shelf until you can loosen the two captive screws that fasten the cable to the failed personality module.
- c. Pull the failed personality module completely out of the slot.

Installing the personality module

Follow these steps to install a personality module:

1. Verify that the DIP switches on the new personality module are set exactly the same as on the module you are replacing.



NOTE: The DIP switch settings are described on a label on the personality module (only visible when the module is out of the shelf) and in Appendix A, “Personality Module DIP Switch Settings” in this guide.

2. Orient the new personality module so that the DIP switches are nearest the top edge of the personality module.
3. Insert the personality module into the guide slot in the shelf and push it part way into the shelf.
4. Attach the SCSI cable to the inside SCSI connector on the personality module and tighten the two captive screws that secure the cable.
5. Push both personality modules into their shelves until the mounting tab on each module locks in place.
6. Plug the disk shelf's power cord into the AC outlet.
7. Power up the filer.

Replacing a shelf fan

Each disk shelf contains two fans mounted on the back panel of the shelf. These fans take their power from the shelf backplane. Figure 4-5 illustrates the location of the two disk shelf fans.

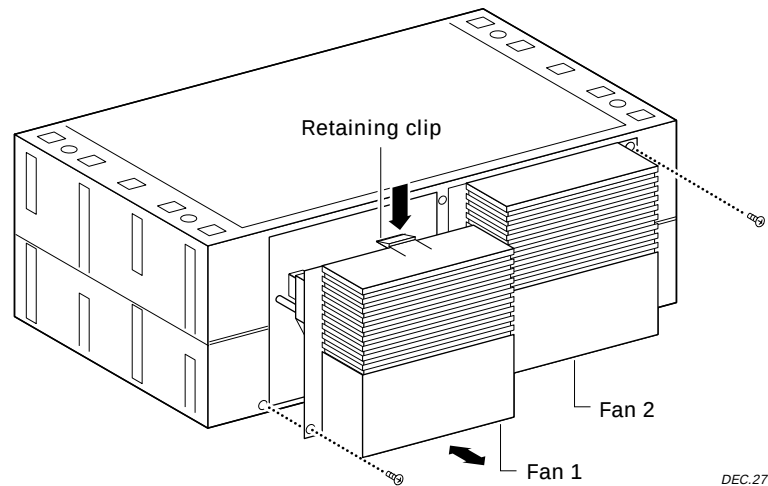


Figure 4-5. Disk shelf fans



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



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

Removing a fan

Follow these steps to remove a fan:

1. Use a #1 Phillips screwdriver to remove the screw that secures the fan to the disk shelf.

- The screw for fan 1 is on the lower left corner.
- The screw for fan 2 is on the upper right corner.

Refer to Figure 4-5 for the location of the screws. Save the screw for reinstalling the fan.

2. Press inward on the top and bottom retaining clips while pulling the fan from the bay. Refer to Figure 4-5 for the locations of the retaining clips.



CAUTION: Do not twist or tilt the fan as you remove it. This can damage the power connector inside the disk shelf. You might feel some resistance from the power connector on the left corner of the fan. Pull the fan carefully but firmly straight out from the disk shelf.

Installing a fan

Follow these steps to install a fan:

1. Turn the fan so that its connector aligns with the system connector inside the disk shelf. Refer to Figure 4-6 for the locations of the connectors.



NOTE: The power connector on the fan is keyed so it can fit into the disk shelf connector only one way.

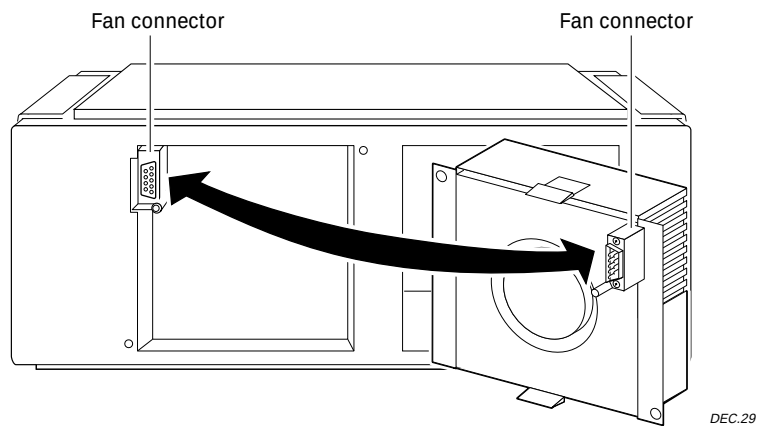


Figure 4-6. Disk shelf fan connection

2. Push the fan into the disk shelf opening until the retaining clips click in place.



CAUTION: Do not twist or tilt the fan as you install it. This can damage the power connector inside the disk shelf. You might feel some resistance in joining the connector on the left corner of the fan housing to the connector on the disk shelf. Push the fan carefully but firmly into the disk shelf.

3. Use a #1 Phillips screwdriver to install the screw that secures the fan to the disk shelf.
 - The screw for fan 1 is on the lower left corner.
 - The screw for fan 2 is on the upper right corner.
4. Power on the filer if it is not already powered on.
5. Check the LEDs on the disk shelf power supply to verify that the disk shelf is operating properly.

For information about LED indicators, refer to Chapter 3, “LEDs on the Disk Shelves.”

Appendix A: Personality Module DIP Switch Settings

This appendix describes the DIP switch settings on the personality module of the wide SCSI disk shelf. The DIP switches are used to set the SCSI IDs of the disks in the shelf and are set at the factory. The DIP switch settings are also described on a label fixed to the personality module (only visible when the module is out of the shelf).



CAUTION: Do not change the DIP switch settings on the personality module of the disk shelf. This appendix provides information for your reference only.

If the disk shelf is attached to a single-ended wide SCSI card, the personality module uses the switch settings shown in Figure A-2.

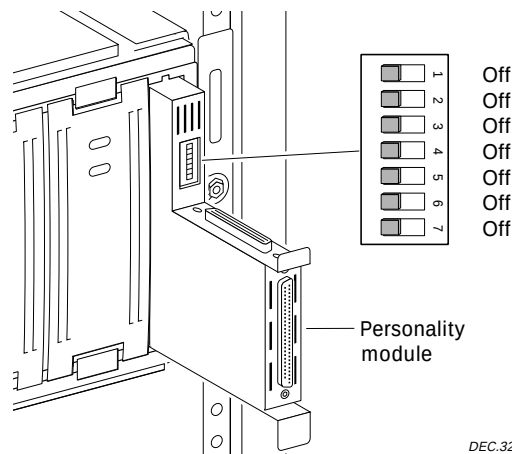


Figure A-1. DIP switch settings on a single-ended wide SCSI disk shelf

If the disk shelf is attached to a differential wide SCSI card as disk shelf 1 in a daisy chain, the personality module uses the switch settings shown in Figure A-2.

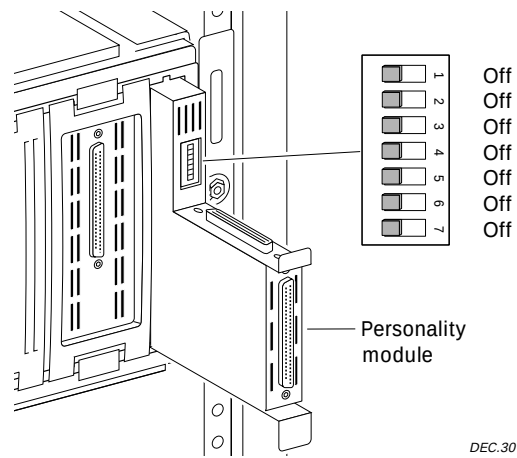


Figure A-2. DIP switch settings on differential wide SCSI disk shelf 1

Disk shelf 2 in a differential disk shelf daisy chain uses the switch settings shown in Figure A-3.

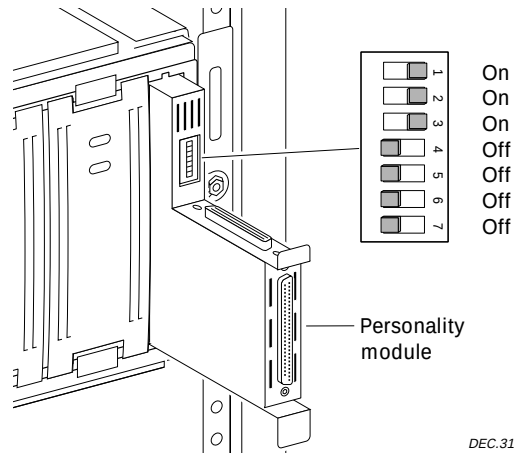


Figure A-3. DIP switch settings on differential wide SCSI disk shelf 2

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