

NetApp[®] NearStore[™]

R150 Hardware and Service Guide

Network Appliance, Inc.
495 East Java Drive
Sunnyvale, CA 94089 USA
Telephone: +1 (408) 822-6000
Fax: +1 (408) 822-4501
Support telephone: +1 (888) 4-NETAPP
Documentation comments: doccomments@netapp.com
Information Web: <http://www.netapp.com>

Part number 210-00313
January 2003

Copyright and trademark information

Copyright information

Copyright © 1994–2003 Network Appliance, Inc. All rights reserved. Printed in the U.S.A.

No part of this book covered by copyright may be reproduced in any form or by any means—graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system—without prior written permission of the copyright owner.

Network Appliance reserves the right to change any products described herein at any time, and without notice. Network Appliance assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by Network Appliance. The use and purchase of this product do not convey a license under any patent rights, trademark rights, or any other intellectual property rights of Network Appliance.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7103 (October 1988) and FAR 52-227-19 (June 1987).

Trademark information

NetApp and the Network Appliance design are registered trademarks of Network Appliance, Inc. in the United States, Canada, and the European Union. Network Appliance is a registered trademark of Network Appliance, Inc. in Monaco and a trademark of Network Appliance, Inc. in the United States and Canada. FAServer is a registered trademark of Network Appliance, Inc. in the United States and the European Union. NetCache is a registered trademark of Network Appliance, Inc. in the European Union and Japan, and a trademark of Network Appliance, Inc. in the United States. SnapCopy is a registered trademark of Network Appliance, Inc. in the European Union and a trademark of Network Appliance, Inc. in the United States. WAFL is a registered trademark of Network Appliance, Inc. in the United States, the European Union, and Canada. FilerView, SecureShare, SnapManager, SnapMirror, and SnapRestore are registered trademarks of Network Appliance, Inc. in the United States. Data ONTAP is a trademark of Network Appliance, Inc. in the United States and Canada. Snapshot is a trademark of Network Appliance, Inc. in the United States and the European Union. NetApp—the Network Appliance Company is a registered trademark of Network Appliance, Inc. in the United States and other countries. ApplianceWatch, BareMetal, Center-to-Edge, ContentDirector, DataFabric, MultiStore, NearStore, SecureAdmin, Serving Data by Design, Smart SAN, SnapCache, SnapDrive, SnapVault, Vfiler, and Web Filer are trademarks of Network Appliance, Inc. in the United States.

Network Appliance is a licensee of the CompactFlash and CF Logo trademarks.

All other brands or products are trademarks or registered trademarks of their respective holders and should be treated as such.

Table of Contents

	Preface	vii
	Safety Information (Sicherheitshinweise)	ix
Chapter 1	Preparing for the Installation.	1
	Required tools, equipment, and documentation	2
	R150 component and environmental parameters	4
	R150 storage engine	5
	R150 disk shelf	7
	Installation rules and restrictions	9
Chapter 2	Installing an R150 System	11
	Installing an R150 disk shelf	12
	Disk shelf fundamentals	13
	Installing an R150 disk shelf using two-post mounting brackets	15
	Installing an R150 disk shelf using the four-post rail kit	19
	Installing an R150 storage engine	21
	Installing in a four-post equipment rack	22
	Installing in a two-post equipment rack	24
Chapter 3	Connecting an R150 System	27
	Connecting an R150 disk shelf	28
	Disk shelf connections for a 24-TB system	29
	Disk shelf connections for a 12-TB system	31
	Securing the cables	33
	Connecting an R150 storage engine to third-party devices.	35
	Connecting to a third-party SCSI tape backup device	37
	Connecting to a third-party Fibre Channel switch	39
	Connecting an R150 storage engine to an Ethernet network	42
	Connecting through an RJ-45 connection	44
	Connecting to a fiber optic GbE network	47
	Connecting to a Fibre Channel network	50
	Connecting the remote management card	52

Chapter 4	Powering On an R150 System	55
	Connecting the storage engine to an ASCII terminal console	56
	Connecting the system to a power source and powering on	58
	Connecting the disk shelves to AC power	59
	Connecting the storage engine to AC power.	61
 Chapter 5	 Startup Responses on an R150 System.	 63
	Storage engine LED responses at startup.	64
	Front panel LEDs.	65
	FC-AL/FC HBA LEDs.	67
	GbE NIC LEDs.	69
	Remote management card LEDs	72
	Power supply LEDs	74
	Disk shelf LED responses at startup	75
 Chapter 6	 Replacing R150 Disk Shelf Components.	 77
	Replacing a disk shelf in a rack.	78
	Replacing a disk in a disk shelf.	80
	Removing a disk from a disk shelf.	81
	Installing a disk in a disk shelf	82
	Replacing a power supply in a disk shelf.	84
	Removing a power supply from a disk shelf.	85
	Installing a power supply in a disk shelf	87
	Replacing the EMU.	88
	Removing the EMU from the disk shelf	89
	Installing an EMU in a disk shelf	90
	Replacing the cooling fans and blower	91
 Chapter 7	 Replacing R150 Storage Engine Components.	 93
	Field-replaceable unit overview	94
	Opening the PCB carrier	95
	Removing the PCB carrier	97
	Replacing the motherboard	99
	Replacing the motherboard lithium battery.	102
	Replacing the memory card assembly	104

	Replacing SDRAM DIMMs on the memory card assembly	107
	Installing or replacing expansion adapters	110
	Closing the PCB carrier.	116
	Replacing fan subassemblies	117
	Replacing the power supplies.	121
	Replacing the control panel subassembly	125
Chapter 8	Error Messages and Troubleshooting	129
	Startup error messages	130
	POST error messages.	133
	Boot error messages	139
	Remote management card e-mail notifications.	143
	Operational error messages	145
Appendix A	Recommended Power Line Sizes	147
	Recommended AC power line sizes	148
Appendix B	Communications Regulations.	149
	Regulatory notices	150
	Declaration of Conformity	152
	Index	153

Preface

About this guide

This guide describes how to install a NetApp® NearStore™ R150 storage system, connect it to the network, and start it up.

Audience

This guide is for system administrators who are familiar with operating systems that run on the storage system's clients, such as UNIX®, Windows 95™, Windows NT®, Windows® 2000, and Windows XP. The procedures in this guide describe replacement, upgrade, and maintenance tasks for personnel with the following skills and experience:

- ◆ Working familiarity with small computer system hardware and operation
- ◆ Basic understanding of common networking concepts and practices
- ◆ Working familiarity with accepted tools and procedures for installing and operating sensitive electronic equipment

Terminology

This guide uses the following terms:

- ◆ *R150 or R150 system* refers, at a minimum, to an R150 storage engine and 5 or 9 connected R150 SCSI disk shelves, depending on your configuration.
- ◆ *Disk shelf* refers to an R150 disk shelf.
- ◆ *Storage engine*, or *R150 storage engine*, refers to the “controller unit” that the disk shelves are attached to.

Note

In the Data ONTAP™ software documentation that came with your R150, the term *filer* is used in place of the term *storage engine*. For this instance, the terms *filer* and *storage engine* refer to the same physical component of the storage system; that is, the device that oversees the flow of data to and from the disk shelves.

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 says 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.
Monospaced font	◆ Command and daemon names. ◆ Information displayed on the system console or other computer monitors. ◆ The contents of files.
Bold monospace 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.

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.

Safety Information (Sicherheitshinweise)

Safety rules

All products are class 1 laser devices. You must follow these safety rules when working with this equipment:

WARNING

Failure to follow these directions could result in bodily harm or loss of life.

When installing disk shelves and a storage appliance into a movable cabinet or rack, install from the bottom up for best stability.

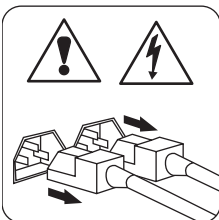
- ◆ DC-based systems must be installed in a restricted access location and the two input power terminals for the DC power supply must be connected to separate isolated branch circuits.
- ◆ To reduce the risk of personal injury or equipment damage, allow internal components time to cool before touching them and ensure that the equipment is properly supported or braced when installing options.
- ◆ This equipment is designed for connection to a grounded outlet. The grounding type plug is an important safety feature. To avoid the risk of electrical shock or damage to the equipment, do not disable this feature.
- ◆ This equipment is furnished with one or more replaceable batteries. There is danger of explosion if the battery is incorrectly replaced. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Warning for units with multiple power cords

If your storage appliance or disk shelf has multiple power cords and you need to turn the unit off, heed the following warning:

WARNING

This unit has more than one power supply cord. To reduce the risk of electrical shock, disconnect all power supply cords before servicing.



Sicherheitsvorgaben

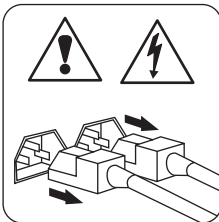
Alle Produkte sind Lasergeräte der Klasse 1. Die folgenden Sicherheitshinweise sind beim Betreiben des Geräts unbedingt zu beachten:

Vorsicht

Nichtbeachtung dieser Anweisungen kann zu schweren Körperschäden führen oder tödlich sein.

- ◆ Bei der Montage der Diskettenregale und Archivierungsgeräte, des NetCache™ -Geräts oder des NearStore™ -Systems in bewegliche Schränke oder Regale sind die Geräte von unten nach oben einzubauen, um optimale Stabilität zu gewährleisten.
- ◆ Gleichstrom-Systeme müssen an Betriebsstätte mit beschränktem Zutritt installiert sein und die beiden Eingangsstromklemmen für das Gleichstrom-Netzteil müssen an separate und isolierte Abzweigungen angeschlossen sein.
- ◆ Zum Schutz vor Körperverletzung oder Sachschäden am Gerät lassen Sie die inneren Bauteile stets vor dem Berühren abkühlen. Sorgen Sie dafür, dass das Gerät richtig abgestützt ist oder fest aufrecht steht, bevor Sie neues Zubehör einbauen.
- ◆ Dieses Gerät ist für die Einspeisung aus einer geerdeten Netzverbindung ausgelegt. Der Netzstecker mit Erdungsvorrichtung ist ein wichtiger Sicherheitsschutz. Zum Schutz vor elektrischem Schlag oder Sachschäden am Gerät die Erdung nicht abschalten.
- ◆ Das Gerät ist mit einer oder mehreren auswechselbaren Batterien ausgestattet. Bei unsachgemäßem Auswechseln der Batterie besteht Explosionsgefahr. Batterien nur mit dem vom Hersteller empfohlenen Typ oder entsprechenden Typen ersetzen. Gebrauchte Batterien sind gemäß den Anweisungen des Herstellers zu entsorgen.

Warnhinweis für Geräte mit mehrfachen Netzan-schlussleitungen



Sollte Ihr Archiviergerät, NetCache-Gerät, NearStore-System oder Diskettenregal mehrfache Netzan-schlussleitungen aufweisen und Sie wollen das Gerät abschalten, bitte folgenden Warnhinweis beachten.

ACHTUNG

Gerät besitzt zwei Netzan-schlussleitungen. Vor Wartung alle Anschlüsse vom Netz trennen.

About this chapter

This chapter specifies the preparation requirements for a first-time installation of an R150.

The preparation requirements include tabulated descriptions of site requirements, lists of required tools and equipment, and rules for the installation of an R150.

Note

This guide does not provide the process for configuring your new R150. However, it does provide a list of the hardware equipment you require to configure your R150.

Topics in this chapter

This chapter discusses the following topics:

- ◆ “[Required tools, equipment, and documentation](#)” on page 2
- ◆ “[R150 component and environmental parameters](#)” on page 4
- ◆ “[Installation rules and restrictions](#)” on page 9

Required tools, equipment, and documentation

Equipment you should receive

In addition to this guide, your R150 contains the following components:

- ◆ One storage engine and bezel
- ◆ Nine disk shelves for 24 TB systems, or 5 disk shelves for 12 TB systems
- ◆ 42U storage equipment cabinet, or rack mounting hardware and installation kit for the storage engine and disk shelves.
- ◆ A DB-9 to DB-9 straight-through serial cable and a DB-9 to RJ-45 adapter for an ASCII terminal connection
- ◆ SCSI cables for connecting the storage engine to the disk shelves
- ◆ A disposable antistatic grounding leash
- ◆ User manuals
- ◆ Shelf and storage engine power cables
- ◆ Cabinet power cable sets with IEC or NEMA plugs (for systems sold with a storage cabinet)

Required tools and equipment

To install the R150 components in an equipment rack, you need the following tools and equipment:

- ◆ Phillips screwdrivers (#0, #1, and #2)
- ◆ #10-32 steel screws for fastening the storage engine to the rack
- ◆ Antistatic wrist strap and grounding leash

Caution

The R150 uses electronic components that are sensitive to static electricity. Static discharge from your clothing or other fixtures around you can damage these components. Always wear an antistatic wrist strap and attach the grounding leash so that you are appropriately grounded before touching any electronic components.

Required configuration equipment

To configure your system, you need the following equipment on site:

- ◆ ASCII terminal (also referred to as an ANSI terminal)
- ◆ Serial console
- ◆ Communications server
- ◆ Null modem cable (optional if the DB-9 to DB-9 serial cable for an ASCII terminal connection is not compatible with your terminal connector.)

Required documentation

The following table lists documentation you might need to help manage the R150.

Document name	When to use	Where to find
<i>Site Requirements Guide</i>	Use this guide to assist you in preparing your site for your new R150.	Document package, and online at now.netapp.com
<i>Data ONTAP Release Notes</i>	Use this document to see what is new with your appliance, for a list of new procedures that didn't make the user documentation, and for a listing of the changes since the last release of the Data ONTAP software.	Media kit with CD
<i>System Configuration Guide</i>	Use this guide to determine which NICs are supported by the storage engine.	Online at now.netapp.com
<i>Data ONTAP System Administrator's Guide</i>	Use this guide to configure your system software.	Document package, and online at now.netapp.com

R150 component and environmental parameters

Installation considerations

When planning your R150 installation, you must consider the following:

- ◆ Physical characteristics, such as height and weight
- ◆ Environmental requirements, such as temperature and humidity
- ◆ Space requirements that you must have around the storage engine
- ◆ Electrical requirements

R150 system environmental conditions

The following table lists the environmental conditions that your site must meet to properly run or store your storage engine and disk shelves.

Environmental condition	Operating condition	Storage condition
Temperature range	50° F to 104° F (10° C to 40° C)	-4° F to 149° F (-20° C to 65° C)
Relative humidity (noncondensing)	10% to 90%	10% to 90% in original shipping container; otherwise, 50%.

Freestanding equipment rack requirements

The freestanding equipment rack must meet the following requirements:

- ◆ A width of 19 inches (48.26 cm)
- ◆ Front installation rails compliant with EIA standard EIA-310-D

For detailed information

For details about R150 component and environmental parameters, see the following topics:

- ◆ [“R150 storage engine”](#) on page 5
- ◆ [“R150 disk shelf”](#) on page 7

R150 storage engine

Physical characteristics

The following table lists the physical characteristics of the storage engine.

Characteristics	U.S.	Metric
Height	10.3 in. or 6U, where 1U = 1.75 in.	26.2 cm
Width	17.0 in.	43.2 cm
Depth	22.0 in.	55.9 cm
Weight fully loaded	105.0 lbs	47.7 kg

Space requirements

The following table describes the recommended minimum clearance for the storage engine.

Recommended minimum clearance	U.S.	Metric
Front clearance	9.0 in.	22.9 cm
Rear clearance	30.0 in.	76.2 cm
Bezel clearance	1.5 in.	3.8 cm

Electrical requirements

The following table lists the AC power electrical requirements for the storage engine.

Condition	Requirement
AC power supply	88V to 264V AC single phase
Maximum rated current per AC input	12 to 6A RMS at 100 to 240V AC
Typical current per AC input	3.8A at 100V AC

Condition	Requirement
Inrush current	30A maximum at 264V AC per power supply
Frequency	50 to 60 Hz

Power	Rating
Watts	330 maximum (with Power Factor correction)
BTU/hr	1,126 maximum

Note

For detailed environmental and electrical information, see the *Site Requirements Guide*.

R150 disk shelf

Physical characteristics

The following table lists the physical characteristics for each disk shelf.

Characteristics	U.S.	Metric
Height	7.0 in. or 4U, where 1U = 1.75 in.	17.8 cm
Width	17.0 in.	43.2 cm
Depth	22.0 in.	55.9 cm
Weight fully loaded	55 lbs	25 kg

Environmental specifications for each disk shelf enclosure

The following table lists the environmental operating specifications for each disk shelf.

Condition	Requirement
Power input	115/230V AC, 2.2A, 50/60 Hz, auto-sensing
Power output	200W (max.)
Steady state current	1.8/0.95A at 100/200V
Inrush current	50 Apk/2.5msec. @ 120V AC, or 60 Apk/2.5msec. @ 200V AC.
Temperature	41° to 104°F (5° to 40°C)
Humidity	5% to 95%, noncondensing
Operating shock	5G's at 8mS
Operating vibration	0.100G rms for 10–300Hz, 0.88G rms for 301–500Hz
Altitude	-650 to 10,000 feet

**Electrical
requirements for
the entire R150
system**

The following table lists the AC power electrical requirements for the entire R150 system with 24 TB capacity.

Power	Rating
Current	8.5A (steady state; 200V AC)
Watts	2,100 (steady state current)
BTU/hr	7,167

Installation rules and restrictions

General rules and restrictions

Observe the following rules and restrictions when installing an R150:

- ◆ You must wear an antistatic wrist strap when you handle electronic equipment.
- ◆ You must work with two other people when installing the storage engine.

WARNING

The storage engine is extremely heavy. Three people are required to install the storage engine when both power supplies are installed. Two people are required to install the disk shelves safely into a rack or NetApp® System Cabinet.

Rules for arranging the components in the rack

Observe the following rules when arranging the components in a rack for an R150:

- ◆ The R150 storage engine supports either 5 or 9 disk shelves.
- ◆ A 24 TB R150 is designed to be arranged in the equipment rack with five disk shelves on the bottom, followed by the storage engine, followed by four disk shelves installed above the storage engine. For a 12 TB R150, no disk shelves are installed above the storage engine.
- ◆ Only install the number of disk shelves supported by your storage engine. Go to the System Configuration Guide at <http://now.netapp.com> to determine the current storage limit for your model.

About this chapter

This chapter provides the information you need to install an R150 system into a rack.

Topics in this chapter

This chapter describes the following topics:

- ◆ [“Installing an R150 disk shelf”](#) on page 12
- ◆ [“Installing an R150 storage engine”](#) on page 21

Installing an R150 disk shelf

About this section

This section provides all the information you need to install an R150 disk shelf into a rack.

For detailed information

For details about installing an R150 disk shelf, see the following topics:

- ◆ [“Disk shelf fundamentals”](#) on page 13
- ◆ [“Installing an R150 disk shelf using two-post mounting brackets”](#) on page 15
- ◆ [“Installing an R150 disk shelf using the four-post rail kit”](#) on page 19

Disk shelf fundamentals

Supported disk drives

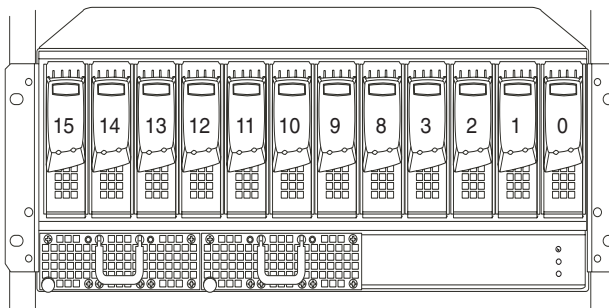
Each R150 disk shelf supports twelve 250-GB ATA hard disk drives with an actual storage capacity of 212 GB per hard drive after formatting.

Disk drive labeling

Each disk drive is labeled with a unique SCSI address, which helps define its location within the disk shelf. Addresses are assigned to each drive bay beginning right to left in four groups, corresponding to the disks supported by each bridge in the disk shelf.

	SCSI address	Drive bay number
Bridge 1	0	0
	1	1
	2	2
	3	3
	4	SES device
reserved	5	unused
	6	unused
	7	SCSI adapter
Bridge 2	8	4
	9	5
	10	6
	11	7
Bridge 3	12	8
	13	9
	14	10
	15	11

Therefore, the 12 drive bays in the disk shelf are labeled between 0 and 15 from right to left with SCSI addresses 4, 5, 6, and 7 reserved for other internal functions. The SCSI address labels are shown in the following illustration.



Enclosure services monitoring

The R150 uses the enclosure services monitoring method to monitor environmental conditions of the disk shelf. Enclosure services conditions are communicated to the storage engine through the EMU module.

The following table describes the four stages of enclosure services monitoring.

Stage	Device	What it does...
1	Storage engine	Uses a subset of SCSI-3 commands to monitor the disk shelf for data related to disk presence, temperature, power supply units, and fan status.
2	Disk shelf	The SCSI-ATA bridge requests information from the EMU.
3	Disk shelf	The EMU returns the environmental data to the bridge.
4	Disk shelf	The bridge returns EMU data to the storage engine.

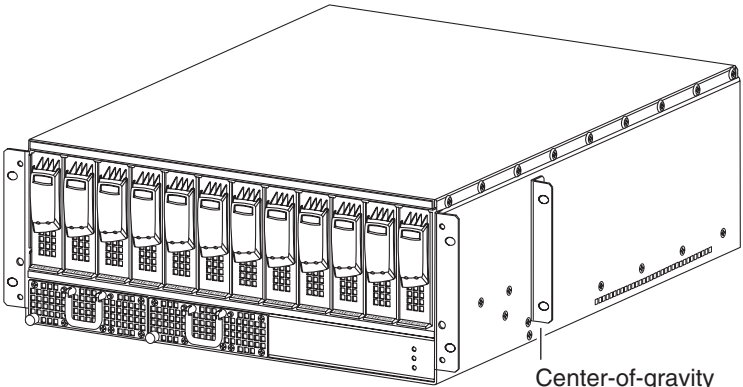
Installing an R150 disk shelf using two-post mounting brackets

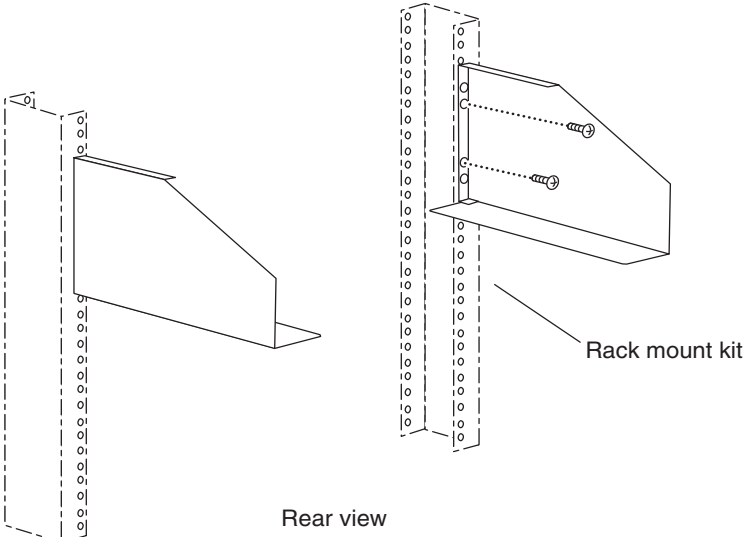
Installing the disk shelf

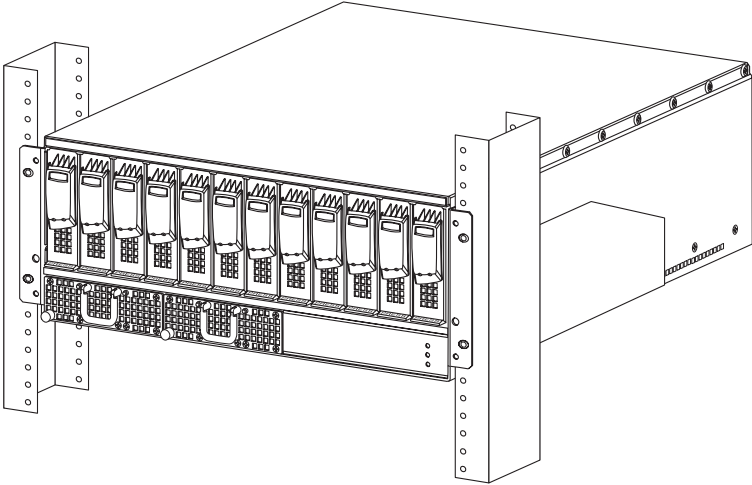
To install the disk shelf using two-post mounting brackets, complete the following steps.

WARNING — You must install each disk shelf with either the two Telco brackets or the center-of-gravity brackets that came with the rack mounting hardware kit in your shipment package. Do not ear-mount the R150 into a Telco-type rack without Telco support brackets; the R150 disk shelf will collapse from the rack under its own weight.

Step	Action	
1	Put on the antistatic wrist strap and grounding leash.	
2	If the disk shelf is...	Then...
	Part of a new R150 that you are installing	Install the storage engine and disk shelves according to the recommended component arrangement; see “ Rules for arranging the components in the rack ” on page 9.
	A replacement shelf	Carefully replace the previous shelf in the rack with the newer shelf; see “ Replacing a disk shelf in a rack ” on page 78.
3	Select two holes on each side of the rack for the installation.	

Step	Action	
4	If you are using the...	Then...
	Center-of-gravity bracket kit	1. Select two holes in the middle of each side of the disk shelf to which you want to attach the brackets and secure the brackets with the #10 Phillips head screws. 2. Align the holes on the rack to the holes on the bracket and secure the disk shelf to the rack with the mounting screws. The following illustration shows an R150 disk shelf with a center-of-gravity bracket installed.  Center-of-gravity bracket installed

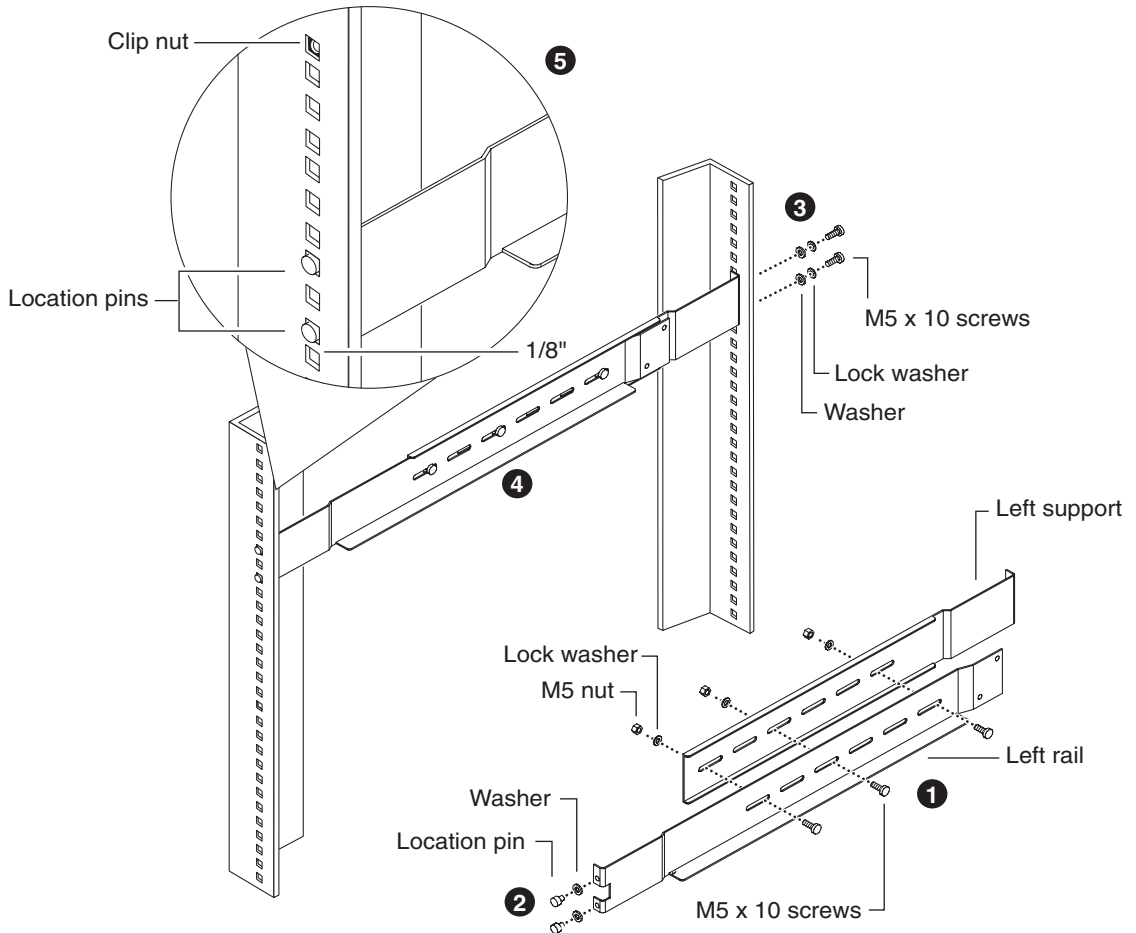
Step	Action	
	If you are using the...	Then...
	Rack mount kit	1. Align the rack mount kit to the holes. Note _____ You might need another person to help hold the rack steady. 2. Insert the mounting screws through the two inner holes of the mounting bracket. Tighten the screws so that the mounting bracket is firmly attached to the Telco rack. Repeat for the opposite mounting bracket.
The following illustration shows the rear view of the rack mount kit being installed.  Rack mount kit Rear view		

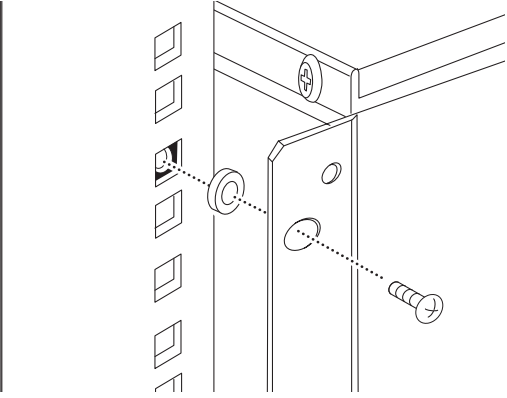
Step	Action	
	3. Install the disk shelf onto the rack mount kit and retain it to the Telco-type rack. The following illustration shows an R150 disk shelf being attached using the rack mount kit. 	
5	Repeat the disk shelf installation for each disk shelf until five disk shelves are installed together from the bottom of the rack.	
6	Go to “ Installing an R150 storage engine ” on page 21 for instructions about installing the storage engine.	
7	If you are installing a...	Then...
	12 TB system	Go to Step 8
	24 TB system	Repeat the disk shelf installations for the remaining four disk shelves above the storage engine.
8	Go to “ Connecting an R150 System ” on page 27.	

Installing an R150 disk shelf using the four-post rail kit

Installing the disk shelf

To install the R150 disk shelf using the four-post rail kit, complete the following steps, using the illustration for reference.



Step	Action
1	Connect the left support with the left rail using three M5 nuts, three lock washers, and three M5 x 10 screws. Leave them loose enough so that you can adjust the length of the rail.
2	Align the holes in the front of the assembled rail with the front post of the four-post rack, and secure it to the post with two location pins and washers.
3	Attach the rear of the assembled rail to the rear post using two M5 x 10 screws, washers, and lock washers, then tighten the rail and support.
4	Repeat Steps 1 through 3 for the right support rail.
5	Install the clip nuts for the disk shelf into the equipment rack posts. Only one clip nut is required per side, located seven holes above the top location pin of the mounting bracket.
6	Slide your R150 disk shelf onto the support rails. Before securing the disk shelf to the rack, be sure to install the supplied spacers between the mounting flange of the disk shelf and the mounting post of your rack, as shown in the following illustration. Tighten the disk shelf to the rack with the mounting screws. 

Installing an R150 storage engine

About this section

This section describes your options for installing an R150 storage engine in a freestanding 19-inch equipment rack.

For detailed information

For details about installing an R150 storage engine, see the following topics:

- ◆ [“Installing in a four-post equipment rack”](#) on page 22
- ◆ [“Installing in a two-post equipment rack”](#) on page 24

WARNING

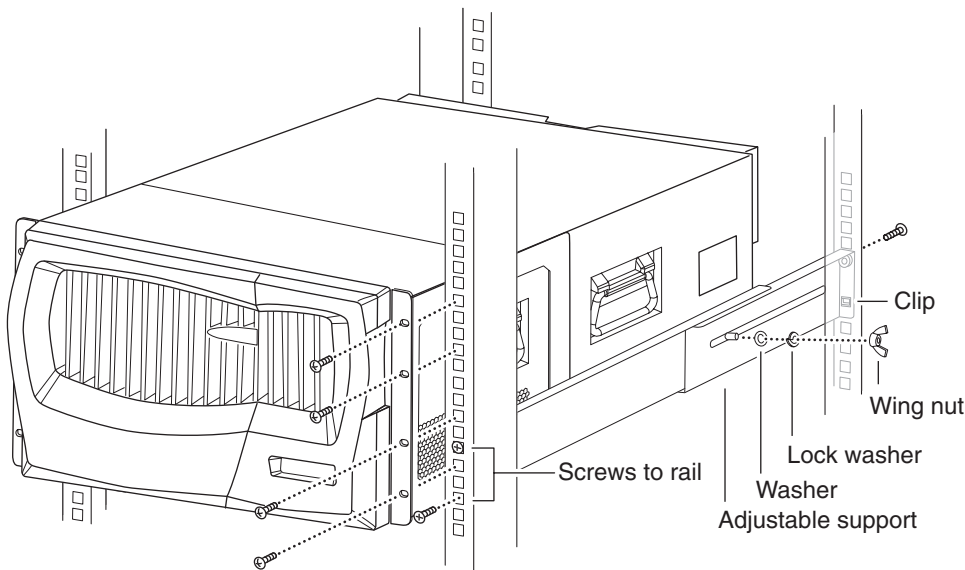
The storage engine is extremely heavy. To avoid personal injury, three people are required to install the storage engine when both power supplies are installed. When you install disk shelves and a storage engine into a rack, you must install the equipment from the bottom up to ensure the greatest stability.

Installing an R150 storage engine

Installing in a four-post equipment rack

Installing the storage engine

To install your storage engine in a four-post equipment rack, complete the following steps using the figure for reference.



Step	Action
1	Attach the clip of each adjustable support to the appropriate slot of each rear post in the equipment rack.
2	Using the wing nut to adjust the length of the support, align the adjustable supports so that they fit between the front and back posts of the rack.
3	Secure each adjustable support to the front post of the rack using two of the supplied #2 Phillips screws, then tighten the wing nut. Use a level to ensure that the adjustable supports are secured in the correct holes in the rack.

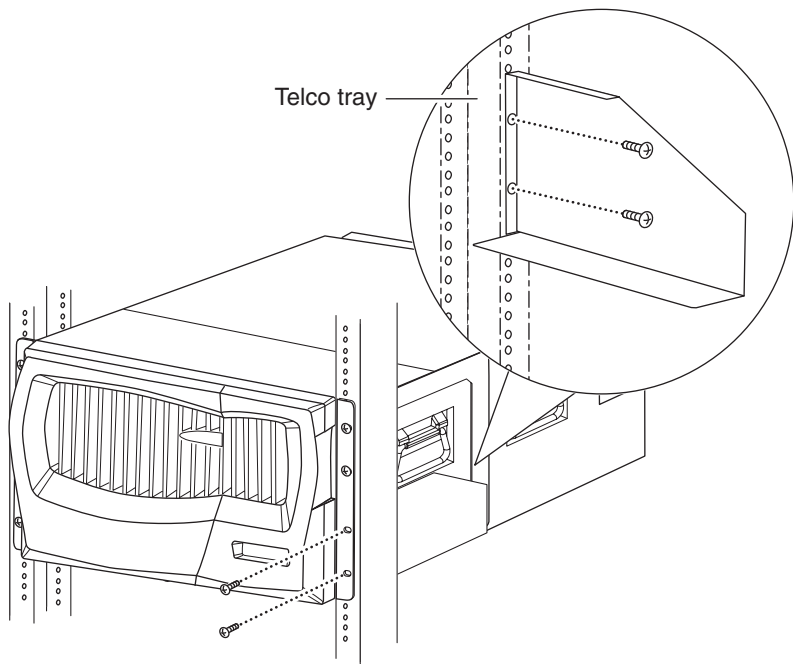
Step	Action
4	Secure each support rail to the back post of the rack using the supplied #2 Phillips screws.
5	Slide the storage engine onto the adjustable supports and secure it to the four-post rack by inserting the appropriate screws through the mounting holes on each side of the bezel and into the front posts of the rack.
6	If desired, apply the ear covers over the heads of the mounting screws by peeling the adhesive strip from the back of the ear covers and applying the ear covers to each mounting flange on your appliance.
7	Go to Chapter 3, “ Connecting an R150 System ,” on page 27, for instructions about connecting the storage engine to your network and connecting an ASCII terminal.

Installing an R150 storage engine

Installing in a two-post equipment rack

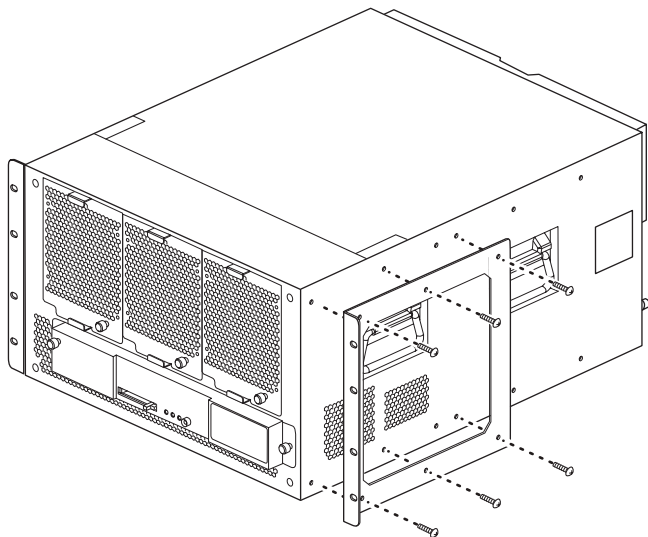
Installing the storage engine

To install your storage engine in a two-post equipment rack as either a mid-mount or flush-mount installation, complete the following steps, using the figure for reference.



Step	Action
1	Attach the small support bracket to the equipment rack using the appropriate screws from the mounting kit. Do not tighten the screws completely. The bracket should wiggle a little.

Step	Action	
2	If you are mounting the storage engine as a...	Then...
	Mid-mount	Complete the following substeps, using the figure for reference. 1. Unscrew the mounting brackets from the side of the storage engine. 2. Set the mounting bracket to the furthest position back on the side of the storage engine. 3. Repeat Steps 1 and 2 for the other side of the storage engine.
	Flush-mount	Go to Step 3 .



Installation bracket

Step	Action
3	Attach the support rack mounts to each post in the rack. Align the mounting brackets with the small brackets attached to the equipment rack, then carefully slide the storage engine into place.
4	Secure the storage engine to the two-post equipment rack by inserting the appropriate screws from the mounting kit through the mounting holes on each side of the bezel and into the front posts of the rack.
5	If desired, apply the ear covers over the heads of the mounting screws by peeling the adhesive strip from the back of the ear covers and applying the ear covers to each mounting flange on the storage engine.
6	Go to Chapter 3, “ Connecting an R150 System ,” on page 27, for instructions about connecting the storage engine to your network and connecting an ASCII terminal.

About this chapter This chapter describes how to connect an R150 system.

Topics in the chapter

This chapter provides information about the following topics:

- ◆ [“Connecting an R150 disk shelf”](#) on page 28
- ◆ [“Connecting an R150 storage engine to third-party devices”](#) on page 35
- ◆ [“Connecting an R150 storage engine to an Ethernet network”](#) on page 42
- ◆ [“Connecting to a Fibre Channel network”](#) on page 50
- ◆ [“Connecting the remote management card”](#) on page 52

Connecting an R150 disk shelf

About this section

Your R150 system uses either 12 TB or 24 TB of data storage, depending on your configuration. The information in this section shows how to connect the disk shelves for both cases.

For detailed information

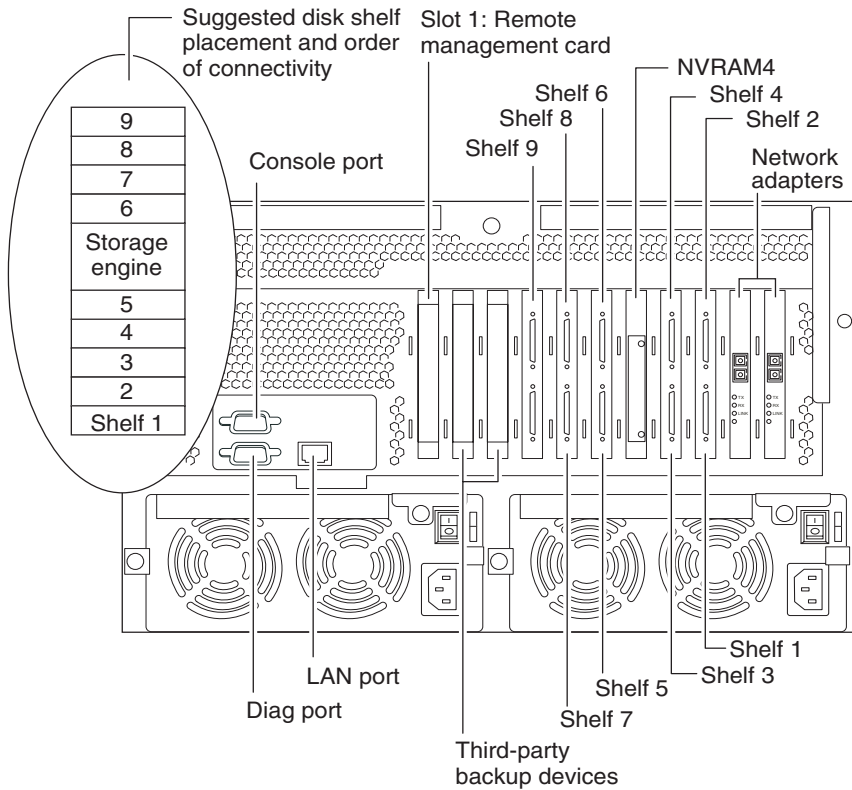
For details about connecting a disk shelf to the R150 storage engine, see the following topics:

- ◆ [“Disk shelf connections for a 24-TB system”](#) on page 29
- ◆ [“Disk shelf connections for a 12-TB system”](#) on page 31
- ◆ [“Securing the cables”](#) on page 33

Disk shelf connections for a 24-TB system

Sequence of disk shelf connections

Connect the disk shelves to the storage engine in the sequence shown in the following illustration.



Connecting a disk shelf to the storage engine

To connect a disk shelf to the storage engine, complete the following steps.

Step	Action
1	Put on the antistatic wrist strap and grounding leash.
2	Make sure that the storage engine and disk shelves are turned off.
3	Connect each disk shelf to the storage engine using the supplied SCSI cables, as shown in the following illustration.

The diagram illustrates the physical connection of a disk shelf to a storage engine within a server rack. Key components and connections include:

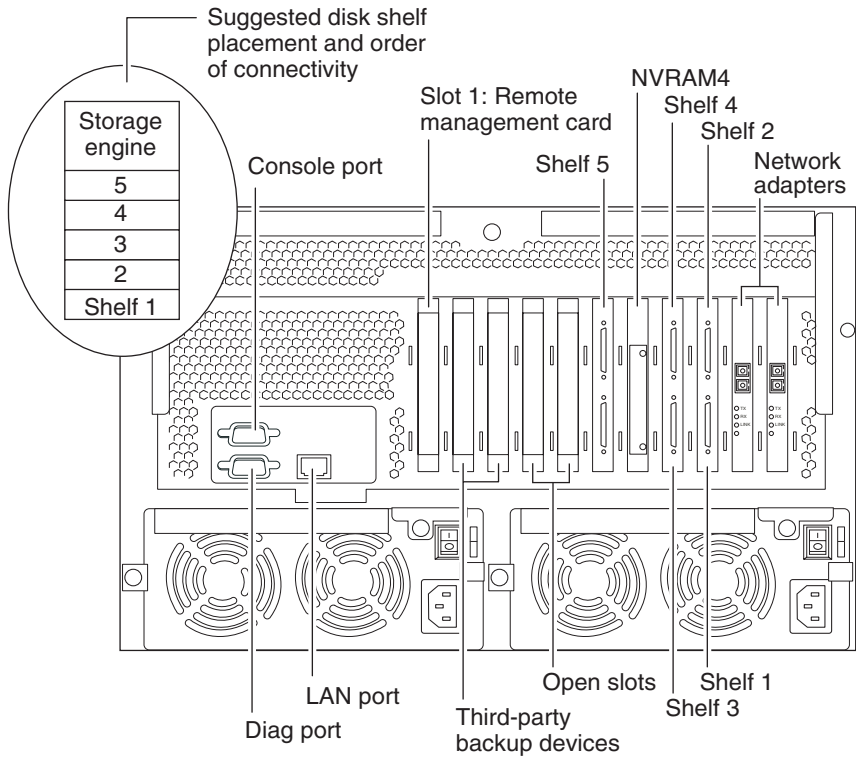
- Top Section:** Labeled 'Disk shelf cables', showing the cable management area at the top of the rack.
- Middle Section:** Labeled 'Third-party backup devices', showing a row of backup units.
- Bottom Section:** Contains the 'Storage engine' with two large cooling fans. It features various ports and connectors.
- Connections:**
 - A cable labeled 'To network' is connected to the left side of the storage engine.
 - Multiple 'Disk shelf power cords' are shown connecting the disk shelf to the storage engine's power ports on the right.
 - 'Disk shelf cables' (SCSI cables) are shown connecting the disk shelf to the storage engine's data ports on the right.

Connecting an R150 disk shelf

Disk shelf connections for a 12-TB system

Sequence of disk shelf connections

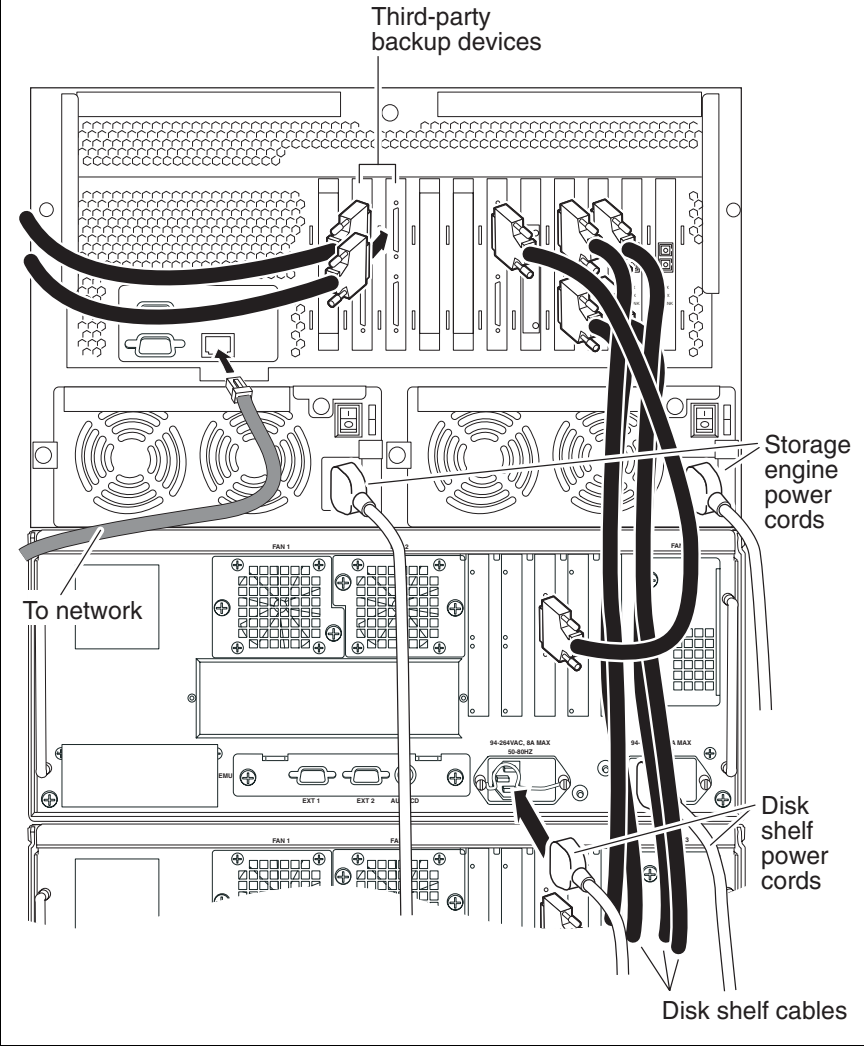
Connect the disk shelves to the storage engine in the sequence shown in the following illustration.



Connecting a disk shelf to the storage engine

To connect a disk shelf to the storage engine, complete the following steps.

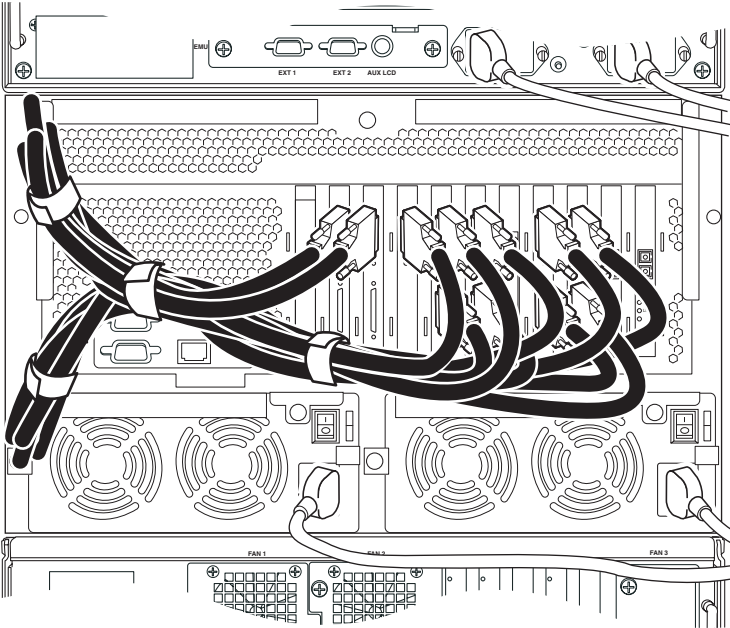
Step	Action
1	Put on the antistatic wrist strap and grounding leash.
2	Make sure that the storage engine and disk shelves are turned off.
3	Connect each disk shelf to the storage engine using the supplied SCSI cables, as shown in the following illustration.

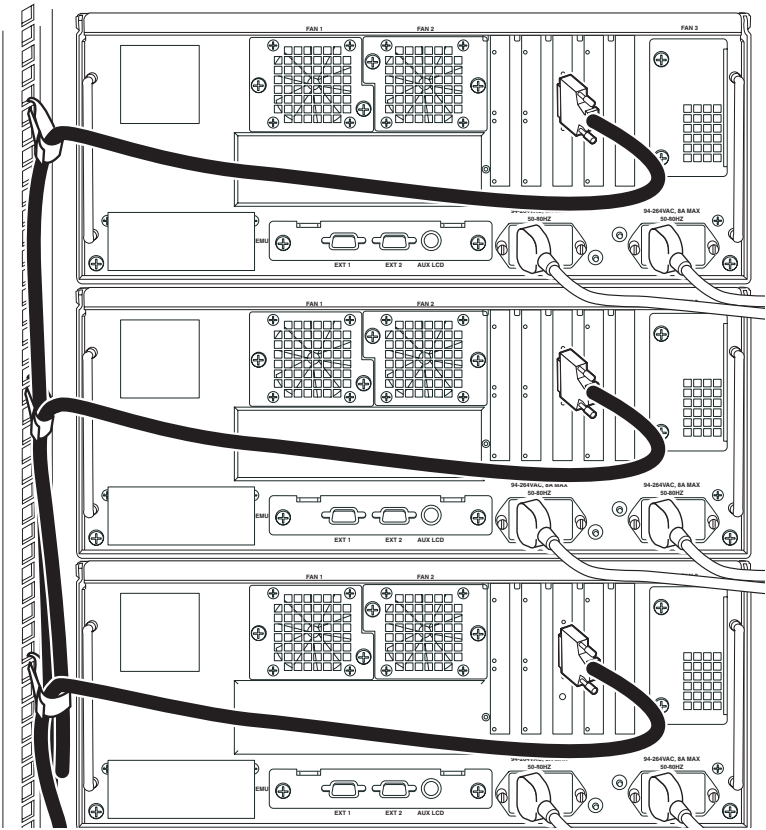


Connecting an R150 disk shelf

Securing the cables

Securing the cables To secure the cables, complete the following steps.

Step	Action
1	Attach the cables so that the connectors protrude directly outward from the cable connections on the storage engine, allowing sufficient stress relief within the cables. Caution_____ There should be no twisting or bending of the connectors at the connection points. Excessive bending and twisting might cause damage to components within the storage engine, or to the cables. _____ 
2	After making the connections, use cable ties to secure the cables into place, as shown in the preceding illustration.

Step	Action
3	Use cable ties at the locations shown in the illustration.  The diagram illustrates three server racks stacked vertically. Each rack contains a fan assembly with two fans (FAN 1 and FAN 2) and a control panel with connectors for EXT 1, EXT 2, and AUX LCD. To the right of the control panel are two power input ports labeled '04-DRIVEC: 8A MAX' and '04-DRIVEC: 8A MAX'. Thick black lines represent cable ties being applied to the left side of each rack, securing the power cables. The cable ties are shown as loops around the rack's side rails, with one tie per rack.

Connecting an R150 storage engine to third-party devices

Preparing the third-party devices

To prepare the third-party devices, complete the following steps.

Step	Action
1	Set the appropriate ID on the tape backup device. See the documentation that came with the tape backup device.
2	If you have a robotic loader on the tape backup device or a Fibre Channel switch, set its ID. See the documentation that came with the Fibre Channel switch.
3	Turn off all third-party devices and go to the following sections, as applicable: ◆ “Connecting to a third-party SCSI tape backup device” on page 37 ◆ “Connecting to a third-party Fibre Channel switch” on page 39

Rules for connecting the third-party devices

Observe the following rules for connecting the third-party devices:

- ◆ Use a cable that is
 - ❖ Appropriate to the tape adapter installed in your appliance
 - ❖ Of an approved length for the third-party device

Note

See the documentation for the third-party device.

- ◆ The expansion slots assigned for tape adapters and the type of tape adapters installed in your storage engine are identified in the System Configuration Guide at <http://now.netapp.com>.
- ◆ Check the System Configuration Guide to verify support for your tape backup device. An unsupported tape backup device might cause the storage engine to halt.

**For detailed
information**

For details about connecting to third-party devices, see the following topics:

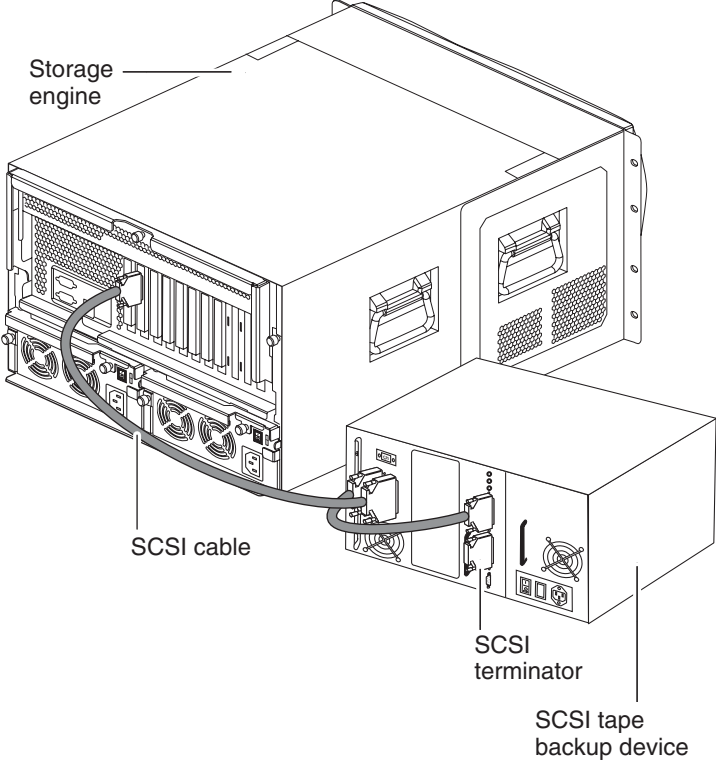
- ◆ [“Connecting to a third-party SCSI tape backup device”](#) on page 37
- ◆ [“Connecting to a third-party Fibre Channel switch”](#) on page 39

Connecting to a third-party SCSI tape backup device

Connecting a SCSI tape backup device

To connect a third-party SCSI tape backup device to your storage engine, complete the following steps.

Step	Action
1	Shut down the storage engine by entering the following command at the console: halt Caution————— Always use the <code>halt</code> command to perform a clean shutdown.
2	Turn off the power to the storage engine.
3	Connect the cable provided with the tape device to the following points of connection: ◆ The appropriate port on the back panel of your storage engine ◆ The port on the tape device
4	Tighten each end of the cable.

Step	Action
5	Terminate any open port on the tape backup device with an active SCSI terminator. For information about terminating the open port, see the documentation for the tape backup device.  The diagram illustrates the physical connection between two SCSI devices. On the left is a 'Storage engine', a large rectangular unit with multiple vertical slots and a SCSI port on its front panel. On the right is a 'SCSI tape backup device', a smaller unit with a SCSI port and a terminator. A 'SCSI cable' is shown connecting the SCSI port of the storage engine to the SCSI port of the tape backup device. A 'SCSI terminator' is also shown connected to the SCSI port of the tape backup device. Labels with leader lines identify each component: 'Storage engine', 'SCSI cable', 'SCSI terminator', and 'SCSI tape backup device'.
6	Go to “Connecting the storage engine to an ASCII terminal console” on page 56.

Connecting an R150 storage engine to third-party devices

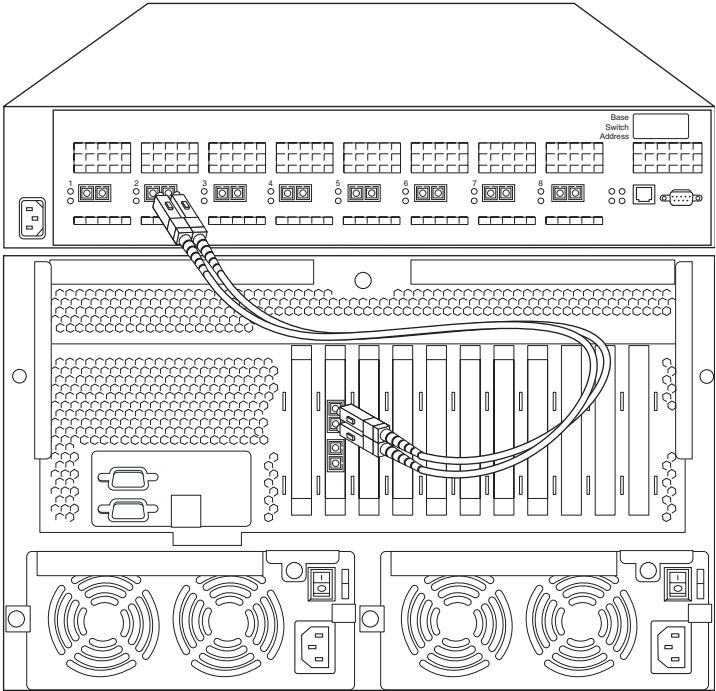
Connecting to a third-party Fibre Channel switch

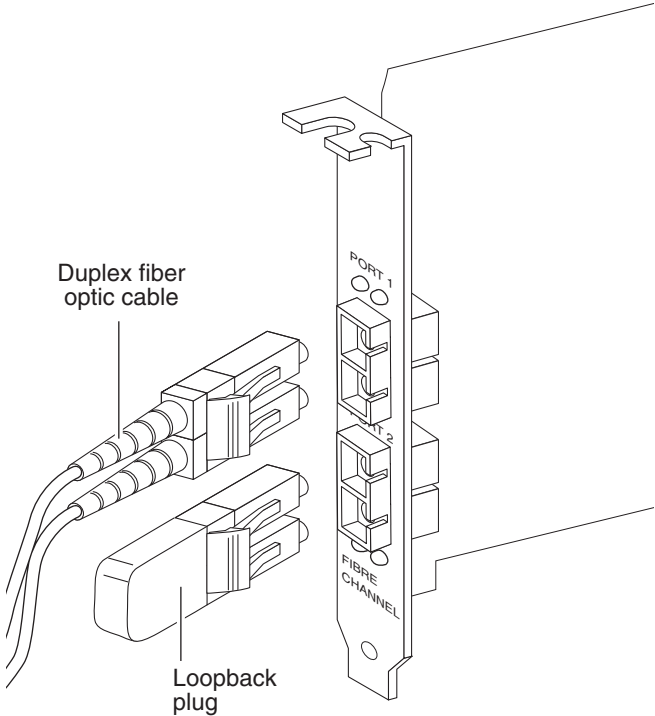
Connecting a Fibre Channel switch

To connect your storage engine to a third-party Fibre Channel switch, complete the following steps.

Note _____
See the third-party documentation about connecting a Fibre Channel switch.

Step	Action
1	Shut down the storage engine by entering the following command at the console: halt Caution _____ Always use the halt command to perform a clean shutdown.
2	Turn off the power to the storage engine.

Step	Action
3	Connect the cable provided with the Fibre Channel switch to the following points of connection: ◆ The appropriate port on the back panel of your storage engine ◆ An available port on the Fibre Channel switch  The diagram illustrates the back panel of an R150 storage engine. At the top, there is a control panel with a 'Base Switch Address' label and a series of indicator lights. Below this, a Fibre Channel cable is shown plugged into one of the ports on the left side of the panel. The cable then runs down and connects to a port on the right side of the panel. The bottom section of the panel features two large cooling fans and several power and status ports.

Step	Action
4	When connecting to a dual-channel Fibre Channel adapter in your storage engine, insert the duplex fibre optic cable into Port 1 and the LC loopback plug into Port 2 until they click and lock into place.  The diagram illustrates the connection of a duplex fiber optic cable and an LC loopback plug to a dual-channel Fibre Channel adapter. The adapter is a vertical component with two ports labeled PORT 1 and PORT 2. The duplex fiber optic cable is inserted into PORT 1, and the LC loopback plug is inserted into PORT 2. The adapter is labeled FIBRE CHANNEL. Labels with leader lines point to the 'Duplex fiber optic cable' and the 'Loopback plug'.
5	Go to “Connecting the storage engine to an ASCII terminal console” on page 56.

Connecting an R150 storage engine to an Ethernet network

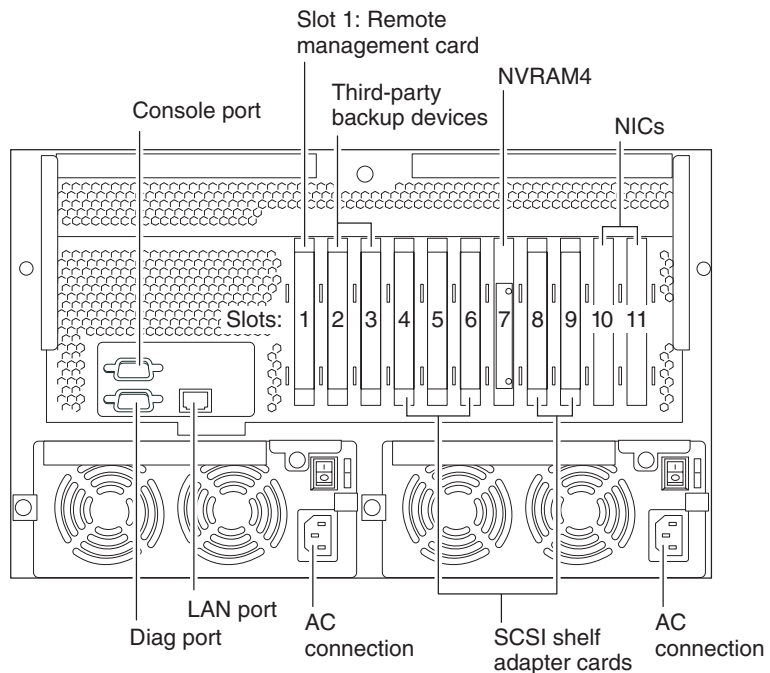
Supported Ethernet connections

Your appliance has one onboard 10Base-T/100Base-TX Ethernet port. It also supports the following Ethernet network interface cards (NICs) in PCI slots 10 and 11 of your appliance motherboard:

- ◆ Copper Gigabit Ethernet (GbE) NIC (with an RJ-45 connection)
- ◆ Fiber optic GbE NIC
- ◆ Dual GbE NIC

Slot assignments on the storage engine

The following illustration shows the location of the onboard Ethernet port and the suggested slot locations for additional NICs, SCSI shelf adapter cards, NVRAM4 card, and backup devices.



Note

The actual slot assignments might vary depending on the options ordered for your system. See the System Configuration Guide at <http://now.netapp.com> for the most current slot assignments.

Cabling requirements

The following table lists the cabling requirements for Ethernet connections.

Ethernet type	Type of cable used	Maximum distance
10Base-T/ 100Base-TX	Category 3 (10Base-T only) or 5 (10Base-T/100Base-TX) unshielded twisted-pair (UTP) cable with RJ-45 connectors	100m
10Base-T/ 100Base-TX/ 1000Base-T adapter	Category 5 UTP cable with RJ-45 connector for the copper GbE adapter only	100m
1000Base-SX adapter	50 micron multimode fiber optic cable, SC connector	550m
	62.5 micron multimode fiber optic cable, SC connector	220m

Connecting through an RJ-45 connection

RJ-45 connection options

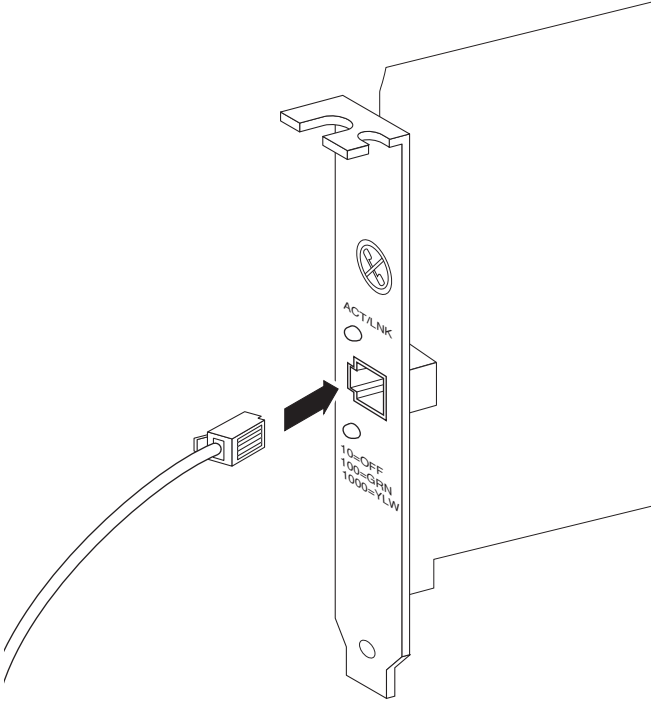
You can connect through either a single-port or dual-port RJ-45 connection, depending on your system configuration. For details about RJ-45 connectivity, see the following topics:

- ◆ [“Connecting through a single-port RJ-45 connection”](#) on page 45
- ◆ [“Connecting through a dual-port RJ-45 connection”](#) on page 46

**Connecting through
a single-port RJ-45
connection**

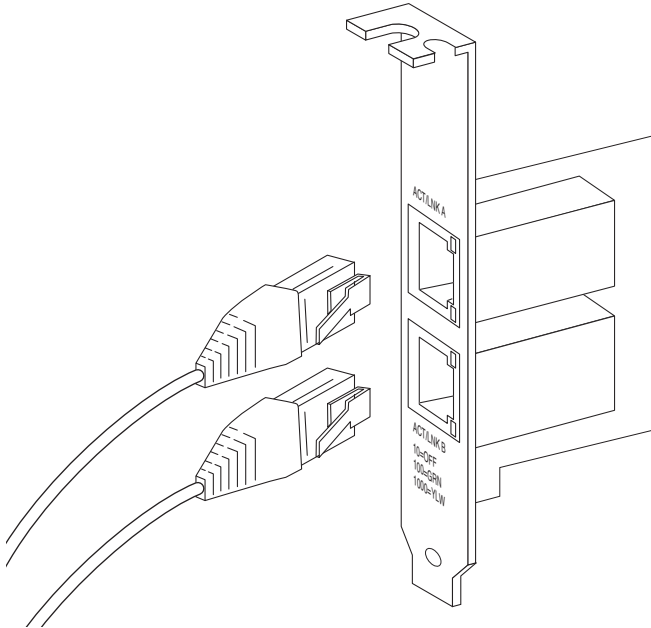
To connect your appliance to a 10Base-T/100Base-TX or 10Base-T/100Base-TX/1000Base-T Ethernet network, complete the following step.

Caution _____
If you use a copper GbE NIC, you should place a ferrite on your cable approximately four inches from the NIC port.

Step	Action
1	Push the RJ-45 connector into the Ethernet port until it clicks and locks into place. The following figure shows a UTP cable with an RJ-45 connector connecting to a 10Base-T/100Base-TX/1000Base-T NIC. 

**Connecting through
a dual-port RJ-45
connection**

To connect your appliance to a 10Base-T/100Base-TX or 10Base-T/100Base-TX/1000Base-T Ethernet network, complete the following step.

Step	Action
1	Push the RJ-45 connector into the Ethernet port until it clicks and locks into place. Repeat this step to connect another network to the second port. The following figure shows a UTP cable with an RJ-45 connector connecting to a dual-port copper GbE NIC. 

Connecting to a fiber optic GbE network

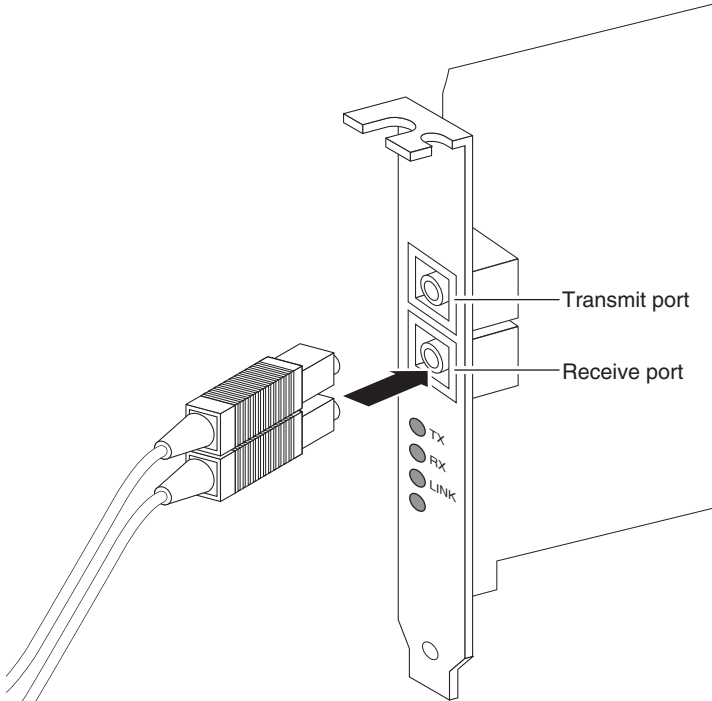
GbE network connection options

You can connect through either a single-port or dual-port GbE connection, depending on your system configuration. For details about GbE connectivity, see the following topics:

- ◆ [“Connecting through a single-port duplex fiber optic GbE connection”](#) on page 48
- ◆ [“Connecting through a dual-port duplex fiber optic GbE connection”](#) on page 49

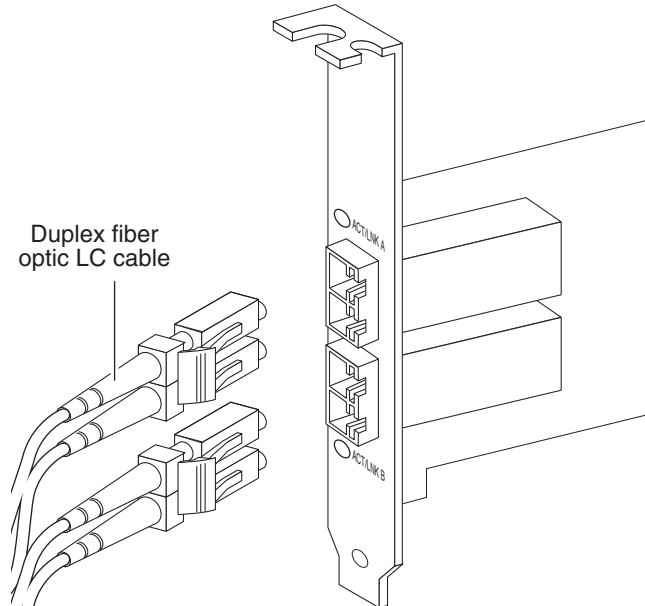
Connecting through a single-port duplex fiber optic GbE connection

To connect the storage engine to a fiber optic GbE network, complete the following step.

Step	Action
1	Push the duplex fiber optic cable with the SC connector into the ports on the NIC, until it clicks and locks into place. The following figure shows a duplex SC cable connecting to a fiber optic GbE NIC. 

**Connecting through
a dual-port duplex
fiber optic GbE
connection**

To connect your appliance to a dual-port fiber optic GbE network, complete the following step.

Step	Action
1	Push the duplex fiber optic cable with the duplex fiber optic LC connector into the port on the NIC, until it clicks and locks into place. Repeat this step to connect another network to the second port. The following figure shows a duplex fiber optic cable with an LC connector connecting to a dual-port fiber 10Base-T/100Base-TX/1000Base-T NIC.  The diagram illustrates the connection of two duplex fiber optic LC cables to a dual-port fiber optic NIC. The NIC is shown as a vertical metal plate with two ports labeled 'ACTLINK A' and 'ACTLINK B'. Each port has a rectangular opening for the LC connector. Two cables, each with two LC connectors, are shown being inserted into the ports. The cables are labeled 'Duplex fiber optic LC cable'.

Connecting to a Fibre Channel network

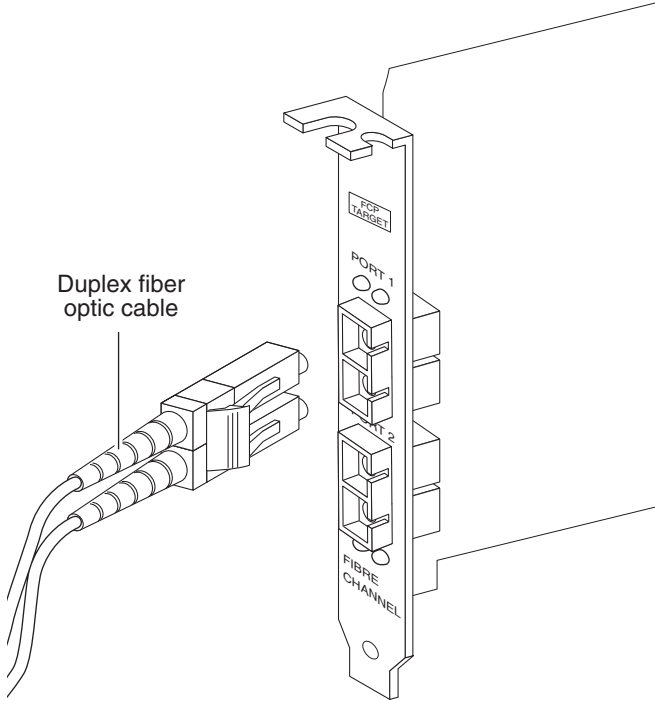
Fibre Channel cabling requirements

The following types of cables and connectors are required for a Fibre Channel network:

- ◆ 50 micron multimode fiber optic cable with LC-to-LC connectors
- ◆ 62.5 micron multimode fiber optic cable with LC-to-LC connectors

Connecting to a Fibre Channel network

To connect the storage engine to a Fibre Channel network, complete the following steps.

Step	Action
1	Insert the duplex fiber optic cable connector into Port 1 on the dual-channel Fibre Channel adapter, until it clicks and locks into place. 

2	If applicable to your network setup, push the duplex fiber optic cable connector into Port 2 on the Fibre Channel adapter, until it clicks and locks into place.
----------	--

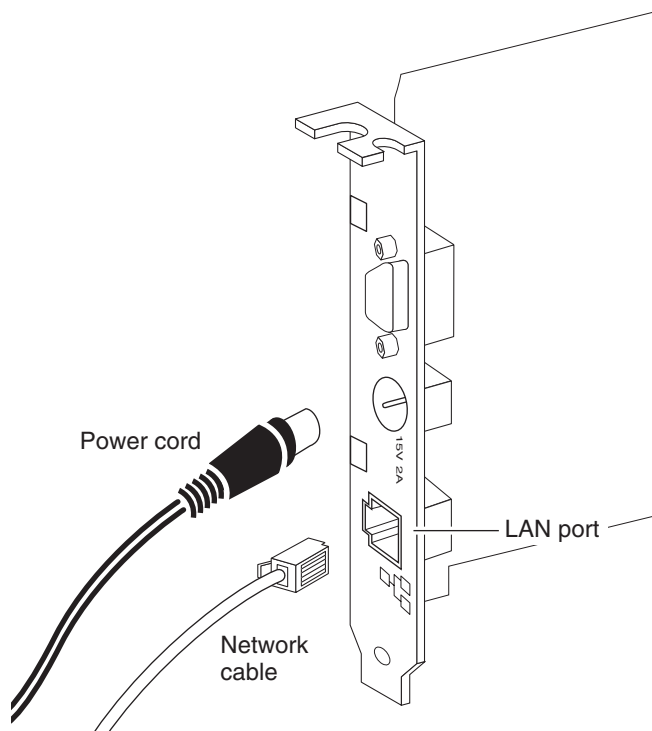
Connecting the remote management card

What your remote management card does

The remote management card enables notification of events to configured autosupport recipients when your storage appliance needs support, including Network Appliance Customer Support.

Connecting your remote management card

To connect your remote management card to a LAN network and to power, complete the following steps, using the figure for reference.



Step	Action
1	Connect your remote management card to the LAN network through the LAN port.
2	Connect the power cord for the remote management card into the socket on the back of the card. Note_____ The remote management card comes with a power cord for connection to its own external power source. Network Appliance recommends that you connect the remote management card to an uninterruptible power supply in case of a power outage.
3	If you are installing your equipment into a two-post or four-post rack, use the velcro strips to attach the remote management card power supply to an appropriate space on your rack.
4	Connect the power cord to a separate power source. Caution_____ If your system comes with a NetApp System Cabinet, do not plug the remote management card power cable into a power strip inside the cabinet. Instead, you must connect the remote management card to a separate power source.

About this chapter

This chapter describes how to establish a console connection to the storage engine and how to power on the system.

Topics in this chapter

This chapter describes the following topics:

- ◆ [“Connecting the storage engine to an ASCII terminal console”](#) on page 56
- ◆ [“Connecting the system to a power source and powering on”](#) on page 58

Connecting the storage engine to an ASCII terminal console

About the ASCII terminal console

The ASCII terminal console enables you to monitor the boot process and helps you configure the storage engine after it boots. Use an ASCII terminal attached through the serial port on the back of the storage engine if you want to perform system administration.

Note

Make sure that you are using an ASCII terminal console attached to the storage engine serial port, and that the display length is set to 25 lines.

ASCII terminal console cable wiring

The ASCII terminal console is connected to the storage engine with a DB-9 serial cable, attached to a DB-9 to RJ-45 converter cable, then through the serial port on the back of the storage engine.

The following table lists how the DB-9 serial cable is wired. Input indicates data flow from the ASCII terminal to the storage engine and output indicates data flow from the storage engine to the ASCII terminal.

Pin number	Signal	Data flow direction	Description
1	DCD	Input	Data carrier detect
2	SIN	Input	Serial input
3	SOUT	Output	Serial output
4	DTR	Output	Data terminal ready
5	GND	N/A	Signal ground
6	DSR	Input	Data set ready
7	RTS	Output	Request to send
8	CTS	Input	Clear to send
9	RI	Input	Ring indicator

Connecting to an ASCII terminal console

To connect an ASCII terminal console to the storage engine, complete the following steps.

Step	Action	
1	Set the following communications parameters to the same values for both the storage engine and ASCII terminal.	
	Parameter	Setting
	Baud	9600
	Data bit	8
	Parity	None
	Stop bits	1
	Flow control	None
	Note _____	
See your terminal documentation for information about changing your ASCII console terminal settings.		

2	Connect the DB-9 serial cable to the DB-9 to RJ-45 converter cable, then connect the RJ-45 end to the console port on the storage engine and the other end to the ASCII terminal.	
3	Go to “ Connecting the system to a power source and powering on ” on page 58.	

Connecting the system to a power source and powering on

Sequence for powering on system components

You power on the components in your system in this sequence:

- ◆ Disk shelves first
- ◆ Storage engine last

Caution

You must power on the storage engine after the disk shelves.

The disk shelves and disk drives require time to power on, reset, and prepare to respond to the storage engine. The storage engine expects these units to be ready for input/output when it powers on and performs its reset and self-test.

Power-on process

The power-on process for a new installation automatically

- ◆ Checks all connections to the storage engine
- ◆ Runs the `setup` command

For detailed information

For details about connecting the system to a power source and powering on, see the following topics:

- ◆ [“Connecting the disk shelves to AC power”](#) on page 59
- ◆ [“Connecting the storage engine to AC power”](#) on page 61

Connecting the system to a power source and powering on

Connecting the disk shelves to AC power

About AC power supplies

The disk shelf is shipped with two power supplies, labeled PSU1 and PSU2, respectively, and an AC power cord for each power supply.

Connecting and powering on the R150 disk shelves

To connect each disk shelf to an AC power source, complete the following steps.

Step	Action
1	Make sure that the storage engine and the disk shelves are turned off.
2	Plug the power cord for PSU1 into the power receptacle on the right connector (rear view).
3	Plug the power cord for PSU2 into the power receptacle on the left connector (rear view).
4	Plug the other end of each power cord into separate grounded AC power sources. Caution_____ To obtain power supply redundancy, make sure that you connect the second power supply to a separate AC circuit.
5	Fasten the power cord with the clamp.
6	Turn the power switch of each power supply to the On position. Result: The disk shelf lights illuminate, indicating system activity. Note_____ The default spin-up time for all disks in the disk shelf is 60 seconds. Reduce this spin-up time to 20 seconds by turning on the switches of both power supplies within 5 seconds of each other.

Step	Action
7	Make sure that the following LEDs illuminate: ◆ Front panel LEDs ◆ Power supply LEDs The LED responses are described in “Disk shelf LED responses at startup” on page 75. Note_____ If the LEDs do not illuminate, contact Network Appliance Technical Support. _____

Connecting the storage engine to AC power

Connecting the R150 storage engine to AC power

To connect the storage engine to an AC power source and power it on, complete the following steps.

Step	Action
1	Turn on any third-party devices, if applicable.
2	Power on the disk shelves. See “Connecting the disk shelves to AC power” on page 59. Caution——— It is important that you power on the storage engine after the disk shelves. The disk shelves and disk drives require time to power on, reset, and prepare to respond to the storage engine, which expects these units to be ready for input/output when it powers on and performs its reset and self-test.
3	Confirm that the power switch on each power supply is in the Off (0) position.
4	Connect the socket end of the supplied power cord to the recessed power plug on the power supply.
5	Secure the power cord with the retaining clip on the power supply.
6	Plug the other end of the power cord into a grounded electrical outlet.
7	Repeat Steps 4 through 6 for the second power supply. Caution——— To obtain power supply redundancy, make sure that you connect the second power supply to a separate AC circuit.
8	Turn the power switch on the power supplies to the On (I) position. Result: The system verifies the hardware and loads the operating system.

Step	Action
9	Make sure that the following LEDs illuminate: ◆ Front panel LEDs ◆ Power supply LEDs ◆ Network port LEDs Note_____ If the LEDs do not illuminate, contact Network Appliance Technical Support. _____
10	Check the startup messages as they appear on the console or LCD. Note_____ If the startup messages do not appear, contact Network Appliance Technical Support. _____
11	Go to the <i>Getting Started Guide</i> when the following default host name prompt appears on the console screen: toaster>

About this chapter

This chapter describes the startup responses from the R150 system and various hardware components on the system. These responses include

- ◆ The LED responses from the various hardware components on the storage engine
- ◆ The LED responses from the various hardware components on the disk shelf

Topics in this chapter

This chapter describes the following topics:

- ◆ [“Storage engine LED responses at startup”](#) on page 64
- ◆ [“Disk shelf LED responses at startup”](#) on page 75

Storage engine LED responses at startup

About this section

This section describes the LED responses from the storage engine and various hardware components on the storage engine at startup.

For detailed information

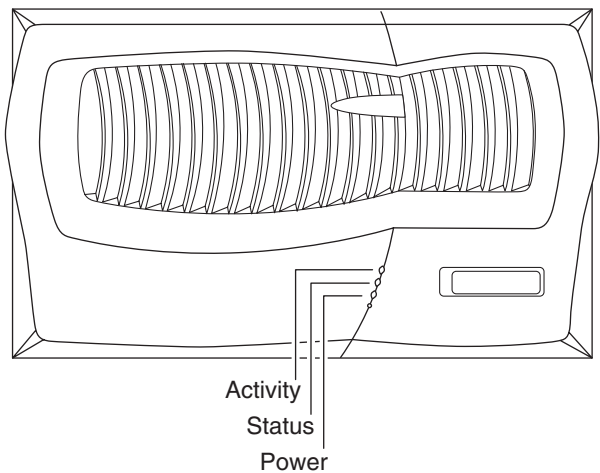
For details about storage engine LED responses at startup, see the following topics:

- ◆ [“Front panel LEDs”](#) on page 65
- ◆ [“FC-AL/FC HBA LEDs”](#) on page 67
- ◆ [“GbE NIC LEDs”](#) on page 69
- ◆ [“Remote management card LEDs”](#) on page 72
- ◆ [“Power supply LEDs”](#) on page 74

Front panel LEDs

Location of front panel LEDs

The following illustration shows the LEDs on the front panel of an R150 storage engine.



Description of front panel LEDs

The following table describes the three LEDs on the front panel.

LED	State of illumination	Explanation
Activity	Green	The system is operating and is active.
	Blinking	The system is actively processing data.
	Off	No activity is detected.

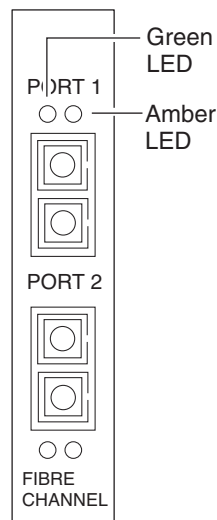
LED	State of illumination	Explanation
Status	Green	The system is operating normally.
	Amber	The system halted or a fault occurred. The fault is displayed in the LCD. Note_____ This LED remains lit during boot, while the operating system loads. _____
Power	Green	The system is receiving power.
	Off	The system is not receiving power.

FC-AL/FC HBA LEDs

Location of the LEDs

The dual-port Fibre Channel Host Bus Adapter (HBA) can be used in two modes: Initiator and Target. The LEDs on both cards are the same color and in the same location, but the Status and Activity indications are different.

The following illustration shows the LED locations for a dual-port Fibre Channel HBA.



What the initiator mode LEDs mean

The following table describes the LEDs on the dual-port Fibre Channel HBA in Initiator mode.

Green	Amber	Indicates...
On	On	Power
Off	Flashing	Loss of synch
Off	On	Signal acquired
On	Off	Ready
Flashing	Flashing	Adapter firmware error

What the target mode LEDs mean

The following table describes the LEDs on the Fibre Channel HBA in Target mode.

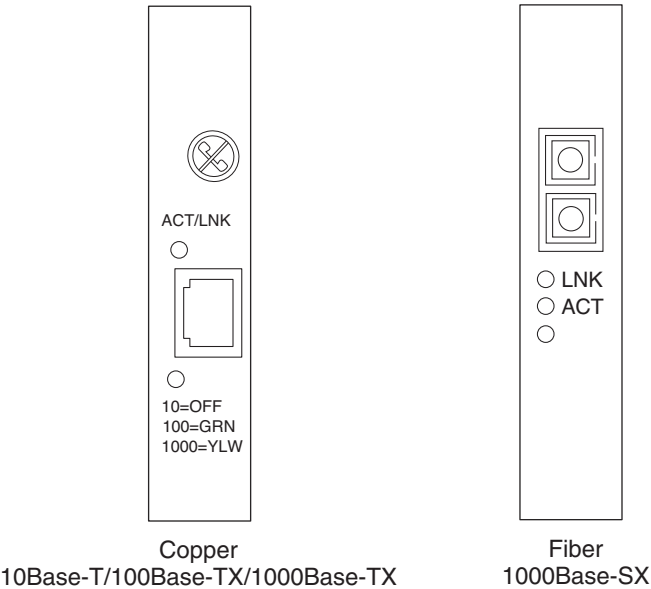
Green	Amber	Indicates...
On	On	Power On
Off	Flashing	Loss of synch
Off	On	Signal acquired
On	Off	Online
Flashing	Flashing	Adapter firmware error

Storage engine LED responses at startup

GbE NIC LEDs

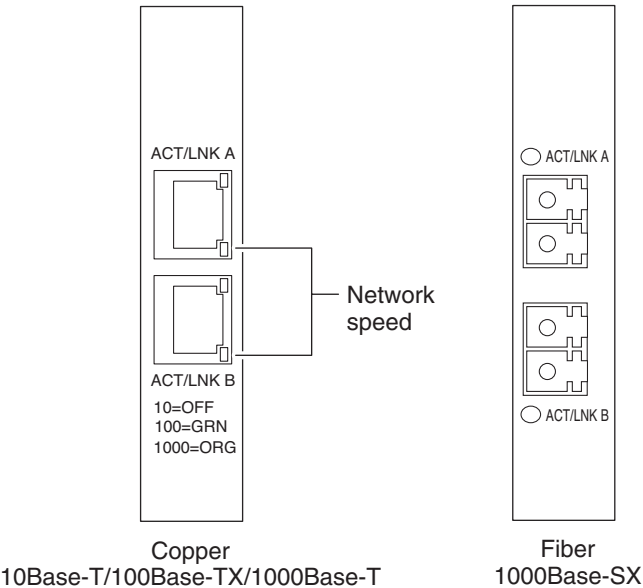
Location of the LEDs for single port GbE NICs

The following illustration shows the location of LEDs for both the copper and fiber single port GbE NICs.



**Location of LEDS
on dual-port GbE
NICs**

The following illustration shows the location of LEDs for both the copper and fiber dual-port GbE NICs.



**What the copper
GbE NIC LEDs
mean**

The following table explains what the LEDs on the copper GbE NIC mean.

LED type	Status indicator	Description
ACT/LNK	Green	A valid network connection is established.
	Blinking green	Data is being transmitted across the network.
	Off	There is no network connection present.
10=OFF	Off	Data transmits at 10 Mbps.
100=GRN	Green	Data transmits at 100 Mbps.
1000=YLW	Yellow	Data transmits at 1,000 Mbps.

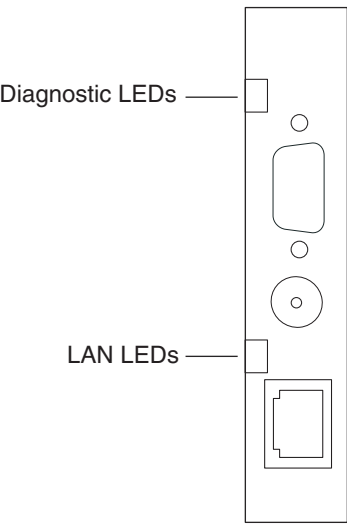
What the fiber GbE NIC LEDs mean

The following table explains what the LEDs on the fiber GbE NIC mean.

LED type	Status indicator	Description
LNK	On	A valid network connection is established.
	Off	There is no network connection present.
ACT	On	Data is being transmitted across the network.
	Off	There is no network activity present.

Remote management card LEDs

Location of LEDs The following illustration shows the location of the remote management card LEDs.



What the LEDS mean The following table explains what the LEDs on the remote management card mean.

LED type	Status Indicator	Description
LAN connection LEDs	Green	The LAN connection is valid.
	Red	There is no connectivity present.
Diagnostic LEDs	Blinks code	This LED flashes red consecutively for the first digit of the code, then subsequently pauses and blinks once with a pause between blinks.

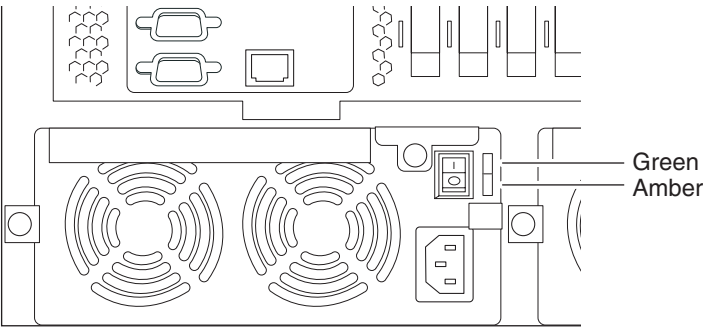
LED type	Status Indicator	Description
	3111	Error occurred during the LAN loopback test.
	4111	Incorrect data returned during the UART1 test (Universal Asynchronous Receiver/Transmitter).
	4112	No data returned during UART1 test.
	4211	Incorrect data returned during UART2 test.
	4212	No data returned during UART1 test.
	4311	Incorrect data returned during UART485 test.
	4312	No data returned during UART1 test.

Storage engine LED responses at startup

Power supply LEDs

Location of LEDs

The following illustration shows the location of the LEDs on your storage engine’s power supplies.



What the LEDs on your power supplies mean

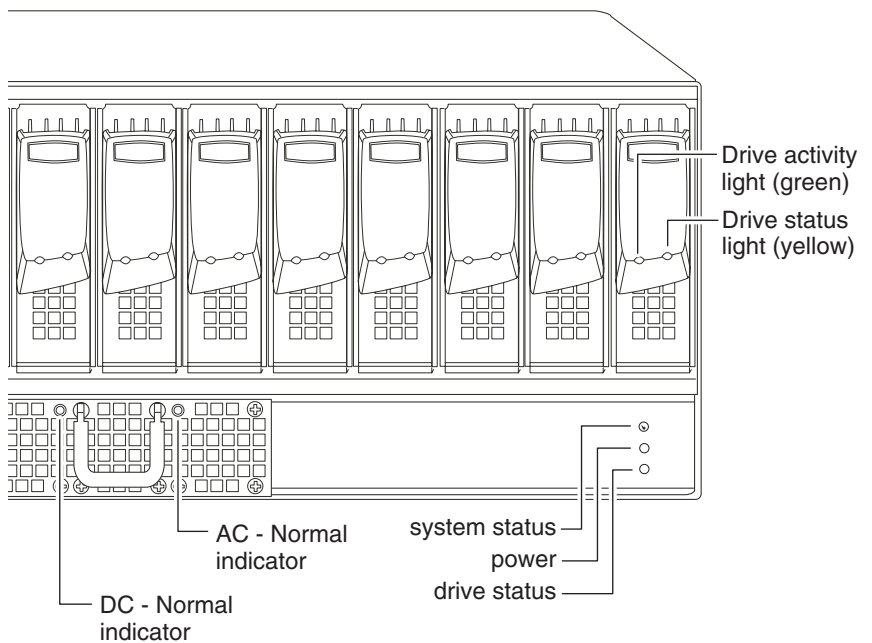
The following table explains what the LEDs on your storage engine power supplies mean.

LED type	Status indicator	Description
Power supply LED	Green only	The AC power source is good and is powering the system.
	Blinking green	The AC power source is good and the power supply is in standby mode.
	Amber and green	The AC power source is good, but no power is reaching the power supply or the power supply failed.
	Off	There is no power to this power supply.

Disk shelf LED responses at startup

About this section This section discusses the types and functions of each LED on the front of the disk shelf.

Location of LEDs The disk shelf LEDs are displayed on the front side of the disk shelf, as shown in the following illustration.



Interpreting the disk shelf LEDs

LED	State	Indicates...
AC—Normal indicator	On (green)	Power supply is functioning properly.
	Off	Power supply failure or nonpowered up condition.
DC—Normal indicator	On (green)	Power supply is correctly converting AC input into the DC voltages that the disk shelf and disks require.
	Off	Power supply failure or nonpowered up condition.
System status	On (blue)	Communication failure between the storage engine and the disk shelf.
	Off	Disk shelf is connected and is communicating with the storage engine.
Power	On (yellow)	Disk shelf is powered on.
	Off	Disk shelf is powered off.
Drive status	On (green)	Disk shelf drives are operating normally.
	Off	One or more drives in the disk shelf are experiencing failure. Check the Drive status light on each disk drive to determine which disk drive failed.
Drive activity light	On (green)	Disk drive is active. The light flashes in response to activity while the drive is being accessed.
	Off	Disk drive is idle.
Drive status light	On (yellow)	Disk drive failure.
	Off	Normal operation.

About this chapter

This chapter describes how to replace disk shelves in a rack, disks in a disk shelf, and other devices.

Topics in this chapter

This chapter provides information about the following topics:

- ◆ [“Replacing a disk shelf in a rack”](#) on page 78
- ◆ [“Replacing a disk in a disk shelf”](#) on page 80
- ◆ [“Replacing a power supply in a disk shelf”](#) on page 84
- ◆ [“Replacing the EMU”](#) on page 88
- ◆ [“Replacing the cooling fans and blower”](#) on page 91

Replacing a disk shelf in a rack

About replacing a disk shelf

Replacing a disk shelf consists of the following procedures:

- ◆ “[Removing a disk shelf from a rack](#)” below
- ◆ “[Installing an R150 disk shelf](#)” on page 12

Removing a disk shelf from a rack

To remove a disk shelf from an R150 rack, complete the following steps.

Step	Action
1	Put on the antistatic wrist strap and grounding leash.
2	Shut down the storage engine by entering the following command at the console: <code>halt</code> Caution _____ Always use the <code>halt</code> command to perform a clean shutdown. _____
3	Verify that the LCD display at the front of the storage engine displays the following message: <code>Halted</code>
4	Turn off and unplug the power to the storage engine and the disk shelf.
5	Disconnect the two disk shelf power cords from the disk shelf.
6	Disconnect the SCSI adapter cable connecting the disk shelf and storage engine.
7	Use a Phillips screwdriver to remove the screws securing the R150 disk shelf to the Telco tray or the center-of-gravity bracket.

Step	Action
8	With the help of another person, remove the disk shelf from the rack. WARNING _____ Because the disk shelf is very heavy when fully loaded, it is advised that at least two people remove the disk shelf.

Replacing a disk in a disk shelf

About replacing a disk

You can replace a disk in a disk shelf for any reason. However, the most common reason is disk failure. Disk drives are also hot swappable, meaning that they can be replaced while the system remains powered on. If a disk in your R150 disk shelf fails, the storage engine logs a warning message to the system console indicating which SCSI disk on which disk shelf failed.

Preparing to replace a disk

Before you replace a disk in a disk shelf, you must first check the disk shelf to ensure that after you remove the disk you still have enough disks installed to meet the enclosure services requirements. For information about these requirements, see “[Disk drive labeling](#)” on page 13.

For detailed information

For details about replacing a disk in a disk shelf, see the following topics:

- ◆ “[Removing a disk from a disk shelf](#)” on page 81
- ◆ “[Installing a disk in a disk shelf](#)” on page 82

Removing a disk from a disk shelf

Removing a disk

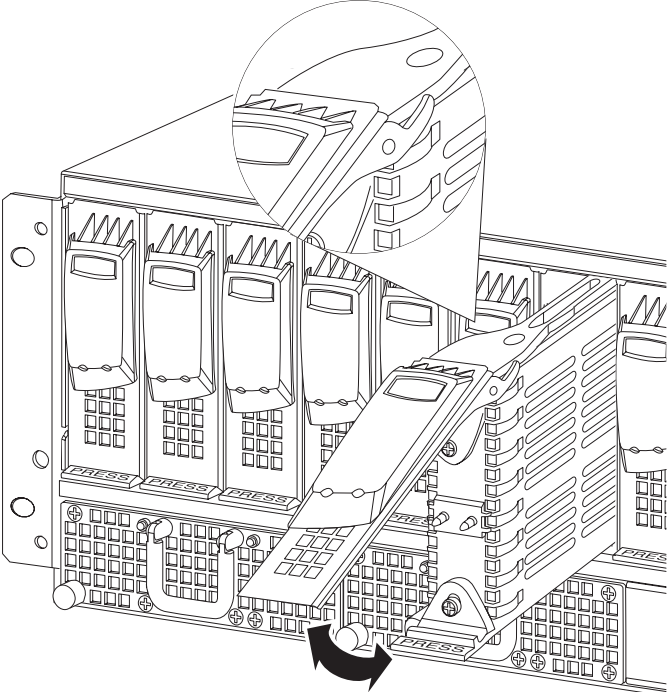
To remove a disk, complete the following steps.

Step	Action
1	Enter one of the following commands at the console, as appropriate: <pre>disk fail disk_name</pre> <pre>disk remove disk_name</pre> Either command causes the yellow drive status LED on the disk to illuminate. For more information about LEDs, see “Disk shelf LED responses at startup” on page 75. For more information about disk commands, see the <i>Data ONTAP System Administrator’s Guide</i>.
2	Wait 30 seconds for the disk to stop spinning.
3	Put on the antistatic wrist strap and grounding leash.
4	To remove the disk, press down on its release mechanism. The drive handle is spring loaded and springs open after you depress the latch. Gently slide the disk out of the disk shelf. WARNING _____ When removing a disk, always use two hands to support its weight. _____

Installing a disk in a disk shelf

Installing a disk

To install a disk in a disk shelf, complete the following steps.

Step	Action
1	Put on the antistatic wrist strap and grounding leash.
2	Orient the disk drive carrier so that the cam mechanism is at the top and the “press” release bar is on the bottom. Caution————— When inserting a disk drive carrier into an R150 disk shelf, the drive carrier handle should be fully extended to its release position before insertion, as shown in the following illustration. Failure to do this might result in damage to the disk drive carrier locking mechanism. ————— 

Step	Action
3	Insert the disk drive carrier into the guide slot in the disk shelf and firmly push it in until it engages the backplane. Caution_____ Do not slam the device carrier into place. _____
4	Making sure that the cam fingers engage the top of the disk drive carrier, swing the drive handle down until it clicks into place.

Replacing a power supply in a disk shelf

About replacing a disk shelf power supply

Replacing a disk shelf power supply consists of the following procedures:

- ◆ Removing a power supply from a disk shelf
- ◆ Installing a power supply in a disk shelf

Rules for replacing power supplies

When replacing a disk shelf power supply, observe the following rules:

- ◆ You do not need to turn off the power when you replace one of the two power supplies.
- ◆ If you are replacing both power supplies in the same disk shelf, replace them one at a time to avoid powering down the disk shelf.

For detailed information

For details about replacing a disk shelf power supply, see the following topics:

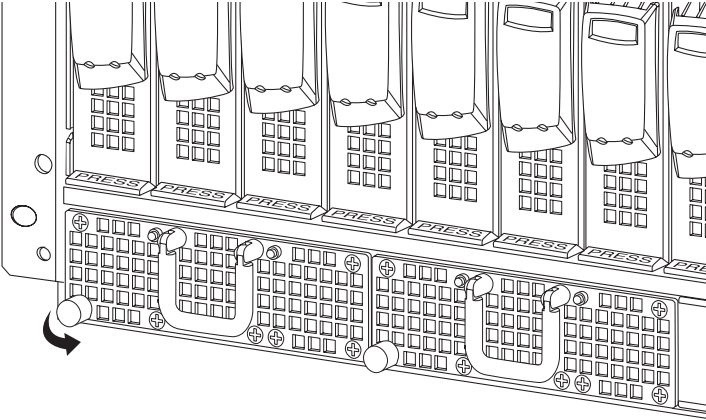
- ◆ [“Removing a power supply from a disk shelf”](#) on page 85
- ◆ [“Installing a power supply in a disk shelf”](#) on page 87

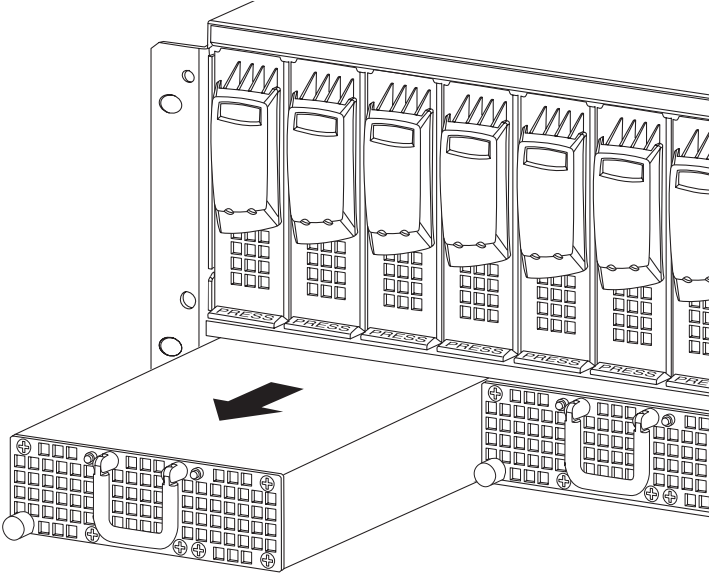
Replacing a power supply in a disk shelf

Removing a power supply from a disk shelf

Removing a power supply

To remove a power supply from a disk shelf, complete the following steps.

Step	Action
1	Put on the antistatic wrist strap and grounding leash.
2	Turn off the power supply that you are replacing and disconnect the AC power cord.
3	Loosen the thumbscrew on the lower left-hand corner of the power supply that you want to remove while simultaneously pulling the power supply handle towards you. 

Step	Action
4	After the thumbscrew is cleared of its threading, use the handle to pull the power supply out of the disk shelf. WARNING — When removing a power supply, always use two hands to support its weight. 

Installing a power supply in a disk shelf

Installing a power supply

To install a power supply in a disk shelf, complete the following steps.

Step	Action
1	Put on the antistatic wrist strap and grounding leash.
2	Slide the power supply into the disk shelf until the threaded end of the thumbscrew contacts the matching screw hole assembly inside the disk shelf. Caution_____ Do not use excessive force when sliding the power supply into the disk shelf; you can damage the connector.
3	Using your fingers, or a screwdriver if necessary, turn the thumbscrew on the lower left-hand corner of the power supply to help pull it into place until the front face is flush with the second power supply. Note_____ The power supply thumbscrew is used for pulling the power supply into the backplane and securing it in place. Do not overtighten the thumbscrew. Apply only enough force to pull the power supply into place. If using a power screwdriver, set the torque initially to its lowest setting.
4	Connect the AC power cord to the back of the disk shelf.
5	Turn on the power supply.

Replacing the EMU

About the EMU

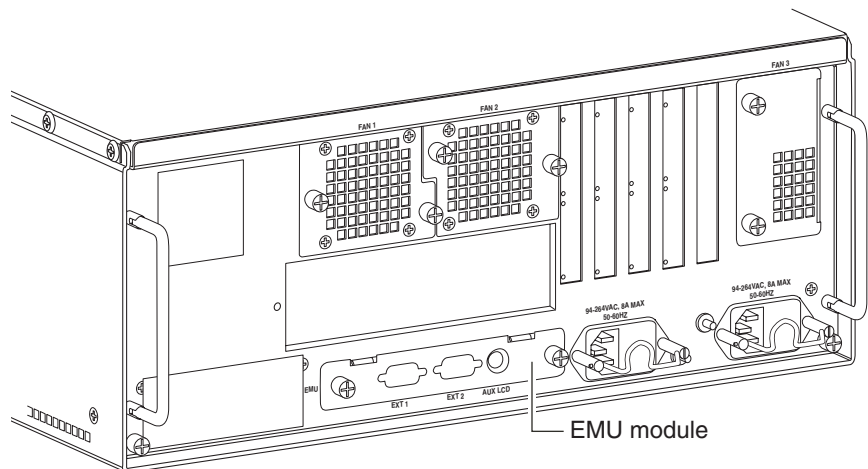
Each disk shelf enclosure features external system indicators (LEDs) that are controlled by the Environmental Monitoring Unit (EMU). The EMU is field-replaceable by removing two thumbscrews and sliding it out the back of the enclosure. The EMU, however, is not hot swappable—the disk shelf must be powered down before replacement. The EMU communicates In-Band to the SCSI host system through its serial port, which is connected to the HDD Backplane Serial Port.

Location of the EMU

The EMU is plugged into the power backplane at the back of the enclosure.

Note

The external connection ports on the EMU are not used.



For detailed information

For details about replacing the EMU in a disk shelf, see the following topics:

- ◆ [“Removing the EMU from the disk shelf”](#) on page 89
- ◆ [“Installing an EMU in a disk shelf”](#) on page 90

Removing the EMU from the disk shelf

Removing the EMU To remove the EMU from a disk shelf, complete the following steps.

Step	Action
1	Put on the antistatic wrist strap and grounding leash.
2	Shut down the storage engine by entering the following command at the console: <pre>halt</pre> Caution _____ Always use the <code>halt</code> command to perform a clean shutdown. _____
3	Verify that the LCD display at the front of the storage engine displays the following message: <pre>Halted</pre>
4	Turn off the power and unplug both power cables to the disk shelf.
5	At the rear of the disk shelf, loosen the two thumbscrews on the left and right side of the EMU.
6	Using both hands, carefully remove the EMU from the back side of the disk shelf and place it on a nonconductive/antistatic surface.

Installing an EMU in a disk shelf

Installing an EMU

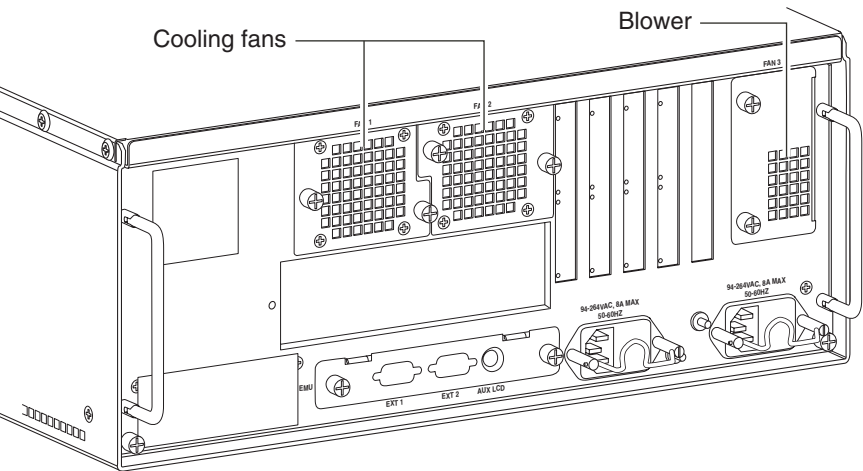
To install an EMU in a disk shelf, complete the following steps.

Step	Action
1	Put on the antistatic wrist strap and grounding leash.
2	Line up both sides of the EMU card with the guides on each side of the EMU bay. Caution————— Install the card in its correct orientation; that is, with the circuit board components facing down. Even though it's physically possible to install the EMU card upside down with the components facing up, the connecting pins do not engage with the connection terminal on the power backplane when it is installed that way.
3	Using both hands, carefully slide the EMU into the rear slot of the disk shelf until it is seated into the insertion slot. Caution————— Do not use excessive force when sliding the EMU into the disk shelf; you can damage the connector.
4	Tighten the thumbscrew on each side of the EMU.
5	Connect both AC power cords to the back of the disk shelf.
6	Turn on the power supply.

Replacing the cooling fans and blower

About the cooling fans

The R150 disk shelf uses two 60 mm cooling fans and one blower mounted at the rear of the disk shelf enclosure to help provide adequate airflow and cooling.



Rules for replacing the fans and blower

When replacing a fan or blower, observe the following rules:

- ◆ You do not need to turn off the power when replacing the blower or two cooling fans as these components are hot swappable.
- ◆ If you are replacing a fan or blower in the disk shelf with the power on, replace them one at a time.

Replacing the fans or blower

To replace a cooling fan or blower, complete the following steps.

Step	Action
1	Put on the antistatic wrist strap and grounding leash.
2	At the rear of the disk shelf, loosen the two thumbscrews securing the fan or blower in place.
3	Remove the old fan or blower by sliding it out through its slot.

Step	Action
4	Carefully disconnect the fan or blower from the power harness.
5	Attach the replacement fan or blower to the power harness and confirm proper operation. WARNING _____ The replacement fan or blower starts spinning after it is connected to the power harness. Keep fingers clear of the fan blades. _____
6	Carefully slide it into the slot. Secure it in place by tightening both thumbscrews.

About this chapter

This chapter lists field-replaceable units (FRUs) that are available for your storage engine, and describes the tasks you must complete to replace each type of FRU.

Topics in this chapter

This chapter discusses the following topics:

- ◆ [“Field-replaceable unit overview”](#) on page 94
- ◆ [“Opening the PCB carrier”](#) on page 95
- ◆ [“Removing the PCB carrier”](#) on page 97
- ◆ [“Replacing the motherboard”](#) on page 99
- ◆ [“Replacing the memory card assembly”](#) on page 104
- ◆ [“Replacing SDRAM DIMMs on the memory card assembly”](#) on page 107
- ◆ [“Installing or replacing expansion adapters”](#) on page 110
- ◆ [“Closing the PCB carrier”](#) on page 116
- ◆ [“Replacing fan subassemblies”](#) on page 117
- ◆ [“Replacing the power supplies”](#) on page 121
- ◆ [“Replacing the control panel subassembly”](#) on page 125

Field-replaceable unit overview

About FRUs

A FRU is a component in your appliance that you can replace if it fails. FRUs must be purchased through Network Appliance or from an authorized reseller.

Units you can replace

The following list specifies the FRUs in the your storage engine:

- ◆ Motherboard tray, including PCB carrier
- ◆ Motherboard lithium system battery
- ◆ Memory card assembly
- ◆ DDR SDRAM DIMMs on the memory card assembly
- ◆ Expansion adapters
 - ❖ NVRAM 4 (nonvolatile random access memory) adapter
 - ❖ Gigabit Ethernet (GbE) network adapter
 - ❖ 10Base-T/100Base-TX/1000Base-T GbE network adapter
 - ❖ Remote management adapter
 - ❖ FC-AL adapters
 - ❖ Fibre Channel target mode adapter
 - ❖ Fibre Channel tape back up adapter
 - ❖ SCSI tape backup adapter
- ◆ Fan assembly
- ◆ Power supply assemblies
- ◆ Bezel
- ◆ Control panel assembly
- ◆ CompactFlash™ Card

What to do if the failed item isn't on the FRU list

If you need to replace a component that is not in the FRU list, call Network Appliance Customer Support for instructions.

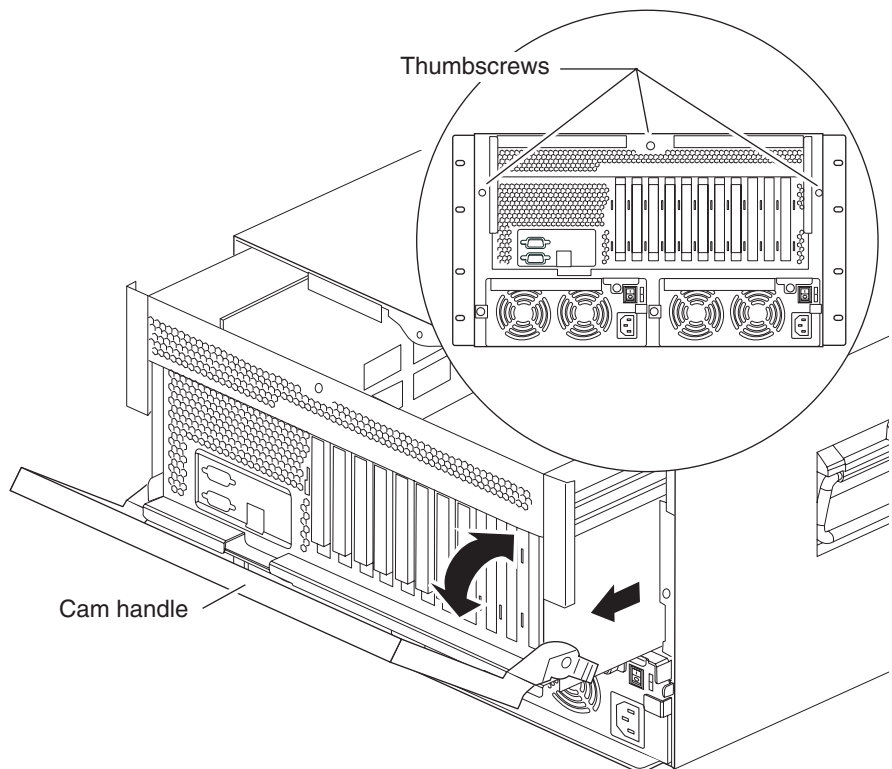
Opening the PCB carrier

Reasons to open the PCB carrier

You open the PCB carrier to access the motherboard tray, memory card assembly, expansion adapters, and other FRUs.

Opening the PCB carrier

To open the PCB carrier for access to the internal FRUs, complete the following steps using the figure for reference.



Step	Actions
1	Shut down the storage engine by entering the following command at the console: halt Caution _____ Always use the <code>halt</code> command to perform a clean shutdown.
2	Turn off and disconnect the power to the storage engine.
3	Put on the antistatic wrist strap and attach the grounding leash to the storage engine chassis.
4	Remove the cable management tray.
5	Loosen the three thumbscrews on the back panel of the PCB carrier.
6	Carefully pull the cam handle so that the PCB carrier slides out from the chassis until the carrier tabs click to lock the slide rails in place. The PCB carrier has a travel distance of approximately 19 inches (48.26 centimeters).

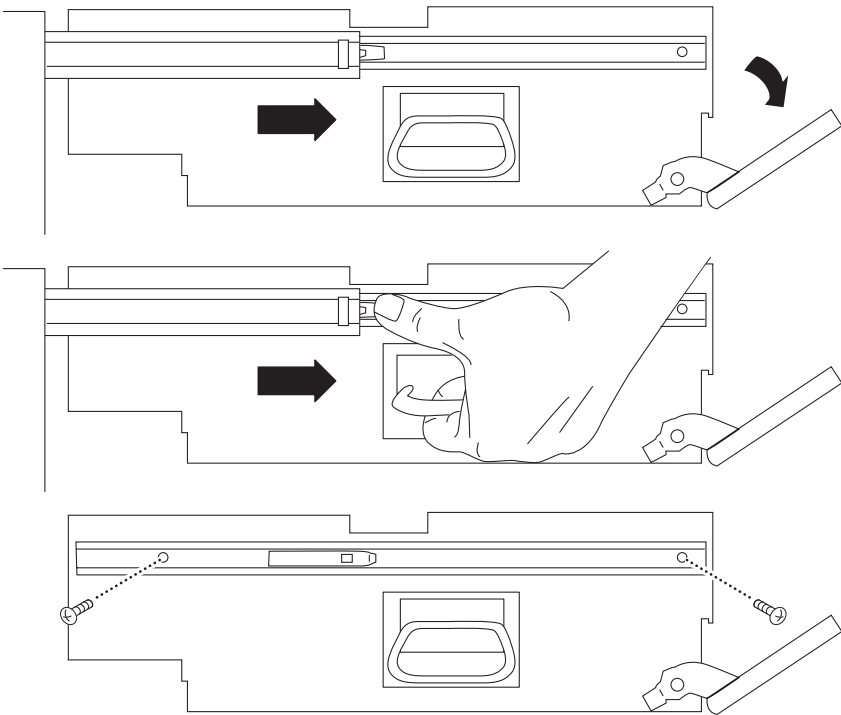
Removing the PCB carrier

Reasons for removing the PCB carrier

You must remove the PCB carrier from the storage engine if you are replacing the motherboard tray. You can also remove the PCB carrier to replace components, such as the memory card assembly and expansion adapters.

Removing the PCB carrier

To remove the PCB carrier from your appliance, complete the following steps using the figure for reference.



Step	Action
1	Open the PCB carrier by following the procedure described in “Opening the PCB carrier” on page 95.

Step	Action	
2	With the PCB carrier completely extended, press inward on the carrier tabs on each slide rail and pull and lift the PCB carrier out of the storage engine chassis. Make sure that you remove the slide rails on the PCB carrier before sending it for replacement.	
3	Support the PCB carrier with both hands and set it aside.	
4	If you are...	Then...
	Replacing the motherboard	Go to “Replacing the motherboard” on page 99.
	Not replacing the motherboard, but you are replacing units on it	Go to the appropriate procedure for the unit you are replacing: ◆ “Replacing SDRAM DIMMs on the memory card assembly” on page 107 ◆ “Replacing the memory card assembly” on page 104 ◆ “Installing or replacing expansion adapters” on page 110

Replacing the motherboard

About replacing the motherboard

Replacing the motherboard consists of the following procedures:

- ◆ “[Removing the motherboard tray](#)” below
- ◆ “[Installing the motherboard tray](#)” on page 100

Removing the motherboard tray

To remove the motherboard tray, complete the following steps.

Caution—————
To prevent shorting the NVRAM 4 battery, you must perform this procedure on a nonconductive surface. Shorting the NVRAM 4 battery causes data loss.

Step	Action
1	Shut down the storage engine by entering the following command at the console: halt
2	Open the PCB carrier by following the procedure described in “ Opening the PCB carrier ” on page 95. Note ————— When the motherboard fails, the storage engine performs a “dirty shutdown.” This prevents you from performing the recommended clean shutdown. However, the data from the last transaction is still buffered in the battery-backed memory on the NVRAM 4 adapter.
3	Remove all adapters by following Steps 2 through 6 of the procedure described in “ Removing an existing expansion adapter ” on page 111. If your PCI expansion adapters are secured by screws, set the screws and adapters aside for later use.
4	Remove the memory card assembly by following the procedure described in “ Replacing the memory card assembly ” on page 104.

Step	Action
5	Remove the PCB carrier from the storage engine chassis by following Steps 2 through 4 of the procedure described in “ Removing the PCB carrier ” on page 97.
6	Unscrew the slides from the PCB carrier using a #2 Phillips screwdriver and set them aside for your replacement motherboard. The motherboard tray includes the PCB carrier, empty of all other FRUs.

Installing the motherboard tray

To install the motherboard tray, complete the following steps.

Step	Action
1	Using a #2 Phillips screwdriver, secure the rails on the side of the PCB carrier.
2	Install the memory card assembly by following the procedure described in “ Replacing the memory card assembly ” on page 104.
3	Reinstall all other adapters into the expansion slots on the motherboard by following Steps 3 through 6 of the procedure described in “ Installing an expansion adapter ” on page 113.
4	Pull the inner slides from the storage engine’s chassis to full extension, then carefully align the PCB carrier rails with the inner slides.
5	Slide the PCB carrier into the storage engine chassis. Note — If the PCB carrier gets stuck while the inner slides are extended, reach inside the storage engine chassis and hold the locking mechanism straight so that the slides are not obstructed.
6	Reconnect the storage engine to the your network.
7	Reconnect the storage engine to AC power, and power on.

Step	Action
8	Go to the NOW site at http://now.netapp.com to download the latest firmware.
9	Run diagnostics for your system. See the <i>Diagnostics Guide</i> for more information.

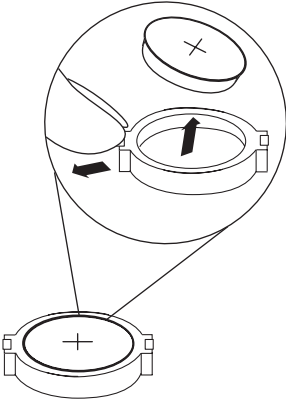
Replacing the motherboard lithium battery

About replacing the motherboard lithium battery

- Replacing the 3.3V lithium battery on the motherboard consists of the following procedures:
- ◆ “[Removing the motherboard lithium battery](#)” below
 - ◆ “[Installing the motherboard lithium battery](#)” on page 103

Removing the motherboard lithium battery

To remove the motherboard lithium battery, complete the following steps.

Step	Action
1	Open the PCB carrier. Follow the procedure in “Opening the PCB carrier” on page 95. Caution _____ Put on an antistatic wrist strap and attach the grounding leash to the storage engine chassis. _____
2	Lift up the battery toward the open side of the battery holder, as shown. 

**Installing the
motherboard
lithium battery**

To install the motherboard lithium battery, complete the following steps.

WARNING —————
Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to manufacturer’s instructions.

AVERTISSEMENT —————
Il y a danger d’explosion s’il y a remplacement incorrect de la pile.
Remplacer la pile seulement avec une pile du même type ou d’un type équivalent recommandé par le fabricant. Mettre au rebut les piles usagées selon les instructions du fabricant.

ACHTUNG —————
Explosionsgefahr bei unsachgemäßem Austausch der Batterie. Die Batterien nur durch denselben oder einen vom Hersteller empfohlenen gleichwertigen Typ ersetzen. Gebrauchter Batterien nach Angaben des Herstellers loswerden.

Step	Action
1	Turn the battery so that the positive side is up (marked with a “+”).
2	Push the battery through the open side of the battery holder so that it sits flush inside the battery holder.
3	Go to “ Closing the PCB carrier ” on page 116.

Replacing the memory card assembly

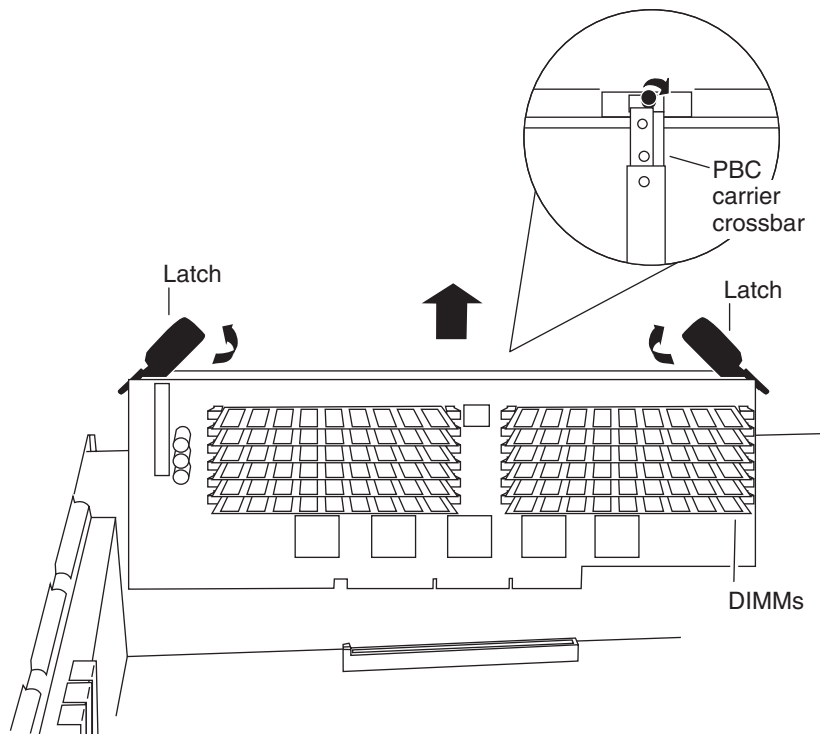
About replacing the memory card assembly

The memory card assembly contains the SDRAM DIMMs of your system and is connected to the motherboard. Replacing the memory card assembly consists of the following procedures:

- ◆ “[Removing the memory card assembly](#)” on page 104
- ◆ “[Installing the memory card assembly](#)” on page 105

Removing the memory card assembly

To remove the memory card assembly, complete the following steps using the figure for reference.



Step	Action
1	Open the PCB carrier. Follow the procedure in “ Opening the PCB carrier ” on page 95.
2	Lift the PCB carrier crossbar from the top of the inside of the PCB carrier by loosening the thumbscrew above the memory card assembly.
3	Pull apart the latches on both sides of the memory card assembly to release it from the PCB carrier.
4	Carefully pull the memory card assembly from its riser slot.
5	Set the memory card assembly aside in an antistatic bag.

Installing the memory card assembly

To install the memory card assembly, complete the following steps.

Step	Action
1	Hold the memory card assembly by the sides to avoid damaging the components.
2	Carefully insert the memory card assembly straight into its riser slot. The memory card assembly fits tightly in the slot, but should go in easily. If not, realign the memory card assembly with its riser slot and try again. Caution _____ Visually inspect the memory card assembly to verify that it is evenly aligned and fully inserted into the slot; otherwise, the edge connector on the memory card assembly does not make complete contact with the slot. _____
3	Push carefully, but firmly on the top edge of the memory card assembly until the latches snap into place.
4	Lower the PCB carrier crossbar and secure it on top of the memory card assembly by tightening the thumbscrew.

Step	Action
5	Go to “ Closing the PCB carrier ” on page 116.
6	After turning on the storage engine, run diagnostics on your new memory card assembly. See the <i>Diagnostics Guide</i> for more information.

Replacing SDRAM DIMMs on the memory card assembly

About replacing SDRAM DIMMs

This section provides the supported memory configurations for your storage engine and describes the procedures for replacing the SDRAM DIMMs on the memory card assembly.

Replacing the SDRAM DIMMs on the memory card consists of the following procedures:

- ◆ “[Removing an SDRAM DIMM](#)” below
- ◆ “[Installing an SDRAM DIMM](#)” on page 108

Required memory configurations

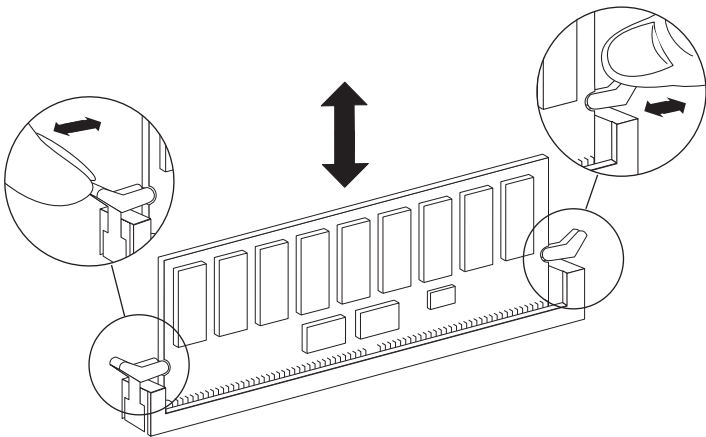
The R150 storage engine supports 3.3V, registered, 12 x 512 MB SDRAM DIMMs. The DIMM slots are located at J40 and J43 on the motherboard.

Caution—
All DIMMs must be listed on the Network Appliance Approved Parts List. Contact Network Appliance Sales to obtain this list. Unapproved DIMMs have not been tested for reliability and might cause system downtime.

Removing an SDRAM DIMM

To remove an SDRAM DIMM, complete the following steps.

Step	Action
1	Open the PCB carrier. Follow the procedure in “ Opening the PCB carrier ” on page 95.
2	Remove the memory card assembly, as described in “ Removing the memory card assembly ” on page 104.
3	Locate the DIMM that you want to remove.

Step	Action
4	Push apart the latches on either side of the DIMM to release the DIMM from its slot, as shown. 
5	Pull the DIMM out of the slot.
6	Set the DIMM aside in an antistatic bag.

Installing an SDRAM DIMM

To install an SDRAM DIMM, complete the following steps.

Step	Action
1	Locate the DIMM slot for the DIMM you are installing.
2	Hold the DIMM by its top corners to avoid damaging the components.
3	Insert the DIMM straight into the slot. 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. _____

Step	Action
4	Push carefully but firmly on the top edge of the DIMM until the latches snap into place.
5	Install the memory card assembly, as described in “ Installing the memory card assembly ” on page 105.
6	Go to “ Closing the PCB carrier ” on page 116.
7	After turning on your system, run diagnostics on the SDRAM DIMMs. See the <i>Diagnostics Guide</i> for more information.

Installing or replacing expansion adapters

About installing or replacing expansion adapters

Replacing an expansion adapter or installing a new expansion adapter consists of one or both of the following procedures:

- ◆ “[Removing an existing expansion adapter](#)” on page 111
- ◆ “[Installing an expansion adapter](#)” on page 113

Expansion adapters used

The storage engine uses the following expansion adapters:

- ◆ NVRAM 4 adapter
- ◆ SCSI controller cards for disk storage
- ◆ Dual port GbE network interface cards
- ◆ Remote management card
- ◆ Tape adapters
 - ❖ SCSI
 - ❖ FC-AL

Slot assignments for expansion adapters

If you are adding expansion adapters to your storage engine, the System Configuration Guide at <http://now.netapp.com> provides current configuration information for the following:

- ◆ Expansion slots that are available on your storage engine
- ◆ Supported adapters
- ◆ Expansion slot assignments

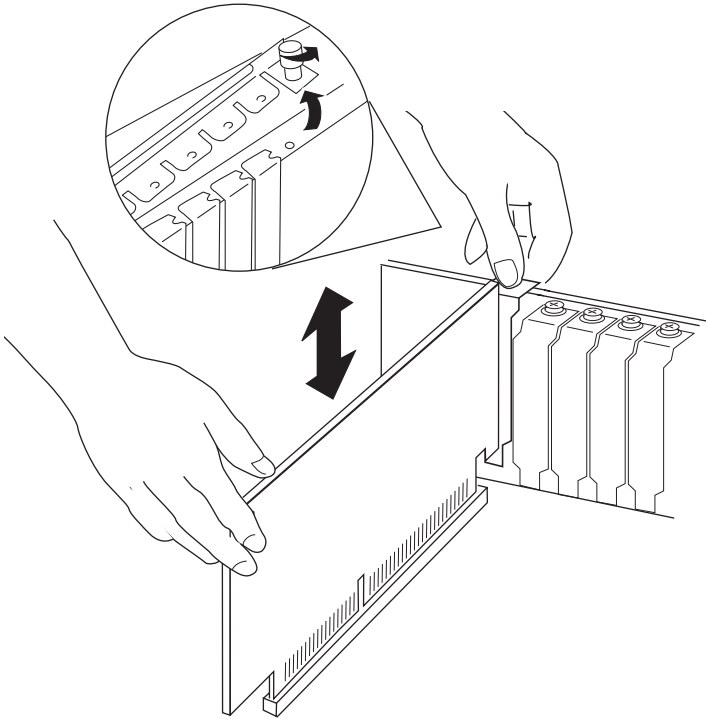
Caution

Install only supported expansion adapters in the assigned expansion slots. To ensure compatibility, performance, and reliability, you must obtain expansion adapters for your storage engine from Network Appliance or an authorized reseller.

Removing an existing expansion adapter

To remove existing expansion adapters, complete the following steps.

Step	Action	
1	Open the PCB carrier. Follow the procedure in “ Opening the PCB carrier ” on page 95.	
2	Unlatch the PCI clamp arm and pull it aside. Note _____ Your system might require that you screw down PCI expansion adapters. If so, remove and set aside any screws for PCI expansion adapters.	
3	Note which cables (if any) are connected to the connectors on the faceplate of the expansion adapter before disconnecting the cables. Caution _____ Do not disconnect or connect SCSI cables while your storage engine is on. You could cause permanent damage to the hardware.	
4	If you are replacing the...	Then...
	NVRAM 4 adapter	Remove the PCB carrier crossbar by loosening the thumbscrew and lifting the crossbar away from the top of the PCB carrier. Caution _____ If you did not perform a clean shutdown using the <code>halt</code> command, disconnecting the NVRAM battery from the NVRAM 4 adapter results in data loss.
	Remote management card	Carefully unplug the internal cable that connects to the motherboard.
5	Remove the PCI clamp-down bracket holding the expansion adapter faceplate to the back panel bracket and save it for reinstalling the adapter.	

Step	Action	
6	Pull upward on the top edge of the expansion adapter and lift it out of the chassis, as shown. 	
7	If you are...	Then...
	Not installing a replacement expansion adapter	Install a slot cover for the empty PCI slot.
	Installing a replacement expansion adapter	Go to “Installing an expansion adapter” on page 113.

Installing an expansion adapter

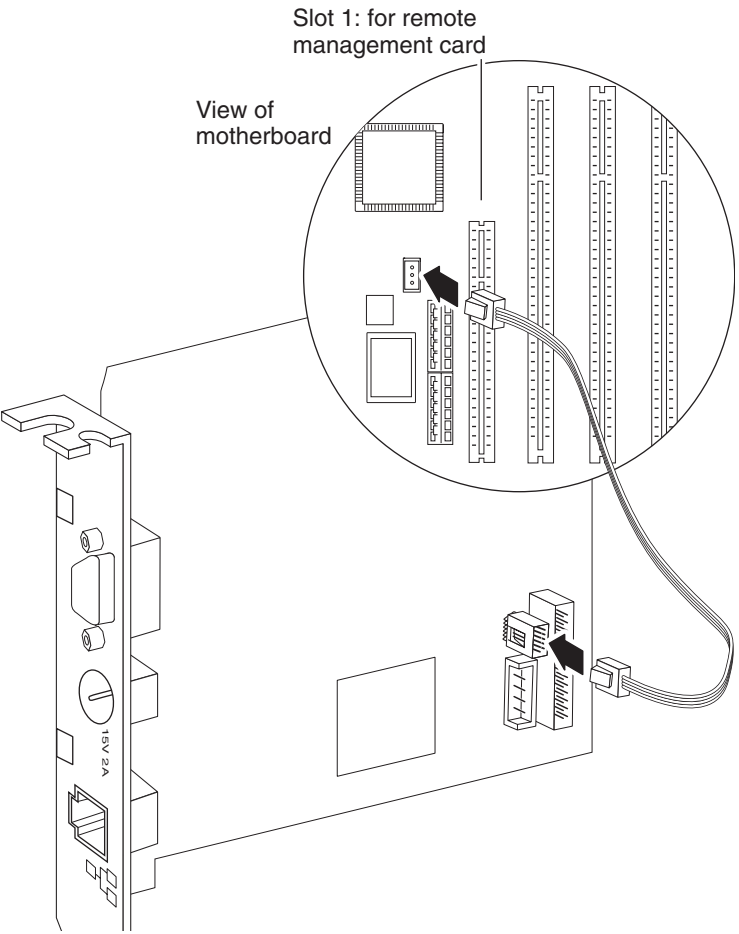
To install an expansion adapter, complete the following steps.

Step	Action	
1	If you are...	Then...
	Installing a new adapter	Take the adapter out of the antistatic bag and discard the bag.
	Installing a replacement adapter	Take the replacement adapter out of the antistatic bag and place the used adapter into that bag.
2	Holding the adapter by its top edge, with the faceplate near the back of the machine, lower the adapter into the slot until its connector edge meets the grooves in the expansion slot. The faceplate of the adapter should be in position against the back panel, and should cover the endplate slot on the back panel.	
3	Press carefully on the top edge of the adapter until the edge connector is seated in the expansion slot.	
4	If applicable, replace the faceplate screw to secure the adapter to the back panel.	
5	Reconnect the cables to the external connectors on the replacement expansion adapter.	

Step	Action	
6	If you are...	Then...
	Replacing the NVRAM 4	Lock down the PCB carrier crossbar over the NVRAM 4, then secure the crossbar to the side of the PCB carrier by tightening the thumbscrew.
	Replacing the remote management card	Remove the connector from the motherboard, as shown in the following illustration.

Slot 1: for remote management card

View of motherboard



Step	Action
7	Go to “ Closing the PCB carrier ” on page 116.
8	After turning on the storage engine, run diagnostics on the expansion adapter you replaced. See the <i>Diagnostics Guide</i> for more information.

Closing the PCB carrier

Closing the PCB carrier

To close the PCB carrier, complete the following steps.

Step	Action
1	If you removed the PCB carrier, screw in the carrier rails on each side, and then carefully place the carrier on the extended slides of the storage engine chassis so that the tabs on the rails fit into the slots on the slides.
2	Using the cam handle, slide the PCB carrier into your appliance chassis. If the PCB carrier is locked in position, press inward on the carrier tabs on each carrier slide rail while pushing the PCB carrier into the chassis.
3	Tighten the three thumbscrews on the back of the chassis.
4	Reconnect any cables you removed from the back panel of the storage engine.
5	Reconnect the power to the storage engine, and if applicable, your disk shelves.
6	Turn on your disk shelves, your tape backup devices and fibre channel switches if applicable, and then the storage engine.
7	Interrupt the boot process by pressing the Delete key during the memory test.
8	Run diagnostics by entering the following command at the ok> prompt: sys-diag See the <i>Diagnostics Guide</i> for more information.
9	Run the specific diagnostics that apply to the unit you installed or replaced.

Replacing fan subassemblies

About replacing fan subassemblies

Replacing a fan subassembly consists of the following procedures:

- ◆ “[Removing a fan subassembly](#)” on page 118
- ◆ “[Installing a fan subassembly](#)” on page 120

Identifying the subassembly to replace

Each of the three fan subassemblies secured to the front of the storage engine chassis contains two fans. If a problem occurs in a fan, the system console displays an error message identifying the specific fan that has the problem, rather than the subassembly it belongs to.

Note _____
You cannot replace the individual fan; you must replace the subassembly.

The following table lists the individual fan numbers that the console might display and their corresponding subassemblies.

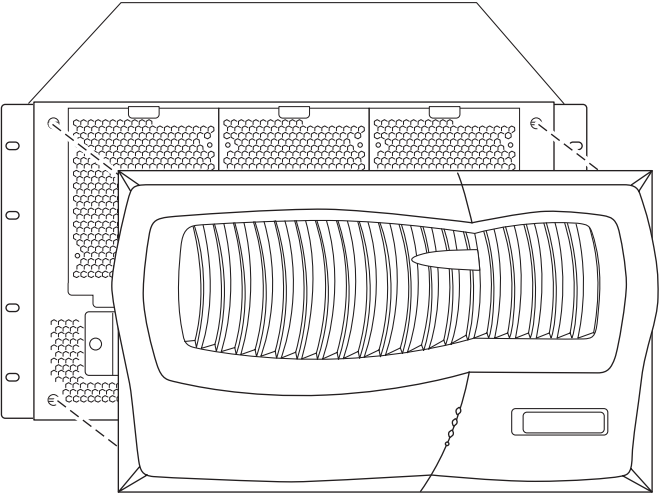
Fan number (as indicated on your console)	Subassembly (as indicated on your chassis)
Baseboard fan 1	Subassembly 1
Baseboard fan 2	
Baseboard fan 3	Subassembly 2
Baseboard fan 4	
Baseboard fan 5	Subassembly 3
Baseboard fan 6	

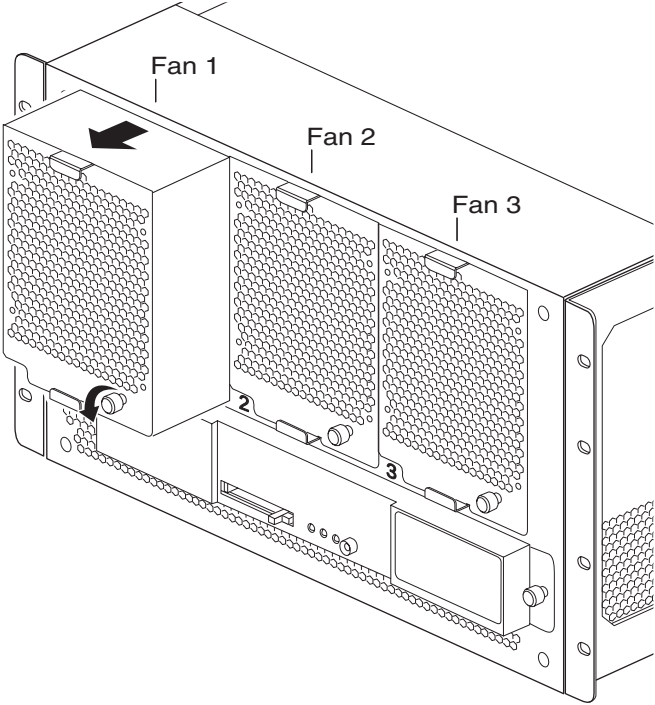
Note _____
To maintain UL, CSA, and TUV safety certifications, you must obtain replacement fan subassemblies from Network Appliance. Using unapproved replacement fan subassemblies voids the safety certifications.

Removing a fan subassembly

To remove a fan subassembly, complete the following steps.

Note Because the three subassemblies are hot swappable, there is no need to shut down the storage engine. There is a two-minute window for replacing fans.

Step	Action
1	From the console, note the identification of the fan that failed and identify the subassembly that it belongs to.
2	Pull the bezel straight off the front panel of your appliance by using the grooves on the left and right edges of the bezel. 
3	Using a #1 Phillips screwdriver, loosen the thumbscrews on the chassis fan subassembly that failed.

Step	Action
4	Using both the upper and lower lips, pull the subassembly out of the storage engine chassis. The sheet metal below the subassemblies is silk-screened with the labels Fan 1, Fan 2, and Fan 3. Note—— If your appliance is running Data ONTAP™ software, it reports a failure for the removed fan subassembly. 
5	Set the subassembly aside.

Installing a fan subassembly

To install a fan subassembly, complete the following steps.

Step	Action
1	Slide the subassembly straight into the storage engine chassis.
2	Tighten the subassembly thumbscrews.
3	Align the pins on the bezel with the holes on the front panel of the storage engine, then push the bezel straight onto the front panel.
4	Reconnect and turn on the power to the storage engine.
5	Interrupt the boot process by pressing the Delete key during the memory test.
6	Run diagnostics by entering the following command at the <code>ok></code> prompt: sys-diag See the <i>Diagnostics Guide</i> for more information.
7	Run the diagnostics that apply to the unit you installed or replaced.

Replacing the power supplies

About replacing a power supply

Your storage engine has two power supplies in two separate power supply bays at the back.

Note

Because you have two power supplies that are hot swappable, you do not have to shut down the storage engine when you are replacing one of them.

Replacing a power supply consists of the following procedures:

- ◆ [“Removing a power supply”](#) on page 122
- ◆ [“Installing a power supply”](#) on page 123

Power supply compatibility

Be aware of the following caution regarding the compatibility between the two power supplies in your appliance.

Caution

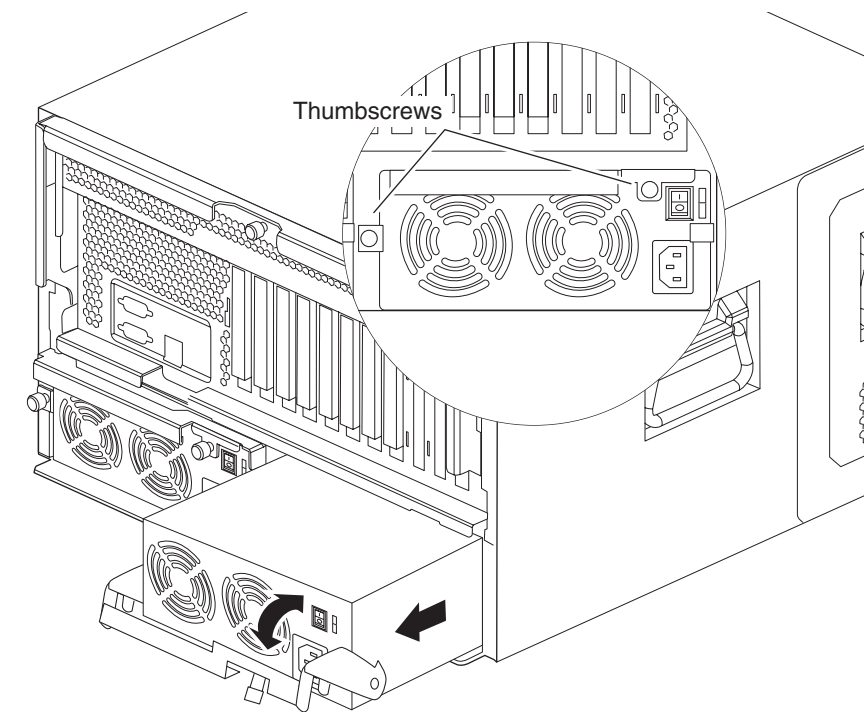
When replacing a power supply, be sure not to mix power supplies from different systems. The two power supplies in your appliance must have the same part number.

Removing a power supply

To remove a power supply, complete the following steps, using the figure for reference.

WARNING

To avoid an electric shock hazard, you must disconnect the power supply before removing it from the storage engine.



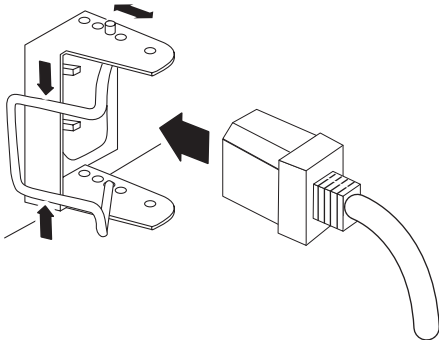
Step	Action
1	From the console or LCD screen, identify the failed power supply. Note The power supply identifiers, PS1 and PS2, are silk-screened onto the storage engine chassis.
2	Put on the antistatic wrist strap and grounding leash.
3	Turn off the switch on the power supply that you are replacing.

Step	Action
4	Lift up the clip lock and unplug the power cord from the storage engine power supply.
5	Loosen the power supply thumbscrews by turning each thumbscrew counterclockwise.
6	Use the cam handle to slide the power supply out of the power supply bay. WARNING _____ The power supply is heavy. Support the bottom of the unit while removing the unit from its bay.
7	Set the power supply aside. Note _____ If the storage engine is running Data ONTAP, it reports a failure for the removed power supply.

Installing a power supply

To install a power supply, complete the following steps.

Step	Action
1	Verify that the switch on the power supply is turned off.
2	Slowly and firmly push the power supply into the bay until the power supply is firmly seated in the bay.
3	Secure the power supply by turning the thumbscrew clockwise until it stops.

Step	Action
4	Plug the power cord into the power cord receptacle on the power supply and secure it with the adjustable clip lock, shown below.  The diagram illustrates the process of securing a power cord. On the left, a metal bracket with a sliding clip is shown. A black arrow points down to the clip, and another black arrow points up to the bracket's base. On the right, a power cord with a multi-pin connector is shown. A large black arrow points from the cord's connector towards the clip on the bracket, indicating the direction of insertion.
5	Turn on the power to the new power supply.

Replacing the control panel subassembly

About replacing the control panel subassembly

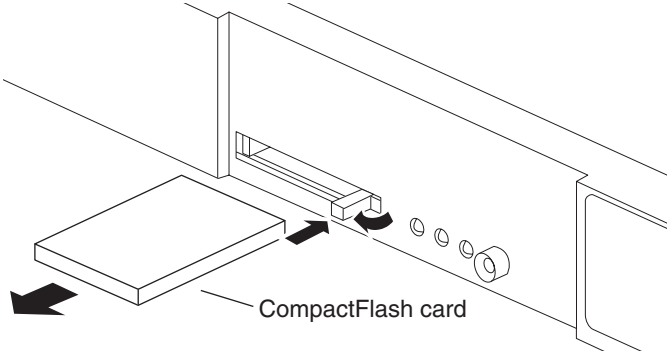
The control panel assembly includes your CompactFlash unit. Replacing the control panel subassembly consists of the following procedures:

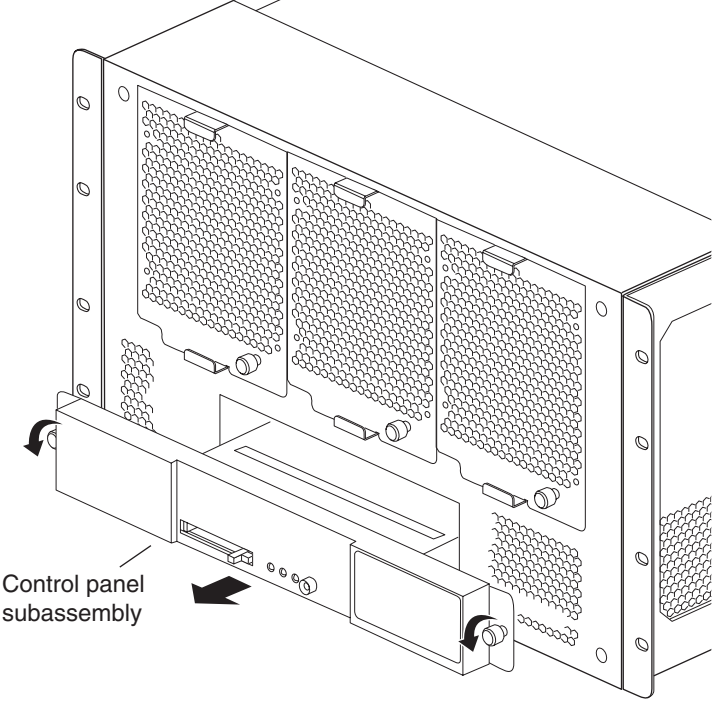
- ◆ “[Removing the control panel subassembly](#)” on page 125
- ◆ “[Installing the control panel subassembly](#)” on page 127

Removing the control panel subassembly

To remove the control panel subassembly, complete the following steps.

Step	Action
1	Shut down the storage engine by entering the following command at the console: halt Caution————— Always use the <code>halt</code> command to perform a clean shutdown of your appliance. If you do not perform a clean shutdown before removing the CompactFlash unit, your system panics.
2	Turn off and disconnect the power to the storage engine.
3	Put on the antistatic wrist strap and attach the grounding leash to the storage engine chassis.

Step	Action
4	Remove the CompactFlash card by pulling the lever on the side of the CompactFlash bay and pushing to release the unit, as shown in the following illustration.  CompactFlash card

Step	Action
5	Pull the control panel subassembly out of the drive bay. 

Installing the control panel subassembly

To install the control panel subassembly, complete the following steps.

Step	Action
1	Slide the control panel subassembly into the drive bay.
2	Tighten the two thumbscrews to secure the control panel subassembly to the chassis.
3	Slide the CompactFlash unit into the slot on the front of the CompactFlash reader.

Step	Action
4	Reinstall the front bezel by aligning the pins on the bezel with the holes on the front panel of the storage engine, and then pushing the bezel straight onto the front panel.
5	Reconnect and turn on the power to the storage engine.
6	Interrupt the boot process by pressing the Delete key during the memory test. Note_____ If Delete doesn't interrupt booting, try using Ctrl-Bksp. _____
7	Insert the CompactFlash unit and run diagnostics by entering the following command at the ok> prompt: sys-diag See the <i>Diagnostics Guide</i> for more information.

About this chapter

This chapter lists error messages you might encounter during the boot process. It also describes the location of the LEDs and how to interpret the information they provide.

Note

If you contact Network Appliance Technical Support for service, report both the LCD message and the console message. Most LCD messages are truncated versions of console messages that provide more information about the error condition than the LCD messages.

Topics in this chapter

This chapter describes the following topics:

- ◆ “[Startup error messages](#)” on page 130
- ◆ “[Remote management card e-mail notifications](#)” on page 143
- ◆ “[Operational error messages](#)” on page 145

Where to get more information

The following table lists the documentation that can help you with some of the corrective actions.

If you are troubleshooting...	Then...
R150 storage engine hardware problems and need to open the storage engine	See “ Replacing R150 Storage Engine Components ” on page 93.
R150 SCSI disk shelf problems	See “ Replacing R150 Disk Shelf Components ” on page 77.
Software problems	See the <i>Data ONTAP System Administrator's Guide</i> .

Startup error messages

Startup sequence

When you apply power to the your appliance, it verifies the hardware that is in the system, loads the operating system, and displays two types of startup informational and error messages on system console:

- ◆ Power-On Self-Test (POST) messages
- ◆ Boot messages

POST messages

POST is a series of tests run from the motherboard PROM. These tests check the hardware on the motherboard and differ depending on your system configuration. The following series of messages are examples of POST messages displayed on the console.

Header:

```
Intel Open Firmware by FirmWorks  
Copyright 1995-2002 FirmWorks, Network Appliance. All Rights  
Reserved.  
Firmware release x.x_in
```

POST messages:

```
Memory size is 6GB  
Testing SIO  
Testing LCD  
Probing devices  
Testing 512MB  
Complete  
Finding image...  
Starting
```

Note

Your appliance LCD displays only the POST messages without the preceding header.

Boot messages

After the boot is successfully completed, the storage engine loads the operating system. The following message is an example of the boot message that appears on the system console of an R150 at first boot. The exact boot messages that appear on your system console depend on your system configuration.

Boot messages	
NetApp Release x.x.x: Thu Oct 3 04:06:00: PDT 2002	
System ID: 0050385230 ()	
System Serial Number: 1032264	
System Rev: A0	
slot 0:	System Board
	Processors: 1
	Memory Size: 6144 MB
slot 0:	10/100 Ethernet Controller IV
	e0 MAC Address: 00:a0:98:00:ef:e1 (auto-100tx-fd-disabling)
slot 0:	NetApp ATA/IDE Adapter ata0a (1f0)
slot 3:	Fibre Channel Target Host Adapter 3a
slot 3:	Fibre Channel Target Host Adapter 3b
slot 4:	SCSI Host Adapter 4a
	12 Disks: 2120.0GB
	1 shelf with EMU
slot 4:	SCSI Host Adapter 4b
slot 5:	SCSI Host Adapter 5a
	12 Disks: 2544.0GB
	1 shelf with EMU
slot 5:	SCSI Host Adapter 5b
	12 Disks: 2544.0GB
	1 shelf with EMU
slot 6:	SCSI Host Adapter 6a
	12 Disks: 2332.0GB
	1 shelf with EMU
slot 6:	SCSI Host Adapter 6b
	12 Disks: 2544.0GB
	1 shelf with EMU

Boot messages	
slot 7:	NVRAM Memory Size: 256 MB
slot 8:	SCSI Host Adapter 8a 12 Disks: 2544.0GB 1 shelf with EMU
slot 8:	SCSI Host Adapter 8b 12 Disks: 2120.0GB 1 shelf with EMU
slot 9:	SCSI Host Adapter 9a 12 Disks: 2544.0GB 1 shelf with EMU
slot 9:	SCSI Host Adapter 9b 12 Disks: 2332.0GB 1 shelf with EMU
slot 10:	Dual 10/100/1000 Ethernet Controller V e10a MAC Address: 00:07:e9:09:07:7a e10b MAC Address: 00:07:e9:09:07:7b
slot 11:	Dual Gigabit Ethernet Controller V e11a MAC Address: 00:07:e9:09:34:1a e11b MAC Address: 00:07:e9:09:34:1b

Types of startup error messages

You might encounter two groups of startup error messages during the boot process:

- ◆ POST error messages
- ◆ Boot error messages.

Both error message types are displayed on the system console.

For detailed information

For a detailed list of the startup error messages, see the following sections:

- ◆ [“POST error messages”](#) on page 133
- ◆ [“Boot error messages”](#) on page 139

POST error messages

POST error messages

The following table describes the extended POST error messages that might appear on the system console if your appliance encounters CPU-level system errors during the POST process.

If any Processor 2 error messages are displayed, power cycle the system. If the error message persists, replace the motherboard, as described in [“Replacing the motherboard”](#) on page 99.

Note

Always power cycle your appliance when you receive any of the following errors. If the system repeats the error message, follow the corrective action for that error message.

Error message or code	Description	Corrective action
*BMC disable	The baseboard management card (BMC) is in a state where it cannot supply environmental data. The message can result from two conditions: ◆ The BMC has an internal error and might be able to supply correct environmental data. No further environmental error messages are displayed after this message. ◆ The BMC is in Firmware Update Mode and does nothing else until removed from this mode. Other environmental messages follows this message.	Replace the motherboard, as described in “Replacing the motherboard” on page 99. Use your <i>Diagnostics Guide</i> to get the BMC out of the Firmware Update Mode.
*Watchdog error	An error occurred during the testing of the Watchdog timer.	Replace the motherboard, as described in “Replacing the motherboard” on page 99.

Error message or code	Description	Corrective action
*Missing CF-card	The CompactFlash card is missing from the front of the machine. The kernel does not boot correctly.	Insert a valid CompactFlash card or replace the control panel subassembly, as described in “Replacing the control panel subassembly” on page 125
*Inv boot device	An error with the CompactFlash card occurred. This is usually caused by a card made by an unsupported manufacturer.	Insert a valid CompactFlash card.
*Boot device err	A CompactFlash card could not be found to boot from.	Insert a valid CompactFlash card.
*2.5V power bad *3.3V power bad *5V power bad *+12V power bad *-12V power bad	One (or more) of the power voltages is bad. This could be due to a bad power supply or power-regulation device.	Replace the motherboard, as described in “Replacing the motherboard” on page 99, or replace the memory card assembly, as described in “Replacing the memory card assembly” on page 104.
*Pwr Sup #1 bad	An error occurred within the power supply.	Replace the power supply, as described in “Replacing the power supplies” on page 121.
*Pwr Sup #2 bad	An error occurred within the power supply.	Replace the power supply, as described in “Replacing the power supplies” on page 121.
*Pwr Sup #1 out	The power supply is not connected to the storage engine chassis.	Replace the power supply, as described in “Replacing the power supplies” on page 121.
*Pwr Sup #2 out	The power supply is not connected to the storage engine chassis.	Replace the power supply, as described in “Replacing the power supplies” on page 121.
*Boot DeviceErr	The CompactFlash card could not be found to boot from.	Insert a CompactFlash card.

Error message or code	Description	Corrective action
<i>*Clock invalid. Date reset</i>	The system real-time clock (RTC) contains an invalid date value. The system does not boot, but the date is reset to January 1, 1970, to enable a subsequent boot.	Replace your motherboard battery and reset the date immediately to avoid file system problems.
<i>*Clock dead</i>	The system RTC failed.	Replace the motherboard tray.
<i>*Clock batt dead</i>	The system RTC failed and its battery expired.	Replace the failed motherboard battery, and reset the date immediately to avoid file system problems.
<i>*Clock error</i>	The system real-time clock (RTC) is not operating (counting) correctly.	Replace the motherboard.
<i>*Clock reset</i>	The system RTC is not running. The system does not boot, but the date is reset to January 1, 1970, to enable a subsequent boot.	Reboot your appliance and reset the date immediately to avoid file system problems.
<i>*CPU ucode err</i>	The CPU microcode update did not occur or, in a multiprocessor system, the microcode updates in the CPUs do not match; that is, they have different revisions.	Update the firmware to a version that contains an updated microcode database.
<i>*CPU speed err</i>	The CPU's measured clock speed does not match the expected value for the appliance model. This indicates problems with system clocks and/or buses.	Update the firmware to a version that contains an updated microcode database, or replace the motherboard, as described in “Replacing the motherboard” on page 99.
<i>*CPU count err</i>	The number of CPUs found by the firmware does not correspond to the expected number based on the system model.	Reboot your appliance. If the problem persists, replace the motherboard.

Error message or code	Description	Corrective action
<i>*FP button stuck</i>	The front panel Interrupt button is stuck.	1. Free the Interrupt button. 2. Replace the LED/LCD subassembly. 3. Replace the motherboard.
<i>*LCD won't open</i> <i>*LCD cmd stall</i> <i>*LCD cursor err</i> <i>*LCD data error</i>	The system LCD device is not operating correctly. All subsequent POST messages are displayed on the console.	Replace the control panel assembly.
<i>*Env-A rupt err</i> <i>*Env-B rupt err</i> <i>*Env-C rupt err</i> <i>*Env-D rupt err</i>	One of four environmental status monitors on your appliance cannot interrupt the processor, which prevents your appliance from properly monitoring its environmental health.	Replace the motherboard, as described in “ Replacing the motherboard ” on page 99.
<i>*Env-A stat err</i> <i>*Env-B stat err</i> <i>*Env-C stat err</i> <i>*Env-D stat err</i>	One of four environmental status monitors on your appliance indicates that it cannot properly monitor its environmental health.	Replace the motherboard, as described in “ Replacing the motherboard ” on page 99.
<i>*No power info</i>	The system is clearly running but no information about the power supply is being reported. Something is wrong with the power supply or the status reporting circuitry.	Replace the power supply or the motherboard.
<i>*Onboard battery low</i>	The lithium battery on the motherboard is low.	Replace the lithium battery on the motherboard, as described in “ Replacing the motherboard lithium battery ” on page 102.

Error message or code	Description	Corrective action
<i>*Overtemp alert</i>	The internal temperature sensor detected a dangerously high temperature that can damage the system components inside the chassis.	1. Power down your appliance. 2. Reduce the ambient temperature to 40° C or lower. 3. Make sure that you have proper air circulation through your appliance. If the temperature inside your appliance is not excessively hot, the sensor itself might have failed. 4. Replace the motherboard.
<i>*PCCRD init fail</i> <i>*PCCRD reg error</i> <i>*PCCRD seek err</i> <i>*PCCRD track err</i> <i>*PCCRD head err</i> <i>*PCCRD format err</i> <i>*PCCRD read err</i> <i>*PCCRD setup err</i>	These messages indicate that the control panel assembly failed.	Replace the CompactFlash card, the control panel assembly, or the motherboard.
<i>*SIO error</i>	Your appliance SIO or ISA bridge chip failed its timer interrupt test. The system cannot operate properly without this function.	Replace the motherboard.
<i>*Watchdog failed</i>	Your appliance watchdog reset hardware, used to reset your appliance from a system hang condition, is not functioning properly.	Replace the motherboard.
<i>*Fan(s) failed</i>	A fan in your appliance stopped and should be replaced as soon as possible. The system console displays information about which fan stopped.	Replace the fan, as described in “Replacing fan subassemblies” on page 117.

Error message or code	Description	Corrective action
<i>*Unknown System</i>	The system information in the backplane is incorrect.	Replace your appliance.
<i>*Post error. Rebooting...</i>	BMC has taken a CPU out of operation. Open Firmware is rebooting the system.	If your system is in a reboot loop, press Delete to return to the OK prompt and run diagnostics on your system. If pressing the Delete key several times does not end the reboot loop, press Ctrl-Backspace.

Boot error messages

When boot error messages appear

Boot error messages might appear after the hardware passes all POSTs and your appliance begins to load the operating system.

Boot error messages

The following table describes the error messages that might appear on the LCD if your appliance encounters errors while starting up.

Boot error message	Explanation	Corrective action
<i>No /etc/rc</i>	The /etc/rc file is corrupted.	1. At the hostname> prompt, enter setup. 2. As the system prompts for system configuration information, use the information you recorded in your appliance configuration information worksheet in the <i>Getting Started Guide</i>. For more information about your appliance setup program, see the <i>System Administration Guide</i>.
<i>No /etc/rc, running setup</i>	The system cannot find the /etc/rc file and automatically starts setup.	As the system prompts for system configuration information, use the information you recorded in your appliance configuration information worksheet in the <i>Getting Started Guide</i>. For more information about your appliance setup program, see the <i>System Administration Guide</i>.

Boot error message	Explanation	Corrective action
<i>Cannot initialize labels</i>	When the system tries to create a new file system, it cannot initialize the disk labels.	Usually, you do not need to create and initialize a file system; do so only after consulting Network Appliance Customer Support.
<i>Cannot read labels</i>	When your appliance tries to initialize a new file system, it has a problem reading the disk labels it wrote to the disks. This problem can be because the system failed to read the disk size, or the written disk labels were invalid	Usually, you do not need to create and initialize a file system; do so only after consulting Network Appliance Customer Support.
<i>Disk label processing failed</i>	Your appliance detects that the disk is not in the correct drive bay.	Make sure that the disk is in the correct bay.
<i>Dirty shutdown in degraded mode</i>	The file system is inconsistent because you did not shut down the system cleanly when it was in degraded mode.	Contact Network Appliance Customer Support for instructions about repairing the file system.
<i>Halted: firmware too old</i>	The disk firmware is an old version.	Update the disk firmware by entering the following command: disk_fw_update
<i>No disks</i>	The system cannot detect any FC-AL disks.	Verify that all disks are properly seated in the drive bays.
No disk controllers	The system cannot detect any FC-AL disk controllers.	Turn off your appliance power and verify that all NICs are properly seated in the appropriate expansion slots.
<i>Drive %s.%d not supported</i>	%s—The disk number; %d—The disk ID number. The system detects an unsupported disk drive.	1. Remove the drive immediately or the system drops down to the PROM monitor within 30 seconds. 2. Check the System Configuration Guide at http://now.netapp.com to verify support for your disk drive.

Boot error message	Explanation	Corrective action
<i>FC-AL loop down, adapter %d</i>	The system cannot detect the FC-AL loop or adapter.	1. Identify the adapter by entering the following command: storage show adapter 2. Turn off the power on your appliance and verify that the adapter is properly seated in the expansion slot. 3. Verify that all Fibre Channel cables are connected.
<i>Halted: Illegal configuration</i>	Incorrect cluster configuration.	1. Check the console for details. 2. Verify that all cables are correctly connected.
<i>File system may be scrambled</i>	One of the following errors causes the file system to be inconsistent: ◆ An unclean shutdown when your appliance is in degraded mode and when NVRAM is not working. ◆ The number of disks detected in the disk array is different from the number of disks recorded in the disk labels. The system cannot start when more than one disk is missing. ◆ The system encounters a read error while reconstructing parity. ◆ A disk failed at the same time the system crashed.	
		Contact Network Appliance Customer Support to learn how to start the system from a system boot diskette and repair the file system.
		Make sure that all disks on the system are properly installed in the disk shelves.
		Contact Network Appliance Customer Support for help.
<i>Invalid PCI card slot %d</i>	%d—The expansion slot number. The system detects a adapter that is not supported by Network Appliance.	Replace the unsupported adapter with an adapter that is included in the System Configuration Guide at http://now.netapp.com .

Boot error message	Explanation	Corrective action
<i>Configuration exceeds max PCI space</i>	The memory space for mapping PCI adapters has been exhausted, because either ◆ There are too many PCI adapters in the system ◆ An adapter is demanding too many resources	Verify that all expansion adapters in your appliance are supported. Contact Network Appliance Customer Support for help. Have a list ready of all expansion adapters installed in your appliance.
<i>No network interfaces</i>	The system cannot detect any network interfaces.	1. Turn off the system and verify that all NICs are seated properly in the appropriate expansion slots. 2. Run diagnostics to check the onboard Ethernet port. If the problem persists, contact Network Appliance Customer Support.
<i>ServerNet: wrong pci slot</i>	The system cannot detect the NVRAM adapter.	Make sure that the NVRAM adapter is securely installed in expansion slot 7.
<i>No NVRAM present</i>	<i>n</i> —The serial number of the NVRAM adapter. The NVRAM adapter is an early revision that cannot be used with the system.	Check the console for information about which revision of the NVRAM adapter is required. Replace the NVRAM adapter.
<i>NVRAM #n downrev</i>	<i>%d</i> —The amount of memory on the NVRAM adapter. The specified size is not supported.	Verify that the system has 256 MB of NVRAM.

Remote management card e-mail notifications

When notifications are sent

You can configure your remote management card to send e-mail to designated e-mail addresses, in addition to Autosupport at Network Appliance. When enabled, your remote management card sends e-mail notification to you if your system fails.

Note

You cannot use the remote management card to access your appliance.

The following message is an example of an e-mail notification sent by your remote management card:

Subject: RMC ALERT 00000 03200 Down system

Message: 03200 24-jul-2002 21:59:25 Down system

System Information

Server Name: RMC ALERT

Server URL: -

System Info:

SYSTEM_ID='0050383432'

SYS_SERIAL_NUM='30163'

MB_SERIAL_NUM='30063'

MODEL='FAS960'

Server ID: 00000

Server IP:

Card Information

Card Name: RMC

Card URL: http://172.22.6.40

Card IP: 172.22.6.40

Card Serial Number: DE42090466

Card Version: RMC_NA_1.1

Contact: postmaster@lab.netapp.com

Location: hw-165

Phone Number: -

Remote management card messages

The following table explains the error messages your remote management card sends.

Error message	Action
<i>Down System</i>	1. Gather information from your LCD and console. 2. Contact Network Appliance Customer Support.
<i>Boot error</i>	1. Gather information from your LCD and console. 2. Check to see whether your CompactFlash unit is inserted correctly into the Control Panel Assembly. 3. Contact Network Appliance Customer Support.
<i>POST error</i>	1. Gather information from your LCD and console. 2. Run diagnostics on your system. 3. Contact Network Appliance Customer Support.

Operational error messages

When operational error messages appear

These error messages might appear on the system console or LCD when the system is operating, when it is halted, or when it is restarting because of system problems.

Error messages

The following table describes other error messages that might appear on the LCD if your appliance encounters errors while starting up or during operation.

Error message	Explanation	Fatal?	Corrective action
<i>Disk n is broken</i>	<i>n</i> —The RAID group disk number. The solution depends on whether you have a hot spare in the system.	No	See the <i>System Administration Guide</i> for information about how to locate a disk based on the RAID group disk number and how to replace a faulty disk.
<i>Fans stopped; replace them</i>	One of the fan subassemblies of your appliance failed.	No	Replace the failed fan subassembly as soon as possible.
<i>Power supply degraded</i>	One of the power supply units is turned off, was removed from your appliance, or failed.	No	Verify that both power supplies are installed and turned on. If you still get this error, replace the power supplies one at a time to determine the failed power supply.
<i>Dumping core</i>	The system is dumping core after a system crash.	Yes	Write down the system crash message on the system console and report the problem to Network Appliance Customer Support.

Error message	Explanation	Fatal?	Corrective action
<i>Disk hung during swap</i>	A disk error occurred as you were hot swapping a disk.	Yes	1. Disconnect the disk from the power supply by opening the latch and pulling it half-way out. 2. Wait 15 seconds to allow all disks to spin down. 3. Reinstall the disk. 4. Restart the system by entering the following command: boot
<i>Error dumping core</i>	The system cannot dump core during a system crash and restarts without dumping core.	Yes	Report the problem to Network Appliance Customer Support.
<i>Panicking</i>	The system is crashing. If the system does not hang while crashing, the message <code>Dumping core</code> appears.	Yes	Report the problem to Network Appliance Customer Support.
<i>System too hot</i>	The temperature sensor indicates that the system temperature is too high.	Yes	Verify that the ventilation holes on the top cover of the system are not blocked. If the ventilation holes are not blocked and the problem persists, contact Network Appliance Customer Support for help.

About this appendix The information in this appendix helps you to determine the power line lengths running from the R150 system to the power source.

Recommended AC power line sizes

About AC power feeds

Longer AC power feeds must be properly designed to preserve voltage levels to the equipment. The wiring from the breaker panel to the power strip, which supplies power to the R150 storage engine and disk shelves, can often exceed 50 feet.

Note
Total AC wire length = breaker to wall or ceiling outlet + extension cable or ceiling drop.

Recommended conductor size

The following table lists the recommended conductor size for a 2% voltage drop for a particular distance in feet (taken from the *Radio Engineer's Handbook*).

110V, single-phase	20A circuit	30A circuit	40A circuit	50A circuit
25 ft	12 AWG	10 AWG	8 AWG	8 AWG
50 ft	8 AWG	6 AWG	6 AWG	4 AWG
75 ft	6 AWG	4 AWG	4 AWG	2 AWG

220V, single-phase	20A circuit	30A circuit	40A circuit	50A circuit
25 ft	14 AWG	12 AWG	12 AWG	10 AWG
50 ft	12 AWG	10 AWG	8 AWG	8 AWG
75 ft	10 AWG	8 AWG	6 AWG	6 AWG

Wire gauge approximates

The following table lists the approximate equivalent of American Wire Gauge (AWG) to Harmonized Cordage.

AWG	8	10	12
Harmonized, mm-mm	4.0	2.5	1.5

About this appendix This appendix lists the regulatory notices you need to be aware of when installing and operating your Network Appliance equipment.

Regulatory notices

FCC notices (U.S. only)

Network Appliance devices are designed for a CFR 47 (Code Federal Regulations) Part 15 Class A environment.

The FCC and Network Appliance guarantee the user's rights to operate this equipment only if the user complies with the following rules and regulations:

- ◆ Install and operate this equipment in accordance with the specifications and instructions in this guide.
- ◆ Modify this equipment only in the ways specified by Network Appliance.
- ◆ Use shielded cables with metallic RFI/EMI connector hoods to maintain compliance with applicable emissions standards.
- ◆ If the system has nine or more Fibre Channel disk shelves, install the system in two or three NetApp System Cabinets to maintain performance within Part 15 of CFR 47 regulations.

Compliance with Part 15 of CFR 47

This equipment has been tested and found compliant with Part 15 of the CFR 47 rules for Class A digital devices. These rules are designed to provide reasonable protection from interference to electronics equipment operated in a commercial environment.

Operation of this device is subject to the following two conditions:

- ◆ This device cannot cause harmful interference.
- ◆ This device must accept any interference received, including interference that may cause undesired operation.

Compliance with ICES-003

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A conforme à la norme NMB-003 du Canada.

Compliance with EN regulations

Marking by the symbol **CE** indicates compliance of this Network Appliance device to the EMC Directive and the Low Voltage Directive of the European Union. Such marking is indicative that this Network Appliance device meets the technical standards listed in "Declaration of Conformity," later in this appendix.

Caution

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

**Bureau of
Standards,
Metrology, and
Inspections notice
(BSMI, Taiwan only)****警告使用者：**

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Translation of the BSMI notice:

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

**Voluntary Control
Council for
Interference by
Information
Technology
Equipment (VCCI,
Japan)**

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Translation of the VCCI-A notice:

This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. If such trouble occurs, the user may be required to take corrective actions.

Declaration of Conformity

**Network Appliance, Inc.,
495 East Java Drive
Sunnyvale, California, 94089, U.S.A.,**

declare under our sole responsibility that the products

Type of equipment	Description	Model number	Year of manufacture
Network appliance	NetApp R150 storage engine and disk shelves	R150	2003

to which this declaration relates conform to the following standards:

EN 60950:1992, with A1-A4, A11, Information Technology Equipment (Safety)

EN 55022:1998, Emissions Requirements for Information Technology Equipment

EN 50024:1998, Immunity Requirements for Information Technology Equipment

EN 60825-1, Safety of Laser/LED Equipment

IEC 1000-3-2:1995 Limits for Harmonic Current Emissions

IEC 1000-3-3:1994 Limitation of Voltage Fluctuations and Flicker in Low-Voltage Supply Systems

following the provisions of the directives listed below:

73/23/EEC, Low Voltage Directive (Product Safety)

89/336/EEC, Electromagnetic Compatibility Directive

Date

Jerry Lopatin
Vice President, Platform Engineering

Part number: 210-00351

Index

Numerics

- 10Base-T/100Base-TX Ethernet network
 - cable description 43
 - connecting 46
 - connecting to 45
- 10Base-T/100Base-TX/1000Base-T Ethernet network
 - cable description 43
 - connecting 46
 - connecting to 45
- 12V power bad 134
- 12V power bad 134
- 3.3V power bad 134
- 5V power bad 134

A

- AC power
 - connecting to a disk shelf 59
 - connecting to the storage engine 61
 - connection for remote management card 52
 - electrical requirements for entire system 8
 - electrical requirements for storage engine 5
 - electrical requirements per disk shelf 7
 - recommended power line sizes 148
- adapters, expansion 42
- audience vii

B

- boot error messages
 - Cannot initialize labels 140
 - Cannot read labels 140
 - Configuration exceeds max PCI space 142
 - Dirty shutdown in degraded mode 140
 - Disk label processing failed 140
 - Drive %s.%d not supported 140
 - FC-AL loop down, adapter %d 141
 - File system may be scrambled 141
 - Halted firmware too old 140
 - Halted illegal configuration 141
 - Invalid PCI card slot %d 141

- No /etc/rc 139
- No /etc/rc running setup 139
- no disk controllers 140
- No disks 140
- No network interfaces 142
- No NVRAM present 142
- NVRAM #n downrev 142
- ServerNet wrong pci slot 142
- bridge, disk shelf 13

C

- clearances required for site 5
- connections
 - Fibre Channel switch 39
 - R150 system 27
 - remote management card 52
 - SCSI tape backup device 37
 - securing the disk shelf cables 33
- control panel assembly LEDs 65
- control panel subassembly, storage engine
 - installing 127
 - removing 125
- conventions
 - formatting vii
 - terminology vii
- cooling fans, replacement of disk shelf 91

D

- disk drive compatibility 13
- disk shelf connections
 - for a 12-TB system 31
 - for a 24-TB system 29
- disk shelves
 - bridge 13
 - connecting to the storage engine 28
 - environmental operating conditions 7
 - interpreting LEDs on the 76
 - labeling 13
 - LED responses of 75
 - physical characteristics of 7
 - removal of 78

- removing power supplies from 85
- using center of gravity bracket with 16

disks

- installing in a disk shelf 82
- removing 81

E

electrical requirements 5

EMU

- enclosure services monitoring 14
- location of the 88
- replacing the 88

environmental operating conditions 4

equipment racks

- four-post 22
- two-post 24

error messages

- POST error messages 133
- See* boot error messages 139
- See* operational error messages 145

expansion adapters

- Ethernet types 42
- FRU listing 94
- installing 113
- list of 110
- removing 111
- replacing 110

F

Fan numbering 117

fans

- identifying in the storage engine 118
- replacing in disk shelf 91

FC-AL HBA LEDs 67

fiber optic cable with SC connector

- on 1000Base-SX networks 50

Fibre Channel switch, connecting 39

formatting conventions vii

front panel LEDs 65

FRUs

- See* expansion adapters 94

G

GbE network

- cable description 43
- connecting to 48, 49
- GbE NICs LEDs 70

GbE network connection

- dual-port 49
- single-port 48

H

hot swappable devices

- disk drive 80
- disk shelf fans and blower 91
- disk shelf power supply 84
- storage engine power supply 121

I

installation

- about POST messages 130
- disk shelf fundamentals 13
- disk shelves using four-post mounting kit 19
- disk shelves using two-post mounting brackets 15
- disks in a disk shelf 82
- EMU 90
- expansion adapter 113
- flush-mount in a two-post rack 24
- in a four-post equipment rack 22
- memory card assembly 105
- mid-mount in a two-post rack 24
- motherboard lithium battery 103
- motherboard tray 100
- power supplies in the disk shelf 87
- power supplies in the storage engine 123
- R150 system 11
- remote management card 114
- rules and restrictions for 9
- SDRAM DIMMs 108
- startup sequence for 130
- storage engine control panel subassembly 127
- storage engine fan subassembly 120

L

labels on the disk shelf, drive bay population 14

LED responses

disk shelf 75

storage engine front panel 65

LEDs

control panel assembly 65

disk shelf 75

FC-AL HBA 67

GbE NIC 70

remote management card 72

storage engine power supply 74

M

maintenance, opening the PCB carrier 95

memory card assembly

installing 105

removing 104

replacing 104

messages

boot error messages 139

operational error messages 145

POST error messages 132

messages, system 129

motherboard lithium battery

installing 103

removing 102

replacing 102

motherboard tray, installing 100

motherboard, replacing 99

N

network connections

10Base-T/100Base-TX 45, 46

Fibre Channel 50

GbE 48, 49

O

operational error messages

Disk hung during swap 146

Disk n is broken 145

Dumping core 145

Error dumping core 146

Fans stopped 145

Panicking 146

Power supply degraded 145

System too hot 146

P

PCB carrier

opening 95

removing 97

POST boot messages 130

POST error messages

2.5 V power bad 134

BMC disable 133

boot device err 134

Boot DeviceErr 134

Clock batt dead 135

Clock dead 135

Clock error 135

Clock invalid date reset 135

Clock reset 135

CPU count err 135

CPU speed err 135

CPU ucode err 135

Env-A/B/C/D rupt err 136

Env-A/B/C/D stat err 136

Fan stopped 137

FP button stuck 136

inv boot device 134

LCD cmd stall 136

LCD cursor error 136

LCD data error 136

LCD won't open 136

missing CF-card 134

No power info 136

Onboard battery low 136

Overtemp alert 137

PCCRD format err 137

PCCRD head err 137

PCCRD init fail 137

PCCRD read err 137

PCCRD regerror 137

PCCRD seek err 137

PCCRD setup err 137

- PCCRD track err 137
- Post error. Rebooting... 138
- pwr sup #1 bad 134
- pwr sup #1 out 134
- pwr sup #2 bad 134
- pwr sup #2 out 134
- SIO error 137
- unknown system 138
- watchdog error 133
- Watchdog failed 137
- power line sizes 148
- power on sequence 58
- power supplies
 - connecting AC power to each disk shelf 59
 - connecting AC power to the storage engine 61
 - installing in a disk shelf 87
 - installing in the storage engine 123
 - LEDs on storage engine 74
 - power cord with disk shelf 59
 - removing from a disk shelf 85
 - removing from storage engine 122
 - replacing in a disk shelf 84
 - replacing in a storage engine 121
- power to grounded electrical outlet 59

R

- R150 disk shelf
 - installing a disk in 82
 - installing power supplies in 87
 - installing using four-post mounting kit 19
 - installing using two-post mounting brackets 15
 - power receptacles for 59
 - removing a disk from 81
 - replacing 78
 - replacing a disk in 80
 - supported disks for 13
- R150 system
 - environmental operating conditions 4
 - storage conditions 4
- racks
 - four-post 22
 - requirements 4
 - two-post flush-mount 24
 - two-post midmount 24

- recommended AC power line sizes 148
- remote management card
 - e-mail notification 143
 - installing 114
 - LEDs on 72
 - network connection of 52
 - replacing 114
- removal of
 - disk shelf 78
 - disks 81
 - EMU 89
 - expansion adapter 111
 - memory card assembly 104
 - motherboard lithium battery 102
 - PCB carrier 97
 - power supply from a disk shelf 85
 - SDRAM DIMMs 107
 - storage engine control panel subassembly 125
 - storage engine fan subassembly 118
 - storage engine power supply 122
- replacement of
 - disk shelf 78
 - disk shelf cooling fans 91
 - disk shelf power supply 84
 - disks in a disk shelf 80
 - EMU 88
 - expansion adapters 110
 - memory card assembly 104
 - motherboard 99
 - remote management card 114
 - SDRAM DIMMs 102
- requirements
 - clearance 5
 - electrical 5
 - rack 4
 - tool and equipment 2
- responses
 - See* startup responses
- RJ-45 connection
 - dual-port 46
 - single-port 45

S

- SCSI tape backup device, connecting 37

- SDRAM DIMMs
 - installing 108
 - removing 107
 - replacing 107
- securing the disk shelf cables 33
- slide rails
 - carrier tabs 96, 116
 - PCB carrier 96
 - travel distance of 96
- special messages viii
- startup LED responses 64
- storage conditions 4
- storage engines
 - connecting to an ASCII terminal 56
 - electrical requirements for 5
 - environmental operating conditions for 4
 - physical characteristics of 5
 - required clearance for 5
 - slot assignments for 42

- storage conditions for 4
- system messages
 - boot 131
 - POST 131
- system startup power on sequence 58

T

- tape backup devices
 - Fibre Channel switch 35
 - robotic loader 35
 - termination port on tape device 38
- terminology vii
- third party devices, connecting to 35
- tools and equipment 2

W

- wire gauge approximates 148

