IBM System Storage

N3300, N3400 and N3600 Hardware and Service Guide

GC27-2280-03

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Note:
Before using this information and the product it supports, be sure to read the general information in “Notices” on page 139.

Safety and environmental notices

This section contains information about:

- “Safety notices and labels”
- “Laser safety” on page vi
- “Rack safety” on page vii
- “Fire suppression systems ” on page x

For information about environmental notices, see the *IBM® Environmental Notices and User Guide*.

Safety notices and labels

When using this product, observe the danger, caution, and attention notices contained in this guide. The notices are accompanied by symbols that represent the severity of the safety condition.

The following sections define each type of safety notice and provide examples.

The following notices and statements are used in IBM documents. They are listed below in order of increasing severity of potential hazards. Follow the links for more detailed descriptions and examples of the danger, caution, and attention notices in the sections that follow.

- **Note:** These notices provide important tips, guidance, or advice.
- **“Attention notices” on page v:** These notices indicate potential damage to programs, devices, or data.
- **“Caution notices” on page v:** These statements indicate situations that can be potentially hazardous to you.
- **“Danger notices”:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. Safety labels are also attached directly to products to warn of these situations.
- In addition to these notices, “Labels” on page iv may be attached to the product to warn of potential hazards.

Danger notices

A danger notice calls attention to a situation that is potentially lethal or extremely hazardous to people. A lightning bolt symbol accompanies a danger notice to represent a dangerous electrical condition. A sample danger notice follows.

DANGER

An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (D004)

A comprehensive danger notice provides instructions on how to avoid shock hazards when servicing equipment. Unless instructed otherwise, follow the procedures in the following danger notice.

DANGER

When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:

- **Connect power to this unit only with the IBM provided power cord. Do not use the IBM provided power cord for any other product.**
- **Do not open or service any power supply assembly.**
- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.**
- **Connect all power cords to a properly wired and grounded electrical outlet. Ensure outlet supplies proper voltage and phase rotation according to the system rating plate.**
- **Connect any equipment that will be attached to this product to properly wired outlets.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described below when installing, moving, or opening covers on this product or attached devices.**

To Disconnect:

1. **Turn off everything (unless instructed otherwise).**
2. **Remove power cords from the outlet.**
3. **Remove signal cables from connectors.**
4. **Remove all cables from devices.**

To Connect:

1. **Turn off everything (unless instructed otherwise).**
2. **Attach all cables to devices.**
3. **Attach signal cables to the connectors.**
4. **Attach power cords to the outlets.**
5. **Turn on the devices.**

(D005)

Labels

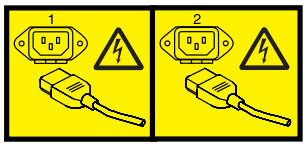
As an added precaution, safety labels are often installed directly on products or product components to warn of potential hazards.

The actual product safety labels may differ from these sample safety labels:

DANGER

Hazardous voltage, current, or energy levels are present inside any component that has this label attached. Do not open any cover or barrier that contains this label.

(L001)



DANGER

Multiple power cords. The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.

(L003)

Caution notices

A caution notice calls attention to a situation that is potentially hazardous to people because of some existing condition. A caution notice can be accompanied by different symbols, as in the examples below:

If the symbol is...	It means....
	A hazardous electrical condition with less severity than electrical danger.
	A generally hazardous condition not represented by other safety symbols.
 Class I	A hazardous condition due to the use of a laser in the product. Laser symbols are always accompanied by the classification of the laser as defined by the U. S. Department of Health and Human Services (for example, Class I, Class II, and so forth).

Attention notices

An attention notice indicates the possibility of damage to a program, device, or system, or to data. An exclamation point symbol may accompany an attention notice, but is not required. A sample attention notice follows:

Attention: Do not bend a fibre cable to a radius less than 5 cm (2 in.); you can damage the cable. Tie wraps are not recommended for optical cables because they can be easily overtightened, causing damage to the cable.

Laser safety

Note: When using an NVRAM5 or NVRAM6 cluster (active/active or high availability) copper-fiber converter, the storage system must be installed in a restricted access location.

CAUTION:
This product contains a Class 1M laser. Do not view directly with optical instruments. (C028)

This equipment contains Class 1 laser products, and complies with FDA radiation Performance Standards, 21 CFR Subchapter J and the international laser safety standard IEC 825-2.

CAUTION:
Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. For this reason, never look into the end of an optical fiber cable or open receptacle. (C027)

Attention: In the United States, use only SFP or GBIC optical transceivers that comply with the FDA radiation performance standards, 21 CFR Subchapter J. Internationally, use only SFP or GBIC optical transceivers that comply with IEC standard 825–1. Optical products that do not comply with these standards may produce light that is hazardous to the eyes.

Usage restrictions

The optical ports of the modules must be terminated with an optical connector or with a dust plug.

Rack safety

Rack installation

DANGER

Observe the following precautions when working on or around your IT rack system:

- **Heavy equipment - personal injury or equipment damage might result if mishandled.**
- **Always lower the leveling pads on the rack cabinet.**
- **Always install stabilizer brackets on the rack cabinet.**
- **To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.**
- **Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.**

- **Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.**
- **Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.**
- **An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.**

(R001 part 1 of 2

CAUTION:

- **Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.**
- **Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.**
- **Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.**
- *(For sliding drawers.)* **Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.**
- *(For fixed drawers)* **This drawer is a fixed drawer and should not be moved for servicing unless specified by manufacturer. Attempting to move the drawer partially or completely out of the rack may cause the rack to become unstable or cause the drawer to fall out of the rack.**

(R001 part 2 of 2)

Rack relocation (19" rack)

CAUTION:
Removing components from the upper positions in the rack cabinet improves rack stability during relocation. Follow these general guidelines whenever you relocate a populated rack cabinet within a room or building:

- **Reduce the weight of the rack cabinet by removing equipment starting at the top of the rack cabinet. When possible, restore the rack cabinet to the configuration of the rack cabinet as you received it. If this configuration is not known, you must do the following:**
  - **Remove all devices in the 32U position and above.**
  - **Ensure that the heaviest devices are installed in the bottom of the rack cabinet.**
  - **Ensure that there are no empty U-levels between devices installed in the rack cabinet below the 32U level.**
  - **If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.**
  - **Inspect the route that you plan to take when moving the rack to eliminate potential hazards.**
  - **Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that came with your rack cabinet for the weight of a loaded rack cabinet.**
  - **Verify that all door openings are at least 760 x 2030 mm (30 x 80 in.).**
  - **Ensure that all devices, shelves, drawers, doors, and cables are secure.**
  - **Ensure that the four leveling pads are raised to their highest position.**
  - **Ensure that there is no stabilizer bracket installed on the rack cabinet during movement.**
  - **Do not use a ramp inclined at more than ten degrees.**
  - **Once the rack cabinet is in the new location, do the following:**
    - **Lower the four leveling pads.**
    - **Install stabilizer brackets on the rack cabinet.**
    - **If you removed any devices from the rack cabinet, repopulate the rack cabinet from the lowest position to the highest position.**
  - **If a long distance relocation is required, restore the rack cabinet to the configuration of the rack cabinet as you received it. Pack the rack cabinet in the original packaging material, or equivalent. Also, lower the leveling pads to raise the casters off of the pallet and bolt the rack cabinet to the pallet.**

(R002)

Fire suppression systems

A fire suppression system is the responsibility of the customer. The customer's own insurance underwriter, local fire marshal, or a local building inspector, or both, should be consulted in selecting a fire suppression system that provides the correct level of coverage and protection. IBM designs and manufactures equipment to internal and external standards that require certain environments for reliable operation. Because IBM does not test any equipment for compatibility with fire suppression systems, IBM does not make compatibility claims of any kind nor does IBM provide recommendations on fire suppression systems.

Contents

Figures

Tables

About this document

This guide describes how to connect and manage the IBM System Storage® N3300 (model numbers 2859-A10 and 2859-A20), N3400 (model numbers 2859-A11 and 2859-A21), and N3600 (model numbers 2862-A10 and 2862-A20) systems.

Compliance ID 2859-NAS covers MT/models 2859-A10, 2859-A11, 2859-A20 and 2859-A21. Compliance ID 2862-NAS covers MT/models 2862-A10 and 2862-A20.

Note: This guide applies to systems, including systems with gateway functionality, running Data ONTAP 7.*x* and Data ONTAP 8.*x* 7-Mode. In the Data ONTAP 8.*x* 7-Mode product name, the term *7-Mode* signifies that the 8.*x* release has the same features and functionality found in the prior Data ONTAP 7.1, 7.2, and 7.3 release families.

For the latest version of this guide and all IBM System Storage N series documentation, go to the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.

Who should read this document

This guide is for customer use. This guide is for qualified system administrators and service personnel who are familiar with IBM storage systems. It addresses setup, operation, and servicing of the 2859 and 2862 models A10/A11/A20/A21. This document is intended to provide information to customers, operators, administrators, installers, and service personnel.

Related documents

The following documents, as well as documentation for Data ONTAP and other software, are available on the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.

For information about installation and setup for your system, see the *Installation and Setup Instructions* that came with your system.

For information about error messages, troubleshooting, and monitoring the LEDs for your system and optional adapter cards, see the *IBM System Storage N series Platform Monitoring Guide*.

For diagnostic information about your system, see the *IBM System Storage N series Diagnostics Guide*.

For a list of N series hardware and hardware-related documents, as well as lists of Data ONTAP documentation by release family, refer to the "Bibliography" appendix in the *IBM System Storage N series Introduction and Planning Guide*.

For a list of optional adapter cards supported by N3600 systems, refer to the appropriate "Optional adapter cards" appendix in the *IBM System Storage N series Introduction and Planning Guide*.

Supported features

IBM System Storage N series storage systems are driven by NetApp Data ONTAP software. Some features described in the product software documentation are neither offered nor supported by IBM. Please contact your local IBM representative or reseller for further details.

Information about supported features can also be found on the N series support website, which is accessed and navigated as described in “Websites.”

Websites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. The following web pages provide N series information:

- A listing of currently available N series products and features can be found at the following web page:

  www.ibm.com/storage/nas/
- The IBM System Storage N series support website requires users to register in order to obtain access to N series support content on the web. To understand how the N series support web content is organized and navigated, and to access the N series support website, refer to the following publicly accessible web page:

  www.ibm.com/storage/support/nseries/

  This web page also provides links to AutoSupport information as well as other important N series product resources.
- IBM System Storage N series products attach to a variety of servers and operating systems. To determine the latest supported attachments, go to the IBM N series interoperability matrix at the following web page:

  www.ibm.com/systems/storage/network/interophome.html
- For the latest N series hardware product documentation, including planning, installation and setup, and hardware monitoring, service and diagnostics, see the IBM N series Information Center at the following web page:

  http://publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM N series product, and whom to call for service, if it is necessary.

The following applies in Taiwan:

IBM Taiwan Product Service Contact Info:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd., Taipei Taiwan
Tel: 0800-016-888

台灣IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

Before you call

Before you call, make sure you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure they are connected.
- Check the power switches to make sure the system is turned on.
- Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.
- Refer to the IBM support website for information on known problems and limitations.

Using the documentation

The latest versions of N series software documentation, including Data ONTAP and other software products, are available on the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.

Current N series hardware product documentation is shipped with your hardware product in printed documents or as PDF files on a documentation CD. For the latest N series hardware product documentation PDFs, go to the IBM N series support website.

Hardware documentation, including planning, installation and setup, and hardware monitoring, service, and diagnostics, is also provided in an IBM N series Information Center at the following web page:

http://publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services. Visit the following web page for support telephone numbers:

www.ibm.com/planetwide/

Firmware updates

IBM N series product firmware is embedded in Data ONTAP. As with all devices, it is recommended that you run the latest level of firmware. Any firmware updates are posted to the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.

Note: If you do not see new firmware updates on the IBM N series support website, you are running the latest level of firmware.

Verify that the latest level of firmware is installed on your machine before contacting IBM for technical support.

Terminology and conventions used in this document

This guide uses the following terminology, command conventions, format conventions and keyboard conventions.

In this document, the term *gateway* describes IBM N series storage systems that have been ordered with gateway functionality. Gateways support various types of storage, and they are used with third-party disk storage systems. In this case, disk storage for customer data and the RAID controller functionality is provided by the

back-end disk storage system. A gateway might also be used with disk storage expansion units specifically designed for the IBM N series models.

The term *filer* describes IBM N series storage systems that either contain internal disk storage or attach to disk storage expansion units specifically designed for the IBM N series storage systems. Filer storage systems do not support using third-party disk storage systems.

The terms *system* or *storage system* refer to either a gateway by itself or a filer, either by itself or with additional disk drives.

Active/active and high-availability terms

active/active configuration
In the Data ONTAP 7.2 and 7.3 release families, refers to a pair of storage systems (sometimes called *nodes*) configured to serve data for each other if one of the two systems stops functioning. Also sometimes referred to as *active/active pairs*.

cluster
In the Data ONTAP 7.1 release family, refers to a pair of storage systems (sometimes called *nodes*) configured to serve data for each other if one of the two systems stops functioning. In Data ONTAP 8.x 7-Mode, a *cluster* is a group of connected nodes (storage systems) that share a global namespace and that you can manage as a single virtual server or multiple virtual servers, providing performance, reliability, and scalability benefits.

HA (high availability)
In Data ONTAP 8.*x* 7-Mode, the recovery capability provided by a pair of nodes (storage systems), called an *HA pair*, that are configured to serve data for each other if one of the two nodes stops functioning.

HA pair
In Data ONTAP 8.*x* 7-Mode, a pair of nodes (storage systems) configured to serve data for each other if one of the two nodes stops functioning.

Storage terms

ACP Alternate Control Path is a protocol that enables Data ONTAP to manage and control the storage expansion unit storage subsystem using a separate network from the data path, so management communication is not dependent on the data path being intact and available.

AT-FCX
The controller module of the EXN1000 serial advanced technology attachment (SATA) storage expansion unit.

Disk Any hard disk drive

Disk shelf or shelf
Any storage expansion unit containing hard disk drives.

ESH The controller module of Fibre Channel disk storage expansion units.

IOM The Input/Output module of SAS disk storage expansion units.

Loop or Fibre-Channel Arbitrated Loop
One or more daisy-chained Fibre Channel storage expansion units connected to an N series storage system.

Node The system controller module that executes the software on an N series

system. There is one node in the single-controller models; there are two nodes in active/active or high availability models.

Stack or SAS stack
A stack of one or more SAS storage expansion units using IOM modules connected to the storage system. The maximum number of storage expansion units in a stack of storage expansion units and the number of storage expansion unit stacks in a configuration are dependent on the type of storage system.

Command conventions

You can enter commands on the system console or from any client that can obtain access to the storage system using a Telnet session. In examples that illustrate commands executed on a UNIX workstation, the command syntax and output might differ, depending on your version of UNIX.

Formatting conventions

The following table lists different character formats used in this guide to set off special information.

Formatting convention	Type of information
Italic type	• Words or characters that require special attention. • Placeholders for information you must supply. For example, if the guide requires you to enter the `fctest` *adaptername* command, you enter the characters "fctest" followed by the actual name of the adapter. • Book titles in cross-references.
`Monospaced` font	• Command and daemon names. • Information displayed on the system console or other computer monitors. • The contents of files.
`Bold monospaced` font	Words or characters you type. What you type is always shown in lowercase letters, unless your program is case-sensitive and uppercase letters are necessary for it to work properly.

Keyboard conventions

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

What is in this guide...	What it means...
hyphen (-)	Used to separate individual keys. For example, Ctrl-D means holding down the Ctrl key while pressing the D key.
Enter	Used to refer to the key that generates a carriage return, although the key is named Return on some keyboards.

What is in this guide...	What it means...
type	Used to mean pressing one or more keys on the keyboard.
enter	Used to mean pressing one or more keys and then pressing the Enter key.

How to send your comments

Your feedback is important in helping us provide the most accurate and high-quality information. If you have comments or suggestions for improving this document, send us your comments by e-mail to starpubs@us.ibm.com.

Be sure to include the following:

- Exact publication title
- Publication form number (for example, GC26-1234-02)
- Page, table, or illustration numbers
- A detailed description of any information that should be changed

Chapter 1. Preparing for the installation

This chapter provides an overview of the entire IBM System Storage N3300, N3400 and N3600 system installation process, hardware specifications, and the appropriate documentation references for the procedures. Refer to the *Installation and Setup Instructions* that came with your system for further information about installing your equipment.

This chapter discusses the following topics:

- "Required manuals, tools and equipment"
- "Handling static-sensitive devices"
- "Planning and organizing the installation" on page 2

Required manuals, tools and equipment

You need the following manuals in addition to this manual. Data ONTAP publications are available on the IBM N series support website, which is accessed and navigated as described in "Websites" on page xxii.

- *Installation and Setup Instructions* that shipped with your system and storage expansion units
- *IBM System Storage N series Data ONTAP Software Setup Guide* for your version of Data ONTAP

  Attention: Before you begin your installation, print and complete a configuration worksheet for your storage system to gather the information that the software setup process requires. The configuration worksheet is provided in the *Data ONTAP Software Setup Guide* for your version of Data ONTAP.
- *IBM System Storage N series Data ONTAP Active/Active Configuration Guide* or *High Availability Configuration Guide* for your version of Data ONTAP, if applicable

You need to supply the following tools and equipment:

- Ethernet LAN cables
- Fibre Channel cables
- Console (for example, a PC or laptop) with a serial port
- #2 Phillips screwdriver and slotted screwdriver
- Grounding leash and ESD strap
- 7-mm nut driver (required if removing or installing storage expansion units)

Handling static-sensitive devices

Attention: This system uses electronic components that are sensitive to static electricity. Static discharge from your clothing or other fixtures around you can damage these components. Put on an antistatic ESD strap and grounding leash to free yourself of static electricity before touching any electronic components.

Attention: Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of electrostatic discharge (ESD), observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the system unit for at least two seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into your system unit without setting it down. If it is necessary to set the device down, place it in its static-protective package. Do not place the device on your system unit cover or on a metal table. Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

Planning and organizing the installation

This section identifies the shipment contents and the rules and regulations you need to observe for the proper installation of your system. It also provides an overview of the entire system installation process and the appropriate documentation references for the procedures.

For detailed information, see the following topics:

- "Hardware specifications"
- "Checking shipment package contents" on page 14
- "Rules for installing the system in a rack" on page 15
- "Guide to the installation process" on page 16

This product is not intended to be connected directly or indirectly by any means whatsoever to interfaces of public telecommunications networks.

Hardware specifications

The following table lists the characteristics and requirements for your hardware.

CAUTION:
Two people are required to lift the N3300 or N3400 system during installation. Three people are required to lift the N3600 system during installation.

Table 1. N3300, N3400 and N3600 system hardware physical characteristics

Weight	2859-A10, 2859-A20, 2859-A11, 2859-A21	Active/active controller with 12 SAS disk drives: 31.1 kg (68.6 lb) Single controller with no disk drives: 19.5 kg (43.0 lb)
	2862-A10, 2862-A20	Active/active controller with 20 SAS disk drives: 51 kg (112 lb) Single controller with no disk drives: 32.6 kg (72 lb)
Rack units	2859-A10, 2859-A20, 2859-A11, 2859-A21	2U
	2862-A10, 2862-A20	4U

Table 1. N3300, N3400 and N3600 system hardware physical characteristics (continued)

Height	2859-A10, 2859-A20, 2859-A11, 2859-A21	8.85 cm (3.5 in.)
	2862-A10, 2862-A20	17.75 cm (6.95 in.)
Width		44.6 cm (17.6 in.)
Depth	2859-A10, 2859-A20, 2859-A11, 2859-A21	56.9 cm (22.4 in)
	2862-A10, 2862-A20	58.5 cm (23 in)

Table 2. N3300, N3400 and N3600 system hardware clearance dimensions

Front-cooling	All versions	10 in. (25.4 cm)
Rear-cooling	All versions	12 in. (30.5 cm)
Front-maintenance	All versions	30 in. (76.2 cm)
Rear-maintenance	All versions	30 in. (76.2 cm)

Table 3. N3300, N3400 and N3600 system environmental requirements

Operating temperature maximum range		50° F to 104° F (10° C to 40° C)
Operating temperature recommended range		68° F to 77° F (20° C to 25° C)
Nonoperating temperature range		-40° F to 158° F (-40° C to 70° C)
Relative humidity		20 to 80% noncondensing
Recommended operating temperature relative humidity range		40 to 55%
Maximum wet bulb temperature		28° C (82° F)
Maximum altitude		3050 m (10,000 ft.)
Acoustic level	N3300, N3400	54 dBA @ 23° C 7.2 bels @ 23° C
	N3600	49 dBA @ 23° C 6.7 bels @ 23° C
Note: Operating at the extremes of the environmental requirements might increase the risk of device failure.		

Table 4 lists the maximum electrical power for the N3300, N3400 and N3600

Table 4. N3300, N3400 and N3600 maximum electrical power

System	**Maximum electrical power**
N3300 and N3400	100-240 V ac, 10-4 A, 50-60 Hz
N3600	100-240 V ac, 12-5 A, 50-60 Hz

The following tables list the electrical requirements for different configurations of N3300, N3400 and N3600 systems.

Notes:

1. In the following tables, *Worst-case* indicates a system running with one PSU and high fan speed, with power distributed over one power cord. *Per PSU* indicates typical power needs, per PSU, for a system operating under normal condition. *System* indicates typical power needs for two PSUs in a system operating under normal condition and power distributed over two power cords.
2. 600 GB SAS drives are supported for the N3300, N3400 and N3600. However, electrical requirements data for the 600 GB SAS drives are not currently available for the N3300 and N3600.
3. 2 TB SATA drives are supported for the N3300 and N3400. However, electrical requirements data for the 2 TB SATA drives are not currently available for the N3300.

Table 5. N3300 electrical requirements - one controller module

Input voltage		100 to 120V			200 to 240V		
		Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Input current measured, A	144 GB SAS drives	3.83	1.7	3.39	1.94	0.94	1.87
	300 GB SAS drives	4.44	1.95	3.89	2.23	1.08	2.16
	450 GB SAS drives	4.44	1.95	3.89	2.23	1.08	2.16
	500 GB SATA drives	3.22	1.55	3.09	1.68	0.81	1.61
	750 GB SATA drives	3.37	1.61	3.22	1.69	0.83	1.66
	1 TB SATA drives	3.37	1.61	3.22	1.69	0.83	1.66
Input power measured, W	144 GB SAS drives	377	165	330	371	174	348
	300 GB SAS drives	439	191	381	431	204	407
	450 GB SAS drives	439	191	381	431	204	407
	500 GB SATA drives	319	151	301	322	147	294
	750 GB SATA drives	332	158	316	327	152.5	305
	1 TB SATA drives	332	158	316	327	152.5	305

Table 5. N3300 electrical requirements - one controller module (continued)

Input voltage		100 to 120V			200 to 240V		
		Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Thermal dissipation, BTU/hr	144 GB SAS drives	1287	563	1125	1264	593	1185
	300 GB SAS drives	1497	649	1298	1470	669	1338
	450 GB SAS drives	1497	649	1298	1470	669	1338
	500 GB SATA drives	1088	514	1028	1099	501	1002
	750 GB SATA drives	1133	539	1077	1114	520	1039
	1 TB SATA drives	1133	539	1077	1114	520	1039
Input power frequency, Hz		50 to 60					

Table 6. N3300 electrical requirements - two controller modules

Input voltage		100 to 120V			200 to 240V		
		Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Input current measured, A	144 GB SAS drives	4.69	2.05	4.09	2.34	1.11	2.22
	300 GB SAS drives	4.94	2.38	4.75	2.45	1.19	2.37
	450 GB SAS drives	4.94	2.38	4.75	2.45	1.19	2.37
	500 GB SATA drives	3.94	1.90	3.80	1.97	0.97	1.93
	750 GB SATA drives	4.13	1.95	3.89	2.09	0.99	1.98
	1 TB SATA drives	4.13	1.95	3.89	2.09	0.99	1.98

Table 6. N3300 electrical requirements - two controller modules (continued)

Input voltage		100 to 120V			200 to 240V		
		Worst-case	Per PSU	System	Worst-case	Per PSU	System
Input power measured, W	144 GB SAS drives	464	200	400	452	210	419
	300 GB SAS drives	488	233	465	476	224	448
	450 GB SAS drives	488	233	465	476	224	448
	500 GB SATA drives	389	186	372	381	180	360
	750 GB SATA drives	409	191	382	404	186	372
	1 TB SATA drives	409	191	382	404	186	372
Thermal dissipation, BTU/hr	144 GB SAS drives	1583	683	1365	1542	714.5	1429
	300 GB SAS drives	1665	794	1587	1624	715	1527
	450 GB SAS drives	1665	794	1587	1624	715	1527
	500 GB SATA drives	1328	634	1268	1298	614	1227
	750 GB SATA drives	1395	651	1302	1377	634	1268
	1 TB SATA drives	1395	651	1302	1377	634	1268
Input power frequency, Hz		50 to 60					

Table 7. N3300 electrical requirements - one controller module, no disks

Input voltage	100 to 120V			200 to 240V		
	Worst-case	Per PSU	System	Worst-case	Per PSU	System
Input current measured, A	1.67	0.8	1.60	0.9	0.45	0.89
Input power measured, W	165	77	153	160	75	149

Table 7. N3300 electrical requirements - one controller module, no disks (continued)

Input voltage	100 to 120V			200 to 240V		
	Worst-case	Per PSU	System	Worst-case	Per PSU	System
Thermal dissipation, BTU/hr	563	261	521	544	253	506
Input power frequency, Hz	50 to 60					

Table 8. N3300 electrical requirements - two controller modules, no disks

Input voltage	100 to 120V			200 to 240V		
	Worst-case	Per PSU	System	Worst-case	Per PSU	System
Input current measured, A	2.63	1.12	2.23	1.34	0.59	1.18
Input power measured, W	254	108	215	240	104	208
Thermal dissipation, BTU/hr	866	366	731	818	355	709
Input power frequency, Hz	50 to 60					

Table 9. N3400 electrical requirements - one controller module

Input voltage		100 to 120V			200 to 240V		
		Worst-case	Per PSU	System	Worst-case	Per PSU	System
Input current measured, A	300 GB SAS drives	4.08	1.98	3.96	2.3	1	2
	450 GB SAS drives	3.96	1.92	3.84	1.97	0.97	1.94
	600 GB SAS drives	3.87	1.92	3.83	1.91	0.96	1.91
	500 GB SATA drives	3.25	1.59	3.17	1.62	0.81	1.62
	750 GB SATA drives	3.38	1.64	3.27	1.69	0.84	1.68
	1 TB SATA drives	3.62	1.77	3.53	1.81	0.90	1.8
	2 TB SATA drives	3.34	1.61	3.22	1.66	0.84	1.67

Table 9. N3400 electrical requirements - one controller module (continued)

Input voltage		100 to 120V			200 to 240V		
		Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Input power measured, W	300 GB SAS drives	404	194	387	392	189	378
	450 GB SATA drives	391	188	375	379	184	367
	600 GB SAS drives	387	188	376	368	181	361
	500 GB SATA drives	319	155	310	310	151	301
	750 GB SATA drives	333	161	322	324	157	314
	1 TB SATA drives	357	173	345	347	169	337
	2 TB SATA drives	329	158	315	319	156	312
Thermal dissipation, BTU/hr	300 GB SAS drives	1378	660	1320	1337	645	1289
	450 GB SAS drives	1333	640	1279	1292	626	1252
	600 GB SAS drives	1319	641	1282	1254	616	1231
	500 GB SATA drives	1088	529	1057	1057	513	1026
	750 GB SATA drives	1136	549	1098	1105	536	1071
	1 TB SATA drives	1217	589	1177	1183	575	1149
	2 TB SATA drives	1122	537	1074	1088	532	1064
Input power frequency, Hz		50 to 60					

Table 10. N3400 electrical requirements - two controller modules

Input voltage		100 to 120V			200 to 240V		
		Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Input current measured, A	300 GB SAS drives	4.85	2.33	4.66	2.39	1.18	2.35
	450 GB SAS drives	4.70	2.27	4.53	2.32	1.14	2.28
	600 GB SAS drives	4.44	2.16	4.32	2.18	1.09	2.18
	500 GB SATA drives	3.95	1.92	3.84	1.97	0.98	1.95
	750 GB SATA drives	4.10	1.99	3.98	2.04	1.01	2.01
	1 TB SATA drives	4.36	2.12	4.23	2.16	1.06	2.12
	2 TB SATA drives	3.92	1.94	3.88	1.97	0.98	1.96
Input power measured, W	300 GB SAS drives	480	229	457	464	224	447
	450 GB SAS drives	464	223	445	451	216	432
	600 GB SAS drives	440	212	424	425	208	415
	500 GB SATA drives	390	188	376	379	184	367
	750 GB SATA drives	405	195	389	393	191	381
	1 TB SATA drives	429	207	414	416	202	403
	2 TB SATA drives	387	189	378	382	186	371

Table 10. N3400 electrical requirements - two controller modules (continued)

Input voltage		100 to 120V			200 to 240V		
		Worst-case	Per PSU	System	Worst-case	Per PSU	System
Thermal dissipation, BTU/hr	300 GB SAS drives	1637	779	1558	1582	762	1524
	450 GB SAS drives	1582	759	1518	1538	737	1473
	600 GB SAS drives	1500	723	1445	1449	708	1415
	500 GB SATA drives	1330	641	1282	1292	626	1252
	750 GB SATA drives	1381	664	1327	1340	650	1299
	1 TB SATA drives	1463	706	1412	1419	687	1374
	2 TB SATA drives	1319	644	1288	1302	633	1265
Input power frequency, Hz		50 to 60					

Table 11. N3400 electrical requirements - one controller module, no disks

Input voltage	100 to 120V			200 to 240V		
	Worst-case	Per PSU	System	Worst-case	Per PSU	System
Input current measured, A	1.4	0.7	1.4	0.77	0.39	0.78
Input power measured, W	137	67	133	134	65	130
Thermal dissipation, BTU/hr	467	227	454	457	222	443
Input power frequency, Hz	50 to 60					

Table 12. N3400 electrical requirements - two controller modules, no disks

Input voltage	100 to 120V			200 to 240V		
	Worst-case	Per PSU	System	Worst-case	Per PSU	System
Input current measured, A	1.96	0.98	1.95	1.02	0.52	1.04
Input power measured, W	192	94	187	188	91	182

Table 12. N3400 electrical requirements - two controller modules, no disks (continued)

Input voltage	100 to 120V			200 to 240V		
	Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Thermal dissipation, BTU/hr	655	319	638	641	311	621
Input power frequency, Hz	50 to 60					

Table 13. N3600 electrical requirements - one controller module

Input voltage		100 to 120V			200 to 240V		
		Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Input current measured, A	144 GB SAS drives	5.64	2.38	4.76	2.82	1.33	2.65
	300 GB SAS drives	6.62	2.96	5.92	3.27	2.76	5.52
	450 GB SAS drives	6.62	2.96	5.92	3.27	1.38	2.76
	500 GB SATA drives	4.64	2.18	4.36	2.33	1.09	2.17
	750 GB SATA drives	5.07	2.26	4.51	2.46	1.20	2.40
	1 TB SATA drives	5.07	2.26	4.51	2.46	1.20	2.40
Input power measured, W	144 GB SAS drives	560	233	465	547	251	502
	300 GB SAS drives	658	292	583	636	262	523
	450 GB SAS drives	658	292	583	636	266	523
	500 GB SATA drives	459	213	425	447	204	408
	750 GB SATA drives	504	220	439	474	224	447
	1 TB SATA drives	504	220	439	474	224	447

Table 13. N3600 electrical requirements - one controller module (continued)

Input voltage		100 to 120V			200 to 240V		
		Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Thermal dissipation, BTU/hr	144 GB SAS drives	1909	794	1587	1864	855	1710
	300 GB SAS drives	2243	994	1988	2165	891	1782
	450 GB SAS drives	2243	994	1988	2165	891	1782
	500 GB SATA drives	1564	724	1448	1523	696	1392
	750 GB SATA drives	1718	749	1497	1617	762	1523
	1 TB SATA drives	1718	749	1497	1617	762	1523
Input power frequency, Hz		50 to 60					

Table 14. N3600 electrical requirements - two controller modules

Input voltage		100 to 120V			200 to 240V		
		Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Input current measured, A	144 GB SAS drives	6.31	2.84	5.68	3.09	1.45	2.89
	300 GB SAS drives	7.51	3.34	6.68	3.73	1.71	3.41
	450 GB SAS drives	7.51	3.34	6.68	3.73	1.71	3.41
	500 GB SATA drives	5.74	2.84	5.67	2.89	1.33	2.65
	750 GB SATA drives	5.91	2.74	5.74	2.97	1.39	2.77
	1 TB SATA drives	5.91	2.74	5.47	2.97	1.39	2.77

Table 14. N3600 electrical requirements - two controller modules (continued)

Input voltage		100 to 120V			200 to 240V		
		Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Input power measured, W	144 GB SAS drives	628	279	558	600	275	550
	300 GB SAS drives	747	330	659	728	328	655
	450 GB SAS drives	747	330	659	728	328	655
	500 GB SATA drives	567	277	554	561	252	503
	750 GB SATA drives	585	268	536	575	262	524
	1 TB SATA drives	585	268	536	575	262	524
Thermal dissipation, BTU/hr	144 GB SAS drives	2142	951	1902	2044	938	1876
	300 GB SAS drives	2547	1124	2247	2483	1116	2232
	450 GB SAS drives	2547	1124	2247	2483	1116	2232
	500 GB SATA drives	1932	946	1891	1913	857	1714
	750 GB SATA drives	1996	914	1827	1962	893	1785
	1 TB SATA drives	1996	914	1827	1962	893	1785
Input power frequency, Hz		50 to 60					

Table 15. N3600 electrical requirements - one controller module, no disks

Input voltage	100 to 120V			200 to 240V		
	Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Input current measured, A	2.10	0.90	1.80	1.10	0.50	0.99
Input power measured, W	205	86.5	173	198	84	168

Table 15. N3600 electrical requirements - one controller module, no disks (continued)

Input voltage	100 to 120V			200 to 240V		
	Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Thermal dissipation, BTU/hr	698	295	589	675	287	574
Input power frequency, Hz	50 to 60					

Table 16. N3600 electrical requirements - two controller modules, no disks

Input voltage	100 to 120V			200 to 240V		
	Worst-case	**Per PSU**	**System**	**Worst-case**	**Per PSU**	**System**
Input current measured, A	2.62	1.19	2.37	1.35	0.62	1.24
Input power measured, W	256	114	227	250	111	222
Thermal dissipation, BTU/hr	874	387	773	851	379	758
Input power frequency, Hz	50 to 60					

Checking shipment package contents

Make sure that your shipment package includes the following items:

- Single-controller system (2859 A10 or A11, or 2862 A10)
  - 1 single-controller system containing the power supplies and any options you ordered
  - 1 console adapter cable, RJ-45 to DB-9
  - 1 system bezel
  - 1 ESD wrist strap
  - 1 serial null modem cable
  - 1 set of IBM publications
  - 2 power cords
  - SFPs

  There will also be envelopes with the software EULA and license keys.

  A rail kit for mounting the single-controller system in a standard IBM 19-inch rack may also be present.
- Dual-controller system (2859 A20 or A21, or 2862 A20)
  - 1 dual-controller system containing the power supplies and any options you ordered
  - 2 console adapter cables, RJ-45 to DB-9
  - 1 system bezel
  - 2 wrist ESD straps
  - 1 serial null modem cable
  - 1 set of IBM publications

– 2 power cords
– SFPs

There will also be envelopes with the software EULA and license keys.

A rail kit for mounting the dual-controller system in a standard IBM 19–inch rack may also be present.

Rules for installing the system in a rack

Attention: The rack installation instructions provided in this document and in the *Installation and Setup Instructions* for your N series product apply specifically to the installation of the N series product in an IBM 19-inch rack. IBM service personnel cannot install the N series product in a non-IBM rack.

If the N series product is being installed in a non-IBM rack, the rails shipped with the N series product may or may not work with the non-IBM rack. Physical installation of the N series product in a non-IBM rack is the customer's responsibility.

You need to observe the following rules and restrictions when installing a system in a standard IBM 19-inch (48.26 cm) equipment rack with mounting rails:

CAUTION:
Use safe practices when lifting.

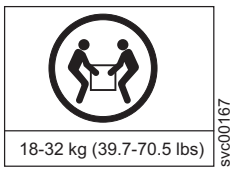
- **For the N3600:** You must work with two other people.

DANGER

The weight of this part or unit is between 32 and 55 kg (70.5 and 121.2 lb). It takes three persons to safely lift this part or unit. (C010)

Attention: Remove the power supplies and fan units from the chassis before attempting to lift the system.

- **For the N3300 and N3400:** You must work with one other person.



DANGER

The weight of this part or unit is between 18 and 32 kg (39.7 and 70.5 lb). It takes two persons to safely lift this part or unit. (C009)

- Install the system at the bottom of your configuration, so that loops extend above your system.

DANGER

To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet. (R001 part 1 of 2)

For additional rack safety notices, refer to “Rack safety” on page vii.

- When installing storage expansion units in a rack, do not exceed the maximum storage limit for your system.
- Make sure that the ID on the back panel of each storage expansion unit matches the ID specified on its label.
- Always install the storage expansion units fully loaded. Do not remove disk drives to reduce the weight.

Guide to the installation process

The following table provides a guide to the installation process.

Attention: Before you begin your installation, print and complete a configuration worksheet for your storage system to gather the information that the software setup process requires. The configuration worksheet is provided in the *Data ONTAP Software Setup Guide* for your version of Data ONTAP. This guide, as well as other Data ONTAP publications, is available on the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.

If you are configuring a storage system as part of a high-availability (or active/active) configuration, some information types must be unique for each storage system mode in the configuration, and some information types must be identical on both storage system nodes. If you have a high-availability (or active/active) configuration, IBM recommends that you print and complete two copies of the configuration worksheet, one for each system node.

Refer to the *Installation and Setup Instructions* that came with your system or storage expansion unit for complete installation details.

Note: All of these procedures are performed by the customer.

Table 17. Installation process procedures

Procedure	Is the procedure required?	For instructions, see...
1. Print and complete a configuration worksheet for each system node of your storage system to gather the information that the software setup process requires.	Yes	The configuration worksheet is provided in the *Data ONTAP Software Setup Guide* for your version of Data ONTAP.
2. Install the system in a standard IBM 19-inch rack.	Yes (unless your system was shipped already assembled and cabled in a rack)	The *Installation and Setup Instructions* for your system.
3. Connect the system to the IP (Internet Protocol) network.	Yes	“Connecting your system to an IP network” on page 19, or the *Installation and Setup Instructions* that came with your system.

Table 17. Installation process procedures (continued)

Procedure	Is the procedure required?	For instructions, see...
4. Connect the system to storage expansion units.	Yes (if you are connecting your system to storage expansion units)	"Connecting your system to storage expansion units" on page 21, or the *Installation and Setup Instructions* that came with your system.
5. Connect the system to a power source.	Yes	"Connecting your system to a power source" on page 21, or the *Installation and Setup Instructions* that came with your system.
6. Configure the system.	Yes	The *IBM System Storage N series Data ONTAP Software Setup Guide* for your version of Data ONTAP, or the *Installation and Setup Instructions* that came with your system.
7. Connect the system to a supported tape device.	No	"Connecting to a supported tape device" on page 26.

Chapter 2. Connecting your system

This chapter describes how to connect your system in the following topics:

Handling fiber-optic cables

Before you use fiber-optic cables, read the following precautions.

Attention: To avoid damage to the fiber-optic cables, follow these guidelines:

- Do not route the cable along a folding cable-management arm.
- When attaching to a device on slide rails, leave enough slack in the cable so that it does not bend to a radius of less than 38 mm (1.5 in.) when extended or become pinched when retracted.
- Route the cable away from places where it can be snagged by other devices in the rack cabinet.
- Do not overtighten the cable straps or bend the cables to a radius of less than 38 mm (1.5 in.).
- Do not put excess weight on the cable at the connection point. Be sure that the cable is well supported.

CAUTION:
Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. For this reason, never look into the end of an optical fiber cable or open receptacle. (C027)

Connecting your system to an IP network

Each node of your N3300, N3400 or N3600 connects to an IP network. If you have an active/active or high availability system, both nodes need to connect to the network. For information that describes how to connect your system, refer to the *Installation and Setup Instructions* that came with your system.

The N3300 and N3600 systems have two onboard Ethernet ports, labeled e0a and e0b, as shown in Figure 1 on page 20.

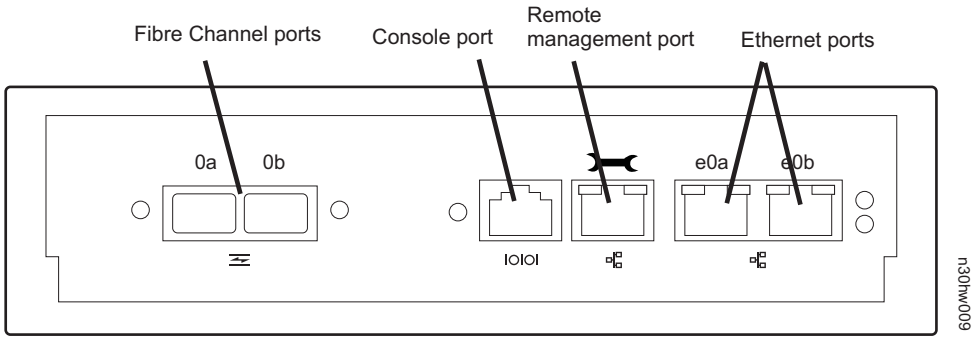


Figure 1. Onboard port locations - N3300 and N3600

The N3400 system has four onboard Ethernet ports, labeled e0a through e0d, as shown in Figure 2.

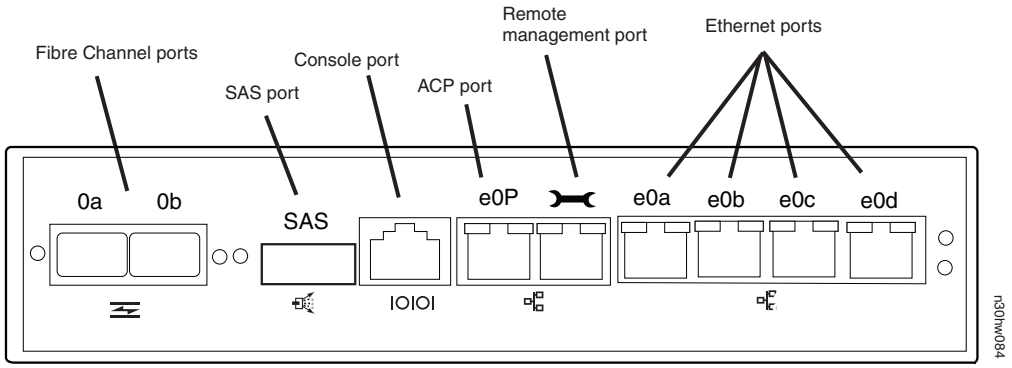


Figure 2. Onboard port locations - N3400

For information about monitoring the Ethernet port LEDs, see “Monitoring the rear panel LEDs” on page 84.

Note: Each node of the N3600 has one PCIe slot available for either a network interface card (NIC) or a host bus adapter (HBA). To support additional Ethernet connections for the N3600, a maximum of one Network Interface Card (NIC) per controller node can be plugged into the PCIe slot or slots. There are no PCI slots on the N3300 or N3400.

The integrated Ethernet RJ-45 twisted-pair connectors are compatible with the IEEE 802.3 Ethernet network 10/100/1000 BASE-TX link. When connecting to the Ethernet port, connect a twisted-pair (CAT-5 or better) cable to the RJ-45 Ethernet port located on the back of the system drawer.

If you are connecting to a copper NIC, use RJ-45 CAT-5 or better copper cables.

If you are connecting to a fiber NIC, use (50- or 62.5-micron) fiber-optic cables with LC connectors.

Connecting your system to a power source

The N3300, N3400 and N3600 systems are shipped with redundant power supplies, referred to as PSU1 and PSU2. Each power supply has its own AC power cord. You should have separate circuit breakers for each power supply to ensure power redundancy.

For information on connecting your system to a power source, see the *Installation and Setup Instructions* that came with your system.

Connecting your system to storage

The N3300, N3400 and N3600 systems have two onboard Fibre Channel ports, labeled 0a and 0b, as shown in Figure 1 on page 20 and Figure 2 on page 20. SFPs must be firmly seated in the FC ports before making connections.

Note: Each node of the N3600 has one PCIe slot available for either a network interface card (NIC) or a host bus adapter (HBA). To support additional Fibre Channel ports for the N3600, a maximum of one host bus adapter (HBA) per node can be plugged into the PCIe slot or slots. Attach the (50- or 62.5-micron) fiber-optic cables with LC connectors to the Fibre Channel ports. There are no PCI slots on the N3300 or N3400.

Connecting your system to storage expansion units

For information that describes how to connect your system using the onboard Fibre Channel ports to storage expansion units, see the *Installation and Setup Instructions* that came with your system.

Attention: If you are connecting your N3400 or N3600 system to SAS storage expansion units, refer to the cabling instructions provided in the *IBM System Storage N series Universal SAS and ACP Cabling Guide*.

This section presents two cabling examples for connecting sample configurations with storage expansion units and Fibre Channel switches.

- “Cabling your system to a Fibre Channel switch” on page 22
- “Cabling an N3600 system to Fibre Channel switches using a Fibre Channel expansion adapter” on page 23

Chapter 4, “Configuration rules and examples for N3300, N3400 and N3600 systems,” on page 31 provides details on additional configurations.

Fiber-optic cables must be used for the connection from the filer to the first storage expansion unit.

Attention: Where applicable, make sure that all storage expansion unit speed switches are set to the correct position. If necessary, refer to the documents that came with the storage expansion unit for information about checking and changing the switch setting.

Attention: **For the N3600 only:** If you are using optional adapter cards instead of the onboard Fibre Channel ports to connect your N3600 to storage expansion units, see the cabling instructions described in “Cabling an N3600 system to Fibre Channel switches using a Fibre Channel expansion adapter” on page 23.

Dual-path Fibre Channel cabling is supported for N3300, N3400 and N3600. Dual-path cabling is designed to improve reliability, availability and serviceability of the storage expansion units attached to the storage controller by creating two redundant paths from each storage controller to each loop of the storage expansion units. For more information about using dual-path cabling, see the *Installation and Setup Instructions* that came with your system.

Cabling your system to a Fibre Channel switch

This section describes how to cable your system to a Fibre Channel switch, using the 0b ports for storage expansion unit storage. The specific example shown in this section illustrates the connections for a dual-controller N3300.

Important: If you are not using the onboard ports for storage, then you must set your onboard ports to Target mode, as described in the *IBM System Storage N series Data ONTAP Block Access Management Guide* for your version of Data ONTAP. This guide, as well as other Data ONTAP publications, is available on the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.

Note: The following illustrations show connections to EXN2000 or EXN4000 storage expansion units. In EXN1000 storage expansion units, the positions of the In and Out ports are reversed from those of the EXN2000 and EXN4000.

1. As shown in Figure 3, cable onboard port 0a of the top controller module (CM-A) to a port on the Fibre Channel switch.
2. As shown in Figure 3, cable onboard port 0a of the bottom controller module (CM-B) to a port on the Fibre Channel switch.

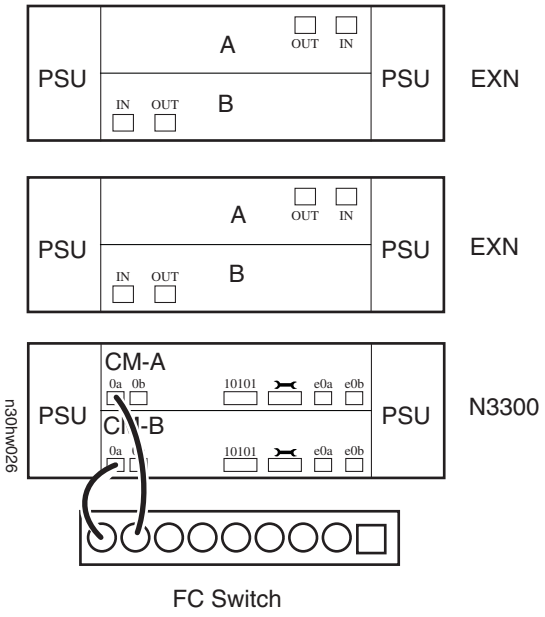


Figure 3. Cabling the system to a Fibre Channel switch

3. As shown in Figure 4 on page 23, cable port 0b on the top controller module (CM-A) to the first storage expansion unit Channel A ESH2/ESH4 or AT-FCX IN port.

4. As shown in Figure 4, cable port 0b on the bottom controller module (CM-B) to the first storage expansion unit Channel B ESH2/ESH4 or AT-FCX IN port.
5. As shown in Figure 4, cable the first storage expansion unit Channel A ESH2/ESH4 or AT-FCX OUT port to the next storage expansion unit Channel A ESH2/ESH4 or AT-FCX IN port. Label this cable with a solid-colored label.
6. As shown in Figure 4, cable the first storage expansion unit Channel B ESH2/ESH4 or AT-FCX OUT port to the storage expansion unit Channel B ESH2/ESH4 or AT-FCX IN port. Label this cable with a solid-colored label.
7. Repeat Steps 5 and 6, connecting OUT port to IN port, for the remaining storage expansion units in the loop.

   Do not plug any cables in the ESH2/ESH4 or AT-FCX OUT port of the last unit. The storage expansion units are self-terminating.

   Note: The ESH2/ESH4 is self-terminating and does not have a terminate switch. The AT-FCX is self-terminating.

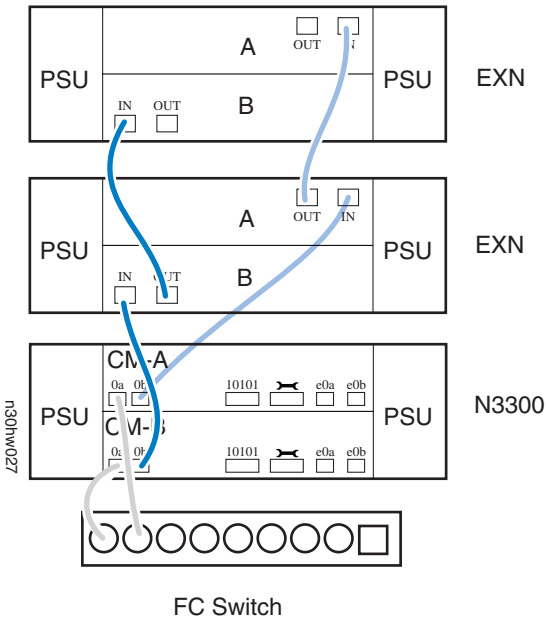


Figure 4. Cabling the system to storage expansion units

Cabling an N3600 system to Fibre Channel switches using a Fibre Channel expansion adapter

This section describes how to cable an N3600 system to Fibre Channel switches using a dual-port optical Fibre Channel expansion adapter for expansion unit storage. The example shown in this section illustrates the connections for a dual-controller N3600.

For additional information about the optional adapter cards supported by N3600 systems, see the appropriate "Optional adapter cards" appendix in the *IBM System Storage N series Introduction and Planning Guide*. This guide, as well as other N series documentation, is available on the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.

Important: If you are not using the onboard Fibre Channel ports for storage, then you must set your onboard Fibre Channel ports to Target mode, as described in the *IBM System Storage N series Data ONTAP Block Access Management Guide* for your version of Data ONTAP.

Note: The illustrations in the following sections show connections to EXN2000 or EXN4000 storage expansion units. In EXN1000 storage expansion units, the positions of the In and Out ports are reversed from those of the EXN2000 and EXN4000.

1. As shown in Figure 5, cable onboard Fibre Channel ports 0a of both the top and bottom controller modules (CM-A and CM-B) to two ports on one Fibre Channel switch.
2. As shown in Figure 5, cable onboard Fibre Channel ports 0b of both the top and bottom controller modules (CM-A and CM-B) to two ports on a second Fibre Channel switch.

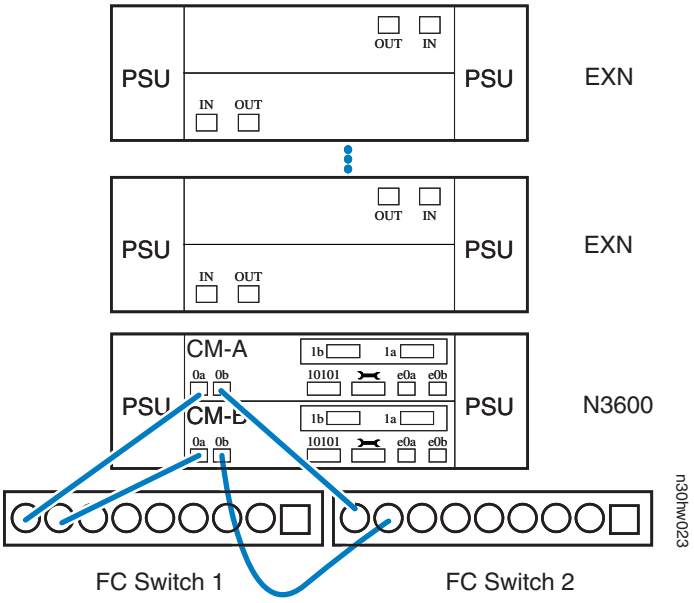


Figure 5. Cabling the N3600 to Fibre Channel switches

3. As shown in Figure 6 on page 25, cable the dual-port expansion adapter Port 1a on the top controller module (CM-A) to the first storage expansion unit Channel A ESH2/ESH4 or AT-FCX IN port.
4. As shown in Figure 6 on page 25, cable the dual-port expansion adapter Port 1a on the bottom controller module (CM-B) to the first storage expansion unit Channel B ESH2/ESH4 or AT-FCX IN port.
5. As shown in Figure 6 on page 25, cable the first storage expansion unit Channel A ESH2/ESH4 or AT-FCX OUT port to the next storage expansion unit Channel A ESH2/ESH4 or AT-FCX IN port. Label this cable with a solid-colored label.
6. As shown in Figure 6 on page 25, cable the first storage expansion unit Channel B ESH2/ESH4 or AT-FCX OUT port to the storage expansion unit Channel B ESH2/ESH4 or AT-FCX IN port. Label this cable with a solid-colored label.
7. Repeat Steps 5 and 6, connecting OUT port to IN port, for the remaining storage expansion units in the loop.

Do not plug any cables in the ESH2/ESH4 or AT-FCX OUT port of the last unit. The storage expansion units are self-terminating.

Note: The ESH2/ESH4 is self-terminating and does not have a terminate switch. The AT-FCX is self-terminating.

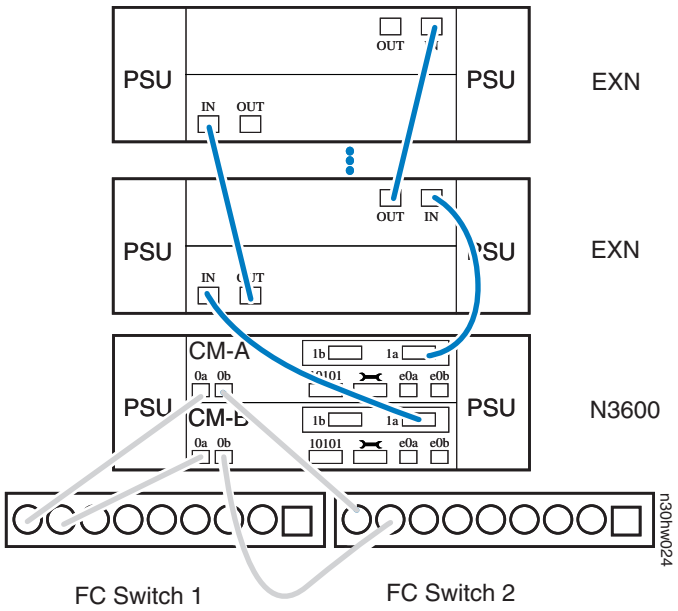


Figure 6. Cabling the N3600 expansion adapter to storage expansion units

8. As shown in Figure 7 on page 26, cable the dual-port expansion adapter Port 1b on the top controller module (CM-A) to the last storage expansion unit Channel B ESH2/ESH4 or AT-FCX OUT port.
9. As shown in Figure 7 on page 26, cable the dual-port expansion adapter Port 1b on the bottom controller module (CM-B) to the last storage expansion unit Channel A ESH2/ESH4 or AT-FCX OUT port.

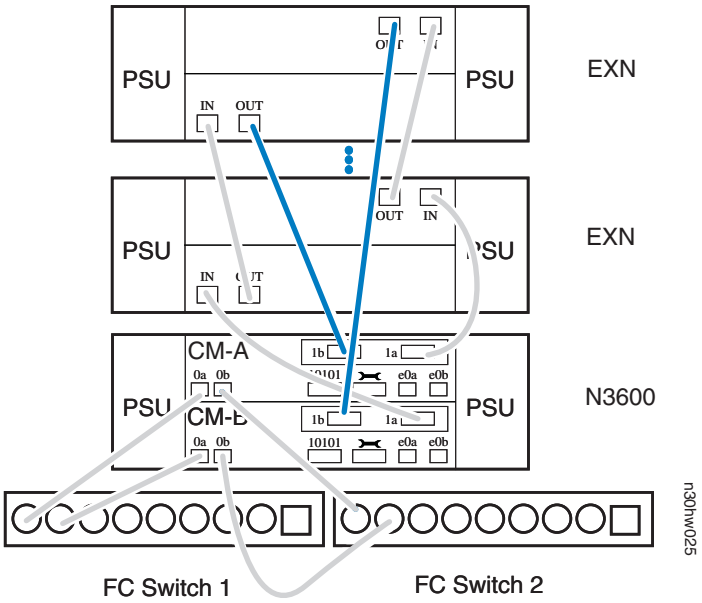


Figure 7. Cabling the N3600 expansion adapter to storage expansion units

Connecting to a supported tape device

You can connect supported tape devices to your N3300, N3400 or N3600 through an optical Fibre Channel interface using any Fibre Channel port on the back of the chassis.

The N3300, N3400 and N3600 only support tape devices with an optical Fibre Channel interface. For supported devices for your system, see the *Interoperability Matrix* on the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.

Refer to the documentation that comes with the supported tape device for connection information.

Rules for connecting supported tape devices

Observe the following rules for connecting the supported tape devices:

- Use a fiber-optic cable that is:
  - Appropriate to the Fibre Channel connection on your system
  - Of an approved length for the supported tape device

  Note: See the documentation for the supported tape device.
- An unsupported tape backup device might cause the system to halt. To verify support for your third-party device, check the *Interoperability Matrix* on the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.
- For additional information about Fibre Channel cables, see the IBM N series support website.

Connecting your system to an ASCII terminal console

The ASCII terminal console enables you to monitor the boot process, helps you configure your system after it boots, and enables you to perform system administration.

For information about ASCII terminal console wiring, DB-9 to RJ-45 console adapter pin connections, and connecting your system to an ASCII terminal console, see the *IBM System Storage N series Introduction and Planning Guide*. This guide, as well as other N series documentation, is available on the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.

Chapter 3. Configuring the system

This chapter describes how to configure an N3300, N3400 or N3600 system in the following topics:

- "Configuring the system"
- "Configuring the Fibre Channel ports"

Configuring the system

Refer to the completed configuration worksheet for your storage system. The configuration worksheet is provided in the *Data ONTAP Software Setup Guide* for your version of Data ONTAP. This document, as well as other Data ONTAP documentation, is available on the IBM N series support website, which is accessed and navigated as described in "Websites" on page xxii.

If you are configuring a storage system as part of a high-availability (or active/active) configuration, some information types must be unique for each storage system mode in the configuration, and some information types must be identical on both storage system nodes. If you have a high-availability (or active/active) configuration, IBM recommends that you print and complete two copies of the configuration worksheet, one for each system node.

For information about how to boot your filer for the first time, refer to the *Installation and Setup Instructions* that came with your system.

Configuring the Fibre Channel ports

The N3300, N3400 and N3600 systems provide two independent Fibre Channel ports, identified as 0a and 0b. SFPs must be firmly seated in both ports before connecting cables.

The Fibre Channel ports can operate in target or initiator mode. Fibre Channel ports do not support mixed initiator/target mode. The default mode for the ports is initiator mode. You do not need to configure the ports to use them in initiator mode.

The Fibre Channel ports should be used in initiator mode to communicate with tape backup devices, such as in a TapeSAN backup configuration.

Fibre Channel ports on HBAs cannot be configured in target mode. They can only be used in initiator mode.

Active/active or high availability configurations

Active/active or high availability configurations must be cabled to switches that support public loop topology. To connect a system to a fabric topology that includes switches that only support point-to-point topology, such as McDATA Director class switches, you must connect the active/active or high availability configuration to an edge switch and use this switch as a bridge to the fabric. For information about specific switch models supported and fabric configuration guidelines, see the *IBM System Storage N series Fibre Channel and iSCSI Configuration Guide* for your version of Data ONTAP on the IBM N series support website, which is accessed and navigated as described in "Websites" on page xxii.

Configuring for initiator mode

To configure the system back to initiator mode, complete the following steps.

1. Set the specified onboard ports to operate in initiator mode by entering the following command:

   ```
   fcadmin config -t initiator adapter
   ```

   where *adapter* is the port number. You can specify more than one port.

   Example: The following example sets onboard port 0b to initiator mode.

   ```
   fcadmin config -t initiator 0b
   ```

2. Reboot the system by entering the following command:

   ```
   reboot
   ```

3. Verify that the Fibre Channel ports are online and configured in the correct state for your configuration by entering the following command:

   ```
   fcadmin config
   ```

   Example: The following output example shows one port configured as Fibre Channel target and one port configured as initiator.

```
n3300a> fcadmin config
                  Local
Adapter Type      State                  Status
-----------------------------------------------------
  0a   target        CONFIGURED             online
  0b   initiator     CONFIGURED             online
```

For information on converting the onboard ports to target mode and configuring your SAN, see the *IBM System Storage N series Data ONTAP Block Access Management Guide* for your version of Data ONTAP. This guide, as well as other Data ONTAP publications, is available on the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.

Configuring and using the remote management port

The following table provides a list of documents for configuring and using the remote management (RM) port. These documents are available on the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.

Table 18. RM configuration manuals

Manual Title	Information Provided
Installation and Setup Instructions that came with your system	Describes the system and RM cabling.
IBM System Storage N series Diagnostics Guide	Lists and describes the diagnostic tests for a new or existing RM.
IBM System Storage N series Data ONTAP System Administration Guide for your version of Data ONTAP	Describes RM configuration and use.
IBM System Storage N series Platform Monitoring Guide	Lists RM error messages and gives corrective action for the error.

Chapter 4. Configuration rules and examples for N3300, N3400 and N3600 systems

This chapter describes the example connections for the onboard Fibre Channel (FC) ports (0a and 0b) for N3300, N3400, and N3600 systems and the onboard SAS port on the N3400 system. For N3600 systems, this chapter also describes supported connections for the expansion PCI card, which adds additional FC ports (1a through 1d, depending on the adapter), SAS ports, or a SCSI port.

Table 19. N3300, N3400 and N3600 configuration options

N3300, N3400 and N3600 configuration options	
Storage protocol	Depending on the storage protocols, the FC or SAS ports attach to storage expansion units or backup devices, and/or the FC ports can attach to a SAN using the FC protocol, in addition to storage expansion unit and backup device connections. See the *Fibre Channel and iSCSI Configuration Guide* for your version of Data ONTAP on for more information. This guide, as well as other Data ONTAP publications, is available on the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.
Controller redundancy	*Active/active configuration*. The system has two redundant controller modules.
	Single-controller configuration. The system has one controller module.
Internal/external storage **Note:** Systems can have both internal and external storage.	*Internal disks*. Internal disks in the system chassis are used.
	External disks. The system connects to one or more loops or SAS stacks of N series storage expansion units.
Storage expansion unit connection redundancy	*Multipath configuration*. The controller has multiple connections to disks on the storage expansion units. The OUT ports of the last storage expansion unit in the storage expansion unit loop are connected back to an FC port on each controller. Multipath is the preferred configuration.
	Dual-path configuration. The controller has two connections to disks on the storage expansion units.
	Single-path configuration. The storage expansion units have a single connection to the controller. This configuration is not preferred.
Backup devices	*External backup devices*. The system connects to a tape backup device.

For more information on supported configurations, see the following:

- “Supported N3300 configurations” on page 33
- “Supported N3400 configurations” on page 44
- “Supported N3600 configurations” on page 54

Connectivity Rules

Use the following connectivity rules when cabling an N3300, N3400, or N3600 system.

Fibre Channel Connectivity Rules

A Fibre Channel port can be connected to storage shelves or tape drives when configured as an initiator or to SAN hosts or FC switches when configured as a target. See the Data ONTAP documentation for the `fcadmin` command and the *Fibre Channel and iSCSI Configuration Guide* for your version of Data ONTAP for more information. This guide, as well as other Data ONTAP publications, is available on the IBM N series support website, which is accessed and navigated as described in "Websites" on page xxii.

Because of limited port density, the N3300, N3400, and N3600 systems support single-path Fibre Channel configurations, but the best practice is to use the dual-path or multipath configurations.

SAS Connectivity Rules

The N3400 onboard SAS port and N3600 expansion SAS ports can only be connected to SAS storage. Refer to the *IBM System Storage N series Universal SAS and ACP Cabling Guide* for additional information on SAS and ACP connectivity.

Because of limited port density, the N3400 systems support single-path SAS configurations. On N3600 systems, dual-path configurations are preferred.

The N3400 and N3600 systems support Fibre Channel storage or tape drives along with SAS storage. For example, the Fibre Channel storage configuration shown in Figure 22 on page 47 and the SAS storage configuration shown in Figure 26 on page 51 can be combined together.

Supported N3300 configurations

Table 20. Supported N3300 configurations

Protocol	Active/active or single-controller	With external storage expansion units	Redundant paths to storage expansion units?	With FC backup device?	See diagram on...
NFS, CIFS, and/or iSCSI	Single-controller	One storage expansion unit loop	Dual-path	NO	Figure 8 on page 34
		Two storage expansion unit loops	Single-path	NO	Figure 9 on page 35
	Active/active	One storage expansion unit loop	Multipath (preferred)	NO	Figure 10 on page 36
		One storage expansion unit loop	Dual-path	YES	Figure 11 on page 37
		Two storage expansion unit loops	Dual-path	NO	Figure 12 on page 38
All protocols including FC	Single-controller	NO	n/a	YES	Figure 13 on page 39
		NO	n/a	NO	Figure 14 on page 39
		NO	n/a	YES	Figure 15 on page 40
	Active/active	NO	n/a	NO	Figure 16 on page 41
		NO	n/a	YES	Figure 17 on page 41
		One storage expansion unit loop	Dual-path	NO	Figure 18 on page 42
		NO	n/a	YES	Figure 19 on page 43

Figure 8 shows an example of a single-controller N3300 in an NFS, CIFS, and/or iSCSI configuration with a dual-path connection to the storage expansion units and one storage expansion unit loop.

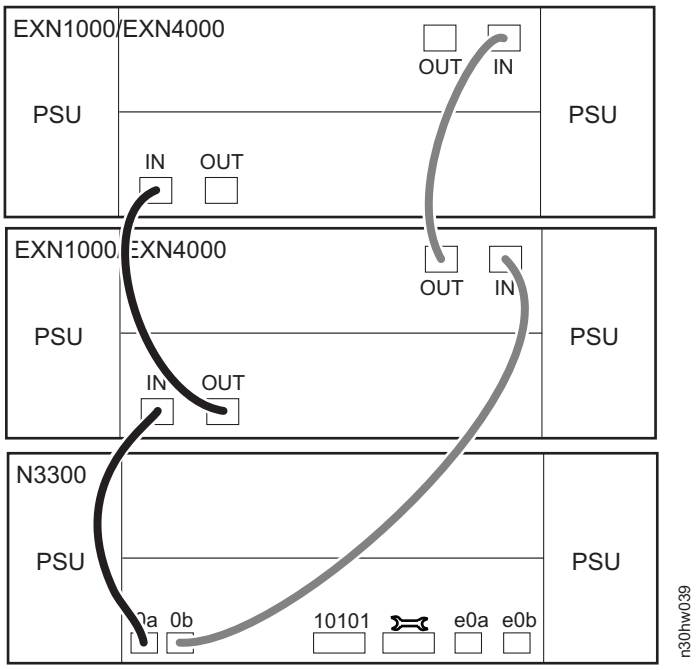


Figure 8. Single-controller N3300 in an NFS, CIFS, and/or iSCSI configuration with a dual path connection to the storage expansion units and one storage expansion unit loop

Figure 9 shows an example of a single-controller N3300 in an NFS, CIFS, and/or iSCSI configuration with a single-path connection to the storage expansion units, and two storage expansion unit loops.

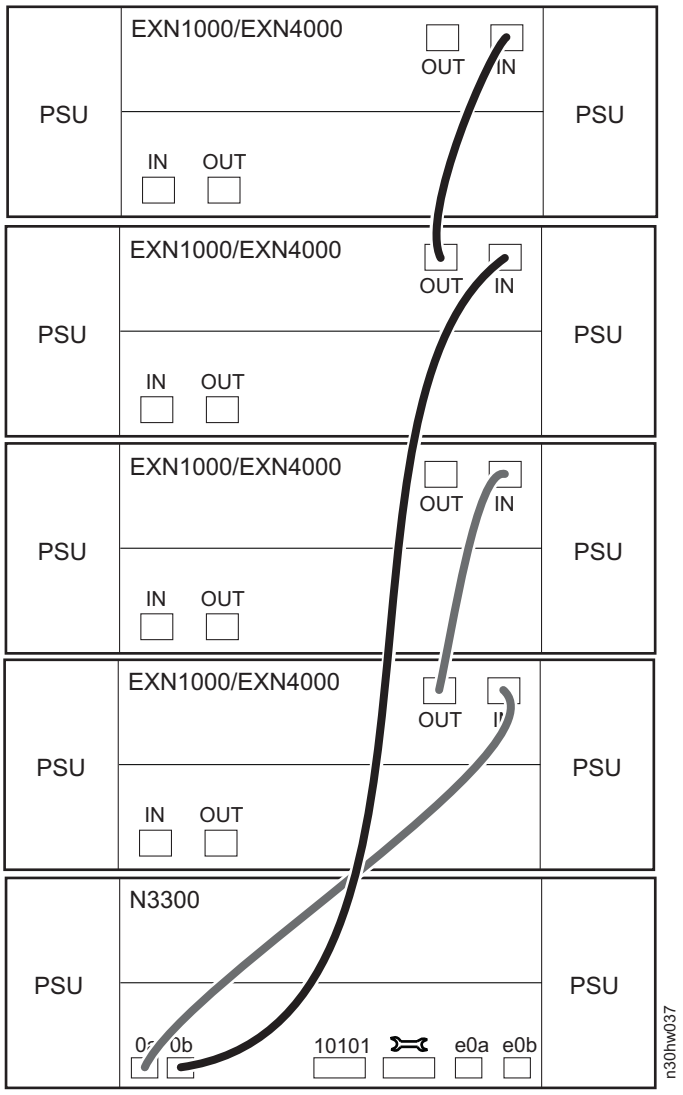


Figure 9. Single-controller N3300 in a NAS configuration with two storage expansion unit loops

Figure 10 shows an example of an active/active N3300 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop and multipath connections to the storage expansion units.

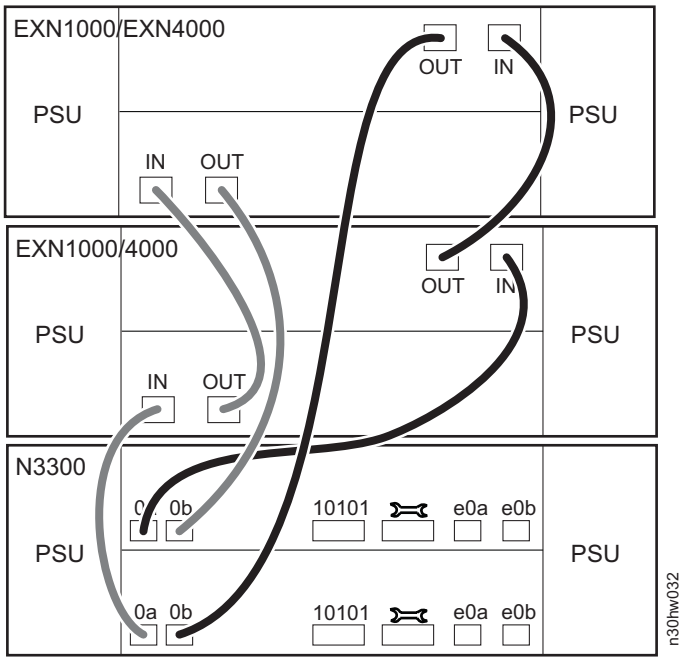


Figure 10. Active/active N3300 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop and multipath connections to the storage expansion units

Figure 11 shows an example of an active/active N3300 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop, dual-path connections to the storage expansion units and a backup device.

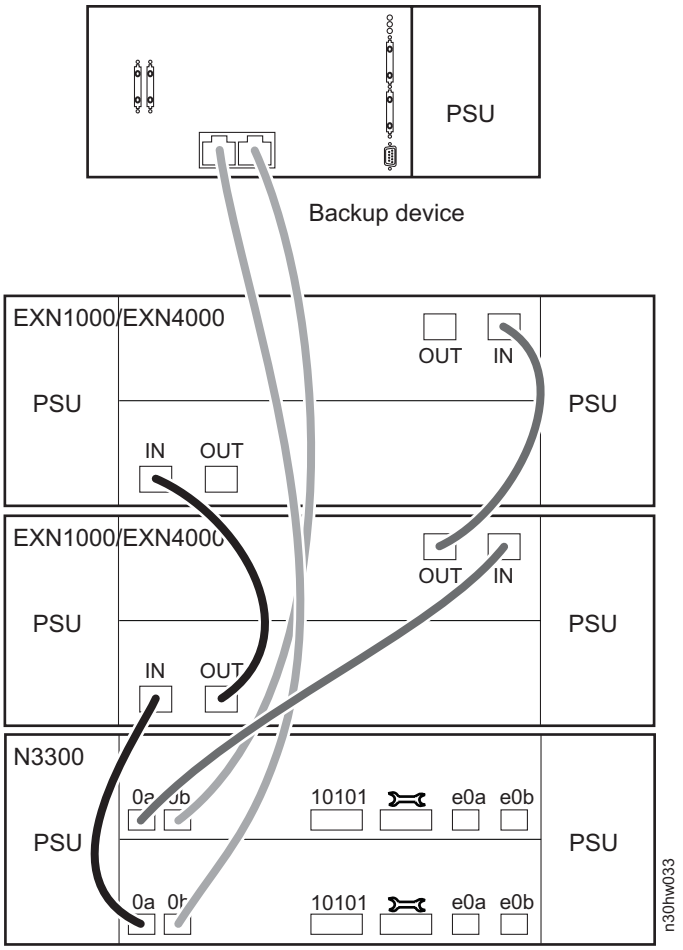


Figure 11. Active/active N3300 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop, dual-path connections to the storage expansion units and a backup device

Figure 12 shows an example of an active/active N3300 in an NFS, CIFS, and/or iSCSI configuration with two storage expansion unit loops and dual-path connections to the storage expansion units.

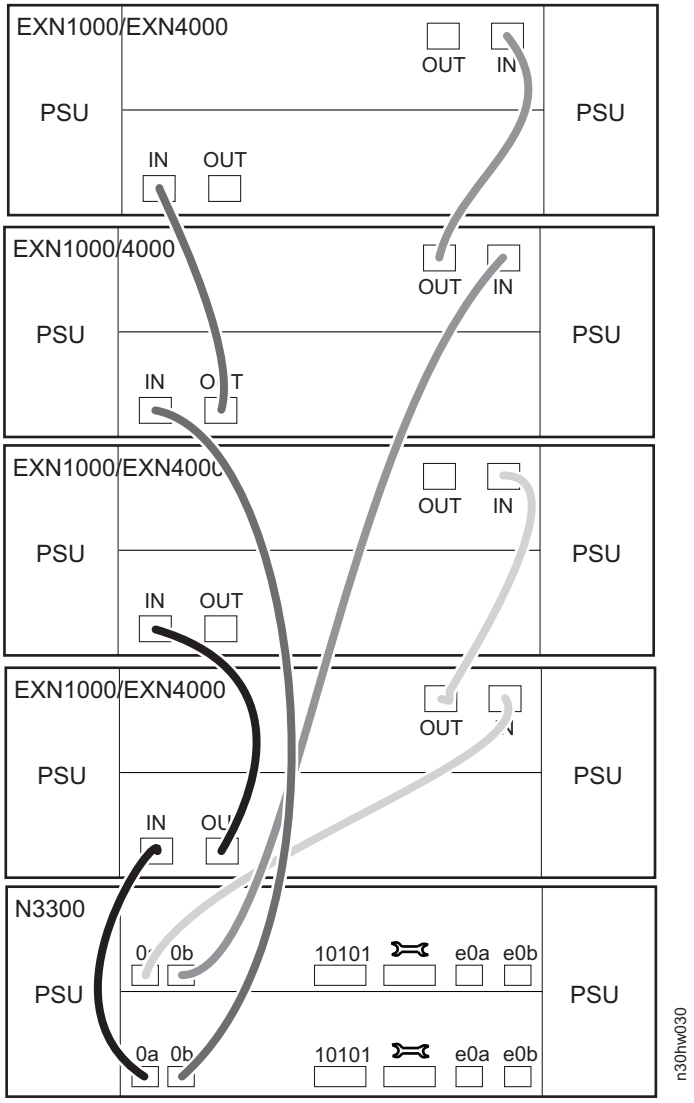


Figure 12. Active/active N3300 in an NFS, CIFS, and/or iSCSI configuration with two storage expansion unit loops and dual-path connections to the storage expansion units

Figure 13 shows an example of a single-controller N3300 supporting all protocols, including FC, with a backup device.

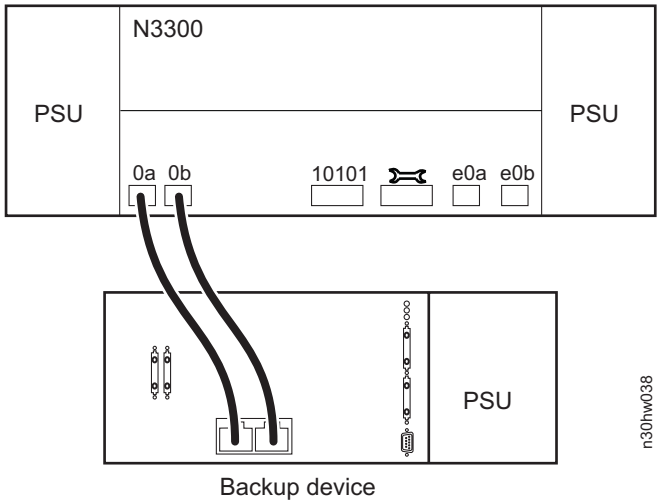


Figure 13. Single-controller N3300 supporting all protocols, including FC, with a backup device

Figure 14 shows an example of a single-controller N3300 supporting all protocols, including FC.

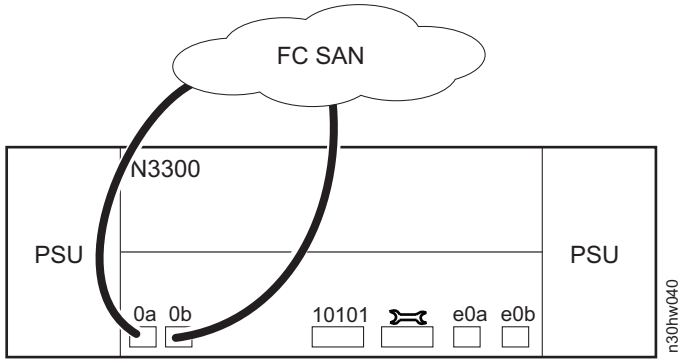


Figure 14. Single-controller N3300 supporting all protocols, including FC

Figure 15 shows an example of a single-controller N3300 supporting all protocols, including FC, with a backup device.

For this configuration, the 0b port must be changed from its default mode (target) to initiator mode. See the *Data ONTAP Block Access Management Guide for iSCSI and FC* for more information.

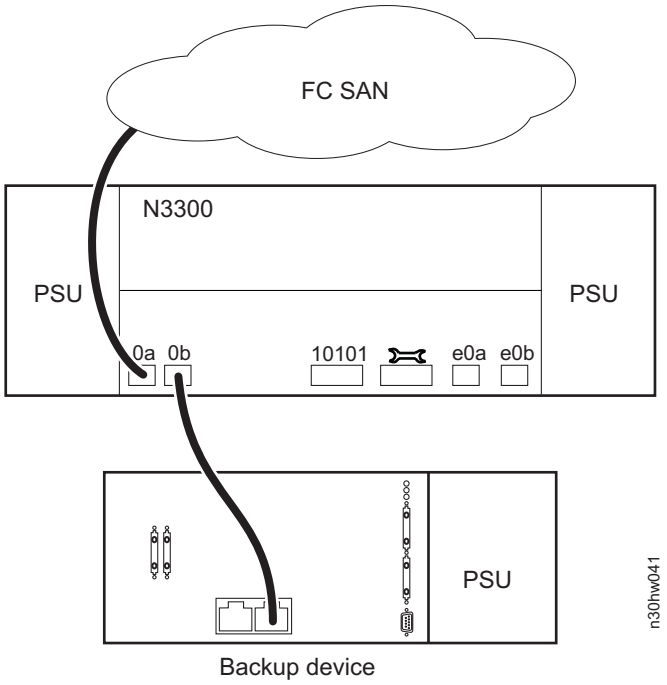


Figure 15. Single-controller N3300 supporting all protocols, including FC, with a backup device

Figure 16 shows an example of an active/active N3300 supporting all protocols, including FC.

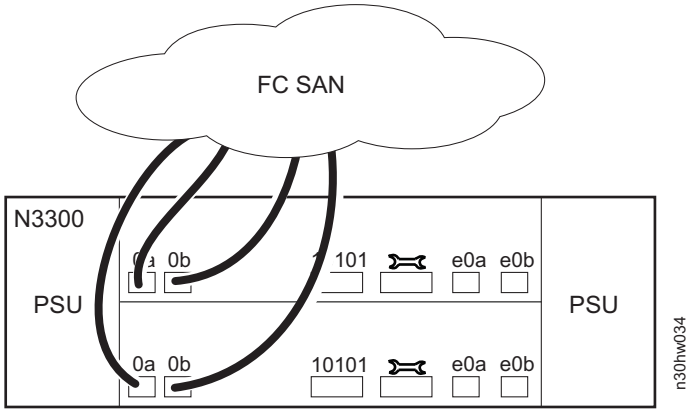


Figure 16. Active/active N3300 supporting all protocols, including FC

Figure 17 shows an example of an active/active N3300 supporting all protocols, including FC, with a backup device.

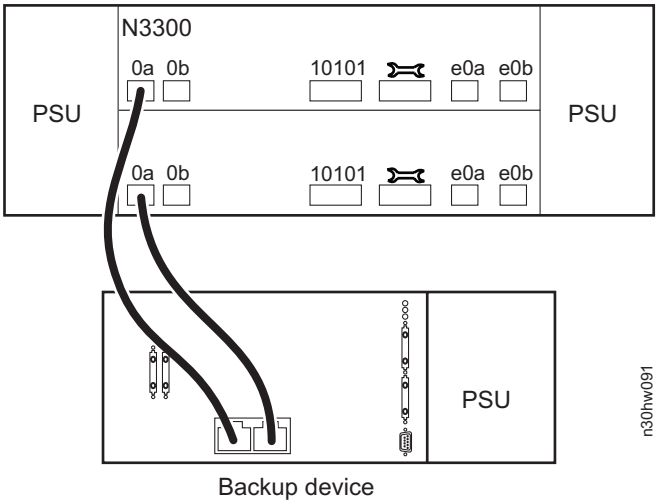


Figure 17. Active/active N3300 supporting all protocols, including FC, with a backup device.

Figure 18 shows an example of an active/active N3300 supporting all protocols, including FC, with one storage expansion unit loop and dual-path connections to the storage expansion units.

For this configuration, the 0b port must be changed from its default mode (target) to initiator mode. See the *Data ONTAP Block Access Management Guide for iSCSI and FC* for more information.

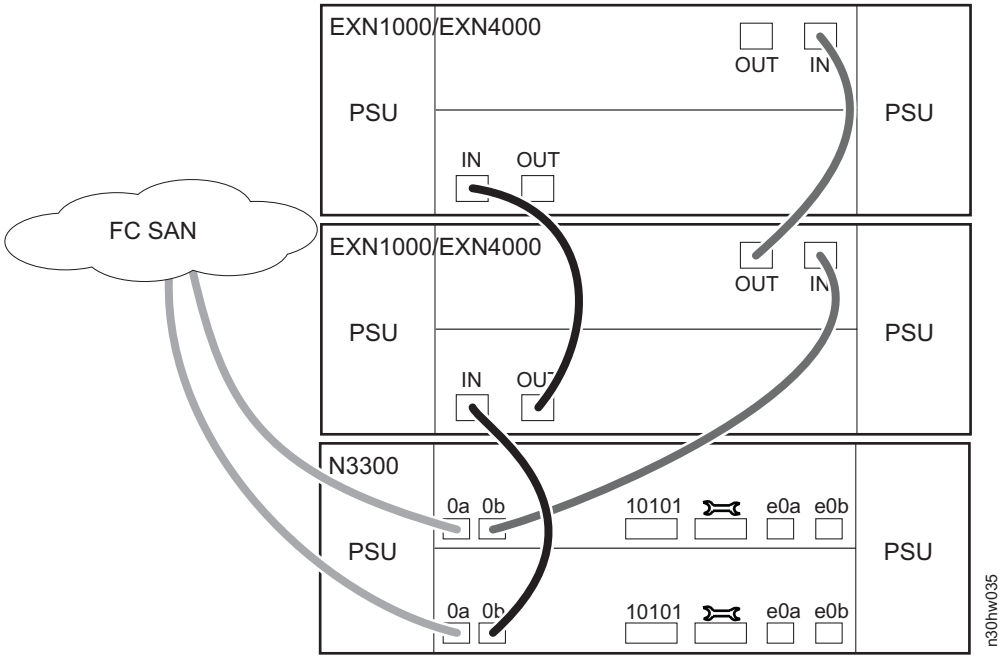


Figure 18. Active/active N3300 supporting all protocols, including FC, with one storage expansion unit loop and dual-path connections to the storage expansion units

Figure 19 shows an example of an active/active N3300 supporting all protocols, including FC, with a backup device.

For this configuration, the 0b ports must be changed from their default mode (target) to initiator mode. See the *Block Access Management Guide for iSCSI and FC* for more information.

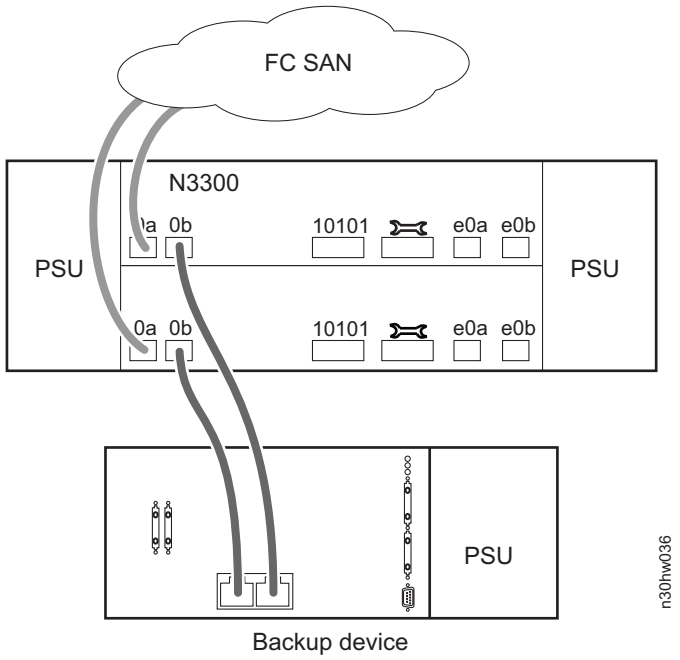


Figure 19. Active/active N3300 supporting all protocols, including FC, with a backup device

Supported N3400 configurations

Table 21. Supported N3400 configurations

Protocol	Active/active or single-controller	With external storage expansion units	Redundant paths to storage expansion units?	With FC backup device?	See diagram on...
NFS, CIFS, and/or iSCSI	Single-controller	Two storage expansion unit loops, FC	Single-path	NO	Figure 20 on page 45
	Active/active	One storage expansion unit loop, FC	Multipath	NO	Figure 21 on page 46
		Two storage expansion unit loops, FC	Dual-path	NO	Figure 22 on page 47
		One storage expansion unit loop, FC	Dual-path	YES	Figure 23 on page 48
All protocols, including FC	Single-controller	One storage expansion unit stack, SAS	Single-path	NO	Figure 24 on page 49
	Active/active	NO	n/a	NO	Figure 25 on page 50
		One storage expansion unit stack, SAS	Dual-path	NO	Figure 26 on page 51
		NO	n/a	YES	Figure 27 on page 52
		NO	n/a	YES	Figure 28 on page 52
		One storage expansion unit loop, FC	Dual-path	NO	Figure 29 on page 53

Figure 20 shows an example of a single-controller N3400 in an NFS, CIFS, and/or iSCSI configuration with two storage expansion unit loops.

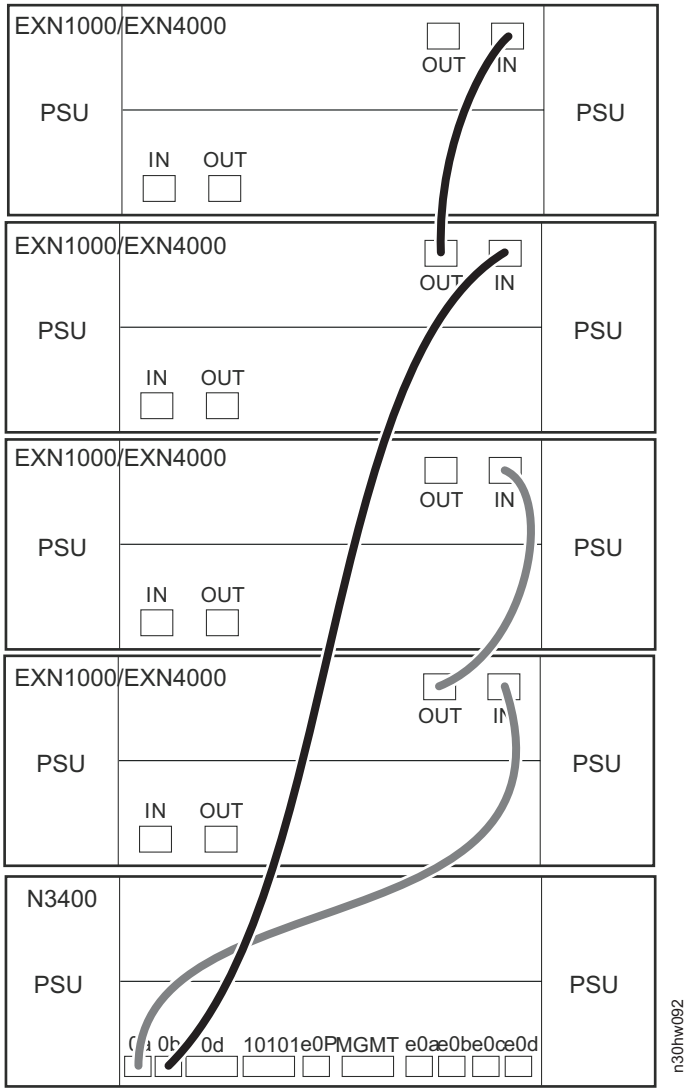


Figure 20. Single-controller N3400 in an NFS, CIFS, and/or iSCSI configuration with two storage expansion unit loops

Figure 21 shows an example of an active/active N3400 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop and multipath connections to the storage expansion units.

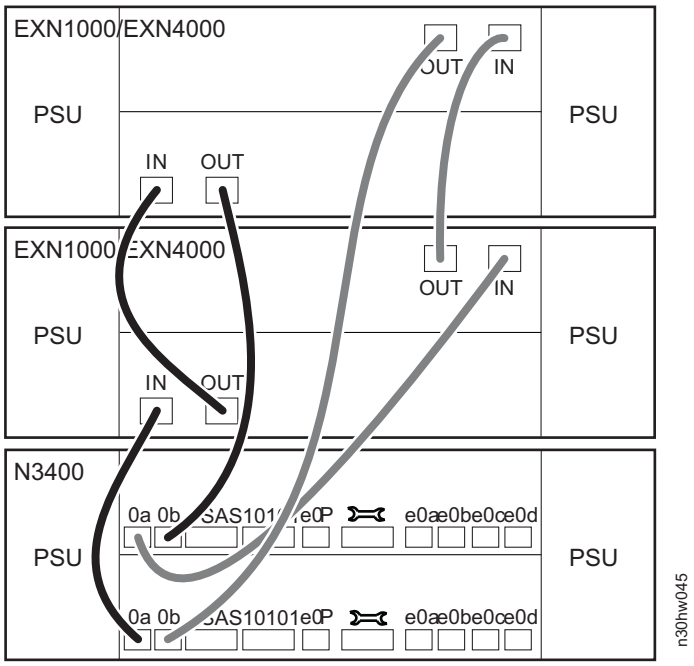


Figure 21. Active/active N3400 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop and multipath connections to the storage expansion units

Figure 22 shows an example of an active/active N3400 in an NFS, CIFS, and/or iSCSI configuration with two storage expansion unit loops and dual-path connections to the storage expansion units.

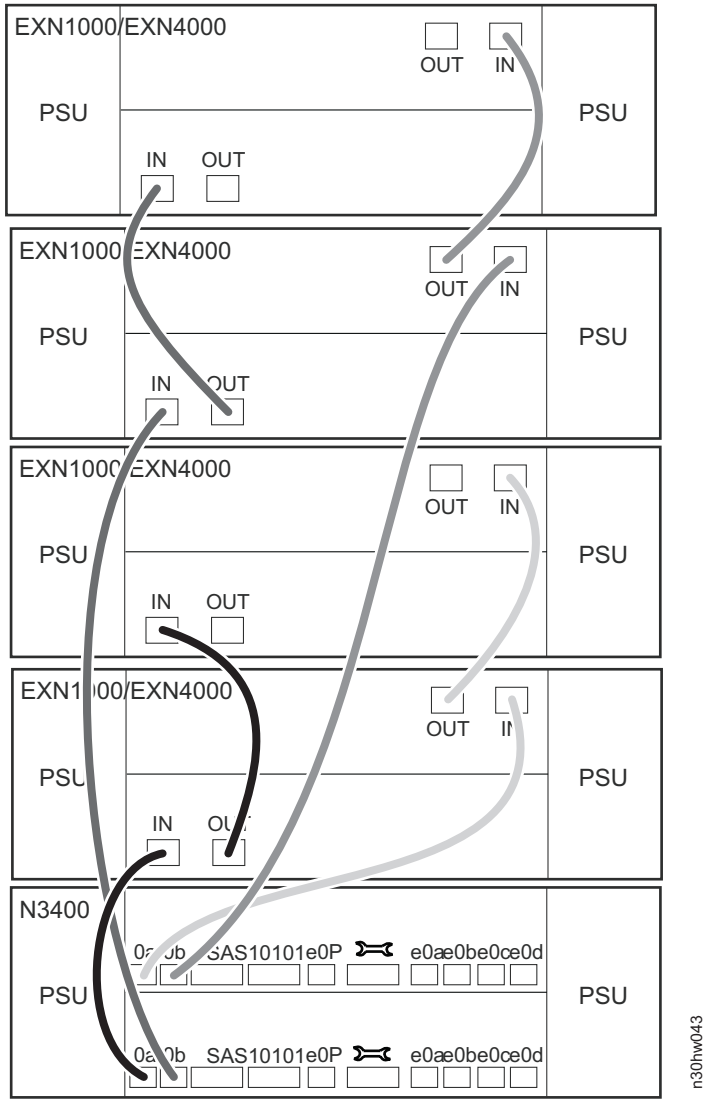


Figure 22. Active/active N3400 in an NFS, CIFS, and/or iSCSI configuration with two storage expansion unit loops and dual-path connections to the storage expansion units

Figure 23 shows an example of an active/active N3400 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop, dual-path connections to the storage expansion units and a backup device.

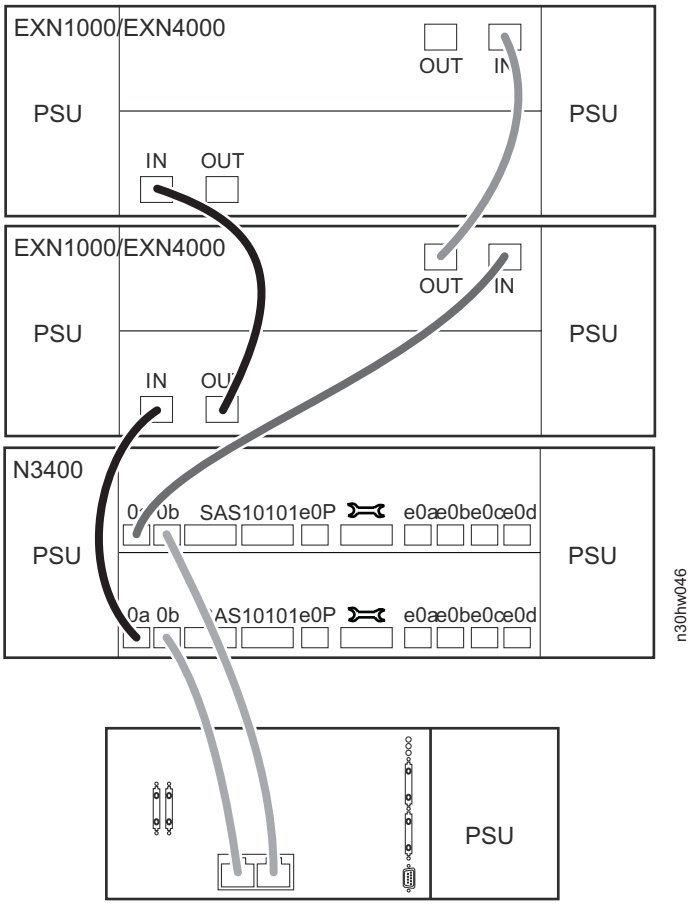


Figure 23. Active/active N3400 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop, dual-path connections to the storage expansion units and a backup device

Figure 24 shows an example of a single-controller N3400, supporting all protocols including FC, with a SAS stack, Alternate Control Path (ACP) Ethernet cabling and single-path connections to storage expansion units.

See the *IBM System Storage N series Universal SAS and ACP Cabling Guide* for additional information on SAS and ACP connectivity.

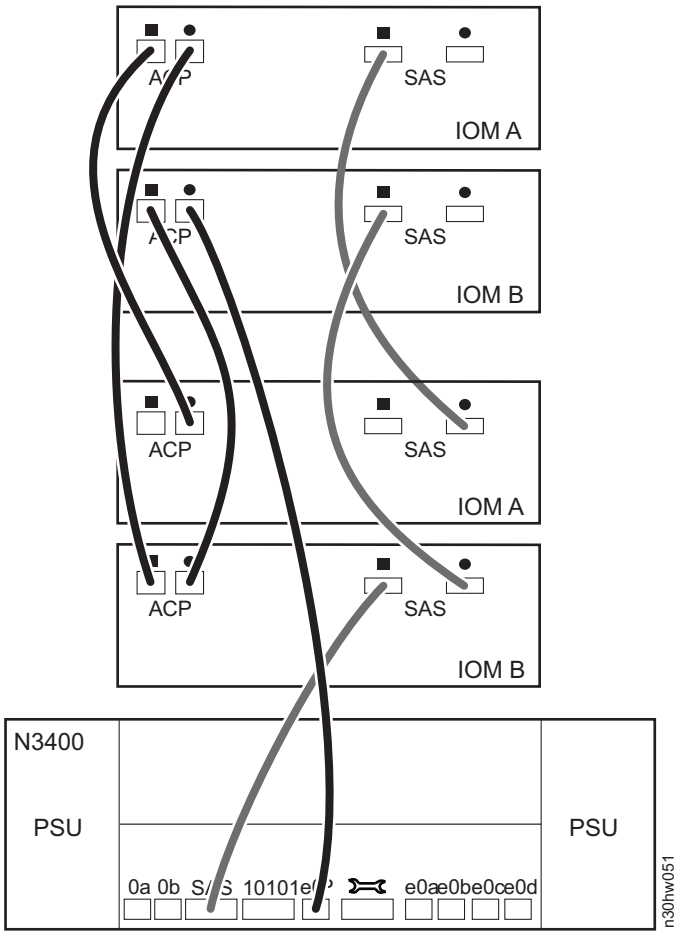


Figure 24. Single-controller N3400 supporting all protocols including FC, with a SAS stack, Alternate Control Path (ACP) Ethernet cabling and single-path connections to storage expansion units

Figure 25 shows an example of an active/active N3400 supporting all protocols, including FC.

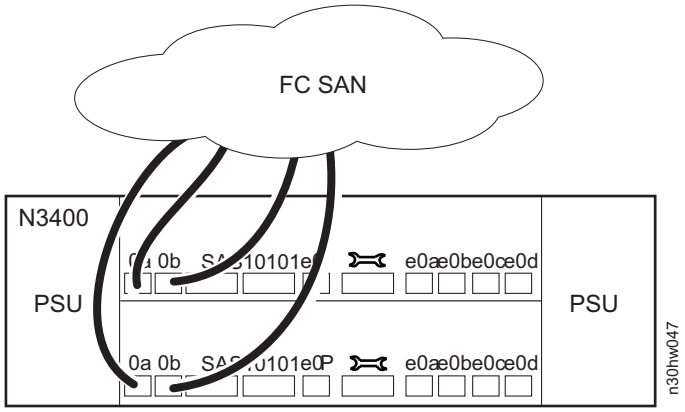


Figure 25. Active/active N3400 supporting all protocols, including FC

Figure 26 shows an example of an active/active N3400 supporting all protocols, including FC, with a SAS stack, Alternate Control Path (ACP) Ethernet cabling and dual-path connections to the storage expansion units.

See the *IBM System Storage N series Universal SAS and ACP Cabling Guide* for additional information on SAS and ACP connectivity.

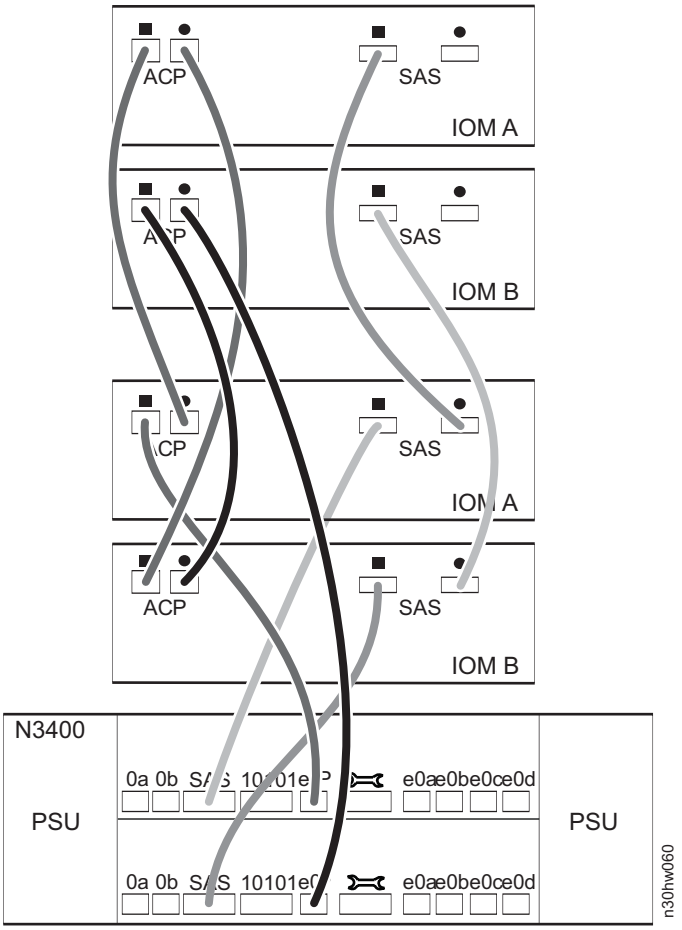


Figure 26. Active/active N3400 supporting all protocols, including FC, with a SAS stack, Alternate Control Path (ACP) Ethernet cabling and dual-path connections to the storage expansion units

Figure 27 shows an example of an active/active N3400 supporting all protocols, including FC, with a backup device.

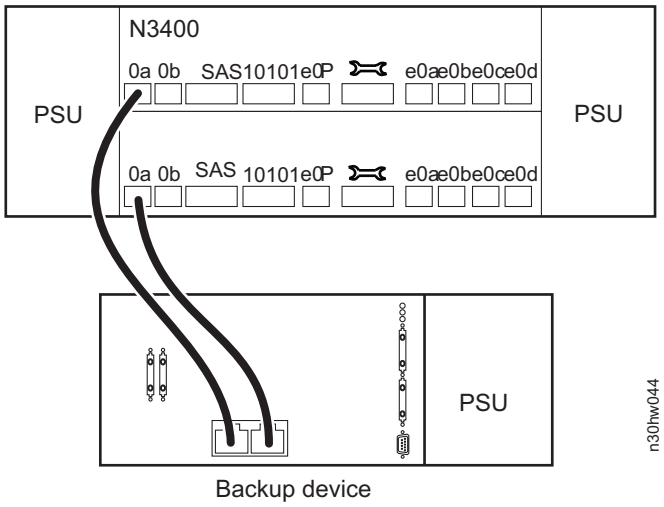


Figure 27. Active/active N3400 supporting all protocols, including FC, with a backup device

Figure 28 shows an example of an active/active N3400 supporting all protocols, including FC, with a backup device.

For this configuration, the 0b ports must be changed from their default mode (target) to initiator mode. See the *Data ONTAP Block Access Management Guide for iSCSI and FC* for more information.

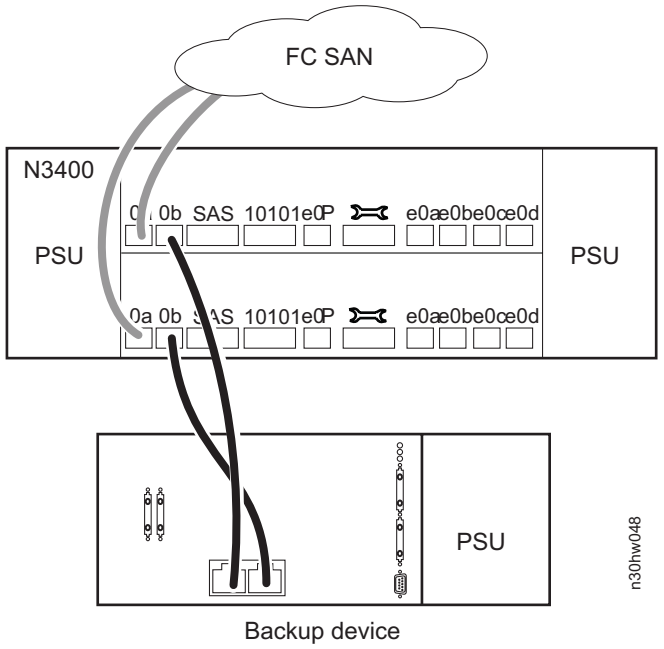


Figure 28. Active/active N3400 supporting all protocols, including FC, with a backup device

Figure 29 shows an example of an active/active N3400 supporting all protocols, including FC, with one storage expansion unit loop and dual-path connections to the storage expansion units.

For this configuration, the 0b ports must be changed from their default mode (target) to initiator mode. See the *Data ONTAP Block Access Management Guide for iSCSI and FC* for more information.

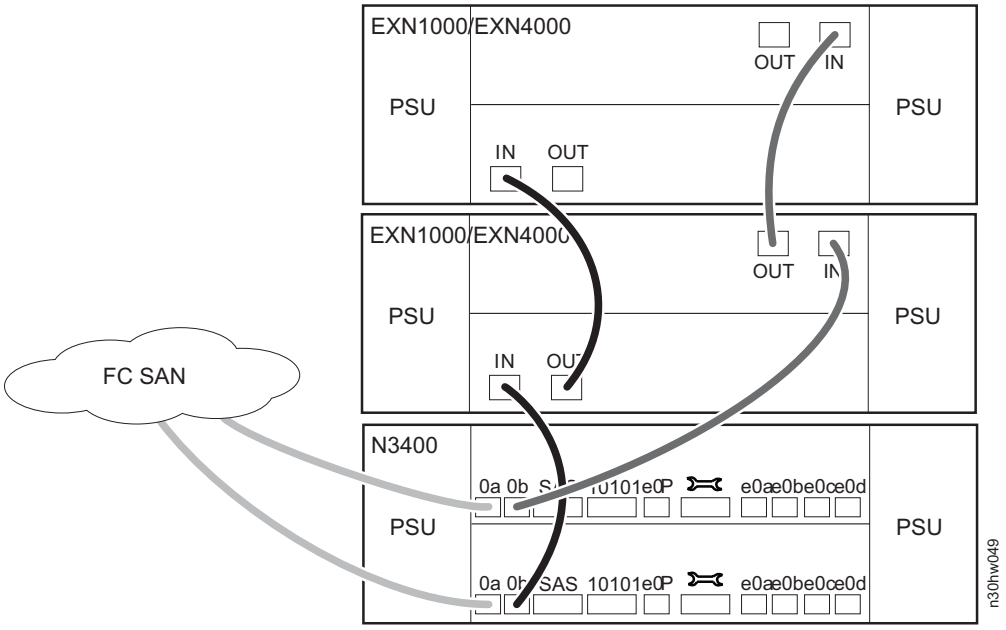


Figure 29. Active/active N3400 supporting all protocols, including FC, with one storage expansion unit loop and dual-path connections to the storage expansion units

Supported N3600 configurations

Note: The N3600 system can connect to SAS storage expansion units through the dual-port SAS HBA. The N3600 does not support the quad-port SAS HBA. See the *IBM System Storage N series Universal SAS and ACP Cabling Guide* for information about connecting with the SAS HBA.

Table 22. Supported N3600 configurations

Protocol	Active/active or single-controller	With external storage expansion units	Redundant paths to storage expansion units?	With external backup device	See diagram on...
NFS, CIFS, and/or iSCSI	Single-controller	One storage expansion unit loop, FC	Dual-path	NO	Figure 30 on page 56
		One storage expansion unit loop, FC	Dual-path	YES	Figure 31 on page 57
		Two storage expansion unit loops, FC	Dual-path	NO	Figure 32 on page 58
	Active/active	One storage expansion unit stack, SAS	Dual-path	NO	Figure 33 on page 59
		One storage expansion unit loop	Dual-path	YES	Figure 34 on page 60
		One storage expansion unit loop	Multipath (preferred)	NO	Figure 35 on page 61
		One storage expansion unit loop	Multipath (preferred)	YES	Figure 36 on page 62
		Two storage expansion unit loops	Multipath (preferred)	NO	Figure 37 on page 63

Table 22. Supported N3600 configurations (continued)

Protocol	Active/active or single-controller	With external storage expansion units	Redundant paths to storage expansion units?	With external backup device	See diagram on...
All protocols, including FC	Single-controller	NO	n/a	YES	Figure 38 on page 64
		One storage expansion unit stack, SAS	Dual-path	NO	Figure 39 on page 65
		NO	n/a	NO	Figure 40 on page 66
		One storage expansion unit loop	Dual-path	NO	Figure 41 on page 66
		One storage expansion unit stack, SAS	Dual-path	NO	Figure 42 on page 67
		One storage expansion unit loop	Dual-path	YES	Figure 43 on page 68
		NO	n/a	YES	Figure 44 on page 69
		One storage expansion unit loop	Dual-path	NO	Figure 45 on page 70
		Two storage expansion unit loops	Dual-path	NO	Figure 46 on page 71
	Active/active	NO	n/a	YES	Figure 47 on page 72
		One storage expansion unit stack, SAS	Dual-path	NO	Figure 48 on page 73
		One storage expansion unit loop	Dual-path	NO	Figure 49 on page 74
		NO	n/a	NO	Figure 50 on page 75
		NO	n/a	YES	Figure 51 on page 75
		One storage expansion unit loop	Dual-path	YES	Figure 52 on page 76
		One storage expansion unit loop	Multipath (preferred)	NO	Figure 53 on page 77
		Two storage expansion unit loops	Multipath (preferred)	NO	Figure 54 on page 78
		One storage expansion unit loop	Multipath (preferred)	YES	Figure 55 on page 79
		NO	n/a	YES	Figure 56 on page 80
		One storage expansion unit loop	Dual-path	NO	Figure 57 on page 81
SCSI backup device	Either	Either	Either	YES	Figure 58 on page 82
SnapMirror	Either	Either	Either	NO	Figure 59 on page 82

Figure 30 shows an example of a single-controller N3600 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop and dual-path connections to the storage expansion units.

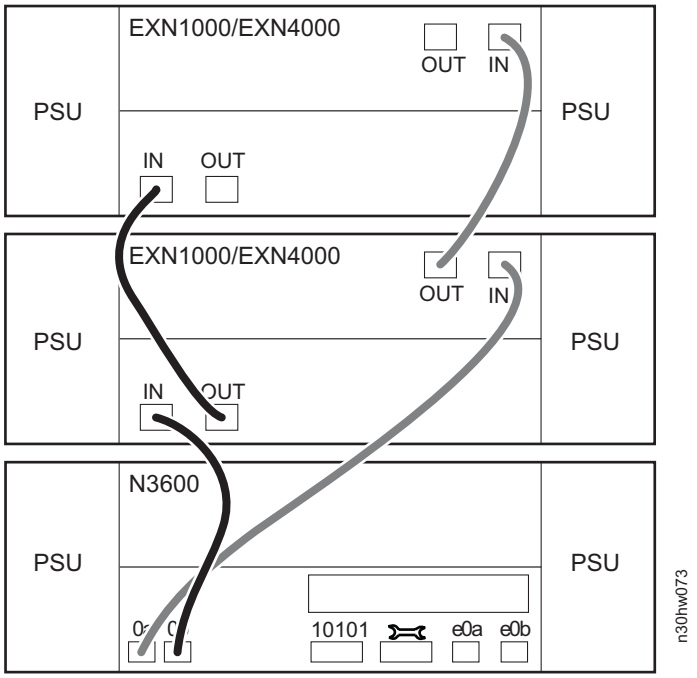


Figure 30. Single-controller N3600 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop and dual-path connections to the storage expansion units

Figure 31 shows an example of a single-controller N3600 in an NFS, CIFS, and/or iSCSI configuration with dual-path connections to a single loop of storage expansion units, backup device and a dual FC initiator in the PCI expansion slot.

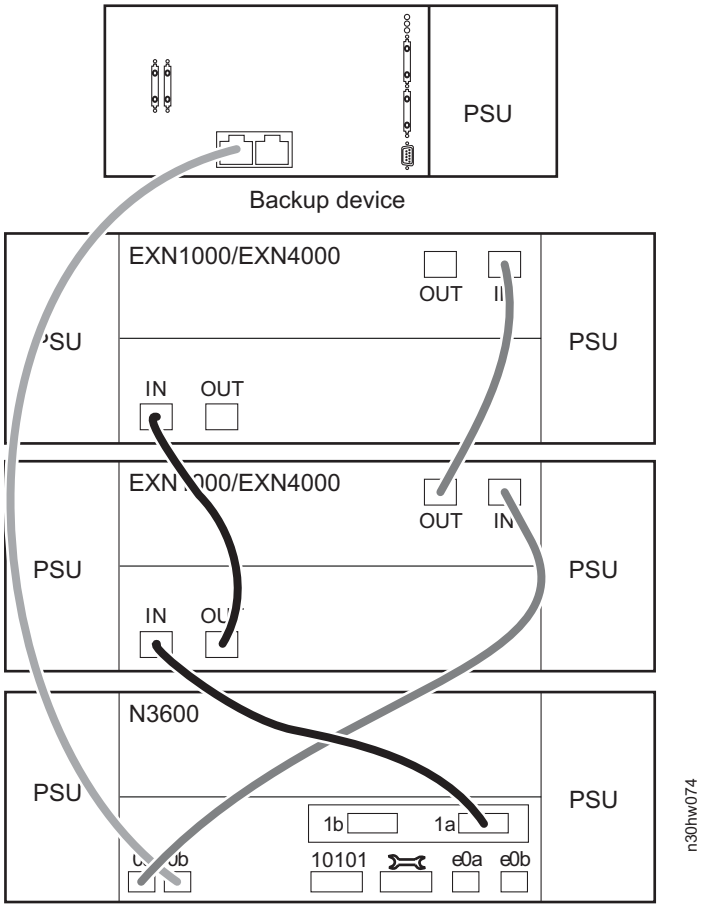


Figure 31. Single-controller N3600 in an NFS, CIFS, and/or iSCSI configuration with dual-path connections to a single loop of storage expansion units, backup device and a dual FC initiator in the PCI expansion slot

Figure 32 shows an example of a single-controller N3600 in an NFS, CIFS, and/or iSCSI configuration with two storage expansion unit loops, dual-path connections to the storage expansion units and dual FC initiator in the PCI expansion slot.

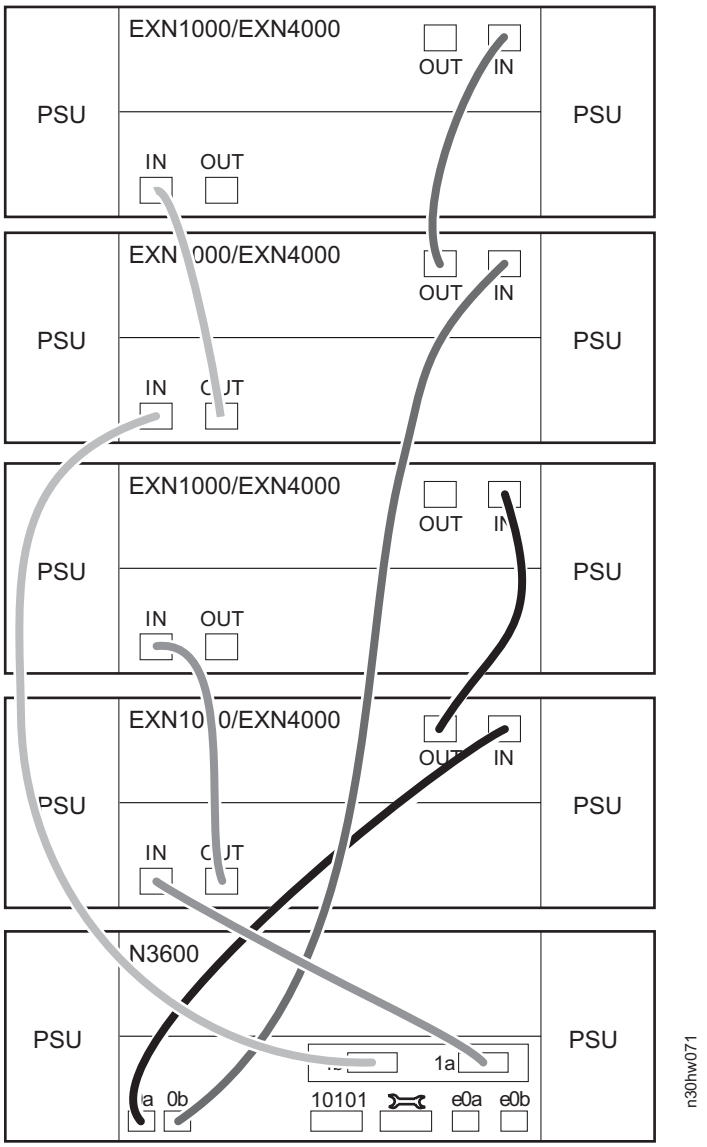


Figure 32. Single-controller N3600 in an NFS, CIFS, and/or iSCSI configuration with two storage expansion unit loops, dual-path connections to the storage expansion units and dual FC initiator in the PCI expansion slot

Figure 33 shows an example of an active/active controller N3600 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion stack, dual-path connections to the storage expansion units, and a two-port SAS HBA in the PCI expansion slot.

See the *IBM System Storage N series Universal SAS and ACP Cabling Guide* for additional information on SAS and ACP connectivity.

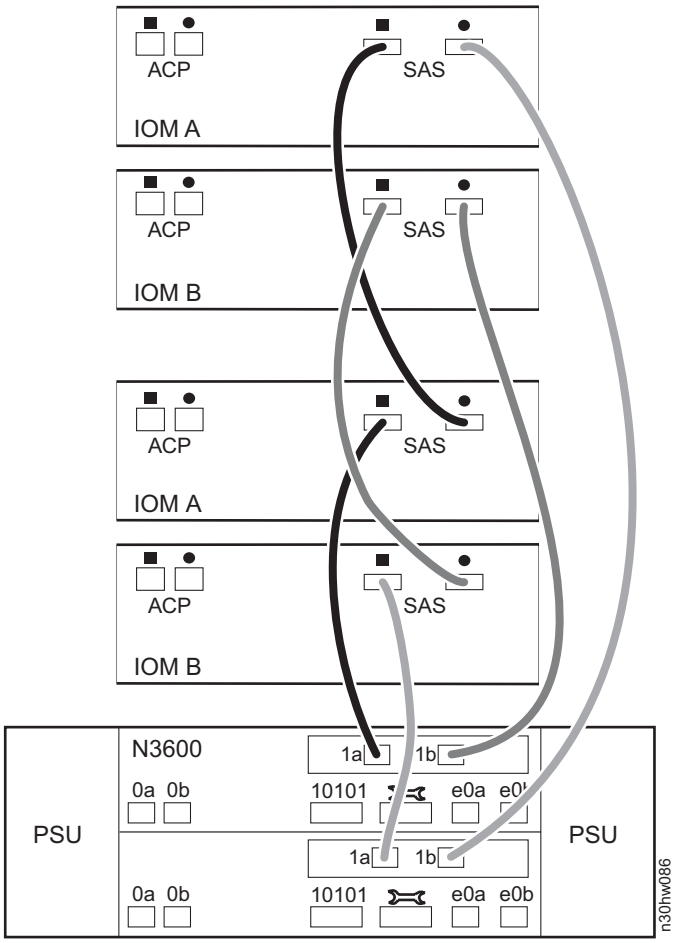


Figure 33. Active/active controller N3600 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion stack, dual-path connections to the storage expansion units, and a two-port SAS HBA in the PCI expansion slot.

Figure 34 shows an example of an active/active N3600 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop, dual-path connections to the storage expansion units and a backup device.

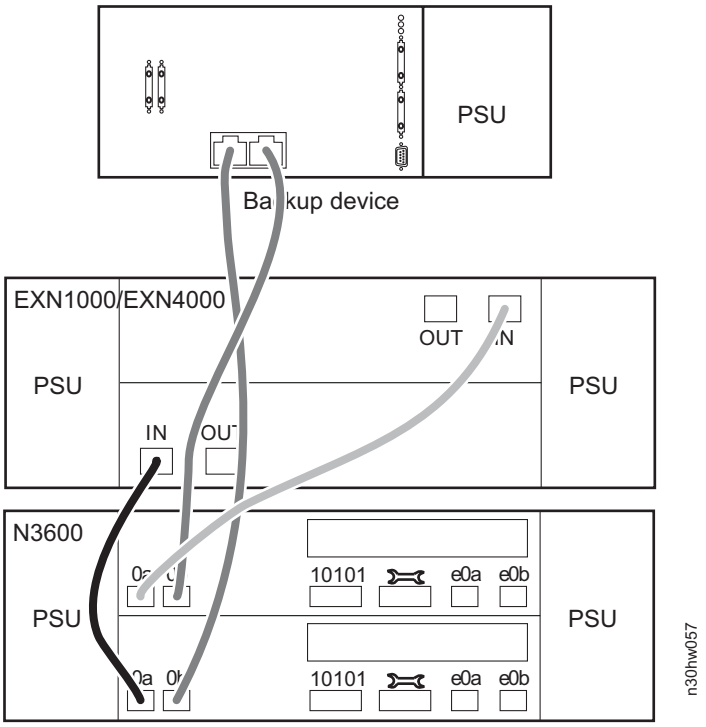


Figure 34. Active/active N3600 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop, dual-path connections to the storage expansion units and a backup device

Figure 35 shows an example of an active/active N3600 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop and multipath connections to the storage expansion units.

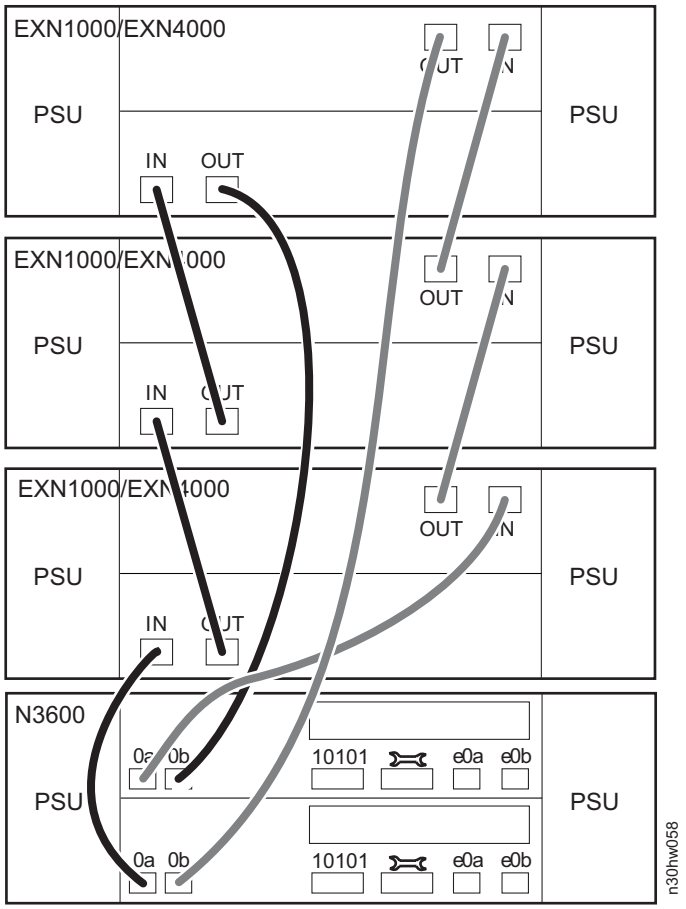


Figure 35. Active/active N3600 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop and multipath connections to the storage expansion units

Figure 36 shows an example of an active/active N3600 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop, multipath connections to the storage expansion units, a backup device and a dual FC tape adapter in the PCI expansion slot.

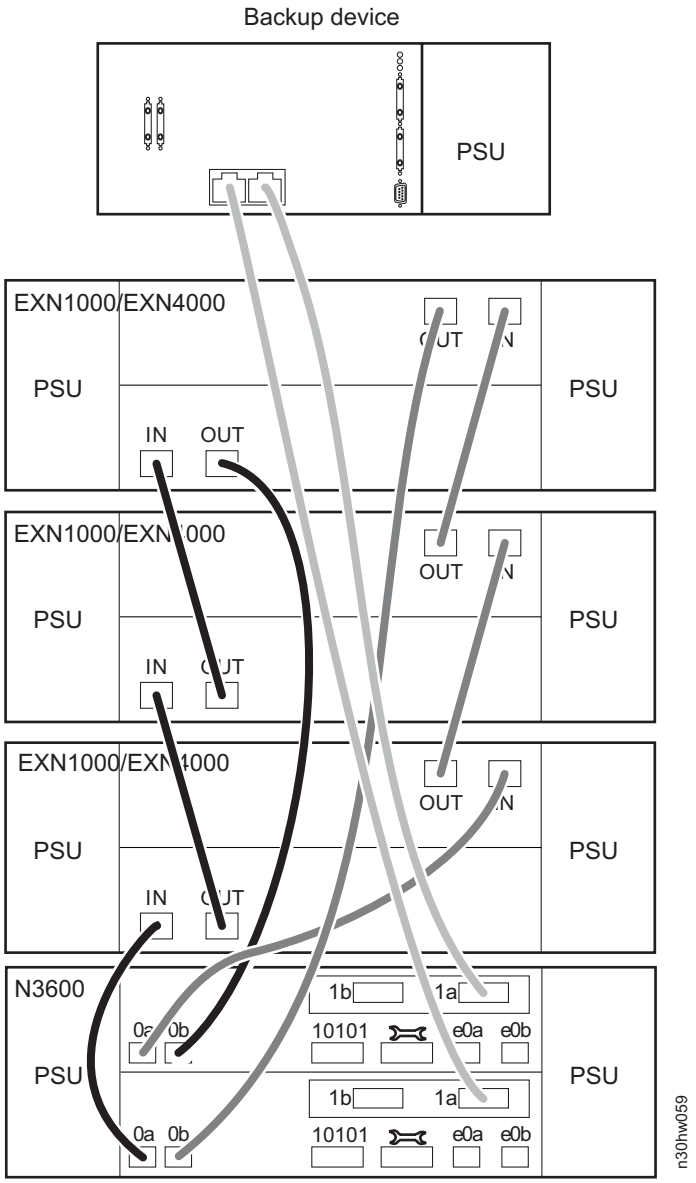


Figure 36. Active/active N3600 in an NFS, CIFS, and/or iSCSI configuration with one storage expansion unit loop, multipath connections to the storage expansion units, a backup device and a dual FC tape adapter in the PCI expansion slot

Figure 37 shows an example of an active/active N3600 in an NFS, CIFS, and/or iSCSI configuration with multipath connections to the storage expansion units and a dual FC initiator adapter in the PCI expansion slot.

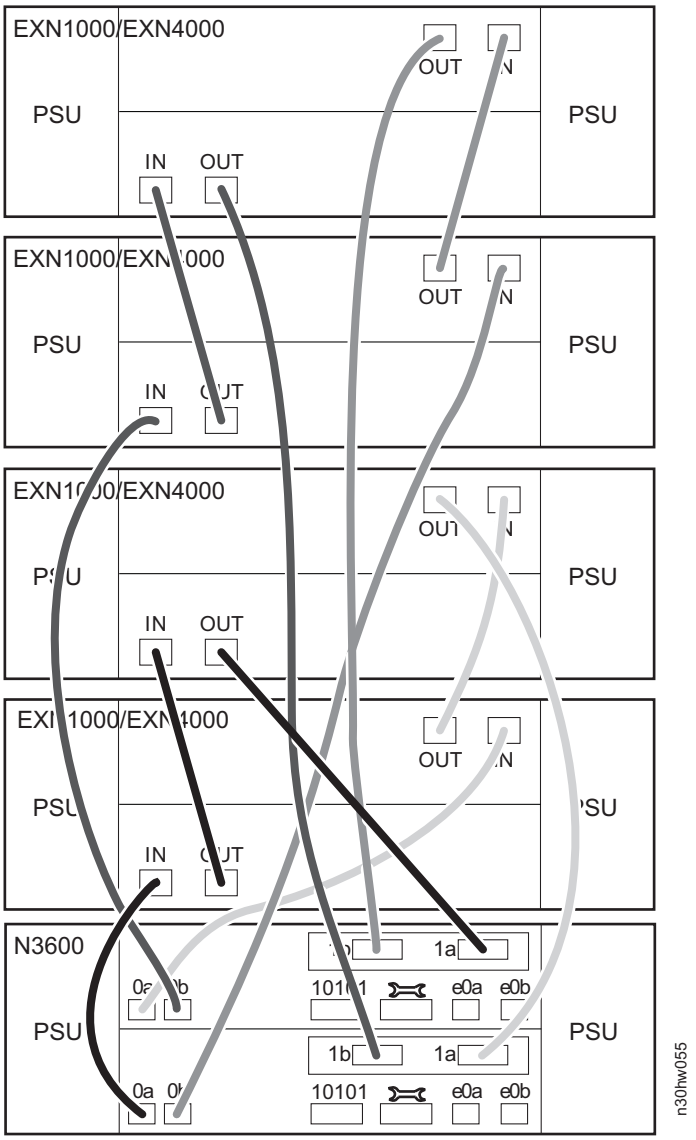


Figure 37. Active/active N3600 in an NFS, CIFS, and/or iSCSI configuration with multipath connections to the storage expansion units and a dual FC initiator adapter in the PCI expansion slot

Figure 38 shows an example of a single-controller N3600 supporting all protocols, including FC, with a backup device.

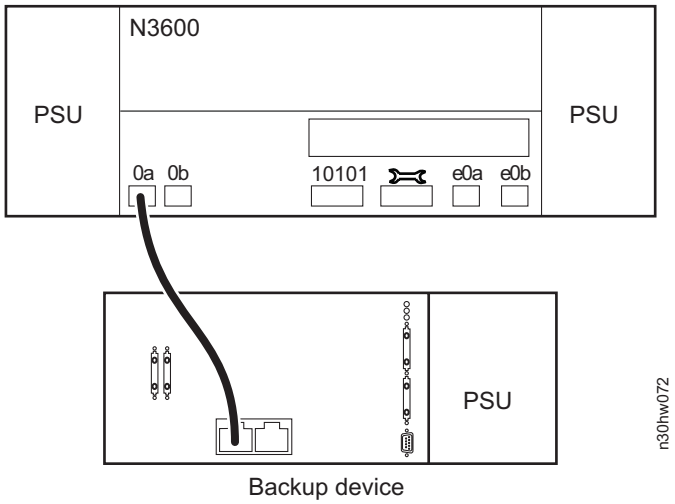


Figure 38. Single-controller N3600 supporting all protocols, including FC, with a backup device

Figure 39 shows an example of a single-controller N3600 supporting all protocols, including FC, with one SAS storage expansion unit stack, dual-path connections to the storage expansion units, and a two-port SAS HBA in the PCI expansion slot.

See the *IBM System Storage N series Universal SAS and ACP Cabling Guide* for additional information on SAS and ACP connectivity.

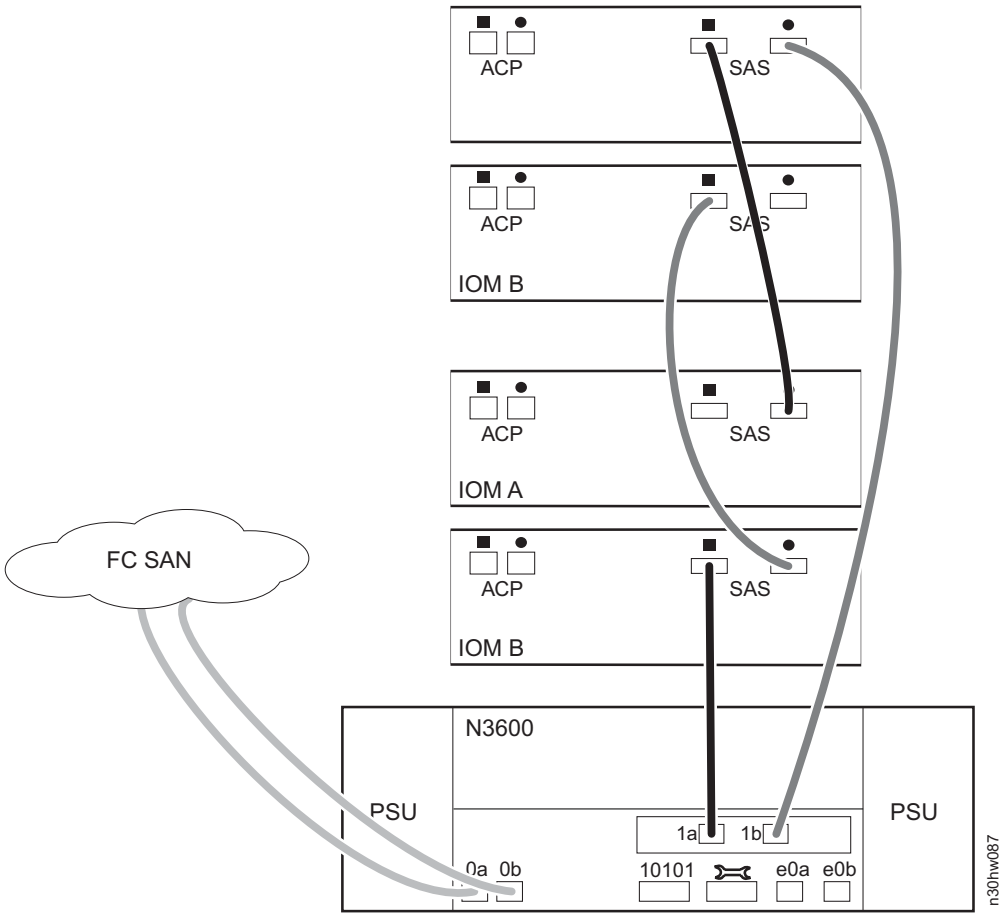


Figure 39. Single-controller N3600 supporting all protocols, including FC, with one SAS storage expansion unit stack, dual-path connections to the storage expansion units, and a two-port SAS HBA in the PCI expansion slot

Figure 40 shows an example of a single-controller N3600 supporting all protocols, including FC.

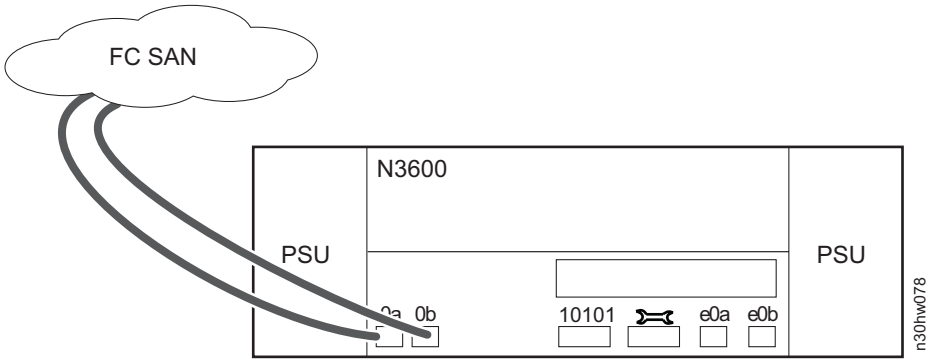


Figure 40. Single-controller N3600 supporting all protocols, including FC

Figure 41 shows an example of a single-controller N3600 supporting all protocols, including FC, with one storage expansion unit loop, dual-path connections to the storage expansion units and dual FC initiator adapter in the PCI expansion slot.

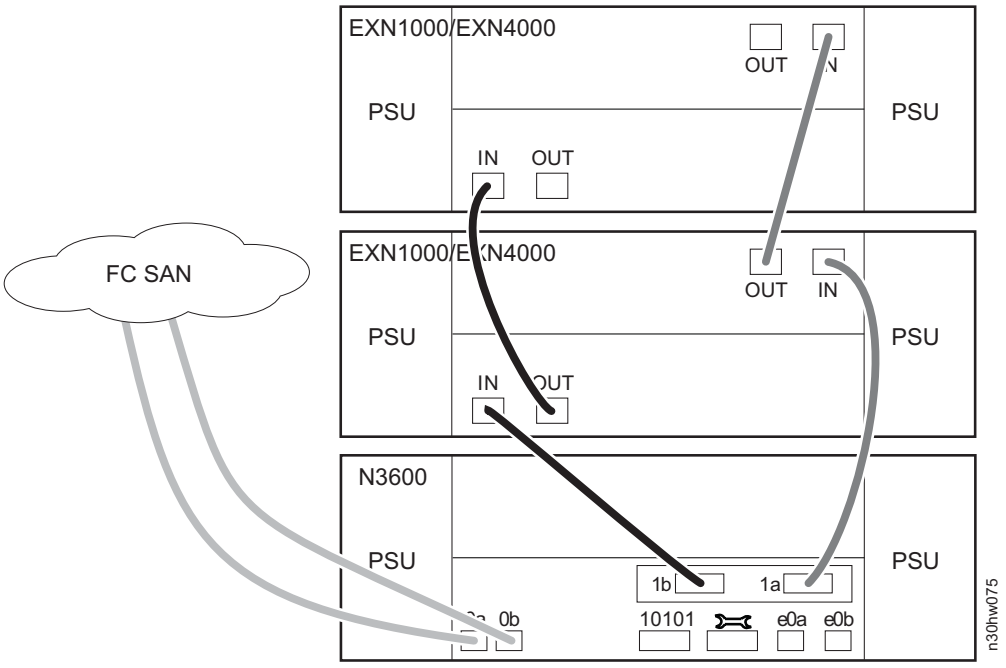


Figure 41. Single-controller N3600 supporting all protocols, including FC, with one storage expansion unit loop, dual-path connections to the storage expansion units and dual FC initiator adapter in the PCI expansion slot

Figure 42 shows an example of a single-controller N3600 supporting all protocols, including FC, with one storage expansion unit stack, dual-path connections to the storage expansion units, and a two-port SAS HBA in the PCI expansion slot.

See the *IBM System Storage N series Universal SAS and ACP Cabling Guide* for additional information on SAS and ACP connectivity.

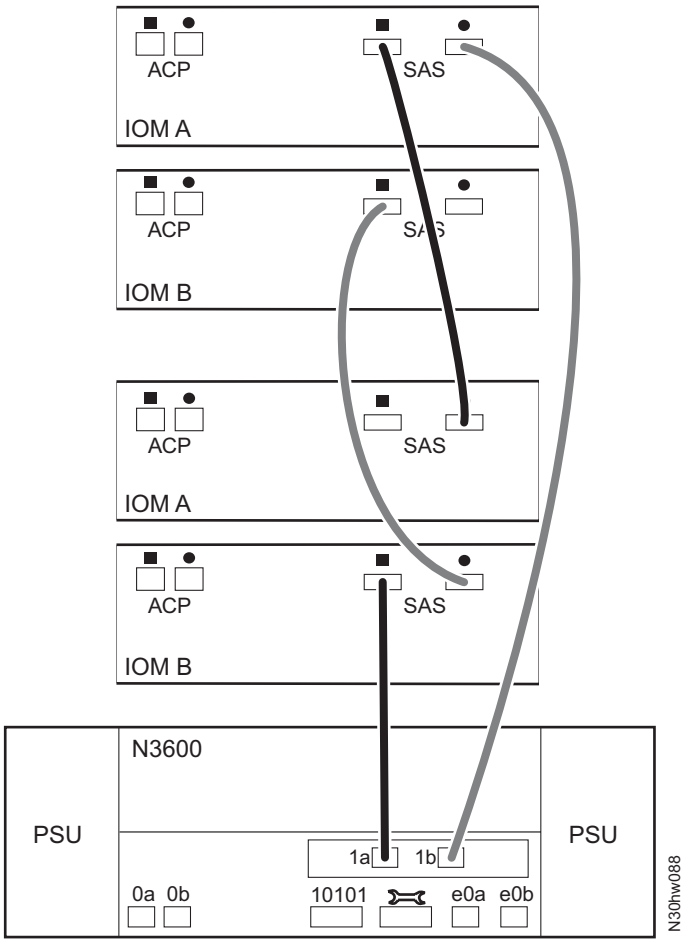


Figure 42. Single-controller N3600 supporting all protocols, including FC, with one storage expansion unit stack, dual-path connections to the storage expansion units, and a two-port SAS HBA in the PCI expansion slot.

Figure 43 shows an example of a single-controller N3600 supporting all protocols, including FC, with two FC connections, one storage expansion unit loop, one backup device, dual-path connections to the storage expansion units and a quad FC initiator adapter in the PCI expansion slot.

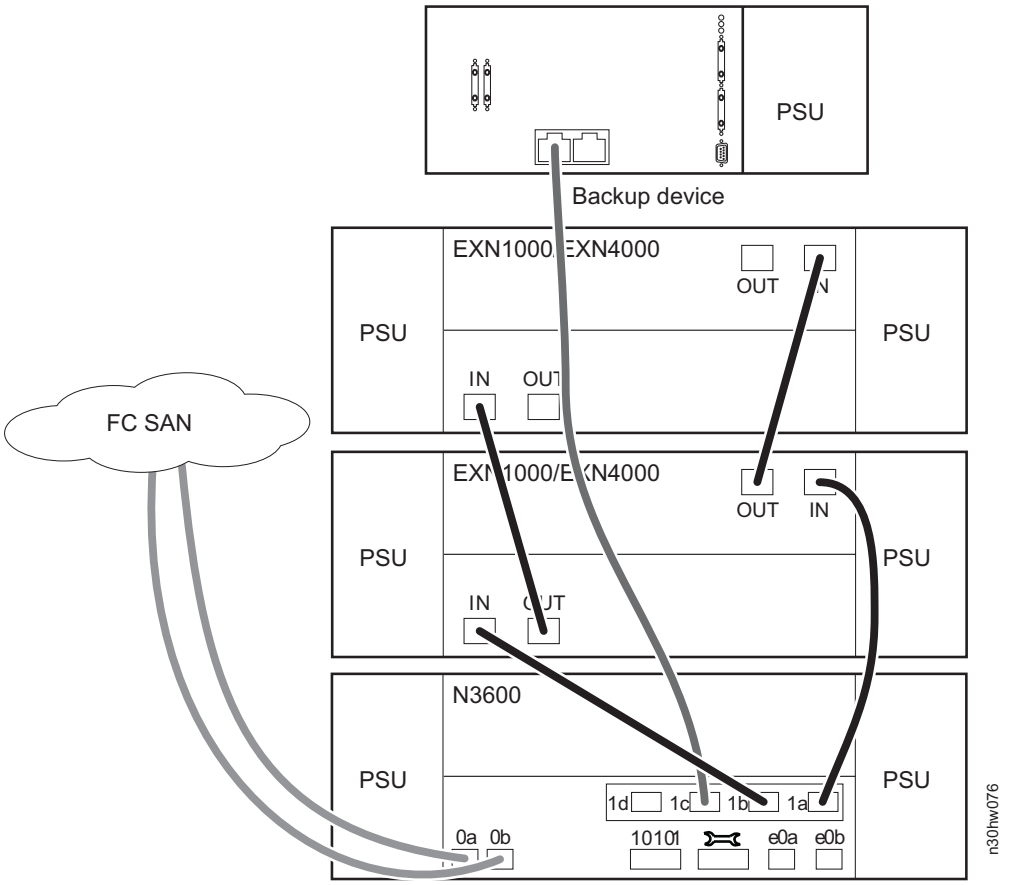


Figure 43. Single-controller N3600 supporting all protocols, including FC, with two FC connections, one storage expansion unit loop, one backup device, dual-path connections to the storage expansion units and a quad FC initiator adapter in the PCI expansion slot

Figure 44 shows an example of a single-controller N3600 supporting all protocols, including FC, with a backup device and a quad FC target adapter in the PCI expansion slot.

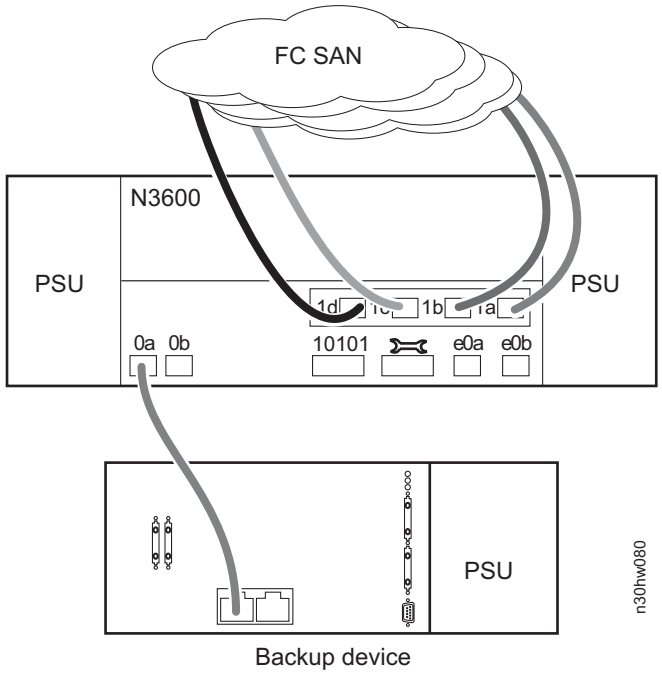


Figure 44. Single-controller N3600 supporting all protocols, including FC, with a backup device and a quad FC target adapter in the PCI expansion slot

Figure 45 shows an example of a single-controller N3600 supporting all protocols, including FC, with one storage expansion unit loop, dual-path connections to the storage expansion units and a Quad FC target adapter in the PCI expansion slot.

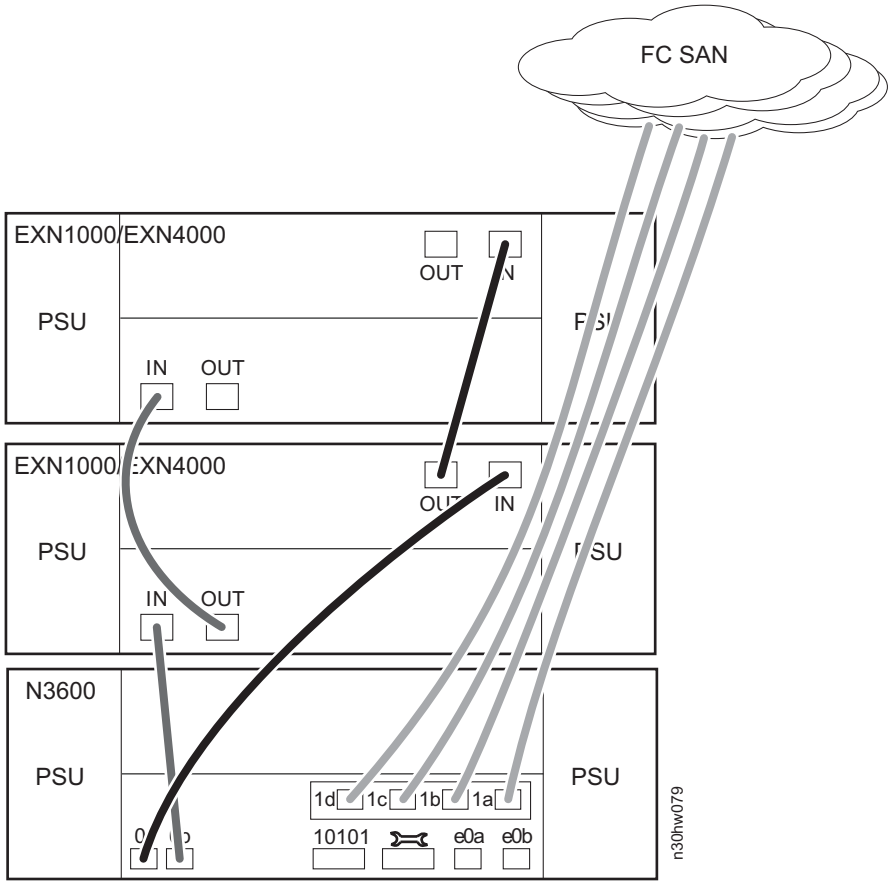


Figure 45. Single-controller N3600 supporting all protocols, including FC, with one storage expansion unit loop, dual-path connections to the storage expansion units and a Quad FC target adapter in the PCI expansion slot

Figure 46 shows an example of a single-controller N3600 supporting all protocols, including FC, with two FC connections, two storage expansion unit loops, dual-path connections to the storage expansion units and Quad FC initiator adapter in the PCI expansion slot.

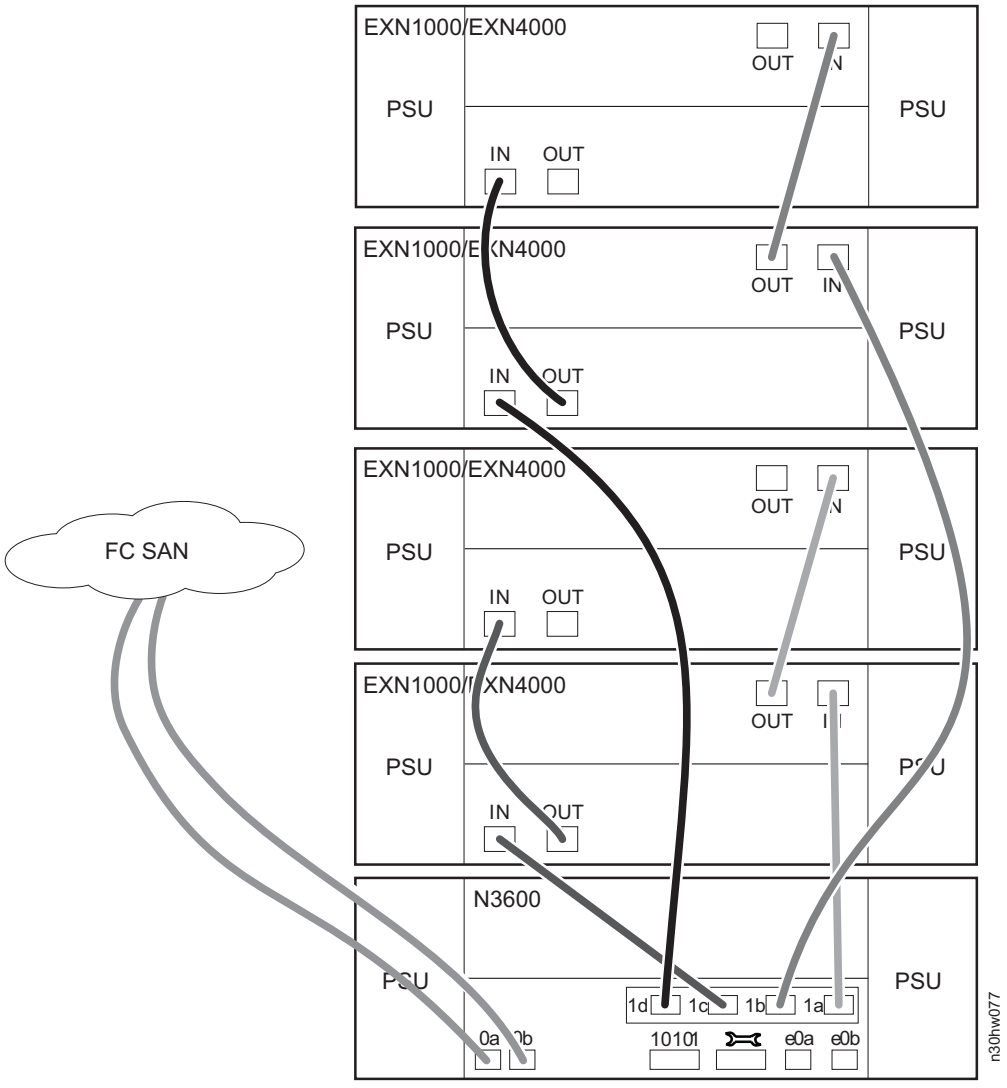


Figure 46. Single-controller N3600 supporting all protocols, including FC, with two FC connections, two storage expansion unit loops, dual-path connections to the storage expansion units and Quad FC initiator adapter in the PCI expansion slot

Figure 47 shows an example of an active/active N3600 supporting all protocols, including FC, with a backup device.

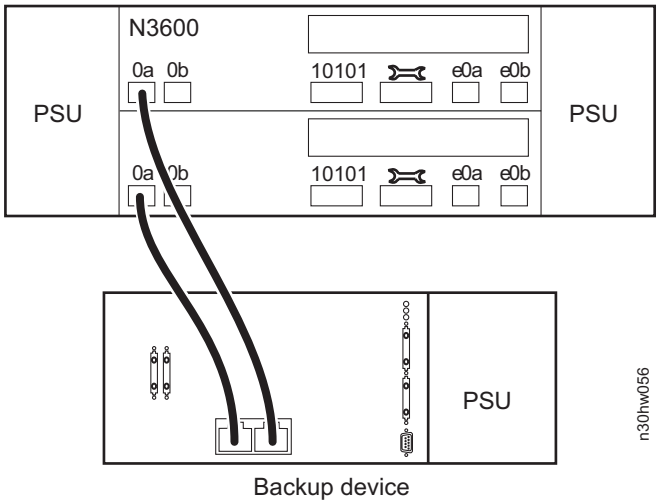


Figure 47. Active/active N3600 supporting all protocols, including FC, with a backup device

Figure 48 shows an example of an active/active N3600 supporting all protocols, including FC, with one SAS storage expansion unit stack, four FC connections, multipath connections to the storage expansion units, and two-port SAS HBAs in each PCI expansion slot.

See the *IBM System Storage N series Universal SAS and ACP Cabling Guide* for additional information on SAS and ACP connectivity.

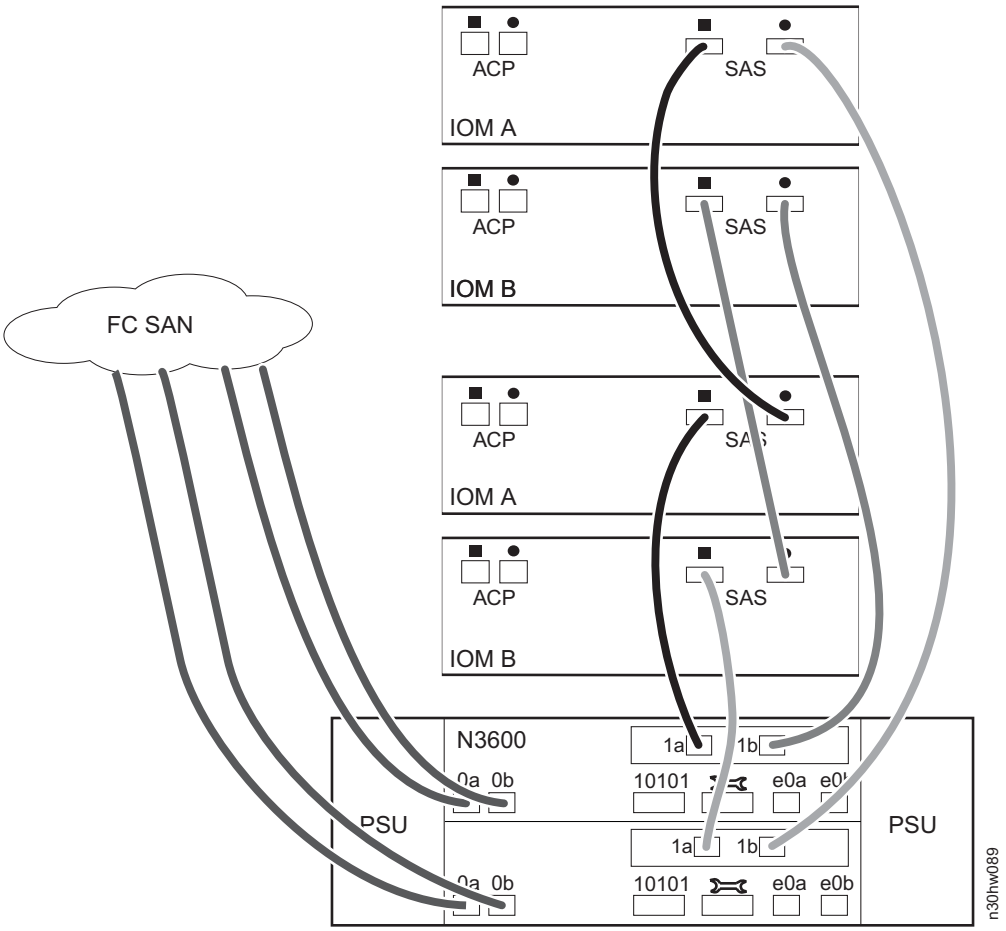


Figure 48. Active/active N3600 supporting all protocols, including FC, with one SAS storage expansion unit stack, four FC connections, multipath connections to the storage expansion units, and two-port SAS HBAs in each PCI expansion slot.

Figure 49 shows an example of an active/active N3600 supporting all protocols, including FC, with one storage expansion unit loop and dual-path connections to the storage expansion units.

For this configuration, the 0b ports must be changed from their default mode (target) to initiator mode. See the *Block Access Management Guide for iSCSI and FC* for more information.

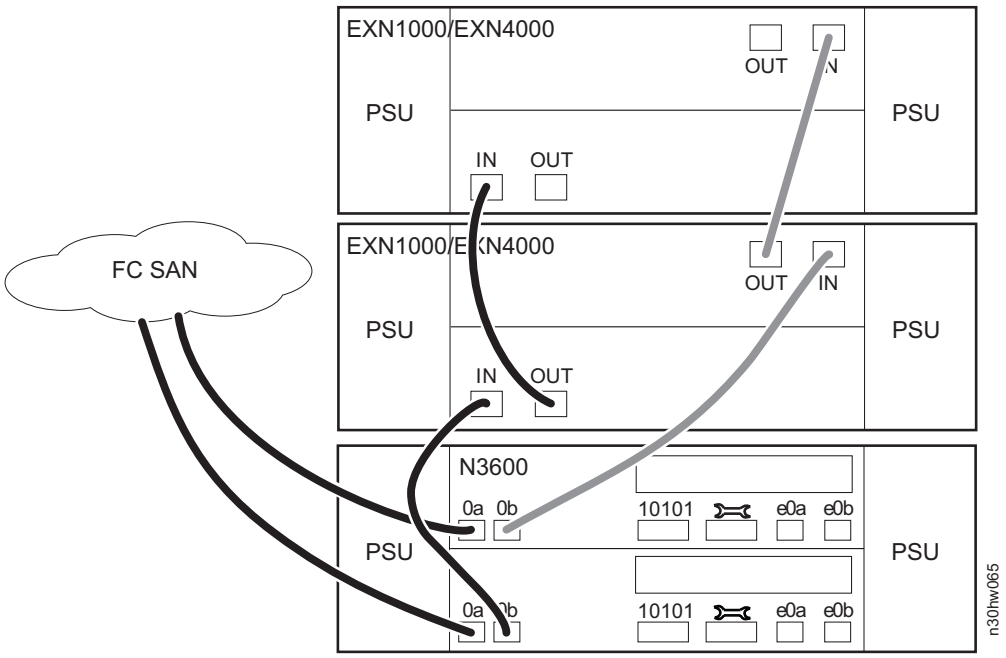


Figure 49. Active/active N3600 supporting all protocols, including FC, with one storage expansion unit loop and dual-path connections to the storage expansion units

Figure 50 shows an example of an active/active N3600 supporting all protocols, including FC.

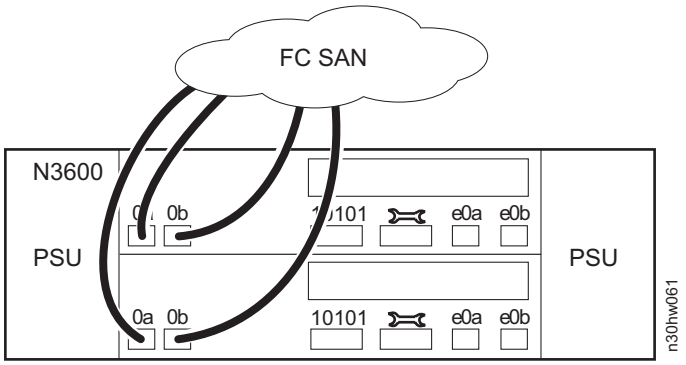


Figure 50. Active/active N3600 supporting all protocols, including FC

Figure 51 shows an example of an active/active N3600 supporting all protocols, including FC, with a backup device.

For this configuration, the 0b ports must be changed from their default mode (target) to initiator mode. See the *Block Access Management Guide for iSCSI and FC* for more information.

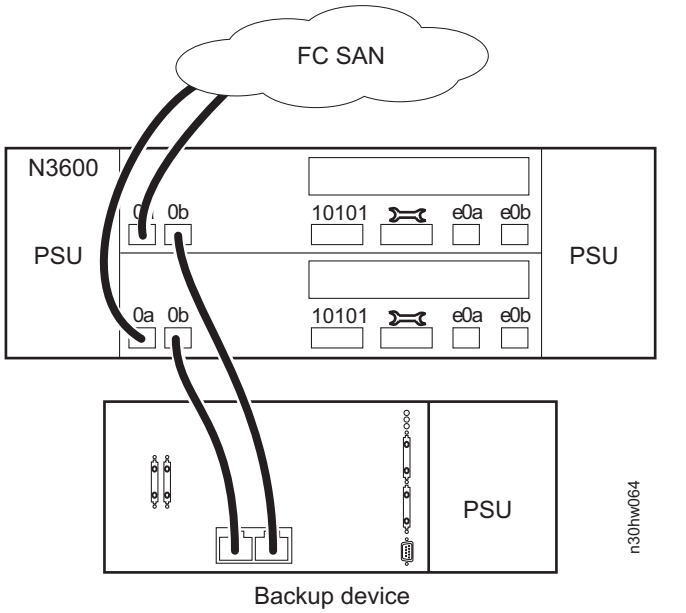


Figure 51. Active/active N3600 supporting all protocols, including FC, with a backup device

Figure 52 shows an example of an active/active N3600 supporting all protocols, including FC, with one storage expansion unit loop, dual-path connections to the disk drives, a backup device and a dual FC initiator adapter in the PCI expansion slot.

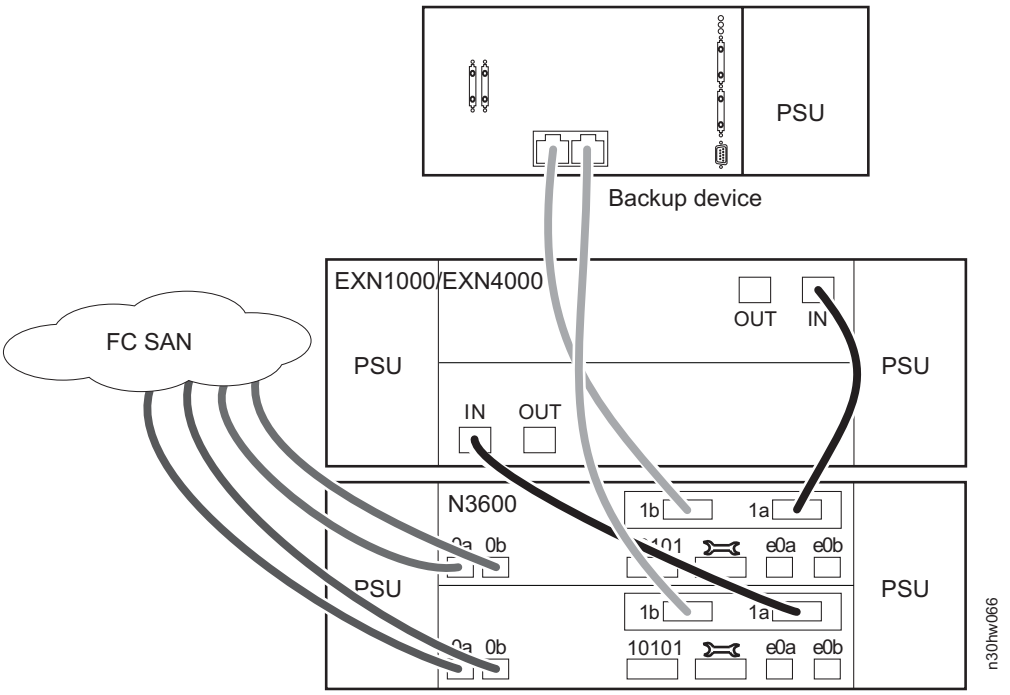


Figure 52. Active/active N3600 supporting all protocols, including FC, with one storage expansion unit loop, dual-path connections to the disk drives, a backup device and a dual FC initiator adapter in the PCI expansion slot

Figure 53 shows an example of an active/active N3600 supporting all protocols, including FC, with one storage expansion unit loop, multipath connections to the storage expansion units and a dual FC initiator adapter in the PCI expansion slot.

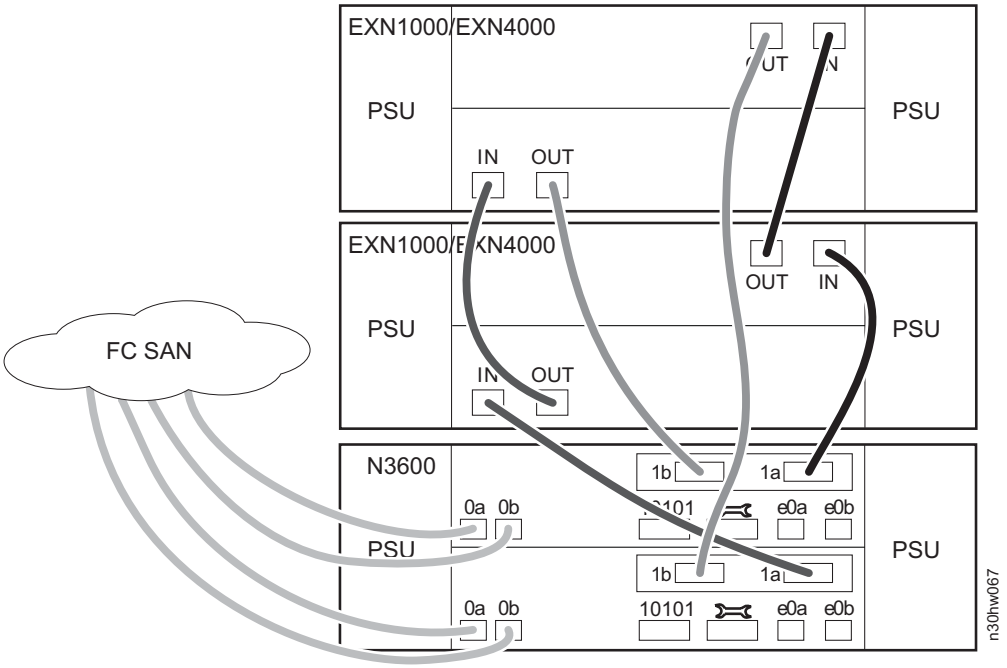


Figure 53. Active/active N3600 supporting all protocols, including FC, with one storage expansion unit loop, multipath connections to the storage expansion units and a dual FC initiator adapter in the PCI expansion slot

Figure 54 shows an example of an active/active N3600 supporting all protocols, including FC, with two FC connections, two storage expansion unit loops, multipath connections to the storage expansion units and a quad FC initiator adapter in the PCI expansion slot.

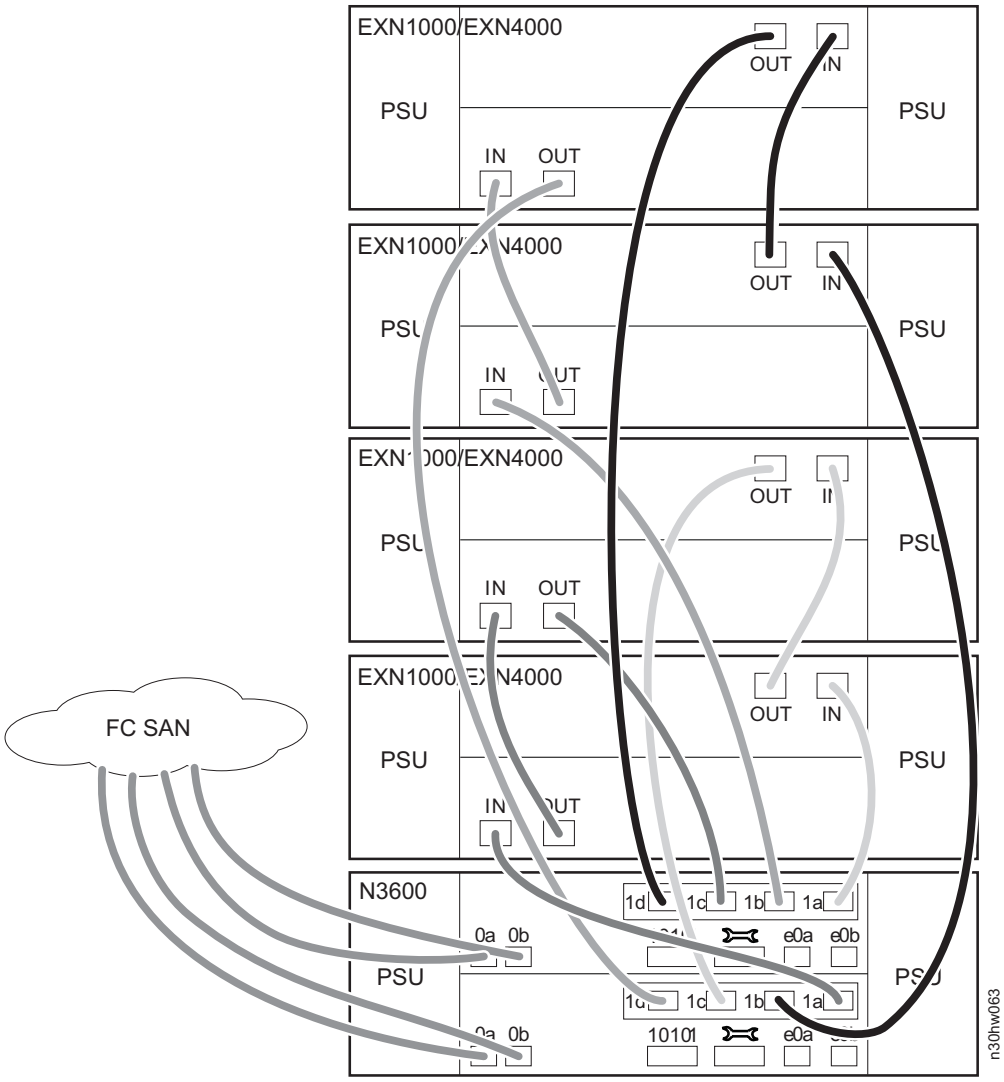


Figure 54. Active/active N3600 supporting all protocols, including FC, with two FC connections, two storage expansion unit loops, multipath connections to the storage expansion units and a quad FC initiator adapter in the PCI expansion slot

Figure 55 shows an example of an active/active N3600 supporting all protocols, including FC, with four FC connections, one FC storage expansion unit loop, one backup device, multipath connections to the storage expansion unit loops and a quad FC initiator adapter in the PCI expansion slot.

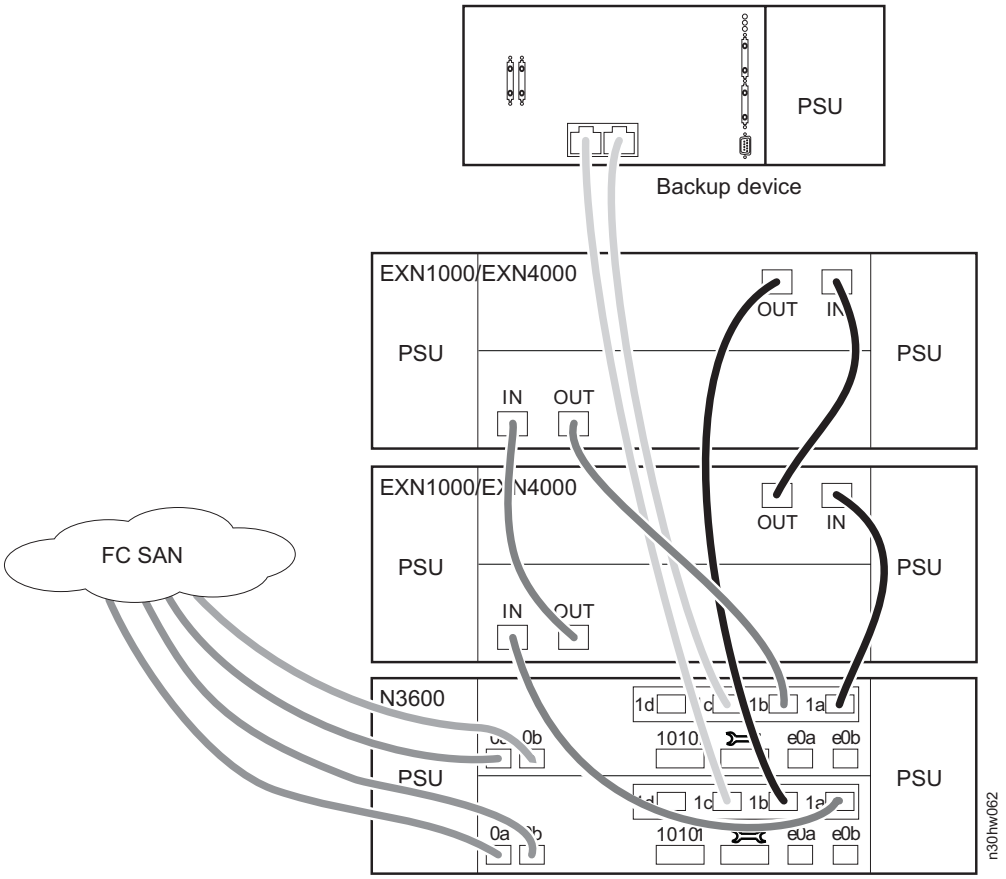


Figure 55. Active/active N3600 supporting all protocols, including FC, with four FC connections, one FC storage expansion unit loop, one backup device, multipath connections to the storage expansion unit loops and a quad FC initiator adapter in the PCI expansion slot

Figure 56 shows an example of an active/active N3600 supporting all protocols, including FC, with four FC connections, one backup device and a quad FC target adapter in the PCI expansion slot.

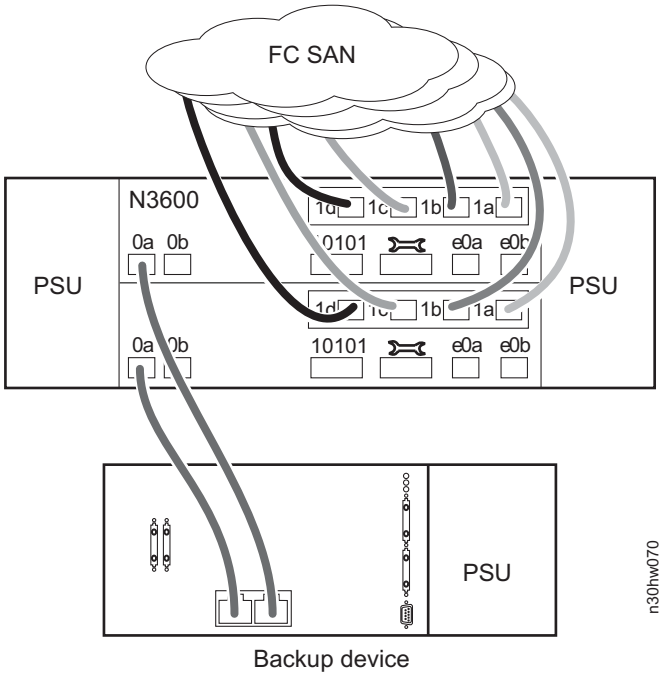


Figure 56. Active/active N3600 supporting all protocols, including FC, with four FC connections, one backup device and a quad FC target adapter in the PCI expansion slot

Figure 57 shows an example of an active/active N3600 supporting all protocols, including FC, with four FC connections, one shelf loop, dual-path connections to the storage expansion units and a quad FC target adapter in the PCI expansion slot.

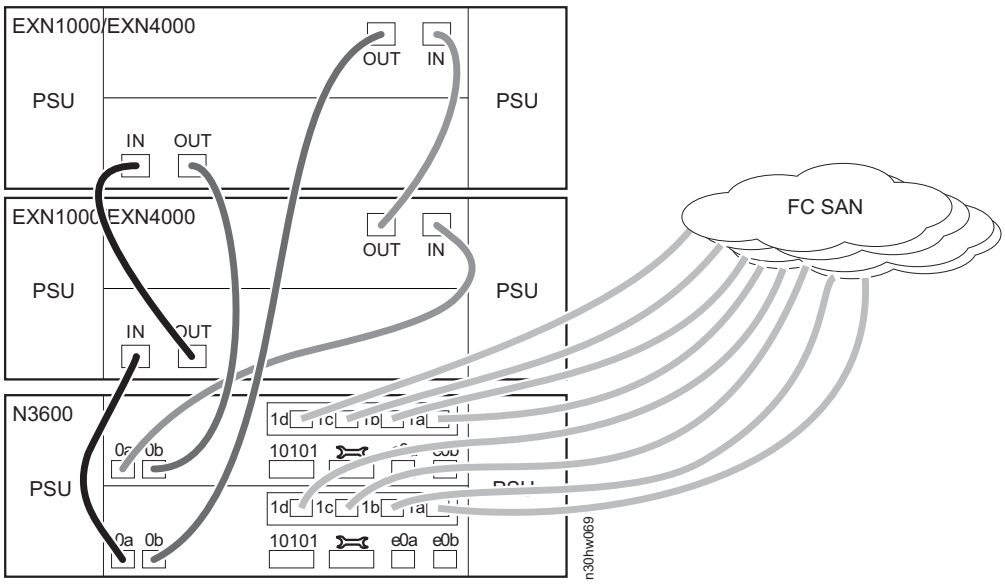


Figure 57. Active/active N3600 supporting all protocols, including FC, with four FC connections, one shelf loop, dual-path connections to the storage expansion units and a quad FC target adapter in the PCI expansion slot

Figure 58 shows an example of a N3600 configuration with a SCSI backup device that uses a parallel SCSI adapter in the PCI expansion slot. This configuration can be used with other N3600 configurations that do not use the PCI expansion slot.

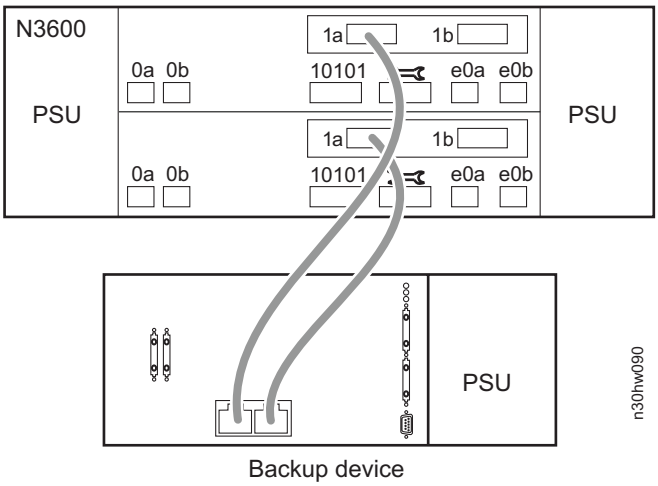


Figure 58. N3600 configuration with a SCSI backup device that uses a parallel SCSI adapter in the PCI expansion slot

Figure 59 shows an example of a N3600 configuration with SnapMirror connectivity using the FC-VI HBA in the expansion slot. This configuration can be used with other N3600 configurations that do not use the PCI expansion slot.

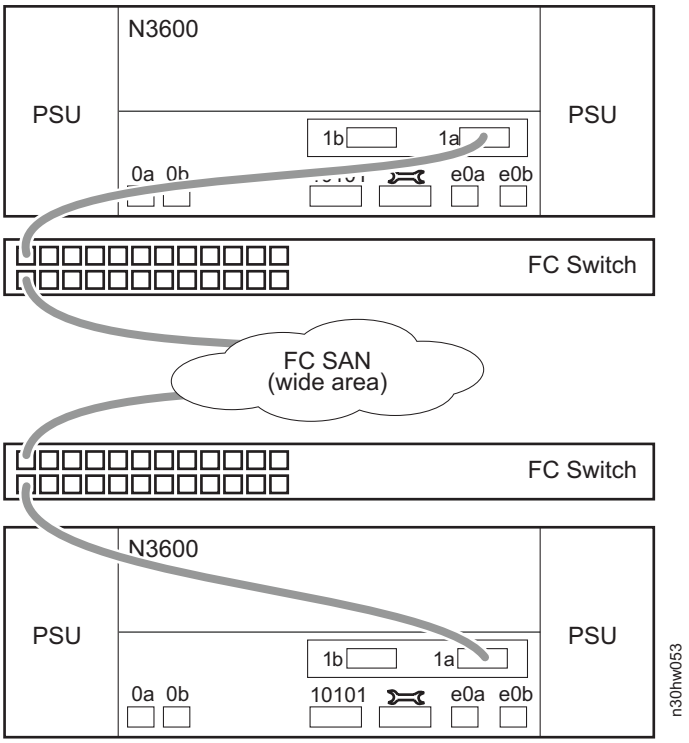


Figure 59. N3600 configuration with SnapMirror connectivity using the FC-VI HBA in the expansion slot

Chapter 5. Monitoring your system

This chapter identifies the location of the various LEDs on your N3300, N3400 or N3600 system and explains how to interpret LEDs for basic monitoring.

For information about monitoring the LEDs for optional adapter cards, refer to the *IBM System Storage N series Platform Monitoring Guide*.

For diagnostic information about your system, see the *IBM System Storage N series Diagnostics Guide*.

This chapter discusses the following topics:

Monitoring the front operation panel

The front operation panel has LEDs that indicate whether your system is active and functioning normally or whether there are problems with the hardware.

You can also identify any hardware failure associated with the front operation panel of the N3300, N3400 or N3600 system from the error messages displayed on your system console.

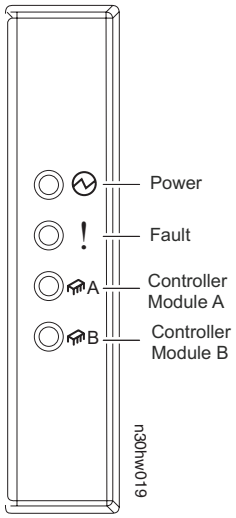


Figure 60. Front panel LEDs

Note: See "Interpreting the front panel LEDs" on page 84 for an explanation of what the LEDs mean.

Interpreting the front panel LEDs

Use the following table to interpret the front panel LEDs on your system.

Table 23. System front panel LED descriptions

LED label	Status indicator	Description
A/B (controller A or B)	Green	The system is operating and is active.
	Blinking	This LED blinks in proportion to activity; the greater the activity, the more frequently the LED blinks. When activity is absent or very low, the LED does not blink.
	Off	No activity is detected.
Fault	Amber	The system halted or a fault occurred in the chassis. The error might be in a PSU, fan, controller module, or internal disk. The LED is lit when there is a FRU failure.
	Off	The system is operating normally.
Power	Green	The system is receiving power.
	Off	The system is not receiving power.

Monitoring the rear panel LEDs

The LEDs on the rear of the system are used to monitor the onboard ports.

Figure 61, Figure 62 on page 85 and Figure 63 on page 85 show the location of the following LEDs on the system rear panel for the N3300, N3400, and N3600 storage systems:

- Fibre Channel port LED
- Remote management (RM) port LEDs
- Ethernet port LEDs
- NVMEM LED
- Controller module fault LED
- SAS (N3400 only)

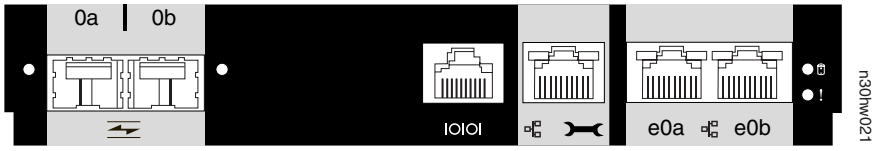


Figure 61. Rear panel LED locations for the N3300

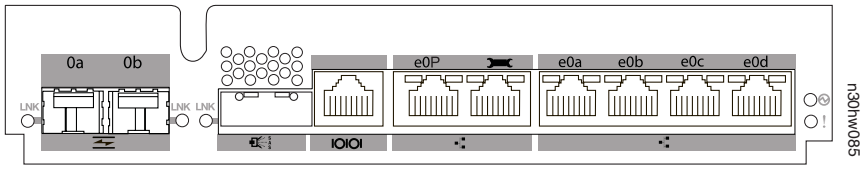


Figure 62. Rear panel LED locations for the N3400

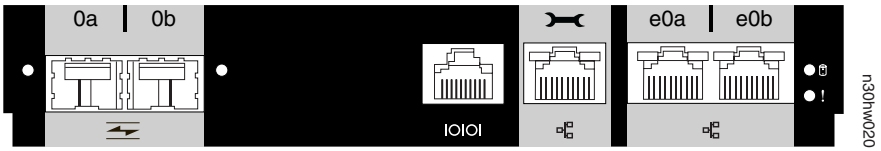


Figure 63. Rear panel LED locations for the N3600

Table 24. Rear panel LED descriptions for the N3300, N3400 and N3600

LED label	LED type	Status indicator	Description
Fibre Channel port	LNK	Green	Link is established and communication is happening.
		Off	No link is established.
SAS port	LNK	Green	Link is established on at least one external SAS lane.
		Off	No link is established on any external SAS lane.
Remote Management port	LNK (Left)	Green	A valid network connection is established.
		Off	There is no network connection present.
	ACT (Right)	Amber	There is data activity.
		Off	There is no network activity present.
Ethernet port	LNK (Left)	Green	A valid network connection is established.
		Off	There is no network connection present.
	ACT (Right)	Amber	There is data activity.
		Off	There is no network activity present.

Table 24. Rear panel LED descriptions for the N3300, N3400 and N3600 (continued)

LED label	LED type	Status indicator	Description
Battery or NVMEM	NVMEM status LED	Blinking green	NVMEM is in battery-backed standby mode.
		Off (power on)	NVMEM is running normally, and NVMEM is armed if Data ONTAP is running.
		Off (power off)	The system is shut down, NVMEM is not armed, and the battery is not enabled.
Controller module fault	Controller module fault	Amber	Controller is starting up, Data ONTAP is initializing, or controller module fault is detected.
		Off	Controller module is functioning properly.

Admonitions about NVMEM status

Attention: The following actions should not be performed if the NVMEM status LED is blinking or if NVMEM is armed.

- Do not replace any system hardware when the NVMEM status LED is blinking. Otherwise, you might lose data. Always flush NVMEM contents to disk by entering a `halt` command at the system prompt before replacing the hardware.
- Do not update firmware when NVMEM is armed. Doing so causes the system to hang when it is rebooted, requiring you to remove the battery for awhile. To ensure that NVMEM is not armed, boot to Data ONTAP and enter the `halt` command. After you see the `OK>` prompt, it is safe to reboot to the bootloader to update your firmware.

Monitoring the power supply

The following illustration shows the location of the power supply LEDs, which are visible from the back of the system.

Note: The following illustration shows an N3600 power supply. The LEDs on the N3300 and N3400 are located in a different place, but are functionally identical.

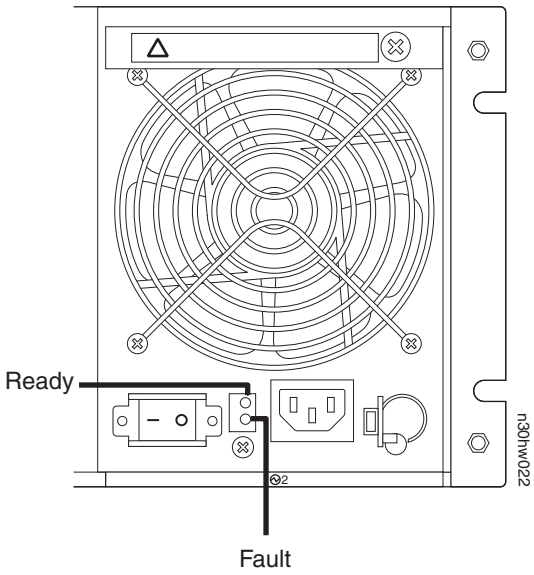


Figure 64. Power supply (PSU) LED locations

Interpreting power supply LEDs

Use the following table to interpret the LEDs on your system power supplies.

Table 25. Power supply LED descriptions

LED	LED Color	Description
Ready	Green	The power supply is functioning correctly.
	Off	AC input is bad or the switch is off.
Fault	Amber	The power supply is not functioning properly and needs service. See the system console for any applicable error messages.
	Off	The power supply is functioning properly.

LED behavior and onboard drive failures

If an internal disk drive fails or is disabled, the fault light on the front of a storage system turns on. When the faulty or disabled disk drive is removed, the fault light on the front of the system turns off.

The failure of disk drives in storage expansion units does not affect the fault light on the front of the system.

Chapter 6. Replacing N3300, N3400 and N3600 system devices

This chapter describes how to shut down, open and close, and replace parts in your N3300, N3400 or N3600 system.

Notes:

1. With the exception of the CompactFlash card procedures, all the procedures in this chapter apply to systems running either Data ONTAP 7.*x* or Data ONTAP 8.*x* 7-Mode. If you are replacing a CompactFlash card, be sure to refer to the appropriate instructions for your version of Data ONTAP.
2. Only the N3400 system supports Data ONTAP 8.*x* 7-Mode.

This chapter discusses the following topics:

The following illustrations show front and rear views of the N3300, N3400 and N3600 systems.

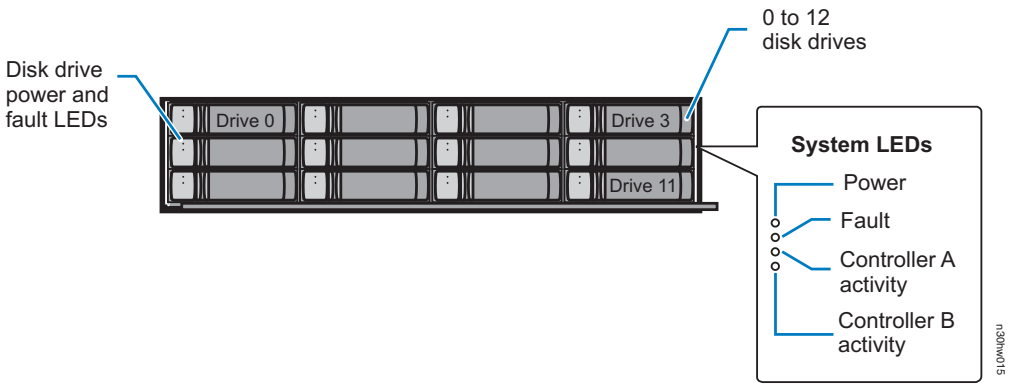


Figure 65. N3300 and N3400 - Front view

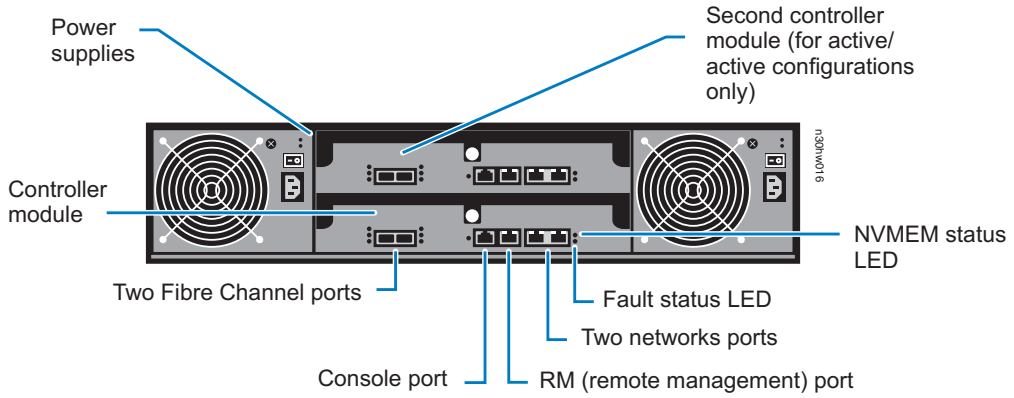


Figure 66. N3300 - Rear view

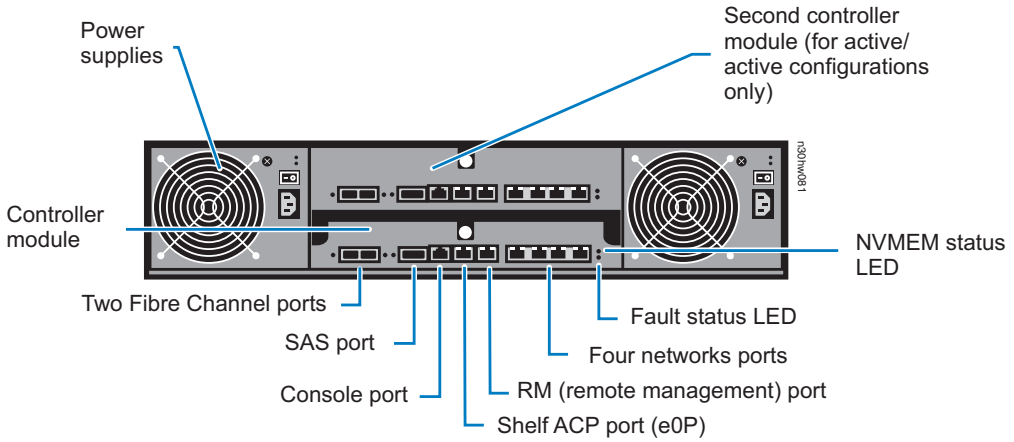


Figure 67. N3400 - Rear view

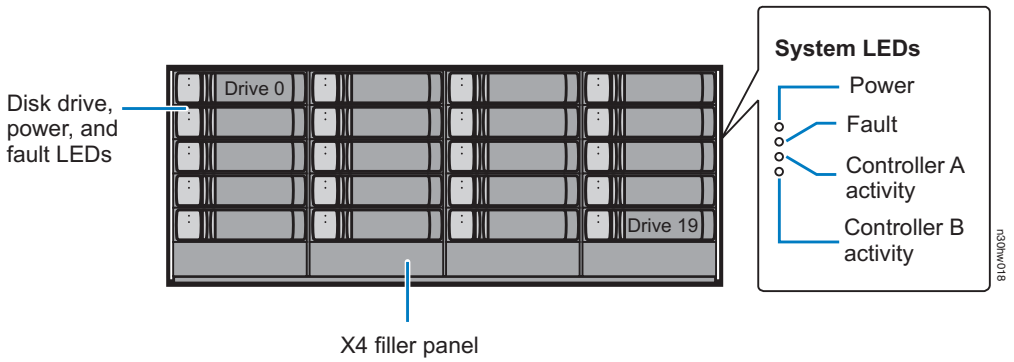


Figure 68. N3600 - Front view

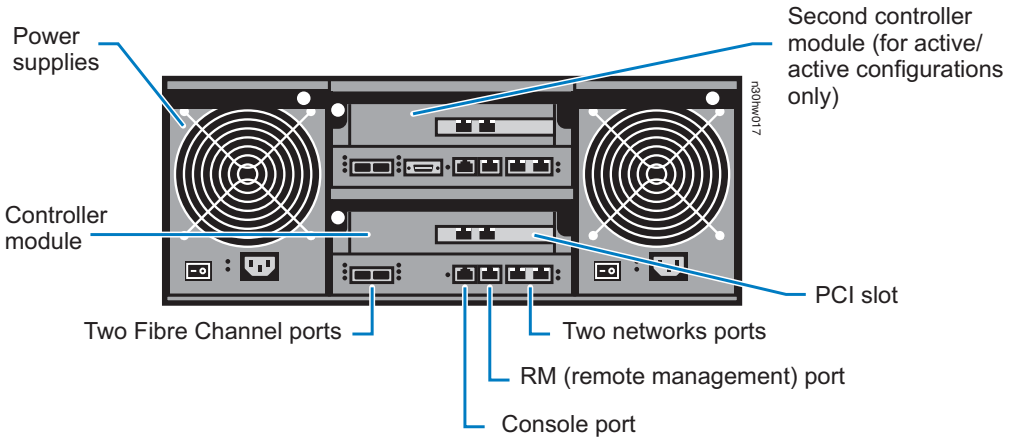


Figure 69. N3600 - Rear view

Shutting down a controller module

Shut down the target controller module (called a “node” in an active/active or high availability configuration) by completing the applicable procedure:

- **Shutting down a node in an active/active or high availability configuration:**
  1. Check the status of the target node by entering the following command at the system console of either node: `cf status`
  2. Take one of the following actions, depending on the result of the `cf status` command:
     - If clustering is enabled and neither node is in takeover mode, go to step 3.
     - If clustering is enabled and the partner node took over the target node, go to “Opening the system” on page 92.
     - If clustering is enabled and the target node took over the partner node, correct the problem, run the `cf giveback` command from the target node console, and go back to step 1.
  3. Take over the target node by entering the following command from the partner node's console:

     ```
     partner> cf takeover
     ```
  4. Go to “Opening the system” on page 92 when the takeover is complete.
- **Shutting down a controller module in a single-controller configuration:**
  1. Enter the following command from the system console:

     ```
     halt
     ```
  2. Turn off the power supplies and unplug both power cords from the power source.
  3. Check the nonvolatile memory (NVMEM) LED.

     If the LED is not flashing, go to “Opening the system” on page 92.

     If the LED is flashing, there is content in the NVMEM that has not been saved to disk. Reconnect the power supplies to the power source, reboot the controller module, and repeat steps 1 through 3. If repeated attempts to cleanly shut down the controller module fail, be aware that you might lose any data that was not saved to disk. Go to “Opening the system” on page 92.

Opening the system

To open the system, complete the following steps, using Figure 70 or Figure 71 on page 93 for reference:

1. If you have not done so yet, perform a clean system shutdown as described in “Shutting down a controller module” on page 91.
2. Ground yourself to the system chassis using the grounding leash.
3. Loosen the thumbscrew on the controller module cam handle.
4. If you are opening an N3400, remove the cable management arms as described in “Replacing the cable management arms on an N3400 system” on page 95.
5. Unplug system cables from the controller module, as needed. Make sure that you keep track of where cables were connected to the controller module.
6. Pull the controller module cam handle downward and slide the controller module out of the system. Make sure that you support the bottom of the controller module with your free hand.

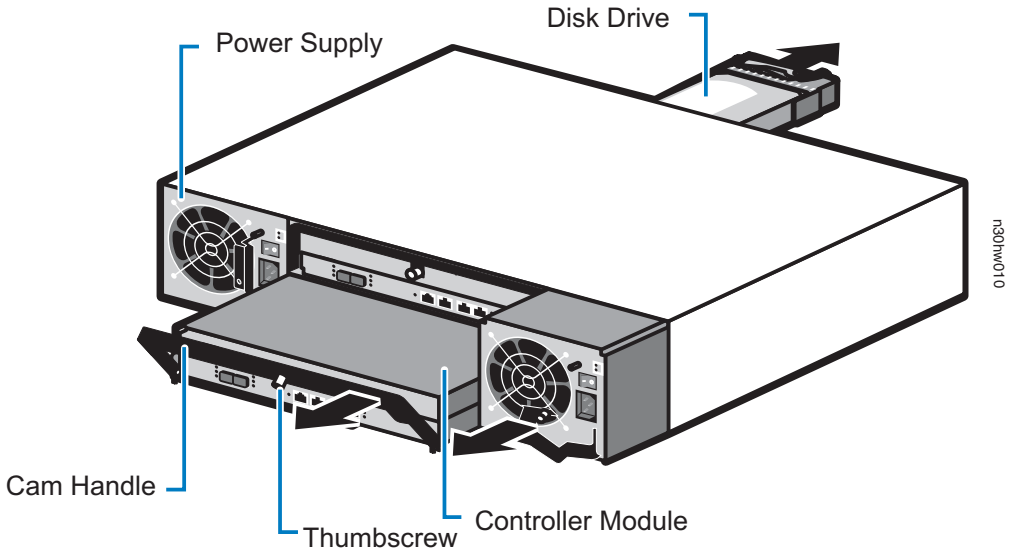


Figure 70. Removing the controller module - N3300 and N3400

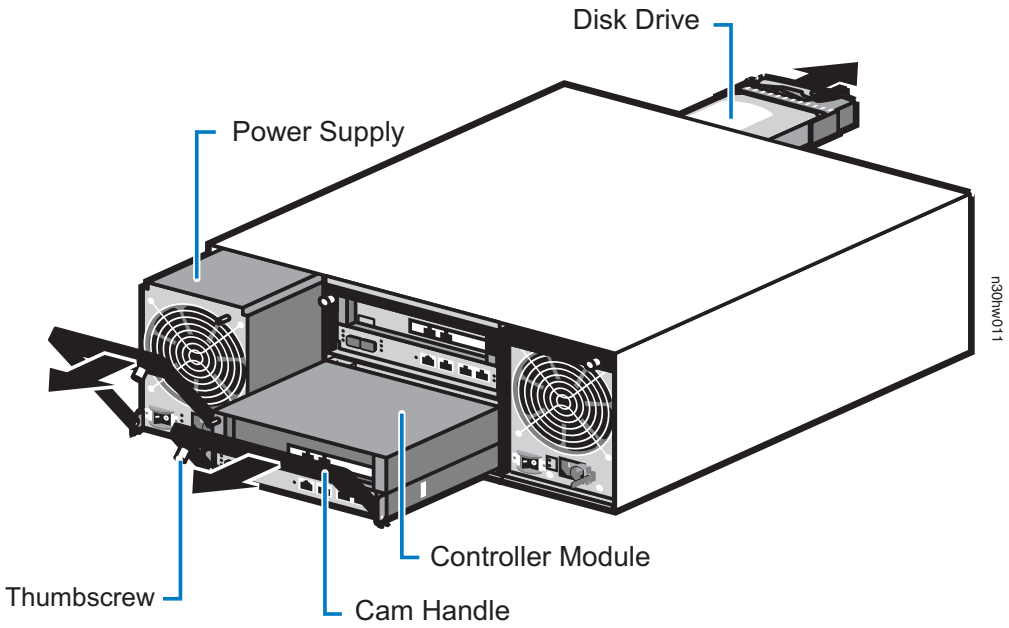


Figure 71. Removing the controller module - N3600

7. Remove the controller module cover by completing the following substeps, using Figure 72 or Figure 73 on page 94 for reference:
   a. Loosen the thumbscrew on the back of the controller module.
   b. Gently press the heel of your hand on the controller module cover closest to the cam handle, and then slide the cover toward the back of the module.
   c. Lift the cover straight up off the controller module.

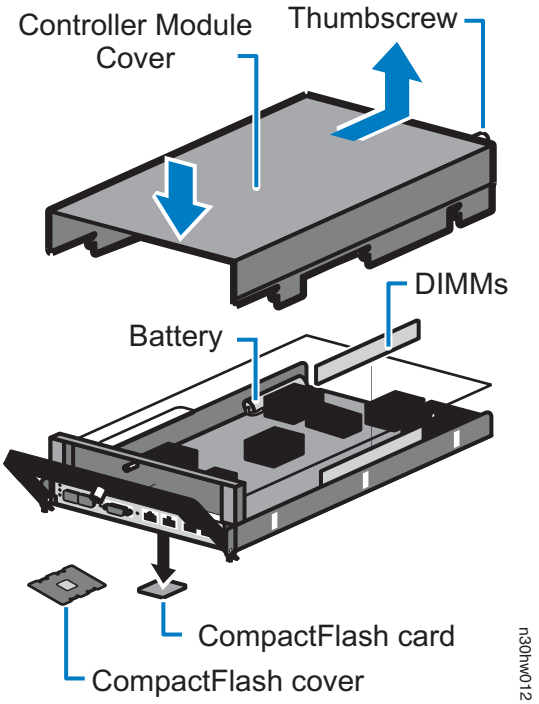


Figure 72. Opening the controller module - N3300 and N3400

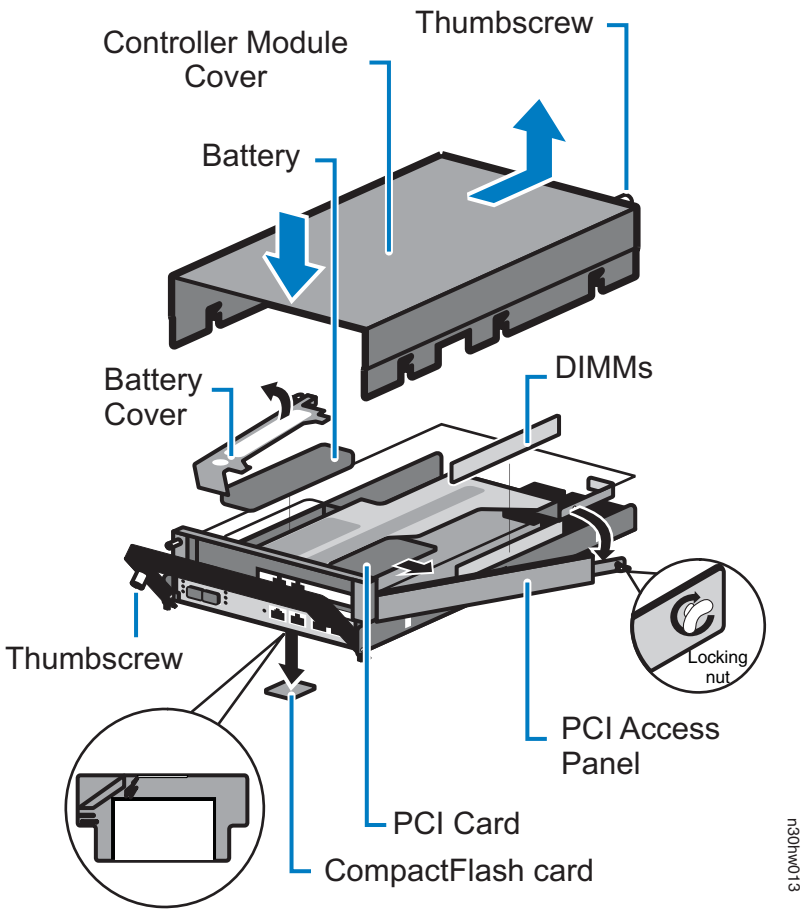


Figure 73. Opening the controller module - N3600

Closing the system

To close the system, complete the following steps:

1. Align the controller module cover with the notches on the sides of the controller module, and then slide the cover down and forward to seat it.
2. Tighten the thumbscrew on the back of the controller module.
3. Align the end of the controller module with the opening in the chassis.
4. Gently push the controller module halfway into the chassis and recable the controller module, and then push the controller module all the way into the chassis.

   For systems in an active/active configuration, the node reboots as soon as you seat the controller module completely into the chassis.
5. Firmly push up the cam handle to finish seating the controller module in the system, and then push the cam handle to the closed position and tighten the thumbscrew on the cam handle.
6. If you are closing an N3400, replace the cable management arms as described in “Replacing the cable management arms on an N3400 system” on page 95.
7. Complete the boot process.
   - If your system has a single controller module, plug in the power supply and turn on the power.

- If your system is in an active/active or high availability configuration, wait a few seconds for the node to boot, then give back the node by entering the following command from the partner console:

  ```
  cf giveback
  ```

Replacing the cable management arms on an N3400 system

You must use this procedure to replace the cable management arms:

1. Remove the cables from the loops on the currently installed cable management arms, if necessary.
2. Remove the cable management arms from the N3400 by unscrewing them from the cam handle, if necessary.

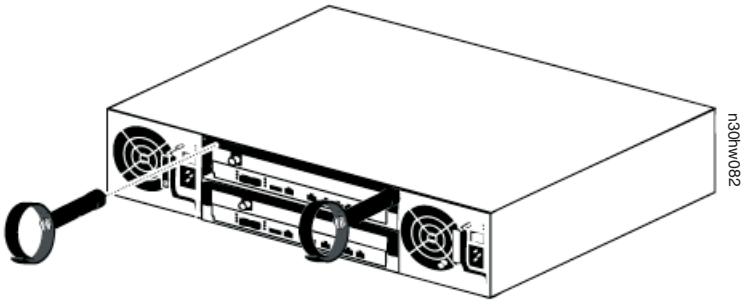


Figure 74. Removing the cable management arms from the N3400

3. Attach the new cable management arms by screwing them into the holes on the cam handle.

   Each N3400 has two cable management arms.
4. Cable your system as needed.
5. Feed the individual cables into the velcro loops on the cable management arms.

Replacing a disk in the chassis

Replacing a disk in the chassis consists of the following procedures:

- "Removing a disk"
- "Installing a disk" on page 96

Note: If you are replacing several disks in the chassis or if you are installing several disks into a half-empty chassis, replace or install the disks one at a time to allow your storage unit to recognize the existence of each new disk.

Removing a disk

To remove a disk from the chassis, complete the following steps:

1. Do one of the following:
   - If you are removing a disk that is a member of a volume, then enter:

     ```
     disk fail disk_name
     ```
   - If you are removing a disk that is a spare disk, then enter:

     ```
     disk remove disk_name
     ```

Note: Either command causes the amber fault LED on the disk to illuminate.

For more information about disk commands, see the *Data ONTAP System Administration Guide* for your version of Data ONTAP. This guide, as well as other Data ONTAP publications, is available on the IBM N series support website, which is accessed and navigated as described in "Websites" on page xxii.

2. Put on the antistatic ESD strap and grounding leash.
3. Gently remove the bezel from the front of the system.
4. Gently remove the disk drive from the chassis by pinching the tab at the top of the cam handle and swinging the cam handle out. The disk drive should disengage from the chassis, allowing it to slide free of the chassis.

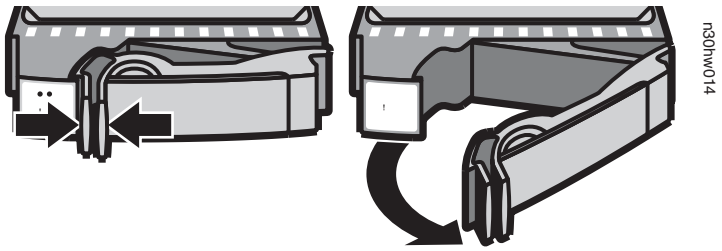


Figure 75. Removing a disk drive

Attention: Disk drives are fragile. Handle them as little as possible to prevent damage to them.

5. Gently slide the disk until it disengages. Wait 30 seconds for the disk to stop spinning; then continue removing the disk from the chassis.

   Attention: When removing a disk, always use two hands to support its weight.

Installing a disk

To install a disk, complete the following steps:

1. Put on the antistatic ESD strap and grounding leash.
2. Align the disk drive with the bay opening in the new chassis.
3. Gently push the disk drive into the chassis as far as it will go. The cam handle engages and begins to close.
4. Firmly push the disk drive the rest of the way into the chassis and lock the cam handle by pushing it up and against the disk drive holder. You will hear it click when it is secure.

   Note: If the device carrier does not fully seat in the drive bay, you may be trying to install an unsupported disk drive in the system.

   Attention: Do not slam the device carrier into place.
5. Repeat steps 2 to 4 for the remaining disk drives in the system.

Replacing a power supply

This section describes the following tasks:

- “Removing a power supply”
- “Installing a power supply”
- “Completing the replacement process” on page 98

This procedure is written with the following assumptions:

- You are replacing only one power supply at a time. This prevents system downtime.
- All other components in the system are functioning properly.

If your system does not meet these criteria, contact IBM technical support.

Removing a power supply

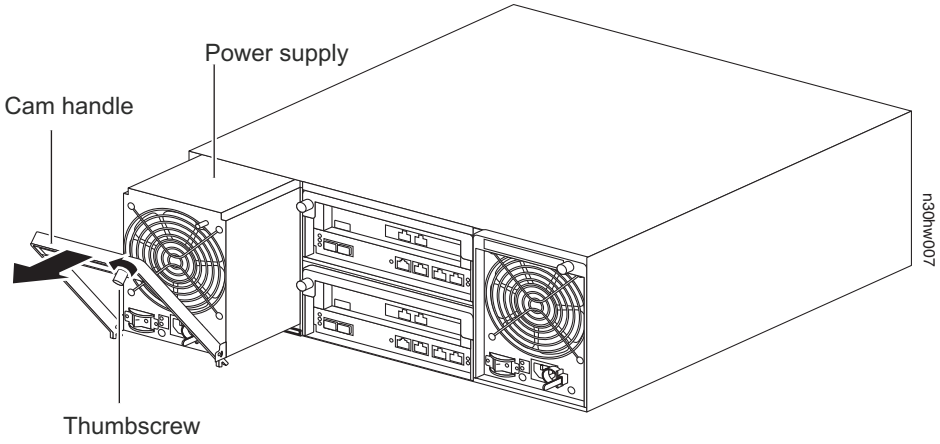


Figure 76. Removing a power supply

1. Make sure that you are properly grounded, then turn off the target power supply.

   Attention: You must replace the power supply within two minutes of removing it from the chassis. System air flow is disrupted and the system shuts down after two minutes to avoid overheating.
2. Remove the power cord by completing the following substeps.
   a. Pinch the tab on the locking mechanism of the cable retainer clip, and open the retainer clip.
   b. Slide the retainer clip off the cable.
   c. Unplug the power cord from the power supply and the power source.
3. Loosen the thumbscrew on the power supply cam handle, lower the cam handle, and slide the power supply out of the chassis. Make sure that you support the power supply with your free hand.

Installing a power supply

1. Align the edges of the new power supply with the opening in the system chassis and gently push the power supply into the chassis until the cam handle begins to rise.
2. Push on the edges of the power supply to seat it all the way into the chassis, and then push the cam handle to the closed position.

3. Tighten the thumbscrew on the power supply cam handle.
4. Reconnect the power cord and secure it to the power supply using the cable retaining clip.
5. Reconnect the power supply to the power source, and then turn it on. The power supply should run with no fault LEDs lit.
6. Go to "Completing the replacement process."

Completing the replacement process

Return the failed part to IBM. Contact IBM Service and Support at 1-800-IBM-SERV (1-800-426-7378) for more information on the return procedure.

Replacing an NVMEM battery

This section describes the following tasks:

- "Removing the NVMEM battery"
- "Installing the NVMEM battery" on page 101
- "Resetting the date and time on the controller module" on page 103
- "Completing the replacement process" on page 132

Removing the NVMEM battery

1. Shut down the target controller module (called a "node" in an active/active or high availability configuration) by completing the applicable procedure:
   - **Shutting down a node in an active/active or high availability configuration:**

     To shut down the node, you must determine the status of the node and, if necessary, take over the node so that the partner continues to serve data from the node's storage.

     The system has two controller modules in the same chassis. You must leave the power supplies turned on to provide power to the partner node.

     a. Check the status of the target node by entering the following command at the system console of either node:

        `cf status`

     b. Take one of the following actions, depending on the result of the `cf status` command:
        - If clustering is enabled and neither node is in takeover mode, go to substep c.
        - If clustering is enabled and the partner node took over the target node, go to step 2 on page 99.
        - If clustering is enabled and the target node took over the partner node, correct the problem, run the `cf giveback` command from the target node console, and go back to substep a.

     c. Take over the target node by entering the following command from the partner node's console:

        `partner> cf takeover`

     d. The system has two controller modules in the same chassis. Do not shut off the power.

     e. Go to step 2 on page 99 when the takeover is complete.
   - **Shutting down a controller module in a single-controller configuration:**

For a node that is in a stand-alone configuration, you must perform a clean shutdown (ensuring that all data has been written to disk) and disconnect the power supplies.

a. Enter the following command from the system console:

```
halt
```

Note: You must perform a clean system shutdown before replacing system components to avoid losing unwritten data in the nonvolatile memory (NVMEM). The NVMEM LED is located on the controller module to the right of the network ports, marked with a battery symbol. If the NVMEM LED is flashing, there is content in the NVMEM that has not been saved to disk. You need to reboot the controller module and proceed from the beginning of this procedure. If repeated attempts to cleanly shut down the controller module fail, be aware that you might lose any data that was not saved to disk.

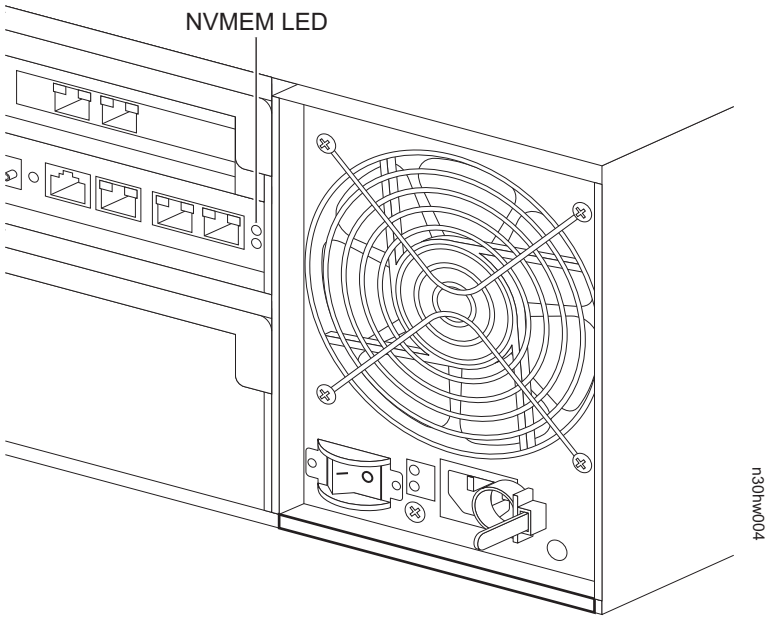


Figure 77. NVMEM LED

Note: The illustration above shows an N3600 system. The NVMEM LEDs are in a similar location on the N3300 or N3400 system. See the *Platform Monitoring Guide* for more information about the NVMEM LEDs.

b. If you are not already grounded, properly ground yourself.

c. Turn off the power supplies and unplug both power cords from the power source.

2. While grounded, remove any cabling from the controller module. Make sure that you keep track of where the cables were connected to the controller module.
3. Remove and open the controller module, as described in “Opening the system” on page 92.
4. Remove the NVMEM battery by completing the substeps applicable to your system and using the related figure for reference.

- **If you have an N3600 system:**

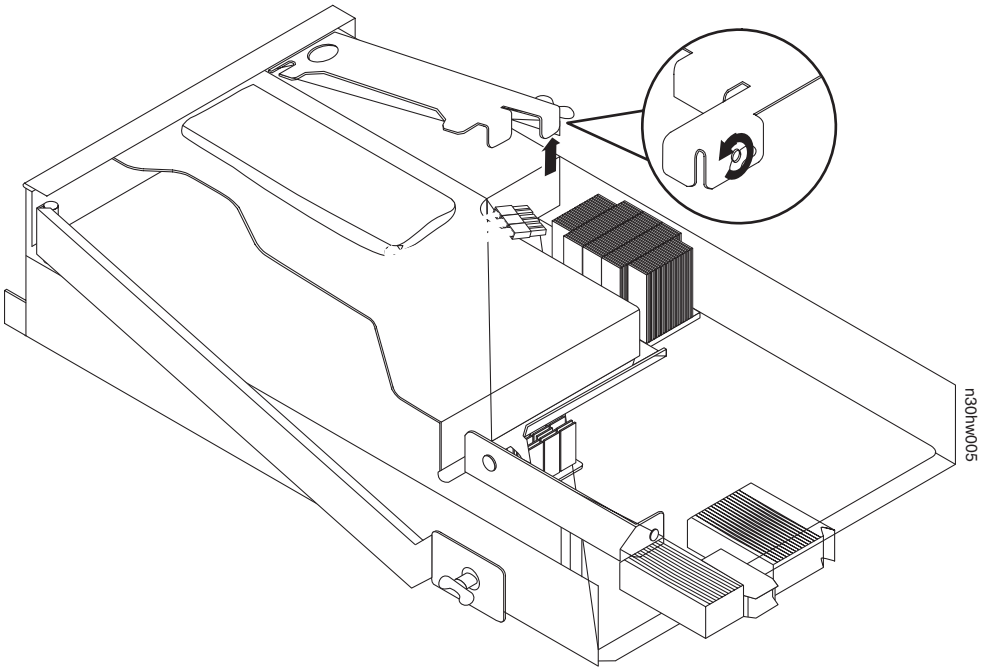


Figure 78. Removing the NVMEM battery from an N3600 system

a. Locate the locking wing nut on the battery cover and push and turn the locking wing nut one quarter turn to the left to unlock it.
b. Swing the cover up and away from the battery.
c. Press the clip on the face of the battery plug to release the lock clip from the plug socket, and unplug the battery cable.
d. Lift the battery out of the holder and controller module.

- **If you have an N3300 or N3400 system:**

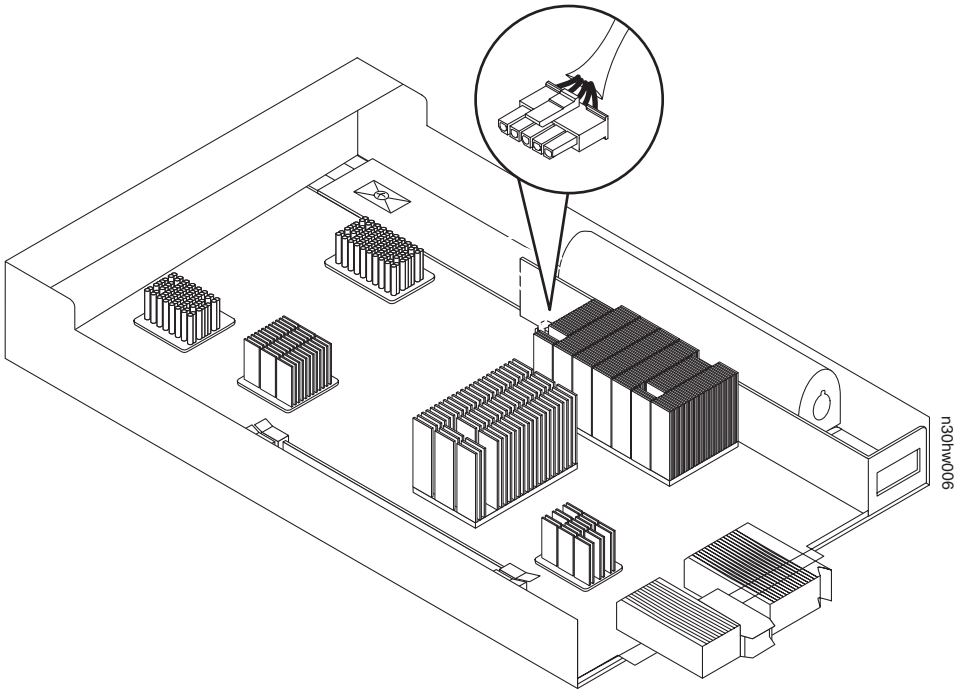


Figure 79. Removing the NVMEM battery from an N3300 or N3400 system

a. Locate the battery, press the clip on the face of the battery plug to release the lock clip from the plug socket, and unplug the battery cable from the socket.

   The battery position and connector are the same in the N3300 and N3400 models, although the locations of other components on the motherboard varies. This illustration is only a guide to the relative position of the battery.

   Attention: The battery plug is close to a heat sink. The heat sink is very hot immediately after you shut down your system. Let the controller module sit to let the heat sink cool before you attempt to unplug the battery.

b. Lift the battery out of the holder and controller module. It is attached to the controller module with a velcro strip.

Installing the NVMEM battery

To install an NVMEM battery in the controller module, you must perform a specific sequence of steps.

1. Align the battery with the holder in the controller module, keeping the label side up. Make sure that the velcro on the battery and the plug is facing in the correct direction, as applicable.
2. Seat the battery in the holder.
3. Plug the battery into the controller module.

   The plug should lock down onto the socket on the controller module motherboard.
4. Close and lock the battery cover, if applicable.

When locking the side panel, push the locking wing nut and turning it a quarter turn to the right.

5. Install the controller module into the system chassis and recable it, as described in “Closing the system” on page 94.

   Note: For HA pairs (or active/active configurations), the sequence in which you reinstall the controller module is especially important because it attempts to reboot as soon as you completely seat it in the chassis.

6. Boot the system and check the status of the NVMEM battery from the system command prompt on the console by completing the following substeps:
   a. If your system is in an HA pair (or active/active configuration):

      The node reboots as soon as you seat the controller module completely into the system.

      1) Press Ctrl-C to stop the boot process.
      2) Enter the following command at the boot loader prompt:

         ```
         boot_diags
         ```

      If your system is in a stand-alone configuration:

      1) Reconnect the power cables to the power supplies and to the power sources, and then turn on the power.
      2) Press Ctrl-C to stop the boot process and get to the Loader prompt.
      3) Enter the following command at the boot loader prompt:

         ```
         boot_diags
         ```

   b. Enter the following command at the main diagnostics prompt to run the NVRAM diagnostics:

      ```
      nvram
      ```

   c. Select option **2** to run the battery tests.
   d. After you complete the tests, exit diagnostics.
   e. Enter the following command at the prompt to boot the system:

      ```
      boot_ontap
      ```

   f. If your system is in an HA pair (or active/active configuration), return the system to normal operation by issuing the following command:

      ```
      cf giveback
      ```

   g. Press Ctrl-G from the console to go to the Baseboard Management Controller (BMC).

      The `bmc shell*->` prompt appears.

   h. Change to the advanced privileges:

      ```
      bmc shell->priv set advanced
      ```

   i. Show the battery status by entering the following command:

      ```
      bmc shell*->battery show
      ```

      Result:

      The output display shows the following information if the battery is good or charging, and fails if the battery is improperly installed or bad:

      ```
      chemistry :LION
      device-name :bq20z80
      expected-load-mw:81
      id :27100010
      manufacturer :AVT
      manufacture-date:3/16/2006
      rev_cell :1
      ```

```
rev_firmware :200
rev_hardware :c0
serial :00e7
status :full
test-capacity :disabled
```

Note: The displayed fields values can change without notice. All fields will be present and have values.

If this command fails, reinstall the battery and run the test again.

If the test is completed successfully, go to substep c.

j. Enter the following command to verify that the battery is charging:

`bmc shell*->sensors show`

The `sensors show` display shows the following information if the battery is good:

`Batt Run Time Critical-Low` (battery is very low and is charging)

or

`Batt Run Time Warning-Low` (battery is currently charging)

Note: When fully charged, the sensor state should be normal. It displays the number of hours of charge held by the battery.

k. Exit the BMC by entering the following command to return to the system console:

`system console`

7. Boot the controller module and run diagnostics on the new NVMEM battery (Diagnostics menu option nine), as desired.

Note: Data ONTAP checks the battery charge during system boot. If the battery is not charged enough to hold the NVMEM contents for a sufficient period, the boot process is stopped until the battery is properly recharged. The system also prints an error message and gives an override command on the console screen.

If you want to run diagnostics, stop the boot process before `LOADER` completes loading, and enter `boot_diags` from the `LOADER>` prompt. After you complete the tests, exit `LOADER`, boot Data ONTAP, and go to "Resetting the date and time on the controller module." See the *N series Diagnostics Guide* for information about specific diagnostics tests you can perform.

If you do not want to run diagnostics, go to "Resetting the date and time on the controller module."

Attention: If your system is in an active/active or high availability configuration, you must enable the configuration again. Use the `cf status` to check the status of your configuration. If it is not enabled, use the `cf enable` command from the partner node's console to enable your active/active or high availability configuration.

Resetting the date and time on the controller module

You must reset the date and time on the controller module after reconnecting the NVMEM battery and rebooting Data ONTAP.

1. Display the current date on the node by entering the following command:

`date`

Attention: If your system is in an active/active or high availability configuration, make sure that you display the date and time on the partner node and set the target node to the same date and time.

2. Set the date by entering the following command:

   `date [-u] [[[CC]yy]mmddhhmm>[.<ss>]]`

   -u sets the date and time to Greenwich Mean Time instead of the local time.

   `CC` is the first two digits of the current year.

   `yy` is the second two digits of the current year.

   `mm` is the current month. If the month is omitted, the default is the current month.

   `dd` is the current day. If the day is omitted, the default is the current day.

   `hh` is the current hour, using a 24-hour clock.

   `mm` is the current minute.

   `ss` is the current second. If the seconds are omitted, the default is 0.

   Example:

   The following command sets the date and time to 22 May 2002 at 9:25 a.m.

   `date 200205220925`

   Note: See the *Data ONTAP System Administration Guide* for more information. This guide, as well as other Data ONTAP documentation, is available on the IBM N series support site, which is accessed and navigated as described in “Websites” on page xxii.

3. Go to “Completing the replacement process.”

Completing the replacement process

Return the failed part to IBM. Contact IBM Service and Support at 1-800-IBM-SERV (1-800-426-7378) for more information on the return procedure.

Disposing of batteries

Dispose of batteries according to local regulations regarding battery recycling or disposal. For more information, see the *IBM Environmental Notices and User Guide*.

Replacing DIMMs

This section describes the following tasks:

Removing a DIMM

1. Shut down the target controller module (called a “node” in an active/active or high availability configuration) by completing the applicable procedure:
   - **Shutting down a node in an active/active or high availability configuration:**
     a. Check the status of the target node by entering the following command at the system console of either node:

        `cf status`

b. Take one of the following actions, depending on the result of the `cf status` command:
   - If clustering is enabled and neither node is in takeover mode, go to substep c.
   - If clustering is enabled and the partner node took over the target node, go to step 2.
   - If clustering is enabled and the target node took over the partner node, correct the problem, run the `cf giveback` command from the target node console, and go back to substep a.

c. Take over the target node by entering the following command from the partner node's console:

```
partner> cf takeover
```

d. Go to step 2 when the takeover is complete.

- **Shutting down a controller module in a single-controller configuration:**
  a. Enter the following command from the system console:

```
halt
```

  b. Turn off the power supplies and unplug both power cords from the power source.
  c. Check the nonvolatile memory (NVMEM) LED.
     - If the LED is not flashing, go to step 2.
     - If the LED is flashing, there is content in the NVMEM that has not been saved to disk. Reconnect the power supplies to the power source, reboot the controller module, and repeat substeps a through c. If repeated attempts to cleanly shut down the controller module fail, be aware that you might lose any data that was not saved to disk. Go to step 2.

2. While grounded, remove any cabling from the controller module. Make sure that you keep track of where the cables were connected to the controller module.
3. Remove and open the controller module, as described in “Opening the system” on page 92.
4. Unplug the NVMEM battery by pressing the clip on the face of the battery plug to release the lock clip and unplugging the plug from the socket.
5. Locate the DIMM that you want to remove: DIMM A, DIMM B, or both.

   Note: The DIMM locations are the same in the N3300, N3400 and N3600 models, although the locations of other components on the motherboard varies. The following illustrations are only guides to the relative locations of the DIMMs.

   Attention: You might receive more than one replacement DIMM. You must replace the same number of DIMMs as you receive in your replacement package.

   Figure 80 on page 106 shows the DIMM locations on an N3300 or N3600 system.

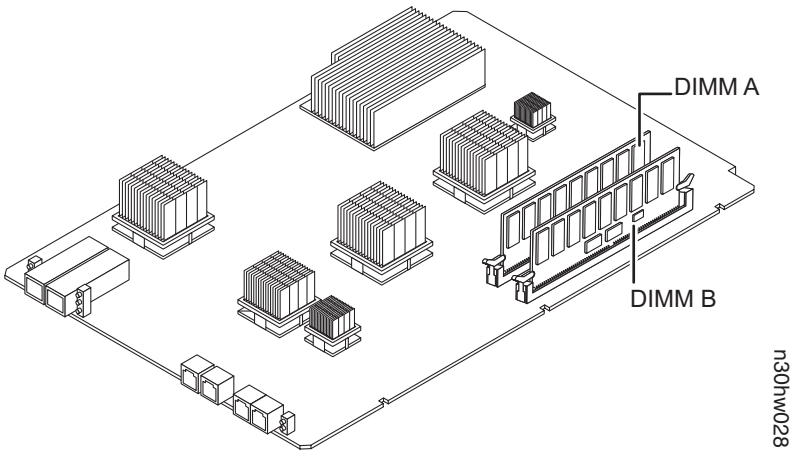


Figure 80. DIMM locations on an N3300 or N3600 system

Note: For an N3600, you may need to remove the PCI access panel for easier access to the DIMMs. For details on removing this access panel, see step 4 on page 109.

Figure 81 shows the DIMM locations on an N3400 system.

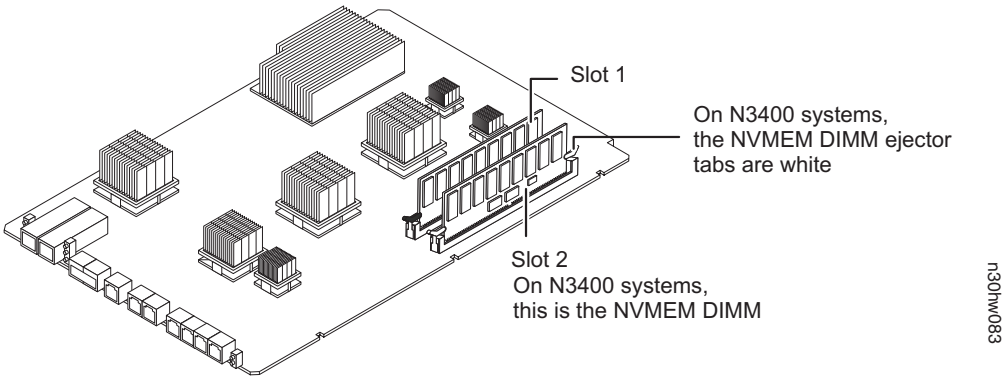


Figure 81. DIMM locations on an N3400 system

6. Note the orientation of the DIMM in the socket so you can insert the replacement DIMM in the proper orientation.
7. Push apart the latches on either side of the DIMM to release the DIMM from its slot, and then lift it out of the slot.

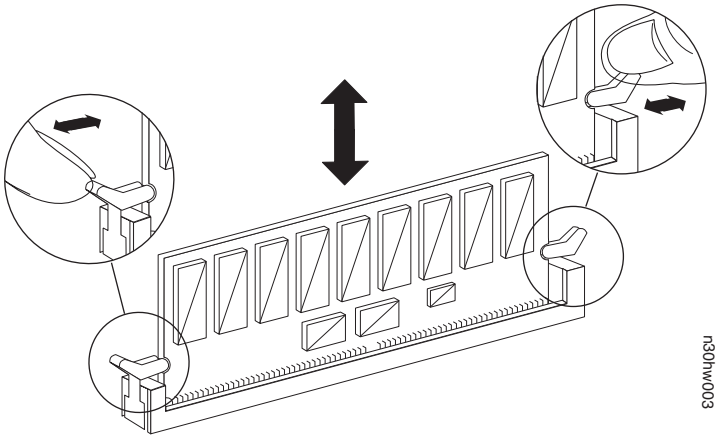


Figure 82. Removing the DIMM

8. Go to “Installing a DIMM.”

Installing a DIMM

1. While grounded, remove the replacement DIMM from the antistatic shipping bag.
2. Locate the slot where you are installing the new DIMM. Hold the DIMM by the corners and align it over the slot.

   The notch among the pins on the DIMM should line up with the tab in the socket.
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 reinsert it.

   Attention: Visually inspect the DIMM to verify that it is evenly aligned and fully inserted into the slot. The edge connector on the DIMM must make complete contact with the slot.
4. Push carefully, but firmly, on the top edge of the DIMM until the latches snap into place over the notches at the ends of the DIMM.
5. Plug the NVMEM battery into the controller module. Make sure that the plug locks down to the socket on the controller module.
6. Close and boot the system, as described in “Closing the system” on page 94.

   If you want to run diagnostics, stop the boot process before `LOADER` completes loading, and enter `boot_diags` from the `LOADER>` prompt. After you complete the tests, exit `LOADER`, boot Data ONTAP, and go to “Resetting the date and time on the controller module.” See the *IBM System Storage N series Diagnostics Guide* for information about specific diagnostics tests you can perform.

   If you do not want to run diagnostics, go to “Resetting the date and time on the controller module.”

   Attention: If your system is in an active/active or high availability configuration, you must enable the configuration again. Use the `cf status` to check the status of your configuration. If it is not enabled, use the `cf enable` command from the partner node's console to enable your active/active or high availability configuration.

Resetting the date and time on the controller module

You must reset the date and time on the controller module after reconnecting the NVMEM battery and rebooting Data ONTAP.

1. Display the current date on the node by entering the following command:

   ```
   date
   ```

   Attention: If your system is in an active/active or high availability configuration, make sure that you display the date and time on the partner node and set the target node to the same date and time.
2. Set the date by entering the following command:

   ```
   date [-u] [[[CC]yy]mmddhhmm>[.<ss>]]
   ```

   -u sets the date and time to Greenwich Mean Time instead of the local time.

   `CC` is the first two digits of the current year.

   `yy` is the second two digits of the current year.

   `mm` is the current month. If the month is omitted, the default is the current month.

   `dd` is the current day. If the day is omitted, the default is the current day.

   `hh` is the current hour, using a 24-hour clock.

   `mm` is the current minute.

   `ss` is the current second. If the seconds are omitted, the default is 0.

   Example:

   The following command sets the date and time to 22 May 2002 at 9:25 a.m.

   ```
   date 200205220925
   ```

   Note: See the *Data ONTAP System Administration Guide* for more information. This guide, as well as other Data ONTAP documentation, is available on the IBM N series support site, which is accessed and navigated as described in “Websites” on page xxii.
3. Go to “Completing the replacement process.”

Completing the replacement process

Return the failed part to IBM. Contact IBM Service and Support at 1-800-IBM-SERV (1-800-426-7378) for more information on the return procedure.

Replacing a PCI Card in an N3600 system

This section describes the following tasks:

- “Removing a PCI card”
- “Installing a PCI card” on page 110
- “Completing the replacement process” on page 111

This procedure is written with the following assumptions:

- You are replacing or installing an existing PCIe card; the N3600 does not support PCI-X cards.
- All other components in the system are functioning properly.

If your system does not meet these criteria, contact IBM technical support.

Removing a PCI card

1. Shut down the target controller module (called a “node” in an active/active or high availability configuration) by completing the applicable procedure:
   - **Shutting down a node in an active/active or high availability configuration**

a. Check the status of the target node by entering the following command at the system console of either node:

   ```
   cf status
   ```

b. Take one of the following actions, depending on the result of the `cf status` command:
   - If clustering is enabled and neither node is in takeover mode, go to substep c.
   - If clustering is enabled and the partner node took over the target node, go to step 2.
   - If clustering is enabled and the target node took over the partner node, correct the problem, run the `cf giveback` command from the target node console, and go back to substep a.

c. Take over the target node by entering the following command from the partner node's console:

   ```
   partner> cf takeover
   ```

d. Go to step 2 when the takeover is complete.

- **Shutting down a controller module in a single-controller configuration**

  a. Enter the following command from the system console:

     ```
     halt
     ```

  b. Turn off the power supplies and unplug both power cords from the power source.

  c. Check the nonvolatile memory (NVMEM) LED.

     If the LED is not flashing, go to step 2.

     If the LED is flashing, there is content in the NVMEM that has not been saved to disk. Reconnect the power supplies to the power source, reboot the controller module, and repeat substeps a through c. If repeated attempts to cleanly shut down the controller module fail, be aware that you might lose any data that was not saved to disk. Go to step 2.

2. While grounded, remove any cabling from the controller module. Make sure that you keep track of where the cables were connected to the controller module.
3. Remove and open the controller module, as described in “Opening the system” on page 92.
4. Remove the target PCI card by completing the following substeps, using Figure 83 on page 110 for reference:

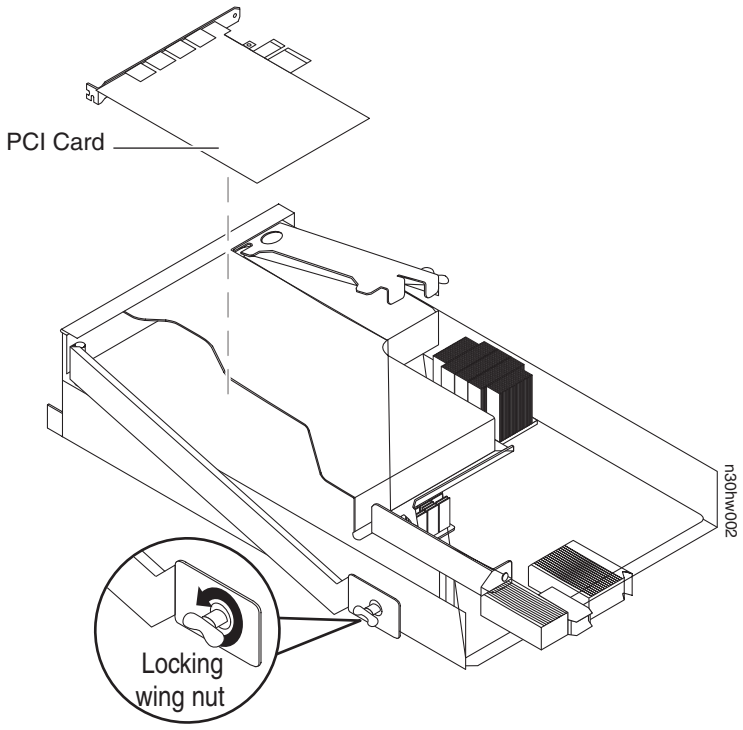


Figure 83. Removing a PCI card

a. Locate the locking wing nut on the side panel and push and turn the locking wing nut one quarter turn to the left to unlock it.
b. Swing the side panel away from the controller module and lift the panel off the controller module.
c. Remove the PCI card from the controller module and set it aside.

   Attention: Do not remove the EMI gasket installed in the PCI slot.
d. Go to “Installing a PCI card.”

Installing a PCI card

1. While grounded, shut down the system, remove the controller module from the chassis, and open the chassis, if necessary, as described in “Opening the system” on page 92.

   Attention: The EMI gasket is preinstalled in the N3600 chassis. Do not install the EMI gasket that comes with your PCI card. You could damage the PCI card by installing the gasket and then installing the PCI card.
2. Open the controller module side panel, if necessary, and install the PCI card. Be sure that you properly align the card in the slot and exert even pressure on the card when seating it in the socket.
3. Close and lock the side panel. When locking the side panel, push the locking wing nut and turn it a quarter turn to the right.
4. Reinstall the controller module, as described in “Closing the system” on page 94.

   Attention: If you have an active/active or high availability configuration, the system attempts to reboot the node as soon as you completely seat it in the chassis. Do not completely seat the node, but go to step 5.
5. Cable the PCI card as needed.

Attention: If you have an active/active or high availability configuration, seat the node in the chassis, then go to step 6.

6. Boot the controller module and run diagnostics on the new PCI card, as desired.

   If you want to run diagnostics, stop the boot process before `LOADER` completes loading, and enter `boot_diags` from the `LOADER>` prompt. After you complete the tests, exit `LOADER`, boot Data ONTAP, and go to step 7. See the *IBM System Storage N series Diagnostics Guide* for information about specific diagnostics tests you can perform.

   If you do not want to run diagnostics, go to step 7.

   Attention: If your system is in an active/active or high availability configuration, you must enable the configuration again. Use the `cf status` to check the status of your configuration. If it is not enabled, use the `cf enable` command from the partner node's console to enable your active/active or high availability configuration.

7. Check the functioning of the new card. Look for the card in the system configuration tables on the controller module, and also check that the card LEDs report traffic or network connections. Make corrections as needed.
8. Go to "Completing the replacement process."

Completing the replacement process

Return the failed part to IBM. Contact IBM Service and Support at 1-800-IBM-SERV (1-800-426-7378) for more information on the return procedure.

Replacing a CompactFlash card in a single-controller system running Data ONTAP 7.*x*

This section contains the procedure for replacing a CompactFlash card in a single-controller system running Data ONTAP 7.*x*. If your system is in an active/active configuration running Data ONTAP 7.*x*, use the procedure in "Nondisruptively replacing a CompactFlash card in an active/active configuration running Data ONTAP 7.*x*" on page 116.

Note: In a single-controller system, the CompactFlash card is not a hot-swappable component. The following steps are disruptive. It is recommended that they be performed only during a maintenance window.

This section describes the following tasks:

You also need the following documentation to perform the identified procedures. These documents, as well as other Data ONTAP documentation, are available on the IBM N series support website, which is accessed and navigated as described in "Websites" on page xxii.

- *Data ONTAP Upgrade Guide*, as applicable
- *Data ONTAP Commands: Manual Page Reference*, if applicable
- *Data ONTAP System Administration Guide*, if applicable

This procedure is written with the following assumptions:

- You are replacing the CompactFlash card in a system with a single controller module running Data ONTAP 7.*x*.
- You have access to either a PC with a card reader/writer and with access to the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii, or access to a networked system for netboot.
- All other components in the system are functioning properly.

If your system does not meet these criteria, contact IBM technical support.

Replacing the CompactFlash card in a single controller system running Data ONTAP 7.*x*

Removing the CompactFlash card

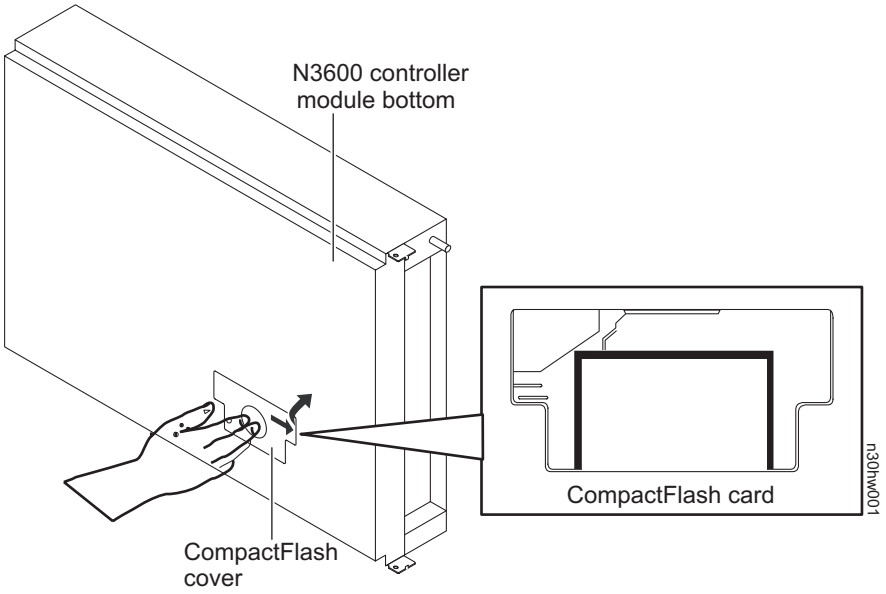


Figure 84. Removing the CompactFlash card

1. Shut down the target controller module by completing the following procedure:
   a. Enter the following command from the system console:

      ```
      halt
      ```

   b. Retrieve and save the system environment variables, if possible, by completing the following substeps:
      1) Bring the system down to the boot loader prompt.
         - If the system is running, reboot it, press Ctrl-C when prompted by the system, and then go to substep 1b2.
         - If the system is at the boot loader prompt, go to substep 1b2.
      2) Display the system environment variables by entering the following command:

         ```
         printenv
         ```

      3) Copy the environment variable values.

         You need these variable values for the replacement CompactFlash card.

Note: You do not need to retrieve the Fibre Channel port settings for a stand-alone configuration. Fibre Channel port settings are stored in the boot environment and also on disk in the system root volume. When you reboot the system, Fibre Channel settings are restored from the saved settings.

2. Turn off the power supplies and unplug both power cords from the power source.

   Check the nonvolatile memory (NVMEM) LED.

   - If the LED is not flashing, go to step 3.
   - If the LED is flashing, there is content in the NVMEM that has not been saved to disk. Reconnect the power supplies to the power source, reboot the controller module, and repeat steps 1 on page 112 and 2. If repeated attempts to cleanly shut down the controller module fail, be aware that you might lose any data that was not saved to disk. Go to step 3.

3. While grounded, remove any cabling from the controller module. Make sure that you keep track of where the cables were connected to the controller module.
4. Remove and open the controller module, as described in "Opening the system" on page 92.
5. Locate the CompactFlash compartment on the underside of the controller module, to the right of center near the I/O ports, and remove the CompactFlash cover.
6. Slide the CompactFlash card out of the controller module and set it on an antistatic mat.

Installing the CompactFlash card

Attention: If you are copying the system files to the CompactFlash card using a PC or laptop with a card writer, you must copy the system files to the CompactFlash card prior to installing it in the controller module. See "Transferring the system files using a PC or laptop" on page 114 for information.

1. While grounded, align the CompactFlash card with the edges of the CompactFlash card slot. Seat the CompactFlash card by sliding it into the CompactFlash reader. The CompactFlash card should be squarely seated and should not move. Reseat the CompactFlash card, if necessary.
2. Install the CompactFlash cover.
3. Reinstall the controller module, as described in "Closing the system" on page 94.
4. Cable the controller module as needed.
5. Go to "Placing the system files on the CompactFlash card."

Placing the system files on the CompactFlash card

This section describes the following tasks:

- "Transferring the system files using netboot"
- "Transferring the system files using a PC or laptop" on page 114

Note: This procedure is written with the assumption that you have access to a PC running Windows XP or higher and have a zip program.

Transferring the system files using netboot:

1. Per the recommendations in the *Data ONTAP Upgrade Guide*, place the system files on the server you use for netbooting. You can copy the system files from the system boot directory, at /etc/boot/netapp-x86, or download them from the

IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii. On the IBM N series support website, the Data ONTAP Matrix provides a current list and history of Data ONTAP releases available by release family and supported storage systems.

2. Turn on your system and press Ctrl-C to stop the boot process at the LOADER> prompt.
3. Configure your network connection, if needed.
   - If you have DHCP running on your network, enter the following command at the prompt:

     ```
     ifconfig e0a -auto
     ```

   - If you do not have DHCP running, configure the connection by entering the following command at the prompt:

     ```
     ifconfig e0a -addr=filer_addr -mask=netmask -gw=gateway -dns=dns_addr
     -domain=dns_domain
     ```

     filer_addr is the IP address of the system.

     netmask is the network mask of the system.

     gateway is the gateway for the system.

     dns_addr is the IP address of a name server on your network.

     dns_domain is the DNS domain name.
4. Enter the following command at the LOADER> prompt:

   ```
   netboot URL
   ```

   URL is the location of the remote system files. It can be either an HTTP or a TFTP network path.
5. At the Special Boot Menu, select Option 1 for Normal Boot.
6. Go to “Updating the CompactFlash card” on page 115.

Transferring the system files using a PC or laptop:

1. Download <rlse>_setup_e.exe to your PC.

   rlse is the Data ONTAP release you are using.

   You can download the system files from the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii. On the IBM N series support website, the Data ONTAP Matrix provides a current list and history of Data ONTAP releases available by release family and supported storage systems.

   You can also copy the system files from the system boot directory of another system at /etc/boot/netapp-x86. Contact technical support if you cannot get the system files from these sources.

   Attention: Make sure that you download the correct file, designated for PC administration.
2. Extract the contents of <rlse>_setup_e.exe to a temporary folder on your PC.
3. Insert the CompactFlash card into the CompactFlash card reader.

   Note: The CompactFlash card is pre-formatted. Do *not* format the CompactFlash card.
4. Create a folder called x86_elf in the root partition of the CompactFlash card, and then create a subfolder called KERNEL in the x86_elf folder.
5. In the \boot folder, copy the file netapp-x86 into the KERNEL subfolder in Windows Explorer.
6. Rename the file netapp-x86 to Primary.KRN.

7. Install the CompactFlash card with the kernel image into the system.
8. Go to “Updating the CompactFlash card.”

Updating the CompactFlash card

1. Turn on the power to the system and boot it, if necessary.
2. Download the system files to the CompactFlash card by entering the following command:

   ```
   download
   ```

   Attention: If the download fails with the following error message, you must run `setup` to reinstall the proper files on the system that enable you to execute the `download` command on the CompactFlash card:

   ```
   Failed to open download script file /etc/boot/x86_elf/kernel_1024.cmds:
   No such file
   [download.requestDoneError:error]: Operator requested download failed,
   ```

3. Check the version of the image by entering the following command:

   ```
   version -b
   ```

   Make sure that the BIOS and Diagnostic images are the same as the old system or are upgraded.
4. Reboot the system by entering the following command:

   ```
   reboot
   ```

5. Go to “Restoring environment variables.”

Restoring environment variables

1. Check the version of the image by entering the following command:

   ```
   version -b
   ```

   Make sure that the BIOS and Diagnostic images are the correct version. If they are not, go to the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii, and follow the installation instructions to install the version you need.
2. Halt the controller by entering the following command:

   ```
   halt
   ```

3. Display the default environment variables by entering the following command:

   ```
   printenv
   ```

4. Compare the default environment variables with the list you made in “Removing the CompactFlash card” on page 112.

   If the variable values are the same, go to step 5.

   If the variable values are different or need modification, complete the following steps:

   a. Set the values of the individual variables by entering the following command for each changed variable:

      ```
      setenv variable_name variable_value
      ```

   b. Verify the values of the variables by entering the following command from the boot loader prompt:

      ```
      printenv
      ```

5. Boot Data ONTAP after you modify all variables (if necessary) by entering the following command:

   ```
   boot_ontap
   ```

6. Go to “Completing the replacement process” on page 116.

Completing the replacement process

Return the failed part to IBM. Contact IBM Service and Support at 1-800-IBM-SERV (1-800-426-7378) for more information on the return procedure.

Nondisruptively replacing a CompactFlash card in an active/active configuration running Data ONTAP 7.*x*

This section describes how to nondisruptively replace the CompactFlash card in an active/active configuration running Data ONTAP 7.*x*. Specifically, it describes the following tasks:

- "Preparing for the CompactFlash card replacement"
- "Removing the CompactFlash card" on page 117
- "Installing the replacement CompactFlash card" on page 118
- "Completing the replacement process" on page 120

Note: If your system is in a single-controller configuration running Data ONTAP 7.*x*, use the procedure in "Replacing a CompactFlash card in a single-controller system running Data ONTAP 7.*x*" on page 111.

You also need the following documentation to perform the identified procedures:

- *Data ONTAP Upgrade Guide*, as applicable
- *Data ONTAP Commands: Manual Page Reference*, if applicable
- *Data ONTAP System Administration Guide*, if applicable

This procedure is written with the following assumptions:

- You are replacing the CompactFlash card in a system with an active/active configuration running Data ONTAP 7.*x*.
- You have access to either a PC with a card reader/writer and with access to the IBM N series support website or access to a networked system for netboot.
- You can perform a takeover of the target node.
- All other components in the system are functioning properly.

If your system does not meet these criteria, contact IBM technical support.

Preparing for the CompactFlash card replacement

1. Check the status of the active/active configuration.

   If you can connect to the target node through normal means, complete the following substeps:

   a. Check that the active/active configuration is enabled by entering the following command:

      ```
      cf status
      ```

      If it is enabled, go to substep b.

      If it is not enabled, enable it by entering the following command:

      ```
      cf enable
      ```

   b. Take over the target node by entering the following command from the partner console:

      ```
      cf takeover
      ```

   c. Connect the console to the target node.

If the target node prompts you with the message: `Waiting for giveback..... (Press Ctrl-C to abort wait)`, press Ctrl-C and then answer `y` to the prompt `Do you wish to halt this node rather than wait [y/n]?`

d. Go to step 2.

If you cannot connect to the target node through normal means and the node is receiving power, complete the following substeps:

a. Connect a console directly to the target node through the marked console port. Follow the manufacturer's installation instructions for configuration. The `LOADER>` prompt should be accessible after the console connection is established. If it is not, contact technical support.

b. Boot the system from the backup system files on the CompactFlash card. You might need to rename the backup system file so that it boots as the primary file.

c. Return to the partner node and enable clustering by entering the following command:

```
cf enable
```

d. Take over the target node by entering the following command from the partner console:

```
cf takeover
```

e. Press Ctrl-C during the node reboot to go to the `LOADER>` prompt.

f. Go to step 2.

2. At the `LOADER>` prompt, display the environment variables for the target node by entering the following command:

```
printenv
```

3. Copy the values for the variables and save them for later use when you restore the environment variables on the new CompactFlash card.
4. Go to the partner console and enter the following command:

```
partner fcadmin config
```

5. Copy the values for the onboard Fibre Channel settings and save them for later use when you restore the settings on the new CompactFlash card.
6. Copy the system files to the replacement CompactFlash card.

   You can choose from one of two methods:

   - If you have access to the IBM N series support website and a server, use the procedure described in “Transferring the system files using netboot” on page 118.
   - If you have access to the IBM N series support website and have a PC with a CompactFlash reader/writer, use the procedure described in “Transferring the system files using a PC or laptop” on page 119.

Removing the CompactFlash card

1. While grounded, remove any cabling from the controller module. Make sure that you keep track of where the cables were connected to the controller module.
2. Locate the CompactFlash compartment on the underside of the controller module, to the right of center near the I/O ports, and remove the cover.
3. Slide the CompactFlash card out of the controller module and set it on an antistatic mat.
4. Go to “Installing the replacement CompactFlash card” on page 118.

Installing the replacement CompactFlash card

This section describes the following tasks:

- "Transferring the system files using netboot"
- "Transferring the system files using a PC or laptop" on page 119

Transferring the system files using netboot

1. Make sure that you are properly grounded.
2. Per the recommendations in the *Data ONTAP Upgrade Guide*, place the system files on the server you use for netbooting. You can copy the system files from the system boot directory, at /etc/boot/netapp-x86, or download them from the IBM N series support website, which is accessed and navigated as described in "Websites" on page xxii.
3. Align the CompactFlash card with the edges of the CompactFlash card slot. Seat the CompactFlash card by sliding it into the CompactFlash reader. The CompactFlash card should be squarely seated and should not move. Reseat the CompactFlash card, if necessary.
4. Install the CompactFlash cover.
5. Reinstall the controller module into the system and recable it, as described in "Closing the system" on page 94.

   Note: The node starts to reboot as soon as you insert it fully back into the chassis.
6. Press Ctrl-C to stop the boot process and go to the `LOADER>` prompt.
7. Configure your network connection, if needed.

   If you have DHCP running on your network, enter the following command at the prompt:

   ```
   ifconfig e0a -auto
   ```

   If you do not have DHCP running, configure the connection by entering the following command at the prompt:

   ```
   ifconfig e0a -addr=filer_addr -mask=netmask -gw=gateway -dns=dns_addr
   -domain=dns_domain
   ```

   `filer_addr` is the IP address of the system.

   `netmask` is the network mask of the system.

   `gateway` is the gateway for the system.

   `dns_addr` is the IP address of a name server on your network.

   `dns_domain` is the DNS domain name.
8. Enter the following command at the `LOADER>` prompt:

   ```
   netboot URL
   ```

   `URL` is the location of the remote system files from step 2. It can be either an HTTP or a TFTP network path.
9. Press Ctrl-C for the Special Boot Menu, and then select **Option 1 for Normal Boot**. Wait until you receive the prompt: `Waiting for giveback....(Press Ctrl-C to abort wait)`
10. On the partner node, type the following command:

    ```
    cf giveback
    ```
11. After the target node completes booting, go to "Updating the CompactFlash card" on page 119.

Transferring the system files using a PC or laptop

1. Download <rlse>_setup_e.exe to your PC.

   rlse is the Data ONTAP release you are using.

   You can download the system files from the Data ONTAP Matrix on the IBM N series support website, which is accessed and navigated as described in "Websites" on page xxii. On the IBM N series support website, the Data ONTAP Matrix provides a current list and history of Data ONTAP releases available by release family and supported storage systems. You can also copy the system files from the system boot directory of another storage system at /etc/boot/netapp-x86. Contact technical support if you cannot get the system files from these sources.

   Attention: Make sure that you download the correct file, designated for PC administration.
2. Extract the contents of <*rlse*>_setup_e.exe to a temporary folder on your PC.
3. Insert the CompactFlash card into the CompactFlash card reader.

   Note: The CompactFlash card is pre-formatted. Do *not* format the CompactFlash card.
4. Create a folder called x86_elf in the root partition of the CompactFlash card, and then create a subfolder called KERNEL in the x86_elf folder.
5. In the \boot folder, copy the file netapp-x86 into the KERNEL subfolder in Windows Explorer.
6. Rename the file netapp-x86 to Primary.KRN.
7. Make sure that you are properly grounded and install the CompactFlash card into the controller module.
8. Install the CompactFlash cover.
9. Reinstall the controller module into the system and recable it, as described in "Closing the system" on page 94.

   Note: The node tries to reboot as soon as you insert it back into the chassis. After booting it will display the following message: Waiting for giveback
10. On the partner node, type the following command: cf giveback.
11. After the target node completes booting, go to "Updating the CompactFlash card."

Updating the CompactFlash card

1. Download the system files to the CompactFlash card by entering the following commands:

   ```
   download
   ```

   Attention: If the download fails with the following error message, you must run setup to reinstall the proper files on the system that enable you to execute the download command on the CompactFlash card:

   ```
   Failed to open download script file /etc/boot/x86_elf/kernel_1024.cmds:
   No such file
   [download.requestDoneError:error]: Operator requested download failed,
   ```
2. Check the version of the image by entering the following command:

   ```
   version -b
   ```
3. Reboot the system by entering the following command:

   ```
   reboot
   ```

4. Press Ctrl-C to stop the system at the LOADER> prompt, then go to “Restoring environment variables and onboard Fibre Channel port configurations.”

Restoring environment variables and onboard Fibre Channel port configurations

1. Retrieve the environment variables you saved in “Preparing for the CompactFlash card replacement” on page 116.
2. Enter the following command for each variable you must reset:

   ```
   setenv variable "value"
   ```

   variable is the variable name.

   value is the setting you are assigning to the variable.
3. Boot Data ONTAP by entering the following command from the target node's console:

   ```
   boot_ontap
   ```
4. Check the configuration of the onboard Fibre Channel ports by entering the following command:

   ```
   fcadmin config
   ```

   If the displayed information is the same as what you captured for the onboard Fibre Channel ports in Step 5 of “Preparing for the CompactFlash card replacement” on page 116, then go to “Completing the replacement process.”

   If the displayed information is different from what you captured for the onboard Fibre Channel ports, complete the following substeps:

   a. Reboot the node and press Ctrl-C when Press CTRL-C for special boot menu appears.
   b. Press Ctrl-C again when Press CTRL-C for Maintenance menu to release disks appears.
   c. Confirm disk release when prompted.
   d. Reset the Fibre Channel ports in one of three ways:
      - To reset the target ports, enter the following command for each port:

        ```
        fcadmin config -t target adapter_name
        ```
      - To reset the initiator ports, enter the following command for each port:

        ```
        fcadmin config -t initiator adapter_name
        ```
      - To reset the ports to unconfigured, enter the following command for each port:

        ```
        fcadmin config -t unconfig adapter_name
        ```
5. Halt the system by entering the halt command, then boot Data ONTAP.
6. Go to “Completing the replacement process.”

Completing the replacement process

Return the failed part to IBM. Contact IBM Service and Support at 1-800-IBM-SERV (1-800-426-7378) for more information on the return procedure.

Replacing a CompactFlash card in an N3400 system running Data ONTAP 8.0 7-Mode

The CompactFlash card stores a primary and secondary set of system files on it (also called the boot image) that the system uses when it boots. To replace the CompactFlash card, you must complete a specific sequence of procedures.

- This procedure refers to *HA pairs*, which in releases prior to Data ONTAP 8.0 were called *active/active configurations*.
- You can use this procedure only with N3400 systems running Data ONTAP 8.0 7-Mode

Replacing a CompactFlash card in a system running Data ONTAP 8.0 7-Mode

Replacing a CompactFlash card in a Data ONTAP 8.0 7-Mode system involves shutting down the node, removing the old CompactFlash card, and transferring the system files to the new CompactFlash card using either a PC and card reader/writer or using netboot.

1. "Shutting down a node"
2. "Removing the CompactFlash card from the controller" on page 122
3. "Installing the CompactFlash card using a PC or laptop with a card reader/writer" on page 123
4. "Installing the CompactFlash card and transferring system files using netboot in a 7-Mode system" on page 127
5. "Completing the replacement process" on page 129

Shutting down a node

When replacing the CompactFlash card in a system running Data ONTAP 8.0 7-Mode, you must shut down the system.

1. Shut down the system or node.

If the system is in...	Then...
A stand-alone configuration and is running	1. Enter the following command at the console: `halt -t 0` 2. Go to the next step.
A stand-alone configuration and is not running	Go to the next step.

An HA pair	1. Check the status of the target node by entering the following command at the console:
	`cf status`
	2. Take one of the following actions, depending the result of `cf status` command:
	• If the target node is not running or has been taken over by the partner node, go to the next step.
	• If the target node has not been taken over by the partner node and is running, enter the following command at the partner node console, and then go to the next step:
	`cf takeover`

2. If this is a stand-alone configuration, turn off the power supplies, unplug the power cords from the power source, and then remove the power cords.

If this is an HA pair, do not remove power from the system.

3. Go to “Removing the CompactFlash card from the controller.”

Removing the CompactFlash card from the controller

You must physically remove the old or failed CompactFlash card from the target controller in your system prior to installing the new or replacement CompactFlash card.

1. If you are not already grounded, properly ground yourself.
2. Remove any cabling from the controller module, if necessary.

   Make sure that you keep track of where the cables were connected into the controller module.
3. Remove the controller module, locate the CompactFlash compartment on the underside of the controller module, and then remove the CompactFlash cover.

   The CompactFlash card is to the right of center, near the I/O ports.

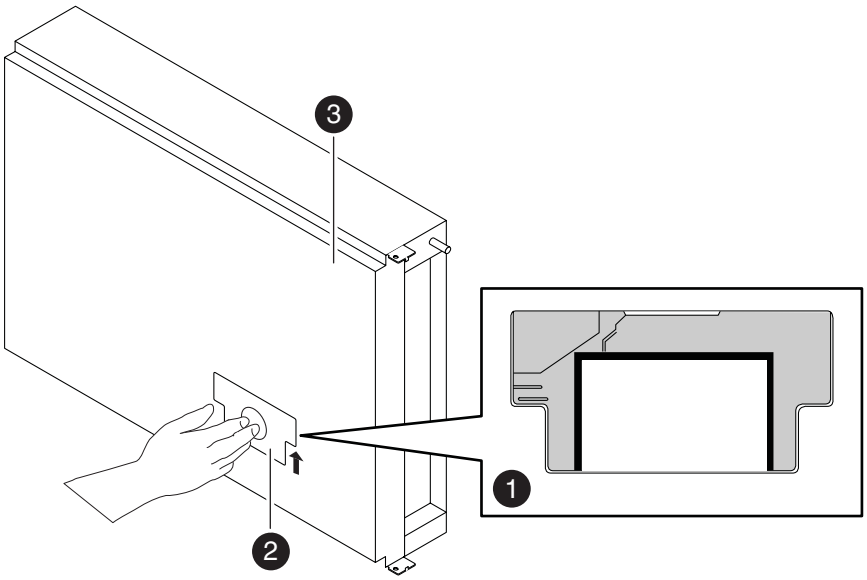


Figure 85. Removing the CompactFlash card

1	CompactFlash card with card cover removed
2	CompactFlash card cover
3	Controller module

4. Grasp the edges of the CompactFlash card and gently slide it out of the socket.
5. Set the CompactFlash card aside.
6. Determine which method you will use to transfer the system files to the replacement CompactFlash card; “Installing the CompactFlash card using a PC or laptop with a card reader/writer” on page 123, or “Installing the CompactFlash card and transferring system files using netboot in a 7-Mode system” on page 127.

Installing the CompactFlash card using a PC or laptop with a card reader/writer

You can transfer the system files to your replacement CompactFlash card using a PC or laptop with a CompactFlash card reader/writer prior to installing the replacement CompactFlash card into your controller.

For copying system files to the CompactFlash card, you must have the following:

- The blank replacement CompactFlash card you received from your provider.
- A PC or laptop with a CompactFlash reader/writer that is running Windows XP or later and that has a .zip program, such as WinZip, installed.
- Access to the IBM N series support website, which is accessed and navigated as described in "Websites" on page xxii. On the IBM N series support website, the Data ONTAP Matrix provides a current list and history of Data ONTAP releases available by release family and supported storage systems.

  This enables you to download the necessary system files for your platform and version of Data ONTAP running on it.

Transferring the system files to a CompactFlash card in a 7-Mode configuration using a PC or laptop: You can transfer the system files to the replacement CompactFlash card in a 7-Mode system using a PC or laptop that has a CompactFlash card reader/writer.

1. Download the *.tgz system image file from the Data ONTAP matrix on the IBM N series support website, which is accessed and navigated as described in "Websites" on page xxii, to a temporary folder on your PC.

   The file you download is named `<rlse>_e_image.tgz` (where *rlse* is the Data ONTAP release you are using).
2. Insert the blank CompactFlash card into the CompactFlash reader/writer and then access the CompactFlash card using Windows Explorer.

   Note: The CompactFlash card is pre-formatted. Do not reformat the CompactFlash card.
3. Create a folder in the root partition of the CompactFlash card, naming it `x86`.
4. Create a `freebsd/` subfolder, and then create `image1/` and `image2/` subdirectories inside `freebsd/`.

   The directory structure should resemble the following example:

   ```
   x86/
     freebsd/
         image1/
         image2/
   ```
5. Navigate to the folder containing the `*.tgz` file on the PC. The *.tgz contains a *.tar file.

   Double-click the `*.tgz` file to open a zip-file window displaying the contents of the *.tgz file.
6. Extract the contents of the *.tar file to the following locations on the CompactFlash card:
   - `freebsd/image1`
   - `freebsd/image2`
7. Return to the open zip-file window that displays the contents of the `*.tgz` file you want to install.
8. Uncompress and untar, if necessary, the contents of the file named `diags.tgz` to the root directory on CompactFlash card.

   This creates the directory structure for the diagnostics utilities and firmware.

9. Verify the directory structure on the CompactFlash card.

   The directory structure should resemble the following example:

```
x86/
  freebsd/
      image1/
      image2/
  diag/
  firmware/
common/
  firmware/
```

10. If the node or controller is in an HA pair and the partner took over the node, copy the backup system configuration file, `varfs.tgz`, from the target node's root volume.

    Note: If the node or controller is a stand-alone system or in an HA pair where the node was not taken over by the partner, skip this step and go to the next step.

To copy the backup system configuration file using...	**Complete the following substeps...**

An NFS client	1. Determine the taken over node's name by entering the following command from the partner's console:
	`partner hostname`*`node_name`*
	2. Export the node's root volume from the partner by entering the following command:
	`partner exportfs -p sec=sys,rw,anon=0,nosuid /vol/vol0`
	3. Go to the NFS client and create a directory for the taken over node on the NFS client by entering the following command:
	`mkdir /mnt/node_name`
	4. Mount the exported volume by entering the following command on the NFS client:
	`mount node_name:/vol/vol0 /mnt/node_name`
	5. Verify the contents of the newly mounted volume by entering the following command on the NFS client:
	`ls -al /mnt/node_name/etc/varfs.tgz`
	`-r-xr-xr-x 1 root root 76229 2009-06-02 15:34 /mnt/node_name/etc/varfs.tgz`
	6. Copy the `varfs.tgz` file to a directory on the NFS client that you can access with the PC, by entering the following command on the NFS client console:
	`cp /mnt/node_name/etc/varfs.tgz /u/target_directory/varfs.tgz`
	7. Go to the PC and copy the `varfs.tgz` file to the `freebsd/` directory and then uncompress it.
	The directory structure should appear as follows:
	`x86/`
	`  freebsd/`
	`      image1/`
	`      image2/`
	`  diag/`
	`  firmware/`
	`common/`
	`  firmware/`
	8. Go to the next step.

To copy the backup system configuration file using...	Complete the following substeps...

A CIFS client	1. Open Windows Explorer and enter the path to the partner controller by entering the following command in the navigation pane:
	`\\partner_node_name\c$`
	2. Open the `/etc` folder.
	3. Copy the `varfs.tgz` file and paste it into target directory.
	4. Go to the PC and copy the `varfs.tgz` file to the `freebsd/` directory and then uncompress it.
	The directory structure should appear as follows:
	`x86/`
	`  freebsd/`
	`  image1/`
	`  image2/`
	`  diag/`
	`  firmware/`
	`common/`
	`  firmware/`
	5. Go to the next step.

11. Close the .zip program.
12. Eject the CompactFlash card from the PC or laptop, as appropriate, and then remove the CompactFlash card from the CompactFlash card reader/writer.
13. Go to “Installing the CompactFlash card into the 7-Mode controller.”

Installing the CompactFlash card into the 7-Mode controller: After the system files are transferred to the replacement CompactFlash card, you must install it into the controller.

1. If you are not already grounded, properly ground yourself.
2. Turn the controller module so that you can locate the CompactFlash card socket.
3. Remove the CompactFlash cover, if applicable.
4. Align the CompactFlash card with the CompactFlash socket or connector, and then firmly push it into the socket or connector.

   The CompactFlash socket is keyed. If you feel resistance while pushing the card into the socket, check the orientation of the card.
5. Check the CompactFlash card to make sure that it is seated squarely and completely in the socket or connector, and reseat the CompactFlash card, if necessary.
6. Replace the CompactFlash cover.
7. Close the module cover, if necessary, by aligning the controller module cover with the notches on the sides of the controller module and sliding the cover down and forward to seat it.
8. Align the end of the controller module with the opening in the chassis, if necessary, and then gently push the controller module halfway into the system.
9. Recable the system, as needed.

   When recabling, remember to reinstall the media converters (SFPs) if you are using fiber cables.

10. Push the controller module all the way into the system, firmly push the cam handle to finish seating it, and then push the cam handle to the closed position.

If your system is in...	Header
A stand-alone configuration	Reconnect the power cables to the power supplies and to the power sources, and then turn on the power.
An HA pair	The node reboots as soon as you seat the controller completely into the system.

11. Go to “Rebooting the controller running 7-Mode.”

Rebooting the controller running 7-Mode: After copying the system files to the new CompactFlash card and installing it back into the controller, you must reboot the system.

1. Reboot the node, if necessary.

If...	Then...
`AUTOBOOT` is set on the node	The node begins the reboot process.
`AUTOBOOT` is not set or the node doesn't begin to reboot	Enter the following command from the prompt: `boot_ontap`

2. Press Ctrl-C to select the Boot Menu.
3. Complete the following substeps:
   a. Select `Update flash from backup config.` from the displayed menu.

```
Please choose one of the following:
(1) Normal Boot.
(2) Boot without /etc/rc.
(3) Change password.
(4) Clean configuration and initialize all disks.
(5) Maintenance mode boot.
(6) Update flash from backup config.
(7) Install new software first.
(8) Reboot node.
Selection (1-8)? 6
```

   b. Enter `y` when you see the following message:

```
This will replace all flash-based configuration with the last backup
to disks. Are you sure you want to continue?: y
```

   When you select this option, the system attempts to mount the root volume where the backup configuration data is located.

If the controller is...	Description
In an HA pair and the partner has taken over the node	The node enters a state of awaiting giveback. Give back the node by entering the following command from the partner's console: `cf giveback` After mounting the root volume, the backup configuration data is restored to the CompactFlash boot device and the controller automatically reboots. In HA pairs, you need to perform a giveback when the node finishes rebooting. On the partner node console, enter `cf status`. If partner is still in takeover, issue `cf giveback` again.
In a stand-alone configuration	The node reboots.

Note: The login prompt is not displayed on the console until after the controller reboots.

c. Go to “Completing the replacement process” on page 129.

Installing the CompactFlash card and transferring system files using netboot in a 7-Mode system

You can transfer the system files and restore configuration information to your system by using netboot to copy the system files to the replacement CompactFlash card.

For copying system files to the CompactFlash card, you must have the following:

- The blank replacement CompactFlash card you received from your provider.
- Access to an HTTP server.
- Access to the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii.

  This enables you to download the necessary system files for your platform and version of Data ONTAP running on it.

1. Download and extract the `netboot.tgz` file from the IBM N series support website, which is accessed and navigated as described in “Websites” on page xxii. On the IBM N series support website, the Data ONTAP Matrix provides a current list and history of Data ONTAP releases available by release family and supported storage systems.

   This file is used for performing a netboot of your system. Download the file contents to a web-accessible directory. To download the file, complete the following substeps:

   a. Download the `netboot.tgz` file from the IBM N series support website to the web-accessible directory.
   b. Change to the web-accessible directory.
   c. Extract the contents of the `netboot.tgz` file to the target directory by entering the following command:

      ```
      tar -zxvf netboot.tgz
      ```

   Your directory listing should contain the following directory:

   ```
   netboot/
   ```

2. Download the `image.tgz` file from the IBM N series support website to the web-accessible directory.

   Your directory listing should contain the following file and directory:

```
image.tgz
netboot/
```

3. If you are not already grounded, properly ground yourself.
4. Turn the controller module so that you can locate the CompactFlash card socket.
5. Remove the CompactFlash cover, if applicable.
6. Align the CompactFlash card with the CompactFlash socket or connector, and then firmly push it into the socket or connector.

   The CompactFlash socket is keyed. If you feel resistance while pushing the card into the socket, check the orientation of the card.
7. Check the CompactFlash card to make sure that it is seated squarely and completely in the socket or connector, and reseat the CompactFlash card, if necessary.
8. Replace the CompactFlash cover.
9. Align the end of the controller module with the opening in the chassis, if necessary, and then gently push the controller module halfway into the system.
10. Recable the system, as needed.

    When recabling, remember to reinstall the media converters (SFPs) if you are using fiber cables.
11. Push the controller module all the way into the system, firmly push the cam handle to finish seating it, and then push the cam handle to the closed position.

If your system is in...	Then...
A stand-alone configuration	Reconnect the power cables to the power supplies and to the power sources, and then turn on the power.
An HA pair	The node reboots as soon as you seat the controller completely into the system.

12. Reboot the system, if necessary, and press Ctrl-C to stop the boot process at the boot environment prompt when you see the following displayed on your console:

    ```
    Starting AUTOBOOT press ctrl-c to abort
    ```
13. Enter one of the following commands at the boot environment prompt:
    - If you are configuring DHCP, enter:

      ```
      ifconfig e0a -auto
      ```
    - If you are configuring manual connections, enter:

      ```
      ifconfig e0a -addr=filer_addr -mask=netmask -gw=gateway
      -dns=dns_addr -domain=dns_domain
      ```

    filer_addr is the IP address of the storage system.

    netmask is the network mask of the storage system.

    gateway is the gateway for the storage system.

    dns_addr is the IP address of a name server on your network.

    dns_domain is the Domain Name System (DNS) domain name. If you use this optional parameter, you do not need a fully qualified domain name in the netboot server URL; you need only the server's host name.

    Note: Other parameters might be necessary for your interface. Enter `help ifconfig` at the firmware prompt for details.
14. At the boot environment prompt, enter the following command:

```
netboot http://path_to_the_web-accessible_directory/netboot/kernel
```

The system begins to boot, but stops at the Boot menu.

15. Select the `Install new software first` option from the displayed menu.

```
Please choose one of the following:
(1) Normal Boot
(2) Boot without etc/rc.
(3) Change password.
(4) Clean configuration and initialize all disks.
(5) Maintenance mode boot.
(6) Update flash from backup config.
(7) Install new software first.
(8) Reboot node.
Selection (1-8)? 7
```

This menu option downloads and installs the new Data ONTAP image to the CompactFlash card.

Note: During the software install process, you are prompted for the URL of the image.tgz file. Enter the path as follows:

```
http://path_to_the_web-accessible_directory/image.tgz
```

16. Reboot the controller after the software install process is complete. Reboot it by entering `y` when you see the following prompt:

```
The node must be rebooted to start using the newly installed software.
Do you want to reboot now? {y|n} y
```

The controller reboots, but stops at the Boot menu because the CompactFlash card has been reformatted and the configuration data needs to be restored.

17. Select the `Update flash from backup config` option from the displayed menu.

```
Please choose one of the following:
(1) Normal Boot
(2) Boot without etc/rc.
(3) Change password.
(4) Clean configuration and initialize all disks.
(5) Maintenance mode boot.
(6) Update flash from backup config.
(7) Install new software first.
(8) Reboot node.
Selection (1-8)? 6
```

The system automatically reboots when the syncflash process is complete.

In HA pairs, you need to perform a giveback when the node finishes booting.

18. Go to “Completing the replacement process.”

Completing the replacement process

Return the failed part to IBM. Contact IBM Service and Support at 1-800-IBM-SERV (1-800-426-7378) for more information on the return procedure.

Replacing the LED board on an N3300, N3400 or N3600 system

To replace the LED board, you must perform a the following tasks.

Notes:

1. This is a disruptive procedure.
2. All other components in the system must be functioning properly; if not, you must contact technical support.
3. You must have a Phillips head screwdriver with a #1 bit.

Shutting down the nodes

1. If your system has two controller modules, you must disable the HA pair (or active/active configuration) with the following command:

   ```
   cf disable
   ```

2. Halt the system by entering the following command from the system console:

   ```
   halt
   ```

   For an HA pair (or active/active configuration), halt both controller modules.

   Note: You must perform a clean system shutdown before replacing system components to avoid losing unwritten data in the nonvolatile memory (NVMEM). The NVMEM LED is located on the controller module to the right of the network ports, marked with a battery symbol. If the NVMEM LED is flashing, there is content in the NVMEM that has not been saved to disk. You need to reboot the controller module and proceed from the beginning of this procedure. If repeated attempts to cleanly shut down the controller module fail, be aware that you might lose any data that was not saved to disk.

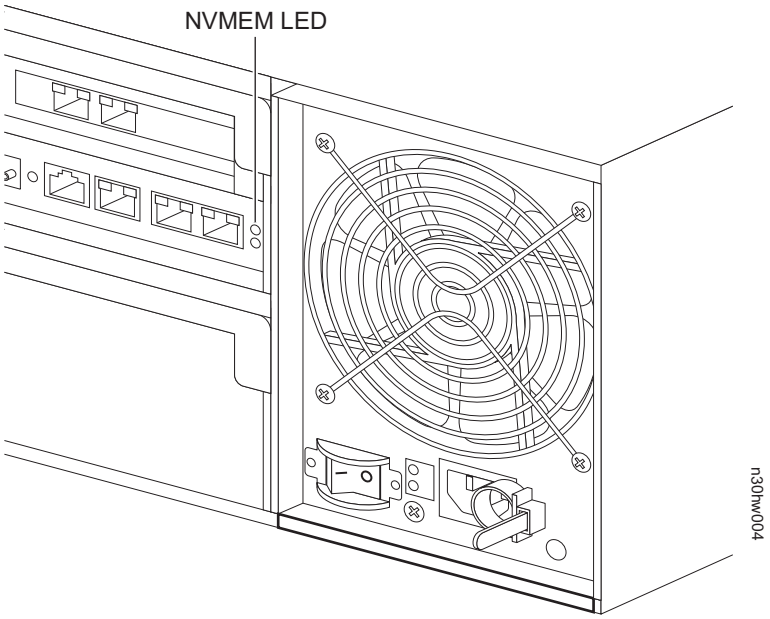


Figure 86. NVMEM LED

   Note: The illustration above shows an N3600 system. The NVMEM LEDs are in a similar location on the N3300 or N3400 system. See the *Platform Monitoring Guide* for more information about the NVMEM LEDs.

3. If you are not already grounded, properly ground yourself.
4. Turn off the power supplies, unplug both power cords from the power source, and then remove the power cords.

Removing the LED board

You must follow a specific sequence of steps to remove the LED board from the chassis.

CAUTION:
The ribbon cable is very delicate. Extreme care must be taken to keep from damaging it.

1. Remove the bezel from the front of the chassis.
2. Pull the chassis out from the rack as far as necessary to access the mounting screws that secure the LED board. See Figure 87.

   Take care in pulling the chassis out to ensure that the cabling on the rear is not disturbed.

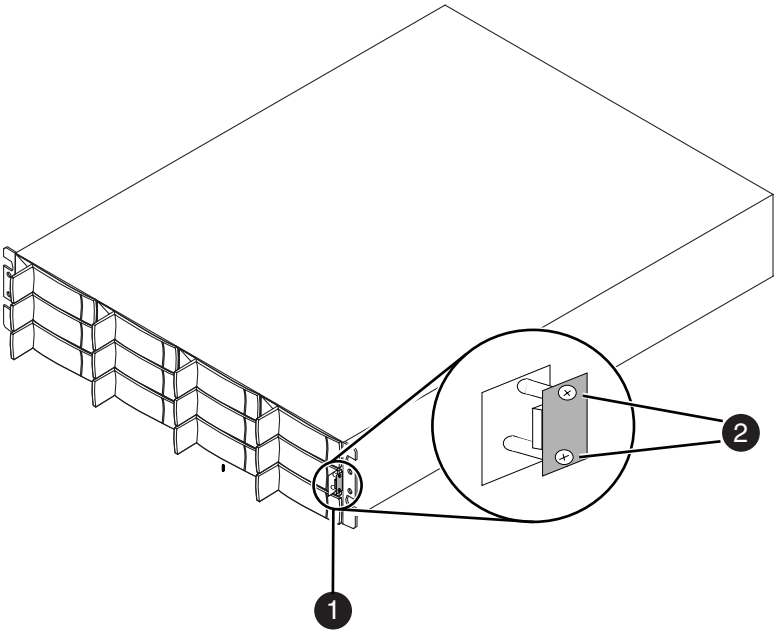


Figure 87. Removing the LED board

1	LED assembly
2	LED board mounting screws

3. Remove the two screws and set them aside.

   You will use the screws to secure the new LED board.
4. Open the ribbon cable clip that secures the ribbon connector to the back of the LED board by pushing on the clip tabs, as shown in Figure 88 on page 132.

   Note: Pay attention to how the cable is oriented into the connector so that you can correctly install the new LED board.

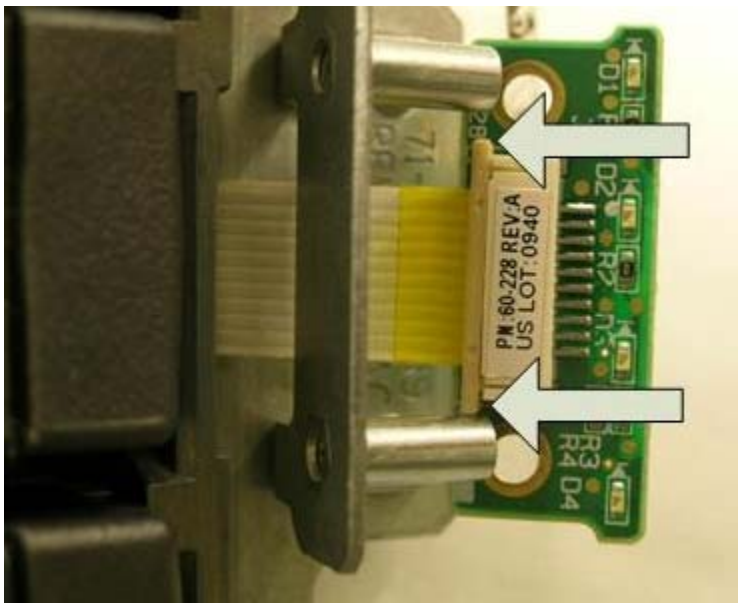


Figure 88. Opening the ribbon cable clip

5. Gently remove the LED board from the ribbon cable mounts.

Installing the LED board

You must follow a specific sequence of steps to install the LED board in the chassis.

CAUTION:
The ribbon cable is very delicate. Extreme care must be taken to keep from damaging it.

1. Make sure that the ribbon cabling is positioned toward the ribbon cable clip, and then attach the ribbon cable to the board by closing the ribbon cable clip.
2. Place the LED board in position on the mount.
3. Use the screws previously removed to attach the LED board snugly to the chassis.
4. Replace the bezel.
5. If necessary, slide the system back into the rack and resecure it to the rack.

Restarting the system

You must power up the system and, if necessary, enable the HA pair (or active/active configuration) to restore normal operation.

1. Plug in the power supplies and turn on the power.
2. If your system has two controller modules, you must enable the HA pair (or active/active configuration) with the following command:

   ```
   cf enable
   ```

Completing the replacement process

Return the failed part to IBM. Contact IBM Service and Support at 1-800-IBM-SERV (1-800-426-7378) for more information on the return procedure.

Appendix A. Recommended power line sizes

This appendix discusses how to determine the power line lengths running from your system to the power source.

Recommended AC power line sizes

Longer AC power feeds need to be properly designed to preserve voltage levels to the equipment. The wiring from the breaker panel to the power strip, which supplies power to your system and storage expansion units, can often exceed 50 feet.

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

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

Table 26. 110V, single phase recommended conductor sizes

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

Table 27. 220V, single phase recommended conductor sizes

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

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

Table 28. American Wire Gage to Harmonized Cordage equivalents

AWG	8	10	12
Harmonized, mm-mm [1]	4.0	2.5	1.5

[1] mm-mm = millimeter squared

Appendix B. FRU/CRU and power cord list for N series products

This appendix contains information about FRU/CRUs and power cords for N series products.

FRU/CRU list for N series products

For the most current FRU/CRU list for your N series product, access the IBM N series support website, as described in “Websites” on page xxii, and refer to the FRU (Field Replaceable Units) lists.

Power cord list for N series products

The following list details the power cord feature codes (FCs) for N series products.

FC 9000 (All countries)

Power cord, Rack PDU

- 27 inches
- Rated 250 V/15 A
- Product end uses C14; PDU end uses C13.

FC 9001 Europe and others

Provides power cords for Austria, Belgium, Bolivia, Bulgaria, Chile, Croatia, Czech Republic, Egypt, Estonia, European Union, Finland, France, Germany, Greece, Hungary, Iceland, Indonesia, Latvia, Lebanon, Lithuania, Luxemburg, Morocco, Netherlands, Norway, Peru, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Suriname, Sweden, Turkey

- 2.5 m (9 feet), unshielded, rated 250 V/10 A.
- Attached plug EL 211 (CEE 7-VII) designed for 200-240 V ac input.

FC 9002 United Kingdom and others

Provides power cords for United Kingdom, Costa Rica, Cyprus, Guyana, Hong Kong, Ireland, Kuwait, Malta, Oman, Singapore, Sri Lanka

- 2.5 m (9 feet), unshielded, rated 250 V/10 A.
- Attached plug EL 210 (13A fuse) designed for 200-240 V ac input.

FC 9003 Japan

Provides power cords for Japan

- 1.83 m (6 feet), unshielded, rated 125 V/15 A.
- Attached plug EL 302 (JIS C3306) designed for 100-110 V ac input.

FC 9004 U.S., Six Feet (2 m)

Provides power cords for U.S., Canada, Mexico, Belize, Columbia, Ecuador, El Salvador, Guatemala, Honduras, Korea, Nicaragua, Panama, Philippines, Puerto Rico, Saudi Arabia, Thailand, Venezuela

- 1.83 m (6 feet), unshielded, rated 125 V/15 A.
- Attached plug EL 302 (Nema 5-15P) designed for 100-120 V ac input.

FC 9005 Australia, New Zealand

Provides power cords for Australia, New Zealand, Uruguay

- 2.5 m (9 feet), unshielded, rated 250 V/10 A.
- Attached plug EL 206 (AS 3112) designed for 200-240 V ac input.

FC 9006 Switzerland, Liechtenstein

Provides power cords for Switzerland, Liechtenstein

- 2.5 m (9 feet), unshielded, rated 250 V/10 A.
- Attached plug EL 203 (SEV 1011) designed for 200-240 V ac input.

FC 9007 Argentina

Provides power cords for Argentina

- 2.5 m (9 feet), unshielded, rated 250 V/10 A.
- Attached plug EL 219 (IRAM 2073) designed for 200-240 V ac input.

FC 9008 China

Provides power cords for China

- 2.5 m (9 feet), unshielded, rated 250 V/10 A.
- Attached plug EL 602 (GB 2099/GB 1002) designed for 200-240 V ac input.

FC 9009 Denmark

Provides power cords for Denmark

- 2.5 m (9 feet), unshielded, rated 250 V/10 A.
- Attached plug EL 213 (DHCR 107-2-D1) designed for 200-240 V ac input.

FC 9010 India, Pakistan, South Africa

Provides power cords for India, Macau, Pakistan, South Africa

- 2.5 m (9 feet), unshielded, rated 250 V/10 A.
- Attached plug EL 208 (BS 164-1, BS 546) designed for 200-240 V ac input.

FC 9011 Israel

Provides power cords for Israel

- 2.5 m (9 feet), unshielded, rated 250 V/10 A.
- Attached plug EL 212 (SI 32) designed for 200-240 V ac input.

FC 9012 Italy

Provides power cords for Italy

- 2.5 m (9 feet), unshielded, rated 250 V/10 A.
- Attached plug EL 502 (CEI 23-16) designed for 200-240 V ac input.

FC 9013 North America (250 V)

Provides power cords for U.S.

- 1.83 m (6 feet), unshielded, rated 250 V/15 A.
- Attached plug EL 309 (NEMA 6-15P) designed for 200-240 V ac input.

FC 9014 Brazil

Provides power cords for Brazil

- 2.5 m (9 feet), unshielded, rated 250 V/10 A.
- Attached plug EL 211 (NBR 6147/2000) designed for 200-240 V ac input

FC 9015 Taiwan

Provides 125 V power cords for Taiwan

- 2.5 m (9 feet), unshielded, rated 125 V/15 A.
- Attached plug EL 302 (CNS 10917-3) designed for 100-120 V ac input.

FC 9016 Taiwan (250 V)

Provides 250 V power cords for Taiwan

- 1.83 m (6 feet), unshielded, rated 250 V/10 A.

- Attached plug EL 610 (CNS 10917, CNS 690) designed for 250 V ac input.

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New Orchard Road
Armonk, New York 10504
Tel: 919-499-1900

European community contact:
IBM Deutschland GmbH
Technical Regulations, Department M456
IBM-Allee 1, 71139 Ehningen, Germany

Germany Electromagnetic Compatibility Directive

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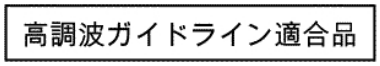

jijeta1

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ВНИМАНИЕ! Настоящее изделие относится к классу А. В жилых помещениях оно может создавать радиопомехи, для снижения которых необходимы дополнительные меры

rusemi

Taiwan Class A Electronic Emission Statement

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。

taiemi

Taiwan Contact Information

IBM Taiwan Product Service Contact Info:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd., Taipei Taiwan
Tel: 0800-016-888

台灣IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

Australia and New Zealand Class A Statement

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

Power cords

For your safety, IBM provides a power cord with a grounded attachment plug to use with this IBM product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

IBM power cords for a specific country or region are usually available only in that country or region.

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