



## **Other platform procedures**

### **ONTAP Systems**

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# Table of Contents

- Other platform procedures . . . . . 1
  - System-level diagnostics . . . . . 1
  - SuperRail kit installation instructions . . . . . 21
  - Two-post support rail kit installation instructions - AFF A700 and FAS9000 . . . . . 23
  - 42U 1280 mm system cabinet . . . . . 25
  - Swap out internal disk drive . . . . . 49
  - All SAN Array systems . . . . . 54
  - Hardware upgrade . . . . . 54

# Other platform procedures

## System-level diagnostics

### Introduction to system-level diagnostics

System-level diagnostics provides a command-line interface for tests that search for and determine hardware problems on supported storage systems. You use system-level diagnostics to confirm that a specific component is operating properly or to help identify faulty components.

System-level diagnostics is available for supported storage systems only. Entering system-level diagnostics at the command-line interface of unsupported storage systems generates an error message.

You run system-level diagnostics after one of the following common troubleshooting situations:

- Initial system installation
- Addition or replacement of hardware components
- System panic caused by an unidentified hardware failure
- Access to a specific device becomes intermittent or the device becomes unavailable
- System response time becomes sluggish

To run system-level diagnostics, you must already be running Data ONTAP because you need to reach the **Maintenance mode boot** option in Data ONTAP. There are several approaches to get to this option, but this is the recommended approach taken in the procedures documented in this guide. Some hardware components in your system may require a specific approach, and this would be documented in the applicable field replaceable unit (FRU) flyer. This guide does not provide detailed definitions of specific commands, subcommands, tests, or conditions.

Once the command is entered, the tests run in the background and the passed or failed outcome of the tests is logged in the internal memory-based log, which has a fixed size. Some tests are utilities and will simply state completed rather than passed or failed. After you run the appropriate tests, the procedures documented in this guide help you generate status report. Once the test results show a successful completion of system-level diagnostics, it is a recommended best practice to clear the log.

In the event of test failures, the status reports will help technical support make appropriate recommendations. The failure could be resolved by reinstalling the FRU, by ensuring cables are connected, or by enabling specific tests recommended by technical support and then re-running those tests. If the failure cannot be resolved, then there is a hardware failure and the affected hardware must be replaced.

There are no error messages that require further definitions or explanations.

### Requirements for running system-level diagnostics

Depending on the system-level diagnostic tests you are running, you need to be aware of time and system hardware requirements.

Each documented task has slight differences; use the recommended procedure for the task.

The following requirements must be met when running system-level diagnostics; otherwise, parts of the tests

fail and error messages appear in the status report:

## General requirements

- Each system being tested must be on a separate network.

The network interface test assigns unique static IP addresses, beginning with 172.25.150.23, to all available network interfaces on a storage system. This results in network interface ports on different storage controllers being assigned the same IP address. If all the systems being tested are on the same network, then duplicate ip address warning messages appear on the connected consoles. These warning messages do not affect the test results.

## System memory requirements

- You need to set aside time when running memory tests; the larger the memory capacity of your storage system, the longer it takes.

## NIC requirements

- All adjacent network interface ports on the system must be connected for best performance using a standard Ethernet cable.

Examples of adjacent ports are e0a and e0b or e2c and e2d.



e0M and e0P ports cannot be connected together due to an internal switch connection. In systems with e0M and e0P ports, the most efficient pairings are e0M with e0a and e0P with e0b.

- If there are a number of network interface ports on the system, you may need to run the NIC system-level diagnostic test several times, limiting each run to no more than two pairs each time.

## SAS requirements

- When running the SAS system-level diagnostic tests, adjacent SAS ports must be connected for best performance; storage shelves must be disconnected from the ports.



Connections between adjacent SAS ports is no longer a requirement for systems running Data ONTAP 8.2; however, only the internal loopback test will be run for systems with unconnected SAS ports.

## FC-AL requirements

- When running the FC-AL system-level diagnostic tests, you must have loopback hoods on FC-AL interfaces on the motherboard or expansion adapters for best performance; all other cables for storage or Fibre Channel networks must be disconnected from the ports.



While the use of loopback hoods on FC-AL interfaces are no longer requirements for systems running Data ONTAP 8.2, the scope of the test coverage on the interface is also reduced.

## CNA requirements

- The use of loopback hoods is not a requirement for running CNA system-level diagnostics tests.

## Interconnect requirements

- Both platform controller modules in a dual controller system must be in Maintenance mode for the interconnect system-level diagnostic test to run.



You will receive a warning message if you attempt to run the interconnect system-level diagnostic test with other system-level diagnostic tests.

## How to use online command-line help

You can get command-line syntax help from the command line by entering the name of the command followed by help or the question mark (?).

The fonts or symbols used in syntax help are as follows:

- **keyword**

Specifies the name of a command or an option that must be entered as shown.

- **< > (less than, greater than symbols)**

Specify that you must replace the variable identified inside the symbols with a value.

- **| (pipe)**

Indicates that you must choose one of the elements on either side of the pipe.

- **[ ] (brackets)**

Indicate that the element inside the brackets is optional.

- **{ } (braces)**

Indicate that the element inside the braces is required.

You can also type the question mark at the command line for a list of all the commands that are available at the current level of administration (administrative or advanced).

The following example shows the result of entering the environment help command at the storage system command line. The command output displays the syntax help for the environment commands.

```
toaster> environment help
Usage: environment status |
[status] [shelf [<adapter>]] |
[status] [shelf_log] |
[status] [shelf_stats] |
[status] [shelf_power_status] |
[status] [chassis [all | list-sensors | Fan | Power | Temp | Power Supply
| RTC Battery | NVRAM4-temperature-7 | NVRAM4-battery-7]]
```

## Run system installation diagnostics

You run diagnostics after an initial system installation to identify the version of system-level diagnostics and the supported devices on your storage system, and to verify that the installation is successful and that all hardware is functioning properly.

Your storage system must already be running Data ONTAP.

1. At the storage system prompt, switch to the LOADER prompt: `halt`
2. Enter the following command at the LOADER prompt: `boot_diags`



You must run this command from the LOADER prompt for system-level diagnostics to function properly. The `boot_diags` command starts special drivers designed specifically for system-level diagnostics.

3. View the version of system-level diagnostics present on your storage system by entering the following command: `sldiag version show`

The version is displayed in the format `System Level DiagnosticsX.nn.nn`. The X is an alpha reference and nn.nn are major and minor numeric references, respectively.

4. Identify the device types in your new system installation so that you know which components to verify by entering the following command: `sldiag device types`

Your storage system displays some or all of the following devices:

- `ata` is an Advanced Technology Attachment device.
- `bootmedia` is the system booting device.
- `cna` is a Converged Network Adapter not connected to a network or storage device.
- `env` is motherboard environmentals.
- `fcache` is the Flash Cache adapter, also known as the Performance Acceleration Module 2.
- `fcsl` is a Fibre Channel-Arbitrated Loop device not connected to a storage device or Fibre Channel network.
- `fcvi` is the Fiber Channel Virtual Interface not connected to a Fibre Channel network.
- `interconnect` or `nvr4m-ib` is the high-availability interface.

- mem is system memory.
- nic is a Network Interface Card not connected to a network.
- nvram is nonvolatile RAM.
- nvmmem is a hybrid of NVRAM and system memory.
- sas is a Serial Attached SCSI device not connected to a disk shelf.
- serviceproc is the Service Processor.
- storage is an ATA, FC-AL, or SAS interface that has an attached disk shelf.
- toe is a TCP Offload Engine, a type of NIC.

5. Run all the default selected diagnostic tests on your storage system by entering the following command:

```
sldiag device run
```

6. View the status of the test by entering the following command: `sldiag device status`

Your storage system provides the following output while the tests are still running:

```
There are still test(s) being processed.
```

After all the tests are complete, the following response appears by default:

```
*> <SLDIAG:_ALL_TESTS_COMPLETED>
```

7. Verify that there are no hardware problems on your new storage system by entering the following command: `sldiag device status -long -state failed`

The following example shows how the full status of the failures is displayed in a test run without the appropriate hardware:

```
*> **sldiag device status -long -state failed**

TEST START -----
DEVTYPE: nvram_ib
NAME: external loopback test
START DATE: Sat Jan  3 23:10:55 GMT 2009

STATUS: Completed
ib3a: could not set loopback mode, test failed
END DATE: Sat Jan  3 23:11:04 GMT 2009

LOOP: 1/1
TEST END -----

TEST START -----
DEVTYPE: fcal
```

```
NAME: Fcal Loopback Test
START DATE: Sat Jan  3 23:10:56 GMT 2009

STATUS: Completed
Starting test on Fcal Adapter: 0b
Started gathering adapter info.
Adapter get adapter info OK
Adapter fc_data_link_rate: 1Gib
Adapter name: QLogic 2532
Adapter firmware rev: 4.5.2
Adapter hardware rev: 2

Started adapter get WWN string test.
Adapter get WWN string OK wwn_str: 5:00a:098300:035309

Started adapter interrupt test
Adapter interrupt test OK

Started adapter reset test.
Adapter reset OK

Started Adapter Get Connection State Test.
Connection State: 5
Loop on FC Adapter 0b is OPEN

Started adapter Retry LIP test
Adapter Retry LIP OK

ERROR: failed to init adaptor port for IOCTL call

ioctl_status.class_type = 0x1

ioctl_status.subclass = 0x3

ioctl_status.info = 0x0
  Started INTERNAL LOOPBACK:
INTERNAL LOOPBACK    OK
Error Count: 2  Run Time: 70 secs
>>>> ERROR, please ensure the port has a shelf or plug.
END DATE: Sat Jan  3 23:12:07 GMT 2009

LOOP: 1/1
TEST END -----
```



If the system-level diagnostics tests...	Then...
Were completed without any failures	<p>There are no hardware problems and your storage system returns to the prompt.</p> <ol style="list-style-type: none"> <li>Clear the status logs by entering the following command: <code>sldiag device clearstatus</code></li> <li>Verify that the log is cleared by entering the following command: <code>sldiag device status</code></li> </ol> <p>The following default response is displayed:</p> <div style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <p>SLDIAG: No log messages are present.</p> </div> <ol style="list-style-type: none"> <li>Exit Maintenance mode by entering the following command: <code>halt</code></li> <li>Enter the following command at the Loader prompt to boot the storage system: <code>boot_ontap</code> You have completed system-level diagnostics.</li> </ol>
Resulted in some test failures	<p>Determine the cause of the problem.</p> <ol style="list-style-type: none"> <li>Exit Maintenance mode by entering the following command: <code>halt</code></li> <li>Perform a clean shutdown and disconnect the power supplies.</li> <li>Verify that you have observed all the considerations identified for running system-level diagnostics, that cables are securely connected, and that hardware components are properly installed in the storage system.</li> <li>Reconnect the power supplies and power on the storage system.</li> <li>Repeat Steps 1 through 7 of <i>Running system installation diagnostics</i>.</li> </ol>

## Run system panic diagnostics

Running diagnostics after your storage system suffers a system panic can help you to identify the possible cause of the panic.

- At the storage system prompt, switch to the LOADER prompt: `halt`
- Enter the following command at the LOADER prompt: `boot_diags`



You must run this command from the LOADER prompt for system-level diagnostics to function properly. The `boot_diags` command starts special drivers designed specifically for system-level diagnostics.

- Run diagnostics on all the devices by entering the following command: `sldiag device run`

4. View the status of the test by entering the following command: `sldiag device status`

Your storage system provides the following output while the tests are still running:

```
There are still test(s) being processed.
```

After all the tests are complete, you receive the following default response:

```
*> <SLDIAG:_ALL_TESTS_COMPLETED>
```

5. Identify the cause of the system panic by entering the following command: `sldiag device status -long -state failed`

The following example shows how the full status of the failures is displayed in a test run without the appropriate hardware:

```
*> **sldiag device status -long -state failed**

TEST START -----
DEVTYPE: nvram_ib
NAME: external loopback test
START DATE: Sat Jan  3 23:10:55 GMT 2009

STATUS: Completed
ib3a: could not set loopback mode, test failed
END DATE: Sat Jan  3 23:11:04 GMT 2009

LOOP: 1/1
TEST END -----

TEST START -----
DEVTYPE: fcal
NAME: Fcal Loopback Test
START DATE: Sat Jan  3 23:10:56 GMT 2009

STATUS: Completed
Starting test on Fcal Adapter: 0b
Started gathering adapter info.
Adapter get adapter info OK
Adapter fc_data_link_rate: 1Gib
Adapter name: QLogic 2532
Adapter firmware rev: 4.5.2
Adapter hardware rev: 2

Started adapter get WWN string test.
```

Adapter get WWN string OK wwn\_str: 5:00a:098300:035309

Started adapter interrupt test

Adapter interrupt test OK

Started adapter reset test.

Adapter reset OK

Started Adapter Get Connection State Test.

Connection State: 5

Loop on FC Adapter 0b is OPEN

Started adapter Retry LIP test

Adapter Retry LIP OK

ERROR: failed to init adaptor port for IOCTL call

ioctl\_status.class\_type = 0x1

ioctl\_status.subclass = 0x3

ioctl\_status.info = 0x0

Started INTERNAL LOOPBACK:

INTERNAL LOOPBACK OK

Error Count: 2 Run Time: 70 secs

>>>> ERROR, please ensure the port has a shelf or plug.

END DATE: Sat Jan 3 23:12:07 GMT 2009

LOOP: 1/1

TEST END -----

If the system-level diagnostics tests...	Then...
Were completed without any failures	<p>There are no hardware problems and your storage system returns to the prompt.</p> <ol style="list-style-type: none"> <li>Clear the status logs by entering the following command: <code>sldiag device clearstatus</code></li> <li>Verify that the log is cleared by entering the following command: <code>sldiag device status</code></li> </ol> <p>The following default response is displayed:</p> <div style="border: 1px solid #ccc; padding: 10px; margin: 10px 0;"> <p>SLDIAG: No log messages are present.</p> </div> <ol style="list-style-type: none"> <li>Exit Maintenance mode by entering the following command: <code>halt</code></li> <li>Enter the following command at the Loader prompt to boot the storage system: <code>boot_ontap</code> You have completed system-level diagnostics.</li> </ol>
Resulted in some test failures	<p>Determine the cause of the problem.</p> <ol style="list-style-type: none"> <li>Exit Maintenance mode by entering the following command: <code>halt</code></li> <li>Perform a clean shutdown and disconnect the power supplies.</li> <li>Verify that you have observed all the considerations identified for running system-level diagnostics, that cables are securely connected, and that hardware components are properly installed in the storage system.</li> <li>Reconnect the power supplies and power on the storage system.</li> <li>Repeat Steps 1 through 5 of <i>Running system panic diagnostics</i>.</li> </ol>

If the failures persist after repeating the steps, you need to replace the hardware.

## Run slow system response diagnostics

Running diagnostics can help you identify the causes of slow system response times.

- At the storage system prompt, switch to the LOADER prompt: `halt`
- Enter the following command at the LOADER prompt: `boot_diags`



You must run this command from the LOADER prompt for system-level diagnostics to function properly. The `boot_diags` command starts special drivers designed specifically for system-level diagnostics.

- Run diagnostics on all the devices by entering the following command: `sldiag device run`

4. View the status of the test by entering the following command: `sldiag device status`

Your storage system provides the following output while the tests are still running:

```
There are still test(s) being processed.
```

After all the tests are complete, the following response appears by default:

```
*> <SLDIAG:_ALL_TESTS_COMPLETED>
```

5. Identify the cause of the system sluggishness by entering the following command: `sldiag device status -long -state failed`

The following example shows how the full status of the failures is displayed in a test run without the appropriate hardware:

```
*> **sldiag device status -long -state failed**

TEST START -----
DEVTYPE: nvram_ib
NAME: external loopback test
START DATE: Sat Jan  3 23:10:55 GMT 2009

STATUS: Completed
ib3a: could not set loopback mode, test failed
END DATE: Sat Jan  3 23:11:04 GMT 2009

LOOP: 1/1
TEST END -----

TEST START -----
DEVTYPE: fcal
NAME: Fcal Loopback Test
START DATE: Sat Jan  3 23:10:56 GMT 2009

STATUS: Completed
Starting test on Fcal Adapter: 0b
Started gathering adapter info.
Adapter get adapter info OK
Adapter fc_data_link_rate: 1Gib
Adapter name: QLogic 2532
Adapter firmware rev: 4.5.2
Adapter hardware rev: 2

Started adapter get WWN string test.
```

Adapter get WWN string OK wwn\_str: 5:00a:098300:035309

Started adapter interrupt test

Adapter interrupt test OK

Started adapter reset test.

Adapter reset OK

Started Adapter Get Connection State Test.

Connection State: 5

Loop on FC Adapter 0b is OPEN

Started adapter Retry LIP test

Adapter Retry LIP OK

ERROR: failed to init adaptor port for IOCTL call

ioctl\_status.class\_type = 0x1

ioctl\_status.subclass = 0x3

ioctl\_status.info = 0x0

Started INTERNAL LOOPBACK:

INTERNAL LOOPBACK OK

Error Count: 2 Run Time: 70 secs

>>>> ERROR, please ensure the port has a shelf or plug.

END DATE: Sat Jan 3 23:12:07 GMT 2009

LOOP: 1/1

TEST END -----

If the system-level diagnostics tests...	Then...
Were completed without any failures	<p>There are no hardware problems and your storage system returns to the prompt.</p> <ol style="list-style-type: none"> <li>Clear the status logs by entering the following command: <code>sldiag device clearstatus</code></li> <li>Verify that the log is cleared by entering the following command: <code>sldiag device status</code></li> </ol> <p>The following default response is displayed:</p> <div data-bbox="670 552 1485 653" style="border: 1px solid #ccc; border-radius: 10px; padding: 10px; margin: 10px 0;"> <p>SLDIAG: No log messages are present.</p> </div> <ol style="list-style-type: none"> <li>Exit Maintenance mode by entering the following command: <code>halt</code></li> <li>Enter the following command at the Loader prompt to boot the storage system: <code>boot_ontap</code> You have completed system-level diagnostics.</li> </ol>
Resulted in some test failures	<p>Determine the cause of the problem.</p> <ol style="list-style-type: none"> <li>Exit Maintenance mode by entering the following command: <code>halt</code></li> <li>Perform a clean shutdown and disconnect the power supplies.</li> <li>Verify that you observed all the requirements for running system-level diagnostics, that cables are securely connected, and that hardware components are properly installed in the storage system.</li> <li>Reconnect the power supplies and power on the storage system.</li> <li>Repeat Steps 1 through 5 of <i>Running slow system response diagnostics</i>.</li> </ol>

If the system-level diagnostics tests...	Then...
Resulted in the same test failures	<p>Technical support might recommend modifying the default settings on some of the tests to help identify the problem.</p> <ol style="list-style-type: none"> <li>Modify the selection state of a specific device or type of device on your storage system by entering the following command: <code>sldiag device modify [-dev devtype mb slot_slotnum_] [-name device] [-selection enable disable default only]</code>   <code>-selection enable disable default only</code> allows you to enable, disable, accept the default selection of a specified device type or named device, or only enable the specified device or named device by disabling all others first.</li> <li>Verify that the tests were modified by entering the following command: <code>sldiag option show</code></li> <li>Repeat Steps 3 through 5 of <i>Running slow system response diagnostics</i>.</li> <li>After you identify and resolve the problem, reset the tests to their default states by repeating substeps 1 and 2.</li> <li>Repeat Steps 1 through 5 of <i>Running slow system response diagnostics</i>.</li> </ol>

If the failures persist after repeating the steps, you need to replace the hardware.

## Run hardware installation diagnostics

You run diagnostics after adding or replacing hardware components in your storage system to verify that the component has no problems and that the installation is successful.

- At the storage system prompt, switch to the LOADER prompt: `halt`
- Enter the following command at the LOADER prompt: `boot_diags`



You must run this command from the LOADER prompt for system-level diagnostics to function properly. The `boot_diags` command starts special drivers designed specifically for system-level diagnostics.

- Run the default tests on the particular device you added or replaced by entering the following command:  
`sldiag device run [-dev devtype|mb|slotslotnum] [-name device]`
  - `-dev devtype` specifies the type of device to be tested.
    - `ata` is an Advanced Technology Attachment device.
    - `bootmedia` is the system booting device..
    - `cna` is a Converged Network Adapter not connected to a network or storage device.



- `env` is motherboard environmentals.
  - `fcache` is the Flash Cache adapter, also known as the Performance Acceleration Module 2.
  - `fcal` is a Fibre Channel-Arbitrated Loop device not connected to a storage device or Fibre Channel network.
  - `fcvi` is the Fiber Channel Virtual Interface not connected to a Fibre Channel network.
  - `interconnect` or `nvrn-ib` is the high-availability interface.
  - `mem` is system memory.
  - `nic` is a Network Interface Card not connected to a network.
  - `nvrn` is nonvolatile RAM.
  - `nvmem` is a hybrid of NVRAM and system memory.
  - `sas` is a Serial Attached SCSI device not connected to a disk shelf.
  - `serviceproc` is the Service Processor.
  - `storage` is an ATA, FC-AL, or SAS interface that has an attached disk shelf.
  - `toe` is a TCP Offload Engine, a type of NIC.
- `mb` specifies that all the motherboard devices are to be tested.
  - `slot slotnum` specifies that a device in a specific slot number is to be tested.
  - `-name device` specifies a given device class and type.

4. View the status of the test by entering the following command: `sldiag device status`

Your storage system provides the following output while the tests are still running:

```
There are still test(s) being processed.
```

After all the tests are complete, the following response appears by default:

```
*> <SLDIAG:_ALL_TESTS_COMPLETED>
```

5. Verify that no hardware problems resulted from the addition or replacement of hardware components on your storage system by entering the following command: `sldiag device status [-dev devtype|mb|slotslotnum] [-name device] -long -state failed`

The following example pulls up the full status of failures resulting from testing a newly installed FC-AL adapter:

```
*> **sldiag device status -dev fcal -long -state failed**

TEST START -----
DEVTYPE: fcal
NAME: Fcal Loopback Test
```

START DATE: Sat Jan 3 23:10:56 GMT 2009

STATUS: Completed

Starting test on FcAl Adapter: 0b

Started gathering adapter info.

Adapter get adapter info OK

Adapter fc\_data\_link\_rate: 1Gib

Adapter name: QLogic 2532

Adapter firmware rev: 4.5.2

Adapter hardware rev: 2

Started adapter get WWN string test.

Adapter get WWN string OK wwn\_str: 5:00a:098300:035309

Started adapter interrupt test

Adapter interrupt test OK

Started adapter reset test.

Adapter reset OK

Started Adapter Get Connection State Test.

Connection State: 5

Loop on FC Adapter 0b is OPEN

Started adapter Retry LIP test

Adapter Retry LIP OK

ERROR: failed to init adaptor port for IOCTL call

ioctl\_status.class\_type = 0x1

ioctl\_status.subclass = 0x3

ioctl\_status.info = 0x0

Started INTERNAL LOOPBACK:

INTERNAL LOOPBACK OK

Error Count: 2 Run Time: 70 secs

>>>> ERROR, please ensure the port has a shelf or plug.

END DATE: Sat Jan 3 23:12:07 GMT 2009

LOOP: 1/1

TEST END -----

If the system-level diagnostics tests...	Then...
Were completed without any failures	<p>There are no hardware problems and your storage system returns to the prompt.</p> <p>a. Clear the status logs by entering the following command: <code>`sldiag device clearstatus [-dev devtype</code></p>
mb	<p>slotslotnum]` .. Verify that the log is cleared by entering the following command: <code>`sldiag device status [-dev devtype</code></p>
mb	<p>slotslotnum]` + The following default response is displayed: + ---- SLDIAG: No log messages are present. ----</p> <p>.. Exit Maintenance mode by entering the following command: <code>halt</code> .. Enter the following command at the Loader prompt to boot the storage system: <code>boot_ontap</code> You have completed system-level diagnostics.</p>
Resulted in some test failures	<p>Determine the cause of the problem.</p> <p>a. Exit Maintenance mode by entering the following command: <code>halt</code></p> <p>b. Perform a clean shutdown and disconnect the power supplies.</p> <p>c. Verify that you have observed all the considerations identified for running system-level diagnostics, that cables are securely connected, and that hardware components are properly installed in the storage system.</p> <p>d. Reconnect the power supplies and power on the storage system.</p> <p>e. Repeat Steps 1 through 6 of <i>Running hardware installation diagnostics</i>.</p>

If the failures persist after repeating the steps, you need to replace the hardware.

## Run device failure diagnostics

Running diagnostics can help you determine why access to a specific device becomes intermittent or why the device becomes unavailable in your storage system.

1. At the storage system prompt, switch to the LOADER prompt: `halt`
2. Enter the following command at the LOADER prompt: `boot_diags`



You must run this command from the LOADER prompt for system-level diagnostics to function properly. The `boot_diags` command starts special drivers designed specifically for system-level diagnostics.

3. Run diagnostics on the device causing problems by entering the following command: `sldiag device run [-dev devtype|mb|slotslotnum] [-name device]`
  - `-dev devtype` specifies the type of device to be tested.

- `ata` is an Advanced Technology Attachment device.
- `bootmedia` is the system booting device..
- `cna` is a Converged Network Adapter not connected to a network or storage device.
- `env` is motherboard environmentals.
- `fcache` is the Flash Cache adapter, also known as the Performance Acceleration Module 2.
- `fcsl` is a Fibre Channel-Arbitrated Loop device not connected to a storage device or Fibre Channel network.
- `fcvi` is the Fiber Channel Virtual Interface not connected to a Fibre Channel network.
- `interconnect` or `nvrn-ib` is the high-availability interface.
- `mem` is system memory.
- `nic` is a Network Interface Card not connected to a network.
- `nvrn` is nonvolatile RAM.
- `nvmem` is a hybrid of NVRAM and system memory.
- `sas` is a Serial Attached SCSI device not connected to a disk shelf.
- `serviceproc` is the Service Processor.
- `storage` is an ATA, FC-AL, or SAS interface that has an attached disk shelf.
- `toe` is a TCP Offload Engine, a type of NIC.
- `mb` specifies that all the motherboard devices are to be tested.
- ``slot`slotnum` specifies that a device in a specific slot number is to be tested.
- `-name device` specifies a given device class and type.

4. View the status of the test by entering the following command: `sldiag device status`

Your storage system provides the following output while the tests are still running:

```
There are still test(s) being processed.
```

After all the tests are complete, the following response appears by default:

```
*> <SLDIAG:_ALL_TESTS_COMPLETED>
```

5. Identify any hardware problems by entering the following command: `sldiag device status [-dev devtype|mb|slotslotnum] [-name device] -long -state failed`

The following example shows how the full status of failures resulting from testing the FC-AL adapter are displayed:

```
*> **sldiag device status fcsl -long -state failed**
```

```
TEST START -----
DEVTYPE: fcal
NAME: Fcal Loopback Test
START DATE: Sat Jan  3 23:10:56 GMT 2009

STATUS: Completed
Starting test on Fcal Adapter: 0b
Started gathering adapter info.
Adapter get adapter info OK
Adapter fc_data_link_rate: 1Gib
Adapter name: QLogic 2532
Adapter firmware rev: 4.5.2
Adapter hardware rev: 2

Started adapter get WWN string test.
Adapter get WWN string OK wwn_str: 5:00a:098300:035309

Started adapter interrupt test
Adapter interrupt test OK

Started adapter reset test.
Adapter reset OK

Started Adapter Get Connection State Test.
Connection State: 5
Loop on FC Adapter 0b is OPEN

Started adapter Retry LIP test
Adapter Retry LIP OK

ERROR: failed to init adaptor port for IOCTL call

ioctl_status.class_type = 0x1

ioctl_status.subclass = 0x3

ioctl_status.info = 0x0
  Started INTERNAL LOOPBACK:
INTERNAL LOOPBACK    OK
Error Count: 2  Run Time: 70 secs
>>>> ERROR, please ensure the port has a shelf or plug.
END DATE: Sat Jan  3 23:12:07 GMT 2009

LOOP: 1/1
TEST END -----
```

If the system-level diagnostics tests...	Then...
Resulted in some test failures	<p>Determine the cause of the problem.</p> <ol style="list-style-type: none"> <li>Exit Maintenance mode by entering the following command: <code>halt</code></li> <li>Perform a clean shutdown and disconnect the power supplies.</li> <li>Verify that you have observed all the considerations identified for running system-level diagnostics, that cables are securely connected, and that hardware components are properly installed in the storage system.</li> <li>Reconnect the power supplies and power on the storage system.</li> <li>Repeat Steps 1 through 5 of <i>Running device failure diagnostics</i>.</li> </ol>
Resulted in the same test failures	<p>Technical support might recommend modifying the default settings on some of the tests to help identify the problem.</p> <ol style="list-style-type: none"> <li>Modify the selection state of a specific device or type of device on your storage system by entering the following command: <code>sldiag device modify [-dev devtype mb slot_slotnum_] [-name device] [-selection enable disable default only]</code>  <code>-selection enable disable default only</code> allows you to enable, disable, accept the default selection of a specified device type or named device, or only enable the specified device or named device by disabling all others first.</li> <li>Verify that the tests were modified by entering the following command: <code>sldiag option show</code></li> <li>Repeat Steps 3 through 5 of <i>Running device failure diagnostics</i>.</li> <li>After you identify and resolve the problem, reset the tests to their default states by repeating substeps 1 and 2.</li> <li>Repeat Steps 1 through 5 of <i>Running device failure diagnostics</i>.</li> </ol>

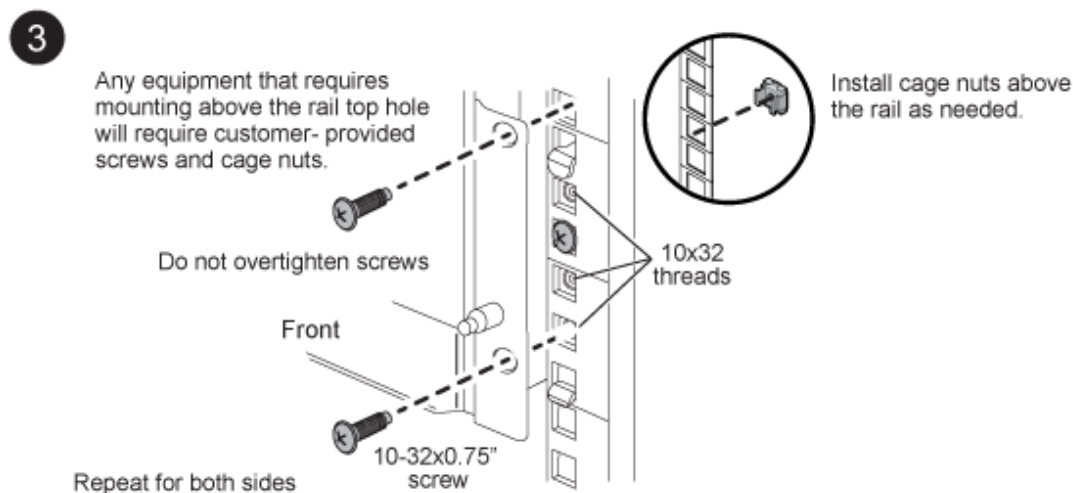
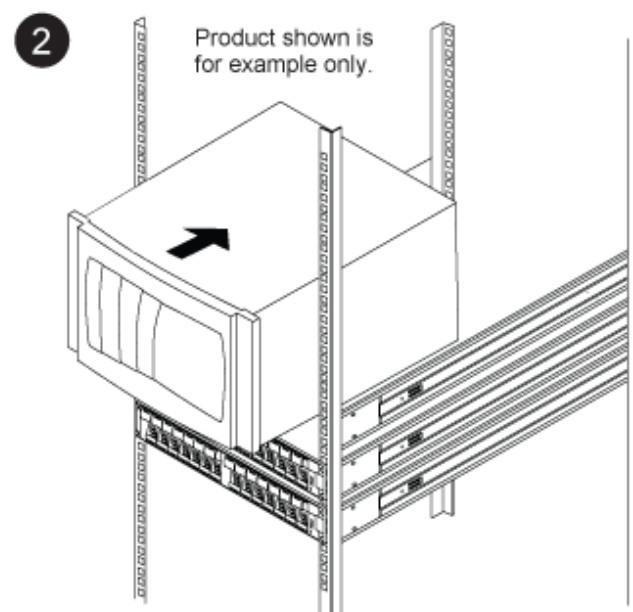
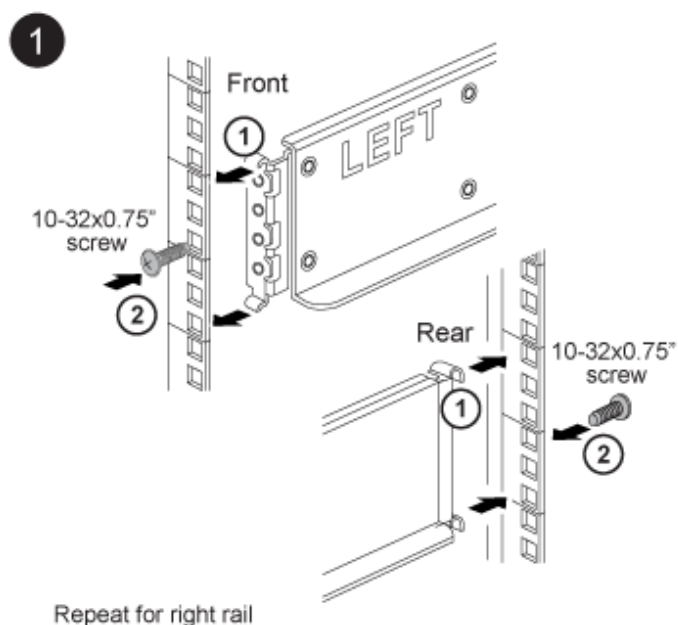
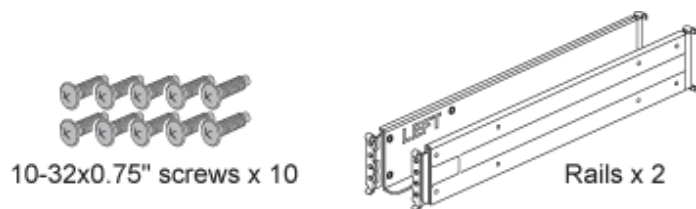
If the system-level diagnostics tests...	Then...
Were completed without any failures	<p>There are no hardware problems and your storage system returns to the prompt.</p> <ol style="list-style-type: none"> <li>Clear the status logs by entering the following command: <code>sldiag device clearstatus [-dev devtype mb slot_slotnum_]</code></li> <li>Verify that the log is cleared by entering the following command: <code>sldiag device status [-dev devtype mb slot_slotnum_]</code></li> </ol> <p>The following default response is displayed:</p> <div data-bbox="670 625 1489 724" style="border: 1px solid #ccc; border-radius: 10px; padding: 10px; background-color: #f9f9f9;"> <p>SLDIAG: No log messages are present.</p> </div> <ol style="list-style-type: none"> <li>Exit Maintenance mode by entering the following command: <code>halt</code></li> <li>Enter the following command at the Loader prompt to boot the storage system: <code>boot_ontap</code> You have completed system-level diagnostics.</li> </ol>

If the failures persist after repeating the steps, you need to replace the hardware.

## SuperRail kit installation instructions

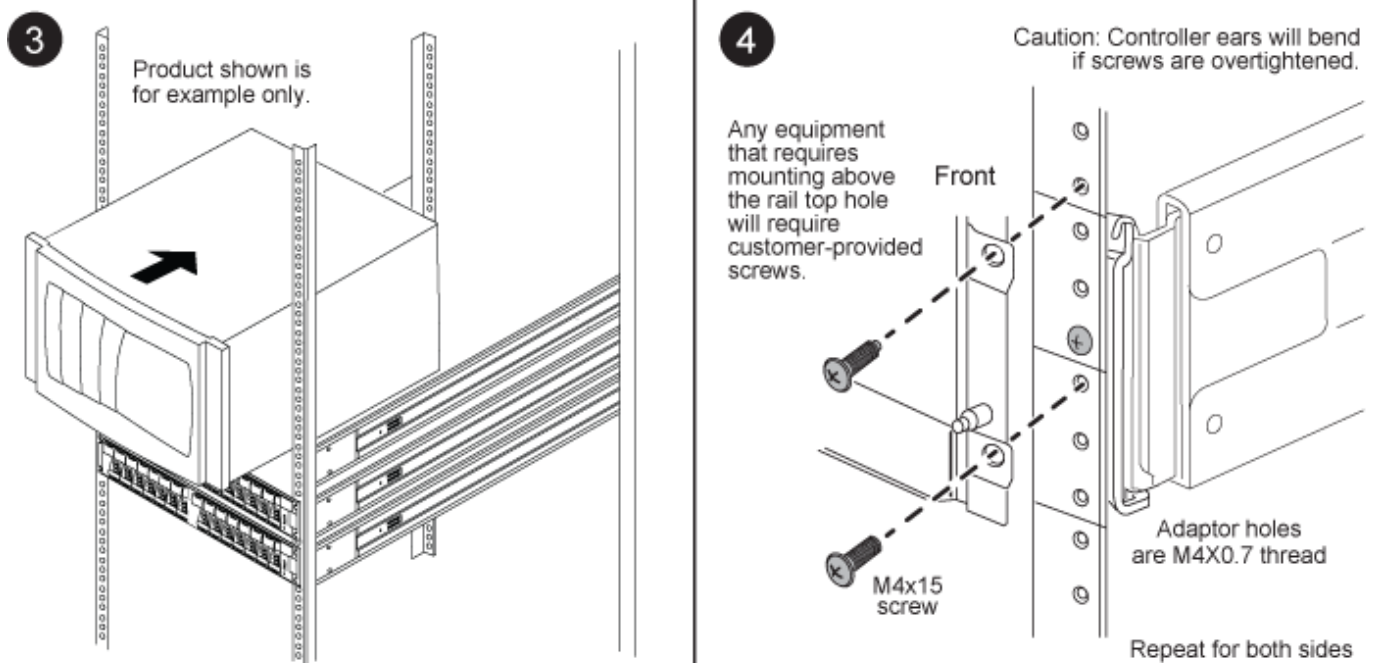
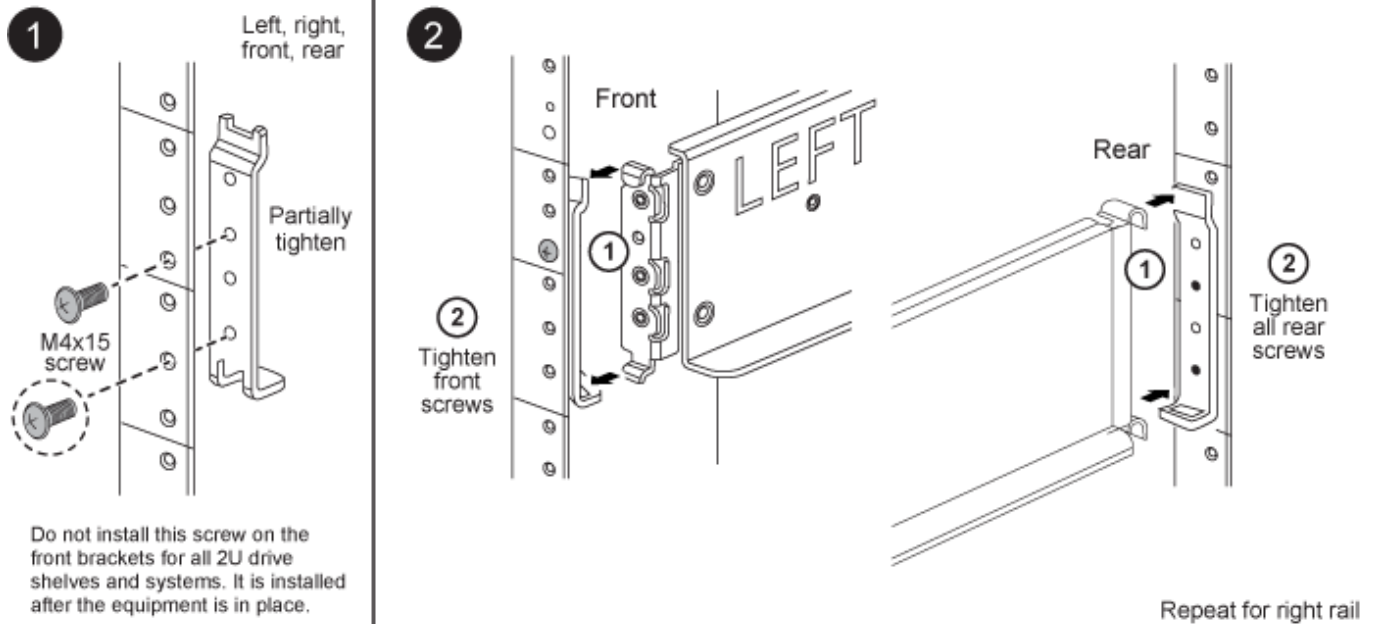
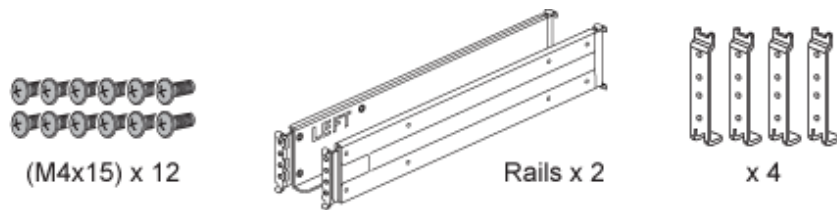
The SuperRail can be either installed on a standard square-hole four-post rack or a standard round-hole four-post rack by using the round-to-square hole adaptor brackets.

### Installing SuperRail to square-hole four-post rack



## Installing SuperRail to round-hole four-post rack



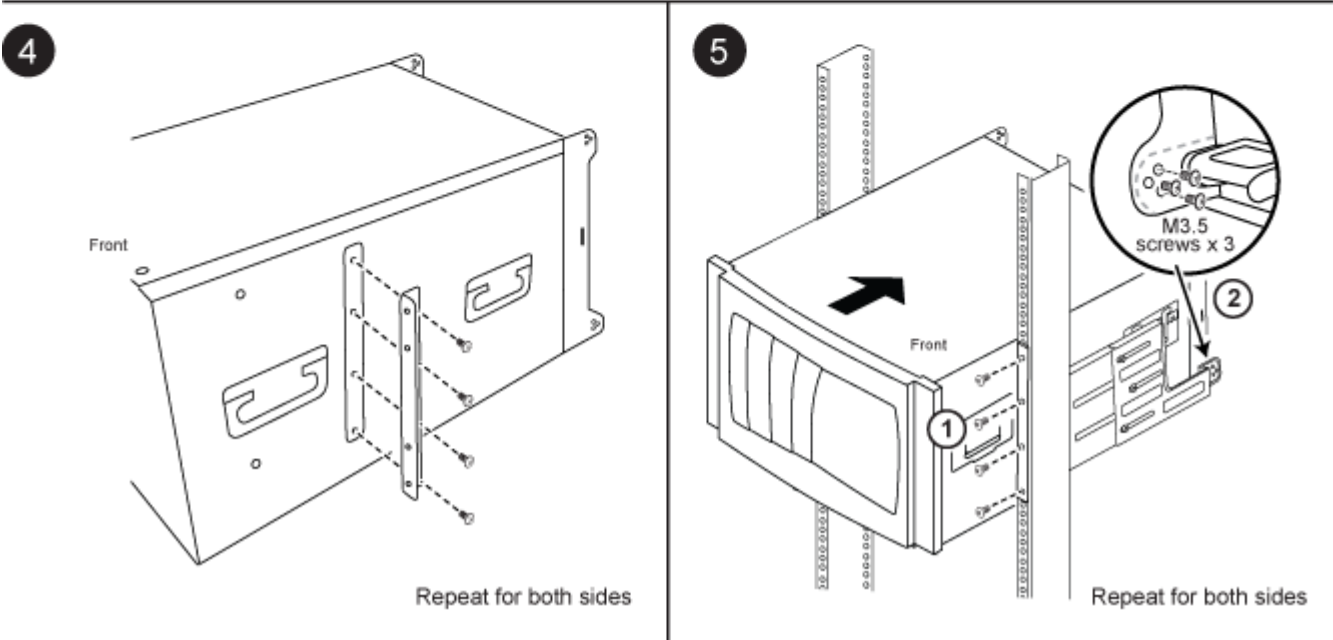
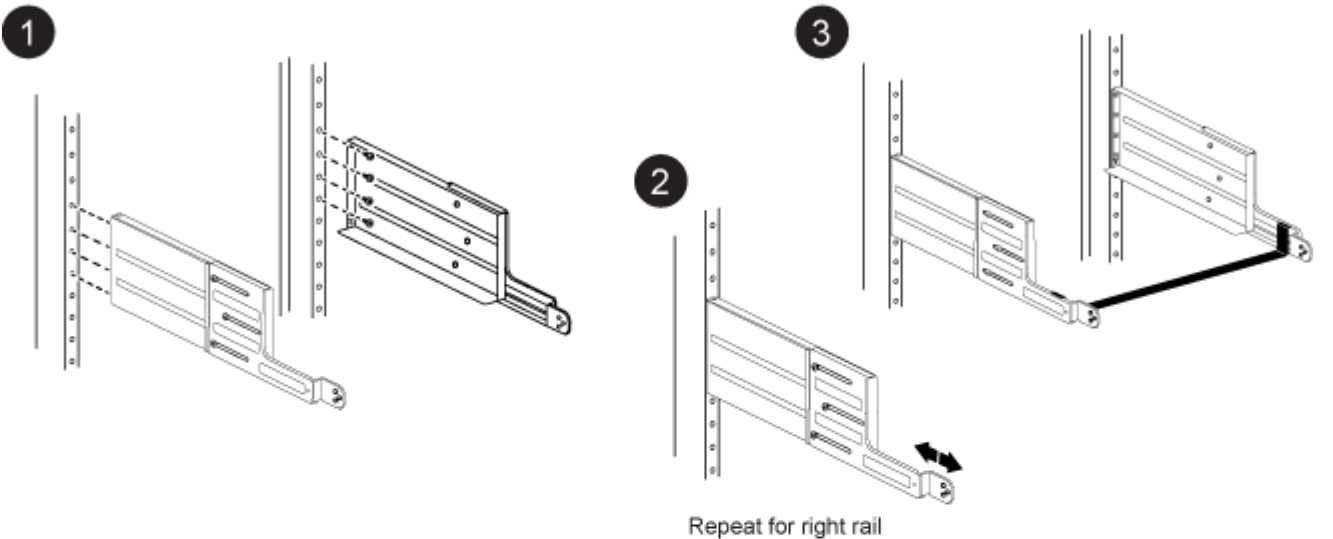
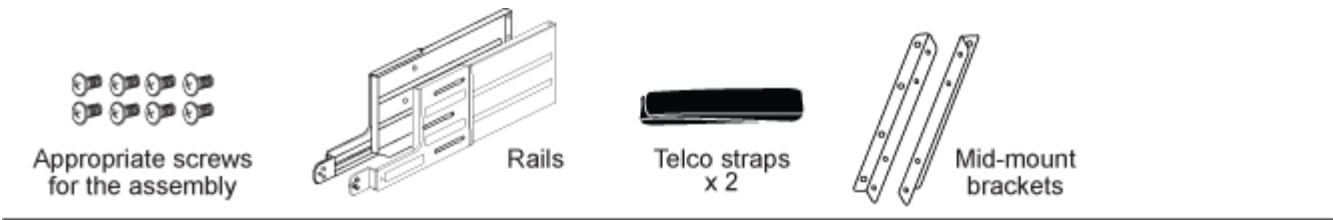


## Two-post support rail kit installation instructions - AFF A700 and FAS9000

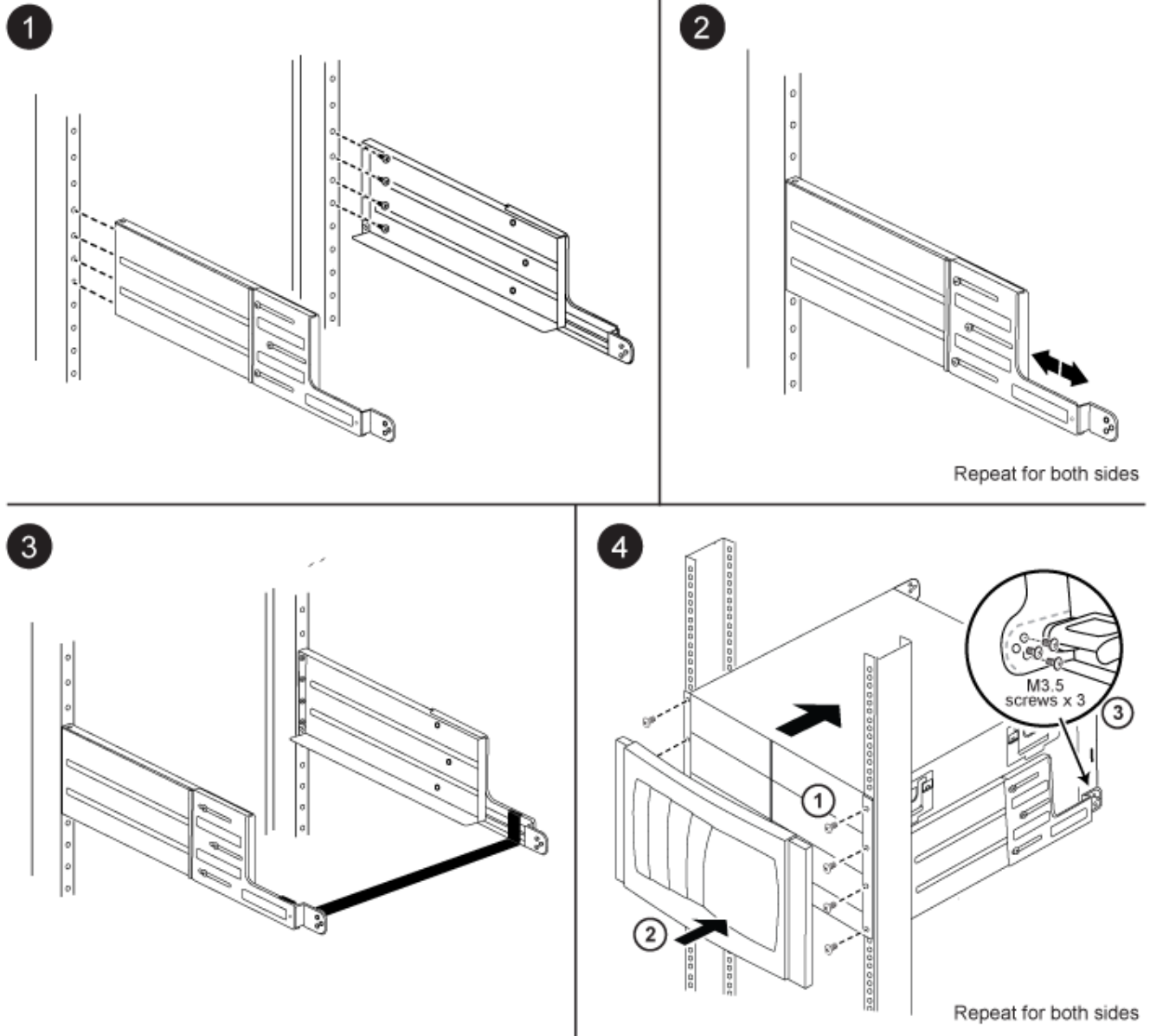
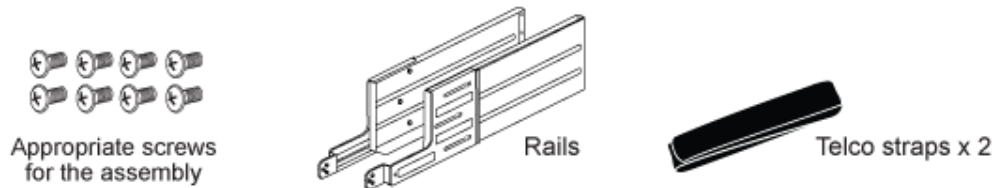
There are two, two-post support rail kits that can be used with the FAS9000 and AFF A700 systems. One kit allows you to flush-mount your system in the two-post rack, and

the other kit allows you to mid-mount your system in the two-post rack.

Install the two-post mid-mount rail kit



Install the two-post flush-mount rail kit




## 42U 1280 mm system cabinet

### Prepare to install cabinet

#### System cabinet features

The system cabinet consists of side panels, front and rear doors, an optional bolt-down kit, an optional interconnect kit, PDUs for your equipment, and an integrated cable management system.

Feature	Description
Side panels	System cabinets have lockable, removable, and interchangeable side panels.
Perforated front and rear doors	System cabinets have removable front and rear doors with a quick release mechanism. The front door is reversible, and the rear doors are split. Both doors are perforated for cooling.
Common key	This key unlocks the front doors, rear doors, and side panels.
Spares kit	<p>This kit is inside the system cabinet, attached to the cabinet door. It contains the following components:</p> <ul style="list-style-type: none"> <li>• Four 10-32 x 0.75 inch Phillips pilot screws</li> <li>• Four 10-32 cage nuts</li> <li>• One cage nut insertion tool</li> <li>• Two master key copies</li> </ul>
Cable access	Cable pass-throughs are built into the top and bottom of the cabinet, as well as between the bottom of the rear door and the frame.
Cable management	Cable management hook and loop strapping is attached to the frame of the system cabinet at equal intervals.
Support rails	<p>The number of support rails you receive depends on your configuration. The empty system cabinet is shipped with no support rails installed.</p> <ul style="list-style-type: none"> <li>• For configured system cabinets, one fixed rail kit is shipped with the system cabinet to support the 80xx, FAS8200, and DS4486 rear hold-down brackets.</li> <li>• Quick-ship system cabinets do not include the additional fixed rail kit.</li> </ul>
Blanking panels	The number and size of blanking panels you receive depends on your configuration. The empty system cabinet is shipped with no blanking panels installed.
Bolt-down kit	<p>This optional kit enables you to secure the system cabinet to the data center floor. The kit it is not intended for seismic stability.</p> <ul style="list-style-type: none"> <li>• Four bolt-down brackets</li> <li>• Four spacer brackets</li> <li>• Six M8x20 mm hex head bolts and washers</li> </ul>

Feature	Description
Interconnect kit	<p>This optional kit enables you to connect multiple system cabinets to each other.</p> <ul style="list-style-type: none"> <li>• Interconnect brackets <ul style="list-style-type: none"> <li>◦ One set of four interconnect brackets for connecting the system cabinets with side panels on</li> <li>◦ One set of four interconnect brackets for connecting the system cabinets with the side panels off</li> </ul> </li> <li>• Four M12x20 Torx-30 screws used in system cabinet with side panels on.</li> <li>• Eight M6x10 countersunk Torx-30 screws used in system cabinet with side panels off.</li> </ul>
Support rail kit	<p>If you ordered additional support rails with your system cabinet, each kit contains one left and one right support rail.</p> <div>  <p>The support rails and kit are designed to fit only the NetApp 42U 1280 mm system cabinet. Do not use the rails or a rail kit from other system cabinets because they are not designed for use in the 42U 1280 mm system cabinet.</p> </div> <ul style="list-style-type: none"> <li>• A left and right support rail</li> <li>• Two screws per rail for securing the rail to the system cabinet frame</li> </ul>
Crescent wrench	<p>The crescent wrench is used to remove the hold-down brackets on the packing pallet, adjust the system cabinet leveling feet, and install the bolt-down kit brackets, if ordered.</p>

## Required tools and equipment

Before unpacking and installing on your system cabinet, you should gather the necessary tools and equipment to move the system cabinet into place and install it or to perform maintenance on it.

- The appropriate hardware guide for your disk shelves
- The appropriate installation and setup instructions for your system

[All Flash FAS Documentation Resources](#)

[FAS Storage Systems documentation resources](#)

- #1 and #2 Phillips screwdrivers
- Torx driver for system cabinet screws
- Leveling tool for leveling the system cabinet

## Space requirements and system cabinet dimensions

When unpacking your system cabinet, you must make sure that you have enough room to remove the system cabinet from the packing material. Also make sure that the intended location for the system cabinet is large enough for you to move the cabinet into place.

### Required space for unpacking the system cabinet

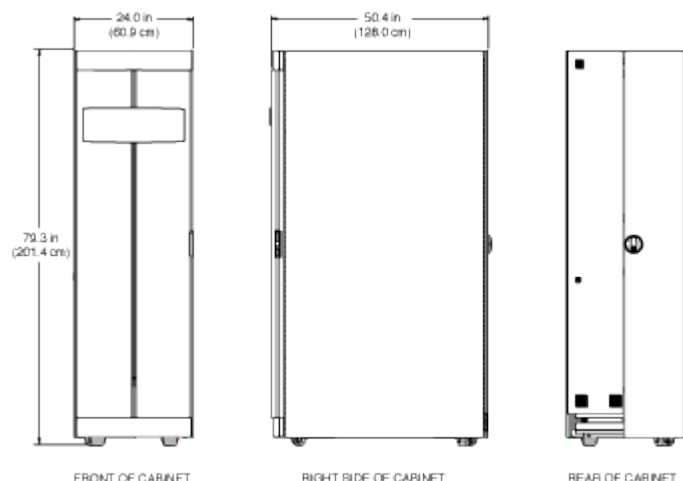
The following table defines the requires space needed to unpack and install your system cabinet:

Dimensions	U.S.
Metric	Shipping ramp length
80 in.	203.2 cm
Clearance beyond the ramp for cabinet mobility	72 in.
182.9 cm	Shipping pallet depth
59 in.	149.9 cm
Shipping pallet width	42 in.
106.6 cm	Shipping pallet and packaging height
86 in.	218.4 cm
Total rack space, 42U	73.5 in.
186.7 cm	Rail load capacity
Supports all current systems	Supports all current systems
Empty weight	~400 lbs (~181 kg) lbs
~ 181 kg	Fully loaded ship weight
Up to 1,800 lbs	Up to 816.5 kg
Fully loaded static weight	Up to 2,700 lbs
Up to 1,224.7 kg	Front service clearance
47.2 in.	120 cm

Dimensions	U.S.
Rear service clearance <b>Note:</b> The rear door is split. Actual minimum rear clearance is approximately 1/2 the recommendation.	30 in.
76.3 cm	Minimum side clearance for panel removal
24 in.	61 cm
Minimum top clearance	12 in.

### System cabinet exterior dimensions

The following illustration shows the front, rear, and side views of the system cabinet:

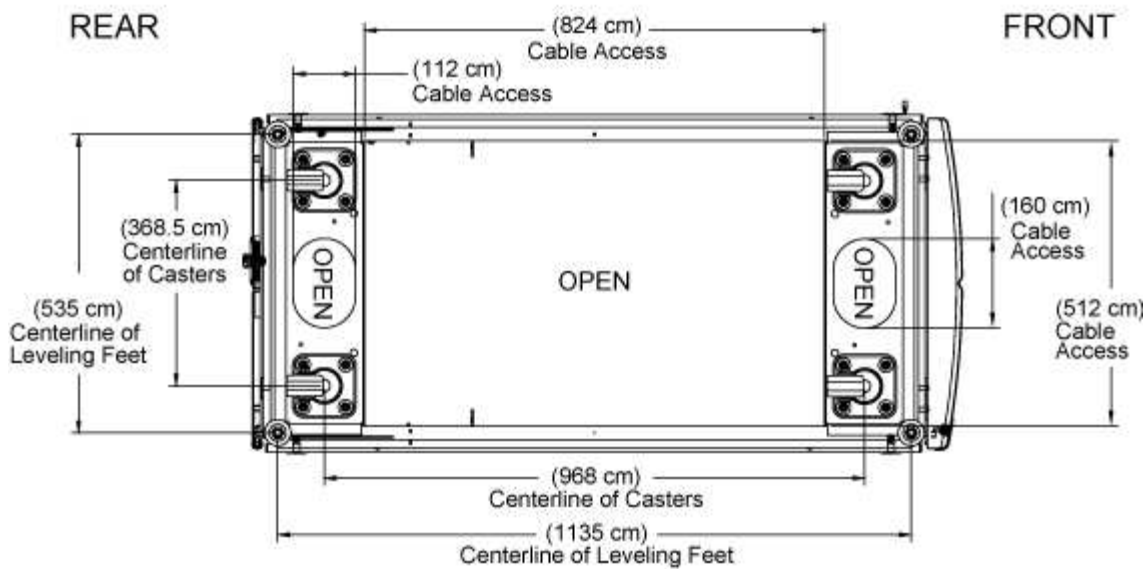
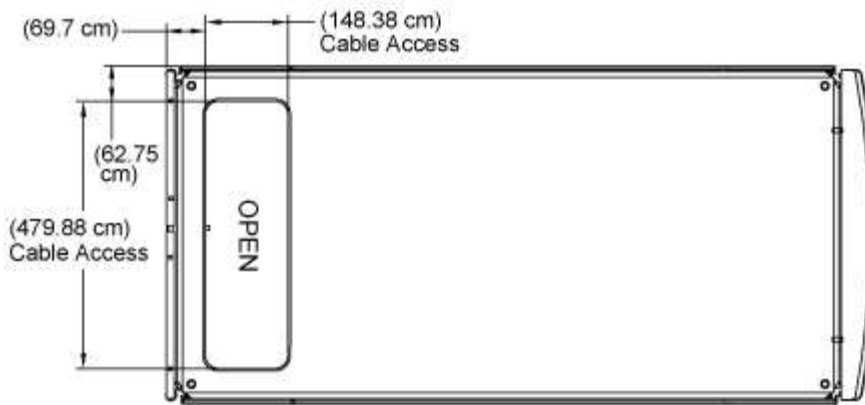


The following illustrations show top and bottom views of the system cabinet, and identify the openings through which you can run cable bundles from the floor of your data center into the system cabinet. The illustrations also show the location of the system cabinet casters and leveling feet.

### CAUTION:

To prevent your system cabinet from falling through the data center floor, do not attempt to roll the system cabinet over a floor opening that is wider than the cable access opening at the bottom of the system cabinet.

## TOP VIEW OF CABINET



## BOTTEM VIEW OF CABINET

### Supported PDU types and specifications

The system cabinet supports different Power Distribution Unit (PDU) types. The PDUs are compliant with NEMA or IEC.

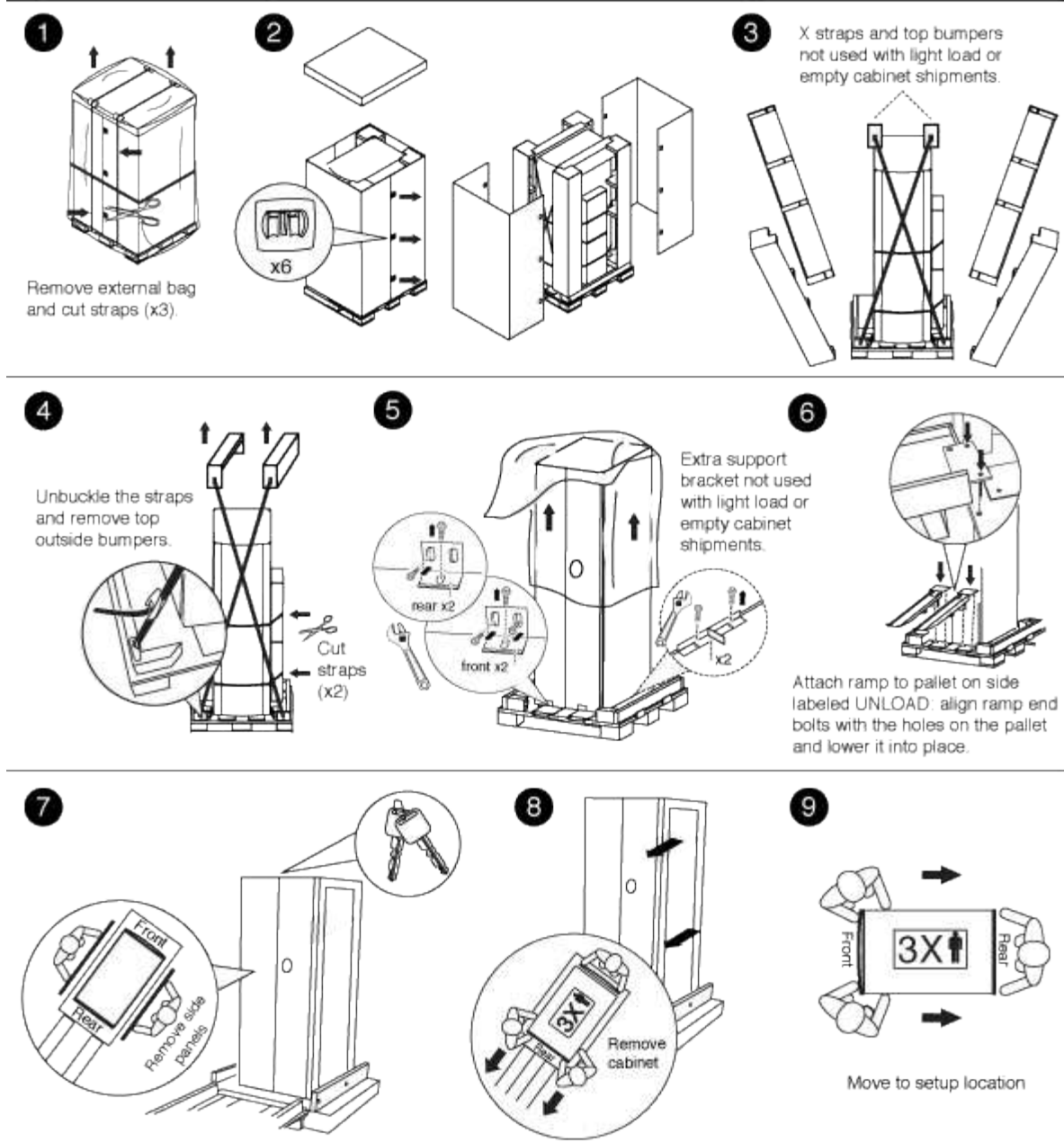
The most current information for PDUs supported in your system cabinet is listed in the Hardware Universe.

[hwu.netapp.com](http://hwu.netapp.com)

### Unpack the system cabinet

You must remove the packing material that surrounds your system cabinet before you move it into place. You should also recycle the packing material after the cabinet is unpacked.





## Install cabinet

### Install a system cabinet

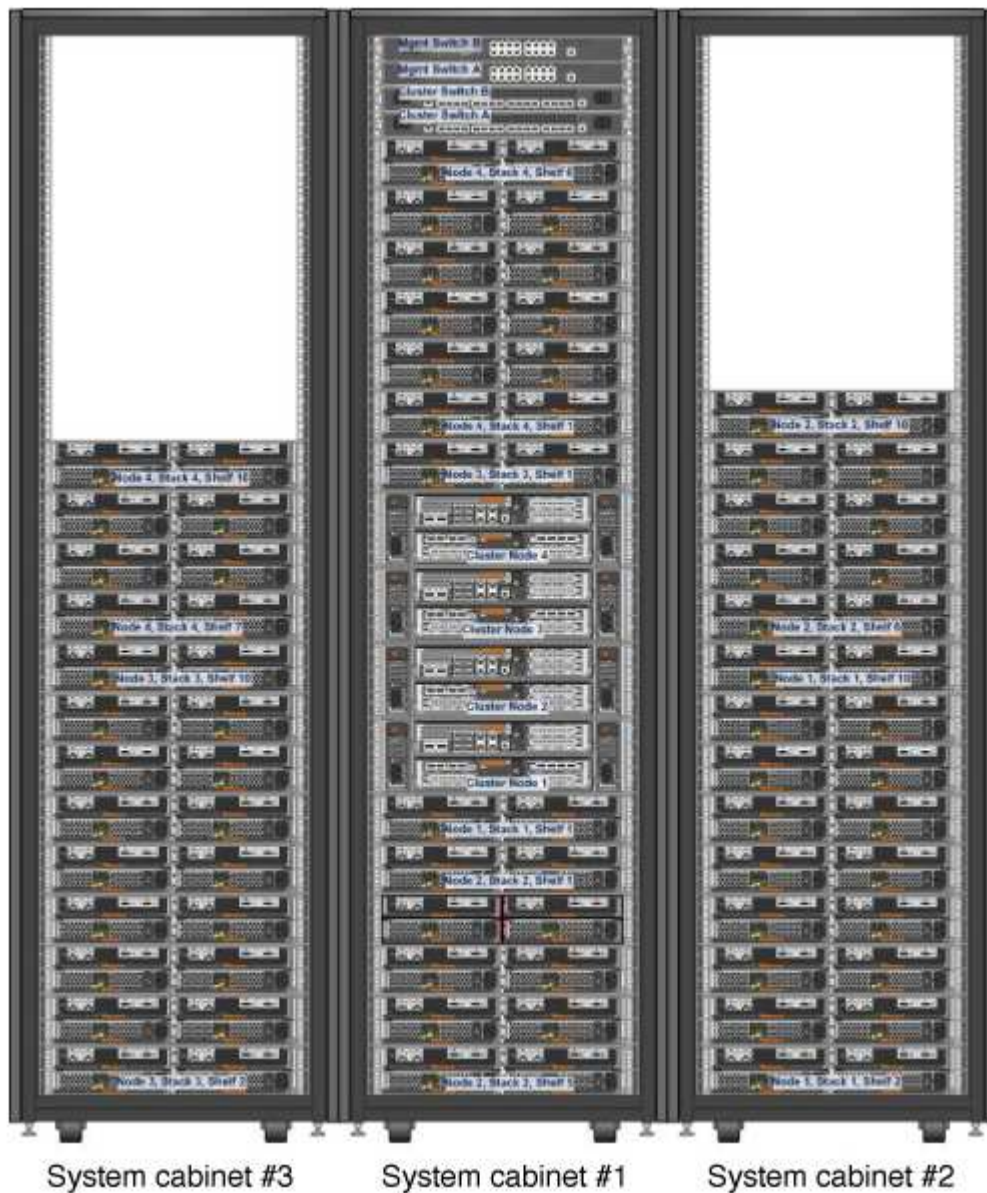
You can order a system cabinet with NetApp storage controllers and disk shelves installed in it or an empty system cabinet if you already have NetApp equipment. Several system cabinets can be connected together by using the optional interconnect kit, and they can be anchored to the data center floor by using the optional bolt-down kit.

### Install the cabinet interconnect kit

You can connect system cabinets together by using the optional cabinet interconnect kit. It is recommended that you install the kit to prevent the cabinets from pulling apart and damaging system cables.

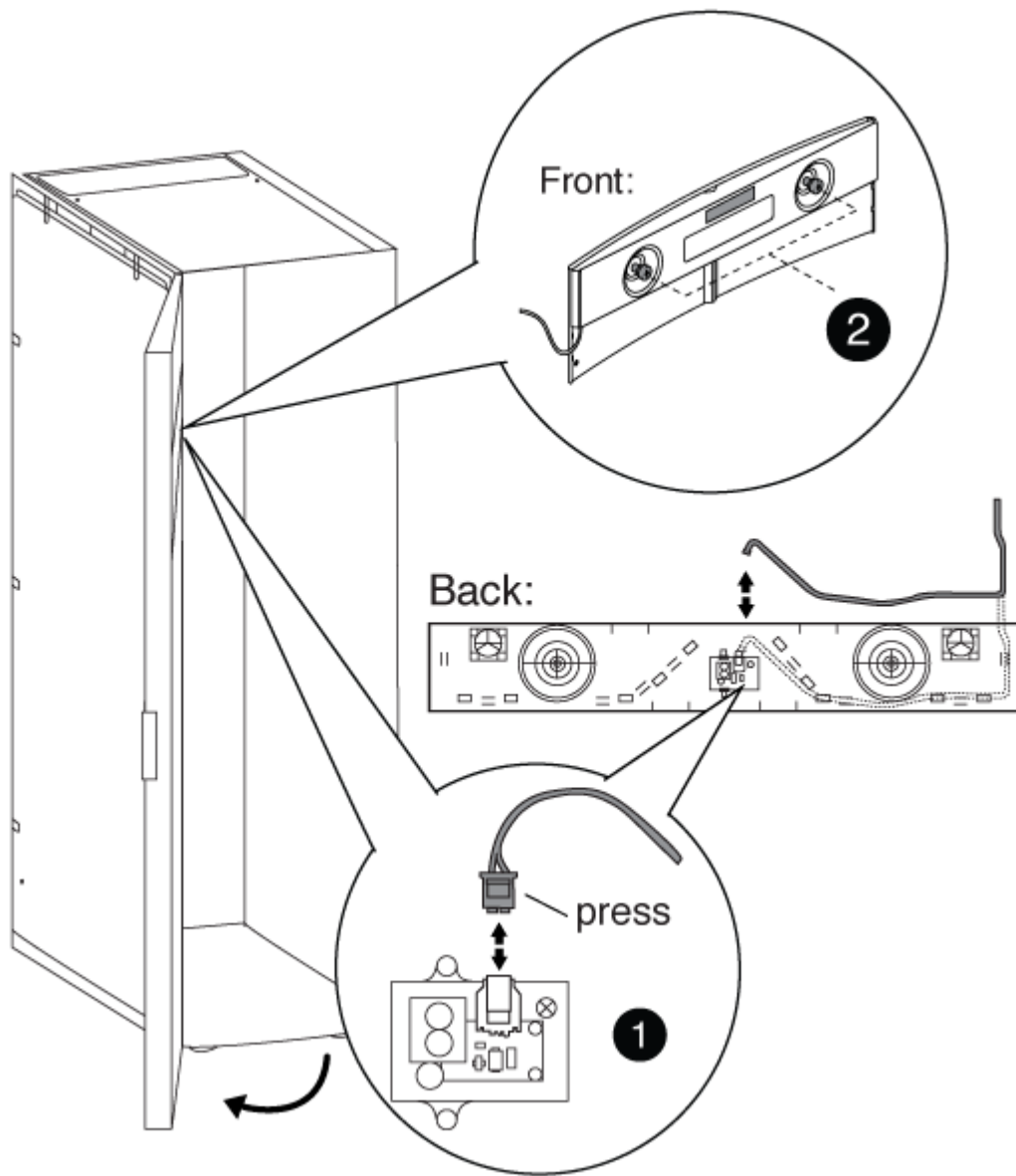
1. Place the system cabinets close together.

The cabinets should be arranged similarly to the following illustration, with the cabinet with the controller modules in the middle, and the cabinets with additional disk shelves on either side. The sides of the cabinets should be close, but do not need to touch each other yet.



2. If you are installing the interconnect kit with the side panels on as recommended, reinstall the side panels that were removed during unpacking:
  - a. Lift the side panel, tilting it about 15 degrees away from the system cabinet bottom, and then hang it over the lip at the top of the system cabinet frame.
  - b. Gently push the side panel against the cabinet frame, and then lock it in place with the key.
  - c. Repeat these substeps for the remaining side panels.
3. If you are installing the interconnect kit with the side panels removed, remove the front door whose hinges are on the edge where the cabinets meet:
  - a. Unlock and open the front door that is being removed.

b. Use the following illustration for reference to unplug the power to the illuminated bezel:



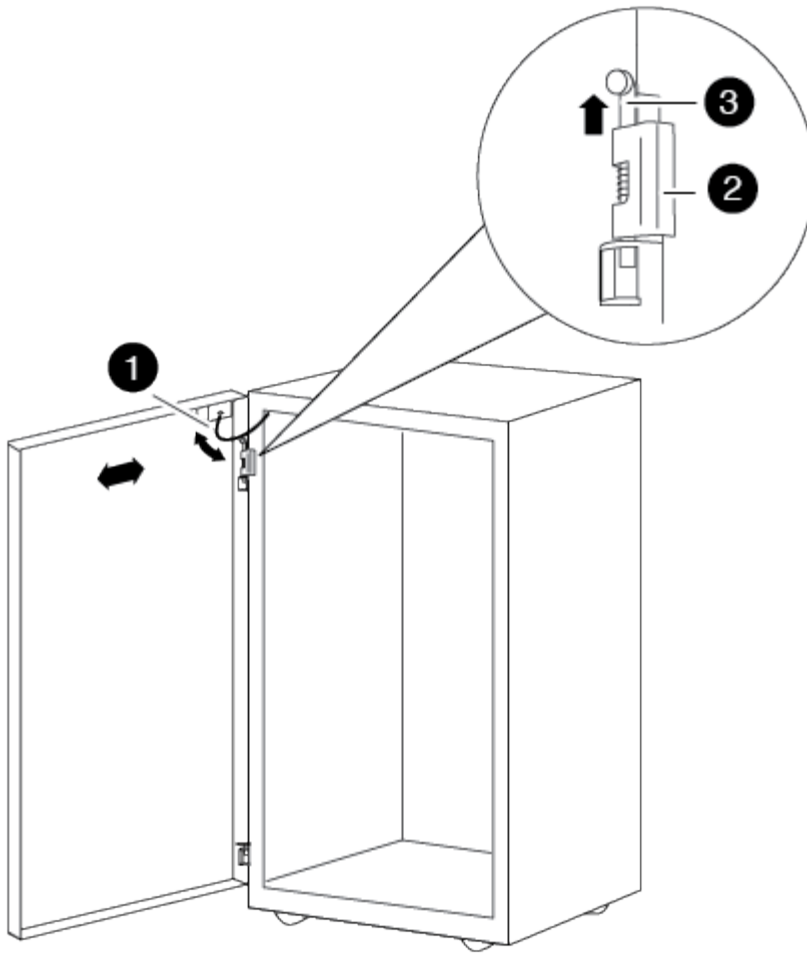
1

Illuminated bezel circuit board and cable

2

Back panel and thumbscrews

c. Use the following illustration for reference to remove the front door:

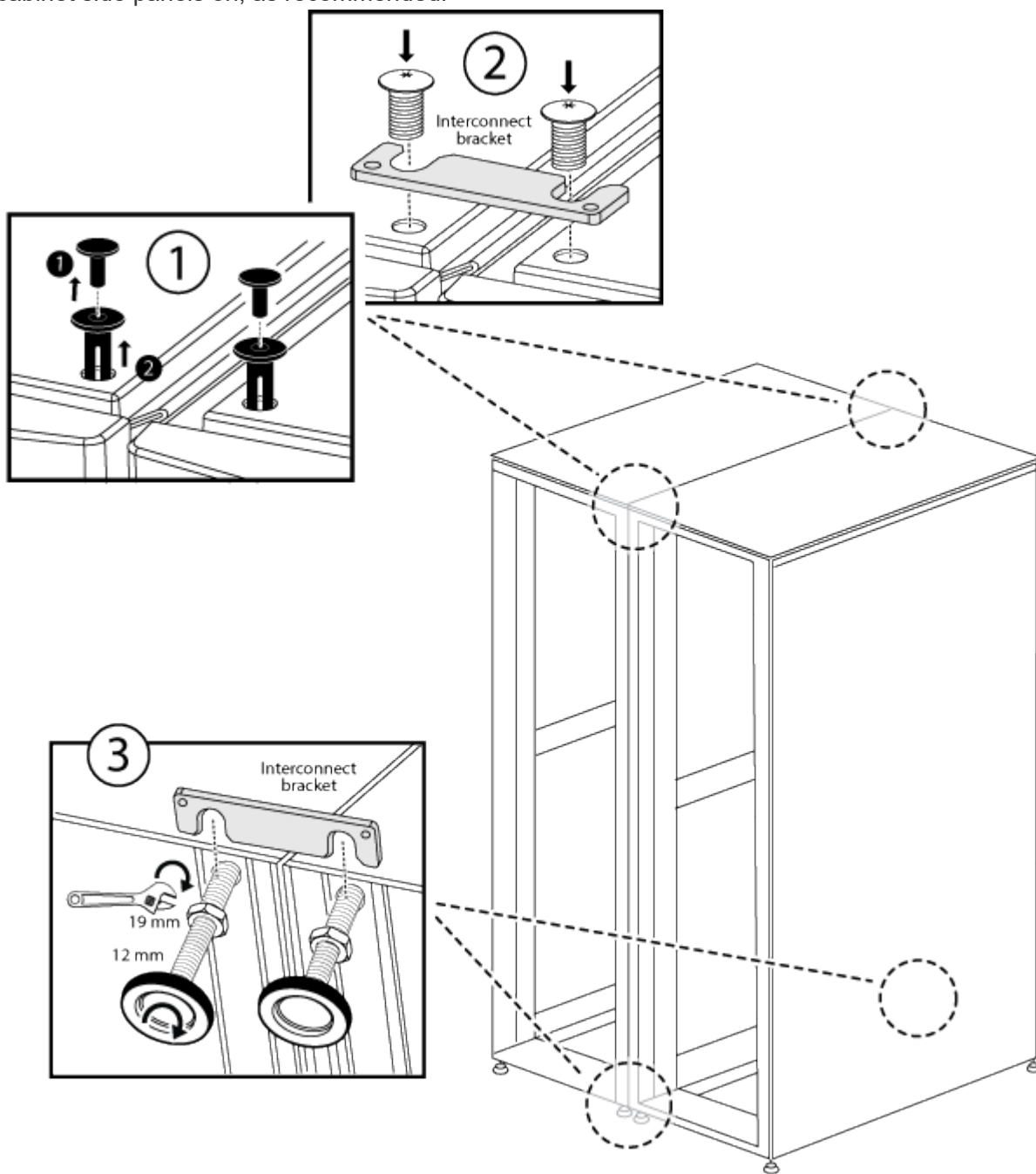


<b>1</b>	
	Door grounding cable
<b>2</b>	
	Door top hinge
<b>3</b>	
	Hinge pin

Make sure that you set the removed doors in a safe place so that they are not accidentally damaged.

4. Remove the rear door whose hinges are on the edge where the cabinets meet:
  - a. Unlock and open the rear door that you are removing.
  - b. Lift the top hinge pin until it clears the bottom of the hinge.
  - c. Gently tip the top of the door away from the system cabinet frame, and then release the hinge pin.
  - d. Lift the door off the bottom hinge, and then set the door aside.

5. Move the system cabinets completely together, and then align and level them by adjusting the four leveling feet at the bottom of the system cabinets.
6. Install the interconnect brackets.
  - Use the following illustration for reference if you are installing the interconnect brackets with the system cabinet side panels on, as recommended:



1

Plastic push-in rivets on the system cabinet top

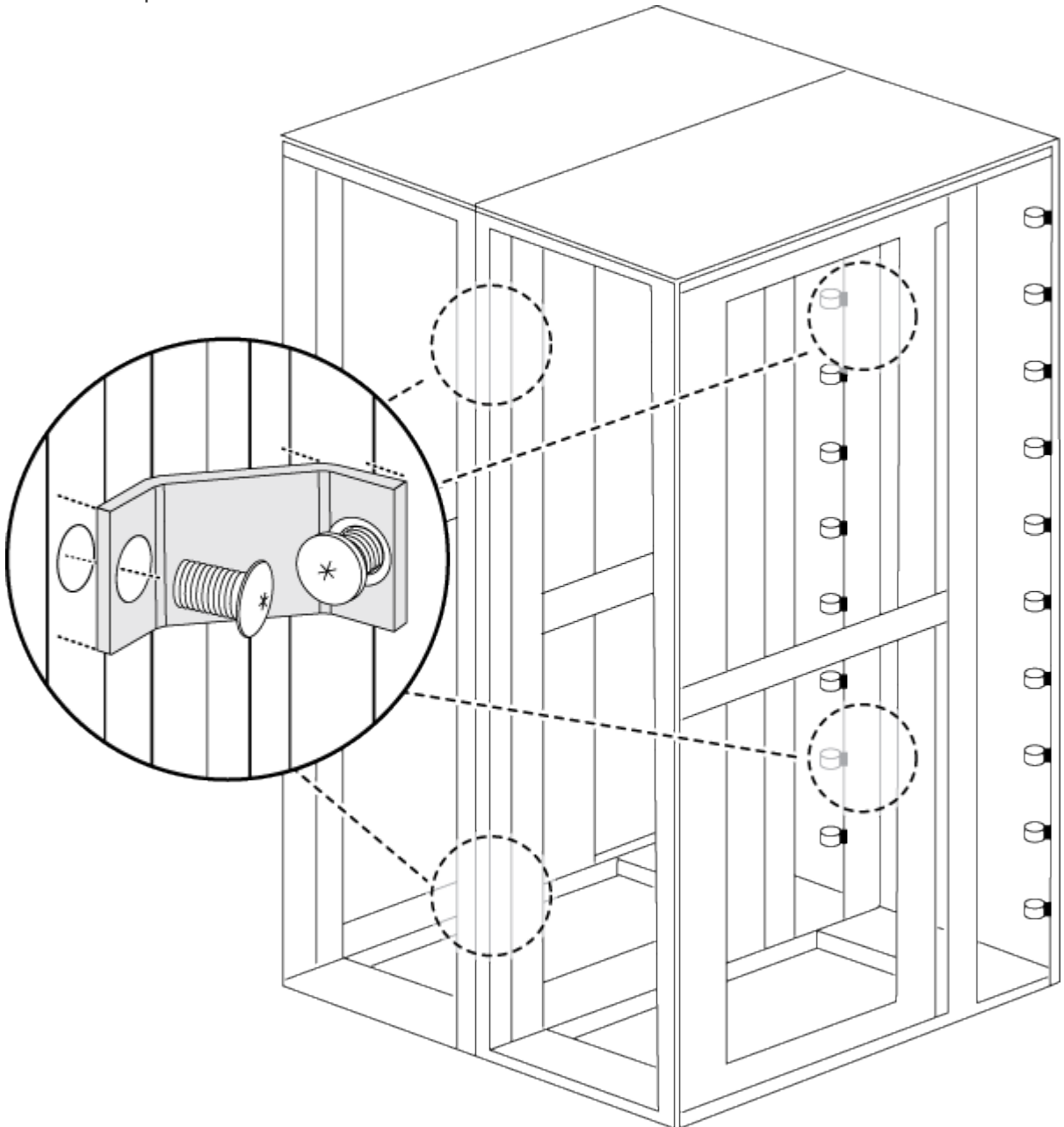
2

Top interconnect bracket

3

Bottom interconnect bracket

- Use the following illustration for reference if you are installing the interconnect brackets with the system cabinet side panels off:



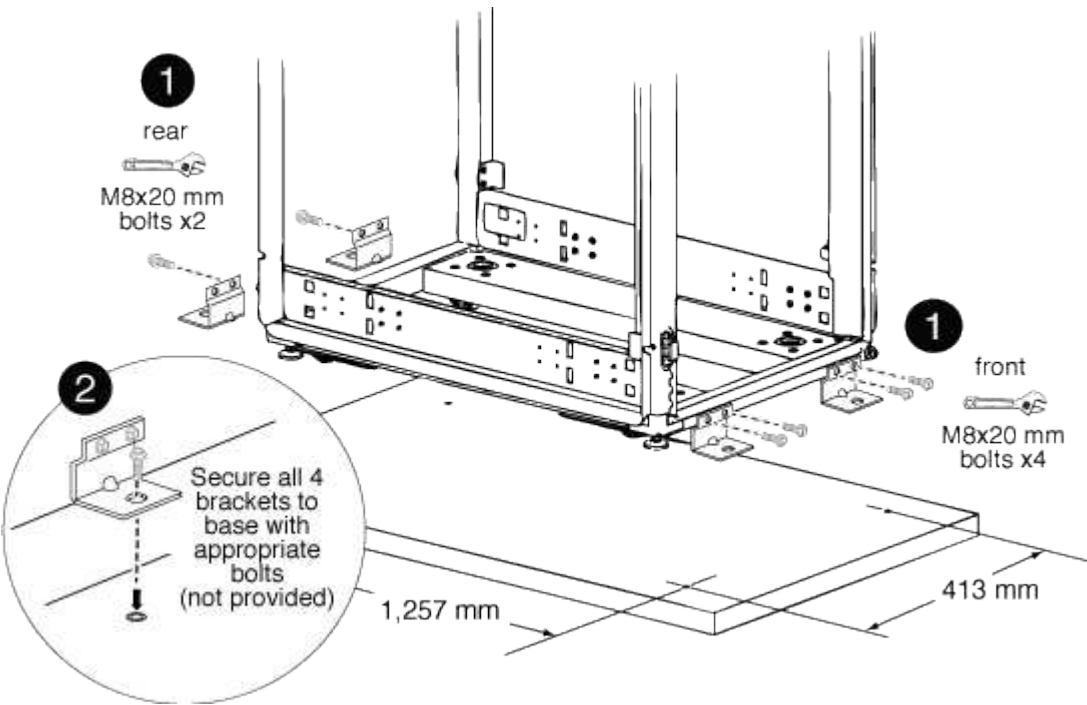
7. Repeat the process for any remaining system cabinets.
8. Tighten all interconnect bracket screws.

**Install the bolt-down kit**

You can secure the system cabinet to the floor by installing the optional bolt-down kit. Installing the kit prevents the system cabinets from being rolled out of position.

You must supply the appropriate anchor bolt for your floor for each bolt-down bracket.

- 1. Mark the area on your floor where the system cabinet will be installed, and then roll the cabinet into place.



1
Front and rear bolt-down brackets
2
Location of floor anchor point on the bracket

- 2. Mark the anchoring points where the rear bolt-down brackets will be anchored to the floor, and then drill the holes for the brackets.  
  
Be sure to use the appropriate bolt sizes and type for your floor.
- 3. If the bolt-down brackets are too low to align with the mount points on the system cabinet frame, place a spacer bracket over the hole in the floor.
- 4. Loosely bolt the rear brackets to the floor, and then using the kit bolts, bolt the brackets to the cabinet frame.
- 5. Mark the anchoring points where the front bolt-down brackets will be anchored to the floor, and then drill the holes for the brackets.

6. If the bolt-down brackets are too low to align with the mount points on the system cabinet frame, place a spacer bracket over the hole in the floor.
7. Bolt the front brackets to the floor, and then using the kit bolts, bolt the brackets to the cabinet frame.
8. Lower the leveling feet as needed, and then tighten the rear bolt-down brackets to the floor.

### Install additional support rails

Your system cabinet has some support rails already installed in it. If you need additional support rails for your system, you must install them before installing your system components.

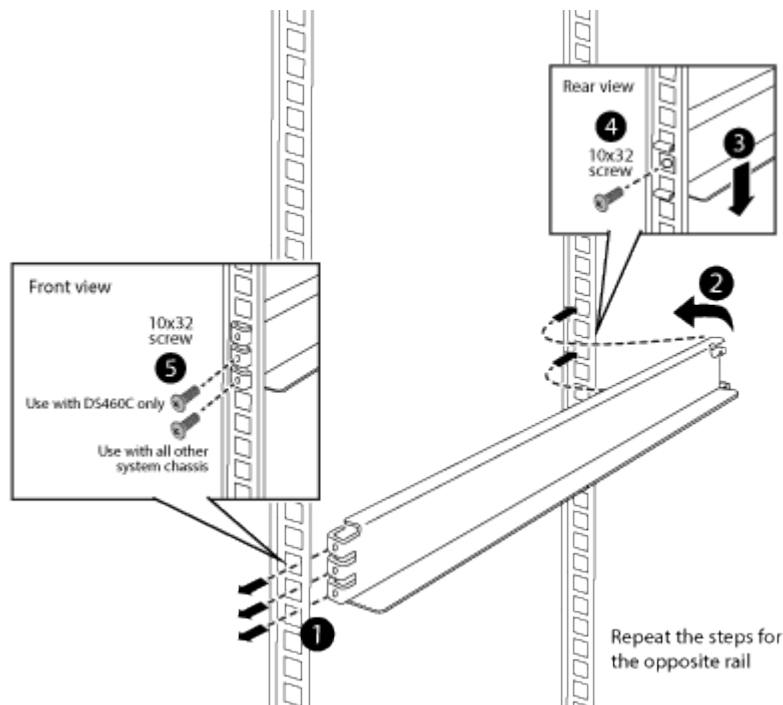
This task applies to all controller and disk shelves except the DS212C and the DE212C disk shelves. Use the instructions in the rail kit flyer applicable to those two disk shelves.

#### Installing a DE212C or DS212C Shelf in a Two-Post or Four-Post Rack

1. Determine how much space your equipment requires.

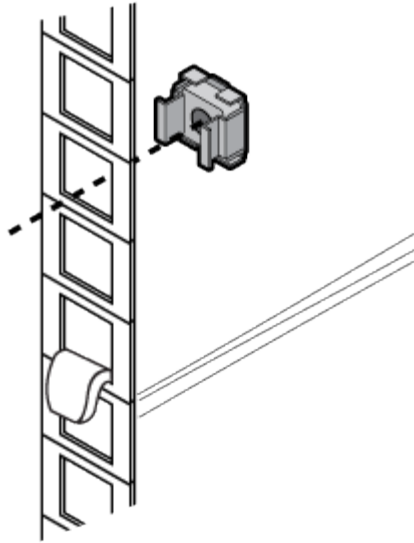
Calculate the amount of U space (1.75 inches per U) the equipment requires, based on the equipment height, and then determine where the equipment will be installed in the system cabinet based on available space.

2. Locate where you need to install the support rails, and then install them using the following illustration for reference:



3. If your equipment mounting flanges extend beyond the screw holes in the support rail, install cage nuts above the support rail, where needed.





### Install equipment in the system cabinet

After you have installed any additional support rails into the system cabinet, you can add more system components to your prepopulated system cabinet or add your existing system components to an empty system cabinet.

1. Unlock and open the rear doors of the system cabinet and the front door, if it is not already open.
2. Install your equipment into the system cabinet as described in the installation instructions accompanying your equipment.

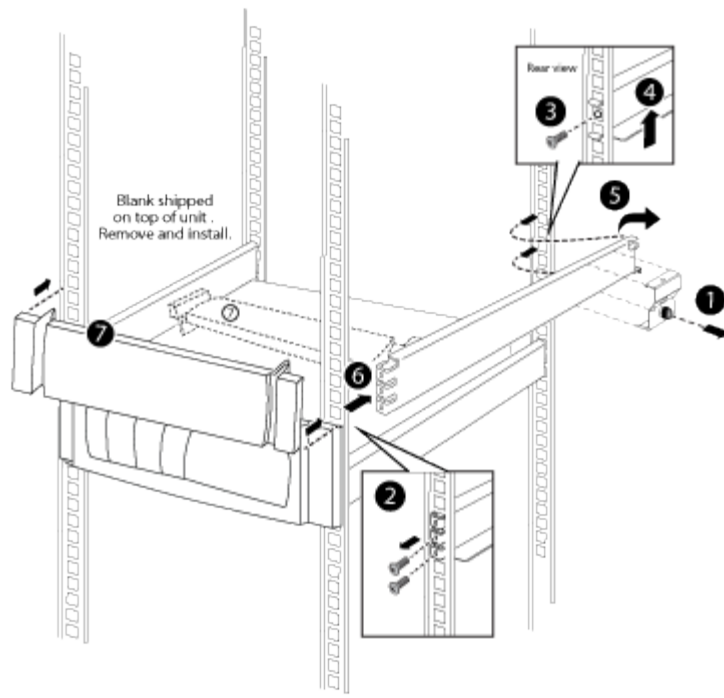
The storage controllers should be in the middle of the system cabinet. The disk shelves should be above and below the storage controllers. Any switches should be at the very top of the system cabinet.



If your equipment mounting flanges extend beyond the screw holes in the support rail, install cage nuts above the support rail where needed to secure the equipment to the cabinet upright.

3. Install blanking panels over any empty bays in the system cabinet.

If you receive the system cabinet with equipment already installed, you must remove the tie-down rails on top of the equipment that is directly below empty cabinet bays, as shown in the following illustration:



4. Reinstall the front and rear system cabinet doors.

### Power on the system cabinet

You must connect the system components to the PDUs, route the PDU cables to the AC power sources, connect them to the power sources, and power on the system.

You must have separate power circuits available for each PDU in your system cabinet.

1. Connect your equipment to the PDUs, making sure that you connect each component's power supplies to a PDU on opposite sides of the system cabinet.
2. Feed the PDU power cables through an opening in the system cabinet.

Use one of the following openings:

- The top of the system cabinet
- Between the rear door bottom and frame of the system cabinet
- Through the floor opening and under the system cabinet

3. Turn off the power switches or circuit breakers on the PDUs.
4. Plug each PDU power cable into individual AC power sources that are on separate AC circuits.
5. Turn on the power switches or circuit breakers to the PDUs.
6. Turn on the power to your components, and then boot the system.
7. Close and lock the system cabinet doors.

### Replace PDUs

You can replace a failed PDU in your system cabinet or replace an existing PDU with a different type of PDU.

The replacement PDU must be supported by your system cabinet and must provide sufficient power to the installed equipment.

[hwu.netapp.com](http://hwu.netapp.com)

1. Turn off the circuit breakers on the target PDU, and then unplug the old PDU from the AC power source.
2. Ground yourself to the system cabinet, and then unplug the power cords from each of the system components and from the PDU.
3. Remove the screws from the PDU frame, bottom screw first.



Ensure that you support the PDU with one hand while you remove the last screw from the top of the PDU. This prevents the PDU from dropping or falling toward you after the screw is removed.

4. Remove the old PDU from the system cabinet.

Make sure that you keep track of the mounting screws so that you can reuse them when installing the replacement PDU.

5. Remove the brackets from the old PDU, and then install them on the back of the replacement PDU.
6. While supporting the replacement PDU, align the slot on the mounting bracket of the PDU with the top holes of the frame on the inside of the system cabinet, and then secure the PDU to the system cabinet frame using the mounting screws from the old PDU.
7. Secure the bottom of the PDU to the system cabinet frame, and then tighten all of the mounting screws.
8. Verify that all of the power switches or circuit breakers are in the Off position.

If the circuit breakers are not in the Off position, push a small screwdriver or straightened paper clip into the slot to the right of the Off label to trip the circuit breaker and turn off the circuit.

9. Plug the system power cords into the PDU, plugging each component into the PDU outlet directly across from the component.



A best practice is to distribute the total load across the PDU branches, making each branch load as equal as possible.

10. Lock each component power cable plug in place with the cable retainer clip above it by sliding the curved edge of the cable retainer clip over the plug shoulder.
11. Plug the PDU power cord into the AC power source.
12. Turn on the PDU power switches or PDU circuit breakers.

For PDU circuit breakers, the button is on when it is flush with the PDU frame.

## Reverse cabinet front door

### Reverse the system cabinet front door

You can change the direction the front door opens by removing the illuminated badge, door, top hinge, and related hardware, and then installing them on the opposite side of the front of the system cabinet frame.

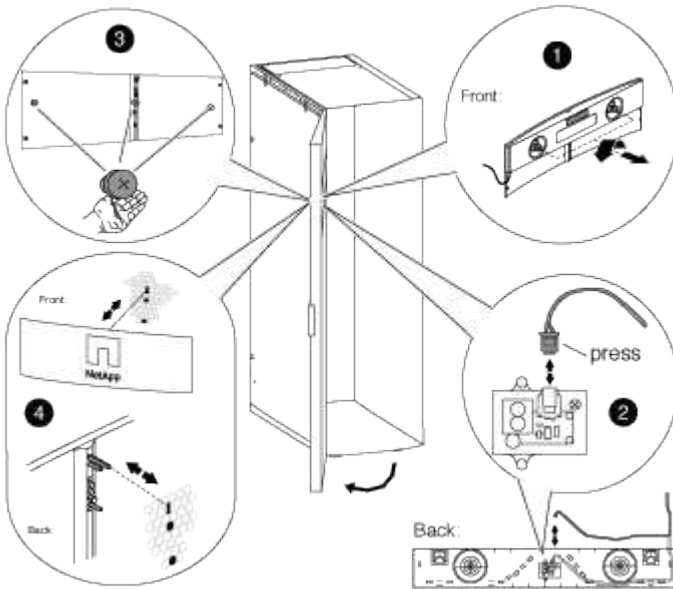
You need the following tools and equipment to complete the door reversal for system cabinets with illuminated badges:

- A Phillips screwdriver
- A 5-mm Allen wrench; magnetic Allen wrench is recommended
- Needle-nose pliers
- A step ladder so that you can easily access the Allen bolts in the top hinge

### Remove the illuminated badge

Removing the illuminated badge requires that you open the system cabinet front door, unplug the power cord from the back of the badge, and then remove the badge components from the system cabinet door.

Use the following illustration along with the following



steps:

1. Unlock and open the system cabinet front door.
2. Loosen the captive screws on the badge back panel on the inside of the door, and then gently pull the back panel away from the door mesh.
3. Unplug the power cord from the back panel by pressing the locking clip on the plug, unplugging the cord from the socket, and removing the cable from the back panel.

Set the back panel aside.

4. Carefully remove the screws from the back of the badge.



The stems on the thumbscrews are very short. Place your free hand under the screw to catch the thumbscrew if you drop it.

5. Remove the badge from the front of the door and set it aside.

## Remove the system cabinet door

You must remove the system cabinet door and side panels to move the illuminated badge and components, and to reverse the door.

1. Open the system cabinet door if it is not already open.
2. Perform the appropriate action depending on whether your cabinets are connected with the interconnect kit.

If your system cabinet is...	Then...
Not connected to another system cabinet	Go to the next step.
Connected to another system cabinet with an interconnect kit	Remove all four interconnect kit brackets and set the brackets and screws in a safe place.

3. Unlock both side panels, disconnect the grounding wires from the side panels, and then remove them and set them aside.
4. Disconnect the grounding wire from the grounding spade located at the top of the door.
5. Unscrew the grounding lug and wire assembly from the system cabinet frame and set it aside.
6. Unscrew the grounding lug assembly from the system cabinet door and set it aside.
7. Lift the top hinge pin until it clears the bottom of the hinge.
8. Gently tip the top of the door away from the system cabinet frame, and then release the hinge pin.
9. Lift the door off the bottom hinge, and set the door aside.

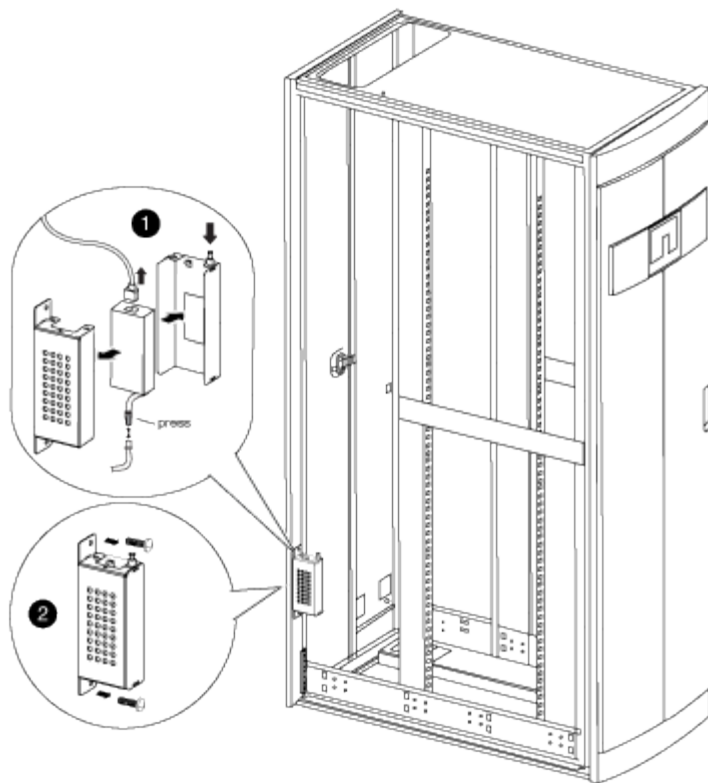
## Move the badge power supply and cabling

You must move the power supply and illuminated badge cabling to the opposite side of the system cabinet frame before you reverse the door and reinstall the illuminated badge.

You must have removed the system cabinet door and side panels.

You must move the illuminated badge power supply, power cable, and cabling conduit to the opposite side of the system cabinet when you reverse the system cabinet door. The assembly is designed so that the cable to the badge is on the side of the cabinet where the door hinge is installed.

1. Open the power cable retaining clip, and then disconnect the power cable from the power supply.
2. Remove the power supply housing and power supply, using the illustration for reference:



- a. Lift the retaining pin on the power supply housing, and then remove the housing cover by rotating it downward and lifting it off the rear power supply housing.



The power supply is attached to the power supply housing with a hook and loop patch.

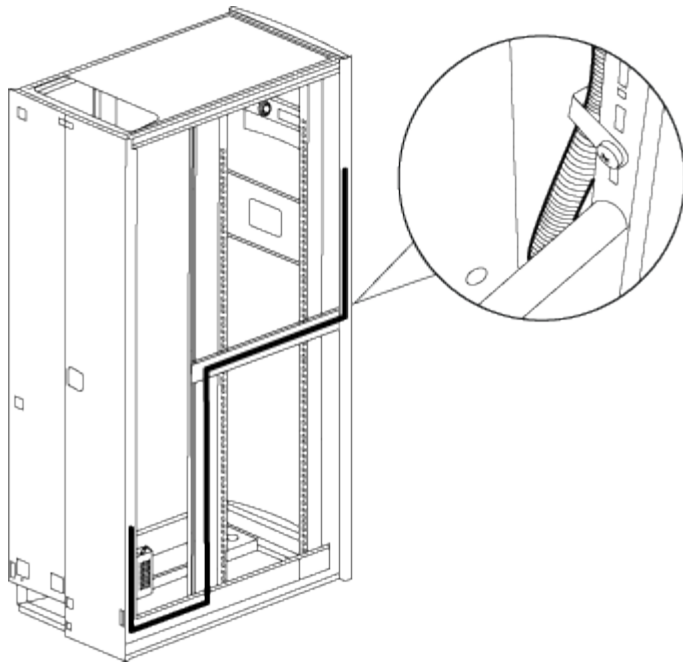
- b. Disconnect the power supply from the illuminated badge cable, and then set the power supply and power supply cover to the side.
  - c. Remove the screws from the top and bottom of the power supply housing that is attached to the system cabinet frame, and then remove the power supply housing.
3. Install the power supply and power supply housing on the opposite side of the system cabinet:
    - a. Locate the two screw holes next to each other on the cabinet frame, and then attach the top of the power supply housing to the bottom-most of the two screw holes.



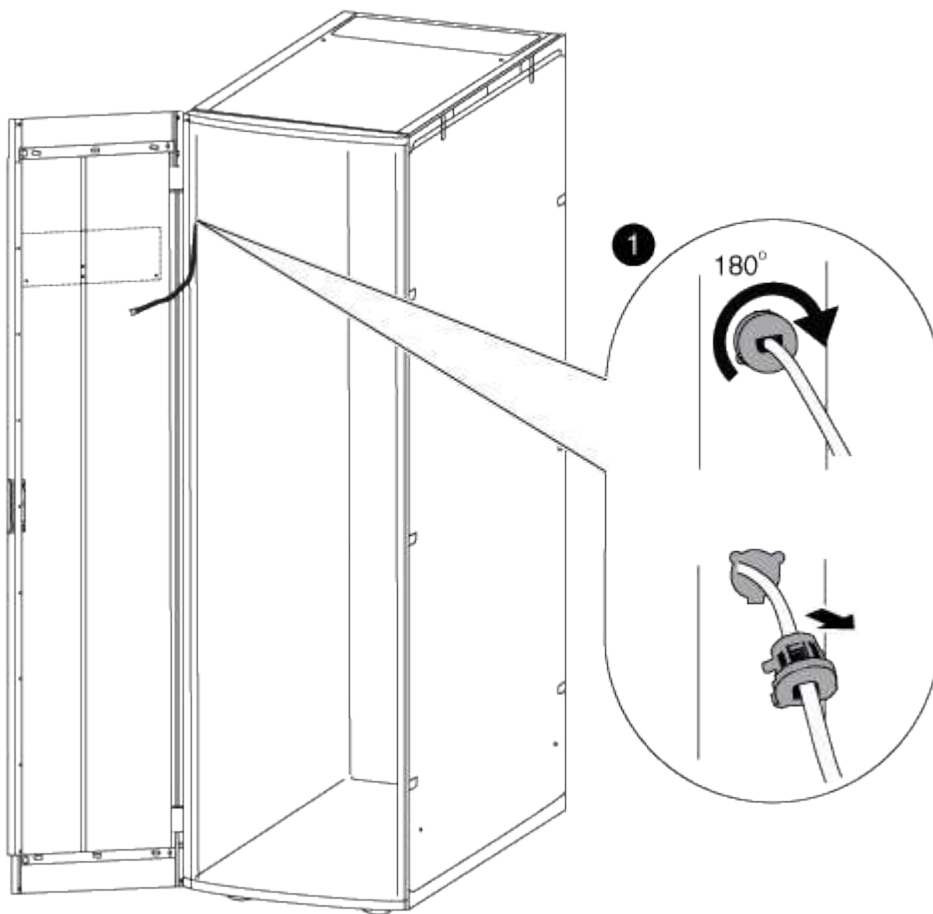
You might need to remove the bottom cable retention strap, if present.

- b. Secure the bottom of the power supply housing to the system cabinet frame.
  - c. Install the power supply cover and power supply by aligning the cover hooks with the power supply back, pulling the plunger up on the cover, rotating the plunger closed, and then releasing the plunger.
4. Remove the bezel power supply conduit by removing the conduit retaining clips from the retaining clips, and then slide the conduit off the power cable.

Keep the retaining clips and screws for installing the conduit on the opposite side of the cabinet.



5. Move the badge power cable to the other side of the cabinet:



- a. Rotate the rubber cable retainer on the cabinet upright 180° to the right, remove it from the system cabinet frame, and then gently pull the cable out of the system cabinet.
- b. Move the cable to the other side of the cabinet, and then thread it completely through the hole near the top of the cabinet upright.

- c. Align the rubber cable retainer with the hole in the frame, push it in as far as it will go, and then rotate the cable retainer 180° to the left to secure it.
  - d. Run the cable along the cabinet frame to the back of the cabinet.
6. Reinstall the cable conduit:
- a. Slide the conduit over the PDU power cable and route the conduit along the system cabinet frame to the PDU.
  - b. Install the conduit retaining clips from the other side of the cabinet over the conduit to secure it to the cabinet frame.
7. Plug the badge cable back into the power supply, but do not reconnect the power supply to the power source.

### Reverse the door hinge and lock catch

When reversing the system cabinet door, you must move the system cabinet door hinge and lock catch to the opposite front-side system cabinet upright.

You need the following tools:

- Phillips screwdriver
- 5 mm Allen wrench; magnetic Allen wrench is recommended
- Needle-nose pliers
- Step ladder so that you can easily access the Allen screws in the top hinge

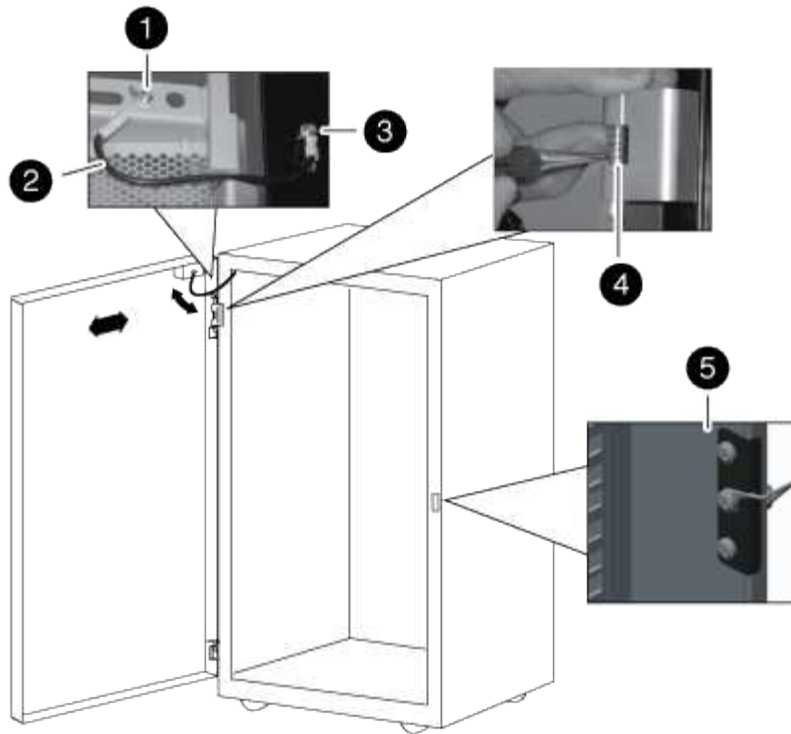
1. Remove the screws securing the top hinge from the system cabinet frame, and set the screws and hinge aside.



Be careful when removing the Allen screws to avoid dropping them into the cabinet frame. Spare Allen screws are provided in the spares kit that shipped with your system cabinet.

2. Remove the screws securing the bottom hinge from the system cabinet frame, and set the screws and hinge aside.





1	
	Door grounding screw with grounding wire spade
2	
	Grounding wire
3	
	Frame grounding wire lug
4	
	Top front door hinge with hinge pin held by retaining clip
5	
	Lock catch

3. Reverse the hinge pin from the top hinge:
  - a. Lift the hinge pin and expose the retaining clip on the hinge pin shaft.

- b. Using the needle-nose pliers, gently remove the retaining clip from the hinge pin shaft and set it aside.
- c. Slide the hinge pin and spring out of the hinge body.
- d. Rotate the hinge so that the thread holes are facing the opposite side of the hinge, and then install the hinge pin and spring back into the hinge.
- e. Install the hinge retaining clip onto the hinge pin.

Make sure that you push the retaining clip completely onto the hinge pin.

4. Reinstall the hinges:

- a. Insert the top Allen screw through the system cabinet upright, aligning it with the top threaded hole on the top hinge, and then partially tighten the Allen screw.

Do not completely tighten the screw until after the second Allen screw is installed.

- b. Insert the bottom Allen screw through the system cabinet upright, aligning it with the bottom threaded hole on the top hinge, and then partially tighten the Allen screw.
- c. Tighten the top and bottom Allen screws.
- d. Repeat these steps for the bottom hinge.

5. Remove the screws from the lock catch, and then move the lock catch to the opposite front-side system cabinet upright.

6. Rotate the catch 180 degrees, and then secure it to the system cabinet upright.

## **Reinstall the door and illuminated badge**

After you move the power supply and components to the other side of the system cabinet and moved the hinges and lock catch, you must reinstall the system cabinet door and the illuminated badge, and then reconnect the badge to the power source.

### **Reinstall the system cabinet door**

After you reverse the door hinge and door catch, you must reinstall the grounding wire and lug assembly and wire, and the system cabinet front door prior to reinstalling the illuminated badge.

1. Rotate the door 180 degrees.
2. Align the bottom of the door with the bottom hinge post, and then seat the door bottom on the hinge post.
3. Lift the top hinge pin so that it clears the hinge housing.
4. Tip the top of the door into the hinge housing so that the hinge pin and door hinge are aligned, and then release the hinge pin.

Make sure that the hinge pin is seated completely through the door hinge and the bottom of the door hinge housing.

5. Reattach the grounding lug and wire assembly to the system cabinet frame on the same side of the newly reversed front door and reinstall the grounding lug with spade on the top of the system cabinet door.
6. Reattach the grounding wire to the spade on the grounding lug assembly on the system cabinet door.

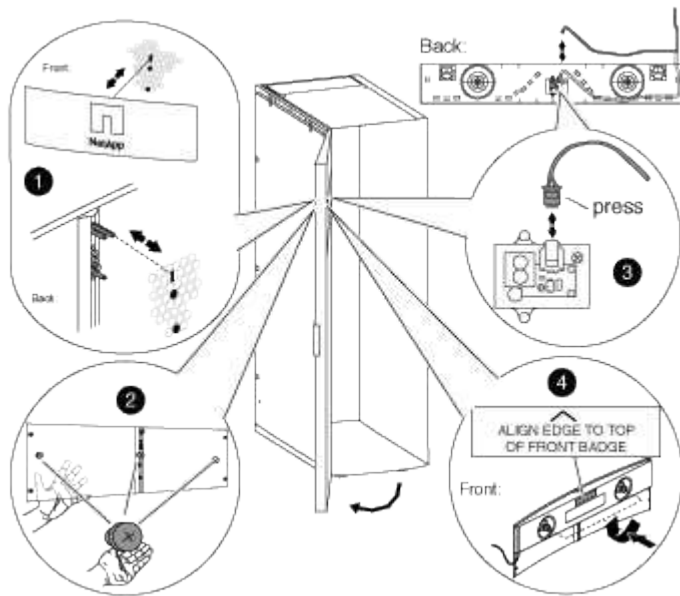
7. Reinstall either the side panels or the interconnect brackets, as applicable:

- If your system cabinet is not connected to another system cabinet, reinstall the side panels.
- If your system cabinet is connected to another system cabinet with an interconnect kit, reinstall the interconnect brackets.

#### Reinstall the illuminated badge

After the system cabinet door is installed, you need to install the illuminated badge to complete the door reversal process, and then close and lock the front door.

1. Using the following illustration for reference, reinstall the illuminated badge on the front door of the system cabinet:



2. Close and lock the front door.

## Swap out internal disk drive

### Video overview

This video shows an overview of the embedded drive replacement procedure.

[NetApp video: Hot-swapping an internal disk drive](#)

### Hot-swap embedded drive

#### Which procedure to use

You can replace a failed drive on your platform nondisruptively by choosing the procedure appropriate to the drives that your platform supports. The procedure for Hot-swapping an SSD is meant for non-spinning drives and the procedure for Hot-swapping an HDD is meant for spinning drives.

## Hot-swap a drive

When a drive fails, the platform logs a warning message to the system console indicating which drive has failed. In addition, both the fault LED on the operator display panel and the fault LED on the failed drive are illuminated. You can replace a failed drive nondisruptively while I/O is in progress.

- The replacement drive must be supported by your platform.

### [NetApp Hardware Universe](#)

- If SED authentication is enabled, you must use the SED replacement instructions in the ONTAP documentation.

Instructions in the ONTAP documentation describe additional steps you must perform before and after replacing an SED.

### [ONTAP 9 NetApp Encryption Power Guide](#)

- All other components in the system must be functioning properly; if not, contact technical support.
- Verify the drive you are removing is failed by running the `storage disk show -broken` command. The failed drive appears in the list of failed drives. If it does not, you should wait, and then run the command again.



Depending on the drive type and capacity, it can take up to several hours for the drive to appear in the list of failed drives.

- **Best practice:** The best practice is to have the current version of the Disk Qualification Package (DQP) installed before hot-swapping a drive.
- Drive firmware is automatically updated (nondisruptively) on new drives that have non current firmware versions.
- When you unpack the replacement drive, save all packing materials for use when you return the failed drive.
  1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenables automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the “Auto Assign” column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Physically identify the failed drive.

When a drive fails, the system logs a warning message to the system console indicating which drive failed. Additionally, the attention (amber) LED on the drive shelf operator display panel and the failed drive illuminate.



The activity (green) LED on a failed drive can be illuminated (solid), which indicates that the drive has power, but should not be blinking, which indicates I/O activity. A failed drive has no I/O activity.

4. Remove the failed drive:
  - a. Press the release button on the drive face to open the cam handle.
  - b. Slide the drive out of the shelf using the cam handle and supporting the drive with your other hand.
5. Wait a minimum of 70 seconds before inserting the replacement drive.

This allows the system to recognize that a drive was removed.

6. Insert the replacement drive:
  - a. With the cam handle in the open position, use both hands to insert the replacement drive.
  - b. Push until the drive stops.
  - c. Close the cam handle so that the drive is fully seated into the mid plane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the drive.

7. Verify that the drive's activity (green) LED is illuminated.

When the drive's activity LED is solid, it means that the drive has power. When the drive's activity LED is blinking, it means that the drive has power and I/O is in progress. If the drive firmware is automatically updating, the LED blinks.

8. If you are replacing another drive, repeat Steps 3 through 7.
9. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenable automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner owner_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenale automatic drive assignment on both controller modules.

10. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

## Hot-swap a disk drive

When a disk drive fails, the platform logs a warning message to the system console indicating which disk drive has failed. In addition, both the fault LED on the operator display panel and the fault LED on the failed disk drive are illuminated. You can replace a failed drive nondisruptively while I/O is in progress.

- The replacement disk drive must be supported by your platform.

### [NetApp Hardware Universe](#)

- Identify the failed disk drive by running the `storage disk show -broken` command from the system console. The failed drive appears in the list of failed drives. If it does not, you should wait, and then run the command again.

How you hot-swap the disk depends on how the disk drive is being used. If SED authentication is enabled, you must use the SED replacement instructions in the ONTAP documentation. Instructions in the ONTAP documentation describe additional steps you must perform before and after replacing an SED.

## [ONTAP 9 NetApp Encryption Power Guide](#)

When replacing several disk drives, you must wait one minute between the removal of each failed disk drive and the insertion of the replacement disk drive to allow the storage system to recognize the existence of each new disk.



Always use two hands when removing, installing, or carrying a disk drive.

- **Best practice:** The best practice is to have the current version of the Disk Qualification Package (DQP) installed before hot-swapping a drive.
- Drive firmware is automatically updated (nondisruptively) on new drives that have non current firmware versions.
- When you unpack the replacement drive, save all packing materials for use when you return the failed drive.
  1. If you want to manually assign drive ownership for the replacement drive, you need to disable automatic drive assignment replacement drive, if it is enabled



You manually assign drive ownership and then reenables automatic drive assignment later in this procedure.

- a. Verify whether automatic drive assignment is enabled: `storage disk option show`

You can enter the command on either controller module.

If automatic drive assignment is enabled, the output shows `on` in the “Auto Assign” column (for each controller module).

- b. If automatic drive assignment is enabled, disable it: `storage disk option modify -node node_name -autoassign off`

You must disable automatic drive assignment on both controller modules.

2. Properly ground yourself.
3. Gently remove the bezel from the front of the platform.
4. Identify the failed disk drive from the system console warning message and the illuminated fault LED on the disk drive
5. Press the release button on the disk drive face.

Depending on the storage system, the disk drives have the release button located at the top or on the left of the disk drive face.

For example, the following illustration shows a disk drive with the release button located on the top of the disk drive face:

The cam handle on the disk drive springs open partially and the disk drive releases from the midplane.

6. Pull the cam handle to its fully open position to unseat the disk drive from the midplane.
7. Slide out the disk drive slightly and allow the disk to safely spin down, which can take less than one minute, and then, using both hands, remove the disk drive from the disk shelf.
8. With the cam handle in the open position, insert the replacement disk drive into the drive bay, firmly pushing until the disk drive stops.



Wait a minimum of 10 seconds before inserting a new disk drive. This allows the system to recognize that a disk drive was removed.



If your platform drive bays are not fully loaded with drives, it is important to place the replacement drive into the same drive bay from which you removed the failed drive.



Use two hands when inserting the disk drive, but do not place hands on the disk drive boards that are exposed on the underside of the disk carrier.

9. Close the cam handle so that the disk drive is fully seated into the midplane and the handle clicks into place.

Be sure to close the cam handle slowly so that it aligns correctly with the face of the disk drive..

10. If you are replacing another disk drive, repeat Steps 4 through 9.
11. Reinstall the bezel.
12. If you disabled automatic drive assignment in Step 1, then, manually assign drive ownership and then reenable automatic drive assignment if needed.

- a. Display all unowned drives: `storage disk show -container-type unassigned`

You can enter the command on either controller module.

- b. Assign each drive: `storage disk assign -disk disk_name -owner owner_name`

You can enter the command on either controller module.

You can use the wildcard character to assign more than one drive at once.

- c. Reenable automatic drive assignment if needed: `storage disk option modify -node node_name -autoassign on`

You must reenable automatic drive assignment on both controller modules.

13. Return the failed part to NetApp, as described in the RMA instructions shipped with the kit.

Contact technical support at [NetApp Support](#), 888-463-8277 (North America), 00-800-44-638277 (Europe), or +800-800-80-800 (Asia/Pacific) if you need the RMA number or additional help with the replacement procedure.

## All SAN Array systems

### All SAN Array systems

You can use the AFF documentation with your ASA system. The information for AFF models applies to the corresponding ASA system. For example, all cabling and other information for the AFF A400 system also applies to the ASA AFF A400 system.

[All SAN Array Software Configuration](#)

## Hardware upgrade

### Upgrade procedures

AFF or FAS controller module upgrade procedures have moved [here](#).



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