# NetApp

# System-level diagnostics

## ONTAP Systems

NetApp
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# Table of Contents

# 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.

  > (i) 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.

  > (i) 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.

  > (i) 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.

  (i) 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.

   - `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 `nvram-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.
- `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.

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 | There are no hardware problems and your storage system returns to the prompt.<br><br>a. Clear the status logs by entering the following command: `sldiag device clearstatus`<br><br>b. Verify that the log is cleared by entering the following command: `sldiag device status`<br><br>The following default response is displayed:<br><br>```<br>SLDIAG: No log messages are present.<br>```<br><br>c. Exit Maintenance mode by entering the following command: `halt`<br><br>d. Enter the following command at the Loader prompt to boot the storage system: `boot_ontap` You have completed system-level diagnostics. |
| Resulted in some test failures | Determine the cause of the problem.<br><br>a. Exit Maintenance mode by entering the following command: `halt`<br><br>b. Perform a clean shutdown and disconnect the power supplies.<br><br>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.<br><br>d. Reconnect the power supplies and power on the storage system.<br><br>e. Repeat Steps 1 through 7 of *Running system installation diagnostics*. |

# 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.

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 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 | There are no hardware problems and your storage system returns to the prompt.<br><br>a. Clear the status logs by entering the following command: `sldiag device clearstatus`<br><br>b. Verify that the log is cleared by entering the following command: `sldiag device status`<br><br>The following default response is displayed:<br><br>`SLDIAG: No log messages are present.`<br><br>c. Exit Maintenance mode by entering the following command: `halt`<br><br>d. Enter the following command at the Loader prompt to boot the storage system: `boot_ontap` You have completed system-level diagnostics. |
| Resulted in some test failures | Determine the cause of the problem.<br><br>a. Exit Maintenance mode by entering the following command: `halt`<br><br>b. Perform a clean shutdown and disconnect the power supplies.<br><br>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.<br><br>d. Reconnect the power supplies and power on the storage system.<br><br>e. Repeat Steps 1 through 5 of *Running system panic diagnostics*. |

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.

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 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 | There are no hardware problems and your storage system returns to the prompt.<br><br>a. Clear the status logs by entering the following command: `sldiag device clearstatus`<br><br>b. Verify that the log is cleared by entering the following command: `sldiag device status`<br><br>The following default response is displayed:<br><br>``` SLDIAG: No log messages are present. ```<br><br>c. Exit Maintenance mode by entering the following command: `halt`<br><br>d. Enter the following command at the Loader prompt to boot the storage system: `boot_ontap` You have completed system-level diagnostics. |
| Resulted in some test failures | Determine the cause of the problem.<br><br>a. Exit Maintenance mode by entering the following command: `halt`<br><br>b. Perform a clean shutdown and disconnect the power supplies.<br><br>c. 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.<br><br>d. Reconnect the power supplies and power on the storage system.<br><br>e. Repeat Steps 1 through 5 of *Running slow system response diagnostics*. |

| If the system-level diagnostics tests… | Then… |
|---|---|
| Resulted in the same test failures | Technical support might recommend modifying the default settings on some of the tests to help identify the problem.<br><br>a. Modify the selection state of a specific device or type of device on your storage system by entering the following command: `sldiag device modify [-dev devtype\|mb\|slot_slotnum_] [-name device] [-selection enable\|disable\|default\|only]`<br><br>`-selection enable\|disable\|default\|only` 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.<br><br>b. Verify that the tests were modified by entering the following command: `sldiag option show`<br><br>c. Repeat Steps 3 through 5 of *Running slow system response diagnostics*.<br><br>d. After you identify and resolve the problem, reset the tests to their default states by repeating substeps 1 and 2.<br><br>e. Repeat Steps 1 through 5 of *Running slow system response diagnostics*. |

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.

1. At the storage system prompt, switch to the LOADER prompt: `halt`

2. Enter the following command at the LOADER prompt: `boot_diags`

   > (i) 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 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 **nvram-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.
- **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 | There are no hardware problems and your storage system returns to the prompt.<br><br>a. Clear the status logs by entering the following command: `sldiag device clearstatus [-dev devtype` |
| mb | slotslotnum]` .. Verify that the log is cleared by entering the following command: `sldiag device status [-dev devtype` |
| mb | slotslotnum]` + The following default response is displayed: + ---- SLDIAG: No log messages are present. ----<br><br>.. Exit Maintenance mode by entering the following command: `halt` .. Enter the following command at the Loader prompt to boot the storage system: `boot_ontap` You have completed system-level diagnostics. |
| Resulted in some test failures | Determine the cause of the problem.<br><br>a. Exit Maintenance mode by entering the following command: `halt`<br>b. Perform a clean shutdown and disconnect the power supplies.<br>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.<br>d. Reconnect the power supplies and power on the storage system.<br>e. Repeat Steps 1 through 6 of *Running hardware installation diagnostics*. |

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.
- `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 `nvram-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.
- `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 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… |
|---|---|
| Resulted in some test failures | Determine the cause of the problem.<br><br>a. Exit Maintenance mode by entering the following command: `halt`<br><br>b. Perform a clean shutdown and disconnect the power supplies.<br><br>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.<br><br>d. Reconnect the power supplies and power on the storage system.<br><br>e. Repeat Steps 1 through 5 of *Running device failure diagnostics*. |
| Resulted in the same test failures | Technical support might recommend modifying the default settings on some of the tests to help identify the problem.<br><br>a. Modify the selection state of a specific device or type of device on your storage system by entering the following command: `sldiag device modify [-dev devtype|mb|slot_slotnum_] [-name device] [-selection enable|disable|default|only]` `-selection enable|disable|default|only` 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.<br><br>b. Verify that the tests were modified by entering the following command: `sldiag option show`<br><br>c. Repeat Steps 3 through 5 of *Running device failure diagnostics*.<br><br>d. After you identify and resolve the problem, reset the tests to their `default` states by repeating substeps 1 and 2.<br><br>e. Repeat Steps 1 through 5 of *Running device failure diagnostics*. |

| If the system-level diagnostics tests… | Then… |
|---|---|
| Were completed without any failures | There are no hardware problems and your storage system returns to the prompt.<br><br>a. Clear the status logs by entering the following command: `sldiag device clearstatus [-dev devtype\|mb\|slot_slotnum_]`<br><br>b. Verify that the log is cleared by entering the following command: `sldiag device status [-dev devtype\|mb\|slot_slotnum_]`<br><br>The following default response is displayed:<br><br>`SLDIAG: No log messages are present.`<br><br>c. Exit Maintenance mode by entering the following command: `halt`<br><br>d. Enter the following command at the Loader prompt to boot the storage system: `boot_ontap` You have completed system-level diagnostics. |

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