

AFF A700s System-Level Diagnostics Guide

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doccomments@netapp.com

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1. Introduction to System-Level Diagnostics

AFF A700s System-level diagnostics provides a menu-driven 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. AFF A700s system-level diagnostics is specifically designed for AFF A700s storage systems only.

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

To access system-level diagnostics for the storage system, you must directly connect to the serial console port of the storage system or access the serial console remotely via the Baseband Management Controller (BMC) of the storage system. Then, take over or halt the storage system to reach the LOADER prompt. Once at the LOADER prompt, enter the **boot_diags** command to start system-level diagnostics.

From the main menu of system-level diagnostics, the following choices are available:

1. **Scan system** – Scan the system to obtain an accurate H/W inventory of the system for subsequent testing.
2. **Test system** – Test specific components or the entire system for proper operation.
3. **Test memory** – Test part of all of the system's memory.
4. **Show VPD information** – Display vital product data (VPD) for components in the system.
5. **Show FW revision** – Display the firmware revision information for components in the system.
6. **Show MAC address** – Display the unique MAC addresses allocated to components in the system.
7. **Show logs** – Display a recorded log of previous scan and test results.
8. **Reboot (BMC power cycle) controller to LOADER** – Exit system-level diagnostics and return to the LOADER prompt.

Once a menu command is chosen, all output is displayed on the console session. Terminal session logging can be used to conveniently capture test results and other displayed information. In addition, system scans, system tests and memory tests are persistently logged on the boot media. The last ten results for each scan or test

command are available for review.

If test results complete successfully, you can exit system-level diagnostics and reboot the system for normal operation. In the event of test failures, the test results will help technical support make appropriate recommendations. The failure could be resolved by reinstalling the FRU. If the failure cannot be resolved, then there is a likely hardware failure and the affected hardware must be replaced.

2. Scan system

When you scan the system, system-level diagnostics obtains an accurate hardware inventory of the system. You must scan the system first, before you run any tests. To execute the "Scan system" operation, type "1" and then press "Enter" to start the system scan.

```
Copyright (c) 2016 NetApp Inc. All rights reserved.
#### AFF A700s System-Level HW Diagnostics 01.05.14 ####
#### System      PN: j00-600-g+20      ####
#### System      SN: shffg1631000187  ####
#### Controller-B PN: TEMP-S000092338  ####
#### Controller-B SN: 2BJJ0267S00N    ####
1) Scan system
2) Test system
3) Test memory
4) Show VPD information
5) Show FW revision
6) Show MAC address
7) Show logs
8) Reboot (BMC power cycle) controller to LOADER
Select a number 1-8 to execute the respective command:1
```

The scan system summary provides general information about the hardware inventory present in the system. Press "Enter" to return to the main menu after the scan is complete.

```

Scan System Summary:
Controller-B PN:TEMP-S000092338      SN:2BJJ0267S00N
  CPU                :Expect: 2 Present: 2 Result:PASSED
  TPM                :Expect: 1 Present: 1 Result:PASSED
  SAS                :Expect: 2 Present: 2 Result:PASSED
  Expander          :Expect: 2 Present: 2 Result:PASSED
  SFPGA             :Expect: 1 Present: 1 Result:PASSED
  Ethernet - I210   :Expect: 2 Present: 2 Result:PASSED
  BMC                :Expect: 1 Present: 1 Result:PASSED

Memory: PASSED
Expect:16 Present:16
slot  PN                      SN
dimmm1 SHB724G4LML23P2-SB  3213D720
dimmm2 SHB724G4LML23P2-SB  3213C819
dimmm3 SHB724G4LML23P2-SB  3213D19E
dimmm4 SHB724G4LML23P2-SB  3213D47D
dimmm5 SHB724G4LML23P2-SB  3213D13C
dimmm6 SHB724G4LML23P2-SB  3213CAC5
dimmm7 SHB724G4LML23P2-SB  3213D19F
dimmm8 SHB724G4LML23P2-SB  3213CB3F
dimmm9 SHB724G4LML23P2-SB  3213CB1A
dimmm10 SHB724G4LML23P2-SB 3213CD73
dimmm11 SHB724G4LML23P2-SB 3213C84B
dimmm12 SHB724G4LML23P2-SB 32149EEA
dimmm13 SHB724G4LML23P2-SB 3213D250
dimmm14 SHB724G4LML23P2-SB 3213D806
dimmm15 SHB724G4LML23P2-SB 3213D44B
dimmm16 SHB724G4LML23P2-SB 3213D52D

NVMe: PASSED
Expect: 2 Present: 2
slot  PN                      SN
NVME0 SAMSUNG MZVLV128HCGR S2J4NX0H510081
NVME1 SAMSUNG MZVLV128HCGR S2J4NX0H510038

HBA: PASSED
Expect: 7 Present: 7
slot  description              PN                      SN
1     NVRAM10P Module           031611001295           031615000072
2     32Gb FC HBA-1             111-03249               FC60778265
3     32Gb FC HBA-2             111-03249               FC61004370
4     12Gb SAS HBA              N/A                     N/A
5     40GbE NIC HBA             H76496-002              3CFDFE9DCBB8H76496-002
6     40GbE OCP-1               H52289-004              90E2BABBDF90H52289-004
7     40GbE OCP-2               H52289-004              90E2BAC7EC30H52289-004

Fan: PASSED
Expect: 8 Present: 8
Fan_1  13536RPM
Fan_2  13728RPM
Fan_3  13632RPM
Fan_4  13632RPM
Fan_5  13632RPM
Fan_6  13536RPM
Fan_7  13632RPM
Fan_8  13632RPM

PSU: PASSED
Expect: 1 Present: 1
slot  PN                      SN
PSU1  HZBD1625000552

Press [Enter] key to go back to Main Menu

```

3. Test system

The "Test system" command allows you to specify component-level or system-level testing of the system. One or more iterations or "loops" can be specified, as well. To execute the "Test System" operation, type "2" and then press "Enter" to go to the Test System option page.

```
Copyright (c) 2016 NetApp Inc. All rights reserved.
#### AFF A700s System-Level HW Diagnostics 01.05.14 ####
#### System      PN: j00-600-g+20          ####
#### System      SN: shffg1631000187      ####
#### Controller-B PN: TEMP-S000092338    ####
#### Controller-B SN: 2BJJ0267S00N      ####
1) Scan system
2) Test system
3) Test memory
4) Show VPD information
5) Show FW revision
6) Show MAC address
7) Show logs
8) Reboot (BMC power cycle) controller to LOADER
Select a number 1-8 to execute the respective command:2
```

The Test System page is shown, below:

```

+-----Test System-----+
| Select one or more items to test using the SPACE bar to toggle the
| option. Use Arrow keys to move up/down to select individual test. Use
| Arrow keys left/right to select Test Control. Press [Enter] to execute.
+-----+
| [ ] a. CPU Test (Stability Test)
| [ ] b. Ethernet I210 Test (Internal loopback/MDI/Interrupt Test)
| [ ] c. PCH-I2C Test (Devices Read Test/MUX Test)
| [ ] d. SAS Controller Test (PHY Status Check)
| [ ] e. Expander Test (PHY Error Count Check)
| [ ] f. PCI Devices Test (Retrain Test)
| [ ] g. RTC Accuracy Test (RTC Accuracy Test)
| [ ] h. TPM Test (Self-Test)
| [ ] i. BMC Test (Self-Test/Sensors Test)
| [ ] j. PSU Test (Sensors Test)
| [ ] k. Fan Test (Fan Speed Test)
| [ ] l. 40GbE OCP-1 Test (Internal Loopback/MDI/Interrupt Test)
| [ ] m. 40GbE OCP-2 Test (Internal Loopback/MDI/Interrupt Test)
| [ ] n. 40GbE NIC HBA Test (Internal Loopback/MDI/Interrupt Test)
| [ ] o. 32Gb FC HBA-1 Test (PCI loopback Test/Internal Loopback Test)
+-----v(+)-----83%-----+
|
| < Run > <Test All> < Cancel >

```

- Use the "up" and "down" arrow keys to select test options (from option "a" to option "r").
 - Note: Scroll down to see all available tests
- Use the "space" bar to toggle an option on or off.
- Use the left and right arrow keys to select "Run", "Test All" or "Cancel":
 - Run – Run the selected tests from the Test System page
 - Test All – Run all available system tests
 - Cancel – Cancel system test and return to the main menu.
- Press "Enter" to execute your choice.

If "Run" or "Test All" is chosen, the "Configure Test Loop" page is displayed.

```

+-----Configure Test Loop-----+
| Fill in the number of test loops. The acceptable input value
| ranges from 0 to 99. A 0 means an infinite loop. You can use
| BACKSPACE to correct errors and use Arrow keys left/right to
| select Test Control. Use Tab or Arrow keys up/down to move
| between loop count and Test Control. Press [Enter] to execute.
+-----+
| 1
+-----+
|
| < OK > <Cancel>

```

- Enter the number of test loops for the selected tests.
- Use the "Tab" key to switch the cursor between the loop input panel and the

page control panel.

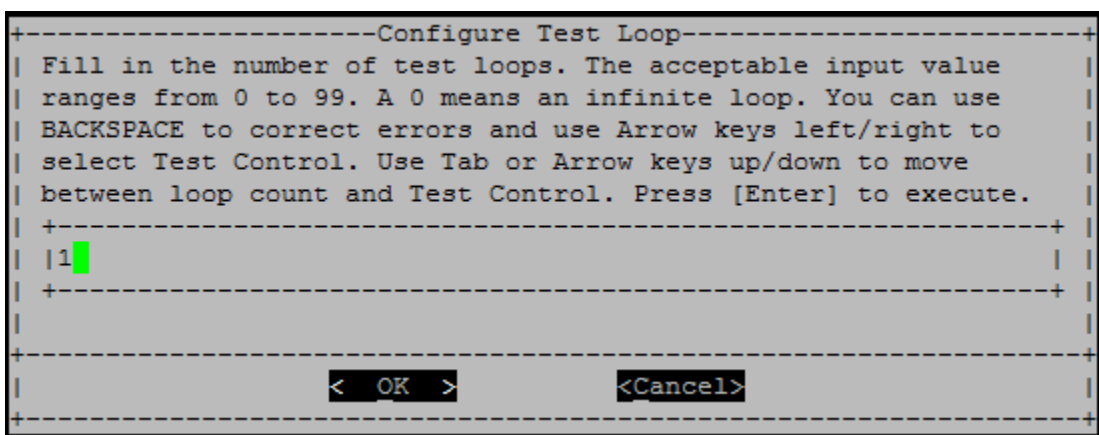
- Use the left and right arrow keys to select "OK" or "Cancel".
- Press "Enter" to start the tests.

3.1. Test example: Run CPU Test

To only run the CPU test, toggle on option "a. CPU test (Execute stability Test)", select "Run", and then press "Enter".

```
-----Test System-----
| Select one or more items to test using the SPACE bar to toggle the
| option. Use Arrow keys to move up/down to select individual test. Use
| Arrow keys left/right to select Test Control. Press [Enter] to execute.
+-----+
| [*] a. CPU Test (Stability Test)
| [ ] b. Ethernet I210 Test (Internal loopback/MDI/Interrupt Test)
| [ ] c. PCH-I2C Test (Devices Read Test/MUX Test)
| [ ] d. SAS Controller Test (PHY Status Check)
| [ ] e. Expander Test (PHY Error Count Check)
| [ ] f. PCI Devices Test (Retrain Test)
| [ ] g. RTC Accuracy Test (RTC Accuracy Test)
| [ ] h. TPM Test (Self-Test)
| [ ] i. BMC Test (Self-Test/Sensors Test)
| [ ] j. PSU Test (Sensors Test)
| [ ] k. Fan Test (Fan Speed Test)
| [ ] l. 40GbE OCP-1 Test (Internal Loopback/MDI/Interrupt Test)
| [ ] m. 40GbE OCP-2 Test (Internal Loopback/MDI/Interrupt Test)
| [ ] n. 40GbE NIC HBA Test (Internal Loopback/MDI/Interrupt Test)
| [ ] o. 32Gb F HBA-1 Test (PCI loopback Test/Internal Loopback Test)
+-----v(+)------83%-----+
|
| < Run > <Test All> < Cancel >
```

The "Configure Test Loop" page is displayed.



To run one test loop only, retain the default "1" value, press "Tab" to switch contexts to the control panel, select "OK", and then press "Enter" to start the test.

The test results are displayed on the console, as shown below. Press "Enter" to return to the main menu.

```

Test end time: 2016-09-26-10:13:22
Test Elapsed Time: 0m:36s
-----
Test start time: 2016-09-26-10:13:22
-----
Clear MCE:
No MCE error message.
Processor1 Stability Test:
100.0%
Time: 0h 0m 35.328s
RESULT: PASSED
Check MCE error:
No MCE error message.
-----
Test end time: 2016-09-26-10:13:58
Test Elapsed Time: 0m:36s
=====
System Test Summary:
=====
PCM PN:TEMP-S000092338 SN 2BJJ0267S00N
      CPU Test           : PASSED
Press [Enter] key to go back to Main Menu
  
```

4. Test memory

The "Test memory" command allows you to run tests on part or all of system memory. To execute the "Test Memory" operation, type "3" and then press "Enter".

```

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#### AFF A700s System-Level HW Diagnostics 01.05.14 ####
#### System      PN: j00-600-g+20      ####
#### System      SN: shffg1631000187   ####
#### Controller-B PN: TEMP-S000092338  ####
#### Controller-B SN: 2BJJ0267S00N    ####
1) Scan system
2) Test system
3) Test memory
4) Show VPD information
5) Show FW revision
6) Show MAC address
7) Show logs
8) Reboot (BMC power cycle) controller to LOADER
Select a number 1-8 to execute the respective command:3

```

4.1. Configure Memory Test Range

Use the Configure Memory Test Range to specify the start and the end addresses for the memory tests.

- Fill in the "Start Address" and "End Address" fields with the desired memory address range (in hexadecimal).
- Use the "Tab" key to switch the cursor between memory address input and the page control panel ("OK" or "Cancel").
- Select "OK" in the control panel, and then press "Enter".

```

+-----Configure Memory Test Range-----+
| Fill in the start address and the end address for the |
| memory test range. The default range is the maximum |
| testable memory range. You can use BACKSPACE to correct |
| errors and use Arrow keys left/right to select Test |
| Control. Press [Enter] to execute. |
| +-----+ |
| |Start Address: 0x180000000 |
| |End Address: 0x807fffffff |
| +-----+ |
| | |
| | < OK > | <Cancel> |
+-----+

```


The test results are displayed on the console, as shown below. Press "Enter" to return to the main menu.

```

=====
Total Memory Size: 512 GB
slot      Size      PN              SN
dimmm1   32 GB    SHB724G4LML23P2-SB  3213D720
dimmm2   32 GB    SHB724G4LML23P2-SB  3213C819
dimmm3   32 GB    SHB724G4LML23P2-SB  3213D19E
dimmm4   32 GB    SHB724G4LML23P2-SB  3213D47D
dimmm5   32 GB    SHB724G4LML23P2-SB  3213D13C
dimmm6   32 GB    SHB724G4LML23P2-SB  3213CAC5
dimmm7   32 GB    SHB724G4LML23P2-SB  3213D19F
dimmm8   32 GB    SHB724G4LML23P2-SB  3213CB3F
dimmm9   32 GB    SHB724G4LML23P2-SB  3213CB1A
dimmm10  32 GB    SHB724G4LML23P2-SB  3213CD73
dimmm11  32 GB    SHB724G4LML23P2-SB  3213C84B
dimmm12  32 GB    SHB724G4LML23P2-SB  32149EEA
dimmm13  32 GB    SHB724G4LML23P2-SB  3213D250
dimmm14  32 GB    SHB724G4LML23P2-SB  3213D806
dimmm15  32 GB    SHB724G4LML23P2-SB  3213D44B
dimmm16  32 GB    SHB724G4LML23P2-SB  3213D52D
===== LOOP 1 =====
Memory Pattern Test:
=====
Clear ECC:
ECC error counts:0
-----
Run Pattern Test for 0x180000000 - 0x807fffffff:
-----
Test start time: 2016-09-26-10:25:44
-----
Progressing:100%
RESULT: PASSED
-----
Test end time: 2016-09-26-10:33:39
Test Elapsed Time: 7m:55s
-----
Check ECC:
ECC error counts:0
Press [Enter] key to go back to Main Menu

```

5. Show VPD information

The "Show VPD information" command displays vital product data (VPD) information for components of the system. To execute the "Show VPD information" operation, type "4"

and then press "Enter".

```

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#### AFF A700s System-Level HW Diagnostics 01.05.14 ####
#### System      PN: j00-600-g+20      ####
#### System      SN: shffg1631000187   ####
#### Controller-B PN: TEMP-S000092338  ####
#### Controller-B SN: 2BJJ0267S00N    ####
1) Scan system
2) Test system
3) Test memory
4) Show VPD information
5) Show FW revision
6) Show MAC address
7) Show logs
8) Reboot (BMC power cycle) controller to LOADER
Select a number 1-8 to execute the respective command:4

```

VPD information is displayed. Press "Enter" to return to the main menu.

```

32Gb FC HBA-1:
Product Name      : Emulex LightPulse LPe32002-M2-NA 2-Port 32Gb Fibre Chan
nel Adapter, FC PF
PN (Part Number) : 111-03249
SN (Serial Number) : FC62671258
V0                : FC62671258
V1                : 111-03249 Emulex LightPulse LPe32002-M2-NA 2-Port 32Gb
Fibre Channel Adapter
V2                : 111-03249
V5                : LPe32002-M2-NA
V7                : ID:0294,V:00.00.03.09
32Gb FC HBA-2:
Product Name      : Emulex LightPulse LPe32002-M2-NA 2-Port 32Gb Fibre Chan
nel Adapter, FC PF
PN (Part Number) : 111-03249
SN (Serial Number) : FC62787200
V0                : FC62787200
V1                : 111-03249 Emulex LightPulse LPe32002-M2-NA 2-Port 32Gb
Fibre Channel Adapter
V2                : 111-03249
V5                : LPe32002-M2-NA
V7                : ID:0294,V:00.00.03.09
12Gb SAS HBA:
Serial number     : 031627002195
NetApp P/N        : 111-02026
NetApp Rev.       : B0
Date              : 20160703
Manufacturer      : NetApp, Inc.
Manufacturer P/N  : 110-00401
Manufacturer Rev. : B0
Driver name       : pm80xx
major rev         : 1
minor rev         : 3
build rev         : 0
maxdevices        : 3984
maxoutstandingIO : 8192
Press [Enter] key to go back to Main Menu

```

6. Show FW revision

The "Show FW revision" command displays the firmware revision information for components in the system. To execute the "Show FW revision" operation, type "5" and then press "Enter".

```
Copyright (c) 2016 NetApp Inc. All rights reserved.
#### AFF A700s System-Level HW Diagnostics 01.05.14 ####
#### System      PN: j00-600-g+20      ####
#### System      SN: shffg1631000187  ####
#### Controller-B PN: TEMP-S000092338  ####
#### Controller-B SN: 2BJJ0267S00N    ####
1) Scan system
2) Test system
3) Test memory
4) Show VPD information
5) Show FW revision
6) Show MAC address
7) Show logs
8) Reboot (BMC power cycle) controller to LOADER
Select a number 1-8 to execute the respective command:5
```

The FW revision is displayed. Press "Enter" to return to the main menu.

```
Canister firmware      : E0.A2
Canister firmware date : Jun 30 2016 09:12:12
Canister bootloader   : 0.A5
Canister config CRC   : Not present
Canister VPD structure : 0x0B
Canister VPD CRC      : 0x0E1325F7
Canister CPLD         : 0x1B
Canister chip         : 0x00000003
Canister SDK          : 00.0A.04.00
Midplane VPD structure : 0x0C
Midplane VPD CRC      : 0x9A076550
Midplane CPLD         : 0x14

32Gb FC HBA-1:
FW Version            : 11.0.250.0

32Gb FC HBA-2:
FW Version            : 11.0.250.0

40GbE NIC:
FW Version: f4.40.35115 a1.4 n4.53 e1fa6

40GbE OCP-1:
FW Version: f5.0.40043 a1.5 n5.02 e2422

40GbE OCP-2:
FW Version: f5.0.40043 a1.5 n5.02 e2422
Press [Enter] key to go back to Main Menu
```

7. Show MAC address

The "Show MAC address" command displays the unique MAC addresses allocated to components in the system. To execute the "Show MAC address" operation, type "6" and then press "Enter".


```

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#### AFF A700s System-Level HW Diagnostics 01.05.14 ####
#### System          PN: j00-600-g+20          ####
#### System          SN: shffg1631000187       ####
#### Controller-B   PN: TEMP-S000092338       ####
#### Controller-B   SN: 2BJJ0267S00N           ####
1) Scan system
2) Test system
3) Test memory
4) Show VPD information
5) Show FW revision
6) Show MAC address
7) Show logs
8) Reboot (BMC power cycle) controller to LOADER
Select a number 1-8 to execute the respective command:6

```

MAC address information is displayed. Press "Enter" to return to the main menu.

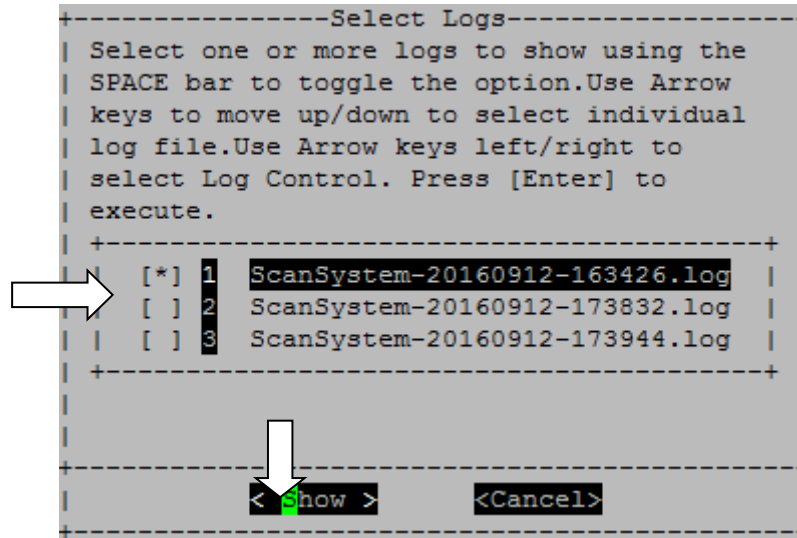
```

I210 (Copper)      : 1C:66:6D:BE:28:A4
I210 (SerDes)     : 1C:66:6D:BE:28:A5
BMC MAC0          : 1c:66:6d:be:28:a6
LSI SAS3x40       : 1C:66:6D:BE:28:A7
BMC MAC1          : 1c:66:6d:be:28:a8
32Gb FC HBA-1 Port0 : 10:00:00:90:fa:c7:72:ca
32Gb FC HBA-1 Port1 : 10:00:00:90:fa:c7:72:cb
32Gb FC HBA-2 Port0 : 10:00:00:90:fa:c7:71:1a
32Gb FC HBA-2 Port1 : 10:00:00:90:fa:c7:71:1b
40GbE NIC Port0   : 3C:FD:FE:9D:CB:B8
40GbE NIC Port1   : 3C:FD:FE:9D:CB:B9
40GbE OCP-1 Port0 : 90:E2:BA:BB:DF:90
40GbE OCP-1 Port1 : 90:E2:BA:BB:DF:91
40GbE OCP-2 Port0 : 90:E2:BA:C7:EC:30
40GbE OCP-2 Port1 : 90:E2:BA:C7:EC:31
Press [Enter] key to go back to Main Menu

```

8. Show logs

The "Show logs" command displays a recorded log of previous scan and test results. System scans, system tests and memory tests are persistently logged on the boot media. The last ten results for each scan or test command are available for review. To execute the "Show logs" operation, type "7" and then press "Enter" to go to the "Show Logs" page.



The system saves the latest ten logs and conveniently includes the timestamp in the log name.

- Use the "up" and "down" arrow keys to select the logs to display.
- Use the "space" bar to toggle an option on or off.
- Use the left and right arrow keys to select "Show" or "Cancel".
- Press "Enter" to execute your choice.

The logs are displayed, shown as below.

```

=====
CPU:
Processor  T/C  Vendor      Model  Family Core  Frequency  Stepping  Cache
  Temperature
Processor0  1    GenuineIntel  79    6    18    2.30GHz    1    46080 KB
Processor1  1    GenuineIntel  79    6    18    2.30GHz    1    46080 KB
=====

Memory:
DIMM      Size  Speed  Rank  Manufacturer  PN              SN
dimm1    32 GB  2133 MHz  2    Samsung      SHB724G4LML23P2-SB  3213D720
dimm2    32 GB  2133 MHz  2    Samsung      SHB724G4LML23P2-SB  3213C819
dimm3    32 GB  2133 MHz  2    Samsung      SHB724G4LML23P2-SB  3213D19E
dimm4    32 GB  2133 MHz  2    Samsung      SHB724G4LML23P2-SB  3213D47D
dimm5    32 GB  2133 MHz  2    Samsung      SHB724G4LML23P2-SB  3213D13C
dimm6    32 GB  2133 MHz  2    Samsung      SHB724G4LML23P2-SB  3213CAC5
dimm7    32 GB  2133 MHz  2    Samsung      SHB724G4LML23P2-SB  3213D19F
dimm8    32 GB  2133 MHz  2    Samsung      SHB724G4LML23P2-SB  3213CB3F
dimm9    32 GB  2133 MHz  2    Samsung      SHB724G4LML23P2-SB  3213CB1A
dimm10   32 GB  2133 MHz  2    Samsung      SHB724G4LML23P2-SB  3213CD73
dimm11   32 GB  2133 MHz  2    Samsung      SHB724G4LML23P2-SB  3213C84B
dimm12   32 GB  2133 MHz  2    Samsung      SHB724G4LML23P2-SB  32149EEA
/boot/EFI/lemur/ScanSystem-20160923-094234.log

```

Use the following keys to control the displayed log output:

- PgUp/PgDn – Scroll up or down page by page
- Up/Down Arrow keys – Scroll up or down line by line
- Home – Return to the beginning of the page
- End – Go to the end of the page
- / (slash) – Keyword search (enter text and press "Enter")
- Q – Return to the main menu

9. Reboot (BMC power cycle) controller to LOADER

To exit system-level diagnostics and return to the LOADER prompt, type "8" and then press "Enter".

```
Copyright (c) 2016 NetApp Inc. All rights reserved.
#### AFF A700s System-Level HW Diagnostics 01.05.14 ####
#### System      PN: j00-600-g+20      ####
#### System      SN: shffg1631000187  ####
#### Controller-B PN: TEMP-S000092338  ####
#### Controller-B SN: 2BJJ0267S00N    ####
1) Scan system
2) Test system
3) Test memory
4) Show VPD information
5) Show FW revision
6) Show MAC address
7) Show logs
8) Reboot (BMC power cycle) controller to LOADER
Select a number 1-8 to execute the respective command:8
```

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- NetApp, Inc., 495 East Java Drive, Sunnyvale, CA 94089 U.S.
- Telephone: +1 (408) 822-6000
- Fax: +1 (408) 822-4501
- Support telephone: +1 (888) 463-8277