User Guide

Dell EMC Data Domain Operating System

Version 6.x

Dell EMC Data Domain Operating System Offline Diagnostics Suite User Guide

302-002-906
REV. 03
April 2019

This guide provides a troubleshooting flow for selecting the appropriate diagnostics for your problem, running the diagnostics to identify the faulty field replaceable unit (FRU), and generating the recommended service actions.

Your suggestions help us continue to improve the accuracy, organization, and overall quality of the user publications. Send your opinions of this document to DPAD.Doc.Feedback@emc.com.

This document includes:

EMC²

Revision history

The following table presents the revision history of this document.

Table 1 Document revision history

Revision	Date	Description
03	April 2019	Updated software family applicability
02	October 2016	Updated to include new hardware
01	August 2016	Initial publication for DD OS 6.0

This document was previously published under a different part number, 302-001-635.

Overview and supported systems

Data Domain provides both online and offline diagnostics for its systems:

- *Online diagnostics* are invoked on the Data Domain operating system (DD OS) command line. Some of these, such as `system status` and `enclosure show all`, which report the status of fans, power supplies, and temperature sensors, also run automatically in the background to monitor the system during runtime. Alerts are issued and emails are optionally sent when problems are detected.

- *Offline diagnostics* are run in response to customer problem reports, such as when a system cannot be booted to online operation, a card or disk is absent, or memory, connectivity, or configuration problems are suspected. Offline diagnostics check FRUs such as the system controller disks, motherboard, memory (DIMMs), NVRAM card(s), and other hardware.

Major differences in the use of online and offline diagnostics are:

- Offline diagnostics are used when the system is unable to come online.

- Offline diagnostics are used if the system is hanging frequently or has serious performance issues. These diagnostics can isolate performance problems to specific components.

- After online diagnostics detect a problem, offline diagnostics may be needed for further fault isolation or confirmation.

- Online diagnostics detect problems only when they access the part of the component that has the problem, whereas offline diagnostics test the full range of the component —an entire disk, for example—and can detect latent faults.

Data protection

Note

Diagnostics are run in offline mode and require a reboot to load.

In offline mode, the Data Domain file system is not running, and no customer data is flowing through the system. Tests are completely data-safe and non-destructive.

Supported systems

The next table shows which diagnostic tests can be run on each supported Data Domain system (DD*xxx[x]*) and which FRU is tested. For test coverage information, see Diagnostic test descriptions on page 30.

> ⚠ **CAUTION**
>
> **The offline diagnostics described in this guide support only the systems shown in the table below. Do not run these diagnostics on any other systems, as unexpected behavior may result.**

Table 2 Offline Diagnostics Support for DD OS Systems (X=Supported)

FRU Tested	Test Name	DD160 DD620	DD640 DD670 DD860 DD880 DD890	DD990 DD2200 DD2500 DD4200 DD4500 DD7200	DD6300 DD6800 DD9300	DD9500 DD9800
(See list.)	System Inventory	X	X	X	X	X
(See Diagnostic test descriptions on page 30.)	SEL Log Scan			X	X	X
System Controller Boot Disk	HDD Quick Test	X	X	X	X	X
System Controller Disks (all)	HDD Comprehensive Test	X	X	X	X	X
Memory (DIMMs)	Memory Diagnostics	X	X	X	X	X
Motherboard	CPU Test	X	X	X	X	X
	CPU MCE Test	X	X	X	X	X
	CPU SSE Test	X	X	X	X	X
	Motherboard PCIe Topology Test	X	X	X	X	X
	SAS HU Diagnostics Test		X	X	X	
	SATA HU Diagnostics Test	X				
Ethernet Network	Network Internal Loopback Test	X	X	X	X	X

Table 2 Offline Diagnostics Support for DD OS Systems (X=Supported) (continued)

FRU Tested	Test Name	DD160 DD620	DD640 DD670 DD860 DD880 DD890	DD990 DD2200 DD2500 DD4200 DD4500 DD7200	DD6300 DD6800 DD9300	DD9500 DD9800
Interface Card (NIC)	Network External Loopback Test	X	X	X	X	X
NVRAM Card	NVRAM Card Test	X	X	All except DD2200	X	X
Serial Attached SCSI (SAS) Daughter and HBA Expansion Cards	SAS Diagnostics Test		X	All except DD2200		
VTL HBA Card, Cable	VTL Diagnostic	X	X	X	X	X
Battery Backup Unit	BBU Diagnostic			DD2200 Only		

Requirements

System controller boot disk or USB key with DD OS

To boot offline diagnostics, you must have one of the following:

- A functional system controller boot disk with DD OS 5.5 (or a later version) installed.

- A dedicated USB 2.0-compatible key (a.k.a. keychain drive, thumb drive, or flash memory stick), 2 GB or larger, with DD OS 5.5 (or a later version) installed and inserted into one of the system's USB ports. USB keys must be formatted as FAT32 (Unix VFAT).
  Refer to the *EMC Data Domain Operating System USB Installation Guide,* available on the EMC Online Support site, to request and download a bootable DD OS USB image and install it onto a USB key.

Note

Starting with DD OS 5.5, you can run offline diagnostics from a USB key on systems running the same DD OS version or any of the previous four versions (DD OS 5.4–5.1). You can also run offline diagnostics on systems running later versions of DD OS, however diagnostic logs will be written only to the USB key and not to the system disk.

USB key (optional for saving logs)

After running diagnostics, log files are automatically saved to the system boot disk and to an external USB key, if one is inserted. You can also insert a USB key and save logs to a USB key from the Main Menu after they are written to the system disk.

You may want to use a USB key to store log files if:

- Diagnostic logs cannot be written to the system disk. (You are prompted to insert a USB key, or cancel without saving logs.)

Note

If you are running offline diagnostics from a USB key on a system with a later version of DD OS, diagnostic logs will not be written to the system disk, but will be written to the USB key.

- You might not be able to reboot the system to online mode to access the offline diagnostics log file (a concatenation of all logs) on the system boot disk.

Requirements for the USB key are:

- FAT32 (Unix VFAT) format
- 10 MB of free space

For more information on viewing log files on the system or USB key after running offline diagnostics, Getting log information after running diagnostics on page 29.

Note

If you booted offline diagnostics from a USB key, you can use the same key to store log files if it has at least 10 MB of free space.

System downtime

The typical time required to run all tests in the suite is 75 to 90 minutes, depending on the system type and configuration.

The next table shows the maximum possible run time, to the nearest minute, for each test in the offline diagnostics user interface. Maximum run time is the test execution time plus the time needed for the diagnostic to time out if it cannot complete. This is always greater than the test execution time.

Table 3 Maximum Run Times for Individual Tests

Test Group	Test	Maximum Run Time
System	System Inventory	5 minutes
	SEL Log Scan	5 minutes
Network Interface Card	Network Internal Loopback Test	11 minutes
	Network External Loopback Test	10 minutes
Motherboard	CPU Test	16 minutes
	CPU MCE Test	3 minutes
	CPU SSE Test	60 minutes [a]

Table 3 Maximum Run Times for Individual Tests (continued)

Test Group	Test	Maximum Run Time
	Motherboard PCIe Topology Test	2 minutes
	SAS HU Diagnostics Test, or SATA HU Diagnostics Test	20 minutes, 10 minutes
NVRAM Card	NVRAM Card Test	1–8 minutes [b]
Fibre Channel	Gateway Diagnostic	25 minutes
	VTL Diagnostic	23 minutes [c]
HDD	HDD Quick Test	10 minutes
	HDD Comprehensive Test	60 minutes
SAS	SAS Diagnostics Test	20–51 minutes[d]
Battery Backup	BBU Diagnostic	10 minutes

a. Maximum CPU SSE test time for DD6300, DD6800, and DD9300: 40 minutes.
b. Maximum NVRAM test time varies by system:

- For DD880: 1 minute.
- For DD160 and DD620: 3 minutes.
- For DD640, DD670, DD860, and DD890: 4 minutes.
- All others: 8 minutes.

c. Maximum VTL Diagnostic test time for DD6300, DD6800, and DD9300: 20 minutes.
d. Maximum SAS test time varies by SAS configuration:

- For a minimum SAS configuration: 20 minutes.
- For a maximum SAS configuration: 51 minutes.

Table 4 Maximum Run Times for MemoryTests

Test Group	Test	Maximum Run Time
Memory	Memory Diagnostics	7–15 minutes[a]

a. Maximum Memory test time varies by system:

- For DD160 and DD620: 7 minutes.
- For DD9800: 15 minutes
- All others: 11 minutes.

Selecting and running diagnostics

Steps in the diagnostic troubleshooting flow are given below.

Procedure

1. Find your problem in the problem list and note the diagnostics specified.

   (See Finding the problem definition and its specified diagnostics on page 7.)

2. Reboot the Data Domain system to offline diagnostics mode.

   (See Rebooting the system and running diagnostics on page 13.)

3. Run the diagnostics specified for your problem and check the results.

   (See Running diagnostics and checking results on page 18.)

4. Perform the recommended service actions for failed diagnostics and get additional information from diagnostic logs.

   (See Performing the recommended service actions on page 26.)

5. Save logs to the system disk and (optional) USB key, then quit diagnostics and reboot the system.

   (See Saving logs and exiting diagnostics on page 28.)

Finding the problem definition and its specified diagnostics

The next figure shows failures identified for supported systems and specifies which diagnostics to run. If there are additional symptoms, such as behavior, messages, or alerts, go to the table indicated to obtain the diagnostics to run. Then go to Rebooting the system and running diagnostics on page 13.

Note

You can access online diagnostic log messages with alerts and information in the `bios.txt` file using the DD OS `log view` command. Autosupport (ASUP) reports containing alerts from online diagnostics can be generated and viewed using the `autosupport show report` command described in the *EMC Data Domain Operating System Command Reference Guide*. You can also enable logging on your console emulator to capture the `autosupport` output directly to the console session log.

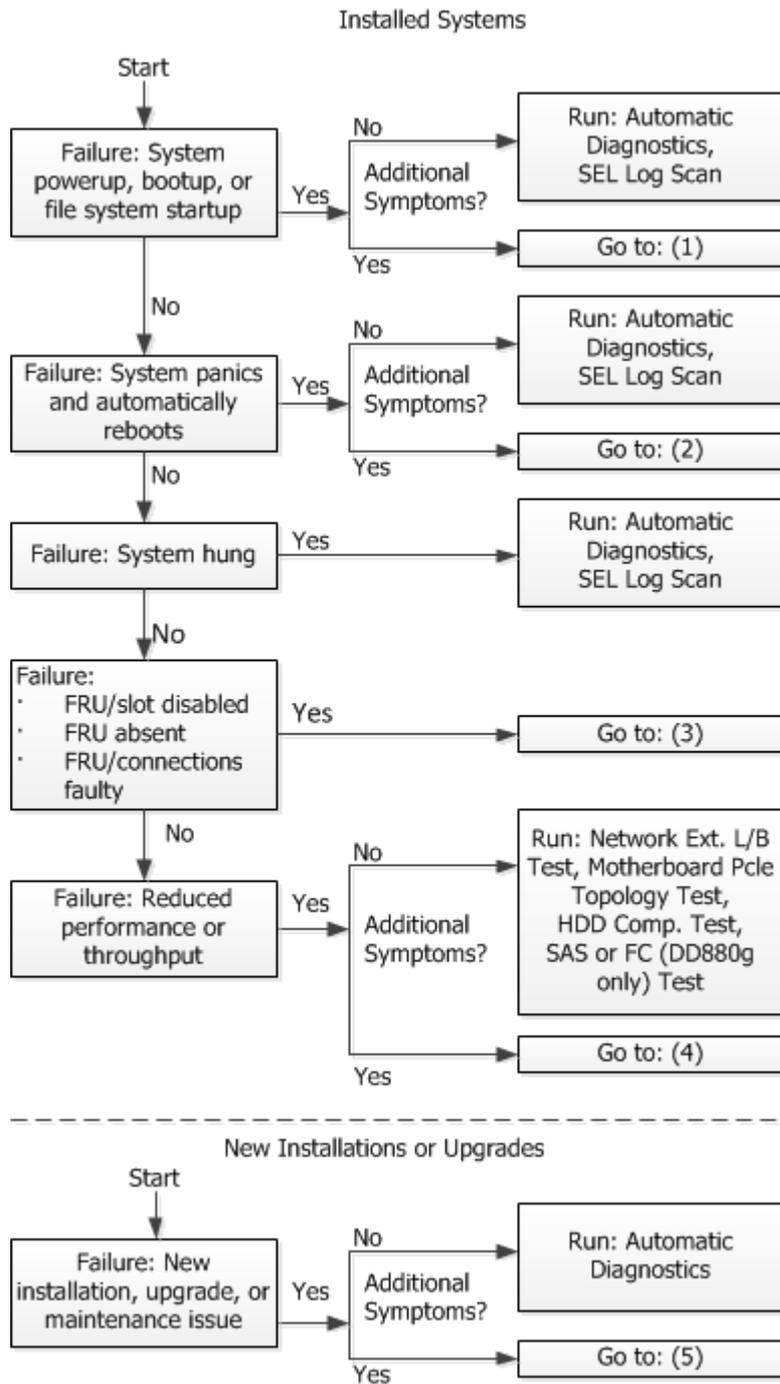**Figure 1** Failure Identification and Relevant Diagnostics

Table 5 Troubleshooting quick links

(1)	Powerup, Bootup, or File System Problems with Additional Symptoms Table 6 on page 9
(2)	System Panics and Reboots with Additional Symptoms Table 7 on page 9
(3)	Slot or FRU Disabled, FRU Absent, or Faulty FRU or Connection with Additional Symptoms Table 8 on page 10

Table 5 Troubleshooting quick links (continued)

(4)	Reduced Performance or Throughput with Additional Symptoms Table 9 on page 12
(5)	Installation, Upgrade, or Maintenance Issue with Additional Symptoms Table 10 on page 12

Table 6 Powerup, Bootup, or File System Problems with Additional Symptoms

Console Message/Alerts/Other	Tests to Run
Boot messages during system startup indicate that one or more network port configuration operations failed.	Network Internal Loopback Test
• Console displays NVRAM errors during boot. • Alert indicates multi-bit uncorrectable errors on NVRAM card after power cycle. • Alert indicates that the NVRAM card battery is low. • Alert indicates that DD OS has disabled NVRAM batteries or that batteries have not fully charged.	NVRAM Card Test
DD2200 system, which has a Battery Backup Unit instead of NVRAM board(s), fails to vault data on a power failure (the system does not recover from a power cycle).	BBU Diagnostic
System is unable to boot with expansion shelves connected, but does boot when they are disconnected.	SAS Diagnostics Test
Memory slot is disabled. • Example message in `bios.txt: …| Slot/Connector #0xe3 | Slot is Disabled | Asserted)`	• Memory Diagnostics • SEL Log Scan

Table 7 System Panics and Reboots with Additional Symptoms

Console Message/Alerts/Other	Tests to Run
System panics and automatically reboots. • Single-bit flip is logged in `messages.engineering` and `kern.info`. • MCE error is logged in `kern.info`.	• CPU Test • CPU MCE Test • CPU SSE Test • SEL Log Scan

System panic and reboot is caused by an uncorrectable ECC (POST or runtime) error.
• Console message: `Uh-huh. NMI received for unknown reason 20`
• Typical alert:
  ■ `Message Multibit Uncorrectable ECC error on [Locator: Memory Board A, DIMM_3, Serial Number: 0x01109DE6 ]`
  ■ `Event Id EVT-DIMM-00002`
	• Memory Diagnostics
	• SEL Log Scan

Table 7 System Panics and Reboots with Additional Symptoms (continued)

Console Message/Alerts/Other	Tests to Run
- Event Id EVT-DIMM-00003 - DIMM failed self-test during bootup. • Slot fault or disable message is logged in `bios.txt` during POST.	
System reboots early in boot cycle.	HDD Quick Test
System keeps rebooting and is unstable with a NIC card, but stable without it.	Network External Loopback Test

Table 8 Slot or FRU Disabled, FRU Absent, or Faulty FRU or Connection with Additional Symptoms

Console Message/Alerts/Other	Tests to Run

Memory slot is disabled.
 	
• Example message in `bios.txt`: …| `Slot/Connector #0xe3 | Slot is Disabled | Asserted)`
• Memory reported is less than expected for DD880, or DD990 systems.
• DIMM failure is suspected.
• Correctable ECC limit is exceeded (runtime error).
• ECC errors are logged in `bios.txt`.
• Typical alerts:
  ■ `ALERT: MSG-TOOLS-00005 : DRAM slot disabled due to ECC errors Correctable ECC limit exceeded`
  ■ `ALERT: MSG-TOOLS-00005 : DRAM slot disabled due to ECC errors`
	• Memory Diagnostics
	• SEL Log Scan

DD OS disables a memory DIMM slot because of excessive correctable errors. • Typical alert: `ALERT: MSG-TOOLS-00005 : DRAM slot disabled due to ECC errors.` • Faulty memory, CPU, or motherboard is suspected. • Faulty QPI link is suspected.	• Memory Diagnostics • CPU Test • CPU MCE Test • SEL Log Scan
System is unable to access a device when it is physically present, or device fails to respond to PCIe transactions. • Incorrect platform topology is suspected. • Faulty connection is suspected.	• Motherboard PCIe Topology Test • SEL Log Scan • Network or VTL Cards Test
System controller hard disk drive (HDD) is absent.	• HDD Quick Test

Table 8 Slot or FRU Disabled, FRU Absent, or Faulty FRU or Connection with Additional Symptoms (continued)

Console Message/Alerts/Other	Tests to Run
	• HDD Comprehensive Test
• NVRAM card is absent. • NVRAM card batteries are disabled. • NVRAM card battery fault is suspected. • NVRAM card battery connection fault is suspected after visual inspection. • NVRAM batteries have not fully charged.	NVRAM Card Test
For system DD2200, which has a Battery Backup Unit instead of NVRAM board(s), batteries are reported as: • BBU is not charging • Battery hardware fault alert	BBU Diagnostic
DD OS SAS diagnostics command `enclosure test topology` detected a connectivity problem and further fault isolation is necessary. • Multiple drive failures occurred. • Repeated failures or absences of drives, especially if in the same slot. • Multipath errors on failure.	SAS Diagnostics Test
Runtime alerts indicate that the path to a system controller drive or the "enclosure" logic built into the system controller was lost. **Note** SAS HBA connectivity is not tested.	SAS HU Diagnostic Test/ SATA HU Diagnostic Test
• Statistics output from the DD OS command `net config` (alias `ifconfig`) shows abnormally high values for Tx/Rx and error counters. Possible issues are with the system bus or NIC IO interfaces. • Statistics output from the DD OS command `ethtool -S ifname` shows errors such as DMA underrun, DMA overrun, frame errors, and CRC errors. The diagnostic verifies that the controller is functional. **Note** There is an `ethtool_stats.log` under `log/debug/ platform/` where the ethtool -S statistics for each physical interface is saved every hour.	• Network External Loopback Test • Motherboard PCIe Topology Test

Table 8 Slot or FRU Disabled, FRU Absent, or Faulty FRU or Connection with Additional Symptoms (continued)

Console Message/Alerts/Other	Tests to Run
Note Contact EMC Customer Service for information on using the `se ethtool -S ifname` command. • PCIe reads terminate with aborts, and all Fs are returned by the system, resulting in big values. This could be an indication of problems with the system bus and network device's IO interface. The diagnostic confirms whether there is an issue with either the IO slot or the controller. The link light on the NIC card does not get turned on after: • Changing the cable, transceiver, and switch port. • Issuing the DD OS `net config ifname up` command, even if the ports are connected to a switch or a peer device.	

Table 9 Reduced Performance or Throughput with Additional Symptoms

Console Message/Alerts/Other	Tests to Run
• System is slow. • Monitor `kern.info` for disk-related errors or excessive retries causing sluggish or slow response.	• HDD Comprehensive Test • SAS Diagnostics Test
• System shows a large, random slowdown of throughput. • Network performance is low. The diagnostic shows whether or not hardware is functional. • CIFS/NFS applications fail on backup or restore, with many resets.	• Network External Loopback Test • SAS Diagnostics Test
• System shows degraded IO performance. • System shows reduced IO throughput.	• Motherboard PCIe Topology Test • Network External Loopback Test • SAS Diagnostics Test • SEL Log Scan

Table 10 Installation, Upgrade, or Maintenance Issue with Additional Symptoms

Console Message/Alerts/Other	Tests to Run
System fails a fresh install and drops into kernel debug mode (kdb).	NVRAM Card Test
System has a Battery Backup Unit instead of NVRAM board(s) and a fresh-install because a battery alert is present.	BBU Diagnostic

Table 10 Installation, Upgrade, or Maintenance Issue with Additional Symptoms (continued)

Console Message/Alerts/Other	Tests to Run
The system is down and not booting up properly.	See Table 6 on page 9.
The system is down and you want to check for hard drive failure.	• HDD Quick Test • HDD Comprehensive Test
On a new installation, you need to verify that shelves are connected according to the installation plan.	SAS Diagnostics Test

Continue to the next section,

Rebooting the system and running diagnostics

Offline diagnostics are part of the DD OS software and can be run from:

• The system boot disk

• A USB key with a bootable DD OS image
Refer to the *EMC Data Domain Operating System USB Installation Guide*, available on the EMC Online Support site, to download a bootable DD OS USB image and install it onto a USB key.

Note

In this section, you power up or reboot the Data Domain system. If the system is crashed or hung and cannot be powered up or rebooted, contact EMC Customer Service.

Launching offline diagnostics from the system boot disk

Procedure

1. Connect a console to the system, if not present, using one of these methods:

   • Remote serial link: Use for a serial console or laptop with terminal emulation software such as Secure CRT, PuTTY, or HyperTerminal (required for running DD OS commands). A null modem cable with a DB-9 female connector is required. Laptops without a serial DB-9 connector should use a USB/Serial adapter (not included) with the null modem cable.
   Connect the console or laptop to the standard DB-9 male or micro DB-9 female port on the system.

   • Direct connection: Use for a PS/2 or USB keyboard with a VGA monitor, or KVM console.
   Connect the P/S2 keyboard and mouse to the system's DIN-type ports, the USB keyboard to the system's USB-A port, and the VGA monitor to the system's DB-15 female port.

   Note

   KVM is not supported for DD2200, DD2500, DD4200, DD4500, and DD7200 systems.

   • Remote IPMI/SOL link: Use any of the console types listed above.

Connect to the system's RJ45 receptacle, as follows: For DD880 systems, use either of the built-in Ethernet ports; for other systems, use the Maintenance port.

2. If the system is powered down, power it up as follows. and then, skip to step 4:

   - If the system has a power button on the front, press it.

   - If the system does not have a power button on the front, remove (if inserted) the AC power cords from the power supplies, wait until the power supply LEDs have turned off, then reconnect the power cords.

   Note

   Systems that have a battery (e.g., DD2200) will require a longer wait time for the LEDs to turn off.

3. If the system is powered up and there is a system prompt on the console, stop any backups that are running or wait until those backups are completed, then:

   a. Log in as sysadmin (or an administrative-level user).

   Note

   The factory default password is the serial number on your Data Domain system. For its location, refer to your system's *Installation Guide*.

   If the default password has been changed, you need to use the new password.

   Enter:

   ```
   # system reboot
   ```

   b. Answer **yes** to the Are you sure? prompt.

4. During boot-up, the following message prints repeatedly on the console:

   ```
   Press any key to continue.
   ```

   Within ten seconds, press and hold down the spacebar until the boot menu appears.

   ⚠ **CAUTION**

   Do not press any other key, as unexpected behavior may result.

5. Depending on your system, one of the following boot menus will appear.

   - If you are running diagnostics on a system introduced with DD OS 5.4 or later, a boot menu appears that displays only the supported serial and SOL console connections:

Use the up or down arrow key to highlight the offline diagnostics option for your console interface, then press **Enter** to select it.

If you selected **Offline Diagnostics (Serial Console)**, a screen summarizing serial console connection settings will appear for 10 seconds, or until you press any key.

- If you are running diagnostics on a system introduced with DD OS 5.3 or earlier that has been upgraded or fresh installed with DD OS, then this boot menu appears:

Use the up or down arrow key to select the offline diagnostics option for your console interface, then press **Enter** to select it.

Note

For Serial-Over-LAN, select **Offline Diagnostics (Serial OverLan,ttyS0)** for all systems except DD160 and DD620 which must use **Offline Diagnostics (SerialOverLan,ttyS1)**. The 115200 baud rate option is not supported at this time.

If you selected **Offline Diagnostics (Serial Console)**, a screen summarizing serial console connection settings will appear. Press any key to dismiss it.

After you finish

Continue to Running diagnostics and checking results on page 18.

Launching offline diagnostics from a USB key

Note

- You may need to change your system's BIOS settings before you can boot from a USB key and run diagnostics. Contact EMC Customer Service for assistance before starting the steps below.

- Starting with DD OS 5.5, you can run offline diagnostics from a USB key on systems running the same DD OS version or any of the previous four versions (DD OS 5.4–5.1). You can also run offline diagnostics on systems running later versions of DD OS, however diagnostic logs will be written only to the USB key and not to the system disk.

- Refer to the *EMC Data Domain Operating System USB Installation Guide*, available on the EMC Online Support site, to download a bootable DD OS USB image and install it onto a USB key.

Procedure

1. Connect a console to the system, if not present, use one of these methods:

   - Remote serial link: Use for a serial console or laptop with terminal emulation software such as Secure CRT, PuTTY, or HyperTerminal (required for running DD OS commands). A null modem cable with a DB-9 female connector is required. Laptops without a serial DB-9 connector should use a USB/Serial adapter (not included) with the null modem cable.
   Connect the console or laptop to the standard DB-9 male or micro DB-9 female port on the system.

   - Direct connection: Use for a PS/2 or USB keyboard with a VGA monitor, or KVM console
   Connect the P/S2 keyboard and mouse to the system's DIN-type ports, the USB keyboard to the system's USB-A port, and the VGA monitor to the system's DB-15 female port.

     Note

     Keyboard, video, and mouse (KVM) is not supported for DD2200, DD2500, DD4200, DD4500, and DD7200 systems.

2. Insert the USB key with the DD OS image into a USB port on the system. (For USB port locations, refer to your system's Hardware Overview manual.)

3. If the system is powered down, power it up as follows:

   - If the system has a power button on the front, press it.

   - If the system does not have a power button on the front, remove (if inserted) the AC power cords from the power supplies, wait until the power supply LEDs have turned off, then reconnect the power cords.

   Skip to step 5.

4. If the system is powered up and there is a system prompt on the console, stop any backups that are running or wait until those backups are completed, then:

   a. Log in as sysadmin or an administrative-level user.

Note

The factory default password is the serial number on your Data Domain
system. For the serial number location, refer to your system's installation
guide.

If the default password has been changed, you need to use the new
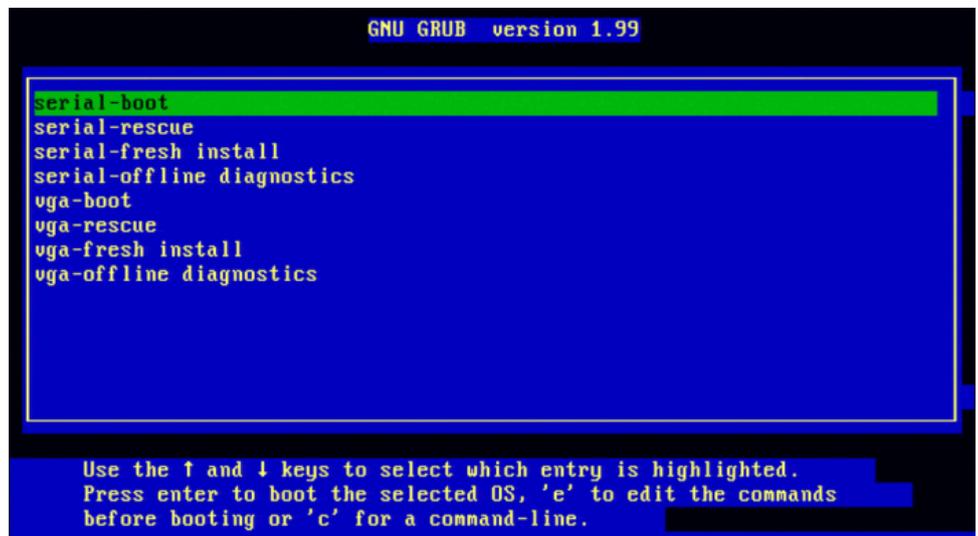password.

Enter:

```
# system reboot
```

   b. Answer **yes** to the `Are you sure?` prompt.

5. As the system reboots, confirm that it is booting from the USB key by checking
   the activity light (LED) on the key, if present.

Note

If the system appears to be booting from the internal disk rather than the USB
key, contact EMC Customer Service for assistance.

---

6. The boot menu appears:

Scroll down using the down arrow key to highlight the offline diagnostics option
for your console interface, then press **Enter** to select it.

Note

VGA options are not supported for DD2200, DD2500, DD4200, DD4500, and
DD7200 systems.

If you selected **serial-offline diagnostics**, a screen summarizing serial console
connection settings will appear for 10 seconds, or until you press any key.
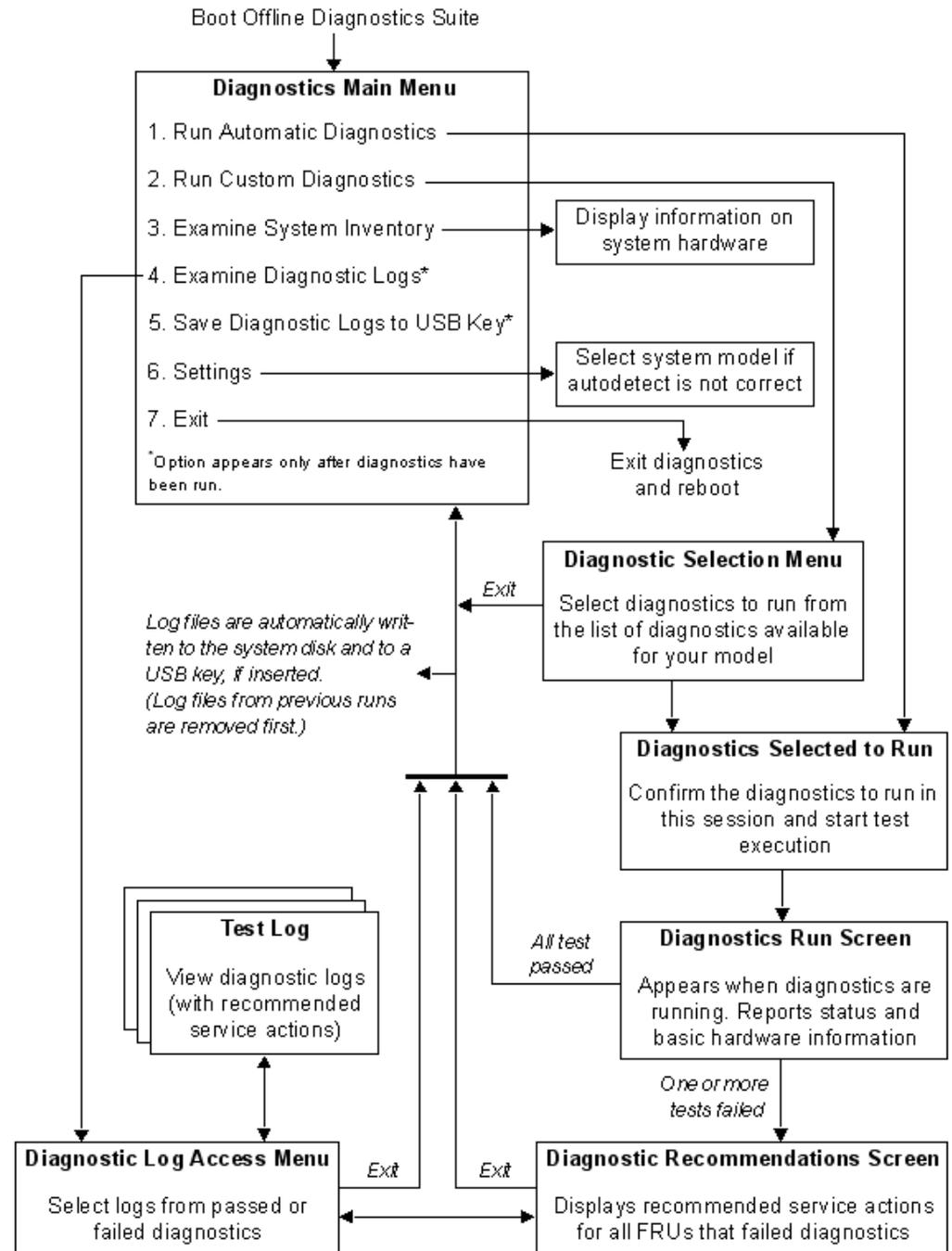
After you finish

Continue to

Running diagnostics and checking results

Navigating the diagnostics interface

The next figure shows the diagnostic flow.

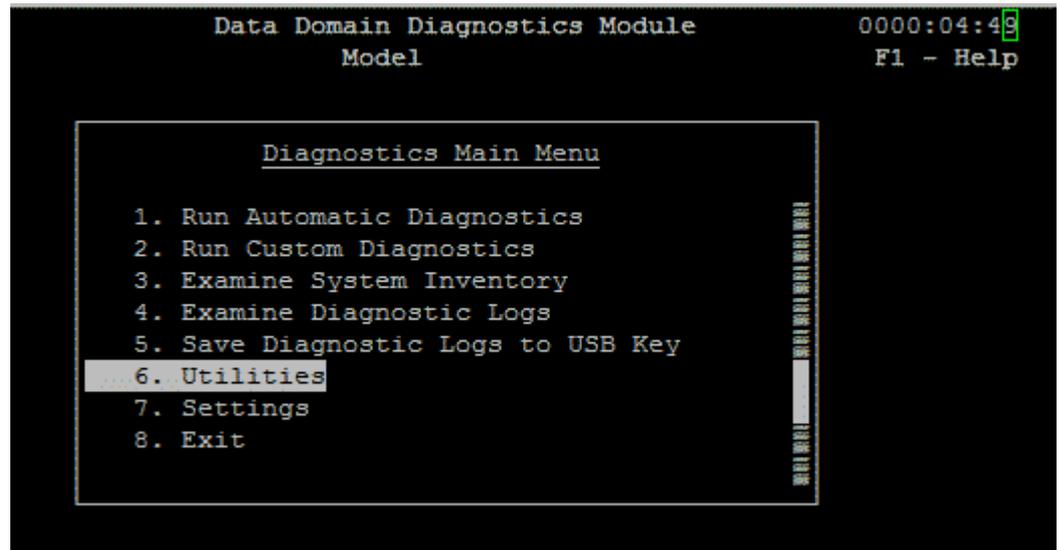**Figure 2** Diagnostic Menus and Flow

Main menu

The Main Menu appears after you boot offline diagnostics.

Note

- If the Main Menu does not appear, see Bringing up the offline diagnostics main menu on page 33.

- The **Examine Diagnostic Logs** and **Save Diagnostic Logs to USB Key** selections are visible only after diagnostics have been run.

- The navigation and selection keys available for a screen can be obtained by displaying the help window (press F1). These are also listed in Keyboard shortcuts for diagnostic screens on page 36.

- The total time in offline diagnostics mode is displayed at top, right.

- To save log files automatically following a diagnostics run, insert the USB key after the Main Menu appears, but before running diagnostics. Remove the USB key before starting another diagnostics run (existing logs are erased) or exiting the Main Menu. If you launched offline diagnostics from a USB key, leave that key inserted to write logs to it. The USB key is unmounted automatically when you exit the Main Menu. For USB key requirements, see USB key (optional for saving logs) on page 5.

```
        Data Domain Diagnostics Module          0000:04:49
                     Model                        F1 - Help


                Diagnostics Main Menu

          1. Run Automatic Diagnostics
          2. Run Custom Diagnostics
          3. Examine System Inventory
          4. Examine Diagnostic Logs
          5. Save Diagnostic Logs to USB Key
          6. Utilities
          7. Settings
          8. Exit
```

Main Menu selections are:

- **Run Automatic Diagnostics** - Run all diagnostics that apply to your system. Before starting test execution, you can see the test list on the Diagnostics Selected to Run screen (see Diagnostics Selected to Run screen on page 24). The following diagnostics have special setup requirements, run times of 1 hour or longer, or just display logs and are disabled for **Run Automatic Diagnostics**:

  - **Network External Loopback Test** (requires installing loopback cables, no IPMI/SOL connection)

Note

Diagnostics run from the serial port can terminate any IPMI/SOL connection.

- **CPU SSE Test** (run time is 60 minutes)
- **HDD Comprehensive Test** (run time is 60 minutes)
- **SEL Log Scan** (only displays logs)

These tests can be enabled by choosing **Run Custom Diagnostics**.

- **Run Custom Diagnostics** - Select a subset of the diagnostics that apply to your system (see Using the Diagnostic Selection menu on page 23).

- **Examine System Inventory** - Get information on the following system hardware:
  - CPU
  - BMC
  - BIOS
  - Motherboard
  - I/O riser
  - Front panel board
  - Backplane
  - Riser cards
  - System fan state
  - Power supplies
  - BBU module (DD2200 only)
  - Memory configuration
  - NVRAM card(s) (not present for DD2200)
  - SAS controllers (HBAs)
  - Ethernet controllers (NICs)
  - Fibre channel (FC) controllers (Gateway and VTL systems)

  Execution takes a few minutes, but then the information is cached for quicker subsequent retrieval. This functionality is also available by selecting **System Inventory** on the Diagnostic Selection Menu (it is enabled by default for **Run Automatic Diagnostics**). The cached inventory information is updated each time **System Inventory** is executed in a diagnostic run. A portion of the inventory listing is shown in the next figure.

Note

For DD990 systems, in the output from **Examine System Inventory,** the serial number is in the Product Version field instead of the Product Serial field where this value is found on other systems.

```
                    Data Domain Diagnostics Module        0000:02:57
                          Model : DD7200                   F1 - Help


                    System inventory (ESC or Q to exit)

  Model: DD7200
  Service Tag:       FNM00114901214
  Product Serial : FCNME114200104


  -----------------------------------
  CPU
    Model name            :           Intel(R) Xeon(R) CPU E5-2680 0 @ 2.70GHz
    Total number of CPU's : 2
    Number of cores / cpu : 16
  Motherboard
  BMC
    Device Revision       : 0
    Firmware Revision     : 10.3
    IPMI Version          : 2.0
  BIOS
    Version: 14.30
    Release Date: 04/23/2013
```

- **Examine Diagnostic Logs** - Display log files for all passed and failed diagnostics after diagnostics have been run (see Viewing log files on page 27). Only log files from the last diagnostic run are available.

- **Save Diagnostic Logs to USB Key** - Write logs to a USB key after diagnostics have been run. Only log files from the last diagnostic run are available. (All logs on a USB key are erased when a subsequent diagnostics run finishes and new logs are written.) Remove the USB key before exiting the Main Menu (and rebooting the system). The USB key is unmounted automatically. For USB key requirements, see USB key (optional for saving logs) on page 5.

Note

If there was a problem writing logs automatically to a USB key after running diagnostics, you can insert a different USB key and save logs to it using this function.

- **Utilities** - The Utilities menu appears after you select Utilities on the Main Menu.

```
                    Data Domain Diagnostics Module        0000:01:3
                          Model                            F1 - Help



                         Utilities Menu


            1. Erase NVRAM data
            2. Save Support Bundle to USB key
            3. Exit
```

Utilities Menu selections are:

- Utilities Menu selections are: **Erase NVRAM data** - Only the NVRAM 8 GB Model 3 has a battery that enables the NVRAM to preserve content when the system loses power, and the battery cannot be disconnected to erase memory. This feature appears in the menu only if there is at least one NVRAM 8 GB Model 3 installed on the system.

- Select **Erase NVRAM data** and then select the NVRAM slot to be erased from the following menu.

■ **Save Support Bundle to a USB key** Copy a record of system activity (time stamped log messages in a text file) to a USB key for debugging purposes. This feature collects a large subset of the DD OS state and log files which are normally collected when a support bundle can be gathered from a running DD OS system. The system saves the support bundle on the USB key in the following subdirectory: /mnt/diag-usbkey-mnt/diag_sub/sub-MM-DD-hh-mm/. The time of the support bundle is recorded in the directory name: MM is the month, DD is the day, hh is the hour, and mm is the minute. The support bundle is packaged in a tar file, compressed by gzip, and named: support-bundle.tar.gz. This feature is helpful:

- When collecting data from appliances that cannot boot the Data Domain Operating System (DD OS), but can boot to Offline Diagnostics.

- If LAN connectivity cannot be established.

- **Settings** - Specify your system's model from a list of supported models if it is not identified correctly at top of the Main Menu (see Bringing up the offline diagnostics main menu on page 33).

- **Exit** - Quit offline diagnostics to reboot the system (after confirming the exit).

Note

■ If you inserted a USB key to store log files, remove it before exiting diagnostics.

■ If you installed loopback cables for the Network External Loopback test, remove them and restore the previous network cable connections before exiting diagnostics.

Using the Diagnostic Selection menu

If you selected **Run Custom Diagnostics** in the Main Menu, the Diagnostic Selection Menu appears. This menu lists all applicable diagnostics for the system. These are deselected by default.

Procedure

1. Select at least one individual diagnostic or group of diagnostics according to Finding the problem definition and its specified diagnostics on page 7.

   Highlight the test or group, then press the spacebar to select ([x]) or deselect ([ ]) it.

   Note

   - Navigation and selection keys available can be obtained by displaying the help window (press **F1**). These are also listed in Keyboard shortcuts for diagnostic screens on page 36.

   - If you want to run the Network External Loopback Test, you must first install loopback cables as described in Installing loopback cables on page 35; otherwise, the test fails.

---

2. Press **Enter** (or type **r** or **R**) to display the Diagnostics Selected to Run screen and confirm your choices (Diagnostics Selected to Run screen on page 24).

```
            Data Domain Diagnostics Module          0000:20:04
                     Model : DD7200                   F1 - Help

                  Diagnostic Selection Menu

        [ ] Network Interface Card
        [ ]     Network Internal Loopback Test   (11 min)
        [ ]     Network External Loopback Test   (10 min)
        [x] Memory
        [x]     Memory Diagnostics   (10 min 40 sec)
        [ ] Motherboard
        [ ]     CPU Test   (16 min)
        [ ]     CPU MCE Test   (3 min 30 sec)
        [ ]     CPU SSE Test   (60 min)
        [ ]     Motherboard PCIe Topology Test   (1 min 40 sec)
        [ ] System
        [ ]     System Inventory   (5 min 20 sec)
        [ ]     SEL Log Scan   (5 min)
        [x] NVRAM CARD
        [x]     NVRAM Card Test   (7 min 40 sec)
        [ ] Fibre Channel
        [ ]     VTL Diagnostic   (23 min)
        [x] HDD
```
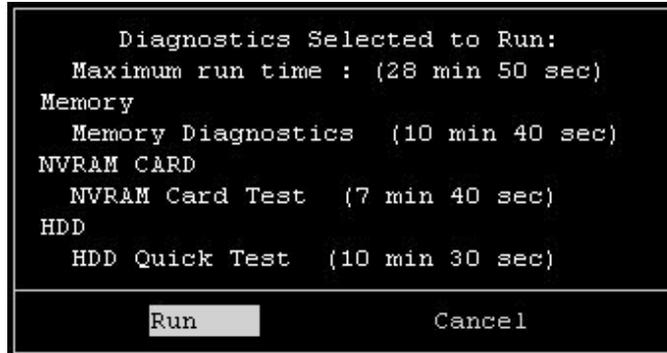
After you finish

Continue to Diagnostics Selected to Run screen on page 24.

Diagnostics Selected to Run screen

This screen appears after the Diagnostic Selection Menu (for custom diagnostics) or if you selected **Run Automatic Diagnostics** in the Main Menu. Select **Run** and press **Enter** to begin test execution. Selecting **Cancel** returns you to the previous menu.

```
        Diagnostics Selected to Run:
   Maximum run time : (28 min 50 sec)
Memory
   Memory Diagnostics   (10 min 40 sec)
NVRAM CARD
   NVRAM Card Test   (7 min 40 sec)
HDD
   HDD Quick Test   (10 min 30 sec)

          Run                Cancel
```

Using the Diagnostics Run Screen

The Diagnostics Run screen is active whenever diagnostics are executing.

Procedure

1. If all diagnostics pass, press **Enter** to automatically write test logs and return to the Main Menu.

2. If one or more diagnostics fail, press **Enter** to go to the Diagnostic Recommendations screen, which provides suggested service actions and access to diagnostic logs.

Note

In the example shown below for memory diagnostics, the test reports the locations and sizes of DIMMs it finds and prints these in the Diagnostic Information area, along with the expected system memory (MemTotal). If there is a mismatch between the DIMMs found and the expected system configuration, the log's Recommended Service Actions section lists the locations and sizes of found and expected DIMMs. Clear any DIMM problems before running other diagnostics.

```
                    Data Domain Diagnostics Module            0000:24:27
                          Model : DD7200             Ctrl-c - Abort
                    Maximum run time left : 28 min 5 sec

                          Diagnostic Progress
Memory Diagnostics : configure  ....PASSED
Memory Diagnostics : initialization  ....PASSED
Memory Diagnostics  ....running (9 min 55 sec left)




                          Diagnostic Information
Model Information:     SKU: DDMEGATRON-IDE    SN: FCNME114200104
CPU Model: Intel(R) Xeon(R) CPU E5-2680 0 @ 2.70GHz
Number of CPU's: 2    Number of Cores/CPU: 16
MemTotal: 264130768 kB MemFree: 261875756 kB
DIMM 0 16384   DIMM 1 16384
DIMM 2 16384   DIMM 3 16384
DIMM 7 16384   DIMM 6 16384
DIMM 5 16384   DIMM 4 16384
For more information, please check the diagnostic log
```

If all tests passed, this prompt appears:

```
Completed, all diags PASSED

            [OK]
```

Click **OK** to write logs and return to the Main Menu.

If all one or more tests failed, this prompt appears:

```
Completed, one or more diags FAILED

            [OK]
```

Click **OK** to continue to the Diagnostic Recommendations screen ().

Performing the recommended service actions

If one or more diagnostics fail, the Diagnostic Recommendations screen displays service actions suggested by the failing diagnostics. Perform all recommended service actions before concluding that the FRU has failed.

```
                Data Domain Diagnostics Module          0000:35:2
                    Model : DD7200                       F1 - Help


        Diagnostic Recommendations (ESC or Q to exit, L to access logs)


    ----------------------------------------
    NVRAM Card Test Recommendations :
    ----------------------------------------
    NVRAM card in slot 10
     encountered an internal error
    Unable to get NVRAM battery info in slot 10
    Recommended Service Actions:
     - Cable connecting NVRAM card and battery unit may be loose
     - Power cable connecting battery unit may be loose
     - or battery unit may be faulty
    Caution: There may be live data in NVRAM card!!
    Please contact DataDomain customer support to resolve

    Unable to Access VPD information
    Caution: There may be live data in NVRAM card!!
    Please contact DataDomain customer support to resolve.
```

⚠ **CAUTION**

Recommended service actions can include reseating and replacing cards and other components. These activities involve powering down the system and removing system covers for FRU access. Follow the FRU's installation guide to perform these tasks. These guides are available on the EMC Online Support site.

Using Log Files

Most diagnostics contain several subtests that check different conditions and, upon failure, generate a different recommended service action for each. Recommended service actions appear on the console, but the conditions that generate them are recorded only in the full test log. Before performing the recommended service actions, you can display the full log file to get more information on the failing condition (see Viewing log files on page 27). You can also view log files after exiting diagnostics (see Getting log information after running diagnostics on page 29).

Viewing log files

There are several ways to access log files:

- From the Diagnostics Recommendations screen, type **L**.

- After diagnostics have been run, you can return to the Main Menu at any time and select **Examine Diagnostic Logs** to see logs for all passed and failed diagnostics.

- To view logs after exiting diagnostics, see

Logs for failed diagnostics include recommended service actions. Returning to the Main Menu also causes logs to be written to a USB key, if one is inserted. If you want to copy current logs to a USB key later, select **Save Diagnostic Logs to USB Key** in the Main Menu.

Note

All logs on a USB key are erased when a subsequent diagnostics run finishes and new logs are written. To preserve existing logs, copy them to another device before running diagnostics again.

Diagnostic Log Access Menu
From the Diagnostic Log Access Menu, you can select and display logs for all tests run. If diagnostics are run more than once, all logs from the previous run are removed before the new logs are written.

Note

The navigation and selection keys available for a screen can be obtained by displaying the help window (press **F1**). These are also listed in

Example Test Log for NVRAM Cards
The NVRAM log appears as follows:

```
                    Data Domain Diagnostics Module        0000:37:42
                         Model : DD7200                   F1 - Help


                     NVRAM Card Test log (ESC or Q to exit)

Output STDOUT & STDERR log for pre-execution '/ddod/bin/nvramdiag_pre-execut
ion' with switches '(null)' (pid: 27835) (DDOS Version: 5.5.0.0-398793)
Tue Oct 08 21:32:39 UTC 2013
PREEXECUTION_START
Number of EMC NVRAM cards:        1
PREEXECUTION_END
PREEXECUTION_START
Slot 10: EMC NVRAM
PREEXECUTION_END
Tue Oct 08 21:32:39 UTC 2013

[START] Timestamp: Tue Oct 08 21:32:39 UTC 2013
Diagnostic STDOUT and STDERR log for 'NVRAM Card Test' with switches '-e -m
DD7200 '
(DDOS Version: 5.5.0.0-398793) (pid: 27864) (sequence number: 3) (iteration:
 1) (list element: 1)
Loading NVRAM driver
```

From this screen you can go to the Diagnostic Log Access Menu.

For example offline diagnostics log file listings with annotations, see:

- Example system disk log file on page 40
- Example USB key log file on page 41

Continue to the next section, Saving logs and exiting diagnostics on page 28.

Saving logs and exiting diagnostics

Saving Test Log Files to the System Controller Disk and a USB Key
Exiting from the following windows results in log files being written to the system boot disk and to an external USB key (if one is inserted):

- Diagnostics Run screen with `All tests PASSED` (select **OK**, then press **Enter**)
- Diagnostic Recommendations screen (press the **Esc** key or the **Q** key)
- Diagnostic Log Access Menu (select **Return to Main Menu**, then press **Enter**)

Status screens appear while the required drivers are loaded and logs are written, then control is returned to the Main Menu.

Note

- You can run offline diagnostics on systems running later versions of DD OS, however diagnostic logs will be written only to the USB key and not to the system disk.
- If a core dump occurs while you are running offline diagnostics, the core file is written to the SUB area for analysis by EMC Customer Service. Core files are not saved to USB keys.

Saving Logs to a USB Key Only
Logs cannot be saved to the system controller boot disk if:

- The current DD OS release, or one of the four previous releases is not installed.
- Disk hardware is not functional.
- The disk has been swapped out (serial number mismatch with system).

- A system controller upgrade was started, but did not complete.

If logs cannot be saved to disk and no USB key is present, you are prompted to insert a USB key. You can use any FAT32 (Unix VFAT) formatted USB key with at least 10 MB of free space. If you do not insert a USB key, no diagnostic logs are saved.

Note the following messages:

- `No USB key present or not formatted correctly` indicates that the inserted key is defective or not formatted properly. Verify formatting and try a different port or a different USB key.

- `Could not write log files to USB key` indicates that the key has less than 10 MB of free space.

After logs are successfully saved to the USB key, you are returned to the Main Menu.

Remove the USB key before exiting the Main Menu (and rebooting the system).

Continue to the next section, Getting log information after running diagnostics on page 29.

Getting log information after running diagnostics

After running diagnostics, ASCII-format logs are:

- Concatenated and written to a single `diag_log.sub` file on the system disk.

- Written as separate files to a USB key (if one is inserted).

Viewing the log file on the system disk

If you are able to reboot the system to online mode, you can get the logs from the last offline diagnostics run. These are concatenated into single file on the system boot disk: `/ddr/var/log/debug/platform/diag_log.sub`

You can view this file using the DD OS `log view` command as follows:

```
# log view debug/platform/diag_log.sub
```

A `diag_log.sub` file is provided in Example system disk log file on page 40.

Viewing the log files on a USB key

Log files are written to a USB key, if inserted, when you return to the Main Menu after running diagnostics or when you select **Save Diagnostic Logs to USB Key** on the Main Menu. These logs are displayed when running offline diagnostics.

The parent log directory `/diag_logs` is created off the USB root and a subdirectory `/log-mm-dd-hh-mm` is created (where *mm* = month, *dd* = day, *hh* = hour, and *mm* = minute the logs were saved). Individual diagnostic logs and a log of the diagnostic flow are saved in this subdirectory. These logs are saved in ASCII format for viewing on any Linux or Windows machine.

Note

All logs on a USB key are erased when a subsequent diagnostics run finishes and new logs are written. To preserve existing logs, copy them to another device before running diagnostics again. However, a support bundle gathered by the Support Bundle utility is not erased after the bundle is saved on the USB key.

A USB log file is provided in Example USB key log file on page 41.

Diagnostic test descriptions

The next table provides additional information on diagnostic test coverage. See
Supported systems on page 3 to determine which tests are applicable to your system.

Table 11 Offline Diagnostic Test Coverage

Test Name	Coverage
System Inventory	Displays information on system hardware. (See list.)
BBU Diagnostic	Detects faults in the Battery Backup Unit (BBU) on system DD2200 that uses this module instead of NVRAM boards.
CPU MCE Test	Decodes and prints the stored machine check record generated by a machine check event. • Most errors can be corrected by the CPU using internal error correction mechanisms. Uncorrected errors cause machine check exceptions that may panic the system. • The MCE error condition displayed by the test unambiguously identifies the faulty component.
CPU SSE Test	Compares Adler and SHA1 checksums generated by SSE and non-SSE instructions for the same random data.
CPU Test	Tests the processor's ability to perform a Compress–Uncompress–Compare operation sequence. • An MD5 fingerprint is generated for the data file before it is compressed. The compressed file is then uncompressed and its MD5 fingerprint is compared against the one generated for the original file.
HDD Comprehensive Test	Tests all system controller disks. • Reads disk sectors and their SMART data.
HDD Quick Test	Tests the system controller boot disk only. • Reads disk sectors and their SMART data.
Memory Diagnostics	Tests available free memory and reports any ECC errors (correctable and uncorrectable) detected by hardware. • Identifies and reports a failing DIMM or DIMM pair. • Reports a failing memory riser on DD880 and DD990 systems.
Motherboard PCIe Topology Test	Checks that HBA cards (SAS, NIC, VTL, and NVRAM) conform to legal system model configurations and are in appropriate slots. • PCIe interconnect tests exercise and verify the PCIe subsystem. They ensure the connectivity for all the PCIe-based controllers and other IO targets present on the motherboard.

Table 11 Offline Diagnostic Test Coverage (continued)

Test Name	Coverage
	• The tests scan the entire PCIe fabric, starting from the PCIe root and looking for expected PCIe topology. The tests indicate errors if an expected device or a set of devices is absent.
Network External Loopback Test	Tests if the network controller's data path is functional through the NIC Tx and Rx ports. Built-in Ethernet and dual- and quad-port NICS can be tested; single-port NICs cannot be tested. This test generates and sends out packets, and expects to receive the same number of packets.
	Note
	• Before you run the Network External Loopback Test, loopback cables must be installed. For instructions, see Installing loopback cables on page 35. Installing loopback cables for the Network External Loopback Test does not affect running the Network Internal Loopback Test.
	• If you previously enabled the old-style network port names option in DD OS, see Mapping to legacy network port names on page 38 for the corresponding new, slot-based port names used by Offline Diagnostics Suite.
Network Internal Loopback Test	Tests if the network controller's data path is functional to the MAC layer. Loopback is through the internal loopback interface (MAC layer); packets do not leave the controller. This test generates and sends out packets and expects to receive the same number of packets.
	Note
	If you enabled the old-style network port names option in DD OS, see Mapping to legacy network port names on page 38 for the corresponding new, slot-based port names used by the Offline Diagnostics Suite.
NVRAM Card Test	Performs the following tests and checks:
	• Tests all partitions of NV memory on one or multiple NVRAM cards. Scans through the entire range to NV memory in each partition.
	• Checks Memory ECC.
	• Checks battery status.
	• Checks battery state (enabled/disabled).
SAS Diagnostics Test	Tests the SAS topology to determine the reliability of the connections:

Table 11 Offline Diagnostic Test Coverage (continued)

Test Name	Coverage
	• Pinpoints SAS connectivity problems to specific links. • Tests each external SAS Host Bus Adapter (HBA) port and attached shelf chain. • Generates read traffic to find errors that occur only under load. Failures are reported by slot.
SAS HU Diagnostics Test	Tests the SAS controller in the system controller. • In the log and runtime display, lists all system controller disks present and which disks are used to exercise each SAS link. • Generates read traffic to test the SAS links in the system controller and provides recommended service actions if there are connection problems.
SATA HU Diagnostics Test	Tests the SATA controller in the system controller. • Checks if the number of disks reported by the SATA hardware matches the expected configuration and generates a recommended service action if there is a mismatch or the SATA controller has failed.
SEL Log Scan	Unlike other diagnostics that exercise specific hardware components, this diagnostic fetches runtime system event logs and filters them for possible system hardware and firmware errors, and other noteworthy events. This feature enables you to monitor the system and identify faults while in offline diagnostics mode. Errors must be resolved manually; no FRU-specific service recommendations are provided.
VTL Diagnostic	Checks the following conditions: • The FC link is up or down. • A LUN has been assigned to the FC port. • Link reception errors have occurred. Failures are reported by slot and port number. **Note** The logic does NOT exercise the FC interface by reading or writing any data. This is because the VTL is a passive device and does not originate transactions. The diagnostic only gathers and interprets hardware state information.

Related topics

Bringing up the offline diagnostics main menu

As you boot offline diagnostics, the software attempts to determine your system model and then checks whether it is supported for offline diagnostics. If these actions complete without failure, the Main Menu is displayed.

Note the following:

- If this message appears, your system is not supported for offline diagnostics. If you booted offline diagnostics from a USB key, remove the key now to reboot to online mode.

- If this message appears, the automatic model detection function was unable to identify the system model.

Dismissing the screen brings up a list of supported models. Use the up or down arrow key to select your model, then press **Enter**.
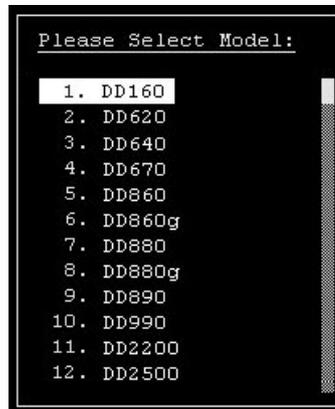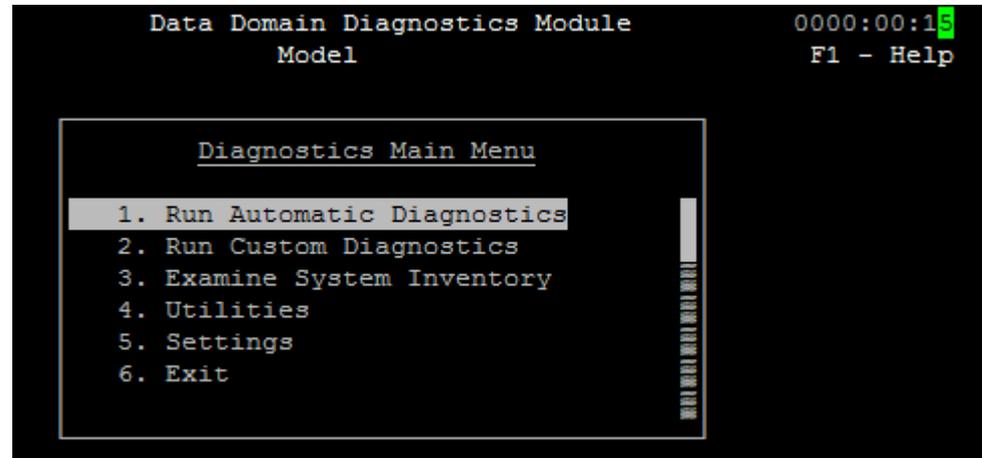

Note

If your system model is not listed, it is not supported for offline diagnostics. Do not select a different model to attempt to run diagnostics. Instead, select any system listed to return to the Main Menu, remove the USB key if you booted offline diagnostics from a USB key, then select Exit to reboot the system.

After automatic model detection or after you enter the correct model manually, the Diagnostics Main Menu appears.

Note

The navigation and selection keys available for a screen can be obtained by displaying the help window (press **F1**). These are also listed in Keyboard shortcuts for diagnostic screens on page 36.

```
Data Domain Diagnostics Module        0000:00:15
            Model                      F1 - Help


            Diagnostics Main Menu

      1. Run Automatic Diagnostics
      2. Run Custom Diagnostics
      3. Examine System Inventory
      4. Utilities
      5. Settings
      6. Exit
```

Go to Main menu on page 19 to continue running diagnostics, or select **Exit** to quit diagnostics and reboot the system.

Installing loopback cables

Loopback cables must be installed when you run the Network External Loopback Test. You can use the cables currently installed on the system, or equivalents. Cross-over cables are not necessary. Using the wrong cable will cause the test to fail.

Note

Before removing or changing any cable connections, note or mark the connector and port locations, so that you can easily restore them after running diagnostics.

Loopbacks can be implemented between built-in Ethernet ports, or between ports on the same Ethernet card (NIC) as shown in the figure. Refer to the Hardware Overview or Installation and Setup Guide for your system to obtain the location of built-in Ethernet ports and optional NIC slot assignments.

Note

Do not make a loopback from the maintenance port or single-port cards, which are not supported for loopback testing.

Connect the loopback cables as follows:

- Built-in Ethernet (RJ45), Intel SFP+, or Chelsio: Connect the two ports.
- Other NIC copper ports (RJ45): Connect ports on the same card. (Rx and Tx are determined automatically.)
- Other NIC fiber ports: Each port has Tx and Rx connectors. Connect the Tx side of one port to the Rx side of the other port (on the same card).

Figure 3 Loopback Connections
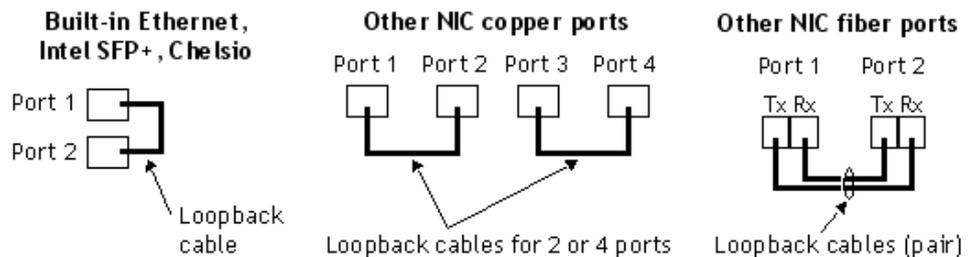
Remove the loopback connections and restore the previous network cable connections before exiting the Main Menu (and rebooting the system).

Keyboard shortcuts for diagnostic screens

The next table lists the navigation and selection keys you can use in the diagnostics user interface.

You can also obtain the keyboard shortcuts by displaying the help window for that screen (press **F1**).

Table 12 Keyboard Shortcuts

Screen Name	Key	Use
Diagnostics Main Menu, Diagnostic Log Access	F1	Displays a help window.
	up arrow	Moves highlighting up.
	down arrow	Moves highlighting down.
	Enter	Selects a highlighted item.
System Inventory, Logs	F1	Displays a help window.
	up arrow	Scrolls text up.
	down arrow	Scrolls text down.
	left arrow	Skips to the beginning of the information.
	right arrow	Skips to the end of the information.
	b, B, Page Up	Pages backward.
	f, F, Page Down	Pages forward.
	Esc, Q	Dismisses the screen.
Diagnostic Selection Menu	F1	Displays a help window.
	up arrow	Moves highlighting up.
	down arrow	Moves highlighting down.
	h, H	Displays help information for a highlighted item.
	b, B, Page Up	Pages backward.
	f, F, Page Down	Pages forward.
	spacebar	Toggles enabling or disabling a highlighted test or group.
	Tab	Skips to the next diagnostic group.
	Shift+Tab	Skips to the previous diagnostic group.
	d, D	Selects the default set of diagnostics that would be run if **Run Automatic Diagnostics** was selected on the Main Menu.

Table 12 Keyboard Shortcuts (continued)

Screen Name	Key	Use
	0 (zero)	Deselects all diagnostics (resets the menu).
	r, R	Runs the currently selected diagnostics without selecting the **Run Selected Diagnostics** item.
	Enter	Selects the highlighted field at bottom: **Run Selected Diagnostics**, or **Return to Diagnostics Main Menu**.
Diagnostics Selected to Run	up arrow	Scrolls text up.
	down arrow	Scrolls text down.
	left arrow	Highlights **Run**.
	right arrow	Highlights **Cancel**.
	b, B, Page Up	Pages backward.
	f, F, Page Down	Pages forward.
	Enter	Selects the highlighted field.
Diagnostic Progress/ Diagnostic Information	Ctrl+C	Aborts the diagnostic run. All diagnostics in the session are cancelled and no log files are written. Returns to the Diagnostics Main Menu after a few seconds.
Diagnostic Recommendations	F1	Displays a help window.
	up arrow	Scrolls text up.
	down arrow	Scrolls text down.
	b, B, Page Up	Pages backward.
	f, F, Page Down	Pages forward.
	l, L	Goes to the Diagnostic Log Access screen.
	Esc, Q	Dismisses the screen.

Mapping to legacy network port names

By default, DD OS 4.9 replaces the port names used in older releases with slot-based port names. While you can optionally use the legacy names in the current DD OS release, the Offline Diagnostics Suite uses only the slot-based names.

Slot-based port names use the following syntax:

`eth slot_number port_letter`

In this syntax,

- *slot_number* is a system slot.
- *port_letter* is one of the ports of the named slot.

Example port names include eth0a, eth0b, eth2a, eth2b, and so on.

Note

On newer systems the slot number may be "M," which means it is on the motherboard. The older systems have "0" for the motherboard interfaces. DD880 systems use legacy port names and may need port mapping. These names are used in system alerts, output from the `net show hardware` command, and in the "Net show hardware" section of ASUP reports, for example. You must consult the tables below to get the equivalent slot-based names.

DD880 systems

The next table shows the port name mapping for built-in Ethernet and optional NICs.

Table 13 Port Name Mapping for DD880 Systems

Number of NICs	NIC Configuration	Slot-Based Port Name	Legacy Port Name
N/A	Built-in interfaces	eth0a	eth0
		eth0b	eth1
1	Slot 5: Single-port card	eth5a	eth2
1	Slot 5: Dual-port card	eth5a	eth2
		eth5b	eth3
1	Slot 4: Single-port card[a]	eth4a	eth2
1	Slot 4: Dual-port card[b]	eth4a	eth2
		eth4b	eth3
2	Slot 5: Single-port card	eth5a	eth2
	Slot 4: Single-port card	eth4a	eth3
2	Slot 5: Single-port card	eth5a	eth2
	Slot 4: Dual-port card	eth4a	eth3
		eth4b	eth4
2	Slot 5: Dual-port card	eth5a	eth2
		eth5b	eth3

Table 13 Port Name Mapping for DD880 Systems (continued)

Number of NICs	NIC Configuration	Slot-Based Port Name	Legacy Port Name
	Slot 4: Single-port card	eth4a	eth4
2	Slot 5: Dual-port card	eth5a	eth2
		eth5b	eth3
	Slot 4: Dual-port card	eth4a	eth4
		eth4b	eth5

a. This configuration is valid only for DD880-GD single-node systems using a single node 10GE optical card or dual node 10GE CX4 card.
b. This configuration is valid only for DD880-GD single-node systems using a single node 10GE optical card or dual node 10GE CX4 card.

Example logs

Example system disk log file

The next figure shows a portion of a `diag_log.sub` file containing an NVRAM test log. Because all diagnostic logs are concatenated into a single file, the left column identifies the test log and the right column contains log information. This log shows that the NVRAM board in slot 10 failed.

Figure 4 NVRAM Test and Framework Logs in diag_log.sub File

```
File created at Tue Oct 8 15:50:14 PDT 2013
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Output STDOUT & STDERR log for pre-execu
tion '/ddod/bin/nvramdiag_pre-execution' with switches '(null)' (pid: 1325) (DDO
S Version: 5.5.0.0-398793)
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Tue Oct 08 21:43:04 PST 2013
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] PREEXECUTION_START
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Number of EMC NVRAM cards:        1
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] PREEXECUTION_END
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] PREEXECUTION_START
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Slot 10: EMC NVRAM
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] PREEXECUTION_END
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Tue Oct 08 15:45:04 PST 2013
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] [START] Timestamp: Tue Oct 08 21:43:04 PDT
 2013
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Diagnostic STDOUT and STDERR log for 'NV
RAM Card Test' with switches '-e -m DD7200 '
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] (DDOS Version: 5.5.0.0-398793) (pid: 135
4) (sequence number: 3) (iteration: 1) (list element: 1)
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Driver has already been loaded, skip loa
ding it
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] ----------------------------------------
/ddr/var/log/debug/platform/diag_log.sub  ::11::0000::110000--------
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]  Begin to test Remote-Battery NVRAM in S
lot 10
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] ----------------------------------------
--------
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] 0x00000078: 0x00810000 0x00000000 0x0000
0000 0x00000000
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Detected Link Width of internal PCIe lin
k: x8
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Expected Link Width of internal PCIe lin
k: x8
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Detected Link Speed of internal PCIe lin
k (GT/s): 2.5
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Expected Link Speed of internal PCIe lin
k (GT/s): 2.5
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] -------------------------------
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] NVRAM VPD Info in slot 10 :
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] -------------------------------
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] 4GB NVRAM IO Module detected
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Model                   = 1
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] HW Rev                  = 1.0
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] CPLD version            = b
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Total memory Size       = 4096MB
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] NVRAM Size              = 4032MB
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Memory initialized flag = 1
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Dirty partition map     = 0
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Active bank fw version  : 2.0.3-0
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Inactive bank fw version: 2.0.3-0
```

Figure 4 NVRAM Test and Framework Logs in diag_log.sub File (continued)

```
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Unable to get NVRAM battery info in slot
 10
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] RECOMMENDATIONS_START
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] NVRAM card in slot 10
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]  encountered an internal error
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Unable to get NVRAM battery info in slot
 10
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Recommended Service Actions:
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]  - Cable connecting NVRAM card and batte
ry unit may be loose
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]  - Power cable connecting battery unit m
ay be loose
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]  - or battery unit may be faulty
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Caution: There may be live data in NVRAM
 card!!
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Please contact DataDomain customer suppo
rt to resolve
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] RECOMMENDATIONS_END
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] RECOMMENDATIONS_START:
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Unable to Access VPD information
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Caution: There may be live data in NVRAM
 card!!
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Please contact DataDomain customer suppo
rt to resolve.
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] RECOMMENDATIONS_END
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] Skipping testing this device
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log]
[/tmp/ddod/ddod_NVRAM_Card_Test_tr.log] [FINISH] Timestamp: Tue Oct 08 15:49:05
 PST 2013
```

Example USB key log file

The next figure shows a USB log file for the NVRAM test. This log shows that the NVRAM board in slot 10 failed.

Figure 5 NVRAM Test Log File on a USB Key

```
Output STDOUT & STDERR log for pre-execution '/ddod/bin/nvramdiag_pre-execution' with
switches '(null)' (pid: 1325) (DDOS Version: 5.5.0.0-398793)
Tue Oct 08 21:43:04 PST 2013
PREEXECUTION_START
Number of EMC NVRAM cards:        1
PREEXECUTION_END
PREEXECUTION_START
Slot 10: EMC NVRAM
PREEXECUTION_END
Tue Oct 08 21:43:04 PST 2013

[START] Timestamp: Tue Oct 08 21:43:04 PST 2013
Diagnostic STDOUT and STDERR log for 'NVRAM Card Test' with switches '-e -m DD7200 '
(DDOS Version: 5.5.0.0-398793) (pid: 1354) (sequence number: 3) (iteration: 1) (list
element: 1)
Driver has already been loaded, skip loading it

------------------------------------------------
 Begin to test Remote-Battery NVRAM in Slot 10
------------------------------------------------
0x00000078: 0x00810000 0x00000000 0x00000000 0x00000000
Detected Link Width of internal PCIe link: x8
Expected Link Width of internal PCIe link: x8

Detected Link Speed of internal PCIe link (GT/s): 2.5
Expected Link Speed of internal PCIe link (GT/s): 2.5
```

Figure 5 NVRAM Test Log File on a USB Key (continued)

```
--------------------------------
NVRAM VPD Info in slot 10 :
--------------------------------
4GB NVRAM IO Module detected

Model           = 1
HW Rev          = 1.0
CPLD version        = b
Total memory Size    = 4096MB
NVRAM Size        = 4032MB
Memory initialized flag    = 1
Dirty partition map    = 0
Active bank fw version    : 2.0.3-0
Inactive bank fw version: 2.0.3-0
Unable to get NVRAM battery info in slot 10

RECOMMENDATIONS_START
NVRAM card in slot 10
 encountered an internal error
Unable to get NVRAM battery info in slot 10
Recommended Service Actions:
 - Cable connecting NVRAM card and battery unit may be loose
 - Power cable connecting battery unit may be loose
 - or battery unit may be faulty
Caution: There may be live data in NVRAM card!!
Please contact DataDomain customer support to resolve

RECOMMENDATIONS_END
RECOMMENDATIONS_START:
Unable to Access VPD information
Caution: There may be live data in NVRAM card!!
Please contact DataDomain customer support to resolve.
RECOMMENDATIONS_END
Skipping testing this device

[FINISH] Timestamp: Tue Oct 08 21:43:05 PST 2013
```

Additional Resources

As part of an effort to improve its product lines, EMC periodically releases revisions of its software and hardware. Therefore, some functions described in this document might not be supported by all versions of the software or hardware currently in use. The product release notes provide the most up-to-date information on product features, software updates, software compatibility guides, and information about EMC products, licensing, and service.

Contact your EMC technical support professional if a product does not function properly or does not function as described in this document.

Getting Help

Support, product, and licensing information can be obtained as follows:

Where to find product documentation
For the most up-to-date documentation and help go to EMC Online Support at https://support.emc.com.

Product Information

For technical support resources that may enable you to resolve a product issue before contacting EMC Customer Service, go to the following Support by Product pages on EMC Online Support (registration required) https://support.emc.com.

After logging in to the appropriate Support by Product page, you can access product documentation, release notes, software updates, Knowledge base articles, How-to and troubleshooting information, hardware, and software compatibility guides or information about EMC products, licensing, and service.

Troubleshooting and Technical Support

For information about EMC products, software updates, licensing, and service, go to EMC Online Support (registration required) at https://support.emc.com. After logging in, locate the appropriate Support by Product page.