Oracle® Flash Accelerator F160 PCIe Card and Oracle 1.6 TB NVMe SSD Product Notes

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Contents

Using This Documentation

- **Overview** – These product notes include information about supported software and firmware, and important operating guidelines for Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSDs.
- **Audience** – Technicians, system administrators, authorized service providers, and users.
- **Required knowledge** – Experience with servers and advanced understanding of server storage systems.

Product Documentation Library

Documentation and resources for this product and related products are available at http://www.oracle.com/goto/oracleflashf160/docs.

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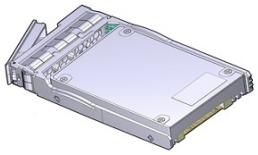
Provide feedback about this documentation at: http://www.oracle.com/goto/docfeedback

Oracle 1.6 TB NVMe SSD Product Notes

This document contains late-breaking information about the Oracle 1.6 TB NVMe SSD. Read this document before reading other Oracle 1.6 TB NVMe SSD documentation.

For specific installation instructions, see your server documentation. For late-breaking information about the installation and use of the Oracle 1.6 TB NVMe SSD with your server, see the most recent version of the server product notes.



These topics are included in this section.

Description	Links
Review the software and firmware supported for the Oracle 1.6 TB NVMe SSD.	“Supported Hardware and Software” on page 9
Review important information for configuring the Oracle 1.6 TB NVMe SSD.	“Implementation Considerations” on page 14
Check known issues.	“Known Issues” on page 26

Supported Hardware and Software

The following sections describe the software and firmware supported for the Oracle 1.6 TB NVMe SSD.

Supported Servers and Operating Systems

This section lists the servers that support the Oracle 1.6 TB NVMe SSD. For detailed information about using this storage drive with your server, see the product notes for your server, available at:

https://docs.oracle.com

The following servers are supported for the Oracle 1.6 TB NVMe SSD.

x86 Servers	Number of 1.6 TB NVMe SSDs	Slots Supported for Installing 1.6 TB NVMe SSD	Minimum Supported Operating Systems
Oracle Server X5-2	1 to 4	2, 3, 4, 5 Slots labeled NVMe0, NVMe1, NVMe2, NVMe3	■ Oracle Solaris 11.3 (SRU 2) ■ Oracle Solaris 11.2 (SRU 5) ■ Oracle Linux 6.5, based on UEK3 (Unbreakable Linux Kernel Release 3)
Oracle Server X5-2L 8 drive: 24 drive:	 1 to 4 1 to 4	 2, 3, 4, 5 3, 4, 19, 20 Slots labeled NVMe0, NVMe1, NVMe2, NVMe3	■ Oracle Solaris 11.3 (SRU 2) ■ Oracle Solaris 11.2 (SRU 5) ■ Oracle Linux 6.5, based on UEK3 (Unbreakable Linux Kernel Release 3) **Note -** Oracle Server X5-2L with pre-installed Oracle VM does not support Oracle 1.6 TB NVMe SSD operation. Oracle Server X5-2L with 12 drive configuration does not support Oracle 1.6 TB NVMe SSD operation.
Oracle Server X5-4	1 to 4	2, 3, 4, 5 Slots labeled NVMe0, NVMe1, NVMe2, NVMe3	■ Oracle Solaris 11.3 (SRU 2) ■ Oracle Solaris 11.2 (SRU 9) ■ Oracle Linux 6.6, based on UEK3 (Unbreakable Linux Kernel Release 3) **Note -** Oracle Server X5-4 with pre-installed Oracle VM does not

x86 Servers	Number of 1.6 TB NVMe SSDs	Slots Supported for Installing 1.6 TB NVMe SSD	Minimum Supported Operating Systems
			support Oracle 1.6 TB NVMe SSD operation.

SPARC Servers	Number of 1.6 TB NVMe SSDs	Slots Supported for Installing 1.6 TB NVMe SSD	Minimum Supported Operating Systems
SPARC S7-2 Server	1 to 4	2, 3, 4, 5 Slots labeled NVMe0, NVMe1, NVMe2, NVMe3	Oracle Solaris 11.3 (SRU 9)
SPARC S7-2L Server 8 drive: 12 drive: 24 drive:	1 to 4 1 to 12 1 to 4	2, 3, 4, 5 Slots labeled NVMe0, NVMe1, NVMe2, NVMe3 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23 Slots labeled NVMe0, NVMe1, NVMe2, NVMe3 NVMe4, NVMe5, NVMe6, NVMe7, NVMe8, NVMe9, NVMe10, NVMe11 3, 4, 19, 20 Slots labeled NVMe0, NVMe1, NVMe2, NVMe3	Oracle Solaris 11.3 (SRU 9) **Note -** SPARC S7-2L with 3.5-inch 12 drive configuration does not support Oracle 1.6 TB NVMe SSD operation.
SPARC T7-1 Server	1 to 4	2, 3, 4, 5 Slots labeled NVMe0, NVMe1, NVMe2, NVMe3	Oracle Solaris 11.3 (SRU 2)
SPARC T7-2 Server	1 to 4	2, 3, 4, 5 Slots labeled NVMe0, NVMe1, NVMe2, NVMe3	Oracle Solaris 11.3 (SRU 2)
SPARC T7-4 Server	1 to 8 4 drive: 1 Oracle PCIe NVMe Switch Card 8 drive: 2 Oracle PCIe NVMe Switch Cards	0, 1, 2, 3, 4, 5, 6, 7 Slots labeled NVMe0, NVMe1, NVMe2, NVMe3 NVMe4, NVMe5, NVMe6, NVMe7	Oracle Solaris 11.3 (SRU 2)

Other servers and processors might be added to this list in the future, if they qualify. Check your server product notes for confirmation that your server has subsequently been qualified.

Caution - Any unsupported configuration causes the host to power off as soon as it is powered on. A fault is generated on the service processor when an unsupported configuration is detected. The fault clears after the unsupported configuration is fixed and the host is powered on.

Note - Slots that can contain either SAS HDD or NVMe storage drives have labels with both HDD and NVMe identification marks on the server panel.

Note - Refer to your server's product notes for up-to date information on supported servers, operating systems, and required patchsets.

Minimum Supported Oracle 1.6 TB NVMe SSD Firmware Version

The Oracle 1.6 TB NVMe SSD runs with the minimum required firmware package listed below:

Firmware	Minimum Required Drive Firmware Version	Recommended Firmware Version
Oracle 1.6 TB NVMe SSD Package	22318131 F160 SW 1.0.0 - FIRMWARE (Patch)	22318131 F160 SW 1.0.0 - FIRMWARE (Patch) ■ Oracle X5 series servers: 8DV1RA13 ■ SPARC servers: 8DV1RA13 ■ Fujitsu M10 series servers: 8DV1RA13

Summary of Changes in Firmware RA13 Release

The following improvements/changes were included in firmware RA13 release of the Oracle 1.6 TB NVMe SSD:

- For Oracle X5 series servers.
- For SPARC S7 series servers.
- For SPARC T7 series servers.
- For Fujitsu M10 series servers.

- Changes were made to improve enumeration in SPARC systems or host systems that have rapid resets.
- If you install the Oracle 1.6 TB NVMe SSD as an x-option, you must update the firmware from RA12 to RA13, or a subsequent release if available. Servers ordered with this option already have the updated firmware.

Summary of Changes in Firmware RA12 Release

The following improvements/changes were included in firmware RA12 release of the Oracle 1.6 TB NVMe SSD:

- Oracle 1.6 TB NVMe SSDs with firmware version RA10 must be updated to version RA11 before being updated to version RA12. Therefore, an update to version RA12 from version RA10 requires a two-step process. First, update the 1.6 TB NVMe SSD to version RA11; then, update the 1.6 TB NVMe SSD to version RA12.
- Changes were made in the NVMe flash firmware to improve I/O task handling resources and modifications to the background refresh algorithms and operations. The flash performance is equivalent or slightly higher in this release.
- Changes were made to improve performance of workloads smaller than 4KB. Improvements are significantly higher for smaller workloads and all workloads should also be slightly higher. Less than 4KB block workloads have equivalent or slightly higher performance.
- Improvements were made to the power cycle bootloader. Corrected S3/S4 power cycling firmware download timeout issue, improved data units read/write reporting. During power cycling/S4, the drive no longer fails to recover.
- Corrected bootloader stop during warm reset, which was generated by a PCIe interrupt that disabled the device. Changes to power loss interrupt: Disable Logical ASSERT_XH067.
- Changes were made to the device power supply for overtemp logging and self-protection against race conditions. Corrected device power supply settings.

Required Host Software

The Oracle 1.6 TB NVMe SSD runs with the minimum required host software listed below:

x86 Driver	Minimum Required Host Firmware Version With Patches	Recommended System Software Version (Patch No.)
Oracle Server X5-2	Oracle Server X5-2 SW 1.0.0 Firmware Pack - Patch number 20116785	Oracle Server X5-2 SW 1.4.0 Firmware Pack - Patch number 22229268
Oracle Server X5-2L	Oracle Server X5-2L SW 1.0.0 Firmware Pack - Patch number 20116799	Oracle Server X5-2L SW 1.4.0 Firmware Pack - Patch number 22229241

x86 Driver	Minimum Required Host Firmware Version With Patches	Recommended System Software Version (Patch No.)
Oracle Server X5-4	Oracle Server X5-4 SW 1.0.1 Firmware Pack - Patch number 21131292	Oracle Server X5-4 SW 1.0.3 Firmware Pack - Patch number 22393676

SPARC Driver	Minimum Required Host Firmware Version With Patches	Recommended System Software Version (Patch No.)
SPARC S7-2 Server	S7-2 Sun System Firmware 9.7.2c - Patch number 23632951	SPARC S7-2 Sun System Firmware 9.7.5.b - Patch number 25790079
SPARC S7-2L Server	S7-2L Sun System Firmware 9.7.2c - Patch number 23632952	SPARC S7-2L Sun System Firmware 9.7.5.b - Patch number 25790080
SPARC T7-1 Server	T7-1 Sun System Firmware 9.4.3.d - Patch number 20214653	SPARC T7-1 Sun System Firmware 9.7.5.b - Patch number 25790075
SPARC T7-2 Server	T7-2 Sun System Firmware 9.4.3.d - Patch number 20214655	SPARC T7-2 Sun System Firmware 9.7.5.b - Patch number 25790076
SPARC T7-4 Server	T7-4 Sun System Firmware 9.5.2.c - Patch number 22270885	SPARC T7-4 Sun System Firmware 9.7.5.b - Patch number 25790077

Keeping Drivers and Firmware Up To Date

Refer to the server documentation to check and update SSD firmware. For information on updating drivers and firmware for the Oracle 1.6 TB NVMe SSD, see “Accessing Software Updates and Firmware Downloads” on page 17 and refer to “Update Your System to the Latest Software Release” in *Oracle 1.6 TB NVMe SSD User Guide*.

Implementation Considerations

The following sections contain important information about configuring the Oracle 1.6 TB NVMe SSD:

Oracle Server X5-2 Configuration

Refer to the server documentation for more information at http://www.oracle.com/goto/x5-2/docs.

Oracle Server X5-2L Configuration

Oracle Server X5-2L with pre-installed Oracle Virtual Machine 3.2 does not support Oracle 1.6 TB NVMe SSD operation.

Refer to the server documentation for more information at http://www.oracle.com/goto/x5-2l/docs.

Oracle Server X5-4 Configuration

For more information about server configuration, refer to the server documentation at http://www.oracle.com/goto/x5-4/docs-videos.

SPARC S7-2 Server Configuration

SPARC S7-2 servers support the Oracle 1.6 TB NVMe SSD as a boot device.

An Oracle PCIe NVMe Switch Card is not required in a four NVMe drive configuration. The switch function is included in the motherboard.

For more information about the servers, refer to the server documentation at http://www.oracle.com/goto/s7-2/docs.

SPARC S7-2L Server Configuration

SPARC S7-2L servers support the Oracle 1.6 TB NVMe SSD as a boot device.

An Oracle PCIe NVMe Switch Card is not required in a four NVMe drive configuration. The switch function is included in the motherboard. The SPARC S7-2L Server can support three Oracle PCIe NVMe Switch Cards. Additional Oracle PCIe NVMe Switch Cards are required to support backplane configurations with more than four NVMe drives.

For more information about the servers, refer to the server documentation at http://www.oracle.com/goto/s7-2l/docs.

SPARC T7-1 Server Configuration

SPARC T7 series servers support the Oracle 1.6 TB NVMe SSD as a boot device. The SPARC T7-1 Server supports one Oracle PCIe NVMe Switch Card in PCIe slot 3 only.

For more information about server configuration, refer to the server documentation at http://www.oracle.com/goto/t7-1/docs.

SPARC T7-2 Server Configuration

SPARC T7 series servers support the Oracle 1.6 TB NVMe SSD as a boot device. The SPARC T7-2 Server can support one or two Oracle PCIe NVMe Switch Cards, in PCIe slots 1 and 2 only.

For more information about server configuration, refer to the server documentation at http://www.oracle.com/goto/t7-2/docs.

SPARC T7-4 Server Configuration

SPARC T7 series servers support the Oracle 1.6 TB NVMe SSD as a boot device. The SPARC T7-4 Server can support one or two Oracle PCIe NVMe Switch Cards.

For more information about server configuration, refer to the server documentation at http://www.oracle.com/goto/t7-4/docs.

SSD Volume Management

A volume manager can present multiple SSD devices as one larger volume. Use the Automatic Storage Management (ASM) volume manager or other volume manager to concatenate multiple

flash memory domains. For example, a volume manager can be used to concatenate four 1.6 TB domains into a single 6.4 TB volume.

Refer to the documentation for more information at http://docs.oracle.com/cd/B28359_01/server.111/b31107/asmcon.htm.

Accessing Software Updates and Firmware Downloads

Product patches, updates and firmware are available on My Oracle Support at https://support.oracle.com. from the Patches and Updates tab. Information on accessing and using My Oracle Support can be found at the *My Oracle Support Welcome Center for Oracle Sun Customers and Partners*.

See:

- “Downloading the SSD Software Package” on page 17
- “Update the NVMe Storage Drive Firmware” on page 18
- “Verify Oracle 1.6 TB NVMe SSD Operation” on page 23

▼ Downloading the SSD Software Package

To find the SSD software package, access *My Oracle Support* and download the latest software package for the Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSD.

1. **Sign in to *My Oracle Support* at https://support.oracle.com.**
2. **Click the "Patches & Updates" tab.**
3. **In the "Patch Search" box on the right side, select "Product or Family (Advanced Search)"**
4. **Enter a partial product name for "Product is".**
   A list of matches displays.
5. **Select the product of interest.**
   Select one or more "releases" in the "Release is" drop down list.
   Close the pop-up window.
6. **Click Search.**

A list of product downloads (listed as patches) displays.

7. **Select the download of interest.**
   The Download Information Page displays.
   If, on the Download Information Page, you get the message "You do not have permissions to download this Patch...", see *How Patches and Updates Entitlement Works* at https://support.oracle.com to help you determine the reason.

▼ Update the NVMe Storage Drive Firmware

This topic provides instructions to update Oracle 1.6 TB NVMe SSD NAND flash controller firmware for the host on supported Oracle Solaris and Linux operating systems. Oracle 1.6 TB NVMe SSD firmware is updated as a single package using Oracle Hardware Management Pack utility CLI tools.

Note - Refer to the server documentation for detailed instructions.

Before You Begin

- Update your system to the latest software release.
- Verify that the latest supported software release of Oracle Hardware Management Pack is installed on the host.

  Refer to the Oracle Hardware Management Pack documentation for instructions at: http://www.oracle.com/goto/ohmp/docs
- Servers that support Oracle System Assistant can use Oracle System Assistant to update Oracle 1.6 TB NVMe SSD controller firmware if Oracle Hardware Management Pack is not available. Refer to the server administration guide.

1. **Check the Oracle 1.6 TB NVMe SSD Product Notes for the latest firmware requirements at:**
   “Minimum Supported Oracle 1.6 TB NVMe SSD Firmware Version” on page 12

2. **Log into the target system through SSH or through Oracle ILOM Remote System Console.**
   Refer to the server installation guide.

3. **Download and store any firmware image file updates on the server that are required to support the Oracle 1.6 TB NVMe SSD.**

   a. **Download firmware image files from this location:**
      https://support.oracle.com

See “Downloading the SSD Software Package” on page 17.

b. Copy the firmware image files obtained to the target system root directory.

4. Identify all Oracle 1.6 TB NVMe SSDs and controller firmware versions in the server.

a. To identify all 1.6 TB NVMe SSD NVMe controllers and current firmware versions in the system, type:

```
# fwupdate list controller
```

In the following examples, 1.6 TB NVMe SSD controllers `c1` and `c2` are enumerated in the output returned by the above command.

```
# fwupdate list controller
================================================
CONTROLLER
================================================
ID    Type   Manufacturer   Model     Product Name   FW Version     BIOS Version
 EFI Version    FCODE Version  Package Version  NVDATA Version    XML Support
-------------------------------------------------------------------------------------------
c0    SAS    LSI Logic      0x0097    SAS9311-8i
c1    NVMe   Intel          0x0953    INTEL SSDPE2ME016T4S      8DV1RA10
c2    NVMe   Intel          0x0953    INTEL SSDPE2ME016T4S      8DV1RA10
```

b. Verify that the firmware package file that is installed in the Oracle 1.6 TB NVMe SSD requires updating.

To identify NVMe controllers that need updated firmware image files, view the `FW Version` column in the output from the `fwdupdate list controller` command.

In the following example, 1.6 TB NVMe SSD controller `c7` shows firmware version `8DV1RA10`, while all of the other NVMe controllers show firmware version `8DV1RA12`. All 1.6 TB NVMe SSD controllers `c0` through `c8` are enumerated in the output returned by the above command.

```
# fwupdate list controller
================================================
CONTROLLER
================================================
ID Type Manufacturer Model    Product Name         FW Version BIOS Version EFI
 Version FCODE Version Package Version NVDATA Version XML Support
-------------------------------------------------------------------------------
c0 NVMe Intel        0x0953   INTEL SSDPE2ME016T4S 8DV1RA12 - - - - - N/A
c1 NVMe Intel        0x0953   INTEL SSDPE2ME016T4S 8DV1RA12 - - - - - N/A
c2 NVMe Intel        0x0953   INTEL SSDPE2ME016T4S 8DV1RA12 - - - - - N/A
```

```
c3 NVMe Intel        0x0953   INTEL SSDPE2ME016T4S 8DV1RA12 - - - - - N/A
c4 SAS LSI Logic     0x005d   LSI MegaRAID 9361-8i 4.230.00-3739 6.00.00.2
 00.00.00.00 4.00.00.00 - - N/A
c5 SAS LSI Logic     0x0097   ORCL-EXT-SAS3 00.00.00.00 00.00.00.00 00.00.00.00
 00.00.00.00 - 00.00.00.00 N/A
c6 NVMe Intel        0x0953   INTEL SSDPEDME016T4S 8DV1RA12 - - - - - N/A
c7 NVMe Intel        0x0953   INTEL SSDPEDME016T4S 8DV1RA10 - - - - - N/A
c8 NVMe Intel        0x0953   INTEL SSDPEDME016T4S 8DV1RA12 - - - - - N/A
```

c. View the Firmware Revision in the output from the `nvmeadm list -v` command.

To identify NVMe controllers and current firmware versions type:

```
# nvmeadm list -v
```

In the following example, controllers `SUNW-NVME-1` and `SUNW-NVME-2` show firmware version `8DV1RA10` in the output returned by the above command.

```
# nvmeadm list -v
SUNW-NVME-1
        PCI Vendor ID:                  8086
        Serial Number:                  CVMD446000AQ1P6KGN
        Model Number:                   INTEL SSDPE2ME016T4S
        Firmware Revision:              8DV1RA10
        Number of Namespaces:           1
SUNW-NVME-2
        PCI Vendor ID:                  8086
        Serial Number:                  CVMD446000CF1P6KGN
        Model Number:                   INTEL SSDPE2ME016T4S
        Firmware Revision:              8DV1RA10
        Number of Namespaces:           1
root:~#
```

5. Quiesce the Oracle 1.6 TB NVMe SSD device.

Before removing the drive, manually quiesce I/O and device usage.

Caution - System hang or data loss. Before updating device firmware, make sure that the device is quiesced and the following events are not occurring:

- The operating system is not accessing the disk (for example, the system boot disk).
- An application is not accessing the disk (for example, a database application).

6. Update the selected 1.6 TB NVMe SSDs with the specified firmware package.

The `fwupdate` command can update firmware for all similar devices in the system utilizing an XML metadata file. This method is called Automatic Mode and is the recommended method for upgrades. (See below for alternative methods.)

Note - Alternately, if you determine that each device must be updated with a separate `fwupdate` command, perform the `fwupdate` Automatic Single Drive method, or the `fwupdate` Manual method (if an XML metadata file is not available). Refer to the Oracle Hardware Management Pack documentation for instructions at: http://www.oracle.com/goto/ohmp/docs.

---

a. Verify that an XML metadata file is available for the server.

An XML metadata file must be included with the firmware update package to use Automatic Mode. Refer to the update package release notes for more information.

b. To update device firmware on Oracle 1.6 TB NVMe SSDs, type:

```
fwupdate update controller -x metadata.xml
```

```
# fwupdate update controller -x metadata.xml
 The following components will be upgraded as shown:
=========================================================
ID        Priority Action     Status      Old Firmware Ver.   Proposed Ver.
 New Firmware Ver.   System Reboot
-------------------------------------------------------------------------------------------------------
c1        1        Check FW   Success     8DV1RA10            8DV1RA11            N/
A                 System Reset
c2        1        Check FW   Success     8DV1RA10            8DV1RA11            N/
A                 System Reset
Do you wish to process all of the above component upgrades? [y/n]?
```

If the current firmware package version on the selected drive is higher than the specified firmware package version, the command returns an error. Refer to the Oracle Hardware Management Pack documentation for error codes at: http://www.oracle.com/goto/ohmp/docs

c. To upgrade the firmware packages and process all of the above component upgrades, type `y`.

```
Updating c1:  Success
Updating c2:  Success

Verifying all priority 1 updates

Execution Summary
=========================================================
```

```
ID        Priority Action     Status      Old Firmware Ver.   Proposed Ver.
 New Firmware Ver.   System Reboot
-------------------------------------------------------------------------------------------------------
c1        1        Post Power Pending     8DV1RA10            8DV1RA11            N/
A                 System Reset
c2        1        Post Power Pending     8DV1RA10            8DV1RA11            N/
A                 System Reset
System Reboot required for some applied firmware
Do you wish to automatically reboot now? [y/n]?
```

d. Reboot the host server to initialize the firmware update.

Type **y** to reboot the system.

7. Re-access the console.

Refer to the server installation guide.

8. Verify that the updated firmware package is installed in the Oracle 1.6 TB NVMe SSD.

a. Type the following from a terminal:

```
# fwupdate list controller
```

```
# fwupdate list controller
================================================
CONTROLLER
================================================
ID    Type   Manufacturer   Model     Product Name              FW Version     BIOS
 Version   EFI Version    FCODE Version  Package Version  NVDATA Version    XML
 Support
-------------------------------------------------------------------------------------------
c0    SAS    LSI Logic      0x0097    SAS9311-8i                06.00.02.00
 08.13.00.00    07.00.00.00    01.00.65.00    - 06.03.00.10       N/A
c1    NVMe   Intel          0x0953    INTEL SSDPE2ME016T4S      8DV1RA12
c2    NVMe   Intel          0x0953    INTEL SSDPE2ME016T4S      8DV1RA12
```

b. Verify host recognition of all 1.6 TB NVMe SSDs by checking ID enumeration.

In the above example, 1.6 TB NVMe SSD controller IDs `c1` and `c2` are enumerated in the output returned by the above command.

c. Ensure that the 1.6 TB NVMe SSD firmware was updated in the output returned by the above command.

9. Verify Oracle 1.6 TB NVMe SSD operation.

See “Verify Oracle 1.6 TB NVMe SSD Operation” on page 23.

10. **Repeat the firmware upgrade process until the Oracle 1.6 TB NVMe SSD has the most up to date firmware release.**

    See “Minimum Supported Oracle 1.6 TB NVMe SSD Firmware Version” on page 12.

    For example, upgrade firmware revision from 8DV1RA10 to 8DV1RA11, and then to 8DV1RA12.

Related Information

- *Oracle Server CLI Tools User's Guide* at: `http://www.oracle.com/goto/ohmp/docs`
- “Minimum Supported Oracle 1.6 TB NVMe SSD Firmware Version” on page 12

▼ Verify Oracle 1.6 TB NVMe SSD Operation

This topic provides instructions to verify Oracle 1.6 TB NVMe SSD operation on the host for supported Oracle Solaris and Linux operating systems. Verify Oracle 1.6 TB NVMe SSD operation using Oracle Hardware Management Pack utility CLI tools.

Note - Refer to the server documentation for detailed instructions.

Before You Begin

- Verify that Oracle Hardware Management Pack is installed on the host.

  Refer to the Oracle Hardware Management Pack documentation for instructions at: `http://www.oracle.com/goto/ohmp/docs`
- Ensure that you have access to the server (either directly or over the network).

1. **Observe the Oracle 1.6 TB NVMe SSD status indicators (LEDs).**

   Verify that the Service Action Required 1.6 TB NVMe SSD status indicator is not lit and that the green Power status indicator is lit on the 1.6 TB NVMe SSDs that you updated. Green (operational), Amber (faulty disk), Blue (SSD has been prepared for removal).

   Refer to the *Oracle 1.6 TB NVMe SSD User Guide*.

2. **Log into the target system.**

   For example, to log into the target system through SSH or through Oracle ILOM Remote System Console, do one of the following:

   - **If you are using an SSH client connection, perform these steps.**

a. **From a shell command line in a terminal window, establish an SSH connection to the server host.**

   Type: **`ssh root@`***hostname*, where *hostname* can be the DNS name or the IP address for the server host.

b. **Log into the system using an account with root access.**

c. **Proceed to Step 3.**

- **If you are using a KVM console, refer to the server administration guide and perform these steps.**

  a. **Access the host console locally or remotely:**

     To establish a local connection to the host console, perform the following steps:

     i **Connect a VGA monitor to the VGA port on the server.**

     ii **Connect a USB keyboard and mouse to the USB connectors on the server.**

     iii **To establish a remote connection to the host console:**

     Launch an Oracle ILOM Remote System Console Plus session.

     For instructions, see Launching Remote KVMS Redirection Sessions in the server administration guide.

  b. **Ensure that the server is powered on and booted.**

  c. **Access the operating system command-line interface.**

     You issue Oracle Hardware Management Pack commands from the operating system command-line interface.

3. **Identify all 1.6 TB NVMe SSDs and verify that the latest firmware packages are installed.**

   a. **Type the following command:**

      ```
      # fwupdate list controller
      ```

      In the following example, devices are enumerated in the output returned by the above command.

```
# fwupdate list controller
================================================
CONTROLLER
================================================
ID    Type   Manufacturer   Model     Product Name              FW Version     BIOS
 Version   EFI Version    FCODE Version  Package Version  NVDATA Version    XML
 Support
--------------------------------------------------------------------------------
c0    SAS    LSI Logic      0x0097    SAS9311-8i                06.00.02.00
 08.13.00.00    07.00.00.00    01.00.65.00    - 06.03.00.10       N/A
c1    NVMe   Intel          0x0953    INTEL SSDPE2ME016T4S      8DV1RA12
c2    NVMe   Intel          0x0953    INTEL SSDPE2ME016T4S      8DV1RA12
```

b. Verify host recognition of all 1.6 TB NVMe SSDs by checking controller ID enumeration.

In the above example, 1.6 TB NVMe SSD controllers `c1` and `c2` are enumerated in the output returned by the above command.

c. Ensure that all 1.6 TB NVMe SSDs firmware revisions are current in the output returned by the above command.

See "Minimum Supported Oracle 1.6 TB NVMe SSD Firmware Version" on page 12.

4. Check NVMe device status.

To identify NVMe controllers and current firmware versions type:

```
# nvmeadm list -v
```

To identify NVMe controllers that have updated firmware, view the **Firmware Revision:** row in the output from the `nvmeadm list -v` command.

In the following example, controller `F160-NVME-1` and `F160-NVME-1` show firmware version `8DV1RA12` in the output returned by the above command.

```
# nvmeadm list -v
F160-NVME-1
        PCI Vendor ID:                  8086
        Serial Number:                  CVMD446000AQ1P6KGN
        Model Number:                   INTEL SSDPE2ME016T4S
        Firmware Revision:              8DV1RA12
        Number of Namespaces:           1
F160-NVME-2
        PCI Vendor ID:                  8086
        Serial Number:                  CVMD446000CF1P6KGN
        Model Number:                   INTEL SSDPE2ME016T4S
        Firmware Revision:              8DV1RA12
```

```
        Number of Namespaces:           1
root:~#
```

5. **Check the health of the Oracle 1.6 TB NVMe SSD.**

   To check the selected 1.6 TB NVMe SSD health and SMART information, type:

   # `nvmeadm getlog -h`

   Ensure the 1.6 TB NVMe SSDs have remaining drive life in the output returned by the above command.

```
# nvmeadm getlog -h
F160-NVME-1
SMART/Health Information:
        Critical Warning: 0
        Temperature: 312 Kelvin
        Available Spare: 100 percent
        Available Spare Threshold: 10 percent
        Percentage Used: 0 percent
        Data Unit Read: 0x1 of 512k bytes.
        Data Unit Written: 0x0 of 512k bytes.
        Number of Host Read Commands: 0x30313b3
        Number of Host Write Commands: 0x302f25d
        Controller Busy Time in Minutes: 0x0
        Number of Power Cycle: 0xf
        Number of Power On Hours: 0x1c
        Number of Unsafe Shutdown: 0xf
        Number of Media Errors: 0x0
        Number of Error Info Log Entries: 0x0
F160-NVME-2
SMART/Health Information:....
```

Related Information

- "Minimum Supported Oracle 1.6 TB NVMe SSD Firmware Version" on page 12
- http://www.oracle.com/goto/ohmp/docs

Known Issues

The following table lists known issues for the Oracle 1.6 TB NVMe SSD:

Links to Issues	Workaround?
To Update Oracle 1.6 TB NVMe SSD Firmware, Install RA11 Before Updating to RA12 or RA13	Yes

Links to Issues	Workaround?
Oracle 1.6 TB NVMe SSD B0 and B1 Devs With 8DV1RA12 Firmware Stops During OS Install or Reboot Testing (20631343)	Yes
Linux NVMe Driver Displays Device Shutdown Incomplete Message (19195500)	No

To Update Oracle 1.6 TB NVMe SSD Firmware, Install RA11 Before Updating to RA12 or RA13

If your Oracle 1.6 TB NVMe SSDs have firmware RA10 or lower, you must update to RA11 before you update to RA12 or RA13. The 8DV1RA13.bin package includes two firmware files, RA11 and RA13, and associated metadata.xml files that automate the update process. RA11 is bridge firmware to get to RA12 or RA13. RA13 includes a critical fix where the device might assert at initial power-on. All supported platforms should upgrade to RA13 at earliest convenience.

Oracle 1.6 TB NVMe SSDs do not support firmware versions lower than RA10.

Workaround:

- If your Oracle 1.6 TB NVMe SSDs have RA10 or lower, you must upgrade to RA11 before upgrading to RA12 or RA13.
- If your Oracle 1.6 TB NVMe SSDs have RA11 or RA12, you can upgrade directly to RA13.

Oracle 1.6 TB NVMe SSD With 8DV1RA12 Firmware Stops During OS Install or Reboot Testing (20631343)

During OS install or reboot testing, Oracle 1.6 TB NVMe SSDs with 8DV1RA12 firmware stop operating.

Under specific conditions, Oracle 1.6 TB NVMe SSDs with 8DV1RA12 firmware undergoing multiple reset or power-off events in a short time span can cause a drive to assert and a stop occurs. The controller places the drive into Disable Logical mode. This ASSERT or BAD_CONTEXT mode shuts down the drive storage device when the internal state of drive metadata could allow the drive to return incorrect data to the host, but the controller will still be visible to the NVMe driver.

Workaround:

Upgrade Oracle 1.6 TB NVMe SSD firmware to 8DV1RA13 or a subsequent release, if available.

Linux NVMe Driver Displays `Device shutdown incomplete` Message (19195500)

On a rare occasion, after an Oracle 1.6 TB NVMe SSD hotplug removal or system shutdown, the system logs a Linux NVMe driver `Device shutdown incomplete` error message. This message is benign.

The following example shows the error message:

```
Device shutdown incomplete; abort shutdown\n
```

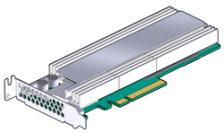
Workaround:

None

Oracle Flash Accelerator F160 PCIe Card Product Notes

This section contains late-breaking information about the Oracle Flash Accelerator F160 PCIe Card from Oracle. Read this section before reading other Oracle Flash Accelerator F160 PCIe Card documentation.

For specific installation instructions, see your server documentation. For late-breaking information about the installation and use of the Oracle Flash Accelerator F160 PCIe Card on your server, see the most recent version of the server product notes.



These topics are included in this section.

Description	Links
Review the software and firmware supported for the Oracle Flash Accelerator F160 PCIe Card.	“Supported Hardware and Software” on page 29
Review important information for configuring the Oracle Flash Accelerator F160 PCIe Card.	“Implementation Considerations” on page 34
Check known issues.	“Known Issues” on page 48

Supported Hardware and Software

These topics describe the software and firmware supported for the Oracle Flash Accelerator F160 PCIe Card.

Supported Servers and Operating Systems

This topic lists the servers that support the Oracle Flash Accelerator F160 PCIe Card. For detailed information about using this storage drive with your server, see the product notes for your server, available at:

https://docs.oracle.com

The following servers are supported for the Oracle Flash Accelerator F160 PCIe Card:

x86 Servers	Number of Cards	Slots Supported for Installing Cards	Minimum Supported Operating Systems
Oracle Server X5-2L	1 to 4	2, 3, 4, 5	■ Oracle Solaris 11.2 (SRU 5) ■ Oracle Linux 6.5, based on UEK3 (Unbreakable Linux Kernel Release 3) **Note -** Oracle Server X5-2L with pre-installed Oracle VM does not support Oracle Flash Accelerator F160 PCIe Card operation. Oracle Server X5-2L with 12 drive configuration does not support Oracle Flash Accelerator F160 PCIe Card operation.
Oracle Server X5-8	1 to 2 in 4-CPU System 1 to 4 in 8-CPU System	7 , 5, 3, 1 11, 9, 7, 5, 3, 1, 15, 13	■ Oracle Solaris 11.3 ■ Oracle Solaris 11.2 (SRU 10) ■ Oracle Linux 6.6, based on UEK3 (Unbreakable Linux Kernel Release 3) ■ Oracle Linux 7.1, based on UEK3 (Unbreakable Linux Kernel Release 3) **Note -** Oracle Server X5-8 with pre-installed Oracle VM does not support Oracle Flash Accelerator F160 PCIe Card operation.

SPARC Servers	Number of Cards	Slots Supported for Installing Cards	Minimum Supported Operating Systems
SPARC S7-2 Server	1 to 3	Slots 1 to 3	Oracle Solaris 11.3 (SRU 9)
SPARC S7-2L Server	1 to 6	Slots 1 to 6	Oracle Solaris 11.3 (SRU 9)

SPARC Servers	Number of Cards	Slots Supported for Installing Cards	Minimum Supported Operating Systems
SPARC T7-1 Server	1 to 6	Slots 1 to 6	Oracle Solaris 11.3 (SRU 2)
SPARC T7-2 Server	1 to 6	Slots 1 to 8	Oracle Solaris 11.3 (SRU 2)
SPARC T7-4 Server	1 to 8	Slots 3, 16, 4, 15, 7, 12, 8, 11, 1, 14, 5, 10, 2, 13, 6, 9	Oracle Solaris 11.3 (SRU 2)
SPARC M7-8 Server with one PDomain	1 to 16 Up to 16 per system .	Slots 1-16	Oracle Solaris 11.3 (SRU 2)
SPARC M7-8 Server with two PDomains	1 to 16 Up to 8 per PDomain or 16 per system .	Slots 1-16	Oracle Solaris 11.3 (SRU 2)
SPARC M7-16 Server	1 to 32 Up to 8 per 4 CMIOU PDomain. Up to 32 per PDomain larger than 4 CMIOU.	Slots 1-48	Oracle Solaris 11.3 (SRU 2)
Fujitsu M10-1 Server	1 to 3	0 to 2	Oracle Solaris 11.3 (SRU 2) Oracle Solaris 11.2 (SRU 14)
Fujitsu M10-4 Server	1 to 11	0 to 10	Oracle Solaris 11.3 (SRU 2) Oracle Solaris 11.2 (SRU 14)
Fujitsu M10-4S Server	1 to 8	0 to 7	Oracle Solaris 11.3 (SRU 2) Oracle Solaris 11.2 (SRU 14)

Other servers and processors might be added to this list in the future, if they qualify. Check your server's product notes for confirmation that your server has subsequently been qualified.

Caution - Any unsupported configuration causes the host to power off as soon as it is powered on. A fault is generated on the service processor when an unsupported configuration is detected. The fault clears after the unsupported configuration is fixed and the host is powered on.

Note - Refer to your server's product notes for up-to date information on supported servers, operating systems, and required patchsets.

Minimum Supported Card Firmware Version

The Oracle Flash Accelerator F160 PCIe Card runs with the minimum required firmware package listed below:

Firmware	Minimum Required Drive Firmware Version	Recommended Firmware Version
Oracle 1.6 TB NVMe SSD Package	22318131 F160 SW 1.0.0 - FIRMWARE (Patch)	22318131 F160 SW 1.0.0 - FIRMWARE (Patch) ■ Oracle Server X5 series servers: 8DV1RA13 ■ SPARC servers: 8DV1RA13 ■ Fujitsu M10 series servers: 8DV1RA13

Summary of Changes in Firmware RA13 Release

The following improvements/changes were included in firmware RA13 release of the Oracle F160 Flash Card:

- For Oracle X5 series servers.
- For SPARC S7 series servers.
- For SPARC T7 series servers.
- For SPARC M7 series servers.
- For Fujitsu M10 series servers.
- Changes were made to improve enumeration in SPARC systems or host systems that have rapid resets.
- If you install the Oracle Flash Accelerator F160 PCIe Card as an x-option, you must update the firmware from RA12 to RA13, or a subsequent release if available. Servers ordered with this option already have the updated firmware.

Summary of Changes in Firmware RA12 Release

The following improvements/changes were included in firmware RA12 release of the Oracle F160 Flash Card:

- Oracle F160 Flash Cards with firmware version RA10 must be updated to version RA11 before being updated to version RA12. Therefore, an update to version RA12 from version RA10 requires a two-step process. First, update the Oracle F160 Flash Card to version RA11; then, update the Oracle F160 Flash Card to version RA12.
- Changes were made in the NVMe flash firmware to improve I/O task handling resources and modifications to the background refresh algorithms and operations. The flash performance is equivalent or slightly higher in this release.
- Changes were made to improve performance of workloads smaller than 4KB. Improvements are significantly higher for smaller workloads and all workloads should also be slightly higher. Less than 4KB block workloads have equivalent or slightly higher performance.
- Improvements were made to the power cycle bootloader. Corrected S3/S4 power cycling firmware download timeout issue, improved data units read/write reporting. During power cycling/S4, the drive no longer fails to recover.

- Corrected bootloader stop during warm reset, which was generated by a PCIe interrupt that disabled the device. Changes to power loss interrupt: Disable Logical ASSERT_XH067.
- Changes were made to the device power supply for overtemp logging and self-protection against race conditions. Corrected the device power supply settings.

Required Host Software

The Oracle Flash Accelerator F160 PCIe Card runs with the minimum required host software listed below:

x86 Driver	Minimum Required Host Firmware Version With Patches	Recommended System Software Version (Patch No.)
Oracle Server X5-2L	Oracle Server X5-2L SW 1.0.0 Firmware Pack - Patch number 20116799	Oracle Server X5-2L SW 1.4.0 Firmware Pack - Patch number 22229241
Oracle Server X5-8	Oracle Server X5-8 SW 1.0.0 Firmware Pack - Patch number 21289232	Oracle Server X5-8 SW 1.0.3 Firmware Pack - Patch number 22393657

SPARC Driver	Minimum Required Host Firmware Version With Patches	Recommended System Software Version (Patch No.)
SPARC S7-2 Server	S7-2 Sun System Firmware 9.7.2c - Patch number 23632951	SPARC S7-2 Sun System Firmware 9.7.5.b - Patch number 25790079
SPARC S7-2L Server	S7-2L Sun System Firmware 9.7.2c - Patch number 23632952	SPARC S7-2L Sun System Firmware 9.7.5.b - Patch number 25790080
SPARC T7-1 Server	T7-1 Sun System Firmware 9.4.3.d - Patch number 20214653	SPARC T7-1 Sun System Firmware 9.7.5.b - Patch number 25790075
SPARC T7-2 Server	T7-2 Sun System Firmware 9.4.3.d - Patch number 20214655	SPARC T7-2 Sun System Firmware 9.7.5.b - Patch number 25790076
SPARC T7-4 Server	T7-4 Sun System Firmware 9.5.2.c - Patch number 22270885	SPARC T7-4 Sun System Firmware 9.7.5.b - Patch number 25790077
SPARC M7-8 Server with one PDomain	M7-8 Oracle System Firmware 9.4.3.d - Patch number 20214660	SPARC M7-SYSTEMS Sun System Firmware 9.7.5.b - Patch number 25790078
SPARC M7-8 Server with two PDomains	M7-8 Oracle System Firmware 9.4.3.d - Patch number 20214660	SPARC M7-SYSTEMS Sun System Firmware 9.7.5.b - Patch number 25790078
SPARC M7-16 Server	M7-16 Oracle System Firmware 9.4.3.d - Patch number 20214660	SPARC M7-SYSTEMS Sun System Firmware 9.7.5.b - Patch number 25790078
Fujitsu M10-1 Server	FUJITSU M10-1 XCP2260 FIRMWARE M10-1:21683464-FUJITSU M10-1 RA13 P3X00 FW	M10-1:21683464-FUJITSU M10-1 RA13 P3X00 FW
Fujitsu M10-4 Server	FUJITSU M10-4 XCP2260 FIRMWARE	M10-4:21683470-FUJITSU M10-4 RA13 P3X00 FW

SPARC Driver	Minimum Required Host Firmware Version With Patches	Recommended System Software Version (Patch No.)
	M10-4:21683470-FUJITSU M10-4 RA13 P3X00 FW	
Fujitsu M10-4S Server	FUJITSU M10-4S XCP2260 FIRMWARE M10-4S:21683474-FUJITSU M10-4S RA13 P3X00 FW	M10-4S:21683474-FUJITSU M10-4S RA13 P3X00 FW

Keeping Drivers and Firmware Up To Date

Refer to the server documentation to check and update card firmware. For information on updating drivers and firmware for the Oracle Flash Accelerator F160 PCIe Card, see "Accessing Software Updates and Firmware Downloads" on page 38 and refer to the *Oracle Flash Accelerator F160 PCIe Card User Guide* at `http://www.oracle.com/goto/oracleflashf160/docs`.

Implementation Considerations

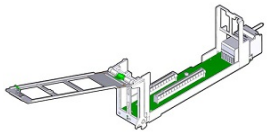
These topics provide important information for configuring Oracle Flash Accelerator F160 PCIe Cards in supported servers:

Oracle Server X5-8 Configuration

Oracle Server X5-8 requires a doublewide PCIe hot plug carrier extension for each installed Oracle Flash Accelerator F160 PCIe Card to facilitate air flow. Dual PCIe Card Carriers

(DPCCs) do not allow the use of one adjacent PCIe slot. PCIe hot plug carrier extensions (Mkt PN 710710) are installed in odd numbered PCIe slots.

The following figure shows an example of a Dual PCIe Card Carrier (DPCC) that populates two PCIe slots for each Oracle Flash Accelerator F160 PCIe Card.



For more information about the server, refer to the server documentation at http://www.oracle.com/goto/x5-8/docs-videos.

SPARC S7-2 Server Configuration

SPARC S7-2 servers support the Oracle Flash Accelerator F160 PCIe Card as a boot device.

For more information about the servers, refer to the server documentation at http://www.oracle.com/goto/s7-2/docs.

SPARC S7-2L Server Configuration

SPARC S7-2L servers support the Oracle Flash Accelerator F160 PCIe Card as a boot device.

For more information about the servers, refer to the server documentation at http://www.oracle.com/goto/s7-2l/docs.

SPARC T7-1 Server Configuration

SPARC T7 series servers support the Oracle Flash Accelerator F160 PCIe Card as a boot device.

For more information about the servers, refer to the server documentation at: http://www.oracle.com/goto/t7-1/docs

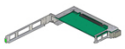
SPARC T7-2 Server Configuration

SPARC T7 series servers support the Oracle Flash Accelerator F160 PCIe Card as a boot device.

For more information about the server, refer to the server documentation at: http://www.oracle.com/goto/t7-2/docs.

SPARC T7-4 Server Configuration

SPARC T7-4 Servers require a singlewide PCIe hot plug carrier extension for each installed Oracle Flash Accelerator F160 PCIe Card to facilitate air flow.



SPARC T7 series servers support the Oracle Flash Accelerator F160 PCIe Card as a boot device.

For more information about the servers, refer to the server documentation at: http://www.oracle.com/goto/t7-4/docs.

SPARC M7 Series Servers Configuration

SPARC M7 series servers support the use of only PCIe x16 hot-plug card carriers, which are physically labeled with "x16 CAR" on the faceplate. PCIe x8 card carriers from earlier generations of Oracle servers, which are labeled with "CAR" on the faceplate, are not supported for use in M7 series servers. PCIe x8 and PCIe x16 cards are supported for use in these servers.

SPARC M7 series servers support the Oracle Flash Accelerator F160 PCIe Card as a boot device. Use slot 3 for the NIC and Boot device. Treat SPARC M7 series server slots 1 and 3 in CMIOUs 0-2 and 4-6 the same. Oracle F160 Flash Cards should be in the lowest number slots available. If the Oracle F160 Flash Card contains the operating system for the physical domain, then bring the physical domain down to the ILOM prompt (power down the PDomain).

For more information about the servers, refer to the server documentation at http://www.oracle.com/goto/m7/docs.

Fujitsu M10 Series Servers Configuration

Fujitsu M10 series servers support the Oracle Flash Accelerator F160 PCIe Card as a boot device.

For more information about the servers, refer to the server documentation at http://docs.oracle.com/cd/E38160_01/.

Fujitsu M10-1 Server

For the Fujitsu M10-1 Server, to use the Oracle F160 Flash Card, the following SRU and XCP must be applied:

- **SRU**: SRU 11.2.14.4.0 or later
- **XSCF**: XCP 2260 or later
- When the Oracle F160 Flash Card is to be mounted in the PCI expansion unit, a PCI expansion unit firmware version 1210 or later must be applied in addition to the above XSCF XCP 2260 or later.

For details on the application of firmware, refer to the PCI Expansion Unit section of the *Fujitsu M10/SPARC M10 Systems Service Manual*.

Fujitsu M10-4 Server and Fujitsu M10-4S Server

For Fujitsu M10-4 and Fujitsu M10-4S Servers, to use the Oracle F160 Flash Card, the following SRU and XCP must be applied.

- **SRU**: SRU 11.2.14.4.0 or later
- **XSCF**: XCP 2260 or later
- When the Oracle F160 Flash Card is to be mounted in the PCI expansion unit, a PCI expansion unit firmware version 1210 or later must be applied in addition to the above XSCF XCP 2260 or later.

In addition, when the PCI expansion unit is to be assigned to a Guest domain while Direct I/O for the PCI expansion unit is unused, perform static allocation and set `nvramrc` as shown in the following example.

```
{0} ok nvedit
 0: d# 10000 ms (quit by Control+C after return)
{0} ok nvstore
{0} ok setenv use-nvramrc? True
```

The `nvramrc` setting is not required when XCP 2290 or later is to be applied.

For details on the application of firmware, refer to the PCI Expansion Unit section of the *Fujitsu M10/SPARC M10 Systems Service Manual*.

SSD Volume Management

A volume manager can present multiple SSD devices as one larger volume. Use the Automatic Storage Management (ASM) volume manager or other volume manager to concatenate multiple flash memory domains. For example, a volume manager can be used to concatenate four 1.6 TB domains into a single 6.4 TB volume.

Refer to the documentation for more information at `http://docs.oracle.com/cd/B28359_01/server.111/b31107/asmcon.htm`.

Accessing Software Updates and Firmware Downloads

Product patches, updates and firmware are available on My Oracle Support at `https://support.oracle.com`. from the Patches and Updates tab. Information on accessing and using My Oracle Support can be found at the *My Oracle Support Welcome Center for Oracle Sun Customers and Partners*.

See:

- “Downloading the SSD Software Package” on page 38
- “Update the NVMe Storage Drive Firmware” on page 18
- “Verify Oracle 1.6 TB NVMe SSD Operation” on page 23

▼ Downloading the SSD Software Package

To find the SSD software package, access *My Oracle Support* and download the latest software package for the Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSD.

1. **Sign in to *My Oracle Support* at `https://support.oracle.com`.**
2. **Click the "`Patches & Updates`" tab.**
3. **In the "Patch Search" box on the right side, select "`Product or Family (Advanced Search)`"**

4. **Enter a partial product name for "`Product is`".**

   A list of matches displays.

5. **Select the product of interest.**

   Select one or more "**`releases`**" in the "Release is" drop down list.

   Close the pop-up window.

6. **Click Search.**

   A list of product downloads (listed as patches) displays.

7. **Select the download of interest.**

   The Download Information Page displays.

   If, on the Download Information Page, you get the message "You do not have permissions to download this Patch...", see *How Patches and Updates Entitlement Works* at `https://support.oracle.com` to help you determine the reason.

▼ Update the NVMe Storage Drive Firmware

This topic provides instructions to update Oracle F160 Flash Card NAND flash controller firmware on the host for supported Oracle Solaris and Linux operating systems. Oracle F160 Flash Card firmware is updated as a single package using Oracle Hardware Management Pack utility CLI tools.

Note - Refer to the server documentation for detailed instructions.

Before You Begin

- Update your system to the latest software release.
- Verify that the latest supported software release of Oracle Hardware Management Pack is installed on the host.

  Refer to the Oracle Hardware Management Pack documentation for instructions at: `http://www.oracle.com/goto/ohmp/docs`
- Servers that support Oracle System Assistant can use Oracle System Assistant to update Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSD controller firmware if Oracle Hardware Management Pack is not available. Refer to the server administration guide.

1. **Check the Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSD Product Notes for the latest firmware requirements at:**

   “Minimum Supported Card Firmware Version” on page 31

2. **Log into the target system through SSH or through Oracle ILOM Remote System Console.**

   Refer to the server installation guide.

3. **Download and store any firmware image file updates on the server that are required to support the Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSD.**

   a. **Download firmware image files from this location:**

      `https://support.oracle.com`

      See "Downloading the SSD Software Package" on page 38.

   b. **Copy the firmware image files obtained to the target system root directory.**

4. **Identify all Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSD controller firmware versions in the server.**

   a. **To identify all Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSD controllers and current firmware versions in the system, type:**

      ```
      # fwupdate list controller
      ```

      In the following examples, Oracle Flash Accelerator F160 PCIe Card controllers `c1` and `c2` are enumerated in the output returned by the above command.

      ```
      # fwupdate list controller
      ================================================
      CONTROLLER
      ================================================
      ID    Type   Manufacturer   Model     Product Name   FW Version     BIOS Version
       EFI Version    FCODE Version  Package Version  NVDATA Version    XML Support
      ------------------------------------------------------------------------------------
      c0    SAS    LSI Logic      0x0097    SAS9311-8i
      c1    NVMe   Intel          0x0953    INTEL SSDPEDME016T4S      8DV1RA10
      c2    NVMe   Intel          0x0953    INTEL SSDPEDME016T4S      8DV1RA10
      ```

   b. **Verify that the firmware package file that is installed in the Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSD requires updating.**

      To identify NVMe controllers that need updated firmware image files, view the `FW Version` column in the output from the `fwdupdate list controller` command.

      In the following example, Oracle Flash Accelerator F160 PCIe Card controller `c0` shows firmware version `8DV1RA10`, while the other NVMe controllers show firmware version `8DV1RA12`.

```
# fwupdate list controller
================================================
CONTROLLER
================================================
ID Type Manufacturer Model    Product Name         FW Version BIOS Version EFI
 Version FCODE Version Package Version NVDATA Version XML Support
--------------------------------------------------------------------------------
c0 NVMe Intel        0x0953   INTEL SSDPEDME016T4S 8DV1RA10 - - - - - N/A
c1 NVMe Intel        0x0953   INTEL SSDPEDME016T4S 8DV1RA12 - - - - - N/A
```

c. View the Firmware Revision in the output from the `nvmeadm list -v` command.

To identify NVMe controllers and current firmware versions type:

```
# nvmeadm list -v
```

In the following example, controllers `SUNW-NVME-1` and `SUNW-NVME-2` show firmware version `8DV1RA10` in the output returned by the above command.

```
# nvmeadm list -v
SUNW-NVME-1
        PCI Vendor ID:                  8086
        Serial Number:                  CVMD446000AQ1P6KGN
        Model Number:                   INTEL SSDPEDME016T4S
        Firmware Revision:              8DV1RA10
        Number of Namespaces:           1
SUNW-NVME-2
        PCI Vendor ID:                  8086
        Serial Number:                  CVMD446000CF1P6KGN
        Model Number:                   INTEL SSDPEDME016T4S
        Firmware Revision:              8DV1RA10
        Number of Namespaces:           1
root:~#
```

5. Quiesce the Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSD devices.

Before removing the drive, manually quiesce I/O and device usage.

Caution - System hang or data loss. Before updating device firmware, make sure that the device is quiesced and the following events are not occurring:

- The operating system is not accessing the disk (for example, the system boot disk).
- An application is not accessing the disk (for example, a database application).

6. Update the selected Oracle Flash Accelerator F160 PCIe Cards with the specified firmware package.

The `fwupdate` command can update firmware for all similar devices in the system utilizing an XML metadata file. This method is called Automatic Mode and is the recommended method for upgrades. (See below for alternative methods.)

Note - Alternately, if you determine that each device must be updated with a separate `fwupdate` command, perform the `fwupdate` Automatic Single Drive method, or the `fwupdate` Manual method (if an XML metadata file is not available). Refer to the Oracle Hardware Management Pack documentation for instructions at: http://www.oracle.com/goto/ohmp/docs.

---

a. Verify that an XML metadata file is available for the server.

An XML metadata file must be included with the firmware update package to use Automatic Mode. Refer to the update package release notes for more information.

b. To update device firmware on Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSDs, type:

```
fwupdate update controller -x metadata.xml
```

```
# fwupdate update controller -x metadata.xml
 The following components will be upgraded as shown:
=============================================================
ID        Priority Action     Status      Old Firmware Ver.   Proposed Ver.
 New Firmware Ver.   System Reboot
-------------------------------------------------------------------------------
c1        1        Check FW   Success     8DV1RA10            8DV1RA11            N/
A                 System Reset
c2        1        Check FW   Success     8DV1RA10            8DV1RA11            N/
A                 System Reset
Do you wish to process all of the above component upgrades? [y/n]?
```

If the current firmware package version on the selected drive is higher than the specified firmware package version, the command returns an error. Refer to the Oracle Hardware Management Pack documentation for error codes at: http://www.oracle.com/goto/ohmp/docs

c. To upgrade the firmware packages and process all of the above component upgrades, type `y`.

```
Updating c1:  Success
Updating c2:  Success

Verifying all priority 1 updates
```

```
Execution Summary
=============================================================
ID        Priority Action     Status      Old Firmware Ver.   Proposed Ver.
 New Firmware Ver.   System Reboot
-------------------------------------------------------------------------------
c1        1        Post Power Pending     8DV1RA10            8DV1RA11            N/
A                 System Reset
c2        1        Post Power Pending     8DV1RA10            8DV1RA11            N/
A                 System Reset
System Reboot required for some applied firmware
Do you wish to automatically reboot now? [y/n]?
```

d. Reboot the host server to initialize the firmware update.

Type **y** to reboot the system.

7. Re-access the console.

Refer to the server installation guide.

8. Verify that the updated firmware package is installed in the Oracle Flash Accelerator F160 PCIe Card.

a. Type the following from a terminal:

```
# fwupdate list controller
```

In the following example, Oracle Flash Accelerator F160 PCIe Cards display.

```
# fwupdate list controller
================================================
CONTROLLER
================================================
ID    Type   Manufacturer   Model     Product Name              FW Version     BIOS
 Version   EFI Version    FCODE Version  Package Version  NVDATA Version    XML
 Support
------------------------------------------------------------------------------------------------
c0    SAS    LSI Logic      0x0097    SAS9311-8i                06.00.02.00
 08.13.00.00    07.00.00.00    01.00.65.00    - 06.03.00.10       N/A
c1    NVMe   Intel          0x0953    INTEL SSDPEDME016T4S      8DV1RA12
c2    NVMe   Intel          0x0953    INTEL SSDPEDME016T4S      8DV1RA12
```

b. Verify host recognition of all Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSDs by checking PCIe ID enumeration.

In the above example, Oracle Flash Accelerator F160 PCIe Card controllers `c1` and `c2` are enumerated in the output returned by the above command.

c. **Ensure that the Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSD firmware was updated in the output returned by the above command.**

In the above example, Oracle Flash Accelerator F160 PCIe Card controllers `c1` and `c2` show firmware version `8DV1RA12`.

9. **Verify Oracle Flash Accelerator F160 PCIe Card operation.**

See "Verify Oracle Oracle Flash Accelerator F160 PCIe Card Operation" on page 44.

10. **Repeat the firmware upgrade process until the Oracle Flash Accelerator F160 PCIe Card has the most up to date firmware release.**

See "Minimum Supported Card Firmware Version" on page 31.

For example, upgrade firmware revision from 8DV1RA10 to 8DV1RA11, and then to 8DV1RA12.

Related Information

- "Minimum Supported Card Firmware Version" on page 31
- *Oracle Server CLI Tools User's Guide* at: `http://www.oracle.com/goto/ohmp/docs`

▼ Verify Oracle Oracle Flash Accelerator F160 PCIe Card Operation

This topic provides instructions to verify Oracle Flash Accelerator F160 PCIe Card operation on the host for supported Oracle Solaris and Linux operating systems. Verify Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSD operation using Oracle Hardware Management Pack utility CLI tools.

Note - Refer to the server documentation for detailed instructions.

Before You Begin

- Verify that Oracle Hardware Management Pack is installed on the host.

  Refer to the Oracle Hardware Management Pack documentation for instructions at: `http://www.oracle.com/goto/ohmp/docs`
- Ensure that you have access to the server (either directly or over the network).

1. **Observe the Oracle Flash Accelerator F160 PCIe Card status indicators (LEDs).**

Verify that the Service Action Required Oracle Flash Accelerator F160 PCIe Card status indicator is not lit and that the green Power status indicator is lit on the Oracle Flash Accelerator F160 PCIe Card and 1.6 TB NVMe SSDs that you updated.

Refer to "Status Indicators" in *Oracle Flash Accelerator F160 PCIe Card User Guide*.

2. **Log into the target system.**

   For example, to log into the target system through SSH or through Oracle ILOM Remote System Console, do one of the following:

   - **If you are using an SSH client connection, perform these steps.**

     a. **From a shell command line in a terminal window, establish an SSH connection to the server host.**

        Type: **`ssh root@`***hostname*, where *hostname* can be the DNS name or the IP address for the server host.

     b. **Log into the system using an account with root access.**

     c. **Proceed to Step 3.**

   - **If you are using a KVM console, refer to the server administration guide and perform these steps.**

     a. **Access the host console locally or remotely:**

        To establish a local connection to the host console, perform the following steps:

        i **Connect a VGA monitor to the VGA port on the server.**

        ii **Connect a USB keyboard and mouse to the USB connectors on the server.**

        iii **To establish a remote connection to the host console:**

        Launch an Oracle ILOM Remote System Console Plus session.

        For instructions, see Launching Remote KVMS Redirection Sessions in the server administration guide.

     b. **Ensure that the server is powered on and booted.**

     c. **Access the operating system command-line interface.**

        You issue Oracle Hardware Management Pack commands from the operating system command-line interface.

3. **Identify all Oracle F160 Flash Cards and verify that the latest firmware packages are installed.**

   a. **Type the following command:**

   ```
   # fwupdate list controller
   ```

   ```
   # fwupdate list controller
   ================================================
   CONTROLLER
   ================================================
   ID    Type   Manufacturer   Model     Product Name              FW Version     BIOS
    Version   EFI Version    FCODE Version  Package Version  NVDATA Version    XML
    Support
   ------------------------------------------------------------------------------
   c0    SAS    LSI Logic      0x0097    SAS9311-8i                06.00.02.00
    08.13.00.00    07.00.00.00    01.00.65.00    - 06.03.00.10       N/A
   c1    NVMe   Intel          0x0953    INTEL SSDPEDME016T4S      8DV1RA12
   c2    NVMe   Intel          0x0953    INTEL SSDPEDME016T4S      8DV1RA12
   ```

   b. **Verify host recognition of all Oracle F160 Flash Cards by checking controller ID enumeration.**

   In the above example, Oracle F160 Flash Card controllers `c1` and `c2` are enumerated in the output returned by the above command.

   c. **Ensure that all Oracle F160 Flash Card firmware revisions are current in the output returned by the above command.**

   See “Minimum Supported Card Firmware Version” on page 31.

4. **Check NVMe device status.**

   To identify NVMe controllers and current firmware versions type:

   ```
   # nvmeadm list -v
   ```

   To identify NVMe controllers that have updated firmware, view the **Firmware Revision:** row in the output from the `nvmeadm list -v` command.

   In the following example, controller `F160-NVME-1` and `F160-NVME-1` show firmware version `8DV1RA12` in the output returned by the above command.

   ```
   # nvmeadm list -v
   F160-NVME-1
           PCI Vendor ID:                  8086
           Serial Number:                  CVMD446000AQ1P6KGN
           Model Number:                   INTEL SSDPEDME016T4S
           Firmware Revision:              8DV1RA12
   ```

```
        Number of Namespaces:           1
F160-NVME-2
        PCI Vendor ID:                  8086
        Serial Number:                  CVMD446000CF1P6KGN
        Model Number:                   INTEL SSDPEDME016T4S
        Firmware Revision:              8DV1RA12
        Number of Namespaces:           1
root:~#
```

5. **Check health of the Oracle F160 Flash Card.**

   To check the selected Oracle F160 Flash Card health and SMART information, type:

   # `nvmeadm getlog -h`

   Ensure the Oracle F160 Flash Cards have remaining drive life in the output returned by the above command.

```
# nvmeadm getlog -h
F160-NVME-1
SMART/Health Information:
        Critical Warning: 0
        Temperature: 312 Kelvin
        Available Spare: 100 percent
        Available Spare Threshold: 10 percent
        Percentage Used: 0 percent
        Data Unit Read: 0x1 of 512k bytes.
        Data Unit Written: 0x0 of 512k bytes.
        Number of Host Read Commands: 0x30313b3
        Number of Host Write Commands: 0x302f25d
        Controller Busy Time in Minutes: 0x0
        Number of Power Cycle: 0xf
        Number of Power On Hours: 0x1c
        Number of Unsafe Shutdown: 0xf
        Number of Media Errors: 0x0
        Number of Error Info Log Entries: 0x0
F160-NVME-2
SMART/Health Information:....
```

Related Information

- “Minimum Supported Card Firmware Version” on page 31
- http://www.oracle.com/goto/ohmp/docs

Known Issues

The following table lists known issues for the Oracle Flash Accelerator F160 PCIe Card:

Links to Issues	Workaround?
To Update Oracle Flash Accelerator F160 PCIe Card Firmware, Install RA11 Before Updating to RA12 or RA13	Yes
Oracle Hardware Management Pack Utility `fwupdate` Does Not Update Host Profile After OS/pkg Update (21849217)	Yes
Linux NVMe Driver Displays Device Shutdown Incomplete Message	No

To Update Oracle Flash Accelerator F160 PCIe Card Firmware, Install RA11 Before Updating to RA12 or RA13

If your Oracle Flash Accelerator F160 PCIe Cards have firmware RA10 or lower, you must update to RA11 before you update to RA12 or RA13. The 8DV1RA13.bin package includes two firmware files, RA11 and RA13, and associated metadata.xml files that automate the update process. RA11 is bridge firmware to get to RA12 or RA13. RA13 includes a critical fix where the device might assert at initial power-on. All supported platforms should upgrade to RA13 at earliest convenience.

Oracle Flash Accelerator F160 PCIe Cards do not support firmware versions lower than RA10.

Workaround:

- If your Oracle Flash Accelerator F160 PCIe Cards have RA10 or lower, you must upgrade to RA11 before upgrading to RA12 or RA13.
- If your Oracle Flash Accelerator F160 PCIe Cards have RA11 or RA12, you can upgrade directly to RA13.

Oracle Hardware Management Pack Utility `fwupdate` Does Not Update Host Profile After OS/pkg Update (21849217)

Oracle Hardware Management Pack Utility `fwupdate` command does not update the host profile after an operating system package (OS/pkg) update. This issue occurs during an upgrade of the SRU or when upgrading Oracle Solaris 11.2 to Oracle Solaris 11.3.

Workaround:

To update firmware, update the host profile after an OS/pkg update when upgrading the SRU or when upgrading Oracle Solaris 11.2 to Oracle Solaris 11.3:

- Remove all files under `/etc/ssm/hmp/`. Leave the directory in place.
- Type:

  ```
  cd /etc/ssm/hmp
  rm -f *
  ```

- Run `fwupdate list all` (or other commands).

Linux NVMe Driver Displays `Device shutdown incomplete` Message (19195500)

On a rare occasion, after an Oracle Flash Accelerator F160 PCIe Card PCIe hotplug removal or system shutdown, the system logs a Linux NVMe driver `Device shutdown incomplete` error message. This message is benign.

The following example shows the error message:

```
Device shutdown incomplete; abort shutdown\n
```

Workaround:

None