Oracle Flash Card

Oracle Flash Accelerator F680 PCIe Card User Guide

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Oracle Flash Card Oracle Flash Accelerator F680 PCIe Card User Guide,

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Contents

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Using This Documentation

- **Overview** – Provides late-breaking information and specifications about Oracle Flash Accelerator F680 PCIe Card
- **Audience** – System administrators, network administrators, and service technicians
- **Required knowledge** – Advanced understanding of server systems

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- Product Documentation Library
- Feedback
- Oracle Flash Accelerator F680 PCIe Card Product Accessibility

Product Documentation Library

Documentation and resources for this product and related products are available at: https://www.oracle.com/goto/oracleflashf680/docs

Feedback

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

Oracle Flash Accelerator F680 PCIe Card Product Accessibility

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For more information about Oracle's commitment to accessibility, go to http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc .

- Documentation Accessibility
- Diversity and Inclusion

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The documentation might contain links to web sites of other companies and organizations that Oracle does not own or control. Oracle neither evaluates nor makes any representations regarding the accessibility of these web sites.

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Oracle Flash Accelerator F680 PCIe Card Product Information

This section contains late-breaking information about Oracle Flash Accelerator F680 PCIe Cards. Read this section before reading other Oracle Flash Accelerator F680 PCIe Card documentation. Always refer to the latest version of the product information.

Review the software and firmware supported for Oracle Flash Accelerator F680 PCIe Cards. Review important information for configuring Oracle Flash Accelerator F680 PCIe Cards. Check known issues and specifications.

For specific installation instructions, late-breaking information about the installation and use of Oracle Flash Accelerator F680 PCIe Cards with your server, supported firmware and operating systems, important operating notes, and known issues, refer to the latest platform product notes document.
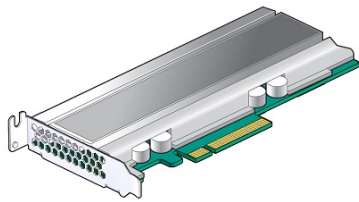
Supported hardware and software topics are included in this section.

- Supported Servers and Locations
- Minimum Supported Card Firmware Version
- Required Host Firmware
- Server Management Tools
- Implementation Considerations
- Updating Oracle Flash Accelerator F680 PCIe Card Software and Firmware
- Known Issues
- Oracle Flash Accelerator F680 PCIe Card Product Specifications

Supported Servers and Locations

This section lists the servers that support Oracle Flash Accelerator F680 PCIe Cards. For detailed information about using this card with your server, see the product notes for your server, available at https://docs.oracle.com.

The following servers are supported for Oracle Flash Accelerator F680 PCIe Cards.

x86 Servers	Number of Cards	Slots Supported for Installing Cards
Oracle Server X9-2L	1 to 4	Slots 4,5,6,10
	1 to 8	Slots 2,3,4,5,6,8,9,10

SPARC Servers	Number of NVMe SSDs	Slots Supported for Installing NVMe SSDs
SPARC S7-2 Server	1 to 4	4 drive: 2, 3, 4, 5
SPARC S7-2L Server	8 drive: 1 to 4	8 drive: 2, 3, 4, 5
	12 drive: 1 to 12	12 drive: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23
	24 drive: 1 to 4	24 drive: 3, 4, 19, 20
SPARC T8-1 Server	1 to 4	2, 3, 4, 5
SPARC T8-2 Server	1 to 4	2, 3, 4, 5
SPARC T8-4 Server	1 to 8	0, 1, 2, 3, 4, 5, 6, 7

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 for device support.

> ⚠️ **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 product notes for up-to date information on supported servers, operating systems, and required patchsets.

Minimum Supported Card Firmware Version

Oracle Flash Accelerator F680 PCIe Cards run with the minimum required firmware package listed in the following table.

Firmware	Minimum Required Card Firmware Version	Recommended Card Firmware Version
Oracle 6.8 TB NVMe SSD Package	9CV1R410 F680 1.0.0	9CV1R410 Patch 36717450: Oracle Flash Accelerator F680 PCIe Card SW 1.0.0 - FIRMWARE PACK

If you install Oracle Flash Accelerator F680 PCIe Cards as an option, you must update firmware to 9CV1R410, or a subsequent firmware release if available.

> **Note:**
>
> For best practice, install the latest device firmware versions.

Required Host Firmware

> **Note:**
>
> Refer to Firmware Downloads and Release History for Oracle Systems (https://www.oracle.com/servers/technologies/firmware/release-history-jsp.html)

Oracle Flash Accelerator F680 PCIe Cards run with the minimum required host firmware listed in the following table.

x86 Driver	Minimum Required Host Firmware Version (Patch No.)	Recommended System Firmware Version (Patch No.)
Oracle Server X9-2	Patch 36010992: Oracle Server X9-2 SW 3.6.0 - FIRMWARE PACK	Patch 36279164: Oracle Server X9-2 SW 3.6.0.1 - FIRMWARE PACK or later
Oracle Server X9-2L	Patch 36011008: Oracle Server X9-2L SW 3.6.0 - FIRMWARE PACK	Patch 36279180: Oracle Server X9-2L SW 3.6.0.1 - FIRMWARE PACK or later
Oracle Server X8-8	Patch 36047385: Oracle Server X8-8 SW 3.6.0 - FIRMWARE PACK	Patch 36707018: Oracle Server X8-8 SW 3.7.0 - FIRMWARE PACK or later

SPARC Driver	Minimum Required System Firmware Version (Patch No.)	Recommended System Firmware Version (Patch No.)
SPARC S7-2 Server	Patch 35949310: FIRMWARE: SPARC S7-2 SUN SYSTEM FIRMWARE 9.10.7	Patch 36549129: FIRMWARE: SPARC S7-2 SUN SYSTEM FIRMWARE 9.10.8.a or later
SPARC S7-2L Server	Patch 35949311: FIRMWARE: SPARC S7-2L SUN SYSTEM FIRMWARE 9.10.7	Patch 36549124: FIRMWARE: SPARC S7-2L SUN SYSTEM FIRMWARE 9.10.8.a or later
SPARC T8-1 Server	Patch 35949304: FIRMWARE: SPARC T8-1 SUN SYSTEM FIRMWARE 9.10.7	Patch 36549209: FIRMWARE: SPARC T8-1 SUN SYSTEM FIRMWARE 9.10.8.a or later
SPARC T8-2 Server	Patch 35949305: FIRMWARE: SPARC T8-2 SUN SYSTEM FIRMWARE 9.10.7	Patch 36549120: FIRMWARE: SPARC T8-2 SUN SYSTEM FIRMWARE 9.10.8.a or later
SPARC T8-4 Server	Patch 35949306: FIRMWARE: SPARC T8-4 SUN SYSTEM FIRMWARE 9.10.7	Patch 36549121: FIRMWARE: SPARC T8-4 SUN SYSTEM FIRMWARE 9.10.8.a or later

Server Management Tools

The following management tools are available for the server:

- **Oracle Integrated Lights Out Manager (ILOM)**, Preinstalled service processor (SP) with integrated firmware. No installation required. Some initial configuration is required. For information, refer to the product information page at Oracle Integrated Lights Out Manager. For documentation, refer to Oracle ILOM Documentation.

- **Oracle Hardware Management Pack**, available with the Oracle Solaris OS or as a standalone product with other OS. Monitor hardware through the host operating system,

either remotely or locally using command-line interface tools. For information, refer to the product information page at Oracle Hardware Management Pack. For documentation and OS support matrix, refer to Oracle Hardware Management Pack Documentation at Servers Documentation Systems Management

- **Oracle Enterprise Manager Ops Center**, available software to manage multiple systems in a data center. For information, refer to the product information page at Oracle Enterprise Manager. For documentation, refer to Oracle Enterprise Manager Cloud Control Documentation at Oracle Enterprise Manager Cloud Control.

Implementation Considerations

These topics provide important information for configuring Oracle Flash Accelerator F680 PCIe Cards in supported servers.

- Oracle Server X9-2L Configuration
- Configure Slot PCIe Connector
- SSD Volume Management

Oracle Server X9-2L Configuration

Minimum required software for Oracle Server X9-2L is SW3.6.1.

Oracle Server X9-2L supports Oracle Flash Accelerator F680 PCIe Card as a boot device.

Oracle Flash Accelerator F680 PCIe Card population rules for Oracle Server X9-2L:

- If Oracle F680 Flash Card quantity is less than three, then installation order is: NVMe0, NVMe1, NVMe2, NVMe3 NVMe4, NVMe5, NVMe6, NVMe7, NVMe8, NVMe9, NVMe10, NVMe11
- If Oracle F680 Flash Card quantity is four, then installation order is: NVMe4, NVMe5, NVMe6, NVMe10
- If Oracle F680 Flash Card quantity is more than four, then installation order is: NVMe0, NVMe1, NVMe2, NVMe3 NVMe4, NVMe5, NVMe6, NVMe7, NVMe8, NVMe9, NVMe10, NVMe11.

  Note the following restrictions for installing more than four Oracle F680 Flash Cards:

  – Do not install Oracle Storage 12 Gb SAS PCIe RAID HBA, Internal: 16 port card.

  – Do not install HBA-connected storage drives in the server front bays.

See Configure Slot PCIe Connector to configure UEFI BIOS for 2x4 bifurcation on Oracle F680 Flash Card. Select `x4x4 HP ENABLED Aura-10` to enable x4x4x4 HP ENABLED Oracle Flash Accelerator F680 PCIe Card special configure this slot's PCIe connector.

Refer to the server documentation for more information.

Configure Slot PCIe Connector

Configure the UEFI BIOS for 2x4 bifurcation on Oracle F680 Flash Card.

1. Access the BIOS Setup Utility menus.

2. In the BIOS Setup Utility menus, navigate to the **IO** menu.

3. On the **IO** screen, select **PCIe Connector Special Configuration**, and press **Enter** to display the **PCIe Connector Configuration Settings** slots.

4. Specify the connector to control PCIe bifurcation and hotplug. On the **PCIe Connector Special Configuration** screen, select the Slot 1-9 PCIe Connector Configuration you want to configure and press **Enter**. **Special configure this slot's connector PCIe SLOT Connector Configuration**

5. On the `Menu to Control PCIE connector Bifurcation and Hotplug` pop-up screen for that slot, select one of the following and press Enter.

   • Select `No Special connector configuration` for this slot's PCIe connector.

   • Select `x16 Bifurcation` to enable x16 bifurcation special configuration in this slot's PCIe connector.

   • Select `x8x8 Bifurcation` to enable x8x8 bifurcation special configuration in this slot's PCIe connector.

   • Select `x4x4x4 Bifurcation` to enable x4x4x4 bifurcation special configuration in this slot's PCIe connector.

   • Select `Hotplug_Enabled` to enable PCIe card hotplug in this slot's PCIe connector.

   • Select `Hotplug_Disabled` to disable PCIe card hotplug in this slot's PCIe connector.

   • Select `x4x4 HP ENABLED Aura-9` to enable **x4x4** HP ENABLED Oracle Flash Accelerator F680 PCIe Card special configure this slot's PCIe connector.

   • Select `x4x4x4x4 HP ENABLED Aura-9` to enable x4x4x4x4 HP ENABLED Oracle Flash Accelerator F680 PCIe Card special configure this slot's connector.

6. Press the **F10** key to save the changes and exit the BIOS Setup Utility.

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 6.8 TB domains into a single 27.2 TB volume.

Refer to the Automatic Storage Management documentation at https://docs.oracle.com/en/database/oracle/oracle-database/19/ostmg/index.html .

Updating Oracle Flash Accelerator F680 PCIe Card Software and Firmware

This section provides information on updating Oracle Flash Accelerator F680 PCIe Card firmware and software.

• Keep Drivers and Firmware Up to Date

• Download the Device Software Package

• Update the NVMe Storage Drive Firmware

• Verify Oracle Flash Accelerator F680 PCIe Card Operation

Keep Drivers and Firmware Up to Date

This section provides information on updating Oracle Flash Accelerator F680 PCIe Card drivers, firmware and software.

Product patches, updates and firmware are available on My Oracle Support from the Patches and Updates tab. Refer to the server documentation to check for updates to the device firmware.

> ✎ **Note:**
>
> Refer to Firmware Downloads and Release History for Oracle Systems (https://www.oracle.com/servers/technologies/firmware/release-history-jsp.html)

Download the Device Software Package

To find the device software package, access My Oracle Support and download the latest software package for Oracle Flash Accelerator F680 PCIe Cards.

1. Go to My Oracle Support.

2. Sign in to My Oracle Support.

3. At the top of the page, click the Patches & Updates tab.

   The Patch Search pane appears at the right of the screen.

4. Within the Search tab area, click Number/Name or Bug Number (Simple).

   The Search tab area appears with search fields.

5. In the Product field, enter the patch number for Oracle Flash Accelerator F680 PCIe Cards.

   See *Minimum Supported Card Firmware Version*.

6. In the Release field, select a software release from the drop-down list.

   Expand the list to see all available software releases.

7. Click Search.

   The Patch Advanced Search Results screen appears, listing the patches for the software release.

8. To select a patch for a software release, click the patch number next to the software release version.

   You can use the Shift key to select more than one patch.

   A pop-up action panel appears. The panel contains several action options, including the ReadMe, Download, and Add to Plan options. For information about the Add to Plan option, click the associated button and select "Why use a plan?".

9. To review the ReadMe file for this patch, click ReadMe.

10. To download the patch for the software release, click Download.

11. In the File Download dialog box, click the patch zip file name.

    The patch for the software release downloads. The download is an archive zip file, which you must extract to find the directory containing the image.pkg file.

Update the NVMe Storage Drive Firmware

- 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.

For CLI command instructions, refer to *Oracle Server CLI Tools User's Guide* in Oracle Hardware Management Pack documentation.

This procedure provides instructions to update Oracle F680 Flash Card NAND flash controller firmware on the host for supported Oracle Solaris and Linux operating systems. Oracle F680 Flash Card firmware is updated as a single package using Oracle Hardware Management Pack utility command-line interface (CLI) tools.

> **Note:**
>
> For detailed instructions on system software updates, refer to the server documentation.

1. Check Oracle Flash Accelerator F680 PCIe Card Product Information for the latest firmware requirements.

   See *Minimum Supported Card Firmware Version*.

2. Log in to the target system.

   For detailed instructions, refer to the server installation guide. For example, to log in to the target system through SSH or through Oracle ILOM Remote System Console Plus, do one of the following:

   - If you are using an SSH client connection.

     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 in to the system using an account with root access.

     c. Proceed to Step 3.

   - If you are using a remote system console, first refer to the server Administration Guide and then perform these steps.

     To launch an Oracle ILOM Remote System Console Plus session, refer to Launching Remote KVMS Redirection Sessions in the server Administration Guide.

     a. Establish a remote connection to the host console.

        Start an Oracle ILOM serial console session, type:

        `-> start /HOST/console`

        `Are you sure you want to start /HOST/console (y/n)? y`

     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. Download and store any firmware image file updates on the server that are required to support Oracle Flash Accelerator F680 PCIe Cards.

   a. Download firmware image files from My Oracle Support.

      See *Download the Device Software Package*.

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

4. Identify all Oracle Flash Accelerator F680 PCIe Card controller firmware versions in the server.

    a. Type `# fwupdate list controller`.

    In the following example, Oracle Flash Accelerator F680 PCIe Card controllers `c5` and `c6` are enumerated in the output returned by the above command.

```
# fwupdate list controller

WARNING: Due to strict MMIO memory settings in the running kernel some
network controllers may not be accessible.
        See Hardware Management Pack documentation regarding iomem
kernel settings required for
        firmware update of these devices.
==================================================
CONTROLLER
==================================================
ID    Type   Manufacturer    Model     Product Name              FW
Version
      BIOS Version    EFI Version    FCODE Version   Package Version
NVDATA Version    XML Support
-----------------------------------------------------------------------
-----------------------
c0    NVMe   Intel           0x0b60    INTEL SSDPF2NV307TZS
ACV1R380
c1    NVMe   Intel           0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c2    NVMe   Intel           0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c3    NVMe   Intel           0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c4    NVMe   Intel           0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c5    NVMe   Intel           0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c6    NVMe   Intel           0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c7    NVMe   Intel           0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c8    NVMe   Intel           0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c9    NVMe   Intel           0x0b60    INTEL SSDPFCKE064T9S
2CV1RC50
c10   NVMe   Intel           0x0b60    INTEL SSDPFCKE064T9S
2CV1RC50
c11   SAS    Samsung         0xa826    MZWLO7T6HBLA-00AU3
OPPA1R5Q
c12   SAS    0x025e          0x0b60    SOLIDIGM SBFPF2BV307TOC
5CV1R077
c13   SAS    0x025e          0x0b60    SOLIDIGM SBFPF2BV614TOC
5CV1R077
c14   SAS    0x1344          0x51c3    Micron_7450_MTFDKBA480TFR
E2MU200
c15   NVMe   Samsung         0xa80a    SAMSUNG MZVL2480HBJD-00A07
GDB7302Q
```

b. Verify that the firmware package files that are installed in Oracle Flash Accelerator F680 PCIe Cards require 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 F680 PCIe Card controllers `c9` and `c10` show firmware version `2CV1R151`, while the other NVMe controllers show firmware version `9CV1R410`.

```
# fwupdate list controller

WARNING: Due to strict MMIO memory settings in the running kernel some
network controllers may not be accessible.
        See Hardware Management Pack documentation regarding iomem
kernel settings required for
        firmware update of these devices.
====================================================
CONTROLLER
====================================================
ID    Type   Manufacturer   Model      Product Name               FW
Version
      BIOS Version   EFI Version    FCODE Version  Package Version
NVDATA Version    XML Support
--------------------------------------------------------------------------
-----------------------
c0    NVMe   Intel          0x0b60     INTEL SSDPF2NV307TZS
ACV1R380
c1    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c2    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c3    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c4    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c5    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c6    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c7    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c8    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c9    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T9S
2CV1RC51
c10   NVMe   Intel          0x0b60     INTEL SSDPFCKE064T9S
2CV1RC51
c11   SAS    Samsung        0xa826     MZWLO7T6HBLA-00AU3
OPPA1R5Q
c12   SAS    0x025e         0x0b60     SOLIDIGM SBFPF2BV307TOC
5CV1R077
c13   SAS    0x025e         0x0b60     SOLIDIGM SBFPF2BV614TOC
5CV1R077
c14   SAS    0x1344         0x51c3     Micron_7450_MTFDKBA480TFR
E2MU200
```

```
c15   NVMe   Samsung        0xa80a    SAMSUNG MZVL2480HBJD-00A07
GDB7302Q
```

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-3` and `SUNW-NVME-4` show firmware version `9CV1R410` in the output returned by the above command.

```
# nvmeadm list -v
SUNW-NVME-1
        PCI Vendor ID:            0x144d
        Serial Number:           S78UNE0TA00209
        Model Number:            SAMSUNG MZVL2480HBJD-00A07
        Firmware Revision:       GDB7302Q
        Number of Namespaces:    32
SUNW-NVME-2
        PCI Vendor ID:            0x1344
        Serial Number:           22283A14CB5C
        Model Number:            Micron_7450_MTFDKBA480TFR
        Firmware Revision:       E2MU200
        Number of Namespaces:    132
SUNW-NVME-3
        PCI Vendor ID:            0x8086
        Serial Number:           PHAZ2233000E6P4AGN-2
        Model Number:            INTEL SSDPFCKE064T1S
        Firmware Revision:       9CV1R410
        Number of Namespaces:    128
SUNW-NVME-4
        PCI Vendor ID:            0x8086
        Serial Number:           PHAZ223300016P4AGN-1
        Model Number:            INTEL SSDPFCKE064T1S
        Firmware Revision:       9CV1R410
        Number of Namespaces:    128
SUNW-NVME-5
        PCI Vendor ID:            0x8086
        Serial Number:           PHAZ223300016P4AGN-2
        Model Number:            INTEL SSDPFCKE064T1S
        Firmware Revision:       9CV1R410
        Number of Namespaces:    128
SUNW-NVME-6
        PCI Vendor ID:            0x8086
        Serial Number:           PHAX137400987P6DGN
        Model Number:            INTEL SSDPF2KX076T1S
        Firmware Revision:       9CV1R410
        Number of Namespaces:    128
SUNW-NVME-7
        PCI Vendor ID:            0x8086
        Serial Number:           PHAX1456003A15PFGN
        Model Number:            INTEL SSDPF2KX153T1S
        Firmware Revision:       9CV1R410
        Number of Namespaces:    128
SUNW-NVME-8
        PCI Vendor ID:            0x8086
        Serial Number:           PHAC2353003930PGGN
```

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```
        Model Number:                   INTEL SSDPF2NV307TZS
        Firmware Revision:              ACV1R330
        Number of Namespaces:           128
SUNW-NVME-9
        PCI Vendor ID:                  0x8086
        Serial Number:                  PHAC2353003D30PGGN
        Model Number:                   INTEL SSDPF2NV307TZS
        Firmware Revision:              ACV1R330
        Number of Namespaces:           128
SUNW-NVME-10
        PCI Vendor ID:                  0x8086
        Serial Number:                  PHAZ223300066P4AGN-1
        Model Number:                   INTEL SSDPFCKE064T1S
        Firmware Revision:              9CV1R410
        Number of Namespaces:           128
SUNW-NVME-11
        PCI Vendor ID:                  0x8086
        Serial Number:                  PHAZ223300066P4AGN-2
        Model Number:                   INTEL SSDPFCKE064T1S
        Firmware Revision:              9CV1R410
        Number of Namespaces:           128
SUNW-NVME-12
        PCI Vendor ID:                  0x8086
        Serial Number:                  PHAZ2233000V6P4AGN-2
        Model Number:                   INTEL SSDPFCKE064T1S
        Firmware Revision:              9CV1R410
        Number of Namespaces:           128
SUNW-NVME-13
        PCI Vendor ID:                  0x8086
        Serial Number:                  PHAZ2233000V6P4AGN-1
        Model Number:                   INTEL SSDPFCKE064T1S
        Firmware Revision:              9CV1R410
        Number of Namespaces:           128
SUNW-NVME-14
        PCI Vendor ID:                  0x8086
        Serial Number:                  PHAX1374001G7P6DGN
        Model Number:                   INTEL SSDPF2KX076T1S
        Firmware Revision:              9CV1R410
        Number of Namespaces:           128
SUNW-NVME-15
        PCI Vendor ID:                  0x1344
        Serial Number:                  172310117DB2
        Model Number:                   MTFDKCC30T7TGR
        Firmware Revision:              G0MQ000
        Number of Namespaces:           128
SUNW-NVME-16
        PCI Vendor ID:                  0x8086
        Serial Number:                  PHAX137000ER3P8CGN
        Model Number:                   INTEL SSDPF2KX038T1S
        Firmware Revision:              9CV1R410
        Number of Namespaces:           128
SUNW-NVME-17
        PCI Vendor ID:                  0x8086
        Serial Number:                  PHAZ2233000E6P4AGN-1
        Model Number:                   INTEL SSDPFCKE064T1S
```

```
            Firmware Revision:              9CV1R410
            Number of Namespaces:           128
```

5. Quiesce Oracle Flash Accelerator F680 PCIe Card devices.

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

   > ⚠️ **Caution:**
   >
   > **System hang or data loss.** Before updating device firmware, ensure 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 F680 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.

   > ✎ **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). For CLI command instructions, refer to Oracle Hardware Management Pack documentation.

   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 F680 PCIe Cards, type
      `fwupdate update controller -x metadata.xml`

      In the following example, controllers `c0` and `c1` will be upgraded to firmware version 9CV1R410.

```
# 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
-----------------------------------------------------------------------
-------------------------------------------
c0        1        Check FW     Success     2CV1R151
9CV1R410           N/A                     None
c1        1        Check FW     Success     2CV1R151
```

```
9CV1R410              N/A                None
Do you wish to process all of the above component upgrades? [y/n]?
```

If the current firmware package version on the selected controller is higher than the specified firmware package version, the command returns an error. For error codes, refer to Oracle Hardware Management Pack documentation.

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
-------------------------------------------------------------------------
-----------------------------------
c0    1         Check FW    Success    2CV1R151
9CV1R410         N/A                 None
c1    1         Check FW    Success    2CV1R151
9CV1R410         N/A                 None
System Reboot required for some applied firmware
Do you wish to automatically reboot now? [y/n]?
```

d. Type y to reboot the host server to initialize the firmware update.

7. Re-access the console. See step 2.

For more instructions, refer to the server Installation Guide.

8. Verify that updated firmware packages are installed in Oracle Flash Accelerator F680 PCIe Cards.

a. Type the following from a terminal: # fwupdate list controller

In the following example, Oracle Flash Accelerator F680 PCIe Cards c1 - c8 are displayed.

```
# fwupdate list controller

WARNING: Due to strict MMIO memory settings in the running kernel some
network controllers may not be accessible.
        See Hardware Management Pack documentation regarding iomem
kernel settings required for
        firmware update of these devices.
=================================================
CONTROLLER
=================================================
ID    Type    Manufacturer    Model      Product Name              FW
Version
-------------------------------------------------------------------------
----
c0    NVMe    Intel          0x0b60     INTEL SSDPF2NV307TZS
ACV1R380
```

```
c1    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c2    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c3    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c4    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c5    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c6    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c7    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c8    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T1S
9CV1R410
c9    NVMe   Intel        0x0b60    INTEL SSDPFCKE064T9S
2CV1RC51
c10   NVMe   Intel        0x0b60    INTEL SSDPFCKE064T9S
2CV1RC51
c11   SAS    Samsung      0xa826    MZWLO7T6HBLA-00AU3
OPPA1R5Q
c12   SAS    0x025e       0x0b60    SOLIDIGM SBFPF2BV307TOC
5CV1R077
c13   SAS    0x025e       0x0b60    SOLIDIGM SBFPF2BV614TOC
5CV1R077
c14   SAS    0x1344       0x51c3    Micron_7450_MTFDKBA480TFR
E2MU200
c15   NVMe   Samsung      0xa80a    SAMSUNG MZVL2480HBJD-00A07
GDB7302Q
```

b. Verify host recognition of all Oracle Flash Accelerator F680 PCIe Cards by checking PCIe ID enumeration.

In the above example, Oracle Flash Accelerator F680 PCIe Card controllers `c1` - `c8` are enumerated in the output returned by the above command.

c. Ensure that Oracle Flash Accelerator F680 PCIe Card firmware was updated in the output returned by the above command.

In the above example, Oracle Flash Accelerator F680 PCIe Card controllers `c1` to `c8` show firmware version `9CV1R410`.

9. Verify Oracle Flash Accelerator F680 PCIe Card operation.

See Verify Oracle Flash Accelerator F680 PCIe Card Operation.

10. Repeat the firmware upgrade process until Oracle Flash Accelerator F680 PCIe Cards have the most up to date firmware release.

See *Minimum Supported Card Firmware Version*. For example, upgrade firmware revision to 9CV1R410.

Verify Oracle Flash Accelerator F680 PCIe Card Operation

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

For CLI command instructions, refer to Oracle Hardware Management Pack documentation *Oracle Server CLI Tools User's Guide*.

- Ensure that you have access to the server (either directly or over the network).

This procedure provides instructions to verify Oracle Flash Accelerator F680 PCIe Card operation on the host for supported Oracle Linux and Oracle Solaris operating systems. Verify Oracle Flash Accelerator F680 PCIe Card and NVMe SSD operation using Oracle Hardware Management Pack utility CLI tools.

1. Observe Oracle Flash Accelerator F680 PCIe Card status indicator LEDs.

    Verify that the Fault-Service Action Required Oracle Flash Accelerator F680 PCIe Card status indicator is not lit and that the green Power status indicator is lit on Oracle Flash Accelerator F680 PCIe Cards and NVMe SSDs that you updated.

    Refer to *LED Status Indicator Characteristics* in *Oracle Flash Accelerator F680 PCIe Card NVMe Solid State Drive Specification*.

2. Log in to the target system.

    For detailed instructions, refer to the server installation documentation. For example, to log in to the target system through SSH or through Oracle ILOM Remote System Console Plus, do one of the following:

    - SSH client connection:

        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 in to the system using an account with root access.

        c. Proceed to Step 3.

    - Remote system console:
        First refer to *Start Serial Console Redirection and Log In to Host Server OS* at Oracle ILOM Documentation and then perform these steps.

        If you are using a remote system console, refer to the server administration documentation and perform these steps.

        a. Establish a remote connection to the host console.

            Start an Oracle ILOM serial console session, type: `-> start /HOST/console`

            `Are you sure you want to start /HOST/console (y/n)? y`

            To launch an Oracle ILOM Remote System Console Plus session, refer to *Launching Remote KVMS Redirection Sessions* in the server administration documentation.

        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.

        d. Proceed to Step 3.

3. Identify all Oracle F680 Flash Cards and verify that the latest firmware packages are installed.

    a. Type the following command: `# fwupdate list controller`.

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

```
# fwupdate list controller

WARNING: Due to strict MMIO memory settings in the running kernel some
network controllers may not be accessible.
        See Hardware Management Pack documentation regarding iomem
kernel settings required for
        firmware update of these devices.
==================================================
CONTROLLER
==================================================
ID    Type   Manufacturer   Model      Product Name              FW
Version
      BIOS Version   EFI Version    FCODE Version  Package Version
NVDATA Version   XML Support
------------------------------------------------------------------------
----------------------
c0    NVMe   Intel          0x0b60     INTEL SSDPF2NV307TZS
ACV1R380
c1    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c2    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c3    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c4    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c5    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c6    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c7    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c8    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T1S
9CV1R410
c9    NVMe   Intel          0x0b60     INTEL SSDPFCKE064T9S
2CV1RC50
c10   NVMe   Intel          0x0b60     INTEL SSDPFCKE064T9S
2CV1RC50
c11   SAS    Samsung        0xa826     MZWLO7T6HBLA-00AU3
OPPA1R5Q
c12   SAS    0x025e         0x0b60     SOLIDIGM SBFPF2BV307TOC
5CV1R077
c13   SAS    0x025e         0x0b60     SOLIDIGM SBFPF2BV614TOC
5CV1R077
c14   SAS    0x1344         0x51c3     Micron_7450_MTFDKBA480TFR
E2MU200
c15   NVMe   Samsung        0xa80a     SAMSUNG MZVL2480HBJD-00A07
GDB7302Q
```

b. Verify host recognition of all Oracle F680 Flash Cards by checking controller ID enumeration.

In the above example, Oracle F680 Flash Card controllers `c1` to `c8` are enumerated in the output returned by the above command.

c. Ensure that all Oracle F680 Flash Card firmware revisions are current in the FW Version output returned by the above command.

See *Minimum Supported Card Firmware Version*.

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, controllers `SUNW-NVME-3` shows firmware version `9CV1R410` in the output returned by the above command.

```
# nvmeadm list -v
SUNW-NVME-1
        PCI Vendor ID:              0x144d
        Serial Number:             S78UNE0TA00209
        Model Number:              SAMSUNG MZVL2480HBJD-00A07
        Firmware Revision:         GDB7302Q
        Number of Namespaces:      32
SUNW-NVME-2
        PCI Vendor ID:              0x1344
        Serial Number:             22283A14CB5C
        Model Number:              Micron_7450_MTFDKBA480TFR
        Firmware Revision:         E2MU200
        Number of Namespaces:      132
SUNW-NVME-3
        PCI Vendor ID:              0x8086
        Serial Number:             PHAZ2233000E6P4AGN-2
        Model Number:              INTEL SSDPFCKE064T1S
        Firmware Revision:         9CV1R410
        Number of Namespaces:      128
SUNW-NVME-4
        PCI Vendor ID:              0x8086
        Serial Number:             PHAZ223300016P4AGN-1
        Model Number:              INTEL SSDPFCKE064T1S
        Firmware Revision:         9CV1R410
        Number of Namespaces:      128
SUNW-NVME-5
        PCI Vendor ID:              0x8086
        Serial Number:             PHAZ223300016P4AGN-2
        Model Number:              INTEL SSDPFCKE064T1S
        Firmware Revision:         9CV1R410
        Number of Namespaces:      128
SUNW-NVME-6
        PCI Vendor ID:              0x8086
        Serial Number:             PHAX137400987P6DGN
        Model Number:              INTEL SSDPF2KX076T1S
        Firmware Revision:         9CV1R410
        Number of Namespaces:      128
SUNW-NVME-7
        PCI Vendor ID:              0x8086
        Serial Number:             PHAX1456003A15PFGN
        Model Number:              INTEL SSDPF2KX153T1S
```

```
        Firmware Revision:          9CV1R410
        Number of Namespaces:       128
SUNW-NVME-8
        PCI Vendor ID:              0x8086
        Serial Number:              PHAC2353003930PGGN
        Model Number:               INTEL SSDPF2NV307TZS
        Firmware Revision:          ACV1R330
        Number of Namespaces:       128
SUNW-NVME-9
        PCI Vendor ID:              0x8086
        Serial Number:              PHAC2353003D30PGGN
        Model Number:               INTEL SSDPF2NV307TZS
        Firmware Revision:          ACV1R330
        Number of Namespaces:       128
SUNW-NVME-10
        PCI Vendor ID:              0x8086
        Serial Number:              PHAZ223300066P4AGN-1
        Model Number:               INTEL SSDPFCKE064T1S
        Firmware Revision:          9CV1R410
        Number of Namespaces:       128
SUNW-NVME-11
        PCI Vendor ID:              0x8086
        Serial Number:              PHAZ223300066P4AGN-2
        Model Number:               INTEL SSDPFCKE064T1S
        Firmware Revision:          9CV1R410
        Number of Namespaces:       128
SUNW-NVME-12
        PCI Vendor ID:              0x8086
        Serial Number:              PHAZ2233000V6P4AGN-2
        Model Number:               INTEL SSDPFCKE064T1S
        Firmware Revision:          9CV1R410
        Number of Namespaces:       128
SUNW-NVME-13
        PCI Vendor ID:              0x8086
        Serial Number:              PHAZ2233000V6P4AGN-1
        Model Number:               INTEL SSDPFCKE064T1S
        Firmware Revision:          9CV1R410
        Number of Namespaces:       128
SUNW-NVME-14
        PCI Vendor ID:              0x8086
        Serial Number:              PHAX1374001G7P6DGN
        Model Number:               INTEL SSDPF2KX076T1S
        Firmware Revision:          9CV1R410
        Number of Namespaces:       128
SUNW-NVME-15
        PCI Vendor ID:              0x1344
        Serial Number:              172310117DB2
        Model Number:               MTFDKCC30T7TGR
        Firmware Revision:          G0MQ000
        Number of Namespaces:       128
SUNW-NVME-16
        PCI Vendor ID:              0x8086
        Serial Number:              PHAX137000ER3P8CGN
        Model Number:               INTEL SSDPF2KX038T1S
        Firmware Revision:          9CV1R410
        Number of Namespaces:       128
```

```
SUNW-NVME-17
        PCI Vendor ID:                  0x8086
        Serial Number:                  PHAZ2233000E6P4AGN-1
        Model Number:                   INTEL SSDPFCKE064T1S
        Firmware Revision:              9CV1R410
        Number of Namespaces:           128
```

5. Check Oracle Flash Accelerator F680 PCIe Card health and SMART information.

   To check the selected 6.8 TB NVMe SSD health and SMART (Self-Monitoring, Analysis, and Reporting Technology) information, type: `# nvmeadm getlog -h`

   The `Critical Warning` field should be zero. A non-zero `Critical Warning` field indicates a SMART Trip.

   Ensure that Oracle F680 Flash Cards have remaining drive life (`Percentage Used`) in the output returned by the above command.

```
# nvmeadm getlog -h
SUNW-NVME-1
SMART/Health Information:
        Critical Warning: 0
        Temperature: 315 Kelvin
        Available Spare: 100 percent
        Available Spare Threshold: 10 percent
        Percentage Used: 0 percent
        Data Unit Read: 0x2fa1c314 of 512k bytes.
        Data Unit Written: 0x23bd12c7 of 512k bytes.
        Number of Host Read Commands: 0x3f0bb9308
        Number of Host Write Commands: 0x1c2433434
        Controller Busy Time in Minutes: 0x525
        Number of Power Cycle: 0x56e
        Number of Power On Hours: 0x55f
        Number of Unsafe Shutdown: 0x307
        Number of Media Errors: 0x0
        Number of Error Info Log Entries: 0x0
```

Known Issues

This section describes important operating issues and known hardware and software issues for Oracle Flash Accelerator F680 PCIe Card.

Supplementary and workaround information for Oracle Flash Accelerator F680 PCIe Card. Specific Bug ID identification numbers are provided for service personnel.

• Secure Erase Drives Before Use

Secure Erase Drives Before Use

Oracle Flash Accelerator F680 PCIe Card may report uncorrectable errors or assert after not being powered for three or more months. For best practice, secure erase Oracle Flash Accelerator F680 PCIe Cards before use (especially if use is reading from the card as a test) and especially if the Oracle Flash Accelerator F680 PCIe Card has been unpowered for more than three months. If the NAND media is not refreshed for approximately three months, the drive may experience media errors.

Over time, the drive firmware policy refreshes the media in the background while it remains powered-on. If the drive has been powered on long enough for the background refresh policy to be applied to all bits, the drive is not at risk for this issue. The time required to refresh all the bits is approximately 14 days and varies by product.

If the number of bits experiencing this issue exceeds the error-correction code (ECC) capability, it may result in an uncorrectable read error. If the uncorrectable read errors occur during normal drive operation, the drive will report an increased number of SMART media errors to the host.

Workaround:

Secure erase the drive to return the drive to service. Secure erase frees and reuses all blocks starting with an empty Flash Translation Layer table (FTL). Any LBAs that may have held data that may have degraded are now released as free blocks to be reused.

Select one of the following methods before use of the drive for operation or test. An off-line server can be used.

Choose one of the erase options:

- Secure erase the drive, using the `nvmeadmin` utility.

- Download and use third party utilities to secure erase the drive.

- Wait two weeks for a media refresh while the drive is powered-on before using the drive.

> ⚠️ **Caution:**
>
> All data will be destroyed after an erase.

Secure Erase Drive Using `nvmeadmin` **Utility**

To secure erase the drive, using the Oracle Hardware Management Pack NVMe admin utility:

1. Stop all IO to the NVMe device before attempting this action.

2. To securely erase all namespaces, type: `# nvmeadm erase -s -a` *controller_name*. For example: `# nvmeadm erase -s -a SUNW-NVME-1`

3. List all server devices.

4. Verify drive health.

For CLI command instructions, refer to Oracle Hardware Management Pack documentation *Oracle Server CLI Tools User's Guide*.

Secure Erase Drive Using Third-party Utilities

To secure erase the drive before use, using the Solidigm Storage Manager utility, if available:

1. Install the Solidigm Storage Manager.

2. Stop all IO to the NVMe device before attempting this action.

3. Use the `-secure_erase` option to erase all the data on the drive.

   ```
   ssm -drive_index 1 -secure_erase
   ```

4. The user is prompted unless the `-force` option is used:

   ```
   WARNING: You have selected to secure erase the drive!
   Proceed with the secure erase? (Y/N)
   ```

5. If the drive contains a partition, the prompt contains a second warning message:

```
WARNING: You have selected to secure erase the drive!
WARNING: Tool has detected as partition on the drive!
Proceed with the secure erase? (Y/N)
```

6. To bypass the warning prompts, use the `-force` option:

```
ssm -drive_index 1 -secure_erase -force
```

7. List all server devices.

8. Verify drive health.

Oracle Flash Accelerator F680 PCIe Card Product Specifications

This section provides the specification for Oracle Flash Accelerator F680 PCIe Cards.

- NVMe Storage Drive Product Specification

NVMe Storage Drive Product Specification

Oracle Flash Accelerator F680 PCIe Card product specifications are listed in the following table.

Table 2-1   Oracle Flash Accelerator F680 PCIe Card: 6.8 TB, NVMe PCIe 4.0

Specification	Value

Device name	• Product Identifier: SSDPFCKE064T1S
	• Oracle Part Number: 8210616
	• Device Identification:
	  – Designation: SE=Standard Endurance
	  – Subsystem PCIe Vendor ID: 0x8086
	  – PCIe Device ID: 0x0B60
	  – Subvendor ID: 0x108E
	  – Subsystem ID: 0x488D

Marketing Part Number	7605208: Oracle Flash Accelerator F680 PCIe Card: 6.8 TB, NVMe PCIe 4.0
Manufacturing name	6.8TB Intel ArbordalePlus D7-P5628, 3D NAND TLC AIC HHHL Solid State Drive Solidigm™ D7-P5520/D7-P5620
Form factors	• AIC (Add-In-Card form factor): HHHL (Half Height, Half Length) • PCIe card form factor
PCIe interface	PCIe Gen 4 Interface, x8 lanes 4 lanes, each going directly to a controller (no PCIe bus switch). Requires 2 x 4 lanes bifurcation.
Features	• NVMe PCIe Gen4 Interface • Basic Management commands, No MCTP support. • VPD per NVMe-MI Ver 1.0a specification
Product Compliance	• NVM Express Specification Rev. 1.3c • PCI Express Base Specification Rev. 4.0 • Enterprise SSD Form Factor Version 1.0a • NVMe-MI Rev 1.0a
Product ecological compliance	RoHS

Table 2-1   (Cont.) Oracle Flash Accelerator F680 PCIe Card: 6.8 TB, NVMe PCIe 4.0

Specification	Value
Certifications and declarations	cUL-us, CE, TUV-GS, CB, CE, BSMI, KCC, Morocco, VCCI, RCM, FCC, IC

Table 2-2   Drive Capacity and Performance

Attribute	Value
Capacity, formatted	Default Formatted Capacity: 3,400,670,601,216 bytes (x2) Sector Size (LBA size): 512 bytes per sector per controller
Capacity, unformatted	Unformatted Capacity (Total User Addressable LBA): 6,641,934,768 per controller
Capacity, raw NAND	4096 GiB per controller
Random 4 KB Read	1.56M IOPS Typical 4KB Random Read QD=256, Worker=8
Random 4 KB Write	460K IOPS Typical 4KB Random Write QD=256, Worker=8
Sequential Read	128 KB, QD 128, Worker=1: 13,400 MB/s **Note**: Sequential accesses on both controllers for aggregate performance.
Sequential Write	128 KB, QD 128, Worker=1: 6,800 MB/s **Note**: Sequential accesses on both controllers for aggregate performance.
Interface data transfer rate	• Interface Data Rate: PCIe Gen 4 • Data Transfer Rate 16 GT/sec • Interface drivers/receivers AIC: 2x4 lanes • 2 Controllers, 4 lanes per controller. 8 lane card bifurcated to two 4 lanes.

Table 2-3   Drive Usage Information

Usage	Description
Operating temperature (Case)	0 to 70 degrees Celsius (SMART)
Non-Operating temperature	-40 to 95 degrees Celsius
Maximum temperature (SMART trip)	Thermal Throttling at 70 degrees Celsius (SMART) when approaching maximum temperature. Thermal Shutdown at 80 degrees Celsius (SMART)
Error rates	Uncorrectable Bit Error Rate (UBER): 1 sector per 10^{17} bits read
Data retention	3 months powered off at 40 degrees Celsius at end of rated endurance
Endurance	• Drive Writes Per Day (DWPD) for 5 years: 3 • PBW (at 4KB Random Write) 30 PB Refer to the JEDEC JESD218A standard for SSD device life and endurance measurement techniques.
Other environmental factors	Conforms to IEC standards

Table 2-4   Drive Reliability

Attribute	Value
Component Design Life (Useful life)	5 years
MTBF	2,000,000 hours
Expected AFR (Annualized Failure Rate)	0.44% for normal 24x7 operating conditions

Table 2-5   Drive Electrical Specifications

Attribute	Value
Power On to Ready (no rebuild)	RTD3R: 10 seconds
Power On to Ready (full rebuild)	18 seconds
Supply Voltage / Tolerance	12 V +10%/-20% 3.3 Vaux +/-9%
Supply Average Current	12 V: 2.1 A @ 25W 3.3 Vaux: 20 mA (non-wakeup enabled)
Inrush Current	12 V, 1.5 A
Power Consumption	• Max Avg Active Read: < 25 W • Max Avg Active Write: < 36 W • Idle < 10 W • Max Burst: 2 < 45 W **Note:** Maximum power is measured as the average power in a 1 ms interval.
Power Requirements	Refer to vendor product specification.

Table 2-6   Drive Physical Characteristics

Height	Width	Depth	Weight
68.8 mm +/-0.34	167.55 mm +/-0.1	14.47 mm Max Component side. 2.67 mm Max bottom side.	205g +/- 5g

Table 2-7   NVMe Solid State Drive Characteristics

Attribute	Value
Minimum operating system versions	Refer to the server product notes for minimum operating system versions, hardware, firmware, and software compatibility.

Table 2-7   (Cont.) NVMe Solid State Drive Characteristics

Attribute	Value
Life monitoring capability	Provides alerts for proactive replacement of the drive before the endurance is depleted. Provides endurance remaining in NVMe SMART logs. SSD supports the standard method defined by NVMe for Solid State Drive to report NAND wear through the "Get Log" command SMART/Health Information Percentage Used field. The units are whole percentage of wear.
	Percentage Used: Contains a vendor specific estimate of the percentage of NVM subsystem life used based on the actual usage and the manufacturer's prediction of NVM life. A value of 100 indicates that the estimated endurance of the NVM in the NVM subsystem has been consumed, but may not indicate an NVM subsystem failure. The value is allowed to exceed 100. Percentages greater than 254 are represented as 255. This value is updated once per power-on hour (when the controller is not in a sleep state).
	Refer to the JEDEC JESD218A standard for SSD device life and endurance measurement techniques.
End-to-End data-path protection	T10 DIF Type 0, Type 1, Type 2, Type 3, no performance impact. T10 DIF (data integrity field) end-to-end data protection includes multiple levels of data-path protection.
Enhanced power-loss data protection	Energy storage components complete buffered writes to the persistent flash storage in case of a sudden power loss.
Power loss protection capacitor self-test	Supports testing of the power loss capacitor. Power is monitored using SMART (Self-Monitoring, Analysis, and Reporting Technology) attribute critical warning.
Out-of-Band Management (SMBUS)	Managed through the SMBUS. Provides out-of-band management by means of SMBUS interface. This requires 3.3V auxiliary voltage. SMBUS access includes NVMe-MI, the VPD page and temperature sensor.
Hot-Plug Support	Supports PCIe presence detect and link-up detect. Device advanced power loss protection provides robust data integrity. During IOs, the storage drive integrated monitoring enables the integrity of already committed data on the media and commits acknowledged writes to the media.
Management utilities	For more information about management utilities, refer to the server documentation.

Table 2-8   LED Status Indicator Characteristics

LED	Color	Normal operation	Status
(1) Controller 1 Activity	Green	N/A	Green Drive Activity indicator for controller ASIC 1:
			OFF – Power is off, or normal operation.
			STEADY ON (does not blink) – Oracle Flash Accelerator F640 PCIe Card v3 Activity LED status indicator LED 1 should be ON during idle. Driver is Idle. Driver is disabled. Power off until Host system shuts down. Controller function level reset.
			BLINK with varying duty cycle - Power On. BLINK at 375 msec on, 125 msec off – IO activity, Format NVM.
			Note: Both flash memory controllers enumerate.

Table 2-8   (Cont.) LED Status Indicator Characteristics

LED	Color	Normal operation	Status
(2) Controller 2 Activity	Green	N/A	Green Drive Activity indicator for controller ASIC 2: OFF – Power is off, or normal operation. STEADY ON (does not blink) – Oracle Flash Accelerator F640 PCIe Card v3 Activity LED status indicator LED 2 should be ON during idle. Driver is Idle. Driver is disabled. Power off until Host system shuts down. Controller function level reset. BLINK with varying duty cycle - Power On. BLINK at 375 msec on, 125 msec off – IO activity, Format NVM. **Note**: Both flash memory controllers enumerate.
(3) Link Status	Green Yellow	ON – Normal operation.	Green STEADY ON (does not blink) – Link at highest speed and lane width. Drive PCIe link is healthy. Normal operation. Yellow STEADY ON (does not blink) – Drive link sub-optimal The LED reports only secondary bus link status (behind internal switch) and does not report the status between the switch and host. OFF – No link
(4) Health	Yellow Red	OFF – Normal operation.	Yellow – Fault, Drive Critical Warning: OFF – Drive is idle. Power is off, or normal operation. STEADY ON (does not blink) – Drive critical warning. Red – Drive fail: OFF – Drive is idle. Power is off, or normal operation. STEADY ON (does not blink) – Service Action Required. Drive is in disabled logical mode.