Oracle® Flash Accelerator F640 PCIe Card v2 User Guide

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Part No: E99807-02

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Contents

Using This Documentation

- **Overview** – Provides specifications and describes how to install, administer, and service the Oracle Flash Accelerator F640 PCIe Card v2.
- **Audience** – Trained technicians and authorized service personnel who have been instructed on the hazards within the equipment and qualified to remove and replace hardware.
- **Required knowledge** – Advanced experience troubleshooting and replacing hardware.

Product Documentation Library

Documentation and resources for this product and related products are available at: `https://www.oracle.com/goto/oracleflashf640/docs`

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Product Overview

This section describes specifications and capabilities of Oracle Flash Accelerator F640 PCIe Card v2. Oracle Flash Accelerator F640 PCIe Card v2 is also referred to as Oracle F640 Flash Card in this document.

Review the following product information topics before you install or service your Oracle F640 Flash Card.

Description	Links
Learn about Oracle Flash Accelerator F640 PCIe Card v2 features and functions.	"Oracle Flash Accelerator F640 PCIe Card v2 Overview" on page 11
Review specifications and capabilities.	"Specifications" on page 14

Note - To install the card in a specific server, refer to your server documentation. For information about restrictions and use of Oracle Flash Accelerator F640 PCIe Card v2s on your server, see the most recent version of the server product notes.

Oracle Flash Accelerator F640 PCIe Card v2 Overview

These topics provide an overview of Oracle Flash Accelerator F640 PCIe Card v2 features and functions:

- "About Oracle Flash Accelerator F640 PCIe Card v2s" on page 12
- "Status Indicators" on page 13

About Oracle Flash Accelerator F640 PCIe Card v2s

Oracle Flash Accelerator F640 PCIe Card v2 is designed to deliver high-performance and reliable flash memory. This low-profile card interfaces with the server directly over Gen3 PCI Express (PCIe) and provides a high-bandwidth, low-latency, flash-based caching tier for various enterprise workloads. Oracle Flash Accelerator F640 Card integrates a high-performance Non-Volatile Memory Express (NVMe) controller interface. Oracle Flash Accelerator F640 PCIe Card v2 is designed with advanced enterprise multi-level cell TLC 3D NAND 64-tier technology for high-level performance and write durability.

Along with proactive health monitoring features, functions such as advanced error protection, overprovisioning, and wear leveling are provided to improve efficiency and increase data integrity. Battery-less power failure protection circuitry provides end-to-end data protection and 5-second power failure recovery. Oracle Flash Accelerator F640 PCIe Card v2 is a block storage device, with block sizing optimization capabilities. You can use the Oracle F640 Flash Card for either nonpersistent or persistent data.

The following illustration shows an Oracle Flash Accelerator F640 PCIe Card v2.

Related Information

-
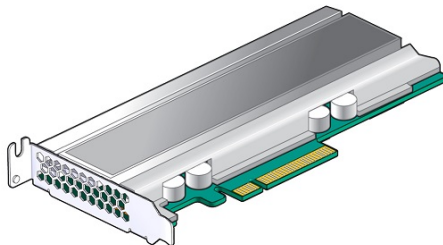
Status Indicators

Use Oracle Flash Accelerator F640 PCIe Card v2 status indicators to determine the status of each drive and perform service actions as required. Four status indicator LEDs are located on the drive bracket to indicate status and diagnose NVMe storage drive issues.

The following illustration shows status indicator LEDs for Oracle Flash Accelerator F640 PCIe Card v2.

Call Out	Status LED	Icon and Color	Description
1	ASIC 1	Green	Drive Activity indicator for controller ASIC 1
			■ OFF – Power is off, or normal operation.
			■ STEADY ON (does not blink) – Drive is healthy. Drive is engaged and is receiving full power. Normal operation.
			Oracle Flash Accelerator F640 PCIe Card v2 Activity LED status indicator LED 1 should be ON during idle.
			■ BLINK at 250 msec high, 250 msec low – IO activity.
			Note - Both flash memory controllers enumerate.
2	ASIC 2	Green	Drive Activity indicator for controller ASIC 2
			■ OFF – Power is off, or normal operation.
			■ STEADY ON (does not blink) – Drive is healthy. Drive is engaged and is receiving full power. Normal operation.
			Oracle Flash Accelerator F640 PCIe Card v2 Activity LED status indicator LED 2 should be ON during idle.

Call Out	Status LED	Icon and Color	Description
			■ BLINK at 250 msec high, 250 msec low – IO activity.
3	PCIe Link Status	Green Yellow	Green STEADY ON (does not blink) – Drive link is healthy. Normal operation. Green Drive IO (data input/output) activity ■ OFF – Normal operation. ■ BLINK at 250 msec high, 250 msec low – Drive IO activity. ■ STEADY ON – Idle IO, no activity, ON if idle. Yellow – 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.
4	Health	Green Yellow Red	Green – Drive health: ■ OFF – Power is off, or drive is unhealthy; Service Action Required. ■ STEADY ON (does not blink) – Drive is healthy. Drive is engaged and is receiving full power. Normal operation. Yellow – Drive Critical Warning: ■ OFF – Power is off, or drive is healthy. ■ STEADY ON (does not blink) – Drive critical warning. Red – Drive fail: ■ OFF – Power is off, or normal operation. ■ STEADY ON (does not blink) – Service Action Required. Drive is in disabled logical mode.

Related Information

■ "Service Overview" on page 39

Specifications

The following sections provide the specifications and capabilities of Oracle Flash Accelerator F640 PCIe Card v2:

■ "Product Specification" on page 15
■ "Characteristics" on page 16
■ "Usage Information" on page 17

Note - For server specifications, see the most recent version of the server product notes.

Product Specification

Oracle Flash Accelerator F640 PCIe Card v2 general specifications are listed in the following table.

Specification	Value
Device name	7361454_ICRPC5ED2ORA6.4T
Manufacturing name	SSDPEDME064T4S
Form factor	Add-in card (AIC) form factor
PCIe card	■ Low-profile, half-height, and half-length PCIe 3.1 board ■ PCI low-profile MD2 specification
PCIe interface	■ PCIe interface that complies with the PCI Express Base Specification 3.1 ■ PCIe Gen3 half-height, half-width, single-slot x8 connector
NAND	High-endurance Intel TLC 3D NAND flash memory 64-tier
Flash controller	Two Intel flash memory NVMe controller ASICs **Note -** Both flash memory controllers enumerate.
Flash controller firmware	Intel custom and proprietary PCIe to NAND flash controller
Product Compliance	■ NVM Express 1.2b ■ PCI Express Base Specification Rev 3.1 ■ PCI Express Card Electro-Mechanical (CEM) Specification Rev 3.0 ■ Enterprise SSD Form Factor Version 1.0a
Product ecological compliance	RoHS
Certifications and declarations	UL, CE, C-Tick, BSMI, KCC, Microsoft WHCK, VCCI

Related Information

Characteristics

Oracle Flash Accelerator F640 PCIe Card v2 has the following hardware and software characteristics.

Characteristic	Value
Minimum operating system versions	Refer to "Supported Hardware and Software" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes* for minimum operating system versions, hardware, firmware, and software compatibility.
Oracle X8 series servers	Minimum operating system versions: ■ Oracle Linux 7 Update 6 with the Unbreakable Enterprise Kernel Release 5 Update 2 (UEK5U2) or the Red Hat Compatible Kernel ■ Oracle Linux 6 Update 10 with the Unbreakable Enterprise Kernel Release 4 Update 7 (UEK4U7) or the Red Hat Compatible Kernel ■ Oracle VM 3.4.6 ■ Oracle Solaris 11.4 ■ Windows Server 2016 ■ Windows Server 2019 ■ VMware ESXi 6.7 Update 1
Oracle X7 series servers	Minimum operating system versions: ■ Oracle Linux 7.3[†] ■ Oracle Linux 6.9[‡] ■ Oracle VM 3.4.4 ■ Oracle Solaris 11.3 SRU 23, Oracle Solaris 11.4 ■ Windows Server 2016 ■ Windows Server 2012 R2 ■ VMware ESXi 6.5 Update 1
Life monitoring capability	Provides alerts for proactive replacement of the drive before the endurance is depleted. Provides endurance remaining in NVMe SMART logs.
High Endurance Technology (HET)	Includes HET NAND silicon enhancements. Includes SSD NAND management techniques to extend SSD write endurance up to 5 drive writes per day for five years.
End-to-end data-path protection	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. Device advanced power loss protection provides robust data integrity. During IOs, the SSD's integrated monitoring enables the integrity of already committed data on the media and commits acknowledged writes to the media.
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.

Characteristic	Value
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 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	Refer to "Server Management Tools" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes*. For more information about management utilities, refer to the server documentation.

[†]With Unbreakable Enterprise Kernel Release 4 Update 4 (UEK R4u4) or the Red Hat Compatible Kernel

[‡]With Unbreakable Enterprise Kernel Release 4 Update 4 (UEK R4u4) or the Red Hat Compatible Kernel

Related Information

- "Oracle Flash Accelerator F640 PCIe Card v2 Overview" on page 11
- "Oracle Flash Accelerator F640 PCIe Card v2 Product Notes" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes*
- "Servicing Oracle Flash Accelerator F640 PCIe Card v2" on page 39

Usage Information

Oracle Flash Accelerator F640 PCIe Card v2 operates and is stored in an environment defined by the parameters and specifications listed in the following table.

Specification	Value
Operating temperature	0 to 55°C with specified airflow
Non-operating temperature	Storage and transit environment: –55°C to 95°C (dry bulb)
Temperature monitoring	Temperature monitoring in-band and by way of SMBUS See "Troubleshooting Oracle F640 Flash Card Cooling" on page 55 for more information on thermal throttling.
Thermal sensors	- Thermal sensors on the storage drives monitor flash memory modules - Thermal sensor temperature cannot exceed 73°C - See illustration in "Troubleshooting Oracle F640 Flash Card Cooling" on page 55 for thermal sensor locations.
Dry bulb temperature	Maximum dry bulb temperature is derated by 3.3°C per 1000 m above 500 m
Altitude (Simulated)	- Operating: -1,000 to 10,000 ft

Specification	Value
	■ Non-operating: -1,000 to 40,000 ft
Relative humidity range	■ Operational environment: 8% to 80% noncondensing
	■ Storage and transit environment: 5% to 95% noncondensing
	■ Non-operating: -20°C to 75°C noncondensing
Airflow requirement	More than 400 LFM (linear feet/minute) at 55°C, with airflow towards IO bracket

Note - For specific site planning guidelines and best practices, refer to the server documentation and product notes for your server. Refer to the system site planning guide, if available.

Related Information

-
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Drive Capacity and Performance

Oracle Flash Accelerator F640 PCIe Card v2 capacity, performance, and reliability specifications are listed in the following table.

Specification	Value
Capacity	■ Usable capacity 6.4 TB
	■ Unformatted capacity (total user addressable sectors in LBA mode) 12,502,446,768
Performance[†‡]	Consistently high IOPS and throughput
	■ Sequential read speeds of up to 6.5 GB/s IOPS for 128KB Block Size, QD (Queue Depth) 256
	■ Sequential write speeds of up to 4.7 GB/s IOPS for 128KB Block Size, QD256
	■ Random read speeds of up to 1,339,000 IOPS for 4KB Block Size, QD256
	■ Random write speeds of up to 425,000 IOPS for 4KB Block Size, QD256
Latency	■ Sequential Latency (typical) Read/Write: 7/9 µseconds
	■ Random Latency (typical) Read/Write: 79/34 µseconds
	■ Power On to Ready Latency (typical): 2 seconds
	■ Less than 18 µsec for sequential access to the SSD.
Uncorrectable Bit Error Rate (UBER)	< 1 sector per 10^{17} bits read [*]
Data Retention	Three months power-off retention once storage drive reaches rated write endurance at 40°C. The time period for retaining data in the NAND at maximum rated endurance.

Specification	Value
Endurance Rating	■ Up to 34.7 PBW (petabytes written) [*] ■ 2.95 Drive Writes/day (JESD219 workload) [5]
Mean Time Between Failures (MTBF)	2 million hours Mean Time Between Failures is estimated based on Telcordia methodology and demonstrated through Reliability Demonstration Test (RDT).

[†]Performance values vary by capacity and form factor.

[‡]Performance specifications apply to both compressible and incompressible data.

[*]Uncorrectable bit error rate will not exceed one sector in the specified number of bits read. In the unlikely event of a non-recoverable read error, the storage drive will report it as a read failure to the host; the sector in error is considered corrupt and is not returned to the host.

[·]Endurance rating verification is defined to establish UBER <1E-16 at 60% upper confidence limit.

[5]The number of drive writes is such that the storage drive meets the requirements according to the JESD219 standard.

Related Information

- "Oracle Flash Accelerator F640 PCIe Card v2 Overview" on page 11
- "Servicing Oracle Flash Accelerator F640 PCIe Card v2" on page 39

Electrical Specifications

Oracle Flash Accelerator F640 PCIe Card v2 electrical specifications are listed in the following table.

Specification	Value
Power feeds	3.3V and 12V Supply Rail
Power consumption	■ Active Write - Average = 21.5W ■ Active Read - Average = 12.5W ■ Idle = 10W ■ Active/Idle: Up to 25W/4W (typical)
Enhanced power-loss data protection	For data protection, Oracle Flash Accelerator F640 PCIe Card v2 is designed with energy storage components to complete buffered writes to the persistent flash storage in case of a sudden power loss. These energy storage components are designed for the life of the drives and do not require periodic maintenance.

Oracle Flash Accelerator F640 PCIe Card v2 receives electrical power from the PCI Express +12 VDC and +3.3 VDC power rails as listed in the following table.

Specification	12 V Operating Characteristics	3.3 V Operating Characteristics	3.3 V aux Operating Characteristics
Operating voltage range	12 V (+10%/-20%)	3.3 V (+-10%)	3.3 V (+-10%)
Rise time (max/min)	50ms/1ms	50ms/1ms	50ms/1ms
Fall time (max/min)	5s/1ms	5s/1ms	5s/1ms
Noise level	1000 mV pp at 10 Hz – 100 KHz 100 mV pp at 100 KHz – 20 MHz	300 mV pp at 10 Hz – 100 KHz 50 mV pp at 100 KHz – 20 MHz	300 mV pp at 10Hz – 100 KHz 50 mV pp at 100KHz – 20 MHz
Minimum off time	3s	3s	3s
Inrush current (typical peak)	1.5 A	1.5 A	1.5 A
Maximum average current	2.1 A	3.0 A	1 mA

Related Information

- "Oracle Flash Accelerator F640 PCIe Card v2 Overview" on page 11
- "Service Overview" on page 39

Physical Dimensions

The following diagram shows Oracle Flash Accelerator F640 PCIe Card v2 physical dimensions.
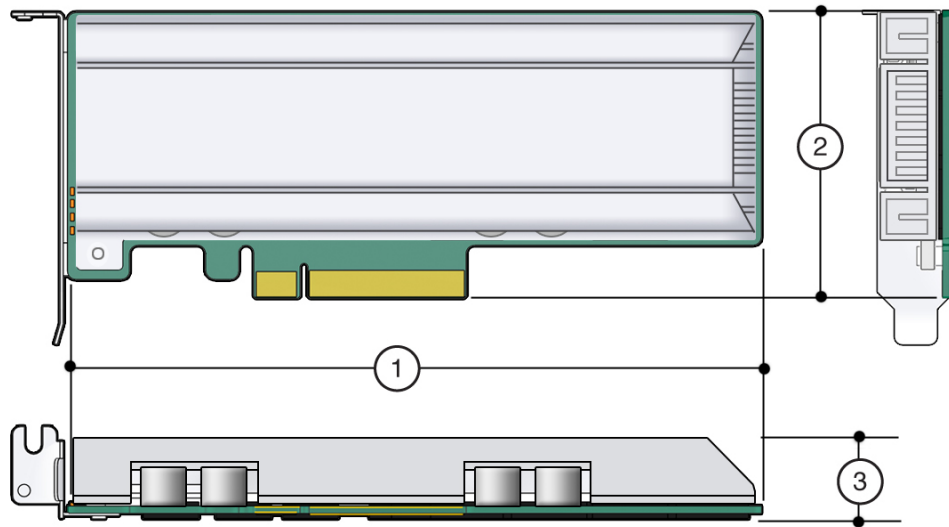
Height (3)	Width (2)	Depth (1)	Weight
0.67 in.	2.21 +/- 0.0098 in.	6.59 in.	4.4 oz
30 mm	68.9 mm	166.78 mm maximum	195 g maximum

Related Information

- "Oracle Flash Accelerator F640 PCIe Card v2 Overview" on page 11

Preparing Oracle F640 Flash Card for Installation

This section contains information about preparing Oracle Flash Accelerator F640 PCIe Card v2 for installation.

Description	Links
Prepare for installation.	"Prepare for Installation" on page 23
Gather the required tools.	"Required Tools" on page 24
Unpack the shipping kit.	"Ship Kit Contents" on page 24
Review safety information.	"Observing Safety Precautions" on page 25
Review electrostatic discharge (ESD) safety measures.	"ESD Safety Measures" on page 26
Review Oracle F640 Flash Card optimization guidelines.	"Oracle Flash Accelerator F640 PCIe Card v2 Optimization Guidelines" on page 27
Update your system to the latest software release.	"Update Your System to the Latest Software Release" on page 29

Note - To install the card in a specific server, refer to your server documentation. For information about restrictions and use of Oracle Flash Accelerator F640 PCIe Cards on your server, see the most recent version of the server product notes.

▼ Prepare for Installation

1. **Gather the required tools.**

   See "Required Tools" on page 24.

2. **Unpack the ship kit that includes the card.**

   a. **Unpack the card in a static-free environment.**

See "Ship Kit Contents" on page 24.

b. **Remove the card from its packaging and place the drive on an antistatic mat, using good antistatic grounding procedures.**

See "ESD Safety Measures" on page 26.

3. **Carefully inspect the card for shipment damage.**

If you detect any damage, contact OracleTechnical Support or your reseller support representative. See "Technical Support" on page 57.

Required Tools

You will need the following tools for most service operations:

- Antistatic wrist strap
- Antistatic mat
- No. 1 Phillips screwdriver

Related Information

- "ESD Safety Measures" on page 26

Ship Kit Contents

The Oracle Flash Accelerator F640 PCIe Card v2 ship kit contains the components shown in the following illustration.
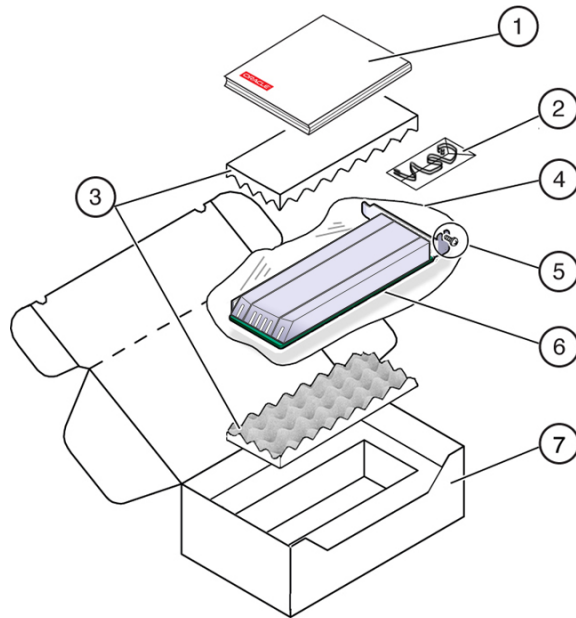
1. Documentation
2. Antistatic wrist strap (Note: Not included in some ship kits)
3. Foam
4. Antistatic bag
5. Bracket screw
6. Oracle Flash Accelerator F640 PCIe Card v2 with low profile PCIe mounting bracket
7. Packaging

Observing Safety Precautions

This section contains safety information about preventing equipment damage and personnel injury.

- "General Safety Information" on page 26
- "Safety Symbols" on page 26
- "ESD Safety Measures" on page 26
- "Perform ESD Prevention Measures" on page 27

General Safety Information

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all cautions and instructions marked on the equipment.
- Follow all cautions and instructions described in the documentation shipped with your system, and described in the server safety information.
- Follow the electrostatic discharge safety practices as described in this section.
- Handle the card by the edges.

Safety Symbols

Note the meanings of the following symbols that might appear in this document.

Caution - There is a risk of personal injury or equipment damage. To avoid personal injury and equipment damage, follow the instructions.

Caution - Hot surface. Avoid contact. Surfaces are hot and might cause personal injury if touched.

Caution - Hazardous voltages are present. To reduce the risk of electric shock and danger to personal health, follow the instructions.

ESD Safety Measures

Circuit boards and drives contain electronic components that are extremely sensitive to static electricity. Ordinary amounts of static electricity from clothing or the work environment can destroy the components located on these boards. Electrostatic discharge (ESD) sensitive devices, such as the drives, require special handling.

- Place ESD-sensitive components, such as printed circuit boards and cards on an antistatic mat (not provided).
- Wear an antistatic wrist strap when handling ESD-sensitive components.
- See "Perform ESD Prevention Measures" on page 27.

⚠ **Caution -** Possible component damage. Do not touch components along connector edges.

▼ Perform ESD Prevention Measures

1. **Prepare an antistatic surface to set parts on during the removal, installation, or replacement processes.**

   Place ESD-sensitive components such as the printed circuit boards on an antistatic mat. The following items can be used as an antistatic mat:

   - **Antistatic bag used to wrap a replacement part**

   - **ESD mat**

   - **A disposable ESD mat (shipped with some replacement parts or optional system components)**

2. **Attach an antistatic wrist strap (not provided).**

   When servicing or removing server components, attach an antistatic strap to your wrist and then to a metal area on the chassis.

   Related Information

   - "ESD Safety Measures" on page 26

Oracle Flash Accelerator F640 PCIe Card v2 Optimization Guidelines

To optimize preformance, observe the following guidelines when setting up Oracle Flash Accelerator F640 PCIe Cards in a server.

- Block size can be configured through a server operating system or file system and is set to a default size with Oracle databases.
- Oracle Flash Accelerator F640 PCIe Card v2 is designed to provide best performance for data transfers that are multiples of 4k size and using addresses that are 4k aligned. Partitions should be aligned to start on 4k boundaries.

- The ZFS file system might require manual alignment. Oracle Flash Accelerator F640 PCIe Card v2 has a maximum transfer size of 128k. IO requests for larger transfer sizes will be broken into transfer sizes of size 128k or smaller. For optimal performance, transfer sizes should be limited to 128k to avoid additional overhead associated with breaking into smaller transfer sizes.

- Oracle Flash Accelerator F640 PCIe Card v2 should be formatted using a label of type `EFI` (`format -e` command).

  Ensure that when the EFI label is created by ZFS, the default start sector is 256, which aligns S1 with 128k (if the block size is 512). The `vtoc` label default cylinder size is 50176 (224*224) blocks. If the block size is 512, the default Oracle Solaris operating system partition aligns with 512k. For example: *50176*512 = 49*512*1024.*

  Specify and ensure 4k alignment: The default start sector of 34 for `EFI` labels is not a 4k aligned value. Use the partition subcommand of the Oracle Solaris `format` command to change the start sector to 256, or any other 128k aligned value. Note that there are 512B per sector.

- The ZFS file system automatically aligns partitions to start on 8k boundaries when a full disk is allocated to ZFS (recommended). If you allocate individual `EFI` partitions to a ZFS pool, ensure that the partition is 4k-aligned as discussed above. For optimal performance of ZFS with Oracle Flash Accelerator F640 PCIe Card v2, refer to the ZFS documentation.

- For highest performance, ensure that the system meets the physical, environmental, and electrical specifications listed in "Specifications" on page 14.

Related Information

- "Preparing Oracle F640 Flash Card for Installation" on page 23
- Tuning ZFS When Using Flash Storage: `http://docs.oracle.com/cd/E26502_01/html/E29022/chapterzfs-flash.html`

Drive Volume Management

A volume manager can present multiple card 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 6.4 TB domains into a single 25.6 TB volume.

For more information about ASM, refer to *Oracle Database Administrator's Guide, Release 18c*.

▼ Update Your System to the Latest Software Release

It is highly recommended that you update your system to the latest software release before you use the system. Software releases often include bug fixes, and updating ensures that your server software is compatible with the latest server firmware and other component firmware and software.

Note - System firmware update releases include Oracle Flash Accelerator F640 PCIe Card v2 component firmware updates. When system firmware updates, as described in the server documentation, Oracle Flash Accelerator F640 PCIe Card v2 firmware automatically updates.

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1. **Check the Oracle Flash Accelerator F640 PCIe Card v2 Product Notes for the latest firmware requirements. The most up-to-date Product Notes document is available at: `https://www.oracle.com/goto/oracleflashf640/docs`**

2. **Download and install any firmware updates required to support the card, host bus adapter (HBA), drive backplane, system BIOS, or OBP/system (SPARC) firmware.**

   You can download the latest firmware and software updates from My Oracle Support at `https://support.oracle.com`.

   For information about downloading card firmware and software from My Oracle Support, refer to "Accessing Software Updates and Firmware Downloads" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes*.

   Refer also to the "Getting Server Firmware and Software Updates" in the server Installation Guide documentation.

   ### Related Information

   - "Download the Device Software Package" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes*
   - "Update the NVMe Storage Drive Firmware" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes*
   - "Verify Oracle Flash Accelerator F640 PCIe Card v2 Operation" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes*
   - "Technical Support" on page 57

Installing Oracle Flash Accelerator F640 PCIe Card v2

This section contains information about installing Oracle Flash Accelerator F640 PCIe Card v2 into a server PCIe slot.

Description	Links
Review installation tasks and performance tuning information before installing card.	"Installation Overview" on page 31
Install a new card into a server when the card is cold-plug inserted into a PCIe slot.	"Install a New Oracle F640 Flash Card (Server Power-Off)" on page 32
Install a new card into a server when the card is hot-plug inserted into a PCIe carrier.	"Install a New Oracle F640 Flash Card (Server Power-On)" on page 35

Installation Overview

Read this overview information section before installing the Oracle Flash Accelerator F640 PCIe Card v2 into a server.

For information on how to install your Oracle F640 Flash Card, refer to your server documentation. Your server chassis might contain a card carrier or other configuration. Refer to the server service manual for PCIe card installation instructions and additional information.

The bracket assembly should not be disassembled for any reason by the user.

Caution - Hazardous voltages are present. Refer to the server service manual for PCIe card installation instructions.

Oracle Flash Accelerator F640 PCIe Card v2 Installation Tasks

To install your Oracle Flash Accelerator F640 PCIe Card v2 into a server system, refer to the steps described in the following table.

Steps	Task	See
1.	Prepare the Oracle F640 Flash Card for installation. Carefully unpack the card. Inspect the card for damage. Follow ESD precautions.	"Preparing Oracle F640 Flash Card for Installation" on page 23
2.	Insert the Oracle F640 Flash Card in an available PCIe slot with server power in the off state. or Insert the Oracle F640 Flash Card in an available PCIe carrier with server power in the on state.	"Install a New Oracle F640 Flash Card (Server Power-Off)" on page 32 or "Install a New Oracle F640 Flash Card (Server Power-On)" on page 35

Related Information

- "Service Overview" on page 39
- "Install a New Oracle F640 Flash Card (Server Power-Off)" on page 32
- "Install a New Oracle F640 Flash Card (Server Power-On)" on page 35
- "Replace Oracle F640 Flash Card (Server Power-Off)" on page 44
- "Replace Oracle F640 Flash Card (Server Power-On)" on page 51

▼ Install a New Oracle F640 Flash Card (Server Power-Off)

To install a new Oracle Flash Accelerator F640 PCIe Card v2 into a supported server:

Note - Refer to the server service manual for PCIe card installation instructions.

1. **Prepare Oracle F640 Flash Card for installation.**
   See "Preparing Oracle F640 Flash Card for Installation" on page 23.

2. **Back up your data, as required, before changing your server configuration.**

3. **Identify a supported and available PCIe slot in the server.**

Refer to the server service manual for PCIe slot locations in the server.

Refer to "Supported Hardware and Software" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes*.

4. **Prepare the server for service.**

Refer to the server service manual for detailed instructions.

Caution - Hazardous voltages are present. To reduce the risk of electric shock and danger to personal health, follow the instructions.

Note - Your server chassis might require a PCIe carrier extension for each installed Oracle Flash Accelerator F640 PCIe Card v2 to facilitate airflow. Your server chassis might contain a card carrier or other configuration. Refer to the server service manual for PCIe card installation instructions.

a. **Take antistatic measures.**

See "ESD Safety Measures" on page 26.

b. **Remove the server from active operation.**

c. **Power down (turn off) the server.**

d. **Disconnect all power cords from the server power supplies.**

e. **Remove the cover from the chassis.**

5. **Record the serial number of Oracle F640 Flash Cards and the PCIe slot number where the cards will be installed.**

This server slot information can be used at a later time for identifying Oracle F640 Flash Cards from the console. Refer to the server service manual for identification information.

6. **Insert Oracle F640 Flash Card in the supported PCIe slot.**

a. **Remove the blank bracket panel on the server chassis that aligns with the empty PCIe slot. Save the bracket screw, if applicable.**

b. **Press down gently, but firmly, to properly seat the card in the slot.**

The following figure shows how to insert Oracle F640 Flash Card in a PCI Express slot.
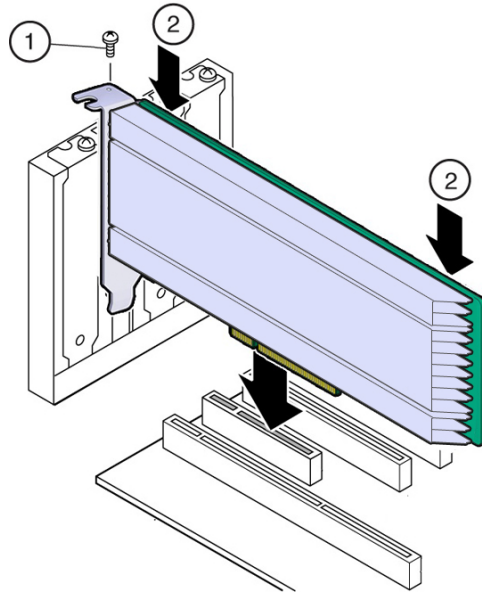
Note - Your server chassis might contain a card carrier or other configuration. Refer to the server service manual for PCIe card installation instructions.

7. Secure the card bracket to the server chassis.

Engage the server retention mechanism to secure the card to the server chassis.

Or, install the bracket screw, as required to secure the card to the server chassis.

8. Return the server to service.

Refer to the server service manual for detailed instructions.

a. Replace the cover, if applicable.

b. Reconnect the power cord and any network cables.

c. Power on the system.

The card hardware insertion is complete.

9. **Configure the server for the new Oracle F640 Flash Card.**

   Refer to the server administration guide or the operating system documentation for detailed instructions.

   a. **If applicable, perform any required commands for your system to install the device driver for the new Oracle F640 Flash Card.**

   b. **If applicable, perform any required commands for your system to recognize the new Oracle F640 Flash Card.**

   c. **Verify successful installation of Oracle F640 Flash Card through your server operating system.**

      When the installation is complete, the Oracle Flash Accelerator F640 PCIe Card v2 is visible to your server operating system.

   d. **Configure the system to maximize flash technology.**

   Related Information

   - "Oracle Flash Accelerator F640 PCIe Card v2 Optimization Guidelines" on page 27
   - "Oracle Flash Accelerator F640 PCIe Card v2 Overview" on page 11
   - "Installation Overview" on page 31
   - "Service Overview" on page 39
   - "Replace Oracle F640 Flash Card (Server Power-Off)" on page 44
   - "Replace Oracle F640 Flash Card (Server Power-On)" on page 51

▼ Install a New Oracle F640 Flash Card (Server Power-On)

To install a new Oracle Flash Accelerator F640 PCIe Card v2 in a supported powered-on server when the card is hot-plug inserted into an empty PCIe carrier:

Note - Refer to the server service manual for PCIe card installation instructions.

1. **Prepare the Oracle F640 Flash Card for installation.**
   See "Preparing Oracle F640 Flash Card for Installation" on page 23.

2. **Back up your data, as required, before changing your server configuration.**

3. **Identify a supported and available PCIe carrier in the server.**

Refer to the server service manual for PCIe carrier and slot locations in the server.

Refer to "Supported Hardware and Software" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes*.

4. **Prepare the server for service.**

Refer to the server service manual for detailed instructions.

a. **Remove the domain from active operation, as required.**

b. **Take antistatic measures.**

See "ESD Safety Measures" on page 26.

5. **Remove the carrier from the server slot.**

Note - Your server chassis might require a PCIe carrier extension for each installed Oracle Flash Accelerator F640 PCIe Card v2 to facilitate airflow. Your server chassis might contain a card carrier or other configuration. Refer to the server service manual for PCIe card installation instructions.

6. **Record the serial number of Oracle F640 Flash Card and the PCIe slot number where the card will be installed.**

This server slot information can be used at a later time for identifying Oracle F640 Flash Cards from the console. Refer to the server service manual for server slot information.

7. **Install Oracle F640 Flash Card in the carrier.**
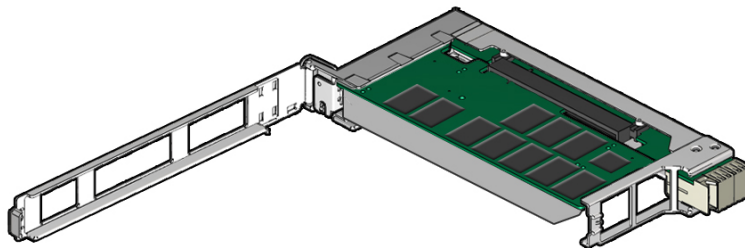
a. **Unlatch and swing open the arm of the PCIe card carrier, and insert the new Oracle F640 Flash Card until the bottom connector is firmly seated in the carrier's connector.**
The card is correctly seated only when the notch at the top of the card bracket fits around a guide post on the carrier.

Caution - Do not twist or turn the PCIe card as you insert it into the carrier. The card's connector must be fully seated in the carrier's slot before you attempt to close the top cover.

Note - If the PCIe card includes a mounting screw, do not use the mounting screw. The carrier does not accept mounting screws.

b. **Close the top of the carrier.**
The green latch should click into place. If the top is difficult to close, verify that the notch of the card bracket or filler panel fits around the guide post.

8. **Insert the carrier into the server chassis.**
Refer to the server service manual for detailed instructions.

9. **Return the server to service.**
Refer to the server service manual for detailed instructions.

10. **Configure the server for the new Oracle F640 Flash Card.**
Refer to the server documentation library for detailed instructions. Refer to the server administration guide or the operating system documentation detailed NVMe SSD configuration instructions.

a. **If applicable, perform any required commands for your system to install the device driver for the new Oracle F640 Flash Card.**

b. **If applicable, perform any required commands for your system to recognize the new Oracle F640 Flash Card.**

c. **Verify successful installation of the Oracle F640 Flash Card through the server operating system.**
When the installation is complete, the Oracle Flash Accelerator F640 PCIe Card v2 is visible to the server operating system.

d. **Configure the system to maximize flash technology.**

Related Information

- "Oracle Flash Accelerator F640 PCIe Card v2 Optimization Guidelines" on page 27
- "Oracle Flash Accelerator F640 PCIe Card v2 Overview" on page 11
- "Installation Overview" on page 31
- "Service Overview" on page 39

Servicing Oracle Flash Accelerator F640 PCIe Card v2

This section provides service information and procedures for Oracle Flash Accelerator F640 PCIe Card v2.

Description	Links
Review service task and troubleshooting information.	"Service Overview" on page 39
Review NVMe drive component serviceability information.	"Component Serviceability" on page 40
Remove and replace Oracle F640 Flash Cards.	"Replace Oracle F640 Flash Card (Server Power-Off)" on page 44
	"Replace Oracle F640 Flash Card (Server Power-On)" on page 51
Troubleshoot Oracle F640 Flash Card thermal issues.	"Troubleshooting Oracle F640 Flash Card Cooling" on page 55
Contact Technical Support.	"Technical Support" on page 57

Service Overview

For service, Oracle Flash Accelerator F640 PCIe Card v2 contains updatable flash ROM for storing the BIOS and firmware, as well as NVRAM for storing nonvolatile configuration data. Use Oracle Hardware Management Pack to monitor and service Oracle F640 Flash Cards. You can also use Oracle Hardware Management Pack for troubleshooting. See Server Management in "Characteristics" on page 16 and refer to "Server Management Tools" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes*.

In addition, you can monitor Oracle Flash Accelerator F640 PCIe Card v2 health and flash media drive life through card bracket status indicator LEDs. Oracle F640 Flash Card has four status indicator LEDs on the card bracket to indicate activity, drive health, and status. See "Status Indicators" on page 13.

Oracle Flash Accelerator F640 PCIe Card v2 requires no periodic maintenance. For data protection, Oracle F640 Flash Card is designed with energy storage components to complete buffered writes to the persistent flash storage in case of a sudden power loss. These energy storage components are designed for the life of Oracle F640 Flash Card and do not require periodic maintenance.

Note - Your server chassis might contain a card carrier or other configuration. Refer to the server service manual for PCIe card removal and replacement instructions. Refer to the server documentation for additional Oracle F640 Flash Card service and firmware download information.

Component Serviceability

The following service actions can be performed on an Oracle F640 Flash Card.

- Unmount an NVMe storage drive
- Remove an NVMe storage drive from the server
- Verify removal of an NVMe storage drive
- Install an NVMe storage drive in the server
- Power on an NVMe storage drive and attach a device driver

Caution - Hazardous voltages are present. Disconnect the server from the main power and from any networks before servicing the card to avoid electrical shock.

Refer to the server documentation for additional service information. Late-breaking information and known issues for this product are included in the "Oracle Flash Accelerator F640 PCIe Card v2 Product Notes" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes*.

Components are either hot serviceable or cold serviceable. Hot-service capability allows you to safely remove this component while the server is running. Cold-service capability requires a powered off state, therefore you need to remove power from the server.

Components are designated either CRU (customer-replaceable unit) or FRU (field-replaceable unit). CRU service capability allows trained technicians and authorized field service personnel to service this component. FRU service capability allows only authorized service personnel to service this component.

Oracle F640 Flash Card is a CRU.

The following table lists the serviceability of NVMe components and directs you to replacement instructions.

Component	Serviceability	Replacement Instructions
Oracle Flash Accelerator F640 PCIe Card v2	Cold for servers with motherboard PCIe connections or Hot for servers with PCIe carriers. CRU	"Installing Oracle Flash Accelerator F640 PCIe Card v2" on page 31 **Note -** Your server chassis might contain a card carrier or other configuration. Refer to the server service manual for PCIe card removal and replacement instructions. "Replace Oracle F640 Flash Card (Server Power-Off)" on page 44 "Replace Oracle F640 Flash Card (Server Power-On)" on page 51 For instructions on safe installation and removal of Oracle F640 Flash Cards, refer to the server service manual.

Related Information

- "Oracle Flash Accelerator F640 PCIe Card v2 Overview" on page 11
- "Technical Support" on page 57

▼ View Installed Oracle Flash Accelerator F640 PCIe Card v2 in BIOS Setup Utility

You can install an operating system on Oracle Flash Accelerator F640 PCIe Card v2 without any additional configuration. All installed Oracle Flash Accelerator F640 PCIe Card v2 controllers (two per card) are visible to an operating system installer program.

You can use the BIOS Setup Utility to see a list of installed Oracle Flash Accelerator F640 PCIe Cards.

Note - Oracle Flash Accelerator F640 PCIe Cards support two controllers. Two separate 3.2 TB devices appear in the BIOS Setup Utility, and in operating system installation programs.

1. **Configure the server for a one-time boot to BIOS.**

    a.   **Access the Oracle ILOM web interface.**

        For instructions, refer to the server installation guide or Oracle ILOM documentation.

    b.   **Navigate to Host Management → Host Control.**

    c.   **Select BIOS from the drop-down list, and select Save.**

        This causes the server to boot to BIOS on the next boot.

2.   **Access a system console.**

For more information, refer to *Oracle X7 Series Servers Administration Guide* at `https://www.oracle.com/goto/x86admindiag/docs`.

3.   **Power on or reset the server.**

For example, to reset the server:

- **From the local server,** press the On/Standby button on the front panel of the server for approximately 1 second to power off the server, and then press the On/Standby button again to power on the server.
- **From the Oracle ILOM web interface,** select Host Management → Power Control, and in the Select Action list box, select Power On. Click Save, and then click OK.
- **From the Oracle ILOM CLI,** type: `reset /System`.

The system boots to the BIOS Setup Utility.

Note - The steps and screens in this procedure are examples. What you actually see might differ depending on your system's equipment and configuration.

---

4.   **Navigate to the BIOS Setup Utility Advanced page.**

```
        Aptio Setup Utility - Copyright (C) 2017 American Megatrends, Inc.
         Main  Advanced  Intel  IO  Boot  Save & Exit

     ▶ iSCSI Configuration                       ▲  NVMe Device Options
     ▶ Intel(R) Virtual RAID on CPU                 Settings
     ▶ Intel RSTe SATA Controller
     ▶ AVAGO MegaRAID <Avago MegaRAID SAS 9361-16i>
       Configuration Utility - 03.23.06.00
     ▶ Oracle Dual Port 10Gb/25Gb SFP28 Cloud
       Ethernet Controller - 00:10:E0:72:EF:24
     ▶ Oracle Dual Port 10Gb/25Gb SFP28 Cloud
       Ethernet Controller - 00:10:E0:72:EF:25
     ▶ Driver Health
     ▶ Serial Port Console Redirection               ↔: Select Screen
     ▶ Network Stack Configuration                   ↑↓: Select Item
     ▶ NVMe Configuration                            Enter: Select
     ▶ Primary Video Selection                       +/-: Change Opt.
     ▶ Trusted Computing 2.0                         F1: General Help
     ▶ PCH SATA Configuration                        F2: Previous Values
     ▶ Processor Configuration                       F3: Optimized Defaults
     ▶ Memory Configuration                       ▼  F4: Save & Exit
                                                     ESC: Exit

            Version 2.19.1266. Copyright (C) 2017 American Megatrends, Inc.
                                                                        B4
```

5.   **Select NVMe Configuration.**

A list of installed Oracle Flash Accelerator F640 PCIe Cards appears.

```
          Aptio Setup Utility – Copyright (C) 2017 American Megatrends, Inc.
              Advanced

          NVMe controller and Drive information

          Bus:1B Dev:0 Func:0        INTEL SSDPECKE064T7S
          Nvme Size                  3200.6GB

          Bus:1C Dev:0 Func:0        INTEL SSDPECKE064T7S
          Nvme Size                  3200.6GB


                                                         ↔: Select Screen
                                                         ↑↓: Select Item
                                                         Enter: Select
                                                         +/-: Change Opt.
                                                         F1: General Help
                                                         F2: Previous Values
                                                         F3: Optimized Defaults
                                                         F4: Save & Exit
                                                         ESC: Exit

              Version 2.19.1266. Copyright (C) 2017 American Megatrends, Inc.
                                                                          B4
```

▼ Replace Oracle F640 Flash Card (Server Power-Off)

Replace an existing Oracle Flash Accelerator F640 PCIe Card v2 if the drive fails or the usable drive life has been exceeded.

⚠️ **Caution -** Possible data loss. Exceeding the maximum number of Oracle Flash Accelerator F640 PCIe Cards or placing cards in unsupported slots results in a host platform error report and shutdown.

Caution - Possible component damage. Circuit boards and drives contain electronic components that are extremely sensitive to static electricity. Ordinary amounts of static electricity from clothing or the work environment can destroy the components located on these boards. Do not touch the components along their connector edges. These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the components to fail. To avoid damage, ensure that you follow antistatic practices as described in "ESD Safety Measures" on page 26.

Caution - Hazardous voltages are present. To reduce the risk of electric shock and danger to personal health, follow the instructions.

Note - Your server chassis might require a PCIe carrier extension for each installed Oracle Flash Accelerator F640 PCIe Card v2 to facilitate airflow. Your server chassis might contain a card carrier or other configuration. Refer to the server service manual for PCIe card removal and replacement instructions.

The following steps provide an example procedure. Follow the server service manual for detailed instructions.

1. **Prepare the server operating system, as required, before you remove drives.**

   - Follow the server service manual instructions for orderly shutdown during NVMe storage drive insertion and removal service actions.
   - Unmount Oracle F640 Flash Cards. Refer to the server service manual for detailed instructions.

2. **Observe the status indicator LEDs on the back panel of the server to verify which Oracle F640 Flash Card in the server requires replacement.**

   - See "Status Indicators" on page 13.
     - ASIC 1 status – Solid Green (operational)
     - ASIC 2 status – Solid Green (operational)
     - PCIe Link Activity – Green (Blinks, IO activity); Amber (Solid, idle)
     - Drive Health – Green (operational); Yellow (Pre-fail); Red (non-operational)
   - Note where the PCIe cards are installed.

3. **Prepare the server for service.**

   Refer to the server service manual for detailed instructions.

⚡ **Caution -** Hazardous voltages are present. Disconnect the server from the main power and from any networks before installing the card to avoid electrical shock.

   a. **Remove the server from active operation.**

⚠ **Caution -** Possible data loss. Exceeding the maximum number of Oracle Flash Accelerator F640 PCIe Cards or placing cards in unsupported slots results in a host platform error report and shutdown.

   b. **Power down (turn off) the server.**

   c. **Take antistatic measures.**

    See "ESD Safety Measures" on page 26.

   d. **Disconnect all power cords from the server power supplies.**

   e. **Remove the cover from the chassis.**

    Your server chassis might use another configuration.

4. **Identify the physical location of Oracle F640 Flash Cards that you want to remove.**

Your server chassis might require a PCIe carrier extension for each installed Oracle Flash Accelerator F640 PCIe Card v2 to facilitate airflow. Refer to the server service manual for instructions.

Refer to "Supported Hardware and Software" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes*.
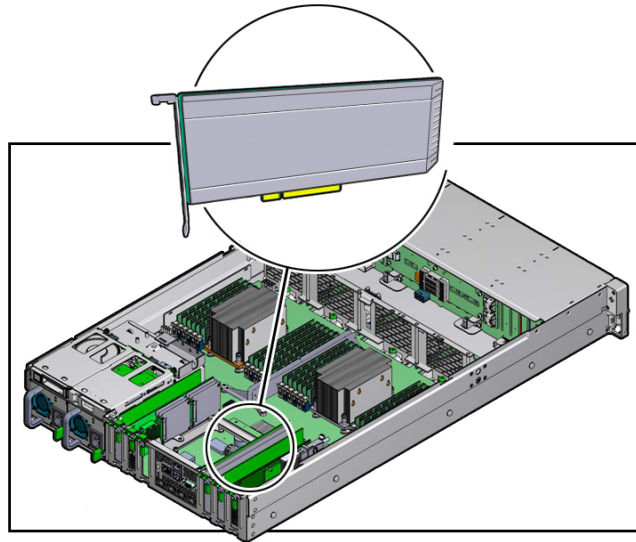
5. **Remove the bracket from the server chassis [1].**

    Remove the bracket screw.

6. **Remove the card from the server chassis [2].**

Carefully lift the card out of the PCIe slot to remove the card.
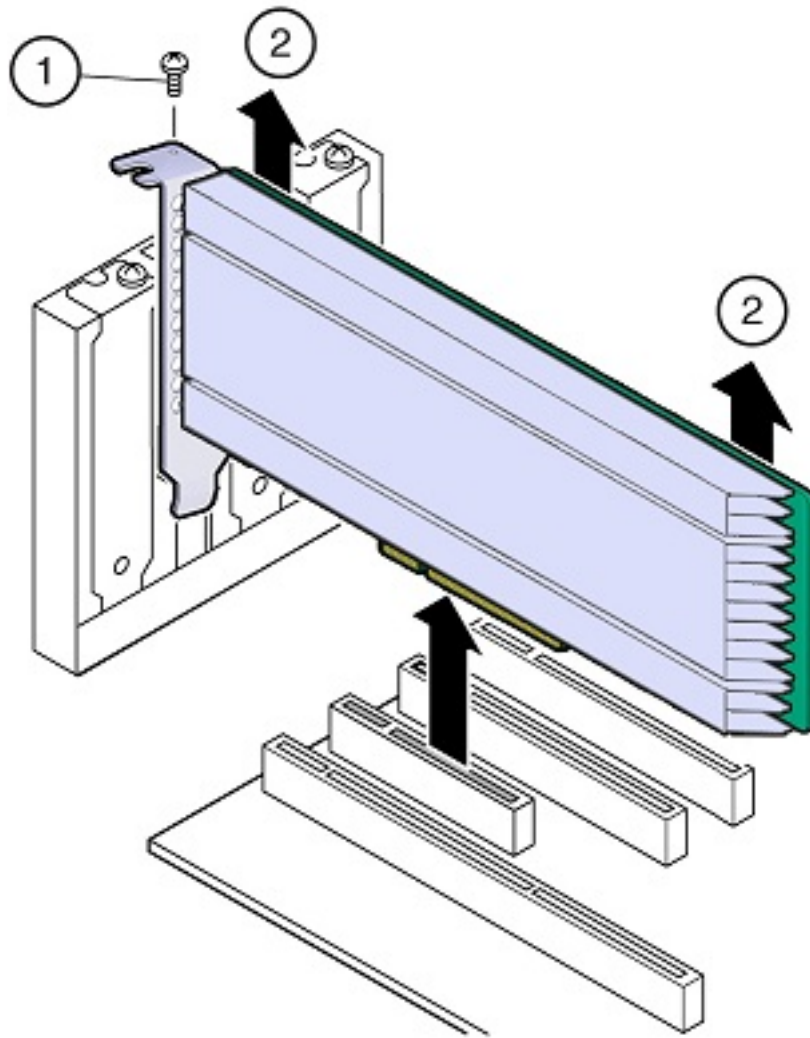
⚠ **Caution -** Hot surface during operation and after. Avoid contact. Surfaces are hot and might cause personal injury if touched.

Note - When you remove a PCIe card, you should replace it with another PCIe card or a PCIe filler panel. Installing PCIe filler panels in vacant PCIe slots helps reduce the level of electromagnetic interference (EMI) emitted by the server.

---

7. **Place the PCIe card on an antistatic mat.**

8. **Locate the proper PCIe slot for the card you are replacing.**

   If necessary, remove the PCIe filler panel from the slot.

9. **Insert the replacement card in the supported PCIe slot.**

   Your server chassis might require a PCIe carrier extension for each installed Oracle Flash Accelerator F640 PCIe Card v2 to facilitate airflow.
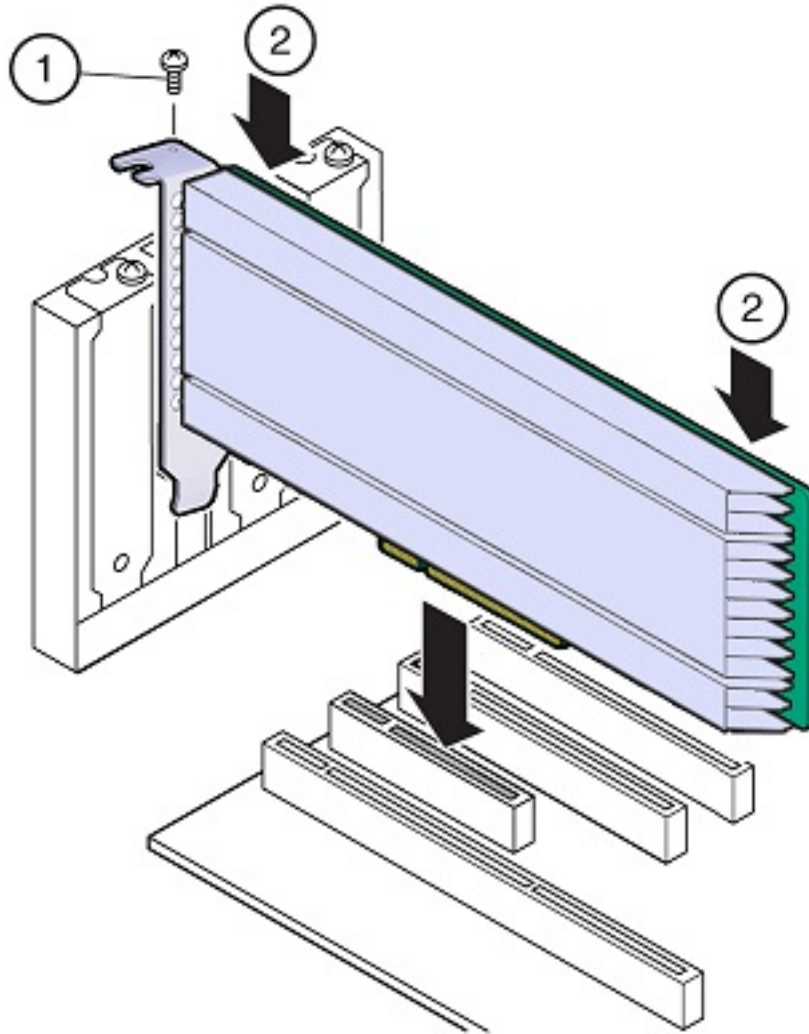
   Your server chassis might contain a card riser or other configuration. Refer to the server service manual for card installation instructions.

   a. **Remove the blank bracket panel on the server chassis that aligns with the empty PCIe slot [1].**

      Save the bracket screw, if applicable.

   b. **Press down gently, but firmly, to properly seat the card in the slot [2].**

   The following figure shows how to insert the card in a PCIe slot.

Your server chassis might contain a card riser or other configuration. Refer to the server service manual for card installation instructions.

10. **Secure the card bracket to the server chassis.**

Install the bracket screw, as required to secure the card to the server chassis.

Or, engage the server retention mechanism to secure the card to the server chassis.

11.   Return the server to service.

Refer to the server service manual for detailed instructions.

a.   Replace the cover.

Your server chassis might use another configuration.

b.   Reconnect the power cord and any network cables.

c.   Power on the system.

The card hardware insertion is complete.

12.   Configure Oracle F640 Flash Card and verify drive availability.

- Follow the server service manual instructions for Oracle F640 Flash Card NVMe storage drive configuration and identification.
- Use appropriate software commands to return the system to an operational state:
  - Power on Oracle F640 Flash Card, as required.
  - Attach a device driver, as required.
  - Re-activate mirror if manual intervention is required.
  - Re-sync mirror if manual intervention is required.

13.   Verify that the Fail LED is not lit and that the green Health LED is lit on the card that you installed.

See "Status Indicators" on page 13.

▼   Replace Oracle F640 Flash Card (Server Power-On)

Replace an existing Oracle Flash Accelerator F640 PCIe Card v2 if the drive fails or the usable drive life has been exceeded.

⚠ **Caution -** Possible data loss. Exceeding the maximum number of Oracle 6.4TB NVMe PCIe Flash Cards or placing cards in unsupported slots results in a host platform error report and shutdown.

Caution - Possible component damage. Circuit boards and drives contain electronic components that are extremely sensitive to static electricity. Ordinary amounts of static electricity from clothing or the work environment can destroy the components located on these boards. Do not touch the components along their connector edges. These procedures require that you handle components that are sensitive to electrostatic discharge. This sensitivity can cause the components to fail. To avoid damage, ensure that you follow antistatic practices as described in "ESD Safety Measures" on page 26.

Caution - Hazardous voltages are present. To reduce the risk of electric shock and danger to personal health, follow the instructions.

Note - Your server chassis might require a PCIe carrier extension for each installed Oracle Flash Accelerator F640 PCIe Card v2 to facilitate airflow. Your server chassis might contain a card carrier or other configuration. Refer to the server service manual for PCIe card removal and replacement instructions.

The following steps provide an example procedure. Follow the server service manual detailed instructions.

1. **Take antistatic measures.**

   See "ESD Safety Measures" on page 26.

2. **Prepare the server operating system, as required, before you remove drives.**

   Some Oracle F640 Flash Cards are hot-service components that can be replaced at any time if the card is not currently in use. Follow the server service manual instructions for orderly shutdown during NVMe storage drive insertion and removal service actions.

   Unmount Oracle F640 Flash Cards. Refer to the server service manual for instructions.

3. **Identify the physical location of the carrier and Oracle F640 Flash Card that you want to remove.**

   Your server chassis might contain a card riser or other configuration. Refer to the server service manual for instructions.

   Refer to "Supported Hardware and Software" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes* at `https://www.oracle.com/goto/oracleflashf640/docs`.

4. **Observe the status indicator LEDs on the server to verify which Oracle F640 Flash Card in the server requires replacement.**

- See "Status Indicators" on page 13.
  - ASIC 1 status- Solid Green (operational)
  - ASIC 2 status- Solid Green (operational)
  - PCIe Link Activity- Green (Blinks, IO activity); Amber (Solid, idle)
  - Drive Health- Green (operational); Yellow (Pre-fail); Red (non-operational)
- If necessary, note where the PCIe cards are installed.

5. **Remove the carrier from the server slot.**

6. **Carefully remove Oracle F640 Flash Card from the carrier.**
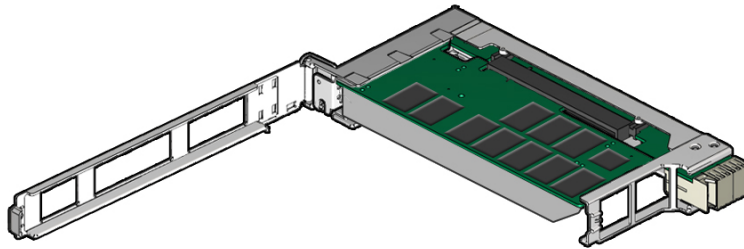
a. **Press the green tab to unlock the carrier latch and open the top of the PCIe carrier.**

b. **Slide the card from the slot.**

⚠ **Caution -** Avoid twisting, tilting, or pulling unevenly on the PCIe card, which could damage the carrier slot or components on the PCIe carrier circuit board.

7. **Place the card on an antistatic mat.**

   See "ESD Safety Measures" on page 26.

8. **Locate the PCIe slot in the carrier for the card you are replacing.**

   If necessary, remove the PCIe filler panel from the slot.

9. **Insert the replacement card in the carrier, in the supported PCIe slot.**

    a. Remove the blank bracket panel on the carrier that aligns with the empty PCIe slot (optional).

    Save the bracket screw, if applicable.

    b. Press down gently, but firmly, to properly seat the card in the slot.

10. Secure the card bracket to the carrier.

Note - If the PCIe card includes a mounting screw, do not use the mounting screw. The carrier does not accept mounting screws.

Engage the server retention mechanism to secure the card to the carrier.

11. Insert the carrier into the server chassis, in the supported PCIe slot.

12. For hot-plug service actions, configure Oracle F640 Flash Card and verify drive availability.

- Follow the server service manual instructions for Oracle F640 Flash Card NVMe storage drive configuration and identification.
- Use appropriate software commands to return the system to an operational state:
  - Power on Oracle F640 Flash Card, as required.
  - Attach a device driver, as required.
  - Re-activate mirror if manual intervention is required.
  - Re-sync mirror if manual intervention is required.

13. At a terminal, use the `hotplug` command to ensure that the card is connected.

For example:

```
# hotplug list /SYS/CMIOU0/PCIE1
        [/SYS/CMIOU0/PCIE1]  ENABLED
        network@0  <pci.0,0> ONLINE
        network@0,1  <pci.0,1> ONLINE
        network@0,2  <pci.0,2> ONLINE
        network@0,3  <pci.0,3> ONLINE
```

14. Verify that the Fail LED is not lit and that the green Health LED is lit on the card that you installed.

See "Status Indicators" on page 13.

Related Information

-

Troubleshooting Oracle F640 Flash Card Cooling

Maintaining the proper internal operating temperature of the server is crucial to the health of the server. To prevent server shutdown and damage to components, address overtemperature and hardware-related issues as soon as they occur.

Use the status indicator LEDs to determine the status of Oracle Flash Accelerator F640 PCIe Card v2. The LEDs provide key status information to diagnose Oracle F640 Flash Card issues. See "Status Indicators" on page 13.

Oracle F640 Flash Card is designed to provide continuous full bandwidth performance with temperatures up to 73°C. Qualified host platforms with required software updates operate with sufficient margin to the maximum temperature under worst case environments. Should the system exceed the maximum operating temperature, or a system fault occur that causes internal temperatures of the flash memory modules to rise above this limit, Oracle F640 Flash Card responds as follows:

- 73°C – Drive write throttling is engaged to reduce Oracle F640 Flash Card power.
    - Oracle F640 Flash Card amber status indicator LED is lit, Service Action Required.
    - Temperature warning is displayed in utility output.
- 78°C – Additional drive write throttling is engaged.
    - Oracle F640 Flash Card amber status indicator LED is lit, Service Action Required.
   - Critical temperature status is displayed in utility output.

⚠ **Caution -** Sustained critical temperatures might cause data loss.

Oracle Flash Accelerator F640 PCIe Cards have an internal temperature sensor with an accuracy of +/-2°C over a range of -10°C to +85°C which can be monitored using the NVMe Health Log. For more information on sensor reading, refer to the SMART attributes. In addition, Oracle F640 Flash Cards provide out-of-band access to temperature by means of an SMBUS. The sensor has an accuracy of +/-3°C over a range of -20°C to 125°C. SMBUS temperature sensor is not reported in NVMe Health Log. Oracle F640 Flash Card thermal parameters are:

- Tstart – Throttling starts

- Tmax – Maximum throttling is applied
- Pmaxdrop – Maximum drop allowed determined by the internal setting
- Thysteresis – 2°C set during the cooling phase to prevent rapid oscillations between throttle states. The temperature must reach the hysteresis level to return the power ceiling back to previous levels.

The following image shows Oracle F640 Flash Card temperature sensor location.
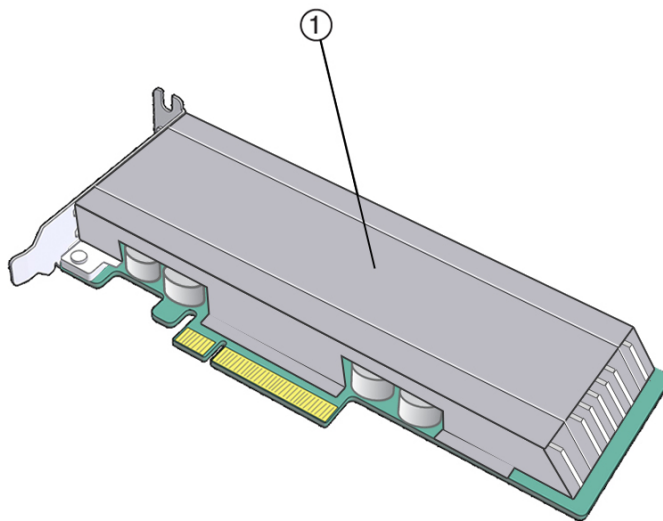
(1): Oracle F640 Flash Card temperature sensor location

Refer to the server documentation for additional service information.

Related Information

- "Status Indicators" on page 13
- "Product Overview" on page 11
- "Technical Support" on page 57

Technical Support

For assistance installing, configuring, or running Oracle Flash Accelerator F640 PCIe Card v2, contact Technical Support.

- Go to https://www.oracle.com/support/. Please have your server Customer Support ID (CSI) ready. Sign in to My Oracle Support to open a service request. You must have purchased support to access My Oracle Support.
- You can also call Oracle support, using the appropriate number from Oracle Global Customer Support Contacts Directory.

Related Information

- "Supported Hardware and Software" in *Oracle Flash Accelerator F640 PCIe Card v2 and Oracle 6.4 TB NVMe SSD v2 Product Notes*.

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