Non-RAID disks

A non-RAID disk is a single disk to the host, and not a RAID volume. The only supported cache policy for non-RAID disks is Write-Through.

Physical disk power management

Physical disk power management is a power-saving feature of PERC 11 series cards. The feature allows disks to be spun down based on disk configuration and I/O activity. The feature is supported on all rotating SAS and SATA disks, and includes unconfigured and hot-spare disks. The physical disk power management feature is disabled by default. You can enable the feature in the Dell Open Manage Storage Management application or in the Human Interface Infrastructure (HII) configuration utility. For more information on HII configuration and physical disk power management, see Enabling physical disk power management. For more information on using the Dell Open Manage Storage Management application, see the Dell OpenManage documentation at www.dell.com/openmanagemanuals.

Profile Management

PERC 11 supports the PD240 and PD64 profile. It defines controller queue depth and the maximum number of physical and virtual disks.

Table 3. Supported profile on PERC 11

Feature	PD240	PD64
Controller	PERC H755 front SAS, PERC H755 MX adapter, and PERC H750 adapter SAS	PERC H355 front SAS, PERC H355 adapter SAS, and PERC H350 adapter SAS
Maximum virtual disk supported	240	32
Controller queue depth	5120	1536

Secure firmware update

This feature provides a cryptographic method of updating the firmware using an RSA encryption-decryption algorithm.

Only Dell-certified firmware is supported on your PERC controller.

Snapdump

The Snapdump feature provides the Dell support team with the debug information which can help to find the cause of firmware failure. In the instance of firmware failures, the firmware collects the logs and information at the time of failure, which are stored in a compressed file called a snapdump.

Snapdumps are also generated manually to provide additional debug information. When a snapdump is generated, it is stored in the controller's cache memory. This means in the event of a power loss the controller will offload the snapdump as part of its cache preservation mechanism. Snapdumps are preserved by default through four reboots before its deleted.

To generate a snapdump, change the snapdump, delete a snapdump, and to download a stored snapdump settings, see *Dell EMC PowerEdge RAID Controller CLI Reference Guide* at www.dell.com/storagecontrollermanuals.

Virtual disk features

This section lists the following virtual disk features supported on PERC 11 cards in detail:

- Virtual disk read cache policies
- Virtual disk write cache policies
- Virtual disk migration
- Virtual disk initialization

- Reconfiguration of virtual disk
- Background operations

Virtual disk write cache policy

The write cache policy of a virtual disk determines how the controller handles writes to the virtual disk.

Table 4. Write cache policies

Feature	Description
Write-back	The controller sends a data transfer completion signal to the host when the controller cache has received all the data in a transaction. The controller then writes the cached data to the storage device in the background. NOTE: The default cache setting for virtual disks is Write-back caching. Write-back caching is also supported for single drive RAID 0 virtual disks.
Write-through	The controller sends a data transfer completion signal to the host system when the disk subsystem has received all the data in a transaction. NOTE: Certain data patterns and configurations perform better with a write-through cache policy.

NOTE: All RAID volumes are presented as write-through to the operating system (Windows and Linux) independent of the actual write cache policy of the virtual disk. PERC cards manage the data in cache independently of the operating system or any applications.

NOTE: Use the Dell OpenManage storage management application or the HII Configuration Utility to view and manage virtual disk cache settings.

Conditions under which write-back is employed

Write-back caching is used under all conditions in which the battery is present and in good condition.

Conditions under which forced write-back with no battery is employed

CAUTION: **It is recommended that you use a power backup system when forcing write-back to ensure there is no loss of data if the system suddenly loses power.**

Write-back mode is available when you select force write-back with no battery. When forced write-back mode is selected, the virtual disk is in write-back mode even if the battery is not present.

Virtual disk read cache policy

The read policy of a virtual disk determines how the controller handles reads to that virtual disk.

Table 5. Read policies

Feature	Description
Read ahead	Allows the controller to read sequentially ahead of requested data and to store the additional data in cache memory, anticipating that the data is required soon. This speeds up reads for sequential data, but there is slight improvement when accessing random data.
No read ahead	Disables the read ahead capability.

NOTE: Adaptive read ahead is no longer supported. Selecting adaptive read ahead is equivalent to selecting the read ahead option.

Virtual disk migration

The PERC 11 series supports migration of virtual disks from one controller to another without taking the target controller offline. The controller can import RAID virtual disks in optimal, degraded, or partially degraded states. You cannot import a virtual disk that is offline. When a controller detects a configured physical disk, it marks the physical disk as foreign, and generates an alert indicating that a foreign disk was detected.

Disk migration pointers:

- Supports migration of virtual disks from H740P, H745, H745P MX, and H840 to the PERC 11 series except for H345.
- Supports migration of volumes created within the PERC 11 series.
- Does not support migration from the PERC 11 series to PERC H345, H740P, H745, H745P MX, and H840.
- Does not support migration from PERC H330, H730, and H830 to the PERC 11 series.

NOTE: The source controller must be offline prior to performing the disk migration.

NOTE: Importing non-RAID drives and uneven span RAID 10 virtual disks from PERC 9 to PERC 11 is not supported.

NOTE: Disks cannot be migrated to older generations of PERC cards.

NOTE: Importing secured virtual disks is supported as long as the appropriate local key management (LKM) is supplied or configured.

NOTE: Virtual disk migration from PERC H755 adapter, PERC H755 front SAS, PERC H755N front NVMe, PERC H750 adapter SAS, PERC H755 MX adapter to PERC H350 adapter SAS, PERC H355 front SAS, and PERC H355 adapter SAS is not supported.

CAUTION: **Do not attempt disk migration during RLM or online capacity expansion (OCE), this causes loss of the virtual disk.**

Virtual disk initialization

PERC 11 series controllers support two types of virtual disk initialization:

- Full initialization
- Fast initialization

CAUTION: **Initializing virtual disks erases files and file systems while keeping the virtual disk configuration intact.**

Full initialization

Performing a full initialization on a virtual disk overwrites all blocks and destroys any data that previously existed on the virtual disk. Full initialization of a virtual disk eliminates the need for the virtual disk to undergo a Background Initialization (BGI). Full initialization can be performed after the virtual disk is created.

You can start a full initialization on a virtual disk by using the Slow Initialize option in the Dell OpenManage storage management application. For more information on using the HII Configuration Utility to perform a full initialization, see Configure virtual disk parameters.

NOTE: If the system reboots during a full initialization, the operation aborts and a BGI begins on the virtual disk.

Fast initialization

A fast initialization on a virtual disk overwrites the first and last 8 MB of the virtual disk, clearing any boot records or partition information. The operation takes only 2–3 seconds to complete, but it is followed by BGI, which takes a longer time to complete. To perform a fast initialization using the HII Configuration Utility, see Configure virtual disk parameters.

NOTE: During full or fast initialization, the host cannot access the virtual disk. As a result, if the host attempts to access the virtual disk while it is initializing, all I/O sent by the host will fail.

NOTE: When using iDRAC to create a virtual disk, the drive undergoes fast initialization. During this process all I/O requests to the drive will respond with a sense key of **"Not Ready"** and the I/O operation will fail. If the operating system attempts to read from the drive as soon as it discovers the drive, and while the fast initialization is still in process, then the I/O operation fails and the operating system reports an I/O error.

Reconfiguration of virtual disks

An online virtual disk can be reconfigured in ways that expands its capacity and changes its RAID level.

NOTE: Spanned virtual disks such as RAID 50 and 60 cannot be reconfigured.

NOTE: Reconfiguring virtual disks typically impacts disk performance until the reconfiguration operation is complete.

Online Capacity Expansion (OCE) can be done in two ways:

1. If there is a single virtual disk in a disk group and free space is available, the capacity of a virtual disk can be expanded within that free space. If multiple virtual disks exist within a common disk group, the capacities of those virtual disks cannot be expanded.
   NOTE: Online capacity expansion is allowed on a disk group with a single virtual disk that begins at the start of the physical disk. It is not allowed when there is a free space at the beginning of a disk.
2. Free space is also available when the physical disks of a disk group are replaced by larger disks using the replace member feature. The capacity of a virtual disk can also be expanded by performing an OCE operation to add more physical disks.

RAID level migration (RLM) refers to changing a virtual disk's RAID level. Both RLM and OCE can be done simultaneously so that a virtual disk can simultaneously have its RAID level that is changed and its capacity increased. When an RLM or an OCE operation is complete, a reboot is not required.

CAUTION: **Do not attempt disk migration during RLM or OCE operations. This causes loss of the virtual disk.**

NOTE: If an RLM or an OCE operation is in progress, then an automatic drive rebuild or copyback operation will not start until the operation is complete.

NOTE: If the controller already contains the maximum number of virtual disks, you cannot perform a RAID level migration or capacity expansion on any virtual disk.

NOTE: The controller changes the write cache policy of all virtual disks to write-through until the RLM or OCE operation is complete.

See the following table for a list of RLM or OCE options: The source RAID level column indicates the virtual disk RAID level before the RLM or OCE operation and the target RAID level column indicates the RAID level after the RLM or OCE operation.

Table 6. RAID level migration

Source RAID Level	Target RAID Level	Number of Physical Disks (Beginning)	Number of Physical Disks (End)	Capacity Expansion Possible	Description
RAID 0	RAID 0	1 or more	2 or more	Yes	Increases capacity by adding disks.
RAID 0	RAID 1	1	2	Yes	Converts a non-redundant virtual disk into a mirrored virtual disk by adding one disk.
RAID 0	RAID 5	1 or more	3 or more	Yes	Adds distributed parity redundancy; at least one disk needs to be added.
RAID 0	RAID 6	1 or more	4 or more	Yes	Adds dual distributed parity redundancy; at least two disks need to be added.
RAID 1	RAID 0	2	2 or more	Yes	Removes redundancy while increasing capacity.
RAID 1	RAID 5	2	3 or more	Yes	Maintains redundancy while adding capacity.
RAID 1	RAID 6	2	4 or more	Yes	Adds dual distributed parity redundancy and adds capacity.
RAID 5	RAID 0	3 or more	2 or more	Yes	Converts to a non-redundant virtual disk and reclaims disk space that is used for distributed parity data; one disk can be removed.
RAID 5	RAID 5	3 or more	4 or more	Yes	Increases capacity by adding disks.
RAID 5	RAID 6	3 or more	4 or more	Yes	Adds dual distributed parity redundancy; at least one disk needs to be added.
RAID 6	RAID 0	4 or more	2 or more	Yes	Converts to a non-redundant virtual disk and reclaims disk space that is used for distributed parity data; two disks can be removed.
RAID 6	RAID 5	4 or more	3 or more	Yes	Removes one set of parity data and reclaims disk space used for it; one disk can be removed.
RAID 6	RAID 6	4 or more	5 or more	Yes	Increases capacity by adding disks.
RAID 10	RAID 10	4 or more	6 or more	Yes	Increases capacity by adding disks; an even number of disks need to be added.

NOTE: You cannot perform a RAID level migration and expansion on RAID levels 50 and 60.

Background operations

Background initialization

Background initialization (BGI) is an automated process that writes parity or mirror data on newly created virtual disks. BGI does not run on RAID 0 virtual disks. You can control the BGI rate in the Dell OpenManage storage management application. Any change to the BGI rate does not take effect until the next BGI is executed.

NOTE:

- You cannot disable BGI permanently. If you cancel BGI, it automatically restarts within five minutes.
- Unlike full or fast initialization of virtual disks, background initialization does not clear data from the physical disks.
- Consistency Check (CC) and BGI typically cause some loss in performance until the operation completes.
- PERC H355 adapter SAS, PERC H355 front SAS, and PERC H350 adapter SAS background operations will not run until the operating system boots.

Consistency check and BGI perform similar functions in that they both correct parity errors. However, CC reports data inconsistencies through an event notification, while BGI does not. You can start CC manually, but not BGI.

Consistency checks

Consistency Check (CC) is a background operation that verifies and corrects the mirror or parity data for fault tolerant virtual disks. It is recommended that you periodically run a consistency check on virtual disks.

You can manually start a CC using the HII Configuration Utility or the Dell OpenManage storage management application. You can schedule a CC to run on virtual disks using the Dell OpenManage storage management application. To start a CC using the HII Configuration Utility, see Perform consistency check.

NOTE: CC or BGI typically causes some loss in performance until the operation completes.

CC and BGI both correct parity errors. However, CC reports data inconsistencies through an event notification, while BGI does not. You can start CC manually, but not BGI.

Hard drive features

This section lists the following hard drive features supported on PERC 11 cards in detail:

- Self-Encrypting Disks (SED)
- Instant Secure Erase (ISE)
- 4 KB sector disk drives

Self-Encrypting Disks

The PERC 11 series of cards support self-encrypting disks (SED) for protection of data against loss or theft of SEDs. Protection is achieved by the use of encryption technology on the drives. There is one security key per controller. You can manage the security key using local key management (LKM) or OpenManage Secure Enterprise Key Manager also referred as Secure Enterprise Key Manager (SEKM). The security key is used by the controller to lock and unlock access to encryption-capable physical disks. In order to take advantage of this feature, you must:

- Have SEDs in your system.
- Create a security key.

SEDs that are secured by a non-PERC entity cannot be used by PERC. Ensure that the SED is re-provisioned in an applicable manner by that non-PERC entity before connecting to PERC.

For more information, see Security key and RAID management section.

NOTE: You cannot enable security on non-optimal virtual disks.

NOTE: PERC 11 supports Trusted Computing Group Enterprise (TCG) Security Subsystem Classes (SSC) SAS or SATA SED drives and TCG Opal SSC NVMe drives.

Instant secure erase

Instant Secure Erase (ISE) drives use the same encryption technology as SED drives but do not allow the encryption key to be secured. The encryption technology allows the drive to be re-purposed and securely erased using the cryptographic erase function.

NOTE: ISE drives do not provide protection against theft.

4 KB sector disk drives

PERC 11 controllers support 4 KB sector disk drives, which enables you to efficiently use the storage space.

Before installing Windows on 4 KB sector disk drives, see Windows operating system installation errors.

NOTE: Mixing 512-byte native and 512-byte emulated drives in a virtual disk is allowed, but mixing 512-byte and 4 KB native drives in a virtual disk is not allowed.

NOTE: 4 K is only supported in UEFI mode and not legacy BIOS.

NOTE: 4 K devices do not appear under the select boot device option. For more information, see Enable boot support.

Fault tolerance

The PERC 11 series supports the following:

- Self Monitoring and Reporting Technology (SMART)
- Patrol read
- Physical disk failure detection
- Controller cache
- Battery Transparent Learn Cycle

The next sections describe some methods to achieve fault tolerance.

The SMART feature

The SMART feature monitors certain physical aspects of all motors, heads, and physical disk electronics to help detect predictable physical disk failures. Data on SMART compliant physical disks can be monitored to identify changes in values and determine whether the values are within threshold limits. Many mechanical and electrical failures display some degradation in performance before failure.

A SMART failure is also referred to as predicted failure. There are numerous factors that are predicted physical disk failures, such as a bearing failure, a broken read/write head, and changes in spin-up rate. In addition, there are factors related to read/write surface failure, such as seek error rate and excessive bad sectors.

NOTE: For detailed information on SCSI interface specifications, see t10.org and for detailed information on SATA interface specifications, see t13.org.

Automatic Replace Member with predicted failure

A replace member operation can occur when there is a SMART predictive failure reporting on a physical disk in a virtual disk. The automatic replace member is initiated when the first SMART error occurs on a physical disk that is part of a virtual disk. The target disk needs to be a hot spare that qualifies as a rebuild disk. The physical disk with the SMART error is marked as failed only after the successful completion of the replace member. This prevents the array from reaching degraded state.

If an automatic replace member occurs using a source disk that was originally a hot spare (that was used in a rebuild), and a new disk is added and set as a target disk for the replace member operation, the hot spare drive will revert to the hot spare state after the replace member operation successfully completes.

NOTE: To enable automatic replace member, use the Dell storage management application.

Patrol Read

The Patrol read feature is designed as a preventative measure to ensure physical disk health and data integrity. Patrol read scans and resolves potential problems on configured physical disks. The Dell storage management applications can be used to start patrol read and change its behavior.

The following is an overview of patrol read behavior:

- Patrol read runs on all disks on the controller that are configured as part of a virtual disk, including hot spares.
- Patrol read does not run on physical disks that are not part of a virtual disk or are in Ready state.
- The amount of controller resources dedicated to patrol read operations adjusts based on the number of outstanding disk I/O operations. For example, if the system is processing a large number of I/O operations, then patrol read uses fewer resources to allow the I/O to take a higher priority.
- Patrol read does not run on disks that are involved in any of the following operations:
  - Rebuild
  - Replace member
  - Full or background initialization
  - CC
  - RLM or OCE

  NOTE: By default, patrol read automatically runs every seven days on configured SAS and SATA hard drives.

For more information about patrol read, see the Dell OpenManage documentation at www.dell.com/openmanagemanuals.

Physical disk failure detection

If a disk fails and it is replaced with a new disk, the controller will automatically start a rebuild on the new disk. See, Configured slot behavior. Automatic rebuilds can also occur with hot spares. If you have configured hot spares, the controller will automatically try to use them to rebuild the degraded virtual disk.

Using persistent hot spare slots

NOTE: The persistent hot spare slot feature is disabled by default.

The PERC 11 series can be configured so that the system backplane or storage enclosure disk slots are dedicated as hot spare slots. This feature can be enabled using the Dell storage management application.

Once enabled, any slots with hot spares configured automatically become persistent hot spare slots. If a hot spare disk fails or is removed, a replacement disk that is inserted into the same slot automatically becomes a hot spare with the same properties as the one it is replacing. If the replacement disk does not match the disk protocol and technology, it does not become a hot spare.

For more information on persistent hot spares, see the Dell OpenManage documentation at www.dell.com/openmanagemanuals.

Configured slot behavior

This feature is similar to persistent hot spare slot behavior. If a redundant VD is configured to the system and if a drive is replaced, the configured slot will automatically rebuild or copyback on the inserted drive regardless of the data on the drive. This operation will overwrite the data on the drive.

Table 7. Drive state/operation

Drive state/operation	Unconfigured slot	Slot configured in VD
Insert unconfigured drive into the system	Ready	Rebuild or copyback start
Insert configured drive into the system	Foreign	• Rebuild or copyback start • Original drive data lost
Insert configured locked drive into the system (unlockable)	Foreign	Cryptographic Erase (If configured VD is not secured) • Rebuild or copyback start

Table 7. Drive state/operation (continued)

Drive state/operation	Unconfigured slot	Slot configured in VD
		• Original drive data lost
Insert locked drive into the system (non-unlockable)	Foreign locked	Foreign locked

Physical disk hot swapping

Hot swapping is the manual replacement of a disk while the PERC 11 series cards are online and performing their normal functions. The following requirements must be met before hot swapping a physical disk:

- The system backplane or enclosure must support hot swapping for the PERC 11 series cards.
- The replacement disk must be of the same protocol and disk technology. For example, only a SAS hard drive can replace a SAS hard drive and only a NVMe drive can replace a NVMe drive.

Using replace member and revertible hot spares

The replace member functionality allows a previously commissioned hot spare to revert to a usable hot spare. When a disk failure occurs within a virtual disk, an assigned hot spare, dedicated, or global, is commissioned and begins rebuilding until the virtual disk is optimal. After the failed disk is replaced in the same slot and the rebuild to the hot spare is complete, the controller automatically starts to copy data from the commissioned hot spare to the newly inserted disk. After the data is copied, the new disk is a part of the virtual disk and the hot spare is reverted to being a ready hot spare. This allows hot spares to remain in specific enclosure slots. While the controller is reverting the hot spare, the virtual disk remains optimal. The controller automatically reverts a hot spare only if the failed disk is replaced with a new disk in the same slot. If the new disk is not placed in the same slot, a manual replace member operation can be used to revert a previously commissioned hot spare.

NOTE: A replace member operation typically causes a temporary impact to disk performance. Once the operation completes, performance returns to normal.

Controller cache

The PERC 11 series of cards contain local DRAM on the controllers. This DRAM can cache I/O operations for Write Back, Read Ahead virtual disks to improve the performance.

NOTE: Virtual disks consisting of SSDs may not see a difference in performance using controller cache and may benefit by Fastpath.

I/O workload that is slow to HDDs, such as random 512 B and 4 kB, may take some time to flush cached data. Cache is flushed periodically but for configuration changes or system shutdown, the cache is required to be flushed before the operation can be completed. It can take several minutes to flush cache for some workloads depending on the speed of the HDDs and the amount of data in the cache.

The following operations require a complete cache flush:

- Configuration changes (add or delete VDs, VD cache setting changes, foreign configuration scan, and import)
- System reboot or shutdown
- Abrupt power loss causing cache preservation

NOTE: The iDRAC or OpenManage periodically scans for the foreign configurations when the foreign disks are present. This action degrades the performance. If a foreign disk is present, it is recommended that you import, clear, or remove the foreign disk to prevent an impact on the performance.

Controller cache preservation

The controller is capable of preserving its cache in the event of a system power outage or improper system shutdown. The PERC 11 series controller is attached to a battery backup unit (BBU) that provides backup power during system power loss to preserve the controller's cache data.

Cache preservation with non-volatile cache

The non-volatile cache (NVC) allows controller cache data to be stored indefinitely. If the controller has data in the cache memory during a power outage or improper system shutdown, a small amount of power from the battery is used to transfer the cache data to non-volatile flash storage where it remains until power is restored and the system is booted. If the cache preservation process is interrupted by power-on, the controller may request an extra reset during the boot to complete the process. The system displays a message during boot as `Dell PERC at Bus <X> Dev <Y> has requested a system reset. System will reboot in 5 seconds.`

Recovering cache data

About this task

Complete these steps if a system power loss or improper system shutdown has occurred.

Steps

1. Restore the system power.
2. Boot the system.
3. When preserved cache exists on the controller, an error message is shown. For more information about how to recover cache, see Preserved Cache State.

Battery Transparent Learn Cycle

A transparent learn cycle is a periodic operation that calculates the charge that is remaining in the battery to ensure that there is sufficient energy. The operation runs automatically, and causes no impact to the system or controller performance.

The controller automatically performs the transparent learn cycle (TLC) on the battery to calibrate and gauge its charge capacity once every 90 days. The operation can be performed manually if required.

NOTE: Virtual disks stay in write-back mode, if enabled, during transparent learn cycle. When the TLC completes, the controller sets the next TLC to +90 days.

Transparent Learn Cycle completion time

The time frame for completion of a learn cycle is a function of the battery charge capacity and the discharge and charge currents used. Typical time completion for a transparent learn cycle is between 4 to 8 hours. If the learn cycle is interrupted mid cycle, it begins at a new cycle.

Conditions for replacing the battery

The PERC battery is marked failed when the state or health of the battery is declared bad. If the battery is declared failed, then all the virtual disks in write-back mode transitions to write-through mode, and the firmware runs learn cycles in subsequent reboots until the battery is replaced. On replacing the battery, virtual disk transitions to write-back mode.

Linux operating system device enumeration

Virtual disks and non-RAID disks are presented to the operating system as SCSI devices. The operating system enumerates these devices based on the SCSI target device ID.

Enumeration order for PERC H355 adapter SAS, PERC H355 front SAS, and PERC H350 adapter SAS

1. Non-RAID disks are enumerated first.
2. Virtual disks (VDs) are enumerated second, based on virtual disk target ID.

Target IDs are assigned to the VDs in the ascending order when they are created. The first created VD is assigned the lowest available target ID, and the last created VD is assigned the highest available target ID. Therefore, the first created VD is discovered first by the operating system.

NOTE: The PERC H355 adapter SAS, PERC H355 front SAS, and PERC H350 adapter SAS non-RAID disks may not appear in the slot order.

Enumeration order for PERC H755 front SAS, PERC H755 front SAS, PERC H755N front NVMe, PERC H750 adapter SAS, and PERC H755 MX adapter

1. Non-RAID disks are enumerated first based on slot ID.
2. Virtual disks (VDs) are enumerated, second based on the virtual disk target ID.

   Target IDs are assigned to the VDs in the descending order when they are created. The first created VD is assigned the highest available target ID, and the last created VD is assigned the lowest available target ID. Therefore, the last created VD is discovered first by the operating system.

   NOTE: Operating system enumeration may not be in this order if virtual disks or non-RAID disks are created while the operating system is running. The operating system may name devices based on the order in which they were created resulting in the operating system enumeration changing after reboot. It is recommended to reboot the system for the final device enumeration after creating any virtual disks or non-RAID disks.

4

Install and remove a PERC 11 card

Topics:

- Safety instructions
- Before working inside your system
- After working inside your system
- Remove the PERC H755 adapter
- Install the PERC H755 adapter
- Remove the PERC H755 front SAS card
- Install the PERC H755 front SAS card
- Remove the PERC H755N front NVMe card
- Install the PERC H755N front NVMe card
- Remove the PERC H755 MX adapter
- Install the PERC H755 MX adapter
- Remove the PERC H750 adapter SAS
- Install the PERC H750 adapter SAS
- Remove the PERC H355 adapter SAS
- Install the PERC H355 adapter SAS
- Remove the PERC H355 front SAS
- Install the PERC H355 front SAS card
- Remove the PERC H350 adapter SAS
- Install the PERC H350 adapter SAS

Safety instructions

NOTE: To avoid injury, do not lift the system on your own. Get others to assist you.

WARNING: **Opening or removing the system cover while the system is turned on may expose you to a risk of electric shock..**

CAUTION: **Do not operate the system without the cover in place for a duration exceeding five minutes. Operating the system without the system cover in place can result in component damage.**

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

CAUTION: **To ensure proper operation and cooling, all system bays and fans must be always populated with a component or a blank.**

NOTE: It is recommended that you always use an antistatic mat and antistatic strap while working on components inside the system.

NOTE: While replacing the hot swappable PSU, after next server boot; the new PSU automatically updates to the same firmware and configuration of the replaced one. For more information about the Part replacement configuration, see the *Lifecycle Controller User's Guide* at https://www.dell.com/idracmanuals

NOTE: While replacing faulty storage controller/FC/NIC card with the same type of card, after you power on the system; the new card automatically updates to the same firmware and configuration of the faulty one. For more information about the Part replacement configuration, see the *Lifecycle Controller User's Guide* at https://www.dell.com/idracmanuals

NOTE: For detailed information on cabling the PERC 11 cards, see the system-specific owner's manual at Installation and Service Manual available at https://www.dell.com/poweredgemanuals

Before working inside your system

Steps

1. Power off the system and all attached peripherals.
2. Disconnect the system from the electrical outlet, and disconnect the peripherals.
3. If applicable, remove the system from the rack.
   For more information, see the *Rail Installation Guide* relevant to your rail solutions at www.dell.com/poweredgemanuals.
4. Remove the system cover.

After working inside your system

Steps

1. Replace the system cover.
2. If applicable, install the system into the rack.
   For more information, see the *Rail Installation Guide* relevant to your rail solutions at www.dell.com/poweredgemanuals.
3. Reconnect the peripherals and connect the system to the electrical outlet, and then power on the system.

Remove the PERC H755 adapter

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.
   NOTE: Perform a graceful shutdown of the system to ensure data in the cache is moved to the disk before the controller is removed.
2. Open the system.
3. Locate the PERC card in the expansion riser on the system board.
   CAUTION: **To prevent damage to the card, you must hold the card by its edges only.**
4. Unfasten and lift the riser from the system board. Remove the PERC card.
5. Disconnect any cables connected to the card:
   a. Press down and hold the metal tab on the cable connector.
   b. Pull the cable out of the connector.
6. Replace the storage controller card and reconnect the data cables before placing them in the riser. For more information on installing the card, see Install PERC H755 adapter.
7. Reinstall the riser on the system board and fasten the riser.
8. Close the system.

9. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

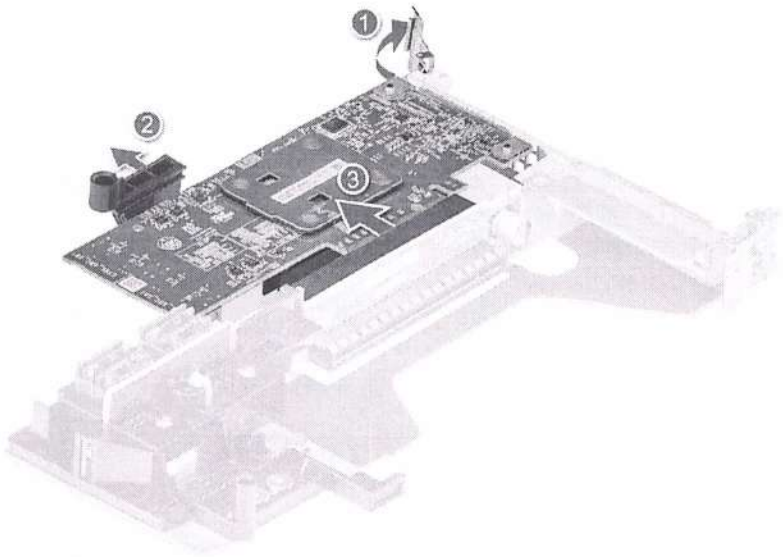

Figure 9. Remove the PERC H755 adapter

Install the PERC H755 adapter

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Open the system.
3. Align the card-edge connector with the connector on the system board.

   CAUTION: **To prevent damage to the card, you must hold the card by its edges only.**

4. Press the card-edge down until the card is fully seated.
5. Connect the data cable connectors to the card.
6. Route the data cable through the channel on the inner side of the chassis to the backplane.
7. Attach the connector to the corresponding connector on the backplane as labeled on the controller.
8. Close the system.
9. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

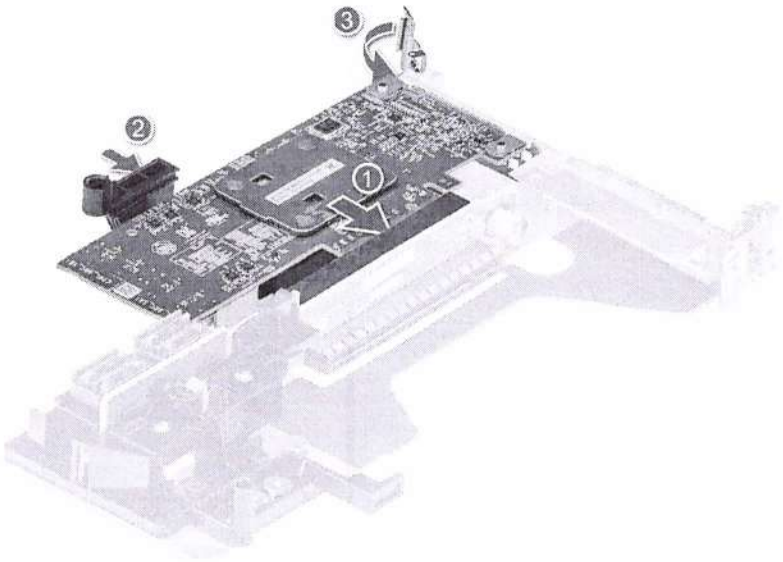

Figure 10. Install the PERC H755 adapter

Remove the PERC H755 front SAS card

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.

   NOTE: Perform a graceful shutdown of the system to ensure data in the cache is moved to the disk before the controller is removed.

2. Open the system.
3. Locate the PERC card in the controller carrier at the front of the system.

   CAUTION: **To prevent damage to the card, you must hold the card by its edges only.**

4. Unscrew the fasteners on the controller carrier and slide the carrier away from the backplane, disconnecting the controller from the backplane.

   If you are removing a PERC H755 front SAS controller in the upside down orientation, you must remove both the backplane and the controller at the same time because of the limited clearance available:

   a. Uninstall all drives from the backplane.
   b. Disconnect all cables between the PERC and the backplane.
   c. Lift the backplane and PERC from the system.

5. Disconnect any cables connected to the card:
   a. Press down and hold the metal tab on the cable connector.
   b. Pull the cables out of the connector.
6. Remove the PERC controller from the controller carrier.

7. Insert the replacement controller into the carrier and secure it with the appropriate screws.
8. Take the replacement storage controller and reconnect the cables before reconnecting it to the backplane.

   If you are removing a PERC H755 front SAS controller in the upside down orientation, reattach the PERC controller to the backplane first before reinstalling the backplane into the system. For more information on installing the card, see Install PERC H755 front SAS card.
9. Close the system.
10. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

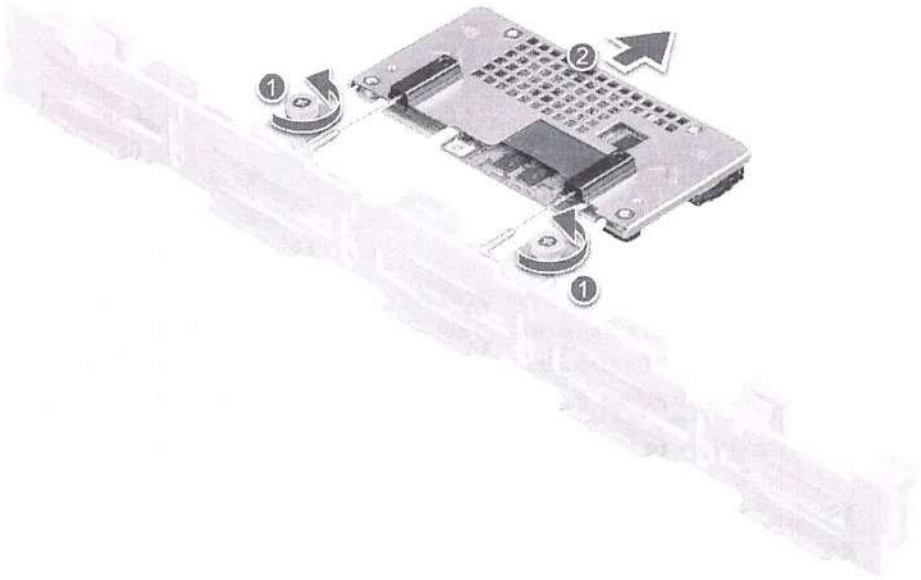

Figure 11. Remove the PERC H755 front SAS card

Install the PERC H755 front SAS card

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

NOTE: Perform a graceful shutdown of the sled to ensure that data in the cache is moved to the disk before the controller is removed.

2. Open the system.
3. Connect the PERC card to the carrier and ensure that the screws are properly fastened in place.

   CAUTION: **To prevent damage to the card, hold the card by its edges only.**

4. Align the carrier with the guide pins until the controller is securely seated.
5. Slide the card into the connector until it is fully seated in the connector. Tighten the screws on the carrier that connect to the chassis to secure the carrier.
6. Connect the cable connectors to the card.

   NOTE: Ensure that you connect the cable according to the connector labels on the cable. The cable does not function properly if reversed.

7. Close the system.
8. Reconnect the system to its electrical outlet and turn on the system and any attached peripherals.

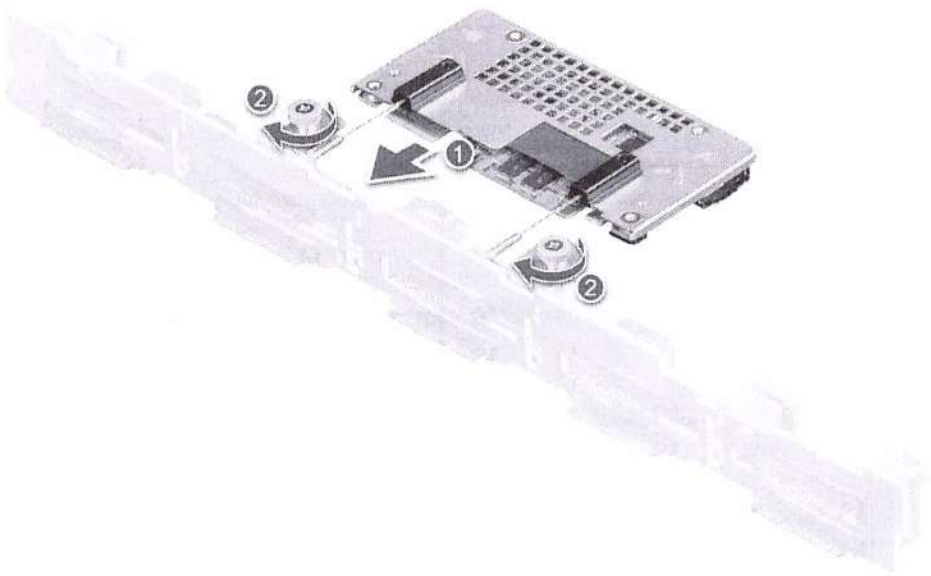

Figure 12. Install the PERC H755 front SAS card

Remove the PERC H755N front NVMe card

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or**

telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.

   NOTE: Perform a graceful shutdown of the system to ensure that data in the cache is moved to the disk before the controller is removed.

2. Open the system.
3. Locate the PERC card in the controller carrier at the front of the system.

   CAUTION: **To prevent damage to the card, you must hold the card by its edges only.**

4. Unscrew the fasteners on the controller carrier, and slide the carrier away from the backplane to disconnect the controller from the backplane.

   If you are removing a PERC H755N front NVMe controller in the upside down orientation, you must remove both the backplane and the controller at the same time because of the limited clearance available:

   a. Uninstall all drives from the backplane.
   b. Disconnect all cables between the PERC and the backplane.
   c. Lift the backplane and PERC from the system.

5. Disconnect any cables connected to the card:
   a. Press down and hold the metal tab on the cable connector.
   b. Pull the cable out of the connector.
6. Remove the PERC controller from the controller carrier.
7. Insert the replacement controller into the carrier and secure it with the appropriate screws.
8. Take the replacement storage controller and reconnect the cable before reconnecting it to the backplane.

   If you are removing a PERC H755 front NVMe controller in the upside down orientation, reattach the PERC controller to the backplane first before reinstalling the backplane into the system. For more information on installing the card, see Installing the PERC H755N front NVMe card.

9. Close the system.
10. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

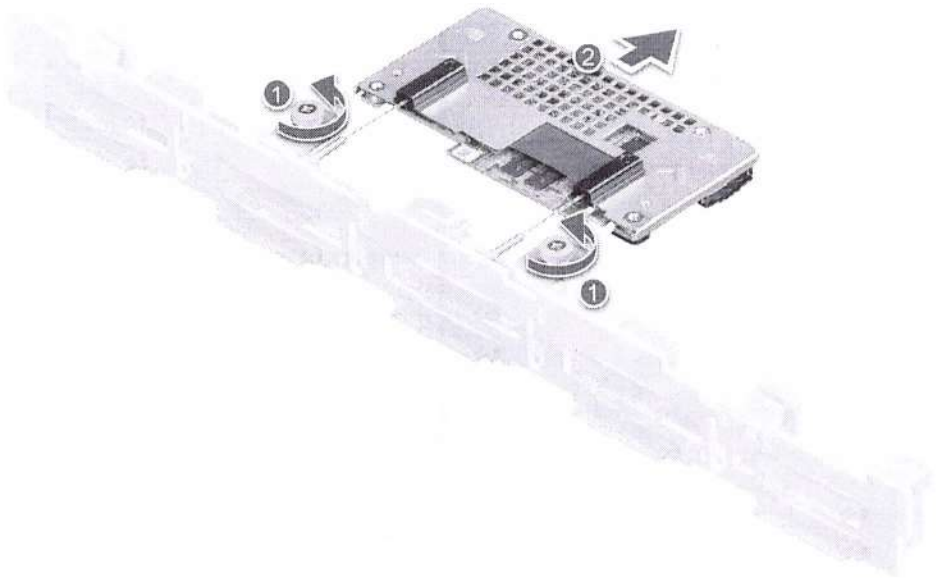

Figure 13. Remove the PERC H755N front NVMe card

Install the PERC H755N front NVMe card

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

   NOTE: Perform a graceful shutdown of the sled to ensure that data in the cache is moved to the disk before the controller is removed.

2. Open the system.
3. Connect the PERC card to the carrier and ensure the screws are properly fastened in place.

   CAUTION: **To prevent damage to the card, hold the card by its edges only.**

4. Align the carrier with the guide pins until the controller is securely seated.

5. Slide the card until it is fully seated in the connector. Tighten the screws on the carrier that connect to the chassis to secure the carrier.
6. Connect the cable connectors to the card.

   NOTE: Ensure that you connect the cable according to the connector labels on the cable. The cable does not function properly if reversed.

7. Close the system.
8. Reconnect the system to its electrical outlet and turn on the system and any attached peripherals.

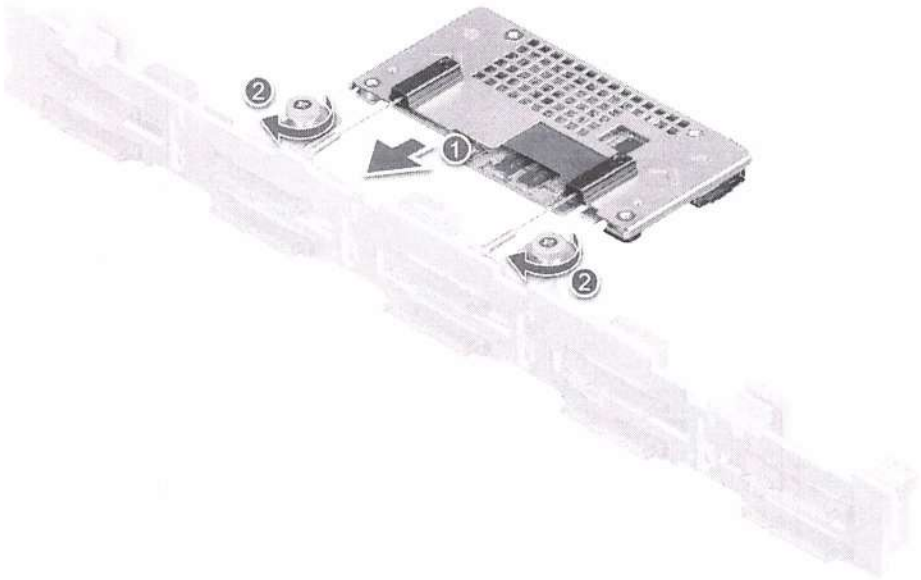

Figure 14. Install the PERC H755N front NVMe card

Remove the PERC H755 MX adapter

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

CAUTION: **To prevent damage to the card, hold the card by its edges only.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the sled, including any attached peripherals, and remove the sled from the MX chassis.

   NOTE: Perform a graceful shutdown of the system to ensure that data in the cache is moved to the disk before the controller is removed.

2. Open the sled.
3. Locate the PERC card on the system board.

   CAUTION: **To prevent damage to the card, hold the card by its edges only.**

4. Using the blue tab, rotate the lever of the controller.
5. Pull the release lever upward to disengage the controller from the connector.
6. Disconnect the cable from the card. To disconnect the cable:
   a. Press and hold the metal tab on the cable connector.
   b. Pull the cable out of the connector.
7. Lift the card from the system board.
8. Replace the storage controller card and connect the cable. For information on installing the card, see Install the PERC H755 MX adapter.
9. Close the sled.
10. Insert the sled into the MX chassis and turn on the system and any attached MX chassis peripherals.

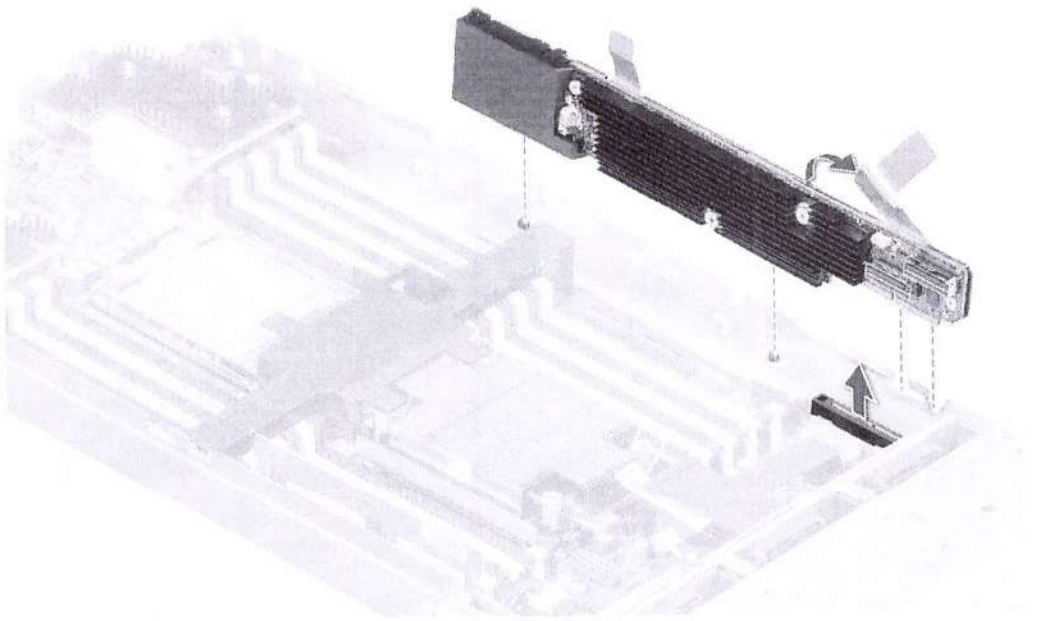

Figure 15. Remove the PERC H755 MX adapter

Install the PERC H755 MX adapter

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or**

telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the sled and any attached peripherals, and remove the sled from the MX chassis.
2. Open the sled.
3. Connect the backplane data cable connector to the card.

   NOTE: Ensure that you connect the cable according to the connector labels on the cable. The cable does not function properly if reversed.

4. Align the bracket notches with the tabs on the sides of the sled chassis and align the PERC card connector with the connector on the system board.

   CAUTION: **To prevent damage to the card, hold the card by its edges only.**

5. Press the PERC card into the connector until it is firmly seated.
6. Press the release lever to secure the card to the sled.

   NOTE: The pin on the release lever secures the card to the chassis of the sled.

7. Route the data cable through the clip on the card and through the channel on the inner side of the chassis.
8. Attach the connector to the corresponding connector on the backplane as labeled in the controller.
9. Close the sled.
10. Insert the sled into the MX chassis and turn on the system and any attached MX chassis peripherals.

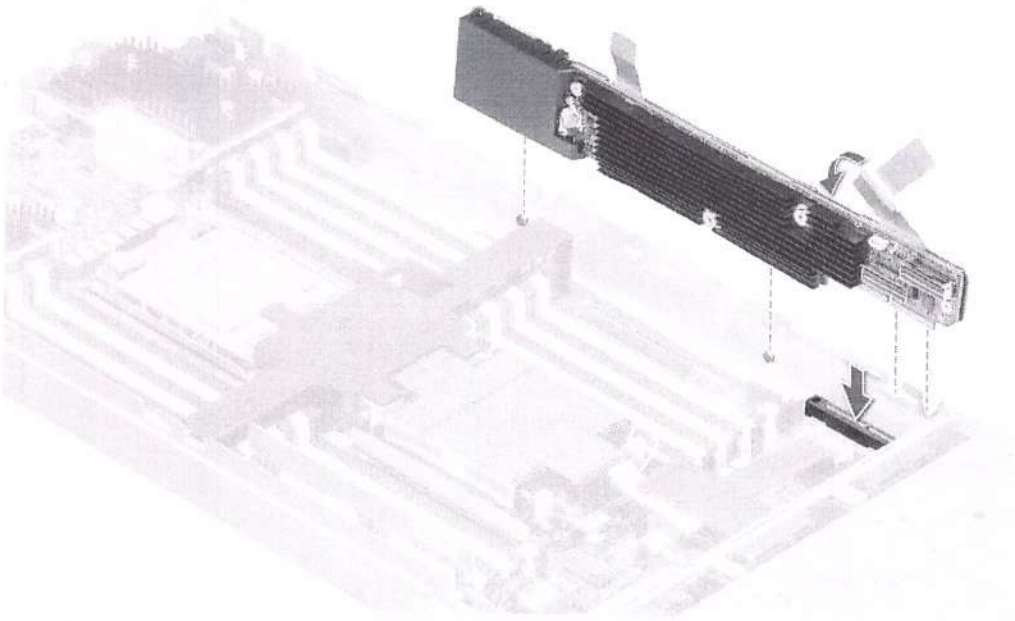

Figure 16. Install the PERC H755 MX adapter

Remove the PERC H750 adapter SAS

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.
2. Open the system.
3. Locate the PERC card on the system board.

   CAUTION: **To prevent damage to the card, you must hold the card by its edges only.**

4. Lift the card to remove it from the connector on the system board.
5. Disconnect the SAS cables connected to the card:
   a. Press down and hold the metal tab on the SAS cable connector.
   b. Pull the SAS cable out of the connector.
6. Replace the storage controller card and connect the cable. For more information on installing the card, see Install the H750 adapter SAS.
7. Close the system.
8. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

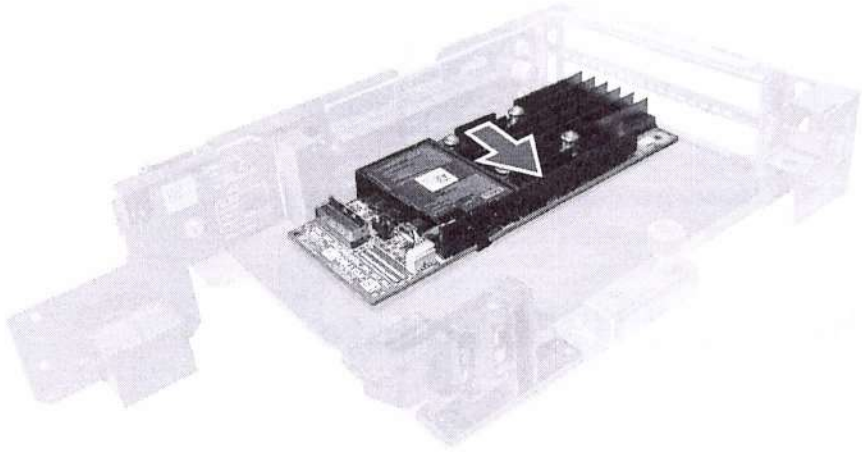

Figure 17. Remove PERC H750 adapter SAS

Install the PERC H750 adapter SAS

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Open the system.
3. Align the card-edge connector with the connector on the system board.

   CAUTION: **To prevent damage to the card, you must hold the card by its edges only.**

4. Press the card-edge down until the card is fully seated.
5. Connect the SAS data cable connector to the card.

   NOTE: Ensure that you connect the cable according to the connector labels on the cable. The cable does not function properly if reversed.

6. Route the SAS data cable through the channel on the inner side of the chassis to the backplane.
7. Attach the connector labeled SAS A to connector SAS A on the backplane.
8. Close the system.
9. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

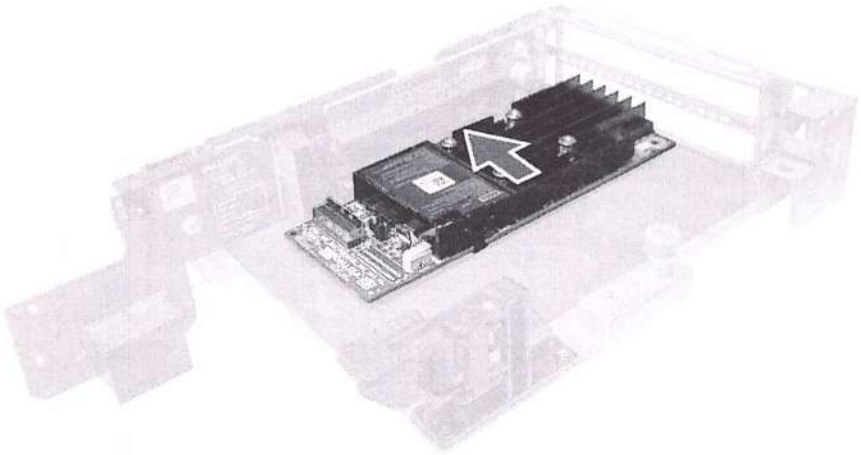

Figure 18. Install PERC H750 adapter SAS

Remove the PERC H355 adapter SAS

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.
2. Open the system.

3. Locate the PERC card in the expansion riser on the system board.

   CAUTION: **To prevent damage to the card, you must hold the card by its edges only.**

4. Unfasten and lift the riser from the system board. Remove the PERC card.
5. Disconnect any SAS cables connected to the card:
   a. Press down and hold the metal tab on the SAS cable connector.
   b. Pull the SAS cable out of the connector.
6. Replace the storage controller and reconnect the SAS cable before placing them in the riser. For more information on installing the card, see Install the PERC H355 adapter.
7. Reinstall the riser on the system board and fasten the riser.
8. Close the system.
9. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

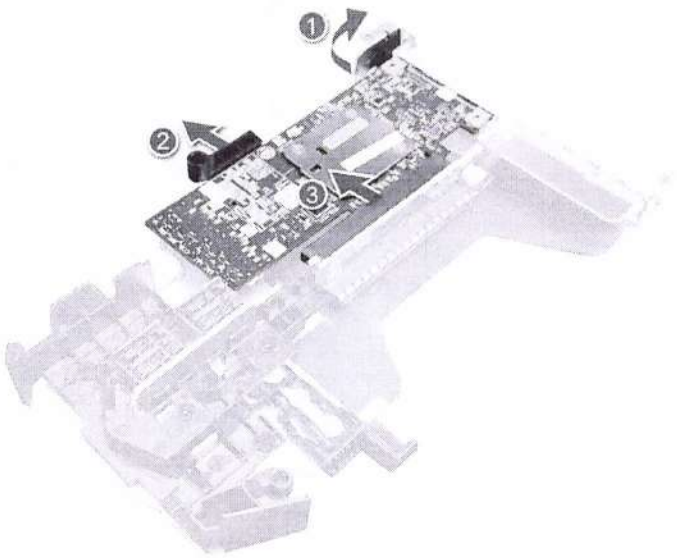

Figure 19. Remove the PERC H355 adapter SAS

Install the PERC H355 adapter SAS

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Open the system.
3. Align the card-edge connector with the connector on the system board.

CAUTION: **To prevent damage to the card, you must hold the card by its edges only.**

4. Press the card-edge down until the card is fully seated.
5. Connect the SAS data cable connectors to the card.

   NOTE: Ensure that you connect the cable according to the connector labels on the cable. The cable does not function properly if reversed.

6. Route the SAS data cable through the channel on the inner side of the chassis to the backplane.
7. Attach the connector labeled SAS A to connector SAS A on the backplane, and attach the connector labeled SAS B to connector SAS B on the backplane.
8. Close the system.
9. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

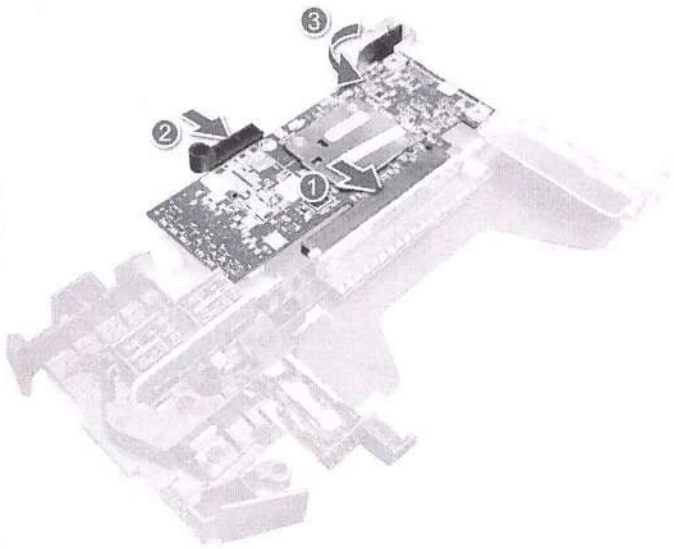

Figure 20. Install the PERC H355 adapter SAS

Remove the PERC H355 front SAS

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.

   NOTE: Perform a graceful shutdown of the system to ensure data in the cache is moved to the disk before the controller is removed.

2. Open the system.

3. Locate the PERC card in the controller carrier at the front of the system.

   CAUTION: **To prevent damage to the card, you must hold the card by its edges only.**

4. Unscrew the fasteners on the controller carrier and slide the carrier away from the backplane, disconnecting the controller from the backplane.

   If you are removing a PERC H355 front SAS controller in the upside down orientation, you must remove both the backplane and the controller at the same time because of the limited clearance available:

   a. Uninstall all drives from the backplane.
   b. Disconnect all cables between the PERC and the backplane.
   c. Lift the backplane and PERC from the system.

5. Disconnect any cables connected to the card:
   a. Press down and hold the metal tab on the cable connector.
   b. Pull the cables out of the connector.
6. Remove the PERC controller from the controller carrier.
7. Insert the replacement controller into the carrier and secure it with the appropriate screws.
8. Take the replacement storage controller and reconnect the cables before reconnecting it to the backplane.

   If you are removing a PERC H355 front SAS controller in the upside down orientation, reattach the PERC controller to the backplane first before reinstalling the backplane into the system. For more information on installing the card, see Install the PERC H355 front.
9. Close the system.
10. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

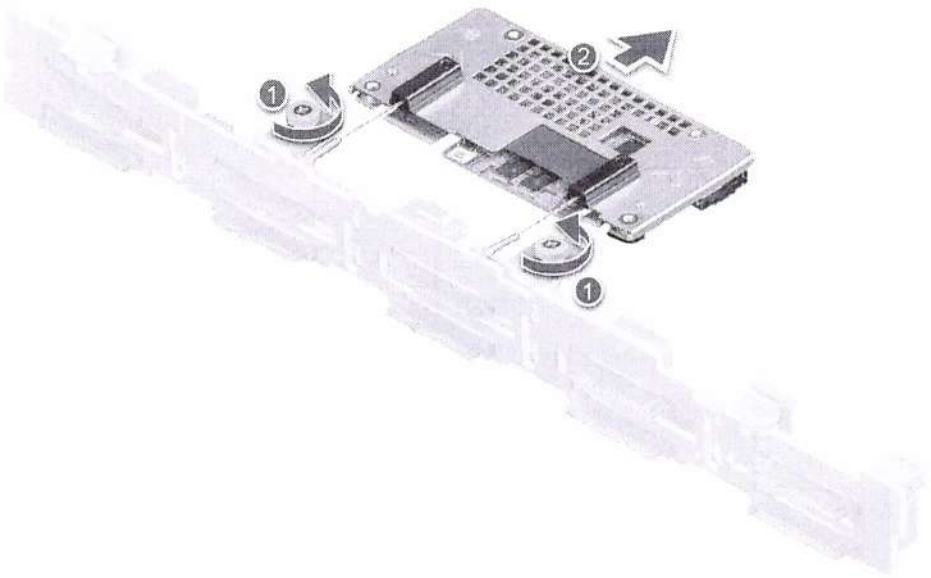

Figure 21. Remove the PERC H355 front SAS

Install the PERC H355 front SAS card

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.

   NOTE: Perform a graceful shutdown of the sled to ensure that data in the cache is moved to the disk before the controller is removed.

2. Open the system.
3. Connect the PERC card to the carrier and ensure that the screws are properly fastened in place.

   CAUTION: **To prevent damage to the card, hold the card by its edges only.**

4. Align the carrier with the guide pins until the controller is securely seated.
5. Slide the card into the connector until it is fully seated in the connector. Tighten the screws on the carrier that connect to the chassis to secure the carrier.
6. Connect the cable connectors to the card.

   NOTE: Ensure that you connect the cable according to the connector labels on the cable. The cable does not function properly if reversed.

7. Close the system.
8. Reconnect the system to its electrical outlet and turn on the system and any attached peripherals.

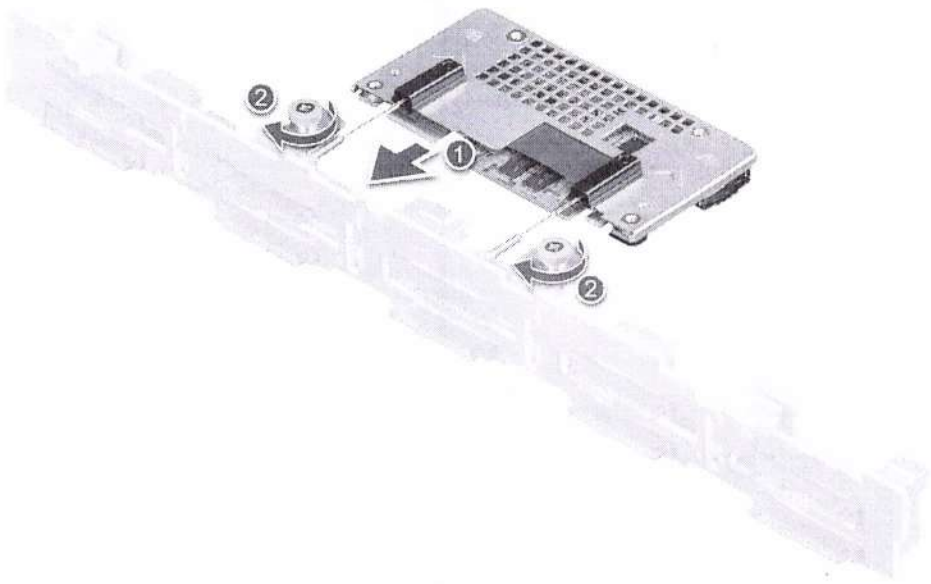

Figure 22. Install the PERC H755 front SAS card

Remove the PERC H350 adapter SAS

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet and peripherals.
2. Open the system.
3. Locate the PERC card on the system board.

   CAUTION: **To prevent damage to the card, you must hold the card by its edges only.**

4. Lift the card to remove it from the connector on the system board.
5. Disconnect the SAS cables connected to the card:
   a. Press down and hold the metal tab on the SAS cable connector.
   b. Pull the SAS cable out of the connector.

6. Replace the storage controller card and connect the cable. For more information on installing the card, see Install the PERC H350 adapter.
7. Close the system.
8. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

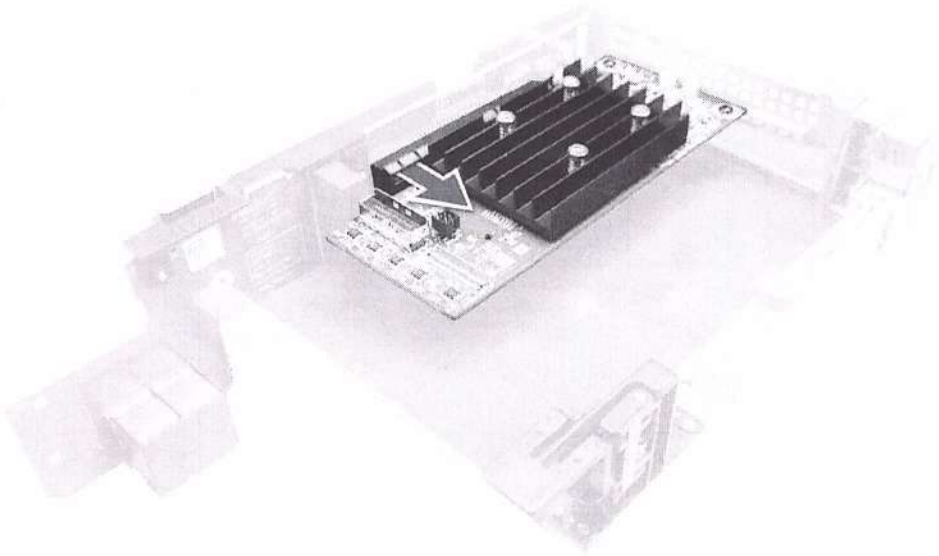

Figure 23. Remove the PERC H350 adapter SAS

Install the PERC H350 adapter SAS

Prerequisites

CAUTION: **Many repairs may only be done by a certified service technician. You should only perform troubleshooting and simple repairs as authorized in your product documentation, or as directed by the online or telephone service and support team. Damage due to servicing that is not authorized by Dell is not covered by your warranty. Read and follow the safety instructions that are shipped with your product.**

NOTE: It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

Steps

1. Turn off the system, including any attached peripherals, and disconnect the system from the electrical outlet.
2. Open the system.
3. Align the card-edge connector with the connector on the system board.

   CAUTION: **To prevent damage to the card, you must hold the card by its edges only.**

4. Press the card-edge down until the card is fully seated.
5. Connect the SAS data cable connector to the card.

   NOTE: Ensure that you connect the cable according to the connector labels on the cable. The cable does not function properly if reversed.

6. Route the SAS data cable through the channel on the inner side of the chassis to the backplane.
7. Attach the connector labeled SAS A to connector SAS A on the backplane.
8. Close the system.
9. Reconnect the system to its electrical outlet and turn the system on, including any attached peripherals.

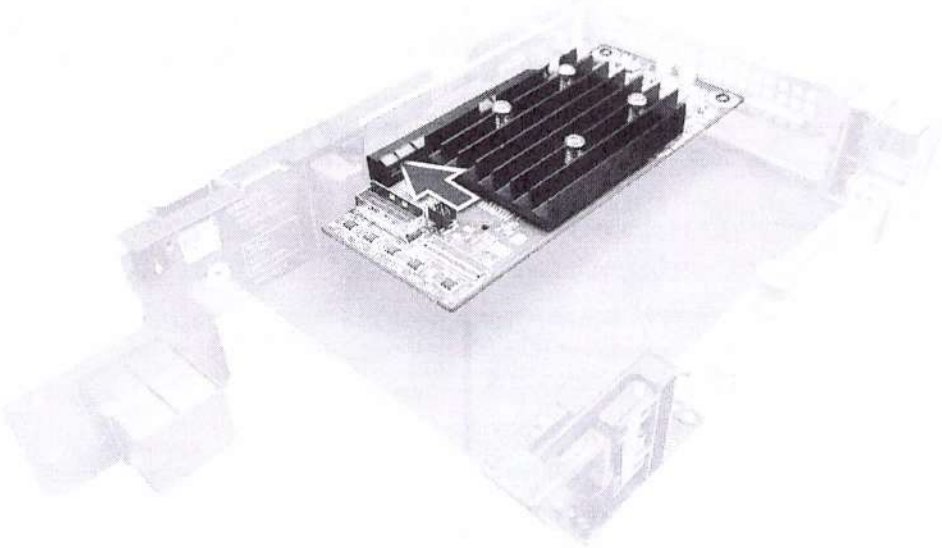

Figure 24. Install the PERC H350 adapter SAS

5

Driver support for PERC 11

The PERC 11 series require software drivers to operate with the supported operating systems.

This chapter contains the procedures for installing the drivers for the PERC 11 cards.

NOTE: The driver for PERC 11 for VMware ESXi is packaged within the VMware ESXi ISO image downloaded from Dell. For more information, see the VMware documentation at www.dell.com/virtualizationsolutions. It is not recommended to have drivers from controllers prior to PERC 11 on the same system.

The two methods for installing a driver discussed in this chapter are:

- **Installing a driver during operating system installation:** Use this method if you are performing a new installation of the operating system and want to include the drivers.
- **Updating existing drivers:** Use this method if the operating system and the PERC 11 family of controllers are already installed and you want to update to the latest drivers.

Topics:

- Creating the device driver media
- Windows driver installation
- Linux driver installation
- Loading the driver while installing an operating system

Creating the device driver media

Use one of the following two methods to create the device driver media:

- Downloading Drivers From The Dell Support Website
- Downloading Drivers From The Dell Systems Service And Diagnostic Tools Media

Download and save PERC 11 drivers from the support site

About this task

To download drivers from the Dell Support website:

Steps

1. Go to www.dell.com/support/home.
2. Enter the service tag of your system in the **Choose by Service Tag to get started** field or select **Choose from a list of all Dell products**.
3. Select the **System Type**, **Operating System**, and **Category** from the drop-down list.
   The drivers that are applicable to your selection are displayed.
4. Download the drivers that you require to a USB drive, CD, or DVD.
5. During the operating system installation, use the media that you created to load the driver. For more information on reinstalling the operating system, see the relevant section for your operating system later in this guide.

Download and save PERC 11 drivers from the Dell Systems Service and Diagnostic Tools

About this task

To download drivers from the **Dell Systems Service and Diagnostic Tools** media:

Steps

1. Insert the **Dell Systems Service and Diagnostics Tools** media in your system.
   The **Welcome to Dell Service and Diagnostic Utilities** screen is displayed.
2. Select your system model and operating system.
3. Click **Continue**.
4. From the list of drivers displayed, select the driver you require.
5. Select the self-extracting ZIP file and click **Run**.
6. Copy the driver to a CD, DVD, or USB drive.
7. Repeat steps 1 to 6 for all the drivers you require.

Windows driver installation

Before you install the Windows driver for PERC 11, you must first create a device driver media.

- Read the Microsoft **Getting Started** document that shipped with your operating system.
- Ensure that your system has the latest BIOS, firmware, and driver updates. If required, download the latest BIOS, firmware, and driver updates from www.dell.com/support/home.
- Create a device driver media using one of the methods listed below:
  - USB drive
  - CD
  - DVD

Install PERC 11 driver while newly installing the Windows Server 2016 and later

About this task

To install the driver:

Steps

1. Boot the system using the Windows Server 2016, or newer media.
2. Follow the on-screen instructions until you reach **Where do you want to install Windows Server 2016 or later** window and then select **Load driver**.
3. As prompted, insert the installation media and browse to the appropriate location.
4. Select a PERC 11 series card from the list.
5. Click **Next** and continue installation.

Install PERC 11 driver on which the Windows Server 2016 is already installed and later

About this task

Perform the following steps to configure the driver for the RAID controller on which the Windows Server 2016 is already installed:

Steps

1. Turn off the system.
2. Install the new RAID controller in the system.
   For detailed instructions on installing the RAID controller in the system, see Install and remove a PERC 11 card.
3. Turn on the system.
   The **Found New Hardware Wizard** screen displays the detected hardware device.
4. Click **Next**.

5. On the **Locate device driver** screen, select **Search for a suitable driver for my device** and click **Next**.
6. Browse and select the drivers from the **Locate Driver Files** screen.
7. Click **Next**.
   The wizard detects and installs the appropriate device drivers for the new RAID controller.
8. Click **Finish** to complete the installation.
9. Reboot the system when prompted.

Update PERC 11 driver that runs on Windows Server 2016 and later

Prerequisites

NOTE: Close all applications on your system before you update the driver.

Steps

1. Insert the media containing the driver.
2. Select **Start** > **Settings** > **Control Panel** > **System.**
   The **System Properties** screen is displayed.
   NOTE: The path to **System** might vary depending on the operating system family.
3. Click the **Hardware** tab.
4. Click **Device Manager**.
   The **Device Manager** screen is displayed.
   NOTE: The path to **Device Manager** might vary depending on the operating system family.
5. Expand **Storage Controllers** by double-clicking the entry or by clicking on the plus (+) symbol next to **Storage Controllers**.
6. Double-click the RAID controller for which you want to update the driver.
7. Click the **Driver** tab and click **Update Driver**.
   The screen to update the device driver wizard is displayed.
8. Select **Install from a list or specific location**.
9. Click **Next**.
10. Follow the steps in the wizard and browse to the location of the driver files.
11. Select the INF file from the drive media.
12. Click **Next** and continue the installation steps in the wizard.
13. Click **Finish** to exit the wizard and reboot the system for the changes to take place.
    NOTE: Dell provides the Dell Update Package (DUP) to update drivers on systems running Windows Server 2016 and newer operating system. DUP is an executable application that updates drivers for specific devices. DUP supports command line interface and silent execution. For more information, see https://www.dell.com/support.

Linux driver installation

The driver update disk (DUD) images are created only for those operating system releases in which the native (in-box) driver is insufficient for installation. In the event that an operating system is being installed with a corresponding DUD image, see, Installing or updating the RPM driver package with KMOD support. If not, proceed with using the native device driver and then skip to the topic Installing or Updating the RPM Driver Package With KMP Support.

NOTE: The driver update disk (DUD) images are created only for those operating system releases in which the native (in-box) driver is insufficient for installation. In the event that an operating system is being installed with a corresponding DUD image, follow the instructions below.

NOTE: To view the complete list of boot loader options, see the installation guide of your operating system.

NOTE: If using out-of-box drivers with RHEL 7 and higher, a tainted kernel message will be displayed in the log. RedHat does not provide a mechanism to sign external drivers for RHEL.

Install or update a RPM driver package using the KMOD support

Prerequisites

NOTE: This procedure is applicable for Red Hat Enterprise Linux 7.x and higher.

About this task

Perform the following steps to install the RPM package with KMOD support:

Steps

1. Uncompress the gzipped tarball driver release package.
2. Install the driver package using the command: `rpm -ihv kmodmegaraid_ sas-<version>.rpm`.

   NOTE: Use `rpm -Uvh <package name>` when upgrading an existing package.

3. If the previous device driver is in use, you must reboot the system for the updated driver to take effect.
4. Verify the loaded driver version by running the following command: `modinfo megaraid_sas`.

Install or update a RPM driver package using the KMP support

Prerequisites

NOTE: This procedure is applicable for SUSE Enterprise Linux 15.x.

About this task

Perform the following steps to install the RPM package with KMP support:

Steps

1. Uncompress the gzipped tarball driver release package.
2. Install the driver package using the command: `rpm -ihv kmpmegaraid_ sas- <version>.rpm`.

   NOTE: Use `rpm -Uvh <package name>` when updating an existing package.

3. If the previous device driver is in use, you must reboot the system for the updated driver to take effect.
4. Verify the loaded driver version by running the following command: `modinfo megaraid_sas`.

Upgrading the Kernel

About this task

When upgrading to a new kernel, you must reinstall the DKMS-enabled driver packages. Perform the following steps to update or install the driver for a new kernel:

Steps

1. At a **terminal** window, type the following: `dkms build -m <module_name> - v <module version> - k <kernel version> dkms install -m <module_name> - v <module version> - k <kernel version>`.
2. To check if the driver is successfully installed in the new kernel, type: `dkms status`.
   A message similar to the following is displayed: `<driver name>, <driver version>, <new kernel version>: installed`.
3. If the previous device driver is in use, you must restart the system for the updated driver to take effect.

Loading the driver while installing an operating system

Steps

1. Perform the following operation to install the driver media:
   a. Download the PERC linux driver ISO, or install the LC driver pack.
   b. Mount the ISO to the Server, burn the ISO to CD/DVD, or copy the ISO file to USB. The USB has to match with the ISO.
   c. For LC driver pack, boot the life-cycle controller and go through the operating system deployment wizard.
2. Boot to the installer.
3. In the Installation screen, press E.
4. Perform the following operation:
   - If the operating system is Red Hat Enterprise Linux 7 or RHEL 8, the CLI displays the syntax `vmlinuz`. Enter **inst.dd**.

     For example, when you are prompted with the command `vmlinuz intrd=initrd.img inst.stage2=hd:LABEL=RHEL-7.0\x20x86_64 quiet inst.dd`.

   - If the operating system is SLES 15, the CLI displays the syntax `linuxefi..` Enter **dud=1**.

     For example, when you are prompted with the command `linuxefi/boot/x86_64/loader/linux splash=silent dud=1`.

   ⓘ NOTE: Boot parameters may vary based on the operating system version. See operating system installation manuals for exact boot parameter syntax.

5. Attach the driver media (ISO, USB).
6. Press F10 to boot to the operating system.
   A screen is displayed prompting you to select the driver media (USB, CD, ISO, and so on).
7. When prompted select the driver media.
   If applicable select the PERC driver `...megaraid_sas...`

   ⓘ NOTE: Ensure that the driver is selected with an X symbol.

8. The driver should be extracted or loaded.
9. Before proceeding or exiting the driver select menu, disconnect the driver media.

   ⓘ NOTE: Ensure that you disconnect the driver media so that the drivers are loaded successfully. If the installation media is deleted, reattach it.

10. Press C or exit to go to the installation.

6

Firmware

This section provides information about downloading and installing the firmware using Dell Update Package (DUP).

Topics:

- Update firmware controller using Dell Update Package (DUP)

Update firmware controller using Dell Update Package (DUP)

Steps

1. Navigate to www.dell.com/support/home.
2. Locate your controller.
3. Download the DUP.
   a. For Window/iDRAC update, download Windows executable file.
   b. For Linux update, download **.bin** file.

   NOTE: For VMware, firmware should be updated through iDRAC or the PERC CLI utility.
4. Install the DUP.
   a. For Windows, run the executable in Windows environment.
   b. For Linux, run **.bin** file in Linux environment.
   c. For iDRAC, navigate to **system iDRAC** > **Maintenance** > **System Update**, upload Windows executable, and then install.

7

Manage PERC 11 controllers using HII configuration utility

The Human Interface Infrastructure (HII) configuration utility is a storage management application integrated into the System BIOS <F2>. It is used to configure and manage the controller(s), virtual disks, and physical disks. This utility is independent of the operating system.

Topics:

- Enter the PERC 11 HII configuration utility
- Exit the PERC 11 HII configuration utility
- Navigate to Dell PERC 11 configuration utility
- View the HII Configuration utility dashboard
- Configuration management
- Controller management
- Virtual disk management
- Physical disk management
- Hardware components
- Security key management in HII configuration utility

Enter the PERC 11 HII configuration utility

About this task

Perform the following steps to boot to the HII configuration utility:

Steps

1. Turn on the system.
2. While the system startup, press <F2> to enter **System Setup**.
3. Click **Device Settings**.
   Device Settings screen lists all the RAID controllers in the system.

   To access the management menu for the controller, use the arrow keys or the mouse.

   NOTE: For more information in all the options, click Help that is available on the top right-hand corner of the browser screen. Help information for individual option menus can also be viewed by scrolling down on each option.

   NOTE: Some of the options within the HII configuration utility are not present if the controller does not support the corresponding feature. Options may also be grayed out if the feature is not applicable to the current configuration.

Exit the PERC 11 HII configuration utility

About this task

To exit the HII configuration utility, perform the following steps:

Steps

1. Click **Finish** at the bottom-right corner on the **System Setup Main Menu** screen.
   Displays a warning message to confirm your choice.
2. Click **Yes** to exit the HII configuration utility.