

# Dell PowerEdge RAID Controller (PERC) S130 User's Guide



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# Notes, Cautions, and Warnings



**NOTE:** A NOTE indicates important information that helps you make better use of your computer.



**CAUTION:** A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.



**WARNING:** A WARNING indicates a potential for property damage, personal injury, or death.

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# Overview

The Dell PowerEdge RAID Controller (PERC) S130 is an economical RAID solution for the Dell PowerEdge systems. The S130 controller supports up to ten SATA HDD or SATA SSD depending on your system backplane configuration.

## PERC S130 specifications

The following table provides PERC S130 specifications:

**Table 1. Specifications for PERC S130**

| Specification                                       | PERC S130                                          |
|-----------------------------------------------------|----------------------------------------------------|
| SATA SSD technology                                 | Yes                                                |
| I/O controller                                      | Intel X99 chipset                                  |
| Communication with the system                       | Integrated                                         |
| Communication with the end devices                  | SATA links                                         |
| SAS connectors                                      | No                                                 |
| SATA connectors                                     | Discrete on the system board                       |
| Dell-compliant SATA compatibility                   | Yes                                                |
| Dell-compliant SAS compatibility                    | No                                                 |
| Direct-connected end devices                        | Dell-compliant HDDs and SSDs                       |
| SMART error support through management applications | Yes                                                |
| Backplane supported systems                         | Yes                                                |
| Software-based RAID                                 | Volume, RAID 1, RAID 0, RAID 5, RAID 10            |
| Support for internal tape drive                     | Yes                                                |
| Support for global hot spare                        | Yes                                                |
| Maximum number of global hot spares                 | Varies with the number of free disks in the system |
| Pass through SSD support                            | Yes                                                |

The following table provides PERC S130 virtual disk specifications:

**Table 2. Virtual disk specifications for PERC S130**

| Specification                                             | PERC S130                                                       |
|-----------------------------------------------------------|-----------------------------------------------------------------|
| Maximum number of virtual disks                           | 10                                                              |
| Minimum virtual disk size                                 | 102MB                                                           |
| Maximum virtual disk size                                 | No maximum size; there may be operating system size limitations |
| Maximum number of physical disks per virtual disk         | 10                                                              |
| Maximum number of virtual disks per physical disk         | 10                                                              |
| Maximum number of physical disks that can be concatenated | N/A                                                             |
| Maximum number of physical disks in a Volume              | 1                                                               |
| Maximum number of physical disks in a RAID 0              | 10                                                              |
| Maximum number of physical disks in a RAID 1              | 2                                                               |
| Maximum number of physical disks in a RAID 5              | 10                                                              |
| Maximum number of physical disks in a RAID 10             | 10                                                              |
| Minimum number of physical disks that can be concatenated | N/A                                                             |
| Minimum number of physical disks in a Volume              | 1                                                               |
| Minimum number of physical disks in a RAID 0              | 2                                                               |
| Minimum number of physical disks in a RAID 1              | 2                                                               |
| Minimum number of physical disks in a RAID 5              | 3                                                               |
| Minimum number of physical disks in a RAID 10             | 4                                                               |

 **NOTE:** The configurations listed in the table above may vary with the hard-drive backplane of the system that you have.

## Supported operating systems

The S130 controller supports the following operating systems:

- Microsoft Windows Server 2012
- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2008 R2 SP1 (64-bit)

 **NOTE:** For the latest list of supported operating systems and driver installation instructions, see the system documentation at [dell.com/support/manuals](http://dell.com/support/manuals). For specific operating system service pack requirements, see the Drivers and Downloads section at [dell.com/support/manuals](http://dell.com/support/manuals).

 **NOTE:** While you install the windows server 2012 operating system, ensure that you install the hotfix update available at [support.microsoft.com/kb/2789962](http://support.microsoft.com/kb/2789962).

## Supported PowerEdge systems

The following PowerEdge systems support S130 controller:

- Dell PowerEdge R730
- Dell PowerEdge T630
- Dell PowerEdge R630
- Dell PowerEdge R530
- Dell PowerEdge T430
- Dell PowerEdge R430
- Dell PowerEdge M630 (for M1000e enclosure)
- Dell PowerEdge M630 (for VRTX enclosure)
- Dell PowerEdge FC630

## Supported physical disks

The PERC S130 controller supports the following physical disk type:

- SATA Hard Disk Drive (HDD)
- SATA Solid State Drive (SSD)

 **NOTE:** Mixing drives of different speeds (7,200 rpm, 10,000 rpm, or 15,000 rpm) and bandwidth (3 Gbps or 6 Gbps) while maintaining the same drive type (SATA) and technology (HDD or SSD), is supported.

## Management applications for the PERC S130

The management applications enable you to manage and configure the RAID system, create and manage multiple disk groups, control and monitor multiple RAID systems, and provide online maintenance. The management applications for PERC S130 include:

- BIOS Configuration Utility — is also known as **<Ctrl><R>**, is a storage management application that configures and maintains RAID disk groups and virtual disks. See [BIOS Configuration Utility](#).
- Unified Extensible Firmware Interface (UEFI) RAID Configuration Utility— The is a storage management application integrated into the System BIOS <F2>. See [UEFI RAID configuration utility](#).
- Dell OpenManage Storage Management—The Dell OpenManage Storage Management application enables you to perform controller and enclosure functions for all supported RAID controllers and enclosures from a single graphical or command-line interface, without using the controller BIOS utilities. For more information, see the *Dell OpenManage Storage Management User's Guide* at **dell.com/openmanagemanuals**.
- Lifecycle Controller— is another management application for PERC. For more information, see Lifecycle controller User's Guide at **dell.com/esmmanuals**.

# Physical Disks

 **NOTE:** The PERC S130 support HDD physical disks with a capacity of 2 TB or more.

 **NOTE:** The physical disks in a virtual disk must be of the same drive type (HDD or SSD). For example, you cannot mix a HDD and a SSD in the same virtual disk.

## Physical disk features

### Physical disk roaming

Physical disk roaming is moving the physical disks from one cable connection or backplane slot to another on the same controller. The controller automatically recognizes the relocated physical disks and logically places them in the virtual disks, which are part of the disk group. You can perform disk roaming only when the system is turned off.

 **CAUTION:** Do not attempt disk roaming during RAID level migration (RLM) or online capacity expansion (OCE). This causes loss of the virtual disk.

### Physical disk hot-swapping

 **NOTE:** To check if the backplane supports hot swapping, see the Owner's Manual of your system.

Hot swapping is the manual replacement of a disk while the PERC S130 is online and performing its 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 S130 to support hot swapping.
- The replacement disk must be of the same protocol and disk technology. For example, only a SATA hard drive can replace a SATA hard drive and only a SATA SSD can replace a SATA SSD.

 **NOTE:** When hot-swapping a physical disk, ensure that the new disk is of equal or greater capacity to the physical disk that is being replaced.

### Physical disk power management

Power management is a power-saving feature of the PERC S130. This feature supports power management of SATA hard drives (HDD) by using Extended Power Conditions (EPC). The EPC feature set provides the host with additional methods to control the power condition of a device.

### Physical disk failure detection

Physical disk failure is detected and controller automatically rebuilds a new physical disk assigned as a hot spare, which is inserted in the same slot.

## Mirror rebuilding

A RAID mirror configuration can be rebuilt after a new physical disk is inserted and the physical disk is designated as a hot spare.

 **NOTE:** The system does not have to be rebooted.

## Fault tolerance

The following fault tolerance features are available with the PERC S130:

- Physical disk failure detection (automatic).
- Virtual disk rebuild using hot spares (automatic, if the hot spare is configured for this functionality).
- Parity generation and checking (RAID 5 only).
- Hot-swap manual replacement of a physical disk without rebooting the system (only for systems with a backplane that allows hot-swapping).

If one side of a RAID 1 (mirror) fails, data can be rebuilt by using the physical disk on the other side of the mirror.

If a physical disk in RAID 5 fails, parity data exists on the remaining physical disks, which can be used to restore the data to a new, replacement physical disk configured as a hot spare.

If a physical disk fails in RAID 10, the virtual disk remains functional and data is read from the surviving mirrored physical disk(s). A single disk failure in each mirrored set can be sustained, depending on how the mirrored set fails.

## Self-monitoring and reporting technology

The Self-Monitoring and Reporting Technology (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](http://t10.org) and for detailed information on SATA interface specifications, see [t13.org](http://t13.org).

## Native command queuing

Native Command Queuing (NCQ) is a command protocol used by SATA physical disks, which are supported on the S130 controller. NCQ allows the host to provide multiple input/output requests to a disk simultaneously. The disk decides the order to process the commands to achieve maximum performance.

# Virtual Disks

A logical grouping of physical disks attached to a PERC S130 allows creating multiple virtual disks of the same RAID levels, without exceeding a maximum of ten virtual disks.

The PERC S130 controller allows:

- Creating virtual disks of different RAID levels on a S130 controller.
-  **NOTE:** Ensure that you do not mix RAID levels on the same physical disks.
- Building different virtual disks with different characteristics for different applications.

The PERC S130 controller does not allow:

- Creating a virtual disk from a mix of different type physical disks. For example, a RAID 10 virtual disk cannot be created from two SATA HDD physical disks and a SATA SSD physical disk. All of the physical disks must be of the same drive type (HDD or SSD).
- Selecting a physical disk as a dedicated hot spare if the physical disk is a different type from the physical disk of the virtual disks.

A virtual disk refers to data storage, which a controller creates using one or more physical disks.

-  **NOTE:** A virtual disk can be created from several physical disks, the operating system considers it a single disk.

The capacity of a virtual disk can be expanded online for any RAID level without rebooting the operating system.

## Virtual disk features

### TRIM for SSDs

TRIM allows an operating system to delete from the SSDs a block of data which is no longer considered in use. The TRIM command resolves Write Amplification issue for operating systems that have been supported. When an operating system deletes a file, the file is marked for deletion in the file system, but the contents on the disk are not actually erased. As a result, the SSDs do not know the LBA (Logical Block Addressing) file previously occupied that can be erased. With the introduction of TRIM, when a file is deleted, the operating system sends a TRIM command along with the LBAs that do not contain valid data.

-  **NOTE:** TRIM feature is supported on the pass-through SSDs only.

### To perform TRIM on the pass-through SSDs

1. Create a volume on a pass-through SSD drive.
2. In windows operating system, navigate to the **Defragmentation and Optimize Drive** tool.

3. Select the volume created on the pass-through SSD and click the **Optimize** button.  
The volume is trimmed.

## Disk initialization

For physical disks, initialization writes metadata to the physical disk so that the controller can use the physical disk.

## Background Array Scan

Verifies and rectifies correctable media errors on mirror, volume, or parity data for virtual disks. Background Array Scan (BAS) starts automatically after a virtual disk is created while in the operating system.

## Checkpointing

Allows different types of checkpointing (BGI, CC, and rebuild) to resume at the last point following a restart. After the system restarts, background checkpointing resumes at its most recent checkpoint.

The following are the three checkpoint features:

- Consistency Check (CC)
- Back Ground Initialization (BGI)
- Rebuild

### Consistency Check

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

By default, CC corrects mirror or parity inconsistencies. After the data is corrected, the data on the primary physical disk in a mirror set is assumed to be the correct data and is written to the secondary physical disk, mirror set.

CC reports data inconsistencies through an event notification. A CC cannot be user-initiated in the **BIOS Configuration Utility (<Ctrl><R>)**. However, CC can be initiated using Dell OpenManage Server Administrator Storage Management.

### Background Initialization

BGI of a redundant virtual disk creates the parity data that allows the virtual disk to maintain its redundant data and survive a physical disk failure. Similar to consistency check (CC), BGI helps the controller to identify and correct problems that might occur with the redundant data at a later time.



**CAUTION: Data is lost if a physical disk fails before the completion of a BGI.**

BGI allows a redundant virtual disk to be used immediately.



**NOTE:** Although a BGI is software-initiated at the **BIOS Configuration Utility (<Ctrl><R>)**, the PERC S130 drivers must be loaded before the BGI runs.

## Automatic virtual disk rebuild

Rebuilds a redundant virtual disk automatically when a failure is detected, if a hot spare is assigned for this capability.

## Virtual disk cache policies

Supports the following cache options:

- Read Ahead/Write Back
- No Read Ahead/Write Back
- Read Ahead/Write Through
- No Read Ahead/Write Through

The PERC S130 uses part of system memory for cache.

**Table 3. Read, Write, and Cache Policy for the PERC S130**

| Category                    | Supported by S130 controller |
|-----------------------------|------------------------------|
| Cache Settings              | Yes                          |
| Read Ahead/Write Back       | Yes                          |
| No Read Ahead/Write Back    | Yes                          |
| Read Ahead/Write Through    | Yes                          |
| No Read Ahead/Write Through | Yes                          |

 **NOTE:** The current default for Write-Cache mode enablement is **Write Through, No Read Ahead** (WT, NRA). To enable **Write Back** (WB), a UPS is recommended.

## Virtual disk migration

The PERC S130 supports automatic virtual disk migration from one PERC S130 to another.

 **CAUTION:** The virtual disk is lost if you perform a virtual disk migration during an Online Capacity Expansion (OCE)/Reconfigure.

 **NOTE:** Backup the virtual disk data before migrating virtual disks.

 **NOTE:** Ensure that all physical disks that are part of the virtual disk, are migrated. Virtual disks in optimal and degraded state are automatically migrated. A virtual disk in an offline state should not be migrated.

 **NOTE:** A bootable virtual disk cannot be migrated between dissimilar system models.

### Migrating a virtual disk

1. Turn-off the system that contains the source controller.
2. Turn-off the target system if the system does not support hot-insert of physical disks.
3. Move the appropriate physical disks from the source controller to the target controller in the target system.

Physical disks do not have to be inserted into the same slots in the target system.

4. If the target system was turned-off, turn-on the system.

 **CAUTION:** The BIOS Configuration Utility (<CTRL><R>) pauses, and prompts for action, for the degraded virtual disk(s), if a "pause if degraded" option is enabled in the BIOS Configuration Utility (<CTRL><R>).

 **CAUTION:** After the migration occurs, ensure that all of the physical disks have been migrated and are present in the appropriate virtual disks.

## Expanding virtual disk capacity

The capacity of a virtual disk can be expanded online by using the Online Capacity Expansion/Reconfigure (OCE/Reconfigure). OCE/Reconfigure is a process that allows you to add storage capacity to an existing virtual disk. In most cases additional storage capacity can be added without taking the system offline.

 **NOTE:** If an additional physical disk needs to be added and the system does not support hot-swapping, the system must be turned off.

OCE/Reconfigure enables you to increase the total storage capacity of a virtual disk by integrating unused storage with the virtual disk.

Data can be accessed while the physical disks are added (if a system has hotswap capability) and while data on the virtual disk is being redistributed.

For Volume, RAID 1, and RAID 10, OCE/Reconfigure expands the virtual disk by using the available space of the physical disks, which have been members of the virtual disk. For RAID 0 and RAID 5, additional capacity can be attained by adding physical disks to the virtual disk.

## Cabling the drives for S130

 **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 came with the product.

 **NOTE:** For information on removing and reinstalling system parts, see the PowerEdge Systems Owner's Manuals at [dell.com/poweredgemanuals](http://dell.com/poweredgemanuals).

This section provides details about the cabling information for the integrated PERC S130 controller. The S130 controller has two AHCI devices, which are embedded on the system board. The first AHCI device provides connectivity for the drives from port 0–3 and the second AHCI device provides connectivity for the drives from port 4–7.

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

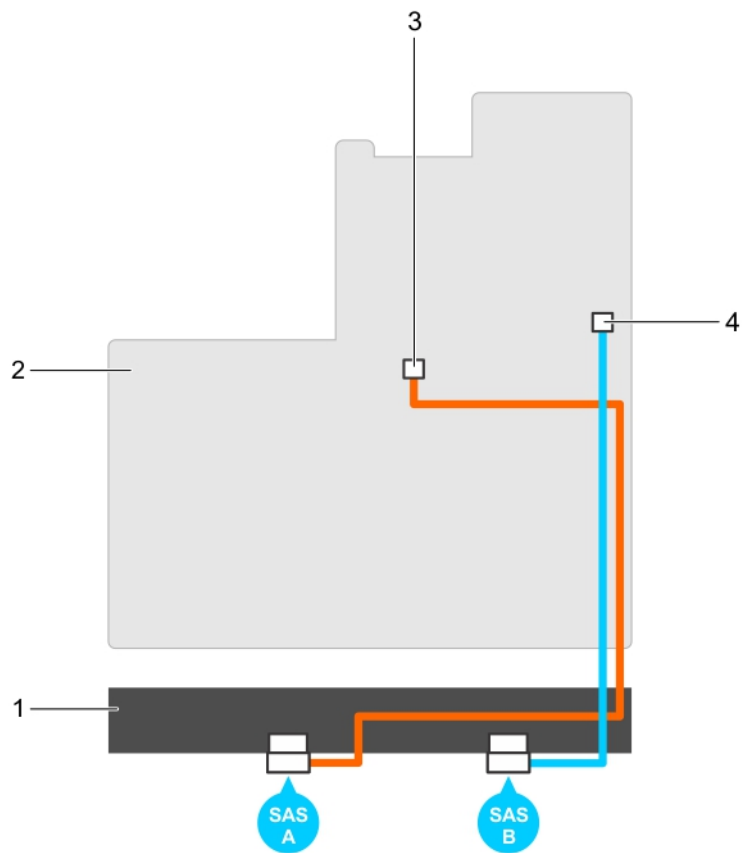
 **NOTE:** It is recommended that you always use a static mat and static strap while working on components in the interior of the system.

2. Remove the system cover.
3. Locate the connectors J\_SATA A and J\_SATA B on the system board.
4. Connect the J\_SATA A and J\_SATA B connectors on the AHCI devices to the corresponding cable connectors on the backplane using the SATA cables.

 **NOTE:** The first AHCI device provides connectivity to the drives available on port 0–3 and the second AHCI device provides connectivity to the drives available on port 4–7.

5. Install the system cover.
6. Turn on the system.

 **NOTE:** Ensure that you create boot LUN only on the hard-drives populated on port 0–3.



**Figure 1. Cabling the S130 controller**

- |                                                    |                                                   |
|----------------------------------------------------|---------------------------------------------------|
| 1. backplane                                       | 2. system board                                   |
| 3. connector on the first AHCI device ( J_SATA A ) | 4. connector on the second AHCI device (J_SATA B) |

## BIOS Configuration Utility

The **BIOS Configuration Utility**, also known as (<Ctrl><R>), is a storage management application integrated into the System BIOS <F2>, which configures and maintains RAID disk groups and virtual disks. The **BIOS Configuration Utility (<Ctrl><R>)** is independent of the operating system.

 **NOTE:** Use the BIOS Configuration Utility (<Ctrl><R>) for initial setup and disaster recovery. You can use advanced features through Dell OpenManage storage management applications.

The following sections provide information about using the **BIOS Configuration Utility (<Ctrl><R>)**. For more information, see the online help option by pressing <F1> in the **BIOS Configuration Utility (<Ctrl><R>)**.

The table below indicates the tasks that are supported or not supported by the PERC S130 at the **BIOS Configuration Utility (<Ctrl><R>)**.

**Table 4. BIOS Configuration Utility (<Ctrl><R>) Tasks**

| PERC S130 Tasks            | Supported by S130 |
|----------------------------|-------------------|
| Enable alarm               | No                |
| Disable alarm              | No                |
| Quiet alarm                | No                |
| Test alarm                 | No                |
| Set check consistency rate | No                |
| Rescan controller          | Yes               |
| Create virtual disk        | Yes               |

## Entering the BIOS Configuration Utility

1. Turn on the system.
2. While the system starts up, press <Ctrl><R> to boot to the BIOS configuration utility.



**CAUTION:** If SATA Controller is not set to RAID Mode, data might be destroyed. Ensure that you backup all data before changing modes.



**NOTE:** If the **BIOS Configuration Utility (<Ctrl><R>)** does not appear and your system uses a PERC S130, press <F2> to access the Dell system BIOS. At the **SATA Settings** field, ensure that SATA Controller is set to RAID Mode. If the settings are correct and the **BIOS Configuration Utility (<Ctrl><R>)** does not appear contact Dell support at [dell.com/support](http://dell.com/support).

 **NOTE:** The PERC S130 adapter supports Dell-supported SATA-based tape devices. With the S130 controller, system can boot to a tape device using an internal Dell RD1000 tape device. Once configured to boot to a tape device, press <Esc> or click Back at any browser screen until you return to the **System Setup Main Menu** and exit normally to continue to boot to a tape device. The RD1000 option goes to the end of the boot order listing, if <Ctrl><Alt><Del> is selected and you would not be able to boot to RD1000.

## Exiting the BIOS Configuration Utility

1. Press <Esc> at any menu screen.  
A dialog box is displayed to confirm your choice.
2. Select <C> to exit or press <Esc> to cancel.

## Initializing the physical disks

New physical disks must be converted to RAID Capable disks before they can be used. When you convert a disk to a RAID Capable one, the controller configuration information is written to the physical disk. Physical disks with the following statuses can be initialized:

- **Non-RAID** — A physical disk that was configured by a non-PERC S130.
- **Ready** — Contains no stored data but has PERC S130 configuration information.

 **NOTE:** Physical disks that are Online cannot be converted to Non-RAID or RAID Capable disks.

1. Enter the BIOS configuration utility. See [Entering the BIOS Configuration Utility](#).
2. In the **Main Menu** field use the arrow keys to select the **Initialize Physical Disk(s)** option.
3. Press <Enter>.  
The **Initializing the physical disk(s)** screen is displayed.

## Converting to RAID disks

1. Enter the configuration utility. See [Entering the BIOS Configuration Utility](#).
2. Use the arrow keys to select **Initializing the physical disks** menu and press <Enter>.
3. Select **Convert to RAID disk** and press <Enter>.
4. Press <C> to continue.
5. In the **Physical Disks** menu, use the arrow keys to move between the physical disks and press <Insert> to select the desired physical disk.
6. Press <Enter>.  
The selected physical disk is converted to RAID capable disks.

## Converting to Non-RAID disks

1. Enter the configuration utility. See [Entering the BIOS Configuration Utility](#).
2. Use the arrow keys to select **Initializing the physical disks** menu and press <Enter>.
3. Select **Convert to Non-RAID disk** and press <Enter>.

 **NOTE:** Create a boot virtual disk only from disk drives populated across slots 0-3 of the system. For slot information, see the Dell PowerEdge system Owner's manual at [dell.com/poweredgemanuals](http://dell.com/poweredgemanuals).

4. Press <C> to continue.
5. In the **Physical Disks** menu, use the arrow keys to move between the physical disks and press <Insert> to select the desired physical disk.
6. Press <Enter>.

The selected physical disk is converted to Non-RAID disks.

## Creating the virtual disks

1. Enter the **BIOS Configuration Utility**. See [Entering the BIOS Configuration Utility](#).
2. Select **Create Virtual Disks** from the **Main Menu** screen and press <Enter>.
 

 **NOTE:** Create boot virtual disk only from disk drives populated across slots 0-3 of the system.
3. In the **Physical Disks** field, select the physical disk(s) on which you want to create a virtual disk:
  - a. To select a physical disk, press <Insert>.
  - b. After selecting the physical disk(s) to be included in the virtual disk, press <Enter>.
4. In the **User Input** field, use the arrow keys to select a virtual disk type (RAID level) and press <Enter>.
5. Select a size for the virtual disk, depending on the available free space of the physical disks and press <Enter>.
6. In the **User Input** field, select a **Caching Mode**. Press <Enter>.
7. Press the <C> key to confirm that you want to create the virtual disk.

## Selecting virtual disk sizes while creating a virtual disk

To create a virtual disk size of < 2.199 TB:

1. Use the <Page Up> or <Page Down> keys to select a size displayed incrementally or use the up arrow or down arrow keys to select a size displayed decrementally.
2. Continue with [Creating the virtual disks](#).

To create a virtual disk size of > 2.199 TB:

1. Press the <Page Up> or the up arrow key to increase the virtual disk size.
2. At the maximum size, a dialog box is displayed in the **User Input** field. It inquires if you want to limit the size of the virtual disk or exceed the normal maximum size.
3. Press <Esc> to create a larger virtual disk.
4. Press the <Page Up> or the up arrow key, until the desired or maximum available size has been attained.
5. Continue with [Creating the virtual disks](#).

## Deleting the virtual disks

1. Enter the **BIOS Configuration Utility**. See [Entering the BIOS Configuration Utility](#).
2. In the **Main Menu** screen, select **Deleting Virtual Disk** using the arrow keys and press <Enter>.
3. Select each virtual disk in the **Virtual Disks** field that you want to delete. Press <Insert> to confirm each selection.
4. Press <Enter>.

 **CAUTION:** A dialog box is displayed, describing the consequences of deleting the selected virtual disk(s). Deleting a virtual disk permanently destroys all data that is on the virtual disk, as well as the virtual disk itself. This action cannot be undone.

5. Press <C> to confirm the deletion.

 **NOTE:** When a degraded or a failed virtual disk from one system is added to another system, and if the number of virtual disks exceeds the maximum limit of 10, you cannot delete the virtual disks that are in **Normal** or **Ready** state.

## Swapping two virtual disks

1. Enter the **BIOS Configuration Utility**. See [Entering the BIOS Configuration Utility](#).
2. In the **Main Menu** screen, select the **Swapping Two Virtual Disks** and press <Enter>.

 **NOTE:** While swapping boot virtual disks, ensure that the boot virtual disks are created from disk drives populated across slots 0-3 of the system. For slot information, see the system Owner's Manual.

3. Use the arrow keys to highlight a virtual disk at the **Virtual Disk** field. Press <Insert>.
4. Use the arrow keys to highlight another virtual disk. Press <Insert>.
5. Press <Enter> to swap the virtual disks.

 **NOTE:** Only two virtual disks can be swapped at a time.

 **NOTE:** When you create up to 10 virtual disks and swap the virtual disks using the **BIOS Configuration Utility**, the order of the virtual disk in option ROM (OPROM) appear different from the order of the virtual disk in operating system.

## Managing the hot spare disks

**Manage Hot Spare(s)** screen enables you to assign or unassign a global or dedicated hot spare(s).

1. Enter the BIOS Configuration Utility. See [Entering the BIOS Configuration Utility](#).
2. In the **Main Menu** screen, use the arrow keys to select **Manage Hot Spare(s)** and press <Enter>.

The **Manage Hot Spare(s)** screen display:

- global hot spare disks
- dedicated hot spare disks

### Assigning the global hot spare disks

Global hot spare disk is a backup physical disk that can be used by any redundant virtual disk. It is not assigned (dedicated) to any specific virtual disk. Virtual disks can typically be rebuilt by using a global spare disk, as long as the global hot spare is not already part of the virtual disk and has enough available capacity. Unlike a dedicated hot spare, a global hot spare can be assigned at anytime, even while tasks are running on virtual disks.

 **NOTE:** A hot spare can be created only if a physical disk is in **Ready** or **Normal** state, in the **Physical Disks** field. If the physical disk is in **Online** state, the disk is being used by a virtual disk and cannot be selected as a hot spare.

Perform the following procedure to assign a global hot spare disk:

1. Enter the **BIOS Configuration utility**. See [Entering the BIOS Configuration Utility](#).
2. In the **Main Menu** screen, select the **Manage Hot Spare** and press <Enter>.

3. Select **Assign Global Hot Spare(s)**. Press <Enter>.



**NOTE:** Assign global hot spare only from disk drives populated across slots 0-3 of the system. For slot information, see the Dell PowerEdge system Owner's Manual at [dell.com/poweredgemanuals](http://dell.com/poweredgemanuals).

4. Use the up or down arrow key to select a physical disk(s) to be used as a global hot spare(s). Press <Insert>.
5. Press <Enter> to add the global hot spare.
6. Press the <C> key to confirm the action.

## Assigning the dedicated hot spare disks

A dedicated hot spare is a backup physical disk for the redundant virtual disk to which it is assigned. The physical disk that is used as a dedicated hot spare cannot be a member of an existing virtual disk. When the hot spare is activated, it becomes the receptacle for the data from the failed physical disk member of the volume, without interrupting the system or requiring your intervention. A dedicated hot spare can be assigned to any redundant virtual disk, and up to four hot spares can be assigned to a virtual disk. A dedicated hot spare cannot be assigned while a task is running on the virtual disk.



**NOTE:** A virtual disk is marked **Failed** or **Degraded** if a physical disk reports a **Failed** state, or if the SAS/SATA cable to the physical disk or power cable is disconnected.



**NOTE:** If a virtual disk with an assigned dedicated hot spare is deleted, the dedicated hot spare is also deleted and the physical disk state changes to **Ready**.

Perform the following procedure to assign a dedicated hot spare disk:

1. Enter the **BIOS Configuration utility**. See [Entering the BIOS Configuration Utility](#).
2. In the **Main Menu** screen, select the **Manage Hot Spare** and press <Enter>.
3. Select **Assign Dedicated Hot Spare(s)**. Press <Enter>.



**NOTE:** Assign dedicated hot spare for boot virtual disk only from disk drives populated across slots 0-3 of the system. For slot information, see the system Owner's Manual at [dell.com/poweredgemanuals](http://dell.com/poweredgemanuals).

4. Use the up or down arrow key to select a physical disk(s) for use as a dedicated hot spare(s). Press <Insert>.
5. Use the up or down arrow key to select a physical disk(s) for use as a dedicated hot spare(s) and press <Insert>.
6. Press <Enter> to add the dedicated hot spare.
7. Press the <C> key to confirm the action.

## Unassign hot spare disks

1. Enter the **BIOS Configuration utility**. See [Entering the BIOS Configuration Utility](#).
2. In the **Main Menu** screen, select the **Manage Hot Spare** and press <Enter>.
3. Select **Unassign Hot Spare(s)**. Press <Enter>.
4. Use the up or down arrow key to select the physical disk(s) to delete as a hot spare(s).
5. Press <Insert>. To delete the hot spare, press <Enter>.
6. Press the <C> key to confirm the action.

## Viewing the physical disks details

1. Enter the **BIOS Configuration Utility**. See [Entering the BIOS Configuration Utility](#).
2. In the **Main Menu** screen, select **View Physical Disk Details** and press <Enter>.
3. Use the arrow keys to choose a physical disk.
4. The following details of the physical disks are displayed:
  - a. Physical disk number
  - b. Channel number
  - c. Physical disk size
  - d. Physical disk status: **Non-RAID/Ready/Online**
  - e. Amount of free space
  - f. Manufacturer and model number
  - g. World Wide Address
  - h. SATA Cache Policy (Enabled or Disabled)
  - i. S.M.A.R.T. State: Error (if a disk with a S.M.A.R.T. error is discovered)
5. Press <Esc> to return to the main window.

## Viewing the virtual disks details

1. Enter the **BIOS Configuration Utility**. See [Entering the BIOS Configuration Utility](#).
2. In the **Main Menu** screen, select **View Virtual Disk Details** and press <Enter>.
3. Use the arrow keys to choose a virtual disk.
4. The following details of the virtual disks are displayed:
  - a. Virtual disk number
  - b. RAID Level
  - c. Size
  - d. Status (**Read Ahead/Write Back, No Read Ahead/Write Back, Read Ahead/Write Through, No Read Ahead/Write Through**)
5. Press <Esc> to return to the main window.



**NOTE:** The **Physical Disks** field indicates the physical disks that are in the virtual disk, highlighted by green text.

## Rescanning the disks

The **Rescan Disks** option rescans all the channels, searches for new or removed physical disks, and re-reads the configuration information from each physical disk.



**NOTE:** Sometimes when a physical disk has failed, you can get it online through a rescan.

1. Enter the **BIOS Configuration Utility**. See [Entering the BIOS Configuration Utility](#).
2. In the **Main Menu** screen, use the arrows to select the **Rescan Disks**.
3. Press <Enter> to continue rescanning.

## Controller Options

The **Controller Options** feature helps you to enable the **BIOS Stop on Error** option. The boot process pauses when **Pause if...** is enabled and a virtual disk becomes **Degraded** or has **Failed**. Press <Enter> to continue booting.

View the error message on the window. If **Pause...** is **OFF**, the error message is displayed briefly, but the system continues to boot.

1. Enter the **BIOS Configuration Utility**. See [Entering the BIOS Configuration Utility](#).
2. In the **Main Menu** screen, use the arrows to select the **Controller Options**.
3. In the **Controller Options** field, use the up or down arrow keys to scroll to the desired controller option.
  - a. **Pause if Degraded**

When **ON**, the BIOS stops booting when a degraded virtual disk is found.

Press <Enter> to toggle between **ON** and **OFF**.
  - b. **Pause if Failed**

When **ON**, the BIOS stops booting when a failed virtual disk is found.

Press <Enter> to toggle between **ON** and **OFF**.
4. Press <Esc> to return to the main window.

## Continue to boot

1. Enter the **BIOS Configuration Utility**. See [Entering the BIOS Configuration Utility](#).
2. In the **Main Menu** screen, use the arrows to select the **Continue to Boot**.

The system restarts normally.

## UEFI RAID configuration utility

The UEFI (Unified Extensible Firmware Interface) RAID configuration utility is a storage management application integrated into the System BIOS <F2>. It is used to configure and manage RAID, virtual disks, and physical disks. This utility is independent of the operating system.

 **NOTE:** The following sections provide information about using the UEFI RAID configuration utility. For more information, see the online help option in the UEFI RAID configuration utility.

 **NOTE:** Use the UEFI RAID configuration utility for initial setup.

### Entering the DELL PERC S130 Configuration Utility

1. Turn on the system.
2. While the system starts up, press <F2> to enter **System Setup**.  
The list of menu items in the **System Setup Main Menu** screen is displayed.
3. Click **Device Settings**.  
**Device Settings** lists the NIC ports and all the options of the S130 configuration utility.  
To access the management menu for the controller, use the arrow keys or the mouse.
  -  **NOTE:** For more information on 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 UEFI RAID 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 supported in existing configuration.
4. Click **Dell S130 Configuration Utility**.  
Displays the list of **Configuration Options**:
  - **Controller Management** : allows you to configure, manage, and view the controller properties.
  - **Virtual Disk Management** : allows you to configure, manage, and view the virtual disk properties.
  - **Physical Disk Management** : allows you to configure, manage, view and perform varied operations on the physical disk properties.

### Exiting the DELL PERC S130 Configuration Utility

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

# Controller management

## Viewing the controller properties

**View Controller Information** screen allows you to view the controller properties and the firmware properties.

In the **System Setup Main Menu**, click **Device Settings** → **Dell PERC S130 Configuration Utility** → **Controller Management** → **View Controller Information**.

The table explains the **View Controller Information** screen details:

| Menu Item                  | Description                                                          |
|----------------------------|----------------------------------------------------------------------|
| <b>PCI ID</b>              | Displays the PCI ID.                                                 |
| <b>Physical disk Count</b> | Displays the total number of physical disks available on the system. |
| <b>Virtual Disk Count</b>  | Displays the total number of virtual disks available.                |
| <b>UEFI Driver Version</b> | Displays the UEFI driver version installed on the system.            |
| <b>Firmware Build Time</b> | Displays the time and date when you last updated the firmware.       |

## Changing the boot order of the virtual disks

**Set Bootable Device** allows you to change the boot order of the virtual disk.

1. Enter the **Dell PERC S130 Configuration Utility**. See [Entering the DELL PERC S130 Configuration Utility](#).

2. Click **Controller Management** → **Change Controller Properties**.



**NOTE:** While swapping boot virtual disks, ensure that the boot virtual disks are created from disk drives populated across slots 0-3 of the system. For slot information, see the Dell PowerEdge system Owner's manual at [dell.com/poweredgemanuals](http://dell.com/poweredgemanuals).

3. Click the link **Set Bootable Device**.

A **Change Order** dialog box displays the list of virtual disks available.

4. Use the arrow keys to set a virtual disk and + or – to change the order of the virtual disks that need to be booted first.
5. Click **Ok**.

The changes to the boot order of the virtual disks are displayed.

## Stopping the system from booting if there is a critical BIOS error

**Change Controller Properties** screen allows you to either enable or disable the option to stop the system from booting if there is any critical BIOS error, which requires manual intervention.

1. Enter the **Dell PERC S130 Configuration Utility**. See [Entering the DELL PERC S130 Configuration Utility](#).
2. Click **Controller Management** → **Change Controller Properties**.

 **NOTE:** While swapping boot virtual disks, ensure that the boot virtual disks are created from disk drives populated across slots 0-3 of the system. For slot information, see the Dell PowerEdge system Owner's manual at [dell.com/poweredgemanuals](http://dell.com/poweredgemanuals).

3. You can either enable or disable the **Enable BIOS Stop On Error**.

## Converting physical disk to Non-RAID disk

1. Enter the **Dell PERC S130 Configuration Utility**. See [Entering the DELL PERC S130 Configuration Utility](#).
2. Click **Controller Management** → **Convert to Non-RAID Disk**.

 **NOTE:** Create boot virtual disk only from disk drives populated across slots 0-3 of the system. For slot information, see the Dell PowerEdge system Owner's manual at [dell.com/poweredgemanuals](http://dell.com/poweredgemanuals).

3. Select **Select physical disks from slots other than slots 0-3**.
4. Select the physical disk and click **OK**.  
A screen is displayed asking if you are sure you want to perform the operation.
5. Click **Yes** to continue.

## Converting physical disk to RAID capable disk

1. Enter the **Dell PERC S130 Configuration Utility**. See [Entering the DELL PERC S130 Configuration Utility](#).
2. Click **Controller Management** → **Convert to RAID Capable Disk**.
3. Select the physical disk to convert to RAID capable disk.
4. Click **OK**.  
A screen is displayed asking if you are sure you want to perform the operation.
5. Click **Yes** to continue.

## Rescan the disks

1. Enter the **Dell PERC S130 Configuration Utility**. See [Entering the DELL PERC S130 Configuration Utility](#).
2. Click **Controller Management** → **Rescan Disks**.  
The **Rescan Disks** screen is displayed. It provides information about the latest physical disk and virtual disk configurations.

# Virtual disk management

## Creating the virtual disks

1. Enter the **Dell PERC S130 Configuration Utility**. See [Entering the DELL PERC S130 Configuration Utility](#).
2. Click **Virtual Disk Management** → **Create Virtual Disks**.
3. Click the link **Select the Physical Disk**.

 **NOTE:** Create boot virtual disk only from disk drives populated across slots 0-3 of the system.

4. Select media type and the physical disks.
5. Click **OK**.

A screen is displayed asking if you are sure you want to perform the operation.

6. Click **Yes** to continue.

## Viewing virtual disks properties and policies

**View Virtual Disk Properties** screen allows you to view the virtual disk properties and the policies.

In the **System Setup Main Menu**, click **Device Settings** → **Dell PERC S130 Configuration Utility** → **Virtual Disk Management** → **View Virtual Disk Properties**.

The table explains the **View Virtual Disk Properties** screen details:

| Menu Item                       | Description                                                                   |
|---------------------------------|-------------------------------------------------------------------------------|
| <b>Virtual Disk ID</b>          | Displays the virtual disk ID.                                                 |
| <b>RAID level</b>               | Displays the RAID level associated with the virtual disk.                     |
| <b>Virtual Disk Status</b>      | Displays the status of the virtual disk.                                      |
| <b>Read Cache Policy</b>        | Displays the read cache policies associated with the virtual disk             |
| <b>Write Cache Policy</b>       | Displays the write cache policies associated with the virtual disk            |
| <b>Associated Physical Disk</b> | Displays the physical disk which is associated with the specific virtual disk |

## Deleting the virtual disks

1. Enter the **Dell PERC S130 Configuration Utility**. See [Entering the DELL PERC S130 Configuration Utility](#).
2. Click **Virtual Disk Management** → **Select Virtual Disk Operations**.
3. Select a virtual disk that you want to delete from the drop-down menu.
4. Click the link **Delete Virtual Disks**.  
To continue, confirm the option that you selected.
5. Select **Confirm** and click **Yes** to continue.  
The selected virtual disk is deleted.

 **NOTE:** When a degraded or a failed virtual disk from one system is added to another system, and if the number of virtual disks exceeds the maximum limit of 10, you cannot delete the virtual disks that are in **Normal** or **Ready** state.

## Physical disk management

### Viewing physical disk properties

**View Physical Disk Properties** screen allows you to view the properties of physical disk and also provides details about the virtual disks associated with the physical disk.

In the **System Setup Main Menu**, click **Device Settings** → **Dell PERC S130 Configuration Utility** → **Physical Disk Management** → **View Physical Disk Properties**.

The table explains the **View Physical Disk Properties** screen details:

| Menu Item                                      | Description                                                                 |
|------------------------------------------------|-----------------------------------------------------------------------------|
| <b>Select Physical Disk</b>                    | Allows you to select the physical disks from the drop-down menu.            |
| <b>Physical Disk Properties</b>                | Displays information about the physical disk properties                     |
| <b>Physical disk ID</b>                        | Displays the ID of the physical disk.                                       |
| <b>State</b>                                   | Displays if it is a RAID capable disk or a Non-RAID disk.                   |
| <b>Size</b>                                    | Displays the total storage space of the physical disk.                      |
| <b>SMART status</b>                            | Displays if the SMART feature is enabled or disabled for the physical disk. |
| <b>Revision</b>                                | Displays the revision.                                                      |
| <b>Device Type</b>                             | Displays the device type.                                                   |
| <b>Certified</b>                               | Displays if the physical disk is Dell certified or not.                     |
| <b>Connector Port</b>                          | Displays the port number in which the physical disk is installed.           |
| <b>SAS Address</b>                             | Displays the SAS address                                                    |
| <b>Disk Cache Setting</b>                      | Displays if the disk cache is enabled or disabled.                          |
| <b>Available Space</b>                         | Displays the free space of the respective physical disk                     |
| <b>Used Space</b>                              | Displays the used space of the respective physical disk                     |
| <b>Disk Protocol</b>                           | Displays if the protocol of the physical disks.                             |
| <b>Negotiated Physical Disk Transfer speed</b> | Displays the speed at which the data is transferred.                        |
| <b>Associated Virtual Disks</b>                | Displays the virtual disk associated with the respective physical disk.     |
| <b>Dell Part Number</b>                        | Displays the part number of the physical disk.                              |
| <b>Serial Number of Disk</b>                   | Displays the serial number of the physical disk.                            |
| <b>Hardware Vendor</b>                         | Displays the information about the hardware vendor.                         |
| <b>Manufacturing Date</b>                      | Displays the manufacturing date of the physical disk.                       |

## Assigning the global hot spare

1. Enter the **Dell PERC S130 Configuration Utility**. See [Entering the DELL PERC S130 Configuration Utility](#).
2. Click **Physical Disk Management** → **Select Physical Disk Operations**.



**NOTE:** Assign global hot spare only from disk drives populated across slots 0-3 of the system. For slot information, see the Dell PowerEdge System Owner's Manual at [dell.com/poweredgemanuals](http://dell.com/poweredgemanuals).

3. Select the physical disk which is in the ready state from the drop-down menu.
4. Click the link **Assign Global Hot Spare**.

### **Unassign a global hot spare**

1. Enter the **Dell PERC S130 Configuration Utility**. See [Entering the DELL PERC S130 Configuration Utility](#).
2. Click **Physical Disk Management** → **Select Physical Disk Operations**.
3. Select a Global hot spare disk from the drop-down menu.
4. Click the link **Unassign Hot Spare**.

# Installing the drivers

The Dell PowerEdge RAID Controller (PERC) S130 requires software drivers to operate with the supported operating systems. Installing drivers for the PERC S130 are dependent on the type of the system and the operating system that you have.

 **NOTE:** To check operating system compatibility, see [dell.com/support/manuals](http://dell.com/support/manuals).

## Pre-installation requirements

Before you install the operating system:

- Read the Microsoft Getting Started document that is shipped with your Windows 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 [dell.com/support](http://dell.com/support).
- Create a device driver media (USB drive, CD, or DVD).

## Setting the SATA controller to RAID mode

1. Turn on the system.
2. When the **Dell Power-On Self-Test (POST)** screen is displayed, press <F2>.
3. When the **Dell PowerEdge System** window is displayed, scroll to **SATA Settings** and press <Enter>. In the sub-screen, confirm that the **SATA Controller** is set to a RAID mode.

 **NOTE:** If necessary, use the space bar to change the setting.

4. Press <Esc> to exit.
5. Press <Esc> again.

## Initializing the virtual disks

For more information about Initializing the virtual disks, see [Initializing the physical disks](#).

## Creating a virtual disk

For more information about creating a virtual disk, see [Creating the virtual disks](#).

## Checking PERC S130 options and the boot list priority.

1. At the **Virtual Disks** field, ensure the bootable virtual disk is the first virtual disk listed. If the bootable virtual disk is not the first virtual disk listed, see [Swapping two virtual disks](#).



**NOTE:** If Non-RAID virtual disks are used (and appear in the Virtual Disks list), the **Swap Two Virtual Disks** option is enabled only if the system contains a RAID Capable physical disk.

2. Select **Continue to Boot** and press <Enter>.

## Creating the device driver media for Windows driver installation

### Downloading drivers for PERC S130 from the Dell support website for all operating systems

1. Go to **dell.com/drivers**.
2. In the **Product Selection** section, enter the service tag of your system in the **Service Tag or Express Service Code** field.



**NOTE:** If you do not have the service tag, select **Automatically detect my Service Tag for me** to allow the system to automatically detect your service tag, or select **Choose from a list of all Dell products** to select your product from the **Product Selection** page.

3. Select the **Operating System**, **Category**, **Release Date**, and **Importance** from the respective drop-down lists.  
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 with the **Load Driver** option to load mass storage drivers. For more information on reinstalling the operating system, see the operating system document at **dell.com/operatingsystemmanuals**.

### Downloading drivers from the Dell Systems Service and Diagnostic Tools media for Windows

1. Insert the *Dell Systems Service and Diagnostics Tools* media in a system.  
The **Welcome to Dell Service and Diagnostic Utilities** screen is displayed.
2. Select your system model and operating system.  
For the list of supported operating systems, see [Supported operating systems](#).
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.  
Repeat this step for all the drivers you require.
7. During the operating system installation, use the media that you created with the **Load Driver** option to load mass storage drivers.  
For more information on reinstalling the operating system, see the relevant section for your operating system below.

## Installing the driver for Windows Server 2008 R2 or Windows Server 2012/2012 R2

1. Power on the system and boot to the Microsoft Windows Server CD.
2. Follow the instructions on the screen until you reach the **Where do you want to install Windows?** screen.
3. Insert the CD-ROM, DVD or USB flash drive that contains the driver files.
4. In the **Load Driver** sub-screen, click **Browse**.
5. Select the directory that has the controller driver files and click **OK**.
6. In the **Select the driver to be installed** window, select **Dell PERC S130** controller and click **Next** to load the driver files.
7. After the driver loads you return to the **Where do you want to install Windows?** screen, click **Next** to continue the installation procedure.

When the installation is complete, to configure the S130 controller, install the configuration driver (if necessary) used by Dell OpenManage (OMSA) component.



**NOTE:** While you install the Windows Server 2012 operating system, ensure that you install the hotfix update available at [support.microsoft.com/kb/2789962](http://support.microsoft.com/kb/2789962).

## Updating the existing driver for Windows Server 2008 or Windows Server 2012/2012 R2

1. Select **Start** → **Control Panel** → **System and Security** → **System**.  
The **View basic information about your computer** window is displayed.
2. Click the link **Device Manager**.  
The **Device Manager** screen is displayed.
3. Click **Storage controller** for updating **Dell PERC S130 Controller** and click **System devices** for updating **Dell PERC S130 Configuration Device**.
4. Double-click the RAID controller for which you want to update the driver.
5. Click the **Driver** tab and click **Update Driver**.  
The **Upgrade Device Driver Wizard** is displayed.
6. Insert the media (USB key/CD/DVD) containing the driver.
7. Click **Browse my computer for driver software** window.
8. Click **Let me pick from a list of device drivers on my computer**.
9. Click **Have Disk** button and browse to the appropriate location.
10. Select the appropriate RAID controller and click **Next**.  
The new driver(s) are uploaded.
11. Close all windows and restart your system for the changes to take effect.

# Troubleshooting your system

To get help with your Dell PowerEdge RAID Controller (PERC) S130, you can contact your Dell Technical Service representative or see [dell.com/support](http://dell.com/support).

## Unable to recover the crash dump file when the operating system fails

|                           |                                                                                                                                         |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Likely Cause:</b>      | If boot virtual disk is created on disks other than disks populated from port 0-3, you will not be able to recover the MEMORY.dmp file. |
| <b>Corrective Action:</b> | Ensure that the boot virtual disk is created on the disks populated from port 0-3.                                                      |

## System startup issues

To troubleshoot the system startup issues, perform the following:

### System does not boot

Check for the following causes when the system does not boot:

- Incorrect **Controller Mode** at the **System Setup**
- Incorrect **Boot Mode**, **Boot Sequence**, and/or **Boot Sequence Retry**
- Bootable virtual disk is in **Failed** State
- Incorrect **Boot Order** for a bootable virtual disk
- A Non-RAID Virtual Disk is no Longer in the First Position in the BIOS Configuration Utility (<Ctrl><R>) List After the System is Rebooted

### Controller mode is set incorrectly at System Setup

1. In the system startup, when the **Dell Power-On Self-Test (POST)** screen is displayed, press <F2> to enter the **Dell Inc. PowerEdge BIOS** screen.
2. Scroll to **SATA Settings**. Press <Enter> and ensure that the **SATA Controller** is set to RAID mode.



**NOTE:** While switching from **RAID Mode** to **ATA Mode** or **AHCI Mode**, there may be data loss.

## Boot mode, boot sequence, and/or boot sequence retry are set incorrectly

1. Turn on the system
2. When the Dell **POST** screen is displayed, press <F2> to enter the **Dell Inc. PowerEdge BIOS** screen.
3. Scroll to **Boot Settings**. Press <Enter> and ensure that **Boot Mode** is set to **BIOS**.
4. Scroll to **Boot Sequence**. Press <Enter> and ensure that **Hard drive C:** is the first device listed.
5. Scroll to **Boot Sequence Retry**. Ensure that the setting is **Enabled**.
6. Press <Esc> to exit and continue booting.



**NOTE:** If changes are made at the **Dell Inc. PowerEdge BIOS** screen, a dialog box is displayed and asks you to save your changes and then exit.

## Bootable virtual disk is in a failed state

1. Press <Ctrl><Alt><Del> to restart.
2. After the system restart, press <Ctrl><R>. Check the status of the bootable virtual disk at the **Virtual Disk** field, or by highlighting **View Virtual Disks Details** and pressing <Enter>.
3. Check for missing or offline physical disks.

## The boot order is incorrect for a bootable virtual disk

1. When prompted at system startup, press <Ctrl><R> to access the PERC BIOS Configuration Utility.
2. Check **Virtual Disks** and ensure that the bootable virtual disk is the first virtual disk listed.
3. If required, use the **Swap Two Virtual Disks** option to reposition the virtual disks.

## A Non-RAID virtual disk is no longer in the first position in the BIOS configuration utility (<Ctrl><R>) list after the system is rebooted



**NOTE:** When booting from a Non-RAID virtual disk, creating a virtual disk in Dell OpenManage Server Administrator changes the virtual disk order and displaces the bootable Non-RAID virtual disk from the first position. PERC S130 then attempts to boot from the first virtual disk.



**NOTE:** A Non-RAID virtual disk can be created from Non-RAID physical disks (which are physical disks initialized by a controller other than the PERC S130).

1. When prompted at system startup, press <Ctrl><R> to access the BIOS Configuration.
2. Check Virtual Disks and determine if the bootable Non-RAID virtual disk is no longer in the first position.
3. Use the **Swap Two Virtual Disks** option to swap the virtual disks and place the bootable Non-RAID virtual disk in the first position of the **Virtual Disks** field.

## The BIOS configuration utility (<Ctrl><R>) option does not display

The **BIOS Configuration Utility (<Ctrl><R>)** option does not display if the PERC S130 mode is set incorrectly in the system BIOS. For correct **SATA Setting**, see [Controller mode is set incorrectly at System Setup](#).

## Warning Message

The **Dell Inc. PERC S130 Controller BIOS** screen is one of the first screens to appear during your system's boot sequence. If the system's virtual disks were in **Normal** or **Ready** status before a system boot, the boot sequence continues normally to the Microsoft Windows Server 2008 operating system. But, if a virtual disk is in **Degraded** or **Failed** status, or if specific options in the **Controller Options** field were changed previously at the **BIOS Configuration Utility (<Ctrl><R>)**, the following warning messages appear during the boot sequence.

### WARNING: Found virtual disks that are degraded

This warning message is displayed when at least one virtual disk is in a **Degraded** state and **Pause if Degraded** is set to **ON** at the **BIOS Configuration Utility (<Ctrl><R>)**.

The following message is displayed after the warning is displayed: --- Press <Enter> to continue, or <CTRL><R> to enter setup ---

Press <Enter> to allow the operating system to continue with the boot sequence, or press <Ctrl><R> to enter into the **BIOS Configuration Utility (<Ctrl><R>)** to investigate the cause of the **Degraded** virtual disk.

To investigate the cause, check for the following:

- Whether a physical disk in the virtual disk has failed or has gone offline. Check the status at the **Physical Disks** field. A **Degraded** status depends on the RAID level of the virtual disk and the number of physical disks that have failed:
  - For a virtual disk at RAID 1 or RAID 5, a single physical disk failure causes a **Degraded** status.
  - For a virtual disk at RAID 10, the failure of a physical disk in each of the mirror sets creates a **Degraded** status for the RAID 10. The failure of two physical disks in the same mirror set creates a **Failed** status for the RAID 10.
- Whether the controller has failed due to a firmware failure or a component failure. A failed controller causes a virtual disk not to boot.

For the virtual disk to recover from **Degraded** status, the failed physical disk must be replaced and the virtual disk must be rebuilt using Dell OpenManage Server Administrator Storage Management. When the rebuild operation is completed, the virtual disk status changes from **Degraded** to **Ready**. For a description of the rebuild function, see Storage Management at [dell.com/support/manuals](http://dell.com/support/manuals).

### WARNING: Found virtual disks that are failed

This warning message is displayed when at least one virtual disk is in a **Failed** state and **Pause if Failed** is set to **ON** at the **BIOS Configuration Utility (<Ctrl><R>)**.

The following message is displayed after the warning is displayed: --- Press <Enter> to continue, or <Ctrl><R> to enter setup ---

Press <Enter> to allow the operating system to continue its boot, or press <Ctrl><R> to enter into the **BIOS Configuration Utility (<Ctrl><R>)** to investigate the cause of the **Failed** virtual disk.

 **NOTE:** A boot virtual disk that is in a **Failed** state prevents the operating system from booting.

To investigate the cause, check for the following:

- Determine if a single or multiple physical disks in a non-redundant virtual disk have failed. If **yes**, data is lost. Recover the lost data from a backup storage source.
- Determine if two or more physical disks in a redundant virtual disk have failed. If **yes**, data is lost. Recover the lost data from a backup storage source.

 **NOTE:** For a RAID 10, if a single physical disk fails in each mirrored set, the redundant virtual disk goes to a **Degraded** status but data is not lost. If two physical disks fail in one of the mirrored sets, the redundant virtual disk goes to a **Failed** status and data is lost.

## **WARNING: Found virtual disks that are degraded and failed**

This warning message is displayed when multiple virtual disks are in **Degraded** and **Failed** state and **Pause if Degraded** or **Pause if Failed** are set to **ON** at the **BIOS Configuration Utility (<Ctrl><R>)**.

The following message is displayed after the warning is displayed: --- Press <Enter> to continue, or <Ctrl><R> to enter setup ---

Press <Enter> to allow the operating system to continue its boot, or press <Ctrl><R> to enter into the **BIOS Configuration Utility (<Ctrl><R>)** to investigate the cause of the **Degraded** and **Failed** virtual disks.

 **NOTE:** A boot virtual disk that is in a **Failed** state prevents the operating system from booting.

To investigate the cause, check for the following:

- Whether the virtual disk is in **Degraded** status because one of the physical disks of a RAID 1 or RAID 5 virtual disk has failed, or one of the physical disks of a RAID 10 virtual disk has failed. Press <Ctrl><R> and verify if the physical disks are offline or missing. Remove and replace a failed physical disk. A second physical disk failure could cause a **Degraded** virtual disk to change to **Failed** status.
- Whether the virtual disk is in a **Failed** status because one or more of the physical disks have failed. Press <Ctrl><R> and verify if the physical disks are offline or missing. Remove and replace the failed physical disk or disks.

## **Other errors appearing on the BIOS screen**

### **S130 does not display greater than ten virtual disks in the BIOS Configuration Utility (<CTRL><R>)**

**Likely Cause:** The function is not supported.

**Corrective Action:** Remove all physical disks except for the last one(s) added. Then proceed with deleting the virtual disks that are not needed. Remember to take account of the virtual disks that are currently being used.

## Unable to delete virtual disks when there are more than ten virtual disks present in the system

|                           |                                                                                                                                                                                                            |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Likely cause:</b>      | The function is not supported.                                                                                                                                                                             |
| <b>Corrective Action:</b> | Remove all physical disks except for the last one(s) added. Then proceed with deleting the virtual disks that are not needed. Remember to take account of the virtual disks that are currently being used. |

## Virtual disk rebuild status in the BIOS Configuration Utility (<CTRL><R>)

|                           |                                                                                                                        |
|---------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Likely Cause:</b>      | Rebuild is not supported in the <b>BIOS Configuration Utility (&lt;CTRL&gt;&lt;R&gt;)</b> .                            |
| <b>Corrective Action:</b> | Boot to a supported operating system. Rebuild starts. To view rebuild status, install a supported storage application. |

## Virtual disks - Related errors

### Cannot create a virtual disk

If you are unable to create a virtual disk, check the following causes:

1. [The physical disk is not displayed.](#)
2. [Insufficient free space available on the selected physical disks.](#)
3. [Incorrect number of physical disks selected for the desired RAID level.](#)
4. [The desired physical disk is unavailable.](#)
5. [The system already has a maximum of eight virtual disks.](#)

### The physical disk is not displayed

This error might be because:

1. The controller cannot communicate with the physical disks.
2. A cable might be loose or defective.
3. The physical disk might be a SAS drive.  
Re-seat the physical disks in the backplane and check their cables.

### Insufficient free space available on the selected physical disks

There must be sufficient available free space on the physical disk(s) used by the virtual disk.

### Incorrect number of physical disks selected for the desired RAID level

For details about RAID levels and the allowable number of physical disks used with each RAID level, see understanding RAID levels in *RAID Technology Guide* at [dell.com/support/manuals](http://dell.com/support/manuals).

### The desired physical disk is unavailable

Determine whether the physical disk:

1. Is a dedicated hot spare and unavailable for use in another virtual disk.
2. Is full or has insufficient available capacity.

### The system already has a maximum of eight virtual disks

Delete unused virtual disks.



**CAUTION:** Deleting a virtual disk destroys all data on the virtual disk.

### A virtual disk is in a failed state

If the virtual disk is in a failed state, check the following causes in the listed order:

1. [The virtual disk has lost one or more physical disks.](#)
2. [A physical disk in the virtual disk has failed or has been removed.](#)
3. [The virtual disk has lost the maximum allowable physical disks per RAID level.](#)

### The virtual disk has lost one or more physical disks

Replace the failed physical disk(s) and restore the data from a backup storage source.

### A physical disk in the virtual disk has failed or has been removed

1. Re-install the original physical disk if it was inadvertently removed. Perform a **Rescan**.
2. Check the status of the physical disks in the virtual disk. Replace any failed disk(s), if necessary. Restore the data from a backup storage source.  
After any change, perform a rescan to verify if the disk is still in a **Failed** state.

### The virtual disk has lost the maximum allowable physical disks per RAID level

One or more physical disks have failed:

1. If the virtual disk is non-redundant, the failure of a single physical disk can cause the virtual disk to fail.
2. If the virtual disk is redundant, two or more physical disks have failed and the virtual disk cannot be rebuilt.  
Create a new virtual disk. Restore the data from a backup storage source.

### A virtual disk is in a degraded state

If the virtual disk is in a degraded state, check the following causes:

1. [A physical disk was removed.](#)
2. [Physical or mechanical problems with the physical disk.](#)
3. [The virtual disk has lost redundancy.](#)
4. [Corrupted metadata in the virtual disk.](#)

### **A physical disk was removed**

1. Install the original physical disk, if it was inadvertently removed, or replace it with a new or used physical disk.
2. Initialize a new physical disk. Perform a **Rescan** for all physical disks that are replaced.
3. If the physical disk was not removed, check that its cables are correctly installed.

### **Physical or mechanical problems with the physical disk**

1. Check if the physical disk in the virtual disk has failed.
2. If a physical disk was recently removed and replaced, check that it is correctly positioned in the backplane. Check the cable connections at the physical disk and at the system board. Perform a **Rescan**.

### **The virtual disk has lost redundancy**

1. One or more physical disks in the virtual disk have failed. Due to the failed physical disk or disks, the virtual disk is no longer maintaining redundant (mirrored or parity) data. The failure of an additional physical disk results in lost data.
2. Replace the physical disk or disks. Rebuild the physical disk using Storage Management. See the applicable **Storage Management** screen at [dell.com/support/manuals](http://dell.com/support/manuals).

### **Corrupted metadata in the virtual disk**

1. Delete the virtual disk that has the failed metadata.
2. Assign the physical disk as a hot spare to rebuild a redundant virtual disk.
3. To create a non-redundant virtual disk, delete and rebuilt the data on a virtual disk, and restore the data from a backup storage source.

### **Cannot assign a dedicated hot spare to a virtual disk**

If you cannot assign a dedicated hot spare to a virtual disk, check the following causes:

1. [The RAID level does not allow a dedicated hot spare to be created.](#)
2. [The designated physical disk does not have sufficient capacity to be a dedicated hot spare.](#)
3. [The physical disk is already part of a virtual disk.](#)
4. [The physical disk are of different types.](#)

### **The RAID level does not allow a dedicated hot spare to be created**

Hot spares cannot be created for Volume or RAID 0 virtual disks.

### **The designated physical disk does not have sufficient capacity to be a dedicated hot spare**

The capacity of the physical disk selected to be a dedicated hot spare must be equal to or larger than the capacity of the smallest physical disk in the virtual disk. For example, if the physical disk selected for a dedicated hot spare is 160 GB, and the physical disks in the virtual disk are 80 GB, 160 GB, and 500 GB, a dedicated hot spare can be assigned. That is because the physical disk selected for the dedicated hot spare is larger than the smallest (80 GB) physical disk in the virtual disk.

### The physical disk is already part of a virtual disk

A dedicated hot spare cannot be assigned to another virtual disk.

### The physical disk are of different types

The physical disk used as a dedicated hot spare must be the same type as the physical disks that are already part of the virtual disk. For example, if a virtual disk consists of SATA-II physical disks, the dedicated hot spare must be a SATA-II physical disk.

### Cannot create a global hot spare

If you cannot create a global hot spare, check the following causes:

1. [There are no empty physical disks available or the physical disks have not been converted to RAID capable disks.](#)
2. [The physical disk is already part of a virtual disk.](#)
3. [The physical disk assigned as the global hot spare has failed.](#)
4. [The physical disk assigned as the global hot spare is missing.](#)

### There are no empty physical disks available or the physical disks have not been converted to RAID capable disks

Install additional physical disks and convert them to RAID Capable disks. If existing physical disks are **Non-RAID** they need to be converted to RAID Capable disks.



**WARNING:** When a physical disk is converted to RAID Capable disks, all data on the physical disk is lost.



**NOTE:** A physical disk with a **Non-RAID** status can be converted to RAID Capable disks, if desired, but it is no longer **Non-RAID** (Converting to RAID Capable disk adds PERC S130 configuration information to the physical disk).

### The physical disk is already part of a virtual disk

A hot spare cannot be selected if it is already part of an existing virtual disk.

### The physical disk assigned as the global hot spare has failed

When prompted at system startup, press <Ctrl><R> to access the **BIOS Configuration Utility (<Ctrl><R>)**. In the **BIOS Configuration Utility (<Ctrl><R>)**, select **View Virtual Disk Details** and press <Enter>. Determine whether the physical disk that is designated as the global hot spare has a status of **Failed**.

1. Check to see if the physical disk is malfunctioning or is physically disconnected.
2. Select another physical disk as the global hot spare.

### The physical disk assigned as the global hot spare is missing

- Check to see if the physical disk was removed from the backplane or cable connection, or whether the cables from the controller to the physical disk are disconnected or faulty.
- Perform a rescan to verify that the physical disk is still missing.

## Physical disk - related errors

### The physical disk fails

If the physical disk fails, check the following causes:

- [A physical disk is not visible in the BIOS Configuration Utility <Ctrl><R> or is offline.](#)
- [A physical disk is highlighted red at the BIOS Configuration Utility <Ctrl><R>.](#)

#### A physical disk is not visible in the BIOS Configuration Utility <Ctrl><R> or is offline

1. Check that the cables are properly connected.
2. Check that the physical disk is installed properly in the system's backplane.
3. Check the system's backplane for damage.
4. Reinstall the physical disk and ensure that it is seated correctly in the system's backplane.
5. Check if the Physical Disk might be a SAS drive.
6. Perform a Rescan, to perform either of the following:
  - a. Update the status of storage devices attached to the controller.
  - b. Fix an error caused by deleting or initializing a virtual disk.

#### A physical disk is highlighted red at the BIOS Configuration Utility <Ctrl><R>

1. Replace the physical disk. Depending on the RAID level of the virtual disk, data might be lost.
2. Perform a **rescan** to confirm that the new disk was discovered.

### A dedicated hot spare fails

If a dedicated hot spare fails, check the following causes:

1. [The controller cannot communicate with the hot spare.](#)
2. [The dedicated spare is not visible in the BIOS Configuration Utility <Ctrl><R> or is offline.](#)

#### The controller cannot communicate with the hot spare

1. Check that the cable from the controller to the physical disk is connected properly.
2. Ensure that the physical disk is still assigned as a global or dedicated hot spare.
3. Check if the physical disk assigned as the hot spare has failed.

#### The dedicated spare is not visible in the BIOS Configuration Utility <Ctrl><R> or is offline

1. Check if the physical disk has been removed or has failed.
2. Check for a loose or bad cable.

### Failed or degraded virtual disk

The removal of one physical disk from a virtual disk causes:

1. A Volume or RAID 0 virtual disk to change to **Failed** status.
2. A RAID 1 and RAID 5 virtual disk to change to **Degraded** status.
3. A RAID 10 virtual disk to change to **Degraded** status (when a physical disk is removed from one of the mirrored sets).

Re-insert the removed physical disk and perform a Rescan of the virtual disk.

### **Cannot initialize a physical disk**

Check whether or not the physical disk is:

1. Already a member of a virtual disk.
2. Currently a global or dedicated hot spare.
3. Reporting an **Offline** state.

Only physical disks that are **Ready** state can be initialized.

### **Cannot create a virtual disk on selected physical disks**

Check whether these physical/virtual disks were migrated from a legacy controller with mixed RAID levels. If so, creating additional virtual disk(s) on these physical disk(s) is not allowed.

### **Cannot perform an Online Capacity Expansion / Reconfigure on a virtual disk**

Check whether these physical/virtual disks were migrated from a legacy controller with mixed RAID levels. If so, Online Capacity Expansion / Reconfigure by adding physical disk on such a set of physical disks is not allowed.

### **Status LED is not working**

Ensure system is booted to the operating system. Install **Dell Open Manage Server Administrator** management utility version 7.0 (or higher).

## Getting help

You can get help with your Dell product by contacting Dell, or send feedback on product documentation.

### Contacting Dell

 **NOTE:** If you do not have an active Internet connection, you can find the contact information on your purchase invoice, packing slip, bill, or Dell product catalog.

Dell provides several online and telephone-based support and service options. Availability varies by country and product, and some services may not be available in your area. To contact Dell for sales, technical support, or customer service issues:

Go to **dell.com/contactdell**.

### Locating your system service tag

Your system is identified by a unique Express Service Code and Service Tag number. The Express Service Code and Service Tag are found on the front of a physical DR Series system by pulling out the information tag. This can also be found on the support tab in the GUI. This information is used by Dell to route support calls to the appropriate personnel.

### Related Documentation

 **NOTE:** For all storage controllers and PCIe SSD documents, go to **dell.com/storagecontrollermanuals**.

 **NOTE:** For all Dell OpenManage documents, go to **dell.com/openmanagemanuals**.

 **NOTE:** For all operating system documents, go to **dell.com/operatingsystemmanuals**.

 **NOTE:** For all PowerEdge documentation, go to **dell.com/poweredgemanuals**.

 **NOTE:** For all PowerVault documentation, go to **dell.com/powervaultmanuals**.

Your product documentation includes, *Dell PowerEdge RAID Controller (PERC) S130 User's Guide*. The User's Guide discusses features, installation, management, and troubleshooting of the PERC S130 controller.

### Documentation feedback

If you have feedback for this document, write to **documentation\_feedback@dell.com**. Alternatively, you can click on the **Feedback** link in any of the Dell documentation pages, fill out the form, and click **Submit** to send your feedback.