RocketRAID 4520/4522 Series
User Manual

April 9th , 2020
Revision 1.5
HighPoint Technologies, Inc.

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Notice

Reasonable effort has been made to ensure that the information in this manual is accurate. HighPoint assumes no liability for technical inaccuracies, typographical, or other errors contained herein.

FCC Part 15 Class B Radio Frequency Interference statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

European Union Compliance Statement

This Information Technologies Equipment has been tested and found to comply with the following European directives:

- European Standard EN55022 (1998) Class B
- European Standard EN55024 (1998)

Table of Contents

Product Specifications

RocketRAID 4522 Technical Specifications	
I/O Processor	6Gb/s RAID-on-Chip
Cache Memory	512MB DDR3 Cache memory with ECC protection
Battery Backup Unit	Optional Battery Backup Module (HPTBBU-05)
Data Transfer Rate	Up to 6Gb/s per port
Number of Device Ports	8 6Gb/s SAS & SATA ports
Host Bus Interface	PCI Express 2.0 x8
Device Connector Type	Dual Mini-SAS Connectors
Onboard Indicators / Monitor	Alarm Buzzer
Device Supported	8 6Gb/s SAS & SATA drives
Backward Compatibility	Backward Compatible with HighPoint RAID HBA
Physical Form Factor	Low Profile
Dimensions	6.57” L x 2.68” H x 0.06” W
RAID Feature Suite	
RAID 0, 1, 5, 6 , 1/0, 5/0, JBOD	
Redundant RAID Configuration for Array availability	
RAID Initialization Types	
Background, Foreground and Quick	
Native Command Queuing (NCQ)	
Staggered Drive Spin Up	
Spin Down Idle Disk	
Enhanced data protection with Write Journaling feature	
NVRAM keeps tracks I/O transaction logs	
S.M.A.R.T Support	
Bootable RAID Array Support	
Auto Rebuild on spare drive	
Hot-Plug and Hot-Swap support	
Larger than 3 TB drive support	
Write Back or Write Through Cache support	
DV Mode Performance Assurance Technology	
Supports OCE / ORLM	
4Kn Drive Compatible	
Configuration Management Suites:	User friendly Browser-based Management Interface Easy to use BIOS configuration Tool Linux Command Line Interface (CLI) – Scriptable configuration tool
Monitoring and Management Support:	SMTP, SES2, Event Log, SGPIO*, LED Status*. (* = RR4520 only)
Operating System Support:	Windows 10 / Windows Server 2016, Major Linux Distributions (RHEL, CentOS, SLES, Fedora, Ubuntu and Linux Open Source Drivers), FreeBSD, Mac OS X 10.6.x and later
Operating Temperature:	Work Temp: $+5°C \sim +55°C$. Storage Temp: $-20°C \sim +80°C$ Relative Humidity: 5% ~ 60% non condensing.
Operating Voltage:	12 V / 3.3 V, Power: 11W
MTBF (Mean Time Before Failure):	920,585 Hours

Certification Approval:	FCC, CE

RocketRAID 4520/4522 Overview

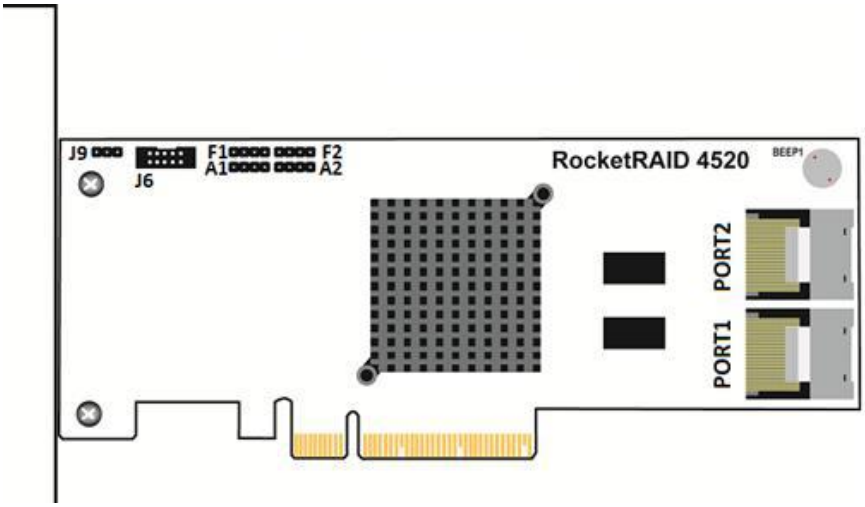


Figure 1. RocketRAID 4520

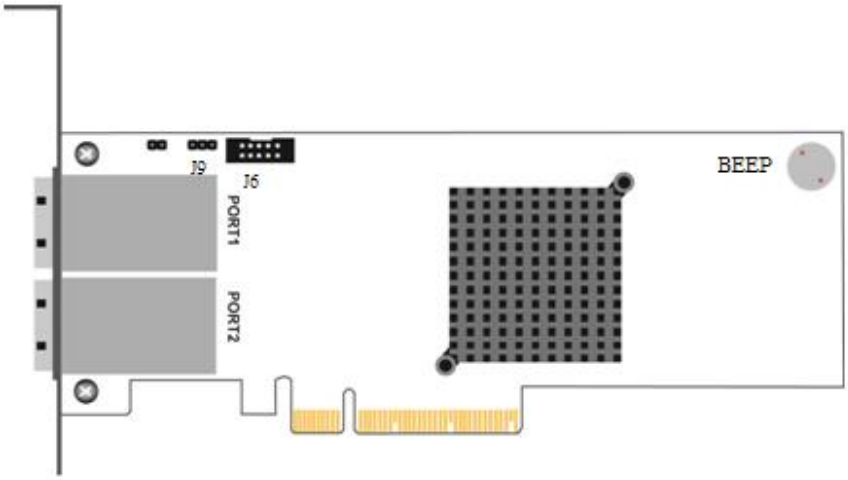


Figure 2. RocketRAID 4522

RocketRAID 4522 Key	
PORT1	mini-SAS (SFF-8088) Connection Corresponds to channel 1-4
PORT2	mini-SAS (SFF-8088) Connection Corresponds to channel 5-8
BEEP	Alarm/Beeper

J9	I^2C Bus PIN 1 is denoted by a square. PIN 2 and PIN 3 are to the right of PIN 1. **PIN 1** SCL **PIN 2** GND **PIN 3** SDA
J6	Battery Backup Unit (BBU) Connector
A1, A2 (RR4520)	Active LED pin
F1, F2 (RR4520)	Fail LED pin

What's in the Box

Make sure the following items are included in your purchase:

- RR4522 Host Bus Adapter (S/N sticker located on RocketRAID card)
- Driver CD
- Low profile bracket
- Quick Installation Guide

Note: Cables and Battery Backup Unit (BBU) are sold separately.

Getting Started

Thank you for purchasing HighPoint Technologies RocketRAID 4522. You are only a few steps away from utilizing RAID storage using the industry's most affordable hardware RAID solution.

To start using your RocketRAID 4522 take the following steps:

1. Setting up the Hardware (pg. 8)
2. Install/Update drivers (pg. 9)
3. Install HighPoint RAID Management (WebGUI) (pg. 15)
4. Create RAID Arrays (pg. 20)
5. Initialize and format RAID Volumes (pg. 30)

Step 1: Setting Up the Hardware

Ensure all items listed under Kit Contents are included in your package. For any discrepancy contact your reseller or submit a support ticket online at www.highpoint-tech.com/websupport.

Preparing the RocketRAID HBA (Host Bus Adapter)

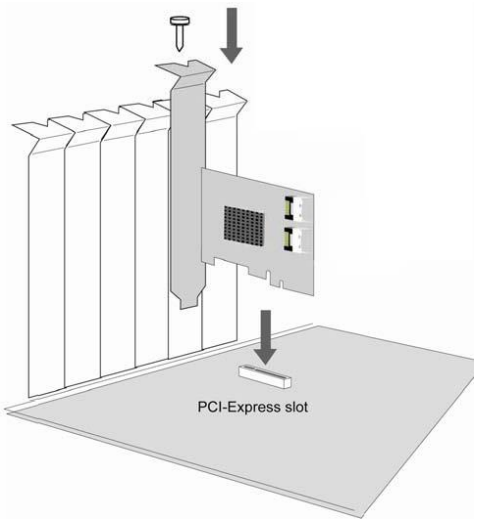
The following instructions describe how to prepare your RocketRAID4522 HBA for use.

To install your RocketRAID4522:

Important: Before installing the RocketRAID4522 Controller, ensure that your system is powered OFF.

1. Locate a PCI Express 2.0 x8 slot (or compatible slot) on your PC or Mac Pro (old version) motherboard.
    - **Note 1**: Refer to your PC or Mac Pro manual for instructions on how to access your motherboard.
    - **Note 2**: Refer to your motherboard manual for instructions on how to locate your PCI Express slot.
2. Align the RocketRAID4522 with the PCI Express slot and push straight down until the card is fully seated.
3. Tighten the connection by fastening the RocketRAID bracket and enclosure together with a screw.
4. Power on system and continue to Step 2: Install/Update Drivers

A PCI Express 2.0 x8 card is compatible with PCI Express 2.0 x16 and PCI Express 3.0 x16 slots. The following diagram shows how to install HBA to a PCIe slow on motherboards.



Step 2: Install/Update Drivers

Installing drivers on a Bootable RAID Array

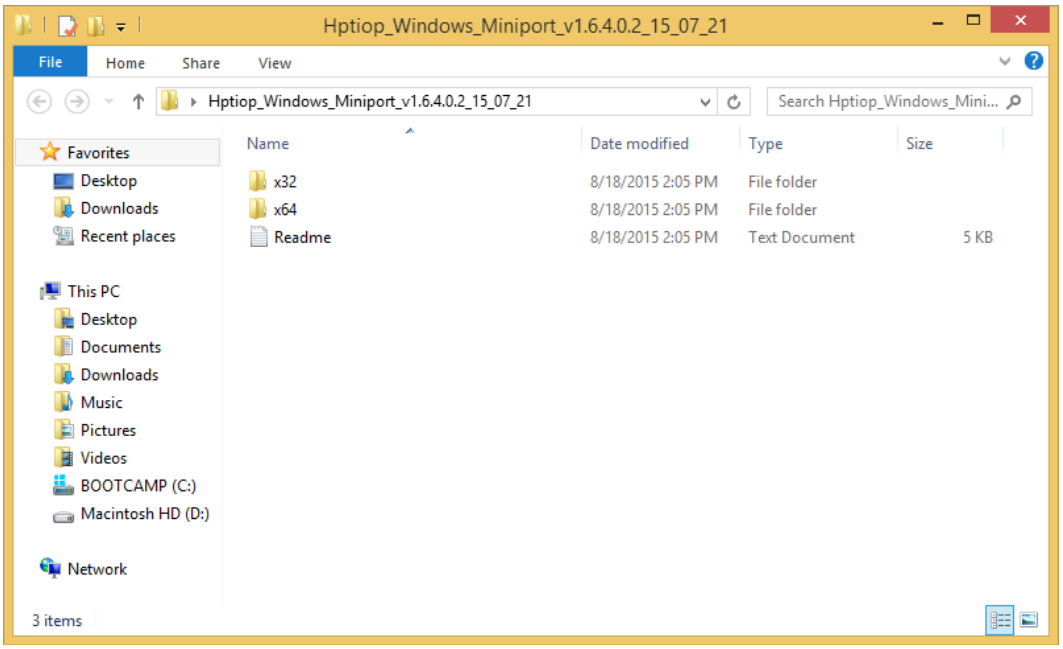
For instructions on how to install drivers during Windows OS installation refer to pg. 50.

Installing Drivers on an Existing Operating System

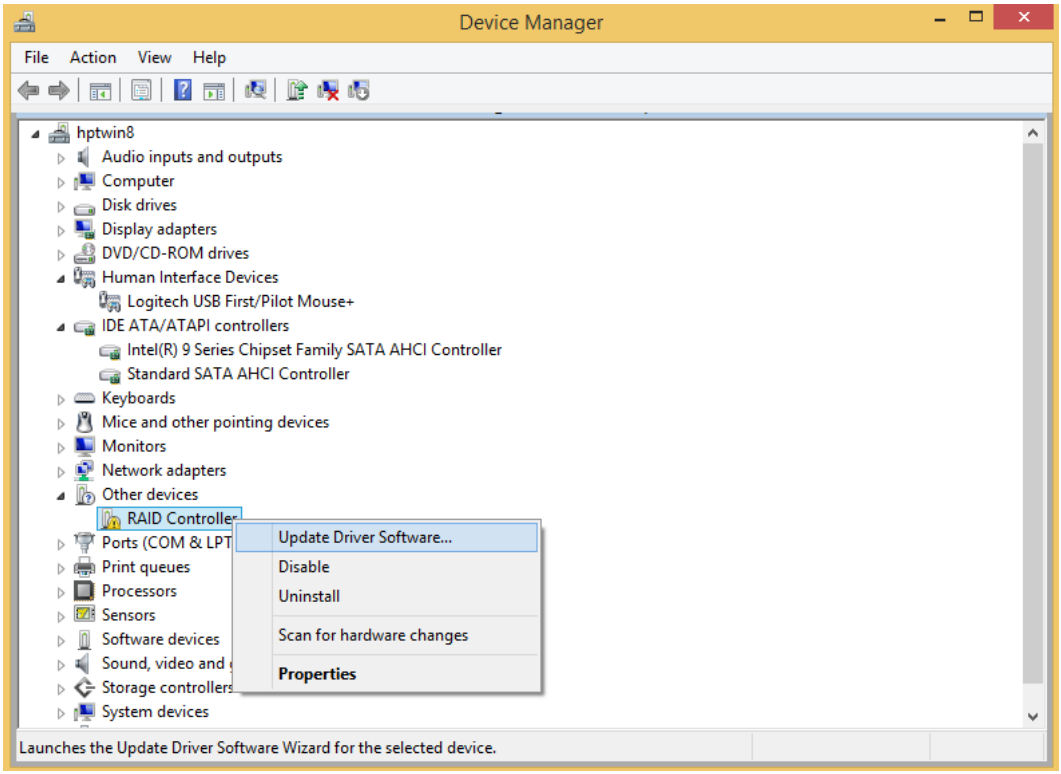
Drivers provide a way for your operating system to communicate with your new hardware. Updating to the latest drivers ensures your product has the latest performance, stability, and compatibility improvements. Drivers are updated regularly at www.highpoint-tech.com.

For **Windows** Users:

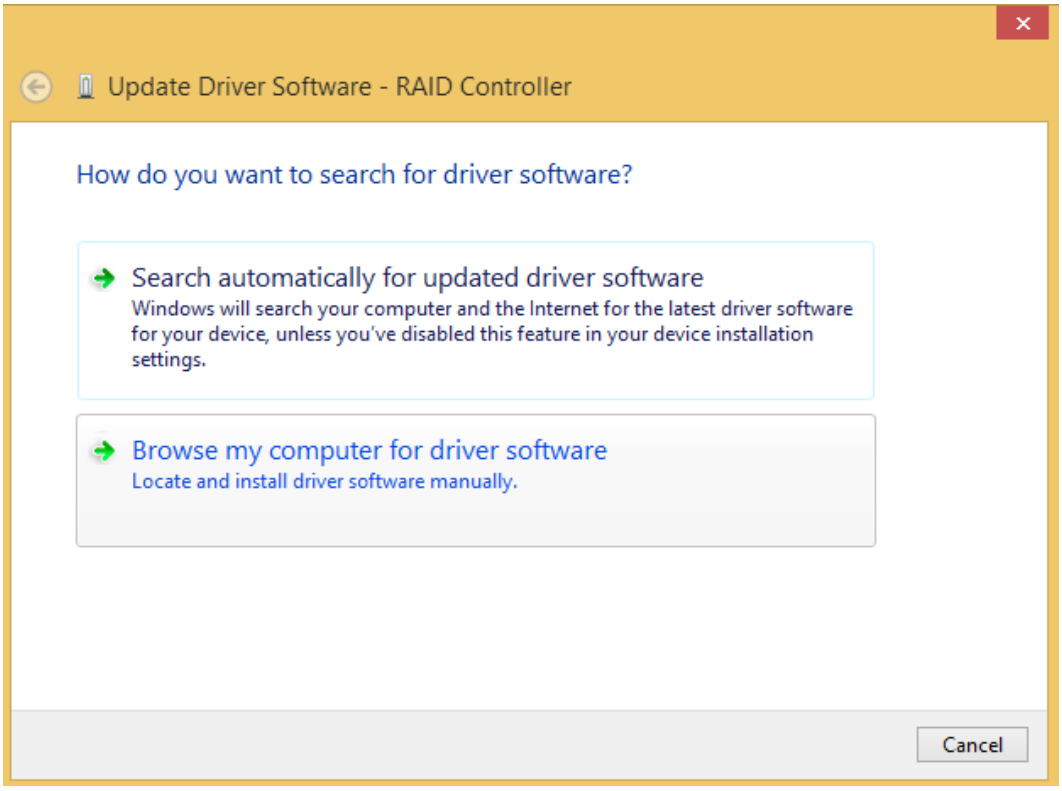
1. Download the latest driver files from our website www.highpoint-tech.com> Support > Documents and Downloads >RocketRAID 4500 Series.
2. Extract the downloaded files onto your PC and note the location of the files.



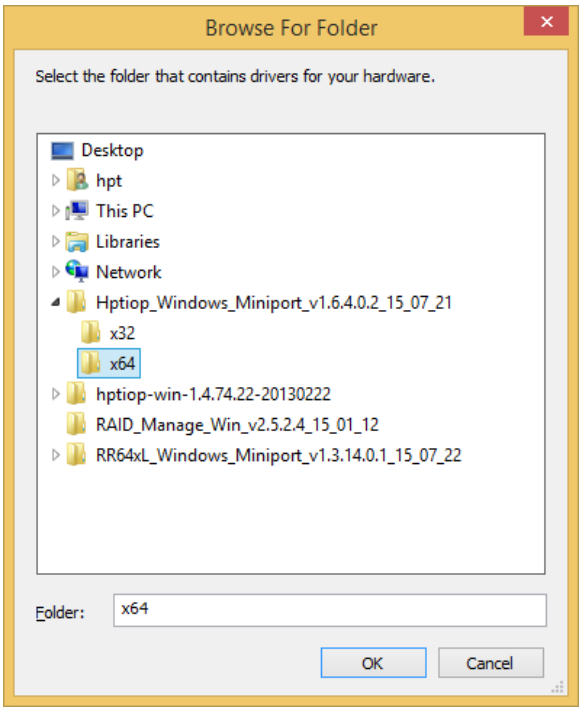
3. Open Windows **Device Manager** (Control Panel > Hardware and Sound > Devices and Printers > Device Manager).
4. Under Other devices, right-click **RAID Controller.**
5. Click **Update Driver Software.**



6. Click **Browse my computer for driver software.**

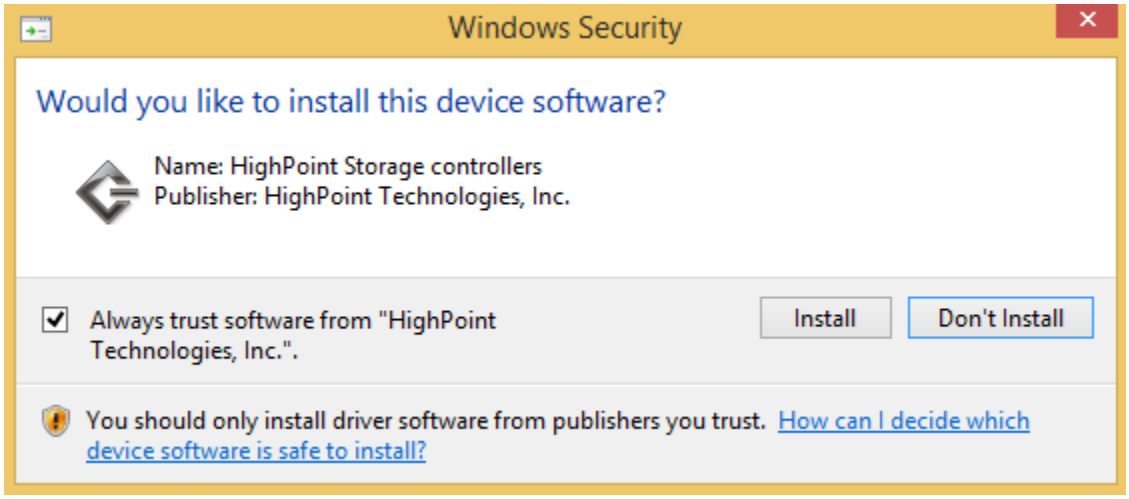


7. Navigate to where you saved the driver files.

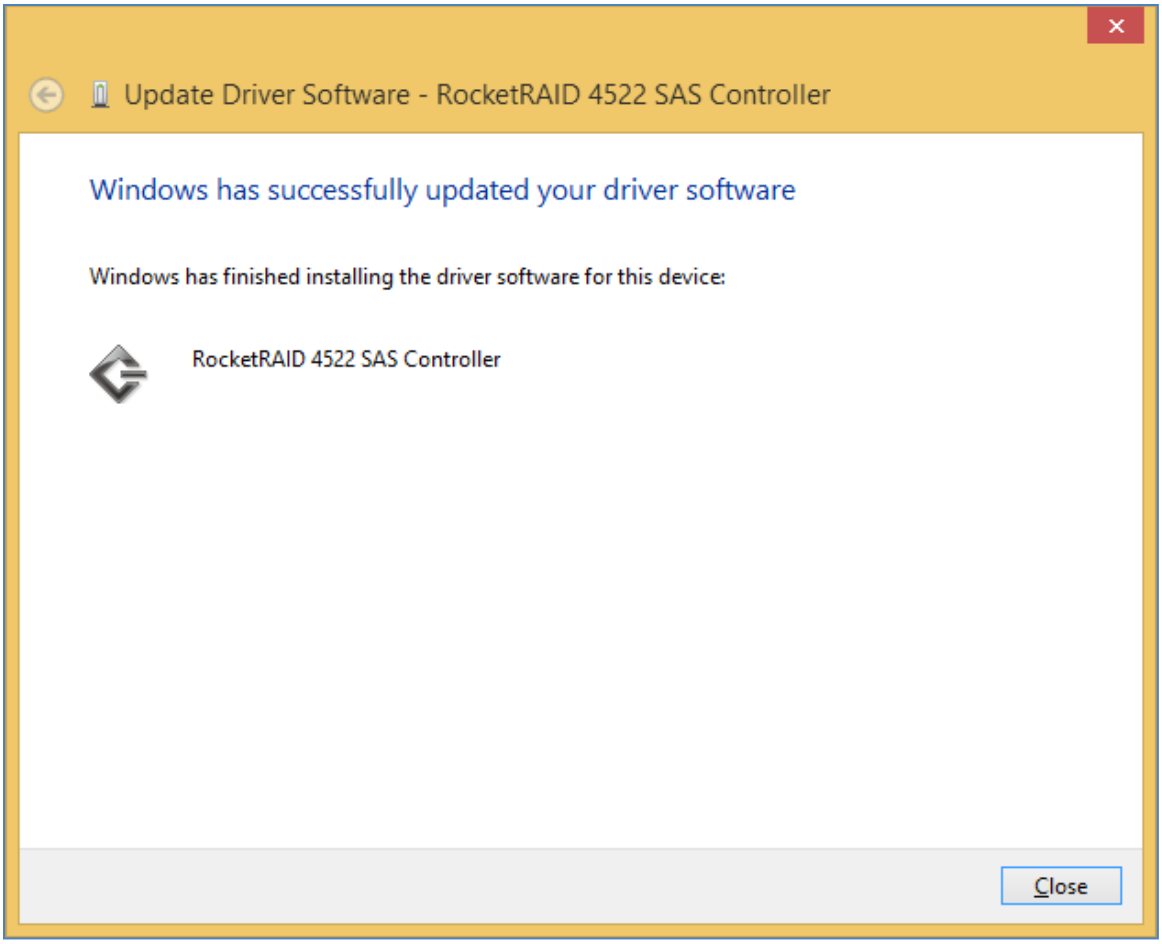


8. Click **OK.**

9. Click **Next**, Windows security will prompt to ask if you are sure you want to install HighPoint Software.



10. After clicking **Install**, driver will be installed.

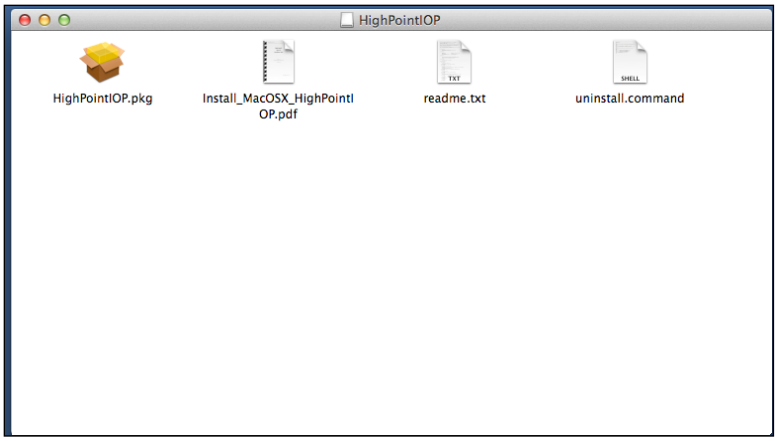


11. **Reboot** for changes to take effect.

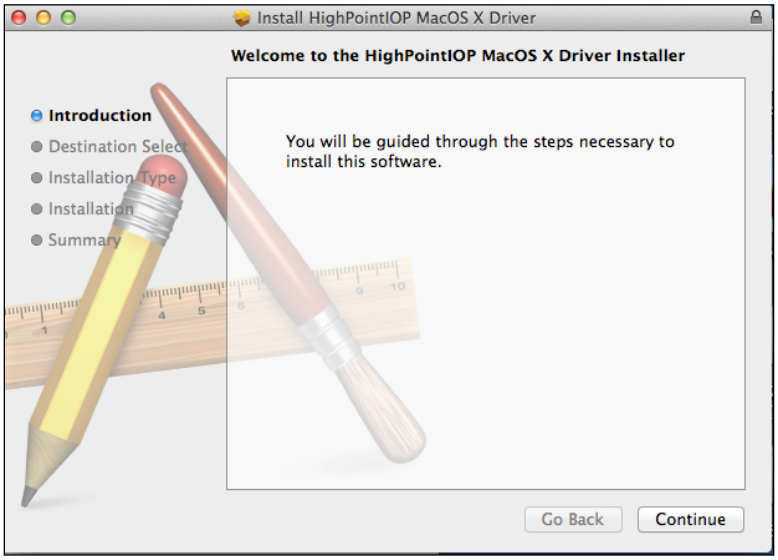
For **Mac** Users:

1. Obtain latest driver online at www.highpoint-tech.com
2. Click the downloaded file.

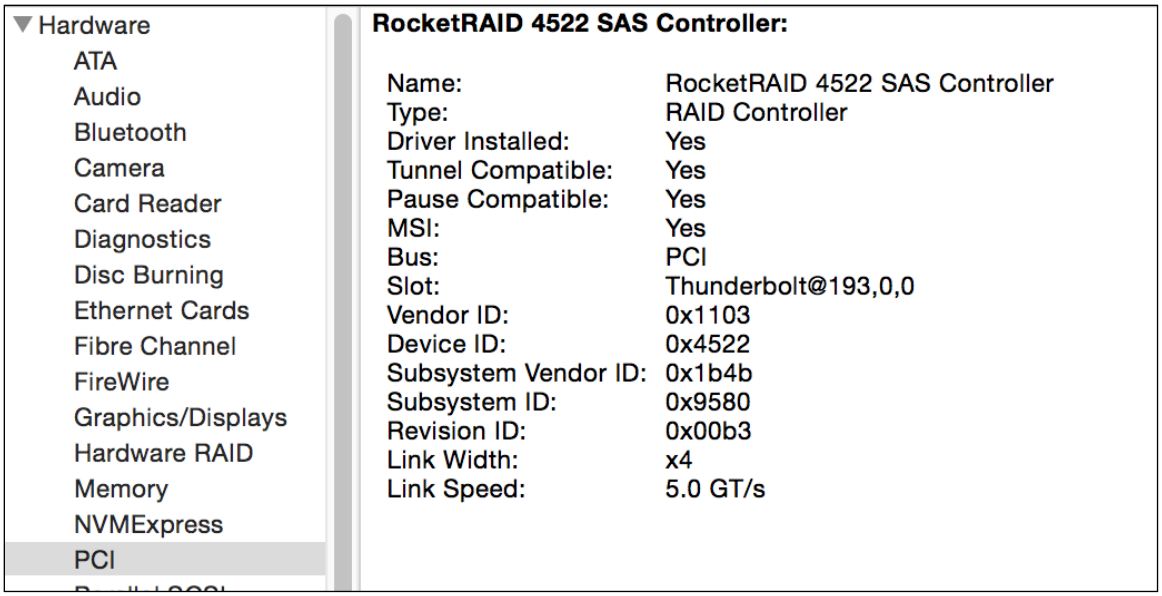
3. A mounted volume will appear on the desktop. Click the icon to open the volume.
4. Click the driver package to start installation (.pkg file)



5. Follow the on-screen instructions of the installer.



6. **Reboot** computer for changes to take effect.
7. Make sure **Driver Installed** is **Yes**



Click Apple Icon > About this Mac> System Report > PCI

For Linux Users:

Users with Linux Kernel 3.9.4 or later have embedded RocketRAID 4500 series drivers in system, therefore do not need to install additional drivers. For users with older Linux kernel versions or driver compatibility issues, take the following steps:

1. Visit www.highpoint-tech.com> Support > Documents and Downloads >RocketRAID 4500 Series.
2. Click Download located next to Linux opensource driver
3. Start Terminal and navigate to the directory containing the drivers.
4. Extract the folder contents using the following commands, for example:
   - `gunzip RR3xxx_4xxx_Linux_Src_v1.10.0_15_06_04.tar.gz`
   - `tar -xvf RR3xxx_4xxx_Linux_Src_v1.10.0_15_06_04.tar`

```
[hpt@localhost     ]$ ls
RR3xxx_4xxx_Linux_Src_v1.10.0_15_06_04.tar.gz
[hpt@localhost     ]$ gunzip RR3xxx_4xxx_Linux_Src_v1.10.0_15_06_04.tar.gz
[hpt@localhost     ]$ ls
RR3xxx_4xxx_Linux_Src_v1.10.0_15_06_04.tar
[hpt@localhost     ]$ tar -xvf RR3xxx_4xxx_Linux_Src_v1.10.0_15_06_04.tar
RR3xxx_4xxx_Linux_Src_v1.10.0/
RR3xxx_4xxx_Linux_Src_v1.10.0/Makefile
RR3xxx_4xxx_Linux_Src_v1.10.0/hptiop.c
RR3xxx_4xxx_Linux_Src_v1.10.0/install.sh
RR3xxx_4xxx_Linux_Src_v1.10.0/hptiop.h
RR3xxx_4xxx_Linux_Src_v1.10.0/README
[hpt@localhost     ]$
```

5. Read the README to verify the commands used to install the driver.

6. Enter super user mode. Type `make` to build driver, then type `make install` to install the driver.
7. Reboot.

For FreeBSD Users:

1. Visit www.highpoint-tech.com> Support > Documents and Downloads >RocketRAID 4500 Series.
2. Download the FreeBSD drivers and copy them onto a USB thumb drive.
3. Mount the USB and extract the drivers, then copy the driver to /boot/kernel/hptiop.ko.

```
# tar-zxvf xxx.tgz
# cp hptiop-xxx.ko /boot/kernel/hptiop.ko
```

4. To set the drivers to automatically load on startup, type the following command.

```
# echo 'hptiop_load="YES"' >> /boot/defaults/loader.conf
```

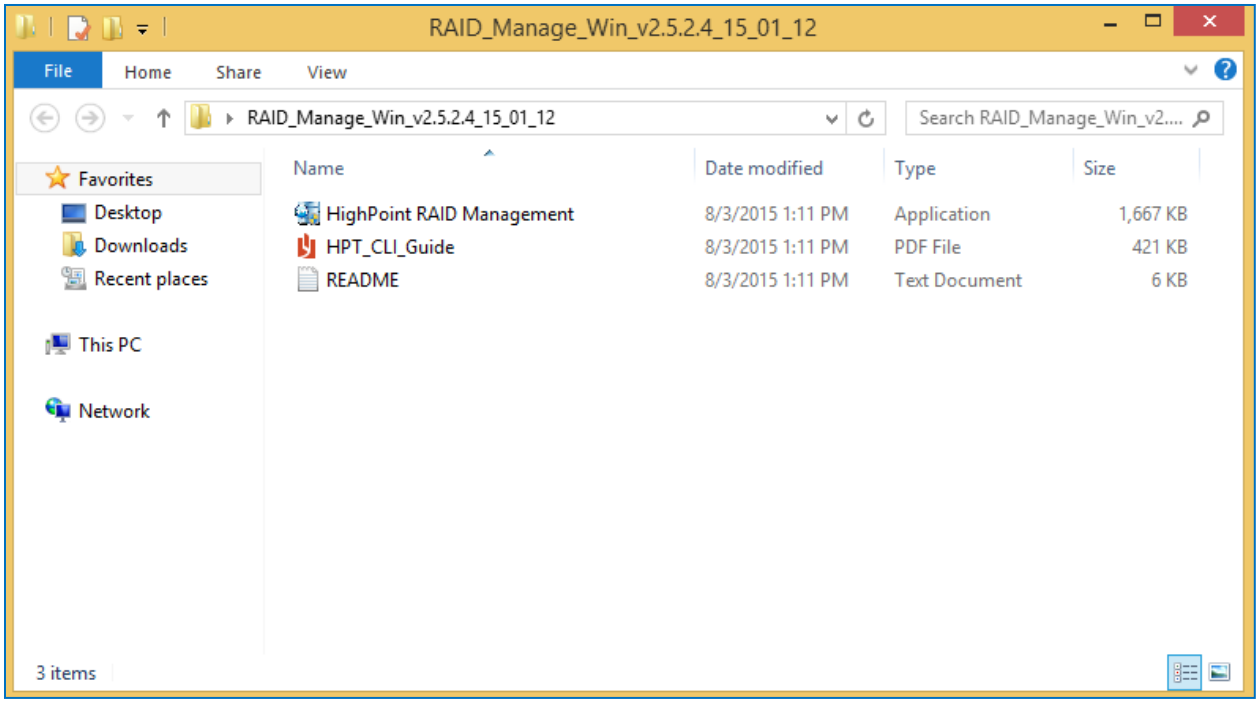
For more information, refer to the FreeBSD Manual at:
http://highpoint-tech.com/BIOS_Driver/rr4520/FreeBSD/rr4522/Install_FreeBSD_RR3xxx_4xxx.pdf

Step 3A: Install HighPoint RAID Management (WebGUI)

The HighPoint RAID Management (WebGUI) software is a useful tool used to create, maintain, and view your RAID arrays.

For **Windows** Users:

1. Download the latest WebGUI from our website at www.highpoint-tech.com> Support > Documents and Downloads >RocketRAID 4500 Series
2. Extract and open the contents of the downloaded file.



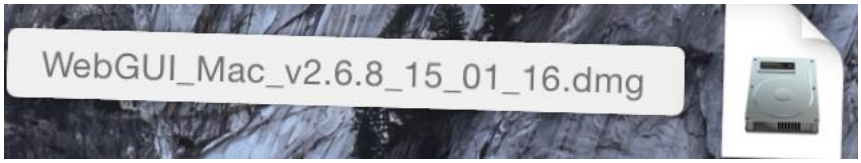
3. Double-click **HighPoint RAID Management.exe.**

4. Follow the on-screen instructions to complete the WebGUI installation
5. Double-click the **HighPoint RAID Management** desktop icon to start the WebGUI. Alternatively, type http://localhost:7402 in your browser address bar.

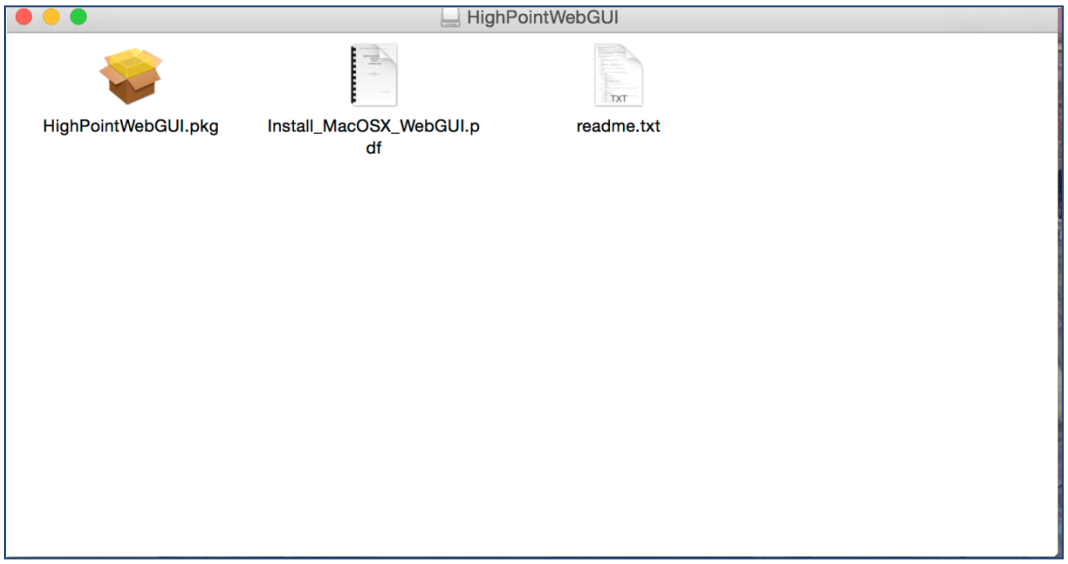
6. Your default web browser will open and prompt for a username and password (Default username: **RAID** / password: **hpt**). Username and password are case-sensitive.

For **Mac** Users:

1. Download the latest WebGUI from our website www.highpoint-tech.com> Support > Documents and Downloads >RocketRAID 4500 Series
2. Double Click the downloaded Mac WebGUI file.



3. Double click the **HighPointWebGUI.pkg** to start the WebGUI installer.



4. Follow the installer on-screen instructions to complete the WebGUI installation.
5. Double-click the HighPoint RAID Management desktop icon to start the WebGUI.

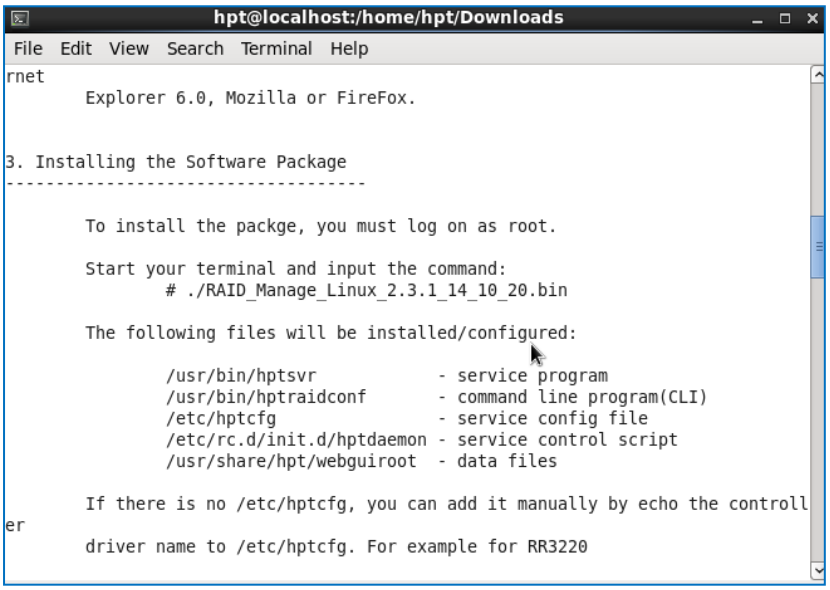
6. Your default web browser will open and prompt for username and password (Default username: **RAID** / password: **hpt**). Username and password are case-sensitive.

For **Linux** Users:

1. Visit www.highpoint-tech.com> Support > Document and Downloads >RocketRAID 4500 Series.
2. Navigate to Linux WebGUI and click Download.
3. Start Terminal and navigate to the downloaded files.
4. Extract the contents by typing the following commands (filename varies):
    - `gunzip RAID_Manage_Linux_v2.3.1_14_10_20.tgz`
    - `tar –xvf RAID_Manage_Linux_v2.3.1_14_10_20.tar`

```
[hpt@win-hpm1fhibepv ~]$ cd Downloads/
[hpt@win-hpm1fhibepv Downloads]$ ls
RAID_Manage_Linux_v2.3.1_14_10_20.tgz
RR3xxx_4xxx_Linux_Src_v1.10.0
RR3xxx_4xxx_Linux_Src_v1.10.0_15_06_04.tar
[hpt@win-hpm1fhibepv Downloads]$ gunzip RAID_Manage_Linux_v2.3.1_14_10_20.tgz
```

5. Read the README.txt file for specific instructions on how to install.



6. Log in as root and type ./`RAID_Manage_ Linux_v2.3.1_14_10_20.bin` to install.
7. Reboot.

Uninstalling HighPoint RAID Management (WebGUI)

For **Windows** Users:

1. Open Control Panel.
2. Click Uninstall a program.

3. Select HighPoint RAID Management to uninstall.

For **Mac** Users:

1. Navigate to /Applications/HPTWEBGUI/uninstall.
2. Click on the uninstall script.
3. Type in the Administrator password when prompted.

Step 3B: Installing HighPoint Command Line Interface (CLI) (Windows / Linux / FreeBSD)

The HighPoint CLI (Command Line Interface) is a command line utility that configures and manages HighPoint RAID controllers via command line. This is ideal for systems that cannot use the browser-based RAID management utility (WebGUI).

For Windows Users:

The HighPoint CLI software is bundled with the Windows platform WebGUI installation. Follow the steps outlined in step 3A to install the CLI.

To run CLI on Windows:

1. Run **hptraidconf**
2. Click **hptraidconf** to open a **cmd** terminal.
3. Input your username and password when prompted (default username: **RAID** / password: **hpt**.)

For Linux Users:

For Linux users, the CLI is an included package with WebGUI.

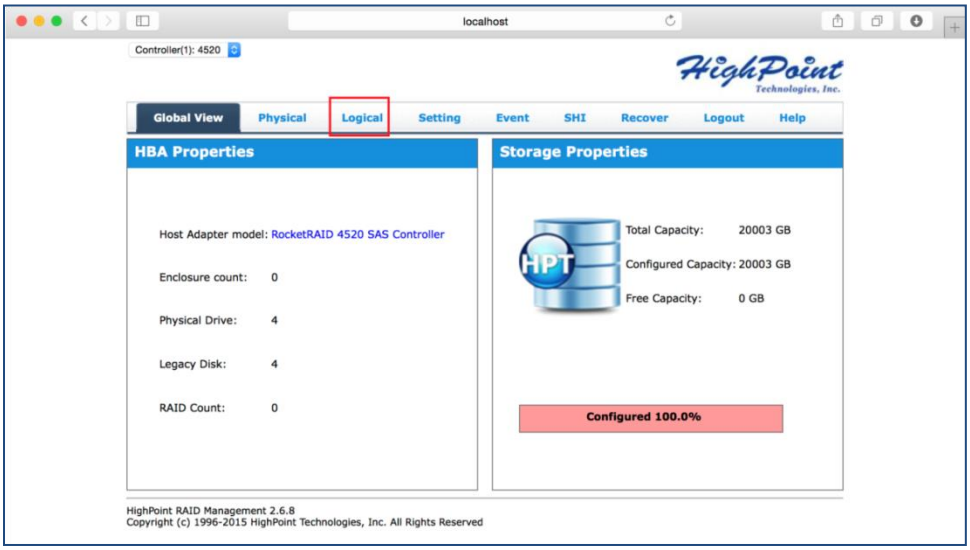
To run CLI on Linux:

1. Visit www.highpoint-tech.com for the latest CLI management update.
2. Download and save the file onto your computer.
3. Navigate to the file in terminal and then read the README for installation instructions.
4. Type `./RAID_Manage_Linux_2.3.1_14_10_20.bin` (file name will vary) to install.
5. Once finished type `hptraidconf` to start CLI.
6. Input your username and password when prompted (default username: **RAID** / password: **hpt**).

Step 4A: Create RAID Arrays using WebGUI

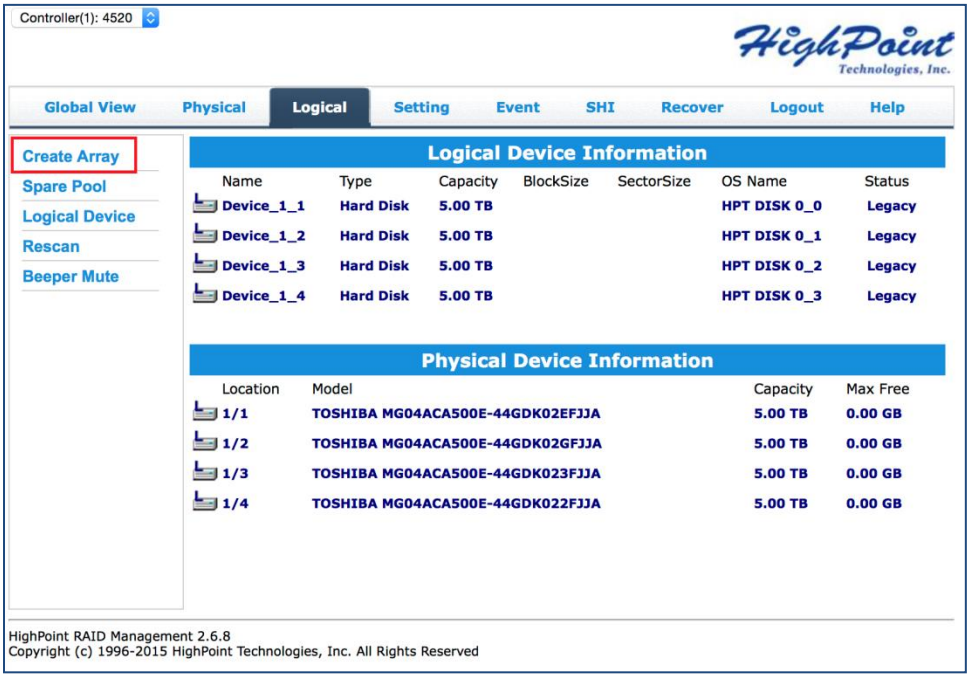
For both **Mac** and **Windows** users:

1. Login to WebGUI (Default username: **RAID** / password: **hpt**).
2. Once logged in, click the Logical tab.

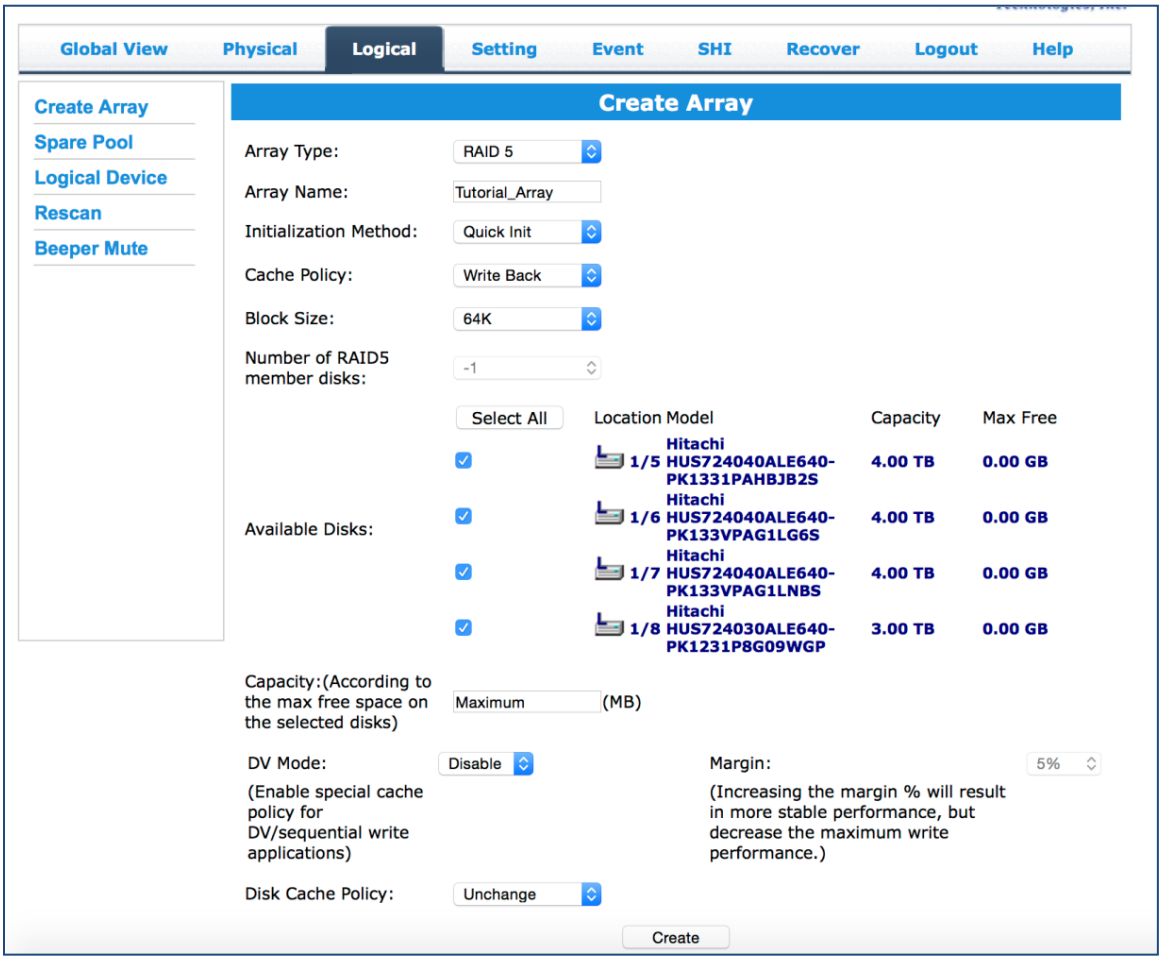


Click Logical to go to create array page.

3. Click Create Array:

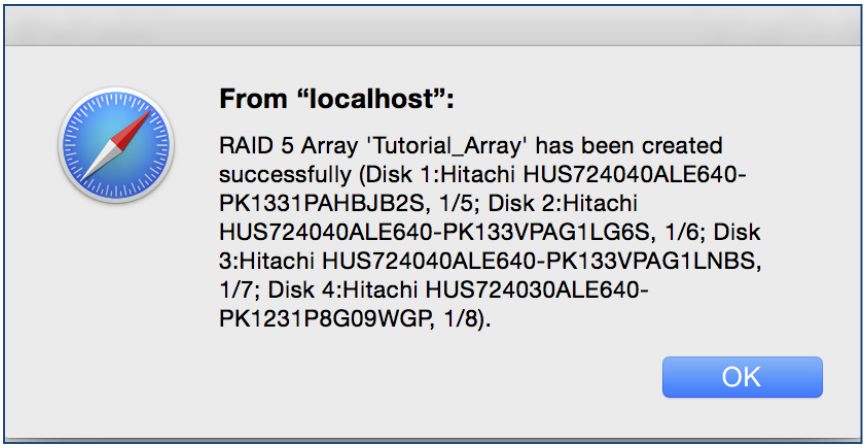


4. The RAID creation page provides many features, options, and settings. Detailed descriptions are provided on pg. 57.
5. Select **RAID5** for Array Type. (RAID Quick Reference on pg. 84)
6. Set array name as “Tutorial_Array”.
7. Select **Quick Init** as the initialization method.
8. Select **Write Back** as the **Cache Policy** for better disk write performance.
9. Select **64K** as the **Block Size**.
10. Select all 4 available disks.
11. Leave the **Capacity**, **Sector Size**, **DV mode**, and **Disk Cache Policy** settings at their default values.
12. Click **Create**

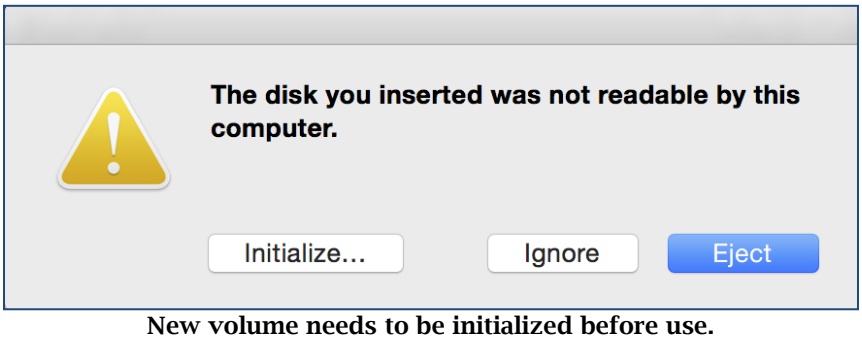


Create Array page.

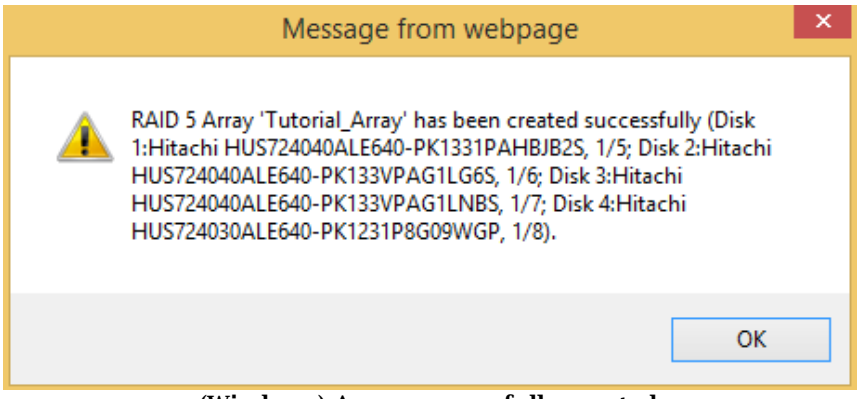
13. Once created, the WebGUI will acknowledge the array has been created and the system will prompt you to initialize the new volume.



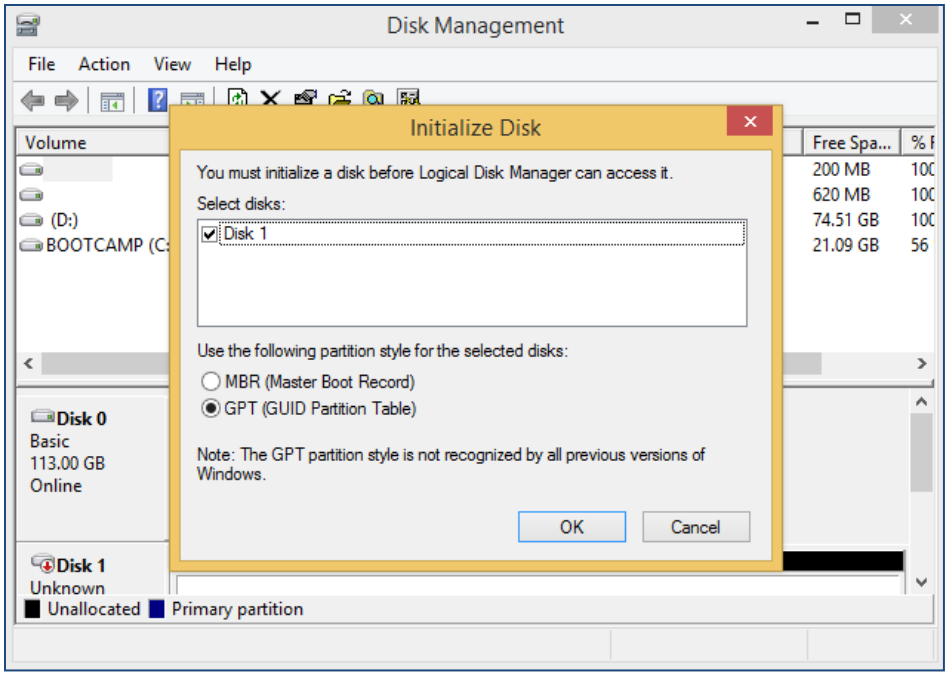
(Mac OS X) Array successfully created.



New volume needs to be initialized before use.



(Windows) Array successfully created.



(Windows) For Windows platforms, user will be prompted to initialize disks in Disk Management.

14. Tutorial_Array can now be seen under Logical Device Information. **(Take note that the OS name is HPT DISK 0_0; this will help identify which volume to initialize)**

Logical Device Information

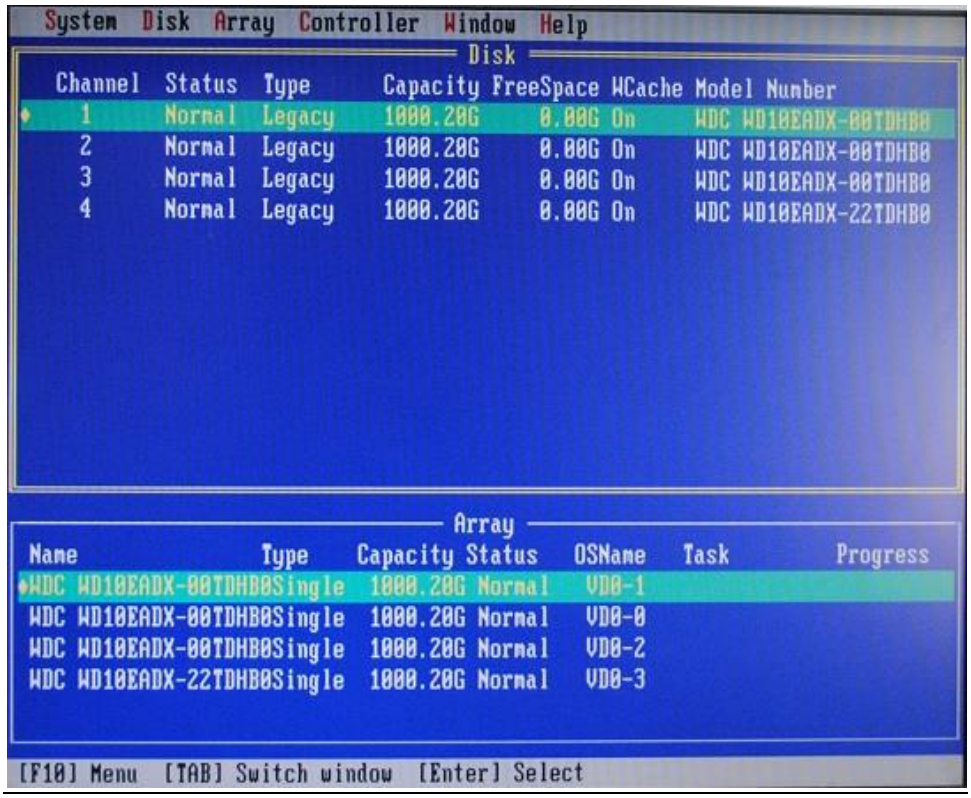
Name	Type	Capacity	BlockSize	SectorSize	OS Name	Status	
Tutorial_Array	**RAID 5**	**9.00 TB**	**64k**	**512B**	**HPT DISK 0_0**	**Normal**	**Maintenance**

Tutorial_Array is now created and can be seen in Logical tab.

Step 4B: Create RAID Array using RocketRAID BIOS (PC only)

RAID arrays can also be created using the RocketRAID BIOS. To enter the RocketRAID BIOS press **CTRL + H** during PC boot up.

Legacy disks, or disks that contain previous partitions, have to be initialized before they can be used for RAID.

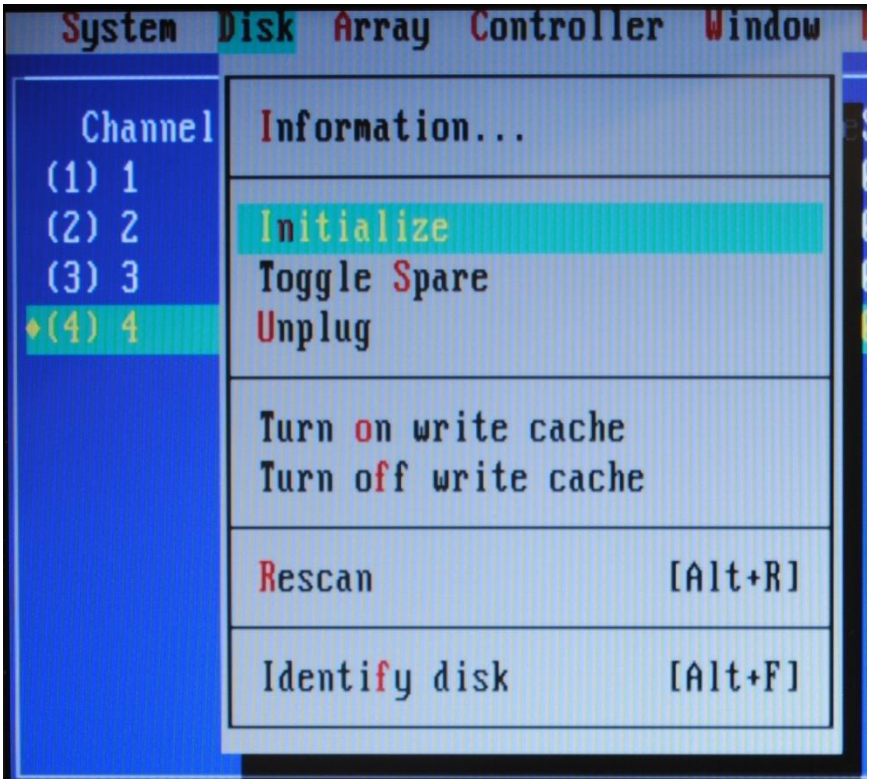


4 Legacy disks are shown here.

Initializing Disks

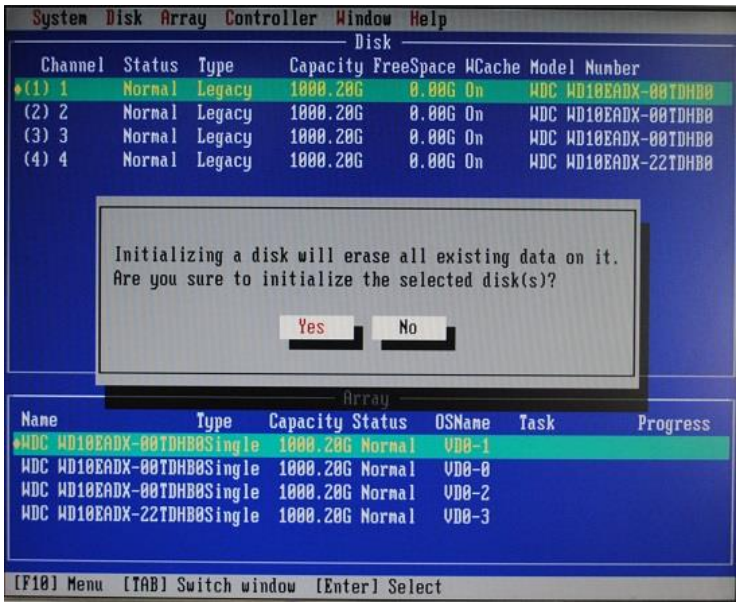
Before initializing, you must make sure you have the disk panel selected. The gold frame represents your current selection. By default, you start on the disk panel.

1. Press **ALT + W** to access Window tab.
2. Select disk(s).
3. Use keyboard arrow keys to navigate and press **Enter** to select desired disk(s).
4. Once disks are selected, press **ALT + D** to activate disk tab.
5. Select **Initialize.**

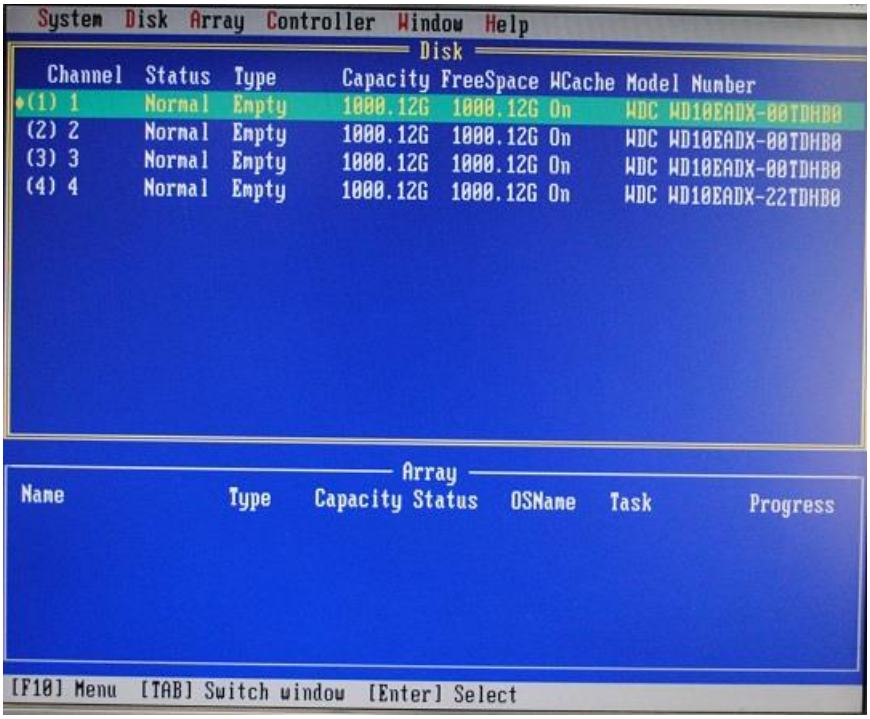


Four disks are selected and about to be initialized.

6. Press **Enter.**
7. A prompt will warn you that data will be erased.

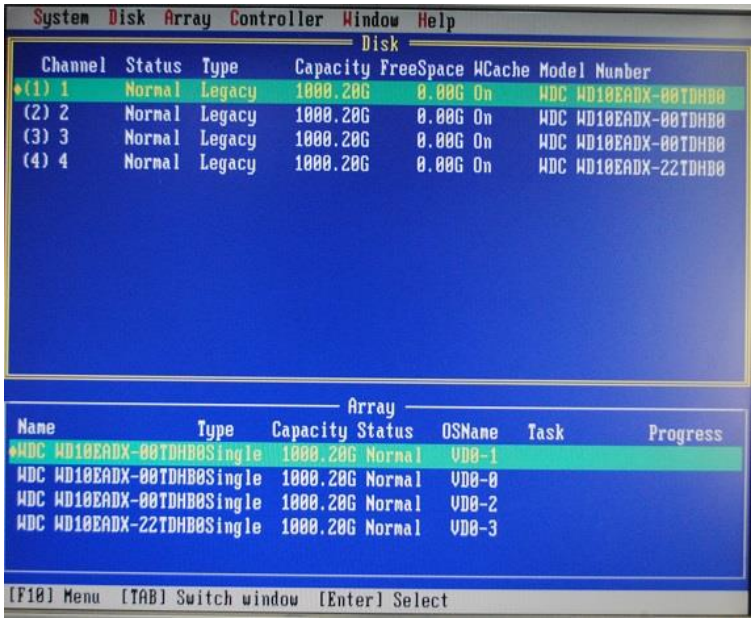


8. Select **Yes.**
9. Once initialized, you can proceed to create an array.



Create Arrays

1. Navigate to the disk panel (**ALT + W**, then press **1**)
2. Select each disk you wish to include in your array

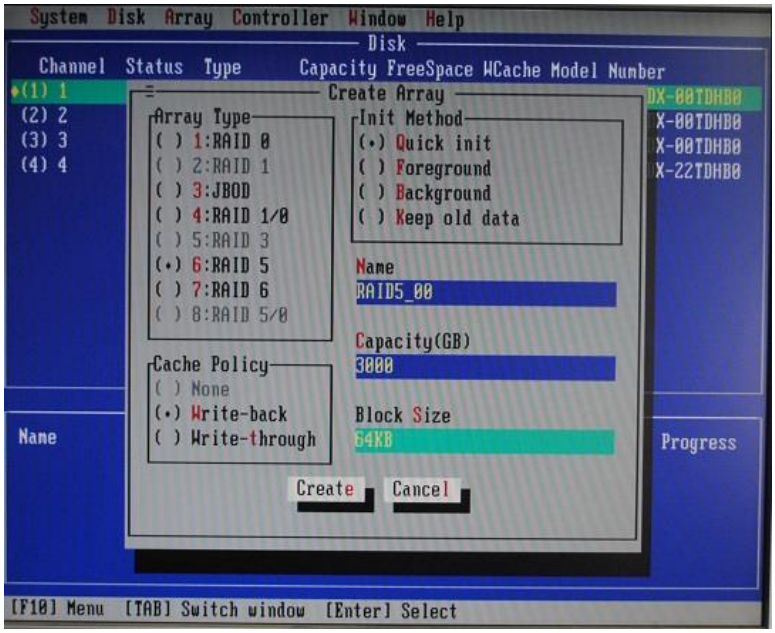


Each selected disk has (#) symbol on the left.

3. Press **ALT + A** to open array panel
4. Press **Create**:

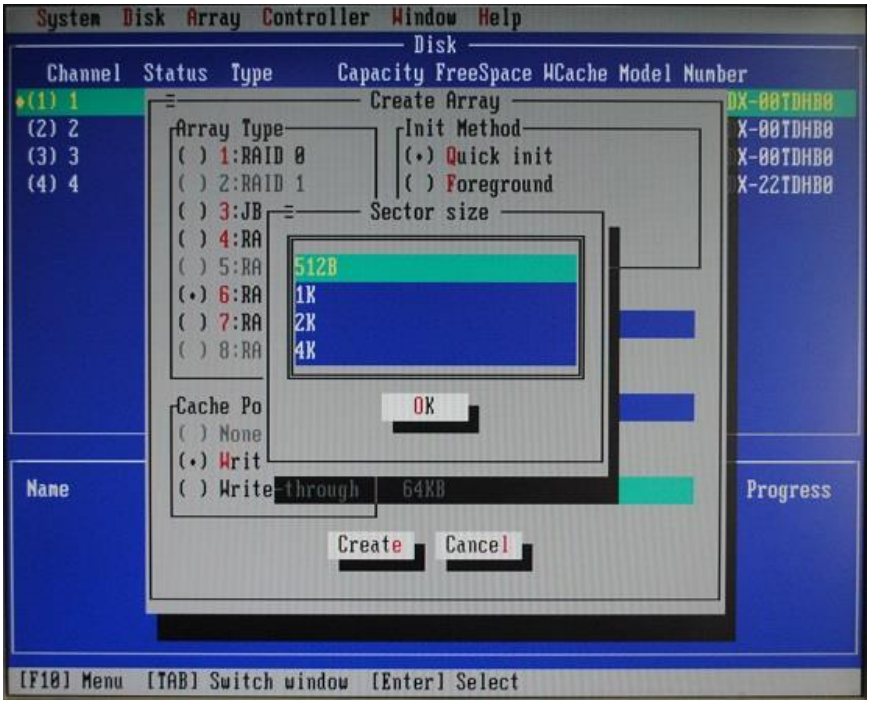
Press ALT+A to open menu, then select create.

5. Press **Spacebar** to navigate and make selections (**TAB** also navigates between windows)

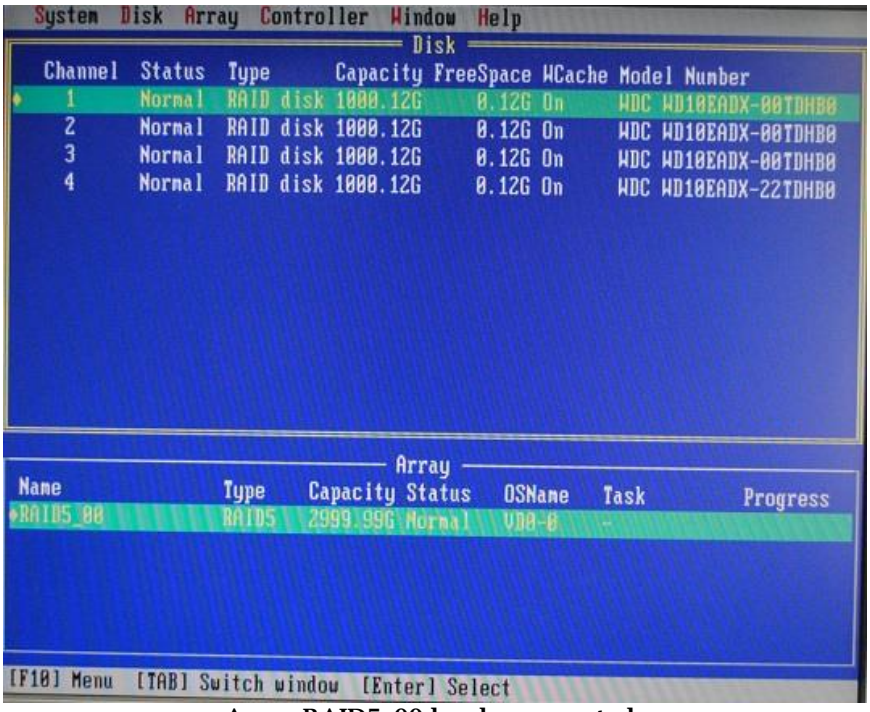


RocketRAID BIOS create array option menu.

6. Press **Create** (**ALT + E**)
7. A prompt about sector size will pop up, select a sector size (irrelevant for Windows XP 64-bit and later.)



8. Your created array will show up in the **Array Window.**

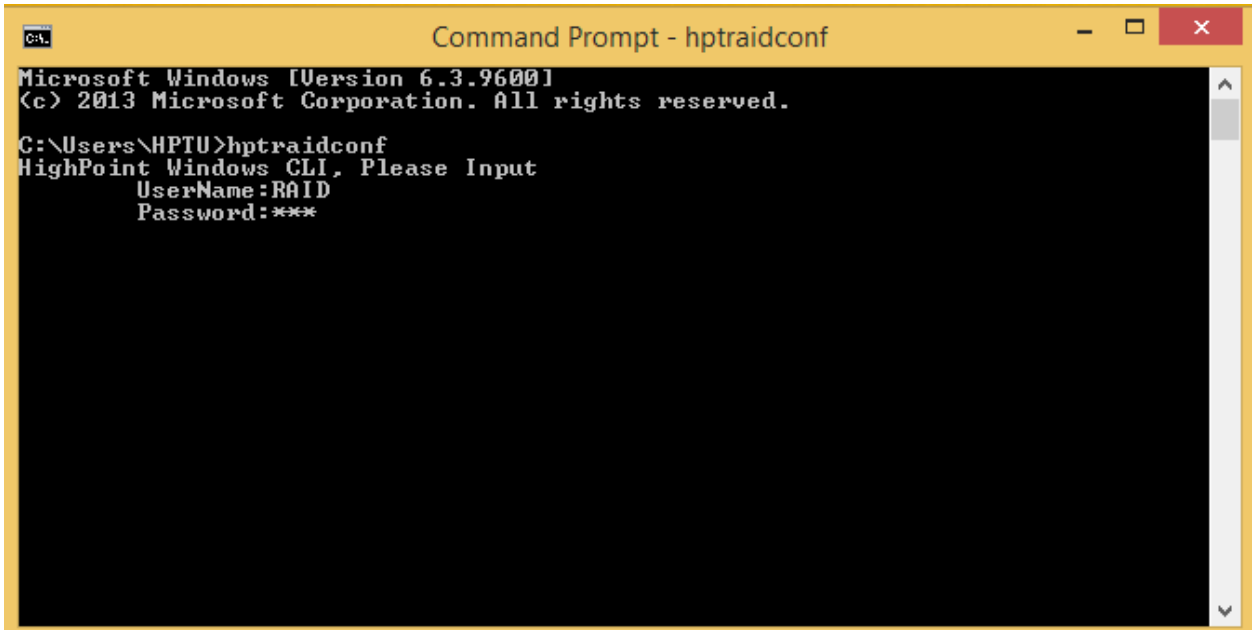


Array RAID5_00 has been created.

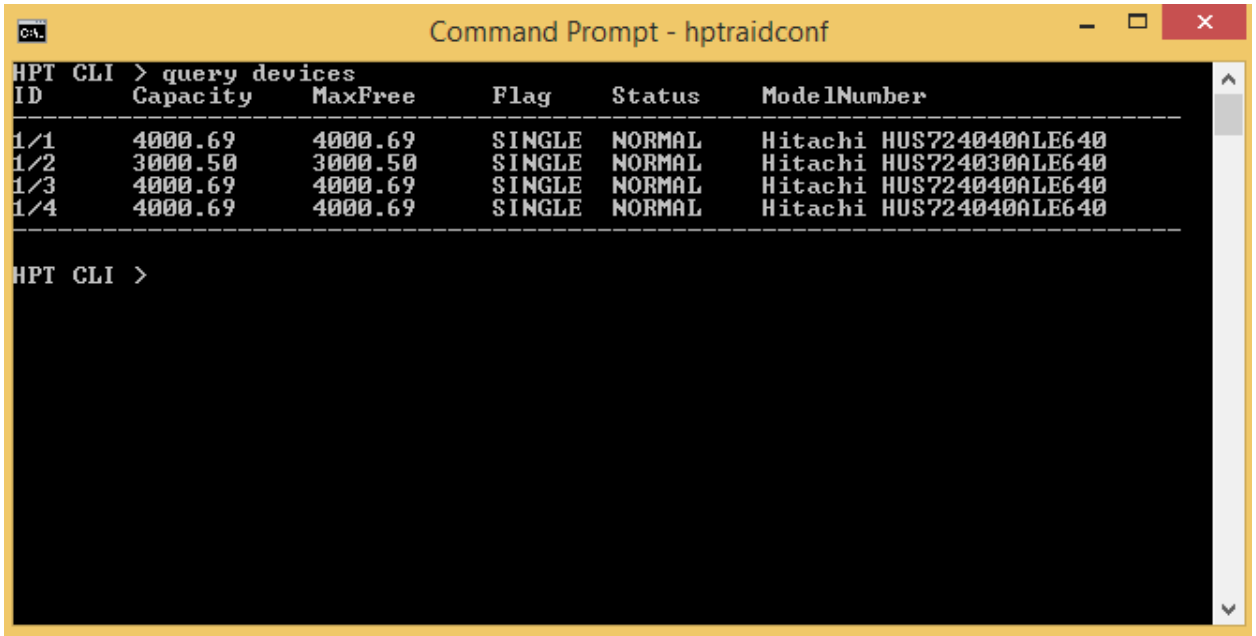
9. Exit the BIOS **(ALT+X)**. Alternatively, **ALT + S** to open System Tab, then select **Exit**.

Step 4C: Create RAID Arrays using CLI (Windows / Linux / FreeBSD)

Start your operating systems console such as command prompt (Windows). On the command line, type hptraidconf to start HighPoint CLI. Enter your login credentials when prompted (default username: **RAID** / password: **hpt**).



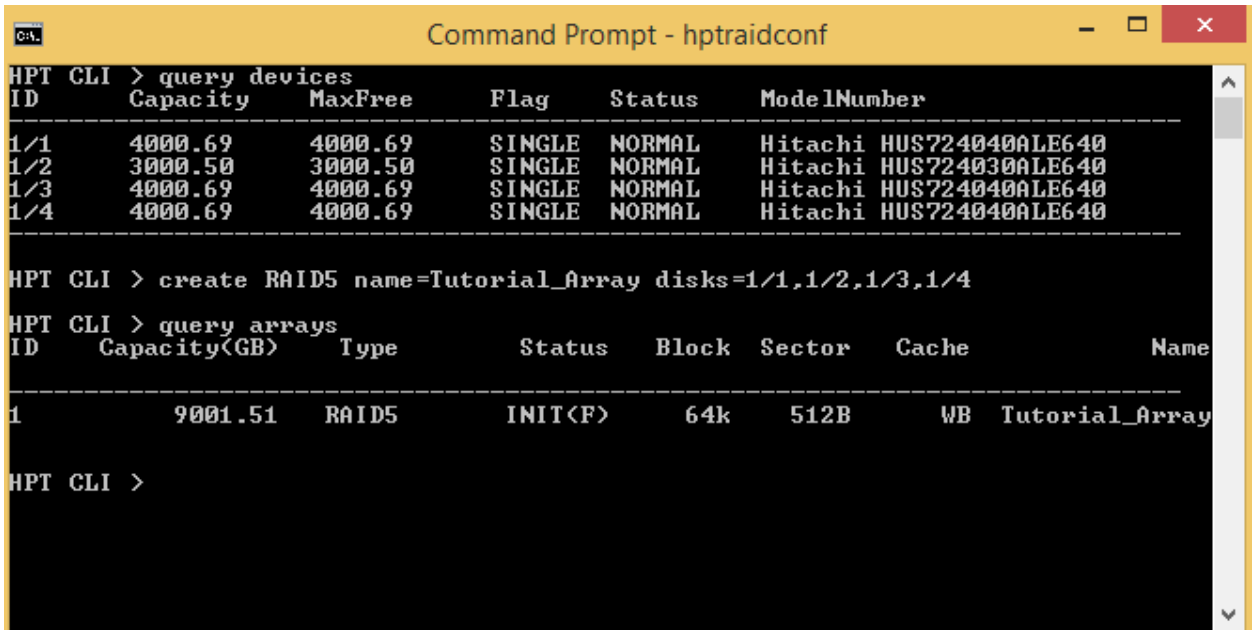
In order to see the devices connected to the controller, type **query devices**.



The device ID gives the position of each drive and is needed to select which drive will be included in the array.

To create a 4 disk RAID 5 array named Tutorial_Array input the following command:

HPT CLI > create RAID5 name=Tutorial_Array disks=1/1,1/2,1/3,1/4



To view the created array, type **query arrays**.

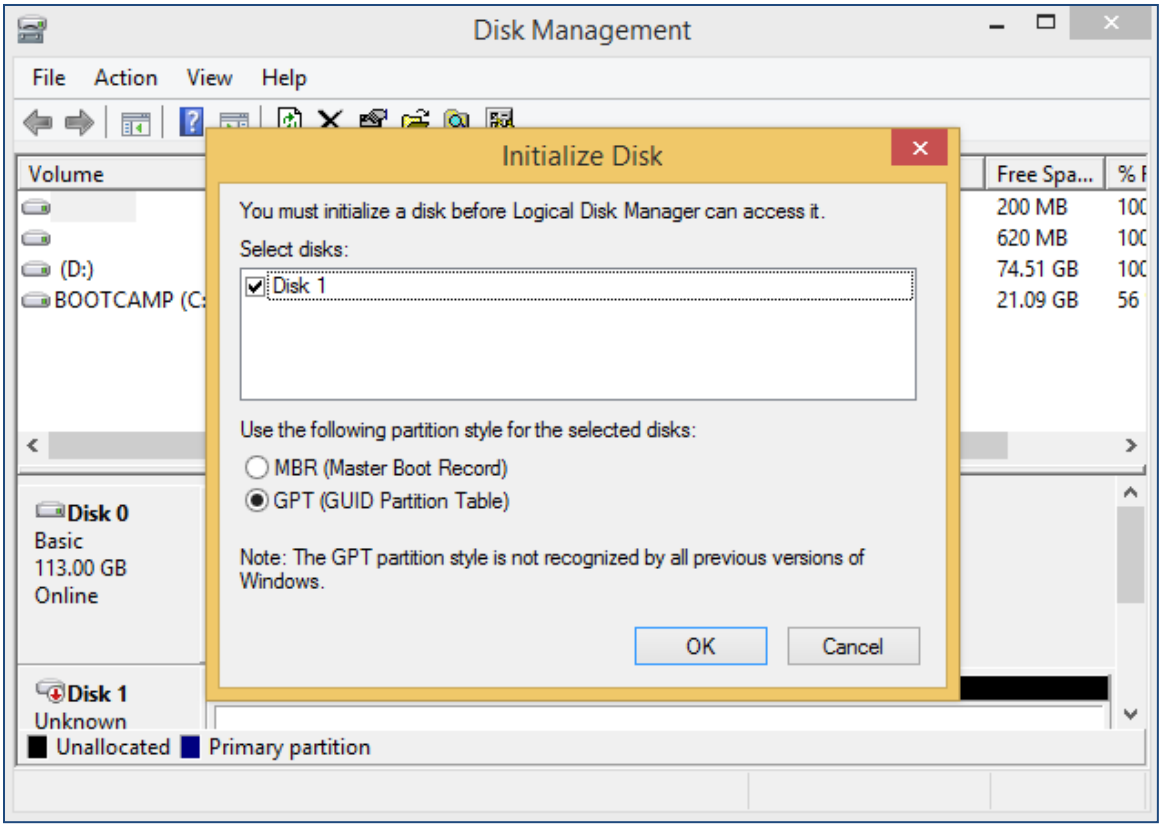
For more HighPoint CLI information type help in the command line or refer to the documentation included in the software package.

Step 5: Initialize and format the RAID Array

Before using the newly created RAID array, you must initialize and format the new volume.

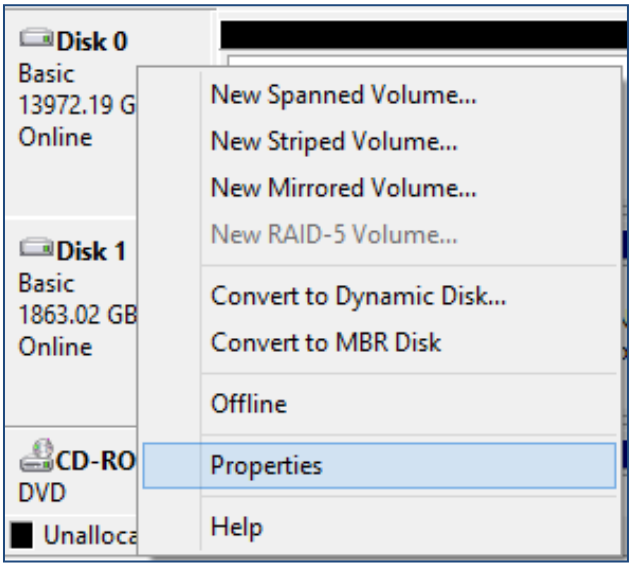
For **Windows** Users:

1. After creating the RAID array, open Windows **Disk Management.**
2. Disk Management will ask to initialize unknown disks either in MBR format or GPT.

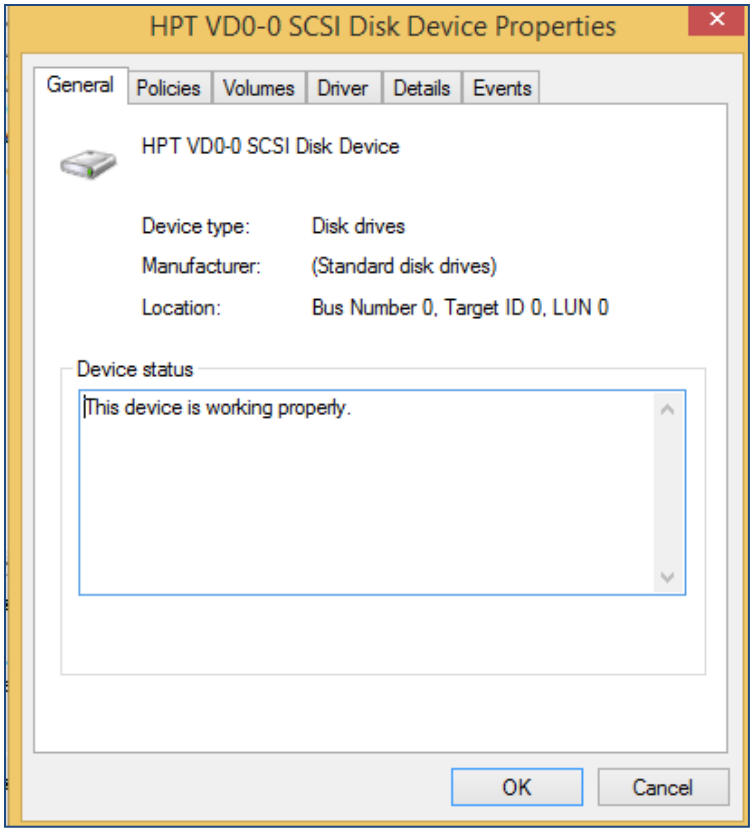


(Windows) Disk Management asks to initialize the disks before use. As a general rule, select MBR for disks less than 2TB and GPT for disks greater than 2TB.

3. Right click the new disk, and click properties.

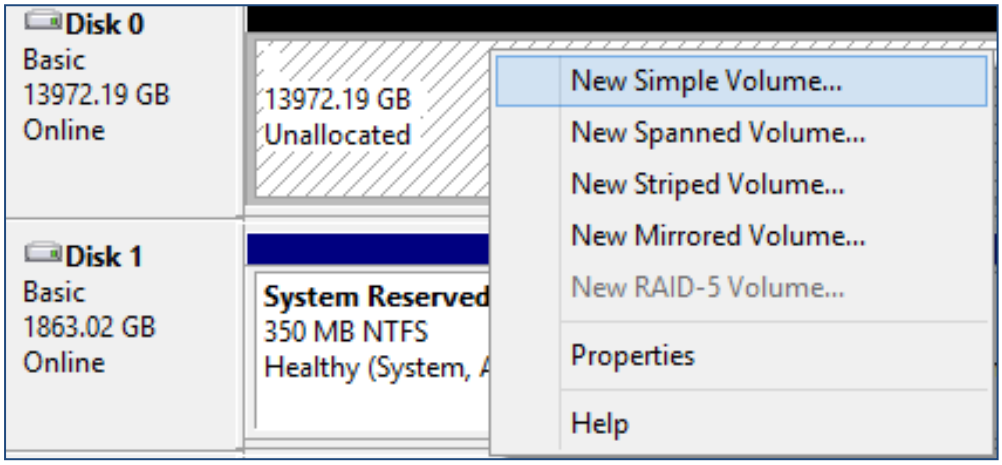


4. In properties, check and make sure it is a HPT VD (HighPoint Virtual Disk).



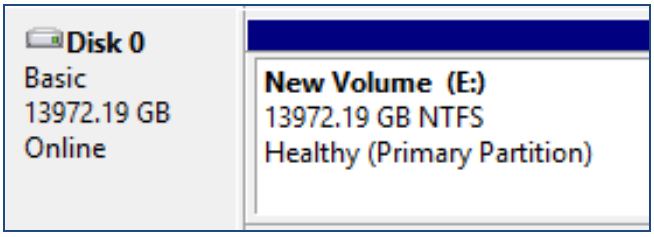
Disk properties show HPT VD 0-0.

5. Once the disk has been confirmed, right click the unallocated space and click New Simple Volume.



Right Click unallocated space, then click New Simple Volume.

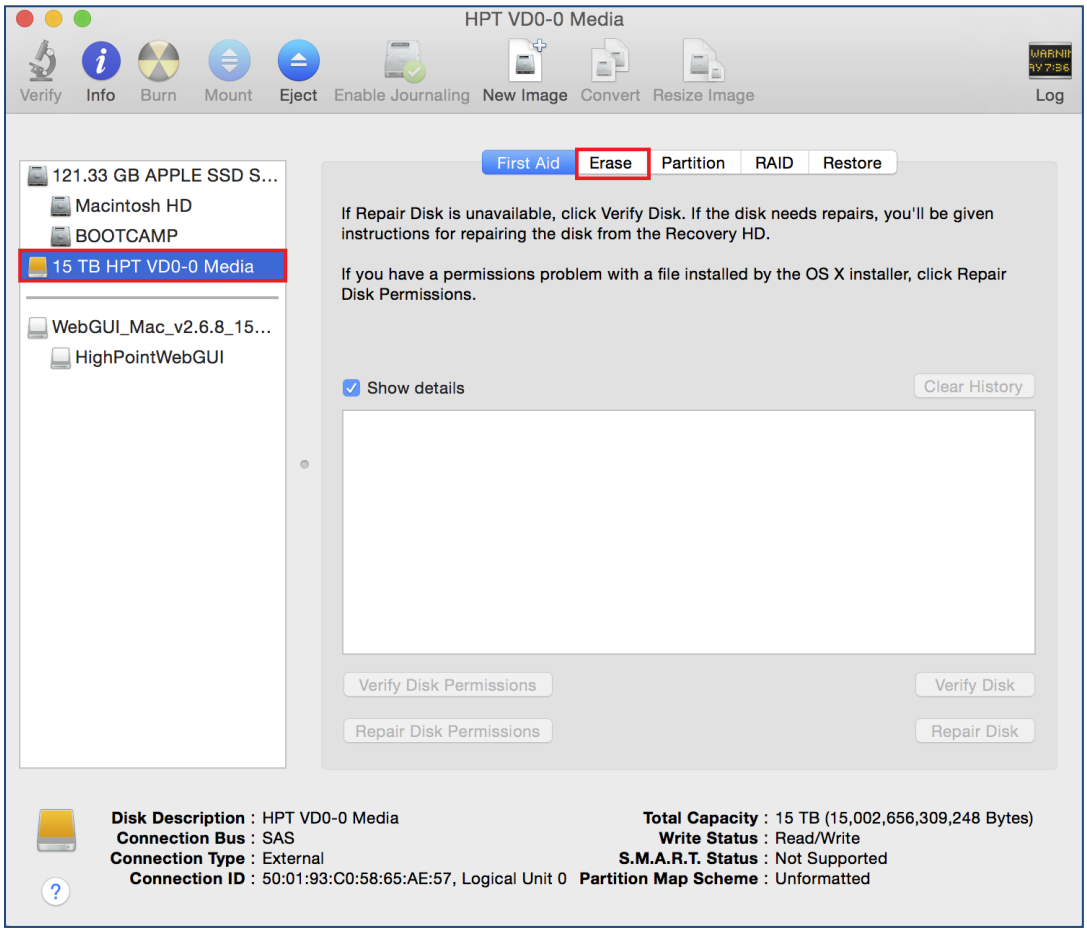
6. Follow the on-screen instructions to configure and format the drive.
7. Once finished, the new volume will receive a drive letter and be available for use.



RAID array is now formatted as NTFS and drive letter E:

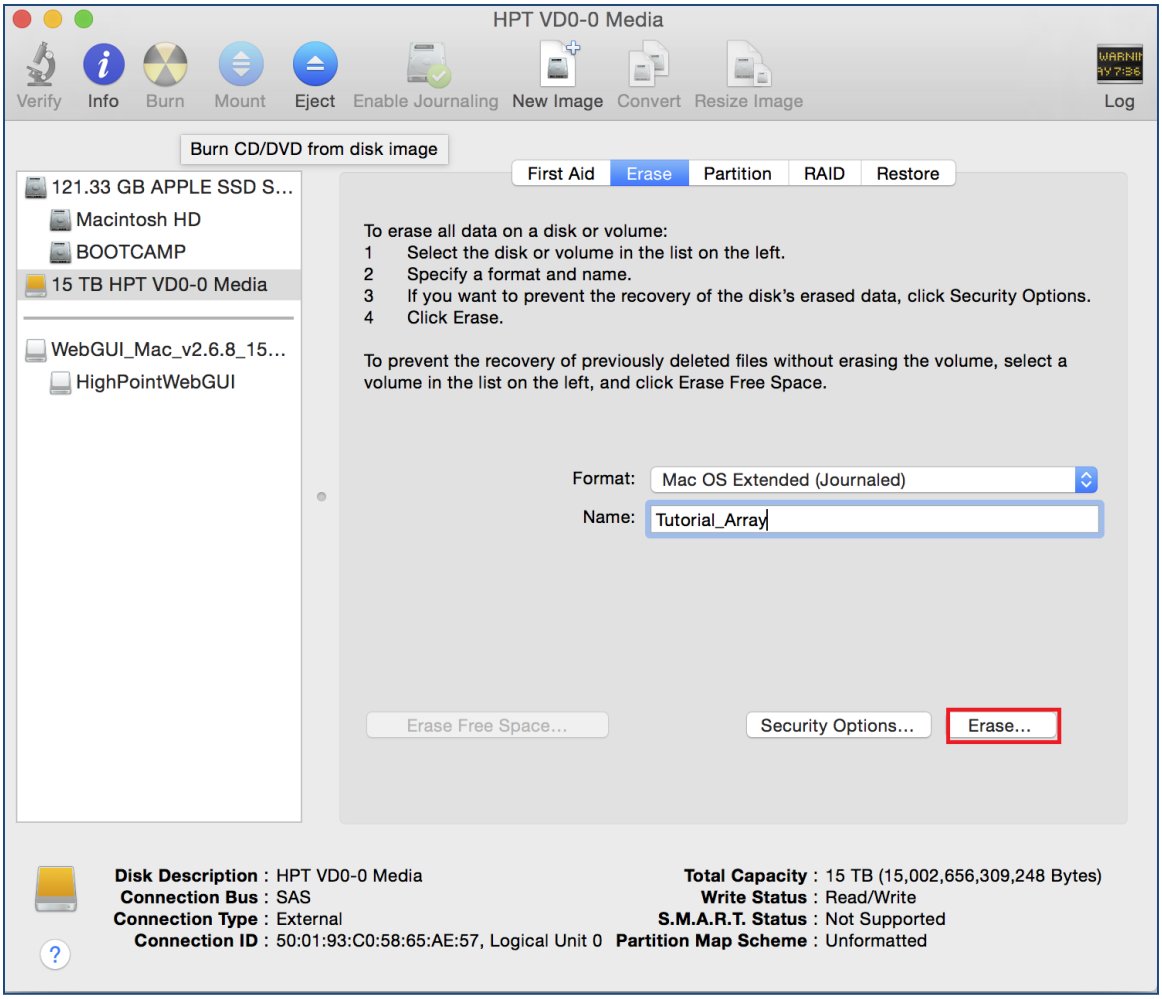
For **Mac** Users:

1. After creating a RAID array, click Initialize when prompted. (**Note**: If you ignored the prompt, simply open Disk Utility).

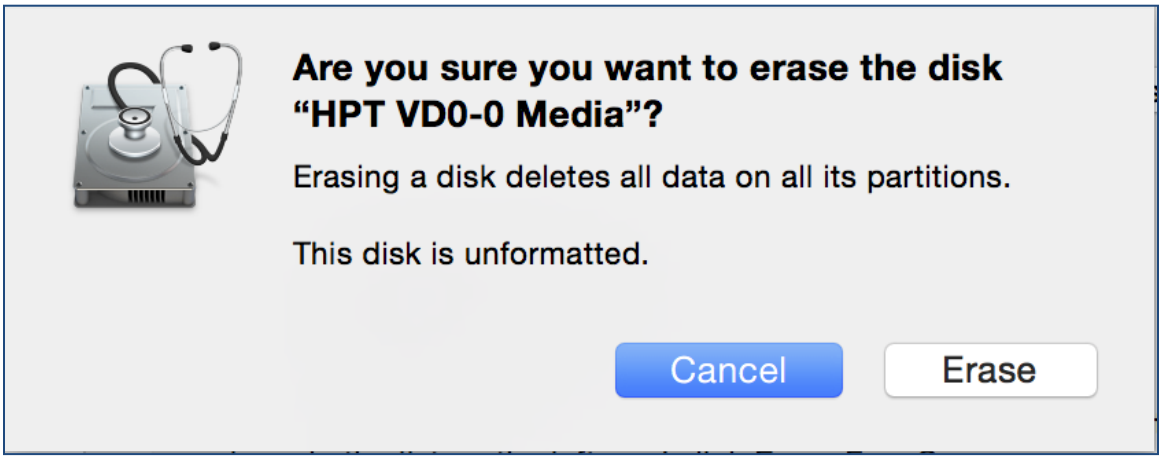


Disk Utility for Mac.

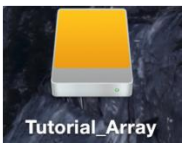
2. In Disk Utility, select the Volume you created on the right, then click the Erase tab.



3. Select the desired disk format and disk name then click **Erase**. (**Note**: All previous data on disks will be erased.)



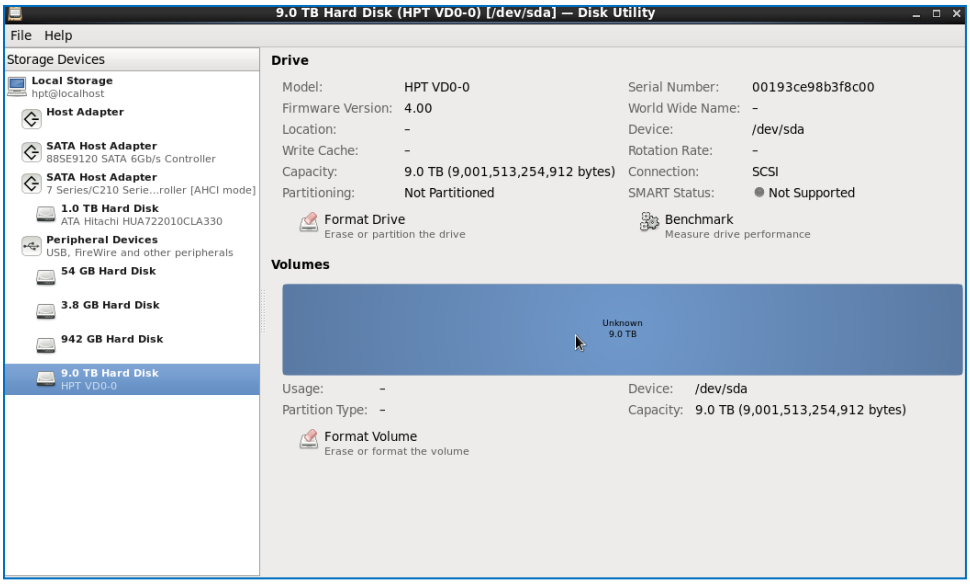
4. When finished, your new RAID volume will be available for use.



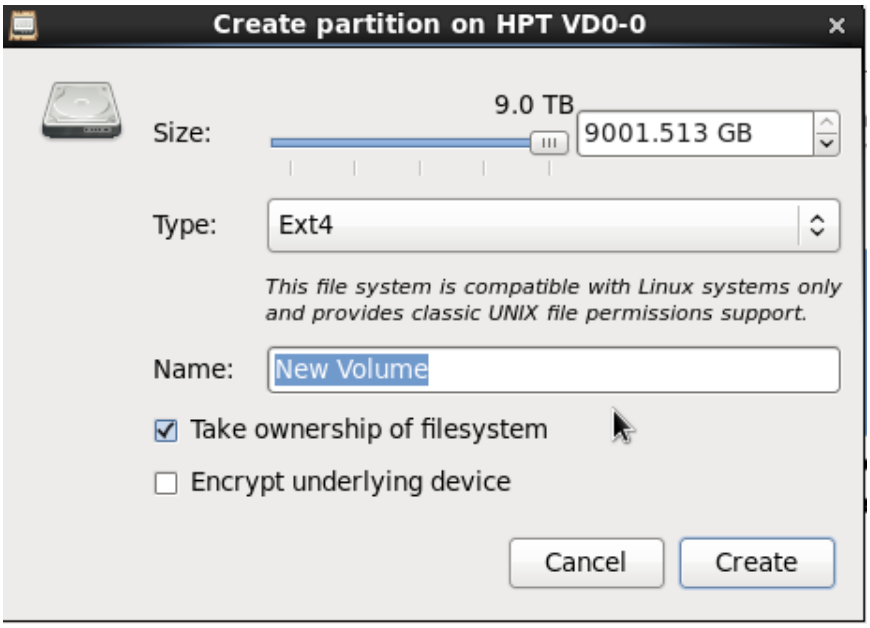
(Mac) Tutorial_Array volume created and mounted on desktop.

For Linux Users:

1. After creating a RAID array, open your disk utility program to view the logical volume.



2. Click Format drive to create an MBR or GPT partition table on the drive.
3. Click Format Volume to format the drive.



4. Once formatted, the volume will be available for use.

Manage your RAID array

The following features allow you to monitor and maintain your arrays to prevent any critical failures from occurring:

- Spare Pool (pg.36)
- Email Notifications (pg.37)
- SMART Monitoring (pg.40)
- Health Inspector Scheduling (pg.41)

RAID Spare Pool

Physical drives marked as a spare will automatically be added to a redundant RAID array (RAID levels 1, 1/0, 5, and 6) whenever there is a disk failure. Enabling this feature minimizes the chances of data loss since it reduces the time an array is in critical status.

Add/Remove Spare

Using **WebGUI**:

1. Log in WebGUI.
2. Click **Logical.**
3. Click **Spare Pool.**
4. Check the box for the disk you want as a spare from **Available Disks.**
5. Click **Add Spare.**

Disks added to the spare pool will show under **Spare Pool** and can be removed by checking the disk checkbox from **Spare Pool**> Click **Remove Spare.**

Using **RocketRAID BIOS**:

1. Navigate to the disk panel (Press **ALT + W**, then press **1**).
2. Use keyboard arrow keys to select desired disk.
3. Press **enter** to confirm each selection.
4. Press **ALT + D** to open disk tab.
5. Select **Toggle Spare.**

Disks added to the spare pool will show under **Spare Pool** and can be removed by checking the disk checkbox from **Spare Pool**> Click **Remove Spare.**

Email Notifications

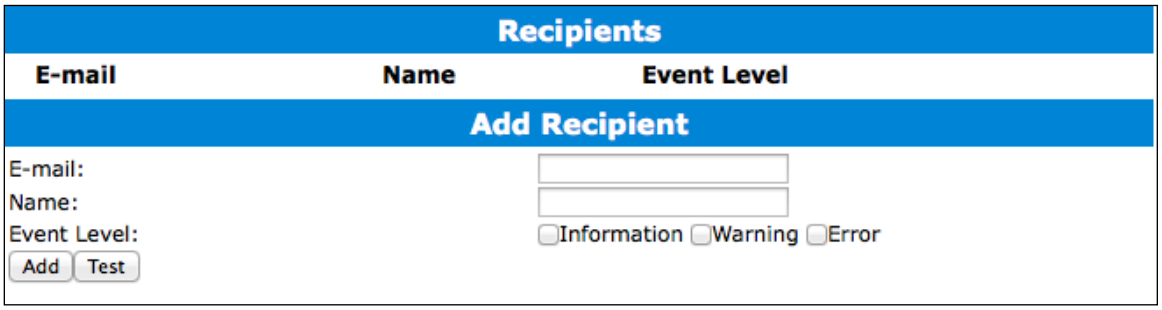
When enabled, all added recipients will receive an email notification for any event log entries. (More information about events refer to pg.80)

To set up email alerts:

1. Check the Enable Event Notification box.
2. Enter the ISP server address name or SMTP name.
3. Type in the email address of the **sender** (email account that is going to **send** the alert).
4. Type in the account name and password of the sender.
5. Type in the SMTP port (default: **25**).
6. Check support SSL box if SSL is supported by your ISP (port value will change to **465**, refer to your ISP if you have a specific SMTP port.

Note: After you click 'Change Setting' the password box will become blank.

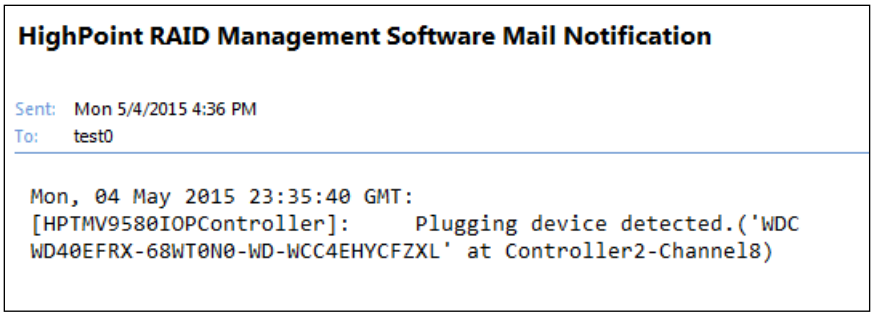
Adding Email Recipients



You can add multiple email addresses as receivers of a notice.

1. Type the email of the recipient in the **E-mail** text box.
2. Type the name of the recipient in the **Name** text box.
3. Check which type(s) of events will trigger an email in the respective **Event Level** check boxes.
4. (**Optional**) Click **test** to confirm settings are correct by sending out a test email.
5. Click **add** to add the recipient to recipient list.
6. The added recipient will display in under **Recipients.**

The email will send to your recipients the output recorded in the event log.



Example event log email message.

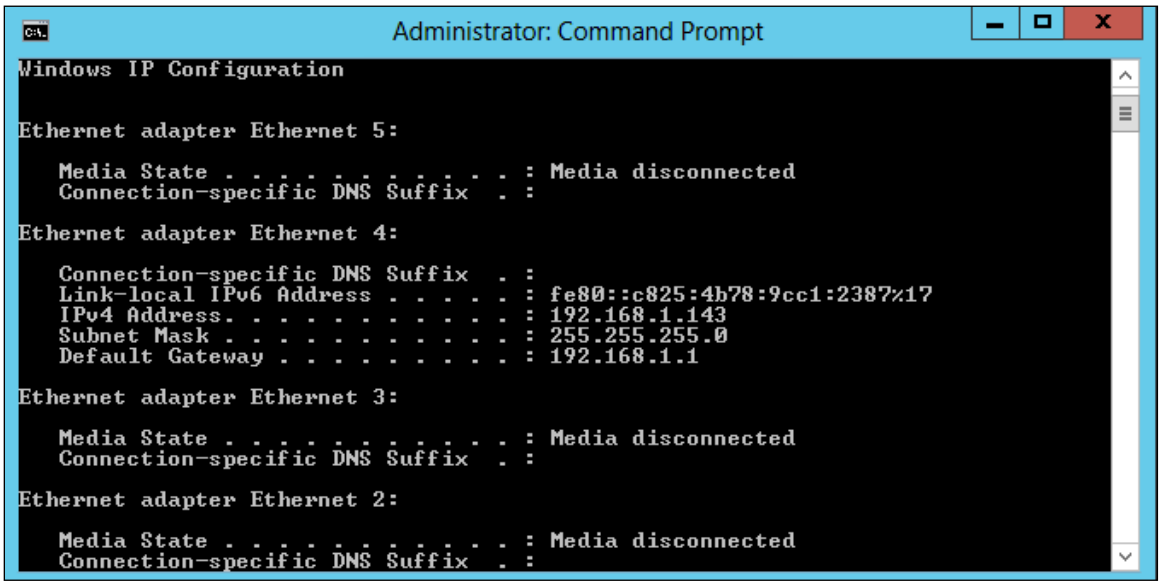
WebGUI Remote Login

A user connected to a local network can remotely access the WebGUI using the IP address of the host device.

To obtain your IP address

For **Windows** Users:

1. Open a command prompt window on the host computer.
2. Type **ipconfig**.
3. Look for the section that contains your network adapter information.
4. Note the IP address.



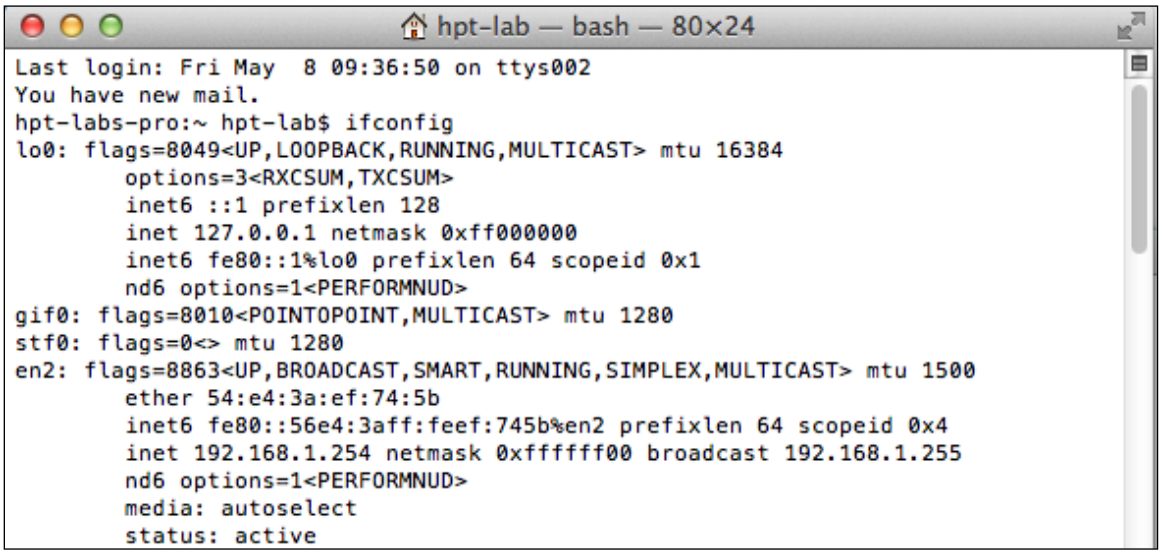
Example: The IPv4 address is under Ethernet adapter Ethernet 4 and is 192.168.1.143

Note: Make sure **Restrict to localhost access** is **disabled** in WebGUI **Setting** (Refer to setting)

You can then remotely access the WebGUI using any other computer that is in your local network by opening any web browser and typing **http://{IP address of host computer}:7402** (default port is 7402).

For **Mac** Users:

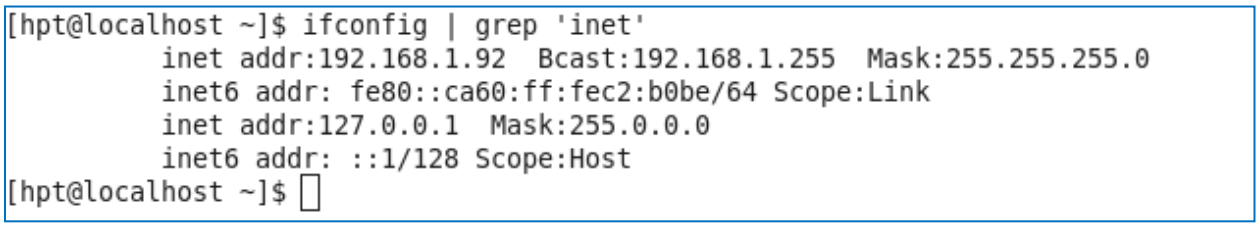
1. Open a **terminal** window on the host computer (computer that is connected to the RR4522.)
2. Type `ifconfig`.
3. Look for the connection that has **status**: **active**
4. Write the IP address located after **inet**:



Example: en2 has active status, the IP is 192.168.1.254

For **Linux** Users:

1. Open a **terminal** window on the host computer (computer that is connected to the RR4522.)
2. Type `ifconfig | grep 'inet'`



3. Write the IP address located after **inet**:

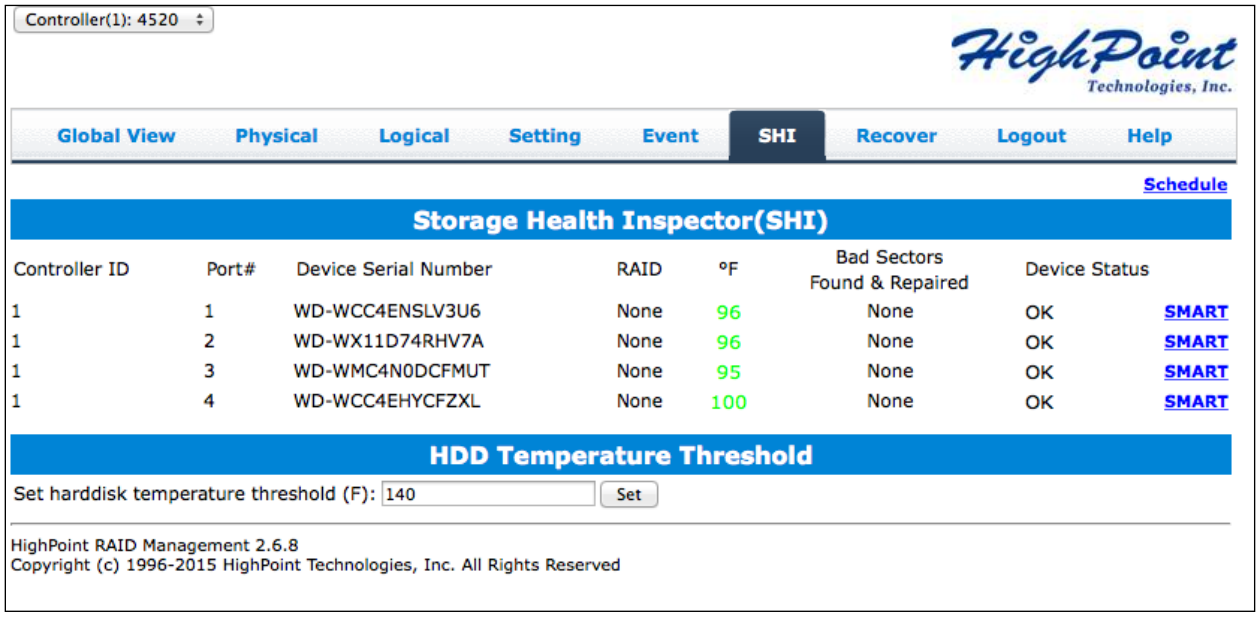
Storage Health Inspection (SHI)

The Storage Health Inspector (SHI) monitors each individual disk's health. Monitoring disk SMART attributes can prevent critical RAID failures from occurring.

This section covers the following:

- Enabling SMART Monitoring
- Disabling SMART Monitoring
- Changing HDD Temperature Threshold

Enabling SMART Monitoring



To access the SMART attributes of an individual disk:

1. Log in to WebGUI (default **user**: RAID **password**: hpt).
2. Select the proper controller using the drop down menu on the top left.
3. Click the **SHI** tab.
4. Click **SMART** on the desired disk.
5. Click **Enable** to enable SMART monitoring.

Disabling SMART monitoring

You have the option to disable SMART monitoring on each individual disk:

1. Select the proper controller using the drop down menu on the top left.
2. Click the **SHI** tab.

3. Click **SMART** on desired disk.
4. Click **Disable.**

Note: Disabling SMART will prompt the Storage Health Inspector to change the disk status to 'Failed'. The RocketRAID alarm will **not** alert you when this setting is disabled. Any potential warnings related to S.M.A.R.T attribute technology will not trigger.

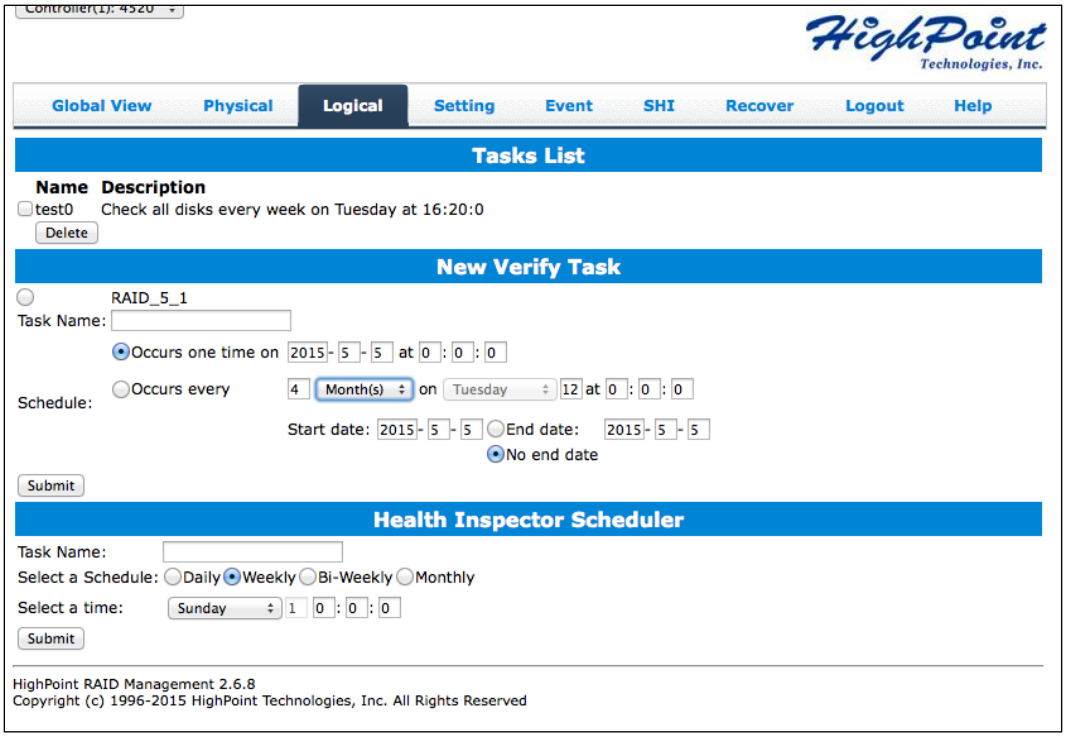
Changing HDD Temperature Threshold

To ensure hard disk temperatures remain cool, enable SMART to monitor disk temperatures. In **SHI**, you can set a threshold so that the WebGUI or controller alarm (if enabled) can warn you when physical disks get too hot.

1. Log in to WebGUI.
2. Select the controller from the drop down on the top left.
3. Click **SHI.**
4. Type the desired hard disk temperature threshold (℉).
5. Click **Set.**

Utilizing the Health Inspector Scheduler

The **Health Inspector Scheduler** (**HIS**) enables you to periodically check your disk/arrays to ensure they are functioning optimally.



Creating a New Verify Task

All arrays will appear under New Verify Task

1. Log in to WebGUI.
2. Select the proper controller from the top left drop down.
3. Click **SHI.**
4. Click **Schedule.**
5. Select the array you want to schedule the verify task.
6. Type the name in **Task Name** entry box.
7. Choose whether you want to schedule.
   - One time verify task on specific date (YYYY-MM-DD) at (HH:MM:SS, 24-hr clock).
   - Or a specific schedule you can adjust based on Daily, Weekly, or Monthly options.
8. Click **Submit.**
9. Your entry will appear under **Tasks List.**

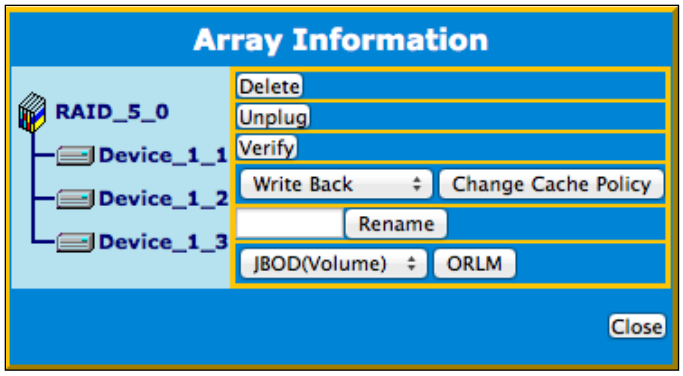
Note: New Verify Task box only appears if you have normal status arrays. If you have a critical array, New Rebuild Task will replace New Verify Task.

RAID Expansion (OCE/ORLM)

Important: It is recommended to **Verify/Rebuild** your array before **Expanding** or **Migrating**. Once you start an **OCE/ORLM** procedure, you *can* stop the process but it **must** be resumed until completion.

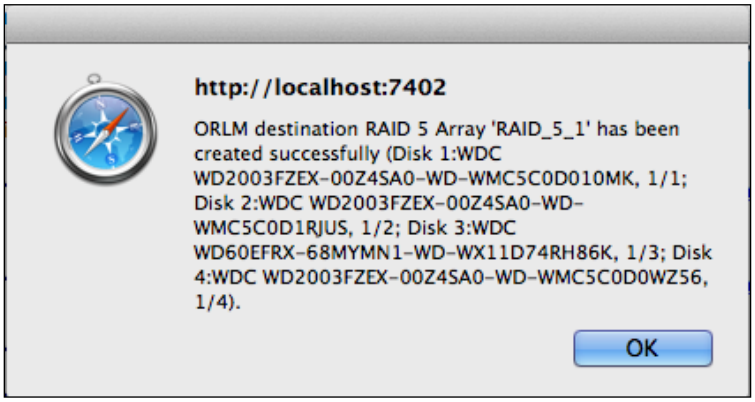
To add more capacity to your current configuration, follow these steps:

1. Log in WebGUI
2. Select desired controller from drop down menu on top left
3. Click **Logical**
4. Click **Maintenance** for the array you want to change
   - Select a **different** RAID level to **Migrate**
   - Select the **same** RAID level to **Expand**

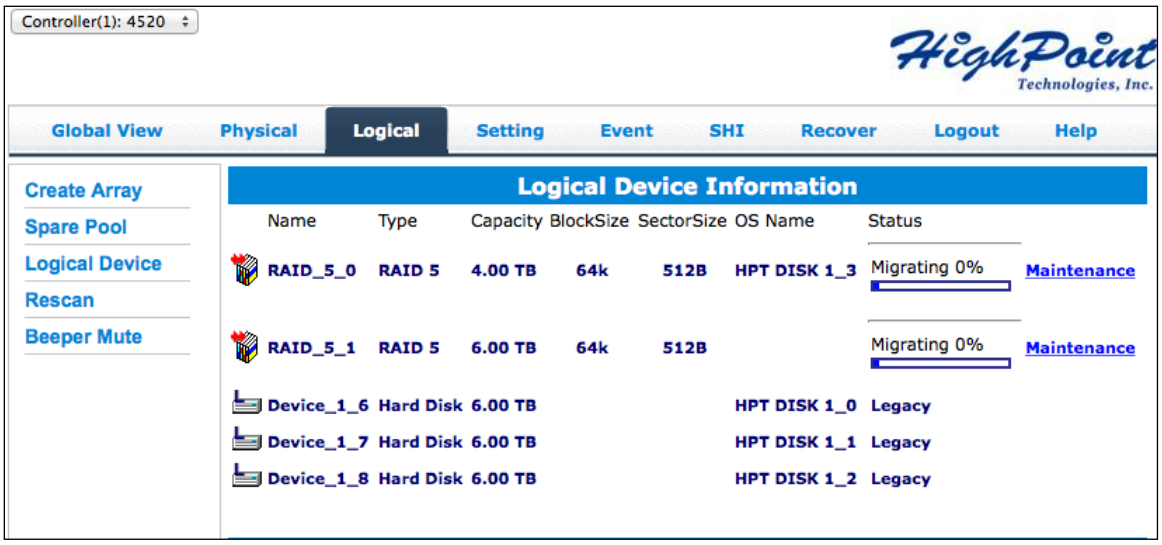


5. **Important**: Record all the physical drives currently in array.
6. Click **ORLM**
7. Select the physical drives you recorded earlier and the drives you want to add
8. Click **Submit**

Upon submission, you will receive a prompt stating ORLM created successfully.



The **Logical Device Information** for the migrating/expanding array will change status to **migrating/expanding**.



Updating RocketRAID HBA BIOS/Firmware

Having the latest BIOS ensures you have the latest firmware stability and performance improvements. Updating the BIOS may fix boot up or system resource issues; make sure to read the README before making any changes.

A few reasons as to why update BIOS/Firmware:

BIOS resource issue	Inefficient BIOS code may cause your boot-up to hang during POST.
Compatibility fixes	Updating firmware may fix issues that occur when using new hardware
Bug fixes	Bugs that are discovered post release are fixed in subsequent updates.

Updating BIOS/Firmware using WebGUI

Keeping the firmware up to date ensures that your RAID controller the latest compatibility and performance updates.

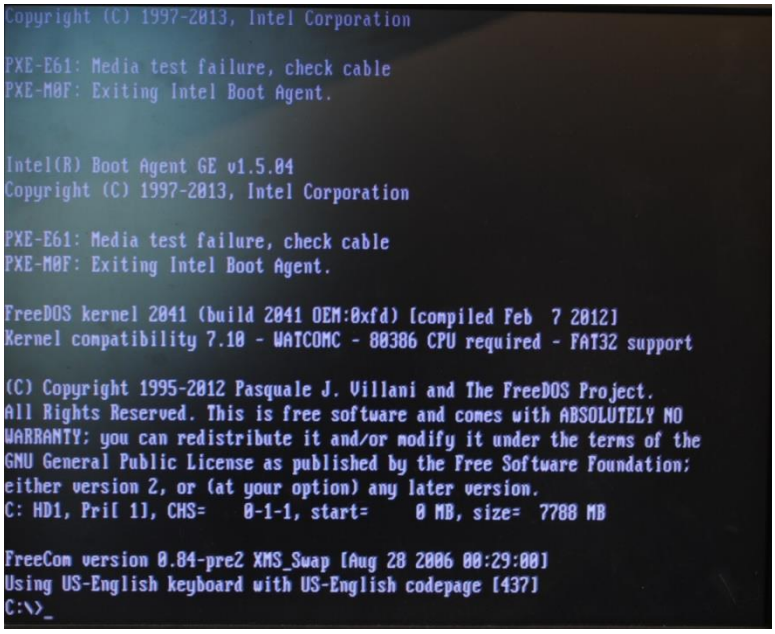
1. Locate the latest firmware on our webpage at www.highpoint-tech.com.
2. Extract the contents of the file.
3. Refer to the readme (if included) to make sure you have the correct firmware for your HBA ***Note***: Your HBA name and properties can be found in the **WebGUI** > **Physical Tab**.
4. Locate the proper firmware file
5. Login to WebGUI, then click the Physical tab.
6. Under **Update Firmware**, click **Browse** and browse to your firmware file.
7. Click **Submit.**
8. **Reboot** for changes to take effect.

Updating BIOS/Firmware using a bootable USB

Create a bootable USB using a utility such as Rufus. **Caution**: Creating a bootable USB will erase all previous data stored on it.

1. Download the latest BIOS/Firmware file found at www.highpoint-tech.com
2. Extract the file contents onto the bootable USB
3. Read the README for instructions on how to flash the BIOS onto your hardware.

4. Reboot your computer into DOS mode by:
   - Setting boot priority to the bootable USB
   - Removing all bootable drives (OS, CD Drives) from motherboard and leaving only the bootable USB and RocketRAID card plugged in
5. Once in DOS mode, you should see a command line interface



Bootable USB formatted with Rufus Utility, FreeDOS CLI (Command Line Interface)

6. Type in the command with the file you found in the README (ex. run go.bat on command line)
7. **Reboot**

Troubleshooting – Hardware

If you face any hardware related issues involving the RocketRAID 4522 or disk drives, refer to the following sections for troubleshooting tips. For all other problems, submit a support ticket at www.highpoint-tech.com/websupport.

PC hangs during Boot Up

The most commons symptom for this problem is the lack of resources.

There are two methods to fix this problem:

1. Update your motherboard BIOS
2. Update your RAID Controller BIOS

Update Motherboard BIOS

To update your motherboard BIOS, refer to your motherboard manufacturer's user manual or website.

Update RocketRAID BIOS

To update RocketRAID BIOS refer to either of these sections:

- Using a Bootable USB to update BIOS.
- Updating the BIOS through WebGUI

Note: Press END to bypass the RocketRAID BIOS splash screen so you can boot up windows and access WebGUI.

Troubleshooting - Software

If you face any software related issues involving the HighPoint RAID Management (WebGUI), refer to the following sections for troubleshooting tips. For all other problems, submit a support ticket at www.highpoint-tech.com/websupport.

WebGUI – Connection cannot be established

1. Check the connection of the card with its PCI Express slot. (PCIe 2.0 x8 for RR4522)
2. Check and make sure the cables are not faulty.
3. Check Device Manager (Windows) or System Report (Mac) to verify the device and drivers are installed and detected by the OS
    a. **For Windows Users:**
        i. Open **Device Manager**.
        ii. Click on the **Storage Controller** tab.
        iii. Check to see if **RocketRAID 4522 SAS Controller** is listed.
        iv. If **RocketRAID 4522 SAS Controller** is not listed, check to see if **RAID Controller** is under **Unknown devices**.
        v. If **RAID Controller** is under **Unknown Devices**, re-install RocketRAID drivers.
        vi. If RAID Controller is **not** present, recheck your hardware and cables.
    b. **For Mac Users:**
        i. Click the Apple Icon on the menu bar.
        ii. Click About this Mac > System Report.
        iii. Click **PCI**.
        iv. Check to see the **Type**: **RAID Controller** and **Driver Installed: Yes.**
        v. If Driver Installed is **No**, re-install the drivers.
        vi. If **RAID Controller** is not present, recheck your hardware and cables.

c. **For Linux User:**
   i. Open **Terminal.**
   ii. Type command **`lsmod | grep 'hptiop'`** to check is driver is running.
   iii. Type command **`modinfo hptiop`** to check driver information**.**

Troubleshooting – RAID

If you face any RAID related issues involving your RAID array, refer to the following sections for troubleshooting tips. For all other problems, submit a support ticket at www.highpoint-tech.com/websupport.

Critical Arrays

When your disk is critical, that means your array as a whole is still accessible, but a disk or two is faulty (depending on your RAID level) is in danger of failing.

Common scenarios for critical array status	• **Unplugging disk that is part of an array** • **Bad sector detected on a disk part of the array** • **Unrecoverable data during rebuilding** • **Defective port or cable interrupts rebuilding process**

To recover from this situation,

1. Backup your existing data.
2. Identify which disk is faulty.
   - You can refer to the LED lights on the enclosure.
   - Refer to the WebGUI Logical tab and Event tab.
3. Re-insert the faulty disk or replace with a new disk.
   - Array will rebuild automatically if you enable auto-rebuild setting and you simply reseated the faulty disk. ***Note***: Click **Rescan** if array still does not rebuild automatically.
4. Once a new disk is added, add the new disk into the critical array.
   - Log in to WebGUI.
   - Click **Logical** Tab.
   - Click **Maintenance**>**Add disk**> select the appropriate disk.
5. Rebuild should start automatically.
   - If rebuild does not start, click 'Rescan' on the left hand panel.

Note: Rebuilding an array takes on average 2 hours per 1 Terabyte of disk capacity. The process will scan through the entire disk, even if you have very little *used* disk space.

Rebuild failed

If rebuilding fails to complete due to bad disk sector errors (check in the Event Log), there is an option to continue rebuilding on error in HighPoint WebGUI.

1. Log in to WebGUI.
2. Click **Setting** tab.
3. Under **System Setting**, change **Enable Continue Rebuilding on Error** to **Enabled.**

This option will enable rebuilding to ignore bad sectors and attempt to make your data accessible. It is important to backup immediately after backup is complete and replace or repair any disk(s) with bad sectors.

Critical array becomes disabled when faulty disk was removed

If this is the case, check to make sure you removed the correct disk. When you remove the wrong disk from a critical array, the array status may become disabled. Data is inaccessible for disabled arrays. Follow these steps to restore the previous state:

1. Shut down your PC.
2. Place all disks, including the removed disks, back to original array configuration.
3. Boot up PC.
4. Once array is back to critical status, identify the correct disk (using the event log) and replace it.

Disabled Arrays

If two or more disks in your array go offline due to an error or physical disconnection your array will become **disabled**.

To recover a disabled array, using the 'Recover Tab' will yield the best results. To utilize the **Recover** tab, you will need to insert the **exact** physical drives that are listed on the recover list. The goal of using recover is to get the RAID status back to critical/normal, allowing you to access and back up your data.

Recover with RAID Maintenance

Note: The recover function will only attempt to recover RAID information stored on your disks. Data integrity of the array will not be fixed, if previously corrupted. All disks in the original (disabled) array must be detected before performing a recover operation.

1. Log in to WebGUI.

2. Click **Maintenance** for the array that is disabled.
3. Click **Recover.**

Recover RAID with Recover Tab

Before using the Recover tab to recover your array, check to see if the RAID array is listed in your **Recover List**. Once you have confirmed the RAID array is listed under the Recover List, proceed to delete the disabled array.

1. Log in to WebGUI.
2. Click **Maintenance** for the array that is disabled.
3. Click **delete,** to delete the disabled array.
4. Click **Recover** Tab.
5. Select the RAID configuration you just deleted.
6. Click **Recover Array.**

Setting up a Bootable RAID

For **Windows** Users:

Creating an array and then installing Windows OS onto the RAID configuration is a bootable array. Since you cannot use the conventional method of installing drivers, the drive must be loaded during installation.

Prepare the following items for installation:

- Operating System Install CD
- Driver files for RocketRAID 4522
- USB thumb drive

Set Array as Boot Device

It is recommended to set the RAID array as a boot device prior to installing Windows.

1. Enter RocketRAID BIOS during boot up (**CTRL+H**).
2. Navigate to **settings** using arrow keys.
3. Press **Enter.**
4. Press **Enter** again.
5. Select the desired RAID array.
6. You will return to the main screen once the flag is set.

Installing Windows on Bootable Array:

1. On first boot-up, press **CTRL** + **H** during the HighPoint RocketRAID splash screen to enter the BIOS RAID creation utility.
2. Create the array you want to install your Windows Operating System onto
3. With the array created, download the RR4522 drivers from www.highpoint-tech.com and load them onto a **USB**. You will need to locate the files when prompted to load drivers during Windows Installation
4. Start Windows Installation.
5. When prompted **Where do you want to install Windows**? Click **Load Driver**
6. When prompted, click **Browse**
7. Browse to your connected USB and driver files you downloaded
8. Click **OK**, and once loaded, you will see a list of drivers detected.
9. Select the HighPoint driver file
10. Click **Next**, and you should see the RAID arrays you created
11. Select the RAID array and click **Next**
12. Follow the Windows installation instructions to complete your installation

---

For **Linux** Users:

RocketRAID 4522 drivers are already embedded in Linux and a bootable Linux can be directly installed on the RAID array.

Battery Backup Unit (BBU, sold separately)

When you set your RAID array or HDD to utilize write back cache, you sacrifice reliability for performance. Utilizing Write Through cache allows you to safe guard your data from power related failures, but it will be much slower.

A BBU is primarily used to safe guard arrays utilizing write back cache. When a power failure occurs, the battery will provide enough power to maintain the data in the cache for however long the battery capacity is.

Attaching the BBU

The connection will be made directly on the RAID controller J6 pins.

Checking the Battery Status

1. Log into WebGUI
2. Select the Controller the BBU is connected to

3. Select the Physical Tab
4. Charge status should be listed under Extended Information
5. For CLI, type `query controllers`

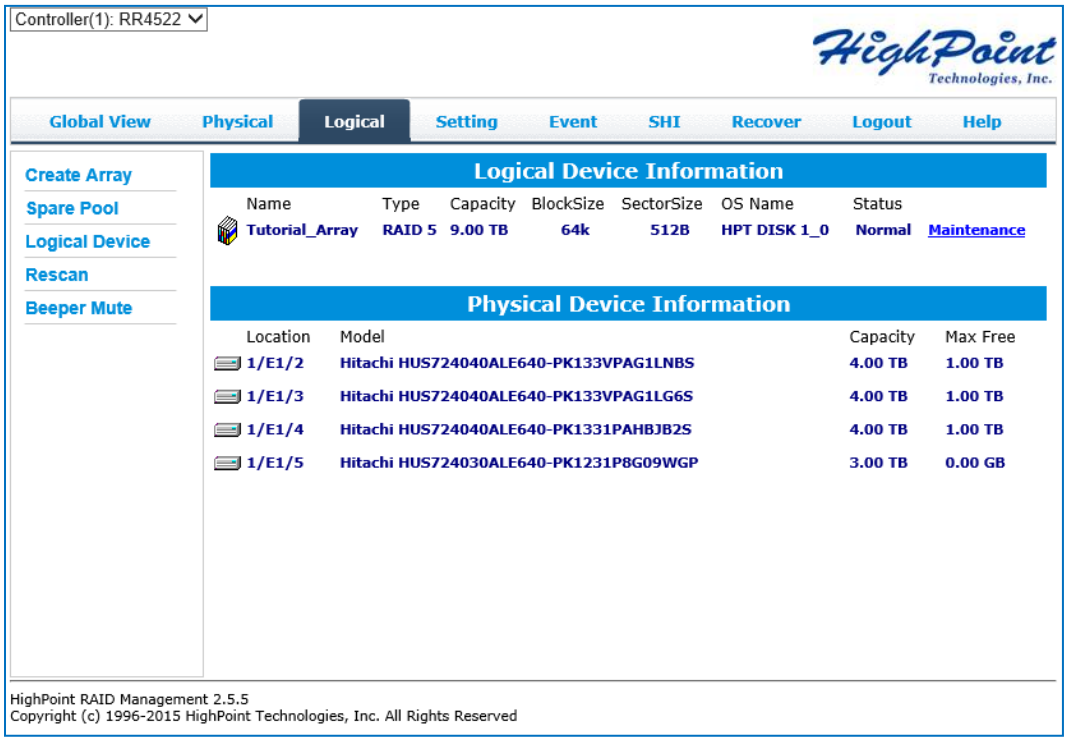
Online Array Roaming

One of the features of all HighPoint RAID controllers is online array roaming. Information about the RAID configuration is stored on the physical drives. If the RR4522 fails or you wish to use another RAID controller, the RAID configuration data can still be read by another HighPoint RocketRAID card.

Port Multiplier (PM) Compatibility

HighPoint RocketRAID 4522 support port multipliers (PM) which enables connectivity of up to 40 hard drives.

Example:

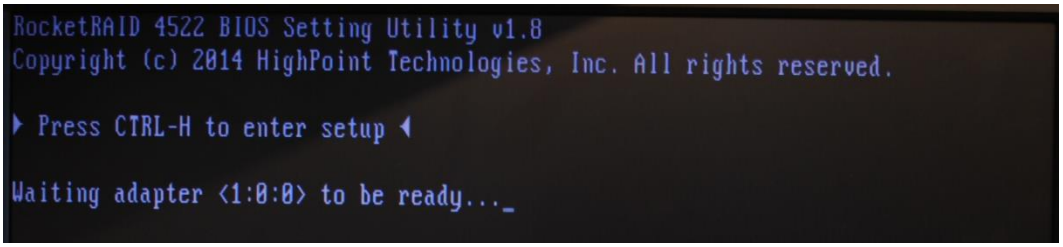


Connected to 1 port on the RocketRAID 4522, the port multiplier split the signal to 4 other targets. Under Physical Device Information (Location), the 1 represents the RR4522 port, E1 represents the port multiplier, and 2…5 represents the additional channels connected to the PM.

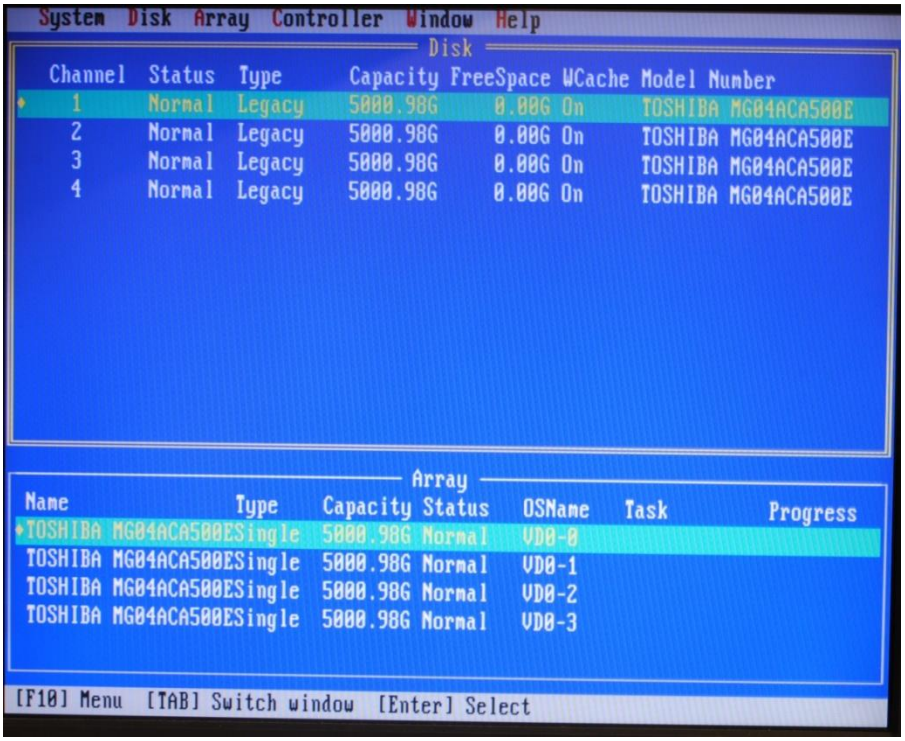
Appendix A: Navigating RocketRAID 4522 BIOS Utility (PC only)

HighPoint RocketRAID BIOS utility allows you to create, manage, and maintain your RAID arrays without the need to install HighPoint WebGUI application.

During boot up, you will see a RocketRAID splash screen prompting you to press **CTRL + H** to enter the BIOS. The following keys will help you navigate through the menus, find information, and make adjustments to your RAID arrays.



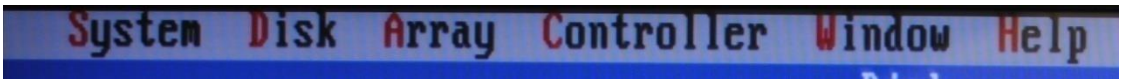
RocketRAID Splash Screen. Press CTRL + H to enter BIOS



Default Screen upon entering BIOS.

Table 1. Navigating the BIOS

Keyboard Arrow Keys	Navigate the menu bar
F10	Accesses the menu bar
TAB	Switches between windows
Enter	Make a selection
ALT + <highlighted key>	Selects Menu Item (Ex. **S**ystem can be accessed with ALT + S
Spacebar	Make certain selections (eg. creating arrays)
ESC	Exits a selection menu



Snapshot of RocketRAID BIOS menu bar

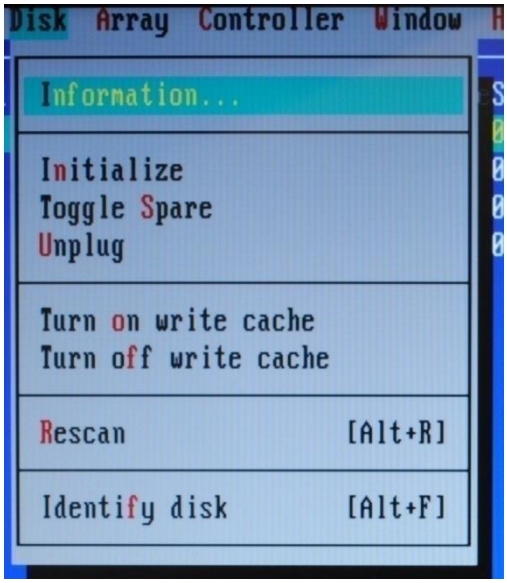
Table 2. Menu Bar Key

System	Exits the BIOS (ALT + X)
Disk	Displays disk Information Initialize disks Add disks to spare pool Unplugs disks
Array	Displays array information Create/delete/unplug arrays Verify array integrity Set boot flag
Controller	Displays RAID controller information Adjust controller settings
Window	View BIOS window panels
Help	www.highpoint-tech.com

Appendix A-1: System Tab

Press **ALT + X** to exit the BIOS.

Appendix A-2: Disk Tab



Access disk tab by **navigating** to disk and pressing **enter**, or press **ALT + D**.

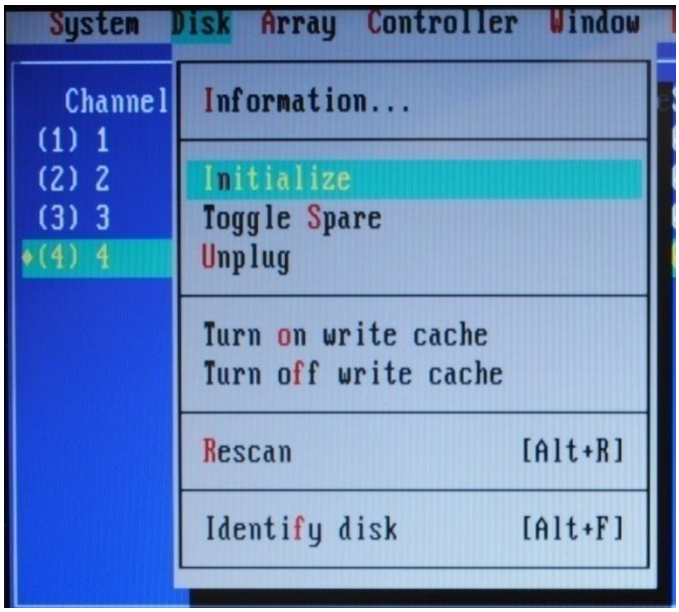
Information	• **Device Type: SATA or SAS** • **Model Number** • **Serial Number** • **Firmware Revision** • **Capacity (in sectors)** • **Read Ahead (on/off)** • **Write Cache (on/off)** • **TCQ** • **NCQ (on/off)** • **Spin up mode**

Initialize	Initializes selected disks
Toggle Spare	Adds selected disks to spare pool
Unplug	Ejects selected disks
Turn on/off write cache	Toggles disk write cache ability
Rescan	Triggers HBA to rescan
Identify Disk	If applicable, will light up identify LED.

Initializing Disks

First you must navigate to the disk panel. By default, you start on the disk panel.

1. Press **ALT + W** to access Window tab.
2. Select disk(s).
3. Use keyboard arrow keys to navigate and press **enter** to select desired disk(s).
4. Press **ALT + D** to activate disk tab.
5. Select **Initialize.**



Four disks are selected and about to be initialized.

6. Press **Enter.**
7. A prompt will warn you that data will be erased.
8. Select **Yes.**
9. Once initialized, you can proceed to create an array.

Adding Disks to Spare Pool

1. Navigate to the disk panel (Press **ALT + W**, then press **1**).
2. Use keyboard arrow keys to select desired disk.
3. Press **enter** to confirm each selection.

4. Press **ALT + D** to open disk tab.
5. Select **Toggle Spare.**

Unplugging Disks

1. Navigate to the disk panel (Press **ALT + W**, then press **1**).
2. Use the keyboard arrow keys and **Enter** to select desired disks.
3. Press **ALT + D** to open disk tab.
4. Select **Unplug.**

Turn On/Off Disk Write Cache

1. Navigate to the disk panel (Press **ALT + W**, then press **1**).
2. Select desired disks.
3. Press **ALT + D** to open disk tab.
4. Select Turn on/off write cache.

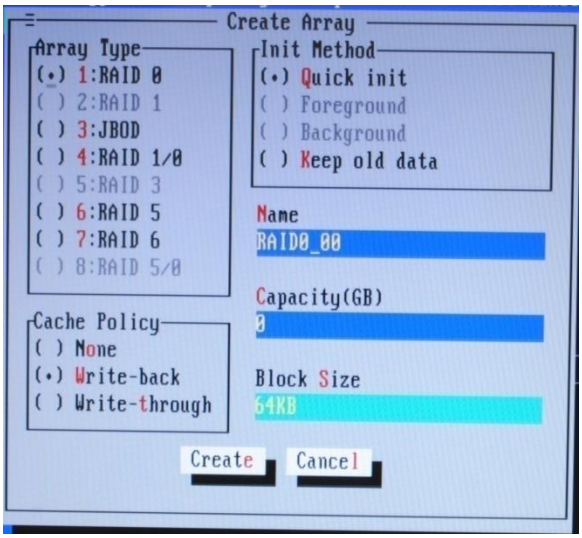
Rescan

Triggers motherboard to rescan the connection

Appendix A-3: Array Tab

Array Information	Will disk the following information on selected array: • Array name • RAID type • Cache Policy • Block Size • Sector Size • Disk Members
Create/Delete/Unplug	Selected action will be performed on array
Verify	Initiates verifying array integrity
Start/Stop Task	Starts or stops the verifying/rebuilding process
Set boot	Sets boot flag on array

Creating an Array

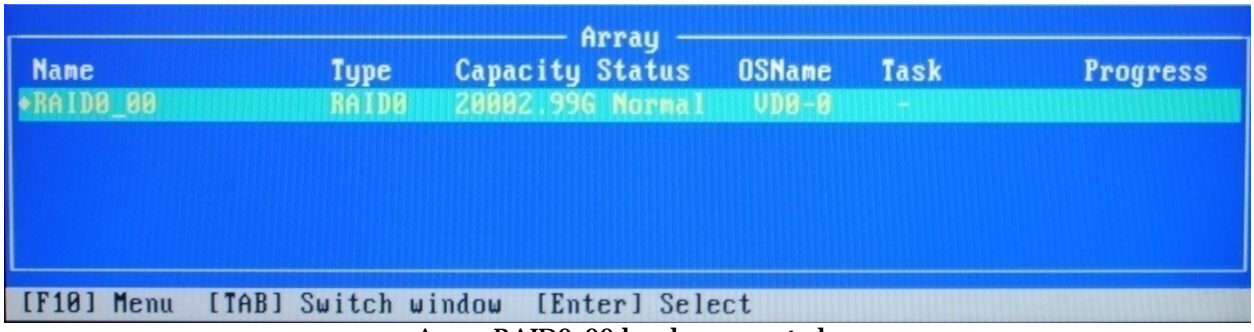


1. Navigate to the disk panel (**ALT + W**, then press **1**.)
2. Select each disk you wish to include in your array.
3. Press **ALT + A** to open array panel.
4. Press **Create**:
5. Press **Spacebar** to navigate and make selections (**TAB** also navigates.)

Array Type	Refer to RAID Level Reference Guide for information about different levels. RAID 0, 1, 5, 6, 1/0, 5/0, and JBOD
Cache Policy	**Write-back** -Any data written to the array will be stored as cache, resulting in better I/O performance at the risk of data failures due to power outages. Data will be stored as cache before it is physically written to the disk; when a power outage occurs, any data in the cache will be lost. **Write-through** -Data written to an array is directly written onto the disk, meaning lower write performance for higher data availability. Without cache acting as a buffer, write performance will be noticeably slower but data loss due to power outages or other failures is significantly minimized.

Init Method	• **Quick Init**- This option grants immediate access to the RAID array by skipping the initialization process, but it will delete all data. **Note***:* Skipping initialization is generally not recommended since residual data on disks may interfere with new data in the future. • **Foreground**-The array initialization process will be set at high priority. During this time array will be non-accessible, but initialization completion time will be shorter. • **Background**-The array initialization process will have a lower priority. During this time array will be accessible, but initialization completion time will be longer. • **Keep Old Data** - This option skips the initialization process and all data on each physical disk of the array will be untouched**.**
Name	Create array name
Capacity	Designate array capacity

6. Press **Create** (**ALT + E**)
7. A prompt about sector size will pop up, **select** a sector size
8. Array will show up in the **Array Window**



Array RAID0_00 has been created.

Verifying your array

1. Navigate to the array panel (Press **ALT + W**, then press **2**)
2. Select desired array to verify (only if you have more than 1 array. If you only have 1 array, verify will automatically start)
3. Press **ALT + A** to open array tab

4. Select **Verify**
5. You can Start/Stop the process by selecting **start/stop task**

Setting Boot Array

1. Navigate to the array panel (Press **ALT + W**, then press **2**)
2. Select desired array
3. Press **ALT + A** to open array tab
4. Press **Set Boot**
5. Window will close, **reboot** to confirm

Appendix A-4: Controller Tab

Information	Provides certain controller information: • Product ID • PCI Location • IOP Model • SDRAM Size • Firmware Version • Battery Installed • Battery MB Installed • Serial Number • CPU Temperatures (Celcius) • Board Temperature (Celcius) • Controller voltage levels
Setting…	Configures certain settings: • Enable audible alarm • Enable Staggered spin up • Spin down idle disk (minutes) • Enable automatic rebuild • Continue Rebuilding on error • INT13 support • Use single BCV entry • Stop on error

Controller > Setting Information

Enable Audible Alarm	Enables/Disables the RocketRAID controller alarm
Enable Staggered Spin up	**(Default: Disabled)** Enabling this setting will force the card to power on each hard disk sequentially (2 seconds between disks). Check with your disk

	manufacturer if your drive supports this feature. Number of drives per spin up: Select the number of disks per spin up (eg. 2 drives powered on every 2 seconds.) Delay between spin up (seconds): Time interval between spin ups.
Spin down idle disk (minutes)	Hard drives can be instructed to spin down when there is no disk activity for set period of time.
Enable automatic rebuild	When enabled, any new disk attached to the controller will automatically be used to rebuild a critical RAID array
Continue Rebuilding on error	Disk bad sectors can interrupt the RAID rebuild process. Enabling this option will allow rebuilding to continue, ignoring bad sectors. Rebuild Priority: This setting determines how HBA resources should be directed towards repairing broken RAID arrays.
Provide INT13 support	INT13 is the HBA's boot function
Use single BCV entry	When enabled (and if HBA hosts several logical disks) only the first disk will be reported to the motherboard BIOS. This setting could be useful when bottom from a disk or array attached to your RocketRAID HBA.
Stop on error	**(Default: Enabled)** If disabled, the host adapter BIOS menu will bypass array or device errors when booting the system

Appendix A-5: Window Tab

The Window is the default screen you see upon entering the BIOS. The Top panel shows all the physical drives detected, and the bottom panel shows all arrays created.

Maximize	Makes Selected Panel (Disk or Array) full screen. You can press TAB to toggle between disks and array panels.
Restore	Restores default panel configuration
1. Disk **2. Array**	Selects the panel you want to work with
Refresh	Refreshes panels

Appendix B: Navigating the HighPoint WebGUI

The HighPoint WebGUI management utility allows you to do several key things:

- View general system overview (see pg. 64)
- Update firmware and BIOS (see pg. 65)
- Create and remove arrays (see pg. 68)
- Change enclosure settings (see pg. 77)
- Troubleshoot faulty drives (see pg. 80)
- Monitor disk health (see pg. 81)

Tab Name	Function
Global View	View HBA (Host Bus Adapter) and Storage Properties
Physical	View Additional Controller properties Update BIOS/Firmware View disk properties Adjust selected disk behaviors
Logical	Manage and create RAID arrays

Setting	Adjust WebGUI controls settings
Event	Show WebGUI Event Log
SHI (Storage Health Inspector)	View and schedule S.M.A.R.T monitoring
Recover	Revert to previously created arrays
Logout	Logout of WebGUI
Help	Additional WebGUI documentation Online Web Support

How to Login HighPoint WebGUI

You can reach the HighPoint WebGUI log in page either by:

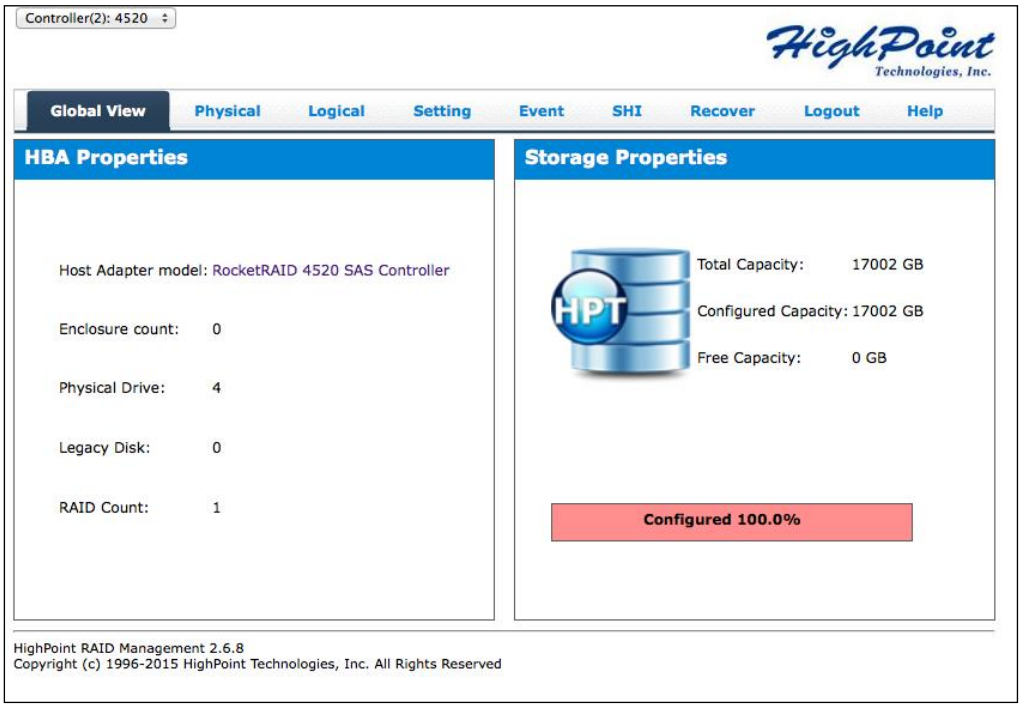
- Double clicking on the **HighPoint RAID Management** icon created on your desktop
- Opening your preferred web browser and typing **http://localhost:7402**in the address bar.

The default username and password to login is

Username: RAID
Password: hpt

Username and Password are Case-Sensitive (Username is not changeable)

Appendix B-1: Global Tab



The WebGUI Global view provides an overview of what each HighPoint controller card connected to your computer detects. It is also the first page you see when logging in.

- Host Bus Adapter Properties
- Storage Properties

On the top left of the page is a drop down menu that allows you to select which controller you want to manage (if you have multiple HighPoint controllers connected).

HBA Properties

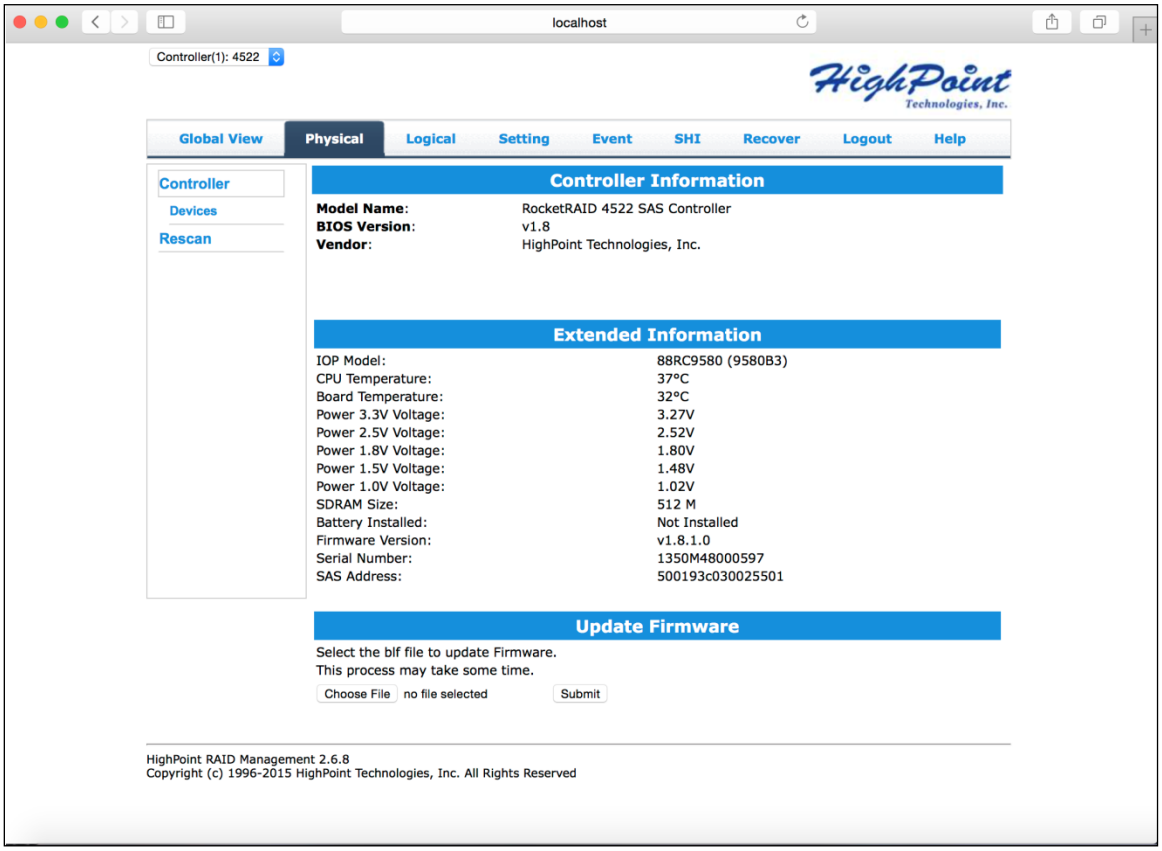
- **Host Adapter model**: the model name of the controller.
- **Enclosure Count**: number of external enclosures detected.
- **Physical drives**: number of drives seen by the controller.
- **Legacy Disks**: number of Legacy disks connected. Legacy disks are physical drives that have previous partitions stored on them.

Storage Properties

- **Total capacity**: the combined capacity of each physical disk connected to controller.

- **Configured capacity**: the amount of space used for creating arrays.
- **Free Capacity**: total amount of space unused.

Appendix B-2: Physical Tab



The physical tab shows general and extended information about the controller you are using. Information about the firmware, BIOS, and operating temperatures are all located here. This information is useful for identifying what RAID controller model you have and to make sure you have the most updated version available.

The physical tab contains the following information:

- Controller Information
- Extended Information
- Update Firmware
- Physical Devices Information

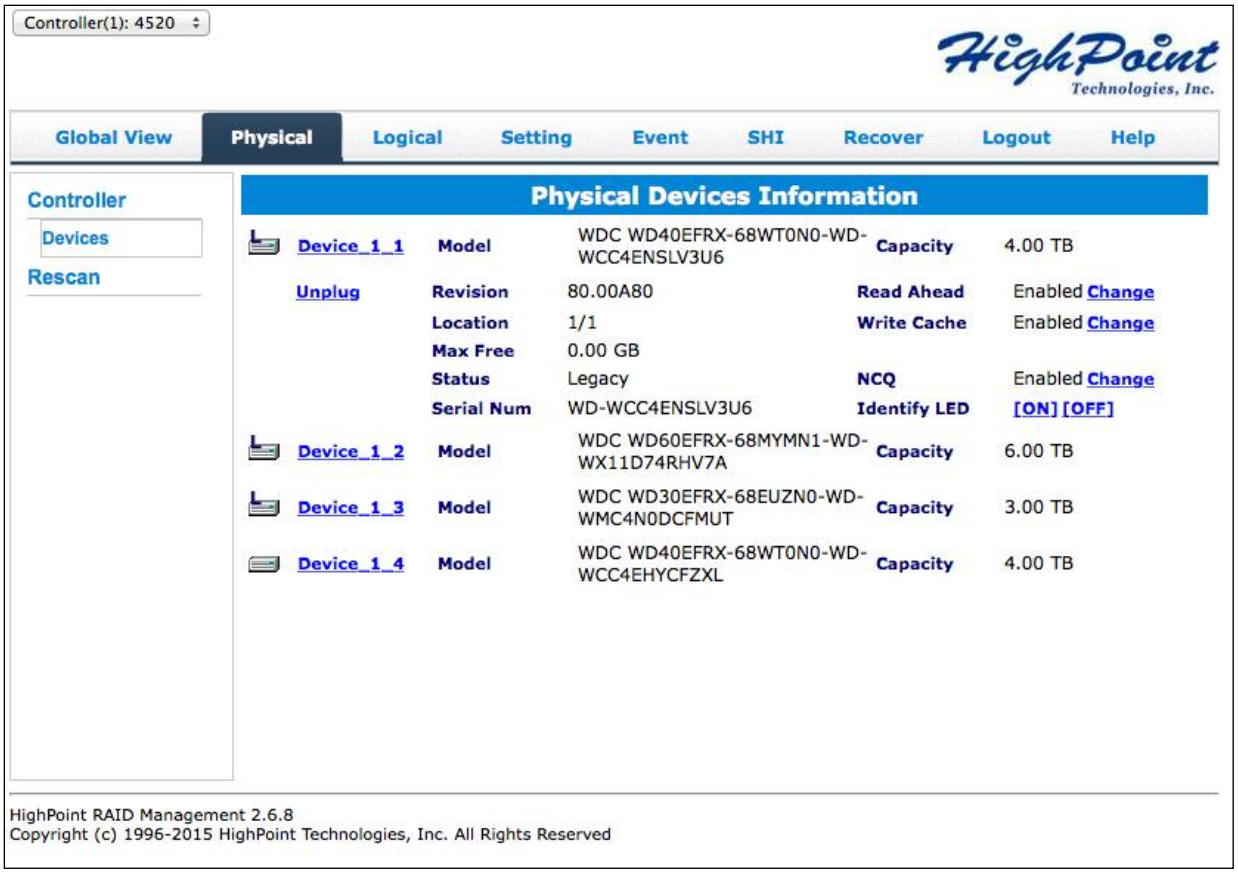
Controller Information: Lists the controller model name, BIOS version, and vendor.

- Model Name: RocketRAID4522 SAS Controller
- BIOS Version: v1.12 (as of 5/5/2015)
- Vendor: HighPoint Technologies, Inc.

Extended Information: Gives you additional information concerning the HBA (**H**ost **B**us **A**dapter) in the enclosure

- **IOP Model**: IOP chip model number
- **CPU Temperature**: Displays computer temperature in Celcius (℃).
- **Board Temperature**: Displays the board temperature in Celcius (℃).
- **SDRAM Size**: SDRAM size of the HighPoint controller card
- **Battery Installed**: Battery Backup Unit information
- **Firmware Version**: Firmware version of the HBA
- **SAS address**: the SAS address

Update Firmware: Allows you to update the controller BIOS and firmware through the WebGUI.



The following properties are part of the **Physical Devices Information** box under the physical tab.

- **Model** – Model number of the physical drive
- **Capacity** – Total capacity of the physical drive
- **Revision** – HDD device firmware revision number
- **Read Ahead*** - (Enable/Disable) Disk read ahead
- **Location** – Device location (example: 1/2 states controller 1, slot 2)
- **Write Cache*** – (Enable/Disable) the disk write cache
- **Max Free** – space on disk that is not configured in an array
- **Status** – (Normal, disabled, critical) status of the disk
- **NCQ*** – (Enable/Disable) Native Command Queuing (SATA disks only)
- **Serial Number** – serial number of the physical disk
- **Identify LED*** – On/Off – toggle the IDENTIFY (RED) on the front panel
- **Unplug** – Safely ejects selected disk. Other methods of disk removal will trigger alarm if enabled

* Disk properties that can be adjusted.

Read Ahead

Enabling disk read ahead will speed up read operations by pre-fetching data and loading it into RAM.

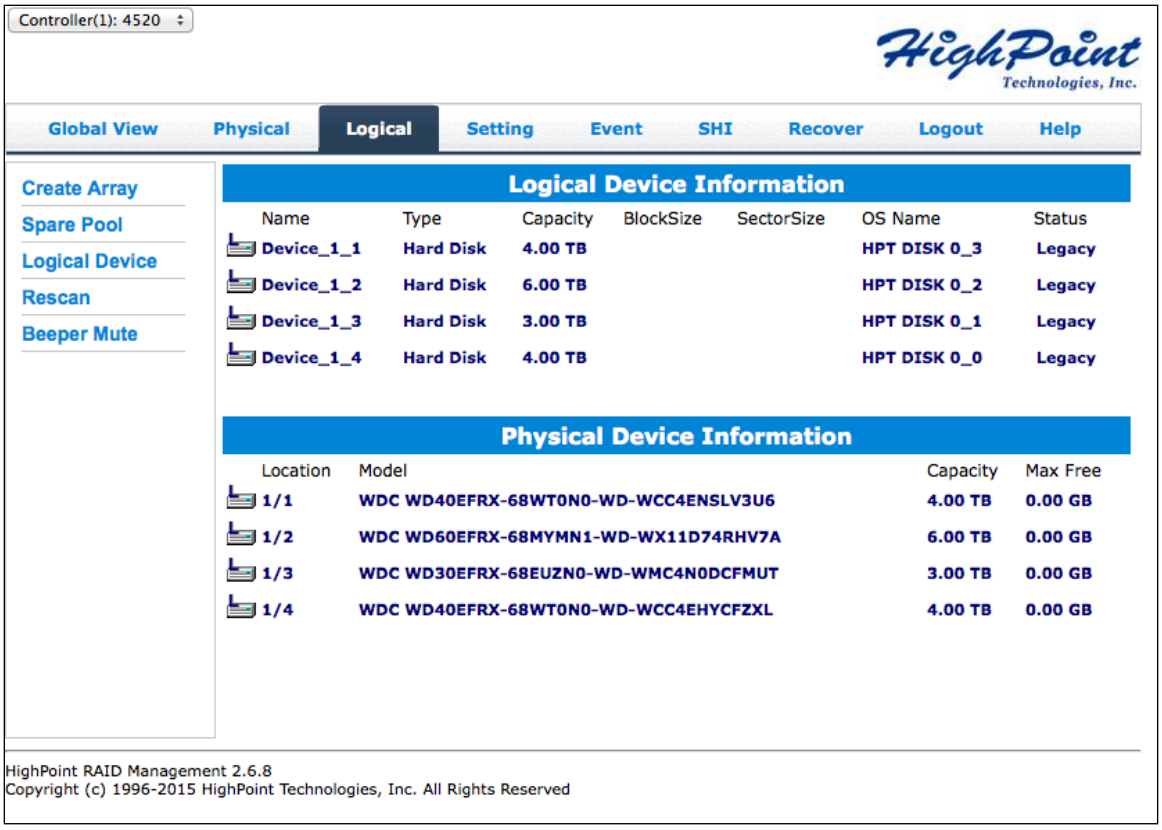
Write Cache
Enabling write cache will speed up write operations.

NCQ (Native Command Queuing)
A setting that allows SATA disks to queue up and reorder I/O commands for maximum efficiency.

Identify LED
The Disk tray LED lights on the front panel can be toggled ON or OFF.

Rescan
Clicking rescan will immediately signal the controller to scan for any changes in the connection. Clicking this button will also stop any alarm if currently ringing.

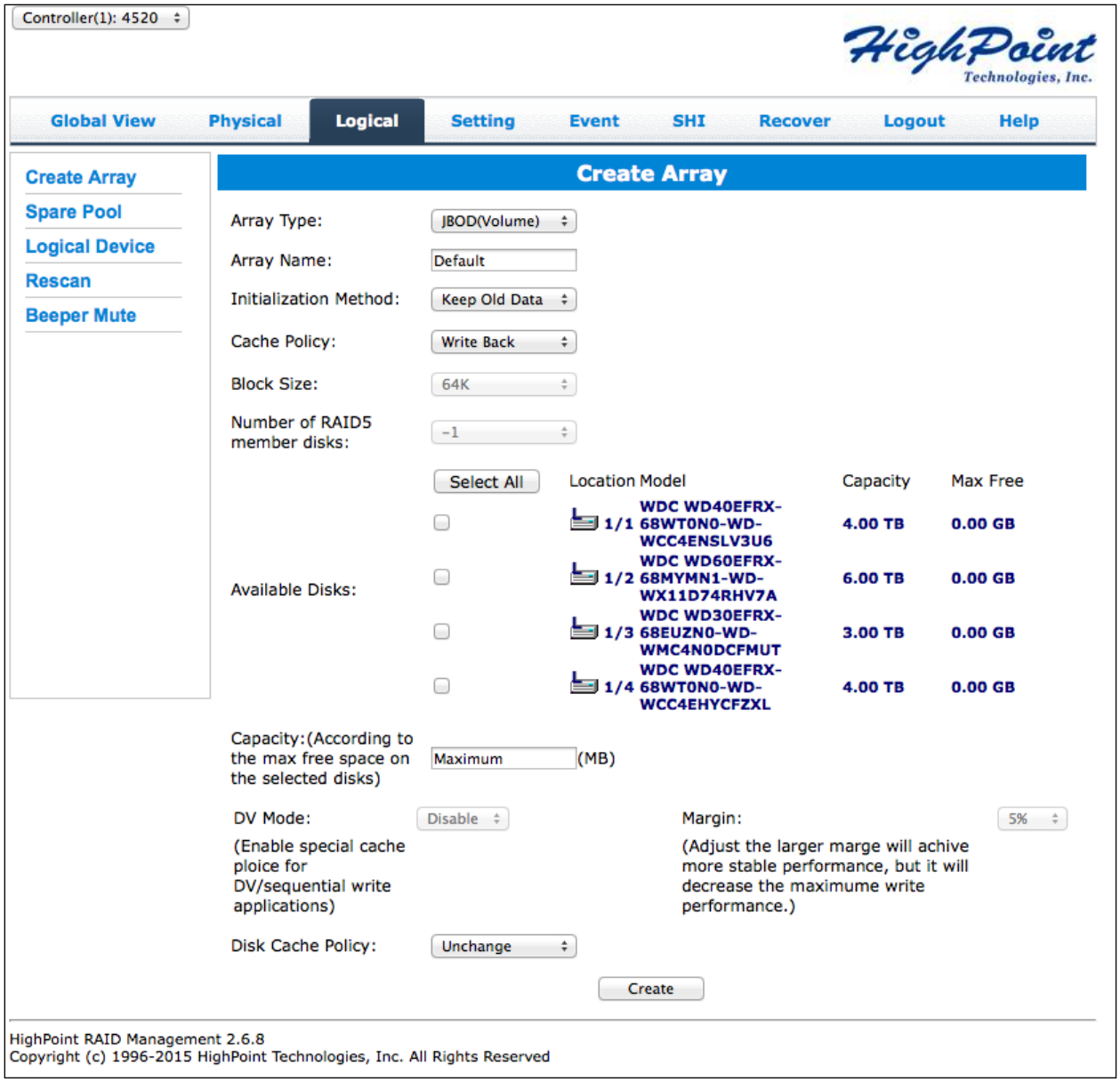
Appendix B-3: Logical Tab



The Logical tab is where you are edit, delete, and maintain your RAID configurations, as well as, adding drives to your spare pool. The logical tab has the following settings:

- Create Array
- Spare Pool
- Logical Device
- Rescan
- Beeper Mute

An array is a collection of physical disks that will be seen as one virtual drive by your Operating System (OS). The RocketRAID4522 controller is capable of creating the following array types:



Array Type:

- **JBOD** – Just a Bunch of Disks
- **RAID0** - Striping
- **RAID 1** - Mirroring
- **RAID 5** – Rotating Parity bit
- **RAID 1/0** – Striping of Mirrored Drives
- **RAID 5/0** – Striping of Distributed Parity
- **RAID6** – Double Parity Bit

Each RAID level has its pros and cons based on the application you use it for (Note: Refer to RAID level Quick Reference)

Array Name: the name that will be displayed in Logical Device Information (Default: RAID_<level>_<array number>)

Initialization Method:

- **Keep Old Data:** Opts to keep all the data on each drive untouched. Best for users that already have HighPoint RAID data on the selected drives.
- **Quick Init:** Grants immediate access to the array volume. This option will delete previous user data, but will not build parity. Recommended for testing purposes only or when new disks are used. Not recommended for RAID 5, RAID 5/0, and RAID 6.
- **Foreground:** The array initialization process will be set at high priority. During this time array will be non-accessible, but initialization completion time will be shorter.
- **Background:** The array initialization process will have a lower priority. During this time array will be accessible, but initialization completion time will be longer.

***Note* 1:** Initialization takes a significant amount of time (approximately 2 hours per 1 TB).

Cache Policy (Default: Write Back)

Write Back – Any data written to the array will be stored as cache, resulting in better I/O performance at the risk of data failures due to power outages. Data will be stored as cache before it is physically written to the disk; when a power outage occurs, any data in the cache will be lost.

Write Through – Data written to an array is directly written onto the disk, meaning lower write performance for higher data availability. Without cache acting as a buffer, write performance will be noticeably slower but data loss due to power outages or other failures is significantly minimized.

Block Size (default: 64K)
[16K, 32K, 64K, 128K, 256K, 512K, 1024K are the supported block sizes]

This option allows you to specify the block size (also known as “stripe size”) for specific array types (RAID 0, 1, 5, 6, 1/0, and 5/0). Adjusting the block size allows you to tailor the array performance towards specific application. Consider the sizes of disk I/O data you are dealing with; as a general rule larger disk I/O may benefit from smaller block sizes, and smaller disk I/O may benefit from larger block sizes. A block size of 64 KB is recommended since it gives balanced performance for most applications.

Capacity (Default: Maximum)

The total amount of space you want the RAID array to take up. When creating RAID levels, disk capacities are limited by the smallest disk.

Example Capacity calculation:

A RAID 5 organizes data in the manner shown below. All parity data will become unusable for the user and not included in the total disk capacity.

Disk 1	**Disk 2**	**Disk 3**	**Disk 4**
Data 1	Data 2	Data 3	**Parity**
Data 4	Data 5	**Parity**	Data 6
Data 7	**Parity**	Data 8	Data 9
Parity	Data 10	Data 11	Data 12

Therefore, RAID 5 capacity will be [SMALLEST DISK CAPACITY] * (number of disks – 1).

Sector Size (Default: 512B)

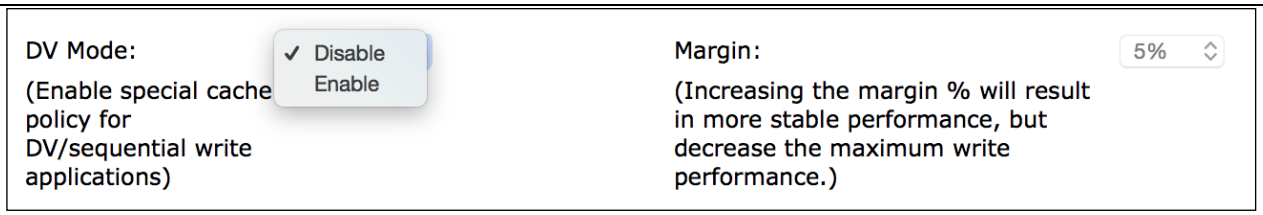
This option is irrelevant for Windows XP 64 and later. Current OS already support larger volumes, and introduce a partitioning method known as GPT (GUID partition table). This option, also known as VSS (Variable Sector Size) allows you to specify the sector size of the array, for use with older Windows Operating Systems.

DV Mode

This mode is specifically designed for video applications. The default firmware cache policy provides balanced performance for standard applications such as workstations, file servers, and web servers. But for DV mode, a special cache firmware is implemented specifically for large sequential writing (large I/O requests such as video files). Enabling DV mode will maintain the performance and consistency of transferring and processing video files.

There are several factors concerning DV mode to take note:

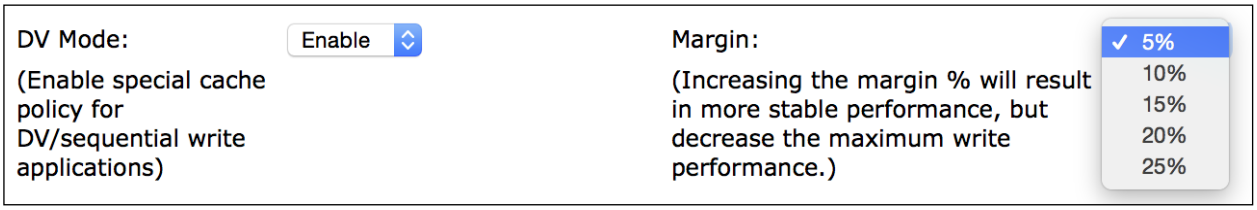
- DV mode only available for RAID 0, 5, and 6
- Only 1 RAID array you created can enable DV mode
- DV mode only works when array status is normal



Margin
[5% - 25%]

When DV mode is enabled, you have the option to set the margin.
This percentage represents the amount of space the designated cache will hold before flushing the data onto the drive. Increasing the margin % will result in more stable performance, but decrease the maximum write performance.

Alternatively, you can change the margin anytime in Logical > Maintenance for DV enabled array.



Logical Device Information

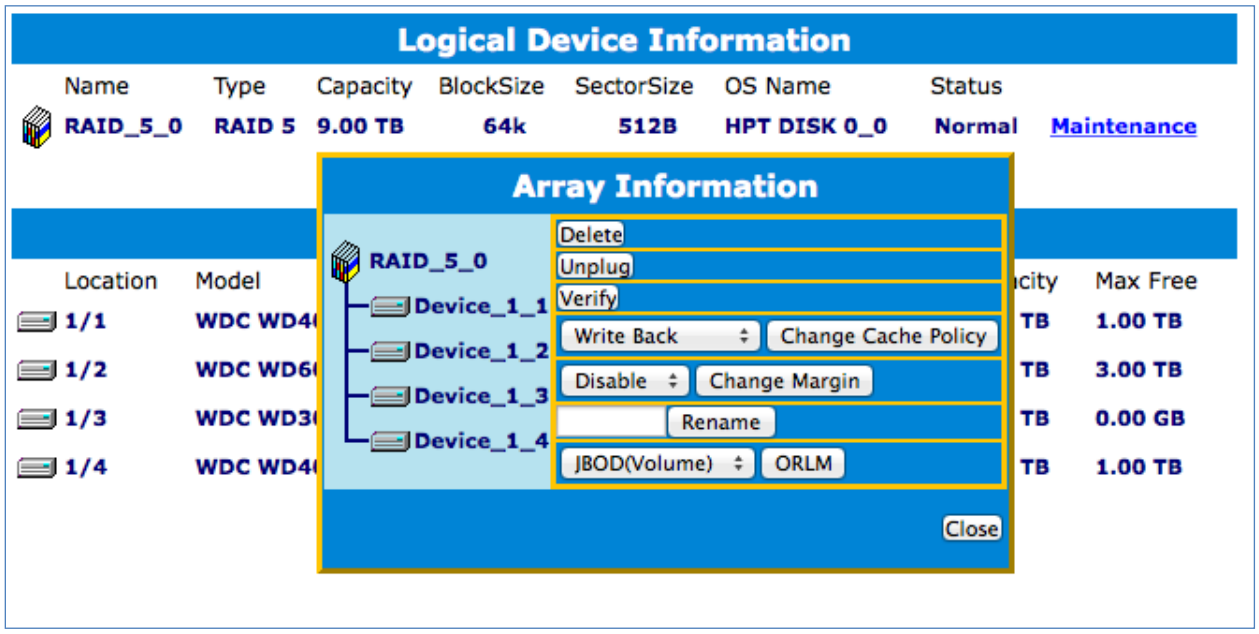
Logical device tab is the default page upon clicking the Logical tab of the WebGUI. This page contains information about your RAID arrays and individual disks your system detects.

Logical Device Information
Arrays you create and the properties associated with them will appear here.

Maintenance
Once an array has been created, click maintenance for options to manage your array.

Array Information
Clicking on the maintenance button will show you the Array information box. Different array statuses (Normal, critical, disabled) will have different maintenance options.

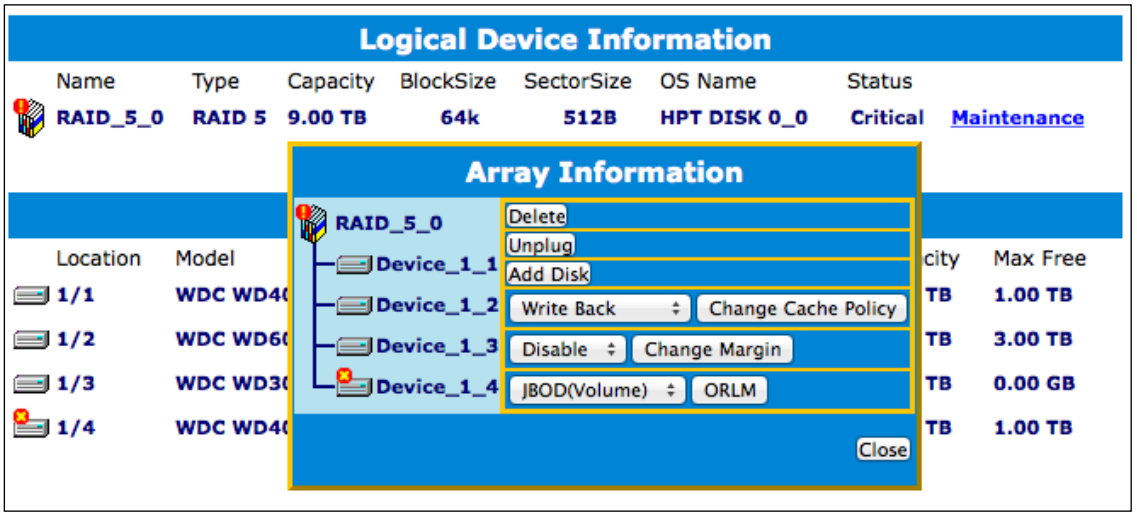
Normal Status



A Normal Status Array has the following options:

Delete – deletes the selected RAID array
Unplug – powers off the selected RAID array
Verify – verifies the integrity of the RAID array
Change Cache Policy – Toggles between Write through and Write back cache
Change Margin – Adjust margin when DV mode is enabled
Rename – renames the RAID array
OCE/ORLM – **O**nline **C**apacity **E**xpansion / **O**nline **R**AID **L**evel **M**igration

Critical Status



A critical status array has all the normal status options except the following:

- The Array can no longer be renamed
- **Add disk** replaces the **verify disk** option

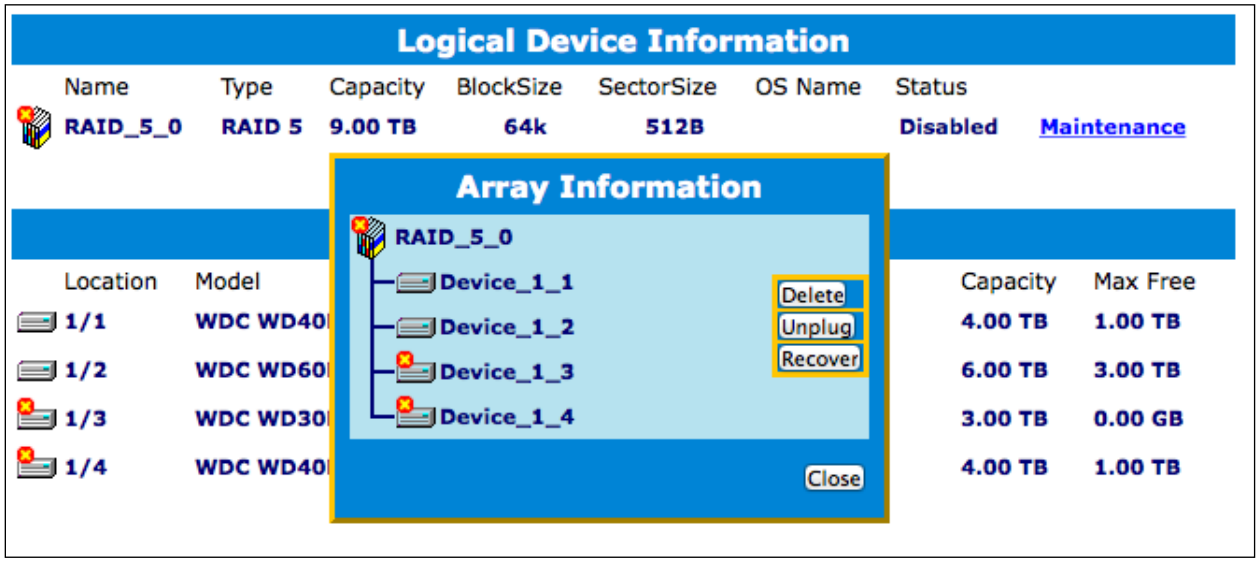
Once array status changes to critical, the faulty disk will be taken offline and you can either:

- Reinsert the same disk
- Insert new disk

Reinserting the same disk should trigger rebuilding status, since data on the disk would be recognized.

If you insert a new disk, clicking **add disk** will give you the option to select that disk and add it to the array.

Disabled Status



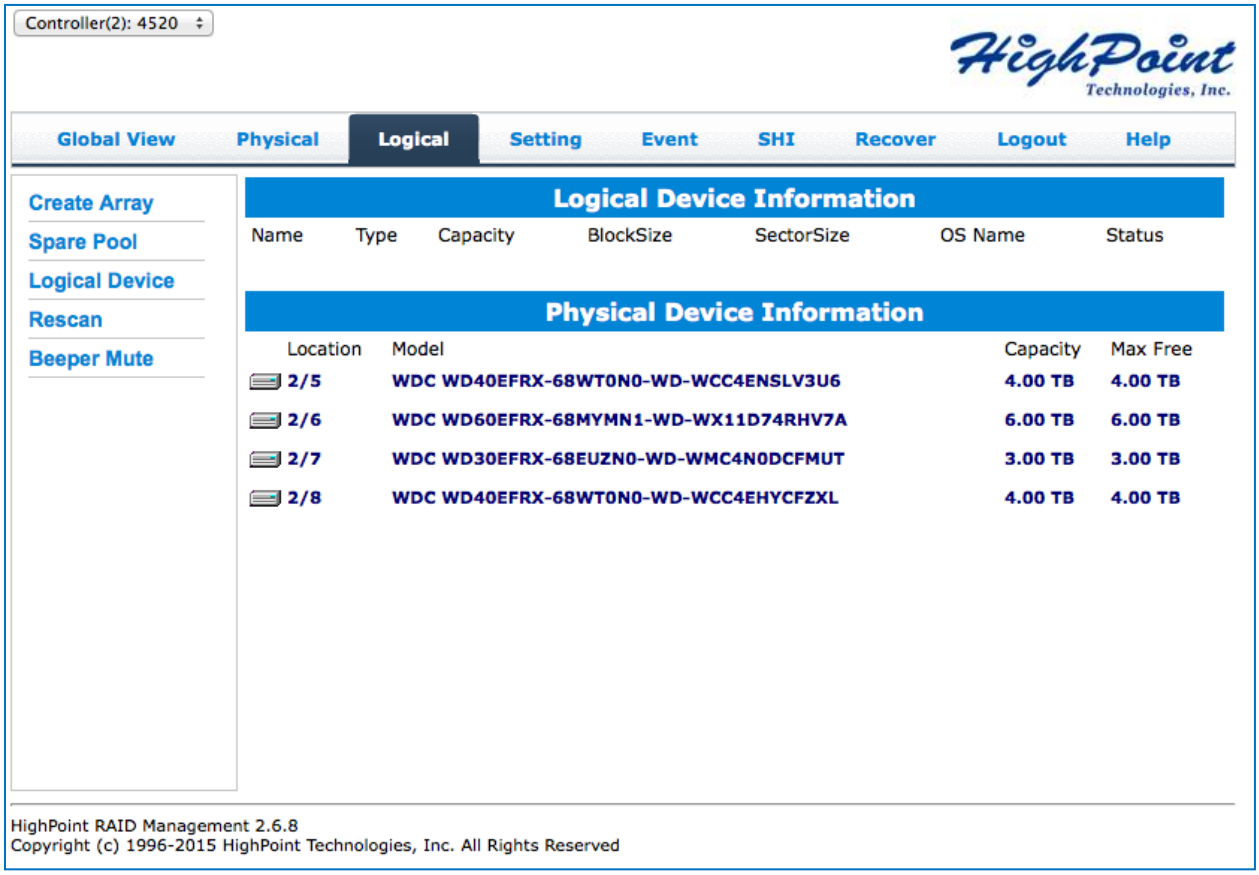
A disabled status array means that your RAID level does not have enough disks to function.

- Your data will be inaccessible.
- Rebuilding will not trigger, since RAID does not have enough parity data to rebuild upon.

Your options in Maintenance are:

Delete – will delete the array
Unplug – will take array offline, making it safe to remove
Recover – will attempt to recover the array using the list from the recover tab

Physical Device Information



- **Location** – which controller and port the drive is located in
- **Model** – model number of the drive connected
- **Capacity** – total capacity of the drive
- **Max Free** – total capacity that is not configured

Rescan

Clicking rescan will force drivers to report array status. For any disk(s) you hot plug into the device, do not click rescan until all physical drives are detected and appear under Logical Device Information.

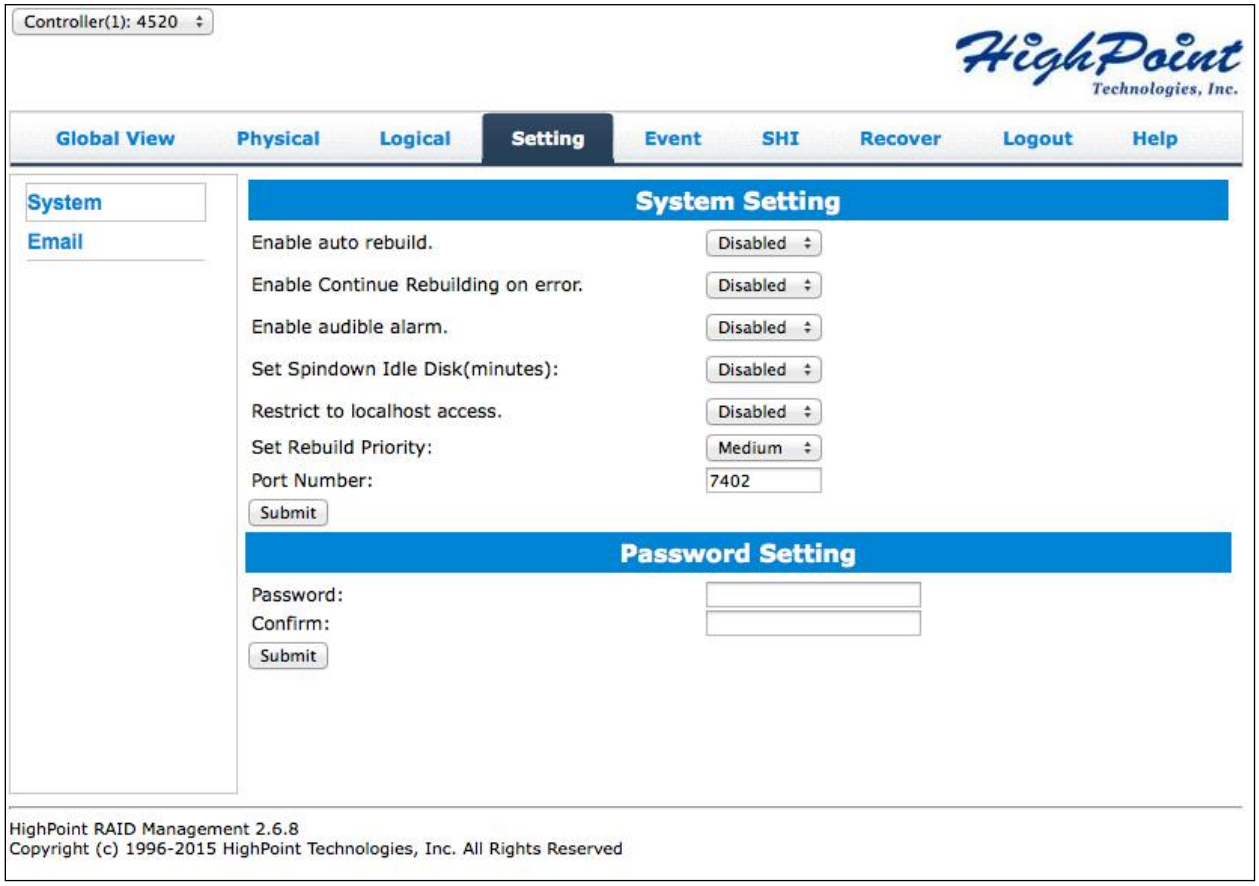
Beeper Mute

The controller emits a beeping sound whenever an

- Array falls into **critical** status
- Array falls into **disabled** status
- You unplug a disk
- Your disk fails due to bad sectors
- SMART sensors anticipate drive failure

If device is currently beeping, clicking Beeper Mute will mute the sound immediately. ***Note***: This button does not permanently mute the alarm. To permanently mute the alarm go to **Setting**>**Enable audible alarm**>**Disabled**.

Appendix B-4: Setting Tab



System Settings

Enable auto rebuild (default: Enabled)

When a physical drive fails, the controller will take the drive offline. Once you re-insert or replace the disk, the controller will not automatically rebuild the array unless this option is enabled.

Enable continue rebuilding on error (default: Enabled)

When enabled, the rebuilding process will ignore bad disk sectors and continue rebuilding until completion. When rebuild is finished, the data may be accessible but data inconsistency due to ignored bad sectors may cause problems in the future. If this option is enabled, HighPoint recommends user to check the event log for bad sectors.

Enable audible alarm (default: Enabled)
When a physical disk fails, the controller will emit an audible sound signaling failure. This option mutes the alarm.

Set Spin down Idle Disk (minutes) (default: Disabled)
When set, physical drives will spin down a certain amount of time after disk activity ceases. Only 10, 20, 30, 60, 120, 180, 240 minutes setting are available.

Restrict to localhost access (default: Enabled)
Remote access to the controller will be restricted when **enabled**, other users in your network will be unable to remotely log in to the WebGUI.

Rebuild Priority (default: Medium)
You can specify the amount of system resources you want to dedicate to rebuilding the array. There are 5 levels of priority [Lowest, Low, Medium, High, Highest]

Port Number (default: 7402)
The default port that the HighPoint WebGUI listens on is 7402. You may change it to any open port.

Password Setting

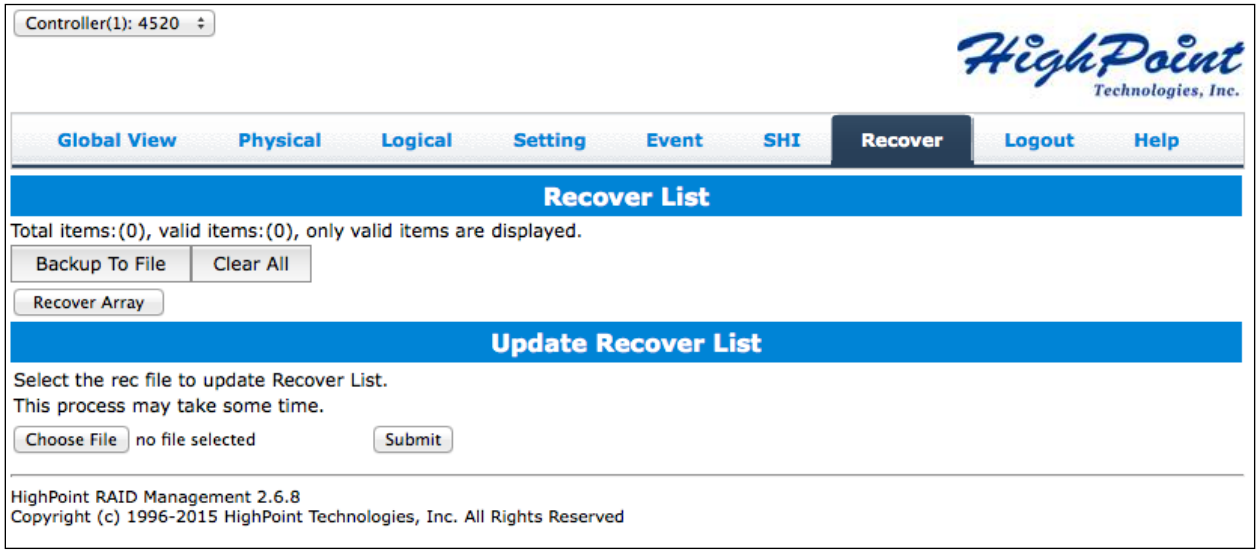
Changing your WebGUI password

Under Password Setting type your new password and confirm it, then click submit.

Email Setting

You can set the controller to send an email out to recipients of your choosing when certain events (refer to Event Tab) trigger.

Appendix B-5: Recover Tab



Previously created arrays will be stored under this tab. Recovering an array from here will attempt to recover a '**disabled'** array and make it '**normal'**.

The Recover List will list all your previous and current created arrays. Each entry will list the following properties:

- Array name
- RAID level
- Array Capacity
- Time created (YYYY/MM/DD, HH/MM/SS, 24 hr clock format)
- Location of physical drives
- Model of physical drives

Important: When recovering an array it is important to note the **location** and **model** of each physical drive because you can **only** recover using those **exact** positions and drive model.

How to Backup your Recover List

The recover list is a record of your previously created arrays containing the model and location information of your physical drives. Recovering from the list could help bring a **disabled** array back to **normal** status for emergency data retrieval.

To backup your recover list:

1. Log in to WebGUI
2. Click **Recover** Tab
3. Click **Backup to File**

Note: The file will be saved as **hptrec.rec**

How to Reload your Backup Recover List

In the case that you cleared the recover list or it does not appear for any reason, you can recover it if you saved the list beforehand.

To reload your recover list

1. Log in to WebGUI
2. Click **Recover** Tab
3. Under **Update Recover List** click **Browse.**
4. Locate your previously saved **hptrec.rec** file and select it
   Note: loading a back up recover list will completely replace the current recover list.
5. Click **Submit**

Appendix B-6: Event Tab

In the event tab, you can see log entries associated with the HighPoint device. The event log provides useful information when troubleshooting your set up.

In the event tab, there are four options available:

- Download – Save the log file on your computer
- Clear – Clears all log entries
- Prev – View previous log page
- Next – View next log page

Table 3. Event Log Icon Guide

Icon	Name	Definition
	Information	Includes general administrative tasks: • Create/delete arrays • Configuring spares • Rebuilding arrays • Configuring event notifications • Configuring maintenance
	Warning	Alerts issued by the Host Adapter: • High temperatures • Sector errors

		• Communication errors • Verification errors
	Error	Hardware related problems • Hard disk failure • Broken errors • Memory failure

The event view is a basic error logging tool built into the HighPoint WebGUI.

Appendix B-7: SHI (Storage Health Inspector)

- S.M.A.R.T Attributes
- HDD Temperature Threshold
- Storage Health Inspector Scheduling

The SHI outputs information collected using SMART (Self-Monitoring Analysis and Reporting Technology) Hard Drive Technology. The data provided on this tab helps you to anticipate any disk failures based on a variety of monitored hard disk properties.

Appendix C:WebGUI Icon Guide

	**Critical** – missing disk A disk is missing from the array bringing it to 'critical' status. The array is still accessible but another disk failure could result in data loss.
	Verifying The array is currently running a disk integrity check.
	Rebuilding The array is currently rebuilding meaning you replaced a failed disk or added a new disk to a 'critical' state array.
	Critical – rebuild required The array has all disks, but one disk requires rebuilding.
	Disabled The icon represents a disabled array, meaning more than one disk failed and the array is no longer accessible
	Initializing The array is initializing. The two types of initialization is Foreground and Background. (See Initialization)
	Uninitialized The array initialization process has been interrupted, and the process is incomplete.
	Not Initialized Disk is not initialized yet, and needs to be initialized before use
	OCE/ORLM Array is performing a OCE/ORLM operation
	OCE/ORLM has stopped The array expansion process has been stopped.
	Legacy An existing file system has been detected on the disk. These disk are classified as legacy drives.
	Spare The device is a spare drive, it will automatically replace any failed drive part of an array.
	Normal The array status is normal

	**Initializing** The array is initializing, either foreground or background initialization
	**Initialization Stopped** The initialization has been stopped. Current status is uninitialized.
	**Critical – Inconsistency** Data in the array is inconsistent and needs to be rebuilt.
	**Critical – missing disk** A disk has been removed or experienced failure, and user needs to reinsert disk or add a new disk.
	**Rebuilding** The array is currently rebuilding.
	**Verifying** The array is performing a data consistency check. Array status will show 'verifying'.
	**Disabled** The array does not have enough disks to maintain the RAID level. A disabled array is not accessible.
	**OCE/ORLM** Array is expanding its capacity or migrating to a different raid level. Status will display 'Expanding/Migrating'
	**OCE/ORLM stopped** The 'Expansion/Migrating' process has been stopped. The status will display 'Need Expanding/Migrating'
	**Critical – OCE/ORLM** A disk member is lost during the OCE/ORLM process.
	**Critical – OCE/ORLM - rebuild** The expanding/migrating array requires a rebuild.

Appendix D: RAID Level Reference Guide[1]

Type	Description	Min. disks	Usable space	Advantage	Disadvantage	Application
JBOD	Just a bunch of disk	1	100%	Each drive can be accessed as a single volume	No fault tolerance - failure of one drive results in complete data loss	Backup
RAID 0	Disk Striping	2	100%	Offers the highest performance	No fault tolerance – failure of one drive in the array results in complete data lose	Temporary file, performance driven application.
RAID 1	Disk Mirroring	2	50%	Provides convenient low-cost data redundancy for smaller systems and servers	Useable storage space is 50% of total available capacity. Can handle 1 disk failure.	Operating system, backup, and transaction database.
RAID 1/0	Disk Mirroring followed by stripe	4	50%	High read performance and medium write performance with data protection for up to 2-drive failures	Useable storage capacity equals total capacity of all drives in the array minus two	Fast database and application servers which need performance and data protection
RAID 5	Disk Striping with Rotating parity	3	67-94%	High read performance, and medium write performance with data protection with a single drive failure	Not recommended for database applications that require frequent/heavy write sessions. Can handle 1 disk failure.	Data archives, and ideal for application that require data protection
RAID 6	Disk Striping with dual rotating parity	4	50-88%	High read performance, and medium write performance with data protection in case of up to two drives failure	Not recommended for applications that require frequent/heavy write sessions.	Data archives and ideal for application that requires data protection

[1] Refer to the RAID controller product specifications for supported RAID levels.

Help

Online Help redirects you to additional documentation concerning the HighPoint WebGUI.
Register Product takes you to HighPoint's web support. On this page you can create a new customer profile where you can register your product or post an online support ticket.

HighPoint List of Recommended Hard Drives

HighPoint maintains a list of tested hard drives suitable for RAID applications. Since not every hard drive in the market can be tested, this list is meant to be a general guideline for selecting hard drives operating in a RAID environment. Regular, desktop grade drives are highly not recommended for RAID use.

http://highpoint-tech.com/PDF/Compatibility_List/RocketRAID_600_2700_3600_and_4500_Series_RAID_HBA_Hard_Drive_Compatiblity_List.pdf

Contacting Technical Support

For any help and support, submit a support ticket online at http://www.highpoint-tech.com/websupport/ .

You may also call us during our regular business hours:
Monday – Friday (Excluding Holidays), 9 AM to 6 PM (PST)
Phone: (408) 240-6108