
Pegasus32

R4, R6, R8

Product Manual

Version 1.0

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About this guide

This *Product Manual* describes how to setup, use, and maintain the Pegasus32 R8, R6 and R4 unit. It also describes how to use the Pegasus Utility software that you install and run on your computer. Please notice that there are different setup instructions for Mac users and Windows users.

Although this manual is written specifically for the Pegasus32 models, many of the functions and descriptions can be applied to previous releases of the PROMISE Pegasus line.

This manual includes a full table of contents, chapter task lists, and numerous cross-references to help you find the specific information you are looking for.

Also included are four levels of notices:

**Note**

A *Note* provides helpful information such as hints or alternative ways of doing a task.

**Important**

An *Important* notice calls attention to an essential step or point required to complete a task. Important items include things often missed.

**CAUTION**

A *Caution* informs you of possible equipment damage or loss of data and how to avoid them.

**WARNING**

A *Warning* notifies you of probable equipment damage or loss of data, or the possibility of physical injury, and how to avoid them.

Notices for USA

Federal Communications Commission (FCC) notice

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.

NOTE: 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.

Modification

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by PROMISE TECHNOLOGY INC. may void the user's authority to operate the equipment.

Notices for Japan

この装置は、クラスB 機器です。この装置は、住宅環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。

取扱説明書に従って正しい取り扱いをしてください。

VCCI-B

Notices for Korea

B 급 기기

이 기기는 가정용(B 급) 으로 전자파적합등록을 한 기기로서 주로 가정에서 사용하는 것을 목적으로 하며 , 모든 지역에서 사용할 수 있습니다 .

“B ” class equipment

As this equipment has undergone EMC registration for house hold purpose (“B ” Class), this product can be used in any area and designed to be used mainly in a household.

Notices for Canada (Avis Canadien)

CAN ICES-003 (B) / NMB-003 (B)

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled “Information Technology Equipment (Including Digital Apparatus)”, ICES-003 of the Canadian Department of Communications.

Cet appareil numérique respecte les limites bruits radio électriques applicables aux appareils numériques de Class B prescrites dans la norme sur le matériel brouilleur: “Matériel informatique (y compris appareils numériques)”, NMB-003 édictée par le Ministre Canadien des Communications.

Notices for European Union

The product herewith complies with the requirements of the Low Voltage Directive 2014/35/EU, the EMC Directive 2014/30/EU, the ErP Directive 2009/125/EC, the RoHS Directive 2011/65/EU and carries the CE-marking accordingly.

Notices for Taiwan

Taiwan RoHS Hazardous Substances table

限用物質含有情況標示聲明

Declaration of the Presence Condition of the Restricted Substances Marking

設備名稱	直連式儲存設備		型號（型式）		Pegasus32 R4 , Pegasus32 R6,	
Equipment name	Direct Attached Storage		Type designation (Type)		Pegasus32 R8	
單元 Unit	限用物質及其化學符號 Restricted substances and its chemical symbols					
	鉛	汞	鎘	六價鉻	多溴聯苯	多溴二苯醚
	Lead	Mercury	Cadmium	Hexavalent chromium	Polybrominated biphenyls	Polybrominated diphenyl ethers
	(Pb)	(Hg)	(Cd)	(Cr ⁺⁶)	(PBB)	(PBDE)
電路板	—	○	○	○	○	○
外殼	○	○	○	○	○	○
線材	○	○	○	○	○	○
電源供應器	—	○	○	○	○	○
風扇模組	—	○	○	○	○	○
備考 1. “超出 0.1 wt %” 及 “超出 0.01 wt %” 係指限用物質之百分比含量超出百分比含量基準值。 Note 1: “Exceeding 0.1 wt %” and “exceeding 0.01 wt %” indicate that the percentage content of the restricted substance exceeds the reference percentage value of presence condition.						
備考 2. “○” 係指該項限用物質之百分比含量未超出百分比含量基準值。 Note 2: “○” indicates that the percentage content of the restricted substance does not exceed the percentage of reference value of presence.						
備考 3. “—” 係指該項限用物質為排除項目。 Note 3: The “—” indicates that the restricted substance corresponds to the exemption.						

Safety Information

Observe all warnings on the product and in the operating instructions. To reduce the risk of bodily injury, electric shock, fire, and damage to the equipment, observe all precautions included in this guide.

You must become familiar with the safety information in this guide before you install, operate, or service PROMISE products.

Use environment

- Make sure that the area in which you install the equipment is properly ventilated and climate controlled. The operate normally in the temperature of 5 ° C – 35 ° C and relative humidity of 10% – 95%.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the electrical rating label of the equipment.
- Never use the equipment in a wet location.

Chassis

- Do not block or cover the openings to the equipment.
- Never push objects of any kind through openings in the equipment. Dangerous voltages might be present.
- Conductive foreign objects can produce a short circuit and cause fire, electric shock, or damage to your equipment.
- Lift equipment using both hands and with your knees bent.

Power Cords

To reduce the risk of electric shock or damage to the equipment:

- Use an approved power cord. If you have questions about the type of power cord to use, contact your PROMISE TECHNOLOGY INC. authorized service provider.
- If you have not been provided with a power cord for your product or for any AC-powered option intended for your product, purchase a power cord that is approved for use in your country.
- You must use a power cord rated for your product and for the voltage and current marked on the electrical ratings label of the product. The voltage and current rating of the cord must be greater than the voltage and current rating marked on the product.
- Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.
- Do not place objects on AC power cords or cables. Arrange them so that no one might accidentally step on or trip over them.
- Do not pull on a cord or cable. When unplugging from the electrical outlet, grasp the cord by the plug.
- To reduce the risk of electrical shock, disconnect all power cords before servicing the equipment.

Equipment Modifications

Do not make mechanical modifications to the system. PROMISE TECHNOLOGY INC. is not responsible for the regulatory compliance of PROMISE TECHNOLOGY INC. equipment that has been modified.

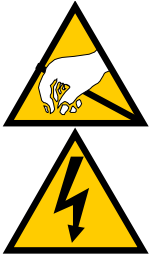
Equipment Repairs and Servicing

The installation of internal options and routine maintenance and service of this equipment should be performed by individuals who are knowledgeable about the procedures, precautions, and hazards associated with equipment containing hazardous energy levels.

- Do not exceed the level of repair specified in the procedures in the product documentation. Improper repairs can create a safety hazard.
- Remove all watches, rings, or loose jewelry when working before removing covers and touching internal components.
- Do not use conductive tools that could bridge live parts.
- Use gloves when you remove or replace internal components; they can become hot to the touch.

If the equipment sustains damage requiring service, disconnect the equipment from the AC electrical outlet and refer servicing to an authorized service provider. Examples of damage requiring service include:

- The power cord, extension cord, or plug has been damaged.
- Liquid has been spilled on the equipment or an object has fallen into the product.
- The equipment has been exposed to rain or water.
- The equipment has been dropped or damaged.
- The equipment does not operate normally when you follow the operating instructions.

**CAUTION**

The electronic components within the Pegasus unit are sensitive to damage from Electro-Static Discharge (ESD). Observe appropriate precautions at all times when handling the Pegasus unit or its subassemblies.

**WARNING**

The fan contains hazardous moving parts. Keep fingers and other body parts away.

**CAUTION**

To avoid hand contact with an electrical hazard, do not remove more than one drive carrier a time” or the equivalent.

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INTRODUCTION TO PEGASUS32

This chapter covers the following topics:

- “Packing List”
- “Architecture”
- “Protocol Support”
- “Key Benefits”
- “Specifications”
- “Hardware”

PROMISE Technology's Pegasus32 R8, R6 and R4 are direct attached storage (DAS) solutions for external storage targeted for small and medium business (SMB) users, small office/home office (SOHO) users, and digital Audio and Video production professionals.

Pegasus32 models (R4, R6, R8) are operationally compatible with the original release Pegasus3 R4, R6 and R8 models. Use the latest version of the Pegasus Utility to monitor the Pegasus32 status and perform maintenance and management functions. The latest version of the Pegasus Utility can also be used for the original release of Pegasus2 and Pegasus3.

PACKING LIST

Check the shipping package to make sure you have the following items:

- Pegasus32 R4, Pegasus32 R6 or Pegasus32 R8
- Thunderbolt™ 3 / USB cable
- Hard disk drives (four in R4, six in R6, eight in R8)
- Power cord
- Quick Start Guide

ARCHITECTURE

The Pegasus32 architecture is based on a state-of-the-art PMC Sierra 8067 I/O processor coupled with 1G of DDR3-1866 SDRAM memory and a world class enterprise-proven RAID engine.

PROTOCOL SUPPORT

Pegasus32 supports Thunderbolt™ 3 and USB 3.2 Gen 2 technology, providing two channels with a maximum 40 Gb/s of throughput in both directions simultaneously. Thunderbolt™ 3 is NOT COMPATIBLE with the previous versions of Thunderbolt™ (i.e. Thunderbolt™ and Thunderbolt™ 2).

Pegasus32 features one DP 1.4 port capable of driving an 8K monitor. DisplayPort standard DP 1.4 supports content via both Thunderbolt™ or USB Type-C.

Thunderbolt™ 3 supports daisy-chaining up to six (6) high-speed peripheral devices, including external disks, and video capture devices.

Pegasus32 has two Type-C ports, that work on either Thunderbolt™ mode or USB mode. Daisy-chaining is supported on Thunderbolt™ mode as required.

KEY BENEFITS

- Use Thunderbolt™ 3 or USB 3.2 Gen 2
(via two Thunderbolt™ 3 / USB 3.2 Gen 2 Type-C ports and cabling)
- Thunderbolt™ 3 40 Gb/s data connection
- USB 3.2 Gen 2 10Gb/s data connection
- DP 1.4 port supports 8K monitor
- Mac/Windows OS in-box (or native) drivers
- Power charging supported up to 85W
- PMC Sierra 8067 I/O processor
- 1G of DDR3-1866 SDRAM memory
- Pegasus Utility management tool
- Compatible with Apple Time Machine
- R6, six SATA 3.5-inch hard disk drives
- R4, four SATA 3.5-inch hard disk drives
- R8, eight SATA 3.5-inch hard disk drives
- Additional storage using multiple daisy-chained Pegasus32 enclosures
- 250W Flex-ATA Power with 80 Plus Bronze.

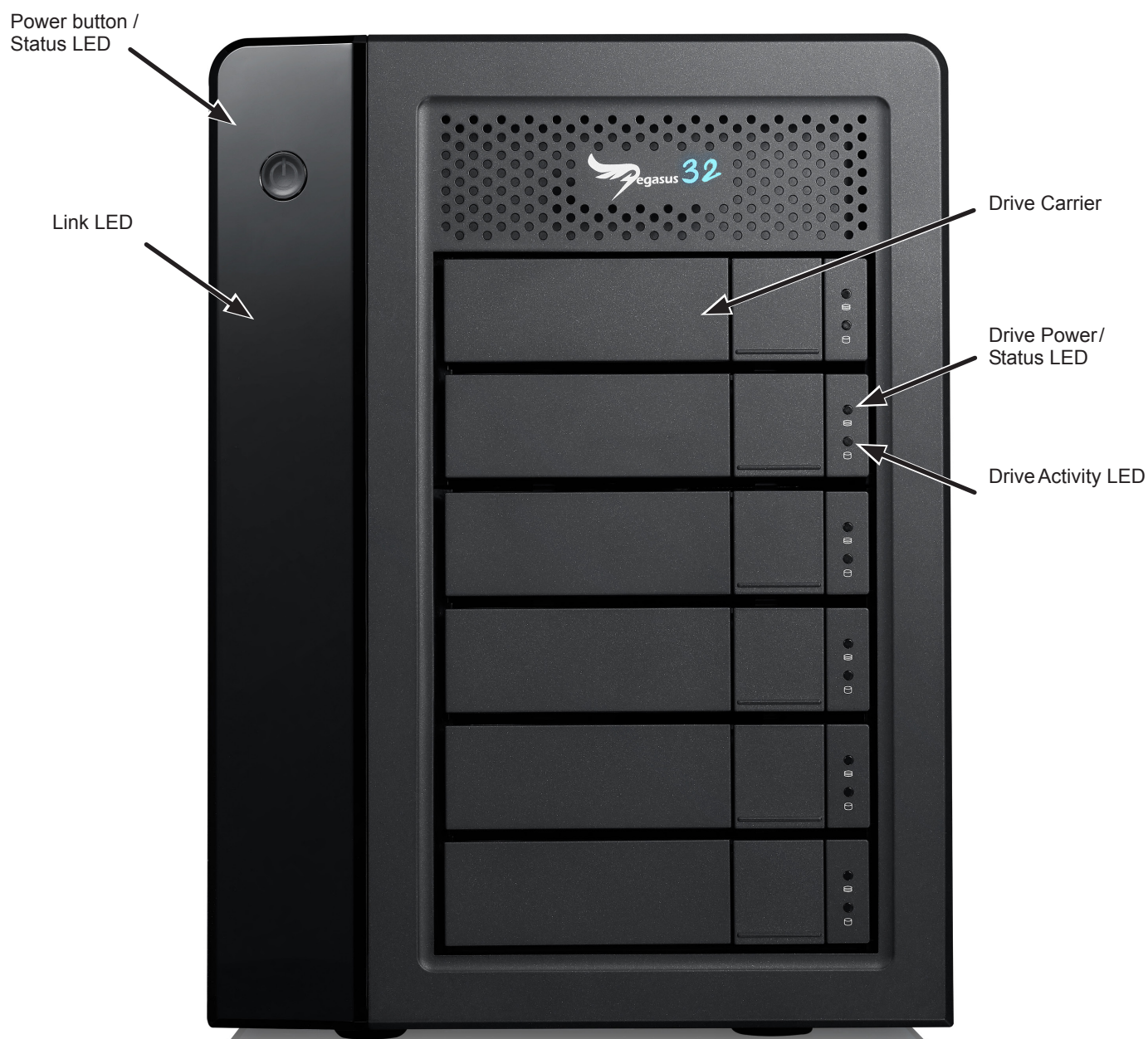
SPECIFICATIONS

Storage Disks	The Pegasus32 is shipped with 3.5 inch SATA Hard Disk Drives (HDD) installed in the drive carriers and placed in the drive bays.
Capacity	<p>The Pegasus32 is available in three form factors that differ in the number of drives that can be installed. Total capacity depends on the size of the HDD shipped with the unit.</p> <p>The Pegasus32 R4 is shipped with four HDD</p> <p>The Pegasus32 R6 is shipped with six HDD</p> <p>The Pegasus32 R8 is shipped with eight HDD</p> <p>In addition, Pegasus32 enclosures can be connected or “daisy-chained” to other Pegasus32 units to scale up the available storage capacity.</p>
Power supply	250W Flex-ATA Power with 80 Plus Bronze with PFC, 100-230V auto-ranging, 50-60Hz AC
System Fan	<p>Pegasus32 R4/R6: Dimension: 92(W) x 92(H) x 25(D) mm / Airflow: 70 CFM</p> <p>Pegasus32 R8: Dimension: 120(W) x 120(H) x 25.8(D) mm / Airflow: 97 CFM</p>
RAID function	<p>RAID level support: RAID 0, 1, 1E, 5, 6, 10, and</p> <p>RAID 50 (Pegasus32 R6/R8 only)</p> <p>RAID 60 (Pegasus32 R8 only)</p>
OS Support	<p>Windows 10 x64</p> <p>macOS 10.14 and above</p>
Hardware monitoring	Fan, Temperature, Power, Enclosure, Physical drives, Logical drives, RAID controller
Temperature	<p>Operating: 5° ~ 35° C</p> <p>Non-operating: -40° ~ 70° C</p>
Humidity	<p>Operating: 10% ~ 95% non-condensing</p> <p>Storage: 5% - 95% non-condensing</p>
Dimensions	<p>R8: 248 x 188 x 314 mm (9.8 x 7.4 x 12.4 in)</p> <p>R6: 248 x 188 x 235 mm (9.8 x 7.4 x 9.3 in)</p> <p>R4: 248 x 188 x 195 mm (9.8 x 7.4 x 7.7 in)</p>
Weight	<p>As shipped with all 3.5” HDD installed:</p> <p>R8: 11 kg / 24.2 lb</p> <p>R6: 9.1 kg / 20.1 lb</p> <p>R4: 6.8 kg / 15 lb</p>
Certification	CE, FCC, VCCI, RCM, BSMI, MSIP, SPRING, BIS, TUV, cTUVus

HARDWARE

This section provides a brief introduction to the external hardware of the Pegasus32 R4, R6 and R8. The R4 is shorter and has four drive carriers, the R8 is taller with eight drive carriers. For the purpose of installation they are nearly identical.

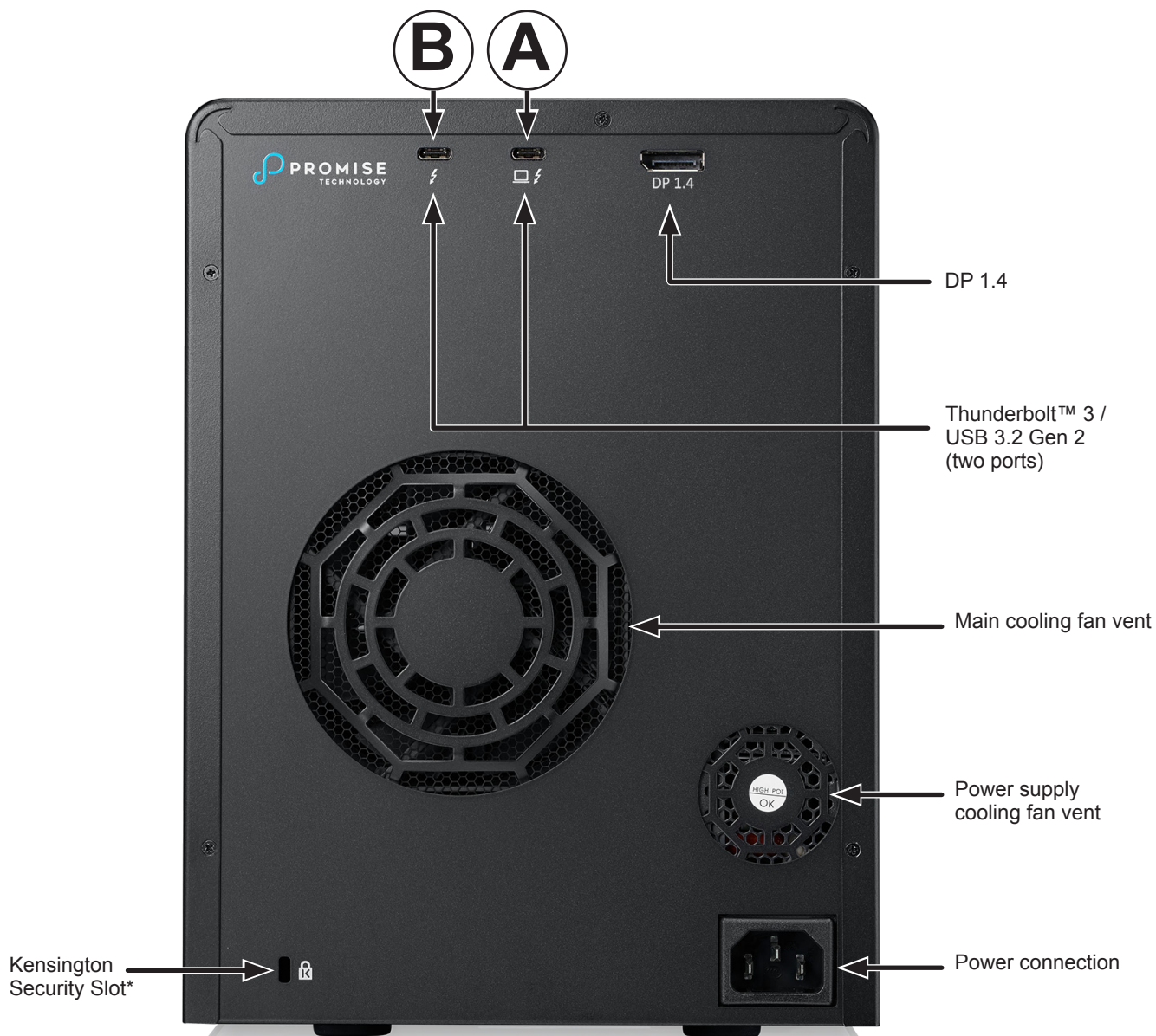
Pegasus32 R6 front view



LED Description

System Status*	The System Status LED located on the Power button lights blue when the Pegasus32 is operating normally. When the system is booting up, this lights orange and will light blue when fully booted if there are no problems detected. A red System Status LED indicates a serious problem such as an incomplete array or failed hard disk drive.
Thunderbolt™ / USB Link	This LED will light blue when the Thunderbolt™ / USB cable is connected; it remains dark if there is no Thunderbolt™ / USB Link link.
Drive Status and Activity*	The Drive Status LED lights blue when a physical drive is present and functioning normally. A red Drive Status LED indicates a problem with the physical drive or an array. The Drive Activity LED lights blue when the physical drive is present and blinks blue when there is activity on the drive.

* See "Checking LEDs" on page 181 for more details about using LED indicators for troubleshooting.

Pegasus32 R6 back view

*The Kensington Security Slot is part of an anti-theft system. This allows the user to lock the Pegasus32 unit to a heavy table or similar object as a theft prevention precaution. You need the other component of the system - a cable with a Kensington lock - in order to use this.

**Note**

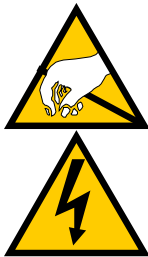
The location of the Thunderbolt™ / USB 3.2 Gen 2 ports and DP 1.4 port on the back of the R4, R6 and R8 are identical. The power connection is in the lower right corner on all models.

Feature	Description
Data Ports: Thunderbolt™ 3 / USB 3.2 Gen 2	<p>Use a Thunderbolt™ 3 / USB cable to connect the Pegasus32 to a Thunderbolt™ 3 or USB equipped computer. This connection completes the physical link, it is the path through which the SATA link is established.</p> <p>Note that both ports can be used for charging (see below).</p>
Power Charging	<p>Port A in the illustration supports up to 85W, making it more suitable for charging devices. Port B is rated at 15W. Either port can be used for the SATA link in USB or Thunderbolt mode; or use the ports to daisy chain to another Thunderbolt™ 3 device in Thunderbolt mode.</p>
DP 1.4	<p>Use with DisplayPort™ digital display monitor or other supported devices. Supports up to DisplayPort 1.4 (8K @ 30Hz)</p> <p>Please consult user documentation for the DisplayPort device for information on cabling and connection set up.</p>
Cooling Vents	<p>The cooling vents on the back should be clear and unobstructed to allow proper airflow for disk and system cooling. Note that the air intake vents located on the front of the enclosure should also be unobstructed.</p>
Power Receptacle	<ul style="list-style-type: none"> • Use an approved power cord. • If you have not been provided with a power cord for your product or for any AC-powered option intended for your product, purchase a power cord that is approved for use in your country. • You must use a power cord rated for your product and for the voltage and current marked on the electrical ratings label of the product. The voltage and current rating of the cord must be greater than the voltage and current rating marked on the product. • Do not place objects on AC power cords or cables. Arrange them so that no one may accidentally step on or trip over them. • Do not pull on a cord or cable. When unplugging from the electrical outlet, grasp the cord by the plug. • Make sure that the total ampere rating of all products plugged into an extension cord or power strip does not exceed 80 percent of the ampere ratings limit for the extension cord or power strip. • Do not disable the power cord grounding plug. The grounding plug is an important safety feature. • Plug the power cord into a grounded (earthed) electrical outlet that is easily accessible at all times.

INSTALLATION AND SETUP FOR MAC USERS

This chapter contains the following topics:

- “Connect the power cord”
- “Connect Pegasus32 to your Mac”
- “Installing Pegasus Driver on your Mac (Thunderbolt only)”
- “Installing the USB Filter Driver on Mac (USB only)”
- “Installing the Software on your Mac”
- “Troubleshooting for installing software or driver on Mac”
- “Check Firmware Version with Promise Utility on Mac”
- “Updating Firmware on Mac”
- “Power modes on the Pegasus32”
- “Shutting down the Pegasus32”
- “Daisy-Chaining Multiple Pegasus32 (Thunderbolt only)”



CAUTION

The electronic components within the Pegasus32 unit are sensitive to damage from Electro-Static Discharge (ESD). Observe appropriate precautions at all times when handling the Pegasus32 unit or its subassemblies.



WARNING

The fan contains hazardous moving parts. Keep fingers and other body parts away.

Summary of the setup procedure

The setup procedure for the Pegasus32 is simple and easy. The device is shipped with hard disk drives installed and a RAID array configured, so it is just necessary to plug it in and connect the device. However, you should install the Pegasus Utility software used for monitoring and administration of the system. Mac users, please follow the setup procedure here or in the Quick Start Guide.

The setup process is summarized below.

1. Unpack the Pegasus32 shipping package
2. Connect the power cord and power on the Pegasus32 R4/R6/R8.
3. Connect the Pegasus32 to your computer with a Thunderbolt™ 3 / USB cable.
4. Mac users can locate the Pegasus Utility installation package located on the device (Pegasus32 is shipped with RAID 5 configuration) and install the management software utility. Windows users please skip ahead to “Installation and Setup for Windows Users” on page 37.

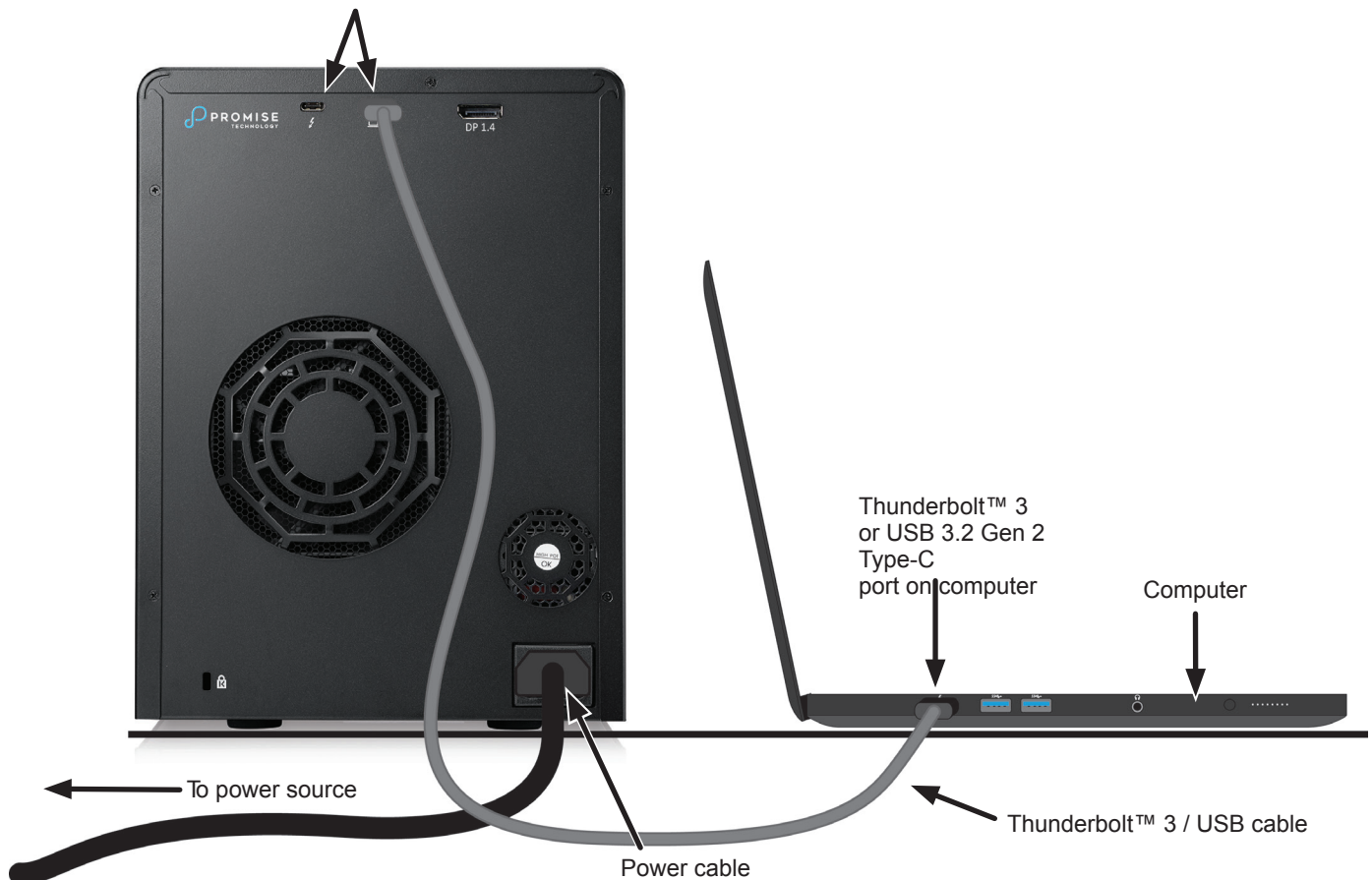
Connect the power cord

To connect the power cord the Pegasus32 unit:

1. Attach the power cord on the back of the Pegasus32 unit. See the illustration below.
2. Plug the other end into a suitable power source.

Thunderbolt™ 3 / USB 3.2 Gen 2 data connection and power connection

Thunderbolt™ 3 / USB 3.2 Gen 2 Type-C ports



Make sure the computer port is a Type-C female connection. If the port is a Thunderbolt™ 3 port, you will see a Thunderbolt™ icon next to the port. If the port is a USB 3.2 Gen 2 port, you will see the USB 3.2 Gen 2 icon next to the port.

Type-C Male connector



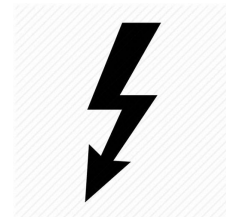
Type-C Female port



USB 3.2 Gen 2 icon



Thunderbolt™ icon



Connect Pegasus32 to your Mac

**Note**

If the Thunderbolt™ 3 / USB cable is connected to a computer that is running, the Pegasus32 will power up as soon as the power is connected.

To establish the Thunderbolt™ 3 / USB connection:

1. Connect a Thunderbolt™ 3 / USB cable from one of the Thunderbolt™ 3 / USB 3.2 Gen 2 (Type-C) ports on the back of the Pegasus32 to the Thunderbolt™ 3 / USB 3.2 (Type-C) port on your computer.
See “Thunderbolt™ 3 / USB 3.2 Gen 2 data connection and power connection” on page 10.
2. If the Pegasus32 is plugged into a power source and the computer is running, the Pegasus32 will power on and begin to boot up. See “Power modes on the Pegasus32” on page 32 for information on power up and shut down behavior.
You will notice the following:
 - The Power Button LED is lit orange at first, then blue.
 - The drive carrier Power / Status LEDs is lit blue.
 - The Link LED for the port connection is lit blue.

See “Pegasus32 R6 front view” on page 4 for illustration of the front of the device.

- The “Promise Pegasus” storage drive icon (see picture below) appears on your desktop. This indicates the Pegasus32 is ready for use.

**Note**

When the device is powered on by connecting the Thunderbolt™ 3 / USB cable, or by pressing the Power Button, the Power Button turns orange. It takes about 30 seconds to start the Pegasus32 unit.

Installing Pegasus Driver on your Mac (Thunderbolt only)

If Pegasus32 is connected to a Thunderbolt port on your computer, a Promise Pegasus Driver should be installed and loaded before you using Pegasus32 on Mac. Follow instructions in the wizard to install the Promise Pegasus Driver. The final step will be to restart the computer in order to complete the installation.

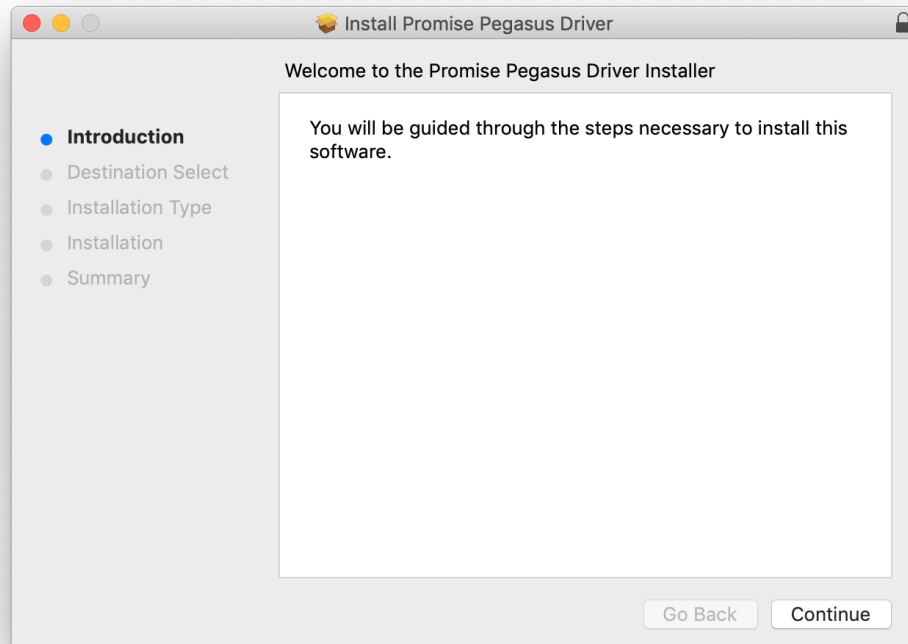
If the driver has been installed, skip ahead to step 6 to check your installed version and other information.



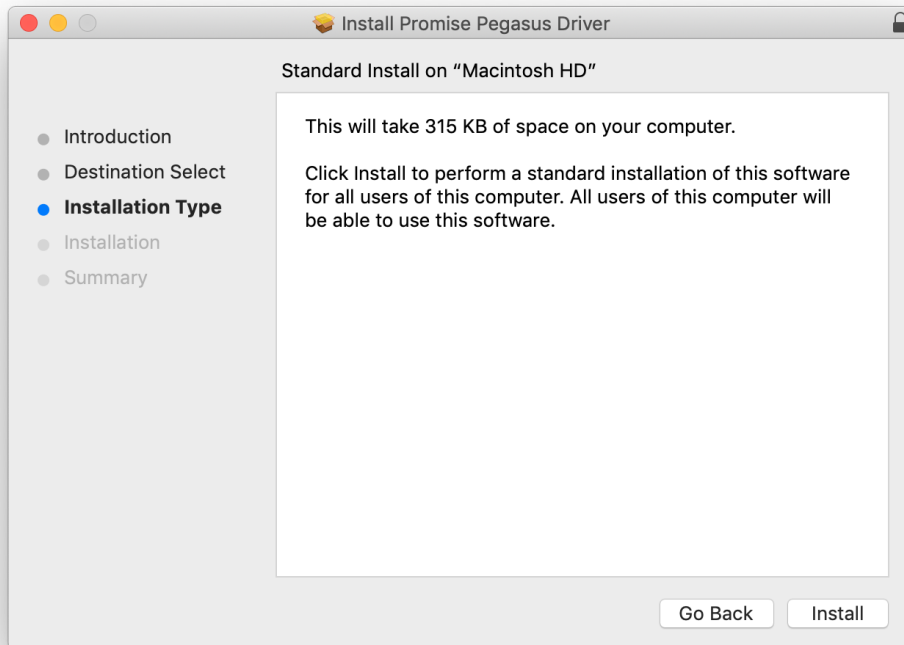
Note

If you get any warning message during installing driver or software, please refer to "Troubleshooting" on page 180.

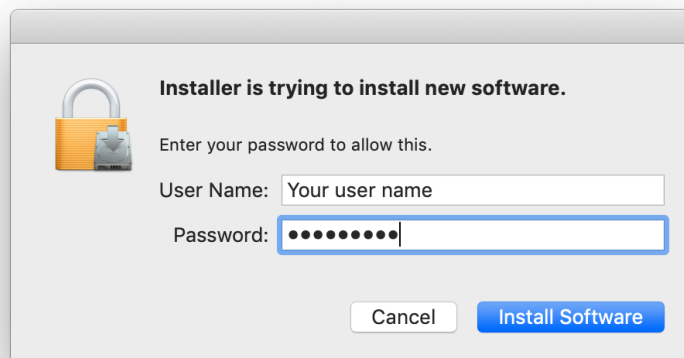
1. Double-click the PKG file for installing the driver; the file name begins with "R_MacDrv" followed by the version number. The Installer appears. Click **Continue** to begin the installation.



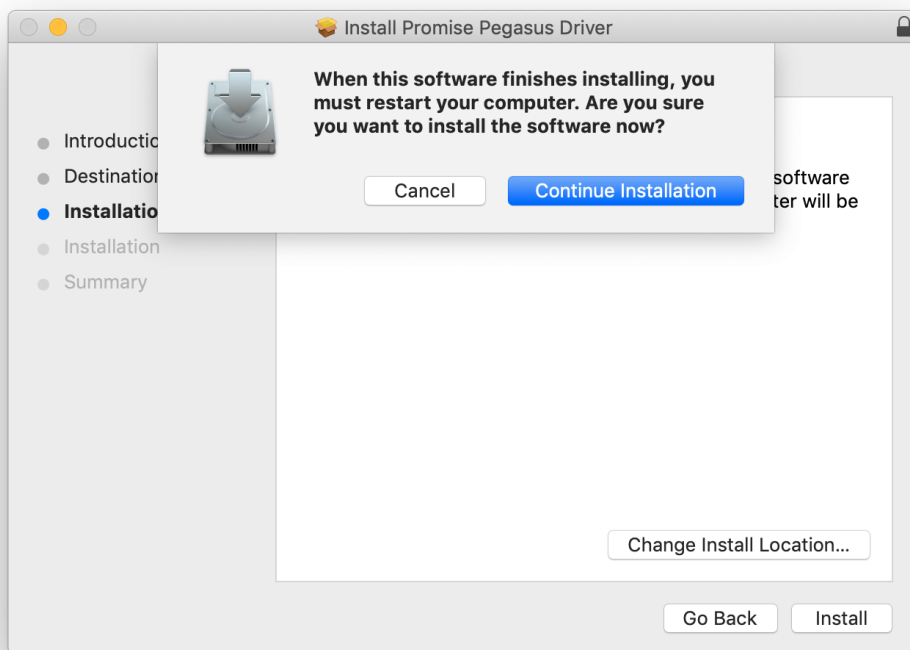
2. Click **Install** to perform a standard installation.



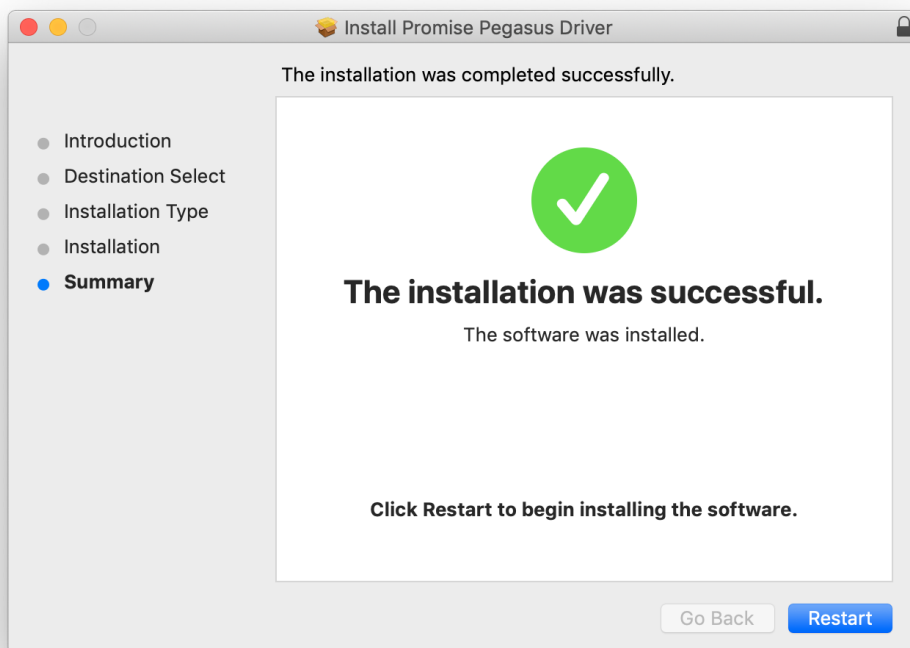
3. Type the administrator password of your computer and click **Install Software**.



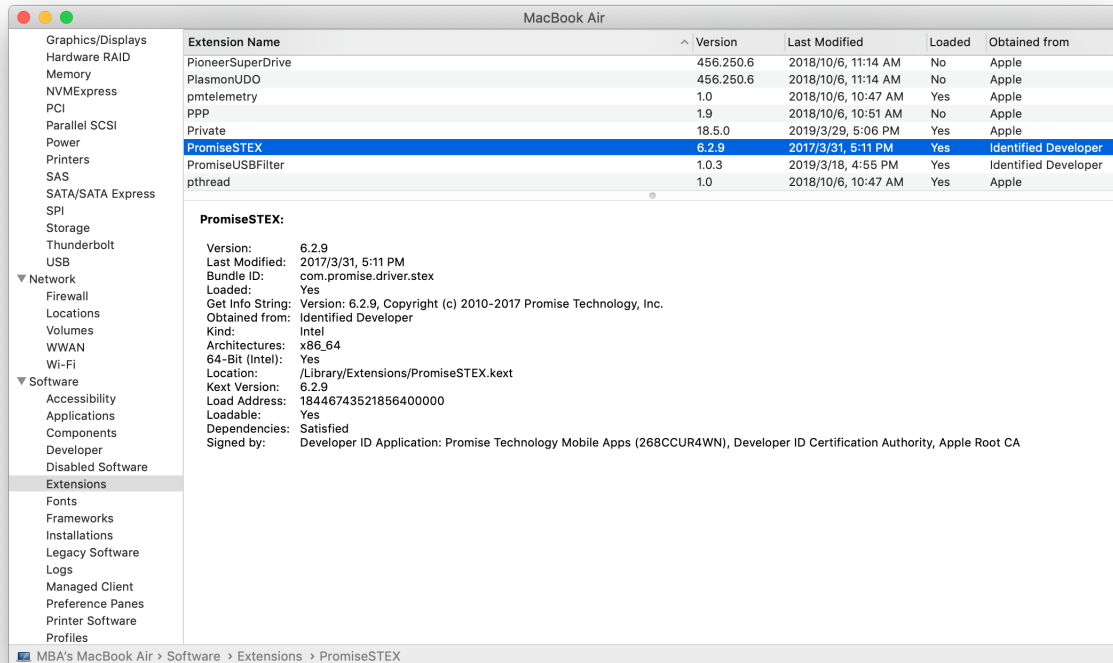
- Click **Continue Installation** to confirm you want to continue with the installation. It will be necessary to restart your computer.



- After few minutes, you are informed that the driver installation was successful. Click **Restart** to reboot your computer.



6. After restarting your computer, you can check your installed version and other information. Open **System Information -> Extensions ->** then find the extension name **PromiseSTEX**.



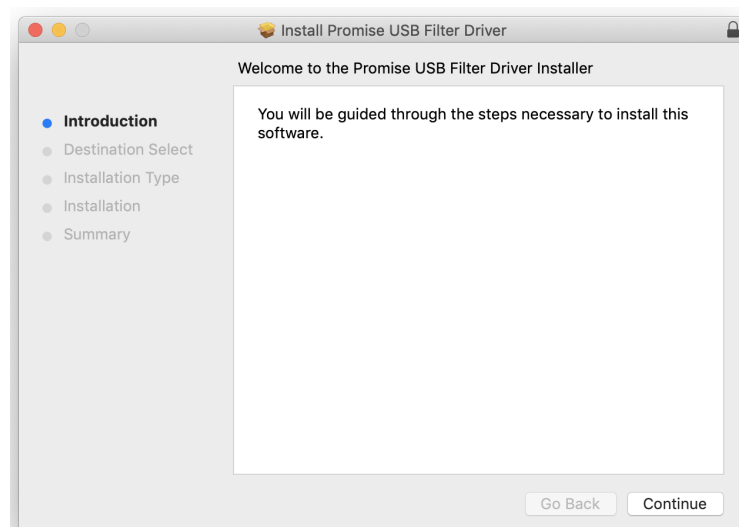
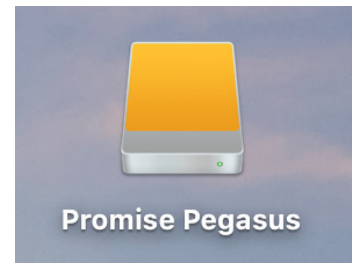
Installing the USB Filter Driver on Mac (USB only)

If the Pegasus32 is connected to a USB port on your computer, you need to install the USB Filter Driver before installing and using Mac software. Follow the instructions in the setup menus to install the driver. The final step will be to restart the computer in order to complete the installation.

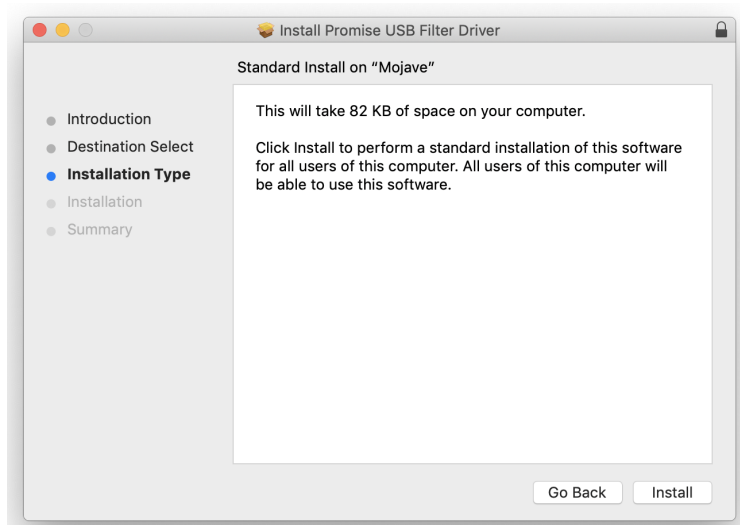
Note that this installer is supported on **macOS 10.14** or later.

To install the USB Filter Driver:

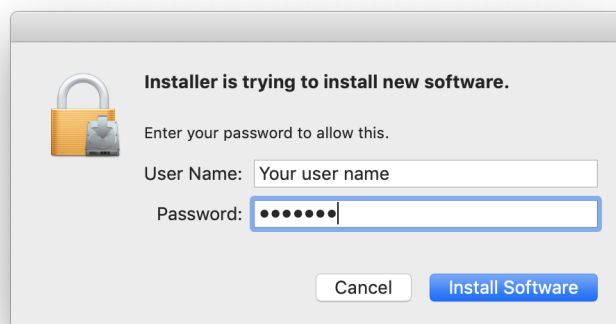
1. Double-click on the Pegasus32 icon on your desktop to view the device contents.
2. Double-click the PKG file for installing the driver; the file name begins with “Promise_USB_Filter_MacDrv” followed by the version number. The installer appears. Click **Continue** to begin the installation.



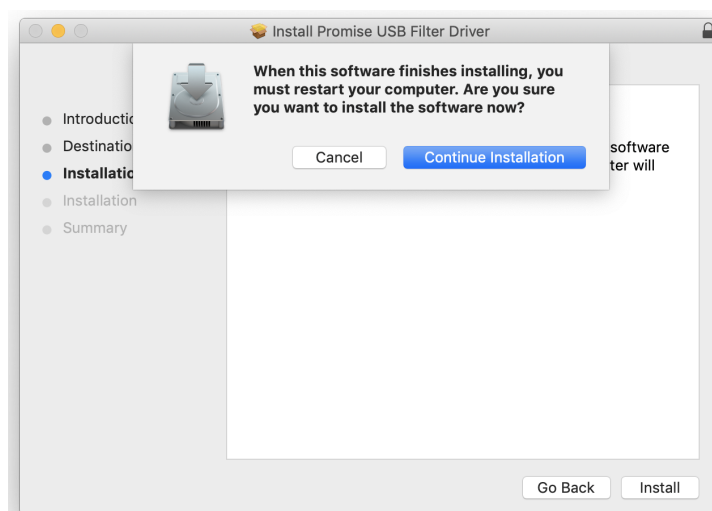
- Click **Install** to perform a standard installation.



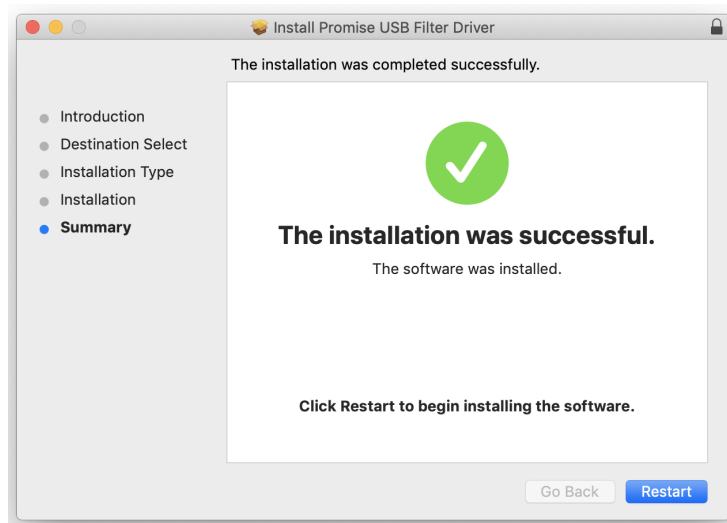
- Enter the administrator User Name and Password of your computer for permission to install the driver.



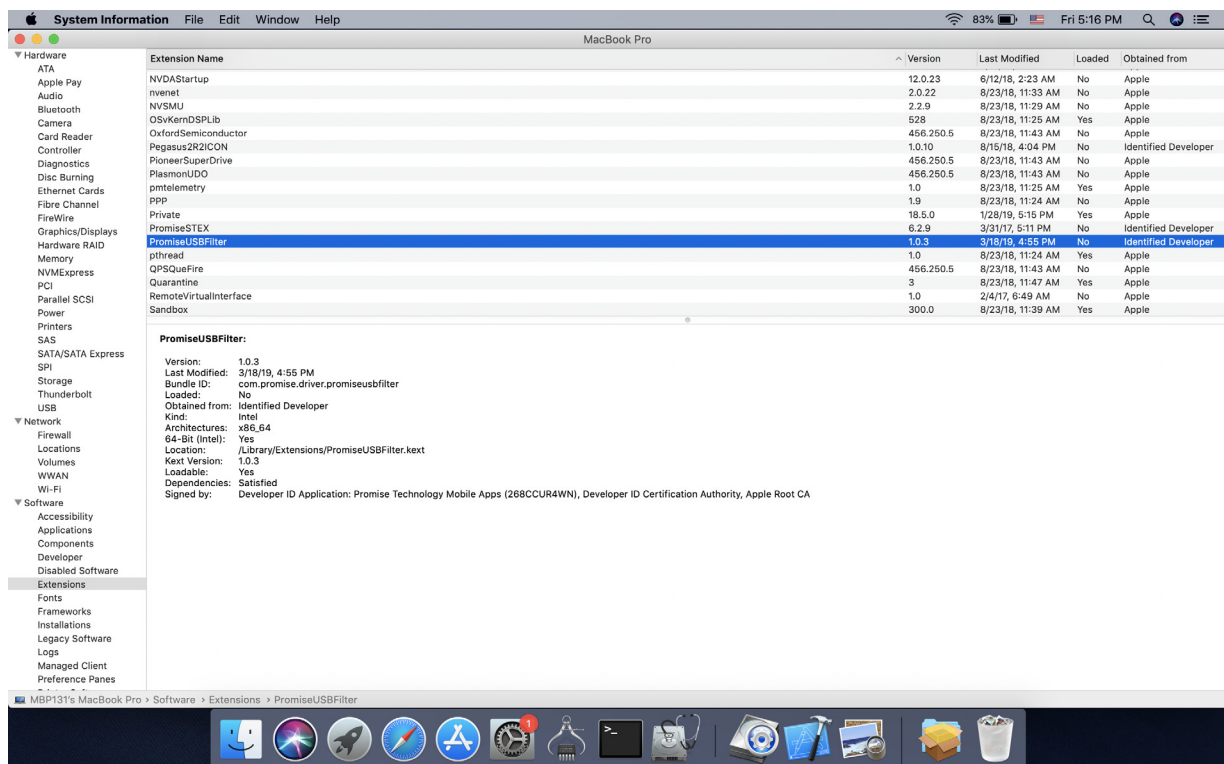
- Click **Continue Installation** to confirm you want to continue with the installation. It will be necessary to restart your computer when you are prompted to do so.



6. After few minutes, a message appears telling you the driver installation was successful. Click **Restart** to reboot your computer.



7. After restarting your computer, you can check your installed version and other information. Open **System Information > Extensions** - then find the extension name **PromiseUSBFilter**.



Installing the Software on your Mac

The Pegasus32 unit ships ready to use without configuration or set-up; however it is a good idea to install the Pegasus Utility software even if you do not plan to make any changes to device configuration. The utility is useful for monitoring the system and getting firmware updates. The utility is necessary if you plan to change the default RAID configuration (Pegasus32 is shipped with a RAID 5) or if you will swap out any of the hard disks shipped with the device.

The software utility installation package is located on the Pegasus32. Follow the instructions below to install the utility.



Note

If you get any warning message during installing driver or software, please refer to "Troubleshooting" on page 180.



Important

If your Pegasus32 is connected to a USB port on your computer, install the **Mac USB Filter Driver** before you begin to install and launch the Pegasus Software Utility. See "Installing the USB Filter Driver on Mac (USB only)" on page 16.

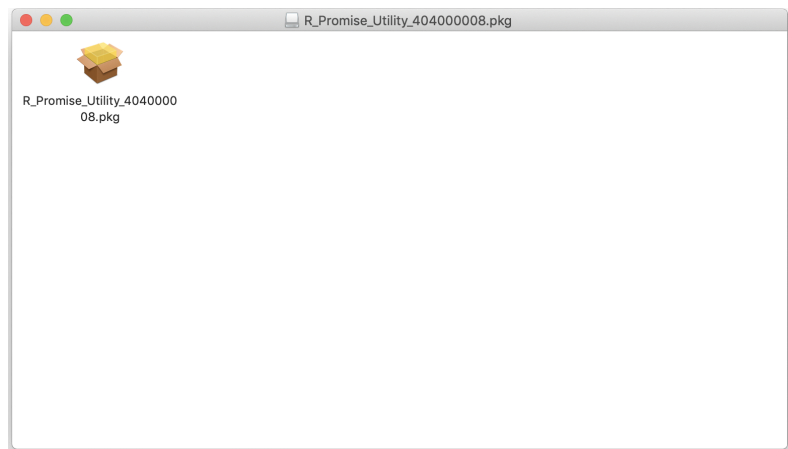
To install the Pegasus32 Software Utility:

1. Double-click on the Pegasus32 icon on your desktop to view the device contents.
2. Find the file **R_PROMISE_Utility_40400000x.dmg** and double-click on it to mount the virtual drive containing the installation software package.

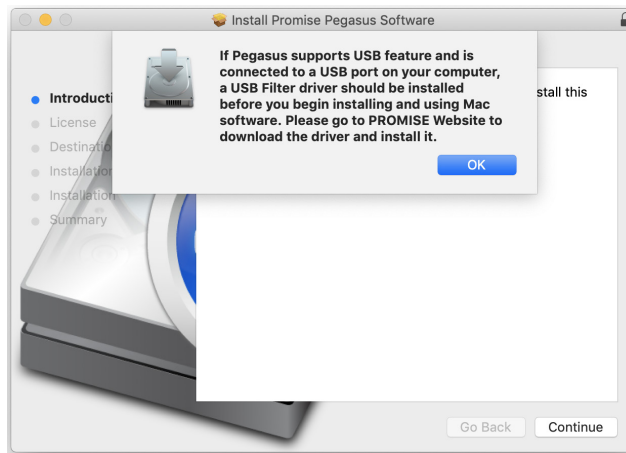


Promise Pegasus

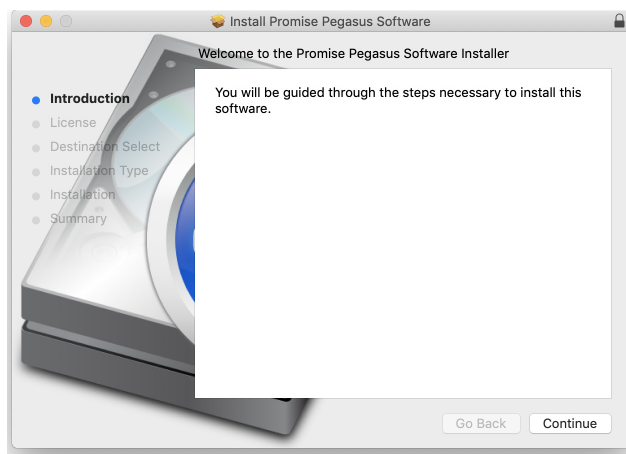
Note that the version number of the .dmg file and .pkg file will change as it is updated. The version number used in this example is just for the purpose of illustration.



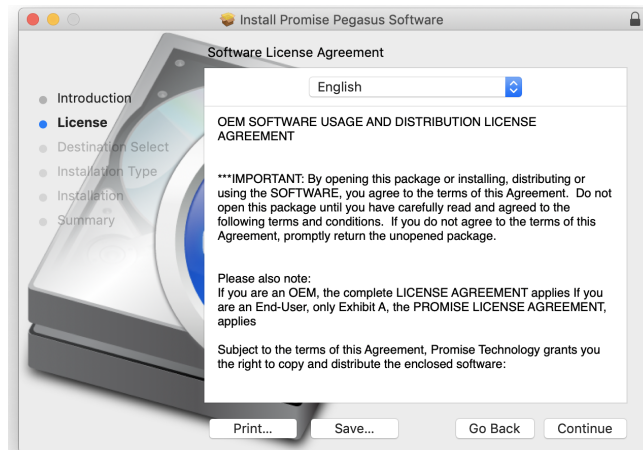
3. Double-click on the PROMISE_Utility_40400000x.pkg* file to begin the software installation. A message pops up to remind the user to install USB Filter driver (if necessary). Click **OK** to continue the installing process.



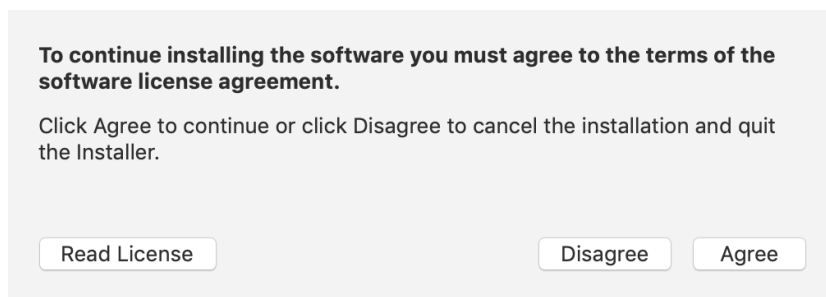
4. The Welcome menu explains that software will be installed on the computer. Click the **Continue** button to proceed with installation.



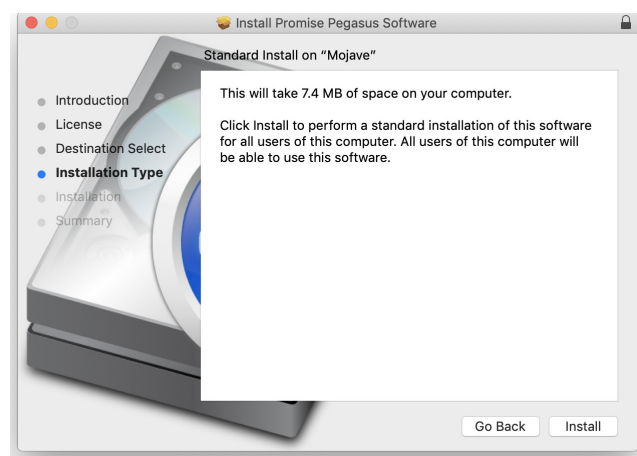
- The Software License Agreement appears, please read the statement and click **Continue** to proceed.



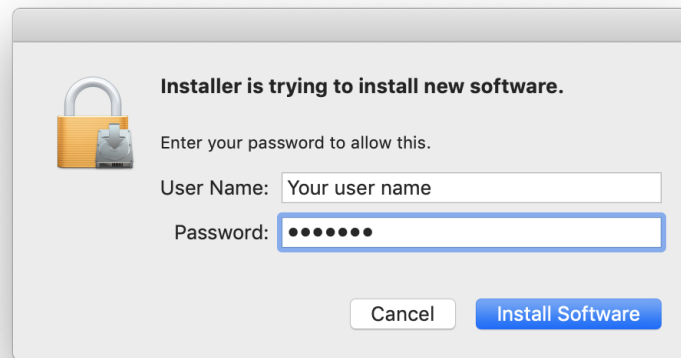
- Click **Agree** if you agree to the terms of the license. To read the license, click **Read License**. Choose **Disagree** if you do not agree the terms, in which case the installation procedure is terminated.



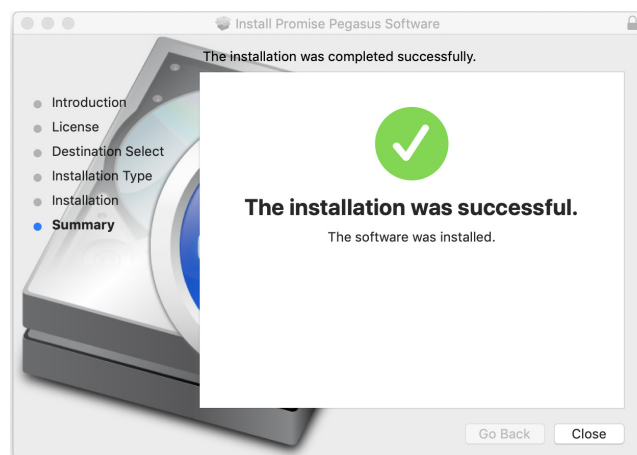
- If you clicked **Agree** in the previous menu, the software is now ready to install. Click **Install** to begin.



8. Type the administrator password of your computer for permission to install the software.



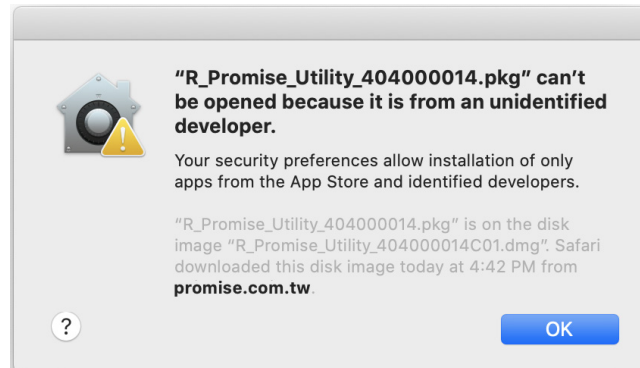
9. It takes a few seconds for the utility software to be installed. When the installation has completed, a message informs you that the installation was successful. Click **Close** to end the installation procedure.



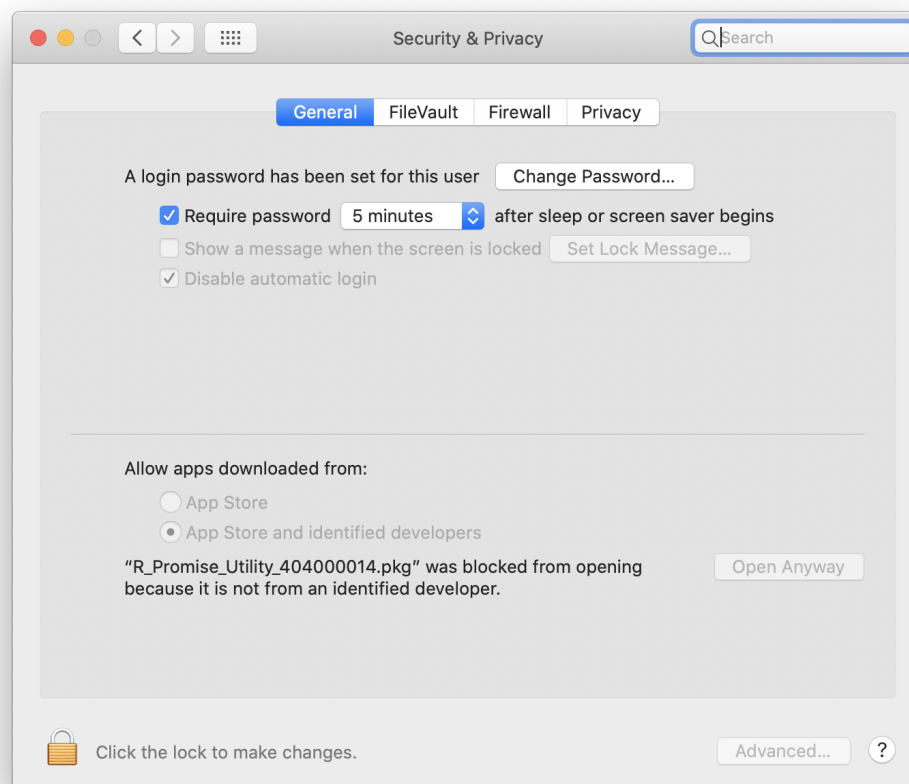
The Pegasus Utility is now available to be used for management of the Pegasus32. Use this if you need to change a hard disk drive, or change the default array configuration, or to update the device firmware. This is also useful for monitoring the status of the system and for troubleshooting. For more information on using the Pegasus Utility, including instructions on how to use the Wizard menus to install a different RAID array configuration, please read page 128.

Troubleshooting for installing software or driver on Mac

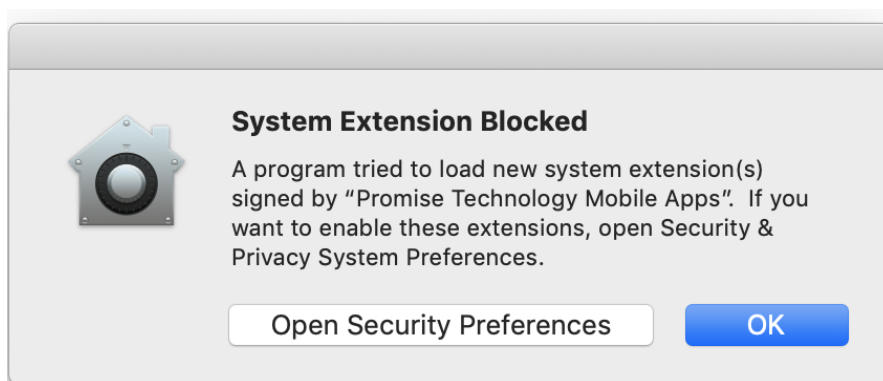
1. If you see the following warning message when installing driver or software:
"Application Name" can't be opened because it is from an unidentified developer.



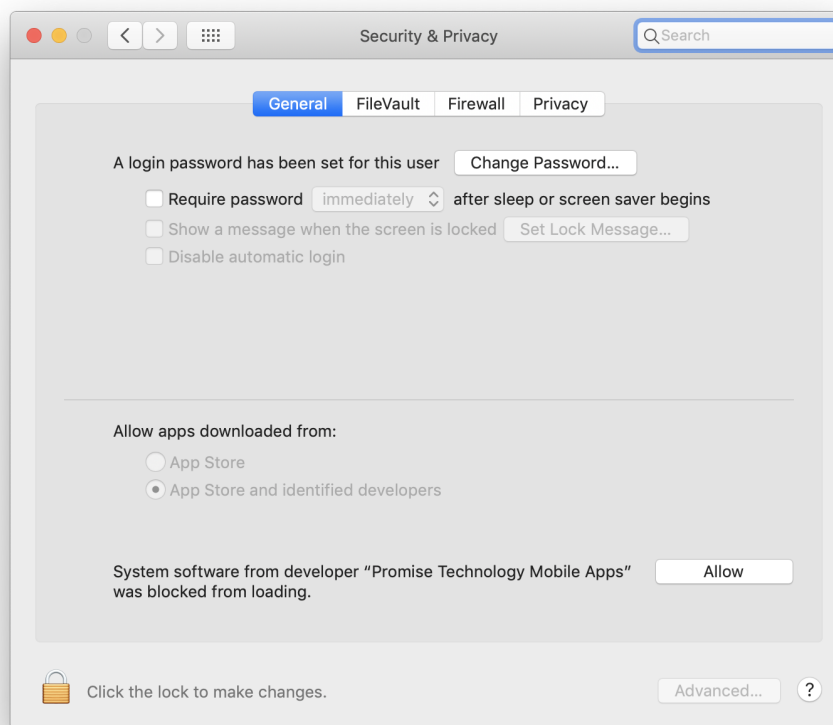
Open **System Preferences > Security & Privacy**, click on the lock icon to allow changes, then click on **Open Anyway** to continue the installation process.



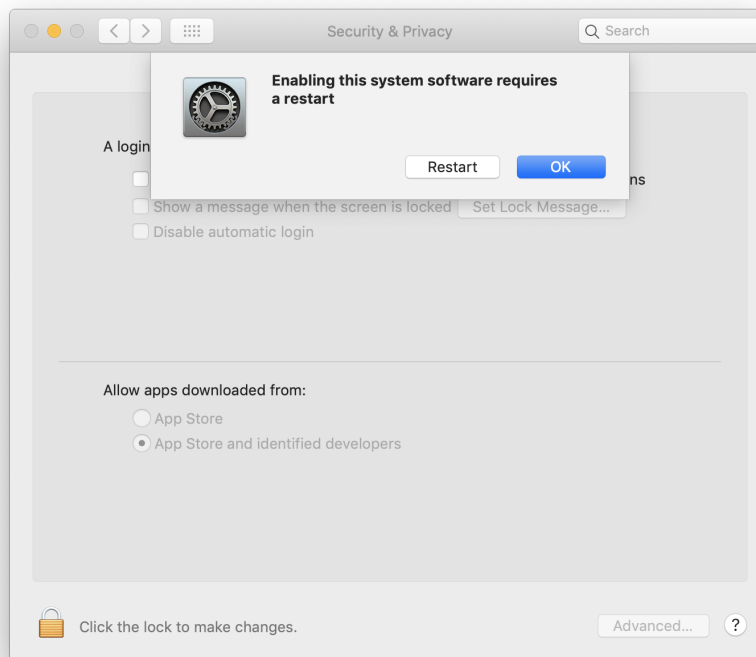
2. If you see a **System Extension Blocked** warning message when installing driver or software:



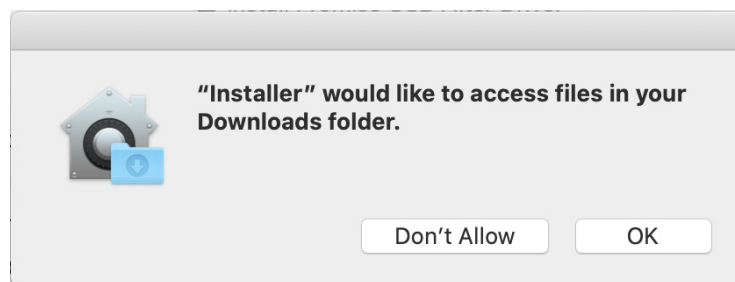
Click on **Open Security Preferences**, click on the lock icon to allow changes, then click on **Allow**.



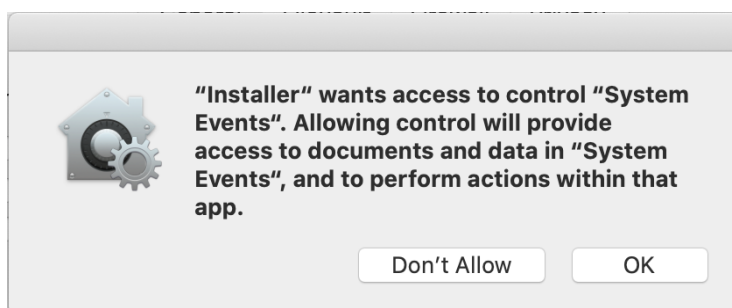
It will be necessary to restart the computer to enable the new setting. Click on **OK** to restart now.



3. If you see the following warning message when installing driver or software, ***"Installer" would like to access files*** in the folder that the driver or software installation file is saved; click **OK** to allow the access and continue the installation process.



4. If you see the ***"Installer" would like access to control "System Events"*** warning message when installing driver or software, click **OK** to allow access and continue with the installation.



Check Firmware Version with Promise Utility on Mac



Important

If the Pegasus32 has been changed from Thunderbolt™ mode to USB mode, update the firmware again after changing the mode.

It is important to make sure the Promise Utility firmware up to date. If you do not know the firmware version, use Pegasus Utility to check the firmware version. Go to **Admin > Firmware Update** to see the *Single Image Version* number. Follow the instructions below to update the firmware before using the Pegasus32.

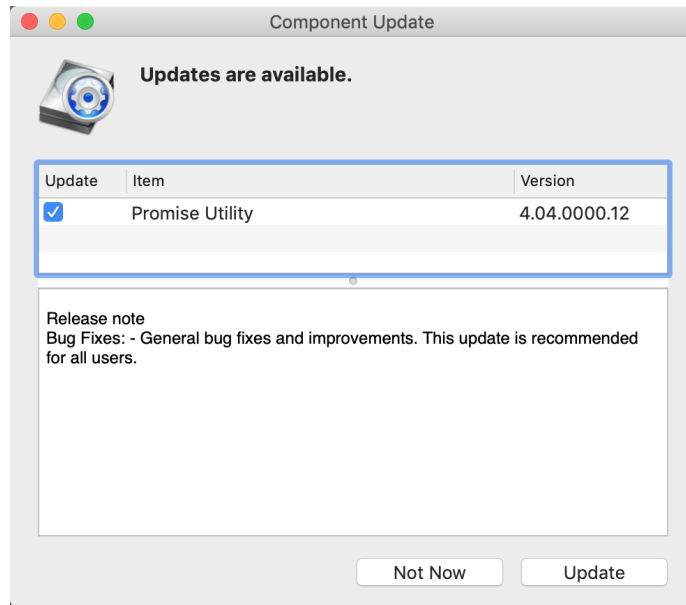
Checking for Updates

The update procedure also can be automatic by going to the Promise Utility menu tab, choose Check for Updates.

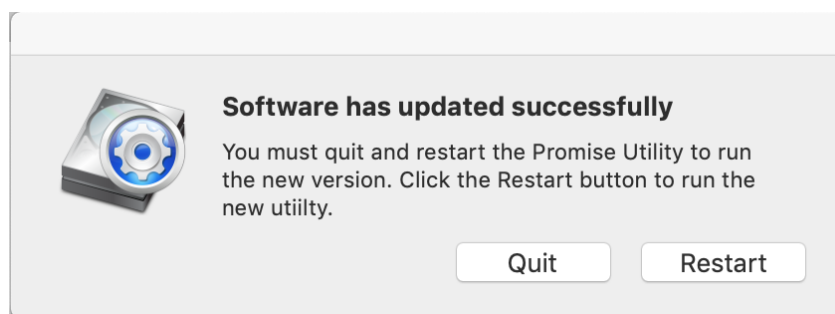


Software, Firmware Version will be checked automatically. If Pegasus32 is USB connection, the USB Firmware Version will also be checked.

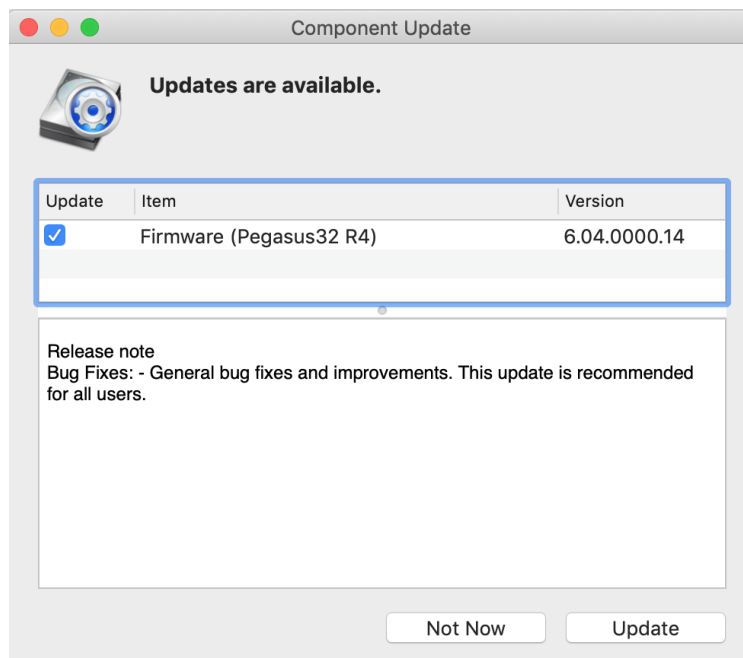
1. If Promise Utility is not up-to-date, a Component Update window will prompt out. Choose *Update* to start software update. If there is not any available update for Promise Utility, go to step 3.



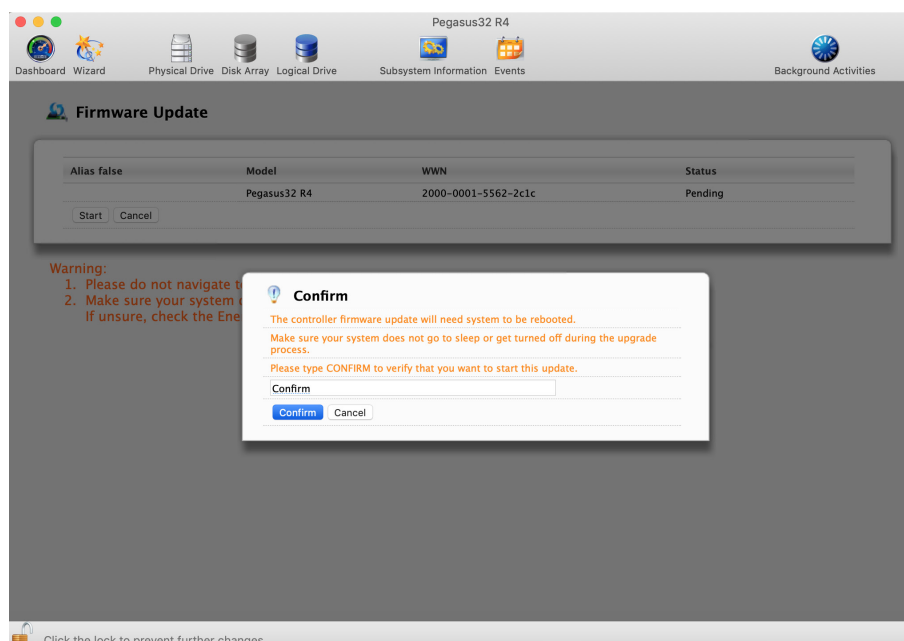
2. When software is installed successfully, a restart will be required to active the newest software utility.



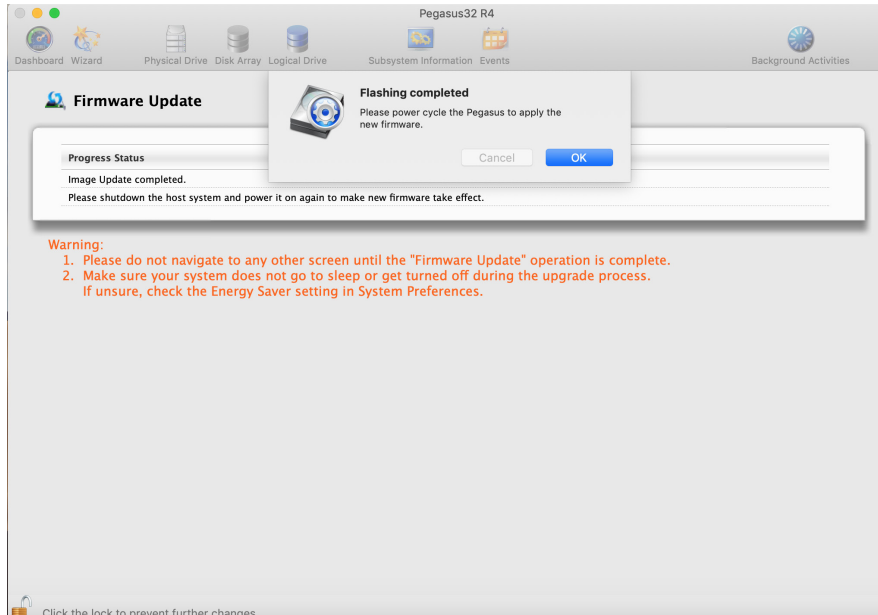
3. If Firmware is not up-to-date, the Component Update menu appears. Click on **Update** to start Firmware update. If there is not any available update for Firmware, go to step 6.



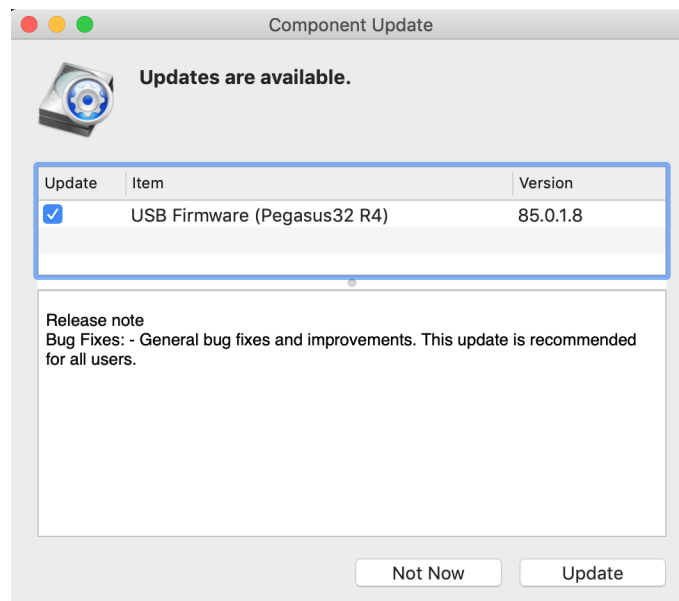
4. After Firmware image is download, choose **Start** then **Confirm** the Firmware update request.



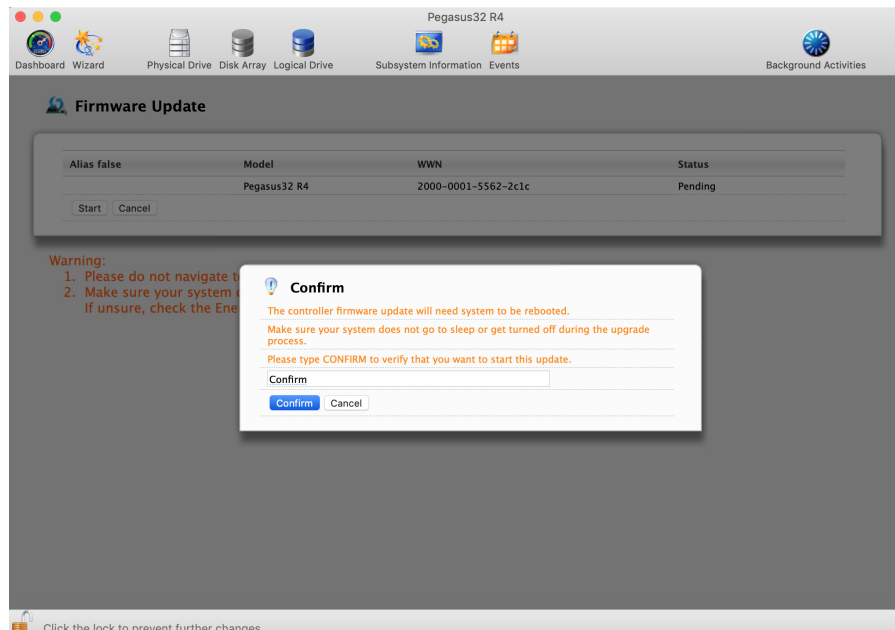
5. The update process will take several seconds to complete. Once the process has completed, it is necessary to restart the computer. **Note that Mac users who are connecting to Pegasus32 via USB need to shut down the host system, wait a few seconds for it to completely shut down, then start it again in order to apply the new firmware.** Once the computer is powered on and booted up, Promise Utility will continue to check USB Firmware if Pegasus32 is connected via USB (go to step 6 for USB connection). *If connecting via Thunderbolt, go to step 9.*



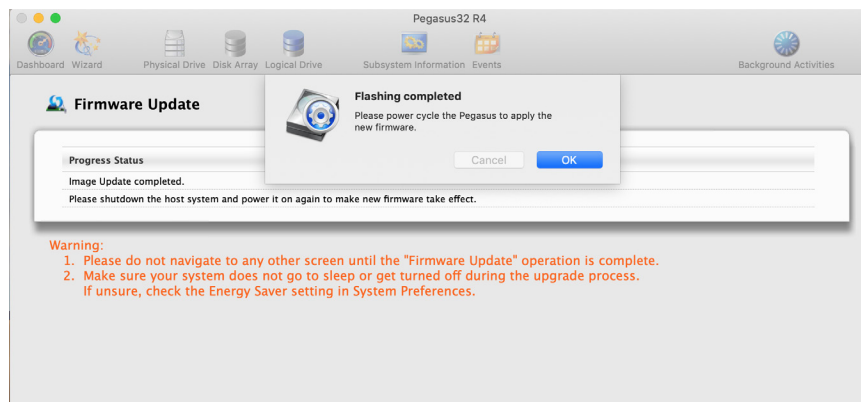
6. **(Mac USB only)** If USB Firmware is not up-to-date, the Component Update menu appears will prompt out. Click on **Update** to start USB Firmware update. If there is not any available update for USB Firmware, go to step 9.



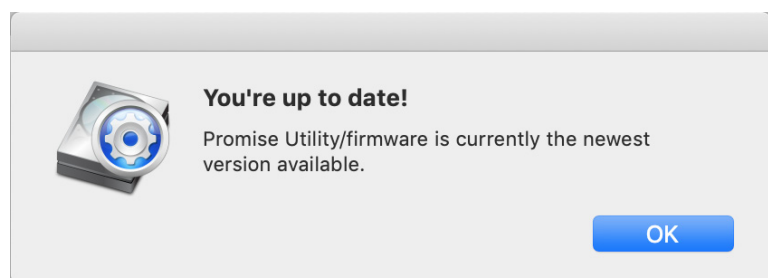
7. After USB Firmware is download, choose **Start** then **Confirm** the Firmware update request.



8. The update process will take several seconds to complete. **Once the process has completed, Mac users who are connecting to Pegasus32 via USB need to shut down the host system, wait a few seconds for it to completely shut down, then start it again in order to apply the new firmware.** Once the computer is powered on and booted up, go to step 9.



9. If the Promise Utility/ Firmware/ USB Firmware are up-to-date, Promise Utility displays the pop-up menu below, and the update process is completed. Pegasus32 is ready for use.



Updating Firmware on Mac

The update procedure should be done before using the Pegasus32 with your Mac computer. Make sure to download the latest firmware from the PROMISE website at www.PROMISE.com/support/download.aspx and place the .img file on your computer.

To update the controller firmware:

1. From the **Admin** drop-down menu in the menu bar at the top of your desktop, choose *Firmware Update*.
2. Click on the padlock icon to unlock the menu, and type in the password for your computer when the prompt appears.
3. Click the **Choose File** button and locate the .img file you downloaded from the PROMISE website.
4. Click the **Submit** button.
5. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.
6. The process will take several seconds to complete. Once the process has completed, it is necessary to restart the computer. **Note that Mac users who are connecting to Pegasus32 via USB need to shut down the host system, wait a few seconds for it to completely shut down, then start it again in order to apply the new firmware.** Once the computer is powered on and booted up, you may continue to use the Pegasus32.

Power modes on the Pegasus32

The Pegasus32 introduces new power saving and response features. These are described below.

The automatic power features are:

- **Shutdown** – When your computer shuts down, the Pegasus32 unit automatically shuts down.
- **Restart After Shutdown** – When your computer powers up, the Pegasus32 unit automatically powers up.
- **Spin down HDD** - The Pegasus32 includes a power saving feature that spins down the hard disk drives if the logical drive is idle for 30 minutes. This can be enabled or disabled and the idle time can be changed in the Pegasus Utility. Click on the **Controller** link in the **Dashboard**, then click the **Settings** button to see how to change this setting.

Shutting down the Pegasus32

The Pegasus32 shuts down automatically if you turn off your computer. If you want to turn off the Pegasus32 without shutting down your computer, follow the steps below.

To shut down the Pegasus32 unit:

1. Eject the Pegasus32 by right-clicking on the drive icon and choosing the *Eject* option.
2. Launch the Pegasus Utility and click on the Subsystem Information menu button at the top of the interface, unlock the user interface (see “Unlocking the UI” on page 33), click on the **Shutdown** button, then click on **Shutdown** in the new menu that appears. You will need to type “confirm” in the pop-up menu and click on the **Confirm** button.

Alternatively, you can press and hold the Power Button until the Power LED on the button turns orange. When you release the Power Button, the LED goes dark.

Daisy-Chaining Multiple Pegasus32 (Thunderbolt only)

Up to 6 Pegasus32 devices can be connected to each other and to your in a daisy chain sequential Thunderbolt™ 3 connection. To daisy-chain multiple Pegasus32 units:

1. Connect a Thunderbolt™ 3 cable from one of the Thunderbolt™ 3 ports on the back of your computer to one of the Thunderbolt™ 3 ports on the first Pegasus32 unit.
2. Connect a second Thunderbolt™ 3 cable from other Thunderbolt™ 3 port on the first Pegasus32 unit to one of the Thunderbolt™ 3 ports on the second Pegasus32 unit.

Unlocking the UI

By default, the UI is locked to prevent unauthorized changes to your RAID system. When the UI is locked, you cannot create logical drives or change settings on the Pegasus32 unit.

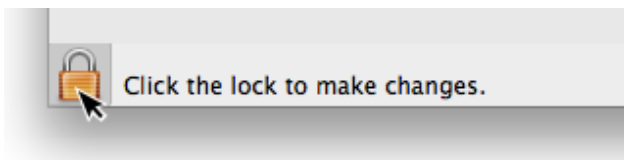


Note

Unlocking the UI requires administrator privilege. Make sure you have the macOS administrator Name and Password.

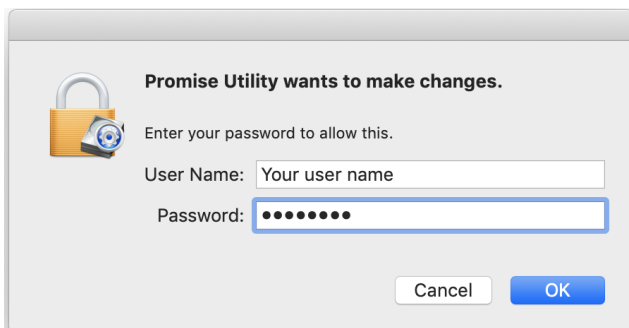
To unlock the UI:

1. At the lower left screen of the Pegasus Utility window, click the closed lock icon.



The Pegasus Utility password dialog box opens.

2. Type your Mac password into the Password field and click the **OK** button.



The lock icon changes to open and you can now add and delete logical drives, make settings, run background activities, and update your Pegasus32 system.

Displaying Multiple Pegasus Units

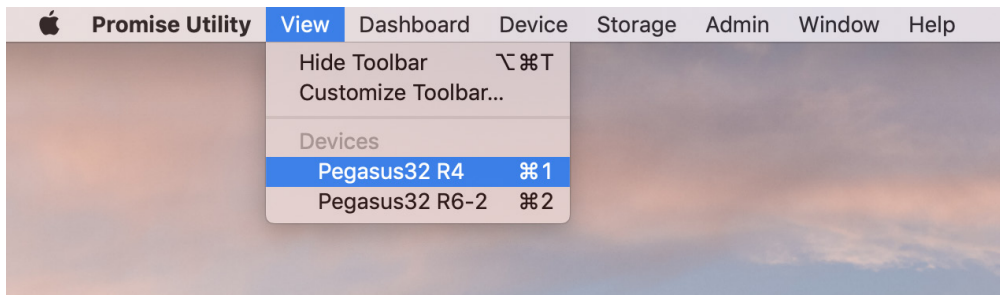
The Pegasus Utility displays a separate window for each Pegasus unit (including previously released versions of Pegasus) that is connected and powered up.



Note

The Pegasus Utility can also be used for earlier releases of Pegasus2, Pegasus3 and Pegasus32; models R4, R6 and R8.

- To view a list of the Pegasus units, click the **View** menu.
- To display a Pegasus unit in the Pegasus Utility, click the **View** menu and choose unit you want to see.



The first unit is Pegasus32 R4, R6, or R8, the second is Pegasus32 R4-2 or R6-2, R8-2, the third is Pegasus32 R4-3 or R6-3, R8-3, and so on. The Pegasus32 units are listed by the order in which they are recognized, not by the cable configuration.

To Create a Disk Array and Logical Drive

The Pegasus32 is shipped with HDD installed and a RAID array configured, so it is not necessary to do this yourself. However, if you want to change the disk drives or configure a different RAID, you will need to create an array and logical drive to use the storage.



Important

The Pegasus32 does NOT require any configuration to use the RAID storage. It is shipped ready to use with a RAID5 configuration.

If you are installing new disk drives, use the Wizard to create a disk array and logical drive. The procedures are described in the next chapter.



WARNING

If you are using utility to create or delete a disk array or logical drive, the system will reboot if Pegasus32 is running USB mode. It is important to make sure the Pegasus32 not being accessed (no IO operation in progress) before submitting the request.



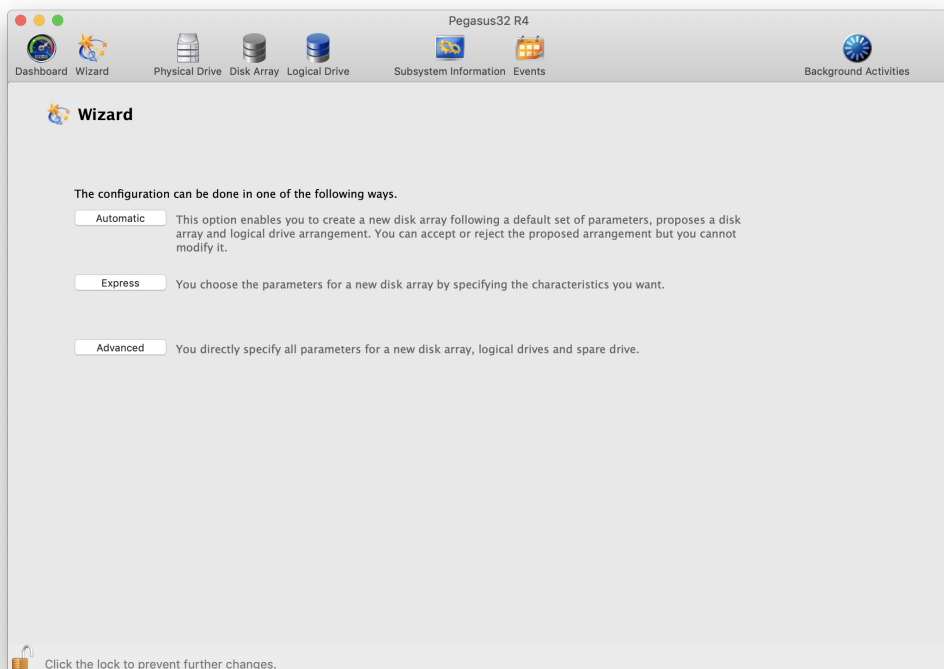
Important

Up to four logical drives (including passthru drive) are supported in USB mode. Any LD beyond the 4th will be inaccessible in USB mode. However, these will be accessible in Thunderbolt™ mode.

To see the **Wizard** menu, launch the Pegasus Utility, in the **Dashboard** menu, under **System Status**, click the Disk Array link. See page 67 for an overview of the Pegasus Utility interface.

The Wizard dialog box opens with three configuration methods.

Wizard dialog box



Choose the best method for your situation. See the table below.

Method	User options	Suggested for users who are	See
Automatic	None	New to data storage	page 129
Express	General parameters	Familiar with data storage	page 130
Advanced	Individual parameters	Data storage professionals	page 132

INSTALLATION AND SETUP FOR WINDOWS USERS

This chapter contains the following topics:

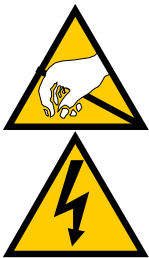
- “System requirements for Windows”

Windows Setup Procedure as follows:

- “Step 1: Download software and driver”
- “Step 2: Connect the Pegasus32 to your Windows computer”
- “Step 3: Power On Pegasus32”
- “Step 4: Install Driver”
- “Step 5: Install Software”
- “Step 6: Format with Pegasus Utility”
- “Step 7: Check firmware version with Pegasus Utility”

Other important procedures for Windows Users:

- “Safely Remove Pegasus32 on Windows”
- “Shutdown the Pegasus32”



CAUTION

The electronic components within the Pegasus32 unit are sensitive to damage from Electro-Static Discharge (ESD). Observe appropriate precautions at all times when handling the Pegasus32 unit or its subassemblies.



WARNING

The fan contains hazardous moving parts. Keep fingers and other body parts away.

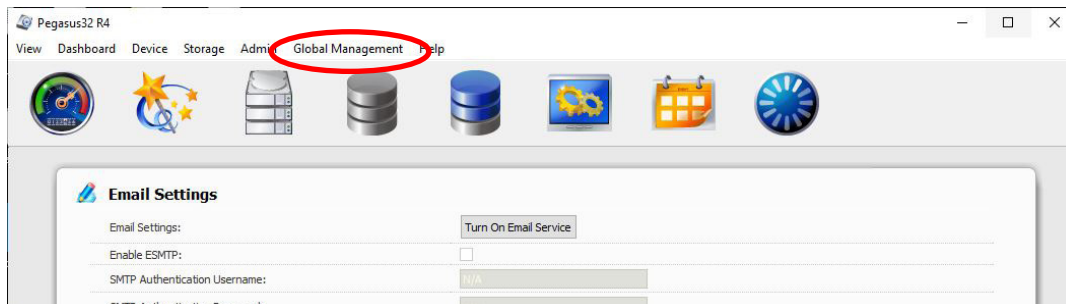
System requirements for Windows

The Pegasus32 hardware driver for Windows can be used on computers equipped with a Thunderbolt™ 3 port or USB 3.2 port running any edition of Windows 10. The Pegasus Utility software, used for administration and management of the Pegasus32, is also compatible with these Windows operating systems.

Email event notifications for Windows

To setup email event notification in Windows, click on **Global Management** in the Pegasus Utility, and select *Service*. Please see “Setting Up Email Notifications” on page 177 for more information.

Pegasus Utility



Step 1: Download software and driver

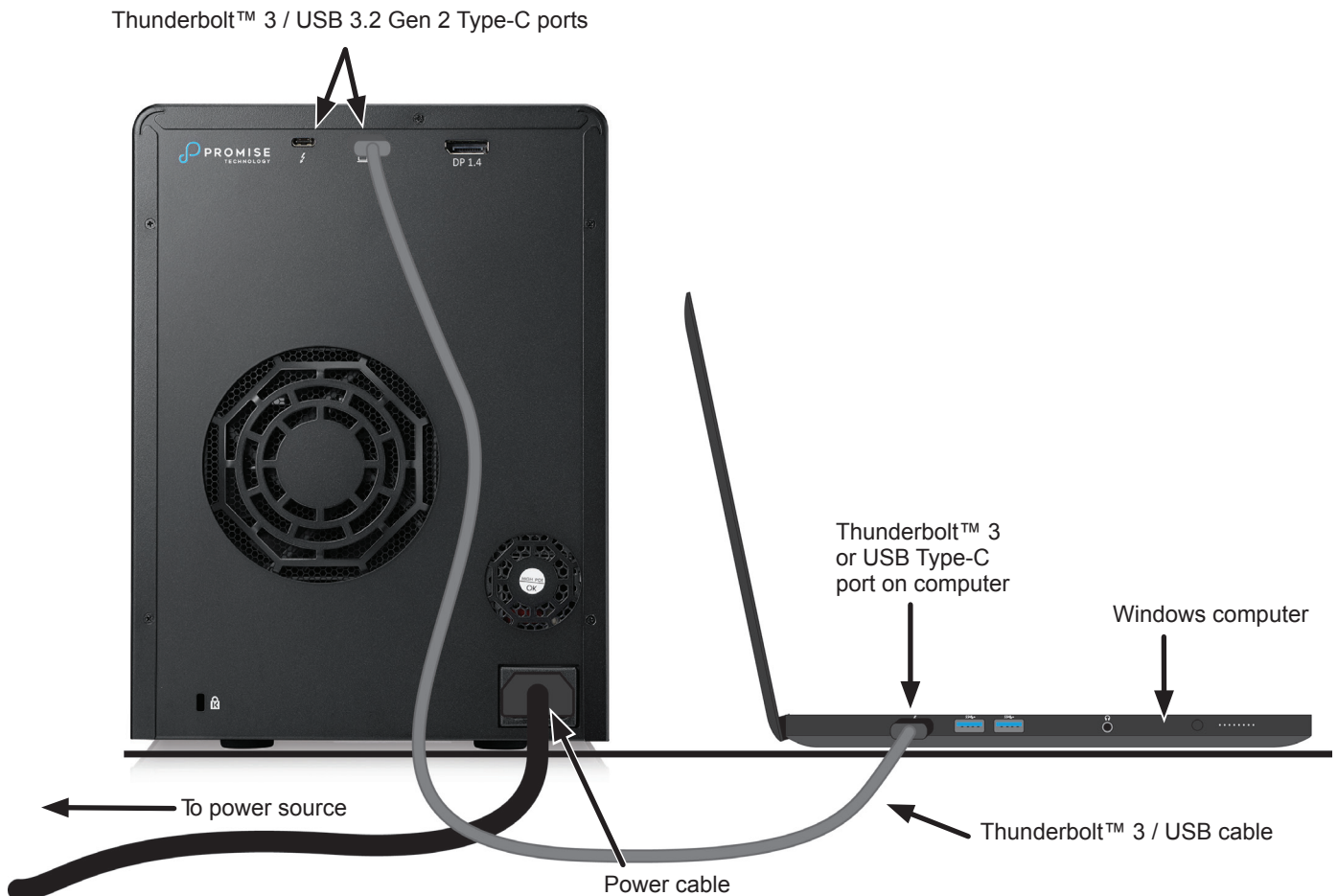
Follow these instructions to download the software and driver installation files for Windows from the PROMISE website.

1. Go to the PROMISE website (www.promise.com) and click on **Support** in the banner at the top of the web page, scroll down and click on **Download Center**.
2. In the **Download Center** page, scroll to find the **Pegasus32 Series** logo and click on it.
3. Look for the Pegasus32 model you have in the list that is presented, and click on it.
4. In the new menu, look for the download links for the **Windows driver** and the **Pegasus Utility for Windows**. Download the driver and utility and follow the instructions in this section to install both.

Step 2: Connect the Pegasus32 to your Windows computer

Insert one end of a Thunderbolt™ 3 / USB cable into the Thunderbolt™ 3 / USB port on the Pegasus32 and connect the other end of the cable to a Thunderbolt™ 3 / USB port on your computer. Make sure the cable connector is oriented correctly to the port on both the Pegasus32 and the computer. It should fit easily in place when correctly positioned.

Thunderbolt™ 3 / USB 3.2 Gen 2 data connection and power connection

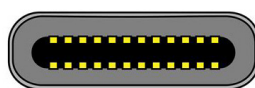


Make sure the computer port is a Type-C female connection. If the port is a Thunderbolt™ 3 port, you will see a Thunderbolt™ icon next to the port. If the port is a USB 3.2 Gen 2 port, you will see the USB 3.2 Gen 2 icon next to the port.

Type-C Male connector



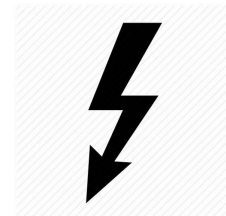
Type-C Female port



USB 3.2 Gen 2 icon



Thunderbolt™ icon



Step 3: Power On Pegasus32

Follow these steps to connect the power cord and power on the Pegasus32.

1. Attach the power cord on the back of the Pegasus32 unit.
(See page 39 to see an illustration of the back of device)
2. Plug the other end into a power source.
3. Press the Power Button. (See illustration of front of device below).

You will observe that the **Power Button** LED turns orange.

It takes about 30 seconds to boot the Pegasus32 unit. When fully booted:

- The Power Button LED turns blue.
- The drive carrier Power/Status LEDs turn blue.

Pegasus32 boot up LED behavior



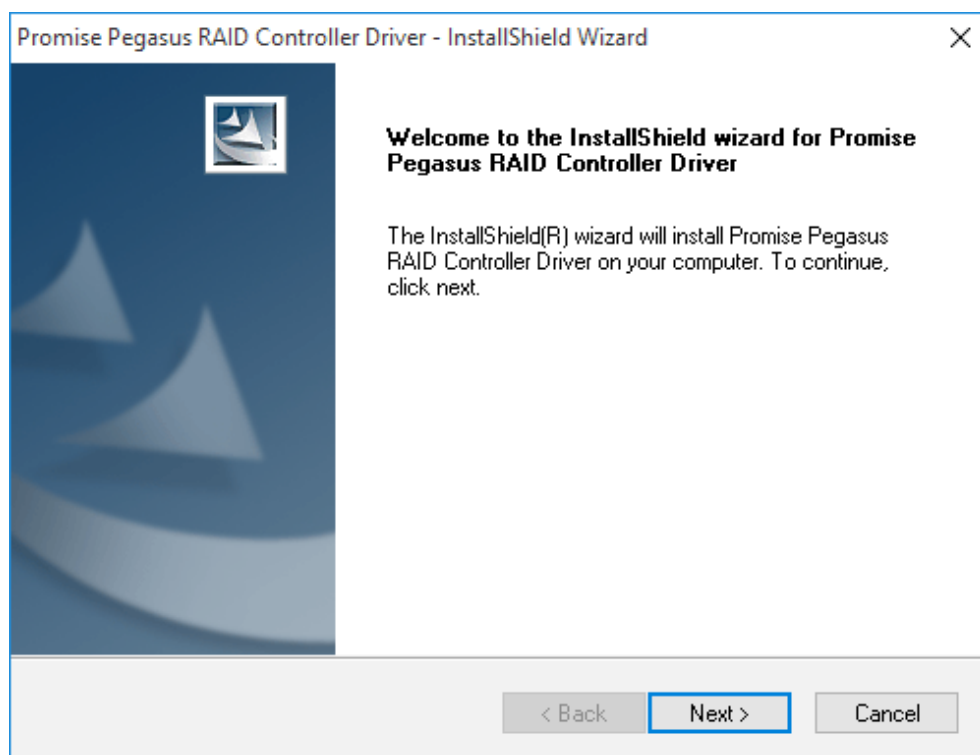
Step 4: Install Driver

Locate the driver file you downloaded in Step 1 and follow the instructions in the InstallShield Wizard to install the PROMISE RAID Controller driver. It will be necessary to restart the computer after to complete the installation.

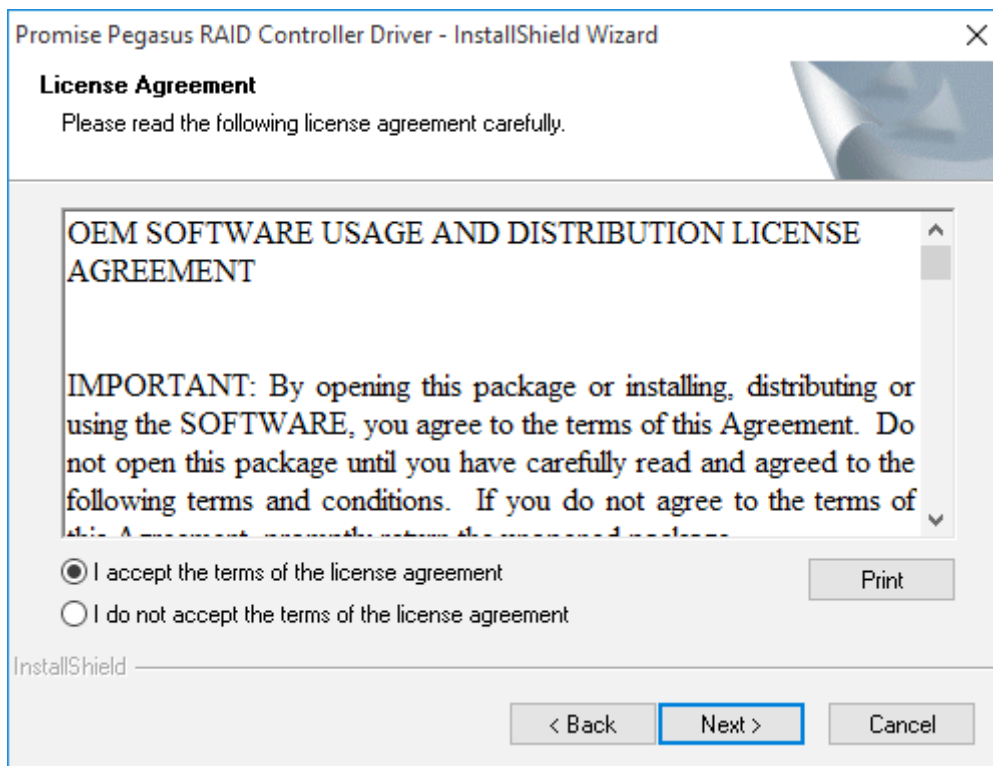
**Note**

The procedure installing the driver is identical for the supported Windows OS.

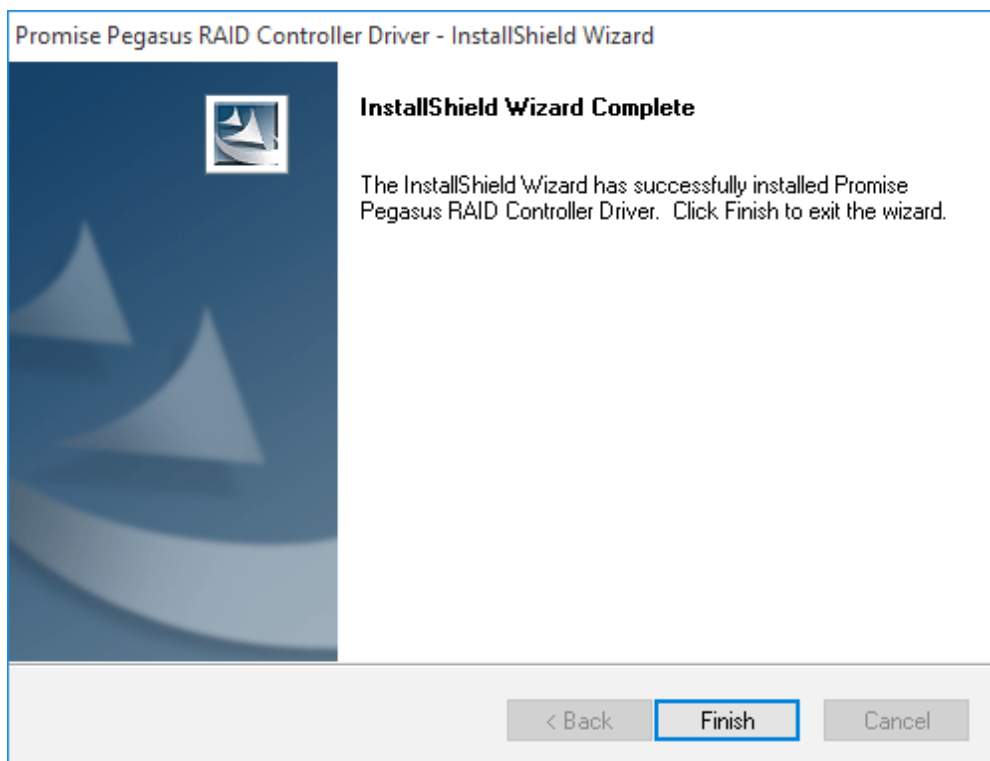
1. Double-click on the zipped file for installing the driver, the file name begins with “PegasusRAID_WinDrv_Installer” followed by the version number. The InstallShield Wizard appears. Click **Next** to begin the installation.



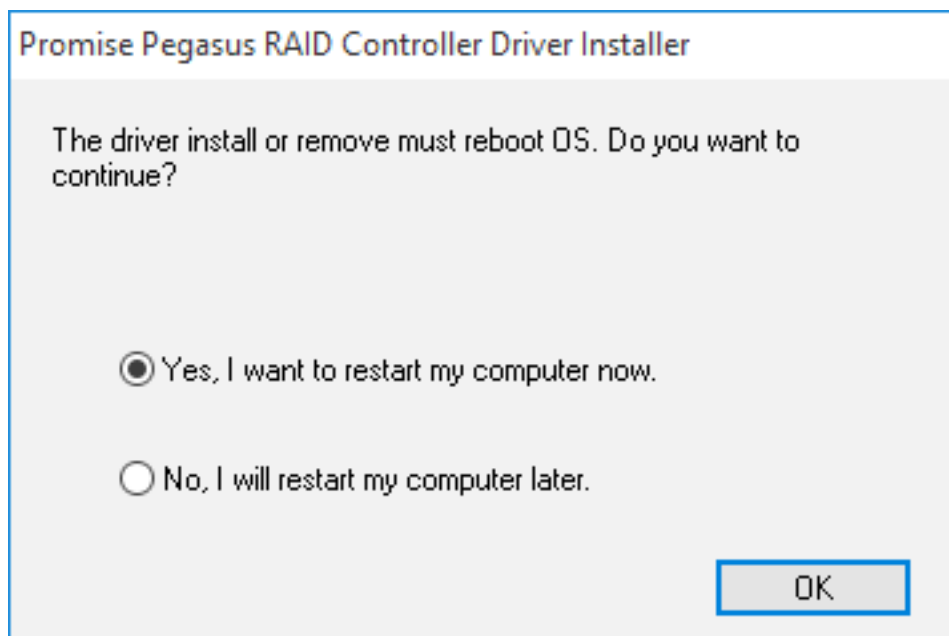
- The License Agreement appears. Click to select the “I accept the terms of the license agreement” option if you accept, and click on **Next** to continue.



- You will be informed once the driver has been installed successfully. Click on **Finish** to continue.



4. A message prompt appears informing you that a system restart is necessary, the “Yes, I want to restart my computer now” option is selected by default. Click **OK** to restart now, otherwise choose the “No, ...” option and restart later. The Pegasus32 cannot be used until you reboot the computer.

**WARNING**

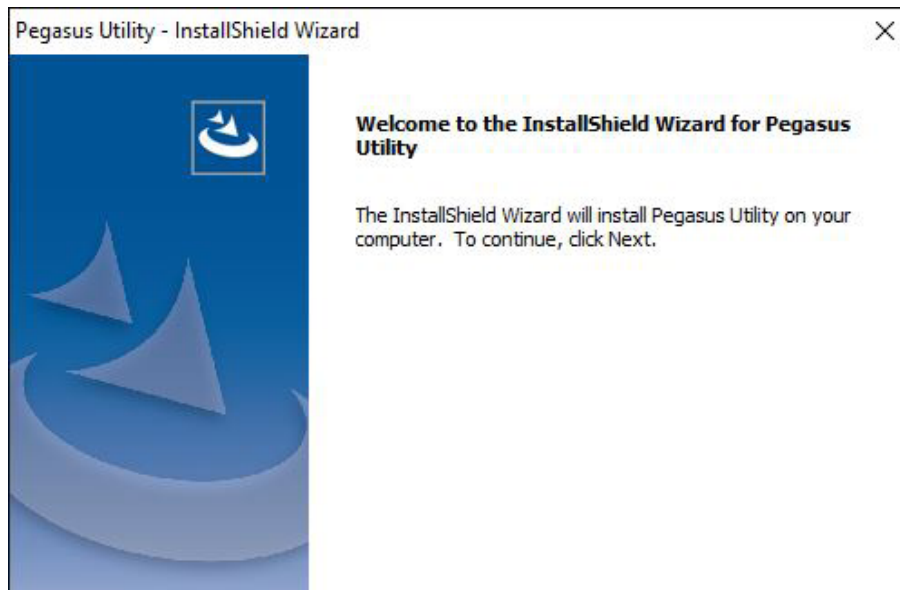
DO NOT disconnect the Thunderbolt™ / USB cable while Windows is running. To safely disconnect the Thunderbolt™ / USB cable while the computer is running, please read “Safely Remove Pegasus32 on Windows” on page 59.

Step 5: Install Software

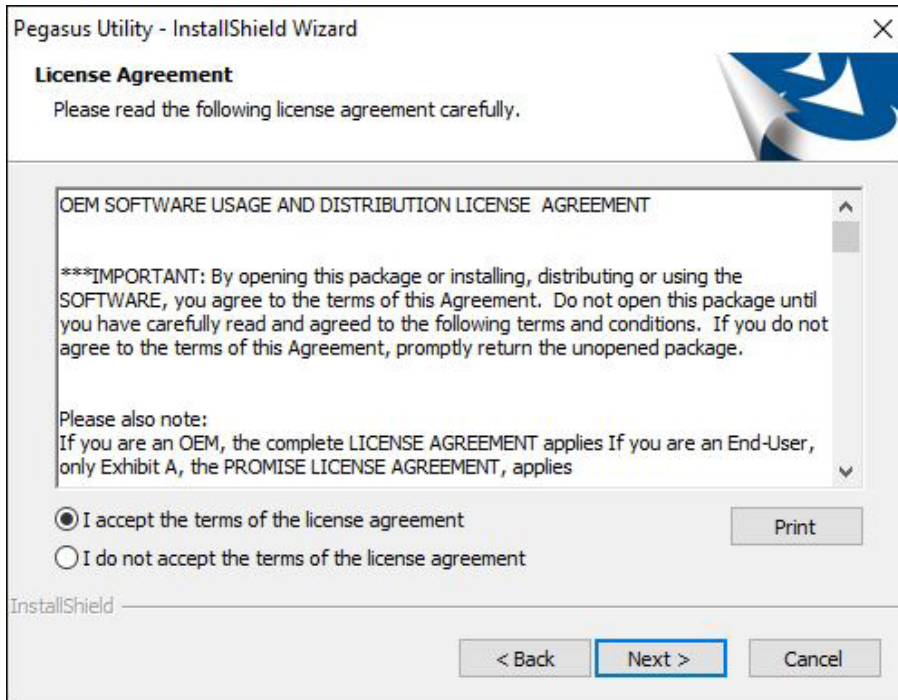
Follow the instructions in this section to complete the installation of the Pegasus32 on your Windows computer. You need to install Pegasus Utility software used for device management and administration.

Locate the Installation program file downloaded previously in Step 1 and follow the instructions in the InstallShield menu to install Pegasus Utility.

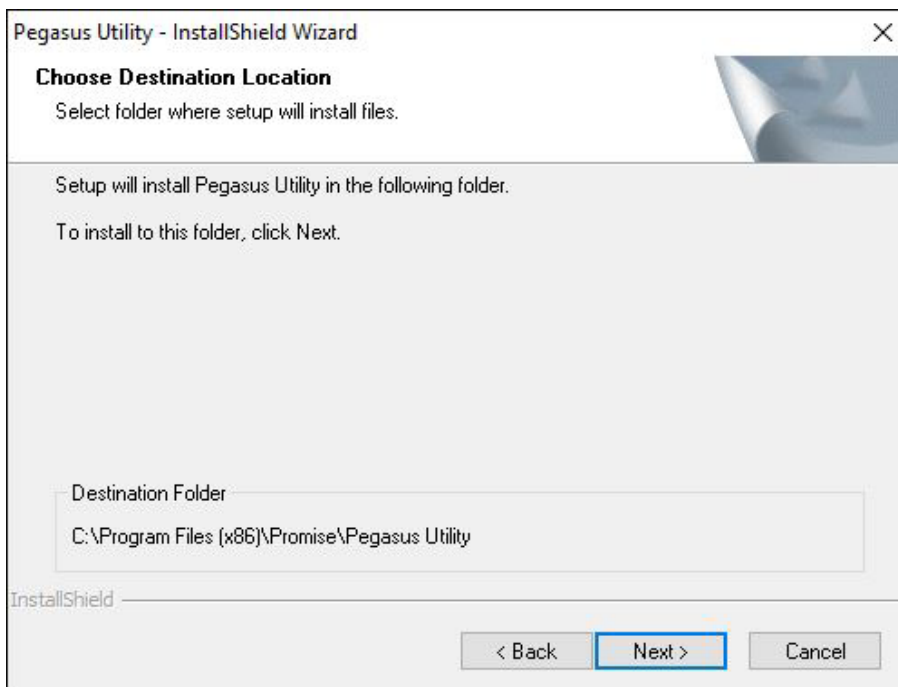
1. Double-click on the zipped file for installing Pegasus Utility, the file name begins with "R_Pegasus_Utility" followed by the version number.
The InstallShield Wizard for Pegasus Utility appears. Click on **Next** to begin installation.



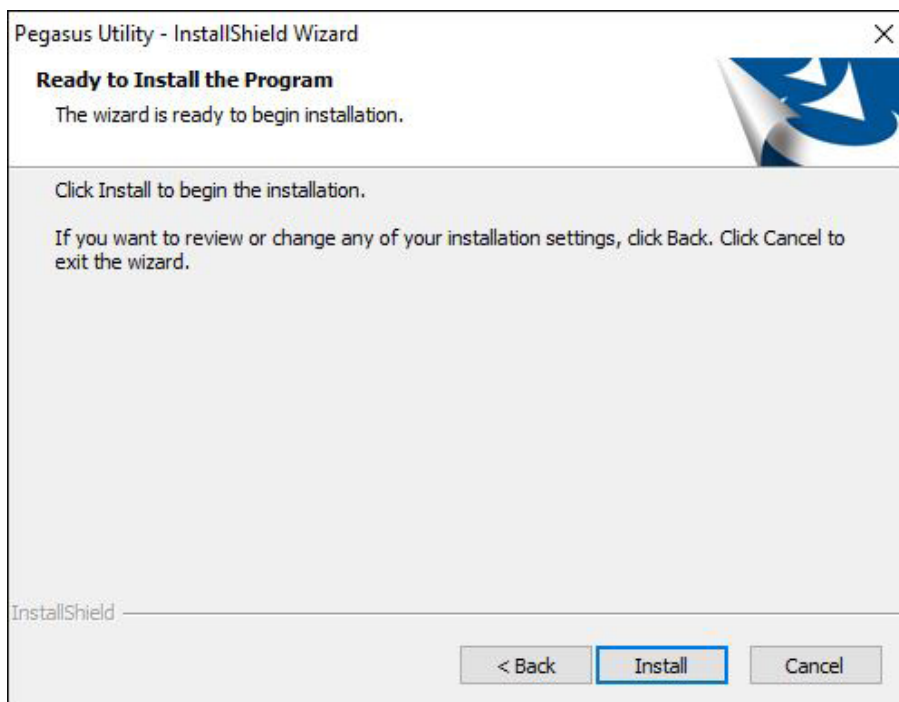
- The License Agreement appears. Click to select the “I accept the terms of the license agreement” option if you accept, and click on **Next** to continue.



- Choose where to put the software on your computer. Click **Browse** to choose a specific location, or click **Next** to accept the default destination. Click **Next** to continue.



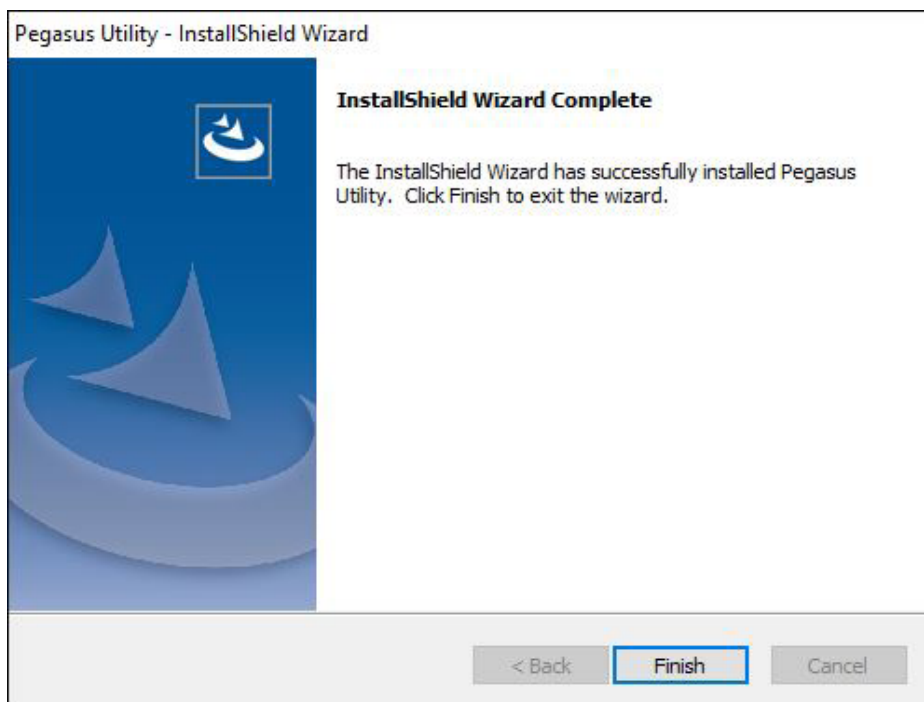
- The program is ready to be installed in the chosen location. Click **Install** to begin.



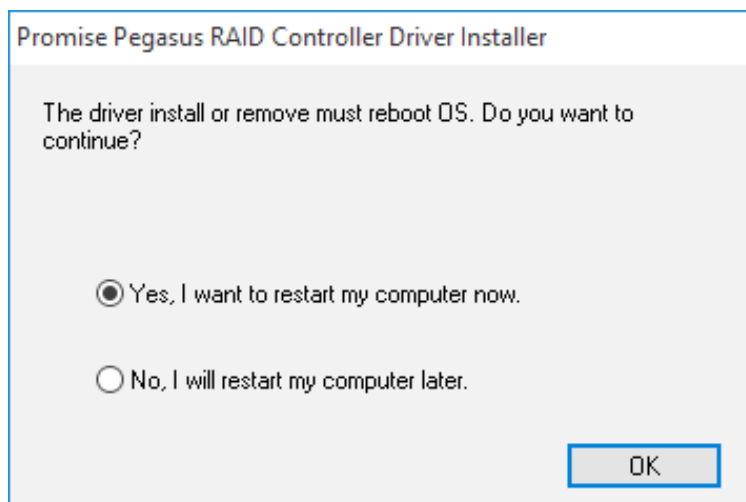
- At this point, a pop-up message might occur (if Windows Firewall is running). Click on **Allow access** to continue.



6. Installation of Pegasus Utility is completed. Click **Finish** to close the InstallShield Wizard.



7. Another dialog menu appears asking if you want to restart your computer. You should do so now if you want to use run the Pegasus Utility



Step 6: Format with Pegasus Utility

Now you are ready to format the Pegasus32 with a the NTFS file system for use as a direct attached storage system with your Windows computer. Use Pegasus Utility to format the RAID array and perform other administrative functions including changing the type of RAID. For information on the other tasks and functions of Pegasus Utility, please read the product manual. For the purpose of this installation guide, only the basic setup using the default PROMISE Hardware RAID 5 array is described. This type of RAID provides the best balance of performance and data safety. For more information on other RAID types, please read the product manual

DO NOT use the Windows Disk Manager to change the RAID on the Pegasus32. Any changes to the RAID array must be done using Pegasus Utility.

Follow the instructions below for the Windows OS you are running:

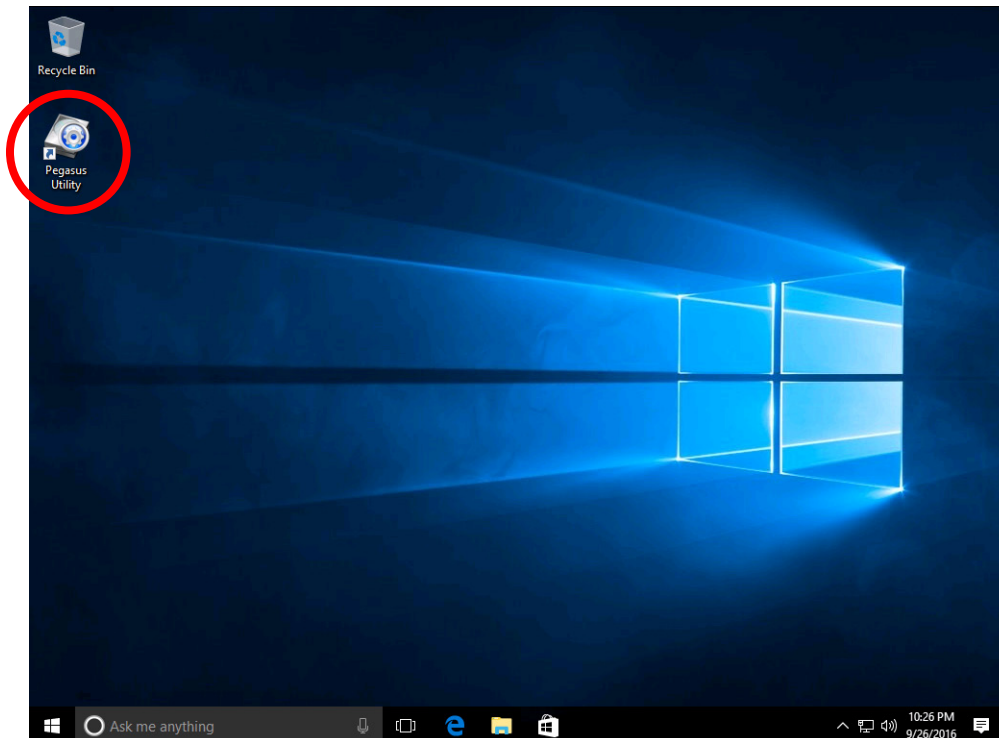
- Windows 10 users, see “Format Pegasus32 on Windows 10” on page 49.

Format Pegasus32 on Windows 10

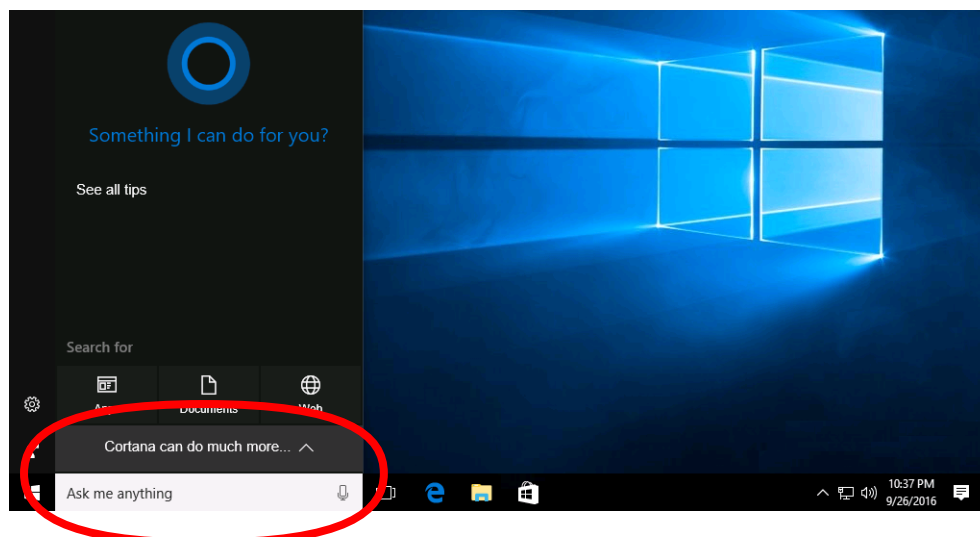
Windows 10 users, please follow the steps listed below to launch Pegasus Utility and format the RAID:

1. Locate Pegasus Utility and launch it. You can use Microsoft Cortana to open it, or click on the Pegasus Utility shortcut on the desktop.

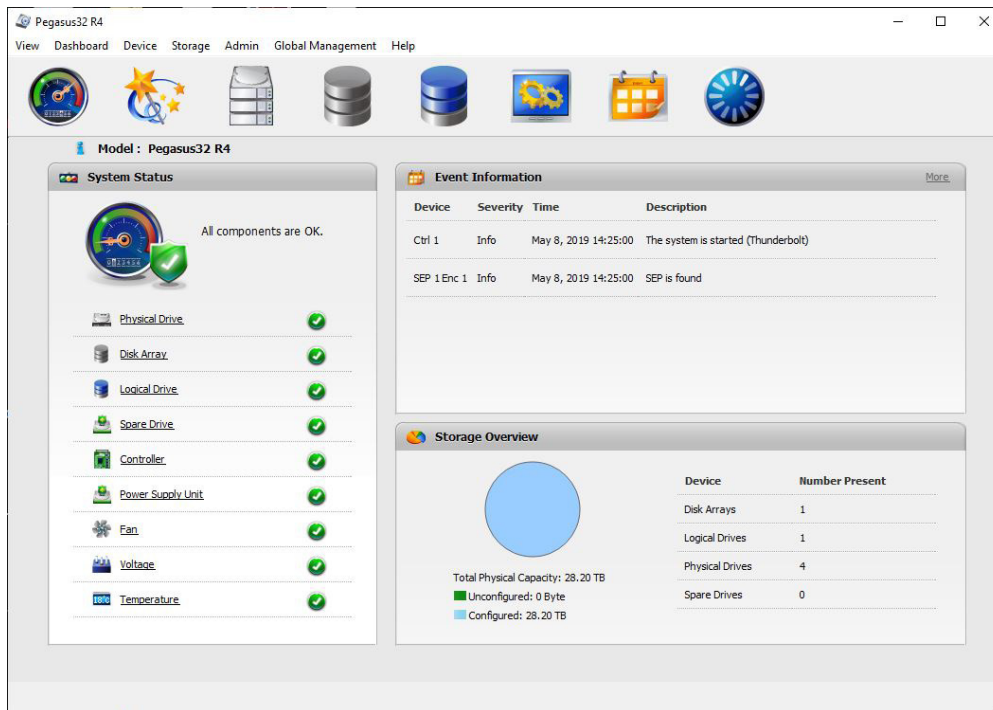
Pegasus Utility shortcut



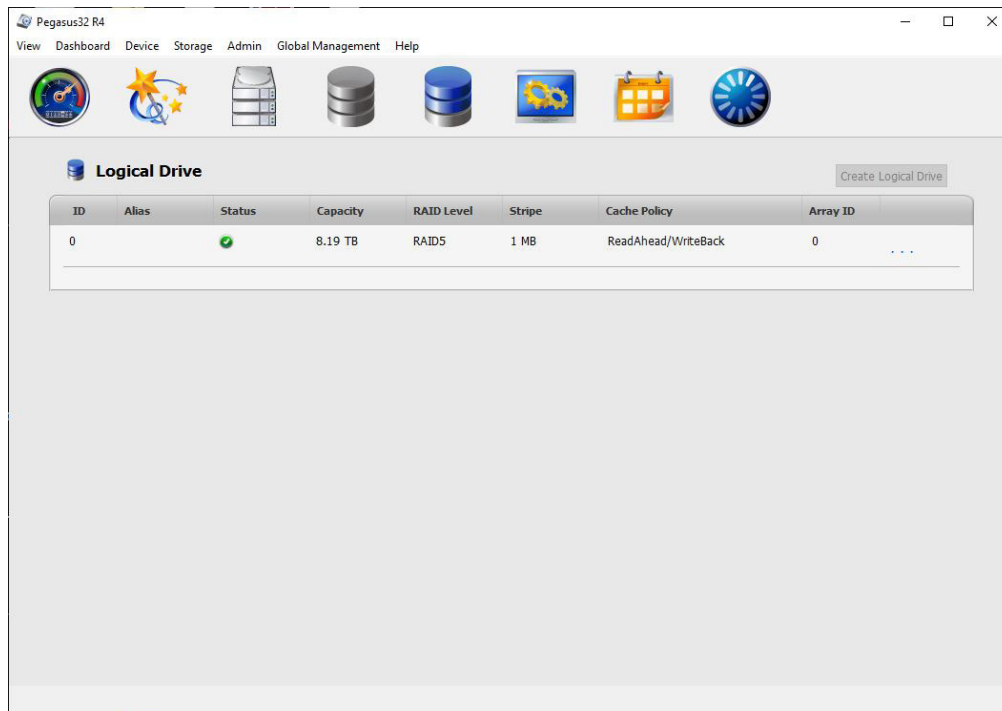
Launch with Cortana



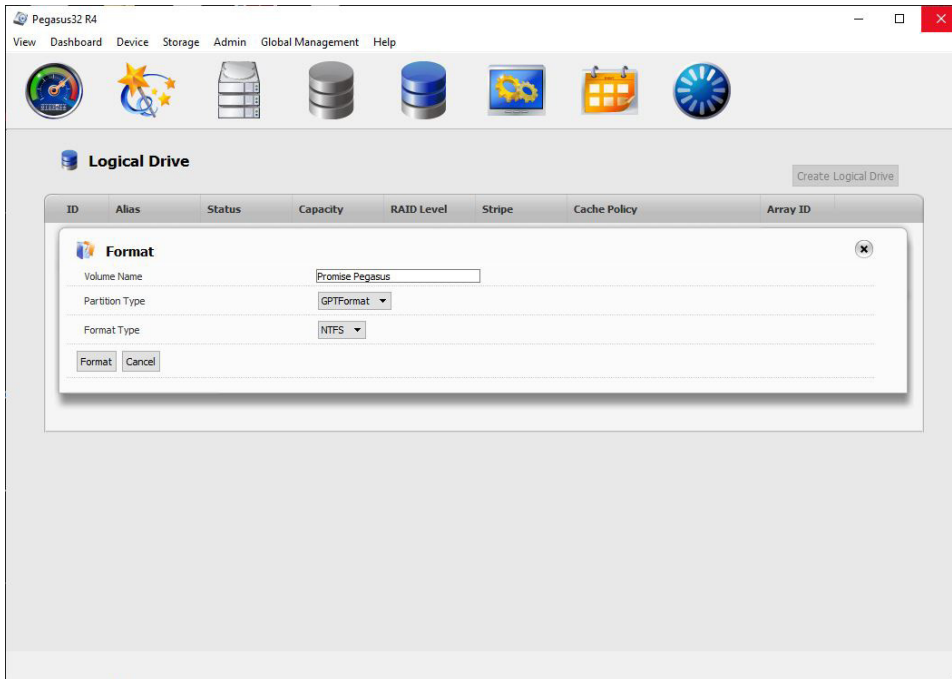
- After several seconds, the **Dashboard** menu appears. Use this menu later to view a summary of the device status. First you need to format the file system for the Pegasus32.



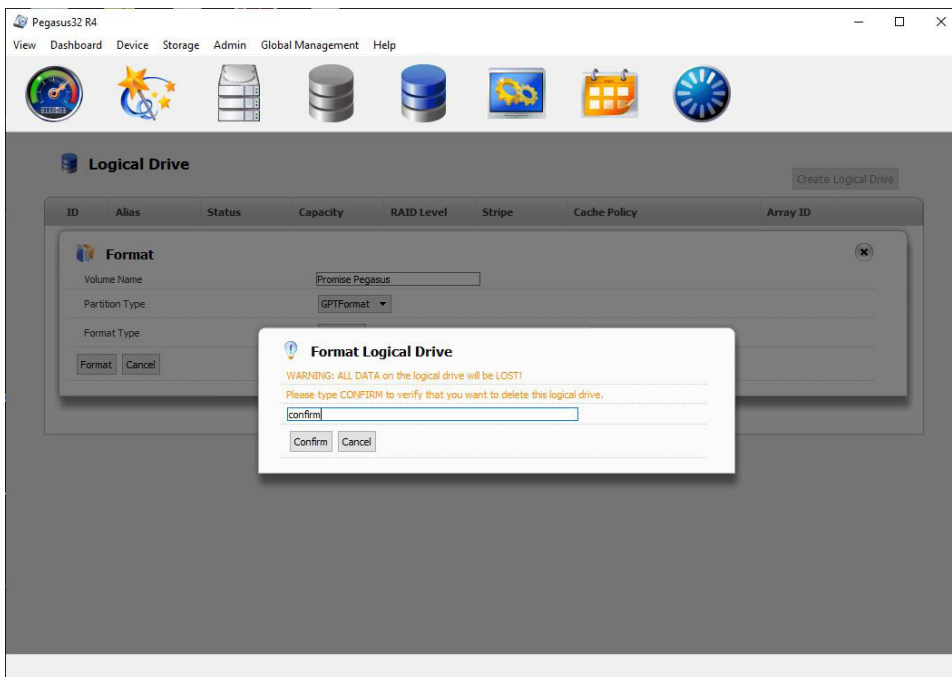
- Click on the **Logical Drive** menu icon near the top of the menu. Notice in the middle of the menu a description of the RAID array that is already setup. The default setup is a RAID 5 using all the hard disks. If you want to change this, please see the product manual. Otherwise, to begin using the Pegasus32 right away, click on the **Format** button to begin the formatting procedure.



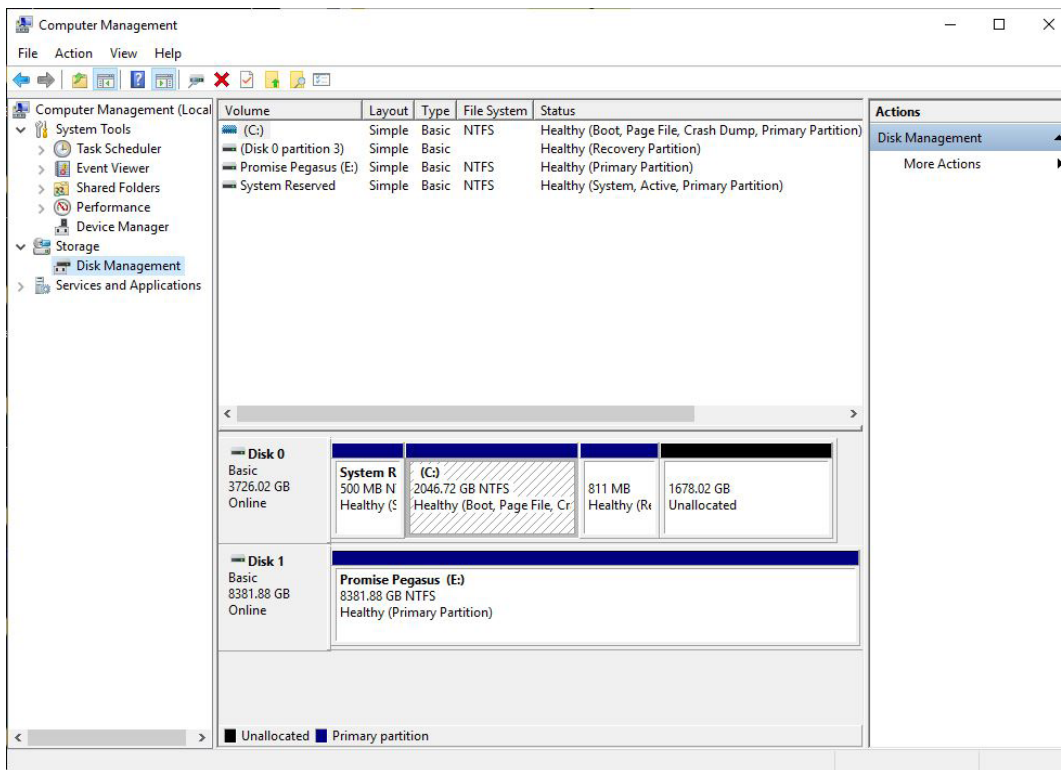
- The formatting options appear in a new menu. You can type in a different name for the Volume or leave the default Promise Pegasus. Most users should use the **Partition Type** set to the default *GPTFormat*. The other Partition Type option, *MBRFormat* (master boot record) does not support Logical Drives greater than 2 TB. The Format Type is set to NTFS, the standard Windows file system. Click **Format** to start formatting the array.



- In order to safeguard against unintended changes to the RAID setup or file system, the Pegasus32 requires that you confirm your decision to begin formatting the drives. To continue formatting, type **confirm** in the space provided and click on the **Confirm** button.



6. When the array is finished formatting, Windows will alert you that a New Volume has been installed. You can see the New Volume in Windows Disk Manager.



7. Make sure you check the firmware version of the Pegasus32 and update it if needed. Go to "Step 7: Check firmware version with Pegasus Utility" on page 53.

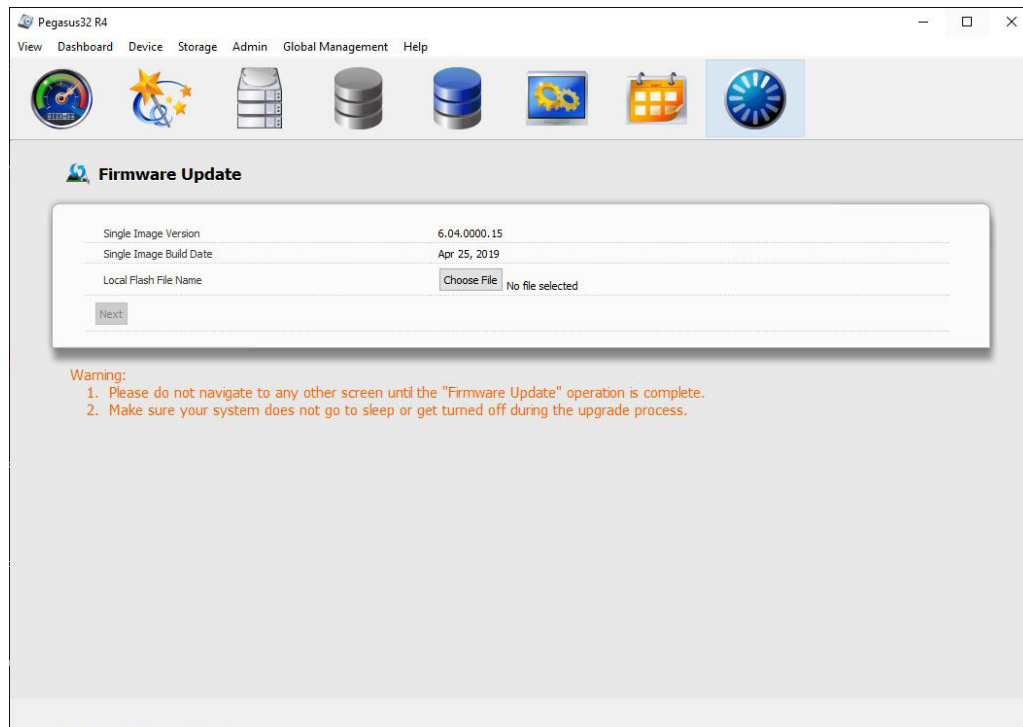
Step 7: Check firmware version with Pegasus Utility

It might be necessary to update the firmware on the Pegasus32. If you do not know the firmware version, use Pegasus Utility to check the firmware version. Go to **Admin>Firmware Update** to see the **Single Image Version** number. Follow the instructions below to update the firmware before using the Pegasus32.



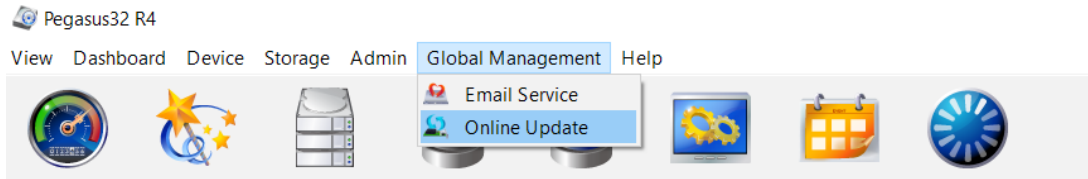
For USB Mode Users

If the Pegasus32 is changed from Thunderbolt™ mode to USB mode, update firmware again after switching modes.



Checking for Updates

The update procedure also can be automatic by going to the Global Management menu tab, choose Online Update.

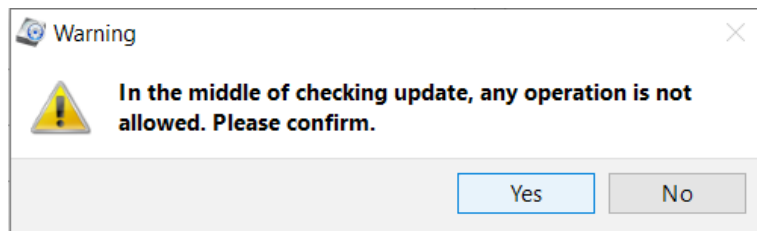


Software, Firmware Version will be checked automatically. If Pegasus32 is USB connection, the USB Firmware Version will also be checked.

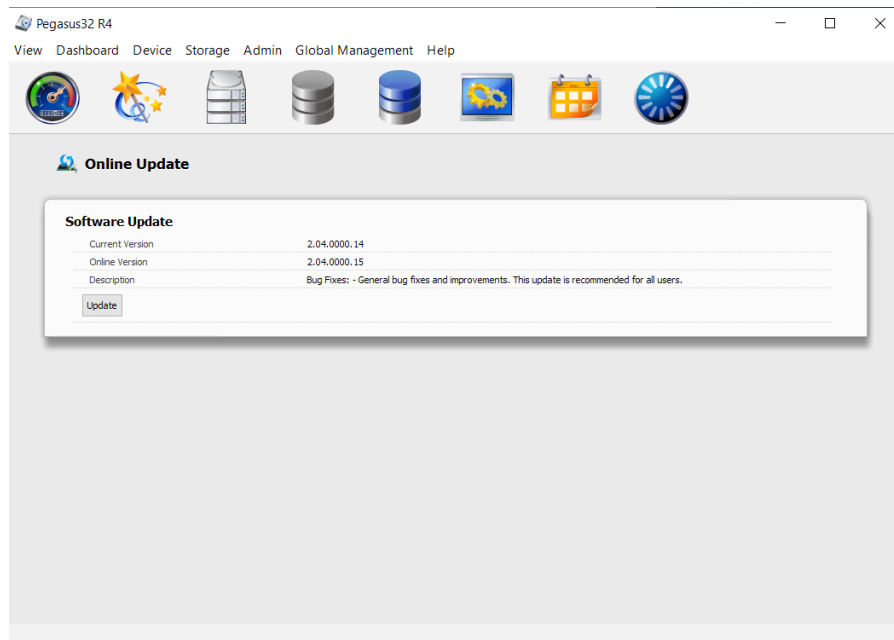


Important

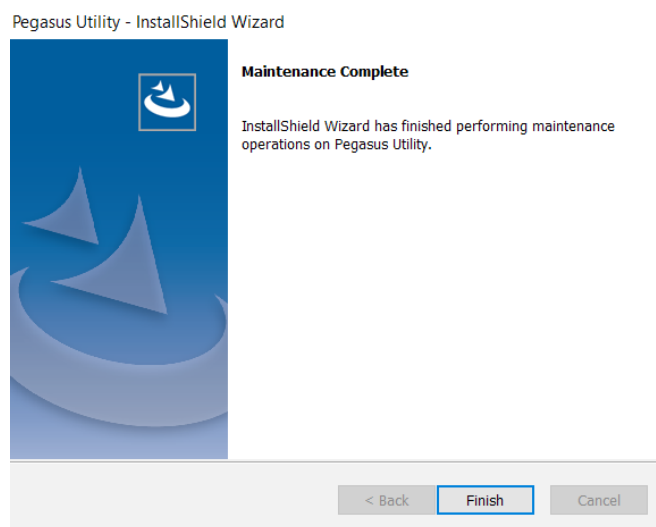
Stop any active operations on the Pegasus32 before updating software or firmware. A warning pops up to confirm the unit is not active. Click on **Yes** if you are sure there are no operations currently active.



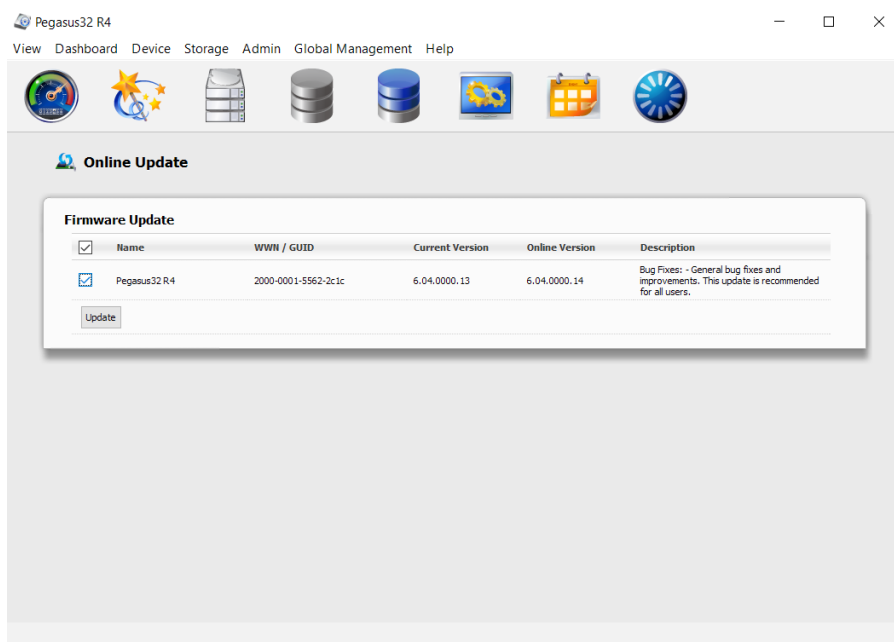
1. If Promise Utility is not up-to-date, a Software Update prompt will appear. Click on **Update** to start software update. If there is not any available update for Promise Utility, go to step 3.



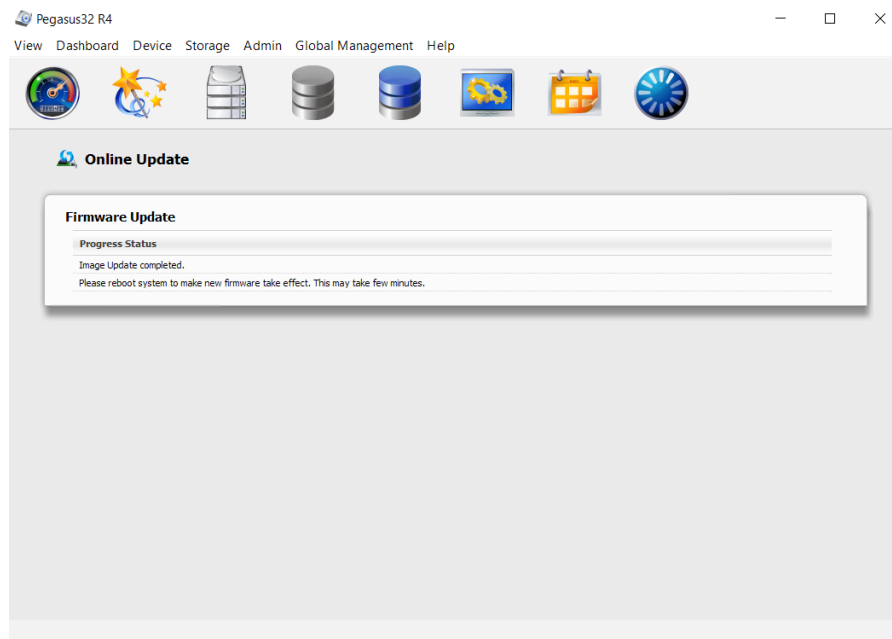
2. Software is installed successfully. Click on **Finish** to complete software update.



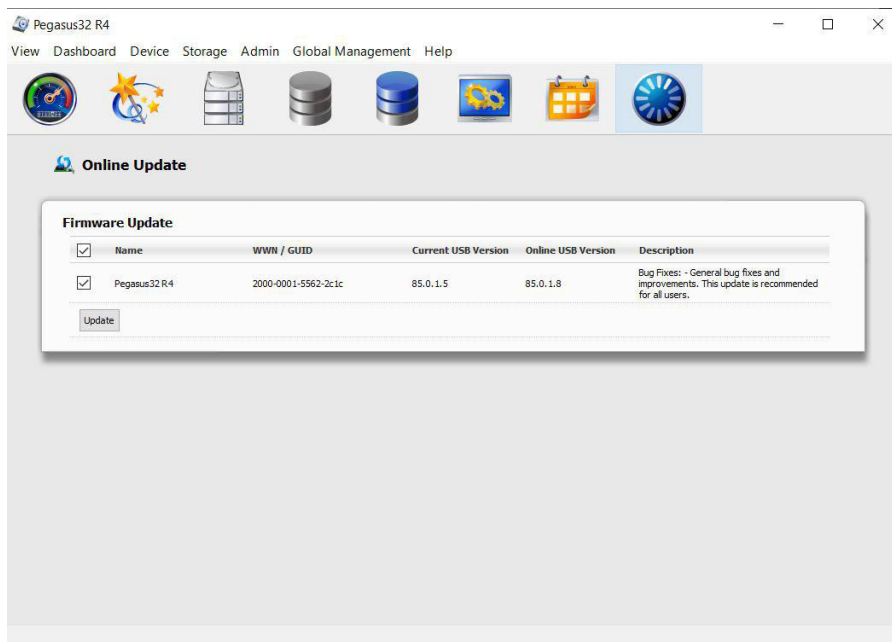
3. If Firmware is not up-to-date, a Firmware Update page will prompt out. Click to select the Pegasus32 and click on **Update** button to start Firmware update. If there is no update available for Firmware, go to step 5.



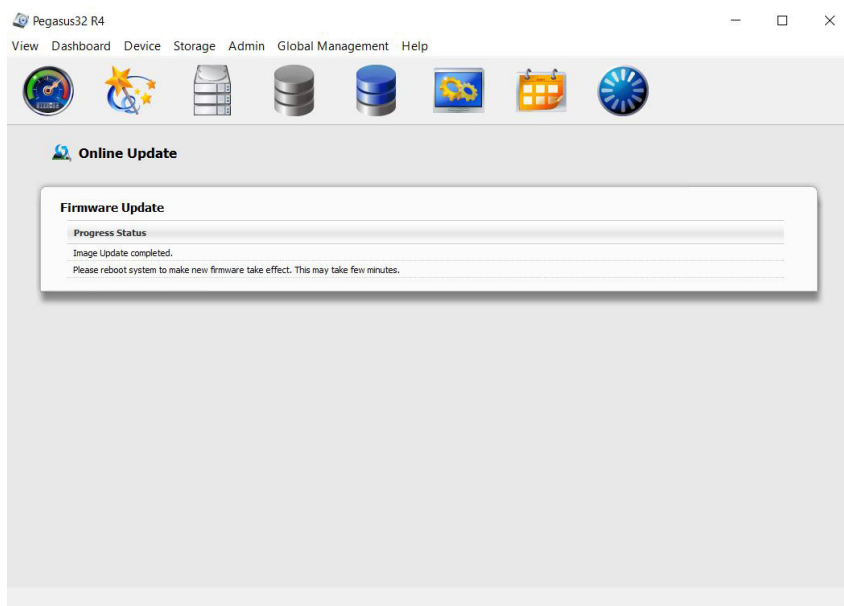
4. The update process will take several seconds to complete. Once the process has completed, it is necessary to restart the computer. *If Pegasus32 is connected via USB, go to step 5. If connecting via Thunderbolt, go to step 7.*



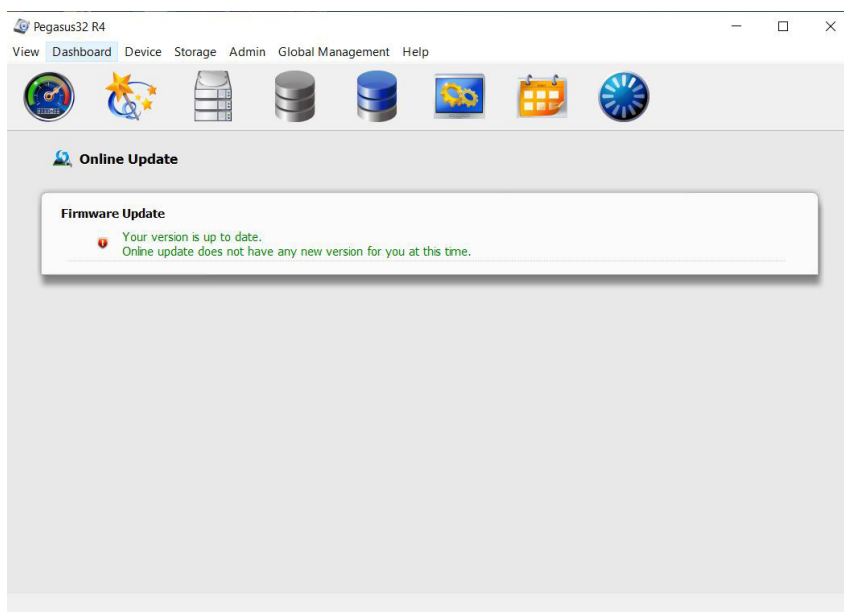
5. **(Windows USB only)** If USB Firmware is not up-to-date, a Firmware Update appears. Click to select the Pegasus32 and click on **Update** button to start USB Firmware update. If there is not any available update for USB Firmware, go to step 7.



6. The update process will take several seconds to complete. Once the process has completed, it is necessary to restart the computer.



7. If the Promise Utility/ Firmware/ USB Firmware are up-to-date, Promise Utility will display the menu below, and the update process is completed. Pegasus32 is ready for use.



**Important**

If the **Single Image** firmware version is **6.04.0000.14** or later, it is not necessary to update. If the firmware is an earlier version (6.04.0000.13 or lower number), you need to update the firmware to operate in Windows.

Updating Firmware

The update procedure should be done before using the Pegasus32 with your Windows computer. Make sure to download the latest firmware from the PROMISE website at www.PROMISE.com/support/download.aspx and place the .img file on your computer.

To update the controller firmware:

1. From the **Admin** menu tab, choose *Firmware Update*. Check the **Single Image Version** number. If the version number is up-to-date, the firmware does not need to be updated. If the number is not the latest firmware, continue with the firmware update procedure.
2. Click on the padlock icon to unlock the menu, and type in the password for your computer when the prompt appears.
3. Click the **Browse** button and locate the .img file you downloaded from PROMISE.
4. Click the **Next** button.
5. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.
6. The process will take several seconds. When it is completed, you will be prompted to restart the computer. Restart your computer and continue to use the Pegasus32.

Safely Remove Pegasus32 on Windows

To disconnect the Pegasus32 drive from your Windows computer while the computer is running, it is necessary to perform a simple procedure to safely disconnect the storage volume from Windows. If you remove the Thunderbolt™ 3 / USB cable while the operating system is running, data on the Pegasus32 might be damaged.

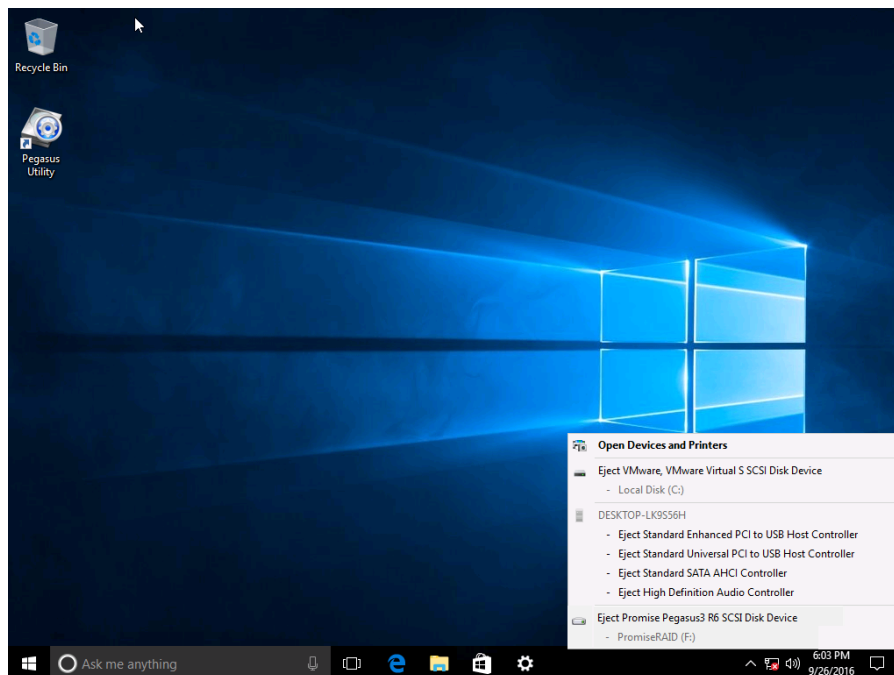
If the computer has been shutdown, it is safe to disconnect the Thunderbolt™ 3 / USB cable.

Alternatively, you can shutdown the Pegasus32. See “Shutdown the Pegasus32” on page 61.

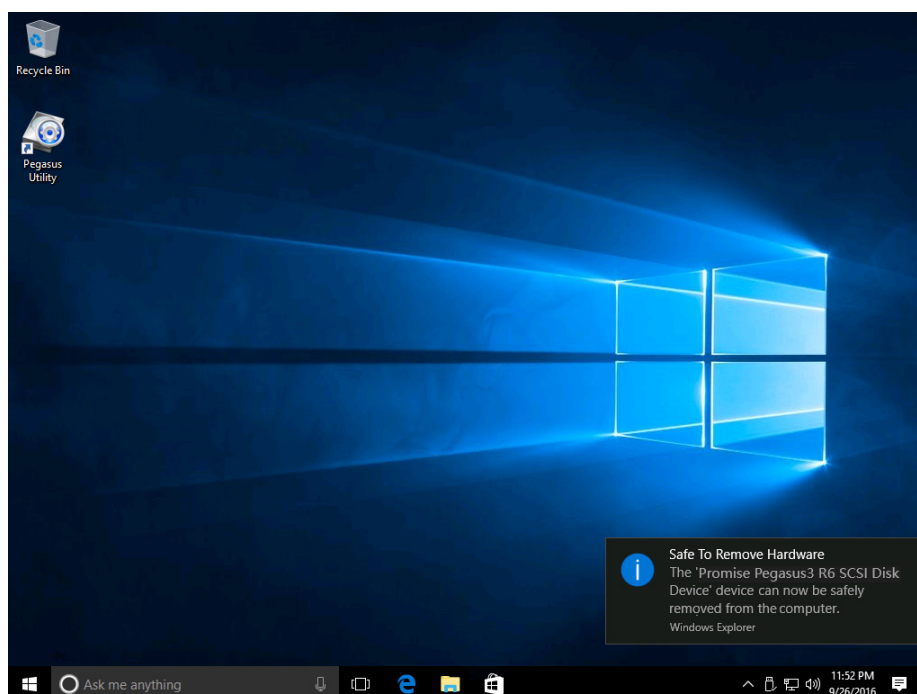
Safely Remove Pegasus32 on Windows 10

To disconnect the Pegasus32 from a Windows 10 computer:

1. Click on the attached drives icon in the System Tray to reveal the eject options and choose the *Eject Promise Pegasus* option.



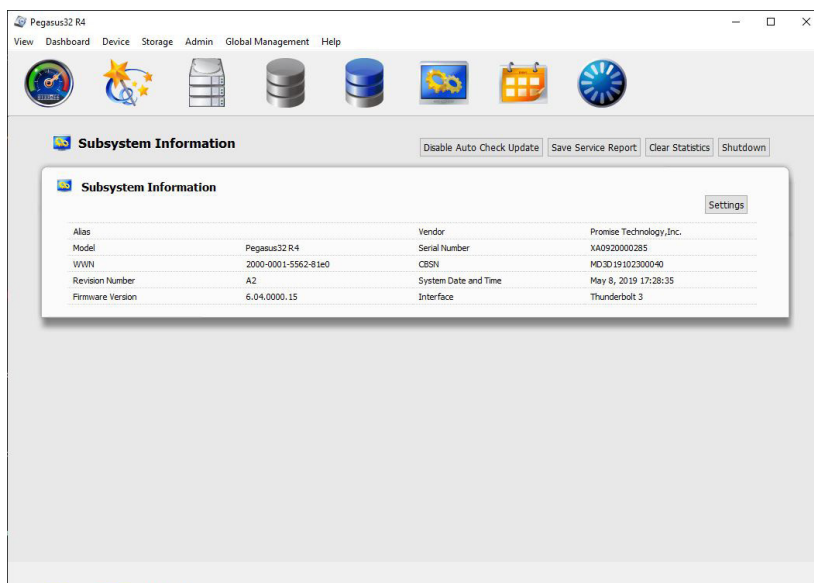
2. Wait for the message to appear telling you it is safe to remove the Pegasus32. You can now safely power off the system or disconnect the Thunderbolt™ 3 / USB cable.



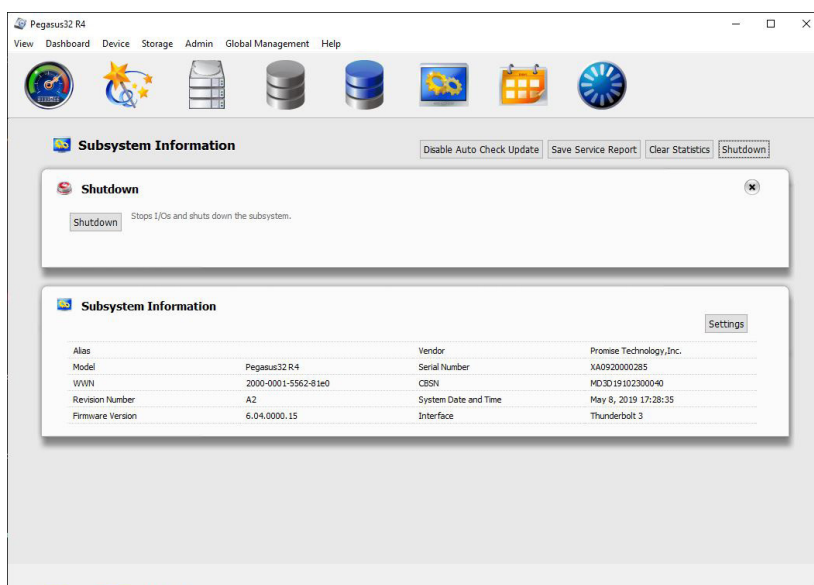
Shutdown the Pegasus32

To shutdown the Pegasus32 on Windows 10:

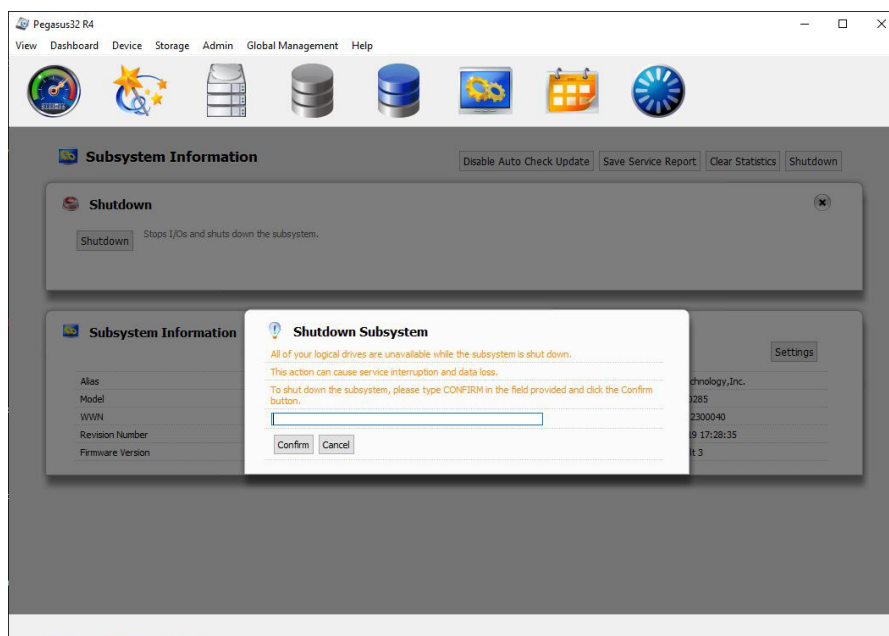
1. Open Pegasus Utility and click on the **Subsystem Information** menu icon, click on the **Shutdown** tab.



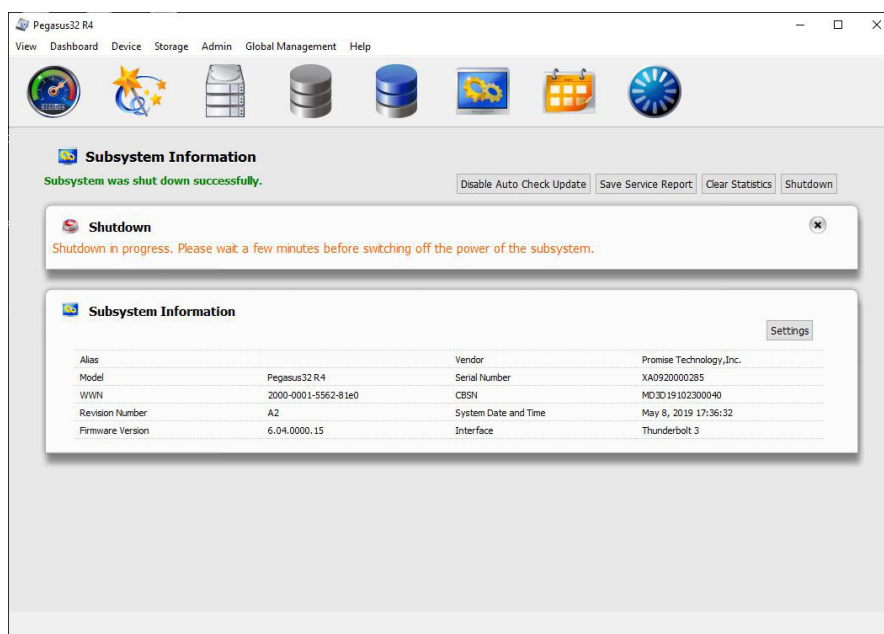
2. Click on the **Shutdown** button.



- To prevent accidental shutdown, you must confirm that you want to shutdown the system. Type **confirm** in the space provided and click on the **Confirm** button.



- A message appears informing you that the shutdown process will take a few minutes. If you want to move the device, wait until the system is completely powered off before disconnecting the power cord.



MANAGING THE PEGASUS32

This chapter contains the following topics:

- “Accessing the Pegasus software utility”
- “Managing Subsystems”
- “Managing the RAID Controller”
- “Managing Enclosures”
- “Managing Background Activities”
- “Managing Physical Drives”
- “Managing Disk Arrays”
- “Managing Logical Drives”
- “Managing Spare Drives”

The Pegasus software utility requires a Thunderbolt™ or USB connection between your computer and the Pegasus unit. See “Viewing Runtime Events” on page 183, and “Installation and Setup for Windows Users” on page 37.

The Pegasus management software utility must be installed onto your computer before you can use it. Note that the management utility

**Note**

The software utility used from management of the Pegasus32, and other devices in the Pegasus line, is called *Pegasus Utility* in Windows, and *Promise Utility* in Mac. The software utility has the same functions in both operating systems.

The examples referenced in this chapter are taken from the Promise Utility in Mac; therefore the term Promise Utility is used to refer to the Pegasus32 software used for managing the device.

Accessing the Pegasus software utility

Access Promise Utility in Mac

For Mac users, accessing the Promise Utility includes:

- Opening and Closing
- Unlocking the UI

Opening

To open the Promise Utility, double-click the **Promise Utility** icon in the Macintosh Dock.

The Promise Utility window opens and displays the Dashboard.


See “The Promise Utility interface with the Dashboard displayed” on page 67.

Closing

There are two ways close the Promise Utility:

Promise Utility icon on Mac desktop



- Click the Promise Utility dropdown menu and choose **Quit Promise Utility**
- Press cmd-Q ( Q)

Access Pegasus Utility in Windows

In Windows, you can click on the shortcut for Pegasus Utility on the Desktop. In Windows 10 you also have the option to use Windows Cortana.

Please see “Installation and Setup for Windows Users” on page 37 to see examples of the shortcut for the different Windows OS.

Unlocking the UI in Mac

By default, the UI is locked to prevent unauthorized changes to your RAID system. When the UI is locked, you cannot create logical drives or change settings on the Pegasus32 unit.

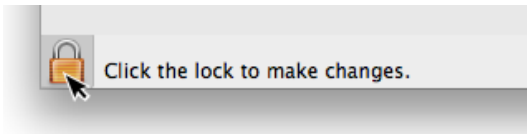


Note

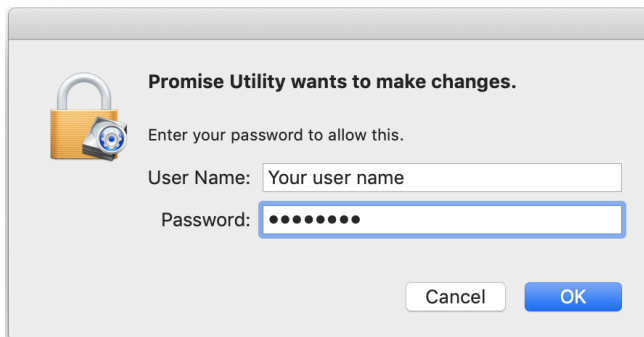
Unlocking the UI requires administrator privilege. Make sure you have the macOS administrator Name and Password.

To unlock the UI:

1. At the lower left screen of the Promise Utility window, click the closed lock icon.



The Promise Utility password dialog box opens.



2. Type your Mac password into the Password field and click the **OK** button.
The lock icon changes to open and you can now add and delete logical drives, make settings, run background activities, and update your Pegasus32 system.

Displaying Multiple Pegasus Units

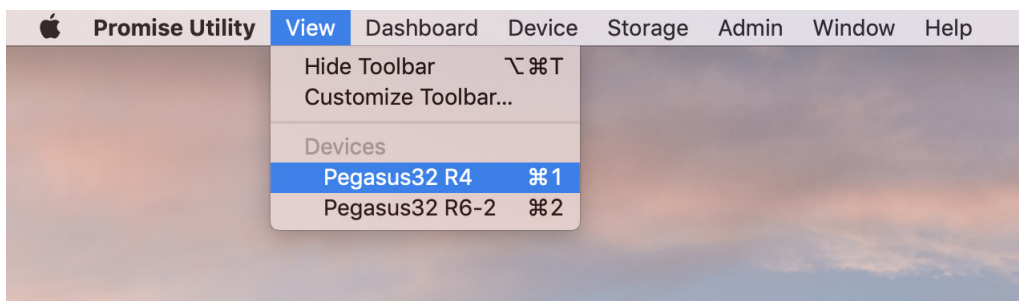
The Promise Utility displays a separate window for each Pegasus unit connected by Thunderbolt™ cable and powered up.



Note

The Pegasus Utility can also be used for earlier releases of Pegasus2, Pegasus3 and Pegasus32; models R4, R6 and R8.

- To view a list of the Pegasus2, Pegasus3 or Pegasus32 units, click the **View** menu.
- To display a Pegasus unit in the Promise Utility, click the **View** menu and choose unit you want to see.

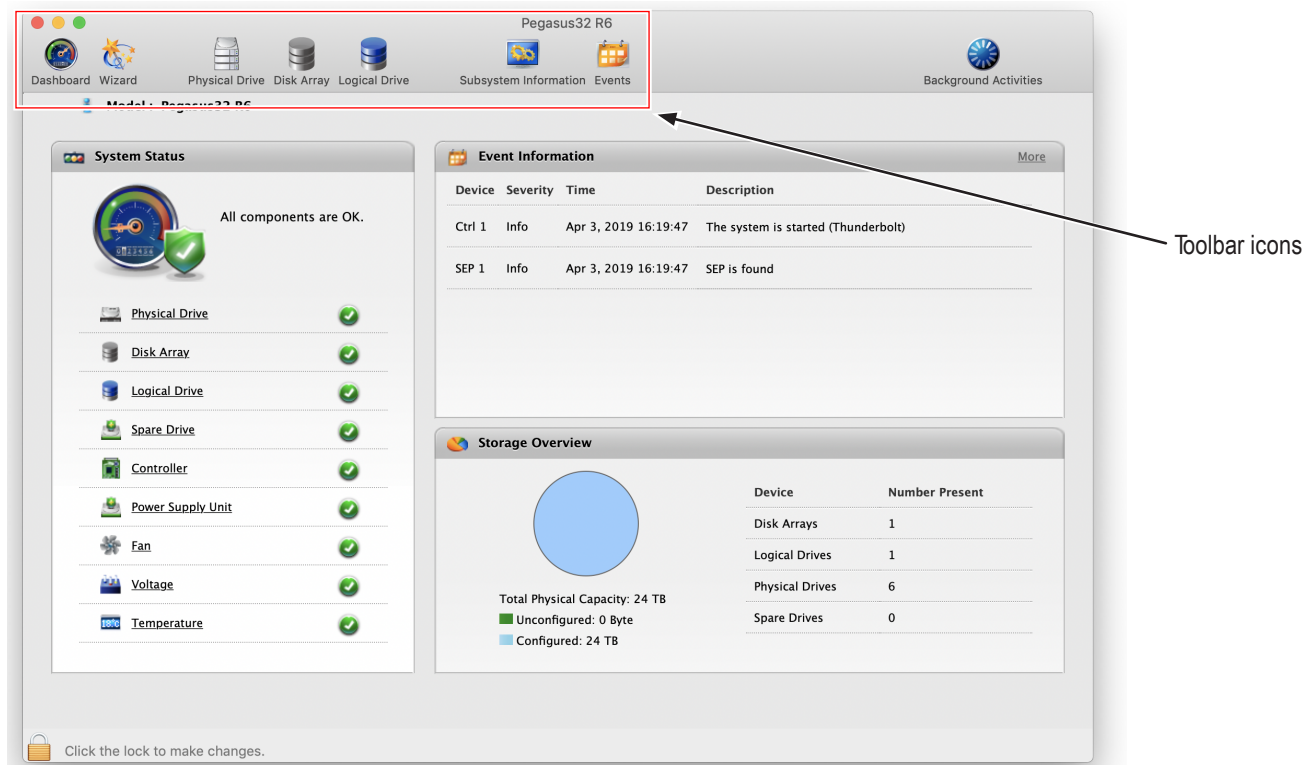


The first unit is Pegasus32 R4, R6, or R8, the second is Pegasus32 R4-2 or R6-2, R8-2, the third is Pegasus32 R4-3 or R6-3, R8-3, and so on. The Pegasus32 units are listed by the order in which they are recognized, not by the cable configuration.

Perusing the Promise Utility interface

The Promise Utility interface consists of menus and icons, each leading you to a specific function.

The Promise Utility interface with the Dashboard displayed



- **Promise Utility** – About, Checking for Updates, Preferences, Services, Hide, Quit
- **View** – Show/Hide Toolbar, Customize Toolbar, Devices (Pegasus units)
- **Dashboard** – Show the Dashboard
- **Device** – Front and Back Views, Component List, Physical Drive List
- **Storage** – Wizard, Disk Array List, Logical Drive List, Spare Drive List
- **Admin** – Enclosure (Pegasus unit) Information, Events, Background Activities, Firmware Update, Performance Monitor and Restore Factory Default (settings)
- **Window** – Minimize, Zoom, Close Window, Bring All to Front, Pegasus unit
- **Help** – Online help search

Most of the functions accessed in the menu bar are described in this chapter.

Toolbar Icons

The default toolbar icons are listed here:

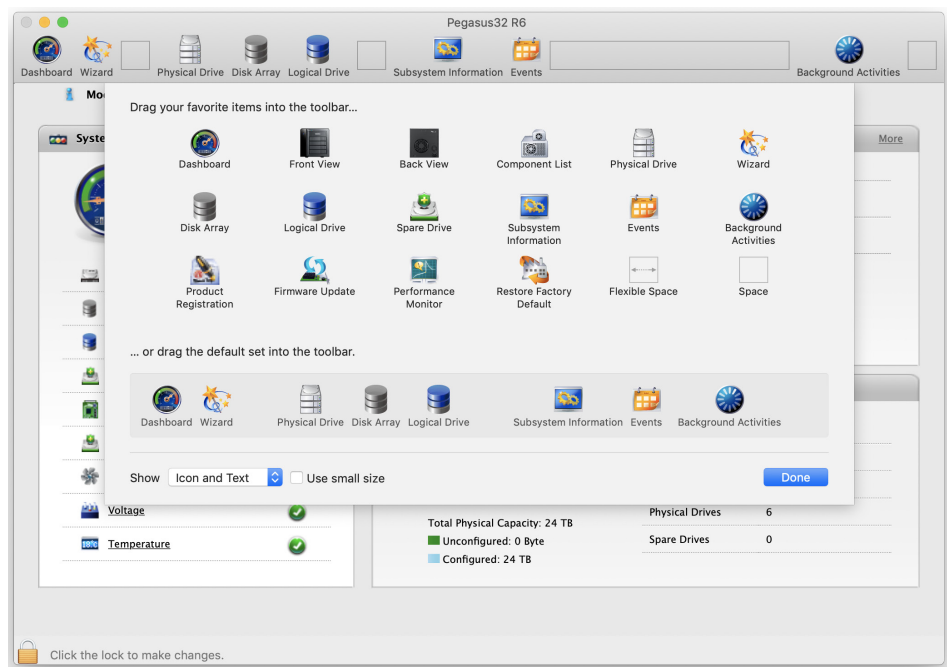
- **Dashboard** icon – Displays the Dashboard and overview
- **Wizard** icon - Displays the Wizard options for quickly setting up RAID arrays
- **Physical Drive** icon – Displays the physical drive list, settings and functions
- **Disk Array** icon - Display menu for monitoring, managing and creating disk arrays
- **Logical Drive** icon – Displays the logical drive list, settings and functions
- **Subsystem Information** icon – Displays Pegasus unit information and settings
- **Events** icon – Displays the event logs

Customizing the Toolbar

You can customize the toolbar by adding or removing icons. To add and remove toolbar icons:

1. From the Promise Utility window, click the **View** menu and choose **Customize Toolbar...**. The toolbar options dialog box appears.
2. Do one or both actions are needed:
 - Click and drag an icon from the dialog box to the toolbar to add the icon.
 - Click and drag an icon from the toolbar to delete the icon.
3. When you are finished, click the **Done** button.

Customize toolbar

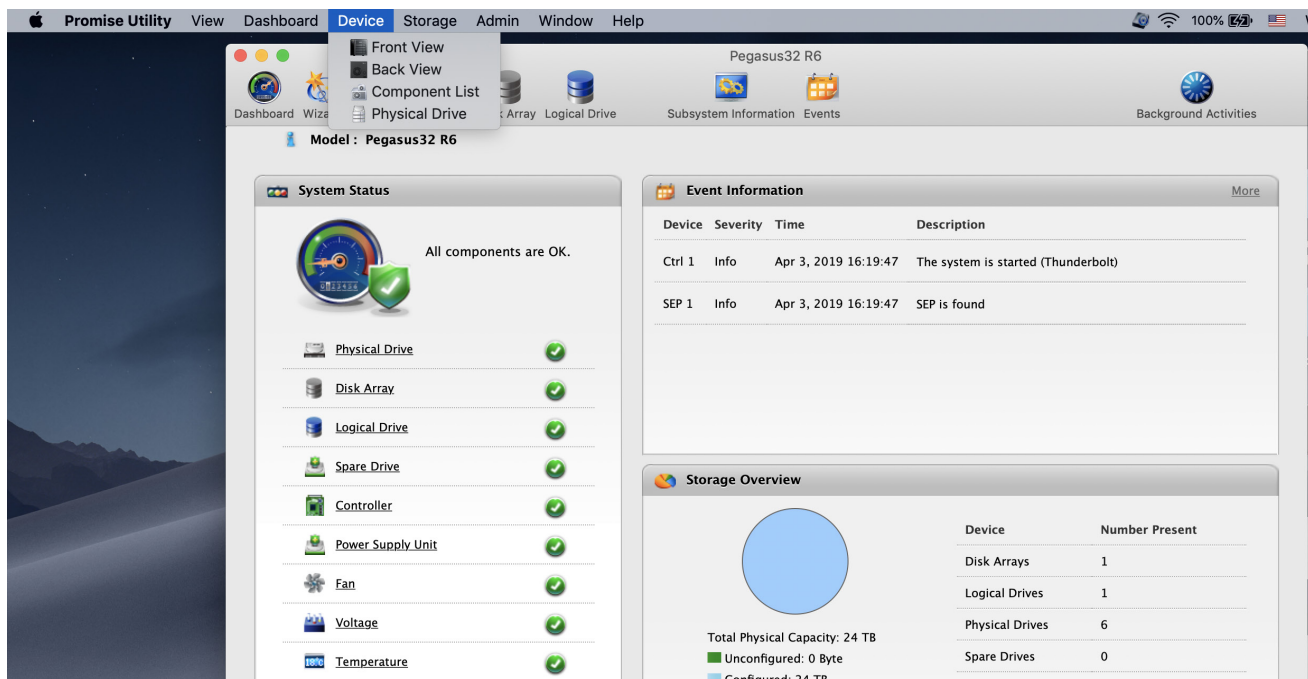


Device menus

Use the Device drop-down menu in the menu bar at the top of your desktop to view an active display of the Pegasus32 device, as well as access to menus used to configure settings for device hardware and physical drives.

To view the Promise Utility menu bar, just select the Promise Utility window, and the menu bar lists the Device, Admin and other menu categories.

Device menu options on Mac



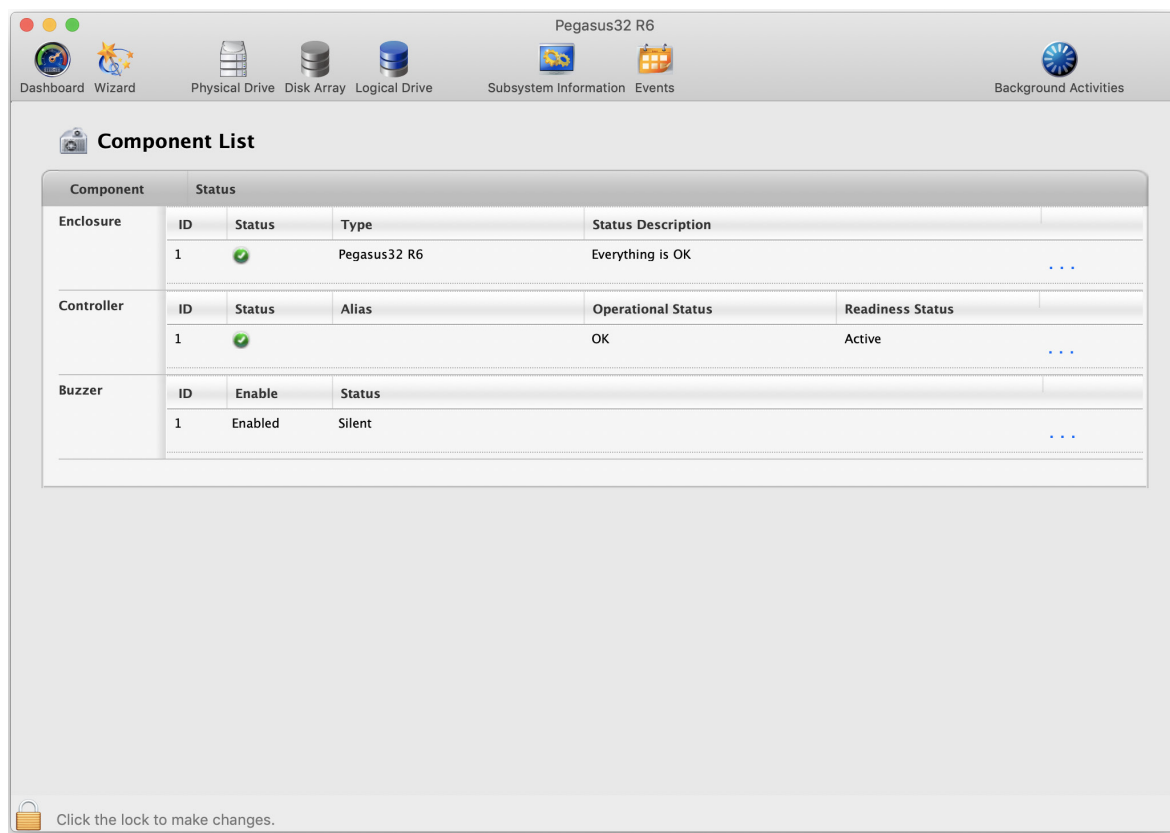
Note

The Physical Drive menu and Component List are also accessible using the Physical Drive and Controller menu links listed under System Status in the Dashboard menu.

Component List

Go to the **Device** drop-down menu and choose the *Component List* option to display the device ID, operational status, enclosure type, and status description of all enclosures. The Enclosure, Controller, Buzzer and Fan menus are described in relevant sections of this chapter. See “Viewing Controller Information” on page 82, “Viewing the Enclosure Information” on page 89, and “Making Buzzer Settings” on page 87 for more information.

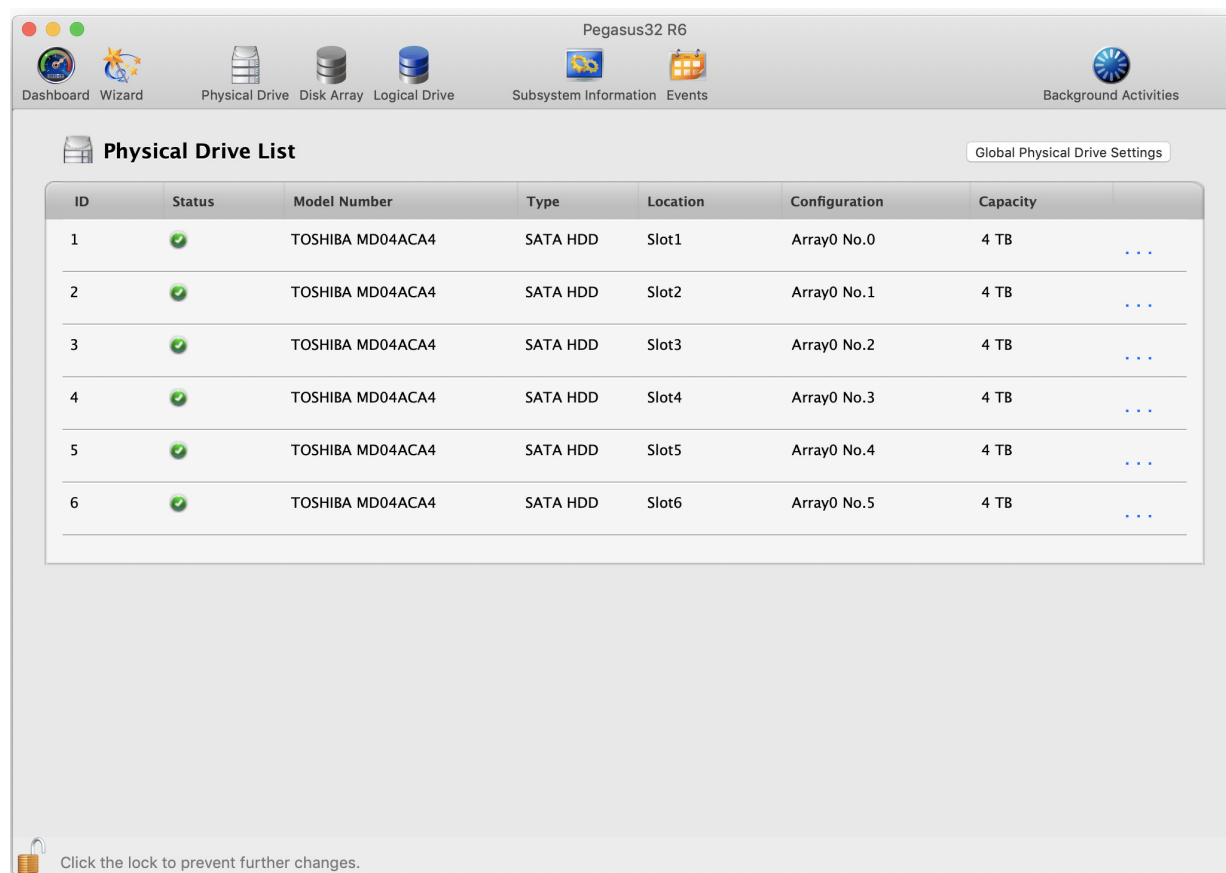
Component List on Mac



Physical Drive menu

Go to **Admin** drop-down menu and choose the *Physical Drive* option to display the Physical Drive menu. This is the same menu you see by clicking the Physical Drive menu button at the top of the Promise Utility window, or by clicking the Physical Drive menu link under System Status in the Dashboard. See “Managing Physical Drives” on page 110 for more information.

Physical Drives List on Mac



Pegasus32 R6

Dashboard Wizard Physical Drive Disk Array Logical Drive Subsystem Information Events Background Activities

Physical Drive List Global Physical Drive Settings

ID	Status	Model Number	Type	Location	Configuration	Capacity	
1	OK	TOSHIBA MD04ACA4	SATA HDD	Slot1	Array0 No.0	4 TB	...
2	OK	TOSHIBA MD04ACA4	SATA HDD	Slot2	Array0 No.1	4 TB	...
3	OK	TOSHIBA MD04ACA4	SATA HDD	Slot3	Array0 No.2	4 TB	...
4	OK	TOSHIBA MD04ACA4	SATA HDD	Slot4	Array0 No.3	4 TB	...
5	OK	TOSHIBA MD04ACA4	SATA HDD	Slot5	Array0 No.4	4 TB	...
6	OK	TOSHIBA MD04ACA4	SATA HDD	Slot6	Array0 No.5	4 TB	...

Click the lock to prevent further changes.

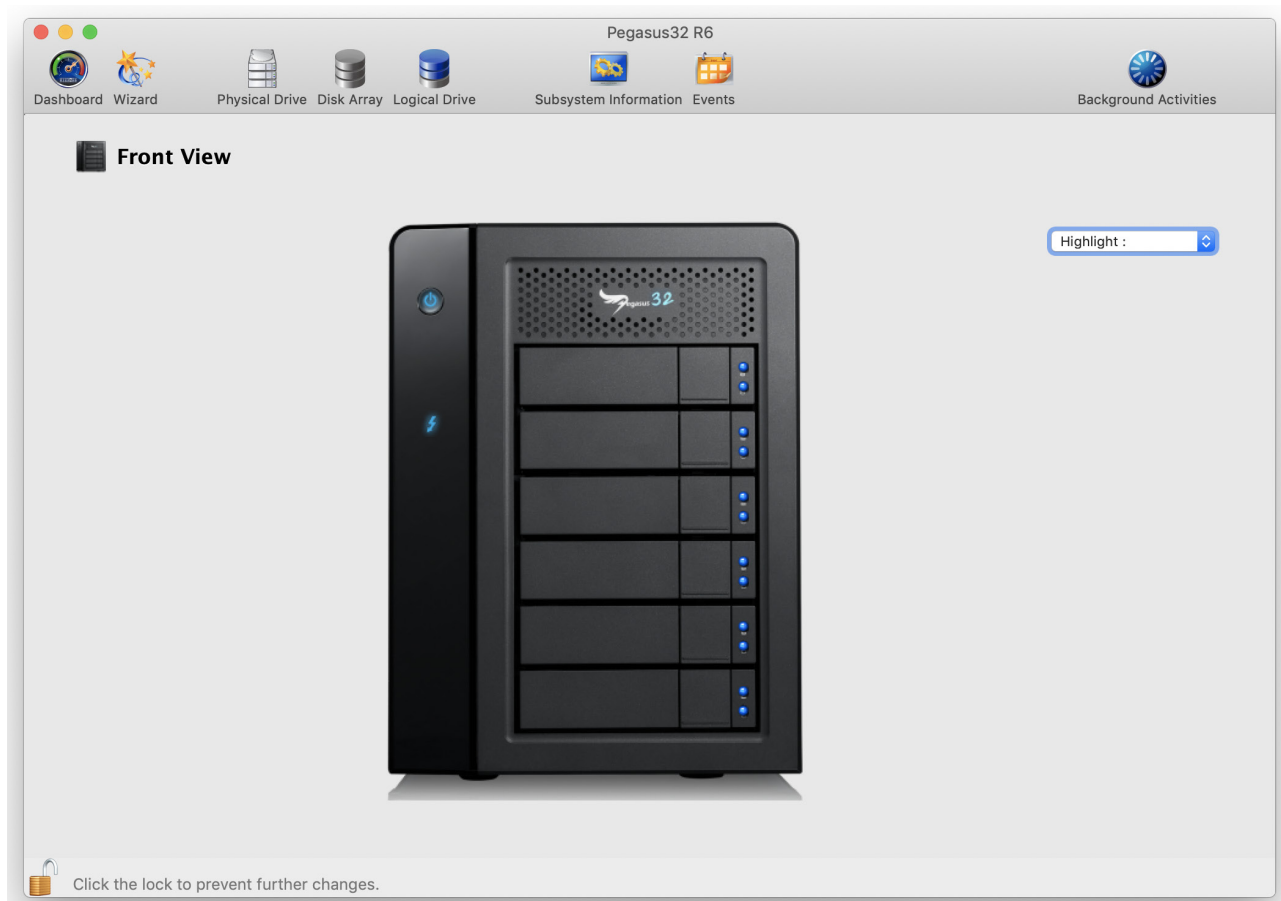
Front View

The Front View active menu lets you view the enclosures and all components on the front of the Pegasus32.

Move the cursor over the drive carrier to display the information of the installed physical drive, including the device ID, physical capacity, operational status, etc. Click on the drive to bring up the Physical Drive Information, displaying the detailed information of the device.

Front View options include the ability to indicate which carriers contain unconfigured physical disks (colored green), or to highlight arrays (colored purple).

Device - Front View display menu



Show Unconfigured Physical Drives

Click the **Highlight** button and choose **Unconfigured PD(s)** to identify any unconfigured physical drives, these appear colored light green.

Highlight Arrays

Click the **Highlight** button and choose one of the following items in the drop-down menu to identify the physical drives assigned to a disk array, these appear colored purple.

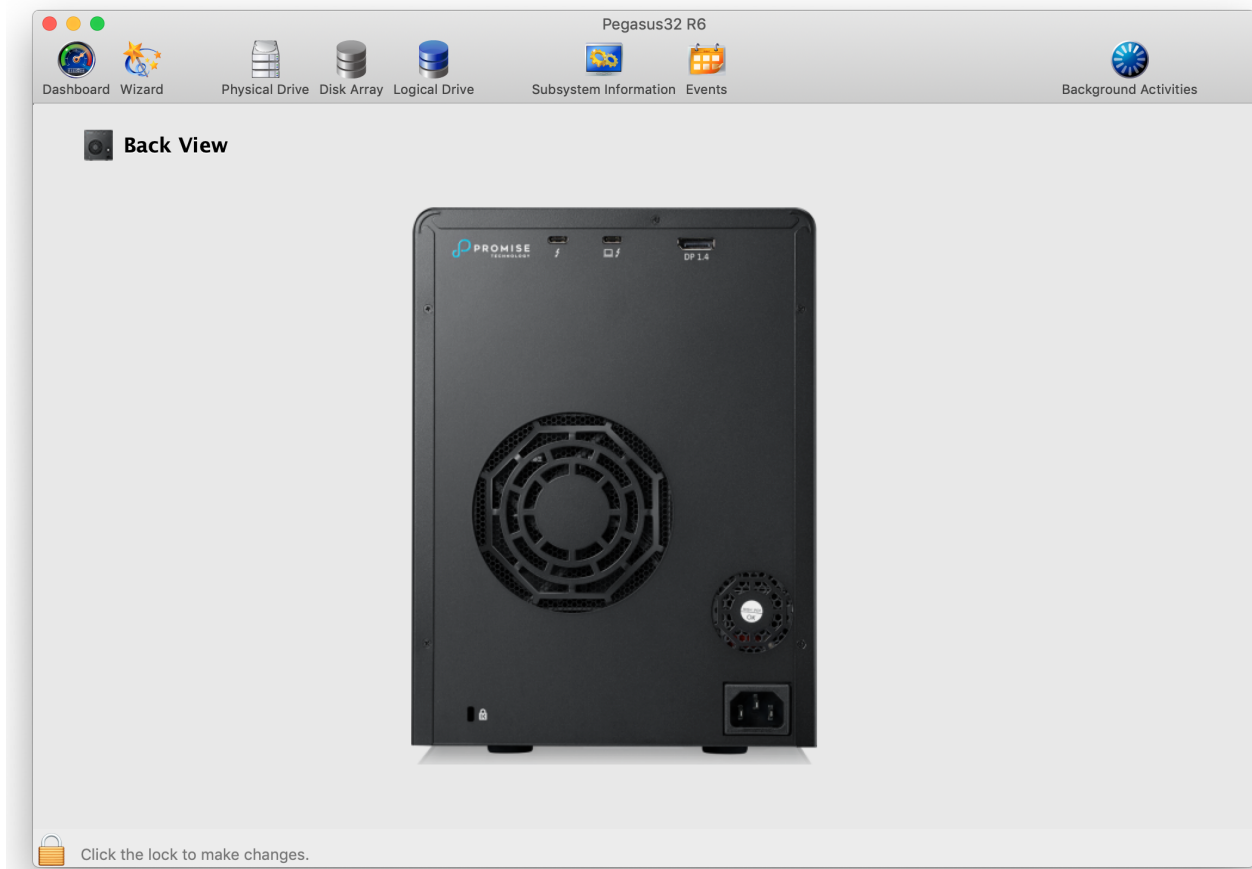
- All DA – Show all disk arrays
- DA0 (DA1, DA2, etc.) – a specific disk array
- close – Click to close the menu and return to normal view.

The carriers containing drives that do not belong to the chosen disk array will be highlighted.

Back View

Go to **Device** drop-down menu and choose the *Back View* option to see a virtual view of the back of the Pegasus32. Move the cursor over the Power Supply (PSU) or system fan, and component status information is displayed.

Device - Back View display menu



Managing Subsystems

Enclosure management includes:

- “Viewing Subsystem Information”
- “Making Subsystem Settings”
- “Clearing Statistics”
- “Restoring Factory Default Settings”
- “Saving a Service Report”
- “Updating Firmware”

Viewing Subsystem Information

The term *enclosure* refers to the Pegasus unit.

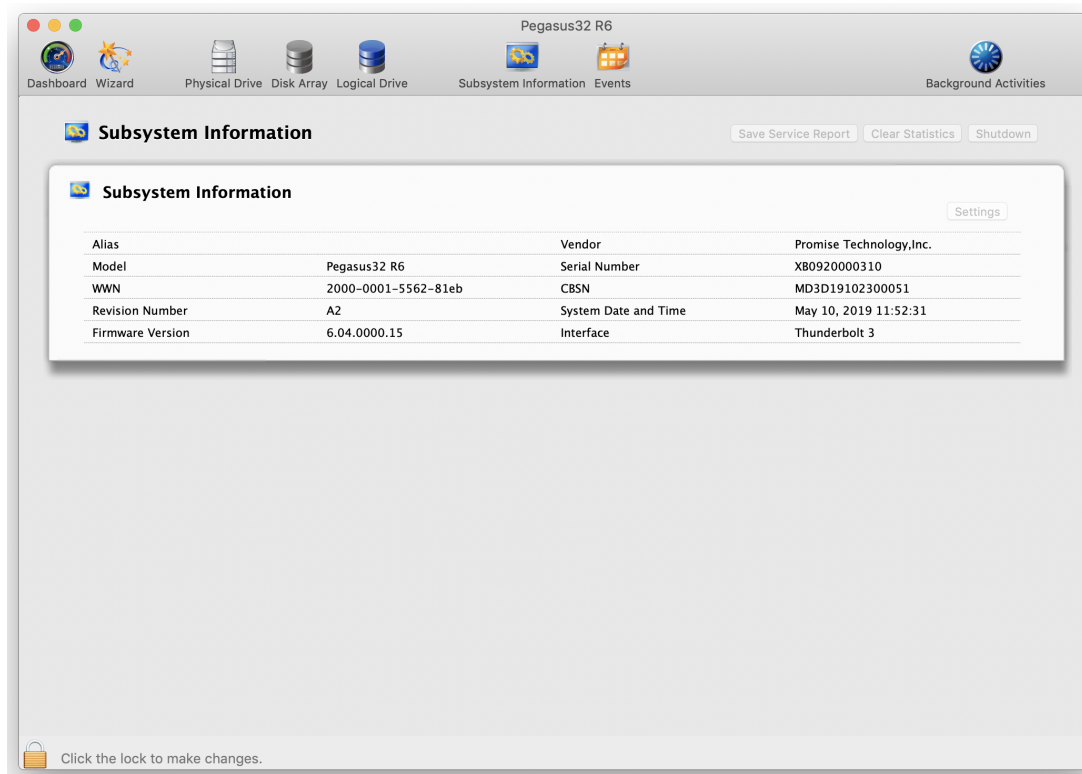
To view enclosure information, click the **Subsystem Information** icon.

Subsystem Information includes:

- Alias * – Same as controller alias
- Model
- WWN – World Wide Number
- Vendor
- Serial number
- Revision number
- System date and time
- Firmware Version
- Interface (USB 3.2 Gen 2 or Thunderbolt™ 3)

Items with an asterisk (*) are adjustable under “Making Subsystem Settings” below.

Subsystem Information

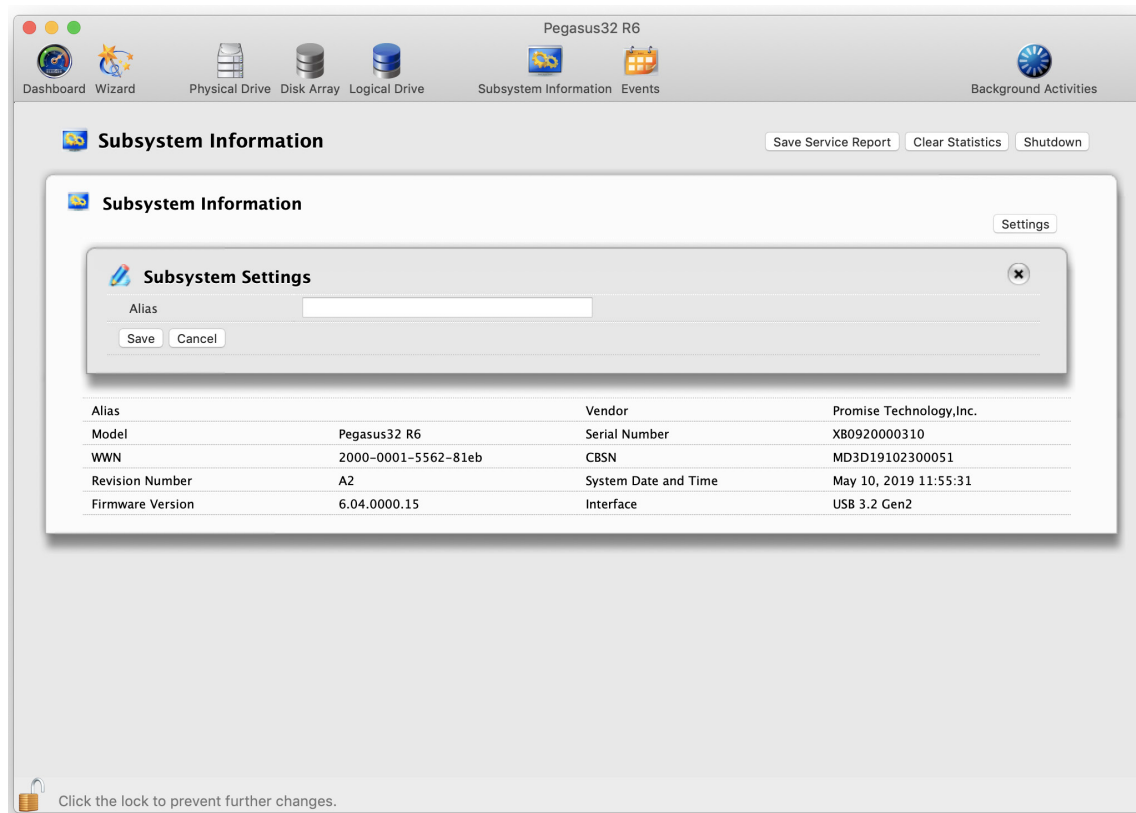


Making Subsystem Settings

To make enclosure settings:

1. Click the **Subsystem Information** icon.
2. Click the **Settings** button.
3. Make changes as required:
 - Enter an alias or change the existing alias in the field provided.
4. Click the **Save** button.

Settings - Subsystem Information



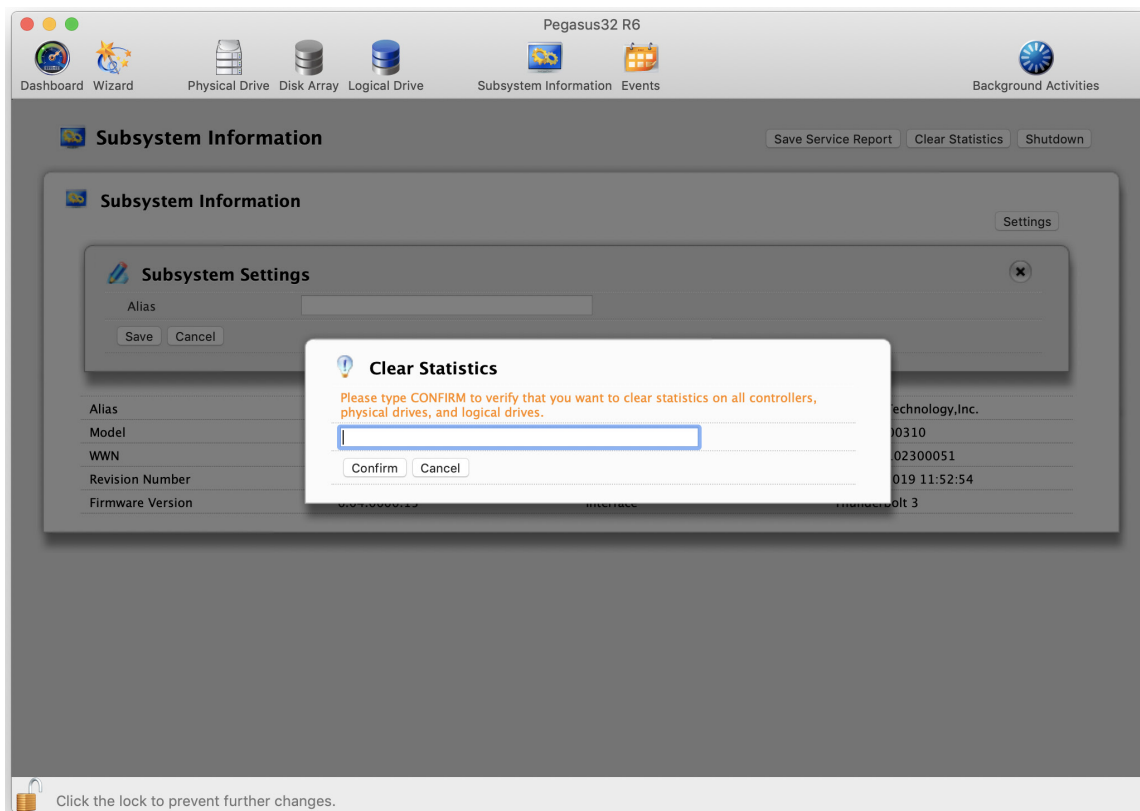
Clearing Statistics

This function clears statistical data on the RAID controller, physical drives, and logical drives.

To clear statistics:

1. Click the **Subsystem Information** icon.
2. Click the **Clear Statistics** button.
3. Type the word “confirm” in the field provided.
4. Click the **Confirm** button.

Clearing Statistics - Subsystem Information



Restoring Factory Default Settings

This feature restores settings to their default values.

To restore all settings to their default values:

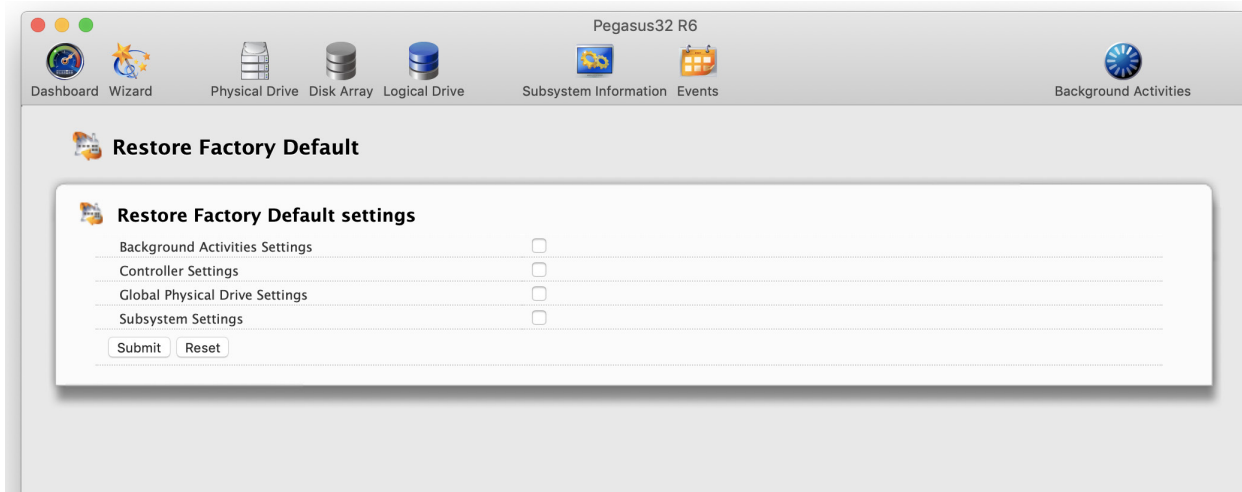
1. From the Admin drop-down menu in the menu bar at the top of your desktop, choose *Restore Factory Default*.
2. In the Restore Factory Default settings screen, check the boxes beside the settings you want to reset to default value.
 - Background activity settings
 - Controller settings
 - Global Physical drive settings
 - Subsystem settings
3. Click the **Submit** button.
4. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.



Note

You must unlock the Promise Utility interface to allow selection of *Restore Factory Default*.

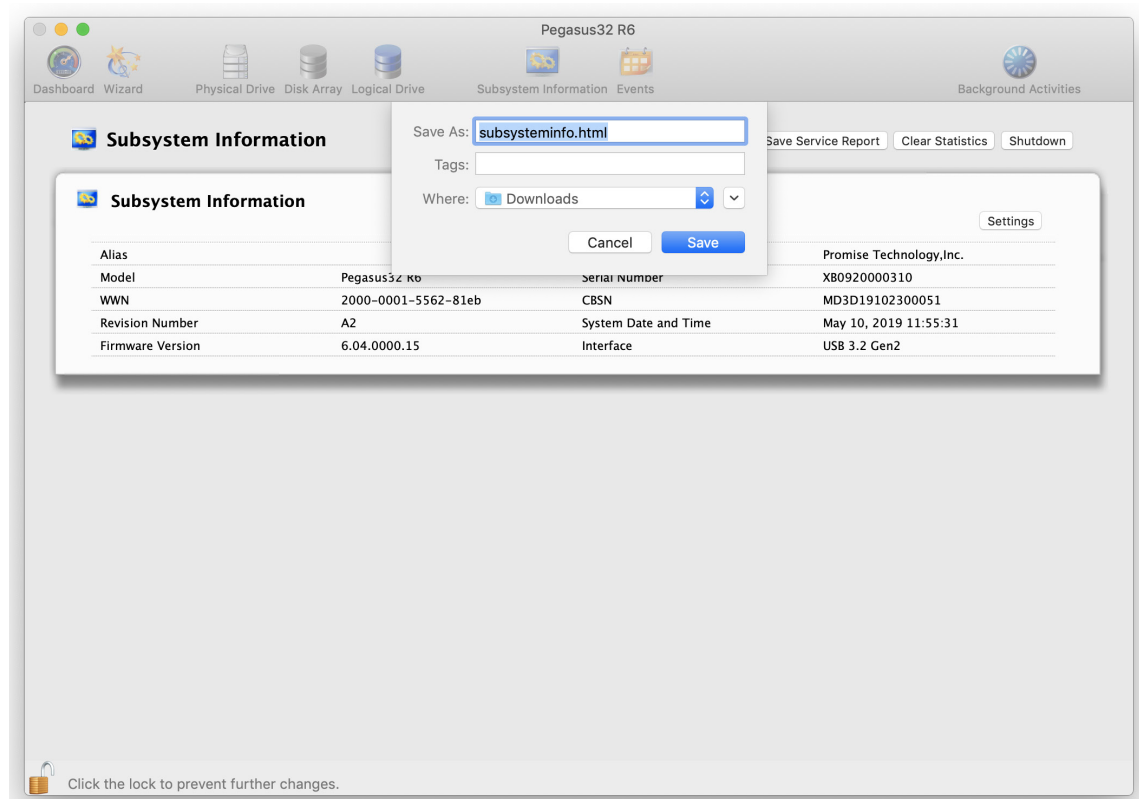
Restore Factory Default settings



Saving a Service Report

A service report can be useful to technical support for troubleshooting or diagnosing issues on the device. To save a service report to your computer, click on the **Subsystem Information** menu link, and click on the **Save Service Report** button. A dialog prompt will ask you where you want to save the HTML file containing the service report. Choose a location and click the **Save** button. A technical support representative might ask you to email this file for system analysis.

Saving a Service Report



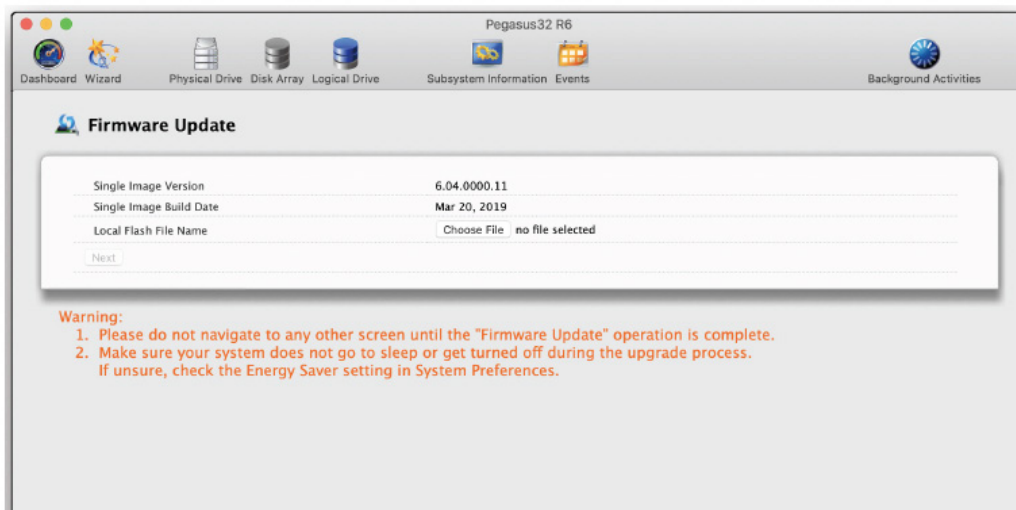
Updating Firmware

For best performance, it is a good idea to keep the Pegasus32 firmware up to date. The update procedure is used for the controller and other system hardware. Download the latest firmware from the PROMISE website at www.PROMISE.com/support/download.aspx and place the .img file on your computer.

Keep in mind that after the update process, it will be necessary to restart your computer.

To update the controller firmware:

1. From the **Admin** drop-down menu in the menu bar at the top of your desktop, choose *Firmware Update*.



2. Click on the padlock icon to unlock the menu, and type in the password for your computer when the prompt appears.
3. Click the **Choose File** button and locate the .img file you downloaded from the PROMISE website.
4. Click the **Submit** button.
5. In the Confirmation box, type the word "confirm" in the field provided and click the **Confirm** button.
6. The process will take several seconds to complete. Once the process has completed, it is necessary to restart the computer. **Note that Mac users who are connecting to Pegasus32 via USB need to shut down the host system, wait a few seconds for it to completely shut down, then start it again in order to apply the new firmware.** Once the computer is powered on and booted up, you may continue to use the Pegasus32.

Managing the RAID Controller

RAID controller management includes:

- “Viewing Controller Information”
- “Viewing Controller Statistics”
- “Making Controller Settings”
- “Making Buzzer Settings”

Viewing Controller Information

To view controller information, from the Device menu, choose **Component List**, the Information tab is displayed.

Controller information includes:

- Controller ID
- Vendor
- Operational Status
- Cache Usage – Percentage
- Part Number
- Hardware Revision
- SCSI Protocol Supported
- Single Image Version
- Host Driver Version
- Alias * – Same as enclosure alias
- Model
- Power On Time
- Dirty Cache Usage – Percentage
- Serial Number
- WWN – Worldwide Number
- BIOS Version
- Single Image Build Date
- USB Firmware Information

Controller Information

The screenshot shows the 'Component List' window with a modal dialog box titled 'Controller' open. The dialog has three tabs: 'Information', 'Advanced Information', and 'Statistics'. The 'Information' tab is active, displaying a table of controller details.

Component	Status																																																															
Enclosure	<table border="1"> <thead> <tr> <th>ID</th> <th>Status</th> <th>Type</th> <th>Status Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td>Pegasus32 R6</td> <td>Everything is OK</td> </tr> </tbody> </table>	ID	Status	Type	Status Description	1		Pegasus32 R6	Everything is OK																																																							
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1	Enabled	Silent																																																														

To view advanced information, click the **Advanced Information** tab.

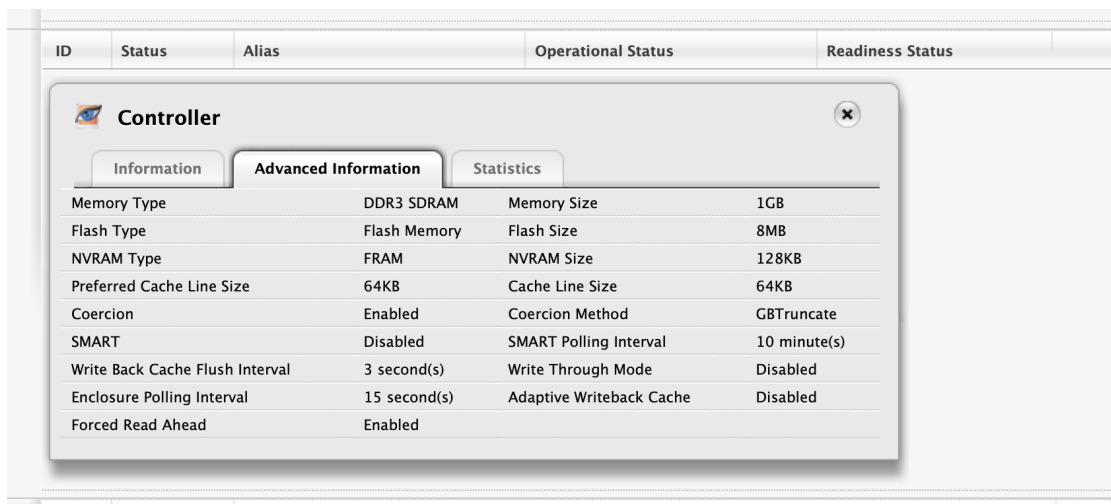
Advanced controller information includes:


- Memory Type
- Flash Type
- NVRAM Type
- Preferred Cache Line Size
- Coercion *
- SMART *
- Write Back Cache Flush Interval *
- Enclosure Polling Interval *
- Forced Read Ahead (cache) *
- Memory Size
- Flash Size
- NVRAM Size
- Cache Line Size
- Coercion Method *
- SMART Polling Interval *
- Write Through Mode *
- Adaptive Writeback Cache *

Items with an asterisk (*) are adjustable under “Making Controller Settings” on page 85.

Click the **X** icon to close the information panel.

Controller Advanced Information



ID	Status	Alias	Operational Status	Readiness Status
<div>  Controller ✕ </div>				
<div> <div>Information</div> <div>Advanced Information</div> <div>Statistics</div> </div>				
Memory Type	DDR3 SDRAM	Memory Size	1GB	
Flash Type	Flash Memory	Flash Size	8MB	
NVRAM Type	FRAM	NVRAM Size	128KB	
Preferred Cache Line Size	64KB	Cache Line Size	64KB	
Coercion	Enabled	Coercion Method	GBTruncate	
SMART	Disabled	SMART Polling Interval	10 minute(s)	
Write Back Cache Flush Interval	3 second(s)	Write Through Mode	Disabled	
Enclosure Polling Interval	15 second(s)	Adaptive Writeback Cache	Disabled	
Forced Read Ahead	Enabled			

Viewing Controller Statistics

To view controller statistics:

1. Click the **Dashboard** icon, then click the **Controller** link.
2. Click the **Statistics** tab.

Controller statistics include:

- Data Transferred
- Write Data Transferred
- Non-Read/Write Errors
- Write Errors
- Non-Read/Write Requests
- Write I/O Requests
- Statistics Collection date and time
- Read Data Transferred
- Errors
- Read Errors
- I/O Requests
- Read I/O Requests
- Statistics Start date and time

3. Click the **X** icon to close the information panel.

Controller Statistics

Controller	ID	Status	Alias	Operational Status	Readiness Status
------------	----	--------	-------	--------------------	------------------

Controller			
Information		Advanced Information	
Statistics			
Data Transferred	291.28MB	Read Data Transferred	291.28MB
Write Data Transferred	0Byte	Errors	0
Non-Read/Write Errors	0	Read Errors	0
Write Errors	0	I/O Request	74834
Non-Read/Write Request	248	Read I/O Request	74586
Write I/O Request	0	Statistics Start Time	May 7, 2019 03:22:00
Statistics Collection Time	May 7, 2019 03:32:35		

Making Controller Settings

To make controller settings:

1. From the Device menu, choose **Component List**.
2. Mouse-over the controller, then click the **Settings** button.

Make setting changes as required:

- Enter, change or delete the alias in the **Alias** field.
 - **SMART Log** – Check the box to enable or uncheck to disable.
 - **SMART Polling Interval** – Enter a value into the field, 1 to 1440 minutes.
1440 minutes = 24 hours
 - **Enable Coercion** – Check the box to enable or uncheck to disable.
 - **Coercion Method** – Choose a method from the dropdown menu:
 - GBTruncate
 - 10GBTruncate
 - GrpRounding
 - TableRounding
 - **Write Back Cache Flush Interval** – Enter a value into the field, 1 to 12 seconds.
 - **Enclosure Polling Interval** – 15 to 255 seconds.
 - **Adaptive Writeback Cache** – Check the box to enable or uncheck to disable.
 - **Forced Read Ahead** – Check the box to enable or uncheck to disable.
 - **Enable HDD Park Ahead (Level 1)** – Check the box to enable
 - HDD Park Ahead Interval [10 - 1440] – Enter a value into the field, 1 to 1440 minutes.
1440 minutes = 24 hours
 - **Enable HDD Low Rotation Speed (Level 2)** – Check the box to enable
 - HDD Low Rotation Speed Interval [10 - 1440] – Enter a value into the field, 1 to 1440 minutes. 1440 minutes = 24 hours
 - **Enable HDD Idle Spin Down (Level 1)** – Check the box to enable
 - HDD Idle Spin Down Interval [10 - 1440] – Enter a value into the field, 1 to 1440 minutes. 1440 minutes = 24 hours
3. Click the **Save** button.
 4. Click the **X** icon to close the settings panel.

Controller Settings

Dashboard Wizard

Physical Drive Disk Array Logical Drive

Subsystem Information Events

Background Activities

Controller

ID	Status	Alias	Operational Status	Readiness Status
----	--------	-------	--------------------	------------------

Controller

Controller ID

1

Alias

Enable SMART Log

☐

SMART Polling Interval
[1-1440]

10

minute(s)

Enable Coercion

☒

Coercion Method

GBTruncate

Write Back Cache Flush Interval
[1-12]

3

second(s)

Enclosure Polling Interval
[15-255]

15

second(s)

Adaptive Writeback Cache

☐

Forced Read Ahead

☒

Enable HDD Park Ahead(Level 1)

☐

HDD Park Ahead Interval
[10-1440]

0

minute(s)

Enable HDD Low Rotation Speed(Level 2)

☐

HDD Low Rotation Speed Interval
[10-1440]

0

minute(s)

Enable HDD Idle Spin Down(Level 3)

☐

HDD Idle Spin Down Interval
[10-1440]

minute(s)

Save

Cancel

Buzzer

ID	Enable	Status
1	Enabled	Silent

Click the lock to prevent further changes.

Making Buzzer Settings

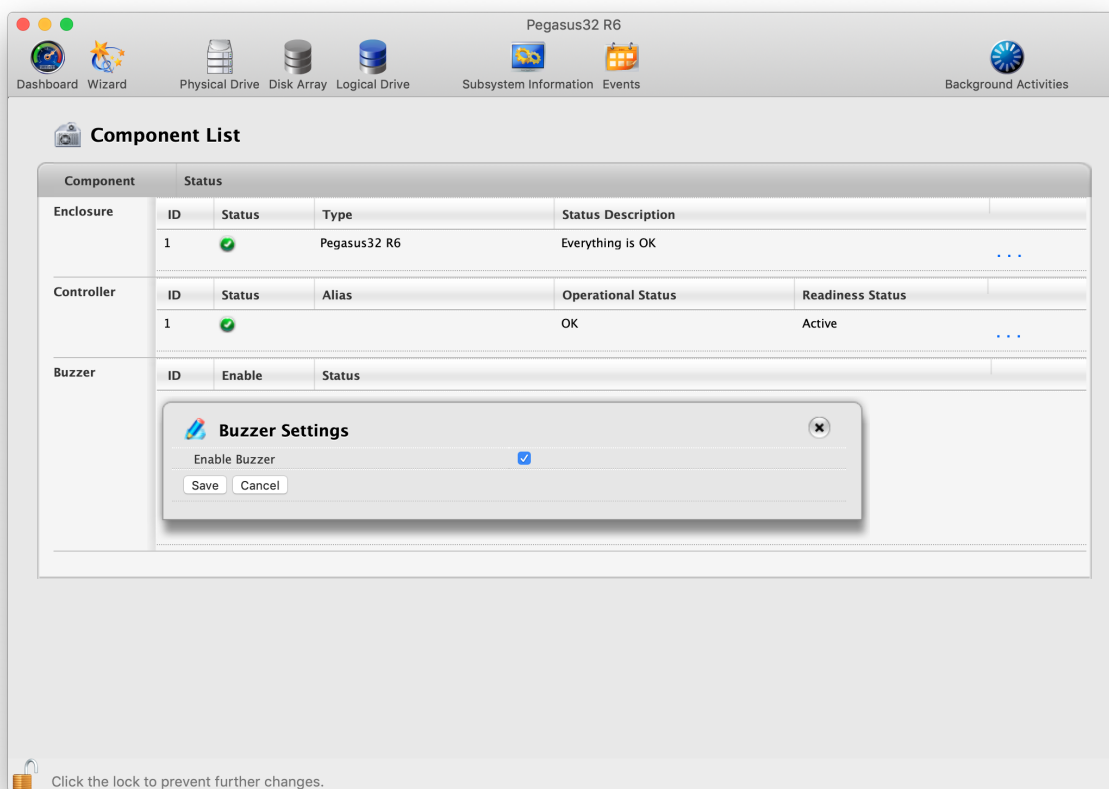
To make buzzer settings:

1. From the Device menu, choose **Component List**.
2. Mouse-over the buzzer, then click the **Settings** button.
3. Check the **Enable Buzzer** box to enable the buzzer.

Or uncheck the box to disable.

4. Click the **Save** button.

Buzzer Settings



Managing Enclosures

Enclosure management includes the following functions:

- “Viewing the Enclosure Information”
- “Viewing Temperature Sensor Information”
- “Locating an Enclosure”

Viewing the Enclosure Information

To access enclosure information:

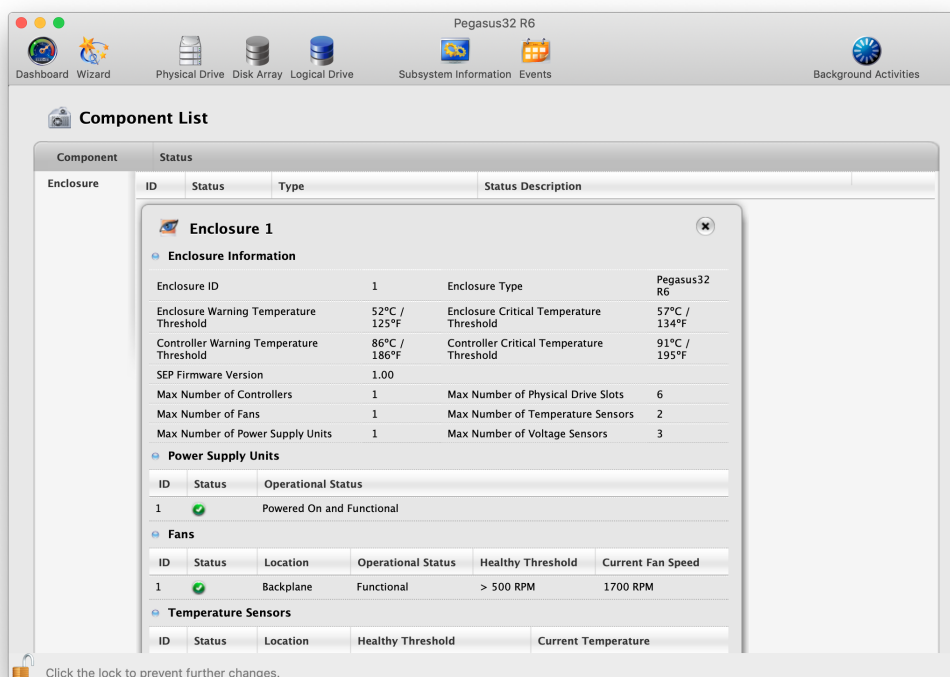
1. Click the **Dashboard** icon, then click the **Controller** link.
2. Mouse-over the **Enclosure**, then click the **View** button.

Enclosure information includes:

- Enclosure ID
- Enclosure Warning Temperature Threshold
- Controller Warning Temperature Threshold
- SEP Firmware Version
- Max Number of Controllers
- Max Number of Fans
- Max Number of Power Supply Units
- Enclosure Type
- Enclosure Critical Temperature Threshold
- Controller Critical Temperature Threshold
- Max Number of Physical Drive Slots
- Max Number of Temperature Sensors
- Max Number of Voltage Sensors

3. Click the **X** icon to close the information panel.

Enclosure Information



Viewing Temperature Sensor Information

To view the status of the temperature sensor:

1. Click the **Dashboard** icon, then click the **Temperature** link.
2. Scroll down until you see **Temperature Sensors**.

Temperature Sensors information includes:

- ID
 - Status (Normal, Warning or Critical icon)
 - Location (Controller or Backplane)
 - Healthy Threshold (Enclosure Warning Temperature Threshold)
 - Current Temperature
3. Click the **X** icon to close the information panel.

Enclosure Information - Temperature Sensors

Power Supply Units

ID	Status	Operational Status			
1	<div></div>	Powered On and Functional			

Fans

ID	Status	Location	Operational Status	Healthy Threshold	Current Fan Speed
1	<div></div>	Backplane	Functional	> 500 RPM	1700 RPM

Temperature Sensors

ID	Status	Location	Healthy Threshold		Current Temperature
1	<div></div>	Controller	< 86°C / 186°F		75°C / 167°F
2	<div></div>	Enclosure	< 52°C / 125°F		48°C / 118°F

Voltage Sensors

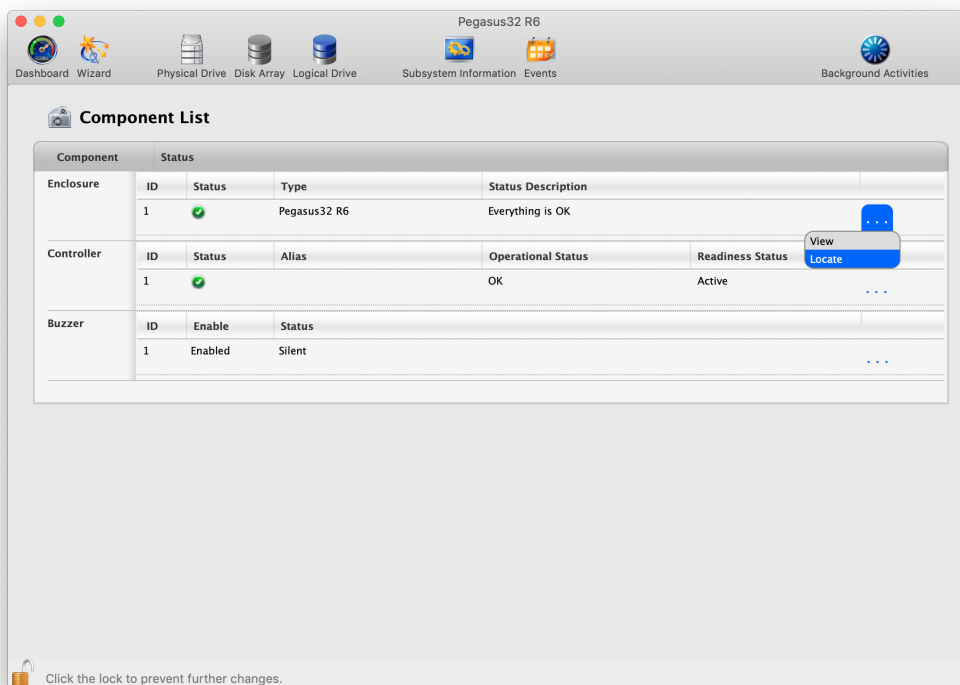
ID	Status	Sensor Type	Healthy Threshold		Current Voltage
1	<div></div>	3.3V	+/- 5%(3.13 – 3.46) V		3.4V
2	<div></div>	5.0V	+/- 5%(4.75 – 5.25) V		5.1V
3	<div></div>	12.0V	+/- 8%(11.04 – 12.96) V		11.9V

Locating an Enclosure

If you have multiple Pegasus units, and you want to verify which unit you are accessing in the Promise Utility, use the *Locate* function.

To locate a enclosure:

1. Go to **Device** drop-down menu and choose the *Component List* option.
2. Mouse-over the **Enclosure**, then double-click on it to activate the *Locate* function.



The Drive Power/Status LEDs on all drive carriers blink blue and orange for one minute.

Running the Locate function to identify an enclosure



Managing Background Activities

Background activity management includes:

- “Viewing Current Background Activities”
- “Viewing Scheduled Background Activities”
- “Adding a Scheduled Background Activity”
- “Changing a Background Activity Schedule”
- “Enabling or Disabling a Scheduled Background Activity”
- “Deleting a Scheduled Background Activity”
- “Media Patrol”
- “Redundancy Check”
- “Initialization”
- “Rebuild”
- “Migration”
- “PDM”
- “Transition”
- “Synchronization”

Background activities perform a variety of preventive and remedial functions on your physical drives, disk arrays, logical drives, and other components.

You can run a background activity immediately or schedule it to run at a later time. Scheduling options are described below.

Setting options for each activity are listed after the scheduling options. These settings determine how the background activity affects I/O performance.

Viewing Current Background Activities

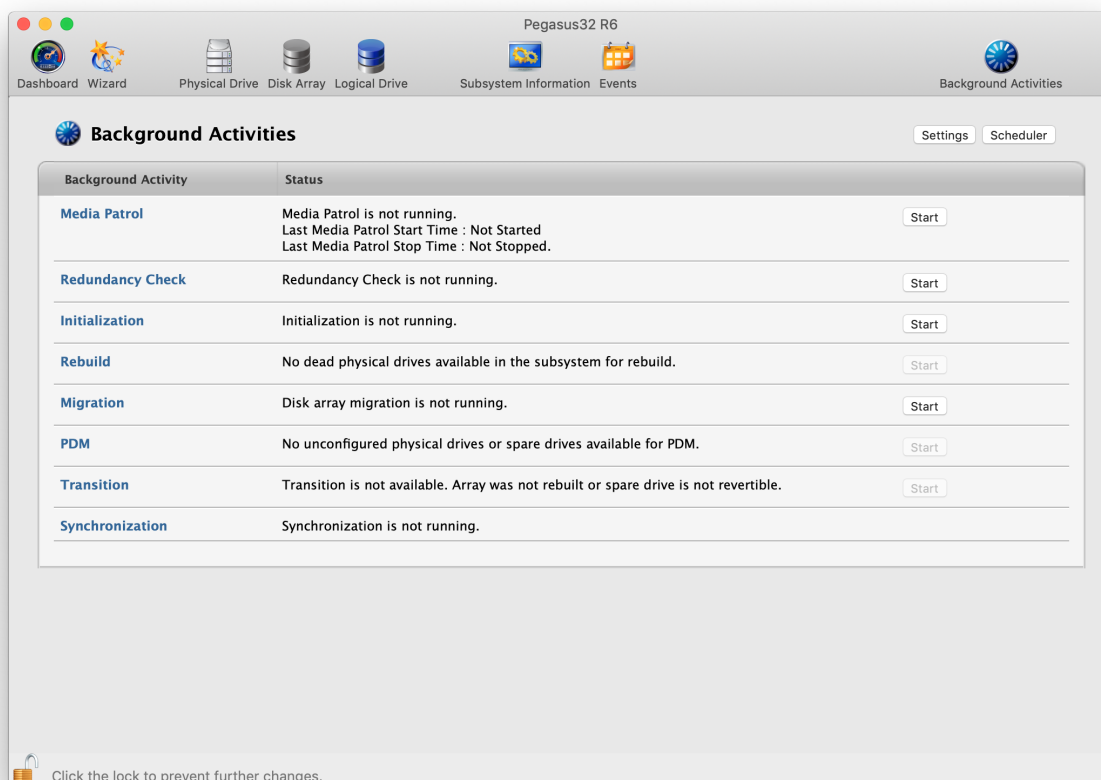
To view a list of background activities, click on the **Background Activities** icon.

The list of background activities appears:

- Media Patrol
- Redundancy Check
- Rebuild
- Migration
- PDM
- Transition
- Synchronization

Running activities will illustrate a progress bar of the process currently running in the background.

Background Activities



Viewing Scheduled Background Activities

To view a list of scheduled background activities:

1. Click on the **Background Activities** icon.
2. Click the **Scheduler** button.

The list of scheduled background appears.

Adding a Scheduled Background Activity

To add a new scheduled background activity:

1. Click on the **Background Activities** icon.
2. Click the **Scheduler** button.
The list of scheduled background activities appears.
3. Click the **Add Schedule** button.

Add a Background Activity Schedule

The screenshot shows the 'Scheduler' window with a tabbed interface. The 'Add Schedule' dialog box is open, allowing the user to configure a new background activity. The dialog includes fields for the scheduler name, enable status, start time, recurrence pattern, and end date. The 'Media Patrol' scheduler is selected, and the 'Weekly' recurrence pattern is chosen with 'Friday' selected. The start time is set to 20:00. The 'No End Date (recommend)' option is selected for the end date. The 'Save' button is visible at the bottom of the dialog.

Scheduler [Turn Off Schedule] [Add Schedule] [Background Activities]

Type	Recurrence	Start Time	Operational Status
Add Schedule			
Scheduler Name: <input checked="" type="radio"/> Media Patrol <input type="radio"/> Redundancy Check			
Enable This Schedule: <input checked="" type="checkbox"/>			
Start Time: 20 :00			
Recurrence Pattern: <input type="radio"/> Daily <input checked="" type="radio"/> Weekly <input type="radio"/> Monthly			
Every 4 weeks [1-52]			
Weekly: <input type="checkbox"/> Sunday <input type="checkbox"/> Monday <input type="checkbox"/> Tuesday <input type="checkbox"/> Wednesday <input checked="" type="checkbox"/> Thursday <input checked="" type="checkbox"/> Friday <input type="checkbox"/> Saturday			
Start From: April 30 2019			
End On: <input checked="" type="radio"/> No End Date (recommend) <input type="radio"/> End After times [1-255] <input type="radio"/> Until April 30 2019			
[Save] [Cancel]			

No background activity scheduled.

4. Modify schedule settings as desired. Choose the option for the activity you want to modify:

- Media Patrol
- Redundancy Check
- Spare Check

Choose a **Start Time** from the dropdown menus.

The menus have a 24-hour clock.

- Choose a **Recurrence Pattern** option, daily, weekly, or monthly.
 - For the Daily option, enter an interval in the Every field.
 - For the Weekly option, enter an interval in the Every field and choose one or more days of the week.
 - For the Monthly option, choose, Day of the Month option or a sequential and specific day from the dropdown menu. Also choose which months you will be designating for the reoccurrence pattern.
- Choose a **Start From** date from the dropdown menus.
- Choose an **End On** option:
 - No end date or perpetual.
 - End after a specific number of activity actions.
 - Until date from the dropdown menus.
- For Redundancy Check, choose:
 - **Auto Fix** option – Attempts to repair the problem when it finds an error. Check to enable
 - **Pause on Error** option – The process stops when it finds a non- repairable error. Check to enable
 - **Select LD** – Check the boxes for the logical drives to run

Redundancy Check. Check at least one logical drive.

5. Click the **Save** button.

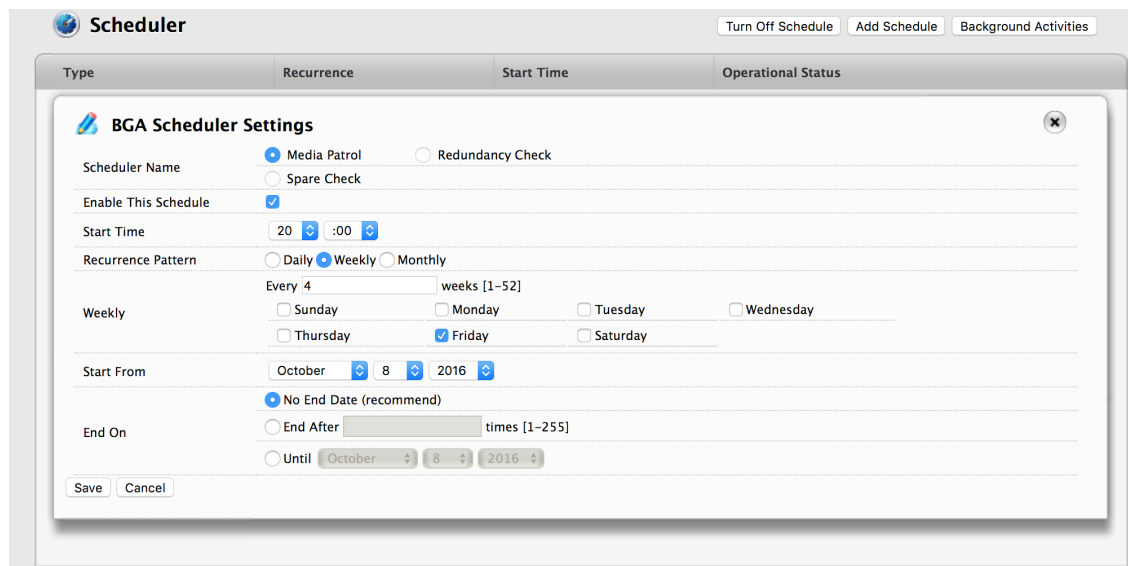
6. To return to the running background activities, click the **Background Activities** button.

Changing a Background Activity Schedule

To change an existing scheduled background activity:

1. Click on the **Background Activities** icon.
2. Click the Scheduler button.
The list of scheduled background appears.
3. Mouse-over the background activity, then click the **Settings** button.

Change a Background Activity Schedule



The screenshot shows the 'Scheduler' window with a 'Background Activities' tab selected. A 'BGA Scheduler Settings' dialog box is open, allowing configuration of a background activity. The dialog includes fields for Scheduler Name, Enable This Schedule, Start Time, Recurrence Pattern, Weekly days, Start From, and End On. The 'Media Patrol' scheduler is selected, and the recurrence is set to 'Weekly' on 'Friday'.

Scheduler Turn Off Schedule Add Schedule Background Activities

Type Recurrence Start Time Operational Status

BGA Scheduler Settings

Scheduler Name ☒ Media Patrol ☐ Redundancy Check
☐ Spare Check

Enable This Schedule ☒

Start Time 20 :00

Recurrence Pattern ☐ Daily ☒ Weekly ☐ Monthly

Every 4 weeks [1-52]

Weekly ☐ Sunday ☐ Monday ☐ Tuesday ☐ Wednesday
☐ Thursday ☒ Friday ☐ Saturday

Start From October 8 2016

☒ No End Date (recommend)

End On ☐ End After times [1-255]
☐ Until October 8 2016

Save Cancel

4. Modify settings as needed.

Choose the option for the activity you want to modify:

- Media Patrol
- Redundancy Check
- Spare Check

Choose a **Start Time** from the dropdown menus.

The menus have a 24-hour clock.

Choose a **Recurrence Pattern** option, daily, weekly, or monthly.

- For the Daily option, enter an interval in the Every field.
- For the Weekly option, enter an interval in the Every field and choose one or more days of the week.
- For the Monthly option, choose, Day of the Month option or a sequential and specific day from the dropdown menu. Also choose which months you will be designating for the reoccurrence pattern.

Choose a **Start From** date from the dropdown menus.

Choose an **End On** option,

- No end date or perpetual.
- End after a specific number of activity actions.
- Until date from the dropdown menus.

For Redundancy Check, choose,

- **Auto Fix** option – Attempts to repair the problem when it finds an error. Check to enable
- **Pause on Error** option – The process stops when it finds a non- repairable error. Check to enable
- **Select LD** – Check the boxes for the logical drives to run
- Redundancy Check. Check at least one logical drive.

5. Click the **Save** button.

To return to the running background activities, click the **Background Activities** button.

Enabling or Disabling a Scheduled Background Activity

Background activity schedules are enabled by default when you create the schedule. If you want to stop a background activity now but plan to use it again in the future, disable the scheduled activity rather than deleting it.

To enable or disable change an existing scheduled background activity:

1. Click on the **Background Activities** icon.
2. Click the Scheduler button.
The list of scheduled background appears.
3. Mouse-over the background activity and click the **Settings** button.
4. Uncheck the Enable This Schedule box to disable this schedule.
Check the box to enable this schedule.
5. Click the **Save** button.

To return to currently running background activities, click the Background Activities button.

Enable/disable a Background Activity Schedule

Scheduler Turn Off Schedule Add Schedule Background Activities

Type	Recurrence	Start Time	Operational Status
Media Patrol	Weekly	20:00 10/8/2016	Enabled

Settings Delete

BGA Scheduler Settings

Scheduler Name: ☐ Media Patrol ☒ Redundancy Check

Enable This Schedule: ☒

Start Time: 22 :00

Recurrence Pattern: ☐ Daily ☒ Weekly ☐ Monthly

Every 2 weeks [1-52]

Weekly: ☐ Sunday ☐ Monday ☐ Tuesday ☒ Wednesday ☐ Thursday ☐ Friday ☐ Saturday

Start From: October 8, 2016

End On: ☒ No End Date (recommend) ☐ End After times [1-255] ☐ Until October 8, 2016

Auto Fix: ☐

Pause on Error: ☐

Select LD	Logical Drive ID	RAID Level	Capacity	Operational Status
<input checked="" type="checkbox"/>	0	RAID5	10 TB	OK, Synchronizing

Save Cancel

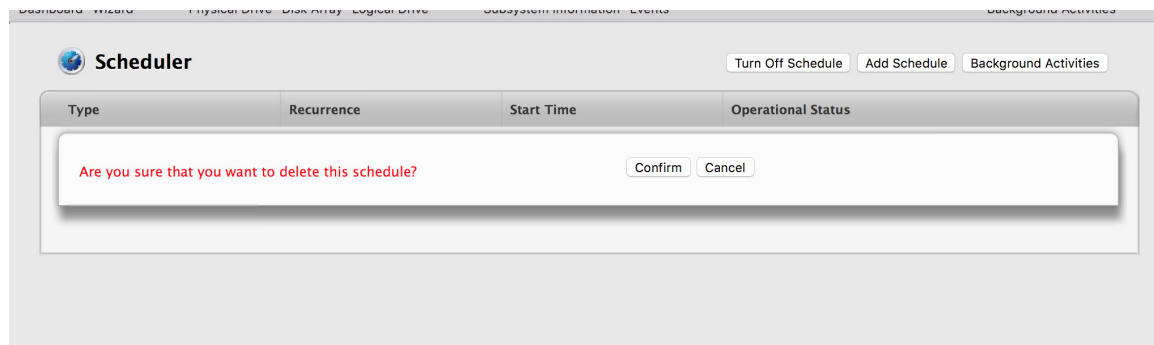
Click the lock to prevent further changes.

Deleting a Scheduled Background Activity

To delete a scheduled background activity:

1. Click on the **Background Activities** icon.
2. Click the Scheduler button.
The list of scheduled background appears.
3. Mouse-over the background activity, then click the **Delete** button.
To return to currently running background activities, click the Background Activities button.

Delete a Background Activity Schedule



Media Patrol

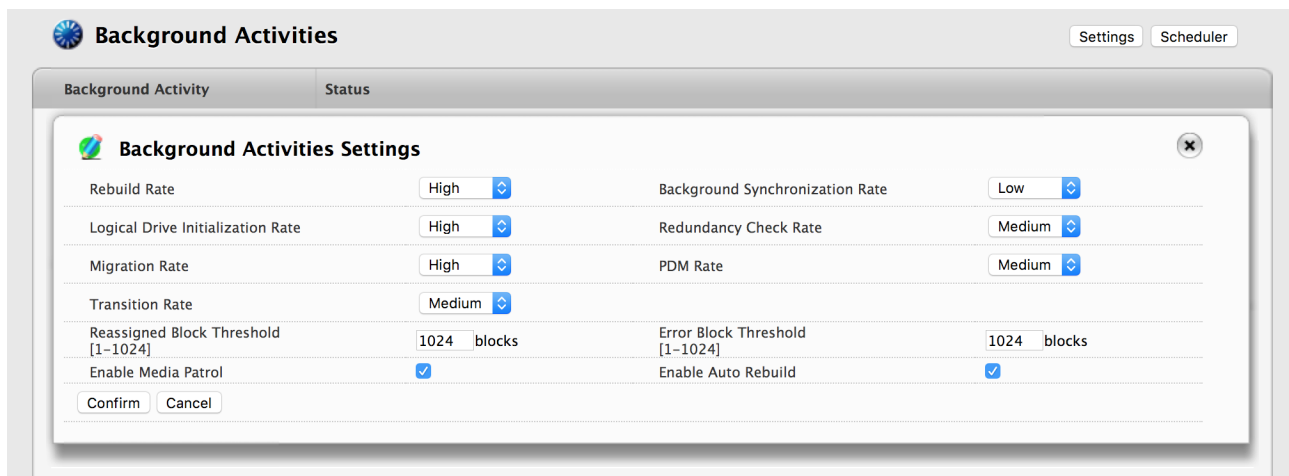
Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol checks are enabled by default on all disk arrays and spare drives. Media Patrol is concerned with the media itself, not the data recorded on the media. If Media Patrol encounters a critical error, it triggers PDM if PDM is enabled on the disk array. See “Making Disk Array Settings” on page 136.

Making Media Patrol Settings

To make Media Patrol settings:

1. Click on the **Background Activities icon**.
2. Click the **Settings** button.
3. Check the Enable Media Patrol box to enable, uncheck to disable. This settings enables or disables Media Patrol for all physical drives.
4. Click the **Confirm** button.
5. Click the **X** icon to close the background activities panel.

Media Patrol

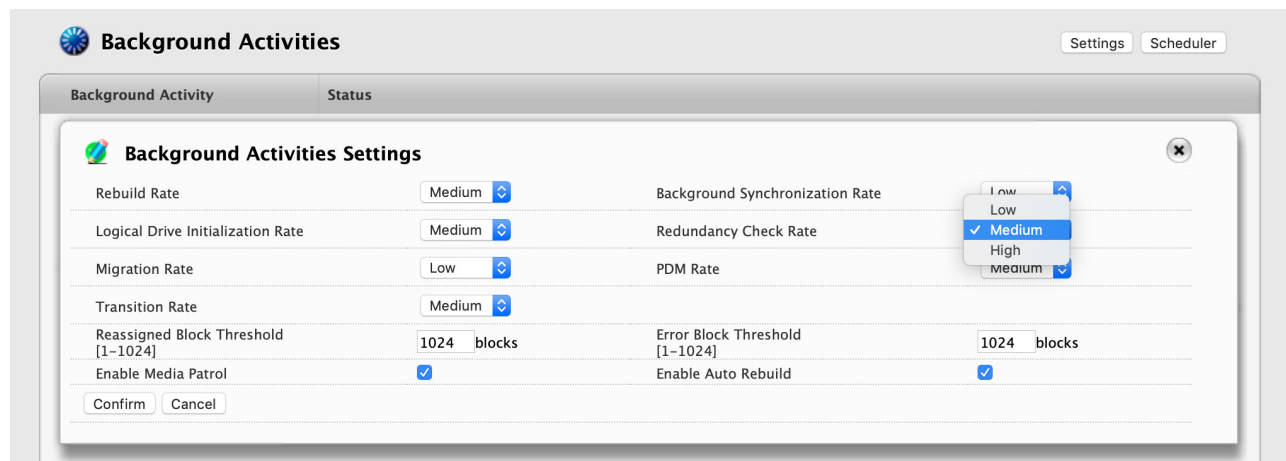


Redundancy Check

Redundancy Check is a routine maintenance procedure for fault-tolerant disk arrays (those with redundancy) that ensures all the data matches exactly. Redundancy Check can also correct inconsistencies.

See “Redundancy Check on a Logical Drive” on page 64.

Redundancy Check



Making Redundancy Check Settings

To make Redundancy Check settings:

1. Click on the **Background Activities** icon.
2. Click the **Settings** button.
3. Click the **Redundancy Check Rate** dropdown menu and choose a rate:
 - **Low** – Fewer system resources to Redundancy Check, more to data read/write operations.
 - **Medium** – Balances system resources between Redundancy Check and data read/write operations.
 - **High** – More system resources to Redundancy Check, fewer to data read/write operations.
4. Click the **Confirm** button.
5. Click the **X** icon to close the background activities panel.

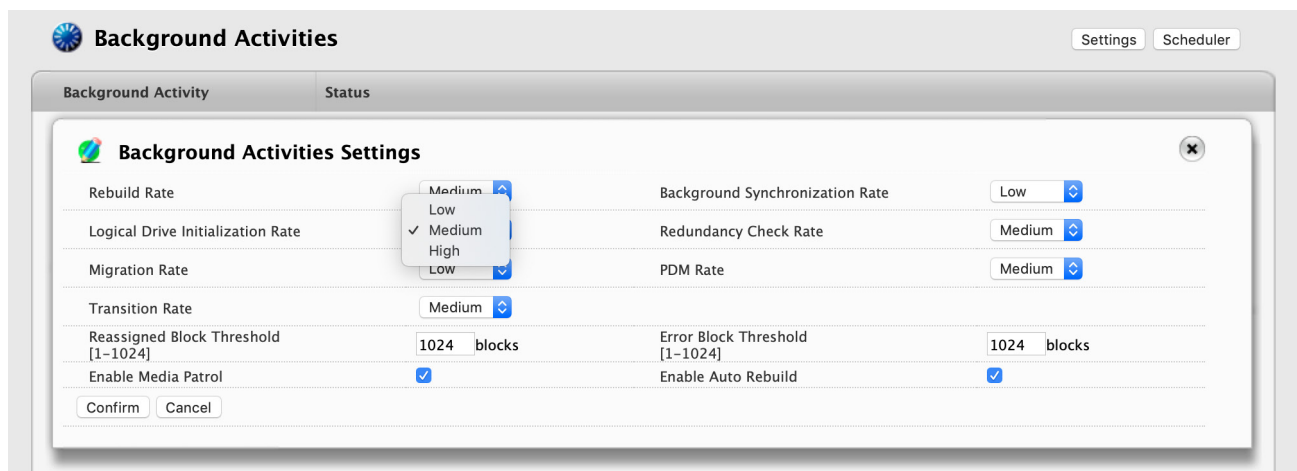
Initialization

Technically speaking, Initialization is a foreground activity, as you cannot access a logical drive while it is Initializing.

Initialization is normally done to logical drives after they are created from a disk array. Initialization sets all data bits in the logical drive to zero. The action is useful because there may be residual data on the logical drives left behind from earlier configurations. For this reason, Initialization is recommended whenever you create a logical drive.

See “Initializing a Logical Drive” on page 154.

Initialization



Making Initialization Settings

To make initialization settings:

1. Click on the **Background Activities** icon.
2. Click the **Settings** button.
3. Click the **Logical Drive Initialization Rate** dropdown menu and choose a rate:
 - **Low** – Fewer system resources to Initialization, more to data read/write operations.
 - **Medium** – Balances system resources between Initialization and data read/write operations.
 - **High** – More system resources to Initialization, fewer to data read/write operations.
4. Click the **Confirm** button.
5. Click the **X** icon to close the background activities panel.

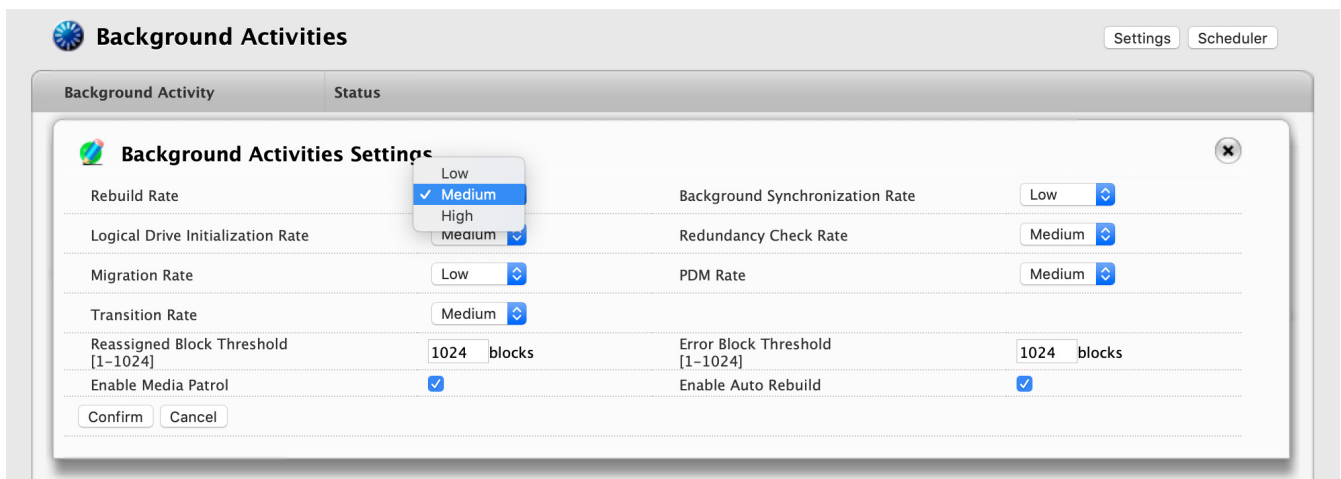
Rebuild

When you rebuild a disk array, you are actually rebuilding the data on one physical drive.

- When a physical drive in a disk array fails and a spare drive of adequate capacity is available, the disk array begins to rebuild automatically using the spare drive.
- If there is no spare drive of adequate capacity, but the **Auto Rebuild** function is ENABLED, the disk array begins to rebuild automatically as soon as you remove the failed physical drive and install an unconfigured physical drive in the same slot. See “Making Rebuild Settings” on page 104.
- If there is no spare drive of adequate capacity and the Auto Rebuild function is DISABLED, you must replace the failed drive with an unconfigured physical drive, then perform a **Manual Rebuild**.

See “Rebuilding a Disk Array” on page 195 and “Managing Spare Drives” on page 166. Also see “Disk Array and Logical Drive Problems” on page 193.

Rebuild Settings



Making Rebuild Settings

1. Click on the **Background Activities icon**.
2. Click the **Settings** button.
3. Click the **Rebuild Rate** dropdown menu and choose a rate:
 - **Low** – Fewer system resources to the Rebuild, more to data read/write operations.
 - **Medium** – Balances system resources between the Rebuild and data read/write operations.
 - **High** – More system resources to the Rebuild, fewer to data read/write operations.
4. Check the **Enable Auto Rebuild** box to enable Auto Rebuild (rebuilds when you swap out the failed drive with a new one).
5. Click the **Confirm** button.
6. Click the **X** icon to close the background activities panel.

Migration

The term “Migration” means either or both of the following:

- Change the RAID level of a logical drive.
- Expand the storage capacity of a logical drive.
See “Migrating a Logical Drive” on page 160.



WARNING

In USB mode, Pegasus32 will reboot when migration is completed.
Be sure to first discontinue any accessing (IO operation) before migrating.



WARNING

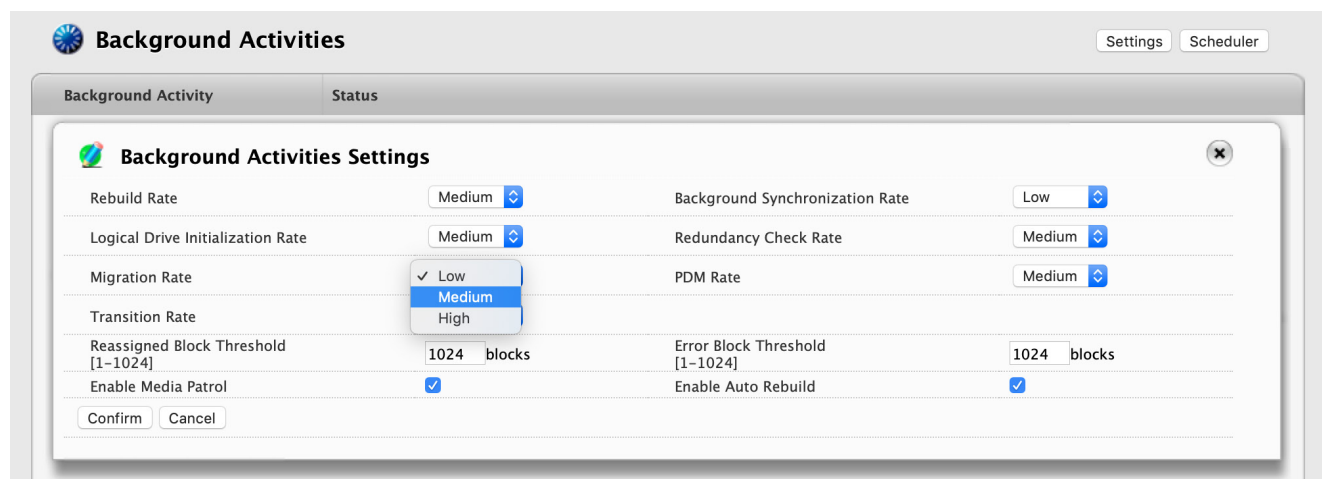
In USB mode, if Utility is NOT “executing”, when migration is completed, power off the host system completely, then power on the host system again, i.e. run a complete power cycle for the host system; do not simply restart the host device. This must be done in order to update the disk configuration for OS.

Making Migration Settings

To make migration settings:

1. Click on the **Background Activities icon**.
2. Click the **Settings** button.
3. Click the Migration Rate dropdown menu and choose a rate:
 - **Low** – Fewer system resources to Migration, more to data read/write operations.
 - **Medium** – Balances system resources between Migration and data read/write operations.
 - **High** – More system resources to Migration, fewer to data read/write operations.
4. Click the **Confirm** button.
5. Click the **X** icon to close the background activities panel.

Migration



PDM

Predictive Data Migration (PDM) is the migration of data from the suspect disk drive to a spare drive, similar to rebuilding a disk array. But unlike rebuilding, PDM automatically copies your data to a spare drive *before* the drive fails and your logical drive goes Critical.

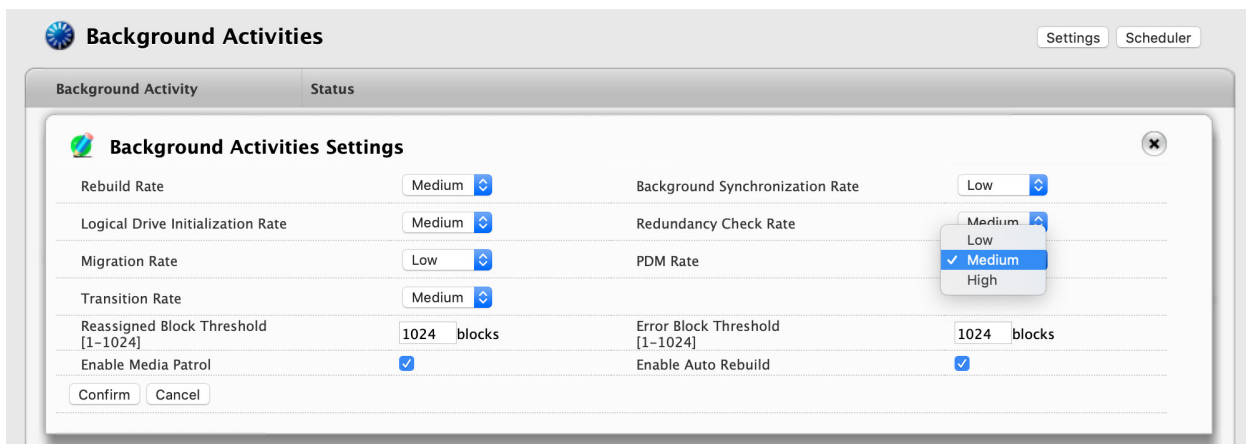
PDM can be triggered automatically by Media Patrol. Also see "Running PDM on a Logical Drive" on page 163.

Making PDM Settings

To make PDM settings:

1. Click on the **Background Activities** icon.
2. Click the **Settings** button.
3. Make the following settings are required:
 - Click the **PDM Rate** dropdown menu and choose a rate:
 - **Low** – Fewer system resources to PDM, more to data read/write operations.
 - **Medium** – Balances system resources between PDM and data read/write operations.
 - **High** – More system resources to PDM, fewer to data read/write operations.
 - Highlight the current values in the block threshold fields and input new values. Reassigned block threshold range is 1 to 512 blocks. Error block threshold range is 1 to 2048 blocks.
4. Click the **Confirm** button.
5. Click the X icon to close the background activities panel.

PDM



Transition

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare drive.

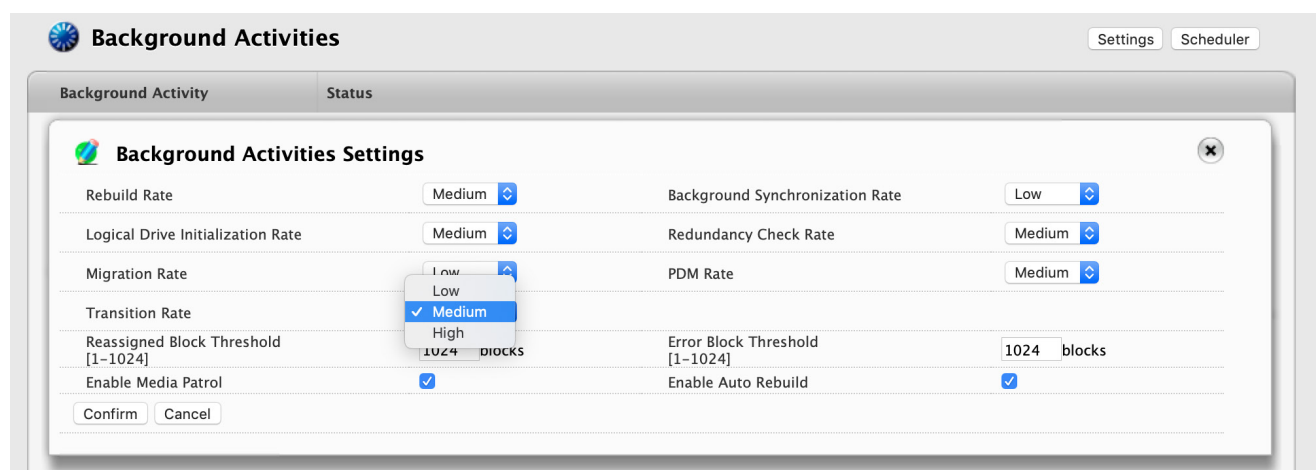
See “Running a Transition” on page 174.

Making Transition Settings

To make Transition settings:

1. Click on the **Background Activities icon**.
2. Click the **Settings** button.
3. Click the **Transition Rate** dropdown menu and choose a rate:
 - **Low** – Fewer system resources to Transition, more to data read/write operations.
 - **Medium** – Balances system resources between Transition and data read/write operations.
 - **High** – More system resources to Transition, fewer to data read/write operations.
4. Click the **Confirm** button.
5. Click the **X** icon to close the background activities panel.

Transition



Synchronization

Synchronization is automatically applied to logical drives when they are created. Synchronization recalculates the redundancy data to ensure that the working data on the physical drives is properly in sync.

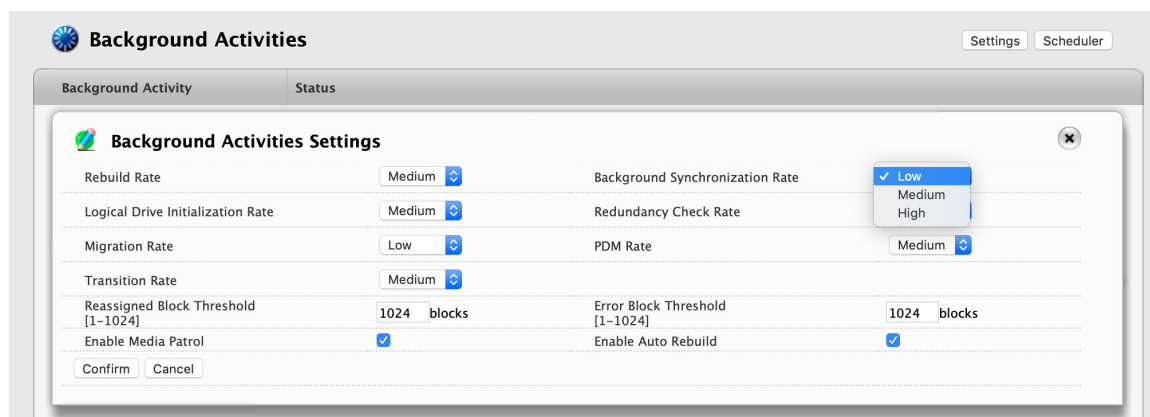
Mouse-over on the logical drive, click the **View** button, and look under Logical Drive Information beside the line that says **Synchronized**. A **Yes** means the logical drive was synchronized. See “Viewing Logical Drive Information” on page 145.

Making Synchronization Settings

To make Synchronization settings:

1. Click on the **Background Activities** icon.
2. Click the **Settings** button.
3. Click the **Background Synchronization Rate** dropdown menu and choose a rate:
 - **Low** – Fewer system resources to Synchronization, more to data read/write operations.
 - **Medium** – Balances system resources between Synchronization and data read/write operations.
 - **High** – More system resources to Synchronization, fewer to data read/write operations.
4. Click the **Confirm** button.
5. Click the **X** icon to close the background activities panel.

Synchronization



Managing Physical Drives

Physical drive management includes:

- “Viewing a List of Physical Drives”
- “Viewing Physical Drive Information”
- “Viewing Physical Drive Statistics”
- “Viewing Physical Drive SMART Log Information”
- “Locating a Physical Drive”
- “Making Global Physical Drive Settings”
- “Making Individual Physical Drive Settings”
- “Making Physical Drive SMART Log Settings”
- “Clearing a Stale or a PFA Condition”







Viewing a List of Physical Drives

To view a list of physical drives in the Pegasus unit, click the **Physical Drive** icon.

Physical drive information includes:

- **ID** – ID number of the physical drive
- **Status** (Normal, Stale or PFA or Dead icon)
- **Model Number**
- **Type** – SATA, HDD or SSD
- **Location** – Enclosure number and slot number
- **Configuration** – Array number and sequence number, spare number, unconfigured, or stale configuration
- **Capacity** – In GB

Physical Drive List

Physical Drive List Global Physical Drive Settings						
ID	Status	Model Number	Type	Location	Configuration	Capacity
1		TOSHIBA MD04ACA4	SATA HDD	Slot1	Array0 No.0	4 TB
2		TOSHIBA MD04ACA4	SATA HDD	Slot2	Array0 No.1	4 TB
3		TOSHIBA MD04ACA4	SATA HDD	Slot3	Array0 No.2	4 TB
4		TOSHIBA MD04ACA4	SATA HDD	Slot4	Array0 No.3	4 TB
5		TOSHIBA MD04ACA4	SATA HDD	Slot5	Array0 No.4	4 TB
6		TOSHIBA MD04ACA4	SATA HDD	Slot6	Array0 No.5	4 TB

Viewing Physical Drive Information

To view physical drive information:

1. Click the **Physical Drive** icon.
2. Mouse-over the physical drive you want then click the **View** button.

Physical drive information includes:

- **Physical Drive ID** – ID number of the physical drive
- **Location** – Enclosure number and slot number
- **Alias** – If assigned
- **Physical Capacity** – Total capacity in GB
- **Configurable Capacity** – Usable capacity in GB
- **Used Capacity** – Capacity actually used in GB
- **Block Size** – Typically 512 Bytes
- **Operational Status** – OK is normal, Stale, PFA, Dead
- **Configuration Status** – Array number and sequence number, spare number
- **Model Number** – Make and model of the drive
- **Drive Interface** – SATA 3Gb/s or 6Gb/s
- **Serial Number** – Serial number of the drive
- **Firmware Version** – Firmware version on the drive
- **Protocol Version** – ATA/ATAPI protocol version

Physical Drive Information

The screenshot shows the 'Physical Drive List' window with a 'Global Physical Drive Settings' button in the top right. The main table lists drives with columns: ID, Status, Model Number, Type, Location, Configuration, Capacity, and an ellipsis menu. Drive 1 is highlighted, and a 'Physical Drive Information' dialog box is open for it. The dialog has tabs for 'Information', 'Advanced Information', 'Statistics', and 'SMART Log'. The 'Information' tab is active, showing the following details:

Physical Drive ID	1	Location	Slot 1
Alias		Physical Capacity	4TB
Configurable Capacity	4TB	Used Capacity	3.64TB
Logical Block Size	512 Bytes	Operational Status	OK
Configuration Status	Array0 No.0	Model Number	TOSHIBA MD04ACA4
Drive Interface	SATA 6Gb/s	Serial Number	29HFKQZEFSAA
Firmware Version	FP2A	Protocol Version	ATA/ATAPI-8
Physical Sector Size	4 KB		

Below the dialog, the main table shows four other drives (IDs 2, 3, 4, 5), all with status 'OK' and model 'TOSHIBA MD04ACA4'.

3. Click the **Advanced Information** tab.

Advanced information for physical drives includes:

- Write Cache – Enabled or disabled *
- Read Look Ahead Cache – Enabled or disabled *
- SMART Feature Set – Yes or No
- SMART Self Test – Yes or No
- SMART Error Logging – Yes or No
- Command Queuing Support – TCQ or NCQ
- Command Queuing – Enabled or disabled *
- Queue Depth – Number of commands
- Power Saving Level – Supported by this drive
- Medium Error Threshold **
- Drive Temperature
- Drive Reference Temperature

Items with an asterisk (*) are adjustable under “Viewing Physical Drive Statistics” on page 114.

Items with two asterisks (**) are adjustable under “Making PDM Settings” on page 107.

4. Click the **X** icon to close the information panel.

Physical Drive Advanced Information

The screenshot displays the 'Physical Drive List' window with a 'Global Physical Drive Settings' button in the top right. The main table lists drives with columns: ID, Status, Model Number, Type, Location, Configuration, and Capacity. A modal window titled 'Physical Drive Information' is open, showing tabs for Information, Advanced Information, Statistics, and SMART Log. The 'Advanced Information' tab is active, displaying a table of drive settings.

ID	Status	Model Number	Type	Location	Configuration	Capacity
2	✓	TOSHIBA MD04ACA4	SATA HDD	Slot2	Array0 No.1	4 TB
3	✓	TOSHIBA MD04ACA4	SATA HDD	Slot3	Array0 No.2	4 TB
4	✓	TOSHIBA MD04ACA4	SATA HDD	Slot4	Array0 No.3	4 TB
5	✓	TOSHIBA MD04ACA4	SATA HDD	Slot5	Array0 No.4	4 TB
6	✓	TOSHIBA MD04ACA4	SATA HDD	Slot6	Array0 No.5	4 TB

Physical Drive Information			
Information		Advanced Information	
Write Cache	Enabled	Read Look Ahead Cache	Enabled
SMART Feature Set	Yes	SMART Self Test	Yes
SMART Error Logging	Yes	Command Queuing Support	NCQ
Command Queuing	Enabled	Queue Depth	32
Power Saving Level	Full Power	Medium Error Threshold	64
Drive Temperature	42°C / 107°F	Drive Reference Temperature	N/A

Viewing Physical Drive Statistics

To view physical drive statistics:

1. Click the **Physical Drive** icon.
2. Mouse-over the physical drive you want then click the **View** button.
3. Click the **Statistics** tab.

Physical drive statistics include:

- Data Transferred
- Read Data Transferred
- Write Data Transferred
- Errors – Number of errors
- Non Read/Write Errors
- Read Errors
- Write Errors
- I/O Request – Number of requests
- Non Read/Write Request – Number of requests
- Read I/O Request – Number of requests
- Write I/O Request – Number of requests
- Statistics Start Time – Time and date
- Statistics Collection Time – Time and date

To clear physical drive statistics, see “Clearing Statistics” on page 77.

4. Click the **X** icon to close the settings panel.

Physical Drive Information - Statistics

The screenshot shows the 'Physical Drive List' window with a 'Global Physical Drive Settings' button in the top right. Below the header (ID, Status, Model Number, Type, Location, Configuration, Capacity), a modal window titled 'Physical Drive Information' is open. It has four tabs: 'Information', 'Advanced Information', 'Statistics' (selected), and 'SMART Log'. The 'Statistics' tab displays a table of drive statistics.

Physical Drive Information - Statistics			
Data Transferred	151.53GB		
Read Data Transferred	17.22MB	Write Data Transferred	151.51GB
Errors	0	Non-Read/Write Errors	0
Read Errors	0	Write Errors	0
I/O Request	316082	Non-Read/Write I/O Request	77
Read I/O Request	94	Write I/O Request	315911
Statistics Start Time	Jan 1, 1970 00:00:05	Statistics Collection Time	Apr 30, 2019 07:06:36

Below the modal, a table lists the physical drives:

ID	Status	Model Number	Type	Location	Configuration	Capacity	
2	✓	TOSHIBA MD04ACA4	SATA HDD	Slot2	Array0 No.1	4 TB	...
3	✓	TOSHIBA MD04ACA4	SATA HDD	Slot3	Array0 No.2	4 TB	...
4	✓	TOSHIBA MD04ACA4	SATA HDD	Slot4	Array0 No.3	4 TB	...
5	✓	TOSHIBA MD04ACA4	SATA HDD	Slot5	Array0 No.4	4 TB	...
6	✓	TOSHIBA MD04ACA4	SATA HDD	Slot6	Array0 No.5	4 TB	...

Viewing Physical Drive SMART Log Information

To view physical drive SMART Log information:

1. Click the Physical Drive icon.
2. Mouse-over the physical drive you want then click the **View** button.
3. Click the SMART Log tab.

SMART Log information includes:

- Physical Drive ID
- SMART Support – Yes or No, depending on the drive
- SMART Status – Enabled or disabled *
- SMART Health Status – OK is normal

Items with an asterisk (*) are adjustable under “Making Controller Settings” on page 85.

4. Click the **X** icon to close the settings panel.

Physical Drive SMART Log Information

The screenshot shows the 'Physical Drive List' window with a 'Global Physical Drive Settings' button in the top right. The main table has columns: ID, Status, Model Number, Type, Location, Configuration, and Capacity. A 'Physical Drive Information' panel is open, showing tabs for Information, Advanced Information, Statistics, and SMART Log. The SMART Log tab is active, displaying a table of SMART attributes.

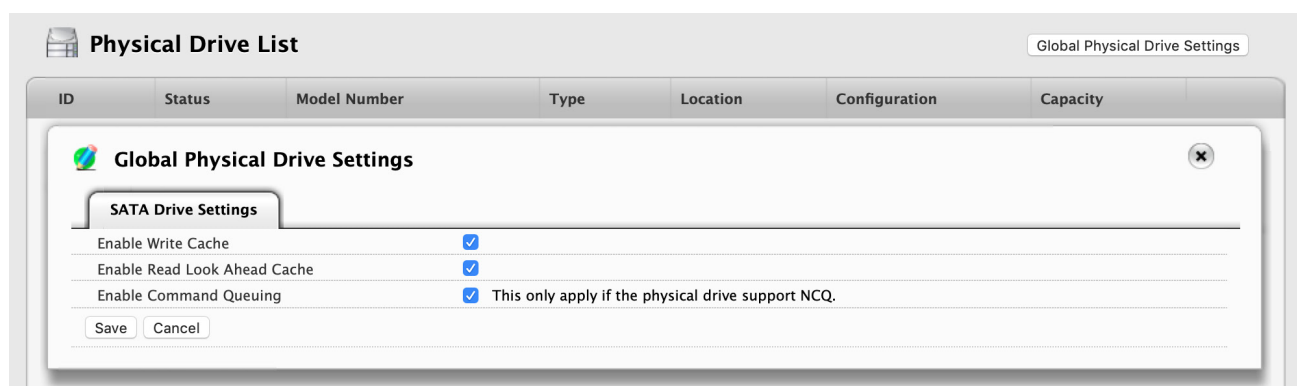
ID	Description	Threshold	Current Value	Worst Value	Raw Data
1	Raw read error rate	50	100	100	0
2	Throughput performance	50	100	100	0
3	Spinup time	1	100	100	4956
4	Start/Stop count	0	100	100	8748
5	Reallocated sector count	50	100	100	0
7	Seek error rate	50	100	100	0
8	Seek timer performance	50	100	100	0
9	Power-on hours count	0	100	100	205
10	Spinup retrv count	30	253	100	0

Making Global Physical Drive Settings

To make global physical drive settings:

1. Click the Physical Drive icon..
2. Click the **Global Physical Drive Settings** button.
3. Check the boxes to enable, uncheck to disable.
 - Enable Write Cache
 - Enable Read Look Ahead Cache
 - Enable Command Queuing
4. Click the **Save** button.
5. Click the **X** icon to close the settings panel.

Physical Drive Global Settings



Locating a Physical Drive

This feature causes the drive carrier LEDs to blink for one minute to assist you in locating the physical drive, and is supported by RAID enclosures and JBOD expansion units.

To locate a physical drive:

1. Click the Physical Drive icon.
2. Mouse-over the physical drive you want then click the Locate button.
The Drive Power / Status LED for the drive carrier holding that drive blinks blue and orange for one minute.

Running the Locate function to identify a physical drive



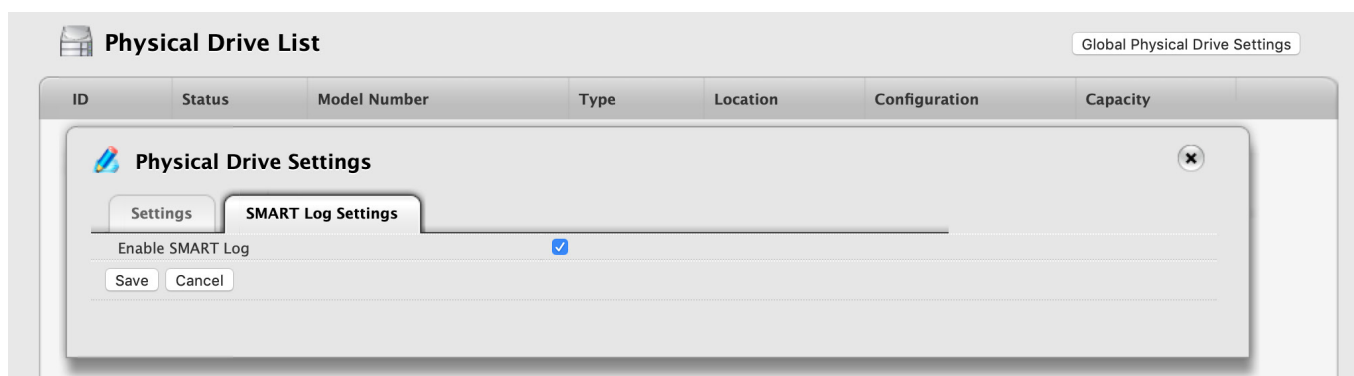
Drive Power/Status LEDs
blink blue and orange

Making Physical Drive SMART Log Settings

To make physical drive SMART log settings:

1. Click the **Physical Drive** icon.
2. Mouse-over the physical drive you want then click the **Settings** button.
3. Click the **SMART Log Settings** tab.
4. Check the box to enable the SMART log.
5. Click the **Save** button.
6. Click the **X** icon to close the settings panel.

Physical Drive SMART Log Settings



Making Individual Physical Drive Settings



CAUTION

Changing the status of a pass-through disk will destroy any data on the disk. Back up your data before you proceed.

To make individual physical drive settings:

1. Do one of the following actions:
 - Click the Physical Drive icon.
 - From the Device menu, choose Physical Drive.
2. Mouse-over the physical drive you want then click the **Settings** button.



WARNING

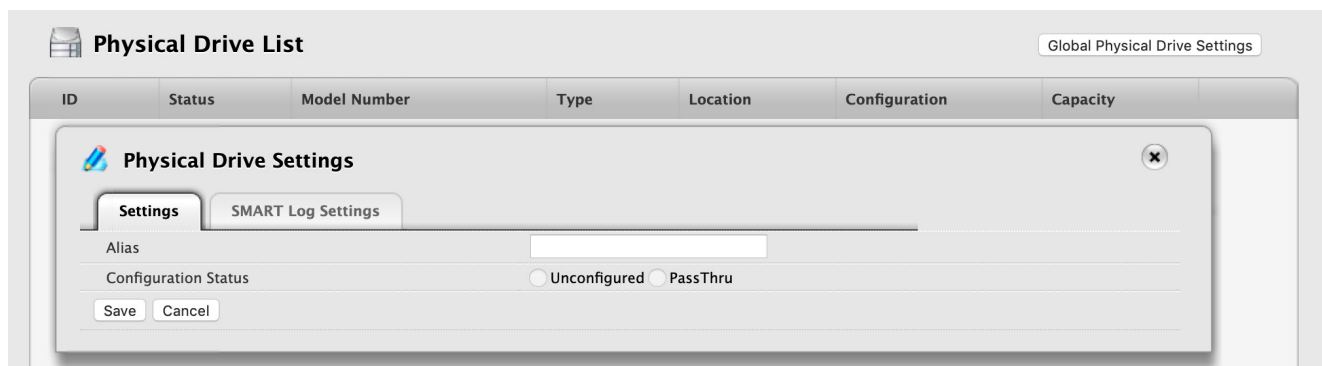
If you are using utility to create or delete a passthru drive, the system will reboot if Pegasus32 is running USB mode. It is important to make sure the Pegasus32 not being accessed (no IO operation in progress) before submitting the request.



Important

Up to four logical drives (including passthru drive) are supported in USB mode. Any LD beyond the 4th will be inaccessible in USB mode. However, these will be accessible in Thunderbolt™ mode.

Physical Drive Settings



3. Make changes as needed:

- Enter, change, or delete the alias in the Alias field.
- Choose Unconfigured or PassThru Configuration.

Unconfigured drives are not visible to your computer. Use them to make disk arrays.

PassThru drives are visible to your computer and are configured as individual drives. They cannot be used to make a disk array.

4. Click the **Save** button.

5. Click the **X** icon to close the settings panel.

Clearing a Stale or a PFA Condition

Stale – The physical drive contains obsolete disk array information.

PFA – The physical drive has errors resulting in a prediction of failure.

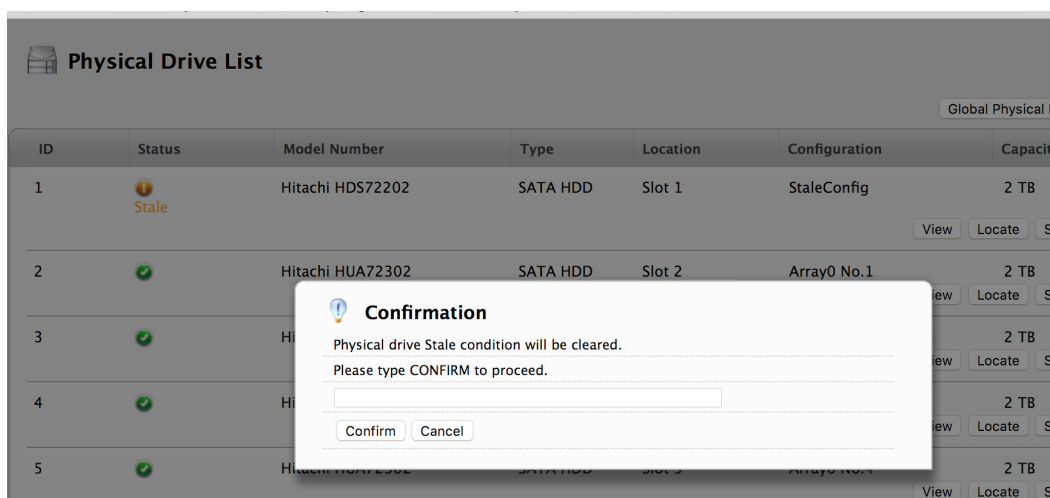
Be sure you have first corrected the condition by a physical drive replacement, rebuild operation, etc. Then clear the condition.

To clear a Stale or a PFA condition:

1. Click the **Physical Drive** icon.
2. Mouse-over the physical drive you want then click the **Clear** button.
3. Click the **Confirm** button.

If the physical drive has *both* a Stale condition *and* a PFA condition, the first click removes the Stale condition. Click the **Clear** button a second time to remove the PFA condition.

Clear a stale drive or PFA condition



Running Media Patrol on your Physical Drives

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol checks are enabled by default on all disk arrays and spare drives. Media Patrol is concerned with the media itself, not the data recorded on the media. If Media Patrol encounters a critical error, it triggers PDM if PDM is enabled on the disk array. Media Patrol checks all physical drives one at a time.

To run Media Patrol on your physical drives:

1. Click on the **Background Activities** icon.
The list of background activities appears.
2. Mouse-over Media Patrol and click the **Start** button.

Running Media Patrol

The screenshot shows the 'Background Activities' window. At the top, it says 'Media Patrol was started successfully.' Below this, there's a table with columns: Background Activity, Status, and buttons (Start, Stop, Pause, Resume). The 'Media Patrol' row is highlighted, showing 'Running' status. Below this, there's a detailed progress bar for PD ID 6, showing 'Overall Progress' at 1% (Running) and 'Current PD Progress' at 2%. To the right, it shows 'Queued PD ID' as 2 [Total:1] and 'Completed PD ID' as None. Below the progress bar, there's a list of other background activities: Redundancy Check, Initialization, Rebuild, Migration, PDM, Transition, and Synchronization, each with a 'Start' button.

Background Activity	Status	Buttons
Media Patrol	Running	Start
PD ID	Overall Progress	Current PD Progress
6	1% - Running	2%
		Queued PD ID
		2 [Total:1]
		Completed PD ID
		None
		Stop Pause Resume
Redundancy Check	No logical drive available for Redundancy Check.	Start
Initialization	No logical drive available for initialization.	Start
Rebuild	Rebuild is not running.	Start
Migration	Disk array migration is not running.	Start
PDM	PDM is not running.	Start
Transition	Transition is not running.	Start
Synchronization	Synchronization is not running.	

Pausing and Resuming a Media Patrol

To pause or resume a Media Patrol:

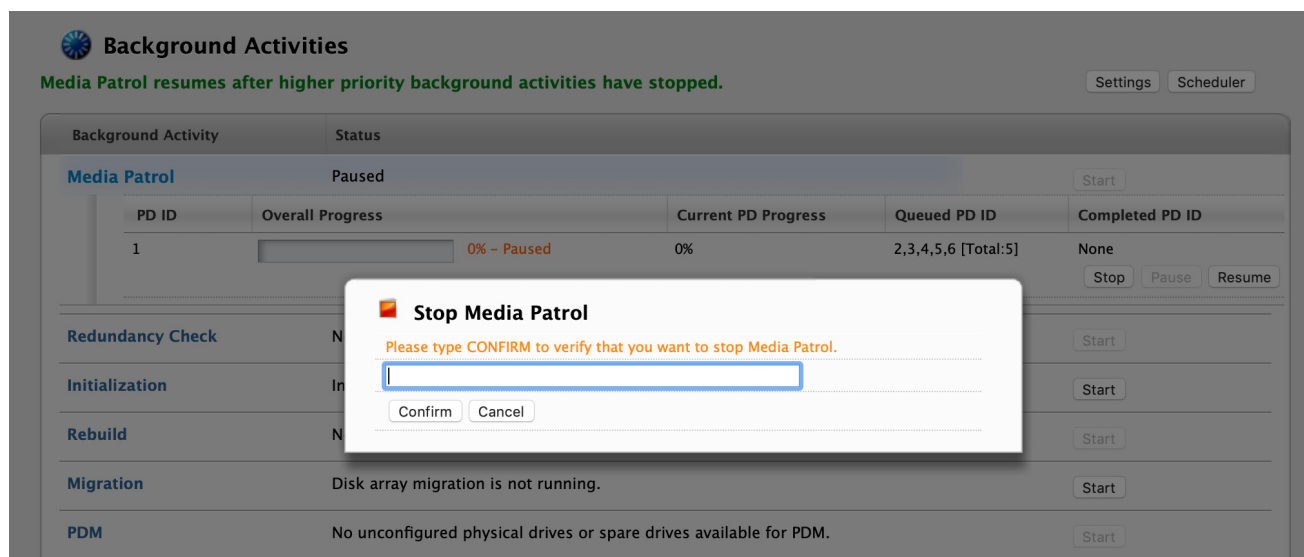
1. Click on the **Background Activities** icon.
The list of background activities appears.
2. Mouse-over Media Patrol and click the **Pause** or **Resume** button.

Stopping a Media Patrol

To stop is to cancel the Media Patrol:

1. Click on the **Background Activities** icon.
The list of background activities appears.
2. Mouse-over Media Patrol and click the **Stop** button.
3. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Stop Media Patrol



Managing Disk Arrays

Disk array management includes:

- “Viewing a List of Disk Arrays”
- “Viewing Disk Array Information”
- “Creating a Disk Array Manually”
- “Making Disk Array Settings”
- “Locating a Disk Array”
- “Deleting a Disk Array”
- “Preparing a Disk Array for Transport”
- “Rebuilding a Disk Array”

Also see “Disk Array and Logical Drive Problems” on page 193.



WARNING

If you are using utility to create or delete a disk array or logical drive, the system will reboot if Pegasus32 is running USB mode. It is important to make sure the Pegasus32 not being accessed (no IO operation in progress) before submitting the request.



Important











Up to four logical drives (including passthru drive) are supported in USB mode. Any LD beyond the 4th will be inaccessible in USB mode. However, these will be accessible in Thunderbolt™ mode.

Viewing a List of Disk Arrays

To view a list of disk arrays, do one of the following actions:

- From the Dashboard window, click the **Disk Array** link.
- From the Storage menu, choose **Disk Array**. The list of disk arrays appears. Each disk array lists:
 - **ID** – DA0, DA1, etc.
 - **Alias** – If assigned
 - **Status** (Normal, Degraded or Incomplete/physical drive missing icon)
 - **Capacity** – Data capacity of the array
 - **Free Capacity** – Unconfigured or unused capacity on the physical drives
 - **Media Patrol** – Enabled or disabled on this array
 - **Number of Logical Drives** – The number of logical drives on this array

List of Disk Arrays

 Dashboard	 Wizard	 Physical Drive	 Disk Array	 Logical Drive	 Subsystem Information	 Events	 Background Activities
 Disk Array							Create Disk Array
ID	Alias	Status	Capacity	Free Capacity	Media Patrol	Number of LDs	
0			24 TB	0 Byte	Enabled	1	...

Viewing Disk Array Information

To view disk array information:

- Do one of the following actions:
 - From the Dashboard window, click the **Disk Array** link.
 - From the Storage menu, choose **Disk Array**.
- Mouse-over the disk array you want then click the **View** button.

Disk array information includes:

- Disk Array ID** – DA0, DA1, etc.
- Alias** – If assigned
- Operational Status** – OK, Degraded, or Offline
- Media Patrol** – Enabled or disabled on this array
- PDM** – Enabled or disabled on this array
- Total Physical Capacity** – Maximum capacity, including used and unused capacity on the physical drives
- Configurable Capacity** – Data capacity of the array
- Free Capacity** – Unconfigured or unused capacity on the physical drives
- Max. Contiguous Free Capacity** – A single chunk of used capacity on the physical drives
- Number of Physical Drives** – The number of physical drives on this array
- Number of Logical Drives** – The number of logical drives on this array
- Number of Dedicated Spares** – The number of spare drives dedicated to this array
- Available RAID Levels** – RAID levels that this disk array can support

Disk Array Information

The screenshot shows the 'Disk Array' management window. At the top, there's a 'Create Disk Array' button. Below it is a table with columns: ID, Alias, Status, Capacity, Free Capacity, Media Patrol, and Number of LDs. The first row is highlighted, showing 'Disk Array 0'. Below this table, there's a detailed view for 'Disk Array 0' with tabs for 'Information', 'Logical Drive', 'Physical Drive', and 'Spare Drive'. The 'Information' tab is active, showing a table of properties and values.

ID	Alias	Status	Capacity	Free Capacity	Media Patrol	Number of LDs
DA0		OK	24 TB	0 Byte	Enabled	6

Disk Array 0	
Property	Value
Disk Array ID	0
Operational Status	OK
PDM	Enabled
Configurable Capacity	24 TB
Max Contiguous Free Capacity	0 Byte
Number of Logical Drives	1
Available RAID Levels	0 5 6 10 50 1E
Alias	
Media Patrol	Enabled
Total Physical Capacity	24 TB
Free Capacity	0 Byte
Number of Physical Drives	6
Number of Dedicated Spares	0

Creating a Disk Array Manually

This feature creates a disk array only. You can also use the Wizard to create a disk array with logical drives and spare drives at the same time.



WARNING

If you are using utility to create or delete a disk array or logical drive, the system will reboot if Pegasus32 is running USB mode. It is important to make sure the Pegasus32 not being accessed (no IO operation in progress) before submitting the request.



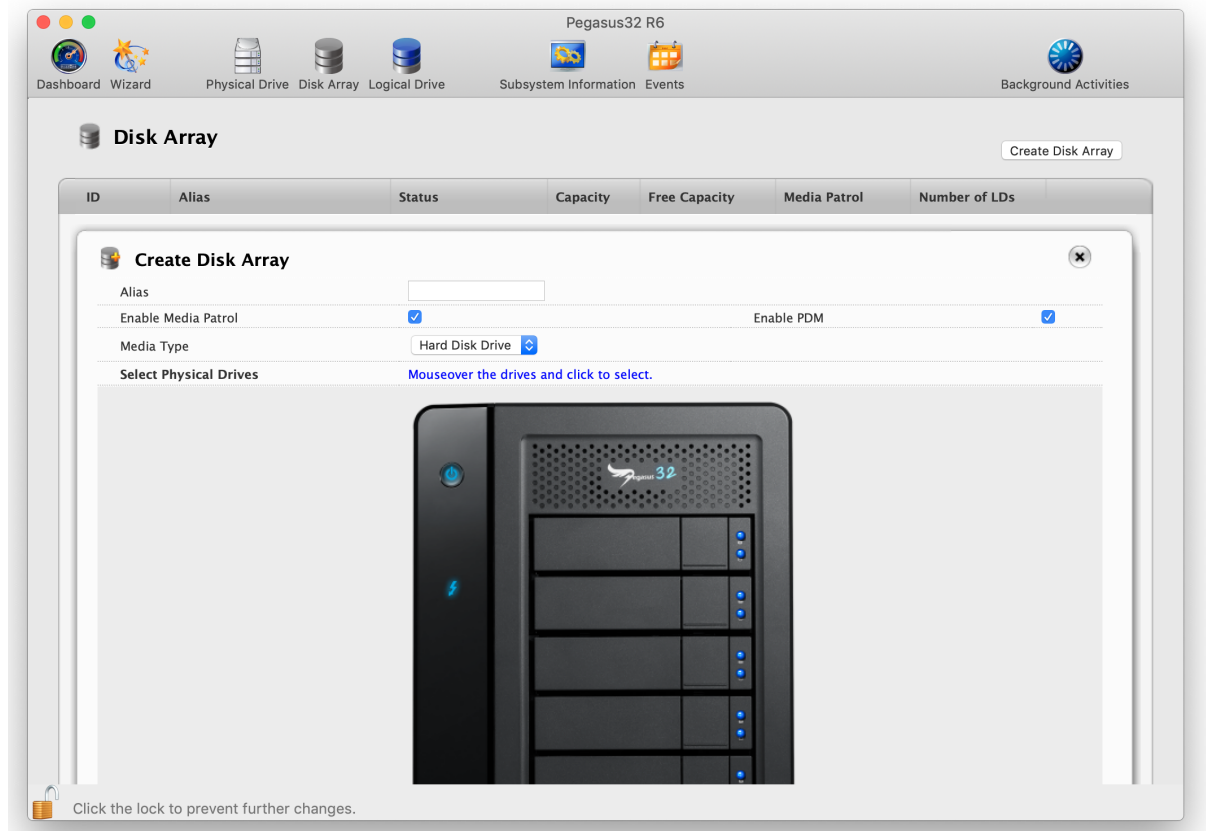
Important

Up to four logical drives (including passthru drive) are supported in USB mode. Any LD beyond the 4th will be inaccessible in USB mode. However, these will be accessible in Thunderbolt™ mode.

To create a disk array:

1. From the Dashboard menu, click the **Disk Array** link.
2. Click the **Create Disk Array** button.
3. Accept the defaults or make changes:
 - Enter an alias in the **Alias** field
Maximum of 32 characters; letters, numbers, space between characters, and underscore.
 - **Enable Media Patrol** – Uncheck to disable on this array.
For more information, see “Media Patrol” on page 100.
 - **Enable PDM** – Uncheck to disable on this array.
For more information, see “PDM” on page 107.

Create Disk Array



4. In the **Select Physical Drives** diagram, click the drives to add them to your array. The drive carriers turn blue when you click them. The physical drives' ID numbers appear in the field below the diagram.
5. When you have finished your settings and choices, click the Submit button. The new array appears in the list.
 - If you are done creating disk arrays, click the **Finish** button.
 - To create additional disk arrays, click the Create More button.

After you create a disk array, create a logical drive on it. See “Creating a Logical Drive Manually” on page 150.

Creating a Disk Array and Logical Drive with the Wizard

A disk array is the method of organizing the hard disk drives or solid state drives in the Pegasus unit. A logical drive is created on a disk array. The logical drive is where your computer saves files on the Pegasus.

The Pegasus Utility includes a Wizard to help you set up a disk array, logical drives, and spare drive.

To open the Wizard, click the Storage menu and choose **Wizard**.

The Wizard dialog box opens with three configuration methods.



WARNING

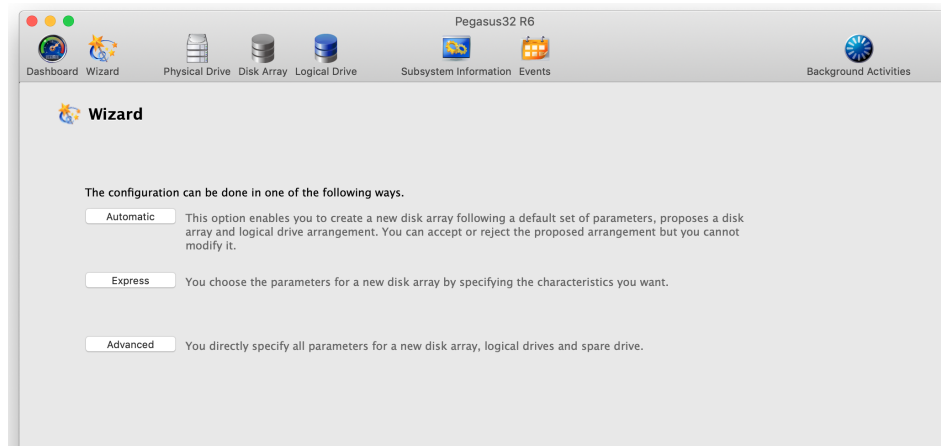
If you are using utility to create or delete a disk array or logical drive, the system will reboot if Pegasus32 is running USB mode. It is important to make sure the Pegasus32 not being accessed (no IO operation in progress) before submitting the request.



Important

Up to four logical drives (including passthru drive) are supported in USB mode. Any LD beyond the 4th will be inaccessible in USB mode. However, these will be accessible in Thunderbolt™ mode.

Wizard dialog box



Choose the best method for your situation. See the table on the next page.

Method	User Options	Suggested for users who are	Page
Automatic	None	New to data storage	page 129
Express	General parameters	Familiar with data storage	page 130
Advanced	Individual parameters	Data storage professionals	page 132

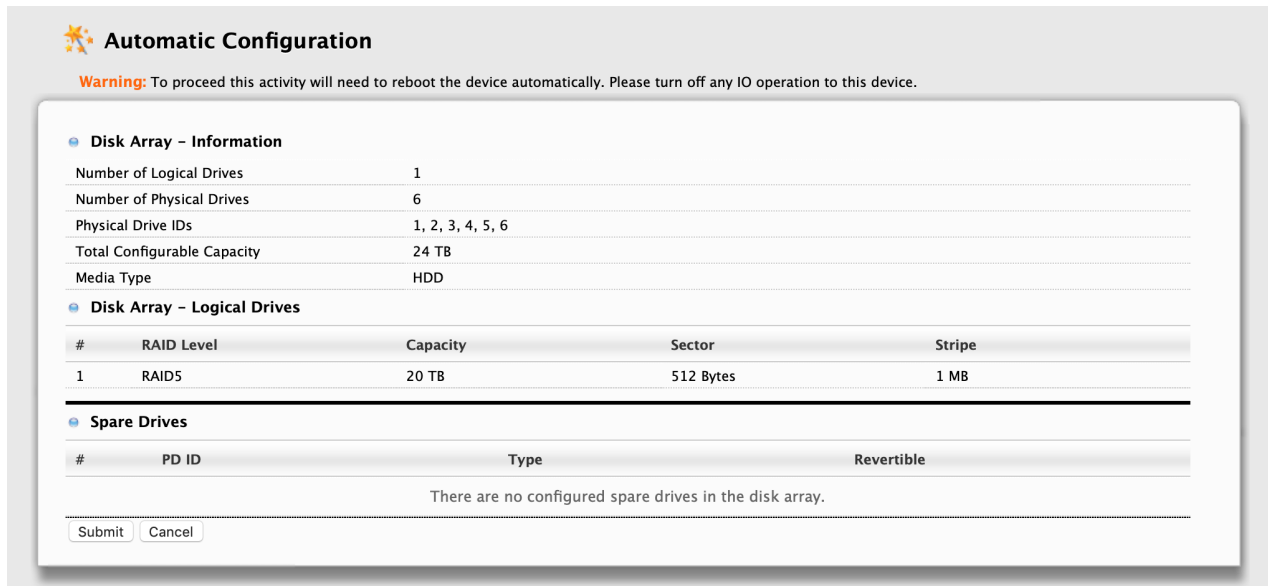
Choosing Automatic Configuration

To use the Automatic Configuration Wizard:

1. From the Storage menu choose **Wizard**.
2. Click the **Automatic** button.

The Automatic Configuration dialog box appears.

Automatic Configuration dialog box



Automatic Configuration

Warning: To proceed this activity will need to reboot the device automatically. Please turn off any IO operation to this device.

Disk Array – Information

Number of Logical Drives	1
Number of Physical Drives	6
Physical Drive IDs	1, 2, 3, 4, 5, 6
Total Configurable Capacity	24 TB
Media Type	HDD

Disk Array – Logical Drives

#	RAID Level	Capacity	Sector	Stripe
1	RAID5	20 TB	512 Bytes	1 MB

Spare Drives

#	PD ID	Type	Revertible
There are no configured spare drives in the disk array.			

Submit Cancel

3. Do one of the following actions:
 - If you agree with the proposed configuration, click the Submit button. The Wizard creates your disk array and logical drive. If you have a Pegasus32 R6, the Wizard also creates a spare drive.
 - If you do NOT agree with the proposed configuration, click the **Cancel** button to return to the original Automatic Configuration menu.

Choosing Express Configuration

To use the Express Configuration Wizard:

1. From the Storage menu choose **Wizard**.
2. Click the **Express** button.

The Express configuration menu appears.

Express Configuration menu

Express Configuration

Warning: To proceed this activity will need to reboot the device automatically. Please turn off any IO operation to this device.

Express Configuration

Redundancy	<input checked="" type="checkbox"/>
Capacity	<input checked="" type="checkbox"/>
Performance	<input checked="" type="checkbox"/>
Spare Drive	<input type="checkbox"/>
Number of Logical Drives	<input type="text" value="1"/>
Application Type	<input type="text" value="File Server"/>

Summary

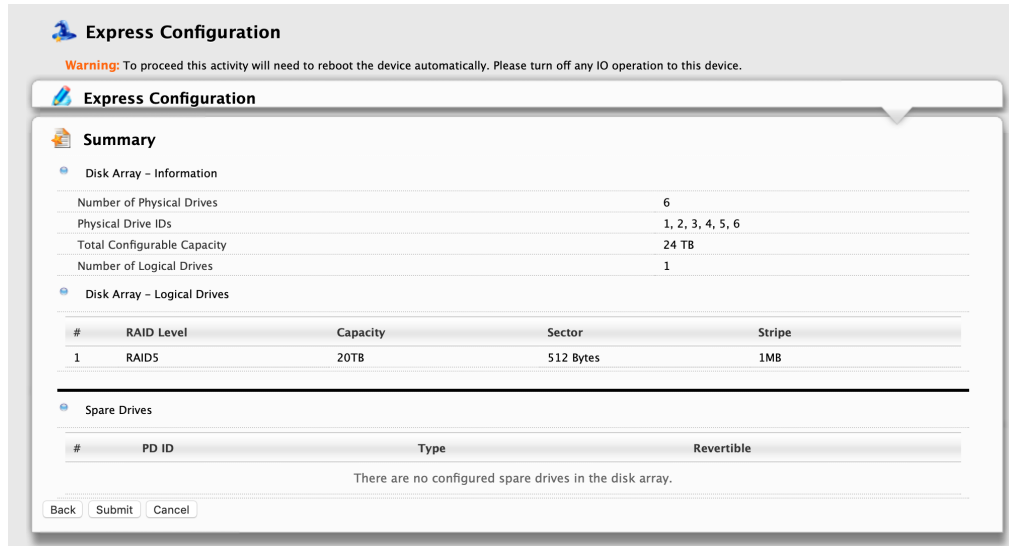
3. Check the boxes to choose any one or a combination of:
 - **Redundancy** – The array remains available if a physical drive fails
 - **Capacity** – The greatest possible amount of data capacity
 - **Performance** – The highest possible read/write speed
 - **Spare Drive** – Check box to create a hot spare drive (R6 and R8 only)
 - **Number of Logical Drives** – Enter a number of logical drives to create
 - **Application Type** - Choose how the storage is used
4. In the Number of Logical Drives field, type the number of logical drives you want to make from this disk array. Pegasus supports 1 to 32 logical drives in Thunderbolt mode, and up to 4 logical drives (including passthru drive) in USB mode.

From the **Application Type** dropdown menu, choose an application that best describes your intended use for the logical drives.

- File Server (default)
- Video Stream
- Transaction Data
- Transaction Log
- Other

5. Click the **Next** button to continue.
The Summary dialog box appears with information on the disk arrays, logical drives, and spare drives you are about to create. See example below.

Express Configuration Summary



The image shows a screenshot of the 'Express Configuration' dialog box. At the top, there is a warning message: 'Warning: To proceed this activity will need to reboot the device automatically. Please turn off any IO operation to this device.' Below the warning, the dialog is titled 'Express Configuration' and contains a 'Summary' section. The 'Summary' section is divided into three expandable sections: 'Disk Array - Information', 'Disk Array - Logical Drives', and 'Spare Drives'. The 'Disk Array - Information' section shows: Number of Physical Drives: 6, Physical Drive IDs: 1, 2, 3, 4, 5, 6, Total Configurable Capacity: 24 TB, and Number of Logical Drives: 1. The 'Disk Array - Logical Drives' section shows a table with one entry: #1, RAID Level: RAID5, Capacity: 20TB, Sector: 512 Bytes, and Stripe: 1MB. The 'Spare Drives' section shows a table with columns: #, PD ID, Type, and Revertible. Below the table, it states: 'There are no configured spare drives in the disk array.' At the bottom of the dialog, there are three buttons: 'Back', 'Submit', and 'Cancel'.

Express Configuration

Warning: To proceed this activity will need to reboot the device automatically. Please turn off any IO operation to this device.

Express Configuration

Summary

- Disk Array - Information**

Number of Physical Drives	6
Physical Drive IDs	1, 2, 3, 4, 5, 6
Total Configurable Capacity	24 TB
Number of Logical Drives	1
- Disk Array - Logical Drives**

#	RAID Level	Capacity	Sector	Stripe
1	RAID5	20TB	512 Bytes	1MB
- Spare Drives**

#	PD ID	Type	Revertible
---	-------	------	------------

There are no configured spare drives in the disk array.

Back Submit Cancel

6. Do one of the following actions:
 - If you accept these parameters, click the **Submit** button.
The Wizard creates your disk array and logical drives. If you have an R6 or R8, the Wizard also creates a spare drive.
 - If you do NOT accept these parameters, click the **Back** button, then review and modify your choices.

Choosing Advanced Configuration

This option enables you to directly specify all parameters for a new disk array, logical drives, and spare drives.

To use the Advanced Configuration Wizard:

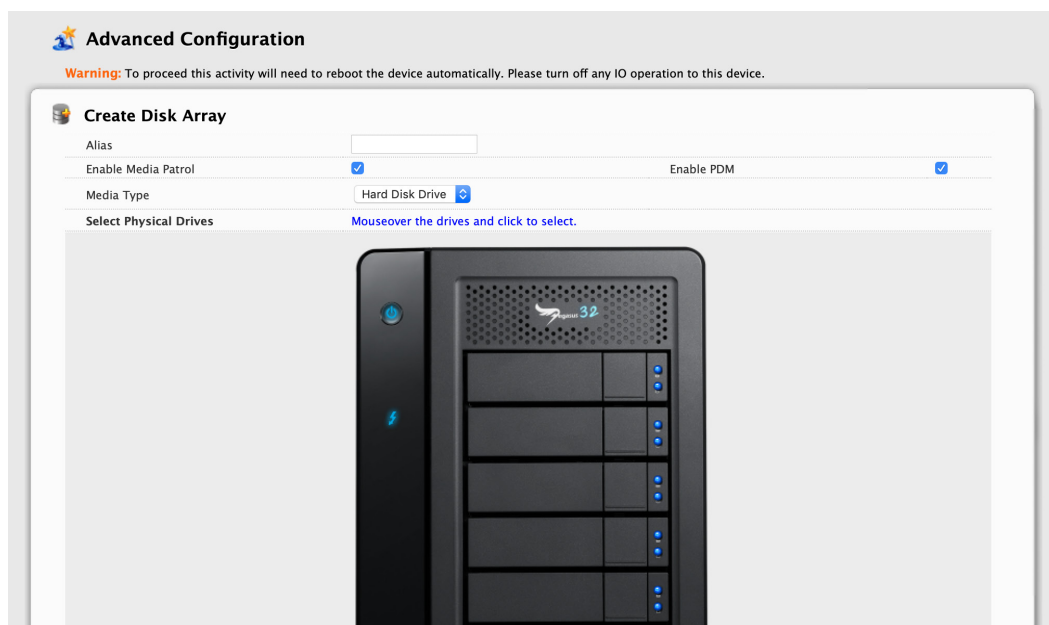
1. From the Storage menu choose **Wizard**.
2. Click the **Advanced** button.
The Create Disk Array screen displays.

Task 1 – Disk Array Creation

To create your disk array:

1. Accept the defaults or make changes:
 - Enter an alias in the **Alias** field.
Maximum of 32 characters; letters, numbers, space between characters, and underscore.
 - **Media Patrol** – Uncheck to disable on this array.
For more information, see “Media Patrol” on page 100.
 - **PDM** – Uncheck to disable on this array.
For more information, see “PDM” on page 107.
2. In the Select Physical Drives diagram, click the drives to add them to your array.
The drive carriers turn blue when you click them. The physical drives’ ID numbers appear in the field below the diagram.
3. Click the Next button to continue.
The Create Logical Drive screen displays.

Advanced Configuration - Create Disk Array



Task 2 – Logical Drive Creation

To create your logical drive:

1. Enter your information and choose your options.
 - Enter a logical drive alias in the field provided
 - Choose a RAID level from the dropdown menu.
Note the Max: capacity value. Then enter a capacity value the field provided and choose a unit of measure from the dropdown menu.
 - Enter a value for Capacity and choose the unit for the value (MB, GB, TB)
 - Choose a Stripe size.
64 KB, 128 KB, 256 KB, 512 KB, and 1 MB are available.
 - Choose a Sector size.
512 B, 1 KB, 2 KB, and 4 KB are available.
 - Choose a Read (cache) Policy.
The choices are Read Cache, Read Ahead (cache), and None.
 - Choose a Write (cache) Policy.
The choices are WriteThru (write through) and WriteBack. Write back requires a Read Cache or Read Ahead Read Cache Policy.
 - RAID 50 only. Choose the number of axes to use.
 - If you want the Pegasus Utility to format your logical drives, leave the Format box checked. For additional format options, see “Formatting Your Logical Drives” on page 152.
2. Click the Add button.
The new logical drive appears on the list at the right.
If there is capacity remaining, you can create an additional logical drive.
3. Click the Next button to continue.
The Create Spare Drive screen displays.

Advanced Configuration - Create Logical Drive

Advanced Configuration

Warning: To proceed this activity will need to reboot the device automatically. Please turn off any IO operation to this device.

Create Disk Array

Create Logical Drive

Alias:

RAID Level: RAID5

Capacity: 20 TB Max: 20 TB

Stripe: 1 MB

Sector: 512 Bytes

Read Policy: ReadAhead

Write Policy: WriteBack

Format: ☒

Quick Init: ☐

Add

New Logical Drives

RAID Level	Capacity
------------	----------

Back Next Cancel

Create Spare Drive

Summary

Task 3 – Spare Drive Creation

To create your spare drive:

1. For each of the following items, accept the default or change the settings as required:
 - Check the Revertible box if you want a revertible spare drive.
A revertible spare drive returns to its spare drive assignment after you replace the failed physical drive in the disk array and run the Transition function.
 - **Global** – Can be used by any disk array
 - **Dedicated** to newly created disk array – The disk array you are now creating.
2. In the Select Physical Drives diagram, click a drive to choose it for your spare.
The drive carrier turns blue when you click it. The physical drive's ID number appears in the field below the diagram.
3. Click the Next button to continue.
The Summary screen displays.


Advanced Configuration - Create Spare Drive




Task 4 – Summary


- Review your choices of disk array, logical drives, and spare drive.
 - To make a change, click the **Back** button to reach the appropriate screen.
 - To accept, click the Submit button.
The disk array, logical drive, and spare drive take a few moments to create.
- Click the **Finish** button to close the Wizard.


Advanced Configuration - Configuration Summary



Advanced Configuration


Warning: To proceed this activity will need to reboot the device automatically. Please turn off any IO operation to this device.

 **Create Disk Array**


 **Create Logical Drive**

 **Create Spare Drive**


 **Summary**

 **Disk Array Information**

Alias					
Number of Logical Drives	1				
Configurable Capacity	20 TB				
Free Capacity	0 Byte				
Number of Physical Drives	5				
Physical Drive IDs	2, 3, 4, 5, 6				

 **Logical Drive Information**

LD ID	RAID Level	Capacity	Sector	Stripe	Format
0	RAID5	16 TB	512 Bytes	1 MB	Yes

 **Spare Drive Information**

PD ID	Type	Revertible
1	Global	No

Formatting your Logical Drives

If you left the **Format** box checked under *Task 2 – Logical Drive Creation*, your logical drives are formatted automatically.

If you UNchecked the **Format** box, you must format your logical drives manually.

When the Pegasus Utility has finished the partition and format operation, new removable-drive icons, each representing one logical drive, appear on your desktop (right).

When you see the icon, your logical drive is ready to use.

Making Disk Array Settings

To make disk array settings:

1. Do one of the following actions:
 - From the Dashboard window, click the **Disk Array** link.
 - From the Storage menu, choose **Disk Array**.
2. Mouse-over the disk array you want then click the **Settings** button.
3. Make setting changes as required:
 - Enter, change or delete the alias in the Alias field
Maximum of 32 characters; letters, numbers, space between characters, and underscore.
 - **Enable Media Patrol** – Check to enable, uncheck to disable on this array.
 - **Enable PDM** – Check to enable, uncheck to disable on this array.
4. Click the **Save** button.

Create a Disk Array

Disk Array Create Disk Array

ID	Alias	Status	Capacity	Free Capacity	Media Patrol	Number of LDs
<div> Disk Array Settings X</div> <div><div>Alias</div><div>demo</div></div> <div><div>Enable Media Patrol</div><div><input checked="" type="checkbox"/></div></div> <div><div>Enable PDM</div><div><input checked="" type="checkbox"/></div></div> <div><div>Save</div><div>Cancel</div></div>						

Deleting a Disk Array



CAUTION

When you delete a disk array, you also delete any logical drives that belong to it, along with the data on those logical drives. Back up any important data before deleting a disk array.



WARNING

If you are using utility to create or delete a disk array or logical drive, the system will reboot if Pegasus32 is running USB mode. It is important to make sure the Pegasus32 not being accessed (no IO operation in progress) before submitting the request.

To delete a disk array:

1. Do one of the following actions:
 - From the Dashboard window, click the **Disk Array** link.
 - From the Storage menu, choose **Disk Array**.
2. Mouse-over the disk array you want then click the **Delete** button.
3. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Delete a Disk Array

The screenshot shows the 'Disk Array' management page. At the top, there's a 'Create Disk Array' button. Below it is a table with columns: ID, Alias, Status, Capacity, Free Capacity, Media Patrol, and Number of LDs. The table contains one entry: ID 0, Status is a green checkmark, Capacity is 20 TB, Free Capacity is 0 Byte, Media Patrol is Enabled, and Number of LDs is 1. To the right of the table is a three-dot menu icon. A modal dialog box is open in the foreground with the title 'Delete Disk Array 0'. It contains a warning: 'WARNING: ALL DATA on the disk array will be LOST!' and a prompt: 'Please type CONFIRM to verify that you want to delete this disk array.' Below the prompt is a text input field with 'CONFIRM' typed in. At the bottom of the dialog are 'Confirm' and 'Cancel' buttons.

ID	Alias	Status	Capacity	Free Capacity	Media Patrol	Number of LDs
0		✓	20 TB	0 Byte	Enabled	1

Delete Disk Array 0

WARNING: ALL DATA on the disk array will be LOST!

Please type CONFIRM to verify that you want to delete this disk array.

Confirm Cancel

Locating a Disk Array

This feature causes the drive carrier LEDs to flash for one minute to assist you in locating the physical drives that make up this disk array.

To locate a disk array:

1. Do one of the following actions:
 - From the Dashboard window, click the **Disk Array** link.
 - From the Storage menu, choose **Disk Array**.
2. Mouse-over the disk array you want then click the Locate button.
The Drive Power / Status LED for the physical drives that make up the disk array blink blue and orange for one minute.

Running the Locate function to identify a disk array



Drive Power/Status LEDs
blink blue and orange

Preparing a Disk Array for Transport

This feature prepares the physical drives that make up the disk array to be removed from the enclosure and installed in a different location.

To prepare a disk array for transport:

1. Do one of the following actions:
 - From the Dashboard window, click the **Disk Array** link.
 - From the Storage menu, choose **Disk Array**.
2. Mouse-over the disk array you want then click the Transport button.
3. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.
The disk array status changes to Transport Ready.
4. Remove the physical drives and install them in their new location.



Note

In USB mode, it is necessary to power cycle the host manually, in order to update configuration information. If configuration information is not updated, a volume might still appear, but the volume is unusable by the OS.

See “Transport” on page 196 for more information.

Transporting a disk array

The screenshot shows the 'Disk Array' management interface. At the top, there's a 'Create Disk Array' button. Below it is a table with columns: ID, Alias, Status, Capacity, Free Capacity, Media Patrol, and Number of LDs. The table contains one entry with ID 0, Status 'Enabled' (indicated by a green checkmark), Capacity '20 TB', Free Capacity '0 Byte', and Number of LDs '1'. A modal dialog titled 'Transport Disk Array 0' is open in the foreground. It contains the text 'Please type CONFIRM to verify that you want to prepare this disk array for transport.' followed by a text input field. At the bottom of the dialog are 'Confirm' and 'Cancel' buttons.

ID	Alias	Status	Capacity	Free Capacity	Media Patrol	Number of LDs
0		Enabled	20 TB	0 Byte	Enabled	1

Transport Disk Array 0

Please type CONFIRM to verify that you want to prepare this disk array for transport.

Confirm Cancel

Rebuilding a Disk Array

When you rebuild a disk array, you are actually rebuilding the data on one of its physical drives.

If there is no spare drive of adequate capacity, you must replace the failed drive with an unconfigured physical drive, then perform a *Manual Rebuild*.

On the carrier with the failed drive, the Drive Power/Status LED is red and the Drive Activity LED is dark.

Drive carrier LEDs for a dead or failed drive





That is the physical drive you must replace.

Performing a Manual Rebuild

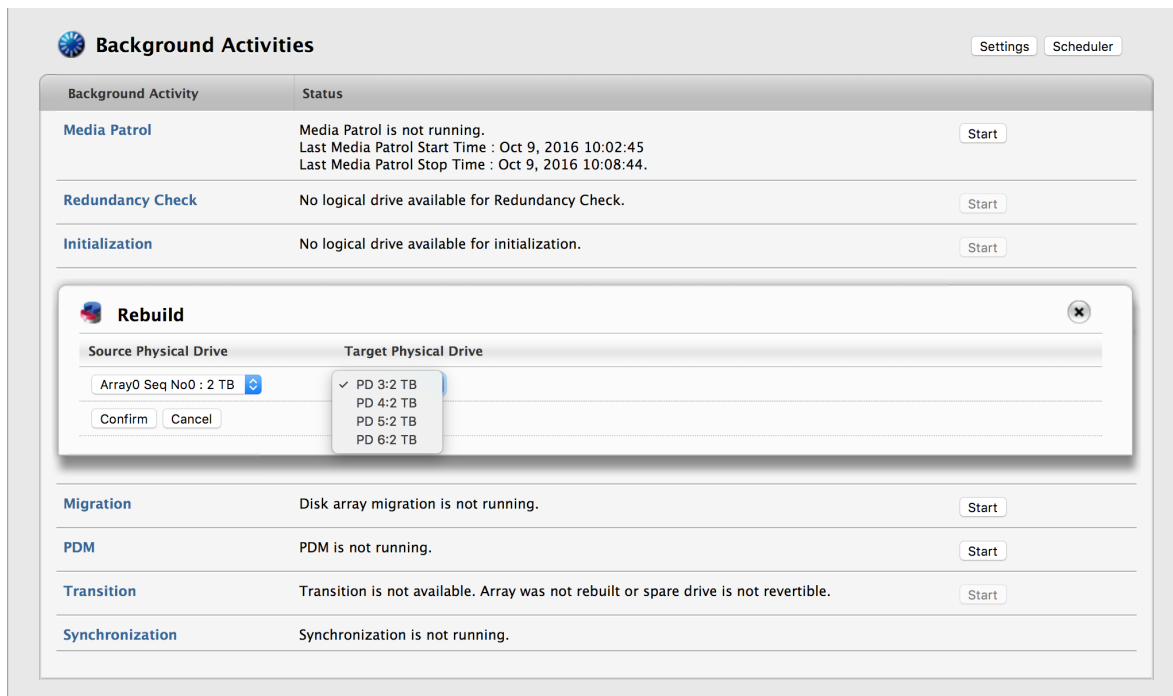
To perform a manual rebuild:

1. Click on the **Background Activities** icon.
2. Mouse-over Rebuild and click the **Start** button.
3. From the **Source Physical Drive** dropdown menu, choose a **Source** disk array and physical drive.
Arrays have an ID No. Physical drives have a Seq. No.(sequence number)
4. From the **Target Physical Drive** dropdown menu, choose a **Target** physical drive.
5. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

When the disk array is rebuilding:

- The disk array shows a green check  icon and **Rebuilding** status.
- Logical drives under the disk array continue to show a yellow  icon and **Critical, Rebuilding** status.
- If the buzzer is enabled, the Pegasus unit emits two quick beeps every five seconds. When the beeps stop, the rebuild is done.

Rebuilding a disk array



The screenshot shows the 'Background Activities' window with a 'Rebuild' dialog box open. The dialog box has two dropdown menus: 'Source Physical Drive' and 'Target Physical Drive'. The 'Source Physical Drive' dropdown is set to 'Array0 Seq No0 : 2 TB'. The 'Target Physical Drive' dropdown is set to 'PD 3:2 TB'. Below the dropdowns are 'Confirm' and 'Cancel' buttons. The background window shows a table of activities with columns 'Background Activity' and 'Status'. The activities listed are Media Patrol, Redundancy Check, Initialization, Migration, PDM, Transition, and Synchronization. Each activity has a 'Start' button next to it.


Background Activity	Status	Action
Media Patrol	Media Patrol is not running. Last Media Patrol Start Time : Oct 9, 2016 10:02:45 Last Media Patrol Stop Time : Oct 9, 2016 10:08:44.	Start
Redundancy Check	No logical drive available for Redundancy Check.	Start
Initialization	No logical drive available for initialization.	Start
Migration	Disk array migration is not running.	Start
PDM	PDM is not running.	Start
Transition	Transition is not available. Array was not rebuilt or spare drive is not revertible.	Start
Synchronization	Synchronization is not running.	Start

Pausing and Resuming a Rebuild

To pause or resume a Rebuild:

1. Click on the **Background Activities** icon.
2. Mouse-over Rebuild and click the **Pause** or **Resume** button.

Pausing a disk array rebuild


Background Activities

Rebuild was paused successfully.

Settings Scheduler

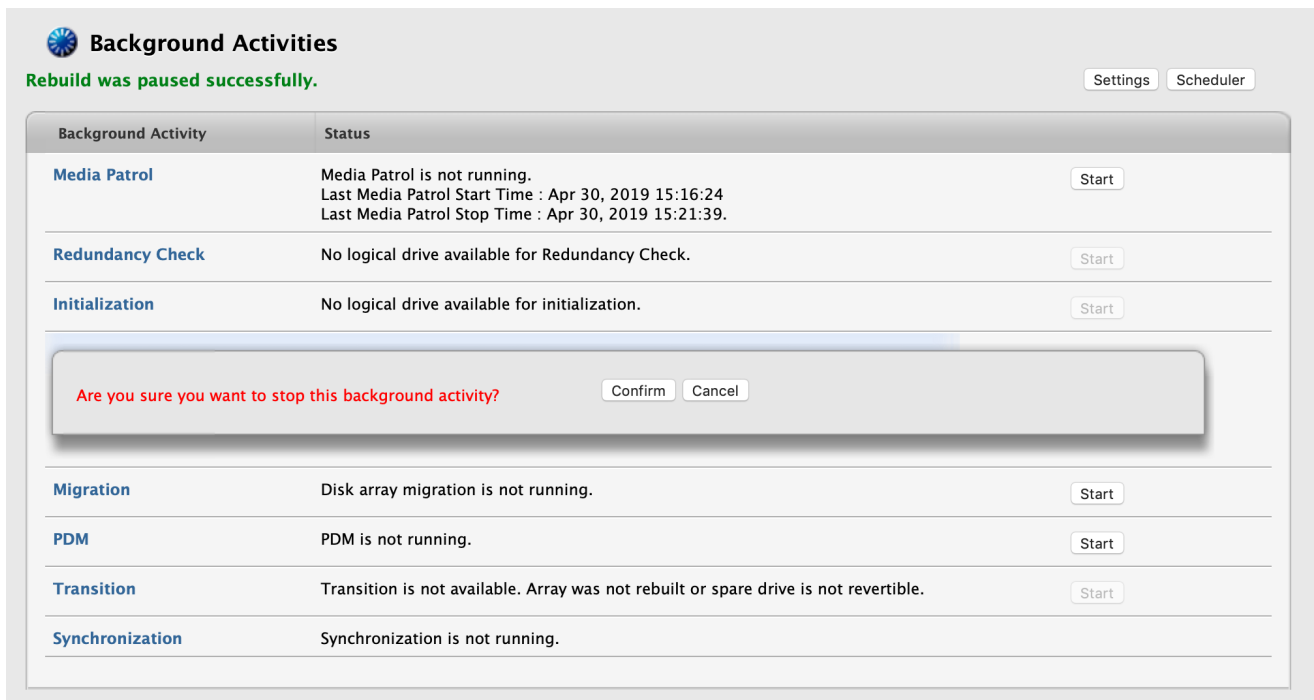
Background Activity	Status											
Media Patrol	Media Patrol is not running. Last Media Patrol Start Time : Apr 30, 2019 15:16:24 Last Media Patrol Stop Time : Apr 30, 2019 15:21:39.	Start										
Redundancy Check	No logical drive available for Redundancy Check.	Start										
Initialization	No logical drive available for initialization.	Start										
Rebuild	PD1 – Paused	Start										
	<table border="1"> <thead> <tr> <th>Target PD</th> <th>PD Progress</th> <th>Current LD Progress</th> <th>Disk Array ID</th> <th>Seq No</th> </tr> </thead> <tbody> <tr> <td>1</td> <td><div></div> 0% – Paused</td> <td>LD 0 0%</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	Target PD	PD Progress	Current LD Progress	Disk Array ID	Seq No	1	<div></div> 0% – Paused	LD 0 0%	0	0	Stop Pause Resume
Target PD	PD Progress	Current LD Progress	Disk Array ID	Seq No								
1	<div></div> 0% – Paused	LD 0 0%	0	0								
Migration	Disk array migration is not running.	Start										
PDM	PDM is not running.	Start										
Transition	Transition is not available. Array was not rebuilt or spare drive is not revertible.	Start										
Synchronization	Synchronization is not running.											

Stopping a Rebuild

To stop or cancel a Rebuild:

1. Click on the **Background Activities** icon.
2. Mouse-over Rebuild and click the **Stop** button.
3. Click the **Confirm** button.
Also see “Making Rebuild Settings” on page 104.

Stopping a disk array rebuild



The screenshot shows the 'Background Activities' window. At the top, there is a green message: 'Rebuild was paused successfully.' Below this is a table with two columns: 'Background Activity' and 'Status'. The table lists several activities: Media Patrol, Redundancy Check, Initialization, Migration, PDM, Transition, and Synchronization. Each activity has a 'Start' button. A confirmation dialog box is overlaid on the table, asking 'Are you sure you want to stop this background activity?' with 'Confirm' and 'Cancel' buttons.

Background Activity	Status
Media Patrol	Media Patrol is not running. Last Media Patrol Start Time : Apr 30, 2019 15:16:24 Last Media Patrol Stop Time : Apr 30, 2019 15:21:39.
Redundancy Check	No logical drive available for Redundancy Check.
Initialization	No logical drive available for initialization.
Migration	Disk array migration is not running.
PDM	PDM is not running.
Transition	Transition is not available. Array was not rebuilt or spare drive is not revertible.
Synchronization	Synchronization is not running.

Managing Logical Drives

Logical drive management includes:

- “Viewing a List of Logical Drives”
- “Viewing Logical Drive Information”
- “Viewing Logical Drive Statistics”
- “Making Logical Drive Settings”
- “Viewing Logical Drive Check Tables”
- “Creating a Logical Drive Manually”
- “Formatting Your Logical Drives”
- “Locating a Logical Drive”
- “Deleting a Logical Drive”
- “Initializing a Logical Drive”
- “Redundancy Check on a Logical Drive”
- “Migrating a Logical Drive”
- “Running PDM on a Logical Drive”



WARNING

If you are using utility to create or delete a disk array or logical drive, the system will reboot if Pegasus32 is running USB mode. It is important to make sure the Pegasus32 not being accessed (no IO operation in progress) before submitting the request.



Important

Up to four logical drives (including passthru drive) are supported in USB mode. Any LD beyond the 4th will be inaccessible in USB mode. However, these will be accessible in Thunderbolt™ mode.

Viewing a List of Logical Drives

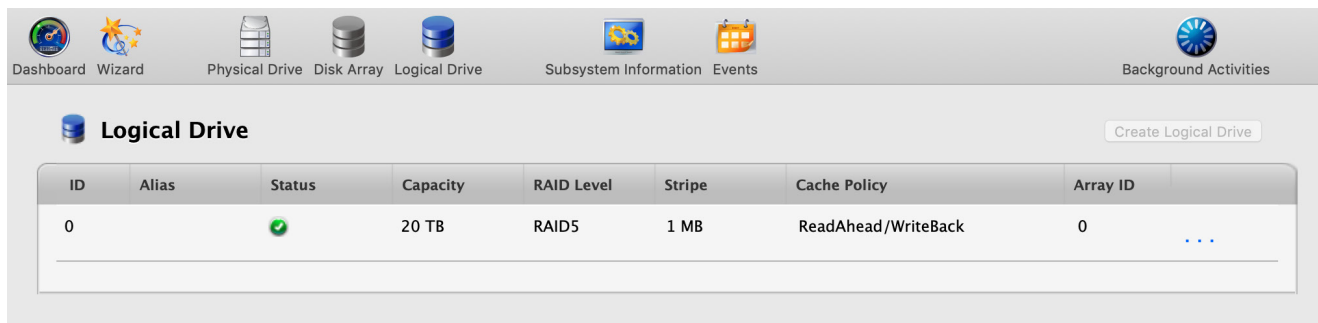
To view a list of logical drives, do one of the following actions:

- Click the **Logical Drive** icon.
- From the Storage menu, choose **Logical Drive**.


The list of logical drives appears. Logical drive information includes:

- **ID** – LD0, LD1, etc.
- **Alias** – If assigned.
- **Status** (Normal, Critical or Offline icon)
- **Capacity** – Data capacity of the logical drive.
- **RAID Level** – Set when the logical drive was created.
- **Stripe** – Set when the logical drive was created.
- **Cache Policy** – Read cache and Write cache settings.
- **Array ID** – ID number of the disk array where this logical drive was created.

Logical Drive list



The screenshot shows the Pegasus32 management interface. At the top is a navigation bar with icons for Dashboard, Wizard, Physical Drive, Disk Array, Logical Drive, Subsystem Information, Events, and Background Activities. Below the navigation bar is a section titled "Logical Drive" with a "Create Logical Drive" button. Below this is a table with the following columns: ID, Alias, Status, Capacity, RAID Level, Stripe, Cache Policy, and Array ID. The table contains one row with the following data: ID 0, Status (green checkmark icon), Capacity 20 TB, RAID Level RAID5, Stripe 1 MB, Cache Policy ReadAhead/WriteBack, and Array ID 0. There are three blue dots to the right of the Array ID column.

ID	Alias	Status	Capacity	RAID Level	Stripe	Cache Policy	Array ID
0			20 TB	RAID5	1 MB	ReadAhead/WriteBack	0

Viewing Logical Drive Information

To view logical drive information:

1. Do one of the following actions:
 - Click the **Logical Drive** icon.
 - From the Storage menu, choose **Logical Drive**. The list of logical drives appears.
2. Mouse-over the logical drive you want then click the **View** button.
3. Click the **X** icon to close the information panel.

Logical Drive Information

Logical Drive Create Logical Drive

ID	Alias	Status	Capacity	RAID Level	Stripe	Cache Policy	Array ID
Logical Drive 0							
Information							
Logical Drive ID	LD0	Alias					
Array ID	DA0	RAID Level	RAID5				
Operational Status	OK, Synchronizing	Capacity	20 TB				
Number of Axes	1	Physical Capacity	24 TB				
Number of Physical Drives	6	Stripe Size	1 MB				
Read Policy	ReadAhead	Sector Size	512 Bytes				
Write Policy	WriteBack	Current Write Policy	WriteBack				
Preferred Controller ID	N/A	Tolerable Number of Dead Drives Per Axle	1				
Synchronized	No	Parity Pace	N/A				
WWN	22c7-0001-554b-b531	RAID5&6 Algorithm	right asymmetric				
Codec Scheme	N/A	Serial No	00000000000000000000000000000006 81DD74B681DD74B				

Logical Drive information displays, including:

- **Logical Drive ID** – LD0, LD1, etc.
- **Alias** – If assigned
- **Array ID** – ID number of the disk array where this logical drive was created
- **RAID Level** – Set when the logical drive was created
- **Operational Status** – OK, Critical, or Offline
- **Capacity** – Data capacity of the logical drive
- **Number of Axes** – For RAID 10, 2 axes
- **Physical Capacity** – Data capacity of the physical drives
- **Number of Physical Drives** – The number of physical drives in the disk array
- **Stripe size** – Set at logical drive creation
- **Read Policy** – ReadCache, ReadAhead, or None *
- **Sector size** – Set at logical drive creation
- **Write Policy** – WriteThru or WriteBack *
- **Current Write Policy** – May change from WriteBack to WriteThru under certain conditions.
- **Preferred Controller ID** – Not applicable
- **Tolerable Number of Dead Drives Per Axle** – Number of physical drives that can fail without the logical drive going offline
- **Synchronized** – A new logical drive shows “No” until synchronizing is completed. See “Synchronization” on page 109
- **Parity Pace** – Pertains to some RAID levels
- **WWN** – Worldwide Number, a unique identifier assigned to this logical drive
- **RAID 5 & 6 Algorithm** – Pertains to RAID 5 and 6
- **Codec Scheme** – Pertains to some RAID levels
- **Serial No** – Serial number assigned to this logical drive

Viewing Logical Drive Statistics

To view logical drive statistics:

1. Do one of the following actions:
 - Click the **Logical Drive** icon.
 - From the Storage menu, choose **Logical Drive**. The list of logical drives appears.
2. Mouse-over the logical drive you want then click the **View** button.
3. Click the **Statistics** tab.

Logical Drive Statistics

The screenshot shows the 'Logical Drive' management interface. At the top, there's a 'Logical Drive' header with a 'Create Logical Drive' button. Below this is a table with columns: ID, Alias, Status, Capacity, RAID Level, Stripe, Cache Policy, and Array ID. A modal window titled 'Logical Drive 0' is open, showing the 'Statistics' tab. The statistics are displayed in a table with two columns.

Logical Drive 0	
Data Transferred	0Byte
Read Data Transferred	0Byte
Write Data Transferred	0Byte
Errors	0
Non-Read/Write Errors	0
Read Errors	0
Write Errors	0
I/O Request	0
Non-Read/Write I/O Request	0
Read I/O Request	0
Write I/O Request	0
Statistics Start Time	Apr 30, 2019 07:38:20
Statistics Collection Time	Apr 30, 2019 08:59:19

4. Logical Drive statistics display, including:
 - Data Transferred – In megabytes
 - Read Data Transferred – In megabytes
 - Write Data Transferred – In megabytes
 - Errors
 - Non-Read/Write Errors
 - Read Errors
 - Write Errors
 - I/O Requests
 - Non-Read/Write I/O Requests
 - Read I/O Requests
 - Write I/O Requests
 - Statistics Start Time
 - Statistics Collection Time
5. Click the **X** icon to close the statistics panel.

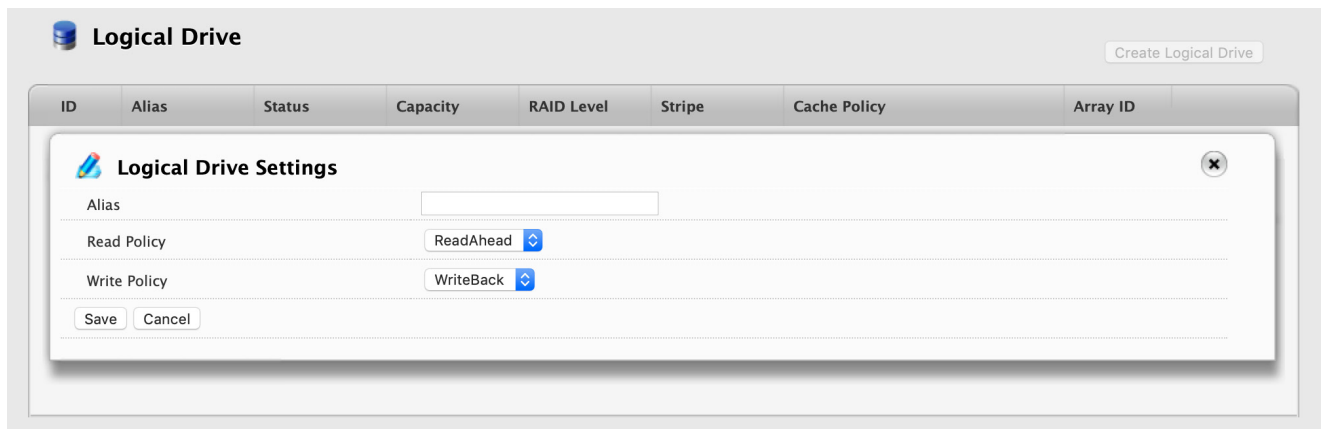
To clear the check tables, see “Clearing Statistics” on page 77.

Making Logical Drive Settings

To make logical drive settings:

1. Do one of the following actions:
 - Click the **Logical Drive** icon.
 - From the Storage menu, choose **Logical Drive**. The list of logical drives appears.
2. Mouse-over the logical drive you want then click the **Settings** button.
3. Make setting changes as required:
 - Enter, change, or delete the alias in the Alias field.
Maximum of 32 characters; letters, numbers, space between characters, and underscore.
 - Choose a Read (cache) Policy.
Read Cache, Read Ahead, and No Cache are available.
 - Choose a Write (cache) Policy.
Write Back and Write Through (Thru) are available.
4. Click the **Save** button.
For more information, see “Read Cache Policy” and “Write Cache Policy”.

Logical Drive Settings



The screenshot shows the 'Logical Drive' management interface. At the top, there's a header bar with a 'Logical Drive' icon and a 'Create Logical Drive' button. Below this is a table with columns: ID, Alias, Status, Capacity, RAID Level, Stripe, Cache Policy, and Array ID. A 'Logical Drive Settings' dialog box is open, overlaying the table. The dialog has a title bar with a close button (X). Inside, there are three fields: 'Alias' (a text input), 'Read Policy' (a dropdown menu currently showing 'ReadAhead'), and 'Write Policy' (a dropdown menu currently showing 'WriteBack'). At the bottom of the dialog are 'Save' and 'Cancel' buttons.

Viewing Logical Drive Check Tables

This feature enables you to view error tables. Use this information to evaluate the integrity of the logical drive and to determine whether corrective action is needed.

To view logical drive check tables:

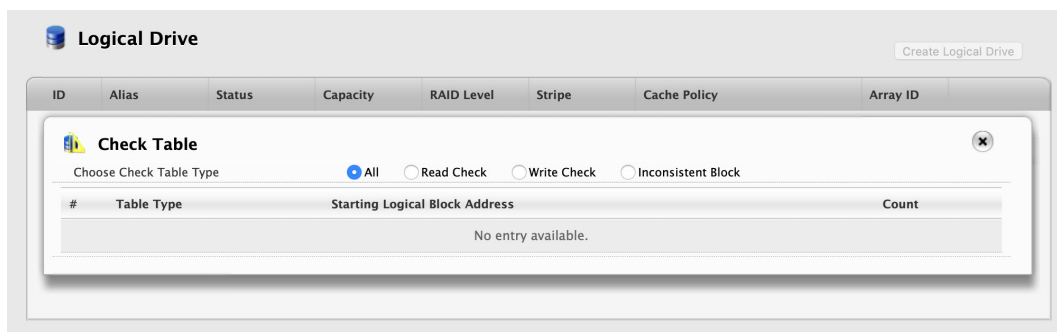
1. Do one of the following actions:
 - Click the **Logical Drive** icon.
 - From the Storage menu, choose **Logical Drive**. The list of logical drives appears.
2. Mouse-over the logical drive you want then click the **Check Table** button.
3. Choose an option:
 - **All** – All errors. The default choice.
 - **Read Check** – Read errors for this logical drive.
 - **Write Check** – Write errors for this logical drive.
 - **Inconsistent Block** – Inconsistent blocks for this logical drive. Mirror data for RAID levels 1, 1E and 10 or Parity data for RAID levels 5 and 6. Identified by the Redundancy Check.

The Check Table lists:

- **Table Type** – Read Check, Write Check or Inconsistent Block.
 - **Start Logical Block Address** – LBA of the first block for this entry.
 - **Count** – Number of errors or continuous blocks starting from this LBA.
4. Click the **X** icon to close the information panel.

To clear the check tables, see “Clearing Statistics” on page 77.

Logical Drive Check Table



Creating a Logical Drive Manually

This feature creates a logical drive only. You can also use the Wizard to create a disk array with logical drives and spare drives at the same time. See “Creating a Disk Array and Logical Drive with the Wizard” on page 128.



WARNING

If you are using utility to create or delete a disk array or logical drive, the system will reboot if Pegasus32 is running USB mode. It is important to make sure the Pegasus32 not being accessed (no IO operation in progress) before submitting the request.



Important

Up to four logical drives (including passthru drive) are supported in USB mode. Any LD beyond the 4th will be inaccessible in USB mode. However, these will be accessible in Thunderbolt™ mode.

To create a logical drive manually:

1. Do one of the following actions:
 - Click the **Logical Drive** icon.
 - From the Storage menu, choose **Logical Drive**.
2. Click the **Create Logical Drive** button.
3. Click the radio button of the disk array you want to use and click the **Next** button.

Create a Logical Drive

The screenshot shows the 'Create Logical Drive' dialog box. At the top, there is a 'Create Logical Drive' button. Below it is a table with columns: ID, Alias, Status, Capacity, RAID Level, Stripe, Cache Policy, and Array ID. The main area of the dialog is titled 'Create Logical Drive' and contains a warning message: 'Warning : To proceed this activity will need to reboot the device automatically. Please turn off any IO operation to this device.' Below the warning are several input fields: Alias (text box), RAID Level (dropdown menu set to RAID5), Capacity (text box set to 20, with a unit dropdown set to TB and a note 'Max: 20 TB'), Stripe (dropdown menu set to 1 MB), Sector (dropdown menu set to 512 Bytes), Read Policy (dropdown menu set to ReadAhead), Write Policy (dropdown menu set to WriteBack), Format (checkbox checked), and Quick Init (checkbox unchecked). There is an 'Add' button and a note 'Please add logical drives to list before submit.' On the right side, there is a 'New Logical Drives' section with a table showing RAID Level and Capacity. At the bottom right are 'Back', 'Submit', and 'Cancel' buttons.

4. Accept the defaults or make changes:

- Optional. Enter an alias in the **Alias** field.
Maximum of 32 characters; letters, numbers, space between characters, and underscore.
- Choose a **RAID level**.
The choice of RAID levels depends the number of physical drives in the disk array.
- In the Capacity field, accept the default maximum capacity or enter a lesser capacity and size in MB, GB or TB.
Any remaining capacity is available for an additional logical drive.
- Choose a Stripe size.
64 KB, 128 KB, 256 KB, 512 KB, and 1 MB are available.
- Choose a Sector size.
512 B, 1 KB, 2 KB, and 4 KB are available.
- Choose a Read (cache) Policy.
Read Cache, Read Ahead, and No Cache are available.
- Choose a Write (cache) Policy.
Write Back and Write Through (Thru) are available.
The Write Cache is always set to WriteThru when the Read Cache is set to NoCache.
- For RAID 6 logical drives, choose a Codec Scheme from the dropdown menu.
P+Q and Q+Q are available.
- If you want the Pegasus Utility to format your logical drives, leave the **Format** box checked.
See “Formatting Your Logical Drives” on page 152.

5. Click the **Add** button.

The new logical drive appears on the list at the right.

If there is capacity remaining, you can create an additional logical drive. Pegasus supports 1 to 32 logical drives in Thunderbolt mode, and up to 4 logical drives (including passthru drive) in USB mode.

6. When you are finished, click the **Submit** button.

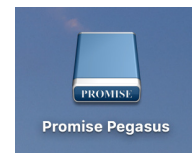
The new logical drive or drives appear in the logical drive list.

Formatting Your Logical Drives

If you left the **Format** box checked when you created your logical drives, they are formatted automatically.

If you UNchecked the **Format** box, you must format your logical drives manually. See “Formatting Your Logical Drives” on page 152.

When the Pegasus Utility has finished the format operation, new removable-drive icons, each representing one logical drive, appear on your desktop (right).



When you see the icon, your logical drive is ready to use. Your logical drives are ready to use.

Locating a Logical Drive

This feature causes the drive carrier LEDs to flash for one minute to assist you in locating the physical drives that make up this logical drive.

To locate a logical drive:

1. Click the **Storage** tab.
2. Click the **Logical Drive** icon.
The list of logical drives appears.
3. Mouse-over the logical drive you want then click the **Locate** button.
The Drive Power/Status LEDs for the physical drives that make up the logical drive blink blue and orange for one minute.

Running the Locate function to identify a disk array

Drive Power/Status LEDs blink blue and orange



Deleting a Logical Drive



CAUTION

When you delete a logical drive, all the data on the logical drive is lost. Back up any important data before deleting a logical drive.

This action requires Administrator or Super User privileges.



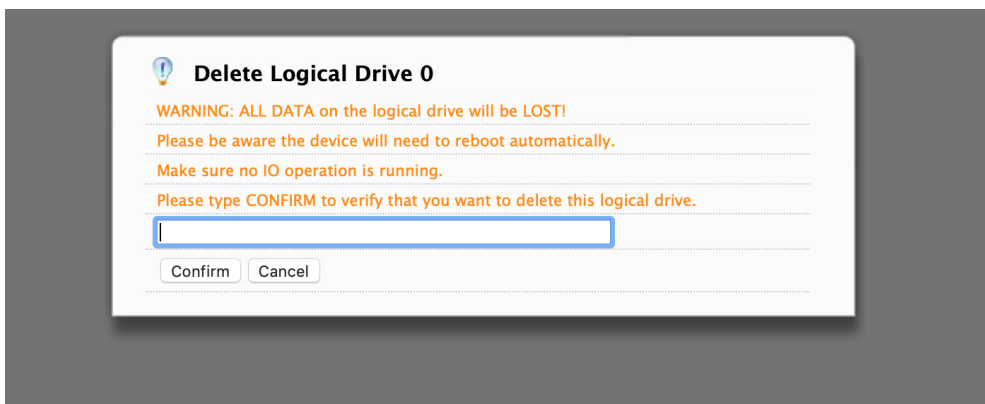
WARNING

If you are using utility to create or delete a disk array or logical drive, the system will reboot if Pegasus32 is running USB mode. It is important to make sure the Pegasus32 not being accessed (no IO operation in progress) before submitting the request.

To delete a logical drive:

1. Do one of the following actions:
 - Click the **Logical Drive** icon.
 - From the Storage menu, choose **Logical Drive**. The list of logical drives appears.
2. Mouse-over the logical drive you want then click the **Delete** button.
3. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Delete a Logical Drive



Initializing a Logical Drive

Initialization is normally done to logical drives after they are created from a disk array.



CAUTION

When you initialize a logical drive, all the data on the logical drive is lost. Backup any important data before you initialize a logical drive.

To initialize a logical drive:

1. Click on the **Background Activities** icon.
The list of background activities appears.
2. Mouse-over Initialization and click the **Start** button.
3. Check the box to the left of the logical drive you want to initialize.
4. Choose the initialization option you want:
 - **Quick Initialization** – Check the box and enter a value in the Quick Initialization Size field. This value is the size of the initialization blocks in MB.
 - **Full Initialization** – Do not check the box. Enter a hexadecimal value in the Initialization Pattern in Hex field or use the default 00000000 value.
5. Click the **Confirm** button.
6. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Logical Drive Initialization

The screenshot shows the 'Background Activities' window with a table of activities. The 'Initialization' dialog box is open, showing options for 'Logical Drive' and 'Quick Initialization'. The 'LD 0:RAIDS' logical drive is selected, and the 'Quick Initialization' checkbox is checked. The 'Quick Initialization Size' is set to 64 MB, and the 'Initialization Pattern in Hex' is set to 00000000. The 'Confirm' button is highlighted.

Background Activity	Status	Action
Media Patrol	Media Patrol is not running. Last Media Patrol Start Time : Apr 30, 2019 15:16:24 Last Media Patrol Stop Time : Apr 30, 2019 15:21:39.	Start
Redundancy Check	No logical drive available for Redundancy Check.	Start

Initialization

<input type="checkbox"/> Logical Drive	<input checked="" type="checkbox"/> Quick Initialization	Quick Initialization Size [1-1024]	Initialization Pattern in Hex
<input checked="" type="checkbox"/> LD 0:RAIDS	<input type="checkbox"/>	64 MB	00000000

Confirm Cancel

Pausing and Resuming an Initialization

To pause or resume Initialization:

1. Click on the **Background Activities** icon.
The list of background activities appears.
2. Mouse-over Initialization and click the **Pause** or **Resume** button.

Pause/Resume Initialization

The screenshot shows the 'Background Activities' window with a title bar and a green status message 'Initialization was paused.' in the top left. In the top right, there are 'Settings' and 'Scheduler' buttons. The main area contains a table with two columns: 'Background Activity' and 'Status'. The table lists three activities: 'Media Patrol', 'Redundancy Check', and 'Initialization'. The 'Initialization' row is highlighted in blue and shows 'LD0 - Paused' in the status column. Below the table, there is a detailed view for the 'Initialization' activity, showing a table with 'ID' and 'Progress Status' columns. The 'ID' is '0' and the 'Progress Status' is '0% - Paused'. At the bottom right of this detailed view, there are 'Stop', 'Pause', and 'Resume' buttons.

Background Activity	Status
Media Patrol	Media Patrol is not running. Last Media Patrol Start Time : Apr 30, 2019 15:16:24 Last Media Patrol Stop Time : Apr 30, 2019 15:21:39.
Redundancy Check	No logical drive available for Redundancy Check.
Initialization	LD0 - Paused

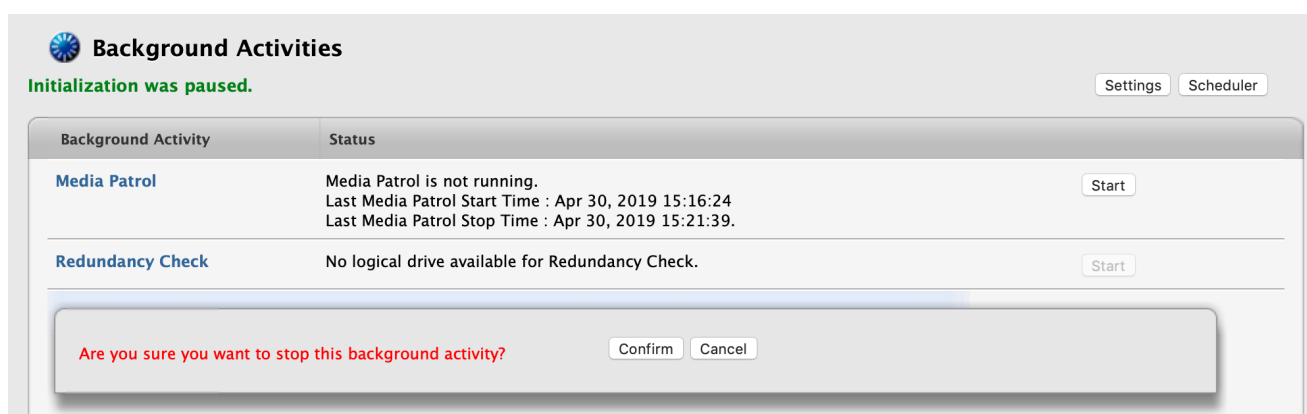
ID	Progress Status
0	0% - Paused

Stopping an Initialization

To stop means to cancel an Initialization:

1. Click on the **Background Activities icon**.
The list of background activities appears.
2. Mouse-over Initialization and click the **Stop** button.
3. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Stop Initialization



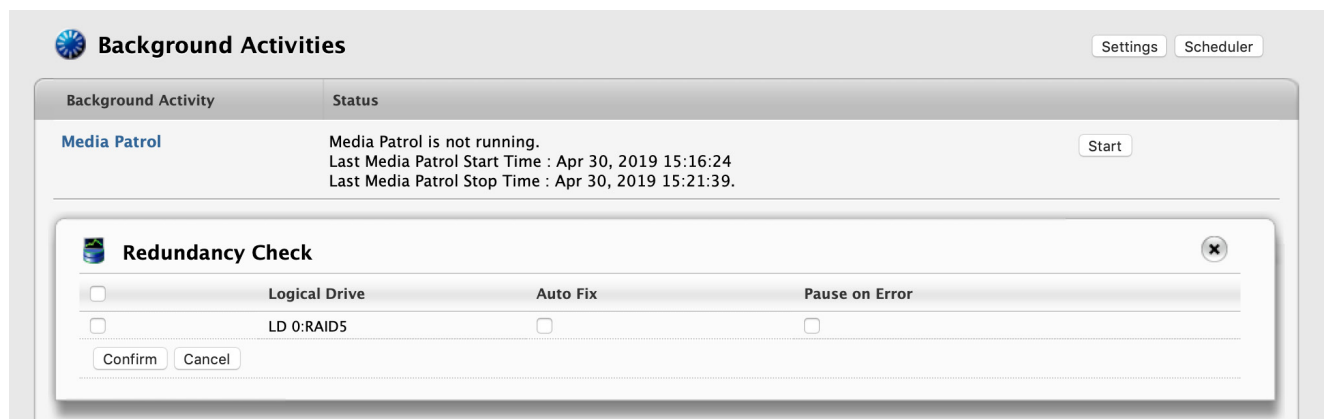
Redundancy Check on a Logical Drive

Redundancy Check is a routine maintenance procedure for fault-tolerant disk arrays (those with redundancy) that ensures all the data matches exactly. Redundancy Check can also correct inconsistencies.

To run Redundancy Check on a logical drive:

1. Click on the **Background Activities** icon.
The list of background activities appears.
2. Mouse-over Redundancy Check and click the **Start** button.
3. Check the boxes to the left of the logical drives on which to run Redundancy Check.
4. Check the options you want:
 - **Auto Fix** – Attempts to repair the problem when it finds an error
 - **Pause on Error** – The process stops when it finds a non-repairable error
5. Click the **Confirm** button.

Redundancy Check



Pausing and Resuming a Redundancy Check

To pause or resume a Redundancy Check:

1. Click on the **Background Activities icon**.
The list of background activities appears.
2. Mouse-over Redundancy Check and click the **Pause** or **Resume** button.

Pause/Resume Redundancy Check

The screenshot shows the 'Background Activities' window. At the top, a green message states 'Redundancy Check was paused.' There are 'Settings' and 'Scheduler' buttons in the top right. The main area is a table with two columns: 'Background Activity' and 'Status'. The 'Redundancy Check' row is highlighted in blue and shows 'LD0 - Paused'. Below this, a progress bar for ID 0 is shown at 23% with the text '23% - Paused'. To the right of the progress bar are 'Stop', 'Pause', and 'Resume' buttons. Other activities listed include 'Media Patrol', 'Initialization', 'Rebuild', 'Migration', 'PDM', 'Transition', and 'Synchronization', each with a 'Start' button.

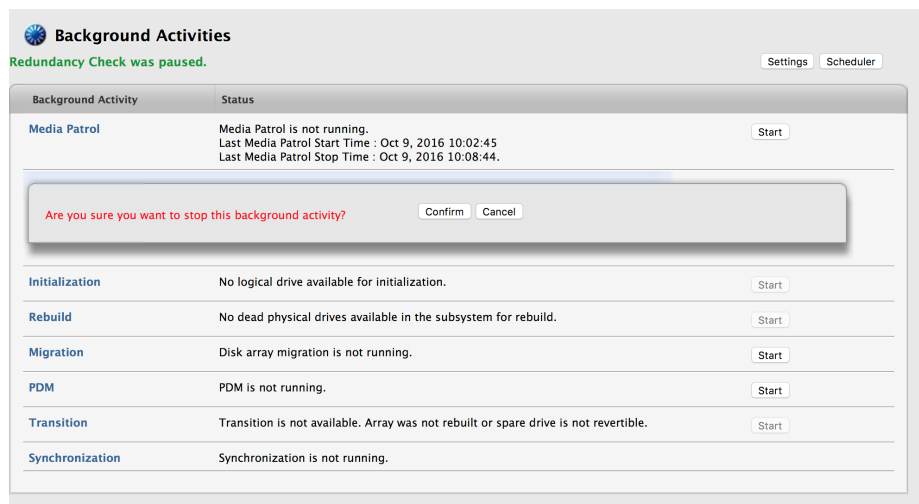
Background Activity	Status				
Media Patrol	Media Patrol is not running. Last Media Patrol Start Time : Oct 9, 2016 10:02:45 Last Media Patrol Stop Time : Oct 9, 2016 10:08:44. Start				
Redundancy Check	LD0 - Paused <table border="1"><thead><tr><th>ID</th><th>Progress Status</th></tr></thead><tbody><tr><td>0</td><td><div><div></div></div> 23% - Paused</td></tr></tbody></table> Start Stop Pause Resume	ID	Progress Status	0	<div><div></div></div> 23% - Paused
ID	Progress Status				
0	<div><div></div></div> 23% - Paused				
Initialization	No logical drive available for initialization. Start				
Rebuild	No dead physical drives available in the subsystem for rebuild. Start				
Migration	Disk array migration is not running. Start				
PDM	PDM is not running. Start				
Transition	Transition is not available. Array was not rebuilt or spare drive is not revertible. Start				
Synchronization	Synchronization is not running.				

Stopping a Redundancy Check

To stop is to cancel the Redundancy Check:

1. Click on the **Background Activities icon**.
The list of background activities appears.
2. Mouse-over Redundancy Check and click the **Stop** button.
3. Click the **Confirm** button.

Stop Redundancy Check



Migrating a Logical Drive

The term “Migration” means either or both of the following:

- Change the RAID level of a logical drive.
- Expand the storage capacity of a logical drive.

Before you begin a migration, examine your current disk array to determine whether:

- The physical drives in your array can support the target RAID level.
- There is sufficient capacity to accommodate the target logical drive size.

If you need to add physical drives to your array, be sure there are unassigned physical drives are installed in your RAID system before you begin migration.

See “RAID Levels” on page 206, and “Accessing the Pegasus software utility” on page 64 and “RAID Level Migration” on page 216.



WARNING

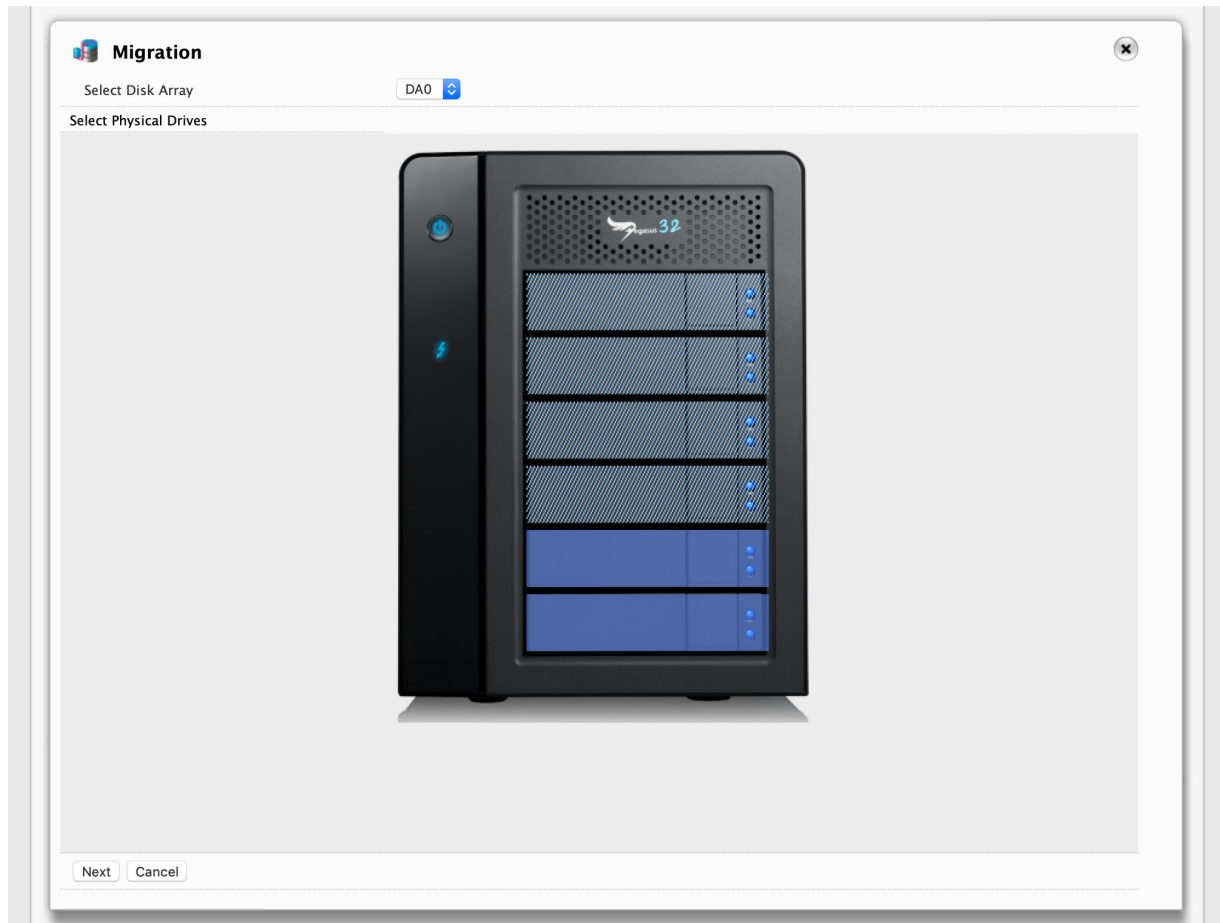
When migration is completed, the system will reboot if it is running in USB mode. It is important to make sure the Pegasus32 not being accessed (no IO operation in progress) before migrating the logical drive.



WARNING

In USB mode, if Utility is NOT “executing”, when migration is completed, power off the host system completely, then power on the host system again, i.e. run a complete power cycle for the host system; do not simply restart the host device. This must be done in order to update the disk configuration for OS.

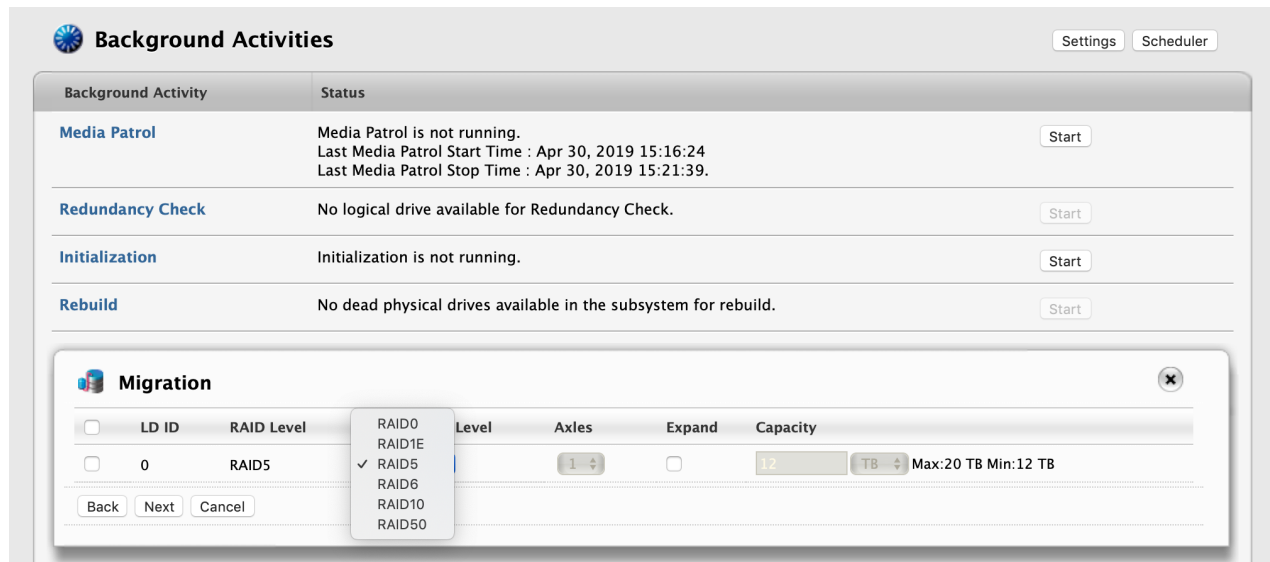
Migration



To migrate a logical drive:

1. Click on the **Background Activities** icon.
The list of background activities appears.
2. Mouse-over Migrate and click the **Start** button.
3. In the **Select Disk Array** dropdown menu, choose the source disk array.
4. In the **Select Physical Drives** diagram, click the drives to add them to your array.
The ID numbers of the chosen drives appear in the field below the diagram.
5. Click the **Next** button.
6. Check the box next to the logical drive you want to modify.
7. From the dropdown menu, choose a **target RAID level**.
The choice of RAID levels depends the number of physical drives in the disk array. See the Note below.

Migration - choose RAID



8. In the **Capacity** field, accept the current capacity.
Or check the **Expand Capacity** box and enter a greater capacity and size in MB, GB or TB.
If there is capacity remaining, you can create an additional logical drive.
9. Click the **Next** button.
The logical drive ID numbers, with the original and target RAID levels and capacities are shown
10. To accept the proposed target values, type "Confirm" and click the **Confirm** button.

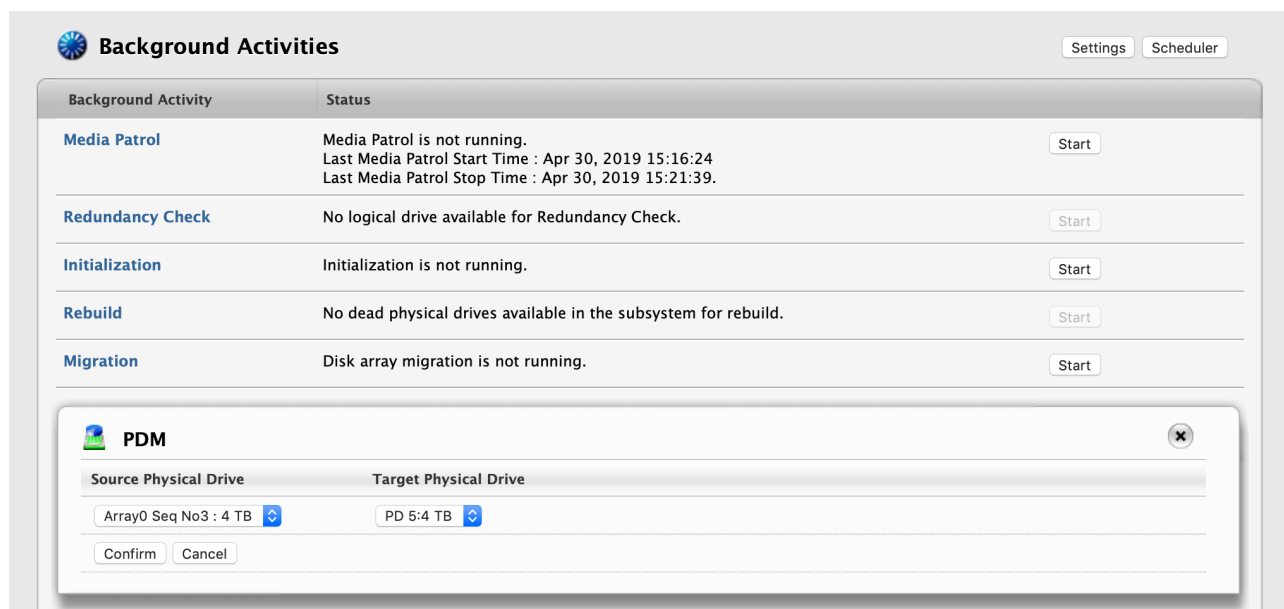
Running PDM on a Logical Drive

Predictive Data Migration (PDM) is the migration of data from the suspect disk drive to a spare drive, similar to rebuilding a disk array. But unlike rebuilding, PDM automatically copies your data to a spare drive *before* the drive fails and your logical drive goes Critical.

PDM can be triggered automatically by Media Patrol. See “PDM” on page 107. To run PDM on a logical drive:

1. Click on the **Background Activities** icon.
The list of background activities appears.
2. Mouse-over PDM and click the **Start** button.
3. Choose a Source Physical Drive.
The Source Physical Drive is the drive suspected of possible failure. Source Physical Drives are identified by the disk array number and their sequence number in the disk array.
4. Choose a Target Physical Drive.
The Target Physical Drive is the replacement drive.
Target physical drives are identified by their physical drive ID number.
5. Click the **Confirm** button.

Run PDM



Pausing and Resuming PDM


To pause or resume PDM:

1. Click on the **Background Activities** icon.

The list of background activities appears.

2. Mouse-over PDM and click the **Pause** or **Resume** button.

Pause/Resume PDM


Background Activities

PDM was paused successfully.
Settings
Scheduler

Background Activity	Status	
Media Patrol	Media Patrol is not running. Last Media Patrol Start Time : Apr 30, 2019 15:16:24 Last Media Patrol Stop Time : Apr 30, 2019 15:21:39.	Start
Redundancy Check	No logical drive available for Redundancy Check.	Start
Initialization	Initialization is not running.	Start
Rebuild	No dead physical drives available in the subsystem for rebuild.	Start
Migration	Disk array migration is not running.	Start
PDM	PD5 - Paused	Start
Target PD	PD Progress	Current LD Progress
5	<div> <div></div> 0% - Paused </div>	LD 0 0%
		Disk Array ID
		0
		Seq No
		3
		Stop Pause Resume

Stopping PDM

To stop is to cancel PDM:

1. Click on the **Background Activities icon**.
The list of background activities appears.
2. Mouse-over PDM and click the **Stop** button.
3. Click the **Confirm** button.

Pause/Resume PDM

The screenshot shows a window titled "Background Activities" with a gear icon. A green message at the top states "PDM was paused successfully." To the right of this message are two buttons: "Settings" and "Scheduler". Below the message is a table with two columns: "Background Activity" and "Status".

Background Activity	Status
Media Patrol	Media Patrol is not running. Last Media Patrol Start Time : Apr 30, 2019 15:16:24 Last Media Patrol Stop Time : Apr 30, 2019 15:21:39.
Redundancy Check	No logical drive available for Redundancy Check.
Initialization	Initialization is not running.
Rebuild	No dead physical drives available in the subsystem for rebuild.
Migration	Disk array migration is not running.

Each row in the table has a "Start" button on the right. At the bottom of the window, there is a confirmation dialog box with the text "Are you sure you want to stop this background activity?" and two buttons: "Confirm" and "Cancel".

Managing Spare Drives

Spare drive management includes:

- “Viewing a List of Spare Drives”
- “Viewing Spare Drive Information”
- “Creating a Spare Drive Manually”
- “Making Spare Drive Settings”
- “Running Spare Check”
- “Deleting a Spare Drive”
- “Running a Transition”

Viewing a List of Spare Drives

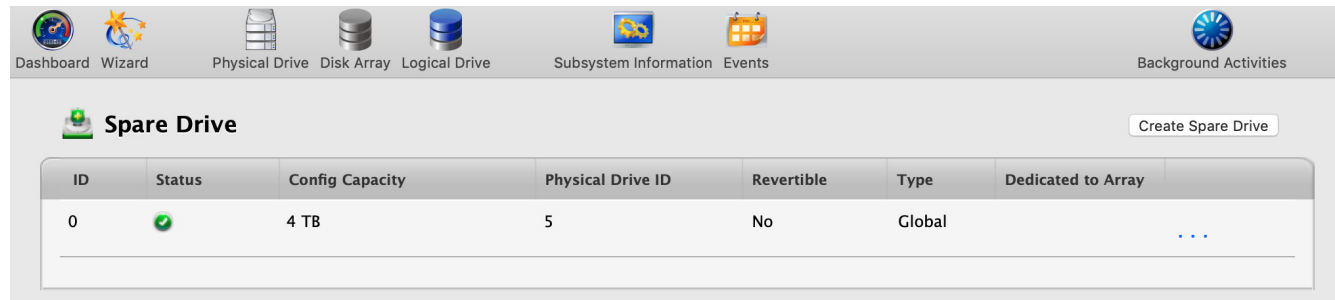
To view a list of spare drives, do one of the following actions:

- From the Dashboard window, click the **Spare Drive** link.
- From the Storage menu, choose **Spare Drive**.


Spare Drive information displays, including:

- **ID** – Spare0, Spare1, etc.
- **Status** (Normal, Rebuilding or Failed/missing icon)
- **Configurable Capacity** – Usable capacity of the spare drive
- **Physical Drive ID** – ID number of the physical drive chosen for this spare
- **Revertible** – Yes or No
- **Spare Type** – Global or Dedicated
- **Dedicated to Array** – ID number of the disk array to which the spare is dedicated

List of Spare Drives



Spare Drive Create Spare Drive

ID	Status	Config Capacity	Physical Drive ID	Revertible	Type	Dedicated to Array
0		4 TB	5	No	Global	...

Viewing Spare Drive Information

To view spare drive information:

- Do one of the following actions:
 - From the Dashboard window, click the **Spare Drive** link.
 - From the Storage menu, choose **Spare Drive**. The list of spare drives appears.
- Mouse-over the spare drive you want then click the **View** button.

Spare Drive information displays, including:

- Spare Drive ID** – Spare0, Spare1, etc.
- Physical Drive ID** – ID number of the physical drive chosen for this spare
- Location** – Enclosure number and slot number
- Model Number** – Make and model of the physical drive
- Operational Status** – OK, Rebuilding, Failed or Missing
- Spare Type** – Global or Dedicated *
- Physical Capacity** – Total data capacity of the spare drive
- Revertible** – Yes or No *
- Configurable Capacity** – Usable capacity of the spare drive
- Spare Check Status** – Not Checked or Healthy
- Media Patrol** – Enabled or Not Enabled *
- Dedicated to Array** – ID number of the disk array to which the spare is dedicated *

Items with an asterisk (*) are adjustable under “Making Spare Drive Settings” on page 171.

For Spare Check, see “Running Spare Check” on page 172.

- Click the **X** icon to close the information panel.

Spare Drive information

Spare Drive Create Spare Drive

ID	Status	Config Capacity	Physical Drive ID	Revertible	Type	Dedicated to Array
Spare Drive 0 X						
Spare Drive ID	Spare 0	Physical Drive ID	PD 5			
Location	Encl1 Slot5	Model Number	TOSHIBA MD04ACA4			
Operational Status	OK	Spare Type	Global			
Physical Capacity	4 TB	Revertible	No			
Configurable Capacity	4 TB	Spare Check Status	Not Checked			
Media Patrol	Enabled	Dedicated to Array				

Creating a Spare Drive Manually

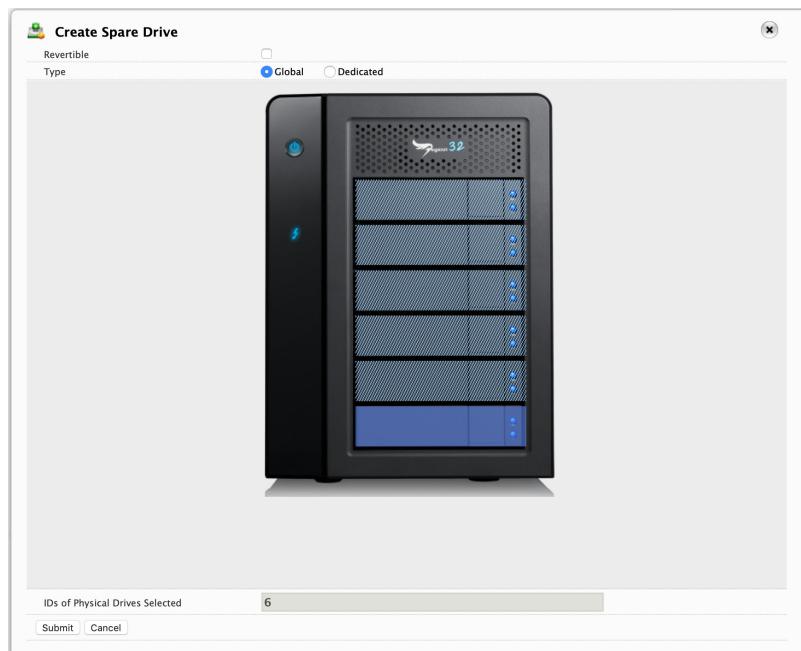
This feature creates a spare drive only. You can also use the Wizard to create a disk array with logical drives and spare drives at the same time.

For more information on settings options, see “Spare Drives” on page 226.

To create a spare drive:

1. From the Dashboard window, click the **Spare Drive** link.
2. Click the **Create Spare Drive** button.

Create Spare Drive - Choose physical drive



3. For each of the following items, accept the default or change the settings as required:
 - Check the **Reversible** box if you want a revertible spare drive. A revertible spare drive returns to its spare drive assignment after you replace the failed physical drive in the disk array and run the Transition function.
 - **Type** (choose spare type)
 - **Global** – Can be used by any disk array
 - **Dedicated** to a disk array. Click the radio button next to the disk array to which this spare drive is dedicated.
 - **Media Type** If you have more than one type of physical drive installed (SSD and HDD for example) choose the type of drive for the spare.

Create Spare Drive - Summary

ID	Status	Config Capacity	Physical Drive ID	Revertible	Type	Dedicated to Array
0		4 TB	5	No	Global	...

Create Spare Drive

Spare drive was created successfully.

Spare ID	1
IDs of Physical Drives Selected	6
Spare Type	Global
Revertible	No
Enable Media Patrol	Yes

Finish Create More

4. In the **Create Spare Drive** diagram, click a drive to choose it for your spare.
The drive carrier turns blue when you click it. The physical drive's ID number appears in the field below the diagram.
5. Click the **Submit** button to continue.
If you are done creating spare drives, click the **Finish** button. To create another spare drive, click the **Create More** button.

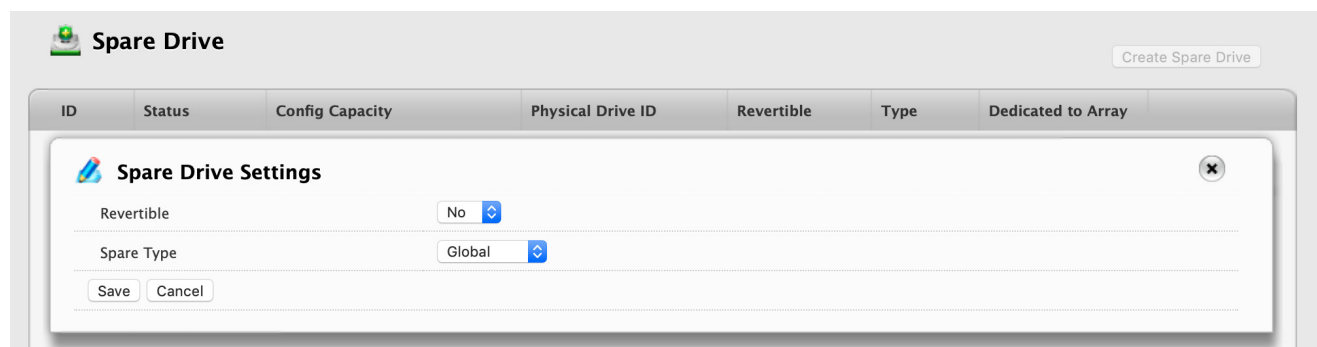
Making Spare Drive Settings

For more information on settings options, see “Spare Drives” on page 226.

To make spare drive settings:

1. From the Dashboard window, click the **Spare Drive** link.
The list of spare drives appears.
2. Mouse-over the spare drive you want then click the **Settings** button.
3. Accept the default or change the settings as required:
 - In the **Revertible** dropdown menu, choose Yes or No.
 - In the **Spare Type** dropdown menu, choose **Global** or **Dedicated**.
 - If you use chose a Dedicated spare, check the box beside the disk array to which this spare drive is assigned.
4. Click the **Save** button.

Spare Drive Settings



The screenshot shows the 'Spare Drive' management interface. At the top, there's a 'Spare Drive' header with a 'Create Spare Drive' button. Below it is a table with columns: ID, Status, Config Capacity, Physical Drive ID, Revertible, Type, and Dedicated to Array. A 'Spare Drive Settings' dialog box is open, showing 'Revertible' set to 'No' and 'Spare Type' set to 'Global'. The dialog has 'Save' and 'Cancel' buttons at the bottom.

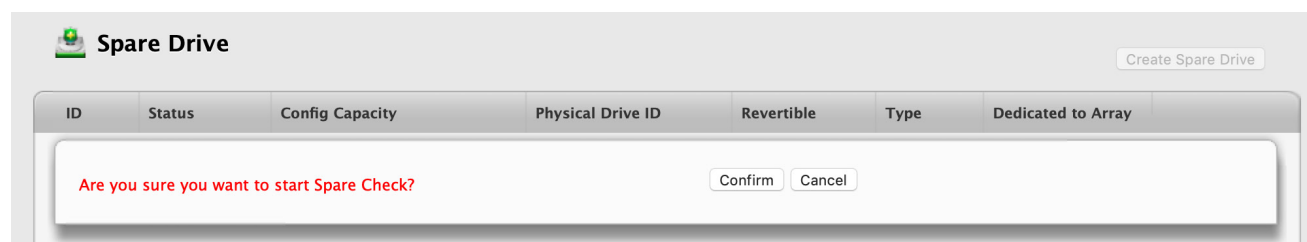
Running Spare Check

Spare Check verifies the status of your spare drives. To run spare check:

1. From the Dashboard window, click the **Spare Drive** link.
The list of spare drives appears.
2. Mouse-over the spare drive you want then click the Spare Check button.
3. Click the **Confirm** button.
Spare Check has no pause, resume or stop functions. When the Spare Check is completed, it adds *Healthy* next to Spare Check Status on the Spare Drive information box.

After the “Spare Check completed” message appears, click the **View** button to see Spare Check Status.

Run a Spare Check



Deleting a Spare Drive

This action requires Administrator or a Super User privileges. To delete a spare drive:

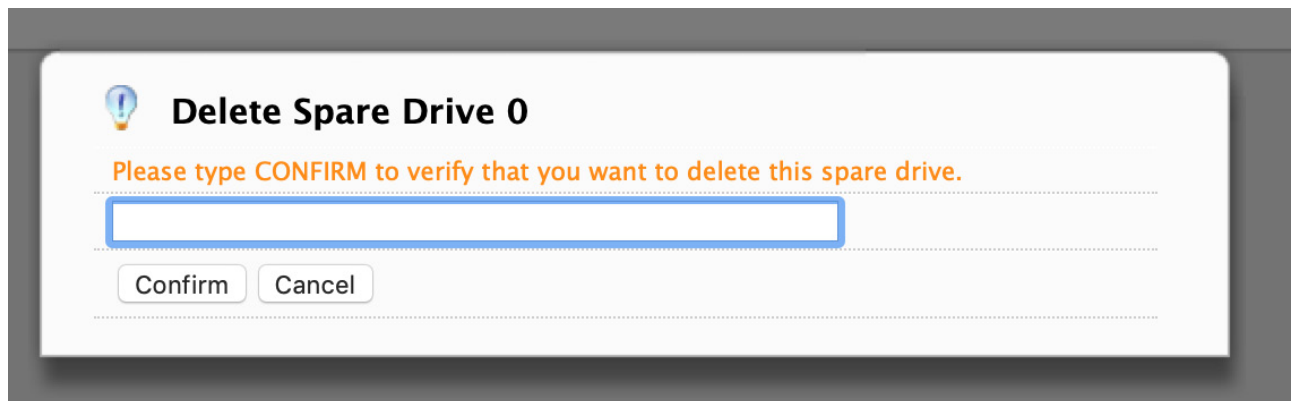
1. From the Dashboard window, click the **Spare Drive** link.
The list of spare drives appears.
2. Mouse-over the spare drive you want then click the **Delete** button.
3. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Running a Transition on a Spare Drive

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare. You must specify an unconfigured physical drive of the same or larger capacity and same media type as the revertible spare drive.

Also see “Transition” on page 108 and “Transition” on page 227.

Delete Spare Drive



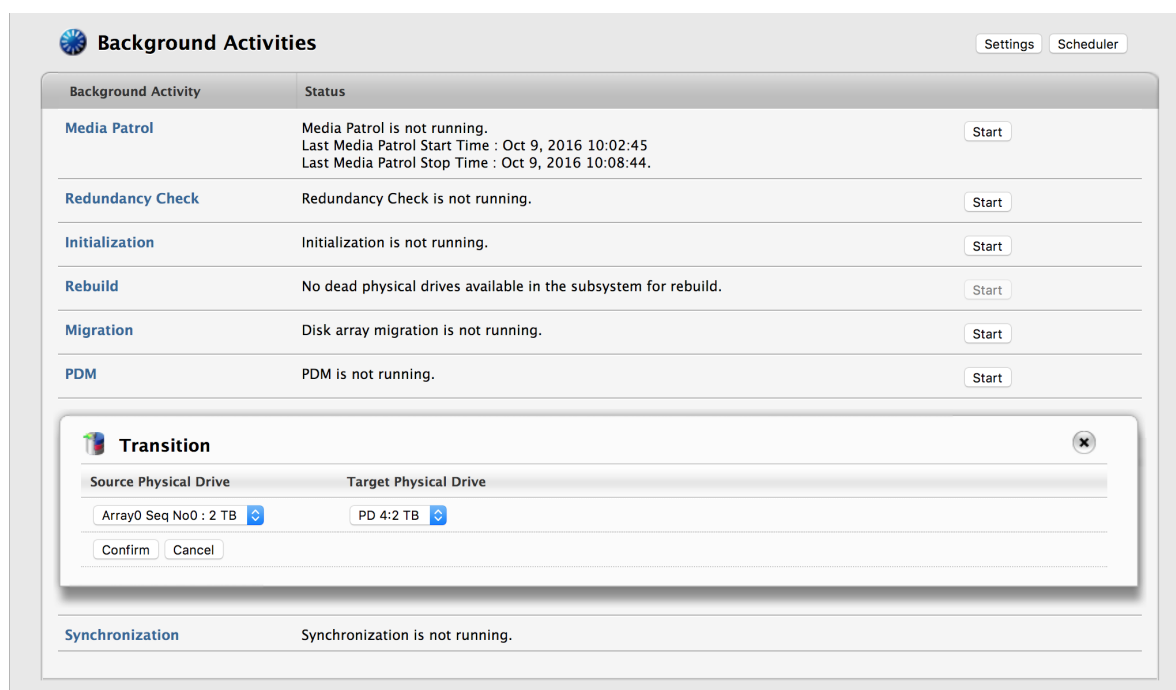
The screenshot shows a confirmation dialog box titled "Delete Spare Drive 0". It features a lightbulb icon on the left. The main text reads: "Please type CONFIRM to verify that you want to delete this spare drive." Below this text is a text input field with a blue border. At the bottom of the dialog are two buttons: "Confirm" and "Cancel".

Running a Transition

To run a transition on a revertible spare drive:

1. Click on the **Background Activities** icon.
The list of background activities appears.
2. Mouse-over Transition and click the **Start** button.
3. Choose a Source Physical Drive.
The Source Physical Drive is the revertible spare drive that is now part of the disk array.
Source Physical Drives are identified by the disk array number and their sequence number in the disk array.
4. Choose a Target Physical Drive.
The Target Physical Drive is the drive that replaces the revertible spare. Target physical drives are identified by their physical drive ID number.
5. Click the **Confirm** button.

Running a Transition




Pausing and Resuming a Transition

To pause or resume Transition:

1. Click on the **Background Activities** icon.
The list of background activities appears.
2. Mouse-over Transition and click the **Pause** or **Resume** button.

Pausing/Resuming a Transition


Background Activities

Transition was paused successfully.

Settings Scheduler

Background Activity	Status											
Media Patrol	Media Patrol is not running. Last Media Patrol Start Time : Oct 9, 2016 10:02:45 Last Media Patrol Stop Time : Oct 9, 2016 10:08:44.	Start										
Redundancy Check	Redundancy Check is not running.	Start										
Initialization	Initialization is not running.	Start										
Rebuild	No dead physical drives available in the subsystem for rebuild.	Start										
Migration	Disk array migration is not running.	Start										
PDM	PDM is not running.	Start										
Transition	PD4 - Paused	Start										
<table> <thead> <tr> <th>Target PD</th> <th>PD Progress</th> <th>Current LD Progress</th> <th>Disk Array ID</th> <th>Seq No</th> </tr> </thead> <tbody> <tr> <td>4</td> <td> <div> <div></div> 14% - Paused </div> </td> <td>LD 0 14%</td> <td>0</td> <td>0</td> </tr> </tbody> </table>	Target PD	PD Progress	Current LD Progress	Disk Array ID	Seq No	4	<div> <div></div> 14% - Paused </div>	LD 0 14%	0	0		<div> <div>Stop</div> <div>Pause</div> <div>Resume</div> </div>
Target PD	PD Progress	Current LD Progress	Disk Array ID	Seq No								
4	<div> <div></div> 14% - Paused </div>	LD 0 14%	0	0								
Synchronization	Synchronization is not running.											

Stopping, Pausing or Resuming a Transition

To stop is to cancel a Transition:

1. Click on the **Background Activities icon**.
The list of background activities appears.
2. Mouse-over Transition and click the **Stop** button.
3. Click the **Confirm** button

Stopping a Transition

The screenshot shows the 'Background Activities' window. At the top, there is a green message: 'Transition was paused successfully.' To the right of this message are two buttons: 'Settings' and 'Scheduler'. Below the message is a table with two columns: 'Background Activity' and 'Status'. The table lists several activities: Media Patrol, Redundancy Check, Initialization, Rebuild, Migration, and PDM. Each activity has a 'Start' button next to its status. A confirmation dialog box is overlaid on the table, asking 'Are you sure you want to stop this background activity?' with 'Confirm' and 'Cancel' buttons.

Background Activity	Status
Media Patrol	Media Patrol is not running. Last Media Patrol Start Time : Oct 9, 2016 10:02:45 Last Media Patrol Stop Time : Oct 9, 2016 10:08:44. Start
Redundancy Check	Redundancy Check is not running. Start
Initialization	Initialization is not running. Start
Rebuild	No dead physical drives available in the subsystem for rebuild. Start
Migration	Disk array migration is not running. Start
PDM	PDM is not running. Start
Synchronization	Synchronization is not running.

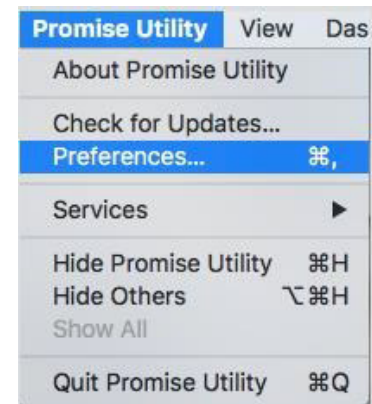
Setting Up Email Notifications

You can use email notifications to receive alerts about events such as a drive error or drive failure on the Pegasus32, so that you can take corrective action.

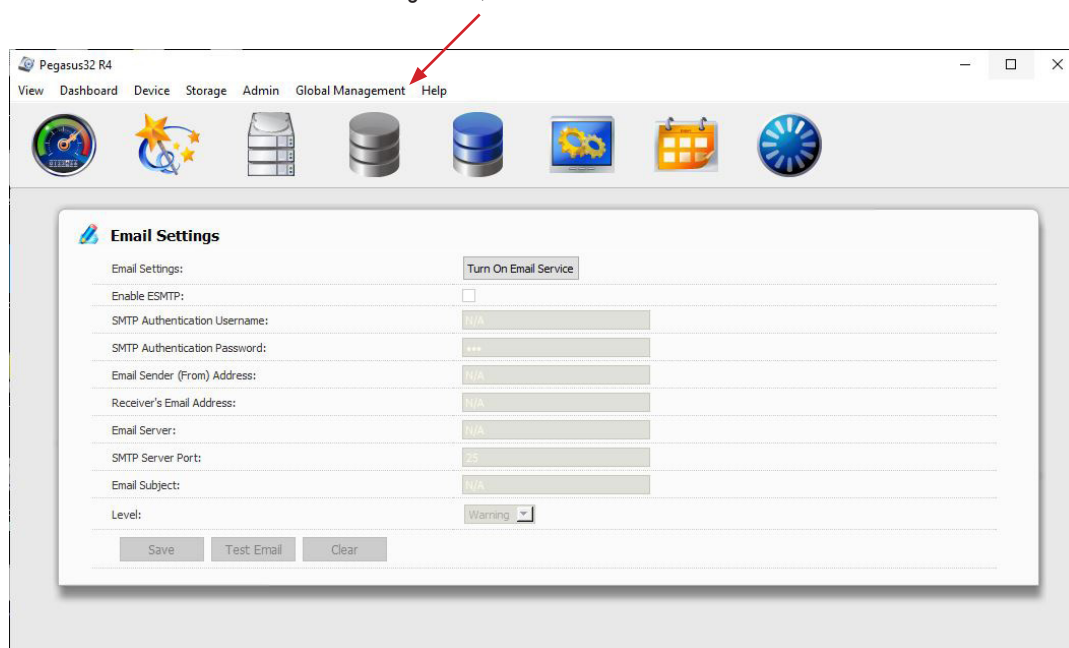
To setup Email notification settings:

1. In Mac, click on **Promise Utility** in the top menu bar and select **Preferences**, click on the **Email** menu tab.
In Windows, click on Global Management in the Pegasus Utility, and select **Service**.
2. For Mac, click the padlock icon to the menu so you can make settings changes. You need to enter the administrator user name and password to change settings.

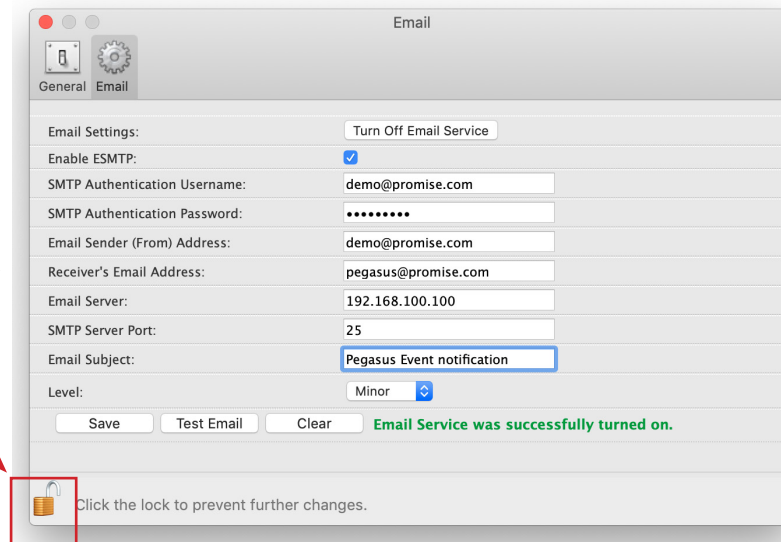
Note that you need to click the padlock icon even if it is unlocked when the Preferences menu appears.



In Windows Pegasus Utility, click Global Management, and select Service.



In Mac, click padlock icon to make changes, then enter administrator user name and password



3. Click on **Turn On Email Service**.
4. Click to **Enable ESMTP** based on your own Email service environment.
Typically ESMTP should be enabled for most users. You can test the email notification to see if it works with ESMTP enabled. If it does not work, try disabling ESMTP and testing it again.
5. If ESMTP is enabled, enter your email account user name in the **SMTP Authentication Username** entry field, and enter your email account password in the **SMTP Authentication Password** entry field. Again, this is only needed if you have ESMTP enabled (See step 4).



Note

If you are using a public email server, such as Google Gmail or Yahoo mail, for the Email Sender address, you might not be able to receive the Pegasus Event Email Notification. Instead, you will receive an **email server blocking notification**. This is because the email server security mechanism does not allow the Pegasus to sign in. It will be necessary to change the security settings on the account in order to allow the Pegasus to sign in and send notification emails. Consult the security settings instructions of your email service to lower the security level if you want to use this public email service for notifications. Use the Test Email button to test the email notifications after making the changes.

6. Enter the email address used for the sender's address in **Email Sender (From) Address**.
7. Enter the email address to receive the email notification in **Receiver's Email Address**.
8. The default value in **SMTP Server Port** is 25, change this only if your company uses a different port for SMTP.
9. Enter the subject text used for the notification emails in **Email Subject**.
10. Use the **Level** dropdown menu In Level to select the event urgency level of the notifications to be sent. Note that your choice of notification urgency level effects how frequently an email notification will be sent. For example, if you choose *Warning*, you will receive many emails which are not urgent. It is recommended to use the *Major* level to alert of significant events that might effect performance or device health so that *Critical* or *Fatal* events might be avoided.
11. Click **Save** to save the settings.
12. It is recommended to run a test of the settings to make sure you are able to receive notifications. Click **Test Email** to send test email to the receiver. If the test email is received, you do not need to change any settings. If an email is not received, check the settings again to make sure they were correctly typed. Also try disabling ESMTP and test the email notifications settings again.

To clear the settings entered in the menu, click the **Clear** button.

TROUBLESHOOTING

This chapter deals problems you might encounter with your Pegasus unit and how to resolve them.

- “” (below)
- “Checking LEDs”
- “Pegasus Utility”
- “Viewing the Event Logs”
- “Physical Drive Problems”
- “Disk Array and Logical Drive Problems”
- “Subsystem Problems”
- “Connection Problems”
- “Performance Monitor”



Note

For troubleshooting information regarding installation of software or driver on Mac, please see “Troubleshooting for installing software or driver on Mac” on page 23.

Responding to an Audible Alarm

The Pegasus unit has two beep patterns:

- **Two beeps, not repeated** – The Pegasus is powering up or ready
- **Two beeps, continuously repeated** – The Pegasus reports a problem

When you boot Pegasus unit, the buzzer beeps twice to acknowledge power up and twice again when the unit is online and ready for work.

If you hear the repeating two-beep pattern, check the following items:

- System Status LED
- Drive Carrier LEDs

Checking LEDs

When you boot Pegasus unit, the Power Button LED turns orange. When fully booted, the LED turns blue. See page 102, Figure 1.

See “Subsystem LEDs” on page 102.

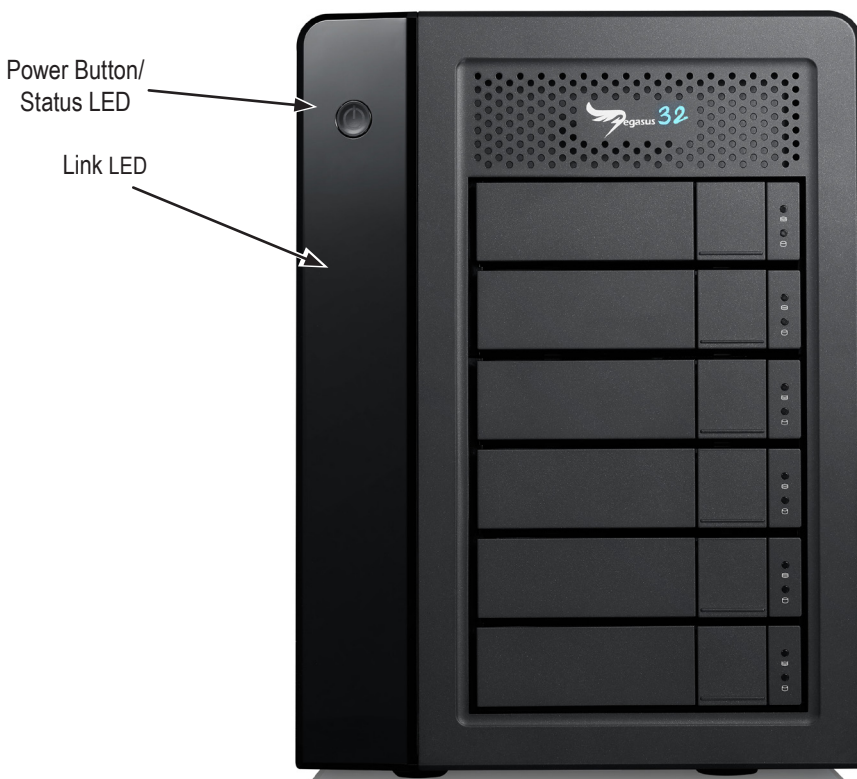
The drive carrier Power/Status LEDs turn blue if a physical drive is installed. See “Drive Carrier LEDs” on page 103.

Subsystem LEDs

The Pegasus subsystem LEDs are the Power Button and the Thunderbolt ports.

State	Power Button	Link LEDs
Dark	No power	No connection
Blue	Normal	Normal
Flashing Blue	—	Activity
Orange	Booting or shutting down	—

Subsystem LEDs



Drive Carrier LEDs

The Pegasus unit spins up the disk drives sequentially to equalize power draw during start-up. After a few moments:

- The Power/Status LEDs turn blue.
- The Activity LEDs turn blue if a drive is installed.

The drive carrier Power/Status LEDs report the condition of the physical drives. See the table below.

Drive carrier LEDs



Drive Carrier LEDs		
State	Power/Status	Drive Activity
Dark	No power	No drive in carrier
Steady Blue	Power is present	Drive is present
Flashing Blue	—	Activity on drive
Blinking Blue and Orange	Locator feature or Drive is rebuilding	—
Red	Drive error or failure	—

See “Physical Drive Problems” on page 106 for a discussion of rebuilding and failed physical drives for more information.

The Locator feature is triggered from the Pegasus Utility. It causes the LEDs to blink orange and blue for one minute. That action helps you find the specific drive. See “Locating a Physical Drive” on page 188.

Locate feature on a drive carrier



Pegasus Utility

If you can open the Pegasus Utility, but you cannot create or delete disk arrays and logical drives, nor can you make settings changes, check the UI lock. See “Unlocking the UI in Mac” on page 65.

Viewing the Event Logs

Viewing Event Logs includes:

- “Viewing Runtime Events”
- “Viewing NVRAM Events”
- “Event Severity Descriptions”

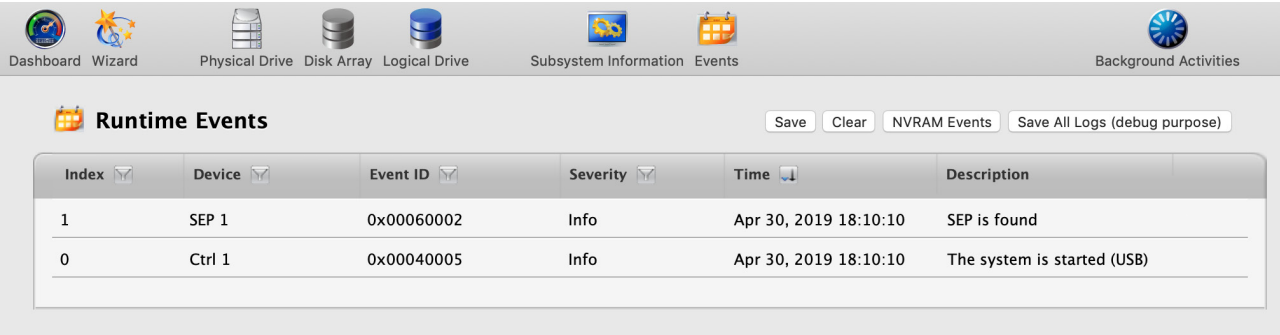
Viewing Runtime Events

To display Runtime Events, click the **Events** icon. The log of Runtime Events appears.

Events are added to the top of the list. Each event includes:

- **Index** – Sequence number of the event. Begins with 0 at system startup.
- **Device** – Disk Array, Logical Drive, Physical Drive by its ID number.
- **Event ID** – Hexadecimal identifier of the event
- **Severity** – (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal
- **Time** – Date and time the event happened.
- **Description** – A description of the event in plain language.

View Runtime Events



Index	Device	Event ID	Severity	Time	Description
1	SEP 1	0x00060002	Info	Apr 30, 2019 18:10:10	SEP is found
0	Ctrl 1	0x00040005	Info	Apr 30, 2019 18:10:10	The system is started (USB)

Viewing NVRAM Events

This screen displays a list of and information about 508 most important events over multiple subsystem startups.

To display NVRAM events:

1. Click the **Events** icon.

The log of Runtime Events appears.

2. Click the **Runtime Events** button.

The log of NVRAM Events appears.







Events are added to the top of the list. Each item includes:

- **Index** – Sequence number of the event. Begins with 0 at system startup.
- **Device** – Disk Array, Logical Drive, Physical Drive by its ID number.
- **Event ID** – Hexadecimal identifier of the event
- **Severity** – (lowest to highest) Information, Warning, Minor, Major, Critical and Fatal
- **Time** – Date and time the event happened.
- **Description** – A description of the event in plain language.

Event Severity Descriptions

Level	Meaning
Fatal	Non-Recoverable error or failure has occurred
Critical	Action is required now and the implications of the condition are serious
Major	Action is required now
Minor	Action is required but the condition is not a serious at this time
Warning	User can decide whether or not action is required
Information	Information only, no action is required

View NVRAM Events

 NVRAM Events <div> <input type="button" value="Save"/> <input type="button" value="Clear"/> <input type="button" value="Runtime Events"/> <input type="button" value="Save All Logs (debug purpose)"/> </div>					
Index 	Device 	Event ID 	Severity 	Time 	Description
39608	Ctrl 1	0x00040005	Info	Apr 30, 2019 18:10:10	The system is started (USB)
39607	Ctrl 1	0x00040006	Info	Apr 30, 2019 18:10:05	The system is stopped by host shutdown
39606	PD 5	0x000D0005	Info	Apr 30, 2019 18:00:36	Global Spare has been deleted
39605	DA 0	0x001B0004	Warning	Apr 30, 2019 17:51:36	PDM is stopped
39604	Ctrl 1	0x00040005	Info	Apr 30, 2019 17:46:24	The system is started (USB)
39603	Ctrl 1	0x0004004A	Warning	Apr 30, 2019 17:46:19	Last shutdown is abnormal
39602	DA 0	0x001B0002	Info	Apr 30, 2019 17:36:36	PDM is paused
39601	DA 0	0x001B0000	Info	Apr 30, 2019 17:36:27	PDM is started
39600	LD 0	0x00090000	Info	Apr 30, 2019 17:32:42	A new Logical drive has been created
39599	DA 0	0x00130000	Info	Apr 30, 2019 17:32:42	New disk array has been created

Saving All Logs

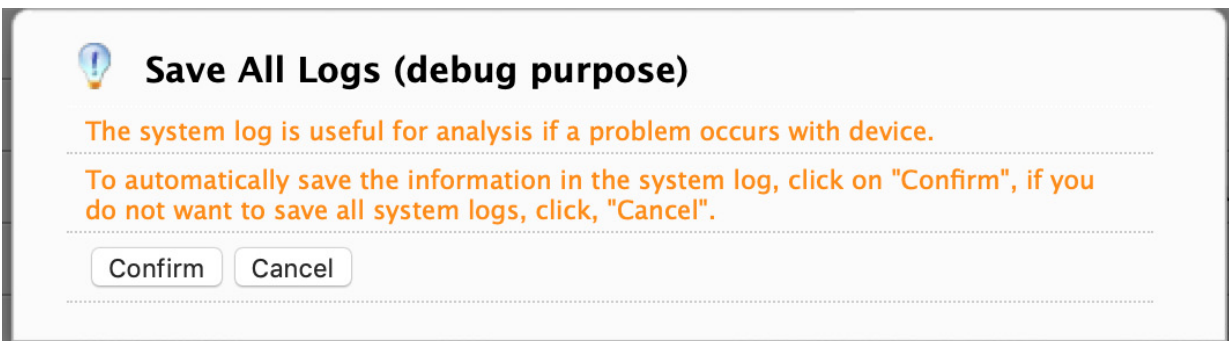
To save event logs,

1. Click the **Events** icon.

The log of Runtime Events appears.

2. Click the **Save All Logs (debug purpose)** button in the top of the menu.
3. You are asked to confirm that you want to save all logs. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

Save All Logs





Physical Drive Problems

Physical drive troubleshooting includes:

- “Diagnosis using the Pegasus Utility”
- “Locating a Physical Drive”
- “Replacing a Physical Drive”
- “Physical Drive Warning Message”

Physical drives are the foundation of data storage. A physical drive problem can affect your entire RAID system.

Diagnosis using the Pegasus Utility

In the Pegasus Utility, when a yellow !  icon or a red X  icon appears beside a physical drive, check the drive's operational status:

1. Click the **Physical Drive** icon.
2. Mouse-over and click the physical drive you want then click the **View** button.

Look under Operational Status for the condition of the physical drive.

- **Offline** – Check the drive for:
- **PFA Condition** – Caused by a bad block or sector. See Note 1 below.
- **Stale Condition** – Caused by obsolete array information on the physical drive. See Note 2 below.
- **Drive Failed or Dead** – The physical drive cannot be repaired. You must replace the failed drive.

Note 1: Clear the error condition. Then the physical drive is available. See “Clearing a Stale or a PFA Condition” on page 120.

Note 2: Identify the disk array to which the physical drive belongs. Then delete the disk array. If the error condition remains on the physical drive, clear the error condition.

Locating a Physical Drive

To locate a physical drive:

1. Do one of the following actions:
 - Click the **Physical Drive** icon.
 - From the Device menu, choose **Physical Drive**.
2. Mouse-over and click the physical drive you want then click the **Locate** button.

The Power/Status LED for the drive carrier holding that drive blinks blue and orange for one minute.


Running the Locate function to identify a physical drive



IMPORTANT

Please read the Compatibility List for physical drives before purchasing new drives to install in Pegasus32. Download the list from the PROMISE website.

Replacing a Physical Drive

A failed physical drive displays a red X  icon in the Pegasus Utility and a red Power/Status LED on the drive carrier.

Failed physical drive



Check the failed drive, then obtain a replacement drive of the same:

- **Type** – Hard disk drive (HDD) or solid state drive (SSD)
- **Interface** – SATA 3 Gb/s or 6 Gb/s
- **Spin speed** – 7,200 RPM or 15,000 RPM
- **Capacity** – Equal size or larger

You do not have to install the identical make and model of the physical drives being used. However replacing with the same make and model of drive makes the process easier and simpler.

You can replace a physical drive without shutting down the Pegasus unit.



CAUTION

To avoid hand contact with an electrical hazard, remove only one drive carrier at a time.

To replace a physical drive:

1. Press the release button to unlock the drive carrier.

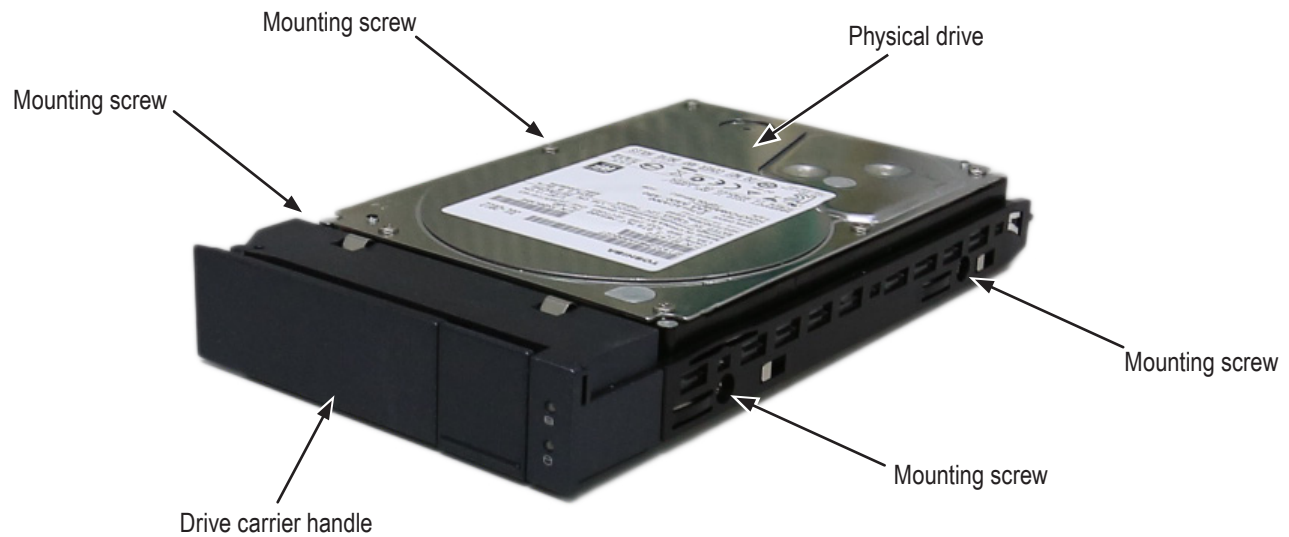


The drive carrier handle swings out.

2. Grasp the handle and gently pull the drive carrier out of the Pegasus unit and place it onto a static-free surface.



1. Remove the four mounting screws, then slide the failed drive out of the carrier.



2. Place the replacement drive into the carrier then install the four mounting screws. Tighten the screws just until they are snug. Position the drive carrier handle in an outward position and slide the drive carrier back into the Pegasus unit.



3. Press the drive carrier handle inward until it locks.

Physical Drive Warning Message

If you see messages that says, “ajar HDD from the backplane,” you must reseal the physical drives.

To reseal the physical drives:

1. On the Pegasus unit, press and hold the Power Button LED until it turns red.
2. Wait until the Power Button LED goes dark.
3. For each drive carrier, press the Release button, pull the drive carrier part way out of the unit, then press the drive carrier back in until it locks.

See “Replacing a Physical Drive” on page 189.

4. Press the Power Button LED to power up the Pegasus unit.

Disk Array and Logical Drive Problems

Disk array and logical drive troubleshooting includes:







- “Disk Array Degraded / Logical Drive Critical”
- “Disk Array Offline / Logical Drive Offline”
- “Repairing an Offline Disk Array or Logical Drive”
- “Rebuilding a Disk Array”
- “Incomplete Array”
- “Unreadable Disk Warning”

Disk array problems typically result from a physical drive failure. The most common problem is a degraded disk array. The RAID controller can rebuild a degraded disk array. See “Rebuilding a Disk Array” on page 195.

Disk Array Degraded/Logical Drive Critical

Disk arrays are made up of physical drives. Logical drives are created on the disk array.

When one of the physical drives in a disk array fails:

- The operational status of the disk array becomes **Critical**.
- The operational status of the logical drives becomes **Critical** or **Degraded**.
- The operational status of the physical drive becomes **Dead** or **Offline**. The Pegasus Utility reports these conditions in the following places:
- Dashboard icon – A yellow !  icon beside the disk arrays, logical drives, and physical drives under System Status.
- Physical Drive icon – Physical drives are shown Dead or Offline and marked with a red X  icon, or Missing.
- Logical Drive icon – Disk Array and Logical Drive are marked Critical with a yellow !  icon. RAID 6 logical drives are marked:
 - Degraded with a yellow !  icon when ONE physical drive is offline.
 - Critical with a yellow !  icon when TWO physical drives are offline. RAID 0 logical drives show Offline status and a red X  icon.
- Events icon – Logs a Major event for the logical drives and a Warning event for the physical drive.

If there is no spare drive in the Pegasus unit, you must provide the replacement drive. See “Replacing a Physical Drive” on page 189.



Disk Array Offline/Logical Drive Offline

Disk arrays are made up of physical drives. Logical drives are created on the disk array. When a disk array and its logical drives go **Offline**, the data stored in the logical drives is no longer accessible.

RAID 0 logical drives go **Offline** when ONE physical drive is removed or fails. RAID 1, 1E, 5, and 10 logical drives go **Offline** when TWO physical drives are removed or fail.

RAID 6 logical drives go **Offline** when THREE physical drives are removed or fail.

The Pegasus Utility reports these conditions in the following places:

- **Dashboard** icon – A red X  icon appears beside the disk arrays, logical drives, and physical drives under System Status.
- **Physical Drive** icon – Physical drives are shown Dead, Offline, or Missing.
- **Logical Drive** icon – Disk Array and Logical Drives are marked with a red X  icon.
- **Event** icon – Major event for the logical drive and a Warning event for the physical drive. Under Background Activities, no Rebuild takes place. See Repairing, below.

Repairing an Offline Disk Array or Logical Drive

RAID 1, 1E, 5, 6, and 10 Logical Drives

If a fault-tolerant logical drive, RAID 1, 1E, 5, 6, and 10, goes **Offline**, it may be possible to recover your data.



WARNING

Take no further corrective action until you have consulted with Technical Support!

RAID 0 Logical Drives

If a logical drive based on a non-fault-tolerant disk array, RAID 0, goes offline, all of the data on the logical drive is lost.

To recreate your logical drive:

1. Identify the failed physical drive.

See “Locating a Physical Drive” on page 188.

2. Replace the failed drive.

See “Replacing a Physical Drive” on page 189.

3. If the disk array had more than one physical drive, delete the disk array and re-create it.

See “Deleting a Disk Array” on page 137 and “Creating a Disk Array and Logical Drive with the Wizard” on page 128.

4. Restore the data from your backup source.

Rebuilding a Disk Array

When you rebuild a disk array, you are actually rebuilding the data on one of its physical drives.

If there is no spare drive of adequate capacity, you must replace the failed drive with an unconfigured physical drive, then perform a Rebuild manually.



See “Replacing a Physical Drive” on page 189. To perform a manual rebuild:

1. Click on the **Background Activities** menu icon.
2. Mouse-over *Rebuild* and click the **Start** button.
3. From the **Source Physical Drive** dropdown menu, choose a **Source** disk array and physical drive.

Arrays have an ID No. Physical drives have a Seq. No.(sequence number)

4. From the **Target Physical Drive** dropdown menu, choose a **Target** physical drive.
5. In the Confirmation box, type the word “confirm” in the field provided and click the **Confirm** button.

When the disk array is rebuilding:

- The disk array shows a green check  icon and **Rebuilding** status.
- Logical drives under the disk array continue to show a yellow !  icon and **Critical, Rebuilding** status.
- If the buzzer is enabled, the Pegasus32 unit emits two quick beeps every five seconds. When the beeps stop, the rebuild is done.

Incomplete Array

A more serious, but far less common problem is an Incomplete Array. An incomplete array results from a physical drive that fails or becomes missing during:

- RAID level migration
- Disk array transport



WARNING

If you are using utility to accept incomplete array, the system will reboot if Pegasus32 is running USB mode. It is important to make sure the Pegasus32 not being accessed (no IO operation in progress) before submitting the request.

Migration

Normally, if a physical drive or the controller fails during migration, the disk array goes critical, and you can rebuild it.

Transport

Transport is the action of moving the physical drives of a disk array:

- To different slots in the same subsystem
- From one subsystem to another

If a physical drive fails during a transport, or you do not move all of the physical drives to their new locations, the Pegasus Utility displays an incomplete array. When the Pegasus Utility discovers an incomplete array, it displays a dialog box asking you to:

- Click the **OK** button to accept the incomplete array.
- Click the **Cancel** button to reject the incomplete array.

Before you accept the incomplete array, be sure all of the physical drives are present and that their drive carriers are properly installed into the subsystem. See “Replacing a Physical Drive” on page 189.

If you choose to accept the incomplete array:

1. Click **OK** in the incomplete array dialog box.
2. Check the operational status of the logical drives in the array.
 - If the logical drives are **Critical**, proceed with a rebuild.
 - If the logical drives are **Offline**, contact Technical Support. See “Contacting Technical Support” on page 233.
3. Restore your data from a backup source.

If you choose NOT to accept the incomplete array:

1. Click **Cancel** in the incomplete array dialog box.
2. Do one of the following:
 - Delete the array. This action deletes all logical drives on the array.
 - Replace the missing physical drive.

Unreadable Disk Warning

Your Pegasus logical drive displays on the computer's desktop as a removable-drive icon (right).

If your computer's operating system recognizes a logical drive but cannot access it, the computer might display a warning message. See Figure 6.

Warning message



Normally, you never see this warning message for Pegasus32 logical drive because the Pegasus Utility formats your logical drives automatically.

If the warning message appears, try using the computer's disk utility to REPAIR the problem logical drive. For more information, see the utility's online help or the computer's *User Manual*.

If the disk utility cannot repair the logical drive, contact Technical Support for advice and assistance. See "Contacting Technical Support" on page 233.



CAUTION



If a logical drive has been in use and suddenly displays this warning message, do NOT format the logical drive. Formatting erases all of your data on your logical drive.

Subsystem Problems

Subsystem problem troubleshooting includes:

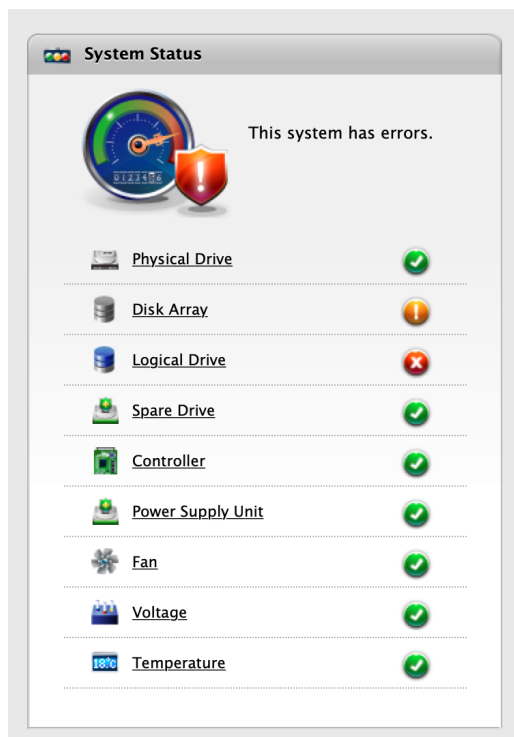
- “Diagnosing a Subsystem Problem”
- “Overheating”
- “Power Supply”

Diagnosing a Subsystem Problem


Check System Status on the Dashboard tab. If a yellow !  or red X  appears in the System Status box:

1. Click the name link of the component with the red X  icon.

System Status box on the Dashboard



The System Status list contains a list of all the components with their appending status. In case there is a failure with one of the components, an indicator icon will be displayed next to the component.

2. For physical drives, disk arrays, logical drives, and spare drives, mouse-over the component with the red X  icon and click the **View** button.

Overheating

Overheating is a potentially serious condition because the excessively high temperatures can lead to physical drive failure and controller malfunction.

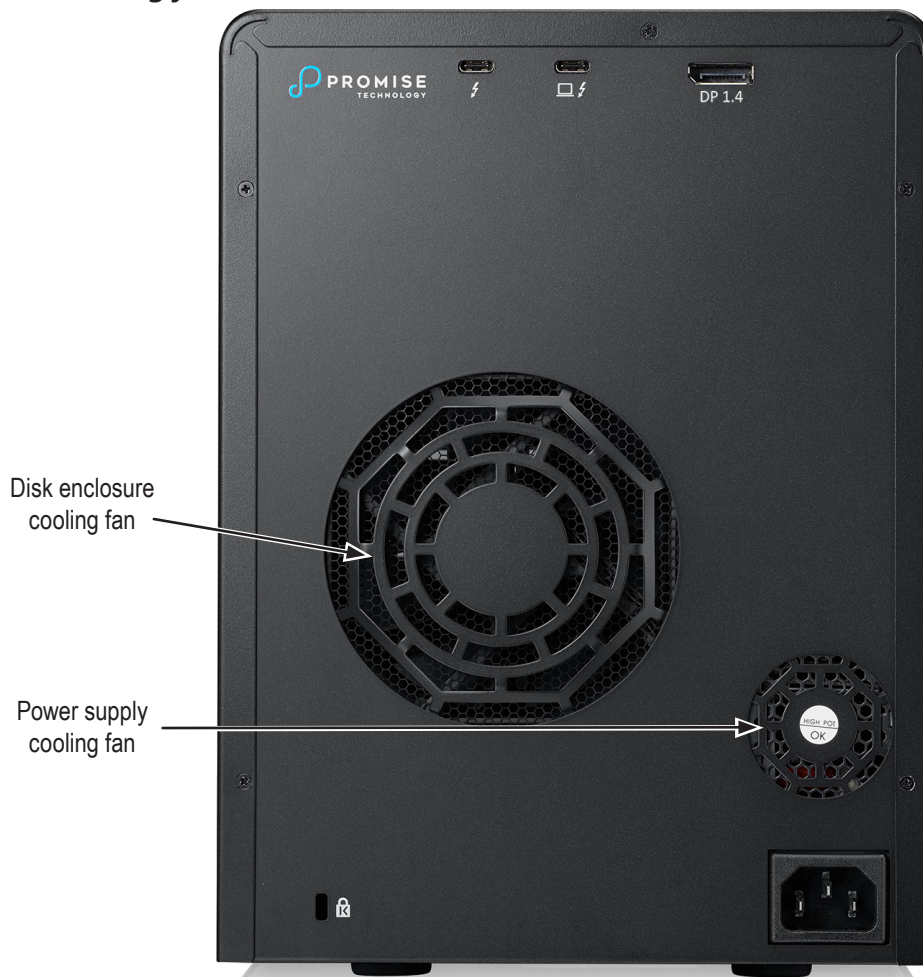
Overheating usually results from:

- Fan failure
- Inadequate air circulation around the Pegasus unit

Fan Failure

The larger fan on the back of the Pegasus unit cools the physical drives and the RAID controller. The smaller fan cools power supply. Cooling fans are not field-replaceable. If there is any problem with a cooling fan, contact Technical Support to make arrangements for a repair.

Pegasus32 cooling fans



Inadequate Air Circulation

Air circulation around the Pegasus unit might be a more complex problem. Check for these conditions:

- Accumulated dust or objects blocking the fans.
- Less than a minimum of 13 cm (5 inches) space between the back of the unit and the wall or other object.
- Ambient temperature above 35°C (95°F) where the unit is operating.

To cool down a Pegasus unit:

- Correct any problems identified above.
- Shut down the Pegasus unit.

Press and hold the Power Button for a few seconds until the LED turns red. The Pegasus Utility displays the message: *Unable to connect to the device*.

- Wait at least one hour, then restart the Pegasus unit.

Press the Power Button. The Pegasus boots within a few seconds.

Power Supply

The power supply used in the Pegasus unit is not field-replaceable. If there is any problem with the power supply, contact Technical Support to make arrangements for a repair. See “Contacting Technical Support” on page 233.

Connection Problems

Cables

If the installation of the cables and components are correctly installed, but they don't function properly, or at all, some of the possible reason could be:

- A connector is dirty or corroded
- A connector is loose or damaged
- A cable looks OK outside but has an open circuit inside
- The wrong cable was used. Look for the Thunderbolt™ logo and **100W** printed on the cable. See the Note below

Be sure to use approved cables because:

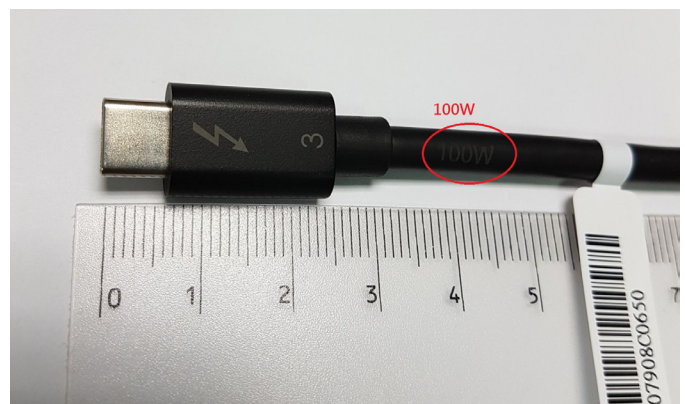
- They are the proper ones for your system.
- They are sold in brand-new condition.



Note

Thunderbolt™ 3 cables are labeled with a Thunderbolt logo and the number three (3). In addition, you should see **100W** printed on the cable. Cable length is 0.7 meter.

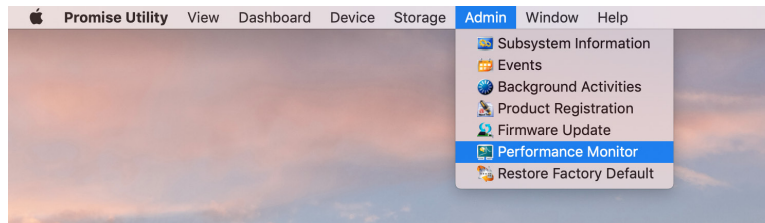
Thunderbolt™ 3 / USB cable connectors



Performance Monitor

The Performance Monitor display can be useful for diagnosing performance issues that will not necessarily trigger any alerts to appear in the System Status display or event logs. You can use it for testing performance of different drive types.

To display the Performance Monitor information, choose *Performance Monitor* from the **Admin** drop-down menu in the Menu Bar. Note that it is necessary to unlock the interface before the option can be selected.

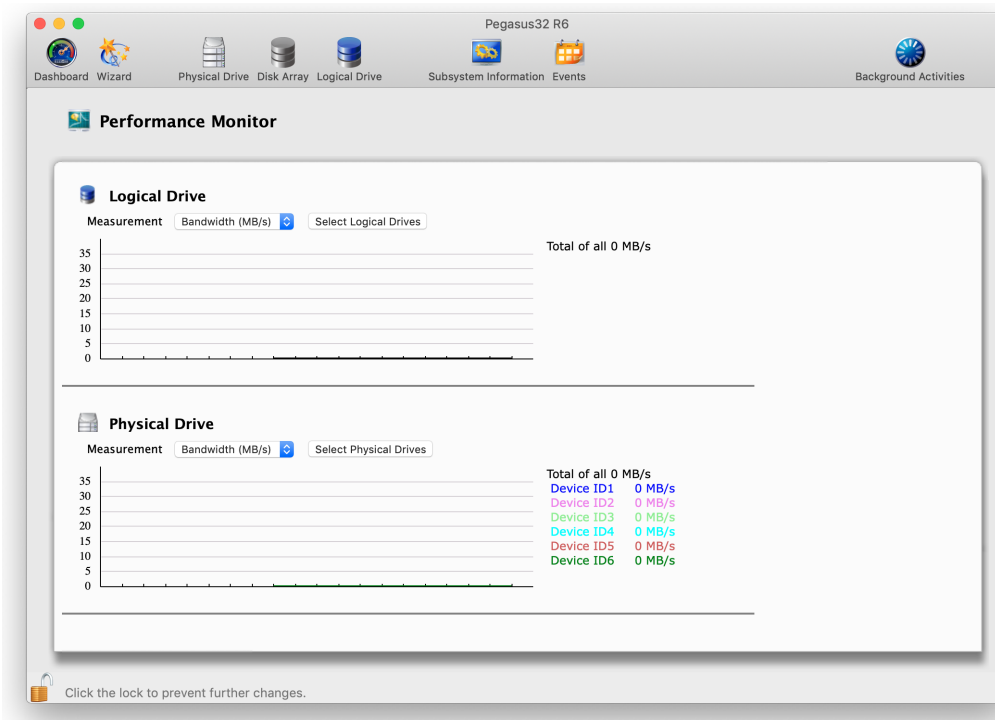


Note

You must unlock the Pegasus Utility interface to allow selection of the Performance Monitor display.

Performance information is displayed in graph form for logical drives and physical drives. Use the pull-down menus to displayed what parameter is being measured and which logical or physical drive you want to monitor. The parameters available for measurement are Bandwidth (in MB/s) and I/O requests.

Performance Monitor display



TECHNOLOGY BACKGROUND

This chapter covers the following topics:

- “Disk Arrays”
- “Logical Drives”
- “Formatting Logical Drives”
- “Spare Drives”
- “RAID Controllers”

Disk Arrays

Disk array technology includes:

- Media Patrol
- PDM

Media Patrol

Media Patrol is a routine maintenance procedure that checks the magnetic media on each disk drive. Media Patrol checks all physical drives assigned to disk arrays and spare drives. Media Patrol does not check unconfigured drives.

Media Patrol checks are enabled by default on all disk arrays and spare drives. You can disable Media Patrol in the disk array and spare drive settings, however that action is not recommended.

Unlike Synchronization and Redundancy Check, Media Patrol is concerned with the condition of the media itself, not the data recorded on the media. If Media Patrol encounters a critical error, it triggers PDM, if PDM is enabled on the disk array.

Media Patrol has three status conditions:

- **Running** – Normal. You can access your logical drives at any time.
- **Yield** – Temporary pause while a read/write operation takes place.
- **Paused** – Temporary pause while another background runs. Or a pause initiated by the user.

See “Media Patrol” on page 100.

PDM

Predictive Data Migration (PDM) is the migration of data from the suspect disk drive to a spare disk drive, similar to rebuilding a logical drive. But unlike Rebuilding, PDM constantly monitors your disk drives and automatically copies your data to a spare disk drive BEFORE the disk drive fails and your logical drive goes Critical.

The following actions trigger PDM:

- A disk drive with unhealthy status (see below)
- Media Patrol finds a disk critical error
- You initiate PDM manually

See “Running PDM on a Logical Drive” on page 163.

PDM also counts the number of media errors reported by Media Patrol. A disk drive becomes unhealthy when:

- A SMART error is reported
- The bad sector remapping table fills to the specified level.

Because data would be lost if written to a bad sector, when a bad sector is detected, the disk drive creates a map around it. These maps are saved in the bad sector remapping table, which have a capacity of 512 reassigned blocks and 2048 error blocks. See “PDM” on page 107.

You can specify the maximum levels for the reassigned and error blocks in PDM settings. When the table fills to a specified value, PDM triggers a migration of data from the suspect drive (the disk drive with the bad sectors) to a replacement physical drive.

During data migration, you have access to your logical drives but they respond more slowly to read/write tasks because of the additional operation. The time required for data migration depends on the size of the disk drives.

PDM is enabled on all disk arrays by default. You can disable PDM in the disk array settings; however that action is not recommended. See “Making Disk Array Settings” on page 136.

Logical Drives

Logical drive technology includes:

- “RAID Levels”
- “RAID Level Migration”
- “Stripe Size”
- “Sector Size”
- “Initialization”

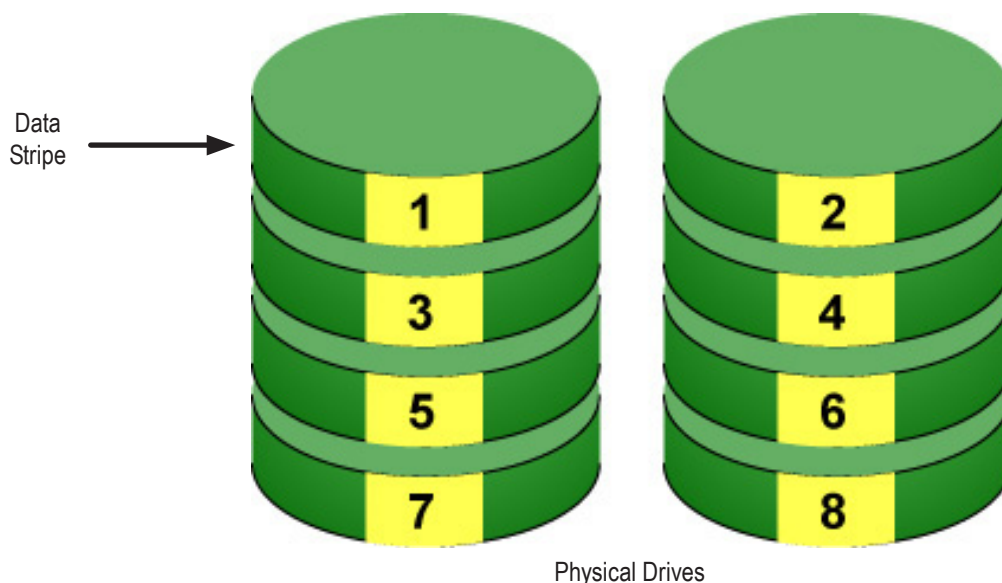
RAID Levels

RAID (Redundant Array of Independent Disks) allows multiple physical drives to be combined together in a disk array. Then all or a portion of the disk array is formed into a logical drive. The operating system sees the logical drive as a single storage device, and treats it as such.

RAID 0 – Stripe

When a logical drive is striped, the read and write blocks of data are interleaved between the sectors of multiple physical drives. Performance is increased, since the workload is balanced between drives or “members” that form the logical drive. Identical drives are recommended for performance as well as data storage efficiency.

RAID 0 Striping interleaves data across multiple drives



The disk array's data capacity is equal to the number of disk drive members multiplied by the smallest drive's capacity. For example, one 100 GB and three

120 GB drives form a 400 GB (4 x 100 GB) disk array instead of 460 GB.

If physical drives of different capacities are used, there is unused capacity on the larger drives.

RAID 0 logical drives on Pegasus consist of one or more physical drives.

Advantages	Disadvantages
<ul style="list-style-type: none">• Implements a striped disk array, the data is broken down into blocks and each block is written to a separate disk drive• I/O performance is greatly improved by spreading the I/O load across many channels and drives• No parity calculation overhead is involved	<ul style="list-style-type: none">• Not a true RAID because it is not fault-tolerant• The failure of just one drive results in all data in an disk array being lost• Not suitable for mission-critical environments

Recommended Applications for RAID 0:

- Image Editing
- Pre-Press Applications
- Any application requiring high bandwidth

RAID 1 – Mirror

When a logical drive is mirrored, identical data is written to a pair of physical drives, while reads are performed in parallel. The reads are performed using elevator seek and load balancing techniques where the workload is distributed in the most efficient manner. Whichever drive is not busy and is positioned closer to the data is accessed first.

With RAID 1, if one physical drive fails or has errors, the other mirrored physical drive continues to function. Moreover, if a spare physical drive is present, the spare drive is used as the replacement drive and data begins to mirrored to it from the remaining good drive.

RAID 1 Mirrors identical data to two drives



The logical drive's data capacity equals the smaller physical drive. For example, a 100 GB physical drive and a 120 GB physical drive have a combined capacity of 100 GB in a mirrored logical drive.

If physical drives of different capacities are used, there is unused capacity on the larger drive.

RAID 1 logical drives on Pegasus consist of two physical drives.

If you want a mirrored logical drive with more than two physical drives, see "RAID 1E – Enhanced Mirror".

Advantages	Disadvantages
<ul style="list-style-type: none"> • Simplest RAID level • Can increase read performance by processing data requests in parallel since the same data resides on two different drives 	<ul style="list-style-type: none"> • Very high disk overhead – uses only 50% of total capacity

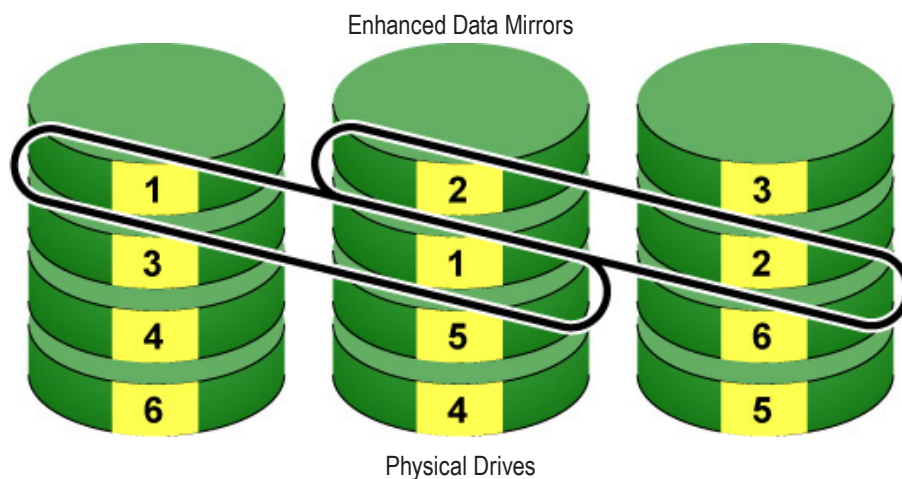
Recommended Applications for RAID 1:

- Accounting
- Payroll
- Financial
- Any application requiring very high availability

RAID 1E – Enhanced Mirror

RAID 1E offers the security of mirrored data provided by RAID 1 plus the added capacity of more than two physical drives. It also offers overall increased read/write performance plus the flexibility of using an odd number of physical drives. With RAID 1E, each data stripe is mirrored onto two physical drives. If one drive fails or has errors, the other drives continue to function, providing fault tolerance.

RAID 1E can mirror data over an odd number of drives



The advantage of RAID 1E is the ability to use an odd number of physical drives, unlike RAID 1 and RAID 10. You can also create a RAID 1E Logical Drive with an even number of physical drives. However, with an even number of drives, you obtain somewhat greater security with comparable performance using RAID 10.

RAID 1E logical drives consist of three or more physical drives. You can create an array with just two physical drives and specify RAID 1E. But the resulting array is actually a RAID 1.

Advantages	Disadvantages
<ul style="list-style-type: none"> Implemented as a mirrored disk array whose segments are RAID 0 disk arrays High I/O rates are achieved thanks to multiple stripe segments Can use an odd number of disks 	<ul style="list-style-type: none"> Very high disk overhead – uses only 50% of total capacity

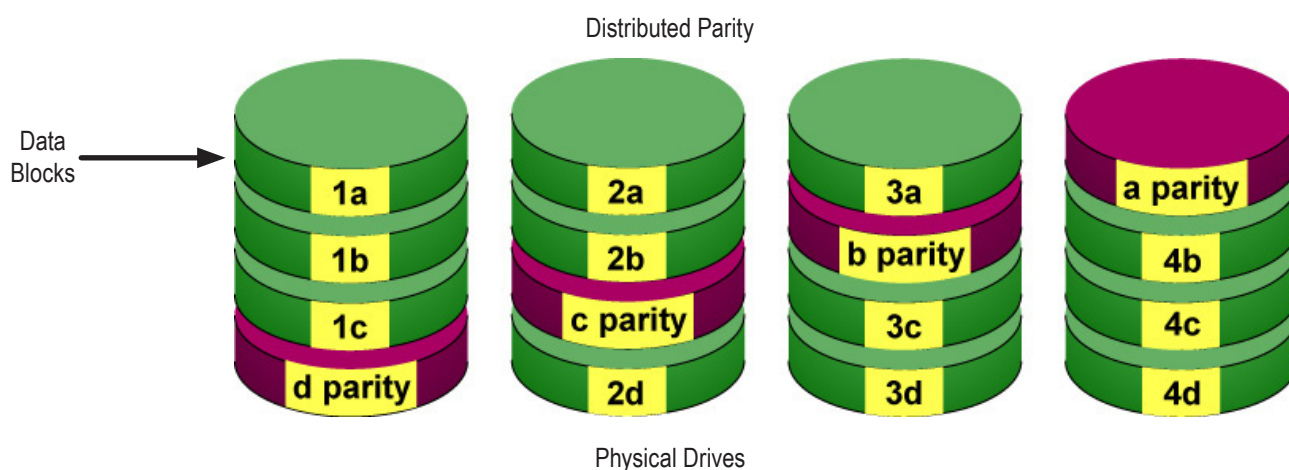
Recommended Applications for RAID 1E:

- Imaging applications
- Database servers
- General fileserver

RAID 5 – Block and Parity Stripe

RAID 5 organizes block data and parity data across the physical drives. Generally, RAID Level 5 tends to exhibit lower random write performance due to the heavy workload of parity recalculation for each I/O. RAID 5 is generally considered to be the most versatile RAID level. It works well for file, database, application and web servers.

RAID 5 stripes all drives with data and parity information



The capacity of a RAID 5 logical drive equals the smallest physical drive times the number of physical drives, minus one. Hence, a RAID 5 logical drive with four 100 GB physical drives has a capacity of 300 GB. A RAID 5 logical drive with two 120 GB physical drives and one 100 GB physical drive has a capacity of 200 GB. RAID 5 is generally considered to be the most versatile RAID level.

A RAID 5 on Pegasus R4 consists of three or four physical drives. A RAID 5 on Pegasus R6 consists of three to six physical drives.

Advantages	Disadvantages
<ul style="list-style-type: none"> • High Read data transaction rate • Medium Write data transaction rate • Good aggregate transfer rate • Most versatile RAID level 	<ul style="list-style-type: none"> • Disk failure has a medium impact on throughput

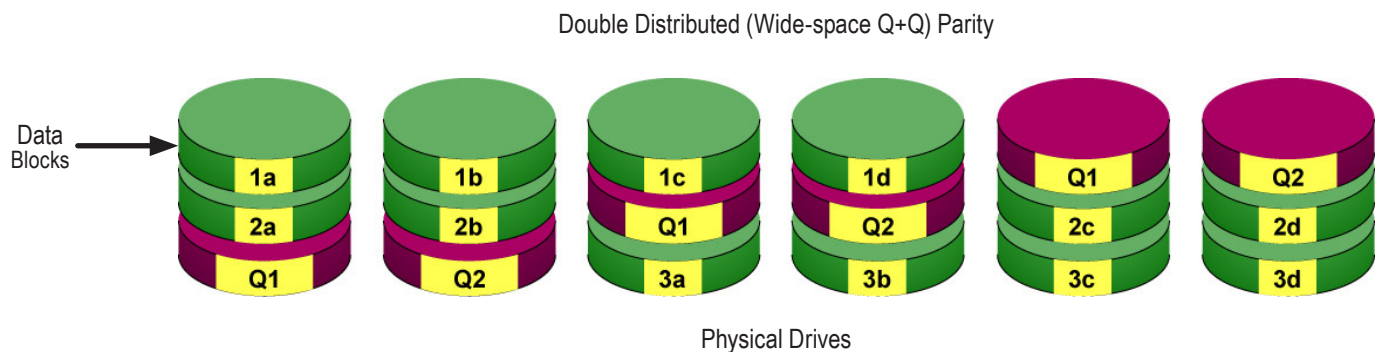
Recommended Applications for RAID 5:

- File and Application servers
- WWW, E-mail, and News servers
- Intranet servers

RAID 6 – Block and Double Parity Stripe

RAID level 6 stores dual parity data is rotated across the physical drives along with the block data. A RAID 6 logical drive can continue to accept I/O requests when any two physical drives fail.

Figure 5. RAID 6 stripes all drives with data and dual parity



Hence, a RAID 6 logical drive with (7) 100 GB physical drives has a capacity of 500 GB. A RAID 6 logical drive with (4) 100 GB physical drives has a capacity of 200 GB.

RAID 6 becomes more capacity efficient in terms of physical drives as the number of physical drives increases.

RAID 6 provides double fault tolerance. Your logical drive remains available when up to two physical drives fail.

RAID 6 is generally considered to be the safest RAID level. A RAID 6 on Pegasus R4 consists of four physical drives.

A RAID 6 on Pegasus R6 consists of four to six physical drives.

Advantages	Disadvantages
<ul style="list-style-type: none"> • High Read data transaction rate • Medium Write data transaction rate • Good aggregate transfer rate 	<ul style="list-style-type: none"> • High disk overhead – equivalent of two drives used for parity • Slightly lower performance than RAID 5

Recommended Applications for RAID 6:

- Accounting and Financial
- Database servers
- Any application requiring very high availability

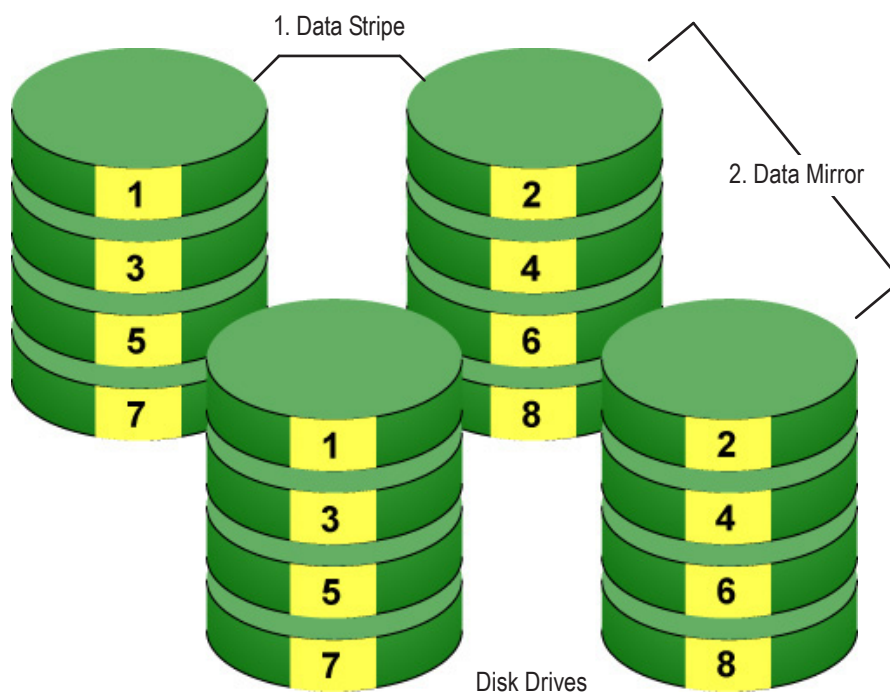
RAID 10 – Mirror + Stripe

Mirror + Stripe combines both of the RAID 1 and RAID 0 logical drive types. RAID

10 can increase performance by reading and writing data in parallel or striping, and duplicating the data, or mirroring.

PROMISE implements RAID 10 by creating a data stripe over one pair of disk drives, then mirroring the stripe over a second pair of disk drives. Some applications refer to this method as RAID 0+1.

PROMISE RAID 10 starts with a data stripe, then mirrors it



The data capacity RAID 10 logical drive equals the capacity of the smallest physical drive times the number of physical drives, divided by two.

In some cases, RAID 10 offers double fault tolerance, depending on which physical drives fail.

RAID 10 arrays require an even number of physical drives and a minimum of four.

For RAID 10 characteristics using an odd number of physical drives, choose RAID 1E.

Advantages	Disadvantages
<ul style="list-style-type: none">Implemented as a mirrored disk array whose segments are RAID 0 disk arraysHigh I/O rates are achieved thanks to multiple stripe segments	<ul style="list-style-type: none">Very high disk overhead – uses only 50% of total capacity

Recommended Applications for RAID 10:

- Imaging applications
- Database servers
- General fileserver

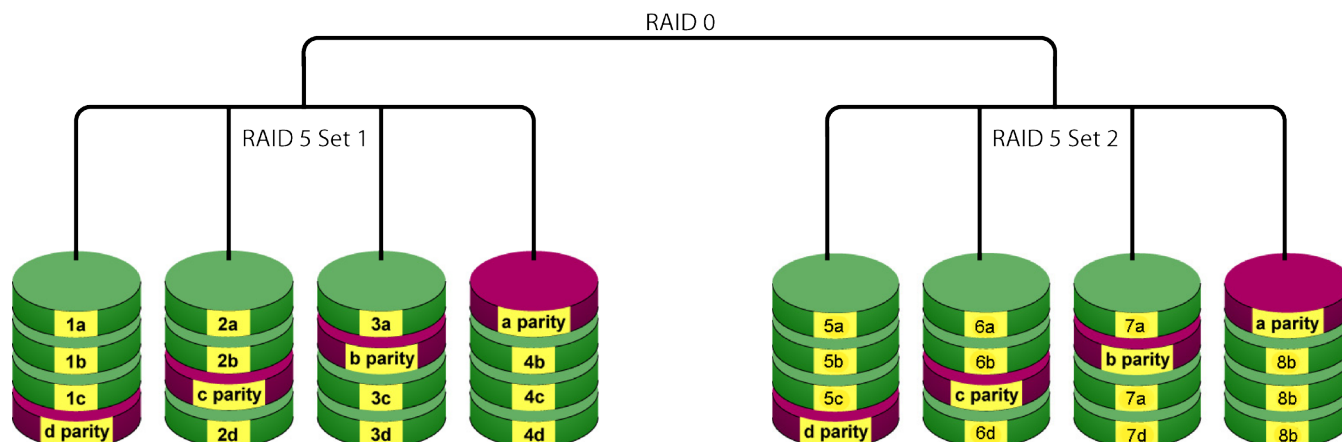
RAID 50 – Striping of Distributed Parity

RAID 50 combines both RAID 5 and RAID 0 features. Data is striped across physical drives as in RAID 0, and it uses distributed parity as in RAID 5. RAID 50 provides data reliability, good overall performance, and supports larger volume sizes.

The data capacity RAID 50 logical drive equals the capacity of the smallest physical drive times the number of physical drives, minus two.

RAID 50 also provides very high reliability because data is still available even if multiple physical drives fail (one in each axle). The greater the number of axles, the greater the number of physical drives that can fail without the RAID 50 logical drive going offline.

A minimum of six drives are required for a RAID 50.

RAID 50 - Striping of Distributed Parity

Advantages	Disadvantages
<ul style="list-style-type: none"> • High Read data transaction rate • Medium Write data transaction rate • Good aggregate transfer rate • High reliability • Supports large volume sizes 	<ul style="list-style-type: none"> • Higher disk overhead than RAID 5 (two drives as hot spares)

Recommended Applications for RAID 50 include applications that require high fault tolerance and good I/O performance.

- File and Application servers
- Transaction processing
- Office application with many users accessing small files

RAID 60 – Double Parity + Stripe

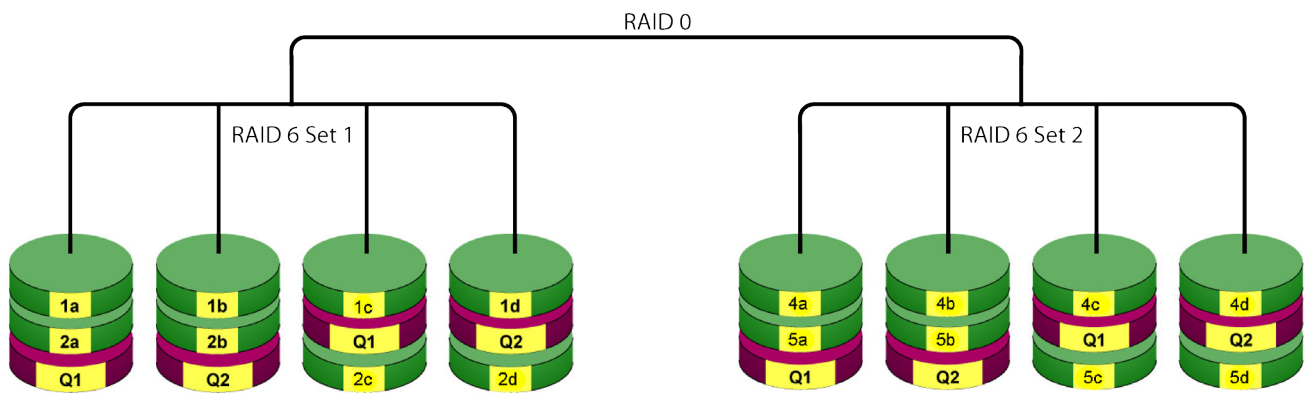
The PROMISE RAID 60 combines RAID 6 distributed (double) parity and RAID 0 block-level striping.

RAID 60 can increase performance by reading and writing data in parallel or striping, while simultaneously providing parity.

PROMISE implements RAID 60 by creating a data stripe across two RAID 6 sets. This creates very high fault tolerance, two drives in each RAID 6 set can fail without interrupting I/O or loss of data.

A minimum of eight drives are required for a RAID 60, so this option is available on the R8.

PROMISE RAID 60 starts with RAID 6 double parity, then stripes the blocks



RAID 60 is available on the R8. To figure out the capacity, multiply the smallest drive capacity by four. So an R8 with 8 2 TB drives has a capacity of 8 TB with a RAID 60.

Advantages	Disadvantages
<ul style="list-style-type: none">• High Read data transaction rate• Medium Write data transaction rate• Good aggregate transfer rate• Safest RAID level	<ul style="list-style-type: none">• High disk overhead (four drives as hot spares on R8)• Slightly lower performance than RAID 50

Recommended Applications for RAID 60 include applications that require extremely high fault tolerance and good I/O performance.

RAID Level Migration

The term “Migration” means either or both of the following:

- Change the RAID level of a logical drive.
- Expand the storage capacity of a logical drive.

On Pegasus, RAID level migration is performed on the disk array but it applies to the logical drives. Migration does not disturb your data. You can access the data while the migration is in progress. When migration is done, your disk array has a different RAID level and/or a larger capacity.

Migration Requirements

The following conditions affect RAID level migration:

- The disk array and logical drive must show a green check icon.
- The Target disk array may require more physical drives than the Source disk array.
- If the Target disk array requires an EVEN number of physical drives but the Source disk array has an ODD number, ADD a physical drive as part of the migration process.
- You cannot reduce the number of physical drives in your disk array, even if the Target disk array requires fewer physical drives than the Source disk array.
- RAID 1 (mirroring) works with two drives only. Only a single-drive RAID 0 disk array can migrate to RAID 1. Other RAID Levels use too many drives to migrate.
- You cannot migrate a disk array when it is Critical or performing activities such as Synchronizing, Rebuilding, and PDM.
- For RAID 6, you can add more physical drives but you cannot change the RAID level.

Source and Target RAID Levels

The tables on the following pages show the migration options for each source logical drive by its RAID level. The available target RAID levels are shown with their requirements.

RAID 1

A RAID 1 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	3 or more physical drives. Add 1 or more physical drives.
RAID 5	3 physical drives minimum, maximum 4 (R4), 6 (R6) or 8 (R8). RAID 1 must have less than 4 (R4), 6 (R6) or 8 (R8) physical drives. Add 1 or more physical drives.
RAID 10	4 physical drives minimum. Even number of physical drives. Add 2 or more physical drives.
RAID 50	6 physical drives minimum.

See “Migrating a Logical Drive” on page 160.

RAID 0

A RAID 0 source logical drive can migrate to the following target logical drives:

Target	Requirements
RAID 0	Add physical drives.
RAID 1	2 physical drives only. Only a single-drive RAID 0 can migrate to RAID 1 by adding 1 physical drive.
RAID 1E	3 or more physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 5	3 physical drives minimum, maximum 4 (R4), 6 (R6) or 8 (R8). RAID 0 must have less than 4 (R4), 6 (R6) or 8 (R8) physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 6	4 physical drives minimum, 4 (R4), 6 (R6) or 8 (R8). If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	4 physical drives minimum. Even number of physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 50	6 physical drives minimum.
RAID 60	8 physical drives minimum.

See “Migrating a Logical Drive” on page 160.

RAID 1E

A RAID 1E Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	Add physical drives.
RAID 5	3 physical drives minimum, 4 (R4), 6 (R6) or 8 (R8). RAID 1E must have less than 4 (R4), 6 (R6) or 8 (R8) physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	4 physical drives minimum. Even number of physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 50	6 physical drives minimum.

See “Migrating a Logical Drive” on page 160.

RAID 5

A RAID 5 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	None.
RAID 5	Add physical drives. Maximum of 4 (R4), 6 (R6) or 8 (R8).
RAID 6	4 physical drives minimum, maximum of 4 (R4), 6 (R6) or 8 (R8). If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	4 physical drives minimum. Even number of physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 50	6 physical drives minimum.
RAID 60	8 physical drives minimum.

See “Migrating a Logical Drive” on page 160.

RAID 6

A RAID 6 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 6	Add physical drives. Maximum of 4 (R4), 6 (R6) or 8 (R8).
RAID 60	8 physical drives minimum.

See “Migrating a Logical Drive” on page 160.

RAID 10

A RAID 10 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None.
RAID 1E	None.
RAID 5	3 physical drives minimum, maximum of 4 (R4), 6 (R6) or 8 (R8). RAID 10 must have less than 4 (R4), 6 (R6) or 8 (R8) physical drives.
RAID 6	4 physical drives minimum, maximum of 4 (R4), 6 (R6) or 8 (R8). The RAID 10 logical drive must have less than 4 (R4) or 6(R6) physical drives. If existing physical drives have no unused space, add 1 or more physical drives.
RAID 10	Add physical drives in multiples of two. Even number of physical drives.
RAID 50	6 physical drives minimum.
RAID 60	8 physical drives minimum.

When you migrate RAID 10 logical drive, it becomes RAID 1E by default.

If you want a RAID 10 logical drive, there must be an even number of physical drives and you must specify RAID 10 for the target logical drive.

See “Migrating a Logical Drive” on page 160.

RAID 50

A RAID 50 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 0	None
RAID 5	None
RAID 6	None
RAID 10	None
RAID 1E	None
RAID 60	None

See “Migrating a Logical Drive” on page 160.

RAID 60

A RAID 60 Source logical drive can migrate to the following Target logical drives:

Target	Requirements
RAID 6	None

See “Migrating a Logical Drive” on page 160.

Stripe Size

Stripe Size, also called “Stripe Block Size,” refers to the size of the data blocks written to, and read from, the physical drives. Stripe Size is specified when you create a logical drive. You can choose Stripe Size directly when you use the Wizard Advanced Configuration function to create a logical drive.

You cannot change the Stripe Size of an existing logical drive. You must delete the logical drive and create a new one.

The default stripe size is 128 KB. When you create your logical drive using the Wizard Advanced option or you create a logical drive manually, you can choose a stripe size of 64 KB, 128 KB, 256 KB, 512 KB, and 1 MB.

See “Creating a Disk Array and Logical Drive with the Wizard” on page 128 and “Creating a Logical Drive Manually” on page 150.

There are two issues to consider when choosing the Stripe Size:

- You should choose a Stripe Size equal to, or smaller than, the smallest cache buffer found on any physical drive in the disk array. Selecting a larger value slows read/write performance because physical drives with smaller cache buffers need more time for multiple accesses to fill their buffers.
- If your data retrieval consists of fixed data blocks, such as with some database or video applications, then you should choose that size as your Stripe Size.

If you do not know the cache buffer or fixed data block sizes, choose 64 KB as your Stripe Size. Generally speaking,

- Email, POS, and web servers prefer smaller stripe sizes.
- Video and database applications prefer larger stripe sizes.

Sector Size

A sector is the smallest addressable area on a physical drive. Sector size refers to the number of data bytes a sector can hold. A smaller sector size is a more efficient use of a physical drive's capacity. 512 bytes (512 B) is the most common sector size, and the default in the Pegasus Utility.

When you create your logical drive using the Wizard Advanced option or you create a logical drive manually, you can choose a sector size of 512 B, 1 KB, 2 KB, or 4 KB.

See “Creating a Disk Array and Logical Drive with the Wizard” on page 128 and “Creating a Logical Drive Manually” on page 150.

Initialization

Initialization is done to logical drives after they are created from a disk array. Full initialization sets all data bits in the logical drive to a specified pattern, such as all zeros. The action is useful because there may be residual data on the logical drives left behind from earlier configurations. For this reason, Initialization is recommended for all new logical drives.

See “Initializing a Logical Drive” on page 154.



CAUTION

When you initialize a logical drive, all the data on the logical drive is lost. Backup any important data before you initialize a logical drive.

Formatting Logical Drives

A RAID logical drive must also be formatted to be compatible with your computer. In this *Product Manual*, the term *format* includes both partition and format operations.

You can format your logical drives using the:

- Pegasus Utility with default settings (below)
- Pegasus Utility with Custom Settings (page 90)
- Disk Utility (page 91)

Both the Pegasus Utility and the computer's disk utility offer a choice of formatting options. However, if there is no specific reason to customize, the default format settings are recommended.

Pegasus Utility with Default Settings

Wizard Automatic or Express

When you create your logical drives using the Wizard *Automatic* or *Express* options, your logical drives are always formatted automatically.

When the Pegasus Utility has finished the format operation, new removable-drive icons labeled **Promise Pegasus**, each representing one logical drive, appear on your desktop.

When you see the icon, your logical drive is ready to use.

***Promise Pegasus
volume icon***



Wizard Advanced or Manual Creation

When you create your logical drives using the Wizard *Advanced* option, the Format option is enabled by default.

When the Pegasus Utility has finished the format operation, new removable-drive icons, each representing one logical drive, appear on your desktop.

When you see the icon, your logical drive is ready to use.

For more information, see “Creating a Disk Array and Logical Drive with the Wizard” on page 47 and “Creating a Logical Drive Manually” on page 61.

Pegasus Utility with Custom Settings

To use your own format settings, you must create your logical drives using the Wizard *Advanced* option or create your logical drives manually, and you must UNcheck the Format box.

See “Creating a Disk Array and Logical Drive with the Wizard” on page 47 and

“Creating a Logical Drive Manually” on page 61.

To format your logical drives using the Pegasus Utility with your own settings:

1. In the Logical Drive list, mouse-over the logical drive you want to format, and click the **Format** button.
2. Supply information as required:
 - **Optional:** Type a different name into the Volume Name field.
 - Choose a partition from the Partition Type dropdown menu.
 - Choose a format type from the Format Type dropdown menu.
 - For Mac computers, the default *GPT Format* partition and the default *Journaled HFS+* format are recommended.
3. Click the **Format** button.

When the Pegasus Utility has finished the partition and format operation, new removable-drive icons, each representing one logical drive, appear on your desktop.

When you see the icon, your logical drives are ready to use.

Disk Utility

For information on using your computer's disk utility, see the online help or the computer's *User Manual*.

To format your logical drives using the computer's disk utility, you must create your logical drives using the Wizard *Advanced* option or create your logical drives manually, and you must UNcheck the **Format** box.

See "Creating a Disk Array and Logical Drive with the Wizard" on page 128 and "Creating a Logical Drive Manually" on page 150.

To format your logical drives using the computer's disk utility:

1. Click the **Go** menu and choose **Utilities** from the dropdown list.
2. Double-click the **Disk Utility** icon to open the utility.
3. In the drive list, highlight the logical drive you want to format and click the **Partition** button.
4. Make your Volume Scheme, Volume Information, and Options settings and click the **Apply** button.

For Mac computers, the default *GPT Format* partition and the default *Journaled HFS+* format are recommended.

5. In the Confirmation dialog box, click the **Partition** button.

When the disk utility has finished the partition and format operation, new removable-drive icons labeled **Promise Pegasus**, each representing one logical drive, appear on your desktop.

Your logical drives are ready to use.

Spare Drives

Spare drive technology includes:

- Definition (page 92)
- Options (page 92)
- Requirements (page 92)
- Transition (page 93)

Definition

A spare drive is a physical drive that you designate to automatically replace the failed physical drive in a disk array. See “Creating a Spare Drive Manually” on page 69.

The general recommendation is to:

- Provide at least one spare drive
- Configure the spares as **global revertible** spare drives

Options

There are several options you can specify for a spare drive:

- **System Options**
 - **Revertible** – Returns to its spare drive assignment after you replace the failed physical drive in the disk array and run the Transition function.
 - **Media Patrol** – By default, Media Patrol runs on spare drives unless you disable it.
- **Spare Type**
 - **Global** – Can be used by any disk array
 - **Dedicated** – Can be used only by the assigned disk array
- **Media Type** (type of physical drive)
 - Hard Disk Drive (HDD)
 - Solid State Drive (SSD)

Requirements

The spare drive must:

- Have adequate capacity to replace the largest physical drive in your disk arrays.
- Be the same media type as the physical drives in your disk arrays.

A revertible spare drive requires:

- You to replace the failed physical drive in the disk array
- You to run the Transition function

Transition

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non-revertible spare. The revertible spare drive returns to its original status. In order to run the Transition function, the spare drive must be revertible.

In addition, you must specify an unconfigured physical drive of the same or larger capacity and same media type as the revertible spare drive.

Running a Transition

The Transition feature enables you to specify “permanent” spare drives for your Pegasus unit.

Transition is the process of replacing a revertible spare drive that is currently part of a disk array with an unconfigured physical drive or a non- revertible spare. The revertible spare drive returns to its original status.

Transition happens automatically when the following sequence of events takes place:

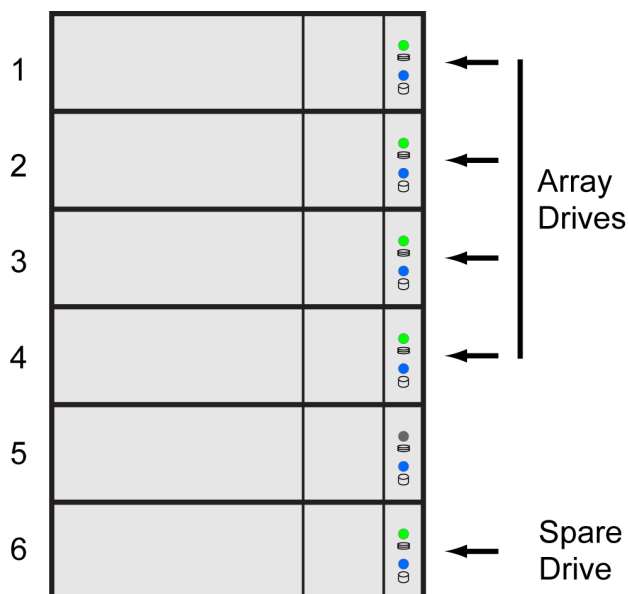
- You create a revertible spare drive. See “Creating a Spare Drive Manually” on page 169.
- A physical drive assigned to your disk array fails and the array goes critical or degraded.
- Pegasus automatically rebuilds your array to the revertible spare drive and the array becomes functional again.
- You replace the failed physical drive with a new physical drive of equal or greater capacity.
- Pegasus automatically transitions (moves) the data from the revertible spare to the new physical drive.
- The new physical drive becomes part of the array and the revertible spare drive returns to its original spare status.

Transition happens manually when you specify a different unconfigured physical drive to transition (move) the data from the revertible spare drive.

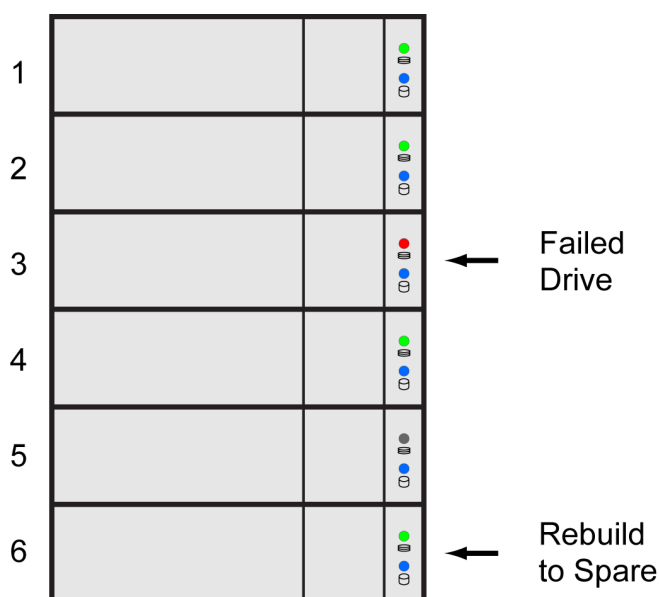
See the example on the following pages.

Example

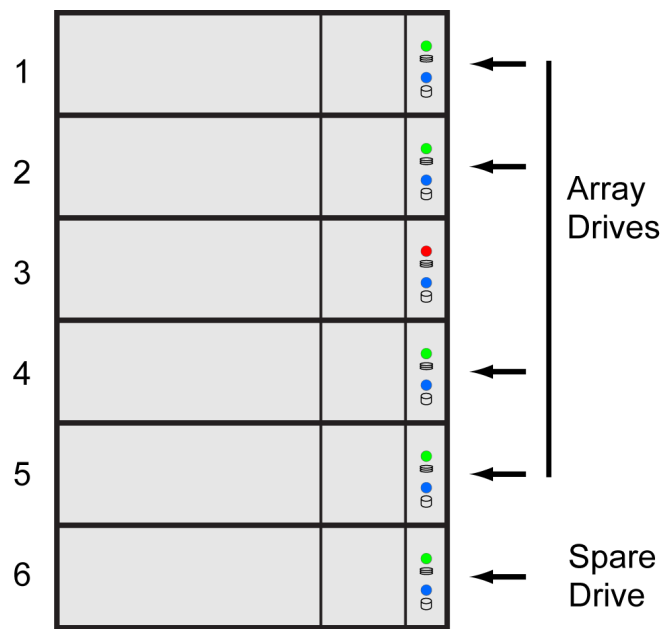
Following is an example to explain the Transition function.



In the example above, there is a four-drive RAID 5 disk array and a global spare drive. Physical drives 1, 2, 3, and 4 belong to the disk array. Physical drive 5 remains unconfigured. Physical drive 6 is a revertible spare drive.



If a physical drive fails in a disk array and there is a spare drive of adequate capacity available, the controller automatically rebuilds the array using the spare drive. In this example, physical drive 3 failed and the array is rebuilt using physical drive 6, the revertible spare drive.

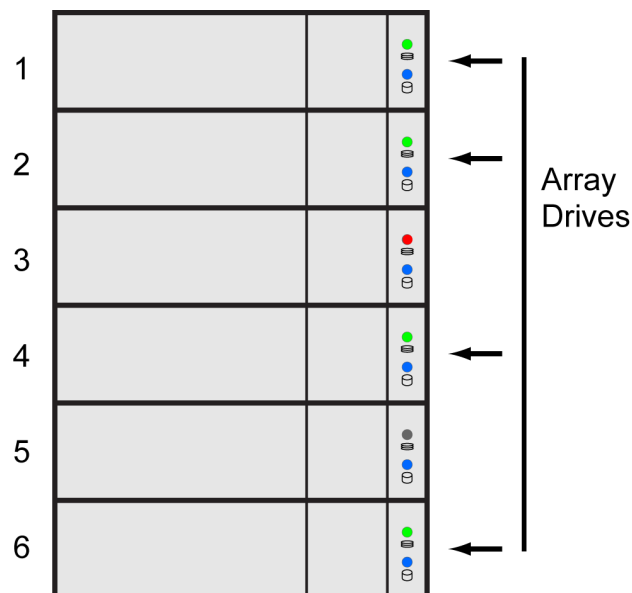


When the rebuild is complete, the spare drive has replaced the failed drive. In this example, failed drive 3 was replaced by spare drive 6. The disk array now consists of physical drives 1, 2, 4, and 6.

There is no spare drive at this moment. Even if physical drive 5 is of adequate capacity, it has not been designated as a spare, therefore the Pegasus controller cannot use it as a spare.

Automatic Transition

At this juncture, you would replace the failed drive in slot 3 with a new physical drive of the same or greater capacity.



When the Pegasus controller detects the new drive in slot 3, the controller:

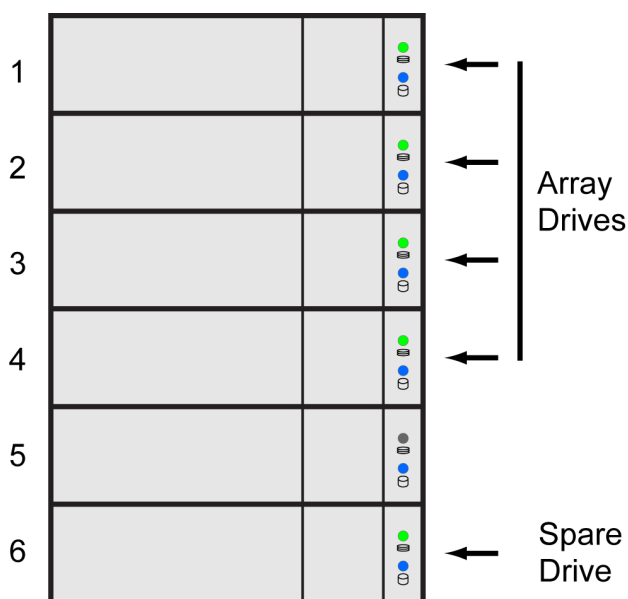
Automatically transitions the data on drive 6 to drive 3

Returns drive 6 to spare status

When the Automatic Transition is finished, physical drives 1, 2, 3, and 4 belong to the disk array and physical drive 6 is a revertible spare drive. The original configuration is restored.

Manual Transition

If you wanted to use the drive in slot 5 as a member of the disk array, rather than the drive in slot 3, you would run the Transition function manually. See “Running a Transition on a Spare Drive” on page 71.



When the Manual Transition is finished, physical drives 1, 2, 4, and 5 belong to the disk array and physical drive 6 is a revertible spare drive.

At this point, you would replace the drive in slot 3. The new drive in slot 3 remains unconfigured until you assign it to a disk array or as a spare.

RAID Controllers

RAID controller technology includes:

- Cache Policy (“Read Cache Policy” and “Write Cache Policy”)
- “Capacity Coercion”

As it is used with Pegasus, the term cache refers to any of several kinds of high- speed, volatile memory that hold data moving from your computer to the physical drives or vice-versa. Cache is important because it can read and write data much faster than a physical drive. There are read caches, which hold data as it is read from a physical drive; and write caches, which hold data as it is written to a physical drive.

In order to tune the cache for best performance in different applications, user- adjustable settings are provided. Cache settings are made on the RAID controller. See “Making Controller Settings” on page 25.

Read Cache Policy

Read Cache – The read cache is enabled but no pre-fetch action.

Read Ahead – The read cache and predictive pre-fetch feature are enabled.

Read-ahead anticipates the next read and performs it before the request is made. Can increase read performance.

No Cache – The read cache is disabled.

Write Cache Policy

Write Back – Data is written first to the cache, then to the logical drive.

This provides better performance.

Write Thru – Also “Write Through.” Data is written to the cache and the logical drive at the same time. This is safer.

Capacity Coercion

This feature is designed for fault-tolerant logical drives (RAID 1, 1E, 5, 6, and 10). It is generally recommended to use physical drives of the same size in your disk arrays. When this is not possible, the system adjusts for the size differences by reducing or coercing the capacity of the larger drives to match the smaller ones. With Pegasus, you can choose to enable capacity coercion and any one of four methods.

Enable capacity coercion and choose the method in the Controller Settings menu. See “Making Controller Settings” on page 25.

The choices are:

- **GB Truncate** – (Default) Reduces the useful capacity to the nearest 1,000,000,000 byte boundary.
- **10GB Truncate** – Reduces the useful capacity to the nearest 10,000,000,000 byte boundary.
- **Group Rounding** – Uses an algorithm to determine how much to truncate. Results in the maximum amount of usable drive capacity.
- **Table Rounding** – Applies a predefined table to determine how much to truncate.

Capacity coercion also affects a replacement drive used in a disk array. Normally, when a physical drive fails, the replacement drive must be the same capacity or larger. However, the capacity coercion feature permits the installation of a replacement drive that is slightly smaller (within 1 gigabyte) than the remaining working drive. For example, the remaining working drives can be 80.5 GB and the replacement drive can be 80.3, since all are rounded down to 80 GB. This permits the smaller drive to be used.

Without capacity coercion, the controller does not permit the use of a replacement physical drive that is slightly smaller than the remaining working drives.

CONTACTING TECHNICAL SUPPORT

Promise offers local Phone Support for Pegasus series during normal business hours:

For telephone support and business hours click here (<http://www.promise.com/ContactUs>) Web support and Live Chat is offered 24/7

Web: <https://support.promise.com>

Live Chat: <http://www.promise.com/us/Support>

Please be sure to register your product at PROMISE eSupport (<https://support.promise.com>)

The information below is required for troubleshooting. Please register this information or have it readily available at the time of your support call

- **TLA number** - Located on the outside of the box or on label toward rear of Pegasus chassis
- **Serial number** - Located on label toward rear of Pegasus chassis
- **Config Logs**. Please refer <http://kb.promise.com/cat/Pegasus32-series/> for instruction on acquiring Config Logs.

LIMITATIONS

RMAs issued before 12:00 noon PST M-F can be shipped out on same day. RMAs issued after 12:00 noon PST M- F ship out the next business day.

RMA METHODS

1. Cross Ship (NOT applicable in APAC and EMEAR)

For this method, Credit card information is required for security purposes. The replacement item is first sent to you (customer). Thirty (30) days, from the day of shipment, are allotted for returning the defective unit. If the defective part is not returned within the allotted 30days, your credit card will be charged the MSRP of the replacement part(s) shipped.

2. Return and Replace

Credit card information is not needed for this method. Once your request for an RMA is approved, an RMA number will be emailed to you along with specific shipping instructions. Product(s) must be returned in its original packaging (inner and outer box). If you do not have the original packaging contents please contact Promise Technical Support. All RMA are shipped standard ground to your location.

See "Returning the Product For Repair" on page 239 for more details.

United States

580 Cottonwood Drive

Milpitas, Ca 95035, USA

Technical Support (E-Support): <https://support.promise.com>

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Europaplatz 9

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Technical Support (E-Support): <https://support.promise.com>

Web Site: <http://www.promise.com>

Japan

3F, Mura Matsu Bldg, 3-8-5, Hongo Bunkyo-ku

Tokyo 113-0033, Japan

Technical Support (E-Support): <https://support.promise.com>

Web Site: <http://www.promise.com>

LIMITED WARRANTY

PROMISE Technology, Inc. ("PROMISE") warrants that this product, from the time of the delivery of the product to the original end user:

- a) all components for a period of three (3) years;
- b) will conform to Promise's specifications;
- c) will be free from defects in material and workmanship under normal use and service.

This warranty:

- a) applies only to products which are new and in cartons on the date of purchase;
- b) is not transferable;
- c) is valid only when accompanied by a copy of the original purchase invoice.

This warranty shall not apply to defects resulting from:

- a) improper or inadequate maintenance, or unauthorized modification(s), performed by the end user;
- b) operation outside the environmental specifications for the product;
- c) accident, misuse, negligence, misapplication, abuse, natural or personal disaster, or maintenance by anyone other than a Promise or a Promise-authorized service center.

DISCLAIMER OF OTHER WARRANTIES

This warranty covers only parts and labor, and excludes coverage on software items as expressly set above.

Except as expressly set forth above, Promise disclaims any warranties, expressed or implied, by statute or otherwise, regarding the product, including, without limitation, any warranties for fitness for any purpose, quality, merchantability, non-infringement, or otherwise. Promise makes no warranty or representation concerning the suitability of any product for use with any other item. You assume full responsibility for selecting products and for ensuring that the products selected are compatible and appropriate for use with other goods with which they will be used.

Promise does not warrant that any product is free from errors or that it will interface without problems with your computer system. It is your responsibility to back up or otherwise save important data before installing any product and continue to back up your important data regularly.

No other document, statement or representation may be relied on to vary the terms of this limited warranty.

Promise's sole responsibility with respect to any product is to do one of the following:

- a) replace the product with a conforming unit of the same or superior product;
- b) repair the product.

Promise shall not be liable for the cost of procuring substitute goods, services, lost profits, unrealized savings, equipment damage, costs of recovering, reprogramming, or reproducing of programs or data stored in or used with the products, or for any other general, special, consequential, indirect, incidental, or punitive damages, whether in contract, tort, or otherwise, notwithstanding the failure of the essential purpose of the foregoing remedy and regardless of whether Promise has been advised of the possibility of such damages. Promise is not an insurer. If you desire insurance against such damage, you must obtain insurance from another party.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, so the above limitation may not apply to you.

This warranty gives specific legal rights, and you may also have other rights that vary from state to state. This limited warranty is governed by the State of California.

YOUR RESPONSIBILITIES

You are responsible for determining whether the product is appropriate for your use and will interface with your equipment without malfunction or damage. You are also responsible for backing up your data before installing any product and for regularly backing up your data after installing the product. Promise is not liable for any damage to equipment or data loss resulting from the use of any product.

RETURNING THE PRODUCT FOR REPAIR

If you suspect a product is not working properly, or if you have any questions about your product, contact our Technical Support staff, and be ready to provide the following information:

- Product model and serial number (required)
- Return shipping address
- Daytime phone number
- Description of the problem
- Copy of the original purchase invoice

The technician helps you determine whether the product requires repair. If the product needs repair, the technician issues an RMA (Return Merchandise Authorization) number.



IMPORTANT

Obtain an RMA number from Technical Support before you return the product and write the RMA number on the label. The RMA number is essential for tracking your product and providing the proper service.

Return **ONLY** the specific product covered by the warranty. Do not ship cables, manuals, CDs, etc.

USA and
Canada: Promise Technology, Inc.
Customer Service Dept.
Attn.: RMA # _____
47654 Kato Road
Fremont, CA 94538

Asia-Pacific: Please return the product to your dealer or retailer or Contact
Promise technical support for instructions before shipping the
product.

Other Countries Please check Promise E-Support: <https://support.promise.com>
for the location nearest you. Contact the office or repair depot for
full instructions before shipping the product.

You must follow the packaging guidelines for returning products:

- Use the original shipping carton and packaging
- Include a summary of the product's problem(s)
- Write an attention line on the box with the RMA number
- Include a copy of your proof of purchase

You are responsible for the cost of insurance and shipment of the product to Promise. Note that damage incurred due to improper transport or packaging is not covered under the Limited Warranty.

When repairing returned product(s), Promise may replace defective parts with new or reconditioned parts, or replace the entire unit with a new or reconditioned unit. In the event of a replacement, the replacement unit is under warranty for the remainder of the original warranty term from purchase date, or 30 days, whichever is longer.

Promise pays for outbound standard shipping charges only. You must pay for any additional shipping options, such as express shipping and return of the defective part or unit.

FILE SYSTEM CONVERSION

This chapter describes the procedures used to convert a Mac file system (JHFS+) on Pegasus32 so it can be used with a Windows operating system. And, how to convert a Windows file system (NTFS) on Pegasus32 so it can be used with a Mac operating system.

The instruction in this chapter describe how to do the following:

- Format Pegasus32 with NTFS for use with Windows
- Format Pegasus32 with JHFS+ for use with Mac



WARNING

Converting the file system will erase the entire contents of the drives on Pegasus32. **All data currently on the hard drives will be lost.**

Make sure you back up all data to another system before proceeding.

If your Pegasus32 is currently formatted with Windows NTFS:

- To use Promise Utility to reformat the drives with JHFS+. See “Format drives for Mac JHFS+ with Promise Utility” on page 247.
- To use Mac Disk Utility to reformat the drives with JHFS+. See “Format drives for Mac JHFS+ with Mac Disk Utility” on page 249.

Formatting Hard Drives

For Windows

Now you are ready to format the Pegasus32 with a the NTFS file system for use as a direct attached storage system with your Windows computer. Use Pegasus Utility to format the RAID array and perform other administrative functions including changing the type of RAID. For information on the other tasks and functions of Pegasus Utility, please read the product manual. For the purpose of this installation guide, only the basic setup using the default PROMISE Hardware RAID 5 array is described. This type of RAID provides the best balance of performance and data safety. For more information on other RAID types, please read the product manual

DO NOT use the Windows Disk Manager to change the RAID on the Pegasus32. Any changes to the RAID array must be done using Pegasus Utility.

Follow the instructions below for the Windows OS you are running:

- Windows 10 users, see “Format Pegasus32 on Windows 10” on page 243.

For Mac

If your Pegasus32 is currently formatted with Windows NTFS, use Promise Utility to reformat the drives with JHFS+. See “Format drives for Mac JHFS+ with Promise Utility” on page 247.

Format Pegasus32 on Windows 10

Windows 10 users, please follow the steps listed below to launch Pegasus Utility and format the RAID:



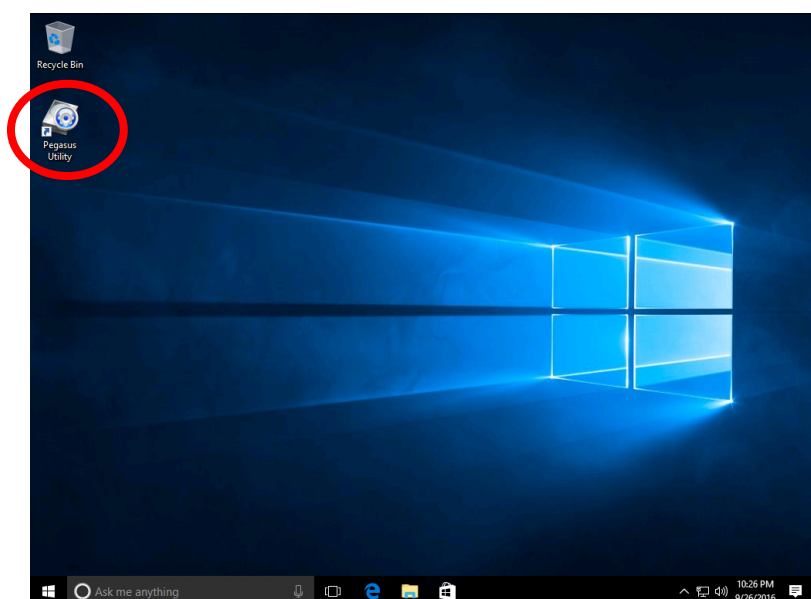
WARNING

Converting the file system will erase the entire contents of the drives on Pegasus32. **All data currently on the hard drives will be lost.**

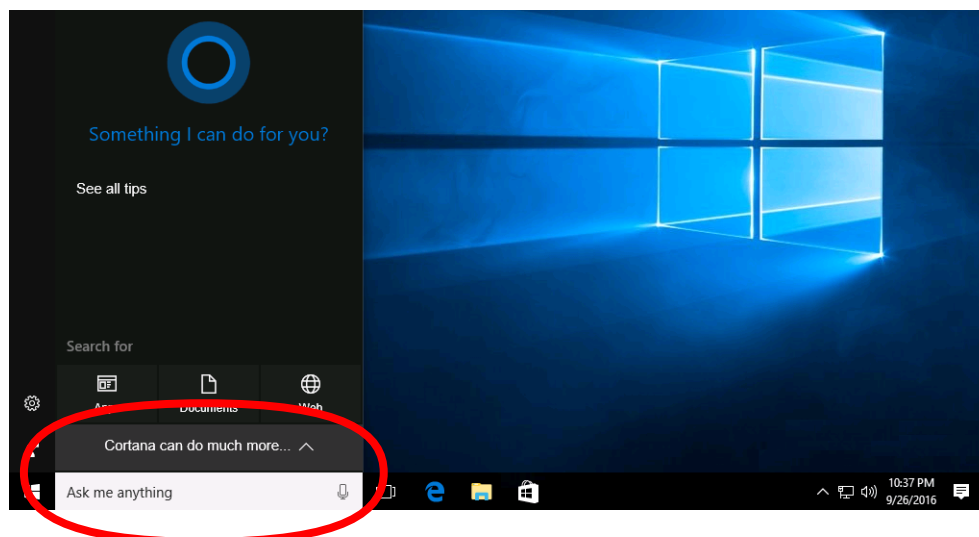
Make sure you back up all data to another system before proceeding.

1. Locate Pegasus Utility and launch it. You can use Microsoft Cortana to open it, or click on the Pegasus Utility shortcut on the desktop.

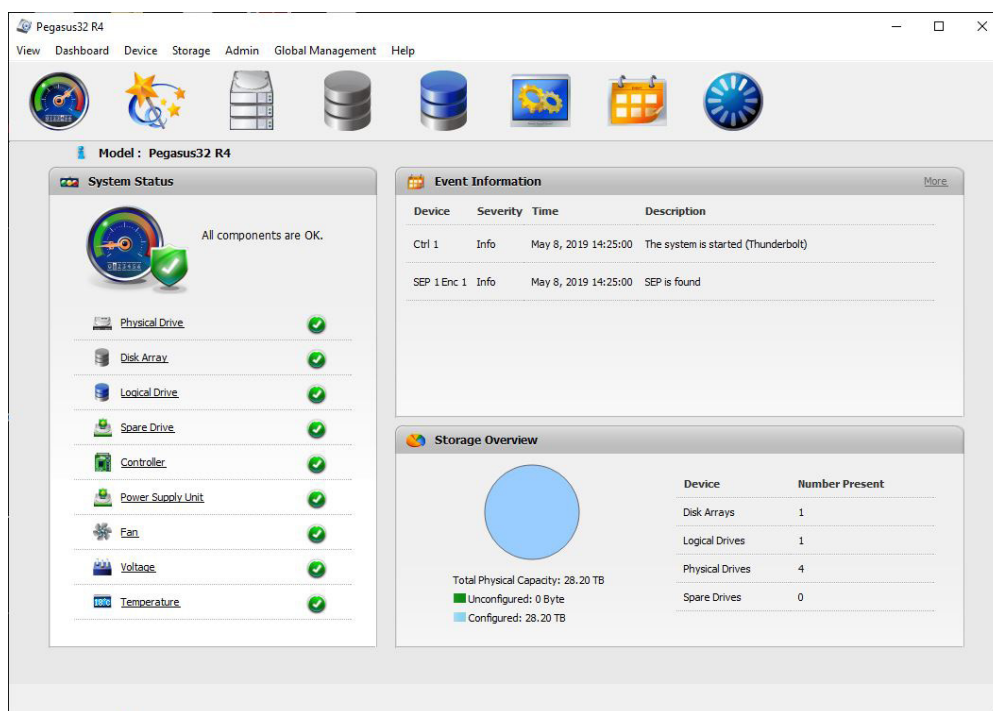
Pegasus Utility shortcut



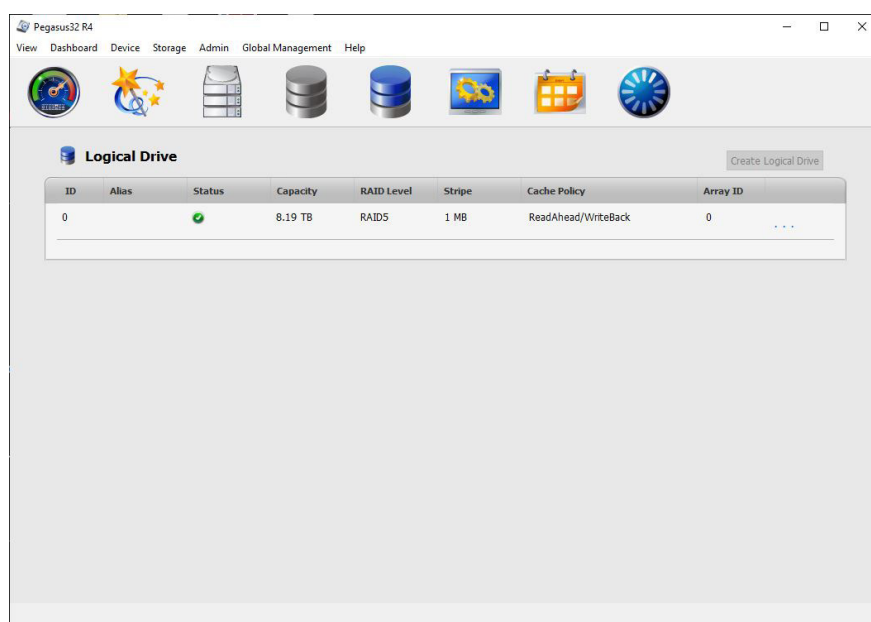
Launch with Cortana



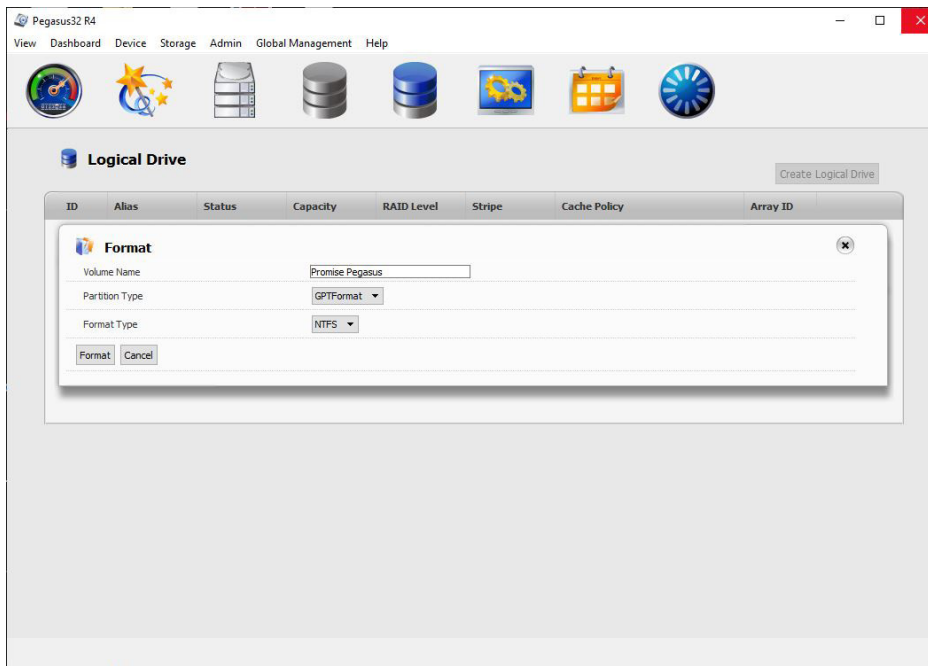
- After several seconds, the **Dashboard** menu appears. Use this menu later to view a summary of the device status. First you need to format the file system for the Pegasus32.



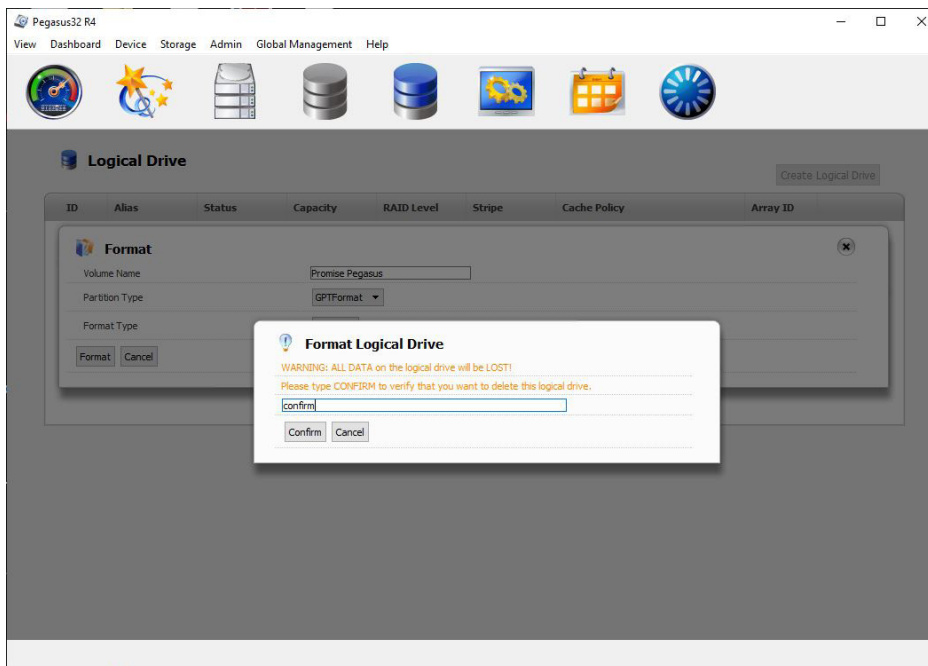
- Click on the **Logical Drive** menu icon near the top of the menu. Notice in the middle of the menu a description of the RAID array that is already setup. The default setup is a RAID 5 using all the hard disks. If you want to change this, please see the product manual. Otherwise, to begin using the Pegasus32 right away, click on the **Format** button to begin the formatting procedure.



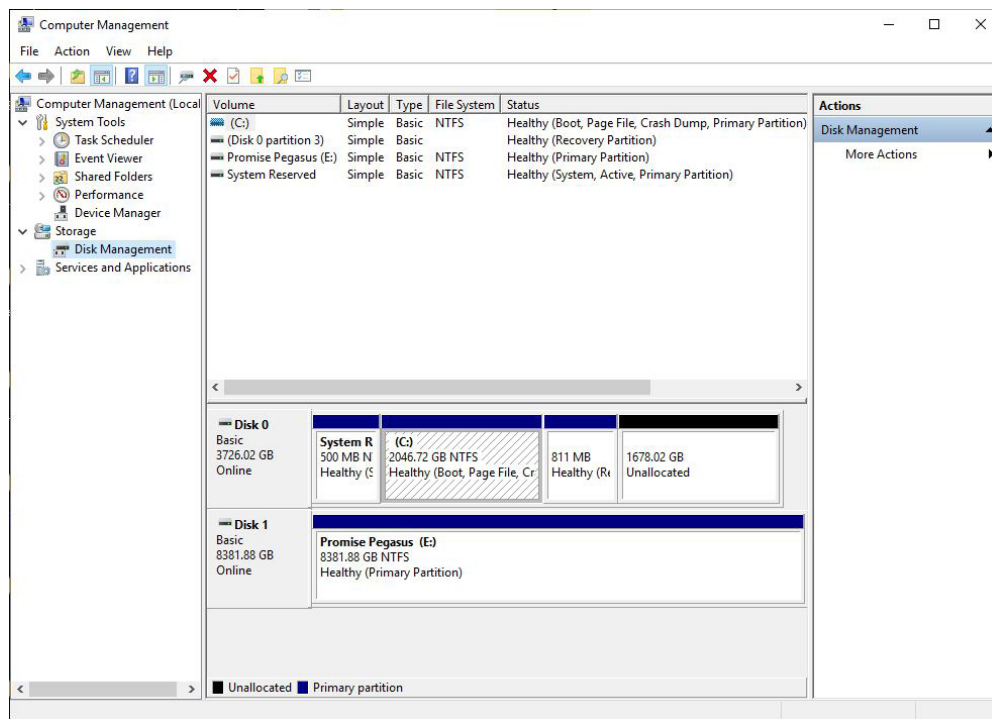
- The formatting options appear in a new menu. You can type in a different name for the Volume or leave the default Promise Pegasus. Most users should use the **Partition Type** set to the default *GPTFormat*. The other Partition Type option, *MBRFormat* (master boot record) does not support Logical Drives greater than 2 TB. The Format Type is set to NTFS, the standard Windows file system. Click **Format** to start formatting the array.



- In order to safeguard against unintended changes to the RAID setup or file system, the Pegasus32 requires that you confirm your decision to begin formatting the drives. To continue formatting, type **confirm** in the space provided and click on the **Confirm** button.



6. When the array is finished formatting, Windows will alert you that a New Volume has been installed. You can see the New Volume in Windows Disk Manager.



7. Make sure you check the firmware version of the Pegasus32 and update it if needed.

Format drives for Mac JHFS+ with Promise Utility



WARNING

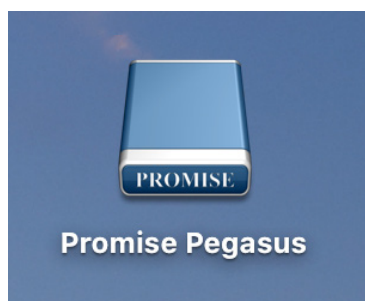
Converting the file system will erase the entire contents of the drives on Pegasus32. **All data currently on the hard drives will be lost.**

Make sure you back up all data to another system before proceeding.

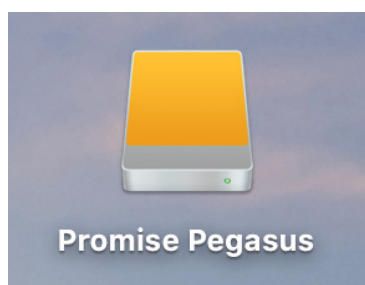
To change the file system using the Mac Disk Utility, please see “Format drives for Mac JHFS+ with Mac Disk Utility” on page 249.

Follow these instructions to change the file system to JHFS+ for use with a Mac using Promise Utility.

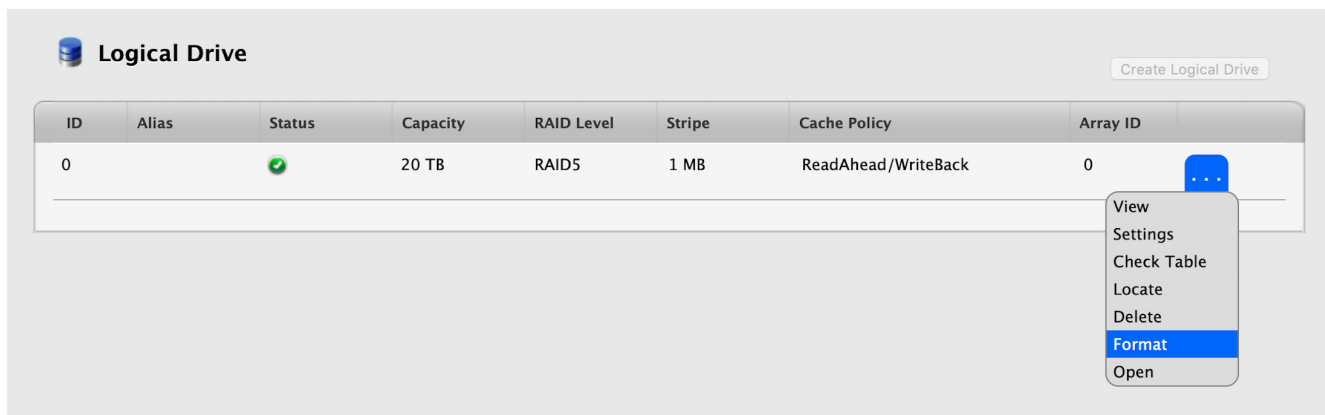
1. If the Mac Driver of Pegasus32 has been installed and loaded successfully, you will see the NTFS volume on your Desktop. Note that the Volume is read-only until you change to JHFS+ file system.
 - If Pegasus32 is connected to a Thunderbolt port on your Mac, the volume icon looks like this:



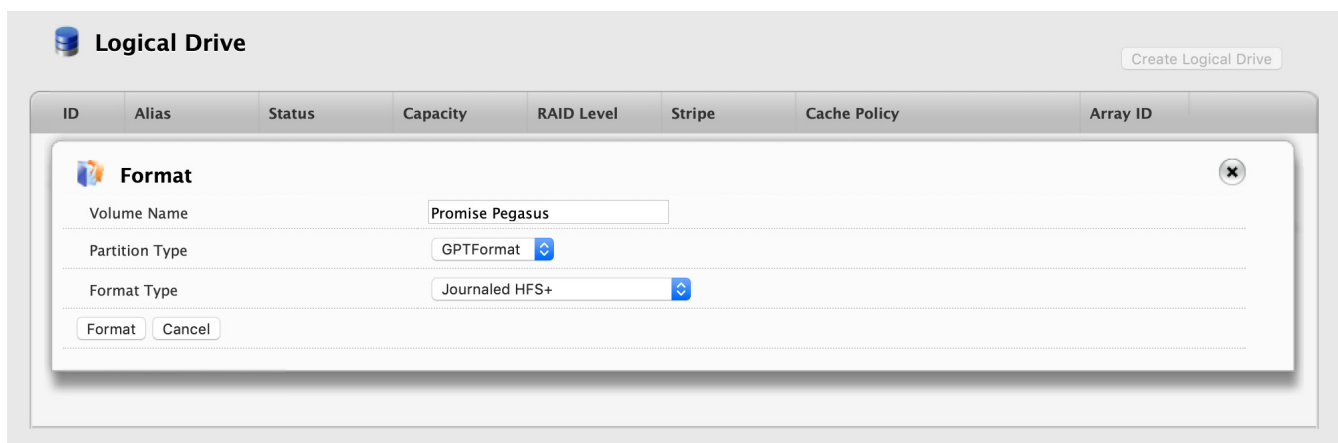
- If Pegasus32 is connected to a USB port on your Mac, the volume icon looks like this:



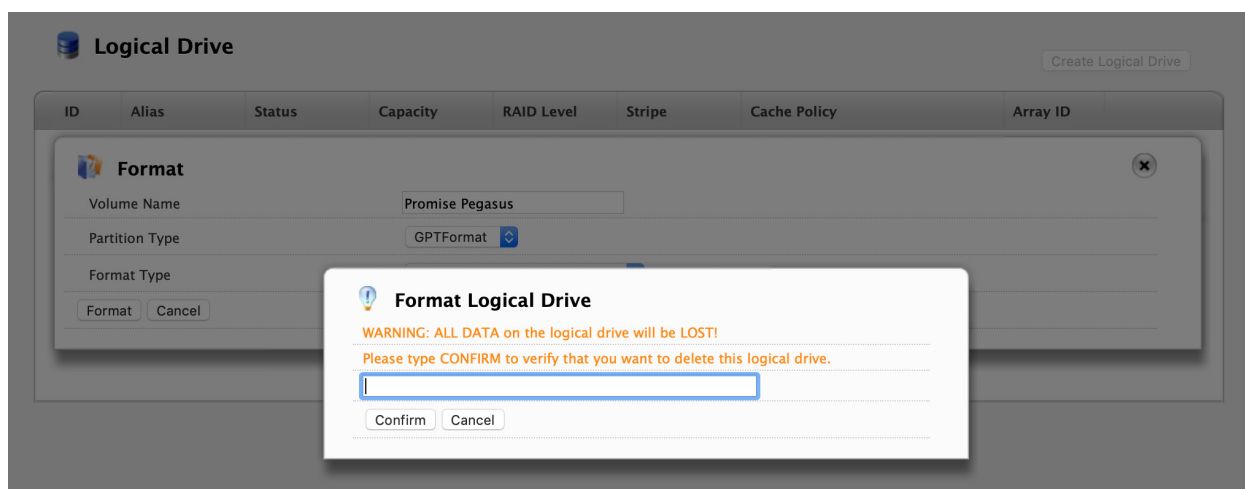
2. Use Promise Utility to Erase Volume from NTFS to JHFS+. Open Promise Utility and find the attached Pegasus32. Click the **Logical Drive** icon, and select the **Format** option.



3. In the new menu, type a Volume Name, select Format Type **Journaled HFS+** then click the **Format** button. A new menu appears to confirm your decision.



4. In the new menu, type "Confirm" then click the **Confirm** button to begin the formatting process.



Format drives for Mac JHFS+ with Mac Disk Utility



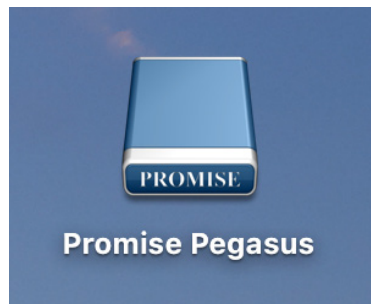
WARNING

Converting the file system will erase the entire contents of the drives on Pegasus32. **All data currently on the hard drives will be lost.**

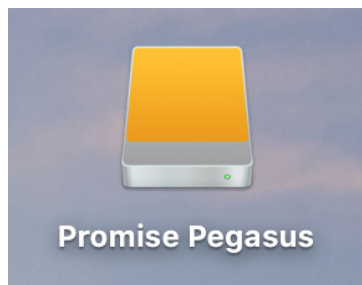
Make sure you back up all data to another system before proceeding.

Follow these instructions to change the file system to JHFS+ using Mac Disk Utility.

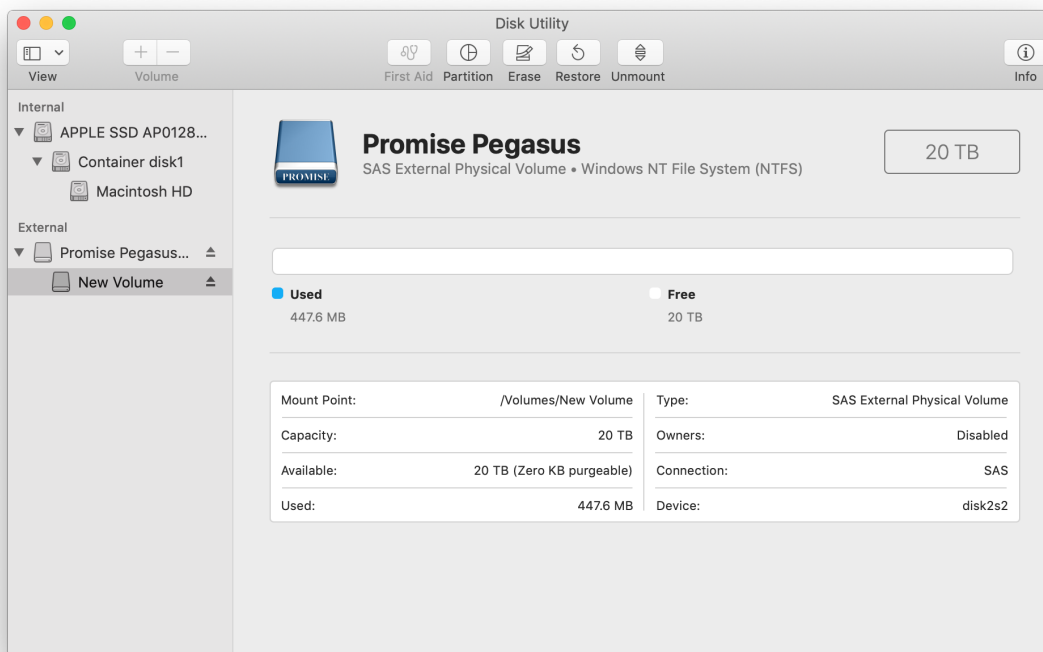
1. If the Mac Driver of Pegasus32 has been installed and loaded successfully, you will see the NTFS volume on your Desktop. Note that the Volume is read-only until you change to JHFS+ file system.
 - If Pegasus32 is connected to a Thunderbolt port on your Mac, the volume icon looks like this:



- If Pegasus32 is connected to a USB port on your Mac, the volume icon looks like this:



2. Use Mac Disk Utility to Erase Volume from and format with JHFS+. Select **External device** > **The Partition Promise Pegasus**, click **Erase** to format JHFS+.



3. Type a **Volume Name** and select **Format** type *Mac OS Extended (Journaled)*.

