



RAIDFrame[®]



High-Rely RAIDFrame^(R) Backup System Documentation V1.5

READ THIS FIRST

Important Quick Start Information for your RAIDFrame^(R)

- DO NOT ATTEMPT TO REMOVE RAIDFrame^(R) media (RAIDPacs) from their drive bays without pressing the “release lever” on the drive slot first! Forced removal of the drive will void your warranty and damage the mechanism.
- RAIDPacs will not “power up” until they are fully inserted and the release lever is in the locked position.
- WE HIGHLY RECOMMEND that the RAIDFrame^(R) is placed on a UPS of 1000VA capacity or better. This will insure stable operation and product life during unstable power situations.
- The latest Service Packs are important! Microsoft has continued to Debug removable drives on the Windows product lines.
- Not all eSATA ports are created equal. We recommend HBA controllers which support Port Multiplier and Hot-Swap capabilities such as those based on the Silicon Image chip sets for maximum compatibility. Other eSATA ports may only recognize the first drive in a multi-drive system or may not function at all.
- If you have more RAIDPacs than you have bays, you WILL have a drive letter problem as you change your media. Windows will assign drive letters randomly, which can confuse your backup software. **You can use the High-Rely Drive Manager utility HRDM2.MSI to solve this problem.** To do this, install HRDM2 on the machine that the RAIDFrame^(R) system will be connected to. See “Understanding the High-Rely Drive Manager” in this manual for more information.
- If you use Veritas Backup Exec, only version 9.0 or higher should be used. Always choose the “Backup to Removable Disk” folder. Never use the “Backup to Disk folder” since Backup Exec may become confused when restoring data from removable drives.
- Many operating systems are unable to deal with volumes over 2 TB of size. In Windows, volumes over 2TB must be partitions as GPT, MBR partitioning won't expose over 2TB. Not all versions of Windows support GPT. If you need volumes over 2TB, be sure that your OS, backup software and RAIDPacs support it.
- Particular photos in this manual may not be your exact unit.

The information in this manual primarily documents Windows systems. Although the RAIDFrame^(R) may work with Windows NT, Linux, Mac OS X and other operating systems, at this time, our tech support can assist with Windows platforms only.

Table of Contents

• 1. Introduction.....	5
• 2. Terminology.....	6
• 3. Primary Equipment in this Manual.....	7
• 4. Front Panel Features.....	8
• 5. Rear Panel Features.....	9
• 6. Connecting a RAIDFrame(R) unit to your computer.....	10
• 6.1 Choosing to connect via eSATA or USB 3.0?.....	11
• 6.2 Connections and power up.....	12
6.2.1 Connecting to host computer (Data connection).....	12
6.2.2 Power connections.....	13
6.2.3 Powering up the RAIDFrame.....	15
• 7. Setup and operation.....	16
• 7.1 Choosing media sizes.	16
• 7.2 Inserting and removing RAIDPacs.....	16
• 7.3 RAIDPac Drives and preparation.....	17
• 8. Physical Security.....	17
• 9. Windows “Safely Remove” RAIDPacs from the RAIDFrame(R).....	18
• 9.1 Using Devcon to Safely Remove Drives.....	21
• 9.2 A Note About the “Optimize for Quick Removal” Option.....	22
• 10. Assigning Drive Letters on Windows Systems	23
• 10.1 Assigning Drive Letters with Microsoft’s Disk Management Program.....	24
• 10.2 Microsoft’s Disk Management Tips and Tricks.....	26
• 11. Operating Scenarios.....	28
• 11.1 Mon-Fri/Sun (Auto Changer).....	28
• 11.2 Mon-Fri/Sun with full backups periodically.....	28
• 11.3 Backing up Multiple Servers.....	28
• 12. Working with backup software.....	30
• 13. For Advanced Users.....	31
• 1.RAID Settings.....	31
• 2.RAIDPac Monitoring and Configuration Software.....	32

NOTE: This equipment has been tested and found to comply with the limits of 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.

1. Introduction

RAIDFrame^(R) is a unique RAID product which provides your backup strategy with a large, reliable, redundant means of near-line storage as well as removable means of storing data for off-site backups. With RAIDFrame^(R), you can rest assured that your backups will be protected on a reliable, redundant RAID system and still have the insurance of an off-site image without the hassles and expense of tape.

The RAIDFrame^(R) system has an integrated RAID controller in each of its RAIDPacs which allows the multiple drives within each RAIDPac to look like a single drive to any connected host. Therefore, no RAID software or additional RAID drivers are necessary, and no load is placed on the host to perform RAID functions. There is no preference or priority to any of the slots within the RAIDFrame^(R) a single RAIDPac will function the same in any bay. As far as your host computer is concerned, each RAIDPac is a single drive. Any data written to a RAIDPac (set for RAID 5) will be broken up and stored in such a way that any one of the drives may fail and your data is still protected, on-line and available. If a RAIDPac is set for RAID 0, all drives must function for your data be present but storage capacity will increase along with speed. A RAID 5 configured RAIDPac can even lose a drive in the middle of a backup or restore, and your system will not know the difference or show any sign of failure other than a possible slow down. In the event of a failure the faulty drive can be removed and replaced and the RAIDPac will reconstruct the data onto the new drive without interruption, or the need for changes or further action to be taken on the host computer.

Because of the redundant capability of each RAIDPac, your backup software can backup data to the RAIDFrame^(R) using an efficient incremental method because the integrity and reliability of the RAIDPac storage is much higher than tape or a single drive. And, entire images are much easier because of the speed and capacity of RAID 0 configured RAIDPacs. Generation I and Generation II RAIDPacs configured as RAID 5 or RAID 0 of different sizes can operate simultaneous within the same RAIDFrame^(R) without any adjustment to the host. This allows you unprecedented flexibility in your backup media and methods.

Many possibilities exist which may be better suited to your needs. The RAIDPacs are interchangeable with other RAIDFrame^(R) products and, in the event that your RAIDFrame^(R) is unavailable or damaged beyond function, each RAIDPac maybe accessed outside of a RAIDFrame via its field access features without the need for drivers or nonstandard controllers. Of course, the drives inside the RAIDPacs are standard SATA drives which offer the best of today's technology in terms of speed, reliability and economy.

RAIDFrame^(R)'s advantages in capacity, flexibility and its convenient use of sata media in stand-alone drive storage systems plus the benefits of RAID 5 data protection make RAIDFrame^(R) a unique and superior proposition in the set of tools used by today's businesses for data storage and backup.

2. Terminology

The definition of some simple terms will help in understanding this manual:

- Hard Disk – The actual hard disk drive where data is stored.
- Tray – The removable cartridge which holds the hard disk.
- Media – The assembly of the hard disk in the tray. Also known in this context as a “RAIDPac”.
- Receiver – Also referred to as the bay. The slot where the Media is inserted into an operating chassis.

3. Primary Equipment in this Manual

5 bay RAIDFrame
4U RackMount Chassis



1 Bay RAIDFrame
MiniTower Chassis



RAIDPac – Generation 1

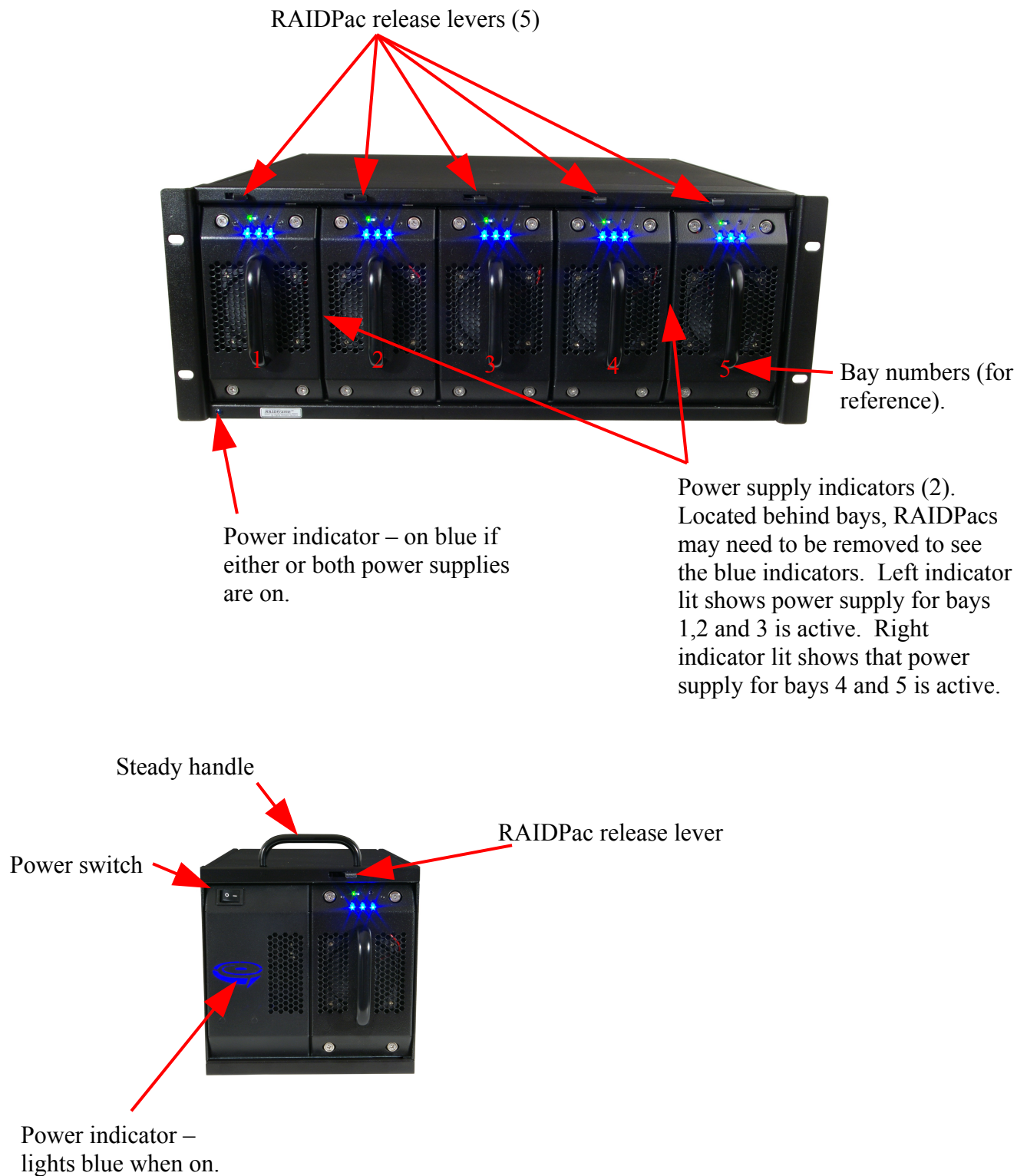


RAIDPac – Generation 2

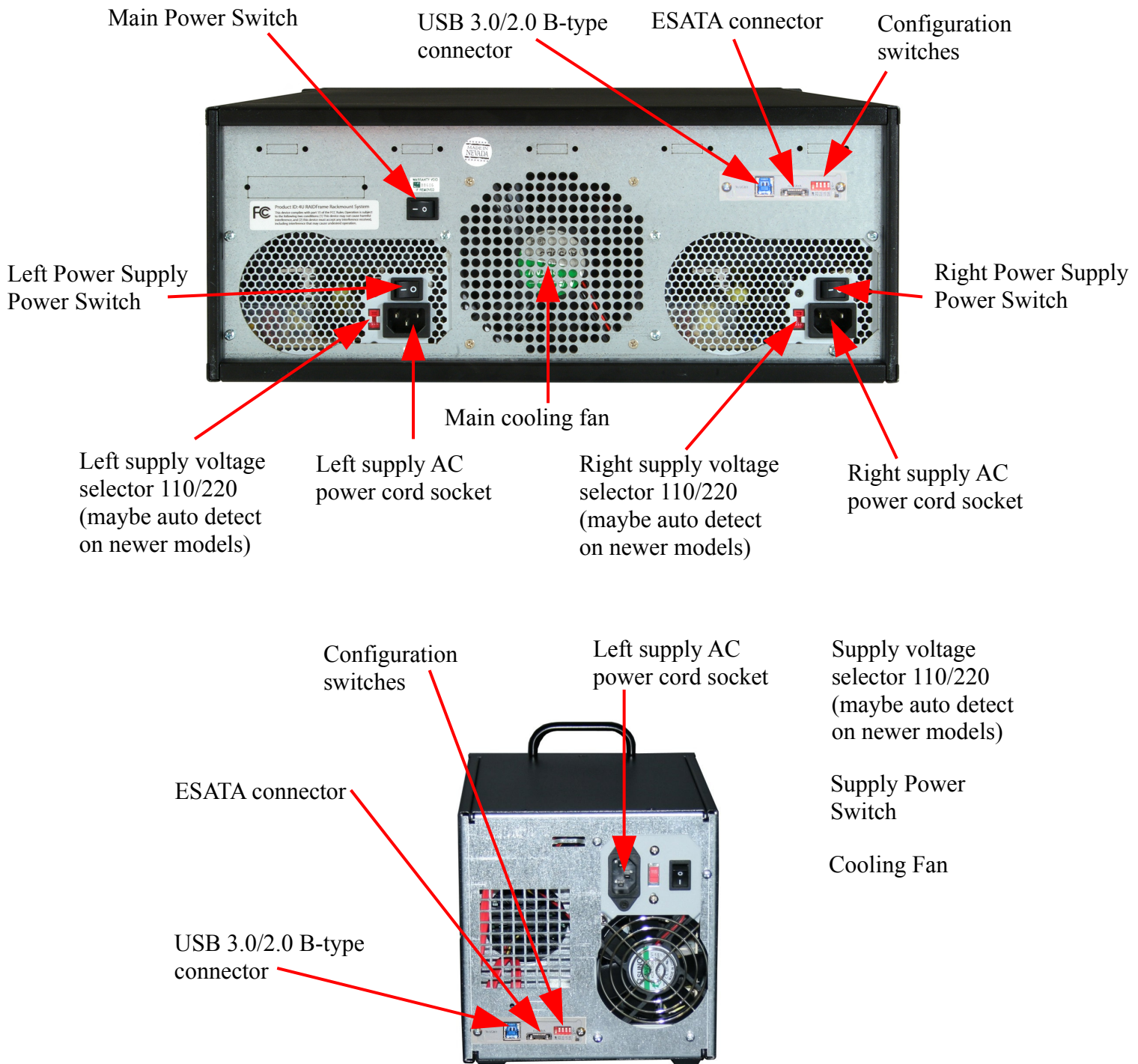


NOTE! Because so much of the features of the RAIDFrame system are within the RAIDPacs themselves, we highly recommend that you download and read the manual on RAIDPacs also.

4. Front Panel Features



5. Rear Panel Features



6. Connecting a RAIDFrame^(R) unit to your computer

RAIDFrame^(R) 5 Bay is available as a single eSATA/USB3 port or in a channeled SATA port configuration where each drive bay can receive it's own eSATA port. If you've ordered a configuration where any of the bays have been grouped onto a single eSATA/USB3 port, your controller within your host computer must be multi-drive capable in order to function properly through an eSATA connection with the RAIDFrame^(R). Typical configurations are:

Bays	Channel(s)
[1,2,3,4,5]	1 eSATA/USB 3
[1,2] [3,4,5]	2 eSATA/USB 3
[1] [2] [3] [4] [5]	5 eSATA

6.1 Choosing to connect via eSATA or USB 3.0?

There are advantages and disadvantages to both connection types. Your RAIDFrame unit offers you the choice of either so you should choose the method of connection by considering the following:

USB 3 (5Gbs)		eSATA (3Gbs)	
Advantages	Disadvantages	Advantages	Disadvantages
Host controllers are usually have fewer conflicts or compatibilities with host computers.	All devices (drives) disconnected then reappear whenever a single device on the same port is removed or attached.	Multiple devices (drives) on the same channel remain attached when installing or removing a single device.	Host controllers when installed into newer host computers often conflict with host's other drive controllers.
Can also run in USB 2.0	Is slower for short transfers (lots of little files)	File transfers for smaller files are faster.	eSATA cabling not as readily available.
Cabling and adapters/converters more readily available (Adapters/Converters should be fully tested first).	Takes longer for devices (drives) to recognize or dismiss when installed or removed.	Devices (drives) recognize or dismiss faster when installed or removed.	Most host computers do not come with eSATA.
Speed for long transfers (enormous files) comparable with eSATA.	If all drives are removed or off together, chassis may need power cycle for host to reconnect and see drives again.		
Many host computers already come with USB 2.0 or USB 3.0 so no adapter card is necessary.			

6.2 Connections and power up

6.2.1 Connecting to host computer (Data connection)

In addition to determining which interface (USB or eSATA) you should use, the choice of controller itself is important. The controller must support all the necessary features in both your operating system and any special features used by your backup software. Check with the card vendor to be sure your system and operating system is supported.

The first order of work is to install your controller card if your host does not already supply the type of port necessary. If you're connecting via eSATA, your eSATA HBA (Host Bus Adapter) needs to support both hot-swap and port multiplier features (some controllers will only support 4 devices per channel which may be a problem if you're using a 5 bay device). If necessary, install the controller card as recommended by the manufacturer. Today's newer servers use controller's which are usually not friendly to third party eSATA controllers. If you have difficulty seeing the controller of drives, try moving the card to another slot (it may be necessary to try every slot in the computer). See our website technical support for more help on this.

USB 3.0 HBAs are much better received by the host computers. High-Rely devices do not require power via USB 2.0 or USB 3.0. However, some USB 3.0 controller may require that the host still supply additional power to the card by connecting with the inside power supply. Check your controller's requirements and server's power resources. **NOTE: If your RAIDFrame is connected via USB, it is advised to leave at least one RAIDPac installed in the frame and running when swapping RAIDPacs. This keeps the USB connection to the host open. If at any point, all RAIDPacs are powered down/removed such that none remain on, it maybe necessary to power cycle the RAIDFrame after RAIDPacs are installed in order for the host to see the drives again. This is not an issue and this process is unnecessary if your unit is connected via eSATA. Also, when connected via USB, whenever a RAIDPac is inserted or removed, it is normal for the remaining devices to go offline momentarily then return.**

Once your controller card is installed and/or the desired port is available, you may begin connecting the the computer to the unit. However, power down the host computer at this time.



USB 3.0
(SuperSpeed) to
host connection

ESATA to host
connection

RAID Mode
Setting Switches
(For Advanced
Users)

Change RAID Mode
to Selection (use open
paper clip, hold for
20 seconds while
powering unit on)

****eSATA/USB 3.0 Back panel.*

1. Be sure the locations of your RAIDFrames allow for plenty of ventilation, keep the areas to the rear and from of the equipment clear enough for air to move freely.
2. Connect your patch cable (USB or eSATA) from the eSATA or USB 3.0/2.0 port of your host computer to the proper connector on the back of your unit. In the Figure above for the eSATA/USB 3.0 back panel, you will see the USB 3.0/2.0 'B' type connector and the eSATA connector. Only one maybe plugged in at a time. If you switch from USB to eSATA or vice-versa, you must wait at least 10 seconds after removing one cable before plugging in the other. If after switching cables, no devices appear, try power cycling the unit. If that fails, look back to the host controller for issues.
3. Look for new volumes to appear using Windows Drive Management. If the drive is not formatted, it will not appear to explorer but will still show in Drive Management and will need to be formatted. If you do not see the drive appear, try reseating your cables. Try power cycling both the host and the High-Rely unit. Again, if this fails, consider controller issues and compatibility.

6.2.2 Power connections

First, check the AC outlet supply voltage and BE SURE that the power supply voltage selectors are correctly set for your outlet's AC supply voltage. Incorrect setting will result in sever damage to your unit and may void the warranty.

Next, turn off the all the power switches. For the 1 Bay, there are two (one on the rear of the unit and one on the front). For the 5 bay, there are three on the rear. Install the power cord(s). Use two power cords for the 5 bay unit, both plugged into the same outlet that is protected by either a surge protector or a battery backup system (HIGHLY RECOMMENDED).

Once the controller and associated driver has been properly installed, you can plug your RAIDFrame^(R) in using the included standard eSATA or USB 2/3 data cable to your host computer.

Turn on your host machine and wait for it to boot.

6.2.3 Powering up the RAIDFrame

For the 1 Bay, turn on the rear power supply switch, then turn on the front power switch. For the 5 bay, turn on both the right and left power supply switches, then turn on the main power switch.

The 5 bay unit has two power supplies. One power supply provides power to three of the bays, the other power supply provides power to the remaining two bays. This allows the RAIDFrame^(R) to continue to operate, but in a reduced capacity, if one of the power supplies fails. Each power supply has a switch on the back which must be on. When first powered on, if RAIDPacs are already installed in the bays, each bay will power on sequentially at about 15 second intervals. This is to avoid producing a current surge from the startup power requirements of all the hard drives at once. If you are installing multiple RAIDPacs when the unit is powered on, wait 15 seconds between insertions to avoid a similar power surge. If you do cause a power surge, it will not damage the RAIDFrame^(R) but it may cause one or more installed RAIDPacs to get confused and go off-line or falsely signal an error. If this occurs, the erroneous RAIDPac can be reset simply by removing it and reinstalling it.

Depending on the version and service pack level of your operating system, Windows (versions 2000, 2003, XP, Vista, 7/8) should automatically detect the RAIDFrame^(R) system and however many RAIDPacs are installed is how many new drives should be detected. Linux and other operating systems that support the eSATA and USB cards should also see the drives come on line automatically if configured properly. It could take up to two minutes for all drives (RAIDPacs to register). If the controller card is not automatically detected by the operating system, seek technical assistance from the card vendor or dealer.

At this point, the system is on line, and you can insert your RAIDPac(s) if it is not in or you have not already done so. *RAIDPacs are sometimes referred to as “media” - the combination of both a hard drives and carrier in which the hard drives reside. This combination is considered a single unit and is intended to be inserted in or removed from your RAIDFrame^(R) like a cartridge.

7. Setup and operation.

7.1 Choosing media sizes.

RAIDPacs are very flexible. They can each be of different sizes. They can also be either RAID 0 or RAID 5. A RAIDFrame^(R) 5 Bay unit can operate up to 5 RAIDPacs each with various configurations simultaneously. For the best performance, within each RAIDPac should be drives of the same make, model and size. RAIDPacs' RAID controllers will deal with drives of different makes and sizes but will not perform as well under these circumstances. If the RAIDPacs drives do not match size, the RAIDPac's RAID controller will only use the amount of space from each drive equal to the smallest drive in the group and will waste the remaining space on the drives that are able to hold more. So, if you have a 100GB drive, a 200GB and a 300GB drive to use in the RAIDPac, the RAIDPac's controller will only use 100GB of each drive giving you a total of 200GB of RAID 5 storage or 300GB of RAID 0 storage. This is because 100GB is the smallest drive in the group and the redundant storage technique of RAID level 5, will always provide a maximum of only 2/3's of the total storage available in a RAIDPac.

RAIDPac G2 RAIDPac will support 1, 2 or 3 drives. If only 1 drive is installed, no RAID features are offered. For 2 drives, RAID 0 (striping) and RAID 1 is allowed and for all 3, RAID 0, or RAID 5. The same drive size rules apply for only for two drives.

Further information can be found in the manual for your particular RAIDPac type (G1 or G2).

7.2 Inserting and removing RAIDPacs

The RAIDFrame^(R)'s hot-swap controllers manage power for each of the bays. When you press a release lever (see front panel descriptions) for the bay of the RAIDPac you wish to remove, the RAIDFrame^(R) will immediately cut power to that RAIDPac. Please wait at least 10 seconds before removing the RAIDPac in order for drives to spin down. **RAIDPacs contain hard drives which ARE VERY FRAGILE! Care should be used when handling your RAIDPacs.** Upon sensing the return of a RAIDPac in the bay (inserting the RAIDPac), it will restore power.

The release lever is also a mechanical lock that prevents a RAIDPac from being removed until the lever is pushed in. Push in the lever while pulling out the RAIDPac to remove it. To install a RAIDPac, simply insert another RAIDPac and be sure to gently but firmly push it in all the way in until the release lever clicks back into position. The RAIDPac should then power on a few seconds later. If the RAIDPac does not power on, pull the pack out and try inserting with a bit more force.

NOTE! DEPENDING ON YOUR CONFIGURATION, IT MAY TAKE UP TO 2 MINUTES FOR A NEWLY INSERTED RAIDPAC TO APPEAR ON-LINE TO YOUR HOST COMPUTER.

7.3 RAIDPac Drives and preparation.

Your RAIDFrame^(R) RAIDPacs should have come with the drives already mounted and prepared for use. **DO NOT REMOVE THESE DRIVES WITHOUT READING THIS SECTION COMPLETELY!**

Because RAIDPacs contain hard drives which are electromechanical devices, one or more drive failures within a RAIDPac is inevitable. The MTBF (average operating time before failure) for RAIDPacs varies depending on the internal drives but, each RAIDPac should operate without trouble for well in excess of 3 years of continuous 24/7 operation. Each RAIDPac may contain two or three drives. These drives should have already been prepared at the factory and should need no further operations performed on them before use. However, in the event there is a failure or you're installing your own drives, this section will be useful. For these and other RAIDPac features and operations, please see the manual for your model of RAIDPac (G1 or G2).

8. Physical Security

The RAIDFrame^(R) can have a small padlocks installed through the holes on the release lever of the bays you wish to secure preventing removal or installation of RAIDPacs. *High-Rely does not provide these locks at this time and must be sought elsewhere.*

9. Windows “Safely Remove” RAIDPacs from the RAIDFrame^(R).

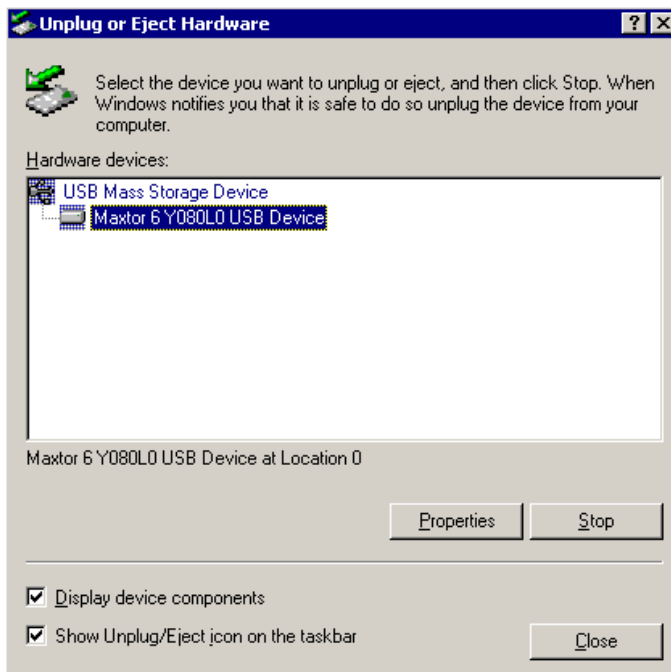
Microsoft calls a hard drive removal without notification a “surprise removal” and has documentation about these removals on their web site. Always insure that no remote users or software service or program is writing to the drive (RAIDPac) prior to removing it. **Removing a drive during a writing process can damage the format of the drive, and possibly lead to data loss. Safely removing a storage device entails telling the operation system to flush all cache write requests to the drive and dismount it.**

NOTE:How Windows handles this feature differs from version to version of Windows and it may appear or function slightly different on your system in comparison to the explanation given here, so some technical interpretation may be necessary in order to apply these directions to your system.

To safely remove a drive through Windows' safe removal feature, start by logging into the server using the Administrator, backup operators, or other account with sufficient rights to deactivate hardware. In the system tray (systray) of the desktop, the lower right hand corner of the screen, find the icon that looks like a small rectangular box with a green arrow floating above it as shown within the red circle in the diagram below. This Icon is the “Safely Remove Hardware” icon. If it is not there, it may be hidden or configured not to display. If you're having difficulty here, contact your system administrator or technical support. You can use the Microsoft “Devcon” command as an alternative means of safe removal and is explained in the next section.



To safely remove the drive if this icon is displayed, double left-click on the icon. This should bring up a pop-up that states “Unplug or Eject Hardware” or “Safely Remove Hardware” depending on which OS you are using. Select the drive you wish to remove and click “OK”. You may see multiple devices associated with each USB device, however RAIDFrame^(R) uses a SATA port and will not have sub-devices. Clicking on the line of the device you wish to remove and selecting “OK” will give your operating system proper notification of your intention to remove a device and prevent loss of or corrupted data. Notice that the two screen shots below look slightly different, which reflect two separate operating systems.



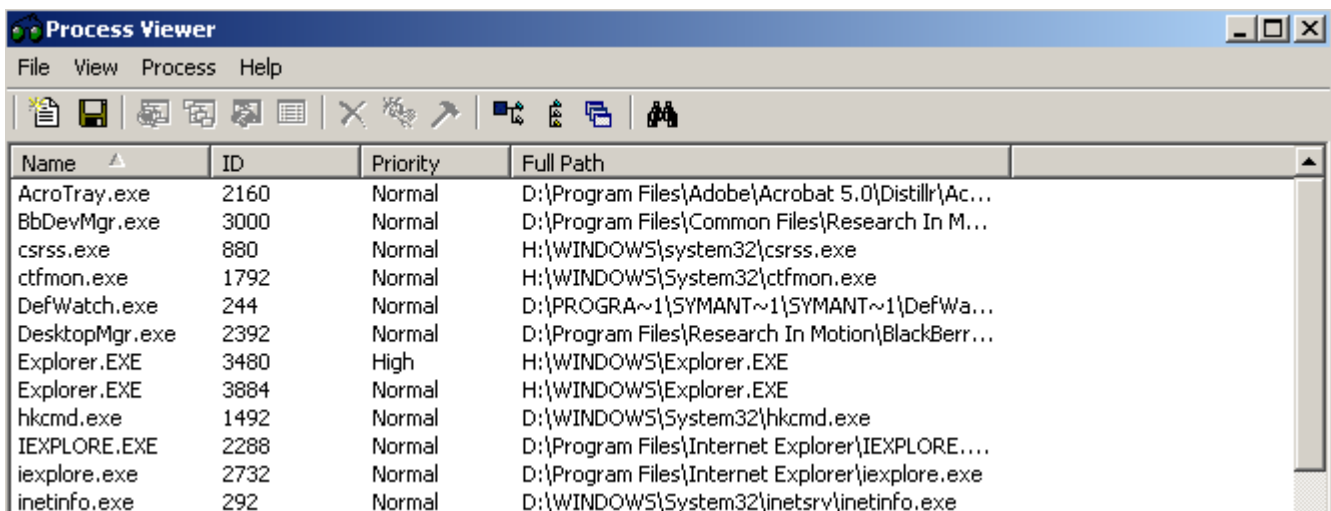
You should see the Safe to Remove Hardware bubble that states “The ‘XXX Mass Storage Device’ can now be safely removed from the system” in the bottom right-hand corner of your screen near the system tray. If you get a message saying the drive is in use, insure that all running software, including explorer windows such as “my computer”, has been shut down, and try again. We have occasionally had software, such as anti-virus or undelete programs, prevent drives from being safely removed. If closing all programs doesn’t solve this issue, you can consider rebooting the machine.



However, rather than rebooting your machine when this happens, we recommend loading a process viewer to check what process is holding the drive letter open so that the program or process can be shut down without rebooting the entire machine. A free process viewer we have used successfully can be found at:

<http://www.prcview.com>

As you can see from the screen shot below, the process viewer helps identify the drive letters and path that each running process might have open. Look for a process that is using the same drive letter as your RAIDFrame^(R) drive and shut it down to allow safe removal.



Notice in the upper right corner of the bubble that there is a small “X”. Click on the “X” to confirm the High-Rely system's future removal, remove the RAIDPac drive from the system. Please refer to “Inserting and removing RAIDPacs” for more specific instructions.

9.1 Using Devcon to Safely Remove Drives

NOTE: This section is for technical users. Do not attempt to use any of the suggestions in this section unless you feel confident in your technical abilities.

Microsoft has a command line utility called Devcon which is an alternative to using the graphical Safely Remove manager. This utility can also be used to create a batch file and a desktop shortcut for quick removal of all the removable hard drives in your system. This is especially useful for multi-bay High-Rely units like the RAIDFrame^(R) as it allows one click notification to the operating system to stop all installed removable drives. Search Microsoft’s web page for knowledge-base article Q311272 for more information on Devcon. This article also has a link to download the utility at no cost. We recommend you save the utility in %systemroot%\system32 or a similar location where the operating system can find it. %systemroot% is a variable that Microsoft uses to denote the folder the operating system is installed into. Normally, this will be either c:\winnt or c:\windows. So in other words, for easy access on a typical Windows 2003 server, you would save the utility in the c:\windows\system32 folder. On a Windows 2000 machine, this would be c:\winnt\system32.

We recommend you create a two line batch file using notepad called “stopall.bat” like the following:

```
Devcon remove usbstor*  
  
Pause
```

However, the above example only removes USB drives – check the name of your SATA devices (usually listed as a SCSI drive) and replace the term “usbstor*” in the above example appropriately.

The only reason for the pause command is to allow you or your operator to see the result of the Devcon command. Occasionally, Devcon will respond that it is unable to stop a device. Since it does not run in the graphical environment, the pause allows you to see what is happening before the window closes. Simply hit any key to close the CMD window and proceed to remove the RAIDPac(s).

If desired, it is possible to create Devcon batch files to stop individual drives as well by modifying the parameters on the command line.

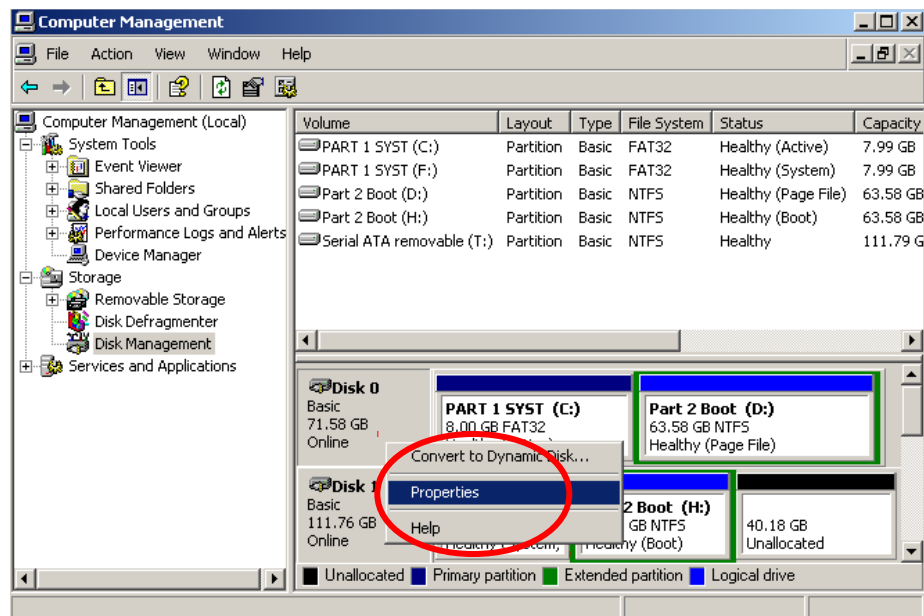
If you want to insure that the drive is not currently in use, you may wish to download and install a small program called wholockme. At the time of this writing, you can find this at <http://www.dr-hoiby.com/WhoLockMe/>. You may also find this on our website, <http://www.high-rely.com>, along with some other useful utilities and information.

Once installed, you can simply right click on a drive letter in explorer - or my computer - and select “wholockme”. If the drive is in use, the program will report the name of the program that has locked the drives or files. If a program erroneously has the drive locked (Windows Explorer seems to be a common culprit) you might consider issuing a mountvol X: /D command (where X is the drive letter) to remove the drive letter prior to removing the drive. Unfortunately, this technique requires that you remount the drive with a mountvol command that specifies the full ID of the drive, which is inconvenient, so this should only be done as a last resort. Once you are sure the drive is not in use, press the release lever and remove the RAIDPac from the bay.

9.2 A Note About the “Optimize for Quick Removal” Option

On the newer operating systems, such as Windows XP and Windows 2003, there is an option to allow “quick removal” of hard drives. We believe “best practice” is to make sure all High-Rely drives are set for quick removal and recommend that you check the setting. To do so, right-click on My Computer, and select "Manage". Click on "Disk Management" in the left-hand column. Now right click in the gray area where the disk # associated with your media is displayed, (see red circle in screen shot) and select “Properties”. Keep in mind that the data is being written to a disk within the media, and Windows refers to the media as a disk as seen in the above screen shot. For the purposes of this section, we will be using the terms disk and media interchangeably.

From this screen you will be able to select the “Policies” tab. Notice the option that allows you to indicate the drive should be “Optimize for Quick Removal”. (NOTE: sometimes the eSATA drivers will override windows and causes the option for Quick Removal to be unavailable, in this case, no change can be made. This commonly indicates that the setting disables write caching on the disk and in windows).



Write caching a removable storage device is not recommended, because with write caching enabled, data can still be buffered within the system and not yet been transferred to the disk when the media is physically removed – thus, the data never made it onto the disk even though it looks as if it did. This can occur when a media is removed without properly notifying the system and can lead to data corruption. Proper ejection of the disk through the system will allow the Windows disk administrator to transfer any unwritten data from the buffers to the disk and insure that no files are open on the devices. If at any time you get a write cache failure that results in your data “disappearing from your HR drive”, please do not panic. Under certain conditions, we have seen windows explorer erroneously show “empty” hard drives that actually had data. Upon rebooting the system, the data reappears.

10. Assigning Drive Letters on Windows Systems

By default, when you power on each RAIDPac, it searches for the first free drive letter it can find. In a multi-drive High-Rely system like RAIDFrame^(R), it is possible that Windows will provide a different drive letter each time you power up a given drive depending on what drives are not being used at that moment. Also, when powering up a loaded High-Rely system (all media in place), the order the drives power up and are ready in is the order the drive letter assignment will occur in. Which drive receives a drive letter first depends on which one is ready and recognized first by Windows. This means that sometimes one RAIDPac maybe recognized first and sometimes a different one may. How drive letters are assigned and whether or not the same drive receives the same drive letter every time it is turned on can cause problems, because backup jobs are typically set to write to a particular drive letter (i.e. the Monday backup job writes to drive K:, the Tuesday backup job writes to drive L:, etc.). So if the drive letter is changing each time your RAIDFrame^(R) is powered up or you swap RAIDPacs, problems will occur such as information being written to the wrong drive. While this won't actually hurt your system, it could result in data misplacement, erasure or the overwriting of important data. Additionally, there can be conflicts if you have network drives already assigned to letters that the High-Rely system needs to use for backup.

To handle the drive letter assignment issue you can:

1. Allow Windows to assign static drive letters to each drive but make sure to power each drive up in the same order each time by using the key lock to power up each drive.
2. Load and use the High-Rely Drive Manager (HRDM2) software to re-map drive letters to your preferences. HRDM2 is free software available from High-Rely.com. Download and install the software then, following the instructions in the program. This software runs as a service to detects drive changes and reassign the drive letters that you configured in HRDM2 based on the serial numbers of each drive which do not change unless reformatted. This way the drive letter will always be used by that media cartridge, so you won't have these problems. Please refer to the section below on HR Drive Manager for more information.

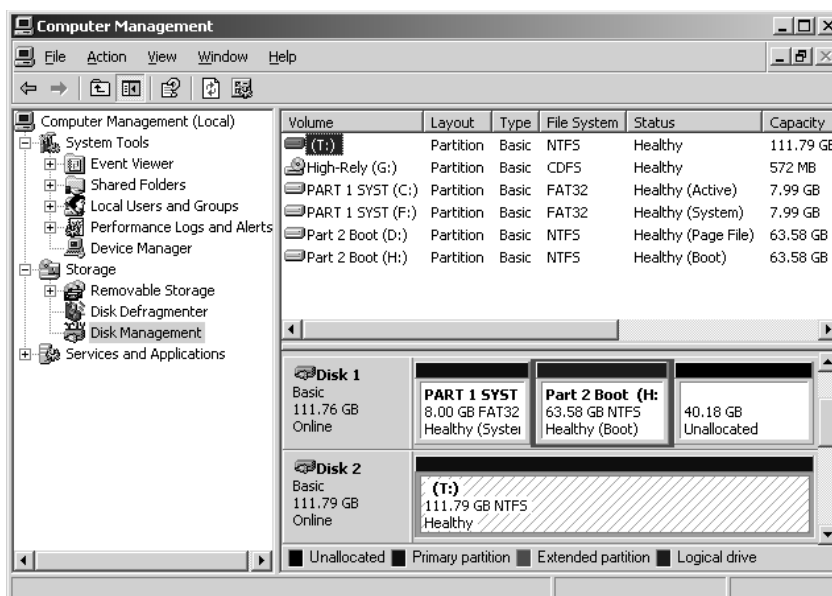
If you prefer to use Microsoft's "Disk Management" to change your drive letters, refer to the following instructions. However, you should be aware that if you change a drive letter on the Media labeled "Monday" to a letter, such as "N:", pull out the drive, replace it with media labeled "Tuesday" and also label that drive "N:", you will find that when you put the original media "Monday" back in the drive that it no longer retains the N: designation. This is a Windows problem that exists in all versions we have tried. This problem is worked around by the High-Rely Disk Management software, HRDM2, because it allows you to assign multiple serial numbers to a single drive letter.

NOTE!!! On some Windows operating systems, the auto mount feature is disabled which will result in drives not appearing after they've been inserted.. To enable it, issue a "mountvol /E" from the command prompt.

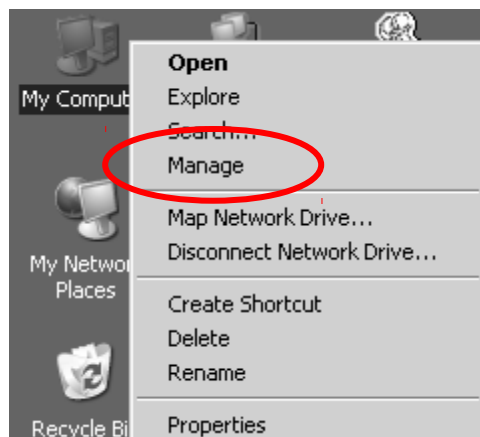
10.1 Assigning Drive Letters with Microsoft's Disk Management Program

Before beginning the process to assign new drive letters to RAIDFrame^(R)'s drives, you may want to record the drive letters that Windows automatically assigned each of your drives, because the Microsoft Disk Management program does not display a drive's serial number, and so you will need another method of identifying which drive letter corresponds to which RAIDPac. That form of identification will be the original drive letter. This can be done by removing all but one RAIDPac. Note the drive letter associated with that RAIDPac. Then, install another RAIDPac and note the drive letter for that pack. Repeat until your RAIDFrame^(R) is full.

Once you've recorded the existing drive letters use Microsoft's disk management program to change them by following these steps:



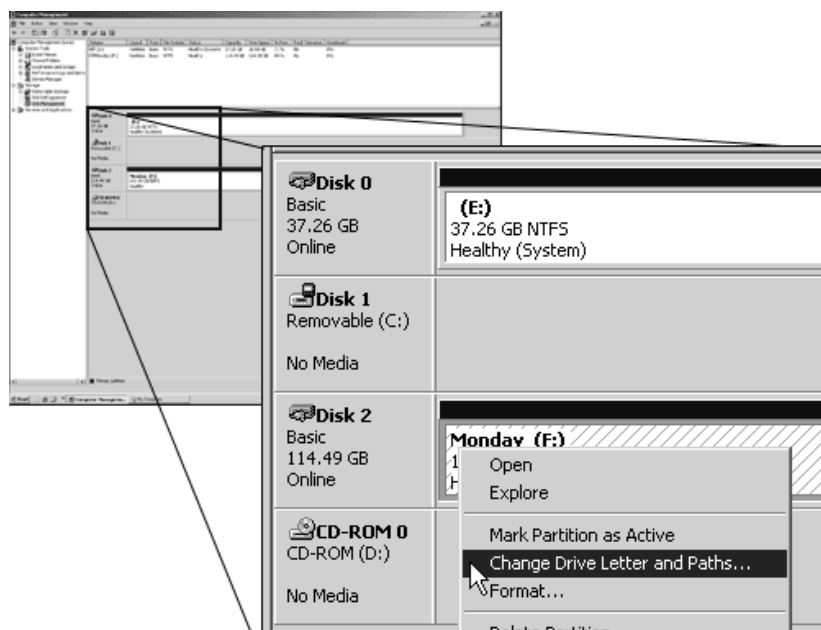
Right-click on My Computer, and select "Manage". (see red circle in diagram below)



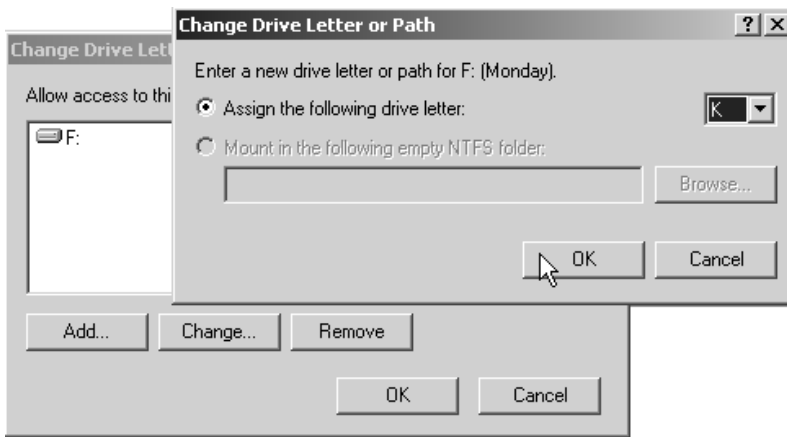
Click on "Disk Management" in the left-hand column.

Notice in the screen shot below that Windows had assigned the drive with volume label "Monday" the letter F:. Let's say we want to change it to J:.

Right-click on the area that contains the volume label "Monday", and select "Change Drive Letter and Paths", as shown below:



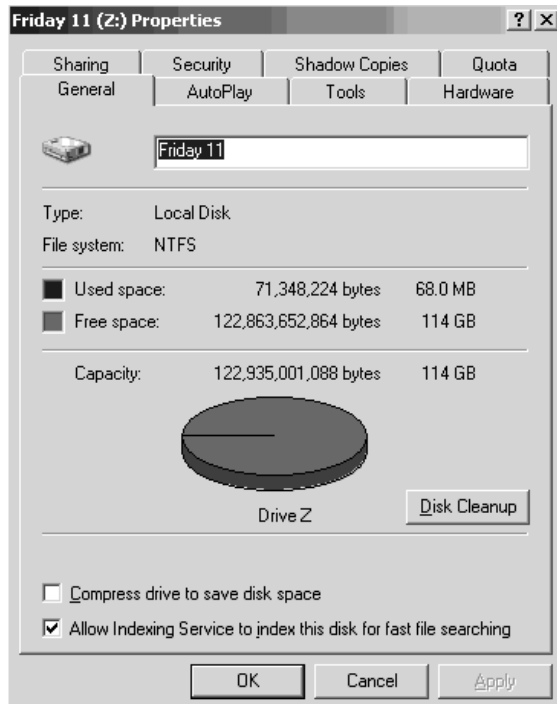
Click "Change", and select the drive letter you want; then click "OK", as shown in the next figure:



Repeat this procedure for every High-Rely media (RAIDPac) you have.

10.2 Microsoft's Disk Management Tips and Tricks

You may want to, and we recommend that you, turn off indexing for your High-Rely drives. It is recommended so that the operating system doesn't lock your drive without your knowledge, complicating the safe removal process. From Disk Manager, right click on same location that you did earlier for a given drive (right hand side that is usually white with blue band above it) and select "Properties". Un-check the box at the bottom of the "General" tab that says "Allow Indexing service to index this disk for faster file searching". See the graphic below.



11. Operating Scenarios.

11.1 Mon-Fri/Sun (Auto Changer)

In this scenario, the High-Rely unit is connected directly to a Windows server which is running backup software on a daily basis. The user has multiples of their weekly backup sets in media (RAIDPacs). For example, if they have a 5 bay to use for Monday through Friday, then they have (5 X) five times however many weeks they wish to go back. If they are backing up Monday through Sunday then they have (7X) 7 times. In this example we shall say the user has a 5 bay and has three weeks back of media so he has 15 pieces of media.

Each of 5 pieces of media is given a different volume letter but those letters repeat for each set. For example, there are three drives with the volume letter H:, three with I:, three with J:, three with K: and three with L:. The Hs are all Mondays, the Is are all Tuesdays, the Js are all Wednesdays and so forth. Thus, one weeks worth of media consists of 5 drives letters, H through L.

His backup software is programmed so that each night at 11:00pm it does a full backup. And on Mondays, it does a full backup to H drives, Tuesdays are I drives, Wednesdays are J drives, and so forth. Every Monday morning, he pulls the entire week's worth of drives and installs another week's set.

Additionally, because windows does not like to assign different volumes the same drive letter and will confuse them, he has installed High-Rely's free utility, HRDM2, to make sure windows assigns the proper drive letter to each drive.

Hence, this type of installation only requires that the media is touched once a week. If the user had two 5 Bays equaling 10 bays, the media would only need to be touched once every two weeks.

11.2 Mon-Fri/Sun with full backups periodically.

In this scenario, the user is using backup software with a "incremental" feature which allows it to backup only data that has changed in multiple sets. For this example, the user has a 5 bay unit and has 15 pieces of media. The user is doing a complete backup every week and incrementals during the week. He has the software set up to place the incrementals on the same drive as the full backup. Thus he need only change the media once a month and has 3 months worth of storage. His full backup is approximately 2800GB and his daily incrementals are about 100GB so he can easily fit an entire week on a single 4TB drive RAID5 RAIDPac. As in the first example above, the user is using HRDM2 to make sure that drive lettering is not confused.

11.3 Backing up Multiple Servers

In this example, the user has a 5 bay unit and is backing up 5 servers to the unit. Like the example above, he is using backup software with an incremental feature. The server the High-Rely is attached to is sharing one of the 5 drives with each of the servers. Thus, share H goes to server 1, share I goes to server 2, share J goes to server 3 and so forth. Or, if the user has a 5 Channel RAIDFrame, each bay is attached directly to its own server. The backup software is loaded onto each of the servers and is set to do a full backup once a week and incrementals for the rest of the week. Again, HRDM2 is used as in the examples above to keep windows from confusing drive letters. Also, the feature in HRDM2 to reactivate shares once a drive has changed is also enable. Without this feature, each drive would have

to be re-shared after it was changed. This is not an issue and shares are not used if this is a 5 Channel 5 Bay RAIDFrame.

The set of 5 media is changed once a week before the day of the full backups. Also, the backup start time of each server are set to start well after the backup of the previous server has ended so that multiple servers are not trying to backup at the same time, otherwise, the network connection to the machine the High-Rely is on can become swamped and the jobs may not complete or connection problems could occur. However, again, staggered backup times and bandwidth are not as much of a concern with the 5 Channel 5 Bay RAIDFrame.

12. Working with backup software

The high-rely multibay devices are, in their simplest configuration, a set of external hard drives. Any software which will work with external hard drives should work with the high-rely equipment. But, there is a technical issue to consider depending on how you connect the devices.

If you connect them to your host via eSATA, everything works as you would expect – when you install a media, a drive shows up on the host and disappears when you remove it. But, on USB, whenever a media is inserted or removed, all drives go off line and then return. Thus, if your software is configured to use more than one drive at a time and that drive must stay attached, there may be issues when you swap media.

Also, if your software needs to use the multiple drives with the same drive letter, then you need to read the section below on HRDM2.

13. For Advanced Users

1. RAID Settings

Your unit has the ability to perform various RAID operations grouping RAIDPacs into a RAID. While the hardware will perform these functions, they are not advised in these models by High-Rely and High-Rely Technical support will not be able to assist you with these configurations. Nonetheless, if you chose to use them, we recommend you test the operation thoroughly. Use these features at your own RISK!

WARNING! Changing the RAID Mode can cause all data to be lost!!! Pick and set the RAID Mode prior to formatting and using the volume(s).

*= Factory Default Setting

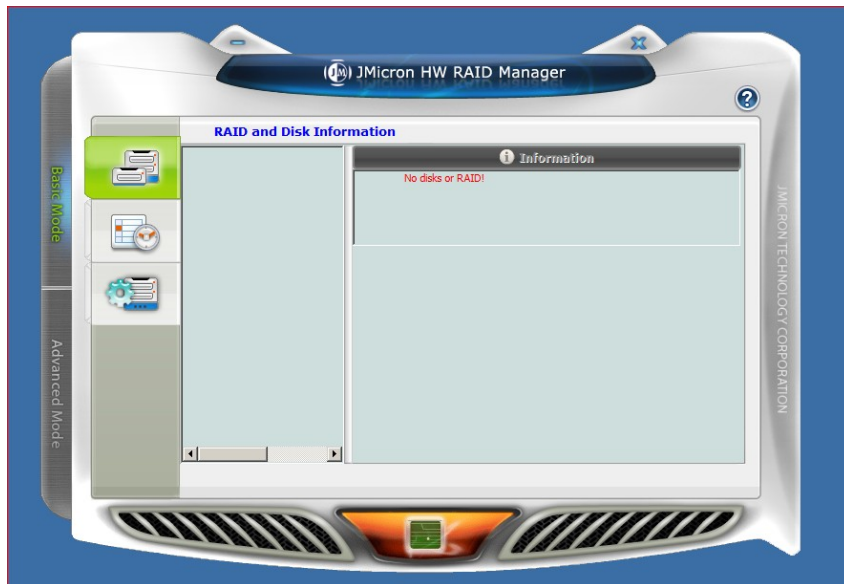
Mute (Speaker)	Off – Audible Alarm during degraded or failed conditions.	On* – Audible alarm is muted.
EZ	Off *– Auto rebuild to spare drive.	On – Rebuild to fresh drive when inserted.

RAID Type	Description	M2	M1	M0
JBOD	Individual Volumes.	Off*	Off*	Off*
RAID 0	All installed volumes are Striped.	On	On	On
RAID 1 or 10	Mirror. Mirror's installed drives. (2 drives for mirror, 4 drives for RAID 10)	On	On	Off
RAID 3	RAID 3 functionality.	On	Off	Off
RAID 5	RAID 5 functionality for installed drives. Hot spares are those installed after RAID 5 is created.	Off	On	Off
BIG	Concatenates all drives.	On	Off	On
CLONE	Clones drives (all drives get the same data).	Off	On	On

Back Panel of Model B, Dip Switch Settings

2. RAIDPac Monitoring and Configuration Software

The RAID Management software (HW RAID Manager or JM RAID Manager, available for free from our website) can monitor RAIDPacs and inform you via email if a RAIDPac fails.



You can also use it to set up RAIDs where the RAID members are actually RAIDPacs (RAIDing RAIDs). This is not advised. But if you intend on doing it, and want to use the monitoring/configuration software, you should be aware of the following criteria:

1. If you're using the 1 Bay, RAIDManager can only email you if the pack drops off-line. It can not tell you about the inner workings of the RAIDPac. Only a direct connection to the RAIDPac (outside of the bay) via eSATA or USB can do that.
2. If you're using a RAIDFrame which was ordered with eSATA/USB3 again, the RAID management software can only tell about the overall functioning of the RAIDPac, not the internal health of each RAIDPac (see #1 above).
3. If you've ordered the RAIDFrame 5 Bay with eSATA only, the RAID management may also reveal the internal health condition of each RAIDPac.



Contact Information

Highly Reliable Systems

1900 Vassar Street

Reno Nevada 89502-2109

TEL: 775-329-5139

FAX: 775-322-5397

www.high-rely.com