

## Easing the Pain Points of Digital Cinema

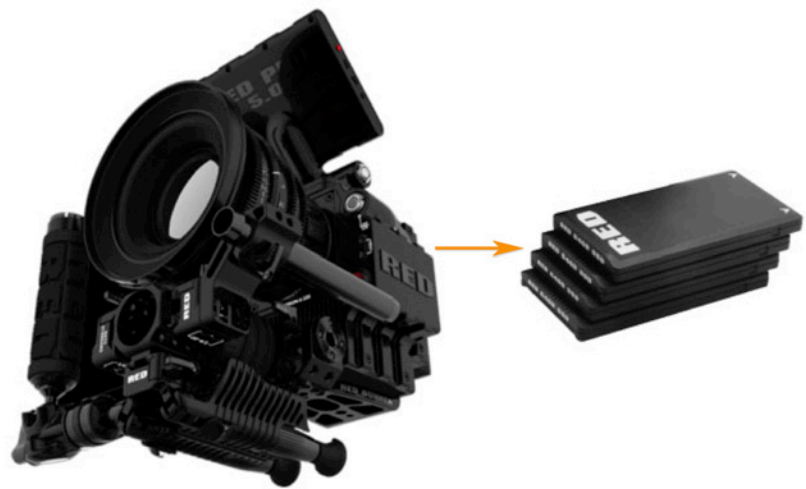
### From Capture to Post-Production



Along the digital cinema data chain, single volume hard drives have three distinct limitations: lack of speed, lack of capacity, and the seemingly endless migration of data from drive to drive as the data links its way through all the phases of production and post production. LSI directly addresses these pain points along the data chain by drastically improving speed and capacity, while eliminating data migration completely, and thus removing the need to relink the data from drive to drive. In addition, LSI's technology adds an extra level of security that only hardware RAID can provide, which makes it ideal for backing up, storing and accessing all of the digital cinema assets without the inherent time and risk factors of migrating data from one physical volume to another. From the very first frame to the very last picture lock, LSI has you covered with a single solution that will plug and play all the way from on set backup through editorial, FX and color correction and on to final output.

Digital cinema presents challenges for every filmmaker. Whether an independent film maker or the largest Hollywood studio, the same storage issues are faced at each point in the production and postproduction links that form the data chain. The pain points of speed and capacity are further exacerbated by data migration and the fact that the priceless data is jeopardized each time it is transferred from drive to drive. The advantage of LSI's approach is that the same physical storage can be used throughout the entire production / post production chain, including final output and even long term storage.

The LSI solution for the digital workflow of the RED Epic camera is built upon the integration of the LSI WarpDrive card and an LSI RAID controller to eliminate the pain points of speed, capacity, and asset migration that are the inherent limitations of single volume hard disk drives.



To explore LSI's digital cinema data chain solution, we will follow the data as it links from phase to phase. The first phase of the Red data chain is at the camera where the footage is shot by the Red Epic camera and stored on a RED Solid State Drive (SSD). Once the footage is shot, the SSD is removed from the camera and put into a REDMAG reader. The REDMAG reader acts to bridge the SSD through an interface, such as USB, Firewire or eSATA, which is used to transfer the data through a computer to an attached data storage device. In the past, this has typically been a single external hard disk drive (HDD).

## Solution Components

### LSI® WarpDrive™ SLP-300 card

- PCIe® solid state storage card
- Provides scalable SSD performance inside-the-box
- Application acceleration for IO intensive and latency sensitive workloads

### LSI 3ware® 9750 series SATA+SAS RAID controller

- The full SATA+SAS RAID line-up includes 6Gb/s and 3Gb/s products ranging from 4 to 28 ports
- Deliver significant performance improvements for both 3Gb/s and 6Gb/s systems
- Designed to offer cost-effective, high-performance, high-capacity storage solutions for a broad range of applications

### AIC MiniBOD®-T082

- High performance, small footprint portable storage device
- Environmental Management

### Magma® ExpressBox 3T

- Works with Thunderbolt™-equipped computers
- Three PCIe 2.0 expansion slots (Two x8 and One x4)
- Up to 10Gbps Thunderbolt connection

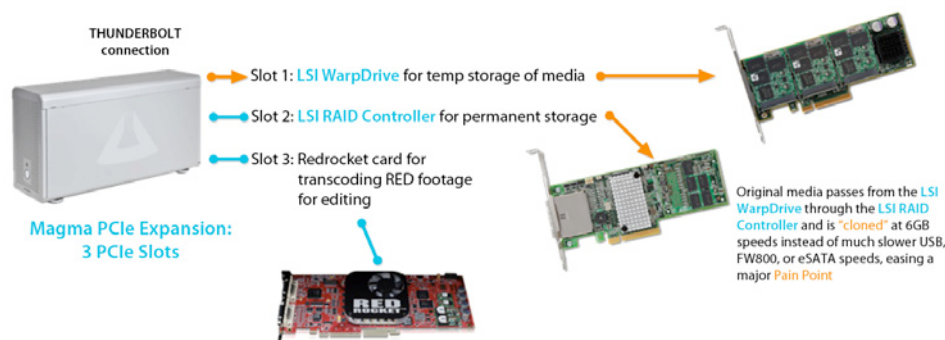
### Toshiba® Enterprise Class 15K RPM SAS Drives

- Available in different capacity points for high performance, mission critical servers and storage system applications
- Best-in-class power consumption at 4.1 watts idle



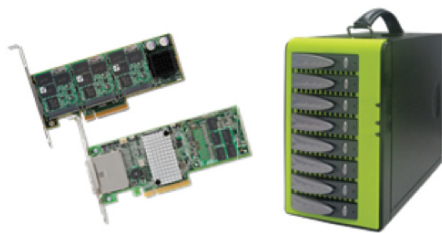
In keeping with the principles of best practices, a second copy is always made to a separate HDD to protect the footage in case anything should happen to the first HDD, such as HDD failure. These drives were then referred to as sets, pairs, twins and/or clones. Since feature films generate so much data (anywhere from 6 to 12 TB on a typical indie film), many paired drives would have to be used. It would always take significant extra time to backup the footage to the second drive. As such, the first pain point LSI addresses by using the WarpDrive card is the speed offered by PCIe-based SSD storage.

Utilizing a Magma ExpressBox 3T to add PCIe capability to a MacBook Pro, a copy of the footage is placed on the PCIe WarpDrive, so that two temporary copies exist simultaneously, one on the Red SSD, and one on the WarpDrive card. Since the WarpDrive card is faster than the REDMAG reader, it can make copies more quickly than the REDMAG, especially when cloning to LSI controlled RAID boxes because they can utilize the full bandwidth of the 6Gb/s SAS interface, which is many times faster than what single drives can sustain using the more typical FireWire, USB, or eSATA connections. In our configuration, the LSI controller can be connected to two AIC MiniBOD-T082 boxes, facilitating not only a high speed clone, but also adding the extra protection of hardware RAID.



Utilizing the PCIe slots in a desktop, or a MacBook equipped with the Magma ExpressBox 3T, LSI is able to address the next “pain point” which is capacity.

Once the Red data is securely backed up, it then needs to be transcoded from the RED “digital negative” to an editable format, such as ProRes for Final Cut Pro. In our diagram, a RedRocket occupies a PCIe slot within the Magma box, and is used to accelerate the transcode process to “faster than realtime”. As these transcodes are made, the quantity of ProRes data can often be equal to (and sometimes greater than) the quantity of native Red data.



LSI RAID Controllers and AIC Portable Drive Enclosure

This is where the capacity pain point becomes the data migration pain point. When dealing with single drives, ProRes files are scattered across multiple volumes, necessitating data migration and “relinking” just to edit. Each time digital assets are moved from drive to drive, it increases the chance that it will get miscategorized, corrupted, or even worse... lost. This data migration pain point is addressed by the combination of the LSI RAID controller with the AIC MiniBOD-T082. This combination can provide scalable capacity to store all of the assets of an entire film, including Red files, ProRes files, sound files, FX files, as well as still photos and any type of digital media that may be generated over the multiple-year shelf life of the film.

By utilizing an LSI WarpDrive card in combination with an LSI RAID controller and disk arrays, rather than a series of single drives for on set back up, all the pain points can be resolved. The digital cinema data chain is now linked with vastly superior speed and capacity, and all of the digital cinema assets can accumulate and remain in one physical location.

Of course, these aren’t the only benefits of the LSI data chain. By using LSI RAID technology, the data in the disk array can be protected from the failure of a single drive. Furthermore, since redundant arrays can be simultaneously created, the data can be protected from the catastrophic loss of an entire array without incurring the time cost of creating a second data copy.

Finally, since an LSI RAID controller can be installed into many types of systems, the array can be connected to any backup, edit, FX, or color correction station that needs the data.

Because LSI RAID controllers write the array configuration data to the disks, the entire array can be moved to any work station with an installed LSI RAID controller and have the data be usable by that system. This allows for the easy movement of data without the time consuming effort of repeatedly copying data that a single drive solution requires.

### In Summary

The solution enabled by LSI eliminates the single volume pain points felt by producers, digital imaging technicians and post-production teams. By vastly improving speed and capacity, eliminating data migration and providing unparalleled data security, LSI’s data chain is undoubtedly comprised of the strongest links in the cinema industry. If you’re looking for the ideal end to end solution, look no further than LSI.

### Learn More Call to Action

You can use the same LSI technology to improve your digital video capture and editing solution. Contact David Graas at [david.graas@lsi.com](mailto:david.graas@lsi.com) for more information.



For more information and sales office locations, please visit the LSI web sites at: [www.lsi.com](http://www.lsi.com)

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