

# External Drives Guide

## INTRODUCTION:

One of the unique capabilities of Cinedeck ingest appliances is recording to your choice of storage including direct attached local drives. Local storage can be connected via; *USB3*, *eSATA*, *Ethernet* and (on MX) by utilizing a *PCIe adapter card* which connects to the storage system.

When combined with Cinedeck's redundant record capability, this external storage can be extremely useful for immediate editing access, customer content delivery, safe copy, etc. One down side is that the majority of these attached storage systems utilize spinning disks which have much greater file I/O limitations as compared to SSD drives. Additionally, USB and eSATA drives suffer from extreme variations in hardware, firmware and controller quality, even between units of the same model/manufacturer, so rigorous testing needs to be done before using such devices in a production environment.

## LIMITATIONS RECORDING TO SPINNING DISKS:

Let's leave quality to the side for a moment and just concentrate on the practical aspects. An SSD disk controller can almost instantly access any portion of the disk for read/write actions while a spinning disk must physically move the heads to a specific location on a disk before starting a file read or write. Additionally, the outer portion of a spinning disk is more easily accessed and has better performance than the inner tracks so as the drive fills, the performance goes steadily down.

For any single file this is not a dramatic problem but Cinedecks can write many files simultaneously, for example, a typical single input recording being written as MXF OpAtom might be generating nine media files, one video and eight audio. In reality the number could more than double with the associated AAF, if all the audio tracks are used and additional data is being included. That number doubles again for each additional channel. It can double again if proxy files are being written and essentially double again if segment or break mode is utilized because at the break point, all the current files must be closed while an entirely new set of files is started. For a two channel RX3G, this means the drive might suddenly need to be writing to more than seventy places at the same time. So you can see that a spinning disk can have a rough time getting its heads wrapped around the problem.

Adding quality back into the equation, the controller, firmware, disk drive and associated hardware used in external storage systems can vary significantly. Some pieces are simply better than others.

## RECOMMENDATIONS:

All of this leads us to the point that utilizing spinning disk storage is not something you can take lightly and is why Cinedeck does not recommend using it for recording. Back on the practicality side, being able (for example) to hand your customer a drive at the end of a recording session is a production capability with benefits that cannot be ignored or avoided. As a result, Cinedeck have taken account of customer experiences and our own internal usage and testing to come up with some guidelines.

### SPINNING DISK DRIVE RECOMMENDATIONS FOR USE WITH CINEDECK

The recommended drives come from manufacturers that take their design, quality and uniformity testing seriously and turn out drives that work very well. While Cinedeck cannot guarantee results or recommend one above the other, there are some interesting plus differences worth noting between the products.

#### AVASTOR HDX 1500



The Avastor drives come in a reusable plastic briefcase, along with their cables which keeps them contained. They eliminated external power supplies in favor of standard IEC power cables which connect directly to the units. And the Avastor drives include eSATA connectivity.

#### CALDIGIT AVPRO, AV DRIVE OR VR2 DRIVE



The CalDigit AV Pro and VR2 drives utilize removable drive modules which allow using different drives in the chassis. The VR2 is a dual drive unit which can be striped for added performance and has a LCD status display.

## PRODUCTION LIMITATIONS AND RULES:

- First and foremost, avoid the lower performance end of a drive and only utilize the first 80% of any spinning disk. This is most easily accomplished by creating **only** a single partition which **only uses 80% of the available space** so for example, if you have a one terabyte drive, it would have about 950GB of useable space so you would create a simple volume of about 760 gigabytes. The rest would remain unused. **(Requirements and best practices for a SAN which has been properly balanced for the desired load will be identified by the SAN manufacturer)**
- Format the drive for NTFS for best security and performance.
- If you must have immediate access to content on an Apple system, exFAT can be used but encodes should be limited to 8bit.

## ADDITIONAL RECOMMENDATIONS:

- Use Cinedeck Version 4.3 or newer
- Use SD or HD inputs, no 444
- Use any codec/wrapper with interlaced sources (no uncompressed)
- Use any codec/wrapper with progressive sources to 30fps (no uncompressed or DPX)
- Record a maximum of two channels per drive
- Limit recordings to 8 channels of audio per input
- If gang record is required, use staggered gang
- If break or segment mode is required, create nothing smaller than 1 minute chunks
- Proxy is OK
- Redundant recording when the other destination is SSD is OK
- **Last and not least, test your drives in advance and Monitor Your File Buffers !**

## BUFFER ACTIVITY AND USB3 vs eSATA:

The Cinedeck systems dedicate a portion of available memory as a buffer to help smooth out any hiccups or delays when writing to a designated disk. Typically, these delays are caused by network and disk access latency and generally the file write buffers will run at zero (0) or one (1) frame.

When starting a recording to a non SSD storage destination, you may see significant file buffer activity which noticeably increases for multi file encodes such as MXF OpAtom & MOV with Wave audio. Peaking at about 300 frames per channel can happen but lower is better. Again, "Staggered Gang" should be used if gang starts are required and the buffers should be monitored as unexpected increases are a sign of disk access issues and a potential failure.

As noted above, the Avastor HDX 1500 drives also include eSATA connectivity. In our tests, the overall throughput performance and capability of these drives when using either type of connection is about the same and also about the same as the CalDigit drives via USB3 however at peak usage moments, eSATA does perform better.

In particular this means, if "Segment Record" or "Break" mode are used, at those file break moments when file I/O is highest, the eSATA drive will require less buffer intervention to balance the file I/O load and because the drive can respond more quickly, it will allow the buffers to recover faster. This is a desirable feature however; in general, eSATA connections to any drive can be more problematic than USB. For example, you may occasionally have start up issues because the eSATA drive is not immediately recognized, so for general use, Cinedeck suggest using the USB3 connections.

## MORE INFORMATION:

Cinedeck Support: <http://cinedeck.com/support/>

Drive Formatting & Management Guide: <http://www.cinedeck.com/#!/cinedeck/training-videos>