Buying an External Drive for Video Editing on a MAC (2017)

Assuming that you already have a decent computer (perhaps you are working at the CDA at Concordia); this document focuses on determining your external drive requirements.

External hard drives are defined by two things: their interfaces and by the type of hard drive inside the case.

1. Interfaces and Connectors

The most common interfaces, in increasing order of speed, are USB 3, USB 3.1 and Thunderbolt. USB 3.1 Gen. 1 has the same speed as USB 3 ,5 Gb/s, and USB 3.1 Gen. 2 has a speed of 10 Gb/s.

USB 2 was superseded several years ago by USB 3, similar in appearance but with a distinctive blue connector, now recently replaced by USB 3.1. If you have an older USB 2 drive, don't use it for video projects, keep it as a back-up drive. Thunderbolt 1 has been successively superseded by version 2 and version 3. Firewire is an older (now obsolete) interface that you may find as an option on certain multi-interface external drives. CDA supports all of these interfaces.

Until recently it was common to find more than one type of interface and their respective connectors on an external drive but now the trend is to use the new USB-C connector as a universal standard connector for different interfaces. USB-C supports both USB 3.1 and Thunderbolt 3 and is also backwards compatible with USB 2 and USB 3.

Apple have adopted the USB-C standard. For example, the 2017 Mac Book Pro has only USB-C connectors with the full 40 Gbps bandwidth. In addition to accommodating external drives, many other peripherals can be used with these USB-C ports once various slightly annoying plastic adapters have been purchased separately.

2. Hard Drives

Inside the external hard drive case, there is a 2.5" drive (sometimes 3.5") that will be either a HDD drive (mechanical drive) or a SSD (solid state) drive. HDD drives come in two speeds: 5400 rpm and 7200 rpm. The latter is preferable.

SSD drives have two major advantages over HDD drives: they are much faster and they have no moving parts. The latter makes them less susceptible to heat and to physical damage. The disadvantage of SSD drives is their cost.

A less common choice of external drive is a larger case with multiple drives within it. These drives will be striped together in a RAID to perform as one faster volume or simply to provide more storage. Two 2.5" drives in one case is a small portable RAID external drive.

3. Breakdown of External Drives from one Manufacturer

There are several external drive manufacturers that target the video editor, I suggest looking at G-Technology and LaCie. LaCie, for example, in their "Rugged" series of portable external 2.5" drives break down their drives into these categories.

Model	Rugged Thunderbolt USB-C	Rugged Thunderbolt USB 3	Rugged RAID	Rugged USB-C	Rugged Mini	Rugged Triple
Interface	TB 1* and USB-C	TB1* and USB 3	TB1* and USB 3	USB-C	USB 3	USB 3 and Firewire 800
Drive Type	HDD or SSD	HDD or SSD	HDD	HDD	HDD	HDD
Transfer Rate	HDD: 130 MB/s SSD: 510 MB/s	HDD: 130 MB/s SSD: 387 MB/s	2 X HDD : 240 MB/s	130 MB/s	130 MB/s	110 MB/s
Connectors	Thunderbolt 1, USB-C	Thunderbolt 1, USB 3	Thunderbolt 1, USB 3	USB-C	USB 3	USB 3 and Firewire 800

*Thunderbolt version 1

LaCie have included the transfer rates as an indication of the speed of these drives.

In comparison, here is the maximum bandwidth (amount of data that can be sent) of each interface:

Interface	**Maximum Bandwidth**
USB 2	480 Mbps or 60 MB/s
USB 3	5 Gbps or 625 MB/s
USB 3.1 Gen.1	5 Gbps or 625 MB/s
USB 3.1 Gen.2	10 Gbps or 1250 MB/s
Thunderbolt 1	10 Gbps or 1250 MB/s
Thunderbolt 2	20 Gbps or 2500 MB/s
Thunderbolt 3	40 Gbps or 5000 MB/s

On the best performing drive on the LaCie list, the Rugged Thunderbolt USB-C, the connector is either Thunderbolt 1 with a maximum bandwidth of 1250 MB/s or USB-C with a potential maximum bandwidth of 5000 MB/s.

LaCie offers the choice of HDD or SSD with this model. With a SSD in the case, the transfer rate is 510 MB/s and with a HDD drive the rate is 130 MB/s. The speed limitation is the drive, not the interface. Or, for SSD drives, it could also be the SATA connection on the drive.

You need a RAID configuration of multiple drives to approach the potential bandwidth of Thunderbolt or USB-C. The LaCie Little Big Disk Thunderbolt 2 drive (not on the above list since it is not in the "Rugged" series) has a data transfer rate of 1375 MB/s. Inside the Little Big Disk Thunderbolt 2 there are two 2.5" SSDs in a RAID 0 configuration. Those two drives are

still not able to take advantage of the full bandwidth of Thunderbolt 2 (2500 MB/s) but the speed is impressive. Yes, it is expensive.

4. Recommended Drives for Video Applications

The requirements of your external drive will vary depending on the nature of your video projects. What is the project: simple editing of compressed video files destined for the web, compositing many layers of video, animating image sequences, or color correction of RAW video?

To determine your needs precisely you need to know the type of video files you will be working with. **You can then compare the data rate of those files with the transfer rate of various external drives.** Keep in mind, unless you never use dissolves, that you will normally require a drive to play back at least two streams of video simultaneously.

The table below indicates how many streams of each type of video can be played back simultaneously on each type of drive, using our LaCie products as a guide. Any figure of ten streams or over is indicated as multiple streams.

Video File Type	**Single HDD** USB3 or USB-C 130 MB/s	**Dual HDD** (RAID 0) USB 3 or TB1 240 MB/s	**Single SSD** USB 3 or TB 1 387 MB/s	**Single SSD** USB-C 510 MB/s	**Dual SSD** (RAID 0) TB 2 1375 MB/s
Compressed video from consumer cameras 3.1 MB/s	multiple	multiple	multiple	multiple	multiple
Sony and Canon Broadcast HD Codecs 6.25 MB/s	multiple	multiple	multiple	multiple	multiple
Sony 4K XAVC 12.5 MB/s	9	multiple	multiple	multiple	multiple
Pro Res 422 HQ (1080 24p) 27.5 MB/s	4	8	multiple	multiple	multiple
2K Pro Res 4444 38 MB/s	3	6	multiple	multiple	multiple
4 K Redcode 40 MB/s	2	3	9	multiple	multiple
2.5 K RAW CinemaDNG (Black Magic) 150 MB/s	0	1	2	3	9
HD Uncompressed 10 Bit 190 MB/s	0	1	2	2	7
4K Apple Pro Res 444 XQ 250 MB/s	0	0	1	2	4
4K Cinema DNG RAW 265 MB/s	0	0	1	1	5

This chart does not tell the whole story. There are other factors involved in playing back video files, especially if they are highly compressed (indicated in red on the chart). By far the most compressed file is 4K Redcode that has a low data rate but requires processor intense debayering. Playing nine streams of 4K Redcode simultaneously will require an expensive Red Rocket video card. But, you can edit two streams of 4K Redcode files from a regular HDD USB 3 drive at ¼ resolution (720p resolution) in Premiere. 4K Sony XAVC files also require a lot of decompression and it will not be possible to play multiple streams on anything but the most expensive iMacs or Mac Pros.

Conclusion

The most common external drive on the market, a HDD USB 3 drive (preferably 7200 rpm) is good enough to play back multiple streams of compressed HD video, Pro Res 422 HQ HD files and 2K files, and even a few streams of compressed 4K video.

But if you are working with uncompressed HD video or RAW video then a SSD drive is the minimum requirement, preferably one with a USB-C connector. A better option for RAW video is a RAID configuration of two SSD drives with a Thunderbolt 2 or USB C interface.

To recap, when purchasing an external drive consider these four things:

1. the interface of the drive
2. the type of drive in the case
3. the type of video files that you will be using
4. the transfer speeds of the external drive stated by the manufacturer

Back-Up

Sooner or later, all hard drives will fail. Take note of the warranty of the drive before you purchase it and keep any receipts or register the drive so that you can claim the warranty if necessary.

Purchase a second cheaper drive as a back-up. I use Carbon Copy Cloner to make and maintain a clone of external drives. This application allows incremental back-ups. It compares the source and destination drive and only backs-up files which have been altered since the last clone. Older versions of files can be archived and deleted at a later date.

Working at the CDA

You will need an external drive to work on your video projects in the CDA edit rooms. However, we do offer local storage for projects requiring higher bandwidths. We have three RAID drives with 8 TB of storage on each that can accommodate 4K RAW video projects.