

Larry's FCP Newsletter

Editor: Larry Jordan
Issue 3: March 15, 2004

Welcome to the third edition of my Final Cut Pro newsletter!

I am delighted by your interest and grateful for your comments. (I'm also looking for some editor jokes to add to future issues.)

The goal of this newsletter is to provide information helpful to the professional, high-end user of Final Cut Pro. This will publish monthly, around the middle of each month. Starting with this issue, the last month's issue will be available in PDF form.

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Technique: Choosing the right codec for capturing SD video

[This article was updated March 16 with additional comments from CinéWave.]

The genesis for this technique came from a recent client installation in New York City where we were experimenting with different codecs to see which would be the best to use for high-quality off-line editing.

And, in some recent editing, I've been working with a CinéWave card and had become very dissatisfied with the low-res images it was creating. So, I decided to go right to the source and talked with Andrew Baum, product manager of CinéWave at Pinnacle Systems, and Clark Simpson, Manager, AJA Technical Support, about how to choose the best codecs.

What I learned was that while there is no single perfect codec solution for everyone, it is possible to make some fairly clear recommendations.

To get us started, a codec is software that converts the signals on your video tape into digital data the computer can read. The better the codec,

the higher-quality images it creates.

Some tape formats, like DV, are already digital. In this case, when you capture a DV tape, you are simply transferring the digital data on the tape to the computer. However, when you capture an analog tape, such as Beta SP, you need to convert the signal from analog to digital. Because you are actually converting your video and audio information, the quality of the codecs you use directly affects the quality of the picture.

Here's the key question I asked both Andrew and Clark: When capturing SD video, what codec should you use when you want the best quality for final on-line? And, secondarily, what codec should you use when you want the smallest possible file size with the best quality for off-line work?

For final on-line quality work, there are five choices

1. Digital 10-bit (i.e. DigiBetacam)
2. Analog 10-bit (i.e. Beta SP)
3. Analog 8-bit (i.e. Beta SP)
4. DVCPRO-50
5. DV (MiniDV, DVCPRO-25, and DVCAM)

Since DigiBeta, DVCPRO and DV are all digital formats, your capture card (or FireWire) doesn't have an impact on the quality of your picture. Instead, you are simply transferring the digital bits from your camera to the computer. In this case, you'll get the highest quality by staying in the digital domain.

- For DigiBeta, use SDI (Serial Digital Interface) set to 10-bit quality
- For DVCPRO-50, use the appropriate Apple-supplied DV50 codec (NTSC or PAL)
- For DV, use the appropriate Apple-supplied DV codecs (NTSC or PAL)

Since DigiBeta, DVCPRO and DV are digital formats, image quality is determined when you shoot, rather than when you capture. So, for this rest of this article, we'll focus on the analog side of the video house.

When capturing analog video, however, your codec choices become much more numerous.

- Use the Apple-supplied uncompressed codecs
- Use vendor-supplied proprietary codecs

Uncompressed 10-bit NTSC 48 kHz
Uncompressed 10-bit PAL 48 kHz
Uncompressed 8-bit NTSC 48 kHz
Uncompressed 8-bit PAL 48 kHz

Both Clark and Andrew agree that the Apple codecs offer excellent quality, with the advantage that clips captured using these codecs can be played on any system that supports QuickTime on the Mac.

Deciding between 10-bit and 8-bit

Generally, given good lighting, good lenses and a photographer that knows how to focus, 10-bit provides the best quality, followed by 8-bit.

If your pictures include lots of compositing, green or blue screen, graphics with gradients, 10-bit is worth it. Even if your pictures start out in an 8-bit environment -- such as Beta SP or Beta SX -- editing using a 10-bit sequence will still be worth it.

If your pictures don't include a lot of graphics, compositing or effects, 8-bit is fine.

Capturing at full "on-line" resolution

If capturing at the highest-possible quality is your goal, your choices depend upon which capture card you own. However, in all cases, 10-bit video looks better than 8-bit. But, 10-bit files are about 20% bigger than 8-bit files. (On a CinéWave it's 27 MB per second for 10-bit, versus 21 MB per second for 8-bit.)

If you use a CinéWave, Andrew recommends the following: "While the Apple uncompressed codecs look very good, and are fully supported by CinéWave, the advantages to using the CinéWave codec are the following:

- Better chroma filtering with options for both graphics in the RGB color space and video in the YUV color space
- Control of the Gamma settings so that the appropriate Gamma levels are used
- Support for High-Definition video (the Apple codecs are only SD)
- Better quality
- Real-time effects

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TARGA Cine NTSC YUV (to 10Bit)-Balanced Audio-Pro Analog
TARGA Cine NTSC YUV (to 10Bit)-Embedded Audio-Pro Digital
TARGA Cine NTSC YUV (to DV)-Balanced Audio-Pro Analog
TARGA Cine NTSC YUV (to DV)-Embedded Audio-Pro Digital
TARGA Cine NTSC YUV (to PhotoJPEG)-Balanced Audio-Pro Analog
TARGA Cine NTSC YUV (to PhotoJPEG)-Embedded Audio-Pro Digital
TARGA Cine NTSC YUV-Balanced Audio-Pro Analog
TARGA Cine NTSC YUV-Embedded Audio-Pro Digital
TARGA Cine NTSC YUV16-Balanced Audio-Pro Analog
TARGA Cine NTSC YUV16-Embedded Audio-Pro Digital
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"Plus, the real benefit is that CinéWave supports multiple codecs in the same sequence with layers and effects all in real-time," says Andrew. "One of the major advantages of CinéWave is that we can capture and playback in any of the following formats in the same sequence in real-time and with real-time effects between and on top of the clips."

- DV25
- DV50
- PhotoJPEG
- 8-bit uncompressed
- True 10-bit uncompressed
- 16-bit uncompressed
- Animation codec
- RGBA with embedding moving alpha
- RGBA with graphic
- Apple LiveType
- CinéOffline

So, I went off to a client's to test all this interoperability and discovered a

BIG "provided..." If you own a CinéWave card and need to integrate all these different codecs on one timeline, you also need to buy the CinéWave RT Pro real-time option. This used to be \$2,500, but has recently been reduced to \$995, according to Andrew. Without the CinéWave RT Pro option, CinéWave only supports one codec per timeline; everything else needs to render.

The reason the CinéWave can handle all this real-time codec integration is that it is using the processing power in the CinéWave card, in addition to your computer.

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Uncompressed 10-bit NTSC 48 kHz
Uncompressed 10-bit PAL 48 kHz
Uncompressed 8-bit NTSC 48 kHz
Uncompressed 8-bit PAL 48 kHz
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If you are using a Kona card, Clark Simpson recommends picking a capture format and sticking with it, "because it is awkward to mix formats on the Timeline." The Kona card uses drivers written by Black Magic, however, recently, Kona and Black Magic parted ways so, in the future, the best codec to use with a Kona will be the Apple uncompressed codecs; both 8- and 10-bit.

While the Kona SD isn't as flexible as the CinéWave in real-time effects, or in handling multiple formats, it has a significant advantage when capturing video for off-lining, which I'll discuss below. It also is significantly less expensive than a CinéWave, while still providing excellent image quality.

The AJA IO always feeds 10-bit video to the computer. So, if you need to conserve file size, while still maintaining "on-line" quality, use the Apple codecs to transcode (i.e. convert) from the 10-bit video stream to 8-bit or DV video. The only significant disadvantage to the IO is that you can't connect both an IO and a DV deck; the IO requires the full bandwidth of FireWire. However, it's easy to add a FireWire switch to change from the deck to the IO and back.

So, what settings should you use?

- CinéWave -- Targa Cine NTSC (or PAL) YUV (10-bit)
- CinéWave -- Targa Cine NTSC (or PAL) YUV (8-bit)
- Kona and IO -- Uncompressed 10-bit
- Kona and IO -- Uncompressed 8-bit

If you need to move video files between computers, use the uncompressed settings provided in the default installation of Final Cut Pro.

Capturing for good quality, off-line resolution

However, many of us work in an off-line environment in order to save disk space and avoid overloading the computer's CPU. Here, some interesting new choices have developed.

If you are using DV, stay with DV for your off-line work. Don't use Offline RT; it causes far more problems than it solves.

If you are using CinéWave, don't use the TARGA Ciné YUV 25% (or 50%, for that matter). The video is ugly and the file sizes are too big. Instead, Andrew recommends you transcode all your captures into DV25 (using

TARGA Ciné YUV to DV). Your file sizes will be half the size of the TARGA 25% quality with DV25 and your image quality will improve dramatically.

(DV25 is about a seventh the size of uncompressed 10-bit video.)

It is also possible to use PhotoJPEG with the CinéWave card for off-line work. As Andrew explains:

“For the full resolution PhotoJPEG mode, the CinéWave has the exact same flexibility [as the Kona SD] on PHOTOJPEG capture. You can capture PhotoJPEG at variable rates, and if you choose, you can record PhotoJPEG at even lower data rates, so it is every bit as flexible as Kona SD on PhotoJPEG data rates.

It's important to note that perceptually, PhotoJPEG at around 5 MB/sec is about the same as DV at 3.6MB/sec, so for a nearly equivalent image, it's better to use DV as it will have a lower data rate. However, to push Offline recording to lower data rates, CinéWave can also be set to capture PhotoJPEG, and PhotoJPEG in the 1-2 MB/sec range isn't too bad. Of course you can mix it with all of the other formats we support in the same timeline.”

If you are using Kona or AJA IO, you can use DV, but, personally, I like the Photo-JEPG codec set to 75% quality. File sizes are about a third the size of DV and the image quality is amazing. It offers the best balance between image quality and file size.

After you capture, be sure to set your sequence settings to match the capture codec you are using, otherwise you'll need to render all your files. (Unless, of course, you are running the CinéWave RT Pro option.)

About the Companies

Pinnacle Systems [www.pinnaclesys.com] is a leading supplier of high-quality digital video creation and distribution tools since 1986. Pinnacle Systems has won nine Emmy Awards for its work in computer-based video productions, with products that range from consumer home video editing and DVD authoring software to broadcast servers and news production solutions. Pinnacle is best known to Final Cut users as the developer of the CinéWave series of products.

Since 1993, AJA Video [www.aja.com] has been a leading manufacturer of professional digital video solutions for the professional broadcast and post-production markets. AJA's desktop video products include uncompressed FireWire and PCI based QuickTime audio/video interfaces for both Standard and High Definition video. AJA is best known for its Kona capture cards and IO FireWire-based interface box.

What's new this month on larryjordan.biz?

- Article: [Using Auto-select \(March\)](#)
- Article: [Fun facts about reel numbers \(March\)](#)
- Update: [Don't trash installer receipts \(March\)](#)
- Article: [Color Correction \(Andrew Balis on Kenstone.net\)](#)

- Article: [Trouble-shooting your FCP System \(March\)](#)
- Article: [Multi-channel audio output tricks \(February\)](#)
- Article: [White vs. Super-white levels -- when to use what? \(February\)](#)
- [Revised teaching schedule](#)
- [Revised Fast-Response support program](#)

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IMPORTANT NOTE: Don't trash installer receipts

Recently, Mac Home magazine ran an article on how to “spring clean” your system. This generally helpful article contained one piece of REALLY bad advice which, if followed, would prevent you from being able to rebuild/repair file permissions.

This article by Tom Harrington explains the problem, suggests some workarounds, and provides more details on what rebuilding permissions is all about.

[\[Click here to read article. \]](#)

Technique: Exporting Audio for Post-Production Sweetening

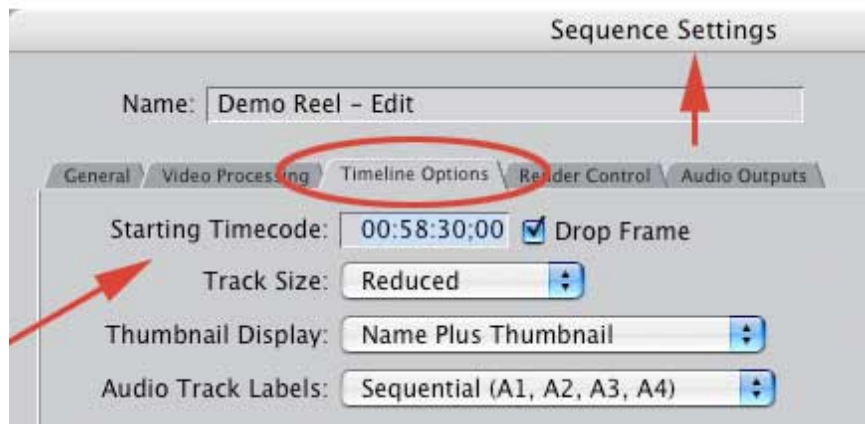
[Updated March 23 to fix a typo. sigh...]

Many Final Cut projects can be mixed directly in Final Cut, especially using the new audio mixer that appeared in version 4.

However, projects with more complex audio demands are more easily mixed using audio software like ProTools, Logic or Deck.

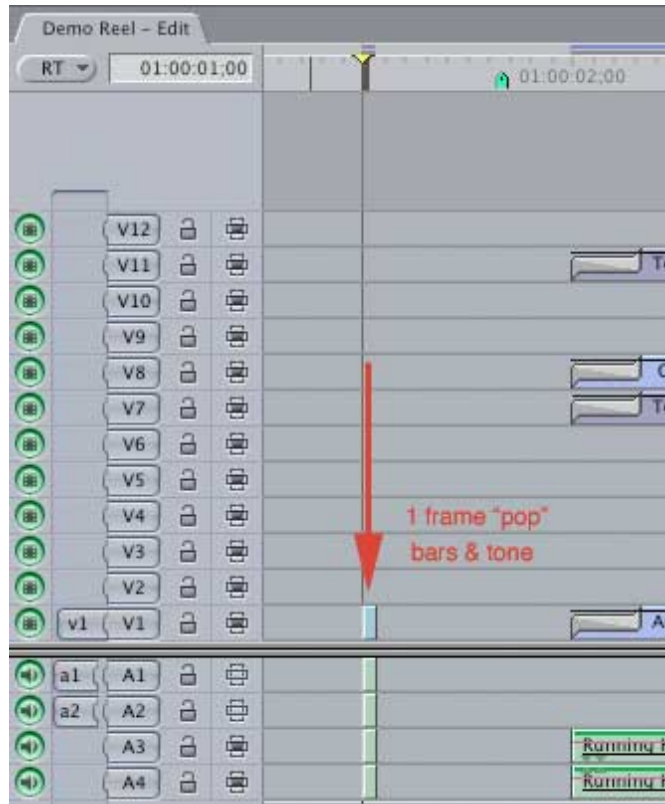
As I am a big ProTools fan, this technique describes what you need to know to move audio out of, then back into, Final Cut Pro.

If you expect to do your final audio mix outside of ProTools, plan your project accordingly:



1) Change the starting timecode on your sequence to 00:58:30 to give you

room to work



2) Add a 1 frame "pop" of audio exactly 2 seconds BEFORE start of first picture on all audio tracks to act as a sync point "just in case"

3) Add a 1 frame "pop" of audio exactly 2 seconds AFTER end of last picture on all audio tracks to act as a sync point "just in case"

4) Checkerboard your audio -- put audio from different scenes on different tracks

5) Don't worry about the mix in Final Cut

6) Give yourself handles where possible

7) Don't export audio until you've locked picture.

Once you have locked picture, that is, you are sure your video timings won't change, you are ready to export your audio.

You can do this one of two ways:

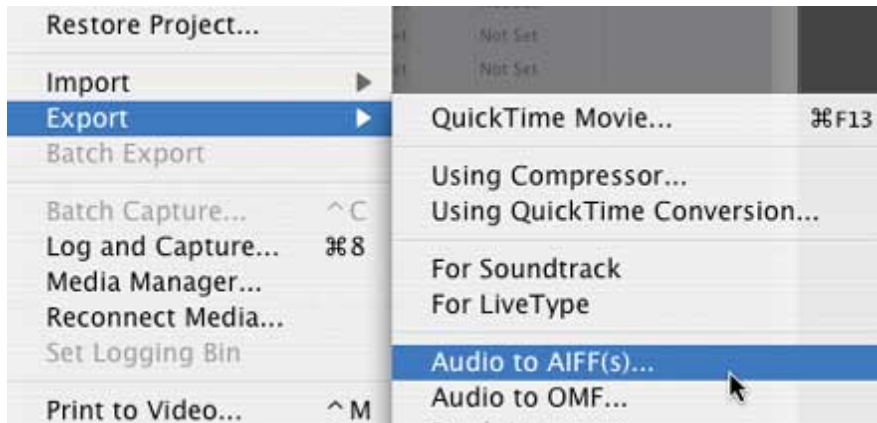
1) Export each pair of tracks as a stereo AIF file

2) Export the entire project audio as an OMF file

AIFFs can be read by any audio editing package. OMFs, which are far more flexible, are generally only readable by audio workstation software; for instance, [DigiDesign's ProTools](#) (if you are using ProTools LE you'll also need to purchase the DV Toolkit option), [Bias' Deck](#), or [Apple's Logic](#).

The benefit to using OMF files is that all clips remain individual clips, so you

can move them between tracks, each with separate volume and pan controls, as well as adjusting their in and out points and adding customized fades.



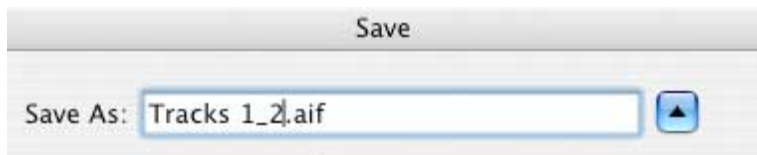
When you export an AIF, all clips on a track get consolidated into one large clip.

To export your audio as a Stereo AIFF

Export all your audio into separate audio pair files, then combine them in your audio editing application.

To do this:

- 1) Turn off the visibility lights on all but TWO adjacent tracks
- 2) Select File -> Export -> Audio to AIFFs



3) Name the export file (i.e. "Tracks"). QuickTime will automatically append the actual track numbers to the end of the file name.



4) Specify whether you want the audio exported as a stereo pair (where the odd number channel is panned left and the even number channel is panned right) or as a channel grouped (where both channels are panned center)

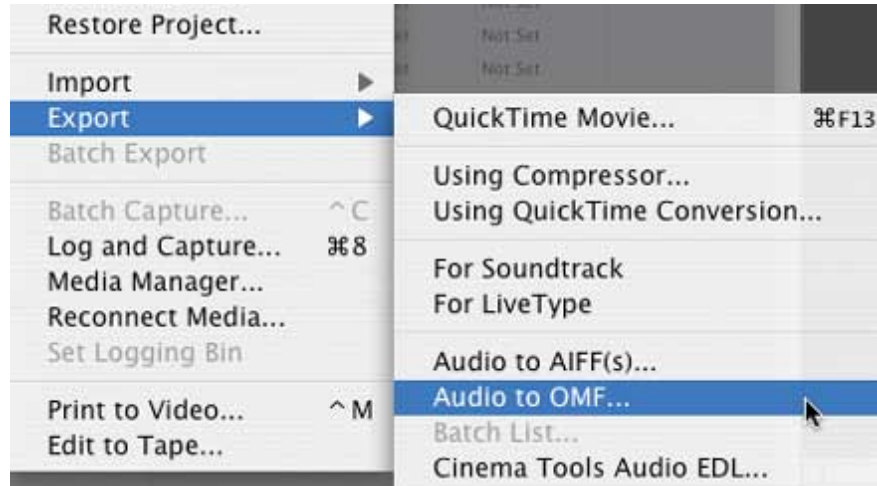
- 5) Repeat this process for all tracks in your project
- 6) Load the tracks into your audio editing software
- 7) Make sure the one frame audio pop exactly lines up vertically between

all tracks.

8) Mix your audio

To export your audio as an OMF file

1) Make sure all tracks you want to export have their visibility light turned on



2) Select File -> Export -> Audio to OMF



3) Select the sample rate, bit depth and handles (48 kHz, 16 bit are fine, you might give yourself an extra second or two on the handles)

4) Open the OMF audio file in your editing application.

Note that OMF files contain all the audio from your selected sequence, so the files can get fairly large. (There is a 2 GB limit on OMF files, so, if you are doing lots of tracks for a long program, you'll probably want to break you sequences up into individual acts for mixing.

Getting your audio back into Final Cut

Regardless of whether you are exporting as AIF or OMF, you'll need to get your finished audio back to Final Cut. When you are ready, export your final mix as a stereo AIF file.

Then, inside Final Cut, import that final AIF mix into your Browser.

From there,

- 1) Move the new mix down to two new tracks on your timeline
- 2) Line up the audio pop just before start of picture on the new mix with the pops that you put into your original audio tracks. I've never had sync drift when I kept files fully digital. However, you can reassure yourself by checking the audio pops at the tail of the project and make sure they still line up.
- 3) Once everything is sync'd, turn off the visibility of all audio layers EXCEPT your mix and you are ready to output.

Editor's credo: Be alert. The world needs more lerts.

Fast-Response FCP Support

Many clients asked me to develop a system to keep them up and running, and provide their editors with fast-response phone support -- especially when:

- downtime is critical
- an editor has a question
- traffic conditions make quick response impossible
- or when productions are in the field.

Using remote desktop technology, I've developed a service where, with your permission, I can securely and remotely access your editing system to get you back up and running -- fast.

This service is designed for the independent producer or production company -- which means it's both fast and affordable. [Here's a link for more information.](#)

The best part about the program is that you get answers to your questions fast, minimize downtime and save money on support costs.

For more information, call (818) 879-5105 -- or send an email to: larry@larryjordan.biz.

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Client report: Setting proper black levels in FCP 4

[Updated March 21, with additional information on PAL video.]

Recently, after we looked at how white levels change depending upon whether we are outputting to SD or DV tape ([Article: White vs. Super-white](#)), I got a call from a client trying to resolve the issue of where to set black levels.

Here's the background. On a computer, using 8-bit video, black is at 0,

while white is at 255. On television, black is at 16 and white is at 235. (Video engineers might prefer these numbers as IRE units, where computer black is 0 IRE, video black in the U.S. is 7.5 IRE, video white is 100 IRE, and computer white is 109 IRE).

Setting white too high will cause video clipping and, on older sets, audio buzzing.

My client wanted to know where to set the black levels to compensate for the difference between digital and analog output.

The good news is that you don't need to worry about it. Regardless of whether you are outputting to digital or analog tape, set your black levels at zero IRE on the Final Cut scope. If you are outputting to DV, these black levels are correct.

If you are outputting to analog, your capture card will automatically elevate your black levels the appropriate amount so that NTSC black outputs at 7.5 IRE; that is, here in the U.S.

Japan and Asian NTSC analog black is at zero IRE. No setup. PAL never has had setup and there is no difference in black level between digital black and analog black.

So, basically, use the waveform scope, set your black levels at zero, and don't worry about it.

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Tip: Setting proper bit and burn rates in Compressor (part 2 in our Compressor series)

I first planned to cover Compressor in two parts (last month and this month). However, the more I got into it, the more I realized there was more to talk about, so we'll continue this series for another month, at least.

This month, I want to give you some suggestions on proper selection of compression bit-rates; as well as how to improve the compatibility of the CDs and DVDs that you burn.

Bit-rates

While the DVD spec allows us to set bit-rates as low as 2.0 Mbps and as high as 9.0 Mbps, there are some general rules you can follow to improve the quality of your videos, while still keeping file size small.

Here's the challenge: older DVD set-top boxes and computers who are playing DVDs using software decoders have problems with fast bit-rates. In fact, it's possible for you to compress a video with such a high bit rate that it can't be played back.

So, to make sure that your DVDs will burn properly:

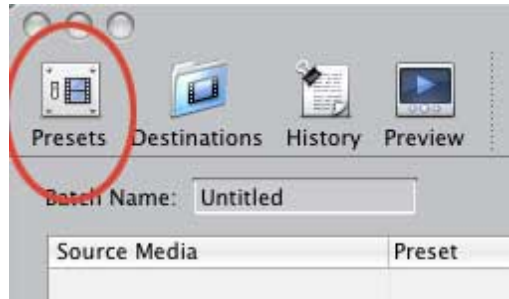
- 1) Set your average bit rate between 4.0 Mbps and 6.5 Mbps. (The lower the number, the more video you can squeeze onto your DVD. 4.0 Mbps

should allow a little more than 2 hours of video.)

2) Make sure your peak bit-rate doesn't exceed 7.5 Mbps. 7.0 Mbps is better. (I use 7.2.) This makes sure you have enough head-room to compress active scenes without creating so much data that computers or older DVD players can't keep up.

You change your bit rate settings in Compressor by:

1) Open Compressor

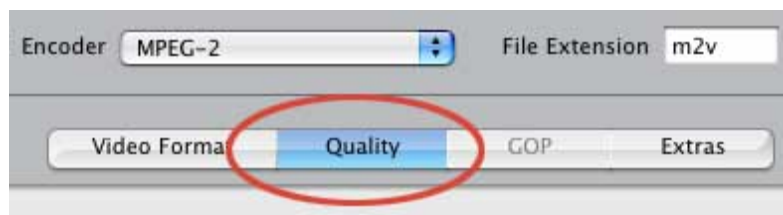


2) Click on Presets

3) Twirl down the Preset you want to change (a preset contains compression settings for audio and video separately)



4) Click the Encode tab



5) Click the Quality tab



6) Change the bit rate settings to match your preferences. Remember, 2-pass VBR gives better quality and smaller files, but takes longer to compress. I always use 2-pass because I am always interested in the best quality. This screen shows the settings I use for longer videos.

When you have a shorter movie, you can increase the lower bit rate 6.5 or even 6.8. However, DON'T change the peak rate.

Burn speeds

Again, to maintain maximum compatibility with other players, follow the following rules:

1) Don't burn too fast. Burning at slower speeds increases accuracy and compatibility

2) Match the speed of your media with the burning speed of your drive (especially for DVDs)

While DVD Studio Pro, iDVD and the Macintosh operating system don't allow you to set the burn speed of your internal disk burner, programs like Roxio Toast do. However, even the Mac programs don't burn at the fastest speed your drive may support.

For CDs, your best burn speed is 16X. For DVDs, the best burn speed is 1x or 2x. What does "best" mean? It means that when you burn at these recommended speeds, you will have fewer errors and drives other than your own will more likely be able to play back the disks you burn.

Remember, your goal is not to get done more quickly, it's to make sure that whatever you burn to disc can be played on other systems -- or on your system, months and years down the road.

By the way, to answer Jim Perry's question, DVD Studio Pro uses the same compression engine as Compressor. The benefit to using DVD SP is that, IF you have a fast enough computer, it will run in the background. The benefit to using Compressor is that you have more controls and can easily create batch files to compress the same video into multiple formats.

Larry's Up-coming Teaching Schedule

If you are interested in taking one of my Final Cut courses, I've got a flock of them coming up. Here are the training dates for late March and early April, along with the Apple-Certified Training Center that is presenting the class.

<i>Date</i>	<i>Subject</i>	<i>City</i>	<i>Training Center</i>
March 22	FREE FCP Overview	Torrance, CA	DV Creators.net
March 23-25	Intro to Final Cut Pro	Westwood, CA	Digital Film Tree
March 27	FREE FCP Overview	Santa Monica, CA	DV Creators.net
Mar 30 - Apr 1	Intro to Final Cut Pro	Santa Monica, CA	DV Creators.net
April 2-6	Intro to Final Cut Pro	Burbank, CA	Video Symphony
April 12-13	Intro to Final Cut Pro	Santa Monica, CA	DV Creators.net

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Reader Feedback

Regarding the article on [Using Auto-Select](#), Bill Carpenter wrote:

The first Technique "Using Auto-Select" reminds me that I couldn't get Match Frame working properly in FCP 4.0 until I realized that Match Frame always picks the bottom video track over which the playhead is positioned. So if one wants V2, and not V1, toggle V1's Auto-Select off.

And to get an audio track, toggle all the video tracks off.

- - -

Regarding the technique on 4:1:1 color space and chroma-keying, Prof. Uli Plank wrote:

You are kind of confusing Beta SP and DigiBeta there. The color-space of 4:2:2 you describe with great clarity in your newsletter only applies to digital Betacam. Beta SP is an analog format and doesn't have any pixels.

That said, color resolution in this format is measured in frequency ranges, not color-samples. Analog Betacam SP has a chroma bandwidth of about 1.5 MHz, and that's not much better than the bandwidth for DV (if you measure the analog signal). Trouble is, we've got a pixel structure in DV, which

doesn't exist in analog media, and it makes things worse. That's why Apple introduced those new filters for 4:2:2 and even 4:1:1 in the keying section of FCP4 (unfortunately forgetting us PAL folks with 4:2:0).

So, while your poor producer didn't do the right thing when copying to DVCAM, he couldn't expect the same keying quality from Beta SP that you can get from DigiBeta right from the start. Actually, we managed to pull pretty good green-keys from DVCAM when using this chroma smoothing. There is something similar in Joe's Filters package for FCP 3 users.

There's a good article from Mike Jennings about the whole subject (Beta SP vs. DV): <http://www.chumpchange.com/parkplace/Video/DVPapers/dv-beta.htm>

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Nick Meyers wrote asking why I didn't discuss the color space of PAL -- which uses 4:2:0. I told him it was because I didn't have a clue how it worked, but will look into it for a future issue.

[In reference to your [article on reel numbers](#),] I try to arrange it so I never have a reel 001. This, as you know, is the default Reel# in FCP, and it's too easy to forget to enter a Reel#, unlike in Avid, where you HAVE to. So if I know I don't have a reel 001 in my project, anytime I see something labeled as 001, I know that's a reel I forget to name, and it needs correcting.

- - -

Gretta Wing Miller wrote in with some personal experience using OMF and AIF (which technically is in THIS issue, not the last issue, but since it's relevant, I'm including it here):

[When her film got accepted at a film festival, it was time for a professional audio mix.] Nuendo and FCP work brilliantly together, OMF out, AIFF back in, never a sync problem. We got EchoFire (Synthetic Aperture) to send full frame DV video out to TV.

Because [the audio engineer and I] work so closely, I don't give him a reference mix... It's been fun, and now i would never do a film without a mix. I have even gotten very sloppy about trimming audio in FCP, since Nuendo can get 1600 times closer to the beginning of a word.

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Article: Trouble-Shooting Your FCP System

There's a new article on the website providing tips on how to repair, maintain, and optimize your Final Cut Pro system. There are so many different parameters that you can consider for FCP, here's a list of those that make the greatest difference.

Click here to view the article: [Trouble-Shooting Your FCP System](#).

Here's the commercial that supports this newsletter

I provide system design, consulting, training and support for Final Cut Pro and DVD Studio Pro.

If you need help, I'd appreciate it if you would give me a call, (818) 879-5105, or send me an email (larry@larryjordan.biz).

Thanks.

Wrap-up

Well, that's it for this edition of the newsletter. Let me know what you think, and if you like it, please tell your friends. I'm also interested in suggestions for future stories.

Planned for next month (and, yes, this changes up till the last minute):

- * Apple's NAB announcements at the (U.S.) National Association of Broadcasters' convention
- * Compressor: Other settings to get the most out of your video
- * Another "Client Report"
- * Reader feedback
- * And more.

Thanks -- and have fun editing!

Larry

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