[f] [t]

[My Twitter Feed](#)

Check out FAQs about my FCPX webinars. All questions come from actual people, inc.: "How will I remember to be... http://fb.me/AOQFM291

- [HOME](#)
- [MEET LARRY](#)
- [Follow Larry](#)
- [LEARN WITH LARRY](#)
- [GOT LARRY?](#)
- [Contest](#)
- [Resources](#)
- [Where's Larry?](#)
- [Contact](#)

Larry Jordan

search site

Search for: [   ] [Search]

Get Larry's **FREE** Monthly Newsletter!

[enter your email] [Subscribe]

Links

- [Industry News](#)
- [Larry's Store](#)
- [Video Tutorials](#)
- [Webinar List](#)

Technique: Black & White vs. Super-Black & Super-White

[This article is from Larry's Free Final Cut Pro Newsletter.
Updated *April, 2004, and May, 2005, with info on black levels.]*

Setting White levels

This whole "White" versus "Super-white" issue surfaced when we started combining computer graphics with video. Normal standard definition (SD) video puts white at 100 IRE units in a YUV color space. PhotoShop, and other computer graphics programs, create graphics using a default RGB color space that puts white at 109% of "broadcast white."

These excessive white levels are called, "Super-whites."

This issue has been further complicated by DV footage (MiniDV, DVCAM, and DVCPRO) that uses Super-whites, while SD footage (Beta SX, SP, and DigiBeta) uses "normal" whites, as do the rest of the broadcast and DVD industry. (I use "broadcast" to mean the professional video industry.)

Putting computer graphics that are higher than 100 IRE units (i.e. RGB values greater than 235 units for any color) into sequences designed for broadcast or DVD will potentially cause buzzing in the audio, tearing whites, bleeding colors, and, often, rejection by Q&A engineers at your distribution outlet.

To solve this problem, Final Cut added the ability to clamp these "super-whites" and make them compatible with SD video.
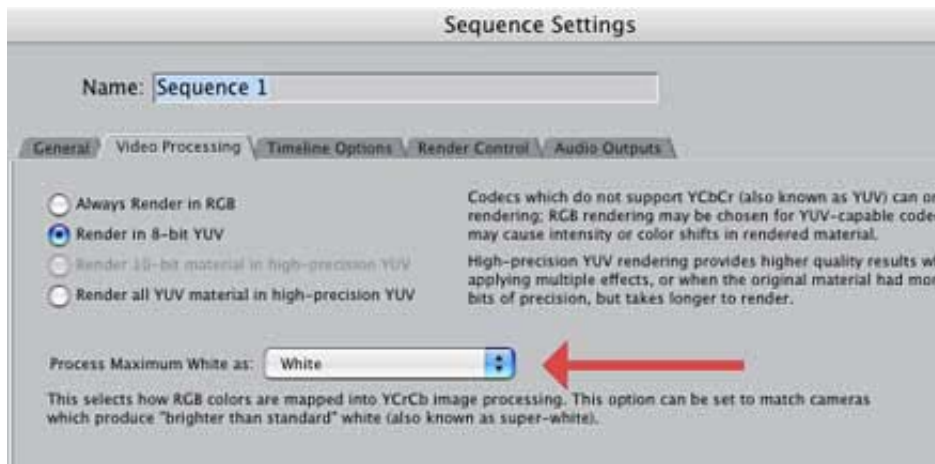
The setting that controls this is:

- For CURRENT sequences: Sequence -> Sequence settings -> Video processing tab
- For FUTURE sequences: Final Cut Pro -> Audio/Video Settings -> Sequence Settings -> Video processing tab

Here's what the sequence setting looks like for super-white:
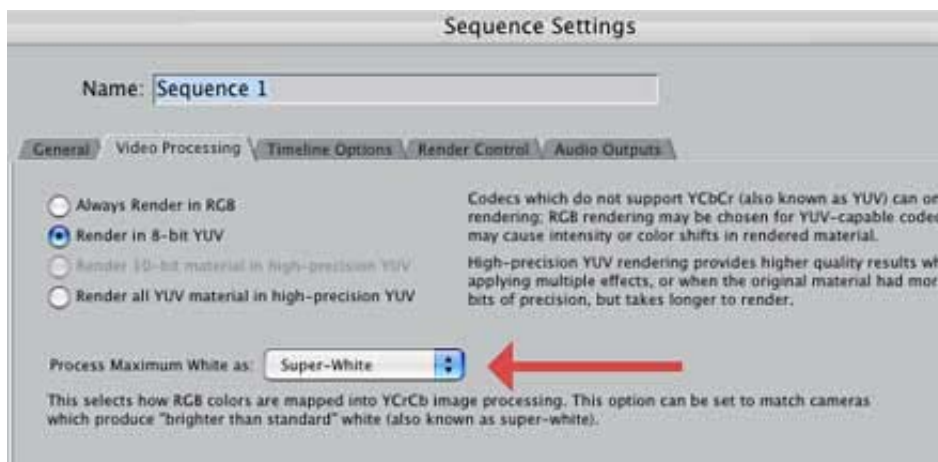
And, by adjusting the pop-up menu, this is the setting for white:

Here's how to set this in FCP 4.1.x. There are, essentially, two options:

- **Option 1 (Output to DV)**: If you are outputting to DV, whether or not you are mixing formats, set the pop-up menu to "Super-white."
- **Option 2 (Output to DVD, Beta or broadcast)**: If you are outputting to DVD, SD, or broadcast, set the sequence to "White."

The big benefit to setting this correctly is that you no longer need to worry about white levels in your graphics. Use computer white and computer black and everything will be OK. Final Cut will handle the white level conversion. (It also handles the black level conversion, too, for that matter.)

Here are the results of importing a super-white graphic into a sequence:

Super-white graphic imported using super-white setting (109%)

Super-white graphic imported using white setting (100%)
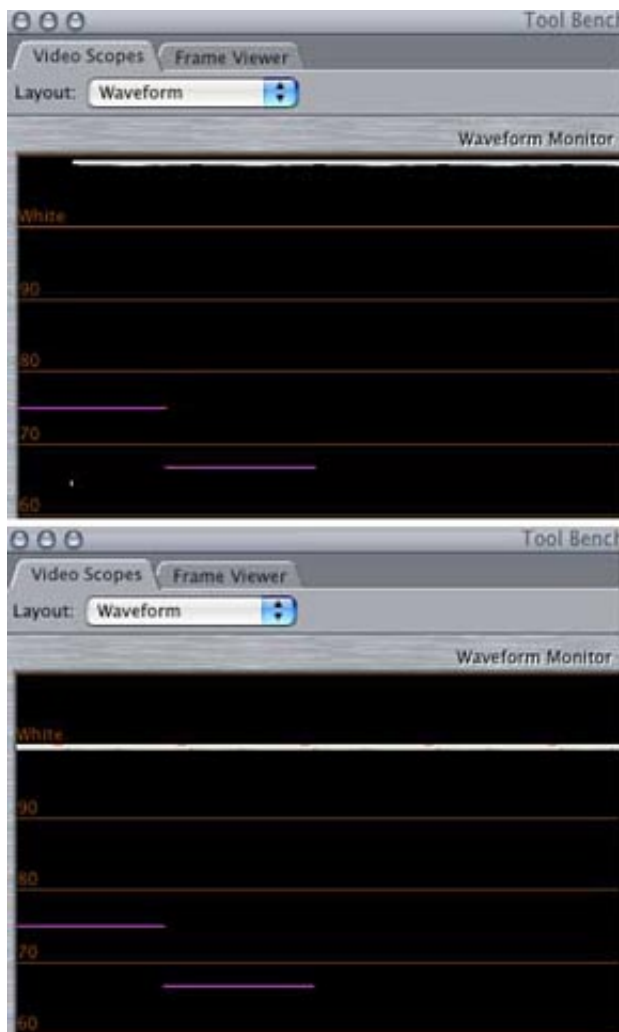
As you can see, the white setting clamps all imported RGB graphics and sets them to the correct level.

Black Levels

Recently, after this article was first posted, 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).

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 as is for DV.

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.

Finally, we can concentrate on creating great looking computer graphics, without worrying about whether we set the white, or black levels too high. Final Cut handles it.

Updated – May, 2005 – Graeme Nattress Comments on Digital Black

Last month, I wrote an article on working with digital black, and I invited comments on points where I may have been inaccurate. Well, while I was headed in the right direction, I missed by a fairly wide margin, so rising to the challenge, Graeme Nattress sent a detailed reply about where I went astray.

(For those of you who don't know, Graeme is the author of some seriously great filters for Final Cut, including one that converts NTSC video into PAL all in software. If you haven't visited his website, you owe yourself a look: www.nattress.com)

Here is his response.

Larry wrote:

> First, though, a definition. Traditionally, the black level of a video signal is called "setup." In NTSC video, but not PAL or NTSC-J, the setup level is set to 7.5 IRE units (7.5% on FCP scopes and 16 when measured on an 8-bit digital scale).

Graeme replies:

> Setup only exists in Analogue video. FCP only works with digital video, or analogue video converted to digital. All digital video adheres to REC-601, which puts black at code 16, and white at code 235. FCP represents this as a 0% to 100% scale. Digital video in FCP should always have black at 0%. There are no IRE in digital video as IRE is a purely analogue voltage measurement. You cannot equate a digital value in FCP to a specific IRE level as you do not know, and FCP does not know the nature of the device that will finally convert the digital video to analogue.

Larry wrote:

> DV video, on the other hand, sets black at 0 IRE / 0% / 0 digital units.

Graeme replies:

> DV, as a digital format adheres to REC-601, so it's black is at code 16 and white a code 235, just like every other 8bit digital video format. Again, you cannot equate analogue IRE to digital units until you know which device will convert digital to analogue. It is wrong to say that DV has black at 0IRE, as DV being a digital format has black at code 16 which FCP represents as 0%, just like every other digital video format.

Larry wrote:

This is a darker black than broadcast allows,

Graeme replies:

In the digital realm DV is exactly on REC-601 specification and has black at 16 which is the worldwide broadcast standard. It is wrong to say that DV's blacks are darker than broadcast allows.

Larry wrote:

…so, it needs to be raised, using a device called a processing amplifier (proc amp). This proc amp is generally built into the capture card, or video deck or broadcast operation, so it's generally not an issue.

Graeme replies:

Now we're getting somewhere. Setup and black levels only ever become an issue on conversion of digital video to analogue or analogue to digital. All DV decks when used as digital devices, with video over FireWire or SDI have totally correct and broadcast standard black levels. Let there be no doubt in this.

However, most DV decks do not correctly (for North America) convert digital video to analogue correctly, and convert code 16 black to 0 IRE rather than the North American standard of 7.5 IRE. I see this being done for a number of reasons:

- Cost. Cheaper to use the same circuitry around the world. It's only North America that uses setup, everyone else doesn't.
- DV decks are primarily used in an all-digital workflow chain, and in these circumstances, setup is utterly irrelevant
- if they are used to dub to analogue, it's usually VHS which has such bad black level tracking that, even if the blacks on the DV deck's analogue outputs are correct, the chances are that the VHS deck won't record them correctly anywaY.

This does leave one situation where setup is relevant, and that is dubbing BetaSP, 1″, Quad, or any other legacy broadcast video format to DV, or dubbing a DV master to a broadcast analogue format. In this case, it is vital that on dubbing, say, BetaSP to DV that the setup is removed, so that black ends up at code 16, which is REC601 standard, and on dubbing DV to BetaSP, say, setup is added so that black ends up at 7.5IRE.

I have had professional BetaSP and Quad dubs made to DVCAM where the facility did an excellent job, and the blacks were at code 16, 0% in FCP, and all was well for turning them into DVDs, but I've also had BetaSP to DV dubs where black was not at code 16, or 0% in FCP and they had to be returned to be re-done, as I will not accept incorrect dubs being made.

If you need to do such a dub and your DV deck does not have the correct analogue black level output, you can use a proc amp to add or remove setup, or just do what I do and pay someone to do it for me on a deck that does have the correct black levels.

In the article, Larry quoted Mark Spencer who wrote:

> It seems that most decks don't add setup out to your NTSC monitor so you aren't getting an accurate view of your black levels.

Graeme replies:

> This is not necessarily the case. The brightness control on a monitor should be more accurately marked as "Black Level" and as long as your computer / deck / monitor system is correctly calibrated, especially black levels with the "brightness" control, you will be seeing a correct representation of the video. Remember, most of your NTSC monitors are made in Japan, so just pretend you're Japanese and ignore setup – just calibrate your monitor to the bars in FCP that you're sending over FireWire to your DV deck and all is well. The only time you have an issue is dubbing – which I covered above.

Larry further quoted Mark Spencer who wrote:

> This happens in the typical DV setup with FCP through FireWire to a deck, and then out to the monitor. The solution is to install a TBC in-between the deck and monitor to add the setup, but I'm wondering if there is any other less expensive solution? I'm convinced that just about every DV-only editor has this issue.

Graeme replies:

> It's a non-issue. As long as you're calibrated, you're seeing your blacks correctly. The only issue is on dubbing.
>
> You only have an issue if you're using your production monitor for a number of sources, say DV, DVD and BetaSP, as the black levels out of your DVD player will be at 7.5IRE, as will those out of your BetaSP deck. In this case, putting a proc amp on the DV deck will make your levels consistent across the devices, allowing you to switch between them without further calibration.

Mark Spencer wrote:

> Ah, but when your program goes to broadcast, setup is added in the D/A conversion (either in the dub to an analog deck, or in the D/A converter in a DVD player), so when it airs, the black level is HIGHER than when you monitored it on your NTSC monitor – don't you think that is an issue?

Larry:

> No, because setup is also added on output from your DV deck to the monitor so you are seeing it correctly.

Graeme replies:

> Absolutely correct. As long as you're calibrated to the chain of devices you're using, you're seeing it right. These days, your DV master would get dubbed to Digital Betacam, which again, being a digital format does not have setup either, and then to an MPEG2 encoder, and delivered to your house digitally. In your set

to box, it will get converted to analogue, and at that point only does setup get added. To add it before then would be disastrous, as then setup would have been added twice, and the blacks would appear grey.

Mark:

Actually, it's not, that's my whole point! Most DV decks do not add setup to the monitor, that is my understanding, and the article I referenced reinforces this.

Graeme:

Indeed, but it's irrelevant as long as you're calibrated.

Larry wrote:

It seems we have two issues: first, do we need to add setup (i.e. increase the black level) when dubbing to tape,

Graeme:

You could very well need to if you're dubbing from DV to an analogue tape format. One way people do this cheaply for VHS dubs (although it hardly matters as VHS mostly doesn't have a stable or accurate black level anyway) is to make a DVD, and dub from DVD as DVD players (in North America) generally add setup.

Larry wrote:

…and the second is do we need to add setup when monitoring our DV signals.

Graeme replies:

No. Just calibrate the chain.

You should never record non-standard black levels onto a DV tape, as then, the chances are, setup will get added twice. Black should be at code 16 on a DV tape, which FCP represents as 0% (remember the FCP scale is not in IRE as IRE is an analogue measurement, not a digital one). Do not be tempted to raise the black levels in FCP to 7.5% as this will create a non-REC-601 standard tape, and reduce picture quality by not using all the allowable digital codes for the picture information.

Also, if you're dubbing from DV to Digital Betacam over SDI then there is no need to worry about setup as you're not converting to analogue at any point. Remember all digital formats do not, never have, never will have setup.

This article is from the February, 2004, issue of "Larry's FCP Newsletter," a FREE, very cool, monthly Final Cut Pro newsletter — click here to subscribe. Or, visit my website at: www.larryjordan.biz.

Larry Jordan is a post-production consultant, and an Apple-Certified Trainer in Digital Media,

with over 25 years experience as producer, director and editor with network, local and corporate credits. Based in Los Angeles, he's a member of both the Directors Guild and Producers Guild.

Text copyright 2006 by Larry Jordan. All rights reserved.