

Flicker Free

Flicker Free 3.0



**Saving Thousands of Hours of Footage
And Saving The Sanity of Thousands of Editors**



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Smart tools for creative minds.

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About This Manual

Flicker Free supports many host applications. The controls for Flicker Free are the same in every application. So throughout the manual we will show examples (and the UI) from different host apps. If a particular graphic doesn't look exactly like what you see, please focus on the name of the controls which are all the same.

Note about Presets

The preset names are more suggestions. Don't take them too literally. A Slow Motion preset might work for rolling bands and a Rolling Bands preset might work for archival footage. However, the settings came about because they worked reasonably consistently for the type of footage they're named after.

Note about the Adobe apps and Macs

Flicker Free 2.0 does not support Metal on Mac. A free update will be coming soon that does support this, but for the moment, FF 2.0 does not support this. This is a problem for the Adobe apps.

After Effects only supports Metal. So Flicker Free 2.0's is NOT accelerated in After Effects. We recommend doing the deflicker pass in Premiere Pro where it will be much faster.

Premiere Pro and Adobe Media Encoder support OpenCL as well as Metal. However, by default both apps use the Metal version of the Mercury Engine. You need to manually switch it to the OpenCL version.

To do this, go to: File>Project Settings and select the OpenCL Mercury Engine.

If you don't do this, when you apply Flicker Free to your clip, you'll see a red bar in the timeline indicating the effect is not GPU accelerated. Usually this is caused by the wrong Mercury Engine being selected.

This is not a problem on Windows. We support OpenCL and CUDA on Windows, same as the Adobe apps.

Installation and Serial Numbers

You can always download the most up-to-date version of Flicker Free from our Demo page. Your serial number will activate the demo.

Mac Demo Page:

https://digitalanarchy.com/demos/psd_mac.html

Download the .dmg file and run the Installer that's on the dmg.

Windows Demo Page:

https://digitalanarchy.com/demos/psd_win.html

Download the .zip file, open it, and run the Samurai_Sharpener.exe file.

The installers should put the plugins where they need to go for whatever host application you're installing for. After running the installer, you'll need to restart your host application.

You can find videos on installing our plugins here:

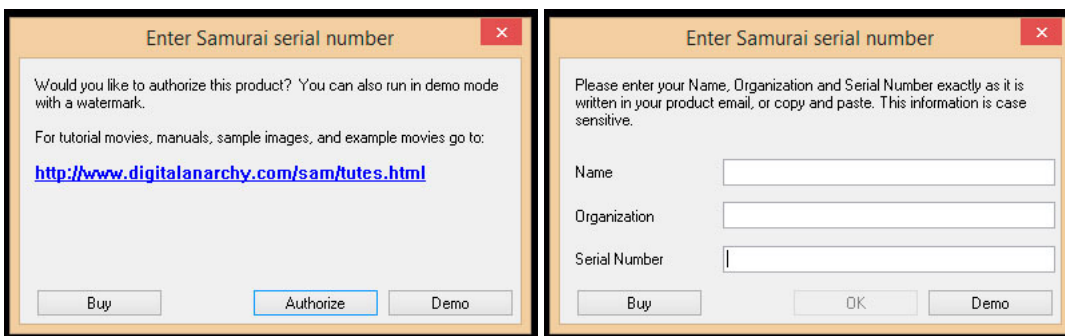
<https://digitalanarchy.com/support/install.html>

Your Serial Number

After purchasing your plugin, you should see an email with the Subject: Your Serial Numbers for Order #XXXXXX

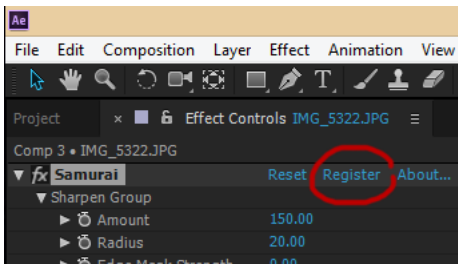
Look for the pink highlighted text in the email and that will have your serial number.

To enter in the serial number and register Flicker Free, you'll need to open your Host Application and apply the plugin to a video clip. You can then register the plugin. The process of registration is the same in all applications, click on Authorize, then enter the serial number. The method for calling up these dialogs is different in each host app.



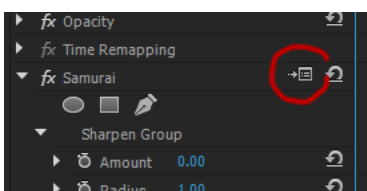
After Effects:

Simply apply the plugin to a video clip. The dialogs will automatically appear. You can also click on the Register button to bring them up if you're in demo mode.

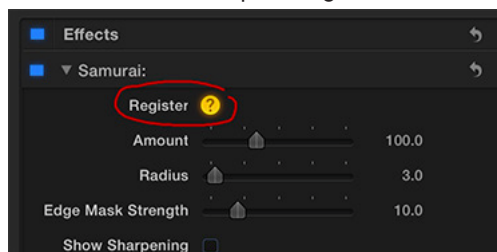


Premiere and Final Cut Pro:

You'll need to apply the plugin and then click on the Setup or Register button:



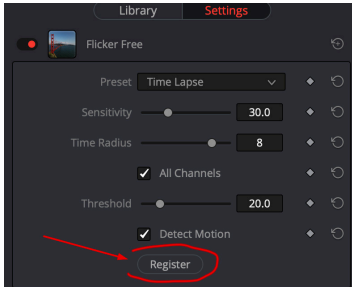
Premiere Pro



Final Cut Pro

Davinci Resolve:

Once you apply the plugin to a clip, go to the Plugin Settings and click the Register button:



Significant Changes to The Licensing System

We've changed the way our licensing system works.

What's the same:

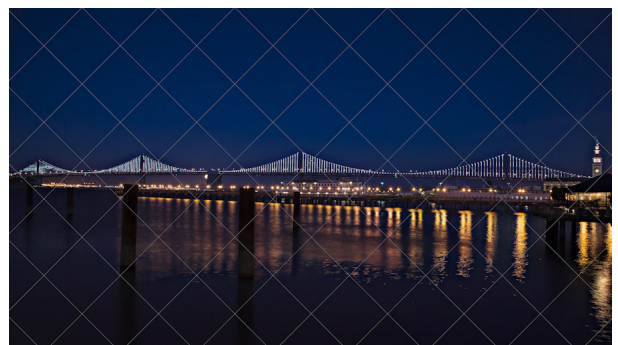
- You're still allowed two installations. This is meant for users who have two machines, perhaps a work machine and a home machine. It is not meant to be used as two separate licenses for two users.
- Network Checking: If the plugin is being used on two machines at the same time, both will go into Demo mode and you'll see the crosshatch watermark.

What's Different:

- Licenses are managed on our server
 - This means you can now easily manage your license activations. For example, if you have a computer die, you can delete that activation and use it for your new machine. You can deactivate licenses from any machine. This is convenient if you're managing a multiple user serial number.
- The license has to get validated at least every 30 days. If not, it will go into Demo mode and display the crosshatch watermark. So the machine needs to be connected to the internet at least every 30 days. If this is a problem, please contact us at CS@digitalanarchy.com and we can manually generate an activation key for you.

Demo Watermark

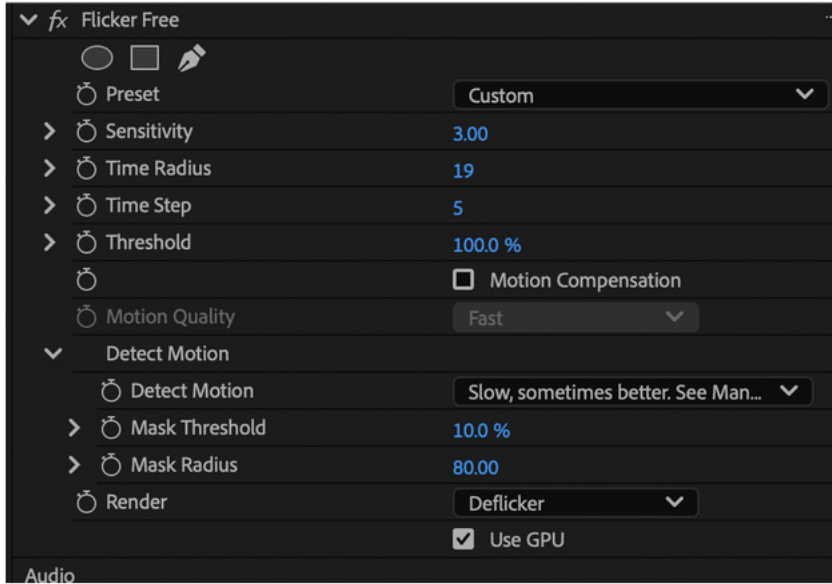
If the plugin is in Demo mode, it will show a crosshatch watermark on your image. This means the plugin is unlicensed. If you have a serial number you've purchased, then you'll need to register the plugin using that. (see above) If not you can purchase one from https://store.digitalanarchy.com/23-VIDEO_PLUGINS



If you have entered in your serial number and it's still showing, please check the TroubleShooting section or email: CS@digitalanarchy.com or call 415-287-6069

What's New in Flicker Free 3.0

The main change to Flicker Free 3.0 is adjusting the algorithm to deal with a wider time range.



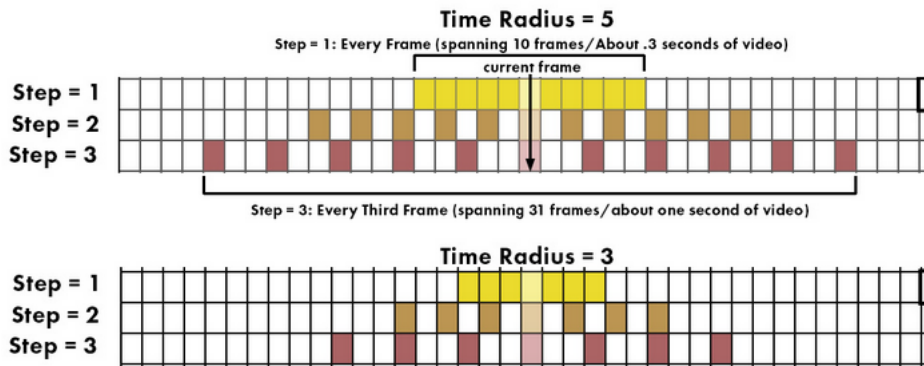
What does this mean?

In FF 2.0 you were limited to a Time Radius of 10. Which gave you a range of 21 frames... 10 frames before the current frame, 10 frames forward, and the current frame. So about 2/3rds of a second, at 30fps. Mm

In FF 3.0 the Time Radius limit has been increased to 19, so a total of 39 frames, 19 back, 19 forward, plus the current frames. About 1.333 seconds at 30fps.

ALSO, there is now a STEP parameter which has a limit of 5. This tells FF to skip to every *n*th frame. So with Step set to 5 and Time Radius set to 4, it'd look at Frame 1, 6, 11, 16, instead of the normal 1, 2, 3, 4. You're still using 4 frames (max of 19) but they're spread out. This means FF 3.0 (time radius = 19) can look at a maximum of 6.5 seconds to try and correct the flicker. (at 30fps)

(see diagram on next page)



What does that mean?

- 1) it allows us to solve some instances of flicker, especially slow rolling bands and very high frame rate video that we were unable to fix before.
- 2) 6.5 seconds is a really loooong time if your video has a lot of motion (handheld camera, sports, dancers, etc). So the parameters for dealing with motion (Motion Compensation, Detect Motion) become REALLY important.

The long time range makes deflickering without adding artifacts problematic. Usually you see this as 'ghost' pixels or blurring. It can also show up in weird discoloration. But check out the next section for some tips on how to determine if the footage is fixable at all and how to fix or improve it without artifacts.

Presets: There are, of course, new presets, mainly for rolling bands but you can also try for other types of flicker. The Medium Slow Rolling Bands presets and Slow Rolling Bands have variations or parameter settings we've seen to be successful. However, you may want to tweak the settings.

Make sure you save your project before fiddling with the presets! Some of the settings can be pretty resource intensive, especially on 4K or higher footage. If you don't have a pretty beefy GPU, Flicker Free may cause the card to run out of memory and hang or crash your system. With Time Radius <10 this is less likely to be a problem. But if you crank the settings up, be careful.

Changes between 1.0 and 2.0

There are two big changes and a bunch of smaller ones.

- 1) SPEED - Flicker Free is now GPU accelerated!
- 2) Motion Compensation / Detect Motion - We use optical flow and other algorithms to compensate for extreme motion. This means if you have a moving camera (handheld, drone, etc) or a subject that's moving a lot (e.g. dancer, sports, etc) Flicker Free 2.0 will do a much better job removing the flicker.

Speed

As with all things related to GPUs, this is complicated. We've seen performance changes of -25% (yes, slower) to 1500% for 4K compared to Flicker Free 1.0. On average though, 2.0 is 300-400% faster than 1.0. The performance change you see will be determined by:

- How old the GPU (and computer) is
- What GPU you have
- Your OS
- The Video Editing App you're using.

The GPU is the biggest factor (see the next section for a full explanation).

Not all apps will see the same performance increase. Editing applications (Premiere, FCP, etc) should be faster than apps like After Effects, due to how AE handles GPU plugins. We know a lot of time lapse videographers use AE, so we're working on improving that. On Mac it's really a problem because AE doesn't support OpenCL, so 2.0 won't be faster at all. Look for a dot release (2.0.1) that optimizes for AE and supports Metal. The speed increase in Premiere and FCP is significant.

The OS makes a big difference. As mentioned we don't support Metal yet (coming soon) and the Adobe's app favor it (AE requires it). So Premiere/Mac/AMD is slower than Premiere/Windows/AMD/Nvidia. Hopefully once we support Metal the performance will even out. However, Final Cut Pro does not have that problem and the performance increase there is awesome.

Motion Compensation / Detect Motion

One of the biggest things that Flicker Free 1.0 didn't handle well was a lot of camera movement or fast moving subjects. Motion Compensation is designed to fix these shots. With the MC checkbox turned ON, Flicker Free uses Optical Flow (retiming) algorithms to help this process.

The other component that deals with motion is the Detect Motion dropdown. It builds a 'motion mask' where we identify the areas that are moving in footage. Detect Motion set to Fast uses the motion mask from Flicker Free 1.0, which is now very fast. Usually this is good enough. However in some cases you may want to set this to Slow, which is a new algorithm. As the name implies, it's much slower. So only use it as necessary. In fact, many shots don't require Detect Motion at all and you can turn it OFF which will make Flicker Free even faster.

Part of what makes Detect Motion = Slow more powerful is the ability to adjust the Motion Mask. There's a pop that lets you Show Mask and two parameters that let you adjust it: Mask Threshold and Mask Radius. This definitely makes the mask more precise, but it comes at a cost, which is speed. However, if you're only option is to go reshoot that wedding... speed might be a small cost to pay! :-)

All this makes it possible to save footage that 1.0 could not. However, if you have Motion Compensation ON and/or Detect Motion set to Slow, you will see increased render times. Especially if you have them both turned on.

There are a lot more details later on in the manual about these features, but just wanted to give everyone a quick overview of what's new!

Happy De-flickering!

(oh... and make sure you check out the info on GPUs in the next section)

Host Applications

A note about supported video editing apps. The first release supports Premiere Pro, Final Cut Pro, and After Effects. We'll add support for Resolve and Avid soon. Resolve will probably drop about a month after the 2.0 release.

The first release of 2.0 works best in either Premiere Pro or Final Cut Pro.

If you're using After Effects, the GPU isn't supported as well as in other host applications. If you're on a Mac, it's not supported at all. We currently don't support Metal and AE/Mac only supports GPU plugins using Metal. Metal support is coming soon but it's not in the first release of 2.0.

Video Cards, GPUs and Host Applications

As mentioned, the speed of Flicker Free relies on the GPU of your machine.

GPU stands for Graphics Processing Unit which is a dedicated chip, usually on your video card, that allows the CPU to offload all graphics rendering to it. Thus a fast GPU/Video Card will make many graphics, not just Flicker Free, sing and dance. Ok, actually it'll just make your renders faster which will make you sing and dance.

Not All GPUs Are Made Equal

Flicker Free is currently optimized for OpenCL and CUDA (a technology on Nvidia cards). Apple also has something called Metal and we'll be releasing a free update that supports Metal soon after the 2.0 launch.

Adobe Applications on Mac: Unfortunately for After Effects users on Mac, this means Flicker Free will not be GPU accelerated until the Metal version is out. AE on the Mac only supports Metal for GPU rendering. Premiere still supports OpenCL. HOWEVER, it defaults to Metal. So if the UseGPU checkbox is grayed out, you need to change Edit>Project Settings to use the OpenCL Mercury Engine. ALSO... In Adobe apps, don't turn off UseGPU and then render. Make sure the Mercury Engine is set to Software Only. UseGPU = Off, should not be used with OpenCL/CUDA Mercury Engine.

We've found Nvidia cards to be somewhat faster than AMD. So on Windows we recommend Nvidia. On Mac, only AMD cards are available.

UseGPU Checkbox and Troubleshooting

The power of the GPU comes at a price. Since it's so beneficial for graphics, every piece of software would like to use it. This can cause render problems or crashes if too many plugins or host applications are trying to access it at the same time.

The UseGPU checkbox is an important tool for troubleshooting and will often solve a problem by turning it off. This will dramatically slow down renders, but if you don't have time to troubleshoot, it can be a quick way of solving the problem and finishing a job.

Also, as noted, in the Adobe apps if the UseGPU checkbox is grayed out, make sure the Mercury Engine is set to the correct platform (OpenCL for AMD cards or CUDA for Nvidia cards). If you use Adobe Media Encoder you need to check it there as well.

Host Applications

The initial release of Flicker Free 2.0 was only optimized for Adobe After Effects, Adobe Premiere Pro, and Apple Final Cut Pro. We do intend to optimize for Davinci Resolve (OpenFX) and Avid.

Due to the nature of GPU rendering we have to tweak the software for each host application. As you can imagine this is time consuming, so please be patient. However, gentle requests/encouragement to get it done for your host app are welcome if you'd like to email us at sales@digitalanarchy.com. We appreciate the feedback as it lets us know what host applications are customers are using.

About Flicker Free

Flicker Free allows you to easily remove flicker from video footage. But what is flicker and what causes it?

Flicker is the perceived change in the luminance (or brightness) of the individual frames (or parts of the frame) as they are played back. This creates a strobing effect which is distracting and can cause epileptic seizures in small children. (ok, we're not sure about children, but we have seen this happen with over caffeinated clients in an editing bay. Very similar to children in many respects.)

Flicker Free was originally designed to fix the flicker caused by varying exposures in timelapse videography. However, once we developed it, we discovered there are many reasons for flicker and that Flicker Free does a great job on most of them. The list below isn't exhaustive, but shows some of the common reasons that video flickers.

Some common causes of video flicker:

- 1: Timelapse: exposure variation of shutter speed in changing lighting (e.g. sunset)
- 2: Slow Motion: The high frame rate (120fps or faster) can reveal lighting variation due to electricity cycles, especially with low quality lights.
- 3: Camera Shutter and Lights being out of sync: Causes Rolling horizontal bands that move vertically through the footage. Traditionally caused by using a US camera in Europe (or anywhere with 50hz electricity). Can also be caused by LED lights, computer monitors, and TVs.
- 4: Archival or old footage where either the film degraded or the older camera was not capable of a consistent exposure because it was hand cranked (or some such problem).
- 5: Electrical interference where the video camera is close to other electronics, like in an iPhone.

Flickering Lights and...

Slow Motion

Flicker can be a HUGE problem for slow motion footage. Electricity cycles at 50-60 times per second. It goes up and down like a Sine Wave. This can cause the brightness of a light to vary as the electricity flows through the ballast of the light. High quality lights will probably not have this problem, but normal lights may and low quality lights almost certainly will have the issue. While shooting at normal speeds (24-30 fps), the camera is capturing slower than the electricity is cycling, so it's usually not a problem for non-LED lights. However...

With high frame rate footage, the camera is shooting faster than the electricity cycles. Sometimes much, much faster. In such a case, the flicker becomes very noticeable. At extremely slow speeds (say, 2500 fps), it's possible that the luminance change can happen over 30 or more frames. Usually the flicker just happens over a few frames though. This is pretty easy to correct and is one of the things Flicker Free is designed for.

So if you're on a budget, you can use lower quality lights, we've even used tungsten shop lights from Home Depot, to shoot your slow motion shots. Of course, you can purchase non-flickering lights or 2K/5K lights (which are so bright the fluctuations aren't noticeable) and solve the problem altogether.

Rolling Bands (Camera/Light Sync Problems)

This usually is caused by the camera shutter speed being out of sync with some light source. You can see it commonly happen when you capture a computer monitor or TV with a video camera. The monitor or TV (the light source) refreshes 60 - 120 times per second. If the camera shutter speed doesn't divide evenly into the refresh rate (TV at 75hz, Camera at 1/30 shutter speed), they will be out of sync and you'll get the bands.



Above Image: You can see there's severe banding on the left, and almost none on the right. To see video footage with the problem, go to: <https://www.youtube.com/watch?v=ILfV3E9rHC0>

This can also be caused by LED lights. These have a refresh rate similar to a monitor or TV! So you need to know what the refresh rate is and adjust the camera accordingly. This is one of the most common reasons Flicker Free is used.

Electrical interference is another source of this problem. If the camera is too close to other electrical components, an iPhone camera or a GoPro on a drone, etc, you may also get the rolling bands.

Flicker Free can usually fix the rolling bands problem, but not always. The slower the bands are, the less likely it is that Flicker Free will work. Oddly, the worse footage looks, with fast moving bands that cause intense flicker, the easier it is to fix. Very slow moving bands are difficult to distinguish from shadows and other naturally occurring color changes.

Timelapse

A time lapse video requires taking a photo every 1 second or 1 hour and combining them to make the video. This can result in beautiful videos, but the problem is that the lighting changes and causes flicker.

You can shoot time lapse one of two ways: 1) Set the camera to manual mode and lock down both the shutter speed and aperture or 2) lock down the aperture and let the camera vary the shutter speed.

Setting the camera to manual mode results in less flicker IF there's no changes in lighting. If the sun is moving in and out of clouds you'll have flicker. I rarely use this mode for shooting time lapse, unless I have complete control over the lighting over the entire length of the shot (which usually means it's in a studio). For nature shots, the problem is that the correct exposure for noon is not going to work for 2pm. So it's problematic.

Locking down just the aperture allows the camera to adjust to changes in lighting conditions so you can shoot over a longer period of time. This will keep the luminance approximately the same throughout the entire video. However, this ALWAYS flickers. The camera's judgement of how bright a scene is varies slightly, so it will fluctuate the shutter speed slightly from frame to frame. This is another thing that Flicker Free was designed to do.

Archival Footage

If you're restoring older footage, flicker comes from a few sources. 1) The film may have degraded over time, 2) The camera was hand cranked making it difficult to maintain a consistent exposure over the course of the shot, and 3) older lights were more prone to flickering.

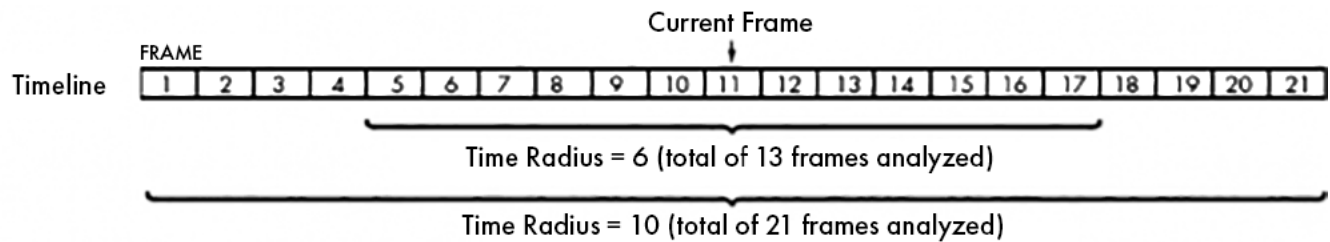
If the problem comes from Exposure, then it's a similar problem to time lapse, in that it effects the whole frame, and should be easy for Flicker Free to fix. There may be some other issues like a lot of grain which goes beyond Flicker Free's capabilities.

If it's due to image degradation, the issue may be more complex as it's possible only parts of a frame will be effected. In which case Flicker Free may or may not be able to fix it.

How Flicker Free Works

Flicker Free tries to remove flicker by analyzing a number of frames around the current frame, and figuring out what the brightness or luminance value should be for the current frame. By doing this for each frame, it can smooth out the changes in any given frame resulting in smooth lighting throughout the footage.

How many frames it looks at is set by Time Radius. The higher the value the more frames FF will look at. More frames usually means better results but slower renders. For example, if you have Time Radius set to 8, FF is looking at 17 frames: The current frame and 8 frames before and after it.



That's a lot of frames! So it's good to apply FF first before applying other effects. If you have a bunch of other effects applied, the host app or video card may run out of memory trying to render 17 frames to give to FF. This is especially true if you're using GPU accelerated effects. It's even better to apply Flicker Free in a pre-comp (or Compound Clip if you're in FCP) and then apply other effects to the pre-comp.

If you're on the first frame or the last frame (or around there), Flicker Free will use as many frames as it can. Obviously if you're at the last frame there's no frames beyond that to use, so FF will only use the frames prior to it.

Flicker Free Parameters

Presets

There are several presets for different types of flicker problems. These are settings we've found to work well in our tests. At best, they'll instantly solve your flicker problems! (this happens a lot... so try one of the presets, it may be all you need to do) Otherwise, they provide a good starting point and you shouldn't need to make too many tweaks.

The presets generally match up to the types of problems we discussed in the intro. Every piece of footage is different, of course, but the types of flicker tend to be the same. So the presets usually work quite well. Sometimes there are two or three presets for a given type of flicker. This happens when we've identified different settings that work for different examples that we have.

Also, sometimes a preset for one type of flicker will solve flicker of a different type. Don't get too hung up on the name. 'Rolling Bands' may solve your Slow Motion flicker better than the Slow Motion preset.

So, after you apply the filter to your footage, start off with the Preset that most closely matches your footage. The presets make excellent starting points and is often all you need to do.

If one of the presets works, great! You're done. :-)

Render a short segment as a test

Render out a few seconds of your footage to see what it looks like. Flicker Free is not usually a real time filter. Especially if Motion Compensation is on or Detect Motion = Slow. You usually don't have to render out the entire video clip to see how well Flicker Free is working. Flicker will be pretty much the same through any given piece of footage. So if Flicker Free works on a few seconds of your footage, it'll work on the rest of it. One caveat, if there's a portion with a lot of movement, either the camera or the subject, use that as your test.

What if it doesn't work?

Here are some quick things to try. But you should read the section on each parameter to really understand how they work, both by themselves and with the other parameters.

If you're seeing halos, ghosting, or blurring, make sure Motion Compensation or Detect Motion is turned ON. You can also leave those Off and set Time Radius to a lower value like 4 or 6 OR set Sensitivity to a higher value..

If there aren't any artifacts, but you're still seeing flickering, try turning Motion Compensation and Detect Motion to OFF. Both of these will fix ghosting problems, but they also reduce the amount of flicker removal.

Next, adjust Sensitivity to somewhere between 3 and 50. Lower values usually mean more flicker reduction, but more risk of ghosting. Time Radius is the opposite... Higher values = less flicker, more ghosting.

Finish by adjusting Threshold to between 5 and 20. For very extreme flickering, a high value like 100 might be in order.

Flicker Free is a pretty awesome solution but it's not perfect. There will be instances where it can't remove the flicker completely or sometimes it will get rid of the flicker but there are halos or ghosting. Meaning there's a tradeoff in

getting rid of the flicker vs. ghosting. Often the halos are much less noticeable to the viewer than the flicker. But you'll need to fiddle with parameters to find the right balance if one of the presets doesn't work perfectly.

Sensitivity

This affects how the flicker is removed. Not all flicker is created equal.

Some flicker affects the entire frame, for example Time Lapse shots have flicker because of the camera changing exposure. The change in exposure affects the entire frame.

Some flicker affects just certain areas. Say, an LED light that was used in a fixture at a wedding. That will cause just the area around the light to flicker and the rest of the frame will be fine.

The general rule of thumb is that flicker affecting the entire frame requires large Sensitivity values (like 30-ish) and regional flicker is better served by smaller values (3-10). However, there are many exceptions to the rule, so it's just a guideline. Most footage usually looks better with a lower value, even if the flicker seems to affect the entire frame. Why? Possibly because even though the lights are affecting the frame, some parts of the subject being shot receive more light than other parts. But to be honest, I have no idea. Lower values just work better. :-)

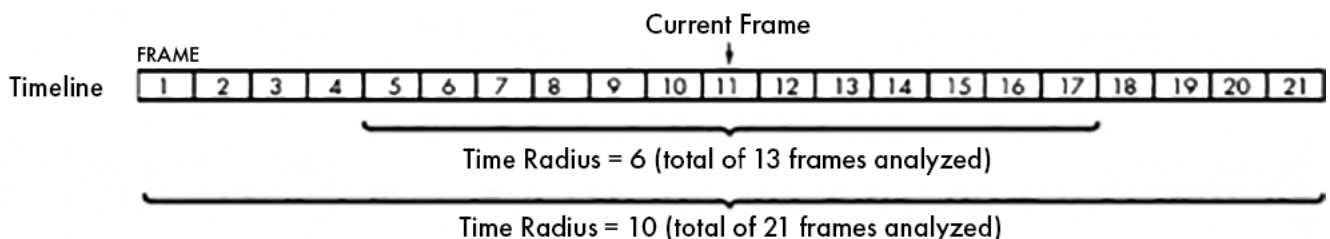
Actually, time lapse footage is the only footage that we've found so far that responds better to higher values.

The caveat is that lower values also cause more artifacts like ghosting. We usually recommend using a Sensitivity value of 3. However, if you start to see ghosting, one way to deal with it is to increase the Sensitivity to 5 or 10. Decreasing Time Radius also helps. In both cases you'll see less ghosting, but there'll be less flicker removal as well. It's a tradeoff.

Time Radius

As noted in the 'How Flicker Free Works' section, FF analyzes a number of frames before and after the current frame. Time Radius sets how many frames it analyzes. The maximum is 10. If you have Time Radius set to 10, FF will analyze 21 frames. This usually works better. However, it can sometimes cause artifacts or blurring, in which case a setting of 6-8 works better. Also, larger values may cause the host application to run out of memory, especially if it's trying to load all those frames into the memory of a graphics card, like Davinci Resolve.

Realistically the minimum setting for this is 3 or 4. FF won't have enough frames to analyze otherwise. Here's a visual representation of what Time Radius does:



So, generally, a lower Time Radius is better... as long as the flicker is being removed.

Again, a higher Time Radius and lower Sensitivity = less flicker but more risk of ghosting. A lower Time Radius and higher Sensitivity = less risk of ghosting, but potentially more flicker. However, the new Motion Compensation parameter goes a long way towards letting you use a high time radius and low sensitivity to get the most flicker removal AND not have any ghosting. See below for more details.

Threshold

Threshold looks at the amount of change in brightness that any given pixel will have. Usually a large change in brightness is not flicker, and is not something that needs to be 'fixed'. (e.g. someone with a white shirt moves to reveal a dark background) Usually you'll want this quite low, 5-20, or you'll want it at 100. Those are the most common settings we've found.

Generally flicker is visible but the change in brightness isn't very dramatic, maybe changing a shade of gray from 50% gray to 55% or 60% gray. That's still a very visible flicker happening frame to frame, but in terms of a percentage it's rather low. Thus, a setting of 10-20 is usually appropriate for Threshold.

For more severe flickering you'll almost certainly want this set to 100.

Motion Compensation

This is one of the big new features in Flicker Free 2.0. It helps remove flicker when there's a lot of motion in the footage. It uses optical flow algorithms to prevent ghosting artifacts while maximizing flicker removal. Not all footage needs this. It does slow rendering down, so it's best to have it turned Off if possible. However, for footage with a moving camera or fast moving subject (e.g. a dancer or sports content), it can be critical in fixing the shot.

This works in conjunction with the Detect Motion settings. You don't need Detect Motion turned on, but Motion Compensation will often work better if it is. Usually setting Detect Motion = Fast is good enough.

When this is turned On, another analysis pass is made to determine what is moving in the footage. This is combined with the deflicker algorithm to adjust the flicker reduction on those areas. It dramatically helps deal with any blurring or ghosting artifacts caused by camera movement or fast moving objects in the footage.

Motion Compensation Quality dropdown

Motion Compensation uses optical flow algorithms. The same algorithms that are used to retime footage (i.e. fake slow motion). As such, it has a 'resolution' which determines how precise the algorithm is.

This dropdown has two settings: Best and Fast. As you might guess, 'Best' is the higher resolution setting (and slower) and 'Fast' is the lower resolution setting and, yep you guessed it, faster.

Detect Motion

With this turned on, Flicker Free will analyze the footage for pixels that seem to be moving. This creates a 'motion mask'. The Deflicker algorithm is applied to areas that aren't moving. This helps remove artifacts like ghosting.

The downside is that the flicker removal may not be as good. So this is definitely something to try with and without. Different pieces of footage are subject to different problems as far as FF is concerned. So the settings that worked for one clip may not work for another. This is especially true with Detect Motion.

Usually we recommend Detect Motion = Fast, with Motion Compensation On or Off. In most cases, this will give you the best results and be relatively quick to render.

OFF: Detect Motion is not used. Sometimes all you need is Motion Compensation turned On. So it's best to try that with Detect Motion set to Off first.

FAST: This is the Flicker Free 1.0 algorithm. It's been GPU-ized and is much faster than in 1.0. If you're trying to replicate 1.0 settings and had Detect Motion turned On, this is what you want to select. It's also the first option you want to try. It'll often work by itself (Motion Compensation = Off), in which case you're renders should be quite fast.

SLOW: This is a new algorithm for 2.0. It creates a different mask than FAST, however, as the name suggests, it results in longer render times. This rarely works by itself. Usually you use it in conjunction with Motion Compensation. It is not necessarily **better**, just different. Do not use this if you're not rendering with the GPU. You'll get really long render times.

One advantage of SLOW is that you can view the mask and make adjustments. Like any mask, 'white' areas will be deflickered and 'black' areas will not be. So having Threshold set to 5 or above, and Radius relatively low (2-5-ish) will give you the best results.

Mask Threshold: This sort of controls the white point. Higher values (5 and higher) will result in more of the image being white, and thus getting deflickered.

Mask Radius: This behaves a little bit like a blur. The larger the radius the larger the black areas will be. Smaller values will result in more precise, smaller areas of masking.

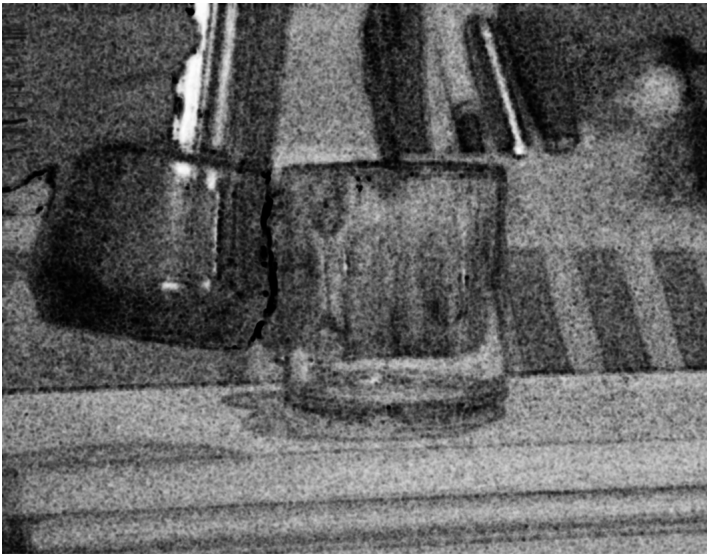
For an example of how Threshold and Radius combine, see the images on the next page.



Threshold = 10, Radius = 2



Threshold = 10, Radius = 7



Threshdhold = 3, Radius = 2

(These are NOT recommended settings as the mask is too dark. You'll see little Deflickering.)



Threshold = 3, Radius = 7

How to Fix Rolling Bands

The most common problem we hear about are rolling bands. A type of flicker that occurs when the camera and lights are out of sync. This guide is mostly designed to give you some ideas on how to fix, or at least reduce, the flicker in such videos.

The method presented here is what we recommend, but there may be other workflows that work. Don't take this as a hard truth, it's just one way of working with Flicker Free.

TL;DR (We really recommend reading this section, but if not...

- Don't apply to 8K.
- Set Time Radius to 19.
- Try Step values of 1, 3, 5.
- Try Motion Compensation On/Off.
- Try with Detect Motion set to None, Fast, and Slow (with values of Threshold = 10, Radius =30 or Threshold = 3, Radius =10)

First off, a lot of footage with rolling bands can be fixed with FF 2.0 settings. i.e. the Rolling Bands presets that are at the top of the preset menu. Setting Time Radius to 8 or 10 is often enough to fix the problem.

Presets: There are, of course, new presets that have settings that take advantage of the new FF 3.0 algorithm. The Medium Slow Rolling Bands presets and Slow Rolling Bands have variations we've seen to be successful. Try the Medium Slow presets first.

If you have footage that you know Flicker Free 2.0 doesn't fix, here's how to approach figuring out if it's fixable with 3.0 and if so, what settings will work to remove or reduce the flicker:

- Apply FF BEFORE any other effects. Especially Lumetri or other GPU plugins.
 - Remember FF needs to render up to 40 frames. If you have other plugins applied and it takes .5 seconds to render a frame, by adding FF on top of that, each frame will now take 20 seconds to render. (.5 x 40). **Apply FF first. Always.**
- Apply FF to the resolution you're going to deliver at. If you have 4K footage and are delivering for 1080p, Precomp it or Nest it inside an 1080p comp/sequence (scale it to 50%). Apply Flicker Free to the 1080p comp/sequence. (This might also be effective for finding good settings for 4K a bit faster, even if you're delivering 4K. It's going to be faster to find settings that work on 1080p. Less rendering time. Once you figure it out, you can apply it to the 4K footage. **caveat:** sometimes you need different settings at different resolutions.)
 - **Do not apply FF 3.0 to 8K footage with a Time Radius > 10.** You will almost certainly run out of memory. Apply it to the resolution that you're delivering it at.
 - You can sometimes get better results with 60fps footage. So if you have that, you might want to try FF on that before dropping it into a sequence with a common frame rate of 29.97 or 25.
 - Exception is if it's high frame rate and the Host App has correctly interpreted that your 240fps video should be played back at 30fps (or whatever). In that case you shouldn't need to Precomp.

- Find a few seconds of the video where there's not too much motion
- Set Time Radius to 19
- Leave Step at 1
- Turn off Detect Motion
- Leave Motion Compensation off
- For rolling bands type flicker you usually want to leave Sensitivity at 3, but for other types of flicker a higher value may work.

With those settings, do a test render to see if it removes the flicker. Don't worry about artifacts at this point (there will probably be a lot). You're just trying to figure out if it will fix or improve the flicker.

If it doesn't remove the flicker, increase Step to 3. Test render. Then increase to 5. Test Render.

This will tell you if there's any chance FF will fix it. If you're still seeing significant flicker in all the test renders, it's probably not going to work. However, if the flicker is removed/reduced then we can start dealing with the artifacts. With the above settings any movement is going to result in crazy blurring.

Next Steps

- Select a few seconds of the video that has lots of movement.
 - You generally don't want to do test renders on the entire video. It'll just take longer. Test on a few seconds where the subject or camera is moving as much as possible. Get it working on that and then test on the full video.
- With the lowest 'Step' value that worked (more is not better per se. Medium speed rolling bands may respond to TR=19 and Step=1 just fine, and Step of 3 or 5 will make it worse.):
- Turn on Motion Compensation. Test Render. Did that work? You're good.
- Still seeing artifacts? Turn on Detect Motion. Test Render. Work? You're good.
- Turn off Motion Compensation and set Detect Motion to Slow.
 - Things can get weird with Slow. It's very prone to fixing the flicker and making things look worse.
 - Thresholds to try: 3, 5, 10.
 - Mask Radius to try: 5, 10, 30, 40 and 60 & 80 (usually just for 4K)
 - Usually I try Threshold of 10 and Radius of 30, first. And then try Threshold = 3. That's probably your best bet. But Threshold=5 and Radius=10 can work for some footage.
- Try a Time Radius of 8, 10 or 15. Time Radius is the big memory hog. So if you can get away with a lower value, it'll speed up renders and make it less likely you'll max out your GPU.

(continued on next page)

Advanced Steps

- SAVE YOUR PROJECT
- If Detect Motion = Slow, you have a good chance of crashing the host app if you turn on Motion Compensation. ESPECIALLY at 4K. Flicker Free is very capable of using every last bit of memory on your GPU and then some. So be careful about using Slow and Motion Compensation together on 4K footage. Less of an issue on HD, but if you have an old machine, still may be an issue.
- That said, sometimes you need both Slow and Motion Compensation on. Especially for slow rolling bands. Just make sure as much RAM as possible is dedicated to your video editing app. (and SAVE YOUR PROJECT). But also, if you have a pretty beefy machine, you're probably fine.

Two instances of Flicker Free:

- Some of the artifacts that get introduced, especially from Detect Motion = Slow, will look like noisy flicker. Or there will still be some rolling bands visible.
- If you render out the footage, you can apply Flicker Free to the new render and use Flicker Free 2.0 settings (TR < 10, Step=1) to fix the artifacts. And sometimes the remaining rolling bands. On the second instance a TR of 4 or 5 sometimes works.
- Do not precomp/Nest the sequence with Flicker Free and then apply Flicker Free to the Precomp/Nested Sequence. You'll probably run out of memory. Create an intermediary file of the Flicker Free Sequence and apply the second instance of Flicker Free to the render. This isn't ideal, of course, but if you want to fix the flicker without crashing your machine it may be necessary.

Flicker Free Problems: Artifacts, Shading, Ghosting, Black Frames and more.

Flicker Free usually works remarkably well and you should be happy with the results. Some customers are even ecstatic due to it saving shots, this is especially true for the 'rolling bands' type of flicker because they did not see it on the set or at the wedding!

HOWEVER... FF is not perfect and can cause problems. Here's what to look for:

Ghosting

Probably the most common problem that happens when you've got fast moving objects. The object will appear in a frame with 'ghosts' or 'echoes' of itself at the positions it was at in prior frames. Reducing the Time Radius or increasing Sensitivity can help with this. Also try adjusting the Threshold to a lower value.



Images above: *With Motion Compensation On; With neither Motion Compensation or Detect Motion*

If you can't get rid of it by adjusting the regular parameters, that's when Motion Compensation and Detect Motion come into play.

Get Time Radius, Sensitivity and Threshold set to you've removed the flicker with the least amount of ghosting. Then turn on Motion Compensation. You can also try adding Detect Motion = Fast. As a last resort, try Detect Motion = Slow. Motion Compensation and Detect Motion will slow things down, so don't use them if you don't need them.

Shading and Halos

This is kind of related to ghosting, but can occur for other reasons as well. FF is trying to blend multiple frames. If there are high contrast areas and the camera moves fast, you may see the lighter areas affected by the darker areas. Causing something that looks like a shadow or halo. As with ghosting, reducing the Time Radius or increasing Sensitivity will help significantly. The main problem is that FF is trying to blend frames that vary a lot. Also, try adjusting the Threshold to a lower value. Having Detect Motion or Motion Compensation ON, will often solve the problem. However, this can cause less flicker reduction.

Of course, it may not be that big of a deal or noticeable to someone not looking for it. Play it back in realtime and see how it looks. Frequently the problem is only noticeable when you turn Flicker Free on and off when you're staring at one frame. When played back normally it may not be that noticeable by the viewer.

This isn't to say it's not a problem but sometimes a tradeoff has to be made between flicker reduction and artifacts. It's useful to remind ourselves that often a viewer isn't going to notice something as it flies by at 30fps that is painfully obvious to us as we stare at a single frame for 10 minutes.

Black Frames / Render Errors

Keep in mind that FF is requesting a lot of frames from the video editing app. If you have Time Radius set to 10, Flicker Free is asking the host app to render 21 frames so we can analyze them. You should apply FF BEFORE applying other effects. If you apply it afterwards, the host app or graphics card may run out of memory trying to render all those frames and won't render. In which case, you'll get a render error, black frames, or some other odd behavior. In some apps we do attempt to cache frames, which reduces the overhead needed but it still can be a problem.

One thing to try is turn UseGPU to OFF. This will let you know if it's a GPU problem or not.

UseGPU

UseGPU is a troubleshooting parameter. In Adobe applications, you should NOT render with this turned off. The correct way to handle GPU problems in After Effects and Premiere Pro is to set the Mercury Engine to Software Only.

In other host applications (FCP, Resolve), turning UseGPU off should work fine. However, Flicker Free will be much slower. If Motion Compensation is turned on and Detect Motion = Slow, it could be VERY slow. We do not recommend using Detect Motion = Slow if you are not using the GPU.