



Nattress Standards Conversion V2.5

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Installation

Copy the plugins from the download of **Nattress Standards Conversion** to the Plugins folder on your hard drive. For more free and commercial plugins visit www.nattress.com



The plugins folder is located at, from the root of your main hard drive:

/Library/Application Support/Final Cut Pro System Support/Plugins

Make sure that you have both read and write privileges to the plugins. Also, be sure to copy them to the correct place on your hard drive. There are multiple “Library” folders in OS X, but the one you need is the one at the root of your hard drive, not the one in your own home folder.

These filters have been tested with FCP3, FCP HD, and FCP5 under OS X. I strongly recommend FCP 4.x / FCP5 for speed and stability while using the **Nattress Standards Conversion** plugins.

New In Version 2.5

Version 2.5 adds a number of new plugins and features.

New Plugins

- G Add Pulldown
- G Remove Pulldown
- G Map Frames

New Features

- Improved de-interlacing code for faster rendering
- Selectable Anti-Aliasing replaces the “Smooth” option for de-interlacing
- Higher quality scaling option for improved downconversions
- “external sync” options for converting video to match original unconverted audio

- Anamorphic to letterbox conversions

Known Issues

- Converting sequences is not an option in FCP5.

Introduction

G Standards Conversion package contains two complex filters that have been designed to convert between the three standards of NTSC video (29.97 frames per second), PAL video (25 frames per second) and 24p (24 frames per second progressive). **G Converter** deals with the video to video frame rate conversions, and **G Film Converter** deals with the video to film frame rate conversions. Both plugins will correctly scale the converted clips if necessary. A new Filter, **G Advanced Pulldown Converter** is designed to help users of cameras that shoot with "Advanced Pulldown", such as the Panasonic DVX100 and SDX900, and the Canon XL2.

New to the package in V2.5 are two plugins for adding and removing 3:2 pulldown, and **G Map Frames**, which acts like "Conform" in Cinema Tools in that it converts frame rates by speeding up or slowing down accordingly.

The Standards Conversion algorithms have been refined to work with both interlaced and progressive PAL and NTSC. In Version 2.5 the algorithms have been further refined to work better with Y'CbCr (commonly know as "YUV"), 10bit video and the chroma sampling of 4:1:1 NTSC DV. Additionally, support has been added to convert 60p footage from a Panasonic Varicam to 24p. In this case, Final Cut Pro does quite a reasonable job of converting from 60p to 24p, but you may find the Film Converter's solution more visually pleasing.

Both G Converter and G Film Converter work in a very similar manner. This method of working is necessary to bypass the poor in-built Final Cut Pro / Quicktime frame rate conversion and allow the high quality algorithms to work effectively. Also, if a change of clip resolution (scaling) is needed, the clip on the timeline should be nested to allow the plugin to work correctly. Again, due to limitations in FCP, the plugin must be correctly informed of the Source Pixel size of the video that is to be converted. If you find that there is not a setting for the source media you are using, then please email me at graeme@nattress.com for it is an easy task to add in the required sizes.

Although conversion will work on a sequence, I have not found this route reliable enough to recommend it's use. Please use the conversions on movie clips rather than sequences.

General Method

All frame rate conversions begin with making sure you have a project which contains the source movie clip which you wish to convert and a sequence whose settings match that to which you wish to convert.

Important

The sequence you are in must be set to the standard to which you wish to convert!

For instance, if you wish to convert from PAL DV to NTSC DV, open a new project, and use the easy setups to create a new sequence that is NTSC DV. Using the easy setups in Final Cut Pro will ensure that the parameters for the new sequence are specified correctly.

The general method of operation is as follows:

PAL to NTSC conversion

1. edit the PAL clip to an NTSC timeline
2. apply the G Converter clip to the PAL clip in the NTSC timeline (dropping the plugin from the bin onto the clip in the Sequence timeline is usually easiest)
3. open the clip in the viewer
4. select the filter tab in the viewer
5. set the correct settings for the desired conversion. In this case, we select Source Pixel size to be 720 x 576 (PAL), lower field order for source (in this case a PAL DV clip) and destination (NTSC DV timeline).
6. if you desire the NTSC output to be de-interlaced, this can be performed in one step by selecting progressive output
7. if you would like to experiment with the conversion algorithm using "Smart De-Interlacing" then this can be selected in the De-Interlace options. The Tolerance control affects the smart de-interlace and its effects can be seen by selecting "View Smart Mask" in the De-Interlace Options.
8. the original PAL clip that was edited to the NTSC timeline must now be dropped from the project browser onto the Source Clip image well in the filter. The plugin will use this video clip for all the image data for the conversion. This is the important step that makes this plugin different from any other, and is vital to its successful operation.

NTSC to PAL conversion

1. edit the NTSC clip to an PAL timeline
2. nest the NTSC clip to allow the plugin to scale the converted clip. Because the pixel dimensions of NTSC video are smaller than PAL, the clip will appear shrunk down in the timeline canvas viewer. This is normal. The nesting of the clip will allow the plugin to correctly scale it to PAL pixel dimensions. (select clip and go to the Sequence Menu and select Nest Items - make sure the pixels dimensions of the nest are PAL sized)
3. apply the G Converter plugin to the nested sequence in the PAL timeline. Make sure the plugin goes onto the nest itself, not the clip that it contains.
4. open the nest in the viewer (control click on the nest and select "Open in viewer" or select nest then press return)
5. select the filter tab in the viewer
6. set the correct settings for the desired conversion. In this case, we select Source Pixel size to be 720 x 480 (NTSC), lower field order for source (in this case a NTSC DV clip) and destination (PAL DV timeline).
7. if you desire the PAL output to be de-interlaced, this can be performed in one step by selecting progressive output
8. if you would like to experiment with the conversion algorithm using "Smart De-Interlacing" then this can be selected in the De-Interlace options. The Tolerance control affects the smart de-interlace and it's effects can be seen by selecting "View Smart Mask" in the De-Interlace Options.
9. the original NTSC clip that was edited to the PAL timeline must now be dropped from the project browser onto the Source Clip image well in the filter. The plugin will use this video clip for all the image data for the conversion. This is the important step that makes this plugin different from any other, and is vital to it's successful operation.

To help follow the special method of use of this plugin, please watch the Tutorial movies on the website at: <http://www.nattress.com> that demonstrate this procedure in operation.

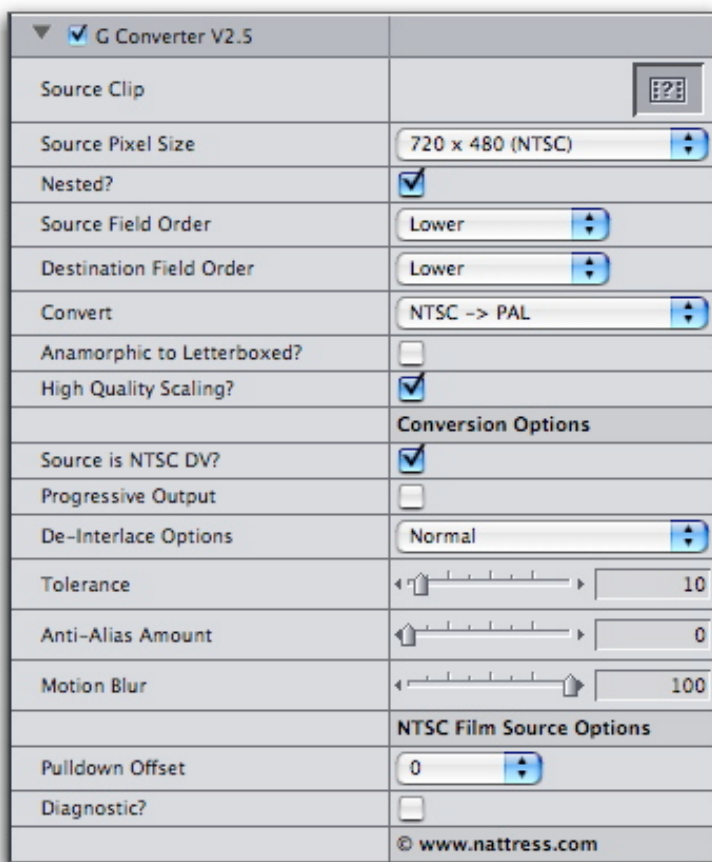
NOTE: Standards Conversion works on Sequences as well as clips, although it is not entirely recommended. If you choose to use sequences, be very careful to

check the finished output as sometimes the correct frames from the sequence are not passed correctly by FCP to the plugin and errors can occur.

NOTE: Be sure to nest the sequence if you are enlarging the pixel dimensions, ie, from NTSC to PAL. If you are using the Film Converter, to just change frame rate, then it is not necessary to nest the sequence.

NOTE: To edit a sequence to the timeline in FCP HD, hold down the Apple key as you drag and drop the sequence onto the destination timeline to avoid causing a mismatched frame rate error. This method does not work in FCP5. If you can figure out how to get it to work with sequences in FCP5, please email me.

G Standards Conversion



Control	Settings	Notes
Source Clip	"image well"	The original PAL or NTSC clip must be dropped here from the project browser, for the conversion to work correctly

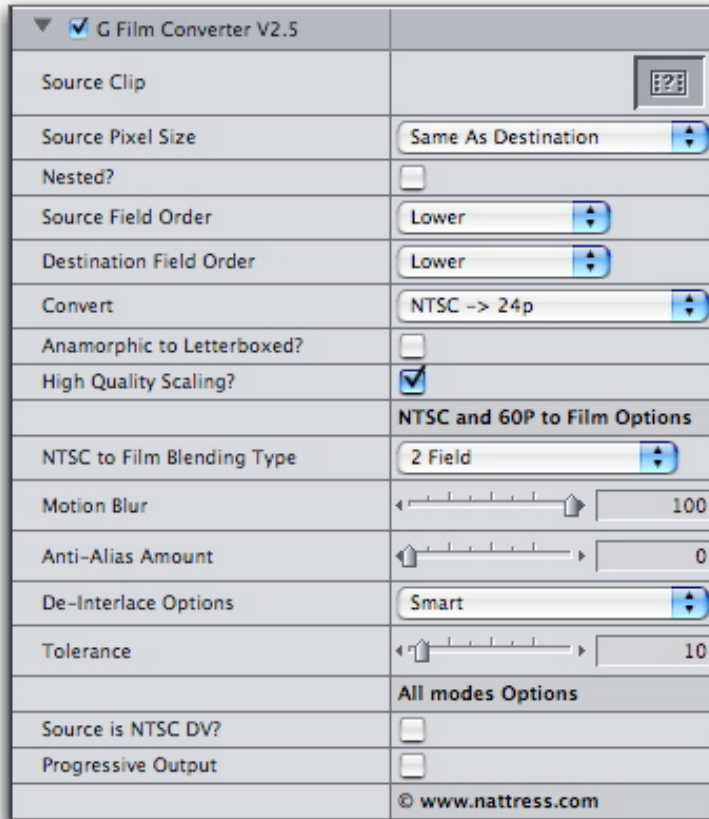
Control	Settings	Notes
Source Pixel Size	720 x 576 (PAL) 720 x 480 (NTSC) 720 x 486 (NTSC) 768 x 576 (PAL) 640 x 480 (NTSC) 720 x 540 1920 x 1080 (HD) 1280 x 720 (HD)	You must select the correct pixel dimensions for your source video here. For HDV 1080i use "1920 x 1080" HD.
Nested	yes no	The "nesting" method is necessary when converting from a "smaller" format to a larger one.
Source Field Order	Upper Lower	Selects the field order of the source video, and must be the same field order with which the source clip was produced
Destination Field Order	Upper Lower	Selects the field order of the destination timeline video, and must be the same field order as the timeline in which you are performing the conversion
Convert	PAL -> NTSC NTSC -> PAL NTSC Film Source -> PAL PAL -> NTSC external sync NTSC -> PAL external sync	selects the required conversion mode: The "external sync" options are for converting the video from, say, PAL to NTSC, but you want the NTSC video to sync to the unconverted PAL audio.
Anamorphic To Letterboxed	yes no	Select to convert anamorphic source video to letterboxed
High Quality Scaling	yes no	enable especially on downconversions for improved quality of scaling.
Source is NTSC DV	yes no	If you are converting from NTSC DV, then use this option to improve the quality of the conversion by smoothing the 4:1:1 chroma
Progressive Output	yes no	This option forces the output of the plugin to be de-interlaced. However, this can reduce the smoothness and resolution of the conversion.
De-Interlace Options	Normal Smart View Smart Mask	This governs the type of de-interlacing algorithm used. Normal is default, although smart can produce a small improvement in image quality for a little extra render time. The view smart mask option allows you to visually optimize the setting of the Tolerance control

Control	Settings	Notes
Tolerance	2 to 100	controls which areas of the screen are defined as moving and which are defined as still, as part of the smart de-interlace process
Anti-Alias Amount	0% to 100%	Use this control to soften or smooth the de-interlacing
Motion Blur	0% to 100%	Adjusts the amount of motion blur that is present in the conversion. Reducing motion blur may also reduce smoothness of the conversion.
Pulldown Offset	0 1 2 3 4	Adjusts the pulldown offset for the "NTSC Film Source -> PAL" option. See note below
Diagnostic?	yes no	Can be useful for Nattress Productions Inc. to track down any issues you may have with the conversion.

NTSC Film Source to PAL Note

Because Film material is converted to NTSC via 3:2 pulldown, the **NTSC Film Source -> PAL option** will first attempt to remove that pulldown before converting to PAL to produce a better quality of conversion. For this to work correctly the clip must have constant cadence - ie, the pattern of the 3:2 pulldown must not change over the length of the clip, and the pulldown offset must be set correctly for that pattern. At the moment, I know of no easy way to determine the correct setting for the pulldown offset other than trial and error, so extreme **caution** must be employed while using the NTSC Film Source -> PAL mode.

G Film Converter



Film Conversion uses the G Film Converter plugin to convert Film from and to video frame rates. This is a more complex filter than G Converter, but it uses a similar method of operation.

NTSC to FILM Conversion

Note: *G Film Converter is designed for producing a video to film standards conversion. For removing the 3:2 pulldown on film telecined to NTSC video, use Apple's Cinema Tools instead. If you need to remove the pulldown inside FCP, use the included G Remove Pulldown plugin.*

To convert from NTSC video's 29.97 frame rate to film's 24 frames per second, G Film Converter uses an algorithm similar to reverse 3:2 pulldown as used in the Film Effects set of plugins. For more information on this it is advised to download and read the instructions for Film Effects from <http://www.nattress.com>. G Film Converter allows you to pick from one of the same four methods that Film Effects uses as outlined below:

Method	Notes	Visual Effect
1 Field	Picks the nearest field to the "right" one	Can look very good when de-interlace is set to Normal - looks choppy on Smart de-interlace. Do not use with Motion Blur set to 0% or low percentage values
2 Field	Picks the nearest field, and blends it with it's neighbour	Looks very good with both Normal and Smart De-interlace
3 Field	Picks the nearest field, and the one before and the one after and blends all three	Has a very smooth look, but also has the most added motion blur
3 Field Var	Picks the nearest field, and the one after or the one after and one before, in a 3:2 pattern	Also has a very smooth look, but also can look like an NTSC kinescope (tele-recording)

for 60p to 24p conversion, the following applies:

Method	Notes	Visual Effect
1 Field	Picks the nearest frame to the "right" one	FCP seems to use this method itself
2 Field	Picks the nearest frame, and blends it with it's neighbour	Looks very good
3 Field	Picks the nearest frame, and the one before and the one after and blends all three	Has a very smooth look, but also has a lot of added motion blur
3 Field Var	Picks the nearest frame, and the one after or the one after and one before, in a 3:2 pattern	Has a very smooth look, but also has a lot of added motion blur

FILM to NTSC Conversion

Film to NTSC conversion simply adds standard 3:2 pulldown to the NTSC video to produce the 29.97 frame rate.

PAL to FILM Conversion

PAL to FILM conversion removes one frame every second to reduce the PAL frame rate from 25fps to 24fps. This would produce a stutter or jump every second, so instead of removing the frame all at once, it is removed a field at a time, so in fact, one field is removed every half-second. I have called this PAL-1 to Film Conversion. This method has the advantage that the speed of the resulting film is identical to that of the video.

If you wish to use the "traditional" method of converting Film to PAL or PAL to FILM by speeding up or slowing down by 4% then please use Apple Cinema Tools and it's conform option to do so.

The included **G Map Frames** can also be used to “conform” video to a new frame rate.

FILM to PAL Conversion

FILM to PAL Conversion uses the same method that PAL to FILM Conversion uses, but in reverse. For converting FILM to PAL the Film to PAL+1 Conversion adds one field every half-second to change the Film's 24fps to PAL video's 25fps.

Control	Settings	Notes
Source Clip	“image well”	The original PAL, NTSC or 24p clip must be dropped here from the project browser, for the conversion to work correctly
Source Pixel Size	Same As Destination 720 x 576 (PAL) 720 x 480 (NTSC) 720 x 486 (NTSC) 768 x 576 (PAL) 640 x 480 (NTSC) 720 x 540 1920 x 1080 (HD) 1280 x 720 (HD)	You must select the correct pixel dimensions for your source video here. For HDV 1080i use “1920 x 1080” HD. When you are just converting frame rate, pick the default, “Same as Destination”
Nested	yes no	The “nesting” method is necessary when converting from a “smaller” format to a larger one.
Source Field Order	Upper Lower	Selects the field order of the source video, and must be the same field order with which the source clip was produced
Destination Field Order	Upper Lower	Selects the field order of the destination timeline video, and must be the same field order as the timeline in which you are performing the conversion
Convert	24p -> NTSC NTSC -> 24p 24p -> PAL+1 PAL-1 -> 24p 60p to 24p	selects the required conversion mode
Anamorphic To Letterboxed	yes no	Select to convert anamorphic source video to letterboxed

Control	Settings	Notes
High Quality Scaling	yes no	enable especially on downconversions or use of letterboxed mode for improved quality of scaling.
Blending Type	1 Field 2 Field 3 Field 3 Field Var	Selects the blending type for the 24p conversion.
Motion Blur	0% to 100%	Adjusts the amount of motion blur that is present in the conversion. Reducing motion blur may also reduce smoothness of the conversion.
Anti-Alias Amount	0% to 100%	Use this control to soften or smooth the de-interlacing
De-Interlace Options	Normal Smart View Smart Mask	This governs the type of de-interlacing algorithm used. Normal is default, although smart can produce a small improvement in image quality for a little extra render time. The view smart mask option allows you to visually optimize the setting of the Tolerance control
Tolerance	2 to 100	controls which areas of the screen are defined as moving and which are defined as still, as part of the smart de-interlace process
Source is NTSC DV	yes no	If you are converting from NTSC DV, then use this option to improve the quality of the conversion by smoothing the 4:1:1 chroma
Progressive Output	yes no	This option forces the output of the plugin to be de-interlaced. However, this can reduce the smoothness and resolution of the conversion.

Conversion Tips

Notes on Audio Sync

Standards Conversions normally preserve audio sync. This has been successfully tested on all modes.

If you are having audio sync issues, there are usually one of two things causing it:

- Your timeline is not the correct format. For instance, if you're converting PAL to NTSC, the timeline you're working in needs to be 29.97fps NTSC standard.

- The nested video clip you are converting has an “in” point marked and you do not have the “Nesting?” checkbox set correctly.
- If you wish the converted video to sync to unconverted audio (useful for making a DVD where you want the NTSC conversion to sync to the PAL’s already produced 5.1 audio files etc.) then be sure to use the “external sync” conversion options.

Notes on the Standards Conversion Filter Operation

Once the original clip has been added to the source image well, the nest can be edited (in or out points moved) or moved in time. The original clip that is added to the timeline must be the same clip that is dropped into the source image well. Any difference in the in/out points will not give the desired result.

Note on using DSR-11 and DSR-25 Dual format DVCAM Decks

The Sony DSR-11 and DSR-25 DVCAM decks are very useful in a multi-standard environment as they can be switched between PAL and NTSC operation at the flick of a switch. However, FCP does not like to switch as easily! I find that I have to re-select a new easy setup and reboot the mac.

From FCP4 onwards, this situation has improved and usually FCP will switch over on the use of the appropriate PAL or NTSC easy preset after the deck is switched and FCP is asked to refresh devices.

G Add Pulldown



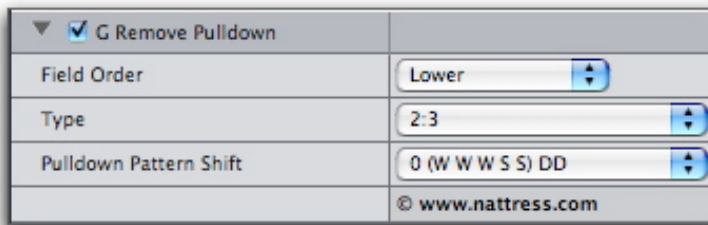
G Add Pulldown is useful for some work flows involving 24p video.

If you take 24p video and “conform” it to 29.97fps for use in an NTSC timeline, it will be sped up. If you need this “sped up” 24p video to run at the right speed again, applying this plugin will add 3:2 pulldown to make it run once again at the correct speed.

Once such workflow could be where pulldown is removed to add special effects, and pulldown needs adding back in to return the finished clip to proper speed. **G Add Pulldown** is therefore intended to be used with it’s companion, **G Remove Pulldown**.

Control	Settings	Notes
Field Order	Upper Lower	Set this to the field order of your timeline.
Pulldown Pattern Shift	0 (W W S S W) AA 1 (W W W S S) DD 2 (S W W W S) CD 3 (S S W W W) BC 4 (W S S W W) BB	Selects the order of the pulldown cadence to be added. See technical note at end of instructions.

G Remove Pulldown



G Remove Pulldown is designed for situations where you have 24p material with 3:2 pulldown that you need to remove. You may need to remove it so that you can add special effects to the video, or to produce better slowmo. You can also use G Remove Pulldown to help you determine the correct pulldown pattern for instructing Cinema Tools to perform a reverse telecine.

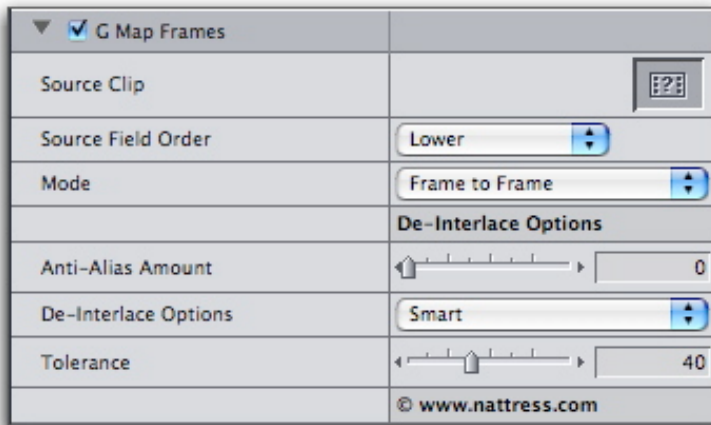
When this plugin removes the pulldown, it will effectively speed up the footage from 24p to 29.97fps (when used in an NTSC timeline) and leave the end of the clip with a repeat of the last frame. This buffer space on the end is useful for when you want to add pulldown back in later with the **G Add Pulldown** plugin as this will ensure the clip returns to the correct length.

Unfortunately, due to errors in the way that FCP handles deeply nested sequences, there can be problems using this filter. It is not possible to take a clip, remove pulldown, add effects, and then add pulldown back in using only nested sequences. If you remove pulldown and then add an effect, you may need to save that segment of the timeline out to disk as a movie, bring it back in, and then use the **G Add Pulldown** filter.

Control	Settings	Notes
Field Order	Upper Lower	Set this to the field order of your timeline.
Type	3:2 2:3:3:2 (Advanced)	Selects to remove normal 3:2 pulldown or 2:3:3:2 Advanced pulldown

Control	Settings	Notes
Pulldown Pattern Shift	0 (W W W S S) DD 1 (S W W W S) CD 2 (S S W W W) BC 3 (W S S W W) BB 4 (W W S S W) AA	Selects the order of the pulldown cadence to be added. See technical note at end of instructions.

G Map Frames



G Map Frames can have many uses. You can use it to “conform” one clip’s frame rate to the frame rate of the timeline, slowing 30fps footage to 24fps, or speeding up 24fps to 30fps. It can also be used as a super-slowmo plugin with the “Field to Frame” options.

To perform a 40% slowdown of 60i video to a 24p timeline, drop the 60i video on the 24p timeline. Use Final Cut Pro’s in-built speed change option (Apple + J) and set it to 40% with blending off. This will make a clip of the right length as a placeholder for the effect to work in.

Add the **G Map Frames** plugin to the lengthened clip, and drop the 60i video clip into the “Source Clip” image well at the top of the filter controls. Set the filter to either of the “Field to Frame” modes. The HQ mode will look better, but will take slightly longer to render.

To perform a 50% slowdown of 50i footage to a PAL timeline (works also with 60i video on NTSC timeline), drop the 50i video on the PAL timeline. Use Final Cut Pro’s in-built speed change option (Apple + J) and set it to 50% with blending off. This will make a clip of the right length as a placeholder for the effect to work in.

Add the **G Map Frames** plugin to the lengthened clip, and drop the 50i video clip into the “Source Clip” image well at the top of the filter controls. Set the filter to either of the “Field to Frame” modes. The HQ mode will look better, but will take slightly longer to render.

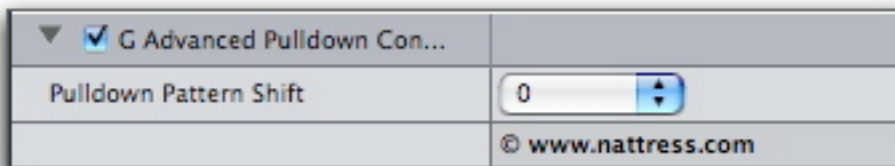
Control	Settings	Notes
Source Clip	“image well”	The original video clip must be dropped here from the project browser, for the effect to work correctly
Source Field Order	Upper Lower	Set this to the field order of your timeline.
Mode	Frame to Frame Field 1 to Frame Field 2 to Frame Field Blend to Frame Field to Frame HQ Field to Frame Fast	See table below
Anti-Alias Amount	0% to 100%	Use this control to soften or smooth the de-interlacing
De-Interlace Options	Normal Smart View Smart Mask	This governs the type of de-interlacing algorithm used. Normal is default, although smart can produce a small improvement in image quality for a little extra render time. The view smart mask option allows you to visually optimize the setting of the Tolerance control
Tolerance	2 to 100	This controls which areas of the screen are defined as moving and which are defined as still, as part of the smart de-interlace process

Method	Description	Visual Effect
Frame to Frame	Takes every frame in sequence from the source clip and maps it to a frame in the timeline	This mode is best used on progressive video. Normally, this mode won't effect a speed change if the frame rate of the clip and the timeline are the same, but if they are different it will cause the source clip to run at the speed of the timeline. This is the equivalent to the “conform” option of Cinema Tools.
Field 1 to Frame	Takes the first field, in time, from the source clip and maps it to a frame in the timeline	For use on interlaced video, this turns the source video progressive based upon the first field, and then acts like “Frame to Frame” mapping the frames of the video to the frames of the timeline.
Field 2 to Frame	Takes the second field, in time, from the source clip and maps it to a frame in the timeline	For use on interlaced video, this turns the source video progressive based upon the second field, and then acts like “Frame to Frame” mapping the frames of the video to the frames of the timeline.

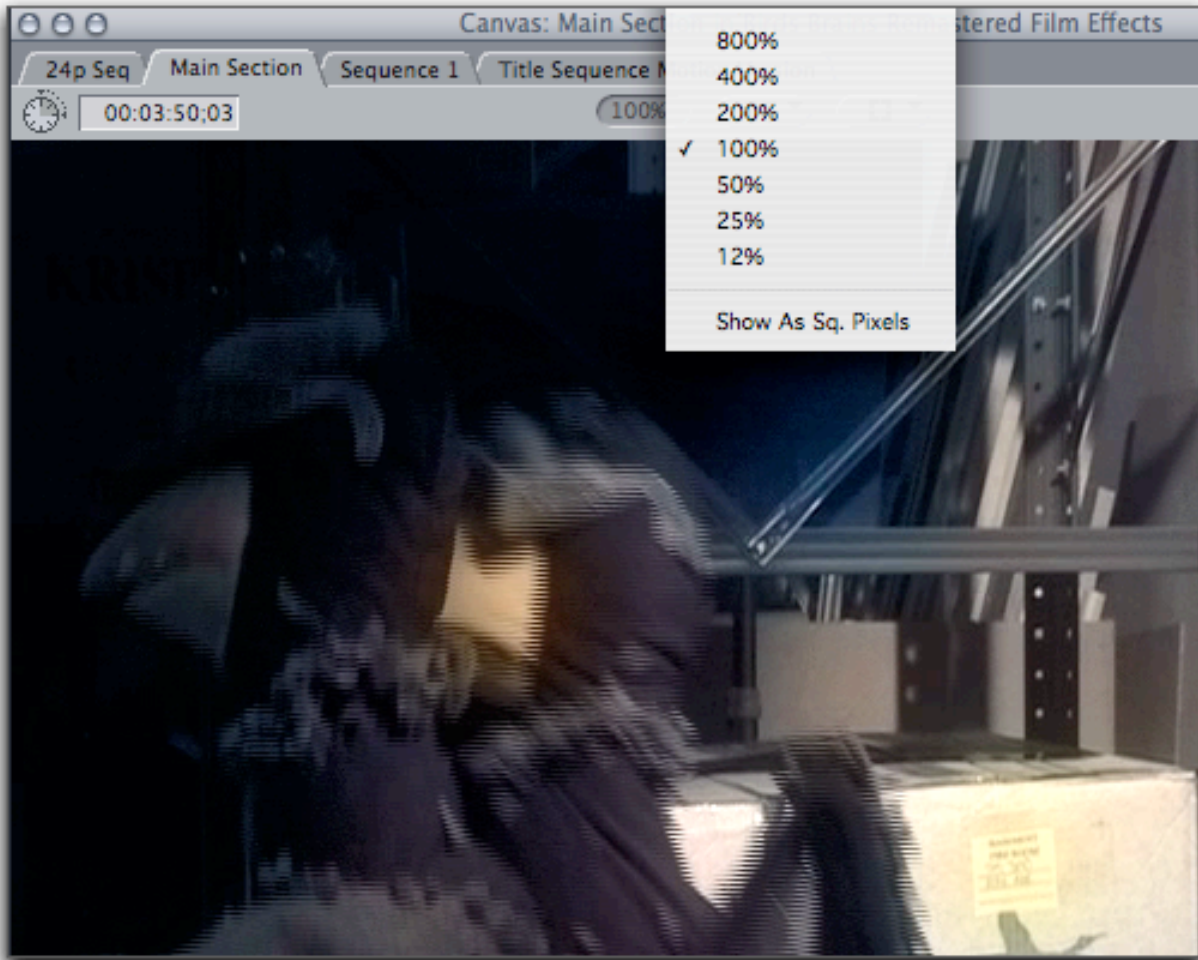
Method	Description	Visual Effect
Field Blend to Frame	Takes a frame from the source clip, de-interlaces it with a blend, and maps it to a frame in the timeline	For use on interlaced video, this turns the source video progressive based upon a blend of both the fields, and then acts like "Frame to Frame" mapping the frames of the video to the frames of the timeline.
Field to Frame HQ	Takes each field in turn and maps it to a frame in the timeline (using a higher quality field extraction)	For use on interlaced video only, these two options turn the source video progressive by creating a new frame from the first field and then a second new frame from the second field. These new frames are then mapped to the frames of the timeline. Because each of the two fields has been turned into one new frame, this will cause a 50% slow motion effect. If normal 60i NTSC video is used with this option in a 24p timeline, you will therefore get a 40% slowdown because the video is slowed 50% and slowed from 30fps to 24fps.
Field to Frame Fast	Takes each field in turn and maps it to a frame in the timeline	If normal 50i PAL video is used with this option in a PAL timeline, you will therefore get a 50%.

G Advanced Pulldown Converter

The **G Advanced Pulldown Converter** filter is designed for situations where you have shot in 24pAdvanced on a Panasonic DVX100 or Canon XL2 by mistake. The 24pA footage should really have its pulldown removed automatically by FCP and edited on a 23.98fps timeline for best quality. 24pNormal is designed to be edited on a normal NTSC 29.97fps timeline. This filter will take 24pA footage that has not had its pulldown removed and convert it to 24pNormal. The filter is designed to be used on a normal 29.97fps timeline. Filters in FCP cannot access the meta-information which tells FCP where the pulldown frames are in advanced footage, so there is a small manual step described below to help you find the correct point in the pulldown sequence for the plugin to work correctly.



- 1 Place your 24pA footage or clip that does not have its pulldown removed onto a normal NTSC 29.97fps timeline. Do not apply the filter yet.
- 2 Set the canvas in Final Cut Pro to 100% and turn off display as square pixels:



3 Now we can correctly see the interlaced nature of the video and determine whether we're on a split frame or a whole frame. A Split frame, like the frame shown above will show interlaced tearing - a sort of comb effect. Park the play head on a split frame. It doesn't matter which. In 24pAdvanced there is one split frame followed by four whole frames. In 24pNormal there are two split frames followed by three whole frames.

4 Apply the **G Advanced Pulldown Converter** filter to the clip in the timeline.

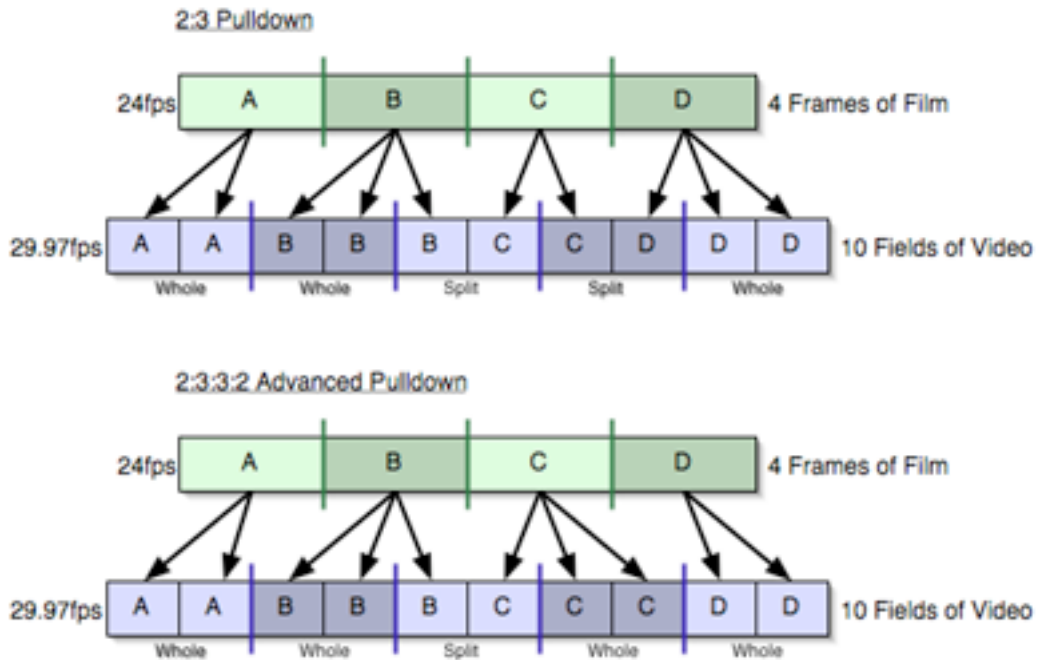
5 Advance the play head one frame.

6 Now adjust the "Pulldown Pattern Shift" control until the current frame you are on is a split frame. This method of operation is a fairly foolproof method of letting the **G Advanced Pulldown Converter** filter know exactly where we are in the five frame pulldown sequence, so that it can accurately convert 24pA to 24pN.

7 Render the clip to see it converted from 24pA to 24pN.

Technical Information

These diagrams illustrate the difference between the 24pNormal (2:3) and 24pAdvanced (2:3:3:2) pulldown patterns.



Also Available at www.nattress.com

Film Effects is *the* 24p Film Effect for Final Cut Pro. Film Effects does everything you need to make your video look like film - whether NTSC or PAL



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