VKey2f Comprehensive Chroma-key FxPlug Plug-in
for Final Cut Pro, Final Cut Express and Motion

by Oak Street Software, Inc.
www.oakstreetsoftware.com/gkey/
(last updated for version 2.01, 2011-Feb-27)

Background: The FxPlug version of VKey2f is a complete rewrite of the VKey2 Quicktime plug-in that utilizes the advanced features of modern CPUs (Power PC G4, G5, and Intel Core Duo/Core 2 Duo) to achieve reasonable performance while doing all internal processing in high precision, 32-bit floating point format. The "f" in VKey2f designates high precision, 32 bits/color channel (128 bits/pixel with alpha!) processing. Version 2 of VKey2f adds advanced spill suppression, a completely rewritten edge blending option, and many improvements to existing features.

VKey2f is a true vector keyer, rather than a simple chroma keyer, which has the unique ability to feather edges and partially key fine detail, which allows things like hair to blend with the new background, like they would naturally.

VKey2f is an FxPlug plug-in which means that it works with most of Apple's current video compositing tools. It can be used with any tool that supports FxPlug plug-ins, including Final Cut Pro version 5.1.2 or higher, Final Cut Express version 4 or higher, and Motion 2 or higher. The FxPlug architecture is Apple's new plug-in architecture. Support for FxPlug could expand to even more products in the future. Apple is currently making improvements and fixing bugs in the FxPlug interface, so some features may only work with the latest versions of Apple products. As of this writing, VKey2f (version 2.01) has been tested on Motion 3 and Final Cut Pro version 6.02.

Using the VKey2f Filter component

Scripted Installation:

Version 2 of VKey2f ships with an AppleScript that will install the plug-in in either your system library (for use by all user accounts on the machine), or your home library (accessible to the current user, only). Double-click the installer program to run the script. You will be prompted for the location, and the script will generate any necessary folders and insert the plug-in into the desired location. If you are upgrading, it will ask you if you want to replace the existing plug-in by the same name. **Note:** Version 2 will not replace Version 1.x of VKey2f. They have different names, and can be installed simultaneously. Also, if you had the demo version installed, you should be sure to install the product version in the same place, so it will replace the demo. If you installed the demo in your home Library folder and you install the product in the system library folder, the demo will take precedence, and you will not be able to access the product version.

Manual Installation:
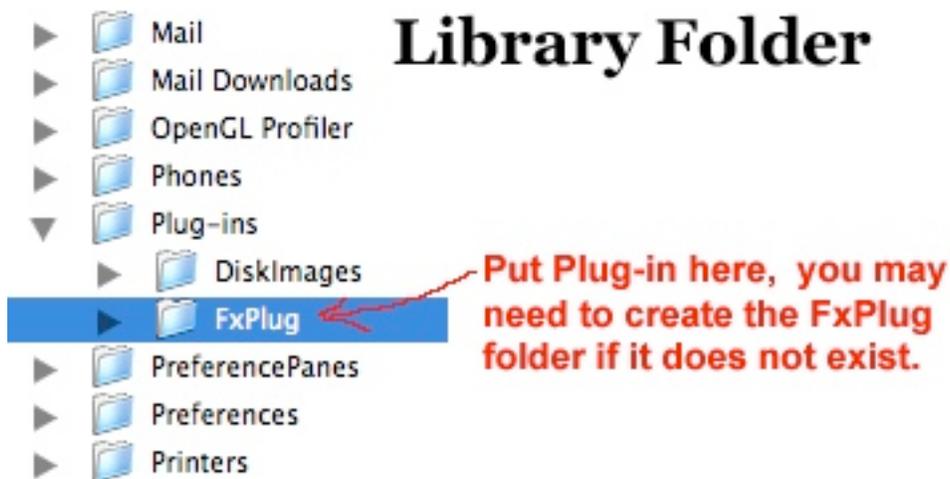
To install the component, you simply drag the `VKey2fv2_fxplug.fxplug` bundle into your *Library/Plug-ins/fxplug* folder. Open your home folder to locate your *Library* folder. Create the *Plug-ins* folder if it does not exist, create the *FxPlug* folder inside of *Plug-ins* if it does not exist, then drag the `VKey2fv2_fxplug.fxplug` bundle into the *FxPlug* folder. If you have your editing software open, you'll have to close it and reopen it for it to recognize the new plug-in. You should find the filter in a group called "Oak Street" on your Final Cut video filters menu, or in the Motion library under filters.

Overview of vector keying: The vector keyer works on color angles, which are largely unaffected by variations in lighting. It should be noted, however, that vectors

are unreliable when the color is near black, or near white. It also generates a more graduated matte, that can reveal subtle details that would be impossible with a simple matte that only had values for fully opaque or fully transparent. Therefore, you must provide the color angle that you will use for your key color (your background color), and the amount of deviation from that angle that is allowed before the color is considered to be a foreground color (not keyed). You can also control the cutoff point within the acceptable range where the alpha will change from zero (transparent) and begin working it's way up to it's maximum value (opaque). **See figure 1** on the next page for a visual description of how the Background color, Key Range, and Feathering are related, and how they affect the resulting alpha channel.   VKey2f improves on the Quicktime version by allowing you to select the primary color (red, green, or blue), and then use a slider to fine tune the exact color angle.   For users of Final Cut Pro 6.02 or higher, the AutoAngle feature can assist in determining the best background color.   See the section on AutoAngle for details on the use of auto color selection.
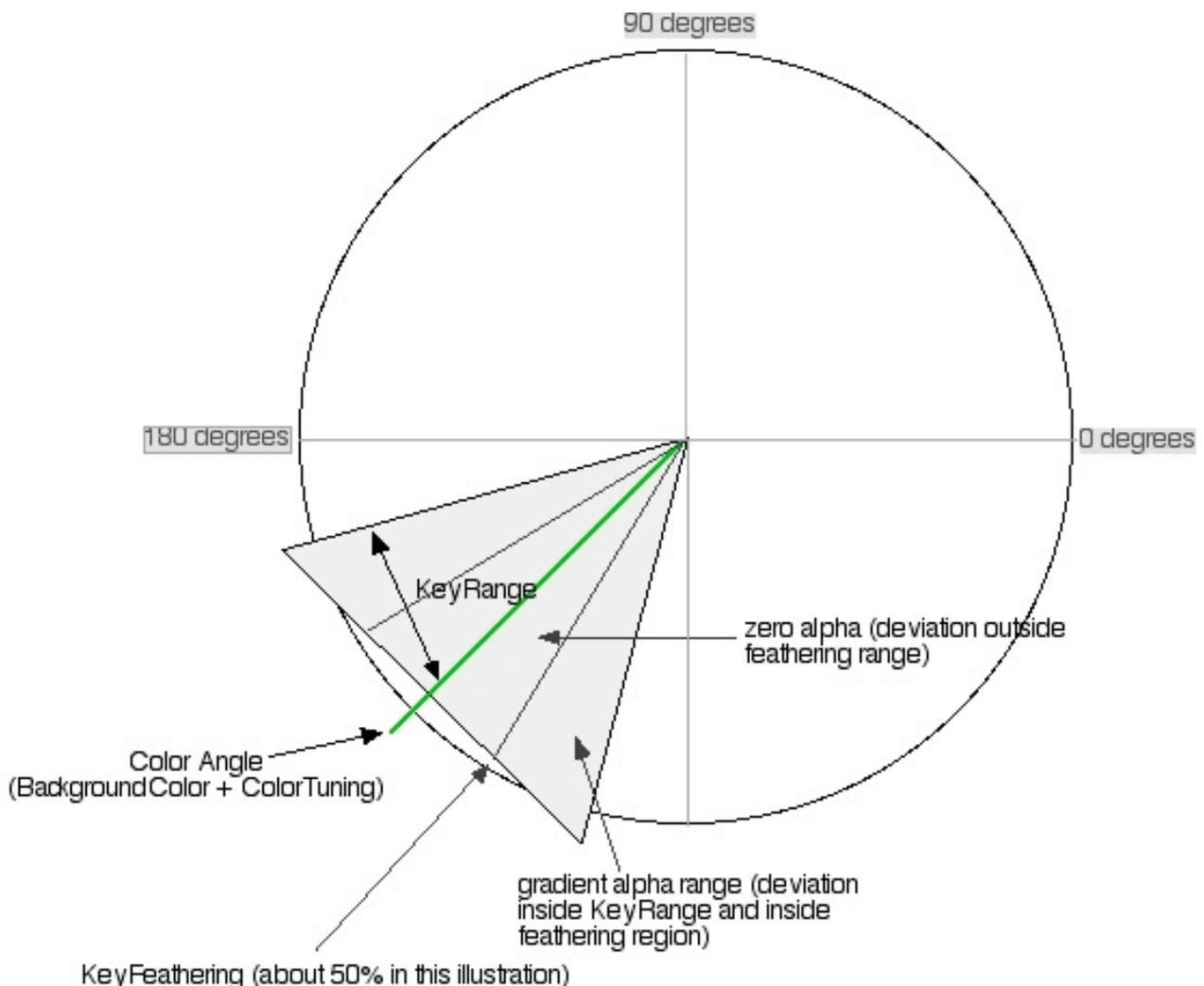

Figure 1 - How angle settings determine alpha values

When setting up the vector keyer, it helps to understand what some of the controls are doing for you. The most obvious one is the color angle, which selects the optimum, or precise color angle of your background (the part you want to remove). The color angle is determined by the **BackgroundColor** plus the **ColorTuning** value. The **KeyRange** defines the width of the region around the selected color angle that will be at least partially transparent. **KeyFeathering** defines the portion of the area inside the key range wedge (as a percentage) that will be totally transparent. For example, if the **KeyRange** is 20, then the range that will be keyed is +/- 20 degrees around the color angle. If the **KeyFeathering** slider is set to 50(%), then the first +/- 10 degrees (half of the range) will have zero alpha. The other half will have a linear gradient from transparent to opaque. Higher values in **KeyFeathering** result in a wider gradient (softer edges).
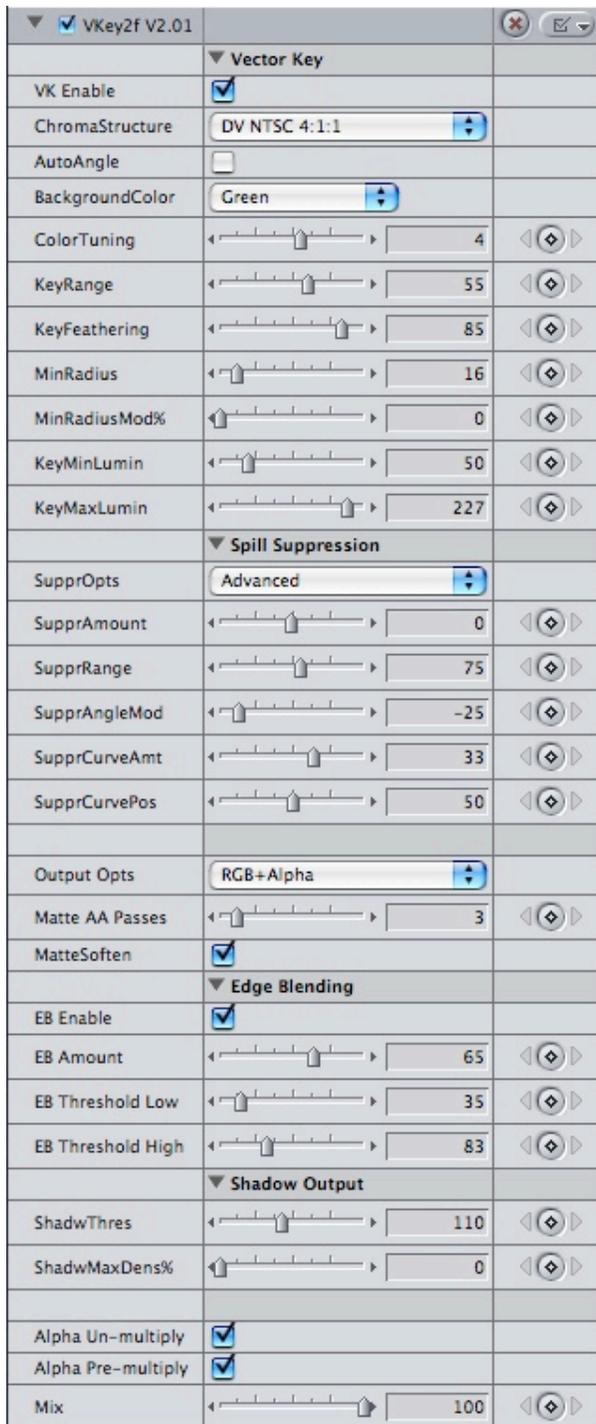
Step 1: (assuming you have your clip in the timeline)In Final Cut Pro or Final Cut Express, double-click your clip in the timeline to load it into the viewer window. Pull down the Effects menu, find Video Filters -> Oak Street -> VKey2f v2.01 and click on it to apply it. You can also drag and drop it from the browser. You'll find it under the effects tab, in the Video Filters section under the Oak Street heading.

Step 2: Once you have the VKey2f filter applied, you'll want to select the correct chroma structure for your particular video clip. If you are shooting with a miniDV camcorder (not HDV), your chroma structure will be 4:1:1 for NTSC and 4:2:0 for PAL. HDV shooters should use 4:2:0. DV-50 (high quality DV) uses 4:2:2. If you have a DV-50Mbps camera, you know who you are. If you don't know, you're probably shooting DV-25Mbps and you should use 4:1:1 (NTSC) or 4:2:0 (PAL). Newer MPEG/AVCHD camcorders use the 4:2:0 chroma structure. The 4:4:4 setting may be useful for keying digital photographs, or video that has had it's chroma pre-smoothed with a quality chroma reconstruction filter.

VKey2f V2.01

Vector Key

Control	Value
VK Enable	☑
ChromaStructure	DV NTSC 4:1:1
AutoAngle	☐
BackgroundColor	Green
ColorTuning	4
KeyRange	55
KeyFeathering	85
MinRadius	16
MinRadiusMod%	0
KeyMinLumin	50
KeyMaxLumin	227

Spill Suppression

Control	Value
SupprOpts	Advanced
SupprAmount	0
SupprRange	75
SupprAngleMod	-25
SupprCurveAmt	33
SupprCurvePos	50
Output Opts	RGB+Alpha
Matte AA Passes	3
MatteSoften	☑

Edge Blending

Control	Value
EB Enable	☑
EB Amount	65
EB Threshold Low	35
EB Threshold High	83

Shadow Output

Control	Value
ShadwThres	110
ShadwMaxDens%	0
Alpha Un-multiply	☑
Alpha Pre-multiply	☑
Mix	100

Step 3: (optional) Move the play head to a frame in your clip (the timeline play head) where there is a good deal of background and click the *AutoAngle* button. The *AutoAngle* button will uncheck itself once the angle has been computed, and the key color should be set correctly. If it picks the wrong key color, pick a different frame with more background and try again.

Step 4: (if you used AutoAngle and it worked for you, you may skip to step 6) To setup the color angle, you'll probably want to first adjust the *KeyRange* to a low value. Anything in the 1 to 5 range should be fine. This is just to select the most accurate key color angle, we'll increase the *KeyRange* in a subsequent step to expand the key over your entire background. Also, adjust the *KeyMinLumin* to a very low value and the *KeyMaxLumin* to a very high value, in order to keep those settings from interfering with your key. We'll set those later. The next step may be easier if you select "Alpha->Grayscale" in the *Output Opts* pull-down list.

Step 5: Select Red, Green, or Blue from the background color selector. Adjust the color tuning slider so that you get the maximum amount of transparency in the background areas of your shot (black in the alpha->grayscale output). The slider value specifies the deviation from the primary color you selected in the background color selection, Using the alpha->grayscale output, white areas are opaque, or not keyed out, and black areas are transparent (the background clip will be revealed). Don't worry if your entire matte isn't keyed out at this time; just get as much as possible, this will determine the best color angle, and we'll widen the range in the next step.

Step 6: Adjust the *KeyRange* slider until you see most or all of your background become transparent. As in the previous step, you can use the alpha->grayscale output option to view the alpha in black and white. You may want to leave a little bit of gray in your matte, where subtle details need to be blended into the background. Otherwise, adjust the *KeyRange* higher until your matte is cleanly outlining your subject.

Step 7: You can adjust the fuzziness of your edges by adjusting the *KeyFeathering*. Low values in the *KeyFeathering* will result in sharp edges whereas a value of 100 will produce wide gradients in the alpha (soft edges). You will generally want *KeyFeathering* to be as high as you can get it without causing the transparent parts of your background to begin to degrade. If you want really soft edges, you may have to increase the value of *KeyRange* to bring back the solid black (transparency) in your background.

Step 8: Configure the minimum radius. If the keyer is keying out areas that you want to keep, setting a higher value in the MinRadius may recover areas of your

subject that are very dark or very desaturated. If you've got a really clean matte and you're trying to key tighter on the edges of your subject, lowering the value in the MinRadius may help you. I discovered in testing that HDV requires high values in the minimum radius to produce a reliable matte, where miniDV works with much lower values. Your results will vary.

Sometimes you might find that you need a higher MinRadius setting to protect some marginal areas of your subject, but you can't get a key in a dark area of your background with the high radius. The MinRadiusMod% allows you to apply a curve to the minimum radius value which effectively reduces the minimum radius when the color angle is very close to the precise background color (determined by BackgroundColor and ColorTuning values).

Step 9: This step is optional, but it may help you achieve a much better key, and it could help you reclaim parts of your image that you didn't want to key out. You use the KeyMinLumin and KeyMaxLumin sliders to define the luminance range of the background.   Pixels that fall below the *KeyMinLumin* or exceed the KeyMaxLumin **will not be keyed**. By choking the luminance range of the keyer, you can save dark areas, or specular highlights in glass, for instance.

- If you don't need or want to setup the KeyMinLumin and KeyMaxLumin values, set KeyMinLumin to 0 and KeyMaxLumin to 255 to insure that they do not adversely impact your key.

> Determine the luminance range of your matte as follows:
>
> Slide the *KeyMinLumin* slider up until you see the darker regions of your background come back, then back the slider down a few clicks, below the point where the background is completely keyed out.   It's probably wise to back off by 10 clicks to avoid unexpected glitches in your key.
>
> Slide the *KeyMaxLumin* slider down until you see the brightest regions of your background begin to reappear, then slide it back up a few clicks above where the background disappears completely. Again, if you go up 10 points above where your matte was affected, you can avoid unexpected artifacts from subtle frame-to-frame variances in luminance.

Step 10: If you have selected the Alpha->Grayscale output option, go back to the RGB+alpha option now, so we can look at the color of the image, while we set up the spill suppression.   Use the *SupprAmount* slider to adjust how much spill is removed from your image. Values around 0 are generally good. Set the slider to a higher or lower value for more or less spill suppression. One good way to judge how much green suppression to use is to turn off the *VK Enable* switch and adjust the SupprAmount until the background appears closest to neutral gray.   You can turn off spill suppression completely by selecting "No Spill Suppression" in the

SupprOpts pull-down. This allows you to make sure your spill suppressor settings are not negatively impacting other color values in your foreground. Please see the section on the spill suppression parameters in the reference section for details on using the advanced spill suppression.

Step 11: Use Matte Anti-Alias (AA) to smooth out rough edges. The Anti-aliasing should be used instead of *MatteSoften*, because it is more intelligent. Use as many passes as you need, but no more, because each pass takes time. You may want to leave anti-aliasing passes set to zero until you're doing your final render.   The *MatteSoften* switch applies a gaussian blur to the matte. You may also consider using one of Final Cut Pro's built in gaussian blur filters to smooth the alpha channel.

Step 12: If you want to generate a traveling matte (luma version), you can use the Alpha->Grayscale output option, and export a grayscale video that can be applied to your video as a traveling matte. The reason you might want to do this, is so that you can rotoscope the matte, where keying or garbage matting are impossible. Also, many video codecs won't store an alpha channel, so keeping the matte as a separate video allows you to store it for use in other applications.   See the advanced section on pre multiplied alpha for more technical reasons to use a traveling matte.

Reference Section

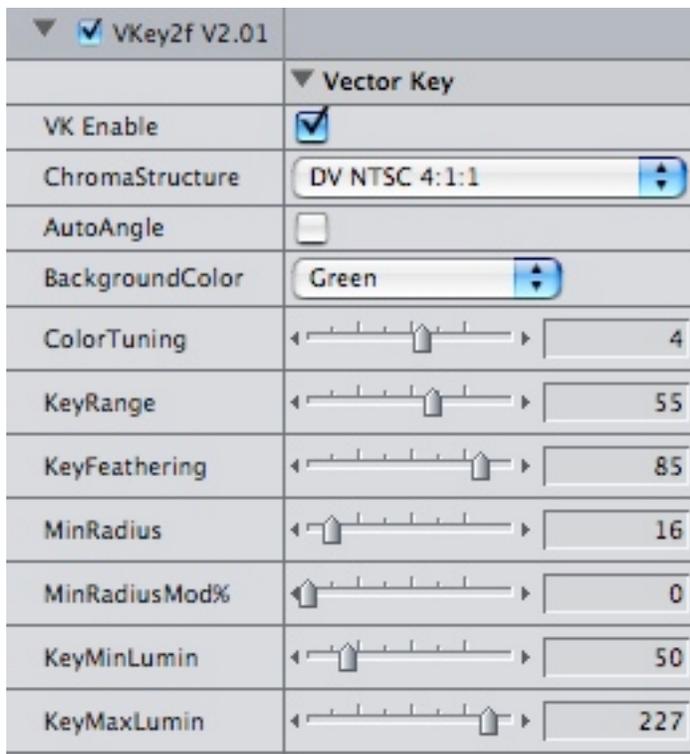## Parameter subgroup: Vector Key
vector keyer configuration parameters

VK Enable Turning this switch off will bypass the vector keyer. Normally, this switch must be on for normal operation. It can be turned off to tune spill suppression, or to access spill suppression without keying.

ChromaStructure Video cameras generally sample only luminance at the full frame resolution. In order to conserve bandwidth (squeeze more video into less space), the color is sampled at a lower resolution. Different video formats sample the color in different patterns. The ChromaStructure pull down lets you specify one of 4 common formats. VKey2f uses this setting to determine which pixels have reliable color information and to predict values for the remaining pixels.

AutoAngle This is not really a switch, it works like a push-button. When you activate it, VKey2f analyzes the current frame to determine the best color angle, and the maximum luminance. It sets the respective sliders for you and then turns the AutoAngle switch off to indicate that it is finished. You'll want to select a frame that has a generous amount of background before you activate AutoAngle. You need only check this box once.

BackgroundColor Use this pull-down to select the primary color of your background. AutoAngle will set the value of this pull-down. Your choices are Red, Blue, Green.

ColorTuning This slider allows for fine tuning of the background color. AutoAngle will set the value of this slider.

KeyRange This slider controls the range of color on either side of the precise color angle defined by the BackgroundColor + Color Tuning controls. Higher values select a broader range of color, whereas low values limit the key to a very specific, narrow range.

KeyFeathering If feathering is 100%, then the entire range from the selected color to the limit specified by KeyRange is computed as a

gradient from transparent to opaque. If feathering is at 0%, the alpha within the KeyRange will always be zero and it will transition from transparent to opaque with no feathering.

MinRadius	The vector algorithm computes the angle of a color, which is a direction from the center of a color graph. The saturation of the color determines how far it is from the center point of the graph. Colors that are very close to the center are unreliable. The Min Radius setting specifies how saturated the color of a pixel must be before the vector keyer will trust the color value of the pixel and allow it to be keyed. Video with high compression (like HDV) may require higher values in Min Radius (25+) to prevent some foreground from keying out. Less compressed video keys fine with values as low as 3, in ideal circumstances. Although this was originally added as an advanced setting, it is now recommended that you always adjust this value when setting up your key.

▼ ☑ VKey2f V2.01	
	▼ Vector Key
VK Enable	☑
ChromaStructure	DV NTSC 4:1:1
AutoAngle	☐
BackgroundColor	Green
ColorTuning	4
KeyRange	55
KeyFeathering	85
MinRadius	16
MinRadiusMod%	0
KeyMinLumin	50
KeyMaxLumin	227

MinRadiusMod%	Short for minimum radius modifier percentage, this control allows the use of higher minimum radius values, while still keying some dark areas that would otherwise be blocked, but are very close the the actual key color. Essentially, the minimum radius is sloped to zero for pixels that are dark, but are a very close match to the selected key color. This slider specifies a percentage of the color range that is in the sloped region. Higher values reduce the minimum radius for a wider range of color values.

KeyMinLumin	This control limits the vector keyer. You can use this control to force the keyer to leave dark parts of your subject alone. If you set this value too high it will bring back all or part of your background.

KeyMaxLumin	This control limits the vector keyer, like KeyMinLumin, except that it blocks the keyer from acting on bright objects. If you set

this value too low it will bring back all or part of your background.

Note: The vector keyer will ignore (will not key) anything that is darker than the *KeyMinLumin* setting or brighter than the *KeyMaxLumin* setting. This allows you to preserve some parts of your subject that might otherwise key out, but **it is critical you do not restrict the key too much**. If you can't get something to key out, check these values first. Set *KeyMinLumin* to 10 and *KeyMaxLumin* to 250 to verify that they are not interfering. When fine tuning a key, it is wise to clamp the luminance using *KeyMinLumin* and *KeyMaxLumin* as the last step.

Parameter subgroup: Spill Suppression

parameters that control color spill suppression

SupprOpts Here you select the type of spill suppression you want to use. You may turn the pill suppression off, by selecting "No Spill Suppression", or you may select from the advanced spill suppressor that supports red and blue suppression, as well as green suppression, or you may select the classic green suppression, if you are using a green screen, and you don't mind the color shift in the yellow regions of your subject. The advanced option is definitely more difficult to configure, but it is also much more robust. If you select the classic green suppression, the only control that will have any effect is the SupprAmount slider.

SupprAmount This slider controls the overall amount of spill suppression. This is the only control that affects classic green suppression. Higher values will remove more color spill and lower values will remove less. You can turn off the vector key (using the VK enable control) to see the background. Generally, you'd start your suppression setup by adjusting this slider until the background is a neutral grey.

SupprRange (advanced only) The advanced spill suppression uses the same color vector as the vector keyer as the base color for suppression. The SupprRange (suppression range) control specifies the maximum variance within which some color suppression will occur. More suppression is applied as the color approaches the exact background color. Typical values for this control are 60 to 75. Watch for unwanted color shifts when using higher values.

SupprAngleMod (advanced only) The color spill on the subject sometimes does not match the background color exactly. The SupprAngleMod (suppression angle modifier) allows you to alter the center of the spill suppression range by plus or minus 35 degrees. You can set this value by lowering the SupprRange value to around 30 and adjusting SupprAngleMod until the unwanted color fringing on the subject reaches the most desirable color value.

SupprCurveAmt (advanced only) When SupprCurveAmt is zero (suppression curve amount), the progression of spill removal from the closest color to the end of the suppression range is linear.

SupprCurveAmt adds a curve to the progression. Positive values create an upward curve and negative values create a downward curve. The further the value is from zero, the more accentuated the curve. Sometimes you just can't get the right range of suppression on a linear scale. In those cases, you can adjust the curve amplitude with SupprCurveAmt to fine tune the range of color suppression.

SupprCurvePos (advanced only) The SupprCurvePos works hand in hand with SupprCurveAmt. The suppression curve is a bezier curve with three control points. The two end points are fixed at the bottom and top of the spill suppression range. The third point is lifted and lowerd by SupprCurveAmt, and moved from side to side with SupprCurvePos (suppression curve position). The curve is centered when SupprCurvePos is centered at 50. This effects of this control are pretty subtle. It is most useful at low values of SupprCurveAmt.

VKey2f V2.01	
	▶ Vector Key
	▼ Spill Suppression
SupprOpts	Advanced
SupprAmount	0
SupprRange	75
SupprAngleMod	-25
SupprCurveAmt	33
SupprCurvePos	50

Output Opts   RGB+Alpha - VKey2f outputs your foreground image with an alpha channel that causes the background to be transparent (this is the normal output mode)

Alpha->Grayscale - In this mode, the alpha value replaces the color channels so that areas of the image that would have been transparent are black. Opaque regions are white and areas that would have been partially transparent are some shade of gray. The actual alpha channel is overwritten with alpha-max so that the entire gray scale image has no transparency.

Shadow Mask - The last 2 sliders control the shadow mask output. The shadow mask is another grayscale output that represents inverse luminance values in the transparent parts of the image. Opaque areas are always black. Shadows on the background should produce lighter output values than brighter areas of the background. The purpose for this mode is to allow the shadows from the background to be transferred to the new background. However, it can also be used to blend dark edges on the subject. See the advanced section for more details.

Matte AA Passes Number of anti-aliasing (edge smoothing) passes that will be made over the alpha channel

MatteSoften   A modified gaussian blur algorithm is applied to the alpha channel when this switch is on. The blur is not as intelligent as the anti-aliasing, so it should not be used when it's not needed.
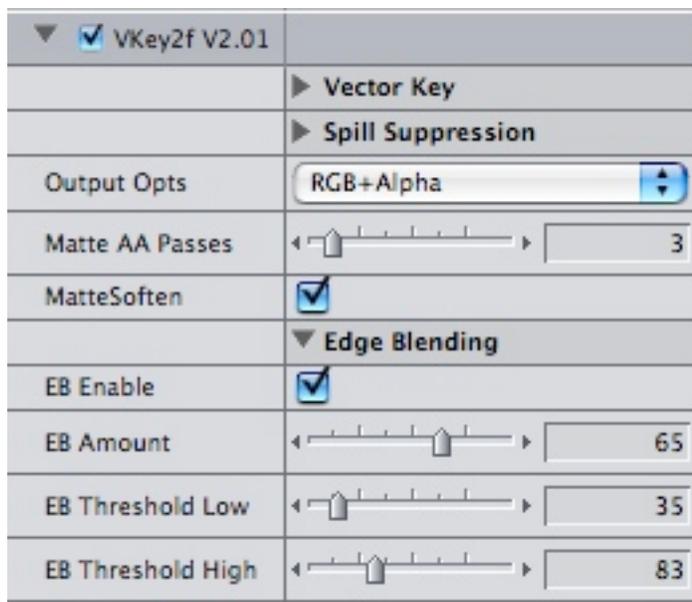
Parameter subgroup: Edge Blending

parameters that control the selective matte edge blending feature

EB Amount The edge blending amount control is used to specify the amount of blending to subtract from the existing alpha channel. Higher values will produce a more profound effect.

EB Threshold Low This slider sets the lower luminance limit on the edge blending process. As a rule, you would not set this value below the MinKeyLumin value set in the vector key parameters.

EB Threshold High This slider sets the upper luminance limit on the edge blending process. This algorithm was originally developed to fix dark edges, so generally you would want to prevent the filter from feathering bright edges that tend to be cleaner than the darker edges.

▼ ☑ VKey2f V2.01		
	▶ Vector Key	
	▶ Spill Suppression	
Output Opts	RGB+Alpha	
Matte AA Passes	◀──◻────▶	3
MatteSoften	☑	
	▼ Edge Blending	
EB Enable	☑	
EB Amount	◀────◻──▶	65
EB Threshold Low	◀─◻────▶	35
EB Threshold High	◀──◻───▶	83

Parameter subgroup: Shadow output
parameters that control the special shadow output feature

ShadwThres The brightest luminance value that will be considered as a shadow which will produce a non-black output. This slider only applies to Shadow Mask output.

ShadwMaxDens% higher values here increase the contrast of the shadow mask resulting in a faster progression towards dense (white) output values. This slider only applies to Shadow Mask output.

Once you have your shadow mask, additional compositing steps are required to apply it to the new background. The compositing steps required are more straightforward in Motion, because the shadow mask can be subtracted from the background layer in it's own group to recreate the shadows. The effect will not be realistic if the shadows are not cast on objects of similar shape and positioning to the objects from which the shadows were captured. The most simple use of this tool is to add shadows to the floor around the subject, when compositing the subject with a new floor. The example shown above would be useless for compositing.

See the advanced topics section for details on how you might use the shadow mask.

Special Parameters

You may want to read the section on premultiplied alpha under advanced topics to understand the purpose and operation of the Alpha Un-multiply and Alpha Pre-multiply parameters. Their intended purpose is for those times when you must stack VKey2f filters to key multiple colors, or for some other purpose. Apple's specification requires that the alpha be premultiplied, or it will not look right. However, only one filter in the stack needs to perform that premultiplication. Furthermore, if the previous filter in the stack did not premultiply the alpha, the next filter does not need to reverse the effect of premultiplication to recover the color. Should you have a need to use these switches, the rule is that only the top filter in the stack should un-multiply the alpha and only the bottom filter in the stack should premultiply, for the most efficient and clean output. At least the bottom filter must premultiply the alpha, or the color output in areas with partial transparency will be wrong. Obviously, most filters don't have these options, because you aren't even supposed to know about these things, so to preserve as much color information through premultiplication and un-multiplication steps, when doing complex compositing, the best choice in your sequence video processing settings is high precision YUV (32 bits/color channel). However, I have found, in some versions of FCP, that can cause render crashes when rendering still images, so if FCP crashes while rendering, you may want to revert to 8 bit YUV, and try rearranging your matte filters so that the ones that depend on the most color information (like chroma keyers) are on top.

Alpha Un-multiply   Turn on/off the step that attempts to revive full color information in the color channels by reversing the effects of alpha premultiplication. You would only need this if there is an alpha channel and the filter above has not premultiplied the alpha (that would probably have to be another VKey2f filter with the alpha pre-multiply step turned off).

Alpha Pre-multiply   This will turn on/off the step in the vector keyer that multiplies all of the color channels by the alpha value, thus blending the colors that are partially transparent into black. This is normal, and required of all alpha producing FxPlug filters, so you should leave this on, unless you have a reason to turn it off.

Advanced Topics

Shadow Masks

The Shadow Mask option is new, and it's powerful, but it could require some deep thought and understanding of compositing modes to grasp thoroughly. The Shadow Mask output is a black and white (grayscale) image in which the brightness of the pixels is determined as follows;

Any pixel that is completely opaque (after applying the vector key) will be black.

Any pixel that is brighter than the value defined by the Shadow Threshold slider will be black.

The remaining pixels will produce an output value that gets brighter as the input values get darker, using a linear progression from *Shadow Threshold* to zero when Shadow Max Density is zero (0). As *Shadow Max Density* increases, the luminance values progress to white faster, resulting in a denser shadow mask with a shorter gradient. If *Shadow Max Density* is 100(%), the shadow mask will be black or white, with no gradient. Any pixel darker than *Shadow Threshold* and not 100% opaque will be white and the rest of the pixels will be black.

The rule above is modified slightly as the shadow mask value is also multiplied by the inverse alpha. Therefore, if the alpha is 50%, the shadow mask value will be 50% of it's computed value. If the alpha is 25%, the shadow mask value will be 75% of it's computed value (multiplied by the inverse of the alpha). The reason for inverting the alpha for multiplication is that you want the shadows to blend with the subject, and those places where the alpha value is high (nearly opaque) are generally in the subject area.

If I haven't lost you, yet, you're probably asking, "how do I use this mask, and what is it good for?". If you're not asking that, then you probably should be, but you don't know it, yet. As the shadow mask was originally conceived, it was to be subtracted from the background (layered over the background using a "subtract" composite mode). By subtracting the shadow mask (assuming you've adjusted the settings to isolate the shadows on the original background), you will darken the new background according to the shadow density on the old background (the green/blue screen). This is really only useful when the subject is contacting the background, or you've thought ahead and arranged the background to create specific shadows

(imagine the subject is standing in front of a bench, and you draped your green screen over a box to roughly approximate the bench, allowing the shadows to fall across the bench shaped drapery. Now, you can apply that custom shadow to your background replacement bench. If I've completely lost you, watch out web-site for a video tutorial on this subject. This feature definitely warrants a tutorial of it's own.

The next purpose I've discovered for the Shadow Mask feature is to create a blending mask to blend dark edges with the new background, or darken the new background where it meets with your subject's dark edges to make the transition from subject to background appear more natural. I think I could write a book on this technique, so it's beyond the scope of version 1.0 of this manual. I will probably develop a video tutorial on how to use the Shadow Mask for strategic blending and darkening, also.

AutoAngle

The AutoAngle feature merits a short discussion here, also. The AutoAngle feature searches for the best key color angle by sampling your video frame and creating a histogram of it's color values. For the AutoAngle to work well, you want to expose as much of the background as possible. Ideally, you'd use AutoAngle on a frame of just the background, so it could find the ideal color angle and brightest spot on your background and make the appropriate settings for you. It is generally very accurate.

When you check AutoAngle, the next render (you may have to force a render in Motion by moving the play head) will perform the calculations and update the respective controls. It will turn off the AutoAngle option to indicate it is finished. If the AutoAngle switch does not turn off, you must either force a frame to render, or you are using an older version of FCP or Motion that doesn't support interactive controls in FxPlug plug-ins. For the AutoAngle feature to work, you must have Final Cut Pro version 6.02 (or higher), or Motion 3 (or higher). I have not tested with Final Cut Express as of this time.

The reason AutoAngle must turn itself off, is because you do not want your settings to be recomputed for each frame. You want them to be computed on an ideal frame and left alone. Otherwise, you'll get a flickering key, as the keyer settings change throughout the clip. Finally, the AutoAngle is only going to determine the best color setting and the brightest area of the background (KeyMaxLumin). You will still need to adjust the other settings, and the AutoAngle could produce invalid results; although it's not likely.

Premultiplied Alpha

Final Cut Pro and Motion (and any other tool supporting FxPlug plug-ins) rely on pre multiplied alpha, which means that color information is degraded as alpha values move towards zero. This is a rather technical subject, so I'm going to start with the mathematical formula for pre multiplication of alpha and proceed with a high level discussion.

For a Red, Green, Blue input pixel with alpha, where alpha is a value from 0.0 to 1.0, the output values would be computed as;

Red = Red * alpha
Green = Green * alpha
Blue = Blue * alpha

Therefore, if alpha is 50% or 0.5, Red, Green, and Blue will be left with 50% of their original values. As long as we make only one pass over the colors in the image, this will be Ok. However, if I stack filters that manipulate color, each filter must Un-multiply the alpha, perform it's calculations, then multiply the alpha back into the color. Each cycle of un-multiplying and re-multiplying has the potential to lose precision in the color channels.

All you need to concern yourself with is how to keep your losses to a minimum. One way to do it is to instruct FCP or Motion to use high precision values for storing your pixels while rendering. The higher precision, the less significant the losses. However, that is not the ideal solution, because it slows everything down and some filters may not support high precision rendering, so you may have losses that you cannot control.

The safest way to protect your color information in a system that relies on pre multiplied alpha is to keep the alpha at 100% all the time. The way to do that is to layer your clip over itself, apply the key and any matte controls you want to the bottom layer and use the bottom layer as a traveling matte. You can use VKey2's Alpha->grayscale output to reduce render time (the grayscale output is simpler and requires less processing) in which case you'll use Travel Matte Luma as the compositing mode on the top layer, or you can let VKey2 output an alpha channel and use Travel Matte alpha for compositing the layer above. All color correction and green suppression is done on the top layer, and all alpha channel adjustments are done on the bottom layer. In case you are thinking this will double your time spent rendering, think again. Instead of having to recompute the alpha channel every time you tweak another filter, your color tuning and image enhancement will not force you to re-render, as long as those filters work in real time. You could even render out the traveling matte as a video clip to save ever having to recompute your alpha

while making other changes. You need to be a little creative in how you handle the traveling matte, as the two layers must stay in sync with each other. However, the traveling matte compositing step will be applied after all other processing on your precious color channels, so there will be no destructive pre multiplying of alpha values until the final composite.

Finally, this is advanced stuff, and there are many editors who will not understand what this means or how to perform the steps I tried to describe. I want to assure those people that we are talking about very subtle losses in everything except the most transparent regions of their clips. Also, VKey2f has been coded to do all of it's work in high precision arithmetic to keep these losses as minimal as is mathematically possible. You may never experience a discernible quality loss.

The next two figures show the dialogs where you control the rendering precision in Final Cut Pro and Motion, respectively.
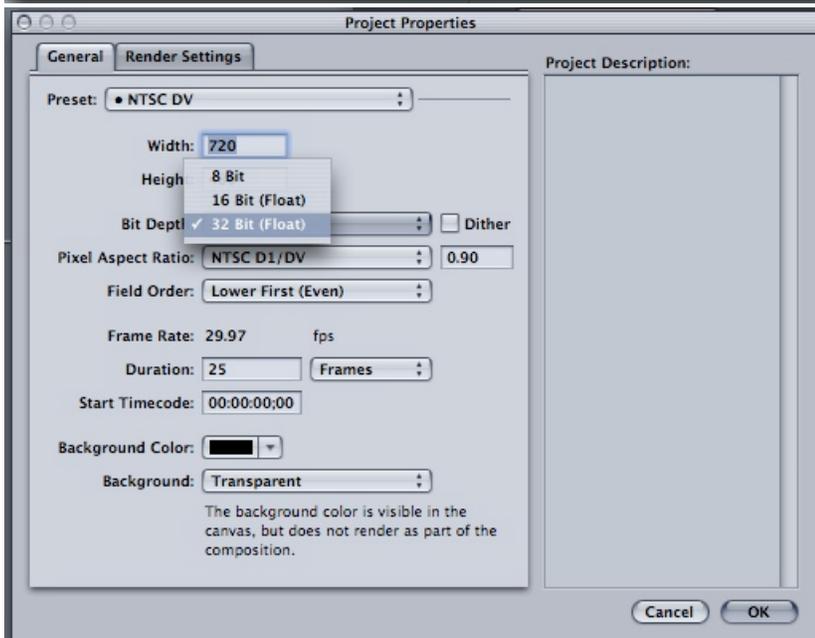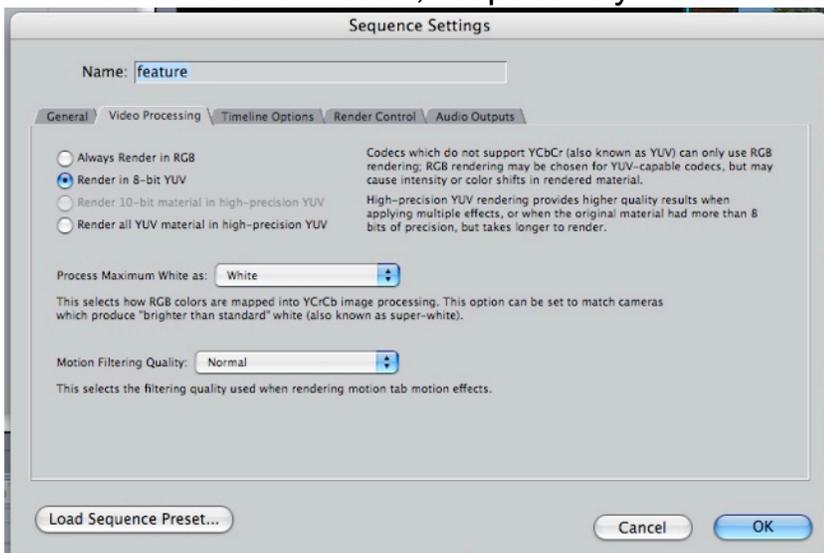
Getting Additional Help
(the fine print)

We at Oak Street Software, Inc. would like to think that this filter will work great for you, with little or no explanation, but we know that some of this is very confusing at first.   Feel free to drop us an e-mail with your questions, concerns, problems, or praise.   We can be reached by e-mail at support@oakstreetsoftware.com.   All customer inquiries will be answered. Please include the name you used when you purchased our product, so we know you're entitled to support.   If you have a copy of our product that you got from a friend, we encourage you to license it, so we can give you support, and continue to develop innovative and exciting products.   You can find details on the most current version of this product, and how to purchase a license on our web-site. The URL is http://www.oakstreetsoftware.com/gkey/.   Our web-site will always have the most up-to-date information, frequently asked questions, tips for shooting your video, and sample keys.