



Color Page Effects

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Color Page Effects

This chapter covers effects and image transformations that you can make in the Color page that are unrelated to adjustments made to color and contrast. It includes topics such as noise reduction, motion blur, the use of OpenFX plugins, blur and sharpening, 2D transforms and image stabilization, and much more.

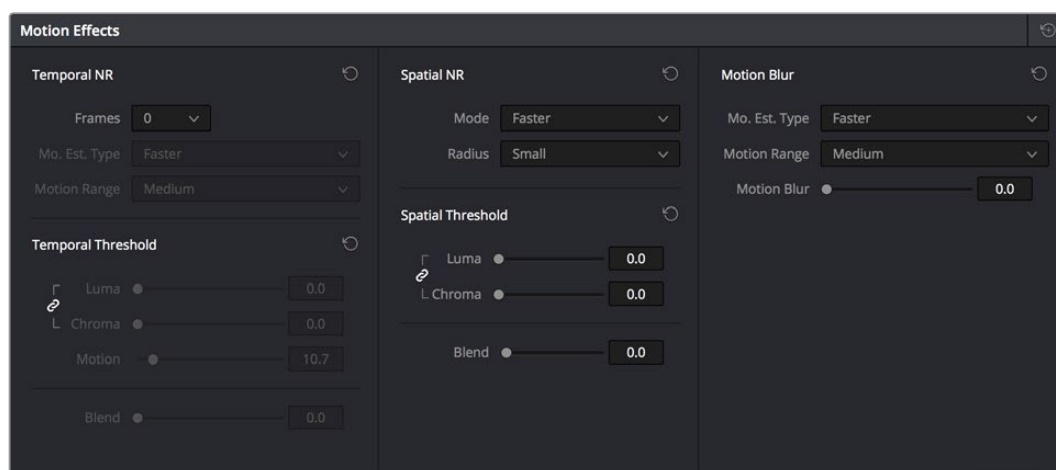
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Motion Effects Palette

The Motion Effects palette (only available in the Studio version) contains two sets of controls for applying optical-flow-calculated effects to clips in your program. These include enhanced Spatial and Temporal noise reduction, and motion-estimated artificial motion blur.

Noise Reduction Controls

Two sets of parameters let you apply GPU-accelerated Temporal and/or Spatial noise reduction that's designed to let you subdue noise in problematic clips, in close to real time on workstations with appropriate processing power. Both methods of noise reduction can be used separately or together, in varying amounts depending on the needs of the particular material you're working on. Furthermore, each set of controls is highly customizable, allowing for varying amounts of noise reduction to the chroma and luma of an image, as well as numerous options for how to apply this noise reduction.



Noise Reduction and Motion Blur controls

Temporal NR Controls

The Temporal NR controls analyze images across multiple frames in order to isolate noise from detail. Motion estimation settings let you exclude moving subjects from this operation in order to prevent unwanted motion artifacts.

- **Number of Frames:** The number of frames you want Resolve to average in order to separate detail from the noise. You can choose between 0 and 5 frames. 0 applies no frame averaging, higher values apply more frame averaging, at the expense of being significantly more computationally intensive the higher a value you use. Also, a higher frame setting will yield a better analysis, but may yield unwanted artifacts if there are fast-moving images in the frame. A value of 1 may yield better results for fast-moving images. If you need to use higher frame values but you see artifacts, you can also try adjusting the Motion Threshold to fix the issue.
- **Motion Est. Type:** Picks the method Resolve uses to detect motion in the image. The default, Faster, is less processor intensive, but less accurate. Choosing Better can effectively exclude motion more accurately, but is more processor intensive. None lets you disable motion estimation altogether, with the result being the application of Temporal NR to the entire image.

- **Motion Range:** Three settings, Small, Medium, and Large, let you set the speed of motion that Motion Estimation should expect to exclude. A Small setting assumes slow-moving subjects with little or no motion blur, allowing Temporal NR to affect more of the image at a given Motion Threshold setting. A Large setting assumes fast motion with blur occupying a larger area of the image, which excludes more of the image from Temporal NR at the same Motion Threshold setting. Choose the setting that gives you the best compromise between a reduction in noise and the introduction of motion artifacts when adjusting the Motion Threshold parameter.
- **Luma Threshold:** Lets you determine how much or how little Temporal NR to apply to the luma component of the image. The range is 0-100, where 0 applies no noise reduction at all, and 100 is the maximum amount. Too high a setting may eliminate fine detail from the image.
- **Chroma Threshold:** Lets you determine how much or how little Temporal NR to apply to the chroma component of the image. The range is 0-100, where 0 applies no noise reduction at all, and 100 is the maximum amount. Too high a setting may eliminate fine color detail from the image, although you may find you can raise the Chroma Threshold higher than the Luma Threshold with less noticeable artifacting.
- **Luma/Chroma Threshold ganging:** Ordinarily, the Luma and Chroma Threshold parameters are ganged together so that adjusting one adjusts both. However, you can ungang these parameters in order to adjust different amounts of noise reduction to each component of the image, depending on where the noise happens to be worst.
- **Motion Threshold:** Defines the threshold separating which moving pixels are in motion (above this threshold) versus which moving pixels are static (below this threshold). Using Motion Estimation, Temporal Noise Reduction is not applied to regions of the image that fall above this threshold, in order to prevent motion artifacts by not applying frame-averaging to parts of the image that are in motion. Lower values omit more of the image from Temporal NR by considering more subtle movements. Higher values apply Temporal NR to more of the image by requiring faster motion for exclusion. You can choose between 0 and 100, where 0 applies Temporal NR to no pixels, and 100 applies Temporal NR to all pixels. The default value is 10.7, which is a suitable compromise for many clips. Be aware that if you set too high a Motion Threshold, you may see artifacts in moving parts of the image.
- **NR Blend:** Lets you dissolve between the image as it's being affected by the Temporal NR parameters (at 0.0) and the image with no noise reduction at all (100.0). This parameter lets you easily split the difference when using aggressive temporal noise reduction.

Spatial NR Controls

The Spatial NR controls let you smooth out regions of high-frequency noise throughout the image, while attempting to avoid softening by preserving detail. It's effective for reducing noise that Temporal NR can't.

- **Mode:** Added in Resolve 12.5, the Mode pop-up lets you switch Spatial NR between two different algorithms. Faster uses the previously available method of noise reduction that's good at lower settings, but may produce artifacts when applied at higher values. Better switches the Spatial NR controls to use a higher quality algorithm that produces vastly superior results, at the expense of being more processor intensive to render. Both modes of operation use exactly the same controls, so you can switch between both modes using the same settings to compare your results.

- **Radius:** Options include Large, Medium, and Small. A smaller radius offers greater real time performance, and can provide good quality when using low Luma and Chroma Threshold values. However, you may see more aliasing in regions of detail when using low NR Threshold values.

Setting Radius to be progressively larger results in higher quality within areas of greater visual detail at high Luma and Chroma Threshold values, at the expense of slower performance. An NR Radius of Medium should provide suitable quality for most images when using medium NR Threshold settings. As with many operations, there's an adjustable tradeoff between quality and speed.

- **Luma Threshold:** Lets you determine how much or how little noise reduction to apply to the luma component of the image. The range is 0-100, where 0 applies no noise reduction at all, and 100 is the maximum amount. Too high a setting may eliminate fine detail from the image.
- **Chroma Threshold:** Lets you determine how much or how little noise reduction to apply to the chroma component of the image by smoothing out regions of high-frequency noise while attempting to preserve the sharpness of significant edge details. The range is 0-100, where 0 applies no noise reduction at all, and 100 is the maximum amount. Too high a setting may eliminate fine color detail from the image, although you may find you can raise the Chroma Threshold higher than the Luma Threshold with less noticeable artifacting.
- **Luma/Chroma Threshold ganging:** Ordinarily, the Luma and Chroma Threshold parameters are ganged together so that adjusting one adjusts both. However, you can ungang these parameters in order to adjust different amounts of noise reduction to each component of the image. For example, if an image softens too much at a certain level of noise reduction, but you find there's more color speckling than there is luma noise, you can lower the Luma Threshold to preserve detail while raising the Chroma Threshold to eliminate color noise.
- **NR Blend:** Lets you dissolve between the image as it's being affected by the Spatial NR parameters (at 0.0) and the image with no noise reduction at all (100.0). This parameter lets you easily split the difference when using aggressive spatial noise reduction.

Using Noise Reduction

The following procedure suggests a method of using the Noise Reduction (NR) parameters to achieve a controlled result.

Applying noise reduction to an image:

- 1 Enable Temporal NR by choosing 1 to 5 frames from the Number of Frames pop-up menu. Keep in mind that more frames dramatically increase the render time of this effect, while it may or may not significantly improve the result, depending on your material.
- 2 Choose options from the Motion Est. Type and Motion Range pop-up menus corresponding to how much motion is in the image. If there's a lot of motion, you may need to choose Better and Large. If there's not very much motion, lesser settings may suffice.
- 3 With Luma and Chroma Threshold linked, slowly raise either parameter until you just start to see a reduction in noise within the non-moving areas of the image, then make smaller adjustments to determine the maximum amount of Temporal NR you can add without creating motion artifacts, or overly softening image detail you want to preserve.

- 4 If there's obviously more chroma than luma noise in the image, you can disable Luma/ Chroma linking at a satisfactory level of luma noise reduction, and then raise the Chroma Threshold to apply more aggressive Temporal NR to address color speckling in the picture.
- 5 If you're not satisfied with the tradeoff between the maximum possible threshold of noise reduction and the prevention of motion artifacts, you may want to adjust the Motion Threshold setting, lowering it to omit more of the motion from the noise reduction operation, or raising it to include more motion. If you're still not satisfied, you can also try better Motion Est. Type and Motion Range settings.

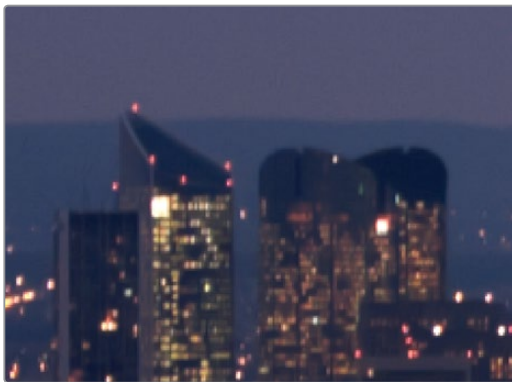


(Top) Before and (Bottom) After Temporal NR to reduce noise in un-moving areas of the image

Keep in mind that the strength of Temporal NR is to reduce noise in un-moving parts of the image. When you've achieve the best tradeoff between noise reduction in the still areas and and avoidance of motion artifacts in the moving areas of the image, then it's time to turn to Spatial NR to further eliminate noise throughout the rest of the picture.

- 6 Enable Spatial NR by raising either the Luma or Chroma Threshold parameters, which are linked by default, until you strike a suitable balance between the reduction of noise, and an unwanted increase in image softness.
- 7 It's recommended to choose the Better option from the Spatial NR mode pop-up, as it will yield the best possible results. However, this can be processor-intensive, so if you need better real-time performance, you can switch the mode to Faster and compare results.

- 8 If there's obviously more chroma than luma noise in the image, you can disable Luma/Chroma linking at a satisfactory level of luma noise reduction, and then raise the Chroma Threshold to apply more aggressive Spatial NR to address color speckling in the picture.



(Top) Before and (Bottom) after noise reduction improves the 'look'

- 9 If you've had to use a high Spatial NR Luma or Chroma Threshold setting to reduce noise visibly, and areas of detail look a bit chunky or aliased, you can choose a larger setting from the Radius pop-up menu to enable a more detailed analysis of the scene.
This will result in higher visual quality, but larger NR Radius settings are more processor intensive, and may reduce real time performance if you don't have adequate GPU resources available to your system.
- 10 If you've found suitable noise reduction settings, but the result is too aggressive and makes the image appear too processed, you can try raising the Spatial NR and/or Temporal NR Blend parameters to fade between the noise reduction added by each set of controls, and the image as it was before you added noise reduction.

Try Applying Temporal NR First, then Applying Spatial NR

Because Temporal NR analyzes multiple frames for its noise isolation, it tends to be better at preserving detail accurately in regions of the image where there's little motion. If you try applying Temporal NR first and get a successful result, even if only in part of the image, you may reduce how much Spatial NR you have to apply, thus improving the overall quality of your final result.

Keep in mind that while Temporal NR does a great job in unmoving parts of an image but is less effective when dealing with subjects in motion, Spatial NR is able to reduce noise everywhere in the frame falling below its threshold, even when there's motion. Ultimately, a combination of the two is almost always going to be a winning combination.

Spatial NR Radius, How Large Should You Go?

Larger NR Radius settings can dramatically improve the quality of high-detail regions in shots where you're using aggressive Spatial noise reduction, but it's not necessary to always jump to the large Radius setting, which provides the highest precision. In many cases, when evaluating an image that you're applying noise reduction to, you may not actually be able to perceive the additional quality, and you'll waste processing time on an unnecessary level of correction.

It's a good idea to make sure that you're evaluating the full-frame image on a large enough display to see the noise you're working on within the viewing context of the intended audience. Zooming really far into a clip while applying noise reduction may encourage you to use higher quality settings than are necessary, because an excessively enlarged detail of an image lets you see subtle changes that you wouldn't notice at actual size.

Limiting Noise Reduction in Useful Ways

As with any other correction in the Color page, noise reduction can be limited using HSL Qualification or Power Windows. This means you can focus your efforts on reducing noise in the most problematic areas of an image (for example, in shadows and background regions), while sparing elements that you don't want to affect (such as faces or better-lit areas of the image).

Furthermore, you can use Spatial NR in lieu of Blur operations to perform a subtler form of complexion smoothing, using the HSL Qualifier or a Window to isolate an actor's skin tone for targeted noise reduction.

Controlling the Order of Operations for Noise Reduction

You can apply noise reduction at any point in your image processing tree using a dedicated node. If you have an image with noise that you think might be enhanced by whatever corrections you need to make (increasing the contrast of underexposed clips often increases whatever noise is within an image), there are two approaches to noise reduction:

- **Apply noise reduction at the beginning of a node tree:** This lets you pre-emptively eliminate any noise before it becomes a problem as a result of whatever adjustments you're planning to make. The result can be smoother, but you may also notice that the edge detail within the image is a bit softer.
- **Apply noise reduction at the end of a node tree:** The alternative is to make your adjustments first, and then apply noise reduction in a separate node afterwards. In this case, you may find that the noise reduced regions of the image aren't quite as smooth, however the edge detail within the image may be visibly sharper as a result.
- **Apply Noise reduction to only one color channel of an image:** Using the Splitter/Combiner nodes, you can also apply noise reduction to only one color component of an image. If you're grading a video clip with a noisy Blue channel, this can be a way to focus noise reduction where it's needed.

Neither result is universally better or worse than the other. Which is preferable depends on the image you're working on, and the type of result you're looking for (you might prefer some shots to be a bit softer, while you'd like other shots to be a bit sharper). The real point is that the node-based image processing of DaVinci Resolve lets you choose which technique works best for you.

NOTE: If you apply noise reduction and make color adjustments within the same node, noise reduction is processed first, followed by color adjustments.

Using Noise Reduction Controls with the DaVinci Control Panel

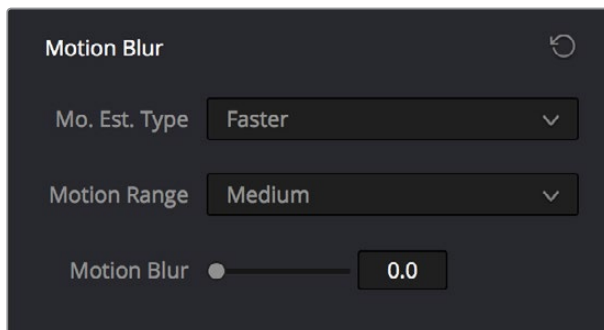
All three Noise Reduction controls are available via knobs on the PRIMARIES, NOISE REDUCTION control group on the Center panel.

To open the Noise Reduction controls on the DaVinci control panel:

Press the PRIMARIES or MAIN soft key on the Center panel, whichever is visible (depending on which control group is currently displayed).

Motion Blur

Motion Blur settings use optical-flow based motion estimation to add artificial motion blur to clips that have none. This can be useful in cases where a program was shot using a fast shutter speed, and you later decide that the resulting video has too much strobing. By analyzing the motion within a clip, the Motion Blur settings can selectively apply blurring to the image based on the speed and direction of each moving element within the scene.



Motion Blur controls

Three parameters let you set how much motion blur to add, and at what quality:

- **Motion Est. Type:** A setting of Better provides more accurate pixel mapping at the expense of being more processor intensive. Faster provides a more approximate result, but is less processor intensive.
- **Motion Range:** Determines what speed of motion to consider when defining regions being blurred.
- **Motion Blur:** Raise this parameter to add more motion blur to the image, lower it to add less. The range is 0-100, where 0 applies no motion blur, and 100 applies maximum motion blur.

OpenFX

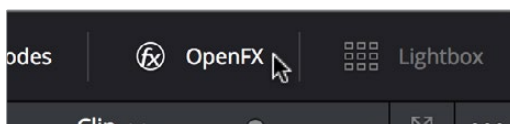
OpenFX (OFX) is an open plug-in standard intended to enable easier development of cross-platform visual effects plug-ins for a variety of applications. Popular plug-in packages include the GenArts Sapphire plug-ins, Boris Continuum Complete, Red Giant Universe, NewBlue TotalFX, all of which are ubiquitous tools for feature and broadcast work. The available number of OpenFX plug-ins is also growing as this format becomes more widely adopted among developers.

With OpenFX support, you can use plug-ins to do many stylized operations that would be difficult or impossible to do using the other tools in Resolve. Everything from lens flares, optical blurs and prism effects, lens warp correction, film and video grain and damage effects, dead-pixel corrections and more can be accomplished with the right plug-in collection.



This kind of optical effect would be impossible to do without plug-in support

The installation and licensing of OpenFX plug-ins is handled by a vendor's own installer. Once installed, OpenFX plug-ins appear within the Library of the Open FX Panel, which can be opened by clicking the FX button at the top right of the Color page Interface Toolbar.

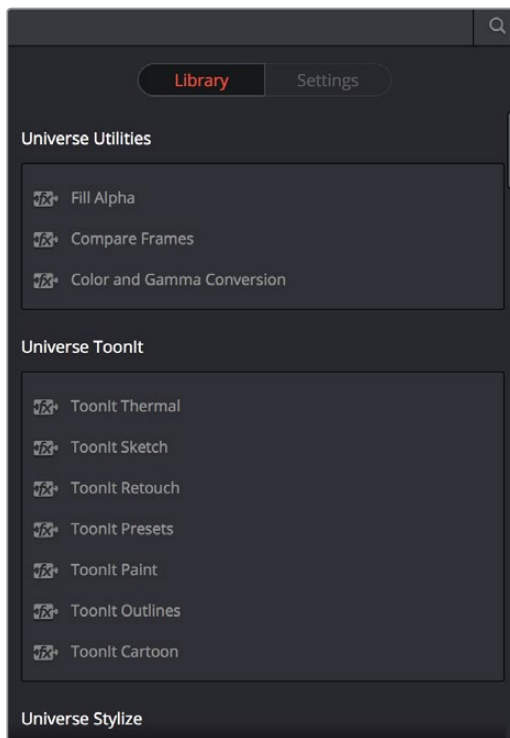


Click the FX button to open the OpenFX Library

When you click the FX button, the Open FX Panel opens out of the right side of the Node Editor to show the Library, resizing the Viewer, Gallery, and Node Editor to make room. The OpenFX Library is organized hierarchically. Each vendor's plug-ins appear under a header with the name of that plug-in collection, and possibly organized into categories, separated by headers with Open or Close buttons that appear when you hover the pointer over them, which let show or hide the contents so that you can make the Hierarchy as compact or spread out as you like.

To open and close OpenFX categories, do one of the following:

- Move the pointer over the header you want to open or close, and click the Close or Open button that appears.
- To open or close all headers at once, Option-click the Open or Close button that appears.



The Library in the Open FX Panel

Since many OpenFX plug-in collections are quite large, an optional Search field can be opened at the top of the Library that lets you quickly find plug-ins by name or partial name.

To search for an OpenFX filter by name:

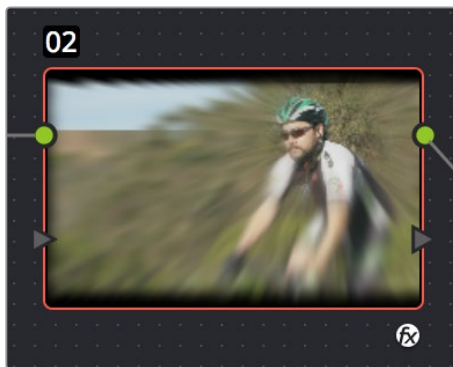
- 1 Click the magnifying glass button at the upper right-hand corner of the OpenFX panel.
- 2 Type your search string into the Search field that appears. A few letters should be enough to isolate only those plug-ins that have that character string within their name.

OFX Random Frame Access

Previous to Resolve 12.5, third party OpenFX plug-ins could only access a limited range of media at a time, which stopped certain types of plug-ins from being able to do the multi-frame temporal analyses of clips they required to function. DaVinci Resolve Studio 12.5 and later enables third-party OpenFX multi-frame random access, so a wider variety of plug-ins and effects will work in Resolve. This feature is not available in the free version of DaVinci Resolve.

Applying OpenFX Plug-Ins

Once you've found an OpenFX plug-in you want to use in the Library, simply drag and drop it onto a new node to apply that plug-in's effect within your grade. Nodes with an OpenFX plug-in applied have an FX badge in the upper right-hand corner.



A node with an OpenFX plug-in applied

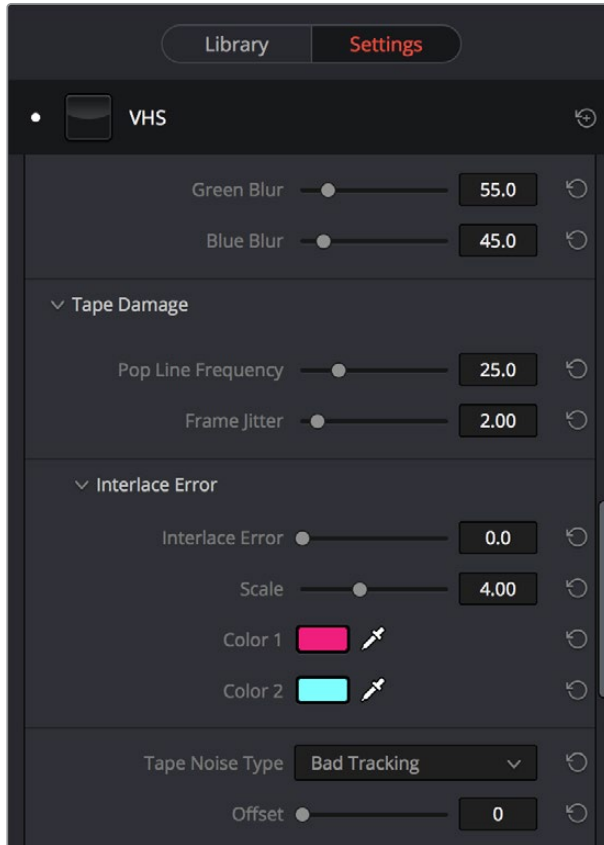
You can only apply one OpenFX plug-in to a node at a time, but by using multiple nodes you can add as many OpenFX plug-ins to your grade as you need.

OpenFX Plug-ins Are Processor Intensive

Because they create such a wide variety of effects, some OpenFX plug-ins can be extremely processor intensive, all the more if you add multiple plug-ins to a single grade. If you find your playback performance dropping because of a particularly expensive effects operation, you can use the Smart Cache to automatically cache nodes and clips that have OpenFX plug-ins applied to them. Once fully cached, you can play these clips back in real time, at least until you change that clip's grade again. For more information on caching and on improving performance in DaVinci Resolve overall, see Chapter 5, "Improving Performance."

OpenFX Settings

When you select a node with an OpenFX plug-in applied to it, the Open FX Panel switches to the Settings, which show you every single parameter associated with that plug-in, ready for customization.

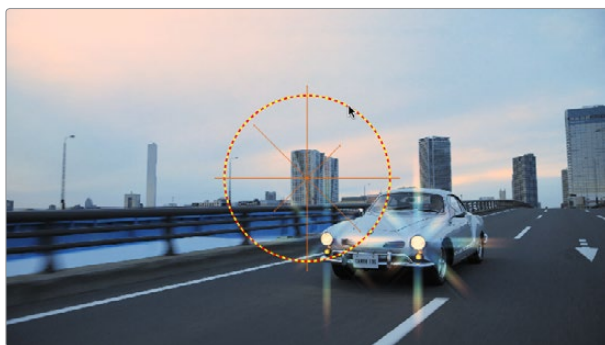


The parameters of a GenArts Sapphire plugin

Adjust any of the standard controls to manipulate that plug-in's effect on the image.

OpenFX On-Screen Controls

When you select a node with an OpenFX plug-in applied to it that has on-screen controls, the Viewer Mode pop-up automatically changes to OpenFX Overlay mode, and the available controls appear within the Viewer. Different plug-ins expose different custom controls, letting you control the effect or manipulate the image, depending on that plug-in's function.



Adjusting the on-screen controls exposed by the GenArts Sapphire Glint Rainbow plug-in

If for whatever reason you switch the Viewer to another on-screen control mode (for example, showing the Window or Image Wipe controls), you can always switch back to the OpenFX controls by choosing the OpenFX Overlay mode from the onscreen control pop-up menu underneath the Viewer.

Using OpenFX

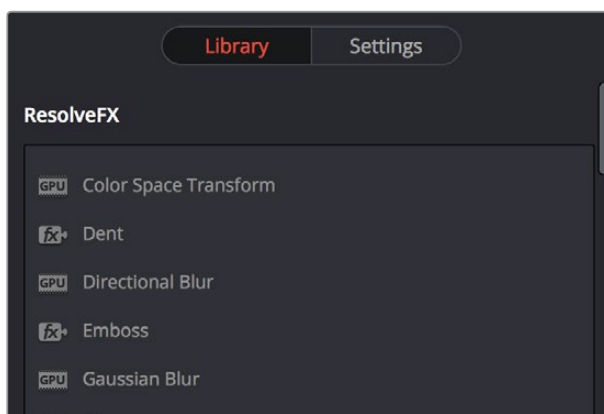
The following procedures describe how you can work with OpenFX plug-ins within the Color page.

Methods of working with OpenFX:

- **To add an OpenFX plug-in to a node:** Drag a plug-in from the OpenFX Library onto a node. If you drag a plug-in onto a node that already has a plug-in, the previous plug-in will be overwritten.
- **To remove an OpenFX plug-in from a node:** Right-click a node showing the FX badge, and choose Remove OFX Plug-in from the contextual menu.
- **To edit the parameters of an OpenFX plug-in:** Select any node with an FX badge, and open the Open FX Panel to show the Settings list. You can switch to the Library by clicking the Library button.
- **To sample a color parameter within an OpenFX plug-in:** Some OFX plug-ins have a color swatch parameter, which exposes an eyedropper button in the Settings. Clicking the eyedropper turns the pointer into an eyedropper you can use to sample the contents of the Viewer.
- **To use OpenFX on-screen controls in the Viewer:** Select any node with an FX badge, and the on-screen controls, if there are any, should appear in the Viewer. If not, make sure the Viewer mode pop-up is set to FX.

ResolveFX Filters

DaVinci Resolve comes with a set of ResolveFX filters that have been optimized for efficient playback. These are located within their own category of the OpenFX browser, and they work just like any other OpenFX plug-in. ResolveFX come in two types. Some are CPU-based, while others are GPU-accelerated, depending on which type of processing is faster for a particular effect. Each ResolveFX filter's icon shows you which it is.



Icons show which ResolveFX filters are GPU-accelerated, versus those that are optimized for CPU processing

In addition to the different parameters built into each filter, every single ResolveFX filter has a Blend parameter that mixes that filter's effect against the original image. Each filter's Blend parameter appears at the bottom of that filter's settings.

The included ResolveFX filters include:

- **Box Blur:** A variable quality blur, the Number of Iterations controls how smooth the resulting blur is, with 1 being the lowest and most “boxy” level of quality, and 6 being the highest and smoothest level of quality. Horizontal and Vertical Strength sliders let you adjust the width and height of blur, while a gang checkbox lets you adjust these parameters together or separately. Border Type lets you choose how the edges of the image are affected by this blur, options include Vignette 1, Vignette 2, Reflection, and Wrap Around.
- **Color Generator:** Generates a single color using a color picker control. Useful in conjunction with a layer node’s ability to mix a color with an image using different composite modes. Click the color picker and use the resulting color controls to choose a color to be generated. You can also click the eyedropper to sample a color from the image in the Viewer; the eyedropper always samples the image from the input of the current node, regardless of how the current image looks.
- **Colorspace Transform:** Exposes four pop-up menus that let you set an Input Colorspace, Input Gamma, Output Colorspace, and Output Gamma, in order to do controlled transforms between various color spaces within a grade.
- **Dent:** A warp effect that creates different types of circular bowing and folding effects. DentType lets you choose from six different types of “dent” warping effects. X and Y position sliders let you offset the center of the warp. Size lets you adjust the diameter of the warp. Strength lets you adjust the extent and direction of the warp, lowering this below zero “pulls” the image into the center of the effect, while raising this above zero “pushes” the image outward to buckle according to the DentType you’ve chosen.
- **Directional Blur:** A blur that’s constrained to a single angle. Parameters include Blur Strength and Blur Angle. Border Type lets you choose how the edges of the image are affected by this blur, options include Vignette 1, Vignette 2, Reflection, and Wrap Around.
- **Edge Detect:** An edge detection effect with options for customizing which edges create outlines. Mode lets you choose between RGB and Grayscale edges. Edge color (only available if Mode is set to Grayscale) lets you colorize the edge outlines that are generated. Threshold determines the lightness level that’s used for edge creation, while Smooth lets you soften these edges, and Brightness lets you adjust edge intensity. Denoise Type can be switched between Soften and Sharpen, to preprocess the image via the Denoise Strength slider in order to further customize which edges result in outlines. The Edge Overlay checkbox lets you superimpose the edges created with this filter over the RGB image via a multiply operation.
- **Emboss:** An emboss effect with several options to create different kinds of outline and emboss effects. The Emboss Style pop-up lets you choose from among Relief, Emboss Over, Sobel, and Laplacian types of embossing. Power lets you adjust how pronounced the emboss effect is. Angle lets you choose the apparent angle at which the emboss effect is rendered. Three checkboxes let you choose to use the Red, Green, and Blue channels to create this effect.
- **Film Grain:** (Studio Version Only) Composites a procedurally generated layer of simulated “film grain” over the image. Selections from the Film Grain Presets pop-up lets you quickly choose from among different 8mm, 16mm, and 35mm film grain effects. Opacity lets you fade the Film Grain effect against the original image. The Grain Only checkbox lets you see just the grain layer that you’re creating, so you can evaluate its look prior to it being composited into the image. The Grain Params group lets you adjust the Texture of the simulated grain layer, the Grain Size, and the Grain Strength, while Softness lets you blur the grain layer, and Saturation lets you make it more or less colorful. In the Advanced Controls, a series of Shadow, Midtone, and Highlight Gain controls let you adjust the amount of grain that’s generated within each of these tonal regions of the image it’s being composited into.

- **Gaussian Blur:** What the name says. Two sliders let you adjust the Horizontal and Vertical Strength independently, while a checkbox lets you gang them together. Border Type lets you choose how the edges of the image are affected by this blur, options include Vignette 1, Vignette 2, Reflection, and Wrap Around.
- **Glow:** A simple, soft glow effect. Select Output lets you preview the image with different stages of the glow effect applied, viewing the Shiny Regions, Glow Alone, or the Glowing Image. Shine Threshold defines the luminance level at which shine appears on the image. Spread defines how far out shine extends from areas of the picture that trigger it. H/V Ratio lets you adjust the proportion of horizontal to vertical spread, allowing you to create “streaky” shine that extends farther in a particular dimension. Relative Spread Red/Green/Blue lets you adjust the spread within each color channel by a different amount. Brightness adjusts the intensity of the glow effect. Colorize lets you tint the glow. Glow framing lets you choose what happens when shine hits the edge of the frame, whether it’s amplified by “Reflect in Camera” or whether it’s moderated by a “Vignette” effect. Composite Type lets you choose a composite mode to use to blend the glow effect with the image. Opacity lets you adjust the transparency of the effect.
- **JPEG Damage:** Simulates the kinds of minor or major artifacts you get when doing JPEG compression; useful for simulating compression damage. Quality lets you lower the bit depth of the image. Resolution lets you increase the size of macroblocking artifacts that appear, while Block Aspect Ratio lets you adjust the macroblocks to be more square or rectangular. Frequency Scale sharpens the effect, while Scale Component lets you base this effect on All Frequencies, the X-Frequency, or the Y-Frequency.
- **Lens Blur:** (Studio Version Only) A high-quality simulation of optical lens blurring, with adjustable parameters to achieve different kinds of “bokeh” effects. Iris Shape lets you choose from a Triangle, Square, Pentagon, Hexagon, Heptagon, or Octagon shaped iris, which influences the shape of the bokeh effect. Blur Strength adjusts the overall amount of blur. Blade Curvature lets you round off the edges of the Iris Shape you selected, while Rotation lets you adjust the angle the shape appears at. Anamorphism lets you adjust the aspect ratio of this effect in order to match the lens blur created by anamorphic lenses. Chroma Shift lets you simulate chromatic aberration within the blur effect. Highlights lets you adjust how the highlights of the image affect the blur, dilating or eroding the image more or less depending on how high Smooth Strength is.
- **Lens Flare:** (Studio Version Only) Simulates different kinds of lens flares resulting from the interplay of light bouncing within layered optical elements in a lens. Lens Flares are procedurally generated, so their resolution will be as high as that required by your project. Four groups of controls give you a lot of ways to customize the presets to create your own effect:
 - You can choose a type of flare from the Lens Flare Preset pop-up. If you manipulate the controls to create your own effect, this switches to Custom.
 - The Select Output pop-up lets you switch between the Final Image (with the flare composited against the current clip) and Flare Elements Alone (showing you the isolated flare, making it easier to adjust). Source Mask and Magnified Source Mask options let you see the result of using the Mask Threshold slider to create a flare-obscuring foreground mask.
 - Mask Threshold lets you pull a fast Luma Key to limit the flare to areas of the picture where the light source of the flaring must “shine through,” for example keying darker trees against a light sky. This works together with Light Source Size to create lens flare occlusion effects.
 - Light Source Size determines how quickly the center of a flare will disappear behind

a luma-keyed occlusion, higher values (bigger light sources) will disappear more slowly when passing “behind” a feature of the image being keyed by the Mask Threshold slider.

- Position parameters let you adjust the X and Y Position of the light source causing the flare.
- The Global Corrections group have parameters that let you quickly adjust the overall quality of the flare effect. Global Scaling lets you make every element larger and smaller. Anamorphism lets you deform the flare elements to simulate an anamorphic lens’ stretching effect. Lens Center X and Y position lets you offset the center of the simulated lens that’s causing the flaring, about which the various elements of the flare pivot. Global Defocus lets you blur the flaring. Global Saturation lets you adjust the color intensity of the flaring. Colorise Result, and Colorization Color let you tint the overall flaring effect; Colorise Result lets you choose how much to tint the flare, and the Colorization Color picker lets you choose which color to use with either a color control or eyedropper to sample color from the source RGB image of the current node.
- The Aperture parameters let you adjust how many blades make up the iris (you can choose from 5 to 16), and the angle of the resulting Aperture shape. This shape affects the look of aperture-shaped “ghosts” and the starburst element of each flare.
- The Elements pop-up lets you expose the customization controls for each of the layers and elements that create the simulated lens flare. These elements include Full-Screen Glare (an overall glare effect covering the entire screen), Flare Spot (the central glow), Starburst (the rays of light stretching out from the center), and seven layers of Ghost elements (different optional shapes for each lens element you want to simulate). Each Ghost element has five types of shapes that it can present, including Aperture Shape (a shape identical to the aperture), Anamorphic Streak (a wide horizontal artifact typical of anamorphic lenses), Disc Shape (a ring artifact), Bubble Shape (an oval with haze within), or Corona Rays (a ring of streaks pointing outward). Each element and ghost shape has a different set of parameters unique to that type of element.
- **Lightray:** A “rays of light” effect. Select Output lets you preview the image with different stages of the Lightray effect applied, viewing the Final Image, Lightrays Alone, and Source Regions. Source of Rays lets you choose the emitter of the rays, using Bright Regions or Edges. Source Threshold is a slider that lets you choose the limit at which light areas of the image emit rays. Position parameters include the Ray Directions pop-up menu that lets you choose either From a Location, which lets you choose an X or Y position to define a point of origin that defines the angle of the light beams, or At an Angle, which lets you choose an overall orientation for the rays. Appearance parameters include Ray Dropoff with options for Default (soft), Keep Shape of Source, CCD Bloom Harsh, and CCD Bloom Soft, as well as Length, Detail, Brightness, and Color of the rays.
- **Mirrors:** An effect that lets you reflect part of the image in any direction you like. Mirror Placement lets you choose different types of mirror effects including Individual, Rosette, and Kaleidoscope. Reflect at Borders lets you add another reflection of the image whenever the angle and position of your reflection would result in offscreen black coming into the frame. Additionally, a series of six sets of Mirror parameters lets you add mirrored edges; by default only one is on, but you can turn more edges on to create more complicated mirror effects. Each group of Mirror parameters has Enable Mirror, X and Y Position, Angle, and Flip controls.

- **Mosaic Blur:** A simple, pixelated blur suitable for hiding the face of anonymous witnesses. Pixel Frequency lets you adjust the size of each pixel, thus determining the density and resolution of the resulting grid of pixels. Smooth Strength lets you blur the edges of adjacent pixels. Border Type lets you choose how the edges of the image are affected by this blur; options include Vignette 1, Vignette 2, Reflection, and Wrap Around.
- **Prism Blur:** Simulates chromatic aberration and a vignetted lens. Blur Strength lets you apply a blur to the primary image. X and Y Position let you change the center of the effect within the frame about which chromatic aberration is created. Aberration Distance adjusts how far the aberration effect appears from the source image, while Aberration Strength intensifies the zoom blur used to create the chromatic aberration effect to intensify it. Vignette Size lets you add edge vignetting to the image; setting this to 0 removes the vignette, while 1 is the maximum size of a vignette using this filter. Vignette Sharpness lets you adjust the feathering of the vignette effect; lowering this value softens the edge, while raising this value sharpens, but never fully eliminates the softness from this edge. The Vignette effect is designed to fall off in a way that simulates how a lens would exhibit vignetting.
- **Radial Blur:** A blur effect that simulates the motion blur that would occur were the image spinning around its center point. Smooth Strength adjusts how much blurring is applied. X and Y Position let you move the center of the blur. Border Type lets you choose how the edges of the image are affected by this blur; options include Vignette 1, Vignette 2, Reflection, and Wrap Around.
- **Ripples:** A warp effect that creates different types of ripples. Ripple Shape lets you choose from Circular, Square, Horizontal, Vertical, Exponential, Star, and Radial ripples. Wave Shape lets you choose from Sinusoidal, Triangular, Fresnel In, Fresnel Out, and Natural waves. A set of Shine parameters lets you overlay a simulated shine on top of these ripples. A checkbox lets you turn this shine on and off. Shine Direction, Vertical Shine Height, Shine Size, and Shine Strength lets you adjust the overall appearance of the shine, while an Animate checkbox, if checked, reveals a Speed slider that lets you set how quickly the ripple effect auto-animates without the need to use keyframes. A separate set of Ripple parameters lets you enable up to five overlapping ripples, adjusting the X and Y Position, Amplitude, Frequency, Decay, and Phase of each ripple effect you enable. If you want to animate a ripple simply, you can also choose to keyframe the Phase parameter to create the same effect created by the Animate checkbox above.
- **Scanlines:** Simulates television scanlines, or any effect where you want alternating lines to darken the image. A variety of parameters makes this an extremely flexible effect that can be applied in numerous ways. Line Frequency lets you choose how many or few lines are superimposed on the image; fewer lines automatically space themselves to be thicker as they're uniformly distributed across the image. Line Sharpness lets you blur the border between each line, softening the effect. Line Angle lets you rotate the lines to appear at any angle, the default is 0 which results in horizontal lines. Line Shift lets you offset the lines. Shift Red, Green, and Blue let you offset individual channels. Color 1 and Color 2 are color picker controls that let you tint each alternating set of lines (eyedroppers let you sample a color from the RGB image being input into the current node). Composite Type lets you choose which composite mode is used to blend the scanline effect into the image. The Scanlines Only checkbox lets you see just the scanlines in isolation while you adjust them.

- **Tilt-Shift Blur:** Simulates depth-of-field effects using a progressive blur that’s applied with a generated Z-depth map. The default settings create a “miniaturization” illusion, where the image appears to be tiny due to the top and bottom depth-of-field settings used. You can choose the Blur Type (Lens Blur is the default) and Blur Strength. Additional Lens Iris settings let you choose the Shape, Blade Curvature, Rotation, Anamorphism, and Highlights of the lens blur effect being created. Additional Depth of Field settings let you adjust the depth map being used to create the depth-of-field effect. The Depth Map Preview checkbox lets you see the grayscale depth map directly while making these adjustments. Center X, Center Y, and Angle let you transform the depth map, while In Focus Range expands or contracts the black center of the depth map, and Near Blur Range and Far Blur Range let you individually adjust the falloff of the white bottom and top of the depth map.
- **Vortex:** Vortex begins as an S shaped warp effect, but you can adjust the parameters to create many types of warping effects. X and Y position sliders let you offset the center of the warp. Size lets you adjust the diameter of the warp. Angle lets you adjust the direction and intensity of the warp effect; setting Angle below 0 twists the image to the left, while raising Angle over 0 twists the image to the right. Power rotates the area that’s effected to create a harder border between what is warped and what isn’t. Swirl intensifies the effect, twisting the image into an even tighter swirling effect.
- **Waviness:** A wavy distortion effect. Waviness Type lets you choose Vertical or Horizontal waviness. Scale lets you choose the size of the waves, while Strength lets you adjust the amplitude. Phase lets you “move” the wave, and is a good parameter to keyframe if you’re animating this effect manually. However, an Animate checkbox, if checked, reveals a Speed slider that lets you set how quickly the Waviness effect auto-animates without the need to use keyframes.
- **Zoom Blur:** A blur effect that simulates the motion blur that would occur were a camera moving toward the image. Smooth Strength adjusts how much blurring is applied. X and Y Position let you move the center of the blur. Border Type lets you choose how the edges of the image are affected by this blur; options include Vignette 1, Vignette 2, Reflection, and Wrap Around.

Motion Tracking ResolveFX and Compatible OFX Plug-ins

ResolveFX that have position parameters, including Dent, Lens Flare, Light Rays (when “From a Location” is selected), Mirrors, Radial Blur, Ripples, Vortex, and Zoom Blur can all be motion tracked to follow the position of a moving subject in the frame using the point-based tracking in the FX mode of the Tracker palette.

To match move ResolveFX to a feature using the FX tracker:

- 1 Create a new node, and drag the ResolveFX filter you want to apply onto that node to apply the effect. In this example, we’re adding a Lens Flare effect, that has the position parameters necessary to be match moved to follow the motion of the shot, and we’re choosing the MIR-I 2.8/37 preset, which looks like a sun.



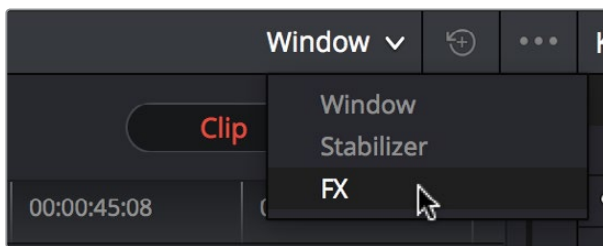
Applying a Lens Flare to the shot

- 2 If necessary, use the on-screen controls in the Viewer or the X Position and Y Position sliders to move the ResolveFX effect to where you want it.



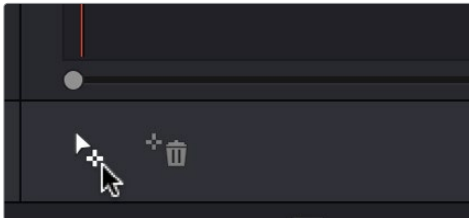
Moving the Lens Flare using the on-screen controls

- 3 Next, open the Tracker Palette and choose FX from the mode pop-up.



Opening the FX tracker mode of the Tracker palette

- 4 Click the Add Tracker Point button, at the bottom left-hand side of the Tracker palette, to add tracker crosshairs to the center the Viewer.



Adding a point tracker

- 5 Drag the crosshairs to a high-contrast detail (such as a small object or corner), and click the track forward button. In this example, there's a rock out at sea that will make a good plane of motion for tracking a far-away sun. There is no inner or outer box to position or resize while you do this; you just need to drag the crosshairs to center on the feature you want to track.



Positioning the point tracker on a feature you want to track

- 6 Now, click the track forward button, and Resolve will track the feature. The ResolveFX applied to that node will simultaneously move to follow the track, and when the tracking is done, you're finished.



A successful track

- 7 After you've finished tracking, you can freely reposition the ResolveFX to offset it from the track.

For more information about single-point tracking, see the “Point Tracker Workflows” section of Chapter 27, “Secondary Grading Controls.”

The Blur Palette

The Blur palette has three different modes of operation—blur, sharpen, and mist. While the functionality of the Blur and Sharpen modes somewhat overlap, each mode provides dedicated controls that the other ones lack.

As with virtually everything else in the Color page, the operations performed in the Blur palette can be limited as a secondary operation using HSL Qualifiers, Windows, or Imported mattes, which makes it easy to apply these effects to specific portions of the image.

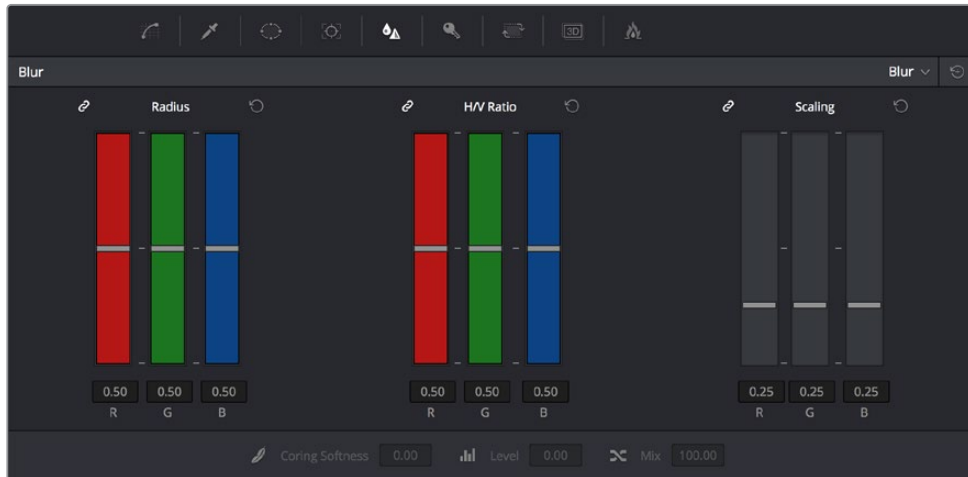
Many of the controls in the Blur palette consist of three ganged sliders, one for red, one for green, and one for blue.

By default, these ganged sliders move together as one, resulting in each color channel of the image being equally affected. A small orange button to the left of each control's name lets you ungang these sliders, in order to apply degrees of adjustment to individual color channels.

Blur

The default mode, Blur lets you apply an exceptionally high-quality Gaussian blur, or another equally high-quality sharpening operation to your image. This mode of operation has the simplest controls.

Two sets of linked parameters let you adjust the extent and directionality of blur or sharpening. Which is applied depends on the direction in which you adjust the Radius control.



Blur Radius controls are ganged by default, but can be unganged

- **Radius:** This is the primary control for adding blur or sharpening. The default value of 0.50 results in no effect being applied to the image. Raising the radius slider increases blur, to an incredibly soft maximum value of 6.00. Lowering the radius increases sharpness, with a minimum value of 0.00 providing maximum sharpness.

TIP: If you raise the Radius slider all the way to 1.00 and the image isn't blurred enough, add another node and use it to add another blur operation.

- **H/V Ratio:** Lets you add directionality to the current operation. At the default value of 0.50, the image is affected in both the horizontal and vertical directions equally. Raising H/V Ratio makes the effect increasingly directional along the horizontal axis, while lowering makes the effect increasingly directional along the vertical axis.

To adjust the Blur controls using the DaVinci control panel:

- 1 Press the VECTORS button on the T-bar panel, or the VECTORS soft key on the Trackball's main page.
- 2 Use the BLUR AMOUNT and H/V RATIO knobs to add either blur or sharpening.
- 3 When you're finished, press the PRIMARIES soft key to return to the Center panel's main page.

Sharpen

While the Blur controls also let you apply sharpening simply by lowering rather than raising the Radius sliders, the actual Sharpen mode provides additional controls specifically for tailoring sharpening operations.



Sharpening with Coring Softness and Level

- **Radius:** This is the primary control for adding blur or sharpening. The default value of 0.50 results in no effect being applied to the image. Raising the radius slider increases blur, to a maximum value of 1.00. Lowering the radius increases sharpness, with a minimum value of 0.00 providing maximum sharpness.
- **H/V Ratio:** Lets you add directionality to the current operation. At the default value of 0.50, the image is affected in both the horizontal and vertical directions equally. Raising H/V Ratio makes the effect increasingly directional along the horizontal axis, while lowering makes the effect increasingly directional along the vertical axis.
- **Scaling:** Multiplies the amount of scaling being applied by the Radius control for sharpening operations. The scaling parameter has no effect if Radius is set to 0.50 or above for blur effects.
- The Coring Softness and Level parameters work together to allow you to be selective about which parts of the image you're sharpening, without the need to build a secondary operation.
- **Coring Softness:** Lets you limit how much of the image is being sharpened, based on the threshold of image detail defined by the Level parameter. With Level at 0, Coring Softness adjusts the blend between sharpening of the most detailed areas of the image (such as the eyes, lips, and dimples of a face), and low detail areas of the image that are not being sharpened at all (such as the cheeks, forehead, and chin).
- **Level:** Sets the threshold at which image detail is omitted from a sharpening operation when Coring Softness is raised. The default setting of 0 sets the threshold low enough to omit all but the most highly detailed edges of an image. Raising Level gradually omits areas of reduced complexity, which results in more of the image being included in a sharpening operation.

To adjust the Sharpening controls using the DaVinci control panel:

- 1 Press the VECTORS button on the T-bar panel, or the VECTORS soft key on the Center panel's main page.
- 2 On the Center panel, press the IMAGE MODE soft key repeatedly to cycle to the RESOLVE IMAGE SHARPENING controls.

- 3 Use the SHARP AMOUNT, SCALING, LEVELS, and SOFTNESS knobs to create the desired sharpening effect.
- 4 When you're finished, press the PRIMARIES soft key to return to the Center panel's main page.

Mist

The Mist mode lets you combine blur and sharpen operations in such a way as to create effects similar to those achieved via “Vaseline on the lens” or Pro-Mist optical filters.



Mist including Mist Mix control

Unlike the Blur or Sharpen modes, where the Radius sliders provide immediate access to the desired effect, the Mist mode requires you to lower the Radius and Mix sliders together to get a desirable result. By varying the amounts of Radius and Mix, you can create many variations on the mist effect.

- **Radius:** When creating a Mist effect, you first need to lower Radius to sharpen the image. This operations then combines with a lowering of the Mix parameter to provide the combination of detail and blurring that results in a mist effect.
- **H/V Ratio:** Lets you add directionality to the current operation. At the default value of 0.50, the image is affected in both the horizontal and vertical directions equally. Raising H/V Ratio makes the effect increasingly directional along the horizontal axis, while lowering makes the effect increasingly directional along the vertical axis.
- **Scaling:** Multiplies the amount of scaling being applied by the Radius control, and lets you intensify a mist effect beyond the Radius slider's ordinary range. The scaling parameter has no effect if Radius is set to 0.50 or above for blur effects.
- **Mix:** After you sharpen the image using the Radius slider, decreasing the Mix parameter adds a superimposed blur that mixes with the high-detail areas of the picture to create the mist effect.

To adjust the Mist controls using the DaVinci control panel:

- 1 Press the VECTORS button on the T-bar panel, or the VECTORS soft key on the Center panel's main page.
- 2 On the Center panel, press the IMAGE MODE soft key repeatedly to cycle to the RESOLVE MIST EFFECT controls.
- 3 Use the RADIUS, H/V RATIO, SCALING, and MIX knobs to create the desired mist effect.
- 4 When you're finished, press the PRIMARIES soft key to return to the Center panel's main page.

Transforms and the Sizing Palette

DaVinci Resolve has a powerful tool set for making geometric transforms, using advanced algorithms for optical-quality sizing operations. This section covers the nuts and bolts of resolution independence in DaVinci Resolve, and how to use the Sizing palette.

Resolution Independence in DaVinci Resolve Explained

DaVinci Resolve is a resolution-independent application. This means that, whatever the resolution of your source media, it can be output at whatever other resolution you like. This also means that you can freely mix clips of any resolution, fitting 4K, HD, and SD clips into the same timeline, and scaling each to fit the project resolution as necessary.

Your project's resolution can be changed at any time, allowing you to work at one resolution, and then output at another resolution. This also makes it easy to output multiple versions of a program at different resolutions, for example, outputting both HD and SD sized versions of the same program.

Finally, the controls found in the Sizing palette let you transform clips individually, either to push into a clip for creative intent, or to pan and scan media of one format to fit better into a different output format.

Using High Resolution Media in Lower Resolution Projects

Every set of transform and sizing parameters and settings that resize clips is combined intelligently, so that the highest resolution media is always used as the source for any transform. For example, if you're using 4K media within a 1920x1080 project, and you need to enlarge a clip using the Input Sizing palette's Zoom parameter, the image is scaled relative to the native 4K resolution of the source, and the result is fit into the current timeline resolution. This automatically guarantees the highest quality for any image transform you make.

Timeline Resolution

This is one of the most fundamental settings in your project, defining its frame size. You can choose a predefined resolution from the "Set timeline resolution to" pop-up menu, or you can type a custom resolution into the X and Y fields below.

Media used in a project does not have to match the timeline resolution, in fact it's common to mix resolutions within the same timeline. Clips that don't match the current resolution will be automatically resized according to the currently selected Image Scaling setting (described below).

As mentioned earlier, you can change the timeline resolution at any time. When you do so, all Power Windows, Sizing palette adjustments, tracking, keyframing, and other geometric operations are automatically and accurately scaled to fit the new resolution.

Pixel Aspect Ratio (PAR)

The Timeline Format settings, found in the Master Project Settings, let you specify a Pixel Aspect Ratio in addition to the frame size. Defaulting to Square Pixel, which is appropriate for high definition projects, there are also options for 16:9 anamorphic, 4:3 standard definition, or Cinemascope. Which options are available depends on what timeline resolution you've selected.

In addition, each clip has individually adjustable PAR settings, for situations where you're mixing multiple types of media within a single project. For example, if you're mixing SD clips with non-square pixels and HD clips with square pixels, you can sort out all of the SD clips in the Media Pool and assign them the appropriate NTSC or PAL non-square pixel ratio PAR setting. For more information, see Chapter 9, "Working with Media."

Image Scaling

If a clip's native resolution doesn't match the timeline resolution, then the currently selected Input Scaling Preset dictates how the mismatched clip will be handled. The default setting is "Scale entire image to fit," which shrinks or enlarges the image to fit, in the best way possible, the current dimensions of the frame, adding letterboxing or pillarboxing as necessary.

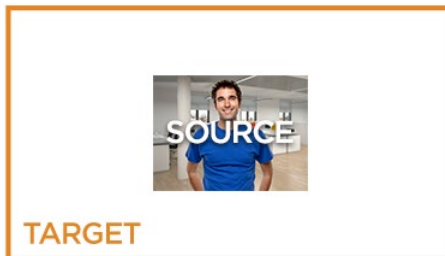
The Image Scaling parameters are found in the Project Settings window, and there are two sets of parameters that let you set the quality and method used for these automatic transforms.

Image Scaling filters let you choose the mathematical method used to resize clips:

- **Uses sharper filter:** Usually provides the best quality for most projects, using an optical quality processing technique that's unique to DaVinci Resolve.
- **Uses smoother filter:** May provide a more pleasing result for projects using clips that must be scaled down to standard definition, as this filter exhibits fewer sharp edges at SD resolutions.
- **Uses bilinear filter:** A lower quality setting that is less processor intensive. Useful for previewing your work on a low-performance computer before rendering, when you can switch to one of the higher quality options.
- **Input scaling preset:** Checking this box lets you choose an Input Sizing preset to apply to the project.
- **Output scaling preset:** Checking this box lets you choose an Output Sizing preset to apply to the project.

Input Image Scaling options let you choose how clips that don't match the current project resolution are handled. The illustrated examples below show an SD clip being fit into an HD project using each of the different options.

- **Center crop with no resizing:** Clips of differing resolution are not scaled at all. Clips that are smaller than the current frame size are surrounded by blanking, and clips that are larger than the current frame size are cropped.



- **Scale full frame with crop:** Clips of differing resolution are scaled so that the clip fills the frame with no blanking. Excess pixels are cropped.



- **Scale entire image to fit:** The default setting. Clips of differing resolution are scaled so that each clip fills the frame without cropping. The dimension that falls short has blanking inserted (letterboxing or pillarboxing).



- **Stretch frame to all corners:** Useful for projects using anamorphic media. Clips of differing resolutions are squished or stretched to match the frame size in all dimensions. This way, anamorphic media can be stretched to match full raster, or full raster media can be squished to fit into an anamorphic frame. An added benefit of this setting is that it makes it easy to mix anamorphic and non-anamorphic clips in the same project.



Output Image Scaling

Another group of settings found in the Image Scaling panel of the Project Settings lets you optionally choose a different resolution to be output via your video output interface, for monitoring, outputting to tape, or rendering.

If you set the resolution in the Render Settings list of the Deliver page to something other than the timeline resolution, these settings are used to make the change. This can be used in situations where you're working on a high resolution 4K project, but you want to monitor using an HD display, and output HD resolution media for approval.

- **Lock to timeline format:** Turned on by default, so that these settings mirror the Image Scaling and Input Image Scaling settings described above. Turning this checkbox off lets you choose different settings for monitoring, outputting to tape, or rendering, using the other settings in this group.
- **Set output resolution to:** Lets you choose an alternate resolution.
- **For "X x Y" processing:** Lets you specify a different custom alternate resolution.
- **Pixel aspect ratio is:** Lets you specify an alternate pixel aspect ratio to match the alternate timeline format.
- **Mismatched resolution files:** Lets you choose an alternate way of handling mismatched resolution files given the alternate resolution you've chosen. These options work identically to those of the "Input Image Scaling" group. For example, for an HD or UHD resolution project you may have the Image Input Scaling set to "Scale Full Frame With Crop," so that all Standard Definition resolution files are center-cut to eliminate blanking. However, if you're using Output Image Scaling to create a Standard Definition master, you may want to set the Output Image Scaling > Mismatched resolution files setting to "Scale entire image to fit" in order to letterbox all HD or UHD resolution clips, while preserving the original aspect ratio of the SD clips.

Edit Page Transform Parameters and Imported Sizing Information

A set of Transform parameters corresponding to each clip in the Timeline is available from the Inspector. These parameters operate independently of the Sizing controls found in the Color page, and exist primarily to store incoming transform data from imported AAF and XML projects coming from other applications.



The transform parameters in the Inspector of the Edit page

If, when importing an AAF or XML project file, you turned on the “Use sizing information” checkbox, then every clip that had position, scale, rotation, or crop settings applied in the originating NLE will have those adjustments applied to these transform parameters.

The transformation applied by these parameters is combined with whatever Input and Output Sizing adjustments are being made to output the final geometric result.

Edit, Input, Output, and Node Sizing on the Color Page

The Sizing palette on the Color page has another dedicated set of keyframable transform parameters that work with the DaVinci control panel to let the colorist apply pan and scan adjustments while working through a project. These parameters work independently of the Edit page Transform parameters, allowing you to keep imported transform settings separate from other transform settings that you apply. However, for convenience the Edit sizing controls are available in the Color page as well.

Format Resolution on the Delivery Page

By default, the Format Resolution setting in the Render Settings of the Deliver page matches the timeline resolution when “Match timeline settings” is enabled in the Output Scaling Preset in Project Settings.

Choosing a new resolution from the “Set Resolution to” pop-up menu lets you override the current Format Resolution setting before rendering. Using this control, you can queue up multiple jobs, each set to a different resolution, to output multiple formats during a single render session. For more information on rendering and setting up jobs for the Render Queue, see Chapter 33, “Using the Deliver Page.”

The Five Color Page Sizing Modes

The Sizing Palette on the Color page can be put into one of five modes, each of which accomplishes a different task.

- **Edit Sizing:** These controls mirror those found in the Inspector of the Edit page.
- **Input Sizing:** These controls let you make sizing adjustments to individual clips that affect their overall geometry (pan, tilt, zoom, and rotation). These controls are useful for doing clip by clip pan and scan adjustments.
- **Output Sizing:** These controls are nearly identical, except that they affect every clip in the entire timeline, all at once. Output sizing is useful for making a formatting adjustment to an entire timeline, such as changing an HD timeline to an SD timeline with simple adjustments to crop and pan the resulting framing.
- **Node Sizing:** Lets you add targeted sizing adjustments at any point within the node tree. Like Input Sizing, Node Sizing is specific to a particular clip. Unlike Input Sizing, Node Sizing is affected by operations that split color channels (such as the splitter/combiner nodes) and limit the image (such as qualifiers and windows). You can also add as many node sizing adjustments to a clip's grade as you need.
- **Reference Sizing:** A set of sizing controls that lets you reposition the still when a wipe comparison is being made. Using these controls, you can move the still image to better compare it to the clip you're wiping it against. The Reference Sizing controls only work when you have a wipe enabled.

Sizing Order of Processing on the Color Page

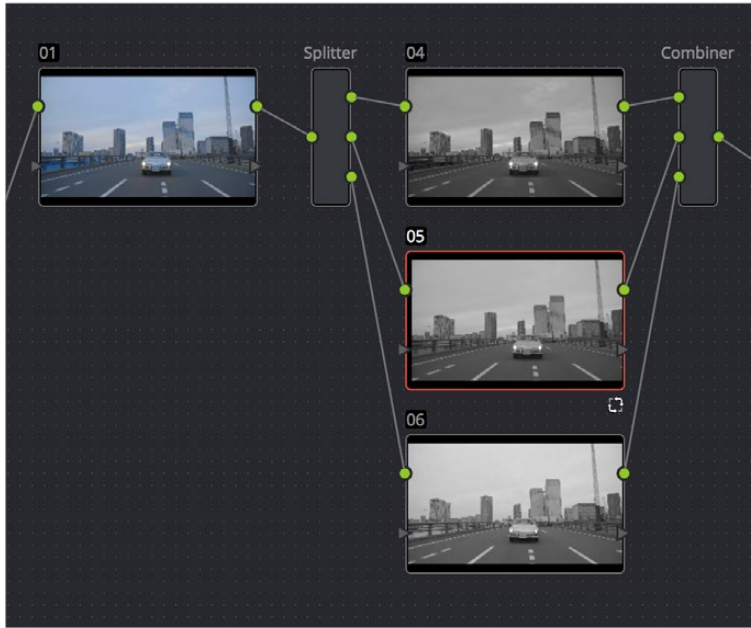
Input Sizing adjustments are applied before all image processing that takes place in the node graph, including Node Sizing, while Output Sizing adjustments are applied after image processing in the node graph.

Using Node Sizing

Using Node Sizing, you can apply individual sizing adjustments on a per-node basis. All Node Sizing adjustments within a grade are cumulative, and any keyframing done to Node Sizing parameters is stored in that node's Node Format keyframe track in the Keyframe Editor. Two good examples of Node Sizing include realigning color channels individually in conjunction with the Splitter/Combiner nodes, or duplicating windowed regions of an image by moving them around the frame.

Example 1: Using node sizing on individual color channels:

- 1 Choose Nodes > Add Splitter/Combiner Node to add this node structure to the current grade.
- 2 Select one of the three Corrector nodes connected between the Splitter and Combiner nodes that corresponds to the color channel you want to transform.



Adding the Splitter/Combiner nodes to use Node Sizing on individual color channels

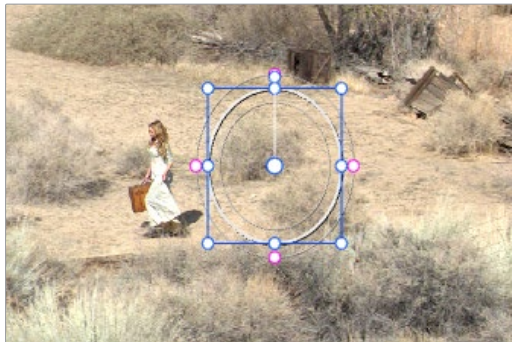
- 3 Open the Sizing palette, choose Node Sizing from the mode pop-up, and use the Sizing parameters to transform that channel as necessary. For example, if you have an old video clip with misaligned color components, you could pan a misaligned channel to the left or right to try and improve its alignment.



Before and after panning the green channel

Example 2: Using Node Sizing to duplicate a windowed area of an image to cover a blemish:

- 1 Create a new node.
- 2 Open the Window palette, create a Circular window, and then shrink and reposition it to surround a feature you want to remove.
- 3 Open the Tracking palette, and track the window to follow the feature to be removed.
- 4 After the track is complete, now move the window to an adjacent area of clean detail that's right next to the feature you want to remove. This is the area of the image you're going to duplicate and cover the unwanted feature with.
- 5 Now, open the Sizing palette, choose Node Sizing from the mode pop-up, and use the Sizing parameters to move a duplicate of the windowed area to cover up the unwanted feature.

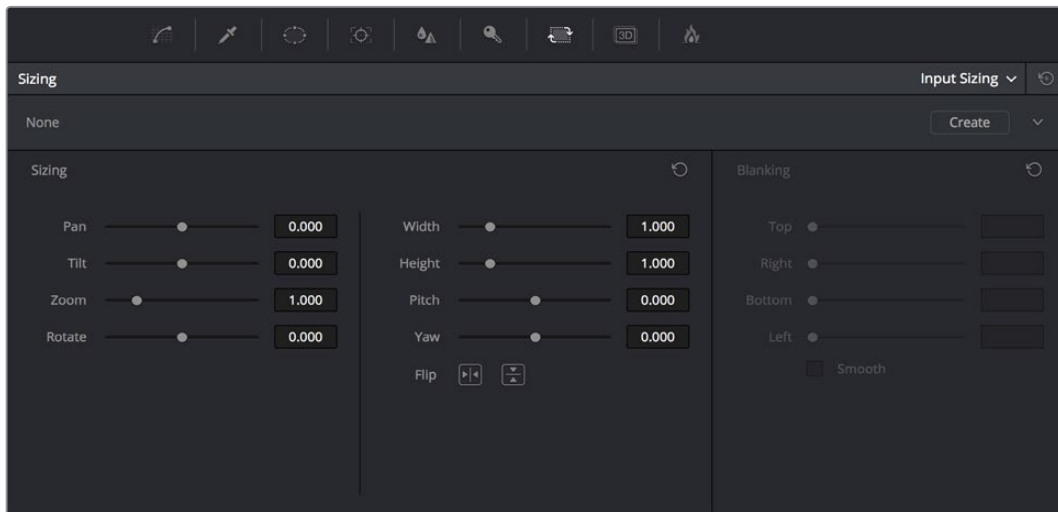


Before/After using Node Sizing to clone an area of the image to cover up the actor with a plant to create a clean background

When you're done, playing through the clip should show that the duplicated area of the image is still tracking the feature you want to remove.

Sizing Controls

Input, Node, and Output Sizing share many of the same controls. When the Sizing palette is set to Input Sizing mode, the controls transform each clip individually. If you're simply pushing in on one or two clips, or making individual pan & scan adjustments to account for a change in format, these are the controls you want to use.



The Sizing palette

- **Pan:** Moves the clip along the horizontal, X axis. Positive values move the clip right, negative values move the clip left.
- **Tilt:** Moves the clip along the vertical, Y axis. Positive values move the clip up, negative values move the clip down.
- **Zoom:** Positive values enlarge the clip, negative values shrink the clip.
- **Rotate:** Positive values rotate the clip clockwise. Negative values rotate the clip counter-clockwise.
- **Width:** Positive values stretch the image wider, negative values squish the image narrower.
- **Height:** Positive values stretch the image taller, negative values squish the image shorter.
- **Pitch:** Rotates the image toward or away from the camera along an axis running through the center of the image, from left to right. Positive values push the top of the image away and bring the bottom of the image forward. Negative values bring the top of the image forward and push the bottom of the image away. Higher values stretch the image more extremely.
- **Yaw:** Rotates the image toward or away from the camera along an axis running through the center of the image from top to bottom. Positive values bring the left of the image forward and push the right of the image away. Negative values push the left of the image away and push the right of the image forward. Higher values stretch the image more extremely.
- **Key Lock:** (Node Sizing only) Lets you choose how regions of the image that are isolated by one or more windows will be transformed. There are two options:
 - **Off:** While off, the transform controls will move the windowed region to another area of the frame, effectively duplicating the windowed area.
 - **On:** While on, the transform controls will move other areas of the frame into the windowed regions, effectively covering up the windowed area with another portion of the picture.
- **Flip Image:** Two buttons let you flip the image in different dimensions.
- **Flip Horizontal control:** Reverses the image along the X axis, left to right.
- **Flip Vertical control:** Reverses the clip along the Y axis, turning it upside down.

- **Lens Correction:** (Edit Sizing only) Two controls let you correct for lens distortion in the image, or add lens distortion of your own (only available in the Studio version).
- **Analyze:** Automatically analyzes the frame in the Timeline at the position of the playhead for edges that are being distorted by wide angle lens. Clicking the Analyze button modifies the effect of the Distortion slider so that it gives a more accurate result, but it doesn't perform a correction.
- **Distortion:** Dragging this slider to the right applies a warp to the image that lets you straighten the bent areas of the picture that can be caused by wide angle lenses. It's not necessary to click the Analyze button prior to using this slider, but using the Analyze button can improve the accuracy of the result.

Sizing OSC

An onscreen control currently mirrors the sizing parameters, showing you a preview of the transformed image, shown by an orange outline, relative to the size of the frame, shown in gray. Zoom and reset controls make it easier to see the full display.

Blanking Controls

Output Sizing mode also has a set of Blanking controls that you can use to add custom blanking to a clip or project. For example, you can use these controls to add nonstandard letterboxing or pillarboxing to an image. Along with all other Output Sizing adjustments, blanking is added last in the image processing pipeline, so it's not affected by any of the color or contrast adjustments you make.

- **Top:** Adjusts the top letterbox.
- **Right:** Adjusts the right pillarbox.
- **Bottom:** Adjusts the bottom letterbox.
- **Left:** Adjusts the left pillarbox.
- **Smooth:** A checkbox that lets you turn on edge anti-aliasing for source blanking. Overrides the Anti-alias Edges pop-up menu found in the Image Scaling panel of the Project Settings.

NOTE: It might be necessary to turn anti-aliasing off if you notice black blurring at the edges of blanking being applied to an image.

Blanking presets are also available by choosing from the Timeline > Output Blanking submenu. Choosing one of these options automatically sets the Blanking parameters of the Sizing palette's Output Sizing mode. The following presets are available:

- **1.33:** SD or 4:3
- **1.66:** European theatrical
- **1.77:** HD or 16:9
- **1.85:** Theatrical flat aspect ratio
- **2.35:** Original anamorphic (scope) theatrical wide-screen
- **2.39:** Current 35mm anamorphic (scope) theatrical wide-screen
- **2.40:** Current 35mm anamorphic (scope) theatrical wide-screen (rounded up for Blu-Ray)
- **Reset:** Restores the clip to its original aspect ratio.

Anti-aliasing at the edges of blanking is handled by a setting in the Image Scaling panel of the Project Settings. For more information, see Chapter 3, "Project Settings and Preferences."

Resetting the Sizing Palette

You can reset every control within the Sizing palette at any time by choosing Reset from the Palette Options pop-up menu, or by clicking the reset button in the upper left-hand corner of the palette.

Input and Output Sizing Presets

If there are Input or Output Sizing settings that you find yourself using repeatedly, you can save them as presets for easy recall. For example, if there's a group of input settings that you use to resize a clip of a particular format to match the current project, you can save it as a preset that you can use whenever.

- **Preset pop-up menu:** Provides access to all the currently saved presets in the current database.
- **Delete preset:** To delete a preset, select it from the pop-up menu, click the trash can button, then click OK.
- **Add preset:** To add a preset, make whatever settings adjustments you need, then click the plus button. When the Format Preset dialog appears, enter a name, check that the settings are correct, then click Save.
- **Change preset:** To change a preset, load the preset you want to change, make whatever changes you need, then click the check button.

The Input and Output Sizing modes save different presets. Each of these sets of presets is available from the "Override input scaling" and "Override output scaling" pop-up menus in the Image Scaling panel of the Project Settings.

Sizing Controls With the DaVinci Control Panel

There are two sets of DaVinci control panel mappings for the sizing controls. The most obvious controls can be seen permanently mapped to the knobs and soft keys of the Transport panel. This makes these controls easy to access for projects where you're panning & scanning nearly every shot of a film-scanned program.

To adjust PTZR settings:

- 1 Press the OUTPUT or INPUT soft key to switch between Output Sizing and Input Sizing modes.
- 2 Use the PAN, TILT, ZOOM, and ROTATE knobs of the Transport panel, and the H FLIP and V FLIP soft keys.

To adjust Input and Output Blanking:

- 1 Press the INPUT BLANKING or OUTPUT BLANKING soft key on the Transport panel.
- 2 Use the knobs labeled LEFT, RIGHT, TOP, and BOTTOM to make a blanking adjustment.
- 3 Press SIZING when you're finished.

Another set of DaVinci control panel mappings appears when you press the SIZING button of the T-bar panel. In this case, the Center panel knobs and soft keys update to a page showing the following:

- **Ref Wipe Sizing Adjustments:** These controls, on the middle screen of the Center panel, let you reposition a still from the Gallery that's being displayed in a split screen. This can make it easier to compare features that would otherwise be obscured by the still's position on screen.

- **Input Sizing Adjustments:** The Input Sizing controls are displayed on the right screen of the Center panel. These are similar to the mappings on the Transport panel, but the Center panel's second row of knobs also exposes PITCH, YAW, H SIZE, and V SIZE controls, and there's an additional MODIFY PAR button that lets you change the pixel aspect ratio of a clip.
- **Output Sizing Adjustments:** If you press OUTPUT soft key on the Center panel, the knobs and soft keys change to show the Output Sizing controls. Press BLANKING to expose all the preset aspect ratios on the Transport panel, along with the USER which allows you to expose user definable presets.

To save and recall user definable blanking aspect ratios:

- 1 Press SIZING on the T-bar panel.
- 2 Press the OUTPUT soft key on the Center panel.
- 3 Press the OUTPUT BLANKING soft key on the Transport panel, and then enter the blanking aspect ratio as a number (e.g., 2.4) using the number pad on the Transport panel to set your customized blanking.
- 4 Press the BLANKING soft key on the Center panel.
- 5 To apply the new ratio, press the BLANKING soft key on the Center panel, then press USER on the Transport panel, and press one of the USER 1-5 soft keys.

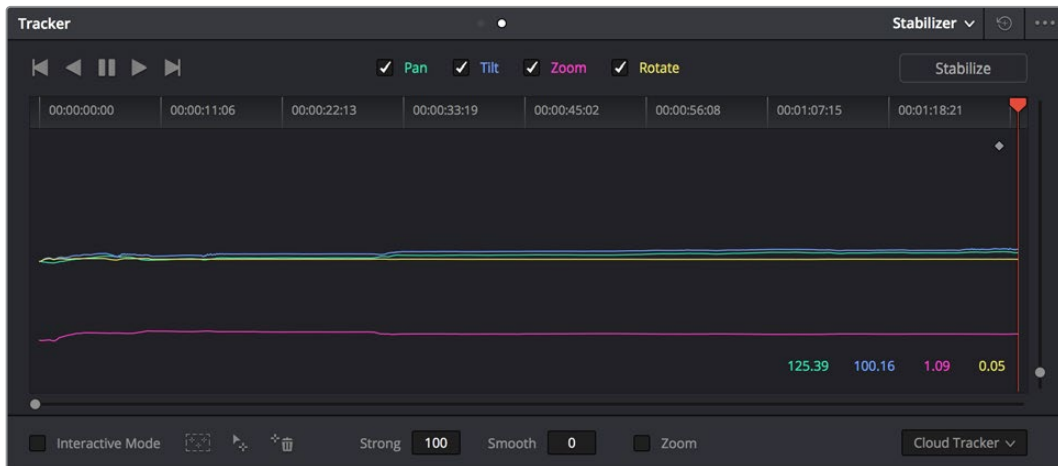
TIP: With the Input Sizing Adjustments controls exposed on the Center panel, you can set the Transport panel to display the Output Sizing controls, for simultaneous presentation of every sizing control that's available.

Image Stabilization in the Tracker Palette

The Image Stabilization mode of the Tracker palette lets you smooth out or even steady unwanted camera motion within a clip. The analysis is performed in such a way as to preserve the motion of individual subjects within the frame, as well as the overall direction of desirable camera motion, while correcting for unsteadiness.

Image stabilization in DaVinci Resolve consists of three steps. First, you analyze the clip. Second, you choose the Stabilization settings you want to use. Third, you click Stabilize to calculate the result.

When analyzing the clip, you can choose to use either the default Cloud Tracker, which automatically finds as many trackable points as possible throughout the image and calculates stabilization based on all of them, or you can use the Point Tracker, which lets you manually place one or more individual crosshairs on image features that you select. For more information on using the Point Tracker for window tracking, see Chapter 27, "Secondary Grading Controls."



The Stabilizer mode of the Tracker palette

As with Object Tracking, you can choose which aspects of motion to stabilize, but this must be done before you do the initial image analysis.

Analyze Controls

The Analyze controls automatically scan through the entire clip, identifying trackable features that can be used to stabilize the shot.

A series of four checkboxes let you turn on and off which axes you'd like to stabilize. These checkboxes must be selected before you perform an analysis in order to restrict the data that's generated.

- **Pan:** Enables horizontal stabilization.
- **Tilt:** Enables vertical stabilization.
- **Zoom:** Enables stabilization of size.
- **Rotate:** Enables stabilization of orientation.

NOTE: Once stabilization has been done, disabling these checkboxes does nothing to alter the result. To make changes, you need to enable or disable the necessary checkboxes first, and then reanalyze the clip.

The next three buttons let you perform the stabilization analysis.

- **Track Reverse button:** Initiates tracking from the current frame backward, ending at the first frame of the clip.
- **Pause button:** Stops tracking (if you're fast enough to click this button before tracking is finished).
- **Track Forward button:** Initiates tracking from the current frame forward, ending at the last frame of the clip.

Interactive Mode Controls

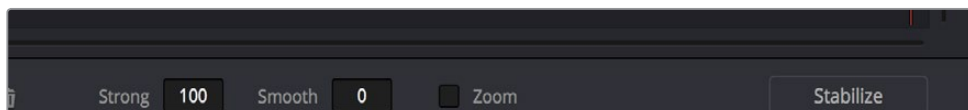
The Interactive controls let you make manual changes to the automatically generated tracking point cloud that Resolve creates, so you can try different ways of obtaining better stabilization results in challenging situations.

- **Interactive Mode checkbox:** Turns the Interactive stabilization mode on and off. When you enter Interactive mode, you can manually alter the point cloud that Resolve uses to stabilize the image. You'll then make your analysis while in Interactive mode. When you exit Interactive mode, your manual changes to the point cloud are eliminated, and Resolve again uses automatically placed point clouds to do all stabilization.
- **Insert:** Lets you add tracking points to whatever analyzable features exist within a bounding box that you've drawn in the Viewer. Inserted stabilization points are automatically placed.
- **Set Point:** Lets you use the cursor (using the DaVinci Resolve control panel), to manually place individual tracking points, one by one, with which to track a feature. If there is no trackable pixel group at the coordinates where you placed the cursor, a tracking point will be placed at the nearest trackable pixel group. You must place at least two tracking points at different pixel groups to track rotation, and at least three to track zoom.
- **Delete:** Eliminates all stabilization points within a bounding box that you've drawn in the Viewer.

The procedures for using Interactive Mode for stabilization are the same as for tracking. For more information, see Chapter 27, "Secondary Grading Controls."

Stabilization Parameters and Controls

There are five controls in the Stabilization group:



Stabilization selections

- **Strong:** Lets you choose how tightly you want to use the stabilization track to eliminate motion from a shot. With a value of 100, stabilization is maximized in an effort to "lock" the shot in place and eliminate all camera motion. This value is a multiplier. Since some clips might look more natural with looser stabilization, choosing a number lower than 100 lets a percentage of the original camera motion show through. Zero (0) disables stabilization altogether. Additionally, you can invert the stabilization by choosing -100, as described in the section on performing a match move below, and you can use a negative value either lower or higher than -100 to under or overcompensate when inverting the stabilization, simulating the effects of parallax where foreground and background planes move together but at different speeds.
- **Smooth:** Lets you apply mathematical smoothing to the analyzed data used to stabilize the clip, and is meant to be used when the Strong parameter is less than 100, allowing camera motion in the shot while eliminating unwanted wiggling. Lower values perform less smoothing, allowing more of the character of the original camera motion to show through, while higher values smooth the shot more aggressively.
- **Zoom:** When this checkbox is turned on, the image is resized by a large enough percentage to eliminate the blanking (black edges) that is the result of repositioning the image to eliminate unwanted camera motion. The higher a value Smooth Frames is set to, the more Resolve will need to zoom into an image to eliminate these blanked edges. If you turn this off, the image is not zoomed at all, and whatever blanking intrudes into

the image is output along with the image, on the assumption that you'll have dedicated compositing artists deal with eliminating this blanking by filling in the missing image data in a more sophisticated manner. You may also leave this checkbox turned off if you're planning on animating the Input Sizing Zoom parameter to dynamically zoom into and out of a shot being stabilized to eliminate blanking only where it occurs, using only as much zooming as is necessary for each region of the shot.

- **Tracker Type:** A pop-up menu below the Tracker graph lets you choose whether to use the Cloud Tracker or the Point Tracker. The default Cloud Tracker automatically finds as many trackable points as possible throughout the image and calculates stabilization based on all of them. This is fast, but can result in problems if there are too many prominent subjects in the frame with different vectors of motion. The Point Tracker, by contrast, lets you manually place one or more individual crosshairs on image features that you select. This involves more steps, but has the advantage of letting you choose exactly which features exhibit the motion you're trying to stabilize. For more information on using the Point Tracker for window tracking, see Chapter 27, "Secondary Grading Controls."
- **Stabilize:** After you've tracked the clip and adjusted the previous two controls, you need to click Stabilize to calculate the resulting effect of the Strong, Smooth, and Zoom controls on your clip. Whenever you make changes to the Strong, Smooth, or Zoom parameters, you need to click Stabilize to recalculate the resulting effect on your clip.

Using Stabilization

Image stabilization in DaVinci Resolve is easy, but you need to follow a specific series of steps for it to be successful.

To stabilize an image:

- 1 Open the Tracker palette, and choose Stabilizer from the Palette mode pop-up menu.
- 2 Turn off any of the Analyze checkboxes (Pan, Tilt, Zoom, Rotate, Perspective 3D) that correspond to transform axes you don't want to smooth.
- 3 Click the Track Forward button to track the clip forward (or Track Reverse if you'd rather start from the end of the clip and work backwards).



Multiple tracking points are automatically placed to analyze the motion of the image for stabilization

This analyzes the clip, but no stabilization is yet applied.

- 4 Adjust the Strong parameter to reflect what kind of stabilization you want. If you want to eliminate all possible motion from the shot, leave Strong set to 100. If you want to use stabilization to smooth out the shot but leave some motion in the frame, reduce the strong parameter to be less than 100 but greater than 0. This parameter is a multiplier, so higher numbers reflect a higher percentage of smoothing being applied to the clip's range of motion, and lower numbers reflect a lower percentage of smoothing being applied to the original range of motion.
- 5 If you've set the Strong parameter to a value less than 100 to calm the motion in the shot, rather than lock the shot completely, you can also adjust the Smooth parameter to mathematically smooth what motion that remains in the shot. This lets you even out any "wobbling" that you don't want, while retaining the camera motion that you do want. The Strong and Smooth parameters work together, so experiment with different values in each parameter to get the result you need.
- 6 Choose how you want the edges of the stabilized clip to be handled using the Zoom checkbox:

If you want Resolve to zoom into the image as much as is necessary to prevent blanking (black edges) from intruding into the frame (the result of repositioning the image to steady camera motion), then turn on the Viewer Zoom checkbox.

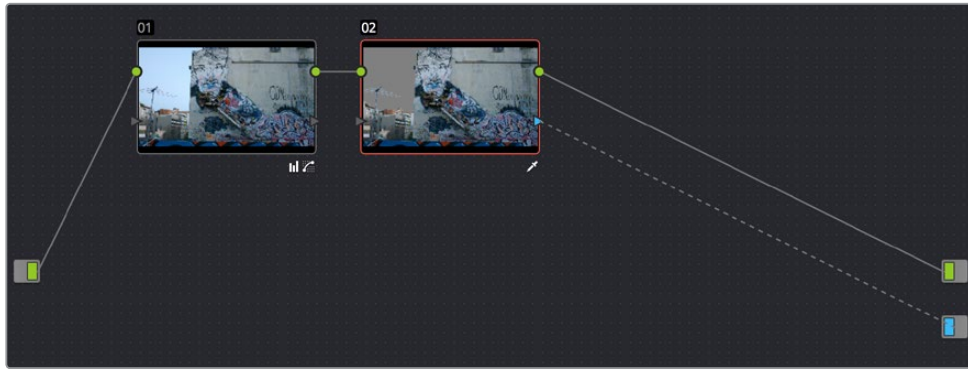
If you want to leave the scale of the image alone, allowing blanking (black edges) to intrude into the frame so that you either (a) have an effects artist deal with filling in these holes later, or (b) manually animate the Input Sizing Zoom parameter to eliminate blanking in a dynamic way, then turn off the Viewer Zoom checkbox.
- 7 With all of these controls adjusted, click Stabilize. The clip is immediately transformed to apply the amount of stabilization you selected via the Smooth Frames slider.
- 8 Play the clip and examine the stabilization effect. If you need to make any changes, choose new Strong and Smooth Frames values, then click Stabilize. Any time you change any of the Stabilization parameters, you need to click Stabilize to recalculate the resulting transform to your clip.

Using Stabilization to Create a Match Move

In some circumstances, such as when you're using the HSL Qualifier to create transparency for a composite (using the Alpha Output described later in this chapter), you may find you need to apply the motion from a foreground clip to the background clip so that the two clips appear to be moving as one. This is referred to as doing a "match move," and is a necessary step when creating a composite for purposes of doing a sky replacement, for example. This can be done in a simple way using the Stabilizer mode of the Tracker palette.

To match the motion of a background clip to a foreground clip:

- 1 First, in the Edit page, edit a foreground clip onto track V2, and a background clip with a more interesting sky onto track V1.
- 2 With that done, open the Color page and follow the instructions in the section titled "Using a Qualifier Key to Create Transparency" in Chapter 30, "Working in the Node Editor," to key the sky, and use that key to create a region of transparency in the foreground clip that lets the background sky clip in track V1 show through.



Creating transparency to replace the sky in a superimposed clip with a sky image edited into a lower video track

In this example, the plain blue sky is being keyed so that it can be replaced with a more interesting photo of a dramatically cloudy sky.

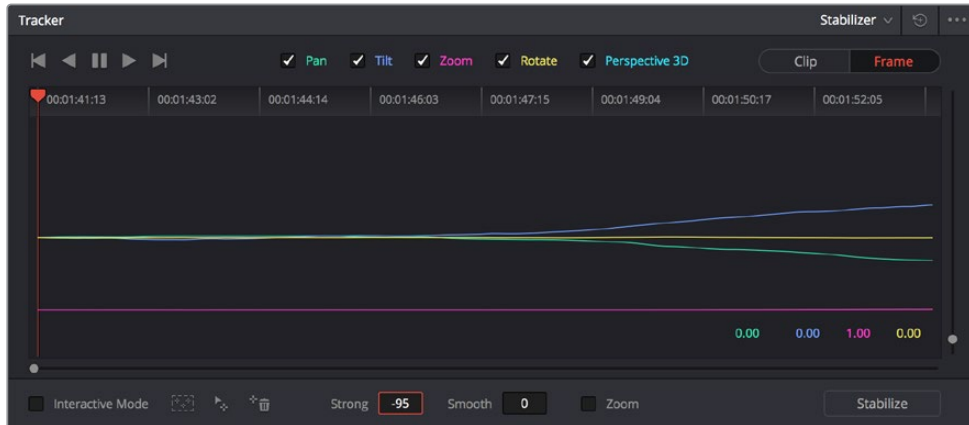


Before (top) and after setting up a sky replacement by connecting an HSL qualifier of the blue in the sky to the Alpha Output to create transparency

This procedure works equally well with still images or movie clips. Also, depending on the range of motion you're going to be matching, you'll probably need to use a background image that's somewhat larger than the region you're keying, to make sure you have full coverage as the layer moves to match the foreground motion. If necessary, you can zoom into the image using the Zoom parameter in the Transform section of the Edit page Inspector.

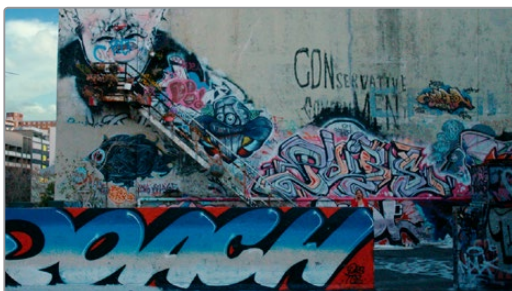
- 3 In this example, the foreground clip happens to have a camera pan, which gives the composite away as the sky doesn't move along with it. To move the compound clip of the sky image to match this pan, open the Tracker pallet.
- 4 Choose its Stabilizer mode, and then click the Analyze Forward button to analyze the motion of the entire clip. Then, click the Tracker palette's Option menu, and choose Copy Track Data.

- 5 Select the clip that you want to match (in this case the sky image), then open the Tracker Palette's Option menu and choose Paste Track Data.
- 6 Now, for this to work correctly, you need to set the Strong parameter to -100 , and click the Stabilize button. Setting a negative value inverts the tracking data you copied in step 3, which enables it to become a match move. If you're feeling extra tricky, you can set the Strong parameter to a little less than -100 , say -94 , which introduces a disparity of foreground and background motion that simulates parallax.



Inverting the Strong parameter with a negative number to create matched motion

At this point, playing through the clip should result in a nicely matched correspondence between the movement of the foreground and background layers.



The background sky layer after it's been matched to the motion of the foreground layer, the sky now follows along with the motion of the camera in the superimposed clip

Tracking and Stabilizing with the DaVinci Control Panel

All of the tracking commands are available via the DaVinci Resolve control panel.

To open and close tracking controls:

- Press OBJECT TRACK MODE at the top of the T-bar panel.
- All of the tracking controls appear on the soft keys of the Center and T-bar panels.

To do simple tracking:

- Use the TRACK FWD, TRACK REV, and STOP TRACK soft buttons on the left side of the Center panel.
- Press SHOW TRACK if you want to see the resulting motion path.

To turn tracking on and off for Pan, Tilt, Zoom, and Rotate:

- 1 Press the P/T/Z/R ENABLE soft key. The middle four soft keys of the Center panel change to display PAN ON/OFF, TILT ON/OFF, ZOOM ON/OFF, and ROTATE ON/OFF.
- 2 Use these buttons to toggle any of these checkboxes on or off, then press BACK to go back to the other tracking controls.

To interpolate between two separately tracked ranges of frames:

- 1 Use the transport controls to move the playhead to the first frame you want to place a mark, and press MARK. A Viewer Mark appears on the tracking bar, identifying either the beginning or the end of the gap in that clip's motion tracking data.
- 2 If necessary, use the transport controls to move the playhead to the second frame where you want to place a mark, and press MARK. A second Viewer Mark appears in the tracking bar, identifying both the beginning and end of the gap in that clip's motion tracking data.
- 3 To perform the interpolation, do one of the following:
 - If you marked both the first and last tracked frames that surround a gap in tracking data, press the INTRPLT BETWEEN soft key.
 - If you marked the last tracked frame in the first half of the clip, then use the transport controls to move the playhead to the first tracked frame of the second half of the clip and press the INTRPLT REV soft key.
 - If you marked the first tracked frame in the second half of the clip, then use the transport controls to move the playhead to the last tracked frame of the first half of the clip and press the INTRPLT FWD soft key.

To move the playhead to different "cue" frames:

- Press the CUE START, CUE LOWER, CUE UPPER, or CUE END soft keys on the T-bar panel.

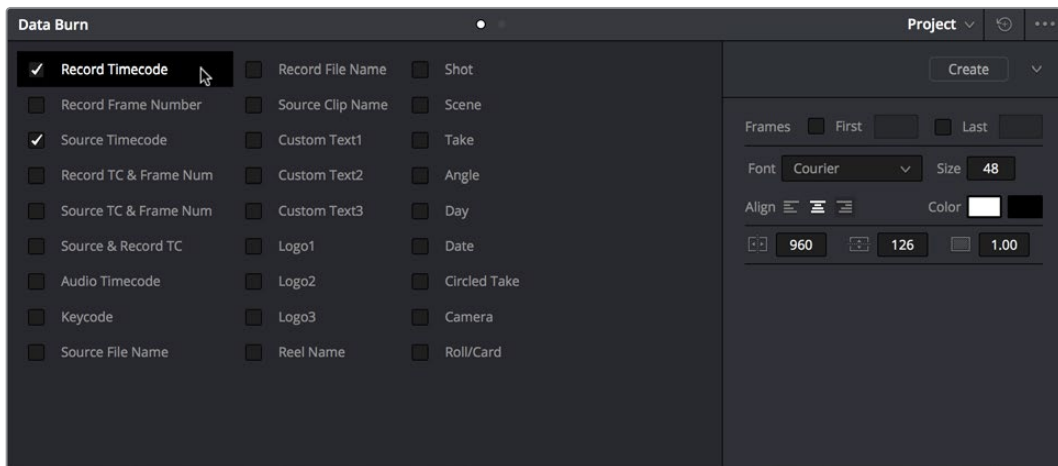
To use Interactive mode:

- 1 Press the INTERACTIVE soft key at the left of the Center panel.
Additional button controls appear on the soft keys of the Transport panel, including INSERT (POINTS), DELETE (POINTS), CLEAR (POINTS), and SET POINT.
- 2 Do one of the following:
 - To eliminate all tracking points, press the CLEAR soft key.
 - To add a single tracking point, press CURSOR (above the fourth trackball), use the fourth trackball to position the on-screen cursor over the feature you'd like to add a tracking point to, and then press the SET POINT soft key.

- To eliminate a range of tracking points in order to prevent the tracking of an undesirable feature, use the mouse to draw a bounding box around the tracking points you want to remove, and press the DELETE soft key.
 - To add a range of tracking points to a specific feature, use the mouse to draw a bounding box around the feature you want to track, and press the INSERT soft key.
- 3 Use the TRACK FWD, TRACK REV, and STOP TRACK soft buttons on the left side of the Center panel to perform the necessary tracking.
 - 4 Press the INTERACTIVE soft key again to leave Interactive mode.

Data Burn

The Data Burn palette lets you display select metadata as a “window burn” that’s superimposed over the image in the Viewer. This window burn is written into files that you render in the Deliver page, and it’s also output to video, for viewing on your external display, or for outputting to tape.



Data Burn-in palette

Window burns are useful as a reference when creating offline media that you need to keep track of later. It’s also useful for watermarking review files that you don’t want to be distributed accidentally, for adding logos or “bugs” to programs in preparation for broadcast, or for temporarily displaying timecode or clip names to refer to on your monitor when reviewing dailies with a client.



Viewer displaying a logo, custom text, timecode and file path

Project vs. Clip Mode

The Palette mode pop-up menu lets you choose whether you want to edit burned-in metadata on a clip-by-clip basis to be applied when rendering individual source clips, or one set of burned-in metadata that will be displayed for the entire duration of the Timeline, to be applied when rendering either individual source clips or as one single clip.

Setting Up Burned-In Metadata

Setting up different clip and project metadata to output as a window burn is easy.

To set up a window burn:

- 1 Choose Project or Clip mode from the Palette mode pop-up menu.
- 2 Turn on the checkboxes of whatever items of metadata you want to display in the “Add to Video Output” column. More information about the available items appears later in this chapter.

The first item of metadata is centered near the bottom of the frame, above Action Safe. Each additional item of metadata you turn on for display is added above whichever items are already displayed, regardless of their position in the “Add to Video Output” list.

- 3 Click any currently enabled item of metadata from the list to highlight it in orange, and edit that item’s Custom Output parameters at the right. More information about the available parameters appears later in this chapter.

To reset the current window burn setup:

Click the Options pop-up menu, and choose Reset to reset the current mode of the Data Burn palette.

Saving and Loading Burn-In Presets

If there are common sets of metadata that you regularly use and switch among, you can save each set up as a preset for future use.

To save a burn-in preset:

- 1 Click the Preset name field, and type a name.
- 2 Click the Preset Options pop-up menu, and choose Add Preset. That preset is added to the list of saved presets.

To delete a burn-in preset:

- 1 Choose a preset from the Preset menu.
- 2 Click the Preset Options pop-up menu, and choose Del Preset.

To modify a burn-in preset:

- 1 Choose a preset from the Preset menu.
- 2 Edit it however you like.
- 3 Click the Preset Options pop-up menu, and choose Update Preset.

Data Burn Metadata

The leftmost column in the Data Burn palette contains a list of all the options that you can add to the video output as a window burn. Each option has a checkbox that lets you turn it on or off. You can also select in the Option pop-up if you would like the item name rendered as a prefix to the burn-in data.

NOTE: If two clips overlap in the Timeline, the metadata that matches the currently visible clip in the Viewer is what will be displayed in the window burn.

- **Record Timecode:** The timecode relative to the Timeline, as set in the Conform Options in the Master Project Settings of the Project Settings.
- **Record Frame Number:** The number of frames from the first frame of the Timeline.
- **Source Timecode:** Each clip's individual timecode.
- **Record TC & Frame Num:** Both metadata options combined in one line.
- **Source TC & Frame Num:** Both metadata options combined in one line.
- **Source & Record TC:** Both metadata options combined in one line.
- **Audio Timecode:** The timecode of audio that's been synced to a clip.
- **Keycode:** Also referred to as edge-code, the identification codes running along the edge of film stocks that provide an absolute reference for which digital frames correspond to which film frames.
- **Source File Name:** The full file path, including file name, of the media file that's linked to the current clip.
- **Record File Name:** The file name as defined in the Render Settings list of the Deliver page.
- **Source Clip Name:** The file name of the media file that's linked to the current clip, without the file path.
- **Custom Text1:** A line of text that you type into the Text field of the Custom Output parameters. You can use any characters you like. When editing any of the three custom text fields that are available, you can use "metadata variables" that you can add as graphical tags that let you display clip metadata. For example, you could add the corresponding metadata variable tags %scene_%shot_%take and the custom text would display "12_A_3" if "scene 12," "shot A," "take 3" were its metadata. For more information on the use of variables, as well as a list of all variables that are available in DaVinci Resolve, see Chapter 44, "Using Variables and Keywords."
- **Custom Text2:** A second line of text that you can customize.
- **Custom Text3:** A third line of text that you can customize.
- **Logo1:** Lets you superimpose a graphic over the image in a customizable location. Compatible graphics formats include PNG, TGA, TIF, BMP, and JPG. Alpha channels are supported for transparency in logos.
- **Logo2:** Lets you superimpose a second graphic.
- **Logo3:** Lets you superimpose a third graphic.
- **Reel Name:** The currently defined reel number for the current clip.
- **Shot:** Shot metadata, if it's been written to the file by a camera, or entered into the Metadata Editor on the Media page.
- **Scene:** Scene metadata, if it's been written to the file by a camera, or entered into the Metadata Editor on the Media page.

- **Take:** Take metadata, if it's been written to the file by a camera, or entered into the Metadata Editor on the Media page.
- **Angle:** Angle metadata, if it's been written to the file by a camera, or entered into the Metadata Editor on the Media page.
- **Day:** Day metadata, if it's been written to the file by a camera, or entered into the Metadata Editor on the Media page.
- **Date:** Date metadata, if it's been written to the file by a camera, or entered into the Metadata Editor on the Media page.
- **Circled Take:** Corresponds to Good Take metadata, if it's been written to the file by a camera, or entered into the Metadata Editor on the Media page.
- **Camera:** Corresponds to the Roll/Card metadata, if it's been written to the file by a camera, or entered into the Metadata Editor on the Media page.
- **Roll/Card:** Corresponds to the Roll/Card metadata, if it's been written to the file by a camera, or entered into the Metadata Editor on the Media page.

Custom Output Options

The parameters in the Custom Output panel let you modify the look, position, and in some cases content, of the selected metadata item. Pan and Tilt are individually customizable for each metadata item.

- **First x frames:** Turning on this checkbox lets you specify a number of frames during which the current item of metadata will be displayed before dissolving away over one second. When enabled, the current item of metadata will cut onscreen with the beginning of each new clip, remain onscreen for the duration specified, and then dissolve away.
- **Last x frames:** Turning on this checkbox lets you specify a number of frames before the end of each clip during which the current item of metadata will appear onscreen after fading up over one second, before cutting away with the end of the clip.
- **Pan:** Lets you change the horizontal orientation of the current item of metadata. The default value is the center of the frame, relative to the current project's frame size.
- **Tilt:** Lets you change the vertical orientation of the current item of metadata. The first item of metadata is centered near the bottom of the frame, above Action Safe. Each subsequent item of metadata you turn on is automatically placed above the previous item of metadata, regardless of its order in the "Add to Video Output" list.
- **Font:** Defaults to Courier, but you can choose any font that's installed on your system.
- **Size:** Defaults to 48, but you can choose standard increments from 6 to 72.
- **Justify Text:** Defaults to Center. The only other option is Left.
- **Color:** Defaults to white, but you can choose from a range of predefined colors in this pop-up menu.
- **Background:** Defaults to black, although the apparent color is influenced by the Opacity setting. For a more garish look, you can choose from a range of predefined colors in this pop-up menu.
- **Opacity:** Defaults to 0.50. Lets you define the transparency of the burned-in metadata's background color.
- **Text:** (only if one of the Custom Text options is checked) A text field that lets you enter custom text to display as one of three possible custom text items.
- **Logo:** (only if one of the Logo options is checked) A field that displays the file path of any currently selected graphic that you're displaying as one of the three possible Logo graphics. Compatible graphics formats include PNG, TGA, TIF, BMP, and JPG. Alpha channels are supported for transparency in logos.
- **Import File button:** (only if one of the Logo options is checked) Lets you choose a graphics file to use as a logo.

Gang Rendered Text Styles

You have the option of independently styling each item of metadata, depending on whether the Gang Render Text Styles option is checked in the Data Burn palette's Option menu. When turned on, all text metadata share the same font, size, color, background, justification, and opacity. When turned off, each item of metadata can have individual settings.

Prefix Render Text

Another option in the Data Burn palette's Option menu lets you turn the prefixes, or headers, on or off for all metadata that's enabled to be burned in.

Dust Removal

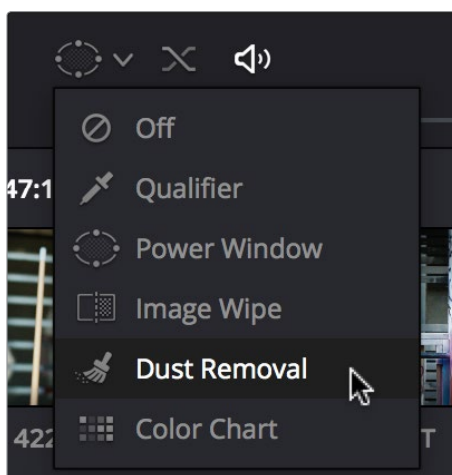
The interactive Dirt and Dust Removal tool provides an interface for dustbusting right from within DaVinci Resolve. This is a raster-based effect, and results in a duplicate set of "dustbusted" media being created within a hidden subdirectory.

If, at any point, you're unsatisfied with the adjustment you've made, you need only use the Undo command to return the clip you're working on to its prior state.

NOTE: The Dirt and Dust Removal tool only works with DPX image sequences. Media in a raw, ProRes, or DNxHD format must first be converted to a DPX image sequence before it can be operated on with this tool.

To use the Dirt and Dust Removal tool:

Click the Onscreen Control pop-up menu at the bottom left of the Viewer, and choose Dust Removal.



Selecting the Dirt and Dust tool in the Viewer OSD menu

To open the Dirt and Dust Removal tool setup options:

- Right-click the Dirt and Dust Removal icon showing in the Onscreen Control pop-up to open the setup window.

Dirt & ROI Settings Parameters

In the Dirt & ROI Settings window, there are a number of parameters that you can use to optimize this tool for the particular problem you're trying to solve.

- **Algorithm:** The Algorithm pop-up menu lets you select the method of filtration to use when painting out dirt or dust. Different options provide different methods for replacing the problem pixels with image data copied from other frames in time, or from other regions of the current frame. You'll want to choose an option that works best for the type of camera and subject motion happening within the clip you need to clean. For more information on the advantages of each algorithm, see the next section.
- **Aggression:** Increase or decrease the Aggression and Blend sliders depending on the degree of correction you want to apply.
- **Blend:** Sets the % of the original image to be feathered at the edges of the repair.
- **Optimize:** Turning this option on provides better-looking results, at the expense of increased processing time.
- **ROI Mode:** Determines whether a correction is applied with a single click, or via a paint stroke. There are three options.
- **Click and Clean:** Applies a correction with one click, and is fast to use on small dust spots.
- **Draw and Clean:** Lets you "paint" over a larger dirty area with the mouse or a pen, with the correction being applied at the conclusion of your paint stroke.
- **Cnc Size:** Defines the width of the "brush" that's used to paint out dirt and dust.

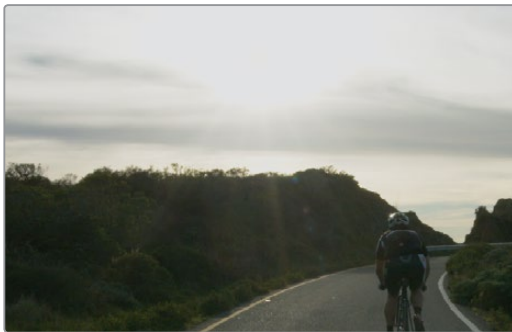
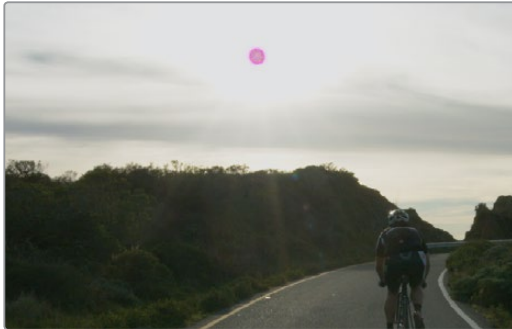
Algorithms for Dirt and Dust Removal

There are six algorithms you can choose from that determine how the pixels you paint over are automatically replaced.

- **Auto-temporal +/- 1:** When an ROI is drawn, the previous frame, the next frame and the current frame will all be used for analysis. The best of these 3 will be automatically selected and used for removing the dirt in the current frame.
- **Auto-temporal +/- 2:** This is the same as the above, but the frames used instead are the current frame, previous-to-previous frame (i.e., 2 frames back), and next-to-next frame (i.e., 2 frames forward). Therefore, if the ROI is drawn on frame 100, frame 98, frame 100 and frame 102 will be used for analysis. The best of these 3 will be used for removing the dirt in the current frame. The advantage of this selection is that it will avoid the appearance of frozen grain, which may be possible in case of dirt against a stationary background.
- **Temporal +/- 1:** if the ROI is drawn by dragging the mouse from left to right, the next frame will be used for motion-compensated dirt removal. If the ROI is drawn by dragging the mouse from right to left, the previous frame will be used.
- **Temporal +/- 2:** if the ROI is drawn by dragging the mouse from left to right, the next-to-next frame will be used for motion-compensated dirt removal. If the ROI is drawn by dragging the mouse from right to left, the previous-to-previous frame will be used.
- **Spatial:** In case of fast or blurred motion, using the previous or next frames may give unsatisfactory results. In this case, the same frame itself can be used for removing the dirt. This will use surrounding information in the current frame to remove the dirt.
- **Median:** The Median filter performs a blending of the pixels, smoothing out the region. Use this when other options do not replace the image, or when there is no support information in which to reconstruct the original. Using small boxes will produce better results.

Black Sun Highlight Correction

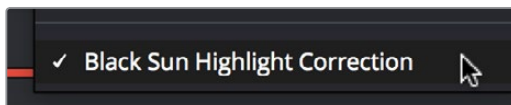
If your project uses media shot with one of the Blackmagic Cinema, Production, Pocket, or Ursa cameras, and you have clips that exhibit so-called “black sun” artifacts, where bright on-screen highlights appear with a dark magenta spot, a command exists to quickly and easily remove these artifacts.



(Top) Black Sun artifact seen in image,
(Bottom) Artifact removed using Black Sun Highlight Correction

To remove black sun artifacts from Blackmagic camera footage:

Right-click the affected clip’s thumbnail in the Thumbnail timeline of the Color page, and choose Black Sun Highlight Correction from the contextual menu.



The command for removing black sun artifacts