

PART 11

Color Page Effects



Chapter 148

Using Open FX and Resolve FX

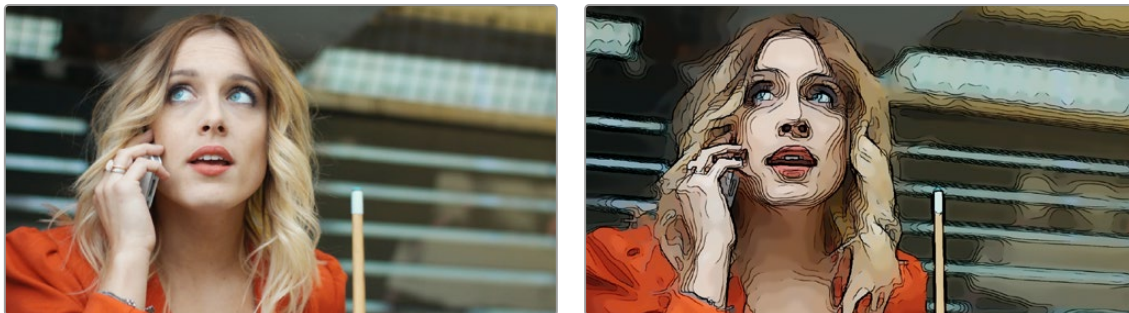
This chapter covers the use of Resolve FX and Open FX plug-ins, that allow you to use the built-in filters that come with DaVinci Resolve, as well as third-party filters from a variety of companies, to create complex effects and adjustments that aren't possible using the ordinary palette tools in the Color page.

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Resolve FX

Resolve FX are the built-in plug-ins that come with DaVinci Resolve. These plug-ins span the gamut from blurs and complex color adjustments to stylized image treatments and lighting effects to sharpen and repair operations that are too complex to accomplish using the palette controls of the Color page.



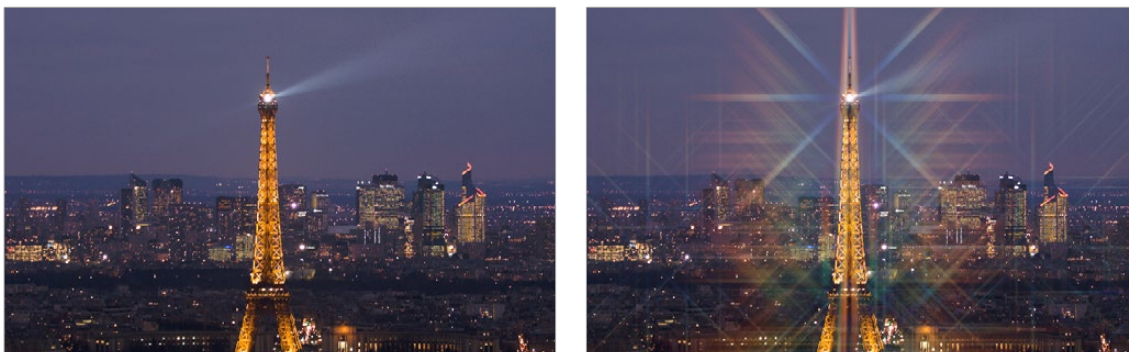
An image before/after using the Abstraction Resolve FX filter

Most Resolve FX plug-ins have been optimized for real-time playback, making it possible to apply complex effects such as Lens Flares, Light Rays, Film Grain, or Warping, and make adjustments while getting immediate, high-quality feedback, and enabling you to play each variation of your effect as you work without the need to wait for rendering or caching to happen first. Of course, if you're working with extremely high-resolution or raw source media, if your workstation is particularly old, or if you're applying many Resolve FX all at once, your performance may slow, necessitating the use of either the Smart Cache or User Cache.

Open FX

Open FX (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 BorisFX Sapphire and Continuum Complete, Red Giant Universe, and NewBlue TotalFX, all of which are ubiquitous tools for feature and broadcast work. The available Open FX plug-in packages are also growing every year as this format becomes more widely adopted among developers.

With Open FX support, you can use plug-ins to do many stylized operations that would be difficult or impossible to do using the other tools in DaVinci 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.



One of the many Sapphire OFX plug-ins from GenArts

The installation and licensing of Open FX plug-ins is handled by a vendor’s own installer. Once installed, Open FX 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 or Edit page Interface toolbar.

Where are OFX Installed?

According to the standard governing how OFX work, all OFX plug-ins on a particular workstation are installed into a standardized location to foster plug-in compatibility with multiple applications. These locations are:

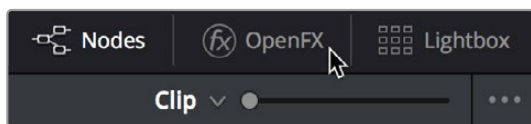
- **On macOS:** /Library/OFX/Plugins
- **On Windows:** C:/Program Files/Common Files/OFX/Plugins
- **On Linux:** /usr/OFX/Plugins

Open FX Plug-Ins Can Be Processor Intensive

Because they create such a wide variety of effects, some third-party Open FX 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 Open FX 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 8, “Improving Performance, Proxies, and the Render Cache.”

Browsing the Open FX Library

All of these built-in plug-ins appear within categories at the top of the Open FX Library.

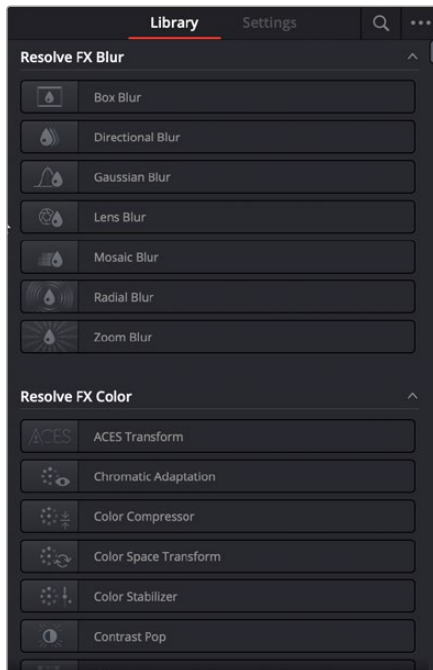


Click the FX button to open the Open FX Library

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 Open FX 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 arrows that appear to the right of the category name, which let you show or hide the contents so that you can make the hierarchy as compact or spread out as you like.

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

- Move the pointer over the header you want to open or close, and click the Close or Open arrow to the right of the category name.
- To open or close all headers at once, Option-click the Open or Close arrow.



The Library in the Open FX panel showing available OFX filters

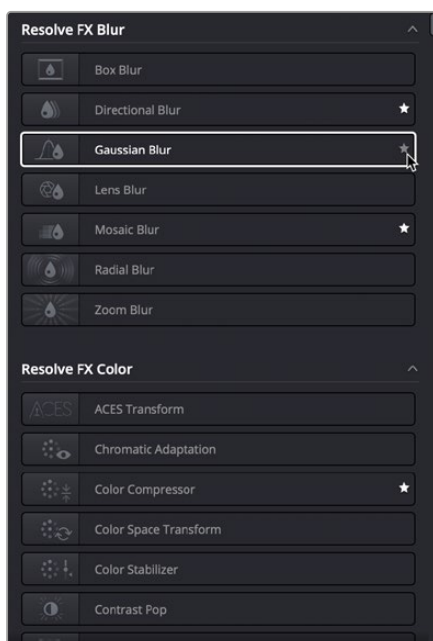
Since many Open FX plug-in collections are quite large, an optional Search field can be opened at the top of the Library that lets you quickly find plug-ins by name or partial name.

To search for an Open FX filter by name:

- 1 Click the magnifying glass button at the upper right-hand corner of the Open FX 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.

Open FX Library Favorites

You can click on the far right of any Resolve FX or OFX filter to flag it with a star as a favorite filter. When you do so, choosing Favorites from the Effects Library option menu filters out all clips that are not favorites, letting you see only effects you most commonly use. To “de-favorite” any effect, click its star to turn it off.



Stars indicate a flagged favorite effect

Using Resolve FX and Open FX in the Color Page

This section provides an overview of procedures that describe how you can work with Open FX plug-ins within the Color page.

Methods of working with Open FX:

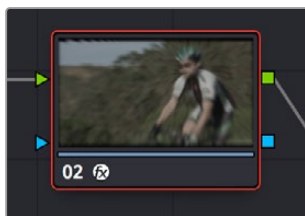
- **To add an Open FX plug-in to a node:** Drag a plug-in from the Open FX Library onto a node. If you drag a plug-in onto a node that already has a plug-in, the previous plug-in will be overwritten.
- **To remove an Open FX plug-in from a node:** Right-click a node showing the FX badge, and choose Remove OFX Plug-in from the contextual menu.
- **To add an Open FX plug-in as a separate node:** Drag a plug-in from the Open FX Library onto a connection line in the Node Editor. A new node is created and labeled with the name of the Open FX plug-in.
- **To edit the parameters of an Open FX 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 Open FX 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 Open FX onscreen controls in the Viewer:** Select any node with an FX badge, and the onscreen controls, if there are any, should appear in the Viewer. If not, make sure the Viewer mode drop-down is set to FX.

Applying Resolve FX and Open FX Plug-Ins

Once you've found an Open FX plug-in you want to use in the Library, there are two ways of applying it within the Node Editor of the Color page. Which method you use depends on how you want to use that plug-in.

Adding a Plug-In to a Corrector Node

If you want to combine an Open FX plug-in with a grade within a single node, simply drag and drop it onto a new corrector node to apply that plug-in's effect to that node. Nodes with an Open FX plug-in applied have an FX badge in the bottom left-hand corner.



A node with an Open FX plug-in applied

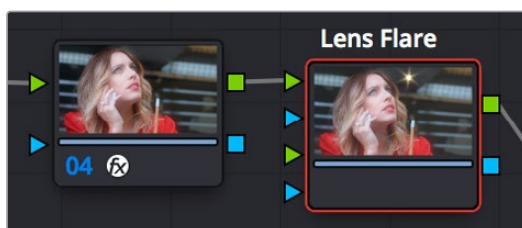
You can only apply one Open FX plug-in to a node at a time, but by using multiple nodes you can add as many Open FX plug-ins to your grade as you need.

When added to a corrector node, Open FX are applied after Motion Blur and Noise Reduction, but before anything else. This means you can use Motion Blur and Noise Reduction to pre-process the image before it's handed off to the Open FX plug-in. This also means that all other adjustments you make within that node are applied to the Open FX plug-in's output.

However, the principal advantage of adding plug-ins to corrector nodes is that you can use secondary operations such as a window, a qualifier, or a key to limit that plug-in's effect, much as you would limit any other kind of adjustment you'd make with a corrector node.

Adding a Plug-In as a Stand-Alone OFX Node

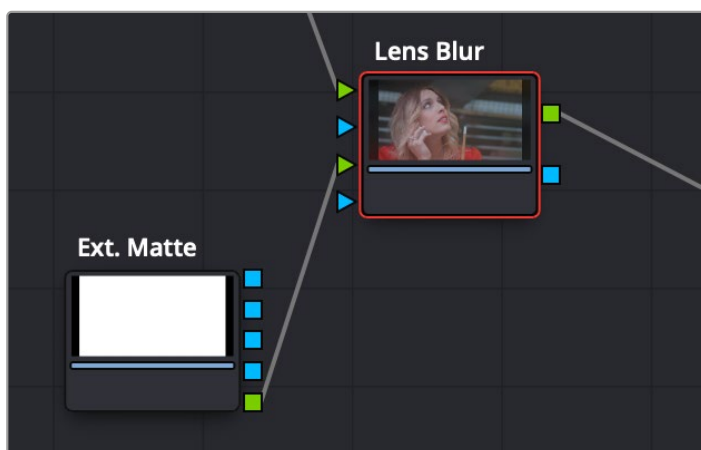
If you want to add an Open FX plug-in to your grade as a stand-alone effect, you can simply drag any plug-in from the Open FX Library onto a connection line of your grade, and an Open FX node will be created.



(Left) A node with an OFX filter applied to it,
(Right) A stand-alone Open FX node

The advantage of this is that it's fast to apply plug-ins in this way, and this can be an easier way for you to add plug-ins that are more complicated, such as those having multiple inputs for creating compositing effects.

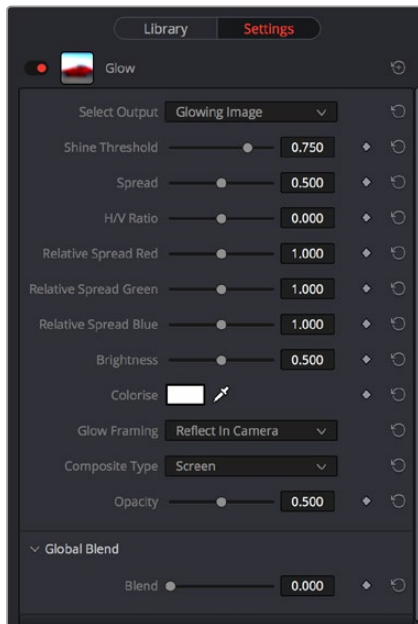
For example, the Lens Blur plug-in lets you connect a black and white image that's been added to the node tree as an external matte to a Lens Blur node's second RGB input to use to create custom bokeh effects when you set the Shape Type drop-down to External Input.



A Lens Blur node set up using a second RGB input with External Input Shape Type

Resolve FX and Open FX Settings

When you select a node with a Resolve FX or Open FX 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 the VHS plug-in from Red Giant Universe

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

Editing Effects Using the Full Screen Viewer

Because the Open FX panel can often be too short to present the full controls of more complicated filters, it remains visible when you switch to the Full Screen Viewer mode in the Color page. Jump into this mode by choosing Workspace > Viewer Mode > Full Screen Viewer (Shift-F).

This control layout makes it considerably easier to do detailed work while viewing a larger image and having all of your effects visible in a taller panel off to the side.



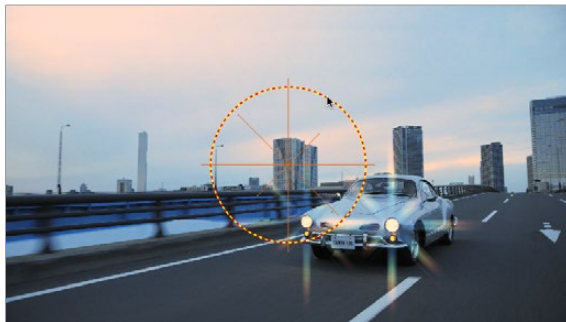
The Full Screen Viewer mode of the Color page lets you keep the Settings panel open as you work

TIP: You can also open and close the Node Editor while in Full Screen Viewer mode, if you need to switch nodes while doing effects work.

Resolve FX and Open FX

Onscreen Controls

In the Edit page, Fusion page, and Color page, Resolve FX and Open FX display on-screen controls that you can use to visually edit an effect. In the Edit and Color pages, selecting an Open FX plug-in node or a plug-in in the Inspector that has onscreen controls automatically changes the Viewer's mode to Open FX Overlay mode, with the available controls ready to use. 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 onscreen controls exposed by the GenArts Sapphire Glint Rainbow plug-in

If for whatever reason you switch the Viewer to another onscreen control mode (for example, showing the Window or Image Wipe controls), you can always switch back to the Open FX controls by choosing the Open FX Overlay mode from the onscreen control drop-down menu underneath the Viewer.

TIP: You may find that as you work you want to temporarily hide or show the onscreen controls in the Viewer so you can get an uncluttered look at the image you're adjusting. You can quickly toggle any set of onscreen controls off and on without selecting Off in the menu by pressing Shift-` (tilde).

Keyframing Resolve FX and OFX in the Inspector

Resolve FX and Open FX can be keyframed in the Edit, Fusion, and Color pages. However, they can only be keyframed in the Edit and Color pages using the keyframing controls found in the Inspector (at the time of this writing). Happily, most simple keyframing tasks can be performed using three buttons that appear to the right of any parameter that's capable of being keyframed. It takes two keyframes at minimum to create an animated effect.



The three keyframe controls that appear in the Inspector, from left to right: Previous keyframe, Create/Delete keyframe, Next keyframe

Methods of keyframing parameters in the Inspector:

- **To add a keyframe:** Select a clip, open the Inspector, then move the Timeline playhead to the frame where you want to place a keyframe, and click the Keyframe button next to the parameter of the Inspector you want to animate. Once you've added at least one keyframe to a parameter, all other adjustments you make to parameters in the Inspector, or using the onscreen Transform/Crop controls in the Timeline Viewer, add new keyframes automatically if the playhead is at another frame.
- **To move the playhead to the next or previous keyframe:** Click the small left- or right-hand arrow to either side of a parameter's keyframe control, or press Right-Bracket (]) or Left-Bracket ([), to jump the playhead to the next or previous keyframe.
- **To edit an existing keyframe of a parameter:** Move the playhead to be on top of the keyframe you want to edit, and then change that parameter, either in the Inspector, or using the onscreen controls of the Timeline Viewer.
- **Methods of changing keyframe interpolation in the Inspector:**
- **To change a keyframe to Static:** (Color page only) Static keyframes create abrupt one-frame changes at the keyframe to which they're applied, which is good for creating sudden effects. Move the playhead to a frame with a keyframe using the next/previous keyframe controls, then right-click the orange keyframe button and choose "Change to Static Keyframe." The keyframe control changes to a round button to show that keyframe is now Static.
- **To change a keyframe to Dynamic:** Move the playhead to a frame with a keyframe using the next/previous keyframe controls, then right-click the orange keyframe button and choose "Change to Dynamic Keyframe." The keyframe control changes to a diamond button to show that keyframe is now Dynamic.

Methods of deleting keyframes and disabling keyframed effects:

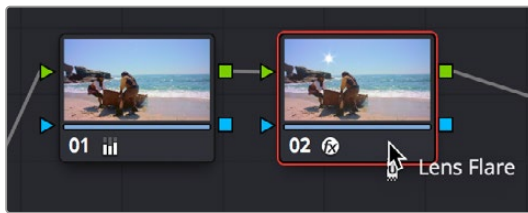
- **To delete a single keyframe:** Open the Inspector, move the Timeline playhead to a frame with a keyframe, and click the orange Keyframe button in the Inspector to delete it.
- **To delete all keyframes for one parameter:** Click the reset button to the right of a parameter's keyframe control in the Inspector.
- **To delete all keyframes in a group of parameters in the Inspector:** Click the reset button to the right of a parameter group's title bar in the Inspector.
- **To disable or enable a single parameter's keyframed effect:** In the Timeline, click the toggle control at the left of a parameter's keyframe track. A white dot means it's enabled, while no dot means it's grayed-out and disabled.
- **To disable or enable a group of parameters in the Inspector:** Click the toggle control at the left of a parameter group's title bar in the Inspector. Orange means that group is enabled. Gray is disabled.

Motion Tracking Resolve FX and Compatible OFX Plug-Ins

When using Resolve FX in the Color page, Resolve FX 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.

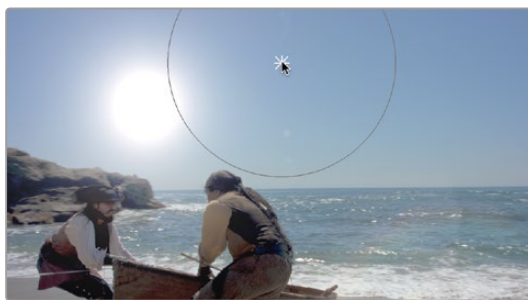
To match move Resolve FX to a feature using the FX tracker:

- 1 Create a new node, and drag the Resolve FX 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.



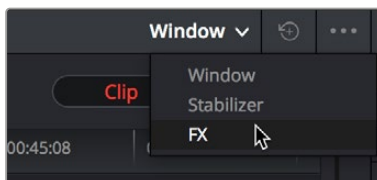
Applying a Lens Flare to the shot

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



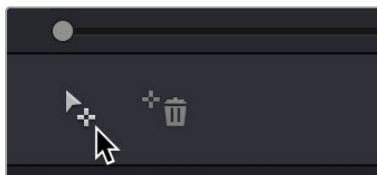
Moving the Lens Flare using the onscreen controls

- 3 Next, open the Tracker Palette and choose FX from the mode drop-down.



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 of 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 DaVinci Resolve will track the feature. The Resolve FX 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 Resolve FX to offset it from the track.

For more information about single-point tracking, see the “Point Tracker Workflows” section of Chapter 136, “Motion Tracking Windows.”

Chapter 149

Sizing and Image Stabilization

DaVinci Resolve has a powerful toolset 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. This chapter also covers how to use the Stabilizer mode of the Tracker palette to subdue unwanted camera wiggle.

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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.

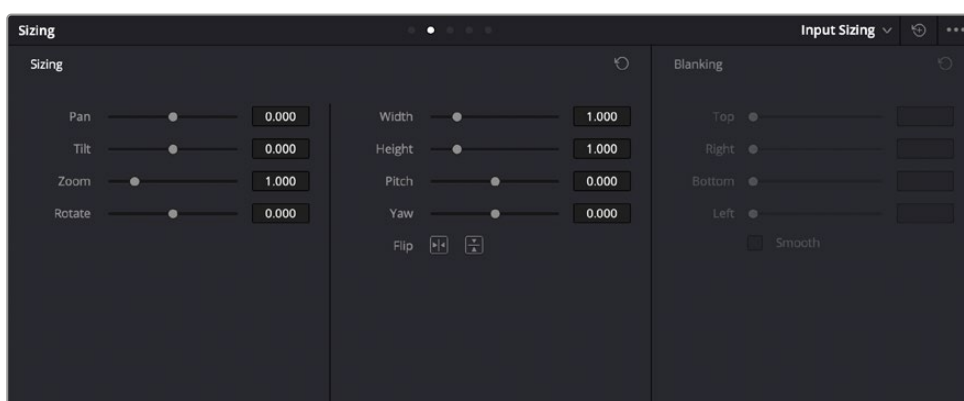
- **Edit Sizing:** These controls mirror those found in the Inspector of the Edit page.
- **Input Sizing:** These controls let you make sizing adjustments to individual clips that affect their overall geometry (pan, tilt, zoom, and rotation). These controls are useful for doing clip-by-clip pan and scan 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.

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 and 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:** Adjusts the overall dimensions of the clip. The range is from 0.250 (1/4x size) to 4.000 (4x size). Normal size is 1.000.
- **Rotate:** Positive values rotate the clip clockwise. Negative values rotate the clip counter-clockwise.
- **Width:** Stretches the image wider or narrower. The range is from 0.250 (1/4x width) to 4.000 (4x width). Normal width is 1.000.
- **Height:** Stretches the image taller or shorter. The range is from 0.250 (1/4x height) to 4.000 (4x height). Normal height is 1.000.
- **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.

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 drop-down 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
- **2.00:** Univisium. Aspect ratio designed to accommodate both theatrical wide-screen and HD delivery.
- **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 an Anti-Alias Edges setting in the Image Scaling panel of the Project Settings. For more information, see Chapter 4, “System and User Preferences.”

Resetting the Sizing Palette

You can reset every control within the Sizing palette at any time by clicking the reset button in the upper right-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 drop-down menu:** Provides access to all the currently saved presets in the current database.
- **Delete Preset:** To delete a preset, select it from the drop-down menu, click the trash can button, then click OK.
- **Save As New 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 in the Format Preset window.
- **Update Preset:** To change a preset, load the preset you want to change, make whatever changes you need, then click Update in the Format Preset window.

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” drop-down menus in the Image Scaling project setting menu.

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 and 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 the 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.

Using Node Sizing for Channel and Paint Effects

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 Color > 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 drop-down, 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 drop-down, check Key Lock, 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.

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.

Using the Stabilizer

DaVinci Resolve uses an advanced stabilizer that's capable of both warping and translation to minimize unwanted shaking in a clip. Replaces the classic stabilization tools that were available previously (these tools are still available should you need specific capabilities of the older toolset, and are covered in a later section). With a single click of the Stabilize button, the currently selected clip is analyzed and automatically stabilized using a combination of warping and image translations.



The default Stabilizer controls

Stabilizer Parameters and Controls

The default settings yield good results for most situations, but there are ways you can customize stabilization in situations where unique issues arise.

A drop-down menu provides three different options that determine how the selected clip is analyzed and transformed during stabilization. You must choose an option first, before clicking the Stabilize button, because the option you choose changes how the image analysis is performed. If you choose another option, you must click the Stabilize button again to reanalyze the clip.

- **Perspective:** Enables perspective, pan, tilt, zoom, and rotation analysis and stabilization.
- **Similarity:** Enables pan, tilt, zoom, and rotation analysis and stabilization, for instances where perspective analysis results in unwanted motion artifacts.
- **Translation:** Enables pan and tilt analysis and stabilization only, for instances where only X and Y stabilization gives you acceptable results.

The other controls let you customize how aggressively the selected clip is stabilized.

- **Bypass Stabilization:** This checkbox lets you turn stabilization off and on to be able to compare the stabilized and unstabilized image.
- **Cropping Ratio:** This value limits how hard the stabilizer tries to stabilize, by dictating how much blanking or zooming you're willing to accept in exchange for eliminating unwanted motion. A value of 1.0 results in no stabilization being applied. Progressively lower values enable more aggressive stabilization. Changing this value requires you to click the Stabilize button again to reanalyze the clip.
- **Smooth:** Lets you apply mathematical smoothing to the analyzed data used to stabilize the clip, allowing camera motion in the shot while eliminating unwanted jittering. 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. Changing this value requires you to click the Stabilize button again to reanalyze the clip.
- **Strength:** This value is a multiplier that lets you choose how tightly you want to use the stabilization track to eliminate motion from a shot using the current analysis. With a value of 1.00, stabilization is maximized. 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. As an additional tip, you can invert the stabilization by choosing -1.00 when pasting a stabilization analysis from another clip to perform a match move based on the overall motion of the scene, and you can use a negative value either lower or higher than -1.00 to under or overcompensate when inverting the stabilization, simulating the effects of parallax where foreground and background planes move together but at different speeds.

- **Camera Lock:** Turning on this checkbox disables Cropping Ratio and Smooth, and enables the stabilizer to focus on eliminating all camera motion from the shot in an effort to create a locked shot.
- **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 warping and transforming the image to eliminate unwanted camera motion. The lower a value Cropping Ratio is set to, the more DaVinci 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.

Using the Classic Stabilizer

The “classic” image stabilizer controls available in DaVinci Resolve version 12.5 and earlier are still available, simply select “Classic Stabilizer” from the option menu of the Tracker palette. Classic 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 136, “Motion Tracking Windows.”



The Classic 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 five direction buttons let you perform the stabilization analysis.

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

Interactive Mode Controls

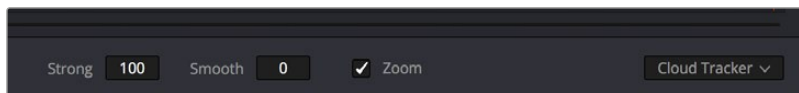
The Interactive controls let you make manual changes to the automatically generated tracking point cloud that DaVinci Resolve creates, so you can try different ways of obtaining better stabilization results in challenging situations.

- **Interactive Mode checkbox:** Turns the Interactive stabilization mode on and off. When you enter Interactive mode, you can manually alter the point cloud that DaVinci 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 DaVinci 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 136, "Motion Tracking Windows."

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 DaVinci 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 drop-down 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 136, "Motion Tracking Windows."
- **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.

Classic Stabilization With the Cloud Tracker

Classic 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 drop-down menu. Select Classic Stabilizer in the option menu. Make sure the Tracker Type drop-down menu at the bottom right of the Tracker palette is set to Cloud Tracker.
- 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 backward).



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 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 DaVinci 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.

Classic Stabilizing Using the Point Tracker

For clips in which there are too many moving subjects for the Cloud Tracker to get a solid lock, you need to track a very specific feature in order to successfully stabilize the image. In these cases, it's often faster to use the Point Tracker for stabilization.

To stabilize an image using the Point Tracker:

- 1 Open the Tracker palette, and choose Stabilizer from the Palette mode drop-down menu. Select Classic Stabilizer from the option menu.

- 2 Choose Point Tracker from the Tracker Type drop-down menu at the bottom right of the Tracker palette. This changes the available controls under the tracker graph.
- 3 Click the Add Tracker Point button to add a crosshairs to the Viewer, and drag it to a high-contrast, angular feature you want to track that's indicative of the overall motion of the clip.



Using the Point Tracker to stabilize an image

TIP: You can optionally add more than one Tracker crosshairs to track multiple features, and DaVinci Resolve will attempt to stabilize as many dimensions as are made possible by the additional trackers. One point lets you stabilize Pan and Tilt. Two points lets you try to stabilize Pan, Tilt, and Rotation. Four points lets you try to stabilize Pan, Tilt, Rotation, and Zoom.

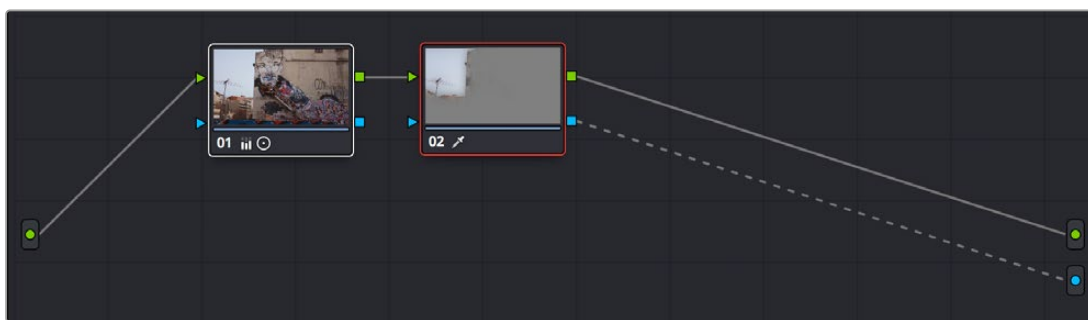
- 4 Click the Track Forward button to track the clip forward (or Track Reverse if you'd rather start from the end of the clip and work backward).
This analyzes the feature you chose to track with the crosshairs, but no stabilization is yet applied.
- 5 Adjust the Strong parameter to reflect what kind 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.
- 6 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 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.
- 7 Choose how you want the edges of the stabilized clip to be handled using the Zoom checkbox:
 - If you want DaVinci 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.
- 8 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.
- 9 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 143, "Channel Splitting and Image Compositing," 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.

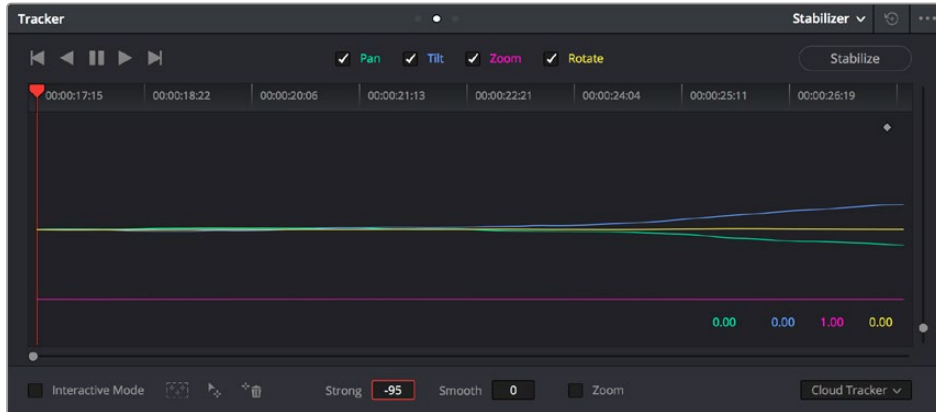


Before (top) and after setting up a sky replacement by connecting an HSL qualifier of the blue in the sky to the Alpha Output to create transparency

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 onscreen 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.

Chapter 150

The Motion Effects and Blur Palettes

This chapter covers the Noise Reduction and Motion Blur effects found in the Motion Effects palette. It also goes into detail about the Blur, Sharpen, and Mist features of the Blur palette.

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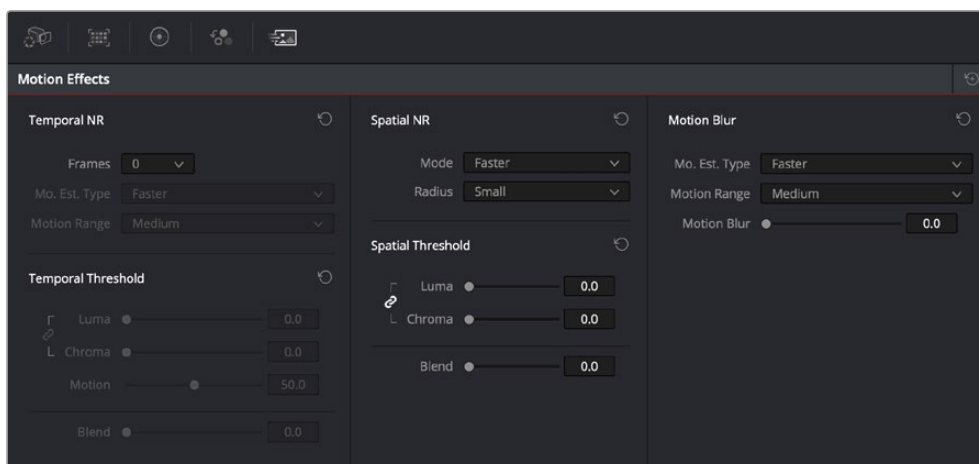
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Motion Effects Palette

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 DaVinci 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 DaVinci 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 50, 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:** The Mode drop-down lets you switch Spatial NR between three different algorithms. All three modes of operation use exactly the same controls, so you can switch between modes using the same settings to compare your results.
 - **Faster:** Uses a computationally lightweight 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 greatly superior results to Faster, at the expense of being more processor intensive to render, as well as not allowing you to decouple the Luma and Chroma Threshold sliders for individual adjustments to each color component.
 - **Enhanced:** Does a significantly better job of preserving image sharpness and detail when raising the Spatial Threshold sliders to eliminate noise. This improvement is particularly apparent when the Spatial Threshold sliders are raised to high values (what constitutes "high" varies with the image you're working on). At lower values, the improvement may be more subtle when compared to the "Better" mode, which is less processor intensive than the computationally expensive "Enhanced" setting. Additionally, "Enhanced" lets you decouple the Luma and Chroma threshold sliders so you can add different amounts of noise reduction to each color component, as the image requires.
- **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.

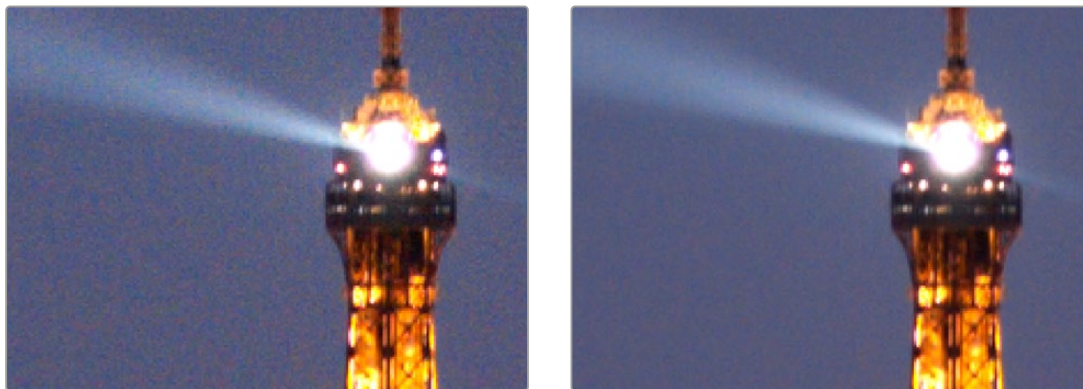
- **Luma Threshold:** Lets you determine how much or how little noise reduction to apply to the luma component of the image. The range is 0–100, where 0 applies no noise reduction at all, and 100 is the maximum amount. Too high a setting may eliminate fine detail from the image.
- **Chroma Threshold:** 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:

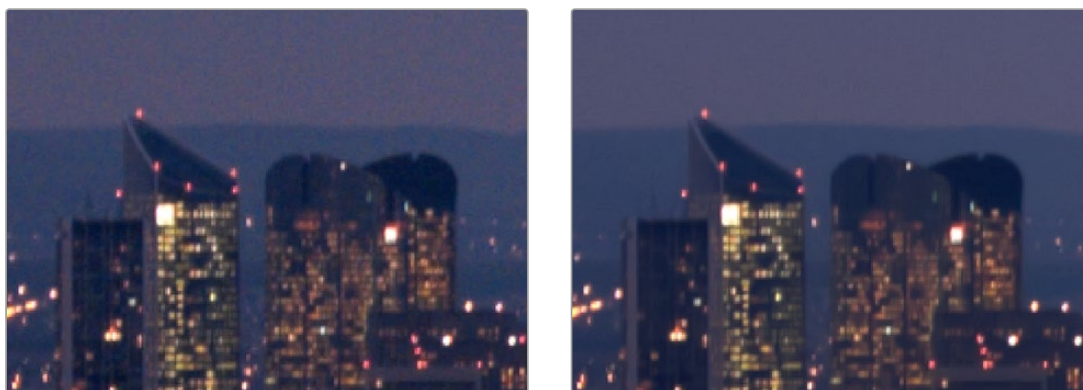
- 1** Enable Temporal NR by choosing 1 to 5 frames from the Number of Frames drop-down menu. Keep in mind that more frames dramatically increase the render time of this effect, while it may or may not significantly improve the result, depending on your material.
- 2** Choose options from the Motion Est. Type and Motion Range drop-down 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 nonmoving 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.



(Left) Before and (Right) 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 achieved the best tradeoff between noise reduction in the still areas 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 Enhanced option from the Spatial NR mode drop-down, 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.



(Left) Before and (Right) 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 drop-down 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. Isolating a single color channel for noise reduction is also possible using the Channels selection when right-clicking a node. By selecting the specific channel numbers in this node corresponding to your color space (RGB, YUV, LAB, etc.), you can limit the noise reduction operation to the appropriate channels only.

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

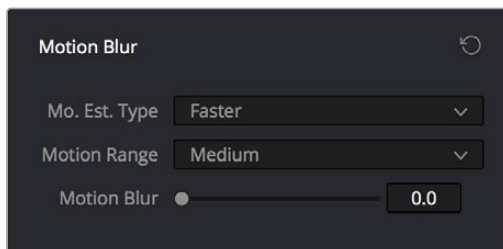
- All three Noise Reduction controls are available via knobs on the PRIMARIES, NOISE REDUCTION control group on the Center panel.

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.

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.

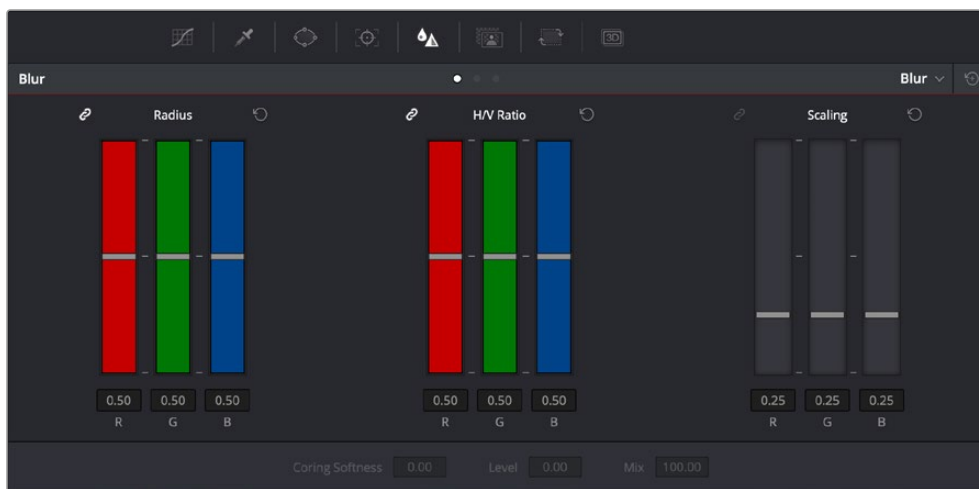
Many of the controls in the Blur palette consist of three ganged sliders, one for red, one for green, and one for blue.

By default, these ganged sliders move together as one, resulting in each color channel of the image being equally affected. A small white 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, while 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. You can also use the scroll wheel on your mouse while hovering over one of the bars to increase the radius.

- **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 let you limit sharpening to only the most detailed areas of the picture that would most benefit from it, based on a threshold of image detail that you define using the Level and Softness parameters.

- **Level:** The first slider you should use. Raising this value sets the threshold at which image detail is omitted from the sharpening operation. The default setting of 0 sets the threshold low enough to sharpen the entire image. Raising Level gradually omits low-detail areas of the image, which results in sharpening being restricted to well-defined outlines.
- **Coring Softness:** After you've set the Level slider to an appropriate amount, raising Coring Softness blends the border between parts of the image that are sharpened and parts of the image that are left alone.

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 operation 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.

Chapter 151

Dust Removal

This chapter shows how you can use the legacy Dust Removal feature that's built into the Color page. There's also a pair of Resolve FX plug-ins: "Automatic Dirt Removal" and "Dust Buster," found in the Revival category of the Resolve FX plug-ins. For more information on those, see Chapter 159, "Resolve FX Revival."

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Introduction to 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.

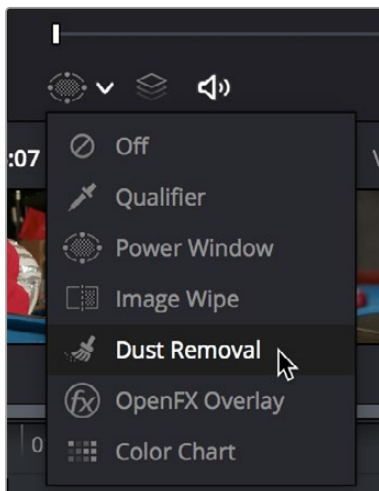
If, at any point, you're unsatisfied with the adjustment you've made, you need only use the undo command to return the clip you're working on to its prior state.

IMPORTANT

The Dirt and Dust Removal tool only works with DPX image sequences. Media in a raw, ProRes, or DNxHD format should use the Dust Buster Resolve FX filter instead, or 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 drop-down 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 drop-down to open the setup window.

Dirt and ROI Settings Parameters

In the Dirt and 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 drop-down 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.