

March 2021

Installation and Operation Manual

Blackmagicdesign 

Cintel Scanner



Cintel Scanner

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Welcome

Thanks for purchasing your new Cintel scanner!

Your new scanner runs film in real time so you can transfer film much faster than a traditional scanner that runs non real time using a constant start-stop motion. However it's important to understand that your scanner is not a telecine and it does not transfer film to video, as it transfers film via Thunderbolt 3 or PCIe directly to DaVinci Resolve where you have the power to edit the film rolls back together and the scans can be color graded, reframed, noise reduced and the audio extracted.

Using DaVinci Resolve to operate the scanner means you have much more creative control than a simple telecine because DaVinci Resolve has many more features than is possible to do in hardware. Plus because Cintel takes advantage of the power of the DaVinci Resolve system and the GPU or eGPU of the host computer, this scanner itself does not need to be cluttered with bulky expensive electronics assemblies.

The scanning workflow is simple as all you need to do is scan your film with standard or high dynamic range into intermediate RAW files and then once you have joined the film rolls back together in the timeline, added noise reduction, color grading and reframing, you can use DaVinci Resolve's deliver page to render out files to any format you like.

We've also designed attachments to improve your workflow. The optional Audio and KeyCode Reader attachment can scan optical or magnetic audio faster than real time, as well as importing KeyCode information directly into your DaVinci Resolve clips. Alternatively, the scanner can synchronize to downstream audio systems.

Of course with all the power of DaVinci Resolve available with your scanner, it's also important to check out the available DaVinci Resolve manual and tutorials. There are some great customer tutorial videos on using DaVinci Resolve as well as high quality training available from third party vendors to help you get the most out of your DaVinci Resolve system.

Check the support page at www.blackmagicdesign.com for the latest version of this manual and for updates to the internal software of your Cintel Scanner.

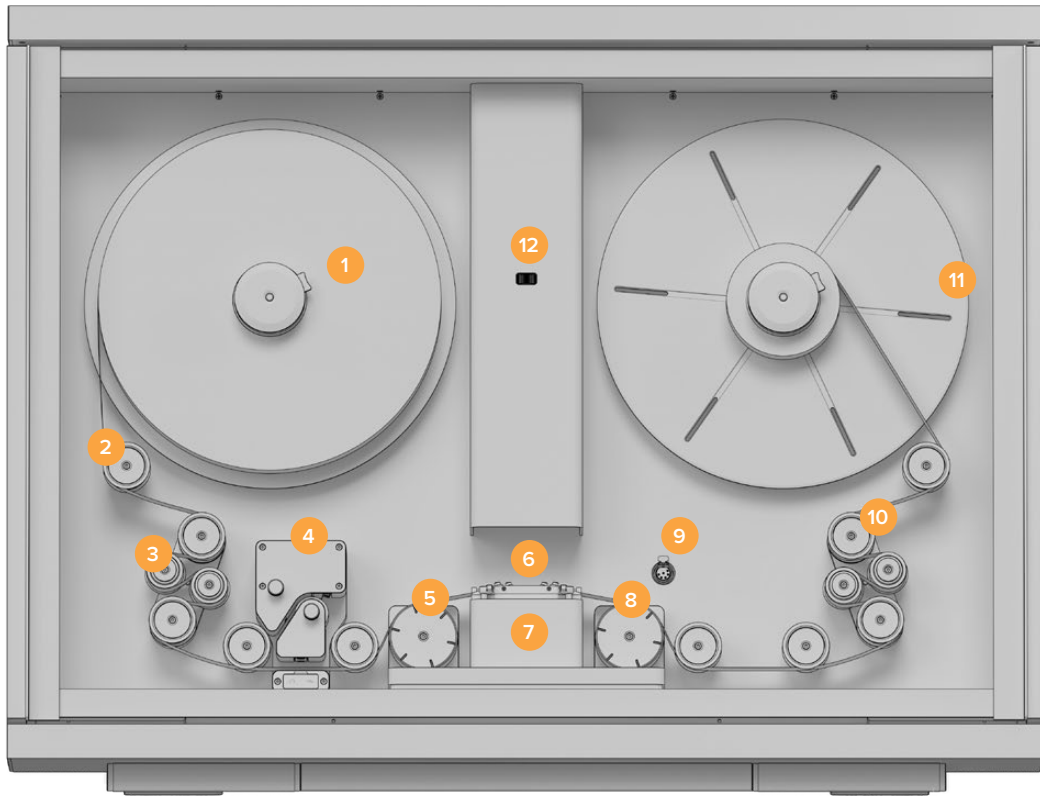
A handwritten signature in black ink that reads "Grant Petty". The signature is written in a cursive, flowing style.

Grant Petty
CEO Blackmagic Design

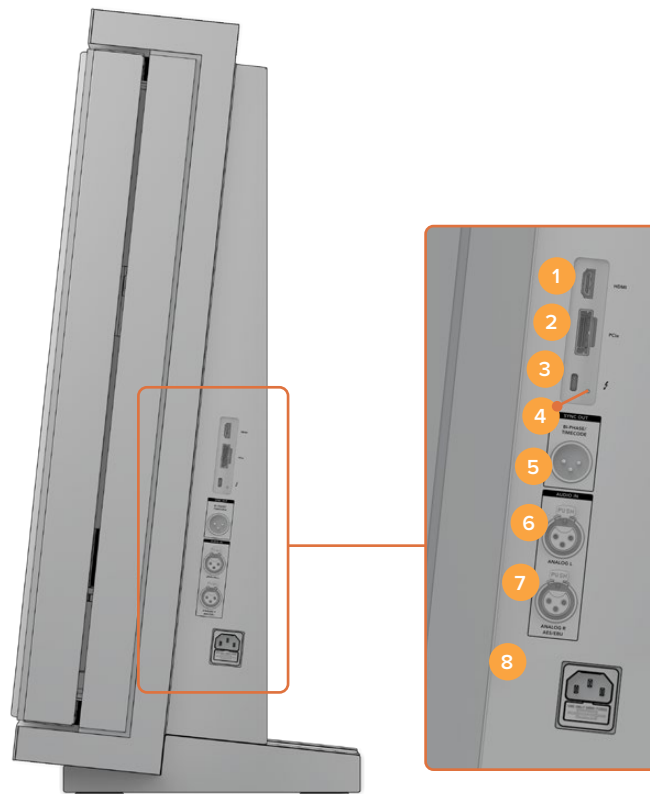
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- 1. Core clamp
- 2. Roller
- 3. Particle transfer roller
- 4. Optional Audio and KeyCode Reader attached via left options interface
- 5. Tensioner wheel
- 6. Skid plate
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- 11. Spooler backplate
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- 1. HDMI
- 2. PCIe
- 3. Thunderbolt 3
- 4. Power supply status
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Unpacking and Mounting

Welcome to your new Cintel scanner!

The first thing to do before you can get started using your scanner is to unpack and securely mount your scanner to a stable surface, or against a wall. Mounting holes are located on your scanner's base, under the feet, for added stability when mounting to a desk. Mounting holes are also located on the back panel so you can firmly mount your scanner to a dedicated wall mount.

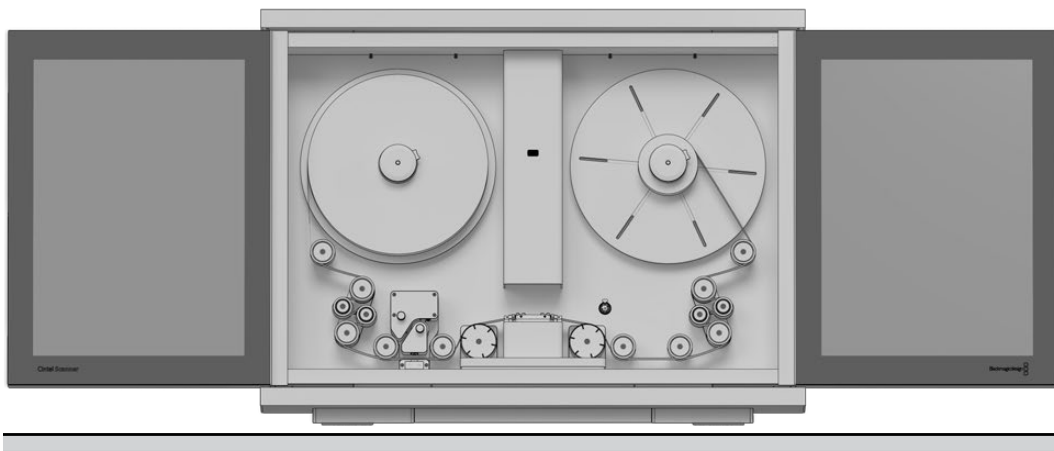
After opening your scanner's road case, you will see that spaces have been cut in the foam padding to give you a sturdy grip on your scanner.

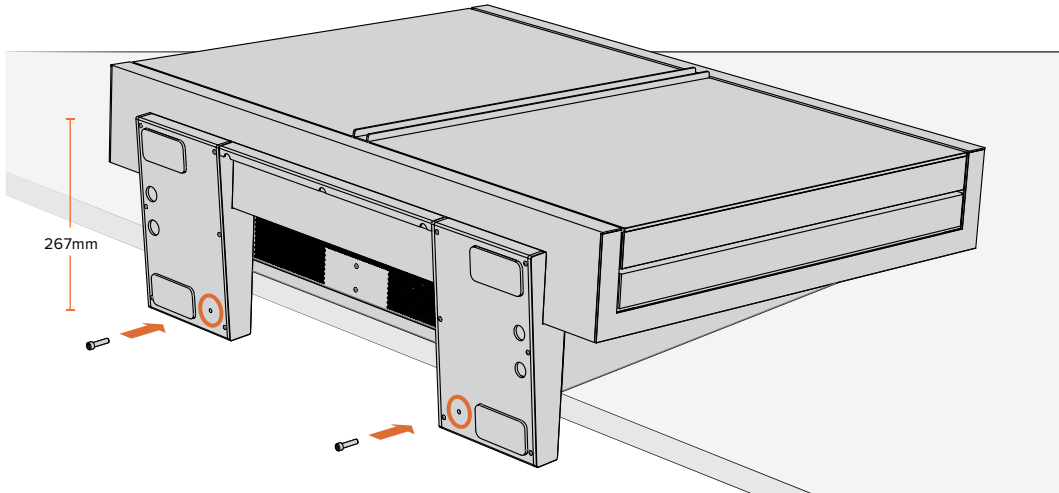
Please note that Cintel weighs over 130 pounds, or 60kg, and is clearly too heavy to be unpacked by one person. You will need to make sure that all lifting is performed by 2 people using correct lifting techniques, such as bending your knees, keeping a straight back and lifting with careful, controlled movements.

Once you have gently removed your scanner from its road case, place it upright on a flat, stable surface capable of supporting its weight.

Desk Mounting

For added stability, you can secure your scanner to your work surface using the mounting holes in your scanner's feet. To do this, you'll need to drill two holes through your desk or work surface so you can insert two M6 safety bolts and screw them into the mounting holes under your scanner's feet. This will hold your scanner firmly to the surface and prevent it from moving





When desk mounted, you can securely fasten your scanner to your work surface by screwing M6 safety bolts into your scanner's feet.

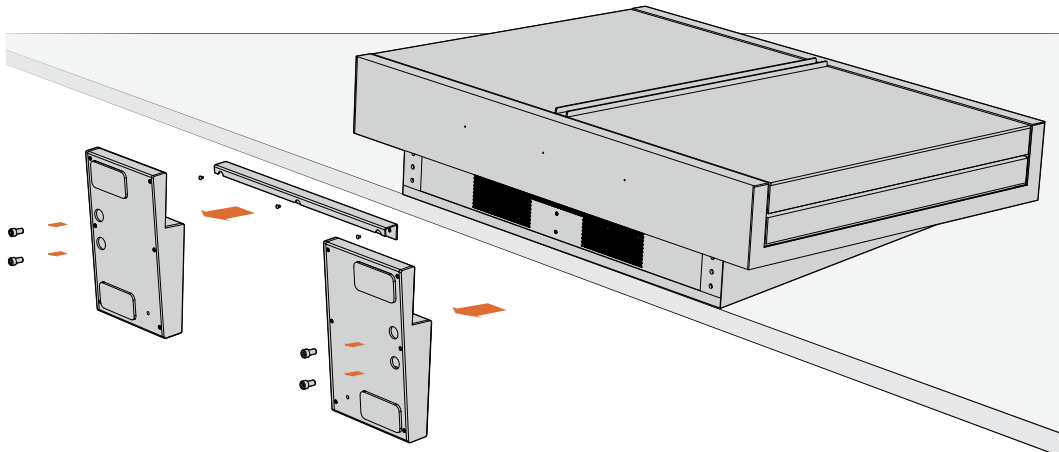
NOTE Your safety is important to us and we strongly advise reading the warning information on the following page before mounting your Cintel scanner.

Wall Mounting

Cintel's elegant industrial design and narrow profile make it ideal for wall mounting.

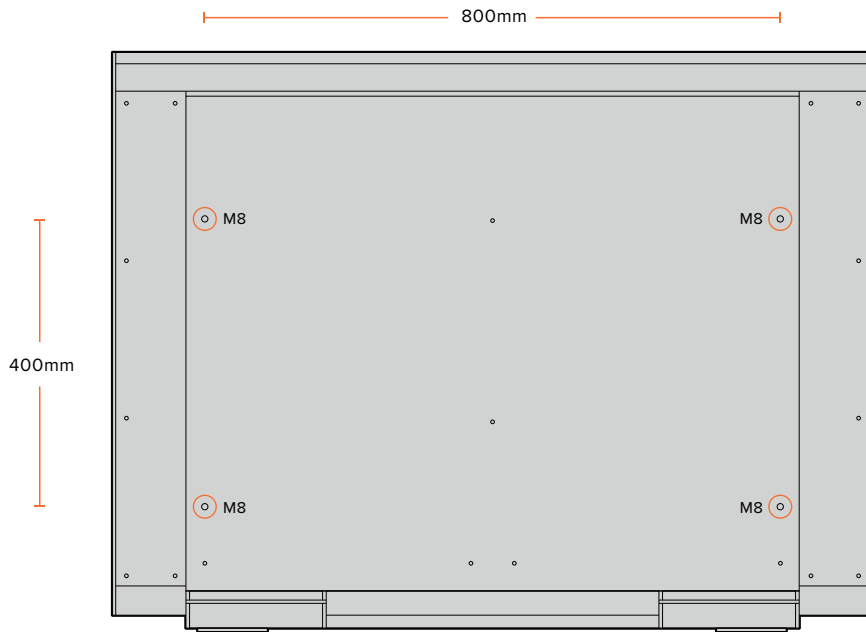
To do this, the first thing you'll need to do is remove the feet and support strut from the base of your scanner.

- 1 Place your scanner face up with its feet over the edge of a solid, stable surface capable of supporting your scanner's weight.
- 2 Unscrew the pair of M8 screws from each foot using a 6mm hex key, then gently remove the feet.
- 3 Using a Phillips head screwdriver, remove the support strut between the feet. Store the support strut in a safe place together with your scanner's feet so you can always reattach them later if you need to relocate your scanner.



Your scanner's desk mount feet and support strut can be removed if you want to mount your scanner to a wall.

The locations of the four M8 mounting screws on your scanner's back panel are shown below. Be sure to use M8 screws when securing your scanner to a wall mount. The M8 screws should not exceed 25mm in length.



Warning for Safely Installing your Scanner

The Cintel Scanner weighs up to 70kg, or 155 pounds, when loaded with film. This is significantly heavier than a large screen television. If you are unsure of the structural capability of the wall or desk to support the total weight of the scanner and film loaded then you must obtain the advice of a qualified engineer to correctly analyze the mounting to ensure safety. Incorrect installation will result in the scanner falling which could cause serious injury or death.

When desk mounting the scanner, and especially when working underneath your scanner to install the desk mounting screws, ensure that your work surface is flat and stable. Mounting brackets and fixings must be of sufficient strength to securely support your scanner's weight. If your work surface is incapable of supporting the scanner's weight, or loses strength over time, your scanner may fall, possibly causing serious personal injury.

When wall mounting the scanner, ensure that the installation location is strong enough to support long term use. If its strength becomes insufficient over the course of long term use, the scanner may drop, possibly causing injury. Do not install in places which are unable to bear loads. Mounting brackets and fixings must be of sufficient strength to securely support the scanner's weight. If the strength of the installation surface is insufficient, the scanner may fall down and personal injury may result.

Desk or wall mounting your scanner must be undertaken by more than one person. Do not attempt installation on your own.

Getting Started

After unpacking and mounting your scanner, getting started is as simple as plugging in power, connecting your computer via Thunderbolt, launching Blackmagic DaVinci Resolve, and lacing your film. If you want to immediately see your scan on an external monitor, you can load film, manually tension it, and output it to an HDMI monitor. To learn more about this, refer to the 'lacing film,' and 'playback controls' section of this manual.

Installing the Software

Capture controls for your scanner are located in DaVinci Resolve's film scanner panel, therefore, the first thing you'll need to do when you're ready to capture your scan is download and install DaVinci Resolve Studio. Your scanner comes with a dongle for DaVinci Resolve to allow you to use the full version of DaVinci Resolve.

Download the latest version of the Cintel Scanner software from the Blackmagic Design support center at: www.blackmagicdesign.com/support

Once your download has completed, unzip the file and double click on it. This will open a setup folder. Now simply run the installer files contained within the setup folder and follow the prompts to install the software on your computer.

You can also use the Cintel Scanner SDK to develop your own software to control Cintel Scanner and integrate it with your workflow. For more information, see the 'Software Development Kit' section.

Plugging in Power

Now that all the required software is installed on your computer, you'll need to plug power into your scanner so that you can lace up your film.

Power your scanner by connecting a standard IEC cable to the AC power socket on the lower right side of the back panel. Your scanner's power indicator LED will glow green when power is connected.

Connecting to a Computer

There are two ways to connect your Cintel Scanner to a host computer. The Thunderbolt 3 port can be used by Windows and Mac computers, while the PCIe external port can be used by Windows and Linux computers when used with the PCIe cable kit from Blackmagic Design. You can also connect to an external monitor via your scanner's HDMI port for focusing or preview purposes. The Thunderbolt 3, PCIe, and HDMI ports are located on the lower right side of your scanner.

Launching DaVinci Resolve

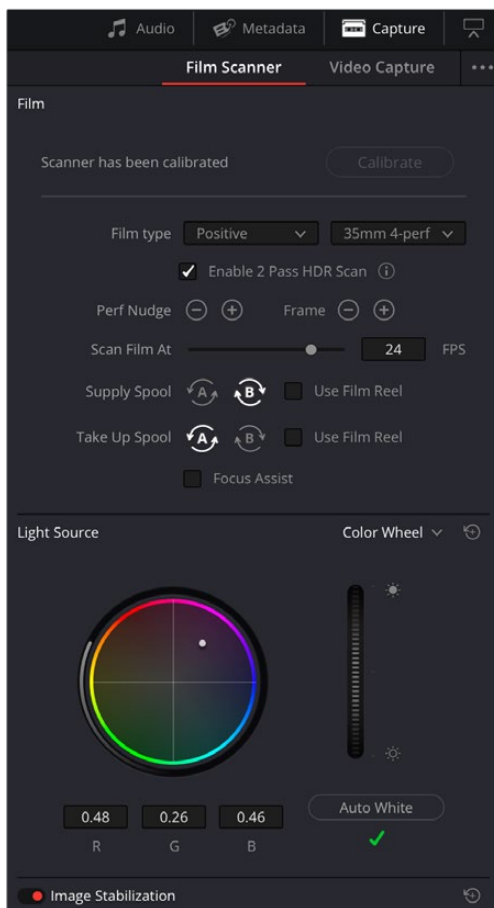
Launch DaVinci Resolve and select the Media page. Open DaVinci Resolve's film scanner panel by clicking on the 'capture' button at the top right of the screen and selecting 'film scanner'.

The scanner will capture a large amount of image data, so you'll need to set the folder you want DaVinci Resolve to record the captured files to.

To do this:

- 1 Launch DaVinci Resolve.
- 2 Click on 'preferences' in the DaVinci Resolve menu bar.
- 3 Click on the 'plus' icon in the 'media storage' tab. Browse to and select a drive or folder path.
- 4 Click 'save', and restart DaVinci Resolve.

For detailed information on how to use all the control features in DaVinci Resolve's film scanner panel, refer to the section in this manual called "Capturing from Cintel using DaVinci Resolve".



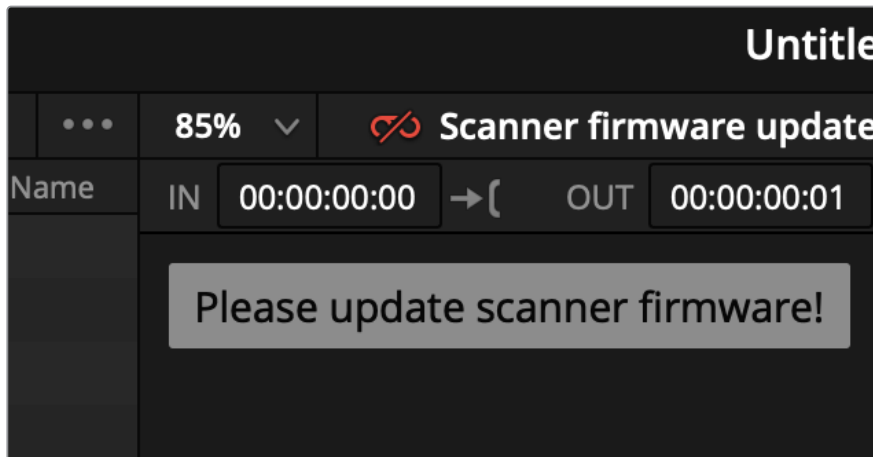
DaVinci Resolve's film scanner panel controls all capture settings.

Firmware Updates

Cintel Scanner and Audio and KeyCode Reader both have internal firmware that may need an update after you install the Cintel Scanner software on your computer.

Cintel Scanner

After you install the Cintel Scanner software on your computer and connect the Cintel Scanner, it will determine whether your scanner's firmware needs an update.



DaVinci Resolve shows a message when the Cintel Scanner is locked

Audio and KeyCode Reader

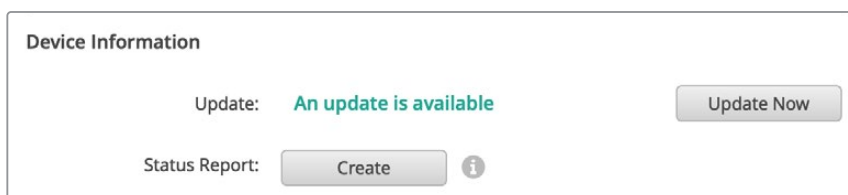
When the KeyCode Reader requires a firmware update, the reader is locked and DaVinci Resolve shows a message to remind you to update the Reader's firmware, similarly to firmware updates as shown in the previous image.

Performing a Firmware Update

Software updates for the firmware on your Cintel Scanner and Audio and KeyCode Reader are managed through the Cintel Setup utility.

To update firmware for Cintel Scanner or Audio and KeyCode Reader:

- 1 Connect your Cintel Scanner to power and to your computer's Thunderbolt 3 or PCIe port.
- 2 If you are updating the Audio and KeyCode Reader, connect it to your computer with a USB-C cable.
- 3 Run the Cintel Setup utility and select the scanner or audio device.
- 4 Click the settings button, go to the 'about' tab, and if an update is available click the 'update now' button.



The 'about' tab shows you if a new version of firmware is available for Cintel Film Scanner or Cintel Reader.

The firmware is now up to date, giving you the latest settings, features and compatibility.

Software Development Kit

Blackmagic Design provides a free software development kit for your scanner. The SDK is cross platform so your software can run on Mac, Windows or Linux. The SDK provides example applications that let you control your scanner like in DaVinci Resolve, but from a command line.

You can use the Cintel Scanner SDK to develop software to control your scanner, change settings, initiate scans, and process clips. DaVinci Resolve Studio is included with your scanner, however, you can use the SDK to develop software to run your scanner on computers that may not match recommended specification for DaVinci Resolve. For more information, see the Developer page at www.blackmagicdesign.com/developer.

What is HDR?

HDR, or High Dynamic Range, is a technique of combining multiple images at different exposures to extend the overall dynamic range of an image as well as to improve the noise performance in the image. The scanner performs HDR scanning in a two pass process. The first pass is a scan at the normal exposure. The second pass is at a significantly higher exposure to give more detail in the blacks. When the normal and high exposures are blended, the result is the best of both at a higher bit depth. The second pass runs at a slower speed to prevent blurring from the longer light source pulse durations required.

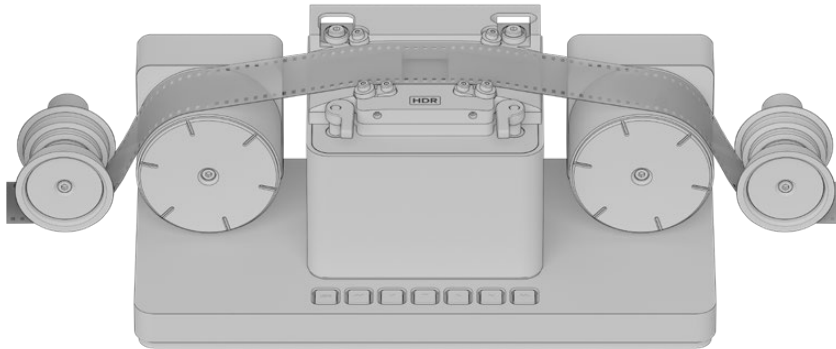


These images are scanned of the same frame to demonstrate the difference between an HDR scan (left) and a standard scan (right). The HDR scan exhibits less noise, more accurate colors and better shadow and highlight detail.

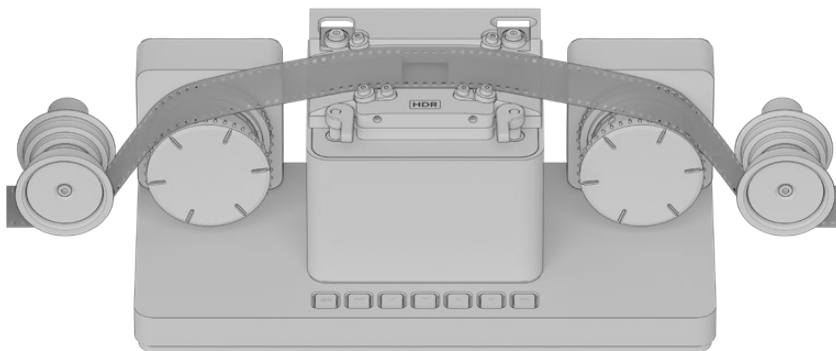
The high precision HDR gates and the image stabilizer align the initial scan and high exposure scan with sub pixel accuracy using a high quality resize filter, which creates an HDR clip free of alignment artifacts.

Drive Wheel Types

Cintel Scanner comes equipped with capstans or sprocket wheels depending on the model of scanner. Both types of drive wheels rotate to advance or rewind the film, and then stop to align each frame accurately within the gate of the image sensor. Drive wheels are integral to the scanner and cannot be exchanged for a different type of drive wheel.



Capstans grip the film with a moderate amount of friction and are gentle on film with fragile or damaged perforations.



Sprocket wheels have a series of teeth to engage with perforations in the film without making contact with the area of film containing the image frame.

The leading drive wheel drags the film, while the secondary drive wheel acts as a tensioner wheel to make sure the film is traveling smoothly over the skid plate. The symmetrical arrangement of drive wheels in Cintel Scanner means it can transport film forward or backward with equal care and precision at a wide range of speeds.

Lacing Film

Now that your scanner and DaVinci Resolve are communicating with each other, you can lace up your film.

1 Accessing the Scanner

Open your scanner's sliding doors.

On the internal front panel you'll see a feeding spool on the left, and a taking spool on the right. The feeding spool holds the film to be scanned, and the taking spool collects the scanned film.

2 Setting Film Wind

Set the 'wind type' so the spools turn in the appropriate direction. Go to DaVinci Resolve's film scanner panel and set the 'wind type' to B/A by clicking 'B' and 'A' on the 'supply spool' and 'take up spool' buttons, respectively.

B/A is your scanner's default wind type which has the feeding spool traveling in a clockwise direction and the taking spool traveling counter clockwise. Refer to the 'wind types' section in this manual for more information.

This is also a good time to make sure that your settings are appropriate for your film type and size.

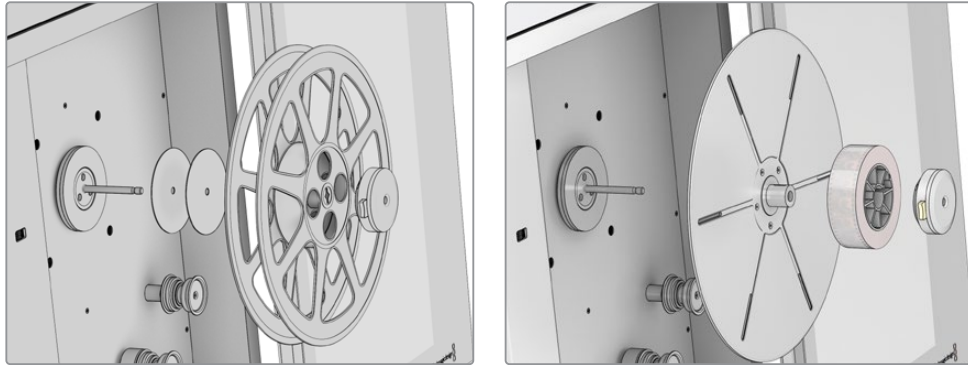
You can select from positive, negative, interpositive and internegative in DaVinci Resolve's film scanner panel, as well as 16mm, 35mm and various perforation layouts.

3 Preparing the Take up Spool

Slide the supplied 75mm spool core and core clamp onto your scanner's taking spindle. To apply the core clamp, hold in the clamp's button and push it onto the spindle until you feel resistance, then release the button and push the clamp on the rest of the way until you hear a 'click.'

4 Loading Film

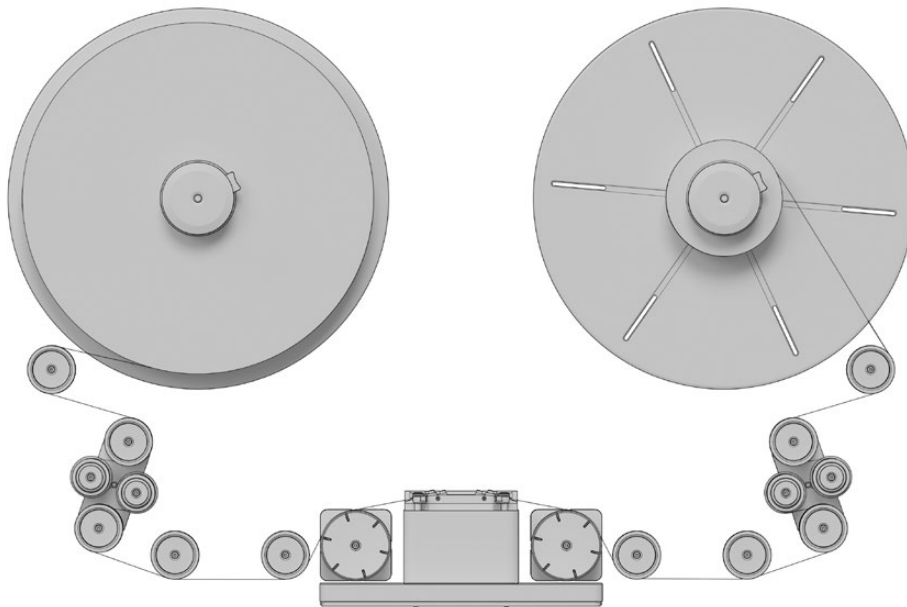
Load your film reel or core onto the feeder spindle following the same procedure in step 3. Note that the procedure differs slightly depending on whether your film is on a core or a reel, and whether it is 35 or 16mm. For example, when loading a core, you'll need to insert the provided backing plate, whereas loading a reel only requires the use of spacers.



When loading film reels, the backing plate is not required and you can simply use the spacers provided. When loading film on a core, the supplied backing plate is required.

5 Lacing Film

Gently lace several feet of the film leader through your scanner's rollers using the following illustration as a guide.



Your scanner's default B/A wind loads from the bottom of the feeding spool and onto the top of the taking spool.

6 Tensioning Film

To secure your film to the taking spool, insert the end of your film into the small notch provided in the spool, then gently hand wind the spool a few times to hold the film in place.

If you don't want to bend the end of the film inside the notch, you can easily use the friction of the film winding onto itself to secure your film to the spool. You can also use very light adhesive tape.

Begin tensioning by pressing the 'load button,' or by manually turning the feeding and taking spools simultaneously.

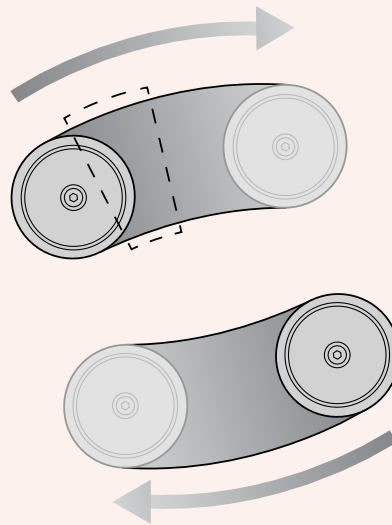
Manual Tensioning

For manual tensioning, turn the feeding spool and taking spool counter clockwise for a B/A wind.

You'll notice the compliance arms below each spool begin to move as you manually introduce tension as in the diagram below. Once these are about a third of the way through their range of motion, hold the spools in place for a second or two. Your scanner will detect secured film on the taking spool, and its tensioning feature will automatically activate, taking up the rest of the slack.

If at any point in a manual or automatic load you notice a problem, you can cancel the load procedure by pressing the 'load' button again or firmly holding the feeding or taking spool.

Your scanner will recognise either action and abort the load.



When manually tensioning film, you only need to apply enough tension to move the compliance arms into the 'sweet spot' of their movement range - a little under half way. Your scanner will automatically take up any additional slack.

7 Inspecting your Film

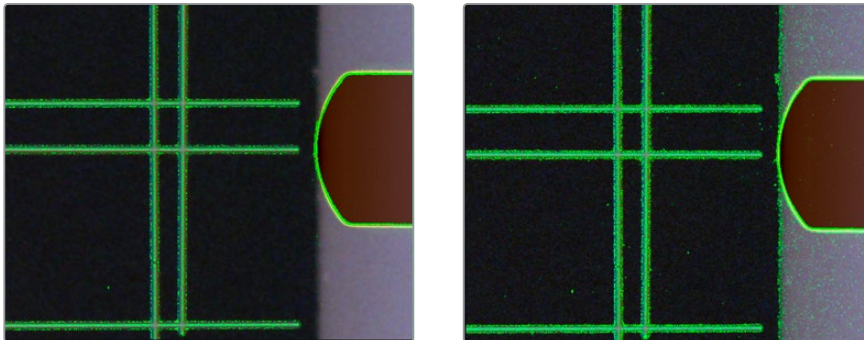
Check that the film is laced properly by pressing the 'play' button on your scanner or clicking the 'play' button in DaVinci Resolve's film scanner panel. If you see your film image playing in the viewer, or on an HDMI monitor if connected, you'll know your scanner is working.

Depending on the wind type you've used, you may find that the image is flipped horizontally or vertically. You can fix this by selecting the appropriate film type. For instance, negative film may appear flipped left to right until the 'negative' setting is selected. If you can't fix this by selecting your film type, you may need to reload your film using a different wind type.

8 Focusing

Just like focusing the lens on a camera, you'll need to focus the projected film image on your scanner's sensor. The focus dial is located on your scanner's center column. The most accurate way to achieve perfect focus is to use the 'focus assist' feature in DaVinci Resolve's film scanner panel. Similar to the focus peaking feature in Blackmagic cameras, focus assist displays a green edge around the sharpest points in your image. This lets you easily adjust focus until the green highlights are at their strongest.

Simply turn the focus assist feature on by enabling the checkbox in DaVinci Resolve's film scanner panel, then watch the HDMI output from your Cintel scanner, or the viewer in the film scanner panel, as you adjust the focus dial. Film grain is a terrific indicator. When the grain in the film is registering the green edges at their strongest, your image is in perfect focus.



Film grain is perfect for setting accurate focus using the 'focus assist' feature. In the above example you can see the image out of focus on the left, and in focus on the right. The focus assist feature can be seen highlighting the grain, most visible inside the perforation area.

The focus assist feature works best when using negative film types, as negative is generally sharper with the most grain detail.

To get the most from the focus assist feature, set the viewer to full resolution. Simply click on the options settings at the top right corner of the viewer and select 'Full Resolution Preview' from the menu.

It's worth mentioning that full resolution preview will remain set until you choose to disable it. The setting is very GPU intensive and can affect the performance of the viewer, for example there may be some frame lag, so it may be helpful to use full resolution for checking focus, then turning it off for better performance.

9 Closing the Scanner Doors

For the best quality scan we recommend closing your scanner's sliding doors.

The doors are designed to gently close when they are almost shut, so all you need to do is slide them towards each other until you feel the spring mechanism take over. When closed, the doors will block any light from entering the film gate.

Your scanner's high quality light source eliminates light pollution in all but the most brightly lit workspaces. Because film is quite shiny it can reflect lights in the ceiling which may show up as blotches in your capture. You can avoid this by keeping the scanner doors shut while scanning.

Now that you have laced your film, set the tension, focused your image and closed the scanner doors, you can start capturing!

Please refer to the Cintel section of the DaVinci Resolve reference manual for details on calibrating the light source, setting the stabiliser, and the capture palette settings for capturing images. The DaVinci reference manual also details how to sync optical audio and shows how you can manage your capture files when scanning.

If you are looking for information on how to maintain and service your scanner, including detailed information about your scanner's technical specifications, refer to the 'Servicing' and 'Specifications' sections near the end of this manual.

Using Your Scanner

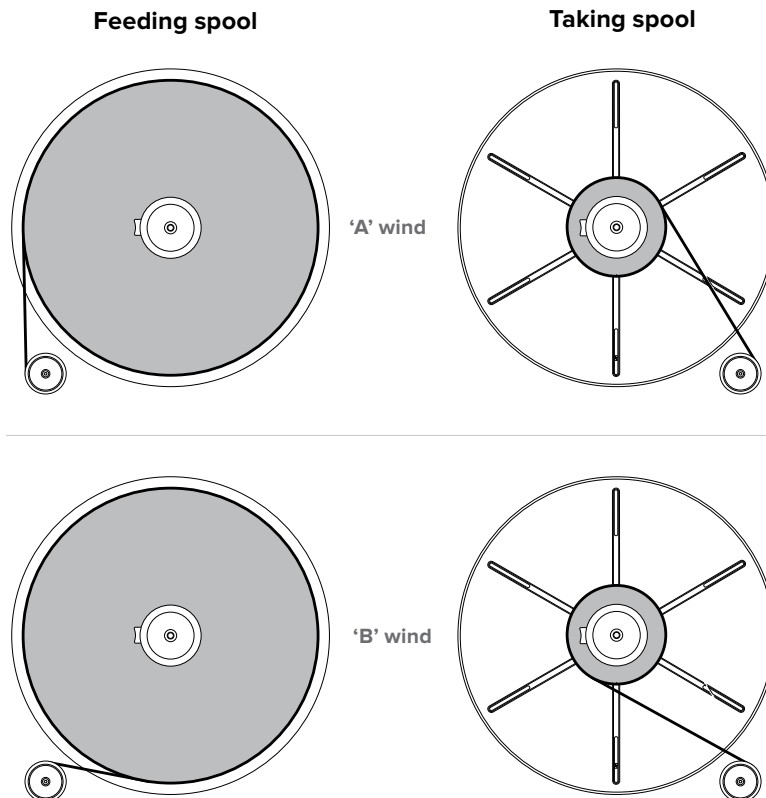
Wind Types

The 'wind type' refers to the loading and unloading position, as well as the turn direction of film on your scanner's feeding and taking spools. As you can see in the diagram below, an 'A' wind refers to film loading/unloading from the top of the spool, while a B type loads or unloads from the bottom. This is true for both the feeding and taking spools.

The default wind type for your scanner is a B/A wind, meaning the feeding spool unloads from the bottom and the taking spool loads across the top. If the film you are working with has been wound a different way, other combinations of A and B winds are supported; simply select the appropriate wind type via the 'feed' and 'take up' buttons in DaVinci Resolve's film scanner panel.

Wind type affects which direction each spool turns, the position of the audio information and perforations, and whether your film travels across the skid plate emulsion side up or down, so it is important to use the appropriate combination for your project.

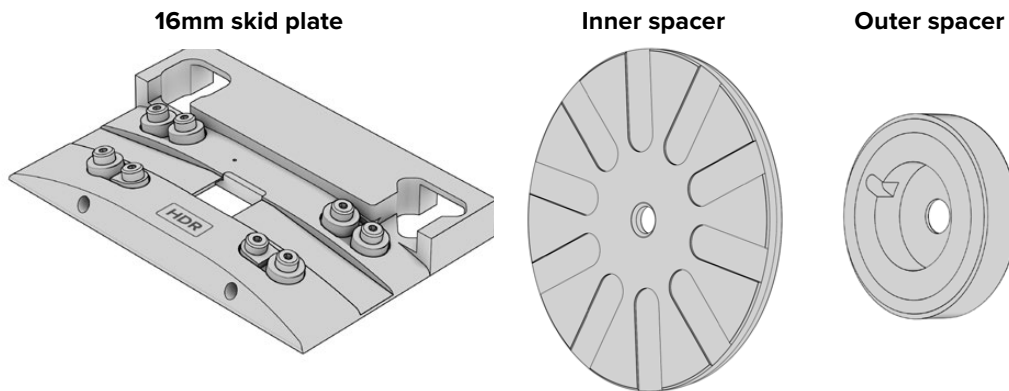
Select the appropriate wind type in DaVinci Resolve's film scanner panel settings.



An easy way to remember the difference between A and B winds is that A winds unload and take up film from the top of the reel or spool, while B winds do the same from the bottom

Switching to 16mm

The optional Cintel Scanner 16mm gate kit contains all the parts you'll require and making the changes to your scanner's setup are minimal.

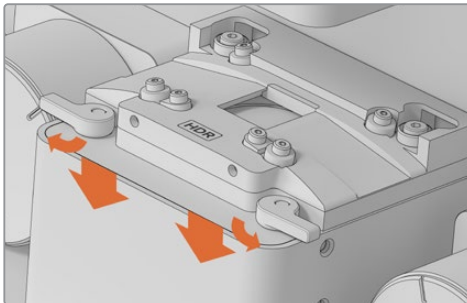


The 16mm kit contains a 16mm skid plate, two inner spacers and two outer spacers.

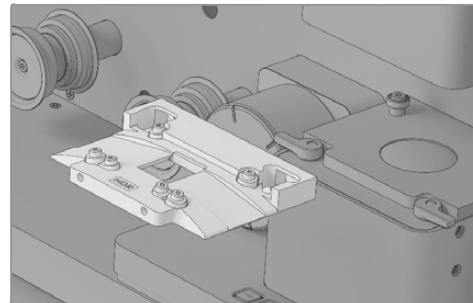
Switching to 16mm scanning is easy:

1 Swapping the Skid Plate

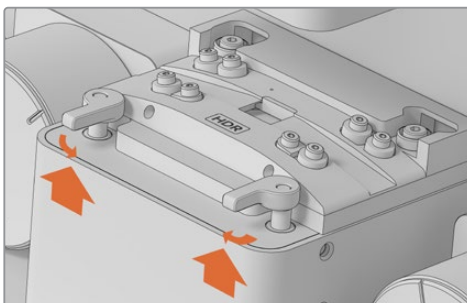
Swap the 35mm skid plate with the 16mm skid plate by pushing the retention levers down on the front of the 35mm plate and turning them outwards. Now remove the 35mm plate and replace it with the 16mm plate. When fitting a skid plate, make sure that the retention levers are lifted all the way up before turning them inwards, or the plate may not seat properly.



When removing the skid plate you will need to push the retention levers down and then turn them outward.



Removing the 35mm skid plate to install the 16mm skid plate.



To secure a skid plate lift the retention levers all the way up and turn them inward.

2 Inserting the 16mm Inner Spacer

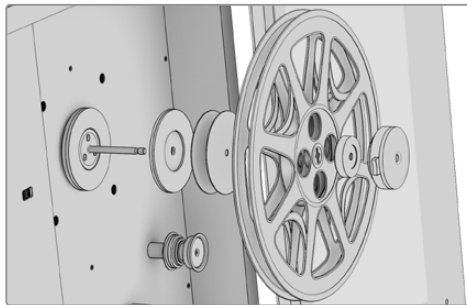
Insert the rubber 16mm inner spacer at the base of the feeding and taking spools. The rubber spacer goes on grooved side inwards prior to a backing plate, spool or reel.

3 Additional Spacers (optional)

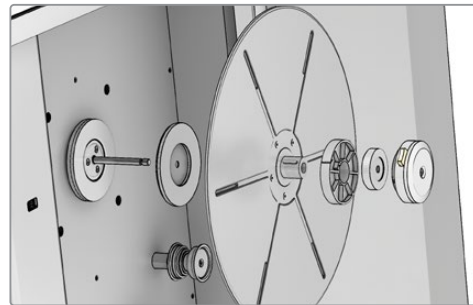
Additional 1mm rubber spacers are included in the 16mm Gate Kit for when mounting a reel. You can use these spacers if you need to adjust the alignment of the film with your scanner's rollers.

4 Mounting your Film

After mounting your 16mm core or reel to the feeding spool, and a backing plate and core to the taking spool, you'll need to install the outer 16mm spacer to secure the spools. This spacer has both a notch and a rubber ring on its inside edge to secure it to cores or reels, respectively. Once this is in place, secure the spools as you would normally.



Reel mounting. Shown from spindle outwards: inner 16mm spacer, 1mm spacers, 16mm reel, outer 16mm spacer and core clamp.



Core mounting. Shown from spindle outwards: inner 16mm spacer, backing plate, 16mm core, outer 16mm spacer and core clamp.

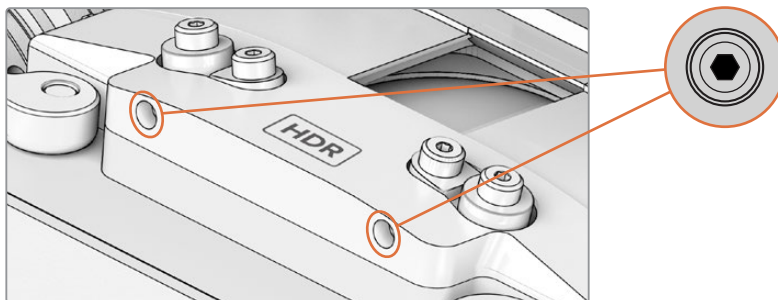
5 Lacing

Complete the lacing procedure as you would for 35mm film. Before pressing 'load' or manually tensioning your 16mm film, make sure that the film is properly threaded over the drive wheels smoothly to avoid damage to the film.

Skid Plate Tension Screws

The four roller bearings on the skid plate keep the film moving in a defined path and help to minimize gate weave. If some of the bearings are not making contact with the film during a scan, their tension can be adjusted. To do this, lightly tighten the M4 tension screws on the front of the plate using a 2mm hex driver.

It's worth mentioning that if too much tension is applied, it can slightly shift the position of the image on the skid plate, which may affect your scan. If this happens, simply reverse your tension adjustments until your scan returns to normal.



The skid plate tension screws are located at the front of both the 16mm and 35mm skid plates.

Playback Controls

The following playback controls are available in DaVinci Resolve and on your scanner.



Your scanner has built in controls for loading, unloading, and previewing scans.



Load

Pressing 'load' will tension the film loaded onto your scanner's feeding and taking spools as described in the section 'lacing film.'

Pressing load once your film is properly tensioned will unload the film by returning the compliance arms to their slack position.



Rewind

Press rewind to wind your film back onto the feeding spool. Pressing this button once will rapidly rewind your film until it reaches the threshold of a fully loaded 75mm spool, at which point it will stop. Press rewind again to slowly wind the rest of your film all the way onto the feeding spool and unload your scanner.

If you are using a 50mm spool, your scanner will initially stop at the 75mm threshold. Pressing rewind a second time will then slowly rewind until the point a 75mm spool should have been fully rewound. If your scanner detects film still loaded at this point, it will resume rewinding quickly until reaching the 50mm threshold, where it will stop again. Press 'rewind' a third time to completely rewind a 50mm spool.

Due to the rarity of 100mm spools, your scanner is not programmed to stop prior to hitting the 100mm threshold. If you are using a 100mm spool, take care with your method of loading film onto the taking spool. Please use the provided notch, or if you don't want to bend the end of the film inside the notch, you can use friction from the film winding onto itself. Avoid using adhesive tape when loading 100mm spools to make sure your spool unloads cleanly.



Step Back

Rewinds the film one frame. You can also hold down the 'step back' button to play the film backward at slow speed.



Stop

Stops playback, fast forward and rewind.

**Play**

Plays the film. The default frame rate is 24 frames per second. You can set the playback frame rate and 'play reverse' in DaVinci Resolve's film scanner panel.

**Step Forward**

Advances the film one frame. You can also hold down the 'step forward' button to play the film forward at slow speed.

**Fast Forward**

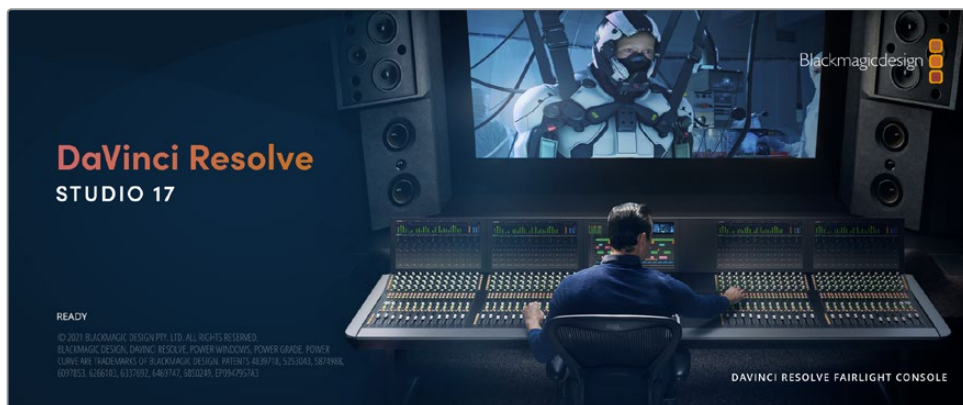
Rapidly advances the film onto the taking spool. The stopping action performs the same way as rewind for 50, 75 and 100mm spools.

When you hold down your scanner's 'step back' or 'step forward' button, the scanner advances or reverses playback at 4 frames per second. You can perform the same 'step back' and 'step forward' transport controls in DaVinci Resolve's film scanner panel by clicking and holding the buttons with your mouse.

Standby Mode

When inactive, your scanner will enter standby mode to preserve the longevity of the light source. This happens after 15 minutes when connected via Thunderbolt, or 1.5 minutes when no software is connected. Your scanner will signal that it is entering standby mode by flashing the light source green.

Capturing from Cintel using DaVinci Resolve

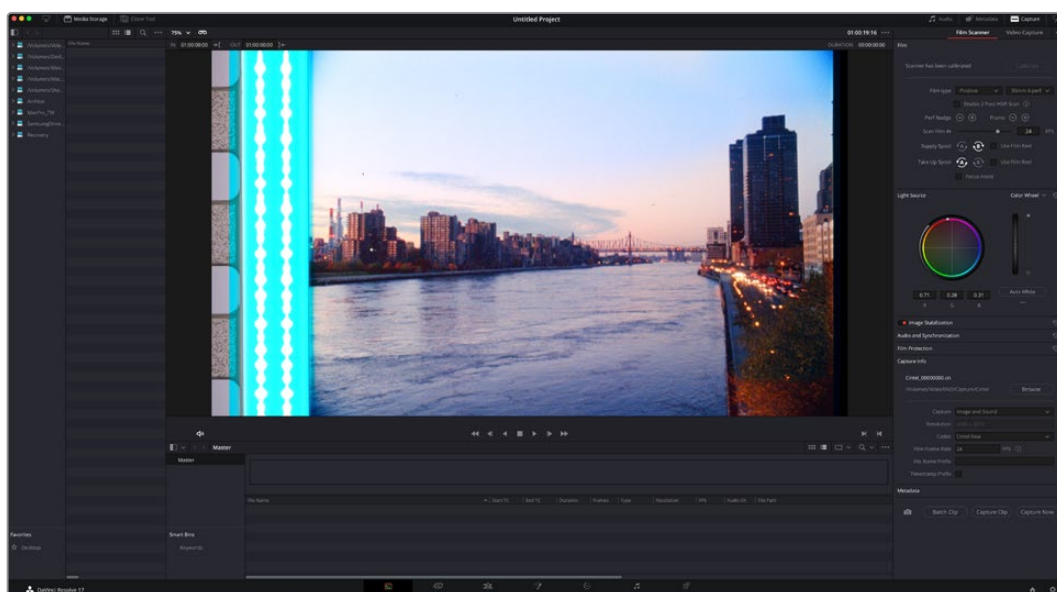


This section of the manual shows you how to use settings and features in DaVinci Resolve's film scanner panel to control your scanner. For example calibrating your scanner, adjusting the light source strength and color temperature, setting image stabilization, and more. You can even set how gentle your Cintel scanner handles film which may have become delicate with age.

TIP DaVinci Resolve saves all scanner settings in your current project.

The Cintel Scanner Interface

Click on the 'capture' button in the UI toolbar at the top of the DaVinci Resolve screen to set the media page to control your Cintel scanner. Open DaVinci Resolve's film scanner panel to set up, calibrate, and choose options for logging or scanning a selected range of the currently spooled roll of film. If you want more room for viewing the Cintel scanner controls, click the full height button that's all the way to the right of the UI toolbar, and turn off the 'metadata' panel.



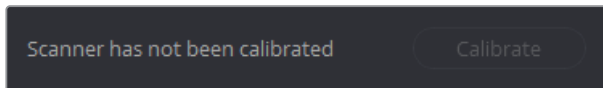
Cintel scanner controls in the Media page

- **Transport Controls:** The transport controls under the viewer, while similar in appearance to those used while in playback mode, now work to control the Cintel scanner. Additional controls appear for moving forward or backward a frame at a time.
- **In and Out Controls:** In Cintel Scanner mode, the In and Out buttons to the right of the transport controls define a range of the film roll from which to capture.

The following groups of settings appear to the right of the 'media' page viewer when in Cintel Scanner mode to scan clips from film into the media pool.

Calibration

This option lets you calibrate the optics of the scanner to eliminate optical blemishes or dust that cannot be removed. Please note that this feature does not remove dust from the film itself.



The calibration button can be used to help remove dust or small blemishes from the optics of your Cintel scanner.

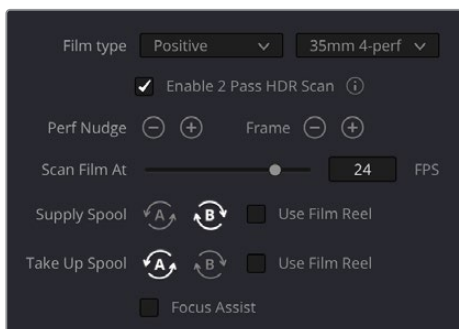
- **Calibrate:** This button lets you eliminate light optical blemishes and dust from the optics of the Cintel scanner via digital calibration. While it's recommended to "spray dust" the optics before scanning new material, it's possible over time for some blemishes on the optics to be unremovable, in which case using the calibrate button will eliminate them from the scanned image.

The skid plate does not normally need to be removed for calibration, however, in cases where there is severe dirt, remove the skid plate, dust it, and then reinstall it. Use the 'calibrate' button before you load film into the scanner, while there's nothing in the optical path, to remove any remaining optical blemishes or dust.

Calibrate the optics with the skid plate installed and correctly aligned, as this assists with image stabilization and offers the best image quality.

Film Type

These controls let you select the type of film you're scanning, align the film with the sensor, and choose what speed you're scanning at.

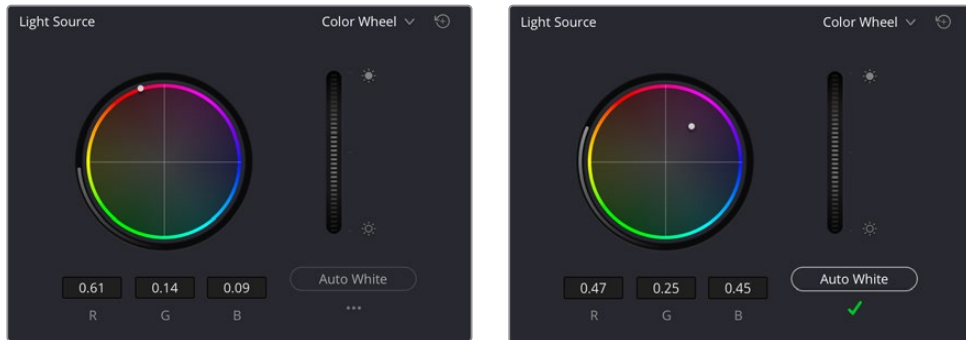


Film Type controls in the Media page

- **Film Type:** Lets you choose what type of film you're scanning. The choices are positive, negative, interpositive, and internegative. HDR scanning offers an improvement for all these film types. Select the reel type you're scanning from 35mm 2, 3, and 4 perf, and 16mm. The scanner automatically detects whether the film is 35mm or 16mm.
When scanning interpositive and internegative film, the increased density of the film requires slightly extended pulse durations from the light source. Normally, this does not affect the scan, however, a slight reduction in resolution may occur when scanning at above 12 frames per second. If you do notice a difference in resolution, simply reduce your scanning speed to 12 frames per second or less.
- **Enable 2 Pass HDR Scan:** Enables high dynamic range multi pass capture. It is important to perform an 'auto black' or 'auto white' on a frame with a wide dynamic range as it determines the high and normal exposure levels from your selected frame.
- **Perf nudge:** Used for making fine adjustments of the perf position relative to the scanner gate aperture. Command-J nudges up, while Command-L nudges down.
- **Frame:** These buttons are push and hold to activate. When on, the film is slowly advanced to move the frame up or down and when released the film stops in place. This is useful for aligning the film frame with the scanner's sensor. Using the 'perf nudge' and 'frame' buttons, you want to align the visible film frame so the bottom of the previous frame and the top of the next frame are just visible at the top and bottom of the viewer, and the current frame is centered vertically.
It's important to make sure the image in the viewer is not zoomed in when you do this. Command-Left Arrow on your keyboard moves the frame up, while Command-Right Arrow moves the frame down.
- **Scan Speed:** With adequate disk performance, you should be able to scan at 30 fps. However, if you're scanning to a slow hard drive, you can reduce the scanning speed to a frame rate that's suitable for your workstation without dropping frames.
- **Supply Spool:** Sets the wind direction of the left-hand side feed spool. While auto-detection will prevent incorrect operation, you should manually configure the reel winding direction based on how each film roll is wound.
- **Take Up Spool:** Sets the wind direction of the right-hand side take up spool. While autodetection will prevent incorrect operation, you should manually configure the reel winding direction based on how each film roll is wound.
- **Use Film Reel:** Small film reels have a different weight and inertia compared to large film spools, and this can affect the transport system. Tick this box to switch to settings that offer improved stability for small film reels.
- **Focus Assist:** Enables luminance peaking on your scanner's HDMI monitor output, plus the viewer inside DaVinci Resolve's film scanner panel, which makes it easy to obtain optimum focus adjustments.

Light Source

These controls let you adjust the scanner's light source to adjust the optimal Dmin, which is the minimum scanned signal value, plus the color temperature of the scanned material. Use the built in software scopes in DaVinci Resolve to help set your light source to its optimum level settings. Scopes can be opened in the Media page by choosing Workspace > Video Scopes > On. You can adjust these settings to make sure you're not clipping image data during the scanning process.



Light Source controls in the Media page showing the default uncalibrated status of the light source (left), and the status when calibration is successful (right)

- **Light Source master wheel:** The vertical light source master wheel is located next to the color wheel and adjusts the intensity of the light source used to illuminate the film, raising or lowering the RGB channels all at once. For typical negative film, this lets you adjust the black point of the film image, which is the darkest part of the image. In negative film, this in fact corresponds to the highlights of the film image. Adjust the light intensity to sit just above the typical Dmin value of 95, as measured on the histogram of the video scopes, which guarantees that the highlights won't be clipped by a Cineon-style LOG conversion. For positive film, simply adjust the master wheel so that no part of the signal is being clipped.
- **Auto Black and Auto White button:** Analyzes the current frame displayed in the viewer and does an automatic adjustment to set the black point for negative, or for print to set the white point. For positive film types, the 'auto black' button changes to 'auto white'. Whenever you change film type, gauge or enable HDR, the auto black/white calibration is reset. The status indicator under the auto black/white button reminds you to recalibrate the LED light source to help ensure the highest quality scans or inform you if any problems occur.
- **RGB controls:** By default, a color balance control lets you adjust all three color channels by varying amounts to alter the color temperature of the light source used to illuminate the film, while the adjusted R, G, and B values are displayed in three fields below. Optionally, you can choose to put this control into 'color bars' mode using the mode pop-up to the right of the 'light source' title bar, which changes this control to three vertical red, green, and blue color channel sliders.

Image Stabilization

These controls let you enable and disable as well as control image stabilization to eliminate vertical film hop.

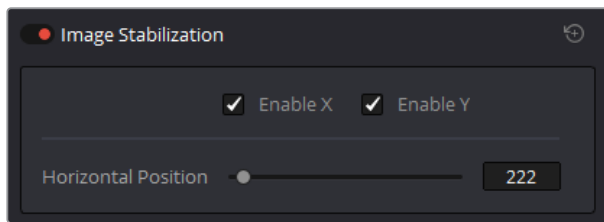
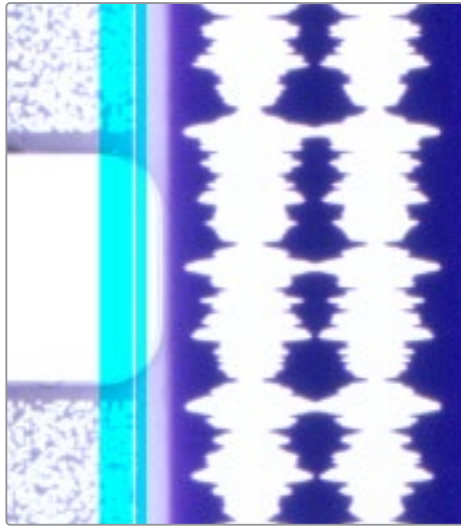


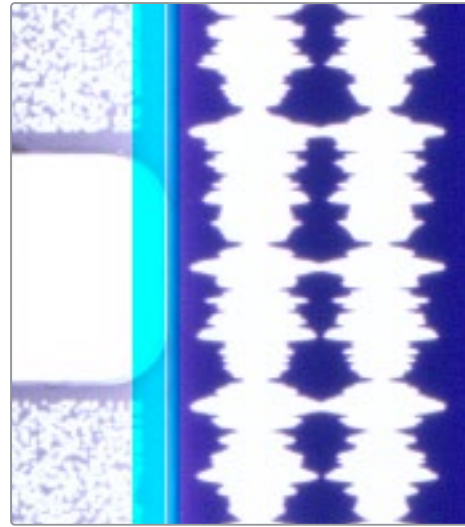
Image Stabilization controls in the Media page

- **Image Stabilization enable/disable control:** The dot to the left of the 'image stabilization' title bar lets you enable or disable your scanner's hardware-based image stabilization altogether. While hardware stabilization is typically desirable when you have high quality perforations, you may want to turn this option off if the condition of the perforations is poor and you decide to use DaVinci's software based stabilization instead.
When image stabilization is enabled, a horizontal X axis detection overlay is displayed in the viewer, highlighting the edge of the film perforation that will be used as the reference for stabilization. This overlay is automatically hidden when recording. Image stabilization is enabled by default.
- **Enable X and Y checkboxes:** Enable X and enable Y lets you choose whether to use hardware image stabilization to fix horizontal gate weave and vertical gate hop respectively. If the results are unsatisfactory with both axes enabled, you can turn off the axis that's causing issues with stabilization.
- **Horizontal Position slider:** Your Cintel scanner attempts to automatically place the stabilization detection overlay at the best location, with reference to the perforation shown on the currently loaded frame, for the best stabilization result.
You will notice a thin transparent line in the blue alignment overlay. For optimum stabilization, this line should touch the edge of the perforation. If the automatic positioning is not ideal, you can manually move the overlay to a more ideal position, either by dragging it in the viewer with your mouse, or by using the horizontal slider.
Ideal placement of the stabilization overlay should position the clear line in the alignment overlay on the edge of the perforation, as shown in the example image. With the overlay correctly positioned, this enables hardware stabilization of gate weave along the X axis.

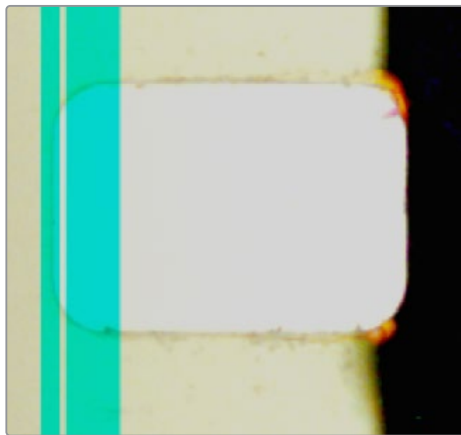
Image stabilization automatically manages vertical gate hop when you select the 'enable y' checkbox. It needs no further adjustment and works in conjunction with horizontal stabilization.



Adjusting the horizontal position of the stabilization overlay. In this screenshot, the overlay is not aligned with the edge of the perf.



Hardware stabilization control correctly positioned over a perforation in the viewer. The transparent stripe in the stabilization overlay touches the edge of the perforation.



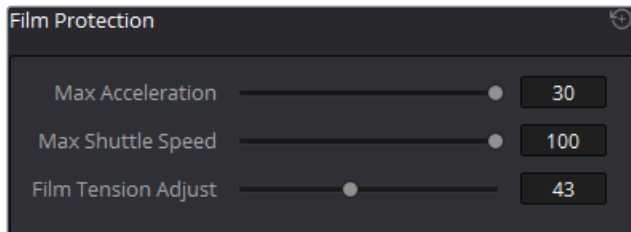
With the 16mm HDR skid plate installed, the stabilizer aligns automatically to the other side of the perforation to avoid interfering with the film image and improve horizontal stability. When using a 'non-HDR' 16mm skid plate, it functions the same as the 35mm skid plate.

To closely check the results of your stabilization settings before capturing, set the viewer to full resolution. Simply click on the options settings at the top right corner of the viewer and select 'Full Resolution Preview' from the menu. This setting does not affect the stabilization feature, but enables the best possible preview so you can monitor how well it is performing.

It's worth mentioning that this setting will remain set until you change it back to your previous setting. Full resolution is very GPU intensive and may result in some frame lag. For best performance, turn full resolution off after checking stabilization.

Film Protection

These controls are intended to allow delicate film to be handled gently by the Cintel Scanner. Fast acceleration and shuttle speeds can be hard on archival footage, so it's recommended to lower both of these sliders from their defaults whenever you're scanning older film.



The 'Acceleration' and 'Shuttle Speed' sliders should be lowered when scanning older, delicate archival film

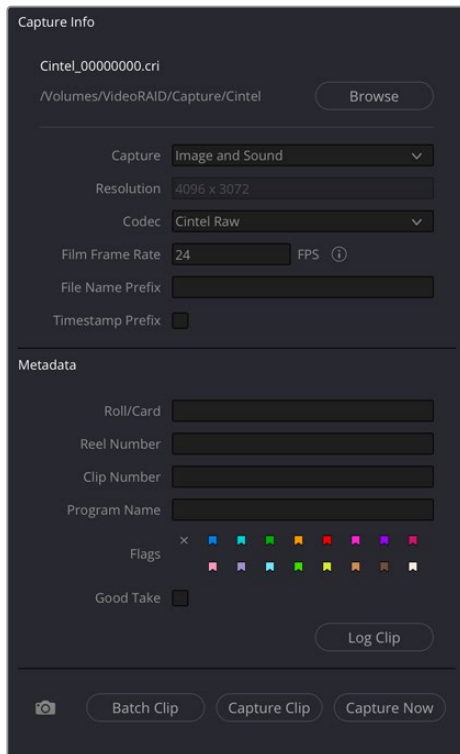
- **Max Acceleration:** Sets the maximum change in speed to increase or decrease by 5-30 fps per second.
- **Max Shuttle Speed:** Changes the speed of shuttling from one section of film to another between 1–100 frames per second for 35mm film, and between 1–200 frames per second for 16mm film.
- **Film Tension Adjust:** If your Cintel Scanner has sprocket wheels, this setting gives you the ability to adjust the amount of tension applied to 35mm film. For example, when loading delicate archival film, or compensating for film shrinkage. There is no possible way you can damage the film with the 'film tension adjust' setting. The adjustment values are very small and only gentle changes are all that's required to prevent sprocket picking.

If your Cintel Scanner has capstans, sprocket picking cannot occur so this setting is disabled.

Editing Capture Info Metadata

When DaVinci Resolve is used in conjunction with Cintel Scanner, a set of capture metadata fields appears at the bottom of DaVinci Resolve's film scanner panel. The 'capture info' panel has editable metadata fields that describe capture properties such as where to save files, the type of codec, frame rate, and the format of file names. This metadata is attached to your clips and can be read on the media page.

Before you begin scanning, you may want to adjust some of the project settings.



The 'capture info' panel lets you specify metadata for your scanned clips


- **Capture Location:** Before you begin a film scanning session, scroll down to the 'capture info' section of DaVinci Resolve's film scanner panel to make sure the scanned files are being saved to the directory and volume where you want them. Click the 'browse' button and choose a location from the file destination dialog. It's good to do this first, as this step is easy to forget.
- **Capture:** When you have a Cintel Audio and KeyCode Reader fitted, this menu gives you options for 'audio only' so no images will be captured, or 'image and sound'. Alternatively, you can capture 'image only' if audio is not important.
- **Resolution:** The resolution of the capture files depends on the source film format so this field cannot be edited.
- **Codec:** DaVinci Resolve selects the 'Cintel Raw' codec for lossless compression by default, or you can choose 'Cintel Raw 3:1' for even smaller file sizes.
- **Film Frame Rate:** Specify the frame rate that the film was originally shot at. DaVinci Resolve automatically adjusts the timeline frame rate based on this value. This setting is unrelated to capture or transport speeds.

When using the optional Audio and KeyCode Reader accessory to scan audio, the reader will automatically adjust for frame rate to maintain an overall sample rate of 48kHz. Timecode output is supported for 24, 25 and 30 fps, and for other frame rates no timecode signal is outputted.

- **File Name Prefix:** Prefix to help identify the scan. This can be the name of your project, such as the title of the film you are scanning.
- **Timestamp Prefix:** Select this checkbox to prefix your scans with a timestamp as well as the 'file name prefix' you specified. Your clips will be saved to independent sub-folders in the destination folder. This checkbox is selected by default.

If you want to save all your clips together in one master destination folder without the timecode in the file name, simply deselect the checkbox.

NOTE If you don't make capture names unique with the timestamp prefix and the files go into the same location, this could potentially overwrite files.

- **Roll/Card, Reel Number, Clip Number, and Program Name:** These are ways to identify the clip with metadata.
- **Flags:** You can use these color coded flags to tag clips.
- **Good Take:** Corresponds to 'circled take' metadata in the media pool.
- **Log Clip:** Adds a clip to the media pool. After you mark 'in' and 'out' points for a section you want to scan, confirm the metadata is correct, and then click 'log clip'. For more information, refer to the 'Logging and Capturing Individual Clips' and 'Logging and Capturing Multiple Clips' sections in the DaVinci Resolve manual.
- **Batch Clip, Capture Clip, Capture Now, and  Snapshot:** These scanning buttons offer different methods to capture clips. For more information about scanning buttons, refer to the 'Scanning One or More Sections of Film' section of this manual.

Film Scanning Workflows

The following sections describe how to scan film using DaVinci Resolve and to control the Cintel scanner. Throughout, the features outlined in the previous section are presented in the order in which you'll perform each step of the scanning process.

Before You Begin

Before turning your scanner on and loading film, you should first dust the gate to make sure your scans are as clean as possible. This can be accomplished using compressed air, but if the gate is extremely dirty, you can remove it to give it a more thorough cleaning. Once that's finished, turn on the Cintel Scanner, open DaVinci Resolve and create the project you'll be using to scan film, and then click the 'Cintel scan' button on the media page. Now click the 'Film Scanner' tab to select DaVinci Resolve's film scanner panel.

Before you load film into the scanner or do anything else, click the 'calibrate' button at the bottom left of the film scanner panel. While you should always dust the gate of the scanner before loading a new reel of film, clicking the calibrate button eliminates any unremovable blemishes in your scanner's optics from the scans you're about to make.

Load and Align the Film

Load the film you want to scan. In the presence of an image the scanner will automatically align a frame. You should note that the image may be framed incorrectly if you first load blank film leader.

Next, choose the film type. If necessary, use the 'perf nudge' and 'frame' buttons to manually improve the alignment of the framing bar to the scanner's sensor such that the bottom of the previous frame and the top of the next frame are just visible at the top and bottom of the viewer, and the current frame is centered vertically. It's important to make sure the image in the viewer is not zoomed in when you do this.

Focus the Scanner

Just as you need to focus the lens on a camera, you'll need to focus the projected film image on your scanner's sensor. To achieve perfect focus, turn on the Focus Assist checkbox in the

Film Scanner capture settings of DaVinci Resolve. This superimposes a focus peaking overlay over the Ultra HD image that's output from the scanner's HDMI output, and is also displayed in DaVinci Resolve's capture window. For the best results, connect an Ultra HD display to your Cintel scanner so that you can monitor at the maximum available resolution while you focus.

With Focus Assist turned on, focus peaking will detect the film grain of the scanned image whenever the film plane is in perfect focus. This enables the operator to focus the scanner even if the film image is out of focus. Simply monitor the Ultra HD output of the scanner while you turn the Cintel scanner's focus wheel. Your image will be in focus when the grain running throughout the image displays peaking outlines.

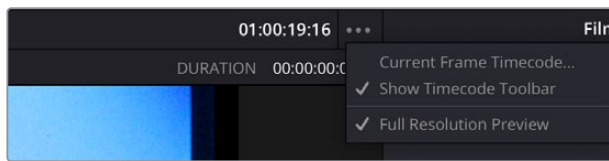
You can verify the focal adjustments you've made by checking the edges of your film's perforations. When these are sharp, your film will be in focus.

Reset the Timecode

To set the timecode for the roll of film you're about to scan, you need to locate the zero frame for that roll. It's standard practice to punch a small physical hole within the frame before the first frame of necessary film on a roll, to use as a permanent reference for whenever that roll is scanned. This is referred to as the marker frame, lab roll hole, or head punch. By always setting the first frame of timecode to match the marker frame, subsequent film scans will have the same frame count as previous scans, making it possible to rescan and reconfirm the same material whenever necessary.

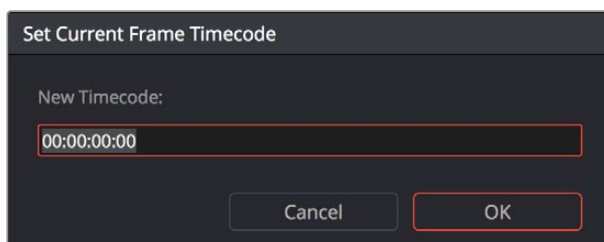
To reset scanned timecode at the marker frame of a new film roll:

- 1 Use the transport controls under the viewer to locate the marker frame.
- 2 Click the 'viewer' option menu and choose 'current frame timecode.'



Choosing Current Frame Timecode from the Viewer Option menu

- 3 Enter a timecode value in the dialog box that appears. For example, if you're scanning the first roll of a project, you can enter 01:00:00:00.



The Set Current Frame Timecode dialog

- 4 When you're done, click OK.

Timecode cannot be a negative value, so don't set the start frame to zero. Another common organizational technique is to change the hour number whenever you change rolls, to coincide with the film roll's number, which makes it easy to identify a scanned clip with the corresponding source roll and frame range.

Your Cintel Scanner has built in 'Options Interface' ports for adding optional hardware in the future. This offers the ability to add optional features such as reading KeyKode from the camera

negative, or optical/magnetic audio. For more information, see the 'Optional Audio and KeyKode Reader' section.

Choose a Location to Save the Scanned Frames

Once all this is done, scroll down to the 'capture info' controls in DaVinci Resolve's film scanner panel, and click the 'browse' button to choose a location for the scanned files. You can use the other fields in this section to set what prefix you want to add to the name of the scanned files and enclosing folders. The 'file name prefix' updates the file name preview that's shown at the top in the header. The header also shows the file path, resolution, frame rate, duration, and the format. Specify what roll, reel, clip, and program information you want associated with the scanned media. The 'timestamp prefix' checkbox in the 'Capture info' controls is selected by default and will save your clips to independent sub-folders within the destination folder, together with a timecode prefix in the file name.

If you want to save all your clips together in one master destination folder, simply deselect the checkbox.

When you capture an HDR clip, the scanner completes a high exposure scan and saves it in a hidden folder named .HDR inside the same folder as the standard scan. If you delete the .HDR folder, the scan converts to a normal clip after refreshing it in the media storage and re-importing the clip into media pool. This is useful if there is a problem with the HDR portion of the scan, as you can easily convert it to a regular CRI clip.

Check the Codec

DaVinci Resolve selects the 'Cintel Raw' codec by default, or you can choose 'Cintel Raw 3:1'.

The Cintel Raw Format

The Cintel Raw Format Bayer pattern of each film frame scanned with your Cintel scanner's sensor is saved with embedded scanner metadata as a 12-bit linear Cintel Raw Image, or CRI, image sequence. When grading in DaVinci Resolve, CRI images are automatically debayered as 12-bit log encoded image data.

The logarithmic encoding is similar, but not identical to Cineon encoding. For example, negative film is encoded using a Gamma of 2.046 for density, while print film is encoded using a full range Gamma 2.2 curve to ensure that no image data is clipped. Both of these logarithmic encodings can be converted to a linear color space using the 'Cintel to Linear' 1D LUT, before converting to other color spaces you may want to work in.

The film is scanned using the full sensor area of 4096x3072 to keep the audio waveform visible for optical audio and to accommodate perforation visibility for stabilization. The image is then cropped and the resolution of the capture files depends on the source film format after overscan for perforations and the audio area are removed. For more information about scanning resolutions for different types of film, see the 'specifications' section.

The Cintel scanner creates Cintel Raw files with variable bitrate lossless compression by default. This is visually lossless compression and achieves approximately 3:2 reduction in file size depending on image content. However, Cintel Raw 3:1 uses lossy compression with a ratio of approximately 3:1. This is still very high quality but may not always be visually lossless. For example, files for 35mm 4 perf are approximately 12.5MB with Cintel Raw and approximately 6.3MB with Cintel Raw 3:1. Files for 16mm are approximately 4MB with Cintel Raw and approximately 2MB with Cintel Raw 3:1.

CinemaDNG Quality Settings

To control the quality of CRI files, use the 'decode quality' and 'play quality' CinemaDNG settings located in the Camera Raw panel of the project Settings. These settings are 'full' by default. On computers with low processor or memory resources, these settings may be lowered but this will affect the quality of the final render.

Set the Timeline Resolution

DaVinci Resolve displays and renders the output from the scanner using the same resolution as the timeline. For example, for 35mm 4 perforation film, a custom resolution of 4096x3072 would be required for maximum resolution.

For more information on the cropped image area resolutions for all film gauges, refer to the 'effective resolutions' in the 'specifications' section. Alternatively, for the full native resolution of the captured clip, access the 'clips attributes' in DaVinci Resolve.

Adjusting the Color of the Scanner

DaVinci Resolve's film scanner panel gives you control over the exposure and color temperature of the light used to illuminate the film for scanning. You can adjust these via the light source master wheel and RGB controls, in order to maximize the amount of information you're extracting from each frame, while preventing any part of the image from being irretrievably clipped. While it's true that CRI is a raw image format, there's no latitude beyond the internal data range used by DaVinci, so be mindful that if you're clipping data in the built in video scopes while scanning, it might be clipped permanently in the scanned media.

How often you'll adjust the color and exposure of scanned shots depends on how much variety there is in the scenes on a particular film roll. For example, some rolls may have many takes of the same scene, all of which have the same lighting and which can share the same adjustments.

Meanwhile, other rolls may have a variety of different scenes with widely different lighting in each one, necessitating you to make individual adjustments for each scanned clip to maximize data quality.

This is important because the light source master wheel and RGB controls cannot be automatically changed between scanned clips in a log and capture workflow. This means that the current light source settings will be used for all clips you scan until you manually change those settings again, even for clips that you've logged from different parts of a film roll. This means that the log and capture style of working is only advisable in situations where it makes sense to log multiple clips that share the same light source master wheel and RGB control adjustments.

Otherwise, it's recommended you make lighting adjustments on a clip by clip basis, as you scan each clip, in situations where you need maximum image quality for finishing. Keep in mind that the goal for these adjustments is to maximize image data from the scan, not to create the final look of the clips, which you'll accomplish later in the grading phase of work using the controls of the 'color' page.

To adjust the light source settings, find a typical image for the section of roll or for the first series of shots you're going to scan, and adjust the light source while viewing the built in video scopes.

Adjust the light source master wheel to set the intensity of the light source used to illuminate the film, raising or lowering the level of the R, G, and B channels all at once. For a typical camera negative, this lets you adjust the black point of the film image. In a negative print, the darkest part of the image corresponds to the highlights of the film image. Set the light source master wheel to sit just above the typical Dmin value of 95, as measured on the histogram of the video scopes, which guarantees that the highlights won't be clipped by the Cineon LOG conversion that DaVinci uses to debayer the CRI image for grading. For positive film, simply adjust light source so that no part of the highlights or shadows of the signal is being clipped.

You can turn on 'show reference levels' in the waveform, RGB parade, or histogram scopes, and set the 'low' value to indicate the digital Dmin value of 95.

Once that's accomplished, adjust the RGB controls to rebalance all three color channels by varying amounts to alter the color temperature of the light source used to illuminate the film, to produce the most useful, or neutral, color balance in the scanned result.

Scanning One or More Sections of Film

After you've adjusted the light source, it's a good idea to stay organized as you scan each clip by entering all relevant metadata into the metadata editor as you go. The 'capture info' group of metadata fields contains information for defining the file name prefix, roll, reel number, clip number, program name, flags, and whether a particular take is good. If you populate these fields before scanning a clip, that metadata will be written into the clip.

At the bottom of the 'capture info' panel, you will see four buttons for film scanning.

With all of this accomplished, you can scan the film in one of four ways:

- **Capture Now:** Use the capture now button to capture long sections of a reel all at once. Clicking 'capture now' begins scanning near the current frame, ending whenever you click 'stop'.

If 'Enable 2 Pass HDR Scan' is selected, click 'Capture HDR' after the capture has begun to let DaVinci Resolve know you've reached the end of your desired clip so it can now proceed to capture the high exposure pass. If you scan the entire reel without clicking 'Capture HDR', the scanner automatically proceeds with the high intensity scan from where you started it until the end of the reel.

- **Capture Clip:** A more controlled means of scanning specific sections of film. After you've used the transport controls and the In and Out button to define a section of film, clicking 'capture clip' scans that one clip and then stops.

If 'Enable 2 Pass HDR Scan' is selected, the high intensity HDR scan uses the same In and Out points as the initial scan.

- **Batch Clips:** A way you can log multiple clips in advance of scanning them all at once using the current light source settings in DaVinci Resolve's film scanner panel. Log each clip in advance by setting In and Out points for each section of film you want to scan, and click the 'log clip' button to save that frame range as an unscanned clip in the media pool. When you click 'batch clips', all unscanned clips will be scanned one after the other until the job is complete. You can also select one or more unscanned clips, and only the selected clips will be scanned. Furthermore, you can import an EDL that corresponds to a particular film roll, and use the resulting logged clips for scanning.

NOTE When you click the 'log clip' button, Cintel Scanner applies the same project settings to all clips in the batch, and uses the newest project settings at the time of capture. You are advised to confirm the scanner settings before starting the batch capture.

If 'Enable 2 Pass HDR Scan' is selected, the high intensity HDR scan uses the same sets of In and Out points as the initial batch of scans.

For more information on batch capture workflows, refer to the 'Ingesting From Tape' chapter in the DaVinci Resolve manual.

- **Snapshot:** Capture a single frame with normal exposure and current scanner settings.

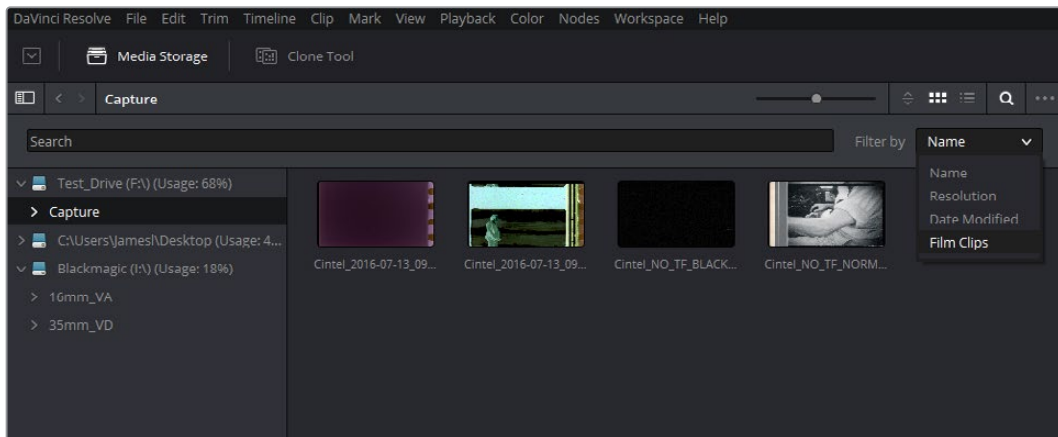
Once scanning, if DaVinci Resolve detects that your storage bandwidth is too low to capture at the selected speed, the scan speed will automatically adjust to ensure the capture is successful. If you are using the optional Audio and KeyCode Reader accessory, the audio sample rate will also be adjusted to maintain your chosen audio quality.

Extracting Audio

If the film you're scanning also contains an optical sound track, you can extract the audio in a separate step. There is a standard image frame to audio frame offset of 26 frames for 16mm and 21 frames for 35mm that DaVinci automatically aligns when extracting the audio. Select all of the clips that have an optical sound track, then right-click one of the selected clips and choose 'extract audio'. Resolve analyzes the overlapping optical track area of each frame and automatically generates a matching audio track, synchronized with the scanned image sequence.

Each clip's audio will be automatically extracted, embedded in the clip and saved to the same directory the scanned frames have been written to. A small audio icon will appear on the corner of your clip's thumbnail so you know there is a corresponding audio file.

To make extraction easier, you can filter the clips in the media storage by name, resolution, date modified or by film clips only. Filtering your clips makes it easier for you to find and select exactly what you need. You can also make a large selection and extract audio from multiple clips at once by right clicking on your selection and choosing 'extract audio...' from the menu. During audio extraction, an information box indicates the progress. You can click the 'stop' button any time to stop the extraction.

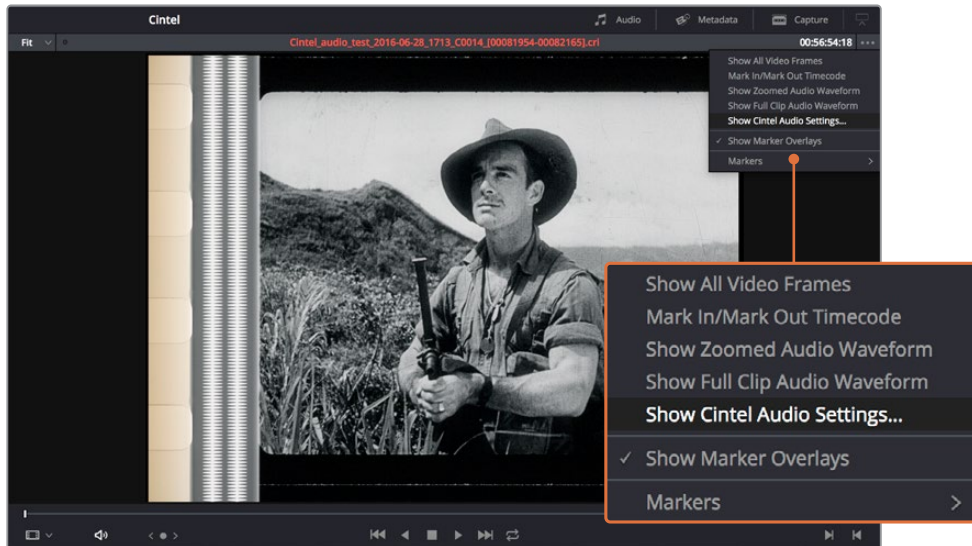


You can filter the contents in the media storage to make it easier to manage them.

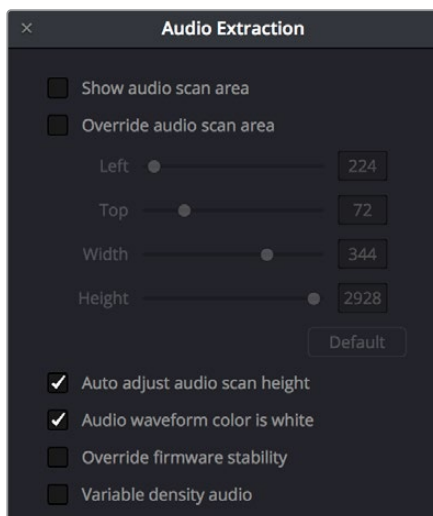
If the 'timestamp prefix' checkbox was deselected in the 'capture info' section when your clips were scanned, and you want to have extracted audio automatically embedded in your clips, always remember to extract audio from the clips inside the media pool.

Audio Extraction Settings

Normally, once you have selected the film type, the automatic features in DaVinci Resolve will extract your optical audio perfectly. However, the condition of the optical track can vary with the condition of the film being loaded and in some instances this can confuse the automation. If this happens, you can bypass the automatic features and make adjustments manually.



For manual adjustments, simply open the 'Audio Extraction' settings window by clicking on 'Show Cintel Audio Settings' in the inspector options near the top right of the viewer.



The Audio Extraction settings let you make manual adjustments if needed.

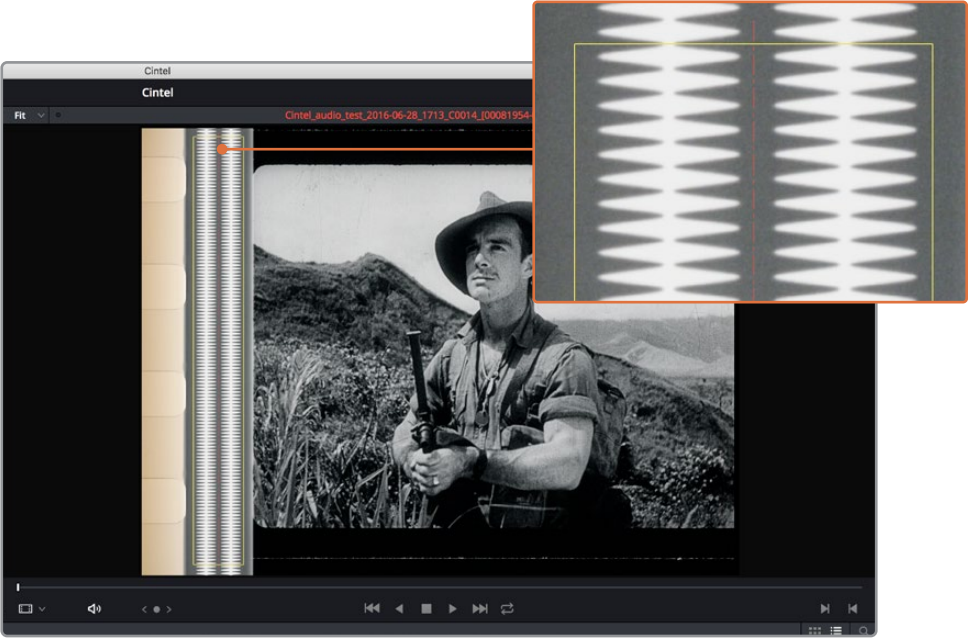
Audio extraction settings let you make the following manual adjustments:

Show audio scan area

This checkbox turns the audio scan area guides on or off. The guides are displayed as a box on the side of the frame covering the optical audio scan area and shows what optical information will be used during extraction. The position of the guides will conform to the film type you have selected. However, you can change the position manually if you need to. The audio scan area guides are also great indicators to show you what is happening during the extraction process so you can identify any potential troubles and make manual adjustments.

Inside the box is a thin red line. This line is the mid point detector which detects the separation between stereo audio channels. When mono sound is detected during audio extraction, the mid point detector disappears and the guides will adjust automatically to suit the width of the mono optical track.

TIP If you need a closer inspection of the audio scan area guides, you can zoom into the viewer and move the viewer position up or down, and left or right. Simply choose the amount of zoom from the sizing options at the top left corner of the viewer, then click and drag the viewer with your mouse or track pad.



When 'show audio scan area' setting is turned on, the audio area guides will be visible so you can see exactly what information is being used and monitor the extraction process.

Override audio scan area

This setting provides sliders for adjusting the horizontal and vertical positioning, width, and height of the audio scan area guides.

These settings include:

- **Left and Width:** If your film type is such that audio appears on the right side of the frame, you can simply adjust the 'left' slider to move the guide box to the right. Normally, this will happen automatically if you have the corresponding film type selected, but the setting gives you more flexibility for adjustments if you need it. Similarly, the 'width' setting is used to adjust the width of the scan area.
These are helpful tools for making subtle adjustments to the side edges of the guide box if there are unwanted elements inside the film's optical audio area. This can happen due to perforation wear and tear, or varying print qualities, and can sometimes interfere with the quality of the audio extraction. You can help avoid this by making a subtle movement to the side edges to keep the stray elements outside of the guide box.
- **Top:** This setting adjusts the vertical position of the guide box.
- **Height:** Sometimes film frames on older rolls of film may be slightly smaller than normal due to shrinkage over time. When making manual adjustments to the guide box, you can make adjustments for film shrinkage using the 'height' slider.
- **Auto adjust audio scan height:** This setting is on by default and automatically adjusts the guide box height to align with the audio waveform at the top of each frame. The automatic feature works well for normal audio conditions, however, if during extraction you notice the box moving randomly and the quality of the extraction is affected, it may be due to similar features in the audio track overlapping between frames. If this occurs, deselect the checkbox and try the extraction again.
If deselecting the 'Auto adjust audio scan height' checkbox, make sure the 'height' setting places the guide box at the optimal position for the frame. Making manual adjustments can help if you need them, but don't forget to turn the automatic features back on afterwards!
- **Audio waveform color is white:** Depending on the scanned film type, the audio waveform may be black or white. If the waveform is white, make sure the corresponding checkbox is enabled. This will ensure the white information in the waveform is used during audio extraction. If the waveform is black and the surrounding audio area is white, disable the checkbox so DaVinci knows to use the black information in the waveform. Other automatic features, such as mid point and mono detection, also rely on this setting being set correctly.
- **Override firmware stability:** In rare instances, the condition of the film may have created large movements in the frame due to the internal firmware stabilization. This can cause the audio extraction guide box to misalign with the optical track. If this occurs, enabling 'override firmware stability' lets the audio extraction guide box track the film perforations independently and adjust its positioning for potentially better results.
- **Variable density audio:** If your film contains variable density audio, make sure you select the 'Variable density audio' checkbox so DaVinci Resolve knows the type of audio to extract. The default state is set to 'off' for variable area audio soundtracks.

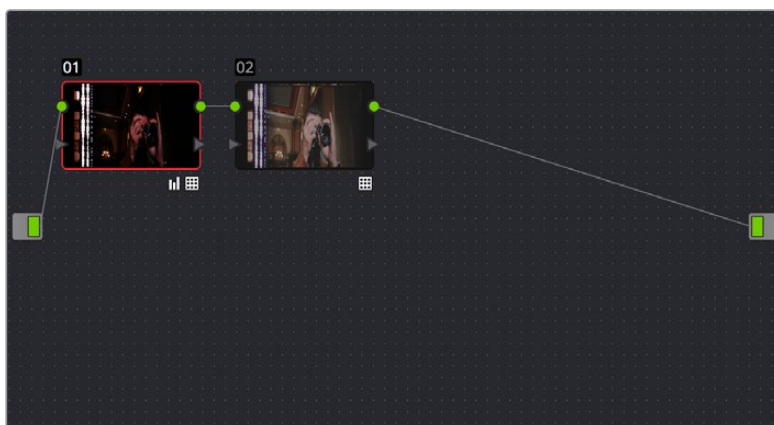
If you haven't used variable density audio before, you can visually identify it as a tight sequence of shaded lines, similar to a bar code with the lines squeezed closer together. By comparison, 'variable area' soundtracks appear as an audio waveform.

Color Space and Sizing

A pair of 1D LUTs, 'Cintel Negative to Linear,' and 'Cintel Print to Linear,' have been provided to help you convert scanned media to a color space in which you can do further work. You can apply these LUTs via a node in the 'color' page to convert the original scans to a Linear color space. However, if you want to convert the image to Rec. 709 or to Cineon for further adjustment, you'll want to apply a second LUT in a second node. The default color space for print is a 2.2 gamma standard log curve, and all others are 2.046 film density log gamma.

In general for negative film, it's best to "color invert" after the second LUT is applied. Furthermore, normally some grading is required on the Linear data to remove black offsets, due to Dmin, for proper conversion into the destination color space. There are a variety of VFX IO LUTs available in the 3D LUT submenu of each node's contextual menu that let you convert an image from Linear color space to any other color space you want to work within.

For more information, see the DaVinci Resolve manual section 'Applying a LUT Within a Node' in Chapter 30, "Working in the Node Editor."

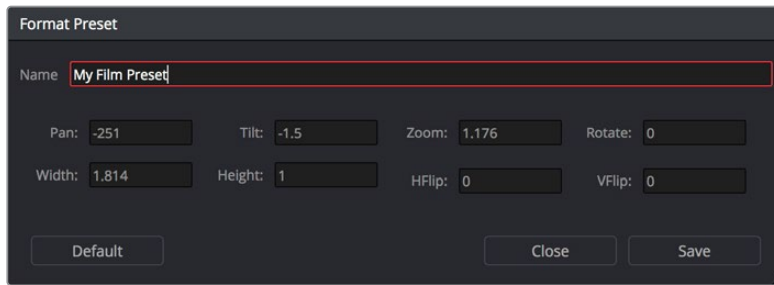


Using three nodes to convert a film scan using LUTs, node 1 converts from Negative or Print to Linear, node 2 converts from Linear to Rec. 709, and node 3, if required, inverts the color

Applying a LUT within a node will clip any image data falling below 0 and above 1. To prevent clipping, you can use the Lift/Gamma/Gain controls within any node with a LUT applied to adjust your image levels prior to the transform applied by the LUT within that node.

The format of the film you're scanning and the way the material was originally shot both affect the framing. You can adjust the final framing of your scanned clip by resizing, zooming, stretching, panning, tilting, and more. On the 'color' page, open the 'sizing' palette and use the 'input sizing' mode to create the necessary framing. To save your sizing preferences as a preset, open the menu, select 'save as new preset' and enter a name for your preset.

Once you've created an appropriate sizing preset for a given type of media, you can apply that preset to multiple film scans all at once, in either the color page or in the media pool using the 'change input sizing preset' command, found in the contextual menu of selected clips. For more information on sizing, see the 'sizing and image stabilization' chapter in the DaVinci Resolve manual.

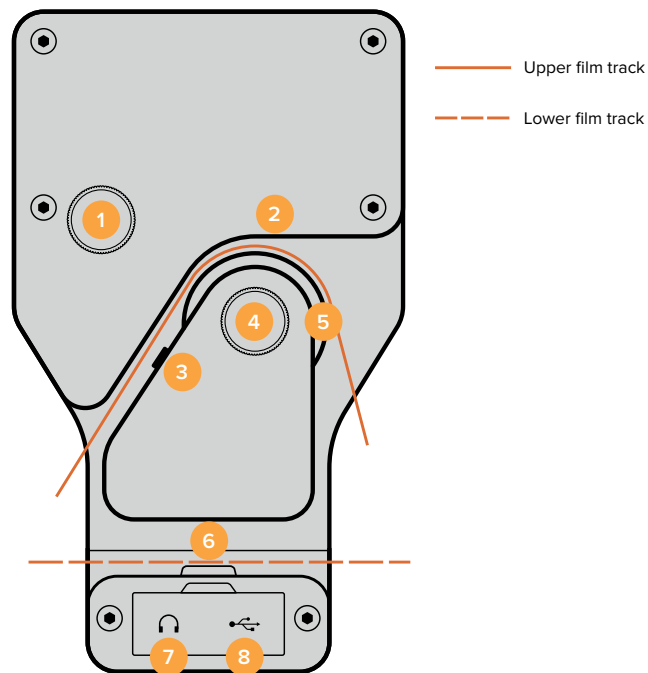


Creating a sizing preset in the Sizing palette of the Color page

Optional Audio and KeyKode Reader

The optional Audio and KeyKode Reader expands your Cintel scanner's capabilities by capturing optical and magnetic soundtracks at any speed, from slow to faster than real time. It can also scan KeyKode information about the frame's position in the reel and film stock used.

The reader has the following components.



1. Optical audio tracking knob
2. Magnetic audio head
3. Optical audio scanner
4. Capstan roller cleaning knob
5. Capstan roller
6. KeyKode scanner
7. Headphone port
8. USB firmware port

By lacing your film through the upper section of the reader, you can extract optical and magnetic soundtracks from your film.

When film is laced through the reader's lower section, you can capture KeyCode information. KeyCode data is located near the perforation area on some negative film stocks and typically contains data about the position of frames within a reel, information to help identify the film roll, and additional details such as the type of film stock. The scanned information is saved as metadata within each Cintel Raw frame.

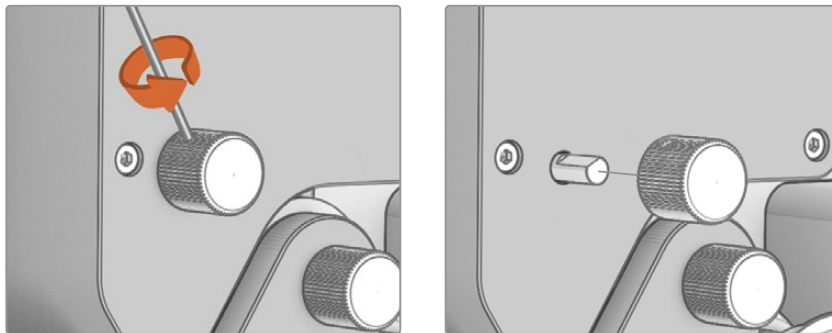
TIP Your Cintel scanner can still capture optical soundtrack information without the Audio and KeyCode Reader attached. Simply use the extract audio feature in the DaVinci Resolve film scanner panel after you have scanned your film. For more information on extracting optical audio see the 'extracting audio' section in this manual.

Attaching the Audio and KeyCode Reader

The reader is powered by your scanner's left interface, which is the 6 pin accessory XLR connector underneath the feeding spool.

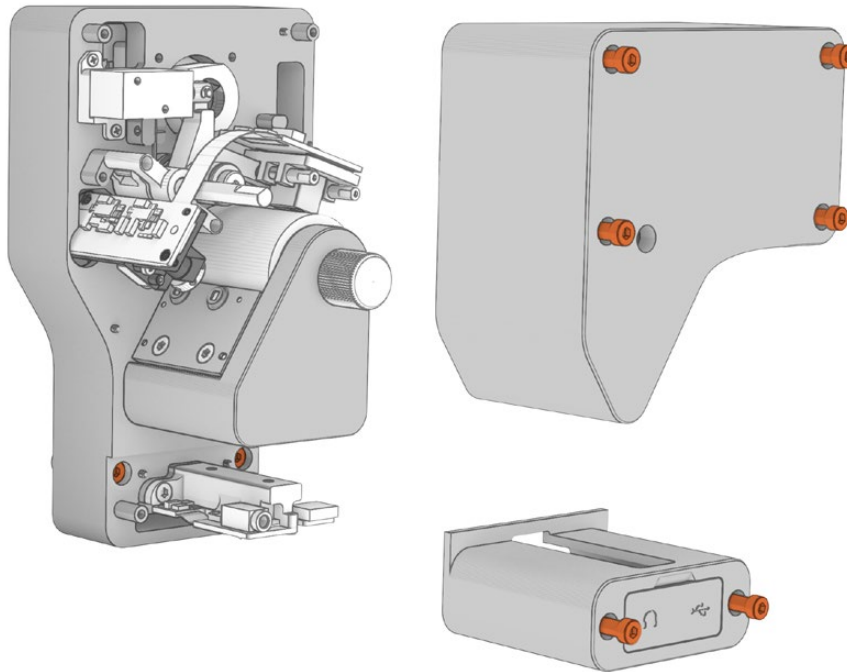
To attach the Audio and KeyCode Reader to your Cintel Scanner:

- 1 First make sure power is disconnected from your Cintel scanner.
- 2 On the reader's upper adjustment knob, you'll find a small retention screw recessed into one side. Use a 1.5mm Allen key to loosen this screw and slide the knob off its spindle. This lets you remove the reader's upper cover.



Use a 1.5mm allen key to loosen the adjustment knob's retention screw, then remove the knob from its spindle

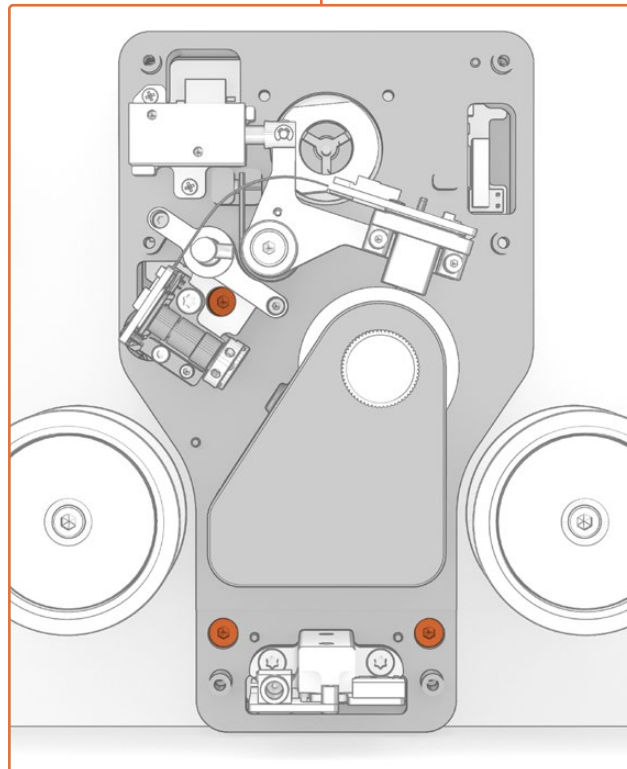
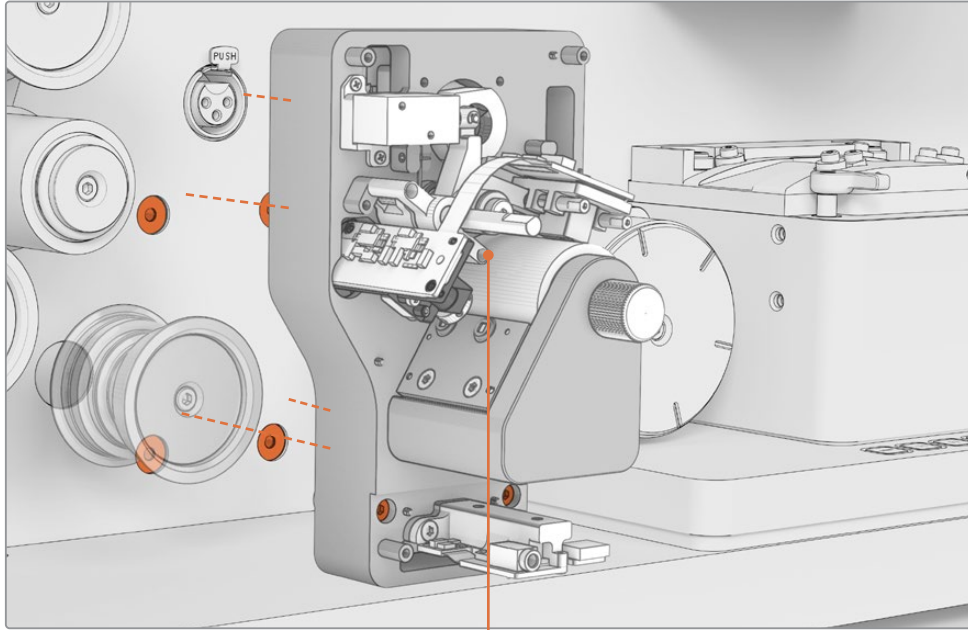
- 3 Remove the upper and lower covers from the Audio and KeyKode Reader by unscrewing the 6 x M3 screws with a 2.5mm Allen key. The screws are 'captive' so they remain attached to the reader. Removing the covers gives you access to the captive screws needed to attach the reader to your Cintel scanner.



Remove the upper and lower covers from the reader by unscrewing the six M3 cover screws. As they are captive screws, you only need to unscrew them a short distance until they release contact, as shown in the image above.

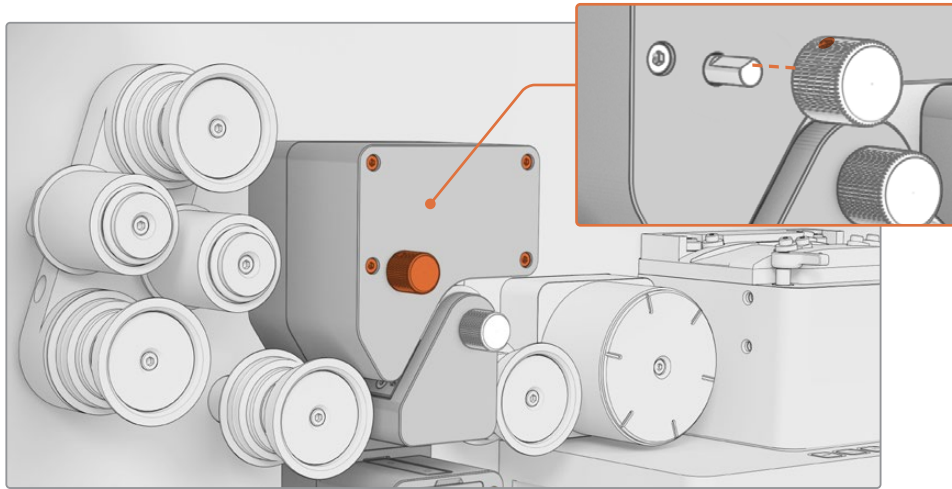
- 4 Remove the four M4 screw plugs from your Cintel scanner using a 2mm Allen key. The correct screws are the top left screw, and bottom two screws located beneath the left options interface XLR connector.
- 5 Mount the reader to your scanner by plugging its male XLR connector into the female XLR left options interface connector on your Cintel scanner.

- 6 Fasten the Audio and KeyKode Reader to your scanner using the 3 x captive M3 screws, ensuring it is seated flat to the deckplate before tightening.



Plug the reader into the left options interface XLR connector and fasten the reader to your Cintel scanner using the three captive M3 screws.

- 7 Reattach the Audio and KeyCode Reader covers and tighten the cover screws. Reattach the upper adjustment knob and lightly tighten the retention screw to the flat side of the spindle.



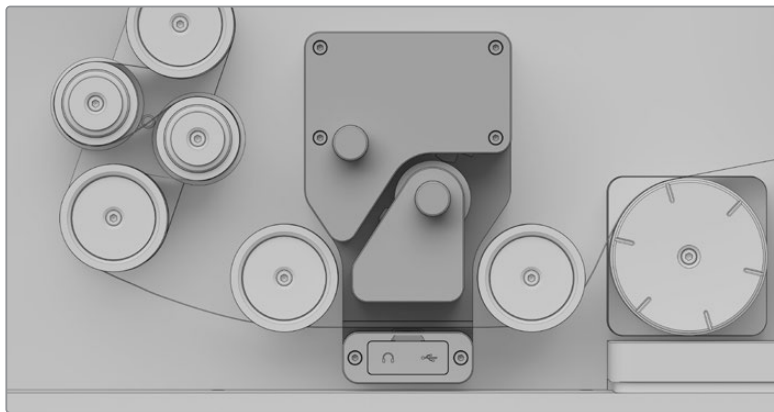
Reattach the reader's covers by tightening the six captive M3 screws and reattach the adjustment knob by tightening the screw against the flat edge of the spindle.

Reading Audio

With the Audio and KeyCode Reader attached, your scanner can record optical audio information from 35 and 16mm film and magnetic audio information from 16mm film.

Lacing Film

To start recording audio information in real time, the first thing you'll need to do is lace your film through the reader's audio path. The correct lacing path is shown below.



Lace film through the Audio and KeyCode Reader's upper section to read audio

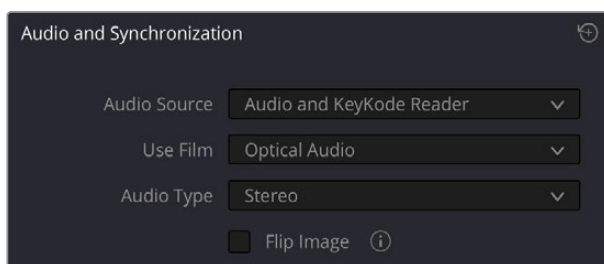
NOTE When scanning optical audio pay particular attention to the position of the 16mm and 35mm scanning LEDs. 35mm is closer to the Cintel chassis, while 16mm is further away.

TIP When film is laced through the reader's audio path, DaVinci Resolve will automatically record audio and add it to your clips. Alternatively, if it is laced through the lower path no audio will be recorded.

Setting the Reader for Audio Scanning

Once your film is laced, go to DaVinci Resolve's film scanner panel and set the 'use film' and 'audio type' settings in the reader accessory pane. The option you choose in the 'audio source' menu will change the options available in the 'use film' and 'audio type' menus.

These settings let you set which function you want your reader to perform, for example setting the reader to scan KeyCode information, or to different audio types, for example optical or magnetic audio.



The audio and KeyCode reader pane in DaVinci Resolve's film scanner panel lets you change the 'use film' option between KeyCode and audio scanning

TIP The available options will differ depending on the type of film you have loaded. For example, magnetic audio is available when 16mm is set as the film type in DaVinci Resolve's film scanner panel.

Audio Source

Select the source for the audio to accompany the images you scan.

- **None:** No audio track. Options for 'use film' and 'audio' type are unavailable.
- **Audio and KeyCode Reader:** Read optical or magnetic audio from the film using the Audio and KeyCode Reader.
- **External Audio:** Select this option to accept analog audio or AES/EBU digital audio via the external XLR audio ports.

Use Film

Use these settings to determine the reader's KeyCode or audio reading functions. For information on reading KeyCode data, refer to the 'Reading KeyCode' section.

The settings for the audio reader include:

- **Optical Audio:** Choose this setting when you want to scan audio from an optical audio track.

You can tell if the audio track is optical by inspecting the film. If you're scanning 35mm or 16mm film and see a continuous waveform or a long, tightly packed series of stripes down one side, your print has an optical soundtrack.

- **Optical Audio Narrow Track:** When scanning optical audio, film shrinkage and the variables inherent in printing will occasionally mean that your film's optical soundtrack is smaller than the area scanned by your Audio and KeyCode Reader. This can result in the audio reader scanning perforations or image data on either side of the sound track, which causes interference in the audio. In this event, adjusting the reader's tracking knob can help improve the audio, but if that is unsuccessful and the audio track is problematic, then you can select 'optical audio narrow track' from the 'use film' menu. This will reduce the area your reader scans by about twenty percent, limiting the unwanted areas around the optical track and improving the quality of the audio scan.

For more information about the tracking feature on the audio reader, refer to the 'tracking' information later in this section.

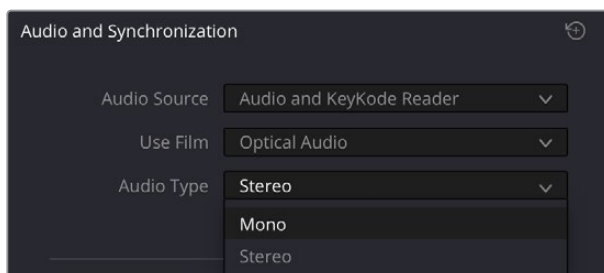
- **Magnetic Audio:** If you want to scan the magnetic striped audio track on 16mm film, set the 'use film' setting to 'magnetic audio'.

You can identify magnetic striped audio audio track on 16mm film by looking for a black strip next to the frames. The black strip will be copper colored on the emulsion side of the film.

NOTE When scanning magnetic stripe audio, we recommend setting your scan speed to 24 frames per second for proper equalization. Scanning at other speeds may require pitch adjustment in post.

Audio Type

- **Stereo or Mono Audio:** Once you've selected the appropriate 'use film' option, choose your audio type from the 'audio type' menu. You can easily tell whether optical audio is stereo or mono by inspecting your film. If you see two waveforms side by side, your film has a stereo soundtrack. If you only see one waveform, or the packed stripes of variable density audio, your film has a mono soundtrack. Magnetic audio is always mono.

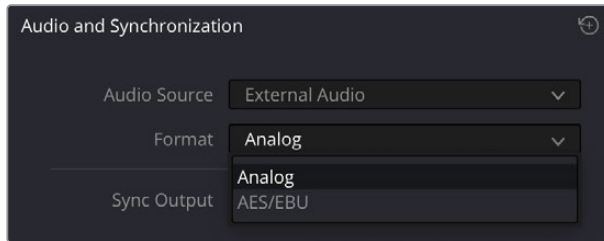


Choose 'stereo' or 'mono' audio depending on the type of audio on the film

Format

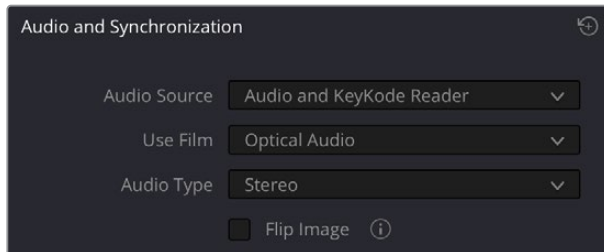
The XLR audio inputs on the side panel of Cintel Scanner can accept analog audio or AES/EBU digital audio. Select an appropriate option from the 'format' menu:

- **Analog:** Choose this setting if you are using balanced analog audio.
- **AES/EBU:** Use this option to receive AES/EBU audio, also known as AES3.



Flip Image

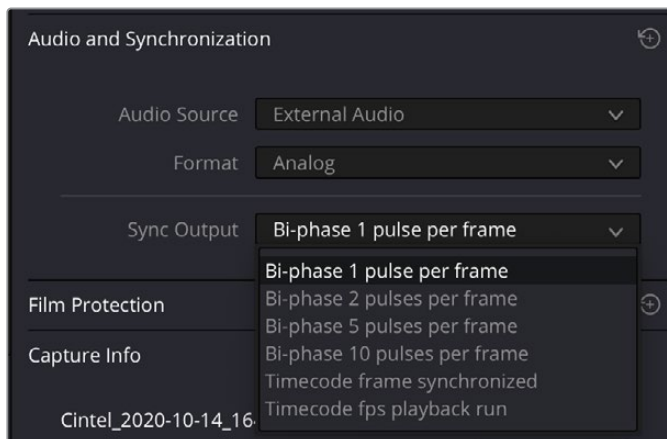
If the image is reversed when scanning audio from negative film types, tick the 'flip image' checkbox.



Enable the 'flip image' option to mirror the frame.

Sync Output

Use the 'sync output' menu to choose a sync standard if the scanner is connected via an XLR port on the side panel to external equipment that requires synchronization.



Bi-phase and timecode output options in the 'sync output' menu

'Bi-phase' outputs two single ended quadrature signals on the standard audio XLR3 differential pair, so direction and frequency can be sensed at the rate you select. 'Timecode frame synchronized' outputs a single timecode value per transported frame. 'Timecode fps playback run' outputs timecodes at a fixed rate determined by your project's film frame rate. The voltage output automatically switches between 4.5V for Bi-phase and 1.5V for Timecode selections.

NOTE Timecode output is supported for 24, 25 and 30 fps free running or frame locked. Timecode output is unavailable for other frame rates.

Capture speed

When the Audio and KeyCode Reader is installed and configured to capture audio, your Cintel scanner's maximum scan speed will be capped to 125% of your film's target frame rate. For example, when scanning film intended for 24 frame per second playback, your scanner's maximum scan speed will be 30 frames per second. This ensures a 48 kHz sample rate.

Tracking

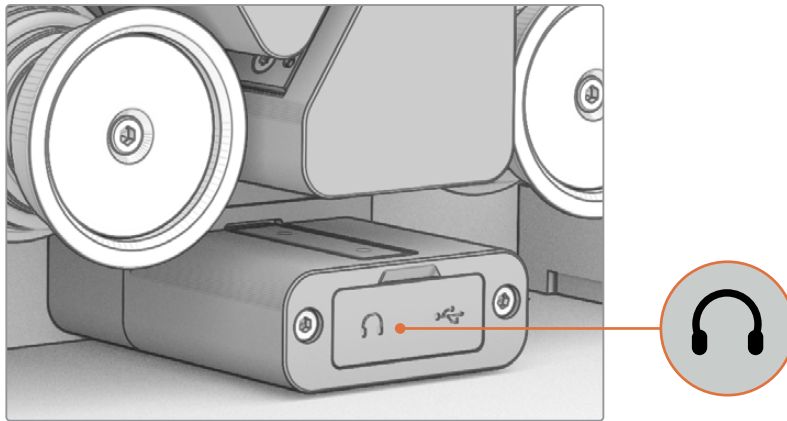
As the positioning of optical soundtracks can vary slightly from print to print, it is important to ensure that your reader is scanning the correct audio area on the film. The tracking feature on the audio reader lets you make fine adjustments to the position of the optical audio scanning head to ensure you are getting the best possible quality.

To use the tracking feature:

- 1 Plug a set of headphones or an audio analyzer into your reader's 3.5mm headphone jack. Lift open the rubber dust cover to access the connector.
- 2 With headphones on, or an analyzer plugged in, use your scanner's transport controls to shuttle to a place in the film where audio is present and play the film.
- 3 While listening to, or analyzing, the audio of your film, rotate the tracking knob clockwise or counterclockwise. The tracking knob is located on the upper section of your reader. As you adjust the tracking knob, the scanning head will move closer or further away from the film's edge so you can refine its position over the optical track. You will also hear the loudness and clarity of the audio change as the tracking is adjusted. An audio analyzer will operate on the same principle, but with more precision, as you move the tracking knob.

For stereo tracks, simply make adjustments until you find the optimum position where both channels are equally strong and clear with no distortion.

For mono audio, it's effective to set the audio type to stereo when adjusting the tracking. This lets you use the left and right stereo channels to center the track, which will ensure the mono track will scan at the best quality. However, don't forget to reset the audio type to mono after you have optimized the tracking.

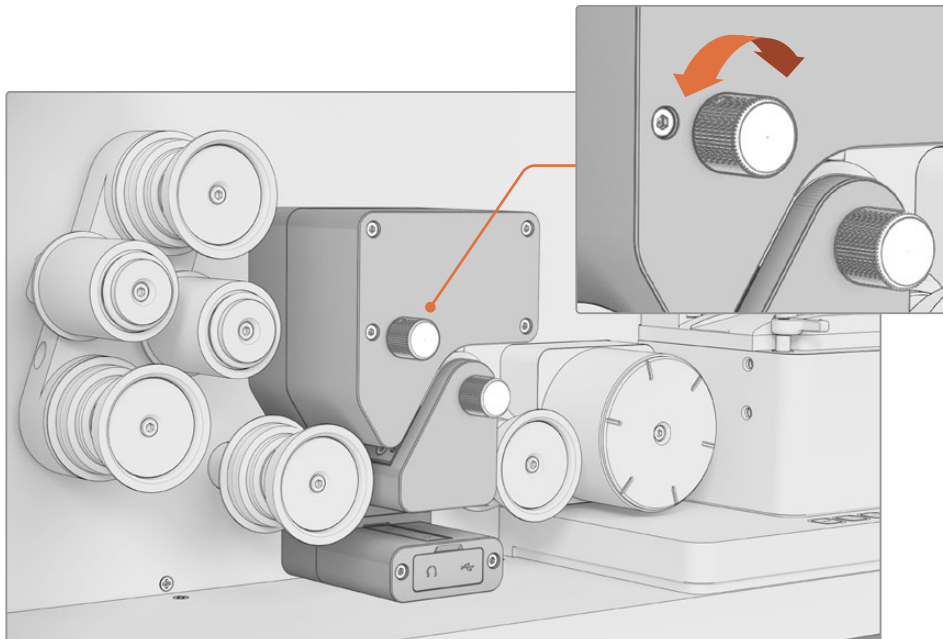


The Audio and KeyKode Reader's headphone jack is behind a rubber dust cover at the bottom of the reader

Previewing Audio via HDMI and the Headphones Jack

Film soundtracks are printed several frames ahead of the images they sync to, therefore, your Cintel scanner automatically delays the audio so it is synced to the picture via the HDMI output and also synced in the scanned clip.

The headphones jack outputs real time, non-synced audio directly from the soundtrack. This means that when you make tracking adjustments, you can hear the difference immediately without a delay.



Rotating the tracking knob adjusts the position of the audio head so you can improve the quality of the optical audio scan

When capturing optical audio, your reader will dim its LED light if the reader's film roller is not turning. The reader conforms to the status of your scanner, so if the scanner enters sleep mode, the reader will too.

Tracking with Magnetic Audio

The Audio and KeyCode Reader's magnetic audio head comes preconfigured from the factory and shouldn't need adjustment. The nature of magnetic audio means that a small amount of overlap shouldn't cause distortion as these areas don't carry magnetic information. There is also typically less variation in the placement of magnetic soundtracks during the printing process, and the reader's magnetic head is slightly oversize to help compensate for any misalignment.

Advanced Tracking

In addition to the tracking adjustments listed here, the reader also supports:

- Magnetic audio azimuth and tracking adjustment
- Optical audio azimuth adjustment
- Optical audio focus adjustment

For most users, these changes will never be necessary. For information on these advanced adjustments, contact your Blackmagic Support Center at www.blackmagicdesign.com/support

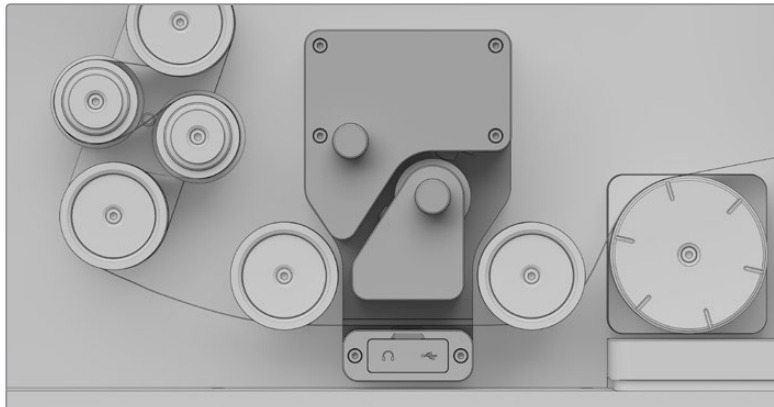
Commencing your scan

Once you have set your audio type and adjusted the tracking, simply commence your scan as detailed in the section 'Scanning One or More Sections of Film.'

It's worth noting that DaVinci Resolve will not begin writing a file until it has synchronized audio and video information being sent from your scanner. As audio information is printed a few frames ahead of its corresponding frame, this means there will be a brief pause of approximately one second between your scanner reaching speed and your scan appearing on screen.

Reading KeyCode

When scanning KeyCode data, lacing the film is exactly the same as lacing film without the reader attached. The film will naturally pass through the KeyCode reader as it travels between the rollers through to the skid plate. The correct lacing path is shown below.

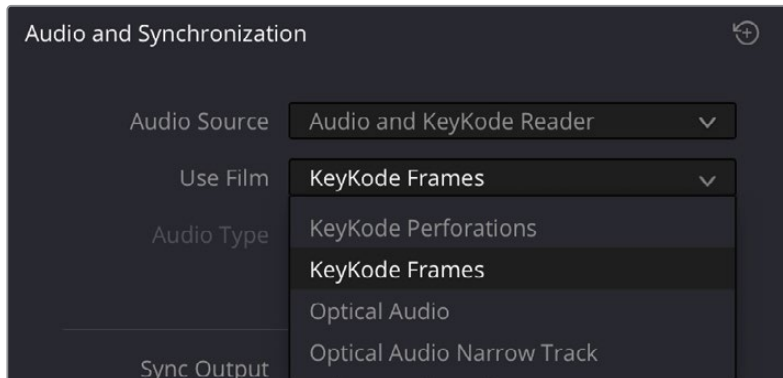


Lace film through your Audio and KeyCode Reader's lower section to scan KeyCode data

NOTE When capturing KeyCode information make sure that the KeyCode section of your film passes over the scanning LED.

Setting the Reader for KeyCode Scanning

After you lace film through the KeyCode reader and tension it, you need to configure your Cintel scanner to read KeyCode. Go to the DaVinci Resolve film scanner panel and in the 'use film' menu select 'KeyCode Perforations' or 'KeyCode Frames'. When you export a DPX file, KeyCode information will be represented in frames or perforations accordingly.



Select 'KeyCode Perforations' or 'KeyCode Frames' from the 'use film' menu to scan KeyCode data on negative film prints

Use Film

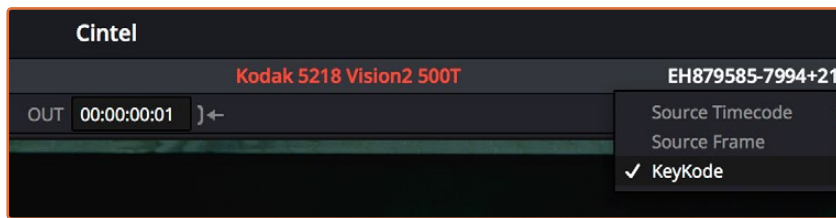
Use these settings to determine the reader's KeyCode or audio reading functions. For information on audio reading, refer to the 'Setting the Reader for Audio Scanning' section.

The settings for the KeyCode reader include:

- **KeyCode Perforations:** Select 'KeyCode Perforations' to record KeyCode based on the perforation count.
- **KeyCode Frames:** Select 'KeyCode Frames' with any type of film to record KeyCode accurate to the frame count.

The reader will now scan any KeyCode information present on the film and save it as metadata in each clip. You can also see the KeyCode metadata displayed at the top of the viewer within DaVinci Resolve's film scanner panel.

To view the information, simply click on the viewer options icon at the top right corner of the viewer and select 'KeyCode' from the menu.



Set the viewer to display KeyCode data by clicking on the viewer options in the top right corner and selecting 'KeyCode' from the menu

KeyCode information is often captured for inclusion in DPX digital intermediates, as detailed in the next section, but this metadata is also available for use in the 'edit' and 'color' panes of DaVinci Resolve just like any other metadata.

Transcoding to DPX including KeyCode Metadata

If you want to, you can also set DaVinci Resolve to transcode your scans to the DPX file format, which will retain all the KeyCode metadata.

To transcode your scans to DPX:

- 1 Go to the menu bar at the top of the screen and click on 'File', then select media management.
- 2 In the media management window, click on the 'clips' icon to transcode all clips individually, and select transcode.
- 3 Set your media destination by browsing to your chosen storage folder and click OK.
- 4 Enable the 'transcode all media' radio button to transcode all the media on your timeline.
- 5 In the video settings, set the video format to 'DPX' and choose your desired codec setting.
- 6 The resolution will automatically match your timeline resolution, but you can change the setting if you want to transcode to a different resolution. You can also set it to match your clips' source resolution by enabling the 'render at source resolution' checkbox.

- 7 In the audio settings, choose the number of audio channels you want to include in your DPX files, or select 'same as source' to match the audio in the source clips. Also set your desired audio bit depth.

The DaVinci icons at the bottom of the window will let you know the current size of your media, and the size of the media once it has been transcoded to DPX files.

- 8 Click 'start'.

All the clips on your timeline will now be transcoded to DPX files with the KeyCode embedded. For more information about transcoding your Cintel Raw files to other formats, refer to the Media Management section of the DaVinci Resolve manual.

You can also render your Cintel Raw files as DPX files with embedded KeyCode by going to DaVinci Resolve's 'Deliver' page and exporting your files as DPX files. Make sure you select 'individual source clips' in the 'render' settings to make sure each file is exported separately.

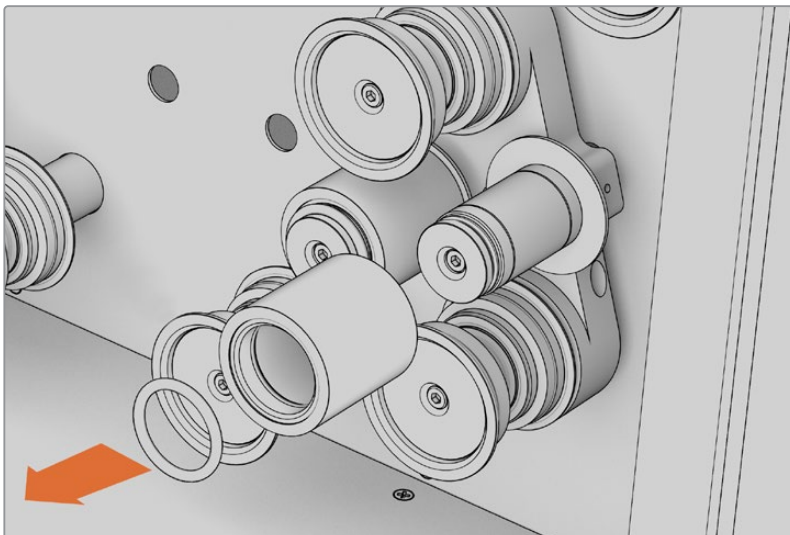
Servicing

To ensure optimal scan quality, it is important to keep your scanner clean and dust free. This is easily done by regularly cleaning the particle transfer rollers and using an air duster to clean the rest of your scanner's contact surfaces including its hard rubber rollers, drive wheels and skid plate.

Cleaning the Particle Transfer Rollers

Cleaning the particle transfer rollers, or PTRs, should be done after every film run. To clean the rollers, simply remove the O-ring at the end of each PTR spindle and slide off the roller. Apply warm, soapy water to the rollers using household dishwashing detergent and allow them to air dry. We don't recommend towel or blow drying as this can deposit new particles on the rollers or heat deform them. Once dry, simply slide the rollers and O-ring back on and you're ready to scan.

If the PTRs are becoming hard to remove or install, apply a thin layer of silicon grease to the inside of the O rings. This will help maintain lubrication so they are easier to remove for cleaning.



To clean the particle transfer rollers, simply remove the O-ring at the end of each PTR spindle and slide off the roller.

If you find your particle transfer rollers losing stickiness even after washing, or have become difficult to mount and remove through age, wear and tear, you can purchase new rollers from the Blackmagic Design website at www.blackmagicdesign.com

Cleaning the Capstans

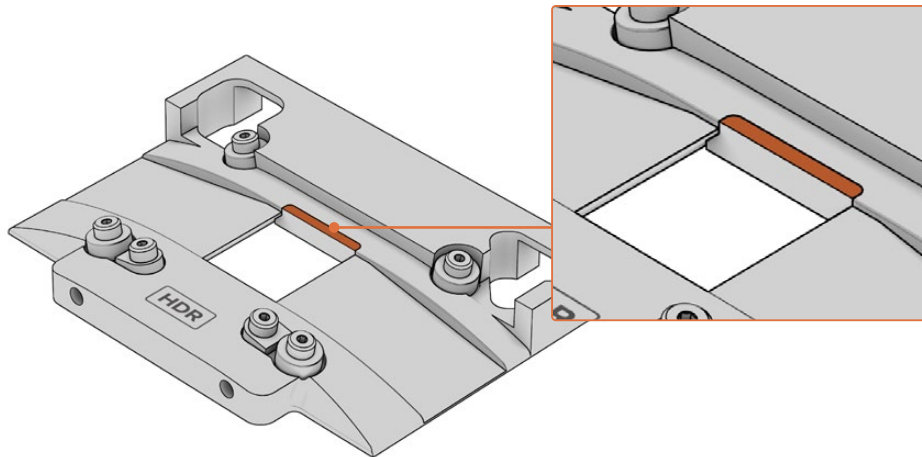
Clean the capstans as needed, ideally prior to scanning every new roll of film. Allow the capstans to air dry before use.

NOTE Caution must be observed to prevent damage by liquids to electronics near the capstans. Apply only a small amount of water to a lint free cloth. Do not use solvents or sprays when cleaning the capstans.

Dusting

Dusting your scanner should be performed daily. This is as easy as using an air duster to remove any particles from your scanner's skid plate, drive wheels and any other film contact surface. This is best performed with the skid plate removed.

When dusting, it's worth paying special attention to the small plastic infill on your scanner's skid plate. Dust buildup in this area can effect stabilization performance, so from time to time it's worth wiping this down with a damp cloth.



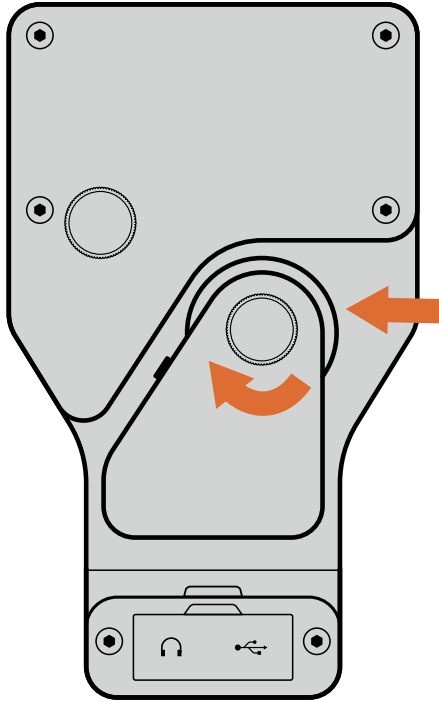
Pay special attention to the skid plate infill when dusting

You may occasionally wish to clean the lens over your scanner's RGB light source. This can be done with a clean cloth and a small amount of isopropyl alcohol.

Both air dusters and isopropyl alcohol are available at most electronics stores.

Cleaning the Audio and KeyKode Reader Roller

The Audio and KeyKode Reader contains a rubber roller for film laced through its upper track. This should be cleaned from time to time with a damp cloth. Simply remove any film laced through the upper track and hold a damp cloth against the roller while turning the cleaning knob to get rid of any dust buildup.

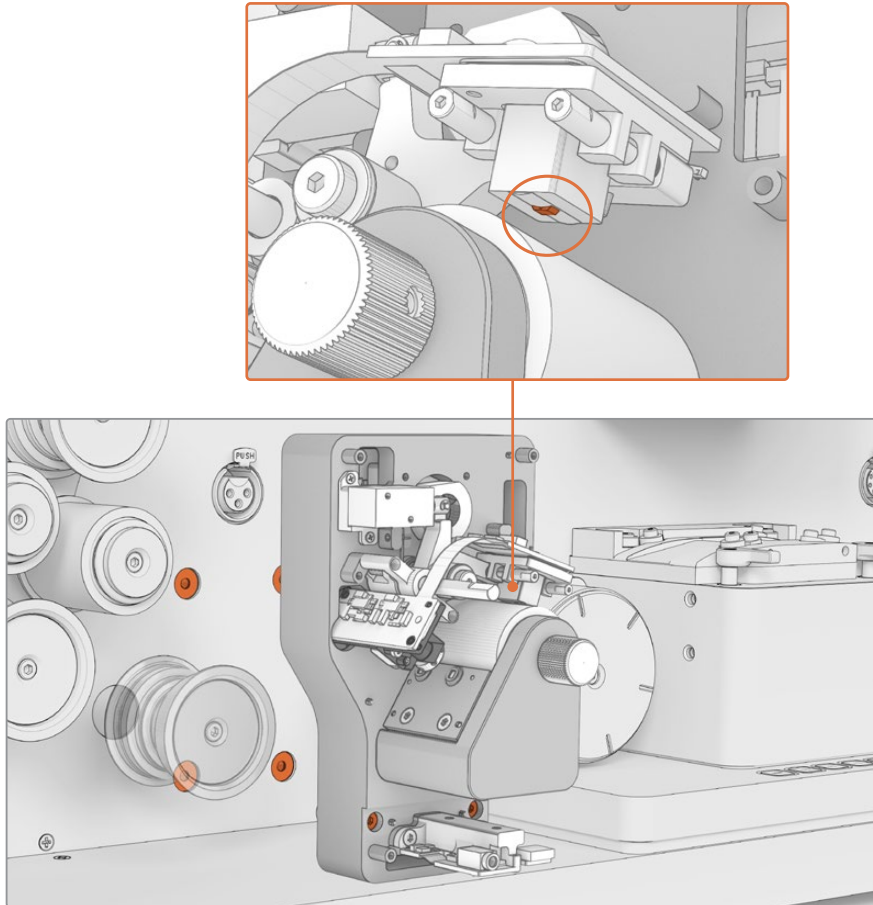


To clean the Audio and KeyKode Reader film roller, hold a damp cloth against the roller surface while turning the roller knob to wipe away dust

We recommend using only water to clean the Audio and KeyKode Reader's rollers and magnetic head. Alcohol, Xylene and other chemicals are not necessary and may damage the reader accessory.

Cleaning the Audio and KeyKode Reader's Magnetic Audio Head

You may wish to occasionally clean the Audio and KeyKode Reader's magnetic head. To clean the magnetic head, remove the top cover of the reader by removing the 4 x M3 screws with a 2.5mm Allen key.



Remove the Audio and KeyKode Reader's upper cover to access the magnetic head

With the magnetic head exposed, simply dip a Q-tip in water and shake off any excess, then gently brush the magnetic head surface to remove dust. Allow the head to dry for a few minutes before reinstalling the reader's upper cover.

The magnetic head is demagnetized at the factory and shouldn't need additional demagnetization.

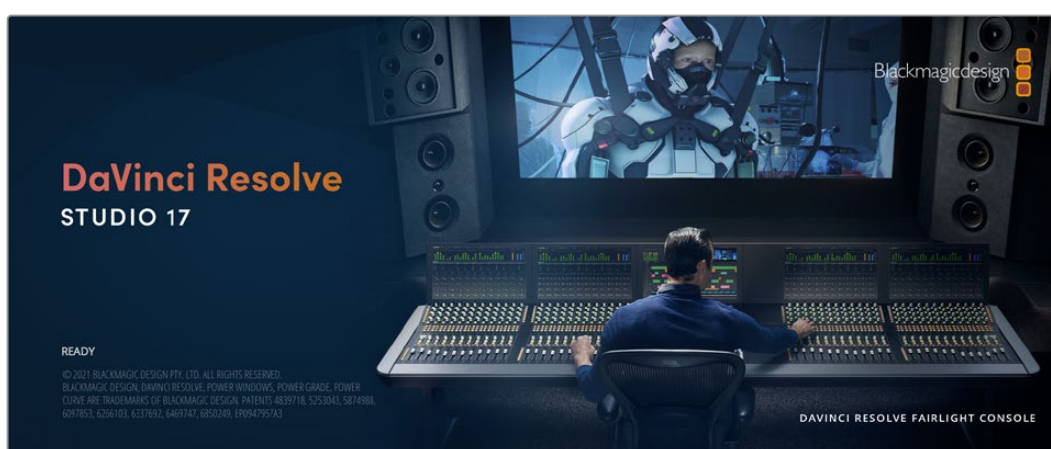
Spare Parts for your Cintel Scanner

Spares of major Cintel scanner components are available through your local Blackmagic Design support office. Servicing your Cintel Scanner is generally quite easy and intuitive, but if required, documentation can be provided from your local sales office to assist.

Working with Clips in DaVinci Resolve

You can use DaVinci Resolve's 'clone' tool, in the 'media' page, to create running backups as you scan your clips. This is recommended as any type of media is susceptible to becoming damaged or developing a fault so creating backups ensures your scanned files will be immune to loss. Once you have used DaVinci Resolve to back up your media, you can add your scanned clips to the DaVinci media pool, then arrange the clips in a timeline, color correct, and finish your production without ever having to leave DaVinci Resolve.

TIP You can identify HDR clips via the HDR icon in the bottom left corner of the clip thumbnail.



Because your Cintel Scanner captures a CRI raw image format with a wide dynamic range, DaVinci Resolve will help you adjust your shots to get any kind of look you are after. DaVinci Resolve is the same tool used on most major blockbuster movies, so it's much more than a simple NLE software tool, as it has extremely advanced technology built in for high end digital film. You get the advantage of this technology when you use DaVinci Resolve to edit and color correct your scans.

Included here is information on how to get started using DaVinci Resolve with your scanned files. Of course, DaVinci Resolve is extremely advanced and includes a lot more features than you immediately see when first looking at its user interface. To learn more about how to use DaVinci Resolve, please check for the DaVinci Resolve instruction manual PDF file on the DaVinci Resolve software disk, or check online for the many training courses and tutorial videos available.

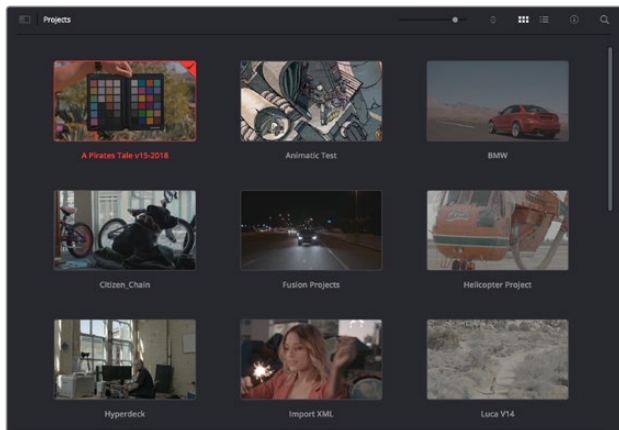
Project Manager

Before you import your clips and start editing, you will need to set up your project using the project manager.

The project manager is the first screen you will see when launching DaVinci Resolve, but you can open the manager at any time by clicking on the 'home' icon at the bottom right of the user interface. This is helpful when you want to open previous projects and create new ones.

To create a new project, click on 'new project' at the bottom of the window and give your project a name. Click 'create'.

Using the 'cut' page, you can start working on your edit immediately.



The project manager shows all projects belonging to the current user

For more information about the Project Manager, refer to the DaVinci Resolve manual which is available to download on the Blackmagic Design website support page.

Editing with the Cut Page

The 'cut' page gives you a fast, dynamic editing workflow that lets you quickly assemble, trim and edit clips efficiently.

Two active timelines let you work with your entire edit plus a detailed area simultaneously. This means you can drop clips anywhere on a large timeline, then refine your edit in a detailed timeline within the same workspace. Using this workflow, you can edit on a laptop without needing to zoom in and out and scroll as you work, which can be an enormous time saver.

The Cut Page Layout

When you open the cut page, you will see the media pool, viewer window and timeline. These three primary windows give you complete control over your edit.



The Cut page default workspace, with the Media Pool in icon view

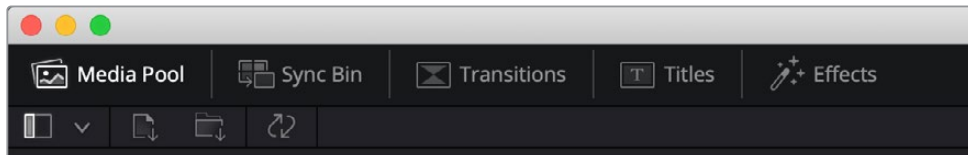
For more information on the Cut page, see the 'The Cut Page' chapter in the DaVinci Resolve manual.

Media Tabs

At the top left corner of the user interface you will see five tabs.

Click on these tabs to open the media toolsets you will use when creating your edit.

For example, the first tab is the media pool and you can see it is already selected. The other tabs are for the sync bin, media transitions, titles and effects.



- **Media Pool:** The media pool contains all your clips, folders and files you imported using the media page. You can also import files directly from the cut page, so you don't have to go back to the media page if you want to import a new clip.
- **Sync Bin:** This powerful feature automatically syncs all your clips via timecode, date and time so you can choose angles from all cameras on a multi camera project.
- **Transitions:** If you click on the neighboring transitions tab, you will see all the video and audio transitions you can use in your edit. These include common transitions such as cross dissolves and motion wipes.
- **Titles:** Next to transitions is the 'titles' tab. Here you can select the title type you want to use. For example a scroll, standard text or lower thirds title. There are also a list of Fusion templates you can use for more animated dynamic titles which can be customized in DaVinci Resolve's 'Fusion' page.
- **Effects:** The fifth tab is the 'effects' tab. This provides all the different filters and effects you can use to bring more life to your edit, for example customizable blurs, glows and lens effects. There are many powerful effects to choose from and you can find them quickly using the search tool.

TIP Use the search tool near the media tab icons to find the exact items you are looking for. For example, if you have the transitions tab selected, type "dissolve" in the search tool and only dissolve transition types will be shown in the viewer, making it quicker for you to find the dissolve transition you want.




Viewer Tabs

In the top left corner of the viewer window you will see the viewer mode buttons.



The viewer mode buttons

These buttons control which viewer is currently being used, including 'source clip', 'source tape', and 'timeline'. These viewer modes give you an enormous amount of control when selecting clips for your edit and it's worth spending a moment to look at how they work.

	Source Clip	The source clip viewer displays a single clip from the media pool and you can set in and out points along the entire length of the viewer timeline. This gives you greater control. Select a source clip to view by double clicking on a clip in the media pool, or dragging it into the viewer.
	Source Tape	Source tape lets you view all the source clips in the media pool. This powerful feature is helpful if you want to quickly search through all your clips to find a specific event. As you scrub the playhead over the clips, you will see their thumbnails selected in the media pool. This means once you have found the clip you want to edit, you can click on the source clip tab and its corresponding source clip will appear in the viewer automatically. The source tape viewer really lets you take advantage of non-linear editing, giving you the freedom to work on your edit, find shots quickly, try new ideas and stay in the moment.
	Timeline	The timeline viewer lets you view the edit timeline so you can play back your project and refine your edits.

Importing Clips to the Media Pool

Now you can start importing media into your project. You can do this in the media pool window of the cut page using the import tools at the top.



Select one of the import options to add media to your project

	Import Media	The import media option will import individual media files selected from your storage location.
	Import Media Folder	To import a folder from your media storage, select the import folder option. When importing a folder, DaVinci Resolve will keep the file structure, treating each folder as a separate bin so you can navigate between bins to find your videos and other media files.

To import media:

- 1 Click on the 'import media' or 'import media folder' icon.
- 2 Navigate to your media storage for the media you want to import.
- 3 Select the file or folder and click 'open'.

Once you've added media to your project, it is a good time to save your changes. DaVinci Resolve features a fast, on the go autosave called 'live save'. Once you save you project once, 'live save' will save further changes as you make them, removing the risk of losing your work.

For more information on 'live save' and other auto save functions, refer to the DaVinci Resolve Manual.

Adding Clips to the Timeline

Now that you are familiar with the media tabs and viewer mode buttons, you can open the media pool and quickly start adding clips to your timeline.



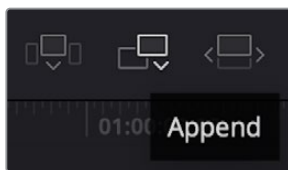
The timeline of the cut page, comprising the upper timeline and the zoomed in timeline below

The timeline is where you will build your edit and is like a board with tracks you can attach clips to, move them around and trim their edits. Tracks let you layer clips over others which gives you more flexibility to try different edits and build transitions and effects. For example, you can try an edit with a clip on one track without affecting other clips on tracks below it.

There are different ways to add clips to the timeline, such as smart insert, append, place on top and more.

Appending Clips

When selecting takes and assembling an edit, you will likely want to add these shots to your timeline one after the other. The append tool is perfect for this task and will get you editing very fast.



Click on the append icon to quickly add clips to the end of the last clip

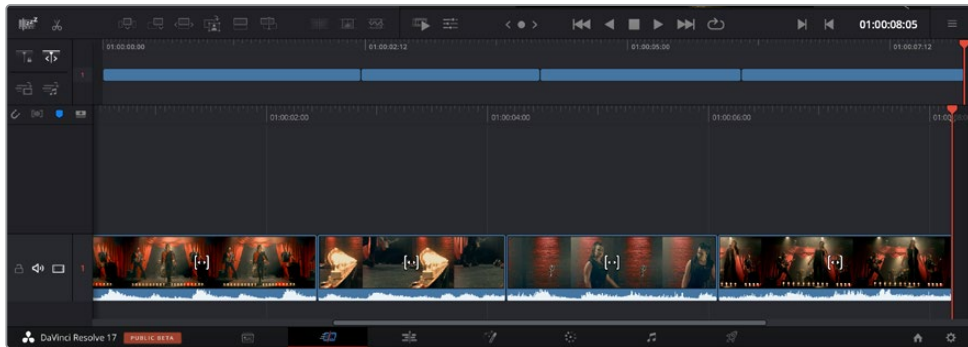
To append a clip:

- 1 Double click on a clip in the media pool to open it in the viewer.
- 2 Using the scratch trim tool, drag the in and out points to select the precise duration of your shot. You can also press the 'i' and 'o' keyboard shortcuts to set in and out points.



- 3 Now click the 'append' icon underneath the media pool.
Your first clip will be placed at the head of the timeline.

Repeat steps 1 to 3 to keep adding more clips and they will automatically append, ensuring there are no gaps in the timeline.



Appending clips ensures there are no gaps between them on the timeline

TIP You can speed up the process further by assigning a keyboard shortcut to the 'append' icon. For example, if you assign the 'P' key, you can set your in and out points using 'I' and 'O' then press 'P' to append the clip. Refer to the DaVinci Resolve manual for information on how to assign shortcut keys.

Trimming Clips on the Timeline

With clips added to the timeline, you have complete control to move them around and trim edits.

To trim an edit, hover the mouse over the start or end of a clip, then click and drag it left or right. For example, drag the end of the clip left or right to decrease or increase its duration. You might notice that all clips after that edit will shift on the timeline to accommodate the new adjustment. This is one way the 'cut' page helps to save you time.

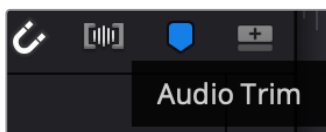
You can even pick the clip up and drop it on a new video track in the large timeline without having to zoom in or out. This speeds up the edit process because it minimizes time navigating a long timeline.

Audio Trim View

Audio trim view helps you make accurate audio edits by expanding the audio waveform in the timeline. This is useful if you're editing a dialogue scene or a music clip and makes it easy to find an edit point between words or beats.

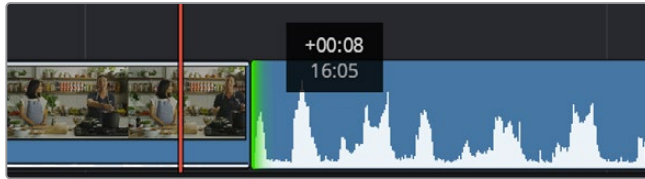
To use Audio Trim view:

- 1 Click the audio trim icon between the snapping and marker tools to the left of the timeline.



The Audio Trim view button

- 2 Now when you trim an edit you will see an expanded waveform in the timeline. When you finish trimming, the clips in the timeline will return to their normal size.



Audio trim view expands the audio waveform in the timeline.

After you have finished editing clips using the 'cut' page, you might want to add a title. The next section will show you how.

Adding Titles

Placing a title on your timeline is easy and you have many options.

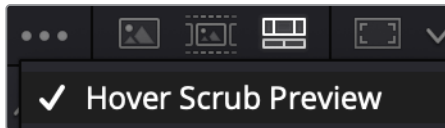
To see the different types of titles you can use, click on the 'titles' media tab at the top left corner of the user interface. In the selection window you will see all the different title generators you can use displayed as thumbnails, from lower thirds, scrolls, to a standard text title. You can even add any of the Fusion titles which are animated titles that you can customize.

Previewing Titles

Before you add a title to your timeline you can preview it from the 'titles' selection window. This lets you quickly scan through all the available options before making a choice.

To preview a title:

- 1 Click the option menu to the top right-hand side of the titles panel and check 'hover scrub preview'.



Enable Hover Scrub Preview from the option menu.

- 2 In the 'titles' selection window, hover your mouse pointer over a thumbnail to preview a title in the viewer. If you are previewing an animated or Fusion title move the pointer across the title's thumbnail from left to right to see the animation.



Hover over a title's thumbnail to preview it in the viewer.

Once you've chosen a title you can add it to your timeline.

To add a standard title:

- 1 Click on the title and drag it onto the timeline. It doesn't matter which timeline, but for greater accuracy we recommend using the detailed timeline. The title will automatically create a new video track for the title and will snap to the playhead.
- 2 Release the mouse and the title will appear on the new track. You can now move it or change its duration like you would another video clip.
- 3 To edit the title, click on the new title clip and then click the tools icon underneath the clip viewer.

You will now see a row of tools you can use to modify the title clip. For example transform, crop, dynamic zoom and more.
- 4 Now click the inspector tab.

This will open the inspector window where you can type in the title you want and edit the text settings, for example tracking, line spacing, font type, color and more.

You have a lot of options to customize the title exactly how you want it. We recommend playing with all the different settings to see how they can change the appearance and shape of your title.

TIP You can also use the hover scrub function to preview effects, transitions, generators and filters on the 'cut' and 'edit' pages.

Working with Blackmagic RAW Files

Blackmagic RAW clips give you maximum flexibility in post production. This lets you make adjustments to clips, such as white balance and ISO settings, as if you were changing the original camera settings. Working with Blackmagic RAW also retains more tonal information within shadows and highlights, which is useful for recovering details, for example in blown out skies and dark areas of the picture.

It's worth shooting in Blackmagic RAW if you are after the highest possible quality, or for shots where there is an extreme variance between highlights and shadows and you may need to push and pull those regions as much as possible in the grade.

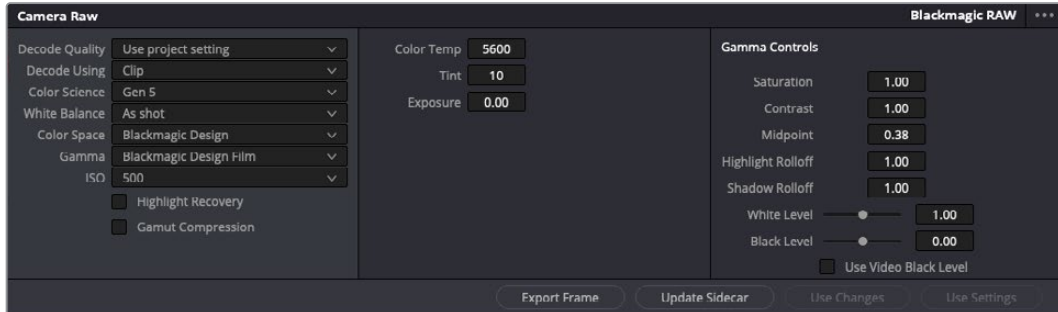
The speed and small file size of Blackmagic RAW means you don't need to make proxy files and playback is just like a standard video clip. This section of the manual describes the features of Blackmagic RAW and how to use Blackmagic RAW files in your DaVinci Resolve workflow.

TIP It is a good practice to adjust the Blackmagic RAW settings for your clips on the 'color' page before you start color grading.

Clip Settings for Blackmagic RAW

When you first import Blackmagic RAW files, DaVinci Resolve will decode the camera data contained in the files using the ISO, white balance and tint settings used at the time of shooting. If you're happy with the look of these settings, you can start editing right away.

The great thing about shooting Blackmagic RAW is that you're not tied to these settings at all! The breadth of available post processing options when working with Blackmagic RAW files mean that you'll develop your own workflow over time. Experimenting with the 'clip' settings for each clip in the 'camera raw' tab will show you just how powerful and flexible working with Blackmagic RAW can be.



In the 'camera raw' tab, select 'clip' from the 'decode using' menu to make adjustments to your clip's Blackmagic RAW settings

Changing Blackmagic RAW Settings

Once you have set DaVinci Resolve to enable clip settings for Blackmagic RAW, the clip settings and gamma controls are now adjustable. Adjusting these settings to optimize your clips can bring them close to a full primaries grade. This is especially powerful when using DaVinci Resolve's scopes which can help you neutralize and balance the clips ready for applying a look.

The following information contains descriptions for the clip and gamma controls.

ISO

The ISO value can be changed by increasing or decreasing this setting. This setting is helpful if you need to set the clip to a brighter or darker starting point for optimization.

Highlight Recovery

Check the box to reconstruct highlight information in clipped channels using information from non-clipped channels.

Gamut Compression

Check the box to automatically maintain safe Gamut levels.

Color Temp

Adjust the color temperature to warm or cool the image. This can be used to help neutralize the color balance in each image.

Tint

Adjusting this setting will add green or magenta into the image to help balance the color.

Exposure

Use this setting to refine the overall brightness of the image.

Saturation

Saturation controls default at 1 and range from 0 for the minimum saturation to 4 for maximum saturation.

Contrast

Defaulting at 1.0, drag the slider to the left for the least amount of contrast at 0 or to the right to increase the contrast up to 2.

Midpoint

In Blackmagic Design Film, your middle gray value defaults to 0.38, or 38.4%. Drag the slider to the left to lower your midpoint or to the right to raise it to 100. When contrast is adjusted away from the default setting, you can modify your highlight and shadow rolloff.

Highlight Rolloff

Adjust the highlights by dragging the slider to the left to lower the value to 0, or to the right to increase the highlights to 2. The default value is 1.

Shadow Rolloff

Drag the slider to the left to lower your shadows to 0 or to the right to raise your shadows to 2.

White Level

Adjust the white point of the gamma curve by dragging the slider from the highest value of 2 to the lowest value of 0. The default value is 1.

Black Level

Raise the black point of the custom gamma curve by dragging the slider to the right from the lowest value of -1 to a maximum of 1. The default value is 0.

Use Video Black Level

Check the box to set your black levels to video.

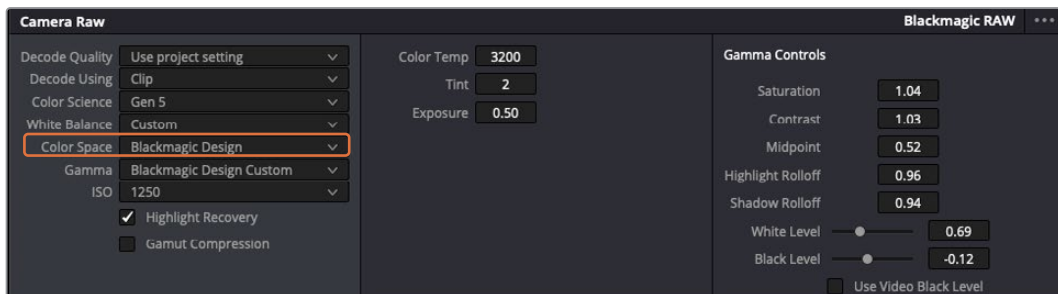
Export Frame

Clicking the 'export frame' button lets you export a single frame from your Blackmagic RAW clip.

Update Sidecar

Click this button to update the Blackmagic RAW sidecar file for the current clip.

Any changes you have made to your Blackmagic RAW clips will be identified by the gamma setting changing to Blackmagic Design Custom.



If you want to revert your clip to one of the default gamma options available, simply select it from the gamma dropdown menu.

TIP Gamma controls are disabled for footage shot with the 'video' dynamic range, but you have not lost your Blackmagic RAW data. Simply select Blackmagic Design Film or Blackmagic Design Extended Video from the dropdown gamma menu and make your adjustments.

Saving your Blackmagic RAW changes

- 1 Adjust the gamma controls for your Blackmagic RAW clip.
- 2 Click the 'update sidecar' button.

A 'sidecar' file will now be created in the same folder as your .braw file. When another user imports the Blackmagic RAW files, the sidecar files will automatically be read by DaVinci Resolve. If you make additional adjustments, press 'update sidecar' again.

TIP To remove your sidecar file, you can simply delete it from its location on your media drive.

Project Settings for Blackmagic RAW

If you need to make a setting change that is common to all the clips, for example a global change to the white balance or ISO setting, you can set the clips to use the project 'camera raw' settings and make global changes from there.

To set project settings for Blackmagic RAW:

- 1 Enter the project settings menu by clicking 'file,' and selecting 'project settings.'
- 2 In the 'Camera RAW' tab, you'll see a menu next to RAW profile. Click on the arrow to select Blackmagic RAW from the list.
- 3 Select 'project' in the 'Decode Using' menu.
- 4 Select a Color Science option from the menu.
- 5 Set the white balance to 'custom'.
- 6 Select 'Blackmagic Design Custom' from the gamma menu. Set the color space to 'Blackmagic Design'.
- 7 Choose your resolution from the 'Decode Quality' menu. A lower resolution will give you better playback on limited systems. You also have the flexibility to change to full resolution later on before delivery for the highest quality output.

Now you can adjust the camera settings for your clips such as saturation, contrast and midpoint. This will affect all clips in your project that are set to decode using 'project'.

Color Correcting your Clips with the Color Page

Now with your clips on the timeline and titles added, you can start color correcting using the 'color' page. The color page is extremely powerful and will define the overall look of your film, but for this example a good place to start is to neutralize all your clips so they are consistent. You can also return to the 'cut' or 'edit' page at any time if you want to make changes to your edit.

The color page lets you adjust the look of your edit and in many ways color correction is an art form in itself. You are really adding emotion to your work when you add color correction. It's an incredibly creative part of the workflow and very satisfying when you learn these skills and can see your work come alive! This is usually the first step and is referred to as primary color correction, or adjusting the primaries. After primary color correction is done, you can then make secondary color correction adjustments which is where you can make extremely precise color adjustments of specific objects in your images. That is a lot of fun, but is normally done after primaries because it helps make the process more efficient and you will get a better result!

First click on the 'color' tab to open the color page.

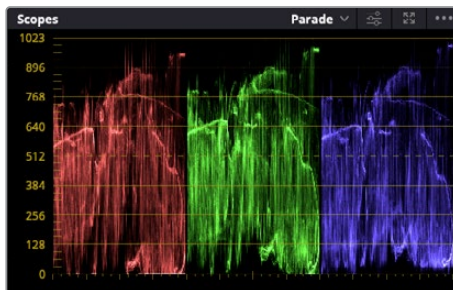
You'll see the camera raw settings, color wheels, curves palettes and general color correction tools as well as the preview and nodes window. Don't feel overwhelmed by the vast array of

features in front of you, they are all there to help you get the most amazing looking pictures. This getting started section will show the basics, but for more detailed information refer to the relevant sections in the manual. They will show you exactly what all the tools are for and how to use them in easy to follow steps. You'll learn the same techniques the professionals use in high end color correction facilities.

Generally, the first step for primary color correction is to optimize the levels for shadows, mid tones and highlights in your clips. In other words adjust the 'lift', 'gamma' and 'gain' settings. This will help get your pictures looking their brightest and best with a clean, balanced starting point from where you can begin grading the 'look' of your film. To optimize the levels, it's helpful to use the scopes.

Using Scopes

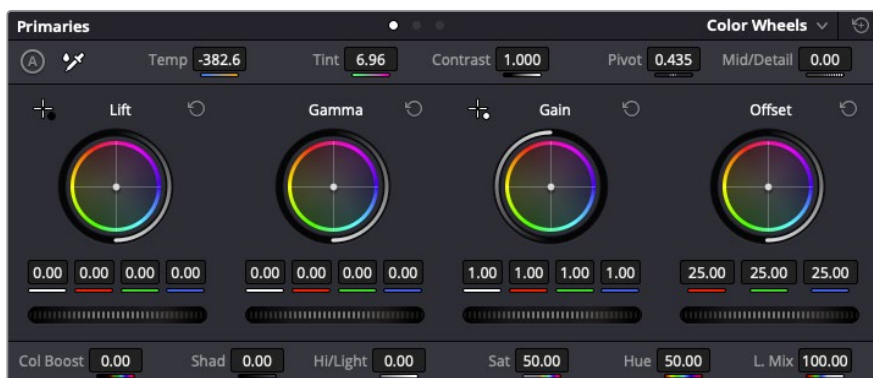
Most colorists make creative color choices by focusing on the emotion and the look they want their program to have and then simply work using the monitor to achieve that look. You can look at everyday objects and how different types of light interact with them to generate ideas on what you can do with your images and a little practice.



The parade scope helps you optimize highlights, mid tones and shadows

Another way to color grade is to use the built in scopes to help you balance shots. You can open a single video scope by clicking the 'scope' button, which is the second from the right on the palette toolbar. You can choose to display a waveform, parade, vectorscope, histogram or CIE chromaticity scope. Using these scopes you can monitor your tonal balance, check the levels of your video to avoid crushing your blacks and clipping the highlights, plus monitor any color cast in your clips.

The 'color wheels' palette contains the 'lift', 'gamma' and 'gain' controls which will generally constitute your first adjustment. If you've previously had experience with color correction, these should resemble controls you've seen in other applications for doing color and contrast adjustments.



The 'lift', 'gamma', 'gain' and 'offset' color wheels give you total control over the color and tonal balance of your clips. To make a uniform adjustment to all colors for each tonal region, drag the dial underneath the color wheels back and forth



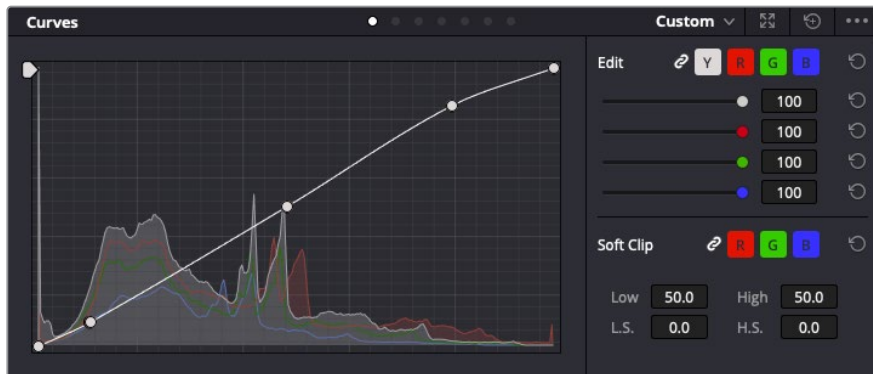
The primaries bars make color adjustments easier when using a mouse.

For more accurate control of each color using a mouse, you can change the color wheels to 'primaries bars' which let you adjust each color and luminance channel for the lift, gamma and gain controls separately. Simply select 'primaries bars' from the dropdown menu near the top right of the color wheels.

- **Adjusting the 'lift':** With your clip selected on the color timeline, click on the 'lift' dial underneath the first color wheel. Slide it back and forth and watch how it affects your image. You'll see the brightness of the dark regions of your picture increase and decrease.
Set it to where you want the dark areas to look their best. If you decrease the lift too much, you'll lose details in the blacks and you can use the parade scope to help avoid this. The optimal position for blacks on the waveform is just above the bottom line of the parade scope.
- **Adjusting the 'gain':** Click on the 'gain' dial and slide it back and forth. This adjusts the highlights which are the brightest areas of your clip. The highlights are shown on the top section of the waveform on the parade scope. For a brightly lit shot, these are best positioned just below the top line of the waveform scope. If the highlights rise above the top line of the waveform scope, they will clip and you will lose details in the brightest regions of your image.
- **Adjusting the 'gamma':** Click on the 'gamma' dial underneath the color wheel and slide it back and forth. As you increase the gamma you'll see the brightness of the image increase. Notice the middle section of the waveform will also move as you adjust the gamma. This represents the mid tones of your clip. The optimal position for mid tones generally falls between 50 to 70% on the waveform scope. However, this can be subjective based on the look you are creating and the lighting conditions in the clip.

You can also use the curves palette to make primary color corrections. Simply click to create control points on the diagonal line inside the curve graph, and drag them up or down to adjust the master RGB contrast at different areas of image tonality. The optimum points to adjust are the bottom third, mid, and top third of the curve line.

There are many more ways of doing primary color correction in DaVinci Resolve.



The curves palette is another tool you can use to make primary color corrections, or enhance specific areas of your clip when using a power window

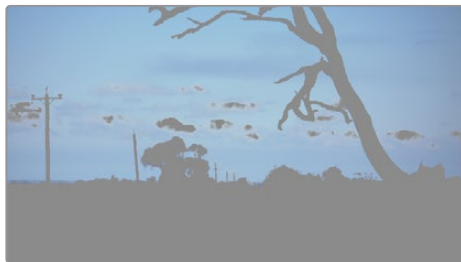
Secondary Color Correction

If you want to adjust a specific part of your image then you need to use secondary corrections. The adjustments you have been doing up until now using the lift, gamma and gain adjustments affect the whole image at the same time and so they are called primary color corrections.

However, if you need to adjust specific parts of your image, say for example you wanted to improve the color in the grass in a scene, or you wanted to deepen the blue in a sky, then you can use secondary corrections. Secondary color corrections are where you select a part of the image and then adjust only that part. With nodes, you can stack multiple secondary corrections so you can keep working parts of your image until everything is just right! You can even use windows and tracking to allow the selections to follow movement in your images.

Qualifying a Color

Often you'll find a specific color in your clip can be enhanced, for example grass by the side of a road, or the blue in a sky, or you may need to adjust color on a specific object to focus the audience's attention on it. You can easily do this by using the HSL qualifier tool.



Using the HSL qualifier to select colors in your image is helpful when you want to make areas of your image 'pop', to add contrast, or to help draw the audience's attention to certain areas of your shot

To qualify a color:

- 1 Add a new serial node.
- 2 Open the 'qualifier' palette and make sure the 'selection range' picker tool is selected.
- 3 Click on the color in your clip you want to affect.
- 4 Usually you'll need to make some adjustments to soften the edges of your selection and limit the region to only the desired color. Click on the 'highlight' button above the viewer to see your selection.
- 5 Adjust the 'width' control in the 'hue' window to broaden or narrow your selection.

Experiment with the high, low and softness controls to see how to refine your selection. Now you can make corrections to your selected color using the color wheels or custom curves.

Sometimes your selection can spill into areas of the shot you don't want to affect. You can easily mask out the unwanted areas using a power window. Simply create a new window and shape it to select only the area of color you want. If your selected color moves in the shot, you can use the tracking feature to track your power window.

Adding a Power Window

Power windows are an extremely effective secondary color correction tool that can be used to isolate specific regions of your clips. These regions don't have to be static, but can be tracked to move with a camera pan, tilt or rotation, plus the movement of the region itself.



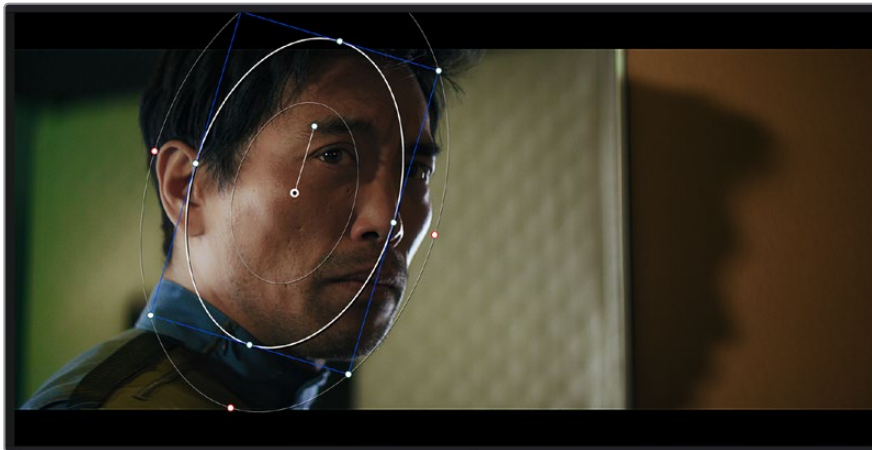
Use power windows to mask out areas you don't want to be affected by the HSL qualifier secondary adjustments

For example, you can track a window on a person in order to make color and contrast changes just to that person without affecting his or her surroundings. By making corrections like this you can influence the audience's attention on areas you want them to notice.

To add a power window to your clip:

- 1 Add a new serial node.
- 2 Open the 'window' palette and select a window shape by clicking on a shape icon. Your selected window shape will appear on the node.
- 3 Resize the shape by clicking and dragging the blue points around the shape. The red points adjust the edge softness. You can position the shape by clicking the center point and moving it to the area you want to isolate. Rotate the window using the point connected to the center.

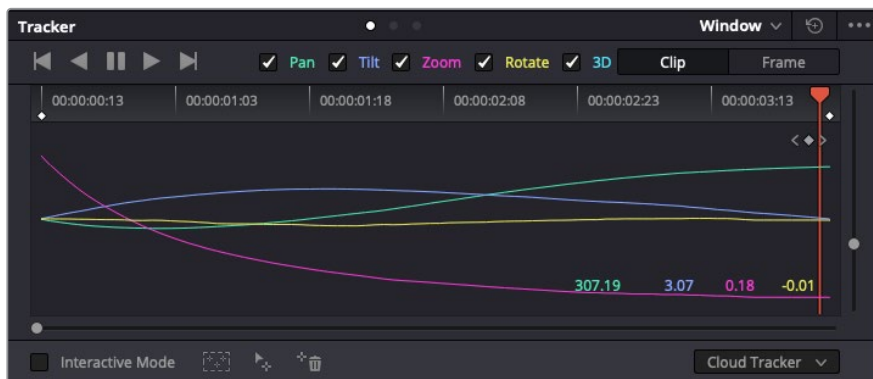
Now you can make color corrections to your image in just the area you want.



Power windows let you make secondary corrections to specific parts of your image

Tracking a Window

The camera, object or area in your shot may be moving, so to make sure your window stays on your selected object or area, you can use DaVinci Resolve's powerful tracking feature. The tracker analyzes the pan, tilt, zoom and rotation of the camera or object in your clip so you can match your windows to that movement. If this isn't done, your correction can move off the selected target and call attention to itself, which you probably don't want.



You can track objects or areas in your clip using the tracker feature so power windows can follow the action

To track a window to a moving object:

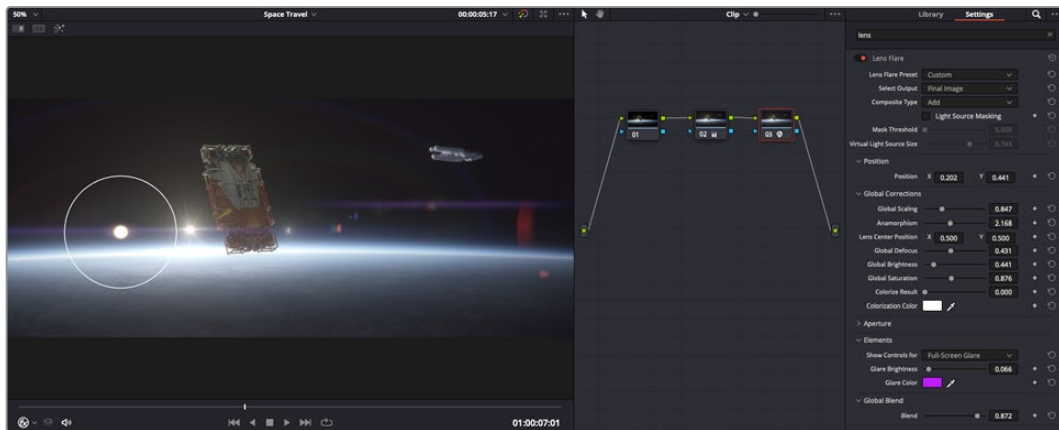
- 1 Create a new serial node and add a power window.
- 2 Go to the start of your clip and position and size the window to highlight just the object or area you want.
- 3 Open the 'tracker' palette. Select the pan, tilt, zoom, rotate, and perspective 3D settings appropriate for the movement in your clip by checking or unchecking the relevant 'analyze' checkboxes.
- 4 Click on the 'forward' arrow to the left of the checkboxes. DaVinci Resolve will now apply a cluster of tracking points on your clip and then step through the frames to analyze the movement. When the tracking is done, your power window will follow the path of the movement in your clip.

Most of the time automatic tracking is successful, but scenes can be complex and sometimes an object can pass in front of your selected area, interrupting or affecting your track. This can be solved manually using the keyframe editor. Refer to the DaVinci Resolve manual to find out more.

Using Plugins

While making secondary color corrections you can also add Resolve FX or Open FX plugins to create fast, interesting looks and effects using the 'color' page, or imaginative transitions and effects on your clips on the 'cut' and 'edit' pages. Resolve FX are installed with DaVinci Resolve, OFX plugins can be purchased and downloaded from third party suppliers.

After installing a set of OFX plugins, you can access them or Resolve FX plugins on the color page by opening the Open FX inspector to the right of the 'node editor'. Once you create a new serial node, simply click the 'Open FX' button to open the FX library and drag and drop a plugin onto the new node. If the plugin has editable settings, you can adjust these in the adjoining 'settings' panel.



OFX plugins are a quick and easy way to create an imaginative and interesting look

In the 'edit' page you can add plugin filters, generators and transitions to clips by opening the 'Open FX' panel in the 'effects library' and dragging your selected plugin onto the video clip or track above your clip on the timeline depending on the plugin requirements.

Mixing Your Audio

Mixing Audio in the Edit Page

Once you have edited and color corrected your project, you can begin to mix your audio. DaVinci Resolve has a helpful set of features for editing, mixing and mastering audio for your project directly in the 'edit' page. For projects requiring more advanced audio tools, the Fairlight page provides you with a full audio post production environment. If you are already familiar with the edit page and want to move straight to Fairlight, skip this section and move onto the next.

Adding Audio Tracks

If you are working in the edit page and want to mix a basic sound edit with lots of sound effects and music, you can easily add more audio tracks when you need them. This can be helpful when building your sound, and separating your audio elements into individual tracks, for example, dialogue, sound effects and music.

To Add an Audio Track to the Edit Page

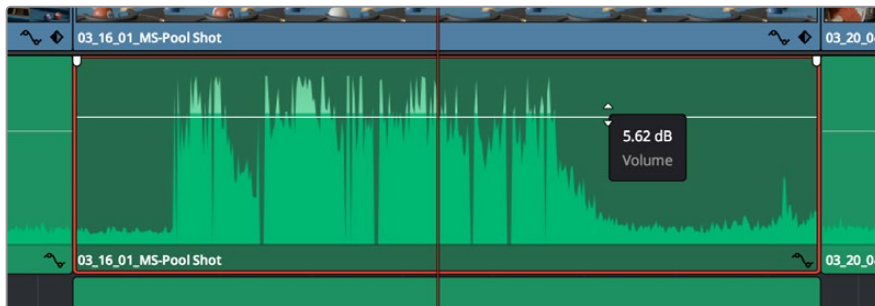
Right click next to the name of any audio track on your timeline and select 'add track' and choose from the options, including 'mono', 'stereo', and '5.1'. This will add the track to the bottom of the track list. Alternatively select 'add tracks' and select the position you would like the new track or multiple tracks placed.

Your new audio track will appear on the timeline.

TIP If you wish to change the type of track after creating it, right click next to the name of the track and select 'change track type to' and select the type of audio track you want, such as stereo, mono or 5.1.

Adjusting Audio Levels in the Timeline

Each clip of audio in the timeline has a volume overlay that lets you set that clip's level by simply dragging it up or down with the pointer. This overlay corresponds to the Volume parameter in the Inspector.



Dragging a volume overlay to adjust the clip level

For projects requiring more advanced audio tools, the Fairlight page provides you with a full audio post production environment.

The Fairlight Page

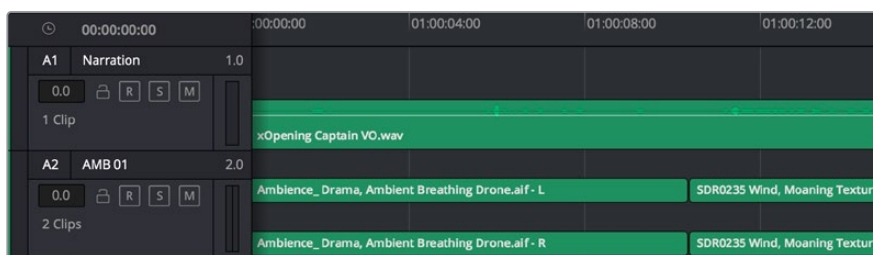
The 'Fairlight' page in DaVinci Resolve is where you adjust your project audio. In single monitor mode, this page gives you an optimized look at the audio tracks of your project, with an expanded mixer and custom monitoring controls that make it easy to evaluate and adjust levels in order to create a smooth and harmonious mix. Don't feel overwhelmed by the vast array of features in front of you, they are all there to help you deliver the best audio quality for your project.



This guide provides a basic overview of the features on the Fairlight page, but to learn more about all the details for each feature, refer to the DaVinci Resolve manual. The DaVinci Resolve manual provides details on the purpose of each tool and describes how to use them in easy to follow steps.

The Audio Timeline

- **Track Header:** At the left of each track is a header area that displays the track number, track name, track color, audio channels, fader value and audio meters. The track header also contains different controls for locking and unlocking tracks, plus solo and muting controls. These controls can help to keep your tracks organized, and let you preview individual tracks one at a time.
- **Tracks:** Each track on the Fairlight page is divided into lanes, which show each individual channel of clip audio for editing and mixing. The edit page hides these individual audio channels, displaying only a single clip in the timeline to make it easier to edit multi channel sources without needing to manage a huge number of tracks.



The track header on track A1 indicates a mono track with a single lane for mono audio, and the A2 track header indicates a stereo track with two lanes to accommodate stereo audio

What is a Bus?

A bus is essentially a destination channel made up of audio sources grouped together into a single signal that can be controlled via a single channel strip. Fairlight automatically creates a bus for you and all the audio tracks in your timeline are sent to this bus by default, this means you can adjust the overall level of your audio mix once you have adjusted the level of each individual track.

If your edit is a bit more complex you can create more buses and combine multiple tracks of audio that belong to the same category such as dialogue, music or effects so that everything in that category can be mixed as a single audio signal. For example, if you have five dialogue tracks, you can route the output of all five dialogue tracks to a separate bus, and the level of all dialogue can then be mixed with a single set of controls.

The Fairlight Flexbus structure gives you complete flexibility over bus types and signal routing including the option for bus-to-bus, track-to-bus and bus-to-track routing. For more information on audio bus settings in Fairlight, refer to the DaVinci Resolve manual.

The Mixer

Each audio track in your timeline corresponds to an individual channel strip in the Mixer, and by default there's a single strip on the right for the default bus labeled 'Bus 1'. Additional channel strips will appear on the right hand side with a set of controls for each additional bus you create. A set of graphical controls allows you to assign track channels to output channels, adjust EQ and dynamics, set levels and record automation, pan stereo and surround audio, and mute and solo tracks.



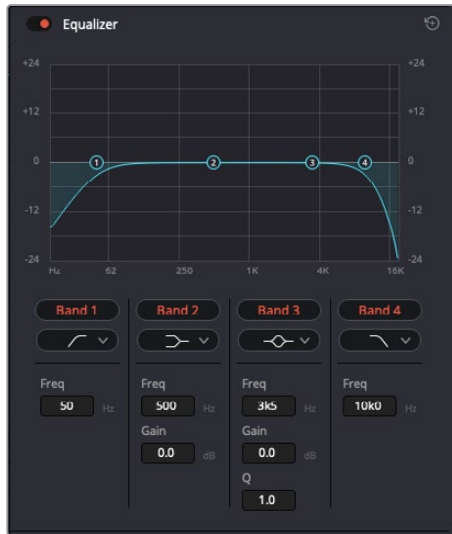
The audio mixer, with channel strips corresponding to the tracks in the timeline

Using the Equalizer to Enhance your Audio

After adjusting the audio levels of your audio clips in your project, you may find that the audio needs further finessing. In some cases you may find that the dialogue, music and sound effects are competing for the same frequency on the audio spectrum, making your audio too busy and unclear. This is where using EQ can help, as it allows you to specify the parts of the audio spectrum that each track occupies. You can also use an equalizer to help remove unwanted elements from your audio by isolating and reducing the level on particular frequencies that contain low rumbles, hums, wind noise and hiss, or simply to improve the overall quality of your sound so it is more pleasing to listen to.

DaVinci Resolve provides EQ filters that can be applied at a clip level to each individual clip or at the track level to affect entire tracks. Each audio clip in the timeline has a four band equalizer in the inspector panel, and each track has a 6 band parametric equalizer in the mixer panel. The

graphical and numeric controls for boosting or attenuating different ranges of frequencies, and different filter types allow you to define the shape of the EQ curve.



The four band equalizer can be applied to every clip in the timeline

Outer bands let you make band filter adjustments using hi-shelf, lo-shelf, hi-pass and lo-pass filters. A pass filter affects all the frequencies above or below a particular frequency, by removing those frequencies completely from the signal. For example, a high pass filter will allow the high frequencies to pass through the filter while cutting the low frequencies. Any frequencies outside the cutoff frequency are cut gradually in a downward sloping curve.

A shelf filter is less aggressive, and is useful when you want to shape the overall top end or low end of the signal without completely removing those frequencies. The shelf filter boosts or cuts the target frequency and every frequency either above or below it evenly, depending on whether you use a high shelf or low shelf.

The middle sets of band controls let you make a wide variety of equalization adjustments, and can be switched between lo-shelf, bell, notch, and hi-shelf filtering options.

- **Bell:** Bell filters boost or cut frequencies around a given center point of the bell curve, and as the name suggests the shape of the curve is like a bell.
- **Notch:** Notch filters allow you to specifically target a very narrow range of frequencies. For example, removing a mains hum at 50 or 60Hz.
- **Lo-Shelf:** Low shelf filters boost or cut the target frequency at the low end, and every frequency below it
- **Hi-Shelf:** High shelf filters boost or cut the target frequency at the high end, and every frequency above it

To add EQ to an individual clip:

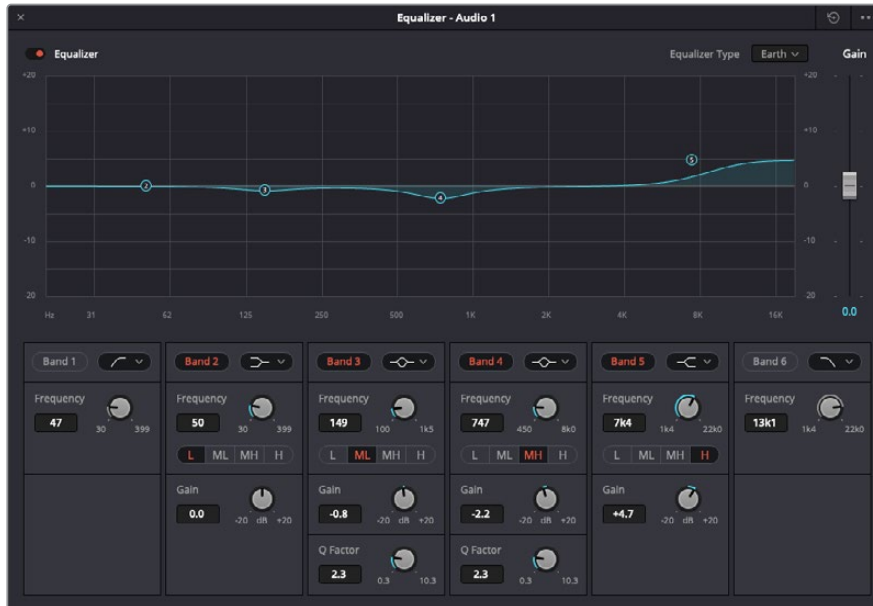
- 1 Select the clip in the timeline that you want to add the EQ filter to.
- 2 Click on the inspector and then click the 'equalizer' enable button.

To add EQ to a track:

- 1 Double click in the EQ section for one of your tracks in the mixer to open the equalizer for that track.
- 2 Select the band filter type from the dropdown menu for the band you want to adjust.



The EQ section in the mixer panel indicating an EQ curve has been applied to track one



The 6 Band parametric equalizer that can be applied to every track

Once you have added EQ to your clip or track, you can adjust the EQ for each band. Note that controls may vary depending on which band filter type is selected.

To adjust the EQ for a band filter:

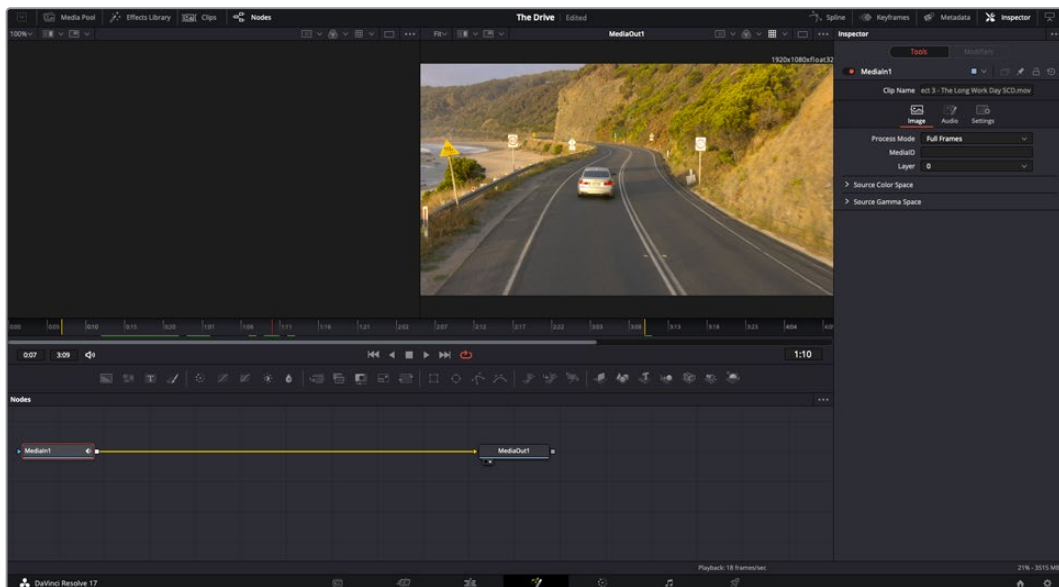
- 1 Select the band filter type from the dropdown menu for the band you want to adjust.
- 2 Adjust the 'frequency' value to select the center frequency of the EQ adjustment.
- 3 Adjust the 'gain' value to boost or attenuate the frequencies governed by that band.
- 4 Use the 'Q factor' value to adjust the width of affected frequencies.

Use the reset button to reset all controls in the EQ window to their defaults.

Fairlight has many controls you can use to improve the quality of each audio track. You can add more tracks and arrange buses to organize them, plus add effects like delay or reverb, and generally perfect your audio mix.

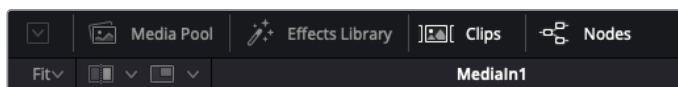
Adding VFX and Compositing on the Fusion Page

Now that you have completed your edit, you can open the Fusion page to add 2D or 3D visual effects and motion graphics right within DaVinci Resolve. Unlike layer based compositing software, Fusion uses nodes, giving you the freedom to build complex effects while routing image data in any direction. The nodes window clearly shows every tool used along the way. If you have experienced the node workflow in the color page, this will feel familiar to you.

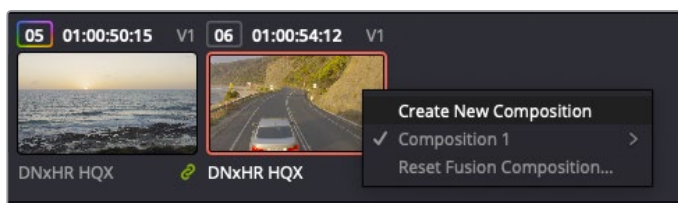


The Fusion Page

The Fusion page features 2 viewer windows across the top with transport controls to view your media, an inspector window to the right to access tool settings, and a nodes window at the bottom where you build your composition. While the viewers and transport controls are always visible, clicking on the icons on the interface toolbar at the very top of the display will let you show or hide the nodes and inspector windows, or reveal or hide additional windows including the effects library and editors for spline and keyframes.



- **Media Pool:** The media pool functions the same way as it appears in the edit page. Simply drag additional media from your bins directly to your composition.
- **Effects Library:** The effects library is where you will find your Fusion tools and templates sorted into categories including particle, tracking, filters and generators. You can either click on the tool or drag it to the nodes area to add it to your composition. The media pool and effects library take up the same screen area, so you can swap between the two to keep your viewers as large as possible.
- **Clips:** Clicking the clips tab will reveal or hide thumbnails representing clips on your timeline. The thumbnails are located underneath the nodes editor, letting you instantly navigate to other clips.



Create a new version of your composition by right clicking on a thumbnail and selecting 'create new composition'.

- **Viewers:** The viewers are always visible and let you see the different views of your composition, for example an overall 3D perspective via the merge 3D node, a camera output, or your final render output. These viewers also let you see how your changes are affecting a specific element.

You can choose which nodes to view by clicking on a node and typing '1' for the left viewer or '2' for the right viewer. White button icons appear beneath the node to let you know which viewer it is assigned to. If you're using external video monitoring, there will be a third button available to route your media to your external video monitor.

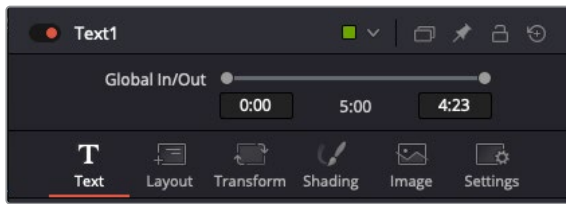
TIP You can also assign a node to a viewer by dragging the node into the viewer itself.

The transport controls underneath the viewers let you skip to the start or end of the clip, play forward or reverse, or stop playback. The time ruler displays the entire range of a clip, with yellow marks indicating the in and out points.



The yellow marks on the time ruler indicate your clip's in and out points on your timeline. If you are using a Fusion clip or compound clip, the time ruler will only show you the duration of the clip as it appears on the timeline, without handles.

- **Nodes:** The nodes window is the heart of the Fusion page where you build your node tree by connecting tools together from one node's output to another node's input. This area will change size depending on which editors are open, for example the spline or keyframes editor. A toolbar at the top of the nodes area features the most commonly used tools for fast access.
- **Spline:** When the spline editor is open, it will appear to the right of the nodes window. This editor lets you make precise adjustments to each node, such as smoothing the animation between two keyframes using bezier curves.
- **Keyframes:** Keyframes for each tool can be added, removed or modified using the keyframes editor. This also appears to the right of the nodes viewer.
- **Metadata:** The metadata window will show you metadata available for the active clip, including the codec, frame rate and timecode.
- **Inspector:** The inspector in the top right corner displays all settings and modifiers available for one or more selected nodes. Additional tab options will appear to provide quick access to other settings for nodes sorted by category.

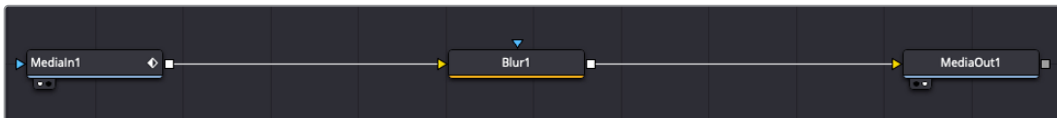


The text inspector contains additional tabs for text, layout, transform, shading, image and settings.

Getting Started with Fusion

To get started with Fusion, simply position your playhead over any clip on your timeline and click on the 'Fusion' tab to open the Fusion page.

On the Fusion page, your clip is immediately available in a media input node labelled 'MediaIn'. Every composition will begin with a 'mediain' and a 'mediaout' node. This mediain node represents the top most clip of your timeline at the playhead, and ignores any clips underneath. Any adjustments you've applied to the clip on the edit page, such as transform tools and cropping changes, are also included.



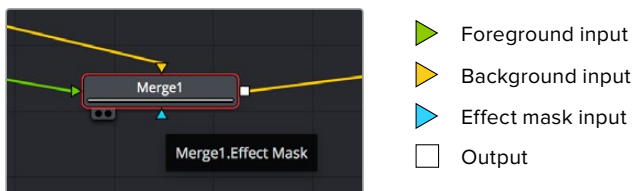
The media output node, named 'MediaOut', is the node that sends the output back to your timeline on DaVinci Resolve's edit page.

TIP ResolveFX or OFX plug-ins applied to clips in the cut or edit pages are not applied in the Fusion page. This is because Fusion effects occur prior to color correction and OFX/ResolveFX processing. If you want OFX applied before Fusion effects, right click the clip in the edit page and select 'new fusion clip' before clicking on the Fusion page.

Understanding Nodes

It can be helpful to think of each node as a visual icon representing a single tool or effect. Nodes are connected to other nodes to build the overall composition, much like ingredients in a cake. It's important to understand the inputs and outputs of each node as this will help you navigate the flow of your composition while building detailed visual effects.

Some tools have multiple inputs and outputs you can connect to other nodes. The merge node, for example, lets you attach a foreground input, background input, and a mask input for mattes or keys.



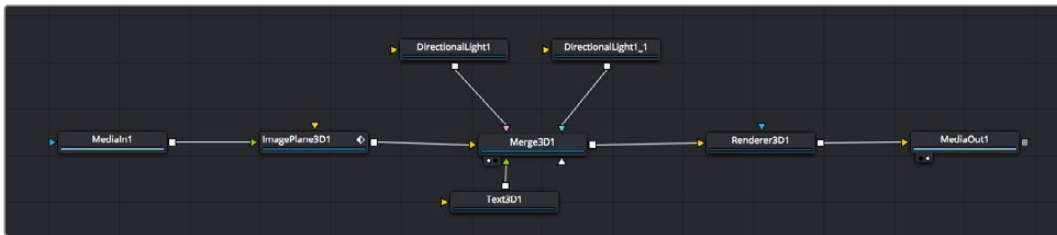
Multiple outputs on nodes means a single node can connect to many different nodes in your composition, so you don't have to duplicate clips as you would in layer based software.

Arrows on the line between connected nodes are a great visual indicator to show you which direction the image data is flowing.

Adding Nodes to the Node Editor

Adding effects is as simple as placing nodes on the line between the 'mediain' and 'mediaout' nodes.

There are a few ways you can do this. You can hold down the shift button and drop a node between two nodes, or click on the node you want to attach an effect to and select the tool you want to add. The new node will automatically connect to the tool selected. You can also add a node anywhere on the node window and manually connect nodes by dragging the output of one to the input on another.



The most commonly used tool is the 2D or 3D merge node. This node is like a central hub that combines tools on the node editor into a single output.

The merge node has controls for how the inputs are managed, including settings for size, position, and blend. These settings are all accessible in the inspector panel when the merge node is selected.

The toolbar above the node panel contains the most commonly used tools as icons that you can either click on to add the node, or drag the tool to the node panel. If you want to see all the complete tools available, click on the 'effects library' in the top left corner and expand the 'tools' option. Here you'll find all the tools sorted by category, as well as a set of pre-built 'templates' you can use, for example lens flares, shaders and backgrounds.

TIP Once you're familiar with the tool names, you can hold down 'shift' and press 'spacebar' on your keyboard and a 'select tools' menu will appear. As you type the tool name, the menu will suggest the relevant tool. This is a very fast way to select the tool you want.

Adjusting Nodes Using the Inspector Panel

Adjust your node settings using the inspector panel. Simply click on the node you want to modify and the panel will update to display its settings and controls.

With Fusion, you don't have to be viewing the node you're editing, as you can modify one node while viewing another in your composition. For example, you can modify the size and center position of a 'text+' node while the merge node is in the viewer, letting you view the text relative to the background.



Selected nodes appear with a red border. Here the inspector panel is displaying the layout tab controls for the text node.

There are different parameters and settings you can adjust for every node depending on its task, from sizing and center positions to changing the number of particles in an emitter node. Setting keyframes and changing the settings over time will animate the effect.

Working with Keyframes

In the inspector window, set a keyframe by right clicking on a setting and choosing 'animate' from the contextual menu. The keyframe icon to the right of the setting will turn red. This means keyframes are now active and any changes you make will be applied to the current frame only. When two or more keyframes are created by changing the setting parameters on a different frame, a transition is interpolated between them. Arrows on each side of the keyframe icon let you move the playhead to those exact positions on the timeline.



Here, the 'size' keyframe animation has been smoothed into a bezier curve. You can click the bezier handles to shorten or lengthen the curve, or the keyframe square icons to move the keyframe location.

The splines panel gives you further control over keyframe animation. You can select keyframes, such as the first and last, and smooth the animation between them into a bezier curve by typing 'shift' + 's', or right clicking on a keyframe and selecting 'smooth'.

Using the Motion Tracker and Adding Text

To get a better idea of how to use Fusion, we have included the following examples to show how to use the tracker tool to track an element in a clip, plus add text and attach it to the element using the tracking data.

The 'tracker' tool tracks pixels over time on the x & y axis, and generates data you can use to attach other elements. This is great for when you want to match the position of text to a moving object, such as a car driving along the road, or a bird as it flies across frame.

- 1 In the 'effects library', select the 'tracker' tool and drag it to the line between the 'mediain' and the 'mediaout' nodes. Now click the tracker node to reveal its properties in the inspector.
- 2 Type '1' on your keyboard to see the 'tracker' node on the left viewer. The clip will appear in the viewer together with the tracker at its default position. Hover your mouse pointer over the tracker to reveal the tracker handle. Click on the tracker handle at the top left corner and drag the tracker to an area of interest on your clip. High contrast areas work well, for example the badge on the hood of a car. The tracker will magnify the image area for extra precision.
- 3 In the inspector window, click on the 'track forward' button to start tracking. A notification window will appear when the tracking is done. Click OK.

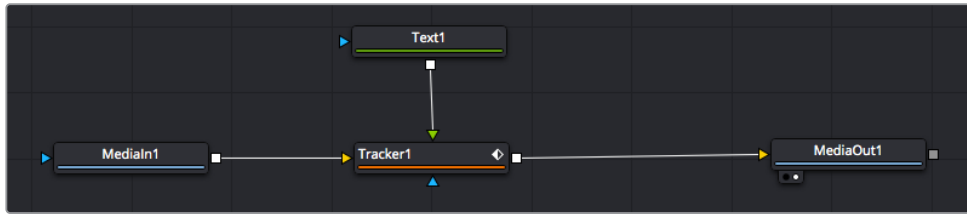


Tracking options in the inspector panel include track reverse from last frame or current frame, stop track or track forward from current frame or first frame.

TIP Track reverse or forward from current frame is great for situations where your area of interest disappears during the render range, such as a car or bird moving out of frame. This lets you track only the relevant footage.

Now you can take that tracking data and apply the motion path to a text tool.

- 4 Click on the 'text+' node icon from the toolbar of commonly used nodes and drag it to the node panel near the 'tracker' node. Connect the 'text' output square to the green foreground input on the 'tracker'.



- 5 Click on the 'tracker' node and type '1' so you can see the merged results on your left hand viewer. In the 'tracker' inspector panel, click on the 'operations' tab. Click the menu next to operation and select 'match move'.
- 6 Click the 'text' node to reveal the properties in the inspector. Type your text into the text box and change the font, color and size to suit your composition.

This will apply the tracking position data from your tracker to your text. If you want to change the text offset, click on the 'trackers' tab back in the inspector panel and use the x and y offset scroll wheels to modify the position.



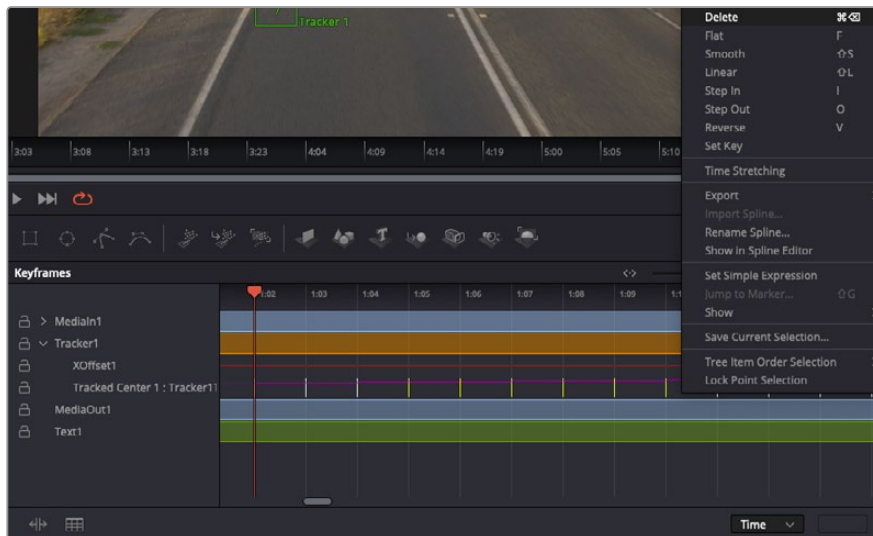
Scroll wheels at the bottom of the tracker inspector panel let you adjust the offset position for the text.

Now you can play back your composition and see your text attached to the object you have tracked!



The green square is the tracker's current position along the green path, and the red dashed line is the offset position used to animate the text.

For some shots you might want to remove track points after tracking, such as when the object you are tracking disappears off the screen. The keyframe editor makes this a very simple process.



- 7 Click on the keyframes tab above the inspector to open the keyframes editor. Any nodes with keyframes applied will have a small arrow next to the node label, and only the parameter with keyframes added will appear in the list below. Click on the magnify icon and drag a box around the area you want to edit. This will zoom into that area so you can see the keyframes easier.
- 8 Move the playhead to the location of the last keyframe you want. Now select the keyframes you wish to remove by drawing a box around them with your mouse. The keyframes will highlight yellow. Right click and choose delete from the menu.

TIP If your effects are particularly system intensive, right clicking on the transport controls area will give you viewer options, including proxy playback, helping you get the most out of your system while you build your composition. Refer to the DaVinci Resolve manual for further detail on all the playback options.

You have now completed your first composition animating text to match a movement in your footage!

If you want to track an area of the image that contains a flat surface you want to enhance or replace, you can use the planar tracker. Tracking 2D planes can be helpful for changing labels and signs in a moving image, or even adding an image to a monitor or TV in your shot.

For more information about the planar tracker and the many powerful tools in the DaVinci Resolve Fusion page, see the DaVinci Resolve manual.

TIP As you build visual effects in the Fusion page, it's worth noting if the effect you are building is a 2D effect, or a 3D effect, as this will determine which merge tool is used. You may discover yourself frequently combining 2D and 3D effects in the one composite. In this scenario, it's helpful to remember that any visual effect using the 3D space needs to be rendered as a 2D image before it can be merged into a 2D composite.

We believe you will have lots of fun with Fusion and exploring Fusion’s visual effects with the power of DaVinci Resolve’s edit, color, and Fairlight pages. With all these tools at your finger tips, DaVinci Resolve is incredibly powerful and there is really no limit to what you can create!

Mastering Your Edit

Now you’ve edited, graded, added vfx and mixed your audio, you’ll want to share it with others. You can use the Quick Export button, or menu selection, to output the contents of the Timeline as a self contained file in one of a variety of different formats, or use the additional features of the ‘deliver’ page.



The ‘deliver’ page is where you export your edit. You can select from many different video formats and codecs

Quick Export

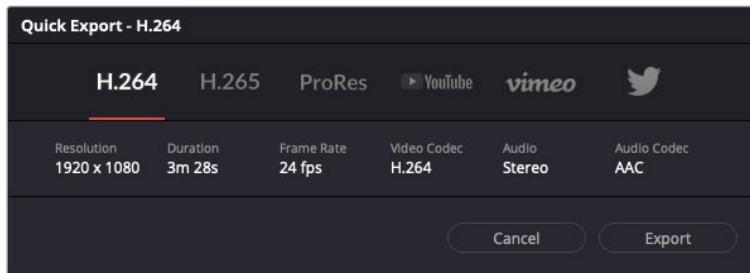
You can choose File > Quick Export to use one of a variety of export presets to export your program from any page of DaVinci Resolve. You can even use quick export to export and upload your program to one of the supported video sharing services, including YouTube, Vimeo, Twitter and Frame.io.

To use Quick Export:

- 1 In the ‘cut’, ‘edit’, fusion’ or ‘color’ page, optionally set in and out points in the timeline to choose a range of the current program to export. If no timeline in or out points have been set, the entire timeline will be exported.

Choose File > Quick Export.

- 2 Select a preset to use from the top row of icons in the quick export dialog, and click ‘export’.
- 3 Choose a directory location and enter a file name using the export dialog, then click ‘save’. A progress bar dialog appears to let you know how long the export will take.



The quick export dialog

The Deliver Page

This page lets you select the range of clips you want to export, plus the format, codec and resolution you want. You can export in many types of formats such as QuickTime, AVI, MXF and DPX using codecs such as 8-bit or 10-bit uncompressed RGB/YUV, ProRes, DNxHD, H.264 and more.

To export a single clip of your edit:

- 1 Click on the 'deliver' tab to open the deliver page.
- 2 Go to the 'render settings' window on the top left of the page. Choose from a number of export presets, for example YouTube, Vimeo and audio presets, or you can set your own export settings manually by leaving it set to the default 'custom' preset and entering your own parameters. For this example, select YouTube, then click on the arrow next to the preset and select the 1080p video format.

The frame rate will be locked to your project frame rate setting.
- 3 Underneath the presets you will see the timeline filename and the target location for your exported video. Click the 'browse' button and choose the location where you want to save your exported file and then select 'single clip' from the render option.
- 4 Immediately above the timeline, you'll see an options box with 'entire timeline' selected. This will export the entire timeline, however you can select a range of the timeline if you want to. Simply choose 'in/out range' and then use the 'i' and 'o' hot key shortcuts to choose the in and out points in your timeline.
- 5 Go to the bottom of the 'render settings' and click on the 'add to render queue' button.

Your render settings will be added to the render queue on the right side of the page. Now all you have to do is click 'start render' and monitor the progress of your render in the render queue.

When your render is complete you can open the folder location, double click on your new rendered clip and watch your finished edit.

Now that you have a basic knowledge of how to edit, color, mix audio and add visual effects, we recommend experimenting with DaVinci Resolve. Refer to the DaVinci Resolve manual for more details on how each feature can help you make the most of your project!

In DaVinci Resolve Studio, the following 'ResolveFX Revival' plugins can help you restore footage you have scanned with your Cintel Scanner. These powerful tools can reduce noise, repair scratches and blemishes, and help remove other visible damage and artifacts from your film clips.

Automatic Dirt Removal

The Automatic Dirt Removal plugin uses optical flow technology to target and repair temporally unstable bits of dust, dirt, hair, tape hits, and other unwanted artifacts that last for one or two frames and then disappear. All repairs are made while maintaining structurally consistent detail in the underlying frame, resulting in a high quality restoration of the image. Fortunately, despite its sophistication, this is a relatively easy plugin to use; just drop the plugin on a shot, adjust the parameters for the best results, and watch it go.



(Left) Original image, (Right) Using Automatic Dirt Removal

NOTE This plugin is less successful with vertical scratches that remain in the same position for multiple frames and is completely ineffective for dirt on the lens that remains for the entire shot.

Main Controls

The primary controls used to adjust how much dirt is removed from the image.

- **Motion Estimation Type:** Lets you choose from among 'none', 'faster', 'normal', and 'better'. This tunes the tradeoff between performance and quality.
- **Neighbor Frames:** Lets you choose how many frames to compare when detecting dirt. Choosing more frames of comparison takes longer to process, but usually results in finding more dirt and artifacts.
- **Repair Strength:** This slider lets you choose how aggressively to repair dirt and artifacts that are found. Lower settings may let small bits through that may or may not be actual dirt, while higher settings eliminate everything that's found.
- **Dirt Size Threshold:** This slider lets you tune how large a detected bit of dirt must be to be removed. Raising this parameter lets you omit things like film grain from the operation but may allow smaller bits of dirt through.
- **Show Repair Mask:** This checkbox lets you see the dirt and artifacts that are detected by themselves, so you can see the effectiveness of the results as you fine tune this filter.

Fine Controls

These controls let you fine tune the effect in an effort to perfect the tradeoff between removing dirt successfully and preserving true image detail.

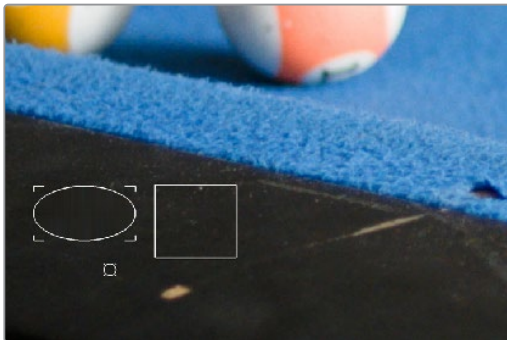
- **Motion Threshold:** This slider lets you choose the threshold at which pixels in motion are considered to be dirt and artifacts. At lower values more dirt may escape correction, but you'll experience fewer motion artifacts. At higher values, more dirt will be eliminated, but you may experience more motion artifacts in footage with camera or subject motion.
- **Edge Ignore:** This slider lets you exclude hard edges in the picture from being affected by dirt or artifacts that are removed. Higher values omit more edges from being affected.

Dead Pixel Fixer

If your scanner has one or more 'dead' or 'stuck' pixels in the sensor, you may have black or white spots that are not moving in the image. This filter is designed to let you place patches on each dead or stuck pixel, identifying them so you can use different methods of fixing the problem.

In many respects, the Dead Pixel Fixer is similar to the Dust Buster, however the Dust Buster effect is designed to repair transient bits of dust and dirt that only last for a frame or two, whereas the Dead Pixel Fixer is designed to work on blemishes that are fixed in place for the duration of a clip.

To fix dead or stuck pixels, apply the Dead Pixel Fixer filter, make sure the OFX onscreen controls are enabled in the viewer, and then click on each pixel you need to fix with the mouse to place a patch on it. You can click anywhere on the image to place as many patches as you like, there's no limit. You can also Option-click to delete patches you no longer need. To move any patches, simply drag it to another location.



Multiple dead pixel removal patches

When you place multiple patches, you can click to select whichever patches you want to adjust the controls for. Each patch can have different control settings.

General

These top level controls let you choose how to draw patches with which to repair blemishes in the frame, whether or not to show their on-screen controls, and how.

- **Patch Style:** There are three different kinds of patches you can draw to deal with different kinds of blemishes in the frame.
 - **Draw Rect:** Click and drag to place a rectangular patch of any size from one corner to the opposite corner. Once drawn, you can click on any edge of the overlay and drag to reposition it.

- **Draw Ellipse:** Click and drag to place an elliptical patch of any size from one corner to the opposite corner. Once drawn, you can click on any edge of the overlay and drag to reposition it.
- **Place Patch:** Lets you place small patches specifically for tiny details such as dead pixels. When you choose this option, a 'new patch size' slider appears that lets you adjust the size of the patches you're about to place prior to placing them. Once drawn, you can click on the edge of any patch and drag to reposition it.
- **New Patch Size:** (only when 'place patch' is selected) Lets you choose how large of a patch to place using the place patch tool.
- **Show Patches:** This checkbox lets you show or hide the onscreen outline of every patch in the viewer.
- **Hide During Interaction:** Hides the onscreen outline of every patch in the viewer while you're moving a patch; this makes it easier to see the effect of moving the patch on the image, without the outline getting in the way.

Patch Type

There are three methods you can use to attempt to fix the contents of a selected patch. When drawing new patches, the currently selected patch type will determine what the next patch will be. When you've selected an existing patch, changing the patch type will change how that patch works.

- **Spatial:** Automatically fills the interior of the selected patch with pixels drawn from the surroundings of the patch, using the fill method. This works well for small blemishes, but for large blemishes a pattern might be discernible, which gives away the effect.
- **Clone:** Clone mode copies part of the image to fill a shape or patch placed over the thing you want to remove. In this mode, clicking and dragging to place a rect or ellipse over an imperfection is followed by a second click to place the sample region you want to clone. Clicking once to place a patch will be followed by a second click to place the sample region. Selecting an existing shape or patch and choosing Clone lets you click on the shape to position the clone region. The sample region is indicated by a dotted shape that's connected to the original shape.
- **Blend Clone:** Operates similarly to clone mode, except the copied part of the image that fills the rect, ellipse, or patch is blended with the image to integrate it more softly.
- **Fill Method:** When using the 'spatial patch type', the fill method determines how the blemish in the image is repaired.
 - **Grid:** Samples the pixels surrounding the rect, ellipse, or patch, and blurs them inward both horizontally and vertically. Extremely effective for tiny blemishes. For larger blemishes, a grid-like pattern may emerge.
 - **Horizontal:** Samples the pixels to the left and right of the rect, ellipse, or patch, and blurs them inward.
 - **Vertical:** Samples the pixels to the top and bottom of the rect, ellipse, or patch, and blurs them inward.
 - **Patchy:** Samples pixels from all around the rect, ellipse, or patch, and expands and blurs them together to create a soft, non-uniform region with which to repair the blemish. Doesn't have the patterning of the grid methods of fill, but produces an extremely smooth result.
 - **Smooth:** Simply uses a gaussian blur to repair the blemish.

Patch Options

These options let you customize the effect of a patch filling over a blemish.

- **Mute:** Lets you turn a particular patch on or off via keyframing. Useful for blemishes that only show up for a few pixels of a shot.
- **Variability:** (Spatial patches only) Raising this parameter lets you make the fill method less uniform.
- **Soft Edges:** Lets you soften the edges of the patch.
- **Size Adjust:** Lets you change the size of a patch after its creation.

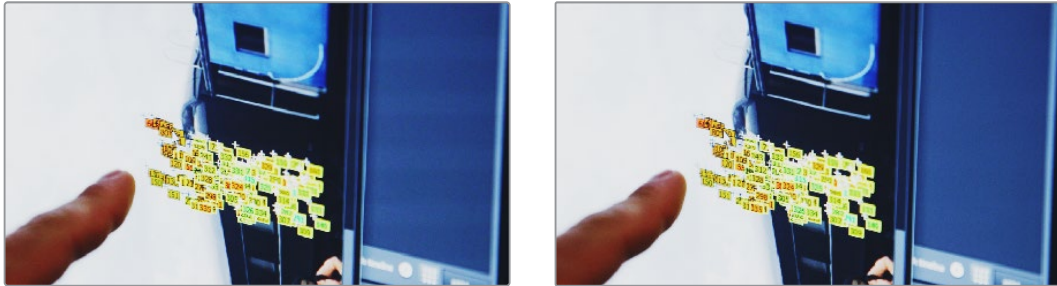
Advanced Controls

These controls let you customize the UI of this effect.

- **Clone Sticks to Mouse:** When enabled, drawing or placing a rect, ellipse, or patch in clone or blend clone mode immediately switches to positioning the sample region, making it faster to use.
- **New Patches Stay Selected:** When enabled, patches stay selected after you draw them, in preparation for further customization.
- **UI Line Thickness:** Lets you choose how thick the on-screen outlines should be.
- **Patches Stick to:** This parameter lets you deal with fixing dead pixels or blemishes on clips that have been stabilized.
 - **Source:** Patches remain in place unless you apply motion stabilization to the shot. In this case, patches move along with the image so they remain associated with the feature selected in the source clip.
 - **Scene:** If you're eliminating a blemish on a moving subject, you can use the FX tracker to track the thing you're fixing, so the patch follows along with it.
- **Output Mode:** This lets you see different representations of the patched effect you're creating. There are four options.
 - **Patched Result:** The final result, with each patch repairing the blemish it's covering.
 - **Patch Locations:** Shows a key where each placed patch is white against black.
 - **Differences:** Shows the difference of each patch against the original image.
 - **Difference Magnitude:** Shows a more pronounced differences representation.

Deflicker

The Deflicker plugin handles such diverse issues as flickering exposure in timelapse clips, flickering fluorescent lighting, flickering in archival film sources, and in certain subtle cases even the ‘rolling bars’ found on video screens shot with cameras having mismatched shutter speeds. Two key aspects to this filter are that it only targets rapid, temporally unstable variations in lightness, and that it’s able to target only the areas of an image where flickering appears, leaving all other parts of the image untouched. As a result, this plugin can often repair problems once considered ‘unfixable.’



(Left) Original image with flicker, (Right) Result setting Deflicker to Fluoro Light, (clip courtesy Redline Films)

Main Parameters

By default, the top section of this plugin exposes a single control, which in many cases may be all you need.

- **Deflicker Setting menu:** The top two options, ‘timelapse’ and ‘fluoro light’, are presets that effectively eliminate two different categories of flickering artifacts. If neither of these presets is quite as effective as you’d hoped, a third option, ‘advanced controls’, opens up the ‘temporal NR’ controls at the heart of this plugin to let you tailor it further to your needs.

Temporal NR

Hidden by default, these controls only appear when you set ‘deflicker setting’ to ‘advanced controls’, and let you choose how to detect motion in the scene so that flickering may be correctly addressed relative to the motion of subjects and items within the frame where it appears.

- **Frames Either Side:** Specifies the number of frames to analyze to determine what’s in motion. Higher values are not always better; the best setting is, again, scene dependent. The default is 3.
- **Mo.Est. Type:** Picks the method DaVinci Resolve uses to analyze the image to detect motion. Despite the names of the available options, which options will work best is highly scene dependent. ‘Faster’ is less processor intensive, but less accurate, however this can be an advantage and actually do a better job with high detail images that would confuse the ‘better’ option. Choosing ‘better’ is more accurate, but more processor intensive, and ‘better’ will try harder to match fine details which can sometimes cause problems. None lets you disable motion analysis altogether, which can work well (and will be considerably faster) in situations where there’s no motion in the scene at all. The default is ‘better’.
- **Motion Range:** Three settings, ‘small’, ‘medium’, and ‘large’, let you choose the speed of the motion in the frame that should be detected.

- **Luma threshold:** Determines the threshold above which changes in luma will not be considered flicker. The range is 0–100, 0 deflickers nothing, 100 applies deflickering to everything. The default is 100.
- **Chroma Threshold:** Determines the threshold above which changes in chroma will not be considered flicker. The range is 0–100, 0 deflickers nothing, 100 applies deflickering to everything. The default is 100.
- **Gang Luma Chroma:** Lets you choose whether to gang the luma and chroma threshold sliders or not.
- **Motion Threshold:** Defines the threshold above which motion will not be considered flicker.

Speed Optimization Options

Closed by default, opening this control group reveals two controls:

- **Reduced-Detail Motion checkbox:** On by default, reduces the amount of detail that's analyzed to detect flicker. In many cases, this setting makes no visible difference but increases processing speed. Disable this setting if your clip has fine detail that is being smoothed too aggressively.
- **Limit Analysis Area checkbox:** Turning this on reveals controls over a sample box that you can use to limit deflickering to a specific region of the image. This option is useful when (a) only one part of the image is flickering, so focusing on just that area speeds the operation considerably, or (b) part of the image is being smoothed too much by deflickering that's fixing another part of the image very well.

Restore Original Detail After Deflicker

Closed by default, opening this control group reveals two controls:

- **Detail to Restore slider:** Lets you quickly isolate grain, fine detail, and sharp edges that should not be affected by the deflicker operation, preserving those fine details exactly.
- **Show Detail Restored checkbox:** Turning this checkbox on lets you see the edges that are detected and used by the 'detail to restore' slider, to help you tune this operation.

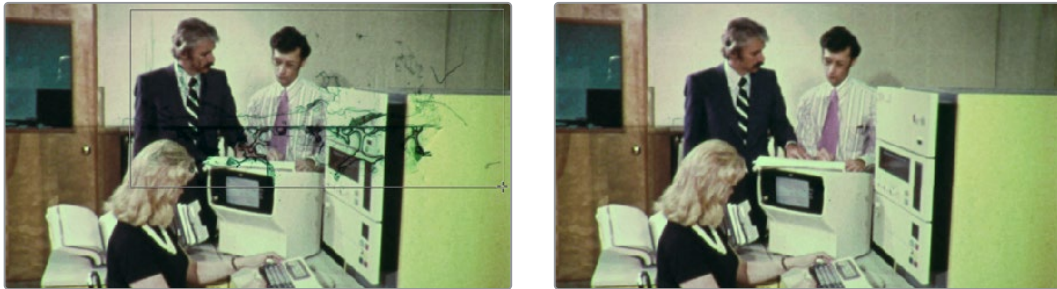
Output

The Output menu lets you choose what deflicker outputs, with options to help you troubleshoot problem clips. Here are the available options:

- **Deflickered Result:** The final, repaired result. This is the default setting.
- **Detected Flicker:** This option shows you a mask that highlights the parts of the image that are being detected as having flickering, to help you evaluate whether the correct parts of the image are being targeted. This mask can be very subtle, however.
- **Magnified Flicker:** This options shows you an exaggerated version of the detected flicker mask, to make it easier to see what the deflicker plugin is doing.

Dust Buster

This plugin is also designed to eliminate dust, dirt, and other imperfections and artifacts from clips, but it does so only with user guidance, for clips where the Automatic Dirt Removal plugin yields unsatisfactory results. This guidance consists of moving through the clip frame-by-frame and drawing boxes around imperfections you want to eliminate. Once you've drawn a box, the offending imperfection is auto-magically eliminated in the most seamless way possible. This works well for dirt and dust, but it also works for really big stains and blotches, as seen below.



(Left) Drawing a box around dirt in the original image, (Right) Result in the Dust Buster plugin

In many respects, the Dust Buster is similar to the Dead Pixel Fixer, however the Dust Buster effect is designed to repair transient bits of dust and dirt that only last for a frame or two, whereas the Dead Pixel Fixer is designed to work on blemishes that are fixed in place for the duration of a clip.

General

These top level controls let you choose how to draw patches with which to repair temporally unstable dust and dirt in the frame, whether or not to show their on-screen controls, and how.

- **Navigation Controls:** Four buttons let you jump to frames on which you've drawn patches. There are four buttons:
 - **First Modified Frame:** Jumps the playhead to the first frame of that clip with a patch.
 - **Previous Modified Frame:** Jumps the playhead to the previous frame with a patch.
 - **Next Modified Frame:** Jumps the playhead to the next frame forward with a patch.
 - **Last Modified Frame:** Jumps the playhead forward to the last frame with a patch.
- **Patch Style:** There are three different kinds of patches you can draw to deal with different kinds of blemishes in the frame.
 - **Draw Rect:** Click and drag to place a rectangular patch of any size from one corner to the opposite corner. Once drawn, you can click on any edge of the overlay and drag to reposition it.
 - **Draw Ellipse:** Click and drag to place an elliptical patch of any size from one corner to the opposite corner. Once drawn, you can click on any edge of the overlay and drag to reposition it.
 - **Place Patch:** Lets you place small patches specifically for tiny details such as dead pixels. When you choose this option, a 'new patch size' slider appears that lets you adjust the size of the patches you're about to place prior to placing them. Once drawn, you can click on the edge of any patch and drag to reposition it.
- **New Patch Size:** (only when place patch is selected) Lets you choose how large of a patch to place using the Place Patch tool.
- **Show Patches:** This checkbox lets you show or hide the onscreen outline of every patch in the Viewer.

- **Hide During Interaction** : Hides the onscreen outline of every patch in the viewer while you're moving a patch; this makes it easier to see the effect of moving the patch on the image, without the outline getting in the way.

Patch Type

There are six methods you can use to attempt to fix the contents of a selected patch. When drawing new patches, the currently selected patch type will determine what the next patch will be. When you've selected an existing patch, changing the patch type will change how that patch works.

- **Auto**: The default method. Once you've drawn a bounding box, the two frames prior to and the two frames after the current clip will be analyzed and compared to the current image. The best of these five frames will be sampled to remove the imperfection in the current frame. Images two frames away are prioritized since that will avoid the appearance of frozen grain, but only if they're a suitable match to the content of the current frame.
- **+/- 1 Frame**: In this mode, if you draw a bounding box from left to right, the next frame will be drawn upon to remove the imperfection. If you draw a bounding box from right to left, the previous frame will be used.
- **+/- 2 Frames**: If you draw a bounding box from left to right, the image two frames forward will be drawn upon to remove the imperfection. If you draw a bounding box from right to left, the image two frames back will be used.
- **Spatial**: Automatically fills the interior of the selected patch with pixels drawn from the surroundings of the patch, using the fill method. This works well for small blemishes, but for large blemishes a pattern might be discernible, which gives away the effect.
- **Clone**: Clone mode copies part of the image to fill a shape or patch placed over the thing you want to remove. In this mode, clicking and dragging to place a rect or ellipse over an imperfection is followed by a second click to place the sample region you want to clone. Clicking once to place a patch will be followed by a second click to place the sample region. Selecting an existing shape or patch and choosing 'clone' lets you click on the shape to position the clone region. The sample region is indicated by a dotted shape that's connected to the original shape.
- **Blend Clone**: Operates similarly to clone mode, except the copied part of the image that fills the rect, ellipse, or patch is blended with the image to integrate it more softly.
- **Fill Method**: When using the spatial patch type, the fill method determines how the blemish in the image is repaired.
 - **Grid**: Samples the pixels surrounding the rect, ellipse, or patch, and blurs them inward both horizontally and vertically. Extremely effective for tiny blemishes. For larger blemishes, a grid-like pattern may emerge.
 - **Horizontal**: Samples the pixels to the left and right of the rect, ellipse, or patch, and blurs them inward.
 - **Vertical**: Samples the pixels to the top and bottom of the rect, ellipse, or patch, and blurs them inward.
 - **Patchy**: Samples pixels from all around the rect, ellipse, or patch, and expands and blurs them together to create a soft, non-uniform region with which to repair the blemish. Doesn't have the patterning of the grid methods of fill, but produces an extremely smooth result.
 - **Smooth**: Simply uses a gaussian blur to repair the blemish.

Patch Options

These options let you customize the effect of a patch filling over a blemish.

- **Mute:** Lets you turn a particular patch on or off via keyframing. Useful for blemishes that only show up for a few pixels of a shot.
- **Variability:** (Spatial patches only) Raising this parameter lets you make the fill method less uniform.
- **Soft Edges:** Lets you soften the edges of the patch.
- **Size Adjust:** Lets you change the size of a patch after its creation.

Advanced Controls

These controls let you customize the UI of this effect.

- **Clone Sticks to Mouse:** When enabled, drawing or placing a rect, ellipse, or patch in clone or blend clone mode immediately switches to positioning the sample region, making it faster to use.
- **New Patches Stay Selected:** When enabled, patches stay selected after you draw them, in preparation for further customization.
- **UI Line Thickness:** Lets you choose how thick the on-screen outlines should be.
- **Output Mode:** This lets you see different representations of the patched effect you're creating. There are four options.
 - **Patched Result:** The final result, with each patch repairing the blemish it's covering.
 - **Patch Locations:** Shows a key where each placed patch is white against black.
 - **Differences:** Shows the difference of each patch against the original image.
 - **Difference Magnitude:** Shows a more pronounced differences representation.

Noise Reduction

Based on the noise reduction controls in the 'color' page, Resolve FX noise reduction has two types of GPU-accelerated noise reduction designed to subdue noise in problematic clips. 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.

Temporal NR Controls

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

- **Frames Either Side:** The number of frames on either side of the current frame that you want averaged 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. A higher frame setting may yield a better analysis, but may also 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 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, resulting in 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 reducing noise and the introduction of motion artifacts when adjusting the motion threshold parameter.

Temporal Threshold Controls

The temporal threshold parameters allow you to control which image characteristics get more or less noise reduction.

- **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:** Determines how much temporal NR is applied 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. However, you may find you can raise the chroma threshold higher than the luma threshold with less noticeable artifacting.
- **Gang Luma Chroma:** Ordinarily, the luma and chroma threshold parameters are ganged together so that adjusting one adjusts both. However, disabling this checkbox ungangs these parameters, allowing you to adjust different noise reduction amounts to each component of the image, depending on where the noise happens to be worst.
- **Motion:** 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 NR is not applied to regions of the image that fall above this threshold, 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.
- **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 (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’ menu lets you switch spatial NR between three different algorithms. All three modes of operation use 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 and not allowing you to decouple the luma and chroma threshold sliders for individual adjustments to each color component.
 - **Enhanced:** Does a significantly better job 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 noise reduction amounts 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.

Spatial Threshold Controls

The spatial threshold parameters allow you to control which image characteristics get more or less noise reduction.

- **Luma:** 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:** 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. However, you may find you can raise the chroma threshold higher than the luma threshold with less noticeable artifacting.
- **Gang Luma Chroma:** Ordinarily, the luma and chroma threshold parameters are ganged together so that adjusting one adjusts both. However, you can ungang these parameters 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 more color speckling than luma noise, you can lower the luma threshold to preserve detail while raising the chroma threshold to eliminate color noise.

- **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 (100.0). This parameter lets you easily split the difference when using aggressive spatial noise reduction.

Global Blend

- **Blend:** Lets you dissolve between the image with no noise reduction (1.0) and the image with both spatial NR and temporal NR at their current settings (0.0).

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' 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' 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 nonmoving areas. Then make smaller adjustments to determine the maximum amount you can add without creating artifacts or overly softening detail.
- 4 If there's obviously more chroma than luma noise in the image, you can disable luma and chroma linking at a satisfactory level of luma noise reduction, and then raise the chroma threshold to address color speckling in the picture.
- 5 Suppose you're not satisfied with the tradeoff between the maximum possible threshold of noise reduction and the prevention of motion artifacts. In that case, 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.

Keep in mind that the strength of temporal NR is to reduce noise in unmoving 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, 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 pop-up, as it will yield the best possible results. However, this can be processor-intensive, so if you need better real-time performance, you can switch the mode to Faster and compare results.
- 8 If there's obviously more chroma than luma noise in the image, you can disable luma and 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.

- 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' 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 can 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 be able to perceive the additional quality. You'll waste processing time on an unnecessary level of correction.

It's a good idea to evaluate 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.

Object Removal

The object removal plugin is best used in the 'color' page, and uses the DaVinci Neural Engine to attempt to remove an object in the frame as automatically as possible. This plugin works best when removing a moving object that passes over a temporally stable background, or dirt on the lens of a shot where the camera is in motion. Smaller objects get better results than larger objects, but your results really depend on the footage. Here's a simple procedure that shows how to do this.

To remove a moving object from a clip:

- 1 In this example, a drone is flying through a long shot that's being simultaneously recorded. We'll remove the drone using a window to identify the feature to be removed using the object removal plugin.



The original shot with a drone that needs to be removed

In simple cases, it's often easiest to apply the object removal effect to a corrector node, so you can use a window or qualifier within that node to isolate the feature you want to remove. That's what we'll do in this example.

- 2 Use the Window palette to draw a window around the object that needs to be removed. You'll get the best results using windows or masks that hug the feature being removed fairly closely.
- 3 Track or keyframe the window to move with the feature you're removing. Again, you'll get better results the closer your window hugs the object being removed, and it's good to have some softness at the edge of this window.



The object that needs to be removed is isolated with a window

- 4 Drag and drop the object removal plugin onto the node in which you've just isolated the feature to be removed.
- 5 The 'use OFX alpha' option will be activated automatically in the node's contextual menu to enable the object removal plugin to use whatever key has been created within that node to do its work.
- 6 Click the 'scene analysis' button, and wait for the analysis to finish. If the object you're removing is moving but the camera is locked, you can turn on the 'assume no motion' checkbox to improve your results in this case.

If your footage is ideal for object removal, the object will disappear once analysis is complete, replaced by a seamless background derived from detail found on neighboring frames.

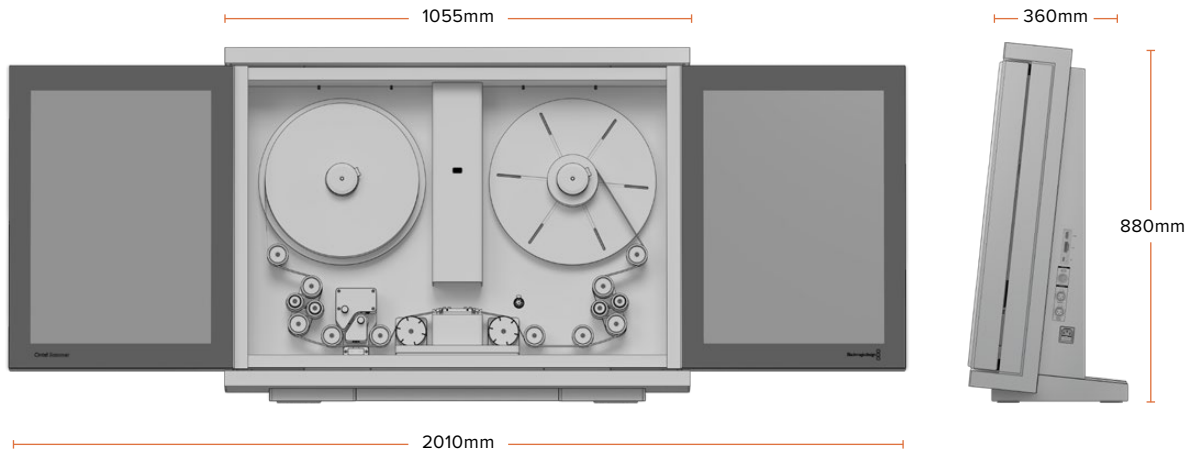


The result after object removal analysis is complete

The object removal plugin is highly footage dependent, and you won't always get this good a result this easily. Problems with the result are shown via gray, either gray fringing or solid gray filling the replacement window. Gray shows you where the current settings are failing to find background content with which to fill in the patch you're removing. If this happens, there are two things you can try.

- If you notice while playing through the analyzed result that the object removal mask has gray fringing on some frames, you can try adjusting the 'search range' slider, which is the distance, in frames, from the current frame that the object removal plugin is searching for replacement image detail. For example, if the search range is 20, it searches +/-20 frames from the current location, or 40 frames total. The allowance of 10 frames means we look at every 4th frame. You will generally get the best results for the smallest range that gives an acceptable result.
- If you're noticing that the object removal mask is filled entirely with gray on some frames, this means that background fill couldn't be easily generated for those frames. In this case, you can try clicking the 'build clean plate' button, which takes a 'best guess' approach to generating a background with which to fill the frame and integrates this with frames that could be successfully filled in.
- If the patch is successfully filled, but the result isn't blending well with the background, you can try changing the blend mode. The default is 'linear', which is a simple cloning operation, but you can also choose 'adaptive blend', which can provide better results except in certain situations where the edges of the replacement patch have a different color or brightness than the background.
- The 'scene mode' menu provides different methods of analyzing the scene, for improving the analysis of how the area that needs to be replaced moves, to best determine how to fill the hole left by the object being removed. Background analyzes the entire image except for the object region. Boundary analyzes the boundary area surrounding the object region. Object is for analyzing an object that moves with the background, like a sticker that's on a window while the camera moves.

Specifications



Weight: 60 kg (132 lb) unloaded. Dimensions wall mounted: (H) 785mm, (D) 265mm

Scanner Features

Film Stocks

- Print, Negative, Interpositive, Internegative.
- Mono and Colour.

Film Gauges

- 35mm: 2, 3, 4 perforations
- Super 35mm: 2, 3, 4 perforations
- 16mm
- Super 16mm

Native Resolution

4096 x 3072

Effective Resolutions¹

- 3840 x 2880 - Super 35
- 3390 x 2864 - Standard 35
- 3390 x 2465 - Anamorphic 35
- 1903 x 1143 - Super 16
- 1581 x 1154 - Standard 16

Audio

Extraction from scanned image.

HDMI Formats

3840 x 2160 Ultra HD or 1920 x 1080 HD, auto selected to match monitor resolution.

Dirt and Scratch Reduction

- Diffuse light source
- Cleaning Rollers

Mounting Options

- Desk Mount
- Wall mount

Dynamic Range

- Normal Scans: 12 stops
- HDR Scans: up to 2 additional stops

Transport Features

Continuous Motion

Run speed
1 - 30 fps

Shuttle
1 - 100 fps (35mm)
1 - 200 fps (16mm)

Film Shrinkage Tolerance

Up to 2% guaranteed, more may be possible if user care is taken.

Acceleration

5 - 30 fps/s

Capacity

2000ft (35mm)

Connections

HDMI Video Output

1 x HDMI 1.4 10-bit 4:2:2
for preview purposes only.

Options Interface

XLR6

Computer Interface²

- Thunderbolt™ 3 for capture of image and audio, software updates and supports USB-C charging with 15W at 5V.
- PCI Express 4 lane generation 2.

Bi-phase/Timecode Output³

- Bi-phase 4.5 Volt DC Coupled
- Timecode 1.5 Volt DC Coupled
- Timecode support for 24, 25 and 30 fps

Analog Audio Inputs

2 Channels of professional balanced analog audio with sample rate converter via XLR connectors with 10dBV levels.

AES/EBU Audio Input

2 Channels with sample rate converter on XLR connector.

¹ Resolution of the cropped image only area.

² Cintel Scanner has a Thunderbolt 2 port only.

³ Cintel Scanner 2 or later.

Power Requirements

Voltage Range

90 - 240V AC

Power

200W

Ideal Film Conditions

Operating Temperature

18 - 28°C

Relative Humidity

Maximum 65% non-condensing.

Operating Systems

Mac, Windows and Linux

Accessories

- Cintel Audio and KeyKode Reader

- Cintel Scanner 16mm Gate HDR

- Cintel Scanner 35mm Gate HDR

- Cintel Cleaning Roller Kit

- Blackmagic PCI Express Cable Kit

Audio and KeyCode Reader

Equalisation

Optical audio SMPTE,
Magnetic audio IEC

Supported KeyCode Scan Speeds

All scanner speeds

LED Type

Optical audio and
KeyCode Deep RED

Supported Audio Scan Speeds

6fps-125% chosen film rate

i.e. 24fps film frame rate has a 30fps maximum scan speed, and 16mm film has a 12fps lower limit.

Supported Optical Audio Types

- Variable Area
- Variable Density

Audio Sampling Rate and Bit Depth

48kHz 24 bit PCM WAV file

Optical Audio 35mm

Bandwidth

40Hz-16kHz +-2dB

SnR Signal to Noise Ratio⁴

Transparent film base -65dB

Wow and Flutter⁵

< 0.15%

Optical Audio 16mm

Bandwidth

40Hz-7kHz +-2dB

SnR Signal to Noise Ratio⁴

Transparent film base -65dB

Wow and Flutter⁵

< 0.3%

16mm Single Perforation Mag Stripe

Engagement Pressure

15 grams

Bandwidth⁶

32Hz-14kHz +-2dB

SnR Signal to Noise Ratio⁴

-55dB

Wow and Flutter⁵

< 0.3%

Full Modulation Level

-18dBFS

Headphones Level⁷

-18dBu at 50Ω load

Audio Connection

XLR6

Computer Interface

USB-C for software updates

Power Consumption

10W at 12V DC

Dimensions

(H) 156mm (W) 92mm (D) 106mm

Weight: 1.35kg

⁴ SnR Signal to Noise Ratio is measured with flat weighting

⁵ Wow and Flutter is measured with IEC 386 weighting

⁶ Theoretically the magnetic audio bandwidth is 20-20kHz by design, but no test material is available to quantify it.

⁷ The headphone output is intended for preview purposes only.

Regulatory Notices



Disposal of waste of electrical and electronic equipment within the European union.

The symbol on the product indicates that this equipment must not be disposed of with other waste materials. In order to dispose of your waste equipment, it must be handed over to a designated collection point for recycling. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city recycling office or the dealer from whom you purchased the product.



This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this product in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

Operation is subject to the following two conditions:

- 1 This device may not cause harmful interference.
- 2 This device must accept any interference received, including interference that may cause undesired operation.



R- REM-BMD-201805001



ISED Canada Statement

This device complies with Canadian standards for Class A digital apparatus.

Any modifications or use of this product outside its intended use could void compliance to these standards.

Connection to HDMI interfaces must be made with high quality shielded HDMI cables.

This equipment has been tested for compliance with the intended use in a commercial environment. If the equipment is used in a domestic environment, it may cause radio interference.

Safety Information

For protection against electric shock, the equipment must be connected to a mains socket outlet with a protective earth connection. In case of doubt contact a qualified electrician.

To reduce the risk of electric shock, do not expose this equipment to dripping or splashing.

Product is suitable for use in tropical locations with an ambient temperature of up to 40°C.

Note, however, that ideal film conditions are between 18 and 28 degrees Celsius.

Ensure that adequate ventilation is provided around the product and that it is not restricted.

No operator serviceable parts inside product. Refer servicing to your local Blackmagic Design service center.



Use only at altitudes not more than 2000m above sea level.



WARNING

The Cintel Scanner weighs up to 70kg / 155 pounds when loaded with film. This is significantly heavier than a large screen television. If you are unsure of the structural capability of the wall or desk to support the total weight of the scanner and film loaded then you must obtain the advise of a qualified engineer to correctly analyze the mounting to ensure safety. Incorrect installation will result in the scanner falling which could cause serious injury or death.

Desk Mounting

When desk mounting the scanner, and especially when working underneath your scanner to install the desk mounting screws, ensure that your work surface is flat and stable. Mounting brackets and fixings must be of sufficient strength to securely support the scanner's weight. If your work surface is incapable of supporting the scanner's weight, or loses strength over time, your scanner may fall, possibly causing serious personal injury.

Wall Mounting

When wall mounting the scanner, ensure that the installation location is strong enough to support long term use. If its strength becomes insufficient over the course of long term use, the scanner may drop, possibly causing injury. Do not install in places which are unable to bear loads. Mounting brackets and fixings must be of sufficient strength to securely support the scanner's weight. If the strength of the installation surface is insufficient, the scanner may fall down and personal injury may result.

Desk or wall mounting your scanner **MUST** be undertaken by more than one person. Do not attempt installation on your own.

Operation

User interaction is required to operate the scanner, and the film loading process is inherently hands on. It is important to be aware that moving parts can be hazardous. Be sure to keep fingers and other body parts clear of the scanner when film is scanning.

State of California statement

This product can expose you to chemicals such as trace amounts of polybrominated biphenyls within plastic parts, which is known to the state of California to cause cancer and birth defects or other reproductive harm.

For more information go to www.P65Warnings.ca.gov.

Warning for Authorized Service Personnel

Disconnect power from both power inlets before servicing!

Help

The fastest way to obtain help is to go to the Blackmagic Design online support pages and check the latest support material available for your Cintel scanner.

Blackmagic Design Online Support Pages

The latest manual, software and support notes can be found at the Blackmagic Design support center at www.blackmagicdesign.com/support.

Blackmagic Design Forum

The Blackmagic Design forum on our website is a helpful resource you can visit for more information and creative ideas. This can also be a faster way of getting help as there may already be answers you can find from other experienced users and Blackmagic Design staff which will keep you moving forward. You can visit the forum at <https://forum.blackmagicdesign.com>

Contacting Blackmagic Design Support

If you can't find the help you need in our support material or on the forum, please use the "Send us an email" button on the support page to email a support request. Alternatively, click on the "Find your local support team" button on the support page and call your nearest Blackmagic Design support office.

Checking the Software Version Currently Installed

To check which version of DaVinci Resolve is installed on your Mac, Windows, or Linux computer, open DaVinci Resolve. Under the 'DaVinci Resolve' menu, click on the 'About DaVinci Resolve' menu heading to see software version number.

To check which version of the Cintel Scanner software is installed on your Mac, Windows, or Linux computer, open the Cintel Setup utility. Go to the 'about' tab to see the software version number.

How to Get the Latest Updates

After checking the versions of DaVinci Resolve and Cintel Scanner software installed on your computer, please visit the Blackmagic Design support center at www.blackmagicdesign.com/support to check for the latest updates. While it is advisable to run the latest updates, you should avoid updating software when in the middle of an important project.

Creating a Status Report

The Cintel Scanner software lets you create a status report that you can send to Blackmagic Support to help them diagnose and resolve problems. If you have an Audio and KeyCode Reader attached, you can generate a status report for it.

To create a status report, run the Cintel Setup utility, click on the settings icon and then go to the 'about' tab. In the 'device information' section, click 'create'. This makes an HTML file so you can easily read the status for both the Cintel Scanner and Audio and KeyCode Reader.

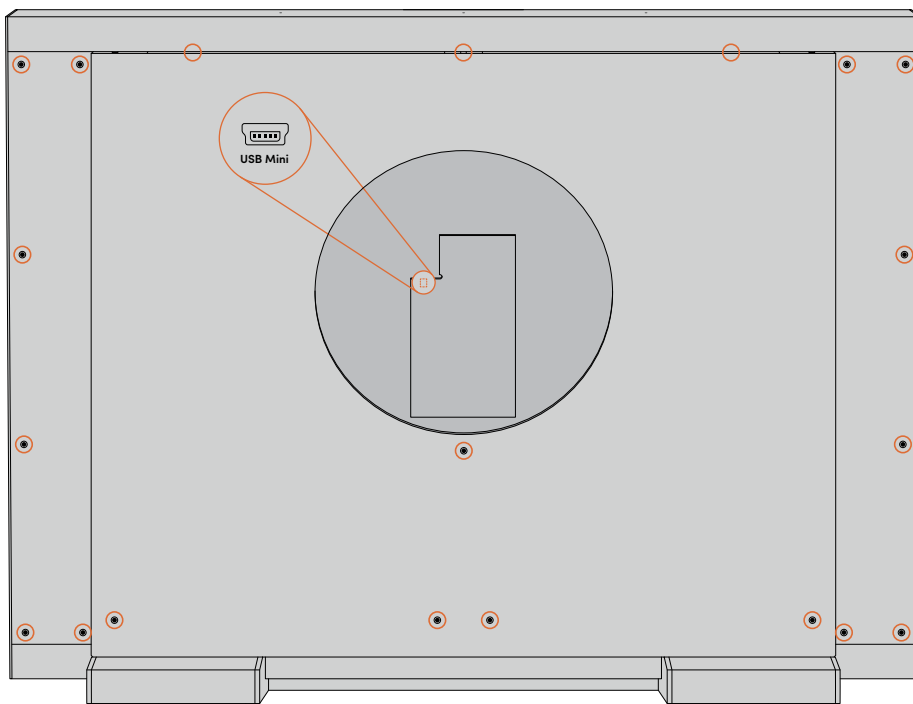
USB Recovery

In the unlikely event the update was interrupted, or you encountered an issue during the update process and your Cintel has become unresponsive, you can plug your computer into a dedicated USB port for USB recovery.

You can confirm that USB recovery is available by powering your Cintel and checking that the status LED near the Thunderbolt port is illuminated green. If the LED is illuminated red, you will need to contact Blackmagic Design support.

- 1 Remove the rear panel of your Blackmagic Cintel Scanner. The USB port for system recovery is in the centre near the top. It is on the side of the circuit board facing the front of the Cintel Scanner and is visible when you look at the top of the Cintel scanner.

NOTE If you don't have immediate access to the rear panel and need to move your scanner, make sure two people are moving the scanner and you have access to a strong platform as the scanner is heavy. For more information, refer to the 'Unpacking and Mounting' section of this manual.



Remove the rear panel to access the USB port for USB recovery

- 2 Connect your computer to the USB recovery port using a mini-B USB cable.

- 3 Download the latest version of the Cintel Scanner software from the Blackmagic Design website, install it on your computer and run it. The Cintel Setup utility will detect your computer is plugged into your Cintel Scanner's USB recovery port. Click 'update now'.



Cintel Scanner software will detect your computer is plugged into Cintel's USB recovery port

- 4 After the update recovery is complete, your Cintel Scanner should now be running the latest software and operating normally. You can check this by disconnecting the USB cable, connecting the thunderbolt cable, and then power cycling your scanner.
- 5 Replace the rear panel and reinstall your Cintel Scanner into position for normal operation. If you need further assistance, you can always visit the Blackmagic Design forum, or reach us via the Blackmagic Design support center.

Warranty

12 Month Limited Warranty

Blackmagic Design warrants that this product will be free from defects in materials and workmanship for a period of 12 months from the date of purchase. If a product proves to be defective during this warranty period, Blackmagic Design, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product. In order to obtain service under this warranty, you the Customer, must notify Blackmagic Design of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. The Customer shall be responsible for packaging and shipping the defective product to a designated service center nominated by Blackmagic Design, with shipping charges pre paid. Customer shall be responsible for paying all shipping charges, insurance, duties, taxes, and any other charges for products returned to us for any reason.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Blackmagic Design shall not be obliged under this warranty: a) to repair damage resulting from attempts by personnel other than Blackmagic Design representatives to install, repair or service the product, b) to repair damage resulting from improper installation, use or connection to incompatible equipment, c) to repair any damage or malfunction caused by the use of non Blackmagic Design parts or supplies, or d) to service a product that has been modified or integrated with other products when the effect of such a modification or integration increases the time or difficulty of servicing the product.

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