

Basic Specs and Important Information:

- 4k DCI Sensor
- Computer control via Davinci Resolve.
- 4k scan for 35mm sources, 1080p scan for 16mm sources, 8mm not supported.
- RAW (.cri) scan, outputted as individual still image files. (Instructions on dubbing to standard video formats at end of guide.)
- Software conversion of optical soundtracks handled by Davinci Resolve.
- Sprocket driven system, not suited to prints with heavy sprocket damage. (Sprocket damaged prints are a case by case issue.)
- Maintenance of machine is needed before and after each reel of material scanned.
- No persistent storage for scanned material is provided by the lab unless otherwise stated.



Before you start:

The scanning process is complicated and must be followed from start to end in order to ensure the protection of the film being scanned and the scanner itself. Any damage (to film scanned or the scanner itself) resulting from improper use of the scanner is the users responsibility.

SECTION 0: Preparation

S0-I : Collecting the Necessary Tools

The first thing you must do when using the scanner is procure the necessary tools to work with the scanner and motion picture film. Most of these should be items should be present around the Cintel's station, some may be user supplied, ensure you have all of them before starting.

- Cintel Gate Kit (Black Box): May contain the 16mm or 35mm Gate kits depending on current set-up.
- Cintel Maintenance Kit (Black Leather "RODE" Pouch): Contains Air Bulb, Lens Cloth, Lens Pen.
- Swiffer Professional Cloths: Box Provided, do not use for other uses than cleaning the scanner.
- Cintel Film Backplates (Black): One may be in the reel box depending on last configuration.
- Film Cores: 35mm & 16mm.
- Reels: 16mm and 35mm of varying types provided.
- Motorized Rewind.
- Cintel Official Manual
- Gloves: for film handling, latex or cotton. (Latex supplied, cotton if desired should be brought by user.)
- Pro Masking Tape: for attaching leader to reels/cores, USUALLY LAB SUPPLIED.
- Splicers: 35mm/16mm. One may be on the bookshelf when not in use.
- Splicer Tape: USUALLY LAB SUPPLIED.
- Film Leader: NOT LAB SUPPLIED, if needed it should be brought by researcher.
- Hard Drive Storage Device: NOT LAB SUPPLIED UNLESS OTHERWISE STATED.

SECTION 0-II : Preparing the station

The first thing you will want to do before starting work is to prepare the station digitally. This means to verify that space is available on the offload media (RAID Drive, see section B), that your end destination media (Your Hard Drive, see section C) has the appropriate amount of space and that the scanner is connected (Thunderbolt connection, see section D).

A: Calculating your approximate space needs

The scanner outputs a large amount of data, as such you will need to make sure requisite space is available before beginning your scan. (On both the Offload Media and your hard drive.)

So first, please consult the following information and come up with an estimate of the file size of footage your scan will result in.

16mm Scans (16mm, S16mm) (24fps)

1080p RAW Scan, 980p Effective Scan Resolution Cropped (980 x 735 (4:3 Ratio))

Image File Sizes (approximative)

- 6.60 MB = 1 RAW Frame
- 158.4 MB = 1 Second of RAW Material
- 9.50 GB = 1 Minute of RAW Material
- 570 GB = 1 Hour of RAW Material

35mm Scans (35mm, S35mm, All Perfs) (24fps)

4k DCI RAW Scan, 2.5k Effective Scan Resolution Cropped (assuming 4 perf.)

Image File Sizes (approximative)

- 22.40 MB = 1 RAW Frame
- 537.60 MB = 1 Second of RAW Material
- 32.25 GB = 1 Minute of RAW Material
- 1.90 TB = 1 Hour of RAW Material

Optical Audio Conversion

16mm or 35mm Scans, 191 kbps.

Audio File Sizes (approximative)

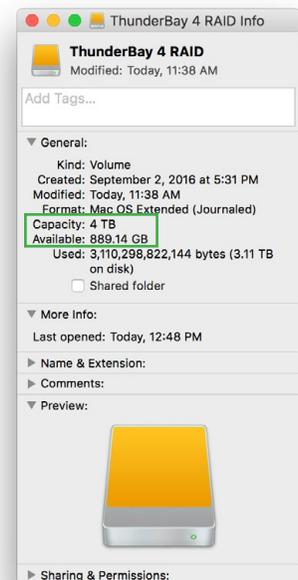
- 11.52 MB = 1 minute of Converted Audio
- 691.20 MB = 1 hour of Converted Audio

So do the following:

1. Determine roughly how much space your scan will take.
2. Check the "Thunderbay 4 RAID" drive to make sure it has enough space to scan to
3. Make sure that your offload hard drive has enough space to transfer the data to afterwards.

To check a drive capacity, select it in finder and hit **[command+i]**.

As for your end destination drive, you can choose to keep the RAW files and the dub file or to just keep the full resolution dub. Depending on your codec choice for your dub, it may take the same amount of space (ProRes 422 HQ for 16mm, ProRes 4444 for 35mm) or it can be larger but retain more of the information (ProRes 4444 for 16mm, ProRes 4444 XQ for 35mm, or DPX 12bit for either.)





THIS IS YOUR WARNING

NO FILES THAT ARE LEFT ON THE "ThunderBay 4 RAID" OFFLOAD DEVICE ARE GUARANTEED TO BE THERE AFTER YOU LEAVE THE STATION UPON COMPLETING THE SCAN SESSION. ANY FILES LEFT ON THE DRIVE ARE SUBJECT TO DELETION WITHOUT NOTICE.

NO EXCEPTIONS.

BEFORE YOUR SCAN MAKE SURE YOU HAVE A HARD DRIVE AVAILABLE TO YOU OF THE NECESSARY SIZE FOR YOUR SCAN!



IMPORTANT HARD DRIVE INFORMATION

Since you are not scanning directly to your hard drive, the speed of your hard drive is not incredibly integral to the process. However, it will affect the amount of time it will take to dump your files from the RAID at the end of this process.

Example Hard drive speeds:

RAID Drive =	1.5 gigabyte+ / second
Solid State Drive =	500 megabytes / second
Regular Desktop Hard drive =	~125 megabytes / second (7200rpm drive)
Regular Portable Hard drive =	~75 megabytes / second (5400rpm drive)

As you can see the raid hard drive is likely to be faster than your hard drive by a large margin.

Most users will likely want to "Dub" out a master file (a full resolution version of your scan) in a more compatible format at the end of their scan. When exporting anything it is suggested that you output it to the RAID and then copy it over as that will decrease the amount of time it will take to output.

Lastly, if you are serious about archiving the material you are scanning, you should have two identical hard drives for the scan. One as your main drive and one as a backup, you should copy the files to both drives. This gives you insurance in the case of hard drive failure, because especially if the film is degrading, losing your scan is like losing your film negative. You don't have to do this, but you should.

D: Maintaining the Cintel (Cleaning)

Before starting with the Cintel itself you will want to make sure it is as clean of dust as possible.

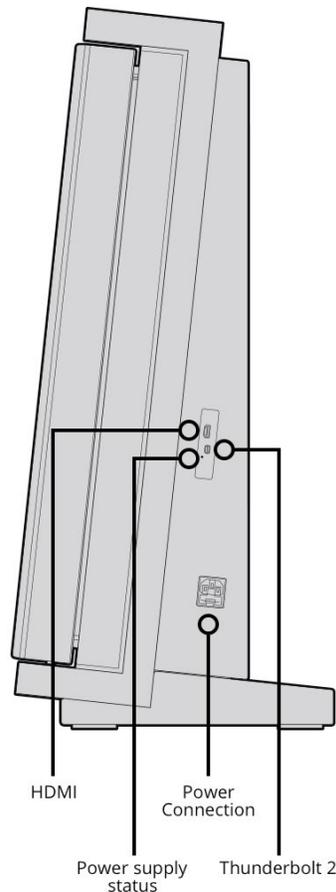


1. First start by opening the doors of the Cintel.
2. Take the Air Bulb from the cleaning kit, blow around all of the rollers and the back plate on the right side. Blow any other dust you see in the cabinet towards the bottom of the cabinet. You can also air bulb the gate and skid plate (or gate area).
3. Take a professional Swiffer cloth and dust the bottom of the cabinet under all of the rollers. (DO NOT TOUCH THE ORANGE ROLLERS WITH ANY FIBROUS CLOTH.)
4. Check the orange rollers, these should look clean and free of dust. If they are not, skip to "Section 3 - H" in order to find the instructions on how to clean the orange friction rollers.
5. Close the doors of the Cintel, use the swiffer cloth to clean off the doors and top of the cabinet.
6. Keep this swiffer cloth as it may be used for other cleaning during the set-up process.
7. Close the doors closed until you get to Section 2: Loading the Cintel.

E: Checking the Cintel Connection / Troubleshooting

The Cintel functions on a Thunderbolt 2 data connection to the station, it does not have an on/off switch per-say, so it detects this connection automatically. (Usually, but not exclusively, when Davinci Resolve is active on the system.)

As a result the Thunderbolt connection can sometimes be disconnected when the scanner is not in use (in example because of a planned power out in the building). The thunderbolt connection is located on the right side of the machine.



If the wire is not plugged in, it should be on the desk right next to the machine, plug it in.

If the scanner does not start up (scanning light turns on) when Davinci Resolve is opened:

1. Check that the scanner is plugged in.
2. Quit and re-open Davinci Resolve.
3. Restart the Computer.
4. Unplug and plug the scanner back in.
5. Go under the desk that the scanner is on, turn off the power supply unit there (instructions on power supply.) Wait a few seconds and turn it back on.

A loss of connection is a common troubleshooting issue, so if the scanner fails to respond to computer controls at any point in the loading process, please try those steps.

Next we will focus on the analog process of preparing the film and then loading the scanner.

Pre / Post Scan Cleanup

Before each scan you should check that the person before you performed this mandatory clean-up, if they did not, you should do it now. After **EACH REEL** you scan you **HAVE** to clean the transfer rollers (orange rollers), you should check the other rollers and gate for residue transfer and you can also clean the rest of the cabinet before the next reel but it isn't mandatory.

1. The metal rollers and gate for residue:

Depending on the print, you may have some transfer of adhesive or grime from the sprocket areas onto the metal rollers on the skid plate or the plate itself. (Common with worn distribution prints.) You'll see this as a yellow/brown adhesive looking residue. To clean this, take the gate out of the machine (see later sections on setting up for 16mm/35mm) grab an edge of the Swiffer cloth you have been using (or a paper towel) and rub off the grime, it should come off easily. This will help the future reels continue to run smoothly.

2. The orange transfer rollers:

Inspect the orange particle transfer rollers (PTRs) for dust and residue. This will be small specs of dust or on a very dirty print you'll see white lines of dust where the edges of the previous film passed over the roller.

1. Remove the rubber "o-rings" from the edge of the orange roller spindles. Place these on the side, on top of the Gate kit box.
2. Since the rollers have dust and dirt from the reel that just ran through the machine, so it is ok to touch the surface of them. With clean dry hands pull them off their spindles, it will take a little bit of force. Place them on their sides so they don't roll away and close the cabinet
4. Take the rollers to the kitchen in the shared space. (I suggest wearing the rollers like rings on one hand to avoid contacting the surface of them, this is the better way to hold them after cleaning as well.)
5. In the kitchen, lay out the rollers on their sides (not on their surface) on the paper towel square.
6. Turn the water on, lukewarm temperature put a single small drop of dish detergent on the roller (any dish detergent is ok) and rub it thoroughly clean with your fingers. Rinse it under the running water. Shake off as much of the excess water as possible in the sink. Put it back on it's side on the paper towel, repeat until all are done.
8. Pick up the rollers, careful not to press their surface against the paper towel and pick up fibres, and proceed back to the lab.
9. Put everything back down and wait for the rollers to air dry. They cannot be dried any other way and they must be dry before being placed back in the machine.
10. When dry, pick up the rollers (again like a ring on your finger to not contact the surface) guide them onto the end of the spindle in the machine and press them on from the side. Replace the "o-ring" on the end of the spindle. Repeat until done.

SECTION 1: Preparing your Film

The following section of the guide is primarily concerned with how to load the Cintel with a Reel or a Core of film.

IT IS GENERALLY SUGGESTED THAT YOU RUN ANY SOURCES THAT YOU CAN OFF OF CORES RATHER THAN REELS.

This is because the scanner was designed to work off of it's backplates and therefore it usually results in the least errors and troubleshooting. We have all of the tools to rotate film onto cores for 16mm, for 35mm we do not have the same equipment so the following section will describe how to deal with 35mm reels.

1. Migrating 16mm from a Reel to a Core:

As long as your 16mm reel is less than ~1000ft you should be able to wind it onto a core using the steps outlined in the 16mm section that follows.

2. 35mm Reels that aren't on a Core:

Unfortunately, we do not currently have a 35mm split reel at the lab that is safe to use on the electric rewind, as a result we cannot currently migrate 35mm that is on a reel to a core. You can however move your film onto a reel that we have tested to work in the scanner on a regular basis

3. Does it have enough leader?

The scanner takes more leader than a conventional projector to thread the machine and load, so it may be the case that you will have to add some. The lab had some leader for use next to the scanner and a splicer you can use to add some. In general a couple feet should do the job. You should check the head and tail of the film for leader.

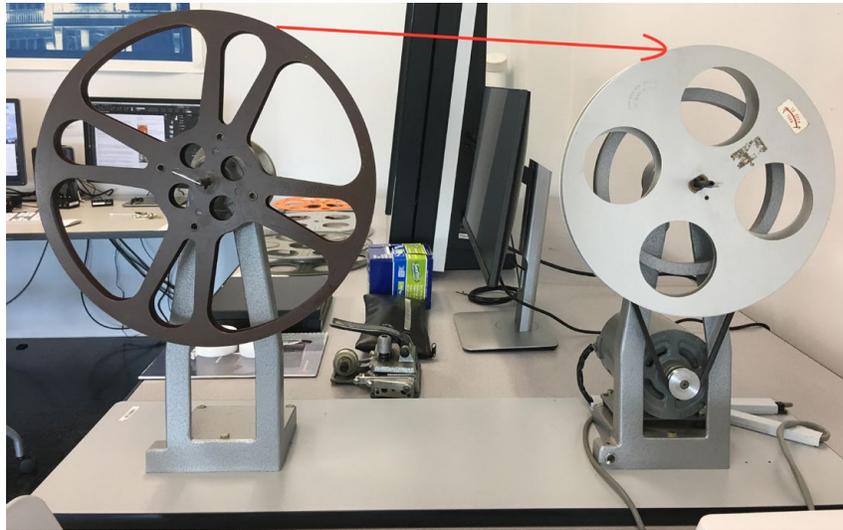
MOVING FILM TO NEW REELS OR CORES

If your film is not already on a core or suitable reel, the basic steps to wind it onto a new reel are the following. (NOTE: do not touch the rewind or film while it is being operated with it's motor.)

1. Make sure it has appropriate leader.
2. Determine if the film has been rewound or not. (If it has not been rewound skip step 3.)

USING THE REWIND:

The rewind is a powered device and should not be touched while in mechanical operation, this can lead to laceration or other injury. Reels should be placed on the spindles and properly locked into place by aligning the notch on the spindle and then flipping the safety lock at the end of the spindle and pushing it in.



3. Place your reel of film on the left side of the rewind, place another reel on the right side (not the final reel or split reel with core.) Connect the film to the right side reel top to top, wind it a few turns by hand, then use the pedal to wind the film onto this second reel. It will now be backwards.
4. Move the reel with your film from the right side to the left side, on the right side place your destination reel.

For 16mm the split reel (seen on the right side in the image here.)
For 35mm the orange and black plastic reel.

Wind a few turns onto the left side by hand and then use the footpedal to wind the rest.

5. If you wound 35mm onto the working reel to scan, you are done. If you wound the 16mm onto a core in the split reel do the following; make sure the film is taped to itself so it won't spaghetti then unscrew the split reel to take it apart. you can now access the core of film.

The following page will discuss what reels will and won't work for scanning 35mm that isn't on a core.

C: Steps for 35mm / S35mm - Correct Reels

In order to work properly (or most likely at all) in the Cintel, 35mm reels must be plastic or "flat centered". Here are examples of what will work and what will not:



Plastic Reel : Will Work!

If your film comes on a plastic reel like this, you are good to go! If you have to wind your film onto a new reel, I suggest you use this orange and black plastic reel we have at the lab.



Flat Centered Reel : Some will Work.

If your film is already on a metal reel, you want it to have a "flat center" like this split reel at the lab. HOWEVER, you do not want to use this specific split reel found at the lab. As marked on it, this reel doesn't lock properly and is potentially dangerous on the powered rewind. Non split reels that look like this would be suitable. (Note: The lab doesn't have any.)



Commercial "Inset" Storage Reels: Will NOT work!

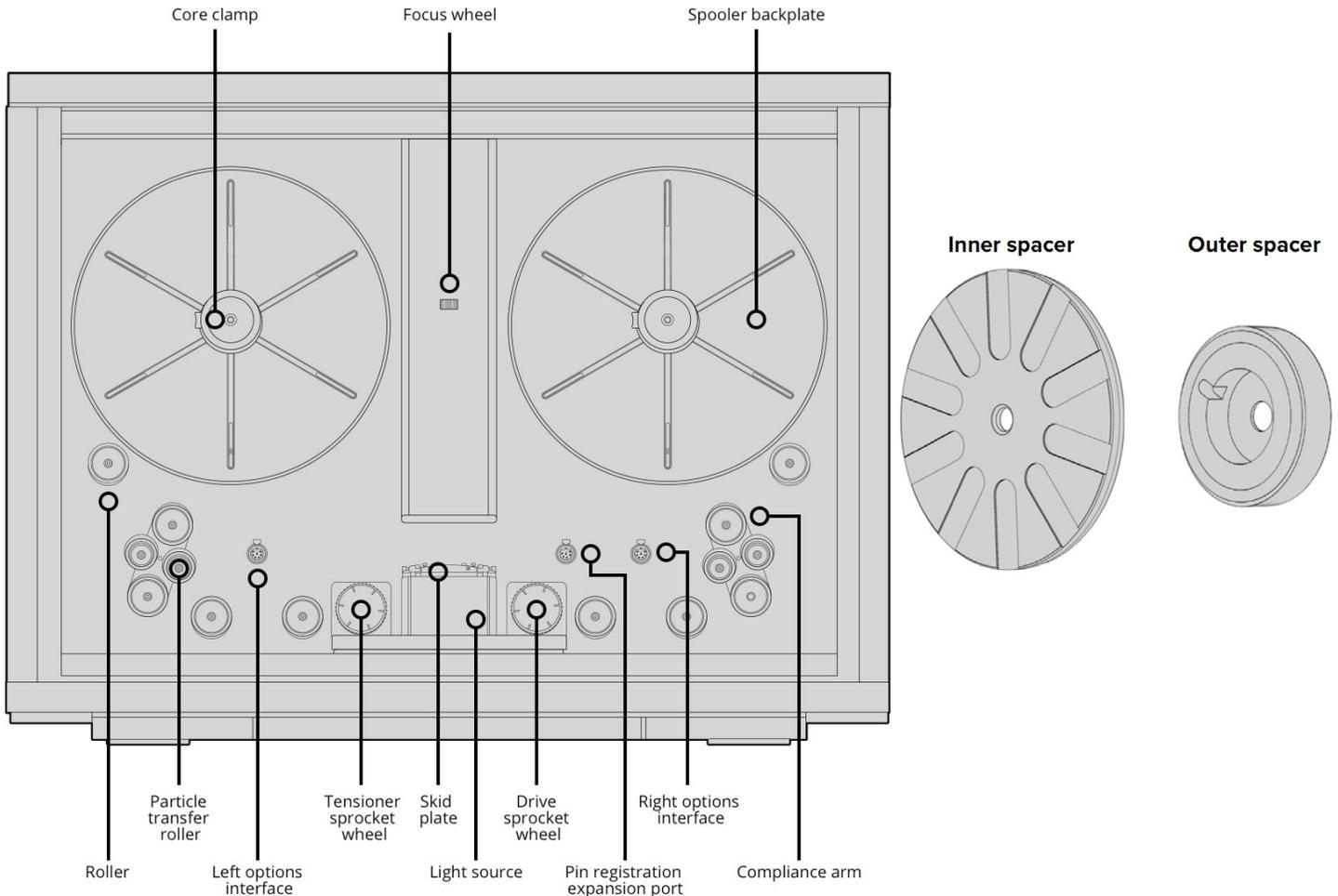
A lot of old film reels retract towards the center of the reel and then jut back out in a small cylinder in the center to grab the spindle. These reels will not work in the Cintel. If your film is on a reel with this type of center, you will need to wind it off of it's original reel and onto our plastic reel, which is a two step process.

The reason for these differences is that while the Cintel is a sprocket driven device, meaning the sprockets pull the film as it scans, the film tension is maintained by the reels or cores on backplated themselves.

The spindles that these reels or backplates are loaded onto do not have a locking pin like the rewind, so they are held in place by tension on the spindle. If a sufficient level of tension is not maintained you film will likely unload while playing back or possibly while scanning. So it is important you have the film on the right plate or reel.

SECTION 2: Checking which gauge is currently set up on the Cintel

The first thing you will want to do is check to see if the Cintel was left set-up for the gauge of film you will be working with. You can check the gauge of core on the take-up side / the size of the skid plate/gate opening to see which is set up.



As illustrated above, the skid plate is in the center of the film scanner, it is a removable metal plate.

If the system is set up for 16mm, you should see the 16mm outer spacer after the locking core clamp and the inner spacer behind the backplate as well as several thin spacers (rubber discs) on back of the spindle. (See illustrations above.)

If these spacers are not on the spindle and the core is the width of 35mm then it is set up for 35mm core.

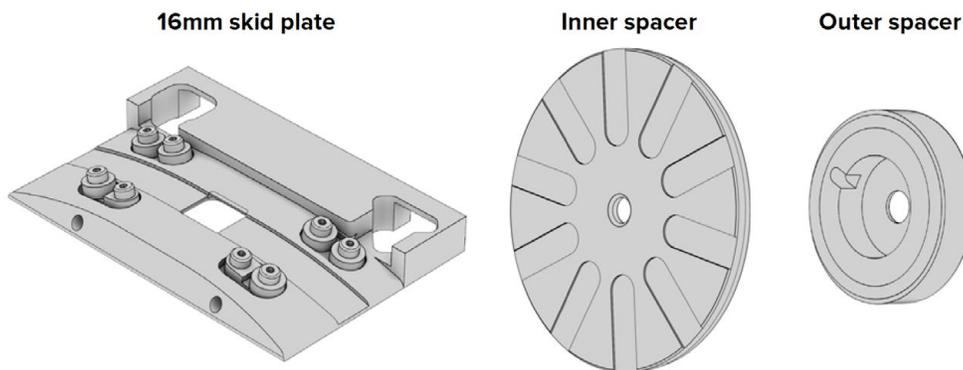
If you only see the core clamp and a few thin rubber spacers on the feed side then the Cintel is set up for 35mm on a reel.

If the scanner is already set up your given film gauge skip to lacing the machine.

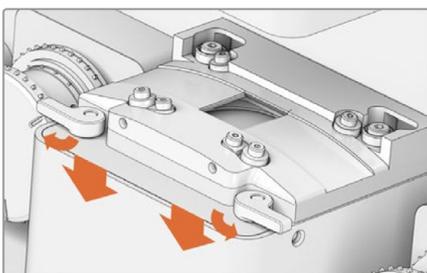
A: Setting up for 16mm

To change from 35mm to 16mm we'll have to change the skid plate (or gate), add the 16mm spacers and make sure the right amount of thin rubber spacers are on in order to get the film scanner properly calibrated.

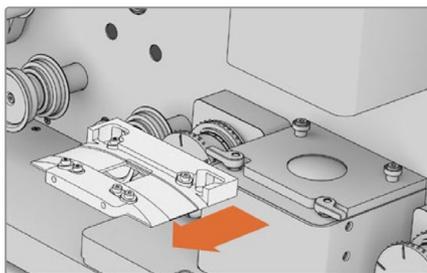
Check the Gate Kit (Black box with Blackmagic Design insignia on it) and find the following pieces as well as extra thin rubber spacers. Then make sure your hands are clean before proceeding.



Remove the skid plate by doing the following.

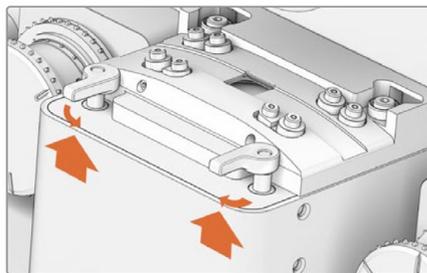


Turn the two outer levers inwards and push them down, as seen in the image to the left.



Then GENTLY slide the gate forward a bit till it is off the two studs at the back and lift it up and away from the machine. (Be careful of the glass surface under the gate, which is the lens for the scanning light.)

At this point you should take the air bulb from the cleaning kit and dust the area under the gate.

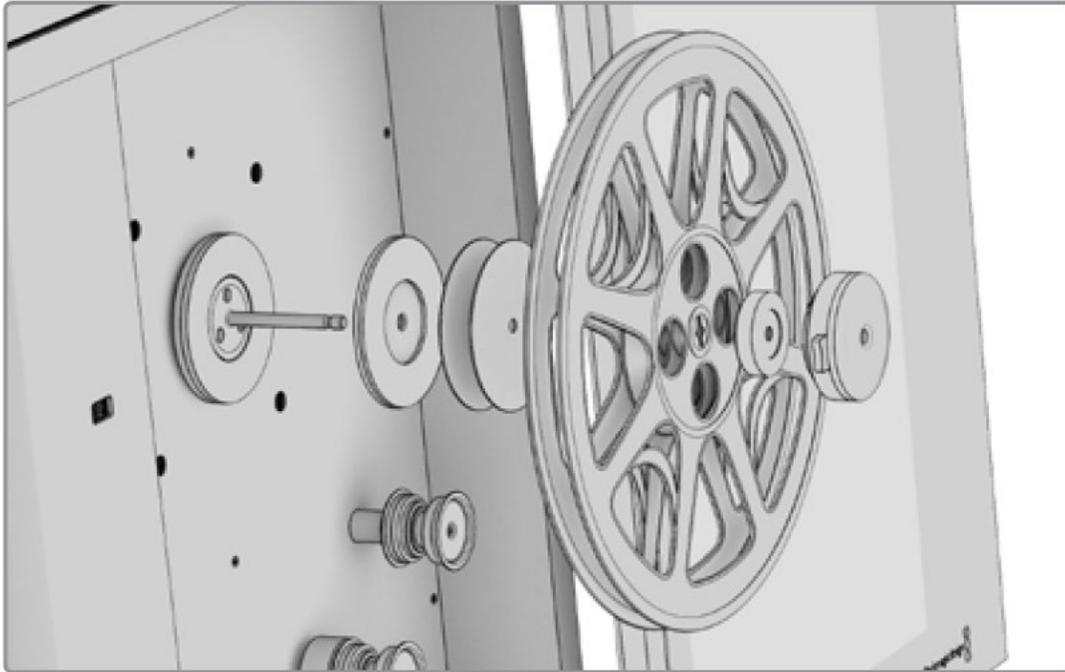


Switch the gates in the Gate Kit box and put the 16mm gate into place just as you removed the 35mm gate. (If the 16mm gate is dirty clean it before putting it on. Read below.)

Finally lift the levers up and push them inwards to lock the gate into place in the machine.

As mentioned above, the gates can get dirty over time. You should clean the gate after your scan, however if you find the gate you want to use is dirty, I suggest using the edge of a swiffer cloth or paper towel and wiping away any gunk that may accumulate from film running over it before putting it in the machine.

The following diagram give you a rough idea of how to mount things to the spindle for 16mm, though you should be running off a backplate not a reel.



So from left to right we have: the 16mm metal inner spacer (rubber side facing towards the reel), thin rubber spacers (two pictured, more may be needed), a reel (which should be a backplate and the core with your film on it), the outer spacer and lastly the core clamp.

The trick with doing this is to make sure the alignment is correct, so that your film is running more or less straight from the reel to the first roller. Usually 2 of the thin spacers should get the alignment correct. If you get to the loading stage and hear a scratching sound while playing the film in the scanner, you can try adding or subtracting a thin spacer from the spindle in order to correct the angle at which it is coming off the backplate.

Inner spacer

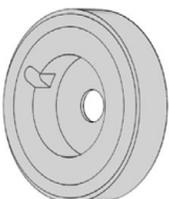


So first, press the orange button on the core clamp to release it and pull it away, then remove any spacers currently on the spindle from the previous 35mm configuration.

Place the inner spacer and 2 thin rubber spacers on the spindle to start with. Put on the black back plate next, and then put your core with your film onto the back plate.

Next place the outer spacer on the spindle, not that it does have a notch which matches the pin on the backplate which holds your reel in place.

Outer spacer



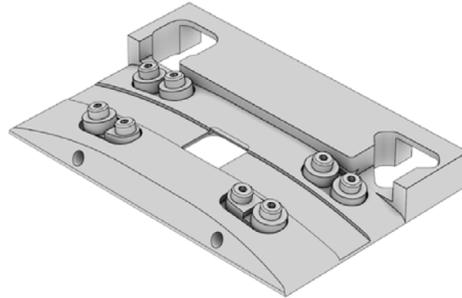
Finally put the core clamp back onto the spindle, hold down the orange locking button as you put it on the spindle. Push it inwards, this may require some force and you can brace the back of the machine. If the locking button pops back up into locking position you are set. If it refuses to lock, take it off and try again.

Repeat these steps with an empty core on the take-up side to finish the 16mm setup.

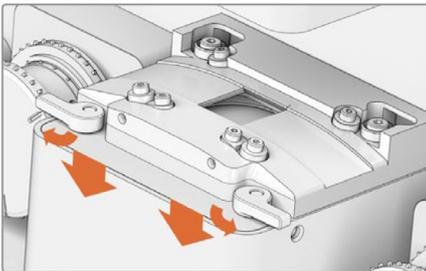
B: Setting up for 35mm

To change from 16mm to 35mm we'll have to change the skid plate/gate, and remove the 16mm spacers

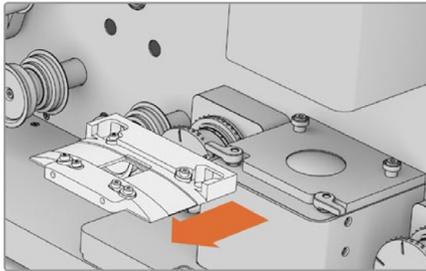
Check the Gate Kit (Black box with Blackmagic Design insignia on it) and find the skid plate (or gate) for 35mm operation. Then make sure your hands are clean before proceeding.



Remove the skid plate currently on the Cintel by doing the following.

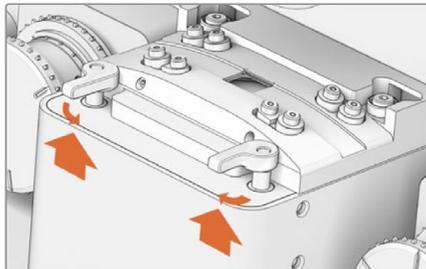


Turn the two outer levers inwards and push them down, as seen in the image to the left.



Then GENTLY slide the gate forward a bit till it is off the two studs at the back and lift it up and away from the machine. (Be careful of the glass surface under the gate, which is the lens for the scanning light.)

At this point you should take the air bulb from the cleaning kit and dust the area under the gate.



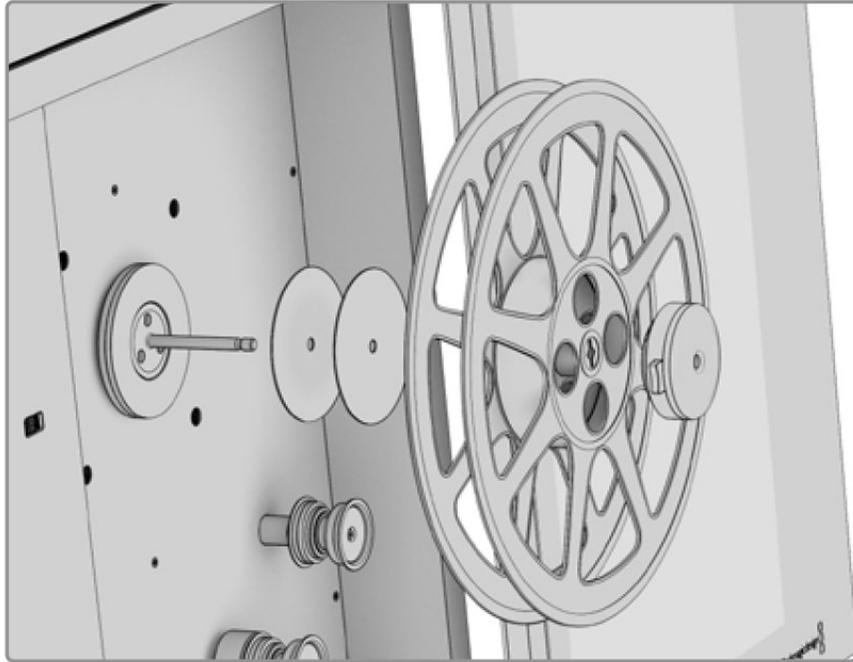
Switch the gates in the Gate Kit box and put the 35mm gate into place just as you removed the 16mm gate. (If the 16mm gate is dirty clean it before putting it on. Read below.)

Finally lift the levers up and push them inwards to lock the gate into place in the machine.

As mentioned above, the gates can get dirty over time. You should clean the gate after your scan, however if you find the gate you want to use is dirty, I suggest using the edge of a swiffer cloth and wiping away any gunk that may accumulate from film running over it before putting it in the machine.

Next we will have to redo the reel spindle mounting.

The spindle mounting for 35mm requires is very simple and is exactly as represented in the following diagram.



So from left to right we have: thin rubber spacers (two pictured), the reel you are running off of and lastly the core clamp.

The trick with doing this is to make sure the alignment is correct, so that your film is running more or less straight from the reel to the first roller. What you don't want is for there to be a lot of strain on the film due to it rubbing on the reel as it runs diagonally to the roller. Running 35mm, two spacers should work 95% of the time, if you feel the film is strained add or remove one at a time to get the angle right.

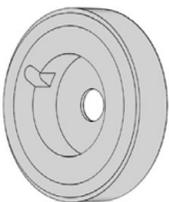
Inner spacer



So first, press the orange button on the core clamp to release it and pull it away, then remove the two 16mm spacers (seen on the left) and the backing plate, put the spacers back in the gate kit box and put the backing plate in the box below. Put these two thin rubber spacers back on the spindle.

Put your reel on the spindle. Un-tape the end of the leader on your reel and run it over the first roller to the left of the reel. Judge the angle at between the reel and roller. If it is too diagonal, try adding/subtracting spacers.

Outer spacer

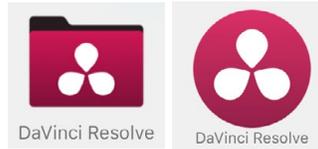


Finally put the core clamp back onto the spindle, hold down the orange locking button as you put it on the spindle. Push it inwards, this may require some force but you shouldn't feel like you have to brace the Cintel. If the orange locking button pops into locking position you are set. If it refuses to lock, then you have to remove a thin spacer and try again, repeat this process until it will lock.

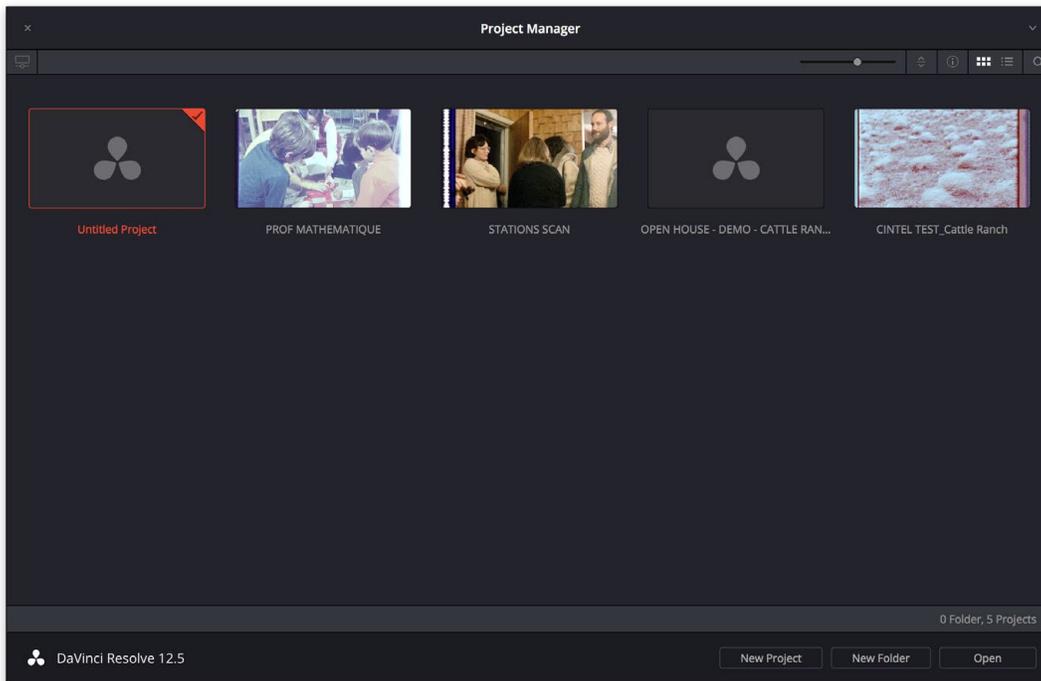
On the take-up side, remove the 16mm spacers (picture on the left) and put the backplate back on with a 35mm core.

D: Starting Davinci Resolve and Calibrating the Scanner

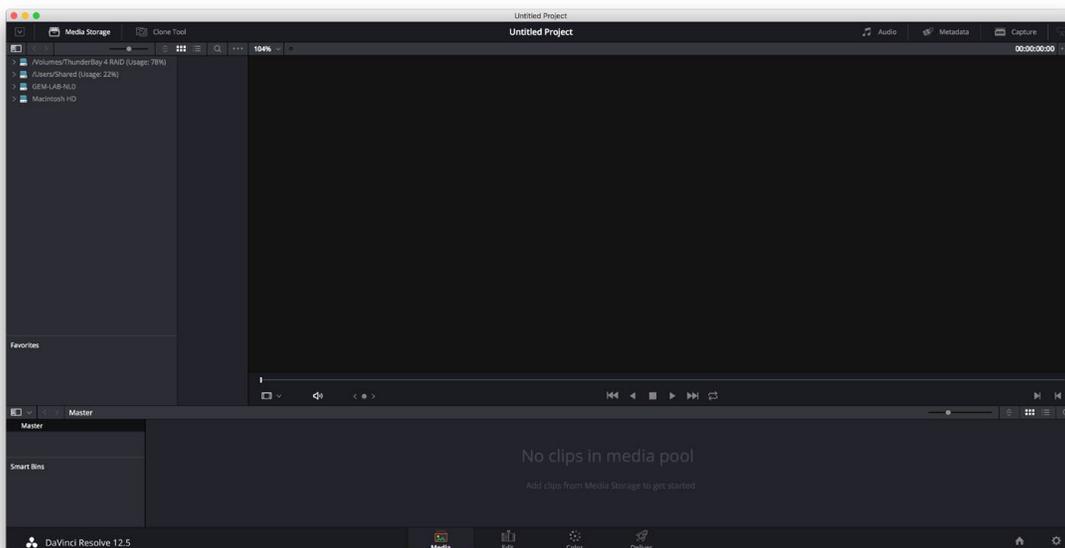
The next step is going to take you back to the computer, go to applications.



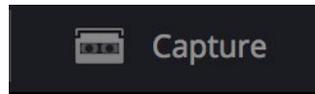
Find the folder called "Davinci Resolve" and Open that and launch Resolve Studio 12.



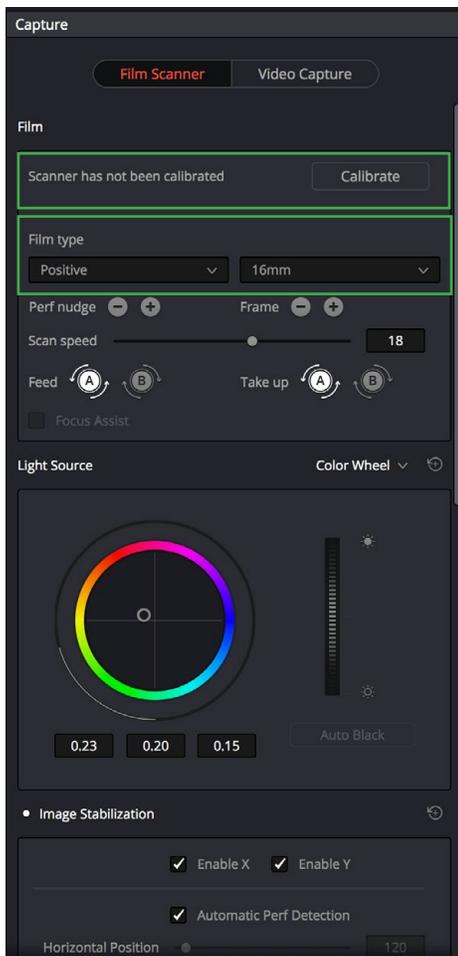
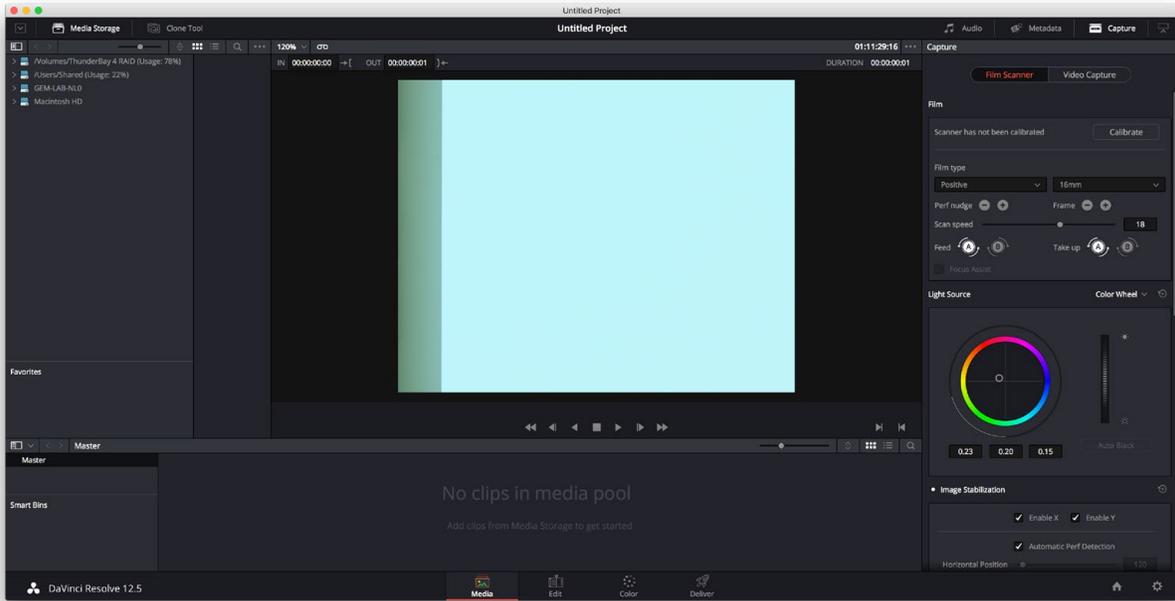
When Resolve Launches it will open up to a project screen. I suggest creating a new project each time you scan, so double click the "Untitled Project" option, this will make a new project you can name.



You are now in the "Media" workspace of Resolve. Click Capture on the top right of this window.



This will open the capture palette on the right side of the screen.



For now we are going to ignore most of these functions. You should have an image preview in the Resolve window as well as on the preview screen next to the Cintel.

If you don't, save your project and quit Davinci Resolve, make sure the scanner is plugged in and restart Resolve. In a few seconds the scanning light should start back up. Re-open Resolve and your project and navigate back to the capture palette.

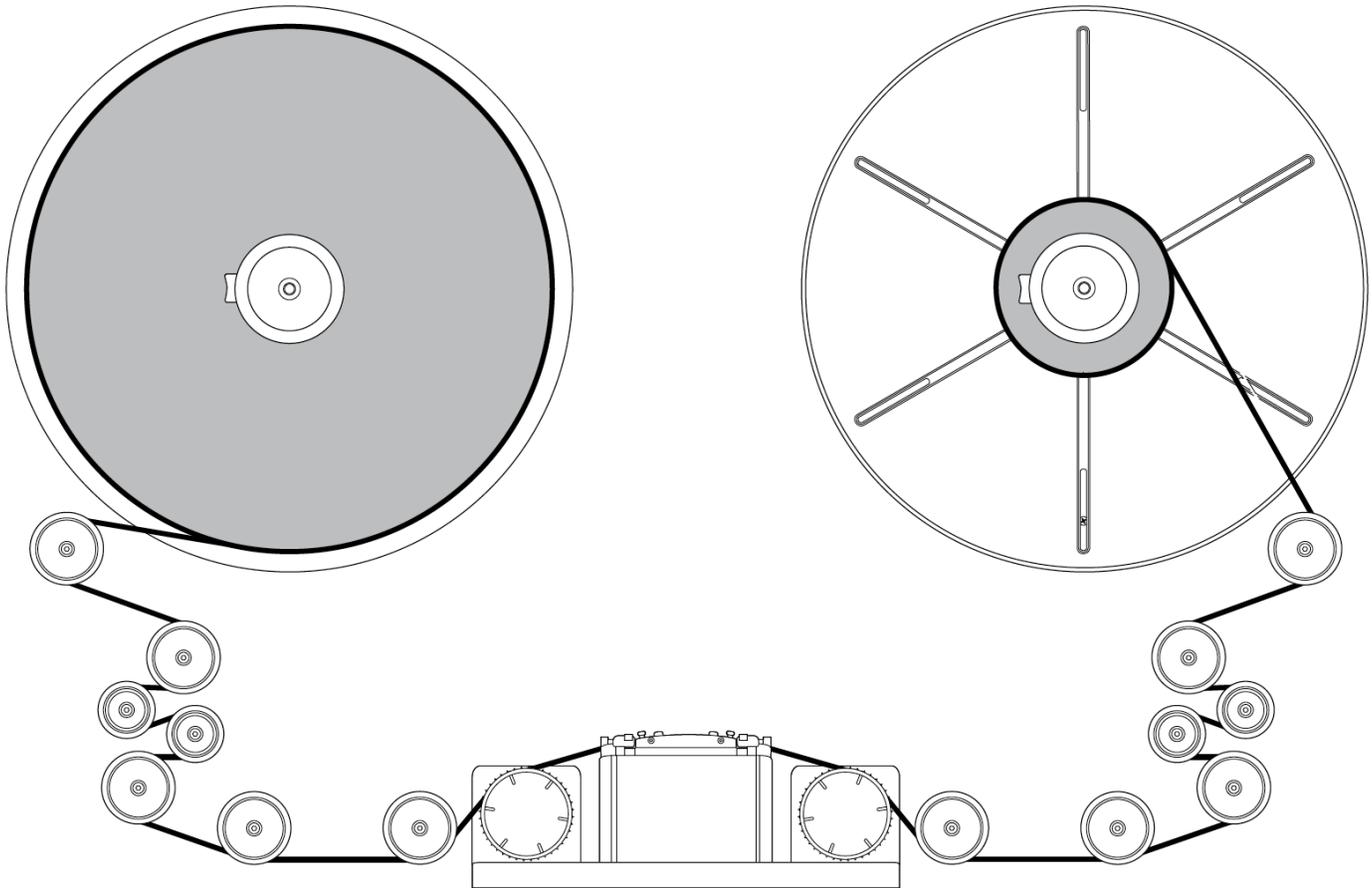
With the scanning light working, first you can select the format of film you are scanning from the gauge section near the top of the palette.

Check the image on your preview, if you see the ghost image of an incorrect gate size or perforation marks (your film should not be loaded yet) click calibrate and the scanner will refresh the sensor and calibrate it.

If you didn't have to change the gauge of the film (and thus skipped the previous section entirely) take the air bulb from the Cintel Cleaning Kit and air dust the light source beneath the skid plate/gate and make sure the skid plate is clean of any residue.

E: Lacing the film through the scanner

Like a projector, we're going to have to lace the film through the scanner and then attach it to the take-up reel. Unlike a projector, the path is fairly complicated and specific.

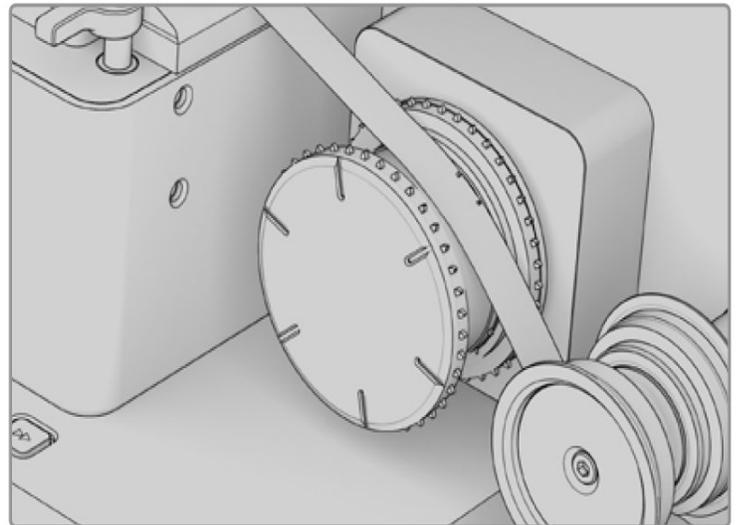
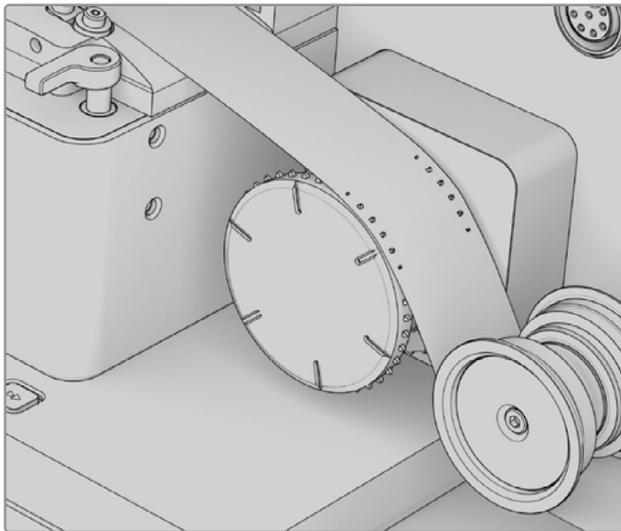


Above is the lacing diagram for a **B/A wind** set-up on the scanner. The wind type is dictated by the way the film winds over the first roller after the feed (left side, B wind above) and last before the take-up (right side, A wind above.) The wind type on the feed side (left side) will be determined by how the reel was wound when you received it.

Also make sure your film is facing the right way. I.e. that the film is not flopped horizontally on 35mm or that the perfs are facing the inside of the machine so they line up with sprockets for 16mm.

From this point on any film handling should be done with gloves or clean hands. As you should have sufficient leader on either end of the film you don't need to be too careful, but if you have to touch a section of film with printed or negative frames follow the following advice. If you have cotton gloves, you can grab the film any way necessary (though obviously avoid touching actual frames too much.) If you are using Nitrile or Latex gloves, try to hold the film by the edges, only place you fingers on the flat of the film if you are touching leader. If you are using clean hands, try to avoid touching the flat of the film.

Lace the film through the path in the orientation you see above or on the previous page. When you get to the sprocket rollers you will follow the relevant sprocket set.

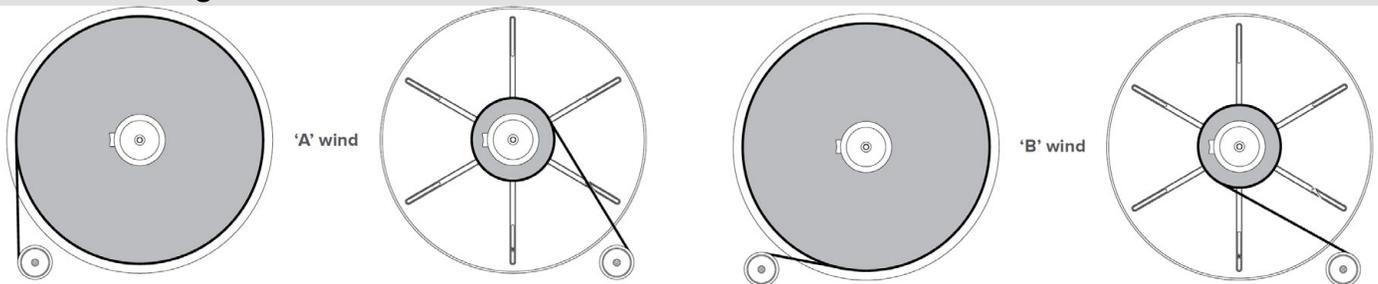


Left for 35mm, right for 16mm.

Make sure it is running over the skid plate (or gate) flatly and then back down the other side and up to the core on the take-up side. Grab the tape you put down on the side of the table earlier and use that to tape the leader down on the take-up side.

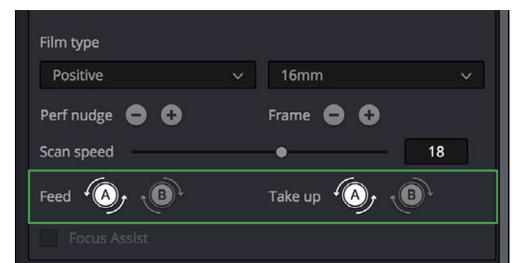
You are now finished (read: hopefully finished) with the physical part of the loading process. Now we need to make the system auto load using the physical Cintel controls and digital controls in Davinci Resolve.

F: Auto Loading



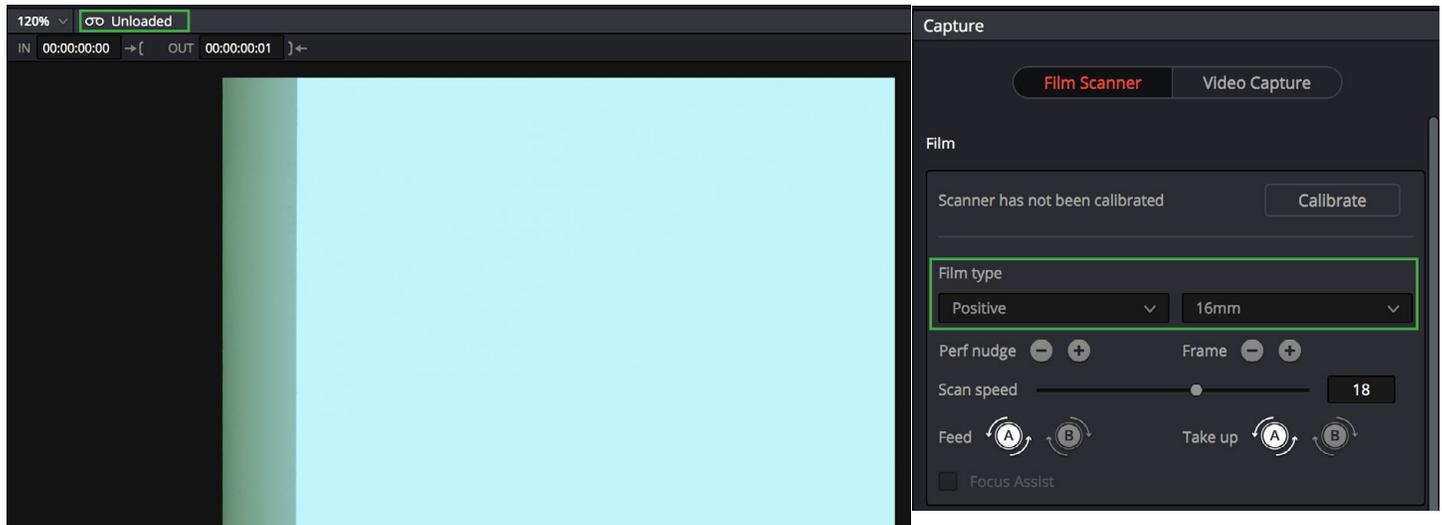
With the film laced and connected to the core on the take-up side we have a few final checks before auto loading. First, we want to check the wind types you used. Once you have determined which way each side of the scanner is wound, go to the Davinci Resolve screen and the film scanner capture palette and find the following controls.

Make sure that the feed and take-up winds are correctly identified in the software, as this will affect how the machine attempts to tension the reels.

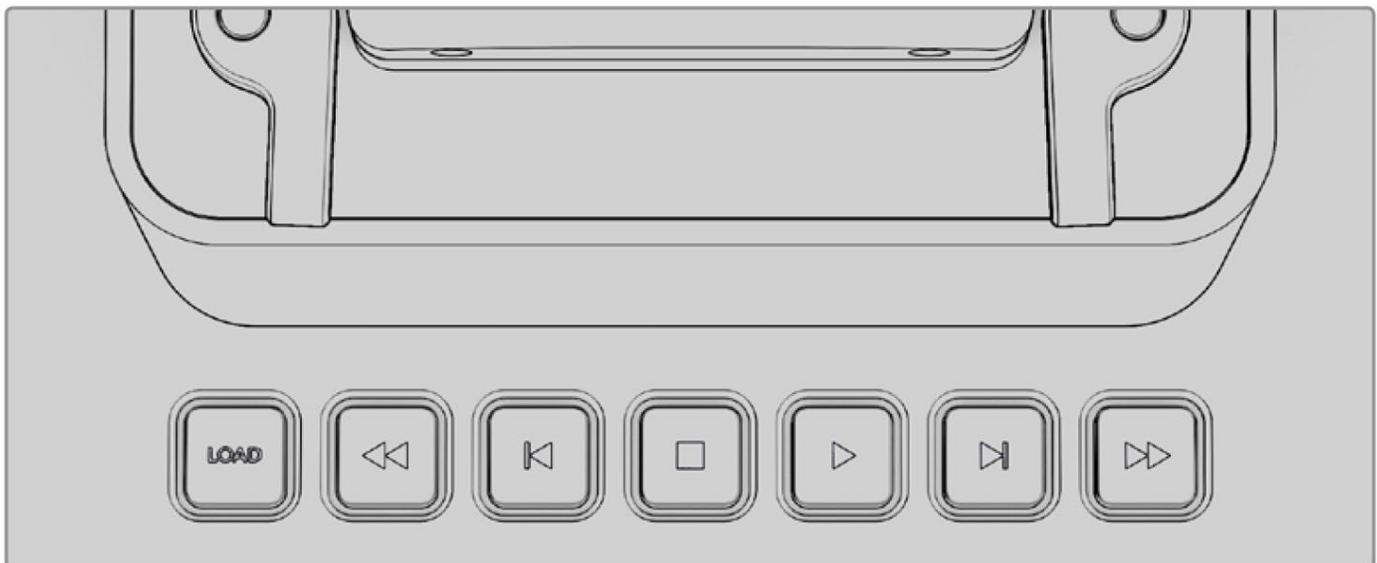


Make sure that your sprockets are correctly lining up inside the perms of the film.

Look at the Davinci resolve interface, above the preview panel there should be an status indicator that at this point will say "Unloaded". Before proceeding, double check that you have the correct gauge of film and film type selected in the capture palette.



Now open the scanner and look at the physical controls under the skid plate (or gate.)



You will want to hit the "LOAD" button on the left hand side of the scanner to Auto Load. There is also another way to load the scanner, which I would call a manual load. This could be suitable for some damaged film, most users will want to auto load.

At this point you should see the two reels moving and beginning to tension the film, the rollers will also change position as this happens. In the same location on the Davinci Resolve screen that said "Unloaded", it should now say "Loading...".

If everything goes correctly this should change to "Loaded". If this did happen, move onto the next section of the guide.

Manual Loading

So there is a method for loading the scanner without using the load button and machine assistance. (All other steps up to that point remain the same.)

Instead of pressing the load button, you will want to manually tension the film by putting your hands on the reel and backplate and rotating them in the correct wind direction to introduce tension. Do this slowly but consistently, when the film starts to reach the correct tension for the machine you should feel the reel and bakplate adjust and "click". When you remove your hands the system should retain tension and the status indicator above the preview window will read "Loaded" if you were successful.

G: Common Problems Experienced while loading

There are common problems that occur when loading: *(Almost all relating to Reel and not Core loading.)*

1. Loss of Preview Image / Scanner Goes to Sleep

Sometimes after a prolonged period of inactivity the scanner will go to sleep. This period can include changing settings or entering data in Resolve that isn't actively using the scanner. As long as it is not asleep too long, this usually does not result in a timeout which will result in the need to restart.

If your preview image turns off while you are loading or prepping the film, simply press the "Stop" button located directly below the preview screen.



This should wake the scanner back up, in a second or two, and the preview image should come back on and you can continue.

2. Loss of Scanner Connection, due to computer sleep.

If it takes so long to prep your scan that the computer goes to sleep, you may need to restart Resolve. This doesn't happen 100% of the time, but there is a bug that sometimes makes it so that if the computer running Resolve goes to sleep while connected to the scanner it can timeout the connection with the scanner. Resulting in either loss of control of the scanner through Resolve (and therefore inability to scan) or it can prevent the scanner from coming back from a sleep state.

Note: If your film is already loaded, you should use the "load" button on the Cintel to unload your film if it is loaded when this happens. It shouldn't damage the film either way, but is a good precaution.

If this happens, save your project and restart Resolve. If that does not restore Resolve's control over the scanner, restart the computer. If even that doesn't work, quit Resolve again, turn off the power supply for the scanner underneath the table. Once it has been started back up re-open Resolve.

2. Scanner won't finish Loading, goes back to unloaded state.

You'll press "Load" and the scanner will start tensioning, then it may stop and release tension. In Resolve this will result in going from "Unloaded" to "Loading..." back to "Unloaded."

This is usually the result of there not being enough grip on the feed reel. This means that the reel you are using may be incompatible with the Cintel. You can review Section 1 (Part B and/or C) for more in-depth details on reels.

3. Scanner Finishes Loading but Resolve doesn't recognize that the film is loaded.

You'll press "Load" and the scanner will tension the film, but in Resolve the status will be stuck at "loading..." Indeterminately, never reaching "Loaded".

This means that the scanner has timed out with the software or is unsure of the load. Un-tension the film in the Cintel by using the Load button to unload the film. Quit resolve and turn off the power supply under the table, wait a few seconds and turn it back on. Re-open Resolve and try again.

Resolve should now go from "Unloaded" to "Loading..." to "Loaded".

If it does not, unload the film again. repeat the process but restart the whole computer.

4. Scanner unloads film after successfully loading for a short period of time

The tension calibration system on the machine, being completely automatic, assumes certain weights of film and other factors when tensioning reels on the feed side and not the back plate. This error is different then the first, in that you will get all the way to the "Loaded" state and then will eventually spontaneously unload without busting a splice during playback, scanning or idling.

For some reason it will occasionally reject and unload reels shortly after loading, sometimes after initial playback. This is especially true of small reels of 16mm that are 400 ft or less. Usually these tiny reels will not load at all or exhibit this behaviour (sometimes they work though, so it is difficult to say.) It is also more common with 16mm loaded on reels and has happened with film as large as 1000ft.

The solution is almost always to just rotate the film onto a new reel (if 35mm) or onto a core (if 16mm.)

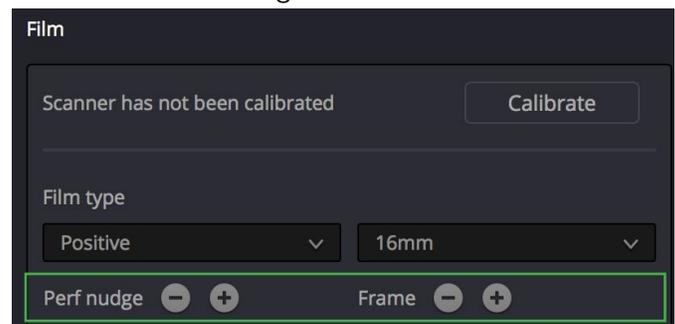
H: Final Loading Steps

So the last thing associated with "Loading" that you need to do is make sure that your film is lining up in the center of the image. If you are working with 35mm you have the following controls.

Perf nudge will move the film by one perf, so if your film is a perforation off being centered you can fix this here.

The frame nudge may stop stabilization issues, which we will discuss later.

If you are dealing with 16mm and your film is mis-aligned (i.e. you have two split frames) you will have to unload and reload the scanner to see if it realigns as 16mm is one image per perf and therefore cannot be nudged into place.



I: Calibrating the rest of the scanner settings.

Now we'll go through the remainder of the settings for the scanner and how to set them up so you can start your scan.

Scan Speed

Scan speed is the speed that the scanner will run at in FPS while scanning. The technical highest speeds you can scan at in the lab is 18fps for 16mm and 16fps for 35mm, at this rate you *should* not run into problems with dropped frames. Generally the suggested speed to scan at is 12fps, for most prints that aren't pristine new negatives, as this will not stress the film and makes the stabilization work better.

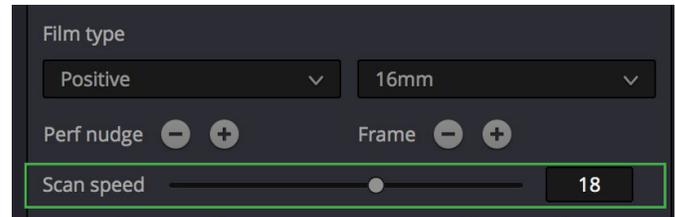
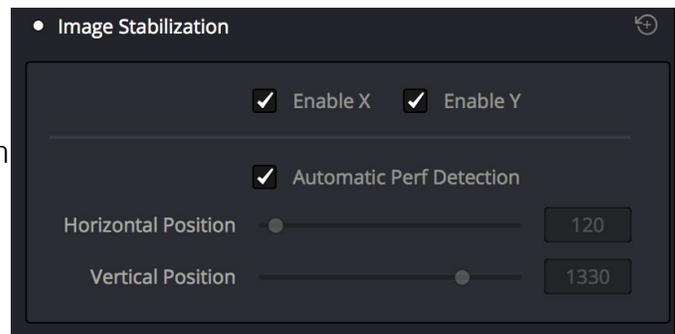


Image Stabilization

Image Stabilization is the Cintel's software driven correction method for the occasional jitter present in film playback or jump in registration due to splices. This should always be engaged!

It will correct for splice based movement, if there is slight movement in the actual printing of the film it will not be corrected.



There is always a bit of trial and error to making sure the stabilization works properly which happens when you finally start your scan, here are sets of options you can try.

Possible Set-ups

1. Full Auto (Enable X, Enable Y, Automatic Perf Detection)

This is all three boxes marked. This will attempt to automatically correct for vertical and horizontal movement. This can be appropriate for very damaged prints, but most prints do not have any noticeable horizontal shift when scanning and the software can begin to over correct as a result.

2. Vertical Auto (Enable Y, Automatic Perf Detection)

This is unchecking the X box but leaving the auto setting on, this is a general good place to test first to see if it works. It will attempt to find and correct for the vertical shift which is very important. However if you have some perf damage or edge code (machine writing on the side of the print) this can be thrown off and cause errors.

3. Full Manual (Enable X, Enable Y + Sliders)

So this will allow you to manually place the guides for the stabilization process for both axis. Here's a brief description of how they work.

- The Y axis guide (Vertical outline of a rectangle) is meant to be centered on the bottom or top edge of a perf, so that the edge of the perf is in the center of the indicator. It then represents the max range up or down that it will attempt to correct in the case of movement.

- The X axis guide (Gradient rectangle next to the Y axis outline rectangle) is meant to be positioned near the right edge of a perf, just touching the edge. It represents where it will start correcting if it notices movement.

4. Vertical Manual (Enable Y + Sliders)

This is the same as manually placing the guides for full auto but again deciding not to correct for the X axis. This way you don't get any overcompensation.

Testing

Generally if you start scanning you should notice any major problems in about the first 30 seconds of your film at the start. If you don't see major issues then stick with whatever setting you are currently on. If not you will have to rewind your film and try another setting.

There may be some natural extra movement in the first few segments as the stabilization kicks in, large problems include:

- The frame moving up and down significantly but intermittently while scanning.
- The film "jumping" a lot. (Frame position changing wildly and then returning to normal.)
- The film jitters (minor shakes and therefore changes in frame placement) constantly.

The following can be the causes of these issues with perf detection:

- Damaged perforations where it can't find the perf edge due to a puncture.
- Edge code or identifier code written partially into the perf area on the side of the film. (Which it then mis-identifies.)
- Printing bleed onto the perfs (if it changes color frequently.)
- Warped perfs due to warped film.

Tips on how to use manual stabilization:

1. You have more options if you only use Y axis stabilization. (As you can move the indicator further left or right on the same perf to avoid damage or edge codes.)
2. If your film has perfs on both sides that are visible (for instance regular 16mm without optical track) you can move the indicator to the right side perfs which sometimes are more consistent and usually do not have edge code. (Doesn't work if using X axis stabilization.)
3. Move the guides to a indicator to a higher or lower perf on the same side, if you see that you are commonly seeing damage or edge code affect the lower or upper part of a frame for instance.

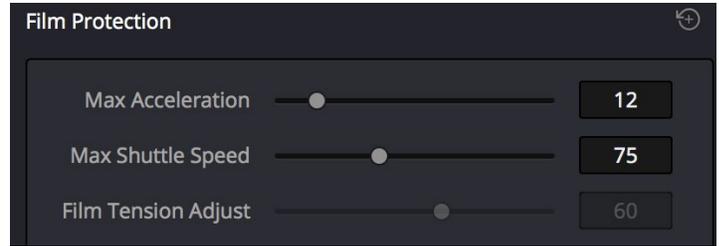
Another last note is that bad splices will almost always jump the films registration. This is acceptable and correctable in post assuming the following don't happen:

- The jump moves the jumped frame partially out of the scan area.
- The jump misaligns the film from that point on to be outside the scan area. (ie after the jump you get a half frame at the top and a half frame at the bottom but not a clean frame in the middle of the scan area.)

If a jump happens that causes mis-alignment, you will have to stop your scan, rewind to a few seconds before the shot or edit where the jump occurred, make sure the film is again relatively centered (perf nudge or re-loading), change your settings and start the scan again from there. Then in post you can stitch the scans together to avoid that jump and move them when cropping to be in the same center.

Film Protection

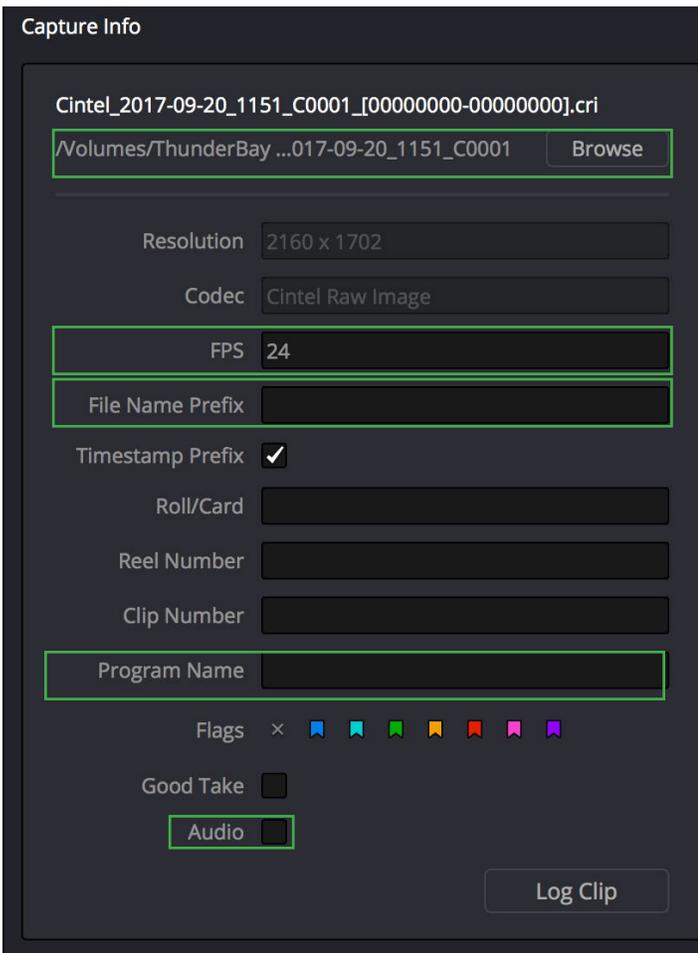
This panel can help you preserve more delicate prints while scanning. These settings are in fps where applicable.



Max Acceleration is the max playback speed for the regular playback and rewind buttons. 12fps or lower is suggested for older or worse condition prints, for newer or more pristine prints 24 fps is fine.

Max Shuttle Speed is for the fast forward and fast rewind controls. For very damaged or old prints 48 fps or lower is suggested. For newer prints 48-72 fps is a good range. If it is a brand new print you could go up to 100 fps.

Film Tension Adjust, which only works for 35mm, is to adjust the level of tension the film is under when loaded in the machine. This defaults to 60 for the initial load and can be adjusted up or down to ease up on archival film or to compensate for extremely mild film shrinkage/warping. It can also be noted that the tension does not change by that wide an amount in the adjustment range so it should not be capable of damaging film (according to the blackmagic manual) small adjustments can prevent sprocket picking.



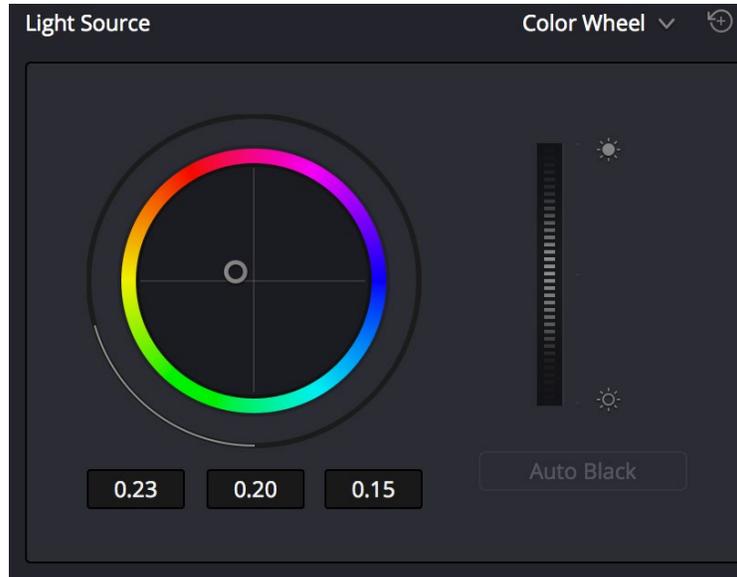
Capture Info is how you manage your media and tell Resolve where to store your media.

First click browse, for each different piece of material and each reel of that material you will want to create a new folder. Navigate to the "Thunderbay 4 RAID" and create a new folder with your name, then inside that folder a folder with the name of the material, then inside that folder a folder for the reel you are scanning.

FPS is the native FPS of the material, this meta-data affects how Resolve will playback and interpret your scan. If it is above 24, you should change it, if it is below 24 keep it as is. (This will be discussed during the post-scan steps.)

File Name Prefix should be a shortened version of the name and Reel #. (i.e. GODF_R1 for The Godfather, Reel 1.) Program name should be the unabridged name of the material.

Make sure Audio is NOT TICKED for any reason, you will process your audio later in Resolve. If this is ticked the scanner will "record" blank audio.



Next we'll look at the Light Source option. This is a relatively advanced, but absolutely necessary element of the scanning process.

When you adjust this panel you are changing the color of the light source being used to project your film onto the sensor in the scanner. This will affect both the brightness of the light source and the color of it and therefore the brightness of your scan and the accuracy of the color of your scan.

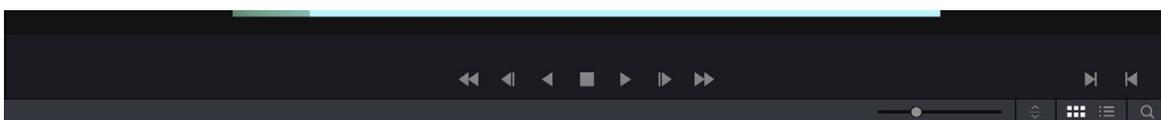
If you do not know how to color correct at all, then I suggest you just use the auto black button on this panel. It will not get you the best results you could have, but it usually pretty good at getting you into an acceptable ball park.

This panel consists of 4 relatively simple and common controls which all interrelate:

- Color Wheel
- R G B Numerical Inputs
- Brightness Vertical Slider
- Auto Black Button

To make use of any of these controls you must find a frame of the film you are scanning that accurately represents even color and brightness for the material in question. (i.e. don't pick a shot that has a large red neon sign in it to correct for your color or a shot you know to be over exposed to set your black level.)

In order to find a frame you want to use you can use the shuttle controls below the preview window.



From left to right we have; Fast Rewind, Frame Back, Play in Reverse, Stop, Play, Frame Forward and Fast Forward. (Note that the Fast and Play options will be affected by the film protection settings from earlier.)

Once you are at that frame, start by hitting Auto Black. The image preview will cycle as the scanner interprets the frame and will ultimately settle the light source on what it deems to be correct.

THE ABSOLUTE BASIC WAY OF DOING THINGS:

Look at the result of Auto Black, if you think the white balance looks correct (i.e. balance of the colors in the frame) and the blacks aren't cutting off detail/the whites aren't blowing out too quickly you can leave it as that and scan if you don't want to learn the rest of the process.

If you don't want to learn the rest of the process, but your color balance is off or things are too bright/too dark do the following.

- First address brightness, as the lightsource will shift white balance as you brighten or darken it. Adjust the brightness to where you think you are preserving the most detail. (Brighter is usually better.)
- Next use the color wheel to fix the white balance by slowly moving the dot away from whatever colors are too saturated on the wheel. (i.e. if it looks blue/teal tinted move towards orange/red, if it is red/magenta move towards green/teal.)
- When it looks right, move on to the next stage.

THE CORRECT WAY OF DOING THINGS:

This is going to assume you know how to read a Parade (and/or) Waveform (and/or) RGB Histogram.

Open your scopes Workspace > Video Scopes > On.

Move these onto the second monitor so they aren't blocking anything.

1. "Expose to the Right"

This is a concept borrowed from Log shooting on Digital Cameras. On most digital sensors, and seems to hold true for this scanner as well, more of the noise free range of the sensor is found in the midtones and highlights than in the shadows of the recorded image.

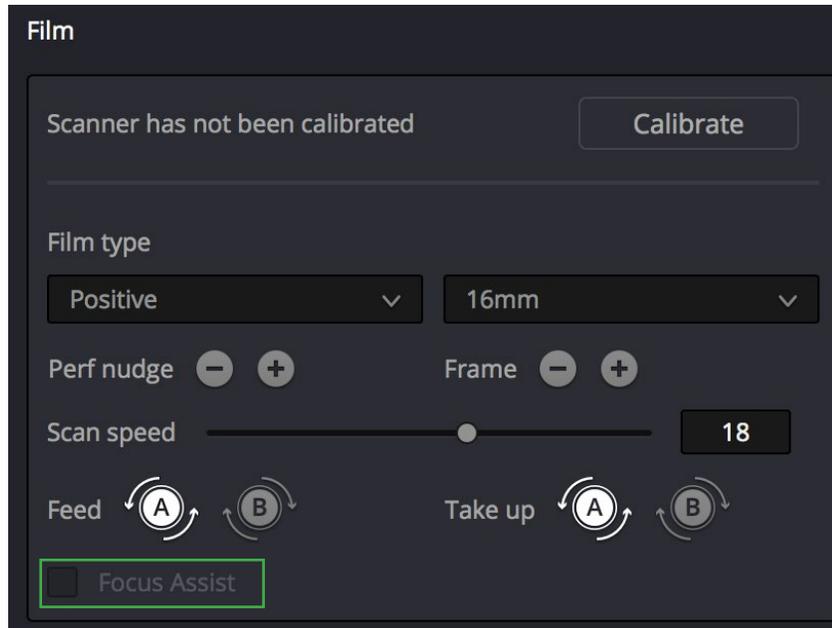
So in order to get the blacks of your scan as clean as possible before getting to post production, you want to push your brightness wheel up to give yourself 3 or 4 notches of headroom on your brightest whites in your Parade/Waveform monitor. (Unless you know the whites are blown in the image, in which case they can hit the second to last notch.) Or do the same in pushing your signal to the right on the RGB Histogram (still 3-4 notches from the right though, to give yourself headroom in the event of brighter whites.)

2. Balance using the RGB Inputs

So the brightness control has now thrown off your white balance. Instead of using the color wheel, which is very hit or miss, use the RGB numerical inputs along with your scopes and the image to align yourself properly into color balance.

Note that the RGB inputs will affect the overall brightness of the light source (hence the color shift on brightening.) So it is possible you will end up slightly lowering the overall brightness, but this is why we start as high as we can, so we drop as little as needed.

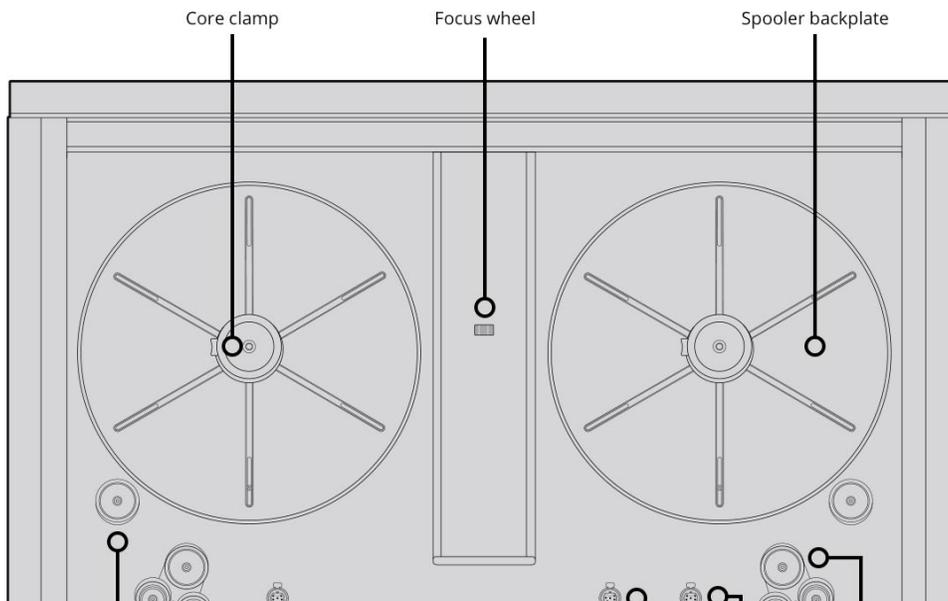
3. Continue to watch the scopes as you scan, if you notice peaking (on whites that aren't already blown on the film), stop, adjust the RGB, rewind to the beginning of the shot and rescan.



Lastly we have to focus the scanner. This is the last necessary step before scanning, above you will see the Focus Assist option. This is useful to turn on as it will create a green border around anything the software deems in focus.

Like with light source control, you want to stop on a suitable frame in your print. In this case something you know isn't purposefully out of focus. A piece of sharp text in a title can be a good example.

Turn on Focus assist and open the doors of the Scanner.



You will want to use the Focus wheel and look at the preview screen next to the Cintel to make sure the print is properly in focus. It can be useful once you have gotten reasonably in focus, to turn off the focus assist and make small adjustments by eye, if of course you deem your eyesight sharp enough. Also the focus assist can sometimes be more exact on the preview window in Resolve, so check back and forth.

Now that your film is completely loaded and you have filled all the relevant settings on the machine you are ready to scan. Luckily the process is a lot simpler from this point forward, we just have to set up the right timecode start and scan start points.

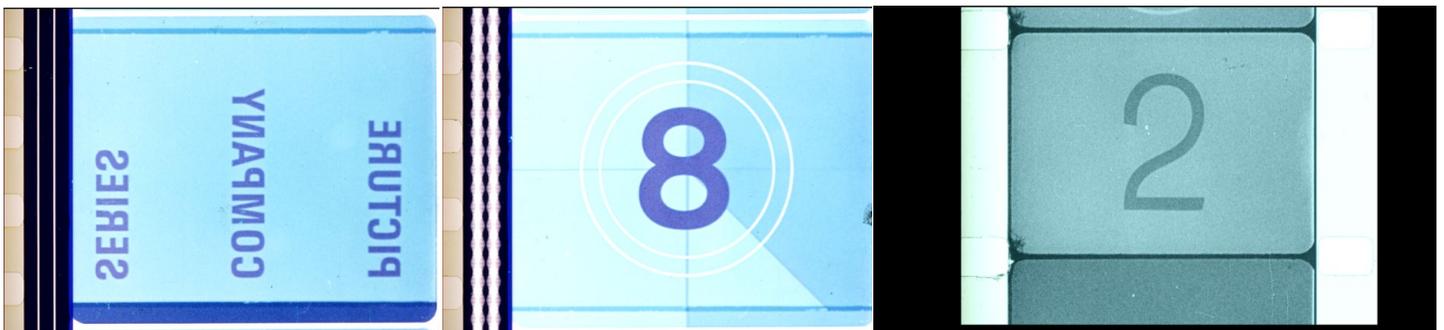
B: Setting the right start point and timecode

Before we send the scan command, we want to make sure that our playhead is where we want to start our scan and that our timecode is properly set.

For those users who are unfamiliar, timecode is the actual runtime encoded into the file which is legible by professional software. As opposed to a self generated runtime, the timecode can be set to a specific point. We're going to use this in order to make post-production or archiving of the print easier.

This is going to vary depending on the material we are scanning, if we are scanning raw archival material (i.e. unedited shots) then our scanning start point and our timecode start point will be the same. If we are scanning an edited piece of material we will set the timecode start to one point and then start the scan at another earlier point. We'll go over how to set these points separately as you can easily extrapolate how to do them at the same frame otherwise.

1. Find the Countdown



Almost all distribution reels will have academy leader on the front of them (lab identifications and an 8 second countdown.) So we're going to want to search for that. If you followed the previous steps, you should be somewhere passed the countdown (given that you had to find an image to check focus and calibrate the colour of the scanner on.) So use the fast rewind (or if you are not passed the countdown the fast forward) to get to the countdown and then stop as close as you can to the "2".



If you are working with raw stock get as close to the first image useable image as possible. By useable, I mean the first full frame where a splice is not seen at the top of the image preview image in Resolve or the Cintel's preview screen. Splices can be problematic for jitter, especially for a scanning start point.

2. Frame by Frame Search for the “2”



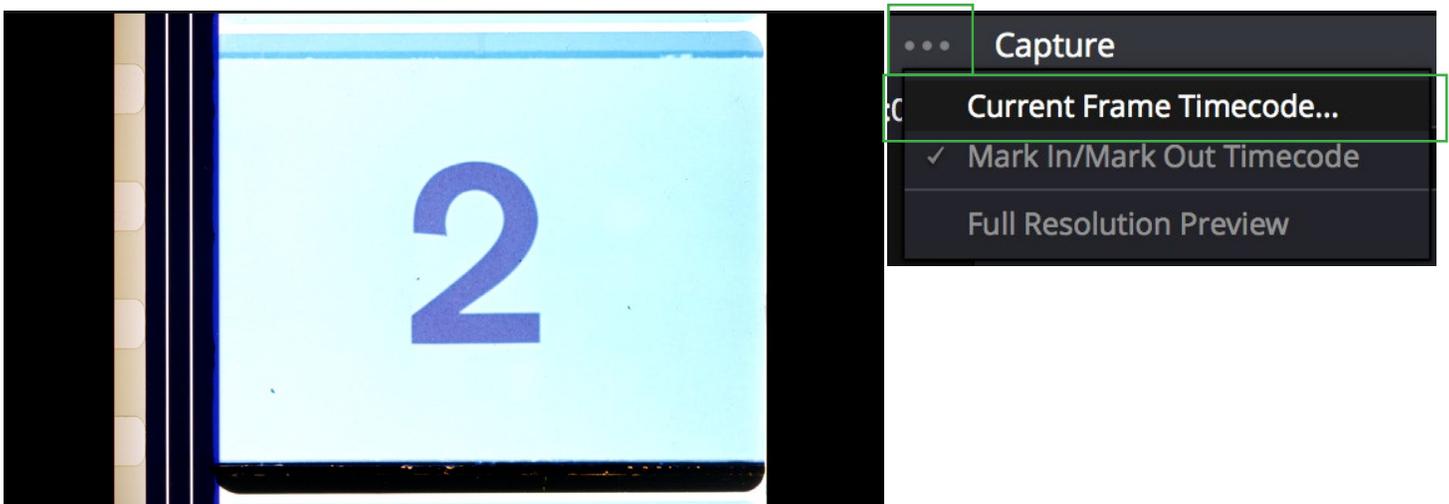
So use the frame by frame controls to land straight on the “2”. It may take a number of clicks, but it is the most effective way of cue-ing up the film, as there will always be a delay to slow down the film when playing back.



Now you will want to land straight on the “2”. This frame is also referred to as the 2 beep. It is commonly used to synch footage to sound. If you have optical sound, this will already have been done during the printing process, but with a mag or dual system, this synch point will be extremely important. Even with automatically synced prints produced generated by Resolve, this synch point is important in case anywhere down the post-production line the audio synch is lost and re-synching is necessary.

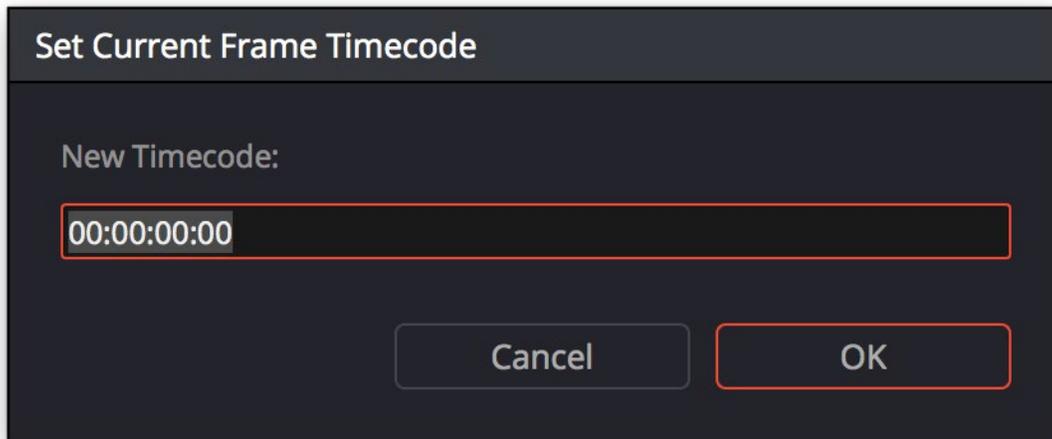
If you are working with raw stock, use the frame by frame controls to land exactly on the first “useable frame” after the leader splice. (Usually splices aren’t perfect, as such they may cause a misalignment for a few frames after they pass. So move a few frames passed it until you see the frame aligned properly in the center of the frame.)

3. Mark this frame as your “Timecode Start”



Now that we are on the proper frame go to the “...” menu over the preview window.

On the dropdown window select “Current Frame Timecode”.



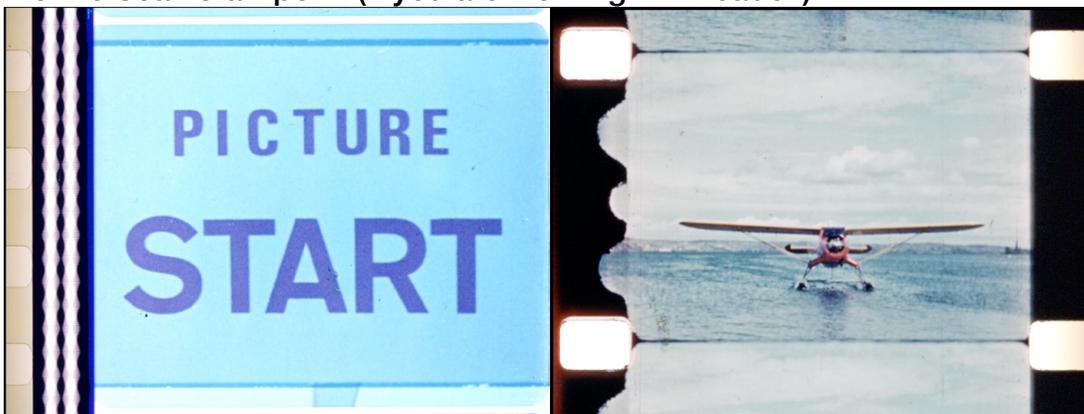
This will open a “Set Current Frame Timecode” pop-up. This will most likely be a random timecode, based on where the film was in the scanner when you loaded it. You’ll want to change this to some variation of 0#:00:00:00.

With timecode there is a sort of standard organisational method. The usual method is to organize it by Roll or Reel. So if you are scanning a source that only has one roll or reel mark this start frame 01:00:00:00, this would tell someone unassociated with you “start of roll 1 of a 1 roll project.”

If you are scanning something with multiple rolls and reels, change the hour number to reflect the roll or reel. I.e. Reel 1 mark “01:00:00:00”, Reel 2 mark “02:00:00:00”, Reel 3 mark “03:00:00:00”, etc. This way someone down the line looking at your footage will understand the order of your scans. This also keeps your editing software from identifying timing conflicts if you are editing the footage.

Click "ok".

4. Play back to the Scan start point (if you are working with leader.)

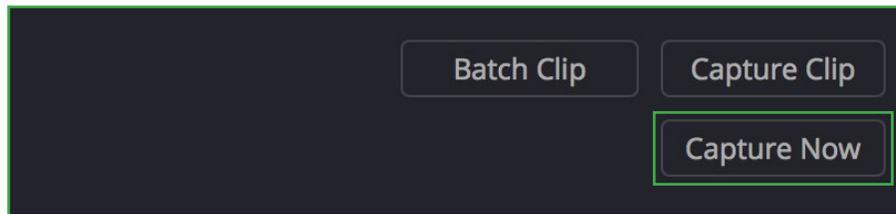


If you are scanning something with academic leader, roll it back to the beginning of the countdown. If you are scanning raw stock and are at the useable frame one, stay on this frame. Rolling back to the “8” in the countdown, will preserve the actual audio of the “2” beep for synch checking, as optical sound is written on the film slightly before the image.

C: Starting the Scan

Make sure the doors of the Cintel are shut, make sure the blackout curtains are closed on the side near the Cintel if it is night or completely closed if it is day, turn the overhead lights to the low setting. (Use the left most light switch on the wall opposite the Cintel.) The doors should block any of the remaining light, but it is better to be careful than to be sorry.

This will run at 18fps (unless otherwise set to a lower fps), so if you know the length of your footage estimate how long it will take to run through the machine (accounting for playback speed) and start a timer when you press capture now. (@ 18fps = Total runtime x 1.33)



Now click "Capture Now".

The scanner will start running and scanning the film, you'll be able to watch the scan on the reference monitor next to the scanner or on the preview in Resolve.

Until the film is near it's end, when you will have to manually stop it, this process is automatic and will run on it's own. It is still suggested to stay by the scanner, especially if your film contains a large amount of splices, to be there to troubleshoot any problems that may arise.*

*Note: If a splice pops in the machine, it will recognize that it has unloaded and should automatically stop driving the film. However there is always the possibility that some other error may also occur.

D: Stopping the scan



When your scan is nearing its end, you want to stop it manually before it comes unloaded from the feed reel. If you do not know the length of your material, on most distribution reels you'll have a synch/reel change mark that you can watch out for, this will be a mark on the emulsion of the film itself.



Watch the preview to know when to be at the ready. (Marks as seen above.) If not, watch out for the image going to black leader or academy leader and stop it as soon as possible once it reaches it.

If your reel is of an unknown length or does not have these marks you can check how much film is left on the reel periodically. The following is a method to do this, but note that you must be VERY careful when using lights near the scanner like in this method.

Take the flashlight on your phone and cup the edge of your phone with your hand in an L shape. (This is so you can block off any light spilling down or to the right, i.e. in the direction of the scanning plane.) Bring the flashlight up to where the feed reel is (in the top left of the cabinet) and inspect how much film is left on the reel. If the reel is getting thin, make sure to be ready at the computer controls.

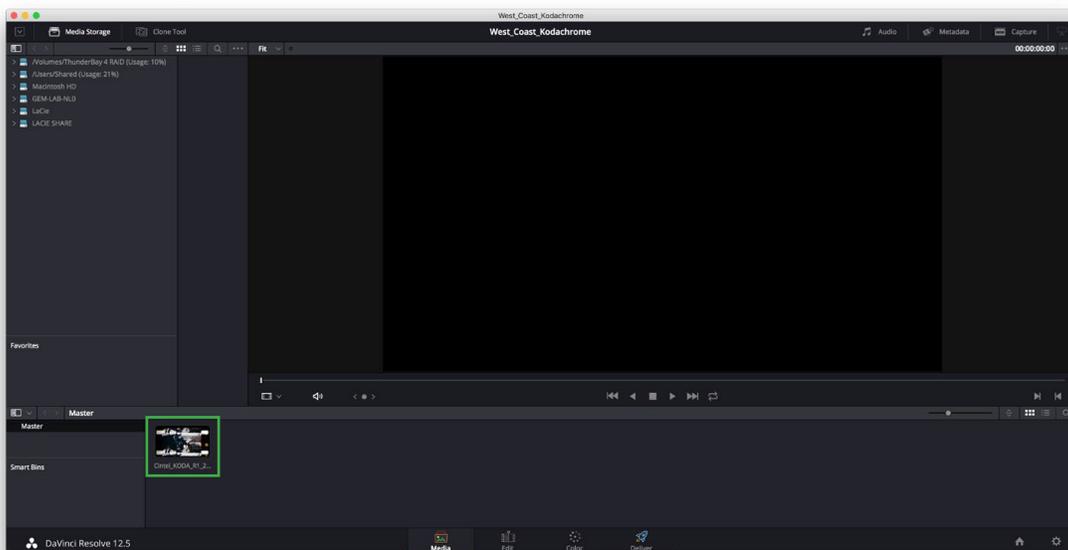


To stop the scan you will hit the stop button in the middle of the preview window. Once you press this the scanner will stop within about 5 frames. Again make sure that you do this before the film unloads.

IF THE FILM UNLOADS, firstly, your scan files will be fine. The machine will save every frame up to the last frame that cleared the scanning plane while the scanner was still in a “loaded” state. You should see an error message on the computer and the sprockets should stop. (It is still worth it to hit the stop button just in case.)

You will have to ease the film backwards and relace it to the feed side and use the load button to re-load the scanner. Immediately remove any tape on the end of the film on the feed side. **IF ANY TAPE HAS PASSED THE ORANGE ROLLERS**, you will have to check that(/those) roller(s) to make sure there is no tape residue on it. If there is, you must immediately go and clean that roller, making sure to remove all of this residue and wait for it to dry to replace it in the machine. Then you will be able to re-load the film as you did at the beginning of the scanning process and then you can reverse the film.

E: Rewinding your footage



So now that the scan is complete, you will see a file in the “Media pool” area below your preview screen which was previously vacant.

The first thing you will want to do is rewind your film through the Cintel back to the reel on the feed side. Use the rewind button rather than the play in reverse button to do this. It will be easier to manage the rewinding process than the play process, as we can watch the timecode count back to 01:00:00:00.

F: Checking your scan for abnormalities and unloading

Unfortunately there are a couple circumstances where you can run into issues with your scan after it has been run. For this reason it is suggested you check the file in Resolve before you finish unloading the machine. You will want to do the checks for Issue 1 and Issue 5 (if you have audio.)

Issue 1: Scan files won't play back

Occasionally you will have a scan that won't play back, or will only play back for the first few seconds in the preview in Resolve. For this reason you should spot check the scan, you will have to close the capture palette to be able to do this by clicking the capture button in the top left again.

Play 15-30 seconds from the beginning of the scan and check that it is playing properly. Scrub to 3 or 4 more points in the scan and watch 15-30 seconds to spot check. If you don't notice any abnormalities, your scan is cleared. If you do, check the following two issues.

Issue 2: Consistent Frame Skips - <24fps Scan Errors

This error manifests as what looks like the playback of the film "dropping" or "skipping" frames at a predictable consistent rate. You should not be experiencing lag when playing back material from the RAID at any point, however an easy way to verify that this is not a hardware issue is to go past one of these skips frame by frame (using the arrow keys) and verify that the skip still occurs. If it does, you will most likely have to run the film again.

This error is unfortunately associated with silent films or animations that run under 24fps during play back. Many silent films were shot and projected below 24fps, typically at 18 or 16fps. There has been an issue run into in the past, where if you set the playback speed to below 24fps in the metadata section (not scanning speed that the film was run at) before you scan this can result in this skip issue. As of yet the cause is unknown, this is why it is suggested you scan this type of material with the metadata set to 24fps and adjust it in post. This will be elaborated on in the post-scan section.

Issue 3: "Scan Split"

If your file would not play back properly, it may be due to a timecode issue. If you leave your time code at 00:00:00:00 when you scan, rather than 01:00:00:00 it is possible the scan files may develop a "scan split" issue.

Frames scanned before (or sometimes just after) the 00:00:00:00 point will have a timecode of 99:99:99:???. This causes issues with Resolve reading the frames and identifying them as the same clip.

There is a simple solution to try. Double click the media pool area in Resolve, go to the scan folder of your scan, "select all" to get all the frames and re-import your scan. You will know that you have scan split if you now see this duplicate of the scan appear in the media pool as 2 or more clips instead of 1.

Do a playback spot check on the split portions of this re-import. If it plays back properly and there is no audio to be extracted, your scan is fine and you can just continue on.

If your source does have optical audio, you will want to verify that you don't experience an audio extraction issue on either section of the scan, continue on to Issue 5.

Issue 4: Blank Audio

If you have optical audio to extract from the scan you will want to check this and the following issue.

First, check that the file doesn't yet have a musical note icon on it (which if you did tick audio in the metadata section earlier, as you were told not to, it may have.) This can cause a problem, as the scanner will have assumed you had an external audio device (or add on) feeding audio during the scan process, as a result, it will have a blank audio track. This will require a work around in order to fix.

You will want to go into the folder for the scan files and delete the audio file you find there and then re-import the scan into Resolve. Do this by double clicking the media pool area, navigating to the scan folder and using select all to select all the image files, then clicking ok. You should now see a duplicate of your scan in the media pool, without the audio icon. It is best to follow check for issue 5 following this.

Issue 5: Audio won't process

If you had any of the above issues and/or want to be very thorough, you can make sure you don't run into an audio extraction error. You will want to read the audio extraction section (following this) to get your settings correct, and whether you want to process audio now or later, you can start the audio extraction process and let it process 1% of the audio.

If the progress bar pops up and processes to 1% you can cancel it and you will be fine to finish processing your audio later.

If however you get an error pop-up saying it cannot process audio, as unfortunate as it is, the simplest solution is to run your scan again. Sometimes this can be due to a split error (above) or can be an error to itself.

Finish with Unloading:

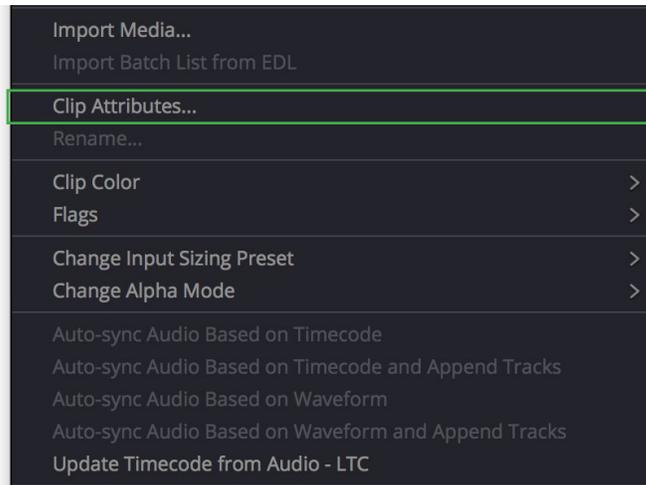
If like most scans, yours passed the checks written about above then you are good to go when it comes to unloading the machine.

Open the Cintel doors and hit the "load" button again. The tension will release, you will see "unloaded" on the computer display. You can now remove the tape from the end of your film on the take-up side and ease it back through the winding path to the feed side. Remove the spindle lock and your reel from the machine and you can tape your leader back down to the reel if you didn't unload it.

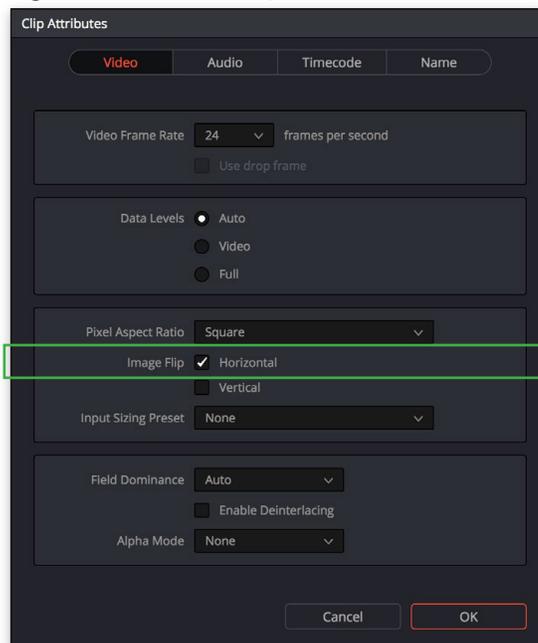
If you had to rotate your film onto one of the suggested reels from the lab, you will have to do this process in reverse using the rewind to get it back onto its original reel. Before you do so, consider the next steps.

F: Dealing with "Image Flop" (or "Mirroring")

If you scanned a negative, or if you loaded your film in reverse, your image may be flopped. (i.e. it looks as though it is being seen through a mirror, a vertical axis flip.)



This is done through right clicking on the scan in question and selecting "clip attributes".



This will bring up a clip attribute window, there is a checkbox here for horizontal flip. Check the relevant box and your clip will be automatically corrected in the media pool, this does not take any processing time. This is important so that your audio track (if present) is in the correct place to be interpreted for Audio Extraction.

G: Audio Extraction

If your reel had optical audio on it, you can now progress to audio extraction while you put away your film and maintain the scanner. This is suggested if you are scanning multiple small to medium reels (400-600ft.)

The conversion will usually take around the runtime of the clip to process.

The cleanup process after a scan will most likely take at least 5-10 minutes, so it is up to you whether you think it is better to spend the time now, or to tack it on to the end of your scan. (Resolve will not be controllable during the time it is converting, so you will have to wait for it to finish before using Resolve again.)

Before you start the conversion you will have to assure that it is set to the correct type of optical audio.



Standard Optical Audio:

Regular optical audio looks like what you see to the left, which is similar in appearance to an audio waveform that you may be familiar with from NLEs (or Video Editing Programs.)

In the example on the right, the print contained a damaged audio track, possibly the result of a printing error/light leak. In this case, the extractor was able to recover the track on the right without distortion and interpret it as a mono track despite the loss of the data from the left channel.

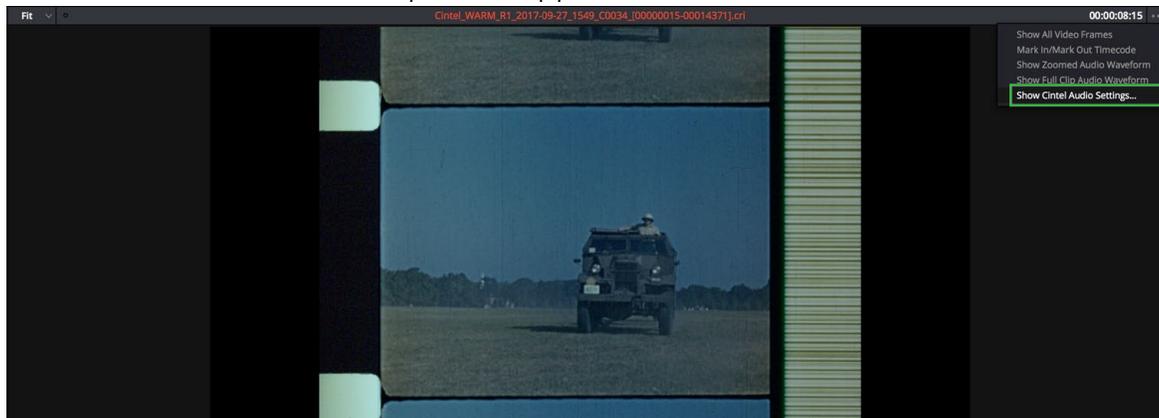
So it does have some latitude if there is some damage to the tracks from wear or misprinting.

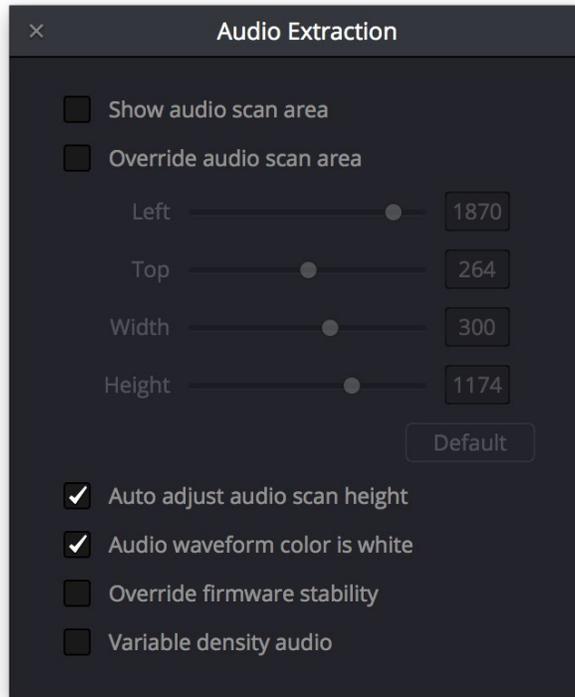


Variable Density Optical Audio:

As you can see, this type of audio represents as varying black, grey and white horizontal lines.

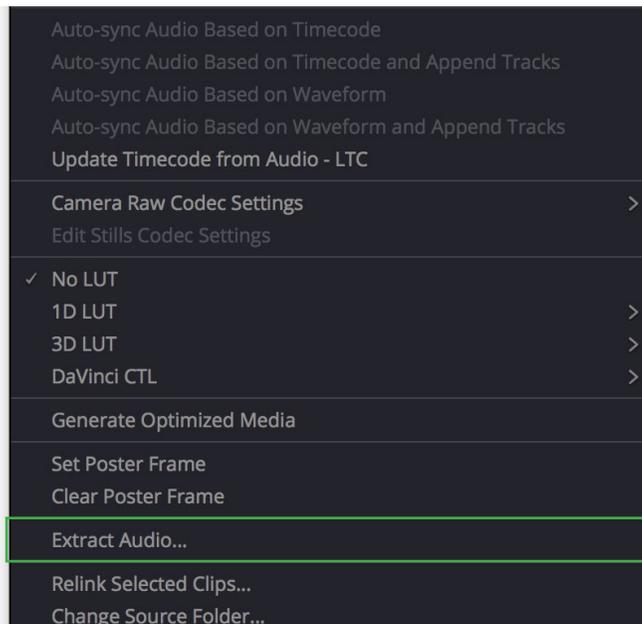
So go to the menu "Show Cintel Audio Settings". Note, that you must have the capture panel closed in order for this option to appear.





This will pop up a dialogue of preferences for the audio extractor. Most of them are to manually align the scanning area, I would leave these unless you find the automatic extraction does not provide satisfactory results.

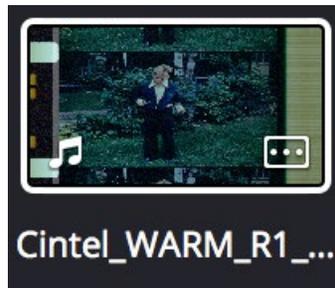
But you must make sure you check the "Variable Density Audio" checkbox if your audio is Variable Density or make sure that it isn't checked if not. This may carry over from the last project to extract audio, so I suggest you check regardless.



To initiate the conversion, right click on your clip in the media pool.

Choose the "Extract Audio Option".

This will pop-up a progress bar, when it is done, the clip in the media pool will have a waveform icon in the bottom right. In the same folder as the scanned frames a 191kbps Broadcast WAV audio file will now be present. Resolve will always recognize the audio and synch it automatically based on the time code.



Your clip will, when complete, a small music note symbol to denote that it is a clip with sound.

H: Post Scan Cleanup

After each reel you scan you **HAVE** to clean the transfer rollers (orange rollers), you should check the other rollers and gate for residue transfer and you can also clean the rest of the cabinet before the next reel but it isn't mandatory. It is however mandatory for you to clean the cabinet when you are completed with your scan in its totality. Ideally you want to do the cabinet and metal roller cleaning before the orange rollers are removed or before they are replaced clean in the machine.

1. Checking the rollers and gate for residue:

Depending on the print, you may have some transfer of adhesive or grime from the sprocket areas onto the metal rollers and/or skid plate. (Common with worn distribution prints.) You'll see this as a yellow/brown adhesive looking residue. To clean this, grab an edge of the Swiffer cloth you have been using when dusting the cabinet and rub off the grime, it should come off easily. This will help the future reels continue to run smoothly.

Cleaning the cabinet should then be done before the rollers, and is done as before. Use the air bulb to dust the upper part of the cabinet and then dust the bottom of the cabinet with a Swiffer to collect the dust.

2. Cleaning the orange transfer rollers:

1. Remove the rubber "o-rings" from the edge of the orange roller spindles. Place these on the side, on top of the Gate kit box.

2. You will see that the transfer rollers have now collected dust and dirt from the reel that just ran through the machine, so it is ok to touch the surface of them. With clean dry hands pull them off their spindles, there will be a click as they are removed and it will take a little bit of force. Place them on their sides so they don't roll away.

3. Close the cabinet.

4. Take the rollers and a piece of paper towel and proceed to the kitchen in the shared space. (I suggest wearing the rollers like rings on one hand to avoid contacting the surface of them, this is the better way to hold them after cleaning as well.)

5. In the kitchen, lay out the rollers on their sides on the paper towel square.

6. Turn the water on, it doesn't have to be very hard and it should be luke warm at most.
7. For each roller, pick it up and put a single small drop of dish detergent on the roller (any dish detergent is ok) and rub it clean with your fingers. Rinse it under the running water, rubbing away any last of the dust or dirt with your fingers. Now shake off as much of the excess water as possible. Put it back on it's side on the paper towel, repeat until all are done.
8. Pick up the rollers, careful not to press them against the paper towel and pick up fibres, pick up the paper towel and proceed back to the lab.
9. Put everything back down and wait for the rollers to air dry. They cannot be dried any other way and they must be dry before being placed back in the machine.
10. When dry, pick up the rollers (again like a ring on your finger to not contact the surface) guide them onto the end of the spindle in the machine and press them on from the side. Replace the "o-ring" on the end of the spindle. Repeat until done.

SECTION 4: POST SCAN

A: Working with your Scan in Resolve

- Preface 0: Putting your scan on a timeline
- Preface 1: Splicing Multi Reel or Multi File Scans
- Preface 3: Working with Raw footage and Amateur Film Scans
(Or preparing to color correct in Resolve.)

B: Suggested Mastering Workflow

- Different Master Settings
- Cropping

A: Working with your Scan in Resolve

So now that you have your scan is complete you have to decide on what your planned post-production route is. The suggested workflows at the lab includes dubbing out your files to a high quality ProRes file for application cross compatibility. It is then up to you whether you keep the original RAW files or whether you work from the master on it's own, this will largely be a decision of whether you plan to work in Davinci Resolve from this point forward.

It is highly suggested you do any dubbing (and thus most any of these steps) at the end of your session before you offload your footage from the RAID, as the speed afforded by the RAID can be the difference between 5-10 minutes of rendering time and 2+ hours of rendering time.

But why do I need to do any of this? The answer is that your scan is in a very particular high quality and exotic RAW format. This format is designed to retain the maximum detail from your scan, giving you the widest set of possibilities in terms of recovering detail in your print. However, 99% of video applications will not be able to understand these files. So in order to be able to watch your scan without loading it into Resolve, or edit/color it without the use of Resolve, it is suggested you follow this route.

If you know Resolve and want to do all of your color correction before dubbing your footage out to ProRes at a later date, you can do this. It is important to remember the deletion policy on the RAID, so if you plan on taking this route you will likely need to have a very fast hard drive to work off of, ideally Solid State (SSD) or RAID (multiple traditional hard drives) based.

In the following Prefaces I will discuss how to prepare your scan for different types of outputs and the next section will deal with the approaches associated with the different final formats you may choose to use.

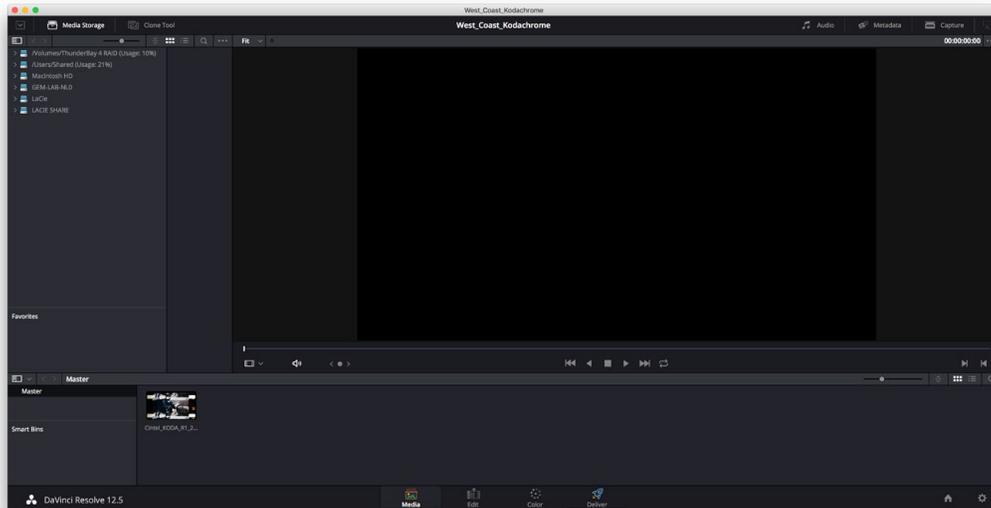
What type of footage do you have? So one thing that this guide is mostly predicated upon is the concept that you are archiving an existing film's print. That is to say an already edited and most likely graded print, where the entirety of the print is supposed to be seen from front to end.

If this is the case, read Preface 0 and/or Preface 1 as they apply.

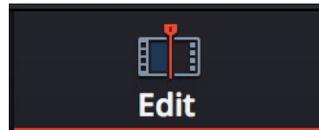
If you are scanning raw footage, or an amateur film of some kind, or intend to color correct in Resolve, please read Preface 3 first and then Preface 0 and 1 as they apply.

PREFACE 0 : Putting your Scan onto a Timeline

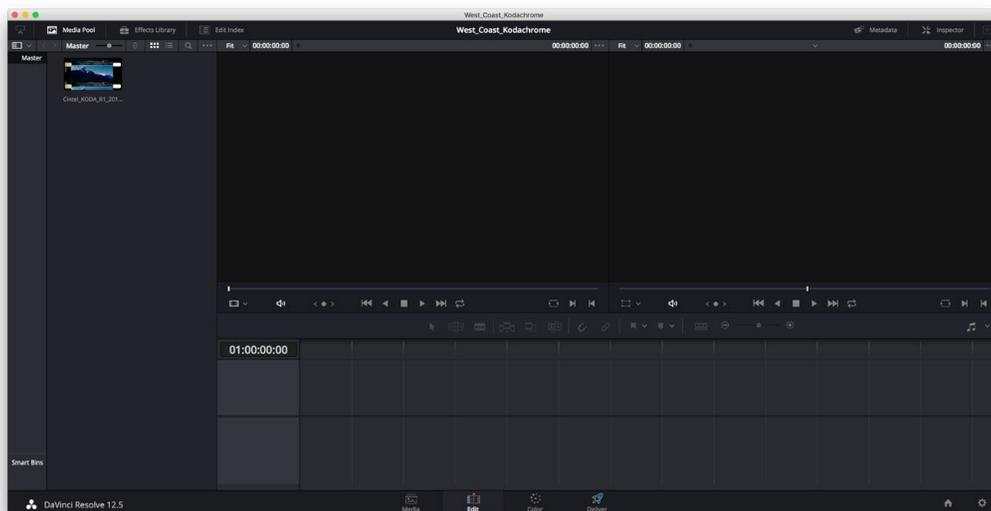
Once your scan is complete, in order to do anything with your scan in DaVinci Resolve you will need to put your scanned footage on a timeline. This entry is going to be assuming that you have a single scan file to work with, but the following entry will address the additional steps to do with how to continue with multi-reel scans.



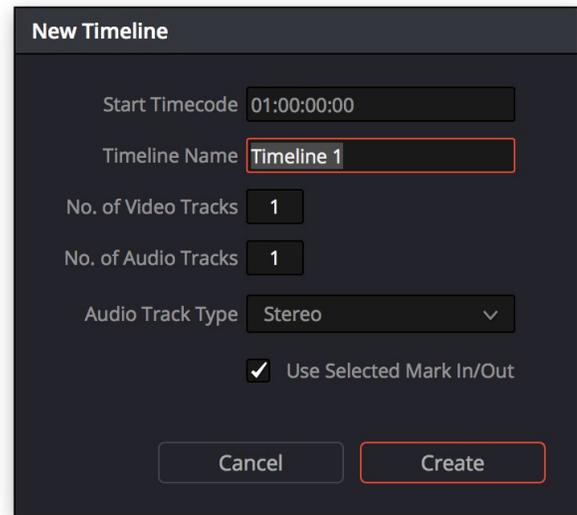
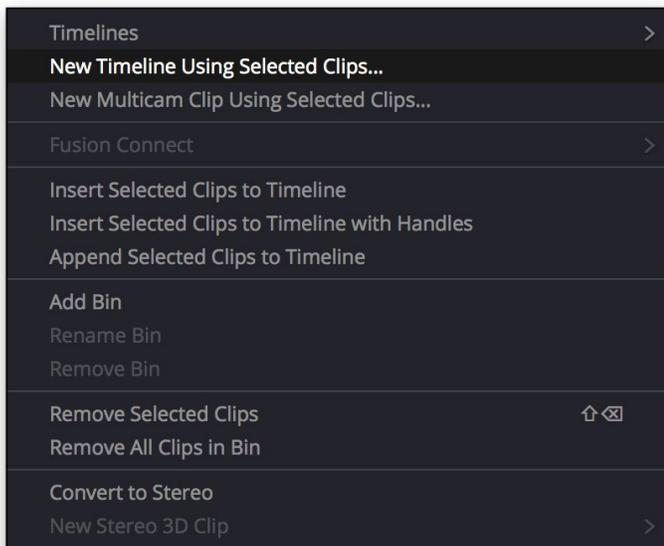
Having completed your scan, your Resolve project should resemble one of the above depending on whether it was a single or multiple reel scan, which is in the Media Workspace.



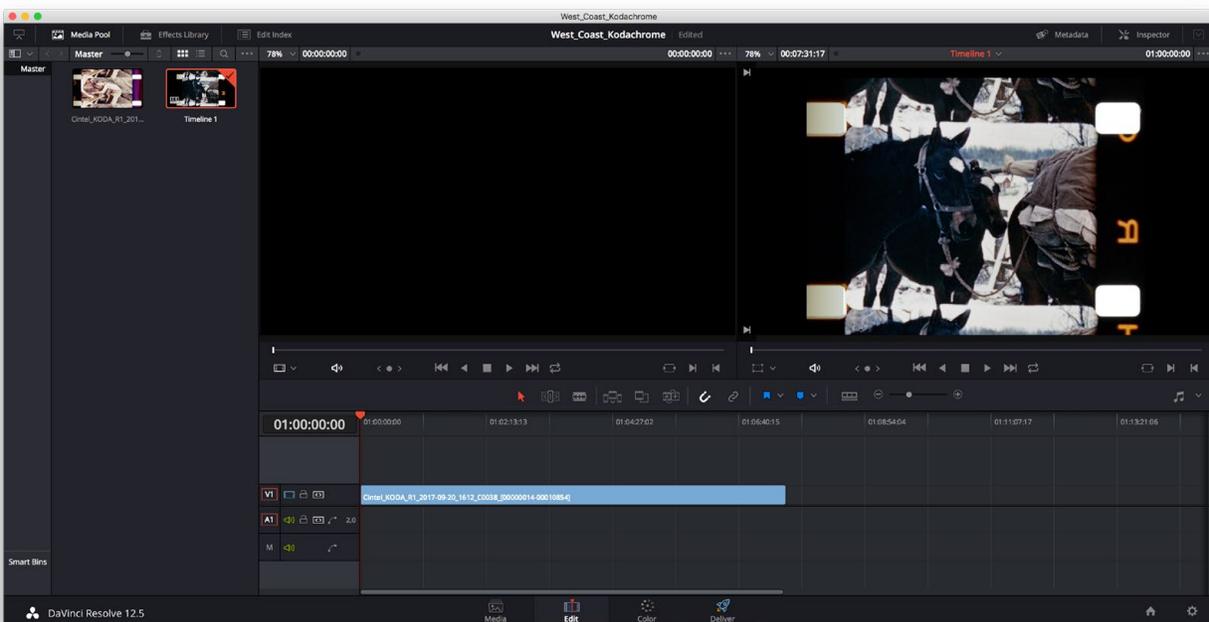
Using the workspace buttons at the bottom of the screen select the edit workspace.



Your window should now look like the example above, with your scan in the Master Pool on the left side of the screen. Right click your clip and select "New timeline using selected clips..."



This will open a Dialogue box prompting you to set certain values for your scan. In general you should most likely only have to change the name of your scan here, since you are creating it from a clip in your scan the rest should be auto-set.



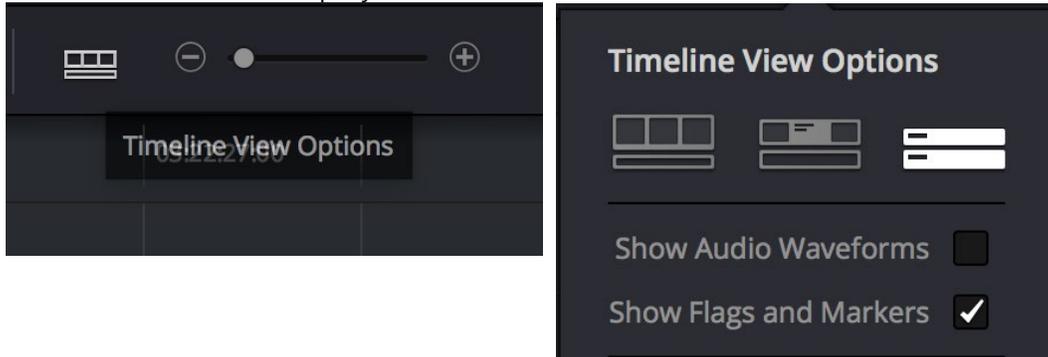
Now you will have a timeline in the bottom right of your project window with your selected clip on it, like in the example above. (If you converted audio from your clip, you should see a green bar in the audio field of your timeline.)

If you followed the instructions on how to line up the start of your scan, the beginning of your scan should be correctly placed at the beginning of the timeline, but you can trim away any extra frames of the end of your scan if desired. The timeline functions similarly enough to most NLEs (Premiere, Media Composer, FCP7, etc.) that it should be a simple enough task.

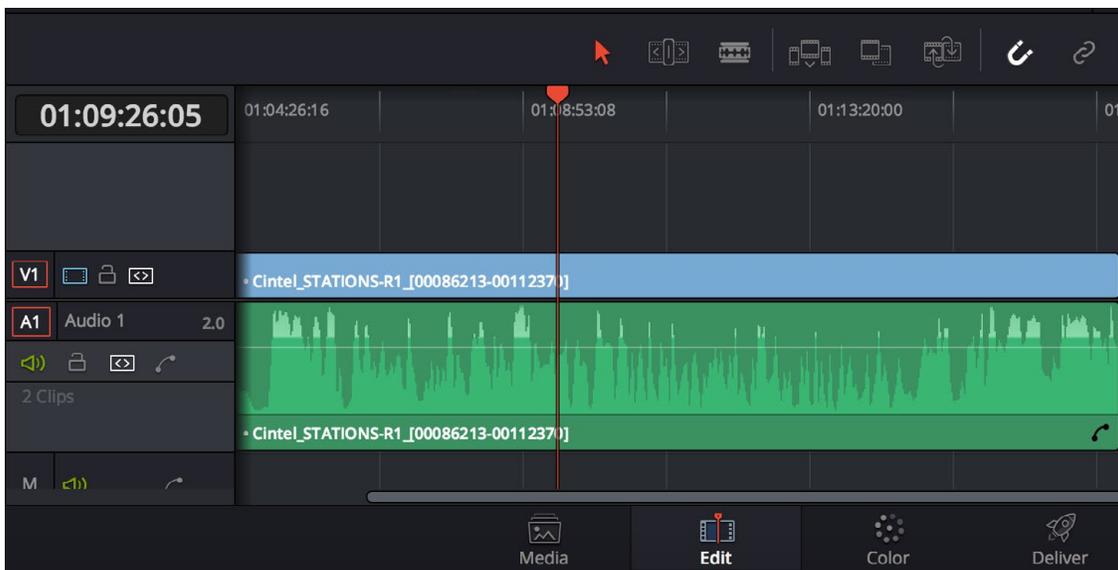
PREFACE 1 : Splicing Multi-Reel Scans

This is a step that might be part of any of the following post-production routes, assuming you of course have a multi-reel scan instead of a single reel scan. This diverges from the PREFACE 1 steps after you create a timeline from the first reel.

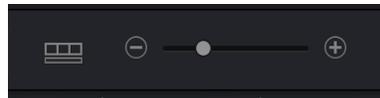
So you have your first reel loaded into the timeline, like in the last image. The first thing you will want to do is make sure audio waveform display is activated.



Click the "Timeline View Options" button on the timeline and check the "Show Audio Waveforms" box.

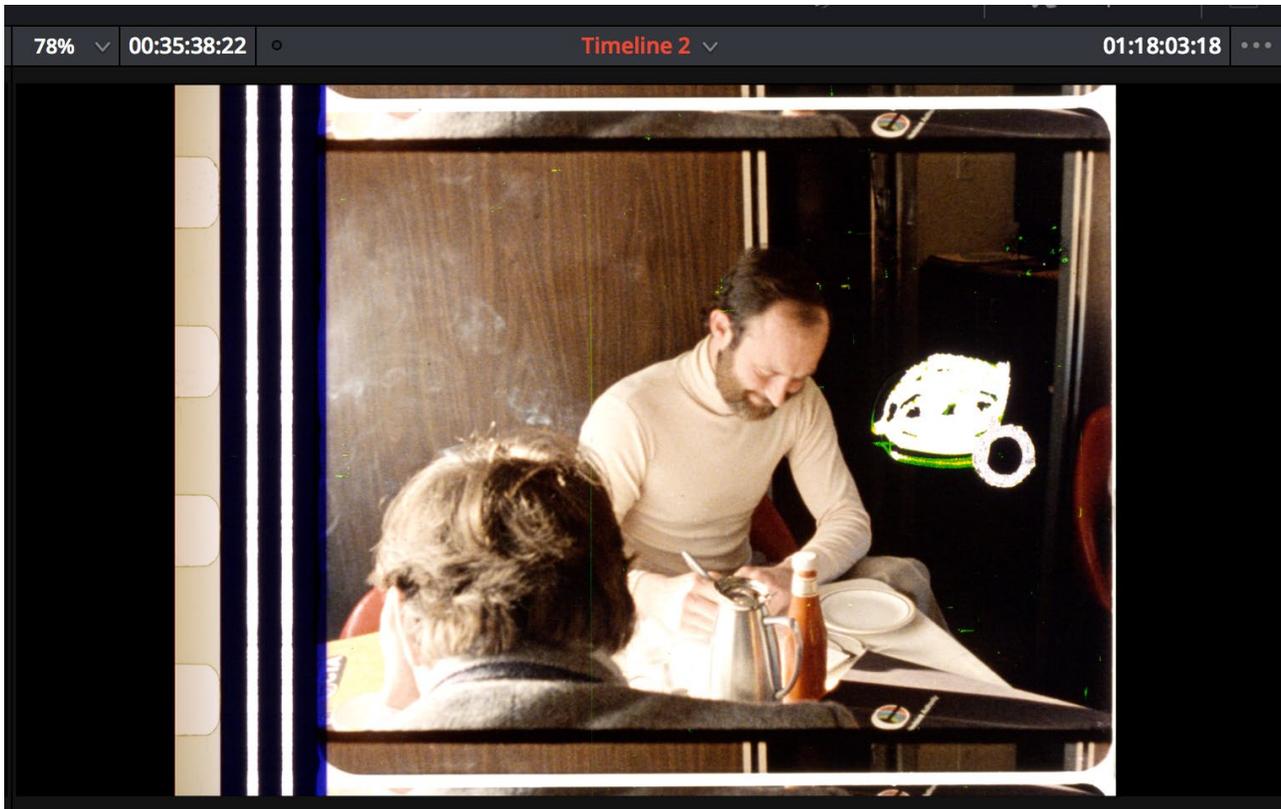


Now inside the green audio fields you should see the waveform displayed, this will be important for linking the reels properly.



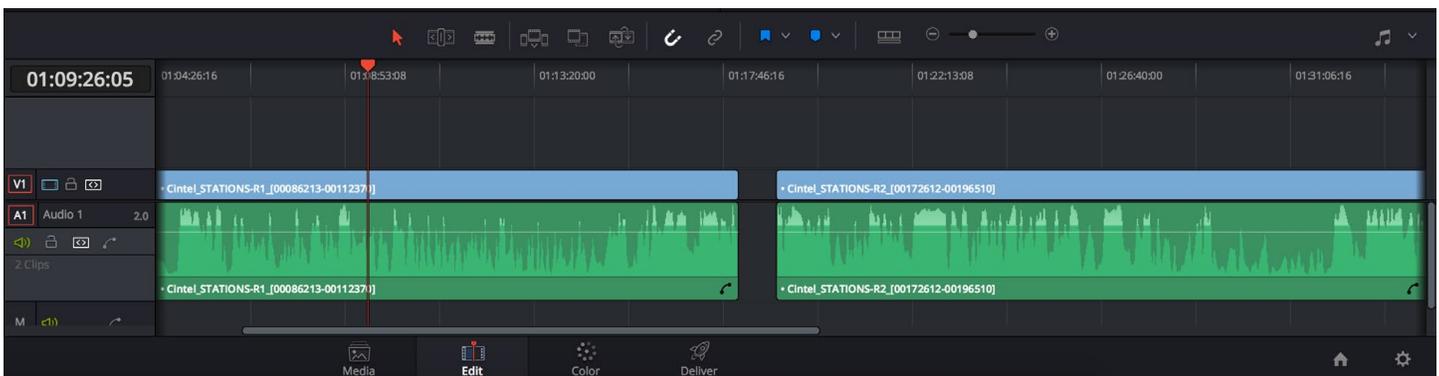
Now scrub through the end of your first reel, you may want to zoom in on the timeline using the (+) and (-) buttons on the timeline panel, and look for a "reel switch mark". This is a mark that is made on a frame of the film so the projectionist would know when to transition from one reel to another seamlessly.

Typically, since this aspect of projections wasn't automated, there is some leeway on the end of the reel after this mark to afford the projectionist time to switch the reels.



This mark should look something like above. The most common element is the scratched circle you see there, the example print here is a well worn independent film print so it also has the additional scratching to really make the mark obvious, but this extra scratching will not always be present on every print.

Depending on personal preference, you can trim the end of this reel to this frame or a few frames later (to really show the remnants of the analog process by keeping the circle mark) or to the frame before this one (to make the resulting digitization more seamless.) You should make sure to cut it before any audio drop out occurs as is common after the synch point.



Now drag your second reel of material onto the timeline. Scrub through it and find the first frame of the program with sound after the leader. If the sound is non contiguous (i.e. it doesn't contain continuous sounds that will cause a noticeable "jump" when cut) then just drag the beginning of this clip to the end of the trimmed first clip. If the sound is contiguous, then the end point of the first clip and start point of the second will require more finessing. The waveforms should help you determine where to put these cuts as in a case like this, they should be visibly similar if not identical.

Repeat this process of splicing the film back together until you have reached the last reel of the program.

On the last reel, you should keep any academy leader appended to the end of the film for the synch marks. (I will instruct you how to cut these out for a web dub if you so desire.)

Your print is now ready to follow the rest of the workflow as you like.

PREFACE 3: Working with Raw footage and Amateur Film Scans (Or preparing to color correct in Resolve.)

This preface can prepare you if you are intending to work with the files within Resolve itself, want to fix stabilization to export a cropped version of your scan or want the option of pre-seperating the shots you scanned.

This will be using the tool known as "Scene Cut Detection", which is a semi automated tool which will make seperating all of the shots in your scan simple (though it will still be time consuming).

Set-up

Navigate to the **Media Workspace** if you are not already there. (Panel select in bottom mid of program window.)

Go to the topbar and click **File > Project Settings...**

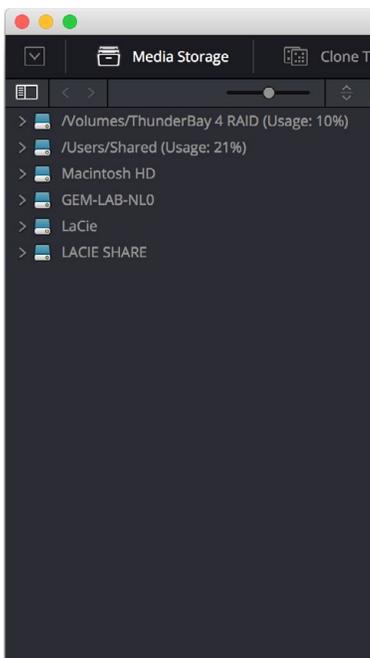
Inside the window that will open you want to go to **Image Scaling** (Left side tab)

Scroll down in that tab to **Input Scaling Preset** (Header).

Change the value in the drop down to **Scale Full Frame with Crop**.

Segmenting your Scan

First go to the media pool where your scans appear in Resolve. Right click an empty space in the window and select "Add a bin". Place all of your scans up to this point in this bin. This will save you from later confusion.



You cannot actually access the feature we are going to use from the media pool where you are used to opening your scan files, you will have to locate them on the RAID hard drive in the Media storage section of the program.

Navigate to the Media Storage Section (Top Left)

- **Navigate to where your scan file is located** on the ThunderBay 4 Raid.
- **Right Click** the Scan File and select **Scene Cut Detection**.
- This will open the **Scene Cut Detection** tool. This tool will help you split the shots in the film.



Before we start, let me explain the tool window. It is composed of basically 4 parts.

- 3 Frame display (Top Section)
- Shot Cut Graphic Timeline (Bottom Left.)
- Shot Cut List with Timecodes (Bottom Right.)
- Tool Palette (Very Bottom Left.)

Your typical keyboard shortcuts for playback (space), frame forward and frame back (left and right arrow keys) will still work for scrubbing through footage.

1. Click **Auto Scene Detect** in the bottom right. The software will scan through the footage attempting to find cuts in your image. It will fill in the **Graphic Timeline** as it progresses creating spikes of different heights. **Each spike represents a possible cut**, the higher the spike, the more certain Resolve is of the cut.

However, **every cut is suspect**, as things like light leaks, development contrast shifts, etc. can be recognized as one or several cuts. So know that **you will have to manually go through each cut**, but this tool will make it much faster than dissecting it on the timeline.

2. Once the Timeline is populated, you will see a **horizontal purple line** appear and will notice some of the spikes are green while some are grey. The purple line, which can be dragged up and down, is how you control the "sensitivity" of the automatic cut detection. As this lowers more spikes will become green, and hence more cuts will appear in the **Shot Cut List** in the bottom right of the window. (If the list does not show up, click the scissor button in the middle control panel.)

3. You can start off at it's default height and then bring it down later, however It is suggested you bring this down relatively low with Cintel Footage, maybe to about 1/3rd above the bottom of the graph, as the partial frames seen on the top and bottom of the scan frame tend to confuse this part of the software if the incoming and outgoing shots aren't very dissimilar. This means you will end up with more of the actual cuts pre-determined, but also expect to have to delete more erroneous cuts along the way.

4. Now you will go through the cuts using the Scene list on the bottom right. This will allow you to quickly get rid of the cuts the software thought were there but weren't and keep the cuts that were correct.



5. The Previews up top will show:

- The frame before the cut
- The 1st frame after the cut
- The 2nd frame after the cut

So a correct cut has a different composition in the first image and the same composition in the second and third image.



6. If a cut is incorrect, use the **delete** button in the bottom left to get rid of it.

7. If a cut is close but off, use the arrow keys to play frame by frame to the proper place of the cut, and click **add** in the bottom right. Then frame by frame back to find the incorrect cut in the list and delete it.

8. Once you've gone through the automatic cuts, watch any long sections which are devoid of any cuts, the playback controls mirror those of the Cintel itself.

Add in any cuts the computer may have missed. (This interface makes this significantly easier than doing it later in the timeline with just the razor tool.)

10. When you are done click **Add Cuts to Media Pool**. This will add subdivided clips of each shot into your media pool (bottom of the media window.)

10. For organization sake, right click inside the media pool and click **Add Bin** to create a bin and put all these separated shots into it. (You can then rename the bin to the name of the clip it relates to.)

11. Go to the **Preferences** (NOT Project Preferences) menu in Resolve. Go to the **User** Submenu and then to the **Editing** section. There will be a **Standard Still Duration** option, change this to **1 frame**, if it is not already one frame. This will ensure that if you missed any 1 frame cuts in your cut separation that they will be loaded into your timeline as only 1 frame.

11. You can then **select all (command+a)** the clips you just created in this new folder and right click to create a new timeline from selected clips. You now have a timeline which is properly segmented for doing color correction work or exporting raw footage out of Resolve in a master format and as separate shots.

B: Suggested Workflow for a Full Master (i.e. out of Resolve)

This basic workflow is suggested if you don't want to continue working in resolve, or just want to master your project so it can be dealt with in any system at a later point.

The decision you will have to make is based on what kind of file you want to retain and the space considerations that go along with that.

The first step is to go to File > Project Settings...

The first tab on the page that opens should be "Master Project Settings", if not, navigate to that tab.

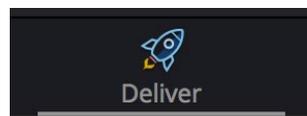
Look for the timeline resolution option, this is usually a drop down menu and will by default will be set to "1920x1080p HD" or maybe "3840x2160 4K". This is important because Resolve assigns all timeline settings and resolutions globally for a project from this drop down, meaning you can't manually change timeline by timeline, you HAVE to set it here and it will effect ALL your timelines.

Instead of the default, select "**Custom...**" this will open up two fields where you can manually input a resolution. **This is important as the scans themselves are not a standard frame size.** You can look up this frame size in the Media tab of Resolve, by looking at the resolution of the media in the browser, but I'll save you the trouble.

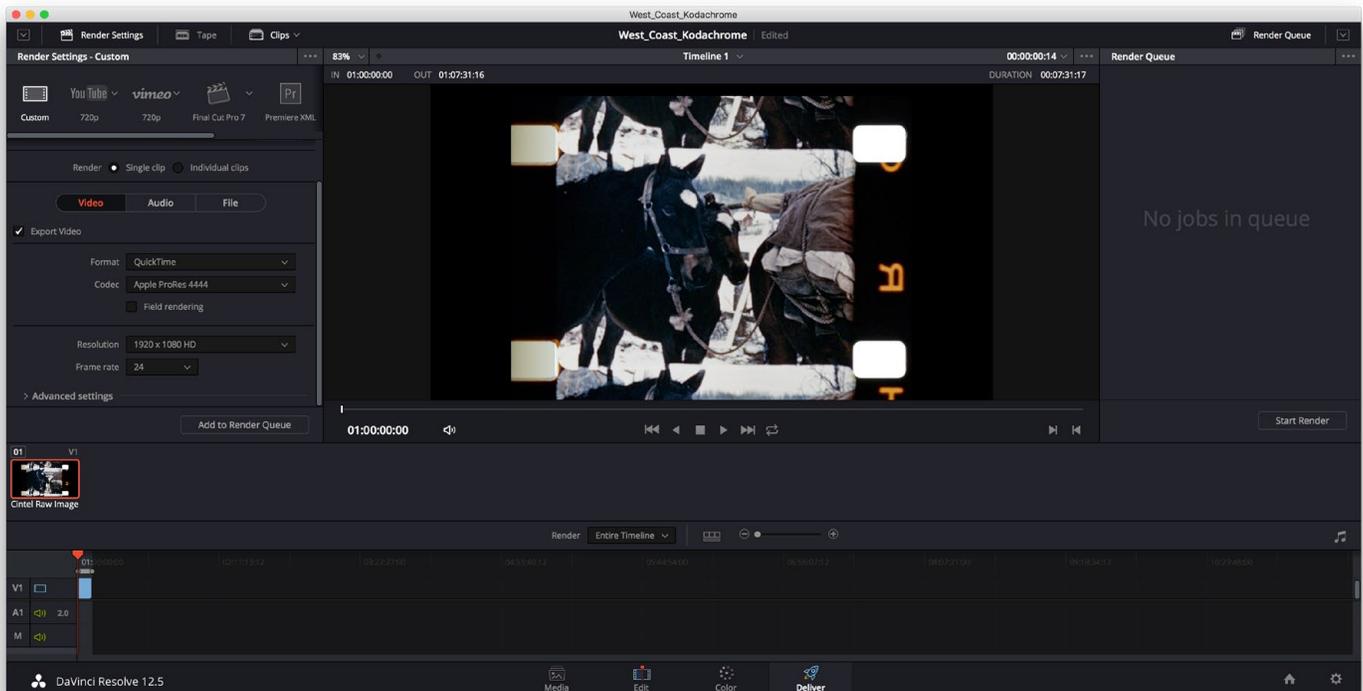
If you are dealing with a 35mm scan it is **4096x3072**.
If you are dealing with a 16mm scan it is **2160x1702**.

So put the relevant one of these values into the timeline resolution window. This means that your raw scan master will be identical, and not shrunked down, to it's original aspect ratio and resolution. You can now close this window and it will have retroactively changed all of the timelines you have already created to this resolution.

Having followed the steps in PREFACE 0, 1 (and/or 2 if applicable) you have have a timeline with all your relevant scan material created.



Now proceed to the Delivery workspace.



You will be greeted with this workspace which is centered around outputs, whatever timeline you had open in the EDIT workspace will be the active timeline here.

From here we can output your master, but we will have to choose what format we are going to master for, which depends on what you want to do with your film and how much space you have to store the master.

The suggested formats are: (From highest fidelity to lowest, and largest file size to smallest)

- DPX
- ProRes 4444 XQ
- ProRes 4444
- Prores 422 HQ

For reference:

- 1 frame of the uncropped **35mm** is 22.4mb, meaning at 24 fps the actual bit rate is **537mb/s**.
- 1 frame of the uncropped **16mm** is 6.6mb, meaning at 24fps the actual bit rate is **158mb/s**.

This file size is still actually somewhat compressed, using a very high quality proprietary compression algorithm.

Cropped Resolutions:

A 16mm/S16mm frame will give you a cropped output of approximately 1920x1080. You will have to use the inspector controls in the EDIT workspace to center your frame and resize it properly.

A 35mm/S35mm frame will give you a cropped output of approximately 3840x2160. Go to File > Project Settings... and on the main page select and change the timeline resolution to 3840 x 2160 Ultra HD. You will have to use the inspector controls in the EDIT workspace to center your frame and resize it properly.

Full Scan Size Master Resolutions:

In order to output your scan at it's full resolution you will need to change the timeline resolution in Resolve (as this is done on the basis of the entire project, not on a timeline by timeline basis.)

Go to **File > Project Settings...**

The **Master Project Settings** tab should be up and the first option at the top of the page would be **1920 x 1080p HD**. Click the dropdown and select **Custom** at the top of the list instead. In the fields right below this enter **4096 x 3072 for 35mm/S35mm** or **2160 x 1702 for 16mm/S16mm**. This will ensure that when you come back to the output tab here, that you will have the option to export at the specialized resolution that the Cintel Scans at.

File Formats suggested for Master Exports:

DPX

Highly Suggested for 35mm or 16mm scans.

- like CRI, this is a frame by frame image format.
(With accompanying WAV sound file if relevant.)
- unlike CRI, it is completely uncompressed.
(It will adapt to the bit-rate from the original scan and save all of it without algorithms in a new format.)
- it can retain the entire bit depth of the original scan (12bit.)
- it retains 1:1 detail.
- industry standard and works with nearly every professional piece of software.
- will likely triple or quadruple the size of your scan.
- will be difficult for non-professional computers to handle.

ProRes 4444 XQ

Suggested for 35mm scans.

- Is a continuous video format that can be played on most computers.
- Is very lightly compressed, (500mb/s)
- It can retain the entire bit depth of the original scan (12bit)
- It retains about as close to 1:1 detail as a non frame by frame format can.
- Works with all industry standard software and some basic software.
- Likely to increase your scan size.

ProRes 4444

Suggested for 16mm scans.

- Is a continuous video format.
- Is very lightly compressed, visually lossless. (330mb/s)
- It can retain the entire bit depth of the original scan (12bit)
- It retains the vast majority of the information in a scan.
- Works with all industry standard software and some basic software.
- Likely to slightly increase your scan size (35mm) or increase it by half (16mm).

ProRes 422 HQ

Only recommended if you absolutely do not have space for the others or are NEVER correcting your file again.

- Is a continuous video format.
- Is a compressed video format, visually lossless. (200mb/s)
- Max bit depth is lower than the scans at 10bit. (Scan is 12bit.)
- It discards color data and uses algorithms to deliver a mostly visually identical result.
- Works with all industry standard software and some basic software.
- Likely to halve your scan size or more depending on film format.

NOTE ON RENDER SPEED AND RENDER ISSUES

In these settings suggestions you will see the last setting is called "Render Speed", this is supposed to regulate how fast Resolve renders out files and therefore how much of the system hardware Resolve is allowed to use while Rendering. Theoretically the automated Maximum setting should always be the right answer.

However, the reality is that the automatic setting of "Maximum" can sometimes cause Resolve to try to render faster than the computer/hard drive can actually run and may result in black frames or other render defects (i.e. black or colored lines in frames of your export, etc.) This can also be a result of the fact that hard drives tend to run slower when they are close to full capacity. (For the Raid drive at the station this is often around 90-95% capacity.)

As such the following is suggested:

1. If you have done NO correction AT ALL, start at "Maximum" speed
If you have done corrections start at 75%, If you've done A LOT of corrections start at 50%.
2. Watch the render preview as it runs for the first ~3 minutes, if black frames or other errors are going to happen, you should see them appear in the preview by around the 3 minute mark.
3. If errors happen, stop the render, delete the partial file it made and (either/or) reduce the Render Speed setting by 1 increment. (i.e. 75% to 50%, 50% to 25%) or output to a less full drive.
4. If the RAID is really too full, you can be permitted to offload to the GEM_LAB_NL0 drive, but you must immediately erase your file once it is transferred to your personal hard drive.