

## **DSLR movie scanner for 8mm film**

This document details the instructions on how to build your own 8mm film scanner using the DSLR camera and Wolverine scanner. The Wolverine scanner available from Wolverinedata and its many variants are OK for everyday low quality scans and can be used as is without any modifications. But for people that want better quality scans with low digital artifacts this modification may be the way to go especially if they already own a DSLR camera with a wide angle lens.

The modification is very reasonable cost, looking at a \$100 range but it does require some mechanical work experience, measuring and cutting aluminum and wood pieces and precision fitting. And also it takes some time and patience, but this is all worthwhile because you will end up with a unit that is comparable to some high end units at only a fraction of the cost.

## **Parts Needed**

### **Unit base**

This is a wood base and can be purchased from your local hardware store.

Something like this one:

<https://www.homedepot.com/p/Rubbermaid-Black-Laminated-Wood-Shelf-8-in-D-x-36-in-L-4B2800BLA/100173931>

### **Angle bar aluminum**

<https://www.amazon.com/gp/product/B000EUGY24>

### **Camera stand**

<https://www.amazon.com/gp/product/B07ZF2VV48>

### **Tripod Collar**

Get the collar that will fit your camera lens. Check on-line camera stores.

This is what I used with my 17-40mm canon lens:

<https://www.amazon.com/gp/product/B07ZFM5M48/>

## **Reverse adapter**

Here again, get the adapter that will fit your camera. This is what I got for my 17-40mm lens and mark2:

<https://www.amazon.com/gp/product/B0054ENY8W/>

## **M4 screws**

<https://www.amazon.com/gp/product/B07X5RLSGC/>

## **Brass Spacers**

<https://www.amazon.com/gp/product/B014KJX65W/>

## **M2 screws**

<https://www.amazon.com/gp/product/B01N1WDUK0/>

## **Tools Needed**

Wood saw with fine cut blade.

Jig saw with metal cutting blades

Drill and Drill bit set.

Step drill bit set for drilling larger holes:

<https://www.amazon.com/gp/product/B0746FZT52/>

Good quality Grinder. Something like this one:

<https://www.amazon.com/Bosch-1375A-2-Inch-Angle-Grinder/dp/B00004SUOU/>

Need different size wood screws, machine screws, screwdrivers, fine sand paper, and a good quality file.

## **Disassemble Wolverine**

Depending on the model that you have, the order of disassembly may change slightly but this will give you a general idea.

**Disconnect power, Remove SD card and film reels.**



Set the unit on a table with enough work space around it.

Make sure SD card is out and power disconnected.



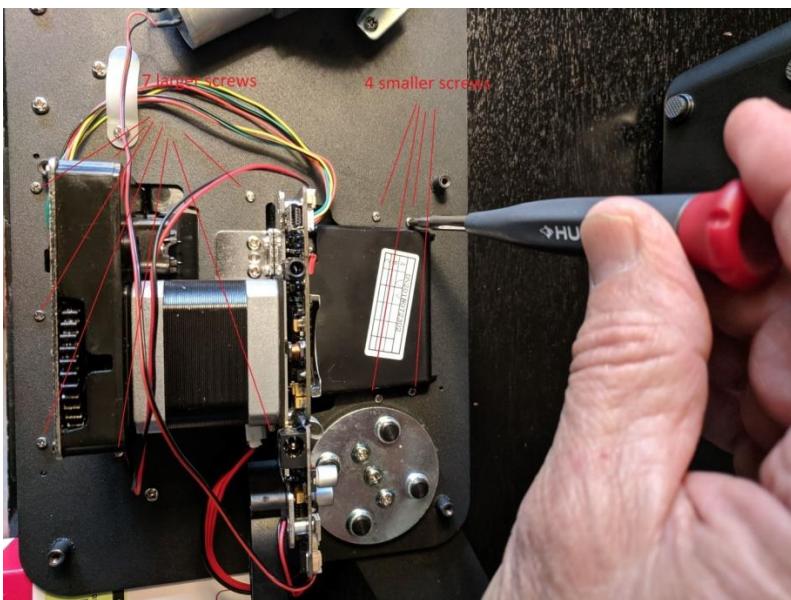
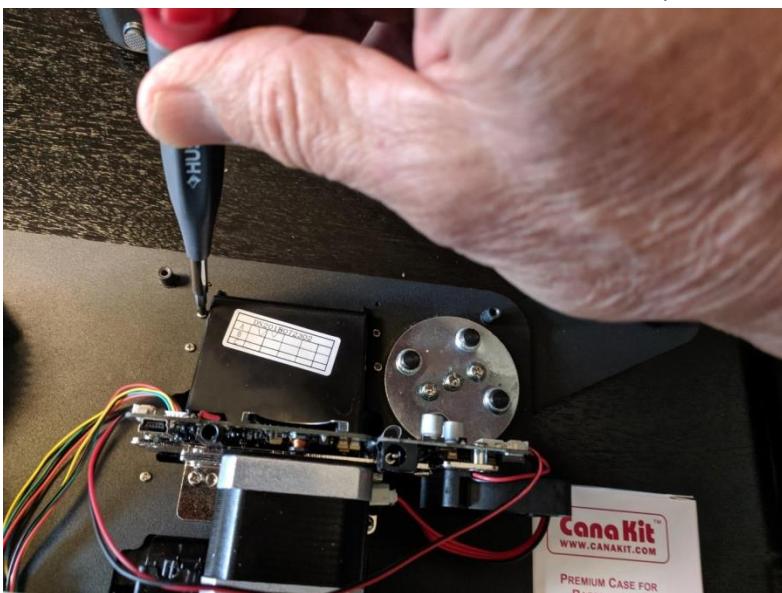
Lay the unit face down on the table. Add support to the sides by using empty boxes of right size or similar support. Remove cover screws (the number of screws varies depending on the model). Set the screws on the side in a small container and mark them up. It is important not to mix up the screws because other unit components use the same thread screws but different sizes.



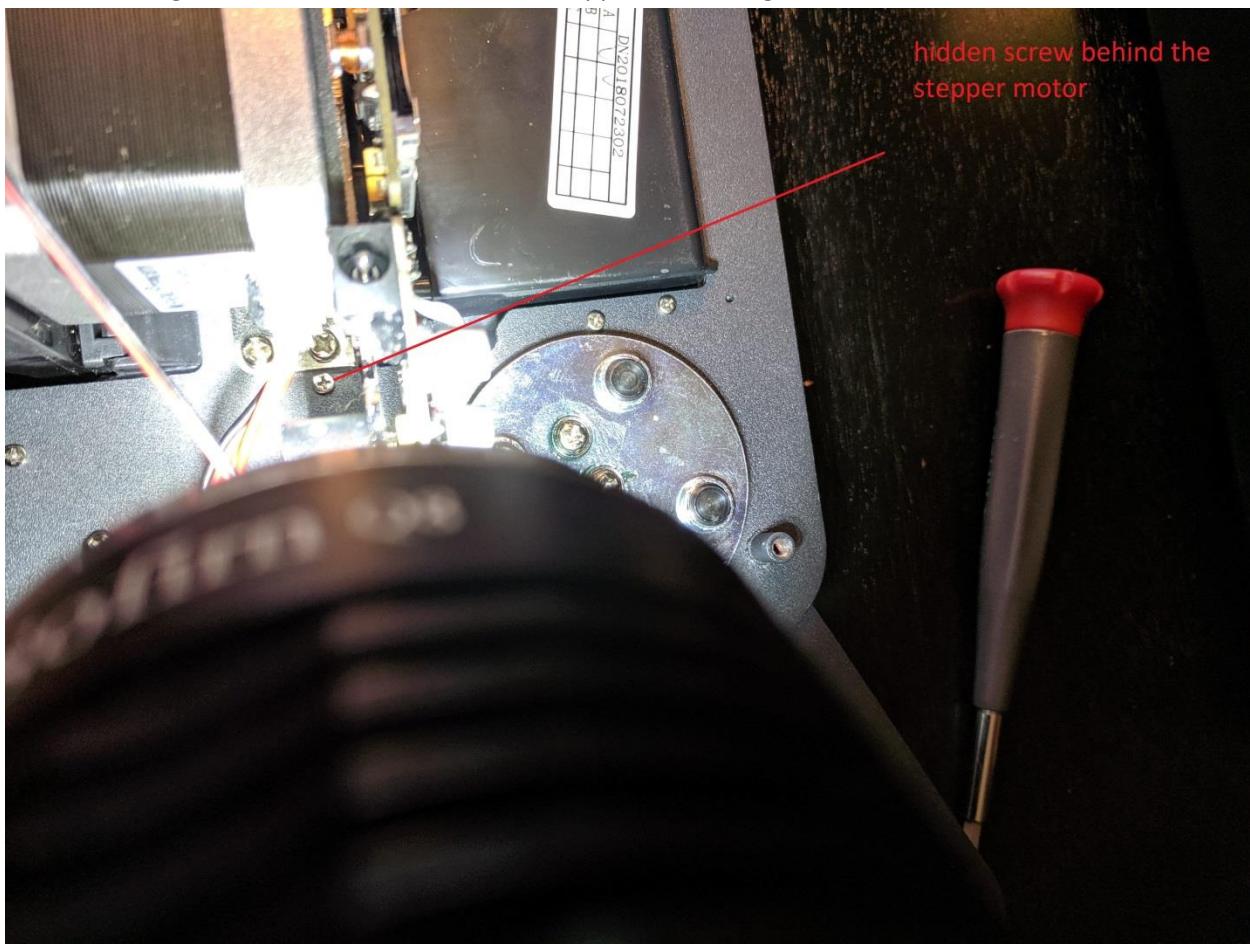
Remove the cover. Observe the greasy areas and avoid touching them.



Remove the front bezel screws. There are 11 of them, 4 for the top part (again this varies with the model). These are smaller screws and 7 for the bottom part. Make sure not to mix them.



One of the larger screws is hidden beside the stepper. Don't forget that one.



Store the screws a container, or a jar or whatever. It is easy to lose them.

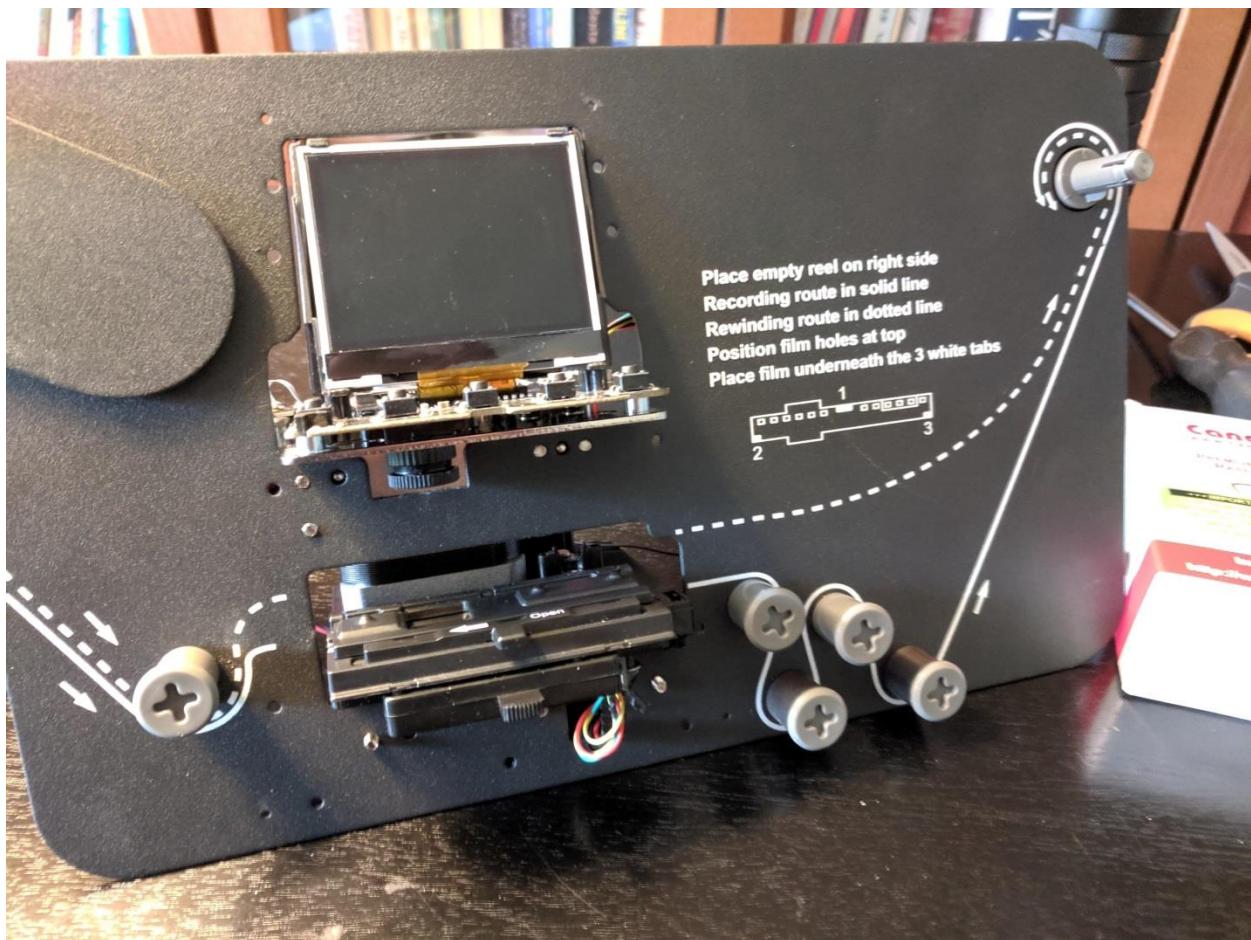


Set the unit upright and leave it supported by the stepper motor bottom. Make sure not to touch the stepper gear. It has grease on it.

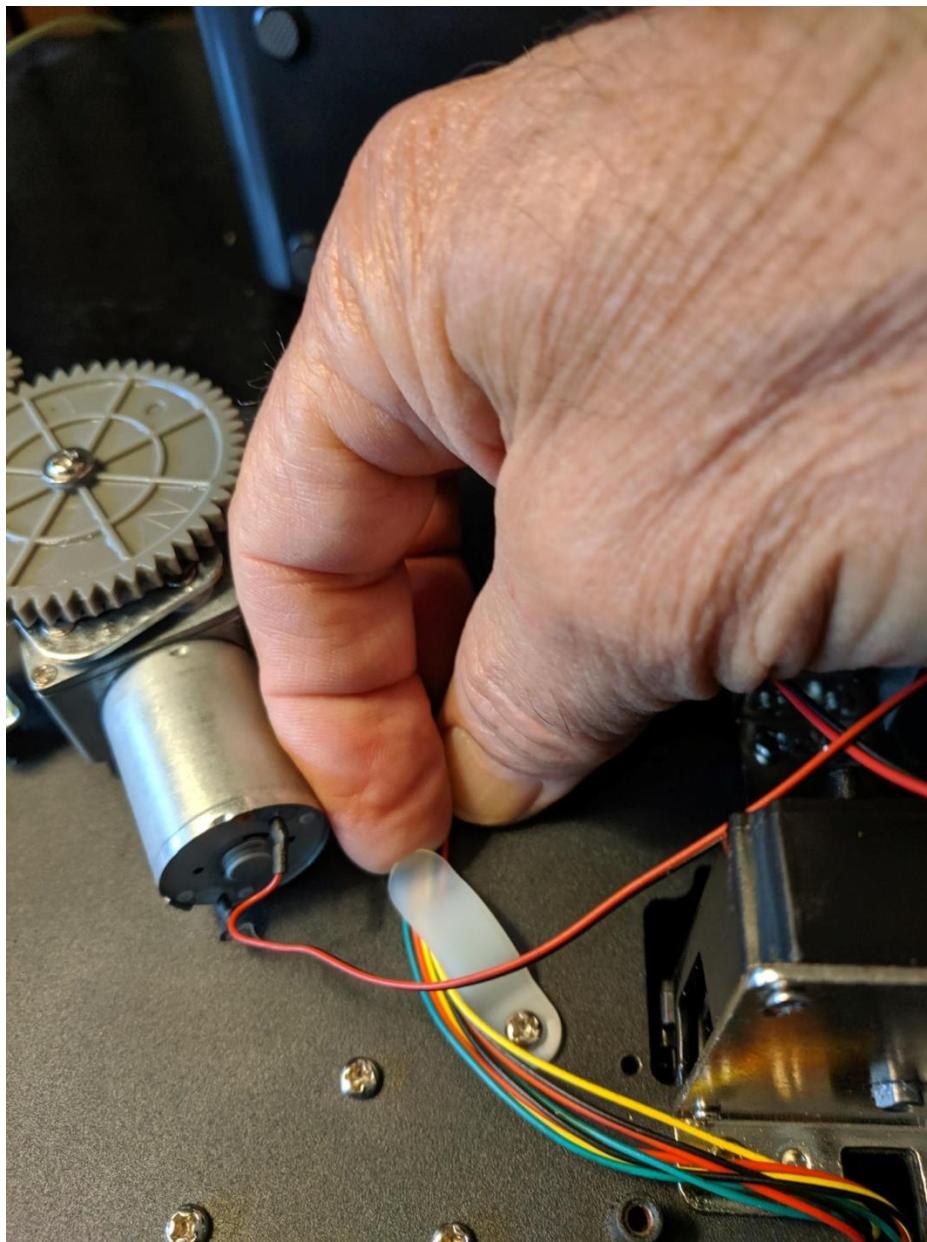
Grab the plastic front cover as shown and slightly push upwards and wiggle it out. DO NOT USE FORCE. It may take some time but it will come out. If it does not, make sure that all 11 screws have been removed.

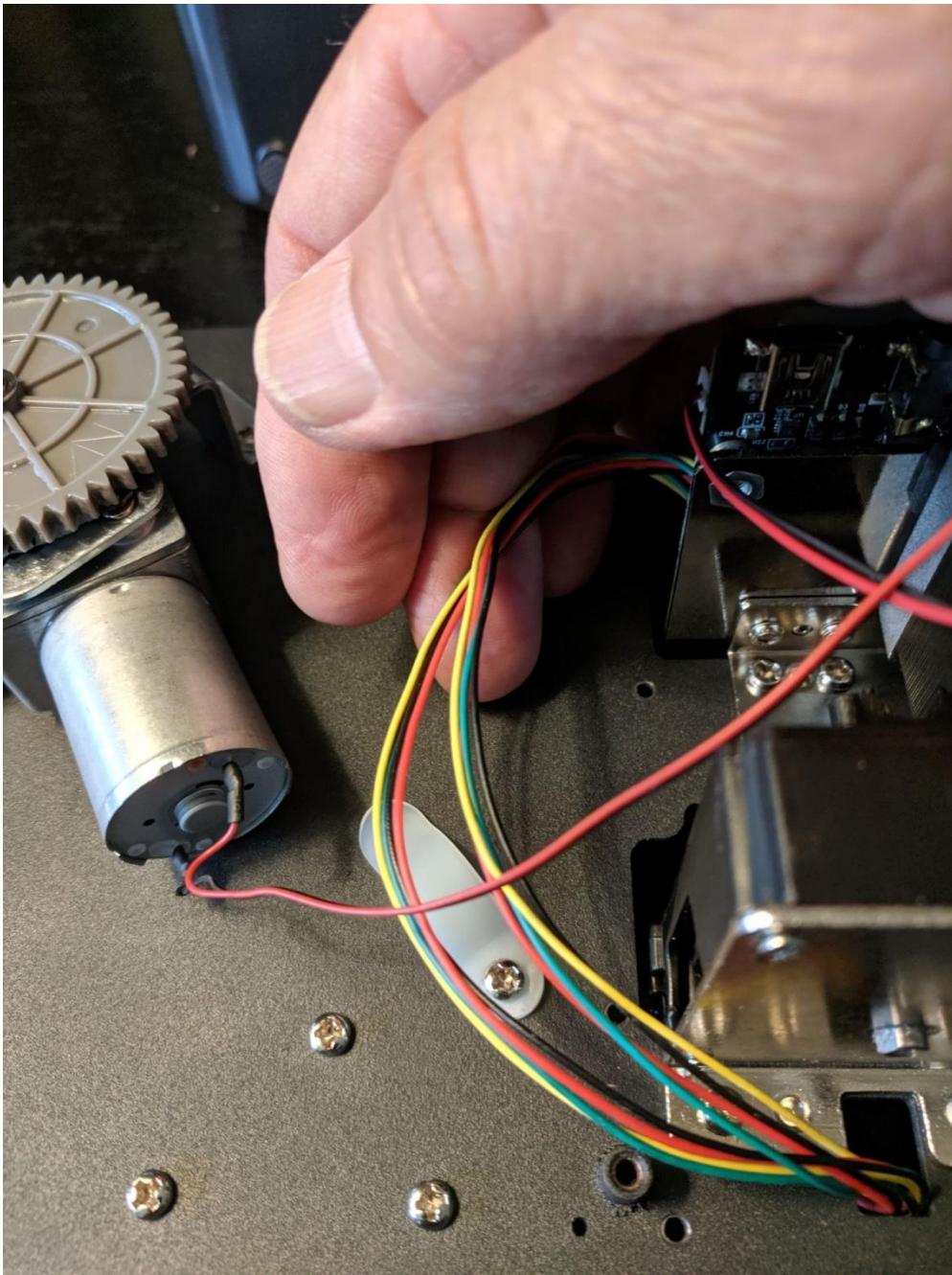


The picture shows the front of the unit with the cover removed.

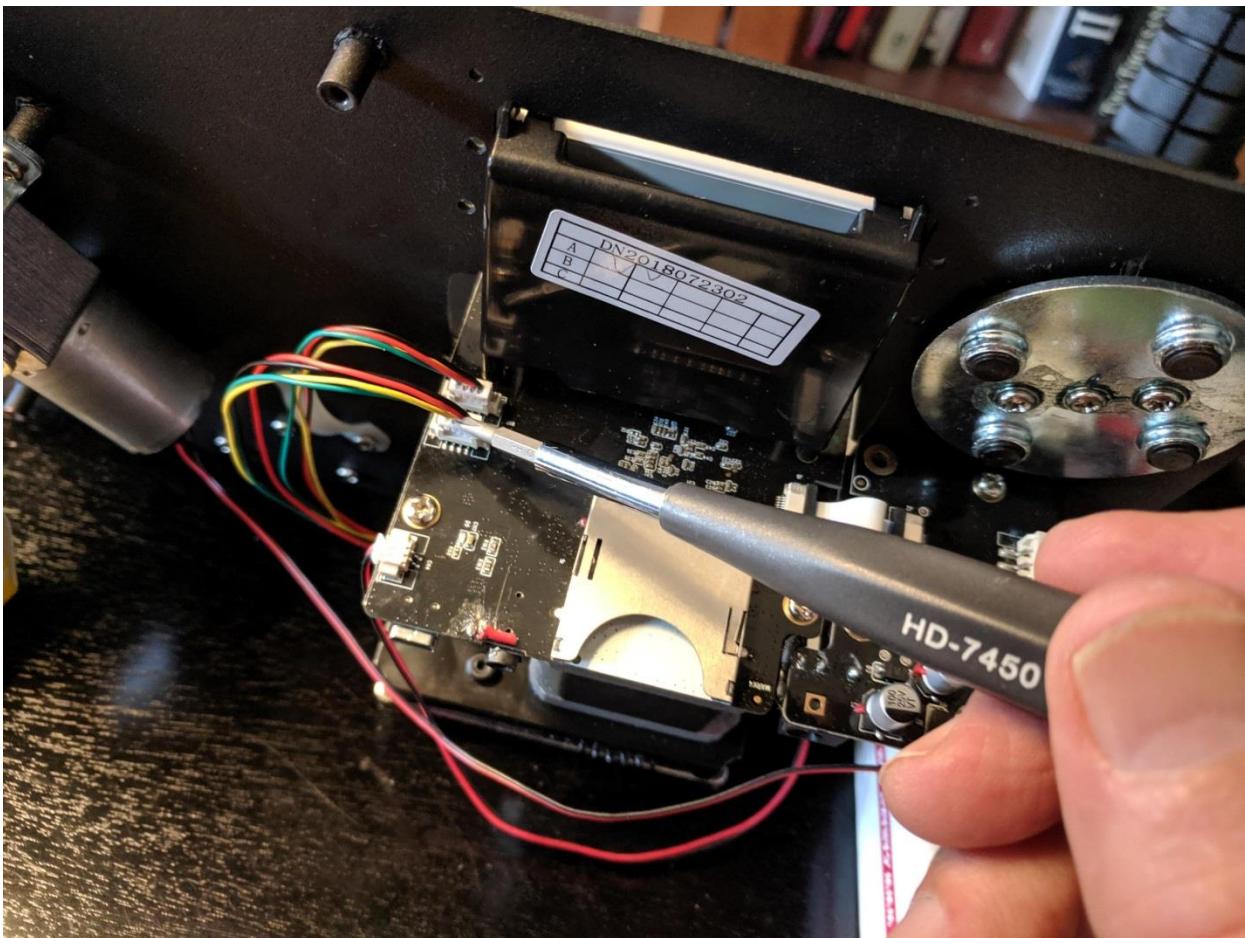


Slide the sync and S8/R8 switch cables from underneath the retainer clip.



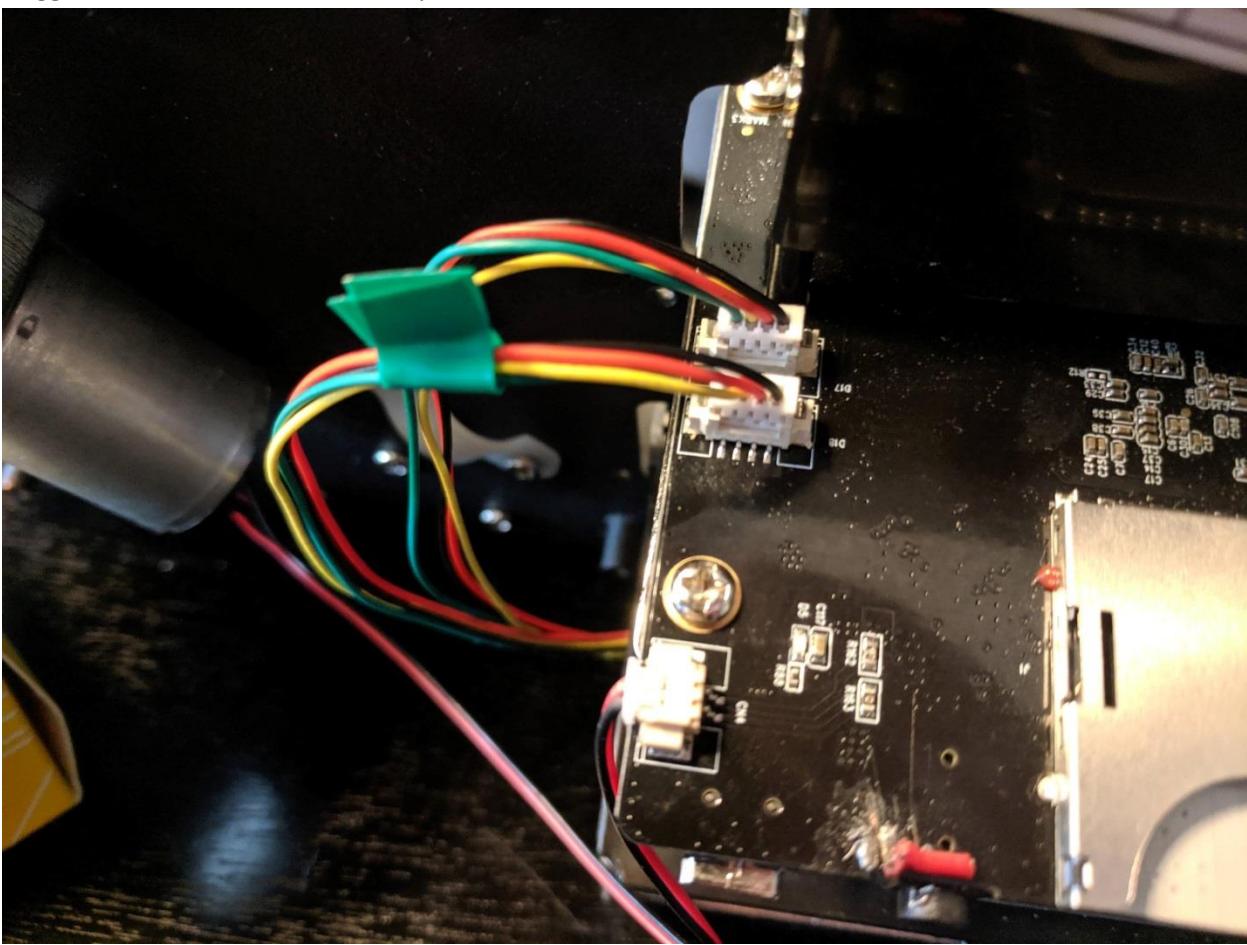


Disconnect sync and super 8 switch cables from the main board.



The connectors are interchangeable so make sure to mark one of the cables. The one towards the front of the unit (that does not have the green tape on it) is the sync cable. The other one is the S8/R8 switch detector cable. The cable tagged with the green tape (I added the green tape) is from the R8/S8 switch.

Wiggle the connectors out. Do not pull hard.

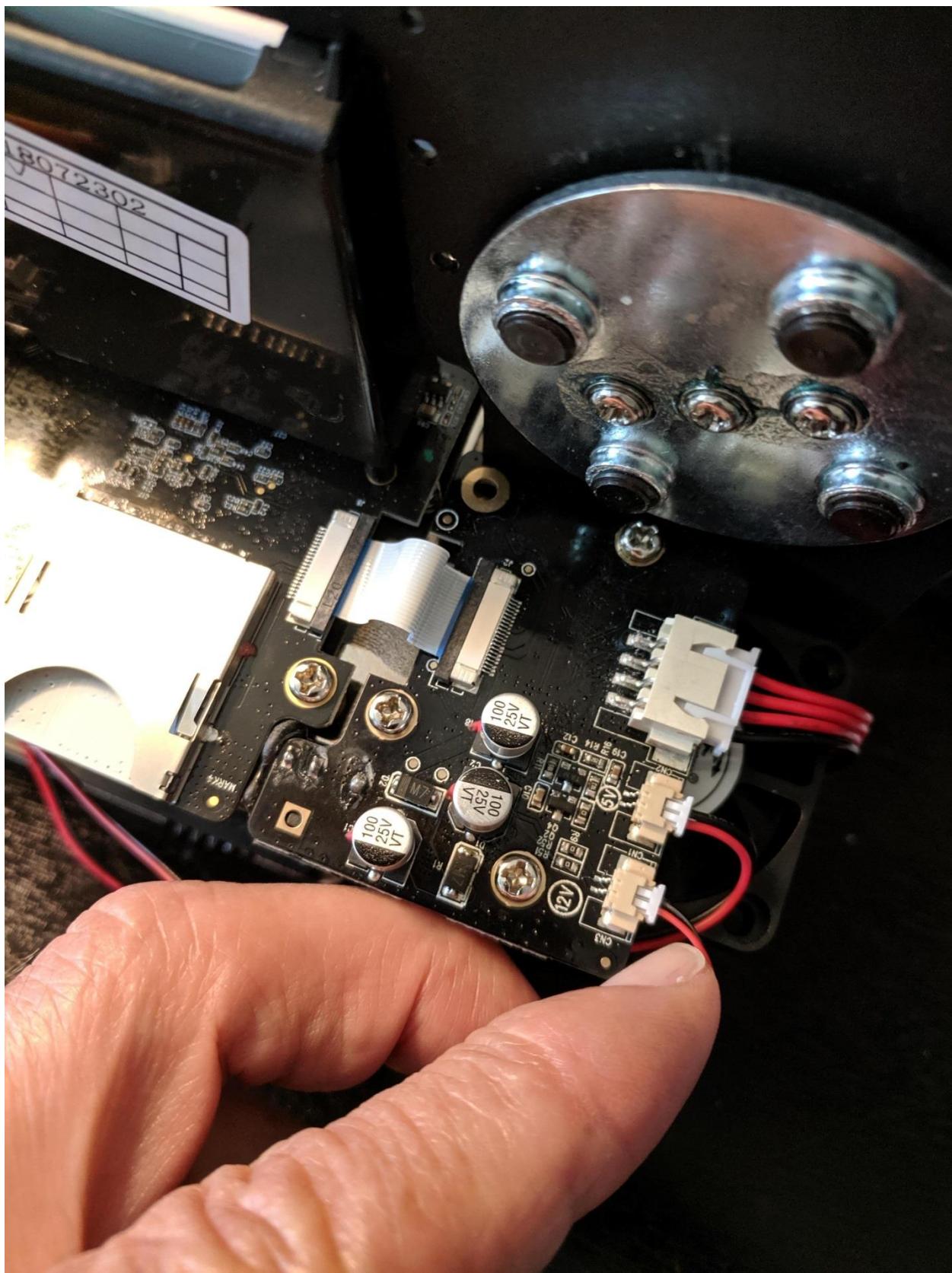




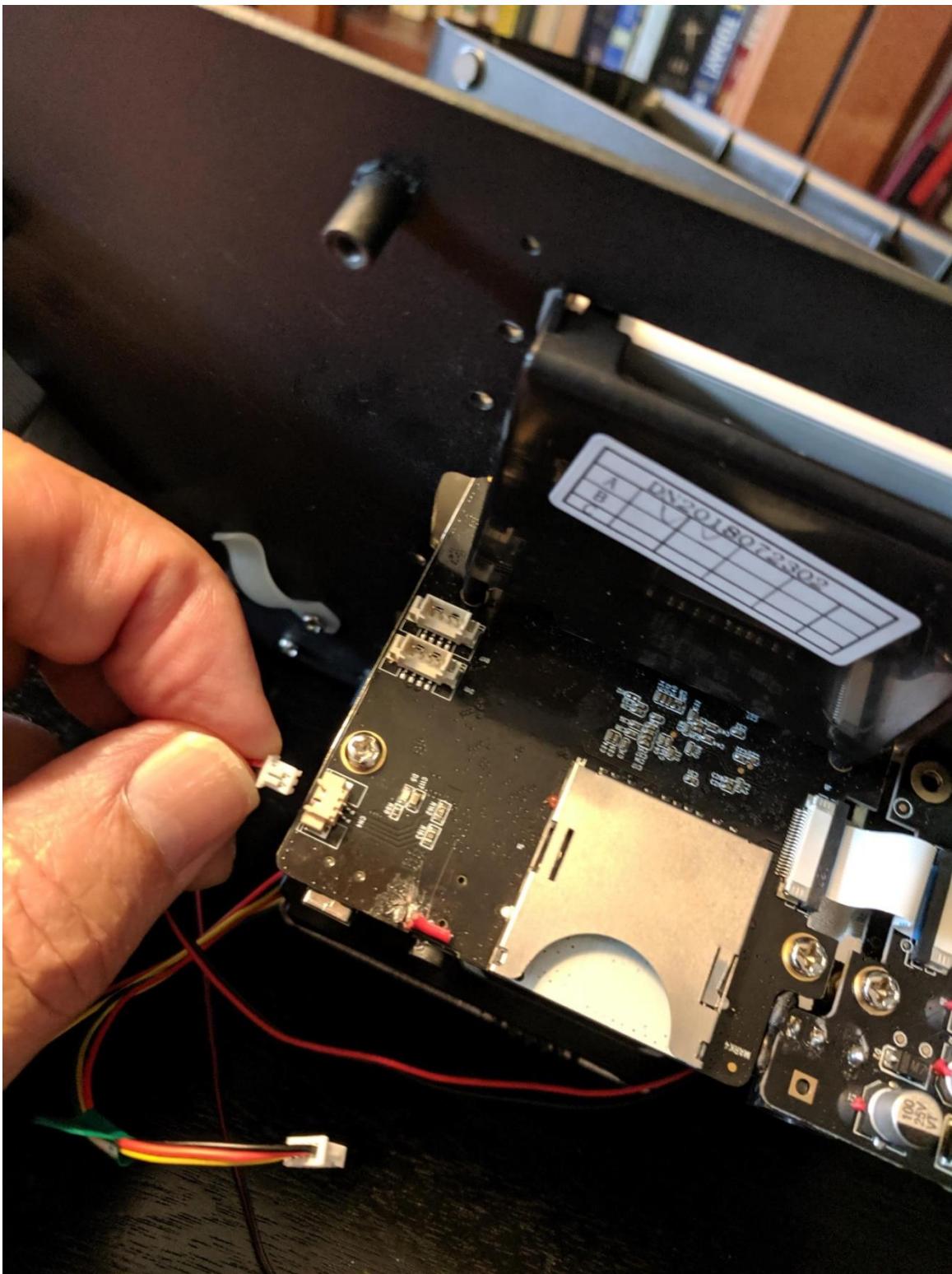




Remove the fan connector from the power supply. Tag this cable. Disconnect the takeup motor cable and tag it.



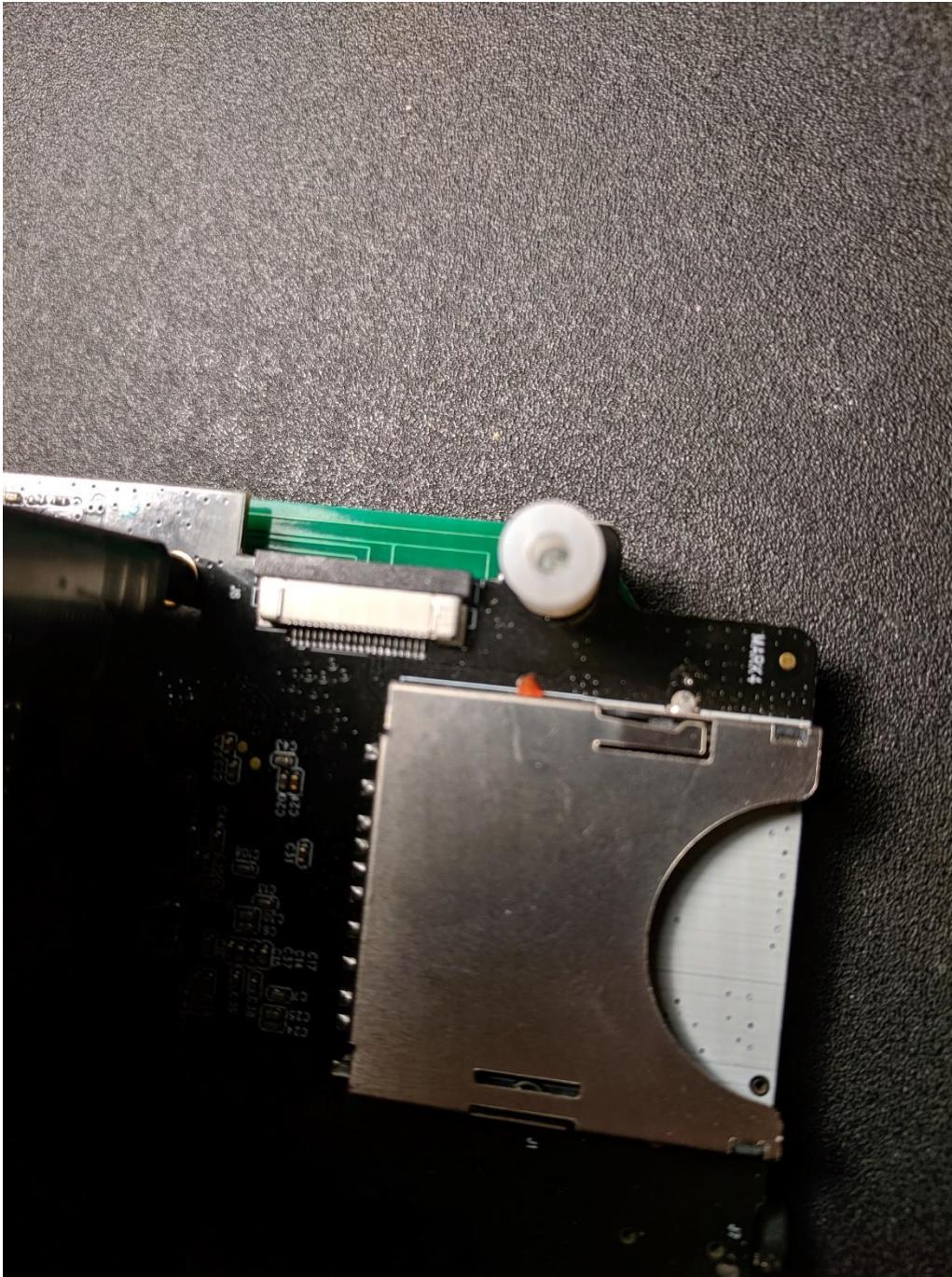
Disconnect the LED connector as shown. Put a tag on it.



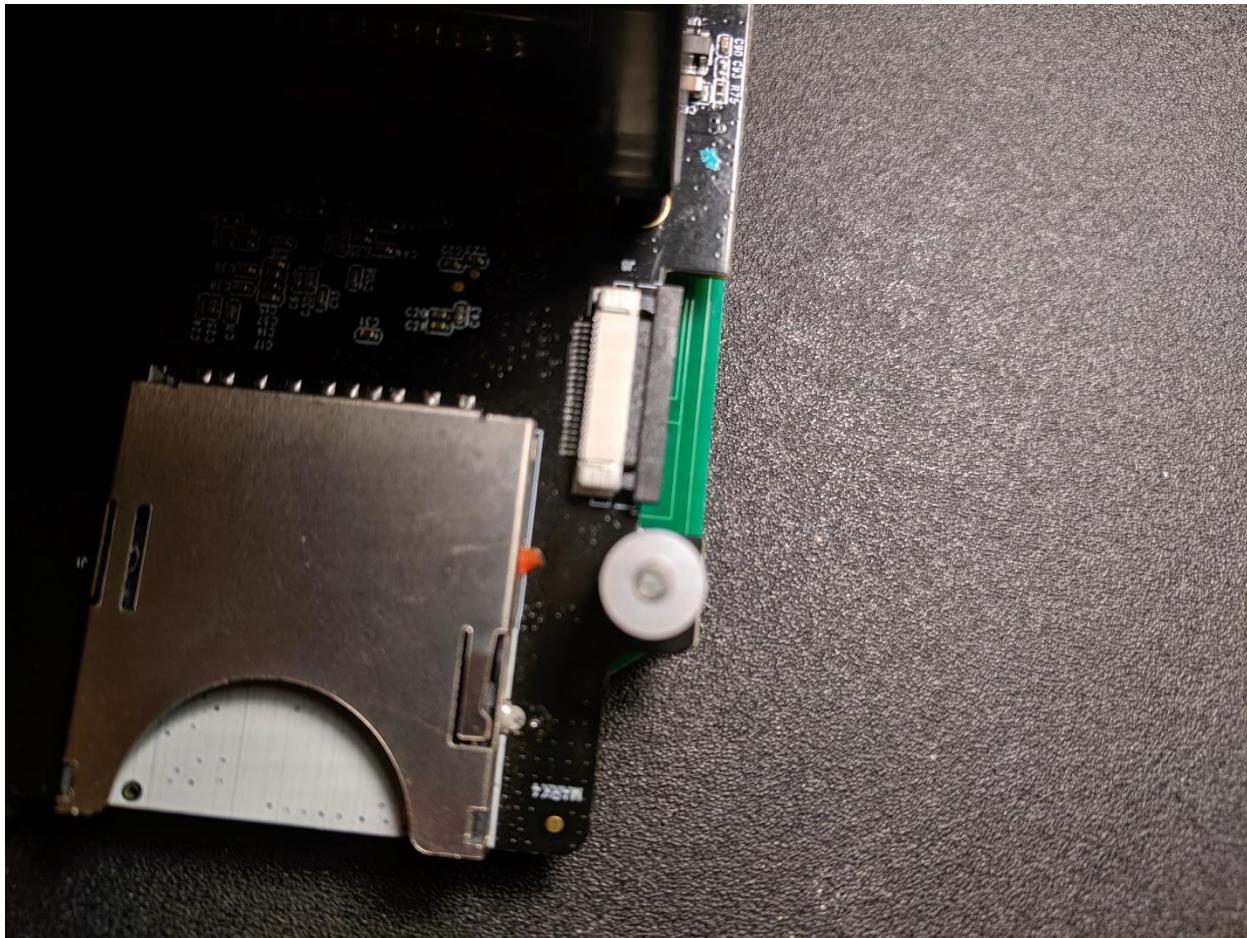
Disconnect the flex connector that connects the controller to the power supply. Be careful with this connector because it can break easily. Do not apply any excessive force.

The flex connector on the controller side has to be “unlocked”. You can do that by pushing the black tabs horizontally towards the power supply. The lock lever will slide out a bit leaving a small gap between the lever and the connector. Once done the cable will become loose and can slide out.

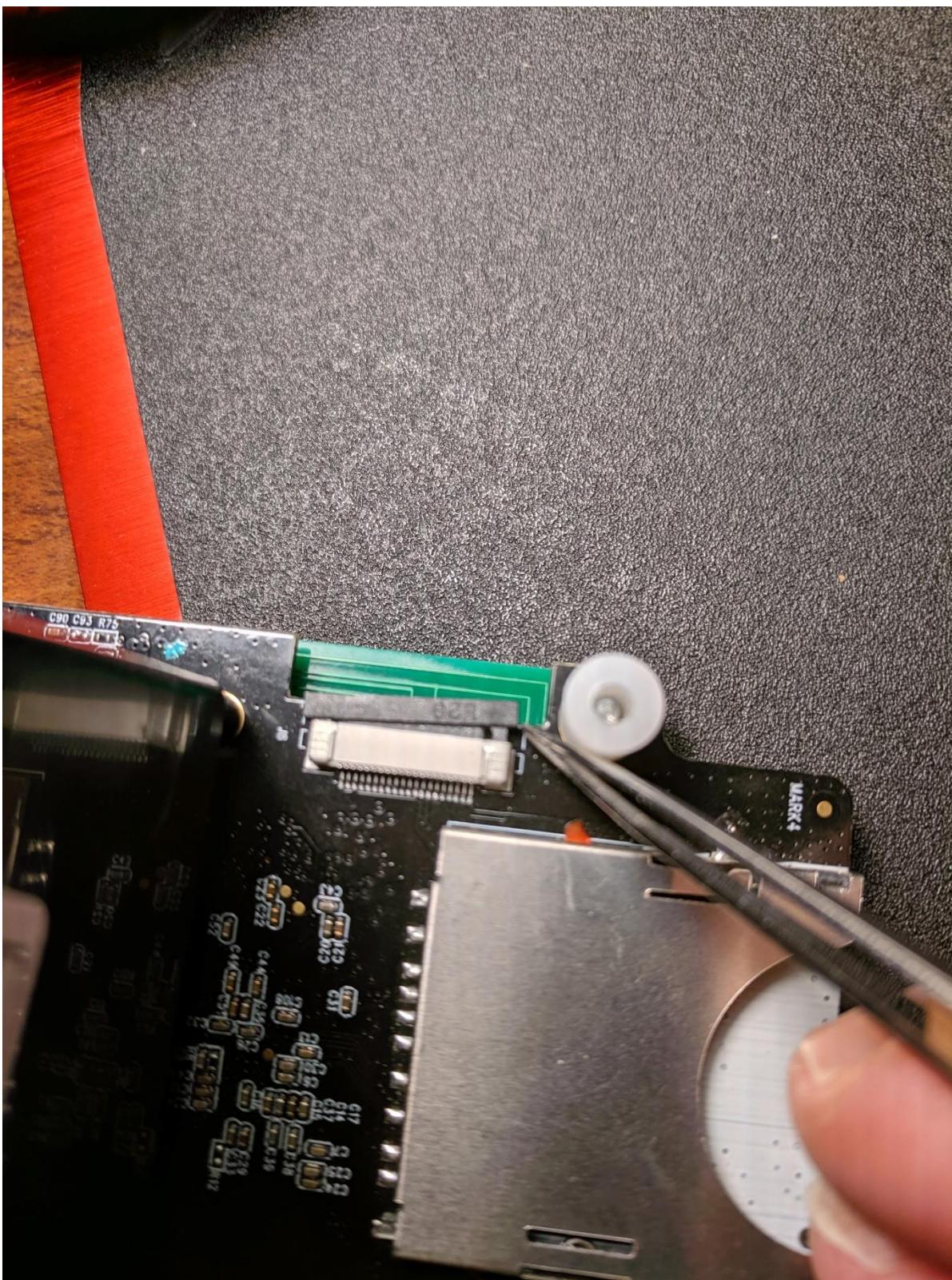
Here is the picture showing the locked connector.



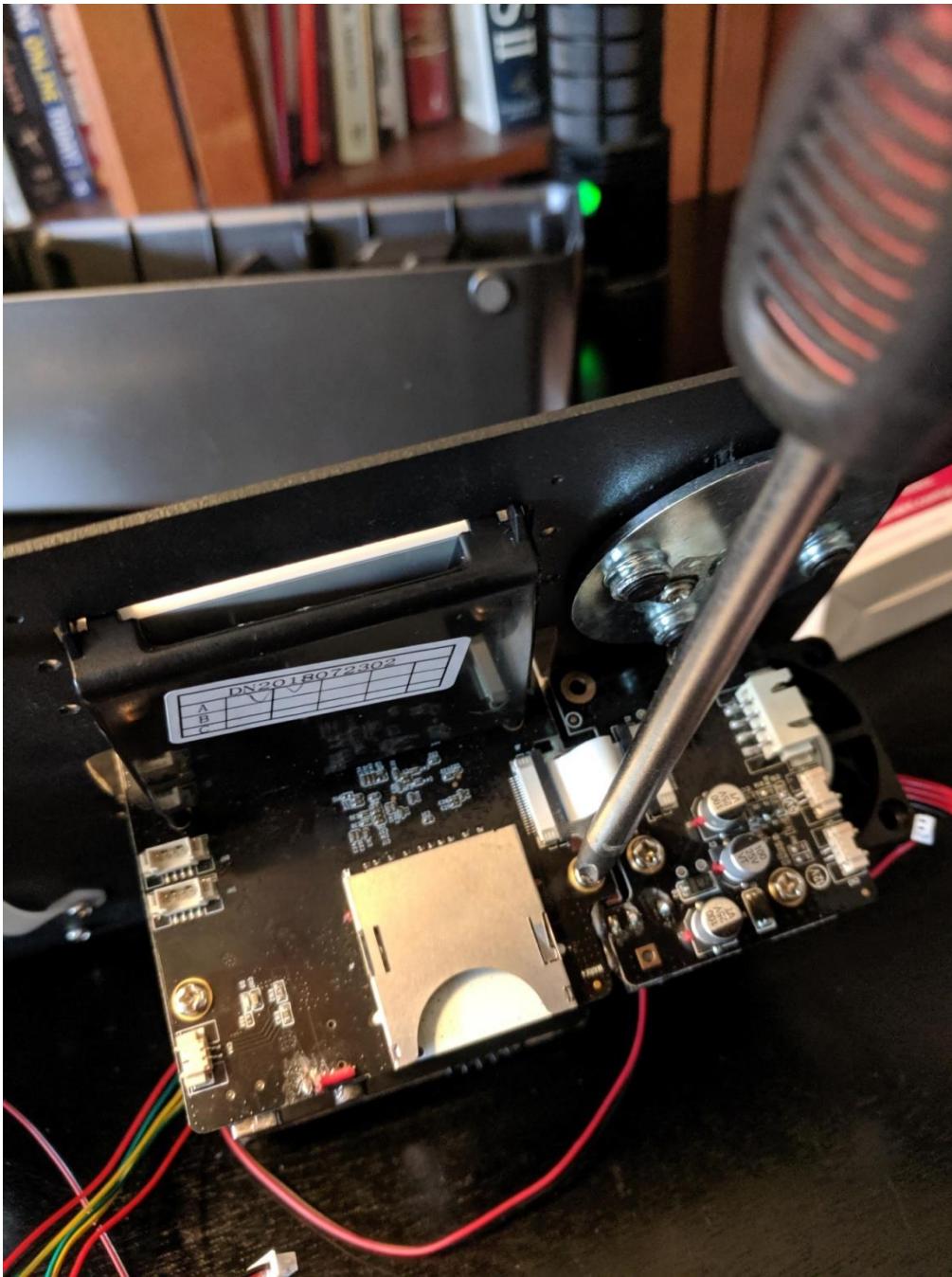
And here is the picture of unlocked connector:



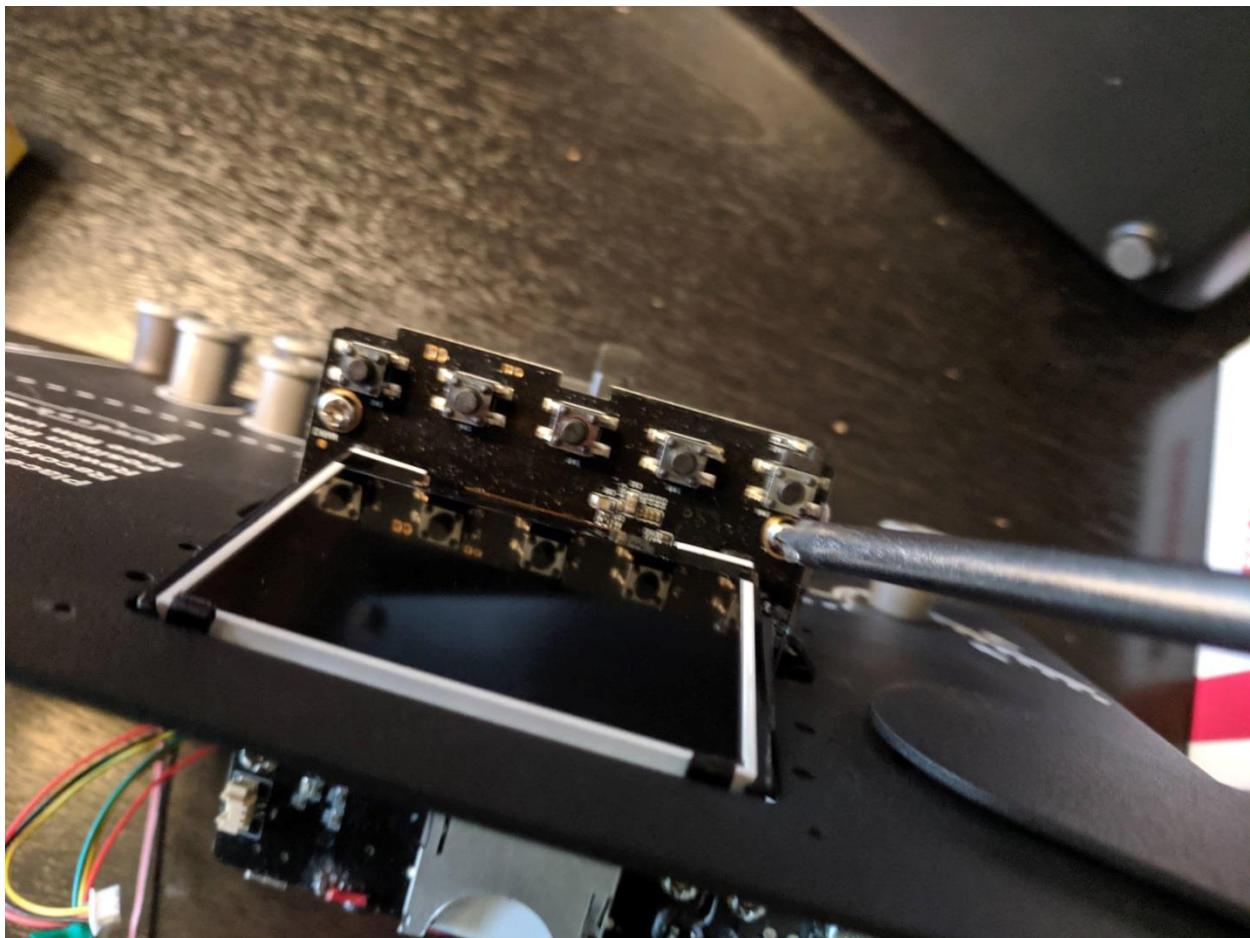
Here is the picture of the connector being unlocked:



Remove the four controller board screws.

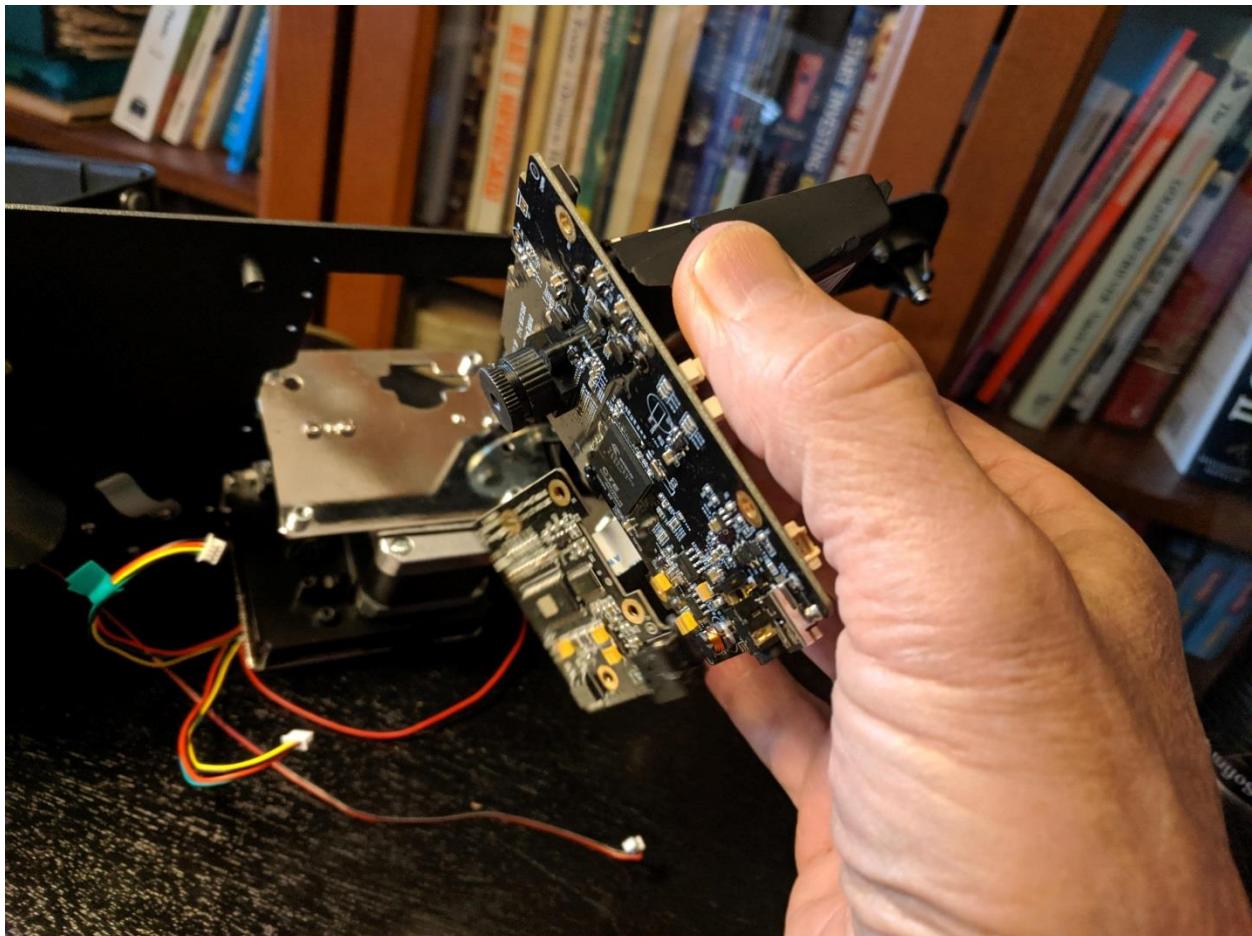


Two of the board screws are at the front.

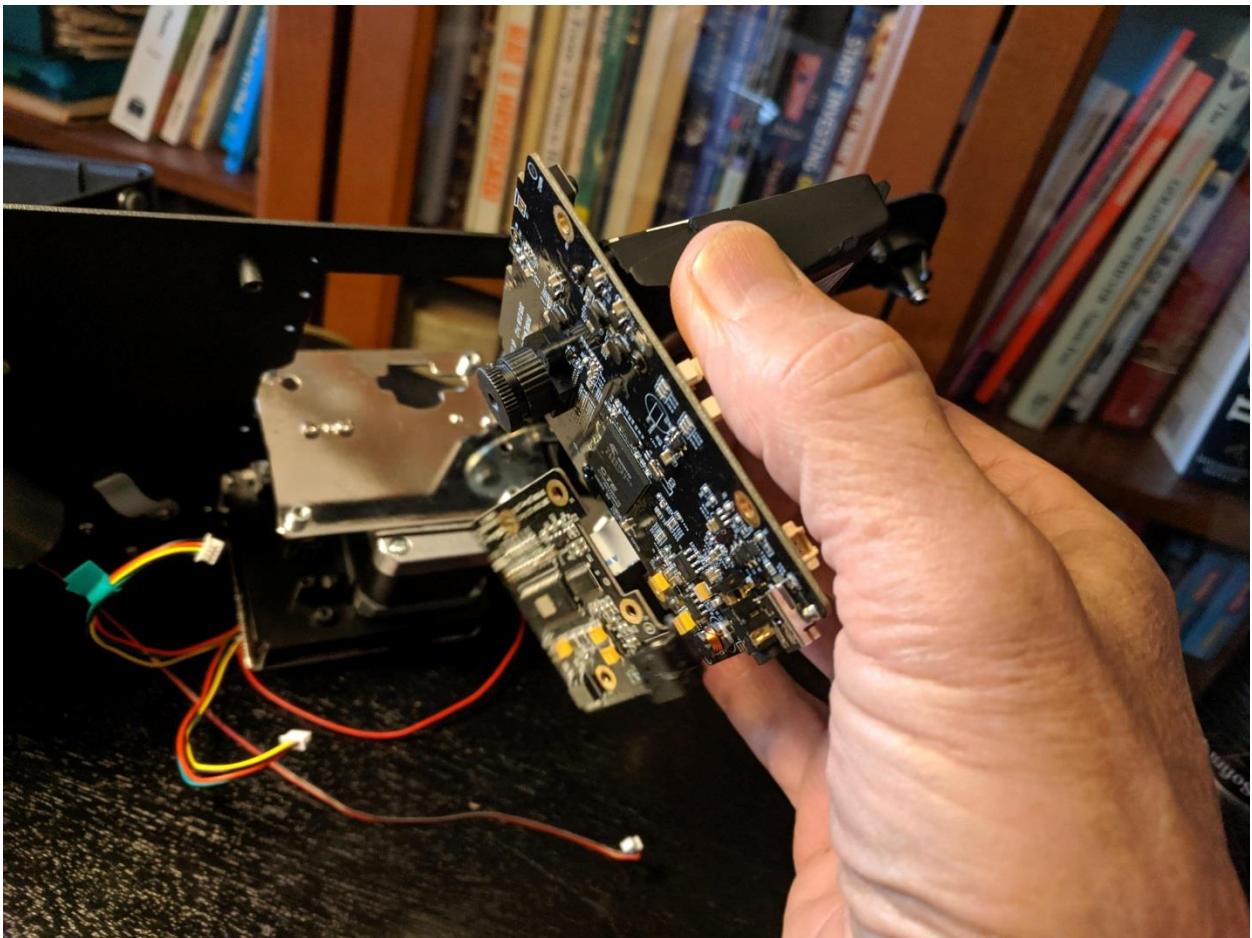




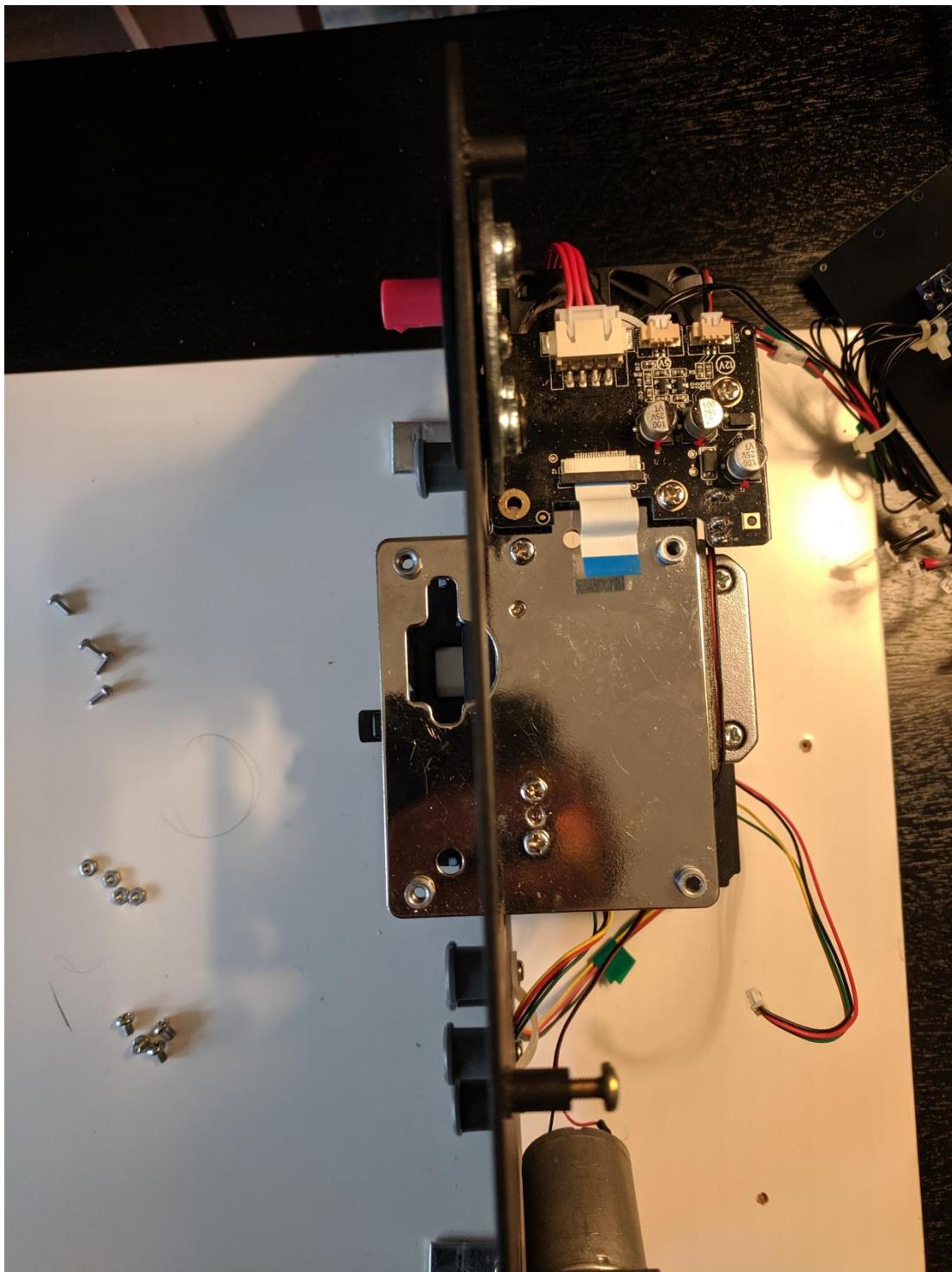
Wiggle the controller board up. Make sure there are no cables in the way. Be careful not to damage the power board ribbon cable.



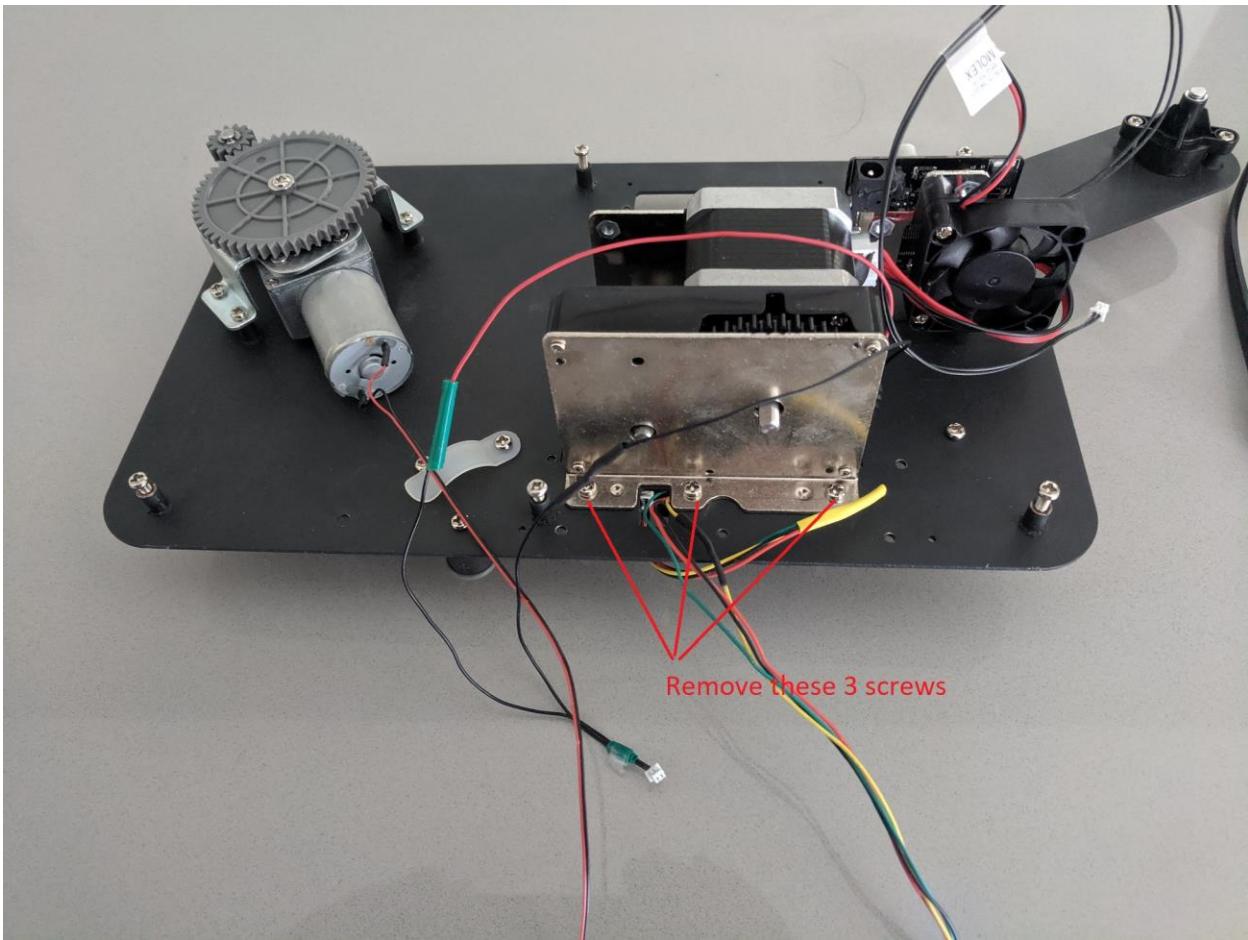




Remove the 3 power board screws and remove the power board..



Finally, remove the three screws holding the stepper motor assembly.

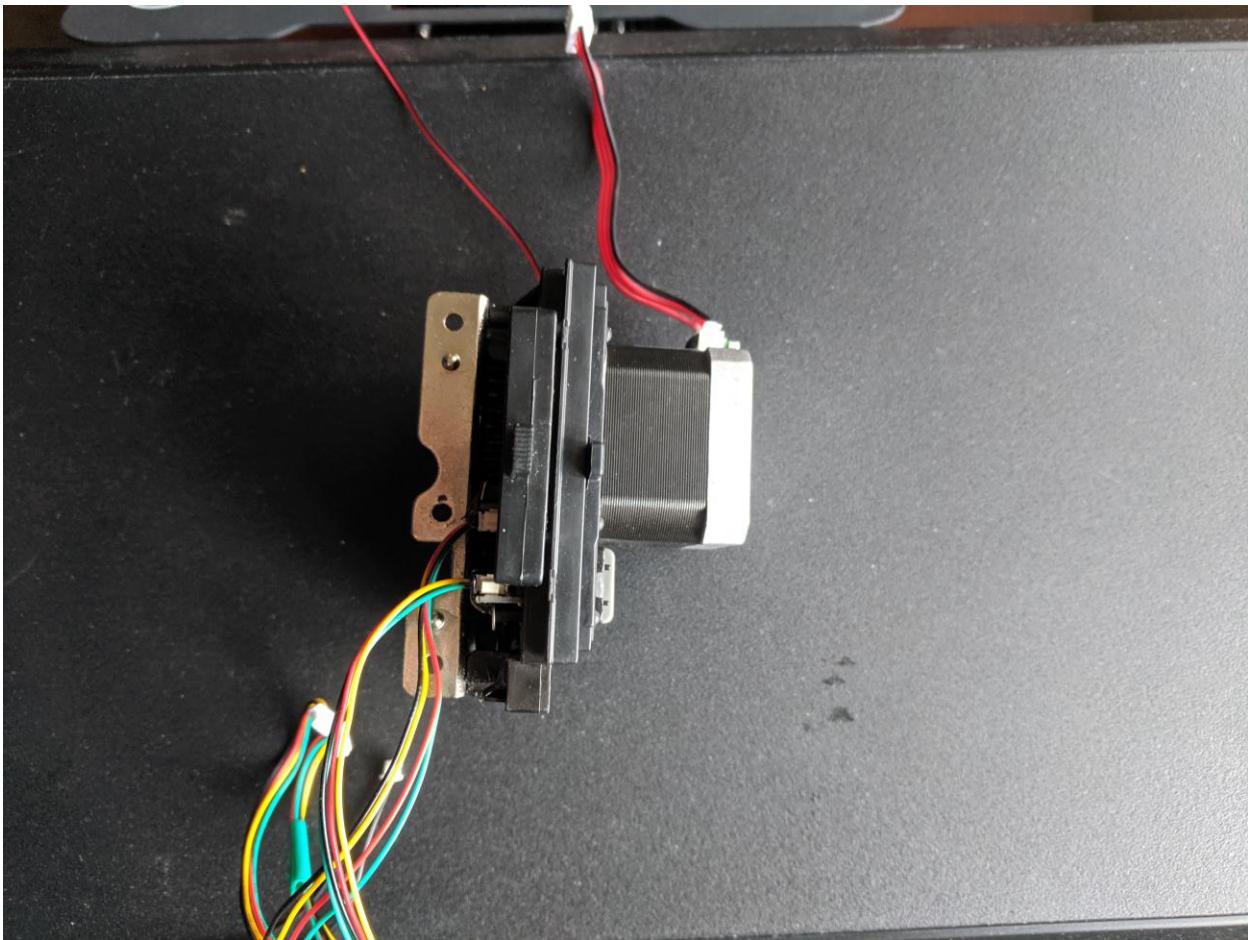


Wiggle the stepper assembly and pull it out slowly. Be careful with the cables.

Note:

The stepper may have some adhesive tape on the top and could be hard to pull out. Check for the tape and carefully wiggle the unit until it is free. Set the unit somewhere on the side away from the work area.

When handling the motor, make sure not to touch the grease coated exposed gears.



## Rigging up new scanner

Shorten the 8' board to 13.5". You end up with the 13.5"x8" base.

From the leftover board cut another small 3" piece to create a 3"x8" stepper mount.

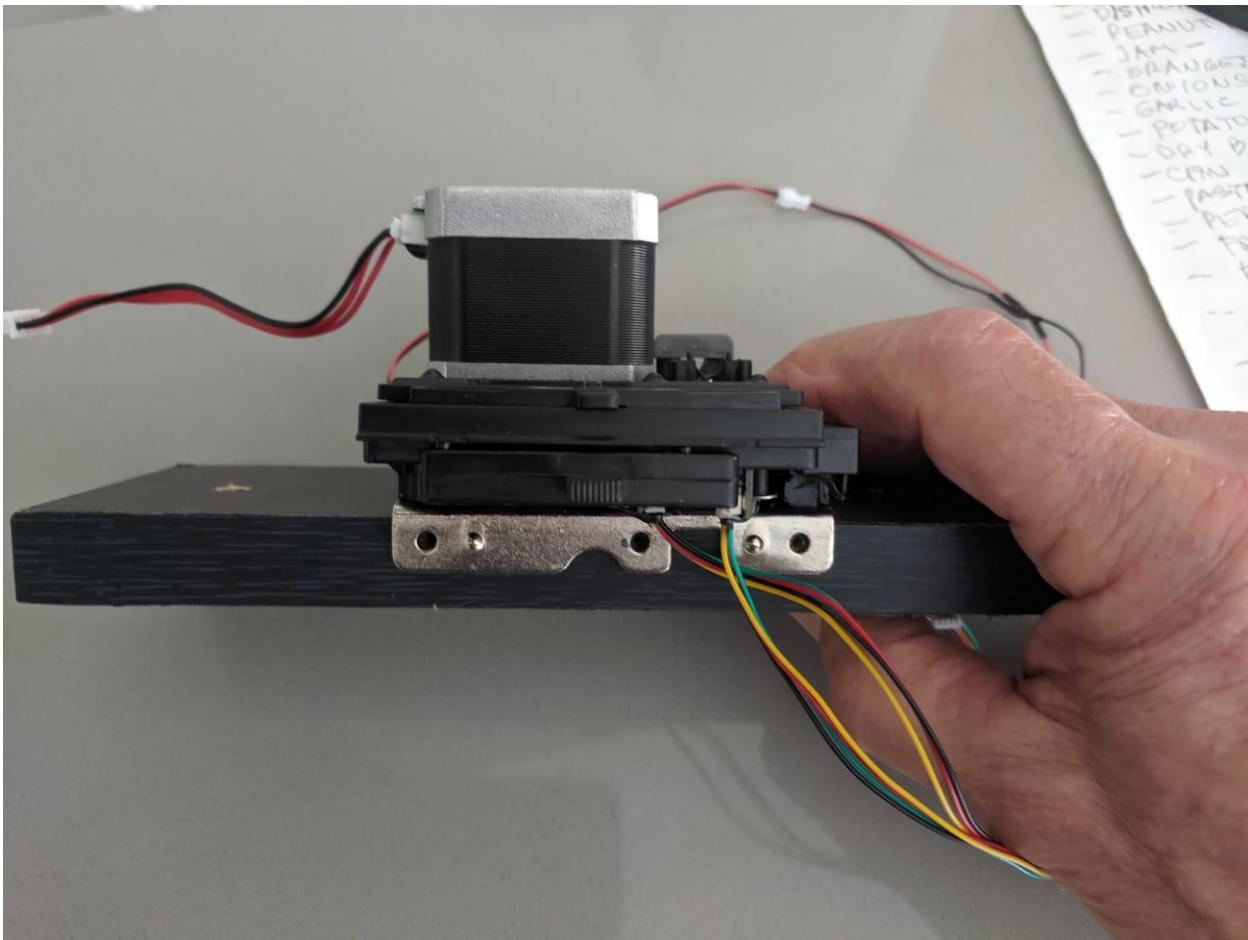


Drill two indentations in the stepper board to clear the two gear shafts. This can be done by seating the stepper assembly on the top of the board (centered from left to right) and pushing down on the assembly. This results in two faint marks on the board. Use that as a drilling guide. Make the holes wider than the shafts for ease of alignment.

Additionally, drill two mounting holes in the left and right area of the board. The board shown above has additional holes because the initial right hole interfered with the controller mounting. So it may be better temporarily put the things together to see where the holes should go and then drill.

Note:

The front flange of the stepper assembly has to be right against the front edge of the board as shown below.

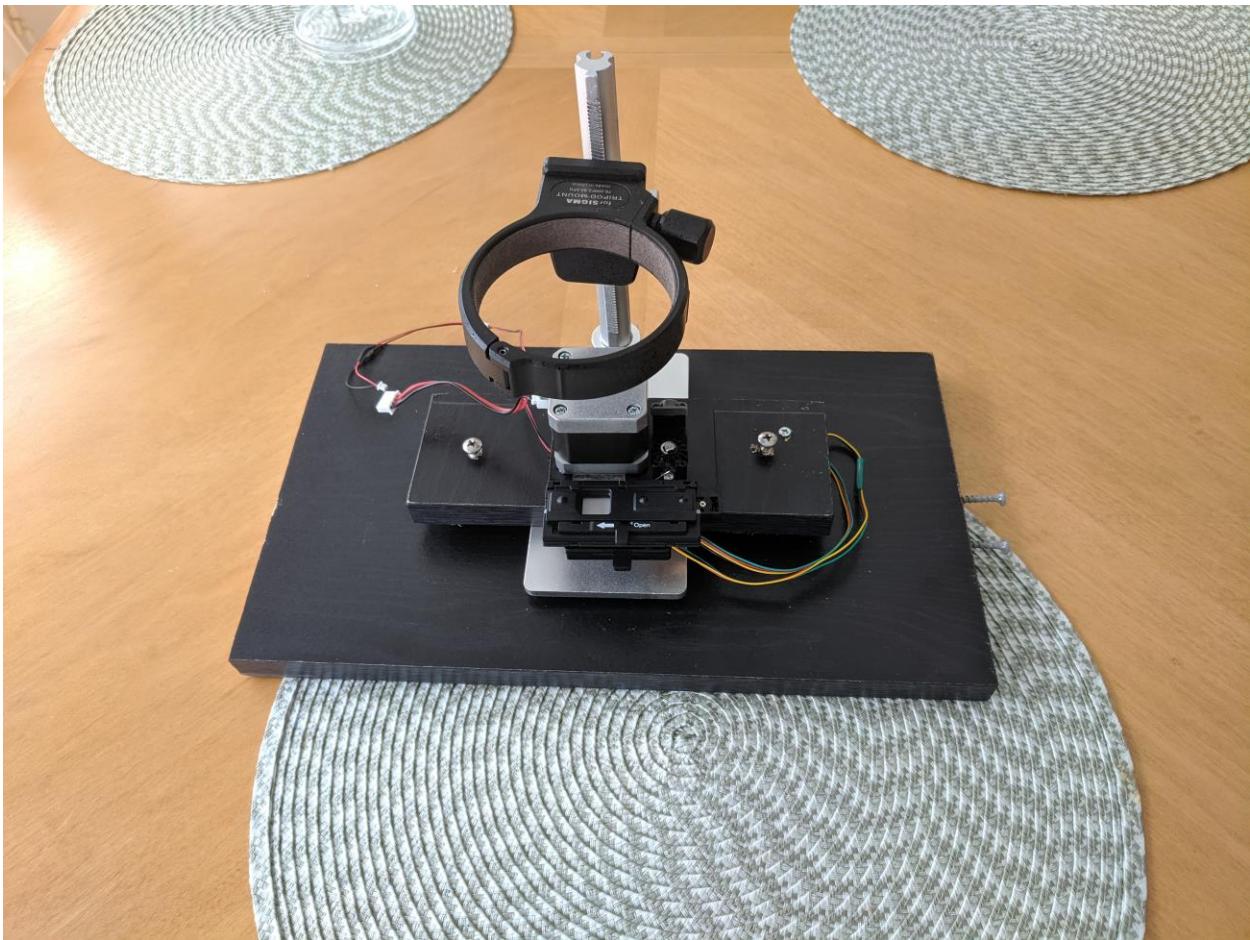


Drill three small guide holes through the stepper bracket mounting holes. The guide holes are required to prevent the board from cracking when the mounting wood screws are tightened.

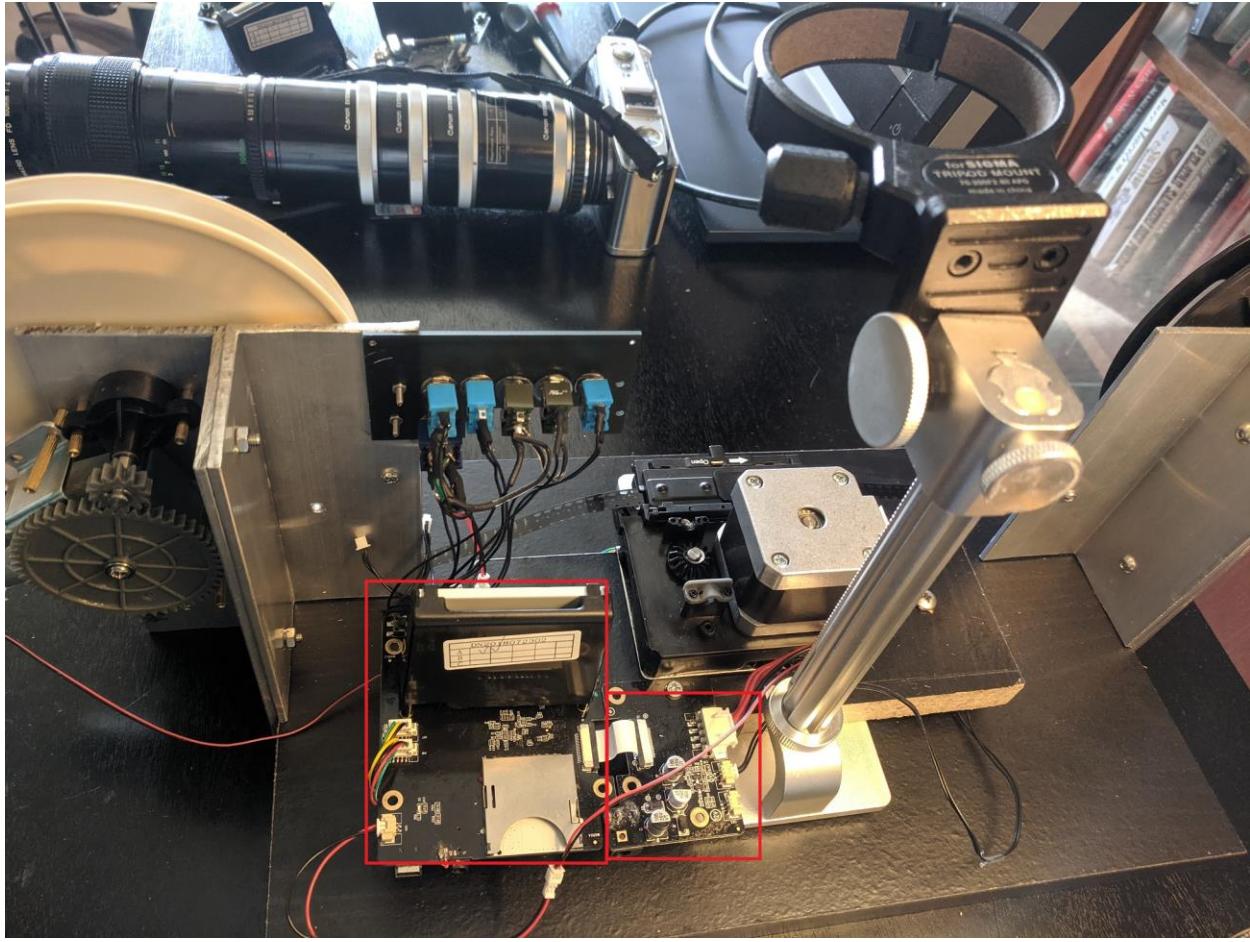
Use three wood screws of appropriate size to fasten the stepper to the board.

Attach the lens collar to the camera stand using one of the M4 screws.

Set the camera stand at the center of the board and put the stepper assembly on top of it.



Now, temporary mount the controller and the power board.



This will give you an idea where to drill the second mounting hole away from the controller.

Fix the stepper motor and its board to the main board using two large wood screws. Leave the screws loose because you still have to do the camera alignment procedure.

Drill a few guide holes for the controller and the power board and secure them using small wood screws.

You will also have to drill the clearance hole for the camera lens so that the board can be laid flush with the board.

You can add another small board section under the controller and power board for additional stability if required.

## Reel mounts

The reel mounts can be made from angle aluminum.

<https://www.amazon.com/gp/product/B000EUGY24/>

Cut 4 pieces using a metal cutting saw or a jig saw.

2 pieces 6" or longer depending on reel sizes that you plan to use

2 pieces  $\frac{1}{2}$ " shorted than the first pair

### **Left side reel mount.**

Drill the mounting hole for the reel close to the top of the longer aluminum piece.



Drill a pilot hole first and then use the step drill to widen the hole a bit at a time until wide enough for the reel spindle. You may want to put some tape around the spindle so that the hole is a bit larger than the spindle.

Mount two 8mm spacers onto spindle mounting holes.



Insert the spindle into the aluminum bracket hole that you drilled.



Mark up a circle around the spacers using a marker. Remove the spindle and drill the holes at marked up locations using a 3/32 drill bit.

Countersink the hole at the front using the 5/32 drill bit. This will prevent the screw heads from protruding out and interfering with the reel.



Install the spindle by using two M2x16mm screws, 8mm brass spacers on the other side. Finish it using two longer spacers as shown.



Mount the short bracket to the long bracket by drilling two holes and using two M4 screws (or similar hw). Make sure the two brackets are aligned properly before drilling. Use a clamp or vise grips.

Drill a 1/8" hole for the film guide. Make sure it will be roughly at the same height as the film gate.



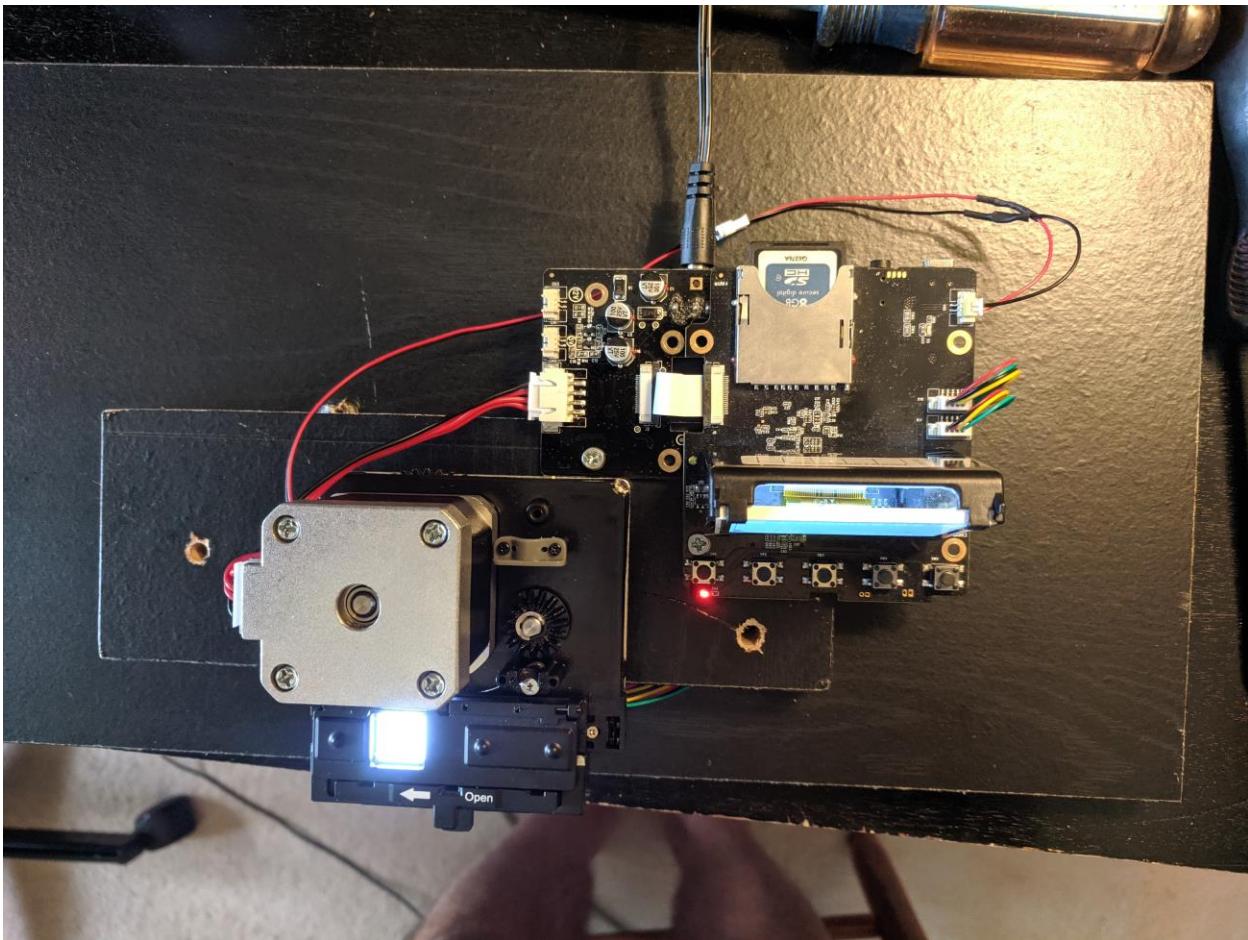
This completes the left side. Use similar procedure for the right hand side to mount the takeup system. You will also have to cut a notch in the bracket to allow enough space for motor mounting. Use the jigsaw for the job and the finish it with a grinder so that there are not bumps and ridges between the two surfaces.

Note: Mount the spindle first. Then add the spacers to the motor bracket and align the gears and then mark up the holes.

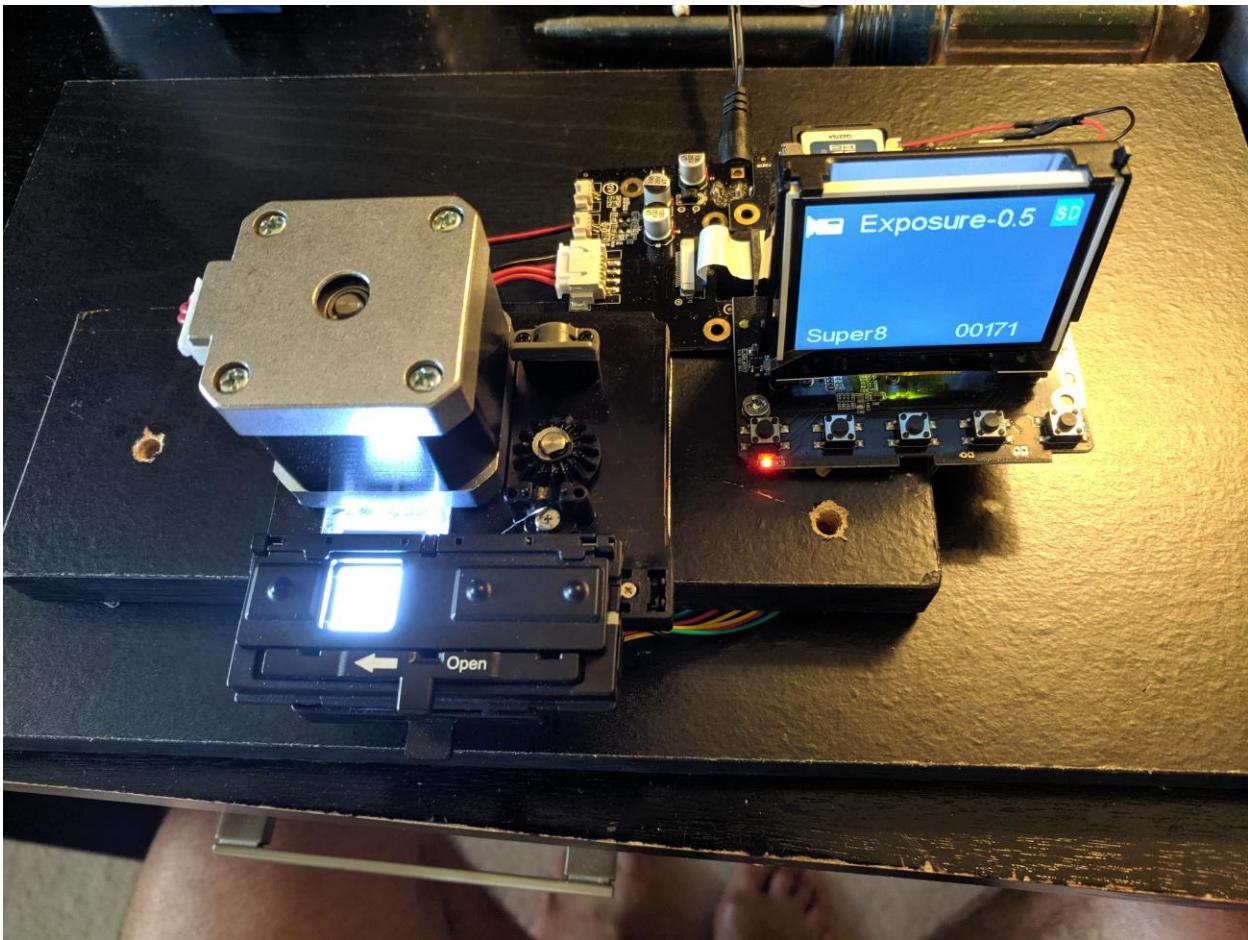
## Final Assembly

Mount the Wolverine controller, stepper and the power board onto the stepper board.

Connect the S8/R8 connector, sync connector, led connector and the stepper connector as shown.

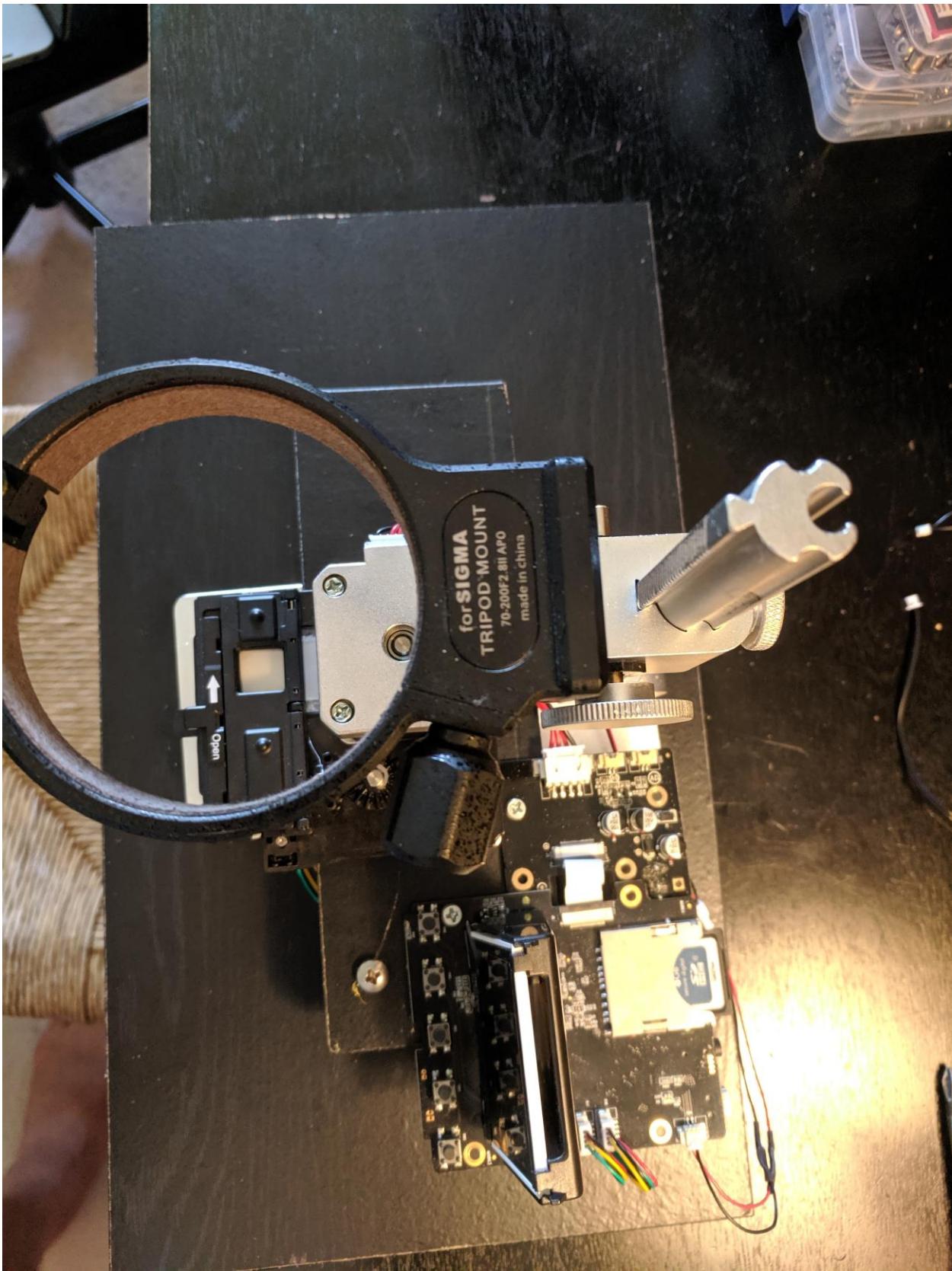


Power the board up and make sure it works.



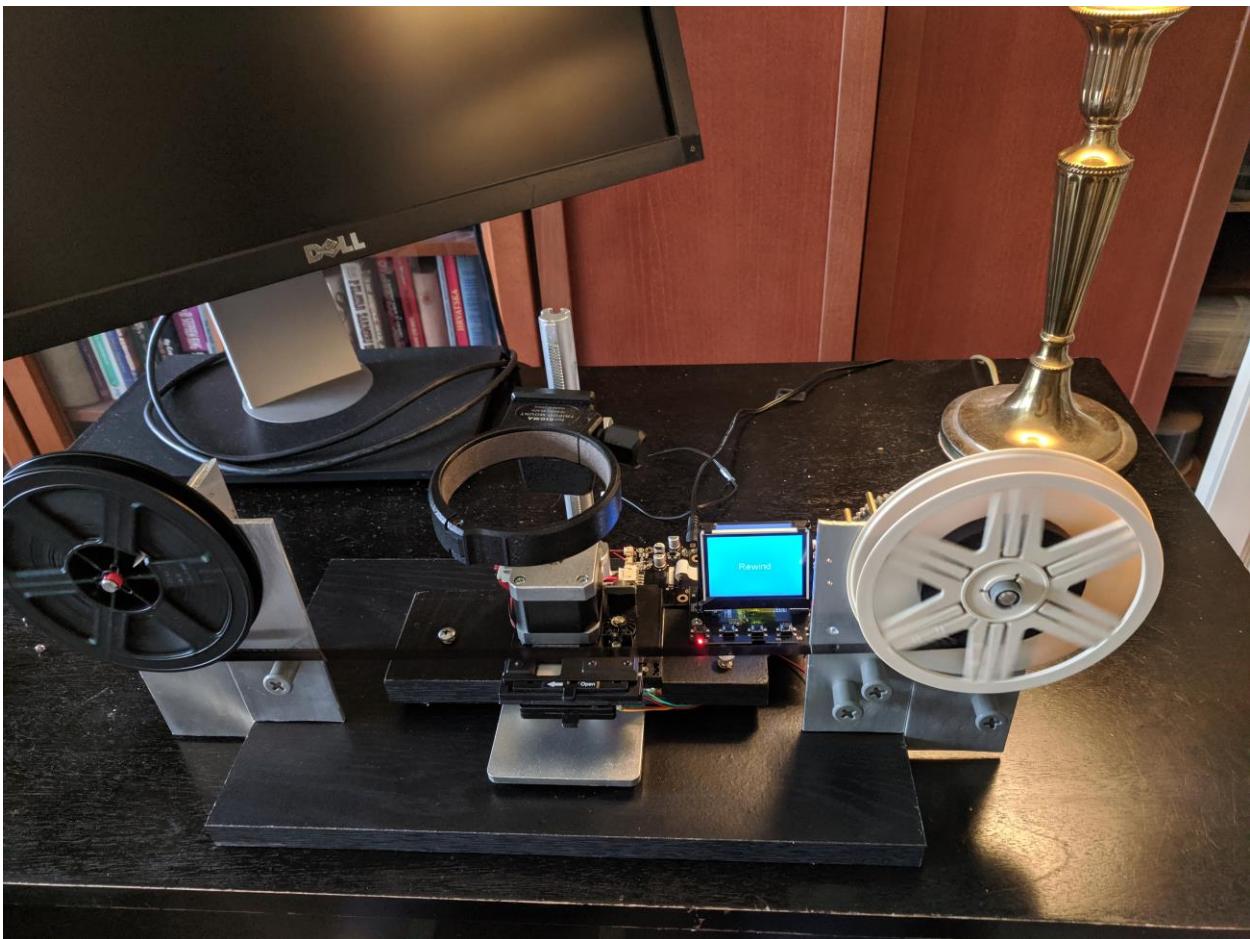
If the stepper turns on upon power up and does not stop then the S8/R8 and sync cables have to be swapped.

Now assemble the camera stand and the stepper assembly onto the main base board.



Do not tighten the mounting screws. That will be done after the camera alignment.

Attach the left and right reel brackets.



Add some synthetic grease to the takeup gears.



Item No. 21030

\*U.S. Patent No. 5,037,566

Reverse the DSLR wide angle lens using the reverse mount. Install the collar on it and mount it on the stand.



Connect the camera to a large monitor. Turn the camera on and put in Live Preview. Turn the Wolverine controller on. Center the camera by sliding the tripod stand until the image is centered on the monitor.

Adjust focus by rotating the tripod stand height knob.

Once the image is in focus and centered tighten the mounting screws slightly, but not too tight. Readjust focus if necessary.

Record the video and by turning on the camera record mode and running the Wolverine scan at the same time. Start the camera recording a bit earlier to make sure that none of the frames get lost. You can delete the still scene later in the post.

Once done, transfer the clips into a computer.

## Post processing

Run the `ffmpeg` command to extract the individual frames from the video clips.

Ffmpeg example:

```
ffmpeg -i "1.mov" "clip1\%03d.jpg" -r 30
```

The jpg format is fast and it is ok for drafts but it will have low resolution and the video will look pixelated. For final video use the tiff format.

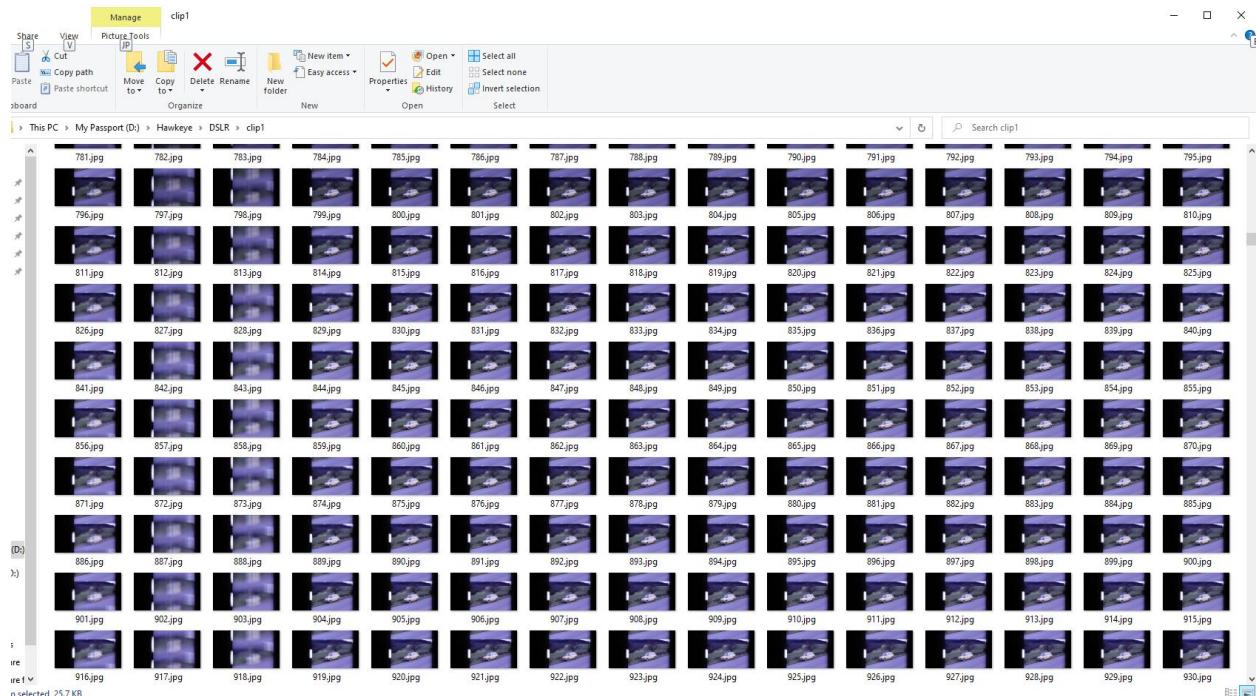
```
ffmpeg -i "1.mov" -pix_fmt rgb24 "clip1\%03d.tiff" -r 30
```

Alternatively, use daVinci or similar video editor to extract the frames.

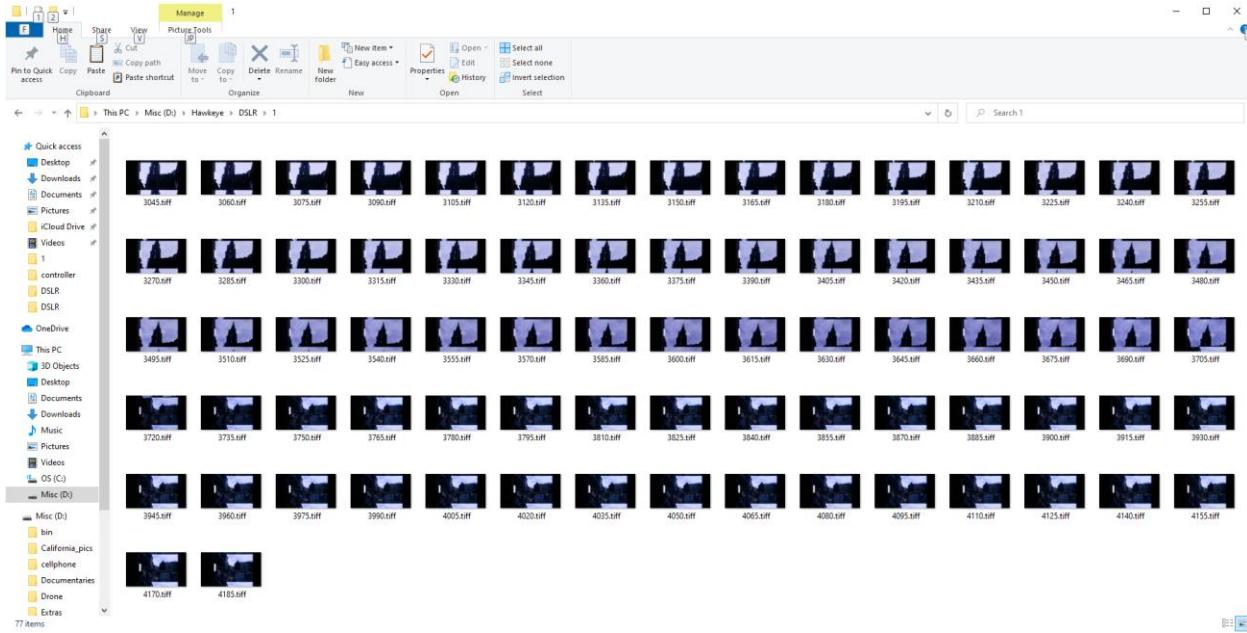
Open up the images folder with the file explorer and set the icons to small images. Resize window so that you have 15 images per row.

What you will see is that one or two columns contain the transitions and the rest of the column images are ok. Select one of the good columns, copy it and paste into another folder. This folder now will contain the clip images and can be spliced into a video in VirtualDub, daVinci or similar editor.

One issue is that the images are not numbered consecutively and some video editors will have problems with that. To renumber the images in the destination directory select all of the images and use a right click and then the rename command.



Here is an example of the output directory. Note that the file name numbers are not consecutive.



Select all and click on the rename button on the top. One of the file names will be highlighted. Type the new name in there, something like “image”. The hit enter and all of the files will be consecutively renamed.

Now you can use a video editor to and process the images.

Alternatively you can use a rename batch file.

```
SET Input_PATCH1=pics
SET Input_PATCH2=pics1

SET srcstart=86
SET dststart=1
SET count=1200

FOR /L %%i IN (%srcstart%,15,%count%) DO (CALL :reorder %%i)
GOTO :eof

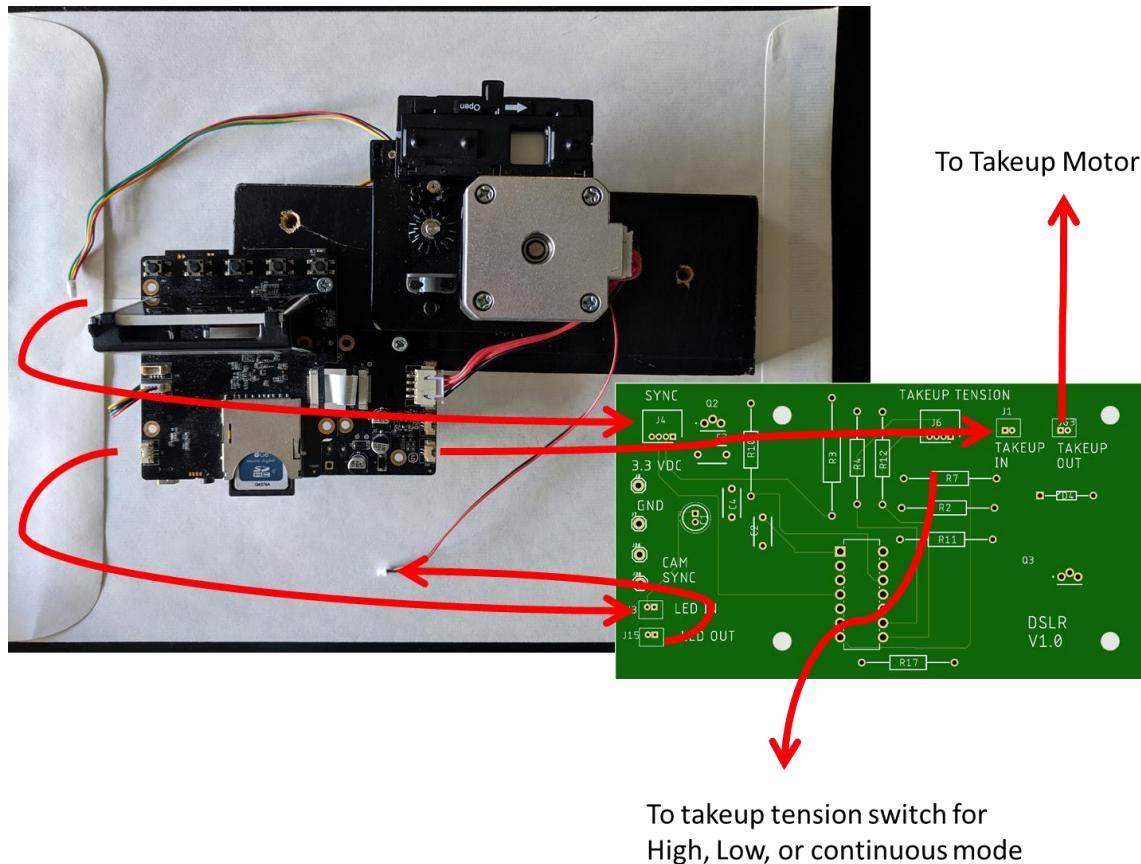
:reorder
set /a j=(%1-86)/15
copy %Input_PATCH1%\%1.jpg %Input_PATCH2%\%j%.jpg
GOTO :eof
```

## Frame-by-frame

For e-shutter cameras it is possible to put together a small interface board from your Wolverine controller to trigger the DSLR. This is not recommended for the DSLRs with the mechanical shutter because it will eventually wear out the shutter rendering the camera useless.

Also in the works is a small board that interfaces to the Wolverine controller to pulse the takeup motor reducing the amount of frame to frame play (jitter).

Here is the wiring diagram for frame-by-frame.



The board gerber file is available from:

<https://github.com/vintagefilmography/DSLR/>