

Hawkeye Operating Guide



This guide provides instructions how to use the Hawkeye scanner. It assumes that the unit has been fully assembled and that it is ready to be used. If you have an unassembled unit i.e. if you have a Wolverine and the Hawkeye kit that are not put together, then refer to the Hawkeye user manual for assembly instructions:

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

Test

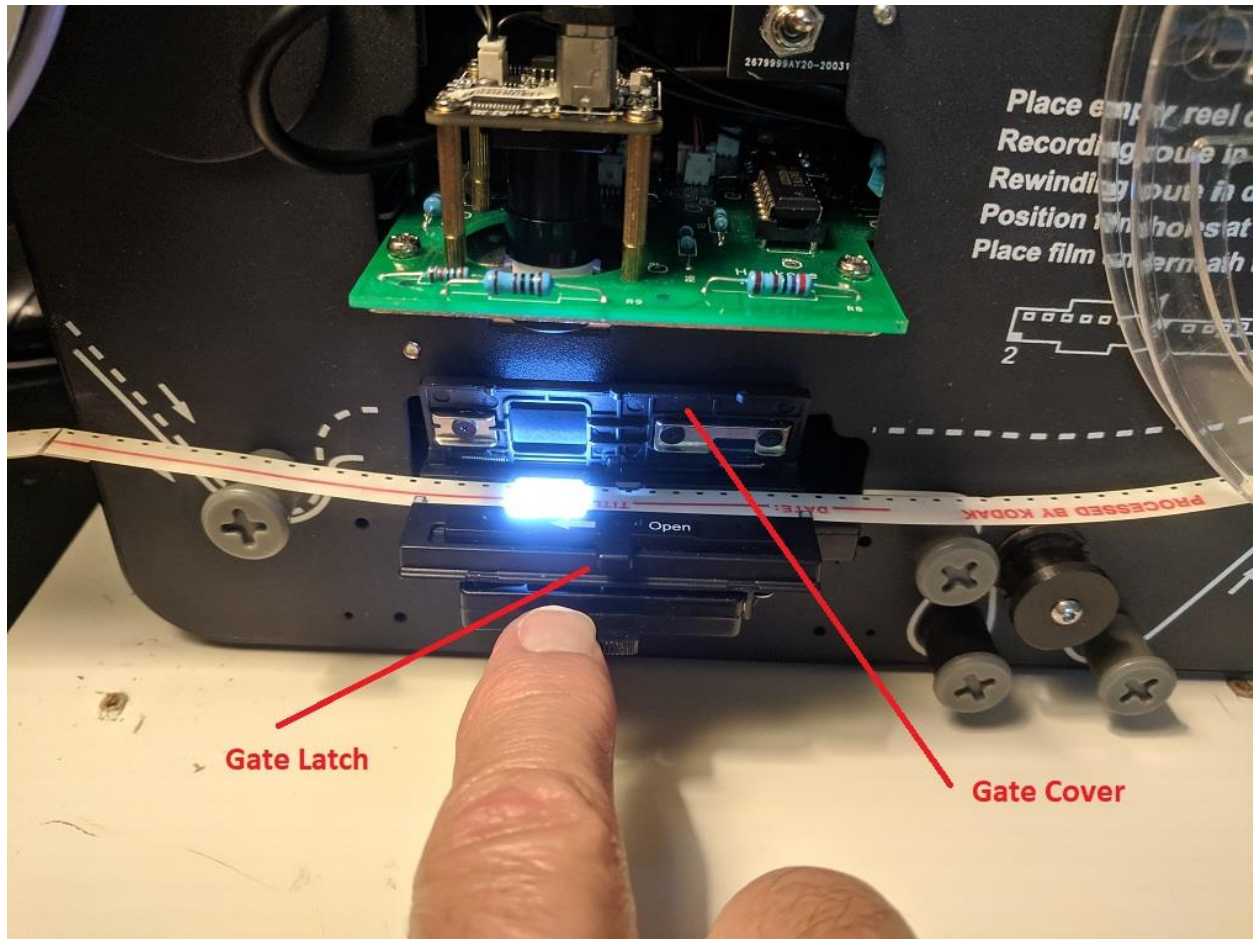
Set a unit on a solid flat surface. Be careful when handling the unit. It is top heavy and can easily tip forward if handled carelessly.

Plug the AC adapter DC output plug into the power supply. The LED should turn on.



Make sure the fan is off. It could sometimes cause 5V startup issue. Once the unit powers up and the LED is on, the fan can be turned on.

Turn the RUN switch on. The stepper motor should start running. Carefully open up the film gate by holding the gate cover with one hand and sliding the gate switch to the left. Gently lift the gate cover up.



Make sure that the claw is moving and running at roughly 0.5 cycles per second.

Turn the SPEED switch on.

The claw should start running at 1 cycle per second.

Turn TURBO switch on.

The claw should start running at 2 cycles per second.

Turn REWIND on. The stepper should stop after 10 seconds and the alarm should sound.

Turn all switches off.

Note:

With the RUN switch on and REWIND on the capstan starts the capstan timeout count. If the capstan motor does not move within 10 seconds (no film), the stepper motor will stop and the alarm will sound.

Turn the REWIND switch on. The takeup motor should start running. Test the REV (reverse) switch and make sure that the takeup motor reverses.

Note: Make sure that the reverse switch is in proper position during normal operation to ensure proper film takeup.

Here is the function table for the switches

Run	Speed	Turbo	Rewind	Mode
Off			Off	Off
Off			On	Rewind
On	Low	Off	Off	0.5 FPS HDR
On	Low	On	Off	1 FPS HDR
On	Hi	Off	Off	1 FPS
On	Hi	On	Off	2 FPS
On	Low	Off	On	0.5 FPS HDR + Capstan
On	Low	On	On	1 FPS HDR + Capstan
On	Hi	Off	On	1 FPS will add capstan
On	Hi	On	On	2 FPS will add capstan

Hawkeye Film Scan Procedure

Overview

Here is a list of apps that you will need.

The IC Capture program can be obtained from the following link:

<https://www.theimagingsource.com/support/downloads-for-windows/end-user-software/iccapture/>

VideoFred's script plus VirtualDub2 – Stan's version:

<https://drive.google.com/open?id=1ICS4yfdq11s3UVfLaKwdj7SDPLWskHyt>

Fred's Script link:

<https://forum.doom9.org/showthread.php?t=144271>

VirtualDub2

<https://sourceforge.net/projects/vdfiltermod/>

First Step First

It is assumed that the Hawkeye board is installed and working.

Mount the reels and thread the film

Connect the camera usb to the camera and the PC.

Run IC Capture in the PC and proceed with the settings.

IC Capture Settings

Two camera models are used with Hawkeye:

DFM72BUC02

DFM37UX226

The UX226 has higher resolution and a bit nicer color tones. The shadows have a bit more details and do not have the red tinge like with BUC02. Other than that the two cameras are similar.

Note: The settings are very similar but there are a few differences listed here:

UX226 exceptions:

White Balance:

R = 2.30

G = 1.0

B = 1.05

WDR should be turned on but does not have additional settings like the BUC02.

End of exceptions.

Set resolution to 1280x1024 for 12mm lens. For 16mm set resolution to the highest and rotate the image properly by clicking on the rotation buttons on the top right hand side of the app.

Select the ROI (Region Of Interest) to crop the frame properly.

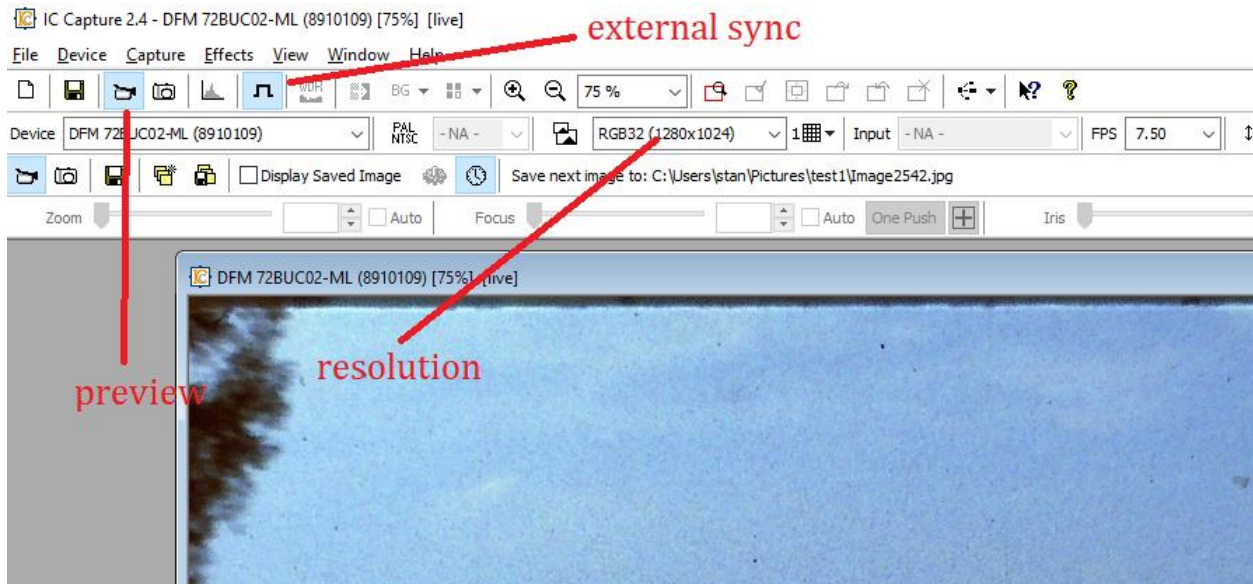
Here is the summary of IC Capture settings. Try the settings first and if not happy with the result follow the detailed procedure below to tweak the settings.

- **Color**
 - Saturation = 59
 - White Balance Auto = off
 - White R = 96
 - White G = 64
 - White B = 65
 - Color Enh = off
- **Exposure**
 - Exposure Auto = on
 - Auto Reference = 84 (INCREASE THIS IF FRAMES TOO DARK)
 - Highlight Reduction = not set
- **Image**
 - Sharpness = 0 (SET AS REQUIRED – SET to 0 IF SHARPENING DONE IN POSTPROCESS)
 - Gamma = 80
 - Denoise = 0
- **Partial Scan** - set as required to center the frame
- **WDR**
 - Tone Mapping = on
 - Intensity = -1.76
 - Global = 0
 - a = 3.28
 - b = -0.24
 - c = 0.30
 - lum_avg = 0.35

Save settings.

Resolution, external sync and preview

The first thing is to set the resolution to 1280x1024.



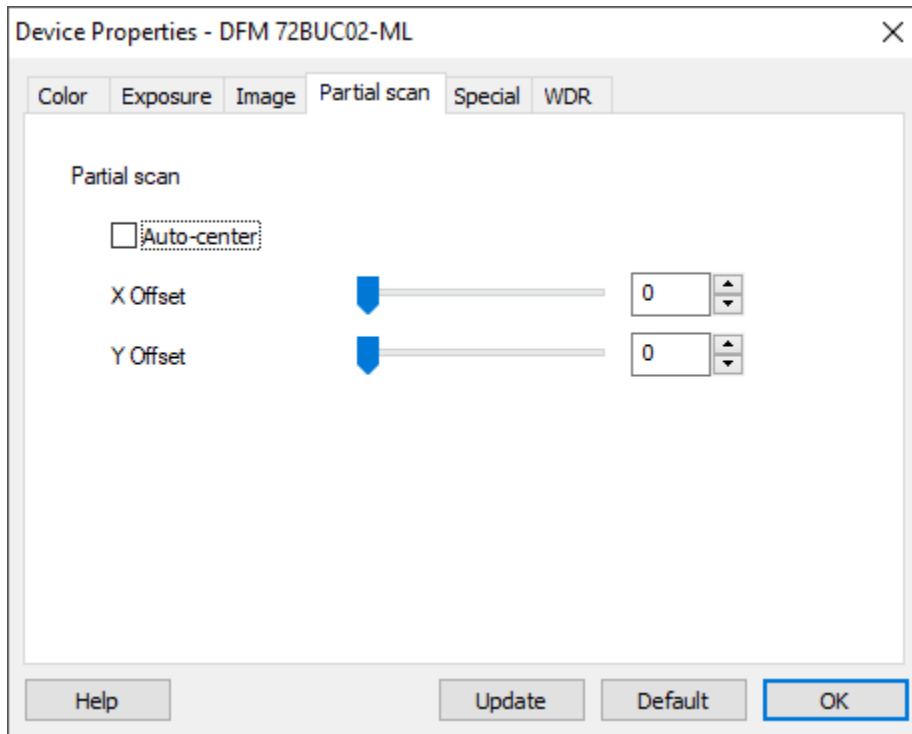
Turn external sync off and turn on preview.

Set Partial Scan

This is not needed if ROI used.

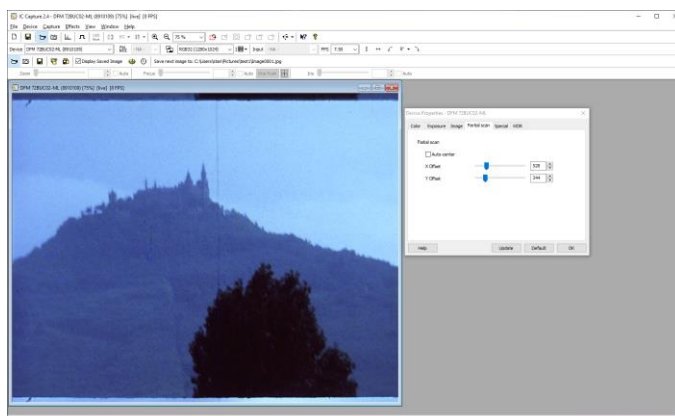
Click on Device menu and then select Properties.

A new window will open up:



Make sure Auto-center is un-checked.

Adjust X offset and Y offset until the frame is centered properly. Since the frame is a bit smaller vertically than the window, some rollover will show on the top and bottom. This can be removed during post-processing.



Color Adjustment

Click on the Color Tab and adjust as shown:

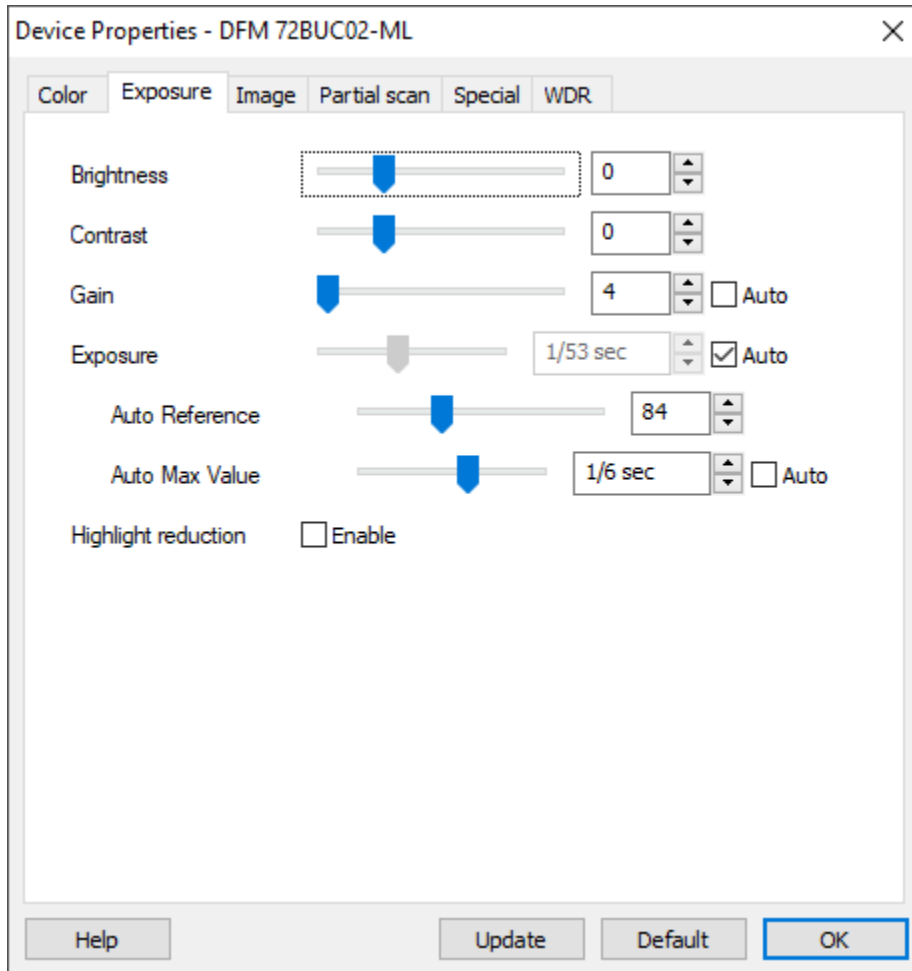
The screenshot shows the 'Device Properties - DFM 72BUC02-ML' dialog box with the 'Color' tab selected. The dialog has a title bar with a close button (X). The tabs are 'Color', 'Exposure', 'Image', 'Partial scan', 'Special', and 'WDR'. The 'Color' tab contains the following settings:

- Hue:** A slider and a numeric input field set to 0.
- Saturation:** A slider and a numeric input field set to 75.
- WhiteBalance:** A checkbox for 'Auto' (unchecked) and a button for 'OnePush'.
- WhiteBalance Mode:** A dropdown menu set to 'Gray World'.
- Auto-Preset:** A dropdown menu set to 'Any'.
- Temperature Preset:** A dropdown menu.
- Temperature:** A slider and a numeric input field set to 0.
- White Balance Red:** A slider and a numeric input field set to 96.
- White Balance Green:** A slider and a numeric input field set to 64.
- White Balance Blue:** A slider and a numeric input field set to 65.
- Color Enhancement:** A checkbox for 'Enable' (unchecked).

At the bottom of the dialog are four buttons: 'Help', 'Update', 'Default', and 'OK'.

Exposure

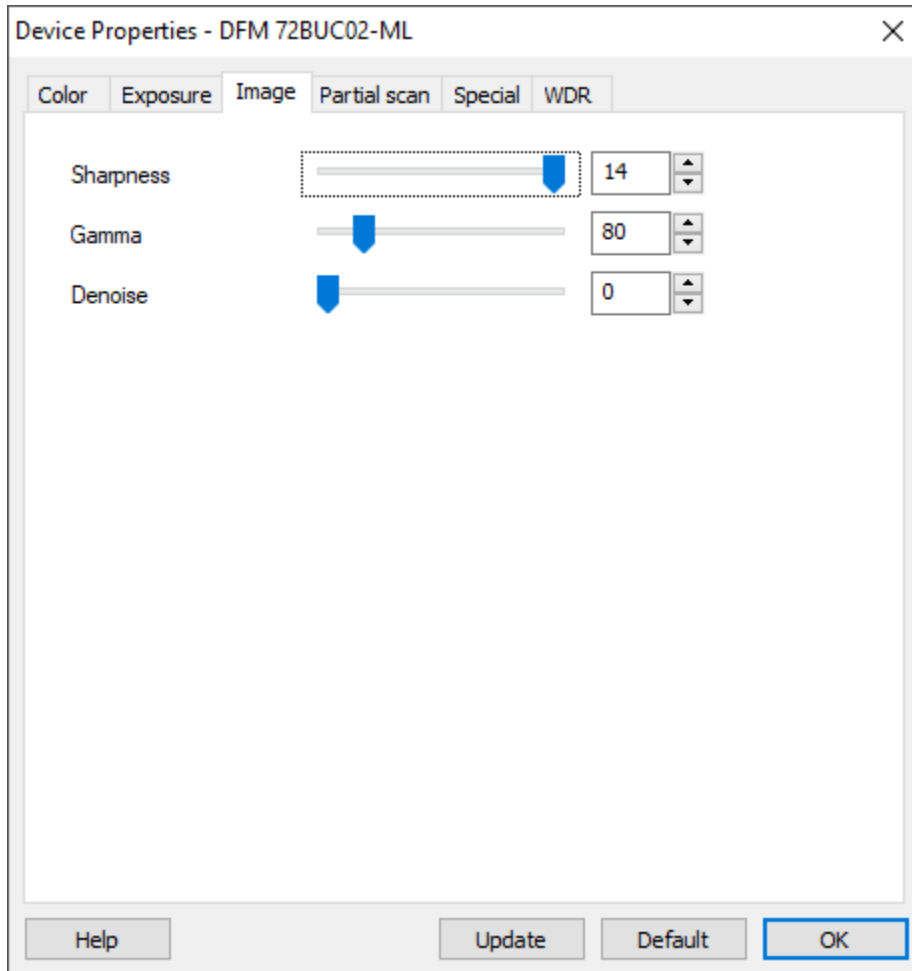
Set as shown:



The Auto Reference setting will impact the average brightness. If a particular scene is difficult and the auto setting is not very good you can change the setting on a fly. Stop the scanner and adjust and then just continue. There will be no break in the images.

Image

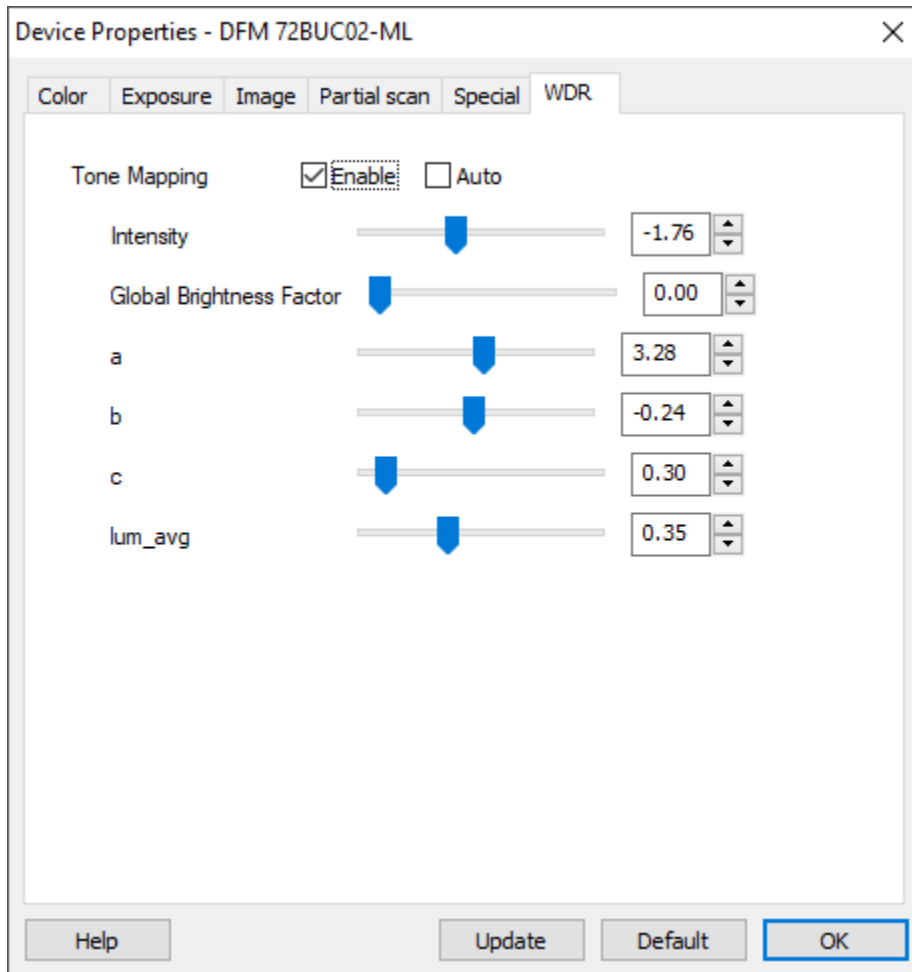
Set as shown:



Set sharpness to 14 if this is a quick scan with no post-processing. Otherwise, set it to 0, and readjust during post-processing.

Gamma is important to keep the balance between the dark and bright areas. It is better to set it here than during post-processing. Make sure WDR is turned on. Otherwise the images will look washed out.

WDR

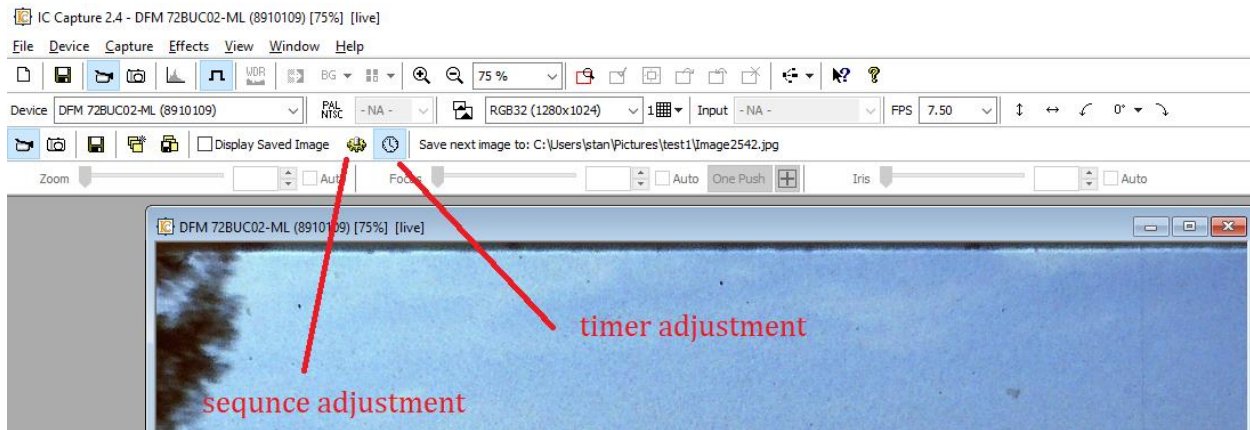


This is the Wide Dynamic Range settings. The chip has a 12bit A/D converter and the camera output is 8. So the 12 bit input has to be compressed into 8 bits. The camera firmware has a smart way of doing this compression. It drops out the bits that are less relevant to the quality of the image.

You can reset these values by picking up nice open scenery with lots of dark and bright areas, such as the blue sky, tree and building deep shadows. Then, turn auto-brightness off and turn the WDR auto on for several seconds to let it do its thing and then turn WDR auto to off, and auto-brightness back to on.

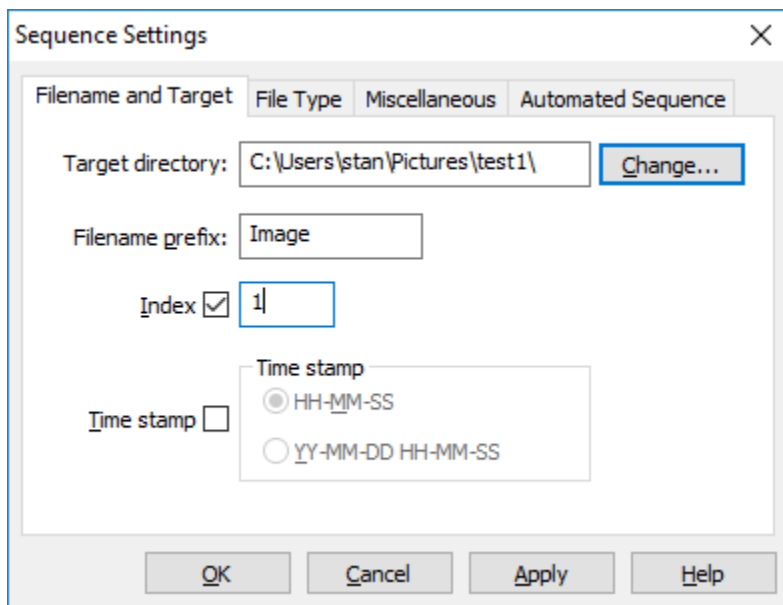
BTW – WDR will make the image more defined because the gamma setting of 80 makes it somewhat dull.

Sequence and timer adjustment



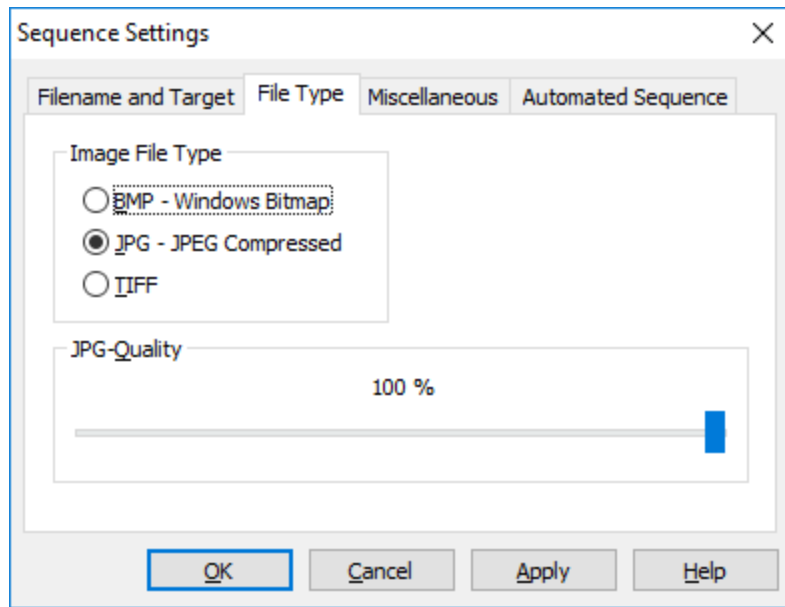
Click the sequence button:

Filename tab



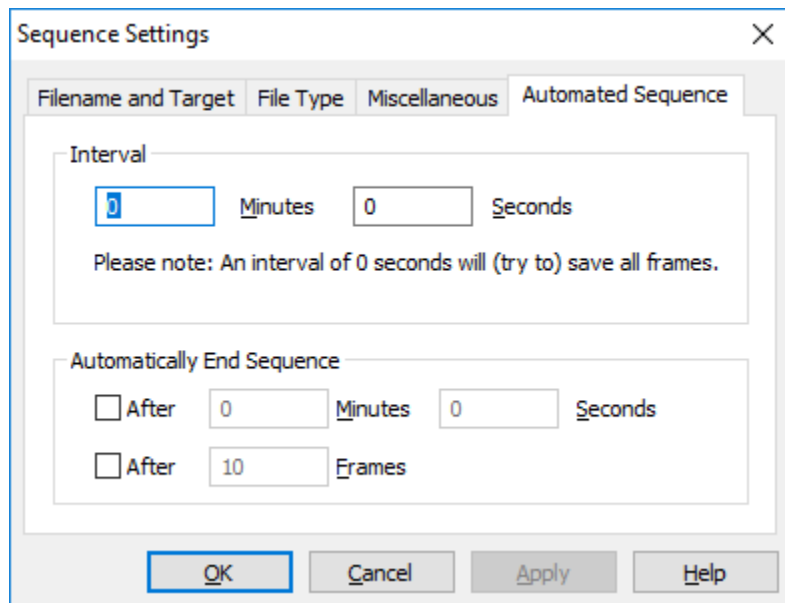
Set the destination folder path for the capture and sequence number and file name prefix as required.

Select File Type tab:



Select the type that you prefer. Jpg lower quality but less storage space required etc... If VideoFred is used, make sure to use tiff files. It will make a big difference in the end. BTW – you can spool the tiff files onto external drive if your machine is fast enough.

Select automated sequence:

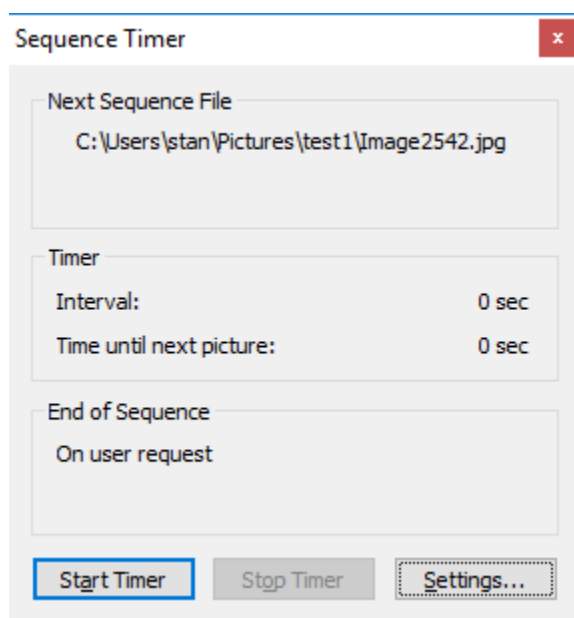


Make sure the interval is 0 minutes and 0 seconds.

Press OK button when done. The window will close.

Turn on external sync. If you do not proceed with the timer and start it the capture folder will be flooded with images. So, always make sure that the external sync is on before you start the timer.

Press the timer button:



Press start timer.

Start the capture by turning the Hawkeye run switch on. The machine will start capturing the images in the destination folder one every two seconds.

The destination folder will contain all of the images. These can be post-processed by Film9:

Create avi file with VideoFred (Virtual Dub2)

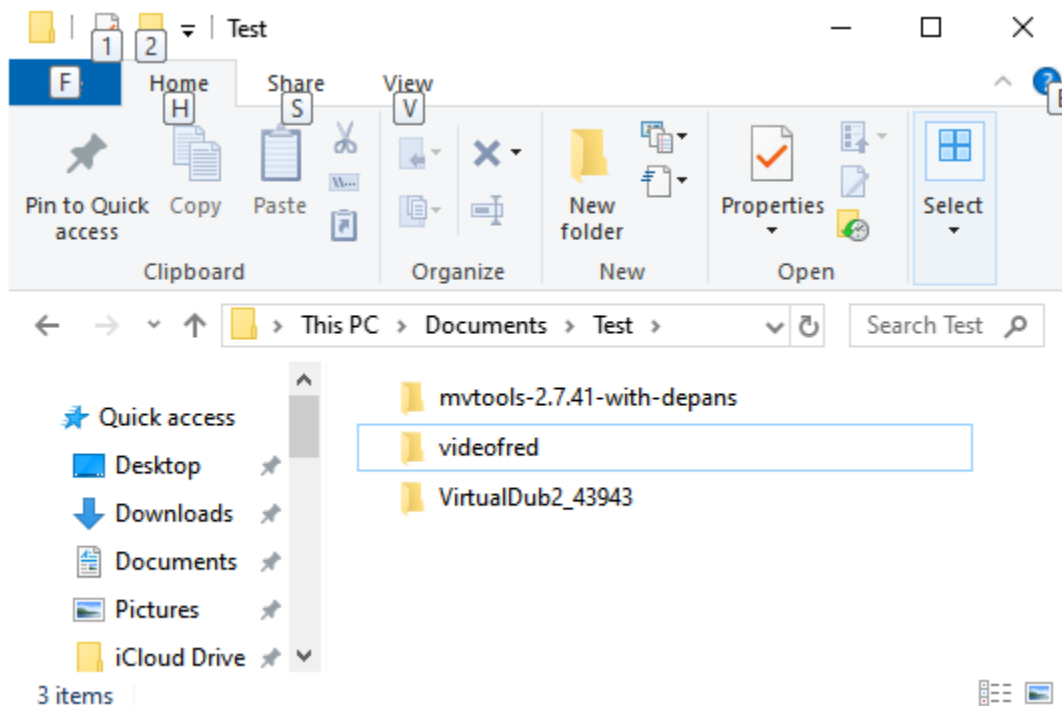
Download the zip file:

<https://drive.google.com/open?id=1ICS4yfdq11s3UVfLaKwdj7SDPLWskHyt>

Extract the zip in your download files folder. You will see Postprocess folder there once the unzip is done.

Move the Postprocess folder somewhere into a work directory on your machine.

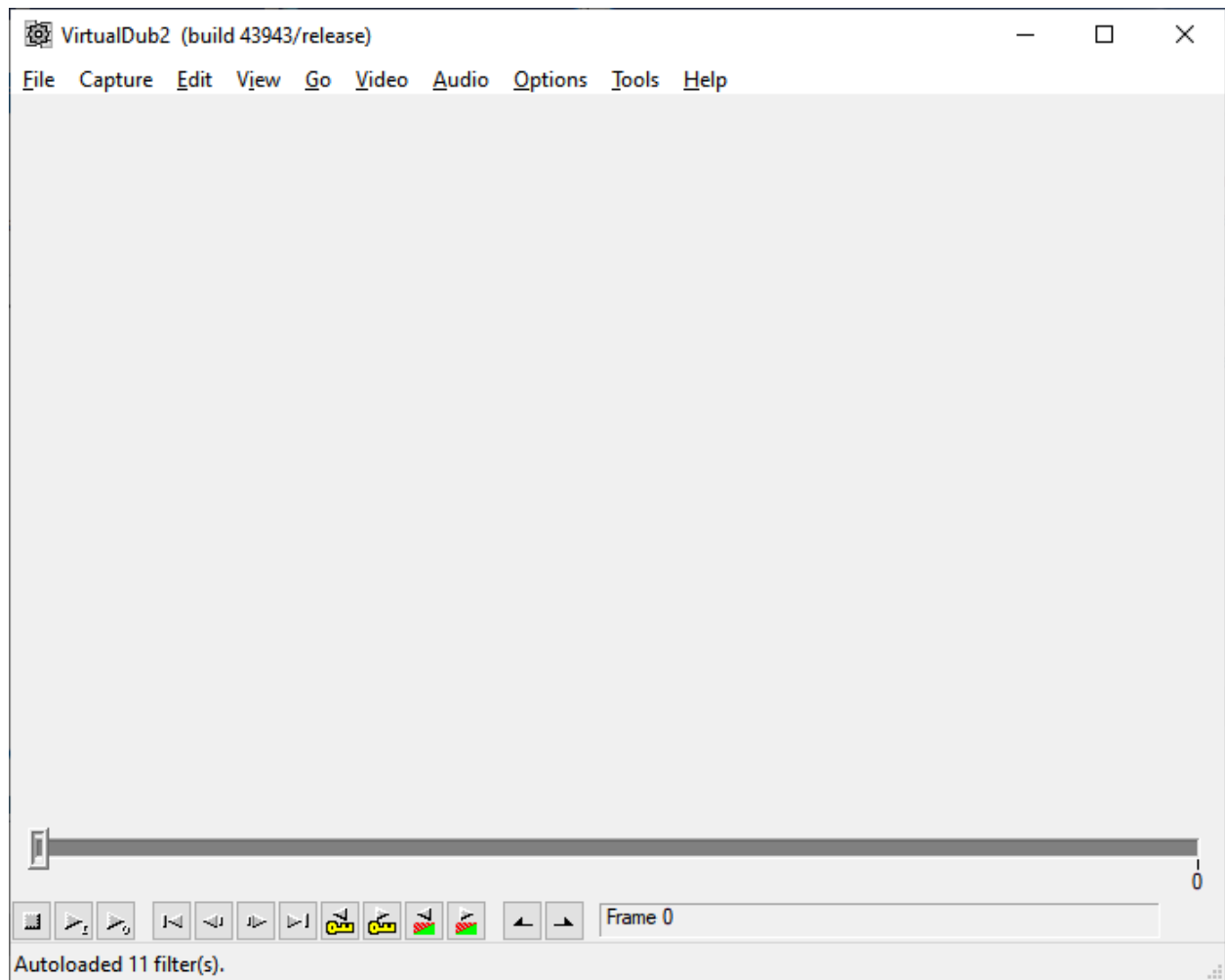
Open up the Postprocess folder. Should see the following directories there:



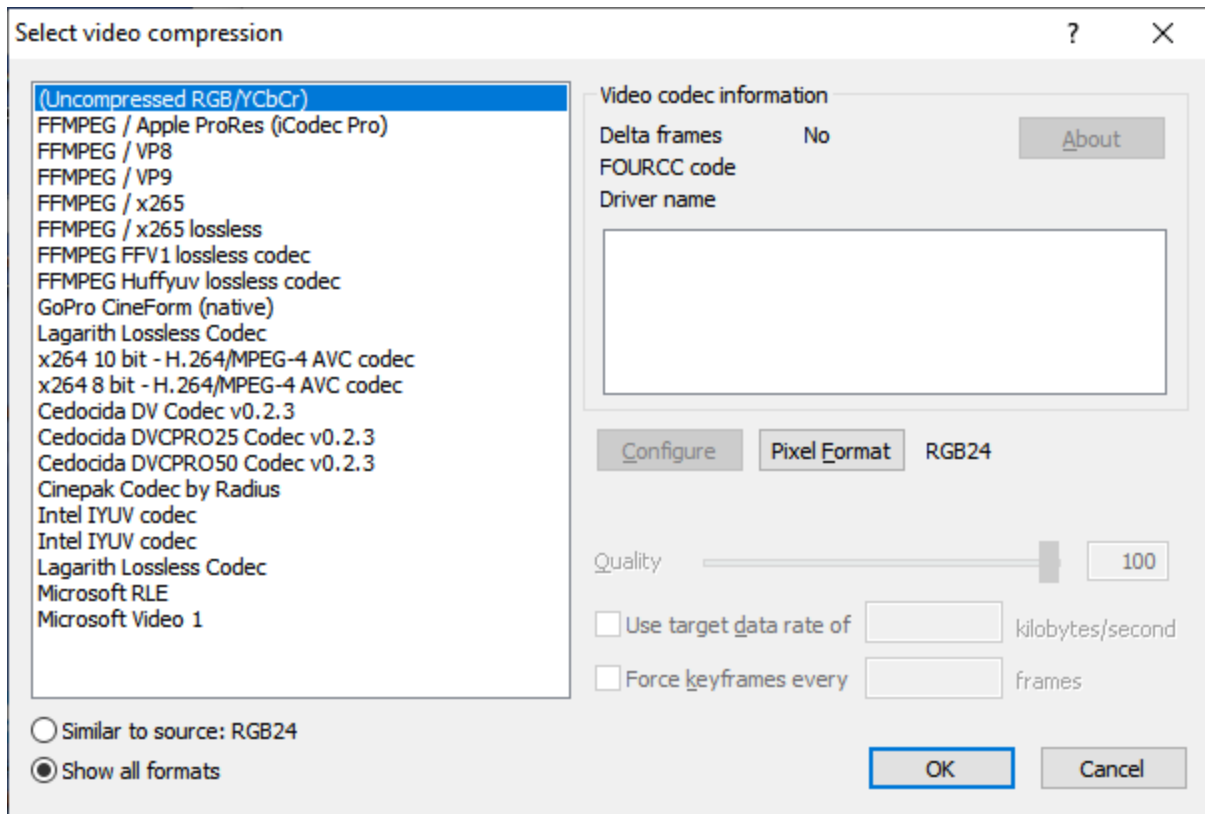
Go into VirtualDub2_43943

Double click on VirtualDub.exe.

VirtualDub2 will open.

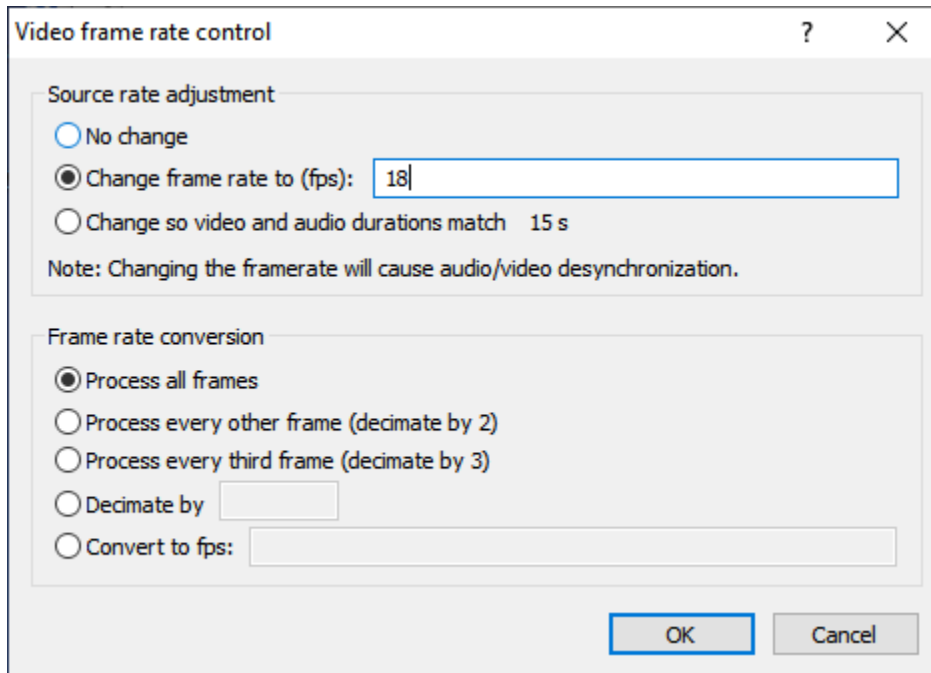


Click on the video tab and compression.



Make sure that Uncompressed is selected. Click OK.

Click on Video tab and then frame rate.



Set frame rate as required. I use 18 fls.

Click OK.

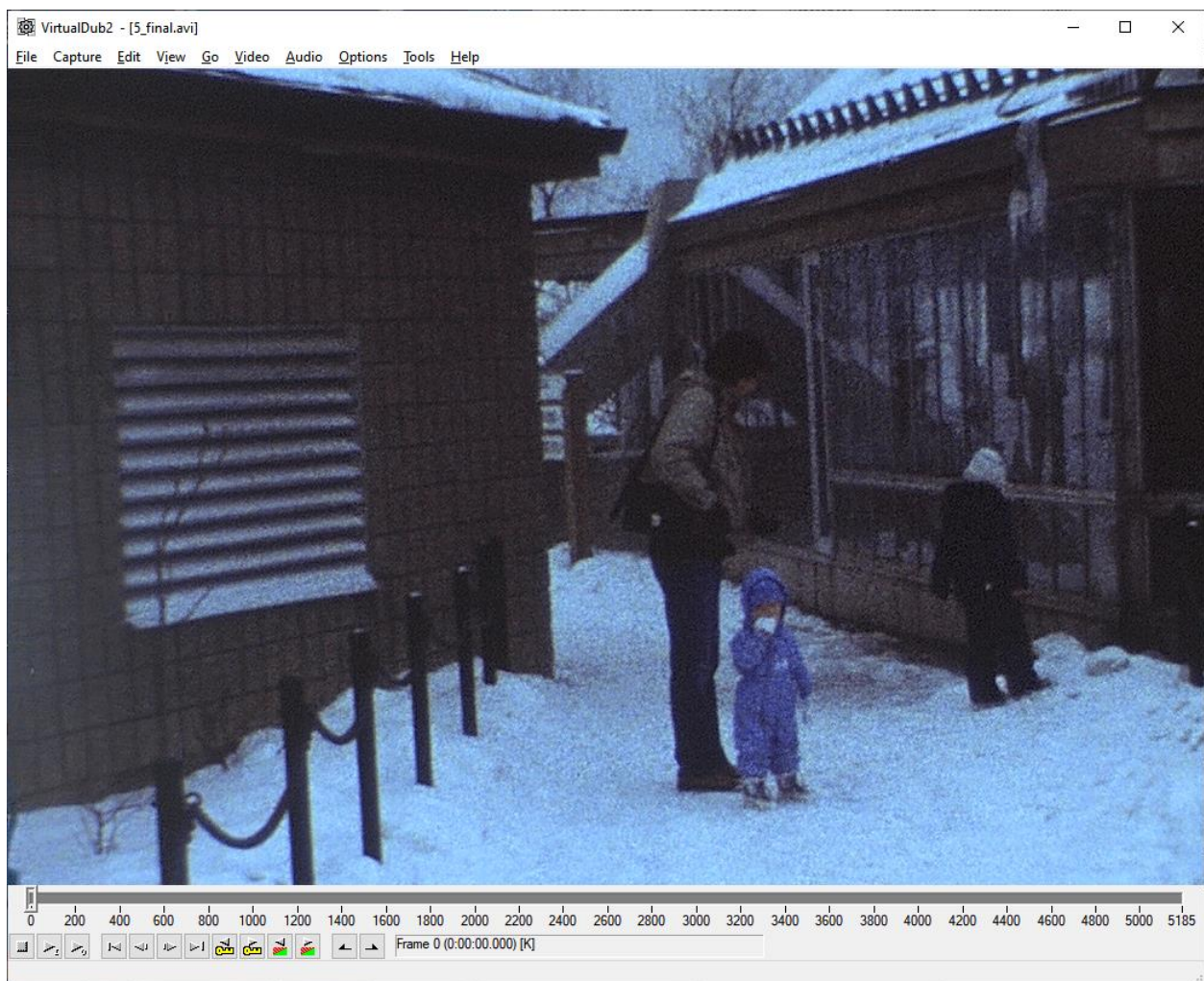
Next create a raw video from tiff images.

In VirtualDub click on File then

Open Video File

Open the first picture in the tiff series of pictures.

VirtualDub will create a video automatically from the series. Make sure that you have consecutive numbers in the series.



Then just save the file into you work directory and call it something something raw.

This is a raw unprocessed file. It is large and you can play it in VirtualDub or some other player but it will be choppy.

Next, close the file in VirtualDub by clicking File and then Close video file. Do not exit VirtualDub. Leave it there.

Now, go into the following directory:

Postprocess\videofred\20)Film_Restoring_vs_06_2012\scripts

Open up option4.avs file with a text editor (notepad is fine).

You have to change only one thing there:

```
# 8mm film restoration script by videoFred.
# www.super-8.be
# info@super-8.be

# version 01.A with frame interpolation
# release date: june 20, 2012
#=====

# august 2010: added removerdirtMC() as suggested by John Meyer
# october 2010: auto sharpening parameters

# march 2011: new autolevels.dll by Jim Battle
# www.thebattles.net/video/autolevels.html

# june 2012: improved stabilisation

#=====

# cleaning, degrading, resizing, stabilizing, sharpening, auto-levels and auto-white balance.
#=====

#film= "C:\Users\stan\Documents\8mm_video_transfer\Wolverine\Videos\Hawkeye\test11.avi"
# source clip, you must specify the full path here
#film= "D:\Hawkeye\video\canada_raw.avi" # source clip, you must specify the full path here
#film= "C:\Users\stan\Documents\8mm_video_transfer\stan_8mm\4a.avi"

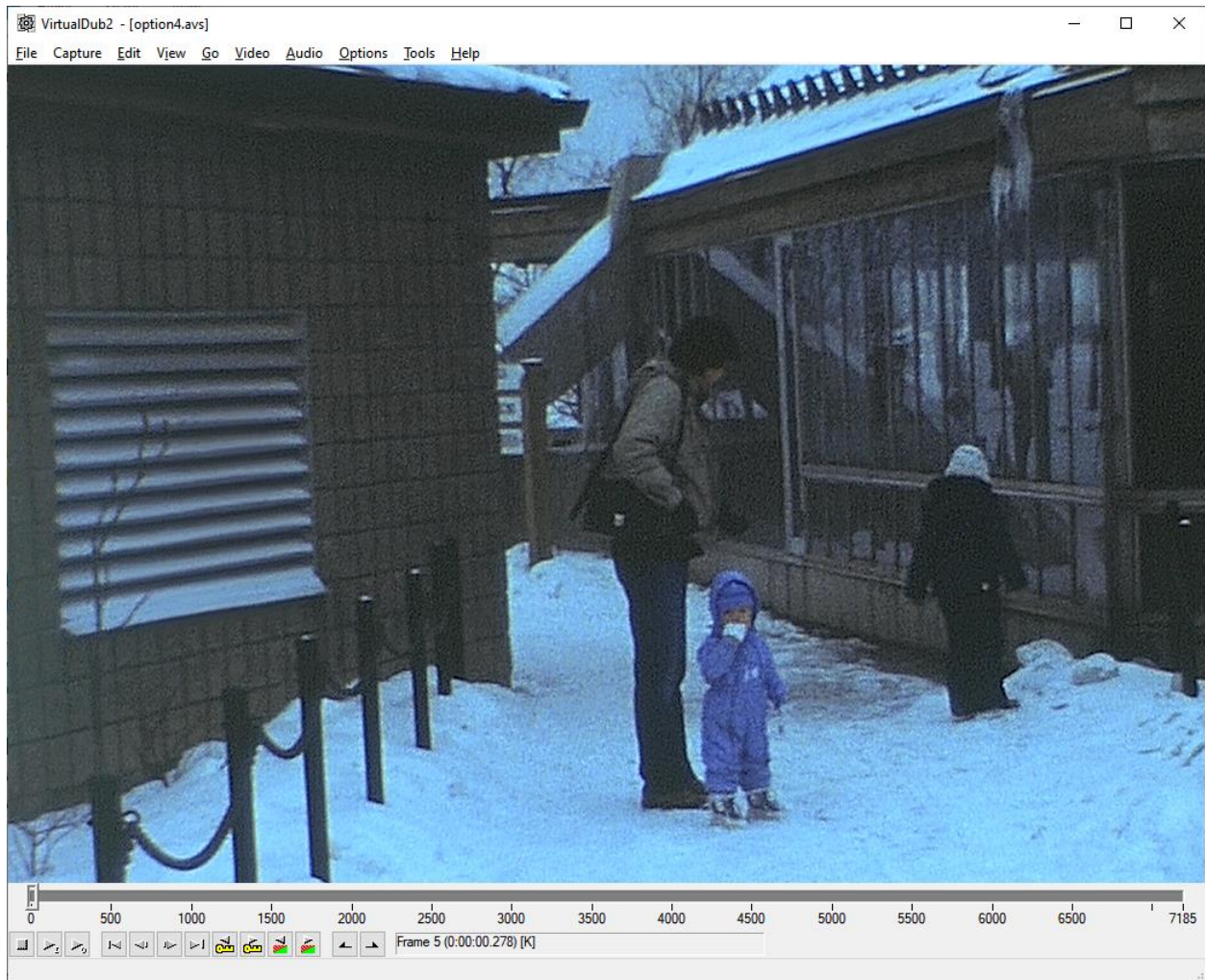
film= "E:\Hawkeye\canada\12_raw.avi"
```

Change the path to the raw file that you just saved whether it is on your local drive or external drive.

Save the avs file.

Now, go back to the WirtualDub program and click on File and then Open Video Fle and point to the avi file that you just saved.

In a few seconds VirtualDub will display the video.



If you get the removegrain.dll error then you probably do not have Microsoft tools runtime library installed on your machine.

Try downloading the runtime from here (will need an account to download). If you are concern that the library may cause other issues with the computer than skip this step.

<https://www.wincert.net/forum/topic/9790-aio-microsoft-visual-bcfj-redistributable-x86x64/>

Try this instead

Use the script debugger (AVSMeter). Download it from here (7z version):

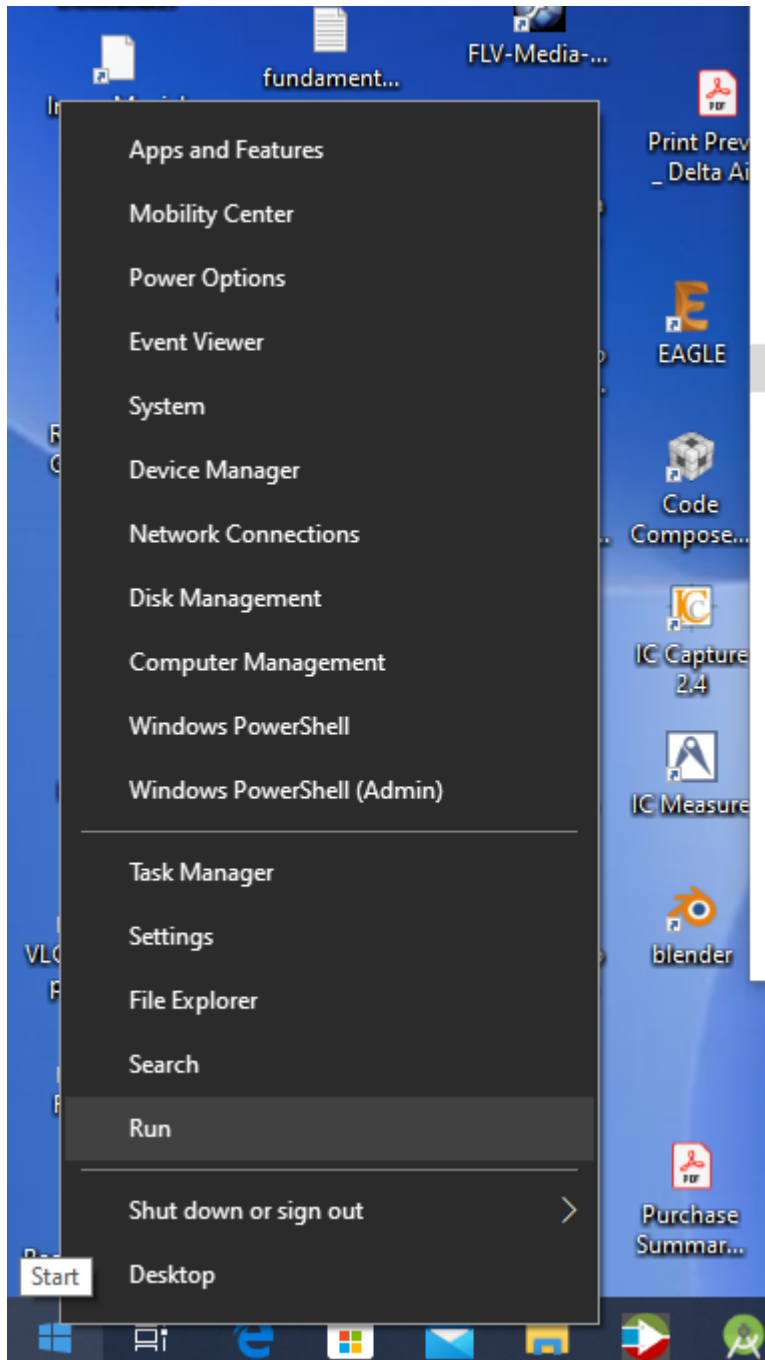
<https://www.videohelp.com/software/AVSMeter>

Or from here (zip version)

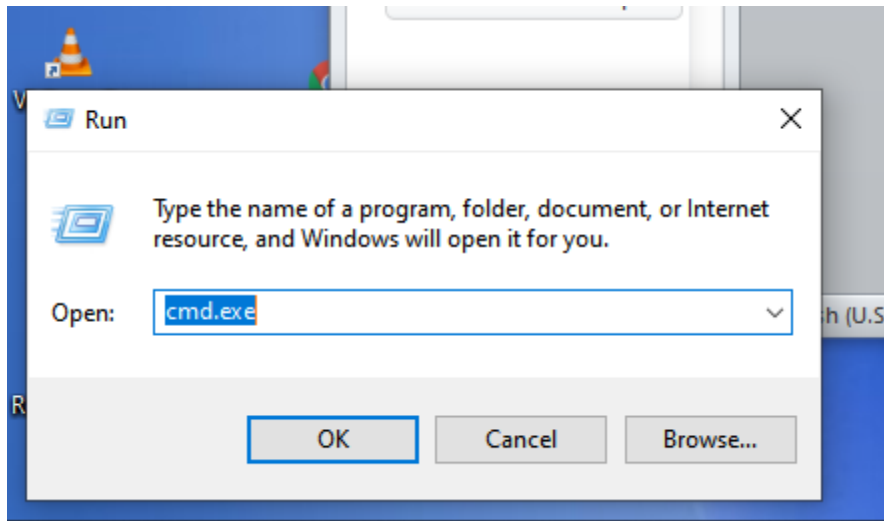
https://drive.google.com/open?id=1nTX_CwFATOGckPw0Upf7jWg6jWbTissD

Save it in your Postprocess dir. Unzip and go into it with the explorer. Copy AVSMeter.exe into your VideoFred scripts directory.

Open up dos shell by right clicking on the start button and hitting the run.

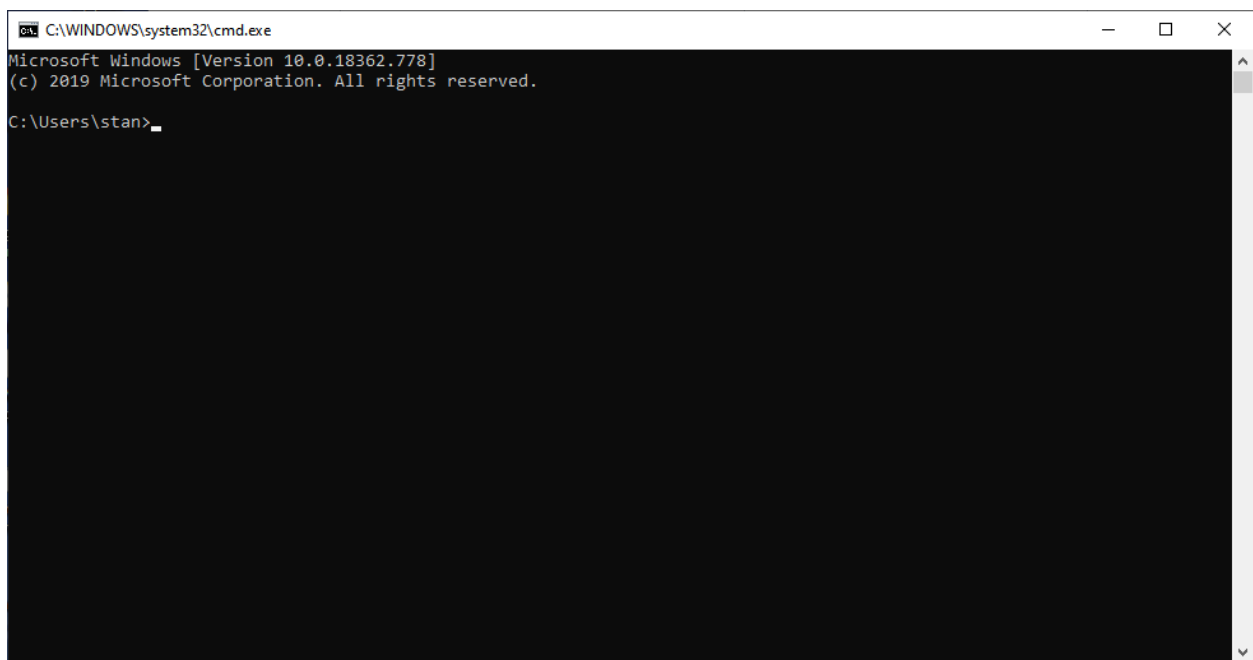


You will get the following:

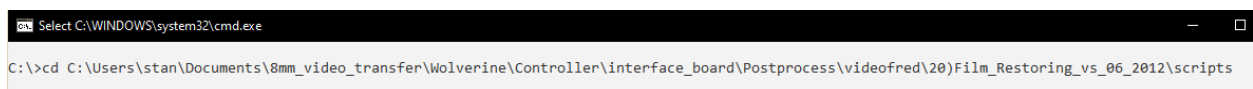


Type in cmd.exe and then hit the OK button.

The command shell opens up.



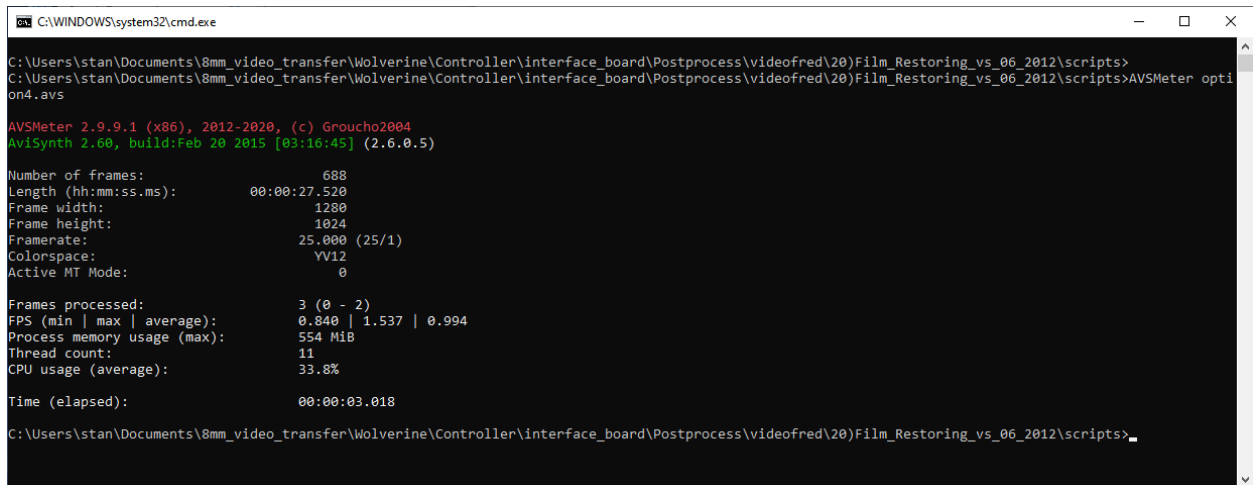
In the shell change the directory to your VideoFred scripts dir. For example, on my machine, I type in the following.



Then type in the following command in the shell:

AVSMeter.exe option4.avs

Should see the debug report.



```
C:\WINDOWS\system32\cmd.exe
C:\Users\stan\Documents\8mm_video_transfer\Wolverine\Controller\interface_board\Postprocess\videofred\20\Film_Restoring_vs_06_2012\scripts>
C:\Users\stan\Documents\8mm_video_transfer\Wolverine\Controller\interface_board\Postprocess\videofred\20\Film_Restoring_vs_06_2012\scripts>AVSMeter option4.avs

AVSMeter 2.9.9.1 (x86), 2012-2020, (c) Groucho2004
AviSynth 2.60, build:Feb 20 2015 [03:16:45] (2.6.0.5)

Number of frames:          688
Length (hh:mm:ss.ms):      00:00:27.520
Frame width:               1280
Frame height:              1024
Framerate:                 25.000 (25/1)
Colourspace:               YV12
Active MT Mode:            0

Frames processed:          3 (0 - 2)
FPS (min | max | average): 0.840 | 1.537 | 0.994
Process memory usage (max): 554 MiB
Thread count:              11
CPU usage (average):        33.8%

Time (elapsed):            00:00:03.018

C:\Users\stan\Documents\8mm_video_transfer\Wolverine\Controller\interface_board\Postprocess\videofred\20\Film_Restoring_vs_06_2012\scripts>
```

If there are DLLs missing the report will show that.

After finding what is missing, get the components from the internet or contact me at:

sjelavic123@gmail.com and I will send you zipped DLLs.

Install the DLLs in your scripts directory and that should fix the issue.

Now you can save the file and it will be cropped, denoised and interpolated.

One more important note. It is not a good idea to save it in uncompressed format. So, in VirtualDub click on Video then Compression and select the compression type. I like Logarith but you may want a different one, whatever suits your needs.

One more note. Option4.avs sets the final frame rate to 25 FPS. You can change that to whatever you want.

```
#PARAMETERS
#-----
result="result4" # specify the wanted output here

trim_begin=2 trim_end=10 play_speed=18 #trim frames and play speed (PAL: 16.6666 or 18.75)

numerator= 25 #numerator for the interpolator (final frame rate)
denominator= 1 #denominator example: 60000/1001= 59.94fps
```

And that is it. Save the file and call it final something something.

VirtualDub can also be used to concatenate the clips. For that, save the processed clips in raw format.

Open the first clip in VirtualDub and move the end of the clip by clicking the end button.



Then click on File then Append Video segment. Hit again end button (do not forget that) then append next clip and so on until the last clip is in. Then set the compression and save the final video.

And that is it.

Run virtual dub. Make sure the compression is set to no compression in video tab. Also set the desired frame rate in video tab.

Open up the first image and save the video avi to the destination folder.

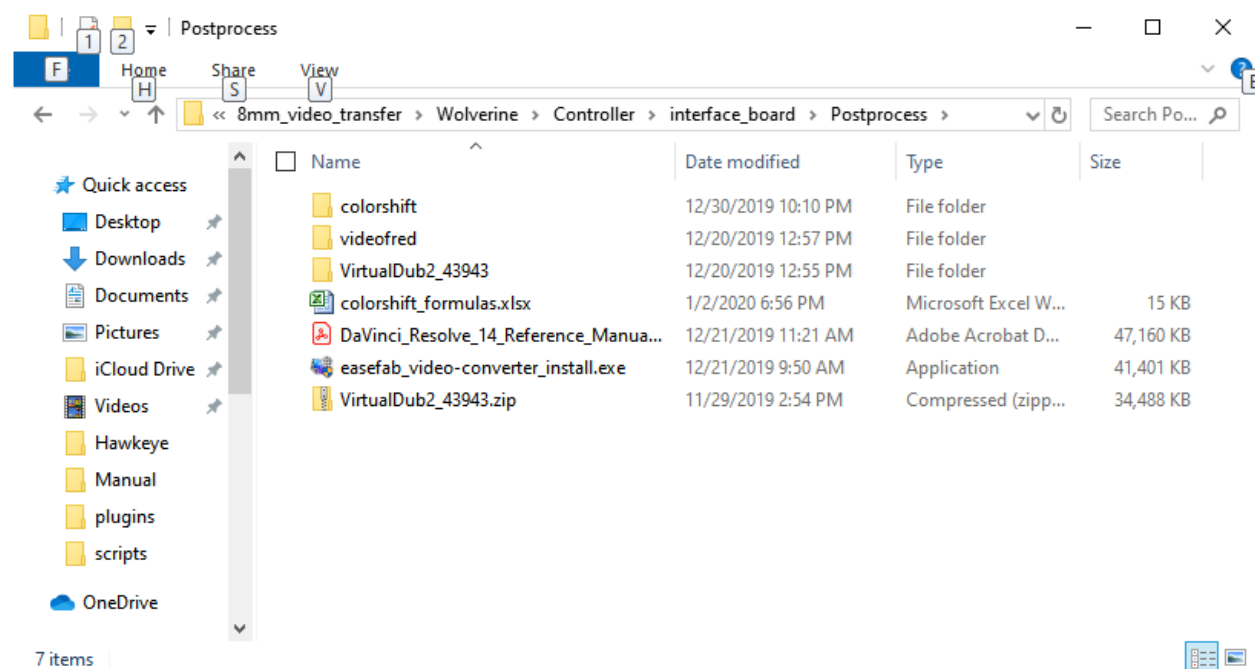
VideoFred's Script (This runs with VirtualDub2)

Download the zip file from:

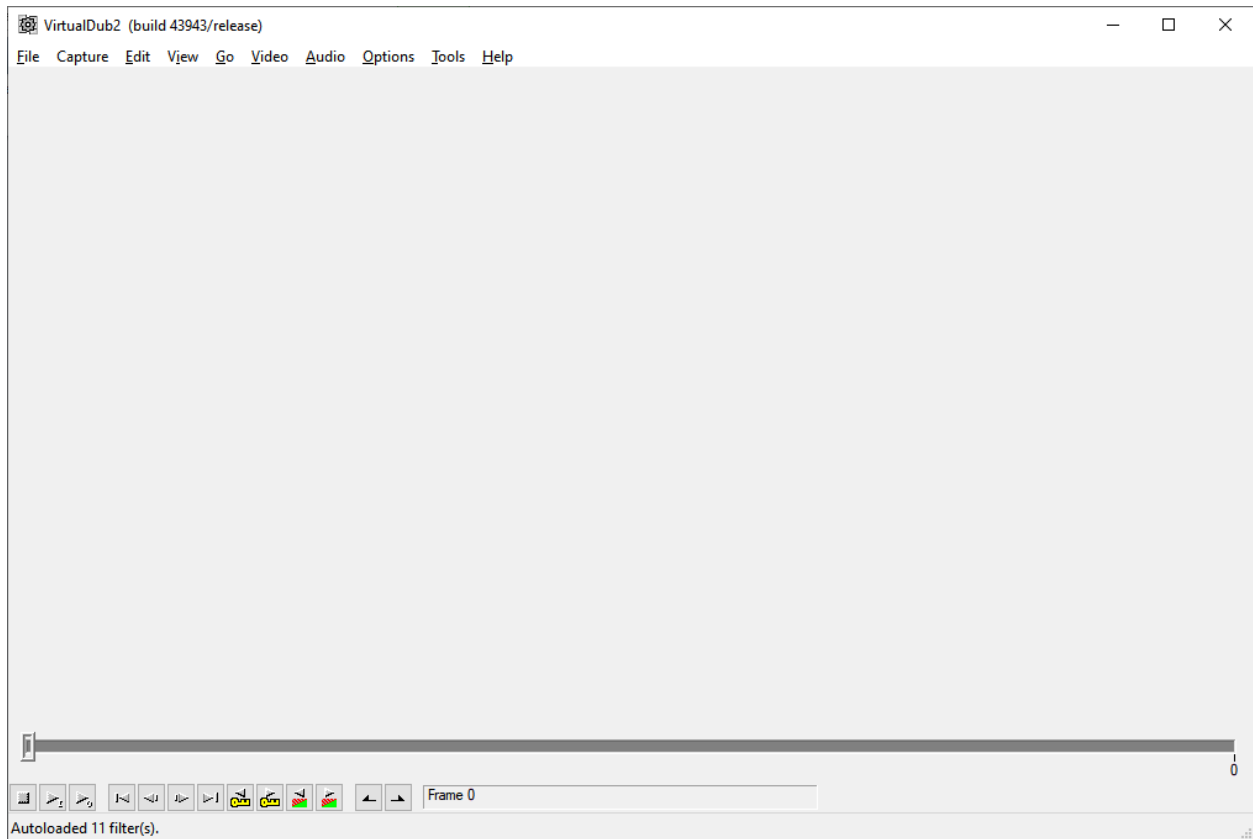
<https://drive.google.com/open?id=1ICS4yfdq11s3UVfLaKwdj7SDPLWskHyt>

Unzip the file into a work folder.

The folder has the following structure:



The VirtualDub2_4393 folder contains VirtualDub and that is first to be run.



The next thing is to set up the script.

Go into:

videofred\20\Film_Restoring_vs_06_2012\scripts

Open up option4.avs in text editor.

Change the video file path to correspond to the avi file that you saved in the previous steps.

Example:

```
film= "C:\Users\stan\Documents\8mm_video_transfer\Wolverine\Videos\Hawkeye\telecine4.avi"
```

Next, change the following line:

```
result="result8" # specify the wanted output here
```

For side by side preview:

```
result="resultS4"
```


And for the final video:

```
result="result4"
```

Also change the red and blue color settings:

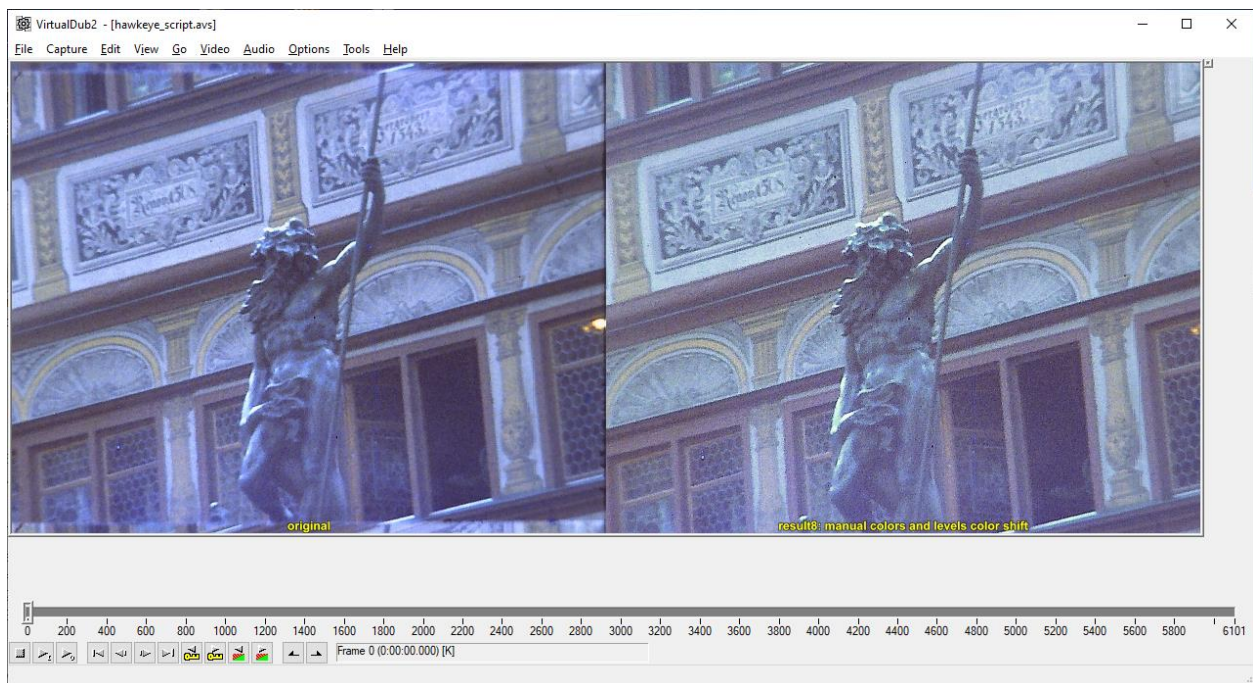
blue= -1 red= -4.5 #manual color adjustment, when returning result3 or result4. Values can be positive or negative

This makes the blue somewhat closer to real blue color, especially the color of the sky.

How to run the script

In VirtualDub2 click on File in the top menu and open up hawkeye.avs script.

The input and output vide will be presented side by side.



You can play the video, stop it etc.

You can also change the script and reload the video and observe the results of your change.

Once done, change the script for final video. Load the video and then save it in whatever format is suitable for you. Note that you can also change the compression in the video menu. It is recommended to use a lossless codec.

Hawkeye 2-exposure HDR

Required Support Software

Download:

<https://www.theimagingsource.com/support/downloads-for-windows/software-development-kits-sdks/icimagingcontrolcsharp/>

Once downloaded, run the .exe file for install the TIS components.

Download Hawkeye HDR app:

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

HDR Windows software for Hawkeye

Note: Hawkeye board V12 or higher and MSP FW mod are required for proper HDR operation to provide two camera triggers for a single external trigger.

This is the windows software that runs hdr on the Wolverine scanner that has the Hawkeye mod. The software is written in Visual Basic and it connects to the camera and waits for the image ready event. After the event is received the sw stores the first image and lowers the camera exposure for the second image. When the second event is received it stores the second image. The process then repeats. The hawkeye MSP430 firmware has a mod to trigger the camera twice for each external trigger.

To run the sw go to the .../bin/Release dir and run the hdr1.exe file.

If you run into DLL issues, make sure that the TIS setup has been run as instructed above.

Ypua Iso may want to install the Visual Studio 2019 community free version just to make sure that there are no DLL incompatibilities.

The Device Settings window will pop up.

Device Settings

Video Capture Device

Device Name: DFM 37UX226-ML

Serial Number: 0x6020232

Properties...

Device Settings

Video Norm: n/a

Video Format: RGB64 (2560x1920)

Customize...

Frame Rate (FPS): 20.45002

Input Channel: n/a

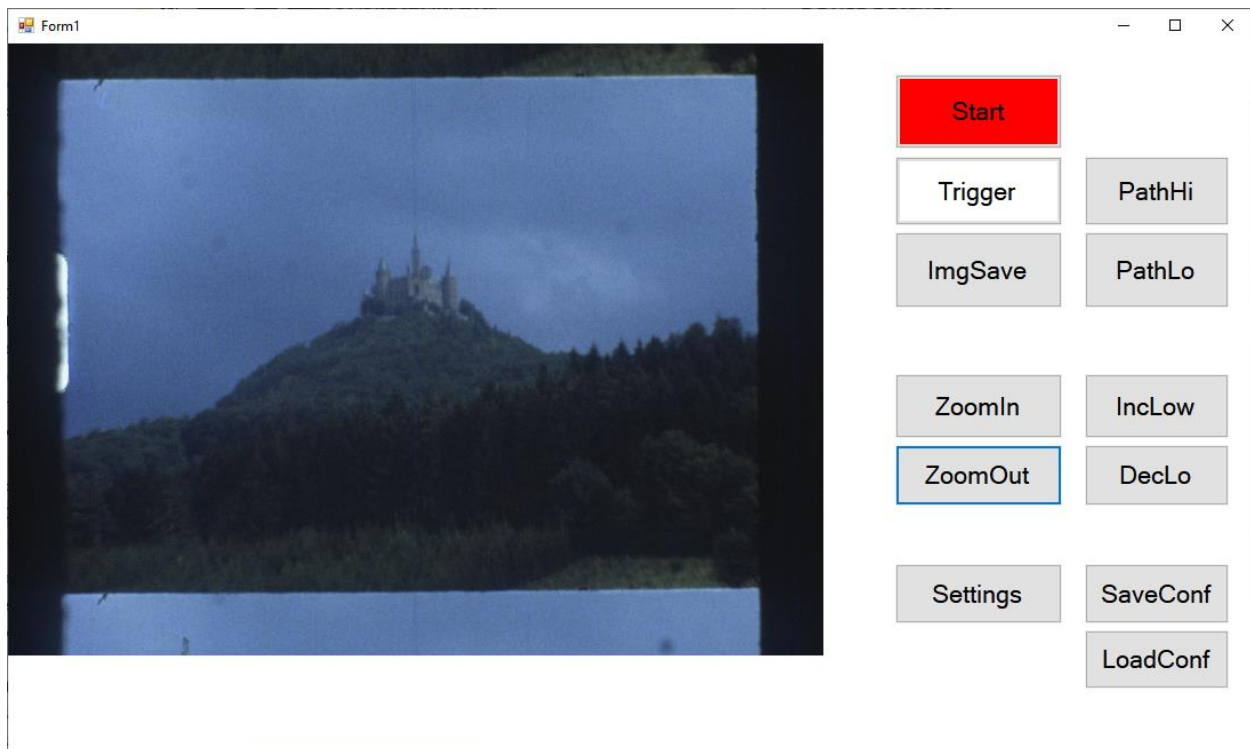
Flip Video Horizontal: ☐

Flip Video Vertical: ☐

Update OK Cancel

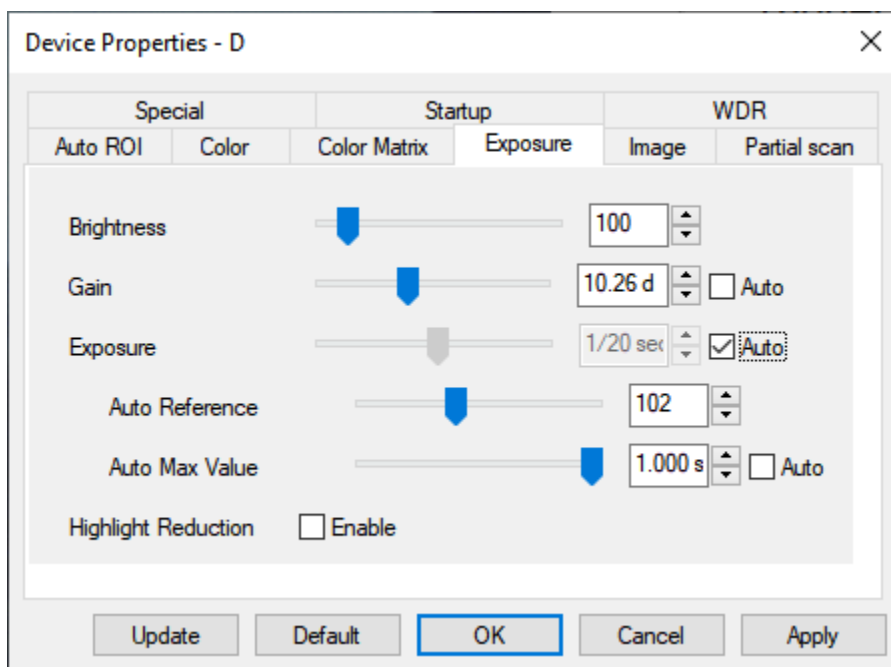
Make sure to set the highest FPS possible.

Click OK. A new window will open.



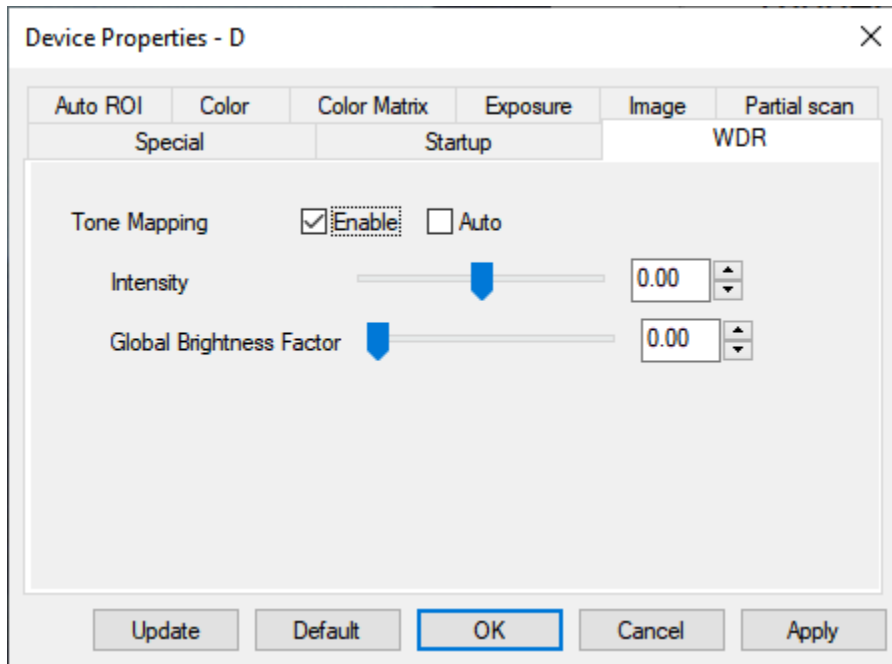
Toggle the Trigger button to make sure the trigger is not on and then click the Start button. The camera preview preview should get displayed. Click on ZoomOut to be able to see the whole frame.

Click on the settings button.



Shown above are recommended settings but ultimately you will want to tweak them to best fit your scan.

Make sure WDR is on:



White balance on manual:

Device Properties - D

Special		Startup		WDR	
Auto ROI	Color	Color Matrix	Exposure	Image	Partial scan

Hue

Saturation

WhiteBalance ☐ Auto

WhiteBalance Mode

Auto Preset

Temperature Preset

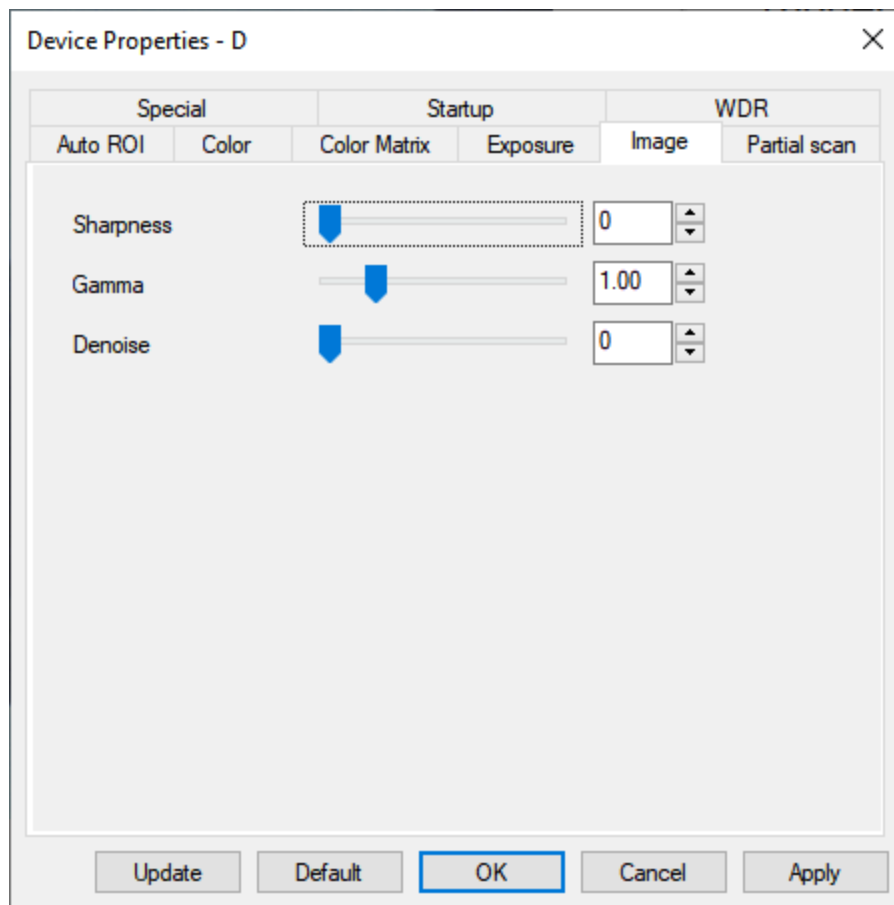
Temperature

White Balance Red

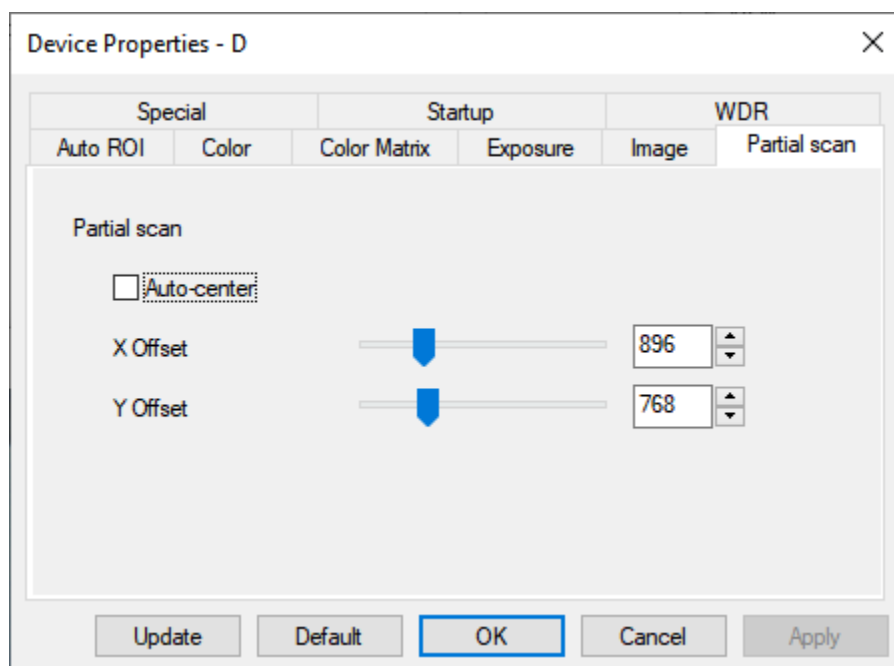
White Balance Green

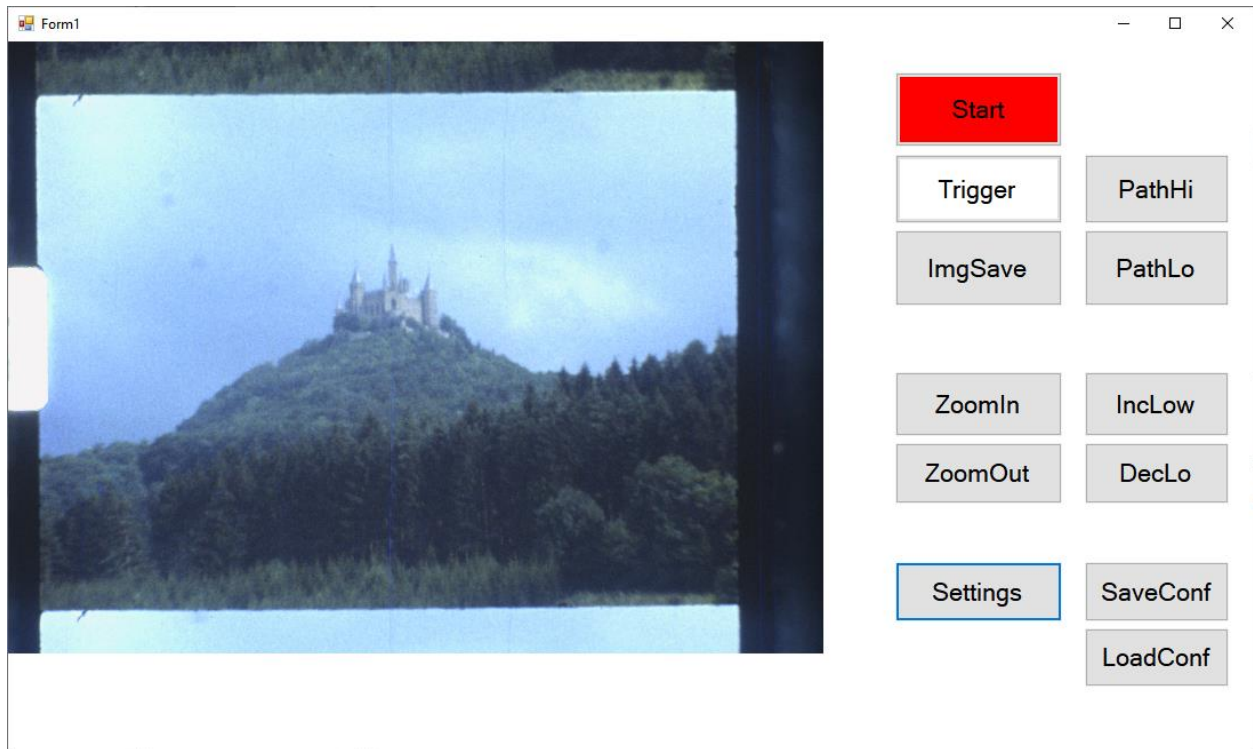
White Balance Blue

No gamma:



Adjust Partial Scan for best image fit:





Now, click on PathHi and PathLo to set the paths for your hi and low exposure images.

Click on IncLo a few times so that it is set to 2 or 3. That means that the lo exposure will be 2 or 3 stops below the hi. You can always go the other way by hitting the DecLo button.

Turn the Start Button Off.

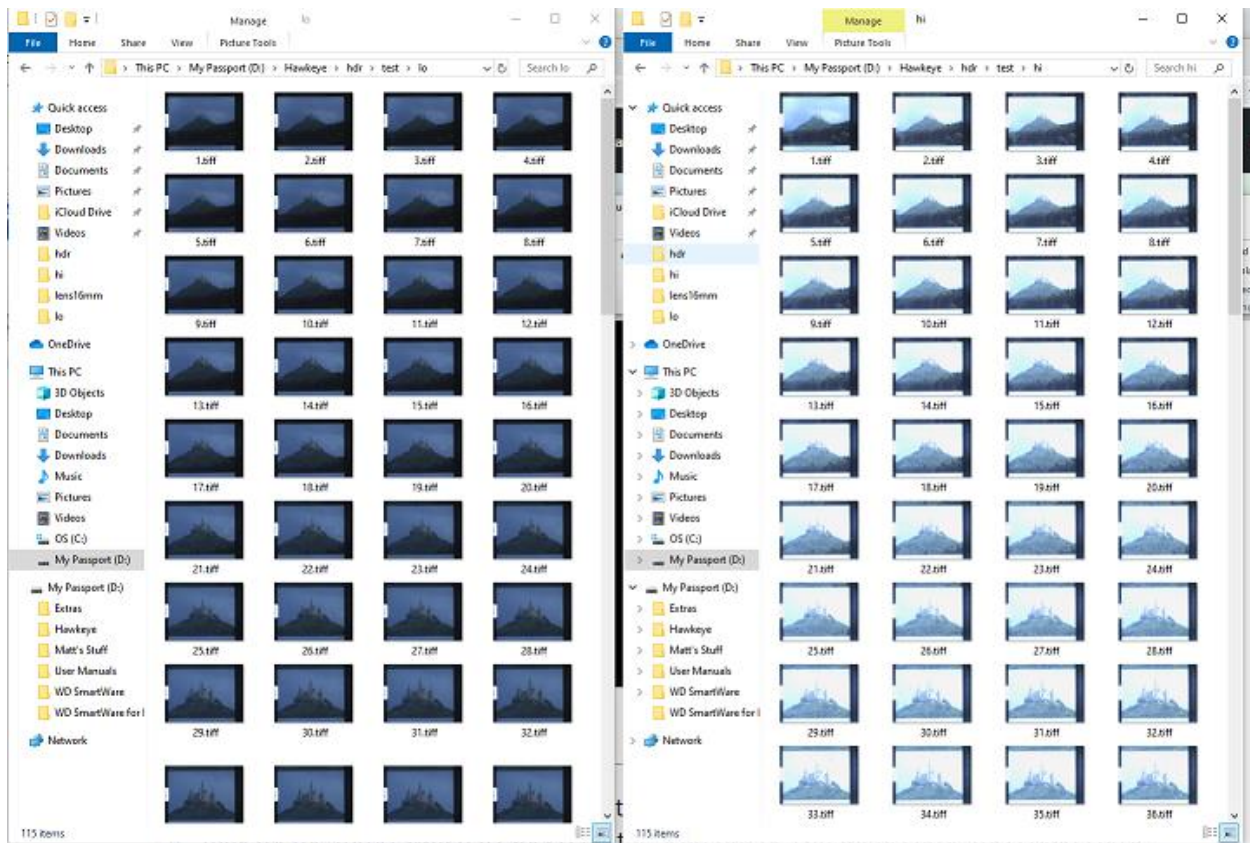
Turn on the Trigger button, Save button and Start button in that order.

The Image should go black.



Now you are ready to do the scan. Set the Hawkeye to slow speed to turn on HDR. You may try the turbo switch to speed up the scan but be careful because this could cause missed frames and the HDR exposures to go out of sequence.

Once done, you should have two directories with a bunch of images



Download enblend/enfuse from:

http://enblend.sourceforge.net/enfuse.doc/enfuse_4.2.xhtml/enfuse.html

Copy it from your download dir to your hdr work dir.

Create the following dos script and name it hdr.bat or enfuse.bat or something similar.

```
SET Input_PATCH1=D:\Hawkeye\hdr\hi

SET Input_PATCH2=D:\hawkeye\hdr\lo

SET OUTPUT_PATCH=D:\hawkeye\hdr\out

SET start=1

SET end=1000

FOR /L %%i IN (%start%,1,%end%) DO (CALL :loopbody %%i)

GOTO :eof

:loopbody

enfuse.exe --soft-mask --exposure-weight=1.0 --saturation-weight=0.2 --contrast-weight=0.0 --entropy-weight=0.0 --exposure-
optimum=0.4 --exposure-width=0.2 -v -o "%OUTPUT_PATCH%\%1.tiff" "%Input_PATCH1%\%1.tiff" "%Input_PATCH2%\%1.tiff"
GOTO :eof
```

Edit the script path names as required. The combined files will be in the out dir.

Before you run the bat file make sure that enfuse.exe and vcomp140.dll are copied over from the enfuse bin directory to the directory where the batch file is located. And that should be it. Run the bat file.

The images on the out dir will be an HDR blend of high and low exposure providing details for the bright and dark areas.

