

Mod-8 Document One

<https://mod-8-film.com>

Version 3 of 11 Jan 2026

The Mod-8 Project aims to improve Super-8mm filming, and rescue old cameras with dead motors:

Use modern drives, eg stepper motors, so we can lose the sprocket holes.

That saves space. Use that space to go 16:9 widescreen.

Modify and Modernise so call it Mod-8.

This is an open information and open source project.

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More at the end of this document. In brief: cite mod-8-film.com

Fig 1 – Overview

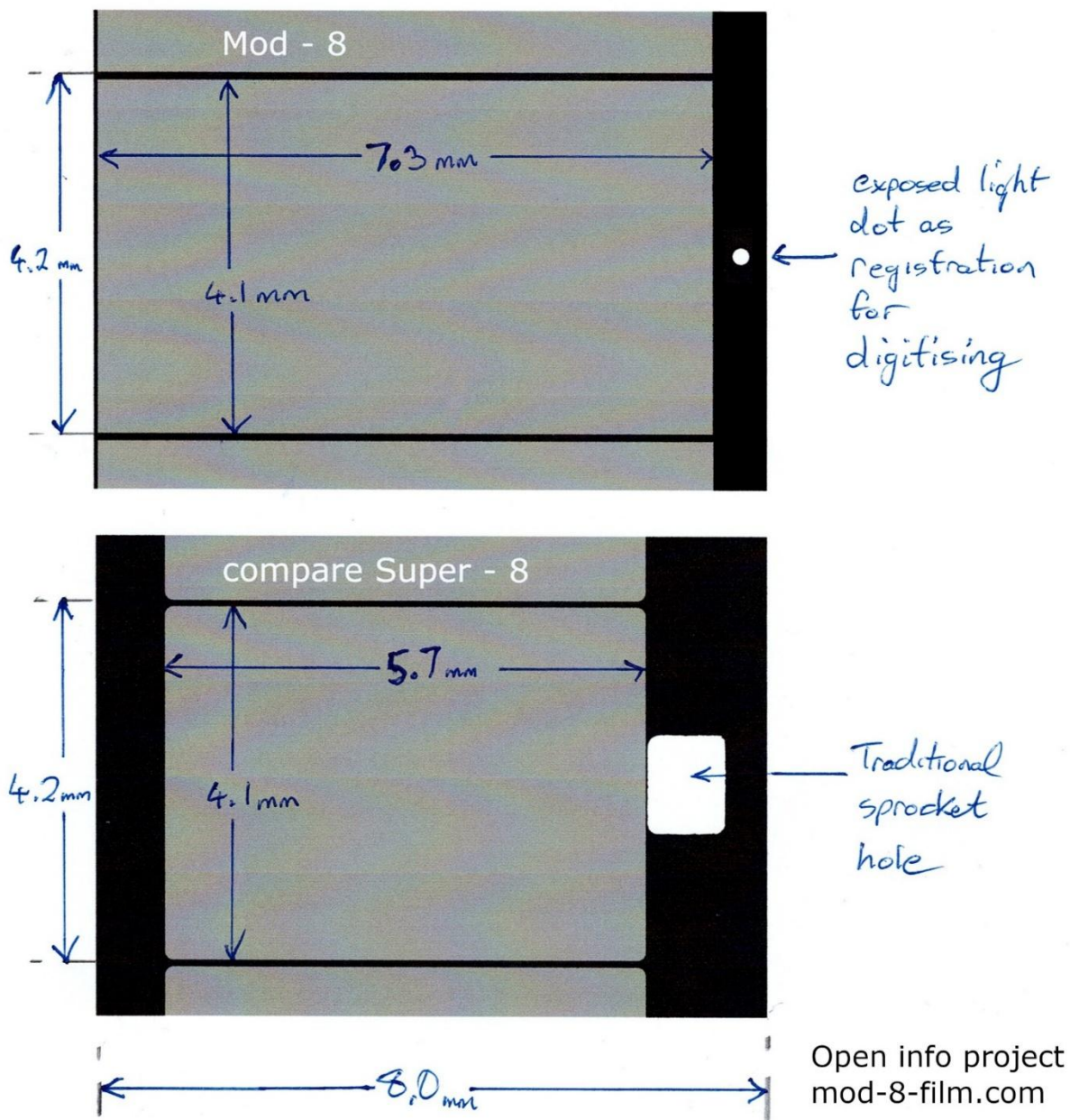
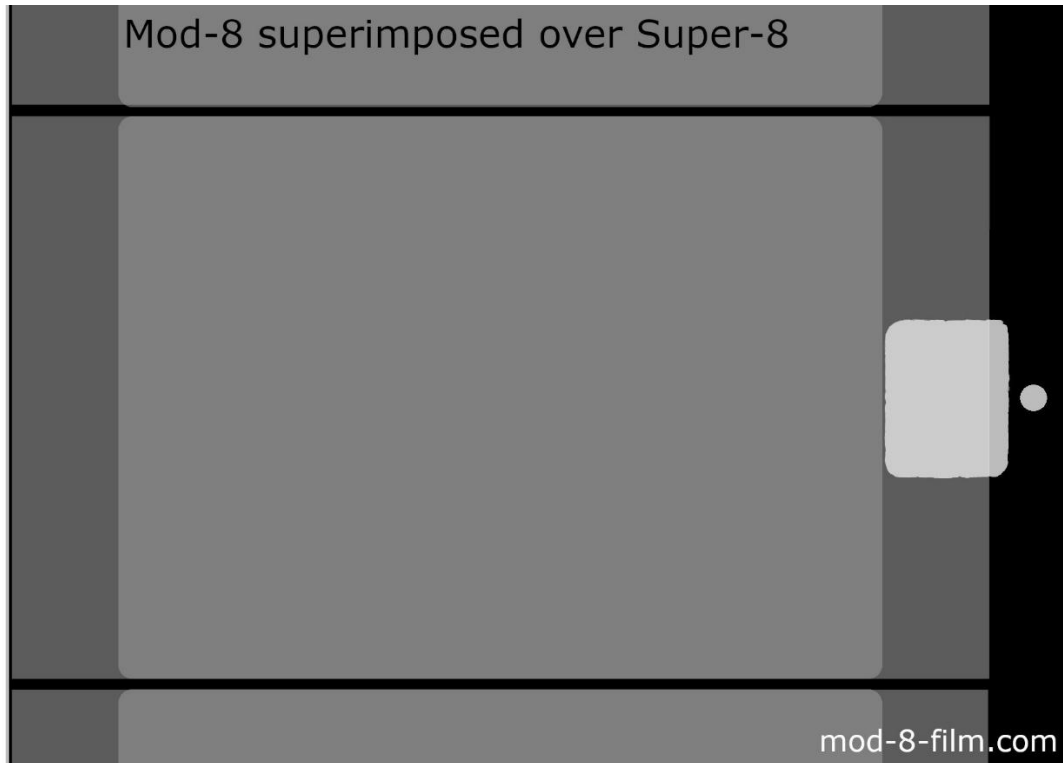


Fig 2. Mod-8 superimposed over Super-8



- Lose the sprocket hole.
Do film transport with a stepper motor capstan and pinch roller drive.
- Extend the Super-8 frame by 0.8mm each side
 $5.7\text{mm} + 0.8\text{mm} + 0.8\text{mm} = 7.3\text{mm}$
- In the remaining 0.7mm expose a dot on the film which the digitizer reads for frame registration.
Under discussion for later versions is a pattern: e.g triangle, circle and square which may give more accurate registration by pattern recognition..
- Enjoy a wide range of film stocks by splitting 35mm bulk-load film.
The imaging area is 24mm wide which is nicely $3 \times 8\text{mm}$ so a 100 ft bulk load can deliver 6 cartridges. Past maker projects trying this have hit a big challenge with precise cutting of sprocket holes. Time to think differently, lose the sprocket holes!
- Modify old Super-8 sound cameras.
The film cartridge is a slightly modified Super-8 Sound cartridge design.
The stepper motor drive goes below the gate in the sound loop area.

What is a “stepper motor drive”?

This is an adaptation of the existing sound drive in old Super-8 Sound cameras. The current working prototype of 03 Jan 2026 uses a Nema 11 stepper motor with its 5mm diameter shaft as the “capstan”. That shaft gets a sleeve to increase the diameter to 10mm. The cartridge gets an idler pulley at the bottom front.

Video of test drive in action. The “drift” effect is expected. What we are looking for is a smooth steady drift.

https://www.youtube.com/watch?v=b9_gR04Lhn4

Fig 3: Case Sankyo 620: Modify a dead Sankyo Supertronic 620

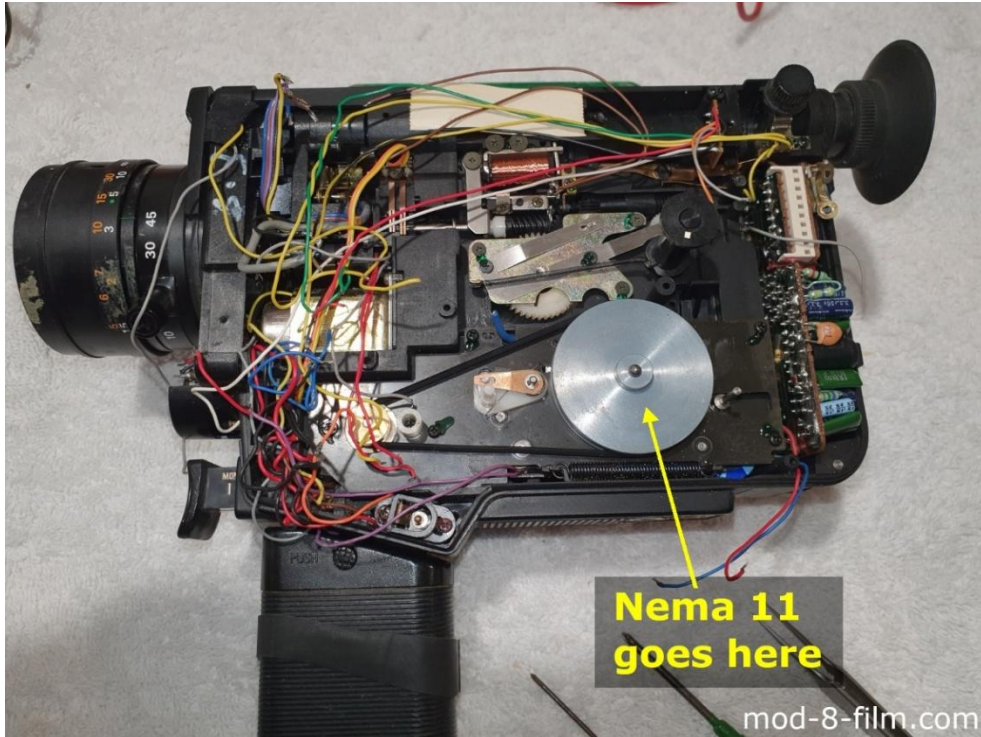


Fig 4: Case Sankyo 620: Nema 11 fitted

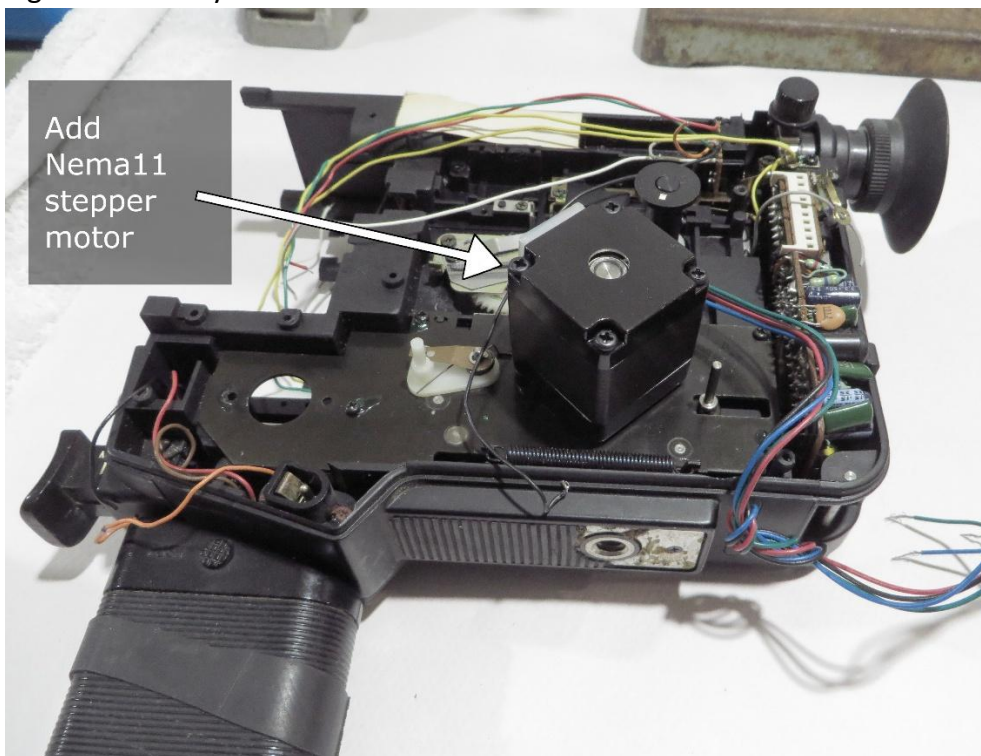
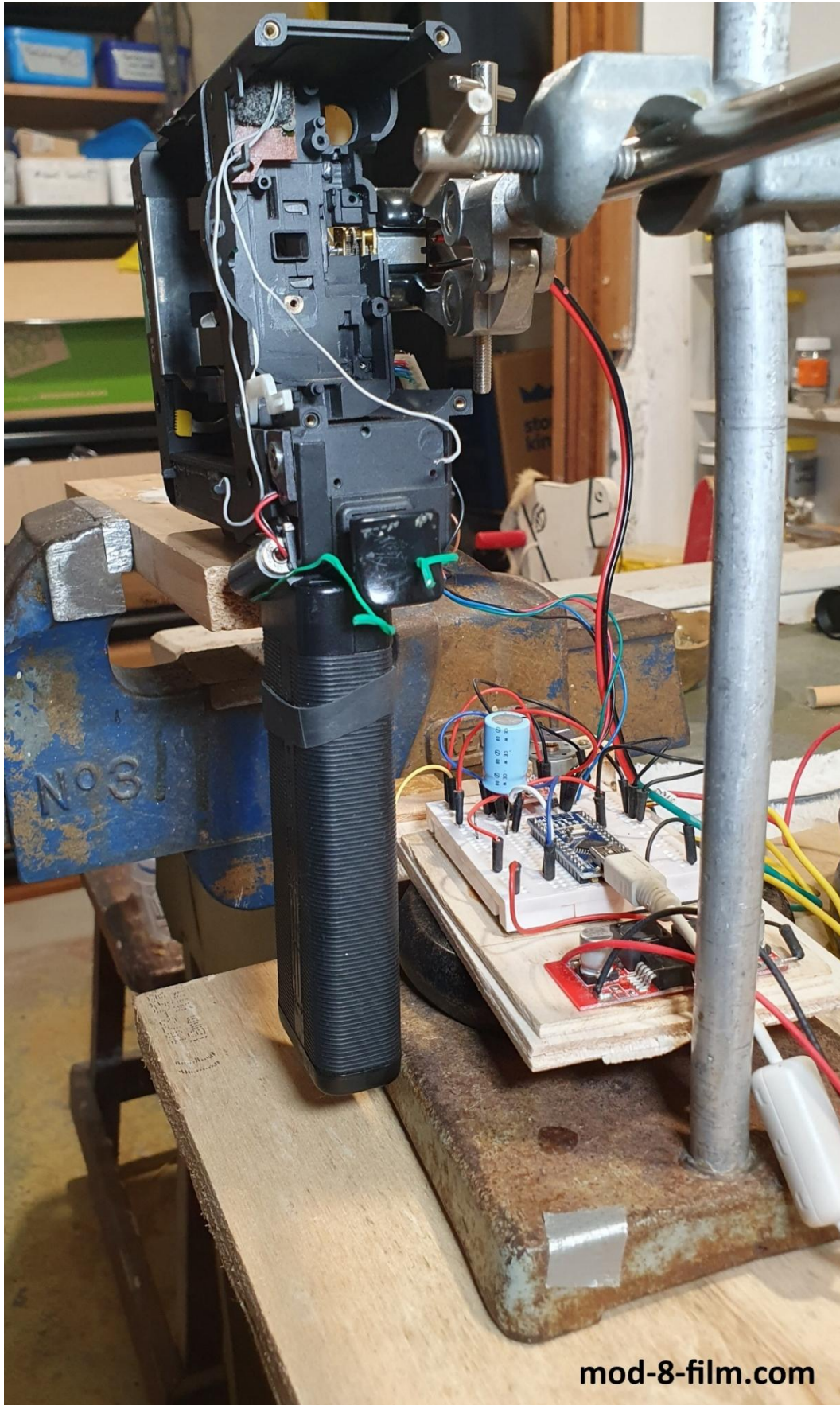


Fig 5. Case Sankyo 620: close up of modified drive in the bottom of the film chamber



Fig 6. Case Sankyo 620: Film transport test setup with Arduino Nano clone and A4988 stepper controller.



For learning about stepper motors, helpful info I have found is "Christopher's Factory"

<https://www.youtube.com/watch?v=jsKug7eEzK8&t=49s>

Christopher tests a Nema 17 with an A4988 driver board.

Christopher gives 350 microseconds as the fastest reliable high pulse.

That suggests a fastest reliable step time of 700 microseconds.

On testing a Nema 11, I get 250 microseconds and 500 microseconds.

How can a Nema 11 deliver an advance of 4.2mm?

Ideas as at 29 Nov 2025

To use the Nema 11 shaft as a capstan, I calculate it needs a sleeve to increase the diameter from 5mm to 10mm. This is because of the limited top rotational speed of this motor.

Command the Nema 11 to move 27 steps.

Can do by programming an "Arduino Nano" microprocessor.

Nema 11 moves 1.8 degrees per step.

$27 \times 1.8 = 48.6$ degrees

Distance = $(48.6/360) \times 10 \times \pi$

= 4.24 mm

We need this to happen in less than 0.18 sec to give 18 fps.

(My tests indicate that the first prototype will be incapable of 24 fps.)

That means 560 microseconds per step which is safely above my measured most reliable fastest time of 500 microseconds.

560 microseconds gives time to provide acceleration and deceleration.

Step 1 - 1680 microseconds

Step 2 - 840 microseconds

Step 3 - 560 microseconds

'''

Step 25 - 560 microseconds

Step 26 - 840 microseconds

Step 27 - 1680 microseconds.

I calculate a simple start - stop will give 30G acceleration

The estimated 2g mass of intermittently moving film will have a weight force on the roller like pulling on 60g, or 0.6N which is approaching the stepper motor spec limit of 1.3N.

Programing the above sequence gives 10G acceleration.

The estimated 2g relevant mass of film now has an inertia force of 0.2 N - much better.

The VITECH 20BY is a smaller, very low cost stepper motor.

My measurement is that its fastest reliable step time is 1500 microseconds.

The VITECH 20BY has a much bigger step angle to move, 18 degrees rather than 1.8 degrees.

The bigger step angle gives it a higher continuously rotating speed.

I find it stops rotating and becomes a buzzer at 2250 – 2300 rpm
with 2000 rpm as the highest reliable speed.

The VITECH 20BY is a candidate for shutter motor.

Case Sankyo 620: It is an easy replacement fit.

At 18fps the shutter needs to rotate at 1050 rpm.

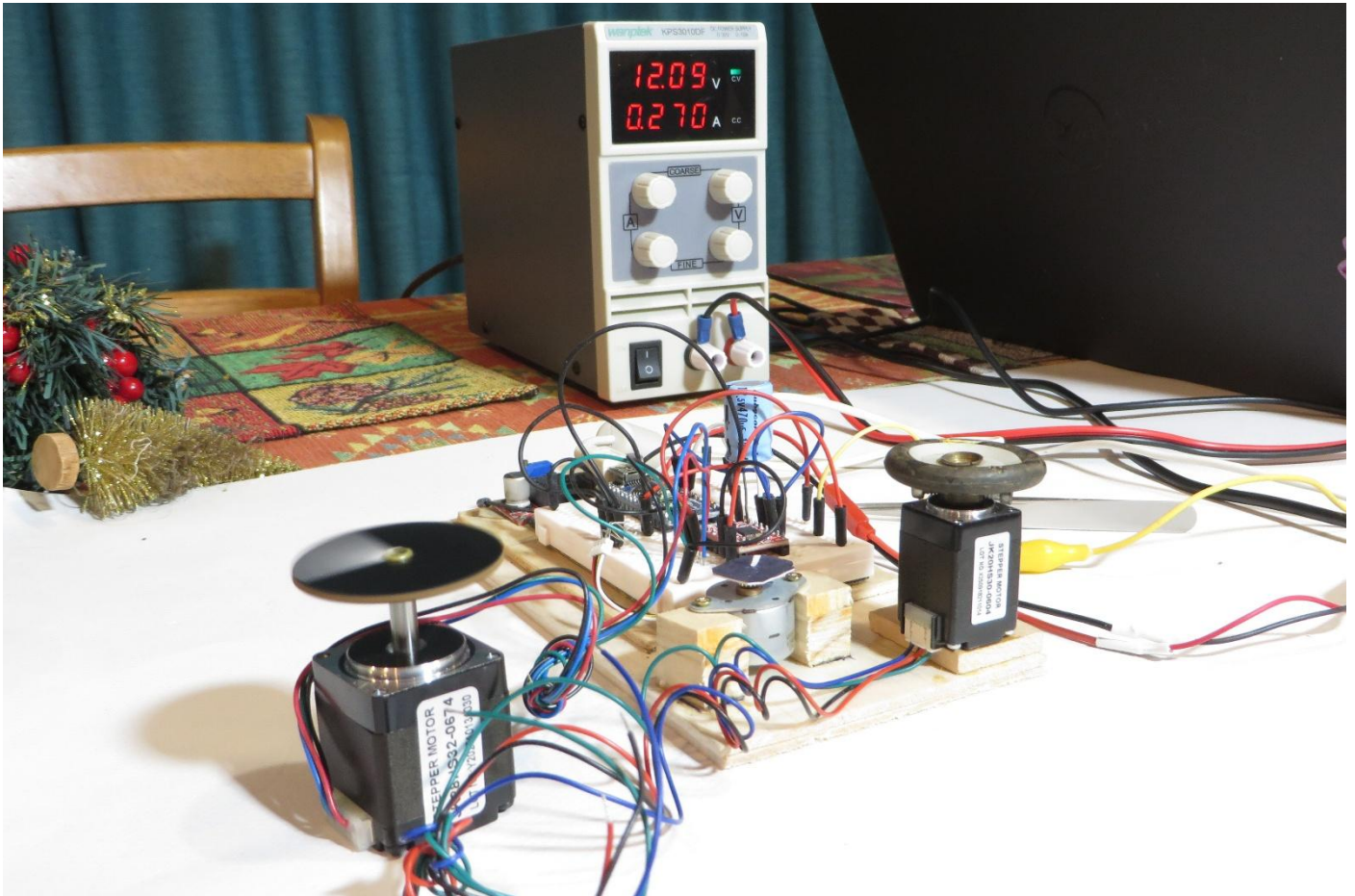
The shutter has a gear wheel with 28 teeth.

The VITECH 20BY comes with a gear wheel with 15 teeth.

Speed required = $1050 \times 28/15 = 1960$ rpm

It “just makes it” and we will not be getting 24fps unless we can change the shaft gear.

Fig 7: Testing stepper motors. L to R: Nema 11 operating, VITECH 20BY, Nema 8.



How can that registration dot get on to the film?

I planned to do nothing about this for the first prototype and rely on the drift effect being small enough that I could manage it for short test shots up to 10 seconds. In other words, my plan was to “kick the can down the road”. Bad plan! The test video makes it clear that I need to deal with the drift.

At first I thought the claw slot in the gate was the place to work. However the space behind that is packed with light metering elements. However below the gate is an empty space where I have removed the original sound drive motor. I now plan to fit a low powered 10mW laser unit in there. Use of a laser means I do not need a precise 0.2mm hole. I can make a larger hole like 2mm in about the right place lining up with a 2mm hole in the lower front of the cartridge. I can then fine tune the laser position with a screw adjustment.

The later plan to mark a pattern on the film can be done with a setup like a tiny slide projector.

How can the Nema 11 sync to the shutter?

Case Sankyo 620: This has a flash sync switch that fires once per shutter rotation.

For other cameras we can imitate this or detect the shutter blade with a photoelectric sensor.

What happens with the lens?

For the first prototypes I will try with no change. Widen the gate. If possible widen the viewfinder view mask, however for current Case Sankyo 620 I find that is not possible.

Can the lens acceptably cover a wider gate area?

The evidence I have is from cameras that have wider than standard gates.

One of mine, and some seen in overscans playing on Youtube. Looks promising.

But like so many questions, I need to build the prototype to find out!

To get more quality, why don't we just film in 16mm?

- Super-8mm and 8mm culture, community and art practice . “Super-8” has status as the number one alternative cinema medium. Actors and other collaborators want to be part of Super-8 filming. “It’s a thing”. “It is THE thing!”.
- We do not have access to 16mm cameras with reflex zoom lenses.
On the other hand, old untested Super-8mm sound cameras “for parts” appear to be the least loved and lowest value Super 8 items in online auctions etc and this Mod-8 project may be a way to make good use of them.
- I anticipate that Mod-8 will go well in the maker culture and community. Helping with creativity has maker appeal. I have hopes for it as a maker competition winner.
- Super-8mm and 8mm are doable in terms of physical size demands. I can store the film from my Super-8 projects. 16mm would soon take up too much room. 16mm DIY processing requires 4 times as much chemistry and twice as many tank processing runs as Super-8mm or Standard-8mm. Our typical mini movie is 1.5 minutes long, edited from 6 minutes of raw footage. With either 8mm that 6 minutes fits into one processing tank for one processing run.

Where is this at?

Prototype works in progress. See blog:

<https://iafilm.blogspot.com>

Is this expensive and time consuming?

About expensive: OK for a maker project. We are in the age of mass produced electronic components for building inkjet and 3D printers. Such is manufacturing now that these parts are on sale to startups, makers and DIYers via factory shops. Motors and electronic driver boards have prices like USD 2 to USD 20. This is alien to 1970s “closed shop” culture, which is where these cameras came from. The expensive part for me at this stage is buying a variety of motors and boards to run tests to find which ones are the best for this job. Coming up is the need for at least 2 more test cameras.

About time-consuming. Yes! However in my opinion Mod-8, if it works, can be way faster and easier than trying to rebuild 1970s cameras to their original state, when that state is full of unknowns from lost manufacturer history. If Mod-8 does not work, then the experiments along the way may provide useful info for rebuilding these old cameras to keep going as Super-8.

Preview-Mod-8

Get an advance look by filming on 16mm, framing and cropping the Mod-8 image area.

Fig 8. Preview Mod-8 by 16mm crop



Fig 9. First Look! Preview-Mod-8. Fomapan 100 negative film.



Fig 10. Extension idea – add barcode

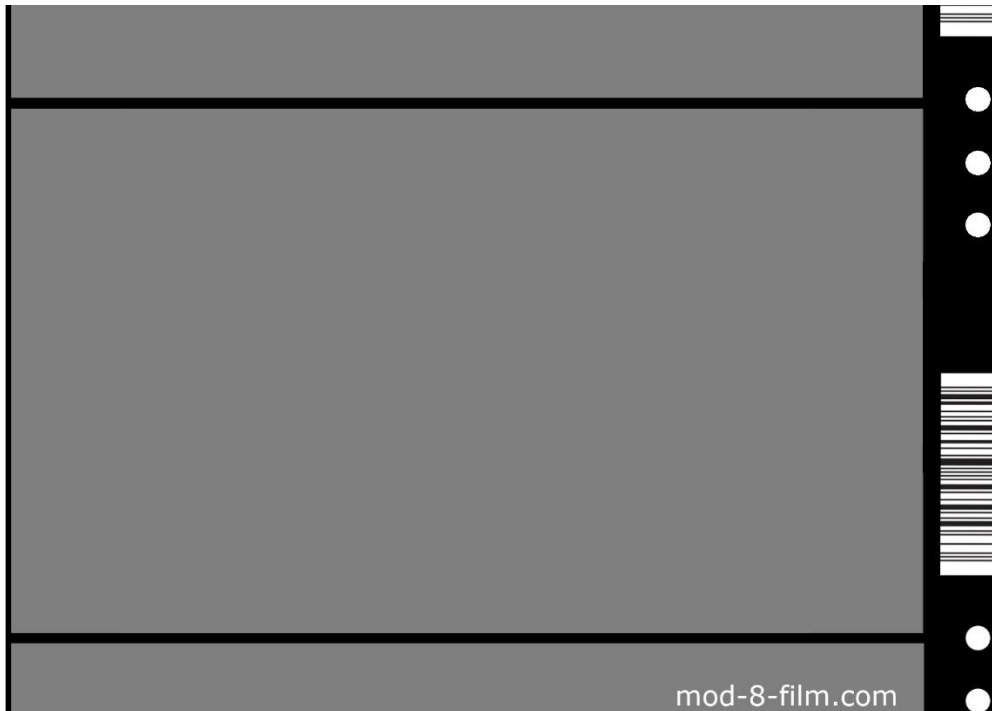
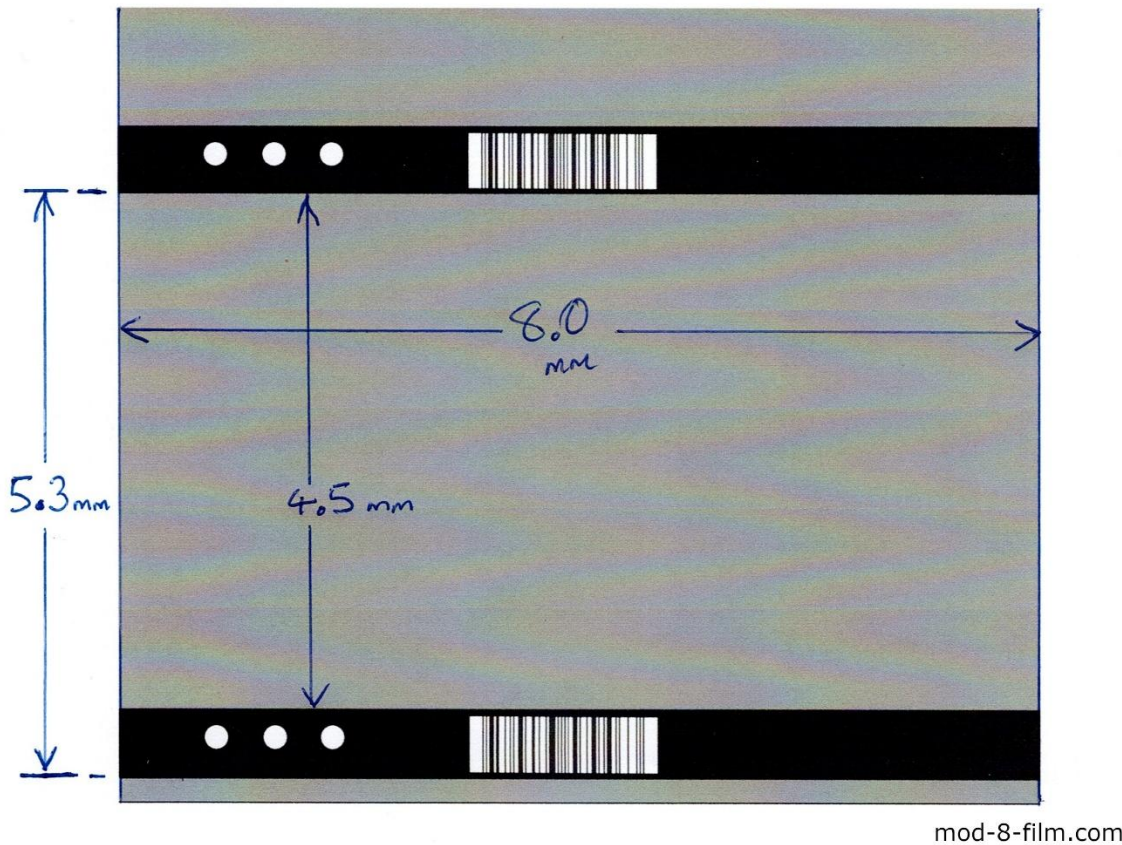


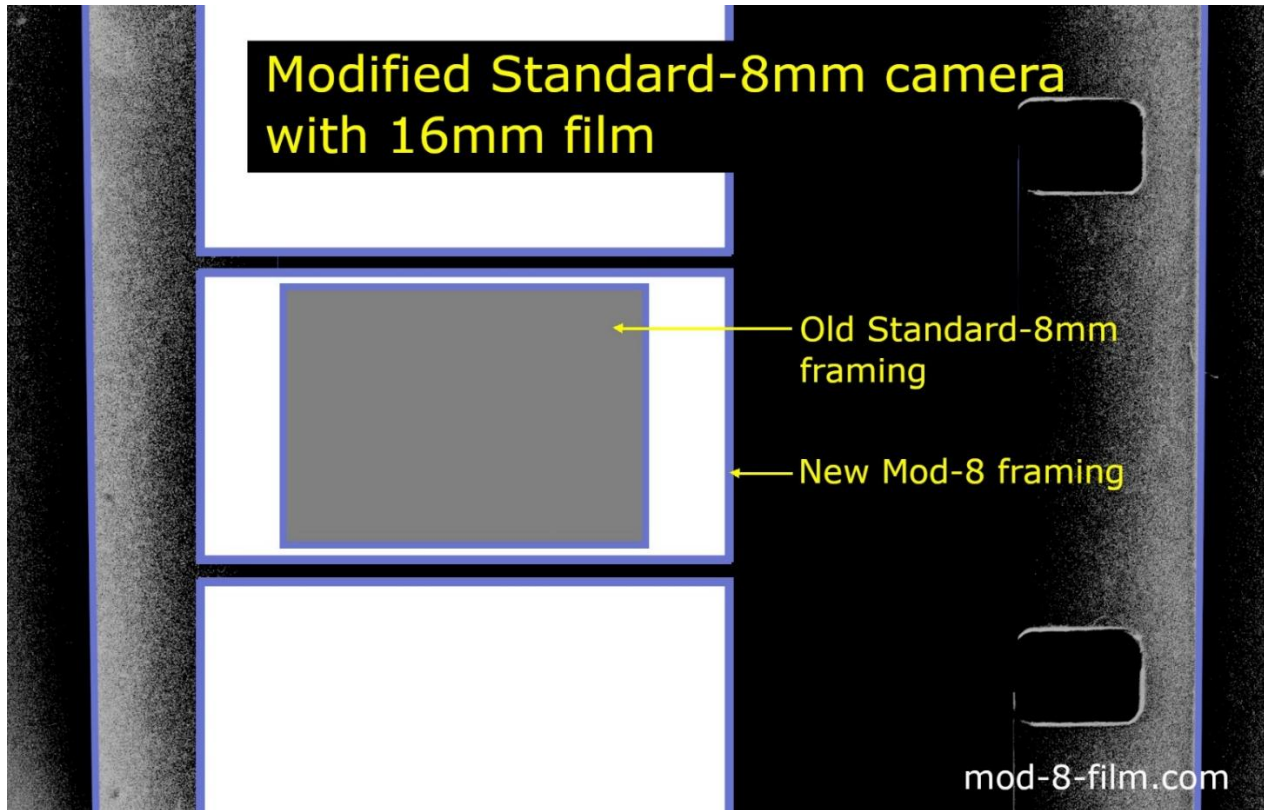
Fig 11. "Maxi-Mod-8"? probably not!

"Maxi-Mod-8" ? Probably not !



"Maxi-Mod-8" was the first version of Mod-8. Lose the sprocket hole and use it all! Then ... thinking more! Maxi probably needs an all new camera. The registration marks are a lot more challenging to manage.

Fig 12. Mod-8 from modification of Standard-8mm cameras



This may be a way of doing fast early prototyping.

The 16mm sprocket holes are not used, We and the equipment ignore them.

This is double the film emulsion cost of 8mm wide film. It is however only about 60% of the cost of 16mm.

Running time is less than 2 minutes.

Possible advantages include:

- Simple viewfinders may be easier to adapt to widescreen. In some cases, just add tape.
- Cameras with D-mount lenses can take adapters to use C-mount lenses.
No worries about covering a wider frame.
- Wider range of film stocks to evaluate.
- No need for any special cartridge modification. Just wind film on to the little reels.

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You can also do linking to, thanks to, or criticism of <https://mod-8-film.com>

John has also done trademark applications for “Mod-8”, “Mod-8mm” and “Mod-8 Film” for film and camera related items. The purpose of this is to reserve and protect these words for this project. Not a power grab, quite the opposite. John is following open source advice, and examples from other projects e.g “Arduino”.

We can see how this works at:

<https://branddb.wipo.int/branddb/en/>

Search “Mod-8”

Search “8mm” or other related film terms and in the “Nice Classification” field enter “1” and “9”

Comparing licensing with projects like “Arduino”, “Mod-8” is more permissive as is appropriate for its film enthusiast community of interest. Main example, Mod-8 use of CC BY rather than CC BY-SA.

To explain: John is not applying the “share-alike” requirement. CC BY gives more freedom to adapt and modify with the only requirement being attribution. Attribution means:

- “indicate if changes were made”. You can do this with wording like:
“based on content from <https://mod-8-film.com> ”
“some ideas from <https://mod-8-film.com> ”
Or source referencing in academic or Wikipedia style.
- “appropriate credit”. John aims to make this easy by asking only for reference to:
<https://mod-8-film.com> for links.
In text “mod-8-film.com” is OK.
Most of the Mod-8 images already provide this as a label.