V1

Building the shutter tester should be relatively easy. Below are some hints & advise on the build.

Refer to the ESP32_wiring_diagram.pdf for connections. Note. A bare board is shown, rather than it sitting in the breakout board.

All of the boards can be purchased fully assembled from eBay, Amazon or AliExpress.

There are also options to purchase the processor and breakout boards without the header pins soldered. These are often cheaper, but obviously require soldering at home. Ensure you pick the right boards.

Using DuPont jumper wire, the boards can be connected together quite easily.

There are many 3.3V power connections. These will not all fit into the breakout board screw-terminal. It will be necessary to connect them all together with a choc-block or similar, with just one wire from here, into the screw terminal. The same is required for the 0V wires.

The LCD (and future TFT) are supplied via the 5V connector.

ESP32 comes in either 30 or 38 pin boards. The parts list specifies the 38 pin version and compatible 38 pin breakout board. If selecting a different ESP32 or breakout board from that specified in the parts list, ensure they are compatible.

Ensure you pay particular attention to the polarity of the connections. The boards are clearly marked.
Note 3.3V is used for the Lasers and rx. 5V is used for LCD.

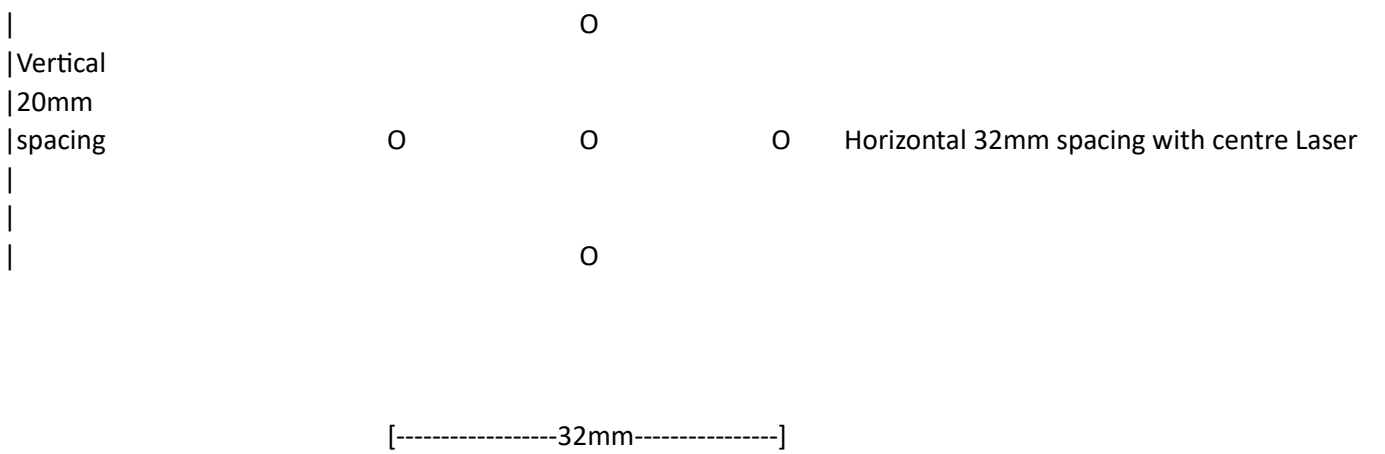
The Laser tx board is marked as VCC (positive or +V) and GND (0V)
Do not connect anything to the centre pin.
On many Laser boards, the Laser barrel is only held to the board by its wires. This means it can easily be knocked out of alignment. Consider using hot-glue or similar to affix the Laser barrel to the board.

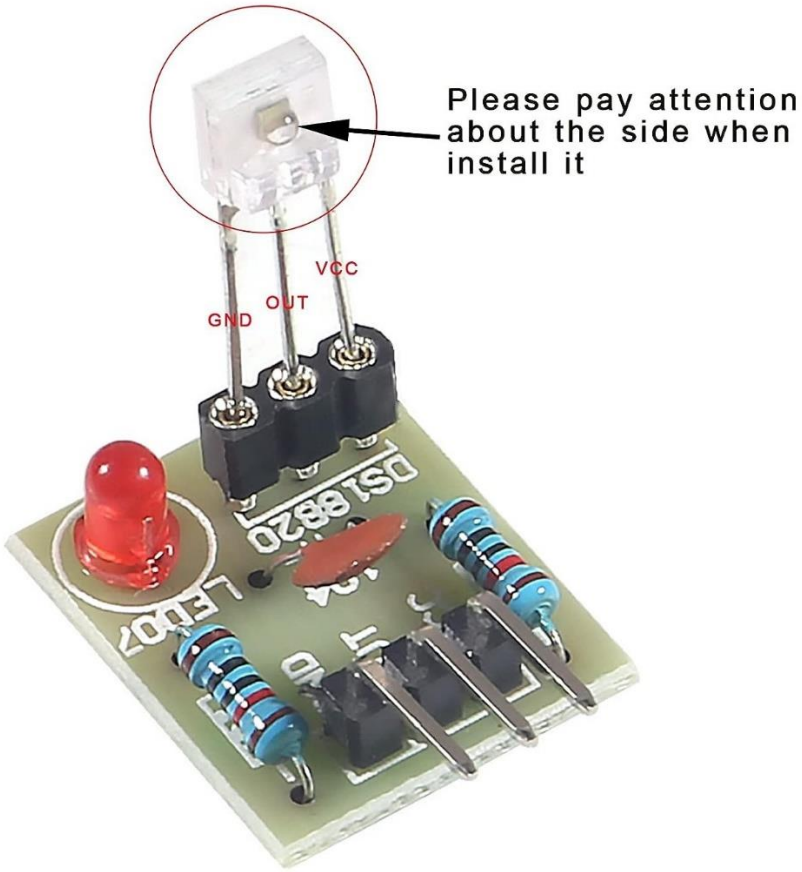
The Laser rx board is marked S (+V) and – (0V) for the power connections. The centre pin is marked OUT, which is wired to one of the input pins on the ESP32

The Third Laser & rx (centre) is not currently used, but it is worth wiring now, ready for future use.

Be very careful when fitting the receiver sensor into the board. Refer to the photograph. The little lens must be pointing towards the header pins on the board.

Currently two Lasers/rx pairs are used, but it is strongly suggested to build the hardware with three, or even five, as future development will require at least three Lasers (centre and either two horizontal or two vertical) They should be arranged in a 3 and 9 o'clock pattern with 32mm spacing for horizontal shutters or 12 and 6 o'clock for vertical shutters.





rx – showing correct sensor placement

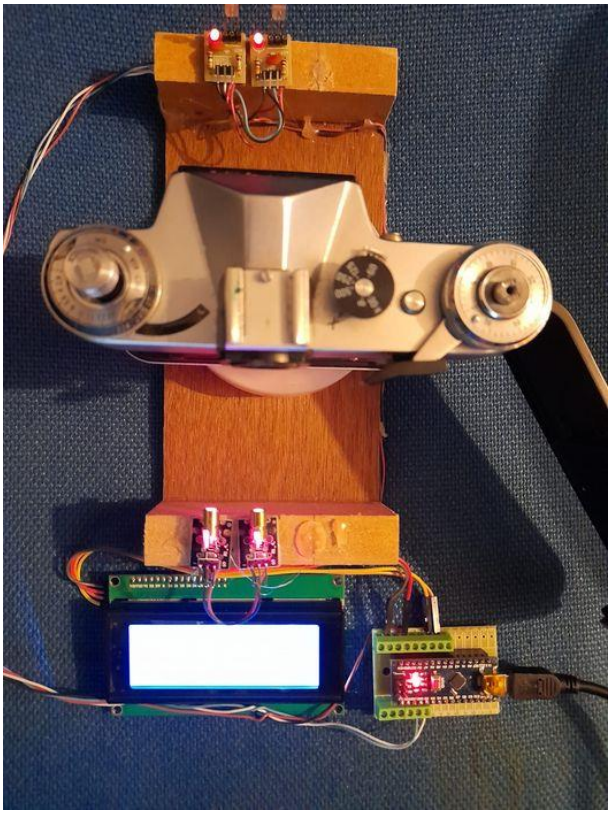
The project is powered via the USB connector on the processor board. No other power is required. Before connecting the USB power lead, check, double check and then treble check all of your connections and the correct orientation of the receiver sensor.

When applying power, the Lasers will shine red and also the red LEDs on each of the rx boards should light.

For the prototype, two pieces of wood were cut, one 40mm high, to mount the Lasers (tx). The other 28mm high, to mount the receivers (rx). These were then glued to a piece of thin ply.

The rx & tx modules were then hot-glued to the top of the wood. Hot-glue allows the lasers to be moved for alignment, whilst the glue cools.

For a horizontal focal plane shutter, the lasers should be glued 32mm apart, measured from the centre of each laser. Same for the receivers. For a vertical shutter, the spacing should be 20mm. For future use, a centre Laser and Rx should be placed between these measurements.



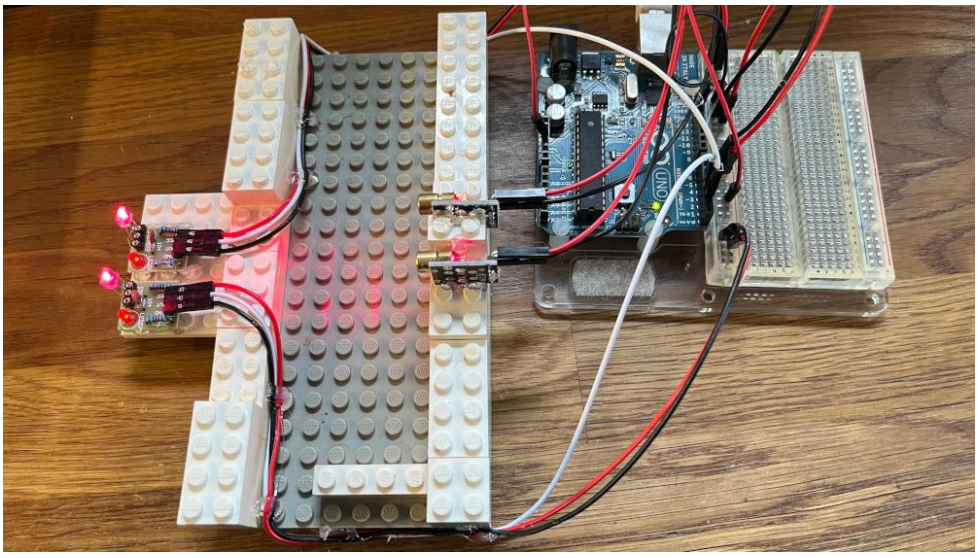
Prototype shutter tester with two Lasers

Note wires (taken from an Ethernet cable) are directly soldered to the Laser boards, rather than jumper wires being used.

This design works perfectly well, up to around 1/250s shutter speed. Above this, the laser beam width to the narrowing curtain slot ratio will cause the tester to under-read. The solution is to use a mask, with holes of 0.8mm, placed in front of the receivers. The best way to achieve this is to mount the receivers inside a project box, behind 0.8mm drilled holes.

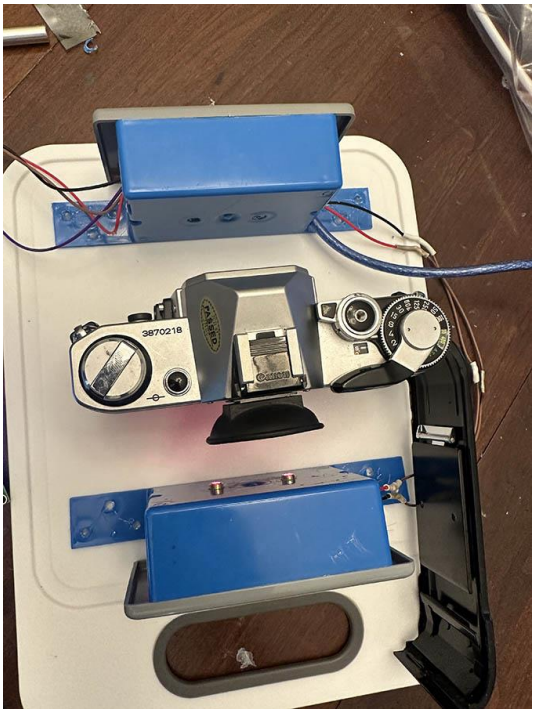
Note:- Arduino code from 3.1.3 and all ESP32 code no incorporates self-calibration to resolve to correct under-reading at higher curtain speeds.

Here are some pictures from the Photrio thread, showing some of the designs people have made

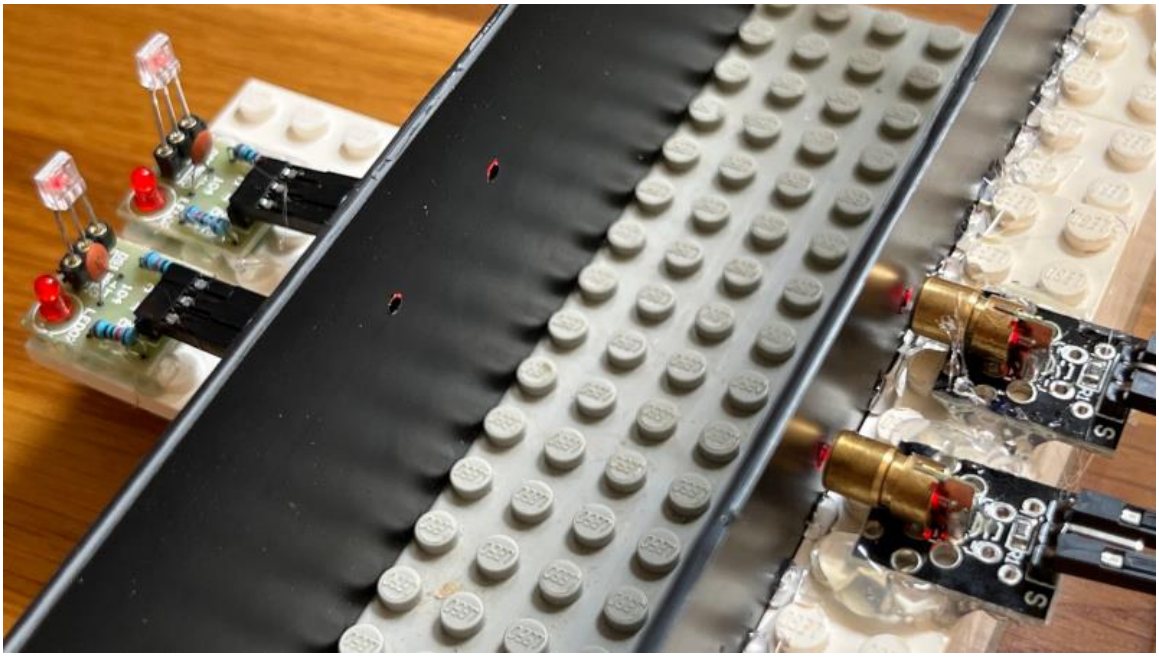


Lego :o)

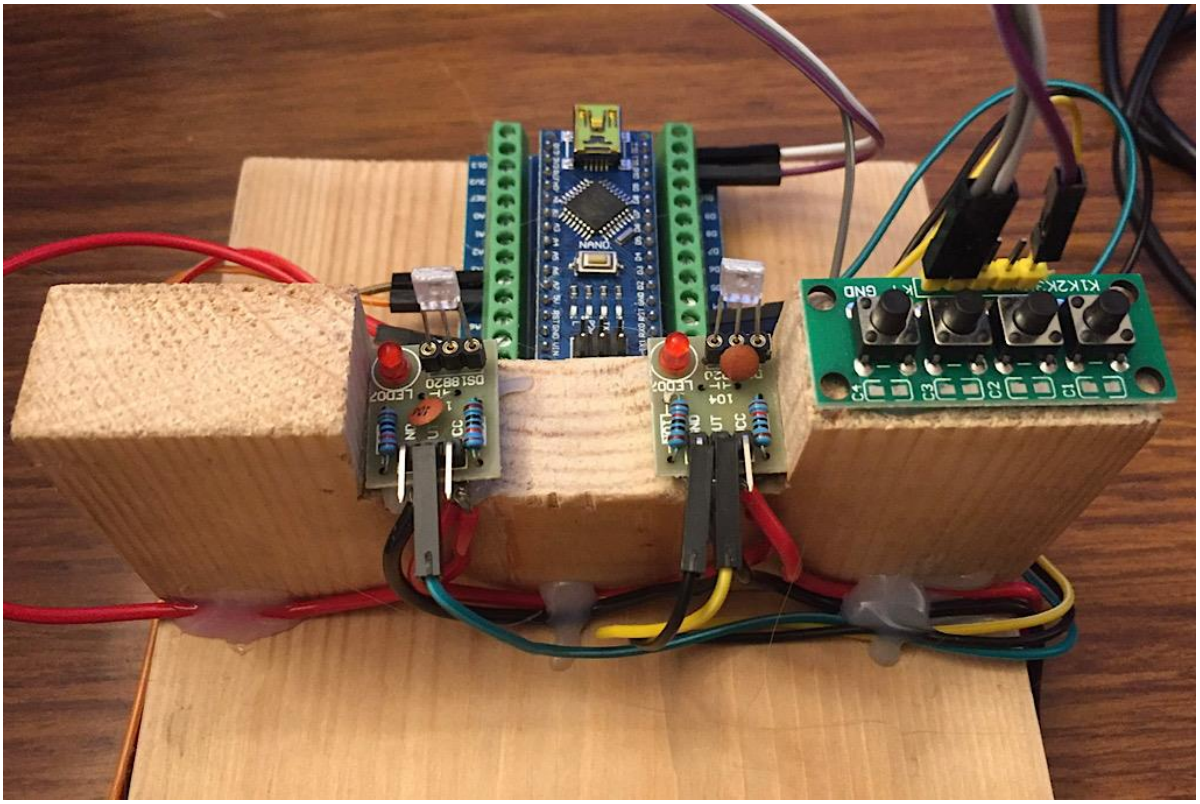
Three laser design for horizontal or vertical shutters. Switch toggles horizontal or vertical Laser.

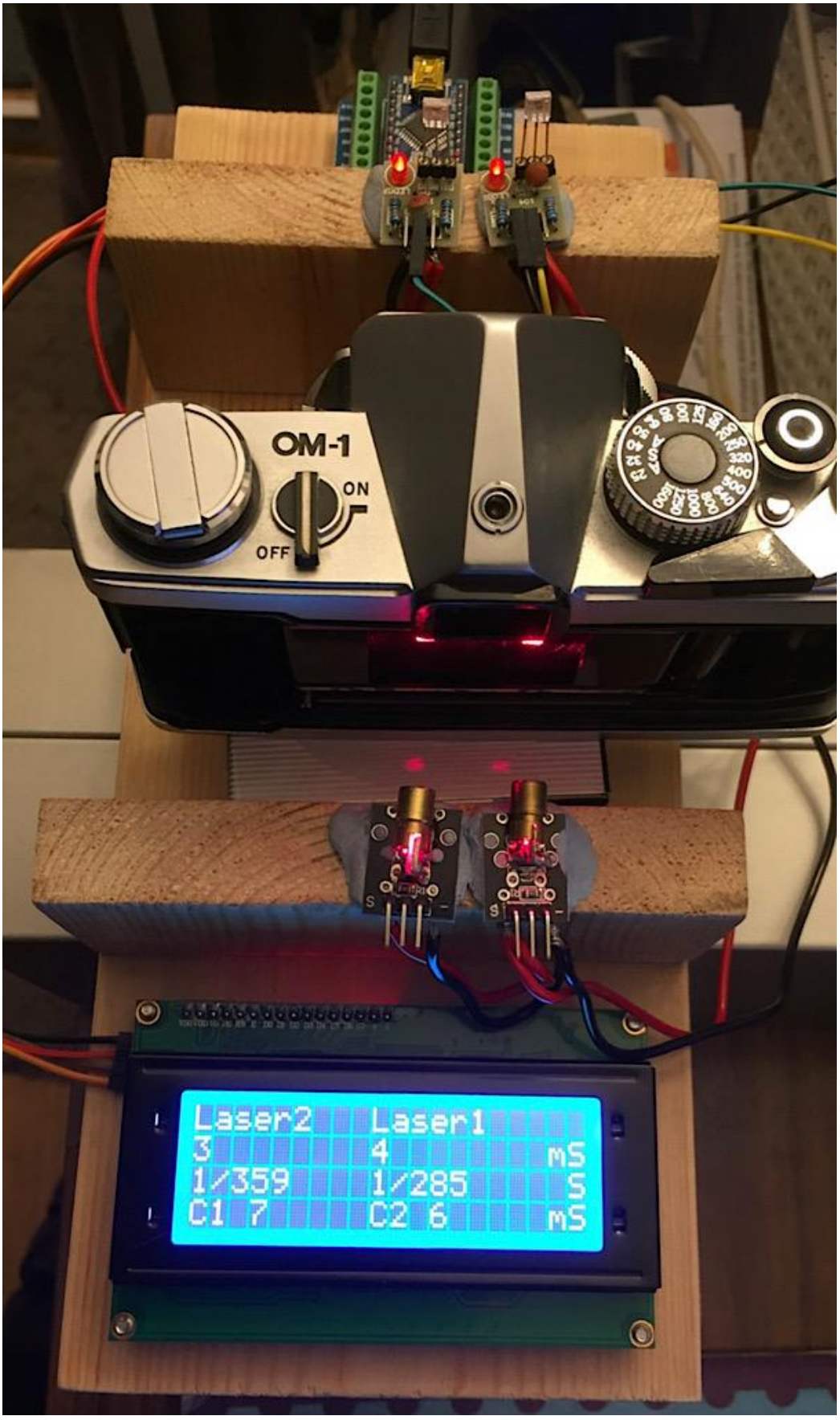


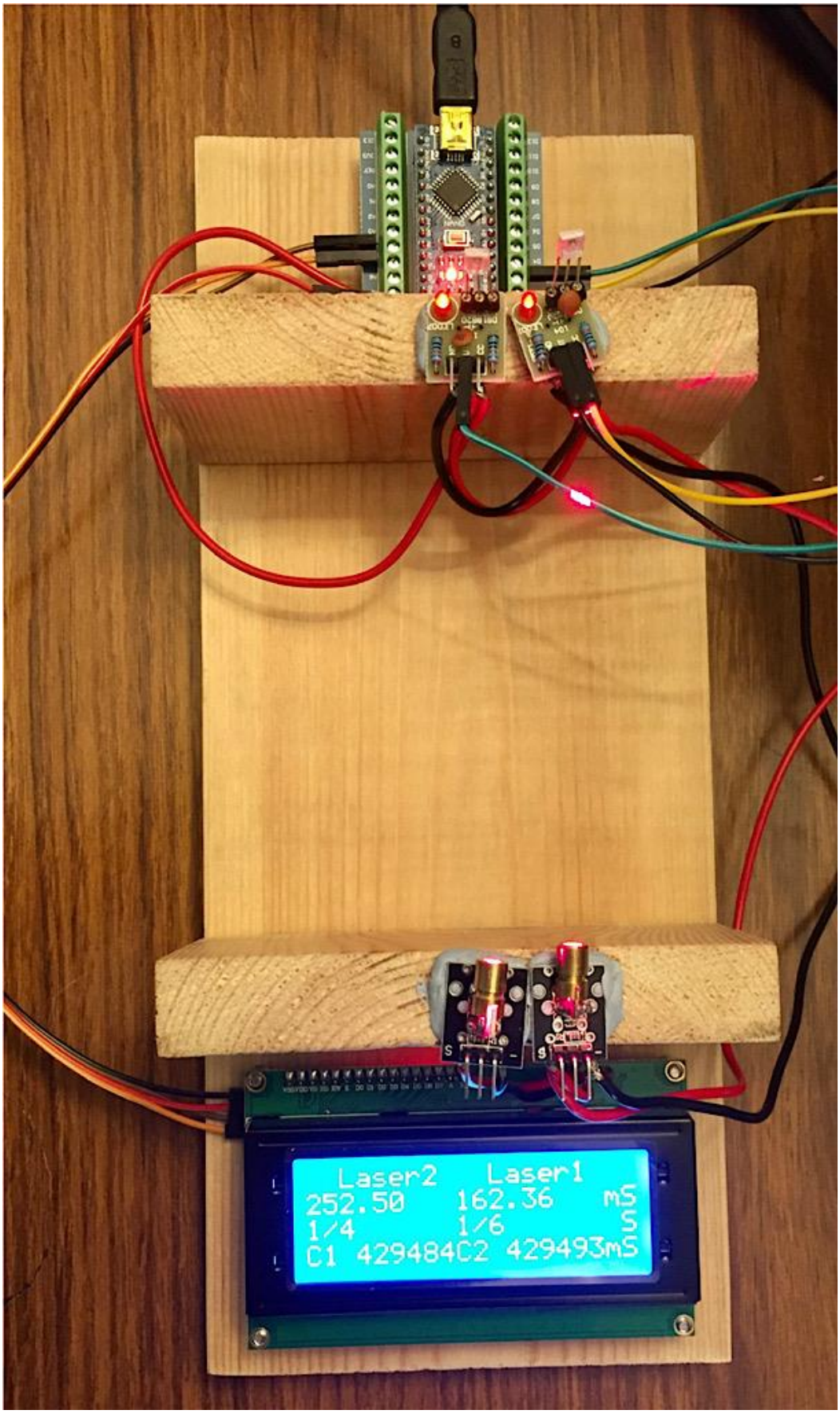
Chopping board used for base and electrical socket boxes used to house re & tx.



Mask added to the Lego version, for better accuracy at higher shutter speeds.




OM-1
ON
OFF
Laser2
Laser1
3
4
mS
1/359
1/285
S
C1 7
C2 6
mS


Laser2 Laser1
252.50 162.36 mS
1/4 1/6 S
C1 429484C2 429493mS