

Laser based train proximity detection

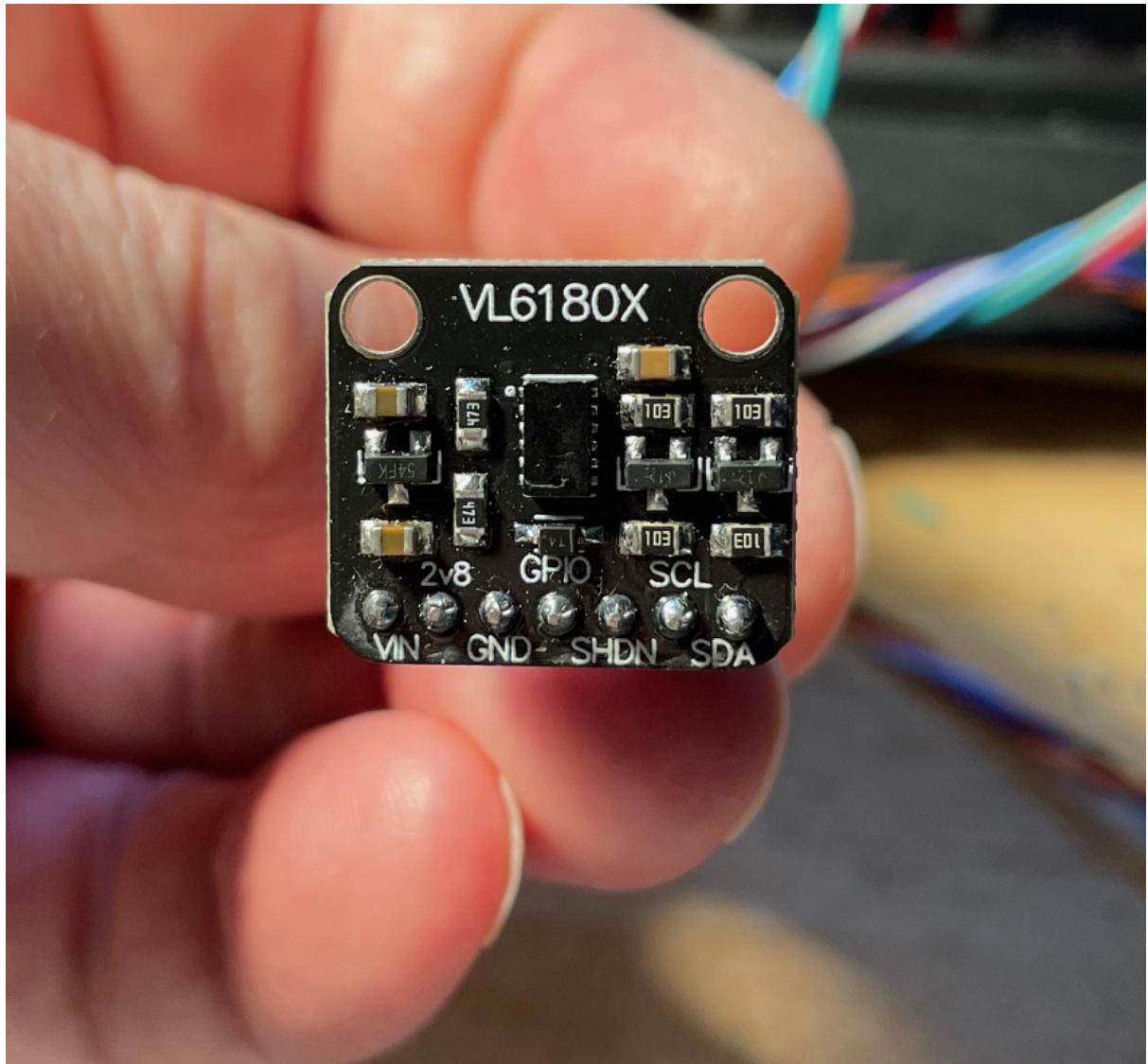
My layout is housed in a garage and adjacent shed with a bridge between them. On this bridge are a couple of sidings but the problem is that there is no easy way for an operator to tell when a train is approaching the brick wall at the end of the track. I tried using a camera, but the space is tight and the available angles don't give a satisfactory view. Another option would be an infra-red train detection system or similar, but that would only give a single indication of train position.

Instead, I took a different approach making use of "time of flight" sensors.



Time of flight sensors are very small modules, which are readily and cheaply available from online suppliers, and use short range laser based radar. Pulses of light are reflected off a target and the integrated circuit measures the time for it to be received.

Different devices can measure different distances so I settled on using the VL6180X module which testing showed could reliably measure up to around 200mm and down to about 30mm.

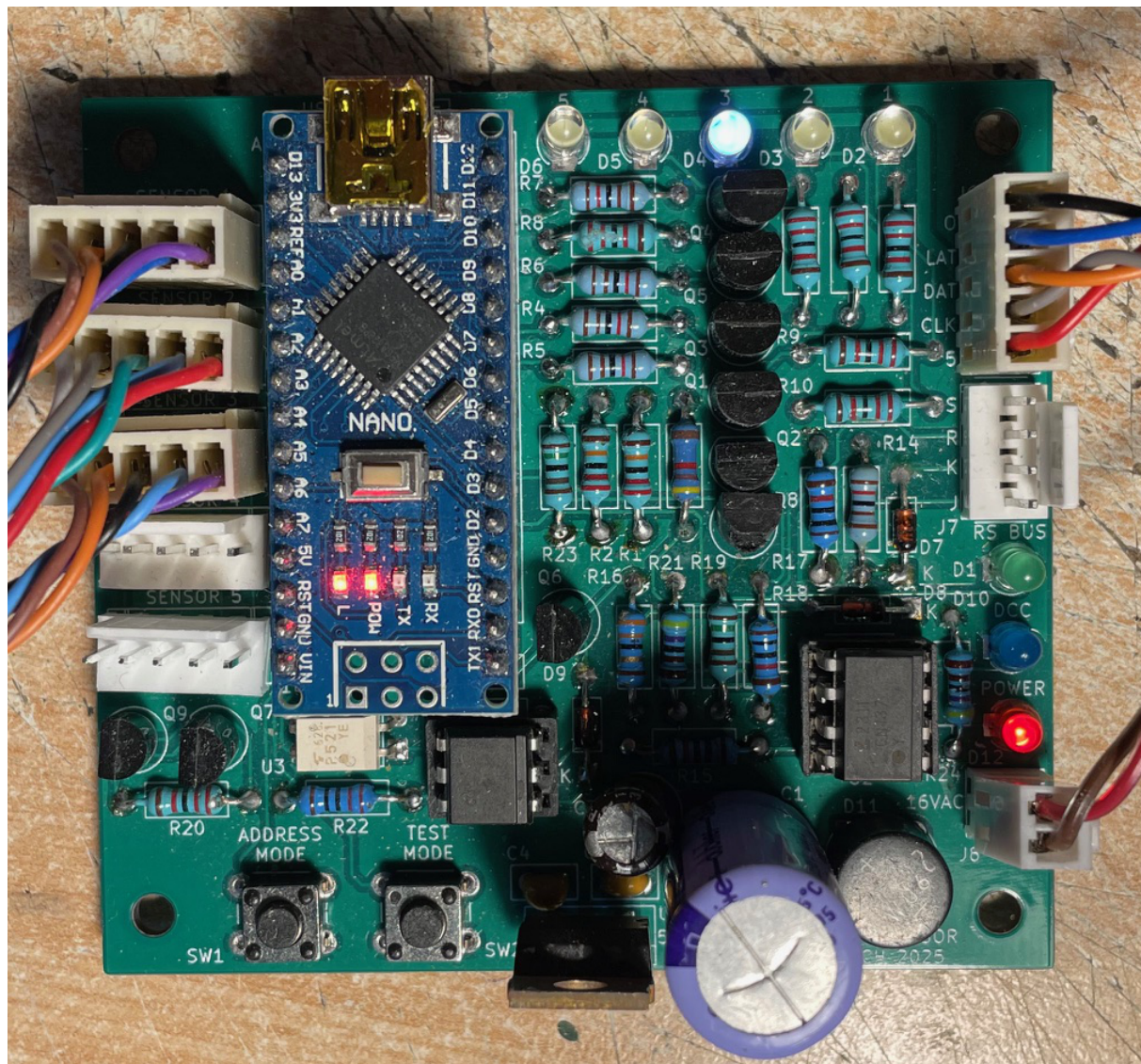




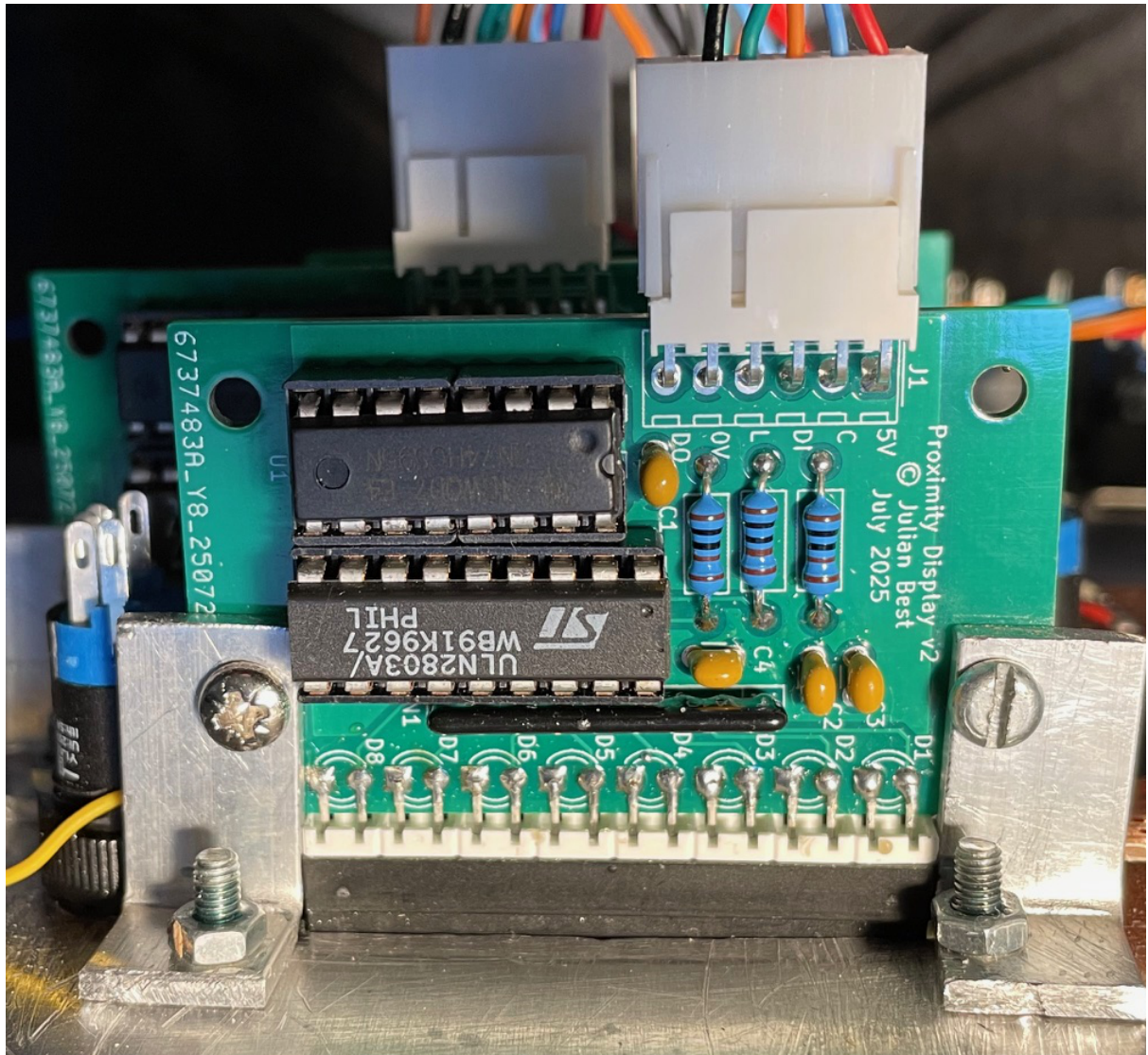
Software libraries are available for these modules for use with Arduinos or Raspberry Pis which make their use much easier.

I worked out that I could easily use 5 of the modules with 1 Arduino nano – you could use more but the limitation would be input output pins and how you want to display the results. I decided to use a bargraph type LED display configured so that as a train approached the end of the track the bargraph LEDs would go out one by one.

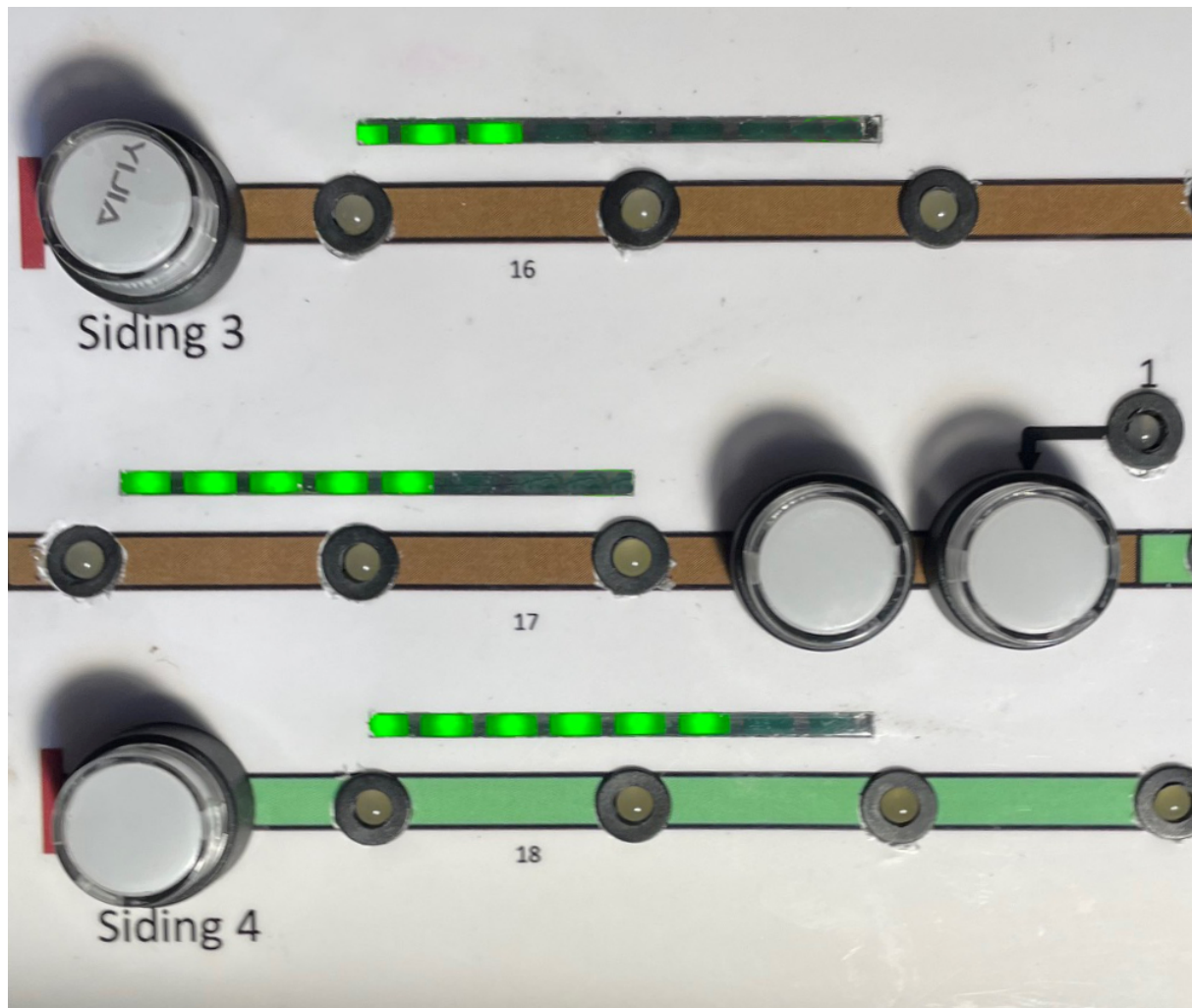
This is the PCB which I designed to allow up to 5 modules which also connect to a DCC accessory bus and a Lenz RS feedback bus, as well as the LED bargraph displays.



Smaller PCBs are used to drive the bargraph display, and also decode the serial data from the nano to reduce the number of connections required. In this photo three are attached to the rear of the control panel with the LED bargraph displays at the bottom.



This is how the control panel looks with various trains in the sidings showing their relative positions from the end of the track.



The entry/exit buttons on the panel have yet to be labelled.

In conclusion this gives a reliable indication of trains as they approach the end of the track, interfaces to DCC systems and gives far more position information than infra red or block detection would do.