

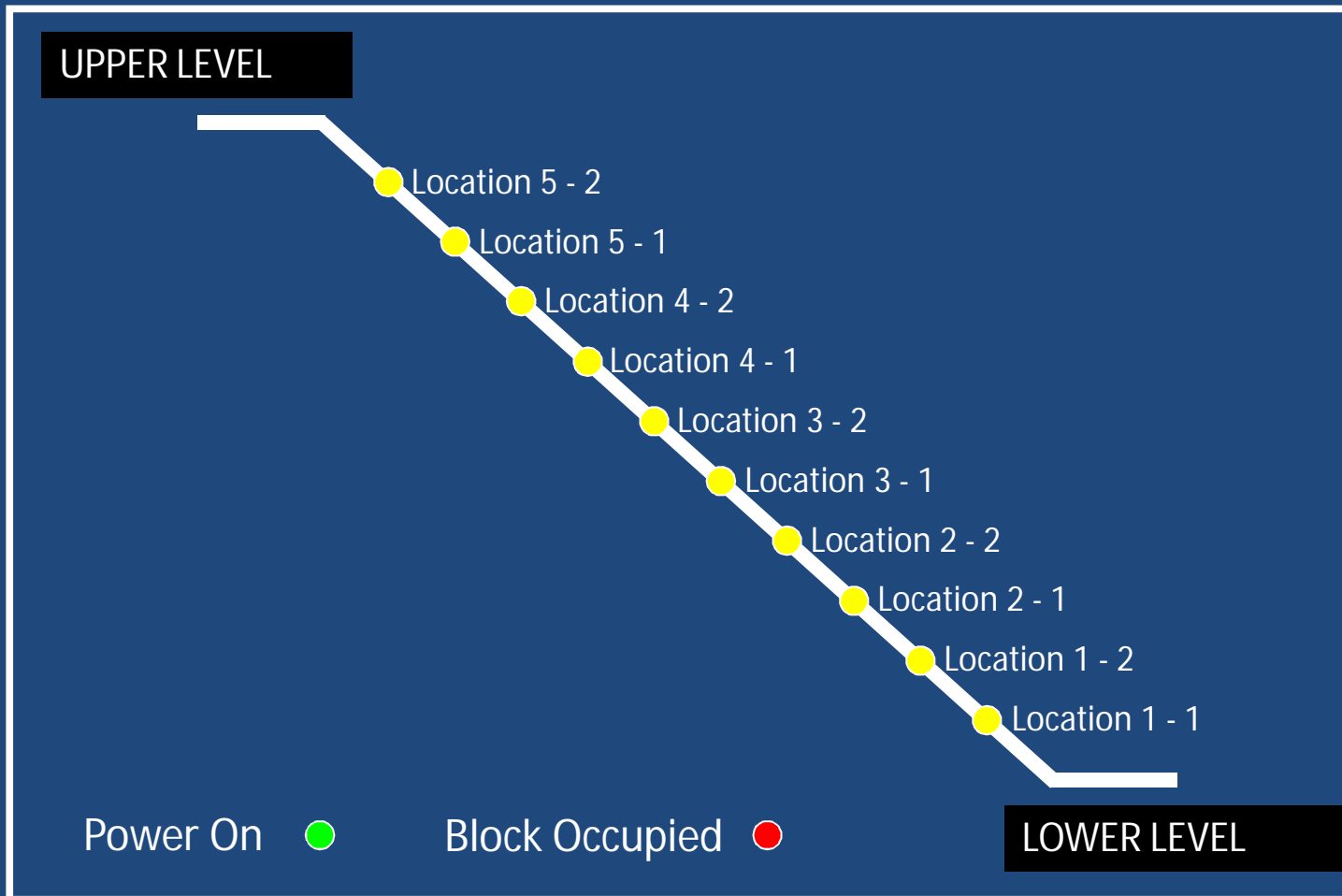
Helix Movement Detection

Incorporating:
Helix – Train Location Indicator
&
Helix Occupied Flasher

Helix – Train Location Indicator

- 10 LED's and 10 Infrared IR Reflectance Sensors covering the helix tracks
- When Sensor senses activity I want a location LED to light and stay on for a predetermined period
- Gaps between vehicles must not cause a location LED to “flicker”
- Multiple locations' LED's can be on simultaneously

Location Indicator Panel



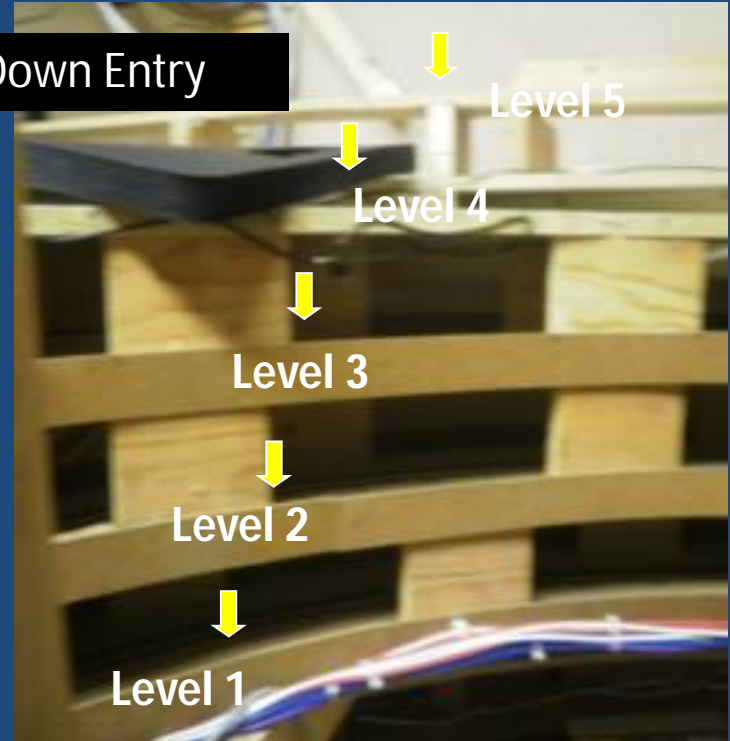
Helix Sensor Locations

Up Exit – Down Entry (5-2 : 3-2)



Up Entry – Down Exit (3-1 : 1-1)

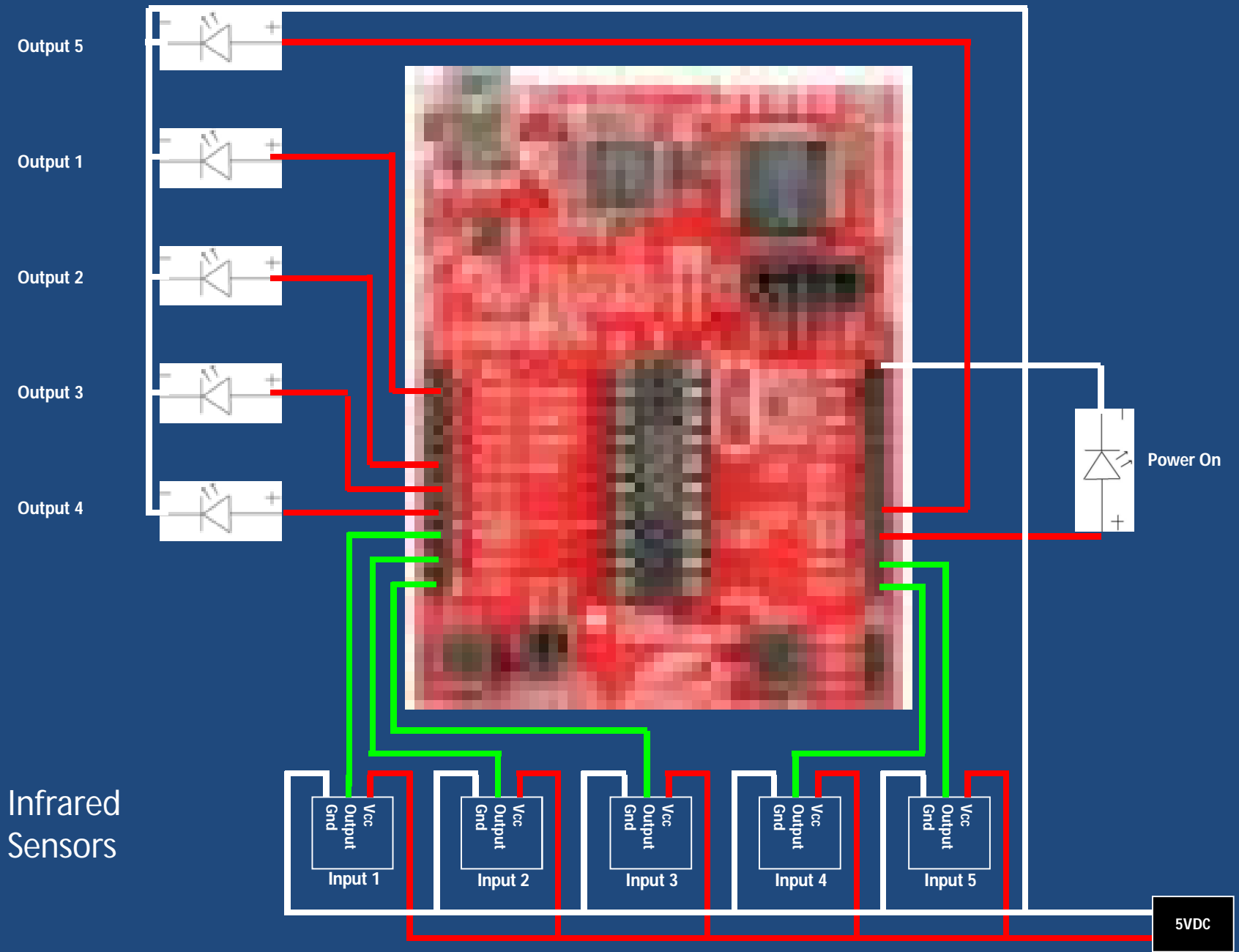
Up Exit – Down Entry



Up Entry – Down Exit

↓ Proposed Detector Location

Location	Input	Location	Input
1 - 1	1	1 - 2	2
2 - 1	3	2 - 2	4
3 - 1	5	3 - 2	6
4 - 1	7	4 - 2	8
5 - 1	9	5 - 2	10



Infrared Sensors

Quintet Optical Sensor & Timed Outputs

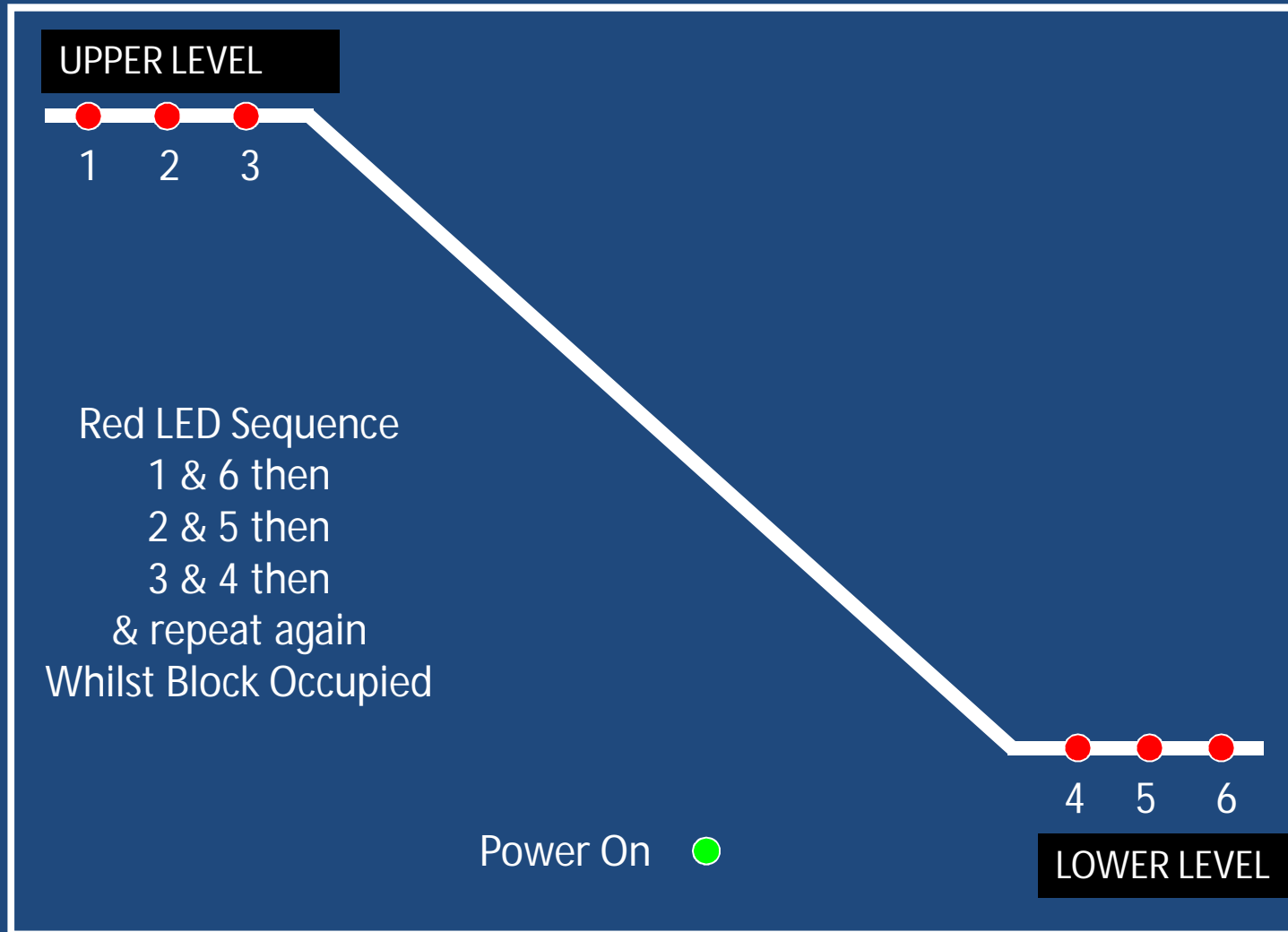
Prototype Trial

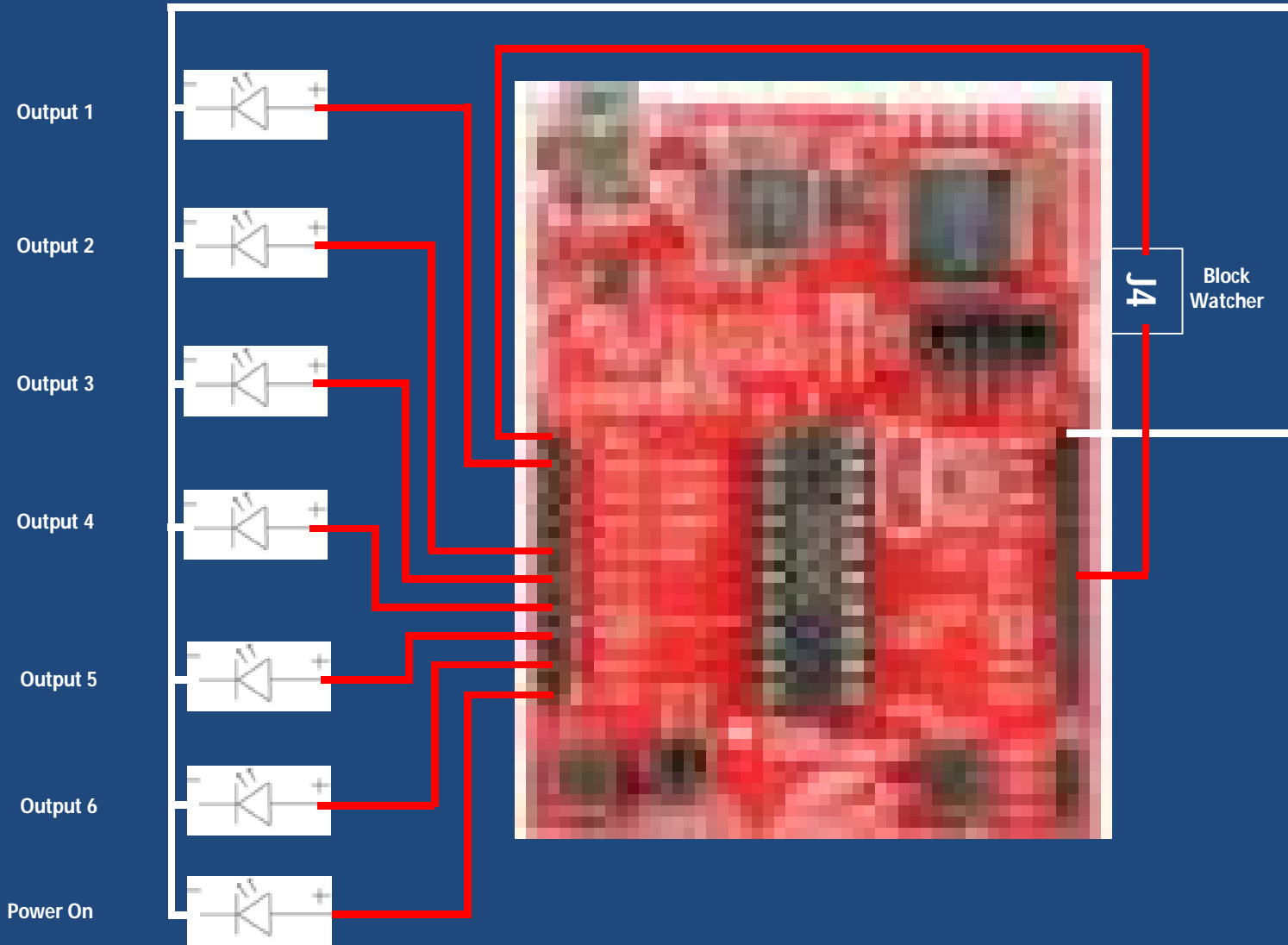


Putting it together

- 10 indicator LED's means
 - 2 x Quintet Optical Sensor & Timed Outputs Launchpad boards required.
- The "Block Occupied LED was too inconspicuous so a more robust solution clearly visible from anywhere in the room was required.
 - 1 x Helix Occupied Flasher

Improved Location Indicator Panel



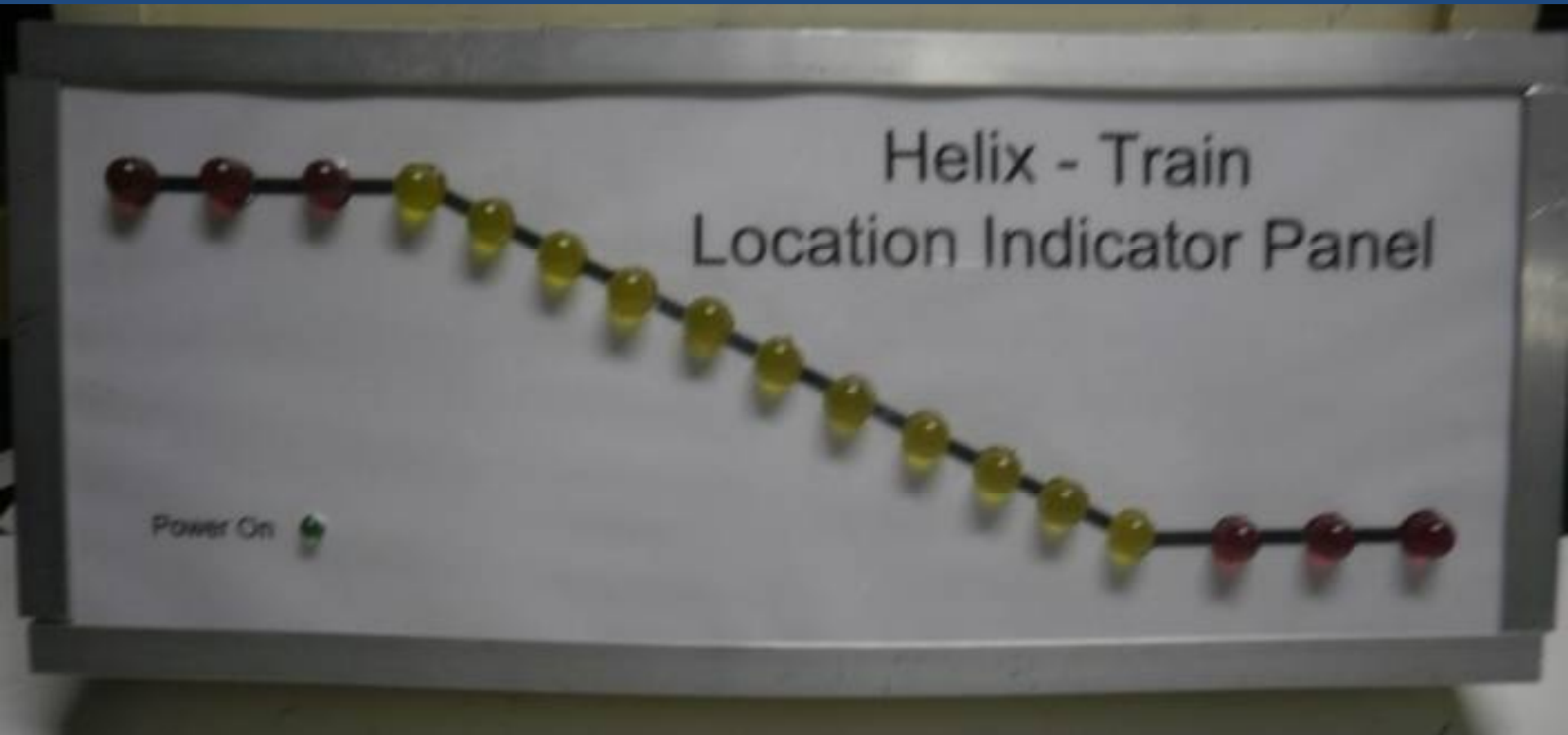


Helix Occupied Flasher V1.0

Prototype Trial



The Actual Indicator Panel

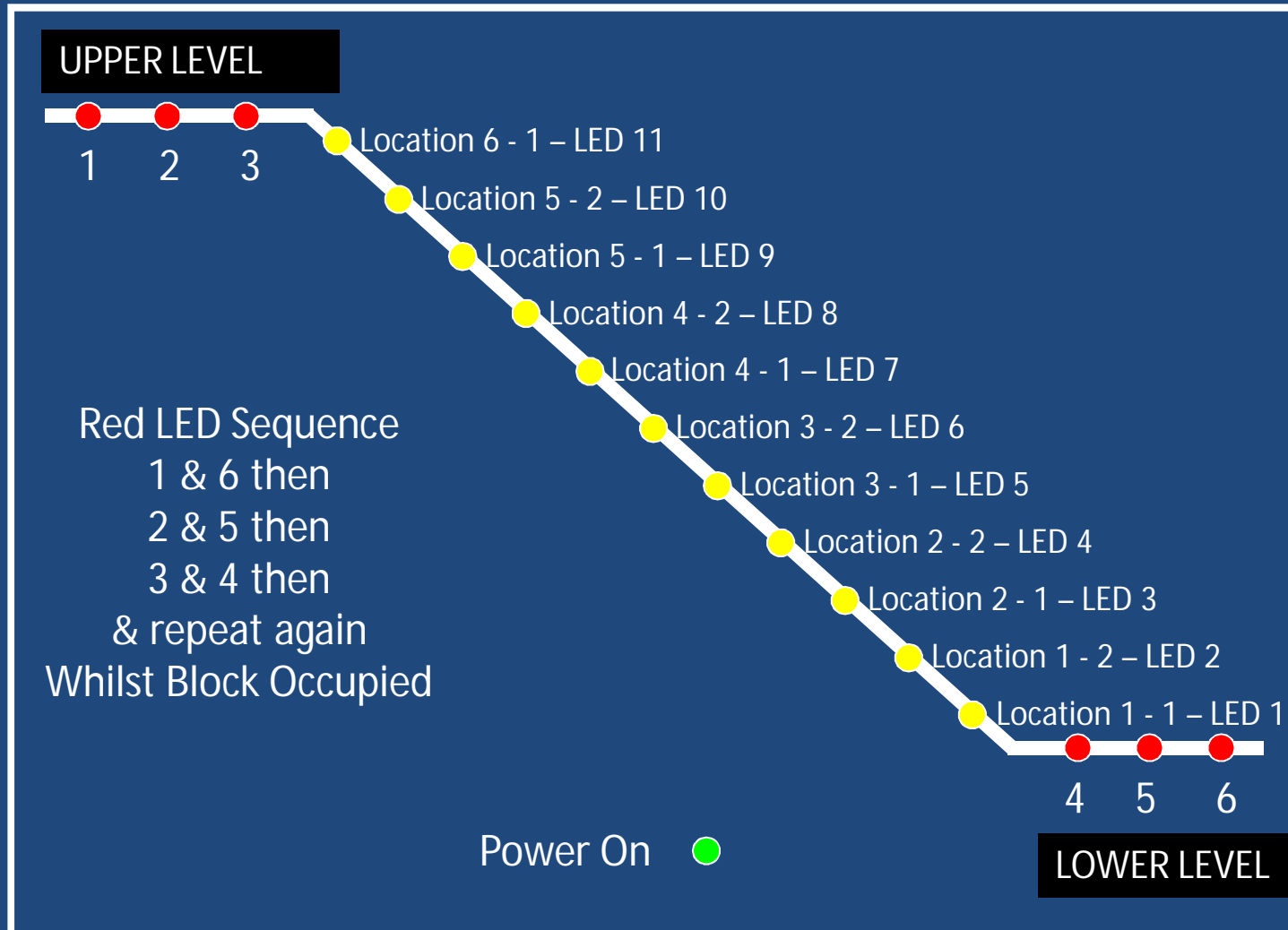


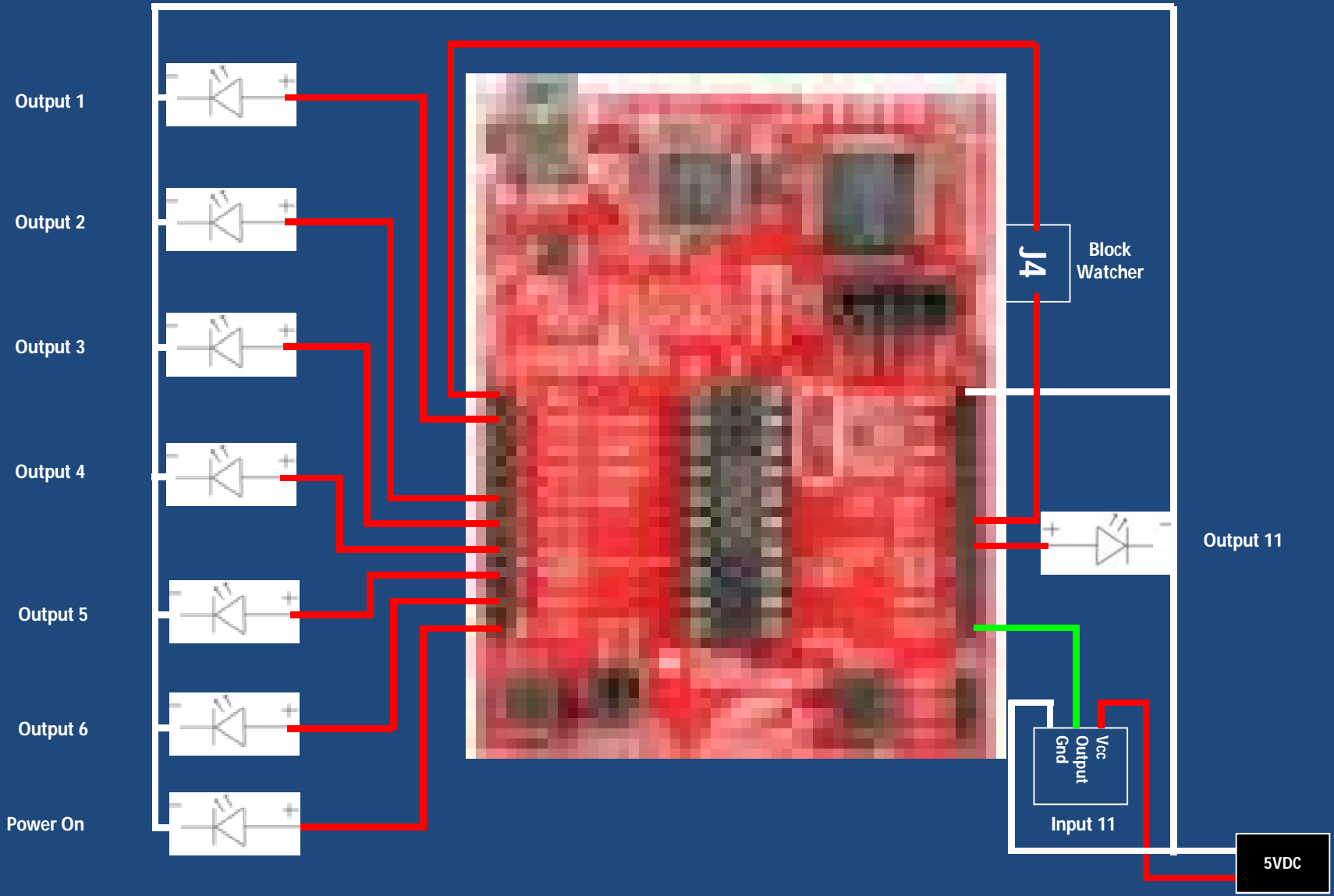
Count the Yellow LED's

Did you find the problem?

- 2 x Qunitet Launchpad Boards = 10 LED's
- Dunno how I did it but I fitted 11 Yellow LEDs!
- Too late to fix so I had to think of a solution...
Ah-ha Spare pins on the Helix Occupied Flasher V1.0 Board so Helix Occupied Flasher V1.1 was born by adding one set of inputs/outputs like the Quintet Board.

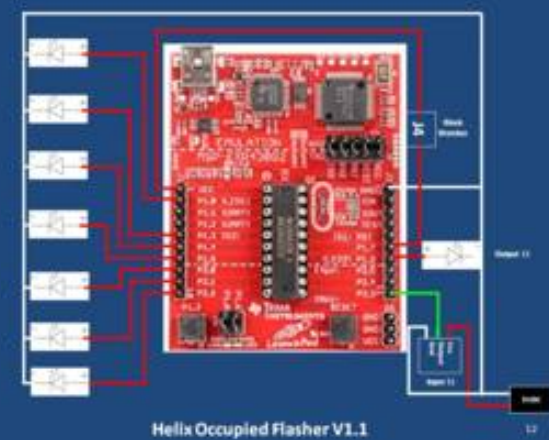
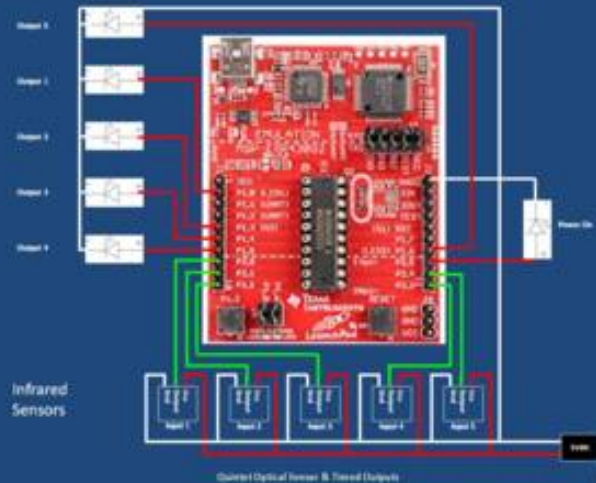
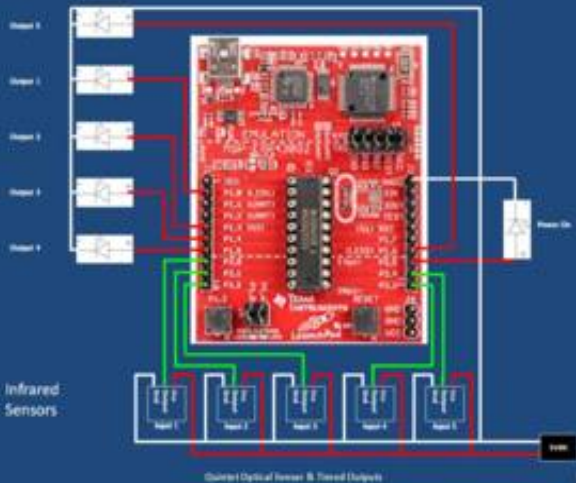
Improved Location Indicator Panel





Helix Occupied Flasher V1.1

Putting it all together



Save the Launchpads!

- Implementation in Breadboard format using a MSP-EXP430G2553N20 chip programmed in the Launchpad and then implemented as standalone with 3.2v regulated power source.

Thanks to David Loman for the [idea!](#)

- How?
 - See the next slide

Now lets save space and money

Parts List

- IC Experimenters Board - 140 x 95mm
- 3 x MSP430G2553N20 chips and sockets
- 1 x 5V Regulator LM7805
- 9 x 1A Power diodes
- 3 x 10k 1/4W resistors
- 17 x 100 ohm 1/4W resistors
- 0.100" male headers and/or machine pins
- Note: Power supply is based on a 12V Regulated DC source that has spare capacity available.

Tutorial 04: Stuck in a Loop

- I have added resistors to the LED's as detailed in the [tutorial 4](#).
 - A LED connected to one of the GPIO (General Purpose I/O) pins (Connect it with a resistor to prevent too much current draw out of the MSP. A couple hundred ohms should be sufficient.)
 - I used one hundred ohms to limit current to about 30mA per LED.

+12V Reg DC

Drop
3V
Over
5
diodes

+9V Reg DC

5V Regulator

+5V Reg DC

+3.2V Reg DC

MSP-EXP430G2553N20

MSP-EXP430G2553N20

Vcc
P1.0
P1.1
P1.2
P1.3
P1.4
P1.5
P2.0
P2.1
P2.2

GND
IN
OUT
TEST
REST
P1.7
P1.6
P2.5
P2.4
P2.3

+12V Reg DC

10k Resistor

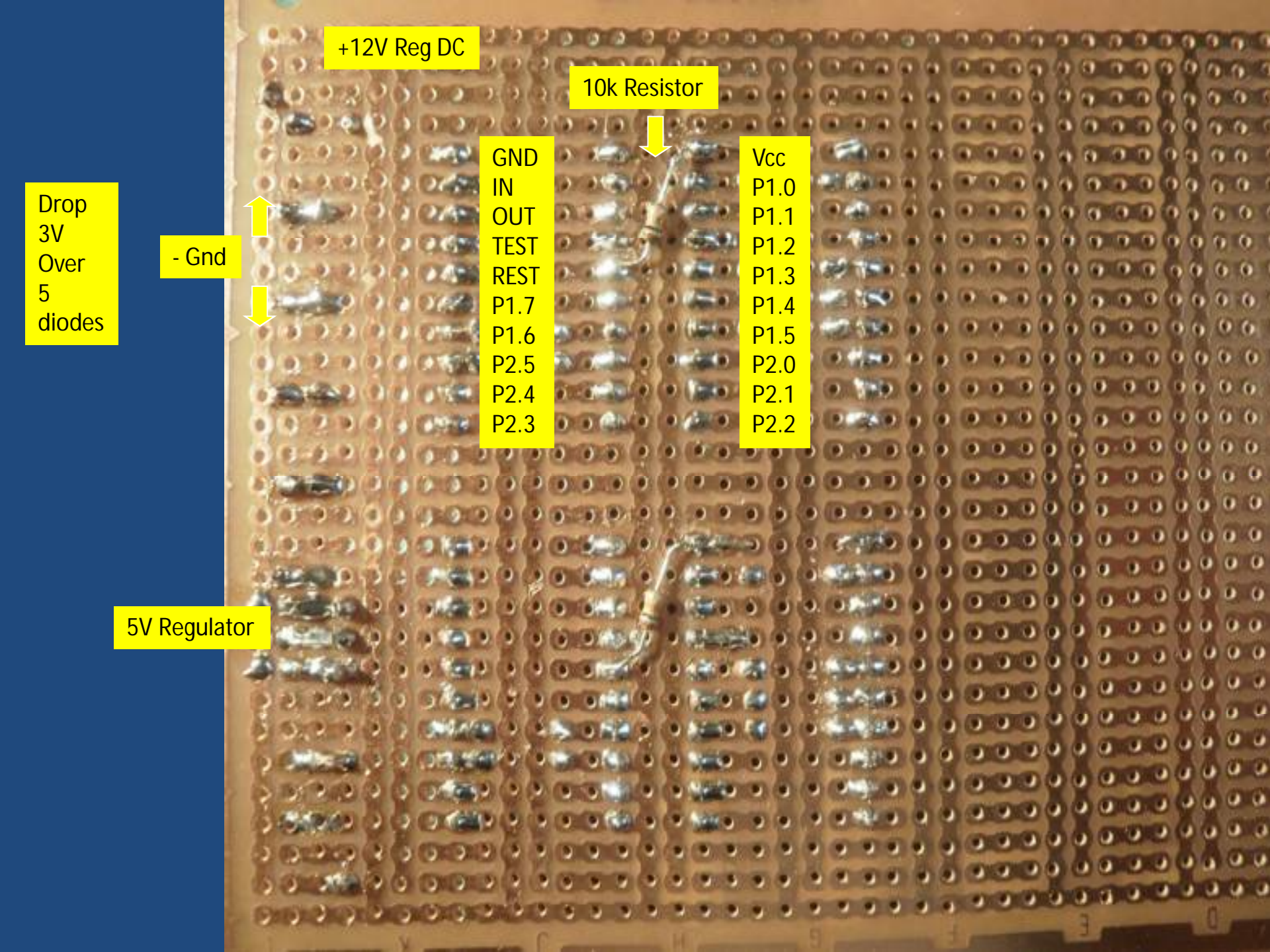
Drop
3V
Over
5
diodes

- Gnd

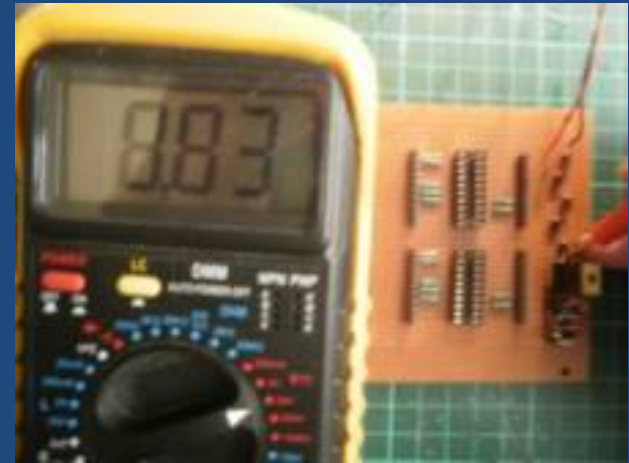
GND
IN
OUT
TEST
REST
P1.7
P1.6
P2.5
P2.4
P2.3

Vcc
P1.0
P1.1
P1.2
P1.3
P1.4
P1.5
P2.0
P2.1
P2.2

5V Regulator

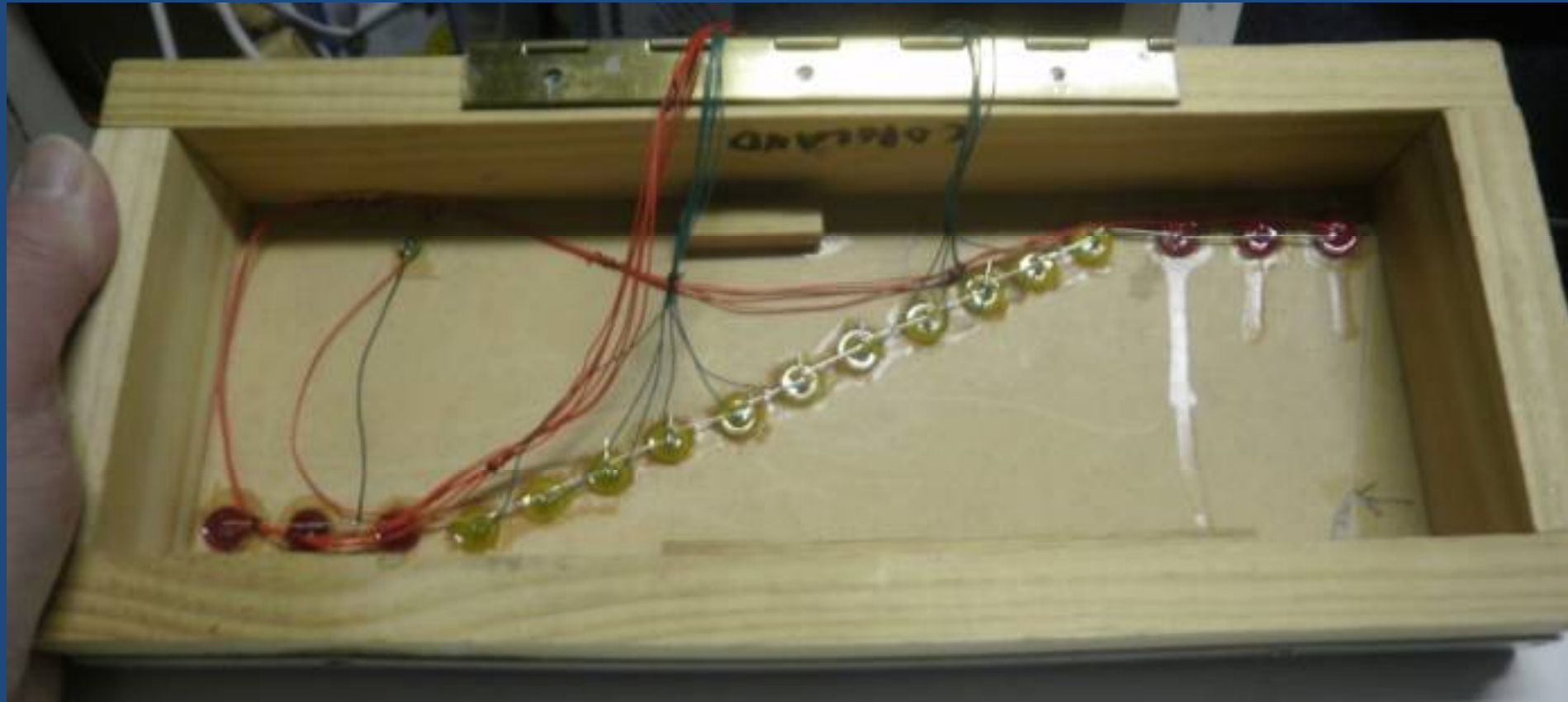


Checking Voltages



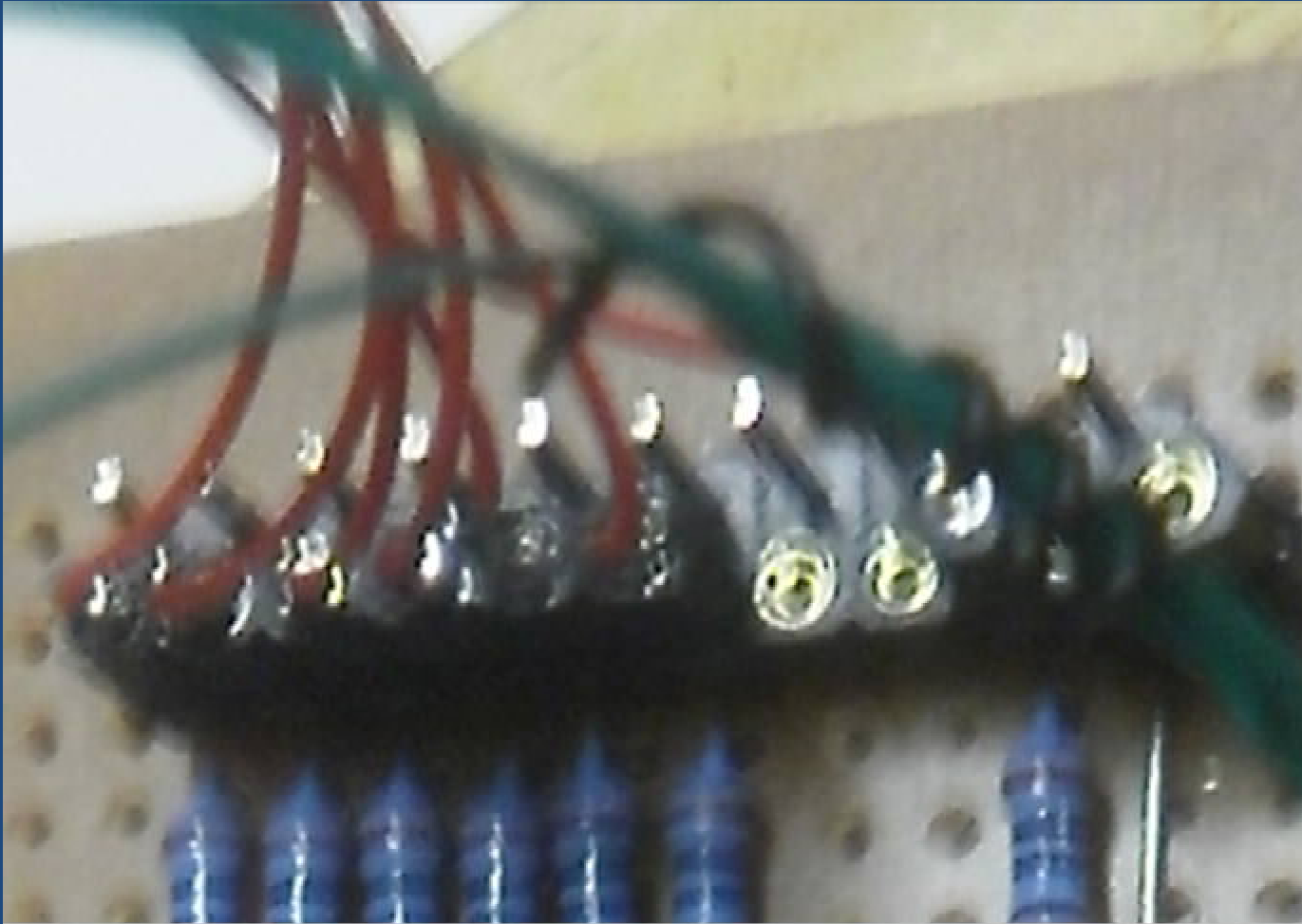
Remember to add a load when testing the 3V output

Wiring the LEDs



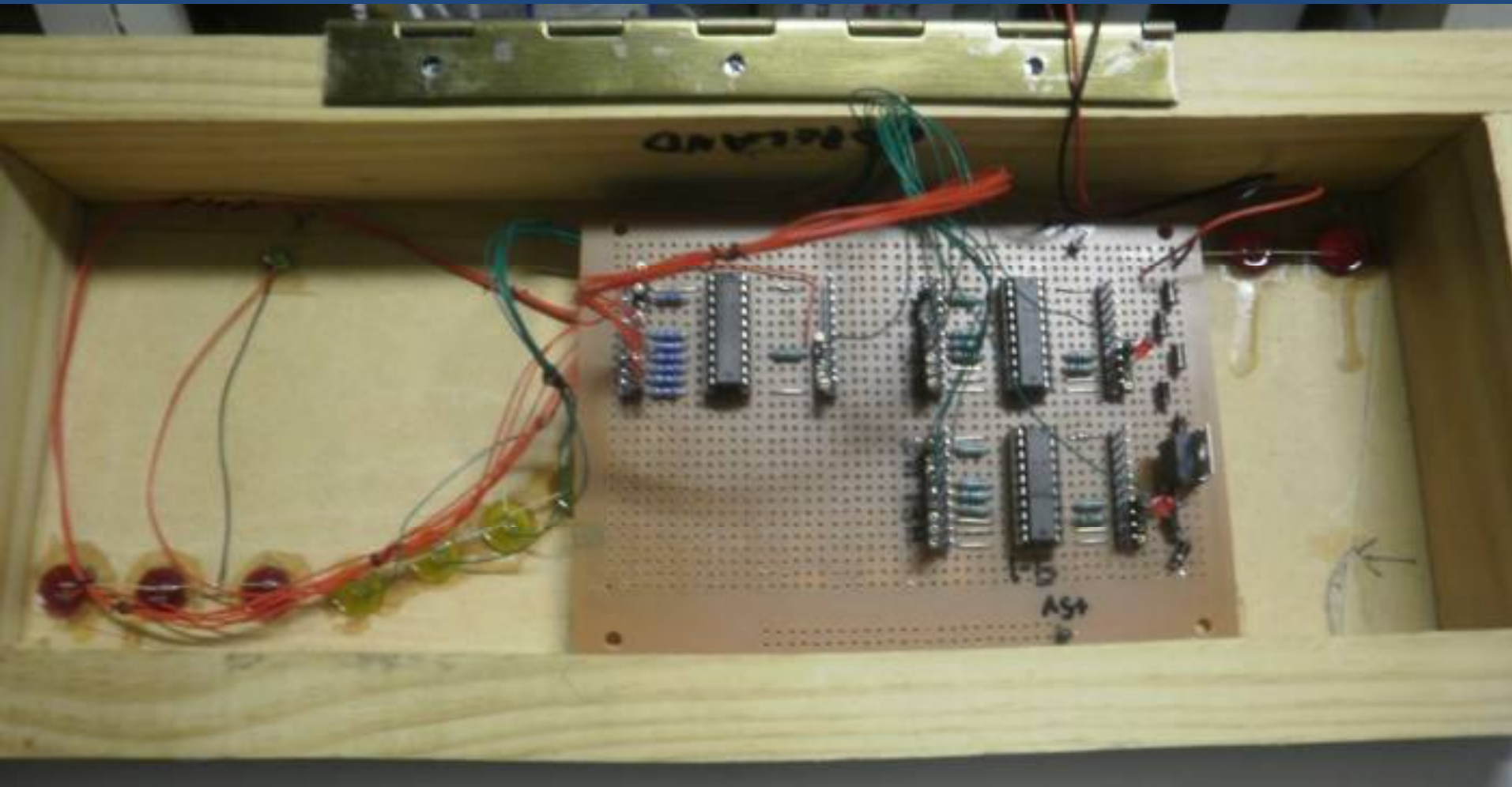
Note: All the cathodes are soldered together

Machine Pin Trial

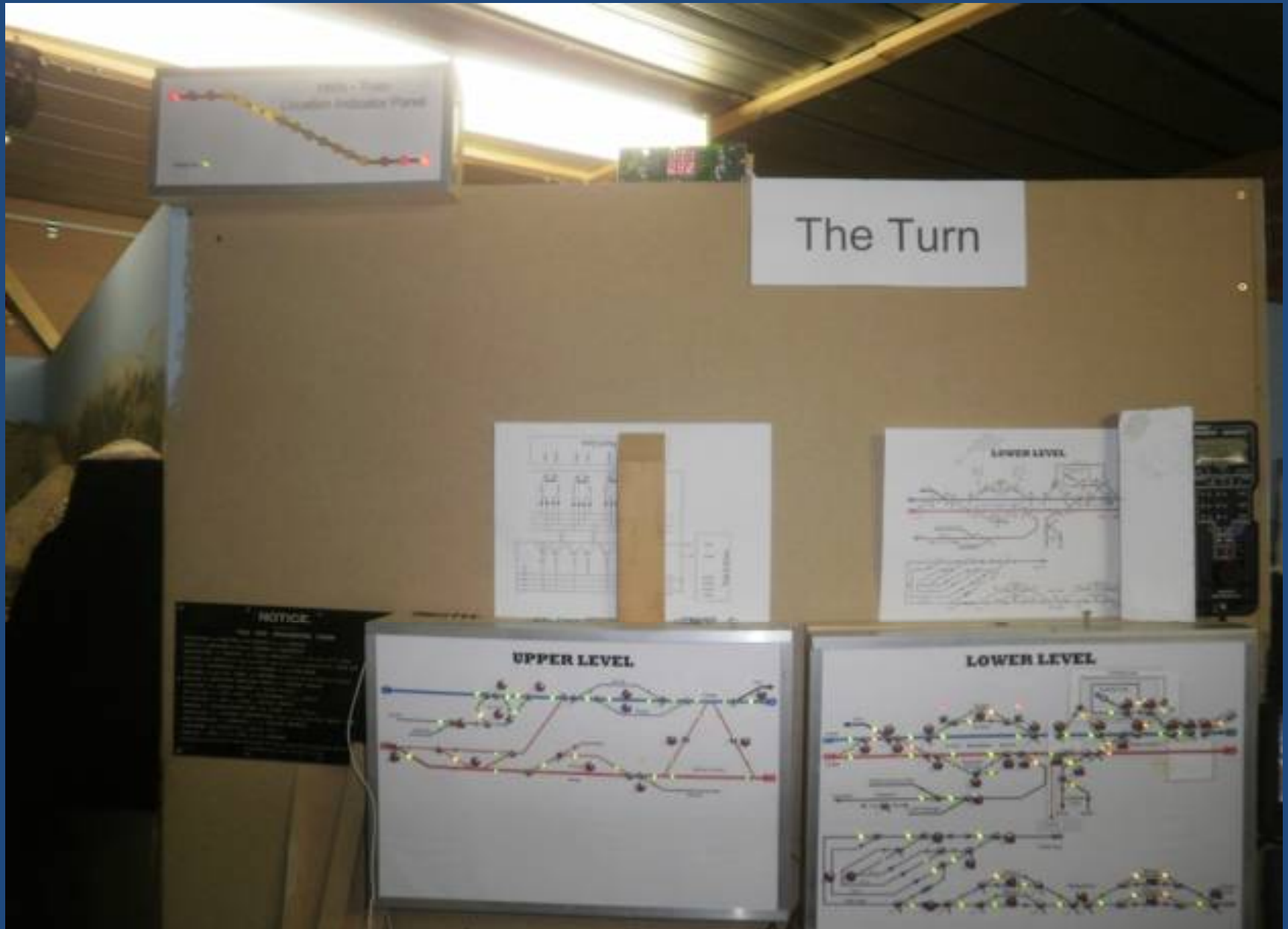


I soldered one set of machine pins to the board and another to the LED anode wires to facilitate easy removal should this be necessary

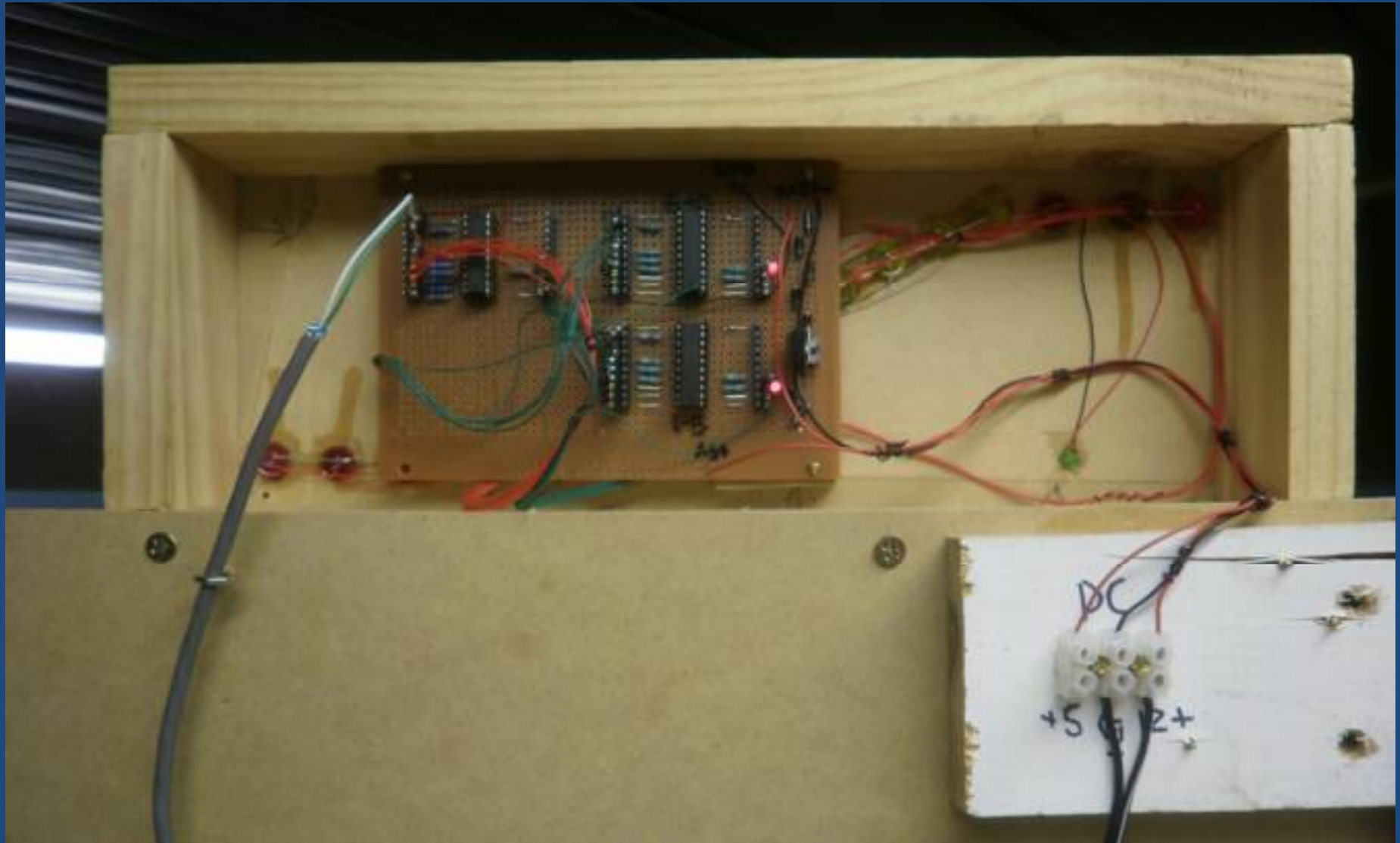
Trial fitting Board in Indicator Panel



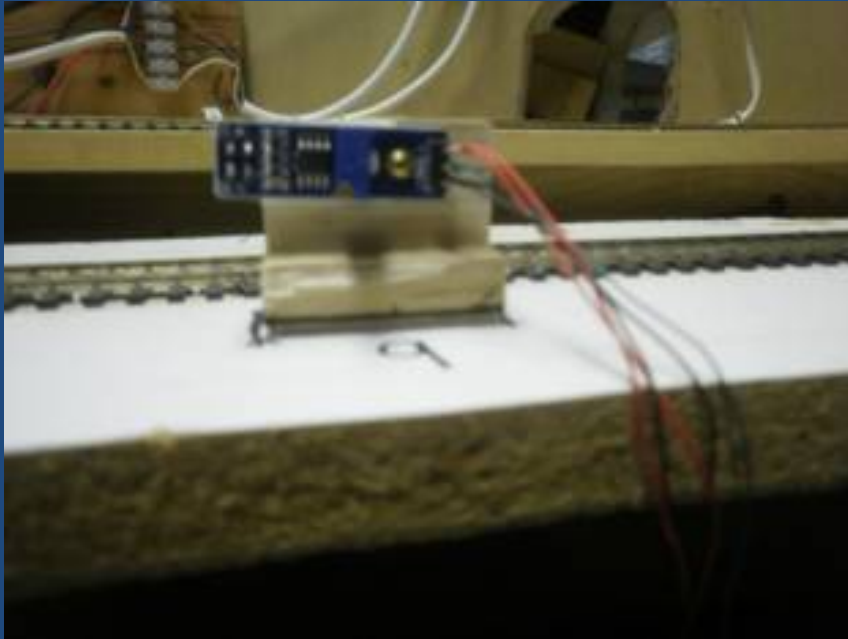
Indicator Board in position



Rear view Indicator Board in position

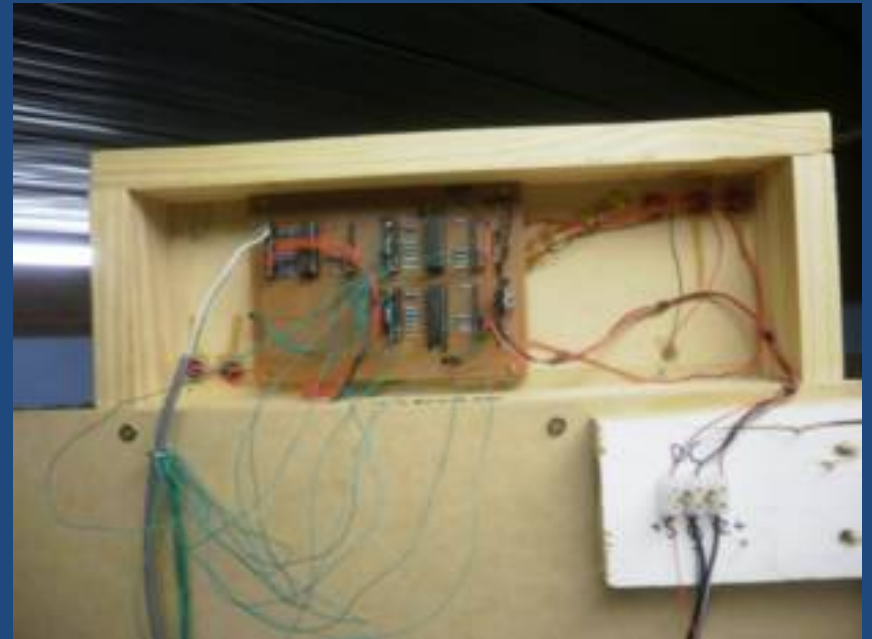
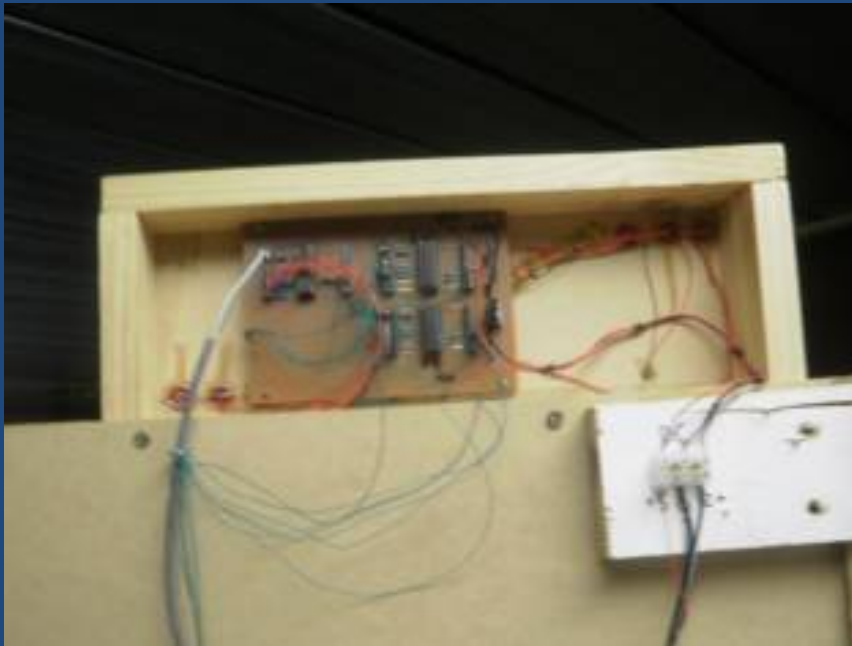


Connecting the Optical Detectors



Note: The original positions had to be amended for 11 detectors in stead of 10!

Wiring Sensor to Launchpad pins



Wire wrapping to header pins

Initial Testing

