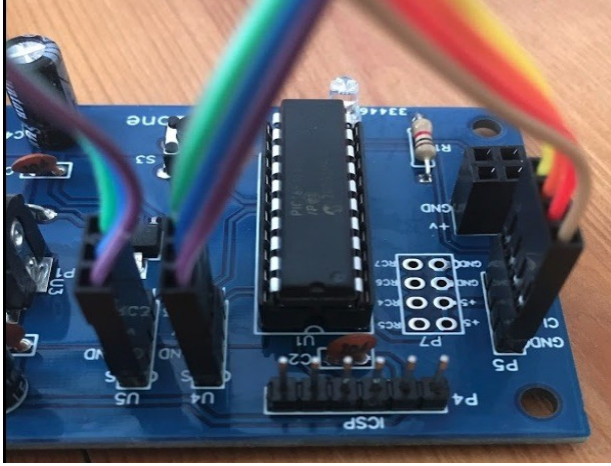


## Train Speedo Notes/Guide

### First Steps – connections

The board will arrive pre-connected, however if you need to reconnect the leads, these are the connections. Below is a photo showing the main 3 connections 2x sensors, 1x display.



Make sure you connect the leads with the pin names below.  
The colour of the ribbon cable may vary

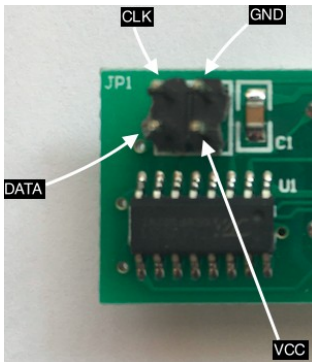
The sensors

On Board	On sensors
S	OUT
GND	GND
+v	VCC

Note: The 4<sup>th</sup> pin, RC3,RC2 are not connected.  
Also see the section below called “The Sensors”

Display

On Board	On Display
DIO	DATA
v+	VCC
CLK	CLK
GND	GND

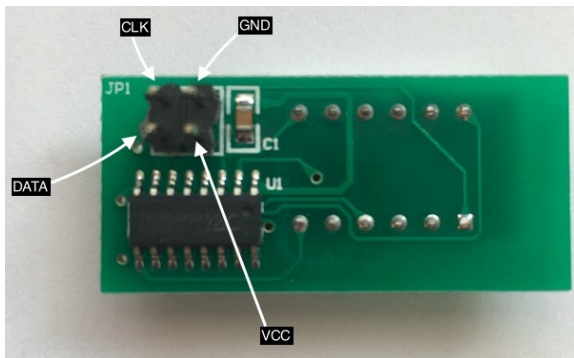


This shows the PIN names on the rear of the display board, as mentioned above.

Also see the section below called “The Display”

### The Display

The display is pre-wired (at the display end of the wire) see the picture above for connecting it to the PCB. But if you do make a new cable etc these are the connections you need to use:



Display Pins

GND  
CLK  
VCC  
DIO

PCB header (P5) pin

1 GND  
2 CLK  
3 +v  
4 DIO

### Powering the board.

You can use any PSU rated at voltage 6v DC – 15v DC able to supply current 150ma (minimum) with a standard DC 2.1mm x 5.5mm Power plug centre pin positive +. This is an open PCB and you must take care not to short circuit the board. It's meant to be mounted under your layout. Keep it away from bare metal etc.



I used an old adapter from a casio CD player it was rated at 12v DC 500ma. Many different type are around, if you do a quick search on Ebay, for example, for “9v power supply” you will gets lots of choice. To help keep the world a better place check your cupboards and draws first – I would be surprised if you can’t find something suitable!

You can of course connect it to your layout supply, but you **must** use a DC connection rated as above, you will probably have to make up a power cable with a plug at one end. The board is protected against reversed power. Be careful all the same. See note in the more information section.

***No responsibility can be accepted for your choice of power. Or if you damage your layout etc.***

This later release of the speedometer also has a JST power plug, labelled as PWR2, the pin nearest the PCB mounting hole in the corner of the board is GND and the other pin is VCC.

## Connecting the sensors.

The sensors have three pins:

- 1 VCC
- 2 GND
- 3 OUT

These connect to the PCB, one sensor on each of U4 and U5, like this:

Sensor	Pin	PCB
N/C	4	Not connected
GND	3	GND
VCC	2	+V
OUT	1	S

You can use ready made cables for these or you can make your own using dupont headers and female connectors. You may also consider, unless you need to detach the cables from the sensor, soldering the wires directly on the sensor pins. Use some heat shrink tubing to give the wires more strength and prevents shorts.

I used 10 way ribbon cable, split down into 3way+3way+4way (2 sensors and 1 LED display). Try to keep the lengths as short as possible, it should be fine up to 3 metres (mine is using 1.5M + 2.5M + 0.5M for the first, second sensors and then the display).

## Adjust the sensors

NOTE: if a sensor is active the display will freeze and wait for it to be released. During normal use this helps prevent false readings. But in cat be confusing if you don’t know that's what it’s waiting for!

To get reliable sensing of the model you need to adjust the sensitivity of each sensor. This is a simple task. With nothing in the sensors way, using a small screwdriver turn the preset resistor on the sensor until the "OUT" Led comes on. Now “back off” the preset until it goes out. You can now test the distance/sensitivity by moving your hand or a model I front of the sensor. By careful adjustment you should be able to get the sensor to trigger OK at a distance of up to 5cm or so. HOWEVER be aware that ambient light will effect this and can cause false triggering, it's better to go for the minimum required setting for your layout - most likely around 2-3cm.

## Sensor timeout

When a sensor is triggered there is a timer set to 45 sec, while it wait for the other sensor to trigger. If it does not trigger within the time out the display will reset back to the ready state.

## The Menu Options

With everything connected, your ready to check the menu options. For most people the defaults are probably ok.

The options you choose in these menus are stored in EEPROM, so once selected you don't need to change them again even after a power off.

Options are chosen using a single button. The button auto selects the sub-menu when you stop pressing it for more than 4 seconds. Each time the button is pressed the sub-menu rotates in a round-robin sequence. When you reach the sub-menu you need just wait a few seconds and it will be selected.

The first value of the sub-menu will be show. You can now use the button to choose the value you need. When selecting values in the sub-menu the button moves round-robin through the values, leaving it on a value for more that 5 seconds auto selects that value. The last value shown on the display will be saved in EEPROM and used from then on, even after a power off

### The sub menu's are:

0 - Exit and do nothing.

1 - Select the Scale to use

Disp	Scale(aprox)	Rail size	Disp	Scale(aprox)	Rail size
076	1:76	OO	160	1:160	N (world)
048	1:48	O	150	1:150	N (Japan)
087	1:87	HO	220	1:220	Z
148	1:148	N (UK)			

2 - Selects the distance to use between the sensors

Disp	Dist	Disp	Dist
30	30cm gap between sensors	75	75cm gap between sensors
50	50cm gap between sensors	100	100cm gap between sensors

3 – Selects MPH/KPH display

Disp	Display speed as	Desc
000	MPH	Display speed as MP/H
001	KPH	Display speed as KP/H

Note: Choosing a larger gap will increase accuracy. But is sometimes more difficult to use on a layout. Try to keep the 30cm gap for portable use (sensors on a movable piece of wood). If possible use 100cm.

### More information

**NOTE, POWER:** I don't provide the power supply unit for two reasons. 1 Many people already have a power supply of one sort or another. 2 I build these things as a hobby, not a business, however I would have to supply certification for each power unit I supplied and that would be too expensive.

If you need to ask questions please email [derek@coopzone.org.uk](mailto:derek@coopzone.org.uk). Asking costs nothing assuming something maybe expensive! You can also ask via Ebay (if you purchased this from ebay !)

See also <https://www.instructables.com/Model-Train-Speedometer-V2/>

You can use the comments/discussion on the instructables web side to leave feedback or ask questions (may not be as quick as email)

I hope you enjoy this board and find it useful. Stay safe and well. Have fun!