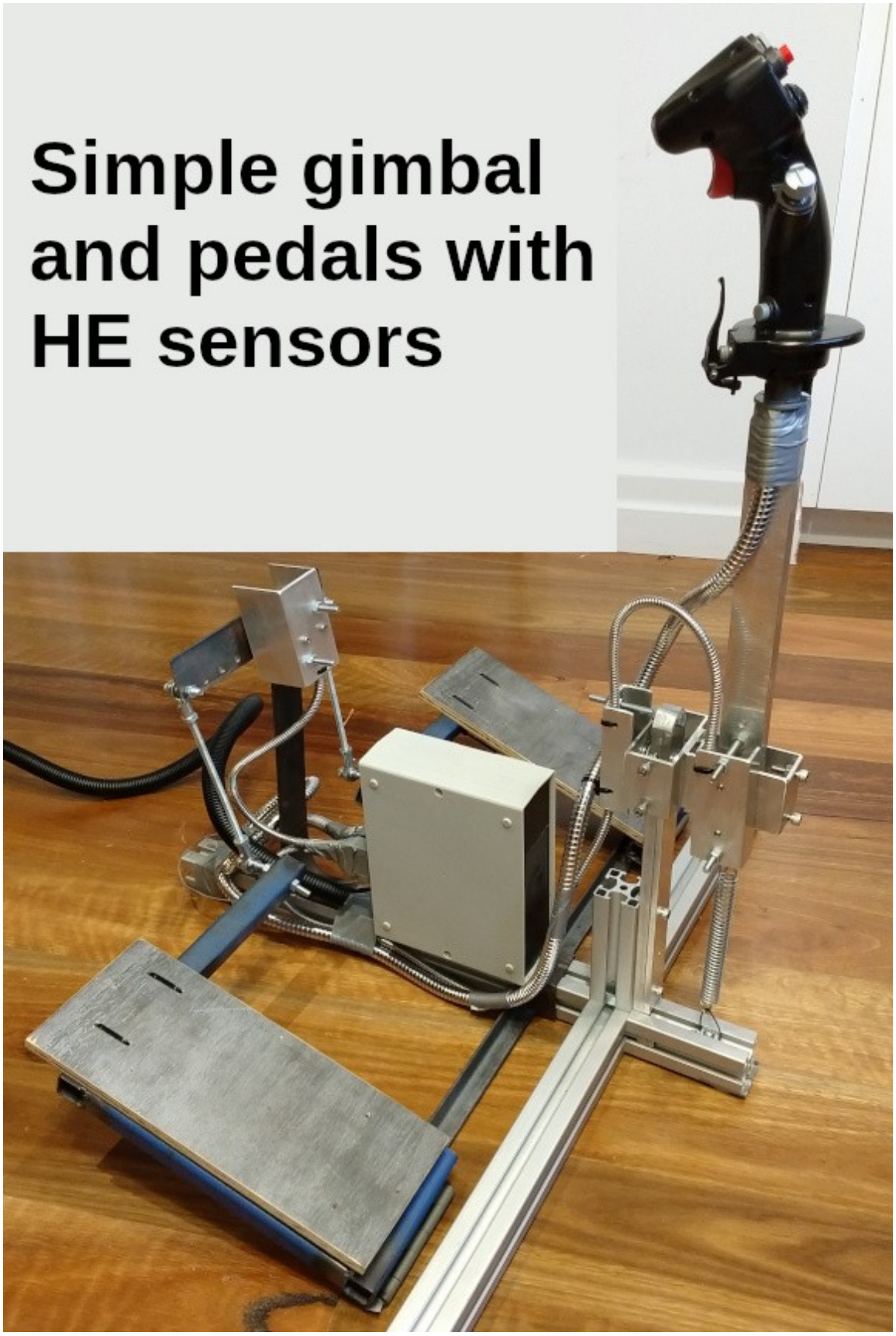
Simple gimbal and pedals with HE sensors



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Mechanical features:

- Easy adjustment of gimbal movement limits.
- Easy adjustment of motion sensitivity.
- No centre clunk… I hate centre clunk.
- Self centring, with selectable force via spring and lever arm length choice.
- Bearing friction vs spring tension set centring repeatability – it can useful in some sims to have the stick stay slightly off-centre.
- Tools required for the gimbal are minimal – a saw, sand paper, drill and drill bits.
- The gimbal is fairly narrow.
- No movement slack.
- The pedals pivot up and down (somewhat like pedals in a car) rather than forward and back, whilst remaining parallel.

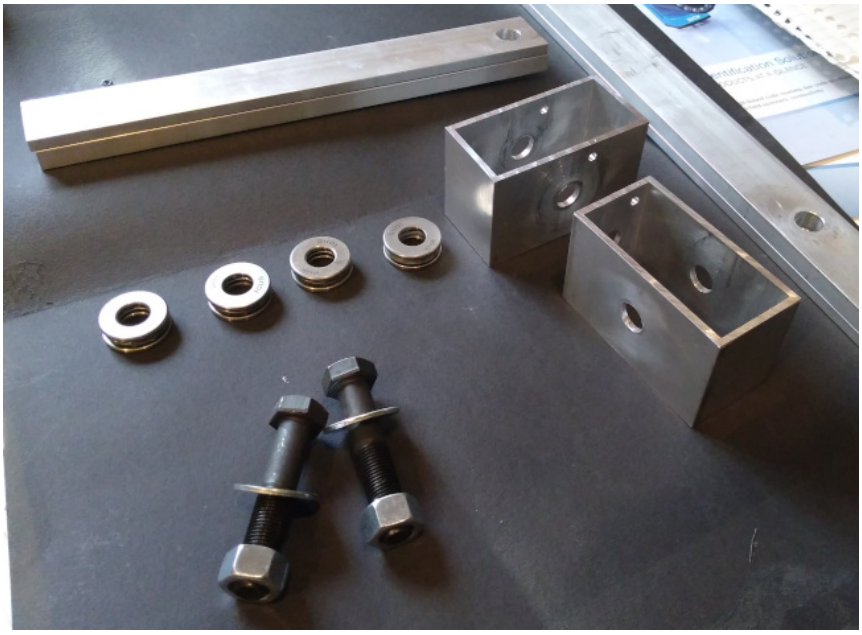
Cons:

- Pedals would need some sort of toe button to implement brakes.

To make the gimbal you'll need these parts:

- 80 x 40 x 3 aluminium extrusion.
- Either:
  - 10 x 32 aluminium flat.
  - 6 x 32 aluminium flat.

  Or:
  - 16 x 32 aluminium flat (if you can find it).
- 4 x 51101 thrust bearings (grease them before assembly).
- 2 x M12 bolts (preferably fine pitch and with lock nuts).
- Small nuts and bolts.



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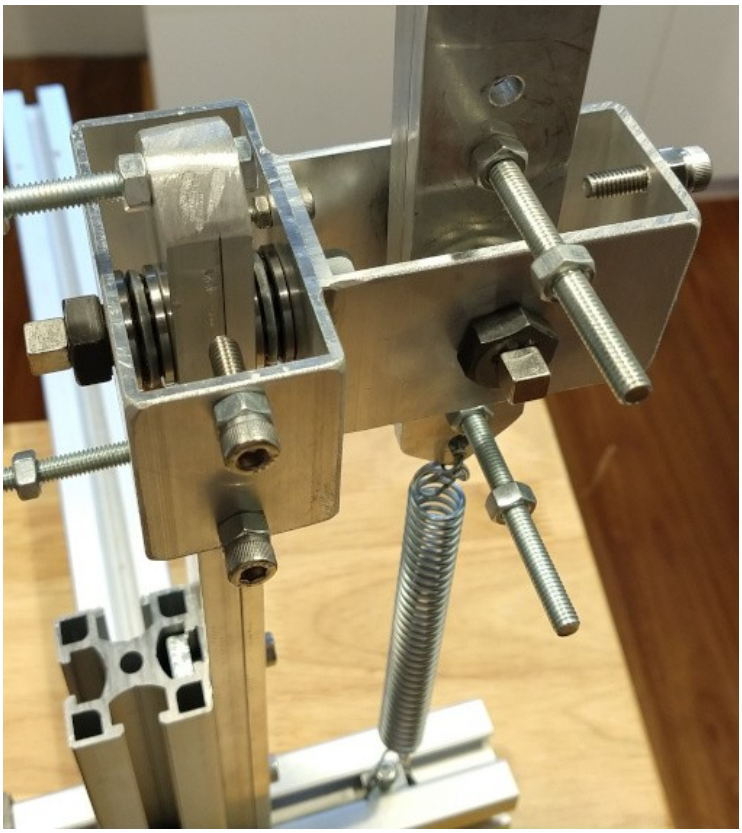
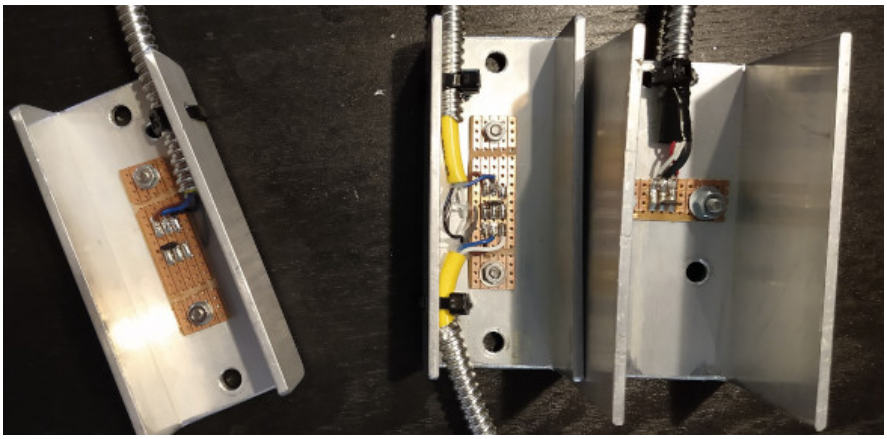
The main point with this gimbal is that the thickness of two bearings and whatever you use as a stick add up to the internal width of the aluminium – in my case 9 + 9 + 10 + 6 = 34mm, which is the inside width of 80 x 40 x 3mm extrusion.

The assembled gimbal:



You can also see the 5mm neodymium magnets, limit screws, and centring spring above. The long bolts are for mounting the sensors and sensor covers.

X, Y and Z sensors are below they are old A1321EUA-T hall effect sensors that I had, but you might find something more sensitive. (A1321EUA-T is 5mV/G).



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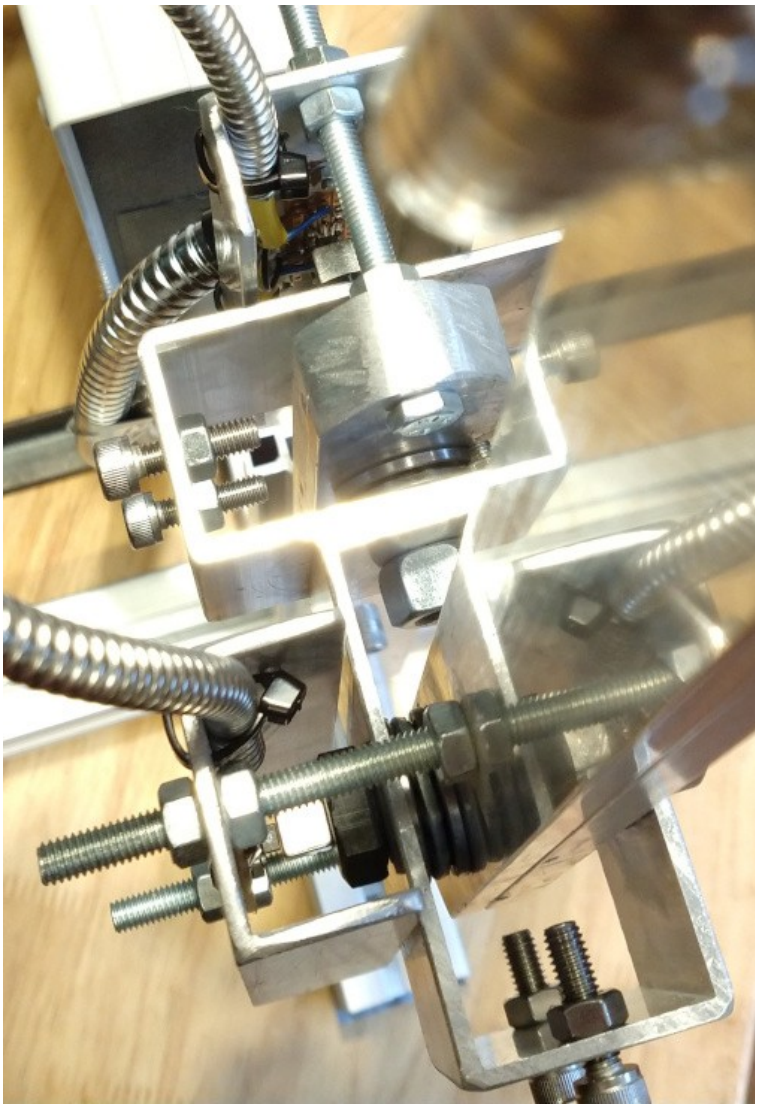
With the sensors mounted on the gimbal:



The distance between the sensor and the magnet sets sensitivity. These sensors and magnets needed to be very close for my chosen range of movement, but there might be better sensors and stronger magnets available.

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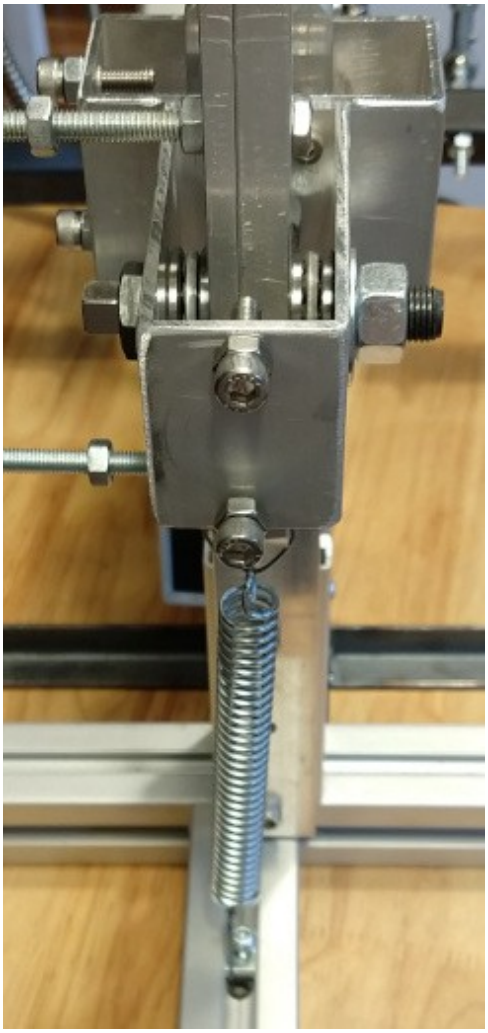
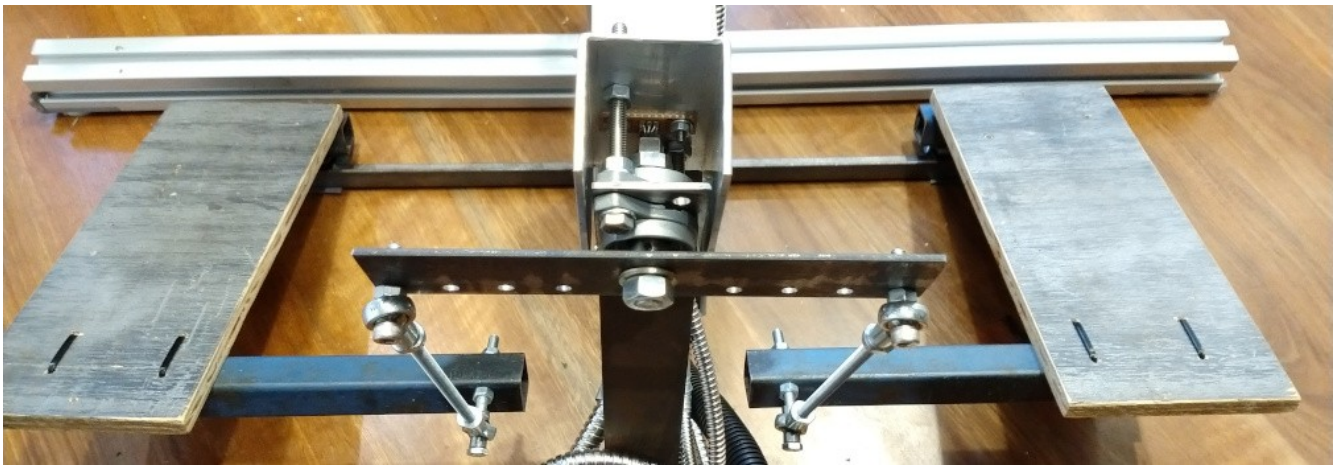
The centring spring is offset left and forward to compensate for the asymmetric mass of the metal grip (which is forward and left of the stick). It is adjusted so that the stick returns to centre:

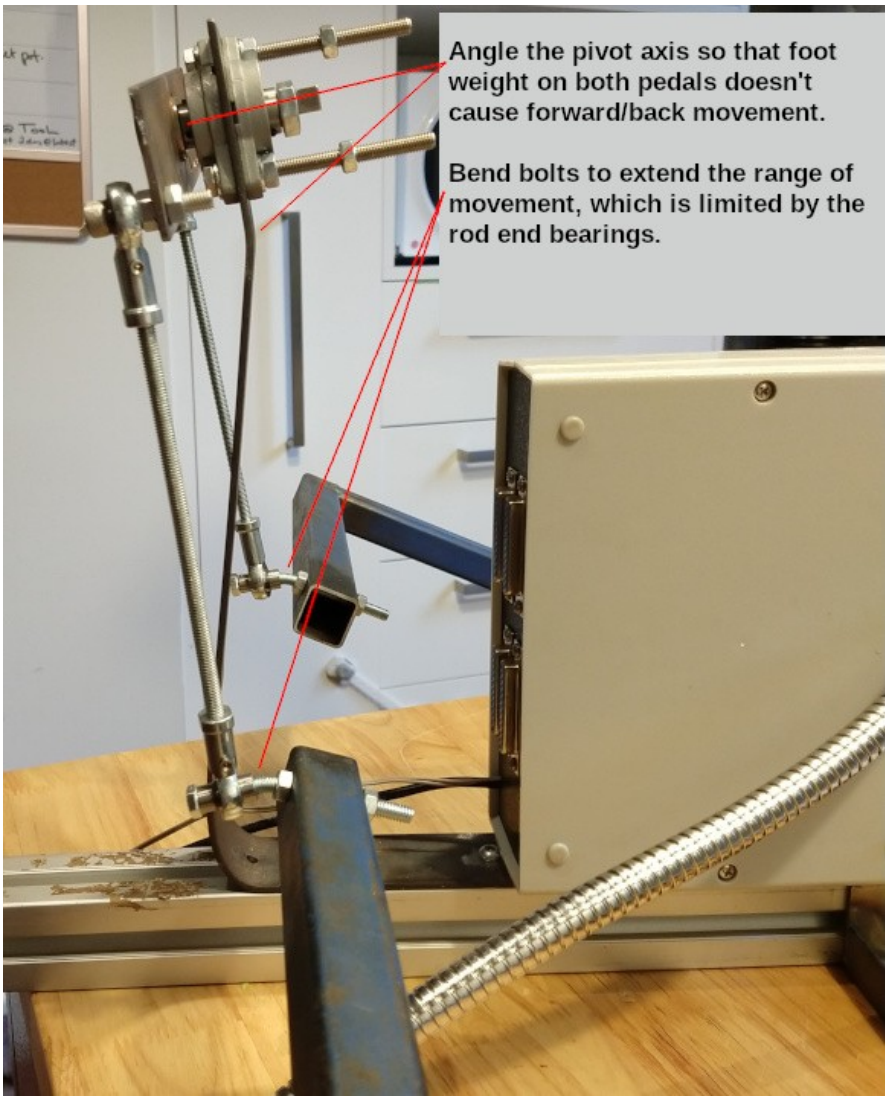


Calibration is done by:

1. Set the stick centre point by adjusting the lower spring loop position.
2. Rotate the magnets so that the centre position reads 50%.
3. Adjust the limit screws so that the stick's movement limits coincide with the sensor output limits.

The pedals are pretty simple too. I used 2 x FL000 bearings, 4 x rod end bearings, threaded rod etc.





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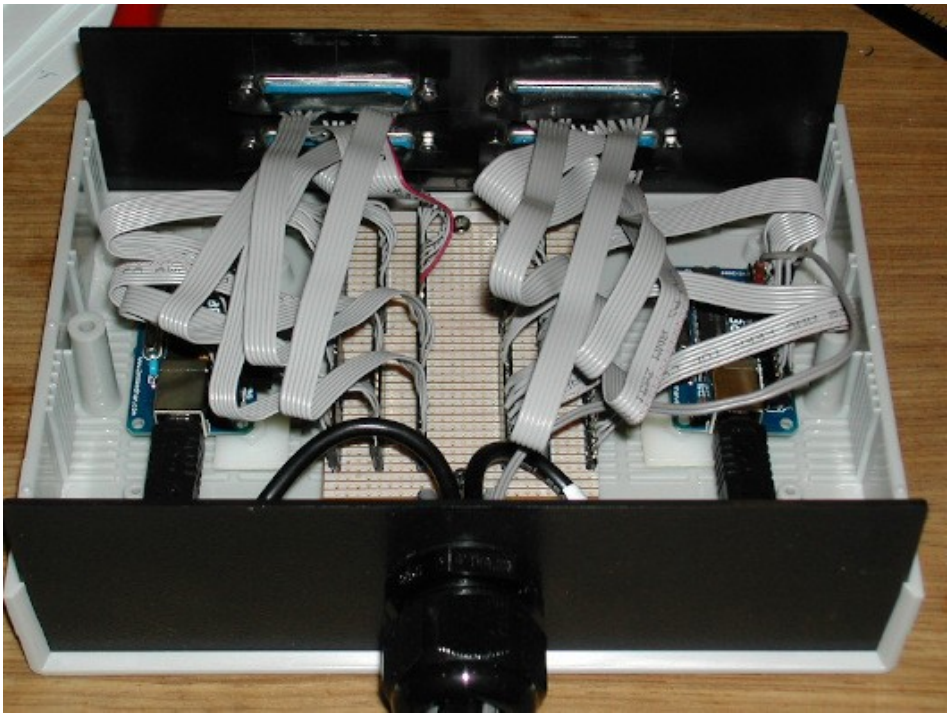
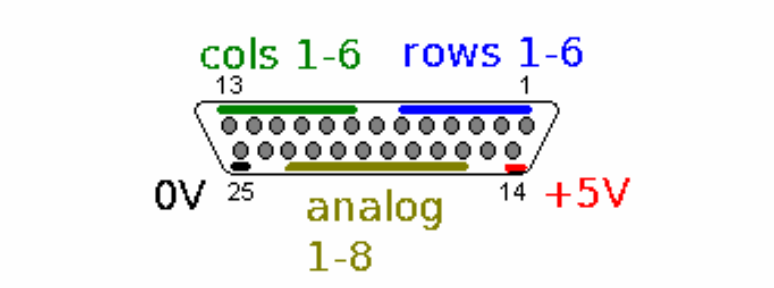
ADC is done by two of Leo Bodnar’s BU0836A, one for stick and pedals and the other for a button a knob board.



Each BU0836 has two 25 pin sockets, each with the pinout below – which allow devices to be disconnected easily, whilst still sharing input pins.



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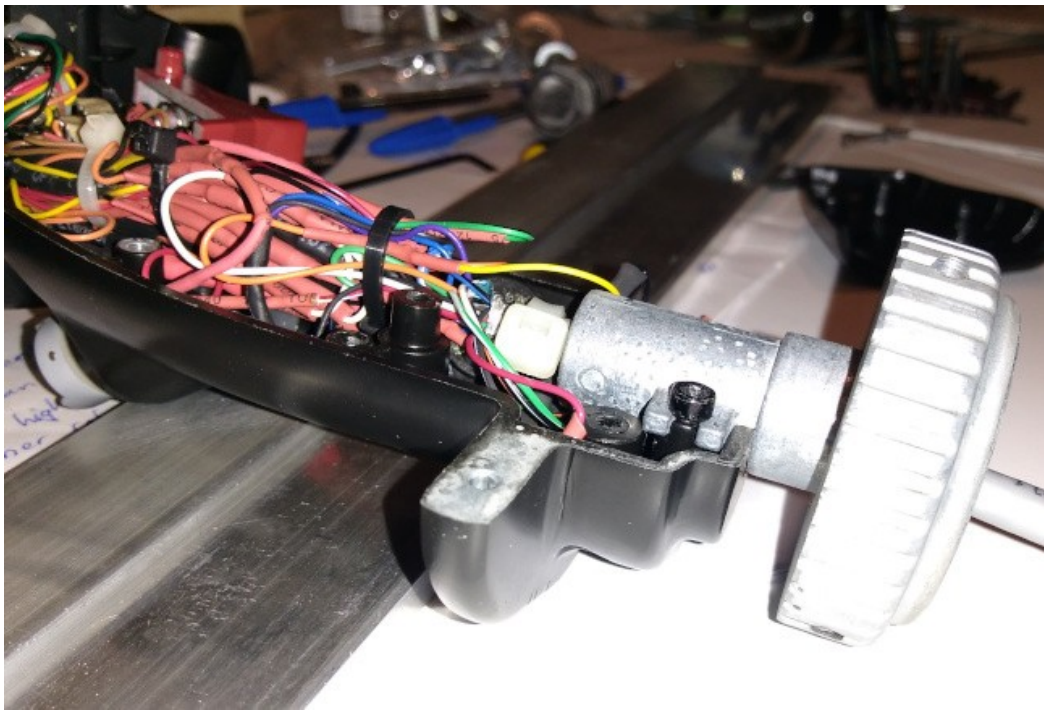
The Thrustmaster Warthog grip was rewired for use with the BU0836A.



The grip’s flange was cut at an angle, and a pipe clamp holds the flat surface against the aluminium stick. It may not look like it, but it’s rock solid.

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