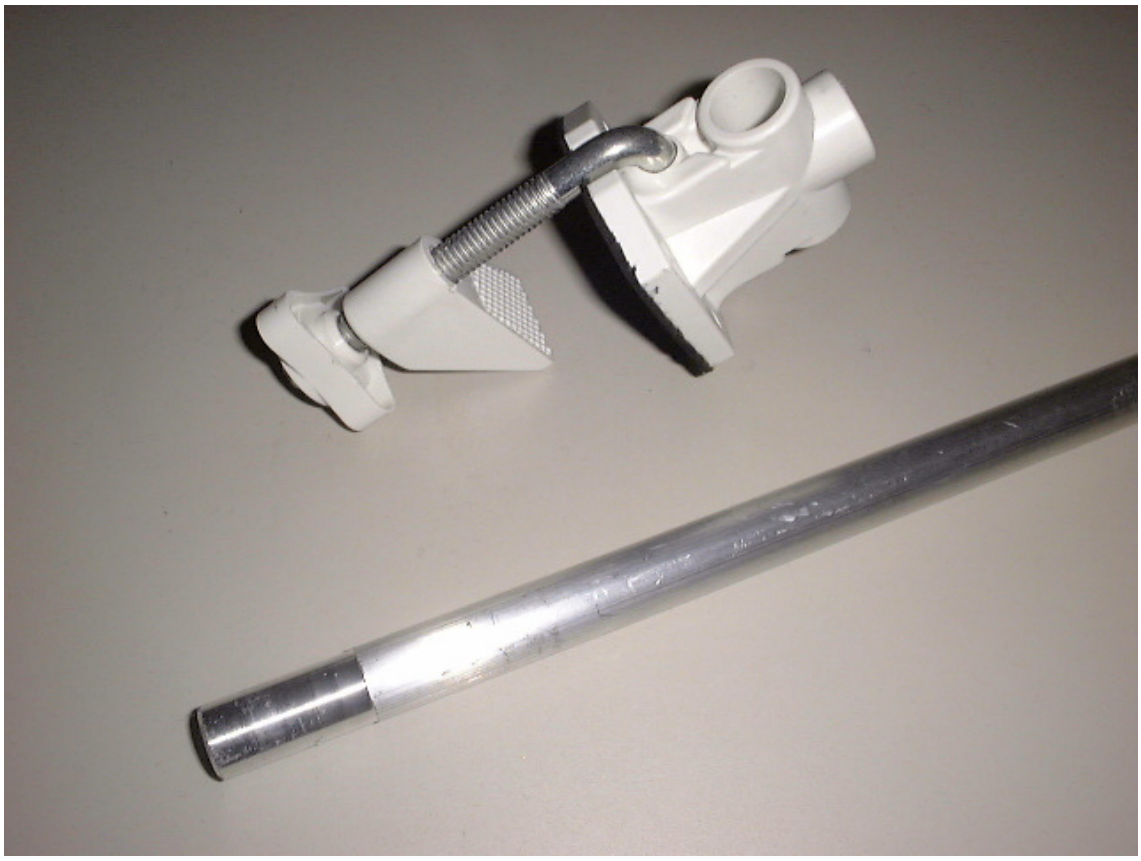
E-reader Based Page Turner – Construction Notes

Part 1 – desk clamp and pole

The desk clamp was purchased from e-bay and was described as a spare wall clamp/bracket for a desk lamp. The identical design seems to be widely available.

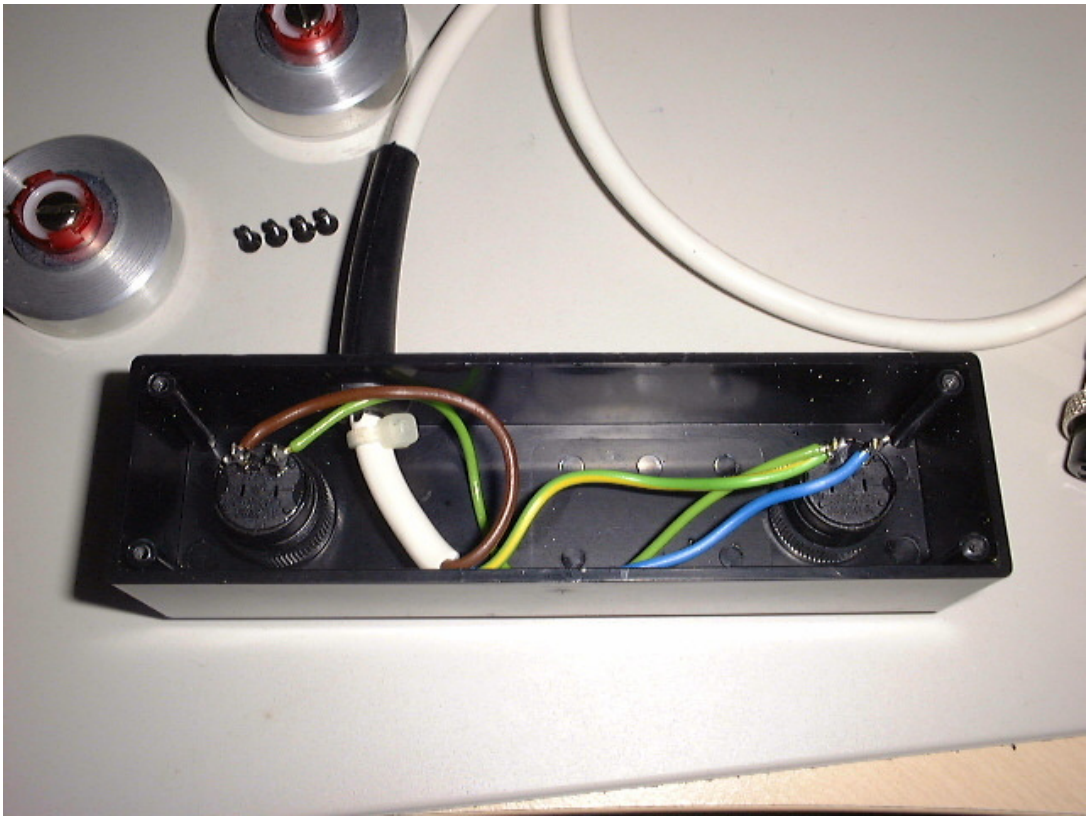
The pole is ½ inch aluminium solid bar, with the final 25mm turned down to precisely 12.3mm to give an interference fit into the desk clamp. Dowel could be used instead if machining facilities are not available.

The length of the pole will depend on the reading height for the client/desk, and how much adjustment is desirable. Suggested length 400-500mm.



Part 2 – switch box

This could in reality be ANY switch panel to suite the client's requirements (e.g. blow switches, foot switches etc.). It could also be two separate "Jelly Bean" switches but these are expensive and such sensitivity wasn't needed in this case.

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Maplin items as follows were used for this box:

FT31J – small narrow box (qty 1)
N01AR – push to make momentary (qty 2)
FM52G – 4 way locking chassis plug (qty 1)
FK24B – 4 way locking line socket (qty 1)

Notes:

1. N02AR and N03AR are similar switches but different colour button caps so would be equally suitable.
2. This particular type of switch was chosen because the buttons caps clip on. By drilling a hole through the button cap, we were able to add a much larger cap to it, which also means the buttons can be removed easily for cleaning/disinfecting.
3. The metal locking audio plugs/sockets sold by Maplin are not cheap, but are more robust than other types. Cheaper multi-way connectors could be used. 3 way is actually sufficient for the connectors (12V out, and return from each switch) but using 4 way connectors gives us the option of adding 0V if (say) we needed a powered touch switch in the future (the panel already has a reliable circuit for this).

Other components used:

- Two button tops turned from 35mm aluminium billet. These are 10mm thick, with a blind tapped M4 hole on the underside to take a short machine screw.
- Rubber cable strain relief
- 3 way flex
- Dymo label indicating the page direction

- Heat shrink sleeve to build up the flex diameter for the screw locks of the line socket

Part 3 - carrier

This was a simple wooden carrier to attach the e-reader front panel to the pole and give vertical and tilt adjustment.

The dimensions are not particularly critical.

The larger block of wood is 60mm x 60mm x 45mm. A ½ inch hole is drilled 20mm in from the back edge. The back of the block is then sawn down the middle of the hole forming a detachable clamp.

Two M8 studs are then tapped and secured with adhesive deep into the timber block, and the clamp secured by two wing nuts and washers. A threaded section of aluminium strip set into the block carries a finger wheel to adjust for tilt.

A door hinge secures the larger block to another 60mm wide, 80mm high and 20mm thick. The front panel of the reader is attached to this block.


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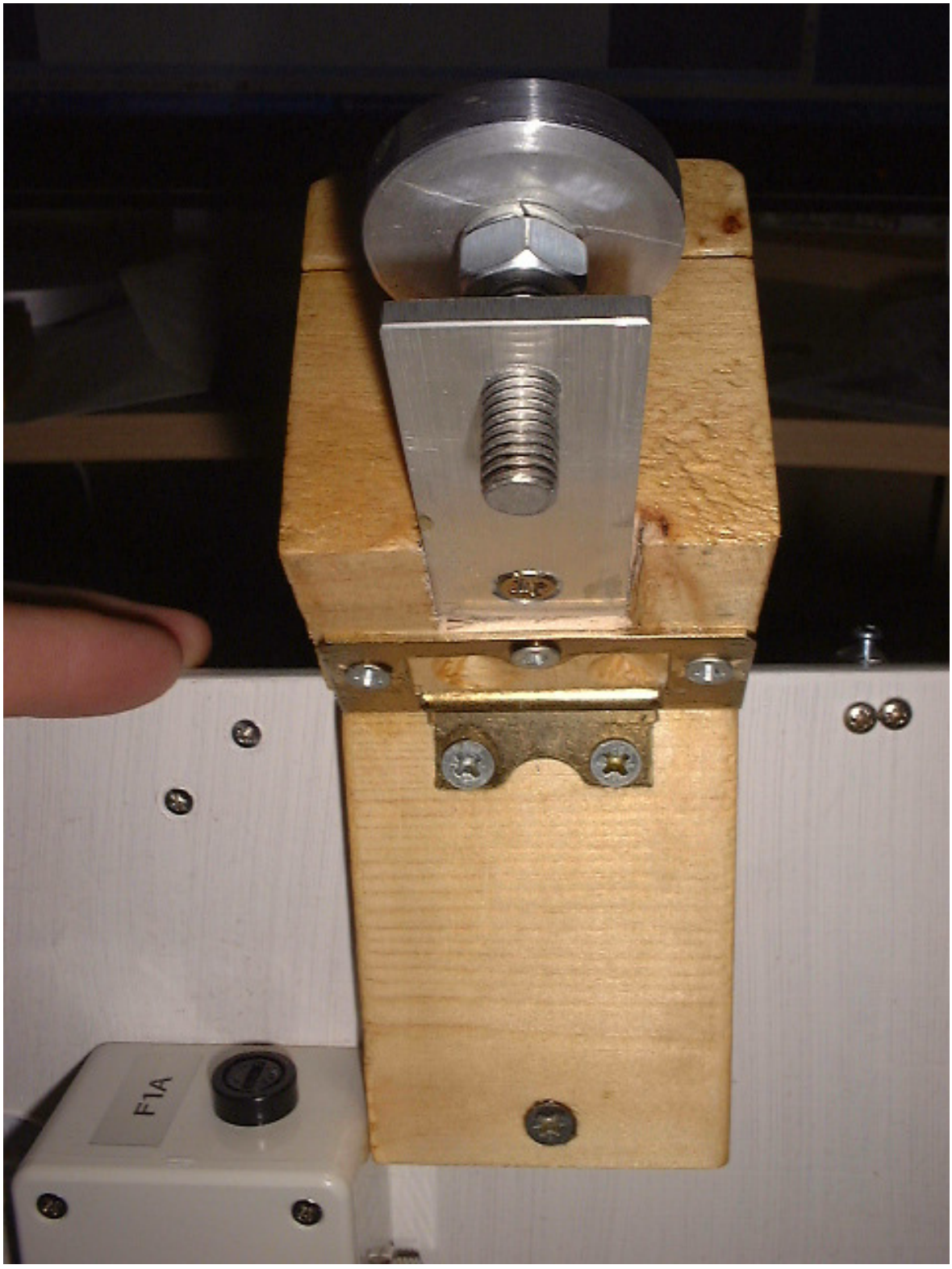
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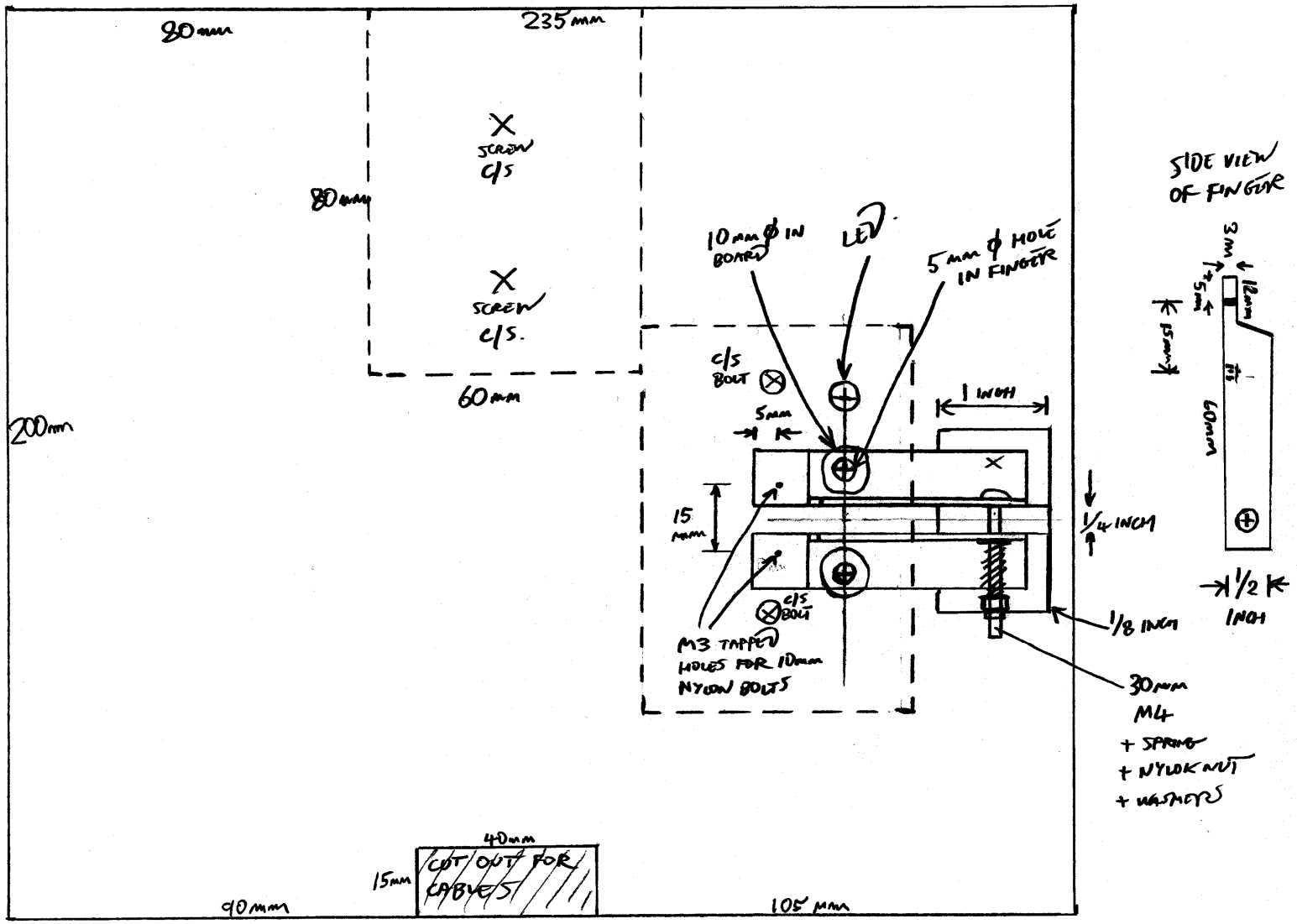
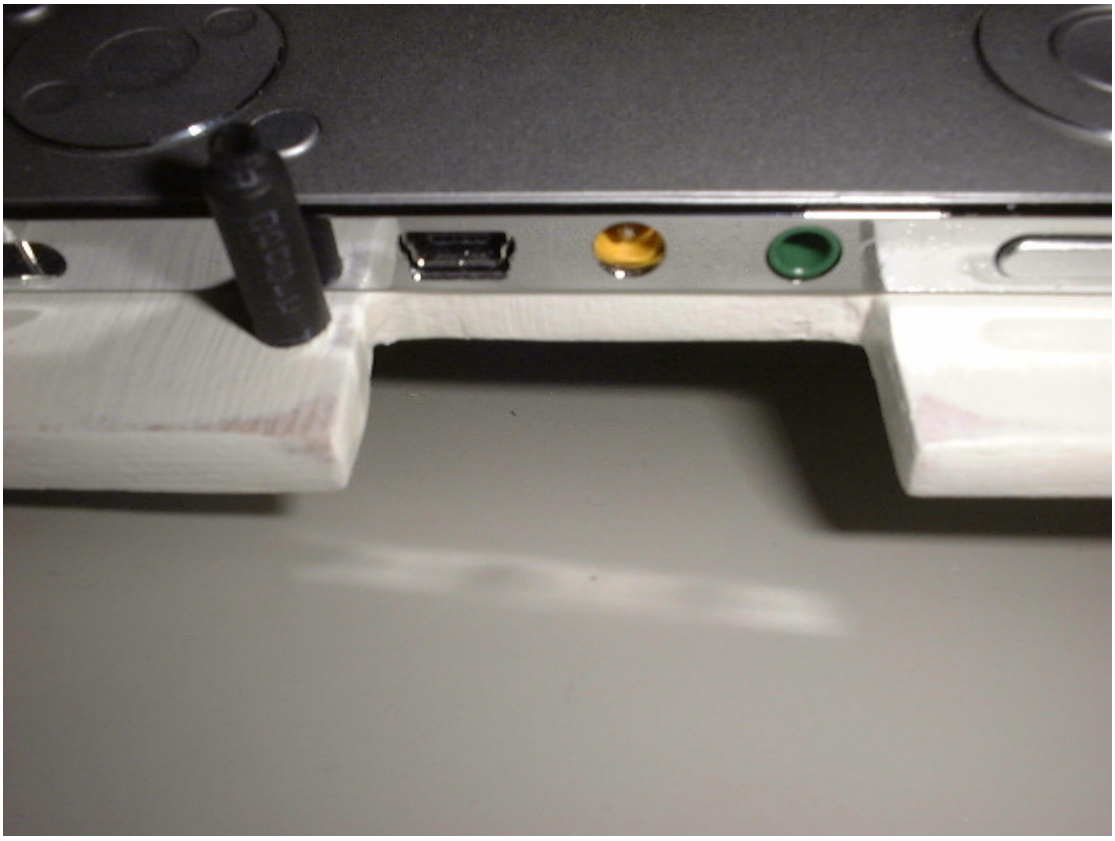
Part 4 – front panel

This is a section of painted MDF 235mm wide by 200mm high and 6mm thick.

The following diagram shows the basic measurements - though the precise location of the reader locating pins and mounts are deliberately omitted as they are best set once the operating fingers are in situ.


80mm
235mm
X
SCREW
C/S
80mm
X
SCREW
C/S.
60mm
200mm
10mm ϕ IN BOARD
LED
5mm ϕ HOLE IN FINGER
C/S BOLT
5mm
1 INCH
15 mm
1/4 INCH
C/S BOLT
M3 TAPPED HOLES FOR 10mm NYLON BOLTS
1/8 INCH
30mm M4
+ SPRING
+ NYLOK NUT
+ WASHERS
40mm
15mm
CUT OUT FOR CABLES
90mm
105mm
SIDE VIEW OF FINGER
3mm
12mm
5mm
15mm
60mm
1/2 INCH

There is a cut out at the bottom of the panel for the power and USB cords to be inserted into the reader in-situ.



Part 5 – finger assembly

The method adopted to secure the reader was to secure the operating fingers FIRST.

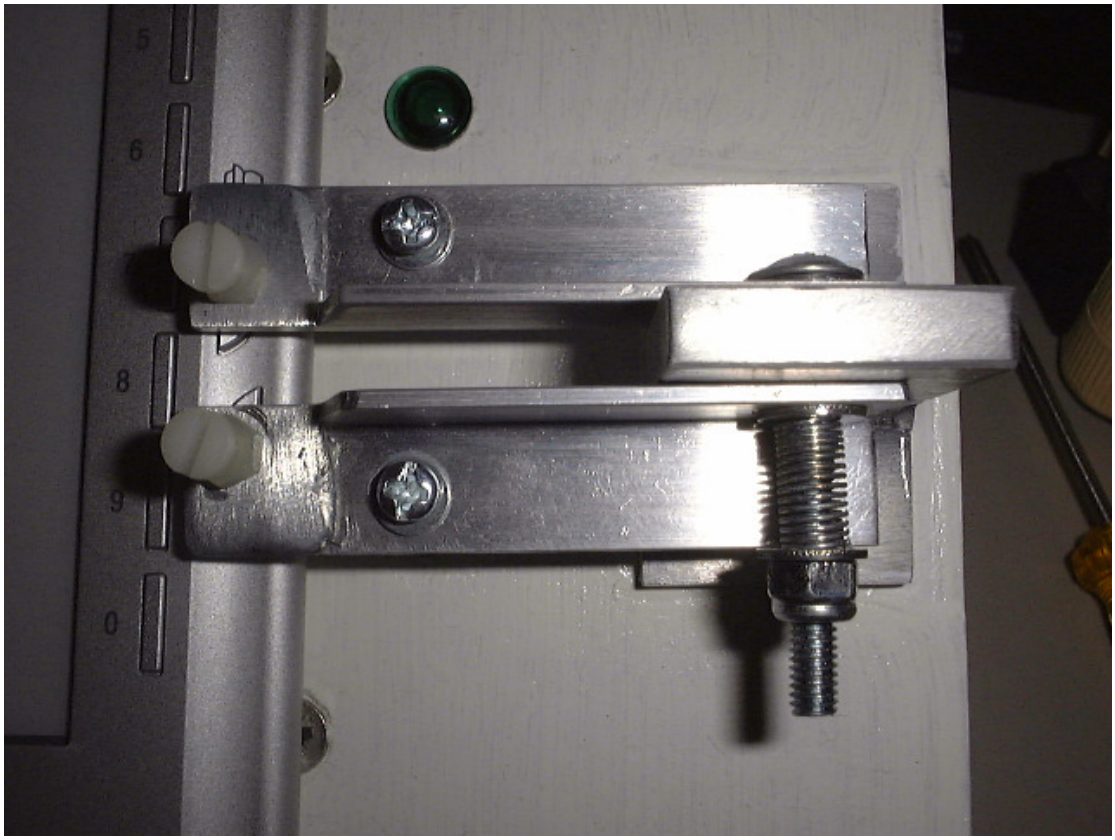
The fingers are made from ½ inch equal aluminium angle, which is 1/8 inch thick. The only modification necessary was to open the sides up towards the end of the finger and build up a thick pad of metal using Durafix Easyweld rods. This is necessary:

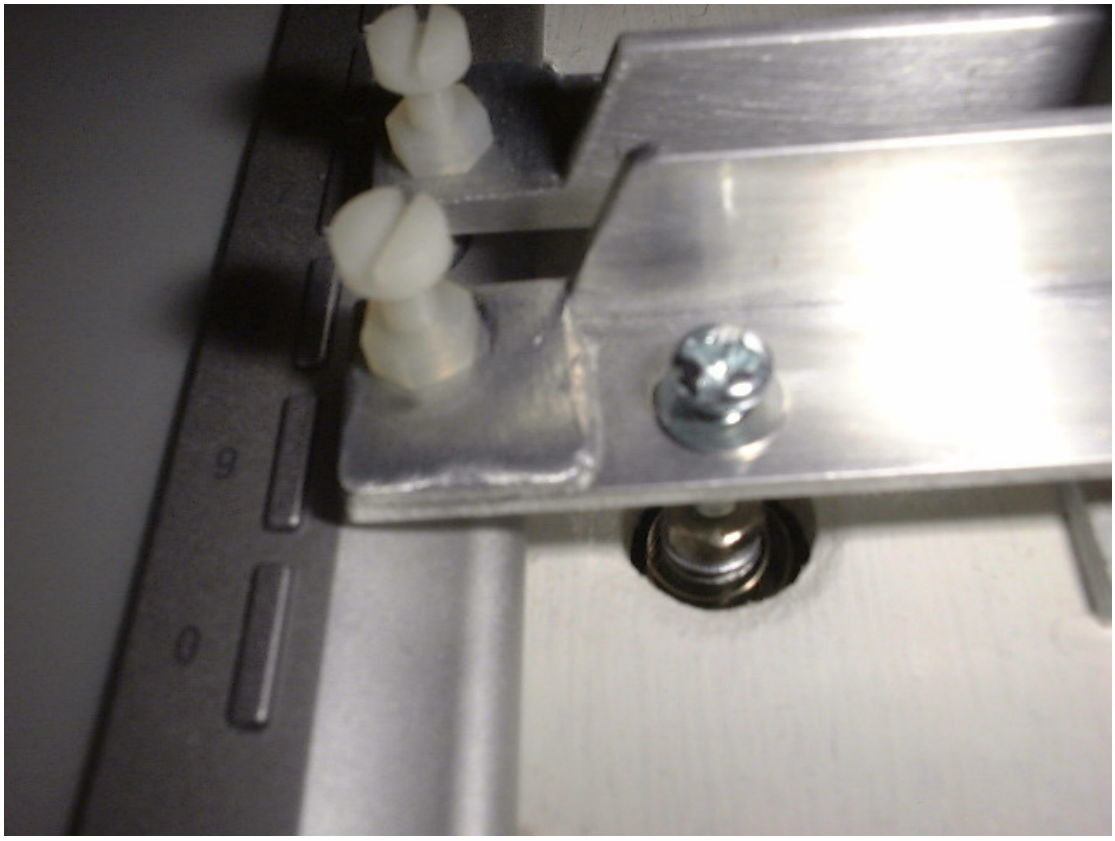
1. To ensure the nylon screws have enough metal to stop them twisting, and 1/8 inch isn't enough.
2. To give a bit of space around the nylon screw and locking nut, for fingers or a spanner.

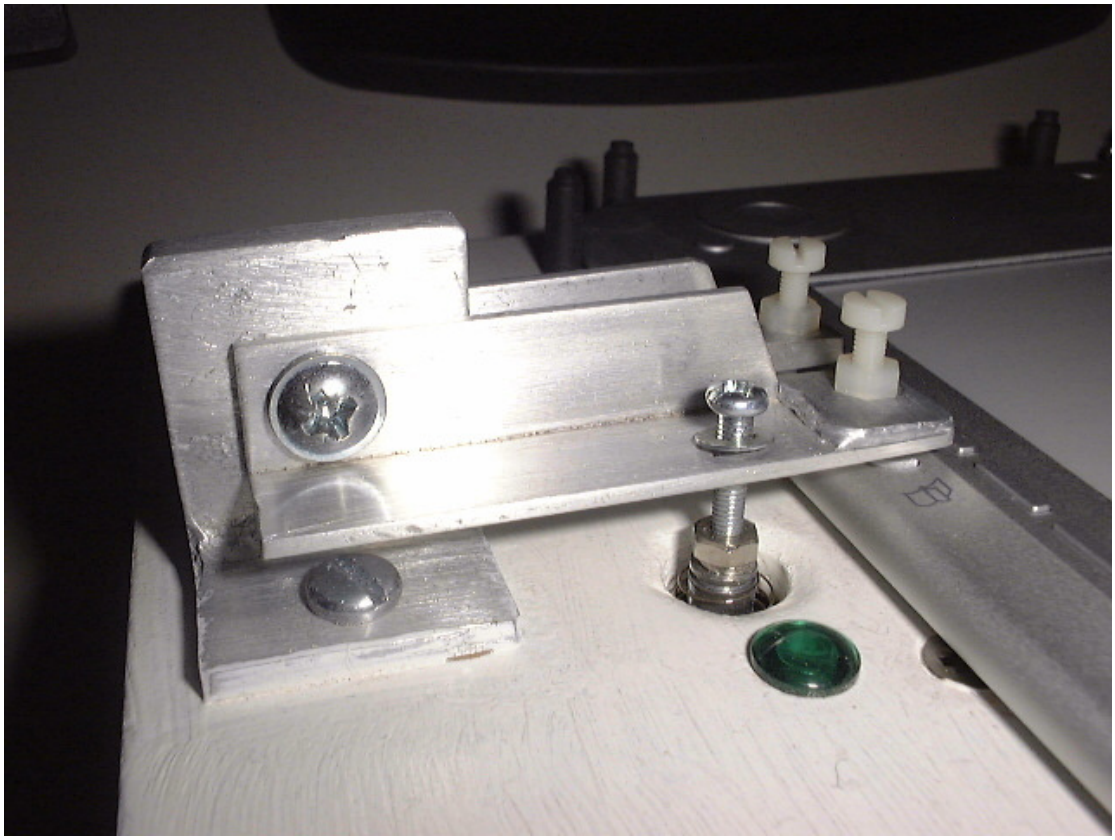
The strength of the finger isn't compromised as the notch taken out of it doesn't go all the way down the side of the angle. See the side view of the finger in the previous diagram.

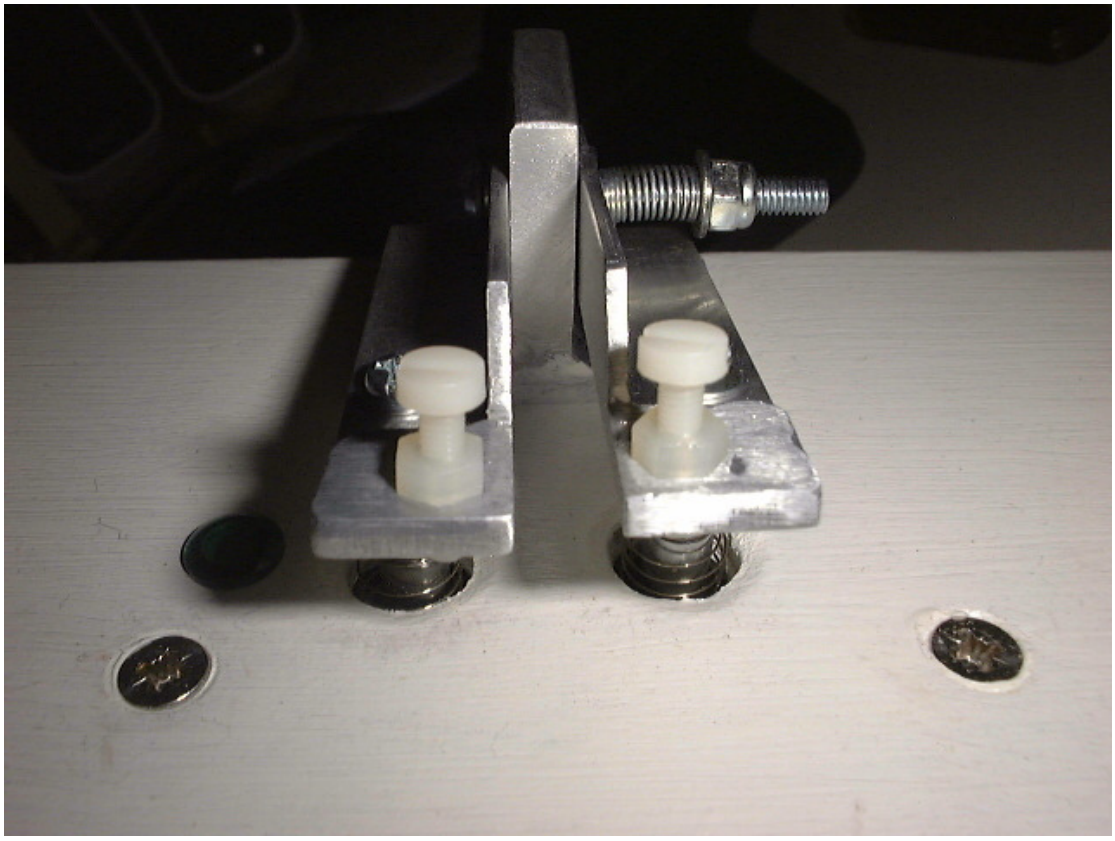
The bracket was made of ¼ inch x 1 inch flat bar, welded to a section of 1/8inch x 1 inch flat bar (using Durafix EasyWeld rods) to form a T shape. This was then bolted to the back board. An M4 hole is drilled through the fingers and bracket, and secured with an M4 x 30mm machine screw. This is done with a compression spring and washers, tightened with a nyloc nut – and ensures that there is just enough movement for the fingers, whilst preventing any lateral/twisting movement over the buttons.

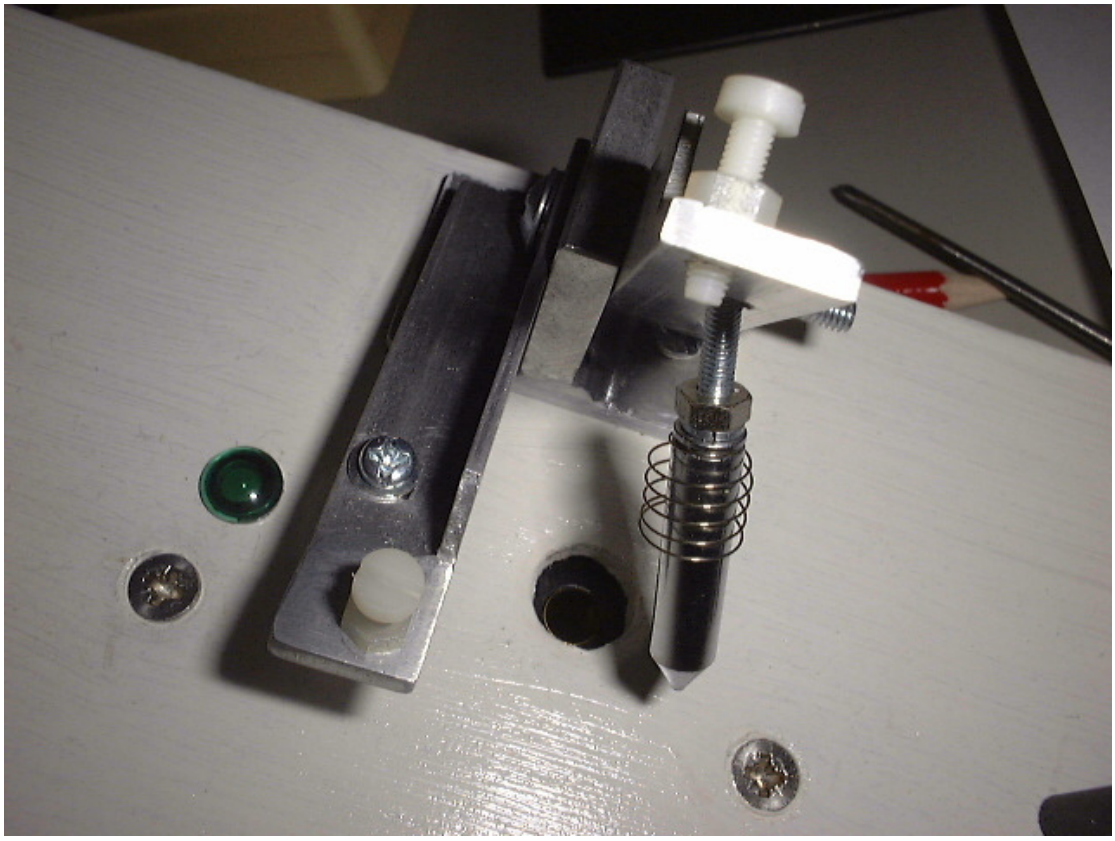
An oval oversize hole is drilled in the finger to allow an M3 machine bolt + washer to go through into the solenoid below. This is secured with an M3 spring washer into the end of the armature.











Part 6 – solenoid box and PSU

Maplin variable voltage supply VN10L was available and at 1200mA is rated well in excess of the current needed, even if both relays are operated together (which you wouldn't expect to happen in normal operation). In reality, a 400mA PSU will be enough.

The supplied "power tip" approach, was replaced with a DC power plug as the tips can become detached too readily. The tips could also be re-attached with polarity reversed, and although the circuit wouldn't be damaged by this, the power LED would not light.

The solenoids were sourced from e-bay. They are 12V and come with a plastic M3 hook which we remove and discard. **It is important to note that the full strength necessary to operate the button occurs just before the armature hits its stop point, so it is necessary to roughly adjust the machine screw in the armature and then fine tune this operating point using the nylon bolt and its locking nut.**

The box is roughly 56mm x 85mm x 34 mm – and is a standard Maplin item. Into this we mount the two solenoids, a fuse holder with 1A 20mm fuse, and a panel mount LED with internal dropping resistor for 12V use.

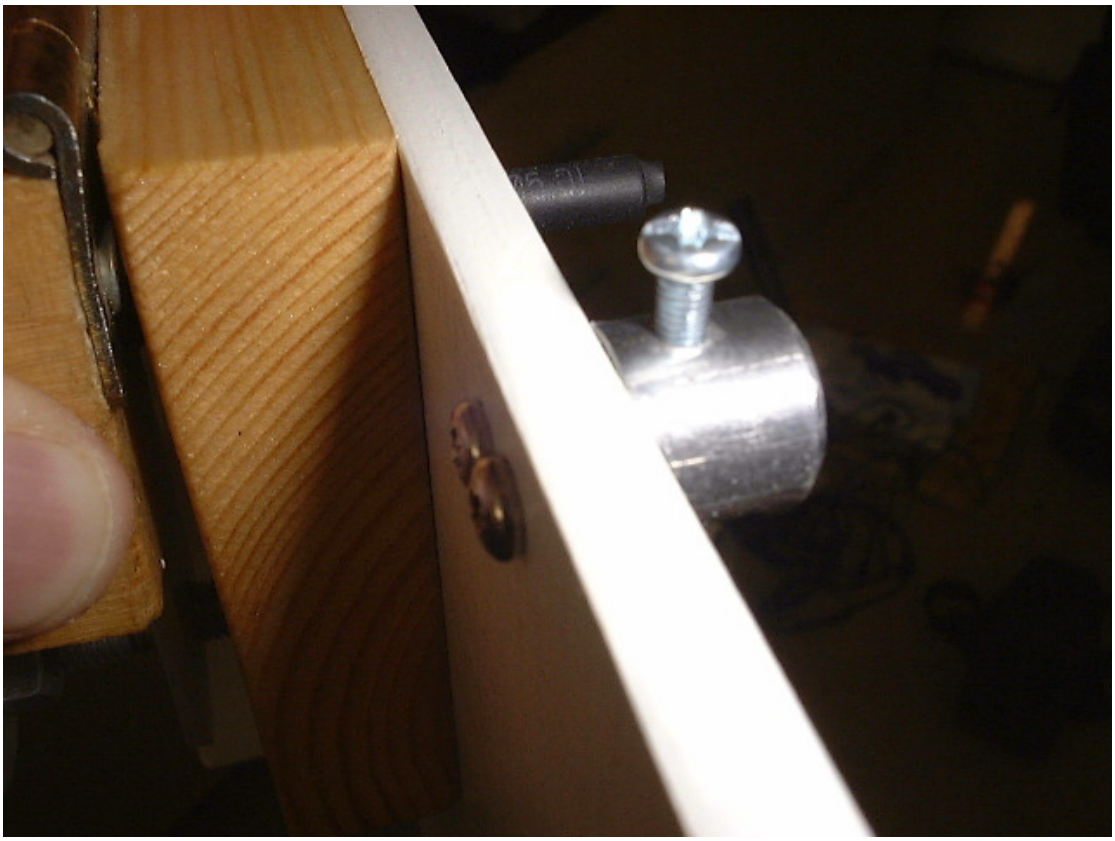
Part 7 – securing the reader

To ensure reliable relocation if the reader is removed, location pins (comprising round M3 threaded spacers secured from beneath with M3 countersunk machine screws) align the reader.

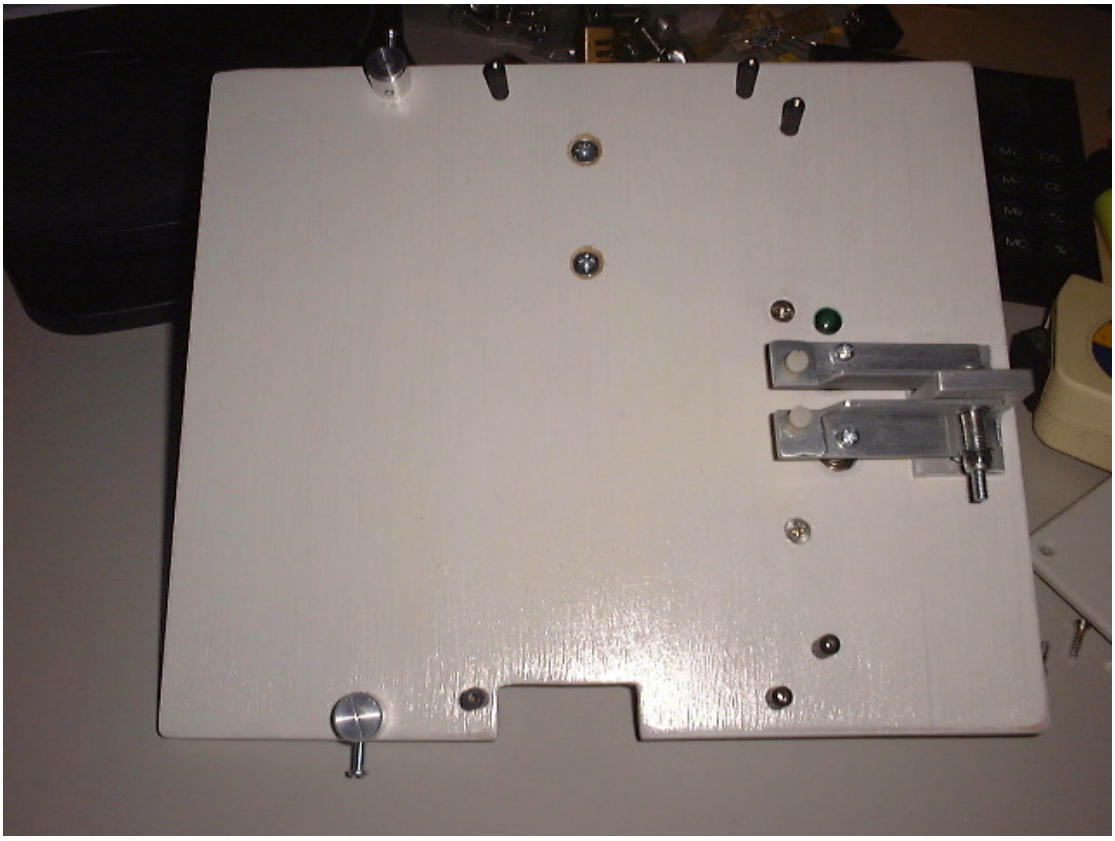
The technique used was to precisely align the reader under the operating fingers, and then super-glue the spacers to the front panel tight up to the edges of the reader. An M2 drill was then inserted down the spacers to drill pilot holes through the front panel. The spacer was then removed again with a razor blade, and covered with heat-shrink sleeve, and then secured back in place with the screw. The effect is a very tight and accurate positioning of the reader such that the reader can be removed and re-inserted without any re-adjustment of the operating fingers.

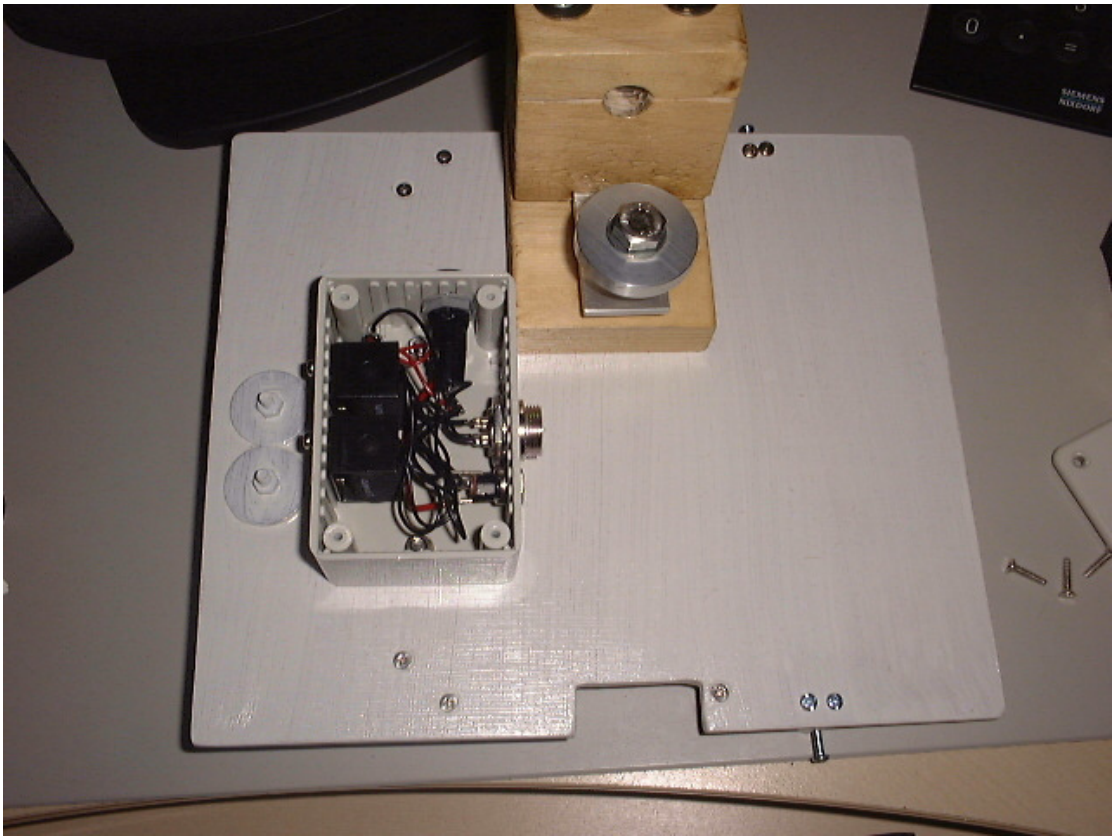
This could equally have been achieved with strips of wood, but the heat shrink/pin approach also protects the body of the reader.

The PRS505 has holes in the top and bottom L/H ends which normally secure the reader into its supplied plastic folder. These were used to add some further security such that the reader couldn't fall out if knocked. Two sections of aluminium bar were turned to form securing points to take an M3 x 20 machine screw drilled/threaded right through, and two blind M3 holes behind, to secure the mounting point from behind the panel.



The end result looks like this:





Spares holding

To ensure continued operation, additional spares are held as follows:

- Relays (these are cheap compared with the effort which would be required to re-work the solution to suit other relays). A keen reader might easily operate the page forward relay >20,000 times a year

- Desk clamps – in case anyone over-tightens them

- M3 nylon nuts and bolts

- Switches, as the clips that hold the switch caps in place can break if the panel is dropped