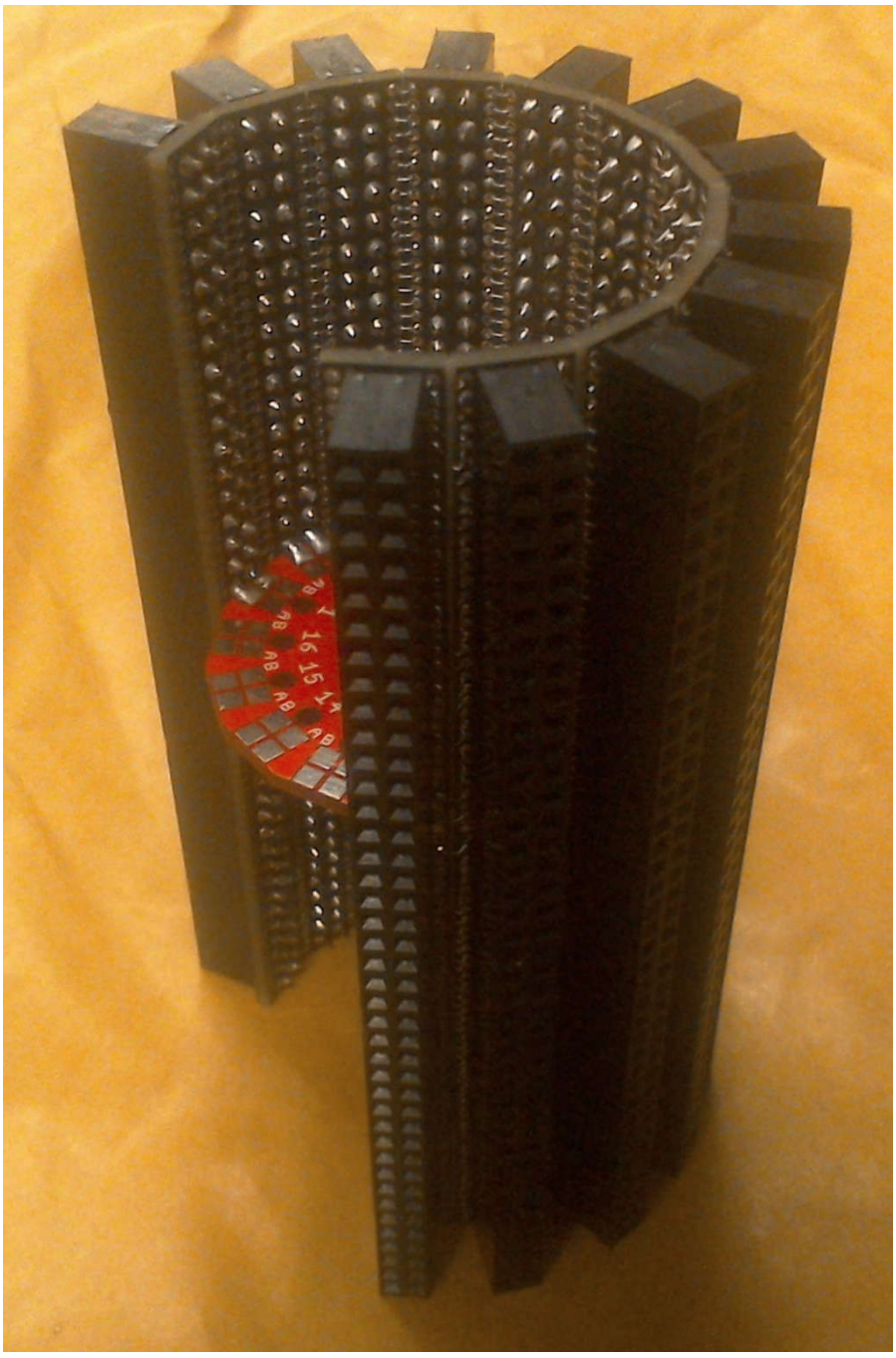
Build Log



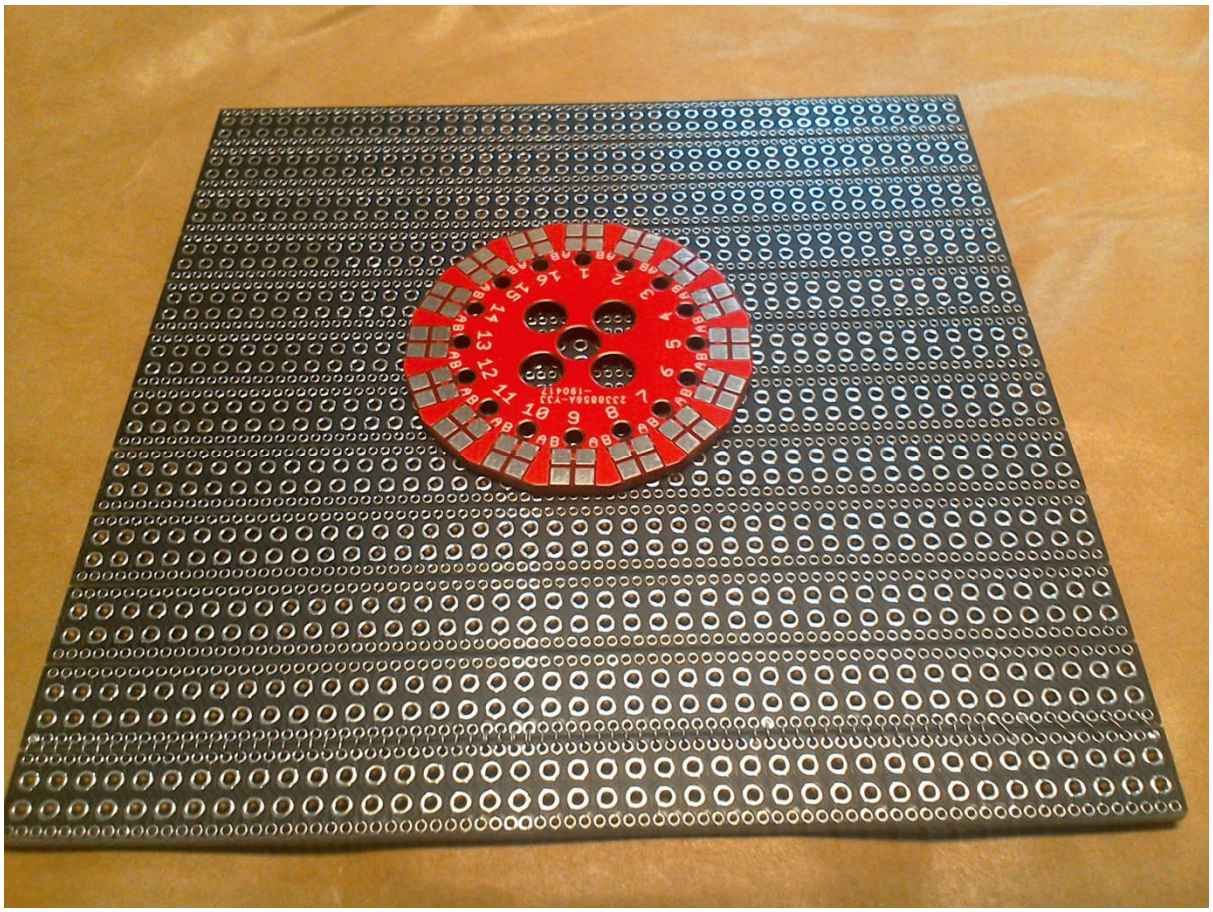
The main panel is made up of twelve segments of backplane with v-score separating each board. Each edge of these boards has eighty 0.6mm through hole pads along each edge connected to one of the backplane connector pads and then through to the corresponding pad on the opposite edge of the board.

The boards are not separated from the panel until later.

The first step was to connect each board to the adjacent board. This was done by threading bare tinned copper wire through the 0.6mm holes using approximately 24 inch lenths of stripped wire wrapping wire.

As the panel used black solder resist it can be difficult to determine the bottom side of the board that has traces and the top side that is ground plane. JLCPCB added the product indentification code to the top side solder mask, not seen in the following photo as this shows the bottom side of the panel with one of the hexa-decagon formers.

The starting point for wrapping wire at the left side of the picture was soldered from the top side of the board as an anchor point. The wire is threaded through the 0.6mm pad directly across the v-score on the bottom side of the panel, then diagonaly on the top side of the panel across the v-score to the next 0.6mm pad.



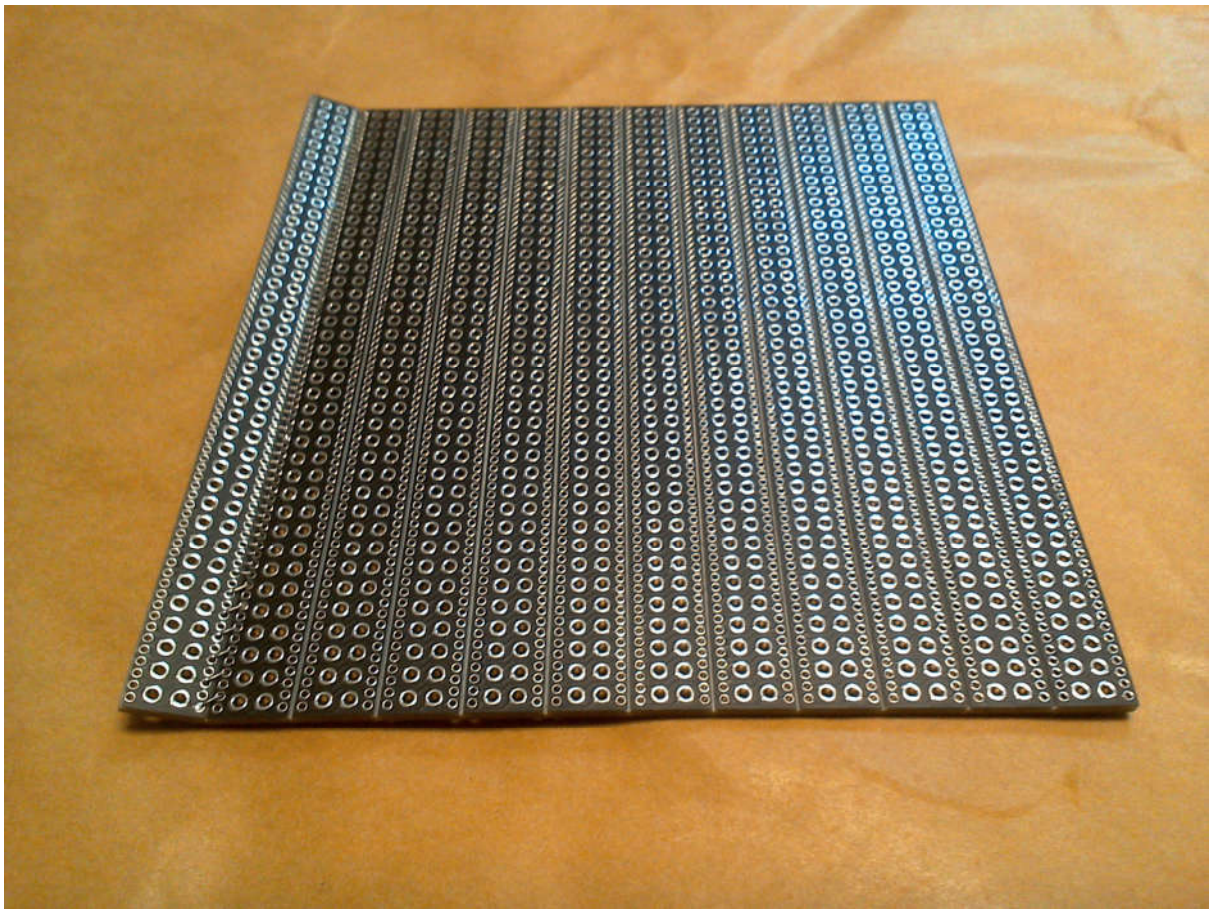
At the power connections of the bus, the wire is double wrapped, see the later photos where I changed the wrapping of the power connections to avoid the wire on the inside of the backplane from interfering with the fit of the former to the inside of the panel.

Note the wire is only soldered at the end of a section of wrapping, this allows the wire to act like a ring binder to hold the adjacent boards together when the v-score is broken.

If the wire snaps during threading then it is soldered to stop it unthreading, and the next section is soldered as a new starting point.

Keep the wire as tight as possible while threading the connections, but don't pull too tight or you risk snapping. Also don't allow the wire to twist or kink during the threading, any kink in the wire is likely to break after repeated bending. After a while you get the feel for the wire and can tell when it is going to kink.

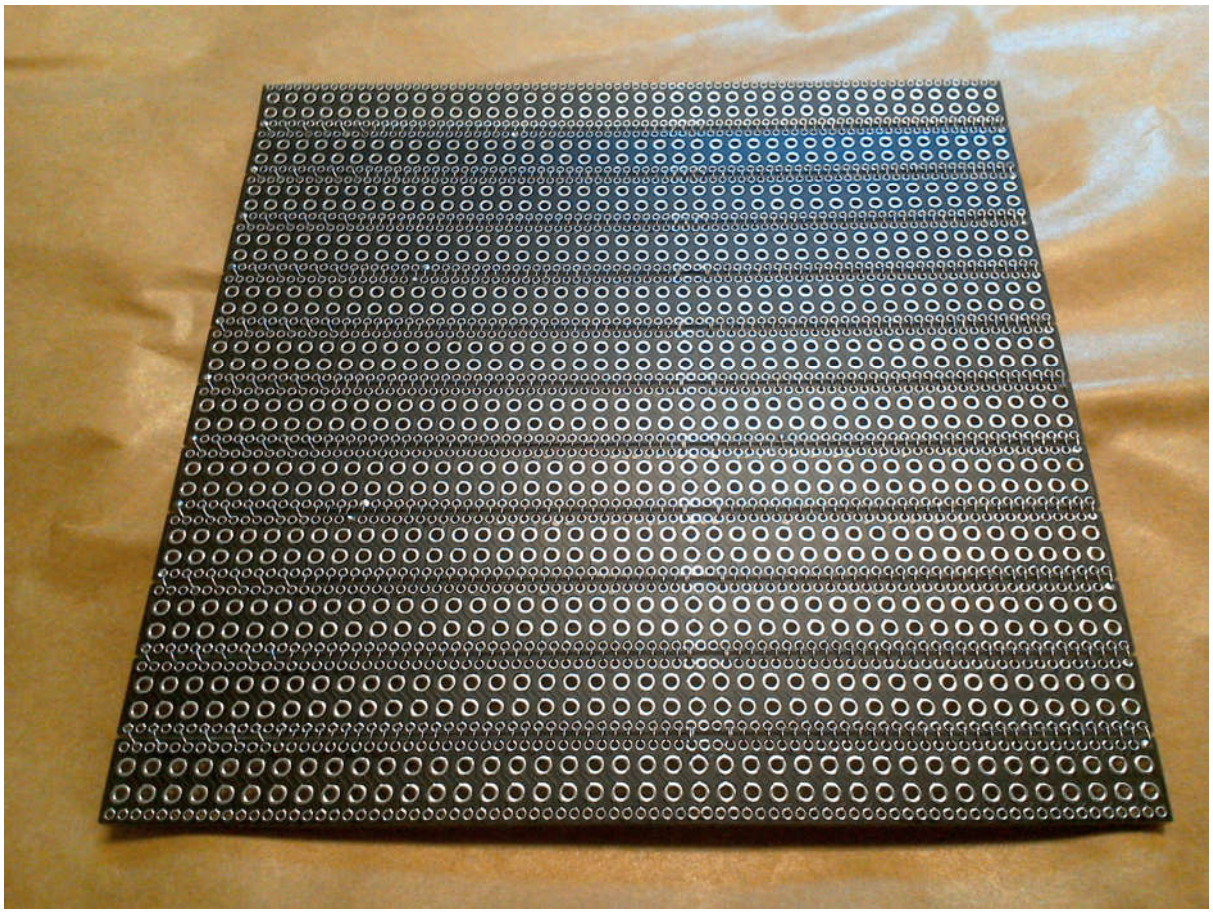
The next picture shows the first segment v-score has been broken to test the wire holding the boards together and verify the break point against the dimensions of the former. Note the straight wire connections on the inside of the break (upper surface in the photo), the diagonal connections are on the outside of the break (bottom surface in the photo).



You'll probably notice in the above photo that the last six rows of the backplane in the foreground are not wired directly across to the adjacent board. This is to keep the same connection between modules that I have used in my modular backplane, pins 35 to 40 of the backplane connect only to the adjacent module.

After making this first break I was cautious handling the panel to make sure I didn't bend the wires and risk breaking or weakening the wire.

The next photo shows the panel after all the segments have been threaded together, this is the view from the bottom side of the panel, which will be the inside of the final assembly, with straight across connections between adjacent boards (except for the user pin section at the left).

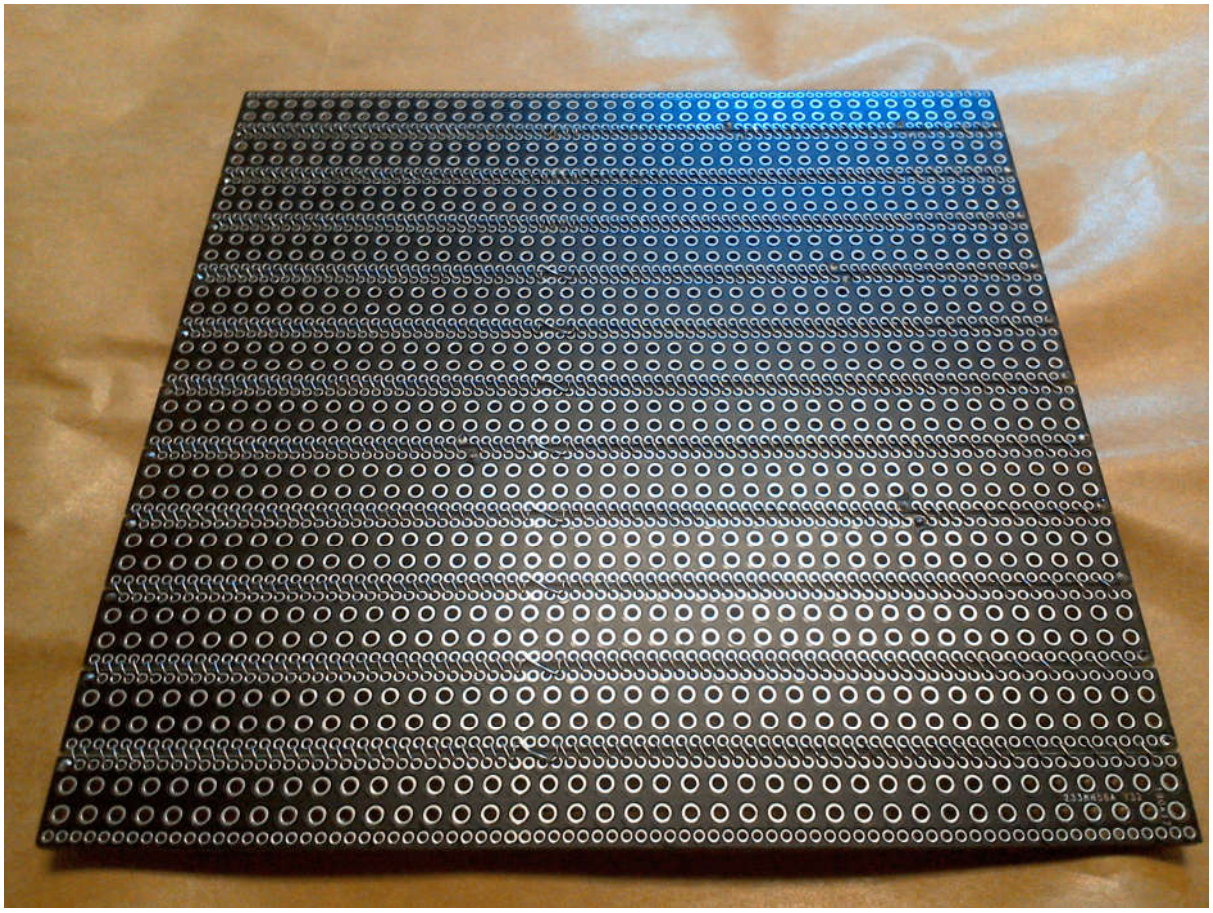


You can also see in this photo that I changed the method of wrapping the power pin connections, this was so that the former can fit flush to the inside of the panel. The first and last power connection is still double wrapped.

After the first few rows were completed I started to get the hang of the threading process. I managed to get the time down to about an hour per section and was able to avoid breakages in the wire.

I used my thumb nail to push the wire tight to the board on the inside surface, where the connection is straight across, but only pull it tight on the outside surface, where the connection is diagonal to the next row.

The following photo shows the top side of the panel, this will become the outside of the final assembly.



The next step was probably the most nerve wracking part of the process, breaking the v-score between all the boards.

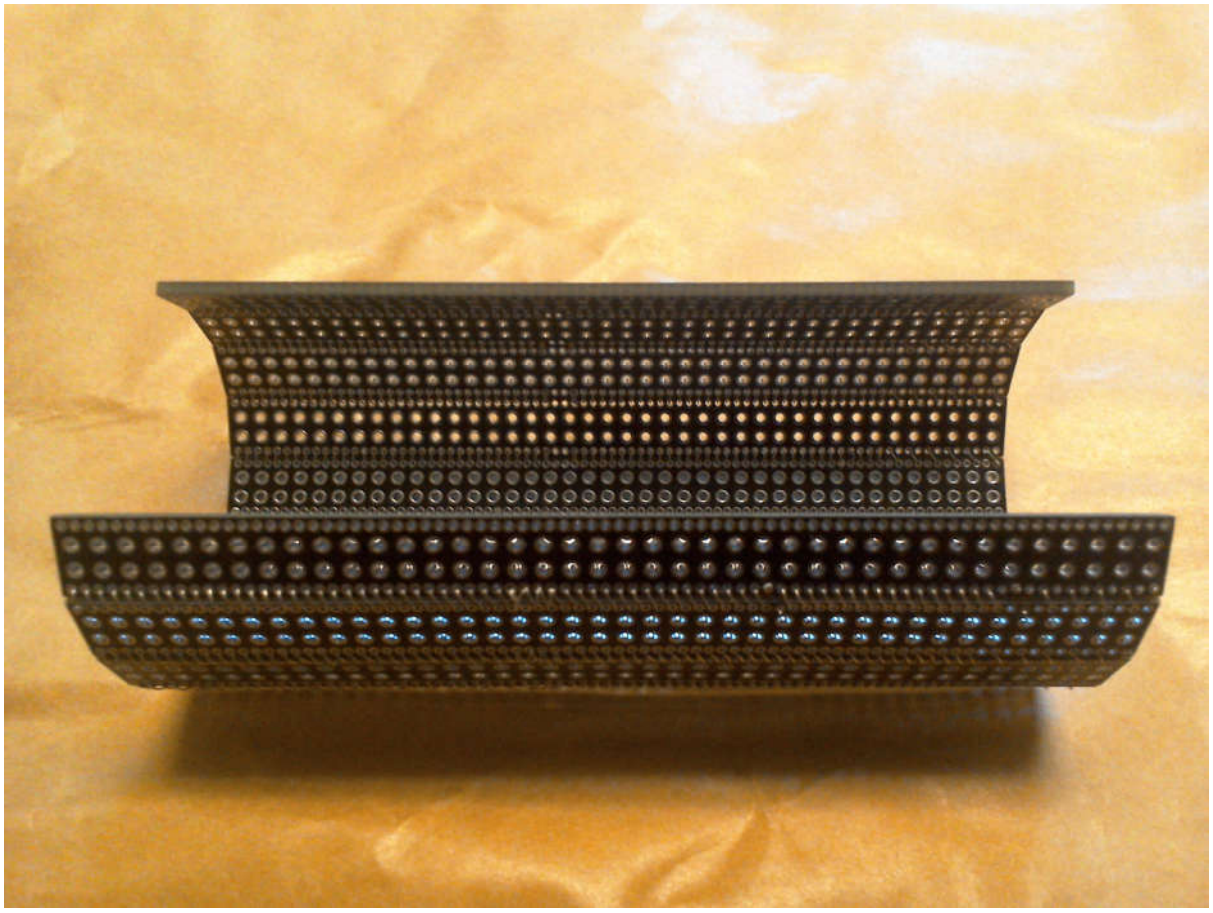
I did this by pressing each segment down onto a rubber mat while holding the unbroken section and trying to spread the force over the width of the panel.

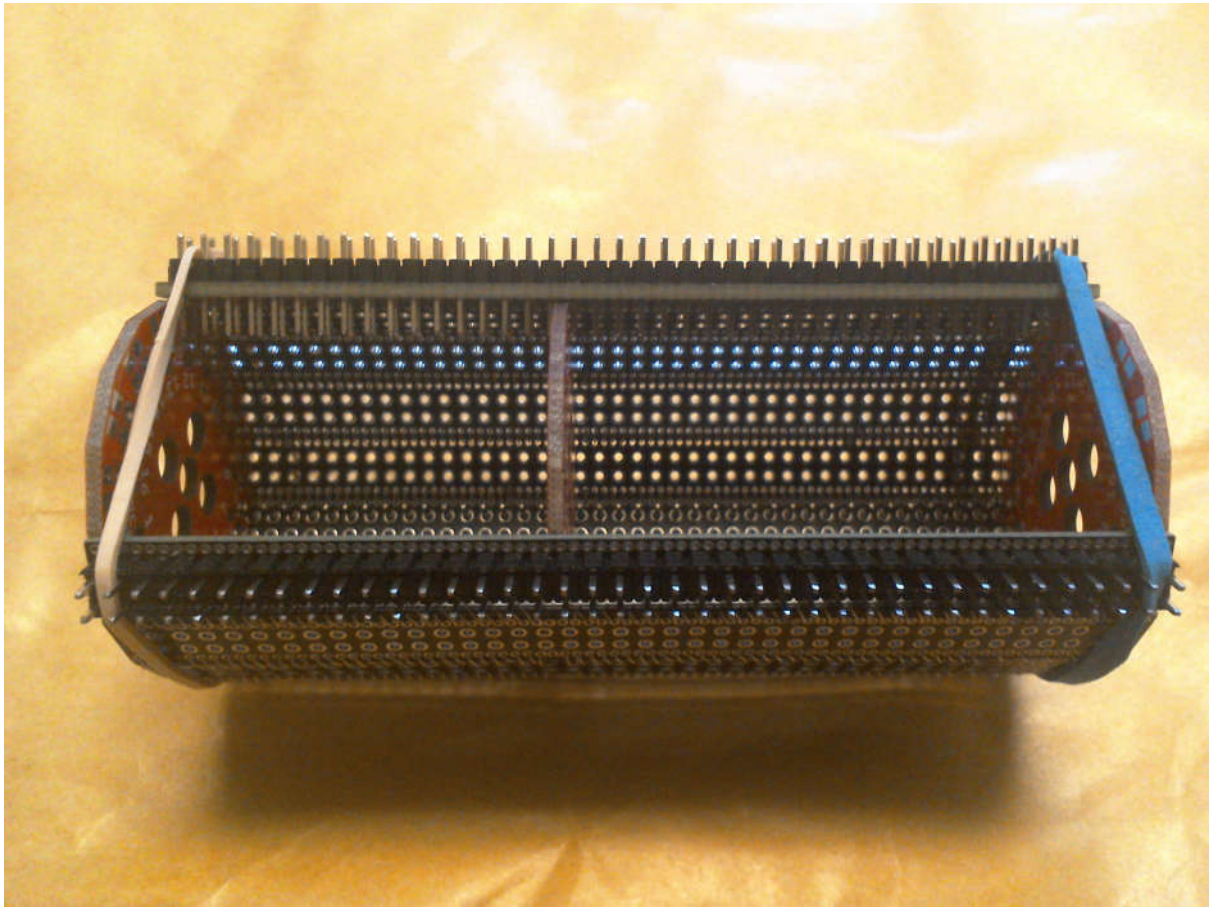
It also required some care to not over bend the wiring of the previously broken segments.

The next photo shows the backplane starting to take shape.

I think I was lucky this didn't break any of the wires, as there was already quite a lot of hours invested in this assembly.

I don't know if I would have started again if this had failed or just given up on the idea altogether.





I added formers after cutting some of the original power wires that were preventing the former from fitting flush to the inside of the assembly.

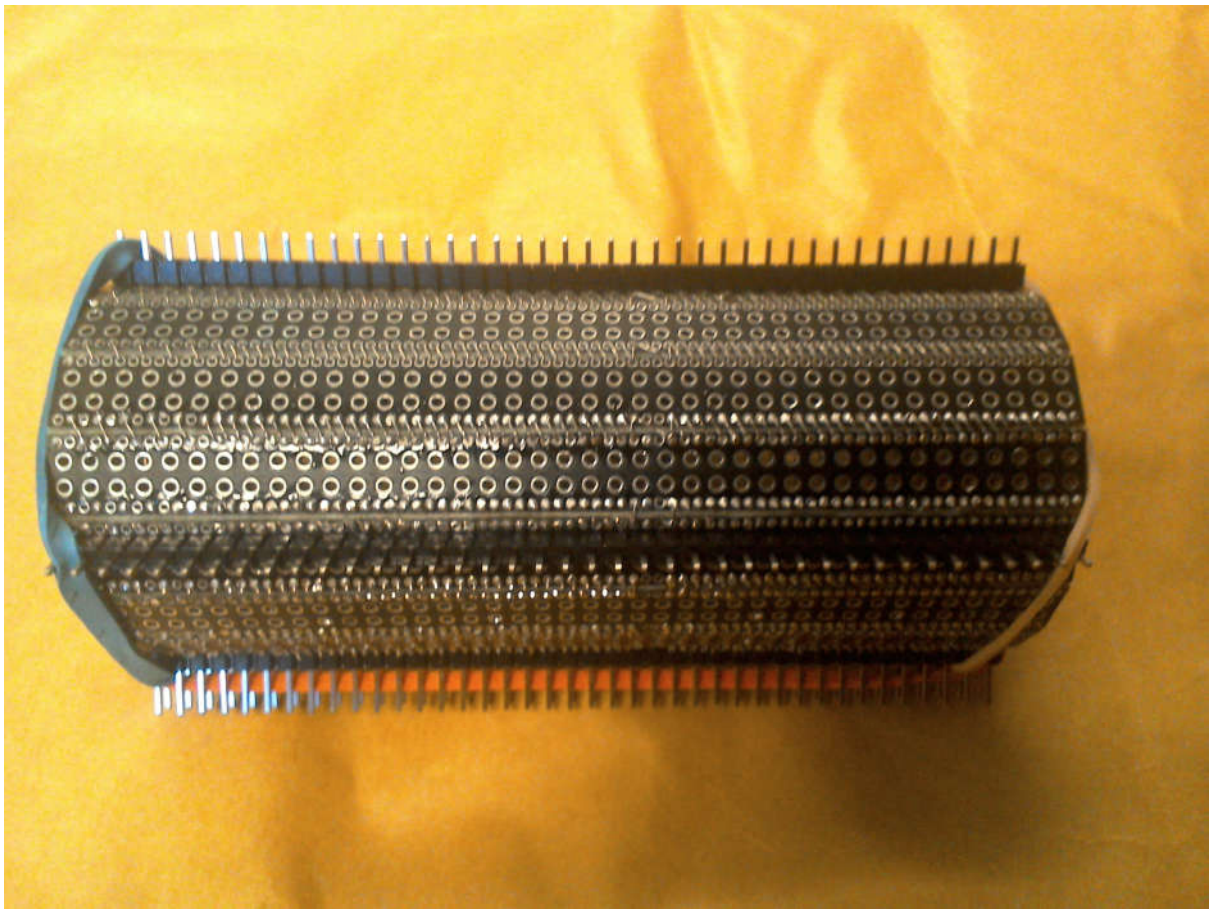
Pin headers were used to hold the formers in position and rubber bands to hold the assembly tight to the formers.

At this point I found that sides of the formers were slightly smaller than the distance between the inside corners of the backplane segments. There is a slight gap between the inside of each segment and the former, my guess is approximately 0.2mm.

This was probably a better outcome than if they had been larger. When designing the dimensions of the former I was relying on an estimate of where the v-score would break, and aimed to be 0.1mm smaller.

The next step was to solder all the links from the outside of the cylinder. Not quite so bad as soldering SMT components, pitch is 1.27mm, but also needed to take care not to add too much solder which might wick though the hole.

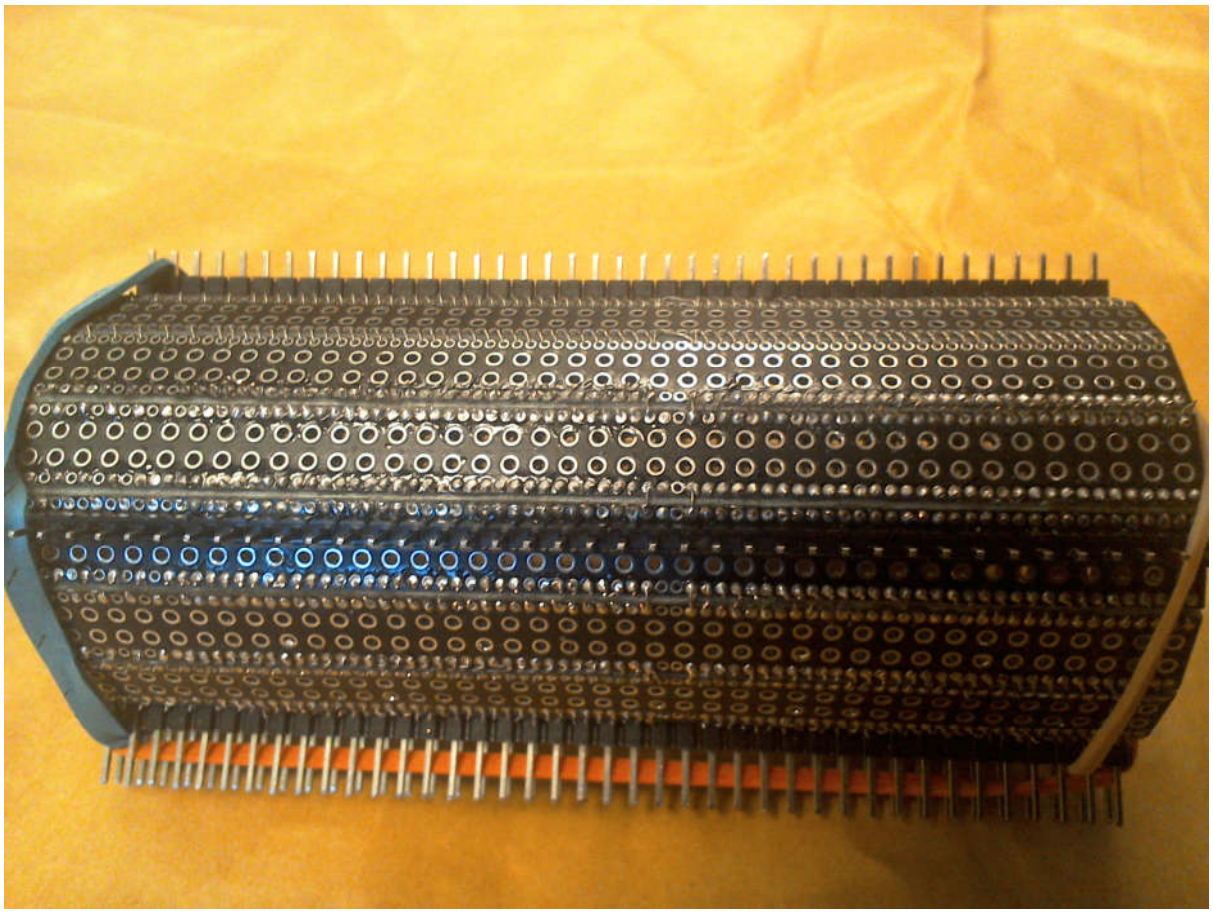
It's not often that you solder something that has a tendency to roll away from you, I used a couple of blocks of antistatic foam to chock it in position.



After soldering the links the next problem was cutting the diagonal links on the outside of the cylinder. My side cutters were not fine enough to do this and I wasn't able to find a set in the local stores that would be any better.

The method I used was to cut the wire with a craft knife close to one of the pads, using the edge of the v-score as a guide. Then lift the remaining link vertical to the board using fine curved tipped tweezers. Finally I cut these links as close to the surface as my side cutters could reach.

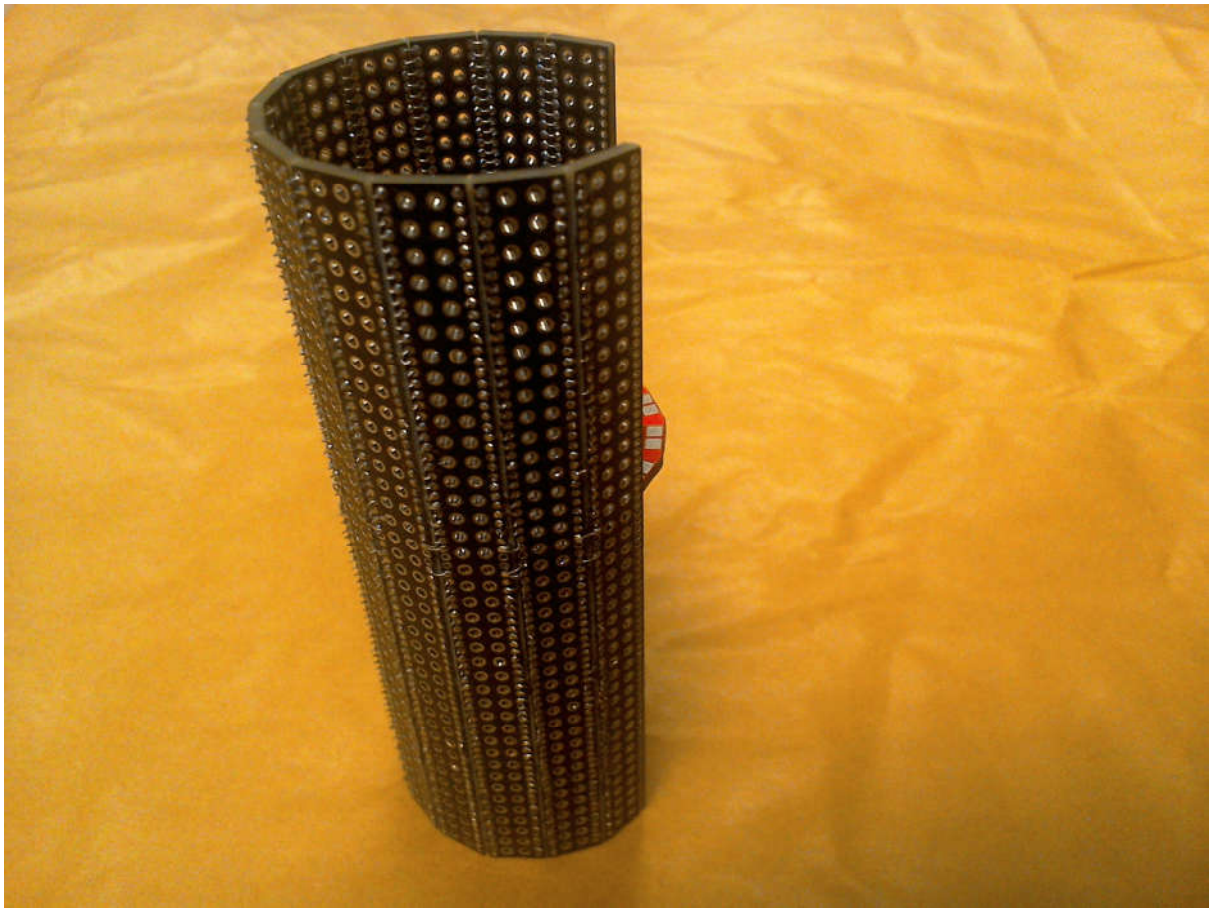
After a few goes I could run the knife down the edge of the v-score to cut the wires on mass and save some time compared to individual cutting, taking care not to cut through the v-score and damage links on the other side.

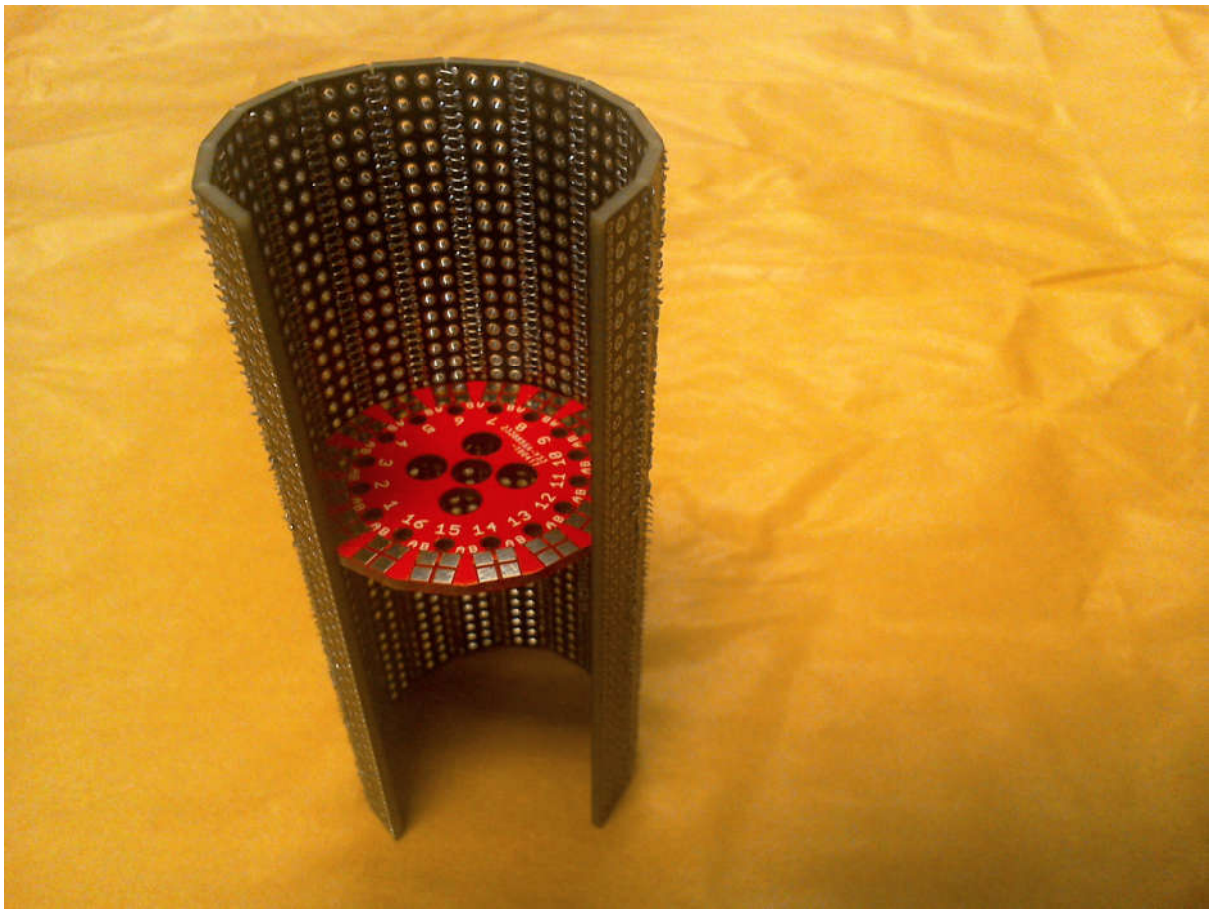


With all the links cut I was then able to check for continuity and shorts with a multi-meter.

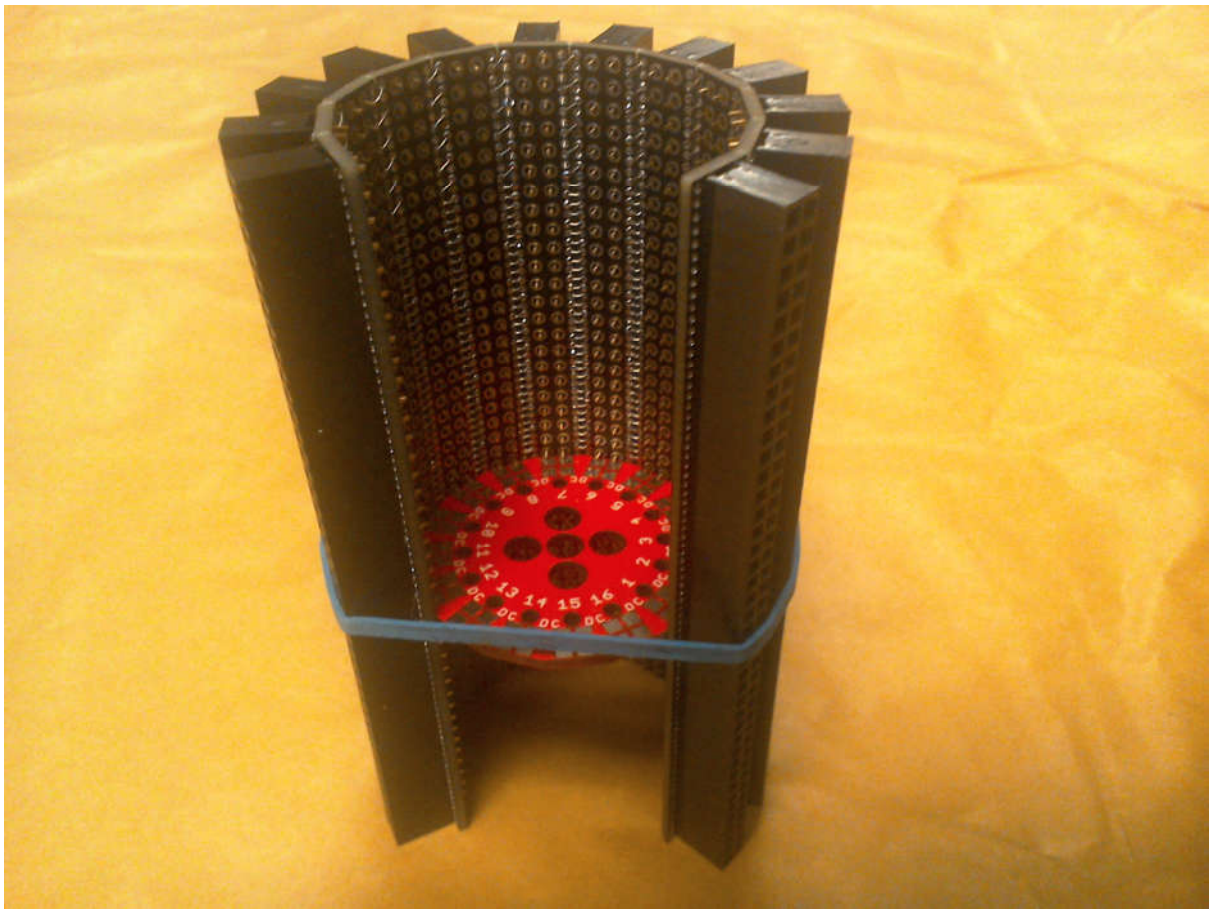
I found three shorts at this stage where the cut wire links had still been a bit long and pressed down onto adjacent connections.

With all the links soldered and the two end formers removed the assembly was starting to become more rigid. I didn't try to remove the centre former in order to avoid stressing any of the wires.





The backplane connectors were fitted and the position of the centre former adjusted so the top and bottom surface of the former would solder to the ground and 5v lines of the connectors.



After fitting the connectors, but before soldering, I checked for shorts and opens again and found one more short. This turned out to be caused by one of the connectors pushing the cut end of a link down onto an adjacent connection.

This was then removed and everything re-assembled and tested again.

I soldered the end pins of each connector, with the connectors flush to the boards. Then being paranoid at this stage I tested everything again, but no more shorts this time.

Next I adjusted the position of the former, so the pads on the former were centred on the pins of the connector, and soldered the power pins of slot 7 to the former and to the backplane board. Then adjusted the position and soldered the power pins of slot 1 and 12, before soldering the power pins of the remaining slots.

The final stage of the assembly was soldering the rest of the pins of each connector to the backplane, from the inside of the assembly. This was finally completed after various attempts at left handed soldering, blind soldering, burnt fingers and swearing.

Thankfully final testing for opens and shorts with a multi-meter didn't find any more issues.