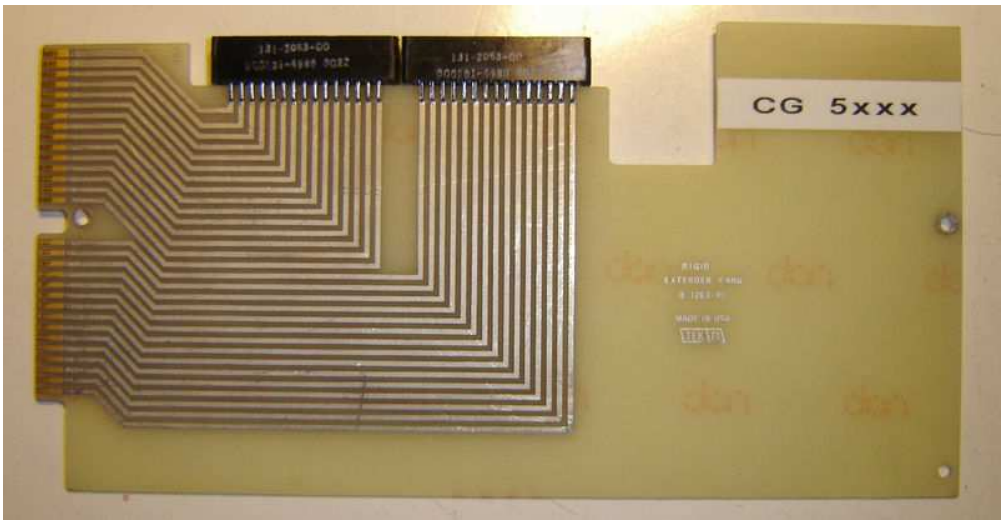
CG5xxx Extender Construction

Introduction

The Tektronix CGxxx Series of Calibration generators require the use of an extender board to service them. This document discusses the construction of a suitable substitute.

The Tektronix CG5xxx series of calibration generators are invaluable tools for calibrating oscilloscopes, but as I know to my cost are very difficult if not impossible to work on unless you can extend the boards out of the case. Tektronix produced an extender board for this purpose with the part number 067-0975-00:



To use this extender you remove the desired board, replace the board with the extender and plug the board into the socket on the rigid extender. If the board you need to work on has connectors at both ends, you also need to use the TM500 Flexible Extender cable (Tektronix Part Number 067-0645-02) to connect the board to the power module, and another pair of these same extenders to connect the remaining cards to the power module.

Tektronix also produced a flexible extender (Part Number 067-0974-00) which is used in the same way as the rigid one or to further extend the rigid extender board:

Neither of these extenders appears for sale at all commonly, though a flexible extender was offered on eBay in late February 2008 at 389 US dollars. I certainly didn't own either of them, and at the time I started this, I don't think the flexible extender had yet been offered on eBay (though I don't think I would have paid 389 dollars for it)[1].

I decided to make up a rigid extender of my own based upon the original, as I felt that would be the more useful of the two, even though it could be argued that the flexible extender would be better used for the A3 Time Interface board.

Building the substitute Rigid Extender

I decided that for a one off item, it wasn't worth getting a PCB made up by a fabrication service. So I bought two double sided prototyping boards from RS Components (order number 434-122) at a cost of £88=10 (about 176 US dollars). These boards are manufactured for RS by Vero Technologies and are available from many other sources. They are 114mm (4.5 inches) deep which by happy coincidence is almost exactly the same depth as the circuit boards in the CG5xxx generators.

[1] The total cost of making up this home-brew extender was around 200 US dollars, so the saving isn't massive, especially if you factor in the amount of time it took me to find suitable parts and to actually put it together.

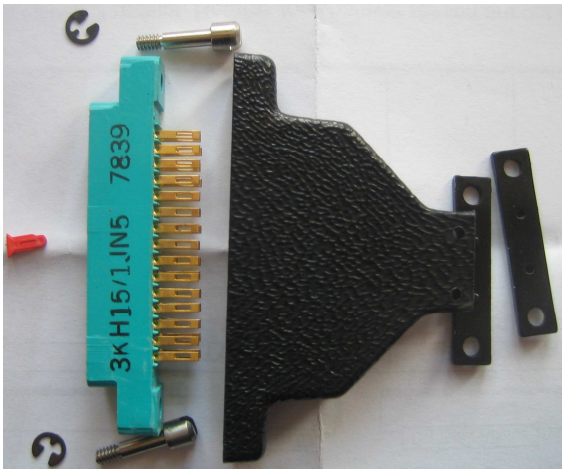
I also needed two 15 way 0.1 inch pitch double sided edge connectors ideally with "board extender" tails. I wanted to use Sullins Electronics part number ECC15DKRN (see pages 32 and 33 of their catalogue), but though Sullins were prepared to supply a minimum quantity of ten, the cost was rather high at about £15 each.

I eventually found some .145 inch between rows edge connectors with long pins (Viking part number 3VH15/1JV5)[2] at a surplus dealer in the UK called Display Electronics (Distel)[3] at about £5 each. All that needs to be done to use these is to cut off the mounting ears, and to bend the pins in to be able to solder them to the PCB.

Distel also had a total of two Viking connectors part number 3KH15/1JN5 complete with back-shell and cable clamp (not a Viking part as far as I can tell), so I grabbed those as well in case I ever decide to make up a flexible extender.

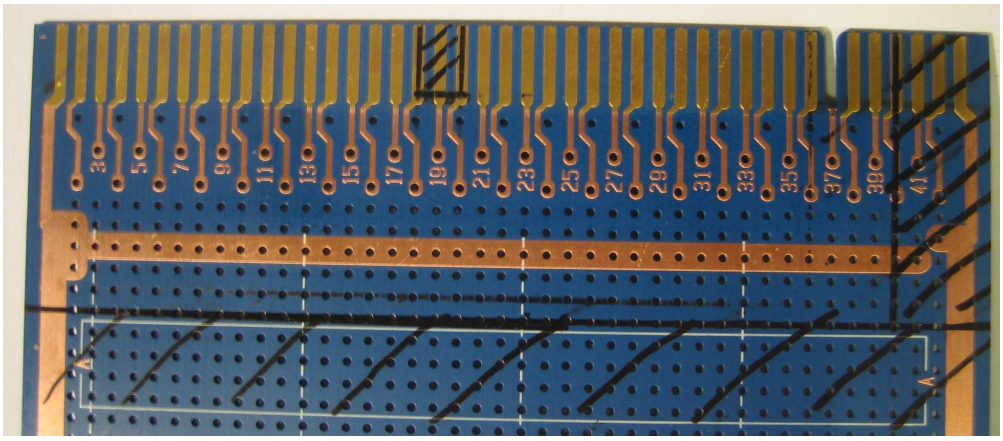
[2] See pages 4 and 5 of Viking Connectors Edge Connector catalogue which can be found at http://www.vikingconnectors.com/images/pcconnectorcatalog.pdf

[3] Distel's web site can be found at http://www.distel.co.uk



Step 1

The first thing to do is to cut out a finger board from the first of the two boards. The following picture shows the mark-up on the board prior to cutting:



I ***do not*** cut out the small section between edge connector positions 18 and 20 on this board. On this board the marking is there to remind me later on where the edge connectors will go. I used a Dremel fitted with a carbide routing bit to cut the boards, but I didn't have a router table and guides, so the cutting wasn't quite as accurate as I might have wished. When cutting, err on the side of removing too little, as any excess can be trimmed later with a fine file.

Step 2

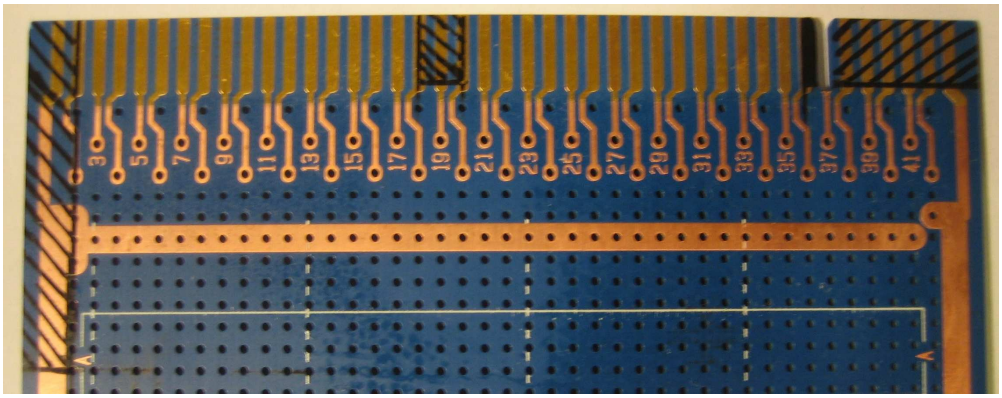
Take the second board and use the CPU board as a guide to mark out what needs to be cut off to convert it from a 36+6 way edge connector board to a 15+15 edge connector board. The details are as follows:

1. Mark through the centre of edge connector position 2 along the perforations as far as half way between the hole to the upper left of the letter A and next hole (further from the edge connectors).

2. An 8mm deep notch running from the middle of connector 18 to the middle of connector 20.

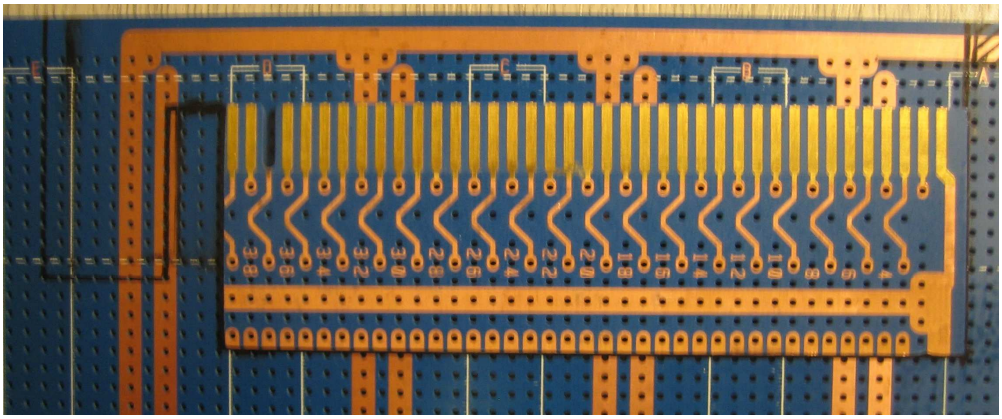
3. Remove the 6 way section entirely to a depth of 8mm from the edge of the board, and extend the cut to the centre of connector 36.

Here's a picture of board 2 at this stage:



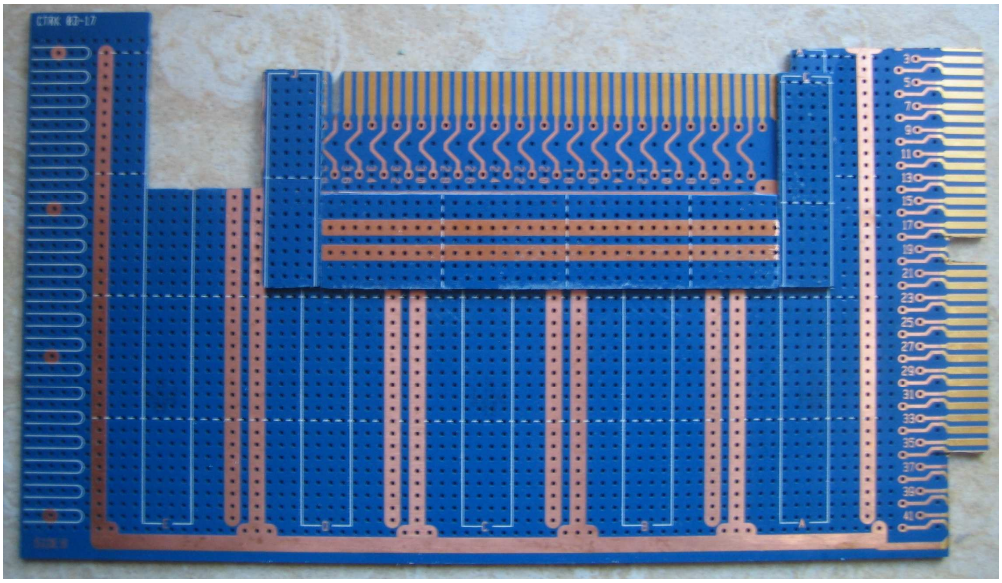
Now position the (flipped over) finger board so that the upper edge is between the third and fourth row of perforations down, and the right edge (near the number one connector) along the line between the row of perforations just to the left of the letter A (middle left above) and the next row.

Draw round the finger board making sure to leave a piece sticking up just to the left of it (this is needed for gluing the boards together) and cut out the waste areas.



Step 3

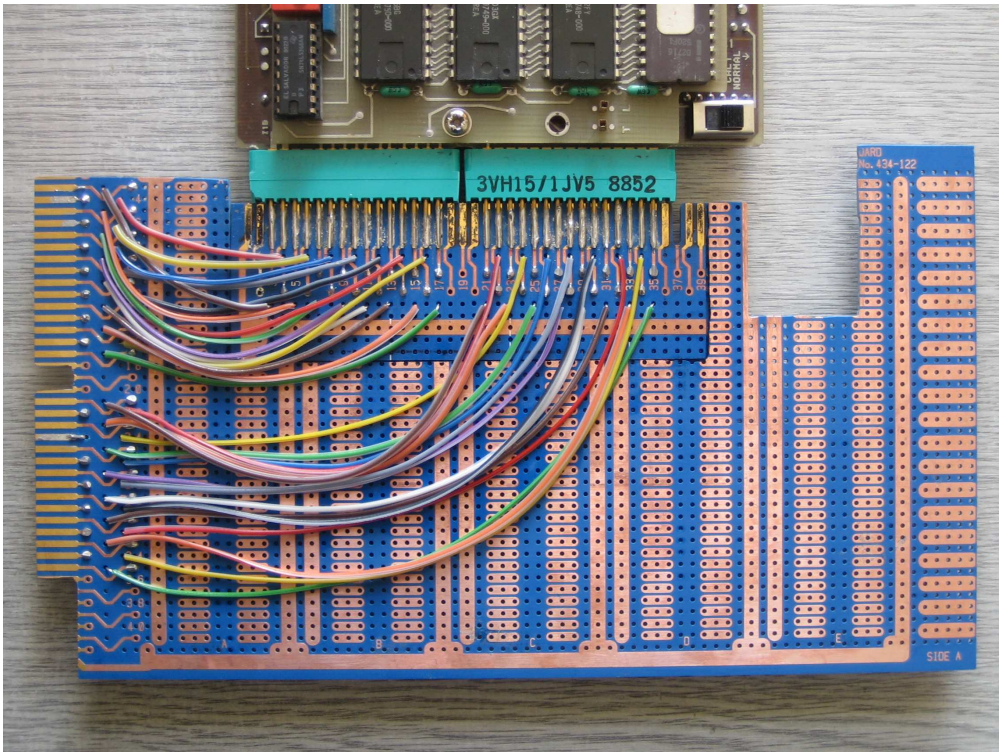
Use off-cuts from the first board and some epoxy resin to glue the fingerboard into the cut-out. The gluing should be done on the B side of the board, as some of the boards in the CG5xxx have pretty tight clearances on the other side. You'll notice that I extended the cut-out on the left of the picture by about 0.35 inches to the left.



The cut-out at the top left is there for a purpose, it's not just a slavish copy of the Tektronix part. It gives you something to push against when inserting or removing the board.

Step 4

Finally wire up the board and attach the edge connectors (you'll need to bend the pins on these to contact the board). Use the CPU board from the calibration generator to ensure that the two connectors are spaced exactly when you are soldering them in place. The finished board looks like this (the other side is pretty much the same):



A final note – I had to shave off about 1mm from the top of the board (right hand in this picture) so it would actually fit the slot in the frame. The boards in the CG5xxx are just a smidge under 4.5 inches deep!