Microbee™ Technology

PS/2 Keyboard Adapter Kit

Suits: Standard & Premium / Premium Plus Microbees

It has been a common problem with older Microbee computers that keys on the keyboard become non-functional. With no supply of original switches, people have to resort to removing them, taking them apart & attempting repairs with varying levels of success.

Microbee Technology has designed an adapter to let you connect a PS/2 keyboard to your Microbee.

The adapter works seamlessly with your Microbee, requiring no special software or drivers etc. In fact, the Microbee's software knows no difference between key strokes coming from the external keyboard, and the inbuilt one, and both can be used at the same time.

The small board fits to the back of the Microbee's baseboard, piggy-backing onto the screen controller chip's socket to attach to most of the required signals. Additionally, there is one track cut & 2 wire links to complete the install.

The adapter provides power to the PS/2 keyboard and has a flying lead PS/2 socket that allows plugging in of the keyboard.

Using the PS/2 Keyboard

Obviously there are some keys on the PS/2 keyboard that are not of interest to the Microbee at all, such as Scroll lock, Windows keys etc. but all the keys that can be mapped to the Microbee have been, including the numeric keypad.

There are two special key mapping cases – The Microbee's LINEFEED and BREAK keys.
F1 & F2 on the PS/2 keyboard have been made to work as LINEFEED & BREAK respectively.
Also, the PAUSE/BREAK key on the PC keyboard works as the BREAK key on the Microbee but due to the way that this key works on the PC keyboard, (Key down codes only) we've implemented the BREAK key on F2 as well to properly give Key down / Key Up control.

How it works

On the adapter board, there are 2 main components. An STM32 microcontroller provides the interface to the PS/2 keyboard, receiving keyboard key down / key up codes. The other main component is a Xilinx CPLD which interfaces to the Microbee keyboard scanning circuit. This

has 8 x 8 bit registers in it, a multiplexor & de-multiplexor and a few bits of glue logic. The 8 register sets (64 bits in total) form a logical keyboard matrix which the microcontroller can then set or reset bits in to signify a Microbee key being pressed or not. As the Microbee's keyboard scanning circuit (driven by the 6545 CRT controller) progresses through scanning the matrix, the matrix address is decoded by the CPLD's logic and a register bit selected to 'OR' with the actual keyboard matrix result for that position. If either of the keys of the original Microbee keyboard, or the register bit in the same position of the matrix inside the CPLD are active, the result is presented to the LIGHT PEN input of the CRT controller and the Microbee sees that key as pressed.

Fitting the adapter PCB to the Microbee

Standard (Non-Premium series) Microbee

Firstly, open the Microbee's case, remove the coreboard, unscrew the baseboard from the base of the case, and turn the baseboard upside down. There is one track to cut as shown in the photo :
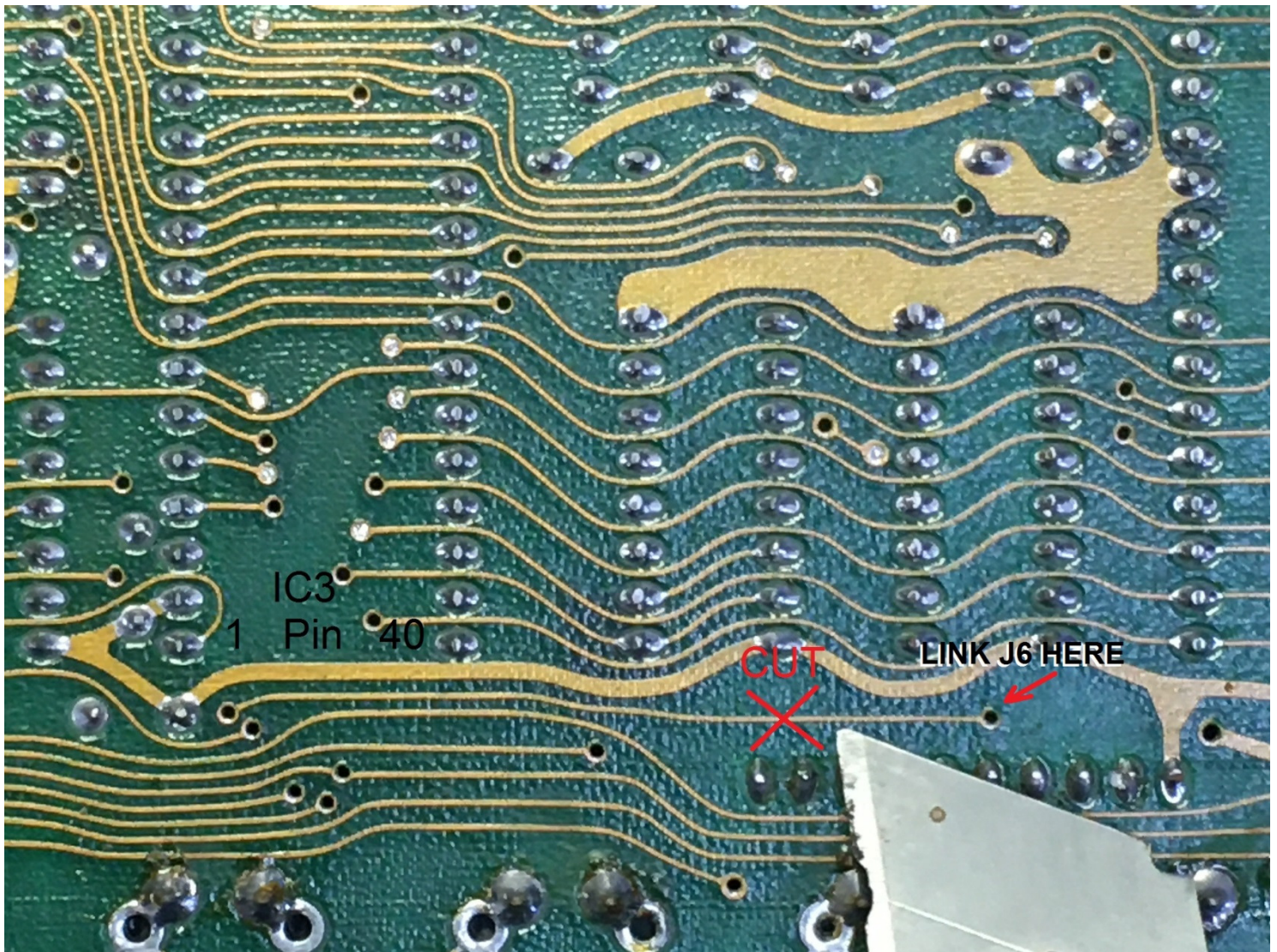
Next, with the tinned copper wire provided, solder 20mm lengths to each of the corner pins of IC3 (the CRT controller) - pins 1, 20, 21 & 40. Also, pins 3, 8, 9, 10, 11, 12 & 13. The adapter PCB has holes in it for the wires at these pin locations. It will slip onto these wires and be soldered in place at a later stage. See the following photo as an example of how to solder the tinned copper
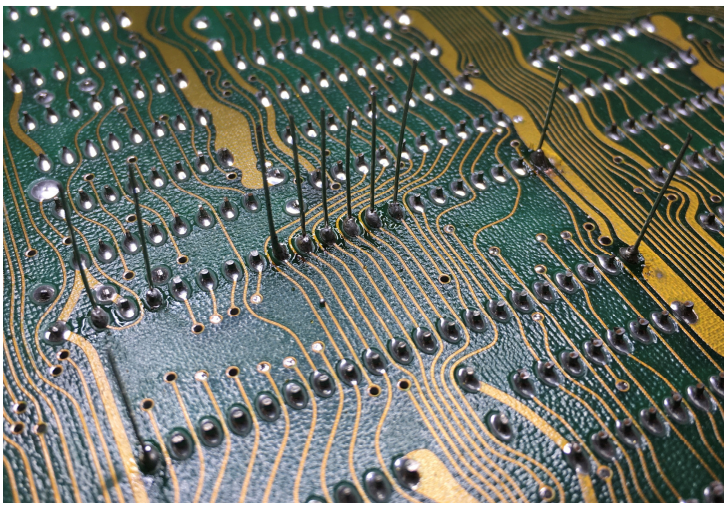
wire onto the pins of the CRT controller position.

Next, decide how long you want the PS/2 socket cable.

The most convenient place for the PS/2 cable to exit the Microbee case is the spare hole in the case next to the power DIN plug hole. However, the earlier cases did not have this hole in the casing design, so the 'USER PORT' hole would be the next best alternative. Decide how you want to route the cable through the case to your chosen exit point, and hence how long the cable needs to be. The PS/2 socket cable is supplied as a PS/2 extension cable, so it has a plug end, and socket end. Make sure you measure from the socket end, and cut it to the length you require. Perhaps leave a little slack, just in case. There are 4 wires that are used in the cable – strip back the outer casing of the cable about 30 mm. Bare the ends of the 4 required wires – the ORANGE, BLACK, YELLOW & RED coloured wires and trim the unused ones back to where you cut the outer casing. We have supplied a small piece of heat shrink tubing to go over the cable end to tidy up & insulate the unused wire ends. Once that is done, connect the wires to the adapter board as shown.
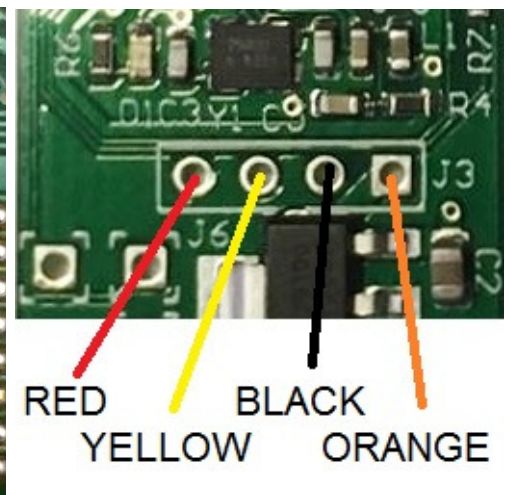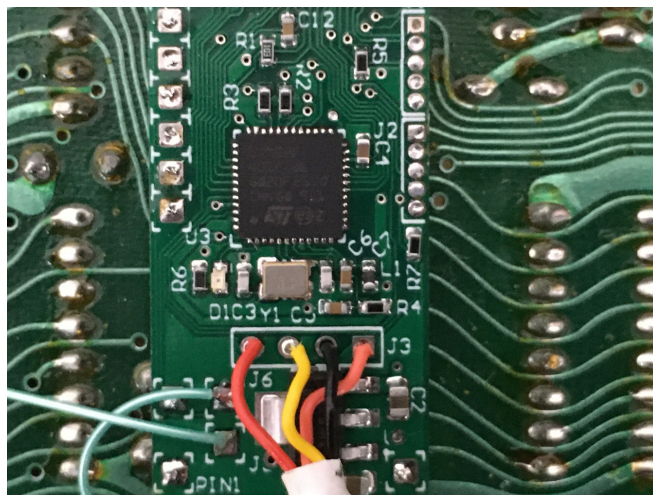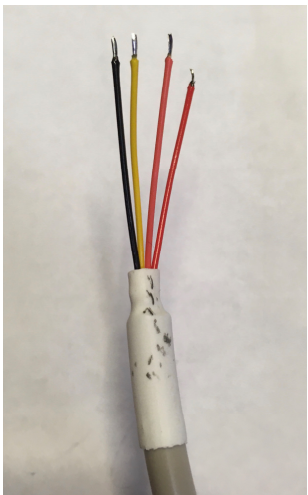
Mounting the adapter board onto the back of the CRT controller (IC3) where you attached the tinned copper wire can now go ahead. Note that the Adapter PCB has pin number 1 shown on the component overlay – this needs to connect to pin 1 of IC3 – make sure you have the correct orientation for the board before you solder it in place. Don't forget that as you are looking at the underside of the baseboard, the pin numbers for the IC's upside down also. EG looking at the 40 pin DIP footprint underneath the board, pin 1 is on the left and pin 40 on the right. If in doubt, go back and look at the photo that details the track cut. It is shown correctly.

Slip all the wires through the holes in the adapter PCB and leave a couple of millimetres of gap between the boards. Carefully solder each of the tinned copper wires to the pads they go through, and trim off the excess. Note that with the heat of soldering the wires to the board, they can move from where they were first soldered to the baseboard, so check that they remain in place & connected.

Here's how the board mounting should look at this point:
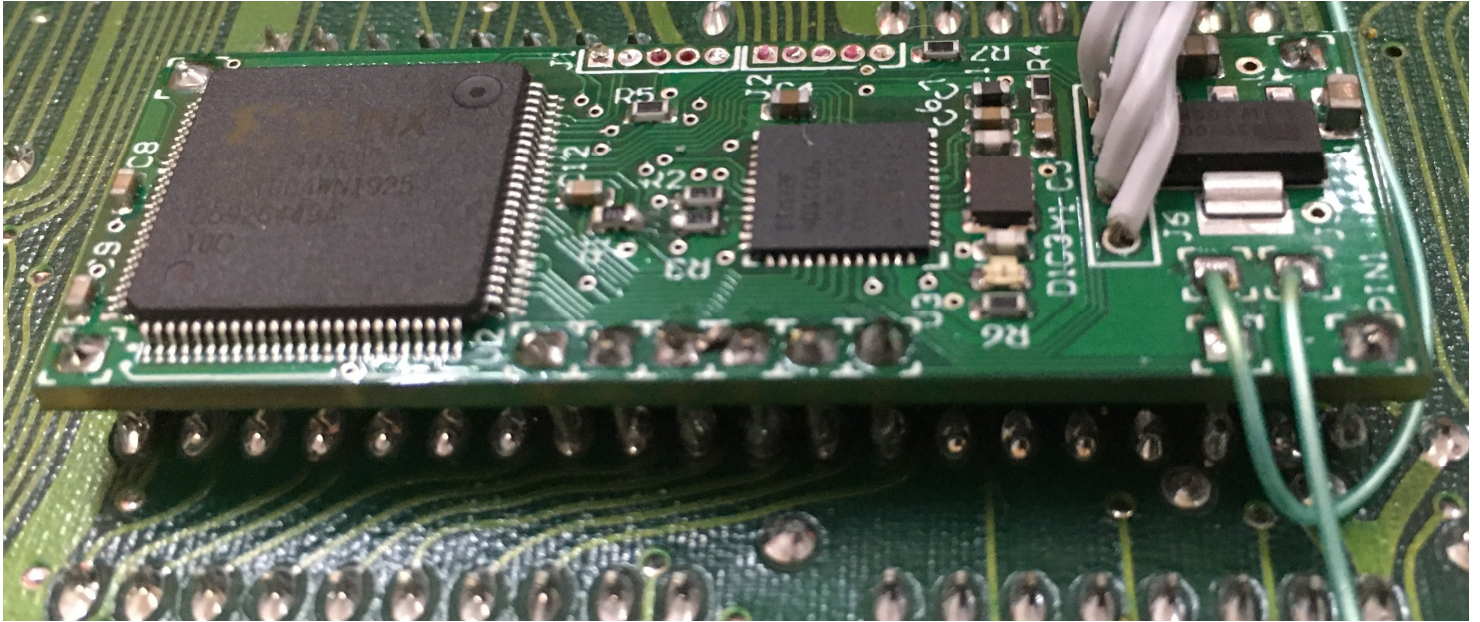
Lastly, we have the 2 wire links to install.

Refer to the earlier photo with the track cut once again. You will see that one link has to go from J6 on the adapter PCB to the VIA at the other end of the track cut. Scrape back some of the solder mask away from the VIA and solder up the VIA hole, making sure you have a good electrical contact. Then, with the wire wrap wire provided, solder wire into the VIA, and then into J6 on the adapter.
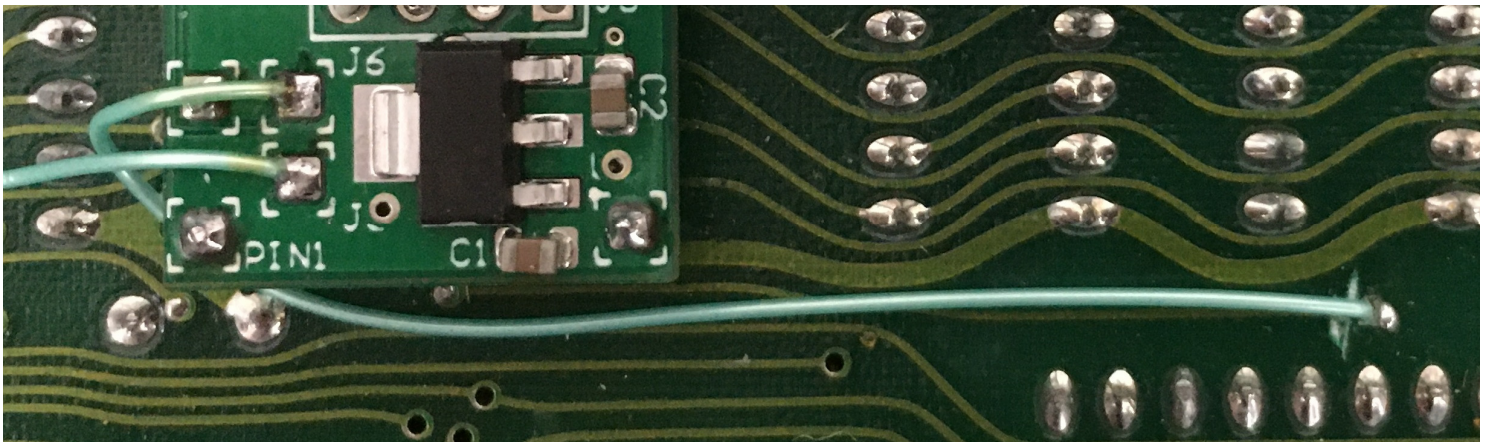
J5 on the adapter links to Pin 10 of IC20 as shown below:
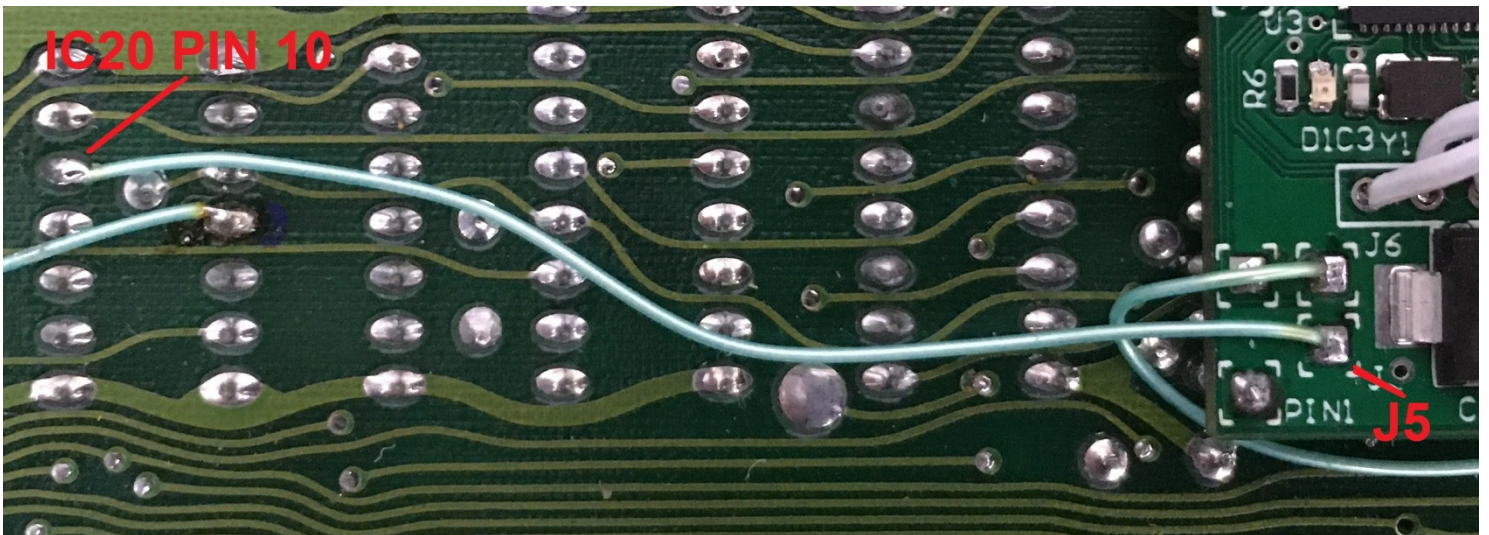
Your installation is complete & ready for use.

Fitting the adapter PCB to the Microbee

Premium & Premium Plus series Microbee

The procedure for fitting up the PS/2 keyboard adapter is much the same on the Premium as with the Standard Microbee installation. The differences in the installation are covered here, but please read through the procedure for mounting the adapter to a standard Microbee first.

Track cut options

The track to be cut on the Premium / Premium Plus series baseboard is a little tricky to get to. It runs on the top side of the board from IC5, pin 6 underneath IC5 to IC1 (the 6545 CRT controller), pin 3. There are 3 ways to tackle this.

Option 1: Remove IC5 (a 74LS08) cut the track at pin 6, replace IC5

Option 2: There is a very small amount of the track visible between IC5 & IC1 (see photo). You can make the track cut there with a long, fine scalpel blade.
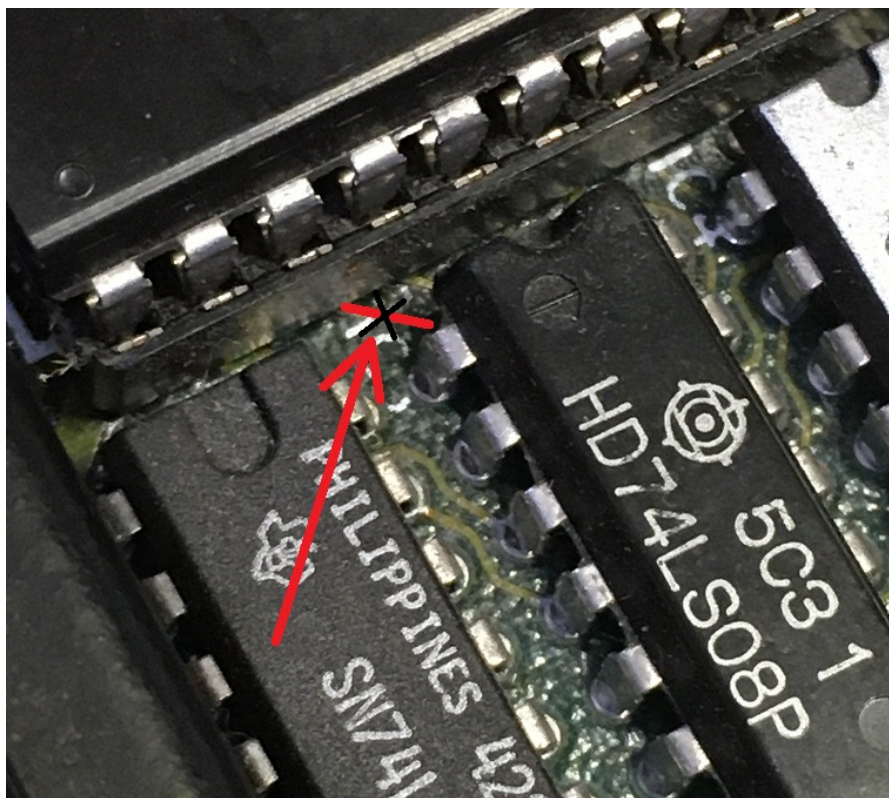

Option 3: No track cut at all – remove IC1 from its socket, bend pin 3 out away from the body and re-insert the IC back into its socket. If you take this option (which is easier) you will have to solder a link wire to Pin 3 of the IC that you have just bent out later. Make sure that, when the IC is back in its socket, that the bent pin is not touching the socket at all.

Trim the PS/2 Socket cable to length:

On the Premium series baseboard, it is convenient to run the cable on the top side of the baseboard under the keyboard frame between the top & second row of keys. This way, the cable can be hidden for the most part, travelling from the far left of the board to the right and exit the case in the spare hole near the power input. The wire needed to connect to the adapter PCB can feed

through one of the holes in the PCB that is for a case post. Note however that the bulkiness of the PS/2 cable is too much to fit through the hole with the post in it, so it is suggested to trim the outer casing of the PS/2 cable back around 80mm instead of the 30mm suggested in the fitting to a standard machine. There is room then in the PCB hole for the 4 small coloured wires from the PS/2 cable to fit through the hole in the PCB and still have room for the case post.
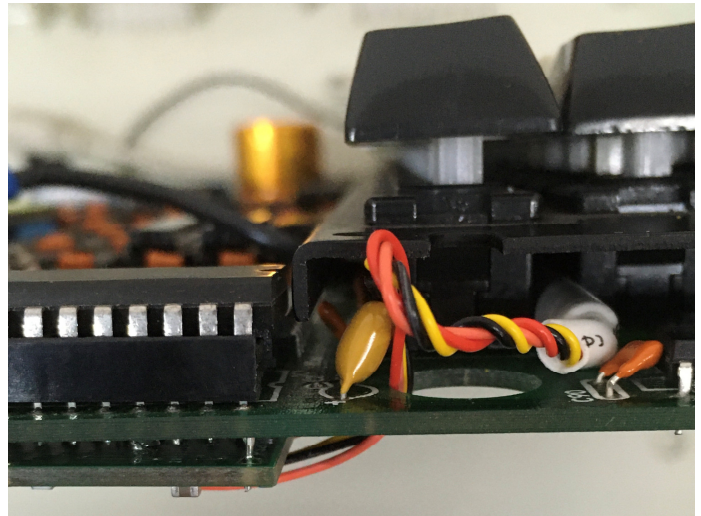
Next, on the underside of the baseboard, with the tinned copper wire provided, solder 20mm lengths to each of the corner pins of IC1 (the CRT controller) - pins 1, 20, 21 & 40. Also, pins 3, 8, 9, 10, 11, 12 & 13. Note though, that if you have taken Option 3 (no track cut) in the track cut section above, please leave out the wire that would normally be soldered to Pin 3 of the CRT controller socket.

Wire the PS/2 cable to the adapter board now, remembering to feed it through the channel between the key switch rows, and the hole in the PCB to the underside of the board before attaching it to the adapter PCB. See the colour coding and wiring of the cable to the adapter PCB in the 'Standard assembly' section.

Slip all the wires through the holes in the adapter PCB and leave a couple of millimetres of gap between the boards. Carefully solder each of the tinned copper wires to the pads they go through, and trim off the excess. Note that with the heat of soldering the wires to the board, they can move from where they were first soldered to the baseboard, so check that they remain in place & connected.

Lastly, we have the 2 wire links to install.
J6 on the adapter PCB links to IC4 pin 6 and,
J5 on the adapter PCB links to IC5 pin 6.

Note that if you chose to lift PIN 3 from IC1, rather than cutting the track, you will also need to link from pin 3 of the adapter around, through the PCB hole to the lifted pin of IC1.

Your installation is now complete.
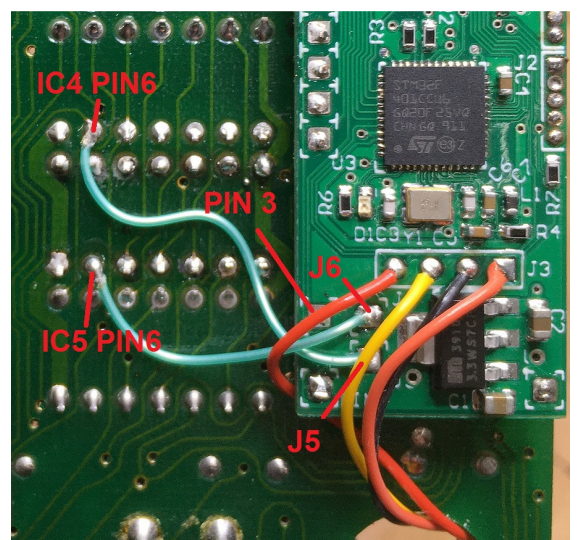
Testing your Microbee with the PS/2 keyboard

Once your Microbee has been re-assembled, you are ready to test it out.

Connect a PS/2 keyboard to the socket cable that should be accessible at the back of the computer and connect the normal power & video leads to the machine as well. If the installation of the adapter has been a success, you can power up the computer and use the PS/2 keyboard to type where you would normally use the inbuilt keyboard. Note that the RESET key on the Microbee is not part of the keyboard Matrix that is scanned, so if you need to reset your computer, you will still need to hold down the RESET key on the Microbee itself.

One further note on the arrow keys:

On a Premium / Premium plus computer, the arrow keys on the PS/2 keyboard will function exactly as the arrow keys on the Microbee keyboard. If you have a non-Premium Microbee though, it will depend on the system software as to whether the arrow keys are recognised or not. Later versions of the Microbee boot rom and system software recognise the arrow keys even if they were not physically fitted to the machine. You may find that you can now use the arrow keys on the PS/2 keyboard for cursor control where you didn't have that functionality before.

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