Premium PLUS +

Construction Manual

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Premium Plus+

Construction Manual

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1.a Introduction

Firstly, Congratulations on purchasing your new Limited Edition Microbee Premium Plus + kit computer! Whether you have never had a Microbee before, or have been a Microbee fan for a very long time, we hope that you enjoy the experience of building your own unit and getting it to do things for you.

As mentioned above, the Premium Plus is a limited edition release with only 105 units being made available in total. Although we will be designing other Microbee kits in the future, we will not be re-producing the Premium case, so 105 units is the maximum number of Premium Plus machines that we can supply. So, to state the obvious, not only do you have a great kit to assemble & use, but you have a collector's item as well.

1.b Requirements

Before you get started on the construction of your new Microbee, there are a number of things that you need to do:

- Read this construction manual completely to see whether you have the knowledge and skills to complete the assembly & testing of the unit. It is important to note that once construction has started, the kit cannot be returned for a refund should you decide that the task is beyond you.
- Check off all of the components against the parts list included at the end of this manual – if anything is missing from the kit, please contact Microbee Technology via our website (www.microbeetechnology.com.au) and let us know.
- You will need the following items to construct this kit :
    - A soldering iron with a good quality tip
    - Good to very good soldering skills
    - The ability to identify components & their values (color codes etc..)
    - Resin cored Solder (there is none supplied with the kit)
    - A pair of electronics grade side-cutters that facilitate close cutting (ie leaving very little component leg left at the joint). This is particularly important when assembling the key switch adapter PCBs.
    - A Philips head screw driver
    - A sharp hobby knife
    - A small pair of pliers
    - A basic multimeter (measuring DC Volts, and resistance)
    - Care & Patience!

Provided you follow the instructions in this manual and take time & care in doing so, you should have a working Microbee very soon.

2.a Getting Started

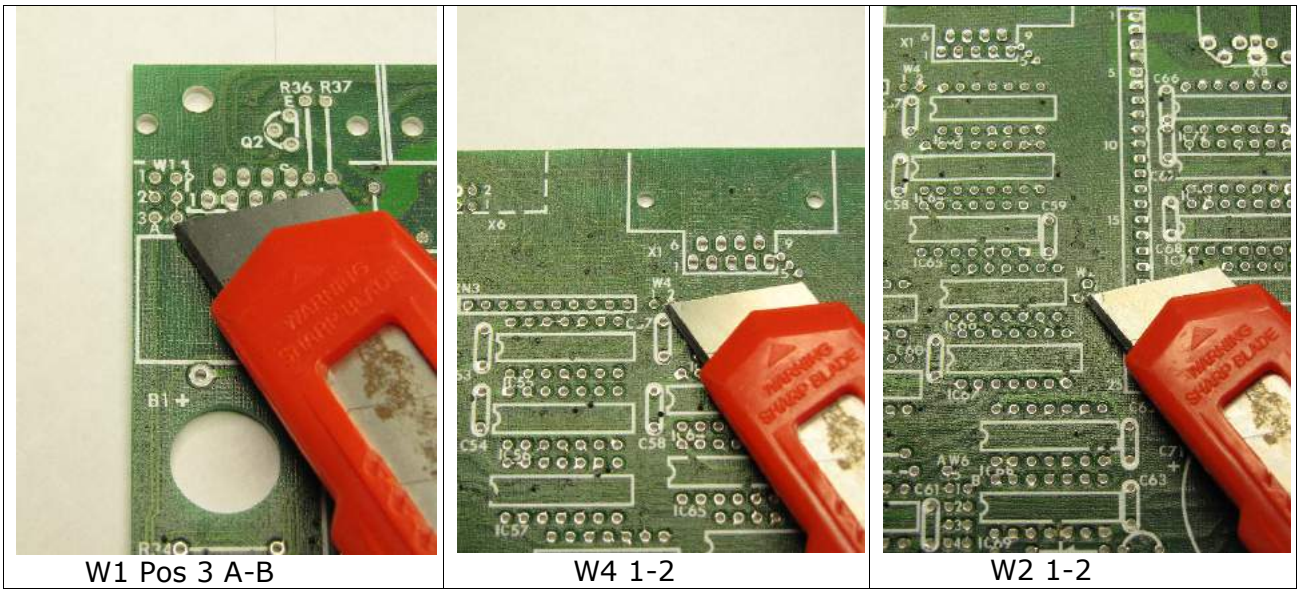
The first thing to do is to set up a suitable workspace where you will be able to lay all the components out and have room to assemble, solder and test.

If you have not done so already, please take the time to check through the component list & check off each item to make sure you have everything that you need that is supposed to be supplied with the kit. We do check every kit for completeness, but mistakes can happen, so its better that you make sure that it is complete before you start construction.

2.b Preparing the Baseboard PCB

You should have a blank Printed Circuit board labelled 8501-4-0CR (this can be found on the PCB on the component side, rear, right side, near the 5 Pin DIN socket position).

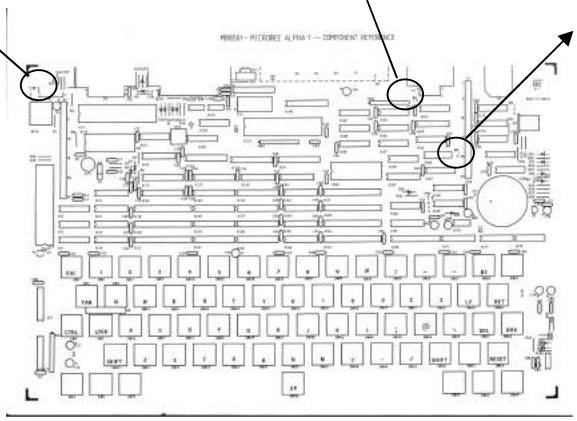
The PCB has a number of configuration 'jumpers' on it where the default position is made by tracks connecting 2 vias (a 'via' is a small plated hole in the board that connects top side tracks to bottom side tracks).
Three of these jumpers have to be cut from their default position and left 'open'. These are Jumper W1 position 3 A-B, Jumper W4 1-2 and Jumper W2 1-2 See the diagrams below :



W1 Pos 3 A-B | W4 1-2 | W2 1-2

< Before

< After

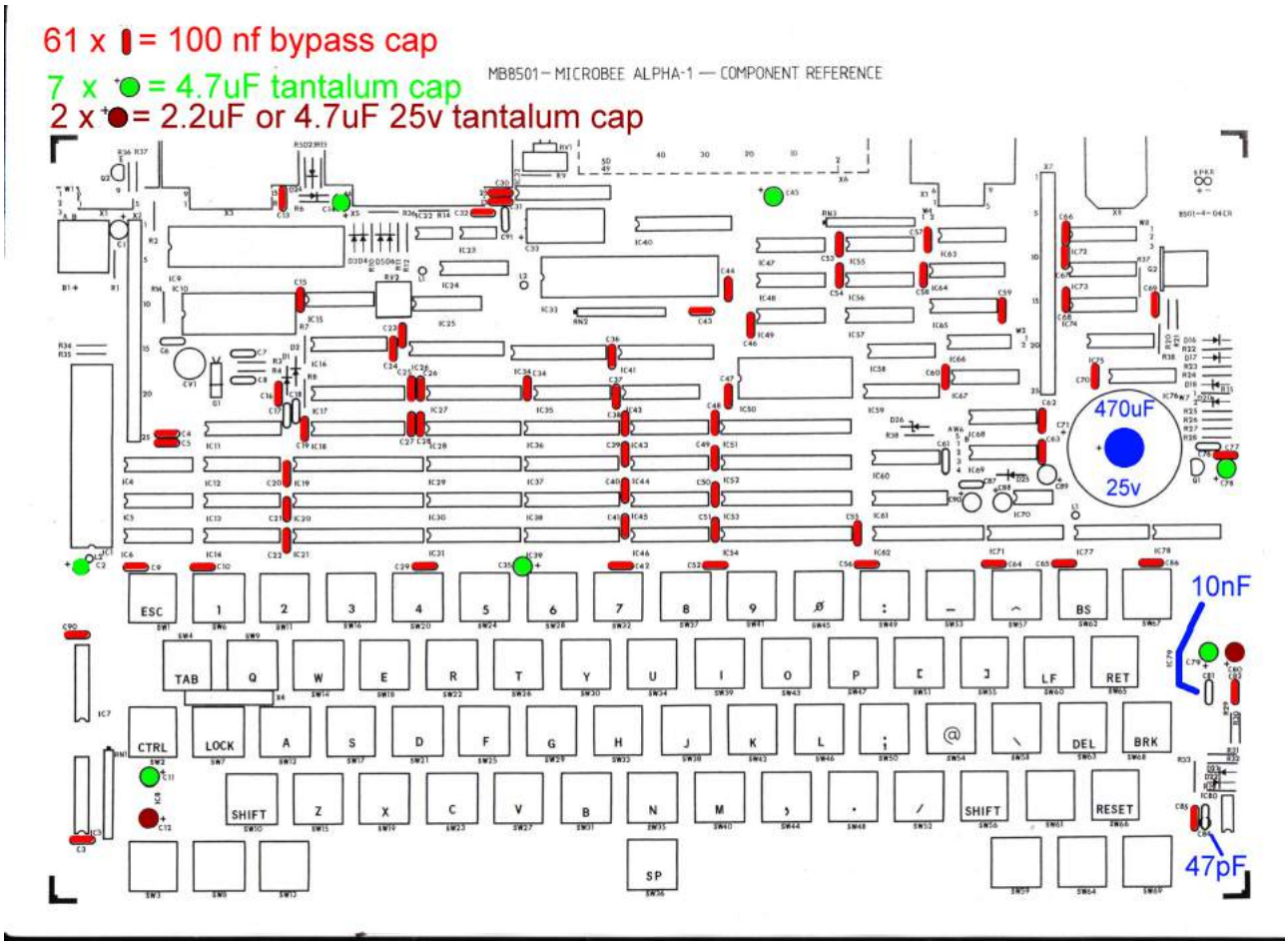


Be very careful when you are making the cuts not to slip and cut another track. It is more controlled just to 'take a little divot' out of the track between the 2 vias, using the sharp

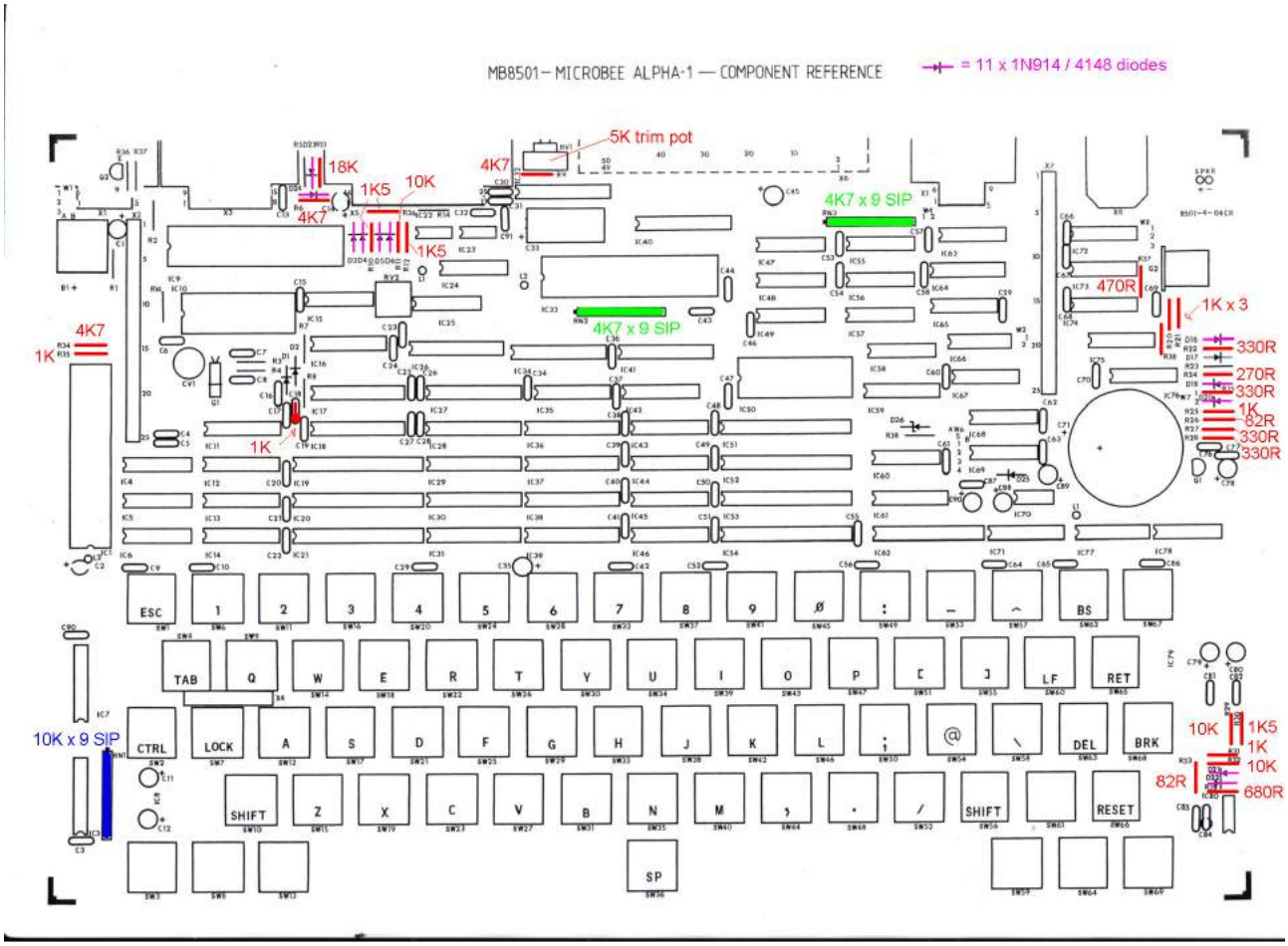
hobby knife in a twisting / digging way rather than trying to slice through the track. Now we are ready to start placing the components onto the board.

3. Passive components

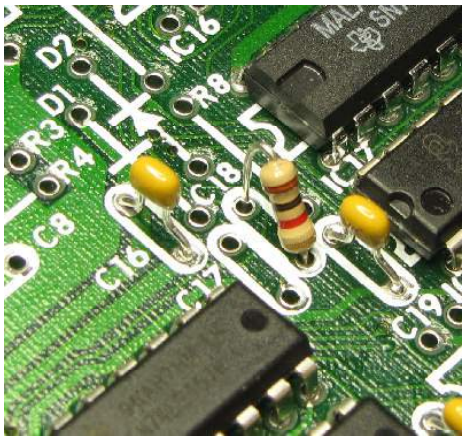
We shall start placing components by starting with the capacitors. There are only 5 different types / values of capacitor on the board and they are as follows :
61 x 100nF bypass cap (supplied on a tape)
7 x 4.7uF 16v Tag Tantalum cap [Polarised], 2 x 4.7uF 25v Tag Tantalum cap [Polarised]
1 x 10nF cap (single, on tape)
1 x 47pF cap (single, on tape)
1 x 470uF 25v Electrolytic cap [Polarised]
You can do these in any order, but take care with the polarised components that you insert them so that the '+' marking on the component is on the same pin side as the '+' marking on the white component legend on the PCB. If these are inserted the wrong way around, they can explode when power is applied.
Please refer to the 'stuffing diagram' below showing where each capacitor is to be placed. With the components supplied on tape, it is easier to cut the legs of the components at the edge of the tape rather than try to remove (unstick) them from the tape. This still leaves enough component leg left to effectively solder them into the PCB and trim them once done.



Next we shall place all of the resistors and also the small signal diodes.
Referencing the marked up component overlay below, work through the resistors section of the parts list which gives values & component reference designators, ticking off each component as you go. The resistor SIPs (Single Inline Package) are 9 resistors in one package with all of those resistors connected to a common pin. If you have a look at the SIP, the value is written on one side (472 = 4.7K, 103 = 10K) and the dot at the left end signifies pin 1. Make sure you line up pin 1 with the marking on the PCB.
Mounting the 11 x 1N914 / 4148 diodes is straight forward but make sure the band on the body of the diode matches the polarity shown on the component legend.



Note also that one of the resistors gets mounted at position 'C18'. The Premium was originally designed to have an LM386 integrated amplifier as its speaker driver and C18 was part of the coupling into the amplifier, however, the LM386 amp was very noisy – even when there was no sound being output from the Microbee, so the LM386 circuit was replaced by a basic one-transistor speaker driver like the original Microbees had. A 1K resistor gets mounted vertically in the C18 position as part of this circuit. See the photo opposite.



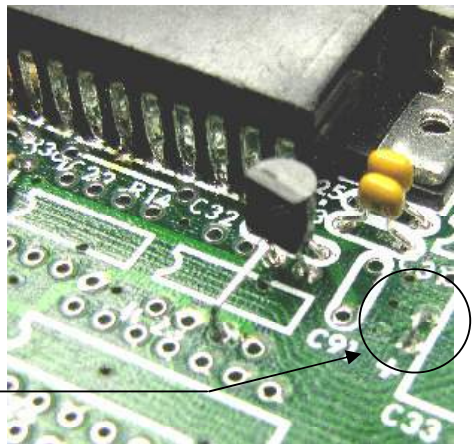
The speaker volume control (RV1) is a 5K ohm trim pot which gets mounted on the under side of the PCB and soldered on the top side.

See the photo opposite which shows the PCB upside down with the trim pot facing the edge of the board.

At this point there are just the 2 transistors & 1 crystal to mount on the board. Transistor Q1 is mounted on the PCB just as the component legend shows. The middle leg (the BASE) will need to be bent out a little to fit into the PCB.

The 13.5Mhz crystal lays flat (horizontal) on the PCB and needs to be located a little bit backward from the hole in the PCB for the case post.
This means that the component legs have to be lead-formed with an offset as in the picture to the right.

The speaker driver transistor (a BC548) gets located at what was the LM386 location – IC23.
As you can see from the photo opposite, the Emitter & Collector of the transistor go into pins 5 & 6 of the IC location, and the BASE lead gets bent backwards & is soldered into IC23 – pin 3.
Note that the round side of the transistor is facing toward the edge of the PCB.
Also, a LINK is needed between the + & - terminals at the C33 component location as shown in the same photo.



Having installed all of the passive components now, there are a few IC's to insert before we can start mounting the keyboard frame & regulators. IC3 (a 74HC151) and IC7 (a 74LS156) form part of the keyboard scanning circuit & are located in the area that the keyboard frame covers once assembled, so it is a good idea to solder these in now. Likewise, IC80 (a CA3140 op amp) on the right side of the board, should be soldered into place now.

Connectors at the rear of the board can be soldered in at this point. Once the keyboard frame is in place (in the next few steps) the board will need to be powered up to check the operation of the 2 regulators, so having (at least) the power connector fitted will be essential. After the connectors are installed, you can refer to 'check photo 6' at the end of the manual and the board being assembled should look the same as the photo.

4. Keyboard Frame & key switch assembly

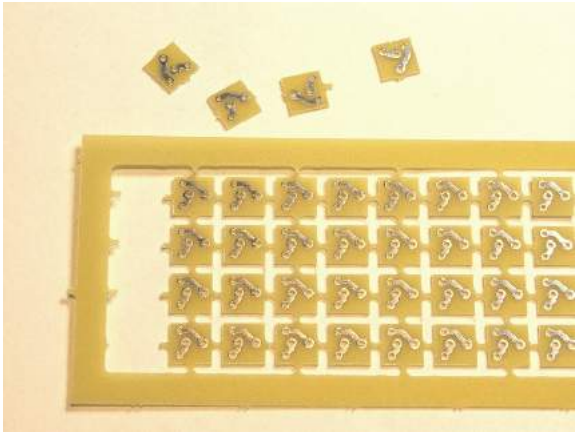
The Microbee Premium Plus keyboard is made up of a number of parts which includes individual mechanical key switches, key tops (caps), a metal keyboard frame and key switch adapter PCBs. In planning and designing the Premium Plus, large efforts were made to try and procure key switches that were the same physical form as the original ones. There was no exact match to be found. Some came close (like the Cherry brand MX series) but were cost prohibitive, others had non-suitable shaft styles and so on. All of the key switches that we looked at also had different pin spacings & locations as well. While we could have scrapped the existing stock of Premium series baseboards and made new ones to suit a different style of switch, this was deemed to be wasteful & expensive. Seen as the Premium Plus is a limited edition kit, the best solution was to provide a small adapter PCB for each of the new key switches, so that the assembled switch would then suit the original PCBs. This also made the solution suitable for people who want to replace the keyboard in other Microbee models.

4.a Key switch assembly

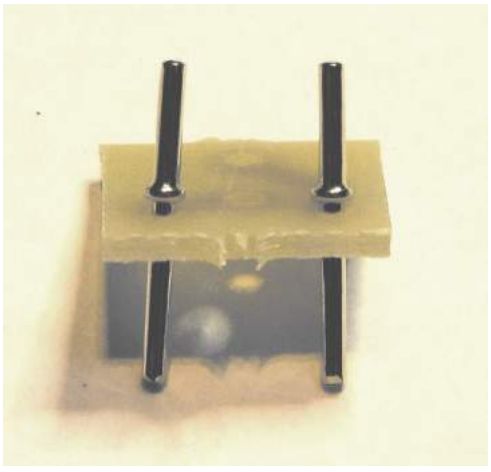
Assembly of all of the key switch adapters & fitting them to the key switches takes quite an amount of time. You can expect to spend 2 hours working through the whole lot of keys, so have some patience & take a break when you need to because it is better to spend as much time as it needs to do a great job rather than rushing it through. If done well, you will have a decent keyboard for your Microbee that will last well. If you rush in assembling them, it is likely that you will have keys that don't work as well as they should.

In your kit, you will have a bag specifically of keyboard bits. This includes the key tops, key switches, gold PCB pins, mounting hardware and so on. There is also a PCB supplied that has 68 (64 needed, plus 4 spare) key switch adapter PCBs in a frame.

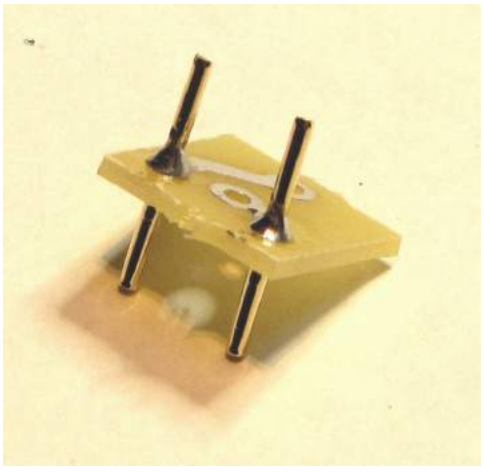
All of the individual adapter PCB's are held together in the frame with breakout tabs. That is, on the edges of each PCB there is a little bit of PCB material that connects one PCB to another to hold all of them in the frame while the board is being manufactured. At these points there are very small holes which provide a breaking point. If this point is flexed, it will break apart & each individual PCB will come away from the others. Refer to the photo to the right which shows some of the key switch adapter PCBs broken out from the frame.



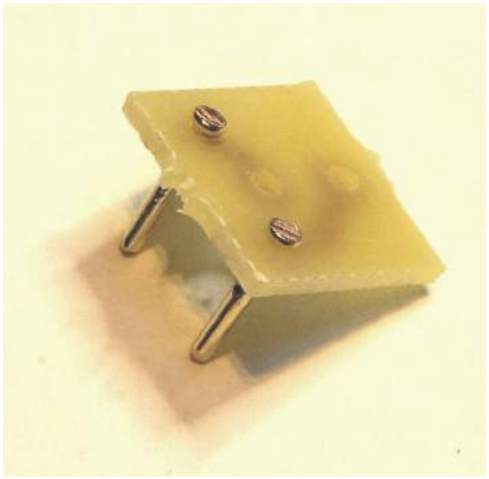
The following shows the general procedure for making up and fitting the key switch adapter PCBs to the key switches.



1. Insert the PCB pins from the non-track side of the PCB, with the longer section of the pin through the hole.



2. Solder the 2 PCB pins in place with a nice triangular fillet or even slightly concave.

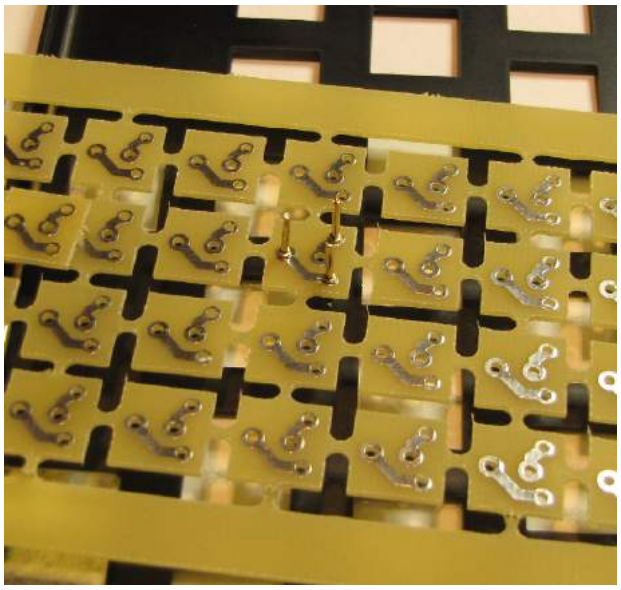


3. Trim the excess pin length as close as possible without removing the collar (this locks the pin into the PCB and stops it from falling out when the pin is soldered into the main PCB later

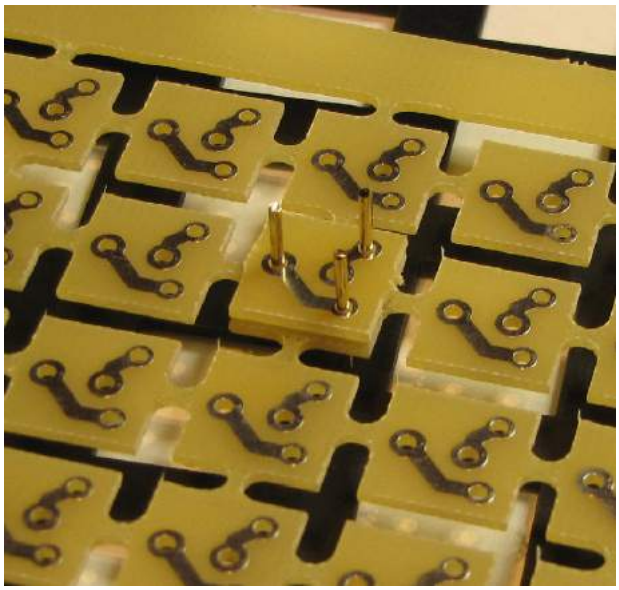
4. Solder the finished adapter onto the back of a key switch. Make sure that the adapter is flat against the back surface of the key switch. This is important as we do not want any 'slack' or chance of pressure on the pins of the switch. If the pins of the switch get pushed into the body, the switch will not work properly.

Note that in step 4, the adapter PCB will be at a slight angle if correctly installed as the collars on the PCB pins will keep it from sitting absolutely flush. This is o.k.

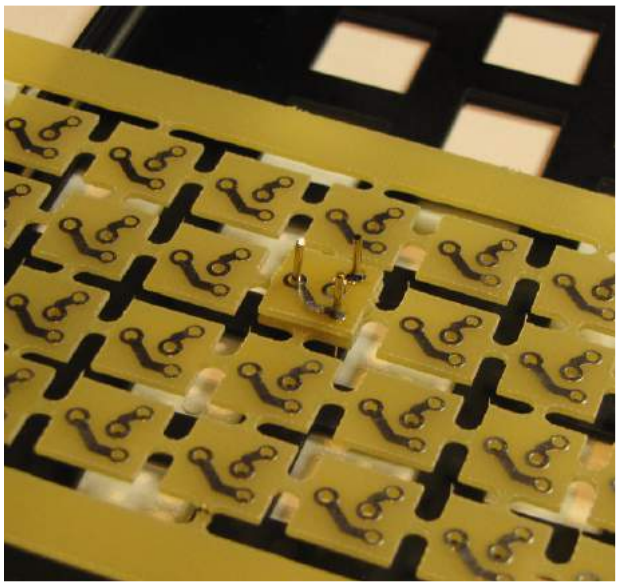
The whole procedure is quite fiddly and it is tricky to ensure that the pins are upright and parallel to each other (and hence keeping the same spacing). The following photos (on the next page) show a setup that makes the job easier & more accurate.



1. With the PCB adapter board spread across the up-turned keyboard frame, insert 3 PCB pins (short end through the holes)



2. Place a 'broken-out' adapter on top so that it is then sitting on the collars of the PCB pins (using 3 pins keeps the adapter PCB level)



3. Solder the 2 required pins, leaving the 3rd un-soldered, and then remove the adapter & trim the pins as described earlier.

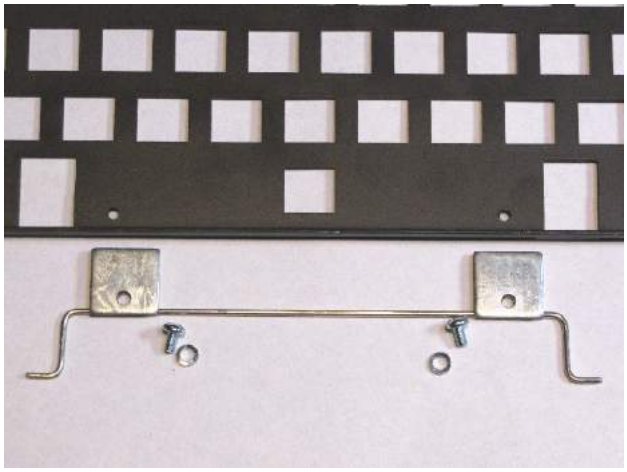
Obviously, as you do more and more of the adapters, the PCB frame will have less and less adapters in it and the last few will probably have to be done with no support from the frame.

One other tip is that if you line the adapter that you are working on up over a key switch hole in the keyboard frame below it, you can press down on the centre of the adapter so that it ensures that all of the PCB pins are pressed 'up' against the bottom of the adapter as you solder it. This also aids in making sure the pins are straight & parallel. There is a bit of a 'knack' to doing this, but after doing a few, you should see it get easier.

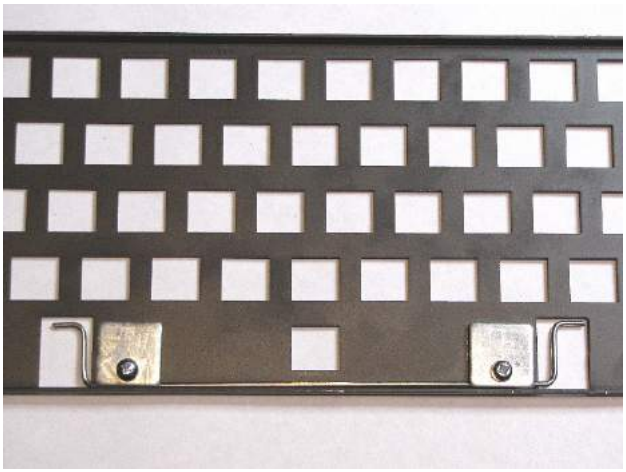
Remember that only 64 key switches are needed, so the last 4 adapters in the frame do not need to be assembled.

4.b Keyboard frame assembly & mounting

Lay the keyboard frame flat on your work surface with the top side facing down.
The torsion bar for the space bar key has to be installed before the keyboard frame is in place on the PCB, otherwise it is very difficult to install.

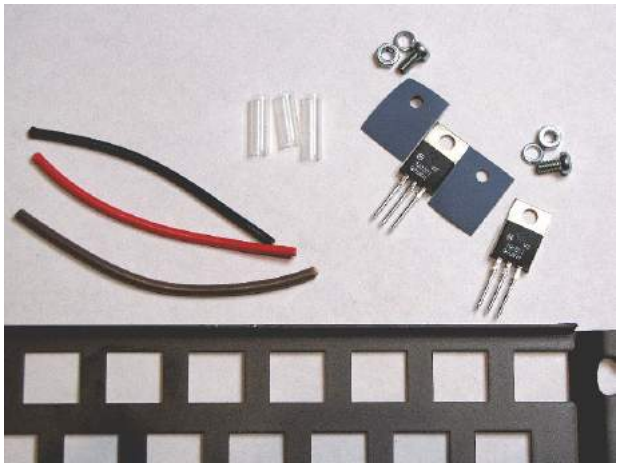


This picture shows the parts required – the torsion bar, 2 clamps & bolts with spring washers.

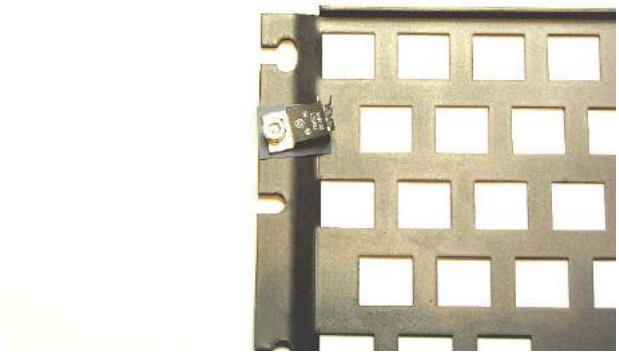


The torsion bar is now in place held into the corner of the keyboard frame by the clamps which are bolted into threaded holes in the keyboard frame.

Mounting the 2 x 7805 5volt regulators is next. Both regulators bolt directly to the keyboard frame underside with a thermal transfer silicon-rubber pad. The regulator for the right hand side [eventually] gets soldered directly to the main PCB. The regulator on the left hand side of keyboard however requires short wires to be attached which then get soldered into the main PCB. This is due to the lack of space on that side of the keyboard frame (having part of the keyboard scanning circuit on the main PCB at that point).



The parts required – 2 x 7805's, thermal washers, nuts, bolts, spring washers, wire and heat shrink tubing.

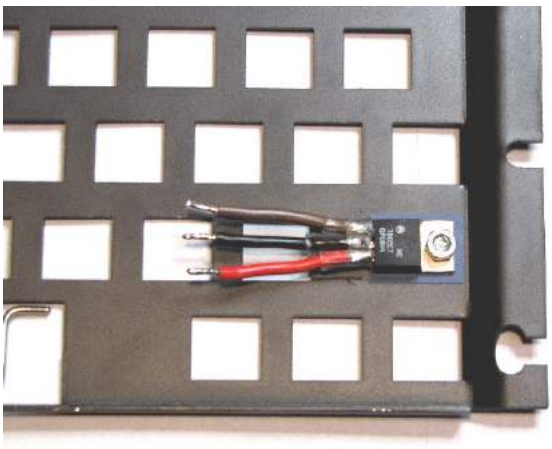


The right hand side regulator (it's on the left of the keyboard frame in this 'upside down' view) gets mounted at a slight angle with its legs bent up at right angles.

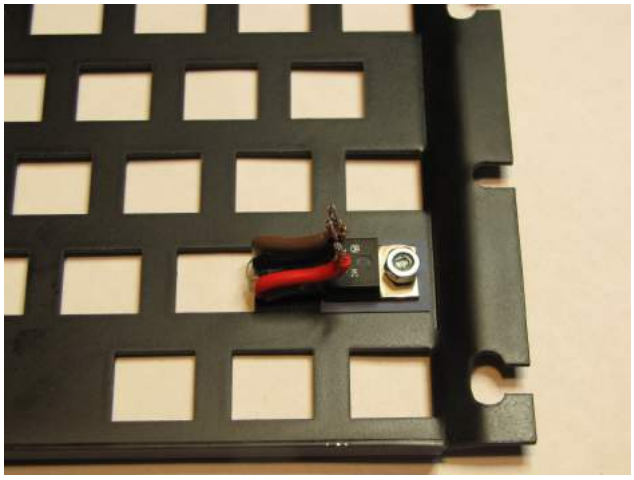
When fitting up this regulator, bolt it down but do not tighten the bolts too much. At this stage we want the regulator to be held firmly in place, but to be able to adjust the position of it and get the right angle to allow the legs to meet with the holes in the main PCB where it is to be soldered in. This will take a bit of fiddling to get everything to line up.
It is advisable at this point to sit the main PCB in the bottom half or the case so that you can position the keyboard frame correctly over the main PCB while taking into account the mounting position of the keyboard frame into the case bottom. Once you have the regulator set up to that the pins line up with the holes in the PCB, you can tighten the bolts to keep it that way. Do NOT solder the regulator to the PCB at this time.

The left hand side regulator…

Trim the legs back to just near the wider part of the leg. Also, prepare 3 wires about 30mm long and tin the ends.



Mount the regulator with the thermal pad, nut, bolt & spring washer as shown. Solder the wires on & slide the heat shrink tubing onto each so that the joints are insulated from each other. The tip of the soldering iron will shrink the tubing.

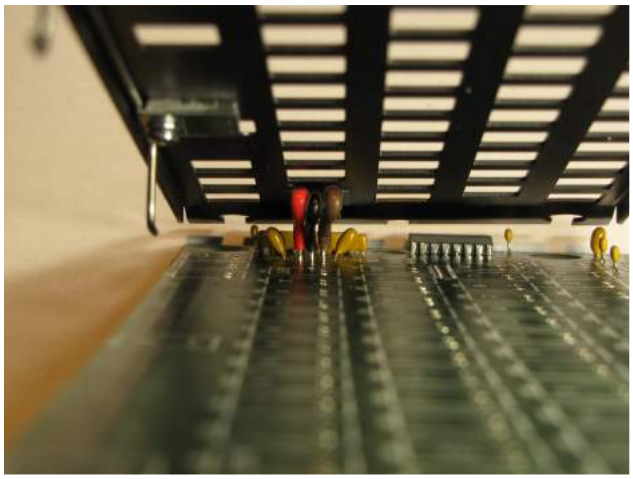


Next, the wires that you have just soldered to the regulators' pins need to be bent up as shown in the photo.

These wires will connect the regulator to the main PCB – they are essentially extending the legs of the regulator so that they reach the correct position and can be soldered in.

You may need to trim the width of each wire a little so as to be able to fit the ends of the wires through the holes in the PCB in the pads for the regulator position.

Soldering the regulators into the main PCB..



Ensure that the wires attached to the regulator fit through the pad holes & then solder all three into the main PCB.

As shown in the photo to the left, the wires line up in order with no need to cross any over.

This is the same as having the regulator pins bent at right angles toward the PCB & soldered in.

Now, before the other regulator gets soldered into place, the positioning and height of the keyboard frame (with respect to the main PCB) needs to be correct.
It is at this point that some key switches are needed to be placed into the frame.
To start with, just 5 keys are needed – in the 'outer most' positions on the keyboard where the 'ESC', 'Backspace', 'Up Arrow' and 'Right Arrow' keys are found. The 'Space bar' position is also used. Once again, it is easier to align the position of the keys if the main PCB and the keyboard frame is sitting in their correct positions in the base of the case.

Inserting the key switches into the frame will require a reasonable amount of force as they are a tight fit. Watch to see that the PCB pins on the adapter of each key switch go through the holes in the main PCB as they should. Once the 5 key switches are in the frame, carefully lift the frame & main PCB out of the bottom of the case, ensuring that it all stays together and then 'tack' solder 1 pin of each key switch. This is a bit of a juggling act but can be achieved by holding the PCB and frame on one side, while soldering the pins.
Do not apply too much heat to the pins while soldering them as this will melt the solder that holds the pins in place in the adapter.

Once the five key switches have been 'tacked' in place, the keyboard frame can be checked to see if it is positioned well and that the height from the PCB to the keyboard frame is the same on all sides. Typically, the PCB pins of each key switch should protrude through the PCB by around 2mm. Once the keyboard frame is all level, the right hand side regulator can be soldered into the main PCB.

<u>Initial test</u>
Now that the regulators are soldered into place, it is a good idea to check to see if there are any shorts & whether the two 5 volt power rails on the main PCB work as required. If something is not right at this point it is easier to get to the regulators than when the full keyboard is assembled.
First check that there are no short circuits.
With a multimeter set to low ohms range, check the following points on the PCB:

a) across the main input capacitor (C71) – you should see an initial low ohms reading due to the charging of the capacitor (by the multimeter), but after a small amount of time, this should be a large resistance value. As long as it is not permanently below 10 ohms, then all is well.

b) across IC16 pins 8 & 16 – this should be a fairly large resistance value and represents the output side of one of the 5volt regulators. Once again, as long as it is not permanently below 10 ohms, then all is well.
c) across IC72 pins 7 & 14 – this should be a fairly large resistance value and represents the output side of the other 5volt regulator. Once again, as long as it is not permanently below 10 ohms, then all is well.

If you find any shorts in the above steps, check over your soldering work – particularly at each regulator and correct these before moving on to the next steps.

Power on test

The Microbee Premium Plus runs with an input power supply of 10 – 14 volts DC which is fed into the main board via the 5 pin DIN connector. 10 Volts is preferred as the regulators will run cooler.

With the multimeter set to measure D.C. volts and a suitable range selected to measure the 10 – 14 Volts D.C., apply power and quickly measure the input voltage across C71 to confirm that the power supply is getting to the board o.k.

Measure the two 5 volts rails at:

a) IC16 – negative meter lead to pin 8, positive to pin 16 – should read +5.0v +/- 10%
b) IC72 – negative meter lead to pin 7, positive to pin 14 – should read +5.0v +/- 10%

If these are measured o.k. then construction can continue and the un-soldered pins on the 5 key switches can now be soldered.

5. I.C. sockets & PCG ram adapter PCB

Sockets have been supplied in the kit for the larger logic devices including the CPU, PIO, 6545, the Font ROM, the Screen RAMs and the Gold PAL. These can be soldered onto the PCB now.

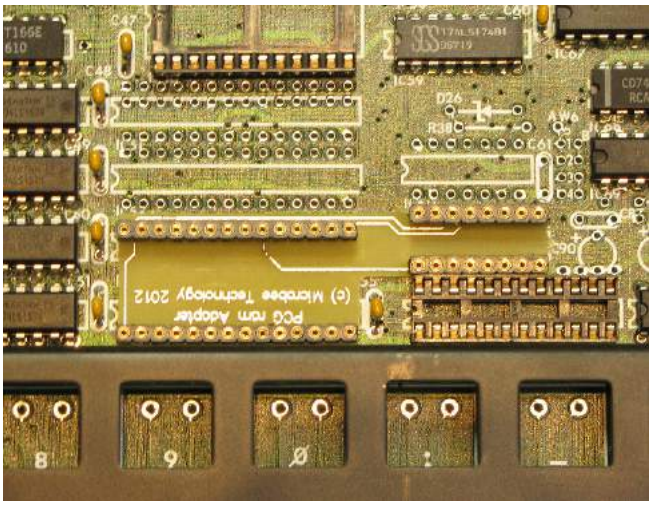
There are 3 x 40 pin sockets for locations IC1, IC9 & IC33.

There are 3 x 24 pin (skinny) sockets for locations IC19, 20 & 21. Note that these locations are actually for 28 pin parts and the 24 pin sockets get soldered into the PCB so that pin 1 of each socket gets soldered into the pin 3 location on the board – i.e. the left-most 4 pads (pins 1,2, 27 & 28) are left empty.

There is 1 x 24 pin (skinny) socket for location IC62.

There is 1 x 24 pin (normal width) socket for location IC50.

The original Microbee Premium Series computers were supplied as standard with 16k bytes of Programmable Character Generator (PCG) memory. The Premium baseboard was designed for a maximum of 32K bytes of PCG memory however and the Premium Plus kit includes this as standard. To implement the full 32k, we have designed a small adapter PCB that takes a single 32k x 8 bit static ram rather than the 4 individual 8k x 8 bit static RAMs in the original design. The adapter is pre-made and has to be soldered into the baseboard. The PCG ram adapter board fits onto the baseboard at IC locations IC53/4 and IC61.



The pins of the PCG ram adapter PCB do not quite protrude through the other side of the baseboard PCB, however, there is enough of the pin in the pad holes that they can still be soldered by 'flooding' the hole with solder. Apply just enough solder for it to 'wick' down the hole and surround the pin so as to get a good solder joint.

6. Integrated Circuits.

Now it is time to start installing the integrated circuits.
Start with all of the smaller 14 & 16 pin devices. Take care that each is located at the correct IC location. Check as you go that the correct device for that location is being installed by cross referencing the parts list. The ICs are supplied on a sheet of anti-static foam with a component reference overlay on it.

* Handy Tip * When installing all of the ICs, solder just 2 diagonal pins to start with. For example, on a 14 pin device, solder pin 7 & pin 14 to the board & leave the rest for now. Then, once all ICs are in position and verified for correct type & orientation, solder the rest of the pins for each device. This way, if you make a mistake and (say) put a device at the wrong location, it is easy to remove the device and make the correction.

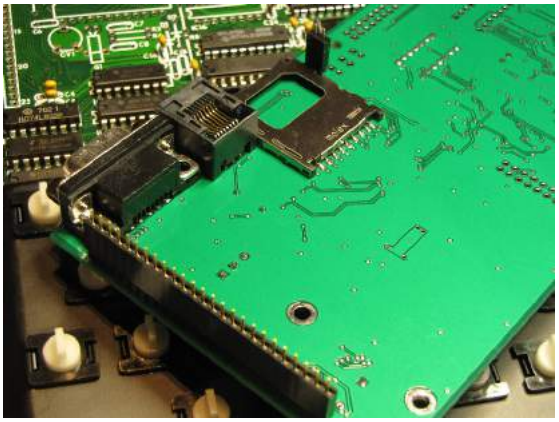
While it is possible to use IC sockets for all of the devices, it is not recommended as, over time, socket contacts oxidise and the circuit performance can be degraded.

Next, move onto the larger 20 pin devices. Install these in the same manor, checking that the location and device types are correct, along with making sure of the proper orientation.

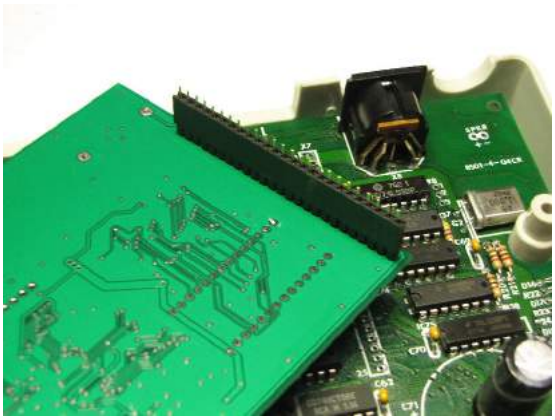
It is a good idea at this point to do a thorough visual inspection of your soldering and check for any component leads that may be shorting. As quite a few of the ICs are close together, it is common for the legs of adjacent components to touch each other on the under side of the board. Trim any leads that are close to each other to ensure no shorts can occur.

7. Core board sockets.

There are 3 sockets that need soldering onto the baseboard PCB for connection to the core board. There are two 25 way socket strips and one 2way socket header that must be installed. The easiest way to get these connectors into the correct position and ensure that they are upright is to use the core board as a guide with the sockets plugged onto the pin strips.

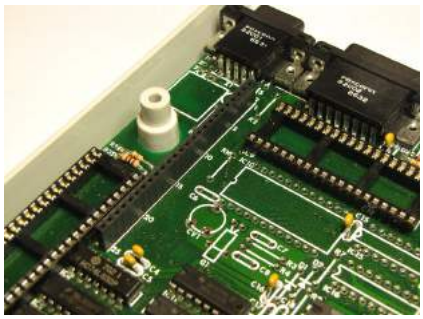


Right side 25 way strip + 2 way socket



Left side 25 way socket strip

Put the core board in location on the main board & 'tack' the 2 outer most pins of each 25 way socket strip first. Check that the sockets are as close to the PCB as possible and that the 2 way socket is in its location at pins 13 & 14 of the 50 way connector position – X6. Once satisfied that everything lines up correctly, solder the rest of the pins on all 3 of the socket strips and then remove the core board.



8. Completing the Baseboard.

The final steps in completing the construction of your Microbee Premium Plus baseboard involve completing the installation of the key switches, fitting the key tops, fitting the socketed components and wiring up the speaker.

Installing the rest of the key switches

Start from the front most row when fitting up the remaining key switches. This enables you to look down through the keyboard frame from the rear so that you can see the pins of the key switch and line them up with the holes in the pads on the PCB. Note that the front most row only has 5 keys and has 2 spare switch positions closest to the space bar. As you solder the key switches in, remember to apply just enough heat to melt the solder and form a decent joint on the PCB. Applying prolonged heat to the key switch pin will melt the solder on the switch adapter and if excessive heat is applied, the pin may lodge itself in the underside of the key switch.

Fitting the key tops

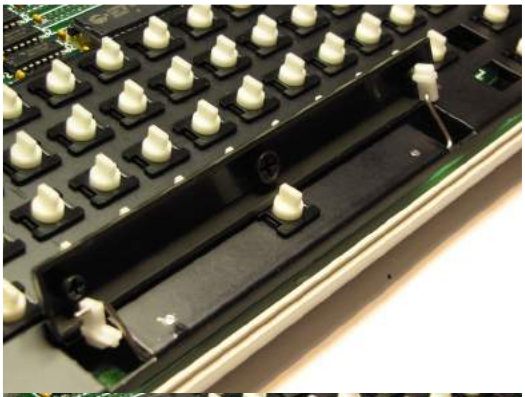
Fitting the space bar requires several steps :

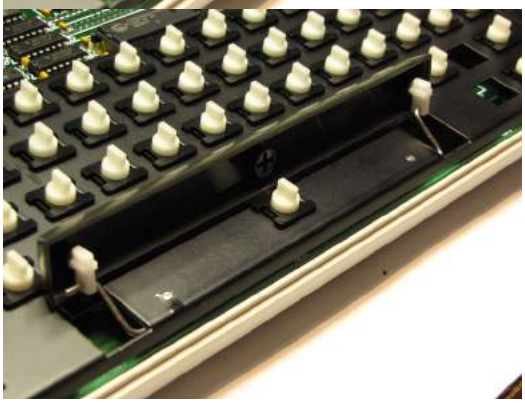
Two white space bar support mounts have been included in the keyboard kit. These fit to the bottom of the space bar & have slots in them to take the ends of the torsion bar.

This arrangement helps to keep the space bar level when pressed somewhere off-centre.

Fit one of these to one side of the space bar as shown in the top picture to the right.
Slide that end of space bar with the support onto the torsion bar, add a support to the other end of the torsion bar & then fit the support into the bottom of the space bar.

Now that the space bar & mounts are fitted to the torsion bar, the space bar can be pushed down onto the key switch and fitting the space bar is done.





Fitting the rest of the key tops is straight forward. Note that the arrow keys can be interchanged with each other unlike the original key top set in which the up arrow, down, left & right arrows were all specific to a particular position.
The original keys had a 'high side' and 'low side' (i.e. they were an angled / sculpted design) whereas the new key tops are uniform in shape.
When finished, the keyboard should look like the picture below.

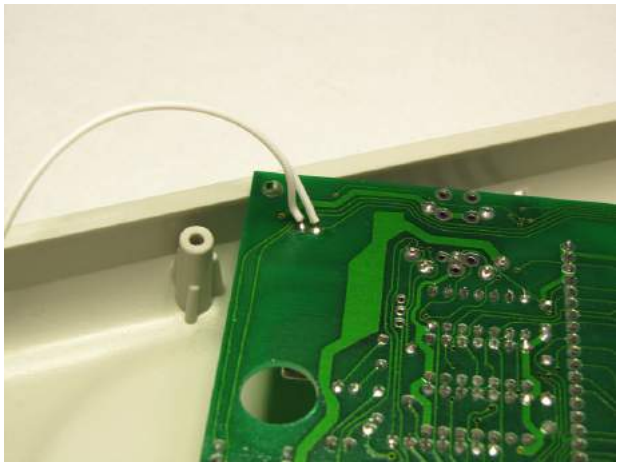
Socketed ICs

All of the remaining ICs can now be put into their sockets. Pay attention to the orientation, checking where Pin 1 should be located for each as you plug them in.
The ICs that are socketed are as follows:
IC1 – 6545, IC9 – Z80APIO, IC33 – Z80ACPU, IC50 – Font ROM (2532),
IC19,20 & 21 – CY7C128A, IC53/4 - CY62256 SRAM, IC61 – 74HC139 and
IC62 - the GOLD PAL
Once done, the baseboard should look like the one in the following photo.

Speaker wiring

The speaker should already be in place in the bottom of the case held in with its metal clamps & screws. Wiring is straight forward with the 2 core bell wire supplied. Strip both ends of the wires, tin them with the soldering iron and attach to the speaker and baseboard as shown in the photos below. The volume control for the speaker should be set at the mid way point of its travel now.

Tinned Bell wire attached to the speaker



Speaker cable connected to the under-side of the PCB near the 5 pin DIN socket.

9. Final checks & first power up.

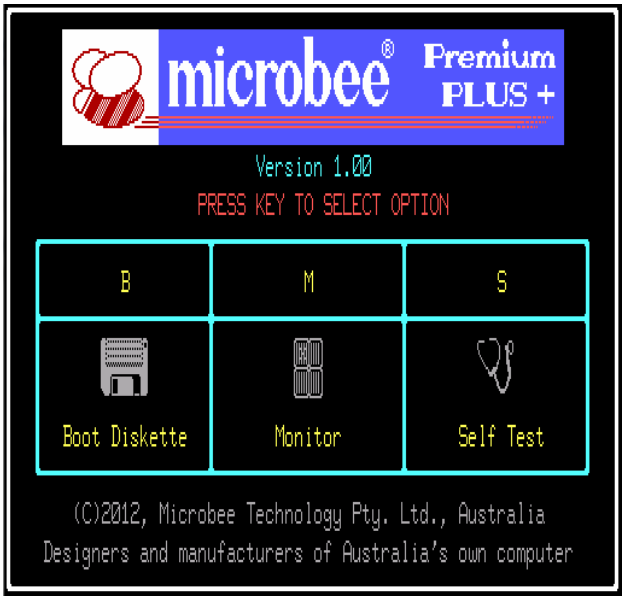
Now that all the components are soldered into the baseboard, it is time for final visual inspections, checking for shorts and un-soldered pins, component orientation mistakes, polarised capacitors & diodes the wrong way around and so on.

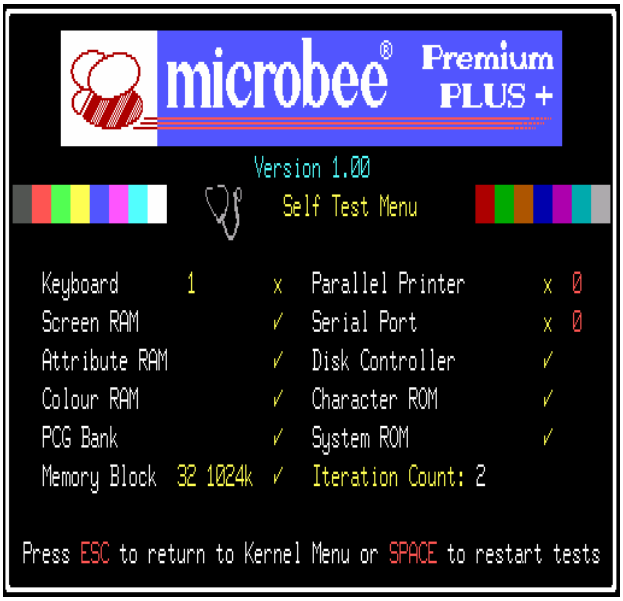
The check that was carried out earlier with the multimeter can be done again in checking for a short across the input power rail at C71, not that much should have changed in that area since the previous check. It is however a simple test & easy to carry out, so best to do it anyway. The voltage checks can also be done, without the coreboard installed, to ensure that the two 5 volt power rails still provide the required voltage.
Without the coreboard plugged in, the system will not do anything, so don't expect to hear a beep or get video on the display – we just want to measure the power rails again.
Once done, remove power from the baseboard.

If all looks good, the coreboard can be plugged into the baseboard. Make sure that the 25 way pins strips fit snugly into the baseboard sockets and pin1 goes to pin 1 (that it hasn't 'missed by 1'). Also make sure that the 2 pins hanging down from the coreboard near the SDcard socket are properly inserted to the 2 way socket on the baseboard. If these 2 pins do not meet with the socket properly, the Coldfire processor on the coreboard will not be able to get the machine up & running properly and will have no way of gaining control of the baseboard signal busses. Leave the SDcard out of the socket for now – it is not needed until the after we see video output & run the in built self test diagnostics.

The 5 pin din lead that plugs into the Microbee has 4 plugs on the other end, or 3 & a plug pack power supply. One of the other connectors on the cable is an RCA connector. This connector provides monochrome video output and can be plugged into a suitable monitor or a television that has an 'AV' input. Connect this to the monitor / TV now and have it switched on and ready to display the boot screen of the Premium Plus.

Apply power now (from the Plug Pak or other suitable 10 – 14 Vdc 1.5amp power supply) and if all is well, the RED L.E.D. on the coreboard should flash once & you should see the boot menu on your monitor.





On the left (above) is the boot menu that appears when there is no SDcard in the socket at boot time (and no disk in the disk drive if you have the physical floppy disk interface option installed on the coreboard). The boot menu gives you 3 options – Boot disk, [machine language] Monitor , and Self Test.

Press the 'S' key to activate the self test mode. It should look like the screen shot on the right (don't forget that you will only have monochrome video, so no color). The keyboard test is the first item to run and for now just press ESC twice to bypass it. All items should pass with the exception of the serial and parallel port tests which need specially wired loopback plugs. The PCG Bank test should test all 15 banks of memory, and the Memory Block test should test all 1024k of memory available to the 'Z80 mode' side of the Microbee. If all is well and all the tests run through as they should, reset the machine by holding down RESET for 1 second & enter Self test again. This time, run through the keyboard test. The test asks you to press each key in turn starting with ESC,1,2,3… and works down the keyboard in rows TAB,Q,W,E,R…, CTRL, LOCK, A,S and so on.

Once you are happy that all the self test diagnostics have passed, try re-booting the machine with the SDcard in the slot.

To insert the SDcard, the card has to be upside-down. That is, the contacts on the card should be facing upwards & the label on the card facing down. The SDcard connector is a PUSH-PUSH type – that is, when the card is inserted, you push it all the way in & it locks into place. When you want to remove the card again, you push the card inwards again to

unlock it & it springs out. You can insert the card while the self test is still running and then hold down the reset key for 1 second (you should see the current test running freeze after a second) and then release the reset key. The Premium Plus should then reset itself, the RED L.E.D. should flash a number of times & after a few seconds the Microbee SHELL should appear with the list of files on the 'disk'. If you get this far, *CONGRATULATIONS,* you have successfully built your very own Microbee Premium Plus!

The last thing to do of course is to put the casing together.
The baseboard is held into the bottom of the case with a screw & flat washer at either side of the keyboard frame. The kit was shipped with these screws in place, holding the keyboard frame. Lastly comes the fitting of the top case. The LEDs on the coreboard show through the metal badge on the top of the rear top case. These may need aligning with the slots in the badge and this can be done by bending the leads a little so that the natural position lines up under the centre of each slot in the badge. Once this is done, the case can be screwed together. There are six 3mm x 16mm screws that fit in the underside of the case and screw into the top case sections.

Now your new Microbee Premium Plus is complete.

Enjoy!

10. Bill of materials / Parts list

Microbee Premium Plus Baseboard (8501-04) Bill of Materials

IC's			
Manufacturers Part#	Description	Component Ref ID's	Qty
Z80PIO	Z80 Parallel input/output chip - DIP40	IC9	1
74ALS574	Octal Latch DIP20	IC32, 36, 37, 38, 39	5
74LS541	Unidirectional Buffer 8 bit DIP20	IC40, 34, 41, 28	4
74LS00	Quad 2 input NAND gate DIP 14	IC47	1
74LS04	Hex inverting buffer DIP 14	IC55, 74, 67, 6	4
74HCT08	Quad 2 input AND gate HC DIP14	IC63	1
74LS32	Quad 2 input OR gate DIP14	IC72, 48, 58, 78, 24, 4	6
Z80CPU	Z80 Central processor Unit	IC33	1
74LS11	Triple 3 input AND gate DIP14	IC56	1
74LS161	BCD Decade counter DIP16	IC64	1
74LS74	Dual D flip-flop DIP14	IC73, 25, 49, 57	4
74LS10	Triple 3 input NAND gate	IC65	1
74LS139	Dual 1of4 decoder DIP16	IC61	1
74LS645/245	Octal Buffer bi-directional DIP20	IC17, 26, 29, 30, 31	5
74HC32	Quad 2 input OR gate HC DIP14	IC66	1
7407/17	Hex buffer O/C DIP14	IC75	1
74LS273	Octal transparent Latch DIP20	IC27	1
74LS157	Quad 2-1 Mux DIP16	IC35, 43, 44, 45, 46, 11, 12, 13	8
74LS166	8 bit shift reg Parallel in Ser out DIP 16	IC42	1
FONTROM / 2532	Microbee Dual Font ROM	IC50	1
74LS174	Hex D Latch DIP16	IC59	1
74LS86	Quad 2 input XOR gate	IC69	1
74LS08	Quad 2 input AND gate DIP14	IC76, 68, 5	3
74LS573	Octal Latch DIP20	IC18	1
CY62256	32K x 8bit Static Ram	IC51	1
CY7C128	2K x 8bit Static Ram	IC19, 20, 21	3
GOLD_PAL	Microbee Premium PAL	IC62	1
74LS138	1of8 decoder DIP16	IC71	1
74LS175	Hex Latch DIP16	IC77	1
74LS156	3to8 encoder DIP16	IC7	1
74HC151	1of8 mux DIP16	IC3	1
CA3140	Op amp	IC80	1
SY6545-1	CRT controller DIP 40	IC1	1
7805	5 v regulator TO-220	IC8, 79	2

Misc Semiconductors			
Manufacturers Part#	Description	Component Ref ID's	Qty
1N914/4148	1N914/4148 Small Signal Diode	D23, 24, 3, 4, 5, 6, 16, 18, 20, 21,22	11
BC548	BC548 Small Signal NPN transistor	Q1, IC23	2

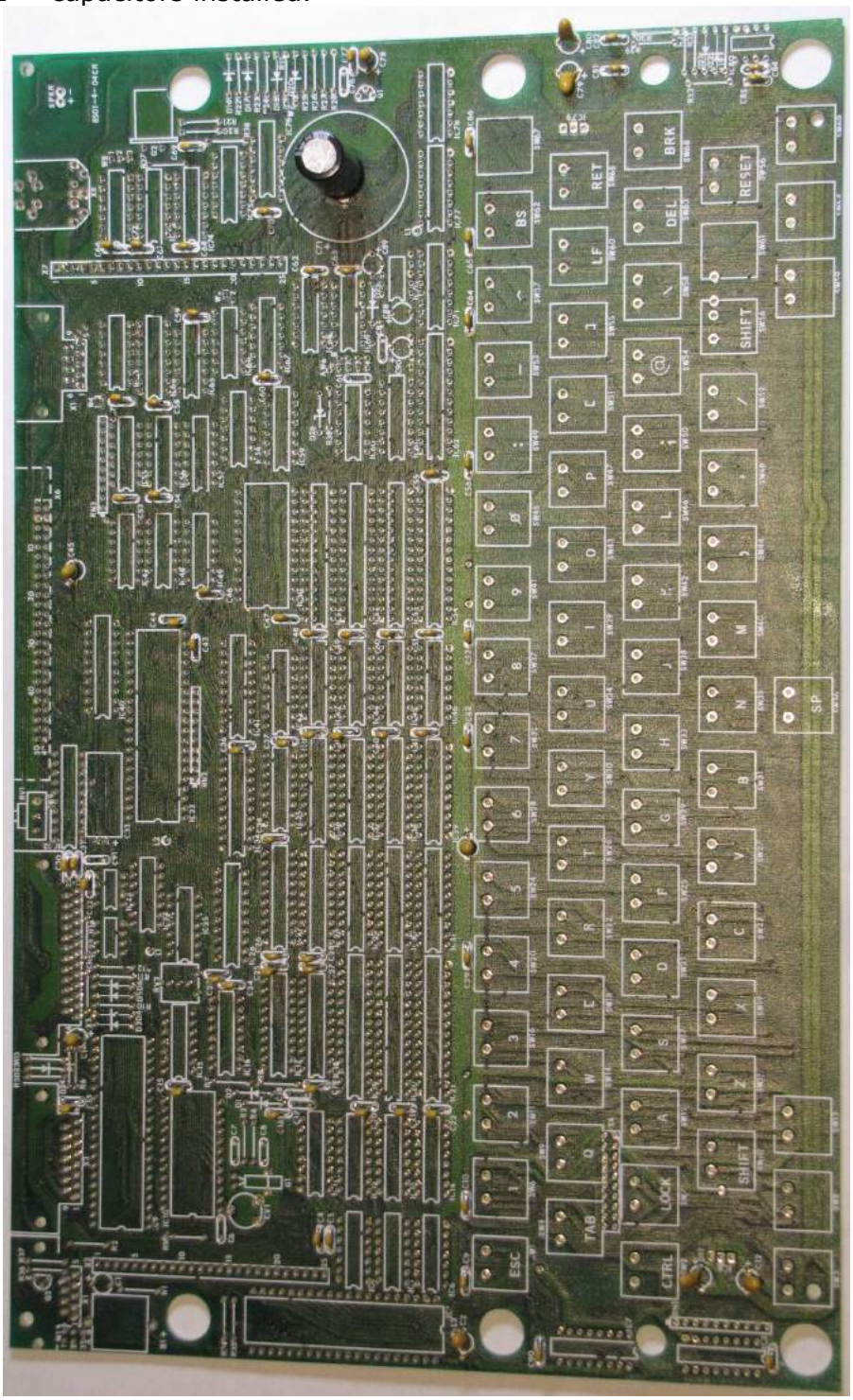
Passive Components			
Manufacturers Part#	Description	Component Ref ID's	Qty
100NBYPASS	100nF Bypass cap - through hole		61
2U2-25V-TANT	2.2uF or 4.7uF 25v or greater rating	C12,80	2
4U7-16V-TANT	4u7 16v Tant cap	C2,11,14,35,45,78,79	7
470uF 25v Electro	470uF 25v Electro	C71	1
47PF-50V-CER	47pF 50v Ceramic Capacitor	C84	1
10NBYPASS	10nF 50v Ceramic Capacitor	C81	1
RSIP4K7X9	Resistor SIP 4K7 x 9 10 pin	RN2,RN3	2
RSIP10K0X9	Resistor SIP 10K x 9 10 pin	RN1	1
330R 1/4W	330R 1/4W resistor, TH	R15,22,27,28	4
270R 1/4W	270R 1/4W resistor, TH	R24	1
82R 1/4W	82R 1/4W resistor, TH	R26,33	2
1K 1/4W	1K0 1/4W resistor, TH	C18, R20,21,25,31,35,38	7
470R 1/4W	470R 1/4W resistor, TH	R37	1
1K5 1/4W	1K5 1/4W resistor, TH	R10,12,30,36	4
18K 1/4W	18K 1/4W resistor, TH	R13	1
10K 1/4W	10K 1/4W resistor, TH	R11,29,32	3
680R 1/4W	680R 1/4W resistor, TH	R19	1
4K7 1/4W	4K7 1/W resistor, TH	R6,9,34	3
13M5XTAL	13.5Mhz crystal HC49	G2	1
Connectors			
Manufacturers Part#	Description	Component Ref ID's	Qty
DN09FR1A0N	DB9 female R/A conn	X1	1
DN15FR1A0N	DB15 female R/A conn	X3	1
DN25FR1A0N	DB25 female R/A conn	X5	1
	5 pin R/A PCB MNT Female DIN	X8	1
	25 way pin strip socket Vert MNT	X2, 7	2
	2 way pin strip socket Vert MNT	X6 (pins 13 & 14)	1

Hardware / Misc			
Manufacturers Part#	Description	Component Ref ID's	Qty
	8501-04 Premium Baseboard PCB		1
	IC Socket 40 PIN DIP	IC9, 33, 1	3
	IC Socket 24 PIN 300mil (Skinny) DIP	IC19, 20, 21, 62	4
	IC Socket 24 PIN 600mil DIP	IC50	1
	Keyswitch Pushbutton		64
	PremPlus keyboard Frame		1
	PremPlus Keycap set		1
	M3x6 bolts		2
	M3 nut		2
	Spring washers - M3		2
	TO-220 heatsink thermal washer		2
	M3 x 16mm bolt		6
	S/tap screw - Speaker mount		2
	Speaker clamp		2
	rubber feet		4
	microbee premium case badge		1
	50ohm 50mm Speaker		1
	Microbee premium case set		1
	Premium Plus coreboard (assembled)		1

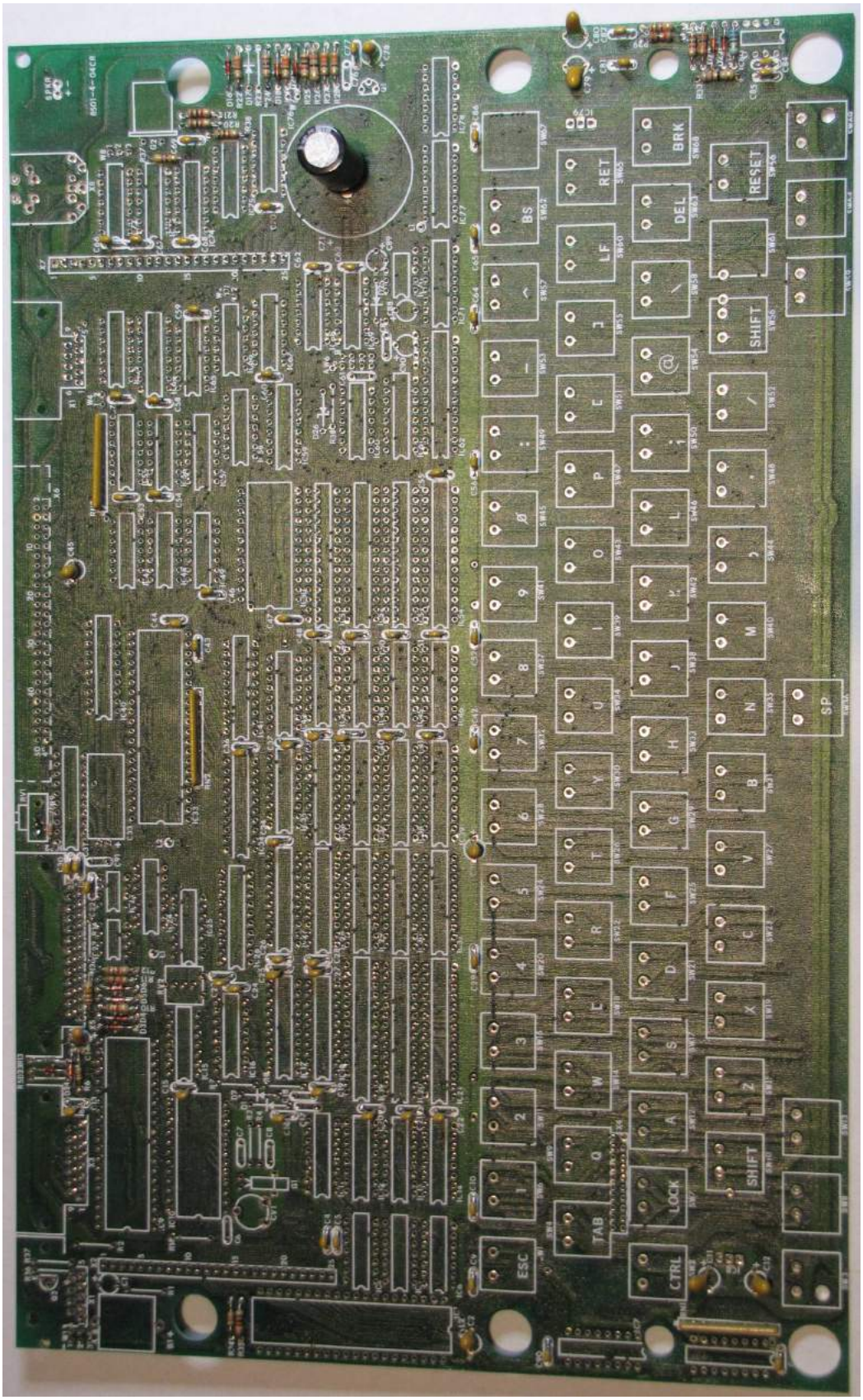
11. 'Check photos'

This section contains photos of the Premium baseboard at various stages of assembly. They have been included here as a reference for you that can be referred to and compared to where you are at in your assembly of the kit.

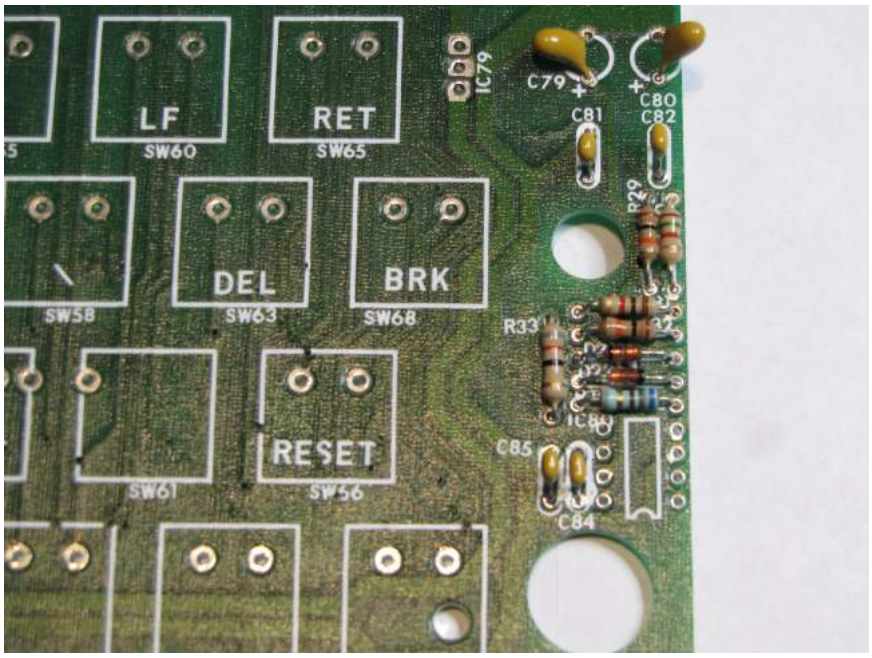
Check Photo '1' – capacitors installed.

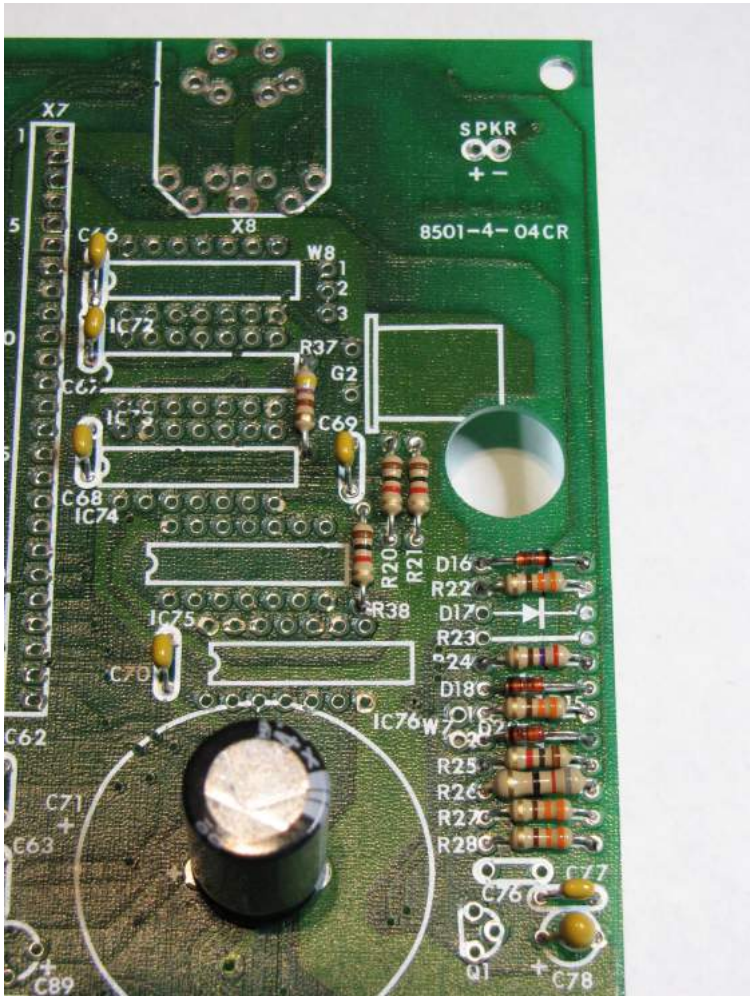


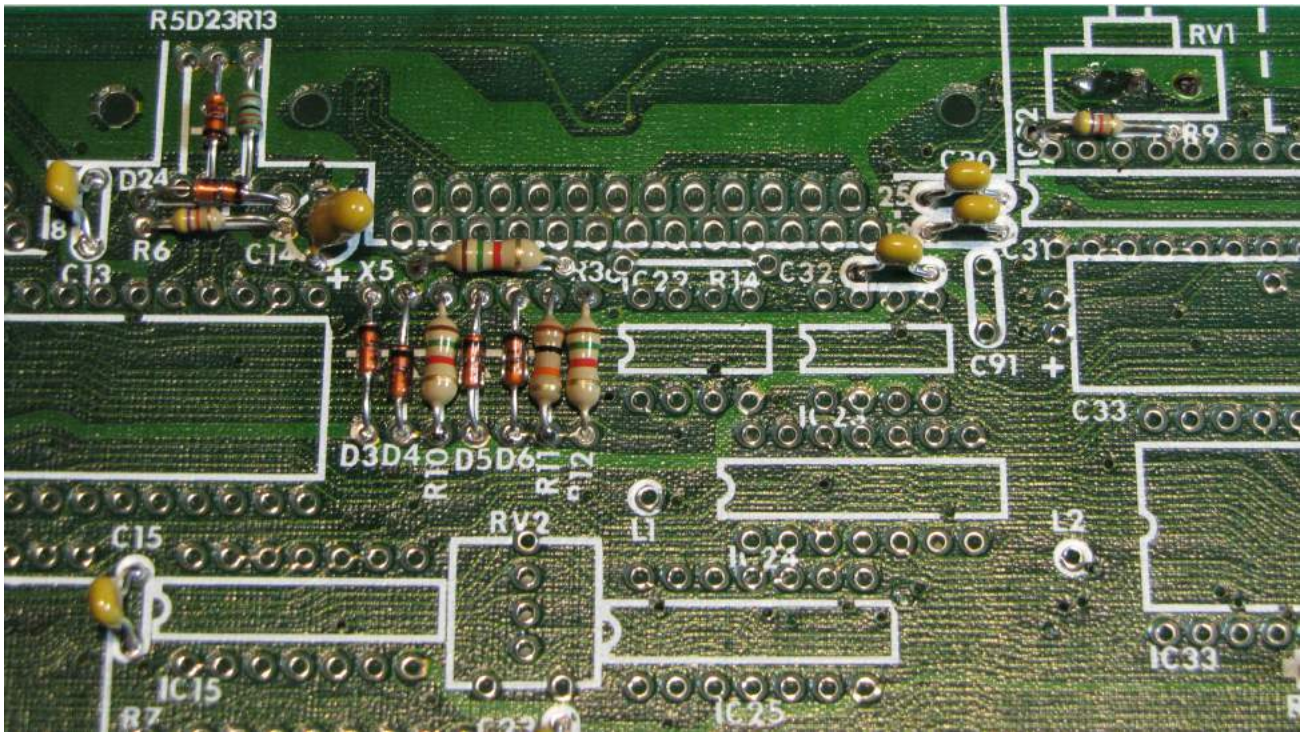
Check Photo '2' – resistors installed.



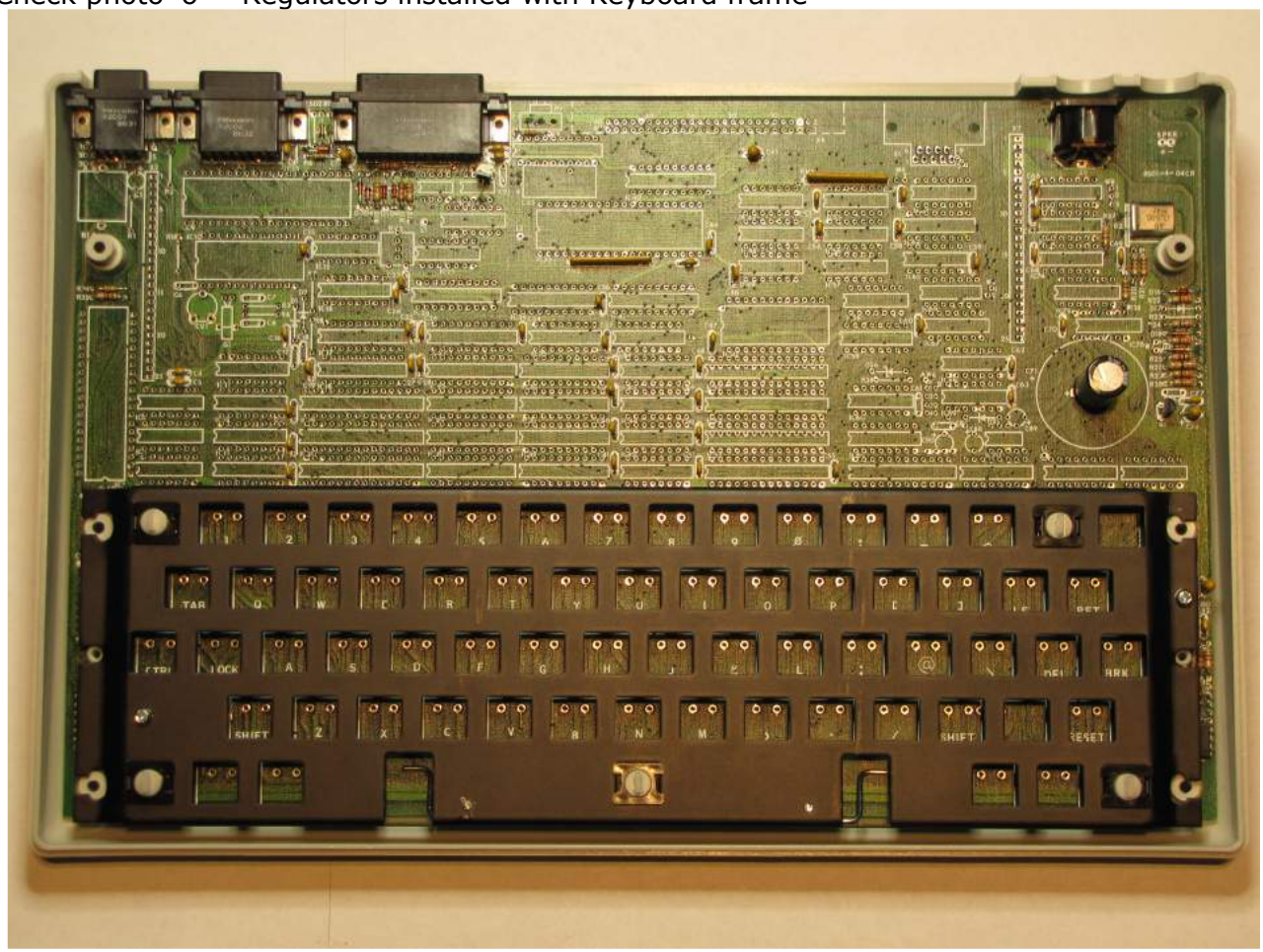
Check photo ‘3, 4 & 5’ – Close up of passive components



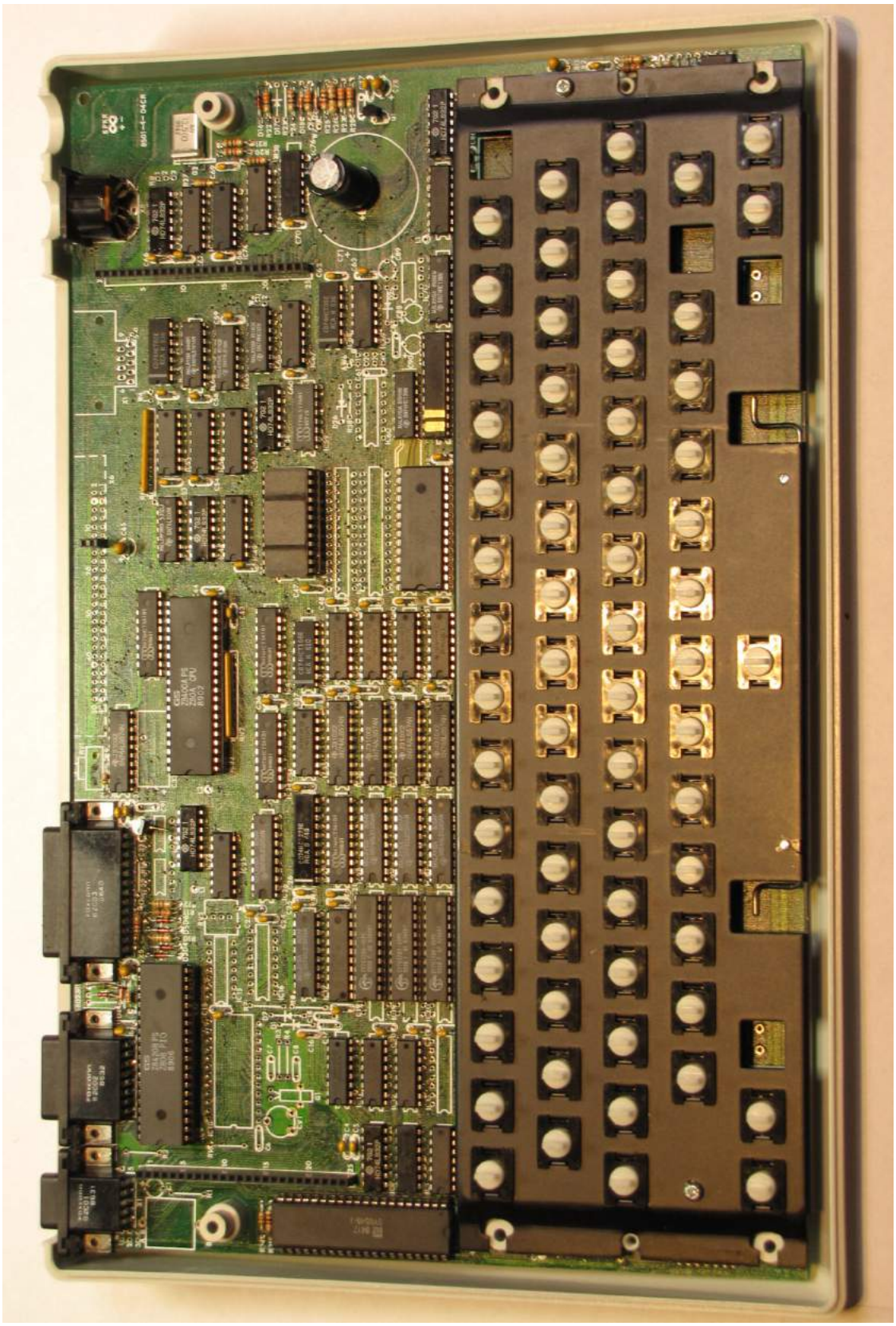




Check photo '6' – Regulators installed with Keyboard frame



Check Photo ‘7’ – baseboard complete – no key tops installed.

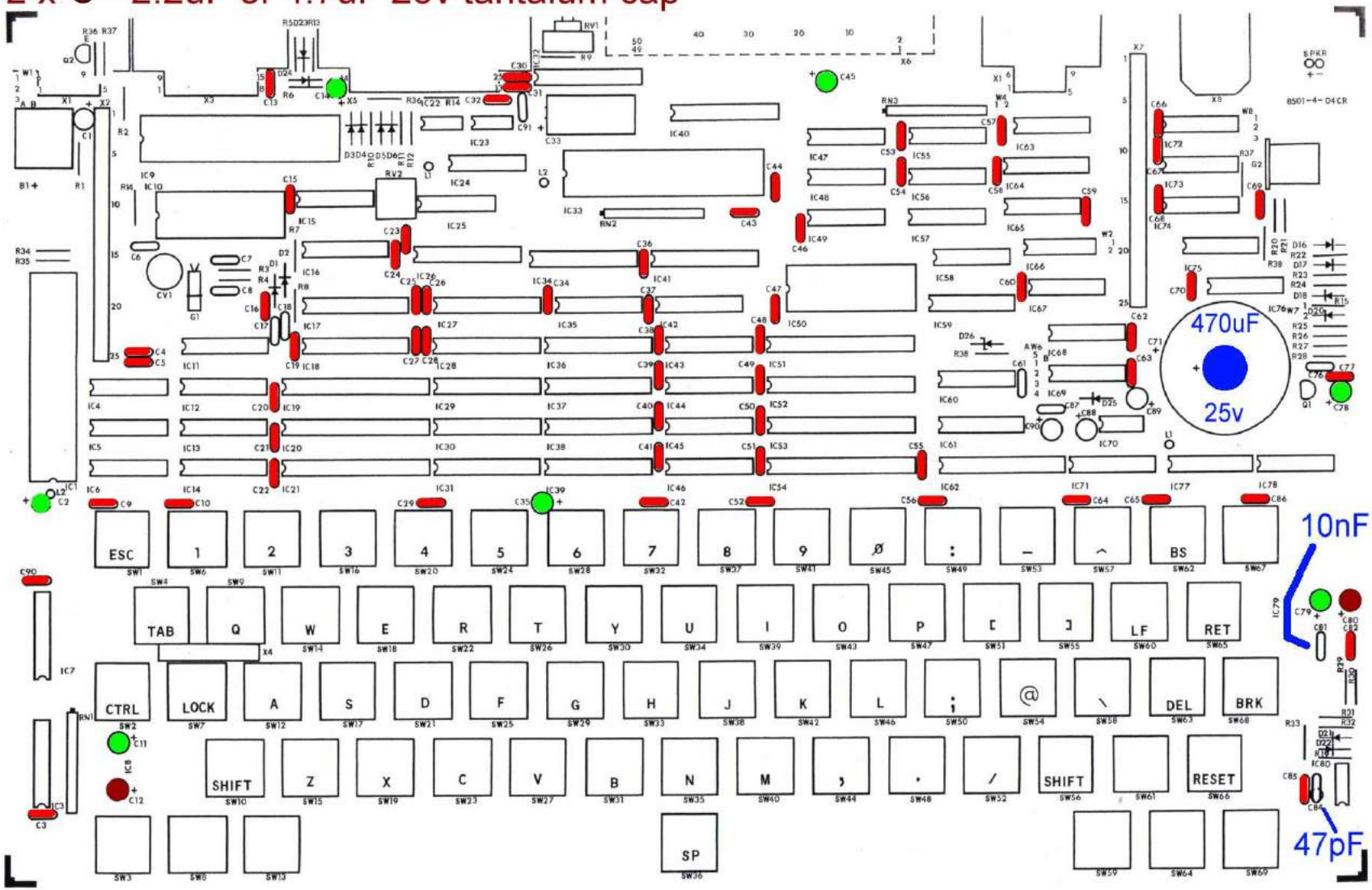


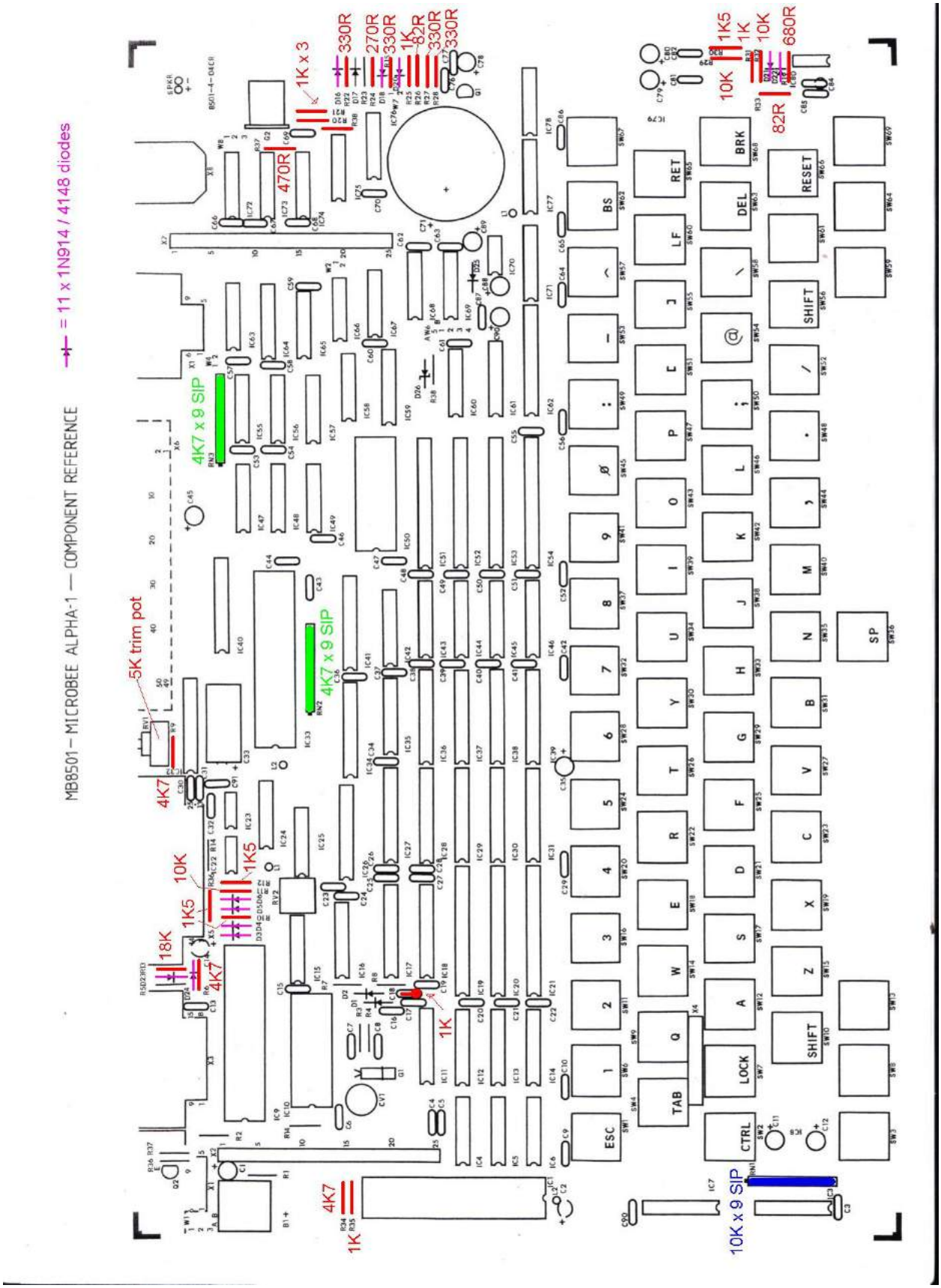
61 x = 100 nf bypass cap

7 x = 4.7uF tantalum cap

2 x = 2.2uF or 4.7uF 25v tantalum cap

MB8501 – MICROBEE ALPHA-1 — COMPONENT REFERENCE




MB8501 – MICROBEE ALPHA-1 — COMPONENT REFERENCE
= 11 x 1N914 / 4148 diodes
5K trim pot
4K7 x 9 SIP
4K7 x 9 SIP
10K x 9 SIP
1K x 3
330R
270R
330R
1K
82R
330R
470R
10K
1K5
1K
10K
82R
680R
18K
1K5
10K
1K5
4K7
4K7
1K
4K7
1K
ESC
TAB
LOCK
CTRL
SHIFT
SHIFT
BS
RET
LF
DEL
BRK
RESET
SP