A guide to repairing Microbee key switches

7th August 2009

This guide applies to all Microbee keyboards with the exception of the 256TC, 640TC (Matilda), the Gamma and the Teleterm.

Introduction :
Microbee computer keyboards are made up of individual switches for each of the keys on the keyboard. 60 switches for the Standard series and 64 switches for the Premium series. There is 2 types of key switch used in production over time. The earlier units had switches that had a black shaft plunger. Most Microbee computers however had key switches with a white shaft plunger and these are the ones that are covered in this repair guide as the earlier (black shaft) ones are more rare and were more reliable. The Premium series Microbees had more key switch failures as well.

Preliminary info :
If you have a Premium Series Microbee that is having problems with its keys failing, it is worth checking a couple of components in the keyboard scanning circuit on the baseboard first. In early production of the Premium units, a 74LS151 was installed for IC3 and a 3.3K resistor network SIP was installed for RN1. These components should be changed so that IC3 is a 74HC151 and RN1 should be a 10K resistor SIP. The change in the resistor SIP value allows for a weaker strength pull up so that key switches with higher 'on' resistance could more effectively pull down the line and signal a key press. The change to a 74HC version of IC3 provided a better noise margin as well.

Warning :
It is suggested that unless you have very good soldering skills and a decent solder sucker, not to attempt to repair the key switches yourself. The Premium series in particular is difficult to repair as it is very easy for the pads on the PCB (that the key switches are soldered to) to lift or tracks to be broken that connect to the switch pads.

Getting started :

Remove the 6 case screws in the bottom of the case, remove the Core Board and remove the 2 screws holding the keyboard frame into the bottom case. There should also be screws in the serial port or parallel port or both connectors that anchor the back of the baseboard to the bottom case – these should also be removed. The baseboard should now be free from the bottom of the case.

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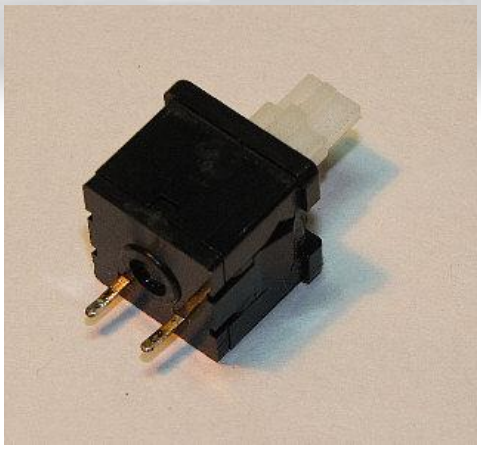
It is suggested that if you have not done this before, just to choose 1 key switch to repair so as to get a good idea of how it all goes together.
Remove the key top of the one you have chosen and then flip the baseboard over (being careful with the speaker lead that is still attached to the baseboard and speaker in the bottom of the case).

Using a good soldering iron, apply a little extra solder to each joint of the 2 pins of the key switch to be removed. A resin cored solder with a flux that has very good wetting properties is what is required and helps 'freshen up' the solder joints and makes it easier to remove the solder with the solder sucker. Now remove the solder with the solder sucker. If you find that there is still some solder visible that is connecting the pin to the PCB pad, have a couple of goes at it, adding a little bit of extra solder if needed – this helps draw the remaining solder from the joint. Don't over heat the joint as you risk the PCB pad lifting.
When you are happy that the 2 pins look unsoldered from the PCB, use a pair of bull nose pliers to grip the 2 pins at the same time, just off the PCB so that the pliers only contact the key switch pins, but are still gripping them well. Give the pins a gentle wiggle (twisting the pliers clockwise & then anti-clockwise a couple of times). This helps to break any minor solder fillets that are still connecting the switch to the plated through hole of the PCB pad. If the pins of the key switch wiggle freely, you are ready to remove the switch from the baseboard. A gentle tap with the nose of the pliers (across both pins at once) or the back of a screwdriver should be enough to push the switch out of the keyboard frame on the top side of the baseboard.

Once you have the key switch removed, it should look like the one opposite.



The switches are easily disassembled but care should be taken not to lose any of the parts. There are no replacement parts available, so if you lose or damage any of the parts of the switch, you will have a keyboard missing functional keys permanently.

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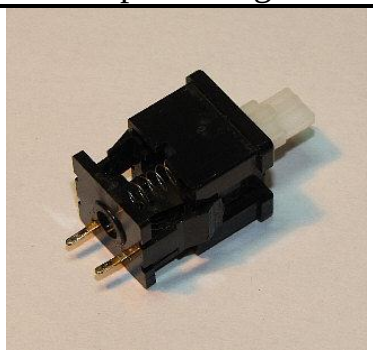
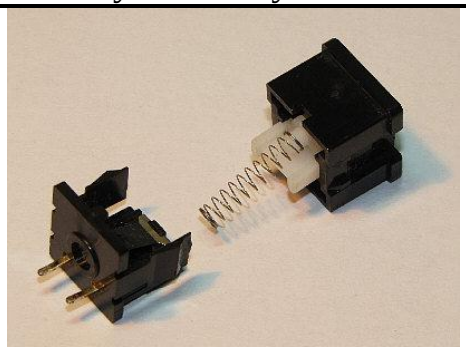
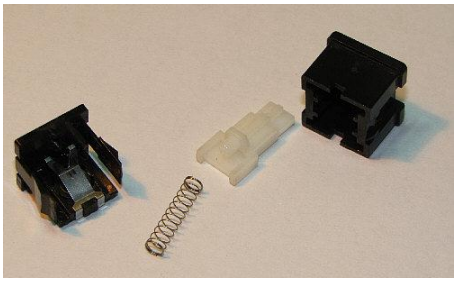
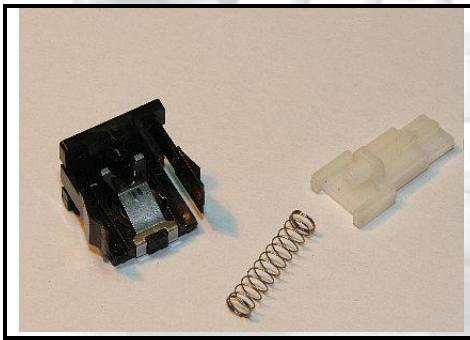
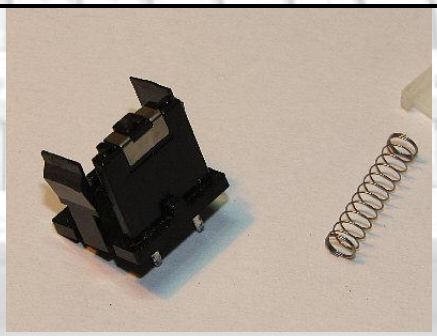
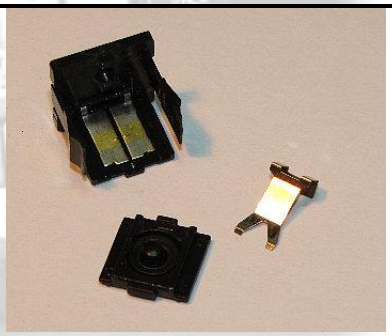
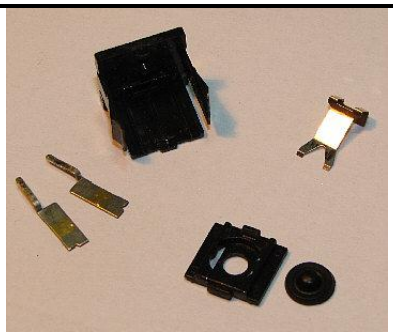
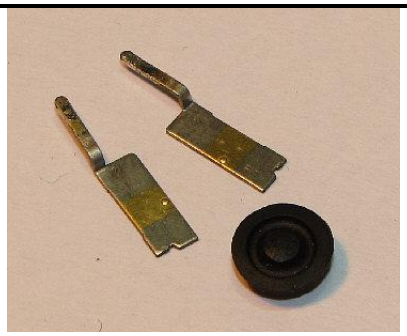
Here is a pictorial guide to disassembly of the key switch :

		
Clips either side of the switch hold the key into the key frame. Pull these out, away from the body to release the bottom from the top half of the switch.	The top & bottom half of the switch are now separated revealing the plunger spring that normally sits on the plunger's round nodule & a similar node on the inside of the black key switch base.	This view shows the metal tab that the plunger presses against when the key is pressed. The metal tab is forced to press closer to the back wall of the key switch against a carbon impregnated rubber bumper that 'closes' the switch.
		
A better view of the insides of the switch is seen here.	Lift the metal tab from the back of the switch to release the rubber bumper housing and gain access to the switch contacts.	With the metal tab removed, the rubber bumper housing comes out easily & the metal switch contacts are exposed.
	Note that the rubber bumper housing has a tab at top & bottom. The wider of the 2 is the bottom end of the housing. That is the end that goes into the base of the key switch. The metal contacts can be removed from the base now.	
Fully disassembled switch.		Back side of rubber bumper.

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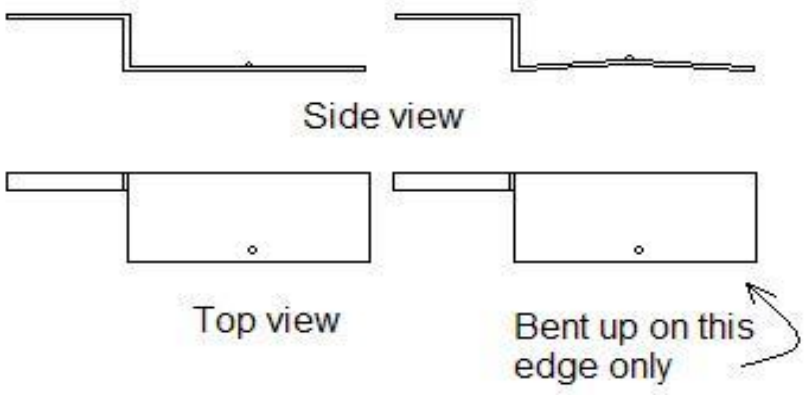
The metal contact & the rubber bumper are the items that normally need attending to.
To start, have a clean sheet of copy paper available, grab the top side nipple of the rubber bumper (the one that the metal tab presses against when the plunger is depressed) and press the rubber bumper down on the sheet of paper so that the inner section of the back side of the bumper has pressure on it against the paper. Drag the rubber bumper across the page, effectively using the paper as a mild abrasive. You should leave a black smudge on the paper as you do this. This cleans the surface of the bumper that 'closes' the switch across the metal contacts. Be careful so as not to apply too much pressure to the rubber bumper so that it tears the rubber in any way. If the bumper is damaged or perished, then the switch will be no good.

Next, the metal contacts should be cleaned. There is a gold colored section in the middle of each contact. This is the area where the rubber bumper makes contact and closes the circuit across the gap in the contacts. I have found that the best way to clean these is by using the flat, back edge of a hobby knife – the kind that sections of the blade can be snapped off one at a time. Rather than using the cutting edge, the back edge usually offers a very flat, keen edge that can be used to lightly scrape the metal contact's surface. Work the back edge of the blade across the surface of the metal contact and around the small nipple that has been formed in the contact. Go over the nipple a couple of times as well. A very small amount of fine metal dust will come off the contact if this is working correctly. When done & the contact is now shiny, wipe the contact with a cloth so as to removed any loose metal dust that remains – this is not overly critical, but still good to do.

The last step is to put a slight bend in the metal contact so that the gap from the rubber bumper to the metal contacts is reduced & effectively more pressure is exerted across the switch contacts by the rubber bumper, hopefully reducing the 'on resistance' of the switch.

Normal shaped Metal contact Metal contact with bend.



As shown in the picture, only bend the side of the contact that has the nipple in it. The left side

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contact (when viewed from the front, bottom of the normally assembled key switch) has been shown here. The right hand one is the mirror of what is shown – only bend the side of the contact that normally sits in the middle of the key switch under the rubber bumper.

Now it is time to reassemble the key switch and this is simply a matter of doing putting it all back in the reverse order to taking it apart. The metal tab will need a little squeeze on the section that fits over the back of the bottom shell to tighten it up. Don't forget that the rubber bumper housing has 2 different sized tabs on it – the bigger of the 2 is the one that goes into the base of the key switch housing & the smaller one is the one that the metal tab clips around.

Once the key switch is back together again, it can be tested with a multimeter before re-installing in the keyboard. Use the multimeter on it's low resistance range. When pressed, a good switch should show no more than around say 40 ohms. What I have seen is that the switch resistance will be low for a very short amount of time when first pressed and then settle to a higher value. If you find that the switch cannot achieve an 'on resistance' of less than around 60 ohms, and you have attempted to clean everything again, it is possible that the rubber bumper has gone brittle or perished and the switch will not be any good. Having said this however, I have seen switches that still work reasonably with an 'on resistance' of more than 80 ohms. After you are happy with the result measured with the multimeter, you can install the switch back into the keyboard & solder it in. If on booting the Microbee the key does not work, there may, of course, be another problem in the keyboard circuit. A good idea would be to measure the key switch with the multimeter while it is still in circuit & see if a key press gives a low 'on resistance' – if it does, then you may have a damaged track or some other fault.

The method described here has been used fairly successfully but it will not fix all faulty switches. Some are too old, or perished and cannot be returned to functionality. Some keys will also return to unreliable status for the same reasons even though thoroughly cleaned and re-worked – they are, after all, almost 20 years old.

Good luck with repairing your Microbee.

Best regards,

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