

Osborne I “Luggable” Computer

Here is another industry first that I’ve been lugging around for decades and finally decided to see if I could get it working again. This was the very first “laptop” computer and I still remember how exciting it was to be able to carry your computer around with you – no need to go to the gym after this!

Turning on the old Osborne computer presented a screen prompting the user to press ‘return’ to boot from the floppy drive.



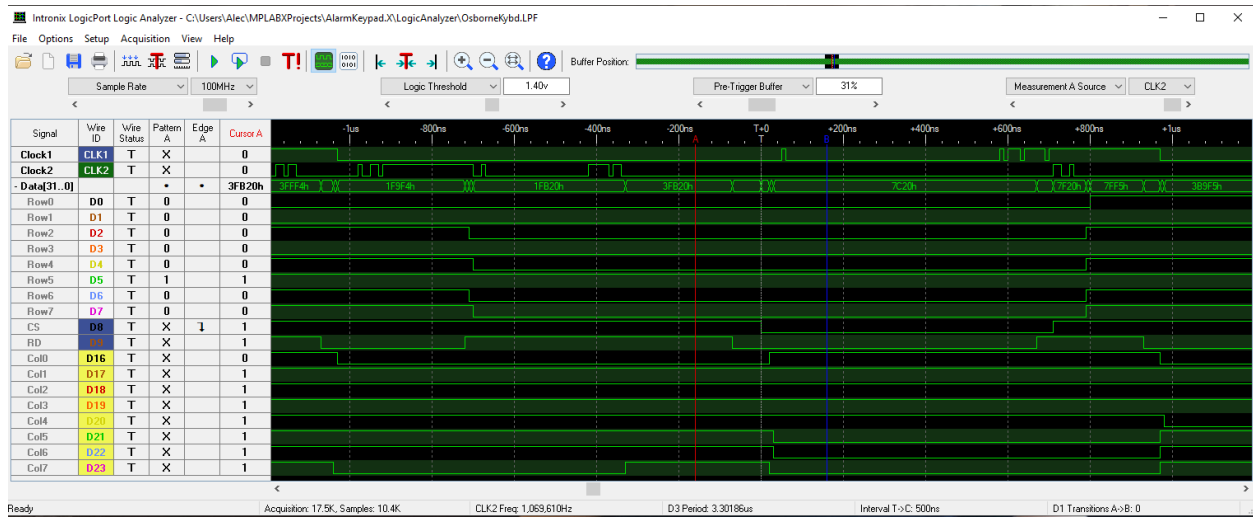
However, pressing the ‘return’ key did absolutely nothing.

After stripping the computer down and hooking up a logic analyzer to the keyboard logic, I was able to ascertain that the row/column scan process was operating – indicating that the CPU was basically working and that the keyboard logic was more or less functional.



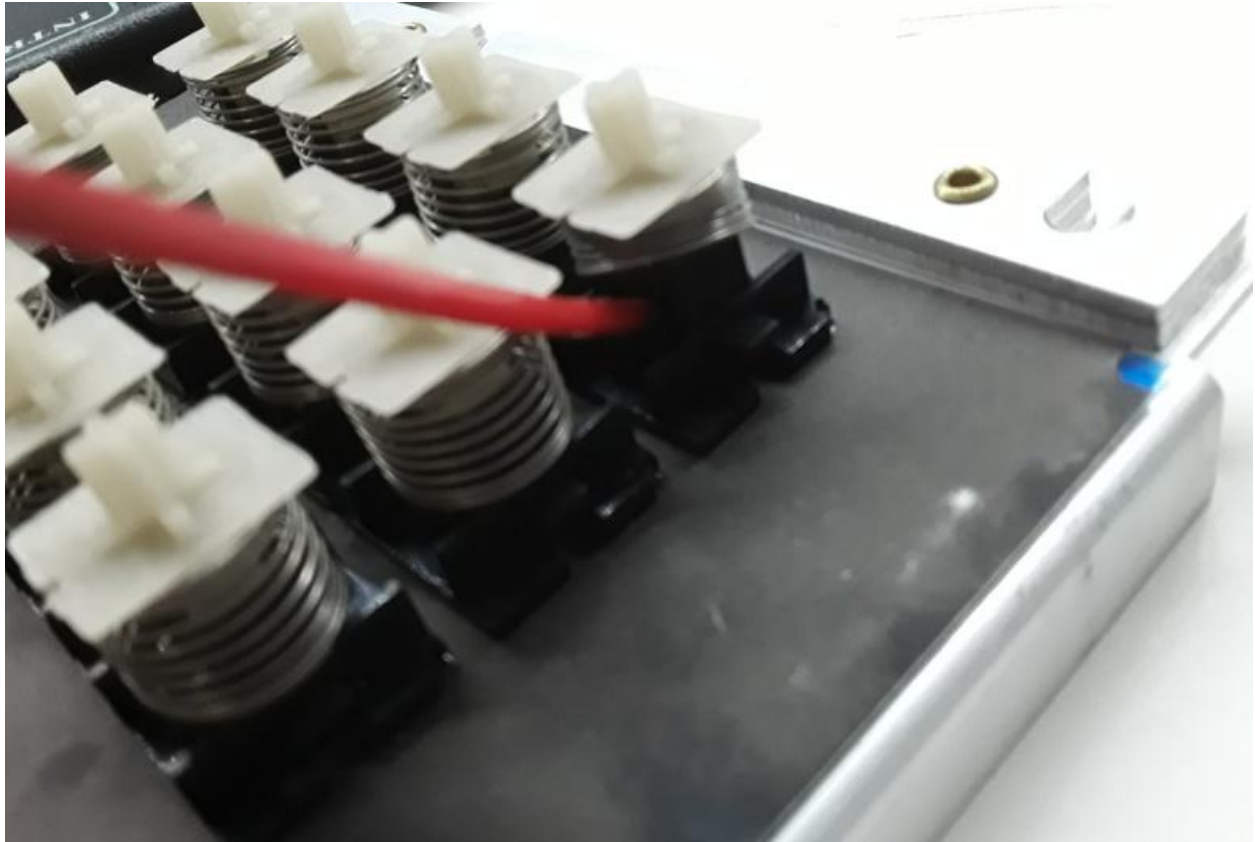
Analysis of the logic analyzer output showed that there was some sort of short in the keyboard matrix.

Scanning row 5 and pressing the 'P' key results in columns 5, 6, and 7 going active (when only column 5 should have been active.) Clearly there is a short in the keyboard. Columns 0 thru 4 appear to be working properly.



I checked the easy case of a short in the cables, but was not that lucky.

I then disassembled the keyboard to see if I could take the keys apart and possibly find some dirt stuck in one of the keys.



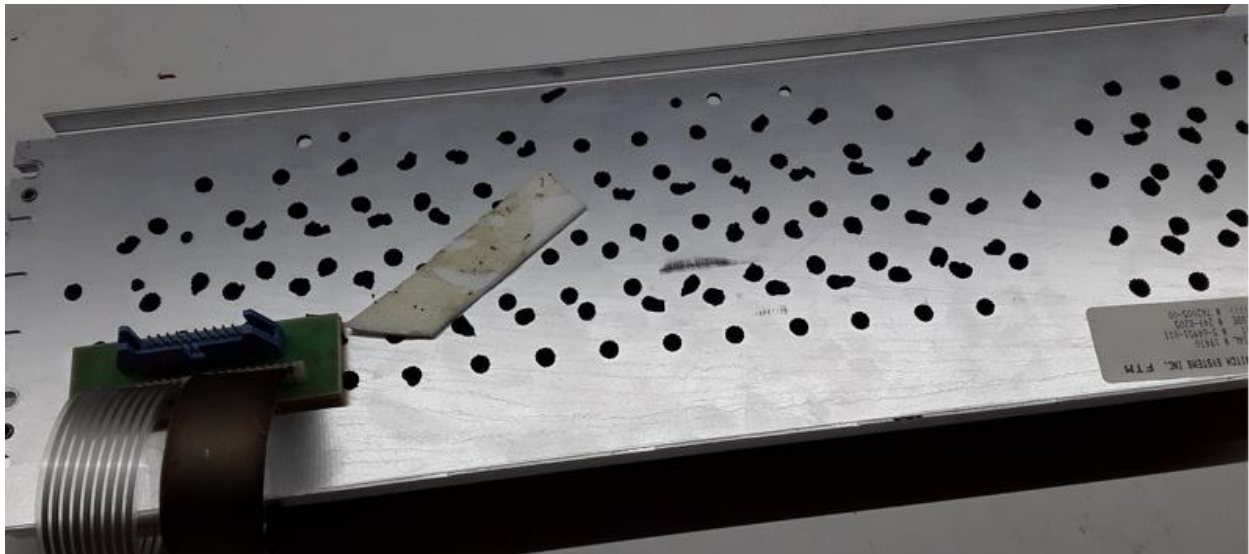
At first I couldn't figure out how to take the keys apart without breaking them. After reviewing some other comments on the internet it became clear that you just had to 'yank' the white plastic tops off. This worked fine and I was able to see 'inside' the switch, however I was not able to find any visible cause for the shorts.

By hooking an ohm meter across the row/column lines that appeared to be shorted (i.e. it was reading about 17 ohms where the working lines were open circuits) and pressing the keys on these rows I was able to notice that only two keys affected the ohm reading when they were pressed – and these only slightly. This was the '5' and '6' keys.

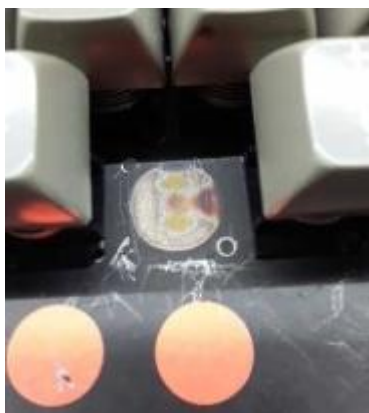


The difficulty in repairing this problem lay in the fact that the keyboard was not designed to be taken apart. Each of the plastic key housings had extrusions that when through holes in the keyboard chassis and had been 'melted' down to permanently attach them mechanically to the chassis.

To make things worse, the keys were simple 'plungers' that activated a membrane keyboard that was sandwiched between the plastic key housings and the metal back-plate. This means that all of the keys would need to be removed to get to the membrane in order to repair it. This appeared to be a daunting amount of work, and it would be questionable whether I would be able to securely re-attach the key housings because most of the extruded plastic would be lost in the removal process.



Eventually, after a lot of thinking about the best way to fix it, I decided to try and remove the two keys that seemed to be causing the problem and hope that there was an obvious fix once they were removed.



Once I had both keys removed, I could see no obvious problem and was starting to think the solution hopeless. At this point I pretty much stopped trying to be delicate and preserve everything because it seemed hopeless – this turned out to be a good thing.



I then simply 'jammed' a screwdriver between the two layers of the membrane keyboard and twisted it around where the contact points for the two questionable switches were located.

This did the trick! The membranes were able to separate and break the short condition.

After hooking the keyboard back up to the computer, I am now able to use the return key to start the OS boot from floppy process – even though the boot fails, it shows that the keyboard is working.

I was just getting ready to re-attach the two previously removed key assemblies and wrap up the keyboard issues.

As I was moving the Osborne computer from the desk so that I could focus on the keyboard, **disaster** struck! The Osborne power cord hooked onto the keyboard cable and dragged the keyboard off the edge of the desk, and sent it crashing onto the ground.

As it was falling, my mind was thinking “oh, it’s only a short fall onto a rubber mat, it should be OK.” But then it hit the ground and about twenty of the keys smashed to bits! I was heartbroken.



After several days (and many glasses of whiskey) I finally decided to re-build the keyboard using modern keys and try to complete the project.

I painstakingly measured the old Osborne keyboard and laid out a new PCB using EPOMAKER AKKO CS Custom Series Tactile Ocean Blue mechanical switches along with EPOMAKER Retro Gray Cherry Profile PBT Dye Sublimation Keycaps.



The keyboard can be seen below with a few of the keycaps installed.



Most of the keys were a drop in as can be seen below, however several keys posed a problem.



- The 'shift' keys on modern keyboards are much larger than the Osborne 'shift' keys so I ended up using the 'alt' keycap as a 'shift' key.
- The '\`' key on modern keyboards is much larger than the Osborne '\`' key, so I arbitrarily used the ']' keycap.
- The 'numeric zero' key on modern keyboards is much larger than the Osborne 'numeric zero' key so I ended up using the 'F10' keycap.
- The 'caps lock' key on modern keyboards is much larger than the Osborne 'caps lock' key so I ended up using the 'Fn' keycap. Additionally, I didn't get a toggle switch for this so it is momentary like the rest of the keys, and really doesn't work as a caps lock.

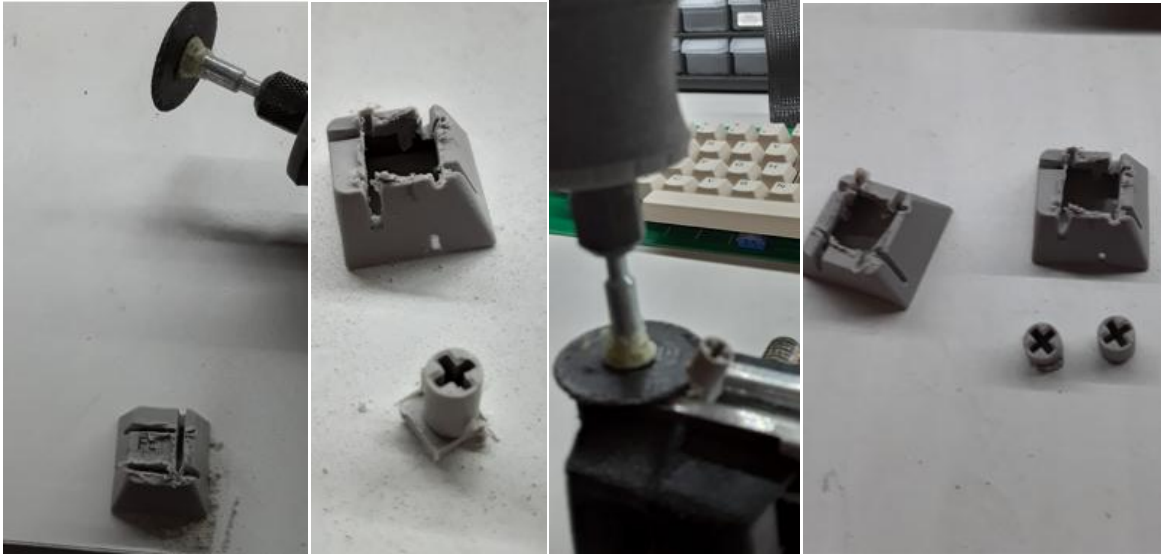
By far the biggest problem was that the 'Enter' keycap was too large to fit in the area allocated on the Osborne keyboard, AND the button mounting points were in the wrong places.



The first thing to do was to file down the 'Enter' keycap until it would fit between the other two keys. And then using a Dremel tool, remove the outside two posts of the 'Enter' keycap. The center post could stay as it passed harmlessly between the two switches.



Then it was necessary to 'steal' two mounting points from other unused keycaps. This also was done using a Dremel tool.



Then the two 'stolen' mounting points were placed onto the 'Enter' key switches and the modified keycap was SuperGlue'd to the top of them.



While not perfect, this (on the right below) did come out pretty close to the original (on the left below) and is far more reliable than the old worn out membrane keyboard.



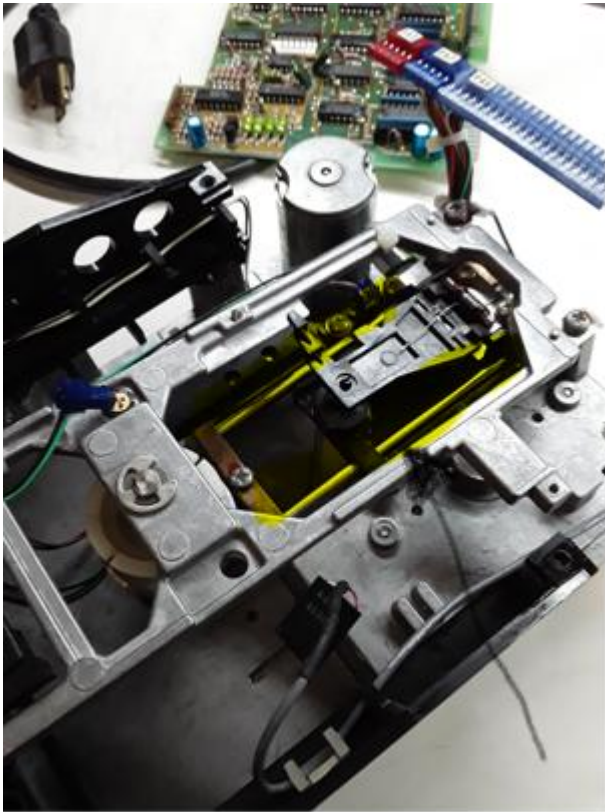
With the keyboard finally functional, I was able to proceed to try and get the computer to boot from the floppy drives.

With a boot floppy inserted, hitting the 'Enter' key at the boot prompt resulted in continuous 'Boot Error' messages on the screen. I could see the floppy 'activity' LED turn on and hear the drive motor spinning, so it appeared to at least be trying to read the disk.

After taking the computer apart, it quickly became obvious what was wrong.



The drive head carriage was 'frozen' on the rails (see below – highlighted in yellow.) This caused the head to be unable to move from track to track and properly read the disk. This was a problem on both of the drives.



After using some penetrating oil to free the carriage, I applied some light machine oil and re-assembled the unit.

Thinking back, I remembered having a problem where the drives would 'squeak' as the head moved back in the 1980's and I think I lubricated them with cooking oil of all things, which wasn't too smart, but I think the only oil I had on hand. Doubtless this is the result of that cooking oil solidifying over the years.

Now the unit powers on AND properly boots from the floppy drive loading the CP/M operating system.



Here's a screen close-up for those of you who are nostalgic about CP/M.



Appendix

Gerber Files

- 760013xx Osborne Keyboard
 - [Gerber Files](#)