

Restoration of Intertec Superbrain QD

written by Sergio Gervasini and Stefania Calcagno for ESOCOP
The European Society for Computer Preservation
<http://www.esocop.org>

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A copy of the license is available on Esocop's site and can be obtained here:

<http://www.esocop.org/gnu/gnu-1.3-license.txt>

References

Vintage Computer Federation forum (see also other threads about Superbrain):

<http://www.vcfed.org/forum/showthread.php?54496-Intertec-SuperBrain-ROM-Dumps>

<http://www.vcfed.org/forum/showthread.php?54295-Intertec-Superbrain-Call-For-Help-10-Years-On>

<http://www.vcfed.org/forum/showthread.php?68138-Creating-a-new-CP-M-image-for-a-Superbrain>

Schematics for Intertec Superbrain:

<https://www.esocop.org/docs/Intertec%20Superbrain%20Schematics.pdf>

Daves Old Computers:

<http://www.classiccmp.org/dunfield/supbrain/>

Maslin Superbrain disk images:

<http://www.retroarchive.org/maslin/disks/intertec/index.html>

Introduction

The Intertec Superbrain was first sold by Intertec Data Systems Corp. of Columbia, South Carolina, USA in 1979. The machine ran the operating system CP/M and was somewhat unusual in that it used dual Z80 CPUs, the second being used as a disk controller.

It was advertised as an "All in ONE smart portable lightweight console (45 lb - 20 kg): Just add a printer!"; the machine featured a 12-inch CRT screen, 80-key keyboard with numeric keypad, and dual 5-inch disk drives.

There were several variants, including the Superbrain II, Superbrain II Jr., "QD" (quad density disk drives) and "SD" (super density) models; ours is a "QD" variant with floppy capacity of 340Kb.

The Superbrain is notable for being at the user end of the first Kermit connection: the first successful file transfer took place on April 29, 1981.

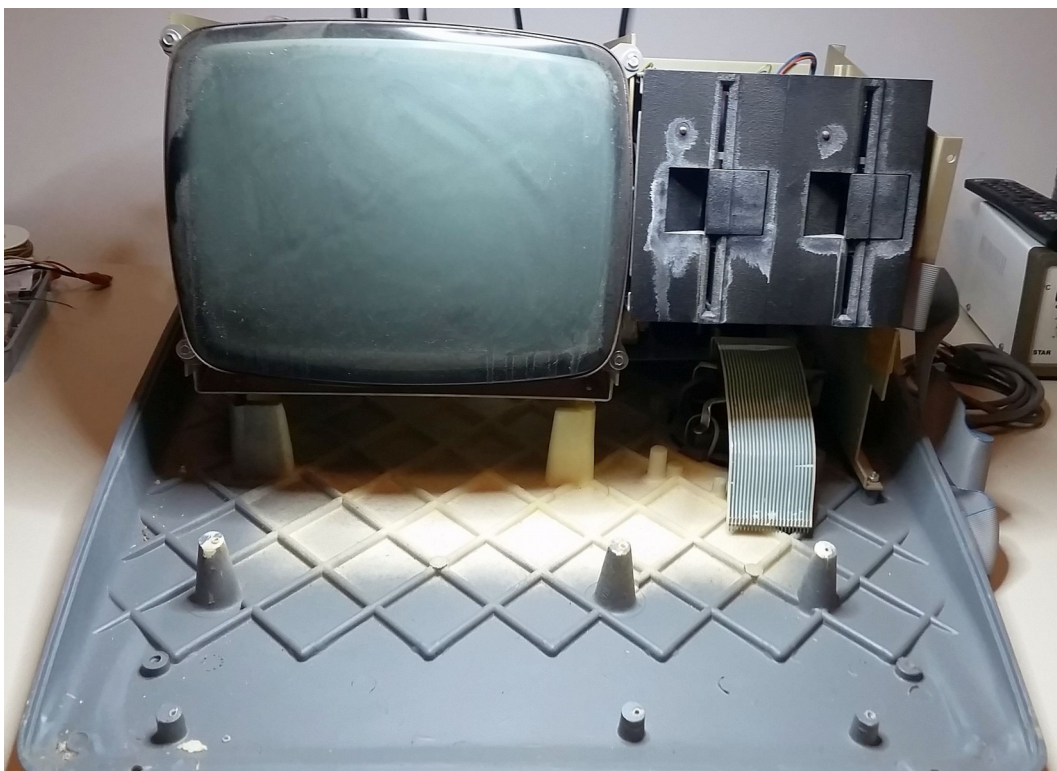


Our machine

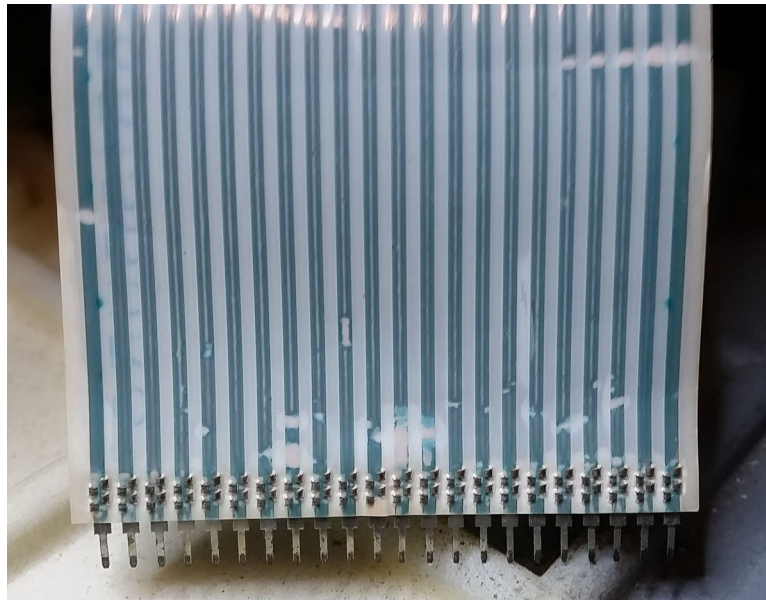


EsoCoP found this machine in a basement in Italy some years ago, the conditions were not very good and for this reason the restoration work was postponed for a long time, until the beginning of 2019 when we started the work.

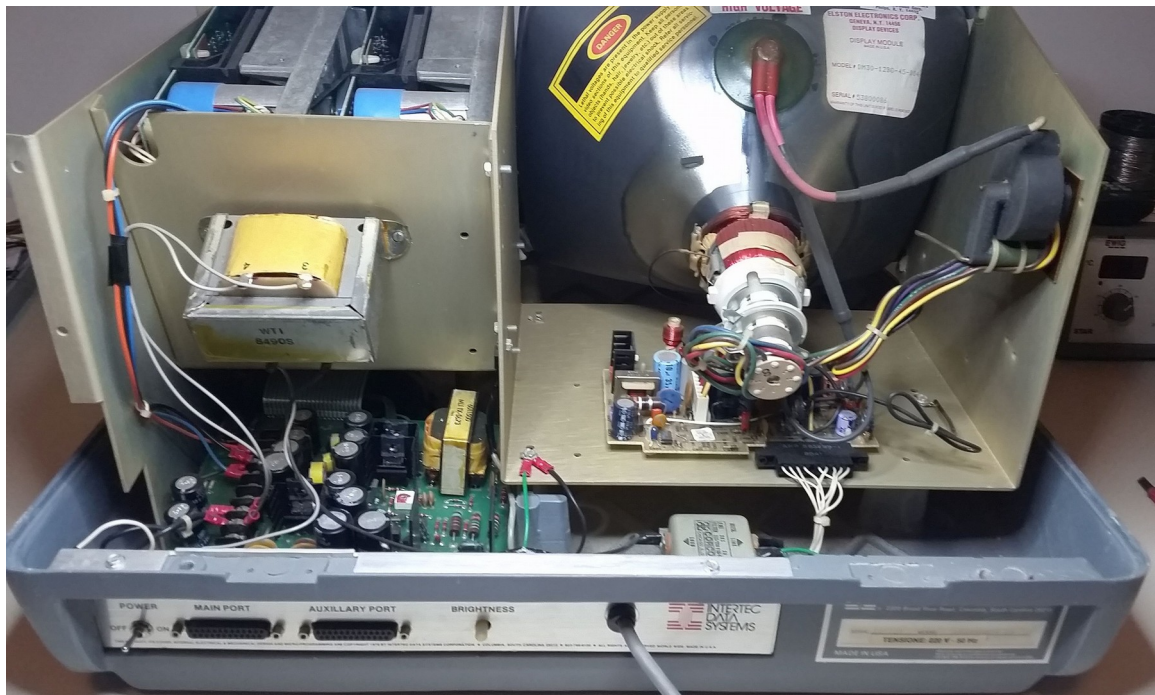
In the next pages we'll show the status of the machine during the disassembly



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Interesting the location of a transformer behind the floppy disk to reduce the main supply from 220v (European standard) to 110v (USA standard):

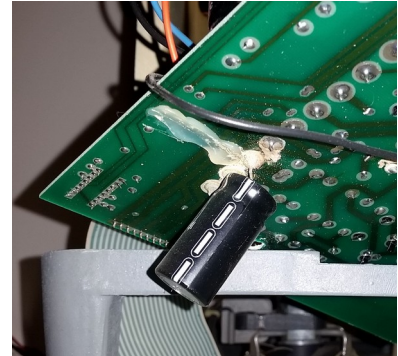


Fixing

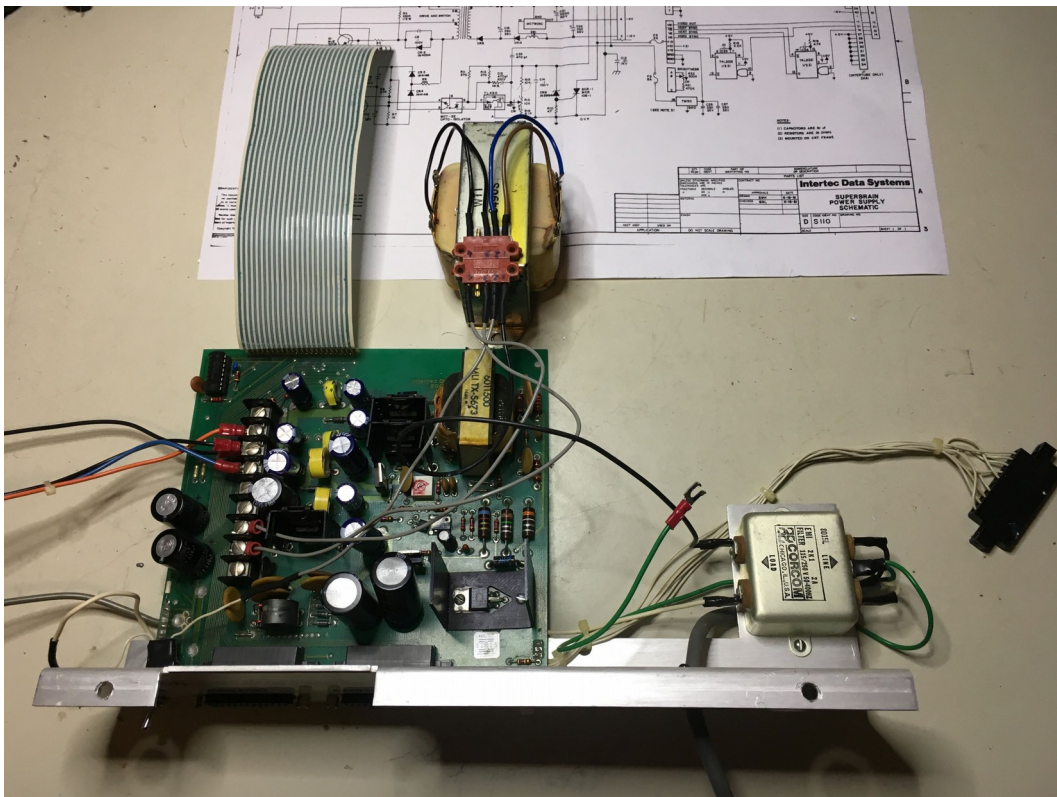
Power supply

Behind the power supply board we discovered a capacitor with signs of oxidation at the welds, so we disassembled it and carefully cleaned the printed circuit board.

We dismantled the board and its cabling, in order to be able to test the power supply circuits independently.



To easily work on the system we also added a connector between the 220v-110v transformer and the board.

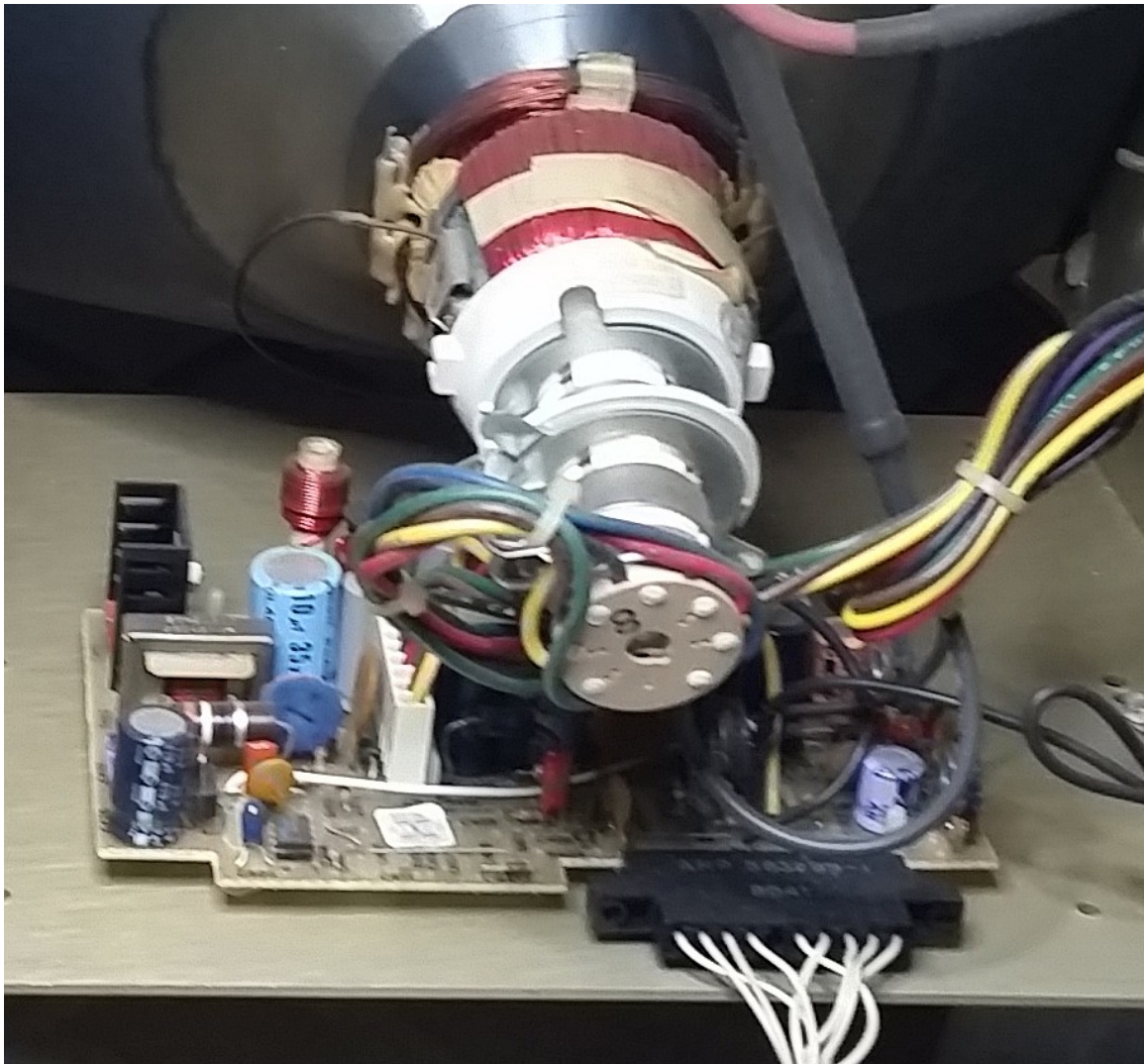


Some capacitors were surely broken, we decided to change every capacitor without losing time to check for faulty ones. The power supply started to work fine. We had been able to make some test under load and everything was working as expected.

Monitor board

As we finished with the power supply we did connect the monitor to check if it was operational, but a capacitor was in short circuit and it did not let the circuit turn on.

It was the "usual" tantalum capacitor. We did change it and suddenly the monitor started working.



Mother board

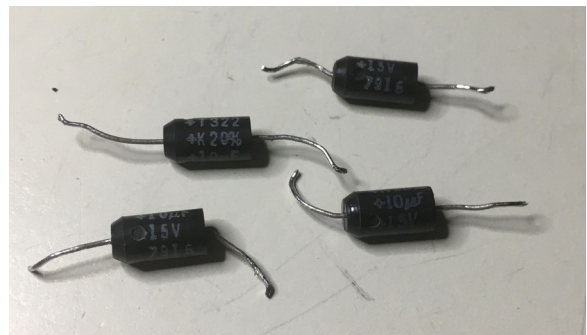
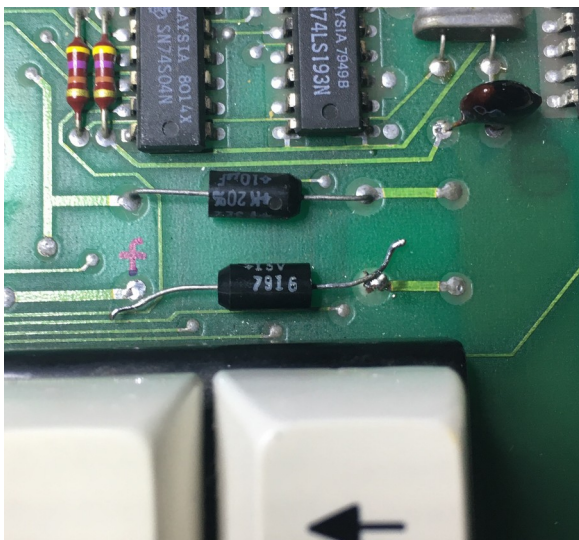
The capacitors nightmare

We did check the mainboard to see if there were problems as we discovered on the monitor board before connecting the board itself. We did find short circuits in the +12v line.

Schematics did not help us to understand which of the capacitors were connected to the +12v line, that's why we located and dismantled one by one every capacitor until we got the guilty.

We changed the capacitor and connected the board but, after a few seconds since we gave power to the board, it turned off again.

Another capacitor on the same line went in short circuit. In order to avoid any more problems we did replace all of them.



The keyboard

5 keys of the keyboard had their pins broken and it wasn't that easy nor to find spares neither to fix them.

We did dismantle the keyboard, which was produced by Maxi-Switch and used keys originally made by SMK. It's not clear if Maxi-Switch and SMK were somehow connected, but except the "Maxi" or "SMK" logo on the back, the keys are exactly the same.

We started from these information.

We could not "steal" keyboards done for Kaypro, Xerox, Acorn or some Commodore PETs (not the original Commodore keyboards, but some third party add-ons extended keyboards).

Searching on the web we did find some spares. But we did follow a different approach, a bit more complex but surely enjoyable, to find a way to fix its original keys.

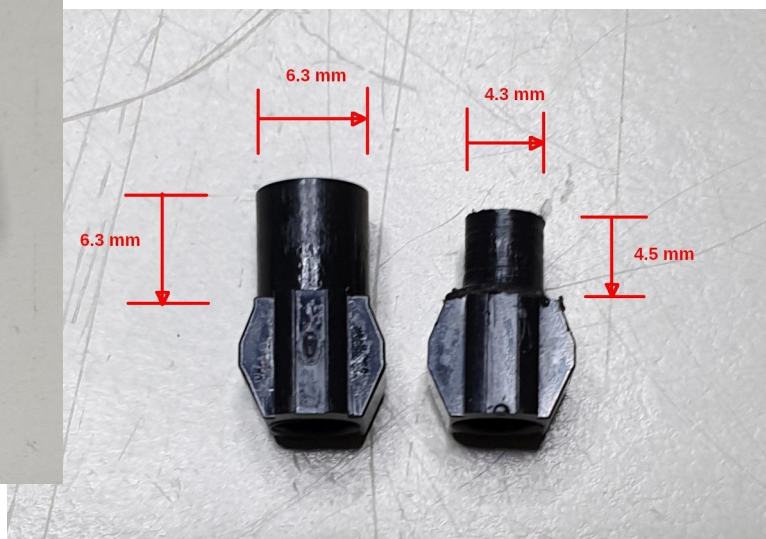


The top of the pin, where the keycap connects to the pin, has got a usual shape. Between the various keyboard spares we have in our availability we discovered it is really similar to the Commodore 64 pins. Everything else is quite different, the behaviour it's completely different indeed.

We discovered that we could have tried a merge between the two pins, exploiting the original pins base and implanting the C64 pin top, which have the same diameter.

Pay attention: the C64 pins aren't always the same, the cross in some keys is shorter. Only the longest have to be used.

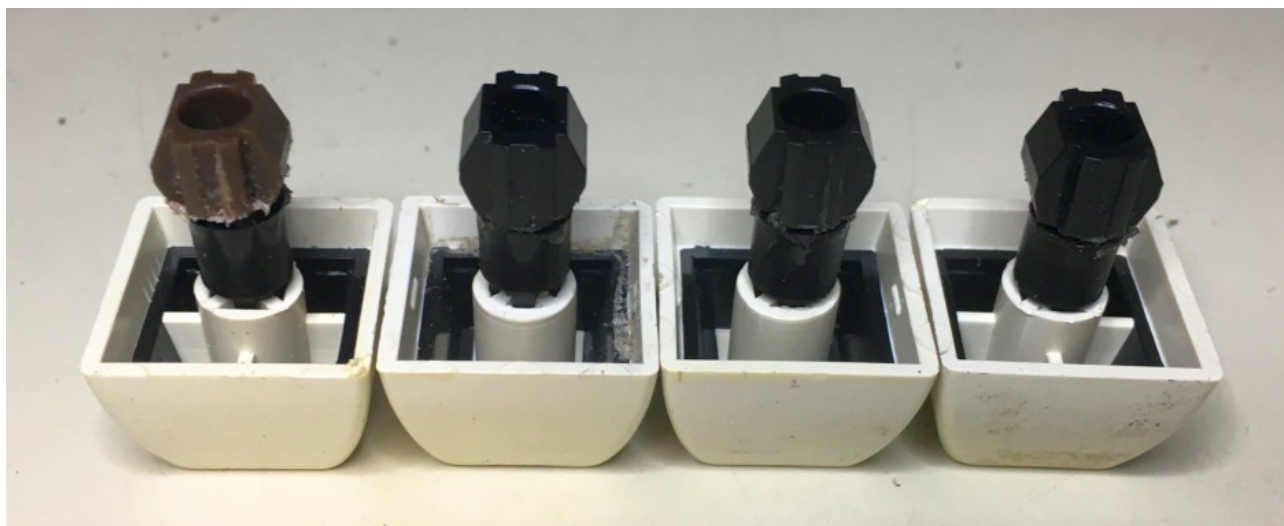




We cut C64 pins to the Maxi-Switch size which we reduced by diameter and shortened. In this way we had been able to perfectly implant the two parts, in order to maintain the same mechanical rigidity and verticality of the pin.

Afterwards we used a bit of glue to attach the two parts.

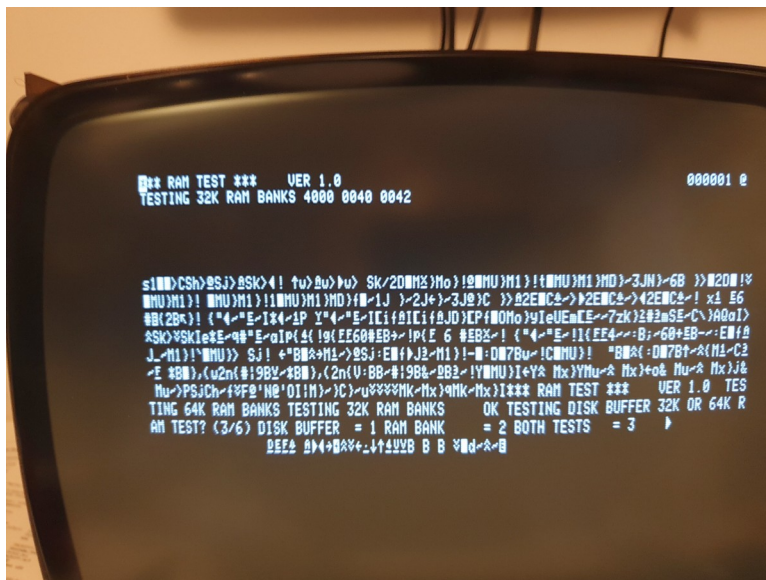
Just be careful to perfectly align the cross to the keycap and the goal is achieved!



Ram check

We finally connected every part together. We connected the floppy disks to make a boot from the diagnostic disk to test the ram. And one of the chips was not working correctly.

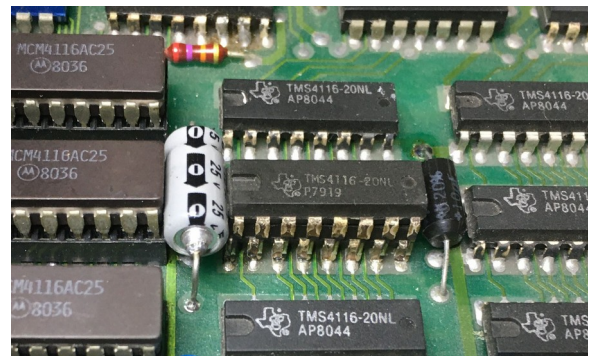
The video output is not exactly "explicit", it quite seems the software is bugged. But the software is accurate and found the broken component.



It's stated that at the address 0x4000 the written data was 0x40 but read data was 0x42, and it means there's a problem on the second memory bank (every bank is 16 Kilobytes) and the problem is on the second bit.

This let us find the faulty chip fastly.

On the mainboard the first 2 banks chips are soldered and this make the work a bit tricky, that's why we did another test before starting to unsold it: the piggyback of a memory chip, to achieve another confirmation.

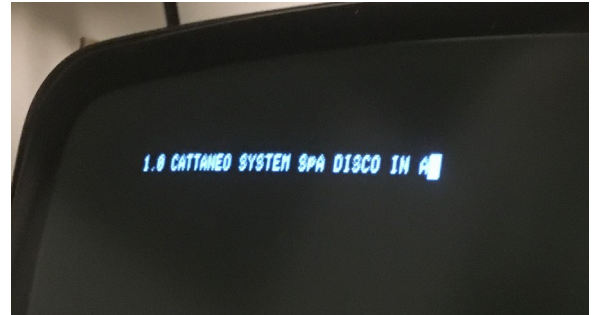


With the piggybacked chip we started another memory test and it went fine, without errors.

We did solve the problem replacing the faulty ram chip.

New bios

The original BIOS of the machine had been changed with a custom one, customized with the name of the Italian dealer (Cattaneo System SpA), the same name which appears on the case just below the Superbrain label.

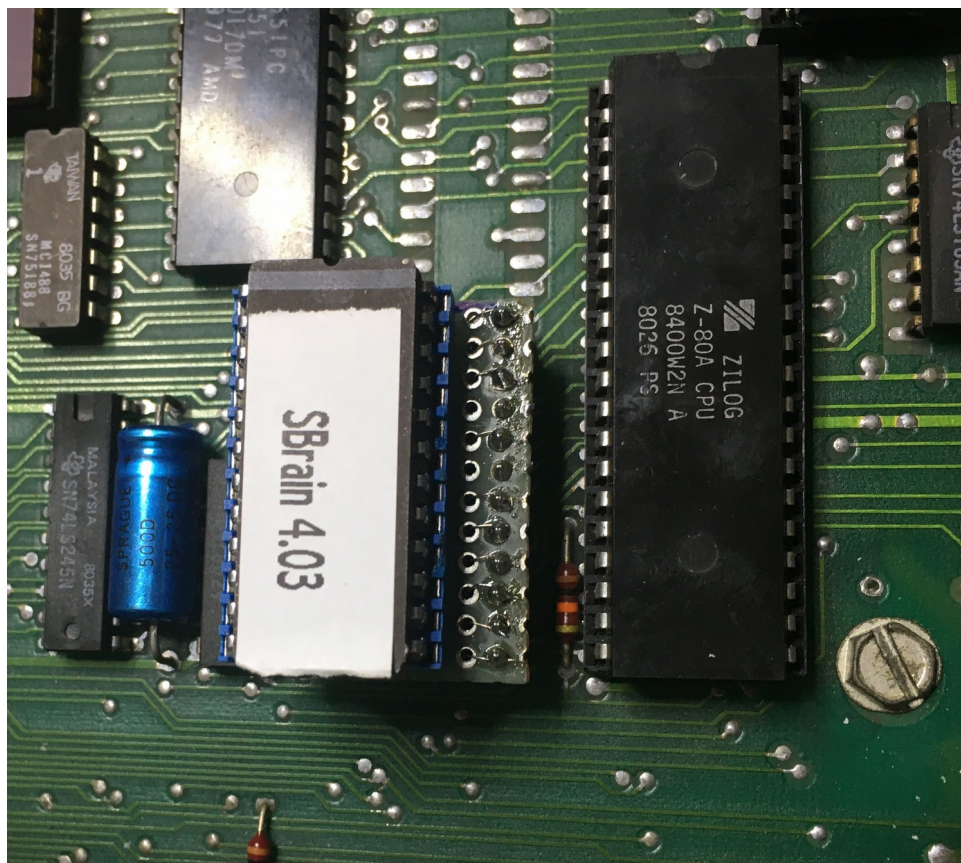


We decided to replace it with the last original release we found on the net. We did create an appropriate socket adapter to be filled with a 2716 eprom.

The BIOS worked fine and we also achieved a faster floppy disk access speed.

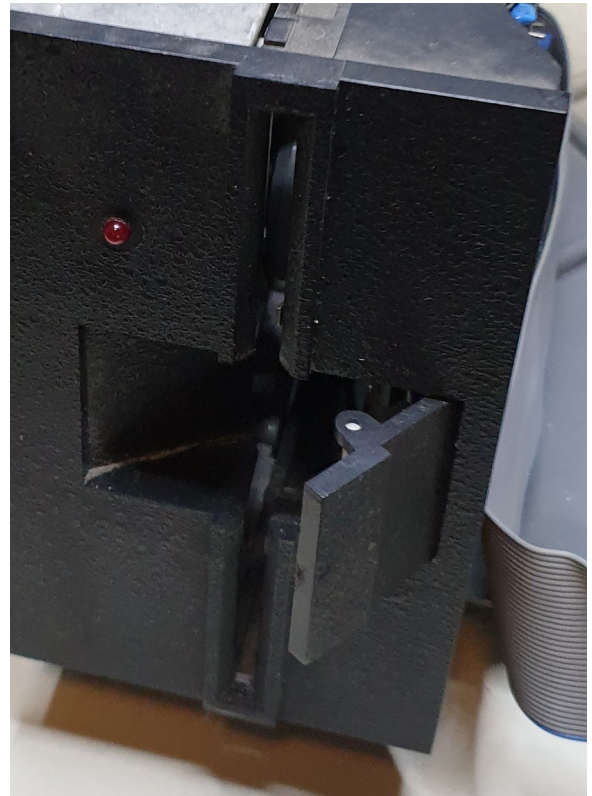
Sadly, while we were reassembling the machine, we discovered that the socket+adapter+eprom was too high and the case did not fit well anymore.

We decided to move backward to the "Italian" version of the firmware.



Floppy disk drive

One of the floppy disk drives had the closing hook blocked in the close position; dismantling it we found that one of the plastic supports was broken.



Luckily we had a spare identical floppy drive in our spare parts warehouse. We had been able to fix it and the closing mechanism it's finally working perfectly.

Cleaning

We spent a big effort in cleaning the Superbrain.

Luckily the computer has been built with strong materials, and we had been able to use a lot of water and soap outdoor for the case and a lot of other detergents on the other parts.



Final testing

The machine now is working perfectly, time to boot the operating system and to run successfully some Cp/m programs.

