



About my upgrade:

Quite a while ago, (some years) I started wondering what I could do to spare me of a "31kb free" after a usual reset...

Then, I started looking for some documentation on the net, about the hp48 internals. With the small knowledge that I had then, I started developing my own ideas and schematics... Just a problem... Where to get the RAM! Just some years after (2 or 3) a friend of mine sold me a 128k and a 512k chip of low power smd RAM.

Since my calculator was a 48G, I ordered some smd chips to make the banked address lines of port2 from cec-coimbra@coimbra.pt.

To do my upgrade I used:

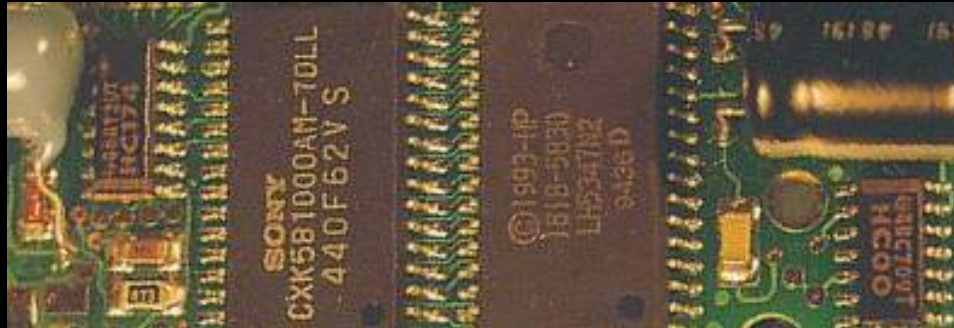
- 74LVX00 SMD (you can use a 74HC00)
- 74HC00 SMD
- 74HC174 SMD
- 47k resistor SMD
- 2,2k resistor
- 1M resistor
- 100nF Capacitor p SMD
- 22nF Capacitor np
- M5M5408AFP-70LL (512k * 8)
- M5M51008AFP-70LL (128k * 8)

To disassemble my calculator, I looked for information in the net and then I:

- Removed the batteries;
- Pulled the "plus" battery terminal of its hook;
- Carefully removed the top overlay with a small hair dryer;
- Defeated the plastic rivets with a 3 mm (.15 inch) drill ;
- Pulled the plastic cover above the metallic rivets located at the side of the calculator with a 5 mm (.2 inch) screwdriver;
- Separated front cover from the back cover.

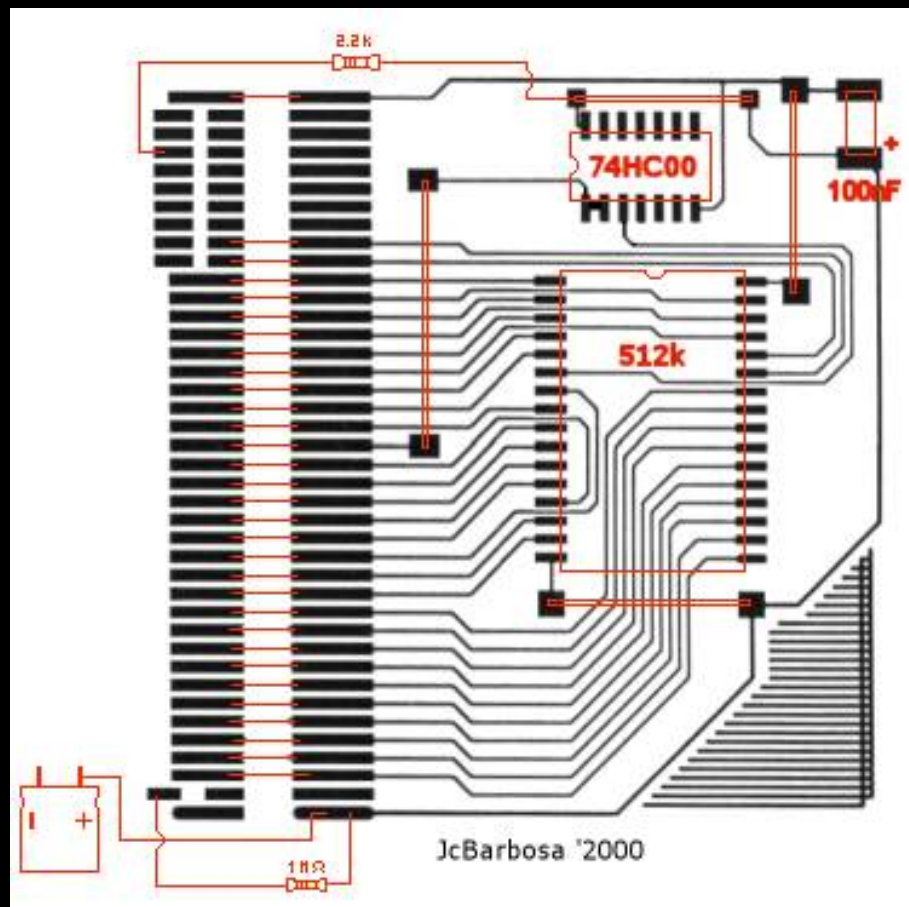
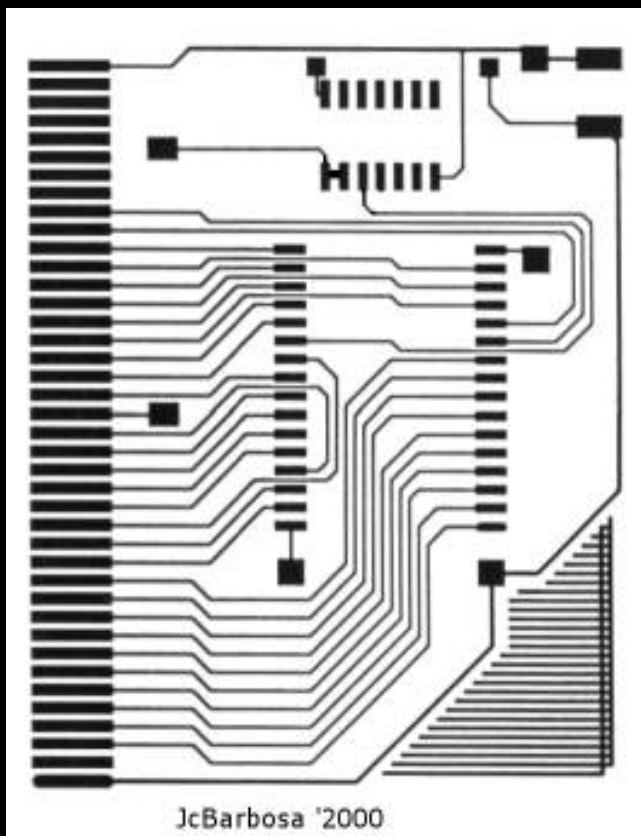
To proceed with the upgrade:

- Removed the 32k RAM chip (MB84256C-70LL) in the calculator with a 1 mm (0,04 inch) soldering iron, a needle and lots of patience!;
- Placed the 128k RAM chip with the soldering iron (Vcc and GND pins go first, to ease the work)
- Placed the 74HC174, the 74HC00, the 22nF Cap. and the 47k Res. (SMD parts) in the place where they are in the 48GX with a 1 mm (0,04 inch) soldering iron:



Gx Close Up

- Made a printed circuit board (PCB) with he schematics that included the 512k RAM chip, the 74VLX00, the 2.2k resistor and the 1M resistor;



[Download PCB in bitmap format](#)

Top PCB overlay & connections

- Placed that PCB next to the empty connector on the calculator and connected both using small wires and the soldering iron;
- Had to remove a part of the metallic shield located on the back cover in order to get space for the PCB;

To reassemble:

- I got together the back and the front covers;
- Pushed the "plus" battery terminal back to it's hook;
- Placed 2 screws in 2 of the 4 holes (ex-rivets) above the display;
- Straightened up the top overlay using a rubber hammer and a smooth table;
- Placed the top overlay with the exiting glue on it;
- Placed the batteries back;

Some Notes:

My first upgrade ideas included a 74HC138 to demux the 512k space, as I have seen, this is not needed, in fact, on the pictures you can notice a third chip (74HC138) that is currently disabled (this is corrected in the schematics & PCB here published)! In stead, I used the 74LVX00 (3,3V Cmos Nand Gate) to obtain the NOT(CE2). This is because the Hp internally looks for mirrored address locations. Don't ask me why... The truth is that with the complete demuxed addressing, the Hp only detects 3 banks on port 2 instead of the expected 4 banks ($4 * 128k = 512k$). I think this as to do with the A18 address line that in fact is seen like a NOT(A18). In the future, I'm planning to place 4Mb plus of low power NVRAM; to do this, I must discover this small trick with a tool that I built recently (a Pc based Logic Analyser). Time is so short ... :)

I have also painted my calculator's top overlay because, in the beginning, I wasn't so careful as I explained with it, and then I removed & placed it too many times until the ink started to disappear... I hope you'll be more careful than I did!!! :)

The result:

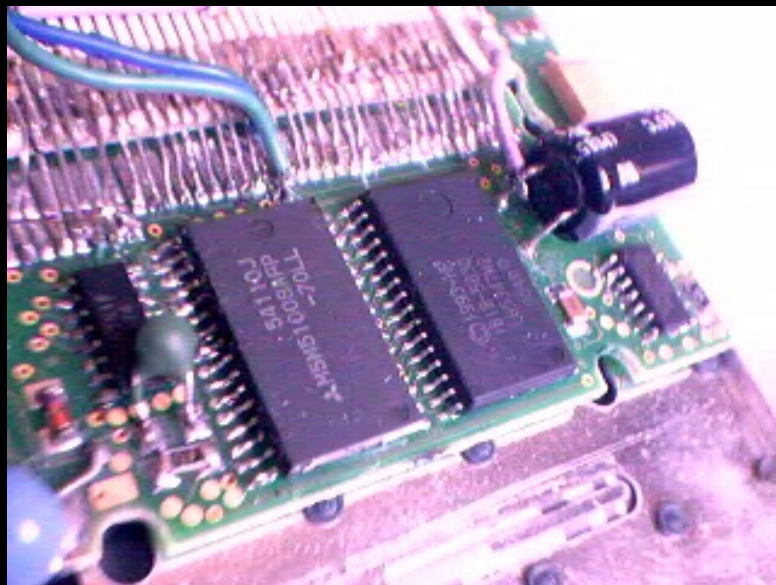
At this moment (the above document revision date), I am proud of having a 640kbytes Hp48 with 128k on port 0, and four 128k ports on ports 2,3,4 and 5.

Attention!!!! I strongly don't suggest upgrading if you don't know exactly what you are doing!!!

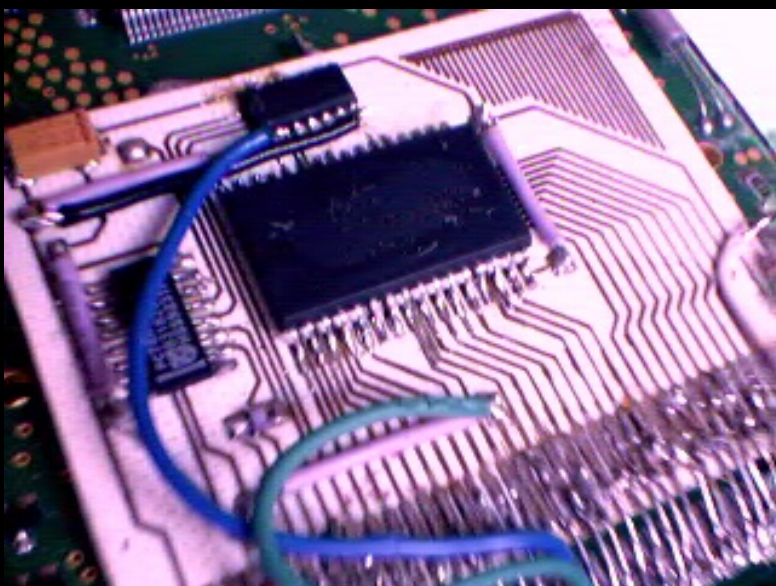
Some pictures:



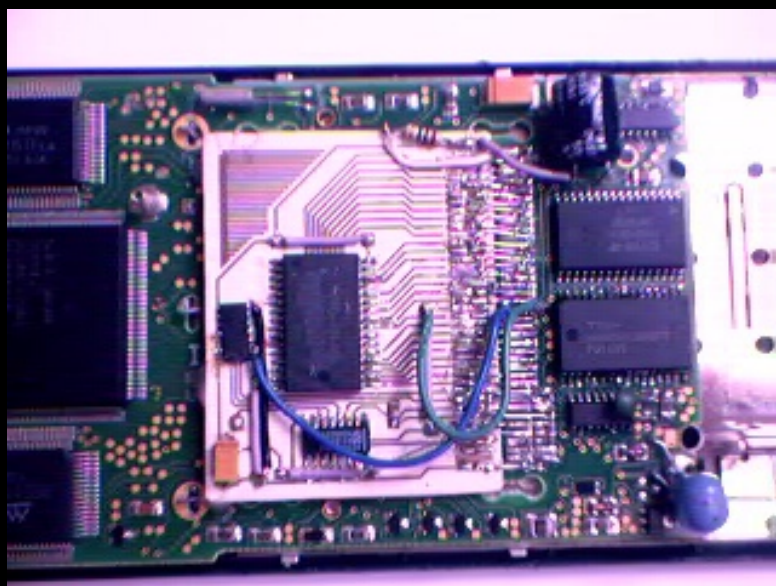
Top overlay & rivets removed



128k chip



512k board



Overview



Back cover



After the upgrade

Any question, suggestion, etc. you can mail me at: jcbarbosa@clix.pt

This upgrade document was created by converting the page located at www.dee.isep.ipp.pt/~e980137/hp48/upgrade.html into a pdf document.

Special thanks to:

- Hewlett-Packard;
- Thomas Otten (first upgrade doc. I've read);
- Marcel Filipse (for it's wonderful work on hp48 schematics 1.5);
- All other non-listed upgrade adventurers and pioneers;

Disclaimer:

I do NOT take any responsibility what so ever as the result of applying what is described here.

Any modification will be made on your own risk! Please be sure of what you are doing.