



24 Kilo more

RAM expansion for the Sharp PC-1403

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The Sharp Pocket Computer PC-1403 is the successor to the almost legendary PC-1401/2 and comes with a program memory of no less than 8 Kbytes. Memory extensions to 32 Kbytes are possible and are also offered by various companies, but the price for this can be undercut by a lot if you build it yourself.

If you can already hold the soldering iron on the right side, i.e. have experience, you can increase the memory of your Sharp PC-1403 to a whopping 32 KByte without too much effort. This requires: a soldering iron with a fine tip, desoldering braid, a 32-K byte memory module, a control IC, a small screwdriver, double-sided adhesive tape, side cutters or a sharp knife, some thread wire and courage. And if you then follow these instructions exactly, you will get the wonderful number 31454 displayed when you enter MEM.

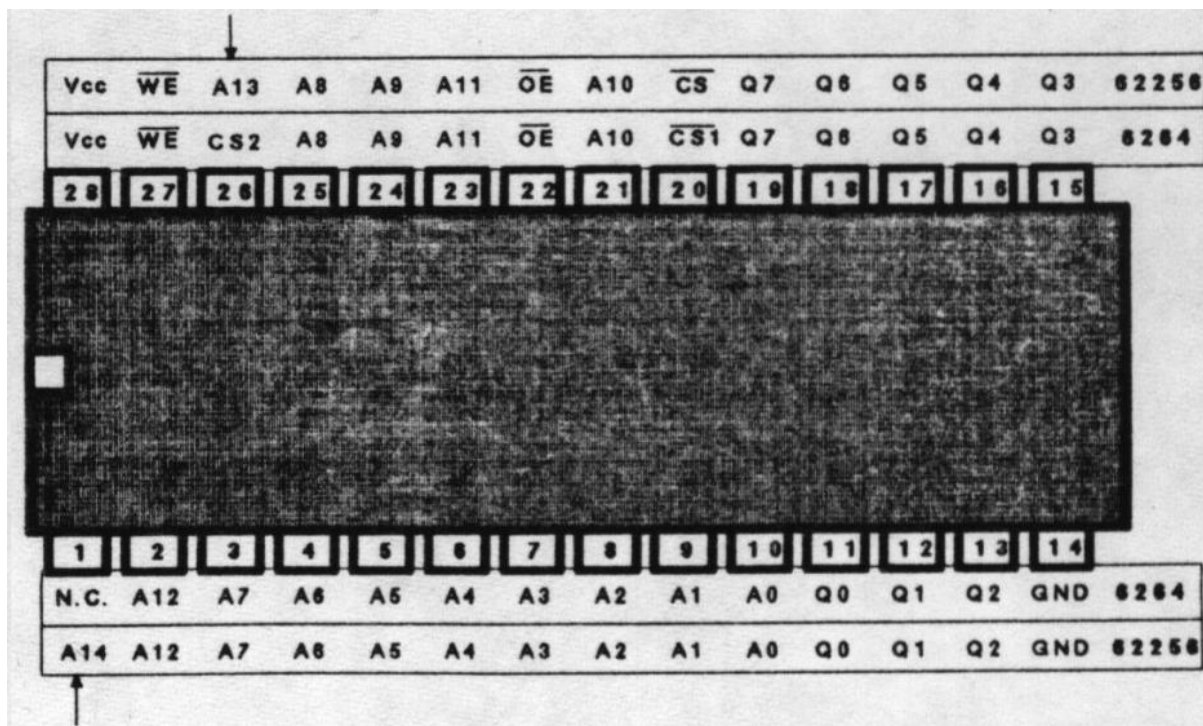
Shopping list

First, the two ICs must be obtained, because they are unlikely to be found in the junk box. The memory IC is a HM62256LFP-12 (Hitachi). The "F" in the designation is important; it stands for 'Flat Pack' and means a particularly small and, above all, flat design, which is usually only half the size of the 'normal'. Only if you take this design will you be able to close the housing afterwards (Type HM62256LFP-10 can also be used. The '10' is the identifier for a shorter access time, but this is not critical here.)

Sharp uses the HM6264 memory IC in the PC-1403. Since the HM62256 has the same pin arrangement, there are no major problems with soldering. Unfortunately, the 32-K byte chips were not taken into account during the development of the computer as shown by the comparison of the pins. In contrast to the HM62256, the HM6264 to be replaced has two CS inputs (chip select), one of which must be driven with high (5 V). And it is precisely this and only this that Sharp uses, the other CS input and OE (output enable) are set to low (0 V).

For you this means that you have to make a few small circuit changes with the side cutters or knife and the thread wire. Most importantly, you also need an inverter IC. The CMOS-IC 4049 can be used here, of which the flat-pack version must also be used. One of these is available under the name HEF4049BT - the flat pack identifier is a 'T' this time.

The price for both components together is less than 50 DM.



The pin assignments of the installed 6264 and the 62256 to be installed. There are only two differences, but that's enough...

There should be no procurement difficulties with the memory IC, it can now be found in various component advertisements. With the 4049, things are (still) different, at the time of going to press only Bürklin was known to be a generally accessible source (PF 20 04 40, 8 Munich 2 or PF 20 22, 4 Düsseldorf 1), which sold the HEF4049BT under the order number 61 S 2510, but unfortunately a processing fee of 10 DM is required for orders under 50 DM.

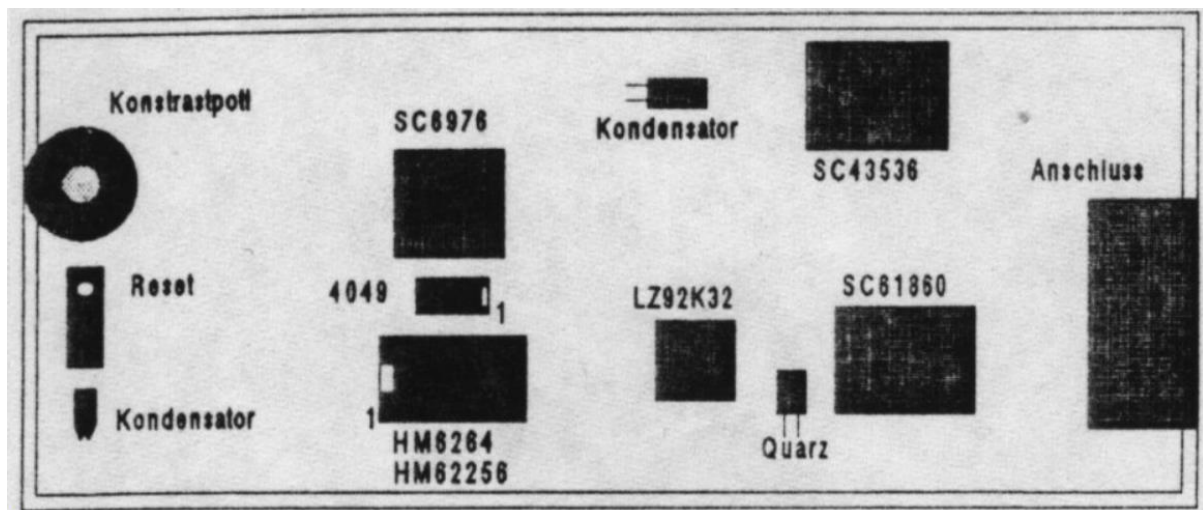
The way to success

Before you dig into the guts of your computer, there are a few precautions you should take. The PC-1403 is built with CMOS ICs, which can end into the 'heaven of silicon' due to static discharges. We therefore recommend a work surface made of metal or conductive foam, which is connected to the protective conductor of the socket and (necessary for almost all soldering stations) to the tip of the soldering iron. Furthermore, you should only touch the computer circuit board where it is absolutely necessary. And if you want to be on the safe side, you can ground yourself using the wristwatch's metal strap.

If you have considered (and followed) everything, you can now unscrew the computer by loosening the two screws on the back of the computer and removing the base plate.

Attention: Now is the last chance to save or print out the program in memory if you need to keep it, because the next step towards 32 Kbytes is to remove the two batteries. While you're at it, make a note of how they fit back in...

The brown plastic cover can then be folded down by loosening another seven screws. But be careful, the piezo speaker is still attached. If you need more freedom of movement, you can unsolder it. Now the innards of the PC-1403 are finally revealed. The graphic below shows the internal structure. To ensure that nothing can break, short-circuit the two capacitors to be on the safe side. One more caveat: unless you absolutely want to sort the buttons, lift the board very carefully, if at all.

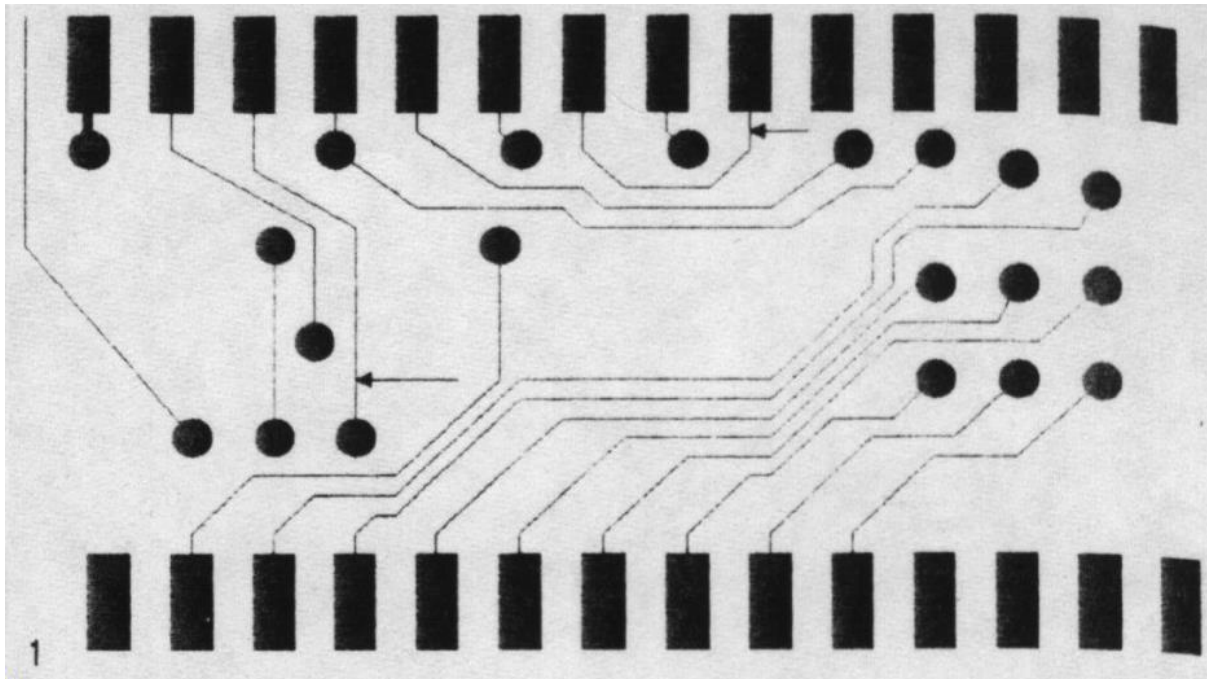


This is how tidy it looks in the PC-1403. For memory expansion, the HM6264 is replaced by the HM62256 and the 4049 is simply glued in.

It's getting hot

Now the actual conversion can finally begin. First, the memory IC (IC1) is desoldered using the desoldering braid. The soldering points are only on the top of the board. Please make sure that you do not 'burn' the individual soldering points, otherwise the copper layer of the circuit board could come loose. Another option is to heat each connector individually while gently prying off the pin with a small screwdriver or knife. Once the IC has been removed, the circuit board should be freed from tin residue.

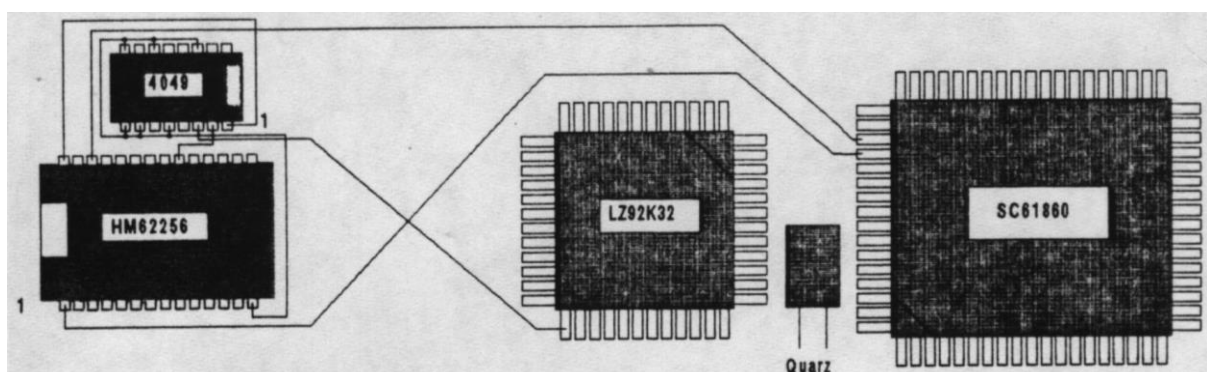
The two lines under the removed memory IC on the circuit board should be cut with the side cutters or a sharp knife (see image below). You have to work very carefully here so that two interruptions don't become more or that the lines don't still have a connection.



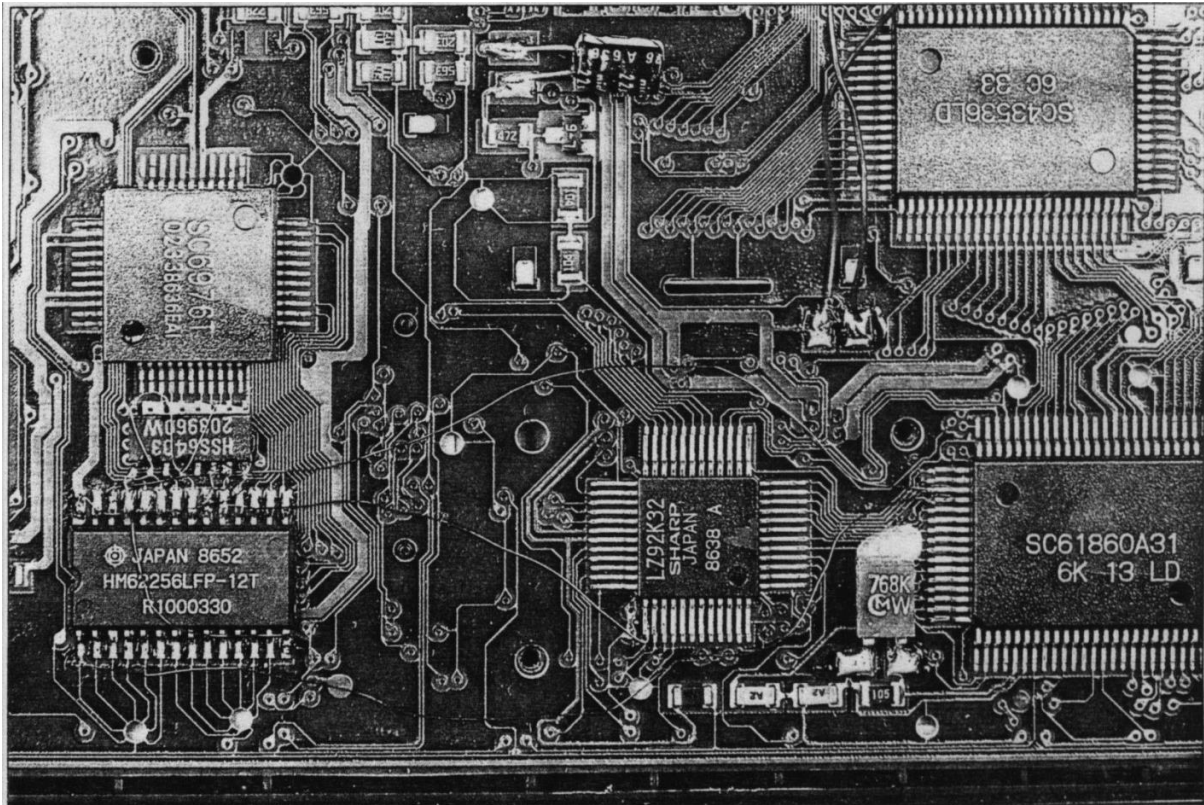
At the points marked with arrows (below the memory IC!), the conductive tracks must be interrupted. The picture shows the board F1034EC - on other boards the conductor tracks may look completely different.

The new memory IC (HM62256) is soldered in the same direction as the 'old' one. Here, too, the effect of heat on the individual pins and soldering surfaces must be kept as short as possible. Then the other IC (4049) is stuck with a piece of double-sided tape upside down (with the connections facing up) and the notch against the memory IC; the photo shows a good place for it.

When that's done, all you have to do is complete the wiring; the wiring diagram can again be seen in the picture below. The necessary cables are best laid with threaded wire, since the heat from the soldering iron will strip the insulation from the enamel on its own. It has proven advantageous to tin the solder joints beforehand. (By the way, the many connections on the 4049 are necessary to guarantee the desired low power consumption of this IC.)



The new ICs are wired according to this scheme. By the way, the two additional address lines for the 62256 come directly from the processor chip (SC61860).



The result of the conversion in real life. When assembling, you should make sure that the wires are not pinched anywhere nor can scour.

Home stretch

Before you screw the computer back together, please carefully check all connections and soldering points again. If everything is in order (and the short circuits on the capacitors have been removed), reassemble in reverse order.

Now comes the solemn moment when the PC-1403 will confirm the success of the tinkering. So, turn it on, press the reset button, in PRO mode type NEW followed by MEM - you should see '31454' on the display. If not, then all steps of the expansion must be checked again.

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