Casio PB-2000C

Main Board 32 kB modification

Table of Contents

Introduction....1
Preparation....1
Engineering Notes....3
Functional Testing....7
Acknowledgments....10

Introduction

This document describes the modifications required to install additional 32 kB of RAM on the main board of an original Casio PB-2000C or AI-1000.

With this modification, total RAM increases up to 96 kB with the installation of an RP-33 on the exposed memory bay. Because Casio CM language card do not support memory banking, this additional memory is accessible only to machine language applications. However, DL-Pascal 1.2 provides a mechanism to declare ABSOLUTE variables using the bank: address descriptor, enabling Pascal applications to utilize the expanded memory.

A special thanks to Piotr, whose expert advice made this document possible.

As of Revision 2, this procedure has been successfully verified in practice. The story of the modification and its verification can be found [here].

Preparation

Please familiarize yourself with the *PB-2000C Service Manual & Parts List*. Read this document carefully before starting. As you perform the modification, document the process with clear photos at each step and annotate the manual based on your hands-on experience. Our goal is to make these updated instructions available to the community, so capturing clear visuals and practical insights is key.

Section 7. “PARTS LOCATION”, starting on page 16 is particularly important.

Opening a PB-2000C requires patience and the right tools to safely disengage the three plastic tabs securing the case. Inside, you will encounter multiple layers of screws and springs that should be carefully cataloged for reassembly. Taking high-resolution photos before and after each step is strongly recommended. Keep in mind that a few small components—such as the black plastic spacer and the power switch mechanism—will fall loose when the case opens. Once unlatched, the housing opens like a clamshell and can be laid flat on your workbench, **with** the ribbon cable acting as the hinge. Be gentle, some of these ribbons have not flexed since 1989.

Note that not all screw holes are labeled on the silkscreen. It is a good idea to mark them yourself using a PCB-friendly white paint pen (or fine-tip acrylic marker) during disassembly to make reassembly easier.

Be sure to use the appropriate JIS torque-limiting driver for reassembly. These delicate vintage screw posts don't need much force, so as soon as your driver signals it has reached torque, stop turning.

Before handling any internal components or performing soldering, ensure you properly ground yourself to prevent Electrostatic Discharge (ESD). Sensitive CMOS chips—such as the RAM ICs and main CPU—can be permanently damaged by static charges too small to feel. Wear a grounded ESD wrist strap or periodically touch a known grounded metal surface throughout the procedure, and avoid working on synthetic carpets or wearing static-generating clothing.

Engineering Notes

The following photograph, courtesy of Rick Schwartz, highlights the location on the main board where an additional 32 kB RAM IC can be installed. Note the DL-Pascal 1.2 marking on the ROM—a rare German modification that replaced the standard C ROM with a DL-Pascal 1.2 ROM on a small number of PB-2000C units[1].



The silk label reads “HM62256LFP-15SL“

The HM62256LFP-15SL is a Hitachi 32 KB CMOS static RAM (SRAM). It is one of the classic SRAM chips used in many late-1980s Japanese computers, organizers and pocket computers.

1 The exact number is 50 according to Silicium’s Xerxes.

Breaking down the part number:

- HM = Hitachi Memory
- 62256 = 32K × 8-bit SRAM (32,768 bytes = 32 KB)
- L = Low-power version (battery backup capable)
- FP = Flat plastic SOP package
- 15 = 150 ns access time
- SL = Super low standby current (optimized for battery-backed operation)

Sourcing this IC is relatively easy. Our resident expert mentions the following equivalents:

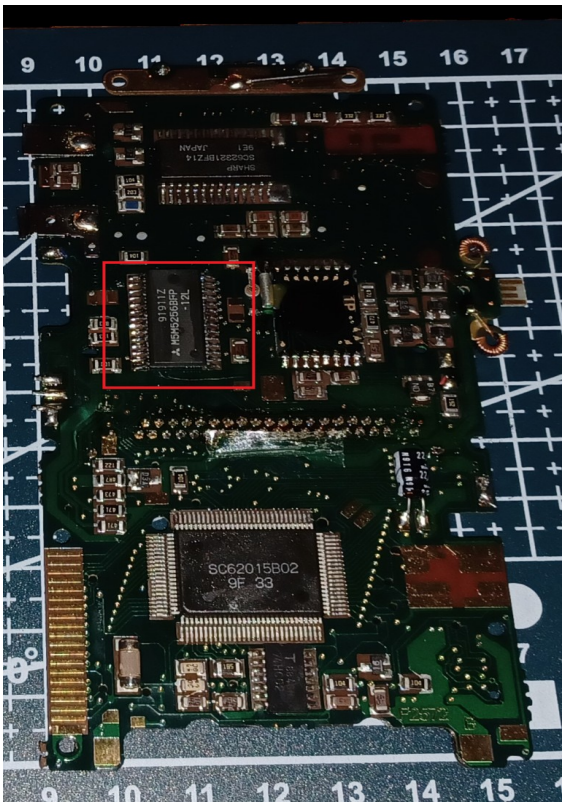
- Toshiba TC55257
- NEC uPD43256
- Samsung KM62256
- Sony CXK58256
- ALLIANCE AS6C62256, CY62256
- ISSI IS62C256

This IC is available [here] in the EU market.

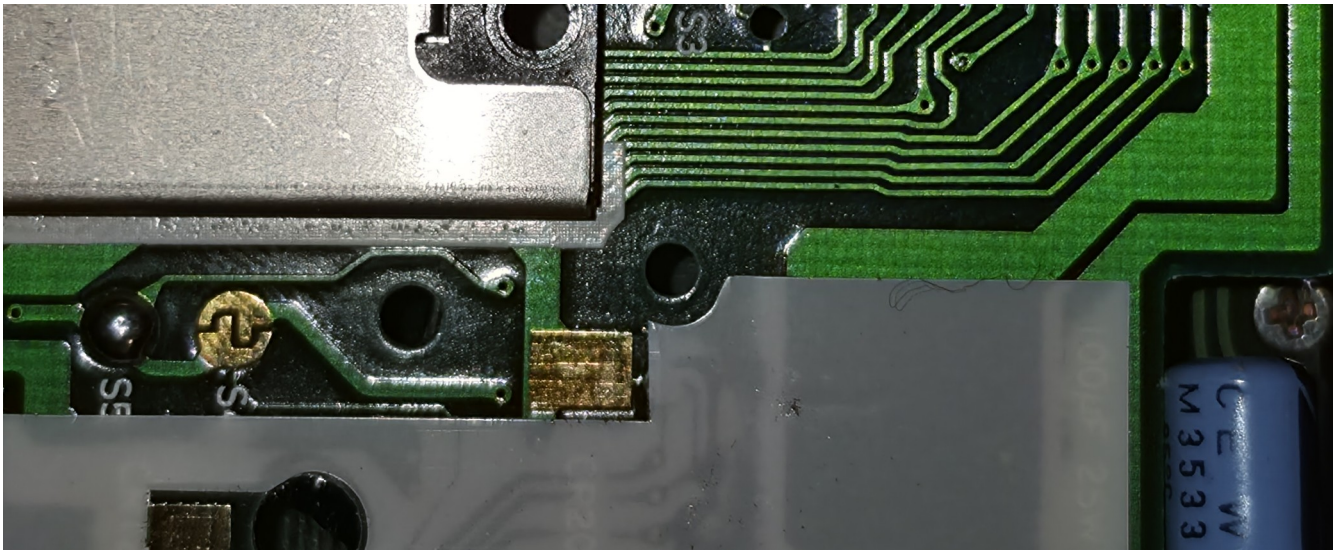
The first PB-2000C modified following this procedure uses this specific IC from DigiKey.

Many consumer electronics of the era used this SRAM IC, for example many Sharp organizers.

The following photograph shows a potential IC donor, a Sharp organizer board that could supply a period correct Mitsubishi M5M52256BFP. We will eventually try this option and update this document with the result.



After installing the memory IC, the RP-33 page needs to move from page 1 to page 2. This behavior is controlled by the S4 and S5 jumpers.
In an original PB-2000C, these jumpers look like the following photograph:



The technician performing the modification needs to remove the solder on S5 and make sure that it is no longer connected (open) and place solder on S4 to connect it (shorted)[2].

With the SRAM IC installed and the final jumper configuration set, the 32 kB hardware modification is complete. You may now reassemble the housing: return the black plastic hold bar, switch, and springs to their original positions, and carefully secure the screws. If any small pieces of tape were damaged or removed during the procedure, replace them. The overarching goal is to leave the device in the exact condition you received it.

2 Note that these jumpers relate to page 27 of the Service Manual, where S5 is short and S4 is open.

With the PB-2000C/AI-1000 open on your rework station, take this opportunity to perform a quick preventive maintenance procedure: replace the two electrolytic capacitors referenced on page 22—C1*O (47µF) and C2*O (100µF)—with suitable tantalum replacements. Be sure to record the exact capacitance values and capacitor models used in your documentation to keep this service record complete.

Original Factory Capacitors

- C1*O: 47µF electrolytic (Part No. CE04C-1C470MS5)
- C2*O: 100µF electrolytic (Part No. CE04C-1E101SS)

Replace with radial aluminum electrolytic capacitors, 47 µF and 100 µF respectively.

After all tasks are complete turn on the device and insert a small probe into the NEWALL and RESET key holes on the back. This will initialize the memory state of the pocket computer.

Functional testing is next.

Functional Testing

Press [**CAL**] to put device in Calculator mode.

The PB-2000C and AI-1000 feature an undocumented monitor launched with the command **CLEAR MON** [**EXE**]. Please take a moment to familiarize yourself with this tool.

Supported **MON** commands:
B Displays the current bank and prompts for a new memory bank 0..3
D Shows memory contents at the current address
E Edits memory contents at the current address
D and **E** accept an optional address. For example: D0F00

All commands must be followed by [**EXE**].

This is the memory organization of a PB-2000C with no language card installed.

Bank	Address	Usage
0	0000-0BFF	Inaccessible CPU internal ROM
	0C00-0C07	HD61710 registers
	0C08-0C0F	same as 0C00-0C07
	0C10-0C11	Gate Array registers
	0C12-FFFF	language ROM (built-in or inserted ROM Language Card)
1	0000-7FFF	RAM Main 32 kB
	8000-FFFF	RAM Additional 32 kB
2	8000-FFFF	RAM Additional 32 kB
3	0000-7FFF	Used by DL-Pascal only, lower half of the DL-Pascal ROM

CLEAR MON [EXE]



Go to bank 1 and use **E7FFC [EXE]** to put 01 02 03 04 05 06 07 08 starting at that location.



Use **D7FFC [EXE]** to confirm that bank 1 has bytes on both lower and upper 32 kB.



Go to bank 2. Use **E8000 [EXE]** to put **AA BB CC DD** starting at that location.



D8000 [EXE] to confirm.



These tests confirm that the device has three 32 kb RAM ICs operating across banks 1 and 2.

Acknowledgments

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Special thanks to Betka for her continued and loyal support.

This is a collaboration with Gemini. All errors are human.

This work is freely shared with the vintage computing community. Please use it, build upon it, and cite the source.

Revision 2.