

H8-8080A-64K RAM ORG0 BOARD (2023 Rev 1.0)

Assembly Guide

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1.0 Disclaimer of Liability

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2.0 Introduction

The H8 8080A/Z80 64K RAM ORG0 V1.3 supplies the H-8 computer with 64K of RAM and provides on-board ORG 0 functionality. This documentation is for board revision 2023 ver. 1.0. The RAM can be configured in several ways with the switches and jumpers located on the board. SW2 allow you to choose which bank of memory is turned on. Another great feature of this board, is that you can enable only the first two banks and disable the rest. Old memory board(s) can be put behind the last address and use the front panel to debug the old memory boards.

3.0 Technical Assistance

The best way to obtain technical assistance and ask questions is via the SEBHC Google group located here: <https://groups.google.com/forum/#!forum/sebhc>. There are many experts that hang out in this group who are willing to help. The SEBHC main website is loaded with helpful documentation on vintage Heathkit computers.

Norberto Collado's website has many replacement cards for those who are restoring vintage Heathkit computers. This includes the H8 8080A/Z80 64K RAM ORG0 V1.0 board.

Norberto's website is: <http://koyado.com/>. Please report all errata to this guide at the SEBHC Google group.

4.0 Assembly

This revised assembly guide H8 8080A/Z80 64K RAM ORG0 V1.3, Assembly, Configuration and Installation Guide, by David Troendle, Document Revision 8, December 18th, 2017. This update reflects changes in the new 2023 Rev 1.0 Board components and design by Norberto Collado.

Within each assembly section, parts of that type are listed as bullet items. For each part, the number of parts required along with a full description of the part are included. Beneath each item, the locations where that part is used are listed. There is a space on the left to check off each item as you install it. Note that some parts are optional. Installing all instances of a part at a time helps reduce assembly errors and eases pulling parts. The order of assembly helps reduce mechanical problems. As each component is installed, check it off.

It may be helpful to refer to the top view of the board on page 15.

4.1 Resistors

- Install 1, 100 (metal film, 5%, 1W, axial, 0.25") as follows:

(☐) at R6.

- Install 2, 220 (carbon/metal film, 5%, 1/4W, axial, 0.25") as follows:

(☐) at R1.

(☐) at R2.

- Install 4, 330 (carbon/metal film, 5%, 1/4W, axial, 0.25") as follows:

(__) at R3.

(__) at R5.

(__) at R7.

(__) at R12.

- Install 3, 1K (carbon/metal film, 5%, 1/4W, axial, 0.25") as follows:

(__) at R8.

(__) at R13.

(__) at R14.

- Install 3, 2K (carbon/metal film, 5%, 1/4W, axial, 0.25") as follows:

(__) at R4.

(__) at R9.

(__) at R10.

4.2 Diodes

Diodes are polarized. The black band on the left side of the glass bead indicates the cathode ("—" lead). This should be aligned with the bar on the silkscreen.

- Install 4, 1N5819 (DO-41) as follows:

(__) at D4.

(__) at D5.

(__) at D7.

(__) at D10.

- Install 3, 1N4148 as follows:

(__) at D3.

(__) at D6.

(__) at D9.

4.3 LEDs

LED's are polarized. Notice one lead is longer than the other. The longer lead is the anode ("+").

- Install 1, LED (radial, green, 0.1") as follows:

(__) D1/POWER-LED.

- Install 1, LED (radial, red, 0.1") as follows:

(__) D2/Side-Select.

- Install 1, LED (radial, yellow, 0.1") as follows:

(__) D8/A16 ENABLED.

4.4 Capacitors

Some components are available in either axial or radial packages. This terminology refers to how the leads exit the component. When the leads exit the component on either side through the center axis, the package is said to be axial. When the leads exit the component on one side, the package is said to be radial.

- Install 15, .1 uF (ceramic, radial, 0.1") as follows:

(__) at C6.

(__) at C7.

(__) at C8.

(__) at C9.

(__) at C10.

(__) at C11.

(__) at C12.

(__) at C13.

(__) at C14.

(__) at C15.

(__) at C16.

(__) at C17.

(__) at C18.

(__) at C19.

(__) at C21.

4.5 Tantalum Capacitors

Tantalum Capacitors are polarized. Tantalum capacitors have two terminals: the anode and the cathode. The longer lead or the lead marked with a "+" symbol indicates the anode, which is the positive terminal.

- Install 4, 33 uF (tantalum, 25V, radial, 0.1") as follows:

(__) at C1.

(__) at C2.

(__) at C20.

(__) at C5.

4.6 Resistor Packs

- Install 2, 1K bussed (SIP-9) as follows:

(__) at RR1.

(__) at RR2.

4.7 Edge Connectors

- Install 2, 25 Position Receptacle Connector 0.100" right angle gold (Samtec BCS-125-L-SHE, Digi-Key SAM1009-25-ND) as follows:

(__) at P1.

(__) at P2.

4.8 Jumpers

- Install 4, 1x2 Straight Male Pin Header (0.1", 0.025" square posts) as follows:

(__) at JP1.

(__) at JP2.

(__) at JP4.

(__) at JP6.

- Install 2, 1x3 Straight Male Pin Header (0.1", 0.025" square posts) as follows:

(__) at JP3.

(__) at JP5.

- Install 1, 1x3 right angle friction lock (0.1", 0.025" square posts) as follows:

(__) at J1.

- Install a wire between the left and middle through-holes at:

(__) JP8. Do not install jumper.

4.9 Switches

- Install 2, 8 position DIP switch (DIP-16, 0.3") as follows:

(__) at SW1.

(__) at SW2.

4.10 Sockets

- Install 6, 14-Pin socket (DIP, 0.3") as follows:

(__) at U1.

(__) at U15.

(__) at U3.

(__) at U5.

(__) at U6.

(__) at U7.

- Install 1, 16-Pin socket (DIP, 0.3") as follows:

(__) at U12.

- Install 5, 20-Pin socket (DIP, 0.3") as follows:

(__) at U10.

(__) at U2.

(__) at U4.

(__) at U8.

(__) at U9.

- Install 1, 32-Pin socket (DIP, 0.6") as follows:

(__) at U16.

4.11 Integrated Circuits

When placing ICs in their socket, orienting pin 1 correctly is important. There are three ways to do this. In order, they are: 1- Most ICs have a dot or circular indentation over pin 1; 2 - If a dot is not present, there is usually a notch. The notch is the top of the IC. Pin 1 is to the left of the notch. Beware, some ICs have two notches. Use the larger notch; 3 - If all else fails, you can use the text on the IC. Pin 1 will be the leftmost pin below the text.

- Install 1, 74HCT/LS02 (Quad 2-input NOR gates, DIP-14, 0.3") as follows:

(__) at U7.

- Install 1, 74HCT/LS14 (Hex inverters w/Schmitt Trigger, DIP-14, 0.3") as follows:

(__) at U1.

- Install 2, 74HCT/LS30 (8-input NAND gate, DIP-14, 0.3") as follows:

(__) at U5.

(__) at U15.

- Install 1, 74HCT/LS38 (Quad 2-input Open Collector NAND gates, DIP-14, 0.3") as follows:

(__) at U6.

- Install 1, 74HCT/LS74 (Dual positive-edge-triggered D flipflops, DIP-14, 0.3") as follows:

(__) at U3.

- Install 1, 74HCT/LS138 (3 To 8 Decoder/Demultiplexer, DIP-16, 0.3") as follows:

(__) at U12.

- Install 4, 74HCT/LS540 (Octal buffer/line driver with 3-state outputs, DIP-20, 0.3") as follows:

(__) at U2.

(__) at U4.

(__) at U8.

(__) at U9.

- Install 1, 74HCT/LS640 (Octal bus transceivers, DIP-20, 0.3") as follows:

(__) at U10.

- Install 1, AS6C1008-55PCN (128Kx8 SRAM, DIP-32, 0.6") (See Section 6.7 on page 7 for handling considerations and Section 6.8 on page 7 for speed considerations.) as follows:

(__) at U16.

- Install 1, TL7757 (Supply-Voltage Supervisor, TO-92) as follows:

(__) at U14.

4.12 Voltage Regulator

Voltage regulators are installed with a regulator, heat sink, screw, nut and thermal paste. There are two options for installing a voltage regulator on this version board assembly.

If using the H8 Circuit Board Mounting Bracket (flat bracket) available from retrocomputers.org (Todd Goodman), bend the three leads exiting the 7805 regulator down 90 degrees.

- Install 1, 7805 5V Voltage regulator at:

(__) U13. The three leads go through the holes on the board.

Place thermal compound on the back of the regulator and attach it to the mounting hole on the bracket and affix with M3 screw and nut.

If using an original Heath Company mounting bracket (L-shaped), assemble the regulator and heatsink (TO-220, compact, 0.5" width) with thermal compound using M3 screw and nut. Do not bend the leads then install the regulator at U13.

4.13 Battery Cells

- Install 1, CR1220 Li-Ion Button Coin Cell Battery holder w/Tab (3.6V, 40mAh) as follows noting alignment (top contact w/tab is positive).

(__) at BT2.

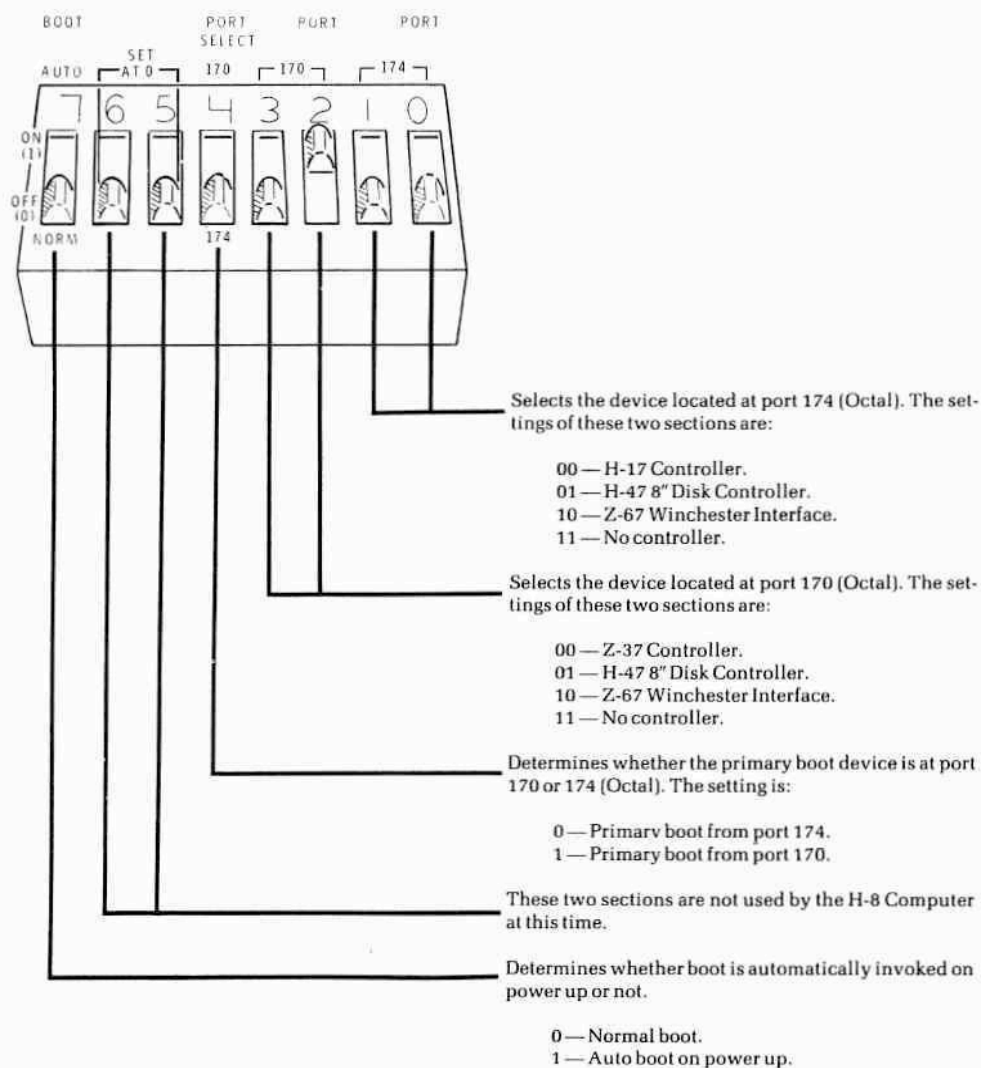
- Leave BT1 blank at this time.

5.0 Configuration

5.1 Switch Settings

1. Refer to Figure 1 below to set the Extended Configuration 8-position DIP switch at SW1 (Status Port). Note the numbering on the switch may not match the numbering on the silkscreen. Always use the number on the silkscreen. Also, the mechanism for closing the switch varies with the switch. Always use the documentation on the switch to determine the on/off position.

Figure 1 – Configuration Switch Settings



2. Table 1 on page 12 details the address selection switch settings for the PAM/8 and XCON-8/PAM37 monitors. Set SW2 to the settings appropriate for your monitor. As before, use the switch numbering on the silkscreen and the on/off position marked on the switch.

Table 1 - Address selection switch settings (SW2)

XCON-8/PAM37 Monitors			PAM-8 Monitor		
Memory Bank	Address Range (Octal)	Switch Position	Memory Bank	Address Range (Octal)	Switch Position
8K	000-000Q to 037-377Q	1 = ON	0	000-000Q to 037-377Q (Reserved for Monitor)	1 = OFF
16K	040-000Q to 077-377Q	2 = ON	8K	040-000Q to 077-377Q	2 = ON
24K	100-000Q to 137-377Q	3 = ON	16K	100-000Q to 137-377Q	3 = ON
32K	140-000Q to 177-377Q	4 = ON	24K	140-000Q to 177-377Q	4 = ON
40K	200-000Q to 237-377Q	5 = ON	32K	200-000Q to 237-377Q	5 = ON
48K	240-000Q to 277-377Q	6 = ON	40K	240-000Q to 277-377Q	6 = ON
56K	300-000Q to 337-377Q	7 = ON	48K	300-000Q to 337-377Q	7 = ON
64K	340-000Q to 377-377Q	8 = ON	56K	340-000Q to 377-377Q	8 = ON

5.2 JUMPERS

- JP1 - "CHARGE": By default is installed as it is used to charge the battery. Remove it if the battery is non-rechargeable.
- JP2 - "RBAT (Remove Battery)": On for normal operation. Removed when replacing the RAM IC.
- JP3 - "H8-SS (Side Select)": Select which backplane pin receives the side select signal for the H17 controller. Choices are pin #18 or pin #24.
- JP4 - "A16SW (RAM Address A16 Connects to an External Switch)": External switch "OFF" for normal operation. When external switch is "ON", it enables the second bank of the 64K RAM, so that the user can key-in manually any programs that they want to preserved. LED D8 turns on when switch is in the "ON" position.
- JP5 - "ORG-DISABLE": Insert jumper between pins 1-2 for normal operation. Insert jumper between pins 2-3 to disable the circuit if using the Heath ORG0 card. Please disable when using Heath/Zenith Z80 or Les Bird's Z80 CPU board. Please enable for the 8080 CPU board.

- JP6 - “BRD-DISABLE”: This is useful for bank switching and adding more than 1 board.

- “TP1 BAT”: This the test point. Should be 4.75V when power is on and 4.50V when power is off.
- “TP2-RESET”: This the test point.

6.0 Final Assembly

There is a gap between the edge connectors on the right side of the board. On Heathkit boards a solid nylon spacer is installed in the gap. The spacer ensures the board is aligned properly when plugged into the backplane. Similar provisions should be made for this board. One easy solution is to glue a jumper header into gap using Gorilla glue.

The last step is a visual inspection of the board looking for:

- _ Unsoldered connions
- _ Cold solder joints
- _ Solder bridges
- _ The correct ICs are inserted into their sockets
- _ The ICs are oriented in their socket correctly and there are no bent pins
- _ Jumpers are installed correctly

7.0 Installation

- _ If the system contains an HA8-8 Extended Configuration Card (commonly known as an ORG 0 board), remove it.

- _ Install the H8 8080A/Z80 64K RAM ORG0 V1.0 in a backplane slot behind the CPU card. Ensure the edge connectors properly align with the backplane pins.

