H8 Dual CF Storage Controller Assembly and User Guide

(2023 Rev 2.1)

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Figure 1 – Top view of Completed H8 Dual CF Storage Controller

1 Contents

2 Disclaimer of Liability

These instructions are provided "as is" and in good faith. We make no representation or warranty of any kind, express or implied, regarding the accuracy, adequacy, validity, or completeness of any information.

3 Introduction

The H8 Dual CF (Compact Flash) Storage Controller[1] is a mass storage device that stores programs and other digital information for the Heath H8 digital computer. It consists of a single board which can contain one or two Compact Flash (CF) cards. Software drivers have been developed for the Digital Research CP/M 2.2 operating system as well as Heath's HDOS (versions 2 and 3). A ROM-able boot software program has also been developed.

This document describes the second generation of this board (V2.1). A previous design (no longer supported) used Intel 8255 Programmable Peripheral Interface (PPI) chips to interface to the CF cards.

4 Technical Assistance

The board was developed as a collaborative effort by members of the "Society of Eight-Bit Heathkit Computerists" (SEBHC), which maintains an on-line email-based discussion forum using Google Groups[2]. For more real-time interaction there is also a Discord[3] discussion server entitled "SEBHC."

The best way to obtain technical assistance and ask questions is via the SEBHC Google group or the Discord server. There are many experts who participate in these venues and are willing to help. The SEBHC also maintains a web repository[4] and wiki page[5] which are loaded with helpful documentation and software on vintage Heathkit computers.

Norberto Collado has served as the lead developer for many modern H8 boards (including the Dual-CF board) and maintains several web sites with detailed information on the boards including bills of material (BOMs), assembly and user guides, schematics, Gerber files and more.

[1] https://koyado.com/heathkit/New-H8-Website/h8-dual-cf-controller.html
[2] https://groups.google.com/g/sebhc
[3] https://discord.com/
[4] https://sebhc.github.io/sebhc/
[5] https://github.com/sebhc/sebhc/wiki

Current and recently developed boards are here: https://koyado.com/heathkit/New-H8-Website/ and older/legacy designs are archived at https://koyado.com/.

Errors or suggested enhancements to this guide should be reported to the SEBHC Google group.

5 Components

The printed circuit board (PCB) for the Dual CF controller is available from Todd Goodman as "H8 Dual CF Storage Controller v2.1"[6].

A BOM including part numbers and suggested sources is contained on Norberto's web site[7].

6 Assembly

These assembly instructions illustrate assembly and configuration of the H8 Dual CF Storage Controller. Experience has shown the value of beginning assembly with smaller passive components such as resistors and capacitors, saving the sockets, headers and semiconductors for last, so the instructions are organized in this fashion.

Within each assembly section, parts are listed as bullet items. For each part, the number of parts required along with a description of the part are included. Beneath each item, the locations where that part is to be installed are listed. If you print these instructions, you can use the space on the left to check off each item as you install it.

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 component is said to be axial. When the leads exit the component on one side, the component is said to radial.

It may be helpful to refer to the top view of the circuit board on the front page (Figure 1).

[6] https://retrobrewcomputers.org/doku.php?id=boardinventory#norberto_collado_s_heathkit_h8_h89_boards
[7] https://koyado.com/heathkit/New-H8-Website/download/h8-dual-cf-storage-bom.xlsx.zip

6.1 Resistors

• Install 9, 330 (carbon/metal film, 5%, 1/4W, axial) as follows:

(__) at R1.

(__) at R4.

(__) at R6.

(__) at R8.

(__) at R12.

(__) at R17.

(__) at R18.

(__) at R19.

(__) at R20.

• Install 15, 3.3K (carbon/metal film, 5%, 1/4W, axial) as follows:

(__) at R2.

(__) at R3.

(__) at R7.

(__) at R9.

(__) at R10.

(__) at R11.

(__) at R21.

(__) at R22.

(__) at R23.

(__) at R24.

(__) at R25.

(__) at R26.

(__) at R27.

(__) at R28.

(__) at R65.

• Install 3, 10K (carbon/metal film, 5%, 1/4W, axial) as follows:

(__) at R5.

(__) at R14.

(__) at R15.

• Install 1, 150 (carbon/metal film, 5%, 1/4W, axial) as follows:

(__) at R13.

• Install 1, 120K (carbon/metal film, 5%, 1/4W, axial) as follows:

(__) at R16.

• Install 2, 100 (carbon/metal film, 5%, 1/4W, axial) as follows:

(__) at R29.

(__) at R30.

6.2 Diodes

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

• Install 1, 1N5819 as follows:

(__) at D7.

• Install 2, 1N4148 as follows:

(__) at D4.

(__) at D5.

6.3 LEDs

LED's are polarized. You will notice that one lead is longer than the other. The longer lead is the anode ("+"); the shorter lead is the cathode ("-"). The silkscreen images for LEDs are circular with a flattened side. The flattened side indicates where the cathode lead (shorter lead) should be inserted. The anode lead (longer lead) hole is also noted with a "+" on the board.

The LEDs should be radial style with 0.1” lead spacing. The size (3mm or 5mm) and color used for each function is a personal choice (suggested colors are shown in parentheses).

• Install 1, LED (green) as follows:

(__) D1 Power.

• Install 1, LED (yellow) as follows:

(__) D10 Reset.

• Install 5, LED (red) as follows:

(__) D2 CF I/O #1

(__) D3 CF-I/O #2

(__) D6 I/O.

(__) D11 /CS0.

(__) D12 /CS1.

Installation of D13 and D14 is optional.

6.4 Ceramic Capacitors

• Install 17, .1uF (ceramic, radial, 0.1”) as follows:

(__) at C5.

(__) at C7.

(__) at C8.

(__) at C9.

(__) at C12.

(__) at C13.

(__) at C14.

(__) at C15.

(__) at C16.

(__) at C17.

(__) at C20.

(__) at C21.

(__) at C22.

(__) at C23.

(__) at C24.

(__) at C25.

(__) at C27.

Do not install C10 or C11

6.5 Tantalum Capacitors

Tantalum Capacitors are polarized. Tantalum capacitors have two terminals: the anode lead is longer in length and marked with a "+"; the cathode lead is shorter. On the silk-screening of the board the hole for the cathode (shorter lead) is indicated by white shading. Install the capacitor with the short lead in that hole.

• Install 1, 33 uF (tantalum, 25V, radial, 0.1") as follows:

(__) at C1.

• Install 5, 2.2 uF (tantalum, 35V, radial, 0.1") as follows:

(__) at C2.

(__) at C3.

(__) at C4.

(__) at C6.

(__) at C26.

• Install 2, 1.0 uF (tantalum, 35V, radial, 0.1") as follows:

(__) at C18.

(__) at C19.

6.6 Compact Flash Adaptors

Installation note – The through-hole leads of the CF Adaptors and the soldering pads on the circuit board are spaced very closely. A fine point soldering tip and fine solder (0.3mm) is

recommended. A magnifying work lamp can also be useful. After soldering, you may want to use a continuity checker (VTVM, VOM, etc.) to test adjacent leads for short circuits. The exceptions are pins 8 to 12 and 14 to 17; these are all tied to ground.

• Install 2, CF Adaptors (CFT-125-01-L-D-RA-01-SL) as follows:

(__) at CFT-A

(__) at CFT-B

6.7 Buss (Edge) Connectors

Note that there are four sets of holes along the right side of the board marked “J5”, “H8”, “J6”, and “J7”. These can accommodate two types of edge connectors: the original Molex style or a newer style from Samtec.

The Molex connectors, used on the original Heathkit boards, are Molex part # 22-16-2251 but are generally obsolete and hard to find. It is possible to use a combination of 10-position and 15-position connectors (Molex 22-16-2101 and 22-16-2151) which are still available. If using Molex connectors use the holes in the row marked “H8”.

The Samtec connectors are part # BCS-125-L-S-HE (Digi-Key part #SAM1009-25-ND; Mouser part #200-BCS125LSHE). The rear side of these connectors have open holes where the connector is visible inside the housing. The front side has closed holes. The connectors should be installed with the front side to the edge of the board (row marked “J5”) and the rear side toward the component side of the board (row marked “J6”).

The row marked “J7” is for optional installation of headers for use in board testing and measurement.

• Install the Samtec or Molex edge connectors as follows:

(__) at H8 top buss connector (board edge).

(__) at H8 bottom buss connector (board edge).

6.8 Jumper Headers

• Install 6, 1x3 Straight Male Pin Header (0.1”, 0.025” square posts, 0.236” pin height) as follows:

(__) at JP1.

(__) at JP2.

(__) at JP3.

(__) at JP4.

(__) at JP5.

(__) at JP6.

• Install 1, 1x2 Straight Male Pin Header (0.1”, 0.025” square posts, 0.236” pin height) as follows:

(__) at JP23.

6.9 Sockets

Note: 14-pin, 16-pin and 20-pin IC sockets are used on this board. Make sure all pins are straight and insert the socket pins into the circuit board holes. The index mark (curved indent) on the circuit board must be aligned with the curved indent on the socket.

• Install 8, 14-Pin socket (DIP, 0.3”) as follows:

(__) at U2.

(__) at U3.

(__) at U6.

(__) at U10.

(__) at U11.

(__) at U12.

(__) at U14.

(__) at U16.

• Install 2, 16-Pin socket (DIP, 0.3”) as follows:

(__) at U4.

(__) at U8.

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

(__) at U1.

(__) at U5.

(__) at U7.

(__) at U9.

(__) at U28.

6.10 Integrated Circuits

When placing ICs in their socket it is important to orient pin 1 correctly. Most ICs have a notch, which represents the top of the IC. Holding the IC vertically with the notch at the top, pin 1 is to the left of the notch at the top of the chip. There may also be a dot or circular indent over pin 1. Also, as you read the text on the IC (manufacturer, part number, etc.) pin 1 will be the leftmost pin below the text.

If the IC is new the leads will generally be angled slightly outward (this is to accommodate automatic insertion machines used in factory assembly). To place the leads at right angles to the body of the IC place the chip on its side on solid surface and gently roll the IC to bend all of the leads slightly toward the center.

• Install 2, 74HCT541 (Buffer, Non-inverting) as follows:

(__) at U1.

(__) at U7.

• Install 2, 74HCT32 (Gate, OR, 4-channel) as follows:

(__) at U2.

(__) at U3.

• Install 1, 74HCT123 (MMV, 2-circuit) as follows:

(__) at U4.

• Install 3, 74HCT14 (Invert Schmitt, Trigger, 6-channel) as follows:

(__) at U6.

(__) at U11.

(__) at U16.

• Install 1, 74LS175 (Flip-flop, D-type, 4-bit, positive) as follows:

(__) at U8.

• Install 1, 74ALS640 (Transceiver, inverting, 8-bit) as follows:

(__) at U9.

• Install 2, 74HCT74 (Flip-flop, D-type, double, 1-bit) as follows:

(__) at U10.

(__) at U12.

• Install 1, 74HCT30 (NAND gate, 1-channel) as follows:

(__) at U14.

• Install 1, 74HCT540 (Buffer, inverting, 8-bit, 3-channel) as follows:

(__) at U28.

6.11 Programmable Logic Device

U5 is a Gate-Array Logic (GAL) device which must be programmed before use. Information of programming the GAL is available at https://koyado.com/heathkit/New-H8-Website/h8-dual-cf-controller.html

• Install 1**,** ATF16V8B-15PU (16V8 Programmable Logic Device (PLD) IC 8 Macrocells 20-PDIP) as follows:

(__) at U5.

6.12 Heat Sink/Bracket

It is recommended that an aluminum bracket be installed along the left side of the board. These are available from the same site where you ordered the board. The bracket serves to hold the board upright and lets you secure it in place to the aluminum bar on the left side of the chassis. It also serves as a heat sink for use with the 7805-style regulator.

There are two styles of brackets as shown in Figure 2. Either can be used.

Figure 2 - Flat and "L" style heat sink brackets.

Install the bracket using two #6-32 x ¼” screws with nut and lock washer.

(__) Heat sink/bracket.

6.13 Voltage Regulator

There are two options for the voltage regulator: a traditional style 7805 regulator, secured (for heat sink purposes) to the aluminum bracket, or a step-up/step-down style such as the Pololu S9V11F5 (Pololu item #2836). The step-up/down type, though more expensive, have the benefit of producing little or no heat and can also be used in an H8 chassis equipped with an ATX-style power supply.

The Pololu regulator can be installed using the 3-pin header provided with the device. Be sure to orient the input and output connectors correctly as shown in Figure 3.

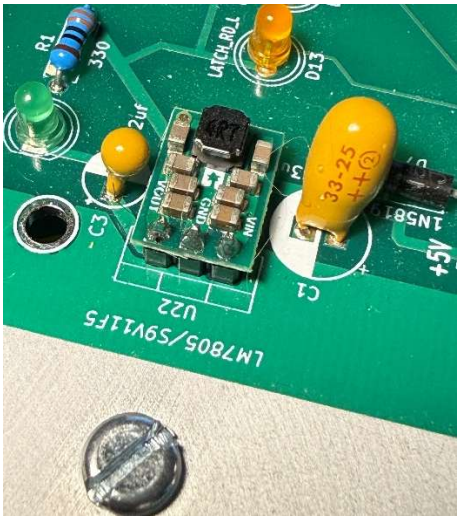

Figure 3 - Installation of Pololu step-up-down regulator

If using a 7805-style voltage regulator you should attach it to the heat sink using a 6-32 screw, nut and lock washer. It is recommended that you apply thermal paste between the regulator and the bracket. With the traditional Heath Company “L” style heatsink (see Figure 2) you will mount the regulator on the upright flange and will need to prepare three 2” insulated leads. The leads should be soldered to the regulator and to the appropriate holes on the PC board at location U22. Be sure to observe the correct polarity.

With the flat style bracket, you can attach the regulator directly to the face of the bracket using a 6-32 3/8” screw and lock washer, bending the leads at a right angle to fit into the holes on the PC board.

• Install 1, LM7805 or Pololu S9V11F5 regulator at:

(__) U22.

7 Board Configuration

Set the programming jumpers as follows (see Figure 4):

(__) JP1 (RD_L)
(__) JP2 (WR_L)
(__) JP3 (IORQF)
(__) JP4 (RESET_H_L)
(__) JP5 (CF-BRDL/CF-RDL)
(__) JP6 (CF-BWRL/CF-WRL)

(__) JP23 (BUFFER-ON/OFF)

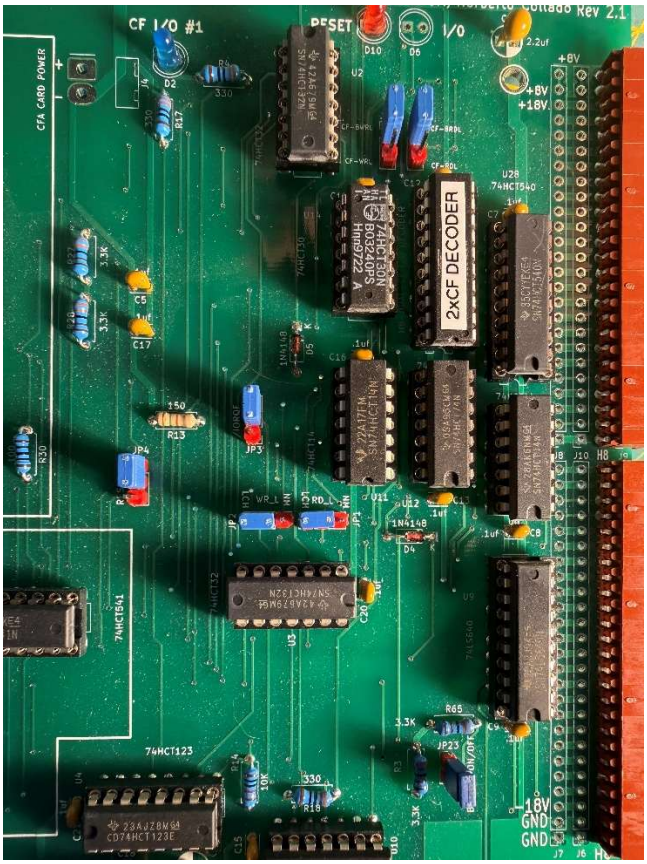

Figure 4 - Recommended jumper settings.

Note: JP20 is for use only in an H8 with an ATX-style power supply. It bypasses the regulator by applying the buss “8v” signal directly to the board. This should only be used if the ATX-style power supply is providing regulated 5 volts on that line.

8 Final Assembly

There is a gap between the edge connectors on the right side of the board. It is advisable to block this space with something solid to prevent installing the board in a “one off” position. Unfortunately, on the H8 a “one off” installation will introduce a short in the power supply potentially damaging the board and the power supply.

On original Heathkit boards a solid nylon spacer is installed in the gap. Similar provisions should be made for this board. One solution is to glue a shorting block into gap using Gorilla glue (Figure 5):

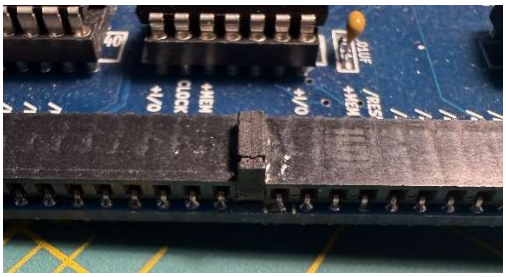

Figure 5 -Using a shorting block to close the gap between edge connectors.

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

- Unsoldered connections.
- Cold solder joints.
- Solder bridges.
- Incorrect IC installations (wrong part, wrong orientation, bent pins, etc.).
- Missing components.
- Incorrect jumper installation.

9 CPU Configuration

The Dual CF Storage Controller is not intended to directly emulate any of the original Heath-supported boot configurations; therefore, it needs customized software/firmware to initiate the boot process. A suitable boot program has been developed for this purpose, and there are three approaches that have been used to execute this boot program:

- Load and run the boot program directly as an HDOS or CP/M program (suitable only for systems that can be booted by some other means, e.g. floppy drive).
- Download and run an H8T version of the boot program using the H-8-5 serial/cassette interface board.
- Install a custom boot EPROM or EEPROM on the CPU board and initiate the boot from the ROM monitor.

This document discusses only the third approach. The details are slightly different, depending on which CPU board you are using, as discussed in the following sections.

9.1 8080 CPU Configuration

The Dual CF Controller is particularly well suited for use with the original Heath 8080 CPU board as the software for the Heathkit-provided hard drive solution (the Z-67) required a Z80 processor.

The Heath-provided ROM-based monitor code on the 8080 board, known as “PAM-8” (for PAnel Monitor) evolved through several versions, culminating in the version known as “XCON-8”. XCON-8 was introduced along with the HA-8-8 “Extended Configuration” board, whose primary function was to allow access to the full range of 64K bytes of Random-Access Memory (RAM). This was necessary to run the CP/M operating system. The XCON-8 ROM also incorporated a copy of the ROM routines from the original H-17 (floppy drive) interface board. This provides a useful set of library routines, which are required to run the Heath Disk Operating System (HDOS).

For the instructions that follow, the system components you should have are:

1. An “Extended Configuration” board, either by using the original HA-8-8, or a modern board which incorporates this “ORG0” capability, such as Norberto Collado’s “H8 8080A 64KB RAM Board”[8].
2. An adapter that lets you substitute an Electrically Erasable Programmable Read-Only Memory (EEPROM) for the standard CPU ROM[9].
3. A 28C256 EEPROM chip such as the Atmel AT28C256-15PU, installed in the above-mentioned adapter.

The XCON-8 code is 4K in size, residing in the region from (in Heath’s split octal notation) 000.000 to 017.377. The new Dual CF boot code resides just after that, at 020.000. This will require that you set some jumpers on the 8080 CPU board to allow a full 8K of ROM to be addressed (the 28C256 is a 32K ROM but only 8K of that can be addressed at any time, depending on the settings of the jumpers on the adapter board.)

To modify your 8080 CPU board, perform the following:

Carefully unsolder or cut the following jumper wires:

(__) Wire between holes T1 and T2.

(__) Wire between holes R1 and R2.

(__) Wire between holes S2 and S3.

[8] https://koyado.com/heathkit/New-H8-Website/h8-8080a-64kb-board.html
[9] https://koyado.com/heathkit/New-H8-Website/h8-8080a-28c256-eeprom-adapter.html

(__) Wire between holes P2 and P3.

(__) Wire between holes Z2 and Z3.

Cut three ¾" bare wires. Use these wires in the next three steps:

(__) Solder a ¾" bare wire from hole P1 to hole P2.

(__) Solder a ¾" bare wire from hole Z1 to hole Z2.

(__) Solder a ¾" bare wire from hole X1 to X2.

Since the original Heath 8080 board was designed for a maximum ROM size of only 2K we need to pick up two more address lines to decode a full 8K (A11 and A12). Fortunately, there are locations on the board to easily tap into those signals, see Figure 6 below:

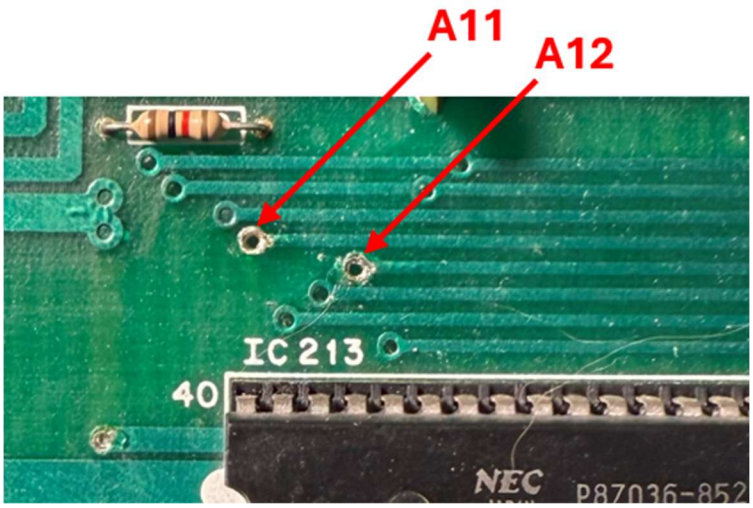

Figure 6 - Locations of A11 and A12 signal lines on 8080 CPU board.

Cut the following lengths of wire, then remove ¼" of insulation from the ends of each:

2 ¼"
2 ¾"

(__) Connect and solder one end of the 2 ¼" wire to hole T2. Connect and solder the other end of the wire to the indicated location for A11. NOTE: Be sure to scrape the solder resist away from this hole on the foil side of the circuit board to insure a good solder connection.

(__) Connect and solder one end of the 2 ¾” wire to hole S2. Connect and solder the other end of the wire to the indicated location for A12. NOTE: Be sure to scrape the solder resist away from this hole on the foil side of the circuit board to insure a good solder connection.

Your board should now look like Figure 7:

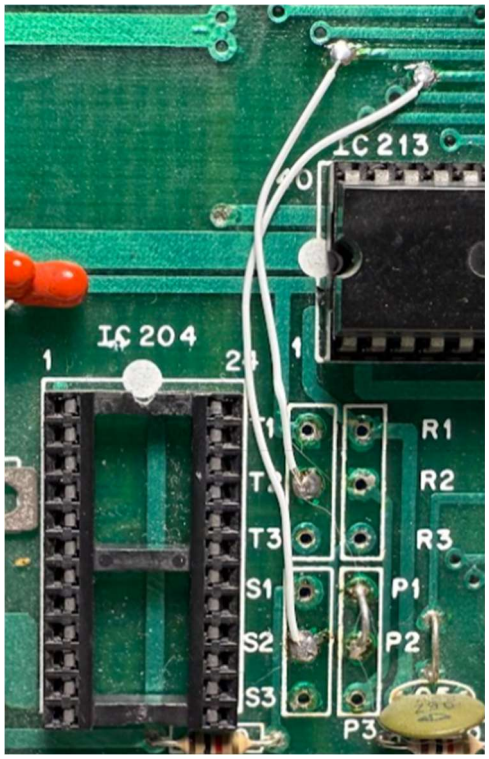

Figure 7 - Completed jumper modifications for 8080 CPU board.

(__) Carefully unplug integrated circuit IC207 from its socket, then gently bend out pins 2 and 3 and re-install the IC in its socket (Figure 8):

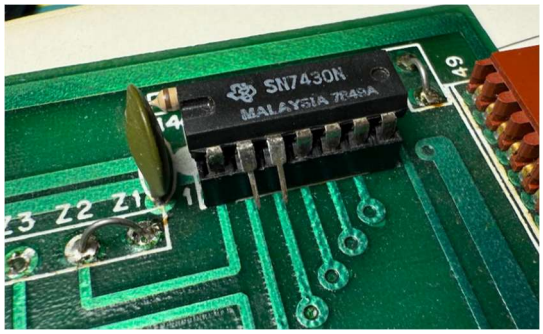

Figure 8 - Modifying IC207 on 8080 CPU board.

Next you need to program the EEPROM. You will need an appropriate EEPROM programmer such as the TL866II Plus, available on Amazon and similar sites. Download the "8080A_XCON8_Monitor" image from Koyado.com[10] and program it into the 28C256 EEPROM following the programmer's directions. Install the EEPROM into the adaptor, setting the two jumpers to their leftmost positions, and plug the adaptor into the 24-pin socket on the 8080 CPU board marked IC204 (Figure 9):

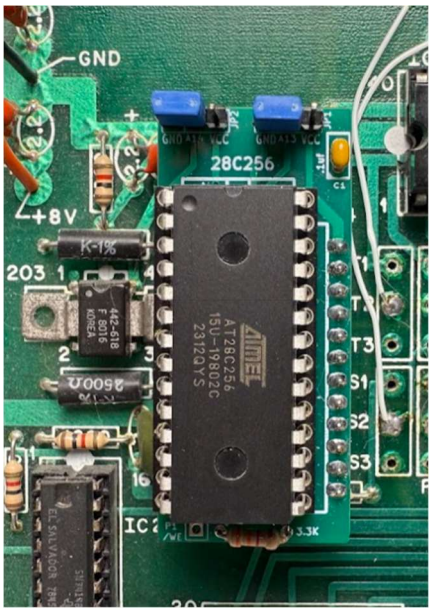

Figure 9 - 28C256 EEPROM installed in ROM adapter on 8080 CPU board.

This completes the modifications to the 8080 CPU board. You may now install at least one RAM board, with starting address set to 000.000, and the CPU board, and power up your H8 to ensure that the PAM software works.

9.2 Z80 CPU Configuration

There are multiple Z80 board options for the H8, including more recent modern "clones" produced by SEBHC members. This documentation only describes how to configure the original Heath brand Z80 board (HA8-6), however the information provided here should help you program and configure other H8 Z80 boards.

There were also two common ROM configurations for the HA8-6. The stock board came configured with the XCON-8 ROM (444-70) but many Z80 users also upgraded to the WH-8-37 Soft-Sectored controller board which came with the PAM-37 (444-140) ROM. The instructions here cover the PAM-37 configuration.

[10] https://koyado.com/heathkit/New-H8-Website/download/hcf-xcon8.bin.zip

9.2.1 PAM-37 Configuration

When using the HA8-6 (Z80) board with the PAM-37 ROM the PAM-37 ROM resides in the upper ROM location on the board (U13) and the XCON-8 ROM is moved to the lower one (U19). The XCON-8 is a 4K ROM but only the upper 2K portion is needed as it contains the H17 ROM code. The lower 2K maps to location 020.000 but is not used.

The file “Heathkit_Z80_444-70_Monitor” at https://koyado.com/heathkit/New-H8-Website/h8-dual-cf-controller.html contains an alternate ROM image that overlays the first 2K of the XCON-8 ROM with the CF boot code. By burning this into an EPROM and installing it at U19 the CF boot code will be visible at address 020.000. To be plug-compatible with the HA8-6 it is necessary to use a 2532 style EPROM:

Figure 10 - Modified XCON-8 ROM with CF Boot Installed in U19.

9.2.2 Other Z80 Board Configurations

There are too many possible Z80 configurations to cover in detail here. The important requirement is to make sure that the CF boot code shows up at location 020.000 (1000 hex) on the H8. The boot code is contained in the first 1K portion of the file “Heathkit_Z80_444-70_Monitor”.

10 Final Configuration and Installation

The CF memory cards used to store operating system images are available in many storage sizes. Though a minimum of 256MB is needed, it is recommended that a card with a capacity of at least 2GB be used. This allows room for future expansion and provides additional flexibility in software development.

Before installing the Compact Flash cards at CFT-A and CFT-B they must be programmed. Instructions on this process may be found at

https://koyado.com/heathkit/New-H8-Website/h8-dual-cf-controller.html

Be sure to scroll down to the section titled: NEW IMPROVED H8 DUAL CF STORAGE CONTROLLER V2.1.

Bootable CF images containing the HDOS-2, HDOS-3, and CP/M 2.2.04 operating systems can be found at that same location. Downloadable software such as HDD-Raw-Copy-Tool[11] can be used to install these images on the CF cards using a memory card reader (many options are available on Amazon). You may install one or two CF cards. If installing one you may install it in either position, however the operating system installed on the board may be designed for use only with only one (consult the appropriate documentation).

Finally, install the H8 Dual CF (Compact Flash) Storage Controller board in a backplane slot behind the CPU card. Ensure the edge connectors properly align with the backplane pins (use a flashlight to double check that the board is installed properly and fully seated). You may want to secure the board to the aluminum heat sink bar on the left side of the chassis using a #6-32 ¼" screw.

10.1 Booting the System via EEPROM

To boot the system via EEPROM you will use the front Panel Monitor keypad (Figure 11):

[11] https://hddguru.com/software/HDD-Raw-Copy-Tool/

Figure 11 - H8 Front Panel Monitor Keypad.

Although there is a “single key” boot option (discussed below), you should also be familiar with the following boot sequence, should you ever need it:

- Press ‘0’ and ‘/’ (RST/0) simultaneously to reset the computer.
- Press MEM 0 0 0 3 6 2 OUT to enable the ROM.
- Press REG PC ALTER 0 2 0 0 0 0 ALTER to set the Program Counter to 020.000.
- Press GO to execute the boot program

Now proceed to the next section 10.3 of this writeup to select the image to boot.

10.2 Single Key Boot Option

Unfortunately, the single-key boot option is not compatible with the Z80/PAM-37 configuration so those users must use the boot sequence described in the previous section.

The XCON-9 ROM allows for a “single boot” option using either the ‘1’, ‘2’, or ‘3’ key on the front panel keypad. The ‘1’ key boots the primary device (typically an H17 or H37 floppy drive) as defined in the Extended Configuration board DIP switches. The ‘2’ key boots the secondary device.

Your EEPROM image has been programmed to have the ‘3’ key automatically execute the boot process for the CF drive, thus to boot the system you need only a single key press

- Press the ‘3’ key to initiate the boot process.

10.3 Selecting the CF Device and Boot Image

After initiating the boot process, you should see the following on the H8 LED display:

Figure 12 - Front Panel Display After Initiating Boot.

This is the prompt to select which CF device to boot from. Press the '0' key to boot from the CF device on the left (CFT-A) or '1' to boot from the device on the right (CFT-B).

Next the software will probe to determine how many bootable images are contained on the specified device and will prompt you to select one:

Figure 13- Front Panel Prompt to Select Boot Image.

In the case shown above there are seven possible boot options, numbered 0 through 6. At the time of this writing the convention has been to use image 0 for HDOS-3, image 1 for HDOS-2 and the subsequent images for various CP/M implementations, however other configurations are possible so consult the appropriate documentation for the image you programmed into the CF device.

To initiate the actual boot, press the appropriate number (e.g. 0 through 6) followed by the '#' key for "enter." The system should then boot your OS, and you should continue the boot process using the system console.

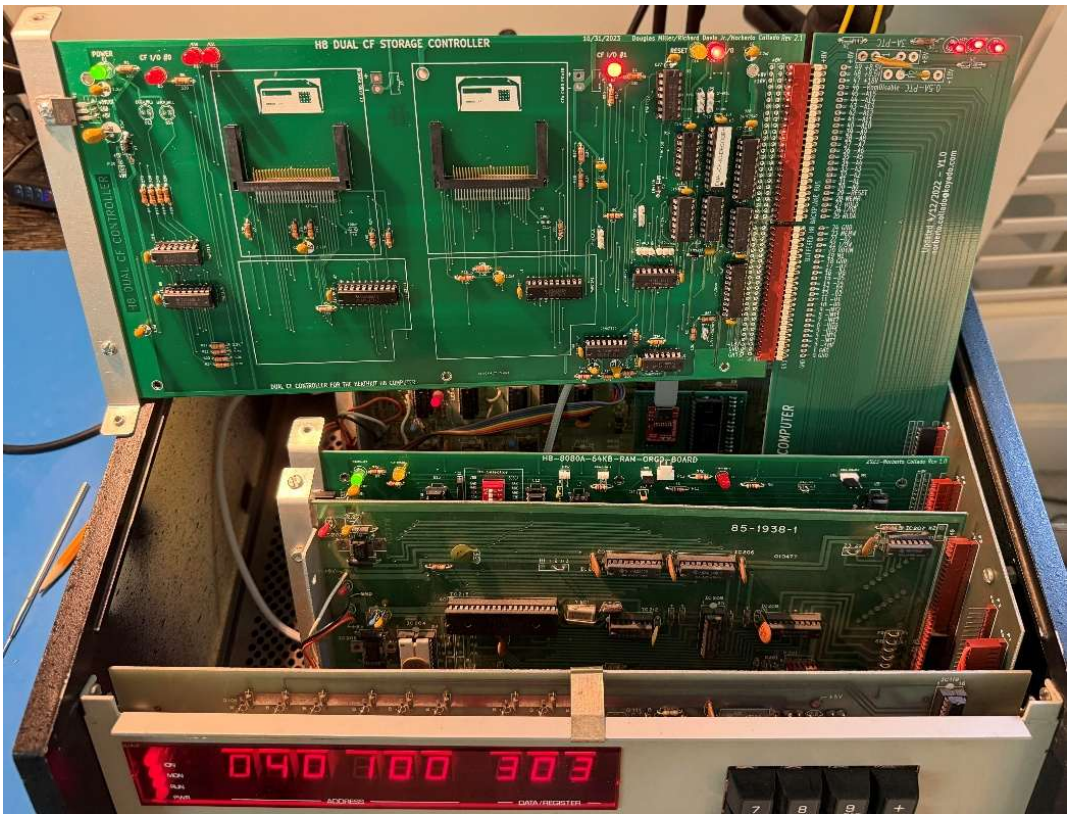

Figure 14 - Completed Dual CF Board Installed in H8 for Testing