H8-8-8 Extended Configuration

The H8-8-8 Extended Configuration card is a replacement for the original Heathkit HA8-8 card. This card is identical in every way except for the following:

1. This card inserts into the H8 facing forward instead of backward to reduce confusion.
2. The card will fit in the back slot if you solder the 25 pin connectors onto the backside (solder side) of the card. Use a rubber foot on the back of the card to keep it from touching the metal power box in the back of the H8.
3. Depending on which dip switch you use, the ON vs. OFF may be different then what was provided with the original HA8-8 Extended Configuration card. The switches on the original were numbered 0 through 7 and the "0" position was actually ON, not off. So in the documentation if you see that the switch should be set to the "0" position this is actually ON. Keep this in mind when configuring the switches on the H8-8-8. Using a standard dip switch the typical configuration would be to set all the switches to the ON position except for 6 which should be set to OFF.

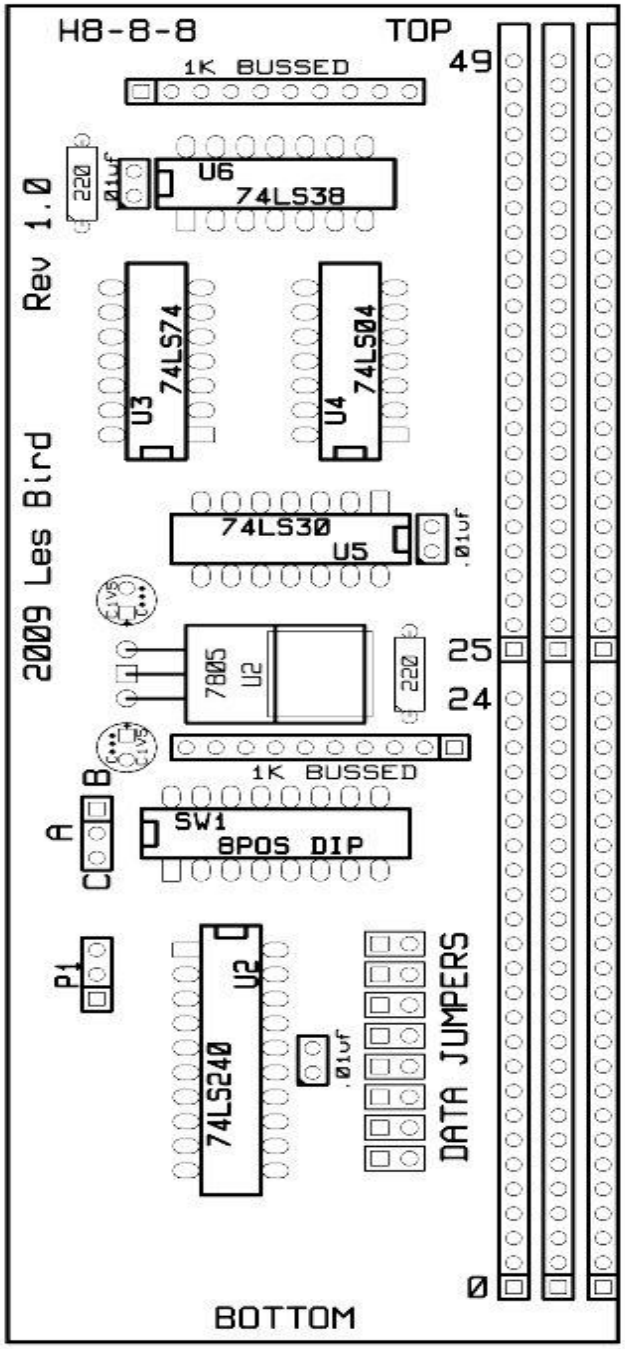
To trouble shoot this card you can use the original HA8-8 schematic as this card is pin-for-pin compatible to the original but with a more compact layout.

The XCON8 ROM that accompanies this card should be installed on the CPU card according to the directions with the exception that this ROM is a 2732 eeprom and will have a slightly different pinout then the original #444-70 ROM did. On the original, pin #18 of the ROM was address line 11 (A11) and on the 2732 pin #21 is A11 and pin #18 is /CS2. If you are using my H8-Z80-64 CPU card then follow the directions to configure it for use with a 2732 ROM.

Contact me at lesbird@bellsouth.net if you have any questions.

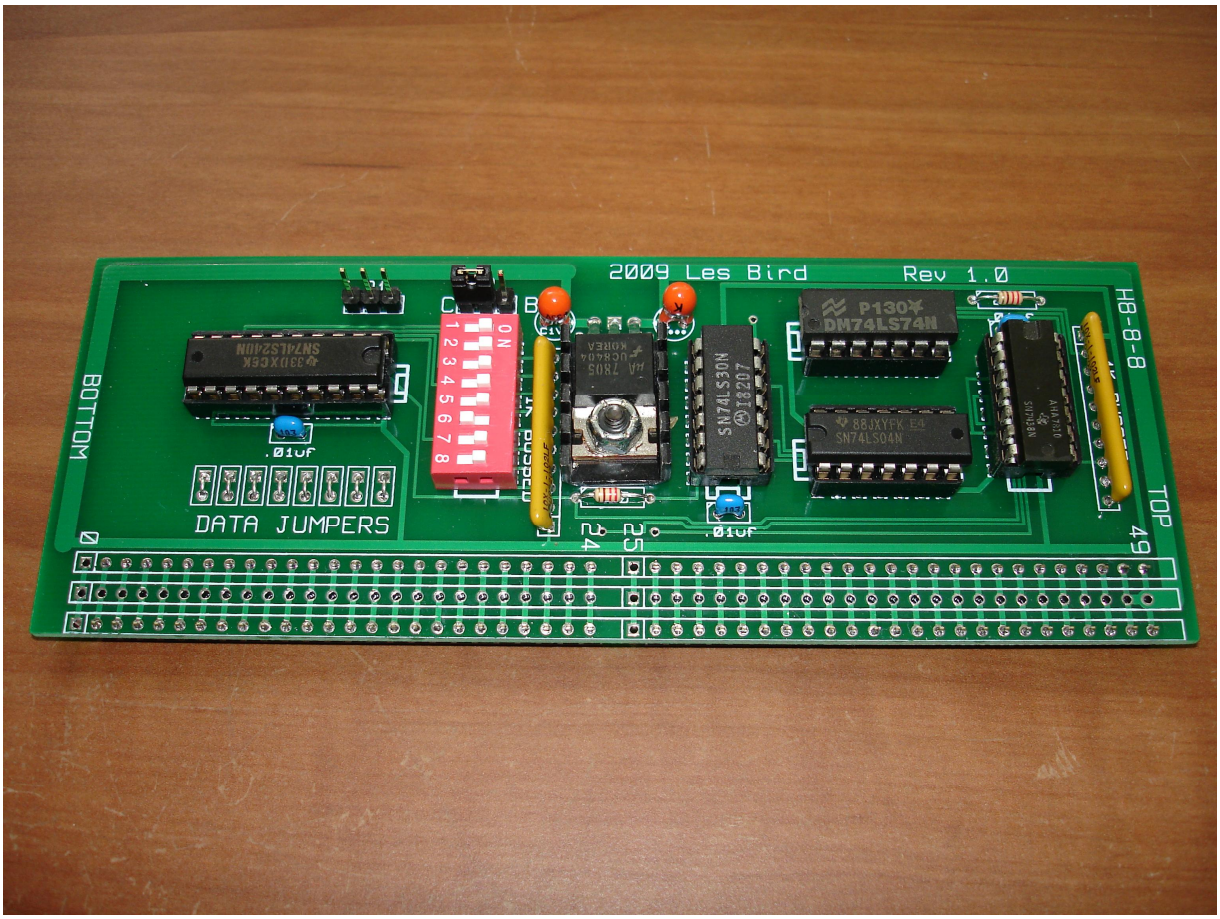
Les Bird

H8-8-8 Extended Configuration



H8-8-8 Extended Configuration

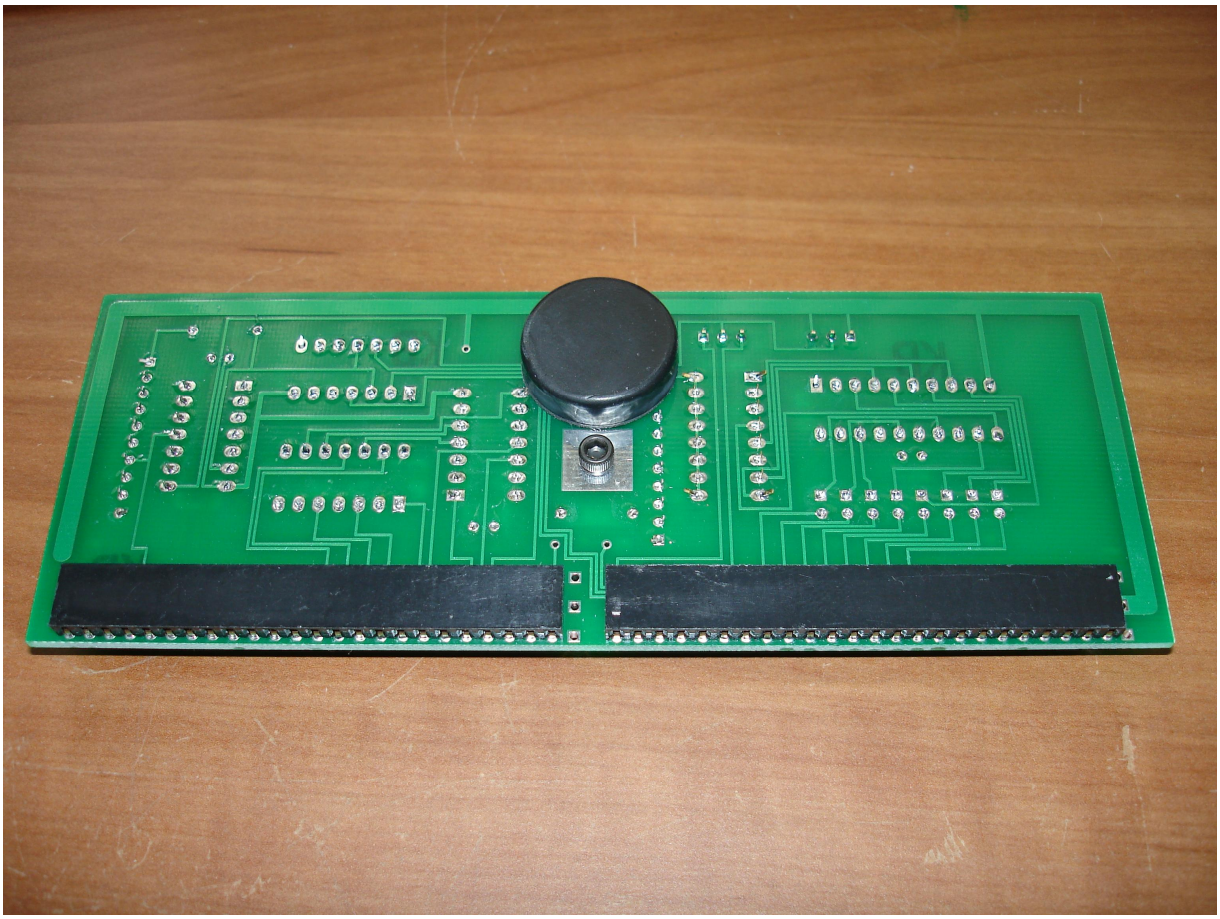
This photo shows the fully assembled card with the edge connectors soldered to the backside of the card so that it can be installed in the last slot of the H8.



The photo shows the card in it’s most common configuration with all dip switches set to the ON position except for 6 which is OFF. The side select jumper is set to position ‘C’ which will use pin 18 of the H8 buss to signal a side select for the H17 disk drives. Your disk controller card should also be configured to use the same H8 buss pin for side select.

H8-8-8 Extended Configuration

This photo shows the backside of the fully assembled card. Note the rubber foot to keep the card from contacting the metal guard for the power supply circuitry.



A photo of the installed card. With the connectors soldered to the back of the card you can install it in the very last slot of the H8.

INITIAL TESTS

The following tests will check the construction of your Extended Configuration Board for errors. It will also check the mother circuit board in your Computer for solder bridges on some of the bus lines which were not used until now. We strongly recommend that you perform these tests before you continue.

NOTE: To perform the following tests, you should have only the following plug-in circuit boards in your Computer:

CPU circuit board

Extended Configuration Board

One 16 k Memory Board set to 040 (or two 8 k Memory Boards, one set to 8 k and the other set to 16 k).

TEST #1

( ) Turn the Computer on. You should hear a short beep, the display should light, and the front panel pushbuttons should operate normally.

If you obtained the proper results, proceed to "Test #2."

If you did not obtain the proper results, remove the Extended Configuration Board and repeat this test. If you now obtain the proper results, check the Extended Configuration Board for solder bridges or other construction errors.

TEST #2

( ) Check the upper right corner of your CPU circuit board for the presence of a jumper wire between holes X1 and X2. If there is a jumper wire at this location, remove it.

( ) Make sure the Extended Configuration Board is installed. Then turn the Computer on and check the voltage at X1 on the CPU. It should measure 5 volts DC.

If you obtained the proper voltage, proceed to "Test #3."

If you did not obtain the proper results, check the mother circuit board for a solder bridge between bus lines 45 and 46. Also check the installation of integrated circuit U6 on the Extended Configuration Board.

TEST #3

( ) Turn the Computer on. Then enter MEM, 040, 362, and OUT. The voltage at X1 on the CPU should go low (less than .5 volts DC). This voltage should go high upon reset.

If you obtained the proper results, proceed to "Test #4."

If you did not obtain the proper results, check the installation of integrated circuit U6 on the Extended Configuration Board.

TEST #4

( ) Set the eight sections of switch SW1 on the Extended Configuration Board to "0".

( ) Turn the Computer on and enter MEM, 111, 362, and IN. The display should read 000,362.

If you obtained the proper results, proceed to "Test #5."

If you did not obtain the proper results, check the installation of integrated circuit U2 and switch SW1 on the Extended Configuration Board.

TEST #5

( ) Set the eight sections of switch SW1 on the Extended Configuration Board to "1."

( ) Turn the Computer on and enter MEM, 111, 362, and IN. The display should read 377, 362.

If you obtained the proper results, proceed to "Status Port."

If you did not obtain the proper results, check the installation of integrated circuits U2, U4, U5, and U6 and switch SW1 on the Extended Configuration Board.

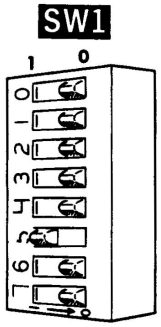
NOTE: The following sections describe the three functions available with the Extended Configuration Board and some modifications that you must make to other circuit boards in your H8. Read all of the information before you actually perform any of the modifications. Decide which functions you wish to use. Then make the necessary modifications for those functions.

STATUS PORT

The status port is interrogated by version 2.0 (or later) HDOS as well as by Heath CP/M. This can be used to determine the system configuration upon bootup without requiring any user interaction. Some user programs may also interrogate the status port.

Refer to Pictorial 2-2 for the following steps.

NOTE: The sections of switch SW1 are grouped as shown by the letters on the Pictorial. These groups are defined as follows:



PICTORIAL 2-2

SWITCH	SETTING	DESCRIPTION
1,0	00*	Port 174(7CH)/177Q(7FH) has an H17 type disk (normal)
	01	Port 174/177Q has an H47 type disk
	10	Undefined
	11	Undefined
3,2	00**	Port 170(78H)/173Q(7BH) is not in use (normal without H47)
	01	Port 170/173Q has an H47 (normal with H47)
	10	Undefined
	11	Undefined
4	0	Boots from device at port 174/177Q (H17, normal)
	1	Boots from device at port 170/173Q (H47)
5	0	Performs memory test upon boot up (not currently supported)
	1	Does not perform memory test (normal)
6	0	Sets Console to 9600 baud (normal)
	1	Sets Console to 19,200 baud (not currently supported)
7	0	Normal boot (normal)
	1	Auto boot on power up or reset (not recommended)

NOTE: Press either the GO key or the 1 key on the Computer's front panel to boot from the drive indicated by the setting of switch section 4 (the primary boot device). Press the 2 key to boot from the device that is not selected by switch section 4 (the secondary boot device).

*Right column is switch 0.

**Right column is switch 2.

ROM DISABLE (ORG Ø)

The ROM disable function is normally used with the CP/M operating system. Since the system RAM must be a continuous block originating at zero instead of 8k, your first RAM circuit board will be addressed at 000 instead of 040.

You can also use this function with Microsoft Basic under HDOS, since the unused memory area between PAM-8 and the H17 ROM/RAM is an excellent location for user functions. You must take care in this application, however, not to overwrite the PAM-8 or H17 ROM/RAM areas. This is due to the fact that these areas now exist in read/write RAM, rather than ROM and write-protected RAM. You can also use up to 64 k of memory with this configuration.

NOTE: If you have less than 64 k of memory, you can use HDOS Version 1.6. For 64 k of memory, you must use HDOS Version 2.0.

This function pulls the ROM disable line on the bus (pin 46) low when a write is performed at I/O address 362Q (0F2H) and it sets data bit D5 to a logic 1. This, in turn, disables the ROM on the CPU circuit board and allows you to address the RAM between 0 and 8 k in the memory space.

To use the ROM disable function, make the following modifications to the circuit boards in your H8 computer.

( ) Remove the tie bracket from your Computer.

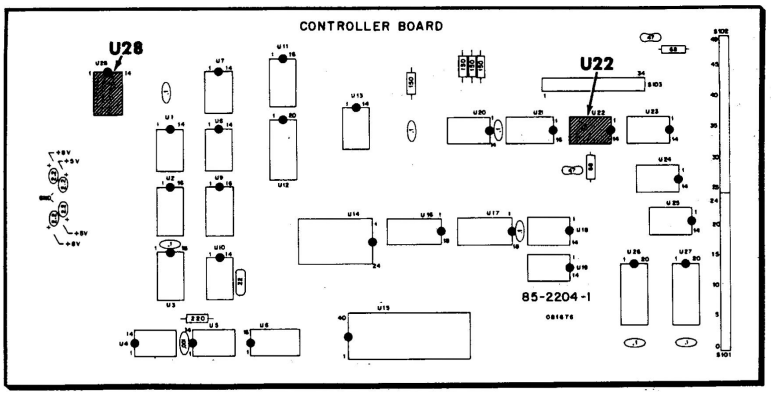
( ) Carefully unplug the H17 controller circuit board from your Computer.

( ) Check the controller circuit board to see if there is an IC U28 (in the upper left corner of the board). If there is, disregard the following information and proceed to Page 25. If there is no IC at this location, perform the following three steps.

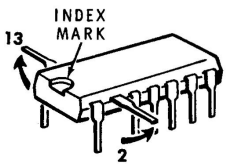
1. ( ) Refer to Pictorial 2-3 below and carefully remove IC U22 from the circuit board.

2. ( ) Refer to Detail 2-3A, position the IC as shown, then bend pins 2 and 13 up so they will not make contact when the IC is reinstalled.

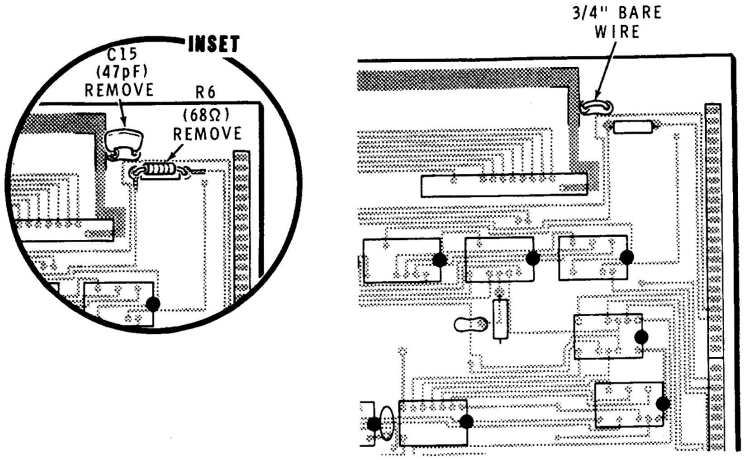
3. ( ) Reinstall the IC at U22. Make sure you position the pin 1 end toward the index mark on the circuit board.



PICTORIAL 2-3



Detail 2-3A



PICTORIAL 2-4

Refer to Pictorial 2-4 for the following steps.

NOTE: Be careful not to damage any circuit board foils when you perform the following steps. Follow the directions on the package of desoldering braid supplied with this kit to unsolder leads or wires.

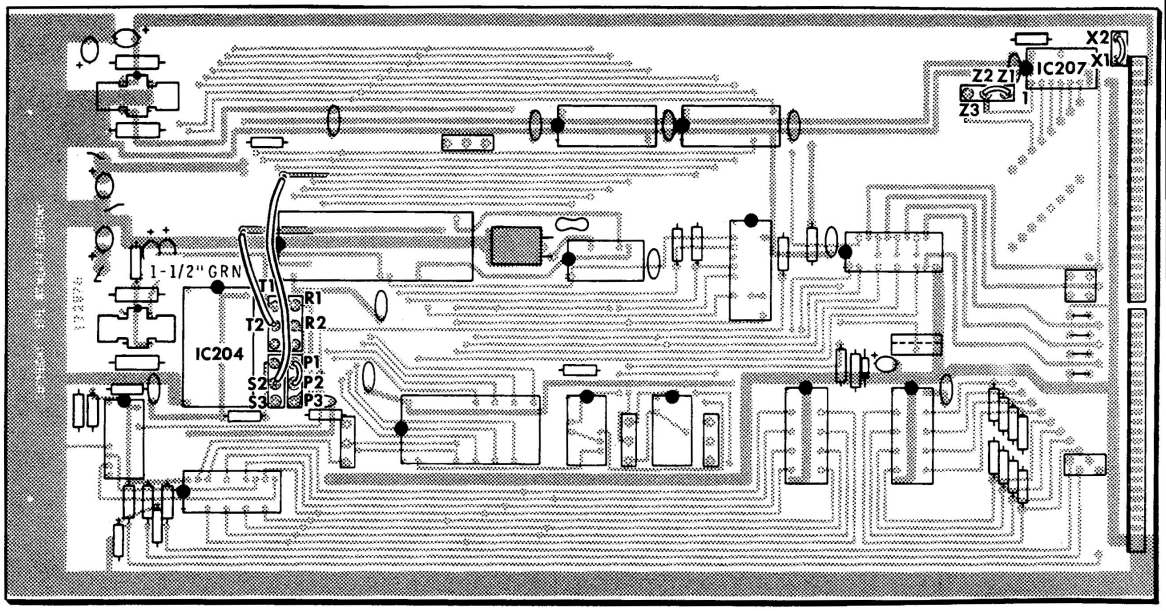
( ) Refer to the inset drawing and carefully unsolder or cut the leads of capacitor C15 (47 pF mica). This capacitor will no longer be used.

( ) Refer again to the inset drawing and carefully unsolder or cut the leads of resistor R6 (68 Ω, blu-gry-blk). This resistor will no longer be used.

( ) Cut a 3/4" length of bare wire. Then solder this bare wire to the foils where the capacitor you removed was connected.

( ) Carefully reinstall the controller circuit board in your Computer.

( ) Carefully unplug the CPU circuit board from your Computer.



PICTORIAL 2-5

Refer to Pictorial 2-5 for the following steps.

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.

( ) Wire between holes P2 and P3.

( ) Wire between holes Z2 and Z3.

( ) Cut three 3/4" bare wires. Use these wires in the next three steps.

( ) Solder a 3/4" bare wire from hole P1 to hole P2.

( ) Solder a 3/4" bare wire from hole Z1 to hole Z2.

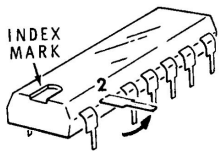
( ) Solder a 3/4" bare wire from hole X1 to hole X2.

( ) Cut the following lengths of green wire. Then remove 1/4" of insulation from the ends of each wire.

1-1/2"
2-3/4"

( ) Connect and solder one end of the 1-1/2" green wire to hole T2. Connect and solder the other end of the wire to the indicated circuit board foil. 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 2-3/4" green wire to hole S2. Connect and solder the other end of the wire to the indicated circuit board foil. 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.



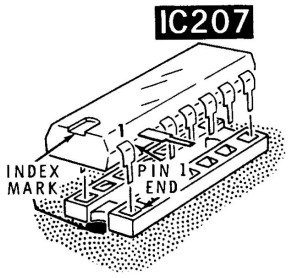
Detail 2-5A

( ) Carefully unplug integrated circuit IC207 from its socket. Then modify this integrated circuit as follows:

1. Refer to Detail 2-5A and note how the pins are numbered.
2. Carefully bend lug 2 of the integrated circuit out as shown so it cannot make contact with the socket when you reinstall it in the next step.

( ) Refer to Detail 2-5B and reinstall integrated circuit IC207 in its socket. Be sure to position the integrated circuit so pin 1 is at the correct location.

( ) Carefully unplug IC204 from your CPU circuit board.

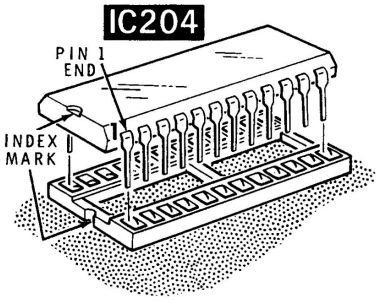


Detail 2-5B

NOTE: The integrated circuit that you will install in the next step is a rugged and reliable component. However, normal static electricity discharged from your body through an integrated circuit pin to an object can damage the integrated circuit. Read the entire instruction first. Then carefully do each step without interruption.

( ) IC204: Install a ROM IC (444-70) at IC204 in your CPU circuit board as follows:

1. Remove the IC from the conductive foam.
2. Hold the IC in one hand and straighten any bent pins with the other hand.
3. Continue holding the IC, being careful not to touch it to anything while you touch the circuit board with your other hand.
4. Install the IC in its socket. Be sure to install this IC so its pin 1 end is toward the index mark on the circuit board. See Detail 2-5C.



Detail 2-5C

( ) Carefully reinstall the CPU circuit board in your Computer. Be sure to reconnect the 5-pin socket coming from the front circuit board in your Computer.

NOTE: Make sure to reconfigure your memory circuit boards so the memory starts at 0 k instead of 8 k. (To set the Model WH8-16 16 k Memory Board to start at 0 k, push the four ORG ADDR switches to OFF and the ENABLE switch to ON.)

( ) Reinstall the tie bracket and top cover on your Computer.

SIDE SELECT

The side select function allows you to use double-sided disk drives with your Computer. NOTE: Heath systems software does not support double-sided drives at this time. This feature is only provided for advanced users who wish to implement non-standard configurations on their own.

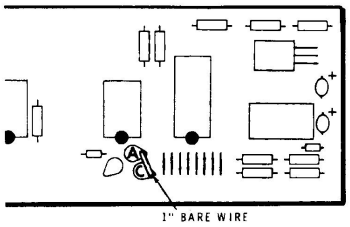
This function pulls pin 32 of your H-17 controller circuit board low (logic 0) whenever a write is performed at I/O address 362Q (0F2H) and data bit D6 is set to a logic 1. This, in turn, selects side 1 of your disk instead of side 0.

CAUTION: Since the side select function and the ROM disable use the same port, be careful to preserve memory status whenever you perform a side select.

You can configure your Computer to use the side select function in two ways. "Method #1" (preferred) allows you to use an unused bus line, while "Method #2" requires a connection to the H-17 controller circuit board. Perform the steps under only one of the following headings.

Method #1

( ) Position the Extended Configuration Board as shown in Pictorial 2-6. Then solder a 1" bare wire between holes AC in the circuit board and cut off any excess lead lengths.

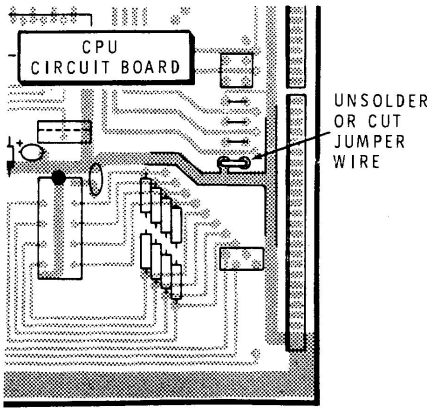


PICTORIAL 2-6

( ) Remove the tie bracket from your Computer.

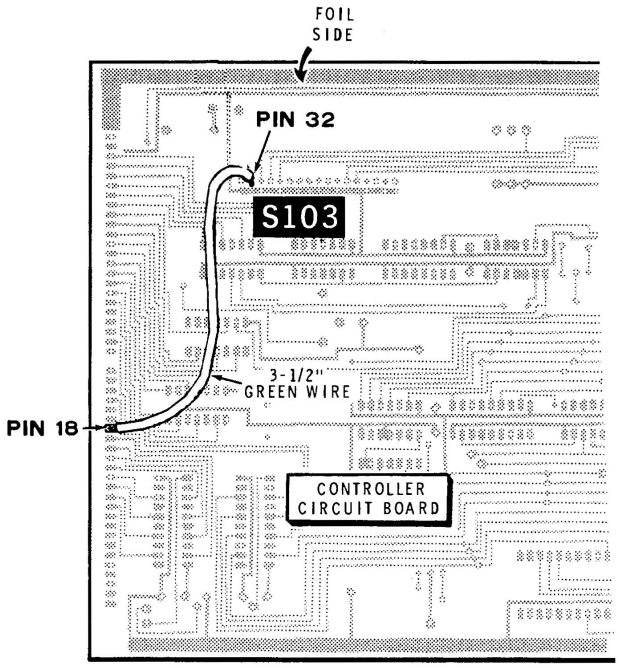
( ) Carefully unplug the CPU circuit board from your Computer.

( ) Refer to Pictorial 2-7 and carefully unsolder or cut the indicated jumper wire from the CPU circuit board.



PICTORIAL 2-7

( ) Carefully reinstall the CPU circuit board in your Computer. Be sure to reconnect the 5-pin socket from the front circuit board in your Computer.



PICTORIAL 2-8

NOTE: If you are using any non-Heath circuit boards in your Computer, be sure to check these boards to make sure bus line 18 is not connected to anything.

( ) Carefully unplug the H17 controller circuit board from your Computer.

( ) Cut a 3-1/2" green wire. Then remove 1/4" of insulation from each end.

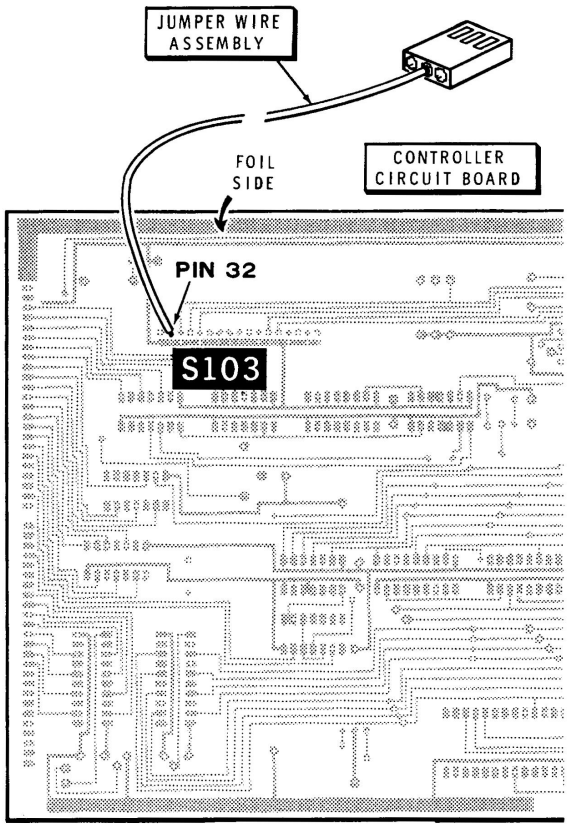
( ) Position the controller circuit board as shown in Pictorial 2-8. Then solder one end of the 3-1/2" green wire to the foil at pin 32 of socket S103 on your controller circuit board. Connect the other end of the wire to the foil at pin 18 of socket S102 on your controller circuit board.

( ) Reinstall the tie bracket and top cover on your Computer.

Method #2

( ) Remove the tie bracket from your Computer.

( ) Carefully unplug the H17 controller circuit board from your Computer.



PICTORIAL 2-9

Refer to Pictorial 2-9 for the following steps.

( ) Position the controller circuit board as shown in the Pictorial.

( ) Locate the jumper wire assembly you assembled earlier. Then solder the free end of this jumper wire to the foil at pin 32 of socket S103 on your controller circuit board.

( ) Carefully reinstall the controller circuit board in your Computer.

( ) Push the connector on the free end of the jumper wire assembly onto plug P1 on your Extended Configuration Board. NOTE: This connector may be installed either way on the plug (only the center pin is used).

( ) Reinstall the tie bracket and top cover on your Computer.

MODIFICATION TESTS

The following test will check the modifications that you made on your CPU circuit board. To make these tests, you should have only the following plug-in circuit boards in your Computer:

The modified CPU circuit board.

One 16 k Memory Card set to 040 (or one 8 k Memory board, one set to 8 k).

( ) Turn the Computer on. You should hear a short beep and the display should read 137 377 SP with a 16 k Memory Card installed, or 077 377 SP with an 8 k Memory Card installed.

( ) Press the "2" key. The display should momentarily display "boot Err."

If you did not obtain the proper results, check the modifications you made to your CPU circuit board.

CIRCUIT DESCRIPTION

Refer to the Schematic (fold-in) while you read the following "Circuit Description." The following paragraphs are grouped according to the various circuits on the circuit board.

ADDRESS DECODER

Integrated circuits U4 and U5 form the address decoder which decodes I/O address 362Q from the address bus. Whenever octal address 362Q appears on the bus, the output of inverting buffer U4D (pin 8) goes to a logic 1. NAND gates U6A and U6B AND this 362Q address signal with the IOR (read) and IOW (write) signals to generate the read and write signals that are exclusive to I/O address 362Q.

STATUS PORT

An octal tri-state buffer and an 8-section slide switch form the status port. The data bus reads the switch information from port 362Q when buffer U2 is enabled. Address decoder U6A enables this buffer via pins 1 and 19.

ROM DISABLE

Latch U3A and buffer U6D generate the ROM DISABLE signal. If data bit D5 is low and a write is performed at I/O address 362Q, the write signal (362IOW) from U6B clocks the data bit into U3A and causes its $\overline{Q}$ output to go high (logic 1). This causes the output of U6D to go low and asserts the ROM DISABLE signal on the bus.

SIDE SELECT

Latch U3B and buffer U6C generate the SIDE SELECT signal. If data bit D6 is low and a write is performed at I/O address 362Q, the write signal (362IOW) from U6B clocks the data bit into U3B and causes its $\overline{Q}$ output to go high (logic 1). This causes the output of U6C to go low and asserts the SIDE SELECT signal at plug P1 pin 2 and at circuit board hole A.

VOLTAGE REGULATOR

Integrated circuit U1 is a conventional 3-terminal voltage regulator which converts the unregulated 8-volts DC available on the Computer's bus to a regulated 5-volts DC. This regulated voltage operates all of the integrated circuits on the Extended Configuration Board.