

Instructions

for the



16K MEMORY EXPANSION ACCESSORY

Model WH88-16

This accessory allows you to increase your H88/H89 computer memory from 48K to 56K when it is used with the Heath Disk Operating System (HDOS). When it is used with ORG Ø CP/M, computer memory is increased from 48K to 64K of RAM.

PARTS LIST

KEY No.	HEATH Part No.	QTY. DESCRIPTION	CIRCUIT Comp. No.
181-3372-1		1 ✓ Wired memory adapter circuit board	
134-1130		1 ✓ Adapter cable	
443-901		1 ✓ SN74S132 IC	U562
204-2518		1 Accessory mounting bracket	
		2 ↗ 6-32 × 3/8" hex head screw	
		2 ↗ #6 lockwasher	
266-944		2 ↗ Nylon guide	
597-2571-1		1 Configuration Guide <i>These go together</i>	

CABINET REMOVAL

WARNING: When the line cord is connected to an AC outlet, hazardous voltages can be present inside your Computer. See Pictorial 1.

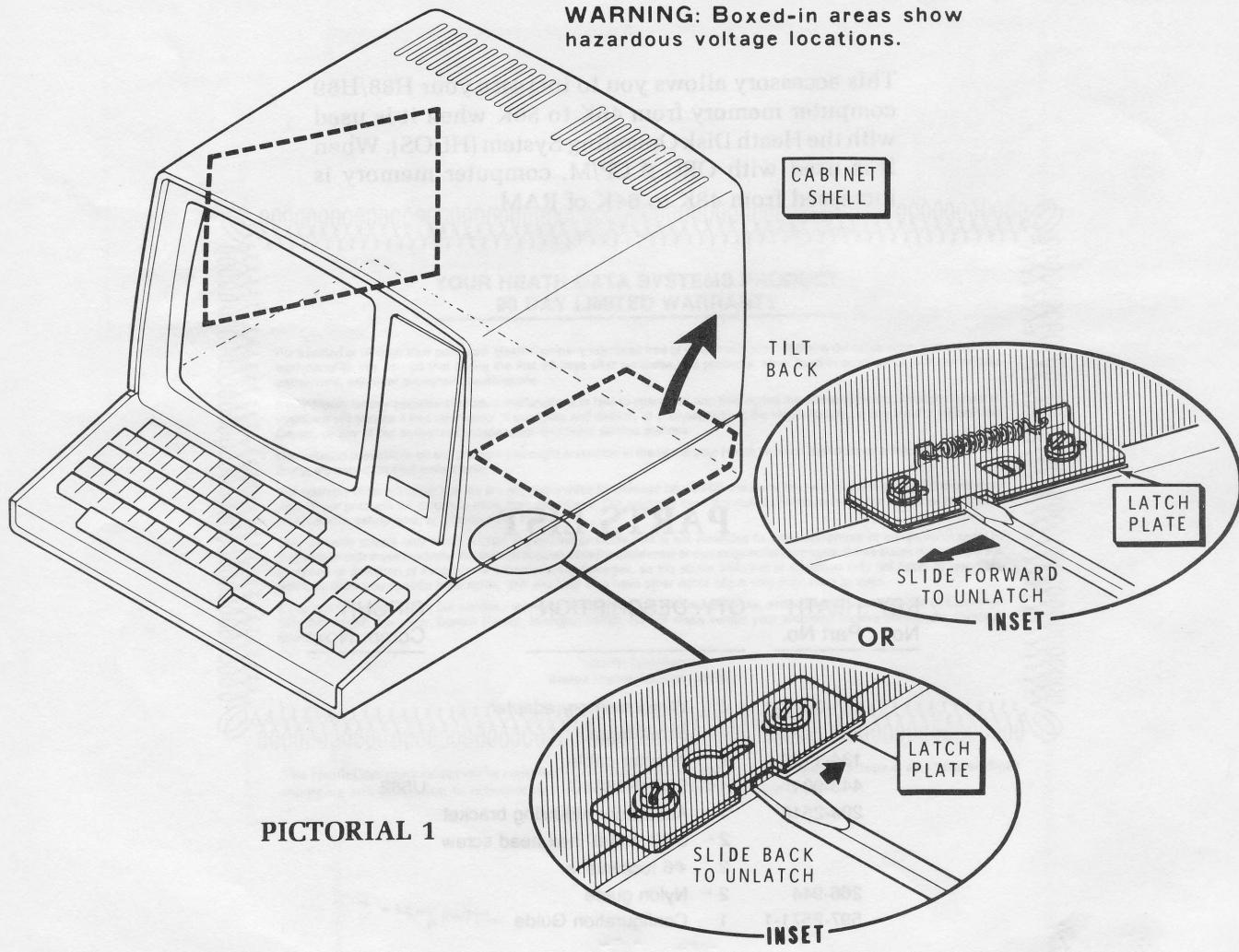
Whenever you need to remove the cabinet shell:

- ✓ • Unplug the line cord from the AC outlet.
- ✓ • Refer to the inset drawings on Pictorial 1 and, using the blade of a small screwdriver, operate the latch plate.
- ✓ • Likewise, open the latch plate on the other side of the cabinet shell.

• Carefully tilt the cabinet shell back. NOTE: Never allow the cabinet shell to hang unsupported. (The hinges are designed so you can easily remove the cabinet shell from the chassis once you have opened it completely.)

- Unplug the fan.

Simply reverse this procedure to close and lock the cabinet shell back on the computer.

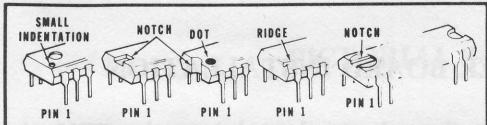


INSTALLATION

Refer to Pictorial 2 (fold in) for the following steps.

- (✓) Check U517, which is shown in Pictorial 2, to see if the memory decoder ROM part no. 444-66, is installed there. Most units have part no. 444-66 installed. If yours does not, order part no. 444-66. When you receive it, remove the IC at U517 as shown in Detail 2-A. Then, install part no. 444-66 at U517 as shown in Detail 2-B.
- (↑) Remove the two screws that hold the top of the CPU logic circuit board.
- (✓) Temporarily unplug P515 and P516 from the CPU logic circuit board.

NOTE: In the following step you will be instructed to raise the CPU logic circuit board several inches to check, and perhaps replace, an IC (integrated circuit). You may find it easier to perform this step if you disconnect all the cables and remove the circuit board



CAUTION: Integrated Circuits (IC's) are complex electronic devices that perform many complicated functions in the circuit. These devices can be damaged during installation. Read all of the following information before you install the IC's.

The pins on the IC's may be bent out at an angle, so they do not line up with the holes in the IC socket. DO NOT try to install an IC without first bending the pins as described below. To do so may damage the IC pins or the socket, causing intermittent contact.

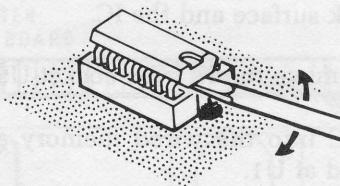


Detail 2-B

entirely. Wire colors are given so you can properly reconnect the cable plugs. The inset drawings show the connectors that some cables are connected to.

- (✓) Temporarily raise the CPU circuit board several inches and check the part number or type number of IC U562. This IC is located near the bottom left-hand corner of the circuit board.

If the IC is marked **74S132** or 443-901, disregard the next step. If it is marked 74LS132 or 443-792, perform the next step.



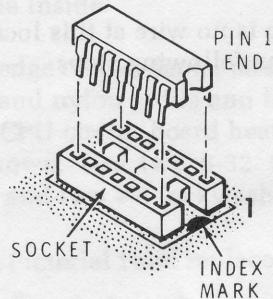
Detail 2-A

- (skip) (✓) U562: Refer to Detail 2A and remove and discard the IC. Then refer to Detail 2B and install the 74S132 IC (#443-901) at U562.

Before you install an IC, lay it down on its side as shown below and very carefully roll it toward the pins to bend the lower pins into line. Then turn the IC over and bend the pins on the other side in the same manner.



Make sure that the pin 1 end of the IC is positioned over the index mark on the circuit board (see the drawing at the top of this Detail). Also make sure that all of the pins are started into the socket. Then press the IC firmly into the socket. NOTE: An IC pin can become bent under the IC and it will appear as though it is correctly installed in the socket.



- (✓) Set the following programming jumpers on the CPU board as follows:

JUMPER	POSITION
JJ504	0 (Front is not left)
JJ502	1 ~OK now
JJ501	1 ~move to left to position 1

The next IC can be damaged by static electricity. Once you remove it do NOT lay it down or let go of it until it is installed in its socket. When you bend the leads of this IC, hold it in one hand and place your other hand on your work surface before you touch the IC to your work surface. This will equalize the static electricity between the work surface and the IC.

- (✓) Carefully remove the IC from socket U549.

- (✓) Plug this IC into the wired memory adapter circuit board at U1.

- (+) Plug either end of the adapter cable into socket P3 of the adapter board as shown.

- (-) Check the CPU circuit board for a jumper wire installed between P509 and JJ503.

there is no jumper wire

- If there is a jumper wire at this location, unplug the P509 end and connect it to plug P4 on the adapter circuit board. Then disregard the following steps and proceed to "Adapter Board Installation."
- If there is no wire at this location, proceed to "No Jumper Wire."

NO JUMPER WIRE

- (-) Check for a jumper wire installed on the BACK (foil side) of the CPU circuit board between the foils of P509 and JJ503. -None-

- If there is a wire between these two points, disregard the following steps and proceed to "Adapter Board Installation."
- If there is no wire at this location, proceed with the following steps.

- (+) Check the part number on your CPU circuit board as shown in Pictorial 2.

181-3413

- If this part number is 85-2549-1 or higher, disregard the following step and proceed to "Adapter Board Installation."
- If it is a lower number, complete the following step.

- (-) Order jumper wire, part no. 134-1120, or obtain a piece of thin insulated wire about six inches long. Connect the wire to JJ503 on the CPU Board and to plug P4 on the Adaptor Board. You may connect the wire using the push-on connector supplied with jumper wire 134-1120, or you may solder or wire-wrap the wire.

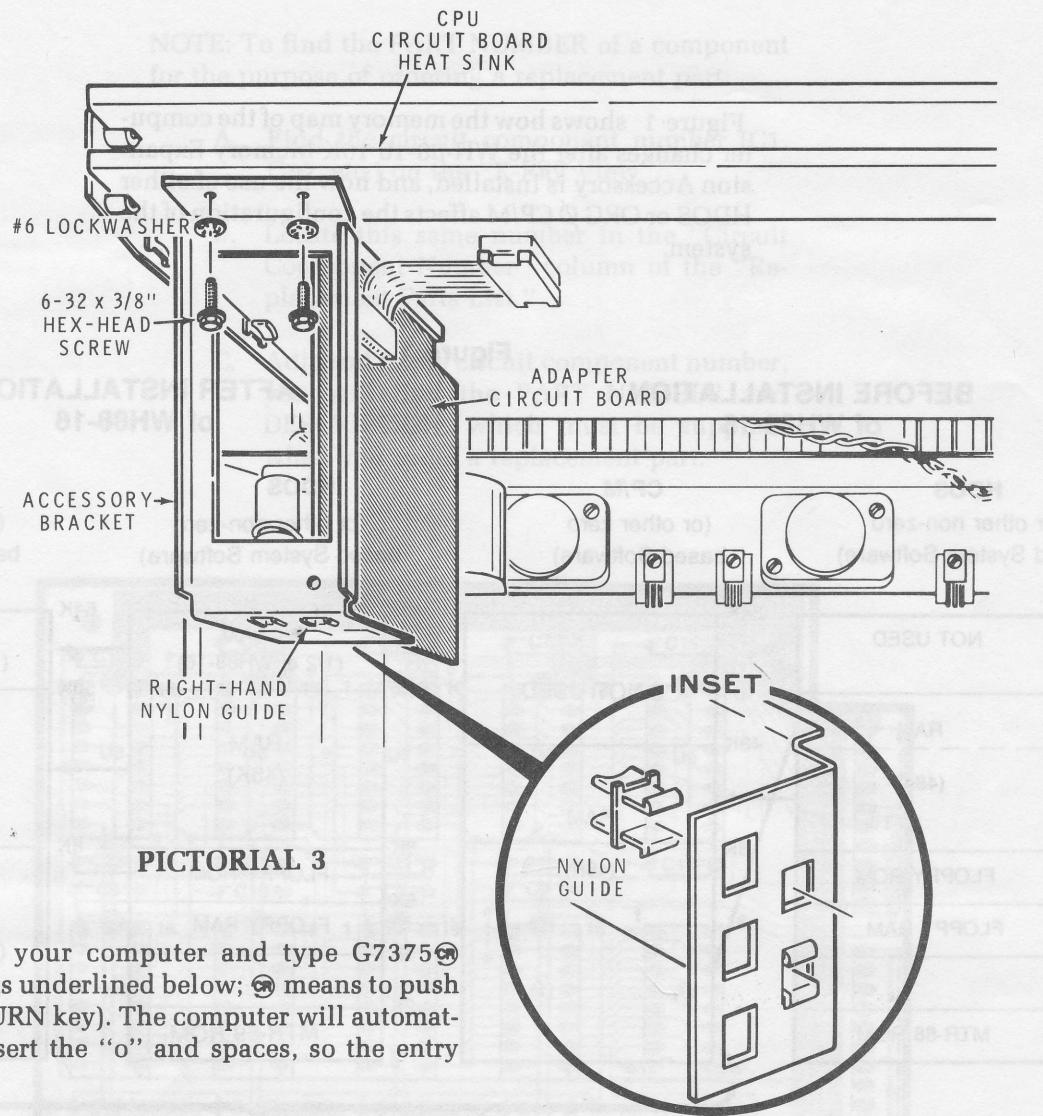
If you choose to solder a wire in place, it should go between the center pin of JJ503 and pin 17 of P509 on the back of the board. If you choose to wire wrap it, connect it between the center pin of JJ503 and pin 17 of P508. Pin 17 of P508, Pin 17 of P509 and P4 on the memory adapter board are all connected together electrically.

Proceed to "Adaptor Board Installation."

ADAPTER BOARD INSTALLATION

- (-) Plug the adapter board into the CPU circuit board at P503 and P509.
- (+) Plug the free end of the adapter cable into the socket at U549.
- (-) Replace the two screws that hold the CPU circuit board.
- (+) Reconnect plugs P515 and P516 to the CPU circuit board (if you disconnected them earlier).
- (-) Refer to Pictorial 2 if you disconnected the serial interface circuit board and reconnect it.

INITIAL TESTS AND FINAL ASSEMBLY



- () Turn on your computer and type G7375^② (shown as underlined below; ^② means to push the RETURN key). The computer will automatically insert the "o" and spaces, so the entry will be:

H: Go 7375^②

The screen display should be:

Dynamic Ram Test
LWA* = 377377
Pass = XXX**

After several minutes the PASS number will reach 377 and then start over. *Worked ok*

- () Stop the test by simultaneously pressing the right-hand SHIFT and RESET keys.

*Last working address (65535)

**Increments by 1 from 000 to 377.

Refer to Pictorial 3 for the following steps.

- () Refer to the inset drawing and install the two nylon guides in the upper holes of the bracket from the inside.
- () Fit the edge of the adapter circuit board into the right-hand nylon guide and install the bracket on the CPU circuit board heat sink at the location shown. Use two 6-32 x 3/8" hex head screws and two #6 lockwashers.

Refer back to Pictorial 1 and replace the cabinet shell.

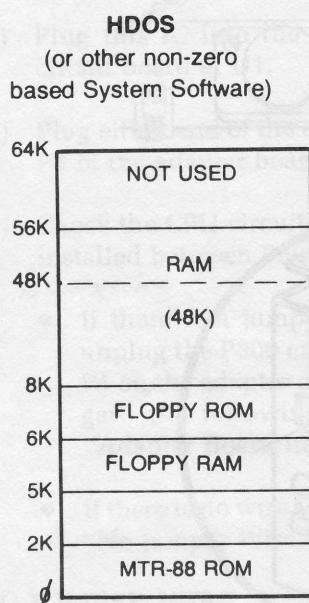
But only when J5504 jumper was on "1", not "0" asked for on last page.

OPERATION

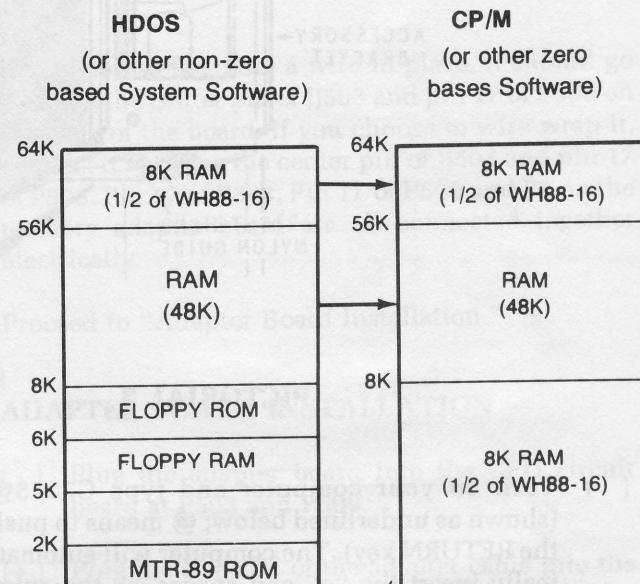
Figure 1 shows how the memory map of the computer changes after the WH-88-16 16K Memory Expansion Accessory is installed, and how the use of either HDOS or ORG Ø CP/M affects the configuration of the system.

Figure 1

**BEFORE INSTALLATION
of WH88-16**



**AFTER INSTALLATION
of WH88-16**



MUST USE MEMORY DECODER ROM (PART NO. 444-66)

See p 3

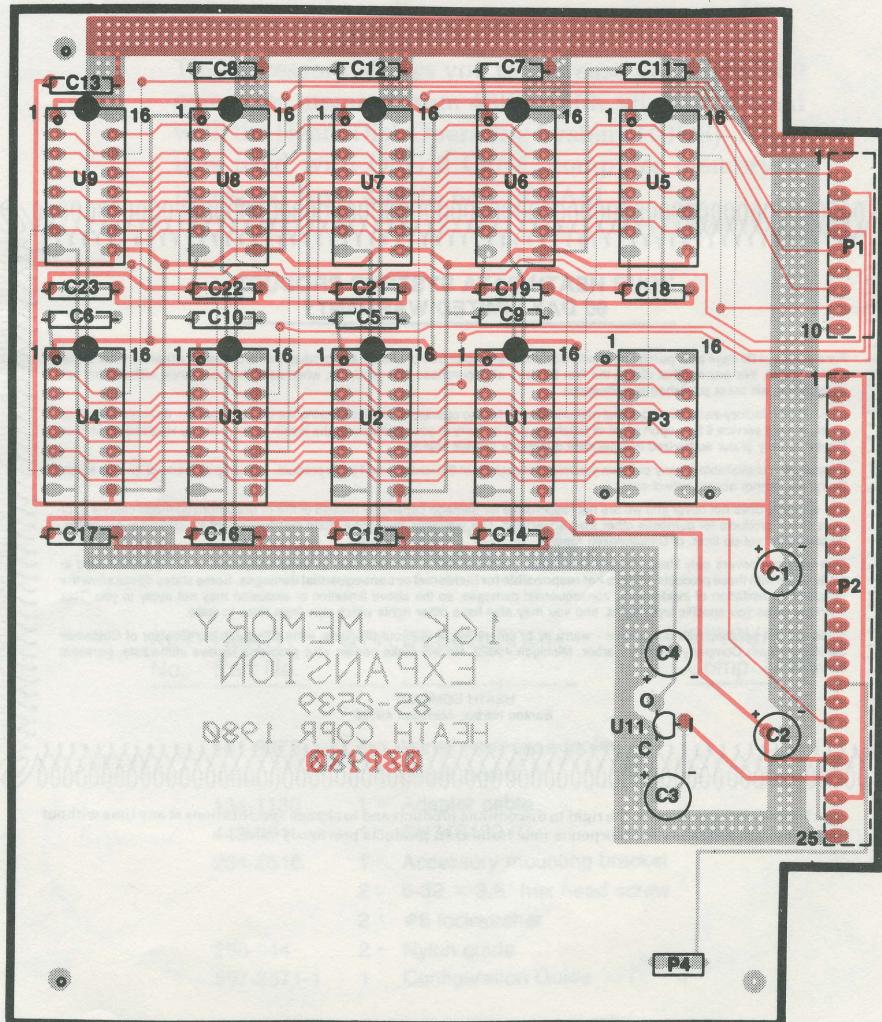
y²⁵, D.J.

X-RAY VIEW

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

- A. Find the circuit component number (C1, C10, etc.) on the "X-Ray View".
- B. Locate this same number in the "Circuit Component Number" column of the "Replacement Parts List."
- C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION, which must be supplied when you order a replacement part.

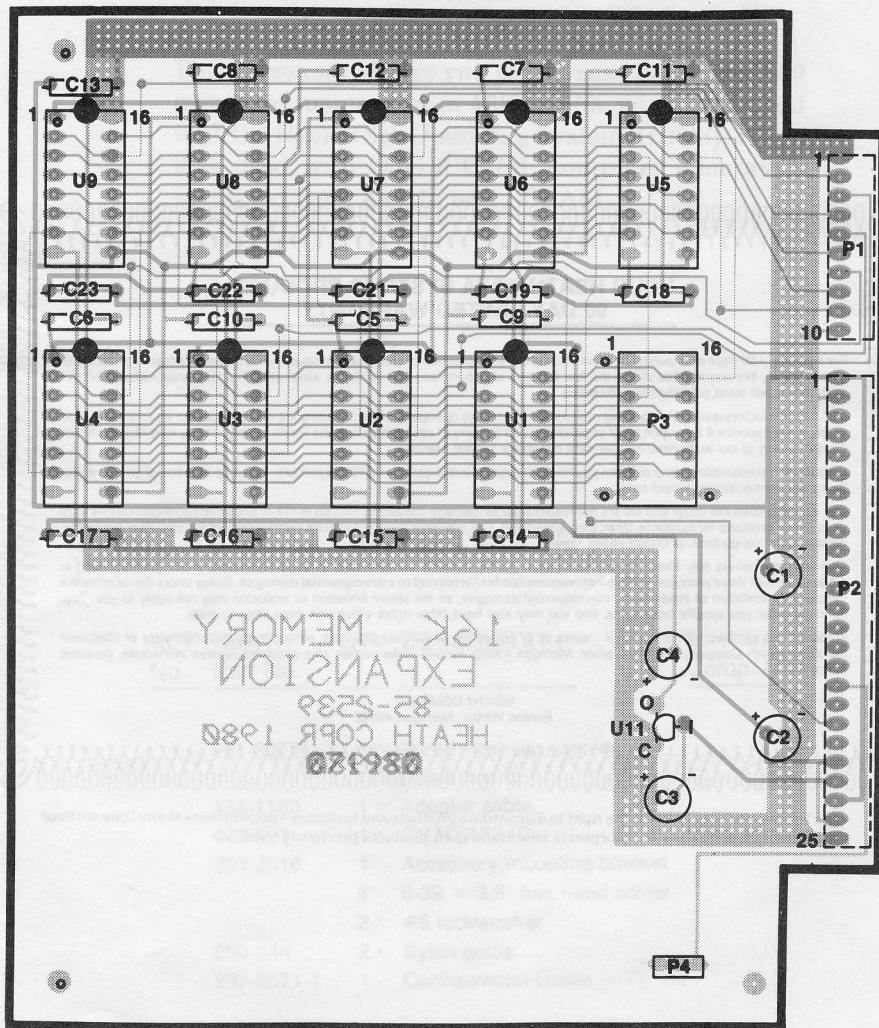
Model WH80-16



X-RAY VIEW

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

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- B. Locate this same number in the "Circuit Component Number" column of the "Replacement Parts List."
- C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION, which must be supplied when you order a replacement part.





REPLACEMENT PARTS LIST

CIRCUIT Comp. No.	HEATH Part No.	DESCRIPTION
U1, U9	443-904	MK4116-4 memory IC
U10	442-665	79L05 5 V regulator
U562	443-901	74S132 quad 2-input NAND
C1, C4	25-917	10 μ F electrolytic capacitor
C5, C19	21-761	.01 μ F glass capacitor
C21, C23	21-761	.01 μ F glass capacitor

YOUR HEATH DATA SYSTEMS PRODUCT 90 DAY LIMITED WARRANTY

For a period of 90 days after purchase, Heath Company will repair free of charge any product that is defective either in materials or workmanship. We warrant that during the first 90 days after purchase, our products, when used in accordance with our printed instructions, will meet published specifications.

If your Heath factory-assembled product malfunctions or fails to operate at any time during the warranty period, through no fault of yours, we will service it free upon proof of purchase and delivery at your expense to the Heath factory, or any Heathkit Electronic Center, or any of our authorized independent distributor service stations.

Consultation is available on any problem you might encounter in the use of your Heath product. Just drop us a line or give us a call. Sorry, we cannot accept collect calls.

Our warranty does not cover and we are not responsible for damage caused by misuse or fire or unauthorized modifications to or uses of our products for purposes other than advertised. Our warranty does not include reimbursement for customer assembly, disassembly, set-up time, or unauthorized repairs.

This warranty covers only Heath factory assembled products and is not extended to allied equipment or components used in conjunction with these products. **We are not responsible for incidental or consequential damages.** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

If you are not satisfied with our service - warranty or otherwise, or with our products, write directly to our Director of Customer Services, Heath Company, Benton Harbor, Michigan 49022. He will make certain your problems receive immediate, personal attention.

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Benton Harbor, Michigan 49022

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