Specialty
Electronic
Products

TRIONYX ELECTRONICS

P.O. Box 5131, Santa Ana, California 92704

01 January 1981

Dear Customer:

Inclosed with this sheet are several modifications for our very popular M-H8 64K memory board designed for use with the Heathkit H8* computer. It is our policy to provide full support for all of our hardware computer products so that they continue to operate reliably and do not become obsolescent.

We learn more about our products as increasing numbers of each are produced and used over a period of time in the field under a wide variety of conditions. As ways to improve the performance of our products become evident, this information will be made available to all purchasers.

Heath and other companies are introducing a wide variety of new products for the H8 computer. The M-H8 memory board can be made to operate with any new product developed for the H8 computer. We will supply design modifications, as required, to insure that the M-H8 will operate with these new products. The M-H8 will never become obsolete. We guarantee this.

This complete hardware support policy will apply to all new computer products developed by Trionyx Electronics. We intend to produce a considerable number of new hardware products for the H8 computer. We have been in business under our present name for more than 10 years. Our first national advertisement appeared in the May, 1970 issue of RAILROAD MODEL CRAFTSMAN magazine.

You may call me personally at any time with any questions or problems.

Yours very truly,

Bill Perry

Bill Perry
President

BP/ms

*Please note that Heathkit and H8 are registered trademarks of the Heath Company in Benton Harbor, Michigan.

April 1981

TRIONYX ELECTRONICS, INC.

M-H8

Extended Performance Modification No. ØØ-A

Access Time Improvement

The H8 computer is a synchronous system operated by a master clock. Improving the memory access time will not speed up the system. If the access time is excessive, however, the system will not operate properly. Marginal access time can result in unreliable operation.

The M-H8 access time can be improved by changing some of the integrated circuits. In this case, an improvement of about 2Ø nanoseconds will be realized. This is well worth doing and will improve the reliability of the memory board.

I. Remove Integrated Circuit U-44 (SN7474)

Remove Integrated Circuit U-52 (SN74ØØ)

Remove Integrated Circuit U-6Ø (SN74Ø2)

II. Install an SN74S74 at U-44

Install an SN74SØØ at U-52

Install an SN74SØ2 at U-6Ø

Please Note:

This modification (No. ØØ-A) superceeds the original modification No. ØØ and should be installed in place of modification No. ØØ.

If modification No. ØØ has already been performed, the SN74SØ8 integrated circuit installed at U-5Ø must be replaced with the original SN74Ø8.

This modification will not only improve the memory access time but will also provide sufficient signal input delay for reliable operation of the asynchronous refresh arbritration circuitry.

Trionyx Electronics, Inc.

New H8* Motherboard = New H8 Computer

The motherboard which carries the computer bus lines is the very heart of the computer. The motherboard is to the computer hardware what the operating system is to the computer software. All of the transactions between the computer boards take place on the computer bus. The functions of the computer, its capabilities and its limitations, are determined by the signal lines defined on the bus.

The present Heath H8 motherboard is very poorly designed. Originally supplied with tin-plated connectors, Heath is now shipping both kit and assembled versions of the H8 computer with gold-plated connectors. This was very quietly done. Those who supported Heath most, by purchasing their product when it was first introduced, are now struggling with tin connectors without any notification that they can be the cause of the most exasperating kinds of system problems.

This is true of most of the products Heath has sold for their computers. Designs are continuously upgraded and improved without any notification to prior purchasers that there are ways to improve their equipment. The policy at Trionyx Electronics, Inc. is very different. Improvements to our designs are published and distributed free of charge to all purchasers, often with parts included. We hope that this service has been noted and is appreciated. We feel that the computer hardware should be supported in exactly the same manner as the software.

The H8 motherboard is very poorly grounded from a signal transmission point of view. This causes distortion of the signals appearing on the bus - which results in unreliable system operation. System operation is then affected by the location and sequence of the boards plugged into the bus. Some boards will work better in some systems than others. The H8 computer has only a single ground connection from the boards to the bus and only one ground line on the bus. This does not work well and is simply not acceptable.

There are no unassigned signal lines on the H8 motherboard. There is no provision for memory expansion or additional control signals. The memory read command is not asserted until 200 nanoseconds after the memory addresses are applied to the bus. This is an incredible waste of memory access time. A memory request signal is needed to begin memory cycles ahead of the memory read and write commands. The 50 pin bus severly limits expansion of the capabilities of the H8 computer.

What is Heath's answer to these problems? It is widely understood at this time that Heath will discontinue production of the H8 and soon offer an entirely new computer to the H8 user's market. This new computer will presumably have a 16 bit processor and a Winchester-type mass storage device. It will have to have a completely different bus structure.

The H8 is still a very good computer. We like the H8 very much and will continue to produce new products for it. The H8 computer still has enormous potential for development in its present form. We challange the Heath Company to produce a new computer which can compete with the H8 - upgraded with new products which will be developed by Trionyx Electronics., Inc.

New high-technology products for the H8 computer cannot be developed using the present motherboard. In particular, 4 MHZ CPU operation requires a well grounded bus. The use of new LSI integrated circuit packages on high component density printed circuit boards which will be produced by Trionyx Electronics, Inc. will enable the H8 computer to employ many new hardware products within the confines of the present chassis, using the Trionyx T-H90 Motherboard.

* H8 is a registered trademark of the Heath Company in Benton Harbor, Michigan.

TRIONYX ELECTRONICS, INC.

MEMORY TEST for the HEATHKIT H8* COMPUTER

TRY THIS MEMORY TEST

This is a significant test of memory capability. Inability to perform this simple test will restrict the application of your computer in several important areas. Trionyx Electronics, Inc. and other manufacturers are developing a number of new products for the H8* computer and it is important that they be supported by properly working memory.

1) Boot HDOS - Get System Prompt.

2) Reset the Computer. Simultaneously depress the 0 and RST keys on the H8 front panel. Hold for 10 to 15 seconds.

   The CPU board must remain reset throughout this period. This simulates a HOLD command on the computer bus.

3) Load the Program Counter (PC Register) with 040 100 (warm boot).

4) Push GO. The system should automatically return to HDOS.

Any well designed computer memory will pass this test. Both Heath and Trionyx memory boards for the H8 computer will pass this test using the Heath 8080A CPU board.

* H8 is a registered trademark of the Heath Company

— TRIONYX ELECTRONICS

BOX 5131-C, SANTA ANA, CA 92704

The M-H8 64K memory board by Trionyx Electronics, Inc. is the only dynamic memory board available for the Heathkit H8* computer which has stand alone refresh. This independent refresh mode enables the memory to retain data when the computer is reset or when the CPU is disconnected from the bus when the bus HOLD signal is asserted.

The HOLD signal is used to transfer control of the computer bus from the CPU to another device. This is a common practice in commercial systems and provision to do this in the H8 computer is a part of the original design by the Heath Company. Most dynamic memories for commercial computers require stand alone refresh and this will be a requirement for the H8 computer as it is upgraded to more advanced levels.

* H8 is a registered trademark of the Heath Company.

Trionyx Electronics, Inc.

Mass Memory for the H8 Computer

Our mass memory will soon be offered on boards which will plug directly into the H8 buss. A single controller board may be used with one or more (any number up to 8) mass memory RAM boards. Each memory board can contain up to 64 memory chips to store information. The boards may be configured to use either 16K (4116) or 64K (4164) memory chips. An additional 8 memory chips can also be added to each board for parity checking. The capacity of each memory board will be either 128K (using 16K RAMS) or 512K (using 64K RAMS). The boards may be partially populated in 16K or 64K byte increments, in each case.

This memory can be used to emulate conventional disk drive data storage. Software drivers for both HDOS and CP/M will be supplied on a diskette for this purpose. This memory can be used in conjunction with regular disk drives. This product is currently under development and will be available in the early part of 1973. A prototype has been working for more than a year and a half. The memory boards will be sold without memory chips. Memory chips may be purchased separately. Prices are as follows:

Memory Boards	MM-H8	Assembled	$ 275.00
		Kit	200.00
Memory Chips	Set of 9	16K (4116)	$ 30.00
		64K (4164)	150.00
Controller Board	MC-H8	Assembled	$ 300.00
		Kit	225.00

In the H8 chassis, the mass memory is intended to operate as an extremely fast floppy disk. Mass memory operation is ideal for user interactive programs, such as word processing, in order to eliminate the delay in continuously going out to the floppy disk to execute various parts of the program. In this case, the program will be executed from the mass memory, after having been initially loaded into the mass memory from the floppy disk.

128K of RAM storage is equivalent to a single 5-1/4 in. hard-sectored diskette. The RAM storage system does not use the operating overhead storage space required on the diskette. Parity error detection will be one of the features provided on the mass memory controller. CPU operation can be interrupted, if desired, for an error message and the memory chip row in use identified. A single floppy disk drive is required to load data into, and remove data from, the RAM disk emulator. The mass memory may operate as several different disk drives at one time.

A controller board and one or two mass memory boards are recommended for use in the H8 chassis as a high speed disk emulator. The same boards may also be used in an expansion box soon to become available for both the H8 and H89 computers. A much larger mass memory (up to 5 megabytes) may be assembled in the expansion box. Both ECC (electronic error checking and correction) and rechargable battery backup will be available for the expansion box mass memory. This will enable the mass memory to emulate a fixed (hard) disk drive over an indefinite period of time.

Mass memory has many advantages over conventional floppy disk drives. It is initially less expensive to purchase and may be expanded in size at any time. It is much easier to maintain. A memory test will be supplied to locate defective memory chips, which may be easily replaced. It is both quiet and reliable. It is extremely fast. It can be used to emulate ANY kind of floppy disk drive - single or double density, single or double sided, 5-1/4 in. or 8 in., as well as any kind of "Winchester" hard disk drive.

June 1981

Trionyx Electronics, Inc.

M-H8

Extended Performance Modification No. ØØ-B

ORG ZERO CP/M

The M-H8 dynamic memory board requires the following modification to operate properly with Zero Based CP/M in the Heathkit H8* computer:

I. Cut the trace to U42-Pin 9 (solder side of the board).

   Carefully cut pin 11 on U42 at the surface of the printed circuit board and lift away from the board (component side of the board).

II. Connect a jumper wire from U42-Pin 9 to U43-Pin 2 (solder side of the board).

   Connect a jumper wire from U42-Raised Pin 11 to U5Ø-Pin 8.

   (Use #3Ø insulated rework wire and route from U42-11 on the component side of the board through the plated-through hole near C81 to U5Ø-8 on the solder side of the board.)

This change is a design improvement which should be incorporated on all M-H8 memory boards.

Please Note:

Modifications ØØ-A (replace 3 integrated circuits) and ØØ-B (install a pair of cuts and jumpers) are the only modifications mandated for the M-H8 memory board. Most M-H8 memory boards work without any modification: However, modifications ØØ-A and ØØ-B should be installed in all cases.

Modifications Ø1 or Ø2, and Ø3 are required to operate the M-H8 memory board with a Z8Ø CPU board. They need not be installed otherwise. Modification Ø2 is required for fully synchronous (transparent) refresh.

Modification Ø4 is required to enable the address range Ø-8K to use the M-H8 memory board with the new Heath "ORG ZERO" Extended Configuration Option.

Additional modifications will be defined in the future for 4 MHZ operation with a Z8Ø CPU Board, battery backup to hold memory data during a power failure, and board selection for memory management. Memory management will allow more than one 64K memory board to be used in the H8 computer.

* H8 is a registered trademark of the Heath Company.

November 1980

TRIONYX ELECTRONICS, INC.

M-H8

Extended Performance Modification No. 02

Refresh Timing Relaxation

This modification lowers the memory refresh rate and reduces the +12 volt (H8 +18 volt) current requirement from 80 to 70 ma (typical) for a fully populated board. The refresh enable slot is also widened so that no asynchronous memory refreshes will occur during normal operation, even at lower memory cycle request rates. If the memory is operated at an extremely low rate, however, or if the processor is halted, the memory will refresh asynchronously to preserve memory data.

I. Remove C73 and C74.

II. Install a 3300pf capacitor (CK05BX332K) at C73.

Install a 3300pf capacitor (CK05BX332K) at C74.

December 1980

TRIONYX ELECTRONICS, INC.

M-H8

Extended Performance Modification No. 04

Zero Address Extention

The M-H8 memory board can accommodate up to 64K bytes of memory. Of this, only 56K can be addressed because Heath originally reserved the memory address range from 0 to 8K for other uses.

New Heath software (Digital Research CP/M 2.2) requires that memory be available in the range 0 to 8K. This modification enables the M-H8 to operate in this range. Note that the Heath HA-8-8 Extended Configuration kit must be installed in this case.

Once this modification is installed, the memory board need not be reconfigured to start at 8K with HDOS. The HA-8-8 Extended Configuration kit does this automatically.

There is more than one way to modify the M-H8 memory board to operate in the 0 to 8K range. Any one of the three methods indicated below may be used.

I. The easiest way to operate the H8 computer in the 0 to 8K address range with a Trionyx M-H8 memory board is to simply install a Heath 8K static memory board jumpered for a zero starting address.

   This has the disadvantage, however, of requiring an extra slot in the H8 chassis and uses additional power. Also, an 8K static memory board may not be available. For those already using 8K static boards with an M-H8, this may be an attractive alternative.

II. If the M-H8 is fully populated to 64K of memory, a simple change will enable the address range from 0 to 8K.

   A. Cut the following traces on the solder side of the printed circuit board:
      1. Cut trace to U36 - pin 2.
      2. Cut trace to U37 - pin 7.

   B. Install the following jumper wires on the solder side of the printed circuit board:
      1. U36 - pin 2 to U37 - pin 7.
      2. U43 - pin 5 to U44 - pin 4.

   Note in this case that the memory chips physically map as before, except that the last row (row 3) is addressed from 56K to 64K and from 0 to 8K.

III. In the general case, for an M-H8 with less than 64K of memory installed, the following modification should be used. This permits later memory expansion without having to make additional changes. Furthermore, memory address ranges will terminate at even 16K boundaries. The memory will physically map in an orderly manner with the range Ø to 16K occupying the first row (row Ø) of memory chips.

A. Cut the following traces on the component side of the printed circuit board between U36 and U37:
   1. Cut trace to U37 - pin 1Ø.
      (trace goes between U37 - pins 6 & 7)
   2. Cut trace to U37 - pin 12.
      (trace goes between U37 - pins 4 & 5)
   3. Cut trace to U37 - pin 14.
      (trace goes between U37 - pins 2 & 3)

B. Cut the following traces on the solder side of the printed circuit board:
   1. Cut trace to U37 - pin 7.
   2. Cut trace to U36 - pin 2.

C. Install the following jumper wires on the solder side of the printed circuit board:
   1. U36 - pin 1Ø to U37 - pin 7.
   2. U36 - pin 4 to U37 - pin 1Ø.
   3. U36 - pin 13 to U37 - pin 12.
   4. U36 - pin 2 to U37 - pin 14.
   5. U43 - pin 5 to U44 - pin 4.

The address jumper should now be implemented as follows:

A to B - Ø to 16K
A to C - Ø to 32K
A to D - Ø to 48K
A to E - Ø to 64K

June 1982

Trionyx Electronics, Inc.

M-H8

Extended Performance Modification No. Ø5

Zero Wait States at 4 MHz

The Trionyx M-H8 memory board was originally designed to operate without wait states at a clock rate of 2 MHz. The Heath H8 computer is based on a 2 MHz clock rate and the M-H8 is fully Heath compatible. The 2 MHz version of the M-H8 may be assembled successfully by kit and bare board purchasers, without special knowledge or equipment.

The standard 2 MHz version of the M-H8 will run with a Z8Ø CPU board at 4 MHz with 2 wait states. This results in a 3Ø% speed increase over 2 MHz. The M-H8 will operate with either an 8Ø8ØA or a Z8Ø at 2 MHz without wait states.

The M-H8 may readily be retimed to operate without wait states at both 4 MHz and 2 MHz with any H8 Z8Ø CPU board. No cuts or jumpers are required for this modification. About a dozen parts must be changed on each board, however. The part values will vary for each board and the modification must be done at the factory. Special equipment is required to set up the boards to make timing measurements. After modification, operation of the memory is perfectly reliable. It should be noted that the modified memory can no longer be used with an 8Ø8ØA CPU board.

High quality 4116-2 (15Ø ns access time) memory chips will be required for this modification. Memory chips obtained elsewhere should be equal in speed and reliability to those currently being supplied by Trionyx for the M-H8.

M-H8 memory boards MUST be returned to Trionyx for the 4 MHz zero wait state modification. A charge of $5Ø.ØØ will be made for this service. This covers the timing modifications only and does not include replacing memory chips.

Note: No other dynamic memory board available for the H8 computer operates reliably in every case at 4 MHz without wait states. The Heath static memory boards for the H8 typically require wait states at 4 MHz.

NEW PRODUCT ANNOUNCEMENT

VOLTAGE CONVERTER

for the

TRIONYX M-H8 64K MEMORY

for the HEATHKIT H8* COMPUTER

* H8 is a registered trademark of the Heath Company in Benton Harbor, Michigan

Model VC-MH8

$19.50 Kit **$29.50 Assembled**

$49.50 Assembled and Installed

Use +8 Volts Only With the 4116 Dynamic Memory Chip

The M-H8 64K dynamic Memory from Trionyx Electronics uses all three power supply voltages on the Heathkit H8 computer bus: +18 Volts, +8 Volts and -18 Volts. The 4116 dynamic memory chip used on the M-H8 memory board uses +12 Volts, +5 Volts and -5 Volts. These voltages are obtained from the three voltages supplied on the H8 bus and are supplied to the memory chips through voltage regulators on the M-H8 memory board.

Only small amounts of current are drawn from the +18 Volt and -18 Volt H8 power supply and the Trionyx M-H8 memory should work with most H8 computer configurations. However, for some applications, the H8 computer +18 Volt and -18 Volt power supply may be fully loaded and unable to supply the M-H8 memory board. In this case, the VC-MH8 voltage converter can be used to convert the M-H8 memory for operation with the H8 +8 Volt power supply only. The VC-MH8 voltage converter uses the H8 +8 Volt power supply to generate both +12 Volts and -5 Volts for the 4116 memory chips used on the M-H8 memory board.

The VC-MH8 voltage converter consists of a tiny 1 in. x 4 in. printed circuit board holding 26 parts which permanently mounts on the M-H8 memory board, using short plastic spacers and riser wires, just below the memory chip area, in place of the +12 Volt and -5 Volt regulator circuit parts.

SPECIFICATIONS:

Input: +6 to +12 Volts (+8 Volts nominal)

Output: +12 Volts at 100 ma.
- 5 Volts at 5 ma.

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TRIONYX ELECTRONICS, INC.

P.O. BOX 5131, SANTA ANA, CA 92704

Specialty
Electronic
Products

TRIONYX
ELECTRONICS

P.O. Box 5131, Santa Ana, California 92704

NEW REPAIR POLICY

Effective March 30, 1981, we are instituting a new repair policy for our computer products.

1) Assembled boards:

Boards purchased assembled are guaranteed for a period of one year following the date of purchase. We will repair assembled boards without charge during this time. These boards will be returned prepaid.

2) Kits:

A service fee of $25.00 will be charged to repair and return all boards assembled from kits. We will replace all kit-supplied defective parts free of charge during the first year following purchase.

3) Bare Boards:

A service fee of $100.00 will be charged to repair and return all boards assembled from bare boards. we will also charge to replace any defective or functionally incorrect parts. The parts prices are published in our parts lists.

Boards must be fully assembled to be eligible for repair. It is very important to use high-quality IC sockets for bare boards. We produce high-quality products of sophisticated design. Bare boards should be built using parts and workmanship which complement the quality of our boards.

Our warranty is intended to cover defects in parts and workmanship and is void in all cases where the boards have been subject to obvious abuse, whether electrical, mechanical or otherwise.

Please allow 30 days for all repairs. Payment must be received before repaired boards can be returned.

#: 29309 Sec. Ø
Sb: Z-H8 CPU BOARD
17-Mar-82 21:4Ø:43
Fm: TRIONYX (Myron Seibold) 7Ø34Ø,27Ø
To: ALL

The Trionyx M-H8 memory board was introduced 2-1/2 years ago as the first 64K memory for the H8 computer. The H8 computer has changed considerably since this time. Sales of the M-H8 memory have remained strong and are strong today. For this reason, the M-H8 has not been upgraded or superceeded.

The M-H8 is still the only 64K memory board available for the H8 in kit form. Most of our customers are able to assemble this kit successfully. The circuit timing on the board is relaxed to facilitate kit and bare-board assembly.

The M-H8 in its present configuration will run with a Z8Ø CPU at 4 MHz. with 2 wait states. This results in a 3Ø% speed increase over 2 MHz. The Heath version of the H8 computer operates at 2 MHz., only. Until the Trionyx Z8Ø CPU board was recently introduced, there was no reason to run the M-H8 memory at 4 MHz. with no wait states.

The M-H8 memory board may readily be retimed to run at 4 MHz. with no wait states. The timing adjustments should be done in our plant by trained persons using a set-up established for this purpose, to insure reliable operation of the board.

After May 1st of this year, M-H8 boards may be returned to Trionyx to be modified to operate at 4 MHz. with zero wait states. We will charge $5Ø.ØØ for this service. It should be noted that many Heath static memory boards for the H8 require 1 or 2 wait states to run at 4 MHz.

This message is no. 6 of a series.

Myron Seibold
Trionyx Electronics, Inc.