# _Modification Kit_

## for the

**HEATH**
_ZENITH_

## H8 COMPUTER

## Model H8-9

This Modification Kit allows you one-button start-up of your H17 disk system. The kit consists of a ROM integraged circuit (#444-60) and these instructions.

**SPECIAL NOTICE**

Before you unpack your Modification Kit and begin to install it, please review the enclosed manual information and consider the following:

1. This Modification Kit is provided as a service to Heathkit customers. The modification instructions have been thoroughly evaluated and tested.

2. Be extremely careful when you perform the modification. An incorrect installation can cause operational difficulties.

3. For the first ninety (90) days after you receive it, Heath will replace, free of charge, any parts contained within this Modification Kit that are defective, either in materials or workmanship. No warranty is implied nor extended to any other parts or service associated with the modification. Replacement parts can be obtained from Heath's Parts Department (phone number (616)-982-3571) or a Heathkit Electronic Center.

4. This Modification Kit is authorized only for the product(s) designated in the enclosed Manual.

5. You must perform the entire modification before Heath can accept the product for service. If service is required, labor and parts charges will apply (except for parts supplied with the modification kit, which will be replaced no charge if defective).

If you find that the Modification Kit is not suitable for your purposes at this time, you may return it prepaid for credit or a refund by contacting Heath Company, Parts Department (phone (616)-982-3571). But, once the kit has been unpacked and/or assembly commenced, it is no longer resalable as a kit and a credit or refund request cannot be accommodated.

# STEP-BY-STEP MODIFICATION

( ) If your Computer is not yet assembled, insert these instructions between Pages 60 and 61 in your Assembly Manual. Then perform these steps when you get to that part of your Manual.

If your Computer is already assembled, proceed with the following steps.

( ) If your CPU circuit board is already mounted in the Computer, follow the steps under "Circuit Board Installation" on Page 61 in reverse order and remove the circuit board. See Pictorial 4-1 (Illustration Booklet, Page 14).

Refer to Pictorial 1 for the following steps.

( ) Carefully remove IC204 from its socket on the CPU board and store the IC in conductive foam or wrap it in tin foil. (You may want to use this IC again some day.) NOTE: If your Computer is still under warranty, this action will NOT void the warranty.

NOTE: The IC that you will install in the next step is an MOS device. If necessary, refer to the right-hand column on Page 57 of your Assembly Manual for instructions on how to handle the IC and identify its pin 1 end.

( ) Install the new ROM IC (#444-60) in socket IC204.

( ) Reinstall the CPU circuit board. See Page 61 of your Assembly Manual if necessary.
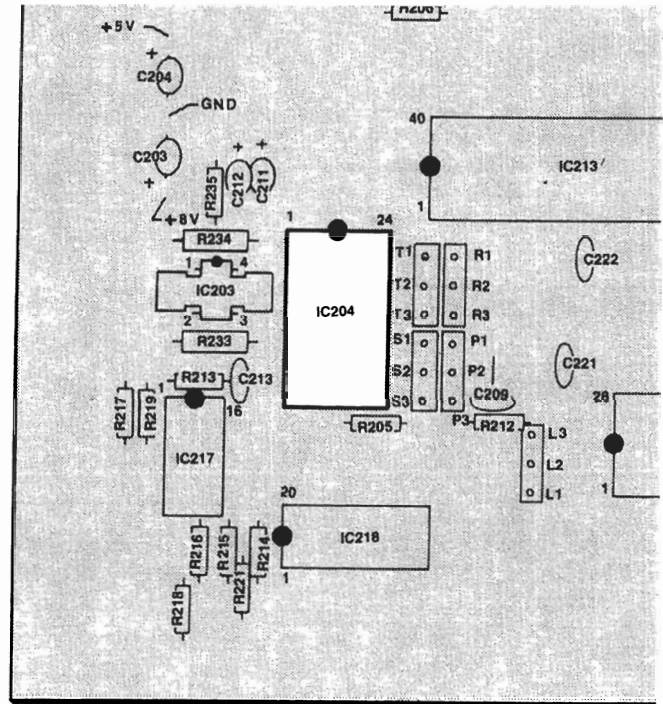
**PICTORIAL 1**

( ) In the upper right-hand corner of the schematic (supplied with your Operation Manual), change the part number of IC204 from #444-13 to 444-60.

( ) Replace the corresponding pages (supplied with these instructions) in the PAM8 section of your H8 Software Reference Manual.

# OPERATION

After you turn on your Computer, push the GO key on your H8. Then continue with normal operation from your Terminal keyboard. (You no longer have to push REG PC ALTER 0 3 0 0 0 0 ALTER GO.)

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FAM/8 - H8 FRONT PANEL MONITOR  #01.00.00.                           HEATH x8ASM V1.0  02/18/77
HARDWARE INTERRUPT VECTORS                                           13:23:25  01-APR-77  PAGE  6


                        180 ***     INTERRUPT VECTORS.
                        181 *
                        182 *

                        184 **      LEVEL 0 - RESET
                        185 *
                        186 *       THIS 'INTERRUPT' MAY NOT BE PROCESSED BY A USER PROGRAM.
                        187 *
000.000                 188         ORG    00A
                        189 *
000.000 021 371 003     190 INIT0   LXI    D,FRSROM        (IIE) = ROM COPY OF FRS CODE
000.003 041 012 040     191         LXI    H,FRSRAM+FRSL-1 (HL) = RAM DESTINATION FOR CODE
000.006 303 073 000     192         JMP    INIT            INITIALIZE
377.073                 193         ERRFL  INIT-1000A      BYTE IN WORD 10A MUST BE 0

                        195 **      LEVEL 1 - CLOCK
                        196 *
000.010                 197 INT1    EQU    10Q             INTERRUPT ENTRY POINT
                        198 *
000.000                 199         ERRNZ  *-11Q           INT0 TAKES UP ONE BYTE
000.011 315 132 000     200         CALL   SAVALL          SAVE USER REGISTERS
000.014 026 000         201         MVI    D,0
000.016 303 201 000     202         JMP    CLOCK           PROCESS CLOCK INTERRUPT
377.201                 203         ERRFL  CLOCK-1000A     EXTRA BYTE MUST BE 0

                        205 **      LEVEL 2 - SINGLE STEP
                        206 *
                        207 *       IF THIS INTERRUPT IS RECEIVED WHEN NOT IN MONITOR MODE.
                        208 *       THEN IT IS ASSUMED TO BE GENERATED BY A USER PROGRAM
                        209 *       (SINGLE STEPPING OR BREAKPOINTING). IN SUCH CASE, THE
                        210 *       USER PROGRAM IS ENTERED THROUGH (UIVEC+3
                        211 *
000.020                 212 INT2    EQU    20A             LEVEL 2 ENTRY
                        213 *
000.000                 214         ERRNZ  *-21A           INT1 TAKES EXTRA BYTE
000.021 315 132 000     215         CALL   SAVALL          SAVE REGISTERS
000.024 032             216         LDAX   D               (A) = (CTLFLG)
040.011                 217         SET    CTLFLG
000.025 303 244 001     218         JMP    STPRIN          STEP RETURN

                        220 ***     I/O INTERRUPT VECTORS.
                        221 *
                        222 *       INTERRUPTS 3 THROUGH 7 ARE AVAILABLE FOR GENERAL I/O USE.
                        223 *
                        224 *       THESE INTERRUPTS ARE NOT SUPPORTED BY FAM/8, AND SHOULD
                        225 *       NEVER OCCUR UNLESS THE USER HAS SUPPLIED HANDLER ROUTINES
                        226 *       (THROUGH UIVEC)
                        227
```

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FAM/8 - H8 FRONT PANEL MONITOR #01.00.00.                    HEATH H8ASM V1.4 01/20/78        PAGE  7
HARDWARE INTERRUPT VECTORS.                                  14:24:48 03-APR-80

000.030                    245        ORG    30A
000.030  303 045 040       246 INT3   JMP    UIVEC+6      JUMP TO USER ROUTINE
                           247
000.033  046 030           248 FIX    MVI    H,30Q        MSB OF H17 BOOT ROM ADDRESS    /FAM860 25AUG79/
000.035  303 043 000       249        JMP    FIX2         JUMP TO NEXT HOLE IN CODE      /FAM860 25AUG79/
000.000                    250        ERRNZ  *-40A                                       /FAM860 25AUG79/

000.040                    252        ORG    40A
000.040  303 050 040       253 INT4   JMP    UIVEC+9      JUMP TO USER ROUTINE
                           254
000.043  153               255 FIX2   MOV    L,E          E CONTAINS 0                   /FAM860 25AUG79/
000.044  343               256        XTHL                HL=RET ADR, (SP)=>30,000       /FAM860 25AUG79/
000.045  016 322           257        MVI    C,ERROR&377Q LSB OF ERROR ROUTINE           /FAM860 25AUG79/
000.047  351               258        PCHL                RETURN TO INLINE CODE          /FAM860 25AUG79/
000.000                    259        ERRNZ  *-50A

000.050                    261        ORG    50A
000.050  303 053 040       262 INT5   JMP    UIVEC+12     JUMP TO USER ROUTINE
                           263
                           264   **  DLY - DELAY TIME INTERVAL.
                           265   **
                           266   *   ENTRY   (A) = MILLISECOND DELAY COUNT/2
                           267   *   EXIT.   NONE
                           268   *   USES    A,F
                           269   *
                           270
000.053  365               271 DLY    PUSH   PSW          SAVE COUNT
000.054  257               272        XRA    A            DONT SOUND HORN
000.055  303 143 002       273        JMP    HRNO         PROCESS AS HORN

000.060                    275        ORG    60A
000.060  303 056 040       276 INT6   JMP    UIVEC+15     JUMP TO USER ROUTINE
                           277
000.063  076 320           278 GO.    MVI    A,CB.SSI+CB.CLI+CB.SFK  OFF MONITOR MODE LIGHT
000.065  303 235 001       280        JMP    SST1         RETURN TO USER PROGRAM

000.070                    282        ORG    70A
000.070  303 061 040       283 INT7   JMP    UIVEC+18     JUMP TO USER ROUTINE
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PAM/8 -- HB FRONT PANEL MONITOR #01.00.00.                              HEATH H8ASM V1:4 01/20/78        PAGE 8
MASTER CLEAR PROCESSING                                                 14:24:48  03-APR-80

                    286  **      ; INIT - INITIALIZE SYSTEM
                    287  *
                    288  *       ; INIT IS CALLED WHENEVER A HARDWARE MASTER-CLEAR IS INITIATED.
                    289  *
                    290  *       ; SETUP PAM/8 CONTROL CELLS IN RAM,
                    291  *       ; DECODE HOW MUCH MEMORY EXISTS, SETUP STACKPOINTER, AND
                    292  *       ; ENTER THE MONITOR LOOP.
                    293  *
                    294  *       ; ENTRY  FROM MASTER CLEAR
                    295  *       ; EXIT   INTO PAM/8 MAIN LOOP
                    296
                    297
000.073 032         298  INIT    LDAX  D              ; COPY *FRSROM* INTO RAM
000.074 167         299          MOV   M,A            ; MOVE BYTE
000.075 053         300          DCX   H              ; DECREMENT DESTINATION
000.076 034         301          INR   E              ; INCREMENT SOURCE
000.077 302 073 000 302          JNZ   INIT           ; IF NOT DONE
                    303
004.000             304  SINCR   EQU   4000A          ; SEARCH INCREMENT
                    305
000.102 026 004     306          MVI   D,SINCR/256    ; (DE) = SEARCH INCREMENT
000.104 041 000 034 307          LXI   H,START-SINCR  ; (HL) = FIRST RAM - SEARCH INCREMENT
                    308  *       ; DETERMINE MEMORY LIMIT.
                    309
                    310
000.107 167         311  INIT1   MOV   M,A            ; RESTORE VALUE READ
000.110 031         312          DAD   D              ; INCREMENT TRIAL ADDRESS
000.111 176         313          MOV   A,M            ; (A) = CURRENT MEMORY VALUE
000.112 065         314          DCR   M              ; TRY TO CHANGE IT
000.113 276         315          CMP   M
000.114 302 107 000 316          JNE   INIT1          ; IF MEMORY CHANGED
                    317
000.117 053         318  INIT2   DCX   H
000.120 371         319          SPHL                 ; SET STACKPOINTER = MEMORY LIMIT -1
000.121 315 033 000 320          CALL  FIX            ; SET RETURN ADDR AS 30,000, C=#ERROR   /PAM860 25AUG79/
000.124 103         321          MOV   B,E            ; B = ERROR/256 = 0                     /PAM860 25AUG79/
000.000             322          ERRNZ ERROR/256                                             /PAM860 25AUG79/
000.125 305         323          PUSH  B              ; SAVE 'RETURN ADDRESS'                 /PAM860 25AUG79/
000.000             324          ERRNZ *-000126A      ; REMAINDER OF CODE MUST STAY FIXED     /PAM860 25AUG79/
                    325  *       ; CONFIGURE LOAD/DUMP UART
                    326
                    328          MVI   A,UMI.1B+UMI.L8+UMI.16X
000.126 076 116
000.130 323 371     329          OUT   OP.TPC         ; SET 8 BIT, NO PARITY, 1 STOP, X16
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                    307 **        SAVALL - SAVE ALL REGISTERS ON STACK.
                    308 *
                    309 *        SAVALL IS CALLED WHEN AN INTERRUPT IS ACCEPTED, IN ORDER TO
                    310 *        SAVE THE CONTENTS OF THE REGISTERS ON THE STACK.
                    311 *
                    312 *        ENTRY  CALLED DIRECTLY FROM INTERRUPT ROUTINE,
                    313 *        EXIT   ALL REGISTERS PUSHED ON STACK,
                    314 *               IF NOT YET IN MONITOR MODE, REGFTR = ADDRESS OF REGISTERS
                    315 *               ON STACK,
                    316 *               (DE) = ADDRESS OF CTLFLG
                    317
                    318
000.132 343         319 SAVALL XTHL              SET H,L ON STACK TOP
000.133 325         320        PUSH  D
000.134 305         321        PUSH  B
000.135 365         322        PUSH  PSW
000.136 353         323        XCHG
000.137 041 012 000 324        LXI   H,10
000.142 071         325        DAD   SP
000.143 345         326        PUSH  H           (H,L) = ADDRESS OF USERS SP
000.144 325         327        PUSH  D           SET ON STACK AS 'REGISTER'
000.145 021 011 040 328        LXI   D,CTLFLG    SET RETURN ADDRESS
000.150 032         329        LDAX  D
000.151 057         330        CMA
000.152 346 060     331        ANI   CB.MTL+CB.SSI   (A) = CTLFLG
000.154 310         332        RZ                SAVE REGISTER ADDR IF USER OR SINGLE-STEP
000.155 041 002 000 333        LXI   H,2         RETURN IF WAS INTERRUPT OF MONITOR LOOP
000.160 071         334        DAD   SP
000.161 042 035 040 335        SHLD  REGFTR      (H,L) = ADDRESS OF 'STACKPTR' ON STACK
000.164 311         336        RET

                    338 **        CUI - CHECK FOR USER INTERRUPT PROCESSING.
                    339 *
                    340 *        CUI IS CALLED TO SEE IF THE USER HAS SPECIFIED PROCESSING
                    341 *        FOR THE CLOCK INTERRUPT.
                    342 *
                    343
040.010             344 CUI1   SET   .MFLAG      REFERENCE TO MFLAG
000.165 012         345        LDAX  B           (A) = .MFLAG
000.000             346        ERRNZ U0.CLK-1     CODE ASSUMED = 01
000.166 017         347        RRC
000.167 334 037 040 348        CC    UIVEC       IF SPECIFIED, TRANSFER TO USER
                    349 *
                    350 *        RETURN TO PROGRAM FROM INTERRUPT.
                    351
000.172 361         352 INTXIT POP   PSW
000.173 361         353        POP   PSW         REMOVE FAKE 'STACK REGISTER'
000.174 301         354        POP   B
000.175 321         355        POP   D
000.176 341         356        POP   H
000.177 373         357        EI
000.200 311         358        RET
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PAM/8 - H8 FRONT PANEL MONITOR #01.00.00.                    HEATH H8ASM V1.4  01/20/78      PAGE   35
CONSTANTS AND TABLES.                                        14:24:59  03-APR-80

                                         IOROM                        /PAM8GO 04MAR80/

003.374  002            1430    DB    DM,RR    DSPMOD  DISPLAY REGISTER
003.375  000            1431    DB    0        DSPROT
003.376  012            1432    DB    10       REGI
003.377  311            1433    DB    MI,RET
                        1434
000.000                 1435    ERRNZ  *-4000A
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PAM/8 - H8 FRONT PANEL MONITOR  #01.00.00.                          HEATH X8ASM V1.1 06/21/77
RAM CELLS                                                           15:44:44 01-APR-77 PAGE 36

                 1413
                 1414 **           THE FOLLOWING ARE CONTROL CELLS AND FLAGS USED BY THE KEYPAD
                 1415 *            MONITOR.
                 1416
040.000          1417        ORG   40000A    8192
040.000          1418 START  DS    2         DUMP STARTING ADDRESS
040.002          1419 IOWRK  DS    2         IN OR OUT INSTRUCTION
040.004          1420 FRSRAM EQU   *         FOLLOWING CELLS INITIALIZED FROM ROM
040.004          1421        DS    1         RET
                 1422
040.005          1423 REGI   DS    1         INDEX OF REGISTER UNDER DISPLAY
040.006          1424 DSPROT DS    1         PERIOD FLAG BYTE
040.007          1425 DSPMOD DS    1         DISPLAY MODE
                 1426
040.010          1427 .MFLAG DS    1         USER FLAG OPTIONS
                 1428 *                      SEE *UO.XXX* BITS DESCRIBED AT FRONT
                 1429
040.011          1430 CTLFLG DS    1         FRONT PANEL CONTROL BITS
040.012          1431 REFIND DS    1         REFRESH INDEX (0 TO 7)
000.007          1432 FRSL   EQU   *-FRSRAM  END OF AREA INITIALIZED FROM ROM
                 1433
040.013          1434 FFLEDS EQU   *         FRONT PANEL LED PATTERNS
040.013          1435 ALEDS  DS    1         ADDR 0
040.014          1436        DS    1         ADDR 1
040.015          1437        DS    1         ADDR 2
                 1438
040.016          1439        DS    1         ADDR 3
040.017          1440        DS    1         ADDR 4
040.020          1441        DS    1         ADDR 5
                 1442
040.021          1443 DLEDS  DS    1         DATA 0
040.022          1444        DS    1         DATA 1
040.023          1445        DS    1         DATA 2
                 1446
040.024          1447 ABUSS  DS    2         ADDRESS BUS
040.026          1448 RCKA   DS    1         RCK SAVE AREA
040.027          1449 CRCSUM DS    2         CRC-16 CHECKSUM
040.031          1450 TFERRX DS    2         TAPE ERROR EXIT ADDRESS
040.033          1451 TICCNT DS    2         CLOCK TIC COUNTER
                 1452
040.035          1453 REGPTR DS    2         REGISETR CONTENTS POINTER
                 1454
040.037          1455 UIVEC  DS    0         USER INTERRUPT VECTORS
040.037          1456        DS    3         JUMP TO CLOCK PROCESSOR
040.042          1457        DS    3         JUMP TO SINGLE STEP PROCESSOR
040.045          1458        DS    3         JUMP TO I/O 3
040.050          1459        DS    3         JUMP TO I/O 4
040.053          1460        DS    3         JUMP TO I/O 5
040.056          1461        DS    3         JUMP TO I/O 6
040.061          1462        DS    3         JUMP TO I/O 7
                 1463
040.064          1464        END

ASSEMBLY COMPLETE
1464 STATEMENTS
0 ERRORS DETECTED
22310 BYTES FREE
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