

MEMORY TEST FOR 6502

Dear Mr. Warren:

Received: 78 Jan 3

Enclosed is a source listing of a program which tests RAM memory in 6502 based systems. I wrote this test after using other memory test programs which did not perform a complete test. The problem areas were untested chip selects, and address line inputs. This program written in my assembler's source syntax (advertised in Vol.2 No. 8 of *DDJ*), performs an exhaustive test of a user specified range of memory. The I/O is arranged for 6502 TIM based systems but can be easily changed.

The program performs two tests:

Test 1: Tests all memory cells for storage retention, and shorted data and address lines. This is done by writing: 00 11...FF 00 11...FF continually throughout the memory range for the first pass. When this has been written it is checked to validate the data. On the next pass 01 02...FF 00 01...FF is written and checked. This continues for 256 (hex FF) passes until all possible combinations of bit patterns have been used.

Test 2: Tests the RAM chip select inputs. This is the same as test 1 except data 00 01...F2 00 01...F2 is used.

Before execution, enter the address of the start of the memory to be tested in 00C0 (lo) and 00C1 (hi), and the end of memory +1 in 00C2 (lo) and 00C3 (hi).

Execution begins at 0000 with the first test.

If an error occurs, it will be outputted in the following form:

Address	Test Pattern	Error
xxxx	yy	zz

When test 1 runs to completion, a break will occur and register A will contain E1 (signifying end of test 1). To execute test 2, simply continue execution (type G to TIM monitor).

If errors occur, they will be of the same form as described above. When test 1 has run to completion, a break will occur and register A will contain E2 signifying the end. To continue execution at test 1, simply type G to the TIM monitor. The address range entered in 00C0-00C3 is not altered by the memory test program.

If errors occurred in test 2 but not in test 1, you can safely assume a chip select malfunction (defective or not connected). Usually a number of errors will occur in test 1 when the fault is a single defective address input, data input, or data output.

If a continuous sequence of addresses with errors occur, the problem is likely to be an open data input, or stuck at '1' or '0' data output.

If every 2nd, 4th, 8th, 16th or some power of 2 address sequence with errors occur, check for defective address inputs.

If you are checking say 2102's (1 x 1K) and are specifying a range of, say 4K of memory, and an error common to the whole range occurs, the problem is likely to be in the power leads, defective data or address buffers, stuck at '0' address inputs, stuck at '0' data inputs, or stuck at '0' data outputs.

In all of the above, you may have to examine the various memory error patterns for some similarity in order to isolate the defective component. This is especially true of the 1 x 1K 2102 memory chip where each chip is devoted to a particular data lead (D₀ - D₇).

Finally, since this program has a copyright assigned, I waive this right for publication in *DDJ* only.

Sincerely,
Carl Moser

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0001      *05
0002      *****COPYRIGHT 1977 BY CARL MOSER*****
0003      ***** ALL RIGHTS RESERVED *****
0004
0005      MCS 6502 MEMORY TEST
0006      PROGRAM
0007
0008      USER ENTERS MEM+1 TO BE TESTED STARTING
0009      ADDRESS IN START+ AND END ADDRESS IN END+
0010
0011
0012
0013      THESE STORAGE VARIABLES ARE EXTERNAL IN ZERO PAGE.
0014      START+  DE 500  USER ENTERS START OF MEM+ TO BE TESTED
0015      END+    DE 502  USER ENTERS END OF MEM+ TO BE TESTED +1
0016      ADDR5   DE 504
0017      TEST+TYPE  DE 506
0018      TEST+PTRN  DE 507
0019
0020
0021      ROM I/O CALLS
0022      INY1     DE 572H1 OUTPUT A PACKED BYTE (TWO DIGITS)
0023      SPACE2    DE 57374 OUTPUT TWO SPACES
0024      CHLF     DE 572H4 OUTPUT A CARRIAGE RETURN, LINE FEED
0025
0026
0027      *RA 98
0028
0029      NEW+TEST  LDY #98
0030      STX TEST+TYPE TEST 1
0031      JSR TEST+PTRN
0032      LDA #E1
0033      NOP
0034      NOP
0035      NOP
0036      INC TEST+TYPE TEST 2
0037      JSR TEST+PTRN
0038      LDA #E2
0039      NOP
0040      NOP
0041      NOP
0042      JMP NEW+TEST
0043
0044      TEST+PTRN JSR CHLF
0045      LDY #98  PATTERN REGISTER
0046      LDY #98
0047      STX TEST+PTRN
0048      JMP NEW+PASS
0049
0050      ECCTH8    JSR NEW+PTRN  INC TEST+PTRN
0051      DRY1      DRY1        AND NEW+PASS
0052      R3        R3         RTS
0053      ECCTH8    JSR NEW+PASS  LDY TEST+PTRN
0054      DRY1      DRY1        JSR INI+ADDR5
0055      R3        R3         TTX
0056      R3        R3         STA (ADDR5+Y) STORE PATTERN
0057      R3        R3         CWP (ADDR5+Y) CHECK
0058      R3        R3         RED NEW+ERR1
0059      R3        R3         JSR ERROR ADDR5+ R(3)+ (ADDR5+Y)
0060      R3        R3         JSR INC+ADDR5C
0061      R3        R3         RED NEW+ERR1
0062      R3        R3         JSR INC+BY
0063      R3        R3         LDY LDRP1
0064      R3        R3         JMP LDRP1
0065
0066      ACCTH8    JSR NEW+PTRN  LDY TEST+PTRN
0067      DRY1      DRY1        JSR INI+ADDR5 INITIALIZE ADDR5
0068      R3        R3         TTX
0069      R3        R3         CWP (ADDR5+Y)
0070      R3        R3         RED NEW+ERR1
0071      R3        R3         JSR ERROR ADDR5+ R(3)+ (ADDR5+Y)
0072      R3        R3         JSR INC+BY
0073      R3        R3         JSR INC+ADDR5C
0074      R3        R3         LDY LDRP1
0075      R3        R3         RED NEW+PTRN
0076
0077      R3        R3         INC+BY  INC BY
0078      R3        R3         LDY TEST+TYPE
0079      R3        R3         RED EXIT1
0080      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0081      R3        R3         ACC EXIT1
0082      R3        R3         LDY #98
0083      R3        R3         RED EXIT1
0084      R3        R3         RTS
0085
0086      R3        R3         INC+ADDR5C INC ADDR5
0087      R3        R3         AND SKIP+H1
0088      R3        R3         INC ADDR5+ERR1
0089      R3        R3         LDA END
0090      R3        R3         CWP ADDR5
0091      R3        R3         AND EXIT2
0092      R3        R3         LDA END+ERR1
0093      R3        R3         CWP ADDR5+ERR1
0094      R3        R3         RTS
0095
0096      R3        R3         INC+BY  INC BY
0097      R3        R3         LDY TEST+TYPE
0098      R3        R3         RED EXIT1
0099      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0100      R3        R3         ACC EXIT1
0101      R3        R3         LDY #98
0102      R3        R3         RED EXIT1
0103      R3        R3         RTS
0104
0105      R3        R3         INC+BY  INC BY
0106      R3        R3         LDY TEST+TYPE
0107      R3        R3         RED EXIT1
0108      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0109      R3        R3         ACC EXIT1
0110      R3        R3         LDY #98
0111      R3        R3         RED EXIT1
0112      R3        R3         RTS
0113
0114      R3        R3         INC+BY  INC BY
0115      R3        R3         LDY TEST+TYPE
0116      R3        R3         RED EXIT1
0117      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0118      R3        R3         ACC EXIT1
0119      R3        R3         LDY #98
0120      R3        R3         RED EXIT1
0121      R3        R3         RTS
0122
0123      R3        R3         INC+BY  INC BY
0124      R3        R3         LDY TEST+TYPE
0125      R3        R3         RED EXIT1
0126      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0127      R3        R3         ACC EXIT1
0128      R3        R3         LDY #98
0129      R3        R3         RED EXIT1
0130      R3        R3         RTS
0131
0132      R3        R3         INC+BY  INC BY
0133      R3        R3         LDY TEST+TYPE
0134      R3        R3         RED EXIT1
0135      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0136      R3        R3         ACC EXIT1
0137      R3        R3         LDY #98
0138      R3        R3         RED EXIT1
0139      R3        R3         RTS
0140
0141      R3        R3         INC+BY  INC BY
0142      R3        R3         LDY TEST+TYPE
0143      R3        R3         RED EXIT1
0144      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0145      R3        R3         ACC EXIT1
0146      R3        R3         LDY #98
0147      R3        R3         RED EXIT1
0148      R3        R3         RTS
0149
0150      R3        R3         INC+BY  INC BY
0151      R3        R3         LDY TEST+TYPE
0152      R3        R3         RED EXIT1
0153      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0154      R3        R3         ACC EXIT1
0155      R3        R3         LDY #98
0156      R3        R3         RED EXIT1
0157      R3        R3         RTS
0158
0159      R3        R3         INC+BY  INC BY
0160      R3        R3         LDY TEST+TYPE
0161      R3        R3         RED EXIT1
0162      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0163      R3        R3         ACC EXIT1
0164      R3        R3         LDY #98
0165      R3        R3         RED EXIT1
0166      R3        R3         RTS
0167
0168      R3        R3         INC+BY  INC BY
0169      R3        R3         LDY TEST+TYPE
0170      R3        R3         RED EXIT1
0171      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0172      R3        R3         ACC EXIT1
0173      R3        R3         LDY #98
0174      R3        R3         RED EXIT1
0175      R3        R3         RTS
0176
0177      R3        R3         INC+BY  INC BY
0178      R3        R3         LDY TEST+TYPE
0179      R3        R3         RED EXIT1
0180      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0181      R3        R3         ACC EXIT1
0182      R3        R3         LDY #98
0183      R3        R3         RED EXIT1
0184      R3        R3         RTS
0185
0186      R3        R3         INC+BY  INC BY
0187      R3        R3         LDY TEST+TYPE
0188      R3        R3         RED EXIT1
0189      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0190      R3        R3         ACC EXIT1
0191      R3        R3         LDY #98
0192      R3        R3         RED EXIT1
0193      R3        R3         RTS
0194
0195      R3        R3         INC+BY  INC BY
0196      R3        R3         LDY TEST+TYPE
0197      R3        R3         RED EXIT1
0198      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0199      R3        R3         ACC EXIT1
0200      R3        R3         LDY #98
0201      R3        R3         RED EXIT1
0202      R3        R3         RTS
0203
0204      R3        R3         INC+BY  INC BY
0205      R3        R3         LDY TEST+TYPE
0206      R3        R3         RED EXIT1
0207      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0208      R3        R3         ACC EXIT1
0209      R3        R3         LDY #98
0210      R3        R3         RED EXIT1
0211      R3        R3         RTS
0212
0213      R3        R3         INC+BY  INC BY
0214      R3        R3         LDY TEST+TYPE
0215      R3        R3         RED EXIT1
0216      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0217      R3        R3         ACC EXIT1
0218      R3        R3         LDY #98
0219      R3        R3         RED EXIT1
0220      R3        R3         RTS
0221
0222      R3        R3         INC+BY  INC BY
0223      R3        R3         LDY TEST+TYPE
0224      R3        R3         RED EXIT1
0225      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0226      R3        R3         ACC EXIT1
0227      R3        R3         LDY #98
0228      R3        R3         RED EXIT1
0229      R3        R3         RTS
0230
0231      R3        R3         INC+BY  INC BY
0232      R3        R3         LDY TEST+TYPE
0233      R3        R3         RED EXIT1
0234      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0235      R3        R3         ACC EXIT1
0236      R3        R3         LDY #98
0237      R3        R3         RED EXIT1
0238      R3        R3         RTS
0239
0240      R3        R3         INC+BY  INC BY
0241      R3        R3         LDY TEST+TYPE
0242      R3        R3         RED EXIT1
0243      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0244      R3        R3         ACC EXIT1
0245      R3        R3         LDY #98
0246      R3        R3         RED EXIT1
0247      R3        R3         RTS
0248
0249      R3        R3         INC+BY  INC BY
0250      R3        R3         LDY TEST+TYPE
0251      R3        R3         RED EXIT1
0252      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0253      R3        R3         ACC EXIT1
0254      R3        R3         LDY #98
0255      R3        R3         RED EXIT1
0256      R3        R3         RTS
0257
0258      R3        R3         INC+BY  INC BY
0259      R3        R3         LDY TEST+TYPE
0260      R3        R3         RED EXIT1
0261      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0262      R3        R3         ACC EXIT1
0263      R3        R3         LDY #98
0264      R3        R3         RED EXIT1
0265      R3        R3         RTS
0266
0267      R3        R3         INC+BY  INC BY
0268      R3        R3         LDY TEST+TYPE
0269      R3        R3         RED EXIT1
0270      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0271      R3        R3         ACC EXIT1
0272      R3        R3         LDY #98
0273      R3        R3         RED EXIT1
0274      R3        R3         RTS
0275
0276      R3        R3         INC+BY  INC BY
0277      R3        R3         LDY TEST+TYPE
0278      R3        R3         RED EXIT1
0279      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0280      R3        R3         ACC EXIT1
0281      R3        R3         LDY #98
0282      R3        R3         RED EXIT1
0283      R3        R3         RTS
0284
0285      R3        R3         INC+BY  INC BY
0286      R3        R3         LDY TEST+TYPE
0287      R3        R3         RED EXIT1
0288      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0289      R3        R3         ACC EXIT1
0290      R3        R3         LDY #98
0291      R3        R3         RED EXIT1
0292      R3        R3         RTS
0293
0294      R3        R3         INC+BY  INC BY
0295      R3        R3         LDY TEST+TYPE
0296      R3        R3         RED EXIT1
0297      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0298      R3        R3         ACC EXIT1
0299      R3        R3         LDY #98
0300      R3        R3         RED EXIT1
0301      R3        R3         RTS
0302
0303      R3        R3         INC+BY  INC BY
0304      R3        R3         LDY TEST+TYPE
0305      R3        R3         RED EXIT1
0306      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0307      R3        R3         ACC EXIT1
0308      R3        R3         LDY #98
0309      R3        R3         RED EXIT1
0310      R3        R3         RTS
0311
0312      R3        R3         INC+BY  INC BY
0313      R3        R3         LDY TEST+TYPE
0314      R3        R3         RED EXIT1
0315      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0316      R3        R3         ACC EXIT1
0317      R3        R3         LDY #98
0318      R3        R3         RED EXIT1
0319      R3        R3         RTS
0320
0321      R3        R3         INC+BY  INC BY
0322      R3        R3         LDY TEST+TYPE
0323      R3        R3         RED EXIT1
0324      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0325      R3        R3         ACC EXIT1
0326      R3        R3         LDY #98
0327      R3        R3         RED EXIT1
0328      R3        R3         RTS
0329
0330      R3        R3         INC+BY  INC BY
0331      R3        R3         LDY TEST+TYPE
0332      R3        R3         RED EXIT1
0333      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0334      R3        R3         ACC EXIT1
0335      R3        R3         LDY #98
0336      R3        R3         RED EXIT1
0337      R3        R3         RTS
0338
0339      R3        R3         INC+BY  INC BY
0340      R3        R3         LDY TEST+TYPE
0341      R3        R3         RED EXIT1
0342      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0343      R3        R3         ACC EXIT1
0344      R3        R3         LDY #98
0345      R3        R3         RED EXIT1
0346      R3        R3         RTS
0347
0348      R3        R3         INC+BY  INC BY
0349      R3        R3         LDY TEST+TYPE
0350      R3        R3         RED EXIT1
0351      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0352      R3        R3         ACC EXIT1
0353      R3        R3         LDY #98
0354      R3        R3         RED EXIT1
0355      R3        R3         RTS
0356
0357      R3        R3         INC+BY  INC BY
0358      R3        R3         LDY TEST+TYPE
0359      R3        R3         RED EXIT1
0360      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0361      R3        R3         ACC EXIT1
0362      R3        R3         LDY #98
0363      R3        R3         RED EXIT1
0364      R3        R3         RTS
0365
0366      R3        R3         INC+BY  INC BY
0367      R3        R3         LDY TEST+TYPE
0368      R3        R3         RED EXIT1
0369      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0370      R3        R3         ACC EXIT1
0371      R3        R3         LDY #98
0372      R3        R3         RED EXIT1
0373      R3        R3         RTS
0374
0375      R3        R3         INC+BY  INC BY
0376      R3        R3         LDY TEST+TYPE
0377      R3        R3         RED EXIT1
0378      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0379      R3        R3         ACC EXIT1
0380      R3        R3         LDY #98
0381      R3        R3         RED EXIT1
0382      R3        R3         RTS
0383
0384      R3        R3         INC+BY  INC BY
0385      R3        R3         LDY TEST+TYPE
0386      R3        R3         RED EXIT1
0387      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0388      R3        R3         ACC EXIT1
0389      R3        R3         LDY #98
0390      R3        R3         RED EXIT1
0391      R3        R3         RTS
0392
0393      R3        R3         INC+BY  INC BY
0394      R3        R3         LDY TEST+TYPE
0395      R3        R3         RED EXIT1
0396      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0397      R3        R3         ACC EXIT1
0398      R3        R3         LDY #98
0399      R3        R3         RED EXIT1
0400      R3        R3         RTS
0401
0402      R3        R3         INC+BY  INC BY
0403      R3        R3         LDY TEST+TYPE
0404      R3        R3         RED EXIT1
0405      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0406      R3        R3         ACC EXIT1
0407      R3        R3         LDY #98
0408      R3        R3         RED EXIT1
0409      R3        R3         RTS
0410
0411      R3        R3         INC+BY  INC BY
0412      R3        R3         LDY TEST+TYPE
0413      R3        R3         RED EXIT1
0414      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0415      R3        R3         ACC EXIT1
0416      R3        R3         LDY #98
0417      R3        R3         RED EXIT1
0418      R3        R3         RTS
0419
0420      R3        R3         INC+BY  INC BY
0421      R3        R3         LDY TEST+TYPE
0422      R3        R3         RED EXIT1
0423      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0424      R3        R3         ACC EXIT1
0425      R3        R3         LDY #98
0426      R3        R3         RED EXIT1
0427      R3        R3         RTS
0428
0429      R3        R3         INC+BY  INC BY
0430      R3        R3         LDY TEST+TYPE
0431      R3        R3         RED EXIT1
0432      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0433      R3        R3         ACC EXIT1
0434      R3        R3         LDY #98
0435      R3        R3         RED EXIT1
0436      R3        R3         RTS
0437
0438      R3        R3         INC+BY  INC BY
0439      R3        R3         LDY TEST+TYPE
0440      R3        R3         RED EXIT1
0441      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0442      R3        R3         ACC EXIT1
0443      R3        R3         LDY #98
0444      R3        R3         RED EXIT1
0445      R3        R3         RTS
0446
0447      R3        R3         INC+BY  INC BY
0448      R3        R3         LDY TEST+TYPE
0449      R3        R3         RED EXIT1
0450      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0451      R3        R3         ACC EXIT1
0452      R3        R3         LDY #98
0453      R3        R3         RED EXIT1
0454      R3        R3         RTS
0455
0456      R3        R3         INC+BY  INC BY
0457      R3        R3         LDY TEST+TYPE
0458      R3        R3         RED EXIT1
0459      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0460      R3        R3         ACC EXIT1
0461      R3        R3         LDY #98
0462      R3        R3         RED EXIT1
0463      R3        R3         RTS
0464
0465      R3        R3         INC+BY  INC BY
0466      R3        R3         LDY TEST+TYPE
0467      R3        R3         RED EXIT1
0468      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0469      R3        R3         ACC EXIT1
0470      R3        R3         LDY #98
0471      R3        R3         RED EXIT1
0472      R3        R3         RTS
0473
0474      R3        R3         INC+BY  INC BY
0475      R3        R3         LDY TEST+TYPE
0476      R3        R3         RED EXIT1
0477      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0478      R3        R3         ACC EXIT1
0479      R3        R3         LDY #98
0480      R3        R3         RED EXIT1
0481      R3        R3         RTS
0482
0483      R3        R3         INC+BY  INC BY
0484      R3        R3         LDY TEST+TYPE
0485      R3        R3         RED EXIT1
0486      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0487      R3        R3         ACC EXIT1
0488      R3        R3         LDY #98
0489      R3        R3         RED EXIT1
0490      R3        R3         RTS
0491
0492      R3        R3         INC+BY  INC BY
0493      R3        R3         LDY TEST+TYPE
0494      R3        R3         RED EXIT1
0495      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0496      R3        R3         ACC EXIT1
0497      R3        R3         LDY #98
0498      R3        R3         RED EXIT1
0499      R3        R3         RTS
0500
0501      R3        R3         INC+BY  INC BY
0502      R3        R3         LDY TEST+TYPE
0503      R3        R3         RED EXIT1
0504      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0505      R3        R3         ACC EXIT1
0506      R3        R3         LDY #98
0507      R3        R3         RED EXIT1
0508      R3        R3         RTS
0509
0510      R3        R3         INC+BY  INC BY
0511      R3        R3         LDY TEST+TYPE
0512      R3        R3         RED EXIT1
0513      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0514      R3        R3         ACC EXIT1
0515      R3        R3         LDY #98
0516      R3        R3         RED EXIT1
0517      R3        R3         RTS
0518
0519      R3        R3         INC+BY  INC BY
0520      R3        R3         LDY TEST+TYPE
0521      R3        R3         RED EXIT1
0522      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0523      R3        R3         ACC EXIT1
0524      R3        R3         LDY #98
0525      R3        R3         RED EXIT1
0526      R3        R3         RTS
0527
0528      R3        R3         INC+BY  INC BY
0529      R3        R3         LDY TEST+TYPE
0530      R3        R3         RED EXIT1
0531      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0532      R3        R3         ACC EXIT1
0533      R3        R3         LDY #98
0534      R3        R3         RED EXIT1
0535      R3        R3         RTS
0536
0537      R3        R3         INC+BY  INC BY
0538      R3        R3         LDY TEST+TYPE
0539      R3        R3         RED EXIT1
0540      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0541      R3        R3         ACC EXIT1
0542      R3        R3         LDY #98
0543      R3        R3         RED EXIT1
0544      R3        R3         RTS
0545
0546      R3        R3         INC+BY  INC BY
0547      R3        R3         LDY TEST+TYPE
0548      R3        R3         RED EXIT1
0549      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0550      R3        R3         ACC EXIT1
0551      R3        R3         LDY #98
0552      R3        R3         RED EXIT1
0553      R3        R3         RTS
0554
0555      R3        R3         INC+BY  INC BY
0556      R3        R3         LDY TEST+TYPE
0557      R3        R3         RED EXIT1
0558      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0559      R3        R3         ACC EXIT1
0560      R3        R3         LDY #98
0561      R3        R3         RED EXIT1
0562      R3        R3         RTS
0563
0564      R3        R3         INC+BY  INC BY
0565      R3        R3         LDY TEST+TYPE
0566      R3        R3         RED EXIT1
0567      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0568      R3        R3         ACC EXIT1
0569      R3        R3         LDY #98
0570      R3        R3         RED EXIT1
0571      R3        R3         RTS
0572
0573      R3        R3         INC+BY  INC BY
0574      R3        R3         LDY TEST+TYPE
0575      R3        R3         RED EXIT1
0576      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0577      R3        R3         ACC EXIT1
0578      R3        R3         LDY #98
0579      R3        R3         RED EXIT1
0580      R3        R3         RTS
0581
0582      R3        R3         INC+BY  INC BY
0583      R3        R3         LDY TEST+TYPE
0584      R3        R3         RED EXIT1
0585      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0586      R3        R3         ACC EXIT1
0587      R3        R3         LDY #98
0588      R3        R3         RED EXIT1
0589      R3        R3         RTS
0590
0591      R3        R3         INC+BY  INC BY
0592      R3        R3         LDY TEST+TYPE
0593      R3        R3         RED EXIT1
0594      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0595      R3        R3         ACC EXIT1
0596      R3        R3         LDY #98
0597      R3        R3         RED EXIT1
0598      R3        R3         RTS
0599
0600      R3        R3         INC+BY  INC BY
0601      R3        R3         LDY TEST+TYPE
0602      R3        R3         RED EXIT1
0603      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0604      R3        R3         ACC EXIT1
0605      R3        R3         LDY #98
0606      R3        R3         RED EXIT1
0607      R3        R3         RTS
0608
0609      R3        R3         INC+BY  INC BY
0610      R3        R3         LDY TEST+TYPE
0611      R3        R3         RED EXIT1
0612      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0613      R3        R3         ACC EXIT1
0614      R3        R3         LDY #98
0615      R3        R3         RED EXIT1
0616      R3        R3         RTS
0617
0618      R3        R3         INC+BY  INC BY
0619      R3        R3         LDY TEST+TYPE
0620      R3        R3         RED EXIT1
0621      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0622      R3        R3         ACC EXIT1
0623      R3        R3         LDY #98
0624      R3        R3         RED EXIT1
0625      R3        R3         RTS
0626
0627      R3        R3         INC+BY  INC BY
0628      R3        R3         LDY TEST+TYPE
0629      R3        R3         RED EXIT1
0630      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0631      R3        R3         ACC EXIT1
0632      R3        R3         LDY #98
0633      R3        R3         RED EXIT1
0634      R3        R3         RTS
0635
0636      R3        R3         INC+BY  INC BY
0637      R3        R3         LDY TEST+TYPE
0638      R3        R3         RED EXIT1
0639      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0640      R3        R3         ACC EXIT1
0641      R3        R3         LDY #98
0642      R3        R3         RED EXIT1
0643      R3        R3         RTS
0644
0645      R3        R3         INC+BY  INC BY
0646      R3        R3         LDY TEST+TYPE
0647      R3        R3         RED EXIT1
0648      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0649      R3        R3         ACC EXIT1
0650      R3        R3         LDY #98
0651      R3        R3         RED EXIT1
0652      R3        R3         RTS
0653
0654      R3        R3         INC+BY  INC BY
0655      R3        R3         LDY TEST+TYPE
0656      R3        R3         RED EXIT1
0657      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0658      R3        R3         ACC EXIT1
0659      R3        R3         LDY #98
0660      R3        R3         RED EXIT1
0661      R3        R3         RTS
0662
0663      R3        R3         INC+BY  INC BY
0664      R3        R3         LDY TEST+TYPE
0665      R3        R3         RED EXIT1
0666      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0667      R3        R3         ACC EXIT1
0668      R3        R3         LDY #98
0669      R3        R3         RED EXIT1
0670      R3        R3         RTS
0671
0672      R3        R3         INC+BY  INC BY
0673      R3        R3         LDY TEST+TYPE
0674      R3        R3         RED EXIT1
0675      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0676      R3        R3         ACC EXIT1
0677      R3        R3         LDY #98
0678      R3        R3         RED EXIT1
0679      R3        R3         RTS
0680
0681      R3        R3         INC+BY  INC BY
0682      R3        R3         LDY TEST+TYPE
0683      R3        R3         RED EXIT1
0684      R3        R3         CWP #E3 RESET R(3) TO CHECK CHIP SELECTS
0685      R3
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CONSARN THAT H-8!

Dear Sirs:

Received: 78 Jan 12

I truly enjoyed the article by ...hmmm...let's see...no name given, eh? Well, anyway, the article by (must be) Dr. Dobbs (or maybe Dr. Duds) himself on the great review of the Heath H8 microcomputer. Fantastic! What a swell job of reviewing. The author really got to the point. You tell 'em Doc.

The H8 HAS to be the worst 8080A microcomputer out. Mine, running with 24K at the moment, actually runs correctly when switched on! No self respecting home computer should do that. It even had the audacity to come up running immediately after I completed building it! What will all the tinkers do with a system that actually runs?

Unlike the original S-100 bus system I first built, the H8 can't destroy memory contents when a reset is performed. The damn thing keeps preserving what is in RAM. Furthermore, if you can believe it, this poor machine doesn't even let the novice write his own bootstrap program to use the cassette interface...one is already in ROM ready to use for loading or dumping. Some spoil sports these Heath people are, aren't they?

That angle rack mounting is really bad. Here, the boards are rigidly secured on top, bottom and side, making this excuse for a computer simple to transport, rather than having the fun of stuffing newspaper or packing 'pop-corn' in so the boards don't snap off like some S-100 Systems. Since the mounting bracket on each board also acts as a heat sink, the fact that they are attached to the computer main frame can dissipate the heat even better, and thus, you don't have the fun of leaving the top off the computer like on other systems, nor the sheer pleasure of the fan constantly running in your ears, since none is needed.

I was able to fix the problem of not enough stuff on the boards that Doc brings up too. (After all, what fun is having a circuit board made simple, with fewer parts to go wrong, when a jumbled up board, taking three times as long to build is much more impressive looking...even if it doesn't work.) I just glued extra ICs on the board indiscriminately to make things more complex!

At least ol' Doc, the author of this H8 review, had enough sense to leave off the metal clip supplied with the H8 (to be placed by the keys mounted on the circuit board) so that his board bends as the keys are hit. I, like a fool, followed the Heath directions and put the clip on, which totally avoided the problem of the bending board Doc points out in his article. As soon as I finish this letter, I intend to immediately run up and pull the clip off my machine so I can bend my front panel board too!

Oh yes, and then there is that God awful OCTAL! My Lord, what a sin! It takes someone almost 10 minutes to get used to a new numbering system. I wish I were as lucky as Doc, and have 8 thumbs on each hand so I could use Hexadecimal too.

The fact that you can monitor, both dynamically, as well as statically any register, memory location or I/O port via the front panel too is also a hardship. I'd much rather have a string of LED lights to view and interpret. Or better yet, no front panel at all, like the SOL or APPLE II. Where's the challenge in seeing what you're doing?

I guess what's really horrible, as Doc points out, is the fact that there is no compatibility with existing S-100 cards. No one is going to make H8 compatible cards (excusing the already announced Godbout 12K RAM card, or some other manufacturers who have also requested to manufacture H8 compatible cards). I mean, outside of them, there's only Heath.

By all means, Heath has really gone too far with the H8. Swelled heads and too big for their britches, as Doc says. They actually had the nerve to offer the typical hobbyist and home user a microcomputer that actually works, has a functional and useful front panel, compatible software, memory boards that hold their contents rather than dropping bits, I/O boards that operate correctly the first time they are built, solid construction and a design that isn't a rehash of all the other hardware on the market today. Damn innovators...next thing you know, someone may offer documentation that isn't 10 mimeographed sheets (like a lot of other systems) and give full support like the H8 documentation.

Do your readers know that the Heath people are actually giving you software in the form of Basic, console debug, text editor and assembler with the computer to get the user going faster? Where's that good old "We'll get 'em on the accessories!" rule that has become a standard in the industry? The people at Heath even returned my phone calls on some questions I had about the system; with right answers even! Now what kind of computer manufacturer is that, that actually RETURNS the users' calls, with correct answers to boot? No one else that I can think of.

And, I can see Doc's dislike of the fact that only the Heath part numbers are given on the schematics. Why make it easy for the non-technician to order parts through Heath when needed? Besides, I guess Doc has the same problem I have of not knowing how to use the cross reference table in the manual (each has one), which gives the user the standard, industrial part number. Hell, you have to know how to match up numbers to use a table like that!

Finally, I have personally gained some special knowledge in writing styles. I am the author of the Microscene column in 65-Notes, a newsletter put out by the HP-65 Users Club (not affiliated with Hewlett-Packard), which is read by some 1900 members. When I ran a poor review of a micro, I was actually dumb enough to sign my name. I've learned now. This may well be my last time I'll sign any of my work that might bring me criticism.

Let's hope that Heath can do better next time, in producing a piece of hardware that constantly requires revisions like the other micro manufacturers, (with their various patches and fixes). And, by all means, Mr. Warren, Jr., keep a high regard for the author of this fine review, ol' Doc Duds. He's really the best.

Oh, one more thing, Mr. Warren...if you should find this little note of some interest, please print it in the letters column, rather than give it to "Doc Duds". At least those who subscribe to your magazine can read.

Sincerely,
Mr. Craig A. Pearce

2529 S. Home Avenue
Berwyn, Illinois 60402

Conclusion of "Memory Test for the 6502"

LABEL FILES (/ = EXTERNAL)

```

/START=0000      /END=0002      /ADDRS=0004
/TEST=TYPE=0000  /TEST=PATH N=0007  /THVT=7201
/SP=DEC-7374     /CLL=7704     /CM=17010000
/TEST=00000010   N=000100000000 N=00000000
LOOP1=00030      N=000100030   CM=00000000
LOOP2=00040      N=000100040   INC=00000001
EXIT1=00040      INC=000000000000 SVIP=00000000
EXIT2=00040      ERROR=00000000 INI=00000000
END=000000000000
//0000
```