PDP-15
MEMORY

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IDENTIFICATION

PRODUCT CODE:	MAINDEC-15-D1HA-D (D)
PRODUCT NAME:	HOT MEMORY TEST, MK 11---HOTMEM
DATE CREATED:	JANUARY 12, 1970
MAINTAINER:	DIAGNOSTICS GROUP
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1. ABSTRACT

This program tests the resistance of cores to being switched from the 1-to the 0-state during or after a rise in temperature. A core in the 1-state is heated by repeatedly addressing the core, using a JMP . instruction. In two seconds, the temperature of the core can rise as much as 15°C. (Cores in the 0-state are not affected). The repetitive read-write switching may cause an unstable core to revert to the 0-state. After the core has been heated, a half-select current passing through it may also cause the core to change state.

The program tests selected cores at (or as near as possible to) thecorners of each array, in the middle of each edge, and at the center of the array. Provisions are made for error printouts and halts, scoping loops, and test repetition. Although intended primarily for extended memory, the test can be run on any PDP-15.

2. REQUIREMENTS

2.1 Equipment

Standard PDP-15 with any size core memory.

2.2 Storage

The program occupies locations 00000-000036, and 01000-01520. All other memory registers are cleared.

2.3 Preliminary Programs

None

3. LOADING PROCEDURE

The program is in absolute binary format.

a. Place the program tape in the reader.

b. Set the ADDRESS Switches to 17700.

c. Set the BANK MODE Switch on a 1.

d. Press I/O RESET, then READIN.

4. STARTING PROCEDURE

4.1 Control Switch Settings

AC SWITCH	STATE	MODE OR OPERATION
Ø	Ø	Normal
	1	Repeat current cycle
1	Ø	Halt after error print-out
	1	Don't halt after print-out
2	Ø	Print error data
	1	Do not print error data
3,4,5		Start testing in the 4K field specified by the octal value (Ø to 7).
6,7,8		Octal number (Ø to 7) of additional 4K extended memory fields.
16	Ø	Halt at end of program
	1	Repeat entire program
17	Ø	Go on to next field
	1	Repeat test on current field

4.2 Operator Action

a. When the program has been loaded, remove the tape from the reader.

b. Set the ADDRESS switches to 0200.

c. Press I/O RESET, then START.

d. A halt will occur with the PC=01006

e. Set the control switches as desired, the press CONTINUE.

To re-start the program, follow steps a through d above.

5. OPERATING PROCEDURE

5.1 Switch Settings

See Section 4.1.

5.2 Operator Action

When the program is started, SW 0-2, 16, and 17, should be set to 0. If no errors occur, the program requires no intervention. To handle errors, several procedures are available.

a. Option 1- When an error first occurs, the data are printed and the program halts. To obtain information about possible failures in other cores, set SW 1 to 1, and press CONTINUE. At each error, the information is printed, and the test proceeds without stopping.

b. Option 2- To examine a signal trace at any given error site, set SW 0 and SW 2 to 1, then press CONTINUE. The cycle just executed will be repeated, whether or not the error occurs (making intermittent errors easily discernible). To observe the temperature-dependent behavior of the core, a 2 second cooling-off period is provided between repetitions of the cycle, during which the core is switched once every 18 microseconds.

The operator can examine a particular memory bank, or all banks in succession.

c. Normal Final Halt-C(PC)=01006. This is the same as the halt after starting, so that the user can proceed from a final halt as though starting the test.

6. ERRORS

6.1 Error Messages

At the first occurrence of an error, the following heading is printed:

HOT MEMORY TEST

CONTENTS LOCATION

Under "CONTENTS", the correct and actual contents of the tested register are printed, in that order. The absolute address of the register is printed under "LOCATION".

Normally, such an error printout occurs whenever a core is switched by a half-select current passing through it while the core is still hot. Sometimes, however, a core will

switch to the o-state while it is being heated; if this happens, the following message is printed:

CORE SWITCHED WHILE HEATING

6.2 Error Stops and Recovery

Tag	C(PC)	C(AC)	Data Printed. Discussion
SPIN +1	00031	I/O status	None A device other than the KSR 33 teleprinter caused a program interrupt. Recovery: Disable the offending device (s) then press CONTINUE.
EH1	01144	n/a	CONTENTS and LOCATION of register (1) A heated core was switched to the 0-state by a half-select current. (2) A core switched to the 0-state while being heated (Special message is printed). Recovery: Set the control switches as desired, then press CONTINUE.
EH2	01055	000000	None The contents of SW3-5 are greater contents of SW6-8. The following message is printed: STARTING BLOCK TOO HIGH. RESET SW3-5. Recovery: Set SW 3-5 to be less than or equal to the setting of SW 6-8. Press CONTINUE.

6.3 Examples

Here is a typical error printout (the heading is printed only at the first occurrence of the error):

```
HOT MEMORY TEST
CONTENTS  LOCATION
605077
600077    24077
```

The register being tested is 24077 (that is, 4077 in memory bank 2). The correct contents should be 604077, which is the JMP . instruction. The actual contents are 600077, showing that bit 6 was switched to 0 incorrectly.

If the same error had occurred while core was being heated, the printout would have appeared as follows:

```
CORE SWITCHED WHILE HEATING
604077
600077          24077
```

7. RESTRICTIONS

None

8. MISCELLANEOUS

Execution Time: 62 seconds for each 4K memory bank.

9. DESCRIPTION

When a core in the 1-state is rapidly and repeatedly switched, it gets hot. If it gets too hot, a marginally-reliable core might spontaneously switch to the 0-state, or else it might be switched to 0 when a half-select current is passed through it (when another register on the same x- or y- line is addressed). This program is designed to catch such errors, examining critically-placed cores in as many bit arrays as is possible with the logic.

The rapid switching is effected by executing a JMP . instruction at the address under examination. All cores in the 1-state will get hot (0-state cores are not affected). By choosing the proper addresses, cores in every memory plane, and in almost every bit array (there are four arrays in a plane), can be tested under the most extreme conditions; in the center of the array, at the corners, and along the edges, where the cores are closest to the sense amps.

Table 1 lists the addresses used in the test. Because the operation code of JMP is 600000, bits 2 and 3 cannot be tested (they will always be 0). Likewise, bit 4 is not tested, because indirect addressing is not used. Bit 5 can be tested only in odd-numbered memory banks.

At the start of the test, the switches are examined to see how much memory is available, and in which bank the test is to start. Table pointers and indices are set up, and the entire test area is cleared to 000000.

A JMP . instruction is constructed and placed in the register being tested. The Teletype is selected (TLS + 10), the interrupt is enabled, and the program jumps to the tested register. The JMP . is repeatedly executed until a program interrupt occurs when the teletype flag is set; this occurs every 100 milliseconds. The flag is tallied, the Teletype reselected, and the JMP . is resumed. After 20 flags (2 seconds), the tested register is half-selected, and the contents of the tested register are compared against a standard.

If a bit changes while the core is being heated, the JMP . becomes either a JMP to another register, or a different instruction. In either case, the program counter is changed, and in most cases an empty register is addressed, causing the program to execute a CAL instruction which traps to location 00020. The program sequence starting in register 00021 causes the special message to be printed, followed by the error data.

When an error occurs, the switches are examined to see which options have been chosen. If SW 0 is set to 1, the program does not halt. Instead, a small time-wasting loop is executed to allow the heated cores to cool off for 2 seconds (the cores are switched every 18 microseconds, just to see if a core might change state while cooling off); the same register is then tested again.

The 30 addresses listed in Table 1 are tested for each memory bank provided. If SW 17 is set to 1, the test is repeated in the current bank. If SW 16 is set to 1, the entire test is repeated; otherwise, the program stops when all banks have been tested. The normal final halt is at PC=01006.

Table 1

Addresses of tested registers, for one 4K memory bank.

0037	0040	0077
0101	0102	0104
4001	4002	4004
7701	7702	7704
3700	3740	3777
4000	4037	4077
7700	7737	7740
0100	0240	0400
0140	0277	0440
0177		0477
7777		

Table 2

Addresses used for half-selecting tested registers

0000
4040
7777
7700
0137

```
                        .TITLE HOT MEMORY TEST,MK II
                       /
                       /COPYRIGHT 1970, DIGITAL EQUIPMENT CORP,
                       /MAYNARD, MASS.
                       /
                       /TEST OF CORE STABILITY DURING AND AFTER SELF-HEATING
                       /
                        .ABS
00001                   .LOC    1
00001  600001           JMP     .
00002  777777           LAW     -1
00003  777777           LAW     -1
00004  777777           LAW     -1
00005  777777           LAW     -1
                       /
00006  001100    IORET TEST                    /'TEST' OR 'SCORE'
                       /
00010                   .LOC    10            /INDICES AND POINTERS
00010  000000    AXT   0                       /TEXT POINTER
00011  000000    AXL   0                       /CORE LOCATION TABLE
00012  000000    AX3   0                       /MISC. INDEX
                       /
00021                   .LOC    21            /CAL CATCHER
00021  201534           LAC     (EM1-1        /SELF-HEATING ERROR
00022  041522           DAC     #ERAP         /ADDRESS OF TEXT
00023  601110           JMP     TEST2
                       /
                       /TELETYPE ROUTINE
                       /
00024  441523    TTYR  ISZ     #FLAC           /COUNT FLAGS, DONE?
00025  600031          JMP     FXINT           /NO.
00026  620006          JMP*    IORET           /YES.
                       /
00027  700314    SPIN  IORS                    /SPURIOUS INTERRUPT
00030  740040          HLT                     / I/O STATUS IN AC
                       /
00031  201531    FXINT LAC     #SAC            /RESTORE AC
00032  703302          CAF
00033  700416          TLS+10
00034  700042          ION
00035  703344          DBR
00036  620000          JMP*    0
                       /
00200                   .LOC    200
00200  201535           LAC     (DAC #SAC      /SETUP PI HANDLER
00201  040001           DAC     1
00202  201536           LAC     (TSF
00203  040002           DAC     2
00204  201537           LAC     (JMP SPIN
00205  040003           DAC     3
00206  201540           LAC     (JMP TTYR
00207  040004           DAC     4
00210  601000           JMP     RGIN
                        .EJECT
```

```
                        /PROGRAM STARTS HERE
                        /
01400                     .LOC      1000
                        /
01000   705514    BGIN  ISA+10                  /DISABLE API IF PRESENT
01001   703302          CAF
01002   201541          LAC       (HEAD-1     /ADDRESS OF HEADING TEXT
01003   041525          DAC       #HSIG       /SET HEADER SIGNAL
01004   141522          DZM       #ERAP       /CLEAR MESSAGE POINTER
01005   750044    NFH   HLT!LAS                 /NORMAL FINAL HALT
                        /
                        /INITIALIZATION
                        /
01006   750004    INIT  LAS
01007   742010          RTL;      RAL
01010   740010
01011   501542          AND       (70000      /SR 6-8
01012   041521          DAC       #BANKS      /NO. OF BANKS
                        /
                        /CLEAR TEST AREAS
                        /
01013   201543          LAC       (37         /CLEAR FROM 40...
01014   040012          DAC       AX3
01015   201544          LAC       (177        /...TO 177
01016   160012          DZM*      AX3
01017   540012          SAD       AX3         /DONE?
01020   751001          SKP!CLC                 /YES. -1 TO AC
01021   601016          JMP       .-3         /NO.
01022   201545          LAC       (211        /CLEAR FROM 211
01023   040012          DAC       AX3
01024   201546          LAC       (777        /TO 777
01025   160012          DZM*      AX3
01026   540012          SAD       AX3
01027   751001          SKP!CLC
01030   601025          JMP       .-3
01031   341516          TAD       PLIM        /UPPER PROGRAM LIMIT
01032   040012          DAC       AX3         /CLEAR FROM THERE...
01033   201521          LAC       #BANKS
01034   341547          TAD       (7777       /...TO THE TOP OF MEMORY
01035   707702          FEM
01036   160012          DZM*      AX3
01037   540012          SAD       AX3         /DONE?
01040   601042          JMP       GO          /YES
01041   601036          JMP       .-3         /NO
                        /
                          .EJECT
```

```
                        /MAIN TEST SEQUENCE
                        /
01042   750004  GO      LAS
01043   501542          AND     (70000          /SR 3-5
01044   041533          DAC     #XBITS          /START IN THIS BANK
01045   740001          CMA
01046   341550          TAD     (1              /2'S COMPLEMENT
01047   301521          ADD     #BANKS          /BANKS-XBITS
01050   740100          SMA                     /STARTING BANK TOO HIGH?
01051   601056          JMP     GO2             /NO.
01052   201551          LAC     (EM2-1          /YES. PRINT WARNING.
01053   101255          PRINT
01054   750040  FH2     HLT!CLA
01055   601042          JMP     GO
                        /
01056   201210  GO2     LAC     LTAB            /RE-ENTRY TO REPEAT THE TEST
01057   040011          DAC     AXL             /LOCATION TABLE POINTER
                        /
01060   220011  GO3     LAC*    AXL             /FETCH NEXT TEST ADDRESS
01061   741100          SPA                     /END OF TABLE?
01062   601173          JMP     NEXB            /YES.
01063   341533          TAD     #XBITS          /NO. ADD EXTENSION BITS...
01064   041524          DAC     #HOP            /...AND STORE FULL ADDRESS
01065   501552          AND     (17777          /REDUCE TO 8K...
01066   241553          XOR     (JMP            /...AND BUILD INSTRUCTION
01067   041526          DAC     #JTEM
                        /
01070   161574  HOTGO   DZM*    #HOP            /RE-ENTRY FOR SCOPING.
01071   201526          LAC     JTEM
01072   061524          DAC*    #HOP            /PLACE JMP INSTRUCTION
01073   777760          LAW     -20             /FLAG COUNT
01074   041523          DAC     #FLAG
01075   700042          ION
01076   700416          TLS+10                  /INITIATE A FLAG
01077   621524          JMP*    #HOP            /GO TURN ON THE BURNER
                        /
                        /COME BACK HERE AFTER 2 SECONDS OF HEATING
                        /
01100   221260  TEST    LAC*    HS1             /THESE ADDRESSES HALF-SELECT
01101   221251          LAC*    HS2             /ALL TESTED CORES
01102   221252          LAC*    HS3
01103   221253          LAC*    HS4
01104   221254          LAC*    HS5
01105   221524          LAC*    #HOP            /NOW LOOK AT THE RECORD
01106   541526          SAD     JTEM            /EVERYTHING OK?
01107   601150          JMP     TOK             /YES.
                                                /NO.
                        /
                          .EJECT
```

```
                        /COME HERE AFTER SELF-DESTRUCT
                        /
01110   750004  TEST2   LAS                             /ENTRY FROM CAL TRAP
01111   742010          RTL
01112   751100          SPA!CLA                         /SW-2; PRINTING?
01113   601136          JMP     TNG                     /NO.
01114   201525          LAC     #HSIG                   /YES. GET HEADER ADDRESS
01115   740200          SZA                             /PRINT HEADER?
01116   101255          PRINT                           /YES.
                        /
                        /SPECIAL MESSAGES
                        /
01117   201522  SPEM    LAC     #ERAP                   /ADDRESS OF MESSAGE
01120   740200          SZA                             /IS THERE ONE TO PRINT?
01121   101255          PRINT                           /YES.
01122   141522          DZM     #ERAP
                        /
                        /PRINT THE DATA
                        /
01123   101365          CRLF
01124   201526          LAC     JTEM                    /CORRECT CONTENTS
01125   101374          PROCT
01126   101365          CRLF
01127   707702          FEM
01130   221524          LAC*    #HOP                    /ACTUAL CONTENTS
01131   101374          PROCT
01132   101352          TAB
01133   201524          LAC     #HOP                    /ABSOLUTE ADDRESS
01134   101401          PROCS
01135   101365          CRLF
                        /
01136   754004  TNG     LAS!CLL                         /HERE IF THERE WERE ERRORS
01137   740010          RAL                             /SW0 AND SW1
01140   741400          SZL                             /SCOPING?
01141   601154          JMP     COOLIT                  /YES
01142   740100          SMA                             /NO. HALT?
01143   740040  FH1     HLT                             /YES.
01144   750004          LAS
01145   754100          SMA!CLA!CLL                     /SCOPING?
01146   601060          JMP     G03                     /NO. NEXT REGISTER.
01147   601070          JMP     HOTGO                   /YES. DO THIS ONE AGAIN
                        /
01150   750004  TOK     LAS                             /HERE IF NO ERRORS
01151   750100          SMA!CLA                         /SCOPING?
01152   601060          JMP     G03                     /NO.
01153   601154          JMP     COOLIT                  /YES
                        /
                        .EJECT
```

```
                        /COOL-OFF PERIOD BETWEEN SCOPE LOOPS
                        /
01154   777754  COOLIT  LAW     -24
01155   041523          DAC     FLAC            /2-SECOND COUNT
01156   201554          LAC     (SCORE          /SET RETURN FROM BREAK
01157   040006          DAC     IORET
01160   700042          ION
01161   700416          TLS+10
01162   221524  COOL2   LAC*    #HOP            /SWITCH THE CORES
01163   777774          LAW     -4
01164   040012          DAC     AX3             /18 USEC. DELAY
01165   440012          ISZ     AX3
01166   601165          JMP     .-1
01167   601162          JMP     COOL2
                        /
01170   201555  SCORE   LAC     (TEST           /COOL OFF DONE; RESTORE NORMAL...
01171   040006          DAC     IORET           /...BREAK RETURN
01172   601070          JMP     HOTGO
                        /
                        /AFTER EACH 4K BANK IS TESTED, DO THIS:
                        /
01173   754004  NEXB    LAS!CLL
01174   742020          RTR                     /SW 16-17 TO AC0,L
01175   741100          SPA                     /REPEAT THIS BANK?
01176   601056          JMP     GO2             /YES.
01177   201533          LAC     #XBITS          /NO. TEST FOR LAST BANK
01200   541521          SAD     #BANKS          /DONE ALL BANKS?
01201   601204          JMP     DONE            /YES.
01202   341556          TAD     (10000          /NO. INCREMENT EXTENSION
01203   601044          JMP     GO+2
                        /
01204   750400  DONE    SNL!CLA                 /FINAL HALT?
01205   601005          JMP     NFH             /YES INDEEDY!
01206   141533          DZM     #XBITS          /NOPE. CLEAR EXTENSION BITS.
01207   601056          JMP     GO2             /AND GO ROUND AGAIN
                        /
                          .EJECT
```

```
                        /JMP LOCATION TABLE (AS 4K ADDRESSES)
                        /
01210   001210      LTAB  .
01211   000037            0037;     0040;     0077
01212   000040
01213   000077
01214   000101            0101;     0102;     0104
01215   000102
01216   000104
01217   004001            4001;     4002;     4004
01220   004002
01221   004004
01222   007701            7701;     7702;     7704
01223   007702
01224   007704
                        /
01225   003700            3700;     3740;     3777
01226   003740
01227   003777
01230   004000            4000;     4037;     4077
01231   004037
01232   004077
01233   007700            7700;     7737;     7740
01234   007737
01235   007740
01236   000100            0100;     0400
01237   000400
01240   000140            0140;     0240;     0440
01241   000240
01242   000440
01243   000177            0177;     0277;     0477
01244   000277
01245   000477
01246   007777            7777;     777777
01247   777777
                        /
                        /HALF-SELECT ADDRESSES
                        /
01250   000000      HS1   0000
01251   007777      HS2   7777
01252   004040      HS3   4040
01253   000137      HS4   0137                  /CATCHES THE X=0 APPROXIMATION ADDRESSES
01254   007700      HS5   7700
                        /
                          .EJECT
```

```
                        /TEXT PRINTER
                        /
01255   000000      PRINT.          0
01256   040010              DAC     AXT
01257   141525              DZM     #HSIG               /SUPPRESS FUTURE HEADERS
01260   707704              LEM
01261   220010      PRINGO          LAC*    AXT                 /FIRST PAIR-WORD
01262   041517              DAC     #ASTEM
01263   101311              CHAR                        /POSITION FIRST CHARACTER...
01264   101323              TESP
01265   101311              CHAR                        /...SECOND...
01266   101323              TESP
01267   101311              CHAR                        /...PUT THE THIRD TOGETHER...
01270   501557              AND     (170
01271   041520              DAC     #AST3
01272   220010              LAC*    AXT                 /SECOND PAIR-WORD
01273   744010              RCL;    PTL                 /ADJUST
01274   742010
01275   041517              DAC     ASTEM
01276   740010              RAL                         /3RD CHAR LOW-ORDER BITS
01277   501560              AND     (7
01300   241520              XOR     AST3                /ASSEMBLE THE PARTS
01301   101323              TESP
01302   101311              CHAR                        /...FOURTH...
01303   101323              TESP
01304   101311              CHAR                        /...AND FIFTH
01305   101323              TESP
01306   601261              JMP     PRINGO
                        /
                        /COME HERE FROM TESP WHEN TERMINATOR APPEARS
                        /
01307   707702      PROUT FEM
01310   621255              JMP*    PRINT.
                        /
                          .EJECT
```

```
                        /TEXT PRINTER SUBROUTINES
                        /
                          /1. POSITION CHARACTER
                        /
01311   000000      CHAR. 0
01312   201517            LAC       #ASTEM
01313   744010            RCL
01314   742010            RTL;      RTL;      RTL
01315   742010
01316   742010
01317   041517            DAC       ASTEM               /NEXT CHAR. NOW LEFT-JUSTIFIED
01320   740010            RAL                           /LAST BIT IN PLACE
01321   501544            AND       (177                /ISOLATE 7 BITS
01322   621311            JMP*      CHAR.
                        /
                        /2.TEST AND PRINT CHARACTER
                        /
01323   000000      TESP. 0
01324   741200            SNA                           /0? (ASCII FILLER)
01325   621323            JMP*      TESP.               /YES. IGNORE IT
01326   541544            SAD       (177                /TERMINATOR?
01327   601307            JMP       PROUT               /YES. GO WAY
01330   241561            XOR       (200                /NO. FINISH THE ASCII-CODE
01331   541545            SAD       (211                /TAB?
01332   601337            JMP       TES1                /YES.
01333   101341            TYPE                          /NO.
01334   541562            SAD       (212                /CR?
01335   141532            DZM       TABCT               /YES, CLEAR TAB
01336   621323            JMP*      TESP.
01337   101352      TES1  TAB
01340   621323            JMP*      TESP.
                        /
                        /3. TYPE A CHARACTER
                        /
01341   000000      TYPE. 0
01342   700002            IOF                           /AVOID INTERRUPT
01343   700406            TLS
01344   700401            TSF
01345   601344            JMP       .-1
01346   700402            TCF
01347   700042            ION
01350   441532            ISZ       TABCT
01351   621341            JMP*      TYPE.
                        /
                        .EJECT
```

```
                        /4. TABULATOR
                        /
01352   000000  TAB.  0
01353   201532        LAC       #TABCT          /COUNT OF SPACES
01354   341563        TAD       (-12            /REDUCE MODULO 10
01355   740100        SMA                       /NEGATIVE YET?
01356   601354        JMP       .-2             /NO.
01357   040012        DAC       AX3             /YES. STORE SPACE COUNT
01360   201564        LAC       (240            /(SPACE)
01361   101341        TYPE
01362   440012        ISZ       AX3             /DONE?
01363   601361        JMP       .-2             /NO.
01364   621352        JMP*      TAB.            /YES
                        /
                        /5. CR-LF
                      /
01365   000000  CRLF. 0
01366   201565        LAC       (215
01367   101341        TYPE
01370   201562        LAC       (212
01371   101341        TYPE
01372   141532        DZM       TABCT
01373   621365        JMP*      CRLF.
                      /
        101255  PRINT=JMS PRINT.
        101311  CHAR=JMS CHAR.
        101323  TESP=JMS TESP.
        101341  TYPE=JMS TYPE.
        101352  TAB=JMS TAB.
        101365  CRLF=JMS CRLF.
                      /
                        .EJECT
```

```
                        /OCTAL PRINT SUBROUPINE
                        /
                        /ENTRY TO PRINT LEADING ZEROS
                        /
01374   000000      PROCT.          0
01375   041530              DAC     #OCTEM
01376   201423              LAC     OPS+3               /NOP
01377   101406              JMS     OP1
01400   621374              JMP*    PROCT.
                        /
                        /ENTRY TO REPLACE LEADING ZEROS WITH SPACES
                        /
01401   000000      PROCS.          0
01402   041530              DAC     #OCTEM
01403   201566              LAC     (SZA
01404   101406              JMS     OP1
01405   621401              JMP*    PROCS.
                        /
                        /PRINTER
                        /
01406   000000      OP1     0
01407   041420              DAC     OPS                 /SET SWITCH
01410   777772              LAW     -6
01411   041527              DAC     #OCCT               /DIGIT COUNTER
01412   201530      OPGO    LAC     #OCTEM
01413   744010              RCL;    RTL
01414   742010
01415   041530              DAC     #OCTEM
01416   740010              RAL
01417   501560              AND     (7
01420   740040      OPS     XX                          /SZA OR NOP
01421   601427              JMP     OPT
01422   441527              ISZ     #OCCT               /LEADING ZERO. COUNT DIGITS
01423   740000              NOP
01424   201564              LAC     (240                /TYPE A SPACE
01425   101341              TYPE
01426   601412              JMP     OPGO
                        /
01427   241567      OPT     XOR     (260                /ASCII MAKER
01430   101341              TYPE
01431   201423              LAC     OPS+3               /REPLACE SZA WITH NOP
01432   041420              DAC     OPS
01433   441527              ISZ     #OCCT
01434   601412              JMP     OPGO
01435   621406              JMP*    OP1
                        /
        101401      PROCS=JMS PROCS.
        101374      PROCT=JMS PROCT.
                        /
                          .EJECT
```

```
                        /MESSAGES
                        /
                          /HEADING TEXT
                        /
01436   064251      HEAD  .ASCII    <15><12>'HOT MEMORY TEST'<15><12><12>
01437   047650
01440   202330
01441   546636
01442   512624
01443   052212
01444   516501
01445   505024
01446   416371            .ASCII    'CONTENTS'<11>'LOCATION'<15><12><177>
01447   652212
01450   472512
01451   304630
01452   476070
01453   152222
01454   476341
01455   505376
                        /
                          /SELF-DESTRUCT MESSAGE
                        /
01456   064250      FM1   .ASCII    <15><12>'CORE SWITCHED WHILE HEATING'<15><12><177>
01457   347644
01460   425012
01461   353622
01462   522071
01463   042610
01464   202571
01465   044630
01466   425011
01467   042602
01470   522231
01471   643432
01472   053760
01473   000000
01474   064252      FM2   .ASCII    <15><12>'STARTING BANK TOO HIGH. RESET SW3-5.'<15><12><177>
01475   352202
01476   512511
01477   147216
01500   202050
01501   147226
01502   202511
01503   747500
01504   442230
01505   744134
01506   202450
01507   551612
01510   521012
01511   353546
01512   265525
01513   606424
01514   774000
01515   000000
```

```
                        /
  01516  001570     PLIM  .SIZE
         000000           .END
           01534   001455   *L
           01535   041531   *L
           01536   700401   *L
           01537   600027   *L
           01540   600024   *L
           01541   001435   *L
           01542   070000   *L
           01543   000037   *L
           01544   000177   *L
           01545   000211   *L
           01546   000777   *L
           01547   007777   *L
           01550   000001   *L
           01551   001473   *L
           01552   017777   *L
           01553   600000   *L
           01554   001170   *L
           01555   001100   *L
           01556   010000   *L
           01557   000170   *L
           01560   000007   *L
           01561   000200   *L
           01562   000212   *L
           01563   777766   *L
           01564   000240   *L
           01565   000215   *L
           01566   740200   *L
           01567   000260   *L
                 SIZE=01570     NO ERROR LINES
```

```
ASTEM     01517
AST3      01520
AXL       00011
AXT       00010
AX3       00012
BANKS     01521
BGIN      01000
CHAR     101311
CHAR.     01311
CLOF     700004
CLON     700044
CLSF     700001
COOLIT    01154
COOL2     01162
CRLF     101365
CRLF.     01365
DONE      01204
EEM      707702
FH1       01143
FH2       01054
FM1       01456
FM2       01474
FRAP      01522
FXINT     00031
FLAC      01523
GO        01042
GO2       01056
GO3       01060
HEAD      01436
HOP       01524
HOTGO     01070
HSIG      01525
HS1       01250
HS2       01251
HS3       01252
HS4       01253
HS5       01254
INIT      01006
IORET     00006
JTEM      01526
KRB      700312
KSF      700301
LEM      707704
LTAB      01210
NEXB      01173
NEW       01305
OCCT      01527
OCTEM     01530
OPGO      01412
OPS       01420
OPT       01427
OP1       01406
PCF      700202
PLIM      01516
PRINGO    01261
```

```
PRINT   101255
PRINT.   01255
PROCS   101401
PROCS.   01401
PROCT   101374
PROCT.   01374
PROUT    01307
PSA     700204
PSB     700244
PSF     700201
RCF     700102
RRB     700112
RSA     700104
RSB     700144
RSF     700101
SAC      01531
SCORE    01170
SPEM     01117
SPIN     00027
TAB     101352
TABCT    01532
TAB.     01352
TCF     700402
TESP    101323
TESP.    01323
TEST     01100
TEST2    01110
TES1     01337
TLS     700406
TNG      01136
TOK      01150
TSF     700401
TTYR     00024
TYPE    101341
TYPE.    01341
XBITS    01533
.EOT     00000
```

```
.EOT      00000
IORET     00006
AXT       00010
AXL       00011
AX3       00012
TTYR      00024
SPIN      00027
EXINT     00031
BGIN      01000
NFH       01005
INIT      01006
GO        01042
EH2       01054
GO2       01056
GO3       01060
HOTGO     01070
TEST      01100
TEST2     01110
SPEM      01117
TNC       01136
EH        01143
TOK       01150
COOLIT    01154
COOL2     01162
SCORE     01170
NEXB      01173
DONE      01204
LTAB      01210
HS1       01250
HS2       01251
HS3       01252
HS4       01253
HS5       01254
PRINT.    01255
PRINGO    01261
PROUT     01307
CHAR.     01311
TESP.     01323
TFS1      01337
TYPE.     01341
TAB.      01352
CRLF.     01365
PROCT.    01374
PROCS.    01401
OP1       01406
OPGO      01412
OPS       01420
OPT       01427
HEAD      01436
FM1       01456
FM2       01474
BLIM      01516
ASTFM     01517
AST3      01520
BANKS     01521
```

```
ERAP      01522
FLAC      01523
HOP       01524
HSIG      01525
JTEM      01526
OCCT      01527
OCTEM     01530
SAC       01531
TABCT     01532
XBITS     01533
PRINT    101255
CHAR     101311
TESP     101323
TYPE     101341
TAB      101352
CRLF     101365
PROCT    101374
PROCS    101401
CLSF     700001
CLOF     700004
CLON     700044
RSF      700101
RCF      700102
RSA      700104
RRB      700112
RSB      700144
PSF      700201
PCF      700202
PSA      700204
PSB      700244
KSF      700301
KRB      700312
TSF      700401
TCF      700402
TLS      700406
EEM      707702
LEM      707704
```