PDP-15
MEMORY

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IDENTIFICATION

Product Code:	MAINDEC 15-D1AØ-D (D)
Product Name:	PDP-15 Basic Memory Checkerboard (Low and High Versions)
Date Created:	October 22, 1969
Maintainer:	Diagnostics Group
Author:	J. W. Richardson

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1. ABSTRACT

The PDP-15 Basic Memory Checkerboard programs test 3D core memories for failure on half-selected lines under worst case noise conditions. Their use is intended for 4K systems. Either program will loop until stopped by the operator, or an error is detected.

2. REQUIREMENTS

Equipment

A standard PDP-15.

Storage

There are two versions of this MAINDEC. The Low End program occupies memory locations 200 to 506, and tests memory from 1000 to 7777 octal. The High End program occupies locations 7400 to 7674, and tests memory from 0000 to 7377 octal.

3. LOADING PROCEDURE

The loading procedure is identical for either program.

a. Place the tape in the reader.

b. Place the BANK MODE switch on a 1.

c. Set the ADDRESS switches to 17700.

d. Press I/O RESET, and then READ-IN.

4. STARTING PROCEDURE

a. 200 is the starting address for the Low End program.

b. 7400 is the starting address for the High End program.

c. The AC switches do not effect the normal operation of the program. However, they may be used to suppress error halts. See section 6.

5. PROGRAM DESCRIPTION

The program tests memory using four different patterns. Three of the patterns are variations of a checkerboard type, plus the complement of each, making a total of six. The fourth pattern is included to test the effects of prolonged reading of a memory location that contains 000000 and all other intersecting addresses contain 777777. As an example, the program may write 777777 in every Y axis address from 0000 through 7300. The Y axis is addressed using bits 6 - 11. The program then deposits 000000 in address 0000 and then reads (LAC*) address 0000 1024 times. Each Y address intersecting X line 00 is then read and checked to make sure that each contains 777777. If a "weak" core is present, it may switch to the 0 state using this test method.

Shown below are the three checkerboard patterns and their complements as they would appear in a portion of one bit plane. Each pattern complements every 40 octal addresses. The X axis is addressed by MA bits 12 - 17, and the Y axis by bits 6 - 11.

Pattern 1: 463144

	Y axis		Y axis
0	10011001	0	01100110
X axis	10011001	X axis	01100110
	⋮		⋮
40	01100110	40	10011001

Pattern 2: 631460

	Y axis		Y axis
0	11001100	0	00110011
X axis	11001100	X axis	00110011
	⋮		⋮
40	00110011	40	11001100

Pattern 3: 525250

	Y axis		Y axis
0	10101010	0	01010101
X axis	10101010	X axis	01010101
	⋮		⋮
40	01010101	40	10101010

The control words used to generate the patterns are:

Pattern 1: 463144 and 314633
Pattern 2: 631460 and 146317
Pattern 3: 525250 and 252527

6. ERROR HALTS

Listed below are the six possible halts which may occur. Halts E1 through E4 apply to the memory checkerboard tests (patterns 1, 2 and 3), and E5 and E6 are used for the fourth pattern (tagged BURST on the program listing).

Two addresses are given for each halt; the first is for the Low End test and the second for the High End test.

C (MO)	Tag	Description
362 7557	E1	A memory location does not contain 777777 or 000000. The AC displays the address of the location in error. Press CONT for next halt.
364 7561	E2	The AC displays the contents of the location in error. Record the value and press CONT for the next halt.
366 7563	E3	The AC displays the data the location should have contained. Press CONT again.
370 7565	E4	The AC displays the control word used to generate the current checkerboard pattern. The value will equal 463144, 631460 or 525250 or their complements - 314633, 146317 or 252527. Press CONT resume testing with the next sequential memory location.
450 7643	E5	An error was detected during pattern 4. A memory location does not equal 777777. The AC displays the failing address. Bits 12 - 17 indicate the X axis address which contains 000000. Bits 6 - 11 indicate the Y axis address which should have contained 777777. Press CONT for the next halt.

C (MO)	Tag	Description
452 7645	E6	The AC displays the data read from the failing address. Press CONT to test the next sequential Y axis address.

Error Suppression

Further error halts for any bit position in the checkerboard tests (halts E1 - E4) may be suppressed by placing the corresponding AC switch on a 1 before pressing CONT after the last error halt (E4). An error halt will occur for any failing bit position whose corresponding AC switch is on a 0. Error halts for all bit positions may be restored by restarting from 200 (Low) or 7400 (High).

Any one of the six checkerboard patterns (3 plus complements) may be used exclusively by placing the correct control word in 3 locations (see error halt E4 above). For the Low End test these locations are 460, 461 and 462. For the High End test the locations are 7671, 7672 and 7673. Either set of 3 locations normally contain 463144, 631460 and 525250, respectively.

Error suppression for pattern 4 is not provided. To loop on any failing address do the following:

1. Manually DEPOSIT the failing address in the location tagged PATR on the listing.

2. Place a NOP 2 locations before the tag BUST (BUST -2).

3. Set the ADDRESS switches to the address of tag BRSTA. Press I/O RESET, and then START.

   The location tagged PATR contains the failing address.

   Location BUST -2 normally contains an ISZ PATWD.

7. EXECUTION TIME

Either program requires approximately 20 seconds to run all 7 patterns.

8. LISTING

```
                        .TITLE LOCK 15
                    /
                    /PDP-15 BASIC 4K MEMORY CHECKERBOARD,
                    /S.A.=200, (RESIDES IN LOW - TESTS HIGH)
                    /
                    /COPYRIGHT 1969 DIGITAL EQUIPMENT CORP.,
                    /MAYNARD, MASS.
                    /
                    /J. RICHARDSON
                    /
                        .ABS
00200                   .LOC 200
                    /
00200   777777  BEGIN   LAW     -1
00201   040453          DAC     BITSUP
00202   777775          LAW     -3
00203   040454          DAC     PATCNT          /CONTROL WORD COUNT
00204   200456          LAC     PATN            /CONTROL WORD POINTER
00205   040457          DAC     NXTPAT
                    /
00206   220457  CKLP    LAC*    NXTPAT          /GET A CONTROL WORD
00207   040465          DAC     CNTRL           /SAVE
00210   100215          JMS     TEST            /WRITE PATTERN AND TEST
00211   440457          ISZ     NXTPAT          /INCREMENT POINTER
00212   440454          ISZ     PATCNT          /DONE ALL IF SKIP
00213   600206          JMP     CKLP            /DO NEXT PATTERN
00214   600202          JMP     BEGIN+2         /START OVER
                    /
00215   000000  TEST    0
00216   100263          JMS     WRITE           /WRITE THE PATTERN
00217   200471          LAC     K1
00220   040470          DAC     BITCON          /USED TO COMPLEMENT BITS
00221   100270          JMS     READ            /READ AND TEST
00222   200470          LAC     BITCON
00223   744010          RCL                     /SETUP FOR NEXT BIT
00224   040470          DAC     BITCON
00225   740200          SZA
00226   600221          JMP     TEST+4          /TEST NEXT BIT POSITION
00227   600374          JMP     BURST
00230   777774  COMP    LAW     -4
00231   260457          XOR*    NXTPAT          /CHECK FOR LAST PATTERN
00232   540465          SAD     CNTRL
00233   620215          JMP*    TEST            /DID COMPLEMENT
00234   040465          DAC     CNTRL
00235   600216          JMP     TEST+1          /WRITE COMPLEMENT
                    /
                    /GENERATE PATTERN
                    /
00236   000000  GENPAT  0
00237   200465          LAC     CNTRL           /CURRENT PATTERN WORD
00240   040472          DAC     SVMSTR          /SAVE
00241   200501          LAC     (1000
00242   040473          DAC     SVADR           /ADDRESS COUNTER
00243   771000          LAW     -7000
00244   040474          DAC     SVLTH
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00245   777714          LAW     -70
00246   040466          DAC     CT04            /COUNTS 4 X 16 SHIFTS
00247   200472          LAC     SVMSTR          /CURRENT CONTROL WORD
00250   040475          DAC     PATR            /SAVE
00251   777762  WCNT    LAW     -20
00252   040467          DAC     CT16            /COUNTS 16 SHIFTS
00253   200475          LAC     PATR            /CONTROL WORD
00254   744010          RCL
00255   040475          DAC     PATR
00256   751400          SZL!CLA
00257   740001  COMPL   CMA                     /WRITE 777777
00260   040455          DAC     PATWD
00261   200455          LAC     PATWD
00262   620236          JMP*    GENPAT          /EXIT TO WRITE OR READ
                /
00263   000000  WRITE   0
00264   100236          JMS     GENPAT          /GET A WORD
00265   060473          DAC*    SVADR           /WRITE
00266   100307          JMS     CKXY            /CHECK FOR PATTERN INVERSION
00267   620263          JMP*    WRITE
                /
                /READ AND TEST
                /
00270   000000  READ    0
00271   100236          JMS     GENPAT          /GET A WORD
00272   040477          DAC     GOOD            /SAVE
00273   200470          LAC     BITCON
00274   260473          XOR*    SVADR           /COMPLEMENT A BIT
00275   060473          DAC*    SVADR           /WRITE WITH INVERTED BIT
00276   200470          LAC     BITCON
00277   260473          XOR*    SVADR           /RE-COMPLEMENT
00300   060473          DAC*    SVADR           /RESTORE
00301   220473          LAC*    SVADR           /READ
00302   540477          SAD     GOOD            /COMPARE
00303   741000          SKP                     /O.K.
00304   600343          JMP     ERROR           /ERROR PATH
00305   100307  RTN     JMS     CKXY            /CHECK FOR PATTERN INVERSION
00306   620270          JMP*    READ            /EXIT
                /
                /ROUTINE TO CHECK FOR PATTERN INVERSION
                /
00307   000000  CKXY    0
00310   440474          ISZ     SVLTH           /DONE 4K IF SKIP
00311   741000          SKP
00312   620307          JMP*    CKXY            /EXIT TO WRITE OR READ
00313   440466          ISZ     CT04            /DONE WITH Y AXIS IF SKIP
00314   741000          SKP
00315   600324          JMP     Y64             /DONE 64 Y LINES
00316   200473          LAC     SVADR
00317   340500  Y64     TAD     K100            /INCREMENT Y ADDRESS BY 1
00320   040473          DAC     SVADR
00321   440467          ISZ     CT16            /CHECK FOR 16 LOCATIONS
00322   600253          JMP     WCNT+2          /NOT YET
00323   600247          JMP     WCNT            /RESTORE COUNT
                /
```

```
00324  440473   Y64    ISZ    SVADR          /INCREMENT X LINE BY 1
00325  777710          LAW    -70
00326  240466          DAC    CT04           /RESTORE Y LINE COUNTER
00327  200473          LAC    SVADR
00330  500464          AND    K77
00331  340501          TAD    (1000
00332  040473          DAC    SVADR
00333  500464          AND    K77
00334  540463          SAD    K40            /COMPLEMENT PATTERN IF EQUAL
00335  741000          SKP
00336  600321          JMP    N64+2          /START WITH NEW X-Y COMBO
00337  200472          LAC    SVMSTR         /PATTERN CONTROL WORD
00340  740001          CMA
00341  340472          DAC    SVMSTR         /COMPLEMENTED CONTROL WORD
00342  600247          JMP    WCNT-2
                /
                /
00343  040476   ERROR  DAC    BAD
00344  741200          SNA                   /CHECK FOR FULL WORD ERROR
00345  600360          JMP    E1-1           /FULL WORD ERROR
00346  740001          CMA
00347  741200          SNA
00350  600360          JMP    E1-1           /FULL WORD ERROR
00351  200476          LAC    BAD
00352  500453          AND    BITSUP         /SEE IF BIT SUPPRESSED
00353  740200          SZA
00354  740001          CMA
00355  500453          AND    BITSUP
00356  741200          SNA
00357  600305          JMP    RTN            /BIT SUPPRESSED
                /
00360  200473          LAC    SVADR
00361  740040   E1     HLT                   /AC = FAILING ADDRESS
00362  200476          LAC    BAD
00363  740040   E2     HLT                   /AC = BAD DATA
00364  200477          LAC    GOOD
00365  740040   E3     HLT                   /AC = GOOD DATA
00366  200465          LAC    CNTRL
00367  740040   E4     HLT                   /AC = PATTERN CONTROL WORD
00370  750004          LAS                   /SUPPRESSED BITS
00371  740001          CMA
00372  040453          DAC    BITSUP
00373  600305          JMP    RTN            /READ ANOTHER
                /
                /READ AND TEST Y LINES 0₂ TO 63 WITH
                /X LINES 00 THRU 63. EACH X LINE WILL
                /EQUAL 000000. AN X LINE WILL BE READ 512
                /TIMES AFTER WHICH, ALL Y LINES INTER-
                /SECTING WITH THAT X LINE WILL BE
                /READ AND TESTED FOR BIT ERRORS.
                /
00374  200501   BURST  LAC    (1000
00375  040473          DAC    SVADR
00376  777777   WONS   LAW    -1             /WRITE 1'S IN 1000 TO 7777
00377  260473          DAC*   SVADR
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00420   440473          ISZ     SVADR
00421   200502          LAC     (177770
00422   540473          SAD     SVADR           /DONE IT EQUAL
00423   741000          SKP
00424   600376          JMP     .-ONS
00425   200501          LAC     (1000
00426   240473          DAC     SVADR           /1000 IS STARTING ADDR
00427   340500          TAD     K100
00430   040475          DAC     PATR            /SAVES XY COORDINATE
00431   200475  BRSTA   LAC     PATR
00432   040474          DAC     SVLTH           /Y LINE ADDRESS
00433   776000          LAW     -2000           /-512 DECIMAL
00434   040455          DAC     PATWD
00435   160473          DZM*    SVADR           /CLEAR LINE XN
00436   220473          LAC*    SVADR           /READ 000000
00437   440455          ISZ     PATWD           /DISTURB LINE 512 TIMES
00440   600416          JMP     .-2
00441   777777  BUST    LAW     -1
00442   260474          XOR*    SVLTH           /DATA MUST BE 777777
00443   741200          SNA                     /SHOULD NOT SKIP
00444   600430          JMP     CEND            /OK
00445   740001          CMA
00446   040476          DAC     BAD
00447   600446          JMP     .E5-1           /ERROR PATH
00450   200500  CEND    LAC     K100
00451   340474          TAD     SVLTH           /Y AXIS PLUS 1
00452   040474          DAC     SVLTH
00453   200502          LAC     (10000
00454   500474          AND     SVLTH
00455   540502          SAD     (10000          /DONE ALL Y FOR CURRENT X
00456   741000          SKP                     /IF EQUAL
00457   600421          JMP     BUST            /READ NEXT Y ON CURRENT X
00460   440473          ISZ     SVADR           /INCREMENT X ADDRESS
00461   440475          ISZ     PATR            /INCREMENT X+Y ADDRESS
00462   200503          LAC     (1100
00463   540473          SAD     SVADR           /DONE 63 X LINES IF EQUAL
00464   600230          JMP     COMP            /WRITE NEXT CHECKERBOARD
00465   600411          JMP     BRSTA           /TEST NEXT X WITH Y02
                                                /THRU Y63
                /
00466   200474          LAC     SVLTH
00467   740040  E5      HLT                     /AC = FAILING X + Y63 LINE
00470   200476          LAC     BAD
00471   740040  E6      HLT                     /AC = BAD DATA
00472   600430          JMP     CEND            /READ ANOTHER
                /
                /CONSTANTS AND STORAGE REGISTERS
                /
00473   777777  BITSUP  LAW     -1
00474   000000  PATCNT  0
00475   000000  PATWD   0
00476   000460  PATN    .+2
00477   000460  NXTPAT  .+1
00460   463144          463144
00461   631460          631460
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00462   525250                  525250
00463   000040          K40     40
00464   000077          K77     77
00465   000000          CNTRL   0
00466   000000          CT04    0
00467   000000          CT16    0
00470   000000          BITCON  0
00471   000001          K1      1
00472   000000          SVMSTR  0
00473   000000          SVADR   0
00474   000000          SVLTH   0
00475   000000          PATR    0
00476   000000          BAD     0
00477   000000          GOOD    0
00500   000100          K100    100
                /
00001                           .LOC    1
00001   600001                  JMP     1
00002   777777                  LAW     -1
00003   777777                  LAW     -1
00004   777777                  LAW     -1
00005   777777                  LAW     -1
        000000                  .END
00501   001000  *L
00502   010000  *L
00503   011100  *L
                NO ERROR LINES
```

```
                        .TITLE CKHI15
                    /
                    /PDP-15 BASIC 4K MEMORY CHECKERBOARD
                    /SA = 7400, (RESIDES IN HIGH - TESTS LOW)
                    /
                    /COPYRIGHT 1969, DIGITAL EQUIPMENT CORP.,
                    /MAYNARD, MASS.
                    /
                    /J. RICHARDSON
                    /
                        .ABS
00001                   .LOC 1
                    /
00001   600001          JMP     1
00002   777777          LAW     -1
00003   777777          LAW     -1
00004   777777          LAW     -1
00005   777777          LAW     -1
                    /
0020 0                  .LOC 200
                    /
00200   607400          JMP     BEGIN
                    /
07400                   .LOC 7400
                    /
07400   777777  BEGIN   LAW     -1
07401   047657          DAC     BITSUP
07402   777775          LAW     -3
07403   047660          DAC     PATCNT          /CONTROL WORD COUNT
07404   207667          LAC     PATN            /CONTROL WORD POINTER
07405   047670          DAC     NXTPAT
                    /
07406   227670  CKLP    LAC*    NXTPAT          /GET A CONTROL WORD
07407   047662          DAC     CNTRL           /SAVE
07410   107415          JMS     TEST            /WRITE PATTERN AND TEST
07411   447670          ISZ     NXTPAT          /INCREMENT POINTER
07412   447660          ISZ     PATCNT          /DONE BOTH IF SKIP
07413   607406          JMP     CKLP            /DO NEXT PATTERN
07414   607402          JMP     BEGIN+2         /START OVER
                    /
07415   000000  TEST    0
07416   107462          JMS     WRITE           /WRITE THE PATTERN
07417   207655          LAC     K1
07420   047663          DAC     BITCON          /USED TO COMPLEMENT BITS
07421   107467          JMS     READ            /READ AND TEST
07422   207663          LAC     BITCON
07423   744010          RCL                     /SETUP FOR NEXT BIT
07424   047663          DAC     BITCON
07425   740200          SZA
07426   607421          JMP     TEST+4          /TEST NEXT BIT POSITION
07427   607571          JMP     BURST           /TEST ALL X LINES WITH
                                                /Y LINE #61.
07430   777774  COMP    LAW     -4
07431   267670          XOR*    NXTPAT          /CHECK FOR LAST PATTERN
07432   547662          SAD     CNTRL
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07433   627415              JMP*    TEST        /HAVE DONE COMPLEMENT
07434   047662              DAC     CNTRL
07435   607416              JMP     TEST+1      /WRITE COMPLEMENT
                /
                /GENERATE PATTERN
                /
07436   000000      GENPAT  0
07437   207662              LAC     CNTRL       /CURRENT CONTROL WORD
07440   047664              DAC     SVMSTR      /SAVE
07441   147665              DZM     SVADR       /ADDRESS COUNTER
07442   770400              LAW     -7400
07443   047666              DAC     SVLTH
07444   777704              LAW     -74
07445   047650              DAC     CT04        /COUNTS Y LINES
07446   207664              LAC     SVMSTR      /CURRENT CONTROL WORD
07447   047652              DAC     PATR        /SAVE
07450   777760      WCNT    LAW     -20
07451   047651              DAC     CT16        /COUNTS 16 SHIFTS
07452   207652              LAC     PATR        /CONTROL WORD
07453   744010              RCL
07454   047652              DAC     PATR
07455   751400              SZL!CLA
07456   740001      COMPL   CMA                 /WRITE 777777
07457   047661              DAC     PATWD
07460   207661              LAC     PATWD
07461   627436              JMP*    GENPAT      /EXIT TO WRITE OR READ
                /
07462   000000      WRITE   0
07463   107436              JMS     GENPAT      /GET A WORD
07464   067665              DAC*    SVADR       /WRITE
07465   107506              JMS     CKXY        /CHECK FOR PATTERN INVERSION
07466   627462              JMP*    WRITE       /DONE 7500 IF SKIP
                /
                /READ AND TEST
                /
07467   000000      READ    0
07470   107436              JMS     GENPAT      /GET A WORD
07471   047654              DAC     GOOD        /SAVE
07472   207663              LAC     BITCON
07473   267665              XOR*    SVADR       /COMPLEMENT A BIT
07474   067665              DAC*    SVADR       /WRITE WITH INVERTED BIT
07475   207663              LAC     BITCON
07476   267665              XOR*    SVADR       /RE-COMPLEMENT
07477   067665              DAC*    SVADR       /RESTORE
07500   227665              LAC*    SVADR       /READ
07501   547654              SAD     GOOD        /COMPARE
07502   741000              SKP                 /OK
07503   607540              JMP     ERROR       /ERROR PATH
07504   107506      RTN     JMS     CKXY        /CHECK FOR PATTERN INVERSION
07505   627467              JMP*    READ        /EXIT
                /
                /ROUTINE TO CHECK FOR PATTERN INVERSION
                /
07506   000000      CKXY    0
07507   447666              ISZ     SVLTH       /DONE 4K IF SKIP
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07510   741000          SKP
07511   627506          JMP*    CKXY        /EXIT TO WRITE OR READ
07512   447650          ISZ     CT04        /DONE WITH Y AXIS IF SKIP
07513   741000          SKP
07514   607523          JMP     Y64         /DONE 64 Y LINES
07515   207665          LAC     SVADR
07516   347656  N64     TAD     K100        /INCREMENT Y ADDRESS BY 1
07517   047665          DAC     SVADR
07520   447651          ISZ     CT16        /CHECK FOR 16 LOCATIONS
07521   607452          JMP     WCNT+2      /NOT YET
07522   607446          JMP     WCNT-2      /RESTORE COUNT
                /
07523   447665  Y64     ISZ     SVADR       /INCREMENT X LINE BY 1
07524   777704          LAW     -74
07525   047650          DAC     CT04        /RESTORE Y LINE COUNTER
07526   207665          LAC     SVADR
07527   507647          AND     K77
07530   047665          DAC     SVADR
07531   547646          SAD     K40         /COMPLEMENT PATTERN IF EQUAL
07532   741000          SKP
07533   607520          JMP     N64+2       /START WITH NEW X-Y COMBO
07534   207664          LAC     SVMSTR      /PATTERN CONTROL WORD
07535   740001          CMA
07536   047664          DAC     SVMSTR      /COMPLEMENTED CONTROL WORD
07537   607520          JMP     N64+2
                /
                /
07540   047653  ERROR   DAC     BAD         /SAVE
07541   741200          SNA                 /CHECK FOR FULL WORD ERROR
07542   607555          JMP     E1-1        /FULL WORD ERROR
07543   740001          CMA
07544   741200          SNA
07545   607555          JMP     E1-1        /FULL WORD ERROR
07546   207653          LAC     BAD
07547   507657          AND     BITSUP      /SEE IF BIT SUPPRESSED
07550   740200          SZA
07551   740001          CMA
07552   507657          AND     BITSUP
07553   741200          SNA
07554   607504          JMP     RTN         /BIT SUPPRESSED
                /
07555   207665          LAC     SVADR
07556   740040  E1      HLT                 /AC = FAILING ADDRESS
07557   207653          LAC     BAD
07560   740040  E2      HLT                 /AC = BAD DATA
07561   207654          LAC     GOOD
07562   740040  E3      HLT                 /AC = GOOD DATA
07563   207662          LAC     CNTRL
07564   740040  E4      HLT                 /AC = PATTERN CONTROL WORD
07565   750004          LAS                 /SUPPRESSED BITS
07566   740001          CMA
07567   047657          DAC     BITSUP
07570   607504          JMP     RTN         /READ ANOTHER
                /
                /READ AND TEST Y LINES 01 TO 49 WITH X
```

```
                /LINES 00 THRU 63.      EACH X LINE WILL EQUAL
                /000000.        AN X LINE WILL BE READ 1024 TIMES
                /AFTER WHICH, ALL Y LINES INTERSECTING,
                /WITH THAT X LINE WILL BE READ AND TESTED
                /FOR BIT ERRORS.
                /
07571   147665  BURST   DZM     SVADR
07572   777777  WONS    LAW     -1
07573   067665          DAC*    SVADR           /WRITE 1'S IN 0000 TO 7400
07574   447665          ISZ     SVADR
07575   207674          LAC     (7400
07576   547665          SAD     SVADR           /DONE IF 7400
07577   741000          SKP
07600   607572          JMP     WONS
07601   147665          DZM     SVADR           /0000 IS STARTING ADDRESS
07602   207656          LAC     K100
07603   047652          DAC     PATR            /SAVES XY COORDINATE
07604   207652  BRSTA   LAC     PATR
07605   047666          DAC     SVLTH           /Y LINE ADDRESS
07606   776000          LAW     -2000           /=1024 DECIMAL
07607   047661          DAC     PATWD
07610   167665          DZM*    SVADR           /CLEAR LINE XN
07611   227665          LAC*    SVADR           /READ 000000
07612   447661          ISZ     PATWD           /DISTURB LINE 1024 TIMES
07613   607611          JMP     .-2
07614   777777  BUST    LAW     -1
07615   267666          XOR*    SVLTH           /DATA MUST BE 777777
07616   741200          SNA                     /SHOULD NOT SKIP
07617   607623          JMP     CEND            /OK
07620   740001          CMA
07621   047653          DAC     BAD
07622   607641          JMP     E5-1            /ERROR PATH
07623   207656  CEND    LAC     K100
07624   347666          TAD     SVLTH           /Y AXIS PLUS 1
07625   047666          DAC     SVLTH
07626   207674          LAC     (7400
07627   507666          AND     SVLTH
07630   547674          SAD     (7400           /DONE ALL Y ON CURRENT X LINE
07631   741000          SKP                     /IF EQUAL
07632   607614          JMP     BUST            /READ NEXT Y ON CURRENT X
07633   447665          ISZ     SVADR           /INCREMENT X ADDRESS
07634   447652          ISZ     PATR            /INCREMENT X+Y ADDRESS
07635   207656          LAC     K100
07636   547665          SAD     SVADR           /DONE 64 X LINES IF EQUAL
07637   607430          JMP     COMP            /WRITE NEXT CHECKERBOARD
07640   607604          JMP     BRSTA           /TEST NEXT X WITH Y01 THRU Y60
                /
                /
07641   207666          LAC     SVLTH
07642   740040  E5      HLT                     /AC = FAILING X + Y61 LINE
07643   207653          LAC     BAD
07644   740040  E6      HLT                     /AC = BAD DATA
07645   607623          JMP     CEND
                /
                /CONSTANTS AND STORAGE REGISTERS
```

```
                    /
07646   000040      K40     40
07647   000077      K77     77
07650   000000      CT04    0
07651   000000      CT16    0
07652   000000      PATR    0
07653   000000      BAD     0
07654   000000      GOOD    0
07655   000001      K1      1
07656   000100      K100    100
07657   777777      BITSUP  LAW     -1
07660   000000      PATCNT  0
07661   000000      PATWD   0
07662   000000      CNTRL   0
07663   000000      BITCON  0
07664   000000      SVMSTR  0
07665   000000      SVADR   0
07666   000000      SVLTH   0
07667   007671      PATN    .+2
07670   007671      NXTPAT  .+1
07671   463144              463144
07672   631460              631460
07673   525250              525250
                    /
        000000              .END
07674   007400  *L
                NO ERROR LINES
```