IDENTIFICATION

PRODUCT CODE: MAINDEC-8E-D0EB-D

PRODUCT NAME: RANDOM TAD TEST

DATE CREATED: JUNE 7,1971

MAINTAINER: DIAGNOSTIC GROUP

AUTHOR: MICHAEL DAVIS

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1.   ABSTRACT

      THIS PROGRAM TESTS THE TAD INSTRUCTING OF THE PDP-8E, THE
      TAD INSTRUCTION, INSTRUCTION ADDRESS, OPERAND ADDRESS AND
      BOTH OPERANDS ARE PRODUCED BY RANDOM NUMBER GENERATORS.

2.   REQUIREMENTS

2.1   EQUIPMENT

      PDP-8E EQUIPPED WITH AT LEAST 4K OF MEMORY;

      TELETYPE.

2.2   STORAGE

      THE PROGRAM IS LOADED INTO LOCATIONS 6600 THRU 7577,
      THE TEST AREA IS 0000-6577. TEMPORARY STORAGE LOCATIONS
      ARE LOCATED ON PAGE 0.

2.3   PRELIMINARY PROGRAMS

      MAINDEC-8E-D0AA, D0BA, D0CA, D0DA

3.   LOADING PROCEDURE

      THE STANDARD PROCEDURE FOR LOADING BINARY TAPES IS TO BE USED.

4.   STARTING PROCEDURE

4.1   STARTING ADDRESS

      0200

4.2   CONTROL SWITCH SETTINGS

      SR00=1, SUPPRESS HALT ON ERROR
      SR03=1, SUPPRESS END OF PASS TYPEOUT
      SR09=1, HOLD DATA 1 CONSTANT
      SR10=1, HOLD DATA 2 CONSTANT
      SR11=1, HOLD INSTRUCTION CONSTANT

4.3   OPERATOR ACTION

4.3.1   SET SR TO 0200

4.3.2   PRESS LOAD ADDRESS SWITCH

4.3.3   SET SR TO 0000

4.3.4   PRESS CLEAR AND CONTINUE SWITCHES
        ----

5.   OPERATING PROCEDURE

        SAME AS 4.

6.   ERRORS

6.1   ERROR HALT

        IF THE RESULTS OF THE TAD INSTRUCTION ARE INCORRECT,
        THAT IS IF THE ACTUAL AND SIMULATED LINKS, OR THE ACTUAL
        AND SIMULATED SUMS DO NOT AGREE, THE PROGRAM
        WILL HALT AT 7407 WITH DATA1 IN THE AC.

        DEPRESS CONTINUE TO DISPLAY DATA2 IN THE AC.
        DEPRESS CONTINUE TO DISPLAY TAD INSTRUCTION IN AC.
        DEPRESS CONTINUE TO DISPLAY INSTRUCTION ADDRESS IN AC.
        DEPRESS CONTINUE TO DISPLAY DATA2 ADDRESS IN AC.
        DEPRESS CONTINUE TO DISPLAY INDIRECT POINTER (USED BY INDIRECT
        TAD) IN AC.
        DEPRESS CONTINUE TO RESUME TEST

6.2   ERROR RECOVERY

        SEE 6.1

)   )   )

6.3   LOOPING

        SET SR00=1 TO PREVENT HALT AFTER ERROR,

        SET SR03=1 TO SUPPRESS END OF PASS TYPEOUT,

        SET SR09=SR11=1 TO HOLD INSTRUCTION AND DATA CONSTANT,

7,   RESTRICTIONS

        NONE

8,   EXECUTION TIME

        THE PROGRAM PERFORMS 4096 RANDOM TESTS IN APPROXIMATELY 5
        SECONDS, THE PROGRAM WILL TYPE "T" AFTER
        EACH 4096 RANDOM TESTS UNLESS SR03=1,

9,   PROGRAM DESCRIPTION

        THE PROGRAM IS LOADED INTO LOCATIONS 6600-7577,
        WITH TEMPORARY STORAGE LOCATIONS ON PAGE 0,

        THE PROGRAM USES SEPARATE RANDOM NUMBER GENERATORS TO GENERATE
        THE TAD INSTRUCTION, INSTRUCTION AND DATA ADDRESSES, AND THE
        TWO ARGUMENTS TO BE "TADDED", THE INSTRUCTIONS AND DATA ARE
        STORED IN THEIR PREVIOUSLY GENERATED ADDRESSES, THE PROGRAM
        TRANSFERS TO THE LOCATION OF THE INSTRUCTION AND EXECUTES IT,
        THE PROGRAM THEN TRANSFERS TO A COMPARISON ROUTINE WHERE THE
        ACTUAL RESULT OF THE TAD INSTRUCTION IS COMPARED TO A SIMULATED
        TAD, THE SIMULATOR IS SIMILAR TO THE ONE USED IN MAINDEC-
        8E-D0CA-D, NO TADS ARE USED IN THE PROGRAM ITSELF,

        AFTER 4096 TESTS, THE PROGRAM TYPES "T" AND CONTINUES TESTING,

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                        /
                        /RANDOM TAD TEST
                        /COPYRIGHT 1972, DIGITAL EQUIPMENT CORP., MAYNARD, MASS. 01754
                        /V 82 07552
                        /
                        /
                        /TEMPORARY STORAGE LOCATIONS
                        /
        0000            *0
0000    0000            RETURN, 0
0001    5001            INSTL,  JMP     .
0002    0002            INADDL, 2
0003    0003            DATADL, 3
0004    0000            PADDL,  0
0005    0000            IFLAGL, 0

        7501                    MQA=7501
        7421                    MQL=7421
        6007                    CAF=6007

        0200            *200
0200    6007            START,  CAF
0201    5602                    JMP I   .+1
0202    6600                    STARTL
```

```
                        /
                        /GENERATE TEST INSTRUCTION AND DATA
                        /
        6600            *6600
6600    7300            STARTL, CLA CLL
6601    3376                    DCA     CNTR1           /CLEAR PASS COUNTER
6602    7604            TEST1L, LAS
6603    0371                    AND     SR11            /TEST SR11
6604    7640                    SZA CLA                 /IS SR11=1
6605    5224                    JMP     TDAT1L          /SR11=1, DO NOT GENERATE INSTRUCTION
6606    4746                    JMS I   TGENL           /GENERATE INSTRUCTION
6607    3355                    DCA     TIFLGL          /SAVE INDIRECT FLA
6610    7040                    CMA
6611    0001                    AND     INSTL           /GET INSTRUCTION
6612    3353                    DCA     TINSTL          /SAVE IT
6613    7040                    CMA
6614    0002                    AND     INADDL          /GET INSTRUCTION ADDRESS
6615    3354                    DCA     TINADL          /SAVE IT
6616    7040                    CMA
6617    0003                    AND     DATADL          /GET DATA ADDRESS
6620    3356                    DCA     TDATAL          /SAVE IT
6621    7040                    CMA
6622    0004                    AND     PADDL           /GET INDIRECT TO DATA
6623    3357                    DCA     TPADDL          /SAVE IT
6624    7604            TDAT1L, LAS
6625    0372                    AND     SR10            /TEST SR10
```

```
6626  7640            SZA CLA                 /IS SR10=1
6627  5234            JMP       TDAT2L        /SR10=1, DO NOT GENERATE DATA1
6630  7040            CMA
6631  0360            AND       TDA1L         /GENERATE RANDOM NUMBER
6632  4752            JMS I     TRANDL
6633  3360            DCA       TDA1L
6634  7604    TDAT2L, LAS
6635  0373            AND       SR09          /TEST SR09
6636  7640            SZA CLA                 /IS SR09=1
6637  5244            JMP       SETTL         /SR09=1, DO NOT GENERATE DATA2
6640  7040            CMA
6641  0361            AND       TDA2L         /GENERATE RANDOM NUMBER
6642  4752            JMS I     TRANDL
6643  3361            DCA       TDA2L
```

```
                      /
                      /SET UP INSTRUCTION AND DATA AT TEST ADDRESS
                      /ALONG WITH RETURN TO THIS ROUTINE
                      /
6644  7340    SETTL,  CLA CLL CMA
6645  0353            AND       TINSTL        /GET INSTRUCTION
6646  3754            DCA I     TINADL        /STORE IN TEST LOCATION
6647  7040            CMA
6650  0355            AND       TIFLGL        /GET INDIRECT FLAG
6651  7650            SNA CLA                 /IS INSTRUCTION INDIRECT
6652  5302            JMP       DIRL          /NO, GET DATA
6653  7040            CMA
6654  0356            AND       TDATAL        /ADDRESS IS INDIRECT
6655  0367            AND       T7760         /IS ADDRESS AUTO-INDEX REGISTER
6656  7640            SZA CLA
6657  5276            JMP       NOTAUT        /NO
6660  7040            CMA
6661  0356            AND       TDATAL
6662  0375            AND       K10
6663  7650            SNA CLA
6664  5276            JMP       NOTAUT
6665  7040            CMA
6666  0357            AND       TPADDL        /ADDRESS IS AUTO-INDEX REGISTER
6667  7041            CIA                     /DECREMENT POINTER TO DATA
6670  7040            CMA
6671  3756            DCA I     TDATAL        /STORE IN TEST LOCATION
6672  7040            CMA
6673  0360            AND       TDA1L         /GET DATA
6674  3757            DCA I     TPADDL        /STORE IN TEST LOCATION
6675  5305            JMP       DOTSTL
6676  7040    NOTAUT, CMA
6677  0357            AND       TPADDL
6700  3756            DCA I     TDATAL
6701  5272            JMP       .-7
6702  7040    DIRL,   CMA
6703  0360            AND       TDA1L         /GET DATA
6704  3756            DCA I     TDATAL        /STORE IN TEST LOCATION
                      /
                      /SIMULATE "TAD"
                      /
      7340    DOTSTL, CLA CLL CMA
```

```
  706   0360         AND      TDA1L        /GET    fA1
 6707   7421         MQL                   /SAVE IN MQ
 6710   7040         CMA
 6711   0361         AND      TDA2L        /GET DATA2
 6712   4751         JMS I    TSIMAD       /DO SIMULATION
 6713   3363         DCA      TSIMAC       /SAVE ANSWER
 6714   7010         RAR
 6715   3362         DCA      TSIML        /SAVE LINK

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                     /
                     /GO TO TEST
                     /
 6716   7040  DOANDL, CMA
 6717   0347         AND      TRETTL       /GET RETURN ADDRESS
 6720   3020         DCA      RETURN       /SAVE
 6721   7040         CMA
 6722   0354         AND      TINADL       /GET INSTRUCTION ADDRESS
 6723   7001         IAC                   /INCREMENT
 6724   7450         SNA                   /IS IT 0
 6725   5202         JMP      TEST1L       /YES, GENERATE NEW INFORMATION
 6726   3345         DCA      TEMP2L       /NO, SAVE
 6727   7040         CMA
 6730   0366         AND      T5400L       /GET RETURN INSTRUCTION
 6731   3745         DCA I    TEMP2L       /PUT IN TEST LOCATION
 6732   7140         CLL CMA
 6733   0361         AND      TDA2L        /GET DATA2
 6734   5754         JMP I    TINADL       /EXECUTE "TAD"
                     /
                     /RETURN HERE AFTER EXECUTION
                     /
 6735   3364  TRETUL, DCA     TAC          /SAVE AC
 6736   7010         RAR
 6737   3365         DCA      TLINK        /SAVE LINK
 6740   4774         JMS I    TCOMAD       /COMPARE REAL AND SIMULATED ADDITIONS
 6741   2376         ISZ      CNTR1
 6742   5202         JMP      TEST1L
 6743   4750         JMS I    TEPASL       /END OF PASS, 4096 TEST COMPLETE
 6744   5202         JMP      TEST1L

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                     /
                     /
                     /
 6745   0000  TEMP2L, 0
 6746   7000  TGENL,  GENL
 6747   6735   TRETTL, TRETUL
              TERROR,
 6750   7442  TEPASL, EPASL
 6751   7200  TSIMAD, RSIMAD
 6752   7430  TRANDL, RANDL
 6753   0000  TINSTL, 0
 6754   0000  TINADL, 0
 6755   0000  TIFLGL, 0
 6756   0000  TDATAL, 0
 6757   0000  TPADDL, 0
```

```
6760   0021      TDA1L,    21
6761   0037      TDA2L,    37
6762   0000      TSIML,    0
6763   0000      TSIMAC,   0
6764   0000      TAC,      0
6765   0000      TLINK,    0
6766   5422      T5422L,   5422
6767   7760      T7760,    7760
6770   7770      T7770,    7770
6771   0001      SR11,     1
6772   0002      SR10,     2
6773   0004      SR09,     4
6774   7313      TCOMAD,   COMAD
6775   0010      K10,      10
6776   0000      CNTR1,    0
```

```
                 /
                 /GENERATE INSTRUCTIONS AND ADDRESSES
                 /
       7000      PAGE
7000   0000      GENL,     0
                 /
                 /GENERATE "AND" INSTRUCTION
                 /
7001   7040      GANDL,    CMA
7002   0350                AND     R1L
7003   4762                JMS I   SRANDL              /GENERATE RANDOM NUMBER
7004   3350                DCA     R1L                 /SAVE NUMBER
7005   7040                CMA
7006   0350                AND     R1L
7007   7421                MQL                         /GENERATE OP CODE
7010   7040                CMA
7011   0365                AND     K1000
7012   7501                MQA
7013   0352                AND     K1777
7014   3001                DCA     INSTL               /SAVE INSTRUCTION
7015   7040                CMA
7016   0001                AND     INSTL               /GET INSTRUCTION
7017   0355                AND     K0177L              /EXTRACT PAGE ADDRESS OF INSTRUCTION
7020   3361                DCA     TEMP3L              /SAVE PAGE ADDRESS OF INSTRUCTION
                 /
                 /GENERATE ADDRESS FOR INSTRUCTION
                 /
7021   7040      GANADL,   CMA
7022   0353                AND     R2L
7023   4762                JMS I   SRANDL              /GENERATE RANDOM NUMBER
7024   3353                DCA     R2L                 /SAVE NUMBER
7025   7040                CMA
7026   0353                AND     R2L
7027   4777'               JMS     LIMIT               /IS ADDRESS WITHIN LIMITS
7030   5221                JMP     GANADL              /NO, GENERATE NEW ADDRESS
7031   7040                CMA
7032   0353                AND     R2L
7033   0354                AND     P0L
7034   7640                SZA CLA                     /IS ADDRESS ON PAGE 0
7035   5244                JMP     PAGADL              /NO
       7040                CMA
```

```
  037  0353              AND     R2L              /GET  .GE ADDRESS OF INSTRUCTION
 7040  4776'    PAGAL,   JMS     ABS_             /GET DIFFERENCE BETWEEN PAGE ADDRESSES
 7041  7700              SMA CLA                  /IS DIFFERENCE >2
 7042  5221              JMP     GANADL           /NO
 7043  5255              JMP     PAL
```

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```
 7044  7040    PAGADL,  CMA
 7045  0001              AND     INSTL            /GET INSTRUCTION
 7046  0357              AND     K200L
 7047  7650              SNA CLA                  /IS PAGE BIT SET
 7050  5255              JMP     PAL              /NO, USE ADDRESS AS IS
 7051  7040              CMA
 7052  0353              AND     R2L              /PAGE BIT SET, EXTRACT PAGE ADDRESS FOR INSTRUCTION
 7053  0355              AND     K0177L
 7054  5240              JMP     PAGAL            /TEST FOR INTERFERENCE
 7055  7040    PAL,      CMA
 7056  0361              AND     TEMP3L           /MAKE SURE DATA WILL
 7057  7650              SNA CLA                  /NOT BE STORED IN LOCATION 0
 7060  5201              JMP     GANDL            /LOCATION ZERO, TRY AGAIN
 7061  7040              CMA                      /USE ADDRESS AS IS
 7062  0353              AND     R2L
 7063  3002              DCA     INADDL
```

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```
                        /
                        /GENERATE ADDRESS FOR DATA
                        /
 7064  7040    DAADL,   CMA
 7065  0001              AND     INSTL            /GET INSTRUCTION
 7066  0357              AND     K200L            /IS PAGE BIT OF INSTRUCTION SET
 7067  7650              SNA CLA
 7070  5307              JMP     P0AL             /NO, USE PAGE ADDRESS BITS OF INSTRUCTION FOR DATA ADDRESS
 7071  7040              CMA
 7072  0002              AND     INADDL           /EXTRACT PAGE OF INSTRUCTION ADDRESS
 7073  0354              AND     P0L
 7074  7421              MQL
 7075  7040              CMA
 7076  0361              AND     TEMP3L
 7077  7501              MQA                      /"OR" TOGETHER TO GET
 7100  3003              DCA     DATADL           /DATA ADDRESS
 7101  7040    INDIRL,  CMA
 7102  0001              AND     INSTL
 7103  0356              AND     K400L
 7104  7640              SZA CLA                  /IS INSTRUCTION INDIRECT
 7105  5313              JMP     PADL             /YES, INSTRUCTION IS INDIRECT
 7106  5600              JMP I   GENL             /EXIT
 7107  7040    P0AL,    CMA                      /USE PAGE ADDRESS OF INSTRUCTION
 7110  0361              AND     TEMP3L           /AS DTAT ADDRESS
 7111  3003              DCA     DATADL
 7112  5301              JMP     INDIRL
                        /
                        /GENERATE INDIRECT ADDRESS FOR DATA
                        /
```

```
7113   7040    PADL,    CMA
7114   0360             AND     R3L              /GENERATE RANDOM NUMBER
7115   4762             JMS I   SRANDL
7116   3360             DCA     R3L
7117   7040             CMA
7120   0360             AND     R3L
7121   4777'            JMS     LIMIT            /IS ADDRESS WITHIN LIMITS
7122   5313             JMP     PADL             /NO, TRY AGAIN
7123   7040             CMA
7124   0002             AND     INADDL           /GET INSTRUCTION ADDRESS
7125   4775'            JMS     ABSL1            /GENEREATE DIFFERENCE BETWEEN ADDRESSES
7126   7700             SMA CLA                  /DO INSTRUCTION AND ADDRESS INTERFERE
7127   5313             JMP     PADL             /YES
7130   7040             CMA                      /NO, TEST DATA ADDRESS AS ABOVE
7131   0003             AND     DATADL
7132   4775'            JMS     ABSL1
7133   7700             SMA CLA
7134   5313             JMP     PADL
7135   7040             CMA
7136   0360             AND     R3L              /ADDRESSES DO NOT INTERFERE
7137   7041             CIA                      /WILL LOCATION BE 0 IF DECREMENTED
7140   7040             CMA
7141   7650             SNA CLA
```

```
7142   5313             JMP     PADL             /YES, GENERATE NEW POINTER
7143   7040             CMA
7144   0360             AND     R3L
7145   3004             DCA     PADDL
7146   7040             CMA
7147   5600             JMP I   GENL             /EXIT
                        /
                        /
                        /
7150   0001    R1L,     1
7151   0003    K3L,     3
7152   1777    K1777,   1777
7153   0005    R2L,     5
7154   7600    P0L,     7600
7155   0177    K0177L,  177
7156   0400    K400L,   400
7157   0200    K200L,   200
7160   0015    R3L,     15
7161   0000    TEMP3L,  0
7162   7430    SRANDL,  RANDL
7163   7200    SRIMAD,  RSIMAD
7164   1201    LIML,    1201
7165   1000    K1000,   1000
```

```
                        /
                        /
                        /SIMULATED ADDITION
                        /
```

7   )   7527

```
 ↓76   7474
7177   7303
       7200     PAGE
7200   0000     RSIMAD, 0
7201   3344              DCA     ARG2            /SAVE ARGUMENTS
7202   7501              MQA
7203   3343              DCA     ARG1
                         /
                         /
                         /SIMULATE ADDITION BY SIMULATED GENERATEION OF SUM
                         /AND CARRY BITS
                         /
                         /
                         /FORM OR OF ARG1 WITH ARG2
                         /
7204   7340     SIMAD,   CLA CLL CMA
7205   0343              AND     ARG1            /LOAD AC WITH ARG1
7206   7421              MQL                     /PLACE IN MQ
7207   7040              CMA
7210   0344              AND     ARG2            /LOAD AC WITH ARG2
7211   7501              MQA                     /FORM ARG1 OR ARG2
7212   3345              DCA     A1ORA2          /SAVE ARG1 OR ARG2

                         /
                         /FORM XOR(EXCLUSIVE OR) OF ARG1 WITH ARG2
                         /BY A XOR B=(A AND NOTB)OR(NOTA AND B)
                         /
7213   7501              MQA                     /GET ARG1 FROM MQ
7214   7040              CMA                     /FORM NOTARG1
7215   0344              AND     ARG2            /AND WITH ARG2 TO GET ARG2 AND NOTARG1
7216   7421              MQL                     /SAVE IN MQ
7217   7040              CMA
7220   0344              AND     ARG2            /LOAD AC WITH ARG2
7221   7040              CMA                     /FORM NOTARG2
7222   0343              AND     ARG1            /AND WITH ARG1 TO GET ARG1 AND NOTARG2
7223   7501              MQA                     /OR WITH ARG2 AND NOTARG1
7224   3346              DCA     SIMAC           /TO GET ARG1 XOR ARG2
7225   3347              DCA     SIMLNK


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                         /
                         /AND ARG1 WITH ARG2
                         /TEST FOR CARRIES
                         /IF THERE ARE NO BITS IN COMMON BETWEEN ARG1 AND ARG2
                         /THERE WILL BE NO CARRIES GENERATED
                         /
7226   7040              CMA
7227   0343              AND     ARG1            /LOAD AC WITH ARG1
7230   0344              AND     ARG2            /AND WITH ARG2
7231   7450              SNA                     /ARE THERE ANY CARRIES
7232   5274              JMP     ENDSIM          /NO, TERMINATE SIMULATION
                         /
                         /GENERATE CARRIES
                         /
7233   7421              MQL                     /SAVE FIRST CARRIES
7234   7521     NXTCAR,  MQA MQL                 /GET CARRIES FROM MQ
7235   0345              AND     A1ORA2          /AND WITH A1ORA2 TO SEE IF MORE CARRIES ARE GENERATED
7236   7450              SNA                     /ARE THERE ANY MORE CARRIES
```

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7237   5244            JMP      ENCAR              /NO, END SIMULATION OF CARRIES
7240   7104            CLL RAL                     /PROPIGATE CARRIES
7241   7521            MQA MQL                     /GET PREVIOUS CARRIES FROM MQ, SAVE NEW CARRIES
7242   7501            MQA                         /OR NEW CARRIES WITH PREVIOUS CARRIES
7243   5234            JMP      NXTCAR             /CONTINUE
                       /
                       /TEST FOR CARRY INTO LINK
                       /
7244   7501   ENCAR,   MQA                         /GET CARRIES
7245   0345            AND      A1ORA2             /AND WITH A1ORA2
7246   0350            AND      K4000              /TEST BIT 00
7247   7450            SNA                         /IS BIT 00 1
7250   5253            JMP      ENCAR1             /NO, CARRIES DID NOT PROPIGATE INTO LINK
7251   3347            DCA      SIMLNK             /YES, SAVE CARRY INTO LINK
7252   5260            JMP      XORALL             /COMPLETE SIMULATION
7253   7130   ENCAR1,  CLL CML RAR                 /SET AC=4000
7254   0343            AND      ARG1               /AND WITH ARG1
7255   0344            AND      ARG2               /AND WITH ARG2 TO SEE IF ORIGINAL
7256   7440            SZA                          /NUMBERS GENERATED CARRY INTO LINK
7257   3347            DCA      SIMLNK             /SAVE SIMULATED LINK

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                       /
                       /FORM XOR OF ARG1, ARG2, AND CARRIES
                       /TO GET FINAL SIMULATED SUM
                       /
7260   7501   XORALL,  MQA                         /SAVE SIMULATED CARRIES
7261   3351            DCA      CARRY
7262   7501            MQA
7263   7040            CMA
7264   0346            AND      SIMAC              /FORM A1ORA2 AND NOTCARRY
7265   7421            MQL                          /SAVE IN MQ
7266   7040            CMA
7267   0346            AND      SIMAC
7270   7040            CMA
7271   0351            AND      CARRY              /FORM CARRY AND NOTA1ORA2
7272   7501            MQA                          /OR WITH CONTENTS OF MQ
7273   3346            DCA      SIMAC
7274   7340   ENDSIM,  CLA CLL CMA
7275   0347            AND      SIMLNK
7276   7640            SZA CLA
7277   7020            CML
7300   7040            CMA
7301   0346            AND      SIMAC
7302   5600            JMP I    RSIMAD             /TO GET FINAL SIMULATED SUM
                       /
                       /TEST ADDRESS
                       /
7303   0000   LIMIT,   0
7304   7421            MQL                          /SAVE ARGUMENT IN MQ
7305   7040            CMA
7306   2777            AND      LIML               /LOAD AC WITH LIMIT
7307   4200            JMS      RSIMAD             /DO ADDITION
7310   7620            SNL CLA                      /LINK SET IF NUMBER TO LARGE
7311   2303            ISZ      LIMIT              /NUMBER OK
7312   5703            JMP I    LIMIT
```

```
                        /
                        /COMPARE SIMULATED AND REAL RESULT
                        /
7313  0000    COMAD,    0
7314  7340              CLA CLL CMA
7315  0776'             AND       TSIML       /GET SIMULATED RESULTANT LINK
7316  7640              SZA CLA
7317  7020              CML
7320  7040              CMA
7321  0775'             AND       TLINK       /COMPARE TO REAL LINK
7322  7640              SZA CLA
7323  7020              CML
7324  7430              SZL                    /IF SAME, LINK=0
7325  5341              JMP       ERROR1       /NOT THE SAME, ERROR
7326  7340              CLA CLL CMA
7327  0774'             AND       TAC          /GET ADDITION RESULT
7330  7040              CMA
7331  0773'             AND       TSIMAC       /COMPARE TO COMPLEMENT OF SIMULATION RESULT
7332  7440              SZA
7333  5341              JMP       ERROR1       /NOT 0, ERROR
7334  7040              CMA
7335  0773'             AND       TSIMAC       /GET SIMULATION RESULT
7336  7040              CMA
7337  0774'             AND       TAC          /COMPARE TO COMPLEMENT OF REAL ADDITION
7340  7640              SZA CLA
7341  4752    ERROR1,   JMS I     ERRORS
7342  5713              JMP I     COMAD
7343  0000    ARG1,     0
7344  0000    ARG2,     0
7345  0000    A1ORA2,   0
7346  0000    SIMAC,    0
7347  0000    SIMLNK,   0
7350  4000    K4000,    4000
7351  0000    CARRY,    0
7352  7400    ERRORS,   ERROR
```

```
                        /
                        /ERROR HANDLER
                        /
7373  6763
7374  6764
7375  6765
7376  6762
7377  7164
      7400    PAGE
7400  0000    ERROR,    0
7401  7604              LAS
7402  0267              AND       SR00         /TEST SR00
7403  7640              SZA CLA                /IS SR00=1
7404  5600              JMP I     ERROR        /YES, DO NOT HALT
7405  7240              CLA CMA
```

```
7406  0777'              AND     TDA1L           /HALT WITH DATA1 IN AC
7407  7402              HLT
7410  7240              CLA CMA
7411  0776'              AND     TDA2L           /HALT WITH DATA2 IN AC
7412  7402              HLT
7413  7240              CLA CMA
7414  0775'              AND     TINSTL          /HALT WITH INSTRUCTION IN AC
7415  7402              HLT
7416  7240              CLA CMA
7417  0774'              AND     TINADL          /HALT WITH INSTRUCTION ADDRESS IN AC
7420  7402              HLT
7421  7240              CLA CMA
7422  0773'              AND     TDATAL          /HALT WITH DATA ADDRESS IN AC
7423  7402              HLT
7424  7240              CLA CMA
7425  0772'              AND     TPADDL          /HALT WITH INDIRECT IN AC
7426  7402              HLT
7427  5600              JMP I   ERROR
                        /
                        /RANDOM NUMBER GENERATOR
                        /
7430  0000     RANDL,   0
7431  7104              CLL RAL
7432  7420              SNL
7433  5240              JMP     ENRAN
7434  7421              MQL
7435  7040              CMA
7436  0241              AND     K3
7437  4771'              JMS     RSIMAD
7440  5630     ENRAN,   JMP I   RANDL
7441  0003     K3,      3
```

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```
                        /
                        /END OF PASS
                        /
7442  0000     EPASL,   0
7443  7604              LAS
7444  0270              AND     SR03
7445  7640              SZA CLA
7446  5642              JMP I   EPASL
7447  7040              CMA
7450  0271              AND     C215
7451  4261              JMS     TYPE
7452  7040              CMA
7453  0272              AND     C212
7454  4261              JMS     TYPE
7455  7040              CMA
7456  0273              AND     C324
7457  4261              JMS     TYPE
7460  5642              JMP I   EPASL
                        /
                        /
                        /
7461  0000     TYPE,    0
7462  6046              TLS
7463  6041              TSF
```

```
 464    5263              JMP      .-1
7465    7200              CLA
7466    5661              JMP I    TYPE
                          /
                          /
                          /
7467    4000    SR00,     4000
7470    0400    SR03,     0400
7471    0215    C215,     215
7472    0212    C212,     212
7473    0324    C324,     324
                          /
                          /TEST FOR PROPER DIFFERENCE
                          /
7474    0000    ABSL,     0
7475    7041              CIA
7476    7421              MQL
7477    7040              CMA
7500    0770'             AND      TEMP3L
7501    4771'             JMS      RSIMAD
7502    7500              SMA
7503    7041              CIA
7504    7001              IAC
7505    7001              IAC
7506    5674              JMP I    ABSL
```
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```
                          /
                          /
                          /
7507    0000    ABSL1,    0
7510    7041              CIA
7511    7421              MQL
7512    7040              CMA
7513    0767'             AND      R3L
7514    4771'             JMS      RSIMAD
7515    7500              SMA
7516    7041              CIA
7517    7001              IAC
7520    7001              IAC
7521    5707              JMP I    ABSL1
                          $
7567    7160
7570    7161
7571    7200
7572    6757
7573    6756
7574    6754
7575    6753
7576    6761
7577    6760
```
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```
0000   11111100   00000000   00000000   00000000   00000000   00000000   00000000   00000000
0100   00000000   00000000   00000000   00000000   00000000   00000000   00000000   00000000

0200   11100000   00000000   00000000   00000000   00000000   00000000   00000000   00000000
0300   00000000   00000000   00000000   00000000   00000000   00000000   00000000   00000000

0400
0500

0600
0700

1000
1100

1200
1300

1400
1500

1600
1700

2000
2100

2200
2300

2400
2500

2600
2700

3000
3100

3200
3300

3400
3500

3600
3700
```

```
4000
4100

4200
4300
```

)   )   )

```
4400
4500

4600
4700


5000
5100

5200
5300

5400
5500

5600
5700


6000
6100

6200
6300

6400
6500

6600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
6700  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111110


7000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
7100  11111111  11111111  11111111  11111111  11111111  11111111  11111100  00000111

7200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
7300  11111111  11111111  11111111  11111111  11111111  11100000  00000000  00011111

7400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
7500  11111111  11111111  11000000  00000000  00000000  00000000  00000001  11111111

7600
7700
```

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```
        A1ORA2  7345              PAGAL   7040
        ABSL    7474              PAL     7055
        ABSL1   7507              R1L     7150
        ARG1    7343              R2L     7153
        ARG2    7344              R3L     7160
        C212    7472              RANDL   7430
        C215    7471              RETURN  0000
        C324    7473              RSIMAD  7200
        CAF     6007              SETTL   6644
        CARRY   7351              SIMAC   7346
        CNTR1   6776              SIMAD   7204
        COMAD   7313              SIMLNK  7347
        DAADL   7064              SR00    7467
```

```
DATADL   0003        SR03     7470
DIRL     6702        SR09     6773
DOANDL   6716        SR10     6772
DOTSTL   6705        SR11     6771
ENCAR    7244        SRANDL   7162
ENCAR1   7253        SRIMAD   7163
ENDSIM   7274        START    0200
ENRAN    7440        STARTL   6600
EPASL    7442        T5400L   6766
ERROR    7420        T7760    6767
ERROR1   7341        T7770    6770
ERRORS   7352        TAC      6764
GANADL   7021        TCOMAD   6774
GANDL    7001        TDA1L    6760
GENL     7000        TDA2L    6761
IFLAGL   0005        TDAT1L   6624
INADDL   0002        TDAT2L   6634
INDIRL   7101        TDATAL   6756
INSTL    0001        TEMP2L   6745
K0177L   7155        TEMP3L   7161
K10      6775        TEPASL   6750
K1000    7165        TERROR   6750
K1777    7152        TEST1L   6602
K200L    7157        TGENL    6746
K3       7441        TIFLGL   6755
K3L      7151        TINADL   6754
K4000    7350        TINSTL   6753
K400L    7156        TLINK    6765
LIMIT    7303        TPADDL   6757
LIML     7164        TRANDL   6752
MQA      7501        TRETTL   6747
MQL      7421        TRETUL   6735
NOTAUT   6676        TSIMAC   6763
NXTCAR   7234        TSIMAD   6751
P0AL     7107        TSIML    6762
P0L      7154        TYPE     7461
PADDL    0004        XORALL   7260
PADL     7113
PAGADL   7044
```

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ERRORS DETECTED: 2

LINKS GENERATED: 23

RUN-TIME: 5 SECONDS

2K CORE USED

)   )   )