IDENTIFICATION

PRODUCT CODE:	MAINDEC-8E-D0CA-D-(D)
PRODUCT NAME:	8E ADDER TESTS
DATE CREATED:	NOVEMBER 2, 1970
MAINTAINER:	DIAGNOSTIC GROUP
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1. ABS(T

THIS PROGRAM TESTS THE ADDER CIRCUITS OF THE PDP-8E. THE PROGRAM IS COMPOSED OF FOUR PARTS.

A SIMULATOR FOR THE TAD INSTRUCTION WHICH TESTS ALL COMBINATIONS OF TWO ARGUMENT ADDITIONS.

A SIMULATOR FOR ROTATE INSTRUCTIONS THAT TESTS ROTATION OF ALL POSSIBLE ARGUMENTS WITH RAL, RAR, RTL, RTR AND BSW.

A CARRY GENERATION TEST

A SERIES OF RANDOM NUMBER TESTS

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-8E EQUIPPED WITH AT LEAST 4K OF MEMORY AND A TELETYPE

2.2 STORAGE

THE PROGRAM IS STORED IN LOCATIONS 0000-5554 AND UTILIZES LOCATIONS 7775-7777 AS A TEST AREA.

2.3 PRELIMINARY PROGRAMS

MAINDEC-8E-D0AA, D0BA

3. LOADING PROCEDURE

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

4. STARTING PROCEDURE

4.1 CONTROL SWITCH SETTINGS

SR00=1 SUPPRESS HALT ON ERROR
SR01=1 SUPPRESS ERROR TYPEOUT
SR02=1 LOOP ON ERROR
SR03=1 FAST TEST
SR09=1 HALT AT END OF TEST
SR10=1 SUPPRESS END OF TEST TYPEOUT
SR11=1 LOOP ON PRESENT TEST

4.2 STARTING ADDRESSES

NORMAL STARTING ADDRESS-0200
RESTORE LOADERS-7600

4.3 OPERATOR ACTION

4.3.1 SET SR=0200

4.3.2 PRESS ADDR LOAD SWITCH

4.3.3 SET S =0000

4.3.4 PRESS CLEAR AND CONT SWITCHES

5. OPERATING PROCEDURE

5.1 FAST TEST

THE ADDITION SIMULATOR NORMALLY STARTS WITH ARG1 AND ARG2 0000. TO SPEED UP THE TEST, THE VALUE OF ARG2 MAY BE SET AT SOME OTHER VALUE INITIALLY. TO DO THIS: DEPOSIT THE DESIRED VALUE IN LOCATION 170, AND PROCEED AS IN 4., BUT WITH SR=0400 INSTEAD OF 0000 IN 4.3.3

5.2 TO RESTORE AND START BINARY LOADER, STOP PROGRAM, LOAD ADDRESS 7600 AND START COMPUTER.

5.3 OPTIONS

SEE 4.1

6. ERRORS

6.1 ERROR MESSAGES

6.1.1 SIMULATED ADDITION TEST

IF A FAILURE OCCURS DURING THE SIMULATED ADDITION TEST, THE PROGRAM WILL TYPE THE FOLLOWING MESSAGE AND THEN HALT:

```
                SIMULATED ADD TEST FAILED
   ARG1          ARG2        SIMULATED      ARG1+ARG2      ARG2+ARG1
XXXXXXXXXXXX XXXXXXXXXXXX X XXXXXXXXXXXX X XXXXXXXXXXXX X XXXXXXXXXXXX
```

ARG1 AND ARG2 ARE THE TWO NUMBERS THAT WERE ADDED.
SIMULATED IS THE ANSWER PRODUCED BY THE ADDITION SIMULATOR (LINK AND AC)
(ARG1+ARG2 IS THE RESULT OF ADDING ARG2 TO ARG1
(ARG1 IS IN AC INITIALLY)
ARG2+ARG1 IS THE RESULT OF ADDING ARG1 TO ARG2
(ARG2 IS IN AC INITIALLY).

NOTE: EITHER THE SIMULATION OR THE ACTUAL ADDITIONS MAY HAVE FAILED.

6.1.2 SIMULATED ROTATE TEST

IF A FAILURE OCCURS DURING THE SIMULATED ROTATE TEST, THE PROGRAM WILL TYPE THE FOLLOWING MESSAGE AND THEN HALT:

```
SIMULATED AAA TEST FAILED
ORIGINAL        SIMULATED        ACTUAL
XXXXXXXXXXXX  X XXXXXXXXXXXX  X XXXXXXXXXXXX
```

ORIGINAL IS THE LINK AND ACCUMULATOR TO BE ROTATED
SIMULATED IS THE SIMULATED RESULT OF ROTATION
ACTUAL IS THE REAL RESULT OF ROTATION
AAA IS THE INSTRUCTION BEING TESTED, I.E. RAL,RAR,RTL,RTR,BSW

6.1.3 FALSE CARRY TEST

IF A FAILURE OCCURS DURING THE FALSE CARRY TEST, THE PROGRAM WILL TYPE THE FOLLOWING MESSAGE AND THEN HALT:

```
        DATA ERROR
AAAA    X XXXXXXXXXXXX
```

AAAA IS THE STARTING ADDRESS OF THE TEST THAT FAILED
X XXXXXXXXXXXX ARE THE CONTENTS OF THE LINK AND AC

NOTE: EACH FALSE CARRY TEST EXPECTS LINK=1 AND AC=0 AS A RESULT.

6.1.4 RANDOM ADD TEST 1

IF A FAILURE OCCURS DURING RANDOM ADD TEST 1, THE PROGRAM WILL TYPE THE FOLLOWING MESSAGE AND THEN HALT:

```
        RANDOM ADD TEST 1 FAILED
   RANDA        RANDC          RESULT
XXXXXXXXXXXX XXXXXXXXXXXX X XXXXXXXXXXXX
```

RANDA IS A RANDOM NUMBER
RANDC IS THE COMPLEMENT OF RANDA
RESULT IS THE RESULT OF CONSECUTIVE ADDITIONS OF RANDA AND RANDC

NOTE: THE EXPECTED RESULT IS LINK=1, AC=0

6.1.5 RANDOM ADD TEST 2

IF A FAILURE OCCURS DURING RANDOM ADD TEST 2, THE PROGRAM WILL TYPE THE FOLLOWING MESSAGE AND HALT:

```
RANDOM ADD TEST 2 FAILED
    ARG1          ARG2          EXPECTED        ARG1+ARG2
XXXXXXXXXXXX XXXXXXXXXXXX X XXXXXXXXXXXX X XXXXXXXXXXXX
```

6.1.6 RANDOM ROTATE TESTS

IF A FAILURE OCCURS DURING ONE OF THE RANDOM ROTATE TESTS, THE PROGRAM WILL TYPE THE FOLLOWING MESSAGE AND THEN HALT!

```
RANDOM AAA TEST FAILED
   ORIGINAL          ACTUAL
X XXXXXXXXXXXX  X XXXXXXXXXXXX
```

AAA=RAR, RAL, RTR OR RTL

6.2 ERROR HALTS

THE FOLLOWING TABLE LISTS ERROR HALT LOCATIONS AND THE TEST THAT THEY APPLY TO

LOCATION	TEST
502	SIMAD
1066	SIMROT (WITH LOCATION OF SPECIFIC TEST IN AC)
3035	FCT (WITH LOCATION OF SPECIFIC TEST IN AC)
3510	RNAD1
4041	RNAD2
4661	RANDOM ROTATE (WITH LOCATION OF SPECIFIC TEST IN AC)

6.2 ERROR RECOVERY

DEPRESS CONT TO RESUME TEST

6.3 LOOPING ON ERROR

6.3.1 SWITCH REGISTER CONTROL

SET SR00=1 TO SUPPRESS ERROR HALT
SET SR01=1 TO SUPPRESS ERROR TYPEOUT
SET SR02=2 TO LOOP
DEPRESS CONT

6.3.2 PROGRAM MODIFICATION

THERE ARE NOPS IN EACH TEST PROVIDED TO ALLOW THE OPERATOR TO SET UP LOOPS TIGHTER THAN THOSE AVAILABLE IN 6.3.1.

7. RESTRICTIONS

NONE

8. EXECUTION TIME

APPROXIMATELY 35 MINUTES. IF SR03=1, AND MAXXX=7777(SEE 9.4)
ONE PASS TAKES APPROXIMATELY 40 SECONDS.

AS EACH TEST OR GROUP OF TESTS IS COMPLETED, THE NAME OF THAT TEST WILL BE TYPED. THE SEQUENCE IS:

SIMAD
SIMROT
FCT
RANDOM

9. PROGRAM DESCRIPTION

9.1 SIMULATED ADDITION TEST

THE SIMULATED ADDITION TESTS SIMULATES THE ADDITION OF TWO ARGUMENTS, ARG1 AND ARG2. ACTUAL ADDITIONS ARE PERFORMED, AND THEN THE ACTUAL RESULTS ARE COMPARED TO THE SIMULATED ANSWER.

THE SIMULATOR OPERATES IN THE FOLLOWING MANNER:
THE ARGUMENTS ARE "ANDED" TOGETHER, AND ANY BITS IN THE RESULT THAT ARE 1'S WILL BE CARRY BITS. THE ARGUMENTS ARE "OR'D" TOGETHER AND THE RESULT IS STORED. THE PREVIOUSLY GENERATED CARRIES ARE ROTATED ONCE TO THE LEFT AND THEN "ANDED" WITH THE "OR" OF THE TWO ARGUMENTS. ANY BITS THAT ARE 1'S ARE ALSO CARRIES AND THESE ARE COMBINED WITH THE PREVIOUS CARRIES. THE PROCEDURE CONTINUES UNTIL NO NEW CARRIES ARE GENERATED. THE FINAL CARRY RESULT IS EXCLUSIVE "OR'" WITH THE "OR" OF THE ARGUMENTS TO GET THE SIMULATED SUM.

9.2 SIMULATED ROTATE TESTS

EACH OF THE ROTATE INSTRUCTIONS, RAR, RAL, RTR, RTL AND BSW IS SIMULATED FOR ALL POSSIBLE COMBINATIONS OF AC AND LINK, AND THE RESULTS ARE COMPARED TO THE RESULTS OF THE ACTUAL ROTATE.

9.3 FALSE CARRY TEST

VARIOUS COMBINATIONS OF INSTRUCTIONS AND DATA ARE USED TO DETECT EITHER FALSE CARRIES, OR MISSINGCARRIES.

).4 RANDOM ADD TEST 1

A RANDOM NUMBER AND ITS COMPLEMENT ARE ADDED SUCCESSIVELY AND THE EXPECTED RESULT IS ALWAYS LINK=1, AC=0.

).5 RANDOM ADD TEST 2

A RANDOM NUMBER, AND ITS MODIFIED COMPLIMENT ARE ADDED TO PRODUCE 1 KNOW BIT IN THE AC, WITH THE LINK=1.

).6 RANDOM ROTATE TEST

A RANDOM NUMBER IS SUCCESSIVELY ROTATED AND THE EXPECTED RESULT IS THE ORIGINAL NUMBER.

```
                        /
                        /ADDER TEST
                        /FOR PDP-8/E
                        /COPYRIGHT 1970 DIGITAL EQUIPMENT CORP. MAYNARD MASS.
                        /V 82 07552
                        /
                        /INSTRUCTION DEFINITIONS
                        /
        7501    MQA=7501
        7421    MQL=7421
        7002    BSW=7002
        6007    CAF=6007
                        /
                        /SWITCH REGISTER MASK BITS
                        /
        0103    SR00=K4000              /=0, HALT ON DATA ERROR
        0104    SR01=K2000              /=1, SUPPRESS DATA ERROR TYPEOUT
        0105    SR02=K1000              /=1, LOOP ON DATA ERROR
        0106    SR03=K0400              /=1, FAST TEST
        0107    SR04=K0200
        0110    SR05=K0100
        0111    SR06=K0040
        0112    SR07=K0020
        0113    SR08=K0010
        0114    SR09=K0004              /=1, HALT AT END OF TEST
        0115    SR10=K0002              /=1, SUPPRESS END OF TEST TYPEOUT
        0116    SR11=K0001              /=1, LOOP ON TEST
                        /
                        /LOCATION EQUIVALENCIES
                        /
        0023    RAC=ARG1                /AC TO BE ROTATED
        0024    RLNK=ARG2               /LINK TO BE ROTATED
        0031    RRAC=SUM1               /AC AFTER REAL ROTATE
        0033    RRLNK=SUM2              /LINK AFTER REAL ROTATE
        0025    TEMPAC=SIMAC            /TEMPORARY AC STORAGE
        0026    TEMPL=SIMLNK            /TEMPORARY LINK STORAGE
        0037    TEMP1=WD1               /TEMPORARY DATA STORAGE
        0037    W1=WD1                  /    "       "     "
        0040    W2=WD2                  /    "       "     "
        0035    RHFLG=AHFLG             /ROTATE TEST ERROR HEADER FLAG
        0067    NERROP=XLOOP

        7775    *7775
7775    0000    TSTA0,  0
7776    0000    TSTA1,  0
7777    0000    TSTA2,  0

        0000    *0000
0000    0000    TSTA3,  0
0001    5001    TSTA4,  JMP     .
0002    0002    TSTA5,  2
0003    0003    TSTA6,  3
0004    0000    TSTA7,  0
```

```
        0010    *10
                        /
                        /INDEX REGISTERS
                        /
0010    0000    TSTIND, 0
0011    0000    POINT1, 0
0012    0000    POINT2, 0

        0020    *20
0020    0000    CNTR1,  0
0021    0022    ADA1,   ADA2
0022    7777    ADA2,   7777
                        /
                        /SIMULATION VARIABLES
                        /
0023    0000    ARG1,   0
0024    0000    ARG2,   0
0025    0000    SIMAC,  0
0026    0000    SIMLNK, 0
0027    0000    A1DRA2, 0
0030    0000    CARRY,  0
0031    0000    SUM1,   0
0032    0000    LINK1,  0
0033    0000    SUM2,   0
0034    0000    LINK2,  0

                        /
                        /MESSAGE OUTPUT VARIABLES
                        /
0035    0000    AHFLG,  0
0036    0000    CHAR,   0
0037    0000    WD1,    0
0040    0000    WD2,    0
                        /
                        /RANDOM VARIABLES
                        /
0041    0037    RANDA,  37
0042    0000    RANDB,  0
0043    0000    RANDC,  0
0044    0000    LINKR,  0
0045    0000    LINKRC, 0


                        /
                        /INDIRECT POINTERS
                        /

0046    1600    XPRINT, PRINT           /CHARACTER STRING TYPE
0047    1652    XTYPE,  TYPE            /CHARACTER TYPE
```

```
0050  1133   XRHD,    RHD              /TYPE ROTATE ERROR HEADER
0051  1200   XSROT,   SROTAL           /COMMON ROTATE SIMULATOR
0052  0756   XRALTA,  RALTAB-1         /RAL MASK TABLE
0053  1157   XRTLTA,  RTLTAB-1         /RTL MASK TABLE
0054  1140   XRTRTA,  RTRTAB-1         /RTR MASK TABLE
0055  1657   XBSWTA,  BSWTAB-1         /BYTE SWAP MASK TABLE
0056  1000   XCOMRO,  COMROT           /ROTATE COMPARISON FOR SIMULATION
0057  1031   XNXTRO,  NXTROT           /ROTATE SETUP FOR SIMULATION
0060  0504   XLNKOU,  LNKOUT           /TYPE LINK
0061  0523   XWDOUT,  WDOUT            /TYPE DATA WORD
0062  3000   XAMEAS,  SAMEAS           /COMPARE DATA
0063  3730   XAMEA,   SAMEA
0064  3017   XAVREG,  SAVREG           /SAVE AC AND LINK
0065  3037   XDATER,  DATER            /DATA ERROR HANDLER FOR FCT
0066  3027   XHALT2,  HALT2            /DATA ERROR HALT FOR FCT
0067  3046   XLOOP,   LOOP             /LOOP ON TEST
0070  7775   XSTA0,   TSTA0
0071  7776   XSTA1,   TSTA1
0072  7777   XSTA2,   TSTA2
0073  3512   XRAND,   RANDOM           /RANDOM NUMBER GENERATOR
0074  0410   XLOOP2,  HLTA+4
0075  0552   XLOOP1,  LOOP1
                      /
                      /WIDELY USED CONSTANTS
                      /
0076  0240   K240,    240
0077  0260   K260,    260
0100  0261   K261,    261
0101  6000   K6000,   6000

0102  0102   XRARTA,  .
0103  4000   K4000,   4000
0104  2000   K2000,   2000
0105  1000   K1000,   1000
0106  0400   K0400,   400
0107  0200   K0200,   200
0110  0100   K0100,   100
0111  0040   K0040,   40
0112  0020   K0020,   20
0113  0010   K0010,   10
0114  0004   K0004,   4
0115  0002   K0002,   2
0116  0001   K0001,   1
0117  0000            0
0120  4000            4000
0121  0001            1

                      /
                      /
                      /TEST POINTERS FOR FCT
                      /
0122  2004   SEQ1,    FCT1
0123  2043   SEQ2,    FCT2
0124  2076   SEQ3,    FCT3
0125  2200   SEQ4,    FCT4
```

```
0126  2232   SEQ5,   FCT5
0127  2270   SEQ6,   FCT6
0130  2400   SEQ7,   FCT7
0131  2436   SEQ8,   FCT8
0132  2472   SEQ9,   FCT9
0133  2600   SEQ10,  FCT10
0134  2634   SEQ11,  FCT11
0135  2667   SEQ12,  FCT12
                     /
                     /
                     /SETUP INSTRUCTIONS FOR FCT
                     /
0136  1376   INS1,   1376                  /=TAD .-1 IN 7777
0137  7001   INS3,   7001                  /=IAC
0140  5404   INS4,   5404                  /=JMP I .+2 IN 0002
0141  5402   INS5,   5402                  /=JMP I .+1 IN 0001
0142  7070   INS6,   7070                  /=CMA CML RAR
0143  2376   INS7,   2376                  /=ISZ .-1 IN 7777
0144  2000   INS8,   2000                  /=ISZ .+1 IN 7777
0145  2410   INS9,   2410                  /=ISZ I TSTIND
0146  4000   INS10,  4000                  /=JMS .+1 IN 7777
0147  4776   INS11,  4776                  /=JMS I .-1 IN 7777
0150  4410   INS12,  4410                  /=JMS I TSTIND
0151  5403   INS13,  5403                  /=JMP I .+1 IN 0002
0152  5401   INS14,  5401                  /=JMP I .+1 IN 0000
0153  4377   INS15,  4377                  /=JMS . IN 7777
0154  2004   SEQ,    FCT1
0155  5301   BIN,    5301

                     /
                     /TEST FOR FAST TAD SIMULATION
                     /
0156  6007   START,  CAF                   /CLEAR ALL FLAGS
0157  7604           LAS                   /GET SWITCHES
0160  0106           AND     SR03          /TEST SR03
0161  7650           SNA CLA               /IS SR03=1
0162  5177           JMP     GOTEST        /DO TEST WITH ALL NUMBERS
0163  7240           CLA CMA
0164  0170           AND     KXXXX         /YES, START AT XXXX
0165  3024           DCA     ARG2
0166  5567           JMP I   .+1
0167  0202           RSIMAD+2
0170  0000   KXXXX,  0                 /INSERT DESIRED STARTING VALUE FOR ARG2 WERE
      0177   *177
0177  7410   GOTEST, SKP                   /SKIP JMP TO START

                     /
                     /
                     /SIMULATED ADDITION TEST
                     /
      0200   *200
0200  5156   RSIMAD, JMP     START         /GO TO FAST TEST CHECK
0201  3024           DCA     ARG2
0202  3023           DCA     ARG1          /CLEAR SIMULATION VARIABLES
```

```
                        /
                        /
                        /SIMULATE ADDITION BY SIMULATED GENERATEION OF SUM
                        /AND CARRY BITS
                        /
                        /
                        /FORM OR OF ARG1 WITH ARG2
                        /
0203  7340      SIMAD,  CLA CLL CMA
0204  0023              AND     ARG1            /LOAD AC WITH ARG1
0205  7421              MQL                     /PLACE IN MQ
0206  7040              CMA
0207  0024              AND     ARG2            /LOAD AC WITH ARG2
0210  7501              MQA                     /FORM ARG1 OR ARG2
0211  3027              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)
                        /
0212  7501              MQA                     /GET ARG1 FROM MQ
0213  7040              CMA                     /FORM NOTARG1
0214  0024              AND     ARG2            /AND WITH ARG2 TO GET ARG2 AND NOTARG1
0215  7421              MQL                     /SAVE IN MQ
0216  7040              CMA
0217  0024              AND     ARG2            /LOAD AC WITH ARG2
0220  7040              CMA                     /FORM NOTARG2
0221  0023              AND     ARG1            /AND WITH ARG1 TO GET ARG1 AND NOTARG2
0222  7501              MQA                     /OR WITH ARG2 AND NOTARG1
0223  3025              DCA     SIMAC           /TO GET ARG1 XOR ARG2
0224  3026              DCA     SIMLNK


                        /
                        /AND ARG1 WITH ARG2
                        /TEST FOR CARRIES
                        /IF THERE ARE NO BITS IN COMMON BETWEEN ARG1 AND ARG2
                        /THERE WILL BE NO CARRIES GENERATED
                        /
0225  7040              CMA
0226  0023              AND     ARG1            /LOAD AC WITH ARG1
0227  0024              AND     ARG2            /AND WITH ARG2
0230  7450              SNA                     /ARE THERE ANY CARRIES
0231  5273              JMP     ADD             /NO, TERMINATE SIMULATION
                        /
                        /GENERATE CARRIES
                        /
0232  7421              MQL                     /SAVE FIRST CARRIES
0233  7521      NXTCAR, MQA MQL                 /GET CARRIES FROM MQ
0234  0027              AND     A1ORA2          /AND WITH A1ORA2 TO SEE IF MORE CAPRIES ARE GENERATED
0235  7450              SNA                     /ARE THERE ANY MORE CARRIES
0236  5243              JMP     ENCAR           /NO, END SIMULATION OF CARRIES
0237  7104              CLL RAL                 /PROPIGATE CARRIES
0240  7521              MQA MQL                 /GET PREVIOUS CARRIES FROM MQ, SAVE NEW CARRIES
0241  7501              MQA                     /OR NEW CARRIES WITH PREVIOUS CARRIES
```

```
0242  5233            JMP     NXTCAR          /CONTINUE
                      /
                      /TEST FOR CARRY INTO LINK
                      /
0243  7501    ENCAR,  MQA                     /GET CARRIES
0244  0027            AND     A1ORA2          /AND WITH A1ORA2
0245  0103            AND     K4000           /TEST BIT 00
0246  7450            SNA                     /IS BIT 00 1
0247  5252            JMP     ENCAR1          /NO, CARRIES DID NOT PROPIGATE INTO LINK
0250  3026            DCA     SIMLNK          /YES, SAVE CARRY INTO LINK
0251  5257            JMP     XORALL          /COMPLETE SIMULATION
0252  7130    ENCAR1, CLL CML RAR             /SET AC=4000
0253  0023            AND     ARG1            /AND WITH ARG1
0254  0024            AND     ARG2            /AND WITH ARG2 TO SEE IF ORIGINAL
0255  7440            SZA                     /NUMBERS GENERATED CARRY INTO LINK
0256  3026            DCA     SIMLNK          /SAVE SIMULATED LINK


                      /
                      /FORM XOR OF ARG1, ARG2 AND CARRIES
                      /TO GET FINAL SIMULATED SUM
                      /
0257  7501    XORALL, MQA                     /SAVE SIMULATED CARRIES
0260  3030            DCA     CARRY
0261  7501            MQA
0262  7040            CMA
0263  0025            AND     SIMAC           /FORM A1ORA2 AND NOTCARRY
0264  7421            MQL                     /SAVE IN MQ
0265  7040            CMA
0266  0025            AND     SIMAC
0267  7040            CMA
0270  0030            AND     CARRY           /FORM CARRY AND NOTA1ORA2
0271  7501            MQA                     /OR WITH CONTENTS OF MQ
0272  3025            DCA     SIMAC           /TO GET FINAL SIMULATED SUM
                      /
                      /
                      /PERFORM ADDITIONS ARG1+ARG2 AND ARG2+ARG1
0273  7340    ADD,    CLA CLL CMA
0274  0023            AND     ARG1            /LOAD AC WITH ARG1
0275  1024            TAD     ARG2            /ADD ARG2
0276  7000            NOP
0277  3031            DCA     SUM1            /SAVE RESULT
0300  7010            RAR
0301  3032            DCA     LINK1           /SAVE LINK
0302  7040            CMA
0303  0024            AND     ARG2            /LOAD AC WITH ARG2
0304  1023            TAD     ARG1            /ADD ARG1
0305  7000            NOP
0306  3033            DCA     SUM2            /SAVE RESULT
0307  7010            RAR
0310  3034            DCA     LINK2           /SAVE LINK
0311  7000            NOP
                      /
                      /
                      /COMPARE RESULTS OF REAL ADDS
```

```
                        /IF A=B, A XOR B=0, THIS IS USED TO COMPARE RESULTS
                        /
0312  7340              CLA CLL CMA
0313  0031              AND     SUM1            /GET RESULT OF ARG1+ARG2
0314  7040              CMA                     /COMPLEMENT
0315  0033              AND     SUM2            /AND RESULTS OF ARG2+ARG1
0316  7440              SZA                     /IS SUM2 AND NOTSUM1=0
0317  5377              JMP     ERROR1          /NO, ERROR
0320  7040              CMA
0321  0033              AND     SUM2            /LOAD AC WITH RESULTS OF ARG2+ARG1
0322  7040              CMA                     /COMPLEMENT
0323  0031              AND     SUM1            /AND WITH SUM1
0324  7440              SZA                     /IS SUM1 AND NOTSUM2=0
0325  5377              JMP     ERROR1          /NO, ERROR

                        /
                        /
                        /COMPARE REAL AND SIMULATED ADDS
                        /
0326  7340              CLA CLL CMA
0327  0031              AND     SUM1            /LOAD AC WITH RESULTS OF ARG1+ARG2
0330  7040              CMA                     /COMPLEMENT
0331  0025              AND     SIMAC           /AND WITH RESULTS OF SIMULATION
0332  7440              SZA                     /IS SIMAC AND NOTSUM1=0
0333  5377              JMP     ERROR1          /NO, ERROR
0334  7040              CMA
0335  0025              AND     SIMAC           /LOAD AC WITH SIMULATION RESULTS
0336  7040              CMA                     /COMPLEMENT
0337  0031              AND     SUM1            /AND WITH RESULTS OF ARG1+ARG2
0340  7440              SZA                     /IS SUM1 AND NOTSIMAC=0
0341  5377              JMP     ERROR1          /NO, ERROR


                        /
                        /COMPARE LINKS GENERATED BY REAL ADDS
                        /
0342  7340              CLA CLL CMA
0343  0032              AND     LINK1           /GET LINK FROM ARG1+ARG2
0344  7004              RAL
0345  7240              CLA CMA
0346  0034              AND     LINK2           /GET LINK FROM ARG2+ARG1
0347  7640              SZA CLA
0350  7020              CML
0351  7430              SZL                     /ARE THEY THE SAME
0352  5377              JMP     ERROR1          /NO, ERROR


                        /
                        /
                        /COMPARE LINKS GENERATED BY REAL AND SIMULATED ADDS
                        /
0353  7340              CLA CLL CMA
0354  0032              AND     LINK1           /GET LINK FROM ARG1+ARG2
0355  7004              RAL
0356  7240              CLA CMA
```

```
0357  0026            AND     SIMLNK          /GET LINK FROM SIMULATION
0360  7640            SZA CLA
0361  7020            CML
0362  7430            SZL                     /ARE THEY THE SAME
0363  5377            JMP     ERROR1          /NO, ERROR

                      /
                      /
                      /SET UP FOR NEXT ADDITION
                      /
0364  5474    NXTADD, JMP I   XLOOP2          /TEST FOR SIMULATION WITH SAME DATA
0365  2023            ISZ     ARG1            /INCREMENT ARG1
0366  5203            JMP     SIMAD           /GO TO SIMULATION
0367  2024            ISZ     ARG2            /INCREMENT ARG2
0370  7410            SKP                     /GO TO SIMULATION
0371  5475            JMP I   XLOOP1          /TEST FOR TRANSFER TO NEXT TEST
0372  7240            CLA CMA
0373  0024            AND     ARG2            /TRANSFER ARG2 TO ARG1
0374  3023            DCA     ARG1
0375  5203            JMP     SIMAD           /CONTINUE SIMULATION
      0377    *377
0377  7000    ERROR1, NOP
                      /
                      /
                      /ERROR HANDLER FOR ADDITION TEST
      0400    *400    /
0400  7604    ADDERR, LAS                     /GET SWITCHES
0401  0104            AND     SR01            /TEST SR01
0402  7650            SNA CLA                 /SUPPRESS TYPEOUT IF SR01=1
0403  4217            JMS     ADPRT           /TYPE ERROR MESSAGE
0404  7604    HLTA,   LAS
0405  0103            AND     SR00
0406  7650            SNA CLA                 /HALT IF SR00=0
0407  4277            JMS     HALTA           /HALT WITH ADDRESS OF TEST IN AC
0410  7604            LAS
0411  0105            AND     SR02            /TEST SR02
0412  7640            SZA CLA                 /LOOP WITH SAME DATA IF SR02=1
0413  5615            JMP I   XADD            /LOOP WITH SAME DATA
0414  5616            JMP I   XNXTAD
0415  0273    XADD,   ADD
0416  0365    XNXTAD, NXTADD+1

                      /
                      /TYPE ERROR MESSAGE FOR ADDITION TEST
                      /
0417  0000    ADPRT,  0
0420  7340            CLA CLL CMA
0421  0035            AND     AHFLG           /GET FLAG FOR ERROR MESSAGE HEADER TYPEOUT
0422  7650            SNA CLA                 /HAS HEADER FOR TEST BEEN TYPED
0423  4267            JMS     AHOUT           /NO TYPE HEADER
0424  7040            CMA
0425  0023            AND     ARG1
0426  3037            DCA     WD1
0427  4323            JMS     WDOUT           /OUTPUT ARG1
0430  7040            CMA
```

```
0431  0024            AND     ARG2
0432  3037            DCA     WD1
0433  4323            JMS     WDOUT           /OUTPUT ARG2
0434  7040            CMA
0435  0026            AND     SIMLNK
0436  3040            DCA     WD2
0437  7040            CMA
0440  0025            AND     SIMAC
0441  3037            DCA     WD1
0442  4304            JMS     LNKOUT          /OUTPUT SIMULATED LINK
0443  4323            JMS     WDOUT           /OUTPUT SIMULATED SUM
0444  7040            CMA
0445  0032            AND     LINK1
0446  3040            DCA     WD2
0447  7040            CMA
0450  0031            AND     SUM1
0451  3037            DCA     WD1
0452  4304            JMS     LNKOUT          /OUTPUT LINK1
0453  4323            JMS     WDOUT           /OUTPUT SUM1
0454  7040            CMA
0455  0034            AND     LINK2
0456  3040            DCA     WD2
0457  7040            CMA
0460  0033            AND     SUM2
0461  3037            DCA     WD1
0462  4304            JMS     LNKOUT          /OUTPUT LINK2
0463  4323            JMS     WDOUT           /OUTPUT SUM2
0464  4446            JMS I   XPRINT
0465  5542            CRLF-1
0466  5204            JMP     HLTA            /TEST FOR HALT

                      /
                      /TYPE HEADER FOR ADDITION TEST ERROR MESSAGE
                      /
0467  0000    AHOUT,  0
0470  4446            JMS I   XPRINT          /TYPE "SIMULATED ADD TEST FAILED
0471  5217            EM1-1
0472  4446            JMS I   XPRINT          /TYPE ARG1, ARG2, SIMULATED, ARG1+ARG2, ARG2+ARG1
0473  4777            DH1-1
0474  7240            CLA CMA                 /SET ADD TEST HEADER FLAG
0475  3035            DCA     AHFLG           /TO PREVENT MULTIPLE HEADER TYPEOUTS
0476  5667            JMP I   AHOUT
                      /
                      /HALT WITH ADDRESS OF TEST IN AC
                      /
0477  0000    HALTA,  0
0500  7240            CLA CMA
0501  0351            AND     ADT
0502  7402            HLT                     /HALT WITH ADDRESS OF ADDITION TEST IN AC
0503  5677            JMP I   HALTA
                      /
                      /
                      /TYPE LINK
                      /
0504  0000    LNKOUT, 0
```

```
0505  7340            CLA CLL CMA
0506  0040            AND     WD2
0507  7640            SZA CLA
0510  5320            JMP     OUT1
0511  7040            CMA
0512  0077            AND     K260
0513  4447    TYLNK,  JMS I   XTYPE
0514  7040            CMA
0515  0076            AND     K240
0516  4447            JMS I   XTYPE
0517  5704            JMP I   LNKOUT
0520  7040    OUT1,   CMA
0521  0100            AND     K261
0522  5313            JMP     TYLNK
                      /
                      /TYPE DATA WORD
                      /
0523  0000    WDOUT,  0
0524  7340            CLA CLL CMA
0525  0102            AND     XRARTA
0526  3011            DCA     POINT1
0527  7040    NXBIT,  CMA
0530  0411            AND I   POINT1
0531  7450            SNA
0532  5345            JMP     SP1
0533  0037            AND     WD1
0534  7640            SZA CLA
0535  5342            JMP     OUT1A
0536  7040            CMA
0537  0077            AND     K260


0540  4447    TYBIT,  JMS I   XTYPE
0541  5327            JMP     NXBIT
0542  7040    OUT1A,  CMA
0543  0100            AND     K261
0544  5340            JMP     TYBIT
0545  7040    SP1,    CMA
0546  0076            AND     K240
0547  4447            JMS I   XTYPE
0550  5723            JMP I   WDOUT
0551  0203    ADT,    SIMAD
                      /
                      /
                      /END OF SIMULATED ADD TEST
                      /
0552  7604    LOOP1,  LAS
0553  0115            AND     SR10            /TEST SR10
0554  7650            SNA CLA                 /IS SR10=1
0555  5370            JMP     SADOK           /NO, TYPE END OF TEST MESSAGE
0556  7604    ADHLT,  LAS
0557  0114            AND     SR09            /TEST SR09
   0  7640            SZA CLA                 /IS SR
   1  7402            HLT                     /YES,    AT END OF TEST
```

```
0562  7604            LAS
0563  0116            AND     SR11            /TEST SR11
0564  7650            SNA CLA                 /IS SR11=1
0565  5377            JMP     SIMR            /NO, GO TO NEXT TEST
0566  5767            JMP I   .+1             /REPEAT SIMAD
0567  0203            SIMAD
0570  4446    SADOK,  JMS I   XPRINT
0571  5521            OK1-1
0572  5356            JMP     ADHLT
      0577    *577
0577  7000    SIMR,   NOP


                      /
                      /
                      /TEST ROTATION BY COMPARISON OF REAL AND SIMULATED
                      /ROTATES
                      /
      0600    *600
0600  4752    SIMRO1, JMS I   XR1             /SET UP FOR RAL TEST
                      /
                      /TEST RAL
                      /
0601  7340    SIMRAL, CLA CLL CMA
0602  0052            AND     XRALTA          /GET MASK TABLE FOR
0603  3012            DCA     POINT2          /SIMULATED RAL
0604  4451            JMS I   XSROT           /SIMULATE RAL
0605  7340    RRAL,   CLA CLL CMA
0606  0024            AND     RLNK            /SET UP TO DO REAL ROTATES
0607  7640            SZA CLA
0610  7020            CML
0611  7040            CMA
0612  0023            AND     RAC
0613  7004            RAL                     /DO REAL RAL
0614  7000            NOP
0615  3031            DCA     RRAC            /SAVE ROTATED ACCUMULATOR
0616  7430            SZL
0617  7040            CMA
0620  3033            DCA     RRLNK           /SAVE ROTATED LINK
0621  4456            JMS I   XCOMRO          /COMPARE ROTATES
0622  5205            JMP     RRAL            /RETURN HERE FOR LOOP ON ERROR
0623  4457            JMS I   XNXTRO          /SET UP FOR NEXT ROTATE
0624  5201            JMP     SIMRAL          /CONTINUE RAL TEST


0625  4753    SIMRO2, JMS I   XR2
                      /
                      /TEST RAR
                      /
0626  7340    SIMRAR, CLA CLL CMA
0627  0102            AND     XRARTA          /GET MASK TABLE FOR
0630  3012            DCA     POINT2          /SIMULATED RAR
0631  4451            JMS I   XSROT           /SIMULATED RAR
```

```
0632  7340   RRAR,   CLA CLL CMA
0633  0024           AND     RLNK          /SET UP TP DO REAL RAR
0634  7640           SZA CLA
0635  7020           CML
0636  7040           CMA
0637  0023           AND     RAC
0640  7010           RAR                   /DO REAL RAR
0641  7000           NOP
0642  3031           DCA     RRAC          /SAVE ROTATED ACCUMULATOR
0643  7430           SZL
0644  7040           CMA
0645  3033           DCA     RRLNK         /SAVE ROTATED LINK
0646  4456           JMS I   XCOMRO        /COMPARE ROTATES
0647  5232           JMP     RRAR          /RETURN HERE FOR LOOP ON ERROR
0650  4457           JMS I   XNXTRO        /SET UP FOR NEXT ROTATE
0651  5226           JMP     SIMRAR        /CONTINUE RAR TEST


0652  4754   SIMRO3, JMS I   XR3
                     /
                     /TEST RTL
                     /
0653  7340   SIMRTL, CLA CLL CMA
0654  0053           AND     XRTLTA        /GET MASK TABLE FOR
0655  3012           DCA     POINT2        /SIMULATED RTL
0656  4451           JMS I   XSROT         /SIMULATE RTL
0657  7340   RRTL,   CLA CLL CMA
0660  0024           AND     RLNK          /SET UP TO DO REAL ROTATE
0661  7640           SZA CLA
0662  7020           CML
0663  7040           CMA
0664  0023           AND     RAC
0665  7006           RTL                   /DO REAL ROTATE
0666  7000           NOP
0667  3031           DCA     RRAC          /SAVE ROTATED ACCUMULATOR
0670  7430           SZL
0671  7040           CMA
0672  3033           DCA     RRLNK         /SAVE ROTATED LINK
0673  4456           JMS I   XCOMRO        /COMPARE ROTATES
0674  5257           JMP     RRTL          /RETURN HERE FOR LOOP ON ERROR
0675  4457           JMS I   XNXTRO        /SET UP TO DO NEXT ROTATE
0676  5253           JMP     SIMRTL        /CONTINUE RTL TEST


0677  4755   SIMRO4, JMS I   XR4
                     /
                     /TEST RTR
                     /
0700  7340   SIMRTR, CLA CLL CMA
0701  0054           AND     XRTRTA        /GET MASK TABLE FOR
0702  3012           DCA     POINT2        /SIMULATED RTR
0703  4451           JMS I   XSROT         /SIMULATE RTR
0704  7340   RRTR,   CLA CLL CMA
```

```
0705  0024            AND      RLNK            /SET UP TO DO REAL ROTATE
0706  7640            SZA CLA
0707  7020            CML
0710  7040            CMA
0711  0023            AND      RAC
0712  7012            RTR                      /DO REAL ROTATE
0713  7000            NOP
0714  3031            DCA      RRAC            /SAVE ROTATED ACCUMULATOR
0715  7430            SZL
0716  7040            CMA
0717  3033            DCA      RRLNK           /SAVE ROTATED LINK
0720  4456            JMS I    XCOMRO          /COMPARE ROTATES
0721  5304            JMP      RRTR            /RETURN HERE FOR LOOP ON ERROR
0722  4457            JMS I    XNXTRO          /SET UP TO DO NEXT ROTATE
0723  5300            JMP      SIMRTR          /CONTINUE RTR TEST


0724  4756    SIMRO5, JMS I    XR5
                      /
                      /TEST BYTE SWAP
                      /
0725  7340    SIMBSW, CLA CLL CMA
0726  0055            AND      XBSWTA          /GET MASK TABLE FOR
0727  3012            DCA      POINT2          /SIMULATED BSW
0730  4776            JMS I    XSBSW           /SIMULATE BSW
0731  7340    RBSW,   CLA CLL CMA
0732  0024            AND      RLNK                    /SET UP FOR REAL BSW
0733  7640            SZA CLA
0734  7020            CML
0735  7040            CMA
0736  0023            AND      RAC
0737  7002            BSW                      /DO REAL BSW
0740  7000            NOP
0741  3031            DCA      RRAC            /SAVE ROTATED ACCUMULATOR
0742  7430            SZL
0743  7040            CMA
0744  3033            DCA      RRLNK           /SAVE ROTATED LINK
0745  4456            JMS I    XCOMRO          /COMPARE ROTATES
0746  5331            JMP      RBSW            /RETURN HERE FOR LOOP ON ERROR
0747  4457            JMS I    XNXTRO          /SET UP FOR NEXT ROTATE
0750  5325            JMP      SIMBSW          /CONTINUE BSW TEST
0751  5777            JMP I    XROTDN          /END OF ROTATE SIMULATION TESTS

0752  1400    XR1,    R1
0753  1410    XR2,    R2
0754  1420    XR3,    R3
0755  1430    XR4,    R4
0756  1440    XR5,    R5
0757  0001    RALTAB, 1
0760  0002            2
0761  0004            4
0762  0010            10
0763  0020            20
0764  0040            40
```

```
0765  0100            100
0766  0200            200
0767  0400            400
0770  1000            1000
0771  2000            2000
0772  4000            4000
0773  0000            0
0774  0001            1
0775  4000            4000
0776  1236    XSBSW,  SBSW
0777  1323    XROTDN, ROTDNE


                      /
                      /(TAPE 2)
                      /COMPARE RESULTS OF REAL AND SIMULATED ROTATES
                      /
      1000    *1000
1000  0000    COMROT, 0
                      /
                      /COMPARE ROTATED ACCUMULATORS
                      /
1001  7340            CLA CLL CMA
1002  0025            AND     SIMAC           /GET SIMULATED ROTATED ACCUMULATOR
1003  7040            CMA                     /COMPLEMENT
1004  0031            AND     RRAC            /AND WITH REAL ROTATED ACCUMULATOR
1005  7440            SZA                     /IS NOTSIMAC AND RRAC=0
1006  5226            JMP     ERROT           /NO, ERROR
1007  7040            CMA
1010  0031            AND     RRAC            /GET REAL ROTATED ACCUMULATOR
1011  7040            CMA                     /COMPLEMENT
1012  0025            AND     SIMAC           /AND WITH SIMULATED ROTATED ACCUMULATOR
1013  7440            SZA                     /IS SIMAC AND NOTRRAC=0
1014  5226            JMP     ERROT           /NO, ERROR
                      /
                      /COMPARE ROTATED LINKS
                      /
1015  7340            CLA CLL CMA
1016  0026            AND     SIMLNK          /GET SIMULATED LINK
1017  7640            SZA CLA
1020  7020            CML
1021  7040            CMA
1022  0033            AND     RRLNK           /GET REAL ROTATED LINK
1023  7440            SZA
1024  7020            CML
1025  7430            SZL                     /ARE THEY THE SAME
1026  5246    ERROT,  JMP     ERROR2          /NO, ERROR
1027  2200            ISZ     COMROT          /RETURN HERE IF NO LOOP ON ERROR
1030  5600            JMP I   COMROT
                      /
                      /
                      /SET UP TO DO NEXT ROTATE
```

```
                        /
1031  0000   NXTROT,   0
1032  7340             CLA CLL CMA
1033  0024             AND     RLNK          /GET LINK OF WORD TO BE ROTATED
1034  7640             SZA CLA               /IS IT 0
1035  5244             JMP     NEWLNK        /NO, CLEAR IT
1036  7040             CMA                   /YES, SET IT
1037  3024             DCA     RLNK
1040  2023             ISZ     RAC           /INCREMENT NUMBER TO BE ROTATED
1041  5631             JMP I   NXTROT        /CONTINUE SIMULATION OF PRESENT ROTATE INSTRUCTION
1042  2231             ISZ     NXTROT        /PRESENT SIMULATION DONE
1043  5631             JMP I   NXTROT        /GO TO NEXT TEST
1044  3024   NEWLNK,   DCA     RLNK
1045  5631             JMP I   NXTROT


                        /
                        /
                        /ERROR HANDLER FOR ROTATE TEST
                        /
1046  7604   ERROR2,   LAS
1047  0104             AND     SR01          /TEST SR01
1050  7650             SNA CLA               /IS SR01=1
1051  4271             JMS     ROTPRT        /NO, TYPE ERROR MESSAGE
1052  7604   HLTB,     LAS
1053  0103             AND     SR00          /TEST SR00
1054  7650             SNA CLA               /IS SR00=1
1055  5263             JMP     HALTB         /NO, HALT WITH ADDRESS OF TEST IN AC
1056  7604             LAS
1057  0105             AND     SR02          /TEST SR02
1060  7650             SNA CLA               /IS SR02=1
1061  5227             JMP     ERROT+1       /NO, GO TO NEW DATA
1062  5230             JMP     ERROT+2       /YES, LOOP WITH SAME DATA
1063  7340   HALTB,    CLA CLL CMA
1064  0451             AND I   XSROT
1065  1270             TAD     M4
1066  7402             HLT
1067  5256             JMP     HLTB+4
1070  7774   M4,       -4


                        /
                        /ERROR TYPEOUT FOR SIMULATED ROTATE TEST ERRORS
                        /
1071  0000   ROTPRT,   0
1072  7340             CLA CLL CMA
1073  0035             AND     RHFLG         /GET ROTATE TEST HEADER FLAG
1074  7650             SNA CLA               /HAS HEADER BEEN TYPED
1075  4331             JMS     RHOUT         /NO, TYPE HEADER
1076  7040             CMA
1077  0023             AND     RAC
1100  3037             DCA     WD1
1101  7040             CMA
```

```
1102  0024            AND     RLNK
1103  3040            DCA     WD2
1104  4460            JMS I   XLNKOU          /OUTPUT ORIGINAL LINK
1105  4461            JMS I   XWDOUT          /OUTPUT ORIGINAL WORD
1106  7040            CMA
1107  0025            AND     SIMAC
1110  3037            DCA     WD1
1111  7040            CMA
1112  0026            AND     SIMLNK
1113  3040            DCA     WD2
1114  4460            JMS I   XLNKOU          /OUTPUT SIMULATED ROTATED LINK
1115  4461            JMS I   XWDOUT          /OUTPUT SIMULATED ROTATED WORD
1116  7040            CMA
1117  0031            AND     RRAC
1120  3037            DCA     WD1
1121  7040            CMA
1122  0033            AND     RRLNK
1123  3040            DCA     WD2
1124  4460            JMS I   XLNKOU          /OUTPUT ACTUAL ROTATED LINK
1125  4461            JMS I   XWDOUT          /OUTPUT ACTUAL ROTATED WORD
1126  4446            JMS I   XPRINT
1127  5542            CRLF-1
1130  5671            JMP I   ROTPRT

                      /
                      /OUTPUT HEADER FOR ROTATE ERROR MESSAGE
                      /
1131  0000    RHOUT,  0
1132  4446            JMS I   XPRINT          /TYPE SIMULATED XXX TEST FAILED
1133  0000    RHD,    0                       /WHERE XXX IS THE INSTRUCTION THAT FAILED
1134  4446            JMS I   XPRINT          /TYPE ORIGINAL, SIMULATED ACTUAL
1135  5044            DH2-1
1136  7240            CLA CMA
1137  3035            DCA     RHFLG
1140  5731            JMP I   RHOUT


1141  2000    RTRTAB, 2000
1142  0400            400
1143  0100            100
1144  0020            20
1145  0004            4
1146  0001            1
1147  4000            4000
1150  1000            1000
1151  0200            200
1152  0040            40
1153  0010            10
1154  0002            2
1155  0000            0
1156  2000            2000
1157  0002            2

1160  0002    RTLTAB, 2
```

```
1161  0010          10
1162  0040          40
1163  0200          200
1164  1000          1000
1165  4000          4000
1166  0001          1
1167  0004          4
1170  0020          20
1171  0100          100
1172  0400          400
1173  2000          2000
1174  0000          0
1175  0002          2
1176  2000          2000


                    /
                    /
                    /ROTATION SIMULATOR COMMON ROUTINE
                    /ROTATE FUNCTION SIMULATED DEPENDS
                    /UPON MASK TABLE SELECTED
                    /
      1200    *1200
1200  0000    $ROTAL, 0
1201  7300            CLA CLL
1202  3025            DCA     SIMAC           /CLEAR SIMULATION ARGUMENTS
1203  3026            DCA     SIMLNK
1204  7040            CMA
1205  0412            AND I   POINT2          /GET FIRST MASK BIT FROM TABLE
1206  3037            DCA     WD1
1207  7040    NBIT,   CMA
1210  0412            AND I   POINT2          /GET MASK BIT FROM TABLE
1211  7450            SNA                     /IS IT 0
1212  5303            JMP     ENDROT          /YES, FINISH SIMULATION
1213  3040            DCA     WD2
1214  7040            CMA
1215  0023            AND     RAC             /LOAD AC WITH WORD TO BE ROTATED
1216  0037            AND     WD1             /TEST BIT TO BE ROTATED
1217  7440            SZA                     /IS IS 0
1220  4225            JMS     OR1             /NO, PLACE BIT INTO NEW POSITION
1221  7040            CMA
1222  0040            AND     WD2             /BIT TO BE ROTATED
1223  3037            DCA     WD1             /BECOMES NEW MASK
1224  5207            JMP     NBIT            /CONTINUE SIMULATION
                    /
                    /OR BITS TO FORM PARTIALLY ROTATED WORD
                    /
1225  0000    OR1,    0
1226  7240            CLA CMA
1227  0040            AND     WD2             /GET BIT TO BE INSERTED
1230  7421            MQL                     /SAVE IN MQ
1231  7040            CMA
1232  0025            AND     SIMAC           /GET SIMULATED ROTATED WORD
1233  7501            MQA                     /OR BIT INTO POSITION
```

```
1234  3025            DCA     SIMAC          /SAVE PARTIALLY ROTATED WORD
1235  5625            JMP I   OR1


                      /
                      /SIMULATE BYTE SWAP
                      /
1236  0000    SBSW,   0
1237  7340            CLA CLL CMA
1240  0236            AND     SBSW           /SET UP FOR ERROR RETURN
1241  3451            DCA I   XSROT
1242  3025            DCA     SIMAC          /CLEAR SIMULATION ARGUMENTS
1243  3026            DCA     SIMLNK
1244  7040    N1BIT,  CMA
1245  0412            AND I   POINT2         /GET MASK FROM TABLE
1246  7450            SNA                    /IS IT 0
1247  5277            JMP     ENDBSW         /YES, FINISH SIMULATION
1250  3037            DCA     WD1
1251  7040            CMA
1252  0412            AND I   POINT2
1253  3040            DCA     WD2
1254  7040            CMA
1255  0023            AND     RAC            /GET WORD TO BE ROTATED
1256  0037            AND     WD1            /TEST BIT TO BE ROTATED
1257  7440            SZA                    /IS IT 0
1260  4225            JMS     OR1            /NO, PLACE BIT IN NEW POSITION
1261  7040            CMA
1262  0037            AND     WD1            /INTERCHANGE MASK AND BIT TO BE ROTATED
1263  7421            MQL
1264  7040            CMA
1265  0040            AND     WD2
1266  3037            DCA     WD1
1267  7501            MQA
1270  3040            DCA     WD2
1271  7040            CMA
1272  0023            AND     RAC            /GET WORD TO BE ROTATED
1273  0037            AND     WD1            /TEST BIT TO BE ROTATED
1274  7440            SZA                    /IS IT 0
1275  4225            JMS     OR1            /NO, PLACE BIT IN NEW POSITION
1276  5244            JMP     N1BIT          /CONTINUE SIMULATION
1277  7340    ENDBSW, CLA CLL CMA
1300  0024            AND     RLNK
1301  3026            DCA     SIMLNK
1302  5636            JMP I   SBSW


                      /
                      /
                      /END OF ROTATE, SHIFT LINK
                      /
1303  7340    ENDROT, CLA CLL CMA
1304  0412            AND I   POINT2         /GET BIT TO BE ROTATED FROM LINK
1305  3040            DCA     WD2
```

```
1306  7040            CMA
1307  0116            AND      K0001          /GET MASK FOR LINK
1310  0024            AND      RLNK           /TEST LINK
1311  7440            SZA                     /IS LINK 0
1312  4225            JMS      OR1            /PLACE LINK IN NEW POSITION
1313  7040            CMA
1314  0412            AND I    POINT2         /GET MASK FOR BIT TO BE ROTATED INTO LINK
1315  0023            AND      RAC            /TEST BIT IN WORD TO BE ROTATED INTO LINK
1316  7440            SZA                     /IS IT 0
1317  7240            CLA CMA                 /NO, SET LINK=1
1320  0116            AND      K0001
1321  3026            DCA      SIMLNK
1322  5600            JMP I    SROTAL
                      /
1323  7604    ROTDNE, LAS
1324  0115            AND      SR10           /TEST SR10
1325  7650            SNA CLA                 /IS SR10=1
1326  5342            JMP      SROTOK         /NO, TYPE "SIMROT"
1327  7604    ROTHLT, LAS
1330  0114            AND      SR09           /TEST SR09
1331  7640            SZA CLA                 /IS SR09=1
1332  7402            HLT                     /YES, HALT AT END OF ROTATE TESTS
1333  7604            LAS
1334  0116            AND      SR11           /TEST SR11
1335  7650            SNA CLA                 /IS SR11=1
1336  5740            JMP I    .+2            /NO, GO TO NEXT TEST
1337  5741            JMP I    .+2            /YES, REPEAT ROTATE TESTS
1340  2000            FCT
1341  0600            SIMRO1
1342  4446    SROTOK, JMS I    XPRINT
1343  5525            OK2-1
1344  5327            JMP      ROTHLT


                      /
                      /
                      /SET UP FOR ROTATE TESTS
                      /
      1400    PAGE
1400  0000    R1,     0
1401  7340            CLA CLL CMA
1402  0250            AND      XM2            /SET UP HEADER
1403  3450            DCA I    XRHD           /FOR RAL TEST ERROR MESSAGE
1404  3035            DCA      RHFLG          /CLEAR ROTATE HEADER FLAG
1405  3024            DCA      RLNK
1406  3023            DCA      RAC
1407  5600            JMP I    R1
1410  0000    R2,     0
1411  7340            CLA CLL CMA
1412  0251            AND      XM3            /SET UP HEADER
1413  3450            DCA I    XRHD           /FOR RAR TEST ERROR MESSAGE
1414  3035            DCA      RHFLG
1415  3024            DCA      RLNK
1416  3023            DCA      RAC
```

```
1417  5610          JMP I   R2
1420  0000   R3,    0
1421  7340          CLA CLL CMA
1422  0252          AND     XM4             /SET UP HEADER
1423  3450          DCA I   XRHD            /FOR RTR TEST ERROR MESSAGE
1424  3035          DCA     RHFLG
1425  3024          DCA     RLNK
1426  3023          DCA     RAC
1427  5620          JMP I   R3
1430  0000   R4,    0
1431  7340          CLA CLL CMA
1432  0253          AND     XM5             /SET UP HEADER
1433  3450          DCA I   XRHD            /FOR RTL TEST ERROR MESSAGE
1434  3035          DCA     RHFLG
1435  3024          DCA     RLNK
1436  3023          DCA     RAC
1437  5630          JMP I   R4
1440  0000   R5,    0
1441  7340          CLA CLL CMA
1442  0254          AND     XM6             /SET UP HEADER
1443  3450          DCA I   XRHD            /FOR BSW TEST ERROR MESSAGE
1444  3035          DCA     RHFLG
1445  3024          DCA     RLNK
1446  3023          DCA     RAC
1447  5640          JMP I   R5
1450  5240   XM2,    EM2-1
1451  5261   XM3,    EM3-1
1452  5302   XM4,    EM4-1
1453  5323   XM5,    EM5-1
1454  5344   XM6,    EM6-1

                    /
                    /
                    /CHARACTER STRING TYPE ROUTINE
                    /←=RETURN, ↑=LINE FEED
      1600   PAGE
1600  0000   PRINT,  0
1601  7200          CLA
1602  1600          TAD I   PRINT
1603  3011          DCA     POINT1
1604  2200          ISZ     PRINT
1605  1411          TAD I   POINT1
1606  3036          DCA     CHAR
1607  1036          TAD     CHAR
1610  7012          RTR
1611  7012          RTR
1612  7012          RTR
1613  4217          JMS     TYPSET
1614  1036          TAD     CHAR
1615  4217          JMS     TYPSET
1616  5205          JMP     PRINT+5
1617  0000   TYPSET, 0
1620  0245          AND     K0077
1621  7450          SNA
1622  5600          JMP I   PRINT
```

```
1623  1246            TAD     M40
1624  7510            SPA
1625  5230            JMP     .+3
1626  1076            TAD     K240
1627  5243            JMP     MTP
1630  7001            IAC
1631  7440            SZA
1632  5235            JMP     .+3
1633  1251            TAD     K215
1634  5243            JMP     MTP
1635  7001            IAC
1636  7440            SZA
1637  5242            JMP     .+3
1640  1250            TAD     K212
1641  5243            JMP     MTP
1642  1247            TAD     K336
1643  4447    MTP,    JMS I   XTYPE
1644  5617            JMP I   TYPSET
1645  0077    K0077,  0077
1646  7740    M40,    7740
1647  0336    K336,   0336
1650  0212    K212,   0212
1651  0215    K215,   0215
1652  0000    TYPE,   0
1653  6046            TLS
1654  6041            TSF
1655  5254            JMP     .-1
1656  7200            CLA
1657  5652            JMP I   TYPE


1660  0001    BSWTAB, 1
1661  0100            100
1662  0002            2
1663  0200            200
1664  0004            4
1665  0400            400
1666  0010            10
1667  1000            1000
1670  0020            20
1671  2000            2000
1672  0040            40
1673  4000            4000
1674  0000            0

      2000    PAGE
2000  7300    FCT,    CLA CLL
2001  1122            TAD     SEQ1
2002  3154            DCA     SEQ
2003  3020            DCA     CNTR1

                      /
                      /
                      /FALSE CARRY TEST#1
```

```
                        /
2004  7300    FCT1,     CLA CLL
                        /
                        /PLACE INSTRUCTIONS AND DATA IN TEST ADDRESSES
                        /
2005  7300    FCS1,     CLA CLL                  /DATA=0000
2006  3471              DCA I   XSTA1            /LOC.=7776
2007  1136              TAD     INS1             /INSTRUCTION=TAD ,-1
2010  3472              DCA I   XSTA2            /LOC.=7777
2011  1332              TAD     INS2             /INSTRUCTION=TAD ,+3
2012  3000              DCA     TSTA3            /LOC.=0000
2013  1137              TAD     INS3             /INSTRUCTION=IAC
2014  3001              DCA     TSTA4            /LOC.=0001
2015  1140              TAD     INS4             /INSTRUCTION=JMP I .+2
2016  3002              DCA     TSTA5            /LOC.=0002
2017  7240              CLA CMA                  /DATA=7777
2020  3003              DCA     TSTA6            /LOC.=0003
2021  1327              TAD     AD1              /ADDRESS=RET1
2022  3004              DCA     TSTA7            /LOC.=0004
                        /
                        /EXECUTE INSTRUCTIONS PREVIOUSLY ASSEMBLED IN TEST
                        /ADDRESSES
                        /

2023  7300    FCL1,     CLA CLL
2024  5472              JMP I   XSTA2
2025  7000    RET1,     NOP                      /PROVIDED FOR PROGRAM MODIFICATION
2026  7000              NOP
2027  4464              JMS I   XAVREG           /SAVE LINK AND AC
                        /
                        /EXPECTED RESULTS ARE AC=0, LINK=1
                        /
2030  7430              SZL
2031  7440              SZA
2032  4465              JMS I   XDATER           /COMPUTATION ERROR HAS OCCURED
2033  7410              SKP
2034  4466              JMS I   XHALT2           /TEST FOR HALT
2035  4467              JMS I   XLOOP            /TEST FOR LOOP
2036  5223              JMP     FCL1
2037  7200              CLA
2040  1123              TAD     SEQ2             /ADDRESS OF NEXT TEST
2041  3154              DCA     SEQ
2042  5554              JMP I   SEQ              /GO TO NEXT TEST


                        /
                        /
                        /FALSE CARRY TEST#2
                        /
2043  7300    FCT2,     CLA CLL
                        /
                        /PLACE INSTRUCTIONS AND DATA IN TEST ADDRESSES
                        /
2044  7340    FCS2,     CLA CLL CMA              /DATA=7777
2045  3471              DCA I   XSTA1            /LOC.=7776
```

```
2046  1136          TAD     INS1          /INSTRUCTION=TAD ,-1
2047  3472          DCA I   XSTA2         /LOC.=7777
2050  1137          TAD     INS3          /INSTRUCTION=IAC
2051  3000          DCA     TSTA3         /LOC.=0000
2052  1141          TAD     INS5          /INSTRUCTION=JMP I ,+1
2053  3001          DCA     TSTA4         /LOC.=0001
2054  1330          TAD     AD2           /ADDRESS=RET2
2055  3002          DCA     TSTA5         /LOC.=0002
                    /
                    /EXECUTE INSTRUCTIONS PREVIOUSLY ASSEMBLED IN TEST
                    /ADDRESSES
                    /
2056  7300    FCL2, CLA CLL
2057  5472          JMP I   XSTA2
2060  7000    RET2, NOP
2061  7000          NOP
2062  4464          JMS I   XAVREG        /SAVE AC AND LINK
                    /
                    /EXPECTED RESULTS ARE AC=0, LINK=1
                    /
2063  7430          SZL
2064  7440          SZA
2065  4465          JMS I   XDATER
2066  7410          SKP
2067  4466          JMS I   XHALT2
2070  4467          JMS I   XLOOP
2071  5256          JMP     FCL2
2072  7200          CLA
2073  1124          TAD     SEQ3
2074  3154          DCA     SEQ
2075  5554          JMP I   SEQ


                    /
                    /
                    /FALSE CARRY TEST #3
                    /
2076  7300    FCT3, CLA CLL
                    /
                    /
                    /
2077  1137    FCS3, TAD     INS3          /INSTRUCTION=IAC
2100  3471          DCA I   XSTA1         /LOC.=7776
2101  1333          TAD     INS16         /INSTRUCTION=TAD I 21
2102  3472          DCA I   XSTA2         /LOC.=7777
2103  1152          TAD     INS14         /INSTRUCTION=JMP I ,+1
2104  3000          DCA     TSTA3         /LOC.=0000
2105  1331          TAD     AD3           /ADDRESS=RET3
2106  3001          DCA     TSTA4         /LOC.=0001
                    /
                    /
                    /
                    /
2107  7300    FCL3, CLA CLL
2110  5471          JMP I   XSTA1
```

```
2111  7000   RET3,   NOP
2112  7000           NOP
2113  4464           JMS I   XAVREG
                     /
                     /
                     /
2114  7430           SZL
2115  7440           SZA
2116  4465           JMS I   XDATER
2117  7410           SKP
2120  4466           JMS I   XHALT2
2121  4467           JMS I   XLOOP
2122  5307           JMP     FCL3
2123  7200           CLA
2124  1125           TAD     SEQ4
2125  3194           DCA     SEQ
2126  5554           JMP I   SEQ
2127  2025   AD1,    RET1
2130  2060   AD2,    RET2
2131  2111   AD3,    RET3
2132  1003   INS2,   1003            /=TAD .+3 IN 0000
2133  1421   INS16,  1421


      2200   PAGE
                     /
                     /
                     /FALSE CARRY TEST #4
                     /
2200  7300   FCT4,   CLA CLL
                     /
                     /
                     /
2201  7340   FCS4,   CLA CLL CMA            /DATA=7777
2202  3471           DCA I   XSTA1          /LOC.=7776
2203  1136           TAD     INS1           /INSTRUCTION=TAD ,-1
2204  3472           DCA I   XSTA2          /LOC.=7777
2205  1142           TAD     INS6           /INSTRUCTION=CMA CML RAR
2206  3000           DCA     TSTA3          /LOC.=0000
2207  1141           TAD     INS5           /INSTRUCTION=JMP I ,-1
2210  3001           DCA     TSTA4          /LOC.=0001
2211  1324           TAD     AD4            /ADDRESS=RET4
2212  3002           DCA     TSTA5          /LOC.=0002
                     /
                     /
                     /
                     /
2213  7340   FCL4,   CLA CLL CMA
2214  5472           JMP I   XSTA2
2215  7000   RET4,   NOP
2216  7000           NOP
2217  4464           JMS I   XAVREG
                     /
```

```
                        /
                        /
2220  7430               SZL
2221  7440               SZA
2222  4465               JMS I    XDATER
2223  7410               SKP
2224  4466               JMS I    XHALT2
2225  4467               JMS I    XLOOP
2226  5213               JMP      FCL4
2227  1126               TAD      SEQ5
2230  3154               DCA      SEQ
2231  5554               JMP I    SEQ


                        /
                        /
                        /FALSE CARRY TEST #5
                        /
2232  7300     FCT5,    CLA CLL
                        /
                        /
                        /
2233  7300     FCS5,    CLA CLL
2234  1143               TAD      INS7            /INSTRUCTION=ISZ ,-1
2235  3472               DCA I    XSTA2           /LOC.=7777
2236  1137               TAD      INS3            /INSTRUCTION=IAC
2237  3000               DCA      TSTA3           /LOC.=0000
2240  1137               TAD      INS3            /INSTRUCTION=IAC
2241  3001               DCA      TSTA4           /LOC.=0001
2242  1151               TAD      INS13           /INSTRUCTION=JMP I .+1
2243  3002               DCA      TSTA5           /LOC.=0002
2244  1325               TAD      AD5             /ADDRESS=RET5
2245  3003               DCA      TSTA6           /LOC.=0003
                        /
                        /
                        /
                        /
2246  7340     FCL5,    CLA CLL CMA
2247  3471               DCA I    XSTA1
2250  7040               CMA
2251  5472               JMP I    XSTA2
2252  7000     RET5,    NOP
2253  7000               NOP
2254  4464               JMS I    XAVREG
                        /
                        /
                        /
2255  7430               SZL
2256  7440               SZA
2257  4465               JMS I    XDATER
2260  7410               SKP
2261  4466               JMS I    XHALT2
2262  4467               JMS I    XLOOP
2263  5246               JMP      FCL5
2264  7200               CLA
```

```
2265  1127            TAD     SEQ6
2266  3154            DCA     SEQ
2267  5554            JMP I   SEQ


                      /
                      /
                      /FALSE CARRY TEST #6
                      /
2270  7300    FCT6,   CLA CLL
                      /
2271  7300    FCS6,   CLA CLL
2272  1144            TAD     INS8            /INSTRUCTION=ISZ ,+1
2273  3472            DCA I   XSTA2           /LOC.=7777
2274  1137            TAD     INS3            /INSTRUCTION=IAC
2275  3001            DCA     TSTA4           /LOC.=0001
2276  1151            TAD     INS13           /INSTRUCTION=JMP I .+1
2277  3002            DCA     TSTA5           /LOC.=0002
2300  1326            TAD     AD6             /ADDRESS=RET6
2301  3003            DCA     TSTA6           /LOC.=0003
                      /
                      /
                      /
                      /
2302  7340    FCL6,   CLA CLL CMA
2303  3000            DCA     TSTA3
2304  7240            CLA CMA
2305  5472            JMP I   XSTA2
2306  7000    RET6,   NOP
2307  7000            NOP
2310  4464            JMS I   XAVREG
                      /
                      /
                      /
2311  7430            SZL
2312  7440            SZA
2313  4465            JMS I   XDATER
2314  7410            SKP
2315  4466            JMS I   XHALT2
2316  4467            JMS I   XLOOP
2317  5302            JMP     FCL6
2320  7200            CLA
2321  1130            TAD     SEQ7
2322  3154            DCA     SEQ
2323  5554            JMP I   SEQ
2324  2215    AD4,    RET4
2325  2252    AD5,    RET5
2326  2306    AD6,    RET6


      2400    PAGE
                      /
                      /
                      /FALSE CARRY TEST#7
                      /
```

```
2400  7300   FCT7,   CLA CLL
                     /
                     /
                     /
2401  7300   FCS7,   CLA CLL
2402  1145           TAD      INS9          /INSTRUCTION=ISZ I TSTIND
2403  3472           DCA I    XSTA2         /LOC.=7777
2404  1137           TAD      INS3          /INSTRUCTION=IAC
2405  3001           DCA      TSTA4         /LOC.=0001
2406  1151           TAD      INS13         /INSTRUCTION=JMP I .+1
2407  3002           DCA      TSTA5         /LOC.=0002
2410  1326           TAD      AD7           /ADDRESS=RET7
2411  3003           DCA      TSTA6         /LOC.=0003
                     /
                     /
                     /
2412  7340   FCL7,   CLA CLL CMA
2413  3010           DCA      TSTIND
2414  7040           CMA
2415  3000           DCA      TSTA3
2416  7040           CMA
2417  5472           JMP I    XSTA2
2420  7000   RET7,   NOP
2421  7000           NOP
2422  4464           JMS I    XAVREG
                     /
                     /
                     /
2423  7430           SZL
2424  7440           SZA
2425  4465           JMS I    XDATER
2426  7410           SKP
2427  4466           JMS I    XHALT2
2430  4467           JMS I    XLOOP
2431  5212           JMP      FCL7
2432  7200           CLA
2433  1131           TAD      SEQ8
2434  3154           DCA      SEQ
2435  5554           JMP I    SEQ

                     /
                     /
                     /FALSE CARRY TEST #8
                     /
2436  7300   FCT8,   CLA CLL
                     /
                     /
                     /
2437  7300   FCS8,   CLA CLL
2440  1137           TAD      INS3          /INSTRUCTION=IAC
2441  3000           DCA      TSTA3         /LOC.=0000
2442  1137           TAD      INS3          /INSTRUCTION=IAC
2443  3001           DCA      TSTA4         /LOC.=0001
2444  1140           TAD      INS4          /INSTRUCTION=JMP I .+2
2445  3002           DCA      TSTA5         /LOC.=0002
```

```
2446  1327          TAD     AD8          /ADDRESS=RET8
2447  3004          DCA     TSTA7        /LOC.=0004
                    /
                    /
                    /
2450  7300    FCL8, CLA CLL
2451  1146          TAD     INS10        /INSTRUCTION=JMS .+1
2452  3472          DCA I   XSTA2        /LOC.=7777
2453  7240          CLA CMA
2454  5472          JMP I   XSTA2
2455  7000    RET8, NOP
2456  7000          NOP
                    /
                    /
                    /
2457  7430          SZL
2460  7440          SZA
2461  4465          JMS I   XDATER
2462  7410          SKP
2463  4466          JMS I   XHALT2
2464  4467          JMS I   XLOOP
2465  5250          JMP     FCL8
2466  7200          CLA
2467  1132          TAD     SEQ9
2470  3154          DCA     SEQ
2471  5554          JMP I   SEQ


                    /
                    /
                    /FALSE CARRY TEST #9
                    /
2472  7300    FCT9, CLA CLL
                    /
                    /
                    /
2473  7340    FCS9, CLA CLL CMA          /DATA=7777
2474  3471          DCA I   XSTA1        /LOC.=7776
2475  1137          TAD     INS3         /INSTRUCTION=IAC
2476  3000          DCA     TSTA3        /LOC.=0000
2477  1141          TAD     INS5         /INSTRUCTION=JMP I .+1
2500  3001          DCA     TSTA4        /LOC.=0001
2501  1330          TAD     AD9          /ADDRESS=RET9
2502  3002          DCA     TSTA5        /LOC.=0002
                    /
                    /
                    /
                    /
2503  7300    FCL9, CLA CLL
2504  1147          TAD     INS11        /INSTRUCTION=JMS I .-1
2505  3472          DCA I   XSTA2
2506  7240          CLA CMA
2507  5472          JMP I   XSTA2
2510  7000    RET9, NOP
2511  7000          NOP
```

```
2512  4464            JMS I   XAVREG
                      /
                      /
                      /
2513  7430            SZL
2514  7440            SZA
2515  4465            JMS I   XDATER
2516  7410            SKP
2517  4466            JMS I   XHALT2
2520  4467            JMS I   XLOOP
2521  5303            JMP     FCL9
2522  7200            CLA
2523  1133            TAD     SEQ10
2524  3154            DCA     SEQ
2525  5554            JMP I   SEQ
2526  2420    AD7,    RET7
2527  2455    AD8,    RET8
2530  2510    AD9,    RET9


      2600    PAGE
                      /
                      /
                      /
                      /FALSE CARRY TEST #10
                      /
2600  7300    FCT10,  CLA CLL
                      /
                      /
                      /
2601  7300    FCS10,  CLA CLL
2602  1150            TAD     INS12           /INSTRUCTION=JMS I TSTIND
2603  3472            DCA I   XSTA2           /LOC.=7777
2604  1137            TAD     INS3            /INSTRUCTION=IAC
2605  3001            DCA     TSTA4           /LOC.=0001

2606  1151            TAD     INS13           /INSTRUCTION=JMP I .+1
2607  3002            DCA     TSTA5           /LOC.=0002
2610  1315            TAD     AD10            /ADDRESS=RET10
2611  3003            DCA     TSTA6           /LOC.=0003
                      /
                      /
                      /
2612  7340    FCL10,  CLA CLL CMA
2613  3010            DCA     TSTIND
2614  7040            CMA
2615  5472            JMP I   XSTA2
2616  7000    RET10,  NOP
2617  7000            NOP
2620  4464            JMS I   XAVREG
                      /
                      /
                      /
2621  7430            SZL
```

```
2622  7440          SZA
2623  4465          JMS I   XDATER
2624  7410          SKP
2625  4466          JMS I   XHALT2
2626  4467          JMS I   XLOOP
2627  5212          JMP     FCL10
2630  7200          CLA
2631  1134          TAD     SEQ11
2632  3154          DCA     SEQ
2633  5554          JMP I   SEQ


                    /
                    /
                    /FALSE CARRY TEST #11
                    /
2634  7300    FCT11,  CLA CLL
                    /
                    /
                    /
2635  7300    FCS11,  CLA CLL
2636  1137          TAD     INS3            /INSTRUCTION=IAC
2637  3000          DCA     TSTA5           /LOC.=0000
2640  1141          TAD     INS5            /INSTRUCTION=JMP I ,+1
2641  3001          DCA     TSTA4           /ADDRESS=0001
2642  1316          TAD     AD11            /ADDRESS=RET11
2643  3002          DCA     TSTA5           /LOC.=0002
                    /
                    /
                    /
2644  7300    FCL11,  CLA CLL
2645  1153          TAD     INS15           /INSTRUCTION=JMS ,
2646  3472          DCA I   XSTA2           /LOC.=7777
2647  7240          CLA CMA
2650  5472          JMP I   XSTA2
2651  7000    RET11,  NOP
2652  7000          NOP
2653  4464          JMS I   XAVREG
                    /
                    /
                    /
2654  7430          SZL
2655  7440          SZA
2656  4465          JMS I   XDATER
2657  7410          SKP
2660  4466          JMS I   XHALT2
2661  4467          JMS I   XLOOP
2662  5244          JMP     FCL11
2663  7200          CLA
2664  1135          TAD     SEQ12
2665  3154          DCA     SEQ
2666  5554          JMP I   SEQ


                    /
```

```
                        /
                        /FALSE CARRY TEST #12
                        /
2667  7300    FCT12,    CLA CLL
                        /
                        /
                        /
2670  7300    FCS12,    CLA CLL
2671  1137              TAD     INS3            /INSTRUCTION=IAC
2672  3472              DCA I   XSTA2           /LOC.=7777
2673  1152              TAD     INS14           /INSTRUCTION=JMP I .+1
2674  3000              DCA     TSTA3           /LOC.=0000
2675  1317              TAD     AD12            /ADDRESS=RET12
2676  3001              DCA     TSTA4           /LOC.=0001
                        /
                        /
                        /
                        /
2677  7340    FCL12,    CLA CLL CMA
2700  5472              JMP I   XSTA2
2701  7000    RET12,    NOP
2702  7000              NOP
2703  4464              JMS I   XAVREG
                        /
                        /
                        /
2704  7430              SZL
2705  7440              SZA
2706  4465              JMS I   XDATER
2707  7410              SKP
2710  4466              JMS I   XHALT2
2711  4467              JMS I   XLOOP
2712  5277              JMP     FCL12
2713  5714              JMP I   .+1
2714  3200              ENDFCT
2715  2616    AD10,     RET10
2716  2651    AD11,     RET11
2717  2701    AD12,     RET12


      3000    PAGE
                        /(TAPE 3)
                        /COMPARE TWO NUMBERS: W1+NOT(W2)+W2+NOT(W1)=0, W1=W2
                        /
3000  0000    SAMEAS,   0
3001  7340              CLA CLL CMA
3002  0040              AND     W2
3003  7040              CMA
3004  0037              AND     W1
3005  7640              SZA CLA                 /W1+NOT(W2)=0
3006  5600              JMP I   SAMEAS          /W1+NOT(W2)NOT 0, ERROR
3007  7040              CMA
3010  0037              AND     W1
```

```
3011  7040            CMA
3012  0040            AND     W2
3013  7640            SZA CLA                 /W2+NOT(W1)=0
3014  5630            JMP I   SAMEAS          /W2+NOT(W1) NOT 0, ERROR
3015  2200            ISZ     SAMEAS
3016  5600            JMP I   SAMEAS          /W1=W2
                      /
                      /SAVE AC AND LINK
                      /
3017  0000    SAVREG, 0
3020  3025            DCA     TEMPAC
3021  7430            SZL
3022  7040            CMA
3023  3026            DCA     TEMPL
3024  7040            CMA
3025  0025            AND     TEMPAC
3026  5617            JMP I   SAVREG
                      /
                      /HALT ON ERROR.  DISPLAY ADDRESS OF FAILED TEST IN AC
                      /
3027  0000    HALT2,  0
3030  7604            LAS
3031  0103            AND     SR00            /TEST SR00
3032  7640            SZA CLA                 /SUPPRESS HALT IF SR00=1
3033  5627            JMP I   HALT2
3034  1134            TAD     SEQ             /PUT ADDRESS OF FAILED TEST IN
3035  7402            HLT                     /AC AND STOP
3036  5627            JMP I   HALT2           /CONTINUE TESTING


                      /
                      /
                      /DATA ERROR HAS OCCURED
                      /
3037  0000    DATER,  0
3040  7604            LAS
3041  0104            AND     SR01                    /TEST SR01
3042  7450            SNA                     /SUPPRESS ERROR TYPE IF SR01=1
3043  4256            JMS     TYPS2           /SET UP FOR ERROR TYPE
3044  2237            ISZ     DATER
3045  5637            JMP I   DATER
                      /
                      /
                      /
                      /
                      /
                      /LOOP ON DATA ERROR
                      /
3046  2000    LOOP,   0
3047  7604            LAS
3050  0105            AND     SR02                    /TEST SR02
3051  7650            SNA CLA                 /LOOP IF SR02=1
3052  5254            JMP     NLOOP           /DO NOT LOOP
3053  5646            JMP I   LOOP
3054  2246    NLOOP,  ISZ     LOOP
```

```
3055  5646            JMP I   LOOP

                      /
                      /TYPE DATA ERROR MESSAGE
                      /
3056  0000    TYPS2,  0
3057  4446            JMS I   XPRINT
3060  5544            DATE-1                  /TYPE "DATA ERROR"
3061  1037            TAD     W1
3062  4673            JMS I   XADOUT          /TYPE TEST ADDRESS
3063  7340            CLA CLL CMA
3064  0025            AND     TEMPAC
3065  3037            DCA     WD1
3066  0026            AND     TEMPL
3067  3040            DCA     WD2
3070  4460            JMS I   XLNKOU          /OUTPUT RECEIVED LINK
3071  4461            JMS I   XWDOUT          /OUTPUT RECEIVED AC
3072  5656            JMP I   TYPS2
3073  3227    XADOUT, ADOUT
                      /
                      /END OF PASS
                      /
      3200    PAGE
3200  7300    ENDFCT, CLA CLL
3201  2020            ISZ     CNTR1           /INCREMENT PASS COUNT
3202  5224            JMP     OUT             /PASS NOT COMPLETE
3203  7604            LAS
3204  0115            AND     SR10            /TEST SR10
3205  7650            SNA CLA                 /IS SR10=1
3206  5221            JMP     FCTOK           /NO, TYPE FCT
3207  7604    FCTHLT, LAS
3210  0114            AND     SR09            /TEST SR09
3211  7640            SZA CLA                 /IS SR09=1
3212  7402            HLT                     /YES, HALT
3213  7604            LAS
3214  0116            AND     SR11            /TEST SR11
3215  7640            SZA CLA                 /IS SR11=1
3216  5224            JMP     OUT             /YES, LOOP ON FCT
3217  5620            JMP I   .+1             /NO, GO TO NEXT TEST
3220  3400            RNAD1
3221  4446    FCTOK,  JMS I   XPRINT
3222  5532            OK3-1
3223  5207            JMP     FCTHLT
3224  1122    OUT,    TAD     SEQ1
3225  3154            DCA     SEQ
3226  5554            JMP I   SEQ


                      /
                      /
                      /CONVERT ADDRESS TO ASCII AND OUTPUT
                      /
3227  0000    ADOUT,  0
3230  3037            DCA     TEMP1
3231  1037            TAD     TEMP1
```

```
3232  0266            AND     K0007
3233  3264            DCA     A2
3234  1037            TAD     TEMP1
3235  7006            RTL
3236  7004            RAL
3237  0267            AND     K0700
3240  1264            TAD     A2
3241  1270            TAD     K6060
3242  3264            DCA     A2
3243  1037            TAD     TEMP1
3244  7012            RTR
3245  7012            RTR
3246  7012            RTR
3247  0266            AND     K0007
3250  3263            DCA     A1
3251  1037            TAD     TEMP1
3252  7012            RTR
3253  7010            RAR
3254  0267            AND     K0700
3255  1263            TAD     A1
3256  1270            TAD     K6060
3257  3263            DCA     A1
3260  4446            JMS I   XPRINT
3261  3262            A1-1
3262  5627            JMP I   ADOUT
3263  0000    A1,     0
3264  0000    A2,     0
3265  4000            4000
3266  0007    K0007,  0007
3267  0700    K0700,  0700
3270  6060    K6060,  6060

                      /MULTIPLE ADDITIONS OF RANDOM NUMBER AND ITS TWO'S COMPLEMENT
      3400    PAGE
3400  7300    RNAD1,  CLA CLL
3401  4473            JMS I   XRAND           /GENERATE RANDOM NUMBERS
3402  7300            CLA CLL
3403  1041            TAD     RANDA
3404  1043            TAD     RANDC           /AC=0
3405  1043            TAD     RANDC
3406  1041            TAD     RANDA           /AC=0
3407  1041            TAD     RANDA
3410  1041            TAD     RANDA
3411  1043            TAD     RANDC
3412  1043            TAD     RANDC           /AC=0
3413  1041            TAD     RANDA
3414  1041            TAD     RANDA
3415  1043            TAD     RANDC
3416  1041            TAD     RANDA
3417  1043            TAD     RANDC
3420  1043            TAD     RANDC           /AC=0
3421  1041            TAD     RANDA
3422  1041            TAD     RANDA
3423  1043            TAD     RANDC
3424  1043            TAD     RANDC           /AC=0
```

```
3425  1043            TAD     RANDC
3426  1041            TAD     RANDA
3427  1043            TAD     RANDC
3430  1041            TAD     RANDA           /AC=0
3431  1041            TAD     RANDA
3432  1041            TAD     RANDA
3433  1043            TAD     RANDC
3434  1043            TAD     RANDC           /AC=0
3435  7000            NOP
3436  4464            JMS I   XAVREG          /SAVE AC AND LINK
3437  7430            SZL                     /IS LINK=1, AND AC=0
3440  7440            SZA
3441  4646            JMS I   XRN1ER          /ERROR, AC NOT 0, OR LINK NOT 1 OR BOTH
3442  4467            JMS I   NERROP          /RESULTS OK
3443  5202            JMP     RNAD1+2
3444  5645            JMP I   .+1
3445  3600            RNAD2

3446  3447    XRN1ER, RN1ER


                      /
                      /RANDOM ADD TEST 1 ERROR HANDLER
                      /
3447  0000    RN1ER,  0
3450  7604            LAS
3451  0104            AND     SR01            /TEST SR01
3452  7640            SZA CLA                 /IS SR01=1
3453  5302            JMP     SKHLT           /YES, SUPPRESS ERROR TYPEOUT
3454  4446            JMS I   XPRINT          /TYPE "RANDOM ADD TEST1 FAILED"
3455  5365            EM10-1
3456  4446            JMS I   XPRINT          /TYPE "RANDA, RANDC, RESULT"
3457  5116            DH4-1
3460  7340            CLA CLL CMA
3461  0041            AND     RANDA
3462  3037            DCA     WD1
3463  4461            JMS I   XWDOUT          /OUTPUT RANDA
3464  7340            CLA CLL CMA
3465  0043            AND     RANDC
3466  3037            DCA     WD1
3467  4461            JMS I   XWDOUT          /OUTPUT RANDC
3470  7340            CLA CLL CMA
3471  0025            AND     TEMPAC
3472  3037            DCA     WD1
3473  7040            CMA
3474  0026            AND     TEMPL
3475  3040            DCA     WD2
3476  4460            JMS I   XLNKOU          /OUTPUT RESULTANT LINK
3477  4461            JMS I   XWDOUT          /OUTPUT RESULTANT AC
3500  4446            JMS I   XPRINT
3501  5542            CRLF-1
3502  7604    SKHLT,  LAS
3503  0103            AND     SR00            /TEST SR00
3504  7640            SZA CLA                 /IS SR00=1
3505  5647            JMP I   RN1ER           /YES, SUPPRESS ERROR HALT
```

```
3506  7300            CLA CLL
3507  1247            TAD     RNIER
3510  7402            HLT                     /HALT WITH ADDRESS OF RNAD1 IN AC
3511  5647            JMP I   RNIER


                      /
                      /RANDOM NUMBER GENERATOR
                      /
3512  0000    RANDOM, 0
3513  7300            CLA CLL
3514  1041            TAD     RANDA
3515  7004            RAL
3516  7430            SZL
3517  1342            TAD     K0003
3520  3041            DCA     RANDA
3521  1041            TAD     RANDA
3522  7041            CIA
3523  3043            DCA     RANDC
3524  7100            CLL
3525  1341            TAD     R2A
3526  7004            RAL
3527  7430            SZL
3530  1342            TAD     K0003
3531  3341            DCA     R2A
3532  7430            SZL
3533  7040            CMA
3534  3044            DCA     LINKR
3535  1044            TAD     LINKR
3536  7040            CMA
3537  3045            DCA     LINKRC
3540  5712            JMP I   RANDOM
3541  0001    R2A,    1
3542  0003    K0003,  3


                      /ADDITION OF RANDOM NUMBER AND MODIFIED
                      /COMPLEMENT TO PRODUCE ONE KNOWN BIT
                      /SET IN AC
                      /
                      /

      3600    PAGE
3600  7340    RNAD2,  CLA CLL CMA
3601  0041            AND     RANDA           /GET RANDOM NUMBER
3602  3346            DCA     APOS            /STORE IT
3603  7040            CMA
3604  0041            AND     RANDA
3605  7040            CMA
3606  3347            DCA     ANEG            /ONE'S COMPLIMENT OF RANDOM NUMBER
3607  7040            CMA
3610  0103            AND     K4000           /GET MASK
3611  3352            DCA     MASK
3612  7040    NXTBT,  CMA
```

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3613  0352            AND     MASK
3614  7040            CMA
3615  3353            DCA     NMASK           /COMPLIMENT MASK
3616  7040    ALT1BT, CMA
3617  0346            AND     APOS            /GET RANDOM NUMBER
3620  0352            AND     MASK            /TEST SIGN BIT
3621  7440            SZA                     /IS NUMBER NEGATIVE
3622  5232            JMP     MODNEG          /YES, MODIFY COMPLIMENT OF NUMBER
3623  7040            CMA
3624  0346            AND     APOS            /GET RANDOM NUMBER
3625  4301            JMS     XOR1            /MODIFY WITH MASK
3626  7040            CMA
3627  0347            AND     ANEG            /GET COMPLIMENT OF RANDOM NUMBER
3630  3351            DCA     BNEG            /AND USE AS IS
3631  5240            JMP     CBTST1
3632  7240    MODNEG, CMA CLA                 /MODIFY NEGATIVE NUMBER
3633  0347            AND     ANEG            /GET COMPLEMENT OF RANDOM NUMBER
3634  4315            JMS     XOR2            /MODIFY WITH MASK
3635  7040            CMA
3636  0346            AND     APOS            /GET RANDOM NUMBER
3637  3351            DCA     BNEG            /AND USE AS IS
3640  7340    CBTST1, CLA CLL CMA
3641  0350            AND     BPOS            /LOAD AC WITH MODIFIED ARGUMENT
3642  1351            TAD     BNEG            /ADD UNMODIFIED ARGUMENT
3643  7430            SZL                     /DID CARRY PROPIGATE INTO LINK
3644  7001            IAC                     /NO, INCREMENT NUMBER
3645  4464            JMS I   XAVREG          /SAVE AC
3646  4463            JMS I   XAMEA           /COMPARE MODIFIED BIT AND MASK
3647  7410            SKP
3650  4756            JMS I   XRN2ER          /AC AND MASK DIFFERENT, ERROR
3651  4467            JMS I   NERROP          /NO ERROR, AC AND MASK THE SAME
3652  5240            JMP     CBTST1          /RETURN HERE FOR LOOPING
3653  5254            JMP     CBTST2


3654  7340    CBTST2, CLL CLA CMA
3655  0351            AND     BNEG            /LOAD AC WITH UNMODIFIED ARGUMENT
3656  1350            TAD     BPOS            /ADD MODIFIED ARGUMENT
3657  7430            SZL                     /DID CARRY PROPIGATE INTO LINK
3660  7001            IAC                     /NO, INCREMENT NUMBER
3661  4464            JMS I   XAVREG          /SAVE AC
3662  4463            JMS I   XAMEA           /COMPARE AC AND MASK
3663  7410            SKP
3664  4756            JMS I   XRN2ER          /AC AND MASK NOT THE SAME, ERROR
3665  4467            JMS I   NERROP          /NOERROR, AC AND MASK THE SAME
3666  5254            JMP     CBTST2          /RETURN HERE FOR LOOPING
                      /SHIFT MASK ONE PLACE TO RIGHT
3667  7340    MOVMSK, CLA CLL CMA
3670  0352            AND     MASK
3671  7010            RAR
3672  3352            DCA     MASK
3673  7420            SNL                     /HAVE ALL BITS BEEN TESTED
3674  5212            JMP     NXTBT           /NO, CONTINUE
3675  4467            JMS I   NERROP          /YES, TEST FOR LOOP ON RNAD2
3676  5200            JMP     RNAD2
```

```
3677  5700            JMP I   .+1
3700  4200            RARR
3701  0000    XOR1,   0
3702  0353            AND     NMASK
3703  7040            CMA
3704  3354            DCA     ABNOT
3705  7040            CMA
3706  0347            AND     ANEG
3707  0352            AND     MASK
3710  7040            CMA
3711  0354            AND     ABNOT
3712  7040            CMA
3713  3350            DCA     BPOS
3714  5701            JMP I   XOR1
3715  0000    XOR2,   0
3716  0352            AND     MASK
3717  7040            CMA
3720  3354            DCA     ABNOT
3721  7040            CMA
3722  0346            AND     APOS
3723  0353            AND     NMASK
3724  7040            CMA
3725  0354            AND     ABNOT
3726  3350            DCA     BPOS
3727  5715            JMP I   XOR2


3730  0000    SAMEA,  0
3731  7040            CMA
3732  3355            DCA     NOTAC
3733  7040            CMA
3734  0025            AND     TEMPAC
3735  0353            AND     NMASK
3736  7440            SZA
3737  5344            JMP     EROUT1
3740  7040            CMA
3741  0352            AND     MASK
3742  0355            AND     NOTAC
3743  7440            SZA
3744  2330    EROUT1, ISZ     SAMEA
3745  5730            JMP I   SAMEA
3746  0000    APOS,   0
3747  0000    ANEG,   0
3750  0000    BPOS,   0
3751  0000    BNEG,   0
3752  0000    MASK,   0
3753  0000    NMASK,  0
3754  0000    ABNOT,  0
3755  0000    NOTAC,  0
3756  4000    XRN2ER, RN2ER
```

```
        4000    PAGE
                /
                /ERROR HANDLER FOR RANDOM ADD TEST 2.
                /
4000    0000    RN2ER,  0
4001    7604            LAS
4002    0104            AND     SR01            /TEST SR01
4003    7640            SZA CLA                 /IS SR01 = 1
4004    5233            JMP     SHLT            /YES SUPPRESS ERROR TYPEOUT
4005    4446            JMS I   XPRINT          /NO, TYPE "RANDOM ADD TEST 2 FAILED"
4006    5405            EM11-1
4007    4446            JMS I   XPRINT          /TYPE ARG1, ARG2, ARG1+ARG2, EXPECTED
4010    5164            DH6-1
4011    7340            CLA CLL CMA
4012    0777'           AND     BPOS            /OUTPUT ARG1
4013    3037            DCA     WD1
4014    4461            JMS I   XWDOUT
4015    7040            CMA
4016    0776'           AND     BNEG            /OUTPUT ARG2
4017    3037            DCA     WD1
4020    4461            JMS I   XWDOUT
4021    7040            CMA
4022    0775'           AND     MASK            /OUTPUT EXPECTED RESULT
4023    3037            DCA     WD1
4024    4461            JMS I   XWDOUT
4025    7040            CMA
4026    0025            AND     TEMPAC          /OUTPUT RESULTANT AC
4027    3037            DCA     WD1
4030    4461            JMS I   XWDOUT
4031    4446            JMS I   XPRINT
4032    5542            CRLF-1
4033    7604    SHLT,   LAS
4034    0103            AND     SR00            /TEST SR00
4035    7640            SZA CLA                 /IS SR00 = 1
4036    5600            JMP I   RN2ER           /YES, DO NOT HALT
4037    7300            CLA CLL                 /NO, HALT WITH ADDRESS IN AC
4040    1200            TAD     RN2ER
4041    7402            HLT
4042    5600            JMP I   RN2ER


                        /ROTATE RANDOM NUMBER RIGHT USING RAR

4175    3752
4176    3751
4177    3750
        4200    PAGE
4200    7300    RARR,   CLA CLL
4201    1044            TAD     LINKR           /GET LINK TO BE ROTATED
4202    7440            SZA
4203    7220            CLA CML
4204    1041            TAD     RANDA           /GET NUMBER TO BE ROTATED
```

```
4205  7010          RAR
4206  7010          RAR
4207  7010          RAR
4210  7010          RAR
4211  7010          RAR
4212  7010          RAR
4213  7010          RAR
4214  7010          RAR
4215  7010          RAR
4216  7010          RAR
4217  7010          RAR
4220  7010          RAR
4221  7010          RAR
4222  7010          RAR
4223  7010          RAR
4224  7010          RAR
4225  7010          RAR
4226  7010          RAR
4227  7010          RAR
4230  7010          RAR
4231  7010          RAR
4232  7010          RAR
4233  7010          RAR
4234  7010          RAR
4235  7010          RAR
4236  7010          RAR
4237  7000          NOP
4240  7000          NOP
4241  4464          JMS I   XAVREG          /SAVE AC AND LINK
4242  1043          TAD     RANDC           /ADD COMPLEMENT OF NUMBER TO AC
4243  7640          SZA CLA                 /ARE THEY EQUAL
4244  5250          JMP     .+4             /NO, ERROR
4245  1044          TAD     LINKR
4246  3037          DCA     WD1
4247  1026          TAD     TEMPL
4250  3040          DCA     WD2
4251  4462          JMS I   XAMEAS          /ARE LINKS THE SAME
4252  4735          JMS I   XRARR           /NO, ERROR
4253  4467          JMS I   NERROP          /TEST FOR LOOPING
4254  5200          JMP     RARR            /LOOP ON RARR

                    /ROTATE RANDOM NUMBER LEFT USING RAL
4255  7300    RALR, CLA CLL
4256  1044          TAD     LINKR           /GET LINK TO BE ROTATED
4257  7440          SZA
4260  7220          CLA CML
4261  1041          TAD     RANDA           /GET NUMBER TO BE ROTATED
4262  7004          RAL
4263  7004          RAL
4264  7004          RAL
4265  7004          RAL
4266  7004          RAL
4267  7004          RAL
4270  7004          RAL
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4271  7004          RAL
4272  7004          RAL
4273  7004          RAL
4274  7004          RAL
4275  7004          RAL
4276  7004          RAL
4277  7004          RAL
4300  7004          RAL
4301  7004          RAL
4302  7004          RAL
4303  7004          RAL
4304  7004          RAL
4305  7004          RAL
4306  7004          RAL
4307  7004          RAL
4310  7004          RAL
4311  7004          RAL
4312  7004          RAL
4313  7004          RAL
4314  7000          NOP
4315  7000          NOP
4316  4464          JMS I   XAVREG          /SAVE AC AND LINK
4317  1043          TAD     RANDC           /ADD COMPLIMENT OF ORIGINAL NUMBER TO AC
4320  7440          SZA                     /ARE THEY THE SAME
4321  5325          JMP     .+4             /NO, ERROR
4322  1044          TAD     LINKR
4323  3037          DCA     WD1
4324  1026          TAD     TEMPL
4325  3040          DCA     WD2
4326  4462          JMS I   XAMEAS          /COMPARE ORIGINAL AND ROTA\ED LINKS
4327  4734          JMS I   XRALR           /LINKS NOT THE SAME, ERROR
4330  4467          JMS I   NERROP
4331  5255          JMP     RALR
4332  5733          JMP I   .+1
4333  4400          RTLR
4334  4613    XRALR,  RALER
4335  4600    XRARR,  RARER

                    /ROTATE RANDOM NUMBER LEFT USING RTL

      4400    PAGE
4400  7300    RTLR,   CLA CLL
4401  1044          TAD     LINKR           /GET LINK TO BE ROTATED
4402  7440          SZA
4403  7220          CLA CML
4404  1041          TAD     RANDA           /GET NUMBER TO BE ROTATED
4405  7006          RTL
4406  7006          RTL
4407  7006          RTL
4410  7006          RTL
4411  7006          RTL
4412  7006          RTL
4413  7006          RTL
4414  7006          RTL
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4415  7006          RTL
4416  7006          RTL
4417  7006          RTL
4420  7006          RTL
4421  7006          RTL
4422  7006          RTL
4423  7006          RTL
4424  7006          RTL
4425  7006          RTL
4426  7006          RTL
4427  7006          RTL
4430  7006          RTL
4431  7006          RTL
4432  7006          RTL
4433  7006          RTL
4434  7006          RTL
4435  7006          RTL
4436  7006          RTL
4437  7000          NOP
4440  7000          NOP
4441  4464          JMS I   XAVREG          /SAVE AC AND LINK
4442  1043          TAD     RANDC           /ADD COMPLEMENT OF ORIGINAL NUMBER TO AC
4443  7440          SZA                     /ARE THEY THE SAME
4444  5250          JMP     .+4             /NO, ERROR
4445  1044          TAD     LINKR
4446  3037          DCA     WD1
4447  1026          TAD     TEMPL
4450  3040          DCA     WD2
4451  4462          JMS I   XAMEAS          /COMPARE ORIGINAL AND ROTATED LINKS
4452  4760          JMS I   XRTLR           /LINKS NOT THE SAME, ERRROR
4453  4467          JMS I   NERROP
4454  5200          JMP     RTLR

                    /ROTATE RANDOM NUMBER RIGHT USING RTR

4455  7300    RTRR, CLA CLL
4456  1044          TAD     LINKR           /GET LINK TO BE ROTATED
4457  7440          SZA
4460  7220          CLA CML
4461  1041          TAD     RANDA           /GET NUMBER TO BE ROTAED
4462  7012          RTR
4463  7012          RTR
4464  7012          RTR
4465  7012          RTR
4466  7012          RTR
4467  7012          RTR
4470  7012          RTR
4471  7012          RTR
4472  7012          RTR
4473  7012          RTR
4474  7012          RTR
4475  7012          RTR
4476  7012          RTR
4477  7012          RTR
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4500  7012            RTR
4501  7012            RTR
4502  7012            RTR
4503  7012            RTR
4504  7012            RTR
4505  7012            RTR
4506  7012            RTR
4507  7012            RTR
4510  7012            RTR
4511  7012            RTR
4512  7012            RTR
4513  7012            RTR
4514  7000            NOP
4515  7000            NOP
4516  4464            JMS I    XAVREG          /SAVE AC AND LINK
4517  1043            TAD      RANDC           /ADD COMPLEMENT OF ORIGINAL NUMBER TO AC
4520  7440            SZA                /ARE THEY THE SAME
4521  5325            JMP      .+4             /NO, ERROR
4522  1044            TAD      LINKR
4523  3037            DCA      WD1
4524  1026            TAD      TEMPL
4525  3040            DCA      WD2
4526  4462            JMS I    XAMEAS          /ARE LINKS THE SAME
4527  4757            JMS I    XRTRR           /NO, ERROR
4530  4467            JMS I    NERROP
4531  5255            JMP      RTRR


4532  2020            ISZ      CNTR1           /INCREMENT PASS COUNTER
4533  5355            JMP      ENRN            /NOT END OF PASS
4534  7604            LAS
4535  0115            AND      SR10            /TEST SR10
4536  7650            SNA CLA                  /IS SR10=1
4537  5352            JMP      RNDOK           /NO, TYPE RANDOM
4540  7604    RNDHLT, LAS
4541  0114            AND      SR09            /TEST SR09
4542  7640            SZA CLA                  /IS SR09=1
4543  7402            HLT                      /YES, HALT AT END OF RANDOM
4544  7604            LAS
4545  0116            AND      SR11            /TEST SR11
4546  7640            SZA CLA            /IS SR11=1
4547  5355            JMP      ENRN            /YES, LOOP ON RANDOM TESTS
4550  5751            JMP I    .+1             /NO, GO TO SIMULATED ADDITION TEST
4551  0200            RSIMAD
4552  4446    RNDOK,  JMS I    XPRINT
4553  5535            OK4-1
4554  5340            JMP      RNDHLT
4555  5756    ENRN,   JMP I    .+1
4556  3400            RNAD1
4557  4626    XRTRR,  RTRER
4560  4641    XRTLR,  RTLER

      4600    PAGE
4600  0000    RARER,  0
```

```
4601  7604            LAS
4602  0104            AND      SR01
4603  7640            SZA CLA
4604  5210            JMP      .+4
4605  4446            JMS I    XPRINT
4606  5425            EM12-1
4607  4264            JMS      ROPRT
4610  7300            CLA CLL
4611  1200            TAD      RARER
4612  5253            JMP      ROHLT


4613  0000    RALER,  0
4614  7604            LAS
4615  0104            AND      SR01
4616  7640            SZA CLA
4617  5223            JMP      .+4
4620  4446            JMS I    XPRINT
4621  5444            EM13-1
4622  4264            JMS      ROPRT
4623  7300            CLA CLL
4624  1213            TAD      RALER
4625  5253            JMP      ROHLT
4626  0000    RTRER,  0
4627  7604            LAS
4630  0104            AND      SR01
4631  7640            SZA CLA
4632  5236            JMP      .+4
4633  4446            JMS I    XPRINT
4634  5463            EM14-1
4635  4264            JMS      ROPRT
4636  7300            CLA CLL
4637  1226            TAD      RTRER
4640  5253            JMP      ROHLT
4641  0000    RTLER,  0
4642  7604            LAS
4643  0104            AND      SR01
4644  7640            SZA CLA
4645  5251            JMP      .+4
4646  4446            JMS I    XPRINT
4647  5502            EM15-1
4650  4264            JMS      ROPRT
4651  7300            CLA CLL
4652  1241            TAD      RTLER
4653  3263    ROHLT,  DCA      ROBACK
4654  7604            LAS
4655  0103            AND      SR00
4656  7640            SZA CLA
4657  5262            JMP      .+3
4660  1263            TAD      ROBACK
4661  7402            HLT
4662  5663            JMP I    ROBACK
4663  0000    ROBACK, 0
```

```
4664  0000   ROPRT,  0
4665  4446           JMS I    XPRINT
4666  5147           DH5-1
4667  7340           CLA CLL  CMA
4670  0044           AND      LINKR
4671  3040           DCA      WD2
4672  7040           CMA
4673  0041           AND      RANDA
4674  3037           DCA      WD1
4675  4460           JMS I    XLNKOU
4676  4461           JMS I    XWDOUT
4677  7040           CMA
4700  0026           AND      TEMPL
4701  3040           DCA      WD2
4702  4460           JMS I    XLNKOU
4703  7040           CMA
4704  0025           AND      TEMPAC
4705  3037           DCA      WD1
4706  4461           JMS I    XWDOUT
4707  4446           JMS I    XPRINT
4710  5542           CRLF-1
4711  5664           JMP I    ROPRT

                     /

      5000   PAGE
5000  3736   DH1,    TEXT     /←↑   ARG1          ARG2          SIMULATED       ARG1*ARG2     ARG2*ARG1←↑/
5001  4040
5002  4001
5003  2207
5004  6140
5005  4040
5006  4040
5007  4040
5010  4040
5011  0122
5012  0762
5013  4040
5014  4040
5015  4040
5016  4040
5017  4023
5020  1115
5021  2514
5022  0124
5023  0504
5024  4040
5025  4040
5026  4040
5027  4001
5030  2207
5031  6153
5032  0122
```

```
5033  0762
5034  4040
5035  4040
5036  4001
5037  2207
5040  6253
5041  0122
5042  0761
5043  3736
5044  0000
5045  3736    DH2,    TEXT    /↑↑     ORIGINAL      SIMULATED       ACTUAL↑↑/
5046  4040
5047  4040
5050  4017
5051  2211
5052  0711
5053  1601
5054  1440
5055  4040
5056  4040
5057  4023
5060  1115
5061  2514
5062  0124
5063  0504
5064  4040
5065  4040
5066  4040
5067  4001
5070  0324
5071  2501
5072  1437
5073  3600
5074  3736    DH3,    TEXT    /↑↑RANDA        RANDC         RESULT↑↑/
5075  2201
5076  1604
5077  0140
5100  4040
5101  4040
5102  4040
5103  4022
5104  0116
5105  0403
5106  4040
5107  4040
5110  4040
5111  4040
5112  2205
5113  2325
5114  1424
5115  3736
5116  0000
5117  3736    DH4,    TEXT    /↑↑RANDA        BPOS          BNEG          RESULT↑↑/
5120  2201
5121  1604
```

```
5122  0140
5123  4040
5124  4040
5125  4040
5126  4002
5127  2017
5130  2340
5131  4040
5132  4040
5133  4040
5134  4040
5135  0216
5136  0507
5137  4040
5140  4040
5141  4040
5142  4040
5143  4022
5144  0523
5145  2514
5146  2437
5147  3600
5150  3736    DH5,    TEXT    /←↑ORIGINAL      ACTUAL←↑/
5151  1722
5152  1107
5153  1116
5154  0114
5155  4040
5156  4040
5157  4040
5160  0103
5161  2425
5162  0114
5163  3736
5164  0000
5165  3736    DH6,    TEXT    /←↑     ARG1          ARG2       EXPECTED      ACTUAL←↑/
5166  4040
5167  4040
5170  0122
5171  0761
5172  4040
5173  4040
5174  4040
5175  4040
5176  4001
5177  2207
5200  6240
5201  4040
5202  4040
5203  4040
5204  0530
5205  2005
5206  0324
5207  0504
5210  4040
```

```
5211  4040
5212  4040
5213  0103
5214  2425
5215  0114
5216  3736
5217  0000
5220  3736    EM1,    TEXT    /6*     SIMULATED ADD TEST FAILED/
5221  4040
5222  4040
5223  4023
5224  1115
5225  2514
5226  0124
5227  0504
5230  4001
5231  0404
5232  4024
5233  0523
5234  2440
5235  0601
5236  1114
5237  0504
5240  0000
5241  3736    EM2,    TEXT    /6*     SIMULATED RAL TEST FAILED/
5242  4040
5243  4040
5244  4023
5245  1115
5246  2514
5247  0124
5250  0504
5251  4022
5252  0114
5253  4024
5254  0523
5255  2440
5256  0601
5257  1114
5260  0504
5261  0000
5262  3736    EM3,    TEXT    /6*     SIMULATED RAR TEST FAILED/
5263  4040
5264  4040
5265  4023
5266  1115
5267  2514
5270  0124
5271  0504
5272  4022
5273  0122
5274  4024
5275  0523
5276  2440
5277  0601
```

```
5300  1114
5301  0504
5302  0000
5303  3736    EM4,    TEXT    /*      SIMULATED RTL TEST FAILED/
5304  4040
5305  4040
5306  4023
5307  1115
5310  2514
5311  0124
5312  0504
5313  4022
5314  2414
5315  4024
5316  0523
5317  2440
5320  0601
5321  1114
5322  0504
5323  0000
5324  3736    EM5,    TEXT    /*      SIMULATED RTR TEST FAILED/
5325  4040
5326  4040
5327  4023
5330  1115
5331  2514
5332  0124
5333  0504
5334  4022
5335  2422
5336  4024
5337  0523
5340  2440
5341  0601
5342  1114
5343  0504
5344  0000
5345  3736    EM6,    TEXT    /*      SIMULATED BSW TEST FAILED/
5346  4040
5347  4040
5350  4023
5351  1115
5352  2514
5353  0124
5354  0504
5355  4002
5356  2327
5357  4024
5360  0523
5361  2440
5362  0601
5363  1114
5364  0504
5365  0000
5366  3736    EM10,   TEXT    /*      RANDOM ADD TEST 1 FAILED/
```

```
5367  4040
5370  4040
5371  4022
5372  0116
5373  0417
5374  1540
5375  0104
5376  0440
5377  2405
5400  2324
5401  4061
5402  4006
5403  0111
5404  1405
5405  0400
5406  3736    EM11,   TEXT    /<>     RANDOM ADD TEST 2 FAILED/
5407  4040
5410  4040
5411  4022
5412  0116
5413  0417
5414  1540
5415  0104
5416  0440
5417  2405
5420  2324
5421  4062
5422  4006
5423  0111
5424  1405
5425  0400
5426  3736    EM12,   TEXT    /<>     RANDOM RAR TEST FAILED/
5427  4040
5430  4040
5431  4022
5432  0116
5433  0417
5434  1540
5435  2201
5436  2240
5437  2405
5440  2324
5441  4006
5442  0111
5443  1405
5444  0400
5445  3736    EM13,   TEXT    /<>     RANDOM RAL TEST FAILED/
5446  4040
5447  4040
5450  4022
5451  0116
5452  0417
5453  1540
5454  2201
5455  1440
```

```
5456  2405
5457  2324
5460  4006
5461  0111
5462  1405
5463  0400
5464  3736    EM14,   TEXT    /←↑     RANDOM RTL TEST FAILED/
5465  4040
5466  4040
5467  4022
5470  0116
5471  0417
5472  1540
5473  2224
5474  1440
5475  2405
5476  2324
5477  4006
5500  0111
5501  1405
5502  0400
5503  3736    EM15,   TEXT    /←↑     RANDOM RTR TEST FAILED/
5504  4040
5505  4040
5506  4022
5507  0116
5510  0417
5511  1540
5512  2224
5513  2240
5514  2405
5515  2324
5516  4006
5517  0111
5520  1405
5521  0400
5522  3736    OK1,    TEXT    /←↑SIMAD/
5523  2311
5524  1501
5525  0400
5526  3736    OK2,    TEXT    /←↑SIMROT/
5527  2311
5530  1522
5531  1724
5532  0000
5533  3736    OK3,    TEXT    /←↑FCT/
5534  0603
5535  2400
5536  3736    OK4,    TEXT    /←↑RANDOM/
5537  2201
5540  1604
5541  1715
5542  0000
5543  3736    CRLF,   TEXT    /←↑/
5544  0000
```

```
5545  3736    DATE,   TEXT    /** DATA ERROR**?/
5546  4004
5547  0124
5550  0140
5551  0522
5552  2217
5553  2237
5554  3600


                      /
                      /
                      /RESTORE BINARY LOADER AND START LOADER
                      /
      7600    *7600
7600  7300            CLA CLL
7601  1155            TAD     BIN
7602  3377            DCA     TSTA2
7603  5377            JMP     TSTA2
                      $
```

```
0000  11111000  11100000  11111111  11111111  11111111  11111111  11111111  11111111
0100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  10000001

0200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111101

0400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0500  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11100001

0600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
0700  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

1000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111110

1200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
1300  11111111  11111111  11111111  11111111  11111000  00000000  00000000  00000000

1400  11111111  11111111  11111111  11111111  11111111  11111000  00000000  00000000
1500  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

1600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111000
1700  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

2000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2100  11111111  11111111  11111111  11110000  00000000  00000000  00000000  00000000

2200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2300  11111111  11111111  11111110  00000000  00000000  00000000  00000000  00000000

2400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2500  11111111  11111111  11111111  10000000  00000000  00000000  00000000  00000000

2600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
2700  11111111  11111111  00000000  00000000  00000000  00000000  00000000  00000000

3000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11110000
3100  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

3200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  10000000
3300  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000000

3400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
3500  11111111  11111111  11111111  11111111  11100000  00000000  00000000  00000000

3600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
3700  11111111  11111111  11111111  11111111  11111111  11111110  00000000  00000000
```

```
6000  11111111  11111111  11111111  11111111  11100000  00000000  00000000  00000000
6100  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000111

6200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
6300  11111111  11111111  11111111  11111100  00000000  00000000  00000000  00000000

6400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
6500  11111111  11111111  11111111  11111111  11111111  11111111  10000000  00000000

6600  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
6700  11111111  11000000  00000000  00000000  00000000  00000000  00000000  00000000


5000  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5100  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

5200  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5300  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111

5400  11111111  11111111  11111111  11111111  11111111  11111111  11111111  11111111
5500  11111111  11111111  11111111  11111111  11111111  11111000  00000000  00000000

5600
5700


6000
6100

6200
6300

6400
6500

6600
6700


7000
7100

7200
7300

7400
7500

7600  11110000  00000000  00000000  00000000  00000000  00000000  00000000  00000000
7700  00000000  00000000  00000000  00000000  00000000  00000000  00000000  00000111
```

A1	3263	EM1	5220	FCT3	2076	K4000	0103
A10 A2	0027	EM10	5366	FCT4	2200	K6000	0101
A2	3264	EM11	5406	FCT5	2232	K6060	5270
ABNOT	3754	EM12	5426	FCT6	2270	KXXXX	0170
AD1	2127	EM13	5445	FCT7	2400	LINK1	0032
AD10	2715	EM14	5464	FCT8	2436	LINK2	0034
AD11	2716	EM15	5503	FCT9	2472	LINKR	0044
AD12	2717	EM2	5241	FCTHLT	5207	LINKRC	0045
AD2	2130	EM3	5262	FCTOK	3221	LNKOUT	0504
AD3	2131	EM4	5303	GOTEST	0177	LOOP	5046
AD4	2324	EM5	5324	HALT2	3027	LOOP1	0552
AD5	2325	EM6	5345	HALTA	0477	M4	1070
AD6	2326	ENCAR	0243	HALTB	1063	M40	1046
AD7	2526	ENCAR1	0252	HLTA	0404	MASK	3752
AD8	2527	ENDBSW	1277	HLTB	1052	MODNEG	3632
AD9	2530	ENDFCT	3200	INS1	0136	MOVMSK	3667
ADA1	0021	ENDROT	1303	INS10	0146	MQA	7501
ADA2	0022	ENRN	4555	INS11	0147	MQL	7421
ADD	0273	EROUT1	3744	INS12	0150	MTP	1643
ADDERR	0400	ERROR1	0377	INS13	0151	N1BIT	1244
ADHLT	0556	ERROR2	1046	INS14	0152	NBIT	1207
ADOUT	3227	ERROT	1026	INS15	0153	NERROP	0067
ADPRT	0417	FCL1	2023	INS16	2133	NEWLNK	1044
ADT	0551	FCL10	2612	INS2	2132	NLOOP	3054
AHFLG	0035	FCL11	2644	INS3	0137	NMASK	3753
AHOUT	0467	FCL12	2677	INS4	0140	NOTAC	3755
ALT1BT	3616	FCL2	2056	INS5	0141	NXBIT	0527
ANEG	3747	FCL3	2107	INS6	0142	NXTADD	0364
APOS	3746	FCL4	2213	INS7	0143	NXTBT	3612
ARG1	0023	FCL5	2246	INS8	0144	NXTCAR	0233
ARG2	0024	FCL6	2302	INS9	0145	NXTROT	1031
BIN	0155	FCL7	2412	K0001	0116	OK1	5522
BNEG	3751	FCL8	2450	K0002	0115	OK2	5526
BPOS	3750	FCL9	2503	K0003	3542	OK3	5533
BSW	7002	FCS1	2005	K0004	0114	OK4	5536
BSWTAB	1660	FCS10	2601	K0007	3266	OR1	1225
CAF	6007	FCS11	2635	K0010	0113	OUT	3224
CARRY	0030	FCS12	2670	K0020	0112	OUT1	0520
CBTST1	3640	FCS2	2044	K0040	0111	OUT1A	0542
CBTST2	3654	FCS3	2077	K0077	1645	POINT1	0011
CHAR	0036	FCS4	2201	K0100	0110	POINT2	0012
CNTR1	0020	FCS5	2233	K0200	0107	PRINT	1600
COMRCT	1000	FCS6	2271	K0400	0106	R1	1400
CRLF	5543	FCS7	2401	K0700	3267	R2	1410
DATE	5545	FCS8	2437	K1000	0105	R2A	3541
DATER	3037	FCS9	2473	K2000	0104	R3	1420
DH1	5000	FCT	2000	K212	1650	R4	1430
DH2	5045	FCT1	2004	K215	1651	R5	1440
DH3	5074	FCT10	2600	K240	0076	RAC	0023
DH4	5117	FCT11	2634	K260	0077	RALER	4613
DH5	5150	FCT12	2667	K261	0100	RALR	4255
DH6	5165	FCT2	2043	K336	1647	RALTAB	0757

RANDA	0041	SBSW	1236	TSTA1	7776	XRHD	0050
RANDB	0042	SEQ	0154	TSTA2	7777	XRN1ER	3046
RANDC	0043	SEQ1	0122	TSTA3	0000	XRN2ER	3756
RANDOM	3512	SEQ10	0133	TSTA4	0001	XROTDN	0777
RARER	4600	SEQ11	0134	TSTA5	0002	XRTLR	4560
RARR	4200	SEQ12	0135	TSTA6	0003	XRTLTA	0053
RBSW	0731	SEQ2	0123	TSTA7	0004	XRTRR	4557
RET1	2025	SEQ3	0124	TSTIND	0010	XRTRTA	0054
RET10	2616	SEQ4	0125	TYBIT	0540	XSDSH	0776
RET11	2651	SEQ5	0126	TYLNK	0513	XSROT	0051
RET12	2701	SEQ6	0127	TYPE	1652	XSTA0	0070
RET2	2060	SEQ7	0130	TYPS2	3056	XSTA1	0071
RET3	2111	SEQ8	0131	TYPSET	1617	XSTA2	0072
RET4	2215	SEQ9	0132	W1	0037	XTYPE	0047
RET5	2252	SHLT	4033	W2	0040	XWDOUT	0061
RET6	2306	SIMAC	0025	WD1	0037		
RET7	2420	SIMAD	0203	WD2	0040		
RET8	2455	SIMBSW	0725	WDOUT	0523		
RET9	2510	SIMLNK	0026	XADD	0415		
RHD	1133	SIMR	0577	XADOUT	3073		
RHFLG	0035	SIMRAL	0601	XAMEA	0063		
RHOUT	1131	SIMRAR	0626	XAMEAS	0002		
RLNK	0024	SIMRO1	0600	XAVREG	0064		
RN1ER	3447	SIMRO2	0625	XBSHTA	0055		
RN2ER	4000	SIMRO3	0652	XCOMRO	0056		
RNAD1	3400	SIMRO4	0677	XDATER	0065		
RNAD2	3600	SIMRO5	0724	XHALT2	0066		
RNDHLT	4540	SIMRTL	0653	XLNKOU	0060		
RNDOK	4552	SIMRTR	0700	XLOOP	0067		
ROBACK	4663	SKHLT	3502	XLOOP1	0075		
ROHLT	4653	SP1	0545	XLOOP2	0074		
ROPRT	4664	SR00	0103	XM2	1450		
ROTDNE	1323	SR01	0104	XM3	1451		
ROTHLT	1327	SR02	0105	XM4	1452		
ROTPRT	1071	SR03	0106	XM5	1453		
RRAC	0031	SR04	0107	XM6	1454		
RRAL	0605	SR05	0110	XNXTAD	0416		
RRAR	0632	SR06	0111	XNXTRO	0057		
RRLNK	0033	SR07	0112	XOR1	3701		
RRTL	0657	SR08	0113	XOR2	3715		
RRTR	0704	SR09	0114	XORALL	0257		
RSIMAD	0200	SR10	0115	XPRINT	0046		
RTLER	4641	SR11	0116	XR1	0752		
RTLR	4400	SROTAL	1200	XR2	0753		
RTLTAB	1160	SROTOK	1342	XR3	0754		
RTRER	4626	START	0156	XR4	0755		
RTRR	4455	SUM1	0031	XR5	0756		
RTRTAB	1141	SUM2	0033	XRALR	4334		
SADOK	0570	TEMP1	0037	XRALTA	0052		
SAMEA	3730	TEMPAC	0025	XRAND	0073		
SAMEAS	3000	TEMPL	0026	XRARR	4335		
SAVREG	3017	TSTA0	7775	XRARTA	0102		

```
ERRORS DETECTED: 0
LINKS GENERATED: 3
RUN-TIME:  17 SECONDS
3K CORE USED
```