IDENTIFICATION
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PRODUCT CODE:    MAINDEC-8E-D0FC-D

PRODUCT NAME:    RANDOM ISZ TEST

DATE CREATED:    JUNE 11, 1971

MAINTAINER:      DIAGNOSTIC GROUP

AUTHOR:          BRUCE HANSEN

1.   ABSTRACT
     --------

     THIS PROGRAM IS WRITTEN TO TEST THE ISZ INSTRUCTION OF THE
     PDP-8E.  AN ISZ INSTRUCTION IS PLACED IN A FROM LOCATION, AND
     A TO LOCATION CONTAINS THE OPERAND.  PART 1 OF THE PROGRAM
     SELECTS FROM, TO, AND OPERAND FROM A RANDOM NUMBER GENERATOR,
     WITH THE OPTION OF HOLDING ANY OR ALL CONSTANT.  PART 2 USES
     A FIXED SET OF FROM, TO, AND OPERAND NUMBERS.

2.   REQUIREMENTS
     ------------

2.1  EQUIPMENT
     ---------

     ONE PDP-8E EQUIPPED WITH TELETYPE.

2.2  STORAGE
     -------

     THIS PROGRAM USES LOCATIONS 0000-7600(8).  THE BINARY LOADER
     MUST BE STORED IN THE LAST MEMORY PAGE.

2.3  PRELIMINARY PROGRAM
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     MAINDEC-8E-D0A(N), AND MAINDEC-8E-D0B(N) MUST HAVE RUN SUCCESSFULLY.

3.   LOADING PROCEDURE
     ------- ---------

     THE STANDARD BINARY LOADER IS USED.

4.   STARTING PROCEDURE
     -------- ---------

4.1  SWITCH SETTINGS
     ------ --------

     SR0(0) = HALT ON ERROR
     SR1(1) = ELIMINATE ERROR PRINTOUTS
     SR3    = FIXED FROMS (1)
              RANDOM FROMS (0)
     SR4    = FIXED TOS (1)
              RANDOM TOS (0)
     SR5    = FIXED OPERAND (1)
              RANDOM OPERAND (0)
     SR9(0) = DO ONE ISZ ONLY
     SR11(1)= DO TEST PART 2 SR3, 4, 5, MUST BE 0'S
     SR11(0)= DO TEST PART 1

4.2  STARTING ADDRESS
     -------- -------

     200

4.3    OPERATOR ACTION

A.  SET SR (SWITCH REGISTER) TO 0200 AND PRESS LOAD ADDRESS.
B.  SET SR TO DESIRED MODE OF OPERATION; FOR MOST RUNS, SR9=0
    ALLOWS THE MOST TESTING IN THE LEAST AMOUNT OF TIME.

    FOR FIXED FROM, TO, OR OPERAND USAGE, THE FIXED NUMBER MAY
    BE SELECTED AND ENTERED INTO THE MEMORY LOCATIONS SHOWN
    BELOW:

    FROM        =0002
    TO          =0021
    OPERAND     =0022

C.  PRESS, CLEAR AND THEN CONTINUE.

5.    OPERATING PROCEDURE
      --------- ---------

      SAME AS PARAGRAPH 4.

6.    ERRORS
      ------

6.1   ERROR HALTS AND DESCRIPTION
      ----- ----- --- -----------

      C(PC)          CAUSE

      0002           PERIPHERAL INTERRUPT
      0254           HALT ON ERROR, SR0=0

6.2   ERROR PRINTOUTS
      ----- ---------

      F       XXXX    T       YYYY
      0       ZZZZ    F       MMMM    R       NNNN    NS

6.2.1 PRINTOUT EXPLANATION
      -------- -----------

      (FROM)         F XXXX  -THE ISZ INSTRUCTION IN LOCATION XXXX
                                FAILED.

      (TO)           T YYYY  -THE OPERAND ADDRESS OF THE ISZ INSTRUC-
                                TION WAS YYYY.

      (OPERAND)      0 ZZZZ  -THE STARTING COUNT IN THE ISZ LOOP WAS
                                ZZZZ.

      (FAILED)       F MMMM  -THE FAILURE OCCURRED TRYING TO ISZ THE
                                NUMBER MMMM.

      (RESULT)       R NNNN  -THE RESULT OF THIS ISZ WAS NNNN.

                     NS      -NO SKIP OCCURRED

                     S.      -INDICATES A SKIP.

)                                    )                                    )

6.2.2   EXAMPLES
        --------

        A.   THE FOLLOWING IS A TYPICAL ERROR PRINTOUT.

             F 3003 T 5470
             0 3705 F 4777 R 5000 S

             LINE 1 OF THE PRINTOUT IS A STATEMENT OF THE PROBLEM.  IT
             SAYS THAT LOCATED AT 3003 IS AN ISZ INSTRUCTION INCREMENTING
             AN OPERAND STORED IN LOCATION 5470.  LINE 2 OF THE PRINTOUT
             GIVES INFORMATION FOR ERROR ANALYSIS.  3705 WAS THE INITIAL
             OPERAND, 4777 WAS THE OPERAND BEING INCREMENTED WHEN THE ERROR
             OCCURRED, AND 5000 IS THE OPERAND FOLLOWING THE FAILING
             INCREMENT.  THE S INDICATES THAT THE INCREMENT RESULTED IN
             A SKIP.  THE ERROR HERE IS OBVIOUSLY THAT THE SKIP SHOULD NOT
             HAVE OCCURRED.


        B.   THE FOLLOWING IS ANOTHER TYPICAL ERROR PRINTOUT.

             F 3003 T 5470
             0 3705 F 4777  R 5020  NS

             THIS IS IDENTICAL TO EXAMPLE (A) EXCEPT THAT A DIFFERENT
             TYPE OF ERROR HAS OCCURRED.  THE RESULT OF INCREMENTING 4777
             SHOULD BE 5000, NOT 5020.

6.3     ERROR RECOVERY
        ----- --------

        THE PROGRAM CONTINUES ON, FOLLOWING AN ERROR PRINTOUT UNLESS
        SR0=0.  AFTER A HALT ON ERROR, PUSH CONTINUE TO RESUME TESTING.
        WHEN ERRORS EXIST, A FAILING CONDITION CHOSEN FROM THOSE TYPED
        OUT MUST BE USED WITH THE SCOPE MODE.  FOR THE SCOPE MODE,
        PERFORM THE FOLLOWING STEPS:

        A.   STOP THE PROGRAM.

        B.   INSERT CHOSEN FROM INTO LOCATION 0002.

        C.   INSERT CHOSEN TO INTO LOCATION 0021.

        D.   INSERT CHOSEN FAILING OPERAND INTO LOCATION 0022

        E.   RESTART PROGRAM WITH CONTROL SWITCHES 1,3,4,5, SET TO
             1 AND 9 SET TO A 0.

        NOTE:  BY SETTTING SR0 TO A 0, THE PROGRAM HALTS FOLLOWING
        THE ERROR PRINTOUT.  THE OPERATOR MAY AT THIS TIME SET
        SWITCHES 1, 3, 4, 5, TO A 1 AND 9 TO A 0 AND PUSH CONTINUE.
        THE PROGRAM ENTERS A SCOPE MODE USING THE FAILING CONDITIONS
        JUST PRINTED.

7.    RESTRICTIONS
      ---------------

7.1   STARTING RESTRICTIONS
      --------- -------------

      NONE.

7.2   OPERATING RESTRICTIONS
      --------- -------------

      THE INTERRUPT IS ENABLED DURING PROGRAM OPERATION.  ANY ATTACHED
      DEVICE WHICH MIGHT CAUSE SPURIOUS INTERRUPTS, MUST BE DISABLED.

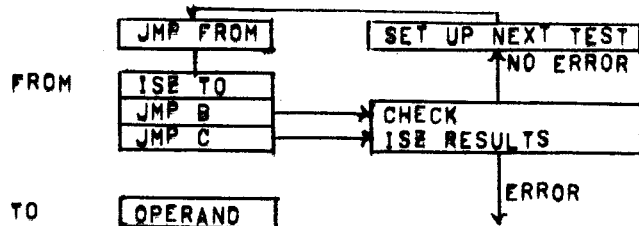8.    MISCELLANEOUS
      ---------------

8.1   EXECUTION TIME
      --------- ----

      SR9 = 1.  11,000 ISZ OPERATIONS/SECOND.
      SR9 = 0.   3,500 ISZ OPERATIONS/SECOND.

)                              )                                )

PROGRAM DESCRIPTION
--------  -------------

THE TEST LOOP IS SHOWN BELOW:

```
                    ┌──────────────────────┐
                    │                      ▼
            ┌──────────────┐    ┌─────────────────┐
            │  JMP FROM    │    │ SET UP NEXT TEST │
            └──────────────┘    └─────────────────┘
    FROM    ┌──────────────┐              ▲ NO ERROR
            │  ISZ TO      │              │
            ├──────────────┤    ┌─────────────────┐
            │  JMP B       │───▶│ CHECK           │
            ├──────────────┤    │ ISZ RESULTS     │
            │  JMP C       │───▶└─────────────────┘
            └──────────────┘              │
                                          │ ERROR
    TO      ┌──────────────┐              ▼
            │  OPERAND     │
            └──────────────┘
```

PART 1 OF THE PROGRAM USES A RANDOM NUMBER GENERATOR TO SELECT
THE FROM, TO, AND OPERAND NUMBERS.  ONCE SELECTED, THE OPERAND
IS INCREMENTED UNTIL IT REACHES ZERO.  EACH ISZ IS CHECKED BY
DUPLICATING ISZ WITH TAD, IAC, DCA.  EACH ITERATION IS ALSO
CHECKED FOR THE PROPER SKIP OR NO-SKIP CONDITION.

PART 2 OF THE PROGRAM IS ACTUALLY PART 1, WITH THE RANDOM NUMBER
GENERATED REPLACED BY A FIXED NUMBER GENERATOR.  SEQUENCING OF
EVENTS IS AS FOLLOWS:

(NOTE:  621(8)<MEMORY TEST AREA<7600(8)):

A.  FROM = 621 TO = 624 TEST A SET OF 24 SELECTED OPERANDS.
    TO SAVE TIME IT IS SUGGESTED THAT SR9 = 0, SO THAT THE ISZ
    IS PERFORMED ON EACH OPERAND ONLY ONCE INSTEAD OF INCREMENT-
    ING IT UNTIL THE ISZ INSTRUCTION SKIPS.

B.  FROM = 621 TO =625 REPEAT THE SET OF OPERANDS USED IN (A)
    ABOVE.

    THIS SEQUENCE CONTINUES UNTIL TO REACHES THE UPPER LIMIT OF
    THE MEMORY TEST AREA.  FROM IS THEN INCREMENTED BY 1 AND
    THE PROCESS IS REPEATED.  WHEN FROM REACHES THE UPPER LIMIT
    OF THE MEMORY TEST AREA, THE TEST IS COMPLETE.

    IDEALLY, IT IS DESIRABLE TO ISZ EVERY LOCATION FROM EVERY
    OTHER LOCATION IN THE TEST AREA AND, IN DOING SO, USE ALL 24
    OF THE SELECTED WORST CASE OPERANDS FOR EACH SET OF
    ADDRESSES.  THIS IS WHAT PART 2 DOES, BUT IT TAKES MANY
    DAYS TO COMPLETE THE TEST.  IT IS FOR THIS REASON THAT THE
    PROGRAM USES THE RANDOM NUMBER GENERATOR SYSTEM OF PART 1.
    PART 2 IS AN ADDITIONAL FEATURE OF THE PROGRAM WITH VERY
    LIMITED USE.

    A FC IS PRINTED AFTER EACH GROUP OF 32,000 TESTS.

)                              )                              )

```
                         /PDP-8E ISZ TEST
                         /COPYRIGHT 1970, DIGITAL EQUIPMENT CORP., MAYNARD, MASS.   01754
                         /
                         /CONSTANTS AND VARIABLES
              0000       *0
     0000     0000                Ø
     0001     5001                JMP 1              /PERIPHERAL INTERRUPT
     0002     0002       FRMLOC,  2                  /ISZ TEST INSTRUCTION LOCATION
     0003     0003       LIMLO,   3                  /LOW LIMIT TEST AREA
     0004     0000                Ø
     0005     0000                Ø
     0006     0202       LIMHI,   -7576              /HIGH LIMIT TEST AREA
     0007     0547       ASUC,    SUC
     0010     0007       MSK7,    0007               /OCTAL CONVERSION MASK
     0011     0000       WORK,    Ø                  /IR0
     0012     0000       WORK1,   Ø                  /IR1
     0013     7401       M377,    -377
     0014     3607       NUM,     3607               /THE RANDOM NUMBER LOCATION
     0015     0003       THREE,   3

     0016     2421       ISZ1,    ISZ I TOLOC        /MOVING ISZ
     0017     5116       JMP1,    JMP BACK                   /TEST INSTRUCTION
     0020     5141       JMP2,    JMP BAKBRN         /GROUP,
     0021     0000       TOLOC,   Ø                  /LOCATION TO BE ISZ'D
     0022     0000       PATRN,   Ø                  /STARTING ISZ PATTERN
     0023     0000       BEFOR,   Ø                  /FAILING PATTERN BEFORE FAILING ISZ
     0024     0000       AFTER,   Ø                  /PREDICTED RESULTS OF EACH ISZ
     0025     0004       K4,      4                  /SWITCH REGISTER MASKS
     0026     0400       K0400,   0400
     0027     0200       K0200,   0200
     0030     0100       K0100,   0100
     0031     0000       NOTE,    Ø                  /7'S=ERROR WITH NO SKIP
     0032     0257       PRINT,   INF1-1             /0'S=ERROR WITH SKIP
     0033     0201       AERR1,   ERR1
     0034     0206       AERR2,   ERR2
     0035     0413       APDR,    PDR
     0036     1014       ITADNM,  TAD NUM
     0037     0600       ATFCLF,  TFCLF


                         /SR0(0)=HALT AFTER ERROR PRINTOUT
                         /SR1(1)=NO PRINTOUTS
                         /SR3(1) = HOLD FROM CONSTANT
                         /SR4(1) = HOLD TO CONSTANT
                         /SR5(1) = HOLD PATTERN CONSTANT
                         /SR9(0) = DO ONE ISZ ONLY
                         /SR11(1) = DO TEST PART 2
                         /
                         /

                         /PROGRAM START
     0040     4441       START,   JMS I .+1          /ION
     0041     0614                PATCH              /LAS
     0042     0015                AND THREE
```

```
        0043  7640              SZA CLA          /SKIP IF PART 1
        0044  5426              JMP I K0400      /GO TO PART 2
        0045  1036              TAD ITADNM
        0046  3165              DCA RANUM+1
                                /CHECK FOR FIXED PATTERN
        0047  7604      CHEK1,  LAS
        0050  0030              AND K0100
        0051  7440              SZA
        0052  5055              JMP CHEK2


                                /SELECT THE PATTERN
        0053  4164      SELPAT, JMS RANUM
        0054  3022              DCA PATRN

                                /CHECK FOR FIXED TO
        0055  7604      CHEK2,  LAS
        0056  0027              AND K0200
        0057  7640              SZA CLA
        0060  5065              JMP CHEK3

                                /SELECT THE TO LOCATION
        0061  4164      SELTO,  JMS RANUM
        0062  3021              DCA TOLOC
        0063  1021              TAD TOLOC
        0064  4151              JMS LIMTST

                                /CHECK FOR FIXED FROM
        0065  7604      CHEK3,  LAS
        0066  0026              AND K0400
        0067  7640              SZA CLA
        0070  5075              JMP PLCINT

                                /SELECT THE FROM LOCATION
        0071  4164      SELFRM, JMS RANUM
        0072  3002              DCA FRMLOC
        0073  1002              TAD FRMLOC
        0074  4151              JMS LIMTST

                                /PLACE FROM INSTRUCTIONS

        0075  7240      PLCINT,     CLA CMA
        0076  1002              TAD FRMLOC
        0077  3011              DCA WORK
        0100  1016              TAD ISZ1
        0101  3411              DCA I WORK
        0102  1017              TAD JMP1
        0103  3411              DCA I WORK
        0104  1020              TAD JMP2
        0105  3411              DCA I WORK


                                /DEPOSIT PATTERN IN TO LOCATION
        0106  1022              TAD PATRN
        0107  3421              DCA I TOLOC
```

```
                              /STORE PREDICTED ISZ RESULT
          0110   1022         TAD PATRN
          0111   3023         DCA BEFOR
          0112   1023   LUP1,  TAD BEFOR
          0113   7001         IAC
          0114   3024         DCA AFTER
          0115   5407         JMP I ASUC

                              /RETURN FOR NO SKIP CONDITION
          0116   7604   BACK,  LAS
          0117   7004         RAL
          0120   7710         SPA CLA
          0121   5132         JMP LAS1
          0122   1421         TAD I TOLOC
          0123   7041         CIA
          0124   1024         TAD AFTER
          0125   7640         SZA CLA
          0126   5433         JMP I AERR1       /ERROR IN ISZ OPERATION
          0127   1421         TAD I TOLOC
          0130   7650         SNA CLA
          0131   5433         JMP I AERR1       /ERROR IN ISZ SKIP DETECTION
          0132   7604   LAS1,  LAS
          0133   0025         AND K4
          0134   7650         SNA CLA           /SKIP IF NOT ONE ISZ (SR9)
          0135   5047         JMP CHEK1
          0136   7001         IAC
          0137   1023         TAD BEFOR
          0140   5111         JMP LUP1-1

                              /RETURN FOR SKIP CONDITION
          0141   7604   BAKBRN,  LAS
          0142   7004         RAL
          0143   7710         SPA CLA
          0144   5047         JMP CHEK1
          0145   1421         TAD I TOLOC
          0146   7640         SZA CLA           /SKIP IF TO LOCATION OK
          0147   5434         JMP I AERR2       /ERROR IN ISZ LOCATION
          0150   5047         JMP CHEK1

                              /TEST HIGH-LOW LIMITS

          0151   0000   LIMTST,  0
          0152   7510         SPA
          0153   5160         JMP .+5
          0154   1003         TAD LIMLO
          0155   7700         SMA CLA
          0156   5551         JMP I LIMTST
          0157   5165         JMP RANUM+1
          0160   1006         TAD LIMHI
          0161   7700         SMA CLA
          0162   5165         JMP RANUM+1
          0163   5551         JMP I LIMTST
```

```
                              /RANDOM NUMBER GENERATOR
        0164   0000    RANUM,   0
        0165   1014            TAD NUM
        0166   7104            RAL CLL
        0167   7430            SEL
        0170   1015            TAD THREE
        0171   3014            DCA NUM
        0172   1014            TAD NUM         /AC=NEW RANDOM NUMBER
        0173   5564            JMP I RANUM

        0174   1000    K1000,  1000
        0175   0000    KP,     0


               0200    *200
        0200   5040            JMP     START
                              /ERROR ROUTINE 1
        0201   1340    ERR1,   TAD SKPDAT+6
        0202   3332            DCA SKPDAT
        0203   7040            CMA
        0204   3031            DCA NOTE
        0205   5210            JMP KPGO


                              /ERROR ROUTINE 2
        0206   1331    ERR2,   TAD SKPDAT-1
        0207   3332            DCA SKPDAT
        0210   1002    KPGO,   TAD FRMLOC
        0211   3011            DCA WORK
        0212   1370            TAD A3
        0213   4342            JMS SETUP

        0214   1021            TAD TOLOC
        0215   3011            DCA WORK
        0216   1371            TAD A4
        0217   4342            JMS SETUP

        0220   1022            TAD PATRN
        0221   3011            DCA WORK
        0222   1372            TAD A5
        0223   4342            JMS SETUP
        0224   1023            TAD BEFOR
        0225   3011            DCA WORK
        0226   1373            TAD A6
        0227   4342            JMS SETUP

        0230   1421            TAD I TOLOC
        0231   3011            DCA WORK
        0232   1374            TAD A7
        0233   4342            JMS SETUP

                              /TTY PRINT ROUTINE
        0234   6002    TTY,    IOF
        0235   1032            TAD PRINT
        0236   3011            DCA WORK
        0237   1411            TAD I WORK
```

)                                    )                              )

```
          0240   6046              TLS
          0241   6041              TSF
          0242   5241              JMP .-1
          0243   1013              TAD M377
          0244   7640              SZA CLA
          0245   5237              JMP TTY+3
          0246   6042              TCF
          0247   6001              ION
          0250   7604              LAS
          0251   7700              SMA CLA
          0252   7402              HLT              /HALT AFTER ERROR (SR0)

          0253   1031              TAD NOTE
          0254   7650              SNA CLA
          0255   5047              JMP CHEK1
          0256   3031              DCA NOTE
          0257   5132              JMP LAS1         /RETURN TO NO SKIP ROUTINE


                                   /ERROR PRINT OUT LINE 1
          0260   0306    INF1,     306              /F       FROM (INSTRUCTION LOCATION)
          0261   0240              240              /SPACE
          0262   0000    INDATA,   0                /X       LOCATION
          0263   0000              0                /X
          0264   0000              0                /X
          0265   0000              0                /X
          0266   0240              240              /SPACE
          0267   0240              240              /SPACE
          0270   0324              324              /T       TO (OPERAND ADDRESS)
          0271   0240              240              /SPACE
          0272   0000    ONDATA,   0                /X       ADDRESS
          0273   0000              0                /X
          0274   0000              0                /X
          0275   0000              0                /X
          0276   0215              215              /CR
          0277   0212              212              /LF
          0300   0215              215              /CR
          0301   0215              215              /CR


                                   /ERROR PRINTOUT LINE 2
          0302   0317              317              /O       OPERAND (STARTING COUNT)
          0303   0240              240              /SPACE
          0304   0000    STDATA,   0                /X       PATTERN
          0305   0000              0                /X
          0306   0000              0                /X
          0307   0000              0                /X
          0310   0240              240              /SPACE
          0311   0240              240              /SPACE
          0312   0306              306              /F       FAILING COUNT
          0313   0240              240              /SPACE
          0314   0000    FLDATA,   0                /X       PATTERN BEFORE FAILING ISZ
          0315   0000              0                /X
          0316   0000              0                /X
          0317   0000              0                /X
          0320   0240              240              /SPACE
```

```
        0321  0240              240               /SPACE
        0322  0322              322               /R          RESULT AFTER FAILURE
        0323  0240              240               /SPACE


        0324  0000      RSDATA,  0                /X          PATTERN AFTER FAILING ISZ
        0325  0000               0                /X
        0326  0000               0                /X
        0327  0000               0                /X
        0330  0240              240               /SPACE
        0331  0240              240               /SPACE
        0332  0316      SKPDAT,  316              /N          NO
        0333  0323               323              /S          SKIP
        0334  0215               215              /CR
        0335  0212               212              /LF
        0336  0212               212              /LF
        0337  0377               377              /RUBOUT
        0340  0316               316              /N
        0341  0323               323              /S

        0342  0000      SETUP,   0
        0343  3012               DCA WORK1
        0344  1011               TAD WORK
        0345  7006               RTL
        0346  7006               RTL
        0347  4362               JMS MORSU
        0350  7012               RTR
        0351  7012               RTR
        0352  7012               RTR
        0353  4362               JMS MORSU
        0354  7012               RTR
        0355  7010               RAR
        0356  4362               JMS MORSU
        0357  4362               JMS MORSU
        0360  7200               CLA
        0361  5742               JMP I SETUP
        0362  0000      MORSU,   0
        0363  0010               AND MSK7
        0364  1375               TAD TW6
        0365  3412               DCA I WORK1
        0366  1011               TAD WORK
        0367  5762               JMP I MORSU


                        /PAGE 1 CONSTANTS
        0370  0261      A3,      INDATA-1
        0371  0271      A4,      ONDATA-1
        0372  0303      A5,      STDATA-1
        0373  0313      A6,      FLDATA-1
        0374  0323      A7,      RSDATA-1
        0375  0260      TW6,     0260


                        /PART 2 INITIALIZATION ROUTINE
              0400      *400
        0400  1003               TAD LIMLO
```

)                              )                                    )

```
            0401   7041              CIA
            0402   3310              DCA FROM                  /LOW LIMIT TO FROM
            0403   1003              TAD LIMLO
            0404   7040              CMA
            0405   3311              DCA TO
            0406   1346              TAD A0
            0407   3313              DCA PATCYC
            0410   1314              TAD INST1
            0411   3165              DCA RANUM+1

            0412   5047              JMP CHEK1                 /GO TO PAGE 0 START

                                    /PATH DECISION ROUTINE
            0413   1164       PDR,   TAD RANUM
            0414   7041              CIA
            0415   1305              TAD GFROM
            0416   7650              SNA CLA        /SKIP IF NOT REQUESTING FROM
            0417   5303              JMP FRUT                /GO TO FROM ADDRESS ROUTINE

            0420   1164              TAD RANUM
            0421   7041              CIA
            0422   1306              TAD GTO
            0423   7650              SNA CLA        /SKIP IF NOT REQUESTING TO
            0424   5301              JMP TORUT               /GO TO TO ADDRESS ROUTINE
            0425   5226              JMP PRUT                /GO TO PATTERN ROUTINE


                                    /SELECT PATTERN AND OTHER THINGS
            0426   1713       PRUT,  TAD I PATCYC
            0427   3312              DCA PATT
            0430   1312              TAD PATT
            0431   7450              SNA            /NO SKIP IF END OF PATTERN TABLE
            0432   5240              JMP .+6        /END PATTERN TABLE LOOK AROUND
            0433   7201              CLA IAC
            0434   1313              TAD PATCYC
            0435   3313              DCA PATCYC
            0436   1312              TAD PATT
            0437   5564              JMP I RANUM    /RETURN, AC=NEW PATTERN
                                    /
            0440   1345              TAD AK7776
            0441   3313              DCA PATCYC     /RESTOR START ADDRESS OF PATT. TABLE
            0442   7001              IAC
            0443   1311              TAD TO
            0444   3311              DCA TO         /INCREMENT TO
            0445   1311              TAD TO
            0446   7041              CIA
            0447   1310              TAD FROM
            0450   7640              SZA CLA        /SKIP IF TO = FROM
            0451   5255              JMP .+4
            0452   1311              TAD TO
            0453   1015              TAD THREE
            0454   3311              DCA TO         /SKIP AROUND FROM
            0455   1311              TAD TO
            0456   7500              SMA
            0457   5276              JMP GOUT
```

```
        0460  1006            TAD LIMHI
        0461  7710            SPA CLA         /SKIP IF END TEST AREA
        0462  5276            JMP GOUT
        0463  7201            CLA IAC
        0464  1310            TAD FROM
        0465  3310            DCA FROM                /ADVANCE FROM
        0466  1003            TAD LIMLO
        0467  7041            CIA
        0470  3311            DCA TO          /RESET TO ADDRESS
        0471  1310            TAD FROM
        0472  1006            TAD LIMHI
        0473  7710            SPA CLA
        0474  5276            JMP GOUT
        0475  5200            JMP 400
        0476  7200    GOUT,   CLA
        0477  1312            TAD PATT
        0500  5564            JMP I RANUM


                        /SELECT TO ROUTINE
        0501  1311    TORUT,  TAD TO
        0502  5564            JMP I RANUM


                        /SELECT FROM ROUTINE
        0503  1310    FRUT,   TAD FROM
        0504  5564            JMP I RANUM

                        /PAGE 3 CONSTANTS
        0505  0072    GFROM,  SELFRM+1                /STORED RETURN ADDRESS WHEN
                                                /RANDOM FROM IS REQUESTED
        0506  0062    GTO,    SELTO+1         /STORED RETURN ADDRESS WHEN
                                                /RANDOM TO IS REQUESTED
        0507  0054    GPAT,   SELPAT+1                /STORED RETURN ADDRESS WHEN
                                                /RANDOM PATTERN IS REQUESTED
        0510  0000    FROM,   0               /CURRENT FROM ADDRESS
        0511  0000    TO,     0               /CURRENT TO ADDRESS
        0512  0000    PATT,   0               /CURRENT PATTERN
        0513  0000    PATCYC, 0               /CURRENT PATTERN ADDRESS
        0514  5435    INST1,  JMP I APDR
        0515  7776    K7776,  7776
        0516  7775            7775
        0517  7773            7773
        0520  7767            7767
        0521  7757            7757
        0522  7737            7737
        0523  7677            7677
        0524  7577            7577
        0525  7377            7377
        0526  6777            6777
        0527  5777            5777
        0530  3777            3777
        0531  0001            0001
        0532  0003            0003
        0533  0007            0007
        0534  0017            0017
```

)                                          )                               )

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0535    0037            0037
0536    0077            0077
0537    0177            0177
0540    0377            0377
0541    0777            0777
0542    1777            1777
0543    3777    K3777,  3777
0544    0000            0
0545    0515    AK7776, K7776
0546    0544    A0,     K3777+1


0547    1375    SUC,    TAD CT
0550    7001            IAC
0551    3375            DCA CT
0552    1375            TAD CT
0553    7640            SZA CLA
0554    5437            JMP I ATFCLF
0555    1175            TAD KP
0556    1174            TAD K1000
0557    3175            DCA KP
0560    1175            TAD KP
0561    7640            SZA CLA
0562    5437            JMP I ATFCLF
0563    6002            IOF
0564    1376            TAD INF2
0565    3011            DCA WORK
0566    5767            JMP I .+1
0567    7602            7602
0570    0215            215
0571    0212            212
0572    0306            306
0573    0303            303
0574    0377            377
0575    0000    CT,     0
0576    0567    INF2,   567



0600            *600

                /CHECK FOR TO=FROM CONFLICT

0600    1021    TFCLF,  TAD TOLOC
0601    7041            CIA
0602    1002            TAD FRMLOC
0603    7450            SNA
0604    5055            JMP CHEK2
0605    7001            IAC
0606    7450            SNA
0607    5055            JMP CHEK2
0610    7001            IAC
0611    7650            SNA CLA
0612    5055            JMP CHEK2
```

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        0613  5402          JMP I FRMLOC

        0614  0000  PATCH,  0               /RESTORE THEN GO AWAY
        0615  3000          DCA 0
        0616  1232          TAD X
        0617  3001          DCA 1
        0620  1233          TAD X1
        0621  3002          DCA 2
        0622  1234          TAD X2
        0623  3003          DCA 3
        0624  1235          TAD X3
        0625  3040          DCA START
        0626  1236          TAD X4
        0627  3041          DCA START+1
        0630  6001          ION
        0631  5614          JMP I PATCH

        0632  7402  X,      7402
        0633  0000  X1,     0
        0634  7157  X2,     7157
        0635  6001  X3,     ION
        0636  7604  X4,     LAS

        7602        *7602
        7602  1411          TAD I WORK
        7603  6046          TLS
        7604  6041          TSF
        7605  5204          JMP .-1
        7606  1013          TAD M377
        7607  7640          SZA CLA
        7610  5202          JMP .-6
        7611  5217          JMP OVR

        7617        *7617
        7617  6042  OVR,    TCF
        7620  6001          ION
        7621  5437          JMP I ATFCLF

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```