IDENTIFICATION

Product Code: MAINDEC-08-D07A-D

Product Name: Random ISZ Test

Date Created: April 1, 1967

Maintainer: Diagnostic Group

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1. ABSTRACT

This program is written to test the ISZ instruction of the PDP-8. 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-8 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 Programs

MAINDEC-08-D01(n), MAINDEC-08-D02(n), and MAINDEC-08-D03(n)

3. LOADING PROCEDURE

The standard Binary Loader is used.

4. STARTING PROCEDURE

4.1 Switch Settings

SR0 = Halt on error

SR1 = 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 = Do one ISZ only

SR11= Do part 2 (1)→SR3, 4, 5 must be 0s.
Do part 1 (0)

4.2 Starting Address

~~0041~~ 0037

4.3 Operator Action

a. Set SR (SWITCH REGISTER) to ~~0041~~ 0037 and press LOAD ADDRESS.

b. Set SR to desired mode of operation; for most runs, SR9 = 1 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 = 0020
OPERAND = 0021

c. Push START.

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 = 1

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 instruction 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 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 = 1. 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 0020

d. Insert chosen failing OPERAND into location 0021

e. Restart program with control switches 1, 3, 4, 5, and 9 set to 1.

NOTE: By setting SR0 the program halts following the error printout. The operator may at this time set switches 1, 3, 4, 5 and 9 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

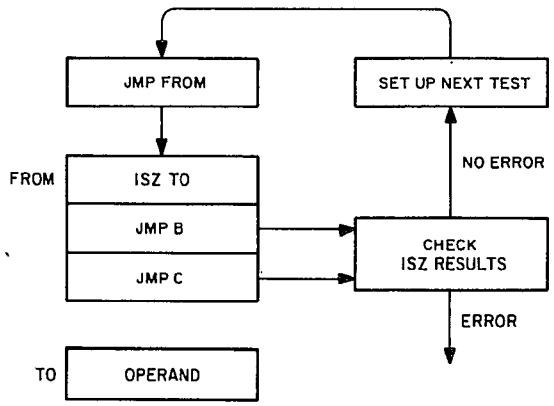
8.1 Execution Time

SR9 = 0. 11,000 ISZ operations/second.

SR9 = 1. 3,500 ISZ operations/second

9. PROGRAM DESCRIPTION

The test loop is shown below:



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 generator 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 = 1, so that the ISZ is performed on each OPERAND only once instead of incrementing 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 07 is printed after each group of 32,000 tests.

10. LISTING

```
ALERR1  0032
ALERR2  0033
AFTER   0023
AK7776  0545
APDR    0034
ASUC    0005
ATFCLF  0036
A0      0546
A1      0173
A2      0174
A3      0371
A4      0372
A5      0373
A6      0374
A7      0375
BACK    0115
BAKBRN  0140
BEFOR   0022
CHEK1   0046
CHEK2   0054
CHEK3   0064
CI      0177
ERR1    0200
ERR2    0205
FLDATA  0315
FRMLOC  0002
FROM    0510
FRUT    0503
GFROM   0505
GOUT    0476
GPAT    0507
GIO     0506
INDATA  0263
INF1    0261
INF2    0574
INST1   0514
IX1     0015
ITADNM  0035
JMP1    0016
JMP2    0017
KP      0176
KPGO    0207
K0100   0027
K0200   0026
K0400   0025
K1000   0175
K3777   0543
K4      0024
K7776   0515
LAS1    0131
LIMHI   0004
LIMLO   0003
LIMTST  0150
LUP1    0111
MURSU   0363
MSK7    0007
M377    0012
M7      0006
NOTE    0030
NUM     0013
ONDATA  0273
OVR     7617
PATCYC  0513
PATRN   0021
PATT    0512
PDR     0413
PLCINT  0074
PRINT   0031
PRUT    0426
RANUM   0163
RSDATA  0325
SELFRM  0070
SELPAT  0052
SELTO   0060
SETUP   0343
SKPDAT  0353
START   0037
STDATA  0305
SUC     0547
SVN     0576
TFCLF   0600
THREE   0014
TO      0511
TOLOC   0020
TORUT   0501
TTY     0235
TW6     0376
WORK    0010
WORK1   0011
ZERO    0575
```

```
                    /PDP-8S ISZ TEST
                    /
                    /CONSTANTS AND VARIABLES
                    *0
0000  0000            0
0001  7402            HLT                 /PERIPHERAL INTERRUPT
0002  0000  FRMLOC,   0                     /ISZ TEST INSTRUCTION LOCATION
0003  7157  LIMLO,    -621                 /LOW LIMIT TEST AREA
0004  0200  LIMHI,    -7600                /HIGH LIMIT TEST AREA
0005  0547  ASUC,     SUC
0006  7771  M7,      -7
0007  0007  MSK/,     0007                 /OCTAL CONVERSION MASK
0010  0000  WORK,     0                    /IR0
0011  0000  WORK1,    0                    /IR1
0012  7401  M377,    -377
0013  3607  NUM,     3607                 /THE RANDOM NUMBER LOCATION
0014  0003  THREE,    3

0015  2420  ISZ1,     ISZ I TOLOC          /MOVING ISZ
0016  5115  JMP1,     JMP BACK                    /TEST INSTRUCTION
0017  5140  JMP2,     JMP BAKBRN           /GROUP.
0020  0000  TOLOC,    0                    /LOCATION TO BE ISZ'D
0021  0000  PATRN,    0                    /STARTING ISZ PATTERN
0022  0000  BEFOR,    0                    /FAILING PATTERN BEFORE FAILING ISZ
0023  0000  AFTER,    0                    /PREDICTED RESULTS OF EACH ISZ
0024  0004  K4,      4                 /SWITCH REGISTER MASKS
0025  0400  K0400,    0400
0026  0200  K0200,    0200
0027  0100  K0100,    0100
0030  0000  NOTE,     0                    /7'S=ERROR WITH NO SKIP
0031  0260  PRINT,    INF1-1               /0'S=ERROR WITH SKIP
0032  0200  AERR1,    ERR1
0033  0205  AERR2,    ERR2
0034  0413  APDR,     PDR
0035  1013  ITADNM,   TAD NUM
0036  0600  ATFCLF,   TFCLF
                    /SR0=HALT AFTER ERROR PRINTOUT
                    /SR1=NO PRINTOUTS
                    /SR3 = HOLD FROM CONSTANT
                    /SR4 = HOLD TO CONSTANT
                    /SR5 = HOLD PATTERN CONSTANT
                    /SR9 = DO ONE ISZ ONLY
                    /SR11 = DO PART 2
                    /
                    /

                    /PROGRAM START
0037  6001  START,    ION
0040  7604            LAS
0041  0014            AND THREE
0042  7640            SZA CLA              /SKIP IF PART 1
0043  5425            JMP I K0400          /GO TO PART 2
0044  1035            TAD ITADNM
0045  3164            DCA RANUM+1
                      /CHECK FOR FIXED PATTERN
0046  7604  CHEK1,    LAS
0047  0027            AND K0100
0050  7440            SZA
0051  5054            JMP CHEK2
```

```
                    /SELECT THE PATTERN
0052  4163  SELPAT,      JMS RANUM
0053  3021        DCA PATRN

                    /CHECK FOR FIXED TO
0054  7604  CHEK2,       LAS
0055  0026        AND K0200
0056  7640        SZA CLA
0057  5064        JMP CHEK3

                    /SELECT THE TO LOCATION
0060  4163  SELTO,       JMS RANUM
0061  3020        DCA TOLOC
0062  1020        TAD TOLOC
0063  4150        JMS LIMTST

                    /CHECK FOR FIXED FROM
0064  7604  CHEK3,    ,  LAS
0065  0025        AND K0400
0066  7640        SZA CLA
0067  5074        JMP PLCINT

                    /SELECT THE FROM LOCATION
0070  4163  SELFRM,      JMS RANUM
0071  3002        DCA FRMLOC
0072  1002        TAD FRMLOC
0073  4150        JMS LIMTST

                    /PLACE FROM INSTRUCTIONS

0074  7240  PLCINT,         CLA CMA
0075  1002        TAD FRMLOC
0076  3010        DCA WORK
0077  1015        TAD ISZ1
0100  3410        DCA I WORK
0101  1016        TAD JMP1
0102  3410        DCA I WORK
0103  1017        TAD JMP2
0104  3410        DCA I WORK
                    /DEPOSIT PATTERN IN TO LOCATION
0105  1021        TAD PATRN
0106  3420        DCA I TOLOC

                    /STORE PREDICTED ISZ RESULT
0107  1021        TAD PATRN
0110  3022        DCA BEFOR
0111  1022  LUP1,       TAD BEFOR
0112  7001        IAC
0113  3023        DCA AFTER
0114  5405        JMP I ASUC

                    /RETURN FOR NO SKIP CONDITION
0115  7604  BACK,       LAS
0116  7004        RAL
0117  7710        SPA CLA
0120  5151            JMP LAS1
0121  1420        TAD I TOLOC
0122  7041        CIA
0123  1023        TAD AFTER
0124  7640        SZA CLA
```

```
0125  5432        JMP I AERR1      /ERROR IN ISZ OPERATION
0126  1420        TAD I TOLOC
0127  7650        SNA CLA
0130  5432        JMP I AERR1      /ERROR IN ISZ SKIP DETECTION
0131  7604  LAS1,       LAS
0132  0024        AND K4
0133  7440        SZA              /SKIP IF NOT ONE ISZ (SR9)
0134  5046        JMP CHEK1
0135  7001        IAC
0136  1022        TAD BEFOR
0137  5110        JMP LUP1-1

                  /RETURN FOR SKIP CONDITION
0140  7604  BAKBRN,     LAS
0141  7004        RAL
0142  7710        SPA CLA
0143  5046        JMP CHEK1
0144  1420        TAD I TOLOC
0145  7640        SZA CLA          /SKIP IF TO LOCATION OK
0146  5433        JMP I AERR2      /ERROR IN ISZ LOCATION
0147  5046        JMP CHEK1

            /TEST HIGH-LOW LIMITS

0150  0000  LIMTST,      0
0151  7510        SPA
0152  5157        JMP .+5
0153  1003        TAD LIMLO
0154  7700        SMA CLA
0155  5550        JMP I LIMTST
0156  5164        JMP RANUM+1
0157  1004        TAD LIMHI
0160  7700        SMA CLA
0161  5164        JMP RANUM+1
0162  5550        JMP I LIMTST

                  /RANDOM NUMBER GENERATO
0163  0000  RANUM,       0
0164  1013        TAD NUM
0165  7104        RAL CLL
0166  7430        SZL
0167  1014        TAD THREE
0170  3013        DCA NUM
0171  1013        TAD NUM          /AC=NEW RANDOM NUMBER
0172  5563        JMP I RANUM

0173  0333  A1, SKPDAT
0174  0334  A2, SKPDAT+1
0175  1000  K1000,      1000
0176  0000  KP, 0
0177  0000  CT, 0
```

```
                *200
                    /ERROR ROUTINE 1
0200   1341     ERR1,       TAD SKPDAT+6
0201   3333         DCA SKPDAT
0202   7040         CMA
0203   3030         DCA NOTE
0204   5207         JMP KPGO

                    /ERROR ROUTINE 2
0205   1332     ERR2,       TAD SKPDAT-1
0206   3333         DCA SKPDAT
0207   1342     KPGO,       TAD SKPDAT+/
0210   3334         DCA SKPDAT+1
0211   1002         TAD FRMLOC
0212   3010         DCA WORK
0213   1371         TAD A3
0214   4343         JMS SETUP

0215   1020         TAD TOLOC
0216   3010         DCA WORK
0217   1372         TAD A4
0220   4343         JMS SETUP

0221   1021         TAD PATRN
0222   3010         DCA WORK
0223   1373         TAD A5
0224   4343         JMS SETUP
0225   1022         TAD BEFOR
0226   3010         DCA WORK
0227   1374         TAD A6
0230   4343         JMS SETUP

0231   1420         TAD I TOLOC
0232   3010         DCA WORK
0233   1375         TAD A7
0234   4343         JMS SETUP

                    /TTY PRINT ROUTINE
0235   6002     TTY,        IOF
0236   1031         TAD PRINT
0237   3010         DCA WORK
0240   1410         TAD I WORK
0241   6046         TLS
0242   6041         TSF
0243   5242         JMP .-1
0244   1012         TAD M377
0245   7640         SZA CLA
0246   5240         JMP TTY+3
0247   6042         TCF
0250   6001         ION
0251   7604         LAS
0252   7710         SPA CLA
0253   7402         HLT                 /HALT AFTER ERROR (SR0)

0254   1030         TAD NOTE
0255   7650         SNA CLA
0256   5046         JMP CHEK1
0257   3030         DCA NOTE
0260   5131         JMP LAS1                /RETURN TO NO SKIP ROUTINE
```

```
                    /ERROR PRINT OUT LINE 1
0261  0306  INF1,      306              /F     FROM (INSTRUCTION LOCATION)
0262  0240      240              /SPACE
0263  0000  INDATA,    0                /X       LOCATION
0264  0000      0              /X
0265  0000      0              /X
0266  0000      0              /X
0267  0240      240            /SPACE
0270  0240      240            /SPACE
0271  0324      324            /T     TO (OPERAND ADDRESS)
0272  0240      240            /SPACE
0273  0000  ONDATA,    0                /X       ADDRESS
0274  0000      0              /X
0275  0000      0              /X
0276  0000      0              /X
0277  0215      215            /CR
0300  0212      212            /LF
0301  0215      215            /CR
0302  0215      215            /CR

                    /ERROR PRINTOUT LINE 2
0303  0317      317            /O     OPERAND (STARTING COUNT)
0304  0240      240            /SPACE
0305  0000  STDATA,    0                /X       PATTERN
0306  0000      0              /X
0307  0000      0              /X
0310  0000      0              /X
0311  0240      240            /SPACE
0312  0240      240            /SPACE
0313  0306      306            /F       FAILING COUNT
0314  0240      240            /SPACE
0315  0000  FLDATA,    0                /X       PATTERN BEFORE FAILING ISZ
0316  0000      0              /X
0317  0000      0              /X
0320  0000      0              /X
0321  0240      240            /SPACE
0322  0240      240            /SPACE
0323  0322      322            /R       RESULT AFTER FAILURE
0324  0240      240            /SPACE
0325  0000  RSDATA,    0                /X       PATTERN AFTER FAILING ISZ
0326  0000      0              /X
0327  0000      0              /X
0330  0000      0              /X
0331  0240      240            /SPACE
0332  0240      240            /SPACE
0333  0316  SKPDAT,    316              /N       NO
0334  0323      323            /S       SKIP
0335  0215      215            /CR
0336  0212      212            /LF
0337  0212      212            /LF
0340  0377      377            /RUBOUT
0341  0316      316            /N
0342  0323      323            /S
```

```
0343  0000  SETUP,      0
0344  3011      DCA WORK1
0345  1010      TAD WORK
0346  7006      RTL
0347  7006      RTL
0350  4363      JMS MORSU
0351  7012      RTR
0352  7012      RTR
0353  7012      RTR
0354  4363      JMS MORSU
0355  7012      RTR
0356  7010      RAR
0357  4363      JMS MORSU
0360  4363      JMS MORSU
0361  7200      CLA
0362  5743      JMP I SETUP
0363  0000  MORSU,      0
0364  0007      AND MSK7
0365  1376      TAD TW6
0366  3411      DCA I WORK1
0367  1010      TAD WORK
0370  5763      JMP I MORSU

                /PAGE 1 CONSTANTS
0371  0262  A3, INDATA-1
0372  0272  A4, ONDATA-1
0373  0304  A5, STDATA-1
0374  0314  A6, FLDATA-1
0375  0324  A7, RSDATA-1
0376  0260  TW6,        0260


                /PART 2 INITIALIZATION ROUTINE
                *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  3164      DCA RANUM+1

0412  5046      JMP CHEK1             /GO TO PAGE 0 START

                /PATH DECISION ROUTINE
0413  1163  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  1163      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  5563              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  1014              TAD THREE
0454  3311              DCA TO              /SKIP AROUND FROM
0455  1311              TAD TO
0456  7500                  SMA
0457  5276                  JMP GOUT
0460  1004              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  1004              TAD LIMHI
0473  7640              SZA CLA
0474  5276              JMP GOUT
0475  5200              JMP 400
0476  7200  GOUT,       CLA
0477  1312              TAD PATT
0500  5563              JMP I RANUM
```

```
                    /SELECT TO ROUTINE
0501  1311  TORUT,      TAD TO
0502  5563      JMP I RANUM

                    /SELECT FROM ROUTINE
0503  1310  FRUI,      TAD FROM
0504  5563      JMP I RANUM

                    /PAGE 3 CONSTANTS
0505  0071  GFRUM,     SELFRM+1              /STORED RETURN ADDRESS WHEN
                                  /RANDOM FROM IS REQUESTED
0506  0061  GTO,       SELTO+1               /STORED RETURN ADDRESS WHEN
                                  /RANDOM TO IS REQUESTED
0507  0053  GPAI,      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  PATI,      0                     /CURRENT PATTERN
0513  0000  PATCYC,    0                     /CURRENT PATTERN ADDRESS
0514  5434  INSTI,     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
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  1177  SUC,        TAD CI
0550  7001      IAC
0551  3177      DCA CI
0552  1177      TAD CI
0553  7640      SZA CLA
0554  5436      JMP I ATFCLI
0555  1176      TAD KP
0556  1175      TAD K1000
0557  3176      DCA KP
0560  1176      TAD KP
0561  7640      SZA CLA
0562  5436      JMP I ATFCLI
```

```
0563  6002        IOF
0564  1375        TAD ZERO
0565  3573        DCA I A1
0566  1376        TAD SVN
0567  3574        DCA I A2
0570  1374        TAD INF2
0571  3010        DCA WORK
0572  5773        JMP I .+1
0573  7602        7602
0574  0332  INF2,         SKPDAT-1
0575  0260  ZERO,         260
0576  0267  SVN,          267
            *600

            /CHECK FOR TO=FROM CONFLICT

0600  1020  TFCLF,        TAD TOLOC
0601  7041        CIA
0602  1002        TAD FRMLOC
0603  7450        SNA
0604  5054        JMP CHEK2
0605  7001        IAC
0606  7450        SNA
0607  5054        JMP CHEK2
0610  7001        IAC
0611  7650        SNA CLA
0612  5054        JMP CHEK2
0613  5402        JMP I FRMLOC

            *7602
7602  1410        TAD I WORK
7603  6046        TLS
7604  6041        TSF
7605  5204        JMP .-1
7606  1012        TAD M377
7607  7640        SZA CLA
7610  5202        JMP .-6
7611  5217        JMP OVR

            *7617
7617  6042  OVR,          TCF
7620  6001        ION
7621  5436        JMP I ATFCLF


AERR1    0032
AERR2    0033
AFTER    0023
AK7776   0545
APDR     0034
ASUC     0005
ATFCLF   0036
A0       0546
A1       0173
A2       0174
A3       0371
A4       0372
A5       0373
A6       0374
```

```
A/      0375
BACK    0115
BAKBRN  0140
BEFOR   0022
CHEK1   0046
CHEK2   0054
CHEK3   0064
CI      0177
ERR1    0200
ERR2    0205
FLDATA  0315
FRMLOC  0002
FROM    0510
FRUT    0503
GFROM   0505
GOUT    0476
GPAT    0507
GTO     0506
INDATA  0263
INF1    0261
INF2    0574
INST1   0514
ISZ1    0015
IIADNM  0035
JMP1    0016
JMP2    0017
KP      0176
KPGO    0207
K0100   0027
K0200   0026
K0400   0025
K1000   0175
K3777   0543
K4      0024
K7776   0515
LAS1    0131
LIMHI   0004
LIMLO   0003
LIMTST  0150
LUP1    0111
MURSU   0363
MSK7    0007
M377    0012
M7      0006
NOTE    0030
NUM     0013
ONDATA  023
OVR     7617
PATCYC  0513
PATRN   0021
PATT    0512
PDR     0413
PLCINT  0074
PRINT   0031
PRUT    0426
RANUM   0163
RSDATA  0325
SELFRM  0070
SELPAT  0052
SELTO   0060
SETUP   0343
SKPDAT  0333
START   0037
STDATA  0305
SUC     0547
SVN     0576
TFCLF   0600
THREE   0014
TO      0511
TOLOC   0020
TORUT   0501
TTY     0235
TW6     0376
WORK    0010
WORK1   0011
ZERO    0575
```