

MAINDEC-08-DO7B-D

IDENTIFICATION

Product Code: MAINDEC-08-DO7B-D

Product Name: Random ISZ Test

Date Created: March 25, 1968

Maintainer: Diagnostic Group

Author: R. Green

PDP-8
LIBRARY

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_g. 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

SR1 = Do part 2 (1) → SR3, 4, 5 must be 0s.
Do part 1 (0)

4.2 Starting Address

37

4.3 Operator Action

- a. Set SR (SWITCH REGISTER) to 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

<u>C (PC)</u>	<u>Cause</u>
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
O 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
O 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 $SRO = 1$. 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 SRO 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

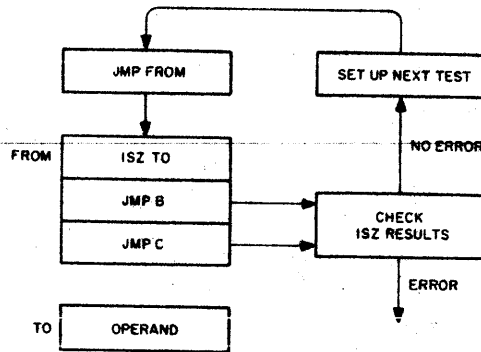
8.1 Execution Time

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: $621_8 < \text{MEMORY TEST AREA} < 7600_8$):

- 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.

```

/PDP-0S ISZ TEST
/
/CONSTANTS AND VARIABLES
*0
0000 0000
0001 5001
0002 0002
0003 0003
0004 0200
0005 0547
0006 7771
0007 0007
0010 0000
0011 0000
0012 7401
0013 3607
0014 0003

0015 2420
0016 5115
0017 5140
0020 0000
0021 0000
0022 0000
0023 0000
0024 0004
0025 0400
0026 0200
0027 0100
0030 0000
0031 0260
0032 0200
0033 0205
0034 0413
0035 1013
0036 0600

JMP 1
FRMLOC, 2
LIMLO, 3
LIMHI, -7600
ASUC, SUC
M7, -7
MSK7, 0007
WORK, 0
WORK1, 0
M377, -377
NUM, 3607
THREE, 3

ISZ1, ISZ I TULOC
JMP1, JMP BACK
JMP2, JMP BAKBRN
TO, UC, 0
PATRN, 0
BEFDR, 0
AFTER, 0
K4, 4
K0400, 0400
K0200, 0200
K0100, 0100
NOTE, 0
PRINT, INF1-1
AERR1, ERR1
AERR2, ERR2
APDR, PUR
ITAUNM, TAD NUM
ATFCLF, TFCLF

/PERIPHERAL INTERRUPT
/ISZ TEST INSTRUCTION LOCATION
/LOW LIMIT TEST AREA
/HIGH LIMIT TEST AREA
/OCTAL CONVERSION MASK
/IR0
/IR1
/THE RANDOM NUMBER LOCATION
/MOVING ISZ
/TEST INSTRUCTION
/GROUP
/LOCATION TO BE ISZ'D
/STARTING ISZ PATTERN
/FAILING PATTERN BEFORE FAILING ISZ
/PREDICTED RESULTS OF EACH ISZ
/SWITCH REGISTER MASKS
//S=ERROR WITH NO SKIP
/0'S=ERROR WITH SKIP
    
```

```
/SR0=MALT AFTER ERROR PRINTOUT
/SR1=NO PRINTOUTS
/SR3 = HOLD FROM CONSTANT
/SR4 = HOLD TO CONSTANT
/SR5 = HOLD PATTERN CONSTANT
/SR9 = DO ONE ISE ONLY
/SR11 = DO PART 2
/
/
```

```
/PROGRAM START
START,  JMS I ,+1      /ION
        PATCH         /LAS
        AND THREE
        SZA CLA       /SKIP IF PART 1
        JMP I K0400   /GO TO PART 2
        TAD I TAUM
        DCA RANUM+1
        /CHECK FOR FIXED PATTERN
CHK1,   LAS
        AND K0100
        SZA
        JMP CHK2

0037  4440
0040  0614
0041  0014
0042  7640
0043  5425
0044  1035
0045  3164

0046  7604
0047  0027
0050  7440
0051  5054
```

0052	4163		/SELECT THE PATTERN
0053	3021	SELPAT,	JMS RANUM DCA PATHN
0054	7604		/CHECK FOR FIXED TO
0055	0026	CHEK2,	LAS
0056	7640		AND K0200
0057	5064		SZA CLA JMP CHEK3
0060	4163		/SELECT THE TO LOCATION
0061	3020	SELTO,	JMS RANUM
0062	1020		DCA TOLOC
0063	4150		TAD TOLOC JMS LIMITST
0064	7604		/CHECK FOR FIXED FROM
0065	0025	CHEK3,	LAS
0066	7640		AND K0400
0067	5074		SZA CLA JMP PLCINT
0070	4163		/SELECT THE FROM LOCATION
0071	3002	SELFM,	JMS RANUM
0072	1002		DCA FRMLOC
0073	4150		TAD FRMLOC JMS LIMITST
0074	7240		/PLACE FROM INSTRUCTIONS
0075	1002	PLCINT,	CLA CMA
0076	3010		TAD FRMLOC
0077	1015		DCA WORK
0100	3410		TAD ISZ1
0101	1016		DCA I WORK
0102	3410		TAD JMP1
0103	1017		DCA I WORK
0104	3410		TAD JMP2 DCA I WORK

```

0105 1021      /DEPOSIT PATTERN IN TO LOCATION
0106 3420      TAD PATHN
                                DCA I TOLUC

                                /STORE PREDICTED ISZ RESULT
0107 1021      TAD PATHN
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 5131      JMP LAS1
0121 1420      TAD I TOLUC
0122 7041      CIA
0123 1023      TAD AFTER
0124 7640      SZA CLA
0125 5432      JMP I AERR1      /ERROR IN ISZ OPERATION
0126 1420      TAD I TOLUC
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 TOLUC
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      LIMITST, 0
0151 7510      SPA
0152 5157      JMP ,+5
0153 1003      TAD LIMLO
0154 7700      SMA CLA
0155 5550      JMP I LIMITST
0156 5164      JMP RANUM+1
0157 1004      TAD LIMHI
0160 7700      SMA CLA

```

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0161 5164
0162 5550

JMP RANUM+1
JMP I LIMIT

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

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

	0200		
		ERR1,	/ERROR ROUTINE 1
0200	1341		TAD SKPUAT+0
0201	3333		DCA SKPUAT
0202	7040		CMA
0203	3030		DCA NOTE
0204	5207		JMP KPGU
		ERR2,	/ERROR ROUTINE 2
0205	1332		TAD SKPUAT-1
0206	3333		DCA SKPUAT
0207	1342	KPGU,	TAD SKPUAT+7
0210	3334		DCA SKPUAT+1
0211	1002		TAD FRMLOC
0212	3010		DCA WORK
0213	1371		TAD A3
0214	4343		JMS SETUP
0215	1020		TAD TOLUC
0216	3010		DCA WORK
0217	1372		TAD A4
0220	4343		JMS SETUP
0221	1021		TAD PATHN
0222	3010		DCA WORK
0223	1373		TAD A5
0224	4343		JMS SETUP
0225	1022		TAD HELFOR
0226	3010		DCA WORK
0227	1374		TAD A6
0230	4343		JMS SETUP
0231	1420		TAD I TOLUC
0232	3010		DCA WORK
0233	1375		TAD A7
0234	4343		JMS SETUP
0235	6002	TTY,	/TTY PRINT ROUTINE
0236	1031		IOF
0237	3010		TAD PRINT
0240	1410		DCA WORK
0241	6046		TAD I WORK
0242	6041		TLS
0243	5242		T5F
0244	1012		JMP ,=1
0245	7640		TAD M377
0246	5240		SZA CLA
0247	6042		JMP TTY+3
0250	6001		TCF
0251	7604		ION
0252	7710		LAS
0253	7402		SPA CLA
			HLT

/HALT AFTER ERROR (SR0)

0254 1030
0255 7650
0256 5046
0257 3030
0260 5131

TAD NOTE
SNA CLA
JMP CHEK1
DCA NOTE
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	S_K PUAT, 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 MSK/		
0365	1376	TAD TW6		
0366	3411	DCA I WORK1		
0367	1010	TAD WORK		
0370	5763	JMP I MORSU		
0371	0262	/PAGE 1 CONSTANTS		
0372	0272	A3, INDATA-1		
0373	0304	A4, ONDATA-1		
0374	0314	A5, STDATA-1		
0375	0324	A6, FLDATA-1		
0376	0260	A7, RSDATA-1		
		TW6, 0260		

/FROM 2 INITIALIZATION ROUTINE

```

*420
0400 0400
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 AD
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
PUR, 0413 1163      TAD RANUM
0414 7041      CIA
0415 1305      TAD GFRUM
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 TURUT        /GO TO TO ADDRESS ROUTINE
0425 5226      JMP PRUT          /GO TO PATTERN ROUTINE

```

```

0426 1713
0427 3312
0430 1312
0431 7450
0432 5240
0433 7201
0434 1313
0435 3313
0436 1312
0437 5563

0440 1345
0441 3313
0442 7001
0443 1311
0444 3311
0445 1311
0446 7041
0447 1310
0450 7640
0451 5255
0452 1311
0453 1014
0454 3311
0455 1311
0456 7500
0457 5276
0460 1004
0461 7710
0462 5276
0463 7201
0464 1310
0465 3310
0466 1003
0467 7041
0470 3311
0471 1310
0472 1004
0473 7640
0474 5276
0475 5200
0476 7200
0477 1312
0500 5563

PRJ, /SELECT PATTERN AND OTHER THINGS
TAD I PATCYC
DCA PATT
TAD PATT
SNA /NO SKIP IF END OF PATTERN TABLE
JMP ,+6 /END PATTERN TABLE LOOK AROUND
CLA IAC
TAD PATCYC
DCA PATCYC
TAD PATT
JMP I RANUM /RETURN, AC=NEW PATTERN
/
TAD AK7//6
DCA PATCYC /RESTOR START ADDRESS OF PATT, TABLE
IAC
TAD TO
DCA TO /INCREMENT TO
TAD TO
CIA
TAD FROM
SZA CLA /SKIP IF TO = FROM
JMP ,+4
TAD TO
TAD THREE
DCA TO /SKIP AROUND FROM
TAD TO
SMA
JMP GOUT
TAD LIMHI
SPA CLA /SKIP IF END TEST AREA
JMP GOUT
CLA IAC
TAD FROM
DCA FROM /ADVANCE FROM
TAD LIMLO
CIA
DCA TO /RESET TO ADDRESS
TAD FROM
TAD LIMHI
SZA CLA
JMP GOUT
JMP 400
GOUT, CLA
TAD PATT
JMP I RANUM

```

0501	1311		/SELECT TO ROUTINE	
0502	5563	TORUT,	TAD TO	
			JMP I RANUM	
0503	1310		/SELECT FROM ROUTINE	
0504	5563	FRUT,	TAD FROM	
			JMP I RANUM	
0505	0071		/PAGE 3 CONSTANTS	
0506	0061	GFROM,	SELFRM+1	/STORED RETURN ADDRESS WHEN
0507	0053	GTO,	SELTO+1	/RANDOM FROM IS REQUESTED
				/STORED RETURN ADDRESS WHEN
				/RANDOM TO IS REQUESTED
				/STORED RETURN ADDRESS WHEN
0510	0000	GPAT,	SELPAT+1	/RANDOM PATTERN IS REQUESTED
0511	0000	FROM,	0	/CURRENT FROM ADDRESS
0512	0000	TO,	0	/CURRENT TO ADDRESS
0513	0000	PATT,	0	/CURRENT PATTERN
0514	5434	PATCYC,	0	/CURRENT PATTERN ADDRESS
0515	7776	INST1,	JMP I APDR	
0516	7775	K7776,	7776	
0517	7773		7775	
0520	7767		7773	
0521	7757		7767	
0522	7737		7757	
0523	7677		7737	
0524	7577		7677	
0525	7377		7577	
0526	6777		7377	
0527	5777		6777	
0530	3777		5777	
0531	0001		3777	
0532	0003		0001	
0533	0007		0003	
0534	0017		0007	
0535	0037		0017	
0536	0077		0037	
0537	0177		0077	
0540	0377		0177	
0541	0777		0377	
0542	1777		0777	
0543	3777		1777	
0544	0000	K3777,	3777	
0545	0515		0	
0546	0544	AK7770,	K7776	
		AO,	K3777+1	

0547	1177	SUC,	TAD CT
0550	7001		IAC
0551	3177		DCA CT
0552	1177		TAD CT
0553	7640		SZA CLA
0554	5436		JMP I ATFCLF
0555	1176		TAD KP
0556	1175		TAD K1000
0557	3176		DCA KP
0560	1176		TAD KP
0561	7640		SZA CLA
0562	5436		JMP I ATFCLF
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,	SKPUAT=1
0575	0260	ZERO,	260
0576	0267	SVN,	267

```

0600
*600
/CHECK FOR TO=FROM CONFLICT

0600 1020      TFCLF,  TAD TULOC
0601 7041      CIA
0602 1002      TAD FRMLUC
0603 7452      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 FRMLUC

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 3037      DCA START
0626 1236      TAD X4
0627 3040      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 1410      TAD I WORK
7603 6046      TLS
7604 6041      TSF
7605 5204      JMP ,=1
7606 1012      TAD M377
7607 7640      SEA CLA
7610 5202      JMP ,=6
7611 5217      JMP OVR

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

```

SYMBOL TABLE

ALRR1	0032
ALRR2	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
CT	0177
ERR1	0200
ERR2	0205
FLODATA	0315
FRMLOC	0002
FROM	0510
FRUT	0503
GFROM	0505
GUUT	0476
GPAT	0507
GTO	0506
INDATA	0263
INF1	0261
INF2	0574
INST1	0514
ISZ1	0015
ITADNM	0035
JMP1	0016
JMP2	0017
KP	0176
KPGU	0207
K0100	0027
K0200	0026
K0400	0025
K1000	0175
K3777	0543
K4	0024
K7776	0515
LAS1	0131
LIMHI	0004
LIMLO	0003
LIMST	0150

SYMBOL TABLE

LUP1	0111
MURSU	0363
MSK7	0007
M377	0012
M/	0006
NUTE	0030
NUM	0013
ONDATA	0273
OVR	7617
PATCH	0614
PATCYC	0513
PATRN	0021
PATT	0512
PUR	0413
PLCINT	0074
PRINT	0031
PHUT	0426
RANUM	0163
RSDATA	0325
SELF RM	0070
SELPAT	0052
SELTO	0060
SETUP	0343
SKPDAT	0333
START	0037
STDATA	0305
SUC	0547
SVN	0576
TCLF	0600
THREE	0014
TU	0511
TULOC	0020
TURUT	0501
TIY	0235
TW6	0376
WURK	0010
WURK1	0011
X	0632
X1	0633
X2	0634
X3	0635
X4	0636
ZLRU	0575

SYMBOL TABLE

FRMLOC	0002
LIMLO	0003
LIMHI	0004
ASUC	0005
M7	0006
MSK7	0007
WORK	0010
WORK1	0011
MS77	0012
NUM	0013
THREE	0014
JSZ1	0015
JMP1	0016
JMP2	0017
TULOC	0020
PATRN	0021
BEFOR	0022
AFTER	0023
K4	0024
K0400	0025
K0200	0026
K0100	0027
NOTE	0030
PRINT	0031
AERR1	0032
AERR2	0033
APDR	0034
ITADNM	0035
ATFCLF	0036
STANT	0037
CHEK1	0046
SELPAT	0052
CHEK2	0054
SELTO	0060
CHEK3	0064
SELFRM	0070
PLCINT	0074
LUP1	0111
BACK	0115
LAS1	0131
BAKBRN	0140
LIMTST	0150
RANUM	0163
A1	0173
A2	0174
K1000	0175
KP	0176
CI	0177
EHR1	0200
EHR2	0205
KPG0	0207
TTY	0235
INF1	0261

SYMBOL TABLE

INDATA	0263
ONDATA	0273
SIDATA	0305
FLDATA	0315
RSDATA	0325
SKPDAT	0333
SETUP	0343
MURSU	0363
A3	0371
A4	0372
A5	0373
A6	0374
A7	0375
TW6	0376
PUR	0413
PRUT	0426
GOUT	0476
TURUT	0501
FRUT	0503
GFROM	0505
GTO	0506
GPAT	0507
FROM	0510
TU	0511
PATT	0512
PATCYC	0513
INST1	0514
K7776	0515
K3777	0543
AK7776	0545
AP	0546
SUC	0547
INF2	0574
ZERO	0575
SVN	0576
TFCLF	0600
PATCH	0614
X	0632
X1	0633
X2	0634
X3	0635
X4	0636
OVR	7617

THERE ARE NO ERRORS