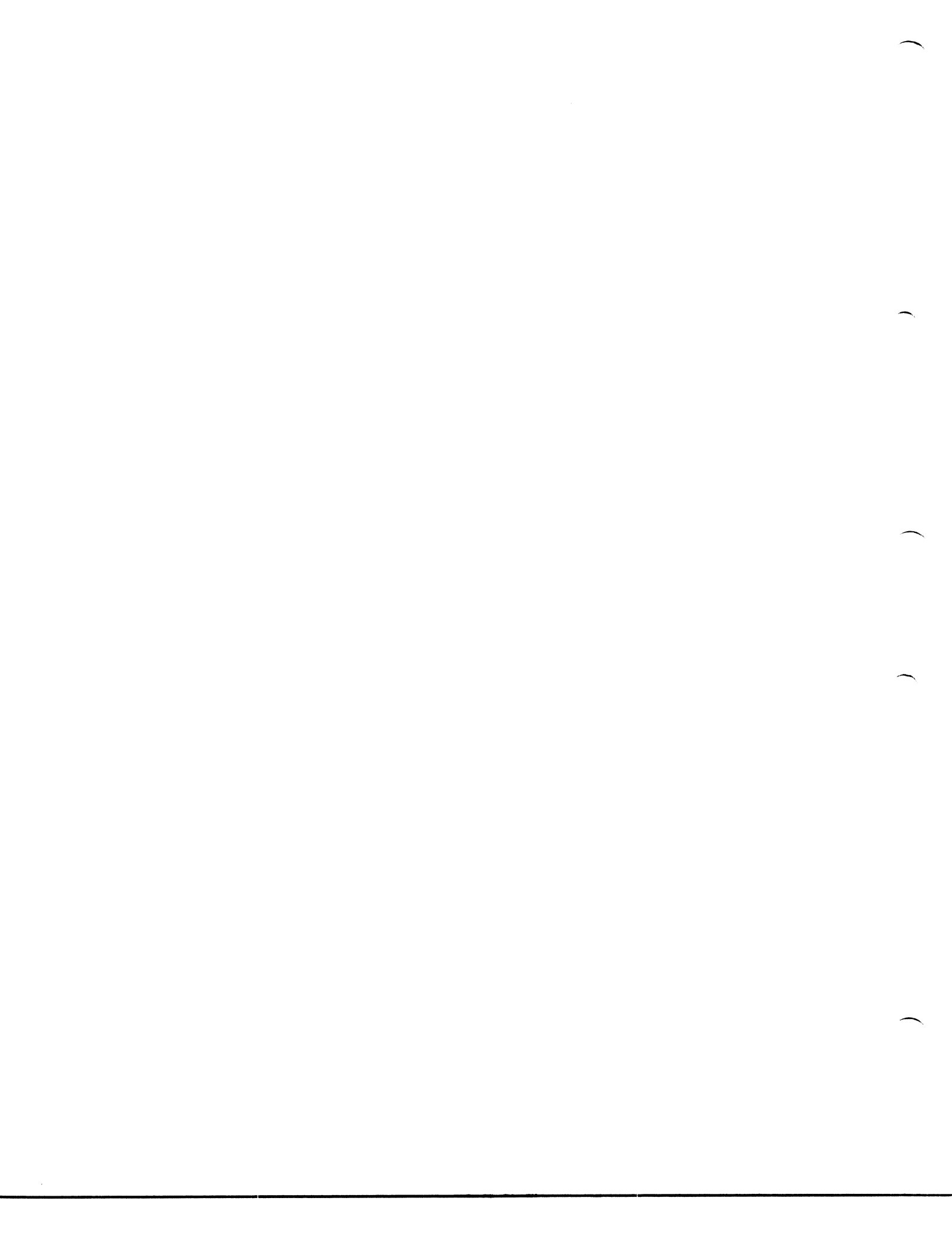


IDENTIFICATION

PRODUCT CODE: MAINDEC-8E-DØDA-D-(D)
PRODUCT NAME: RANDOM AND TEST
DATE CREATED: NOVEMBER 2, 1970
MAINTAINER: DIAGNOSTIC GROUP
AUTHOR: MICHAEL DAVIS

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1. ABSTRACT

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

2. REQUIREMENTS

2.1 EQUIPMENT

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

2.2 STORAGE

TELETYPE.

THE PROGRAM IS INITIALLY LOADED INTO LOCATIONS 0000 THRU 1177. THE INITIAL TEST AREA IS 1200-7777. WHEN THE PROGRAM RELOCATES, IT OCCUPIES 6000-7777. THE TEST AREA IS THEN 0000-6577.

2.3 PRELIMINARY PROGRAMS

MAINDEC-8E-D0AA, D0BA, D0CA

3. LOADING PROCEDURE

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

4. STARTING PROCEDURE

4.1 STARTING ADDRESS

0200

4.2 CONTROL SWITCH SETTINGS

SR00=1, SUPPRESS HALT ON ERROR
SR01=1, HALT AT END OF PASS, RESTORE LOADERS
SR02=1, SUPPRESS PROGRAM RELOCATION
SR03=1, SUPPRESS END OF PASS TYPEOUT
SR09=1, HOLD DATA 1 CONSTANT
SR10=1, HOLD DATA 2 CONSTANT
SR11=1, HOLD INSTRUCTION CONSTANT

4.3 OPERATOR ACTION

4.3.1 SET SR TO 0200

4.3.2 PRESS LOAD ADDRESS SWITCH

4.3.3 SET SR TO 0000

4.3.4 PRESS CLEAR AND CONTINUE SWITCHES

5. OPERATING PROCEDURE

SAME AS 4.

6. ERRORS

6.1 RELOCATION ERROR

IF AN ERROR OCCURS DURING PROGRAM RELOCATION, THE PROGRAM WILL HALT AT 234 OR 6634, DEPENDING UPON WHETHER THE PROGRAM IS LOCATED LOW OR HIGH.

6.2 DATA ERRORS

IF THE LINK IS SET AFTER COMPLETION OF THE AND INSTRUCTION, OR IF THE RESULTS OF THE AND INSTRUCTION ARE INCORRECT, THE PROGRAM WILL HALT AT 731(7331) WITH DATA1 IN THE AC.

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

6.3 ERROR RECOVERY

6.3.1 RELOCATION ERROR

RELOAD PROGRAM

6.3.2 DATA ERROR

SEE 6.2

6.4 LOOPING

SET SR00=1 TO PREVENT HALT AFTER ERROR,

SET SR02=1 TO PREVENT RELOCATION,

SET SR03=1 TO SUPPRESS END OF PASS TYPEOUT,

SET SR09-SR11=1 TO HOLD INSTRUCTION AND DATA CONSTANT.

7. RESTRICTIONS

NONE

8. EXECUTION TIME

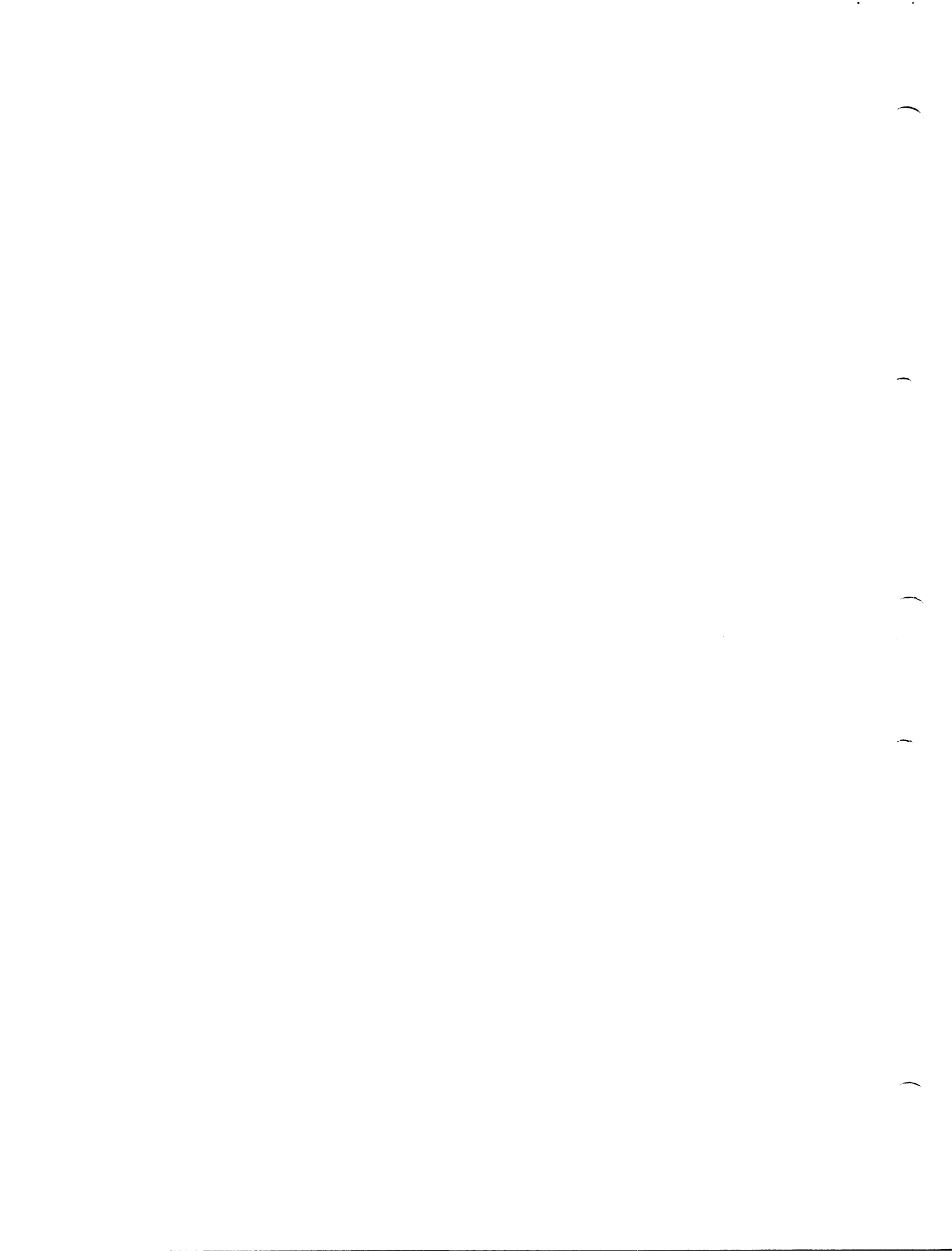
THE PROGRAM PERFORMS 4096 RANDOM TESTS IN APPROXIMATELY 2 SECONDS AND THEN RELOCATES. THE PROGRAM WILL TYPE "A" AFTER EACH 4096 RANDOM TESTS UNLESS SR03=1.

9. PROGRAM DESCRIPTION

THE PROGRAM IS INITIALLY LOADED INTO LOCATIONS 0200-1177, WITH TEMPORARY STORAGE LOCATIONS ON PAGE 0. AFTER INITIAL KEYSART, THE PROGRAM WILL SAVE RIM AND BIN LOADERS IN PAGE 0 AND WILL THEN PROCEED TO USE LOCATIONS 1200-7777 AS A TEST AREA.

THE PROGRAM USES SEPARATE RANDOM NUMBER GENERATORS TO GENERATE THE AND INSTRUCTION, INSTRUCTION AND DATA ADDRESSES, AND THE TWO ARGUMENTS TO BE "ANDED". THE INSTRUCTIONS AND DATA ARE STORED IN THEIR PREVIOUSLY GENERATED ADDRESSES. THE PROGRAM TRANSFERS TO THE LOCATION OF THE INSTRUCTION AND EXECUTES IT. THE PROGRAM THEN TRANSFERS TO A COMPARISON ROUTINE WHERE THE ACTUAL RESULT OF THE AND INSTRUCTION IS COMPARED TO A SIMULATED AND.

AFTER 4096 TESTS, THE PROGRAM TYPES "A", RELOCATES, AND CONTINUES TESTING.



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 /V 82 07552

/TEMPORARY TRANSFER LOCATIONS ON PAGE 0

0000	*0	TTANDL, 0	/STORAGE FOR AND INSTRUCTION
0001		INSTL, JMP	
0002		INADDL, 2	/STORAGE FOR AND INSTRUCTION ADDRESS
0003		DATADL, 3	/STORAGE FOR DATA ADDRESS
0004		IFLAGL, 3	/STORAGE FOR INSTRUCTION INDIRECT FLAG
0005		PADDL, 0	/STORAGE FOR DATA INDIRECT ADDRESS
0006		LIML, 0	
0007		PAGL, 0	

0010	*10	PNTRL, 0
------	-----	----------

6007	CAF=6007
7501	MQA=7501
7421	MOLE=7421
0266	CNTRL=LOWIL
0020	

0020	*20	TEMP3L, 0
------	-----	-----------

/INITIALIZATION AND CONTROL ROUTINES

0200	*200	STARTL, CAF	/SAVE RIM AND BIN IN PAGE 0
6007		TAD	/ONLY AT INITIAL KEYSTART
1204		DCA	/201 BECOMES JMP SETLKL
3201		JMS SAVBNL	/FOR ALL FUTURE PASSES
4205		JMP SETLKL	
5274			

/TRANSFER RIM AND BIN LOADERS TO PAGE 0

0205	0000	SAVBNL, 0	/SET AC=-200, NUMBER OF
0206	1374	TAD	/LOCATIONS TO BE TRANSFERRED
0207	3266	DCA	/FIRST "FROM"
0210	1374	TAD	/LOCATION=7600
0211	3202	DCA	/FIRST "TO" LOCATION=0
0212	3203	DCA	/PERFORM TRANSFER
0213	4225	JMS RELOL	
0214	5625	JMP I SAVBNL	/EXIT

/TRANSFER RIM AND BIN LOADERS TO PAGE 37

```

0215 0000 RESBNL, 0
0216 1374 TAD C7600L
0217 3266 DCA CNTR1L
0220 3202 DCA PNTR1L
0221 1374 TAD C7600L
0222 3203 DCA PNTR2L
0223 4225 JMS RELOL
0224 5615 JMP I RESBNL
/
/SET AC=-200, NUMBER OF
/LOCATIONS TO BE TRANSFERRED
/FIRST "FROM" ADDRESS=0
/FIRST "TO"
/ADDRESS=7600
/PERFORM TRANSFER
/EXIT

```

/DATA TRANSFER ROUTINE

```

0225 0000 RELOL, 0
0226 1602 TAD I PNTR1L
0227 3603 DCA I PNTR2L
0230 1602 TAD I PNTR1L
0231 7041 CIA
0232 1603 TAD I PNTR2L
0233 7640 SZA CLA
0234 7402 HLT
0235 2202 ISZ PNTR1L
0236 7000 NOP
0237 2203 ISZ PNTR2L
0240 7000 NOP
0241 2266 ISZ CNTR1L
0242 5226 RELOL+1
0243 5625 JMP I RELOL
/
/TRANSFER PROGRAM TO UPPER MEMORY

```

```

/GET DATA
/TRANSFER
/GET DATA
/COMPARE
/TRANSFER ERROR
/NEXT "FROM" LOCATION
/NEXT "TO" LOCATION

```

/TRANSFER PROGRAM TO UPPER MEMORY

```

0244 4215 REHL, 0
0245 1373 JMS RESBNL
0246 3266 TAD C7000L
0247 1365 DCA CNTR1L
0250 3202 DCA PNTR1L
0251 1372 TAD C6600L
0252 3203 DCA PNTR2L
0253 4225 JMS RELOL
0254 5772 JMP I C6600L
/
/TRANSFER RIM AND BIN LOADERS
/SET AC=-1000, NUMBER OF
/LOCATIONS TO BE TRANSFERRED
/FIRST "FROM"
/ADDRESS=200
/ADDRESS=6600
/PERFORM TRANSFER
/GO TO PROGRAM START

```

/TRANSFER PROGRAM TO LOWER MEMORY

```

0255 4205 REHL, 0
0256 1373 JMS SAVBNL
0257 3266 TAD C7200L
0260 1372 DCA CNTR1L
0261 3202 TAD C6600L
0262 1365 DCA PNTR1L
0263 3203 TAD C200L
0264 4225 DCA PNTR2L
0265 5765 JMP I C200L
/
/TRANSFER RIM AND BIN LOADERS
/SET AC=-1000, NUMBER OF
/LOCATIONS TO BE TRANSFERRED
/FIRST "FROM"
/ADDRESS=6600
/FIRST "TO"
/ADDRESS=200
/PERFORM TRANSFER
/GO TO PROGRAM START

```



```

/ DETERMINE IF PROGRAM IS IN LOWER OR UPPER MEMORY
/
LOHIL,
0000 /PC
0266 CLA CLL CML RAR /SET AC=4000
0267 TAD , -2 /ADD PC
0270 SEL CLA /IS LINK=0
0271 TAD C6400L /NO, HIGH CORE
0272 JMP I LOHIL /RETURN
0273
/ TRANSFER TO LINKAGE GENERATION
/
SETLKL,
0274 CLA CLL /CLEAR PASS COUNTER
0275 DCA PNTR1L /DETERMINE IF PROGRAM IS HIGH OR LOW
0276 JMS LOHIL /GO TO TEST WITH ADDRESS MODIFIER IN AC
0277 JMP GOSLTL
/ SIMULATE LOGICAL AND WITH A AND B=NOT((NOTA)OR(NOTB))
/
SANDL,
0300 /NOTA
0301 CMA /SAVE NOTA
0302 DCA TEMP1L /GET B
0303 MQA /NOTB
0304 CMA /SAVE NOTB
0305 MQL TAD /GET NOTA
0306 TAD TEMP1L /OR WITH NOTB
0307 MQA /COMPLEMENT
0310 CMA /EXIT WITH RESULT IN AC
0311 JMP I SANDL
/ TEST SWITCHES
/
SWITCL,
0312 /SAVE TEST BIT
0313 MQL /GET SWITCHES
0314 LAS /AND SWITCHES WITH TEST BIT
0315 JMS SANDL /IS SWITCH 0
0316 SNA CLA /NO SKIP INSTRUCTION AFTER RETURN
0317 ISZ SWITCL
0320 JMP I SWITCL
/ END OF PASS
/
EPASL,
0321 /END OF PASS ?
0322 ISZ PNTR1L /NO, RETURN
0323 JMP I EPASL
0324 CLA CLL CML RTR /SET AC=4000
0325 RTR /TEST SR03
0326 JMS SWITCL /SUPPRESS END OF PASS TYPEOUT
0327 JMP ,*7 /TYPE CARRIAGE RETURN
0330 TAD C215L
0331 JMS TYPEL
0332 TAD C212L

```

```

0333 4337 JMS TYPEL /TYPE LINEFEED
0334 4370 TAD A /TYPE A
0335 4337 JMS TYPEL /TEST FOR HALT, RELOCATION
0336 5345 JMP HALT /
/OUTPUT CHARACTER
/
0337 0000
0340 6046 TLS
0341 6041 TSF
0342 5341 JMP
0343 7200 CLA
0344 5737 JMP I TYPEL

```

```

TYPEL,
0337 0000
0340 6046 TLS
0341 6041 TSF
0342 5341 JMP
0343 7200 CLA
0344 5737 JMP I TYPEL

HALT,
0345 7332 CLA CLL CML RTR /CHECK FOR HALT
0346 4312 JMS SWITCH /
0347 7410 SKP /SET AC=2000
0350 5355 JMP RRELL /TEST SR01
0351 4266 JMS LOHIL /SR01=1, HALT
0352 7650 SNA CLA /CHECK FOR RELOCATION
0353 4215 JMS RESBNL /DETERMINE IF PROGRAM IS HIGH OR LOW
0354 7402 HLT /AC=0, PROGRAM LOW
/PROGRAM LOW, RESTORE LOADERS

```

```

/CHECK FOR RELOCATION
0355 7332 CLA CLL CML RTR /SET AC=1000
0356 7010 RAR /TEST SR02
0357 4312 JMS SWITCH /SR02=1, DO NOT RELOCATE PROGRAM
0360 5721 JMP I EPASL /DETERMINE IF PROGRAM IS HIGH OR LOW
0361 4266 JMS LOHIL /AC=0, PROGRAM LOW
0362 7650 SNA CLA /PROGRAM LOW, RELOCATE TO HIGH CORE
0363 5244 JMP REHL /PROGRAM HIGH, RELOCATE TO LOW CORE
0364 5255 JMP RELL
0365 0200 C200L,
0366 0215 C215L,
0367 0212 C212L,
0370 0301 A,
0371 6400 C6402L,
0372 6600 C6602L,
0373 7000 C7002L,
0374 7600 C7602L,

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```

0377 7000 G0SETL,
*377 NOP

```


PAL10

V141

11-NOV-70

21:30

PAGE 1-6

0660 7630 SZL CLA /ADDRESS IS AUTO-INDEX REGISTER
 0661 7040 CMA /GET INDIRECT ADDRESS
 0662 1367 TAD TPADDL /STORE IN TEST LOCATION
 0663 3766 DCA I TDATAI /GET DATA
 0664 1370 TAD TDA1L /STORE IN TEST LOCATION
 0665 3767 DCA I TPADDL /GET DATA
 0666 5271 JMP DOTSTL /STORE IN TEST LOCATION
 0667 1370 TAD TDA1L /STORE IN TEST LOCATION
 0670 3766 DCA I TDATAI /STORE IN TEST LOCATION

DIRL,

/SIMULATE "AND"

0671 7300 DOTSTL, CLA CLL /GET DATA1
 0672 1370 TAD TDA1L /SAVE IN MQ
 0673 7421 MQL TAD TDA2L /GET DATA2
 0674 1371 TAD TANDL /DO SIMULATION
 0675 4755 DCA I TSIML /SAVE ANSWER
 0676 3372 /

0677 1356 DOANDL, TAD TRETTL /GET RETURN ADDRESS
 0700 3000 DCA TTANDL /SAVE
 0701 1564 TAD TINADL /GET INSTRUCTION ADDRESS
 0702 7001 IAC /INCREMENT
 0703 7450 SNA /IS IT 0
 0704 5200 JMP TEST1L /YES, GENERATE NEW INFORMATION
 0705 3353 DCA TEMP2L /NO, SAVE
 0706 1373 TAD T5000L /GET RETURN INSTRUCTION
 0707 3753 DCA I TEMP2L /PUT IN TEST LOCATION
 0710 1371 TAD TDA2L /GET DATA2
 0711 5764 JMP I TINADL /EXECUTE "AND"

/RETURN HERE AFTER EXECUTION

0712 3377 TRETUL, DCA TRACL /SAVE AC
 0713 7430 SZL /IS LINK=1
 0714 4324 JMS ERROR /LINK=1, ERROR
 0715 1372 TAD TSIML /GET SIMULATION RESULT
 0716 7041 CIA /ADD REAL RESULT
 0717 1377 TAD TRACL /ARE THEY THE SAME
 0720 7640 SEA CLA /NO, ERROR
 0721 4324 JMS I TEPASL /END OF PASS
 0722 4760 JMP TEST1L /

0724 0000 ERROR, 0 /
 0725 7330 CLA CLL CML RAR /SET AC=4000
 0726 4757 JMS I TSMITL /TEST SR00

1002 4340 JMS RANDL /GENERATE RANDOM NUMBER
 1003 3367 DCA R1L /SAVE NUMBER
 1004 1367 TAD R1L
 1005 7421 MQL TAD
 1006 1007 TAD PAGL /OR RANDOM NUMBER WITH EXCLUSION BIT
 1007 7501 MQA
 1010 7421 MQL
 1011 1371 TAD K0777 /MASK OFF JMSB
 1012 4400 JMS I TTANDL /TO GET "0" OP CODE
 1013 3001 DCA INSTL /SAVE INSTRUCTION
 1014 1001 TAD INSTL /GET INSTRUCTION
 1015 4354 JMS AND17L /EXTRACT PAGE ADDRESS OF INSTRUCTION
 1016 3020 DCA TEMP3L /SAVE PAGE ADDRESS OF INSTRUCTION

/GENERATE ADDRESS FOR INSTRUCTION

GANADL, 1017 1372 TAD R2L /GENERATE RANDOM NUMBER
 1020 4340 JMS RANDL /SAVE NUMBER
 1021 3372 DCA R2L /SET UP TO TEST ADDRESS LIMITS
 1022 4345 JMS CLIML
 1023 1372 TAD R2L /IS ADDRESS WITHIN LIMITS
 1024 7620 SNL CLA GANADL /NO, GENERATE NEW ADDRESS
 1025 5217 JMP TAD
 1026 1372 TAD R0L
 1027 1373 TAD SNL CLA /IS ADDRESS ON PAGE 0
 1030 7620 SNL 7620 /NO
 1031 5246 JMP PAGADL /GET PAGE ADDRESS OF INSTRUCTION
 1032 1020 TAD TEMP3L /SUBTRACT ADDRESS
 1033 7041 CIA /IS DIFFERENCE >2
 1034 1372 TAD /NO
 1035 4361 JMS ABSL /GET PAGE ADDRESS OF INSTRUCTION
 1036 7700 SMA CLA /YES, GENERATE NEW INSTRUCTION
 1037 5217 JMP GANADL /YES, USE ADDRESS
 1040 1020 TAD TEMP3L /GENERATE ADDRESS FOR DATA
 1041 7650 SNA CLA /GET INSTRUCTION REFERENCE LOCATION 0
 1042 5201 JMP GANDL
 1043 1372 TAD R2L
 1044 3002 DCA INADDL
 1045 5261 JMP DAADL
 1046 1001 TAD INSTL

PAGADL, 1047 7421 MQL /GENERATE ADDRESS FOR DATA
 1050 1376 TAD K200L /GET INSTRUCTION
 1051 4400 JMS I TTANDL /MASK CURRENT PAGE BIT
 1052 7650 SNA CLA /IS PAGE BIT SET
 1053 5240 JMP PAL /NO, USE ADDRESS AS IS
 1054 1372 TAD R2L
 1055 4354 JMS AND17L
 1056 7041 CIA
 1057 1020 TAD TEMP3L
 1060 5235 JMP PAGAL

/GENERATE ADDRESS FOR DATA

4000
4100
4200
4300
4400
4500
4600
4700

5000
5100
5200
5300
5400
5500
5600
5700

6000
6100
6200
6300
6400
6500
6600
6700

7000
7100
7200
7300
7400
7500
7600
7700

TSIML 0772
TSWITL 0757
TTANDL 0000
TYPEL 0337

A	0J70	PADDL	0005
ABSL	1161	PADL	1111
AND17L	1154	PAGADL	1046
C200L	0365	PAGAL	1035
C212L	0367	PAGL	0007
C215L	0366	PAL	1040
C6400L	0371	PNTR1L	0202
C6600L	0372	PNTR2L	0203
C7000L	0373	PNTRL	0010
C7600L	0374	R1L	1157
CAF	6007	R2L	1172
CLIML	1145	R3L	1177
CNTR1L	0266	RANDL	1140
DAADL	1061	REHL	0244
DATADL	0003	RELL	0255
DIRL	0667	RELOL	0225
DOANDL	0677	RESBNL	0215
DOTSTL	0671	RRELL	0355
EPASL	0321	SANDL	0300
ERROR	0724	SAVBNL	0205
GANADL	1017	SETAL	0400
GANDL	1001	SETLKL	0274
GENL	1000	SETTL	0644
GOSETL	0377	STARTL	0200
GOTSTL	0577	SWITCL	0312
HALTL	0345	T3L	0774
IFLAGL	0004	T5400L	0773
INADDL	0002	T7760	0775
INDIRL	1077	T7770	0776
INSTL	0001	TANDL	0755
K0177L	1174	TDA1L	0770
K0777	1171	TDA2L	0771
K200L	1176	TDAT1L	0624
K3L	1170	TDAT2L	0634
K400L	1175	TDATAL	0766
L1201L	0451	TEMP1L	0204
L200L	0440	TEMP2L	0753
L6000L	0450	TEMP3L	0020
L7000L	0441	TEMPL	0437
LEPASL	0444	TERASL	0760
LGENL	0443	TEST1L	0600
LHICOL	0433	TEXT1L	0751
LIML	0006	TGENL	0754
L1STL	0442	TIFLGL	0765
LOHIL	0266	TINADL	0764
LRETUL	0446	TINSTL	0763
LSANDL	0445	TLIML	0762
LSWITL	0447	TPADDL	0767
M0A	7501	TPAGBL	0761
MQL	7421	TRACL	0777
P0AL	1106	TRETTL	0756
P0L	1173	TRETUL	0712

ERRORS DETECTED: 0
LINKS GENERATED: 0
RUN-TIME: 5 SECONDS
2K CORE USED

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