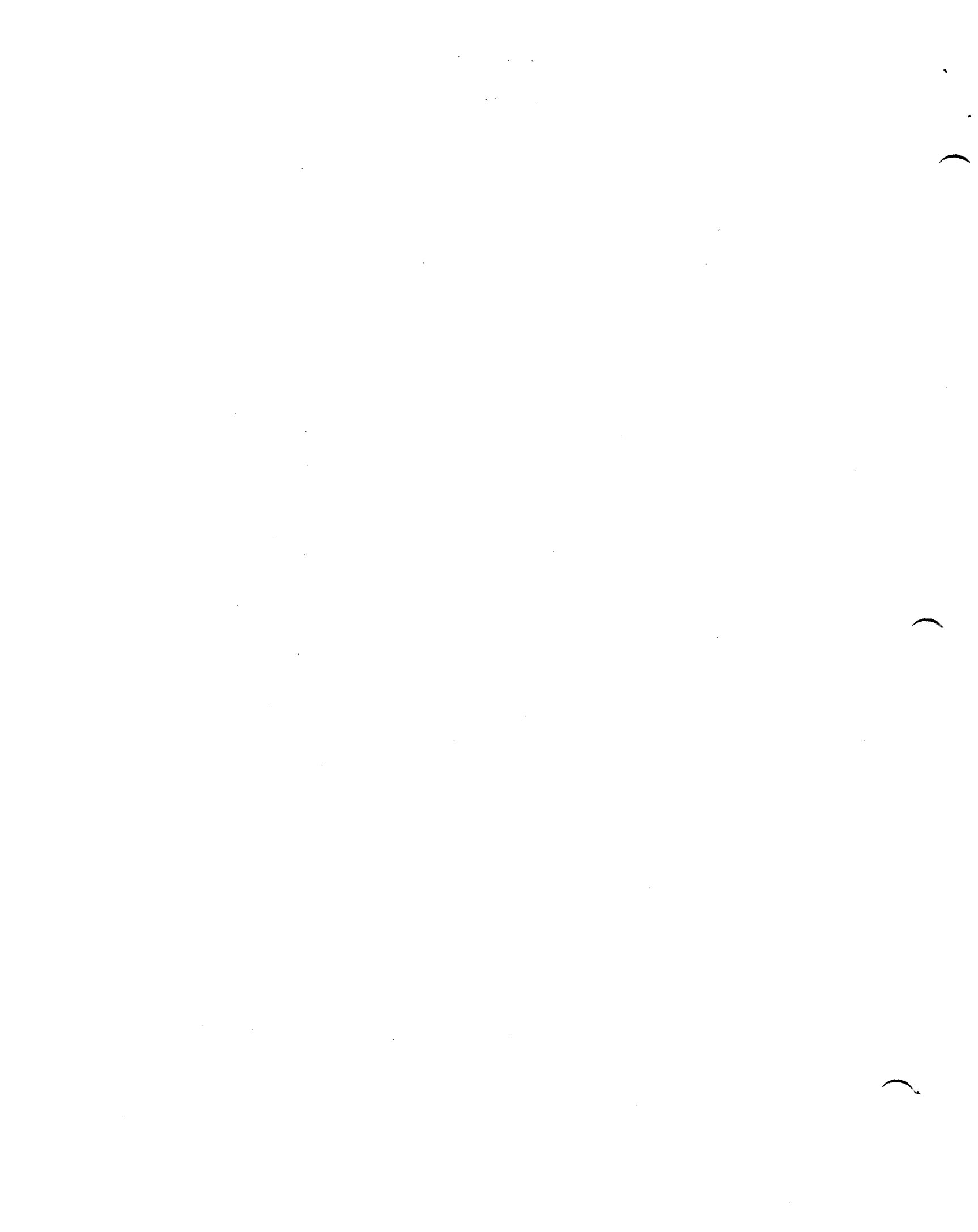


IDENTIFICATION

PRODUCT CODE: MAINDEC-6E-08JC-D
PRODUCT NAME: RANDOM JMP-JMS TEST
DATE CREATED: JUNE 11, 1971
MAINTAINER: DIAGNOSTIC GROUP
AUTHOR: BRUCE HANSEN

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1. ABSTRACT

THIS IS A DIAGNOSTIC PROGRAM TO TEST THE JMS INSTRUCTION OF THE PDP-8E. RANDOM FROM AND TO ADDRESSES ARE SELECTED FOR EACH TEST. THE JMP INSTRUCTION IS TESTED IN THAT EACH TEST REQUIRES A JMP TO REACH THE JMS.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-8E EQUIPPED WITH TELETYPE.

2.2 STORAGE

LOCATIONS 0000-0574

THE BINARY LOADER MUST BE STORED IN THE LAST MEMORY PAGE.

2.3 PRELIMINARY PROGRAMS

IT IS ASSUMED THAT MAINDEC-8E-00A(N), AND MAINDEC-8E-00B(N) HAVE BEEN RUN SUCCESSFULLY.

3. LOADING PROCEDURE

3.1 METHOD

USE THE STANDARD BINARY LOADER

4. STARTING PROCEDURE

4.1 CONTROL SWITCH SETTINGS

SR0(0) HALT ON ERROR,
SR2(1) HOLD THE FROM ADDRESS CONSTANT
SR2(0) SELECT RANDOM FROM ADDRESSES
SR3(1) HOLD THE TO ADDRESS CONSTANT
SR3(0) SELECT RANDOM TO ADDRESSES

4.2 STARTING ADDRESS

0200

RESTART ADDRESS = 0215

6.2 OPERATOR ACTION

- A. SET SR TO 0200 AND PRESS LOAD ADDRESS;
- B. IF IT IS DESIRED TO SET EITHER SR2 OR SR3, THE FROM OR TO ADDRESS MAY BE SPECIFIED BY ENTERING THE ADDRESS INTO THE LOCATIONS SHOWN BELOW

FROM = LOCATION 133
TO = LOCATION 134

IF SR2 OR SR3 IS SET AFTER THE PROGRAM HAS BEEN STARTED, THE LAST ADDRESS TAKEN FROM THE RANDOM NUMBER GENERATOR IS USED REPEATEDLY.

C. PRESS CLEAR, AND THEN CONT;

5. OPERATING PROCEDURE

SAME AS SECTION 4.

6. ERRORS

6.1 ERROR HALTS

ALL UNUSED MEMORY LOCATIONS ARE LOADED WITH HLT INSTRUCTIONS. IF THE PROGRAM EXECUTES ONE OF THESE BACKGROUND HALTS, IT IS PROBABLE THAT THE INTERRUPT FAILED TO OCCUR FOLLOWING THE JMS INSTRUCTION. THE FROM AND TO ADDRESS MAY BE CHECKED AT ANY TIME TO LOCATE THE TEST JMS INSTRUCTIONS.

6.2 ERROR PRINTOUTS

F XXXX TO YYYY

(TO) = MHHM

(NNNN) = RRRR

6.2.1 EXPLANATION

(FROM) F XXXX; XXXX = ADDRESS OF JMS INSTRUCTION BEING TESTED;

(TO) TO YYYY; YYYY = ADDRESS THAT THE JMS INSTRUCTION IS GOING TO.

(TO) = MHHM; MHHM = THE CONTENTS OF THE ADDRESS TO; THIS SHOULD EQUAL XXXX + 1.

(NNNN) = RRRR; NNNN IS THE ADDRESS MINUS ONE THAT WAS STORED IN LOCATION 0000 DURING THE INTERRUPT. RRRR IS THE CONTENT OF ADDRESS NNNN.

6.2.2 EXAMPLES

A. THE FOLLOWING IS A FORCED ERROR PRINTOUT WHERE NO ERROR OCCURRED.

F 5236 TO 6354
(TO) = 5237
(6354) = 5237

THE TEST JMS INSTRUCTION WAS IN LOCATION 5236. THE JMS WAS TRYING TO JUMP TO LOCATION 6354; THE CONTENTS OF TO (LOCATION 6354) WAS 5237. THIS IS CORRECT SINCE THE PC IS STORED ON A JMS INSTRUCTION.

TO GAIN ANY KNOWLEDGE FROM THE THIRD LINE OF THE PRINTOUT, THE USER MUST UNDERSTAND THE SEQUENCE OF EVENTS WHEN A JMS INSTRUCTION IS FOLLOWED BY AN INTERRUPT, AS AN END RESULT OF THIS SEQUENCE, THE ADDRESS OF THE LOCATION FOLLOWING THE CELL WHERE THE PC IS STORED IS PLACED INTO CELL 0; TO DERIVE THIS THIRD LINE OF THE PRINTOUT, THE ADDRESS IN CELL 0 IS DECREMENTED BY ONE AND PRINTED ON THE TELETYPE; THEN THE CONTENTS OF THAT ADDRESS ARE PRINTED.

B. THE FOLLOWING IS A TYPICAL ERROR PRINTOUT.

F 5236 TO 6354
(TO) = 7402
(4354) = 5237

LINE 1 IS AGAIN SIMPLY A STATEMENT OF THE PROBLEM, LINE 2 STATES THAT THE CONTENTS OF LOCATION 6354 ARE NOT 5237 AS THEY SHOULD BE, BUT ARE 7402 INSTEAD. 7402 IS A HLT INSTRUCTION, SINCE MEMORY IS FILLED WITH A BACKGROUND OF HLT ORDERS, IT IS EVIDENT THAT THE PC WAS NOT STORED IN LOCATION 6354 DURING THE JMS.

LINE 3 OF THE PRINTOUT REVEALS WHERE THE PC WAS STORED, SINCE ON THE INTERRUPT 4355 WAS STORED IN LOCATION ZERO AND (4354) CONTAINS THE CORRECTLY STORED PC, 5237, IT IS APPARENT THAT A JUMP ERROR OCCURRED. THE JMS INSTRUCTION SHOULD HAVE JUMPED TO 6354, BUT IT ACTUALLY JUMPED TO 4354, BIT 1 WAS LOST.

C. THE FOLLOWING IS ANOTHER TYPICAL ERROR PRINTOUT.

F 5236 TO 6354

(TO) = 7237

(6354) = 7237

LINE 1 IS AGAIN SIMPLY A STATEMENT OF THE PROBLEM, LINE 2 SAYS THAT THE CONTENTS OF LOCATION 6354 ARE NOT 5237 AS EXPECTED, BUT ARE INSTEAD 7237, SINCE THE CONTENTS ARE NOT A HLT ORDER, 7402. IT IS EVIDENT THAT THE PC WAS STORED HERE, BUT THE NUMBER STORED WAS WRONG, COMPARING THE GOOD (5237), AND THE BAD (7237). IT IS APPARENT THAT BIT 1 WAS "PICKED UP" DURING THE STORE PC OPERATION OF THE JMS INSTRUCTION.

6:3
ERROR RECOVERY

THE PROGRAM CONTINUES TESTING FOLLOWING AN ERROR PRINTOUT. WHEN ENOUGH INFORMATION HAS BEEN GATHERED FROM THE ERROR PRINTOUTS, A FROM AND TO ADDRESS IS SELECTED FOR USE IN THE SCOPE MODE LOOP. ENTER THE CHOSEN ADDRESSES INTO PROPER LOCATIONS (SEE SECTION 4.3.8). ENTER 5534 INTO LOCATION 1 AND RESTART THE PROGRAM WITH SR2 AND SR3 SET.

THE SCOPE MODE LOOP IS:

LOCATION	CODING
0000	JMP 1 PROMI
0001	A, ION
XXXX	JMS 1 TO
XXXX	FROM 1 A
0134	

TO DISCONTINUE THE SCOPE MODE LOOP, RESTORE THE ORIGINAL CONTENTS (7200) OF LOCATION 1 AND RESTART.

7: RESTRICTIONS

(NONE)

8: MISCELLANEOUS

8.1 EXECUTION TIME

4,726 RANDOM TESTS/SECOND

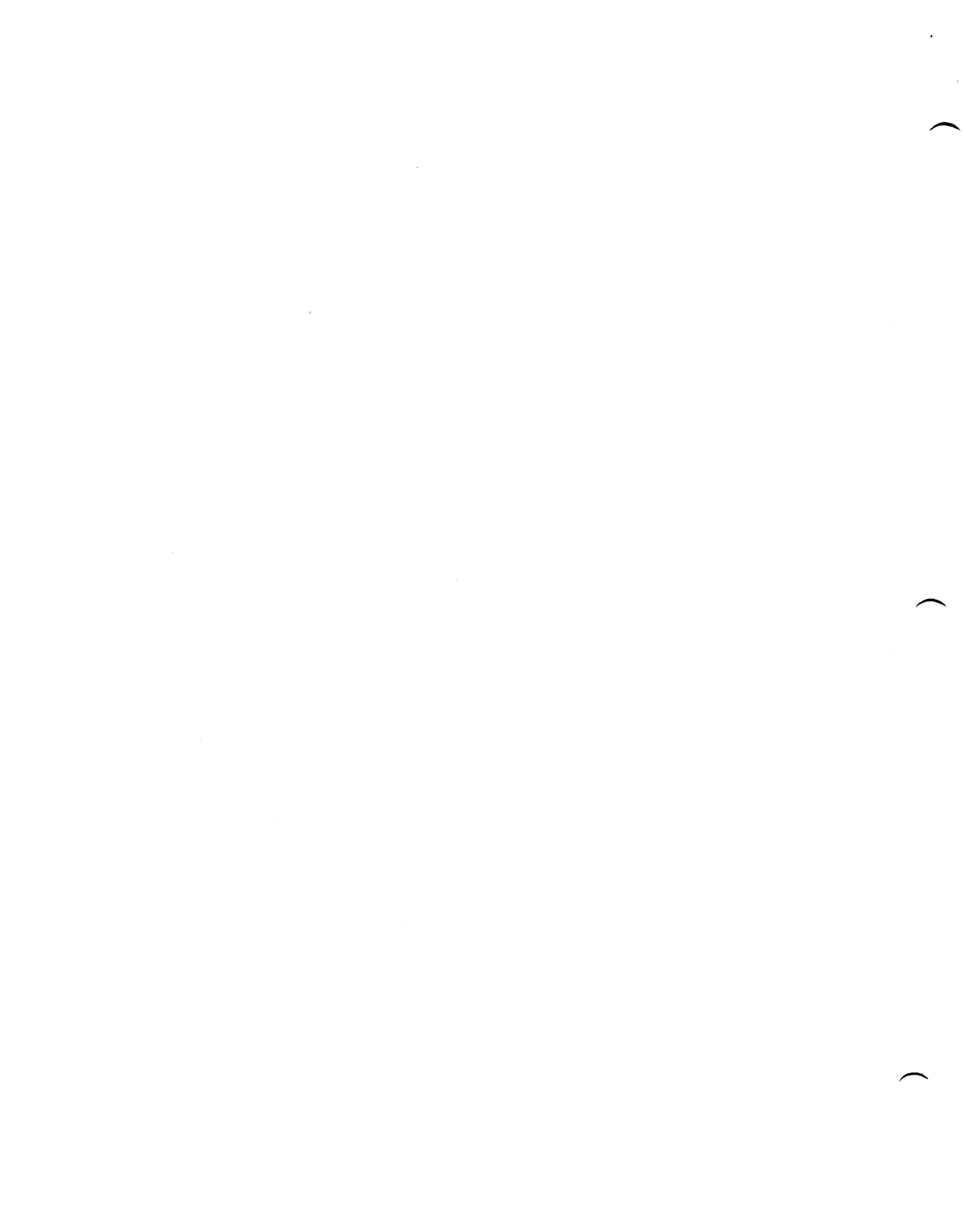
9. PROGRAM DESCRIPTION

THE JMS INSTRUCTION IS CHECKED THROUGH USE OF THE INTERRUPT FUNCTION. A RANDOM NUMBER GENERATOR SELECTS A FROM AND A TO ADDRESS. AN ION INSTRUCTION IS THEN PLACED AT FROM -1 AND THE JMS INSTRUCTION AT FROM. THE PROGRAM JUMPS TO THE ADDRESS SPECIFIED BY TO. AFTER EXECUTING THE ION AND JMS INSTRUCTIONS, AN INTERRUPT OCCURS STARTING THE PROGRAM COUNTER AT LOCATION I. A CHECKING ROUTINE LOCATED HERE VERIFIES THAT THE OPERATION WAS SUCCESSFUL BEFORE STARTING THE NEXT TEST.

RANDOM ADDRESSES ARE RESTRICTED AS FOLLOWS: 0600<RANDOM A ADDRESS<7600

THE AREA BETWEEN 0600 AND 7600 IS FILLED WITH HLT INSTRUCTIONS IN CASE THE INTERRUPT FAILS.

*JCM IS PRINTED AFTER EVERY 01,000 TESTS.




```

/RANDOM JMP-JMS TEST
/SR0(0)=HALT ON ERROR
/SR2(1)=FIXED FROM
/SR3(1)=FIXED TO
/SPREAD HALTS THROUGH MEMORY
/BETWEEN THE LIMLO AND LIMHI
/LIMITS

```

```

0200 *200
0201 4157 BEGIN, JMS PATCH /CLA
0202 1140 TAD LIMLO
0203 7041 CIA TO
0204 3131 DCA TO
0205 1155 TAD HALT
0206 3531 DCA I TO
0207 1131 TAD TO
0208 7001 IAC
0209 3131 DCA TO
0210 1131 TAD TO
0211 1141 TAD LIMHI
0212 7640 SZA CLA
0213 5204 JMP GON
0214 1045 TAD M15
0215 3044 DCA CTI
0216 3043 DCA CT
0217

```

/CHECK FOR FIXED FROM

```

0220 7604 LOOP, LAS
0221 7004 RAL
0222 7006 RTL
0223 7630 SEL CLA
0224 5246 JMP LOOP1=6

```

/GET RANDOM FROM

```

0225 1136 GETRAN, TAD RANUM
0226 7104 RAL CLL
0227 7430 SEL
0228 1137 TAD THREE
0229 3136 DCA RANUM
0230 1136 TAD RANUM
0231 7510 SPA
0232 5241 JMP ,+3
0233 1140 TAD LIMLO
0234 7710 SPA CLA
0235 5225 JMP GETRAN
0236 5244 JMP ,+4
0237 1141 TAD LIMHI
0238 7700 SMA CLA
0239 5225 JMP GETRAN
0240 1136 TAD RANUM

```

/RANDOM JMP=JMS TEST
0245 3133
0246 1133
0247 7001
0250 3135
0251 7040
0252 1133
0253 3134

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DCA FROM
TAD FROM
IAC
DCA FRMP1
CMA
TAD FROM
DCA FROM1

/CHECK FOR FIXED TO

LOOP1, LAS
RTL
RTL
SEL CLA
JMP CRCK=3

/GET RANDOM TO

GTRANI, TAD RANUM
RAL CLL
SEL THREE
DCA RANUM
TAD RANUM
SPA
JMP LIMLO
TAD LIMLO
SPA CLA
JMP GTRANI
JMP LIMHI
TAD LIMHI
SMA CLA
JMP GTRANI
TAD RANUM
DCA TO
TAD TO
IAC
DCA TOP1
TAD FROM
CRCK, CIA
TAD TO
SMA CLA
JMP LOOP

/BRING UP THE FLAG

CMA
TSF
TLS
TSF
JMP =1

/PLACE THE INSTRUCTIONS

0317 7200
 0320 1142
 0321 3534
 0322 1156
 0323 3533
 0324 3000

CLA
 TAD ITON
 DCA I FROM1
 TAD JMP1
 DCA I FROM
 DCA 0

760 DO IT

0325 5534
 0326 7402

JMP I FROM1
 HLT

/PRINTOUT SUBROUTINE

0327 0000
 0330 3146
 0331 1146
 0332 7012
 0333 7010
 0334 3145
 0335 1145
 0336 7012
 0337 7010
 0340 3144
 0341 1144
 0342 7012
 0343 7010
 0344 3143
 0345 5727

TYPAC, 0
 DCA SAVE+3
 TAD SAVE+3
 RTR
 RAR
 DCA SAVE+2
 TAD SAVE+2
 RTR
 RAR
 DCA SAVE+1
 TAD SAVE+1
 RTR
 RAR
 DCA SAVE
 JMP I TYPAC

0346 1044
 0347 7001
 0350 3044
 0351 1044
 0352 7640
 0353 5442
 0354 1393
 0355 3127
 0356 1127
 0357 7001
 0360 3127
 0361 1527
 0362 6046
 0363 6041
 0364 5363
 0365 1046
 0366 7640
 0367 5356
 0370 1045
 0371 3044
 0372 5442

7SUCCESS PRINTOUT
 SUP,
 TAD CTI
 IAC
 DCA CTI
 TAD CTI
 SEA CLA
 JMP I ALOOP
 TAD MSG2
 DCA WORK
 TAD WORK
 IAC
 DCA WORK
 TAD I WORK
 TLS
 TSF
 JMP I
 TAD M303
 SEA CLA
 JMP LPI
 TAD M15
 DCA CTI
 JMP I ALOOP

LPI,

0373 0373
0374 0215
0375 0212
0376 0312
0377 0303

AMSG2,
215
212
312
303

/CR
/LF
/J
/C

*0

0000
0001 5001
0002 0002
0003 0003
0004 0000
0005 0000
0006 7041
0007 1135
0010 7640
0011 5551
0012 1132
0013 7041
0014 1000
0015 7640
0016 5551
0017 1155
0020 3533
0021 1155
0022 3531
0023 7040
0024 1000
0025 3000
0026 1155
0027 3400
0030 1155
0031 3534
0032 7001
0033 1043
0034 3043
0035 1043
0036 7640
0037 5442
0040 5441
0041 0346
0042 0220
0043 0000
0044 0000
0045 7763
0046 7475

0 JMP 1
2
3
0
0 CIA FRMP1
YAD CLA
SEA CLA
JMP I AER
YAD TOP1
CIA
TAD 0
SEA CLA
JMP I AER
TAD HALT
DCA I FROM
TAD HALT
DCA I TO
CMA
TAD 0
DCA 0
TAD HALT
DCA I 0
YAD HALT
DCA I FROM1
IAC CT
TAD CT
DCA CT
YAD CT
SEA CLA
JMP I A LOOP
JMP I ,+1
SUP
LOOP

/FOR SCOPE MODE INSERT
/JMP I FROM 1 (5534) IN LOC1
/GET STORED ADDRESS

/ADDRESS STORED IN (TO) WRONG

/ADDRESS STORED IN (0) WRONG

RETURN,

AL00P,
CT,
CT1,
M15,
M303,

0047 0215
0050 0212
0051 0212
0052 0306
0053 0240
0054 0000

MSG1,
215
212
212
306
240
0
INS1,
0

/CR
/LF
/LF
/F = FROM
/SPACE
/X ADDRESS OF JMS INSTRUCTION

0055	0000	INS2,	0	/X
0056	0000	INS3,	0	/X
0057	0000	INS4,	0	/SPACE
0060	0240		240	/T
0061	0324		324	/O
0062	0317		317	/SPACE
0063	0240	INS5,	0	/X
0064	0000	INS6,	0	/X
0065	0000	INS7,	0	/X
0066	0000	INS8,	0	/CR
0067	0000		0	/LF
0070	0215		215	/RUBOUT
0071	0212		212	/T
0072	0377		377	/O
0073	0250		250	/SPACE
0074	0324	MSG2,	324	/SPACE
0075	0317		317	/SPACE
0076	0251		251	/SPACE
0077	0240		240	/SPACE
0100	0275		275	/SPACE
0101	0240		240	/SPACE
0102	0000	INS9,	0	/X STORED ADDRESS
0103	0000	INS10,	0	/X S/B FRMP1
0104	0000	INS11,	0	/X
0105	0000	INS12,	0	/X
0106	0215		215	/CR
0107	0212		212	/LF
0110	0377		377	/RUBOUT
0111	0250		250	/T
0112	0000	MSG3,	0	/X ADDRESS STORED
0113	0000	INS13,	0	/X IN LOC 0 AT INTERRUPT
0114	0000	INS14,	0	/X
0115	0000	INS15,	0	/X
0116	0251		251	/T
0117	0240		240	/SPACE
0120	0275		275	/SPACE
0121	0240		240	/SPACE
0122	0000	INS16,	0	/X CONTENTS OF ABOVE
0123	0000	INS17,	0	/X ADDRESS
0124	0000	INS18,	0	/X
0125	0000	INS19,	0	/X
0126	0207	WORK,	207	/END MARK
0127	0000	M207,	0	
0130	7571		=207	

CONSTANTS

0131	0000	TO,	0
0132	0000	TOP1,	0
0133	0000	FROM,	0
0134	0000	FROM1,	0
0135	0000	FRMP1,	0
0136	2525	RANUM,	2525
0137	0003	THREE,	3

PAL10	V141	V141
LIMLO,	-600	
LIMHI,	-7600	
ITON,	ION	
SAVE,	0	
	0	
	0	
	0	
MSK7,	7	
TW6,	260	
AER,	ER	
ATYP,	TYPAC	
ATYPI,	TYPAC+1	
AMSGI,	MSG1	
HALT,	HLT	
JMP1,	JMS I TO	

/RESTORE THEN GO AWAY

PATCH,	0	
	DCA 0	
	TAD X1	
	DCA 1	
	TAD X2	
	DCA 2	
	TAD X3	
	DCA 3	
	TAD X4	
	DCA 4	
	DCA 5	
	JMP I PATCH	
X1,	CLA	
X2,	TAD I TO	/TAD I TO
X3,	JMP 6	
X4,	CLA	
X5,	200	

0400	0400	
0401	1204	
0402	3552	
0403	1133	
0404	5953	
0405	0405	
0406	1143	
0407	0147	
0410	1150	
0411	3054	
0412	1144	
0413	0147	
0414	1150	
0415	3055	
0416	1145	
0417	0147	

0417	1150	TAD TM6
0420	3056	DCA INS3
0421	1146	TAD SAVE+3
0422	0147	AND MSK7
0423	1150	TAD TM6
0424	3057	DCA INS4
0425	1231	TAD I+4
0426	3552	DCA I ATYP
0427	1131	TAD TO
0430	5553	JMP I ATYP1
0431	0432	I+1
0432	1143	TAD SAVE
0433	0147	AND MSK7
0434	1150	TAD TM6
0435	3064	DCA INS5
0436	1144	TAD SAVE+1
0437	0147	AND MSK7
0440	1150	TAD TM6
0441	3065	DCA INS6
0442	1145	TAD SAVE+2
0443	0147	AND MSK7
0444	1150	TAD TM6
0445	3066	DCA INS7
0446	1146	TAD SAVE+3
0447	0147	AND MSK7
0450	1150	TAD TM6
0451	3067	DCA INS8
0452	1236	TAD I+4
0453	3552	DCA I ATYP
0454	1531	TAD TO
0455	5553	JMP I ATYP1
0456	0457	I+1
0457	1143	TAD SAVE
0460	0147	AND MSK7
0461	1150	TAD TM6
0462	3102	DCA INS9
0463	1144	TAD SAVE+1
0464	0147	AND MSK7
0465	1150	TAD TM6
0466	3103	DCA INS10
0467	1145	TAD SAVE+2
0470	0147	AND MSK7
0471	1150	TAD TM6
0472	3104	DCA INS11
0473	1146	TAD SAVE+3
0474	0147	AND MSK7
0475	1150	TAD TM6
0476	3105	DCA INS12
0477	7040	CMA 0
0500	1000	TAD 0
0501	3000	DCA 0
0502	1306	TAD I+4

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0570	5356	JMP TYPE
0571	7684	LAS
0572	7788	SMA CLA
0573	7402	HLT
0574	5817	JMP RETURN

/HALT ON ERROR

S

