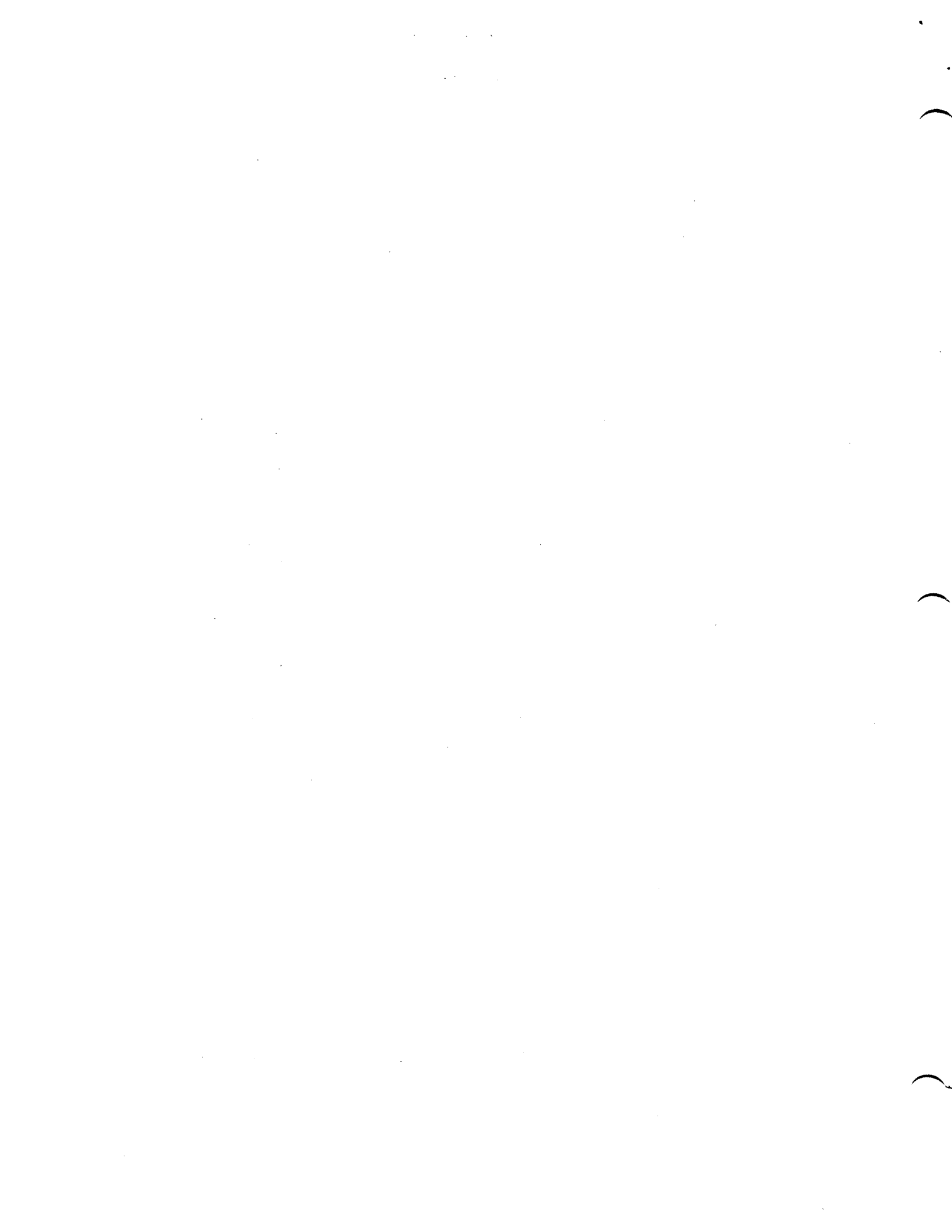


IDENTIFICATION

PRODUCT CODE: MAINDEC-6E-DBJC-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 SAYS 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 PRINTOUT, 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 5334 INTO LOCATION 1 AND RESTART THE PROGRAM WITH SR2 AND SR3 SET.

THE SCOPE MODE LOOP IS:

LOCATION	CODING
0000	JMP 1 FROM 1
0001	A. ION
XXXX	JMS 1 TO
XXXX	FROM 1 A
B134	

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.

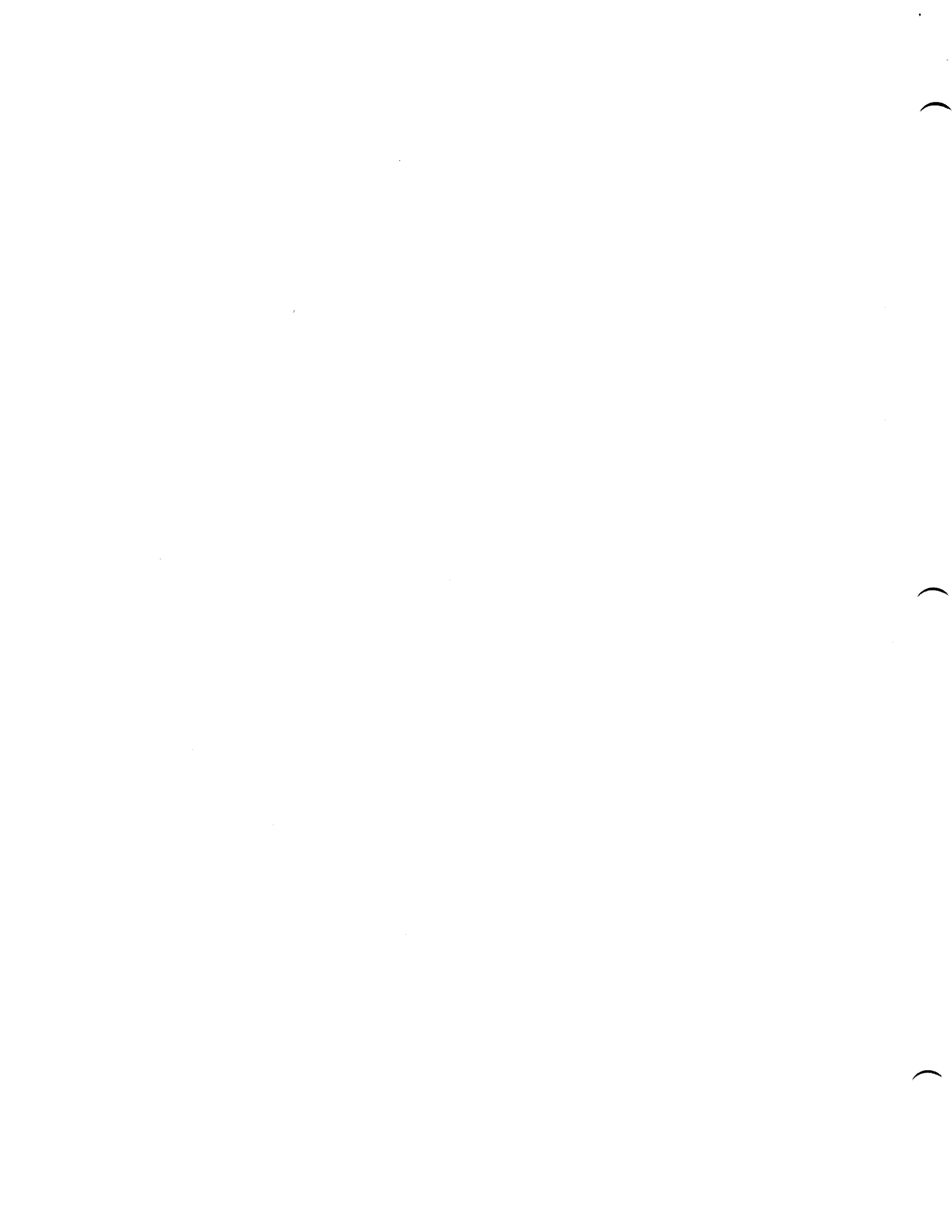
PROGRAM DESCRIPTION

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 1. 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 CT1
0216 3043 DCA CT

```

/CHECK FOR FIXED FROM

```

0220 7004 LOOP, LAS
0221 7004 RAL
0222 7006 RTL
0223 7030 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

0254 7004 LOOPI, LAS
0255 7006 RTL
0256 7006 RTL
0257 7630 SEL CLA
0260 5302 JMP CRCK=3

/GET RANDOM TO

0261 1136 GTRAN1, TAD RANUM
0262 7104 RAL CLL
0263 7430 SEL THREE
0264 1137 TAD RANUM
0265 3136 DCA RANUM
0266 1136 TAD RANUM
0267 7510 SPA
0270 5275 JMP LIMLO
0271 1140 TAD LIMLO
0272 7710 SPA CLA
0273 5261 JMP GTRAN1
0274 5300 JMP LIMLO
0275 1141 TAD LIMLO
0276 7700 SMA CLA
0277 5261 JMP GTRAN1
0300 1136 TAD RANUM
0301 3131 DCA TO
0302 1131 TAD TO
0303 7001 IAC
0304 3132 DCA TOP1
0305 1133 TAD FROM
0306 7041 CIA
0307 1131 TAD TO
0310 7650 SNA CLA
0311 5220 JMP LOOP

CRCK,

/BRING UP THE FLAG

0312 7040 CMA
0313 6041 TSF
0314 6046 TLS
0315 6041 TSF
0316 5315 JMP LIMLO

/PLACE THE INSTRUCTIONS

0317	7200	CLA
0320	1142	TAD ITON
0321	3534	DCA I FROM1
0322	1156	TAD JMP1
0323	3533	DCA I FROM
0324	3000	DCA 0

7GO DO IT

0325	5534	JMP I FROM1
0326	7402	HLT

/PRINTOUT SUBROUTINE

0327	0000	TYPAC, 0
0330	3146	DCA SAVE+3
0331	1146	TAD SAVE+3
0332	7012	RTR
0333	7010	RAR
0334	3145	DCA SAVE+2
0335	1145	TAD SAVE+2
0336	7012	RTR
0337	7010	RAR
0340	3144	DCA SAVE+1
0341	1144	TAD SAVE+1
0342	7012	RTR
0343	7010	RAR
0344	3143	DCA SAVE
0345	5727	JMP I TYPAC

0346	1044	/SUCCESS PRINTOUT
0347	7001	SUP, TAD CTI
0350	3044	IAC CTI
0351	1044	DCA CTI
0352	7640	TAD CTI
0353	5442	SEA CLA
0354	1373	JMP I ALOOP
0355	3127	TAD MSG2
0356	1127	DCA WORK
0357	7001	TAD WORK
0360	3127	IAC
0361	1527	DCA WORK
0362	6046	TAD I WORK
0363	6041	TLS
0364	5363	TSP
0365	1046	JMP I
0366	7640	TAD M303
0367	5356	SEA CLA
0370	1045	JMP LPI
0371	3044	TAD M15
0372	5442	DCA CTI
		JMP I ALOOP

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0055	0000	INS2,	0	/X
0056	0000	INS3,	0	/X
0057	0000	INS4,	0	/X
0060	0240		240	/SPACE
0061	0324		324	/T
0062	0317		317	/O
0063	0240		240	/SPACE
0064	0000	INS5,	0	/X
0065	0000	INS6,	0	/X
0066	0000	INS7,	0	/X
0067	0000	INS8,	0	/X
0070	0215		215	/CR
0071	0212		212	/LF
0072	0377		377	/RUBOUT
0073	0250		250	/I
0074	0324	MS62,	324	/T
0075	0317		317	/O
0076	0251		251	/I
0077	0240		240	/SPACE
0100	0275		275	/S
0101	0240		240	/SPACE
0102	0000	INS9,	0	/X
0103	0000	INS10,	0	/X
0104	0000	INS11,	0	/X
0105	0000	INS12,	0	/X
0106	0215		215	/CR
0107	0212		212	/LF
0110	0377		377	/RUBOUT
0111	0200		200	/I
0112	0000	MS63,	0	/X
0113	0000	INS13,	0	/X
0114	0000	INS14,	0	/X
0115	0000	INS15,	0	/X
0116	0251		251	/I
0117	0240		240	/SPACE
0120	0275		275	/S
0121	0240		240	/SPACE
0122	0000	INS16,	0	/X
0123	0000	INS17,	0	/X
0124	0000	INS18,	0	/X
0125	0000	INS19,	0	/X
0126	0207	WORK,	207	/END MARK
0127	0000	M207,	0	
0130	7571		-207	

/X ADDRESS=1 STORED
 /X IN LOC 0 AT INTERRUPT
 /X S/B FRMP1
 /X CONTENTS OF ABOVE
 /X ADDRESS
 /X
 /CONSTANTS
 TO, 0
 TOP1, 0
 FROM1, 0
 FRMP1, 0
 RANUM, 2525
 THREE, 3

PAL10	V141	V141
LIMLO,	-600	
LIMHI,	-7600	
ITON,	ION	
SAVE,	0	
	0	
	0	
	0	
MSK7,	7	
TH6,	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	
1204	1204	
3552	3552	
1133	1133	
5553	5553	
0405	0405	
1143	1143	
0147	0147	
1150	1150	
3054	3054	
1144	1144	
0147	0147	
1150	1150	
3055	3055	
1145	1145	
0147	0147	

0417	1150	TAD TH6
0420	3056	DCA INS3
0421	1146	TAD SAVE+3
0422	0147	AND MSK7
0423	1150	TAD TH6
0424	3057	DCA INS4
0425	1231	TAD ,+4
0426	3552	DCA I ATYP
0427	1131	TAD TO
0430	5553	JMP I ATYP1
0431	0432	,+1
0432	1143	TAD SAVE
0433	0147	AND MSK7
0434	1150	TAD TH6
0435	3064	DCA INS5
0436	1144	TAD SAVE+1
0437	0147	AND MSK7
0440	1150	TAD TH6
0441	3065	DCA INS6
0442	1145	TAD SAVE+2
0443	0147	AND MSK7
0444	1150	TAD TH6
0445	3066	DCA INS7
0446	1146	TAD SAVE+3
0447	0147	AND MSK7
0450	1150	TAD TH6
0451	3067	DCA INS8
0452	1256	TAD ,+4
0453	3592	DCA I ATYP
0454	1531	TAD ,+0
0455	5553	JMP I ATYP1
0456	0457	,+1
0457	1143	TAD SAVE
0460	0147	AND MSK7
0461	1150	TAD TH6
0462	3102	DCA INS9
0463	1144	TAD SAVE+1
0464	0147	AND MSK7
0465	1150	TAD TH6
0466	3103	DCA INS10
0467	1145	TAD SAVE+2
0470	0147	AND MSK7
0471	1150	TAD TH6
0472	3104	DCA INS11
0473	1146	TAD SAVE+3
0474	0147	AND MSK7
0475	1150	TAD TH6
0476	3105	DCA INS12
0477	7040	CHA
0500	1000	TAD 0
0501	3000	DCA 0
0502	1306	TAD ,+4

0503	DCA I ATYP
0504	TAD 0
0505	JMP I ATYP1
0506	:+1
0507	TAD SAVE
0510	AND MSK7
0511	TAD TH6
0512	DCA MSG3
0513	TAD SAVE+1
0514	AND MSK7
0515	TAD TH6
0516	DCA INS13
0517	TAD SAVE+2
0520	AND MSK7
0521	TAD TH6
0522	DCA INS14
0523	TAD SAVE+3
0524	AND MSK7
0525	TAD TH6
0526	DCA INS15
0527	TAD :+4
0530	DCA I ATYP
0531	TAD I 0
0532	JMP I ATYP1
0533	:+1
0534	TAD SAVE
0535	AND MSK7
0536	TAD TH6
0537	DCA INS16
0540	TAD SAVE+1
0541	AND MSK7
0542	TAD TH6
0543	DCA INS17
0544	TAD SAVE+2
0545	AND MSK7
0546	TAD TH6
0547	DCA INS18
0550	TAD SAVE+3
0551	AND MSK7
0552	TAD TH6
0553	DCA INS19

0554	TAD MSG1
0555	DCA WORK
0556	TAD I WORK
0557	TLS
0560	TSF
0561	JMP :+1
0562	CLA IAC
0563	TAD WORK
0564	DCA WORK
0565	TAD I WORK
0566	TAD M207
0567	SEA CLA

TYPE.

/RANDOM JMP=JMS TEST PAL10 V141 17-JUN-71 11139 PAGE 108

0570	5356	JMP TYPE
0571	7604	LAS
0572	7700	SMA CLA
0573	7402	HLT
0574	5017	JMP RETURN

/HALT ON ERROR

S

