

IDENTIFICATION

PRODUCT CODE: MAINDEC-8E-DBJC-D
PRODUCT NAME: RANDOM JMP-JMS TEST
DATE CREATED: JUNE 11, 1971
MAINTAINER: DIAGNOSTIC GROUP
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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 HLTs, 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) = MMMM

(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) = MMMM: MMMM = 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.

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 FROM 1
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.

RESTRICTIONS

(NONE)

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	
0200	BEGIN,	JMS PATCH /CLA
0201	1140	TAD LIMLO
0202	7041	CIA
0203	3131	DCA TO
0204	1155	TAD HALT
0205	3531	DCA I TO
0206	1131	TAD TO
0207	7001	IAC
0210	3131	DCA TO
0211	1131	TAD TO
0212	1141	TAD LIMHI
0213	7640	SZA CLA
0214	5204	JMP GON
0215	1045	TAD M15
0216	3044	DCA CT1
0217	3043	DCA CT

/CHECK FOR FIXED FROM

0220	7604	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
0230	1137	TAD THREE
0231	3136	DCA RANUM
0232	1136	TAD RANUM
0233	7510	SPA
0234	5241	JMP ,+3
0235	1140	TAD LIMLO
0236	7710	SPA CLA
0237	5225	JMP GETRAN
0240	5244	JMP ,+4
0241	1141	TAD LIMHI
0242	7700	SMA CLA
0243	5225	JMP GETRAN
0244	1136	TAD RANUM

0245 3133 DCA FROM
 0246 1133 TAD FROM
 0247 7001 IAC
 0250 3135 DCA FRMP1
 0251 7040 CMA
 0252 1133 TAD FROM
 0253 3134 DCA FROM1

/CHECK FOR FIXED TO

0254 7604 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
 0271 1140 TAD LIMLO
 0272 7710 SPA CLA
 0273 5261 JMP GTRAN1
 0274 5300 JMP
 0275 1141 TAD LIMH
 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 :-1

/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

/GO 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 CT1
 0350 3044 IAC CT1
 0351 1044 DCA CT1
 0352 7640 TAD CT1
 0353 5442 SEA CLA
 0354 1373 JMP I AL00P
 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 TSF
 0365 1046 JMP I=1
 0366 7640 TAD M303
 0367 5356 SEA CLA
 0370 1045 JMP LPI
 0371 3044 TAD M15
 0372 5442 DCA CT1
 JMP I AL00P

0373	0373	AMSG2,	215	/CR	
0374	0215		212	/LF	
0375	0212		312	/J	
0376	0312		303	/C	
0377	0303				
0000	0000	*0			/FOR SCOPE MODE INSERT
0001	0000		0		/JMP I FROM 1 (5534) IN LOG1
0002	5001		JMP 1		/GET STORED ADDRESS
0003	0002		2		
0004	0003		3		
0005	0000		0		
0006	0000		0		
0007	7041		CIA		
0010	1135		TAD FRMP1		
0011	7640		SEA CLA		
0012	5551		JMP I AER		
0013	1132		TAD TOP1		
0014	7041		CIA		
0015	1000		TAD 0		
0016	7640		SEA CLA		
0017	5551		JMP I AER		
0020	1195	RETURN,	TAD HALT		
0021	3533		DCA I FROM		
0022	1155		TAD HALT		
0023	3531		DCA I TO		
0024	7040		CMA		
0025	1000		TAD 0		
0026	3000		DCA 0		
0027	1155		TAD HALT		
0030	3400		DCA I 0		
0031	1155		TAD HALT		
0032	3534		DCA I FROM1		
0033	7001		IAC CT		
0034	1043		TAD CT		
0035	3043		DCA CT		
0036	1043		TAD CT		
0037	7640		SEA CLA		
0040	5442		JMP I ALOOP		
0041	5441		JMP I ,+1		
0042	0346	AL00P,	SUP		
0043	0220	CT,	LOOP		
0044	0000	CT1,	0		
0045	0000	CT1,	0		
0046	7763	M13,	-15		
	7475	M303,	-303		
0047	0215	MSG1,	215	/CR	
0050	0212		212	/LF	
0051	0212		212	/LF	
0052	0306		306	/P = FROM	
0053	0240		240	/SPACE	
0054	0000	INS1,	0	/X ADDRESS OF JMS INSTRUCTION	

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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	MS02,	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	0250		250	/I
0112	0000	MS03,	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		207	/END MARK
0127	0000	WORK,	0	
0130	7571	MS07,	-207	

/CONSTANTS

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

0140 7200 LIMLO, -600
 0141 0200 LIMHI, -7600
 0142 6001 ITON, ION
 0143 0000 SAVE, 0
 0144 0000 0
 0145 0000 0
 0146 0000 0
 0147 0007 MSK7, 7
 0150 0260 TW6, 260
 0151 0400 AER, ER
 0152 0327 ATYP, TYPAC
 0153 0330 ATYP1, TYPAC+1
 0154 0047 AMSG1, MSG1

0155 7402 HALT, HLT
 0156 4531 JMP1, JMS I TO

/RESTORE THEN GO AWAY

0157 0000 PATCH, 0
 0160 3000 DCA 0
 0161 1172 TAD X1
 0162 3001 DCA 1
 0163 1173 TAD X2
 0164 3002 DCA 2
 0165 1174 TAD X3
 0166 3003 DCA 3
 0167 1175 TAD X4
 0170 3576 DCA I X5
 0171 5997 JMP I PATCH

0172 7200 X1, CLA
 0173 1531 X2, TAD I TO
 0174 5006 X3, JMP 6
 0175 7200 X4, CLA
 0176 0200 X5, 200

/TAD I TO

0400 0400 ER, TAD I+4
 0401 1204 DCA I ATYP
 0402 3552 TAD FROM
 0403 1133 JMP I ATYP1
 0404 0405 I+1
 0405 1143 TAD SAVE
 0406 0147 AND MSK7
 0407 1150 TAD TW6
 0410 3054 DCA INS1
 0411 1144 TAD SAVE+1
 0412 0147 AND MSK7
 0413 1150 TAD TW6
 0414 3055 DCA INS2
 0415 1145 TAD SAVE+2
 0416 0147 AND MSK7

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	TAD I ATYP
0454	1531	DCA I TO
0455	5553	JMP I ATYP1
0456	0457	.+1
0457	1143	TAD SAVE
0460	0147	AND MSK7
0461	1150	TAD TH6
0462	3182	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	CHM
0500	1000	TAD 0
0501	3000	DCA 0
0502	1306	TAD .+4

0503	3552	DCA I ATYP
0504	1000	TAD 0
0505	5553	JMP I ATYP1
0506	0507	:+1
0507	1143	TAD SAVE
0510	0147	AND MSK7
0511	1150	TAD TH6
0512	3112	DCA MSG3
0513	1144	TAD SAVE+1
0514	0147	AND MSK7
0515	1150	TAD TH6
0516	3113	DCA INS13
0517	1145	TAD SAVE+2
0520	0147	AND MSK7
0521	1150	TAD TH6
0522	3114	DCA INS14
0523	1146	TAD SAVE+3
0524	0147	AND MSK7
0525	1150	TAD TH6
0526	3115	DCA INS15
0527	1333	TAD :+4
0530	3552	DCA I ATYP
0531	1400	TAD I 0
0532	5553	JMP I ATYP1
0533	0534	:+1
0534	1143	TAD SAVE
0535	0147	AND MSK7
0536	1150	TAD TH6
0537	3122	DCA INS16
0540	1144	TAD SAVE+1
0541	0147	AND MSK7
0542	1150	TAD TH6
0543	3123	DCA INS17
0544	1145	TAD SAVE+2
0545	0147	AND MSK7
0546	1150	TAD TH6
0547	3124	DCA INS18
0550	1146	TAD SAVE+3
0551	0147	AND MSK7
0552	1150	TAD TH6
0553	3125	DCA INS19

0554	1154	TAD MSG1
0555	3127	DCA WORK
0556	1527	TAD I WORK
0557	6046	TLS
0560	6041	TSP
0561	5360	JMP :+1
0562	7201	CLA IAC
0563	1127	TAD WORK
0564	3127	DCA WORK
0565	1527	TAD I WORK
0566	1150	TAD M207
0567	7640	SEA CLA

TYPE.

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0570 5356
0571 7604
0572 7700
0573 7402
0574 5017

JMP TYPE
LAS
SMA CLA
HLT
JMP RETURN

/HALT ON ERROR

S

