

**IDENTIFICATION**  
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PRODUCT CODE: MAINDEC-8E-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  
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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  
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2.1 EQUIPMENT  
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PDP-8E EQUIPPED WITH TELETYPE.

2.2 STORAGE  
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LOCATIONS 0000-0574

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

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

3. LOADING PROCEDURE  
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3.1 METHOD  
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USE THE STANDARD BINARY LOADER

4. STARTING PROCEDURE  
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4.1 CONTROL SWITCH SETTINGS  
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SR0(0) WAIT 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

4.3 OPERATOR ACTION  
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- 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 131

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  
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SAME AS SECTION 4.

6. ERRORS  
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6.1 ERROR HALTS  
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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  
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F XXXX TO YYYY

(TO) = MMMM

(NNNN) = RRRR

6.2.1 EXPLANATION  
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(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, 7202, 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
8888	
8881	JMP 1 FROM 1
XXXX	A, ION
XXXX	JMS 1 TO
8134	FROM 1 A

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

7.

#### RESTRICTIONS

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(NONE)

8.

#### MISCELLANEOUS

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8.1 EXECUTION TIME

-----

4,726 RANDOM TESTS/SECOND

9. PROGRAM DESCRIPTION

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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 61,000 TESTS,

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/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	4157	BEGIN,	JMS PATCH	/CLA
0201	1140		TAD LIMLO	
0202	7041		CIA	
0203	3131		DCA TO	
0204	1155	GON,	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		SEA CLA	
0214	5204		JMP GON	
0215	1045		TAD M15	
0216	3044		DCA CTI	
0217	3043		DCA CT	

/CHECK FOR FIXED FROM

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

/GET RANDOM FROM

0225	1136	GETRAN,	TAD RANUM	
0226	7104		RAL CLL	
0227	7430		SZL	
0230	1137		TAD THREE	
0231	3136		DCA RANUM	
0232	1136		TAD RANUM	
0233	7510		SPA	
0234	5241		JMP ,+5	
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	LOOP1, 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
0264	1137	TAD THREE
0265	3136	DCA RANUM
0266	1136	TAD RANUM
0267	7510	SPA
0270	5275	JMP ,+5
0271	1140	TAD LIMLO
0272	7710	SPA CLA
0273	5261	JMP GTRAN1
0274	5300	JMP ,+4
0275	1141	TAD LIMHI
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	CRCK, TAD FROM
0306	7041	CIA
0307	1131	TAD TO
0310	7650	SNA CLA
0311	5220	JMP LOOP

/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

/SUCCESS PRINTOUT

0346	1044	SUP, TAD CT1
0347	7001	IAC
0350	3044	DCA CT1
0351	1044	TAD CT1
0352	7640	SEA CLA
0353	5442	JMP I ALOOP
0354	1373	TAD AMSG2
0355	3127	DCA WORK
0356	1127	LPI, TAD WORK
0357	7001	IAC
0360	3127	DCA WORK
0361	1527	TAD I WORK
0362	6046	TLS
0363	6041	TSP
0364	5363	JMP I=-1
0365	1046	TAD M303
0366	7640	SEA CLA
0367	5356	JMP LPI
0370	1045	TAD M15
0371	3044	DCA CT1
0372	5442	JMP I ALOOP

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0373 0373  AMMSG2, 1
0374 0215          215          /CR
0375 0212          212          /LF
0376 0312          312          /J
0377 0303          303          /C

0000 0000  *0
0000 0000          0          /FOR SCOPE MODE INSERT
0001 5001          JMP 1          /JMP I FROM 1 (5534) IN LOC1
0002 0002          2          /GET STORED ADDRESS
0003 0003          3
0004 0000          0
0005 0000          0
0006 7041          CIA
0007 1135          TAD FRMP1
0010 7640          SEA CLA
0011 5551          JMP I AER          /ADDRESS STORED IN (FO) WRONG
0012 1132          TAD TOP1
0013 7041          CIA
0014 1000          TAD 0
0015 7640          SEA CLA
0016 5551          JMP I AER          /ADDRESS STORED IN (0) WRONG
0017 1195  RETURN, TAD HALT
0020 3533          DCA I FROM
0021 1195          TAD HALT
0022 3531          DCA I FO
0023 7040          CMA
0024 1000          TAD 0
0025 3000          DCA 0
0026 1195          TAD HALT
0027 3400          DCA I 0
0030 1195          TAD HALT
0031 3534          DCA I FROM1
0032 7001          IAC
0033 1043          TAD CT
0034 3043          DCA CT
0035 1043          TAD CT
0036 7640          SEA CLA
0037 5442          JMP I ALOOP
0040 5441          JMP I ,+1
0041 0346          SUP
0042 0220  ALOOP, LOOP
0043 0000  CT, 0
0044 0000  CT1, 0
0045 7763  M19, -15
0046 7475  M303, -303

0047 0215  MSG1, 215          /CR
0050 0212          212          /LF
0051 0212          212          /LF
0052 0306          306          /F = 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	MSG2,	324	/T
0075	0317		317	/O
0076	0251		251	/)
0077	0240		240	/SPACE
0100	0275		275	/s
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	/I
0112	0000	MSG3,	0	/X ADDRESS=1 STORED
0113	0000	INS13,	0	/X IN LOC 0 AT INTERRUPT
0114	0000	INS14,	0	/X
0115	0000	INS15,	0	/X
0116	0251		251	/)
0117	0240		240	/SPACE
0120	0275		275	/s
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		207	/END MARK
0127	0000	WORK,	0	
0130	7571	M207,	-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

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

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 5597 JMP I PATCH

/RESTORE THEN GO AWAY

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 \*400

0400 1204 ER, TAD ,+4  
 0401 3552 DCA I ATYP  
 0402 1133 TAD FROM  
 0403 5553 JMP I ATYP1  
 0404 0405 ,+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 TW6
0420	3056	DCA INS3
0421	1146	TAD SAVE+3
0422	0147	AND MSK7
0423	1150	TAD TW6
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 TW6
0435	3064	DCA INS5
0436	1144	TAD SAVE+1
0437	0147	AND MSK7
0440	1150	TAD TW6
0441	3065	DCA INS6
0442	1145	TAD SAVE+2
0443	0147	AND MSK7
0444	1150	TAD TW6
0445	3066	DCA INS7
0446	1146	TAD SAVE+3
0447	0147	AND MSK7
0450	1150	TAD TW6
0451	3067	DCA INS8
0452	1256	TAD ,+4
0453	3552	DCA I ATYP
0454	1531	TAD TO
0455	5553	JMP I ATYP1
0456	0497	,+1
0457	1143	TAD SAVE
0460	0147	AND MSK7
0461	1150	TAD TW6
0462	3102	DCA INS9
0463	1144	TAD SAVE+1
0464	0147	AND MSK7
0465	1150	TAD TW6
0466	3103	DCA INS10
0467	1145	TAD SAVE+2
0470	0147	AND MSK7
0471	1150	TAD TW6
0472	3104	DCA INS11
0473	1146	TAD SAVE+3
0474	0147	AND MSK7
0475	1150	TAD TW6
0476	3105	DCA INS12
0477	7040	CMA
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 TW6
0512	3112	DCA MSG3
0513	1144	TAD SAVE+1
0514	0147	AND MSK7
0515	1150	TAD TW6
0516	3113	DCA INS13
0517	1145	TAD SAVE+2
0520	0147	AND MSK7
0521	1150	TAD TW6
0522	3114	DCA INS14
0523	1146	TAD SAVE+3
0524	0147	AND MSK7
0525	1150	TAD TW6
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 TW6
0537	3122	DCA INS16
0540	1144	TAD SAVE+1
0541	0147	AND MSK7
0542	1150	TAD TW6
0543	3123	DCA INS17
0544	1145	TAD SAVE+2
0545	0147	AND MSK7
0546	1150	TAD TW6
0547	3124	DCA INS18
0550	1146	TAD SAVE+3
0551	0147	AND MSK7
0552	1150	TAD TW6
0553	3125	DCA INS19
0554	1154	TAD AMSG1
0555	3127	DCA WORK
0556	1527	TYPE, TAD I WORK
0557	6046	TLS
0560	6041	TSF
0561	5360	JMP ,=1
0562	7201	CLA IAC
0563	1127	TAD WORK
0564	3127	DCA WORK
0565	1527	TAD I WORK
0566	1130	TAD M207
0567	7640	SZA CLA



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/RANDOM JMP-JMS TEST

PAL10

V141

17-JUN-71

11139

PAGE 1-8

0570 5356  
0571 7604  
0572 7700  
0573 7402  
0574 5017

JMP TYPE

LAS

SMA CLA

HLT

JMP RETURN

/HALT ON ERROR

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