

**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  
-----

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

4.3 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 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

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

-----

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,

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.B), ENTER 5534 INTO LOCATION 1 AND RESTART THE PROGRAM WITH SR2 AND SR3 SET.

#### THE SCOPE MODE LOOP IS:

LOCATION	CODING
0000	
0001	JMP 1 FROM 1
XXXX	A, ION
XXXX	JMS 1 TO
0134	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 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	4157	BEGIN,	JMS PATCH	/CLA
0201	1140		TAD LIMLO	
0202	7041		CIA	
0203	3131		DCA TO	
0204	1195	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		SZA CLA	
0214	5204		JMP GON	
0215	1045		TAD M15	
0216	3044		DCA CT1	
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 CRSCK-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 LIMH1
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	CRSCK, 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 MSG2
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	TSF
0364	5363	JMP I=I
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

0373	0373	AMSG2,		
0374	0215		215	/CR
0375	0212		212	/LF
0376	0312		312	/J
0377	0303		303	/C
	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	1155	RETURN,	TAD HALT	
0020	3533		DCA I FROM	
0021	1155		TAD HALT	
0022	3531		DCA I TO	
0023	7040		CMA	
0024	1000		TAD 0	
0025	3000		DCA 0	
0026	1155		TAD HALT	
0027	3400		DCA I 0	
0030	1155		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	M13,	=15	
0046	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 /(
0074 0324 MSG2, 324 /T
0075 0317 317 /O
0076 0251 251 /)
0077 0240 240 /SPACE
0100 0275 275 /=
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 /(
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 /=
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

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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	ATYPI,	TYPAC+i
0154	0047	AMSGI,	MSG1
0155	7402	HALT,	HLT
0156	4531	JMP1,	JMS I TO

0157	0000	PATCH,	0	/RESTORE THEN GO AWAY
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	5557	JMP	I PATCH	

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

	0400	*400		
0400	1204	ER,	TAD ,+4	
0401	3552		DCA I ATYP	
0402	1133		TAD FROM	
0403	5553		JMP I ATYPI	
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	1236	TAD ,+4
0453	3552	DCA I ATYP
0454	1531	TAD TO
0455	5553	JMP I ATYP1
0456	0457	,+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 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 AMSG1
0555	3127	DCA WORK
0556	1527	TAD I WORK
0557	6046	YLS
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

TYPE.

/RANDOM JMP=JMS TEST

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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