

ADVANCE COPY

This document subject to change
without notice.

IDENTIFICATION

PRODUCT CODE: MAINDEC-8E-DEJ8-D
PRODUCT NAME: RANDOM JHP-JHS TEST
DATE CREATED: DECEMBER 10, 1970
MAINTAINER: DIAGNOSTIC GROUP
AUTHOR: BRUCE HANSEN

1.. ABSTRACT

THIS IS A DIAGNOSTIC PROGRAM TO TEST THE JMP 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 00000-00074

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

2.3 PRELIMINARY PROGRAMS

IT IS ASSUMED THAT MAINTENANCE-02-00000 AND MAINTENANCE-02-00000 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.
SR1(0) HOLD THE FROM ADDRESS CONSTANT
SR2(0) SELECT RANDOM FROM ADDRESSES
SR3(0) HOLD THE TO ADDRESS CONSTANT
SR4(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

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.) 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 534 INTO LOCATION 1 AND RESTART THE PROGRAM WITH SR2 AND SR3 SET.

THE SCOPE MODE LOOP IS:

LOCATION	CODING
0000	
0001	JMP 1 FROM1
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

(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 MLT INSTRUCTIONS IN CASE THE INTERRUPT FAILS.

"JB" IS PRINTED AFTER EVERY 61,000 TESTS.

ADVANCE COPY
This document subject to char
without notice.

/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	0200	4157	BEGIN,	JMS PATCH	/CLA
0201	1140	0201	1140	TAD LIMLO	
0202	7041	0202	7041	CIA TO	
0203	3131	0203	3131	DCA TO	
0204	1155	0204	1155	TAD HALT	
0205	3531	0205	3531	DCA I TO	
0206	1131	0206	1131	TAD TO	
0207	7001	0207	7001	IAC	
0210	3131	0210	3131	DCA TO	
0211	1131	0211	1131	TAD TO	
0212	1141	0212	1141	TAD LIMHI	
0213	7640	0213	7640	SZA CLA	
0214	9204	0214	9204	JMP GON	
0215	1045	0215	1045	TAD M15	
0216	3044	0216	3044	DCA CT1	
0217	3043	0217	3043	DCA CT	

/CHECK FOR FIXED FROM

0220	7604	0220	7604	LOOP,	LAS
0221	7004	0221	7004	RAL	
0222	7006	0222	7006	RTL	
0223	7630	0223	7630	SZL CLA	
0224	9246	0224	9246	JMP LOOP1-6	

/GET RANDOM FROM

0225	1136	0225	1136	GETRAN,	TAD RANUM
0226	7104	0226	7104	RAL CLL	
0227	7430	0227	7430	SZL	
0230	1137	0230	1137	TAD THREE	
0231	3136	0231	3136	DCA RANUM	
0232	1136	0232	1136	TAD RANUM	
0233	7510	0233	7510	SPA	
0234	9241	0234	9241	JMP .+5	
0235	1140	0235	1140	TAD LIMLO	
0236	7710	0236	7710	SPA CLA	
0237	9225	0237	9225	JMP GETRAN	
0240	9244	0240	9244	JMP .+4	
0241	1141	0241	1141	TAD LIMHI	
0242	7700	0242	7700	SMA CLA	
0243	9225	0243	9225	JMP GETRAN	
0244	1136	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 THREE
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 9261 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 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

/SUCCESS PRINTOUT
SUP,

0346	1044	TAD CT1
0347	7001	IAC
0350	3044	DCA CT1
0351	1044	TAD CT1
0352	7640	SZA CLA
0353	5442	JMP I ALOOP
0354	1373	TAD MSG2
0355	3127	DCA WORK
0356	1127	TAD WORK
0357	7001	IAC
0360	3127	DCA WORK
0361	1527	TAD I WORK
0362	0046	TLS
0363	6041	TSF
0364	5363	JMP --1
0365	1046	TAD M302
0366	7640	SZA CLA
0367	5356	JMP LPI
0370	1045	TAD M15
0371	3044	DCA CT1
0372	5442	JMP I ALOOP

LP1,

0373	0373	AMSG2,	0	JMP 1	/FOR SCOPE MODE INSERT
0374	0215		2	JMP 1	/JMP 1 FROM 1 (5534) IN LOC1
0375	0212		3		/GET STORED ADDRESS
0376	0312		0		
0377	0302		0		
0000	0000		0		
0001	0001		0		
0002	0002		0		
0003	0003		0		
0004	0004		0		
0005	0005		0		
0006	7041		0		
0007	1135		0		
0010	7640		0		
0011	9551		0		
0012	1132		0		
0013	7041		0		
0014	1000		0		
0015	7640		0		
0016	9551		0		
0017	1135		0		
0020	3533		0		
0021	1155		0		
0022	3531		0		
0023	7040		0		
0024	1000		0		
0025	3000		0		
0026	1155		0		
0027	3400		0		
0030	1155		0		
0031	3534		0		
0032	7001		0		
0033	1043		0		
0034	3043		0		
0035	1043		0		
0036	7640		0		
0037	9442		0		
0040	9441		0		
0041	0346		0		
0042	0220		0		
0043	0000		0		
0044	0000		0		
0045	7763		0		
0046	7476		0		
0047	0215		0		
0050	0212		0		
0051	0212		0		
0052	0306		0		
0053	0240		0		
0054	0000		0		
0000	0000		0		
0001	0001		0		
0002	0002		0		
0003	0003		0		
0004	0004		0		
0005	0005		0		
0006	7041		0		
0007	1135		0		
0010	7640		0		
0011	9551		0		
0012	1132		0		
0013	7041		0		
0014	1000		0		
0015	7640		0		
0016	9551		0		
0017	1135		0		
0020	3533		0		
0021	1155		0		
0022	3531		0		
0023	7040		0		
0024	1000		0		
0025	3000		0		
0026	1155		0		
0027	3400		0		
0030	1155		0		
0031	3534		0		
0032	7001		0		
0033	1043		0		
0034	3043		0		
0035	1043		0		
0036	7640		0		
0037	9442		0		
0040	9441		0		
0041	0346		0		
0042	0220		0		
0043	0000		0		
0044	0000		0		
0045	7763		0		
0046	7476		0		
0047	0215		0		
0050	0212		0		
0051	0212		0		
0052	0306		0		
0053	0240		0		
0054	0000		0		
0000	0000		0		
0001	0001		0		
0002	0002		0		
0003	0003		0		
0004	0004		0		
0005	0005		0		
0006	7041		0		
0007	1135		0		
0010	7640		0		
0011	9551		0		
0012	1132		0		
0013	7041		0		
0014	1000		0		
0015	7640		0		
0016	9551		0		
0017	1135		0		
0020	3533		0		
0021	1155		0		
0022	3531		0		
0023	7040		0		
0024	1000		0		
0025	3000		0		
0026	1155		0		
0027	3400		0		
0030	1155		0		
0031	3534		0		
0032	7001		0		
0033	1043		0		
0034	3043		0		
0035	1043		0		
0036	7640		0		
0037	9442		0		
0040	9441		0		
0041	0346		0		
0042	0220		0		
0043	0000		0		
0044	0000		0		
0045	7763		0		
0046	7476		0		
0047	0215		0		
0050	0212		0		
0051	0212		0		
0052	0306		0		
0053	0240		0		
0054	0000		0		
0000	0000		0		
0001	0001		0		
0002	0002		0		
0003	0003		0		
0004	0004		0		
0005	0005		0		
0006	7041		0		
0007	1135		0		
0010	7640		0		
0011	9551		0		
0012	1132		0		
0013	7041		0		
0014	1000		0		
0015	7640		0		
0016	9551		0		
0017	1135		0		
0020	3533		0		
0021	1155		0		
0022	3531		0		
0023	7040		0		
0024	1000		0		
0025	3000		0		
0026	1155		0		
0027	3400		0		
0030	1155		0		
0031	3534		0		
0032	7001		0		
0033	1043		0		
0034	3043		0		
0035	1043		0		
0036	7640		0		
0037	9442		0		
0040	9441		0		
0041	0346		0		
0042	0220		0		
0043	0000		0		
0044	0000		0		
0045	7763		0		
0046	7476		0		
0047	0215		0		
0050	0212		0		
0051	0212		0		
0052	0306		0		
0053	0240		0		
0054	0000		0		
0000	0000		0		
0001	0001		0		
0002	0002		0		
0003	0003		0		
0004	0004		0		
0005	0005		0		
0006	7041		0		
0007	1135		0		
0010	7640		0		
0011	9551		0		
0012	1132		0		
0013	7041		0		
0014	1000		0		
0015	7640		0		
0016	9551		0		
0017	1135		0		
0020	3533		0		
0021	1155		0		
0022	3531		0		
0023	7040		0		
0024	1000		0		
0025	3000		0		
0026	1155		0		
0027	3400		0		
0030	1155		0		
0031	3534		0		
0032	7001		0		
0033	1043		0		
0034	3043		0		
0035	1043		0		
0036	7640		0		
0037	9442		0		
0040	9441		0		
0041	0346		0		
0042	0220		0		
0043	0000		0		
0044	0000		0		
0045	7763		0		
0046	7476		0		
0047	0215		0		
0050	0212		0		
0051	0212		0		
0052	0306		0		
0053	0240		0		
0054	0000		0		
0000	0000		0		
0001	0001		0		
0002	0002		0		
0003	0003		0		
0004	0004		0		
0005	0005		0		
0006	7041		0		
0007	1135		0		
0010	7640		0		
0011	9551		0		
0012	1132		0		
0013	7041		0		
0014	1000		0		
0015	7640		0		
0016	9551		0		
0017	1135		0		
0020	3533		0		
0021	1155		0		

17-FEB-71

V141

PAL10

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	/C
0074	0324		324	/T
0075	0317		317	/O
0076	0251		251	/)
0077	0240		240	/SPACE
0100	0275		275	/=
0101	0240		240	/SPACE
0102	0000		0	/X STORED ADDRESS
0103	0000		0	/X S/B FRMP1
0104	0000		0	/X
0105	0000		0	/X
0106	0215		215	/CR
0107	0212		212	/LF
0110	0377		377	/RUBOUT
0111	0250		250	/C
0112	0000		0	/X ADDRESS-1 STORED
0113	0000		0	/X IN LOC 0 AT INTERRUPT
0114	0000		0	/X
0115	0000		0	/X
0116	0251		251	/)
0117	0240		240	/SPACE
0120	0275		275	/=
0121	0240		240	/SPACE
0122	0000		0	/X CONTENTS OF ABOVE
0123	0000		0	/X ADDRESS
0124	0000		0	/X
0125	0000		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

PAL10	V141	V141
LIMLO,	-600	
LIMHI,	-7600	
ITON,	ION	
SAVE,	0	
	0	
	0	
	0	
MSK7,	7	
TW6,	260	
AER,	ER	
ATYP,	TYPAC	
ATYP1,	TYPAC+1	
AMSG1,	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 I X5	
	JMP I PATCH	
X1,	CLA	
X2,	TAD I TO	
X3,	JMP 6	
X4,	CLA	
X5,	200	

/TAD I TO

*400		
ER,	TAD .+4	
	DCA I ATYP	
	TAD FROM	
	JMP I ATYP1	
	.+1	
	TAD SAVE	
	AND MSK7	
	TAD TW6	
	DCA INS1	
	TAD SAVE+1	
	AND MSK7	
	TAD TW6	
	DCA INS2	
	TAD SAVE+2	
	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 I 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	3553	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	3553	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 AMSC1
0555	3127	DCA WORK
0556	1527	TAD I WORK
0557	0046	TLS
0560	0041	TSF
0561	0360	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,

0570	9356	JMP TYPE	
0571	7504	LAS	
0572	7700	8MA CLA	
0573	7402	HLT	/HALT ON ERROR
0574	5017	JMP RETURN	

\$

4000
4100

4200
4300

4400
4500

4600
4700

5000
5100

5200
5300

5400
5500

5600
5700

6000
6100

6200
6300

6400
6500

6600
6700

7000
7100

7200
7300

7400
7500

7600
7700

A	0151	RANUM	0136
AL	0042	RETURN	0017
AMSG1	0154	SAVE	0143
AMSG2	0373	SUP	0346
ATYP	0152	THREE	0137
ATYP1	0153	TO	0131
BEGIN	0200	TOP1	0132
CRSCK	0305	TW6	0150
CT	0043	TYPAC	0327
CT1	0044	TYPE	0556
ER	0400	WORK	0127
FRMP1	0135	X1	0172
FROM	0133	X2	0173
FROM1	0134	X3	0174
GETRAN	0225	X4	0175
GON	0204	X5	0176
GTRAN1	0261		
HALT	0155		
INS1	0054		
INS10	0103		
INS11	0104		
INS12	0105		
INS13	0113		
INS14	0114		
INS15	0115		
INS16	0122		
INS17	0123		
INS18	0124		
INS19	0125		
INS2	0055		
INS3	0056		
INS4	0057		
INS5	0064		
INS6	0065		
INS7	0066		
INS8	0067		
INS9	0102		
ITON	0142		
JMP1	0156		
LIMHI	0141		
LIMLO	0140		
LOOP	0220		
LOOP1	0254		
LP1	0356		
M15	0045		
M207	0130		
M302	0046		
MSG1	0047		
MSG2	0074		
MSG3	0112		
MSK7	0147		
PATCH	0157		

