

IDENTIFICATION

PRODUCT CODE: MAINDEC-8E-DIEC-D
PRODUCT NAME: MEMORY ADDRESS TEST
DATE CREATED: JUNE 11, 1971
MAINTAINER: DIAGNOSTIC GROUP
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1, ABSTRACT

MEMORY ADDRESS TEST, A RELOCATABLE PROGRAM, CHECKS FOR PROPER
MEMORY ADDRESS SELECTION ON THE PDP-8E.

2, REQUIREMENTS

2.1 EQUIPMENT

PDP-8E EQUIPPED WITH A TELETYPE

2.2 STORAGE

MEMORY ADDRESS TEST OCCUPIES LOCATIONS 7200-7507.

AFTER RELOCATING, THE TEST OCCUPIES LOCATIONS 0000-0307.

2.3 PRELIMINARY PROGRAMS

NONE

3, LOADING PROCEDURE

USE STANDARD BINARY LOADER

4, STARTING PROCEDURE

4.1 INITIAL SWITCH SETTINGS

ALL SR'S = 0 RUN ADDRESS TEST HIGH AND RELOCATE PROGRAM AFTER
1 PASS TO ADDRESS TEST LOW AND THEN RELOCATE PROGRAM TO ADDRESS
TEST HIGH, REPEATEDLY.

SR0(0) HALT AFTER ERROR PRINTOUT
SR1(1) AND SR2(0) RUN ADDRESS TEST HIGH ONLY
SR1(1) AND SR2(1) RELOCATE PROGRAM AND RUN ADDRESS TEST LOW ONLY
SR1(0) PROGRAM WILL RELOCATE AFTER A PASS
SR1(1) PROGRAM WILL STAY IN TEST AND WILL NOT RELOCATE

4.2 SWITCH SETTINGS AFTER PROGRAM IS RUNNING

SR0(0) HALT AFTER ERROR PRINTOUT
SR1(0) RUN TEST AND RELOCATE
SR1(1) RUN SAME TEST, DO NOT RELOCATE

4.3 STARTING ADDRESSES

0200 INITIALLY

RESTART ADDRESS: 0000,7200

4.4 OPERATOR ACTION

A. SET SR TO 0200 AND PRESS LOAD ADDRESS

B. SET SR FOR DESIRED OPERATION (SEE 4.1) PRESS CLEAR, THEN CONTINUE. FOR MOST CASES THE SWITCH REGISTER SHOULD EQUAL ZERO.

5. OPERATING PROCEDURE

ONCE THE PROGRAM IS RUNNING, THE STARTING ROUTINE IS GIVEN UP FOR A TEST AREA. SR0 AND SR1 ARE THE ONLY SWITCHES THAT HAVE ANY AFFECT ON THE PROGRAM. (SEE 4.2) IN ORDER TO RESTART THE PROGRAM, CERTAIN LOCATIONS MUST BE EXAMINED (SEE BELOW) TO DETERMINE WHERE THE PROGRAM IS, SINCE THE PROGRAM RELOCATES ITSELF FROM ADDRESS TEST HIGH TO ADDRESS TEST LOW AND ADDRESS TEST LOW TO ADDRESS TEST HIGH. IF ADDRESS 0000 CONTAINS A 7300 AND ADDRESS 307 CONTAINS A 7200, START THE PROGRAM AT LOCATION 0000 FOR ADDRESS TEST LOW. IF 7200 AND 7507 HAS 7300 AND 7200 RESPECTIVELY, LOAD ADDRESS 7200 AND SET DESIRED SWITCHES AND HIT CLEAR AND THEN CONTINUE.

6. ERRORS

6.1 ERROR PRINTOUTS

A XXXX G YYY (ERROR PRINTOUT FORMAT)

A XXXX (ADDRESS) XXXX = ADDRESS CONTAINING WRONG DATA.

C YYY (CONTENTS) YYY = CONTENTS OF LOCATION XXXX

THE CONTENTS OF AN ADDRESS SHOULD EQUAL THE ADDRESS OR THE COMPLEMENT OF THE ADDRESS

6.2 ERROR RECOVERY

ANALYSIS OF SEVERAL ERROR PRINTOUTS SHOULD ESTABLISH A MEANINGFUL PATTERN THAT WILL SINGLE OUT A PARTICULAR ADDRESS SELECTION.

IF IT IS NECESSARY TO SCOPE THE PROBLEM, THE FOLLOWING TWO INSTRUCTIONS MAY BE ENTERED IN MEMORY:

TAD (BAD LOCATION)

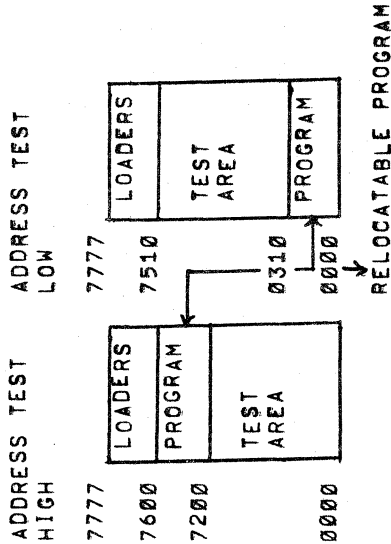
JMP -1

7. MISCELLANEOUS

7.1 EXECUTION TIME

AFTER EVERY 96 COMPLETE PROGRAM LOOPS AN EC IS PRINTED OUT BEFORE THE PROGRAM RELOCATES, EC IS TYPED OUT TWICE, ONCE AFTER ADDRESS TEST HIGH AND THE SECOND TIME AFTER ADDRESS TEST LOW.

7.2 MEMORY MAPS



8. PROGRAM DESCRIPTION

THE PROGRAM CONSIST OF TWO PHASES WHICH OCCUR IN THE FOLLOWING SEQUENCE:

PHASE 1 LOAD MEMORY SEQUENTIALLY IN THE FORWARD DIRECTION WITH EACH ADDRESS EQUAL TO ITS CONTENTS, THEN READ AND CHECK MEMORY FOR ERRORS.

PHASE 2 LOAD MEMORY SEQUENTIALLY IN THE REVERSE DIRECTION WITH ONE'S COMPLEMENT OF EACH ADDRESS, THEN READ AND CHECK MEMORY FOR ERRORS.

IN PHASE ONE, THE CONTENTS OF EVERY LOCATION IN THE TEST AREA IS EQUAL TO ITS ADDRESS. IF AN ERROR OCCURS, THE CONTENTS WERE PROBABLY DEPOSITED INTO A WRONG ADDRESS OR MULTIPLE ADDRESSES. IN PHASE 2 THE MEMORY IS LOADED WITH THE ONE'S COMPLEMENT OF THE ADDRESS, IF THE ADDRESS OR ITS COMPLEMENT IS WRONG, A ERROR MESSAGE WILL BE TYPED OUT GIVING THE FAILING ADDRESS AND ITS CONTENTS.

BETWEEN PHASE 1 AND PHASE 2 EACH ADDRESS IS CHECKED WITH THE ADDRESS EQUAL TO ITS ADDRESS WITH ALL OTHER BITS A ZERO, AND THEN WITH THE ADDRESS BITS EQUAL TO A ZERO AND ALL OTHER BITS SET TO A ONE. THIS CHECKS EACH ADDRESS FOR BIT DROPOUT OR PICKUP OF ALL BITS OF AN ADDRESS.

SAMPLE ERROR PRINTOUT:

A2560 C2760

EXPLANATION - WHILE ATTEMPTING TO WRITE A 2760 INTO LOCATION 2760, THE DATA WAS WRITTEN INTO LOCATION 2560. BIT FOUR WAS DROPPED.

SAMPLE ERROR PRINTOUT:

A2560 C5207

EXPLANATION - WHILE ATTEMPTING TO WRITE THE COMPLEMENT OF 2560 (5217) INTO LOCATION 2560, 5207 WAS WRITTEN INTO THE LOCATION INSTEAD. BIT 8 WAS DROPPED.

AFTER 96 PROGRAM LOOPS OF PHASES 1-4 THE PROGRAM RELOCATES AND RUNS ANOTHER 96 PROGRAM LOOPS BEFORE IT RELOCATES AGAIN.

ADDRESS TEST HIGH - TEST MEMORY LOCATIONS 0000-7177.

ADDRESS TEST LOW - TEST MEMORY LOCATIONS 310-7510.

/PDP-8E MEMORY ADDRESS TEST
*0000

0000	0		
0001	JMP 1		
0002	2		
0003	3		
0004	0		
0005	0		
0200			
0201	LAS		
0202	SZA		
0203	JMP I START		/SR=0 RUN PROGRAM AND RELOCATE
0204	TAD M2000		
0205	SZA CLA		
0206	JMP I START		/RUN MEMORY ADDRESS TEST HIGH
0207	JMP I +2		
0210	LAS		
0211	TAD M3000		
0212	SZA CLA		
0213	JMP I START		/WRONG SWITCH SETTING RUN HIGH AND RELOCATE
0214	JMP I LOWER		/RELOCATES PROGRAM AND RUNS MEMORY ADDRESS TEST HIGH
0215	LOADUP		
0216	LOWER, MOVE LH		
0217	M2000, -2000		
0220	M3000, -3000		
7200	*7200		

/LOAD MEMORY FORWARD DIRECTION

7200	LOADUP, CLA CLL		/SET TEST AREA STARTING ADDRESS
7201	TAD LIMLO		
7202	DCA ADRES		
7203	TAD M7200		
7204	DCA CTR		
7205	TAD ADRES		
7206	DCA I ADRES		/DEPOSIT ADDRESS IN CONTENTS
7207	ISZ ADRES		
7210	ISZ CTR		
7211	JMP LOADUP+5		
7212	TAD LIMLO		
7213	DCA ADRES		
7214	TAD M7200		
7215	DCA CTR		
7216	MEMLUP, TAD I ADRES		/GET CONTENTS FORWARD DIRECTION
7217	CIA		
7220	TAD ADRES		/GET ADDRESS
7221	SZA CLA		/SKIP IF EQUAL
7222	JMS ERROR		/CONTENTS NOT SAME AS ADDRESS
7223	ISZ ADRES		/SELECT NEXT ADDRESS
7224	ISZ CTR		/SKIP IF END TEST AREA

7225	5216	JMP MEMLUP	
/LOAD MEMORY REVERSE DIRECTION			
7226	1276	LOADWN, TAD LIMHI	
7227	3275	DCA ADRES	/SET TEST AREA ENDING ADDRESS
7230	1300	TAD M7200	
7231	3305	DCA CTR	
7232	1275	TAD ADRES	
7233	7040	CMA	
7234	3675	DCA I ADRES	/DEPOSIT 1'S COMPLEMENT OF ADDRESS IN ADDRESS
7235	7240	CLA CMA	/AC=-1
7236	1275	TAD ADRES	/AC=(ADRES)-1
7237	3275	DCA ADRES	/DECREMENT ADDRESS
7240	2305	ISE CTR	/SKIP WHEN LOWER LIMIT REACHED
7241	5232	JMP LOADWN+4	
7242	1300	TAD M7200	
7243	3305	DCA CTR	

/SEQUENTIAL LOCATION TEST (DOWN)			
7244	1276	TAD LIMHI	
7245	3275	DCA ADRES	/SET STARTING ADDRESS
7246	1675	TAD I ADRES	/GET CONTENTS
7247	7001	IAC	
7250	1275	TAD ADRES	/GET ADDRESS
7251	7640	SEA CLA	/SKIP IF EQUAL
7252	4320	JMS ERROR	/CONTENTS NOT COMPLEMENT OF ADDRESS
7253	7240	CLA CMA	/AC=-1
7254	1275	TAD ADRES	/AC=(ADRES)-1
7255	3275	DCA ADRES	/SELECT NEXT ADDRESS
7256	2305	ISE CTR	/SKIP IF END TEST AREA
7257	5246	JMP LOOP2+2	
7260	2301	ISE COUNT	
7261	5200	JMP LOADUP	
7262	1302	TAD RESTOR	
7263	3301	DCA COUNT	
7264	1312	TAD CR	
7265	4343	JMS PRINT	
7266	1313	TAD LF	
7267	4343	JMS PRINT	
7270	1303	TAD K305	
7271	4343	JMS PRINT	
7272	1316	TAD C	
7273	4343	JMS PRINT	
7274	5377	JMP BANK1	

/CONSTANTS AND VARIABLES

7275	0000	ADRES,	0
7276	7177	LIMHI,	7177
7277	0000	LIMLO,	0
7300	0600	M7200,	-7200
7301	7640	COUNT,	-140
7302	7640	RESTOR,	-140
7303	0305	K305,	305

7304 7774 M4, -4
 7305 0000 CTR, 0
 7306 0007 MSK7, 7
 7307 0260 TW6, 260
 7310 0000 STOR, 0
 7311 7004 NUM, RAL
 7312 0215 CR, 215
 7313 0212 LF, 212
 7314 0240 SPACE, 240
 7315 0301 A, 301
 7316 0303 C, 303
 7317 0000 CNT, 0

/ERROR MESSAGE

ERROR, 0
 7320 0000
 7321 1312 TAD CR
 7322 4343 JMS PRINT
 7323 1313 TAD LF
 7324 4343 JMS PRINT
 7325 1315 TAD A
 7326 4343 JMS PRINT
 7327 1275 TAD ADRES
 7330 4351 JMS TYPAC
 7331 1314 TAD SPACE
 7332 4343 JMS PRINT
 7333 1316 TAD C
 7334 4343 JMS PRINT
 7335 1675 TAD I ADRES
 7336 4351 JMS TYPAC
 7337 7604 LAS
 7340 7700 SMA CLA
 7341 7402 HLT
 7342 5720 JMP I ERROR

/HALT ON ERROR (SR0)

PRINT, 0
 7343 0000
 7344 6046 TLS
 7345 6041 TSF
 7346 5345 JMP , -1
 7347 7200 CLA
 7350 5743 JMP I PRINT

/TYPE (AC) IN OCTAL

TYPAC, 0
 7351 0000 DCA STOR
 7352 3310 TAD BACK+1
 7353 1361 DCA BACK+2
 7354 3362 TAD M4
 7355 1304 DCA CNT
 7356 3317 CLL
 7357 7100 TAD STOR
 7360 1310 BACK,
 7361 7026 RTL
 7362 7006 RTL

7363	DCA STOR		
7364	TAD STOR		
7365	AND MSK7		
7366	TAD TW6		
7367	JMS PRINT		
7370	TAD NUM		
7371	DCA BACK+2		
7372	ISE CNT		
7373	JMP BACK		
7374	JMP I TYPAC		
7377		*7377	
7000	NOP	BANK1,	
7604	LAS		/LOOK AT SR TO SEE IF PROGRAM RELOCATES
7401	AND COMP		
7402	SNA CLA		
7403	JMP MOVEH		/JMP TO MOVE ROUTINE
7404	JMP LOADP		/KEEP PROGRAM IN SAME AREA
7405	TAD STORE	MOVEH,	
7406	CMA		
7407	DCA STORE		
7410	TAD STORE		
7411	SMA CLA		
7412	JMP MOVEH		/RELOCATES PROGRAM TO HIGH MEMORY
7413	JMP MOVEH		/RELOCATES PROGRAM TO LOW MEMORY
7414	CLA CLL	MOVEH,	
7415	TAD LIMLOL		
7416	DCA I X1		/LOW ADDRESS UNDER TEST=310
7417	TAD LIMHIL		
7420	DCA I X2		/HIGH ADDRESS UNDER TEST=7510
7421	CLA CLL	SETL,	/SETS UP COUNTERS FOR MOVING
7422	DCA CONT1		
7423	TAD CNT2		
7424	DCA CNT2		
7425	TAD HGH		
7426	DCA HIGH		
7427	TAD I HIGH	MOVITL,	/MOVES PROGRAM TO LOWER MEMORY
7430	DCA I CONT1		
7431	ISE CONT1		/IS PROGRAM RELOCATED
7432	ISE HIGH		/NO
7433	ISE CONT2		/YES START PROGRAM
7434	JMP MOVITL		
7435	JMP 0		
7436	TAD LIMLOH	MOVEH,	/LOW ADDRESS UNDER TEST=0000
7437	DCA I X3		
7440	TAD LIMHIL		
7441	DCA I X4	SETH,	/HIGH ADDRESS UNDER TEST=7177
7442	CLA CLL		/RESETS COUNTERS
7443	DCA LOW		
7444	TAD CNT2		
7445	DCA CNT2		
7446	TAD HGH		
7447	DCA HIGH		
7450	TAD I LOW	MOVITH,	/MOVE PROGRAM TO UPPER MEMORY
7451	DCA I HIGH		

7452 2272
7453 2267
7454 2266
7455 5250
7456 5663
7457 2000
7460 0310
7461 7510
7462 7470
7463 7200
7464 0000
7465 0000
7466 7470
7467 7200
7470 0000
7471 7177
7472 0000
7473 7277
7474 7276
7475 0077
7476 0076
7477 7000
7500 4301
7501 0000
7502 1301
7503 0307
7504 7700
7505 5000
7506 5707
7507 7200

ISZ LOW
ISZ HIGH
ISZ CONT2
JMP MOVITH
JMP I HGH
2000
0310
7510
7470
7200
0
0
7470
7200
0
7177
0
LIMLO
LIMHI
0077
0076
NOP
JMS .+1
0
TAD .-1
AND STAY
SMA CLA
JMP 0
JMP I STAY
7200
\$

/IS PROGRAM RELOCATED
/NO
/YES START PROGRAM

COMP,
LIMLOL,
LIMHIL,
CNT2,
HGH,
STORE,
CONT1,
CONT2,
HIGH,
LIMLOH,
LIMHIH,
LOW,
X1,
X2,
X3,
X4,
LOADP,
STAY,

