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IDENTIFICATION

PRODUCT CODE: MAINDEC-8E-D1AA-D (D)
PRODUCT NAME: MM8-E 4K MEMORY CHECKERBOARD
DATE CREATED: AUGUST 3, 1970
MAINTAINER: DIAGNOSTIC GROUP
AUTHOR: VERNON FREY

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DIAA

1. ABSTRACT

This program is designed to detect core failures on half-selected lines under worst case noise conditions. It's use is intended for the PDP-8E with a basic 4K memory system.

2. REQUIREMENTS

Equipment

A PDP-8E computer with 4K of memory.

Storage

Initially the program is in core locations 200-777 and in core locations 700-7577.

3. LOADING PROCEDURE

Load the program with the binary loader (BIN).

5. ERRORS

The contents of a given memory test location should always be 0000 or 7777, therefore anything other than 0000 or 7777 will result in a test error halt. A relocation error halt will occur if the relocation comparison check fails.

Test Error Halts

A test error halt is indicated by halt address 07XX or 75XX.

If the link is set, the error occurred on complemented data.

1st halt - The AC displays the contents of the location in error.

Record the C(AC) and press key continue.

2nd halt - The AC displays the address of the location in error.

Record the C(AC) and press key continue to resume testing with the next sequential memory address.

Relocation Error Halts

A relocation error halt is indicated by halt address 03XX or 71XX.

1st halt - The AC displays the contents of the location transferring from. Record the C(AC) and press key continue.

2nd halt - The AC displays the address of the location transferring from. Record the C(AC) and press key continue.

3rd halt - The AC displays the contents of the location transferring to. Record the C(AC) and press key continue.

4th halt - The AC displays the address of the location transferring to. Record the C(AC) and C(MA). Manually correct bad core location if possible. Load Address = C(MA) and press key continue to continue relocation.

6. RESTRICTIONS

Starting Restrictions

The program may be restarted at $\theta 200$ if the program is in lower core, or at 7000 if the program is in upper core. It can easily be determined where the program is by manually looking at a few core locations.

Operating Restrictions

None

7. EXECUTION TIME

The time to write and test the worst case pattern and its complement in upper and lower core is approximately 1 second.

During program execution a 5 will be typed on the TTY every 5 minutes of program run time. This allows the operator to determine approximate run time before a failure occurred.

8. SCOPE LOOPS

Two special scope loops have been provided in this program.

Before entering a scope loop run the checkerboard program with the halt switch up. This will write worst case pattern thru core.

Scope Loop 1

This scope loop reads the address in the switches 6 times before complementing.

A. LOAD ADDRESS 0536 if program is in lower core
 7336 if program is in upper core.

B. Set switches = address to be looped on.
C. Press key start.

Scope Loop 2

This scope loop executed a simple read, complement, write.

A. LOAD ADDRESS 0561 if program is in lower core
 7361 if program is in upper core.

B. Set switches = address to be looped on.
C. Press key start.

NOTE: The address being looped on can be changed simply by changing the switch settings. The previous address will be left with its original content.

9. PROGRAM DESCRIPTION

General

A given core is selected when the combined currents of the X- and Y- selection lines produce a magneto motive force which exceeds the threshold for reversing the flux direction of the core. This occurs at the intersection of the activated selection lines. All other cores which are threaded onto the activated lines will be slightly disturbed. Under marginal current conditions, such half-selected cores might also reverse polarity when their states are properly established by the pattern which the Checkerboard Test writes into memory.

When a selected core is in the 1 state, the read current will cause it to reverse polarity and become \emptyset . When the core is in the \emptyset state, the write current will cause it to become 1. Thus, the possibility of a reading error is greatest when all half-selected cores are in the 1 state; a writing error is most probable when all the half-selected cores are in the \emptyset state.

If a half-selected core changes polarity, the error will be detected when the memory location containing that core is tested by the program. For a reading error, the contents of that core will appear as a \emptyset in a field of 1's, and vice versa for a writing error.

The Checkerboard Test pattern consists of alternating 4 memory cells containing 0000 and 4 memory cells containing 7777. This pattern is reversed every 400 octal locations. (This test pattern is generated according to the stringing of the stack and the wiring of the memory system. It is the same pattern for all 8E stacks).

		0000	1111	0000	1111
		0000	1111	0000	1111
		0000	1111	0000	1111
		0000	1111	0000	1111
		1111	0000	1111	0000
		1111	0000	1111	0000
		1111	0000	1111	0000
		1111	0000	1111	0000
x-axis	(MA ₀₋₅)	0000	1111	0000	1111
		0000	1111	0000	1111
		0000	1111	0000	1111
		0000	1111	0000	1111
	y-axis (MA ₆₋₁₁)	0000	1111	0000	1111

The above array is interpreted as follows:

- A. Positions on the y-axis represent consecutive octal locations in memory from 00 thru 77.
- B. Positions on the x-axis represent consecutive octal locations in memory from 00 hundred thru 77 hundred.

Program Relocation

Program relocation is governed by the status of switch register bit 7. With this switch down (\emptyset position) program relocation occurs each time the test pattern and it's complement have been completely tested. During the relocation a comparison check is made to insure no program loss.

Test Procedure

The worst case pattern is written, then each location is treated as follows:

- a. Read, Complement, Write the location.
- B. Read and test the location.
- C. Read, Complement, Write the location.
- D. Read and test the location.
- E. Go on to next location repeating A-D.

After the pattern is completely tested, the complement pattern is written and tested.

For further understanding of how the test is performed, refer to the listing.

/CHECKERBOARD 'WORST CASE NOISE' FOR MM8-E 4K MEMORY (VER A) L10 V141 11-SEP-70 1182 PAGE 1

/CHECKERBOARD 'WORST CASE NOISE' FOR MM8-E 4K MEMORY (VER A)

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/PROGRAMMER, VERNON FREY

/

/SW0=1 HALT PROGRAM SAVING BIN
/SW7=1 INHIBIT PROGRAM RELOCATION

/

/

/PROGRAM STARTING ADDRESS

/0200 TEST UPPER CORE
/7000 TEST LOWER CORE

/

/

/

/

/

/PROJECT NUMBER V82 07581, MAINDEC=8E=D1AA

	0000	*	0	
0000	0000		0	
0001	5001	JMP	1	
0002	0002		2	
0003	0003		3	
	0200	*200		
0200	7000	NOP		/WILL = JMP LGOP2 FOR RESTART
0201	7600	K7600,	7600	/CLA USED AS CONSTANT 7600
0202	1205	LCNT1,	TAD ,*3	/WILL = TRANSFER CONTROL COUNTER
0203	3200	LCNT2,	DCA 0200	/WILL = TRANSFER TO CONTROL
0204	4262	LCNT3,	JMS LSAVBN	/WILL = TRANSFER FROM CONTROL
0205	5364	LINAD1,	JMP LGOP2	/WILL = INDIRECT ADDRESS
0206	5336		JMP LPASS	/THIS INST MUST BE IN LOC 206
0207	4000	LSW0,	4000	/SR BIT 0
0210	0020	LSW7,	0020	/SR BIT 7
0211	0200	K0200,	0200	
0212	7000	K7000,	7000	
0213	7200	K7200,	7200	
	/			
	/CHECK HALT PROGRAM SWITCH			
	/			
0214	7604	LSR00,	LAS	
0215	0207	AND	LSW0	
0216	7650	SZA	CLA	
0217	5223	JMP	LSR07	/HALT SW IS OFF
0220	4232	JMS	LHILO	
0221	4272	JMS	LRESBN	/PROG IN LO = RESTORE BIN
0222	7402	HLT		/PROG IN HI
	/			
	/CHECK INHIBIT RELOCATION SWITCH			
	/			
0223	7604	LSR07,	LAS	
0224	0210	AND	LSW7	
0225	7640	SZA	CLA	
0226	5364	JMP	LGOP2	/INHIBIT RELOCATION
0227	4232	JMS	LHILO	
0230	5240	JMP	LRELOU	/PROG IN LO = MOVE UP
0231	5251	JMP	LREL0D	/PROG IN HI = MOVE DOWN
	/			
	/CHECK FOR PROGRAM IN UPPER OR LOWER MEMORY			
	/			
0232	0002	LHILO,	0	
0233	1232	TAD	, -1	/0XXX OR 7XXX
0234	7004	RAL		
0235	7630	SZL	CLA	/SKIP IF PROG IN LO
0236	2232	ISZ	LHILO	/PROG IN HI
0237	5632	JMP I	LHILO	

```

/
/RELOCATE PROGRAM TO UPPER MEMORY
/
0240 4272 LRELOU, JMS LRESBN      /RESTORE BIN INTO PAGE 31
0241 1213 TAD   K7200      /=600
0242 3202 DCA   LCNT1      /CONTROLS 600 TRANSFERS
0243 1211 TAD   K0200
0244 3204 DCA   LCNT3      /PAGE 1 CA
0245 1212 TAD   K7000
0246 3203 DCA   LCNT2      /PAGE 28 CA
0247 4302 JMS   LRELO      /RELOCATE PROGRAM
0250 5612 JMP I  K7000      /JMP TO PROG IN UPPER MEM

/
/RELOCATE PROGRAM TO LOWER MEMORY
/
0251 4262 LRELOD, JMS LSAVBN     /SAVE BIN INTO PAGE 0
0252 1213 TAD   K7200      /=600
0253 3202 DCA   LCNT1      /CONTROLS 600 TRANSFERS
0254 1211 TAD   K0200
0255 3203 DCA   LCNT2      /PAGE 1 CA
0256 1212 TAD   K7000
0257 3204 DCA   LCNT3      /PAGE 28 CA
0260 4302 JMS   LRELO      /RELOCATE PROGRAM
0261 5611 JMP I  K0200      /JMP TO PROG IN LOWER MEM

/
/SAVE BIN AND RIM INTO PAGE 0
/
0262 0000 LSAVBN, 0
0263 1201 TAD   K7600      /=200
0264 3202 DCA   LCNT1      /CONTROLS 200 TRANSFERS
0265 3203 DCA   LCNT2      /PAGE 0 CA
0266 1201 TAD   K7600
0267 3204 DCA   LCNT3      /PAGE 31 CA
0270 4302 JMS   LRELO      /RELOCATE BIN INTO PAGE 0
0271 5662 JMP I  LSAVBN

/
/RESTORE BIN AND RIM INTO PAGE 31
/
0272 0000 LRESBN, 0
0273 1201 TAD   K7600      /=200
0274 3202 DCA   LCNT1      /CONTROLS 200 TRANSFERS
0275 3204 DCA   LCNT3      /PAGE 0 CA
0276 1201 TAD   K7600
0277 3203 DCA   LCNT2      /PAGE 31 CA
0300 4302 JMS   LRELO      /RELOCATE BIN INTO PAGE 31
0301 5672 JMP I  LRESBN

```

/RELOCATE SUBROUTINE

0302	0000	LRELO, 0	
0303	1604	TAD I LCNT3	/TRANSFER FROM
0306	3503	DCA I LCNT2	/TRANSFER TO
0305	1604	TAD I LCNT3	/CHECK TRANSFER
0306	7041	CIA	
0307	1603	TAD I LCNT2	
0310	7543	SZA CLA	
0311	4320	JMS LXFERF	/TRANSFER FAILED
0312	2204	ISZ LCNT3	/INCREMENT FROM ADDRESS
0313	2203	ISZ LCNT2	/INCREMENT TO ADDRESS
0314	7000	NOP	
0315	2202	ISZ LCNT1	/INCREMENT TRANSFER CONTROL
0316	5303	JMP LRELO+1	
0317	5702	JMP I LRELO	/TRANSFER COMPLETE

/RELOCATION FAILURE HALT ROUTINE

0320	0000	LXFERF, 0	
0321	1604	TAD I LCNT3	
0322	7402	HLT	/1ST HALT = FROM DATA
0323	7200	CLA	
0324	1204	TAD LCNT3	
0325	7402	HLT	/2ND HALT = FROM ADDRESS
0326	7200	CLA	
0327	1603	TAD I LCNT2	
0330	7402	HLT	/3RD HALT = TO DATA
0331	7200	CLA	
0332	1203	TAD LCNT2	
0333	7402	HLT	/4TH HALT = TO ADDRESS
0334	7300	CLA CLL	
0335	5702	JMP I LXFERF	

/
/TYPEOUT A '5' EVERY 5 MINUTES OF RUN TIME
/
0336 2357 LPASS, ISZ LCNT
0337 5214 JMP LSR00 /NOT 5 MINUTES YET
0340 1360 TAD LM750
0341 3357 DCA LCNT /RESTORE COUNTER
0342 1361 TAD K215
0343 4351 JMS LTRANS /CR
0344 1362 TAD K212
0345 4351 JMS LTRANS /LF
0346 1363 TAD K265
0347 4351 JMS LTRANS /5
0350 5214 JMP LSR00

0351 0000 LTRANS, 0
0352 6046 TLS /TRANSMIT CODE
0353 6041 TSF
0354 5353 JMP ,+1 /WAIT FOR FLAG
0355 7300 CLA CLL
0356 5751 JMP I LTRANS

0357 6400 LCNT, -1400 /COUNT 5 MINUTES
0360 6400 LM750, -1400
0361 0215 K215, 215 /CR
0362 0212 K212, 212 /LF
0363 0265 K265, 265 /5

/
/GO TO PAGE 2 OR PAGE 29
/
0364 4365 LGOP2, JMS ,+1
0365 0000 0 /0XXX OR 7XXX
0366 7300 CLA CLL
0367 1365 TAD ,+2
0370 1211 TAD K0200
0371 0201 AND K7600
0372 3205 DCA LINAD1
0373 5605 JMP I LINAD1 /0400 OR 7200

	0400	*400		
0400	5216	JMP	LWR	/WRITE PATTERN
0401	5225	JMP	LWRC	/WRITE COMPLEMENT
0402	7774	LM4,	-4	
0403	7740	LM40,	-40	
0404	0523	KLENDM, LENDM		/LO END MEM ROUTINE
0405	7330	KLAAA, HAAA		/HI END MEM ROUTINE
0406	1000	LEND1, 0		/END MEM ROUTINE
0407	0000	LMADD, 0		/START WRITE ADDRESS
0410	0000	LCNT4, 0		/WRITE 2 PAGES
0411	0000	LCNT5, 0		/WRITE 4 ADDRESSES
0412	0200	KK0200, 0200		
0413	1000	K1000, 1000		
0414	7600	KK7600, 7600		
0415	0000	LINAD2, 0		/INDIRECT ADDRESSING
		/		
		/		/WRITE PATTERN INTO MEMORY
		/		
0416	4235	LWR, JMS	LWCON	/CORRECT WRITE CONSTANTS
0417	4253	JMS	LWRMEM	/WRITE PATTERN
0420	1253	TAD	LWRMEM	/0XXX OR 7XXX
0421	1212	TAD	KK0200	
0422	0214	AND	KK7600	
0423	3215	DCA	LINAD2	
0424	5615	JMP I	LINAD2	/0600 OR 7400
		/		
		/		/WRITE COMPLEMENT PATTERN INTO MEMORY
		/		
0425	4235	LWRC, JMS	LWCON	/CORRECT WRITE CONSTANTS
0426	4255	JMS	LWRMC	/WRITE COMPLEMENT PATTERN
0427	1253	TAD	LWRMEM	/0XXX OR 7XXX
0430	1212	TAD	KK0200	
0431	0214	AND	KK7600	
0432	7001	IAC		
0433	3215	DCA	LINAD2	
0434	5615	JMP I	LINAD2	/0601 OR 7401

/
/UPDATE WRITE CONSTANTS
/
0435 1203 LWCON, 0
0436 1235 TAD , -1 /2XXX OR 7XXX
0437 7004 RAL
0440 7630 SZL CLA
0441 5247 JMP LWCON1 /PROG IN UPPER MEM
0442 1213 TAD K1000 /PROG IN LOWER MEM
0443 3207 DCA LMADD /START WRITE ADDRESS
0444 1204 TAD KLENDM
0445 3206 DCA LEND1 /END MEM ROUTINE
0446 5635 JMP I LWCON

0447 1205 LWCON1, TAD KLAAA
0450 3206 DCA LEND1 /END MEM ROUTINE
0451 3207 DCA LMADD /START WRITE ADDRESS
0452 5635 JMP I LWCON

```

/
/ WRITE PATTERN OR WRITE PATTERN COMPLEMENT
/
0453 5283 LWRMEM, 0
0454 5251 JMP LW1010 /WRITE PATTERN
0455 0000 LWRMC, 0
0456 1255 TAD ,+1
0457 3253 DCA LWRMEM /STORE RETURN ADDRESS
0460 5270 JMP LW0101 /WRITE COMPLEMENT

0461 1203 LW1010, TAD LM40 /~40
0462 3210 DCA LCNT4 /WRITE 2 PAGES
0463 4311 JMS LWONE /WRITE 4 WORDS OF ONES
0464 4300 JMS LWZERO /WRITE 4 WORDS OF ZEROS
0465 2210 ISZ LCNT4
0466 5263 JMP LW1010*2
0467 4606 JMS I LEND1 /END OF MEMORY?
0470 1203 LW0101, TAD LM40 /~40
0471 3210 DCA LCNT4 /WRITE 2 PAGES
0472 4320 JMS LWZERO /WRITE 4 WORDS OF ZEROS
0473 4311 JMS LWONE /WRITE 4 WORDS OF ONES
0474 2210 ISZ LCNT4
0475 5272 JMP LW0101*2
0476 4606 JMS I LEND1 /END OF MEMORY?
0477 5261 JMP LW1010

0500 0000 LWZERO, 0
0501 1202 TAD LM4 /~4
0502 3211 DCA LCNT5 /WRITE 4 ZEROS
0503 3607 DCA I LMADD /INCREMENT MEMORY ADDRESS
0504 2207 ISZ LMADD
0505 7000 NOP
0506 2211 ISZ LCNT5
0507 5303 JMP LWZERO*3
0510 5700 JMP I LWZERO

0511 2000 LWONE, 0
0512 1202 TAD LM4 /~4
0513 3211 DCA LCNT5 /WRITE 4 ONES
0514 7240 STA
0515 3607 DCA I LMADD /INCREMENT MEMORY ADDRESS
0516 2207 ISZ LMADD
0517 7000 NOP
0520 2211 ISZ LCNT5
0521 5314 JMP LWONE*3
0522 5711 JMP I LWONE

```

/
/CHECK FOR END OF MEMORY
/
0523 0000 LENDM, 0
0524 1207 TAD LMADD
0525 7640 SZA CLA
0526 5723 JMP I LENDM
0527 5653 JMP I LWRMEM
0530 0000 LAAA, 0
0531 1207 TAD LMADD
0532 1213 TAD K1000
0533 7640 SZA CLA
0534 5730 JMP I LAAA
0535 5653 JMP I LWRMEM

/
/TWO SPECIAL SCOPE LOOPS
/
0535 7604 LSCOP1, LAS
0537 3372 DCA LSWADD /TEST ADDRESS
0540 1772 TAD I LSWADD
0541 0772 AND I LSWADD
0542 0772 AND I LSWADD
0543 0772 AND I LSWADD
0544 0772 AND I LSWADD
0545 0772 AND I LSWADD
0546 7040 CMA
0547 3772 DCA I LSWADD
0550 1772 TAD I LSWADD
0551 0772 AND I LSWADD
0552 0772 AND I LSWADD
0553 0772 AND I LSWADD
0554 0772 AND I LSWADD
0555 0772 AND I LSWADD
0556 7040 CMA
0557 3772 DCA I LSWADD
0560 5366 JMP LSCOP1

0561 7604 LSCOP2, LAS
0562 3372 DCA LSWADD /TEST ADDRESS
0563 1772 TAD I LSWADD
0564 7040 CMA
0565 3772 DCA I LSWADD
0566 1772 TAD I LSWADD
0567 7040 CMA
0570 3772 DCA I LSWADD
0571 5361 JMP LSCOP2

0572 0000 LSWADD, 0

0600	5214	JMP	LTST	/READ AND TEST PATTERN	
0601	5224	JMP	LTSTC	/READ AND TEST COMPLEMENT	
0602	7774	LM04,	-4		
0603	7701	LM100,	-100		
0604	0763	KLENDT,	LENDT	/LO END TEST ROUTINE	
0605	7570	KLBBCB,	HBBBB	/HI END TEST ROUTINE	
0606	0000	LEND2,	0	/END TEST ROUTINE	
0607	0000	LTSTAD,	0	/START TEST ADDRESS	
0610	0000	LCNT6,	0	/TEST 2 PAGES	
0611	0000	LCNT7,	0	/TEST 4 ADDRESSES	
0612	1000	KK1000,	1000		
0613	7600	KC7600,	7600		
 /					
/ READ AND TEST PATTERN CONTROL					
 /					
0614	4234	LTST,	JMS	LRCON	/CORRECT READ CONSTANTS
0615	4252		JMS	LRMEM	/READ AND TEST PATTERN
0616	1252		TAD	LRMEM	/0XXX OR 7XXX
0617	1213		TAD	KC7600	/-200
0620	0213		AND	KC7600	
0621	7001		IAC		
0622	3207		DCA	LTSTAD	
0623	5607		JMP I	LTSTAD	/0401 OR 7201
 /					
/ READ AND TEST COMPLEMENT PATTERN CONTROL					
 /					
0624	4234	LTSTC,	JMS	LRCON	/CORRECT READ CONSTANTS
0625	4254		JMS	LRHEMC	/READ AND TEST COMPLEMENT PATTERN
0626	1254		TAD	LRHEMC	/0XXX OR 7XXX
0627	7006			7006	/RTL - AND ADDRESS OF TAG HPASS
0630	7630		SZL CLA		
0631	5627		JMP I	,=2	/PROG IN UPPER MEM
0632	5633		JMP I	,=1	/PROG IN LOWER MEM
0633	0206			0206	/ADDRESS OF TAG LPASS
 /					
/ UPDATE READ CONSTANTS					
 /					
0634	2000	LRCON,	0		
0635	1234		TAD	,=1	/0XXX OR 7XXX
0636	7004		RAL		
0637	7630		SZL CLA		
0640	5246		JMP	LRCON1	/PROG IN UPPER MEM
0641	1212		TAD	KK1000	/PROG IN LOWER MEM
0642	3207		DCA	LTSTAD	/START TEST ADDRESS
0643	1224		TAD	KLENDT	
0644	3206		DCA	LEND2	
0645	5634		JMP I	LRCON	/END MEM ROUTINE

0646	1205	LRCON1, TAD	KLBBB	
0647	3206	DCA	LEND2	/END MEM ROUTINE
0650	3207	DCA	LTSTAD	/START TEST ADDRESS
0651	5534	JMP I	LRCON	
 /				
/READ AND TEST PATTERN OR PATTERN COMPLEMENT				
 /				
0652	0200	LRMEM1, 0	LR1010	/READ AND TEST PATTERN
0653	5262	JMP		
0654	0200	LRMEMC, 0		
0655	1254	TAD	,+1	
0656	3252	DCA	LRMEM	/STORE RETURN ADDRESS
0657	5311	JMP	LR0101	/READ AND TEST COMPLEMENT
0660	1203	LR1010, TAD	LM100	/=100
0661	3210	DCA	LCNT6	/READ AND TEST 2 PAGES
0662	1202	LONE,	LM04	/=4
0663	3211	DCA	LCNT7	/READ AND TEST 4 ADDRESSES
0664	1607	LONE1, TAD I	LTSTAD	
0665	7160	CMA STL		
0666	3607	DCA I	LTSTAD	
0667	1607	TAD I	LTSTAD	
0670	7640	SZA CLA		/TEST ONE COMPLEMENTED
0671	4352	JMS	LHALTC	/THIS LOC FAILED READ AND TEST
0672	1607	TAD I	LTSTAD	
0673	7040	CMA		
0674	3607	DCA I	LTSTAD	
0675	1607	TAD I	LTSTAD	
0676	7101	IAC CLL		
0677	7640	SZA CLA		/TEST ONE
0700	4342	JMS	LHALT	/THIS LOC FAILED READ AND TEST
0701	2207	ISZ	LTSTAD	
0702	7000	NOP		
0703	2211	ISZ	LCNT7	
0704	5264	JMP	LONE+2	
0705	2210	ISZ	LCNT6	
0706	5313	JMP	LZERO	
0707	4606	JMS I	LEND2	/END OF MEMORY?
0710	5260	JMP	LR1010	/NO
0711	1203	LR0101, TAD	LM100	/=100
0712	3210	DCA	LCNT6	/READ AND TEST 2 PAGES
0713	1202	LZERO, TAD	LM04	/=4
0714	3211	DCA	LCNT7	/READ AND TEST 4 ADDRESSES
0715	1607	LZERO1, TAD I	LTSTAD	
0716	7040	CMA		
0717	3607	DCA I	LTSTAD	
0720	1607	TAD I	LTSTAD	
0721	7121	IAC STL		
0722	7640	SZA CLA		/TEST ZERO COMPLEMENTED
0723	4352	JMS	LHALTC	/THIS LOC FAILED READ AND TEST
0724	1607	TAD I	LTSTAD	
0725	7140	CMA CLL		

/CHECKER. /D 'WORST CASE NOISE' FOR MM8-E 4K MEMORY (VER A) /AL10 V141 11-SEP-70 1102 PAGE 12-1

0726 3627	DCA I	LTSTAD	
0727 1607	TAD I	LTSTAD	
0730 7640	SEA CLA		/TEST ZERO
0731 4342	JMS	LHALT	/THIS LOC FAILED READ AND TEST
0732 2207	ISZ	LTSTAD	
0733 7000	NOP		
0734 2211	ISZ	LCNT7	
0735 5315	JMP	LZERO+2	
0736 2210	ISZ	LCNT6	
0737 5262	JMP	LONE	
0740 4606	JMS I	LEND2	/END OF MEMORY?
0741 5311	JMP	LR0101	/NO

```
/  
/ERROR HALT ROUTINE FOR DATA FAILURE  
  
0742 0000 LHALT, 0  
0743 1607 TAD I LTSTAD  
0744 7402 HLT /1ST HALT = BAD DATA  
0745 7200 CLA  
0746 1207 TAD LTSTAD  
0747 7402 HLT /2ND HALT = BAD LOCATION  
0750 7200 CLA  
0751 5742 JMP I LHALT  
  
/  
/ERROR HALT ROUTINE FOR COMPLEMENT DATA FAILURE  
  
0752 0000 LHALTC, 0  
0753 1607 TAD I LTSTAD  
0754 7040 CMA  
0755 7402 HLT /1ST HALT = BAD DATA  
0756 7200 CLA  
0757 1207 TAD LTSTAD  
0760 7402 HLT /2ND HALT = BAD LOCATION  
0761 7300 CLA CLL  
0762 5752 JMP I LHALTC  
  
/  
/END OF MEMORY ROUTINE  
  
0763 0000 LENDT, 0  
0764 1207 TAD LTSTAD  
0765 7640 SZA CLA  
0766 5763 JMP I LENDT /MORE MEMORY TO TEST  
0767 5652 JMP I LRMEM /END OF TEST  
0770 0000 LB88, 0  
0771 1207 TAD LTSTAD  
0772 1212 TAD KK1000  
0773 7640 SZA CLA  
0774 5770 JMP I LB88 /MORE MEMORY TO TEST  
0775 5652 JMP I LRMEM /END OF TEST
```

7000	7000	*7000	
7000	7000	NOP	/WILL = JMP HGOP2 FOR RESTART
7001	7600	C7600, 7600	/CLA USED AS CONSTANT 7600
7002	1205	HCNT1, TAD ,+3	/WILL = TRANSFER CONTROL COUNTER
7003	3200	HCNT2, DCA 7000	/WILL = TRANSFER TO CONTROL
7004	7000	HCNT3, NOP	/WILL = TRANSFER FROM CONTROL
7005	5364	HINAD1, JMP HGOP2	/WILL = INDIRECT ADDRESS
7006	5336	JMP HPASS	/THIS INST MUST BE IN LOC 7006
7007	4000	HSW0, 4000	/SR BIT 0
7010	0200	HSW7, 0020	/SR BIT 7
7011	0200	C0200, 0200	
7012	7000	C7000, 7000	
7013	7200	C7200, 7200	

/
 /CHECK HALT PROGRAM SWITCH
 /

7014	7604	HSR00, LAS	
7015	0207	AND HSW0	
7016	7650	SNA CLA	
7017	5223	JMP HSR07	/HALT SW IS OFF
7020	4232	JMS HHIL0	
7021	4272	JMS HRESBN	/PROG IN LO = RESTORE BIN
7022	7402	HLT	/PROG IN HI

/
 /CHECK INHIBIT RELOCATION SWITCH
 /

7023	7604	HSR07, LAS	
7024	0210	AND HSW7	
7025	7640	SZA CLA	
7026	5364	JMP HGOP2	/INHIBIT RELOCATION
7027	4232	JMS HHIL0	
7030	5240	JMP HRELOU	/PROG IN LO = MOVE UP
7031	5251	JMP HREL0D	/PROG IN HI = MOVE DOWN

/
 /CHECK FOR PROGRAM IN UPPER OR LOWER MEMORY
 /

7232	0000	HHIL0, 0	
7233	1232	TAD ,+1	/0XXX OR 7XXX
7234	7004	RAL	
7235	7630	SZL CLA	/SKIP IF PROG IN LO
7236	2232	ISZ HHIL0	/PROG IN HI
7237	5632	JMP I HHIL0	

/
 /RELOCATE PROGRAM TO UPPER MEMORY
 /

7040	4272	HRELOU, JMS	HRESBN	/RESTORE BIN INTO PAGE 31
7041	1213	TAD	C7200	/=600
7042	3202	DCA	HCNT1	/CONTROLS 600 TRANSFERS
7043	1211	TAD	C0200	
7044	3204	DCA	HCNT3	/PAGE 1 CA
7045	1212	TAD	C7000	
7046	3203	DCA	HCNT2	/PAGE 28 CA
7047	4302	JMS	HRELO	/RELOCATE PROGRAM
7050	5612	JMP I	C7000	/JMP TO PROG IN UPPER MEM

/
 /RELOCATE PROGRAM TO LOWER MEMORY
 /

7051	4262	HRELOU, JMS	HSAVBN	/SAVE BIN INTO PAGE 0
7052	1213	TAD	C7200	/=600
7053	3202	DCA	HCNT1	/CONTROLS 600 TRANSFERS
7054	1211	TAD	C0200	
7055	3203	DCA	HCNT2	/PAGE 1 CA
7056	1212	TAD	C7000	
7057	3204	DCA	HCNT3	/PAGE 28 CA
7060	4302	JMS	HRELO	/RELOCATE PROGRAM
7061	5611	JMP I	C0200	/JMP TO PROG IN LOWER MEM

/
 /SAVE BIN AND RIM INTO PAGE 0
 /

7062	0000	HSAVBN, 0		
7063	1201	TAD	C7600	/=200
7064	3202	DCA	HCNT1	/CONTROLS 200 TRANSFERS
7065	3203	DCA	HCNT2	/PAGE 0 CA
7066	1201	TAD	C7600	
7067	3204	DCA	HCNT3	/PAGE 31 CA
7070	4302	JMS	HRELO	/RELOCATE BIN INTO PAGE 0
7071	5662	JMP I	HSAVBN	

/
 /RESTORE BIN AND RIM INTO PAGE 31
 /

7072	0000	HRESBN, 0		
7073	1201	TAD	C7600	/=200
7074	3202	DCA	HCNT1	/CONTROLS 200 TRANSFERS
7075	3204	DCA	HCNT3	/PAGE 0 CA
7076	1201	TAD	C7600	
7077	3203	DCA	HCNT2	/PAGE 31 CA
7100	4302	JMS	HRELO	/RELOCATE BIN INTO PAGE 31
7101	5672	JMP I	HRESBN	

/
/RELOCATE SUBROUTINE
/
7102 0000 HRELO, 0
7103 1604 TAD I HCNT3 /TRANSFER FROM
7104 3603 DCA I HCNT2 /TRANSFER TO
7105 1604 TAD I HCNT3 /CHECK TRANSFER
7106 7041 CIA
7107 1603 TAD I HCNT2
7110 7640 SZA CLA
7111 4320 JMS HXFERF /TRANSFER FAILED
7112 2204 ISZ HCNT3 /INCREMENT FROM ADDRESS
7113 2203 ISZ HCNT2 /INCREMENT TO ADDRESS
7114 7000 NOP
7115 2202 ISZ HCNT1 /INCREMENT TRANSFER CONTROL
7116 5303 JMP HRELO+1
7117 5702 JMP I HRELO /TRANSFER COMPLETE

/
/RELOCATION FAILURE HALT ROUTINE
/
7120 0000 HXFERF, 0
7121 1604 TAD I HCNT3
7122 7402 HLT /1ST HALT = FROM DATA
7123 7200 CLA
7124 1204 TAD HCNT3
7125 7402 HLT /2ND HALT = FROM ADDRESS
7126 7200 CLA
7127 1603 TAD I HCNT2
7128 7402 HLT /3RD HALT = TO DATA
7129 7200 CLA
7130 1203 TAD HCNT2
7131 7402 HLT /4TH HALT = TO ADDRESS
7132 7300 CLA CLL
7133 5720 JMP I HXFERF

```

/
/TYPEOUT A '5' EVERY 5 MINUTES OF RUN TIME
/
7136 2357 HPASS, ISZ HCNT
7137 5214 JMP HSR00 /NOT 5 MINUTES YET
7140 1360 TAD HM750
7141 3357 DCA HCNT /RESTORE COUNTER
7142 1361 TAD C215
7143 4351 JMS HTRANS /CR
7144 1362 TAD C212
7145 4351 JMS HTRANS /LF
7146 1363 TAD C265
7147 4351 JMS HTRANS /5
7150 5214 JMP HSR00

7151 0000 HTRANS, 0
7152 6046 TLS /TRANSMIT CODE
7153 6041 TSF
7154 5353 JMP ,=1 /WAIT FOR FLAG
7155 7300 CLA CLL
7156 5751 JMP I HTRANS

7157 6400 HCNT, -1400 /COUNT 5 MINUTES
7160 6400 HM750, -1400
7161 0215 C215, 215 /CR
7162 0212 C212, 212 /LF
7163 0265 C265, 265 /5

/
/GO TO PAGE 2 OR PAGE 29
/
7164 4365 HGOP2, JMS ,+1 /0XXX OR 7XXX
7165 0000 0
7166 7300 CLA CLL
7167 1365 TAD ,=2
7170 1211 TAD C0200
7171 0201 AND C7600
7172 3205 DCA HINAD1
7173 5605 JMP I HINAD1 /0400 OR 7200

```

7200	5216	JMP	HWR	/WRITE PATTERN
7201	5225	JMP	HWR	/WRITE COMPLEMENT
7202	7774	HM4,	=4	
7203	7740	HM40,	=40	
7204	0523	CHENDM, LENDM		/LD END MEM ROUTINE
7205	7330	CHAAA, HAIA		/HI END MEM ROUTINE
7206	0000	HEND1,	0	/END MEM ROUTINE
7207	0000	HMADD,	0	/START WRITE ADDRESS
7210	0000	HCNT4,	0	/WRITE 2 PAGES
7211	0000	HCNT5,	0	/WRITE 4 ADDRESSES
7212	0200	CC0200,	0200	
7213	1000	C1000,	1000	
7214	7600	CC7600,	7600	
7215	0000	HINAD2,	0	/INDIRECT ADDRESSING
 /				
/ WRITE PATTERN INTO MEMORY				
 /				
7216	4235	HWR,	JMS	HWCON /CORRECT WRITE CONSTANTS
7217	4253	JMS	HWRMEM	/WRITE PATTERN
7220	1253	TAD	HWRMEM	/0XXX OR 7XXX
7221	1212	TAD	CC0200	
7222	0214	AND	CC7600	
7223	3215	DCA	HINAD2	
7224	5615	JMP I	HINAD2	/0600 OR 7400
 /				
/ WRITE COMPLEMENT PATTERN INTO MEMORY				
 /				
7225	4235	HWR,	JMS	HWCON /CORRECT WRITE CONSTANTS
7226	4255	JMS	HWRMC	/WRITE COMPLEMENT PATTERN
7227	1253	TAD	HWRMEM	/0XXX OR 7XXX
7230	1212	TAD	CC0200	
7231	0214	AND	CC7600	
7232	7001	IAC		
7233	3215	DCA	HINAD2	
7234	5615	JMP I	HINAD2	/0601 OR 7401

/
/UPDATE WRITE CONSTANTS
/
7235 1203 HWCON, 0
7235 1235 TAD ,+1 /0XXX OR 7XXX
7237 7024 RAL
7240 7630 SEL CLA
7241 5247 JMP HWCON1 /PROG IN UPPER MEM
7242 1213 TAD C1000 /PROG IN LOWER MEM
7243 3207 DCA HMADD /START WRITE ADDRESS
7244 1204 TAD CHENDM
7245 3206 DCA HEND1 /END MEM ROUTINE
7246 5635 JMP I HWCON

7247 1205 HWCON1, TAD CHAAA
7250 3206 DCA HEND1 /END MEM ROUTINE
7251 3207 DCA HMADD /START WRITE ADDRESS
7252 5635 JMP I HWCON

```

/
/ WRITE PATTERN OR WRITE PATTERN COMPLEMENT
/
7253 0000 HWRMEM, 0
7254 5261    JMP     HW1010      /WRITE PATTERN
7255 0000 HWRMC, 0
7256 1255    TAD     ,=1
7257 3253    DCA     HWRMEM      /STORE RETURN ADDRESS
7260 5270    JMP     HW0101      /WRITE COMPLEMENT

7261 1203    HW1010, TAD   HM40      /=40
7262 3210    DCA     HCNT4      /WRITE 2 PAGES
7263 4311    JMS     HWONE      /WRITE 4 WORDS OF ONES
7264 4300    JMS     HWZERO      /WRITE 4 WORDS OF ZEROES
7265 2210    ISZ     HCNT4
7266 5263    JMP     HW1010*2
7267 4606    JMS I   HEND1      /END OF MEMORY?
7270 1203    HW0101, TAD   HM40      /=40
7271 3210    DCA     HCNT4      /WRITE 2 PAGES
7272 4300    JMS     HWZERO      /WRITE 4 WORDS OF ZEROES
7273 4311    JMS     HWONE      /WRITE 4 WORDS OF ONES
7274 2210    ISZ     HCNT4
7275 5272    JMP     HW0101*2
7276 4606    JMS I   HEND1      /END OF MEMORY?
7277 5261    JMP     HW1010

7300 0000 HZWERO, 0
7301 1202    TAD     HM4      /=4
7302 3211    DCA     HCNT5      /WRITE 4 ZEROES
7303 3607    DCA I   HMADD
7304 2207    ISZ     HMADD      /INCREMENT MEMORY ADDRESS
7305 7000    NOP
7306 2211    ISZ     HCNT5
7307 5303    JMP     HZWERO*3
7310 5700    JMP I   HZWERO

7311 0000 HWONE, 0
7312 1202    TAD     HM4      /=4
7313 3211    DCA     HCNT5      /WRITE 4 ONES
7314 7240    STA
7315 3607    DCA I   HMADD
7316 2207    ISZ     HMADD      /INCREMENT MEMORY ADDRESS
7317 7000    NOP
7320 2211    ISZ     HCNT5
7321 5314    JMP     HWONE*3
7322 5711    JMP I   HWONE

```

/
/CHECK FOR END OF MEMORY

/
7323 0000 HENDM, Ø
7324 1207 TAD HMADD
7325 7640 SZA CLA
7326 5723 JMP I HENDM
7327 5653 JMP I HWRMEM
7330 0000 HAAA, Ø
7331 1207 TAD HMADD
7332 1213 TAD C1000
7333 7640 SZA CLA
7334 5730 JMP I HAAA
7335 5653 JMP I HWRMEM

/
/TWO SPECIAL SCOPE LOOPS

7336 7604 HSCOP1, LAS
7337 3372 DCA HSWADD /TEST ADDRESS
7340 1772 TAD I HSWADD
7341 0772 AND I HSWADD
7342 0772 AND I HSWADD
7343 0772 AND I HSWADD
7344 0772 AND I HSWADD
7345 0772 AND I HSWADD
7346 7040 CMA
7347 3772 DCA I HSWADD
7350 1772 TAD I HSWADD
7351 0772 AND I HSWADD
7352 0772 AND I HSWADD
7353 0772 AND I HSWADD
7354 0772 AND I HSWADD
7355 0772 AND I HSWADD
7356 7040 CMA
7357 3772 DCA I HSWADD
7360 5336 JMP HSCOP1

7361 7604 HSCOP2, LAS
7362 3372 DCA HSWADD /TEST ADDRESS
7363 1772 TAD I HSWADD
7364 7040 CMA
7365 3772 DCA I HSWADD
7366 1772 TAD I HSWADD
7367 7040 CMA
7370 3772 DCA I HSWADD
7371 5361 JMP HSCOP2

7372 0000 HSWADD, 0

7400	07400			
7400	5214	JMP	HTST	/READ AND TEST PATTERN
7401	5224	JMP	HTSTC	/READ AND TEST COMPLEMENT
7402	7774	HM04,	=4	
7403	7703	HM100,	=100	
7404	0763	CHENDT, LENDT		/LO END TEST ROUTINE
7405	7570	CHBBBB, HBBBB		/HI END TEST ROUTINE
7406	0832	HEND2,	0	/END TEST ROUTINE
7407	0800	HTSTAD,	0	/START TEST ADDRESS
7410	0800	HCNT6,	0	/TEST 2 PAGES
7411	0800	HCNT7,	0	/TEST 4 ADDRESSES
7412	1000	CC1000,	1000	
7413	7600	CK7600,	7600	

/
/READ AND TEST PATTERN CONTROL

7414	4234	HTST,	JMS	HRCON	/CORRECT READ CONSTANTS
7415	4252		JMS	HRMEM	/READ AND TEST PATTERN
7416	1252	TAD		HRMEM	/0XXX OR 7XXX
7417	1213	TAD		CK7600	/=200
7420	0213	AND		CK7600	
7421	7001	IAC			
7422	3207	DCA		HTSTAD	
7423	5607	JMP I		HTSTAD	/0401 OR 7201

/
/READ AND TEST COMPLEMENT PATTERN CONTROL

7424	4234	HTSTC,	JMS	HRCON	/CORRECT READ CONSTANTS
7425	4254		JMS	HRMEMC	/READ AND TEST COMPLEMENT PATTERN
7426	1254	TAD		HRMEMC	/0XXX OR 7XXX
7427	7006	7006			/RTL = AND ADDRESS OF TAG HPASS
7430	7630	SZL CLA			
7431	5627	JMP I	,+2		/PROG IN UPPER MEM
7432	5633	JMP I	,+1		/PROG IN LOWER MEM
7433	0206	0206			/ADDRESS OF TAG LPASS

/
/UPDATE READ CONSTANTS

7434 0000 HRCON, 0
7435 1234 TAD ,=1 /0XXX OR 7XXX
7436 7004 RAL
7437 7630 SEL CLA
7440 5246 JMP HRCON1 /PROG IN UPPER MEM
7441 1212 TAD CC1000 /PROG IN LOWER MEM
7442 3207 DCA HTSTAD /START TEST ADDRESS
7443 1204 TAD CHENDT
7444 3206 DCA HEND2 /END MEM ROUTINE
7445 5634 JMP I HRCON

7446 1205 HRCON1, TAD CHBBB
7447 3206 DCA HEND2 /END MEM ROUTINE
7450 3207 DCA HTSTAD /START TEST ADDRESS
7451 5634 JMP I HRCON

```

/
/READ AND TEST PATTERN OR PATTERN COMPLEMENT
/
7452 0000 HRMEM, 0
7453 5260 JMP HR1010 /READ AND TEST PATTERN
7454 0000 HRMEMC, 0
7455 1254 TAD ,=1
7456 3252 DCA HRMEM /STORE RETURN ADDRESS
7457 5311 JMP HR0101 /READ AND TEST COMPLEMENT

7460 1203 HR1010, TAD HM100 /=100
7461 3210 DCA HCNT6 /READ AND TEST 2 PAGES
7462 1202 HONE, TAD HM04 /=4
7463 3211 DCA HCNT7 /READ AND TEST 4 ADDRESSES
7464 1607 HONE1, TAD I HTSTAD
7465 7160 CMA STL
7466 3607 DCA I HTSTAD
7467 1607 TAD I HTSTAD
7470 7640 SZA CLA /TEST ONE COMPLEMENTED
7471 4352 JMS HHALTC /THIS LOC FAILED READ AND TEST
7472 1607 TAD I HTSTAD
7473 7040 CMA
7474 3607 DCA I HTSTAD
7475 1607 TAD I HTSTAD
7476 7101 IAC CLL
7477 7640 SZA CLA /TEST ONE
7500 4342 JMS HHALT /THIS LOCATION FAILED READ AND TEST
7501 2207 ISZ HTSTAD
7502 7000 NOP
7503 2211 ISZ HCNT7
7504 5264 JMP HONE+2
7505 2210 ISZ HCNT6
7506 5313 JMP HZERO
7507 4606 JMS I HEND2 /END OF MEMORY?
7510 5260 JMP HR1010 /NO

7511 1203 HR0101, TAD HM100 /=100
7512 3210 DCA HCNT6 /READ AND TEST 2 PAGES
7513 1202 HZERO, TAD HM04 /=4
7514 3211 DCA HCNT7 /READ AND TEST 4 ADDRESSES
7515 1607 HZERO1, TAD I HTSTAD
7516 7040 CMA
7517 3607 DCA I HTSTAD
7520 1607 TAD I HTSTAD
7521 7121 IAC STL
7522 7640 SZA CLA /TEST ZERO COMPLEMENTED
7523 4352 JMS HHALTC /THIS LOC FAILED READ AND TEST
7524 1607 TAD I HTSTAD
7525 7140 CMA CLL
7526 3607 DCA I HTSTAD
7527 1607 TAD I HTSTAD
7530 7640 SZA CLA /TEST ZERO
7531 4342 JMS HHALT /THIS LOC FAILED READ AND TEST
7532 2207 ISZ HTSTAD

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/CHECKERBOARD 'WORST CASE NOISE' FOR MM8-E 4K MEMORY (VER A) PAL10 V141 11-SEP-70 1102 PAGE 25-1

7533	7000	NOP	
7534	2211	ISZ	HCONT7
7535	5315	JMP	HZERO*2
7536	2210	ISZ	HCONT6
7537	5262	JMP	HONE
7540	4606	JMS I	HEND2
7541	5311	JMP	HR0101

/END OF MEMORY?
/NO

/
/ERROR HALT ROUTINE FOR DATA FAILURE
/

7542 0700 HHALT, 0
7543 1607 TAD I HTSTAD
7544 7402 HLT
7545 7200 CLA
7546 1207 TAD HTSTAD
7547 7402 HLT /1ST HALT = BAD DATA
7550 7200 CLA
7551 5742 JMP I HHALT
/

/
/ERROR HALT ROUTINE FOR COMPLEMENT DATA FAILURE
/

7552 0000 HHALTC, 0
7553 1607 TAD I HTSTAD
7554 7040 CMA
7555 7402 HLT /1ST HALT = BAD DATA
7556 7200 CLA
7557 1207 TAD HTSTAD
7560 7402 HLT /2ND HALT = BAD LOCATION
7561 7300 CLA CLL
7562 5752 JMP I HHALTC
/

/
/END OF MEMORY ROUTINE
/

7563 0000 HENDT, 0
7564 1207 TAD HTSTAD
7565 7640 SZA CLA
7566 5763 JMP I HENDT /MORE MEMORY TO TEST
7567 5652 JMP I HRMEM /END OF TEST
7570 0000 HBBB, 0
7571 1207 TAD HTSTAD
7572 1212 TAD CC1000
7573 7640 SZA CLA
7574 5770 JMP I HBBB /MORE MEMORY TO TEST
7575 5652 JMP I HRMEM /END OF TEST
\$

0000	11110200	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
0100	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
0200	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
0300	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11110000
0400	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
0500	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11100000
0600	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
0700	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111100

1000

1100

1200

1300

1400

1500

1600

1700

2000

2100

2200

2300

2400

2500

2600

2700

3000

3100

3200

3300

3400

3500

3600

3700

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 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111
7100 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11110000

7200 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111
7300 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11100000

7400 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111
7500 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111100

7600
7700

C0200	7011	HRESBN	7072	LCNT6	0610	LWZERO	0500
C1000	7213	HRMEM	7452	LCNT7	0611	LXPERF	0520
C212	7162	HRMEMC	7454	LEND1	0406	LZERO	0713
C215	7161	HSAVBN	7062	LEND2	0606	LZERO1	0715
C265	7163	HSCOP1	7336	LENDM	0523		
C7000	7012	HSCOP2	7361	LENDT	0763		
C7200	7013	HSR00	7014	LGOP2	0364		
C7600	7001	HSR07	7023	LHALT	0742		
CC0200	7212	HSW0	7007	LHALTC	0752		
CC1000	7412	HSW7	7010	LHILO	0232		
CC7600	7214	HSWADD	7372	LINAD1	0205		
CHAAA	7205	HTRANS	7151	LINAD2	0415		
CHBBB	7405	HTST	7414	LM04	0602		
CHENDM	7204	HTSTAD	7407	LM100	0603		
CHENDT	7404	HTSTC	7424	LM4	0402		
CK7600	7413	HW0101	7270	LM40	0403		
HAAA	7330	HW1010	7261	LM750	0360		
HBBB	7573	HWCON	7235	LMADD	0407		
HCNT	7157	HWCON1	7247	LONE	0562		
HCNT1	7002	HWONE	7311	LONE1	0664		
HCNT2	7003	HWR	7216	LPASS	0336		
HCNT3	7004	HWRC	7225	LR0101	0711		
HCNT4	7210	HWRMC	7255	LR1010	0660		
HCNT5	7211	HWRMEM	7253	LRCON	0634		
HCNT6	7410	HWZERO	7309	LRCON1	0646		
HCNT7	7411	HWXFERF	7120	LRELO	0302		
HEND1	7206	HWZERO	7513	LRELOD	0251		
HEND2	7406	HWZERO1	7515	LRELOU	0240		
HENDM	7323	K0200	0211	LRFSBN	0272		
HENDT	7563	K1000	0413	LRGMEM	0652		
HHOP2	7164	K212	0362	LRMEMC	0654		
WHALT	7542	K215	0361	LSAVBN	0262		
HHALTC	7552	K265	0363	LSCOOP1	0536		
HHILO	7032	K7000	0212	LSCOOP2	0561		
HINAD1	7005	K7200	0213	LSR00	0214		
HINAD2	7215	K7600	0201	LSR07	0223		
HM04	7402	KC7600	0613	LSW0	0207		
HM100	7403	KK0200	0412	LSW7	0210		
HM4	7202	KK1000	0612	LSWADO	0572		
HM40	7203	KK7600	0414	LTRANS	0351		
HM750	7163	KLAAC	0405	LTST	0614		
HMADD	7207	KLBBB	0605	LTSTAD	0607		
HONE	7462	KLENDM	0404	LTSTC	0624		
HONE1	7464	KLENDT	0604	LW0101	0470		
HPASS	7136	LAAA	0530	LW1010	0461		
HR0101	7511	LBBC	0770	LWCON	0435		
HR1010	7460	LCNT	0357	LWCON1	0447		
HRCON	7434	LCNT1	0202	LWONE	0511		
HRCON1	7446	LCNT2	0203	LWR	0416		
HRELO	7102	LCNT3	0204	LWRC	0425		
HRELOD	7051	LCNT4	0410	LWRMC	0455		
HRELOU	7040	LCNT5	0411	LWRMEM	0453		

) /CHECKERBOARD 'WORST CASE NOISE' FOR MMB-E 4X MEMORY (VER A) PAL10 V141 11-SEP-70 1102 PAGE 26-4

) ERRORS DETECTED 0

) LINKS GENERATED 0

) RUN-TIME 1.8 SECONDS

) 3K CORE USED