

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DEMHH-A-D
 (SUPERSEDES MAINDEC-11-D1HB)

PRODUCT NAME: CORE HEATING TEST

DATE REVISED: MAY 16, 1972

MAINTAINER: DIAGNOSTIC GROUP

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1, ABSTRACT

THE CORE HEATING TEST VERIFIES THE ABILITY OF MEMORY CORES WITHIN THE TEST ZONE TO WITHSTAND BOTH INTERNAL AND EXTERNAL HEAT WITHOUT MALFUNCTIONING. HEATING IS LIMITED TO THE AMOUNT OF HEAT THAT CAN BE PRODUCED BY THE PROCESS OF EXECUTING MEMORY REFERENCE INSTRUCTIONS AT THE MAXIMUM RATE. A TEST FEATURE IS PROVIDED IN THE FACT THAT THE HEATING INTERVAL CAN BE SET TO ANY SPECIFIED PERIOD TO FACILITATE SPECIALIZED HEAT TESTS. THE TEST CAN BE RUN INDEPENDENTLY OF EXTERNAL DEVICES AND DOES NOT RELY ON EXTERNAL INTERRUPTS FOR OPERATIONAL CONTINUITY.

2, REQUIREMENTS

2.1 EQUIPMENT

PDP-11 WITH A MINIMUM OF 4K MEMORY

2.2 STORAGE

2.2.1 PROGRAM STORAGE - THE ROUTINE USES MEMORY FROM 0 TO 570,

- 1, ABSOLUTE LOADER MUST BE IN MEMORY;
- 2, PLACE BINARY TAPE IN READER,
- 3, LOAD ADDRESS #7500, (* DETERMINED BY ADDRESS OF LOADER)
- 4, PRESS "START" (PROGRAM WILL LOAD);

3, LOADING PROCEDURE

3.1 METHOD

PROCEDURE FOR NORMAL BINARY TAPES SHOULD BE FOLLOWED.

4, STARTING PROCEDURE,

4.1 CONTROL SWITCH SETTING

N/A

4.2 STARTING ADDRESS OR ADDRESSES

- 200 * START WITH AUTOMATIC TEST LIMITS
- 202 * START WITH SELECTED TEST LIMITS

4.3 PROGRAM AND/OR OPERATOR ACTION

LOAD PROGRAM INTO MEMORY,
SET SWITCH REGISTER TO STARTING ADDRESS,
LOAD ADDRESS 200,
PRESS START,
THE PROGRAM WILL RUN THROUGH A TEST OF THE SELECTED ADDRESS FIELD AND LOOP.

5. OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

5.1.1 SW12 = 1 OR UP ; HALT ON END OF PROGRAM

5.1.2 AUTOMATIC TEST LIMITS

IF THE PROGRAM IS STARTED AT ADDRESS 200 THE PROGRAM WILL TEST ALL AVAILABLE MEMORY, CARE SHOULD BE TAKEN TO SELECT THE PROPER OPERATIONAL SWITCH SETTINGS (REFER TO 5.1.1) BEFORE STARTING,

5.1.3 SELECTED TEST LIMITS

IF THE PROGRAM IS STARTED AT ADDRESS 202 THE PROGRAM WILL STOP AT THE FIRST OF THREE HALTS,

- A. SET THE LOW TEST LIMIT IN THE SWITCH REGISTER AND PRESS CONTINUE;
- B. THEN SET THE HIGH TEST LIMIT IN THE SWITCH REGISTER AND PRESS CONTINUE;
- C. THEN SET THE OPERATIONAL SWITCH SETTINGS (REF 5.1.1) AND PRESS CONTINUE;

THE PROGRAM WILL NOW BEGIN TESTING THE SELECTED AREA, THE PROGRAM WILL NOT ALLOW LIMITS TO BE SELECTED THAT WOULD CAUSE ITSELF TO BE DESTROYED;

5,2 SUBROUTINE ABSTRACTS

N/A

5,3 PROGRAM AND/OR OPERATOR ACTION

5,3,1 LOAD AND START AT 200 WITH ALL SWITCHES DOWN, IF AN ERROR OCCURS THE PROGRAM WILL NOT ARRIVE AT THE END OF PASS LOCATION WITHIN THE PROPER AMOUNT OF RUN TIME.

6, ERRORS

6,1 ERROR PRINTOUT

N/A

6,2 ERROR RECOVERY

RELOAD PROGRAM AND START

7, RESTRICTIONS

7,1 STARTING RESTRICTION

NONE

7,2 OPERATIONAL RESTRICTION

NONE

8, EXECUTION TIME

THIS PROGRAM WILL RING THE TELETYPE BELL AFTER EACH PASS THRU THE PROGRAM WHICH IS APPROXIMATELY EVERY 4 MINUTES WITH 4K OF MEMORY.

PROGRAM DESCRIPTION (4K OF MEMORY)

THE COME HEATING TEST DEMONSTRATES THAT THE CORES OF EACH LOCATION TESTED (IN THE SELECTED TEST ZONE) WILL NOT MALFUNCTION AS A RESULT OF AN INTERNAL HEAT RISE DUE TO A CONTINUOUS LOOP ON THAT PARTICULAR LOCATION, AFTER THE HEATING INTERVAL HAS EXPIRED THE PROGRAM MOVES TESTING UP TO THE NEXT LOCATION AND THE HEATING CYCLE IS RESUMED, THE HEATING LOOP IS MAINTAINED BY A SINGLE INSTRUCTION WHICH SERVES TO HOLD THE PC ON THE HEAT LOCATION WHILE INCREMENTING AN ADJUCT POINTER THROUGH MEMORY; ESSENTIALLY, THE HEATING LOOP IS BASED ON THE LENGTH OF TIME REQUIRED TO SCAN 16725 LOCATIONS OUT OF THE BASIC 17776.

THE INSTRUCTION USED BY THIS TEST IS A "MOV @(1)+,X7", WHERE REGISTER 1 IS A POINTER MOVING THROUGH MEMORY, THEREFORE, EACH WORD LOCATION ABOVE THE PROGRAM (UP TO 17476) IS LOADED WITH THE ADDRESS OF THE LOCATION HOLDING THE ADDRESS OF THE HEATING LOCATION, FOR EXAMPLE, IF LOCATION 530 IS BEING HEATED, THE TEST WOULD LOAD THE MOV @(1)+,X7 INSTRUCTION INTO THIS LOCATION; LOCATION 500 (TAGGED AS HLDADD) IS LOADED WITH THE ADDRESS (IN THIS CASE 530) OF THE HEAT LOCATION AS THE LOOP IS BEING INITIALIZED, THE TEST WOULD THEN WRITE THE NUMBER 500 IN EACH LOCATION ABOVE 520 ALL THE WAY UP TO 17476; THE ADDRESS OF ANOTHER LOCATION (502) TAGGED RESCAN IS LOADED INTO 17476, REGISTER 1 IS SET TO 522 AND THE PC IS MOVED TO 530, AT THIS TIME THE INSTRUCTION AT 530 IS EXECUTED TO THE EFFECT THAT; THE LOCATION REGISTER 1 IS POINTING TO CONTAINS THE ADDRESS OF THE QUANTITY TO BE MOVED TO THE PC, SINCE REGISTER 1 IS POINTING TO 522 AND 522 CONTAINS 530, 530 WILL BE MOVED TO THE PC (WHICH WOULD BE POINTING AT 532); REGISTER 1 IS AUTO-INCREMENTED AND THE ENTIRE OPERATION IS REPEATED FOR LOCATION 524, 526, 530, ETC; HOWEVER, WHEN REGISTER 1 REACHES 530 THE RESULT OF EXECUTING THE INSTRUCTION IS AN ATTEMPT TO MOVE THE INSTRUCTION TO THE PC, THIS CONSTITUTES AN ILLEGAL ADDRESS, AND THE PROGRAM WILL BE HARDWARE TRAPPED TO LOCATION 4, THE TRAP VECTORS TO LOCATION 100 WHICH IN TURN (WORD) INCREMENTS REGISTER 1, RESETS THE STACK POINTER (TO KEEP IT OUT OF THE WAY) AND MOVES THE PC BACK TO THE HEATING LOCATION, RESUMING THE HEAT LOOP;

WHEN REGISTER 1 INCREMENTS TO 17476 A TAG ADDRESS, NXSCAN, IS MOVED TO THE PC VIA THE TAG RESCAN (502) STORED IN 17476. NXSCAN IS A BRIEF INTERRUPTION TO DECREMENT THE HEAT LOOP COUNTER AND BRANCH OUT OF LOOP IS ZERO, RESET REGISTER 1 BACK TO THE MEMORY SCAN STARTING POINT (522), AND MOVE THE PC BACK TO THE HEATING LOCATION, THE NUMBER OF HEAT LOOPS IS SET TO 3 WHICH IS EQUAL TO APPROXIMATELY 114

(9, CONT.)

MILLISECONDS PER LOCATION. WHEN A LOOP COUNT IS DECREMENTED TO ZERO, THE PROGRAM WILL PERFORM THE FOLLOWING FUNCTIONS: INCREMENT THE TEST LOCATION POINTER AND COMPARE IT WITH THE HIGH LIMIT BOUNDARY FOR END OF TEST, LOAD THE LAST HEATING LOCATION WITH THE ADDRESS OF THE TAG HLDADD, LOAD THE NEXT HEAT LOCATION WITH THE INSTRUCTION, REINITIALIZE THE HEAT LOOP COUNTER, RESET REGISTER 1 TO START OF SCAN, AND FINALLY, MOVE THE PC TO THE ADDRESS (OF THE NEXT HEATING LOCATION) TO INITIATE TESTING. UPON COMPLETION THE PROGRAM WILL RING THE TELETYPE BELL AND HALT IF SWITCH 12 IS PRESENT, A CONTINUE FROM THE HALT (OR IF SWITCH 12 IS NOT PRESENT) WILL JUMP TO BEGIN.

IT SHOULD BE REALIZED THAT THE ADDRESS (17476) IN THE ABOVE DESCRIPTION ONLY APPLIES WITH A 4K MACHINE, THIS ADDRESS IS DETERMINED BY:
1, HOW MUCH CORE THERE IS
2, HOW THE PROGRAM WAS LOADED.

10,

LISTING

,NLIST SEQ

,TITLE CORE HEATING TEST MAINDEC-11-DZMMH-A
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000240
177776
177570

NOP=240
PSW=177776
SWREG=177570

000000

,ENABL ABS
,#0

,TRAP CATCHER IN UNUSED LOCATION FROM 0 THRU 176

000004 000004
000004 000100
000050 000050
000050 000570
000052 017476
000054 177564
000056 177566
000100 000100
000100 000721
000102 012706
000106 010207

,#4
100
,#50
LOLMT: QEDA
HILMT: 17476
TCSR: 177564
YDBR: 177566

000566

,#100
TST (1)+
MOV #BUFFER,X6
MOV X2,X7

;INCREMENTING R1

;PUT PC BACK TO TEST LOC

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000200 000230 ,#200
000200 000436 BR
000202 012767 000570 177640 START: MOV #QEDA,LOLMT ;GET END PROGRAM MARKER
000210 012767 017474 177634 MOV #17474,HILMT ;GET HIGH LIMIT MARKER
000216 012706 000566 MOV #BUFFER,X6
000222 000000 HALT ;WAIT FOR OPERATOR LOLMT
000224 005767 177340 TST SWREG ;LOOK FOR LOLMT
000230 026767 177334 177612 CMP SWREG,LOLMT ;CKN LOLMT INPUT>TERMNL
000236 103403 BLO HISET ;LOLMT<TERMNL USE LMT DEFINED
000240 016767 177324 177602 MOV SWREG,LOLMT ;LOLMT>TERMNL STORE INPUT
000246 000000 HISET: HALT ;WAIT FOR CONTINUE
000250 005767 177314 TST SWREG ;LOOK FOR HILMT
000254 026767 177310 177566 CMP SWREG,LOLMT
000262 103403 BLO CONSET
000264 016767 177300 177560 MOV SWREG,HILMT ;STORE INPUT
000272 000000 CONSET: HALT ;SET UP CONTROL SWITCHES
000274 000443 BR
000276 012706 000566 START1: MOV #BUFFER,X6
000302 010603 MOV X6,X3
000304 012767 000320 177472 MOV #TLG,4
000312 005723 SEE: TST (3)+
000314 000240 NOP
000316 000775 BR
000320 022626 TLG: CMP (6)+,(6)+
000322 162703 000004 SUB #4,X3
000326 005767 177510 TST 42
000332 001406 BEO S1
000334 020327 000542 CMP X3,#ENDADR
000340 001405 BEO S2
000342 162703 002734 SUB #1500,,X3
000346 000402 BR S2
000350 162703 000300 S1: SUB #300,X3
000354 010367 177472 S2: MOV X3,HILMT
000360 012767 000570 177462 MOV #QEDA,LOLMT
000366 012767 000100 177410 MOV #100,4
000374 016702 177450 MOV LOLMT,X2
000400 000167 000000 JMP BEGIN
000404 016702 177440 BEGIN: MOV LOLMT,X2 ;PUT LOLMT IN R2
000410 012703 000570 MOV #QEDA,X3 ;END PGM MARKER IN R3
000414 012723 000556 SETSCN: MOV #HLDADD,(3)+ ;WRITN HLDADD ADDRESS FROM QED TO HILMT-2
000420 020367 177426 CMP X3,HILMT ;CKN COUNT
000424 101773 BLOS SETSCN ;LOOP CONTINUE WRITN
000426 012713 000560 MOV #RESCAN,0X3 ;WRITE RESCAN ADDRESS IN HILMT
000432 012767 000462 000120 MOV #NXSCAN,RESCAN ;NXSCAN IS LINK FOR SCAN LOOP
000440 012703 000003 REENTR: MOV #3,X3 ;SET HEAT LOOP COUNT IN R3,.030SEC PER LOOP
000444 012701 000570 MOV #QEDA,X1
000450 012712 013107 MOV #13107,0X2 ;WRITE "MOV @(1)+,X7" IN TEST LOC
000454 010267 000076 MOV X2,HLDADD ;PUT TESTING LOC ADDRESS IN HLDADD
000460 010207 MOV X2,X7 ;GO TO TEST LOC AND LOOP
000462 005303 NXSCAN: DEC X3 ;DECREMENT COUNT, 3 LOOPS X.030=114MS PER LOC
000464 001403 BEO ,+10 ;SKIP NX TWO IF EQUAL
000466 012701 000570 MOV #QEDA,X1 ;RESET R1 WITH START OF SCAN
000472 010207 MOV X2,X7 ;GO TO TEST LOC AND LOOP

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000474	012722	000556		MOV	#HLDADD,(2)+	IRESET LOC BACK TO VALUE OF HLDADD
000500	020267	177346		CMP	X2,HILMT	ICKN FOR HILMT
000504	001355			BNE	REENTR	
000506	105777	177342		TSTB	@TCSR	
000512	100375			BPL	,=4	
000514	012777	000207	177334	MOV	#207,@TDBR	IRING BELL ON END OF PASS
000522	032767	010000	177040	CONTCK: BIT	#10000,SWREG	IHALT IF SW12 IS SET
000530	001401			BEG	,+4	
000532	000000			HALT		
000534	013702	000042		MOV	@#42,X2	
000540	001404			BEG	DOAGN	
000542	004712			ENDADR: JSR	X7,(2)	
000544	000240			NOP		
000546	000240			NOP		
000550	000240			NOP		
000552	000167	177626		DOAGN: JMP	BEGIN	ILLOOP AND RERUN
000556	000000			HLDADD: 0		
000560	000000			RESCAN: 0		
000562	000000			QED: 0		
	000566				,#QED+4	
000566	000000			SUFFER: 0		
000570	000000			QEDA: 0		
	000001				.END	

BEGIN	000404	BUFFER	000566	CONSET	000272	CONTCK	000522
DOAGN	000552	ENDADR	000542	HILMT	000052	HISET	000246
HLDADD	000556	LQMT	000250	NOP	= 000240	NXSCAN	000462
PSW	= 177776	QED	000562	QEDA	000570	REENTR	000440
RESCAN	000560	SEE	000312	SETSCN	000414	START	000202
START1	000270	SWREG	= 177570	TCSR	000054	TOBR	000056
TLO	000320	S1	000350	S2	000354	.	= 000572

ERRORS DETECTED: 0

CORE HEATING TEST MAINDEC-11-DENMH-A
DZMMHA,P11

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*DZMMHA,DZMMHA-DZMMHA/SOL
RUN-TIME: 0 1 0 SECONDS
CORE USED: 3K