

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DEMME-A-D
(SUPERSEDES MAINDEC-11-D1CC)

PRODUCT NAME: NO DUAL ADDRESS TEST

DATE REVISED: MAY 22, 1972

MAINTAINER: DIAGNOSTIC GROUP

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1. ABSTRACT

THE NO DUAL ADDRESS TEST CHECKS THE UNIQUE SELECTION OF EACH MEMORY ADDRESS TESTED, THE ADDRESS OF EACH FAILURE LOCATION AND ITS CONTENTS ARE PRINTED ON THE TELETYPE, SCOPE LOOP OPTIONS ARE PROVIDED TO FACILITATE ANY ADDITIONAL DIAGNOSTIC PROCEDURES THAT MAY BE USED IN CONJUNCTION WITH THIS TEST,

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11 WITH A MINIMUM 4K OF MEMORY,

2.2 STORAGE

2.2.1 PROGRAM STORAGE - THE ROUTINE USES MEMORY FROM 0200 TO 3226.

3. LOADING PROCEDURE

3.1 METHOD

PROCEDURE FOR NORMAL BINARY TAPES SHOULD BE FOLLOWED,

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).

4. STARTING PROCEDURE

4.1 CONTROL SWITCH SETTING

STARTING AT SA 200 ALL SWITCHES SHOULD BE DOWN OR ZERO,

4.2 STARTING ADDRESS OR ADDRESSES

- 200 = START FOR AUTOMATIC TEST LIMITS
- 202 = START FOR 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 THE SELECTED ADDRESS FIELD AND LOOP.

5, OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

5.1.1 SWITCH SETTINGS ARE

SW15 = 1 OR UP ... HALT ON ERROR
SW14 = 1 OR UP ... SCOPE LOOP
SW13 = 1 OR UP ... INHIBIT PRINTOUT
SW12 = 1 OR UP ... HALT UPON COMPLETION OF A PASS

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 A MESSAGE WILL BE PRINTED ON THE TELETYPE INSTRUCTING THE OPERATOR ON THE METHOD OF SELECTING OTHER MEMORY TEST AREAS AND THEN 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, AN EXCEPTION TO THIS WOULD BE THE INSTRUCTIONAL TEXT STORAGE AREA, STARTING THE PROGRAM AT 200 OR SELECTING LIMITS WHICH OVERLAP THIS AREA WILL CAUSE THE TEXT MESSAGE TO BE DESTROYED,

5,2 SUBROUTINE ABSTRACTS

5,2,1 ERRORA

SUBROUTINE ERRORA IS CALLED WHENEVER THE PROGRAM DETECTS A LOCATION WHICH FAILS TO STORE DATA PROPERLY. THIS SUBROUTINE IS CALLED FOR EITHER A 1'S (177777) WRITE-READ ERROR OR A 0'S (000000) WRITE-READ ERROR. THE SUBROUTINE SETS AN ERROR FLAG (FOR THE SCOPE LOOP) AND THEN TYPES THE ERROR MESSAGE ON THE TELETYPE (IF THE PRINT INHIBIT SWITCH IS NOT SET), WITH THE ERROR ADDRESS AND CONTENTS OF THE ADDRESS. THE SUBROUTINE THEN TESTS OPERATIONAL CONTROL SWITCHES FOR SWITCHES 13 AND 14. IF THESE SWITCHES ARE BOTH ABSENT THE SUBROUTINE RETURNS TO THE MAIN TEST PROGRAM AND RESUMES TESTING. IF SWITCH 13 IS SET A MESSAGE DESCRIBING THE PROCEDURE FOR SETTING UP THE SCOPE LOOP WILL BE OUTPUT AND THE PROGRAM WILL HALT. IF THE SCOPE LOOP OPTION IS SELECTED A CONTINUE FROM THIS POINT WILL ESTABLISH A SCOPE LOOP AND THE PROGRAM WILL CONTINUE TO LOOP UNTIL THE SCOPE SWITCH IS RESET. ERROR PRINTOUT WILL BE EITHER INHIBITED OR ENABLED IN THE SCOPE LOOP, AS DETERMINED BY THE POSITION OF SWITCH 13.

5,2,2 ERRORB

SUBROUTINE ERRORB IS CALLED WHENEVER THE PROGRAM DETECTS AN ERROR LOCATION IN THE TEST FIELD. AN ERROR IN THIS MODE INDICATES THE PRESENCE OF DUAL ADDRESS SELECTION. THIS SUBROUTINE IS CALLED FOR EITHER A 1'S (177777) FIELD MODE DUAL ADDRESS ERROR, OR A 0 FIELD MODE DUAL ADDRESS ERROR. THE 0'S MODE DUAL ADDRESS ERROR OCCURS IF THE CONTENTS OF ANY LOCATION IN THE MEMORY TEST FIELD PREVIOUSLY SET TO -1 (AT EACH LOCATION) CHANGES AS A RESULT OF WRITING AND READING ZERO AT THE LOCATION CURRENTLY UNDER TEST. THE 1'S MODE DUAL ADDRESS ERROR OCCURS IF THE CONTENTS OF ANY LOCATION IN THE MEMORY TEST FIELD PREVIOUSLY SET TO 0 (AT EACH LOCATION) CHANGES AS A RESULT OF WRITING AND READING -1 (177777) AT THE LOCATION CURRENTLY UNDER TEST. SUBROUTINE ERRORB OPERATES IN THE SAME MANNER AS SUBROUTINE ERRORA EXCEPT THAT AFTER THE TEST LOCATION ADDRESS AND CONTENTS ARE PRINTED, A CARRIAGE RETURN AND LINEFEED ARE PERFORMED, FOLLOWED BY THE ADDRESS OF THE ERROR LOCATION IN THE MEMORY TEST FIELD, SIX SPACES, AND THE CONTENTS OF THAT LOCATION. FOR EXAMPLE THE PRINTOUT:

DUAL ADDRESS ERROR - WRITE 0 MODE

003600	000000
003760	177767

INDICATES WHEN A 0 WAS WRITTEN INTO AND READ OUT OF LOCATION 3600, THE CONTENTS OF LOCATION 3760 CHANGED FROM 177777 TO 177767. THE SWITCH OPTIONS OPERATE EXACTLY AS DESCRIBED ABOVE

- 6, ERRORS
- 6,1 ERROR PRINTOUT
- 6,2 ERROR RECOVERY

IF AN ERROR IS DETECTED THERE WILL BE A PRINTOUT,
WHEN AN ERROR IS DETECTED AND IT IS NECESSARY TO SCOPE
ON IT, PLACE SW15 UP TO HALT ON ERROR, THEN SW14 UP
TO LOOP ON ERROR, THEN SW13 UP TO DELETE PRINTOUTS;

DEPRESS CONTINUE TO RESTART SECTION OR RESTART AT 200

- 7, RESTRICTIONS
- 7,1 STARTING RESTRICTION

NONE

- 7,2 OPERATIONAL RESTRICTION

NONE

- 8, MISCELLANEOUS
- 8,1 EXECUTION TIME

WITH 4K OF MEMORY
THE EXECUTION TIME IS APPROXIMATELY 6 MINUTES 30 SECONDS,
EXECUTION TIME FOR A COMPLETE MEMORY BANK (*00000 TO *17776)
IS APPROXIMATELY 10 MINUTES, TO CALCULATE THE EXPECTED
EXECUTION TIMES FOR MACHINES WITH EXTENDED MEMORY THE FOLLOWING
FORMULA WILL GIVE A CLOSE APPROXIMATION, SUM THE EXECUTION
TIMES FOR THE BANKS SELECTED AND DIVIDE BY THE NUMBER OF BANKS
SELECTED, THIS WILL GIVE THE AVERAGE TIME PER BANK, MULTIPLY
THIS TIME BY THE SQUARE OF THE NUMBER OF BANKS SELECTED TO GET
EXECUTION TIME.

EXAMPLE 1) 8K MACHINE

$$((6,5+10)/2)*(2**2)=33 \text{ MINUTES}$$

EXAMPLE 2) 12K MACHINE

$$((6,5+10+10)/3)*(3**2)=79,5 \text{ MINUTES}$$

9.

PROGRAM DESCRIPTION

THIS TEST CHECKS EACH BIT OF THE SELECTED MEMORY TEST FIELD TO VERIFY THAT THE CORE STORAGE TESTED IS FREE FROM DUAL ADDRESS SELECTION,

THE FIRST LOCATIONS TESTED FOR DUAL ADDRESSING ARE THOSE CRITICAL CORE LOCATIONS ESSENTIAL TO RUNNING THE TEST, THESE ARE TESTED USING THE PROCESSOR REGISTERS, IF ANY ONE OF THESE CRITICAL LOCATIONS FAILS THE PROGRAM HALTS (WITHOUT PRINTOUT),

THE TEST IS DIVIDED INTO TWO SECTIONS, THE FIRST OF WHICH FILLS THE TEST FIELD WITH 1'S AND WRITES 0 INTO THE FIRST TEST (OR LOW LIMIT) LOCATION, FOLLOWING A READ CHECK FROM THIS LOCATION, THE PROGRAM CHECKS EACH FIELD LOCATION FOR NO VARIATION FROM THE -1 CONFIGURATION, UPON COMPLETION OF THIS TEST THE TEST LOCATION POINTER IS INCREMENTED, THE NEXT LOCATION IS WRITE-READ EXERCISED WITH 0, AND THE TEST FIELD RECHECKED FOR ANY CHANGE IN CONTENT, WHEN THE SELECTED TEST FIELD HAS BEEN TESTED IN THIS MODE, THE PROGRAM SETS A FLAG, FILLS THE TEST FIELD WITH 0'S, AND WRITE-READS THE FIRST TEST (OR LOW LIMIT) LOCATION, A READ CHECK OF THE TEST FIELD FOR ANY VARIATION FROM THE 0 CONFIGURATION IS PERFORMED AND TESTING IS CONTINUED AS DESCRIBED ABOVE, IF AN ERROR OCCURS A CALL TO SUBROUTINE ERRORA OR ERRORB OCCURS, ON COMPLETION OF A PASS THRU THE TEST AREA THE PROGRAM WILL RING THE TELETYPE BELL AND THE PROGRAM WILL HALT IF SWITCH 12 IS PRESENT, A CONTINUE FROM THE HALT (OF IF SWITCH 12 IS NOT PRESENT) WILL RETURN TO TEST CONTROL (TSCNTL) FOR THE NEXT PASS,

10.

LISTING

,NLIST SEQ
,TITLE NO DUAL ADDRESSING MEMORY TEST MAINDEC-11-DZMMC-A
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,NOP=240

000240

,ENABL ABS
,#0

000000

,TRAP CATCHER 0-176

000004 000004
000004 000326
000200 000200

,#4
TLG
,#200

000200 000444
000202 000405
000204 002710
000206 017470
000210 177570
000212 177566
000214 177564

BR START
BR START1
LOLMTI QEFA
HILMTI 17470
SWREGI 177570
TOBRI 177566
TCSR1 177564

,SWREG=177570
,TOBR=177566
,TCSR=177564

000216 012703 002710
000222 012704 017470
000226 012706 002706
000232 012702 002712
000236 004767 001726
000242 000000
000244 005777 177740
000250 001405
000252 027703 177732
000256 103402
000260 017703 177724
000264 000000
000266 005777 177716
000272 001405
000274 027703 177710
000300 103402
000302 017704 177702
000306 000000
000310 000427
000312 012706 002706
000316 010603
000320 005723
000322 000240
000324 000775
000326 162703 000004
000332 005737 000042
000336 001407
000340 023727 000042 001400
000346 001405
000350 162703 002734
000354 000402
000356 162703 000300
000362 010304

START1: MOV #QEFA,X3
MOV #17470,X4
MOV #BUFFER,X6
MOV #MSG1,X2
JSR X7, TOP
HALT
TST #SWREG
BEQ HISET
CMP #SWREG,X3
BLO HISET
MOV #SWREG,X3
HISET: HALT
TST #SWREG
BEQ CONSET
CMP #SWREG,X3
BLO CONSET
MOV #SWREG,X4
CONSET: HALT
BR BEGIN
START: MOV #BUFFER,X6
MOV X6,X3
SEE: TST (X3)+
NOP
BR SEE
TLGI: SUB #4,X3
TST #42
BEQ S1
CMP #42,#ENDADR
BEQ S2
SUB #1500,X3
BR S2
S1: SUB #300,X3
S2: MOV X3,X4

,LOAD END OF PGM MARK QEF
,LOAD HIGH MEMORY LIMIT
,SET LP
,MESSAGE ADDRESS IN R2
,PRINT MSG1
,WAIT FOR CONTINUE
,LOOK FOR LOLMT
,DEFERRED
,CKN LOLMT INPUT>QEF
,<QEF USE LIMIT DEFINED
,>QEF STORE INPUT
,WAIT FOR CONTINUE
,LOOK FOR HILMT
,DEFERRED
,CKN INPUT>LOLMT
,INPUT < LOLMT USE LIMIT DEFINED
,INPUT>LOLMT, STORE HILMT
,SET UP CONTROL SWITCHES

,TEST POINT IN LOWEST BANK
,TEST
,DISPLAY
,NO TRAP, CONTINUE
,TRAPPED, IN WHICH BANK?
,LOADED BY A MONITOR?
,BR IF NO
,YES--WAS IT DDP1?
,NOPE
,YES--SAVE CORE FOR CHAIN MODE
,SKIP NEXT I/N
,PROTECT THE LOADERS
,SET HILMT

```

000364 012703 002710
000370 012705 177777
000374 010567 001442
000400 010567 001440
000404 010567 001436
000410 010567 001434
000414 010567 001432
000420 010567 001430
000424 010567 177554
000430 010567 177552
000434 010567 001416
000440 010567 001414
000444 010567 001412
000450 010301
000452 005021
000454 020104
000456 101775
000460 020567 001356
000464 001401
000466 000000
000470 020567 001350
000474 001401
000476 000000
000500 020567 001342
000504 001401
000506 000000
000510 020567 001334
000514 001401
000516 000000
000520 020567 001326
000524 001401
000526 000000
000530 020567 001320
000534 001401
000536 000000
000540 020567 177440
000544 001401
000546 000000
000550 020567 177432
000554 001401
000556 000000
000560 020567 001272
000564 001401
000566 000000
000570 020567 001264
000574 001401
000576 000000
000600 020567 001256
000604 001401
000606 000000
000610 005067 001226
000614 005067 001224
000620 005067 001222
000624 005067 001220
    
```

```

MOV #QEFA,X3
BEGINI MOV #=1,X5
MOV X5,GARCIA
MOV X5,FLAG1
MOV X5,FLAG2
MOV X5,FLAG3
MOV X5,FLAG4
MOV X5,HOLDIT
MOV X5,LOLMT
MOV X5,HILMT
MOV X5,SAVE0
MOV X5,SAVE1
MOV X5,SAVE3
LOADAI MOV X3,X1
CLR (1)+
CMP X1,X4
BLOS LOADAI
CMP X5,GARCIA
BEQ ,+4
HALT
CMP X5,FLAG1
BEQ ,+4
HALT
CMP X5,FLAG2
BEQ ,+4
HALT
CMP X5,FLAG3
BEQ ,+4
HALT
CMP X5,FLAG4
BEQ ,+4
HALT
CMP X5,HOLDIT
BEQ ,+4
HALT
CMP X5,LOLMT
BEQ ,+4
HALT
CMP X5,HILMT
BEQ ,+4
HALT
CMP X5,SAVE0
BEQ ,+4
HALT
CMP X5,SAVE1
BEQ ,+4
HALT
CMP X5,SAVE3
BEQ ,+4
HALT
CLR GARCIA
CLR FLAG1
CLR FLAG2
CLR FLAG3
    
```

```

;THIS SEGMENT TESTS KEY PROGRAM
;LOCATIONS FOR DUAL ADDRESSING
;BETWEEN TEST LOCATIONS AND
;KEY PROGRAM LOCATIONS; A HALT
;IN THIS SEGMENT AUTOMATICALLY
;INDICATES NON OPERATIONAL MEMORY

;CLEAR TEST AREA

;CK KEY LOC'S

;SET KEY LOC'S TO 0
    
```


000630	005067	001216
000634	005067	001214
000640	005067	177340
000644	005067	177336
000650	005067	001202
000654	005067	001200
000660	005067	001176
000664	012700	177777
000670	010301	
000672	010021	
000674	020104	
000676	101775	
000700	005767	001136
000704	001401	
000706	000000	
000710	005767	001130
000714	001401	
000716	000000	
000720	005767	001122
000724	001401	
000726	000000	
000730	005767	001114
000734	001401	
000736	000000	
000740	005767	001106
000744	001401	
000746	000000	
000750	005767	001100
000754	001401	
000756	000000	
000760	005767	177220
000764	001401	
000766	000000	
000770	005767	177212
000774	001401	
000776	000000	
001000	005767	001052
001004	001401	
001006	000000	
001010	005767	001044
001014	001401	
001016	000000	
001020	005767	001036
001024	001401	
001026	000000	
001030	010367	177150
001034	010302	
001036	010467	177144
001042	005067	000772
001046	012700	177777
001052	000411	
001054	005767	000760
001060	001402	
001062	000167	000256

	CLR	FLAG4
	CLR	HOLDIT
	CLR	L0LMT
	CLR	HILMT
	CLR	SAVE0
	CLR	SAVE1
	CLR	SAVE3
	MOV	#=1,X0
	MOV	X3,X1
LOADBI	MOV	X0,(1)+
	CMP	X1,X4
	BLOS	LOADB
	TST	GARCIA
	BEQ	,+4
	HALT	
	TST	FLAG1
	BEQ	,+4
	HALT	
	TST	FLAG2
	BEQ	,+4
	HALT	
	TST	FLAG3
	BEQ	,+4
	HALT	
	TST	FLAG4
	BEQ	,+4
	HALT	
	TST	HOLDIT
	BEQ	,+4
	HALT	
	TST	L0LMT
	BEQ	,+4
	HALT	
	TST	HILMT
	BEQ	,+4
	HALT	
	TST	SAVE0
	BEQ	,+4
	HALT	
	TST	SAVE1
	BEQ	,+4
	HALT	
	TST	SAVE3
	BEQ	,+4
	HALT	
	MOV	X3,L0LMT
	MOV	X3,X2
	MOV	X4,HILMT
TSCNTLI	CLR	FLIPPR
	MOV	#=1,X0
	BR	BEGTST
CNTRTNI	TST	FLIPPR
	BEQ	,+6
	JMP	RING

WRITE 1'S INTO TEST FIELDS

INPUT L0LMT IN L0LMT
INPUT L0LMT IN X2 FOR SPEED
INPUT HILMT IN HILMT

START TEST WJ=1 FIELD

CKN TEST CYCLE

END OF PASS

001066	005000			CLR	X0	ICYCLE TEST W/O FIELD
001070	012767	177777	000742	MOV	#=1,FLIPPR	ISSET UP FLIPPR
001076	010025			BEGTST: MOV	X0,X5	ISAVE 0 IN 5
001100	010201			MOV	X2,X1	IGET LOLMT
001102	010103			MOV	X1,X3	
001104	010021			MEMWRT: MOV	X0,(1)+	IWRITING MEMORY
001106	020124			CMP	X1,X4	ILOOKN FOR HILMT
001110	101775			BLOS	MEMWRT	
001112	005100			COM	X0	IF R0=0, GET=1, R0=-1, GET 0
001114	010201			MOV	X2,X1	ISKIP TEST ON LOLMT, CK IS A TRAP
001116	005721			TST	(1)+	IJUST INCREMENTING
001120	000402			BR	STWRT	IALSO SKIPS REWRT
001122	010201			REWRIT: MOV	X2,X1	IINSERT LOLMT ON EACH TEST ITER
001124	010523			MOV	X5,(3)+	IJUST INCREMENTING
001126	010013			STWRT: MOV	X0,0X3	IWRITE R0 AS SELECT BY LOC POINTER R3
001130	020013			CMP	X0,0X3	IREAD
001132	001013			BNE	EA	IERROR
001134	020521			TESTON: CMP	X5,(1)+	ISTART MEMORY SCAN
001136	001016			BNE	EB	IERROR
001140	020104			TSTONA: CMP	X1,X4	ILOOKN FOR HILMT
001142	001767			BEQ	REWRIT	IEND OF SCAN, GO STEP LOC POINTER
001144	020103			CMP	X1,X3	IS LOLMT#POINTER?
001146	001403			BEQ	TSTONC	IYES
001150	020304			CMP	X3,X4	IAND, IS POINTER#HILMT?
001152	001370			BNE	TESTON	IAND, DO NEXT
001154	000737			BR	CNTRTN	IYES DONE
001156	005721			TSTONC: TST	(1)+	ISTEP LOLMT OVER POINTER
001160	000767			BR	TSTONA	
001162	004767	000024		EAI: JSR	X7,ERRORA	
001166	016702	177012		MOV	LOLMT,X2	
001172	000760			BR	TESTON	
001174	005741			EBI: TST	-(1)	IJUST DECREMENT X1
001176	004767	000016		JSR	X7,ERRORB	
001202	016702	176776		MOV	LOLMT,X2	
001206	010521			MOV	X5,(1)+	IRESTORE MEMORY
001210	000753			BR	TSTONA	
001212	005700			ERRORA: TST	X0	ILOOK AT R0 TO DETERMIN 1 OR 0
001214	100404			BMI	ERROR1	I1'S WRITE/READ ERROR
001216	000417			BR	ERROR3	I0'S WRITE/READ ERROR
001220	005705			ERRORB: TST	X5	ILOOK AT R5 TO DETERMIN 1 OR 0
001222	100007			BPL	ERROR2	IDUAL SELECT ERROR,0 FIELD MODE
001224	000422			BR	ERROR4	IDUAL SELECT ERROR, 1 FIELD MODE
001226	012767	177777	000610	ERROR1: MOV	#=1,FLAG1	IFLAG SW SET
001234	012702	002262		MOV	#MSG1,X2	
001240	000421			BR	ERRMSG	
001242	012767	177777	000576	ERROR2: MOV	#=1,FLAG2	IFLAG SW SET
001250	012702	002313		MOV	#MSG2,X2	
001254	000413			BR	ERRMSG	
001256	012767	177777	000564	ERROR3: MOV	#=1,FLAG3	IFLAG SW SET
001264	012702	002356		MOV	#MSG3,X2	
001270	000405			BR	ERRMSG	
001272	012767	177777	000552	ERROR4: MOV	#=1,FLAG4	IFLAG SW SET
001300	012702	002407		MOV	#MSG4,X2	
001304	010367	000552		ERRMSG: MOV	X3,SAVE3	

001310	010067	000542		MOV	X0,SAVE0	
001314	010167	000540		MOV	X1,SAVE1	
001320	032777	020000	176662	BIT	#20000,@SWREG	ICKN INHIBIT PRINT SW
001326	001004			BNE	ONTOSW	
001330	004767	000634		JSR	X7, TOP	IPRINT ERROR MESSAGE
001334	000167	000054		JMP	ERRPRT	
001340	000167	000152		JMP	SWCHK	
001344	105777	176644		JMP	@TCSR	ICK TTY AVAIL
001350	100375			RPL	, -4	IWAIT
001352	012777	000207	176632	MOV	#207,@TDBR	IRING A DING
001360	032777	010000	176622	BIT	#10000,@SWREG	ISET UP HALT-CONTINUE MASK
001366	001401			BEG	, +4	INO HALT
001370	000000			HALT		
001372	013700	000042		MOV	@#42,X0	
001376	001404			BEG	DOAGN	
001400	004710			JSR	X7,(0)	
001402	000240			NOP		
001404	000240			NOP		
001406	000240			NOP		
001410	000167	177426		JMP	TSCNTL	
001414	010367	000434		MOV	X3,HOLDIT	IPRINT TEST ADDRESS IN LOC POINTER
001420	016702	000430		MOV	HOLDIT,X2	
001424	004767	000436		JSR	X7,PRTAB	
001430	012702	000006		MOV	#6,X2	
001434	004767	000574		JSR	X7,SPACE	
001440	017702	000410		MOV	@HOLDIT,X2	IGET ERROR DATA
001444	004767	000416		JSR	X7,PRTAB	IGO TO PRINT ROUTINE
001450	004767	000534		JSR	X7,CRLF	
001454	005767	000364		TST	FLAG1	ICKN READWRITE ERROR 1/S
001460	100416			BMI	SWCHK	
001462	005767	000362		TST	FLAG3	ICKN READWRITE ERROR 0/S
001466	100413			BMI	SWCHK	
001470	005767	000346		TST	GARCIA	ICK REPRINT LOOP SW
001474	100406			BMI	SWOVR	ISET, TWO LOC PRINTED
001476	012767	177777	000336	MOV	#1,GARCIA	ISET ON END FIRST LOOP
001504	010167	000344		MOV	X1,HOLDIT	IGET FAILURE ADDRESS FROM TEST FIELD
001510	000743			BR	PRTOVR	IPRINT AGAIN
001512	005067	000324		CLR	GARCIA	IALL DONE PRINTING
001516	032777	140000	176464	BIT	#140000,@SWREG	ISET UP HALT-SCOPE MASK
001524	001011			BNE	CKSW45	IGO CK WHICH IS UP
001526	005067	000312		CLR	FLAG1	INO HALT-NO SCOPE CLR OUT FLAGS
001532	005067	000310		CLR	FLAG2	
001536	005067	000306		CLR	FLAG3	
001542	005067	000304		CLR	FLAG4	
001546	000425			BR	OUT	
001550	032777	100000	176432	BIT	#100000,@SWREG	ISET UP HALT MASK
001556	001405			BEG	SCOPE	INO HALT
001560	012702	002452		MOV	#MSG5,X2	IPRINT HALT-ON-ERROR MESSAGE
001564	004767	000400		JSR	X7, TOP	
001570	000000			HALT		IWAIT FOR SCOPE SW AND -OR CONTINUE
001572	032777	040000	176410	BIT	#40000,@SWREG	ISET UP SCOPE MASK
001600	001017			BNE	LOOPON	ISW UP
001602	005067	000236		CLR	FLAG1	INO SW, CLR FLAGS

001606	005067	000234		CLR	FLAG2	
001612	005067	000232		CLR	FLAG3	
001616	005067	000230		CLR	FLAG4	
001622	016703	000234	OUT:	MOV	SAVE3,%3	
001626	016701	000226		MOV	SAVE1,%1	
001632	016700	000220		MOV	SAVE0,%0	
001636	000207			RTS	X7	
001640	016703	000216	LOOP0N1	MOV	SAVE3,%3	
001644	016701	000210		MOV	SAVE1,%1	
001650	016700	000202		MOV	SAVE0,%0	
001654	005767	000164		TST	FLAG1	ICKN FLAGS TO SELECT
001660	100411			BMI	LOOP1	ISCOPE LOOP APPROX ERROR
001662	005767	000160		TST	FLAG2	
001666	100414			BMI	LOOP2	
001670	005767	000154		TST	FLAG3	
001674	100427			BMI	LOOP3	
001676	005767	000150		TST	FLAG4	
001702	100432			BMI	LOOP4	
001704	012713	177777	LOOP11	MOV	#-1,%X3	11'S WRITE-READ LOOP
001710	022713	177777		CMP	#-1,%X3	
001714	001726			BEQ	SCOPE	
001716	000442			BR	PRCK	IGO CK PRINT INHIBIT
001720	012711	000000	LOOP21	MOV	#0,%X1	IDUAL ADDRESS FROM A 1'S WRITE LOOP
001724	005711			TST	%X1	
001726	001401			BEQ	,+4	
001730	000000			HALT		
001732	012713	177777		MOV	#-1,%X3	
001736	022713	177777		CMP	#-1,%X3	
001742	001401			BEQ	,+4	
001744	000000			HALT		
001746	005711			TST	%X1	
001750	001710			BEQ	SCOPE	
001752	000424			BR	PRCK	
001754	012713	000000	LOOP31	MOV	#0,%X3	10 WRITE-READ LOOP
001760	022713	000000		CMP	#0,%X3	
001764	001702			BEQ	SCOPE	
001766	000410			BR	PRCK	
001770	012711	177777	LOOP41	MOV	#-1,%X1	IDUAL ADDRESS FROM A 0 WRITELoop
001774	022711	177777		CMP	#-1,%X1	
002000	001401			BEQ	,+4	
002002	000000			HALT		
002004	012713	000000		MOV	#0,%X3	
002010	005713			TST	%X3	
002012	001401			BEQ	,+4	
002014	000000			HALT		
002016	022711	177777		CMP	#-1,%X1	
002022	001663			BEQ	SCOPE	
002024	032777	020000	176156	PRCKI	#20000,%SWREG	1SET UP PRINT INHIB MASK
002032	001257			BNE	SCOPE	1INHIBIT PRINT UP
002034	000167	177354		JMP	ERRPRI	1OK TO PRINT
002040	000000		FLIPPR1	0		
002042	000000		GARCIA1	0		

002044 000000
002046 000000
002050 000000
002052 000000
002054 000000
002056 000000
002060 000000
002062 000000
002064 000000

FLAG1I 0
FLAG2I 0
FLAG3I 0
FLAG4I 0
HOLDITI 0
SAVE0I 0
SAVE1I 0
SAVE3I 0
SAVE4I 0

*****PRINTING SUBROUTINES*****

```

;PRINT THE CONTENTS OF X2 AS AN OCTAL NUMBER
002066 012767 000006 000072 PRTAB1 MOV #6,BINCT ;SETUP FOR SIX DIGITS
002074 010267 000064 MOV X2,TOODLE ;SAVE THE INPUT
002100 005002 CLR X2
002102 006167 000056 ROL TOODLE ;POSITION THE SIGN BIT
002106 000410 BR FORM
002110 006167 000050 MKNUM1 ROL TOODLE ;POSITION NEXT DIGIT
002114 006167 000044 ROL TOODLE
002120 006167 000040 ROL TOODLE
002124 016702 000034 MOV TOODLE,X2
002130 006102 FORM1 ROL X2 ;FORM THE DIGIT
002132 042702 177770 BIC #177770,X2 ;EXTRACT THIS DIGIT
002136 052702 000260 BIS #260,X2 ;CONVERT TO TTY CODE
002142 105777 176046 WAIT11 TSTB @TCSR ;WAIT ON THE TTY
002146 100375 BPL WAIT1
002150 110277 176036 MOVB X2,@DDBR ;TYPE THIS DIGIT
002154 005367 000006 DEC BINCT ;LAST DIGIT TYPED?
002160 001353 BNE MKNUM ;BR IF NO
002162 000207 RTS
002164 000000
002166 000000
;PRINT A MESSAGE--X2 POINTS TO THE FIRST CHARACTER
;NOTE1 THIS ROUTINE WILL ALWAYS START WITH A CR & LF
002170 142777 000177 176016 TOP1 BICB #177,@TCSR ;CLR INT, FLAG
002176 010246 MOV X2,-(6) ;SAVE THE MESSAGE POINTER
002200 004767 000004 JSR X7,CRLF ;GO DO A CARRIAGE RETURN & LINE FEED
002204 012602 MOV (6)+,X2 ;GET THE MESSAGE POINTER
002206 000402 BR TOP1 ;GO PRINT THE MESSAGE
;ENTER HERE FOR A CARRIAGE RETURN & LINE FEED
002210 012702 002257 CRLF1 MOV #5CRLF,X2
;LIKE "TOP" BUT DOES NOT START WITH A CR & LF
002214 105777 175774 TOP11 TSTB @TCSR ;WAIT ON TTY DONE FLAG
002220 100375 BPL TOP1
002222 112277 175764 MOVB (2)+,@DDBR ;SEND A CHARACTER
002226 105712 TSTB (2) ;CHECK FOR THE END MARKER
002230 003371 BGT TOP1
002232 000207 RTS
;TYPE SPACES AS DETERMINED BY X2
002234 105777 175754 SPACE1 TSTB @TCSR
002240 100375 BPL SPACE
002242 116777 000010 175742 MOVB $SPACE,@DDBR
002250 005302 DEC X2 ;DO MORE?
002252 001370 BNE SPACE ;BR IF YES
002254 000207 RTS X7

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002256	240			SSPACE1	,BYTE 240
002257	015	000012		SCRLF1	,ASCIZ <15><12>
002262	047117	051505	053440	MSG11	,ASCIZIONES WRITE=READ ERROR, <15><12>
002270	044522	042524	051059		
002276	040505	020104	051105		
002304	047522	027122	005015		
002312	000				
002313	104	040525	020114	MSG21	,ASCIZIDUAL ADDRESS ERROR=WRITE 1 MODE, <15><12>
002320	042101	051104	051505		
002326	020123	051105	047522		
002334	026522	051127	052111		
002342	020105	020061	047515		
002350	042504	006456	000012		
002356	042532	047522	053440	MSG31	,ASCIZIZERO WRITE=READ ERROR, <15><12>
002364	044522	042524	051055		
002372	040505	020104	051105		
002400	047522	027122	005015		
002406	000				
002407	104	040525	020114	MSG41	,ASCIZIDUAL ADDRESS ERROR=WRITE 0 MODE, <15><12>
002414	042101	051104	051505		
002422	020123	051105	047522		
002430	026522	051127	052111		
002436	020105	020060	047515		
002444	042504	006456	000012		
002452	047524	051440	047503	MSG51	,ASCIIITO SCOPE-CLEAR HALT SW=SET SCOPE SW, AND CONTINUE, <15><12>
002460	042520	041455	042514		
002466	051101	044040	046101		
002474	020124	053523	051455		
002502	052105	051440	047503		
002510	042520	051440	027127		
002516	040440	042116	041440		
002524	047117	044524	052510		
002532	027105	005015			
002536	042522	042523	020124		,ASCIZIRESET SCOPE SWITCH TO RESUME PROGRAM, <15><12>
002544	041523	050117	020105		
002552	053523	052111	044103		
002560	052040	020117	042522		
002566	052523	042515	050040		
002574	047522	051107	046501		
002602	006456	000012			
002606	000000				
002706	002706			QEF1	,EVEN 0 =QEF+100
002710	000000			BUFFER1	0
002712	042523	020124	042515	QEF1	0
002720	047515	054522	040440	MSG11	,ASCII/SET MEMORY ADDRESS LIMITS VIA SWITCH REGISTER, <15><12>
002726	042104	042522	051523		
002734	046040	046511	052111		
002742	020123	044526	020101		
002750	053523	052111	044103		
002756	051040	043505	051511		
002764	042524	006522	012		
002771	123	052105	046040		,ASCII/SET LOWER LIMIT IN SW=REG AND CONTINUE, <15><12>

002776	053517	051105	046040
003004	046511	052111	044440
003012	020116	053523	051055
003020	043505	040440	042116
003026	050040	042522	051523
003034	041440	047117	044524
003042	052516	006505	012
003047	123	052105	052440
003054	050120	051105	046040
003062	046511	052111	044440
003070	020116	053523	051055
003076	043505	040440	042116
003104	050040	042522	051523
003112	041440	047117	044524
003120	052516	006505	012
003125	125	042116	043105
003132	047111	042105	040440
003140	042116	047457	020122
003146	042504	052123	052522
003154	052103	053111	020105
003162	044514	044515	051524
003170	053440	046111	020114
003176	042502	051440	052105
003204	052040	020117	033462
003212	030061	030455	032067
003220	030067		
003222	005015	000	
	003226		
	000001		

,ASCIISET UPPER LIMIT IN SW-REG AND PRESS CONTINUE;<15><12>

,ASCIIUNDEFINED AND/OR DESTRUCTIVE LIMITS WILL BE SET TO 2710-17470;

,ASCIZ <15><12>
,EVEN
,END

BEGIN	000370	BEGTST	001076	BINCT	002166	BUFFER	002706
CKSW45	001550	CNTRTN	001054	CONSET	000306	CRLF	002210
DOAGN	001410	EA	001162	EB	001174	ENDADR	001400
ERRMSG	001304	ERRORA	001212	ERRORB	001220	ERROR1	001226
ERROR2	001242	ERROR3	001256	ERROR4	001272	ERRPRT	001414
FLAG1	002044	FLAG2	002046	FLAG3	002050	FLAG4	002052
FLIPPR	002040	FORM	002130	GARCIA	002042	HILMT	000206
HIBET	000264	HOLDIT	002054	LOADA	000452	LOADB	000672
LQMT	000204	LOOPON	001640	LOOP1	001704	LOOP2	001720
LOOP3	001754	LOOP4	001770	MEMWRT	001104	MKNUM	002110
MSGA	002712	MSG1	002262	MSG2	002313	MSG3	002356
MSG4	002407	MSG5	002452	NOP	000240	ONTOSW	001340
OUT	001622	PRTAB	002066	PRTCK	002024	PRTOVR	001420
QEF	002606	QEFA	002710	REWRT	001122	RING	001344
SAVE0	002056	SAVE1	002060	SAVE3	002062	SAVE4	002064
SCOPE	001572	SEE	000320	SPACE	002234	START	000312
START1	000216	STWRIT	001126	SWCHK	001516	SHOVR	001512
SHREG	000210	TCSR	000214	TQBR	000212	TESTON	001134
TLG	000326	TOODLE	002164	TOP	002170	TOP1	002214
TSCNTL	001042	TSTONA	001140	TSTONC	001156	WAIT1	002142
SCRLF	002257	SSPACE	002256	\$1	000356	\$2	000362
	003226						

ERRORS DETECTED: 0

NO DUAL ADDRESSING MEMORY TEST MAINDEC-11-DZMMC-A
DZMMCA,P11

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*DZMMCA,DZMMCA-DZMMCA/SOL
RUN-TIME: 2 3 0 SECONDS
CORE USED: 3K