

TEXT LISTING

068-000248-08

PROGRAM

I/O TESTER FOR  
ECLIPSE PROCESSOR  
PART A

TEXT TAPE

097-000248-08

ABSTRACT

THIS IS THE FIRST OF TWO PROGRAMS DESIGNED TO VERIFY THE OPERATION OF THE I/O FEATURE OF THE ECLIPSE PROCESSOR. THE AREAS WHICH EACH PROGRAM CHECKS ARE AS FOLLOWS: PART A - I/O BUS, INTERRUPT AND DATA CHANNEL. PART B - VCT INSTRUCTION. IT SHOULD BE NOTED THAT PART A IS A PREREQUISITE TO PART B.

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0001 *MAIN          11:39:54 03/16/79
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MACRO REV 06.30
*****
NAME: EIOA.IX
PART NUMBER: 097-000248
DESCRIPTION: I/O TESTER FOR ECLIPSE PROCESSOR, PART A
*****

REVISION HISTORY:
REV. DATE
00 08/02/74
01 08/30/74
02 12/20/74
03 07/03/75
04 08/06/76
05 12/31/76
06 08/26/77
07 10/06/78
08 04/01/79

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REVISION HISTORY
U.O
REV. 07 WAS CREATED TO
IMPLEMENT THE STANDARDS PROVIDED
BY DL1B.
THIS HAS NOT CHANGED THE PHILOSOPHY
OR TEST PROCEDURES IN THIS PROGRAM.
ALL UNNECESSARY "IURST" HAVE BEEN
DELETED FROM THIS FILE.
REV. 08 WAS CREATED TO DELETE TESTS DCG24,24A AND 240.
THIS TESTS ARE NOT USEFUL WITH CURRENT I/O TESTERS

EIOA
THIS DIAGNOSTIC IS DESIGNED TO RUN IN AN
AUTO-LOAD AUTO-RUN ENVIRONMENT.

ABSTRACT
THIS IS THE FIRST OF TWO PROGRAMS DESIGNED
TO VERIFY THE OPERATION OF THE I/O
FEATURE OF THE ECLIPSE PROCESSOR. THE AREAS
WHICH EACH PROGRAM CHECKS ARE AS FOLLOWS.

PROGRAM EIOA
I/O BUS
INTERRUPT
DATA CHANNEL

PROGRAM EIOB
VCT INSTRUCTION

IT SHOULD BE NOTED THAT PROGRAM EIOA IS
A PREREQUISITE TO EIOB.

A COMPLETE TEST REQUIRES THAT AN I-O
TESTER BE PRESENT IN THE SYSTEM. IF
AN I-O TESTER IS NOT PRESENT, A
PARTIAL TEST WILL BE PERFORMED.
IF THE I/O TESTER IS NOT AVAILABLE,
THE BIT FOR THE TTY/CRT IS NOT USED
TO GENERATE INTERRUPTS.

IF THE TTY/CRT IS USED, KUBOUT CODES
WILL BE ECHOED.

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MACHINE REQUIREMENTS

2.1 ECLIPSE PROCESSOR

2.2 4K OF READ/WRITE MEMORY

2.3 TTY OR CRT

2.4 I-O TESTER (OPTIONAL)

2.5 RTC (OPTIONAL)

IT SHOULD BE NOTED THAT THE I-O TESTER IS REQUIRED FOR FACTORY TEST.

OPERATING PROCEDURE

3.1 LOADING

LOAD PROGRAM VIA THE BINARY LOADER.

3.2 START ADDRESS

SET SWITCHES TO 200 OCTAL.

PRESS START.

S?MPD 3.3

SWITCH SETTINGS

LOCATION "SWREG" IS USED TO SELECT THE PROGRAM OPTIONS (NOT SYSTEM CONFIGURATION). WHILE RUNNING UNDER DTOS, THIS LOCATION WILL BE LOADED BY THE MONITOR. HOWEVER UNDER STAND ALONE AND PROGRAM LOAD MODES THIS LOCATION WILL BE SET ACCORDING TO THE ANSWERS SUPPLIED BY THE OPERATOR. IN ANY CASE THE OPTIONS CAN BE CHANGED OR VERIFIED BY USING ONE OF THE COMMANDS GIVEN IN SEC. 3.3.2

SWITCH OPTIONS

DIFFERENT BITS AND THEIR INTERPRETATION AT LOCATION "SWREG" IS AS FOLLOWS:

BIT	OCTAL VALUE	BINARY VALUE	INTERPRETATION
1	40000	1	LOOP ON ERROR SKIP LOOPING ON ERROR
2	20000	1	PRINT TO CONSOLE ABORT PRINT OUT TO CONSOLE
3	10000	1	DO NOT PRINT % FAILURE PRINT % FAILURE
4	04000	1	ALLOW END OF PASS PRINT OUT SUPPRESS END OF PASS PRINT OUT
5	02000	1	DO NOT PRINT ON THE LINE PRINTER PRINT ON THE LINE PRINTER
6	01000	1	DO NOT HALT ON ERROR HALT ON ERROR

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DO NOT PRINT SUMMARY AND/OR PASSING OF EACH SUBTEST

PRINT SUMMARY AND/OR PASSING OF EACH SUBTEST

PRINT ONLY THE FIRST ERROR

PRINT EVERY ERROR

SWITCH COMMANDS

ONCE THE PROGRAM STARTS EXECUTING THE STATE OF ANY OF THE BITS CAN BE CHANGED BY HITTING KEYS 1-9. A-F. THE PROGRAM WILL CONTINUE RUNNING AFTER UPDATING THE OPTIONS. EACH KEY WILL COMPLEMENT THE STATE OF THE BIT AFFILIATED WITH IT, THUS BIT 4 CAN BE ALTERED BY HITTING KEY 4. SETTING OF ANY BIT OF LOCATION "SWREG" WILL SET BIT 0. (DEFAULT MODE IS DEFINED AS ALL BITS OF SWREG SET TO 0) THE PROGRAM CAN BE LOCKED INTO SWITCH MODIFICATION MODE BY TYPING A 0. IN WHICH CASE MORE THAN ONE BIT CAN BE CHANGED BEFORE CONTROL IS ALLOWED TO RETURN TO THE MAIN PROGRAM.

OTHER COMMANDS

"CR" A "RETURN" CAN BE TYPED TO CONTINUE THE PROGRAM AFTER ITS LOCKED IN A SWITCH MODIFICATION MODE

"D" THIS COMMAND GIVEN AT ANY TIME WILL RESET "SWREG" TO DEFAULT MODE AND RESTART THE PROGRAM.

"R" THIS COMMAND GIVEN AT ANY TIME WILL RESTART THE PROGRAM. SWITCHES ARE LEFT WITH THE VALUES THEY HAD BEFORE THE COMMAND WAS ISSUED.

"O" THIS COMMAND GIVEN AT ANY TIME WILL CAUSE THE PROGRAM CONTROL TO GO TO ODT (NOTE: THIS IS AN OPTIONAL COMMAND AND IS AVAILABLE ONLY IF ODTPK IS PRESENT)

M THIS COMMAND GIVEN AT ANY TIME WILL PRINT THE CURRENT OPERATING MODES.

NOTE: SWITCH 10 (1) = SET IF I/O BUS SWITCH IN SYSTEM. NORMAL OPERATION

3.4 ACCOMPANYING THE PASS COUNT WILL BE A MESSAGE REGARDING THE EXISTENCE OF THE I-O TESTER.

IF AN I/O TESTER OR RTC IS NOT IN THE SYSTEM, THE TTY WILL ECHO ROROUT CODES AT VARIOUS TIMES IN THE PROGRAM. THIS IS NECESSARY TO PRODUCE INTERRUPTS.

IN AUTO MODE TESTS DC48, DC48R, DC49 AND DC49B ARE NOT RUN. USE LOAD OR DEBUG COMMAND TO EXECUTE THESE TESTS.

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0006 .MAIN

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02DTD 3.5
OCTAL DEBUG TOOL (ODT)

3.5.
THE DIAGNOSTIC IS EQUIPPED WITH A BUILT IN ODT WHICH CAN
BE ACCESSED BY HITTING CONTROL 0 (0) AT ANY TIME DURING
THE EXECUTION OF THE PROGRAM (AFTER SETTING THE PARA-
METERS)
ON ENTERING ODT THE ADDRESS OF THE LOCATION HAVING THE
NEXT INSTRUCTION TO BE EXECUTED WILL BE TYPED-OUT.

3.5.1
CONVENTIONS AND SYMBOLS
THE FOLLOWING CONVENTIONS ARE USED BY THE ODT:
? PRESSING ANY ILLEGAL KEY CAUSES THE ODT TO RES-
POND WITH A "?".
@ ODT IS READY AND AT YOUR SERVICE.

3.5.2
COMMAND STRUCTURE
AN ODT COMMAND HAS THE FOLLOWING FORMAT:
(ARGUMENT) [COMMAND]
AN ARGUMENT MAY BE ONE OF THE FOLLOWING:
"EXP" AN OCTAL EXPRESSION CONSISTING OF OCTAL NUMBERS
SEPARATED BY PLUS (+) OR MINUS (-) SIGNS. LEAD-
ING ZEROS NEED NOT BE TYPED.
"ADR" AN ADDRESS IS THE SAME AS AN EXPRESSION EXCEPT
THAT BIT 0 IS NEGLECTED.
A COMMAND IS A SINGLE TELETYPE CHARACTER

3.5.3
ODT COMMANDS
THE LOCATIONS THAT CAN BE EXAMINED AND MODIFIED BY THE
USER ARE CALLED CELLS. THESE CELLS ARE OF TWO TYPES:
INTERNAL CPU CELLS AND MEMORY LOCATIONS.

3.5.3.1
OPENING INTERNAL CELLS
THE COMMAND TO OPEN ONE OF THE INTERNAL REGISTERS IS OF
THE FORM "NA" WHERE N IS ANY OCTAL EXPRESSION BETWEEN
0 AND 7
0-3 FOR ACCUMULATORS 0-3
4 FOR PC OF THE NEXT INSTRUCTION TO BE EXECUTED IN
THE EVENT OF A "P" COMMAND.
5 CPU AND TIO STATUS
BIT INTERPRETATION
15 STATUS OF TIO DONE FLAG
14 STATUS OF INTERRUPTS (ION FLAG)
13 STATUS OF CARRY BIT
6 ADDRESS OF THE LOCATION HAVING THE BREAK POINT (IF
ANY)
7 INSTRUCTION AT THE BREAK POINT LOCATION

OTHER COMMANDS TO OPEN CELLS ARE:
"ADR"/ OPEN THE CELL AND PRINT ITS CONTENTS
./ OPEN THE CELL CURRENTLY POINTED TO BY THE POINTER
AND PRINT ITS CONTENTS.
.+ "ADR"/ ADD "ADR" TO THE POINTER, OPEN THE CELL
AND PRINT ITS CONTENTS.
.- "ADR"/ SUBTRACT "ADR" FROM THE POINTER, OPEN
THE CELL AND PRINT ITS CONTENTS.
"CR" THE RETURN KEY IS USED TO CLOSE THE OPEN CELL

WITH OR WITHOUT MODIFICATION.
LINE FEED IS USED TO CLOSE THE OPEN CELL WITH OR
WITHOUT MODIFICATION AND TO OPEN THE SUCCEEDING
CELL.
CLOSE THE OPEN CELL WITH OR WITHOUT MODIFICATION
AND OPEN THE PRECEDING CELL
CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND
OPEN THE CELL POINTED TO BY ITS CONTENTS.
+"ADR"/ CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND
OPEN THE CELL POINTED TO BY ITS CONTENTS + "ADR".
-"ADR"/ CLOSE THE OPEN CELL WITHOUT MODIFICATION, AND
OPEN THE CELL POINTED TO BY ITS CONTENTS - "ADR".

3.5.3.2
MODIFICATION OF A CELL
ONCE A CELL HAS BEEN OPENED ITS CONTENTS CAN BE MODIFIED
BY TYPING THE NEW VALUE THE CELL IS TO CONTAIN IN THE
FORM OF AN OCTAL EXPRESSION FOLLOWED BY "CR" OR "LF".
IF A + OR - IS TYPED AS THE FIRST CHARACTER OF THE EX-
PRESSION THEN THE VALUE OF THE EXPRESSION IS ADDED TO OR
SUBTRACTED FROM THE OLD CONTENTS OF THE CELL. THE
ADDRESS ITSELF OR AN EXPRESSION RELATIVE TO THE ADDRESS
CAN BE DEPOSITED BY TYPING A " " OR " " + "/-OCTAL EXPRESS-
ION". A RUBOUT COMMAND GIVEN RIGHT AFTER OPENING A CELL
ALLOWS THE MODIFICATION OF ITS CONTENTS AS IF THEY WERE
TYPED IN JUST BEFORE THE COMMAND WAS ISSUED.

OTHER ODT COMMANDS
THIS KEY IS USED TO DELETE ERRONEOUSLY TYPED
DIGITS. EACH TIME THE KEY IS PRESSED THE RIGHT MOST
DIGIT IS DELETED AND ECHOED ON THE TERMINAL. IF
THE RUBOUT KEY IS PRESSED RIGHT AFTER OPENING A
CELL THEN IT DELETES THE RIGHT MOST DIGIT OF THE CELLS
CONTENTS. THIS ALLOWS THE MODIFICATION OF THE CELL
AS IF ITS CONTENTS WERE TYPED IN JUST BEFORE THE
KEY WAS PRESSED.
"ADR"B INSERT A BREAK POINT AT LOCATION "ADR".
ONLY ONE BREAK POINT CAN BE INSERTED AND ANY
ENTRY TO ODT AFTER EXECUTING A BREAK POINT WILL
CAUSE IT TO BE DELETED.
D DELETE THE BREAK POINT IF ANY.
P RESTART THE EXECUTION OF THE PROGRAM AT LOCATION
POINTED BY 4A.
"ADR"R START EXECUTING THE PROGRAM AT "ADR" AFTER AN
IO-RESET.
K KILL THE STRING TYPED SO FAR. THE ODT RESPONDS
WITH A "?" AND THE OPEN CELL IS CLOSED WITHOUT
MODIFICATION.
= PRINT THE OCTAL VALUE OF THE INPUT ONLY.
THIS WILL CLOSE ANY OPEN CELLS WITHOUT
MODIFICATION AND WILL NOT OPEN A CELL

NOTE:
IN PROGRAMS WHICH RELOCATE THEMSELVES THE
USER SHOULD PLACE BREAK POINTS ONLY IN THE
ORIGINAL PROGRAM AREA. IF A BREAK POINT IS
PLACED OUTSIDE THIS AREA THE RESULTS WILL
BE UNPREDICTABLE.

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14.0 ERROR DESCRIPTION
4.1 NORMAL
IF THE PROGRAM IS RUNNING IN AUTO MODE, AND AN ERROR OCCURS, THE PROGRAM WILL PRINT THE PC AND THE STATE OF THE AC'S BEFORE RETURNING TO DTOS.
IF THE PROGRAM WAS LOADED STAND ALONE, OR IN DTOS MANUAL MODE, THE PROGRAM WILL PRINT THE PC OF THE ERROR AND THE AC'S AND LOOP ON THE FAILING TEST.
EXIT FROM THE LOOP MAY BE EFFECTED BY SETTING SWITCH 1, IF SWITCH 3 HAS BEEN PRESELECTED.
CONSULT THE LISTING FOR A DETAILED TEST DESCRIPTION ABNORMAL
4.2 EXPECTED FAILURES WHICH WILL CAUSE A JSR TO ODT PACK: (WITH RESTART VIA P CR) UNEXPECTED INTERRUPT STACK OVERFLOW OR UNDERFLOW THE CAUSE OF ANY OF THESE FAILURES SHOULD BE CORRECTED BEFORE RESUMING TESTING.
15.0 PROGRAM DESCRIPTION
THE DIAGNOSTIC IS COMPRISED OF A SERIES OF SHORT TESTS. BASICALLY, EACH TEST CONSISTS OF A SETUP PROCEDURE, ONE OR MORE EVALUATING CASES WITH ERROR CALLS, AND A LOOP CAPABILITY. EACH PARTICULAR TEST CASE IS DESCRIBED IN THE LISTING. THE COMMON ROUTINES FOR SETUP (SETUP), ERROR CALLS (EHALT), AND LOOP (LOOP) ARE DESCRIBED HERE.
SETUP EACH TEST BEGINS WITH A CALL TO SETUP. THIS ROUTINE ISSUES AN IORST, SETS THE LOOP ADDRESS RESETS CERTAIN ERROR SWITCHES AND ITERATION COUNTS. THE USER STACK AND VECTOR STACKS ARE ALSO INITIALIZED.
EHALT THIS ROUTINE IS CALLED WHEN AN ERROR IS DETECTED. IT WILL THEN PERFORM SPECIFIC FUNCTIONS AS SELECTED VIA THE SWITCH REGISTER, OR LOOP ON ERROR.
LOOP THIS ROUTINE IS CALLED AT THE END OF EACH TEST SEQUENCE. IT IS USED TO ITERATE THE SEQUENCE 100 TIMES IF NO ERROR HAS BEEN DETECTED. IF AN ERROR HAS BEEN DETECTED, IT IS USED TO MAINTAIN THE SCOOP, INTERROGATE SWITCHES 1+3, IF 3 IS PRESELECTED AND INITIALIZE THE USER AND VECTOR STACK.

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16.0 I/O TESTER HARDWARE DESCRIPTION
6.1 TEST BOARD COMMANDS
IORST - CLEAR THE TESTER (IF NEW MODE)
NIOC 0 - CLEAR THE DATA RUFFER (NOT NEW MODE)
INTA - READ THE PULSE DETECTORS
DATC - READ THE DATA RUFFER
DATA9 - READ THE DCH ADDRESS BUFFER (NEW MODE)
DATA0 - LOAD THE DATA RUFFER
DATOB - LOAD THE FUNCTION BUFFER
DATOC - LOAD THE DATA AND DCH ADDRESS BUFFERS
6.2 FUNCTION REGISTER BIT ASSIGNMENTS
BIT 0 SET DCH SYNC
BIT 1 SET DCH MODE0
BIT 2 SET DCH MODE1
BIT 3 SET PI SYNC
BIT 4 BUSY (IF NOT IN NEW MODE)
BIT 5 DONE (IF NOT IN NEW MODE)
BIT 6 NEW MODE
BITS 7-9 AN OCTAL # WHICH SPECIFIES THE # OF ROENB PULSES BETWEEN SUCCESSIVE DCH CYCLES. (NEW MODE ONLY)
NOTE THAT 0 SPECIFIES 1 ROENB PULSE.
BITS 10-15 # OF DCH CYCLES TO BE RUN. (NEW MODE ONLY)
NOTE THAT 0 SPECIFIES 1 DCH CYCLE.

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6.3 PULSE DETECTOR BIT ASSIGNMENTS

BIT 0 IOPLS  
BIT 1 INTA (INTA AND DCHP)  
BIT 2 MSKO  
BIT 3 DCHI  
BIT 4 OVFL0  
BIT 5 DCHO  
BIT 6 DCHA  
BIT 7 ROENB (COMPLEMENTS WITH EACH PULSE)  
BIT 8 DATOA  
BIT 9 DATOB  
BIT 10 DATOC  
BIT 11 DATIA  
BIT 12 DATIB  
BIT 13 DATIC (NOT SET IF DEV CODE = 0)  
BIT 14 STRT  
BIT 15 CLR

6.4 TEST BOARD LOGIC

THE TEST BOARD CONTAINS 16 PULSE DETECTOR FLIP FLOPS. THESE FF'S MAY BE READ BY A "DIC" WITH A DEVICE CODE OF 0. THEY MAY BE CLEARED BY TORST OR NIOC 0 (IF IN NEW MODE). A PARTICULAR FF SETS WHENEVER A PULSE OCCURS ON THE LINE TO WHICH IT IS CONNECTED.  
THE TEST BOARD ALSO CONTAINS A 16 BIT DATA BUFFER. THIS BUFFER MAY BE LOADED/READ ETC. UNDER PROGRAM CONTROL. THIS BUFFER IS ALSO USED FOR DCH OPERATIONS. IT SHOULD BE NOTED THAT IN NEW MODE, ANY LOAD DATA BUFFER PROCEDURE, ACTUALLY LOADS THE EXCLUSIVE OR OF THE OUTPUT DATA AND THE DATA PREVIOUSLY STORED IN THE BUFFER.  
A 15 BIT DCH ADDRESS BUFFER IS USED TO DIRECT DCH REQUESTS TO ANY LOCATION IN/OUT OF MEMORY.

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MONITOR LOCATIONS

THE FOLLOWING LOCATIONS IN PAGE 0 MAY BE MONITORED/EXAMINED TO PROVIDE ADDITIONAL INFORMATION.

LOC 200 USED BY DTOS  
LOC 201 ADDRESS OF SETUP +1 OF LAST TEST ENTERED  
LOC 202 PROGRAM STARTING ADDRESS  
LOC 203 PROGRAM PASS COUNT  
LOC 204 ITERATION COUNT

MISCELLANEOUS

IT SHOULD BE NOTED THAT THE OVFL0 PULSE DETECTOR, BIT 4, IS NOT USED ON THE ECLIPSE PROCESSOR. ALSO DCHM1, DCH MODE BIT IS NOT USED.  
DATA CHANNEL PRIORITY FUNCTION DCHPIN NOT (A90). MUST BE WIRED TO THE SLOT IN WHICH THE THE IO TESTER RESIDES.  
FAILURE TO DO THIS WILL CAUSE ERRORS WITH ANY TESTS WHICH USE THE INTA PULSE DETECTOR.

-EOT

0011 .MAIN

\*\*00000 TOTAL ERRORS. 00000 PASS 1 ERRORS

0012 .MAIN

02DTD 001520 MC 5/02  
S2MPD 001044 MC 3/21