

IDENTIFICATION

PRODUCT CODE: MAINDEC-15-DAKAA-A-D
REPLACES: MAINDEC-15-DOFB-D

PRODUCT NAME: JMS Y - INTERRUPT TEST

DATE CREATED: NOVEMBER 7, 1972

MAINTAINER: DIAGNOSTIC GROUP

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1. ABSTRACT

The JMS Y - Interrupt Test determine if the PDP-15 will complete a JMS Y (where Y is some random value) instruction before it goes into program interrupt. This is done by setting an I/O flag and then transferring control to an ION/JMS Y instruction group (which is located at some random place in memory). The computer should complete the JMS Y plus the next instruction before the computer goes into program interrupt. If no error occurs, the ION/JMS Y instruction group is moved to other random memory locations and the test is repeated. Errors are indicated to the operator via the Teletype or error halts.

2. REQUIREMENTS

2.1 Equipment

Standard PDP-15 Computer.

2.2 Storage

The program uses all of 4K memory for the program or as a test area. The program occupies memory from location 07300 to 07711 and tests all locations below 07277.

2.3 Preliminary Programs

Basic Instruction Tests

3. LOADING PROCEDURE

3.1 Method

- a. Put HRI tape of program in reader (high speed if available)
- b. Set ADDRESS SWITCHES to 07300; the BANK MODE switch on a 1.
- c. Depress and release READ IN key

4. STARTING PROCEDURE

4.1 Control Switch Settings

The following is a table of ACCUMULATOR SWITCH settings and their action in the program.

<u>AC Switch</u>	<u>Set As</u>	<u>Action</u>
0	1	Halt on error.
	0	Don't halt on error.
1	1	Don't print error.
	0	Print errors.
2	1	Ring bell on error
	0	Ring bell after N passes.
3	1	Loop on current Y.
	0	Don't loop on current Y.
4	1	Loop on current location.
	0	Don't loop on current location.

N is an arbitrary number (initially 100_g) which is controlled by the LAW-N instruction in location 07300 and may be changed at the operator's discretion.

4.2 Starting Address

The starting address of the program is 07300.

4.3 Program and/or Operator Action

- a. Set ADDRESS SWITCHES to 07300.
- b. Set ACCUMULATOR SWITCHES to desired positions (see section 4.1)

Normal setting is 500000.

c. Depress I/O RESET.

d. Depress START.

5. OPERATING PROCEDURE

See Section 4.1.

5.1 Subroutine Abstracts

None.

5.2 Program and/or Operator Action

To put the program in the scope mode, the ACCUMULATOR SWITCH REGISTER should be set to 260000 (don't halt, don't print, bell after N passes, loop on current Y, loop on current location).

6. ERRORS

Unless AC switch 1 is a 1, errors will be printed on Teletype.

6.1 Error Halts and Description

There is one error halt inside the program at location 07507. Any program diagnosed errors will cause a halt at this location if AC switch 0 is a 1. The program stores HALT in all locations of the test area of memory. If the computer does not go into program interrupt immediately after executing the next instruction (a NOP) after the JMS Y, the computer will halt at location Y + 2.

6.2 Error Recovery

6.2.1 Program Diagnosed Error

If AC switch 0 is a 1, the computer will halt on a diagnosed error. To recover from this type of error, reset AC switches 0 to 4 as necessary, (see section 4.1) and then depress CONTINUE.

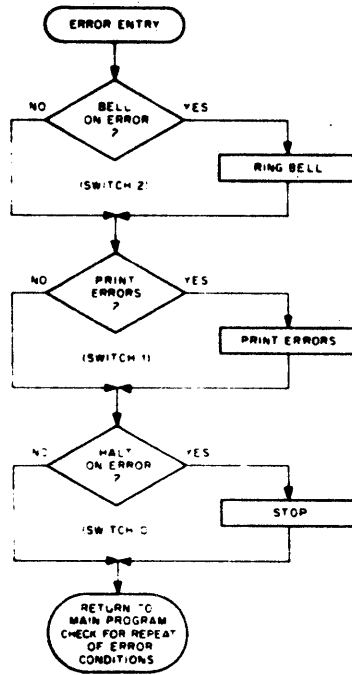
6.2.2 Interrupt Failures

Interrupt failures will cause a halt at location $Y + 1$. To recover, reset AC switches 0 to 4 as necessary (see section 4.1) and then start the computer at location 07300 (BEGIN) after depressing I/O RESET.

6.2.3 Test for ION, JMS Y, and Y

To test particular memory locations for the ION, JMS Y, and/or Y, store the address of the ION in location 07672 (POINT1), that address +1 in location 07673 (POINT2), the address Y in location 07674 (POINT3). Then set AC switches 3 and 4 to 1, depress I/O RESET, and start the computer at location 07300 (BEGIN). Y and location of ION must be less than 07277 and not 00000 or 00001.

6.3 Error Switch Hierarchy



6.4 Error Timeout Example

ION-JMS Y

JMS AT	"Y"	C(0)	C(Y)
001234	007654	001235	740040

The above example shows that a JMS 7654 instruction was stored in location 1234 (it is implied that the ION is in 1233). The 1235 stored in location 00000 as well as the 740040 (HLT) in Y indicates the JMS was not completed before the computer went into program interrupt.

7. MISCELLANEOUS

7.1 Execution Time

Approximately 96 ms per ION/JMS Y instruction group.

8. PROGRAM DESCRIPTION

- a. The first function that is performed is that of initialization. A register to count loops and a location to assure typeout of the error message header are initialized, and the bell on the Teletype is rung to raise the teleprinter flag to assure a flag for program interrupt.
- b. Then a check is made to see if the locations of the ION and JMS Y instructions should be changed (switch 4). If they are not changed, the program proceeds to c. If they are, a number is obtained from a random number generator, made into an address and checked that it is below the program, not equal to Y or Y + 1, not equal to 00000 or 00001, and stored in Point 1 and incremented and stored in POINT2.
- c. Then a check is made to see if the number Y should be changed (switch 3). If it is not, the program proceeds to d. If it is, a number is obtained from a different random number generator than was used in b, made into an address, checked to see that it was at least 2 below the program, not equal to the location of ION or JMS Y instructions, not equal to 00000 or 000001, and stored in POINT3.

- d. Then HALT is stored in all memory locations in the test area of memory. The ION instruction is stored, as well as the JMS Y instruction after it has been formed from Y and JMS. The AC and Link are then cleared and control is transferred to the ION/JMS Y instruction group.
- e. Upon return from the program interrupt, the contents of location Y are checked as well as the contents of location 00000 to make sure the proper numbers were stored in these locations. If not, the error subroutine is called.
- f. A check is then made to see if the SCOPE mode (AC switches 3 and 4 a 1) has been requested and if so, control is immediately transferred back to the instruction group.
- g. If the instruction group is not being SCOPED, a check is made on ringing the bell (switch 2) after which control goes back to b.

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        .TITLE IONJMS
        /COPYRIGHT 1969, DIGITAL EQUIPMENT CORP., MAYNARD, MASS.
        /REVISED NOVEMBER 7, 1972 BY EARL L. BOUSE
        /UPDATED PROGRAM TO ACCOMMODATE ECO #50,
        /
        /JMS Y=INTERRUPT TEST
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                200270
                ;ABS
                ;LOC 0200
        /CHECK ACS AGAINST C(0)
CHECK          LAS
00200 750004   AND KONST
00201 507602   DAC CTEMP
00202 049603   LAC @
00203 200000   DAC SAV0
00204 049604   AND KONST
00205 507602   SAD CTEMP
00206 549603   JMP BEGIN
00207 607400   JMP ERROR
00210 607552   ;LOC 7400
                007400
07400 207605   BEGIN  LAC (740000
07401 049564   DAC COUNT          /SET UP TO COUNT LOOPS
07402 760207   LAW 207
07403 700406   TLS          /RING BELL TO SET UP I70 FLAG
07404 700401   TSP
07405 607404   JMP ;=1

        /
07406 107527   HERE1  JMS RANDOM      /GENERATE RANDOM ADDRESS
07407 507567   AND MASK
07410 049573   DAC POINT1     /STORE IN "ION" POINTER
07411 049574   DAC POINT2     /STORE IN "JMS Y" POINTER
07412 449574   ISE POINT2     /AND INCREMENT
07413 741200   SNA          /IS "ION"00?
07414 607406   JMP HERE1      /YES
07415 549570   SAD ONE       /HOW ABOUT 1?
07416 607406   JMP HERE1      /YES
07417 349576   TAD UPLIM     /IS THE "ION" POINTER
07420 740100   SNA          /INSIDE THIS PROGRAM?
07421 607406   JMP HERE1      /YES, GENERATE ANOTHER
07422 207574   LAC POINT2     /NO, NOW HOW ABOUT
07423 349576   TAD UPLIM     /THE "JMS Y" POINTER
07424 740100   SNA          /IS IT OK?
07425 607406   JMP HERE1      /NO, TRY AGAIN
07426 207573   LAC POINT3     /OK SO FAR, NOW IS "Y" POINTER
07427 549573   SAD POINT1     /EQUAL TO "ION" POINTER?
07430 607406   JMP HERE1      /YES
07431 549574   SAD POINT2     /NO, EQUAL TO "JMS Y" POINTER?
07432 607406   JMP HERE1      /YES
07433 349570   TAD ONE       /ADD 1 AND CHECK
07434 549573   SAD POINT1     /THAT THERE IS AT LEAST
07435 607406   JMP HERE1      /ONE LOCATION BETWEEN "Y" + "ION"
                ,EJECT
    
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07436 107540  HERE2  JMS RANDOM      /YES, GENERATE RANDOM ADDRESS
07437 507567      AND MASK
07440 347575      DAC POINT3    /AND STORE IN POINT 3
07441 741200      SNA          /IS "Y"=?
07442 407436      JMP HERE2     /YES
07443 547570      SAD ONE      /HOW ABOUT 1?
07444 607436      JMP HERE2     /YES
07445 347600      TAD UPLIM2   /IS "Y" INSIDE PROGRAM OR
07446 740100      SMA          /FIRST LOCATION BEFORE
07447 607436      JMP HERE2     /YES
07450 207575      LAC POINT3   /OK SO FAR NOW IS "Y" POINTER
07451 547573      SAD POINT1   /EQUAL TO "ION" POINTER
07452 607436      JMP HERE2     /YES
07453 547574      SAD POINT2   /NO, EQUAL TO "JMS Y" POINTER
07454 607436      JMP HERE2     /YES
07455 347570      TAD ONE      /ADD 1 AND CHECK
07456 547573      SAD POINT1   /THAT THERE IS AT LEAST
07457 607436      JMP HERE2     /ONE LOCATION BETWEEN "Y" + "ION"

/
07460 107513  HERES3  JMS HALT      /STORE "JMP ERROR" IN MEMORY
07461 207565      LAC IONCON   /THEN THE ION VIA
07462 067573      DAC* POINT1 /"ION" POINTER
07463 207575      LAC POINT3   /GET "Y"
07464 247566      XOR JMSQON   /FORM JMS "Y"
07465 067574      DAC* POINT2 /STORE VIA "JMS Y" POINTER
07466 754000      CLAIJCLL    /CLEAR AC & L
07467 627573      JMP* POINT1  /EXECUTE ION=JMS Y
07470 207574  RETURN  LAC POINT2   /GET LOCATION OF JMS
07471 347570      TAD ONE      /FORM ADDRESS STORED IN "Y"
07472 047601      DAC VAR1
07473 227575      LAC* POINT3
07474 507567      AND MASK
07475 547601      SAD VAR1
07476 741000      SKP
07477 607504      JMP ERRCON   /YES, ALL OK
07500 200000      LAC 0        /THE /PC/ SAVED ON THE /JMS/ IS WRONG;
07501 507567      AND MASK    /GET THE /PC/ SAVED ON THE INTERRUPT;
07502 547606      SAD /ERROR  /MASK OUT THE ADDRESS;
07503 741000      SKP        /SHOULD EQUAL /ERROR/ SUBROUTINE ADDR;
07504 607552  ERRCON  JMP ERROR     /YES
07505 207604      LAC SAV0    /THE /PC/ SAVED ON THE INTERRUPT IS WRONG;
07506 741100      SPA
07507 607550      JMP DONE
07510 447564      ISE COUNT   /DONE ENOUGH?
07511 607406      JMP HERE1    /NO
07512 607550      JMP DONE     /YES
          ,EJECT

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