

IDENTIFICATION

Product Code: MAINDEC-15 D0DA-D (D)
Product Name: JMP-Self Test
Date: January 5, 1970
Maintainer: Diagnostic Group
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1. ABSTRACT

JMP-Self Test checks the PDP-15 to ensure that the JMP instruction can be executed properly. The computer is held in a JMP to the current location instruction for a definite time interval. If, during this interval, the JMP instruction fails, the error will be indicated to the operator. If the JMP instruction does not fail, it is moved elsewhere and the check is repeated. All memory locations not occupied by the program are tested.

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 07500 to 07751 and tests all memory locations below 07500.

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 07500; the BANK MODE switch on a 1.
- c. Depress and release KEY READ-IN

4. STARTING PROCEDURE

4.1 Control Switch Settings

The following is a table of accumulator switch settings and their action on 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 errors.
	0	Print errors.
2	1	Ring bell on error.
	0	Ring bell after N passes.
3	1	Loop on current location.
	0	Don't loop on current location.
4	1	Repeat whole test (all locations).
	0	Don't repeat whole test.

N is an arbitrary number (initially 400) which is controlled by the LAW-N instruction in location 07500 and may be changed at the operator's discretion.

4.2 Starting Address

The starting address of the program is 07500.

4.3 Program and/or Operator Action

- a. Set ADDRESS SWITCHES to 07500
- b. Set ACCUMULATOR SWITCHES to desired positions (see section 4.1). Normal setting is 520000.
- c. Depress I/O RESET.
- d. Depress START.

5. OPERATING PROCEDURE

5.1 Operational Switch Settings

(see section 4.1)

5.2 Subroutine Abstracts

(None)

5.3 Program and/or Operator Action

To put the program in the SCOPE mode, the ACCUMULATOR SWITCH REGISTER should be set to 240000 (don't halt, don't print, bell after N passes, loop on current location).

The length of time for the execution of a JMP instruction is controlled by the Teletype.

6. ERRORS

Unless AC switch 1 is a 1, all errors will be printed on the teleprinter.

6.1 Error Halts and Description

There is only one error halt in the program at location 07602. This error halt will occur if the JMP. instruction drops a bit and CAL's out. The computer will halt in location 07546 if the whole test is not repeated.

6.2 Error Recovery

If AC switch 0 is a 1, the computer will halt on an error. To recover and repeat the failure, reset AC switches 0 to 3 as necessary (see section 4.1) and then depress CONTINUE.

To test a particular location below 07500, store the address to be tested in location 07744 (POINT). Restart the program at location 07505 (HERE1+1) with AC switch 3 a 1.

6.3 Error Typeout Example

```
JMP . TEST
```

```
JMP AT CAL FROM
```

```
001234 001230
```

The above typeout shows that the JMP . at location 1234 dropped bit 15 and CALed from location 1230.

7. RESTRICTIONS

7.1 Starting Restrictions

(None)

7.2 Operating Restrictions

(None)

8. MISCELLANEOUS

8.1 Execution Time

Approximately 10 minutes to test from 0 to 07477₈.

9. 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.
- b. Then a location in the program, which indicates where the present JMP . is to be, is set to zero.
- c. All of memory is then cleared, locations 1 and 21 are initialized and the JMP . instruction is formed and stored in the appropriate memory location.
- d. The teleprinter is then ordered to print to set its flag. The interrupt system is then turned on and control is transferred to the JMP . instruction.
- e. After the teleprinter flag is set, assuming no error (see h.) control is returned to the program via the program interrupt facility. A check is made to see if the current JMP . should be repeated (switch 3). If so, then the program returns to c. except that memory is not cleared again.
- f. If the current JMP . is not repeated, a check is made about ringing the bell (switch 2) and then the number in the internal JMP . pointer is incremented and checked to see that it is not 1, 7, 21, or the first address in the program. If it is 1, 7, or 21, it is incremented again. The program then returns to c.
- g. After testing all memory locations, a check is made to see if the test should be repeated (switch 4). If so, the program returns to a. If not, the program halts.
- h. If an error occurs, it is expected that the computer will CAL. When this takes place, control is transferred to an error reporting routine which turns off the interrupt facility, rings the bell (if appropriate), prints the error (if appropriate), stops (if appropriate) and returns to e.

10. LISTING

```

                                .TITLE JMP .
/
/JMP SELF TEST
/
                                .FULL
07500                          .LOC 7500
07500 777400 REGIN            LAW 17400 /SET UP TO COUNT
07501 047735                  DAC COUNT /LOOPS
07502 207734                  LAC CON4
07503 047564                  DAC CHANGE /SET CHANGE TO LAW MESS1
/
07504 147744 HERE1          DZM POINT /ZERO POINTER
07505 107644                  JMS CLEAR /CLEAR MEMORY
07506 207744                  LAC POINT /GET LOCATION OF JUMP.
07507 247736                  XOR JMPCON /FORM JMP. INSTRUCTION
07510 067744                  DAC* POINT /STORE INSTRUCTION IN MEMORY
07511 703302                  CAF
07512 700416                  TLS+10 /THEN SET HTE TELEPRINTER FLAG
07513 754000                  CLA:CLL
07514 700042                  ION /TURN ON INTERRUPT
07515 627744                  JMP* POINT /EXECUTE JMP .
/
RETURN                          LAS
07516 750004                  AND MASK1
07517 507741                  SZA /LOOP ON CURRENT LOCATION
07520 740200                  JMP HERE1+2 /YES
07521 607506                  LAS
07522 750004                  RTL
07523 742010                  SMA /RING BELL?
07524 740100                  JMS BELL /YES
07525 107604                  ISZ POINT /NO, INCREMENT POINT FOR NEXT LOCATION
07526 447744                  LAC POINT
07527 207744                  SAD LOG1 /IS IT 1?
07530 547737                  JMP .+10 /YES
07531 607541                  SAD LOG2 /IS IT 21?
07532 547740                  JMP .+6 /YES
07533 607541                  SAD SEVEN /IS IT 7?
07534 547746                  JMP .+4 /YES
07535 607541                  SAD UPLIM1 /IS IT THE UPPER LIMIT?
07536 547750                  JMP .+4 /YES
07537 607543                  JMP HERE1+1 /NO
07540 607505                  ISZ POINT /INCREMENT POINT
07541 447744                  JMP HERE1+1 /GO BACK
07542 607505                  LAS
07543 750004                  AND MASK2
07544 507742                  SNA /REPEAT WHOLE TEST
07545 741200                  XX /STOP
07546 740040                  JMP REGIN /REPEAT
07547 607500                  .EJECT

```

```

/ERROR REPORTING ROUTINE
/
07550 700002 ERROR1 IOF /TURN OFF INTERRUPT
07551 750004 LAS
07552 742010 RTL
07553 740100 SMA /BELL ON ERROR?
07554 607557 JMP .+3 /NO
07555 760207 LAW 207
07556 107614 JMS TYPE
07557 750004 LAS
07560 740010 RAL
07561 741100 SPA /PRINT ERRORS?
07562 607600 JMP HALT /NO
07563 107702 JMS CRLF /CR-LF

/
07564 207751 CHANGE LAC ZZ7
07565 107661 JMS TYPOUT /TYPE OUT HEADER
07566 207733 LAC CON3 /CHANGE INSTRUCTION
07567 047564 DAC CHANGE /IN CHANGE
07570 207744 LAC POINT
07571 107624 JMS PRINT /PRINT LOCATION OF JMP.
07572 760240 LAW 240
07573 107614 JMS TYPE /1 SPACE
07574 750001 CLA:CMA
07575 340020 TAD 20
07576 107624 JMS PRINT /LOCATION OF CAL
07577 107702 JMS CRLF

/
07600 750004 HALT LAS
07601 741100 SPA /HALT ON ERROR?
07602 740040 XX /YES
07603 607516 JMP RETURN /SEE ABOUT OTHER STUFF
.EJECT

```

```

/USEFUL SUBROUTINES
/
07604 000000
07605 447735
07606 627604
07607 407500
07610 047735
07611 760207
07612 107614
07613 627604

07614 000000
07615 507745
07616 700401
07617 607616
07620 700406
07621 700401
07622 607621
07623 627614

07624 000000
07625 047747
07626 777772
07627 047730
07630 207747
07631 740010
07632 740010
07633 742010
07634 047747
07635 507746
07636 247727
07637 107614
07640 207747
07641 447730
07642 607632
07643 627624

/
BELL 0
      ISZ COUNT
      JMP* BELL
      XCT BEGIN
      DAC COUNT
      LAW 207
      JMS TYPE
      JMP* BELL

/
TYPE 0
      AND RURQUT
      TSF
      JMP .-1
      TLS
      TSF
      JMP .-1
      JMP* TYPE

/
PRINT 0
      DAC TEMP
      LAW 17772
      DAC CNTR
      LAC TEMP
      RAL
      RAL
      RTL
      DAC TEMP
      AND SEVEN
      XOR ASCII
      JMS TYPE
      LAC TEMP
      ISZ CNTR
      JMP .-10
      JMP* PRINT
      .EJECT

```

```

/SUBROUTINE TO CLEAR MEMORY
/
CLEAR      0
           02M PNTR
           02M* PNTR
           ISZ PNTR
           LAC PNTR
           SAD UPLIM1
           SKP
           JMP CLEAR+2
           LAC CON1
           DAC 1
           LAC CON2
           DAC 21
           JMP* CLEAR

/
TYP0UT    0
           DAC PNTR
           LAC* PNTR
           RAR
           RTR
           RTR
           RTR
           RTR
           JMS TYPE
           SAD RUR0UT
           JMP* TYP0UT
           LAC* PNTR
           JMS TYPE
           SAD RUR0UT
           JMP* TYP0UT
           ISZ PNTR
           JMP TYP0UT+2

/
CRLF      0
           LAW 215
           JMS TYPE
           LAW 212
           JMS TYPE
           JMP* CRLF
           .EJECT

```

```

07644 200000
07645 147743
07646 167743
07647 447743
07650 207743
07651 547750
07652 741000
07653 607646
07654 207731
07655 240001
07656 207732
07657 240021
07660 627644

07661 000000
07662 047743
07663 227743
07664 740020
07665 742020
07666 742020
07667 742020
07670 742020
07671 107614
07672 547745
07673 627661
07674 227743
07675 107614
07676 547745
07677 627661
07700 447743
07701 607663

07702 000000
07703 760215
07704 107614
07705 760212
07706 107614
07707 627702

```

```

/ERROR MESSAGE
/
07710 312315 MESS1 312315 /J,M
07711 320240 320240 /P,SP
07712 256240 256240 /.,SP
07713 324305 324305 /T,E
07714 323324 323324 /S,T
07715 215212 215212 /CR,LF
07716 312315 312315 /J,M
07717 320240 320240 /P,SP
07720 301324 301324 /A,T
07721 240303 240303 /SP,C
07722 301314 301314 /A,L
07723 240306 240306 /SP,F
07724 322317 322317 /R,O
07725 315215 315215 /M,CR
07726 212377 212377 /LF,RO

```

```

/
/CONSTANTS AND VARIABLES
/
07727 000260 ASKII 260
07730 000000 CNTR 0
07731 607516 CON1 JMP RETURN
07732 607550 CON2 JMP ERROR1
07733 607570 CON3 JMP CHANGE+4
07734 207751 CON4 LAC ZZZ
07735 000000 COUNT 0
07736 600000 JMPCON JMP
07737 000001 LOC1 1
07740 000021 LOC2 21
07741 040000 MASK1 40000
07742 020000 MASK2 20000
07743 000000 PNTR 0
07744 000000 POINT 0
07745 000377 RUBOUT 377
07746 000007 SEVEN 7
07747 000000 TEMP 0
07750 007500 UPLIM1 REGIN
07751 007710 ZZZ MESS1
000000 .END
NO ERROR LINES

```

ASKII	07727
REGIN	07500
RELL	07604
CHANGE	07564
CLEAR.	07644
CLOF	700004
CLON	700044
CLSF	700001
CNTR	07730
CON1	07731
CON2	07732
CON3	07733
CON4	07734
COUNT	07735
CRLF	07702
ERROR1	07550
HALT	07600
HERE1	07504
JMPCON	07736
KRB	700312
KSF	700301
LOC1	07737
LOC2	07740
MASK1	07741
MASK2	07742
MESS1	07710
PCF	700202
PNTR	07743
POINT	07744
PRINT	07624
PSA	700204
PSB	700244
PSF	700201
RCF	700102
RETURN	07516
RRB	700112
RSA	700104
RSB	700144
RSF	700101
RUROUT	07745
SEVEN	07746
TCF	700402
TEMP	07747
TLS	700406
TSF	700401
TYPE	07614
TYPOUT	07661
UPLIM1	07750
ZZZ	07751

REGIN	07500
HERE1	07504
RETURN	07516
ERROR1	07550
CHANGE	07564
HALT	07600
BELL	07604
TYPE	07614
PRINT	07624
CLEAR	07644
TYPOUT	07661
CRLF	07702
MESS1	07710
ASKII	07727
CNTR	07730
CON1	07731
CON2	07732
CON3	07733
CON4	07734
COUNT	07735
JMPCON	07736
LOC1	07737
LOC2	07740
MASK1	07741
MASK2	07742
PNTR	07743
POINT	07744
RUROUT	07745
SEVEN	07746
TEMP	07747
UPLIM1	07750
ZZZ	07751
CLSF	700001
CLOF	700004
CLON	700044
RSF	700101
RCF	700102
RSA	700104
RRR	700112
RSR	700144
PSF	700201
PCF	700202
PSA	700204
PSH	700244
KSF	700301
KRR	700312
TSF	700401
TCF	700402
TLS	700406