

## IDENTIFICATION

Product Code:      MAINDEC 08-D02B-D  
Product Name:      PDP-8 Instruction Test Part 2B  
Date Created:      January 12, 1968  
Maintainer:        Diagnostic Group



## 1. ABSTRACT

This program is a test of the 2s complement add (TAD) and rotate logic (RAL, RTL, RAR, RTR). Random numbers are used in the Twos Add portion of the test and sequential numbers are used in the Rotate portion. Program control depends on operator manipulation of four switches in the SWITCH REGISTER (bits 0, 1, 2, 3). Error information is normally printed out on the keyboard printer.

## 2. REQUIREMENTS

### Storage

Memory locations  $20_8-4177_8$ .

### Subprograms and/or Subroutines

High RIM Loader, High Binary Loader.

### Equipment

PDP-8 Processor-Keyboard Reader

## 3. USAGE

### 3.1 Loading

If the Binary Loader beginning at  $7777_8$  is in memory, load the Instruction Test - Part 2b. Otherwise, the RIM Loader beginning at  $7756_8$  and/or the Binary Loader must be loaded into memory.

PDP-8 Instruction Test - Part 2B (Maindec 801-2B) may now be loaded as follows:

Set  $7777_8$  in the SWITCH REGISTER.

Press LOAD ADDRESS key.

Place Instruction Test-Part 2B in the keyboard reader.

Press START key on the operator console.

Engage the keyboard reader.

### 3.2 Switch Settings

When starting at the TAD portion ( $200_8$ ) of the test, set switches 0 and 2 to the 1 state. This switch configuration allows the program to print any error message and halt on the error condition. After the TAD portion has run for a minimum of 10 minutes, set switch 3 to a 1 to enter the Rotate Test.

When starting at the rotate portion ( $2000_8$ ) set switches 0 and 2 to the 1 state as above. This switch configuration allows the program to print any error message and halt on the error condition.

Switch 0	Stop on error ( $406_8$ for TAD or $2433_8$ for Rotate Test).
Switch 1	Scope mode (repeat loop causing the error).
Switch 2	Print error.
Switch 3	Leave the Twos Add test and start the Rotate Test.

- Switch 0 and 1      Scope mode and stop on error .
- Switch 0 and 2      Print error and halt .
- Switch 1 and 2      Scope and print error .

### 3.3      Start-Up and/or Entry

The starting address of the TAD portion of the test is 0200<sub>g</sub>. The starting address of the Rotate portion of the test is 2000<sub>g</sub>. If bit 3 of the SWITCH REGISTER is set, it automatically causes an exit from the Twos Add portion of the test to the Rotate portion of the test.

Set either 0200<sub>g</sub> in the SWITCH REGISTER to start at the Twos Add portion of the test, or set 2000<sub>g</sub> in the SWITCH REGISTER to start at the Rotate portion of the test.

Press the LOAD ADDRESS key.

Press the START key.

### 3.4      Errors in Usage

The error halt for TAD Test is 406<sub>g</sub>.

The error halt for Rotate Test is 2433<sub>g</sub>.

Error printouts from both tests would appear as follows:

TWOS ADD ERROR PRINTOUT:

Good	Bad	X ARG	Y ARG
0 000000000001	0 000000000000	0 000000000000	000000000001

Indicating loss of a 1 bit in AC bit 11.

ROTATE ERROR PRINTOUTS:

PAT 0	000000000001	(original pattern)
RAL 0	000000000010	(pattern after RAL inst.)
RAR 0	000000000000	(pattern after RAR inst.)

Indicating loss of a 1 bit in AC bit 11 as a result of an RAR.

PAT 0	000000100000
RTR 0	000000000000
RTL 0	000000000000

Indicating loss of a 1 bit in AC bit 8 as a result of an RTR.

### 3.5      Recovery from such Errors

The program may be continued after it halts on an error, by pressing the CONTINUE key. The program continues to the next test, unless scope mode (bit 1) is requested.

Set the state of AC switch 1 to 1 to repeat the loop causing the error (scope mode).

Reference 4.3 for other switch variations.

#### 4. RESTRICTIONS

This test should be run only after a successful run of the Instruction Test 2A to provide maximum reliability of the module repair table.

#### 5. DESCRIPTION

##### 5.1 Discussion

The PDP-8 Instruction Test-Part 2B tests the 2s ADD and ROTATE logic.

The 2s ADD logic is tested by the addition of pseudo random numbers. Two pseudo random numbers are generated and 2s added by a logical (simulated) adder. The same two numbers are added by the 2s add logic (TAD). The results are compared, and if an equality exists, two new random numbers are generated and the sequence is re-executed. If an inequality exists, the computer halts and/or types the error condition depending on the switch settings.

##### 5.2 Examples and/or Applications

The error printout will contain the correct answer, the incorrect answer, and the two random numbers used.

Visual inspection of these patterns will determine the cause of the error. A lookup table is provided for rapid repair which will give all of the information shown in section 4.6.

Exit from TAD Test to the Rotate portion is accomplished by setting bit 3 in the SWITCH REGISTER. This switch also causes the program to print "ADD OK."

The Rotate Test generates 8192 patterns to be tested on two pairs of rotate instructions. The first pair of rotate instructions to be tested is RAL and RAR. The test pattern is rotated left once, then the result is rotated right once. The following items are compared:

The result of the RAR should equal the test pattern and original link.

The result of the link after the RAL should equal bit 0 of the test pattern.

If the RAR results and link equals the test pattern and link, the RAL and RAR instructions have operated correctly.

If an error occurs and an error printout is requested, the test pattern and the results of both the RAL and RAR instructions are printed. Visual inspection of these patterns will determine the probable cause of the error.

The second pair of rotate instructions to be tested is RTR and RTL. The test pattern is rotated right twice, then the result is rotated left twice. The following items are compared:

The result of the RTL should equal the test pattern and original link.

The result of the link after the RTR should equal pattern bit 1 of the test pattern.

If the RTL results and link equal the test pattern and link, the RTR and RTL, instructions have operated correctly.

If an error occurs and an error printout is requested, the test pattern and the results of both the RTR and RTL instructions are printed. Visual inspection of these patterns will determine the probable cause of the error.