Experiment - III

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1 Aim:

Write a program using 8085 & test for typical data:

- Multiplication of two 8-bit numbers by bit rotation method

2 Theory:

The 8085 is an 8-bit microprocessor produced by Intel.
It has the following configuration –

- 8-bit data bus
- 16-bit address bus, which can address upto 64KB
- A 16-bit program counter
- A 16-bit stack pointer
- Six 8-bit registers arranged in pairs: BC, DE, HL
- Requires +5V supply to operate at 3.2 MHZ single phase clock

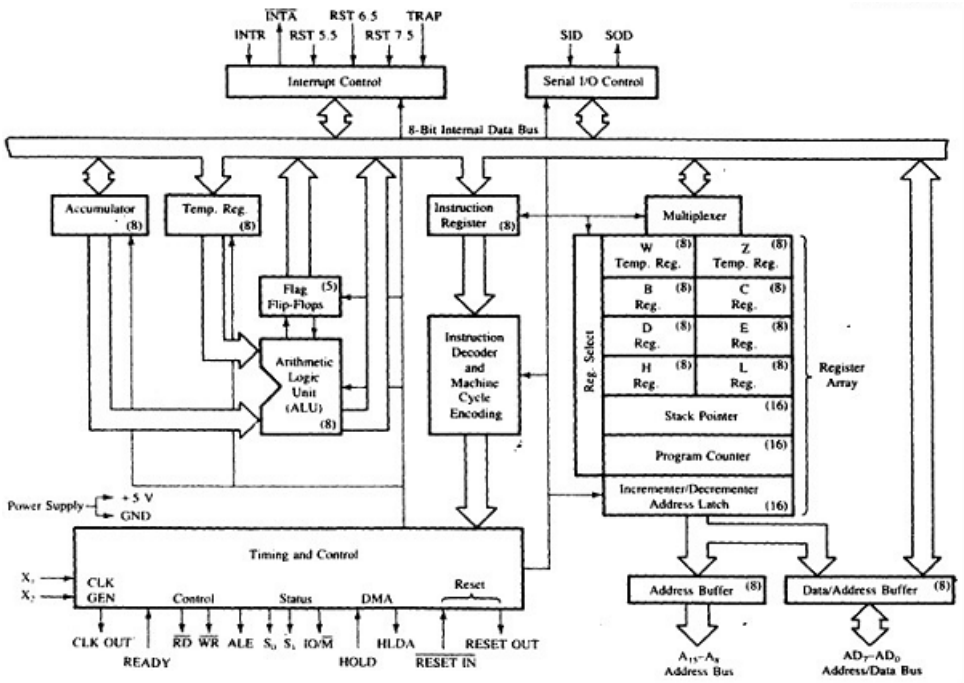


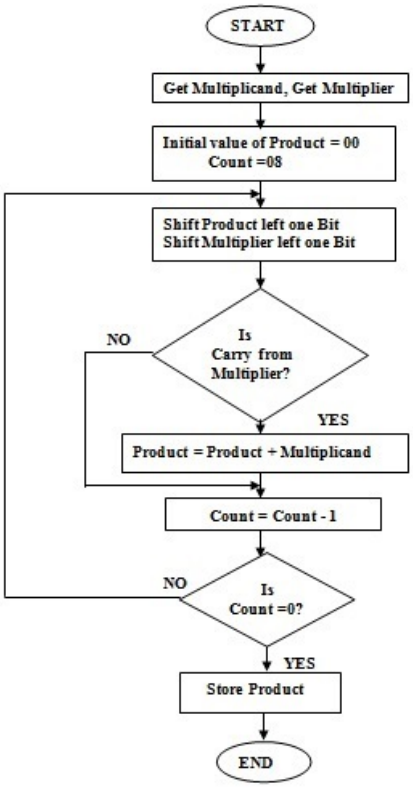
Figure 1: 8085 Architecture

2.1 Some instructions

1. **LXI** H
   (Load register pair immediately) loads 16 bit data in register pair designated by operand.
2. **XCHG**
   (Exchange) exchange HL with DE pair.
3. **LDA**
   (Load accumulator) copies the address content to accumulator.
4. **LHLD** addr.
   (Load HL pair direct) loads 16 bit data from specified address to designate in register pair.
5. **MOV** A, M
   Copies the data byte into accumulator from the memory specified by the address in H-L pair.

6. **MVI**
   (Move immediate data) moves immediate value to specified register.
7. **DAD**
   Instruction adds specified register pair content to HL pair content and store results into HL pair.
8. **SUB**
   (Subtraction) subtracts register content to accumulator and stores result into accumulator.
9. **CMP**
   (Compare with accumulator) compares the register/memory content to accumulator
   - (A) < (Reg/Mem) ; carry flag is set and zero flag is reset.
   - (A) = (Reg/Mem) ; carry flag is reset and zero flag is set.
   - (A) > (Reg/Mem) ; both carry flag and zero flag are reset.
10. **JNC** addr
    Instruction jump the execution to the specified Address if carry flag is reset.
11. **RAL**
    (Rotate accumulator left through carry)
12. **DCR**
    instruction decrement the specified register content by 1.
13. **STA** addr
    (Store accumulator direct) copies the contents of the accumulator to the memory location specified in the instruction
14. **SHLD** addr
    (Store HL directly) instruction store HL pair content to specified address.
15. **JNC** addr
    (Jump if no carry) jump to specified address if carry flag reset.

2.2 Flowchart



3 Code

3.1 Multiplication of two 8-bit numbers

```
# ORG 7000H
LHLD 7501H          // Get Multiplicand in H-L pair
XCHG                // Exchange HL pair with DE pair
LDA 7503H           // Get  2nd  no in acc.
LXI H, 0000H        // Initial product in HL=00
MVI C, 08H          // Count=08 in reg C
up: DAD H           // Shift partial product left by 1 bit
RAL                 // Rotate multi. by 1 bit
JNC down            // No, go to ahead
DAD D               // Product=Product + Multiplicand
down: DCR C         // Decrement Count
JNZ up              // Jump until C=0
SHLD 7504H          // Store result
RST 1               // Terminate

# ORG 7501H         // Store inputs at the address
# DB 25, 00, 05     // Get the numbers from successive locations
```

4 Observations:

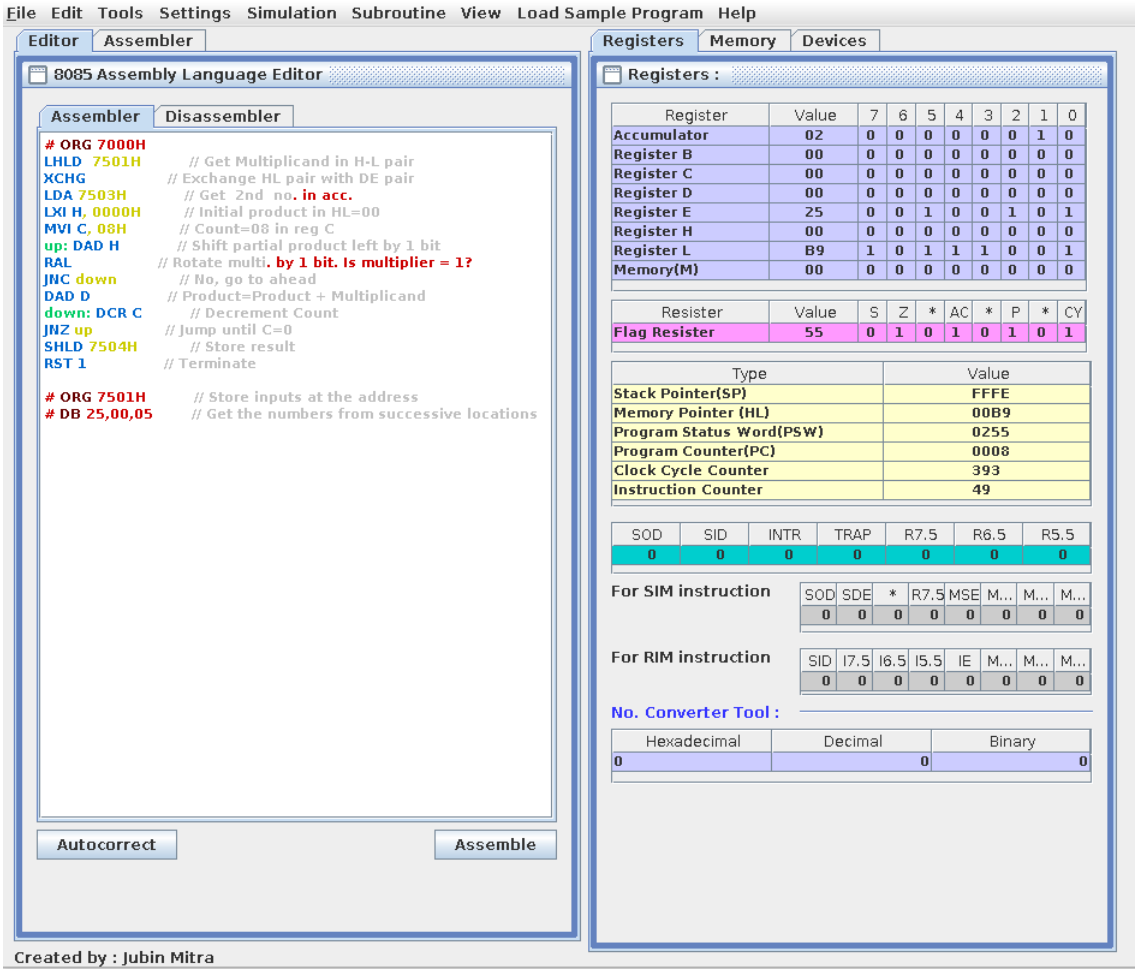


Figure 2: (a) 8-bit multiplication

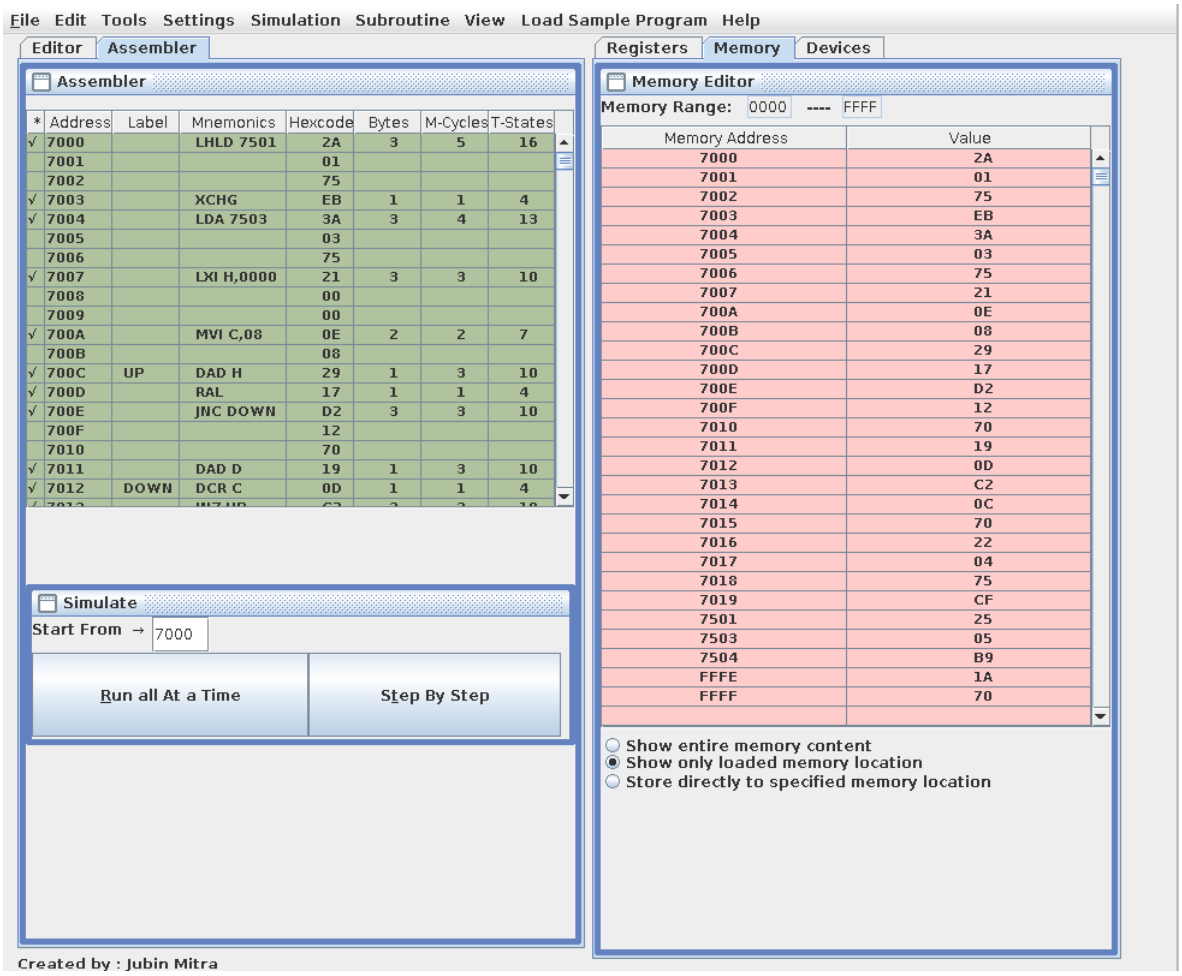


Figure 3: (b) 8-bit multiplication

5 Conclusion:

Input: 7501 – $25H$, 7502 – $00H$, 7503 – $05H$
Output: 7504 – $B9H$, 7505 – $00H$

Hence the programs for multiplication of two 8-bit numbers given in section 3 works as expected for 8085 microprocessor.