

Experiment 5

Shift and Rotate operation

5.1 Aim(s) / Objective(s) / Purpose.

The purpose of this experiment is to learn Rotate and Shift commands in assembly language.

5.2 Hardware Requirement:

The 8086 Microprocessor kit, Power Supply.

5.3 Program Logic:

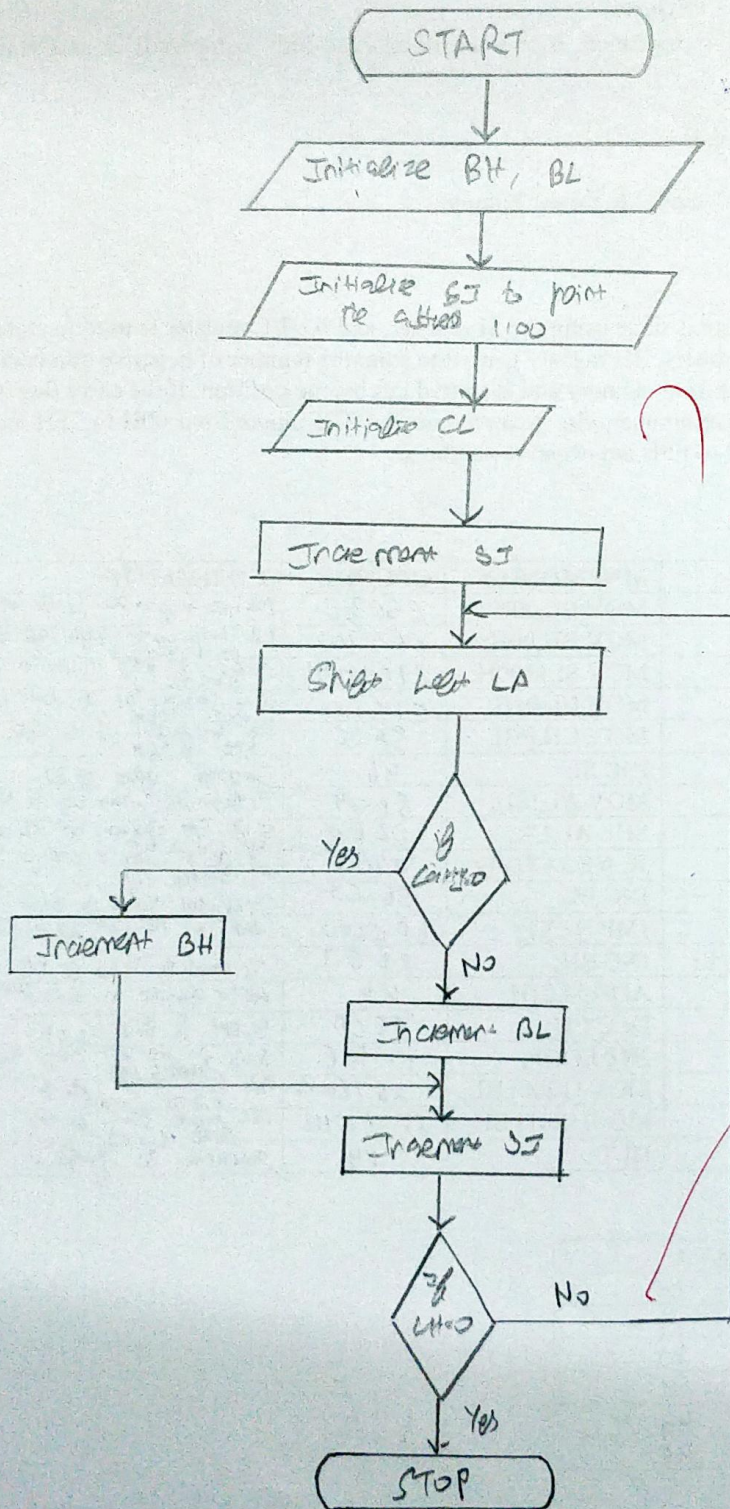
Addressing the string is done using the SI register, and the BL register is used to store the number of positive numbers, BH register is used to store the number of negative numbers. Hence each data is fetched from memory and is shifted left by one position. If the carry flag is set, then it denotes negative number. The inputs from 00H to 7FH are positive numbers and 80H to FFH are negative numbers.

5.4 Program:

ADDRESS	LABEL	MNEMONICS	OPCODE	COMMENTS
1000		MOV BL,00H;	C6C300	Data transfer from 00 to BL register
1003		MOV BH,00H;	C6C700	Data transfer from 00 to higher byte of register
1006		MOV SI,1100H;	C7C60011	Transfer of data in 1100 to SI register
100A		MOV CL,01H;	C6C101	Data transfer 01 to CL register
100D		MOV CH,[SI];	8A2C	Move data from SI to higher byte of CH
100F		INC SI;	46	Increment value of SI
1010	LOOP:	MOV AL,[SI];	8AC4	Transfer data from SI to AL
1012		SHL AL,CL;	D2E0	Shift left operation on AL and CL register
1014		JC NEGATIVE;	7205	If carry flag is set, then it will go to JC instruction
1016		INC BL;	FE03	Increment value of BL
1018		JMP NEXT;	EB0200	Jump to NE instruction
101B	NEGATIVE:	INC BH;	FE07	Increment the value of BH
101D	NEXT:	ADD SI,01H;	46	Addition operation on SI, 01H
101E		DEC CH;	FE0D	Decrement the value of CH
1020		JNZ LOOP;	750E	Jump if not zero carry flag
1022		MOV [1200],BL;	891E0012	Data transfer from BL to 1200
1026		MOV[1201],BH;	893E0112	Data transfer from BH to 1201
102A		HLT	F4	Terminate the program

Observation

INPUT ADDRESS	DATA
1100	05
1101	79
1102	55
1103	24
1104	46
1105	98



OUTPUT ADDRESS	DATA
1200	03
1201	01

5.5 Pre Lab Questions

1. Explain the SHR, SAR, SHL, SAL, ROL, ROR, RCL, RCR instruction with neat diagrams.
2. Find out the answer for a given program?
MOV CL,04H ;
MOV AX,564AH ;
SAL AX,CL ;
RET

5.6 Post Lab Questions

1. Simulate the above lab experiment program in emulator 8086 software
2. Find out the answer for the pre lab Question 2 with ROR and RCR instead of SAL?

5.7 Results and Conclusion

Thus, the instruction sets, addressing modes and to perform shift and rotate operation by given number of bits in the memory was experimented.



Microprocessor Lab

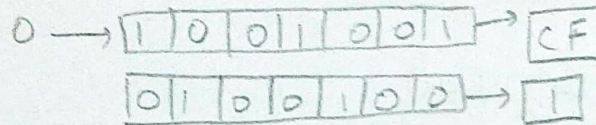
Experiment 5 - Shift and Rotate operation.

I. Pre-Lab Questions

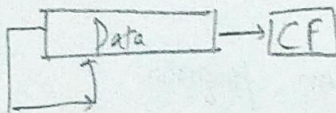
1. Explain the SHR, SAR, SHL, SAL, ROL, ROR, RCL, RCR instruction with neat diagrams.

Soln

SHR (Shift Right)

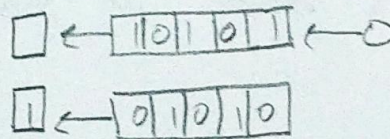


SAR (Shift Arithmetic Right)

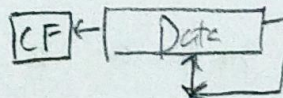


In case of SAR, the MSB is restored.

SHL (Shift Left)

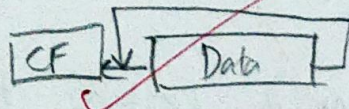


SAL (Shift Arithmetic Left)

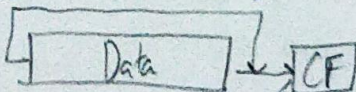


ROL (Rotate Left)

Rotates the mentioned bits to the left, one by one, such that the left most bit that is being rotated is again placed as right most bit.

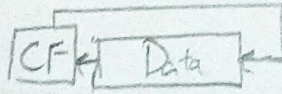


ROR (Rotate Right)

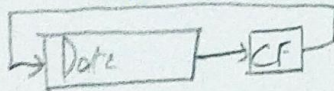


RCL (Rotate Carry Left)

It rotates mentioned bits to the left side one by one, such that the left most bit is rotated and placed in Carry flag, to bit in CF is moved to LSB.



RCR (Rotate Carry Right)



2. Find out the output for the given program.

100. When `MOV AX, 564AH` is executed, AX stores `564A` and when `SAL AX, CL` is executed, AX stores `54A0` and CF is set to 1.

Post Lab Questions

2. Find out the output for the pre lab Q. 2 with `ROR` and `RCR` instead of `SAL`.

100. ROR: When `AX, 564AH` is executed, then AX stores 564A, when `ROR AX, CL` is executed, then AX stores A564 and CF becomes 1.

RCR: When `MOV AX, 564AH` is executed, AX stores 564A and when `RCR AX, CL` is executed, then AX stores 4564 and CF becomes 1.