Microprocessor [8085 Instructions – Data transfer] **Date: 2nd Feb 2021**

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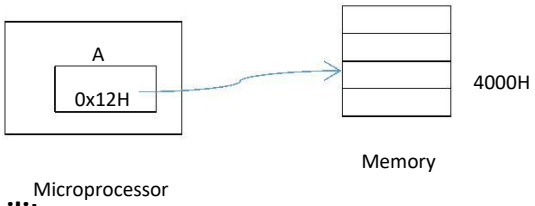
Data Transfer Instructions

1. Write an ALP to performs the below tasks? Find out different possibilities and identify the best one?
   a. **Store/write 8 bit data 0x12 into 4000H memory location.**



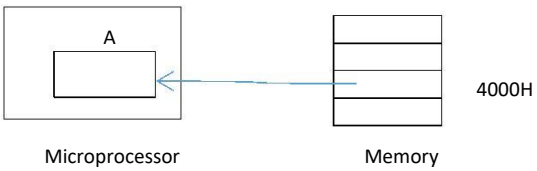
Different Possibilites:

Sl.no	Opcode	Operand	Byte size	TIME cycles	comments
1	**STA**	4000H	3B	13T	[4000H] ←A
		TOTAL:	3B	13T	
2	**MVI**	L,000H	2B	7T	L←00H
	MVI	4,40H	2B	7T	H<-40H
	MOV	M,A	1B	7T	[HL]←A
		TOTAL:	5B	21T	
3	**MVI**	L,00H	2B	7T	L←00H
	MVI	H,40H	2B	7T	H←40H
	STAX	H	1B	4T	[HL]<-A
		TOTAL	5B	18T	
4	**LXI**	H,400H	3B	10T	HL←4000H
	MOV	M,A	1B	7T	[HL]←A
		TOTAL	4BYTE	17T	
5	**LXI**	H,400H	3B	10T	HL←4000H
	STAX	H	1B	4T	[HL]←A
		TOTAL	4B	14T	

CONCLUTION:

According to the above program first instruction STA 4000H takes only 3Bytes memory space and 13 T-cycles to execute.

b. Load 8 bit data from 4000H memory location into Accumulator.



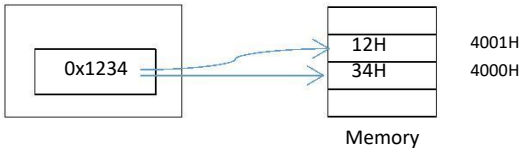
Different Possibilites:

Sl.no	Opcode	Operand	Byte size	TIME cycles	comments
1	**LDA**	4000H	3B	13T	A←[4000H]
		TOTAL:	3B	13T	
2	**MVI**	L,000H	2B	7T	L←00H
	MVI	4,40H	2B	7T	H←40H
	MOV	A,M	1B	7T	A←[HL]
		TOTAL:	5B	21T	
3	**MVI**	L,00H	2B	7T	L←00H
	MVI	H,40H	2B	7T	H←40H
	LDAX	H	1B	4T	A←[HL]
		TOTAL	5B	18T	
4	**LXI**	H,400H	3B	10T	HL←4000H
	MOV	A,M	1B	7T	A←[HL]
		TOTAL	4BYTE	17T	
5	**LXI**	H,400H	3B	10T	HL←4000H
	LDAX	H	1B	4T	A←[HL]
		TOTAL	4B	14T	

CONCLUTION:

According to the above program first instruction LDA 4000H takes only 3Bytes memory space and 13 T-cycles to execute.

c. Store 16 bit data 0x1234 into 4000H and 4001H corresponding memory locations using Little Endian format.



Register pair not mentioned in the above diagram. So I assume it as **HL register pair**.

Different Possibilites:

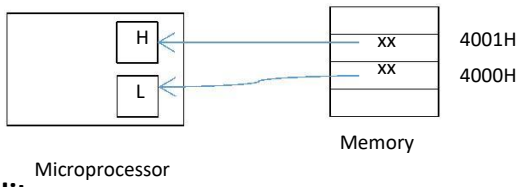
Sl.no	Opcode	Operand	Byte size	TIME cycles	Comments
1	**SHLD**	4000H	3B	16T	[4000H] ←L
					[4001H] ←H
		TOTAL:	**3B**	**16T**	
2	**XCH**	-	1B	4T	DE←→HL ; Initially **HL pair** holds the **data** so, swap with **DE pair**
	LXI	H,400H	3B	10T	HL←4000H
	MOV	M,E	1B	7T	[HL]←E ; **Lower byte data** moved to the location pointed by the HL pair[4000H].
	LXI	H,4001H	3B	10T	HL←4001H
	MOV	M,D	1B	7T	[HL]←D; **Higher byte data** moved to the location pointed by the HL pair[4001H].
		TOTAL	**9B**	**38T**	
3	**XCH**	-	1B	4T	DE←→HL; Initially **HL pair** holds the **data** so, swap with **DE pair**
	MVI	L,00H	2B	7T	L←00H
	MVI	H,40H	2B	7T	H←40H
	MOV	M,E	1B	7T	[HL]←E **Lower byte data** moved to the location pointed by the HL pair[4000H].
	LXI	H,4001H	3B	10T	HL←4001H
	MOV	M,D	1B	7T	[HL]←D **Higher byte data** moved to the location pointed by the HL pair[4001H].
		TOTAL	**10B**	**42T**	

4	**XCH**	-	1B	4T	DE←→HL; Initially HL pair holds the **data** so, swap with DE pair
	MVI	2, 00H	2B	7T	L←00H
	MVI	H, 40H	2B	7T	H←40H
	MOV	M, E	1B	7T	[HL]←E
	MVI	2, 01H	2B	7T	L←01H
	MVI	H, 40H	2B	7T	H←40H
	MOV	M, D	1B	7T	[HL]←D
		TOTAL	**11B**	**46T**	

CONCLUTION:

According to the above program first instruction SHLD takes only 3Bytes memory space and 16 T-cycles to execute.

d. Load 16 bit data from 4000H & 4001H memory locations into HL pair using Little Endian format.



Different Possibilites:

Sl.no	Opcode	Operand	Byte size	TIME cycles	Comments
1	**LHLD**	4000H	3B	16T	L←[4000H] H←[4001H]
		TOTAL:	3B	16T	
2	**LXI**	D, 4000H	3B	10T	DE←4000H
	LDAX	D	1B	4T	A←[DE]
	MOV	L,A	1B	4T	L←A **Lower byte data** moved to the location pointed by the HL pair[4000H].
	LXI	D, 4001H	3B	10T	DE←4001H
	LDAX	D	1B	4T	A←DE
	MOV	H, A	1B	4T	H←A **Higher byte data** moved to the location pointed by the HL pair[4001H
		TOTAL:	**10B**	**36T**	

3	**MVI**	E, 00H	2B	7T	E←00H
	MVI	D, 40H	2B	7T	D←40H
	LDAX	D	1B	4T	A←[DE]
	MOV	L,A	1B	4T	L←A **Lower byte data** moved to the location pointed by the HL pair[4000H].
	LXI	D,4001H	3B	10T	DE←4001H
	LDAX	D	1B	4T	A←[DE]
	MOV	H,A	1B	4T	H←A **Higher byte data** moved to the location pointed by the HL pair[4001H
		TOTAL	**11B**	**40T**	
4	**MVI**	E, 00H	2B	7T	E←00H
	MVI	D, 40H	2B	7T	D←40H
	LDAX	D	1B	4T	A←[DE]
	MOV	L, A	1B	4T	L←A **Lower byte data** moved to the location pointed by the HL pair[4000H].
	MVI	E, 01H	2B	7T	E←01H
	MVI	D, 40H	2B	7T	D←40H
	LDAX	D	1B	4T	A←[DE]
	MOV	H, A	1B	4T	H←A **Higher byte data** moved to the location pointed by the HL pair[4001H
		TOTAL	**12B**	**44T**	

CONCLUTION:

According to the above program first instruction LHLD takes only 3Bytes memory space and 16 T-cycles to execute.