



1509040

ECE - 3rd Year

NJSA

Microprocessors & Microcomputers Laboratory ECE 3104

1. Check the specifications of your computer and study to explain each terms (for example processor speed, RAM, ROM, 32 bit/64 bit processor, different ports of your PC, operating systems etc.).
2. Instruction sets of 8085 and 8086 microprocessor (as marked by the course teachers).
3. Practice the following programs in assembly language for both 8085 and 8086 microprocessors:
 - a. Unsigned Multiplication of two 8 bit number.
 - b. Unsigned Division of two 8 bit numbers.
 - c. Addition of two 16 bit number.
 - d. Transferring block of data from one memory location to another memory location.
 - e. Find smallest number from the given array.
 - f. Find largest number from the given array.
 - g. Subtraction of two 8 bit numbers.
 - h. Program to arrange the numbers in the ascending order.
 - i. Program to arrange the numbers in the descending order.
 - j. Program to implement the Fibonacci series.
 - k. Find the factorial of a number.
 - l. Sum of series of 10 numbers and store result in a memory location.
 - m. Program to find the area of a circle (avoid the fractional part of pi).
 - n. Find the square and cube of a number.

4. Description and function of each key of both 8085 and 8086 microprocessor kit.
5. Microprocessor, Architecture, Programming and Applications with the 8085:

Chapter 1: 1.1, 1.1.2, 1.1.3, 1.2, 1.2.1, 1.2.2, 1.2.3, 1.2.6

Chapter 2: 2.1, 2.1.2, 2.3, 2.4.2

Chapter 3: 3.1.1, 3.2.7, 3.5.1

Chapter 4: 4.1.1

Ins. data format, storage

diff

6. Microprocessors and Interfacing:

Chapter 2: Main features of 8086 (Page 2.7), 8086 Internal Architecture (Page 2.10-2.14)

UP
Prev.
model

TABLE OF COMMAND KEYS

SR.NO	KEYS	DESCRIPTION
1	SUB	Substitute Data Into RAM/ Read data from memory, to check the register
2	COMP	Compare Block/Data in memory
3	PREV	To check data of previous location in substitute command
4	MOV	Move Block/Data from memory within memory.
5	EXE	To execute the program in full swing or single step
6	SR I/P	Serial data in from PC or any terminal
7	SR O/P	Serial data out to PC or any Terminal
8	ESC	Return to command mode
9	ENTER	To proceed to next step in any above command.
10	USER	Key 1- available to user/ future expansion
11	USER	Key 2- available to user/ future expansion.

PROCEDURE: ENTER AND EXECUTE A PROGRAM

Insert a 2 pin female connector at top left hand corner of your trainer to power on your system. FALCon 85 will display and your trainer is ready to work.

- 1) Press respective key to get the command long form on display followed by?.
- 2) Press Enter key to authorise the command displayed.
- 3) Further you can use Enter key also-
 - a) To choose various options within command
 - b) To save data at particular location.
- 4) You can return to main flow (command mode) just by pressing Esc at any Point of operation of the kit. No need to press Reset key, which reinitializes system washing away useful data structures, created during development e.g. contents of registers etc.
- 5) Once inside a command pressing any other key than Enter/Esc on round robin basis till you press Enter key can see various options within.
Now we will see how to enter a very simple program, which adds two 8-bit numbers.

Addition of two 8-bit numbers –

Memory Add	Op code	Label	Instruction	Comment
8000	3E 24	START:	MVI A, 24	Load the accumulator
8002	06 42		MVI F0, 42H	Load register B with 42H
8004	50		MOV D,B	Move data in B to D
8005	80		ADD B	Add B register to A register.
8006	CF		RST1	Jump to command mode

Sequences of keys to be pressed along with response of trainer.

Sr. no	Press key	Display	Description
1		FALCon 85	After Power ON. Now it is a command mode.
2	S	SUBSTITUTE?	Use substitute command to enter Program.
3	Enter	MEMORY?	Use substitute External memory mode.
4	Enter	ADDR 0000	Asks memory address. Enter here 4 digit address 8000H entering 8 then 0 then 0 then 0. If you make any mistake while entering, don't worry, enter 4 digits again in sequence starting from the first left most position
5	8		
6	0		
7	0		
8	0		
9	Enter	8000 00	Enter The address & data are displayed here

10	3	8000 03	Enter a new data byte 74 at address 8000. Note that data entered in memory when you press Enter.
11	E	8000.3E	While entering 2 digit data press both the digits in correct sequence before pressing Enter key.
12	Enter	8001 00	Address is Incremented by 1 displaying corresponding data. At this step if press PREV address is decremented by 1, displaying corresponding data.
13	PREV	8000 3E	You can check / modify data Previously entered.
14	Enter	8001 00	Now enter remaining data bytes each followed by a Enter key until you arrive at address 8006H. You can check data again by decrementing address one by one

Execution of the program

Sr. no	Press key	Display	Description
1	Esc	COMMAND	Come to command mode.
2	EXE	EXECUTE?	Use EXECUTE command to Execute program..
3	Enter	FULL?	Use execute full swing mode
4	Enter	ADDR 0000	Asks program address.
5	8	8	Execute program at 8000H & comes to command mode
6	0	80	
7	0	800	
8	0	8000	
9	Enter		On successful execution of the program system will display COMMAND on display.

Checking contents of registers:-

Sr. no	Press key	Display	Description
1	Sub	Substitute?	Substitute mode
2	Enter	Memory?	Memory mode.
3	Any other key Except Enter & ESC	REG?	Registers are selected. Now press than Esc/Enter Enter key to see register contents
4	Enter	A 66	Now it will shows the contents of all registers if press Enter key.

FALCON

4 2. OPERATION INTRODUCTION

2. OPERATION INTRODUCTION

2-1. KIND & FUNCTION OF KEY

MDE-8086 has high performance 64K-byte monitor program. It is designed for easy function. After power is on, the monitor begins to work. In addition to all the key function the monitor has a memory checking routine.

The following is a simple description of the key functions.

FUNCTION KEY

DATA KEY

GO	STP	C	D	E	F
+	REG	8	9	A	B
-	DA	4	5	6	7
:	AD	0	1	2	3

RES system reset.

STP execute user's program,
a single step.

AD set memory address.

GO go to user's program or execute
monitor functions.

DA Update segment & Offset
and input data to memory.

MON Immediately break user's program
and Non maskable interrupt.

:

Offset set.

REG Register Display.

+

Segment & Offset +1 increment.
Register display increment.

-

Segment & Offset -1 decrement.
Register display decrement.

5 2 OPERATION INTRODUCTION

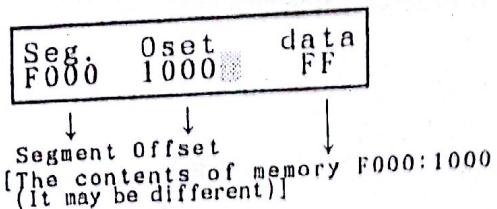
▷ [AD], [:], HEXA-DIGIT KEY : Substitute to segment & offset address.

EXAMPLE 1) Check the contents in memory.

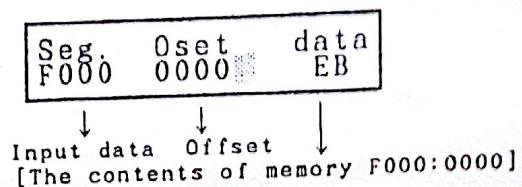
KEY	LCD						
[AD]	<table border="1"><tr><td>Seg.</td><td>Oset</td><td>data</td></tr><tr><td>0000</td><td>1000</td><td>FF</td></tr></table> <p>↓ ↓ ↓ Input data Offset [The contents of memory 0000:1000 (It may be different)]</p>	Seg.	Oset	data	0000	1000	FF
Seg.	Oset	data					
0000	1000	FF					
[F]	<table border="1"><tr><td>Seg.</td><td>Oset</td><td>data</td></tr><tr><td>000F</td><td>1000</td><td>FF</td></tr></table> <p>↓ ↓ ↓ Input data Offset [The contents of memory 000F:1000 (It may be different)]</p>	Seg.	Oset	data	000F	1000	FF
Seg.	Oset	data					
000F	1000	FF					
[0]	<table border="1"><tr><td>Seg.</td><td>Oset</td><td>data</td></tr><tr><td>00F0</td><td>1000</td><td>FF</td></tr></table> <p>↓ ↓ ↓ Input data Offset [The contents of memory 00F0:1000 (It may be different)]</p>	Seg.	Oset	data	00F0	1000	FF
Seg.	Oset	data					
00F0	1000	FF					
[0]	<table border="1"><tr><td>Seg.</td><td>Oset</td><td>data</td></tr><tr><td>0F00</td><td>1000</td><td>FF</td></tr></table> <p>↓ ↓ ↓ Input data Offset [The contents of memory 0F00:1000 (It may be different)]</p>	Seg.	Oset	data	0F00	1000	FF
Seg.	Oset	data					
0F00	1000	FF					
[0]	<table border="1"><tr><td>Seg.</td><td>Oset</td><td>data</td></tr><tr><td>F000</td><td>1000</td><td>FF</td></tr></table> <p>↓ ↓ ↓ Input data Offset [The contents of memory F000:1000 (It may be different)]</p>	Seg.	Oset	data	F000	1000	FF
Seg.	Oset	data					
F000	1000	FF					

2-2. BASIC OPERATION 7

:



0



► [AD], [+], [-] KEY : Increment and decrement to segment & offset address.

If on a power-up or pressing RES key, following message will be displayed on LCD.

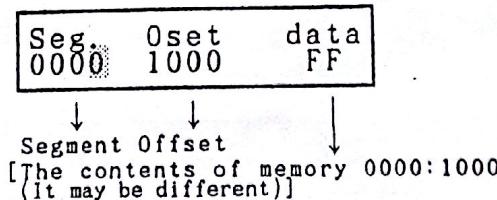
MDE-8086 Kit!
Midas 335-0964/5

If on a AD key,

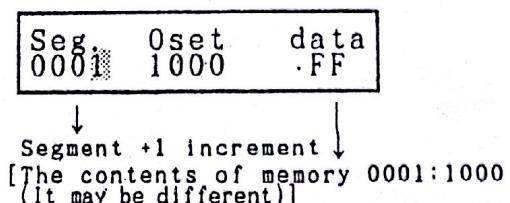
KEY

LCD

[AD]



[+]



③ 2. OPERATION INTRODUCTION

[+]

Seg.	Oset	data
0002	1000	FF

↓
Segment +1 increment
[The contents of memory 0002:1000
(It may be different)]

[-]

Seg.	Oset	data
0001	1000	FF

↓
Segment -1 decrement
[The contents of memory 0001:1000
(It may be different)]

> [AD], [:], HEXA-DIGIT KEY : Update to memory contents.

EXAMPLE 2) Let's store the following like to 01000H ~ 01003H
contents.

< ADDRESS	DATA >
01000	AB
01001	CD
01002	EF
01003	34

KEY

LCD

[RES]

MDE-8086 Kit!!
Midas 335-0964/5

[AD]

Seg.	Oset	data
0000	1000	FF

↓ ↓
Segment Offset
[The contents of memory 0000:1000]

[DA]

Seg.	Oset	data
0000	1000	FF

↓ ↓
Segment Offset
[The contents of memory 0000:1000
(It may be different)]

2-2. BASIC OPERATION ④

A B

Seg.	Oset	data
0000	1000	AB

+

Seg.	Oset	data
0000	1001	FF

↓
offset increment

C D

Seg.	Oset	data
0000	1001	CD

+

Seg.	Oset	data
0000	1002	FF

↓
offset increment

E F

Seg.	Oset	data
0000	1002	EF

+

Seg.	Oset	data
0000	1003	FF

↓
offset increment

3 4

Seg.	Oset	data
0000	1003	34

+

Seg.	Oset	data
0000	1004	FF

↓
offset increment

▷ [REG], [+], [-] KEY : Display to register contents.

KEY

LCD

[REG]

AX=0000	BX=0000
CX=0000	DX=0000

↓
Current register contents.

10 3. EXAMPLE PROGRAM

[+]	SP=0540 BP=0000 SI=0000 DI=0000
[+]	DS=0000 ES=0000 SS=0000 CS=0000
[+]	IP=1000 FL=0000 =.....
[+]	Current register contents.
-	DS=0000 ES=0000 SS=0000 SS=0000
-	SP=0540 BP=0000 SI=0000 DI=0000

3. EXAMPLE PROGRAM

♣ **STP** Single Step

Store the following program in RAM and execute it by single steps.

ADDRESS	MACHINE CODE	MNEMONIC
1000	B8 0000	MOV AX, 0
1003	9E	SAHF
1004	05 8947	ADD AX, 4789H
1007	15 8864	ADC AX, 6488H
100A	04 88	ADD AL, 88H
100C	80 D4 33	ADC AH, 33H
		:
100F	2D 6735	SUB AX, 3567H
1012	1D 0080	SBB AX, 8000H
1015	2C 45	SUB AL, 45H
1017	80 DC 78	SBB AH, 78H
		:
101A	B0 FF	MOV AL, FFH
101C	FE C0	INC AL
1C1E	FE C8	DEC AL
1020	98	CBW
1021	F6 D8	NEG AL
		:
1023	B0 F0	MOV AL, F0H
1025	B3 11	MOV BL, 11H