EEE 316

Microprocessor and Interfacing Sessional

Experiment 1

Name of the experiment: Basic idea of microprocessors and interfacing devices. Assembly language introduction and elementary commands.

Venue: VLSI Lab/ RNS Lab

Department of Electrical and Electronic Engineering, BUET

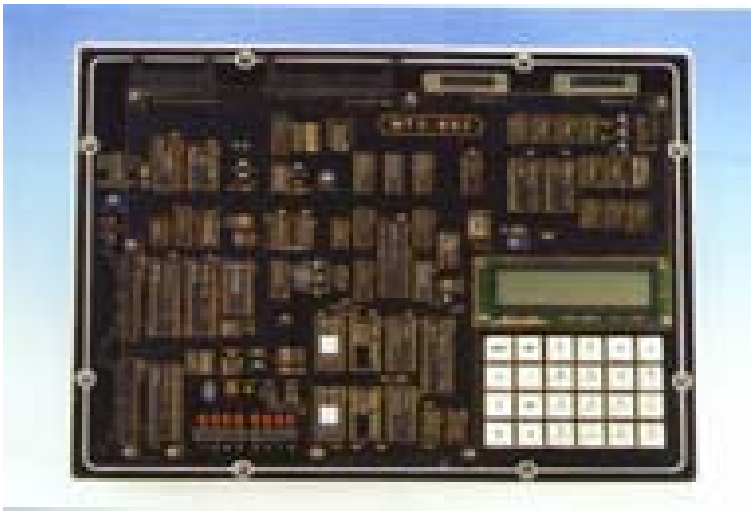
Objective:

The objective of this experiment is to familiarize the students with microprocessor trainer and loading some simple programs in the kit.

Introduction:

MTS-86C:

In our laboratory we shall study via 8086 kit MTS-86C. It a kit with I/O facility and built in interfacing devices such as 8255, 8251, 8259, 8253, 8254 etc.

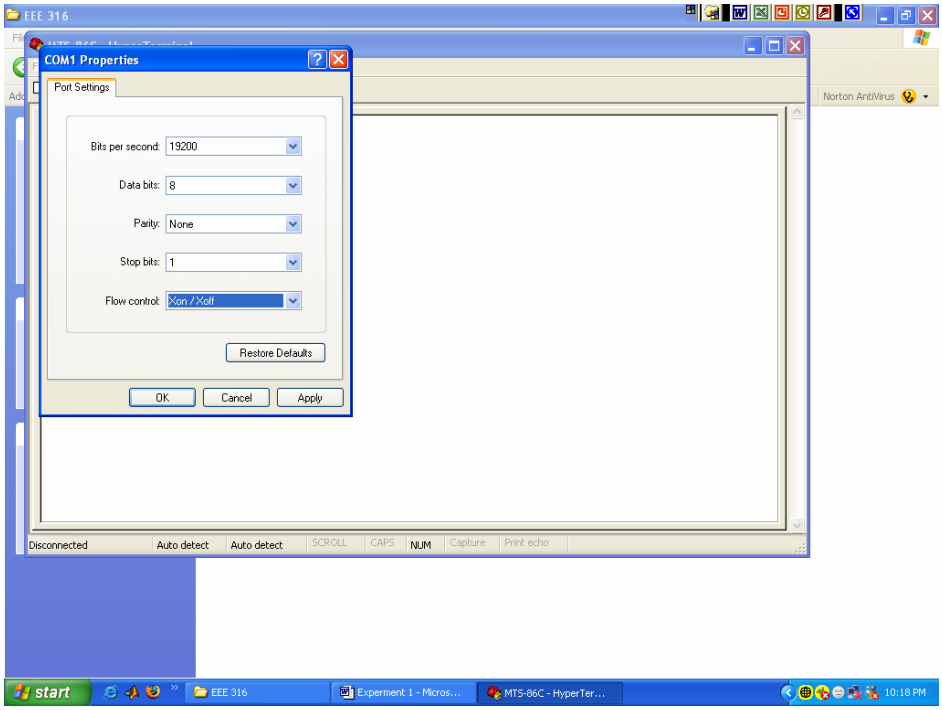


MDA-8086 module:

MDA-8086 is another module that will be used in the lab. Its purpose is same as MTS86C but operation is a little different.

Connecting MTS-86C to PC and loading program to it:

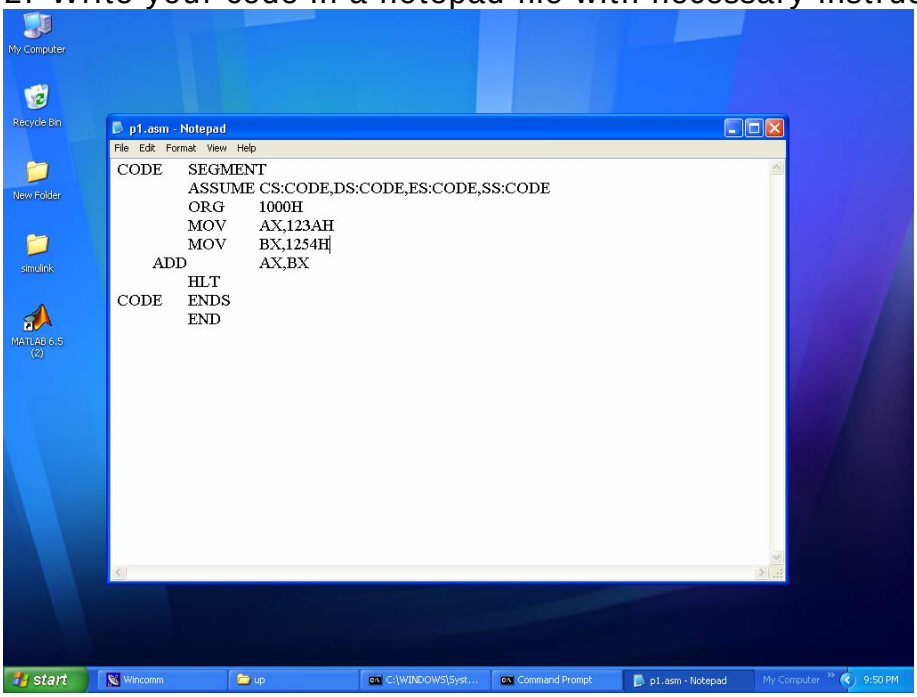
1. To connect MTS-86C to a PC, connect parallel port of the extended cord supplied to MTS-86C. Connect the COM1 type end to COM1 port of PC. Switch on the module MTS-86C.
2. Go to start>program files>accessories>communications>Hyper Terminal
3. Select COM1 as port.
4. Click ok tab. Select bit rate to be 19200.
5. Mark flow control as (Xon/Xoff)



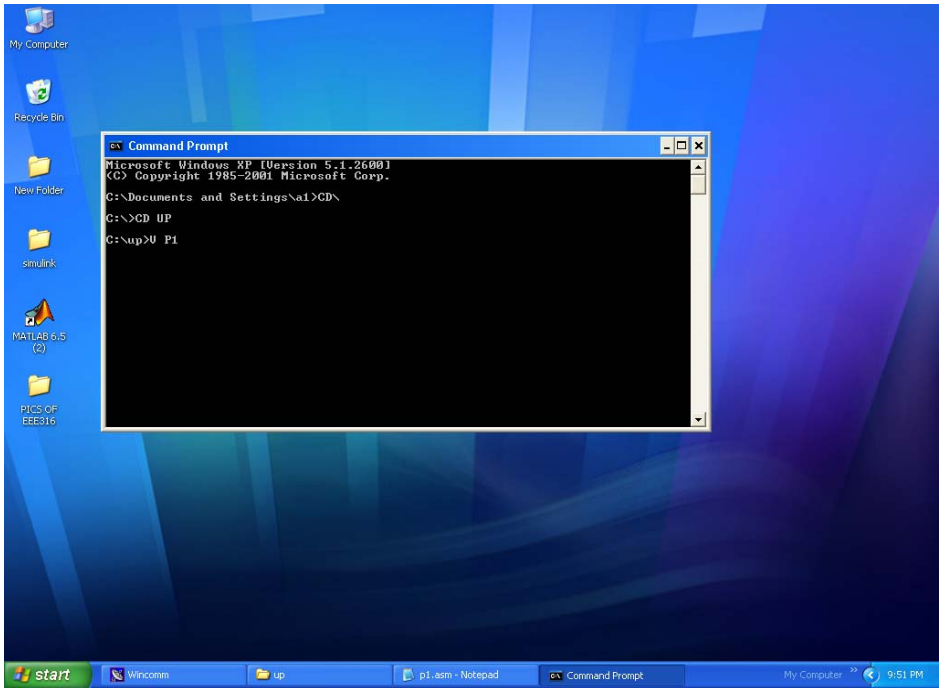
6. Press any key (between A-F) to make a communication between MTS-86C and PC.

Writing Code and making hex file:

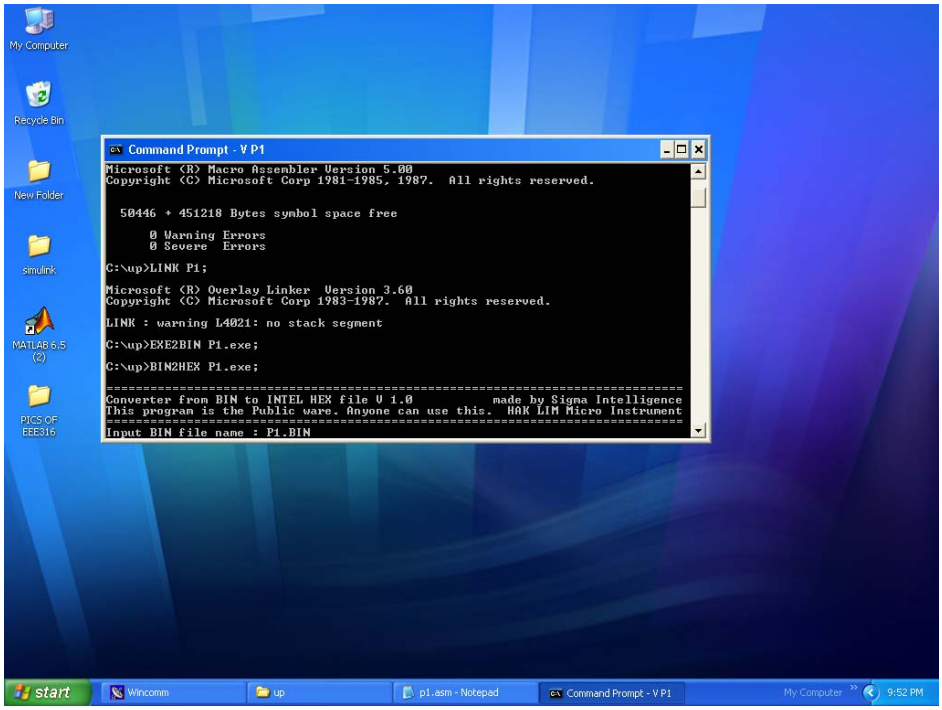
1. 8086 cannot take a simple written text file. It takes hex files. So an text file needs to be converted to hex file. This is done in following steps.
2. Write your code in a notepad file with necessary instructions.



3. Save the file as p1.asm (for example) in the folder named up in C drive.
4. Go to command prompt window. Go to folder up. Type: v p1



5. You can observe that execution has begun.
6. Give bin file name as p1.bin.



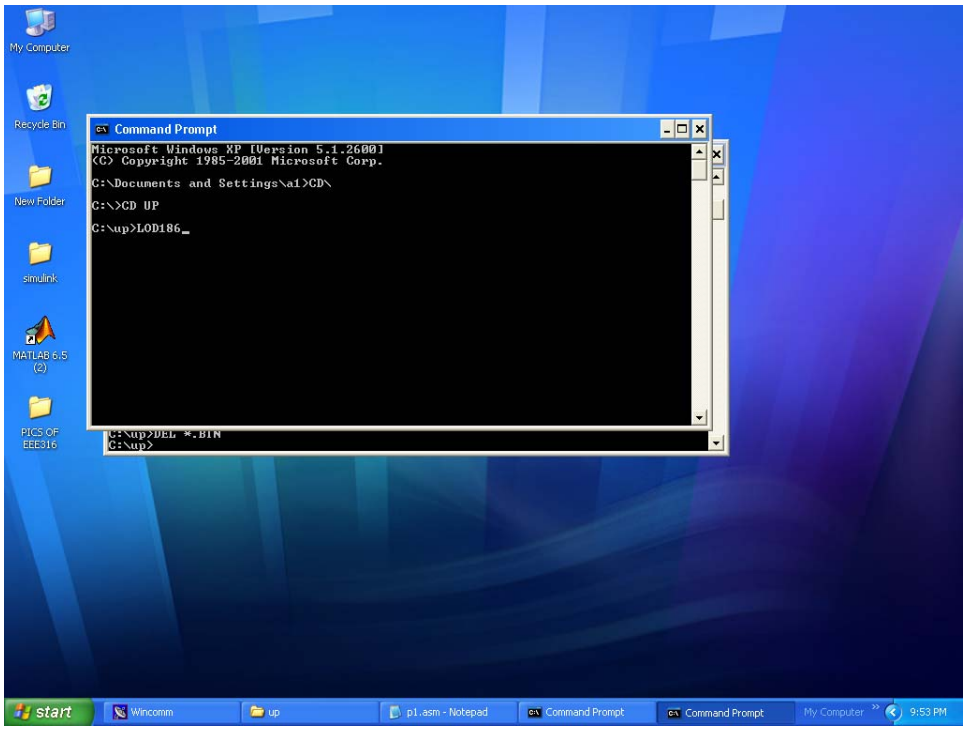
7. Press Enter when asked for address.
8. Your hex file is created. For checking you can go to up folder and fine out newly created file p1.hex.

Loading the hex file in MTS-86C:

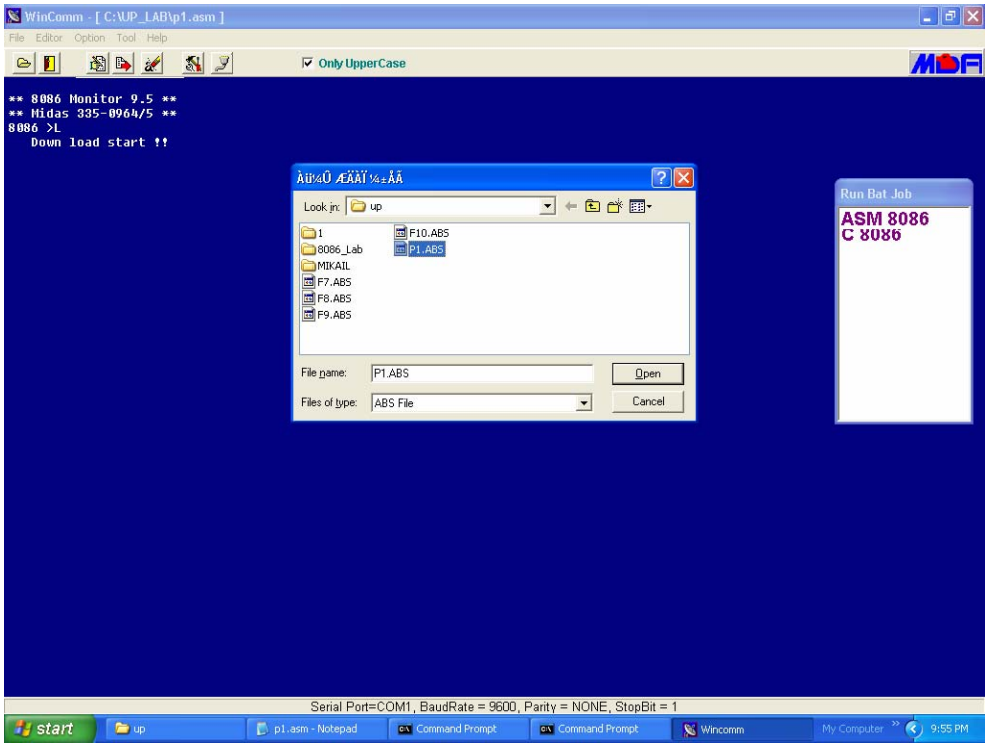
1. Press L in hyperterminal window.
2. Click to transfer tab in upper right corner. Select send text file.
3. Select your hex file.
4. Type g (Go) and press enter.
5. Your program has been executed.
6. Press R to see register values.

Connecting MDA-8086 to PC:

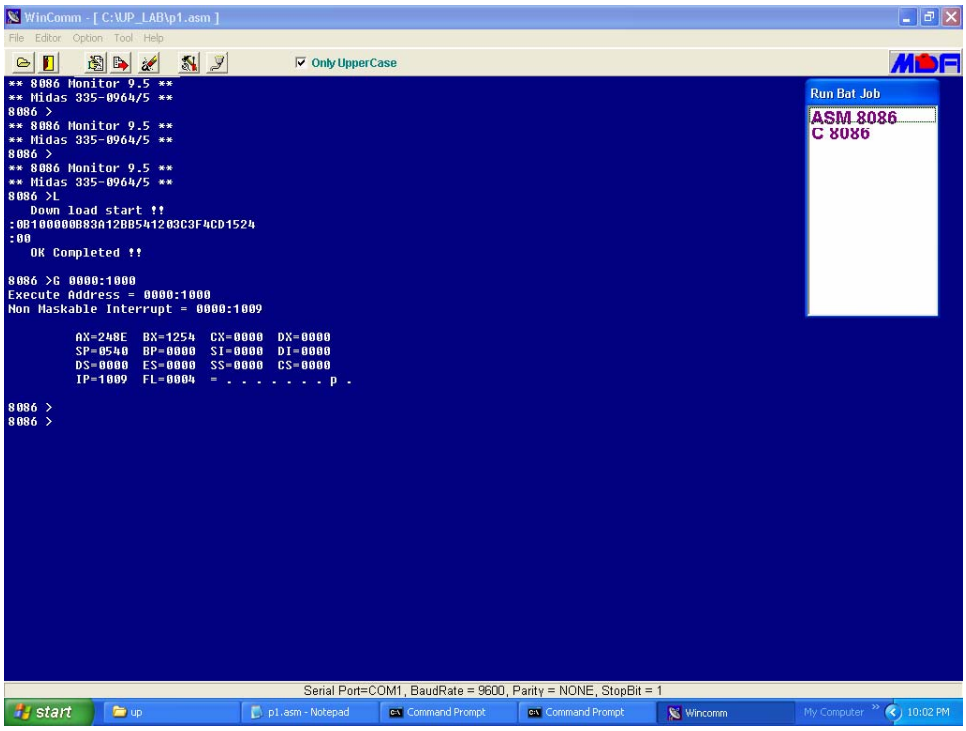
1. Open COMM software. Connect extended cord of MDA-8086 with PC's serial port. Press res button. Make sure the module is set in serial monitor mode.
2. Write your Code in notepad file and perform operations up to hex file creation.
3. open another command promt file.



4. Type LOD186 and press Enter.
5. Go to Comm window and press L. Press Enter. Select desired ABS file from up folder.



6. Type G 0000:1000 and press Enter.



7. Program is successfully run in MDA-8086 module.

MOV Command:

MOV is a basic command to assign a number to a variale. For example following word can be converted to a MOV command as,

x = 33;

MOV AX,33d
(d stays for decimal)
here AX stands for x. In this way we can declare variables. MOV can also be used to assign another registers value.

x = 33
y = x

MOV AX,33
MOV BX,AX

MOV can also be used to assign some value to a memory location or from a memory location.

MOV AX,[1000H]	Storing value to AX from memory location 1000H
MOV [1000H],AX	Storing value to memory location 1000H from AX
MOV [BX],AX	Storing value of memory location that has address given by the value of BX, to AX

More about MOV:

MOV command must be used with registers of equal size.

MOV AX,BL is not correct as AX is of 16bits and BL is of 8 bits. Similarly MOV BL,1652h is not correct as 1652h is 16 bit number and available space for BL is only 8 bits.

Remember if you write ‘h’ after a number then it is hexadecimal number. If nothing is written then default type is decimal.

NEG command:

NEG command is used to get the 2’s complement of any number.

MOV AL,30h
NEG AL

Now AL will have the value D0h

Exercise Part 1:

Write following codes and perform indicated operations. Take help from previously stated operations for loading and executing the program.

a)

```
MOV AX,3012
```

Observe content of AX register.

```
MOV BX,AX
```

Observe content of BX register.

what operation happened here _____

_____

_____

b)

```
MOV AX,30h
MOV [2010],AX
MOV BX,[2010]
```

Observe content of BX register.

what operation happened here _____

_____

_____

c)

```
MOV SI,1256h
MOV [SI],3251h
MOV AX,[SI]
```

Observe content of BX register.

what operation happened here _____

_____

_____

d)

```
MOV AL,87h
NEG AL
NEG AL
```

Write value of AL for every step._____

Arithmetic Commands:

ADD, SUB, DIV, MUL are all arithmetic commands. ADD is used to add two numbers. For example following lines can be converted to,

```
x = 1236H
y = 1438H
z = x+y
```

```
MOV AX, 1236H
MOV BX, 1438H
ADD AX,BX
```

This command adds AX and BX content and stores it to AX register.

Similarly SUB command is used for subtraction of two numbers. For example,

```
x = 1236H
y = 1438H
z = x – y
```

```
MOV AX, 1236H
MOV BX, 1438H
SUB AX,BX
```

AX holds the subtraction result.

MUL command is used to multiply two operands.
x = 146H
y = 5898H
z = x*y

```
MOV AX,1456H
MOV BX,5898H
MUL BX
```

AX holds the lower 16 bit and DX holds the upper 16 bit result. For example result of upper operation is 0709A310. So AX holds A310 and DX holds 0709.

DIV is used to perform division operation.

x = 5327H
y = 15F2H
z = x/y

```
MOV AX,5327H
MOV BX,15F2H
DIV BX
```

AX holds the result and DX holds the remainder. For example for upper operation AX holds 3H and DX holds 1151H.

Exercise Part 2:

Write following codes and perform indicated operations.

a)

```
MOV AX,1782H
MOV BX,1278H
ADD AX,BX
```

Examine register contents _____

_____

b)

```
MOV AX,1782H
MOV BX,1278H
SUB AX,BX
```

Examine register contents _____

_____

c)

```
MOV AX,2782H
MOV BX,1278H
MUL BX
```

Examine register contents _____

_____

d)

```
MOV AX,57F2H
MOV BX,1375H
DIV BX
```

Examine register contents _____

_____

Home Task:

1. Write complete assembly language for the following operation and verify it in EMU 8086 software.

```
x = 30D
y = 50D
z = x + y
w = z*y
x = w – 20D
y = x/5
u = x%5
```

Clearly indicate which register contains which value clearly.

2. Write a assembly code that will put 1265H to memory location 2100H and 4512H in memory location 1287H. Access these values via registers and perform subtraction operation.

3. Perform Multiplication of 1254H and 4512H. Store the higher 16 bit of the result to CX result.

4. Perform Division operation of 4512H by 1254H. ADD 03H with remainder value.

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References: Assembly language programming: Marut
8086 microprocessors: Rafiquzzaman