How to use MTS – 86C
EEE 316

There are 2 types of keys/buttons in the MTS board.

Function Keys/buttons :

RESET	**NMI**
+	**-**
:	**REG**
,	**•**

Hexadecimal Keys/buttons:

C / IP	D / FL	E	F
8 IW/CS	9 OW/DS	A / SS	B / ES
4 IB / SP	5 OB/ BP	6 MV/SI	7 EW/DI
0 EB/AX	1 ER/BX	2 GO/CX	3 ST/DX

You can see that there are some buttons that have several meanings.
Example:

0 EB/AX

Some times this button will act as 0 or some times as EB or some times as AX.
So this button acts in three ways and it depends on the previous situation you were using.
It will be clear later.

Now observe the following problems:

1. I want to see one byte data in the memory location : **0000 : 0011** (Here the format is in segment : offset).

Solution: Press in the following sequence and see the LCD display:

RESET → EB → 1 → 1 → ,

If you press [**,**] again and again you can see the next memory location data. To quit from this mode press [**•**]. EB means – Examine Byte. The data may be 00 or any thing inputted previous time.

2. I want to **CHANGE** one byte data to **1A** in the memory location : **0000 : 0011**

Solution: Press in the following sequence and see the LCD display:

RESET → EB → 1 → 1 → , → 1 → A

To quit from this mode press [**•**] . You can verify the data again according to problem 1.

3. I want to **change** one byte data to **FF** in the memory location : **00AB : 0000**

Solution: Press in the following sequence and see the LCD display:

RESET → EB → A → B → : → 0 → , → F → F

To quit from this mode press [•] . You can verify the data again according to problem 1.

4. I want to change one **word** data to 1**234** in the memory location : **00AB : 0000** and **00AB : 0001**

Solution: Press in the following sequence and see the LCD display:

RESET → EW → A → B → : → 0 → , → 1 → 2 → 3 → 4

To quit from this mode press [•] . You can verify the data again according to problem 1.

EW means – Examine Word.

Remember : one single memory location can hold only one byte (16 bit) data. So one word data (32 bit) needs two memory location.

5. I want to see the contents of the register AX.

Solution: Press in the following sequence and see the LCD display:

RESET → ER → AX

If you press [**,**] again and again you can see the next registers also. To quit from this mode press [•] . The same way you can see BX, CX, DX, SP, SI, DI, CS, DS, SS, ES, IP, FL also. ER means – Examine Register.

6. I want to **CHANGE** the contents of the register DX to 1F .

Solution: Press in the following sequence and see the LCD display:

RESET → ER → DX → 1 → F

To quit from this mode press [•] . The same way you can change AX, BX, CX, SP, SI, DI, CS, DS, SS, ES, IP, FL also.

7. I want to load the following program and run it.

The full code is written in notepad with file extension - asm.

```
CODE        SEGMENT
            ASSUME      CS:CODE, DS:CODE
            ORG     100H
            MOV     AX, 1234H
            MOV     BX,  5678H
            MOV     CX, AX
            MOV     DX, BX
            MOV     BX, CX
            HLT
CODE        ENDS
            END
```

<u>Solution:</u>

Using Masm.exe , Link.exe, Exe2bin.exe, Bin2hex.exe we have generated the Hex file.

The Hex file is as follows:

```
:10000000000000000000000000000000000000000F0
:10001000000000000000000000000000000000000E0
:10002000000000000000000000000000000000000D0
:10003000000000000000000000000000000000000C0
:10004000000000000000000000000000000000000B0
:10005000000000000000000000000000000000000A0
:100060000000000000000000000000000000000000090
:100070000000000000000000000000000000000000080
:100080000000000000000000000000000000000000070
:100090000000000000000000000000000000000000060
:1000A0000000000000000000000000000000000000050
:1000B0000000000000000000000000000000000000040
:1000C0000000000000000000000000000000000000030
:1000D0000000000000000000000000000000000000020
:1000E0000000000000000000000000000000000000010
:1000F0000000000000000000000000000000000000000
:0D010000B83412BB78568BC88BD38BD9F462
:00000001FF
```

Observe the line before the last line of the above hex code. Press in the following sequence and see the LCD display:

EB → 10 → : → 0 → , B8 → , → 34 → , → 12 → , → BB → , → 78 → , → 56 → , → 8B → , → C8 → , → 8B → , → D3 → , → 8B → , → D9 → , → F4 → .

Now you have loaded the code into the board. To run the program we need to use the GO button. Follow the sequence bellow (we are running the program partially):

GO → 10 → : → 0 → , → 6 → .

Now verify the registers.

ER → AX → , → , → .

Now the rest of the program :

GO → , → C → .

Again verify the registers:

ER → AX → , → , → .

You can also check/debug the program using Single Step mode where one line will be executed for each ST . To do that follow the sequence:

ST → 10 → : → 0 → , → .

ER → AX → , → , → .

ST → , → .

ER → BX → , → , → .

ST → , → .

ER → CX → , → , → .

ST → , → .

ER → DX → , → , → .

ST → , → .

Thus you can use the single step mode.
In your computer monitor when the communication between the hyper terminal and the board is established you can do all these using computer keyboard. Use the R (for register), G (for Go), T (for Trace – single step), H (for help) , E (for Edit) , D (for Dump – to verify the memory content), etc.

- Rajib Mikail, Lecturer, EEE.