

Course Title: Peripherals, Interfacing and Embedded Systems Lab (CSE-4640)

Department of Computer Science and Engineering (CSE)
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Lab # 4

Getting Familiar with Dot-Matrix Display of MDA-8086 Kit.

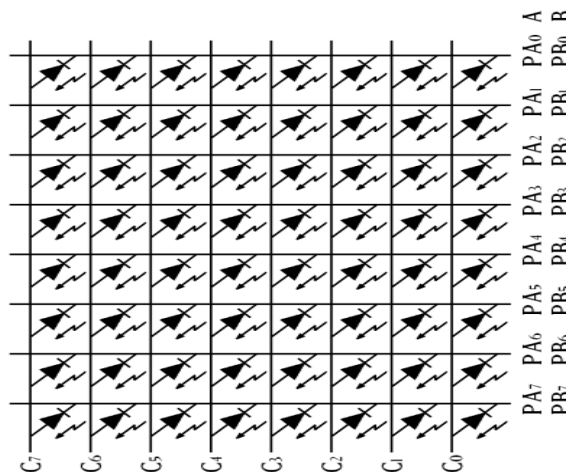
Objective:

To understand MDA 8086 trainer Kit Commands to control its Dot-Matrix display.

Theory:

- **Dot-Matrix Display**

The Dot Matrix inside the MDA–8086 trainer kit can be used to display any pattern of LEDs in the dot matrix display. This requires PIO 8255 PPI ports which are already connected to the Dot Matrix internally. Through the code we can access these ports and provide binary or hex value to switch the required LEDs on and off. In order to turn an LED ON, a logical 0 should be provided to the row and a logical 1 should be provided to the column because of the following arrangement. Any particular shape or design can be formed by turning on the required LEDs on the Dot-Matrix Display.



- **Dot-Matrix Display Data Generation Rule:**

As a different Programmable Peripheral Interface (PPI) 8255A is used for Dot-Matrix display, the address of the ports also different. Hence, the addresses are:

Port A: 18h

Port C: 1Ch

Port B: 1Ah

Control Register: 1EH

In Dot-Matrix display, Port C will be used for the value of the COLUMNS and Port A or B will be used for the value of the ROWS. In-case of Port C, pass LOGIC '1' signal for the particular column. In-case of Port A or B pass LOGIC '0' signal for the particular row.

Port A is used for displaying GREEN light and port B for displaying ORANGE light. Column 0 is the MSB of Port C and Column 7 is the LSB of Port C. Row 0 is the MSB of Port A or B and Row 7 is the LSB.

- **Example 1:** To illuminate the TOP RIGHT-MOST LED with green light the values are:

For port C = 10000000
 For port A = 01111111
 For port B = 11111111

Col	7	6	5	4	3	2	1	0	Row
	○	○	○	○	○	○	○	○	0
	○	○	○	○	○	○	○	○	1
	○	○	○	○	○	○	○	○	2
	○	○	○	○	○	○	○	○	3
	○	○	○	○	○	○	○	○	4
	○	○	○	○	○	○	○	○	5
	○	○	○	○	○	○	○	○	6
	○	○	○	○	○	○	○	○	7

- **Example 2:** To illuminate Column LEDs from Left-to-Right with an interval the code is

```

CODE SEGMENT
    ASSUME      CS:CODE, DS:CODE, ES:CODE, SS:CODE
PPIC_C EQU     1EH           ; Control register address
PPIC EQU       1CH           ; Port C address
PPIB EQU       1AH           ; Port B address
PPIA EQU       18H           ; Port A address

    ORG        1000H
    MOV        AL, 10000000B ; Control register initialization with a 8255 Mode set
    OUT        PPIC_C, AL

    MOV        AL, 11111111B ; Turning off Port A
    OUT        PPIA, AL

    MOV        AL, 00000000B ; Passing Data to Port B
    OUT        PPIB, AL

L1:    MOV        AL, 00000001B ; Passing Data to Port C
L2:    OUT        PPIC, AL
        CALL     TIMER
        CLC
        ROL        AL, 1          ; Changing Data of Port C
        JNC        L2
        JMP        L1
        INT        3

TIMER: MOV        CX, 0FFFFH
TIMER1: NOP
        NOP
        NOP
        NOP
        LOOP     TIMER1
        RET

CODE ENDS
END
  
```

Tasks to do:

1. Write a program to illuminate rows from Top-to-Bottom with alternate colors LEDs.
2. Write a program to illuminate rows from Left-to-Right with alternate colors LEDs.