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

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Lab # 4

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

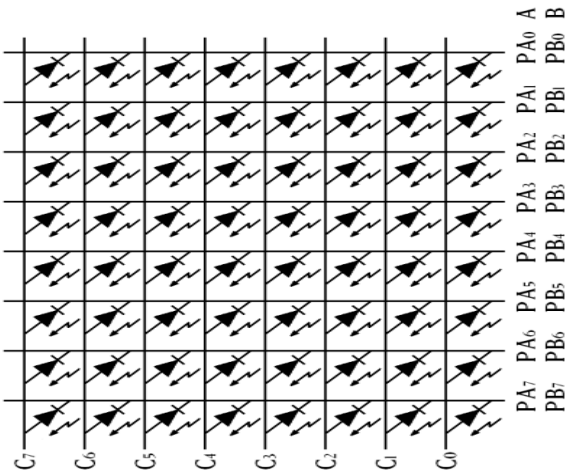
Objective:

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:

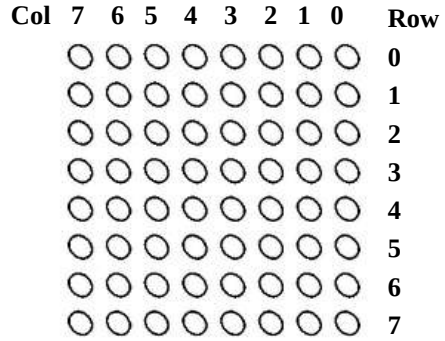
Port A: 18h	Port C: 1Ch
Port B: 1Ah	Control Register: 1EH

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



- **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.