Experiment No. 10

10.1 Experiment Name

LED ON/OFF using 8253, 8255 & 8259

10.2 Objectives

- To get acquainted with the "MDA 8086" Trainer Board and its operation
- To understand working procedure of LED ON/OFF using 8253, 8255, and 8259
- To learn how to implement program in “MDA 8086” Trainer Board and interconnect it with “Emu 8086”

10.3 Theory

The **8255** is a **Programmable Peripheral Interface**, is a general purpose programmable I/O device designed to interface the CPU with its outside world such as ADC, DAC, keyboard etc.

On the contrary, the **8253** is a **Programmable Timer Interval IC** which are designed for microprocessors to perform timing and counting functions using three 16-bit registers.

The **8259** is a **Priority/Programmable Interrupt Control IC** which combines the multi-interrupt input sources into a single interrupt output.

For this experiment, in order to turn on or off the LEDs concurrently with the specified time delay, the 8086 will control the 8255 PPI. The 8255 PPI IC's Port B is linked to the LEDs in the following way:

Port name	LED no.
PB_0	11
PB_1	12
PB_2	13
PB_3	14

The LEDs will be on and off in the following sequence by turning on each separately,

LED-11(PB0) -- LED-12(PB1) -- LED-13(PB2) -- LED-14(PB3)

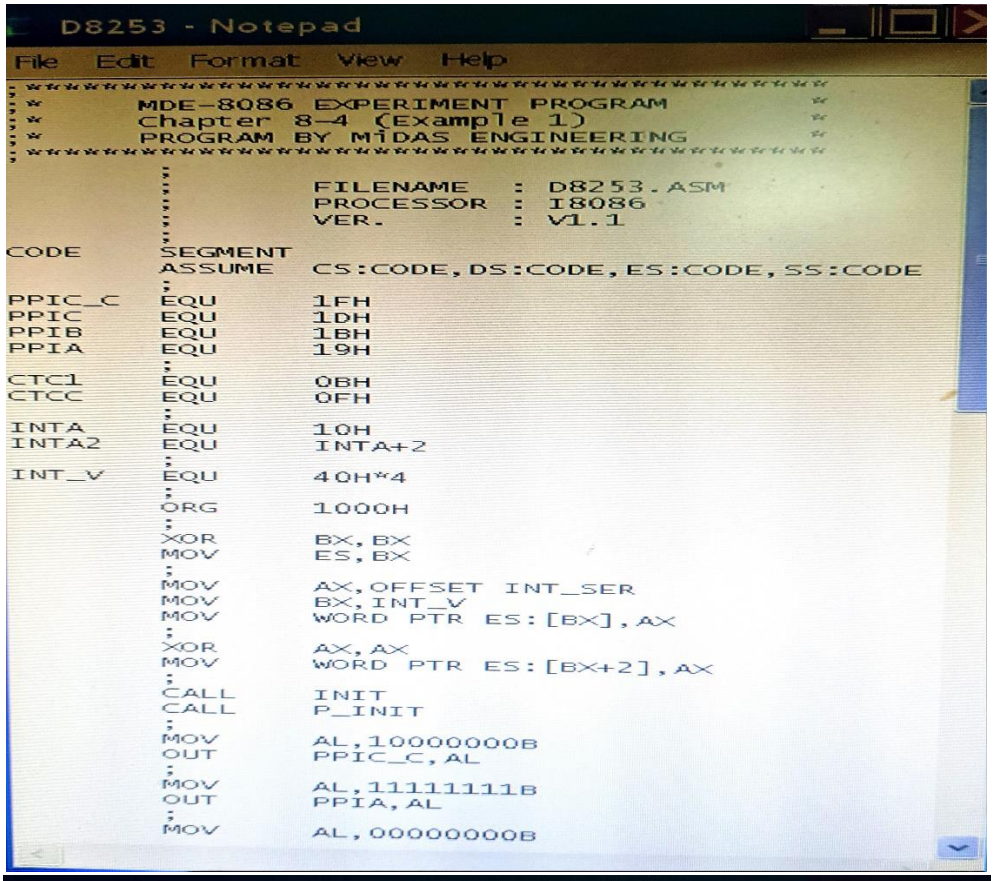
The MDA 8086 kit contains I/O mapped memory. So, to communicate with the peripherals, the commands "in" and "out" are needed. The 8255 PPI-CS-2 is used to connect the LEDs. So, port addresses for 8255, 8253 PTIC, and 8259 PICIC respectively are,

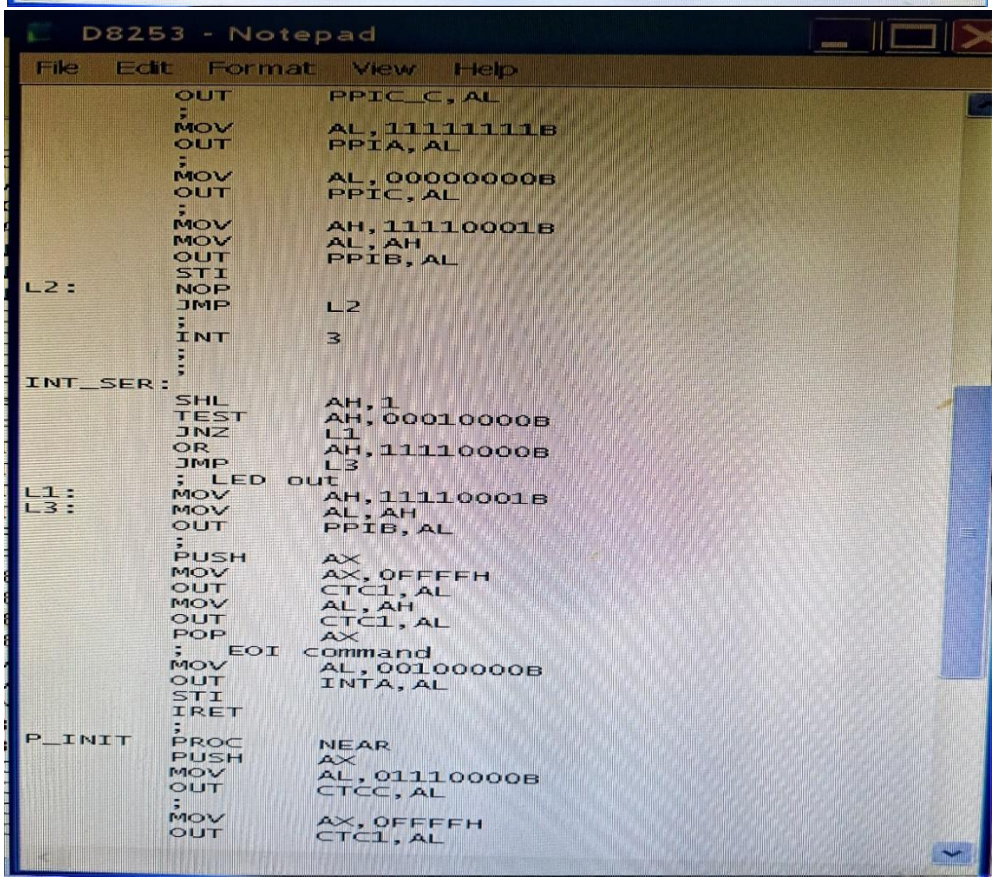
8255		8253		8259	
Port name	**Port address**	**Port name**	**Port address**	**Port name**	**Port address**
Port A	18H	Counter - 0	09H	INTA (Command Register)	10H
Port B	1AH	Counter - 1	0BH		
Port C	1CH	Counter - 2	0DH	$INTA_2$ (Data Register)	12H
Control register	1EH	Control register	0FH		

10.4 Apparatus

- MDA 8086 - Trainer Board

10.5 Code and Output as Z pattern


D8253 - Notepad
File Edit Format View Help
;***
;* MDE-8086 EXPERIMENT PROGRAM   *
;* Chapter 8-4 (Example 1)   *
;* PROGRAM BY MIDAS ENGINEERING   *
;***
;
; FILENAME : D8253.ASM
; PROCESSOR : I8086
; VER.   : V1.1
;
CODE SEGMENT
ASSUME CS:CODE,DS:CODE,ES:CODE,SS:CODE
;
PPIC_C EQU 1FH
PPIC EQU 1DH
PPIB EQU 1BH
PPIA EQU 19H
;
CTC1 EQU 0BH
CTCC EQU 0FH
;
INTA EQU 10H
INTA2 EQU INTA+2
;
INT_V EQU 40H*4
;
ORG 1000H
;
XOR BX,BX
MOV ES,BX
;
MOV AX,OFFSET INT_SER
MOV BX,INT_V
MOV WORD PTR ES:[BX],AX
;
XOR AX,AX
MOV WORD PTR ES:[BX+2],AX
;
CALL INIT
CALL P_INIT
;
MOV AL,10000000B
OUT PPIC_C,AL
;
MOV AL,11111111B
OUT PPIA,AL
;
MOV AL,00000000B


D8253 - Notepad
File Edit Format View Help
OUT PPIC_C,AL
;
MOV AL,11111111B
OUT PPIA,AL
;
MOV AL,00000000B
OUT PPIC,AL
;
MOV AH,11110001B
MOV AL,AH
OUT PPIB,AL
STI
L2: NOP
JMP L2
;
INT 3
;;
;
INT_SER:
SHL AH,1
TEST AH,00010000B
JNZ L1
OR AH,11110000B
JMP L3
; LED out
L1: MOV AH,11110001B
L3: MOV AL,AH
OUT PPIB,AL
;
PUSH AX
MOV AX,0FFFFH
OUT CTC1,AL
MOV AL,AH
OUT CTC1,AL
POP AX
; EOI command
MOV AL,00100000B
OUT INTA,AL
STI
IRET
;
P_INIT PROC NEAR
PUSH AX
MOV AL,01110000B
OUT CTCC,AL
;
MOV AX,0FFFFH
OUT CTC1,AL

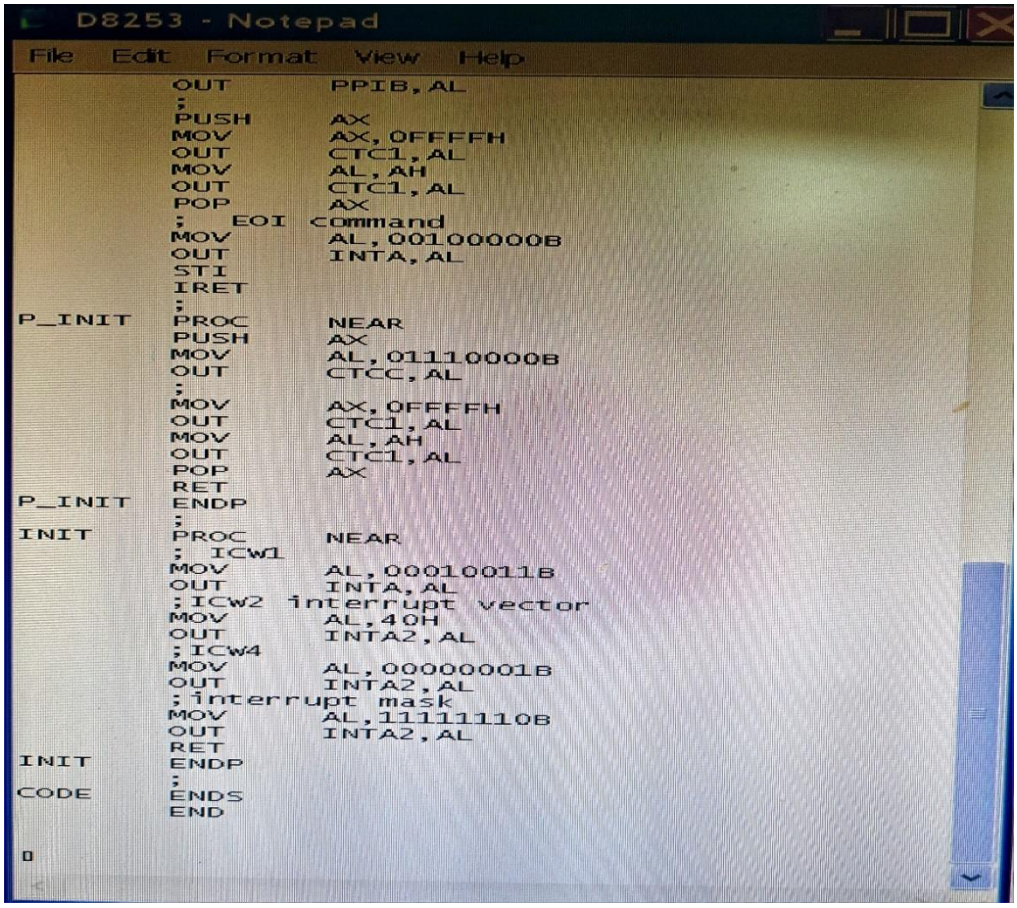


Fig. 9.1: Writing program on notepad

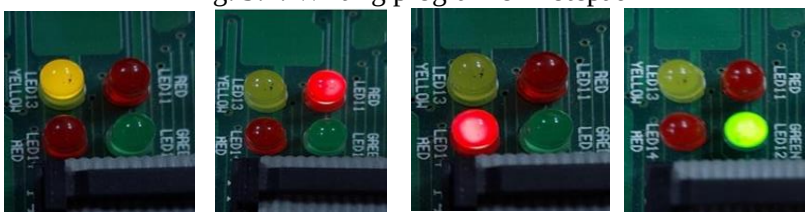


Fig. 9.2: Output

10.6 Discussion & Conclusion

In this experiment, we used code to perform the LED interfacing in 8255, 8253, and 8259. A program was developed in notepad and saved as **'.asm'** file, which was then translated to **'.obj'** and later into a **'.abs'** file. This was then executed and the output was observed using direct execution.

To turn ON and OFF each LED sequentially and concurrently with a predetermined interval, the 8253 PTI IC provided the necessary time delay and pushed the pin IR0 of the 8259 PIC IC with an interrupt. The 8255 PPI IC, which is coupled to the LEDs, was managed by the 8086, which received this interrupt. The 8086, which was in charge of the associated 8255 LEDs, lighted them up one at a time while maintaining the required time delay.

Thus, the experiment was a success.