EXPERIMENT: 6   8255- PROGRAMMABLE PERIPHERAL INTERFACE (PPI)

6.1 Problem Statement:

Write an Assembly language program to read inputs from the 8-switches and send the same data to LED's by interfacing 8255 interface add on card.

6.2 Hardware Requirement

The 8086 Microprocessor kit, 8255 Programmable Peripheral Interface add on card, Interface cable and Power Supply.

6.3 Theory

PPI 8255 is a general purpose programmable I/O device designed to interface the CPU with its outside world such as ADC, DAC, keyboard etc. We can program it according to the given condition. It can be used with almost any microprocessor.

It consists of three 8-bit bidirectional I/O ports i.e. PORT A, PORT B and PORT C. We can assign different ports as input or output functions.

Features

- Three 8-bit IO ports Port A, Port B and Port C
- Port A can be set for Modes 0, Mode 1 and Mode 2. Port B for Mode 0 and Mode1 and Port C for Mode 0 and for BSR. Mode1 and Mode 2 are interrupt driven.
- Port C has two 4-bit ports: Port C upper (PC_U) and Port C lower (PC_L). Each can be set independently for Input or Output. Each Port C bit can be set/reset individually in BSR mode.
- Port A and Port C Upper are Group A (GA) and Port B and Port C Lower are Group B (GB)
- Address/data bus must be externally demultiplexed.

8255 can be operated in two modes. There are

   i.   I/O mode
  ii.   BSR mode

6.3.1 BSR (Bit Set Reset) mode

Bit set/reset, applicable to Port C only. If MSB of control word (D7) is 0, PPI works in BSR mode. In this mode only Port C bits are individually set or reset.

Control Word Format

D_7				D_6	D_5	D_4	D_3	D_2	D_1	D_0
0 (0=BSR)				X	X	X	B_2	B_1	B_0	S/R (1=S,0=R)

Bit select: (Taking Don't care's as 0)

B_2	B_1	B_0	Port C bit	Control word (Set)	Control word (reset)
0	0	0	0	0000 0001 = 01h	0000 0000 = 00h
0	0	1	1	0000 0011 = 03h	0000 0010 = 02h
0	1	0	2	0000 0101 = 05h	0000 0100 = 04h
0	1	1	3	0000 0111 = 07h	0000 0110 = 06h
1	0	0	4	0000 1001 = 09h	0000 1000 = 08h
1	0	1	5	0000 1011 = 0Bh	0000 1010 = 0Ah
1	1	0	6	0000 1101 = 0Dh	0000 1100 = 0Ch
1	1	1	7	0000 1111 = 0Fh	0000 1110 = 0Eh

6.3.2 I/O mode

If MSB of control word (D_7) is 1, PPI works in input-output mode. This is further divided into three modes:

Mode 0: All ports function as simple I/O ports.

Mode 1: Hand shake mode where Ports A and/or B use Port C bits as handshake signals.

Mode 2: Port A can be set up for bidirectional data transfer using handshake signals as Port C, and Port B can be set up either in Mode 0 or Mode 1.

Control Word Format

D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
1 (1=I/O)	Group A mode select		Port A	Port C Upper	Group B mode select	Port B	Port C Lower

- D_6, D_5: Group A Mode select:
    - 00 = Mode 0
    - 01 = Mode 1
    - 1X = Mode 2
- D_4(Port A), D_3(Port C Upper): 1=input 0=output
- D_2: Group B Mode select: 0=Mode 0, 1=Mode 1
- D_1(Port B), D_0(Port C Lower): 1=input 0=output

Port Address

Register	Address
Control word register	C6
Port A	C0
Port B	C2
Port C	C4

6.4 In-Lab Assignment

1. Initialize Port A as input port and Port B as output port in Mode 0 , to input the data at Port A as set by the SPDT switches and to output the same data to Port B to glow the LED accordingly.
2. Initialize Port A as input port and Port C as output port in Mode 0 , to input the data at Port A as set by the SPDT switches and to output the same data to Port B to glow the LED accordingly.
3. Initialize Port C as input port and Port B as output port in Mode 0 , to input the data at Port A as set by the SPDT switches and to output the same data to Port B to glow the LED accordingly.

6.5 Program

Mode 0, Port A input port, Port B output port

ADDRESS	LABEL	MNEMONICS	OPCODE	COMMENTS
		MOV AL,90H		
		OUT C6,AL		
		IN AL,C0		
		OUT C2,AL		
		MOV [1200],AL		
		HLT		

Mode 0, Port A as input port and Port C as output port

ADDRESS	LABEL	MNEMONICS	OPCODE	COMMENTS
		MOV AL,90H		
		OUT C6,AL		
		IN AL,C0		
		OUT C4,AL		
		MOV [1200],AL		
		HLT		

Mode 0, Port C input port, Port B output port

ADDRESS	LABEL	MNEMONICS	OPCODE	COMMENTS
		MOV AL,89H		
		OUT C6,AL		
		IN AL,C4		

		OUT C2,AL		
		MOV [1200],AL		
		HLT		

6.5 Pre-lab Questions

1. How 8255 is programmed?

2. What is the use of mode 2 in 8255A PPI?

3. What is an interrupt I/O?

4. Why a latch is used for the output port and a tri-state buffer is used for the input port?

6.6 Post-lab Questions

1. A control word is given CW=CDH. Explain the conditions of ports of 8255.

2. What is the need for Port?

3. The 8255 Programmable Peripheral Interface is used as described below.
   (i) An A/D converter is interface to a microprocessor through an 8255. The conversion is initiated by a signal from the 8255 on Port C. A signal on Port C causes data to be strobed into Port A.
   (ii) Two computers exchange data using a pair of 8255s. Port A works as a bidirectional data port supported by appropriate handshaking signals.
   What would be an appropriate mode of operation for (i) and (ii) conditions?. Give explanation.

6.7 Result