K. J. Somaiya College of Engineering, Mumbai-77

(Autonomous College Affiliated to University of Mumbai)

Batch: B3 Roll No.: 1711118
Experiment / assignment / tutorial No.___7__
Grade: AA / AB / BB / BC / CC / CD /DD
Signature of the Staff In-charge with date

Title: Interfacing 8255 PPI with 8086 to perform different modes of 8255 i.e. basic mode and BSR mode by using trainer kit

Aim: To interface peripherals of 8086

Expected Outcome of Experiment:

CO 2: Build Microprocessor based system using memory chips and peripheral chips

---

Books/ Journals/ Websites referred:

1) 8086/8088 family: Design Programming and Interfacing: By John Uffenbeck (Pearson Education).

2) 8086 Microprocessor Programming and Interfacing the PC: By Kenneth Ayala

3) Microprocessor and Interfacing: By Douglas Hall (TMH Publication).

4) www.wikipedia.org/wiki/Intel_8255

Pre Lab/ Prior Concepts:

What is PIO 8255?

8255 is Programmable Peripheral Interface (**PPI**) chip is a peripheral chip.

The 8255 is widely used not only in many microcomputer/microcontroller systems, but also in the system board of the best known original IBM-PC. and clones, along with numerous homebuilt computers .

The 8255 has 24 input/output pins in all These are divided into three 8-bit ports. Port A and port B can be used as 8-bit input/output ports. Port C can be used as an 8-bit input/output port or as two 4-bit input/output ports or to produce handshake signals for ports A and B.

The three ports are further grouped as follows:

1. Group A consisting of port A and upper part of port C.
2. Group B consisting of port B and lower part of port C.

Eight data lines (D0 - D7) are available (with an 8-bit data buffer) to read/write data into the ports or control register under the status of the ¬RD (pin 5) and ¬WR (pin 36), which are active low signals for read and write operations respectively. The address lines A_1 and A_0 allow to successively access any one of the ports or the control register as listed below:

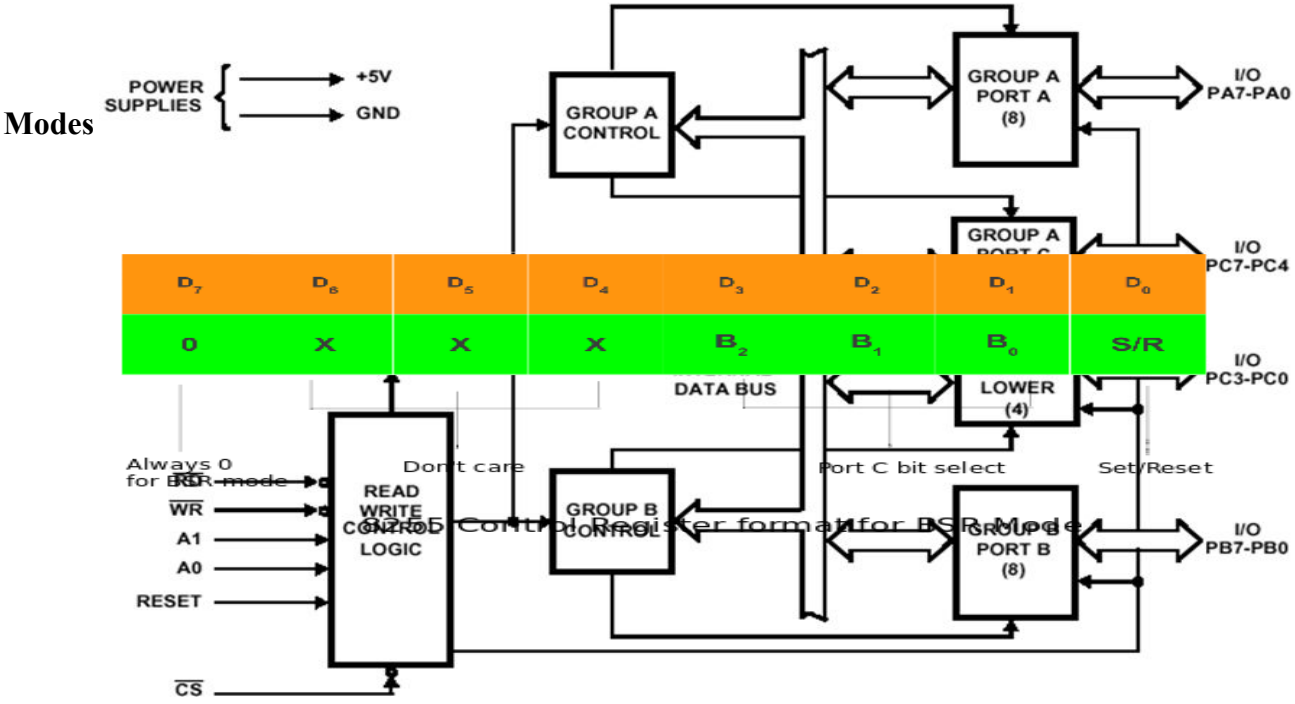
A_1	A_0	Port selected
0	0	port A
0	1	port B
1	0	port C
1	1	control register

The control signal ¬CS (pin 6) is used to enable the 8255 chip. It is an active low signal, i.e., when ¬CS = '0', the 8255 is enabled. The RESET input (pin 35) is connected to the RESET line of system like 8085, 8086, etc., so that when the system is reset, all the ports are initialized as input lines. This is done to prevent 8255 and/or any peripheral connected to it, from being destroyed due to mismatch of ports. As an example, consider an input device connected to 8255 at port A. If from the previous operation, port A is initialized as an output port and if 8255 is not reset before using the current configuration, then there is a possibility of damage of either the input device

connected or 8255 or both since both 8255 and the device connected will be sending out data.

The control register or the control logic or the command word register is an 8-bit register used to select the modes of operation and input/output designation of the ports.

Block Diagram of 8255:

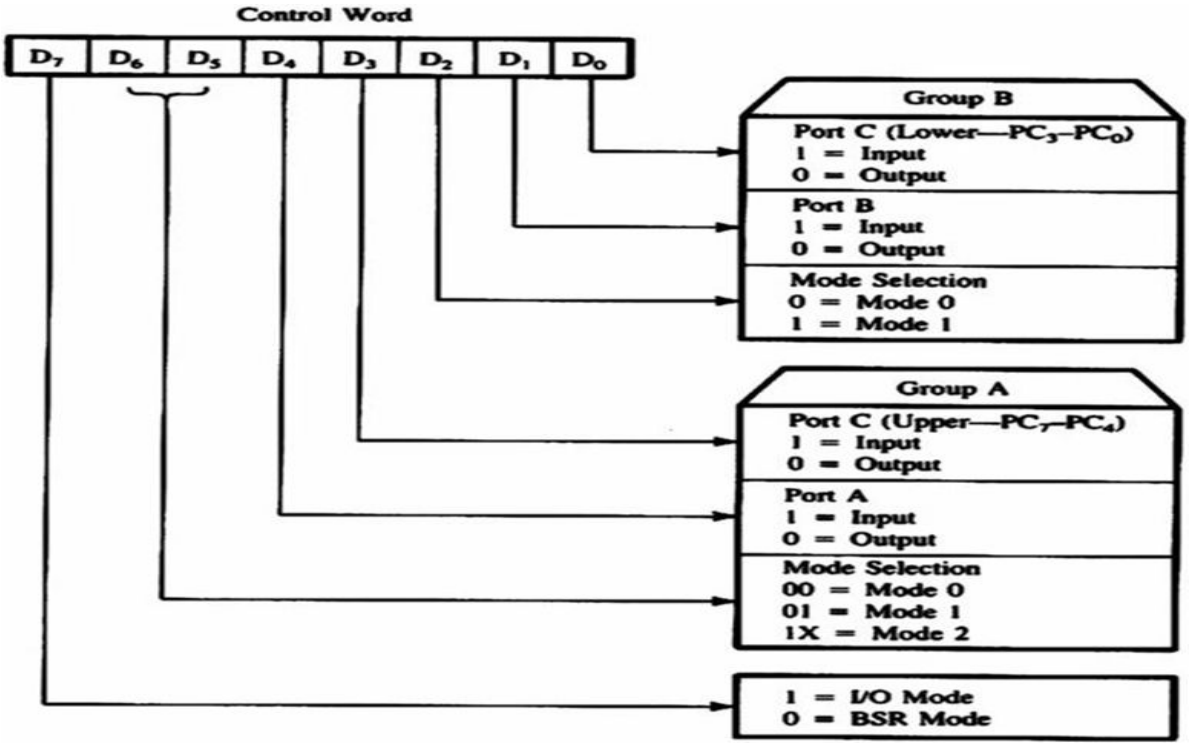


Modes

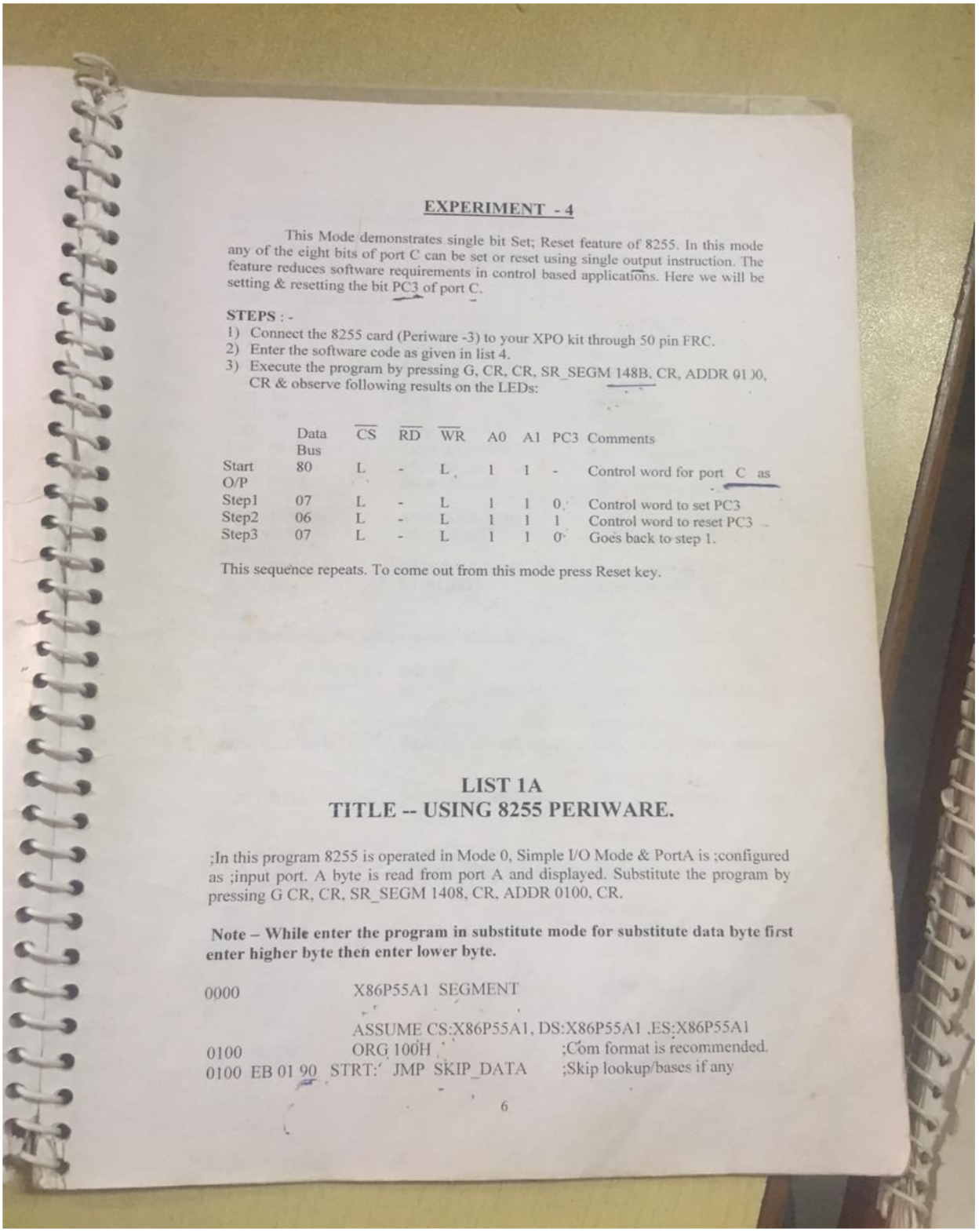
1.I/O Mode: In I/O mode, the 8255 ports work as programmable I/O ports

Under the IO mode of operation, further there are three modes of operation of 8255, So as to support different types of applications, viz. mode 0, mode 1 and mode 2.

1) Mode 0 - Basic I/O mode
2) Mode 1 - Strobed I/O mode
3) Mode 2 - Strobed bi-directional I/O


Control Word
D7 D6 D5 D4 D3 D2 D1 D0
Group B
Port C (Lower—PC3–PC0)
1 = Input
0 = Output
Port B
1 = Input
0 = Output
Mode Selection
0 = Mode 0
1 = Mode 1
Group A
Port C (Upper—PC7–PC4)
1 = Input
0 = Output
Port A
1 = Input
0 = Output
Mode Selection
00 = Mode 0
01 = Mode 1
1X = Mode 2
1 = I/O Mode
0 = BSR Mode

Explanation of the output:



EXPERIMENT - 4

This Mode demonstrates single bit Set; Reset feature of 8255. In this mode any of the eight bits of port C can be set or reset using single output instruction. The feature reduces software requirements in control based applications. Here we will be setting & resetting the bit PC3 of port C.

STEPS : -

1) Connect the 8255 card (Periware -3) to your XPO kit through 50 pin FRC.
2) Enter the software code as given in list 4.
3) Execute the program by pressing G, CR, CR, SR_SEGM 148B, CR, ADDR 0100, CR & observe following results on the LEDs:

	Data Bus	$\overline{CS}$	$\overline{RD}$	$\overline{WR}$	A0	A1	PC3	Comments
Start O/P	80	L	-	L	1	1	-	Control word for port C as
Step1	07	L	-	L	1	1	0	Control word to set PC3
Step2	06	L	-	L	1	1	1	Control word to reset PC3
Step3	07	L	-	L	1	1	0	Goes back to step 1.

This sequence repeats. To come out from this mode press Reset key.

LIST 1A
TITLE -- USING 8255 PERIWARE.

;In this program 8255 is operated in Mode 0, Simple I/O Mode & PortA is ;configured as ;input port. A byte is read from port A and displayed. Substitute the program by pressing G CR, CR, SR_SEGM 1408, CR, ADDR 0100, CR.

Note – While enter the program in substitute mode for substitute data byte first enter higher byte then enter lower byte.

```
0000                X86P55A1  SEGMENT

                    ASSUME CS:X86P55A1, DS:X86P55A1 ,ES:X86P55A1
0100                ORG 100H                    ;Com format is recommended.
0100 EB 01 90  STRT:  JMP  SKIP_DATA    ;Skip lookup/bases if any
```

6

EXPERIMENT - 1 (A)

Here, we will be using 8255 in Mode 0 which is simple Input/Output Mode. In this experiment port A is configured as input. Whatever the data input through port A will be displayed on kit display. Note status of LEDs.

STEPS : -

1) Connect the 8255 card to your kit through 50 pin FRC.
2) Set the required data on port A tags by connecting the corresponding tags to GND and Vcc.
3) Make S1 towards you to enable Single Stepping.
4) Enter the software code as given in list 1(A).
5) Execute the program by pressing G, CR, CR, SR_SEGM 1408, CR, ADDR 0100, CR & observe following results on the LEDs:
6) For active low signals "L" implies LED is lighted. For active high signals "1" implies LED is lighted. "_" implies don't care condition 1 implies active high signal L means active low signal

	Data Bus	$\overline{CS}$	$\overline{RD}$	$\overline{WR}$	A0	A1	Comments
Start	90	L	-	L	1	1	Control Word Mode 0, port A - input.
Step1	DATA	L	L	-	-	-	Read data from port A.
Step2	-	-	-	-	-	-	Displays input data on kit display & goes to command mode

EXPERIMENT - 1 (B)

This program illustrates 8255 in Mode 0 which is simple Input/Output Mode. In this experiment port B is configured as output. Whatever the data input through keyboard will be displayed on port B LEDs.

STEPS : -

1) Connect the Periware 3 to your kit.
2) Make S1 towards you to enable Single Stepping.
3) Enter the software code as given in list 1(B).
7) Execute the program by pressing G, CR, CR, SR_SEGM 141D, CR, ADDR 0100, CR & observe following results on the LEDs:

	Data Bus	$\overline{CS}$	$\overline{RD}$	$\overline{WR}$	A0	A1	Comments
Start	80	L	-	L	1	1	Control Word Mode 0, port B - output.
Step1	"BYTE" will be displayed on kit display. Enter data through keyboard & press CR. for example "AA" - CR.						
	DATA	L	-	L	1	-	Data entered through keyboard will be displayed on Data Bus.
Step2	-	-	-	-	-	-	Data is displayed on Port B.

2

Conclusion:

Thus, we learnt about interfacing 8255 along with 8086 and about it's various modes of operation.

Post Lab Descriptive Questions (Add questions from examination point view)

Explain significance of 8255 as PIO

The 8255A is a general purpose programmable I/O device designed to transfer the data from I/O to interrupt I/O under certain conditions as required. It can be used with almost any microprocessor.

It consists of three 8-bit bidirectional I/O ports (24I/O lines) which can be configured as per the requirement.

8255A has three ports, i.e., PORT A, PORT B, and PORT C.

- Port A contains one 8-bit output latch/buffer and one 8-bit input buffer.
- Port B is similar to PORT A.
- Port C can be split into two parts, i.e. PORT C lower (PC0-PC3) and PORT C upper (PC7-PC4) by the control word.

8255A has three different operating modes −

- Mode 0 − In this mode, Port A and B is used as two 8-bit ports and Port C as two 4-bit ports. Each port can be programmed in either input mode or output mode where outputs are latched and inputs are not latched. Ports do not have interrupt capability.
- Mode 1 − In this mode, Port A and B is used as 8-bit I/O ports. They can be configured as either input or output ports. Each port uses three lines from port C as handshake signals. Inputs and outputs are latched.
- Mode 2 − In this mode, Port A can be configured as the bidirectional port and Port B either in Mode 0 or Mode 1. Port A uses five signals from Port C as handshake signals for data transfer. The remaining three

signals from Port C can be used either as simple I/O or as handshake for port B.

Date: _____ **Signature of faculty in-charge**