



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

(Autonomous College Affiliated to University of Mumbai)

Batch: B1                      Roll No.:1711072

**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

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**Expected Outcome of Experiment:**

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

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**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](http://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 .



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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  $\neg$ RD (pin 5) and  $\neg$ WR (pin 36), which are active low signals for read and write operations respectively. The address lines A<sub>1</sub> and A<sub>0</sub> allow to successively access any one of the ports or the control register as listed below:

A <sub>1</sub>	A <sub>0</sub>	Port selected
0	0	port A
0	1	port B
1	0	port C
1	1	control register

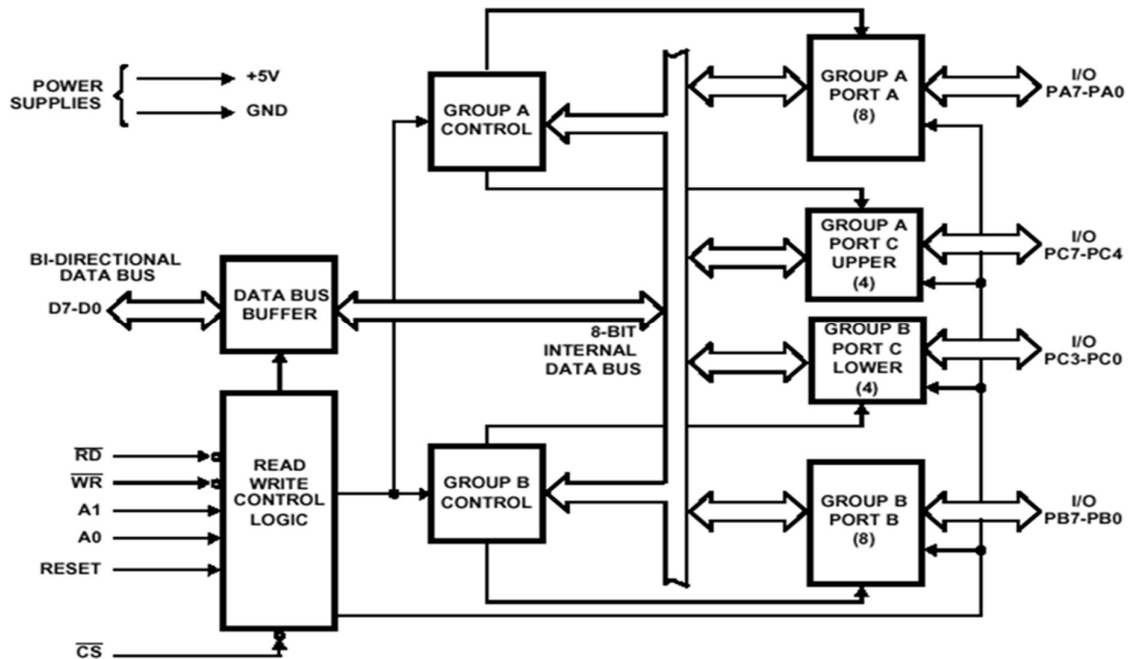
The control signal  $\neg$ CS (pin 6) is used to enable the 8255 chip. It is an active low signal, i.e., when  $\neg$ CS = '0', the 8255 is enabled. The RESET input (pin 35) is connected to the RESET line of system like 8085, 8086, etc., so that when the system is reset, all the ports are initialized 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.

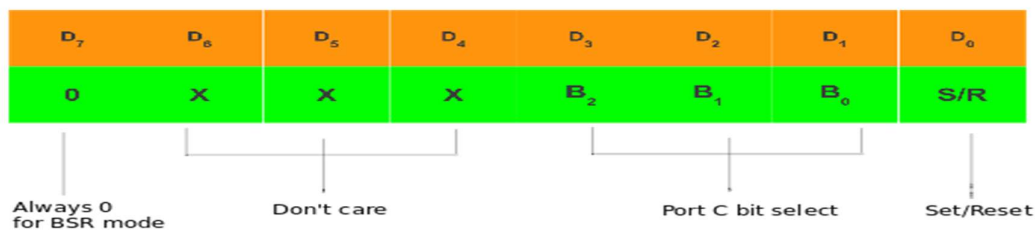
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## Block Diagram of 8255:



**Modes of Operation of 8255:** BSR Mode: In this mode any of the 8-bits of port C can be set or reset depending on D0 of the control word. The bit to



8255 Control Register format for BSR Mode

be set or reset is selected by bit select flags D3, D2 and D1 of the CWR as given in table.

**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

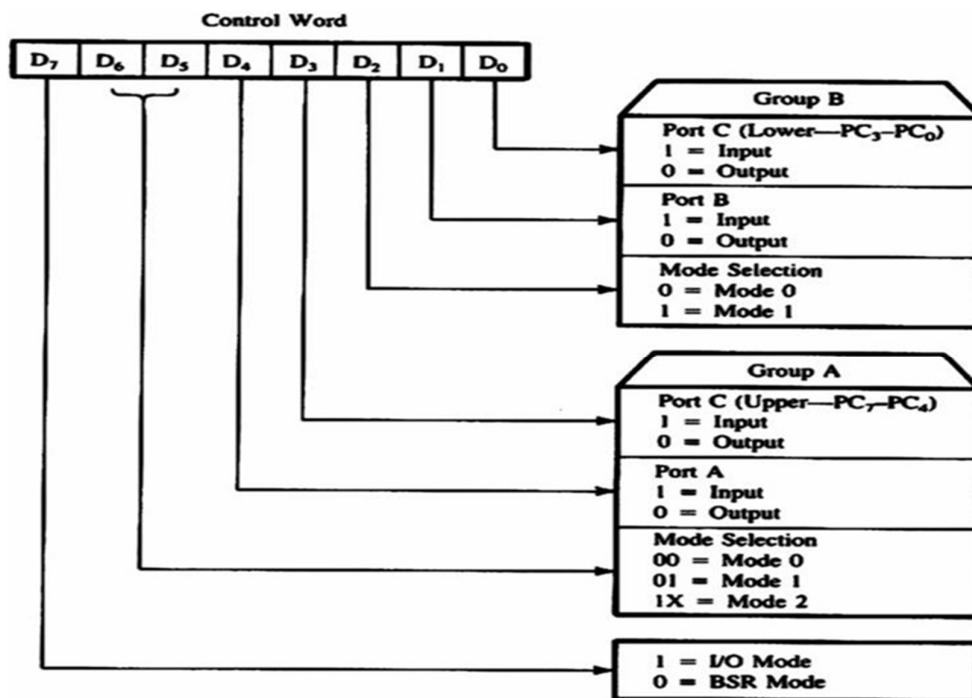


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of 8255, So as to support different types of applications, viz. mode 0, mode 1 and mode 2.

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



Steps to interface 8255 with 8086:



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**EXPERIMENT - 4**

This Mode demonstrates single byte hex. Reset Status of 8255. In this mode one of the eight bits of port C can be set or reset using single output instruction. The hexware software experiments in control based applications. Here, we will be setting & resetting the bit PC3 of port C.

**STEPS -**

- 1) Connect the 8255 card (Periware -1) to your KPO kit through 50 pin DBC.
- 2) Enter the software code as given in list A.
- 3) Execute the program by pressing G, CR, CR, SR, SEG01 1405, CR, ADDR 01 05, CR & observe following results on the LEDs.

	DATA	CR	SR	WR	RD	A3	PC3	Comments
Start	80	L	-	L	1	1	-	Control word for port C is
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	Go 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, Single IO 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, SEG01 1405, CR, ADDR 0105, CR.

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

```
0000      XMAP15A1 SEGMENT
                ASSUME CS,XMAP15A1,DS,XMAP15A1,ES,XMAP15A1
0000      ORG 1000H
0000      FR 01 00  STRT: JMP SKIP_DATA      ;Skip bootup routine if any
```



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**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 1409, CR, ADDR 0100, CR & observe following results on the LEDc.
- 6) For active low signals "L" implies LED is lighted. For active high signals "H" implies LED is lighted. "-" implies don't care condition. 1 implies active high signal. L means

	Data Bus	CS	RD	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. Whenever the data input through keyboard will be displayed on port B LEDc.

**STEPS :-**

- 1) Connect the Periwire 3 in 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 01 00, CR & observe following results on the LEDc:

	Data Bus	CS	RD	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.	L	-	L	1	-	Data entered through keyboard will be displayed on Data Bus.
Step2	-	-	-	-	-	-	Data is displayed on Port B.

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**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**

**Ans.** The 8255 gives a CPU or digital system access to programmable parallel I/O. The 8255 has 24 input/output pins. These are divided into three 8-bit ports (A, B, C). 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.

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A1	A0	Port selected
0	0	port A
0	1	port B
1	0	port C
1	1	control register

The control signal chip select 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.

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**Date: 01/04/2019**

**Signature of faculty in-charge**