

the 8255 PPI has 3 modes: 0 (simple I/O. ex. LED), 1 (strobe signal, handshake signal. ex. humidity sensor), 2 (Bidirectional. ex. printer)

Programmable Peripheral Interface device

PPI and its characteristics:

1. A control register in where microprocessor can write instruction.
2. A status register in that can be read by microprocessor.
3. I/O device or register.
4. Chip select logic
5. Bidirectional data bus
6. Control logic
7. Handshake signal/Interrupt signal. [\[synchronizes the frequency\]](#)

Hand Shaking Signal:

Handshaking is a I/O control method to synchronize I/O devices with the microprocessor. As many I/O devices accepts or release information at a much slower rate than the microprocessor, this method is used to control the microprocessor to work with a I/O device at the I/O devices data transfer rate.

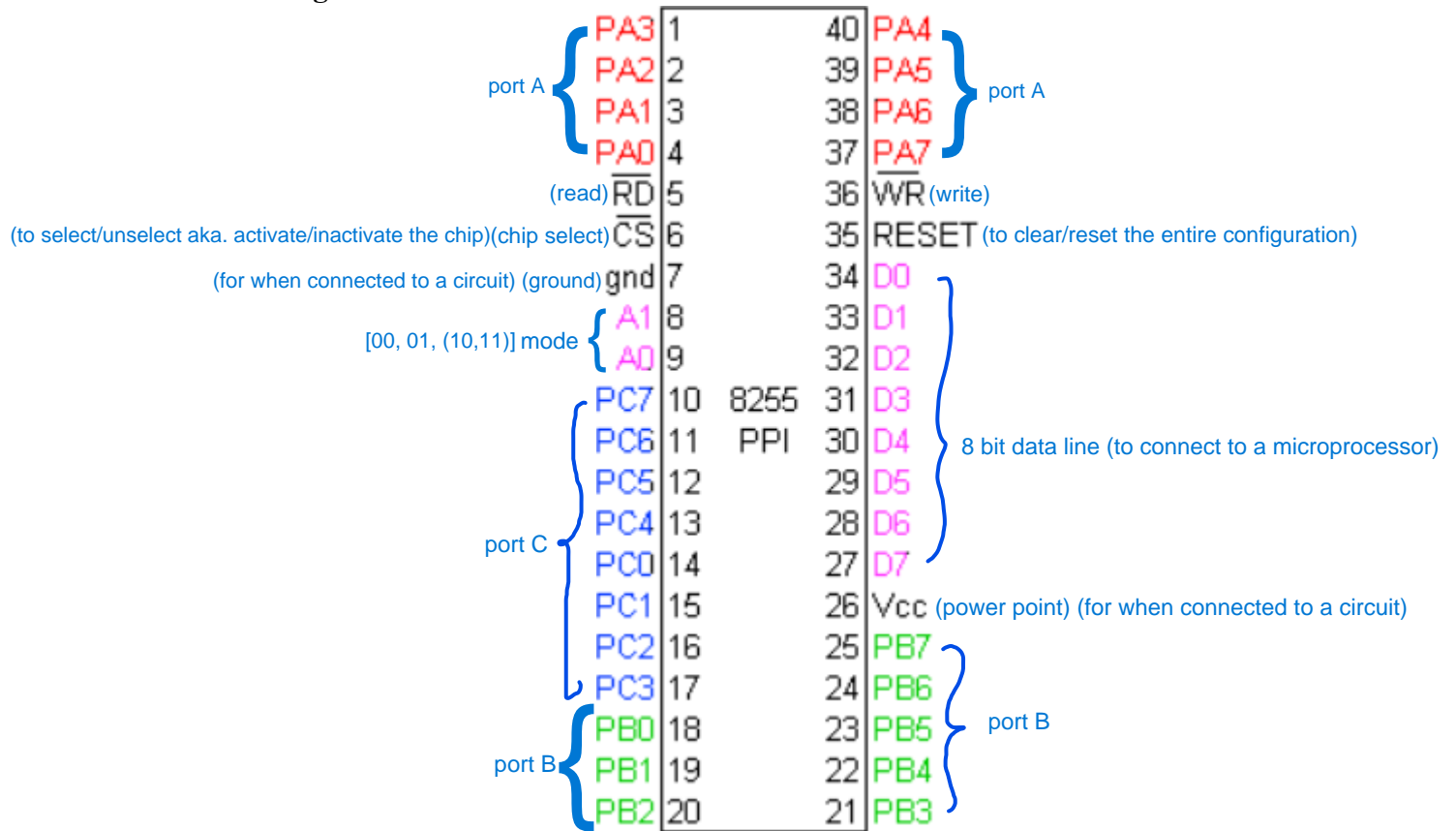
The functions of handshaking signal are:

- i) Selecting I/O port
- ii) Latch output data
- iii) Sampling input data
- iv) Data transfer
- v) Translate between TTL

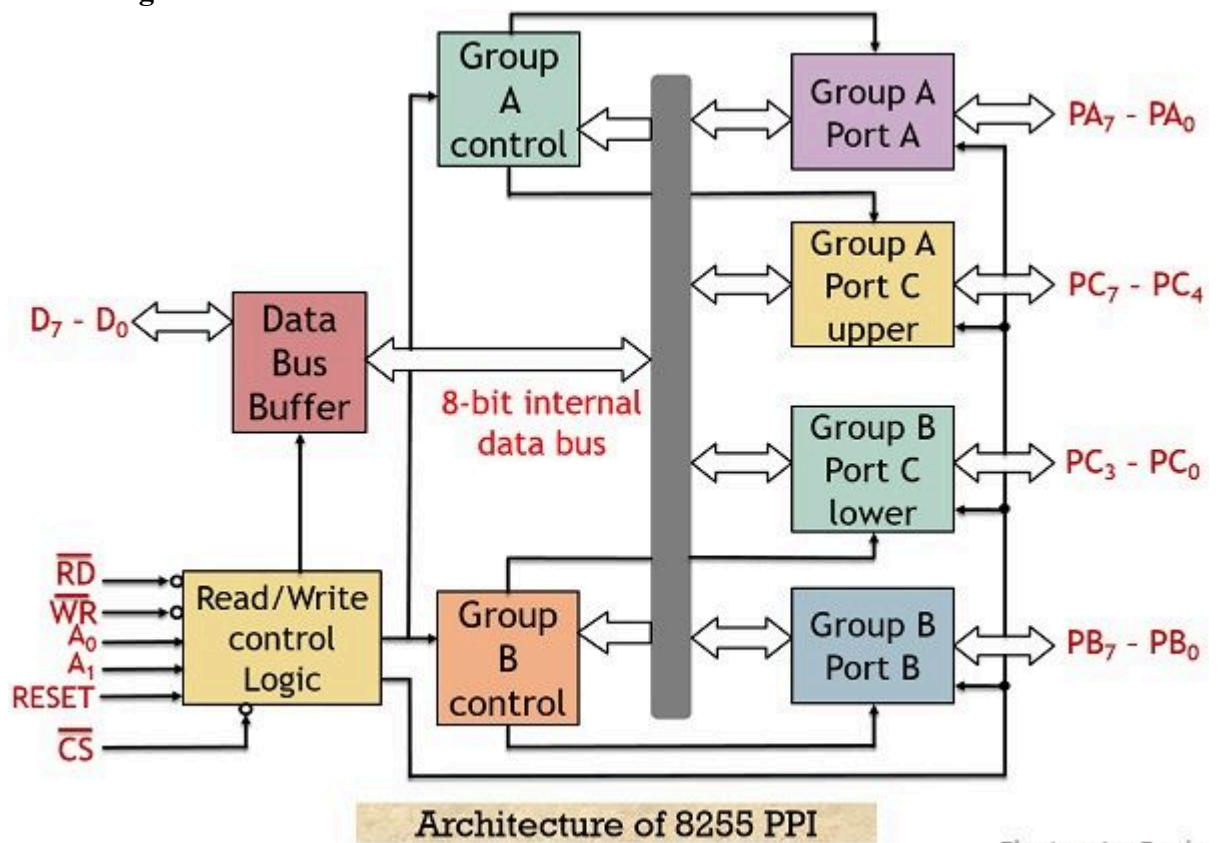
Introduction to 8255A

- The 8255A programmable peripheral interface (PPI) implements a general purpose I/O interface
- Connects peripheral equipment to a microcomputer system bus.
- External logic is not required to interface peripheral devices.

Pin diagram:



Block Diagram:



Description:

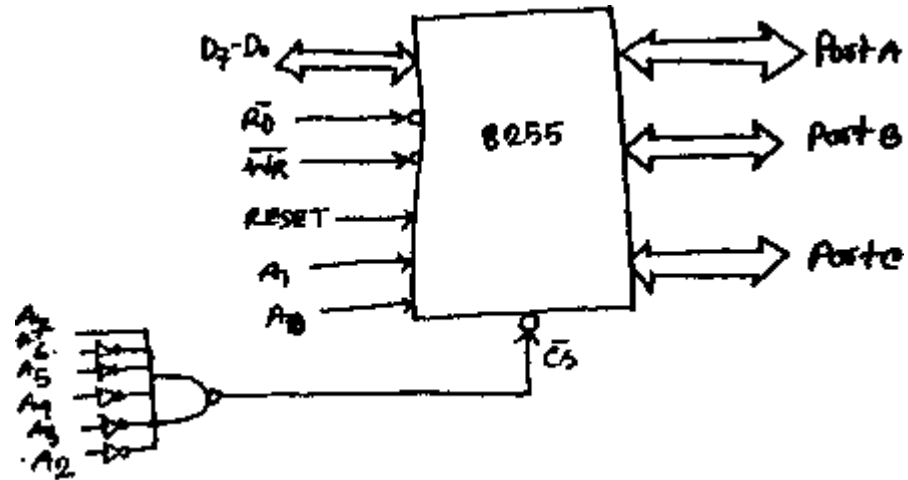
From the above pin diagram it is seen that -

- The 8255A has 24 pins such as PA7-PA0, PB7-PB0, and PC7-PC0. The first two groups are grouped as 8 bit port named Port A and Port B. Port C is divided into two parts: Port PC7-PC4 as Port C upper and PC3-PC0 as Port C lower.
- 8255A is an LSI peripheral device designed to permit easy implementation of parallel I/O device in the 8088 and 8086 microprocessor system. It provides a flexible parallel interface which includes features such as single bit, 4 bit and byte wise input/output parts, level sensitive input, latch outputs and strobe bidirectional input/output.
- The left side of the block diagram represents the microprocessor interface. It includes 8 bit bidirectional data bus (D7-D0) through which command, status information and data are transferred between input and 8255A. Timing of data is controlled by read/write control signals.
- The source or destination within 8255A is selected by 2 bit register select code. The code and corresponding port are given below:

A1	A0	Port
0	0	A
0	1	B
1	0	C
1	1	Control Register

- Two other signals are RESET and CS' (Chip Select) inputs. It enables interface circuitry for read/write operations. It is inactive low mode and requires 0 for operation. RESET is used to initiate the device.
- The block diagram totally represents 24 I/O ports or 3 byte wide I/O ports known as port A, port B and port C.
- Operating characteristics is under software control and it contains 8 bit internal register (Control register) for the purpose.
- It has 8 bit bidirectional data bus.
- Vcc and GND switches are used for power supply.
- It has three operating mode: mode 0, mode 1 and mode 2.

Function of A0 and A1:

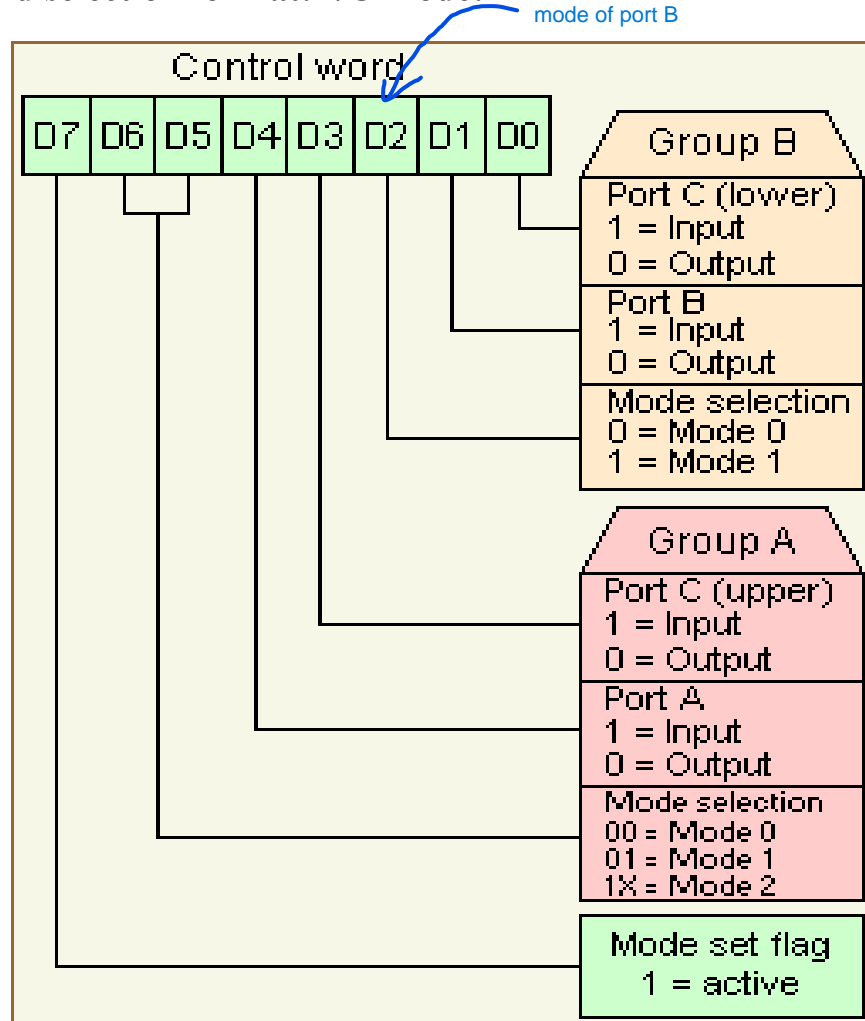


For chip select, the signal at CS' must be 0. For the above diagram, A₇=1, A₆ to A₂ is 0. Therefore, A₀ and A₁ select one of the I/O ports and control register.

Here,

Port	A ₇	A ₆	A ₅	A ₄	A ₃	A ₂	A ₁	A ₀	Address
Port A	1	0	0	0	0	0	0	0	80H
Port B	1	0	0	0	0	0	0	1	81H
Port C	1	0	0	0	0	0	1	0	82H
Control Register	1	0	0	0	0	0	1	1	83H

Control word selection format: I/O mode:



D7=1, the mode of operation is selected by control word

=0, the mode of operation is selected by set/reset mode.

Operation mode of 8255A:

- BSR mode (for port C, no effect on I/O mode)

- ii) I/O mode
 - a) mode 0: Simple I/O for Port A, B, C
 - b) mode 1: Store I/O, handshake I/O for Port A, B, C
 - c) mode 2: Bidirectional data bus for Port A

Example-1:

Initialize 8255 for simple I/O as follows: by default D7 =1

Port A as Mode 0 input D5 & D6 = 00 D4 = 1

Port B as Mode 0 output D2 = 0 D1 =0

Port C upper as output D3 = 0

Port C lower as input D0 =1

Solution:

Control word:

A				B mode		C lower	
D7	D6	D5	D4	D3	D2	D1	D0
1	0	0	1	0	0	0	1

A mode-----
C upper
B

Hence, the control word is 91H

Instruction:

MOV AL,91 H

OUT 83h, AL

Example-2:

Initialize 8255 for simple I/O as follows:

Port A as Mode 1 input

Port B as Mode 0 output

Port C upper as output

Port C lower as input

Solution:

Control word:

D7	D6	D5	D4	D3	D2	D1	D0
1	0	1	1	0	0	0	1

Hence, the control word is B1H

Instruction:

MOV AL,0B1H

OUT 83h, AL

Example-3: Write down the mode and I/O configuration for port A, B and C of 8255 after its control register is loaded with 82H.

Solution:

Here the control register= 82h

Hence, the equivalent binary:

D7	D6	D5	D4	D3	D2	D1	D0
1	0	0	0	0	0	1	0

D7=1	the mode of operation of is I/O.
D6=0 D5=0	The operating mode of port A is 0.
D4=0	Port A is used as output
D3=0	The upper bit of port C is used as output
D2=0	The mode of port B is 0.
D1=1	Port B is used as input
D0=0	The lower bit of port C is used as output.

Control word selection format: BSR mode:



8255 Control Register format for BSR Mode

The Bit Set/Reset (BSR) mode is available on port C only. Each line of port C (PC7 - PC0) can be set or reset by writing a suitable value to the control word register. BSR mode and I/O mode are independent and selection of BSR mode does not affect the operation of other ports in I/O mode.

- D7 bit is always 0 for BSR mode.
- Bits D6, D5 and D4 are don't care bits.
- Bits D3, D2 and D1 are used to select the pin of Port C.
- Bit D0 is used to set/reset the selected pin of Port C.

Selection of port C pin is determined as follows:

D3	D2	D1	Bit/pin of port C selected
0	0	0	PC ₀
0	0	1	PC ₁
0	1	0	PC ₂
0	1	1	PC ₃
1	0	0	PC ₄
1	0	1	PC ₅
1	1	0	PC ₆
1	1	1	PC ₇

Example-1:

Initialize PC5 to be set.

Solution:

D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	1	0	1	1

Here, the control word is= 0BH

Instruction:

MOV AL, 0BH

OUT 83, AL