

## Output Mode

This mode deals with display-related operations. This mode is further classified into two output modes.

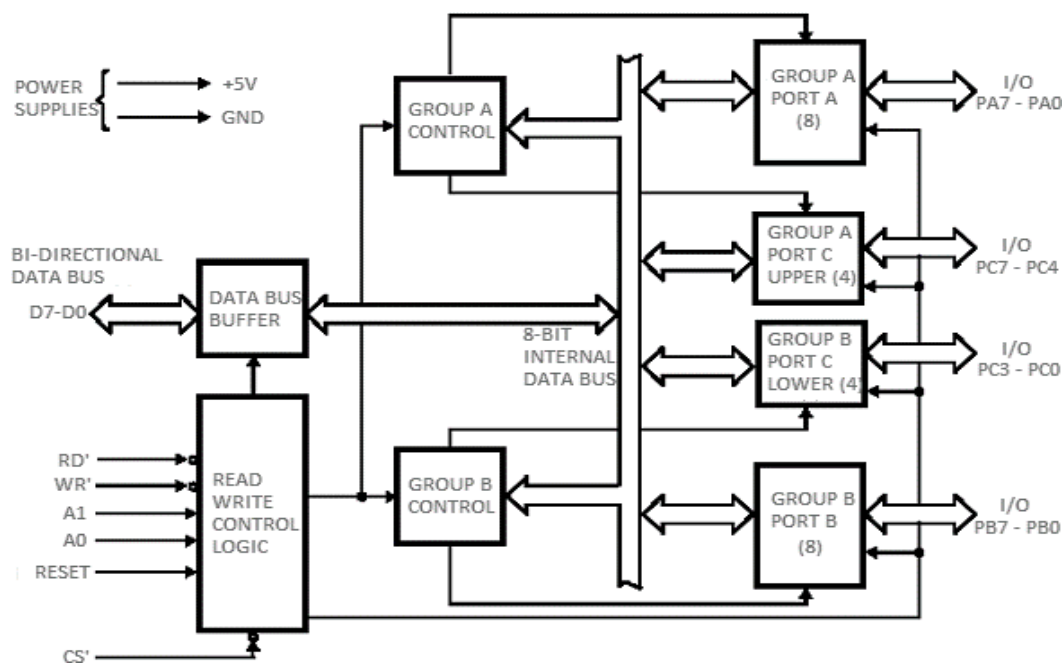
- **Display Scan** – This mode allows 8/16 character multiplexed displays to be organized as dual 4-bit/single 8-bit display units.
- **Display Entry** – This mode allows the data to be entered for display either from the right side/left side.

## Programmable peripheral interface 8255

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.

### Block diagram –



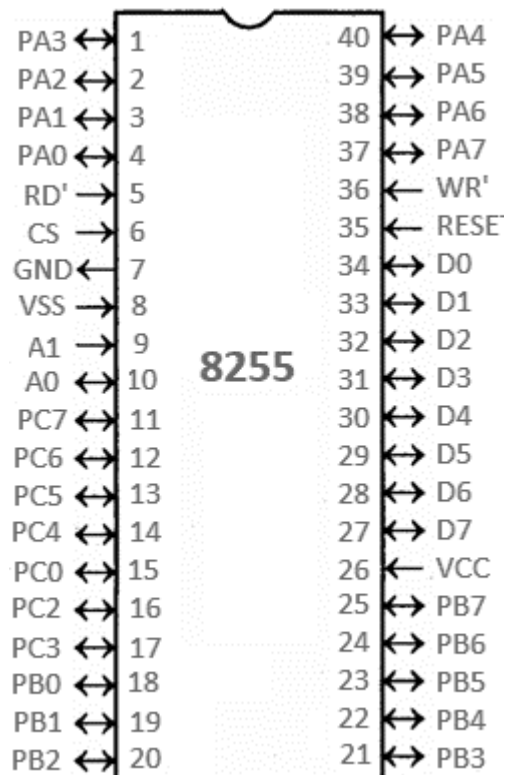
It consists of 40 pins and operates in +5V regulated power supply. Port C is further divided into two 4-bit ports i.e. port C lower and port C upper and port C can work in either BSR (bit set rest) mode or in mode 0 of input-output mode of 8255. Port B can work in either mode 0 or in mode 1 of input-output mode. Port A can work either in mode 0, mode 1 or mode 2 of input-output mode.

It has two control groups, control group A and control group B. Control group A consists of port A and port C upper. Control group B consists of port C lower and port B.

Depending upon the value of CS', A1 and A0 we can select different ports in different modes as input-output function or BSR. This is done by writing a suitable word in control register (control word D0-D7).

CS'	A1	A0	Selection	Address
0	0	0	PORT A	80 H
0	0	1	PORT B	81 H
0	1	0	PORT C	82 H
0	1	1	Control Register	83 H
1	X	X	No Seletion	X

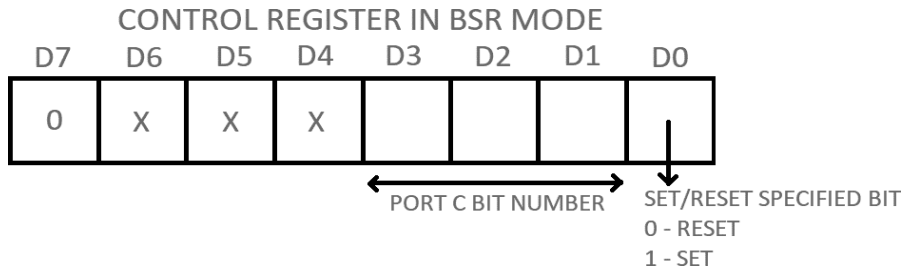
**Pin diagram –**



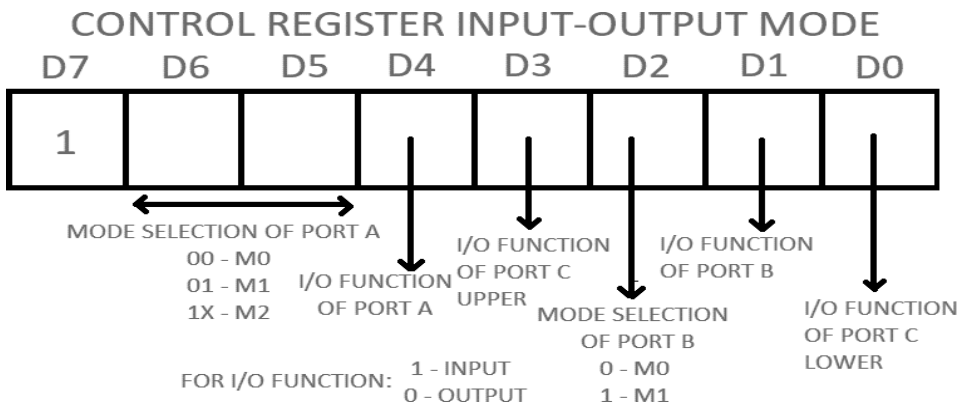
- **PA0 – PA7** – Pins of port A
- **PB0 – PB7** – Pins of port B
- **PC0 – PC7** – Pins of port C
- **D0 – D7** – Data pins for the transfer of data
- **RESET** – Reset input
- **RD'** – Read input
- **WR'** – Write input
- **CS'** – Chip select
- **A1 and A0** – Address pins

**Operating modes –**

1. **Bit set reset (BSR) mode –**  
 If MSB of control word (D7) is 0, PPI works in BSR mode. In this mode only port C bits are used for set or reset.



2. **Input-Output mode –**  
 If MSB of control word (D7) is 1, PPI works in input-output mode. This is further divided into three modes:



**Mode 0** –In this mode all the three ports (port A, B, C) can work as simple input function or simple output function. In this mode there is no interrupt handling capacity.

**Mode 1** – Handshake I/O mode or strobed I/O mode. In this mode either port A or port B can work as simple input port or simple output port, and port C bits are used for handshake signals before actual data transmission. It has interrupt handling capacity and input and output are latched.

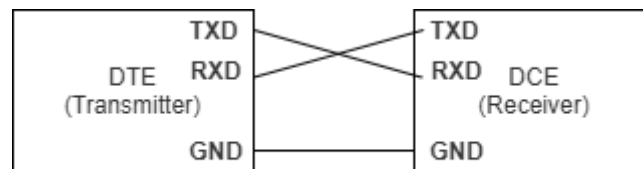
Example: A CPU wants to transfer data to a printer. In this case since speed of processor is very fast as compared to relatively slow printer, so before actual data transfer it will send handshake signals to the printer for synchronization of the speed of the CPU and the peripherals.



**Mode 2** – Bi-directional data bus mode. In this mode only port A works, and port B can work either in mode 0 or mode 1. 6 bits port C are used as handshake signals. It also has interrupt handling capacity.

## RS232

RS232 is an Interface and the protocol between DTE(data terminal equipment) and DCE(data communication equipment) using serial binary data exchange. Here C is used for the current version. *Universal Asynchronous Data Receiver & Transmitter (UART)*, attached in a motherboard, used in connection with RS232 for transmitting data to any serial device like modem or printer from its DTE interface.



RS232 PROTOCOL

*Electrical Specifications :*

### 1. Voltages:

There can be two states in the signal level of RS232C pins.

- **Mark state** – It is the high bit which is represented by binary 1 and have negative voltages. Its voltage limits for transmitting signal ranges from -5 to -15V. Its voltage limits for receiving signals ranges from -3 to -25V.
- **Space state** – It is the low bit which is represented by binary 0 and have positive voltages. Its voltage limits for transmitting signal ranges from +5 to +15V. Its voltage limits for receiving signals ranges from +3 to +25V.

### 2. Cables and Wires :

The maximum cable length for RS232C is equals to 15.24 meters or equal to the capacitance of 2500pF. Limits for the impedance of wires ranges from 3 ohms to 7 ohms.

### 3 Data and Slew rates :

Rate of data transmission through RS232C is up to 20Kbps. The rate of change in signal levels ie. slew rate is up to 30V/microsecond.

### 4. Current :

Maximum current rating is 3Amps at the maximum operating voltage of 250V AC.

*Pins and Working :*