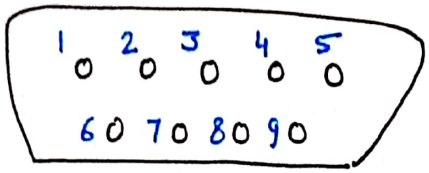
RS-232 (DB-9 connector)



DB-9 connector

Pin	Description
1	Data Carrier Detect (DCD)
2	Received data (RxD)
3	Transmitted data (TxD)
4	Data terminal Ready (DTR)
5	Ground (GND)
6	Data Set Ready (DSR)
7	Request to Send (RTS)
8	Clear to send (CTS)
9	Ring Indicator (RI)

RS-232 pin description

1.) **DCD** :- The MC asserts DCD to inform the PC that a valid carrier has been detected and that connection is established. MC → O/P & PC → I/P

2.) **DTR** :- DTR s/g will inform MC that it is ready for communication. DTR is the output of the PC COM port.

3.) **DSR** :- When the MC is turned on, it will undergo self-test for UART and assert DSR to signal the PC COM port that it is ready. Active Low s/g

4.) **RTS** :- When a PC COM port wants to transmit a byte of data to the MC, it will s/g the MC by asserting the RTS s/g. Active Low s/g

5.) **CTS** :- PC start transmission once it receive CTS. MC → O/P & PC → I/P

6.) **RI** :- Handshaking signal, which is not often used.

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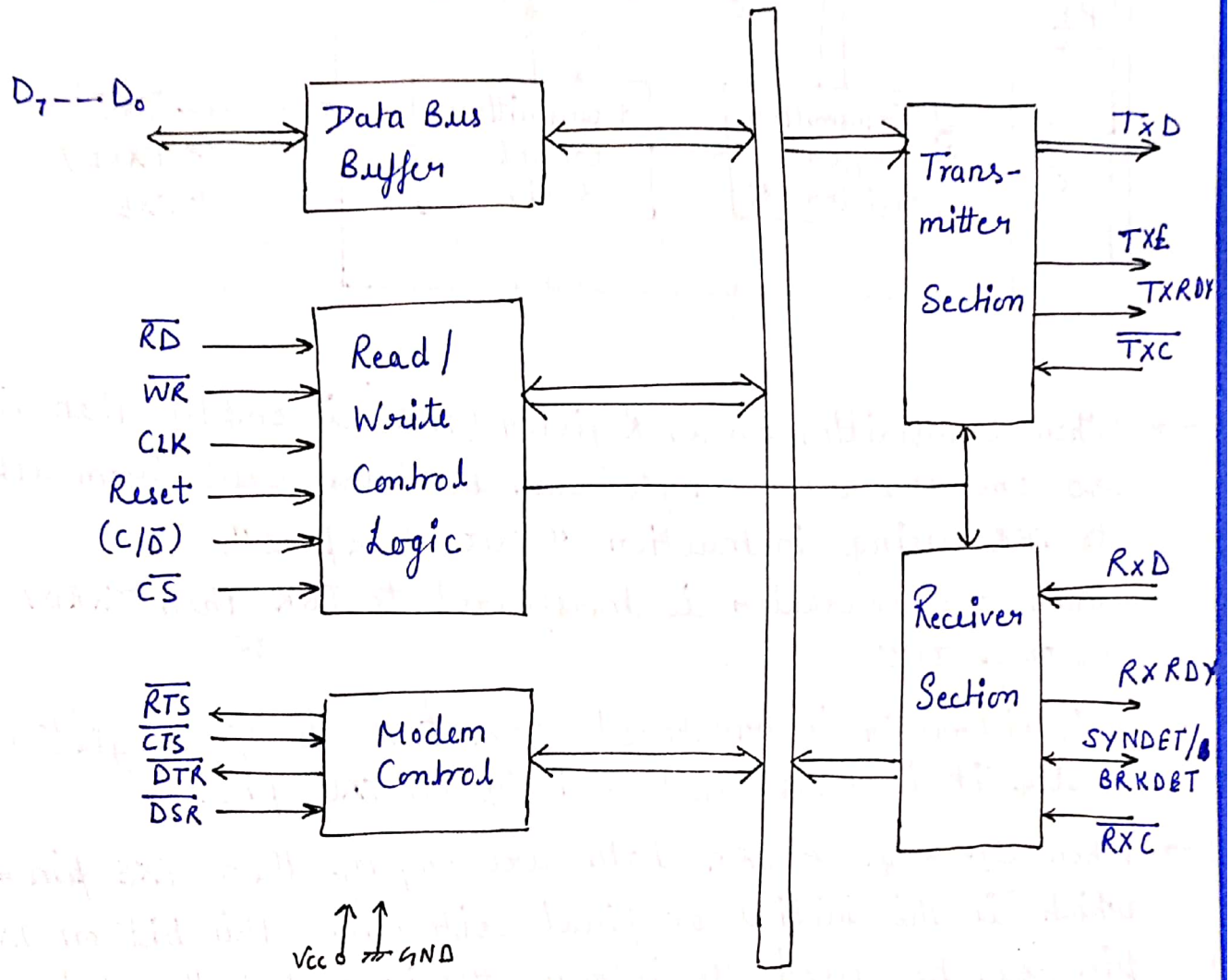
ARCHITECTURE OF 8251 USART :-



- USART supports the µp to perform transmission & reception of serial data in synchronous as well as asynchronous format.
- → Data transfer b/w µp & USART takes place in parallel form
- → 8251 USART is source & destination of serial data so it is called Data Terminal Equipment.
- → USART transfering a set of two 8-bit control words [mode word & command word] in its control word register.

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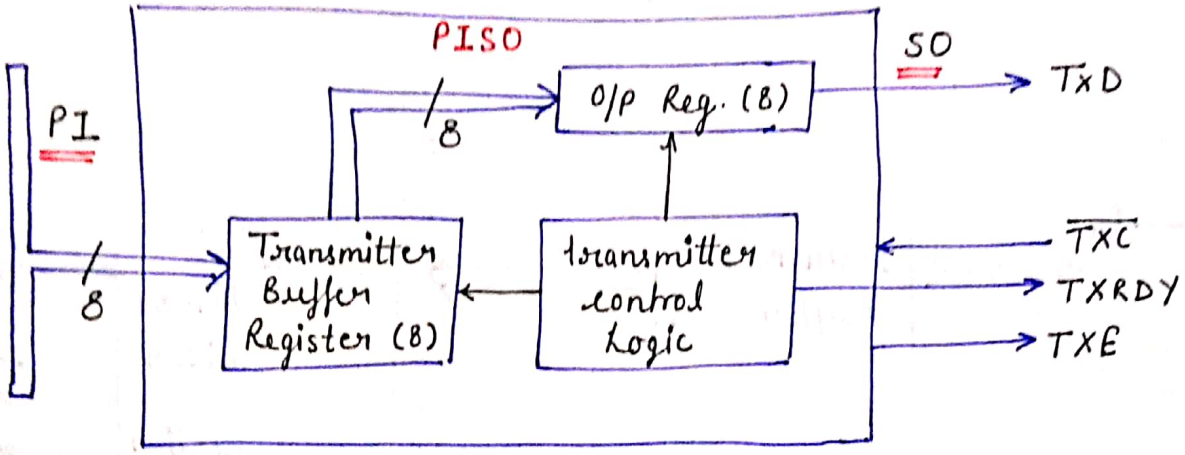
Transmitter section of 8251 :-



→ When transmitter Buffer Register (TBR) is empty then TxRDY=1 so one character (byte) can be transferred from up to TBR using instruction "Out data port".
When one character is transferred to TBR then TxRDY becomes zero.

→ This character is transfered from TBR to O/P register & finally it is transmitted serially on TXD pin.

→ When O/P Reg. & TBR both are empty then TXE pin = 1 which is the initial or final situation. This bit on TXE pin can be used to inform receiver that the data transmission be over.

→ Data will transmitted on TXD pin only if →

1.) transmitter is enabled
2.) $\overline{CTS} = 0$

TxRDY = 0

```
S1 : IN AL, CP
     RCR AL, 01      TxRDY | CF
     JNC S1
     MOV AL, M
     OUT M, AL
     INC BX
     LOOP S1
```

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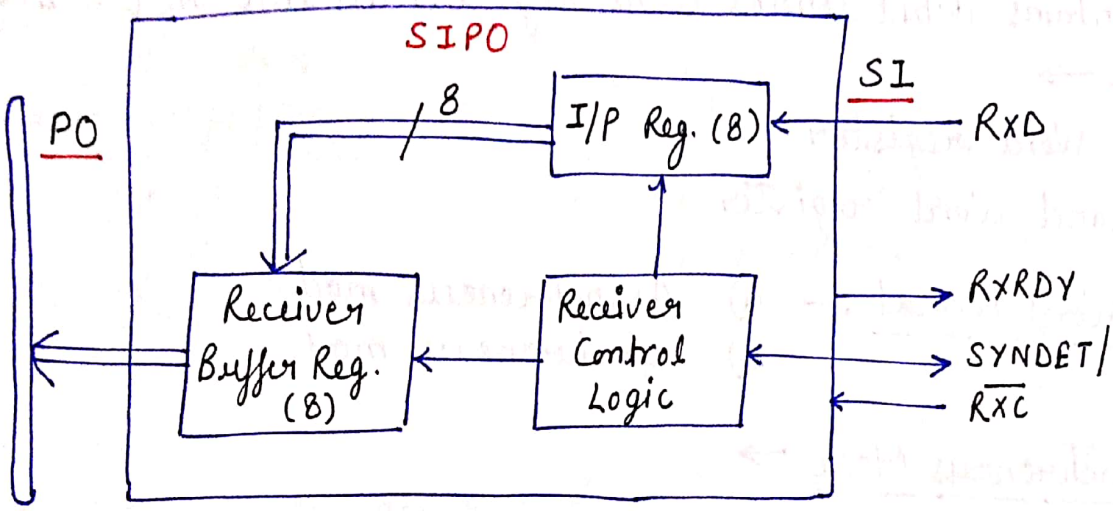
Receiver Section of 8251 :-



- Rx section will Receive data on RXD pin in serial form & collect in i/p register. When 8-bits are received in i/p reg. then they are transfered into RBR in parallel form so RXRDY = 1
- → RXRDY = 1 indicates that up should read the byte. this character can be read by instruction "IN data port". so RXRDY = 0 & some process is repeated.
- → When RXRDY = 1 & up doesn't read the byte. Mean while if another character is received in i/p reg. then it is transfered into RBR. Hence firest character is lost. to indicate that there is overwriting in RBR. 8251 sets overrun error flag. OE = 1

```
RXRDY=0 { IN AL, CP
          RCR AL,02      RXRDY | CF
          JNC S1
          IN AL, DP
          MOV M, AL
          INC BX
          LOOP S1
```

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