# MICROCONTROLLER

UNIT–III

Lecture–4

BASICS OF SERIAL COMMUNICATION

❑ Computers transfer data in two ways:
   ➢ Parallel
      ▪ Often 8 or more lines (wire conductors) are used to transfer data to a device that is only a few feet away
   ➢ Serial
      ▪ To transfer to a device located many meters away, the serial method is used
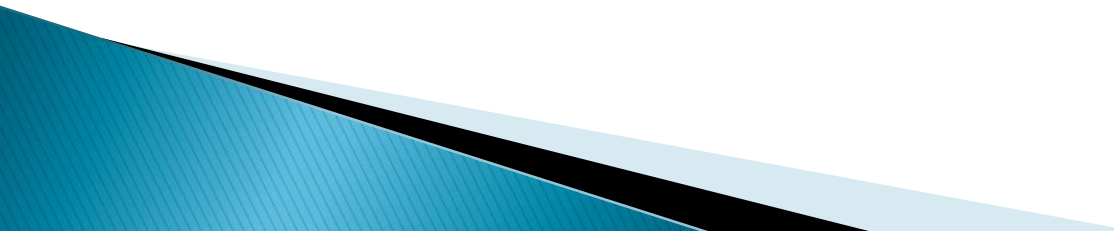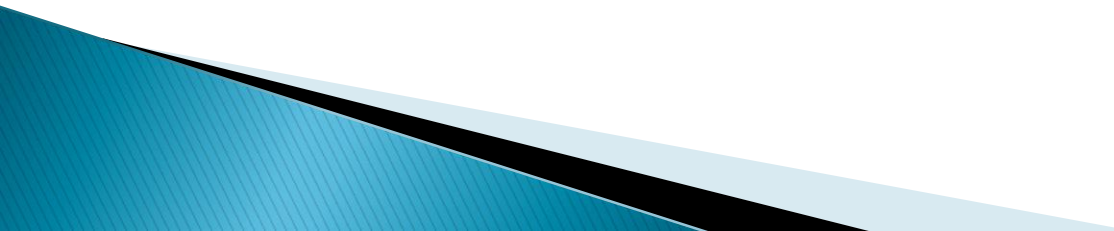   ▪ The data is sent one bit at a time

Serial Transfer

Sender ——→ Receiver
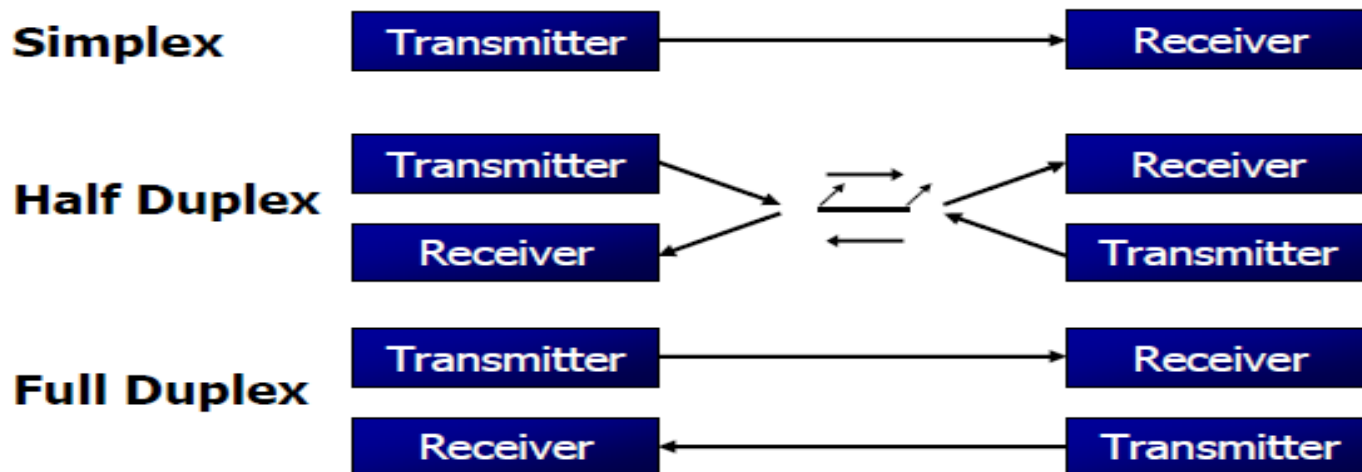
Parallel Transfer

D0

Sender ⇉ Receiver

D7
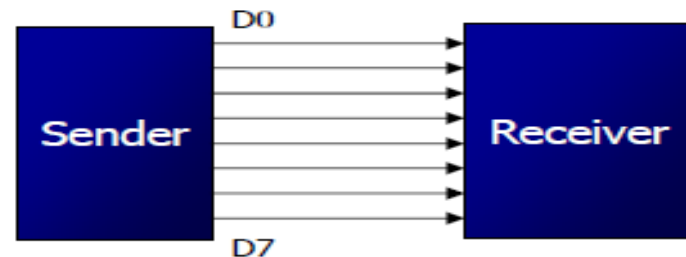
Contd.

- At the transmitting end, the byte of data must be converted to serial bits using parallel-in-serial-out shift register.

- At the receiving end, there is a serial-in-parallel-out shift register to receive the serial data and pack them into byte.

- When the distance is short, the digital signal can be transferred as it is on a simple wire and requires no modulation.

Contd.

- If data is to be transferred on the telephone line, it must be converted from 0s and 1s to audio tones.
- Serial data communication uses two methods:
- Synchronous method transfers a block of data at a time
- Asynchronous method transfers a single byte at a time

Half- and Full- Duplex Transmission

- ❑ If data can be transmitted and received, it is a *duplex* transmission
  - ➤ If data transmitted one way a time, it is referred to as *half duplex*
  - ➤ If data can go both ways at a time, it is *full duplex*
- ❑ This is contrast to *simplex* transmission

Simplex	Transmitter ⟶	Receiver
Half Duplex	Transmitter / Receiver	Receiver / Transmitter
Full Duplex	Transmitter ⟶ / Receiver ⟵	Receiver / Transmitter

Start and Stop Bits

- A protocol is a set of rules agreed by both the sender and receiver on
  - How the data is packed
  - How many bits constitute a character
  - When the data begins and ends
  - Asynchronous serial data communication is widely used for character-oriented transmissions
- Each character is placed in between start and stop bits, this is called framing

Contd.

- Block-oriented data transfers use the synchronous method
- The start bit is always one bit, but the stop bit can be one or two bits
- Due to the extended ASCII characters, 8-bit ASCII data is common
- In older systems, ASCII characters were 7-bit
- In modern PCs the use of one stop bit is standard

Contd.

- In older systems, due to the slowness of the receiving mechanical device, two stop bits were used to give the device sufficient time to organize itself before transmission of the next byte
- Assuming that we are transferring a text file of ASCII characters using 1 stop bit, we have a total of 10 bits for each character
- This gives 25% overhead, i.e. each 8-bit character with an extra 2 bits