

Group 2

# UART

## Universal Asynchronous Receiver and Transmitter

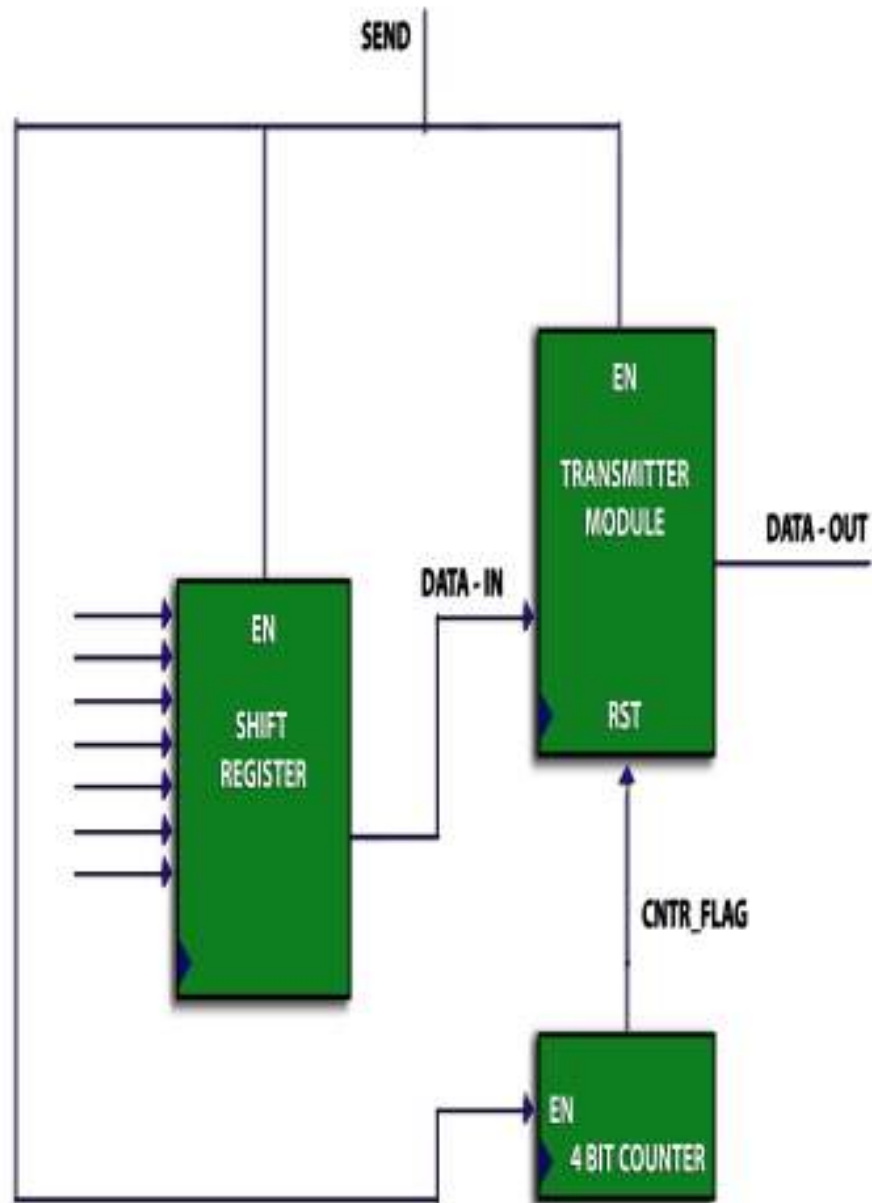
A serial communication protocol that sends parallel data through a serial line.

The UART includes both a transmitter and receiver :-

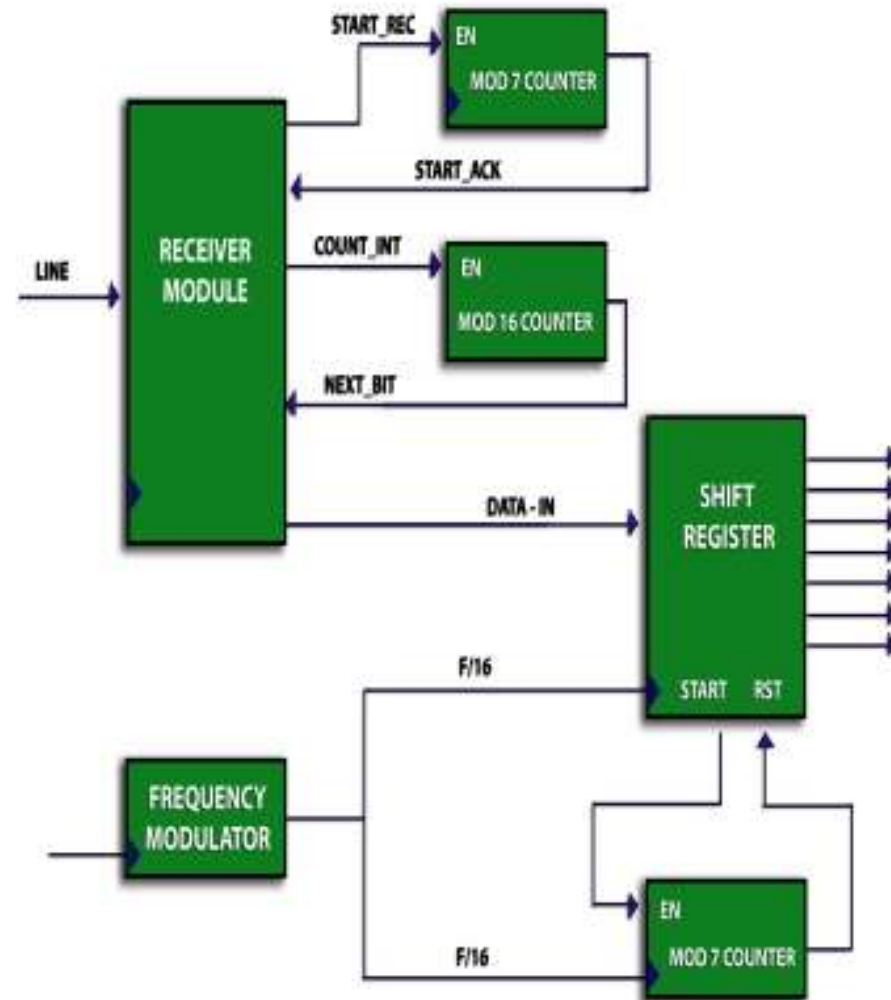
The transmitter is a special shift register that loads data in parallel and then shifts it out bit-by-bit.

The receiver shifts in data bit-by-bit and reassembles the data byte

## Transmitter



## Receiver



# Methodology

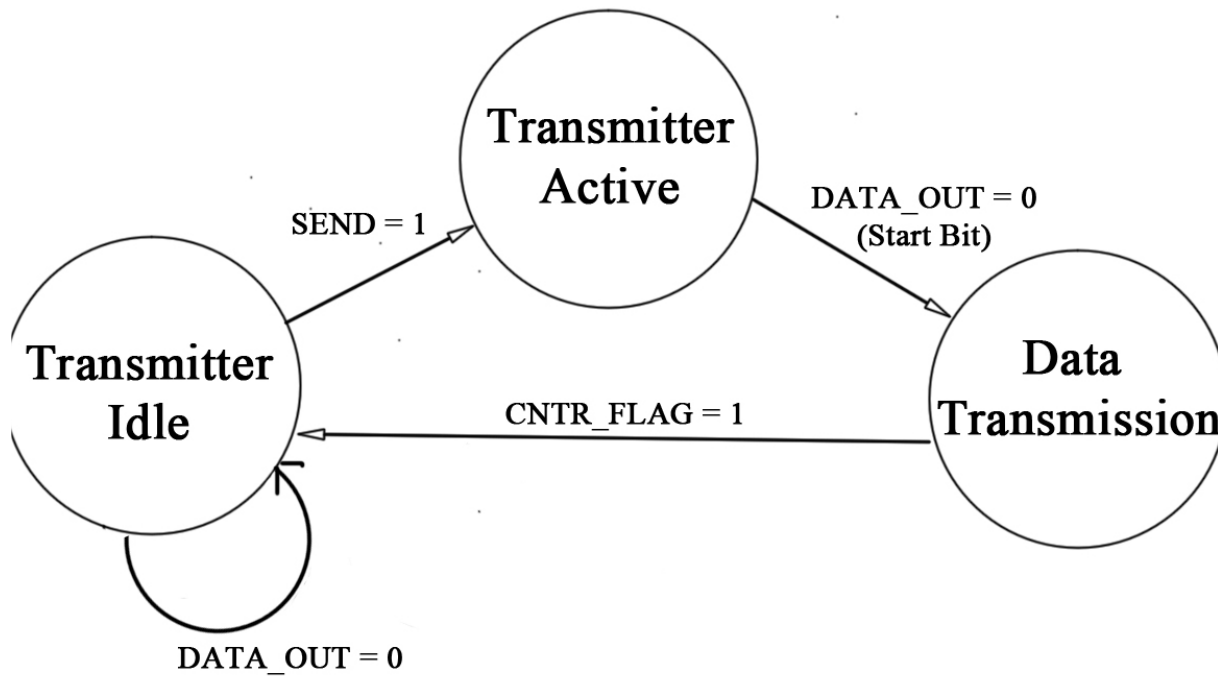
## Transmitter

- Inputs : The 8 switches (SW0 to SW7 ) will be used to give 8 bit signal as input to shift register
- Send input – This input is used to enable the transmitter and its components
- The shift register is used to convert the parallel input to serial input
- A counter is used for counting number of bits sent.

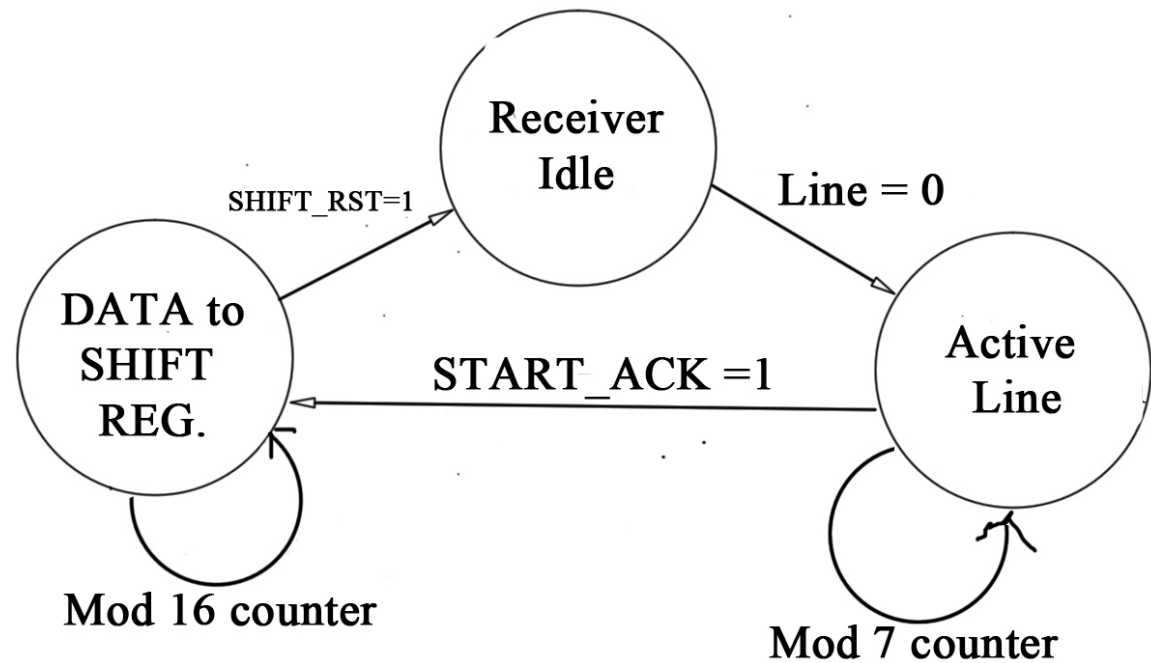
## Receiver

- Outputs: The 8 LEDs (LD0 to LD7 ) will be used to give 8 bit signal as output from shift register
- line input – This input is received from the transmitter. A 0 input triggers a mod 7 counter which is used to reach the center of the signal.
- Mod 16 counter is used to reach the centers of consecutive bits which are then fed into a shift register
- A clock that operates at 16 times the frequency of that of transmitter(say  $f$  ) is used. A mod 16 counter is used to convert it into a clock of frequency  $f$ .
- The shift register is used to convert the serial input to parallel output which operates at frequency  $f$ .

**Transmitter State Diagram**



**Receiver State Diagram**



# Timing Diagram

