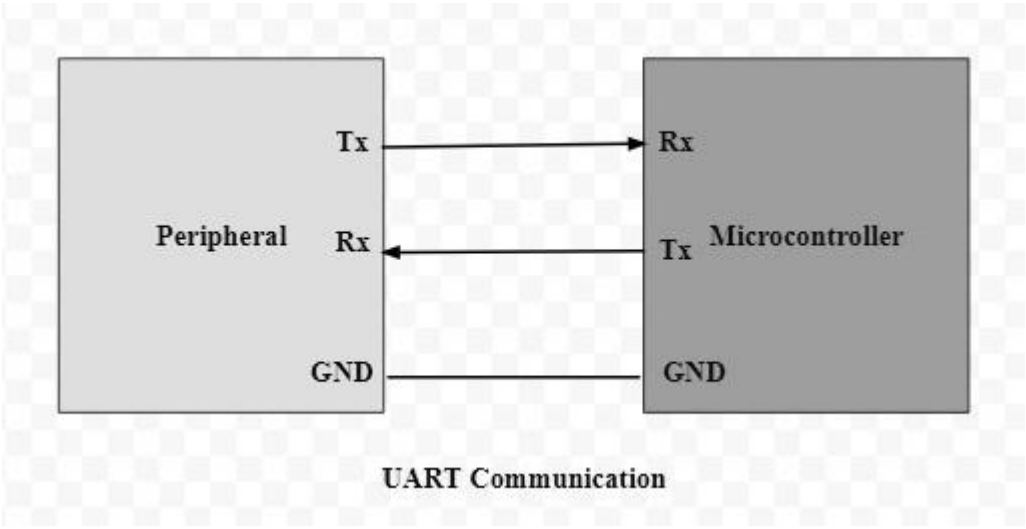
SERIAL UART INTERFACING

The UART full form is “Universal Asynchronous Receiver/Transmitter”, and it is an inbuilt IC within a microcontroller but not like a communication protocol (I2C & SPI). The main function of UART is to serial data communication. In UART, the communication between two devices can be done in two ways namely serial data communication and parallel data communication.

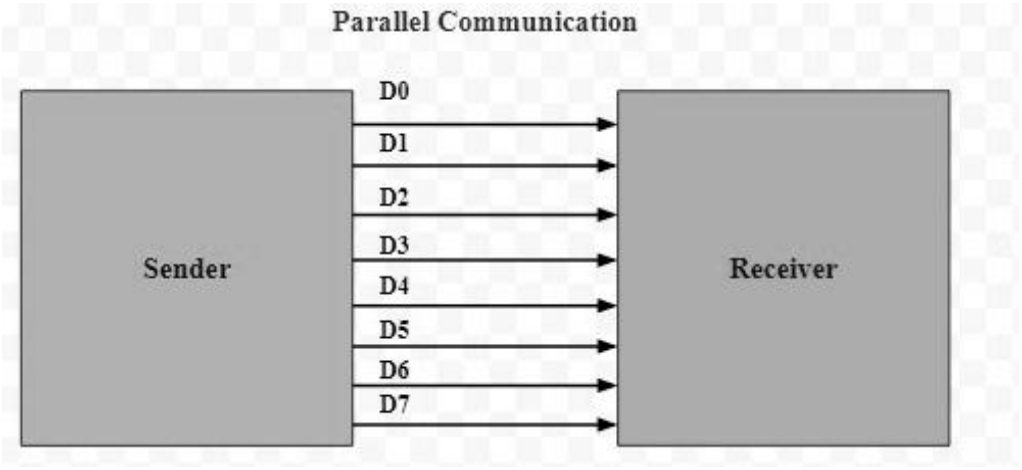
Serial and Parallel Communication

In serial data communication, the data can be transferred through a single cable or line in a bit-by- bit form and it requires just two cables. Serial data communication is not expensive when we compared with parallel communication. It requires very less circuitry as well as wires. Thus, this communication is very useful in compound circuits compared with parallel communication.



UART Communication

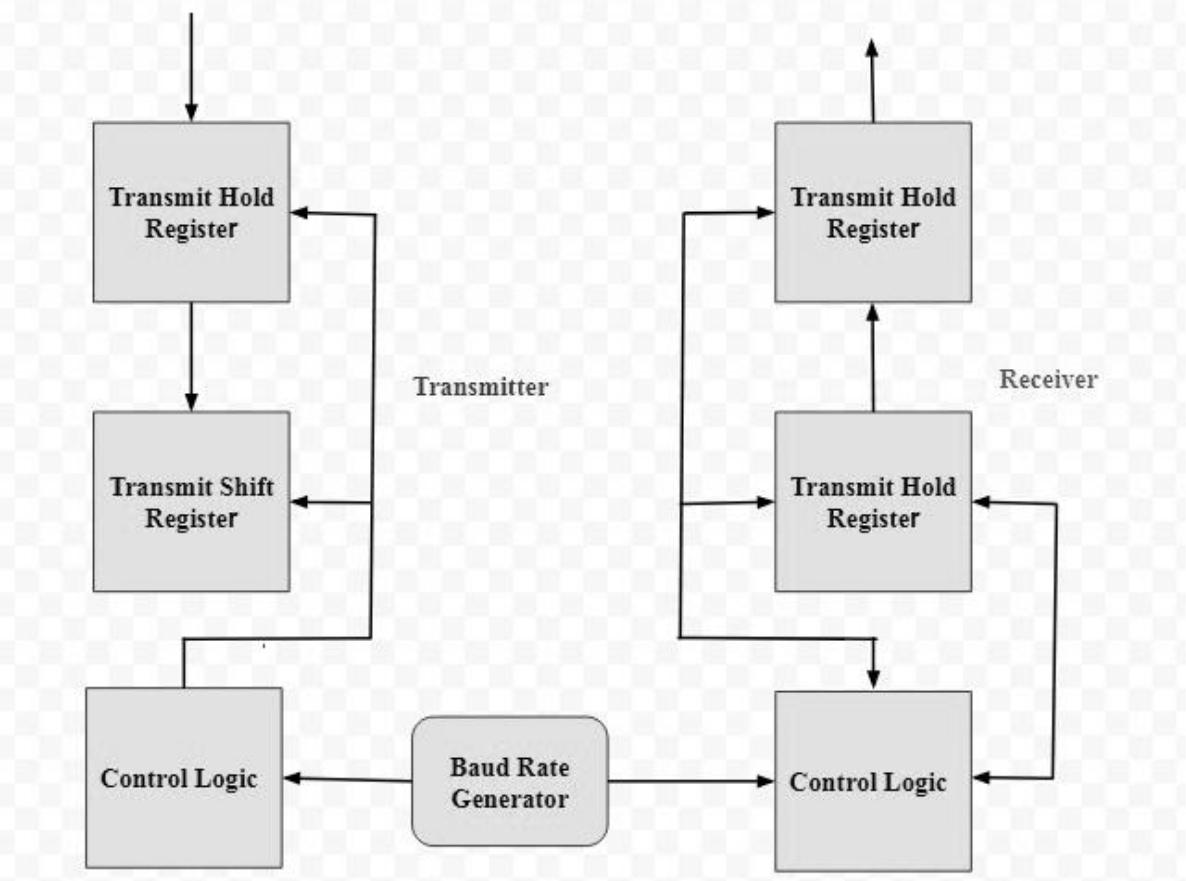
In parallel data communication, the data can be transferred through multiple cables at once. Parallel data communication is expensive as well as very fast, as its requires additional hardware and cables. The best examples for this communication are old printers, PCI, RAM, etc.



UART Block Diagram

The UART block diagram consists of two components namely the transmitter & receiver that is shown below. The transmitter section includes three blocks namely transmit hold register, shift register and also control logic. Likewise, the receiver section includes a receive hold register, shift register, and control logic. These two sections are commonly provided by a baud-rate-generator. This generator is used for generating the speed when the transmitter section & receiver section has to transmit or receive the data.

The hold register in the transmitter comprises the data-byte to be transmitted. The shift registers in transmitter and receiver move the bits to the right or left till a byte of data is transmitted or received. A read (or) write control logic is used for telling when to read or write. The baud-rate-generator among the transmitter and the receiver generates the speed that ranges from 110 bps to 230400 bps. Typically, the baud rates of microcontrollers are 9600 to 115200.



In this communication, there are two types of UARTs available namely transmitting UART and receiving UART, and the communication between these two can be done directly by each other. For this, simply two cables are required to communicate between two UARTs. The flow of data will be from both the transmitting (Tx) & receiving (Rx) pins of the UARTs. In UART, the data transmission from Tx UART to Rx UART can be done asynchronously (there is no CLK signal for synchronizing the o/p bits).

The data transmission of a UART can be done by using a data bus in the form of parallel by other devices like a microcontroller, memory, CPU, etc. After receiving the parallel data from the bus, it forms a data packet by adding three bits like start, stop and parity. It reads the data packet bit by bit and

converts the received data into the parallel form to eliminate the three bits of the data packet. In conclusion, the data packet received by the UART transfers in parallel toward the data bus at the receiving end.