Serial communication

Serial communication is a communication method that uses one or two transmission lines to send and receive data, and that data is continuously sent and received one bit at a time. Since it allows for connections with few signal wires, one of its merits is its ability to hold down on wiring material and relaying equipment costs.

Serial communication standards

RS-232C/RS-422A/RS-485 are EIA (Electronic Industries Association) communication standards. Of these communication standards, RS-232C has been widely adopted in a variety of applications, and it is even standard equipment on computers and is often used to connect modems and mice. Sensors and actuators also contain these interfaces, many of which can be controlled via serial communication.

Serial Standard	Operation mode	Total nr. of devices	Cable length	Speed	Wires
RS-232	Single Ended	1 Sender / 1 Receiver	15 m	20 Kbits/s	min. 3
RS-422	Differential	1 Sender / 10 Receiver	1200 m	10 Mbit/s	4
RS-485	Differential	32 Sender / 32 Receiver	1200 m	10 Mbit/s	2

Serial communication

Single-ended signaling is the simplest and most commonly used method of transmitting electrical signals over wires.

One wire carries a varying voltage that represents the signal, while the other wire is connected to a reference voltage, usually ground.

Differential signaling is a method for electrically transmitting information using two complementary signals.
The technique sends the same electrical signal as a **differential pair** of signals, each in its own conductor.
The pair of conductors can be wires in a twisted-pair or ribbon cable or traces on a printed circuit board.

Serial communication

RS-232C

This serial communication standard is widely used and is often equipped on computers as standard.It is also called "EIA-232".The purpose and timing of the signal lines and the connectors have been defined (D-sub 25-pin or D-sub 9-pin).Currently the standard has been revised with the addition of signal lines and is formally called "ANSI/EIA-232-E".However, even now it is generally referred to as "RS-232C".

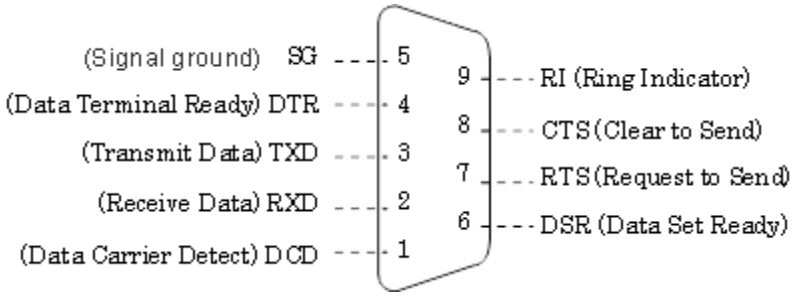
RS-422A

This standard fixes problems in RS-232C such as a short transmission distance and a slow transmission speed.It is also called "EIA-422A".The purpose and timing of the signal lines are defined, but the connectors are not.Many compatible products primarily adopt D-sub 25-pin and D-sub 9-pin connectors.

RS-485

This standard fixes the problem of few connected devices in RS-422A.It is also called "EIA-485".RS-485 is forward compatible standard with RS-422A.The purpose and timing of the signal lines are defined, but the connectors are not.Many compatible products primarily adopt D-sub 25-pin and D-sub 9-pin connectors

In RS-232C, the connectors to use and the signal assignments have been defined and are standardized. The figure to the right describes the D-sub 9-pin signal assignments and signal lines.



Pin No.	Signal name	Description	
1	DCD	Data Carrier Detect	Carrier detect
2	RxD	Received Data	Received data
3	TxD	Transmitted Data	Transmitted data
4	DTR	Data Terminal Ready	Data terminal ready
5	SG	Signal Ground	Signal ground or common return
6	DSR	Data Set Ready	Data set ready
7	RTS	Request To Send	Request to send
8	CTS	Clear To Send	Clear to send
9	RI	Ring Indicator	Ring indicator
CASE	FG	Frame Ground	Maintenance ground or earth

RS 232 Connection method

In RS-232C, the connectors and signal assignments have been standardized, so many standard-compliant cables are available commercially. However, equipment comes in the following types, and depending on the equipment that will be connected, a straight cable or a crossover cable is required.

Equipment type

DCE

Data communication equipment.This term indicates equipment that passively operates such as modems, printers, and plotters.

DTE

Data terminal equipment.This term indicates equipment that actively operates such as computers.

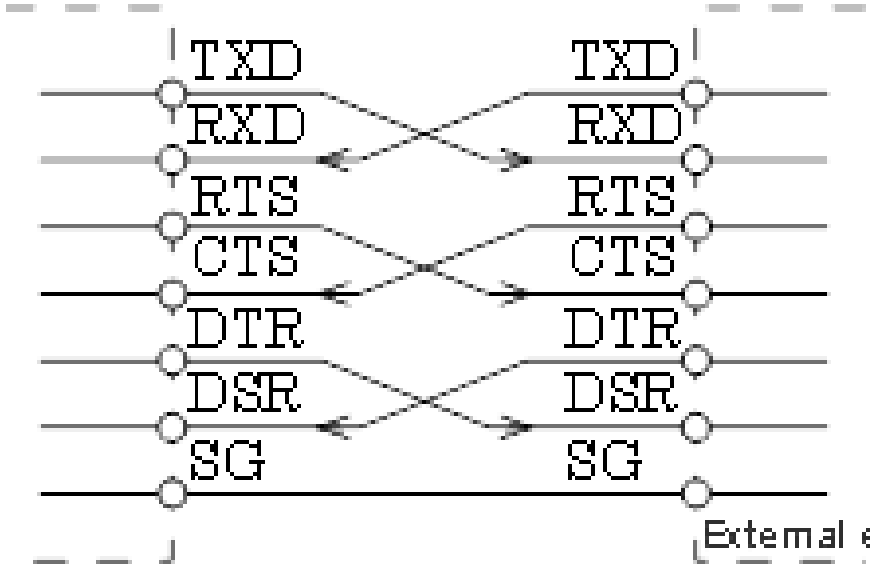
Full-duplex communication

A method where send and receive both have their own transmission line so data can be simultaneously sent and received.

Half-duplex communication

A method where communication is performed using one transmission line while switching between send and receive. For this reason, simultaneous communication cannot be performed.

Crossover cable connection



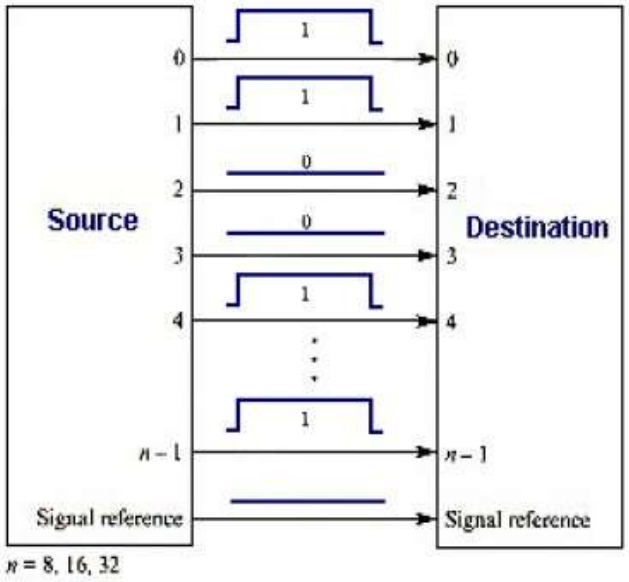
Full-duplex communication A method where send and receive both have their own transmission line so data can be simultaneously sent and received. Half-duplex communication A method where communication is performed using one transmission line while switching between send and receive. For this reason, simultaneous communication cannot be performed

Serial Data transfer schemes

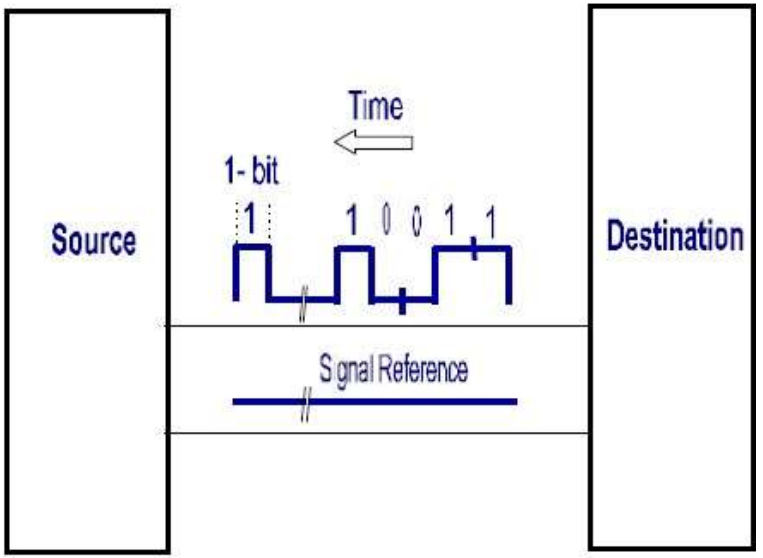
Serial communication transmits data one bit at a time, sequentially, over a single communication line to a receiver.

Serial is also a most popular communication protocol that is used by many devices for instrumentation.

This method is used when data transfer rates are very low or the data must be transferred over long distances and also where the cost of cable and synchronization difficulties makes parallel communication impractical. Serial communication is popular because most



Parallel Transmission

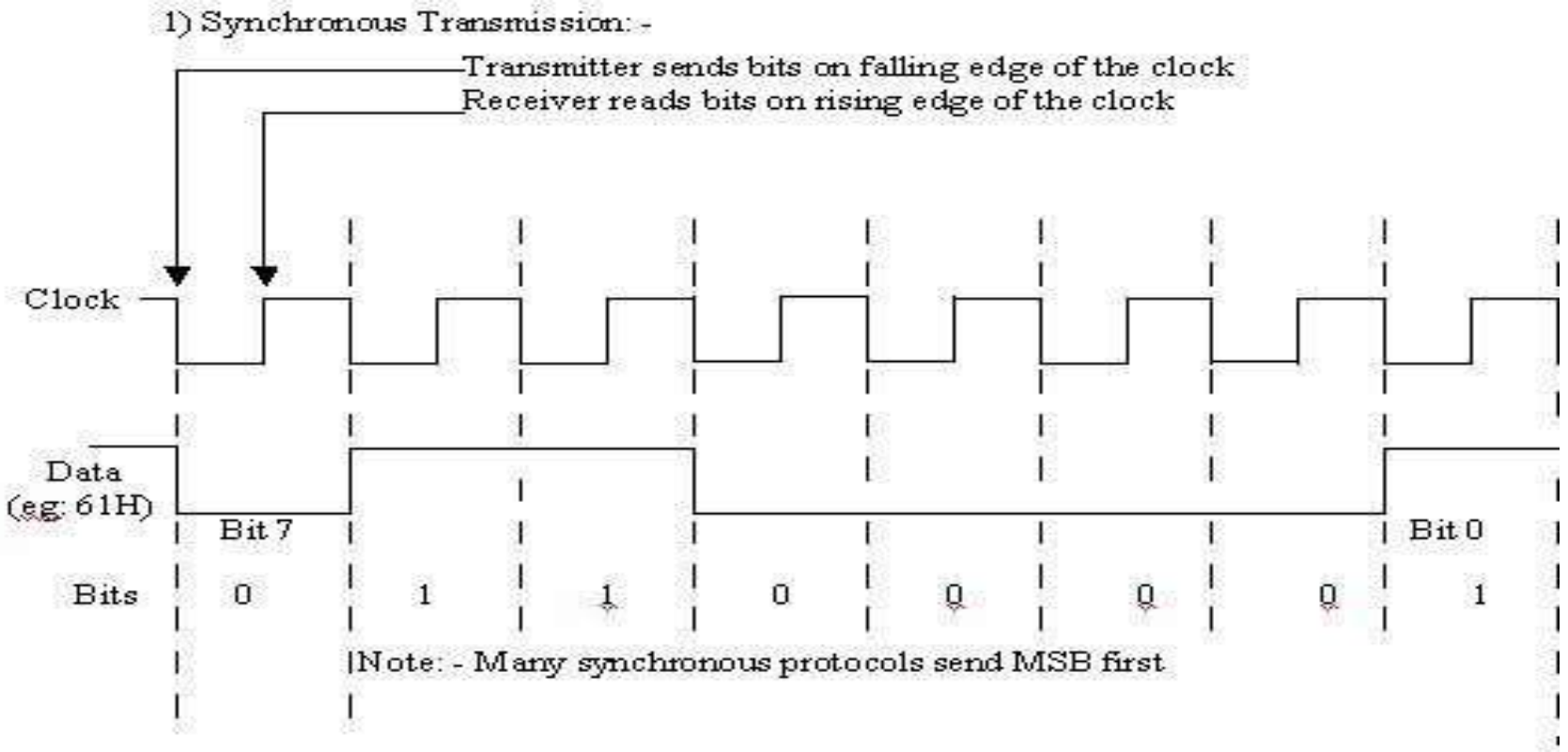


Serial Transmission

Synchronous data transmission

The synchronous signaling methods use two different signals. A pulse on one signal line indicates when another bit of information is ready on the other signal line.

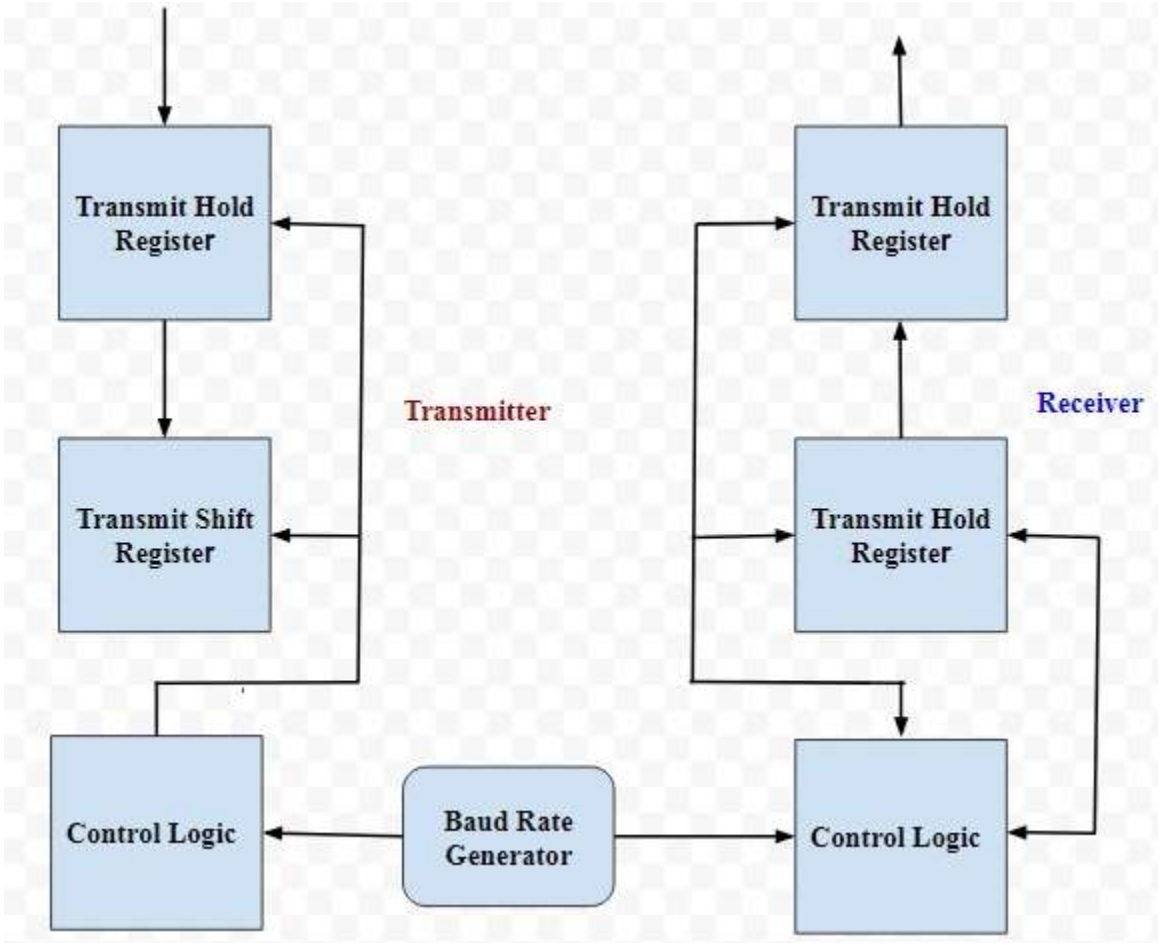
In synchronous transmission, the stream of data to be transferred is encoded and sent on one line, and a periodic pulse of voltage which is often called the "clock" is put on another line, that tells the receiver about the beginning and the ending of each bit.



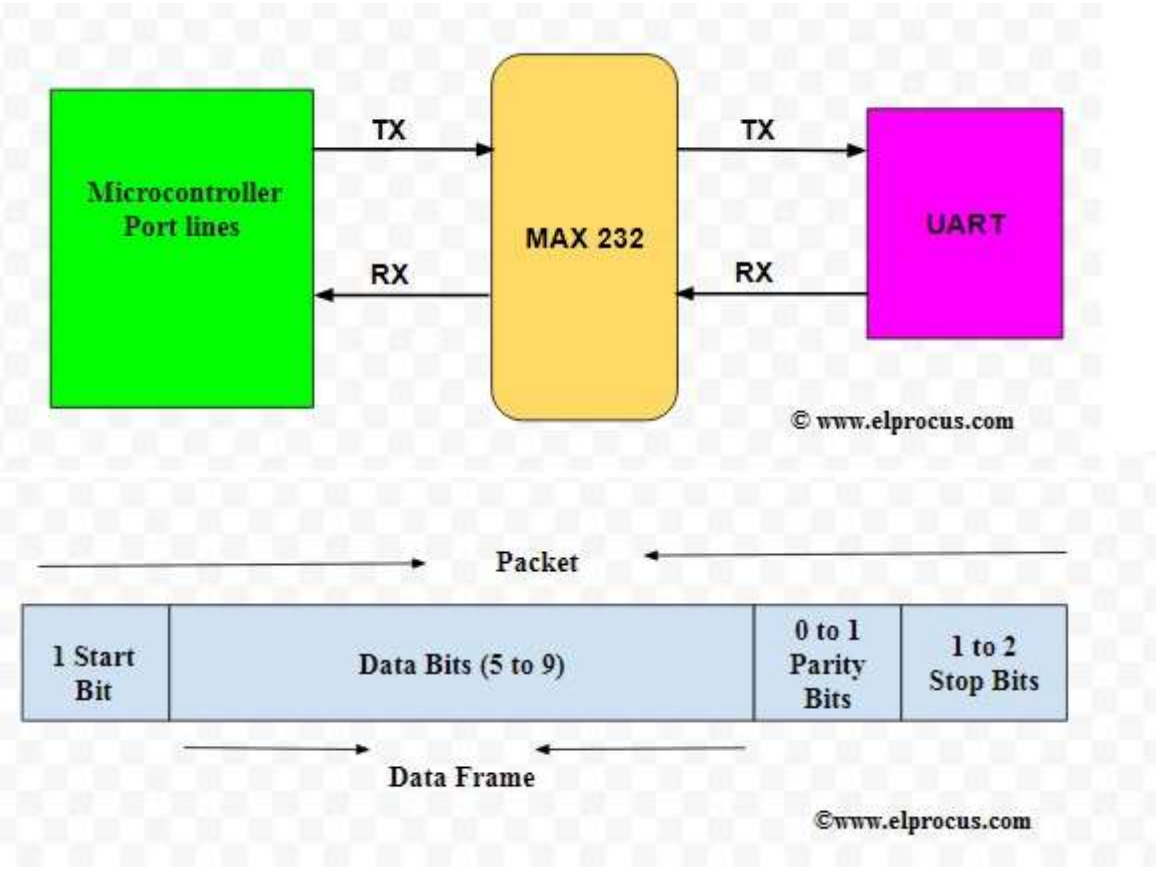
UART BLOCK DIAGRAM

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.



UART COMMUNICATION



Serial communication

The asynchronous signaling methods use only one signal. The receiver uses transitions on that signal to figure out the transmitter bit rate (known as auto baud) and timing.

A pulse from the local clock indicates when another bit is ready. That means synchronous transmissions use an external clock, while asynchronous transmissions use special signals along the transmission medium.

Asynchronous communication is the commonly prevailing communication method in the personal computer industry, due to the reason that it is easier to implement and has the unique advantage that bytes can be sent whenever they are ready, a no need to wait for blocks of data to accumulate.

Asynchronous data transmission

2) Asynchronous Transmission: -