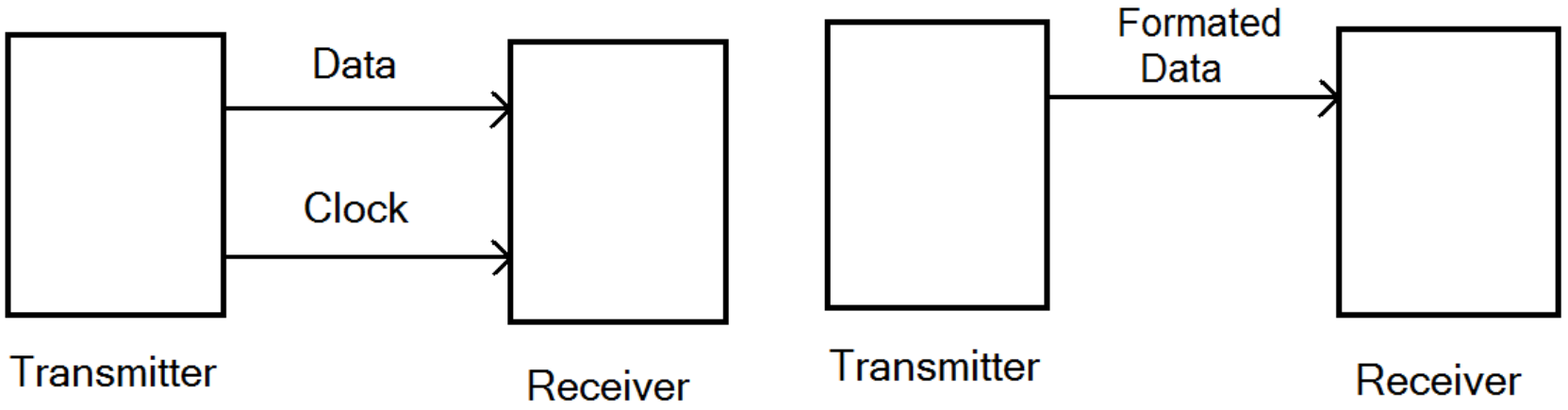
INTERFACING MICROCONTROLLER WITH PC

Serial Data Communication

✓ When using serial communication, only one bit is transferred at a time

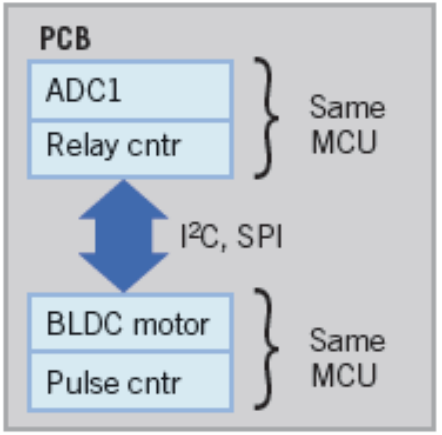
✓ This is different to parallel communication, where several bits are sent at the same time

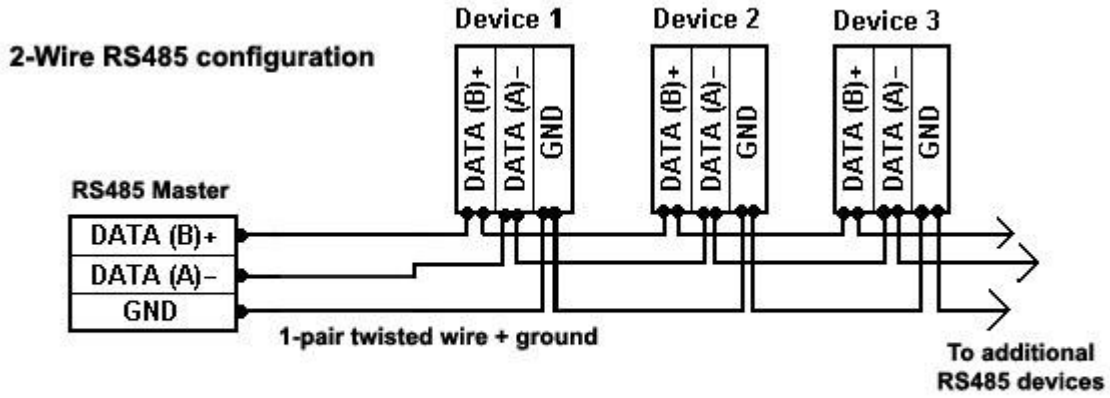


Synchronous **Asynchronous**

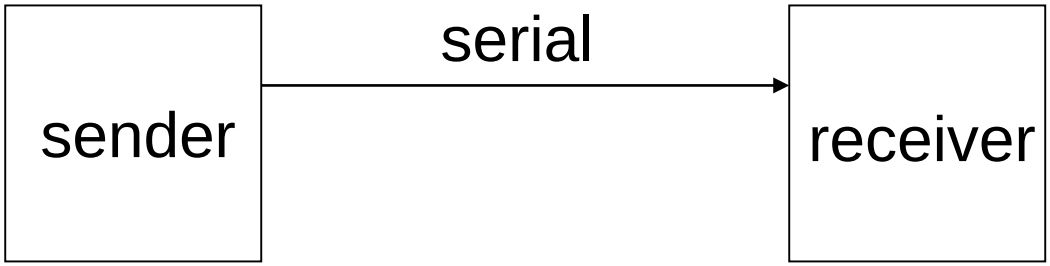
Serial Busses

•A serial bus is a link for a shingle stream of data between two or more devices
• Peripheral Integrated circuits are more expensive when they have more pins.
• To reduce the number of pins in a package, many ICs use a serial bus to transfer data
• Low-cost serial examples RS485, SPI, I²C …





Asynchronous Serial Data Transmission



Receiver must know

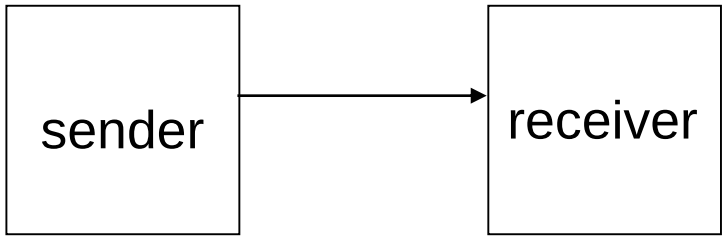
– when transmission begins
– when transmission ends
– if data was transferred correctly

✓ Standards: RS485, RS232…
✓ MCU implementations: UART, USART, EUART

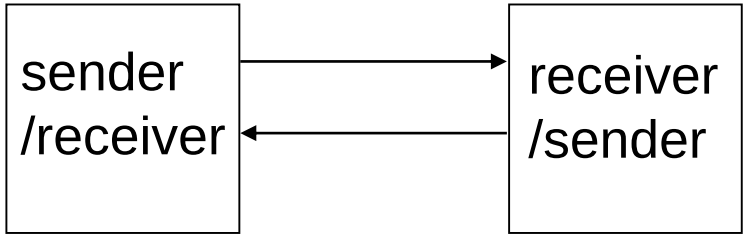
Asynchronous Communication

Sender and receiver agree on a common data transfer rate (BAUD rate)

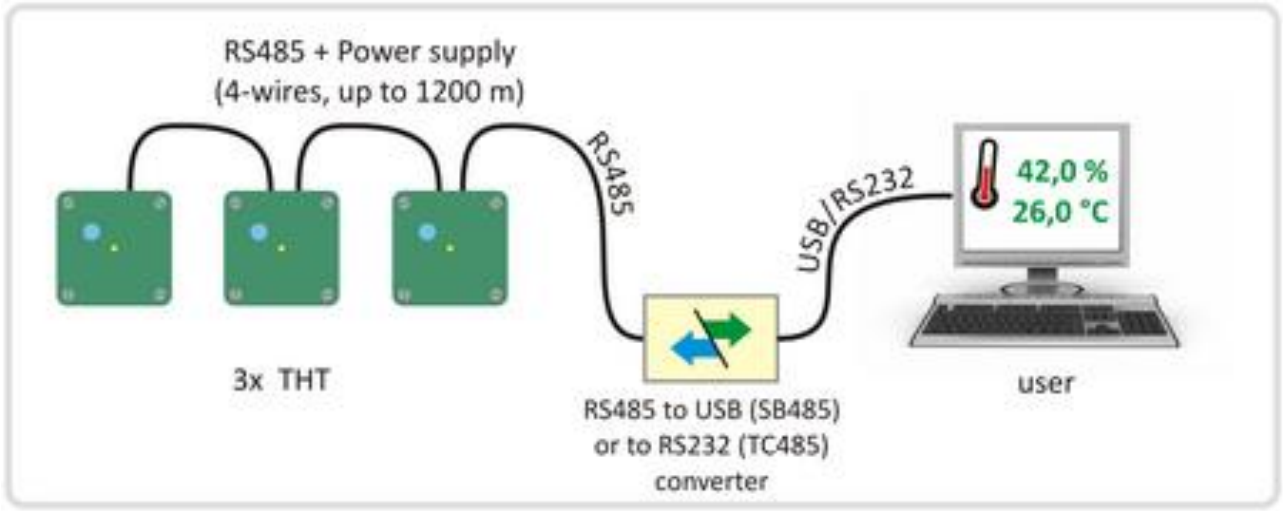
Half-duplex
(one way)

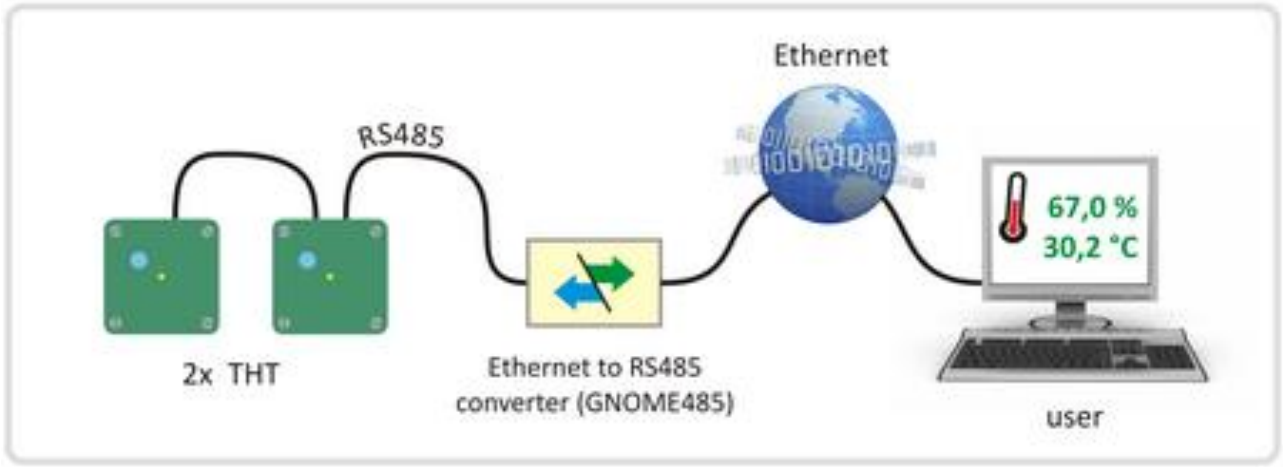


Full-duplex
(two ways)



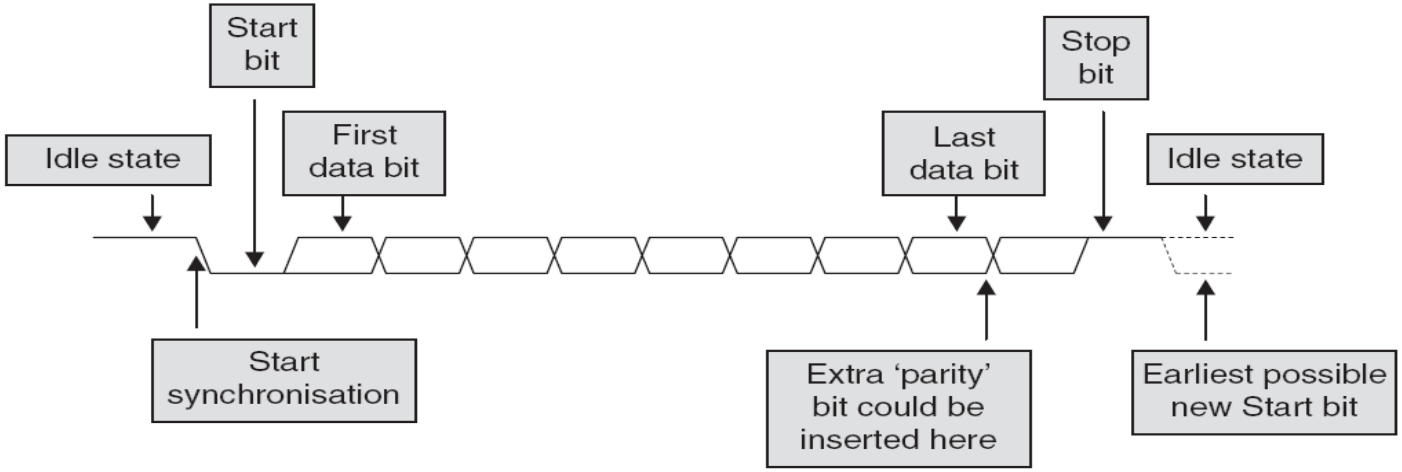
Typical Application



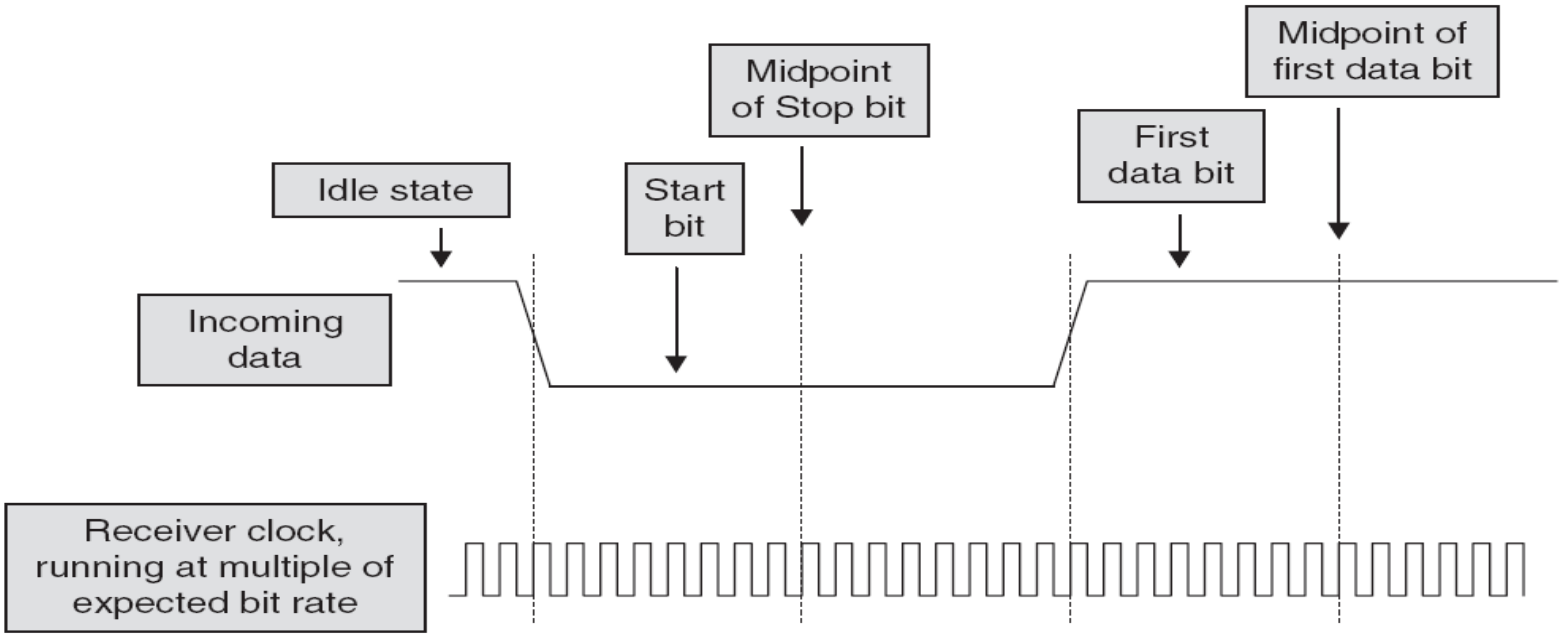


Asynchronous Principles

- No clock transmitted
- Data rate is predetermined – both transmitter and receiver are preset to recognize the same data rate.
- Each node needs an accurate and stable clock source.
- Each byte or word is framed with a Start and Stop bit. These allow synchronization to be initiated before the data starts to flow.



Synchronizing The Asynchronous Data Signal



Each data is transferred in the following way:

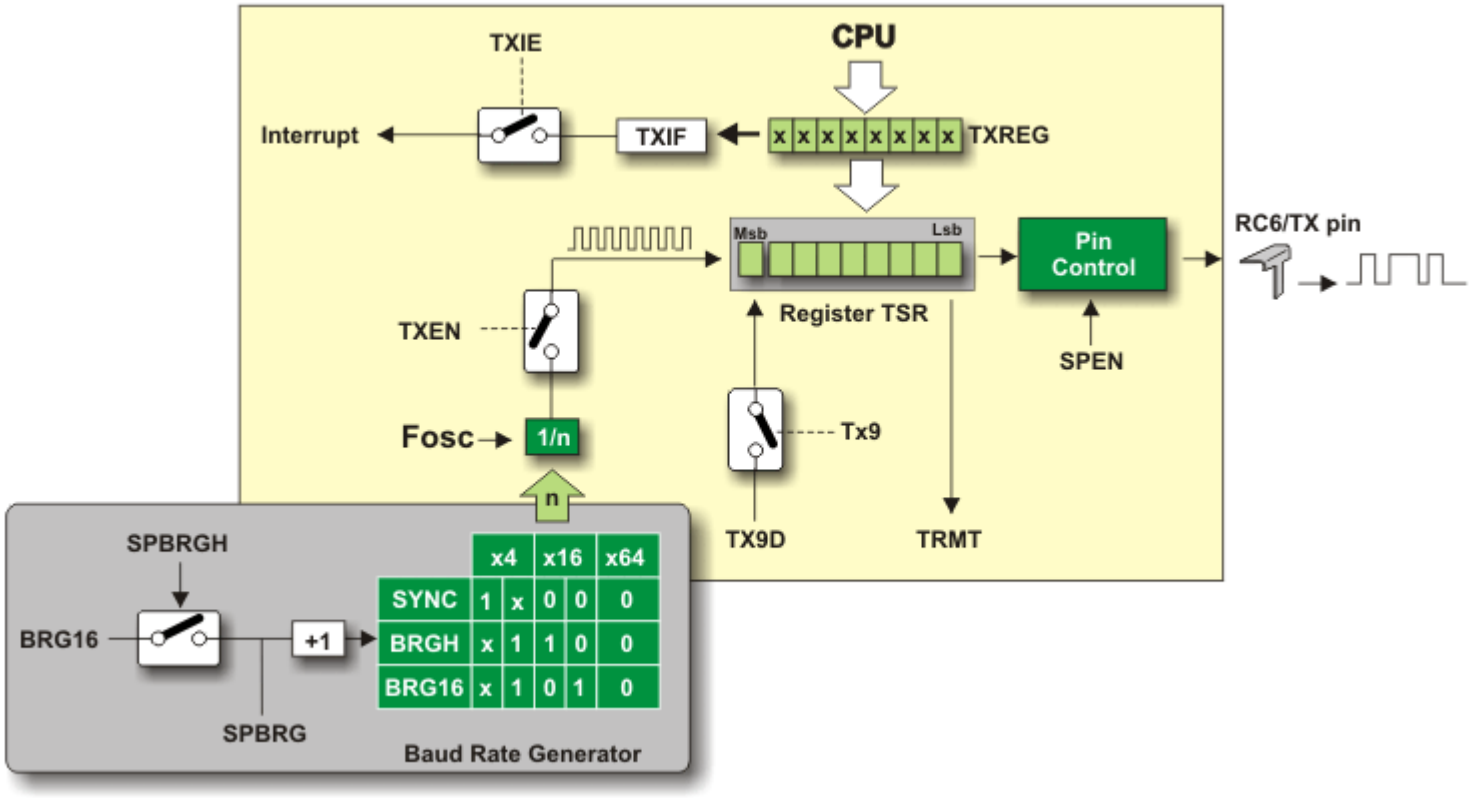
✓In idle state, data line has high logic level (1);

✓Each data transmission starts with START bit which is always a zero (0);

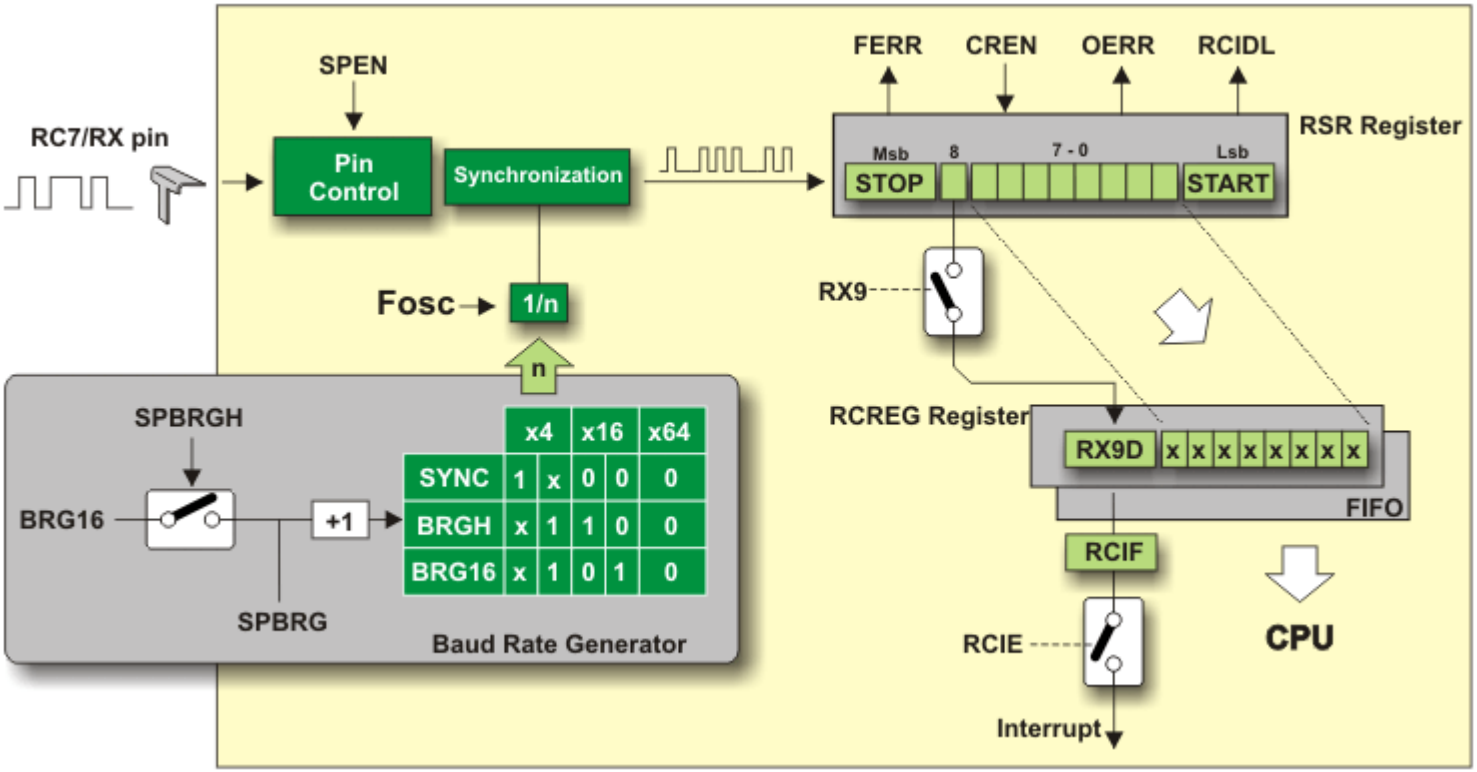
✓Each data is 8- or 9-bit wide (LSB bit is first transferred); and

✓Each data transmission ends with STOP bit which always has logic level which is always a one (1).

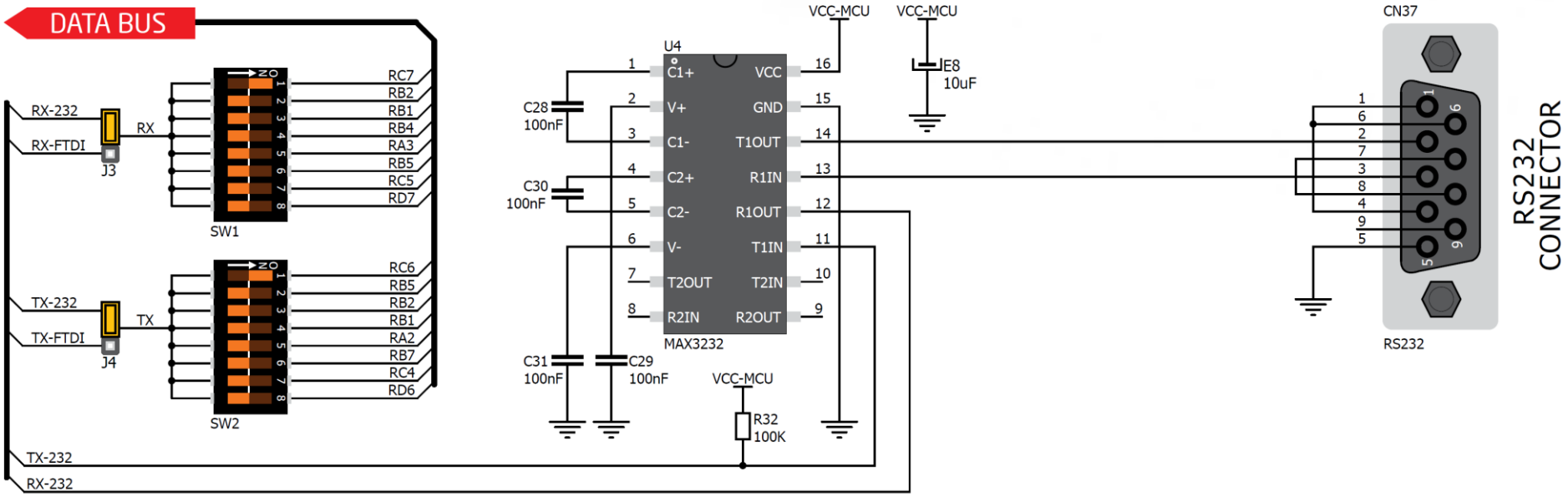
PIC EUSART Asynchronous Transmitter



PIC EUSART Asynchronous Receiver



EasyPIC UART via RS-232

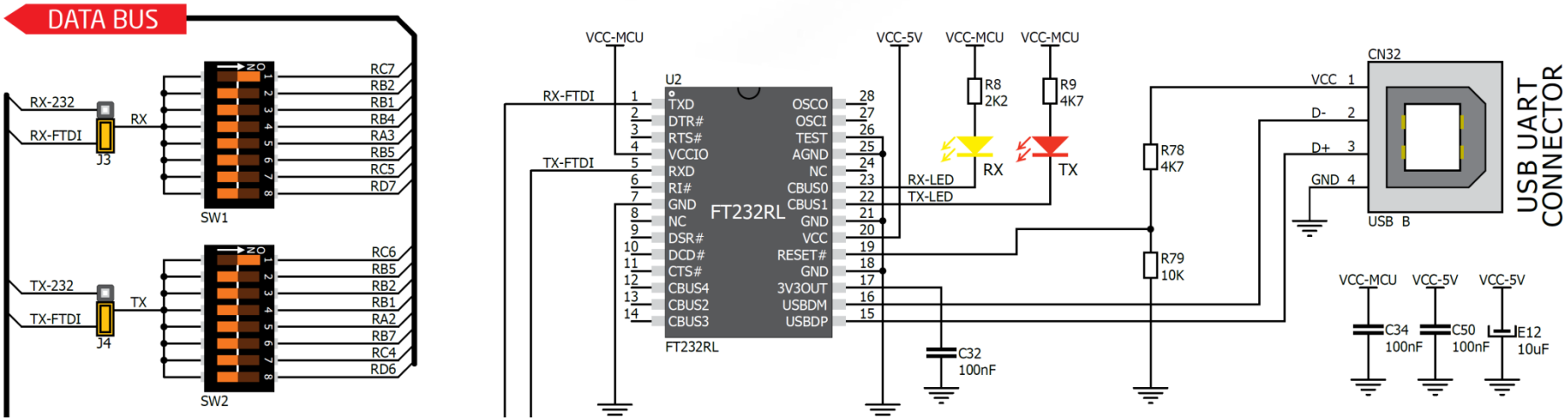


✓ RS-232 serial communication is performed through a 9-pin SUB-D connector and the microcontroller UART module.

✓ In order to enable this communication, it is necessary to establish a connection between RX and TX lines on SUB-D connector and the same pins on the target microcontroller using DIP switches.

✓ Since RS-232 communication voltage levels are different than microcontroller logic levels, it is necessary to use a RS-232 Transceiver circuit, such as MAX3232 as shown

EasyPIC UART via USB



Modern PC computers, laptops and notebooks are no longer equipped with RS-232 connectors and UART controllers. They are nowadays replaced with USB connectors and USB controllers. Still, certain technology enables UART communication to be done over USB connection. Controllers such as FT232RL from FTDI convert UART signals to the appropriate USB standard. In order to use USB-UART module on EasyPIC, you must first install FTDI drivers on your computer.