# Serial Communication in Microcontroller

- A general Embedded system consists of various building blocks.

- All these building blocks should communicate with each other.

- They must share a common communication protocol.

- Hundreds of communication protocols have been defined to achieve this data exchange.

- Can be separated into one of two categories: parallel or serial.

Parallel vs. Serial

- Parallel interfaces transfer multiple bits at the same time.
- Transmitting across eight, sixteen, or more wires.
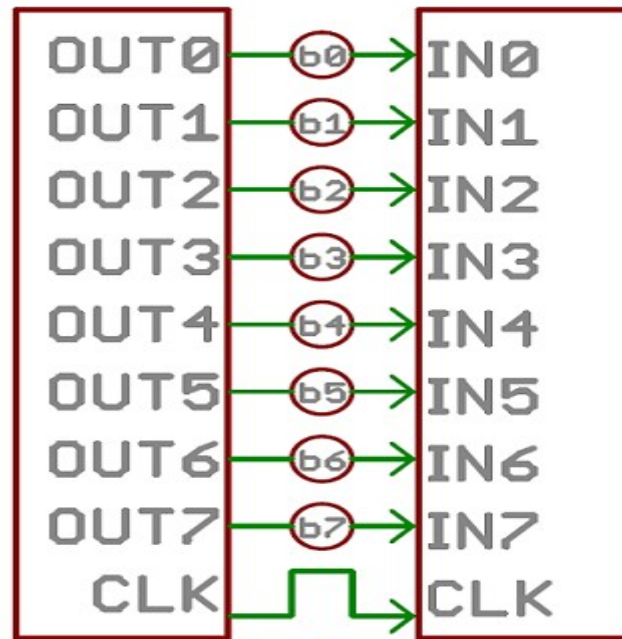
Parallel vs. Serial (Continue..)
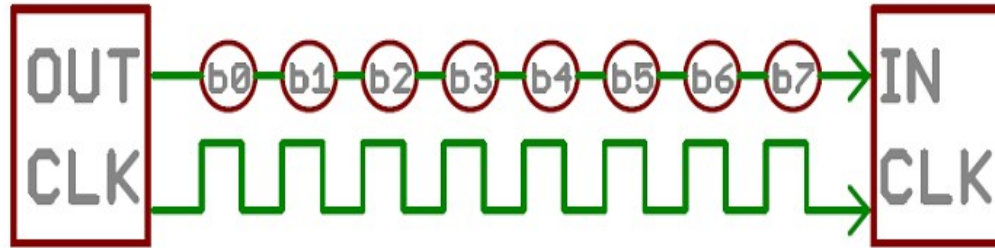
- Serial interfaces stream their data, one bit at a time.

- These interfaces can operate with lesser number of wires.

- Eg: USB, Ethernet, SPI, I2C, ...

- synchronous or asynchronous.

Synchronous serial interface

- A synchronous serial interface always pairs its data line(s) with a clock signal

- So all devices on a synchronous serial bus share a common clock

- Faster serial transfer

- Requires at least one extra wire between communicating devices

- Eg: SPI, I2C
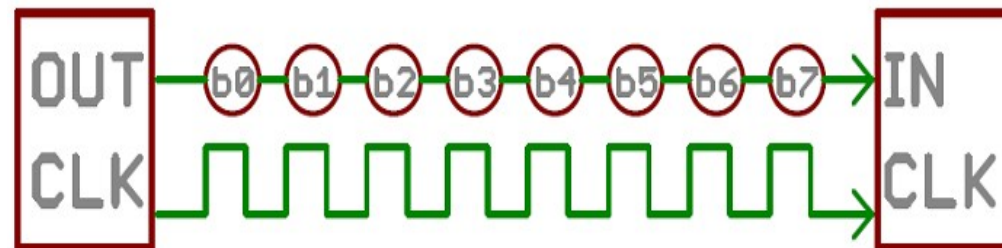
Asynchronous serial interface

- Asynchronous means that data is transferred without support from an external clock signal.

- Clock-less serial protocol

- Minimizing required wires and I/O pins

- This is used for GPS module, Bluetooth, XBee's, serial LCDs, or many other external devices
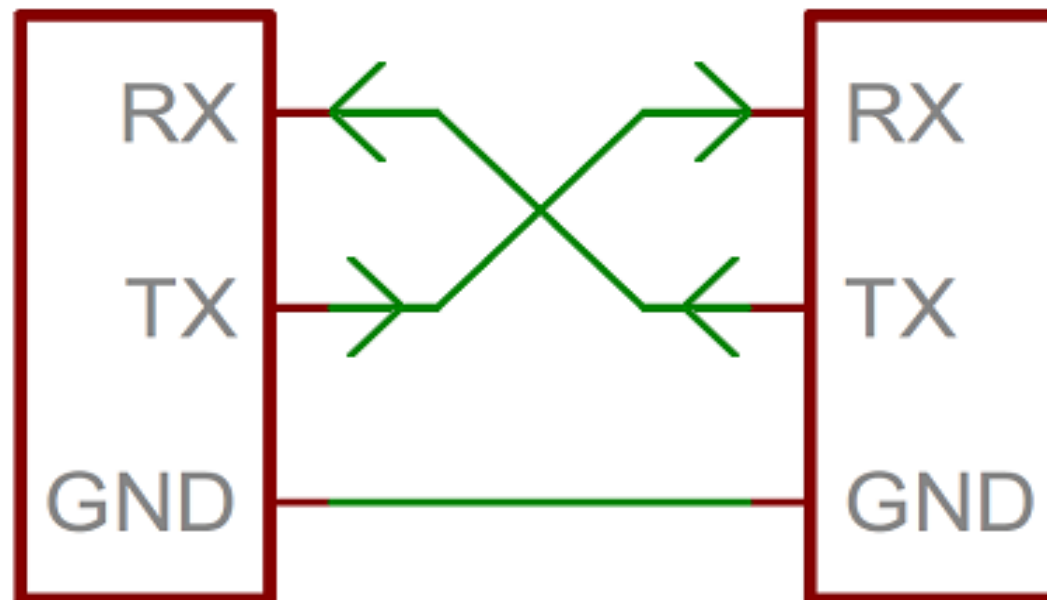
Baud Rate

- The baud rate specifies how fast data is sent over a serial line

- It's usually expressed in units of bits-per-second (bps)

- Common 9600 bps.

- Other "standard" baud are 1200, 2400, 4800, 19200, 38400, 57600, and 115200.
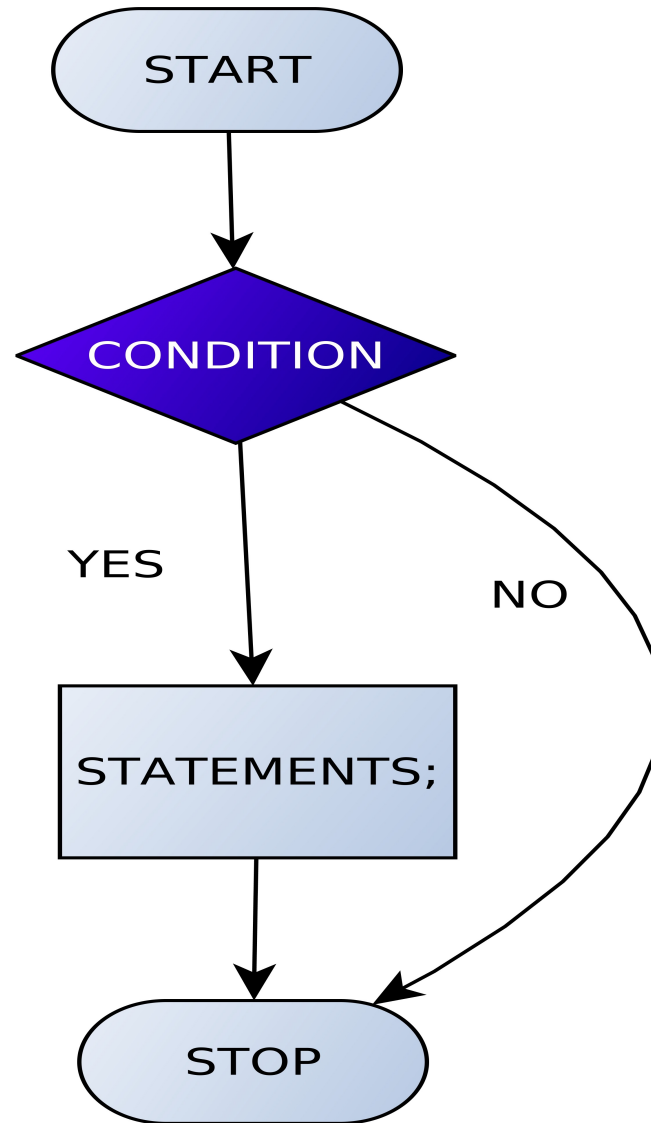
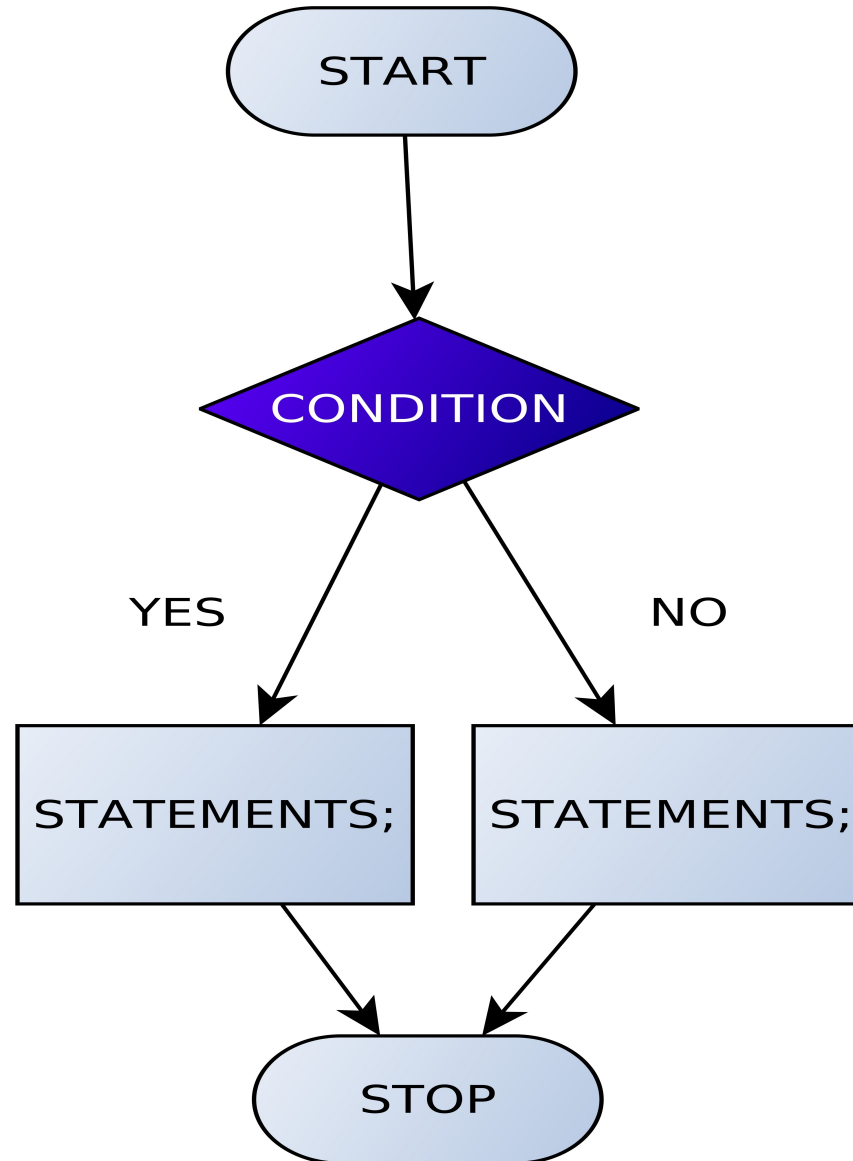# Framing the data
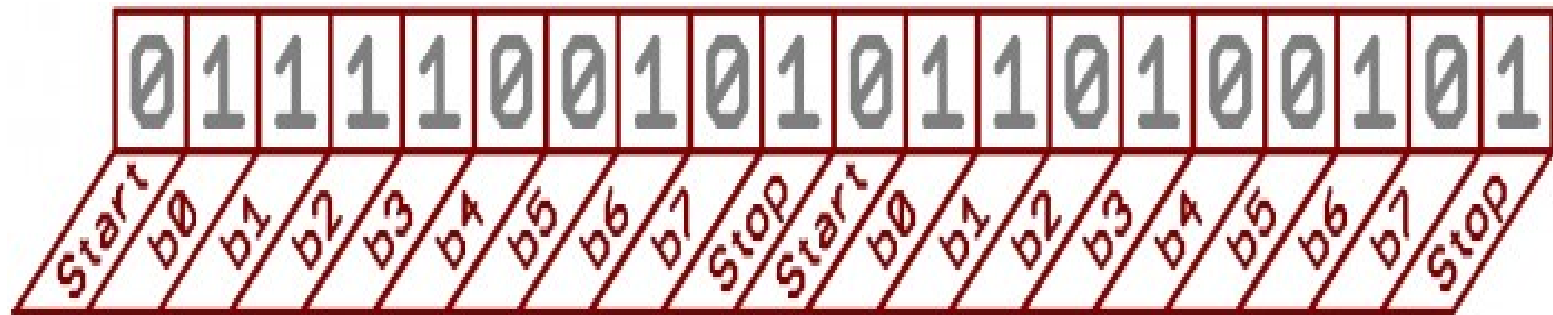
Wiring

Hello world !

Serial write functions

- Serial.println();
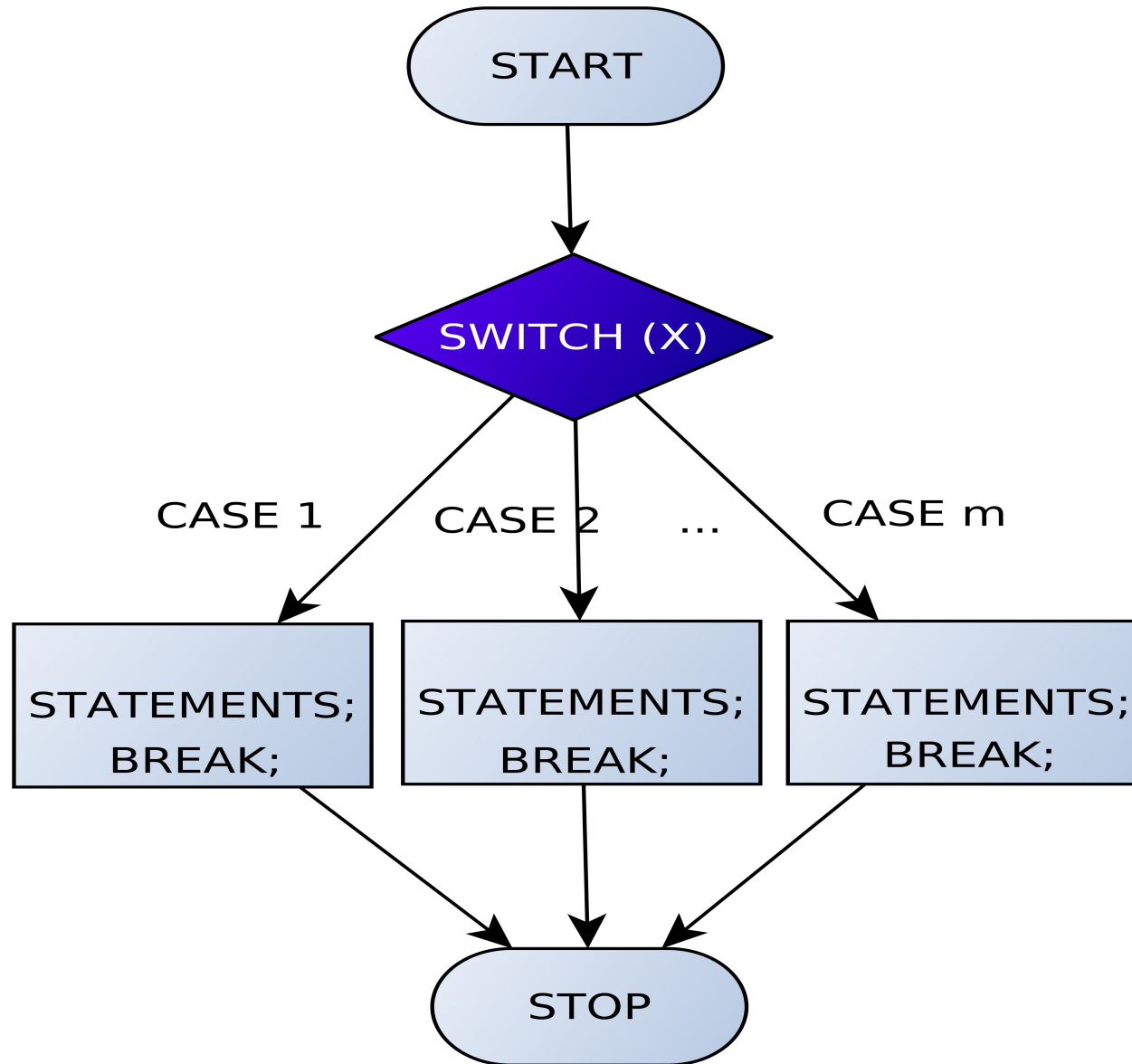

- Serial.print();

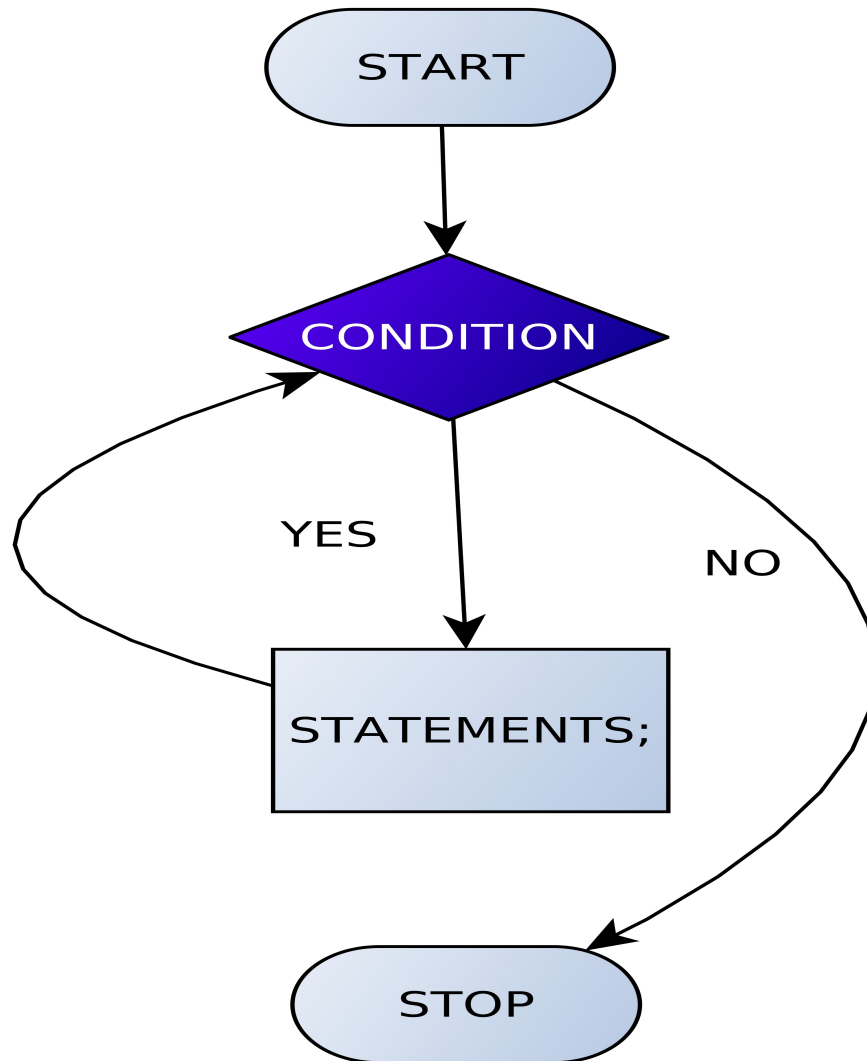- Serial.write();

Branching conditions (if)

Branching conditions (if else)

Branching conditions (switch case)

Looping conditions (for and while)

Tasks

- Program to print all natural numbers in serial monitor with 1 second delay.

- Start printing natural numbers when char "a" is entered and stop printing when char "s" is entered.

Tasks

- Read the entered character from the keyboard

  - If character is 'r', RED LED ON.

  - If character is 'b', BLUE LED ON.

  - If character is 'g', GREEN LED ON.

  - If character is 'a', all LED ON.

  - If character is 's', all LED OFF.

  Using IF, ELSE condition

- Above problem using SWICH CASE condition

Tasks

- Read String(RGB, BGR, GRB,....) from the keyboard and Blink the LED as per input sequence with 2 second delay.

- Read integer from the keyboard(4 digit delay value) and blink RED, GREEN, BLUE with entered delay.

Tasks

- Lights four LEDs in sequence, then in reverse the order using a for() loop.

  – Also use "for loop" to setup the pins to output mode.