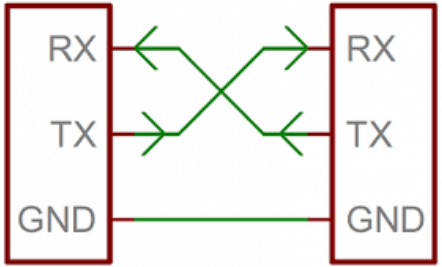
Communication

Electro

2022/2023

What You Will Learn

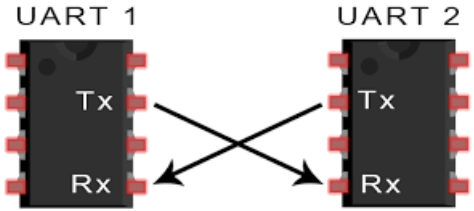
- **Serial Communication Principle: UART?**
- **Arduino UART Example**
- **Interfacing Arduino with a bluetooth module**
- **Controlling LED from an Android phone**



UART

The Arduino hardware has built-in support for serial communication on pins 0 and 1 (which also goes to the computer via the USB connection). The native serial support happens via a piece of hardware (built into the chip) called a UART.

- **Only two wires are needed to transmit data between two UARTs**
- **Both UARTs must also must be configured to transmit and receive the same data packet structure (Baudrate, 8bit data ..)**

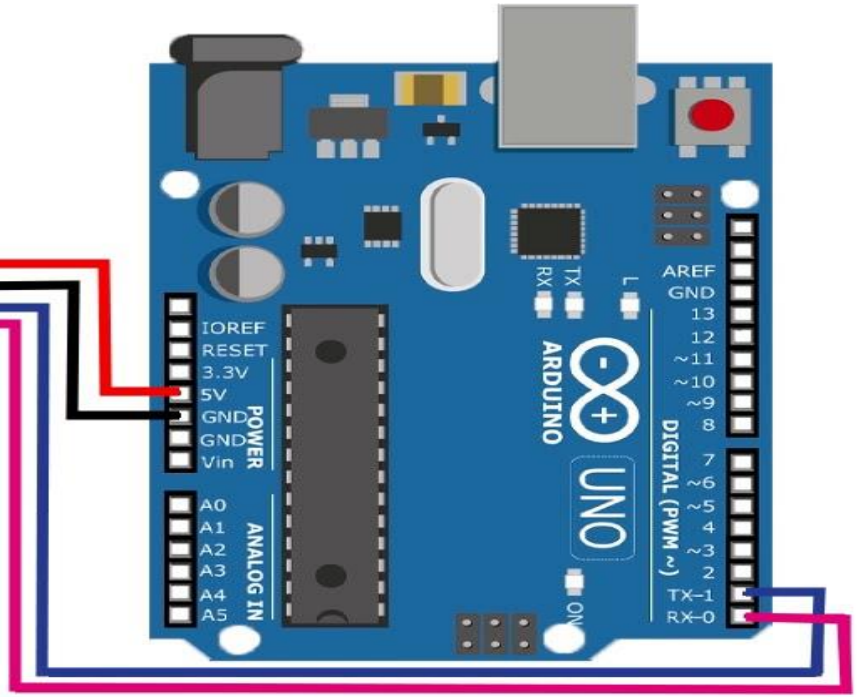


USB-Serial Converter

Sending data from the UART pins of the MCU need to be converted to USB data using an USB-Serial converter (FTDI)

Arduino With UART

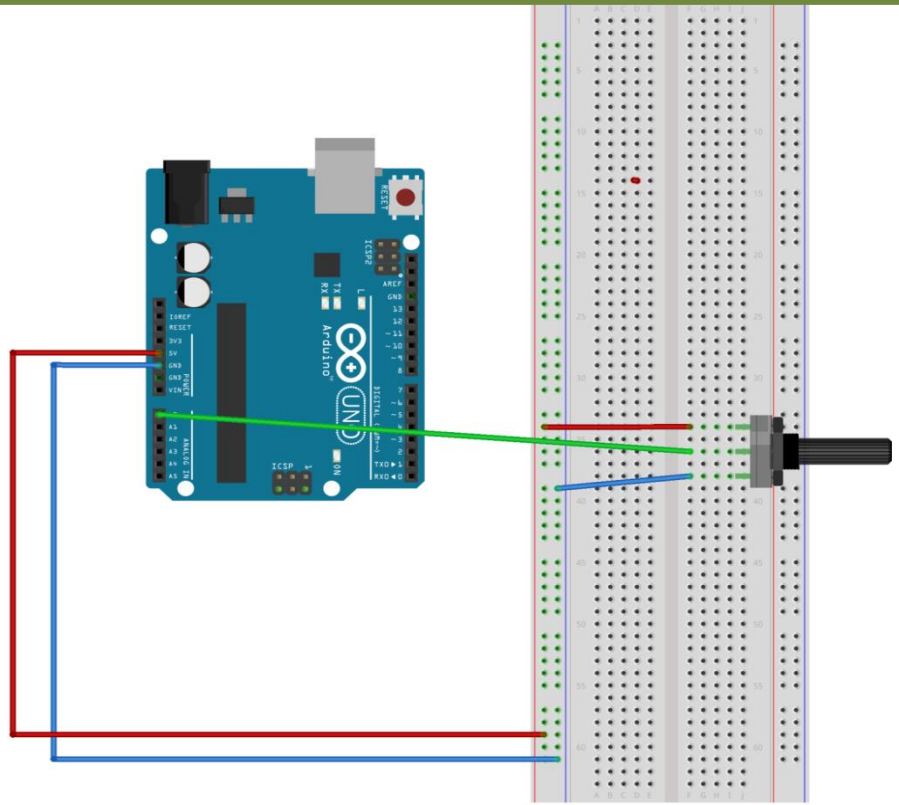
	USB to TTL	Arduino UNO/NANO
1	5V	5V
2	GND	GND
3	Tx	Rx
4	Rx	Tx



Please Note some USB to TTL Converter have not DTR pin.if your module have DTR pin than connect it to RESET pin of arduino

Example 1

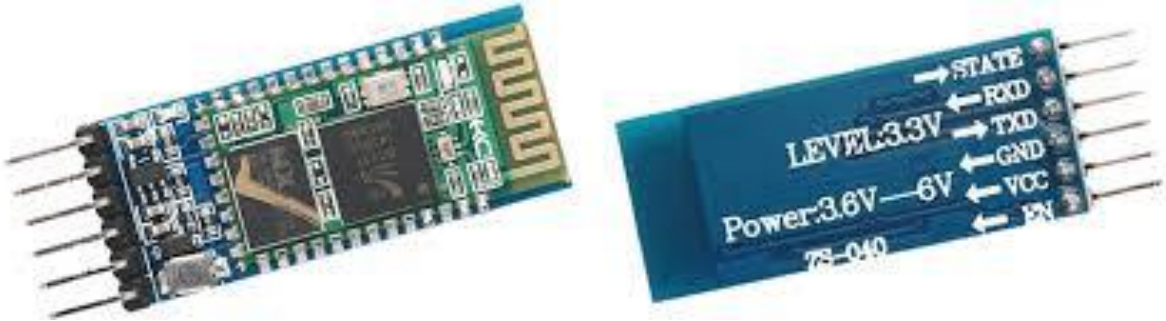
```
int potentiometer_value;

void setup() {
  Serial.begin(9600);
}

void loop() {
  potentiometer_value = analogRead(A0);
  Serial.println(potentiometer_value);
  delay(500);
}
```



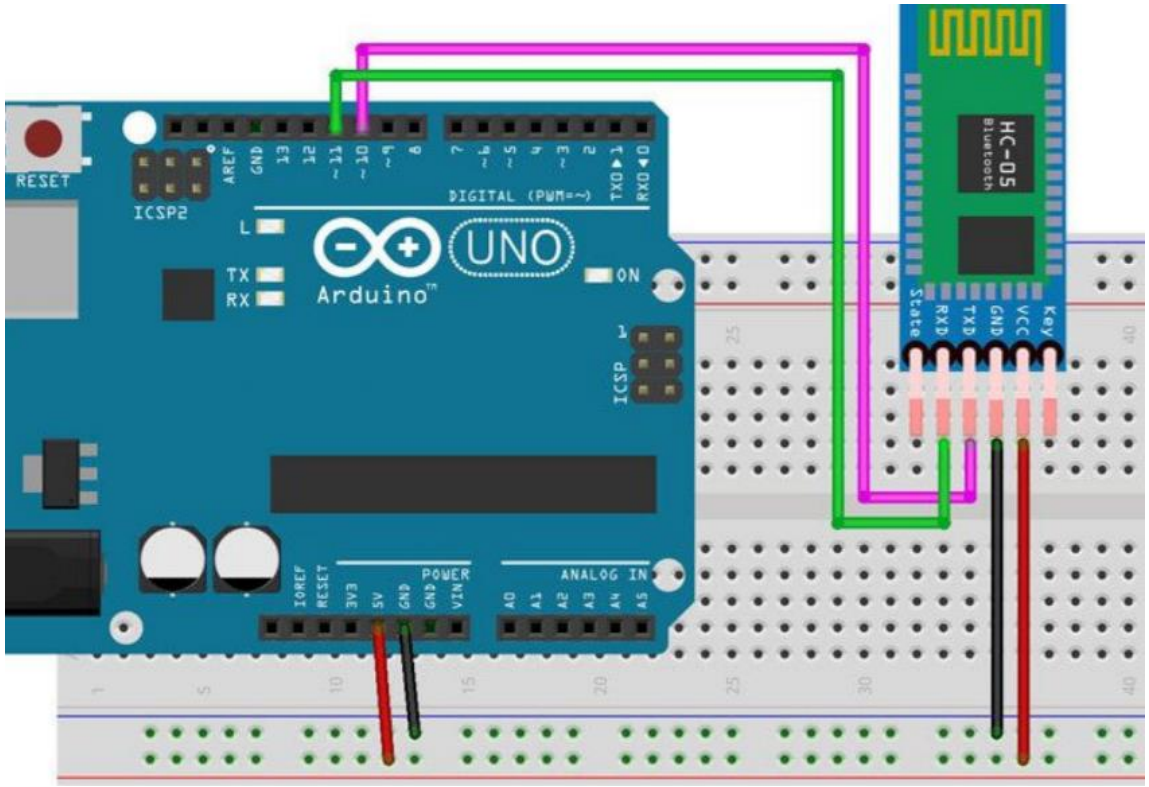
Bleutooth

•HC-05 works on serial communication. The Android app is designed to send serial data to the Arduino Bluetooth module when a button is pressed on the app.

•HC-05 at the other end receives the data and sends it to the Arduino through the TX pin of the Bluetooth module (connected to RX pin of Arduino).



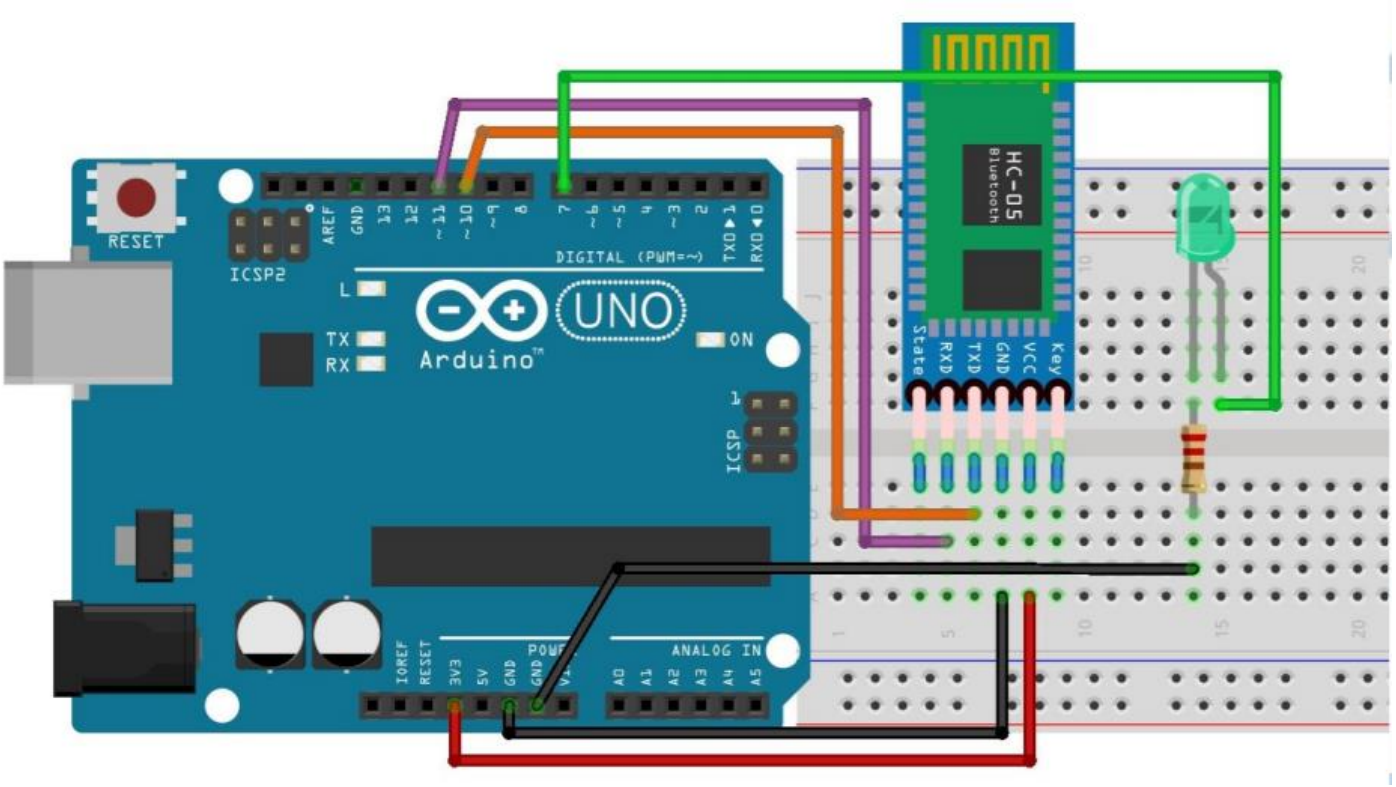
Circuit


RESET
ICSP2
AREF
GND
DIGITAL (PWM=~)
TXD
RXD
L
TX
RX
UNO
Arduino
ON
ICSP
POWER
ANALOG IN
IOREF
RESET
3V3
5V
GND
GND
VIN
A0
A1
A2
A3
A4
A5
HC-05
Bluetooth
State
RXD
TXD
GND
VCC
Key

Code

```
#include <SoftwareSerial.h>     //include the SoftwareSerial library

SoftwareSerial Bluetooth(10, 11);    // (RX, TX), our new RX is in pin 10 and our new TX is in pin 11
char pc,phone;

void setup() {
  Serial.begin(9600);           //initialize the serial at the baud rate of 9600
  Bluetooth.begin(9600);        //initialize the bluetooth's serial at the baud rate of 9600
}

void loop() {
  while (Serial.available() > 0)      //check if Serial Monitor is receiving something
  {
    pc = Serial.read();               //read the value received from the serial
    Bluetooth.println(pc);            //send the value by bluetooth's serial
  }


  while (Bluetooth.available() > 0)   //check if Bluetooth's Serial is receiving something
  {
    phone = Bluetooth.read();         //read the value received from the bluetooth
    Serial.println(phone);            //send the value by Serial Monitor
  }

}
```

Example 2


RESET
ICSP2
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM=~)
L
TX
RX
UNO
Arduino™
ON
ICSP
POWER
ANALOG IN
IOREF
RESET
3V3
5V
GND
GND
Vin
A0
A1
A2
A3
A4
A5
HC-05
Bluetooth
State
RXD
TXD
GND
VCC
Key

Code

```
#include <SoftwareSerial.h>                //include the SoftwareSerial library
SoftwareSerial Bluetooth(10, 11);      // (RX, TX), our new RX is in pin 10 and our new TX is in pin 11
char phone;

void setup() {
  Serial.begin(9600);          //initialize the serial at the baud rate of 9600
  Bluetooth.begin(9600);       //initialize the bluetooth's serial at the baud rate of 9600
  pinMode(7,OUTPUT);           //initialize the pin 7 as output
}

void loop() {
  while (Bluetooth.available() > 0)    //check if Bluetooth's Serial is receiving something
  {
    phone = Bluetooth.read();        //read the value received from the bluetooth
    Serial.println(phone);           //send the value by Serial Monitor
    if (phone == 'y')                //check if the data received is the character 'y'
    {
      digitalWrite(7,HIGH);          //if it's true the pin 7 will turn on (high)
      Serial.println("LED ON");      //printing the string "LED ON" in Serial Monitor
    }
    else if (phone == 'z')           //check if the data received is the character 'z'
    {
      digitalWrite(7,LOW);           //if it's true the pin 7 will turn on (high)
      Serial.println("LED OFF");     // printing the string "LED OFF" in Serial Monitor
    }
  }
}
```

That’s it!

@electro.sc

https://github.com/electro-sc/Arduino-Bootcamp-2023

Thanks!