Electronic Basics #4: Arduino+Bluetooth+Android=Awesome

Note on Bluetooth Module for Arduino (HC-05 & HC-06)

A **Bluetooth module** enables wireless communication between an **Arduino** and other devices like smartphones, computers, or other microcontrollers. The **HC-05** and **HC-06** are the most commonly used Bluetooth modules in Arduino projects.

- **HC-05**: Can work as both **Master** (initiates connections) and **Slave** (responds to connections).
- **HC-06**: Works only as a **Slave** (can only be connected to, not initiate connections).

Structure and Pin Description of HC-05/HC-06 Module

Pin Name	Function
VCC	Connects to **5V** (Some modules require **3.3V**)
GND	Ground connection
TXD	Transmit data (Sends data to Arduino)
RXD	Receive data (Receives data from Arduino)
State	Indicates if the module is connected
EN/KEY	Used to configure the module (HC-05 only)

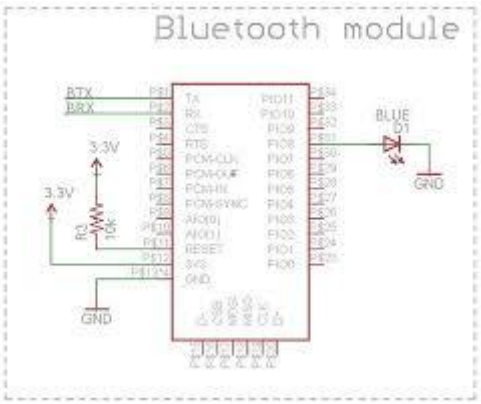

Fig4.1: Bluetooth Module Schematic Diagram

Voltage Considerations

Receiving Voltage from Arduino (Arduino → Bluetooth RXD)

- The **HC-05/HC-06 RXD pin operates at 3.3V** and is **not** directly compatible with Arduino's **5V logic**.

- Use a **voltage divider** (two resistors) or a **logic level shifter** to step down Arduino's 5V TX signal to 3.3V.

Sending Voltage to Arduino (Bluetooth TXD → Arduino)

- The **TXD pin of the Bluetooth module outputs 3.3V**.
- This is **safely read by the Arduino**, as **Arduino's RX pin is 5V tolerant** (for most boards).

Connecting HC-05/HC-06 to Arduino

Bluetooth Module	Arduino
VCC	**5V**
GND	**GND**
TXD	**Arduino RX (Pin 10 in SoftwareSerial)**
RXD	**Arduino TX (Pin 11 via voltage divider)**

Note: The SoftwareSerial library is used because Arduino's default serial pins (0,1) are used for programming and debugging.

Arduino Code for Controlling LED via Bluetooth

This code allows an Arduino to turn an **LED ON/OFF** using a **smartphone app** via Bluetooth.

```
#include <SoftwareSerial.h>

// Define SoftwareSerial Pins for Bluetooth
SoftwareSerial BTSerial(10, 11); // RX, TX

const int ledPin = 7; // LED connected to pin 7

void setup() {
  pinMode(ledPin, OUTPUT);
  BTSerial.begin(9600);  // Start Bluetooth communication
  Serial.begin(9600);    // Start serial monitor
}

void loop() {
```

```
  if (BTSerial.available()) {  // If data is received
    char command = BTSerial.read(); // Read the received character

    if (command == '1') {
      digitalWrite(ledPin, HIGH); // Turn LED ON
      Serial.println("LED ON");
    } else if (command == '0') {
      digitalWrite(ledPin, LOW); // Turn LED OFF
      Serial.println("LED OFF");
    }
  }
}
```

How to Control Bluetooth Using a Phone App

1. **Install a Bluetooth Terminal App** (e.g., "Bluetooth Terminal HC-05" or "Serial Bluetooth Terminal" from Play Store).
2. **Pair the HC-05/HC-06 Module** with your phone:
    - Open Bluetooth settings on your phone.
    - Scan for available devices and connect to **HC-05** (default PIN: **1234** or **0000**).
3. **Open the Bluetooth Terminal App** and connect to the HC-05.
4. **Send Commands to Control the LED:**
    - Send **1** → LED **ON**
    - Send **0** → LED **OFF**

Conclusion

The **HC-05 and HC-06 Bluetooth modules** provide a simple way to enable **wireless communication** between an **Arduino and a smartphone**. They are ideal for projects like **home automation, robotics, and remote control systems**. By using a **Bluetooth terminal app**, we can easily send commands to an Arduino to perform various tasks.