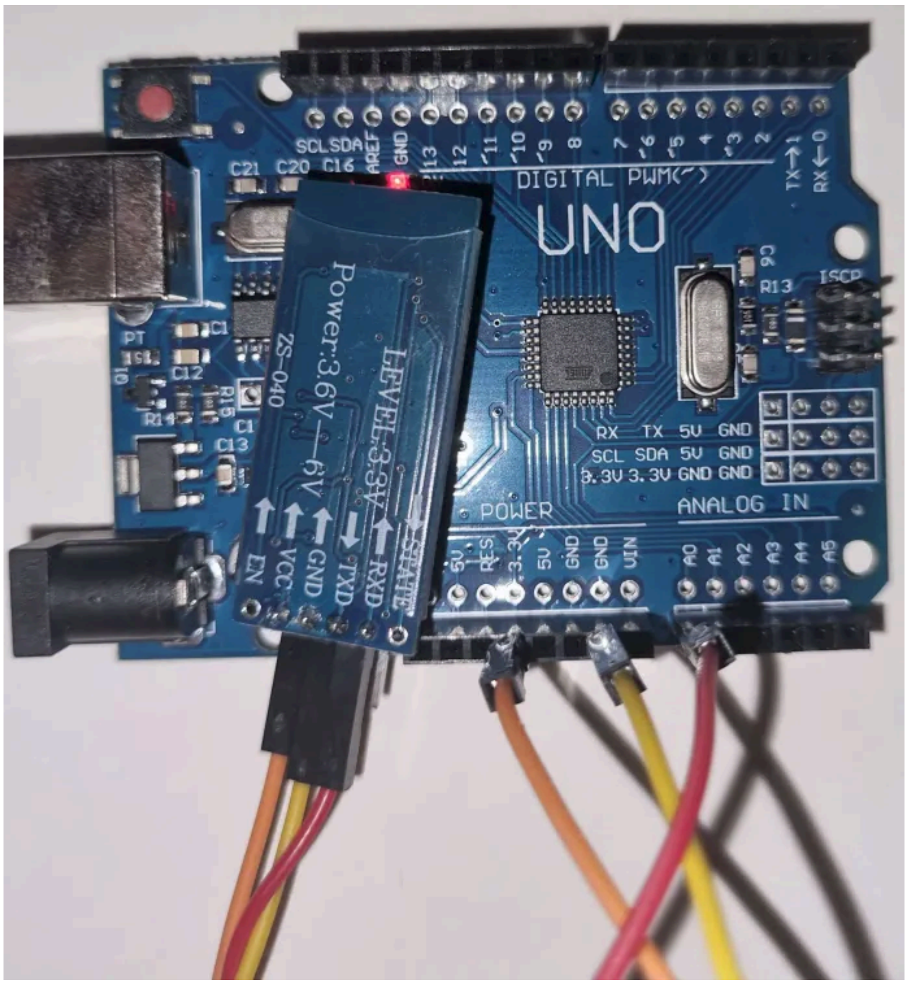
Bluetooth communicating with Arduino

Bluetooth devices are either master or slave devices. Master devices can establish connections to other devices, while slave devices can only accept connections from master devices. Wireless earphones are slave devices as they only broadcast their availability, while the smartphone acts as the master device which establishes the required connection. HC-06 is a slave only bluetooth module, and therefore needs a master device to connect to it.
For our purposes we will have the HC-06 establish a connection with your smartphone. You will send commands to the HC-06 bluetooth module via a wireless connection, then the HC-06 will relay that command over to the arduino via a wired connection.



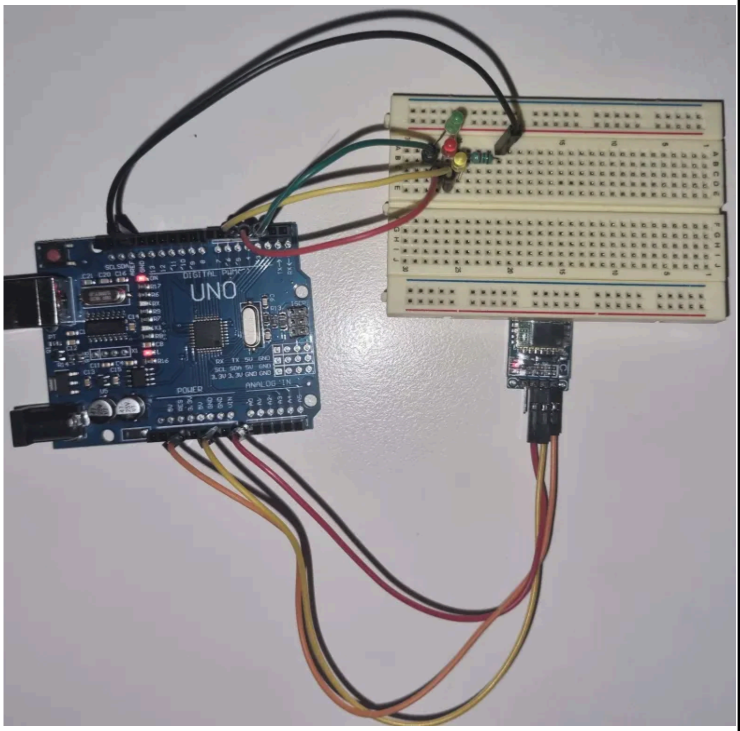
EN	VCC (3.3V)	GND (0V)	TXD	RXD	STATE
Mode - either master or slave. Internally set to slave mode so there is no pin for us to access.	Powers the module.	Powers the module.	Data is transmitted to the arduino from the HC-06. Once the HC-06 receives data from the master device it will relay it to this pin.	Data that the HC-06 receives from the arduino. This pin is not used as the arduino will not talk to the master device.	Flashing LED if not connected to any master device. Stable LED if connection established.

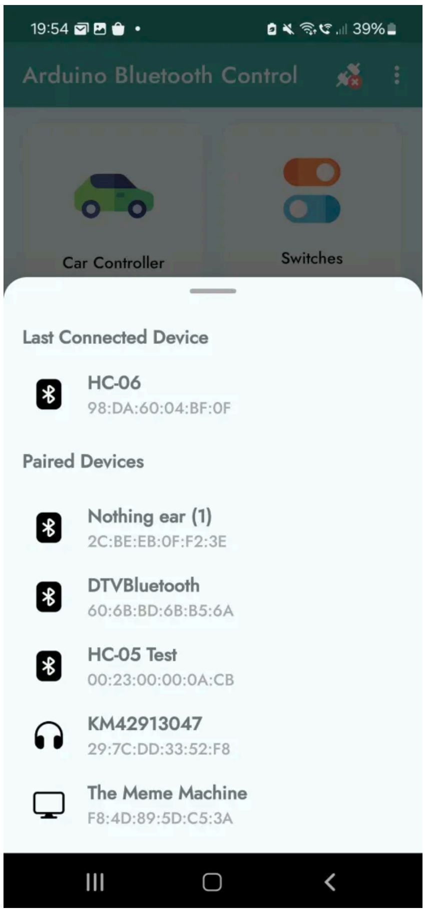
Using your phone as a controller

Android apps to connect to HC-06 (some apps don't work with this module)

- We will use this to play with the terminal and switches function https://play.google.com/store/apps/details?id=com.giristudio.hc05.bluetooth.arduino.control
- Use this one for a virtual controller https://play.google.com/store/apps/details?id=com.giristuido.bluetooth.car.controller

Note down your MAC address, in this case 98:DA:60:04:BF:0F, because you cannot change the name of the HC-06 (other models such as the HM-10 you can). Make sure you add a resistor in series with the LEDs (anything 220Ω or larger is fine) and attach the jumper wire from the arduino to the long leg of the LED, that is the positive terminal.





Last Connected Device

HC-06
98:DA:60:04:BF:0F

Paired Devices

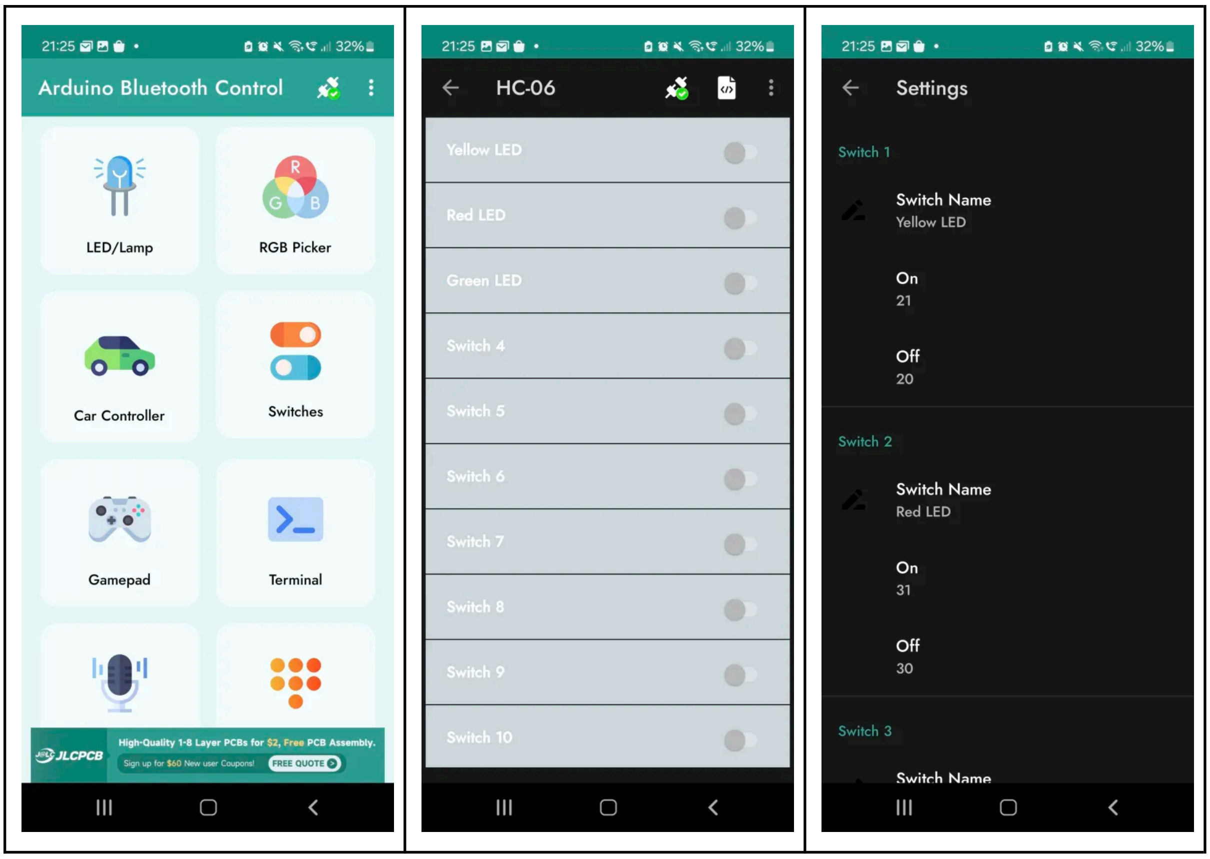
Nothing ear (1)
2C:BE:EB:0F:F2:3E

DTVBluetooth
60:6B:BD:6B:B5:6A

HC-05 Test
00:23:00:00:0A:CB

KM42913047
29:7C:DD:33:52:F8

The Meme Machine
F8:4D:89:5D:C5:3A



Settings

Switch 1

Switch Name
Yellow LED

On
21

Off
20

Switch 2

Switch Name
Red LED

On
31

Off
30

Switch 3

Switch Name

```
C/C++
#include <SoftwareSerial.h>

#define RXD A0
SoftwareSerial BTSerial (RXD,RXD);
String data = "";

#define YELLOW_LED_PIN 2
#define RED_LED_PIN 3
#define GREEN_LED_PIN 4

void LED(int command){
 switch (command) {

     case 20:
       digitalWrite(YELLOW_LED_PIN, LOW);
       break;

     case 21:
       digitalWrite(YELLOW_LED_PIN, HIGH);
       break;

     case 30:
       digitalWrite(RED_LED_PIN, LOW);
```

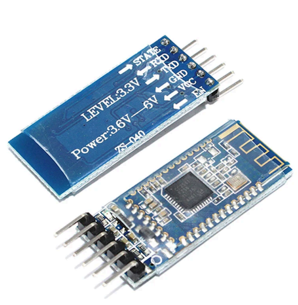
```
        break;

      case 31:
        digitalWrite(RED_LED_PIN, HIGH);
        break;

      case 40:
        digitalWrite(GREEN_LED_PIN, LOW);
        break;

      case 41:
        digitalWrite(GREEN_LED_PIN, HIGH);
        break;

      default:
        break;
    }
}

void  setup() {
 //Setting up serial monitor and bluetooth serial
 Serial.begin(9600);
 BTSerial.begin(9600);

 // Setting up LED pins
 pinMode(YELLOW_LED_PIN, OUTPUT);
 pinMode(RED_LED_PIN, OUTPUT);
 pinMode(GREEN_LED_PIN, OUTPUT);
}

void loop() {
 // this is where we will store the command from the bluetooth module
 int bt_data = 0;
  while (BTSerial.available()){
     // BTSerial.read() reads ascii values one by one from the bluetooth
buffer as an integer according to https://www.ascii-code.com/
     char c = BTSerial.read();
     bt_data = bt_data * 10 + (c - '0');
     delay(1);  // required for stabiltty
 }
  LED(bt_data);
}
```

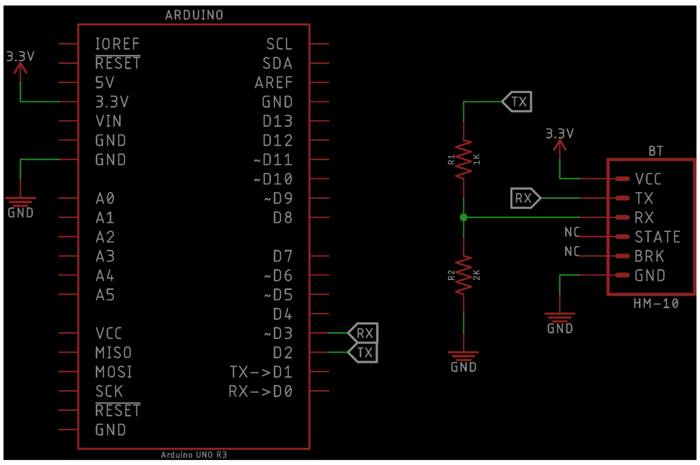
HM-10 as Master or Slave communication

Establishing a connection

The HM-10 is an alternative which can act as both a master device - one which can transmit data, or a slave device - one which receives the data. Since this module has more functionality AT commands are required for configuration. It is possible to make an arduino based controller, reading inputs from the GPIO pins and transmitting those commands to the HM-10 module to a slave device (Note this will not work between HM-10 and HC-06 as they use different different bluetooth technologies but between two HM-10 modules is possible).

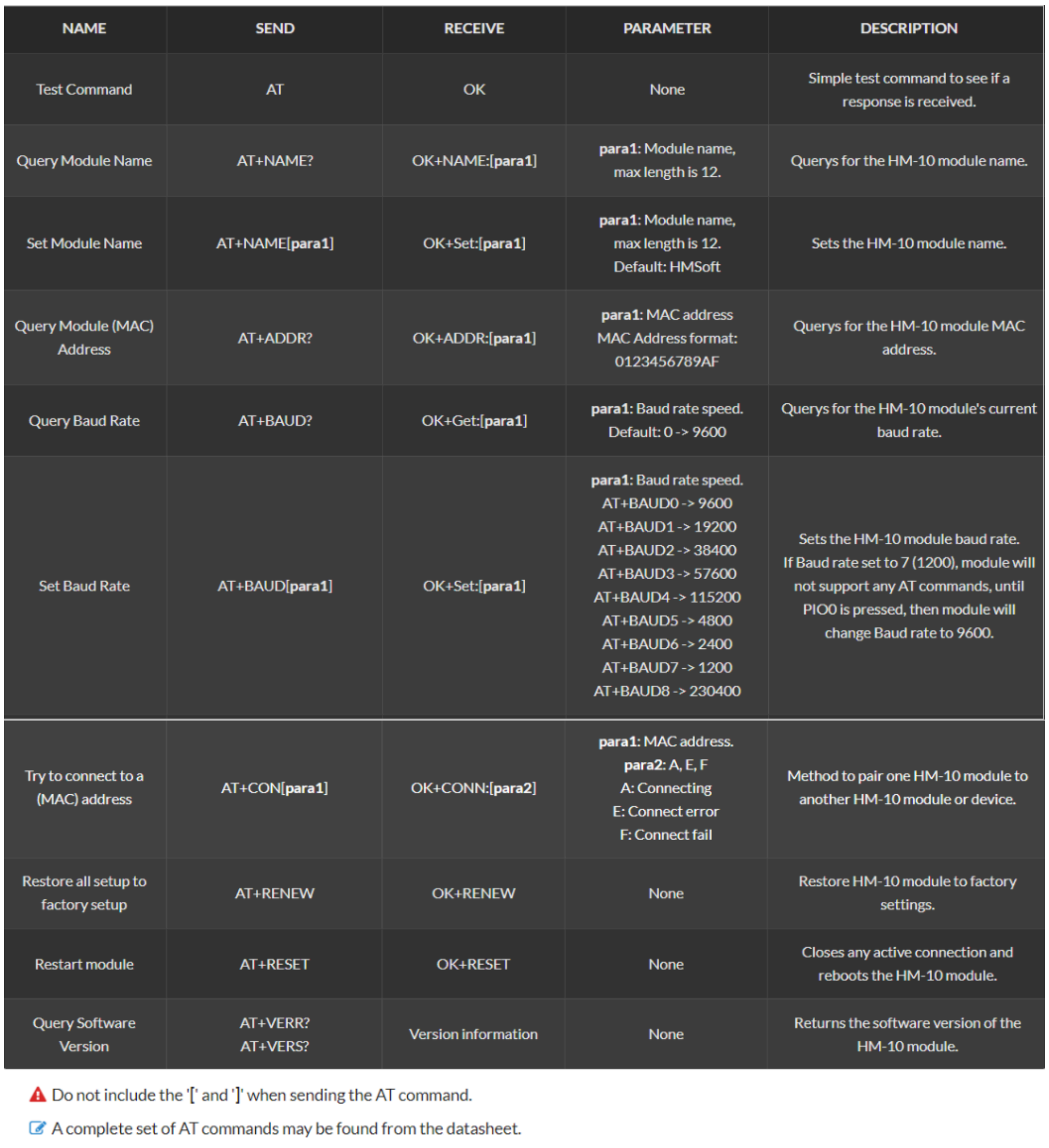
EN	VCC	GND (0V)	TXD	RXD	STATE
Set high to enable module	3.6-6v	Common Ground	Serial UART transmit	Serial UART receive. Ensure that the voltage divider is implemented.	High when connected, Low when not connected





AT commands will be used to communicate and interfere with these modules, so we can connect the bluetooth module to your phone app using Bluetooth connection. Here is a

```
script that you can run for interfacing with the HM10 bluetooth module via Arduino.
```



NAME	SEND	RECEIVE	PARAMETER	DESCRIPTION
Test Command	AT	OK	None	Simple test command to see if a response is received.
Query Module Name	AT+NAME?	OK+NAME:[**para1**]	**para1**: Module name, max length is 12.	Querys for the HM-10 module name.
Set Module Name	AT+NAME[**para1**]	OK+Set:[**para1**]	**para1**: Module name, max length is 12. Default: HMSoft	Sets the HM-10 module name.
Query Module (MAC) Address	AT+ADDR?	OK+ADDR:[**para1**]	**para1**: MAC address MAC Address format: 0123456789AF	Querys for the HM-10 module MAC address.
Query Baud Rate	AT+BAUD?	OK+Get:[**para1**]	**para1**: Baud rate speed. Default: 0 -> 9600	Querys for the HM-10 module's current baud rate.
Set Baud Rate	AT+BAUD[**para1**]	OK+Set:[**para1**]	**para1**: Baud rate speed. AT+BAUD0 -> 9600 AT+BAUD1 -> 19200 AT+BAUD2 -> 38400 AT+BAUD3 -> 57600 AT+BAUD4 -> 115200 AT+BAUD5 -> 4800 AT+BAUD6 -> 2400 AT+BAUD7 -> 1200 AT+BAUD8 -> 230400	Sets the HM-10 module baud rate. If Baud rate set to 7 (1200), module will not support any AT commands, until PIO0 is pressed, then module will change Baud rate to 9600.
Try to connect to a (MAC) address	AT+CON[**para1**]	OK+CONN:[**para2**]	**para1**: MAC address. **para2**: A, E, F A: Connecting E: Connect error F: Connect fail	Method to pair one HM-10 module to another HM-10 module or device.
Restore all setup to factory setup	AT+RENEW	OK+RENEW	None	Restore HM-10 module to factory settings.
Restart module	AT+RESET	OK+RESET	None	Closes any active connection and reboots the HM-10 module.
Query Software Version	AT+VERR? AT+VERS?	Version information	None	Returns the software version of the HM-10 module.

⚠ Do not include the '[' and ']' when sending the AT command.

A complete set of AT commands may be found from the datasheet.

C/C++

```
#include <SoftwareSerial.h>
SoftwareSerial mySerial(7, 8); // RX, TX
// HM10         Arduino Uno
// TXD          Pin 2
// RXD          Pin 3
void setup() {
 // You may need to change baud rate if it has previously been set to
another value
 Serial.begin(9600);
 BTSerial.begin(9600);
}
```

```
void loop() {
 char c;
 // Transmitting to HM-10 via serial communication
 if (Serial.available()) {
   c = Serial.read();
   BTSerial.print(c);
 }
 // Receiving from HM-10
 if (BTSerial.available()) {
   c = BTSerial.read();
   Serial.print(c);
 }
}
```

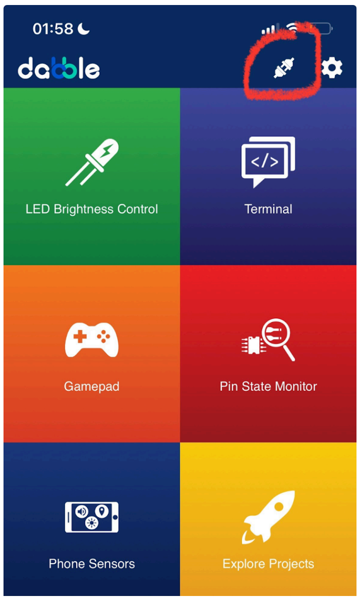
Explore the following query commands in the serial monitor (remember to set the baud rate of the serial monitor to 9600):

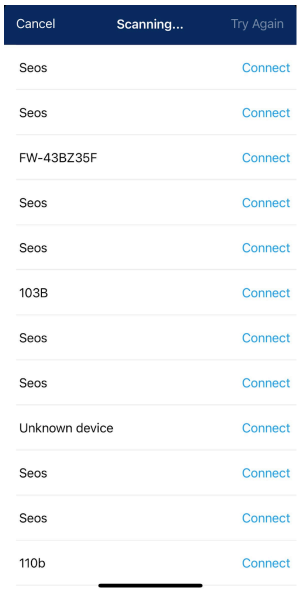
- AT
- AT+NAME?
  - device name, by default it is HMSoft.
  - You should change it so we don't have 32 HMSoft to be detected…
  - When you change this name it is saved even if the power is lost.
- AT+IMME0
  - 0 for configuration mode, 1 for control mode.
  - 0 because we still have more things to set
- AT+ROLE0
  - A *role* of 0 implies a *slave* (*peripheral*) role, meaning receiving information.
  - A *role* of 1 implies a *master* (*central*) role, meaning sending information.
- AT+ADVI5
  - how frequently the sensor advertises its presence
  - you don't really need to care about this, just type it in for setting up Bluetooth
- AT+RESET
  - set the above setting to the Bluetooth

If you get stuck, ask for help !

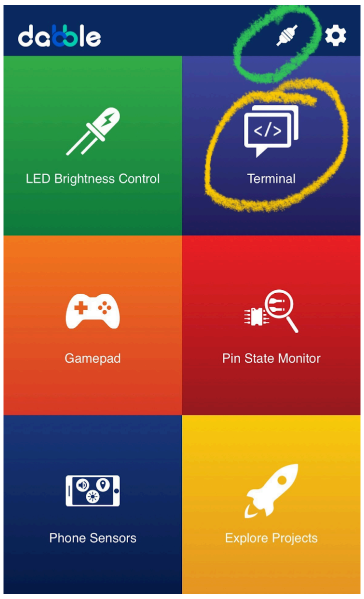
Apple and android apps to connect to HM-10

- https://apps.apple.com/au/app/dabble-bluetooth-controller/id1472734455
- https://play.google.com/store/apps/details?id=io.dabbleapp&gl=au




Cancel Scanning... Try Again

Seos	Connect
Seos	Connect
FW-43BZ35F	Connect
Seos	Connect
Seos	Connect
103B	Connect
Seos	Connect
Seos	Connect
Unknown device	Connect
Seos	Connect
Seos	Connect
110b	Connect



Instructions on how to use the gamepad are in this link.
If you would like to watch a YouTube video about Dabble click on this link.

Activity: Controlling LEDs

Your task is to connect three different LEDs to the arduino that is receiving data and glowing the LED based on the data received.
Say, the number received is “1”, LED number 1 should glow, while all others are dimmed.
When the number “3” is received, LED number 3 should glow, while all others are dimmed.

That’s it ! Try playing around.
Look at the additional resources if you want to delve deeper!