

Interfacing LED. :-

LED: Two Terminal semiconductor.

Anode (+).

Cathode (-).

use resistor with LED.

(resistor limits the current flowing through LED).

use 100Ω to $10K\Omega$.

- use 150Ω resistor

Component Requirement:

Arduino Uno

5mm LED

150Ω resistor

Jumper Cable

Breadboard

Step by Step

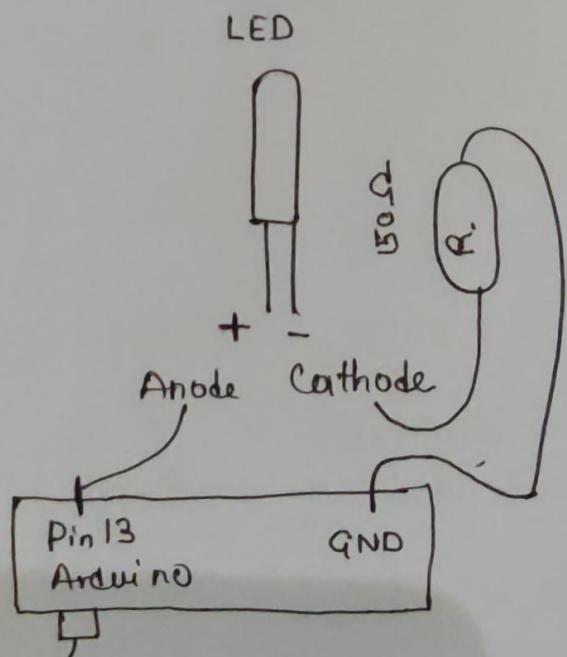
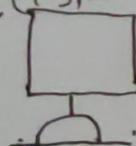
void setup ()

```
{ pinMode(13, OUTPUT)  
}
```

void loop()

```
{ digitalWrite(13, HIGH);  
delay(1000);  
digitalWrite(13, LOW);
```

```
}
```



Button:

Turn on and off LED with a push Button.

Arduino Uno

PushButton

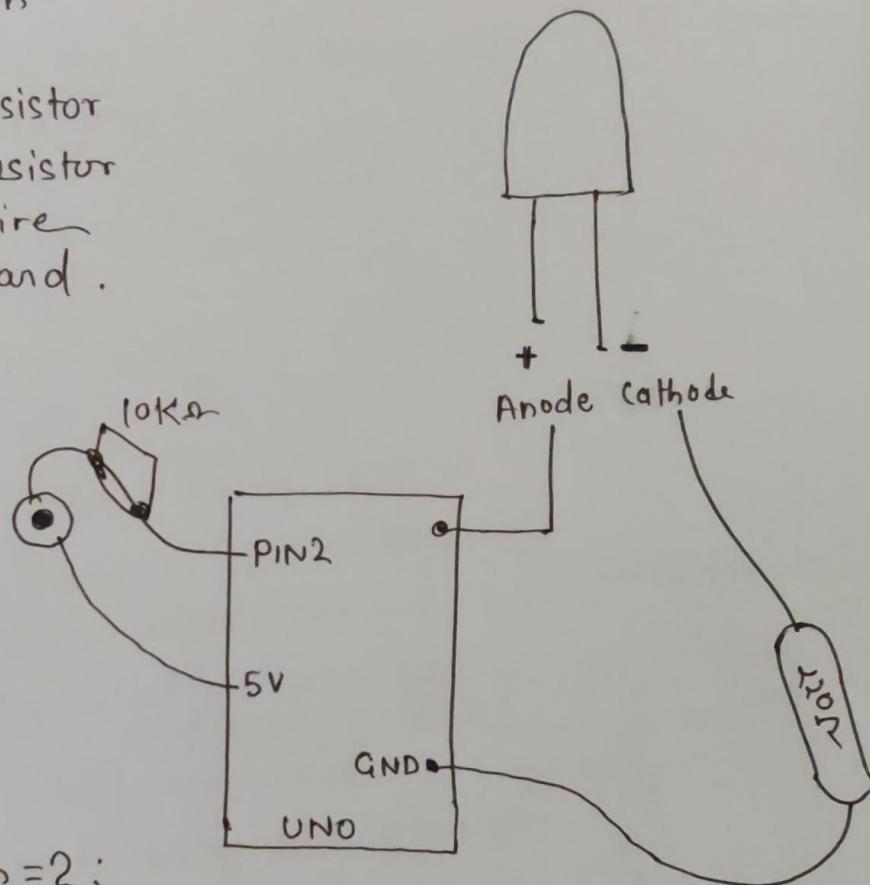
LED

10K Ω Resistor

220 Ω Resistor

Jumper wire

Breadboard .



```
int buttonPin=2;
int ledPin =13;
int buttonState=0;
Void setup()
{
    Serial.begin(9600);
    pinMode(ledPin,OUTPUT);
    pinMode(buttonPin,INPUT);
}
Void loop()
{
    buttonState=digitalRead(buttonPin);
    Serial.println(buttonState);
    if(buttonState==HIGH)
    {
        digitalWrite(ledPin,HIGH);
    }
    else
    {
        digitalWrite(ledPin,LOW);
    }
    delay(1000);
}
```

Display the Data on LCD

Interface a LCD with Arduino to provide UI.

16x2 LCD is commonly used LCD display.
(It can display 32 characters in 2 Lines.
(It has 16 pins)

Command Register,

Data Register.

Pin 1 (V_{ss}) - ground Pin of LCD

Pin 2 (V_{cc}) - Power to LCD (+5V)

Pin 3 - Contrast adjustment — 10kΩ potentiometer

Pin 4 (^(RS)_{RS}) Register Select pin JHD162A.
comm register / data

Pin 5 - R/W - Read / write modes

Pin 6 (E) — Enabling LCD module

Pin 7
Pin 8 — DBO Data Pin.

Pin 9

Pin 10

Pin 11

Pin 12

Pin 13

Pin 14 — DB7 back light LED anode

Pin 15 — (LED+) back light LED cathode.

Component.

—Arduino

LCD

pin headers to solder to LCD display pins.

10 k Ω potentiometer

220 Ω resistor.

hook-up wires

Step by Step:

Connect LCD RS pin to digital pin 12.

Connect LCD Enable pin to digital pin 11

Connect LCD D4 pin to digital pin 5

Connect LCD D5 pin to digital pin 4

Connect LCD D6 pin to digital pin 3

Connect LCD D7 pin to digital pin 2

Connect wire a 10K pot to +5V & GND,
with its wiper(O/P) to LCD screen Vo pin (Pin 3)

220 Ω resistor is used to power backlight of display,
usually on pin 15 & 16 of LCD connector.

```
#include <LiquidCrystal.h> // add library
LiquidCrystal lcd(12, 11, 5, 4, 3, 2); // Arduino pin numbers.

void setup()
{
    lcd.begin(16, 2) // specify screen size of LCD (16,2)
    lcd.print("svinfotech");
}

void loop()
{
    lcd.setCursor(0, 1) // move the cursor
    lcd.print(millis() / 1000);
}
```

Create a Simple function to add two numbers :

```
void setup() {  
    Serial.begin(9600);  
}  
  
void loop() {  
    int val1=10;  
    int val2=20;  
    int total;  
  
    total = sum(val1, val2);  
    Serial.println(total);  
    delay(500);  
}  
  
int sum(int a, int b) {  
    int result;  
    result = a+b;  
    return result;  
}
```

Another Example:

It will read a sensor 5 times with analogRead()
4 calculate the average of five readings.

```
int ReadSens_and_Condition() {  
    int i;  
    int sval=0;  
    for(i=0; i<5; i++) {  
        sval = sval + analogRead(0);  
    }  
    sval = sval / 5;  
    sval = sval / 4;  
    sval = 255 - sval;  
    return sval;  
}
```

Print "Himanshu Singh" to the LCD

Component Required :

Arduino

LCD

pin headers to solder to the LCD display pins

10.KΩ potentiometer

220Ω resistor

hook up wires

breadboard

Step by Step Procedure

- 1 Connect LCD RS pin Pin4 to digital pin 12.
- 2 Connect LCD Enable pin Pin6 to digital pin 11.
- 3 Connect LCD D4 pin to digital pin 5.
- 4 Connect LCD DS pin to digital pin 4
- 5 Connect LCD D6 pin to digital Pin3
- 6 Connect LCD D7 Pin to digital pin 2

- 7 Conned wire a 10K pot to +5V and GND, with its wiper (output) to LCD Screens V_O pin (pin3)
- 8 A 220Ω resistor is used to power the backlight of display, usually on pin15 & 16 of LCD connector.

```
#include <LiquidCrystal.h>
```

```
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
```

initialize lcd object followed by pin number.

```
void setup()
```

```
{
```

```
lcd.begin(16, 2);
```

Screen Size
column row.

Don't need to set pin modes because they are auto configured.

```
lcd.print("Himanshu Singh");
```

```
// lcd.write("Himanshu Singh");
```

```
}
```

```
void loop()
```

```
{
```

```
lcd.setCursor(0, 1);
```

To move the cursor
x is horizontal position

```
lcd.print(millis() / 1000);
```

```
}
```

16x2 LCD

x is from 0 to 15

y is 0 to 1

Interfacing HC-05 (Bluetooth module) :

- ✓ HC05 is a bluetooth SPP (Serial port, protocol) module
- ✓ It communicates with Arduino via, serial communication.
- ✓ wireless communication
- ✓ used for WL mouse / keyboard / headset / game controllers
- ✓ Range upto < 100m normal < 5m
- ✓ HC05 has red LED which indicates connection status
 - Continuous Blink — not connected
 - Slowed blinking — (2 sec) — connected
- ✓ HC05 module works on 3.3V
- ✓ This module can be used in a master or slave configuration
- ✓ It communicates with microcontroller using serial Port (USART)
- ✓ It is IEEE 802.15.1 protocol — we can build wireless PAN.
- ✓ It uses frequency-hopping spread spectrum (FHSS) radio technology to send data over Air

HC-05 has 6 pins.

(EN Pin) :

HC-05 has two modes

+ Data mode — Exchange of data b/w devices .

Command mode — qt uses AT Commands which are used to change setting of HC-05

To send these commands to module serial(USART) port is used .

EN pin
High — Command mode .
Low (default mode) — Data mode .

Vcc Connect 5V or 3.3V to this pin .

GND : Ground pin of module .

TXD : Transmit Serial data (wirelessly received data by BT module transmitted out serially on TXD pin .)

RXD : Receive data Serially

State : it tells whether module is connected or not .

Component Required :

Arduino Uno

HC-05

LED

jumper wire

Android phone

Breadboard

Arduino Bluetooth Control (Android Application)

Step by Step :

Procedure :

Step 1 : Connect a LED cathode \ominus to GND of Arduino
anode \oplus to pin 13 \rightarrow with a resistor
 220Ω to $1K\Omega$

Step 2 :
✓ Ground of HC-05 to Ground of Arduino

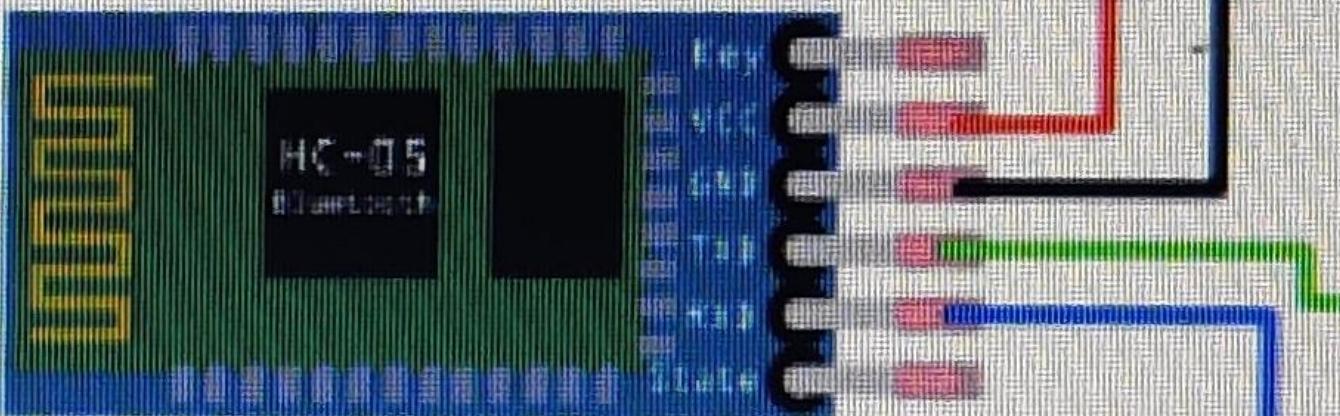
Power of HC-05 to 3.3V of Arduino.

TX of HC-05 to RX of Arduino.

RX of HC-05 to TX of Arduino.

```
void setup()
{
    pinMode(13, OUTPUT);
    Serial.begin(9600);
}

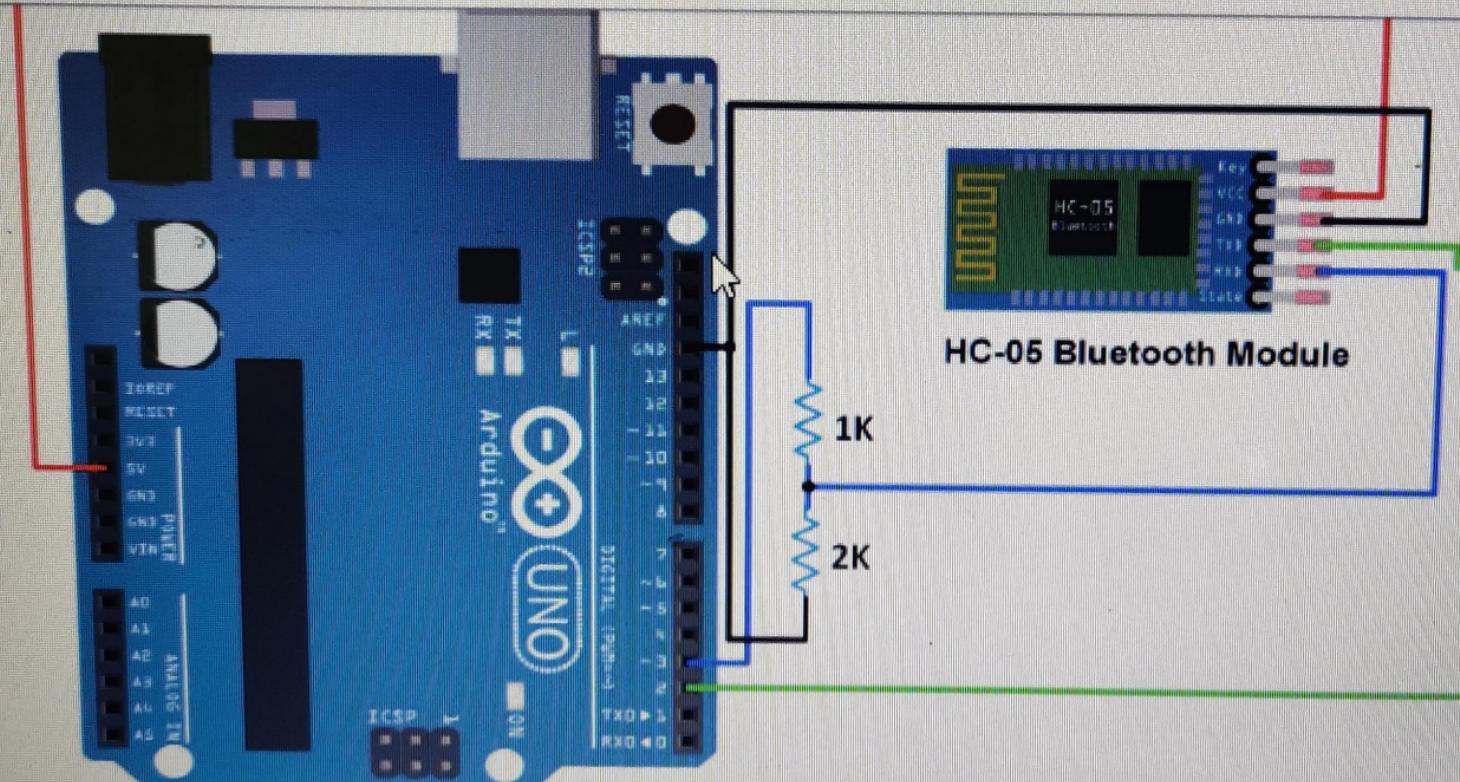
void loop()
{
    if (Serial.available() > 0)
    {
        char data = Serial.read();
        switch(data)
        {
            case 'a': digitalWrite(13, HIGH);
                        break;
            case 'b': digitalWrite(13, LOW);
                        break;
            default:   break;
        }
        delay(100);
    }
}
```



HC-05 Bluetooth Module

1K

2K



Interfacing HC-05 Bluetooth Module with Arduino UNO

