

Analog Design Through Arduino

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1 Interfacing of LCD with Arduino UNO.

- 1.1. Plug the LCD onto the Breadboard.
- 1.2. Connect the 5V pin of the Arduino to an extreme pin of the Breadboard.
- 1.3. Connect the GND pin of the Arduino to the opposite extreme pin of the Breadboard.
- 1.4. Connect the Arduino pins to LCD pins as per the table given below:

Arduino to LCD Connection	
Arduino Pins	LCD Pins
Pin D2	Pin D7
Pin D3	Pin D6
Pin D4	Pin D5
Pin D5	Pin D4
Pin 11	Pin 6
Pin 12	Pin 4
GND Pin	Pin 1 and Pin 5
5V Pin	Pin 2

- 1.5. The Potentiometer to LCD connection are given below:

Potentiometer to LCD Connection	
Potentiometer	LCD Pins
Middle Pin	Pin 3
Pin 1	Pin 2(V _{cc} Pin)
Pin 3	Pin 1(GND Pin)

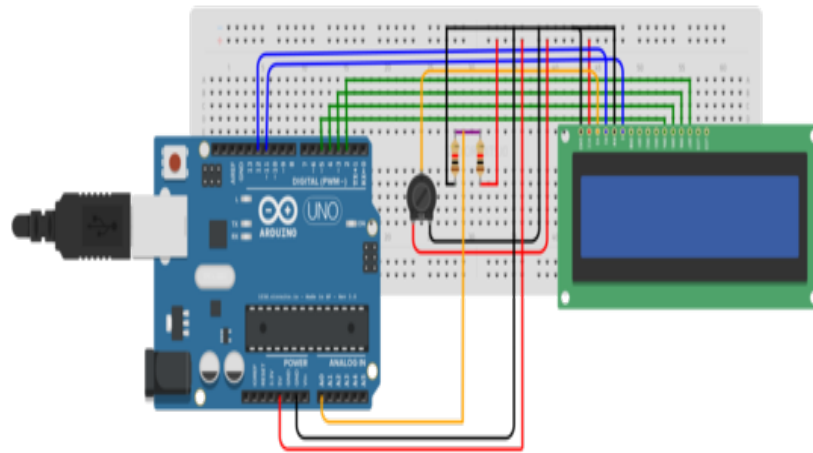


Figure 1: CIRCUIT DIAGRAM

2 Resistance Measurement Through Arduino

The resistance is an analogue function, but the value displayed on LCD is digital function. So, we need to do analogue to digital conversion. Arduino has built-in 10-bit analogue to digital converter. Two resistors are used, one of which is known resistor value and other is unknown resistor value.

- 2.1. Take 2 resistors, one known resistor with resistance value (For e.g. 1K, 2K, 10K), here we have taken 1K and another an unknown resistor whose value we are going to calculate.
- 2.2. Connect one end of known resistor (i.e. 1Kohm) to GND pin of Arduino and another end to the unknown resistor end.
- 2.3. Connect the other end of unknown resistor to 5V pin of Arduino.
- 2.3. Now, at the connection point of the 2 resistors, take a wire from the connection point and connect it to the A0 pin on the Arduino.

CODE:-

```
1 #include <LiquidCrystal.h>
2 LiquidCrystal lcd(12,11,5,4,3,2);
3 int analogPin=0;
4 int x=0;
5 float Vout=0;
6 float R=1000; //Known Resistor value in Ohm
7 float resistor=0;
8 float buffer=0;
9 void setup()
10 {
11   lcd.begin(16,2);
12   lcd.setCursor(0,0);
13   lcd.print("----OHM METER--");
14 }
15 void loop()
16 {
17   x=analogRead(analogPin);
18   buffer=x*5;
19   Vout=(buffer)/1024.0;
20   buffer=(5/Vout)-1;
21   resistor=R*buffer;
22   lcd.setCursor(0,1);
23   lcd.print("R = ");
24   lcd.print(resistor);
25   lcd.print(" Ohm");
26   delay(3000);
27 }
```

3 Explanation

- 3.1. We create a variable called analogPin and assign it to 0. This is because the voltage value we are going to read is connected to analogPin A0.
- 3.2. The 10-bit ADC can differentiate 1024 discrete voltage levels, 5 volt is applied to 2 resistors and the voltage sample is taken in between the resistors. The value which we get from analogPin can be between 0 and 1023. 0 would represent 0 volts falls across the unknown resistor. And a value of 1023 would mean that practically all 5 volts falls across the unknown resistor.
- 3.3. Vout represents the divided voltage that falls across the unknown resistor.
- 3.4. The Ohmmeter works on the principle of voltage dividing circuit.

$$V_{out} = (R1 / (R1 + R2)) * V_{in}$$

$$(i.e. V_{in} = 5V)$$

$$R2 = R1 * ((V_{in} / V_{out}) - 1)$$