Measuring Unkown Resistance Using ESP32

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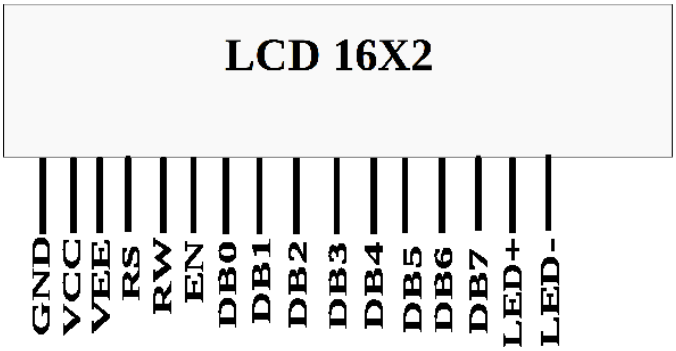

Fig. 2.1.1: lcd

***Abstract*—Through this manual, we learn how to measure an unknown resistance through ESP32 and display it on an LCD.**

1 Components

Component	Value	Quantity
Resistor	220 Ohm	1
	1K	1
ESP32	Devkit V1	1
Jumper Wires		20
Bread board		1
LCD	16 X 2	1
Potentiometer	10K	1

TABLE 1.1

2 Setting up the Display

2.1. Plug the LCD in Fig. 2.1.1 to the breadboard.

2.2. Connect the 220Ω resistance from V_{cc} to pin 15 (Led+) of the LCD.

2.3. Connect the ESP32 pins to LCD pins as per Table 2.3.1.

2.4. Execute the following code

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ESP32	LCD Pins	LCD Pin Label	LCD Pin Description
GND	1	GND	
5V	2	Vcc	
220Ω –GND	3	Vee	Contrast
GPIO 19	4	RS	Register Select
GND	5	R/W	Read/Write
GPIO 23	6	EN	Enable
GPIO 18	11	DB4	Serial Connection
GPIO 17	12	DB5	Serial Connection
GPIO 16	13	DB6	Serial Connection
GPIO 15	14	DB7	Serial Connection
5V	15	LED+	Backlight
GND	16	LED-	Backlight

TABLE 2.3.1

2.5. Execute the following code after editing the wifi credentials

```
https://github.com/gadepall/vaman/tree/master/esp32/codes/ide/lcd/setup
```

3 Measuring the resistance

3.1. Connect the 5V pin of the ESP32 to an extreme pin of the Breadboard shown in Fig. 3.1.1. Let this pin be V_{cc}.

3.2. Connect the GND pin of the ESP32 to the opposite extreme pin of the Breadboard.

3.3. Let R_1 be the known resistor and R_2 be the unknown resistor. Connect R_1 and R_2 in series such that R_1 is connected to V_{cc} and R_2 is connected to GND. Refer to Fig. 3.3.1

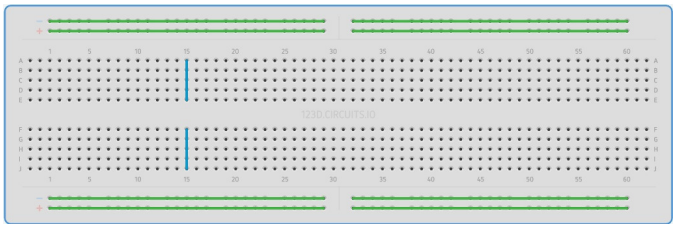

Fig. 3.1.1: Breadboard

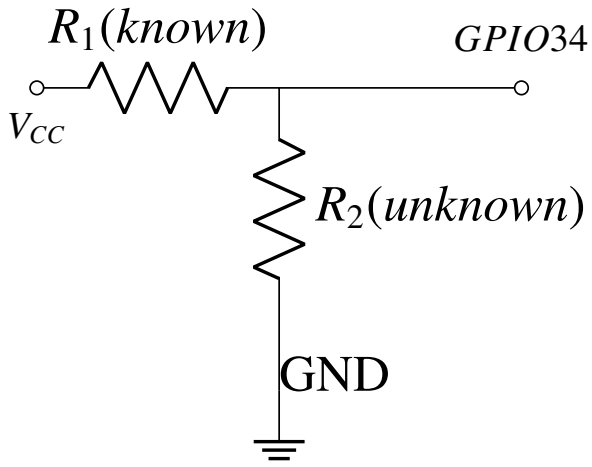

Fig. 3.3.1: Voltage Divider

3.4. Connect the junction between the two resistors to the GPIO34 pin on the ESP32.
3.5. Connect the ESP32 to the computer so that it is powered.
3.6. Execute the following code after editing the wifi credentials

```
https://github.com/gadepall/
    vaman/tree/master/esp32/
    codes/ide/lcd/resistance
```

4 Explanation

4.1. 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 GPIO34.
4.2. The 12-bit ADC can differentiate 4096 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 4095. 0 would represent 0 volts falls across the unknown resistor. A value of 4095 would mean that practically all 5 volts falls across the unknown resistor.
4.3. V_{out} represents the divided voltage that falls across the unknown resistor.
4.4. The Ohm meter in this manual works on the principle of the voltage divider shown in Fig. 3.3.1.

$$V_{out} = \frac{R_1}{R_1 + R_2} V_{in} \tag{4.4.1}$$

$$\Rightarrow R_2 = R_1 \left(\frac{V_{in}}{V_{out}} - 1 \right) \tag{4.4.2}$$

In the above, $V_{in} = 5\text{V}$, $R_1 = 220\Omega$.