

# Measuring Unknown Resistance Using ESP32

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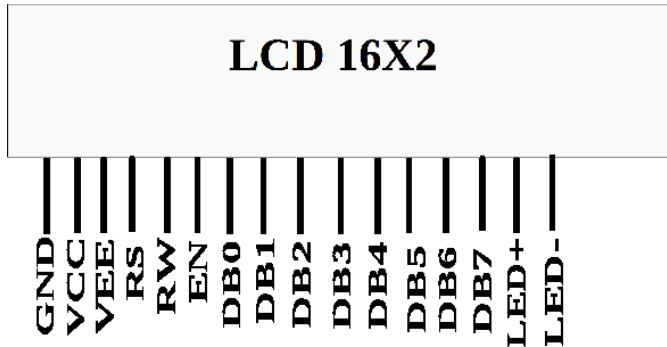


Fig. 2.1.1: lcd

**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 ESP32 pins to LCD pins as per Table 2.2.1. Make sure that all 5V sources are connected to the LCD through a 220  $\Omega$  resistance.
- 2.3. Execute the following code after editing the wifi credentials

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ESP32	LCD Pins	LCD Pin Label	LCD Pin Description
GND	1	GND	
5V	2	Vcc	
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 2.2.1: Make sure that all 5V sources are connected to the LCD through a 220  $\Omega$  resistance.

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

You should see the following message

```
Hi
This is CSP Lab
```

- 2.4. Modify the above code to display your name.

## 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.

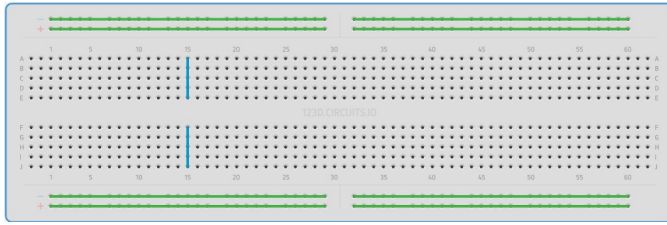


Fig. 3.1.1: Breadboard

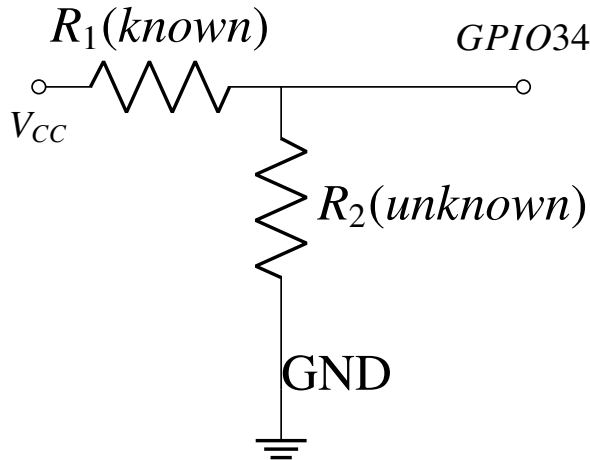


Fig. 3.3.1: Voltage Divider

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.

$$V_{out} = \frac{R_1}{R_1 + R_2} V_{in} \quad (4.4.1)$$

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

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

- 4.5. Repeat the exercise with another unknown resistance.

- 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
- 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