

Digital Voltmeter using Arduino

1. Introduction: This project demonstrates a simple digital voltmeter built using an Arduino and an LCD. It measures analog voltage input and displays the calculated voltage on the LCD screen.

2. Key Components:

- Arduino Uno
 - 16x2 LCD Display
 - 1 M Ω Resistor
 - 10 k Ω Resistor
 - Breadboard
 - Connecting Wires
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3. Working Principle:

- **Analog Signal Reading:** Arduino reads the analog voltage from pin A0.
 - **Voltage Divider:** A voltage divider circuit (using 1 M Ω and 10 k Ω resistors) steps down the input voltage.
 - **Voltage Calculation:**
 - The analog value is converted to voltage.
 - The actual input voltage is calculated considering the voltage divider ratio.
 - **Display:**
 - The calculated voltage is shown on the Serial Monitor.
 - Simultaneously, it is also displayed on the 16x2 LCD.
 - **Delay:**
 - The display updates every 1 second.
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4. Circuit Overview:

- A voltage divider is built using a 1 M Ω and a 10 k Ω resistor.
 - The divided voltage is fed to the Arduino analog pin A0.
 - The Arduino is connected to the LCD using digital pins 2, 3, 4, 5, 11, and 12.
 - Power is supplied to the Arduino, which also powers the LCD.
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5. Code:

```
/*      Code written by-
```

```
Fuad Hasan
```

```
BME, KUET    */
```

```
/*Digital Voltmeter using Arduino*/
```

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

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

```
float input_voltage = 0.0;
```

```
float temp = 0.0;
```

```
float r1 = 1000000.0; //1 M ohm
```

```
float r2 = 10000.0; //1k ohm
```

```
void setup()
```

```
{
```

```
  Serial.begin(9600);
```

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

```
  lcd.print("DIGITAL VOLTMETER ");
```

```

}

void loop()
{
    //Conversion formula for voltage
    float analog_value = analogRead(A0);
    temp = (analog_value * 5.0) / 1024.0;
    input_voltage= temp/(r2/(r2+r1));

    if (input_voltage < 0.1)
    {
        input_voltage = 0.0;
    }

    Serial.print("v = ");
    Serial.println(input_voltage);
    lcd.setCursor(0,1);
    lcd.print("Voltage= ");
    lcd.print(input_voltage);
    delay(1000);
}

```

6. Code Explanation:

- **Library Inclusion:**

- `#include<LiquidCrystal.h>`: Includes the LCD library to control the 16x2 LCD.

- **LCD Initialization:**

- LiquidCrystal lcd(12, 11, 5, 4, 3, 2);: Connects LCD pins to Arduino digital pins.
 - **Variable Declaration:**
 - input_voltage, temp: For storing voltage values.
 - r1, r2: Resistance values for voltage divider.
 - **Setup Function:**
 - Serial.begin(9600);: Starts serial communication at 9600 bps.
 - lcd.begin(16,2);: Initializes the LCD.
 - lcd.print(): Displays “DIGITAL VOLTMETER” initially.
 - **Loop Function:**
 - analogRead(A0);: Reads the analog voltage from pin A0.
 - temp = (analog_value * 5.0) / 1024.0;: Converts analog value to corresponding voltage.
 - input_voltage= temp/(r2/(r2+r1));: Adjusts voltage considering the voltage divider.
 - Conditional check for very small voltage values (<0.1V).
 - Serial.print() and Serial.println(): Displays voltage in Serial Monitor.
 - lcd.setCursor(0,1), lcd.print(): Displays the voltage on the LCD.
 - delay(1000);: Updates the display every 1 second.
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7. Conclusion: The project effectively shows how Arduino can be used to create a basic yet accurate digital voltmeter. It demonstrates fundamental concepts like analog-to-digital conversion, voltage division, and interfacing with an LCD for real-time display.

tuadhasanbme (Md. Fuad Hasa) x Circuit design Glorious Lappi-Bigery x

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