**Rain Monitoring Alert System**

**📘 Project Title:**

**Rain Alert System using Arduino Mega 2560 and HW-028 Rain Sensor**

**🎯 Objective:**

To design a rain detection system that provides a **visual (LED)** and **audible (buzzer)** alert for different rain conditions (No Rain, Light Rain, Heavy Rain), and displays the system status on an **I2C 16x2 LCD display**.

**🧰 Components Required:**

| **Component Name** | **Quantity** |
| --- | --- |
| Arduino Mega 2560 | 1 |
| HW-028 Rain Sensor | 1 |
| Red LED | 1 |
| Green LED | 1 |
| Buzzer (Active) | 1 |
| 16x2 I2C LCD Module | 1 |
| 220Ω Resistors | 2 |
| Breadboard + Wires | As needed |

**🔌 Wiring Table (Excel Format)**

**(**[**URL:-https://app.cirkitdesigner.com/project/00f88018-9143-43e8-8981-980a5ccbca44**](URL:-https://app.cirkitdesigner.com/project/00f88018-9143-43e8-8981-980a5ccbca44)**)**

| **Component Name** | **Pin No** | **Destination Component** | **Pin No** | **Special Remark** |
| --- | --- | --- | --- | --- |
| Rain Sensor (Analog) | AO | Arduino Mega | A0 | Analog output used |
| Red LED | Anode | Arduino Mega | D8 | Use 220Ω resistor |
| Green LED | Anode | Arduino Mega | D9 | Use 220Ω resistor |
| Buzzer | +ve | Arduino Mega | D10 | Active buzzer preferred |
| I2C LCD | SDA | Arduino Mega | SDA (Pin 20) | I2C Communication |
| I2C LCD | SCL | Arduino Mega | SCL (Pin 21) | I2C Communication |
| All GNDs | GND | Arduino Mega | GND | Common Ground |
| All VCCs | VCC | Arduino Mega | 5V | 5V Power |

**💾 Required Arduino Libraries:**

You’ll need this library:

* **LiquidCrystal\_I2C**

To install:

1. Open Arduino IDE.
2. Go to **Sketch → Include Library → Manage Libraries…**
3. Search for LiquidCrystal\_I2C
4. Install **by Frank de Brabander** (or compatible).

**🧠 System Behavior:**

| **Rain Sensor Reading** | **Rain Status** | **Green LED** | **Red LED** | **Buzzer** | **LCD Message** |
| --- | --- | --- | --- | --- | --- |
| >800 | No Rain | ON | OFF | OFF | Status: No Rain |
| 401–800 | Light Rain | Blinks | Blinks | OFF | Status: Light Rain |
| ≤400 | Heavy Rain | OFF | Blinks | Blinks | Status: Heavy Rain |

**🔁 Code with Explanation**

**✅ Full Arduino Code:**

#include <Wire.h>

#include <LiquidCrystal\_I2C.h>

// Define pins

#define rainPin A0

#define redLED 8

#define greenLED 9

#define buzzer 10

// Set up LCD: 0x27 is the default I2C address

LiquidCrystal\_I2C lcd(0x27, 16, 2);

void setup() {

pinMode(rainPin, INPUT);

pinMode(redLED, OUTPUT);

pinMode(greenLED, OUTPUT);

pinMode(buzzer, OUTPUT);

lcd.init(); // Initialize LCD

lcd.backlight(); // Turn on backlight

Serial.begin(9600); // Start Serial Monitor

lcd.setCursor(0, 0);

lcd.print("Rain Alert System");

delay(2000); // Welcome delay

}

void loop() {

int rainValue = analogRead(rainPin); // Read rain sensor

Serial.print("Rain Sensor Value: ");

Serial.println(rainValue);

lcd.clear();

if (rainValue > 800) { // No Rain

digitalWrite(redLED, LOW);

digitalWrite(greenLED, HIGH);

digitalWrite(buzzer, LOW);

lcd.setCursor(0, 0);

lcd.print("Status: No Rain");

delay(1000);

}

else if (rainValue > 400 && rainValue <= 800) { // Light Rain

lcd.setCursor(0, 0);

lcd.print("Status: Light ");

lcd.setCursor(1, 1);

lcd.print(" Rain ");

digitalWrite(redLED, HIGH);

delay(250);

digitalWrite(redLED, LOW);

digitalWrite(greenLED, HIGH);

delay(250);

digitalWrite(greenLED, LOW);

digitalWrite(buzzer, LOW);

}

else { // Heavy Rain

lcd.setCursor(0, 0);

lcd.print("Status: Heavy ");

lcd.setCursor(1, 1);

lcd.print(" Rain ");

digitalWrite(redLED, HIGH);

digitalWrite(buzzer, HIGH);

delay(300);

digitalWrite(redLED, LOW);

digitalWrite(buzzer, LOW);

delay(300);

digitalWrite(greenLED, LOW);

}

}

**🧪 Testing Procedure:**

1. Upload code to **Arduino Mega 2560**.
2. Open **Serial Monitor** at 9600 baud to observe raw sensor values.
3. Simulate rain by:
   * Keeping sensor dry: observe “No Rain”.
   * Sprinkle few drops: observe blinking LEDs and “Light Rain”.
   * Drench sensor: buzzer and red LED blink; LCD shows “Heavy Rain”.

**📝 Customization Tips:**

* You can tweak these values for your specific sensor:
* if (rainValue > 800) // Adjust if your sensor behaves differently
* if (rainValue > 400 && rainValue <= 800)
* To mute buzzer at night, add a manual switch or real-time clock (RTC) condition.