

Ultrasonic Water Level Indicator

GROUP: 05

Prepared By :

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Introduction:

The Ultrasonic Water Level Indicator is a smart system designed to measure and visualize the level of water in a tank using an ultrasonic distance sensor (HC-SR04) and a WS2812B addressable RGB LED strip.

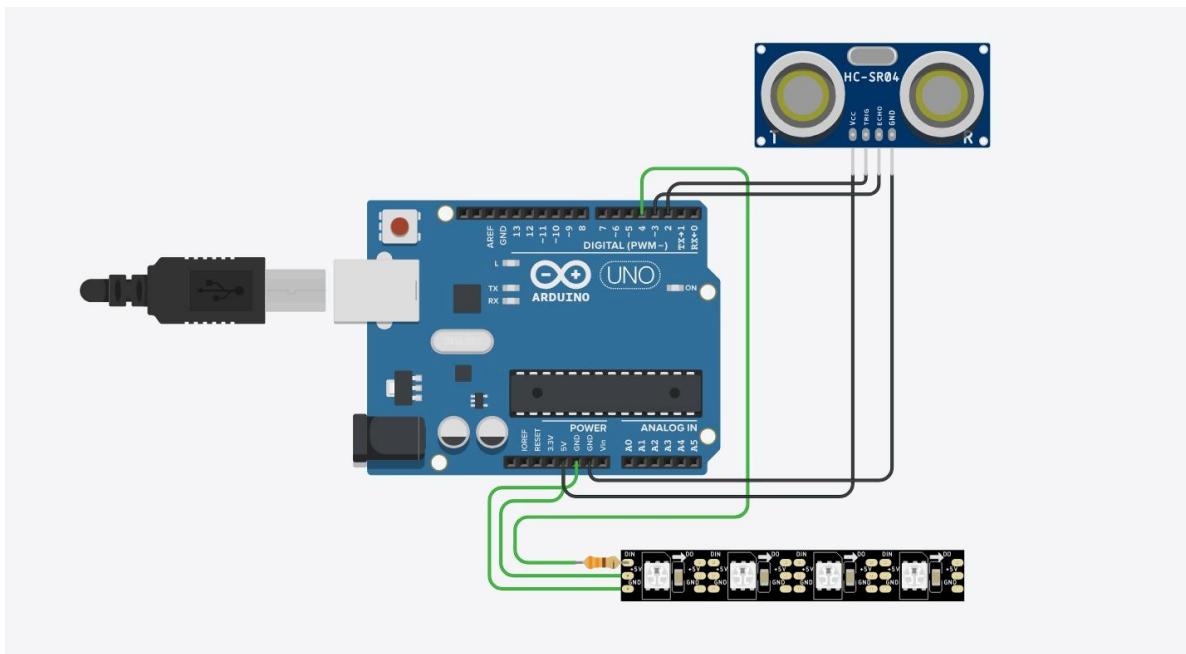
The ultrasonic sensor measures the distance between the water surface and the sensor mounted at the top of the tank. Based on this distance, the Arduino calculates the water level and lights up the LED strip accordingly — red for low, yellow for medium, and green for high levels.

This system provides a visual and non-contact method to monitor tank levels, preventing water overflow and pump dry-run, while being safe, efficient, and easy to install.

Components/Modules:

1. Arduino UNO – Main microcontroller board that processes distance data.
2. Ultrasonic Sensor (HC-SR04) – Measures distance between sensor and water surface.
3. WS2812B LED Strip – Displays the water level visually using color-coded lights.
4. Jumper Wires – For circuit connections.
5. 5V Power Supply / USB – To power Arduino and LED strip.
6. Resistor (330Ω) – Between Arduino data pin and LED data input for signal stability.

Connection Diagram:



Working:

1. The ultrasonic sensor sends out sound waves and measures the time taken for the echo to return from the water surface.
2. Using this data, the Arduino calculates the distance to water and thus the current water level.
3. The calculated level is mapped to the number of LEDs that should glow on the strip.
4. The LED strip lights up in sections:
 - Bottom 4 LEDs (Red): Low water level
 - Middle 4 LEDs (Yellow): Medium level
 - Top 4 LEDs (Green): Full tank
5. The display continuously updates in real time, giving a quick visual representation of the tank status.

Program:

```
#include <Adafruit_NeoPixel.h>
#include <HCSR04.h>

#define PIN 4      // Pin connected to the NeoPixel strip
#define NUMPIXELS 12 // Total LEDs in the strip

Adafruit_NeoPixel pixels(NUMPIXELS, PIN, NEO_GRB +
NEO_KHZ800);

// Ultrasonic Sensor (Trig = 13, Echo = 12)
UltraSonicDistanceSensor distanceSensor(2, 3);

int current_Last_LED = 0;

void setup() {
    pixels.begin();
    pixels.clear();
    pixels.show();
    Serial.begin(9600);
}

void loop() {
    pixels.clear(); // Turn off all LEDs

    // Measure distance in cm
    float distance = distanceSensor.measureDistanceCm();

    // Map distance to LED count (closer = more LEDs)
    current_Last_LED = map((int)distance, 16, 1, 0, 10); // adjust as needed
    current_Last_LED = constrain(current_Last_LED, 0, 10);

    Serial.print("Distance: ");
    Serial.print(distance);
    Serial.print(" cm | LEDs On: ");
}
```

```
Serial.println(current_Last_LED);

// Turn on LEDs based on measured level (reversed color order)
for (int i = 0; i < current_Last_LED; i++) {
    if (i < 3) {
        pixels.setPixelColor(i, pixels.Color(255, 0, 0)); // Green zone (bottom - full)
    } else if (i < 7) {
        pixels.setPixelColor(i, pixels.Color(255, 255, 0)); // Yellow zone (middle)
    } else {
        pixels.setPixelColor(i, pixels.Color(0, 255, 0)); // Red zone (top - low)
    }
}

pixels.show(); // Update LED strip
delay(200);
}
```

Results:

- The system successfully detected varying water levels using the ultrasonic sensor.
- The LED strip visually indicated the levels in three color zones:
 - **Red**: Low water (Refill Required)
 - **Yellow**: Medium water
 - **Green**: Full tank
- This simple system provides a cost-effective, maintenance-free, and intuitive solution for household and industrial water monitoring.

