Adding an I2C LCD display to your irrigation system setup will allow you to view real-time information, such as soil moisture, water levels, and system status, directly on the device. Here’s how to integrate an I2C LCD with the components you’ve specified.

**1. Components Overview with I2C LCD**

* **I2C LCD Display** (e.g., 16x2 LCD with I2C backpack)
* **Microcontroller** (e.g., Arduino Uno)
* **Ultrasonic Sensor**
* **Soil Moisture Sensor**
* **GSM Module**
* **12V DC Water Pump**
* **Relay Module**
* **12V Battery**
* **Voltage Regulator** (e.g., LM7805, optional for stepping down 12V to 5V if needed)

**2. Updated Wiring Guide with I2C LCD**

**Power Supply Connections**

1. **12V Battery**: Powers the 12V water pump and the relay’s COM (Common) pin.
2. **Voltage Regulator (optional)**: Steps down 12V to 5V for components requiring 5V power, if your Arduino needs it.

**Microcontroller (Arduino Uno) Connections**

1. **Ultrasonic Sensor (HC-SR04)**:
   * **VCC**: Connects to 5V on the Arduino.
   * **GND**: Connects to GND on the Arduino.
   * **TRIG**: Connects to digital pin D9 on the Arduino.
   * **ECHO**: Connects to digital pin D8 on the Arduino.
2. **Soil Moisture Sensor**:
   * **VCC**: Connects to 5V on the Arduino.
   * **GND**: Connects to GND on the Arduino.
   * **Analog Output (AO)**: Connects to analog input pin A0 on the Arduino.
3. **Relay Module**:
   * **VCC**: Connects to 5V on the Arduino.
   * **GND**: Connects to GND on the Arduino.
   * **IN (input)**: Connects to digital pin D7 on the Arduino.
4. **GSM Module (SIM800L)**:
   * **VCC**: Connects to the 5V pin on the Arduino.
   * **GND**: Connects to GND on the Arduino.
   * **TX**: Connects to digital pin D10 (Arduino RX).
   * **RX**: Connects to digital pin D11 (Arduino TX).
5. **I2C LCD Display**:
   * **VCC**: Connects to the 5V pin on the Arduino.
   * **GND**: Connects to GND on the Arduino.
   * **SDA**: Connects to the Arduino’s A4 pin.
   * **SCL**: Connects to the Arduino’s A5 pin.

**Water Pump Connections**

1. **Relay NO (Normally Open)**: Connects to the positive terminal of the 12V water pump.
2. **Pump Negative Terminal**: Connects to the negative terminal of the battery.
3. **Relay COM (Common) Terminal**: Connects to the positive terminal of the 12V battery.

**3. Arduino Code with I2C LCD Support**

To control the LCD display with I2C, you’ll need the LiquidCrystal\_I2C library. This code will display real-time water levels and soil moisture status on the LCD.

**Install the LiquidCrystal\_I2C library:**

* Go to Arduino IDE → Sketch → Include Library → Manage Libraries
* Search for "LiquidCrystal I2C" and install it.