Hydroponic IoT Monitoring System

Installation and Setup Guide

A circuit board with wires and switches

AI-generated content may be incorrect.

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# Hardware Requirements (Simulated via Wokwi)

|  |  |
| --- | --- |
| **Component** | **Description** |
| ESP32-S2 | Microcontroller (Wokwi virtual board) |
| 2 x Flowmeters (Simulated) | Generates pulse inputs (via PWM) |
| 3 x Float Switches | Horizontal (Warning and Critical) + Vertical (Overflow) |
| 1 x Push Button | Pump Override |
| 2 x Potentiometers | Control flow rate of flowmeters |
| 6 x LED | Indicators for flowmeters, pump and float switches |

All hardware is simulated in Wokwi

# Software Requirements

|  |  |
| --- | --- |
| **Tool/Platform** | **Purpose** |
| Wokwi | Online simulation environment |
| Arduino IDE (Optional) | For testing real ESP32 hardware |
| Adafruit IO | IoT dashboard for visualizing data |
| MQTT Protocol | For device-to-cloud communication |
| GitHub | Code and documentation repository |

# Simulation Setup (Wokwi)

1. Go to: [Hydroponic Wokwi Simulation](https://wokwi.com/projects/433543810637673473)
2. Press the Play button to start the simulation.
3. Adjust the potentiometers to simulate the flowmeter frequency
4. Press buttons to simulate:
   1. Pump override switch
   2. Reservoir warning level
   3. Reservoir critical level
   4. Pipe overflow

# Adafruit IO Setup

1. Go to: Adafruit IO
2. Sign in with your account (hcshah26)
3. Open the dashboard: [Hydroponic Project Dashboard](https://io.adafruit.com/hcshah26/dashboards/hydroponic-project)
4. You will see:
   1. Inflow and Return Flow Rates
   2. Pump Status
   3. Reservoir Alerts
   4. Toggle switch for remote override

Feeds must match exactly

|  |
| --- |
| **Feed names** |
| pump-in-flow-rate |
| pump-return-flow-rate |
| reservoir-warning-alert |
| reservoir-critical-alert |
| pipe=overflow-warning |
| pump-override |

# MQTT Configuration (Enbedded in code)

#define AIO\_USERNAME “<USERNAME>”

#define AIO\_KEY “<AIO KEY>”

#define AIO\_SERVER “<io.adafruit.com>”

#define AIO\_SERVERPORT 1883 (Non secure) or 8883 (Secure)

Note: Use the correct Username and AIO Key details!

# Deployment on Physical ESP32 (Optional)

If testing on a real board

1. Download Arduino IDE and install ESP32 board via Board Manager
2. Connect your ESP32-S2
3. Flash the code from GitHub Repository
4. Replace Wokwi-GUEST with your Wi-Fi SSID in code
5. Power using USB or external source (5V, 300mA minimum)

# Troubleshooting

|  |  |
| --- | --- |
| **Issue** | **Solution** |
| MQTT not connecting | Check Adafruit AIO Key and network status |
| Dashboard not updating | Ensure simulation is running and connected |
| Pump doesn’t turn off | Check if Critical or Overflow switch is HIGH |
| Feed not appearing | Ensure feed names match in code and dashboard |

# Project Links

* GitHub: [Capstone IoT Hydroponic Project](https://github.com/HCShah26/Capstone-IoT-Hydroponic)
* Wokwi Simulation: [Run in Wokwi](https://wokwi.com/projects/433543810637673473)
* Adafruit Dashboard: [Hydroponic Project](https://io.adafruit.com/hcshah26/dashboards/hydroponic-project)