ECET 230 - Read Me

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Table of Contents

Smart Plant Monitor Overview

The Smart Plant Monitor is a compact and portable device designed to help users maintain healthy plants by monitoring key environmental conditions. It collects data from a capacitive soil moisture sensor, a DHT11 temperature and humidity sensor, and a photoresistor to track sunlight levels. Users can set optimal ranges and monitoring intervals directly through a 4×4 keypad, with clear prompts and feedback provided on a 16×2 LCD. An RGB LED gives immediate visual alerts when conditions fall outside the desired ranges, while a reset button allows the system to restart and clear alerts. The goal of the project is to simplify plant care, provide reliable real-time monitoring, and make maintaining optimal conditions easy for any plant owner.

Team Members
- Rachel Romeo
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Features
- Soil Moisture Sensor – Detects when the soil is too dry and alerts the user.
- Light Sensor (LDR) – Measures ambient light levels and tracks sunlight exposure.
- DHT11 Temperature & Humidity Sensor – Monitors environmental conditions that affect plant health.
- RGB LED – Provides intuitive visual feedback for plant status (e.g., red = high temperature, blue = low temperature, yellow = dry soil, purple = low light).
- 16×2 LCD – Displays setup prompts, real-time readings, and configuration feedback.
- LCD Potentiometer – Adjusts the contrast of the LCD for better visibility.
- 4×4 Keypad – Allows the user to input optimal thresholds and monitoring intervals directly on the device.
- Reset Button – Enables full system restart and clears active alerts when held for 5 seconds.
- Microcontroller (Arduino Mega 2560) – Processes sensor data, controls the RGB LED, and manages the LCD and keypad inputs.
- Portable Power – Powered by a 5V Battery Bank, making it easy to deploy and move between plants. This also allows the smart plant monitor to operate continuously for up to 100 hours before recharging the battery bank.

Hardware Components

Works-Like Prototype

- 1× Arduino Mega 2560 (or compatible board)
- 1× Capacitive Soil Moisture Sensor Module
- 1× Light Sensor (Photoresistor with voltage divider)
- 1× 10k ohm resistor for a voltage divider with a Photoresistor
- 1× RGB LED (common cathode or anode)
- 3× Current Limiting Resistors
- 1× 16×2 LCD Display
- 1× Potentiometer (for LCD contrast adjustment)
- 1× 4×4 Keypad
- 1× Reset Button
- Jumper wires
- Breadboard
- 9V Battery + 5V Voltage Regulator

PCB Prototype:

- 1× ATmega2560
- 1× 16 MHz Crystal
- 2× 22 pF Capacitors (for crystal)
- 1× Voltage Regulator
- 3× 0.1 μF Decoupling Capacitors
- 1× 4.7 μF Electrolytic Capacitor
- 1× DHT11 Sensor
- 1× Capacitive Soil Moisture Sensor
- 1× Female 1×3 Header for Soil Moisture Sensor
- 1× Photoresistor (LDR)
- 1× 10k ohm Resistor (voltage divider for LDR)
- 1× RGB LED (common cathode/anode per schematic)
- 3× Current-Limiting Resistors (for R, G, B channels)
- 1× 22 ohm Resistor for the ATMega chip reset button
- 2× 5.1k ohm Resistors for the USB-C Connector
- 1× 16×2 LCD
- 1× 10k Potentiometer (LCD contrast)
- 1× 4×4 Keypad
- 1× Male 1×8 Header for 4×4 Keypad
- 2× Reset Button (one for ATMega chip, one for the Smart Plant Monitor)
- 1× ISP 6 Programming Adapter
- 1× Female 2×3 Header for Programming Adapter
- 1× Female 1×6 Header for Serial Monitor (TX/RX)
- 1× USB Connector for Battery Bank

- 1× Slide Switch for powering the battery ON/OFF
- 5V Battery Bank (At least 10000 mAh)
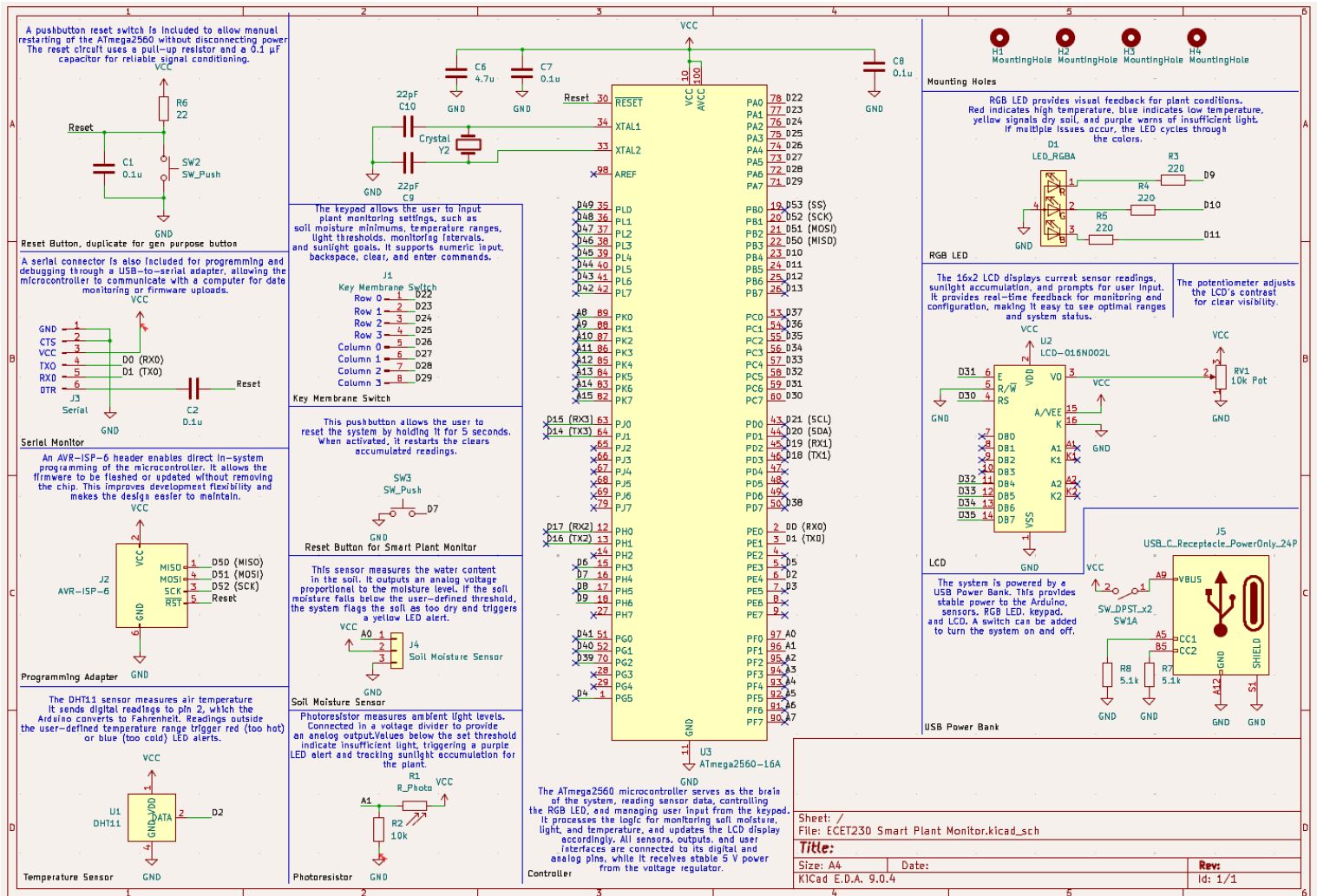
Operating Instructions

Works-Like Prototype

1. Power the device: Connect the Arduino Mega to a computer or battery bank.
2. Set thresholds: Use the keypad to enter optimal ranges for soil moisture, temperature, humidity, and light.
3. Monitor readings: Check the LCD for real-time sensor data. RGB LED indicates status visually.
4. Reset device: Hold the reset button for 5 s to restart and clear alerts.

PCB Prototype:

1. Power the device: Connect the USB battery bank to the PCB or plug in the Arduino. Switch it on if using the slide switch.
2. Set thresholds: Use the keypad to enter optimal ranges for soil moisture, temperature, humidity, and light.
3. Monitor readings: Check the LCD for real-time sensor data. RGB LED indicates status visually.
4. Reset device: Hold the reset button for 5 s to restart and clear alerts.

Wiring Diagram

Below is the schematic diagram of the Smart Plant Monitor. This schematic also serves as the wiring diagram. Note, some components are only used for the PCB prototype and NOT the work-like prototype. Please refer to the Hardware Components Section of this document to ensure the correct components are being used.

Tools Components

- Arduino IDE (C/C++ programming)
- Fusion 360 (3D design)
- KiCad for PCB designing
- GitHub for version control and collaboration
- PCB Way for Ordering instructions

License

The Smart Plant Monitor is shared for educational purposes.