**Greenhouse Automation System Setup Guide**

**Introduction:**

This document provides a basic step-by-step instructions for setting up and configuring the Greenhouse Automation System using Arduino. The system includes temperature and humidity sensors, motion detectors, LED lighting control, soil moisture monitoring, and a water pump for efficient greenhouse management. Enjoy automated control of your greenhouse environment for optimal plant growth.

**Components Needed:**

1. Arduino Mega
2. Temperature and humidity sensors (DHT11, Dallas DS18B20)
3. Motion sensors
4. Soil moisture sensor
5. Stepper motor and driver
6. Relay modules for fan and water pump control
7. LED strips (for lighting)
8. LCD display (I2C)
9. Breadboard and jumper wires
10. Power supply
11. Solar Panel
12. Solar charge controller

**Connections:**

* Connect DHT11 to pin 2 (DHTPIN) for internal temperature and humidity monitoring.
* Connect DS18B20 sensors to pins 52 (tG, soil temperature) and 53 (tE, external temperature).
* Connect the motion sensors to pins 4 and 5.
* Connect the stepper motor to pins 8, 9, 10, and 11 for IN1, IN3, IN2, and IN4, respectively.
* Connect the soil moisture sensor to pin A0.
* Connect the light sensor to pin A1.
* Connect the water pump relay to pin 33.
* Connect the LED strip relays to pins 30 and 32.
* Connect the fan control relay to pin 31.
* Connect the LCD display to the I2C pins (SDA to pin 20, SCL to pin 21).

**Software Setup:**

1. Install the necessary libraries in the Arduino IDE:

* Wire.h
* LiquidCrystal\_I2C.h
* OneWire.h
* DallasTemperature.h
* DHT.h
* AccelStepper.h
* Adafruit\_Sensor.h

1. Upload the provided Arduino sketch to the Arduino Mega using the Arduino IDE.

**Physical Setup:**

1. Place the temperature and humidity sensors in suitable locations (internal, external, and soil). (**see the provided photos**)
2. Install the motion sensors to detect movement inside the greenhouse.
3. Position the soil moisture sensor in the soil to monitor moisture levels.
4. Set up the LED strips for optimal lighting coverage.
5. Install the water pump and connect it to the water supply.

**Operation:**

1. Power on the Arduino Mega.
2. The LCD display will show real-time data, including temperature, humidity, soil moisture, and system status.
3. The stepper motor controls the opening and closing of vents based on humidity levels.
4. LED strips are controlled by motion sensors and manual buttons (if pressed).
5. The water pump is activated when soil moisture falls below a specified threshold.
6. The fan speed adjusts based on internal temperature (low, medium, high).

**User Interface:**

1. The LCD display provides information on temperature, humidity, soil moisture, and system status.
2. Buttons (connected to pins 6 and 12) control the LED strips, allowing manual control.
3. The system automatically adjusts settings based on environmental conditions.

**Maintenance:**

1. Regularly check and calibrate sensors if necessary.
2. Ensure proper functioning of the water pump and verify soil moisture levels.
3. Inspect LED strips for any issues and replace faulty components.
4. Keep the greenhouse environment clean and organized.