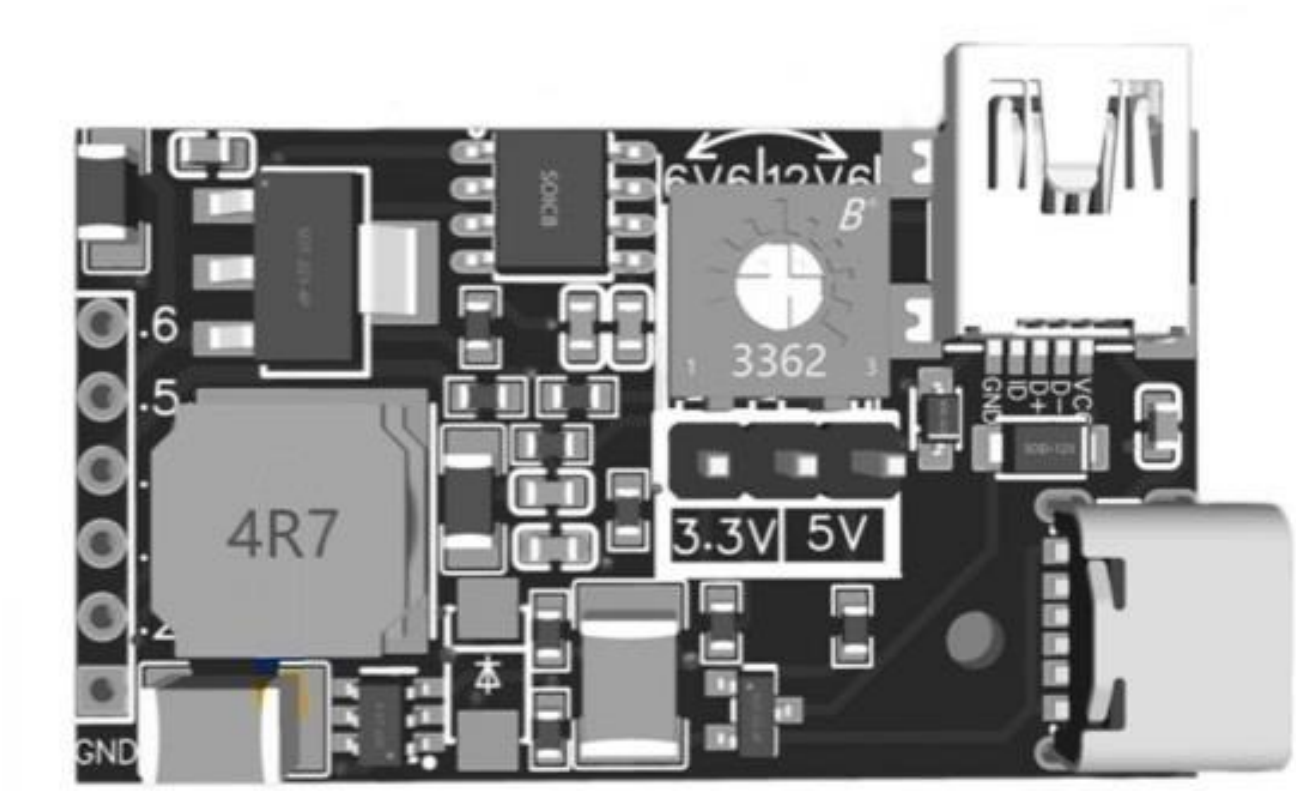
Plantmate® DC 5V to 3.3V 5V 6.6-12.6V DC Converter & Water Comparator Module Instructions



Overview

This DC-DC voltage regulator is intended for small, low power applications. Convert up to 12.6V DC power from a 5V USB-C input.

This module features a USB Type-C input connector; 3.3V, 5V and 6.6V-12.6V outputs from the pin 4, 5 and 6.

Water comparator receives the signal from the water sensor probes and sends it to the pin 2.

Load Control Unit receives the control signal from the pin 3 to control the load's speed and ON/OFF.

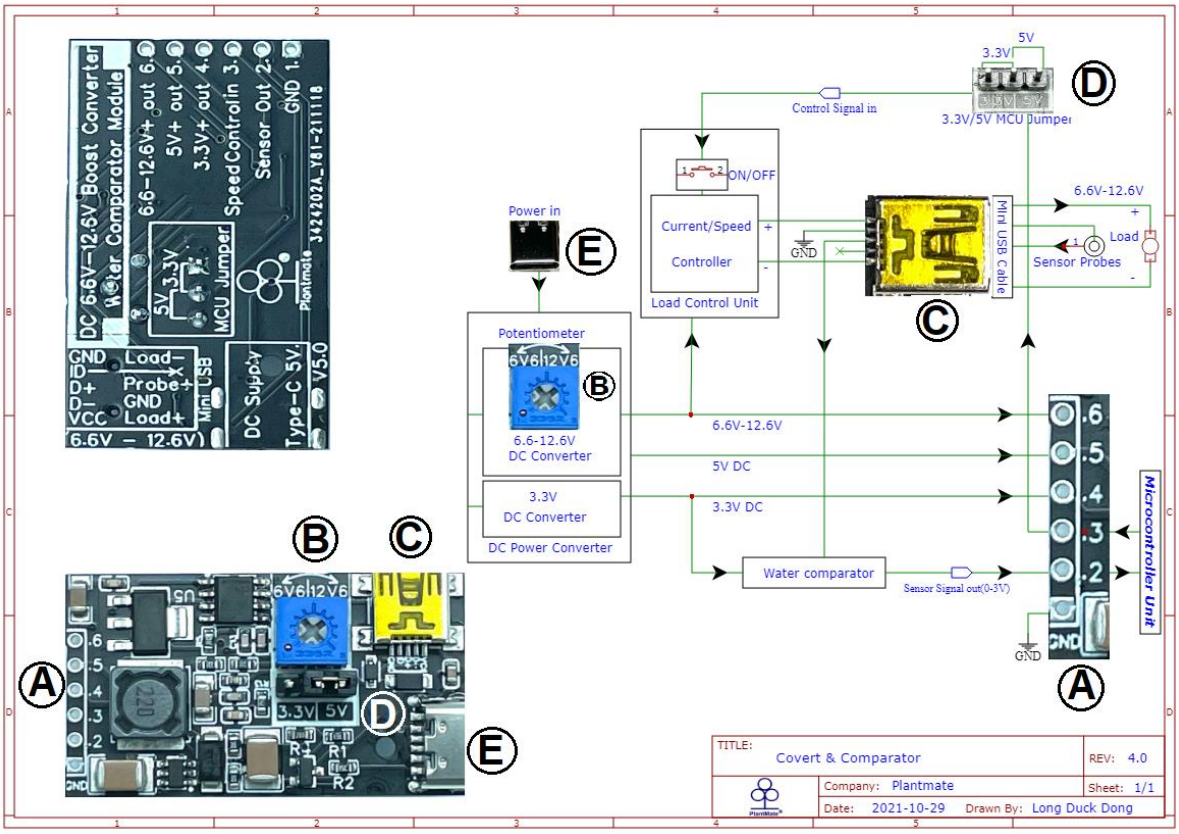
Compatible with the 'Plantmate DC 6.6V Mini Water Pump with Water Sensor Plate'.

Package Content:

- 1 x Module;
- 1 x Mini USB male connector;
- 1 x 6 pin header.

Table of Contents

1. Operating Introductions:



Connect the module to a +5V USB-C power supply, pin 4 for 3.3V and pin 5 for 5V applications; Adjust the potentiometer to vary voltages output from pin 6. Turn clockwise to increase the voltage from 6.6V to 12.6V.

In the module, the DC power unit converts the USB-C 5V DC power to vary voltages for vary functions and applications needed. 3.3V goes to supply the Water Comparator on board and to the 3.3V output pin 4 for 3.3V applications; 5V goes to the 5V output pin 5 for 5V applications; Adjust the potentiometer to vary voltages (6.6V-12.6V), vary voltages go to the Load Control Unit on board and to the vary voltages output on pin 6.

2. Water Comparator

The water comparator sends a square wave signal to the probe+ connects via the Mini USB pin D+. When the square wave travels through the probes, there is a reactance to the square wave, depends on the water situation on the probes, the reactance is different, thus the voltage on the signal line is different(0-3V) and this signal line carry the water situation information. This voltage is on the 'Sensor Out' pin, the pin number 2 on the module. To get the water situation, we can connect this pin to an analog pin on the MCU(Arduino) to measure this voltage, this voltage is different between dry and in water while the sensor probe not in water or in water. Therefore, we can learn the water stage by measure this voltage.

3. Load Control Unit

Load Control Unit controls the load via the Mini USB on board, the DC output via pin 4,5, 6 cannot be controlled by the Load Control Unit.

By sending a voltage signal to the Unit (between 0-3V, 0-5V) through the 'Speed Control in' pin, the pin number 3 on board to control the current to the load so that to control the load speed.

This module compatible with 3.3V or 5V MCUs, on the top side of the module, you can see a jumper pins. If your MCU is a 5V board, like Arduino UNO, please select the jumper cap on 5V, if your MCU is a 3.3V board, please select the jumper cap on 3.3V.

Through the pin 2, MCU(Arduino) receives the voltage of the water situation, so we can decide to control the load ON/OFF, for example to have the load stop by sending a 0V to pin 3.

To have the load speed on 0-100%, we can send a 0V to 5V (3.3V MCU or5V MCU) via pin 3.

4. Specifications:

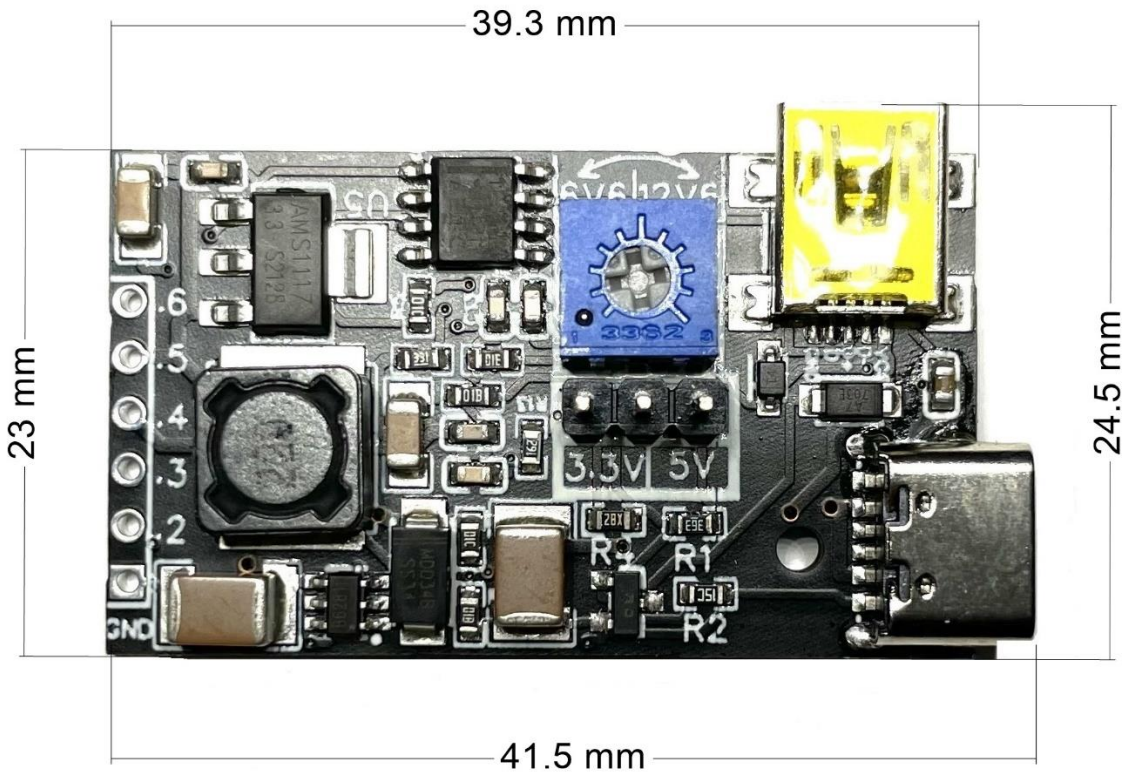
Maximum Output Current: 2A
Input Voltage: +5V USB-C, or 3.5V-9V DC
Maximum Output Voltage: 12.6V
Load Control Voltage: 6.6V - 12.6V
Control Load Voltage: 0-3V, 0-5V (select the jumper for 3V or 5V MCU)
Maximum Efficiency: Up to 97%
Load Control Interface: Mini USB
Power Supply Interface: USB Type-C
Voltage output Interface: 2.54mm header
Sensor Output Voltage: 0-3V
Assemble: Soldering
Compatible: Plantmate 6.6V Mini Water Pump with Sensor Plate
Compatible MCU: Arduino

Dimensions: 41.5mm x 24.5mm

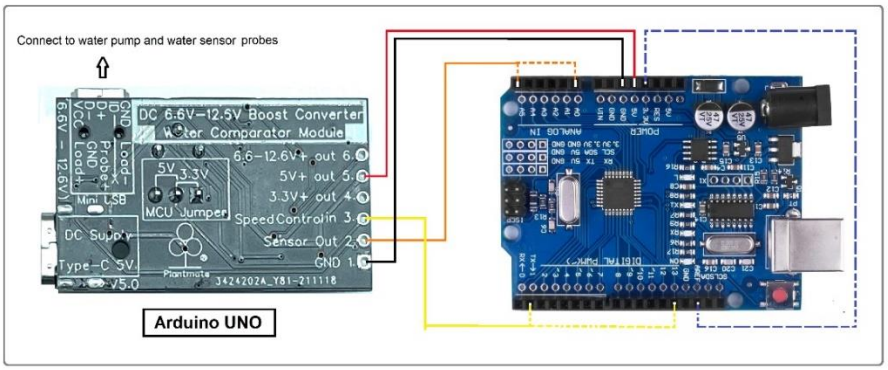
Load Control Unit Mini-USB Wire Assignments:

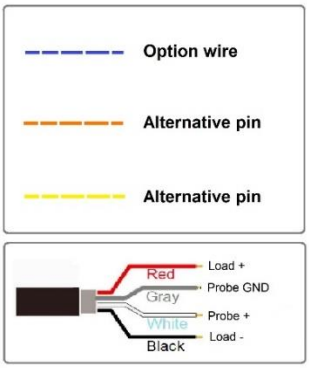
Wire	Description
Red	Load positive (“VCC” on Mini USB pin)
White	Sensor plate probe+ (“D+” on Mini USB pin)
Gray	Sensor plate probe- (” D-” on Mini USB pin)
Black	Load negative (“GND” on Mini USB pin)

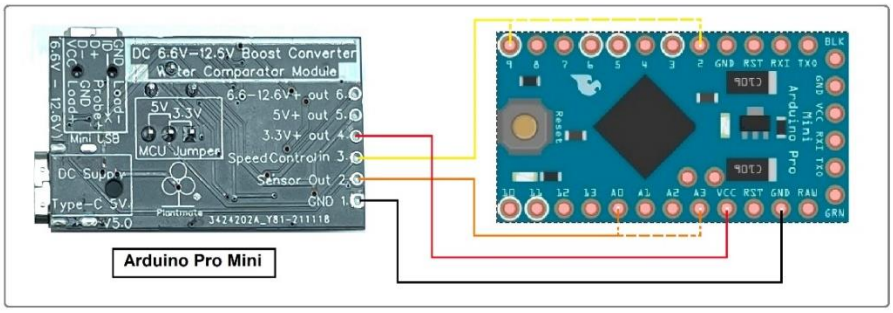
Dimensions:



5. Arduino Board Wire Diagrams:







6. DIY The Sensor Probes:

This is a simple method to DIY a water sensor probes for the Plantmate DC Converter & Water Comparator Module.

Material:

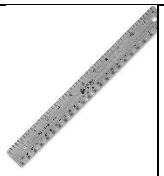
1. Copper Foil
2. A piece of discarded credit card size plastic
3. Wires
4. Mini USB male connector (it comes with the Module)

			
3/16" Copper Foil	**Discarded gift card**	**2 conductor wires**	**Mini USB male connector**

Tools:

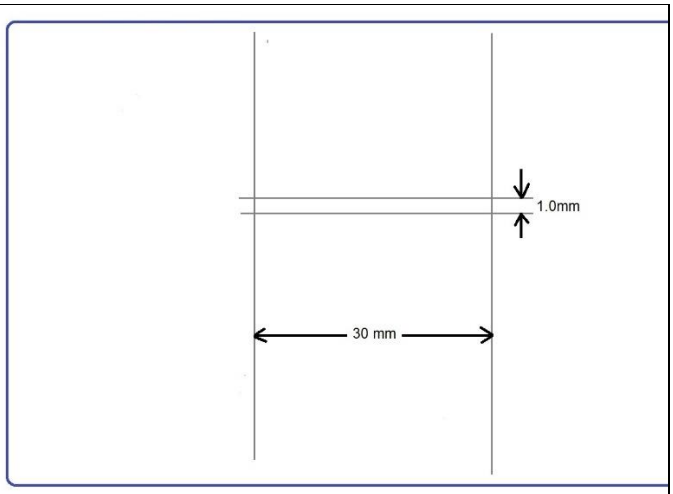
1. Scissor
2. Glue gun
3. Soldering iron

4. Ruler
5. Permanent Maker pen
6. Clear nail polish

					
Scissor	**Glue gun**	**Soldering iron**	**Ruler**	**Permanent Maker**	**Clear nail polish**

Steps:

Step 1

Use the permanent maker pen and ruler to draw the line on a empty space of the plastic card. 	

Step 2

Cut 2 pieces 30 mm copper foils	

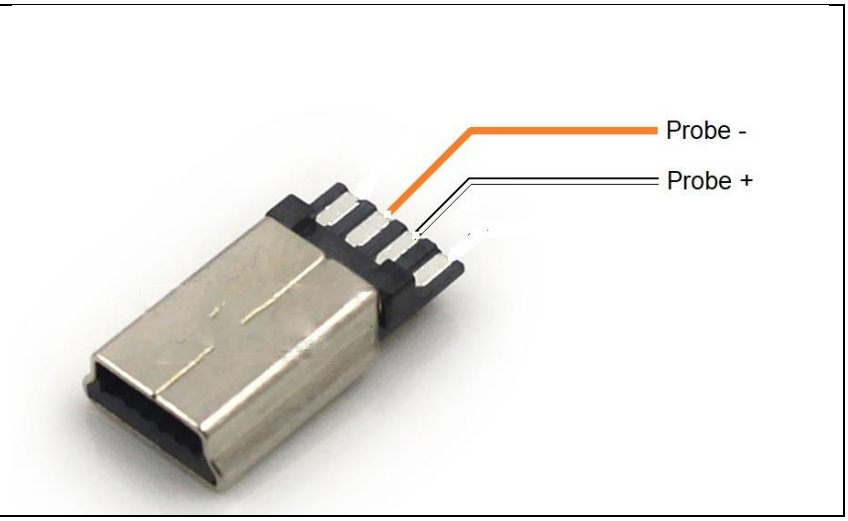
Step 3

Peal the 2 pieces 30 mm copper foils and stick them to the plastic card, line up with the draw line.	

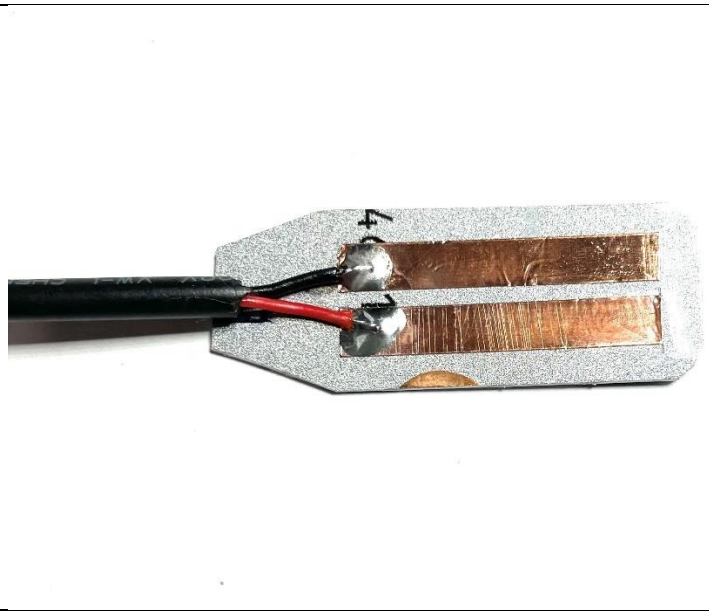
Step 4

Cut 80 cm 2 conductor wire and solder one end to the 2 copper foils on the plastic card.	

Step 5

Solder the other end of the wire to the Mini USB male connector. (This connector comes with the module)	

Step 6

Use a scissor to cut the shape as you like.	

Step 7

Use the glue gun to glue the soldered area.	

Step 8

Wait for the hot glue to cold down and dry, use the clear nail polish to paint on it carefully and don't touch it until it is completely dry. **This it the final step, we made the water sensor probes.**	

TEST:

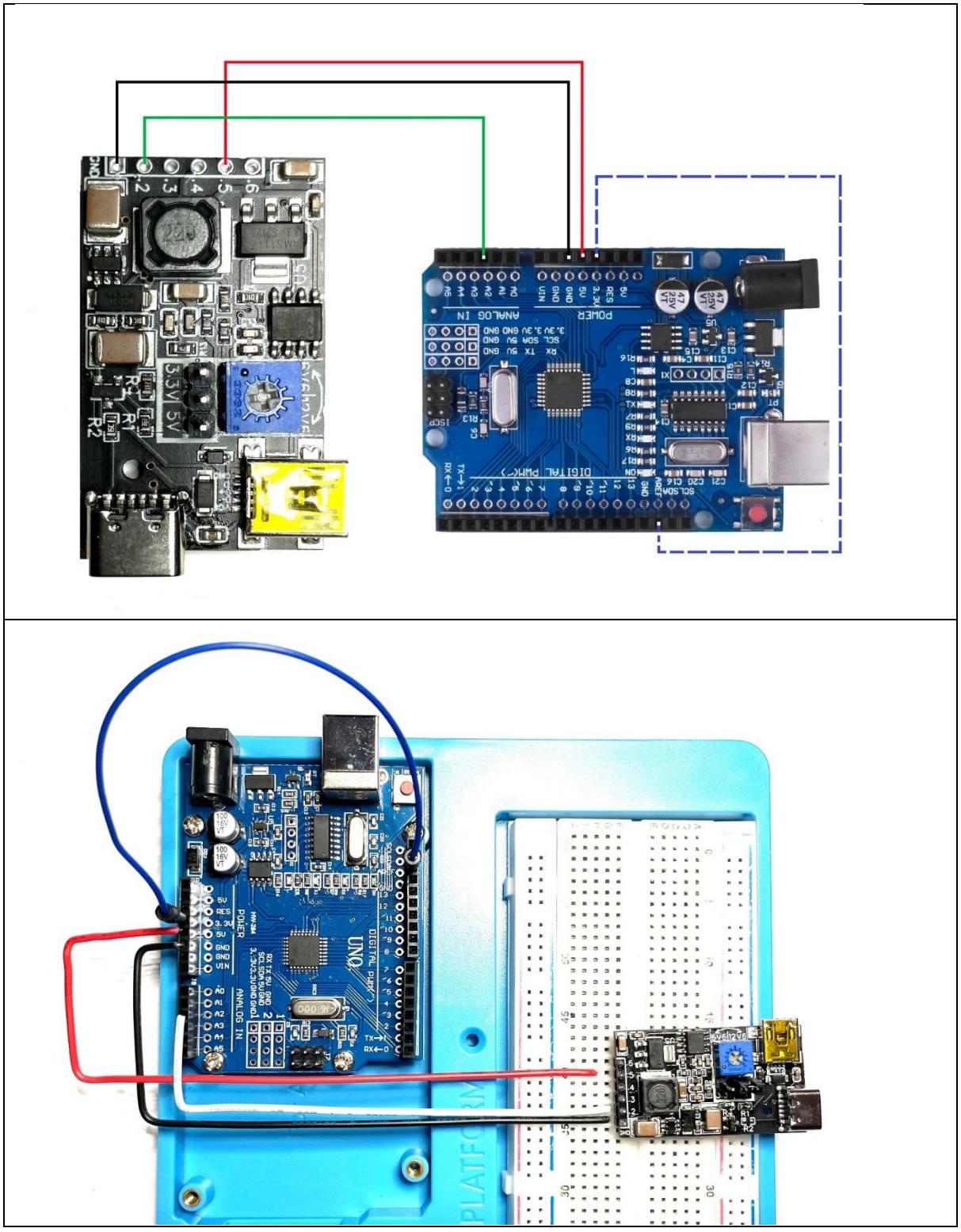
Connect the Module to the Arduino UNO:

* 1. Pin 1 to UNO GND

* 2. Pin 2 to UNO A2

* 3. Pin 5 to UNO 5V

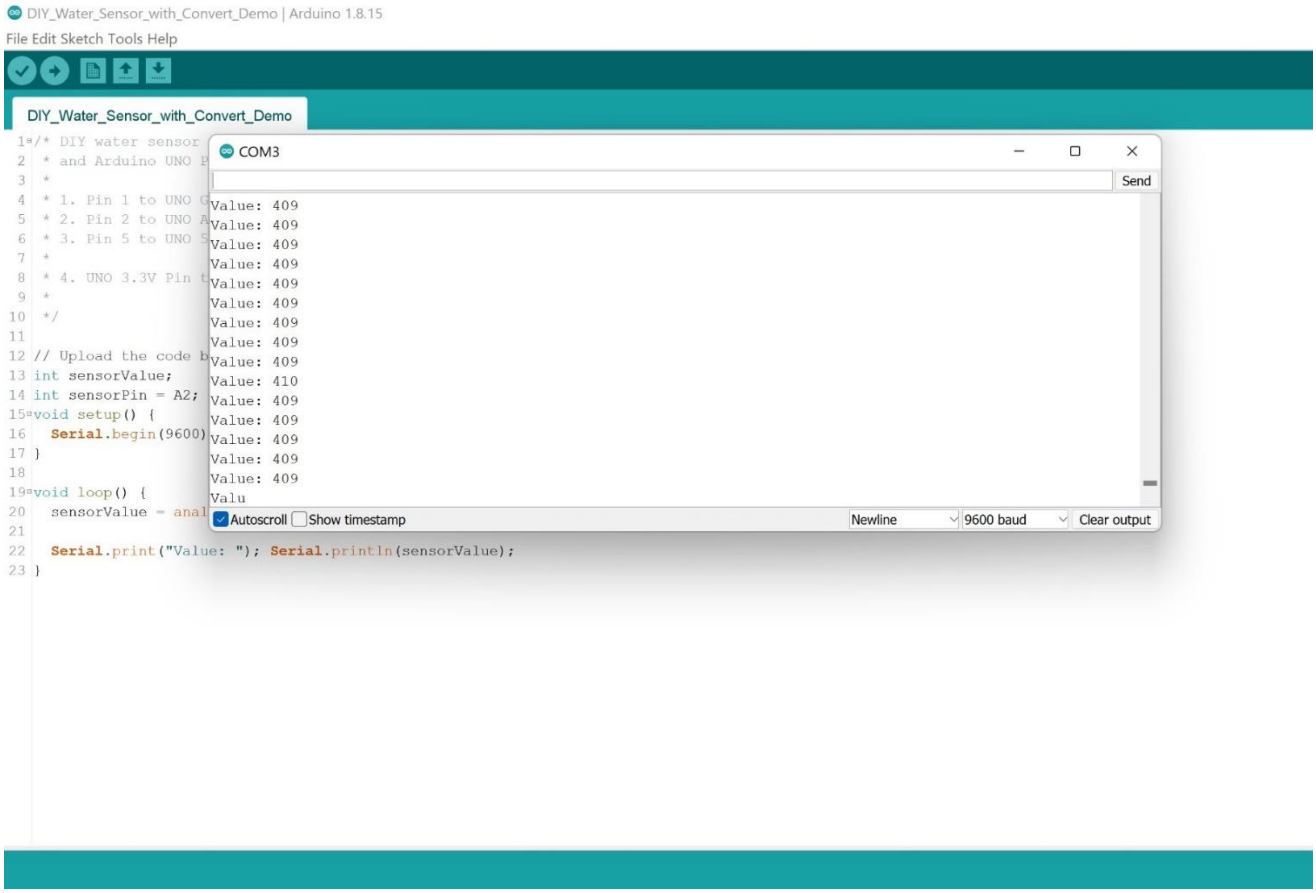
* 4. UNO 3.3V Pin to UNO AREF Pin (option)



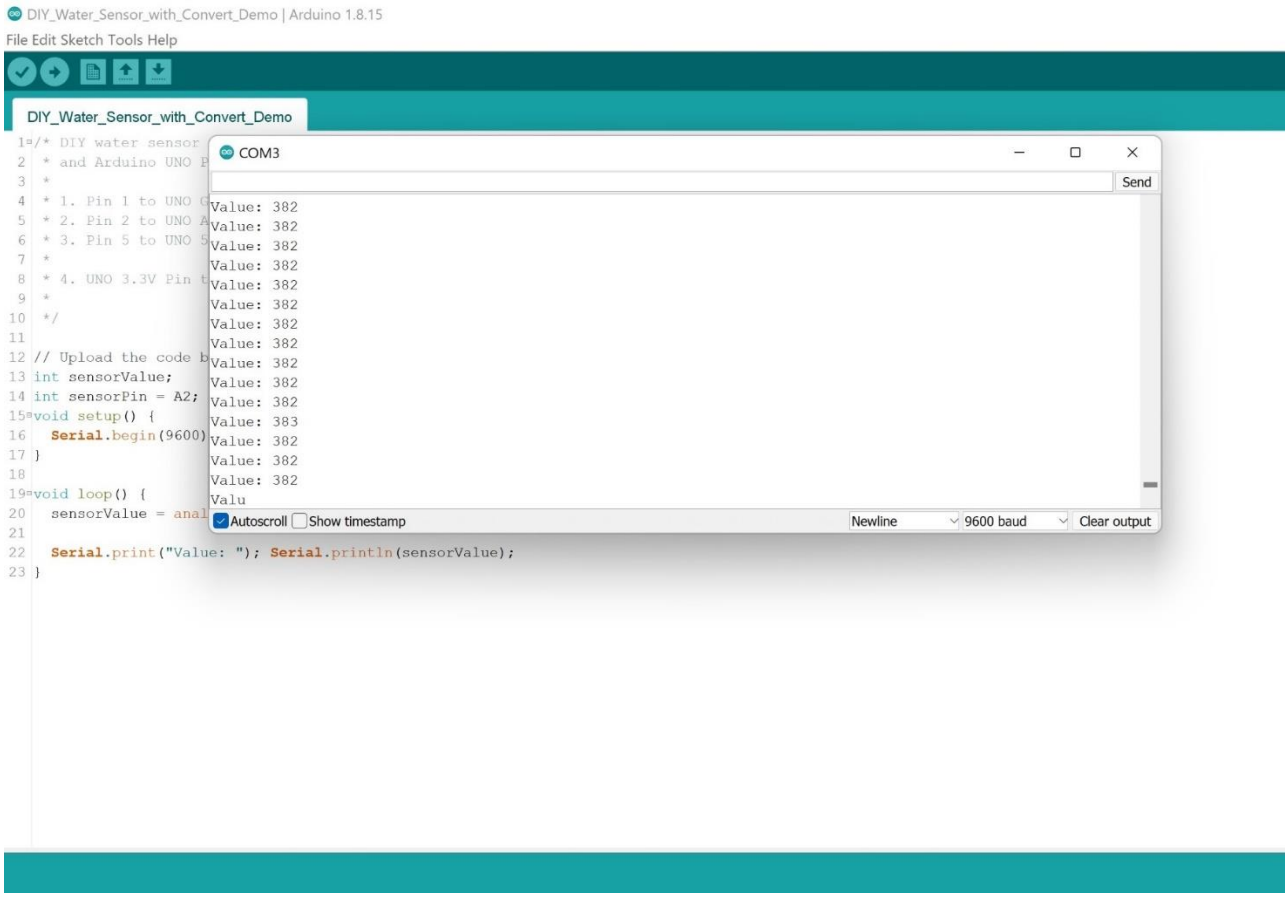
- Use the Arduino USB cable to connect with your computer.
- Connect the DIY water sensor probe to mini-USB adapter on the module board.
- Open the IDE program on your computer, make sure the Board and the Port on your IDE ->Tools drop down menu are correct.
- Copy the codes below and upload them to your Arduino UNO.

```
/*
 *  DIY water sensor with Plantmate DC 5V to 3.3V 5V 6.6-12.6V DC Converter & Water
Comparator Module
 * and Arduino UNO PIN connection:
 *
 * 1. Pin 1 to UNO GND
 * 2. Pin 2 to UNO A2
 * 3. Pin 5 to UNO 5V
 * 4. UNO 3.3V Pin to UNO AREF Pin
 *
 */

// Upload the code below to your Arduino UNO
int sensorValue;
int sensorPin = A2;    // select the input pin for the Water Comparator
void setup() {
  Serial.begin(9600); //open serial port, set the baud rate to 9600bps
}

void loop() {
  sensorValue = analogRead(sensorPin); // read the value from the sensor

  Serial.print("Value: "); Serial.println(sensorValue);
}
```

Leave the DIY water senor on air and dry, click the Serial Monitor on your IDE program, on the pop-up window, you will see something like this:



Put the DIY water sensor into water, you will see something like this:



Conclusion:

This simple and easy to DIY sensor probe with the Plantmate DC 5V to 3.3V 5V 6.6-12.6V DC converter & Water Comparator Module actually work well together.

We read the values from the Arduino UNO and the range is 27 from 382 to 409 while the DIY water sensor probe in water or not in water. Beware your data may different, it depends on many variables (the wire's length, the copper foil's size, the gap between the copper foils, etc.…). The wire I used is 24-gauge 2 conductor wire, if use different wire or copper foil or the gap between 2 copper foils is different. The data may different and better.

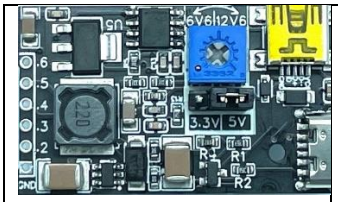
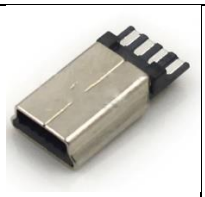
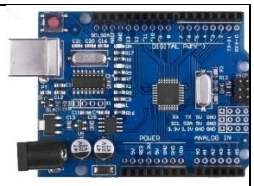
The range between water and no water is not too wide, but it is good enough to detect water, if we connect a DC water pump to the module that we can use this DIY water sensor to control the water pump for your own project purpose. We see many application scenarios on this little device.

7. The Module with 12V Water Pump Example:

In this project, we show how to use the 'Plantmate DC 5V to 3.3V, 5V, 6.6-12.6V converter & Water Comparator Module' to control a DC 12V water pump's speed and ON/OFF with an Arduino UNO board.

Hardware:

1. Plantmate DC 5V to 3.3V, 5V, 6.6-12.6V converter & Water Comparator Module
2. 12V DC water pump
3. Jumper wires
4. Mini-USB male connector (it comes with the Module)
5. Arduino UNO board

				
Plantmate Converter & Water Comparator Module	12V DC water pump	Jumper wires	Mini-USB male connector	Arduino UNO board

Tools:

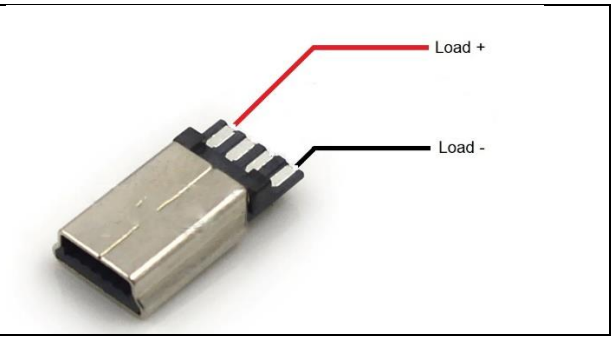
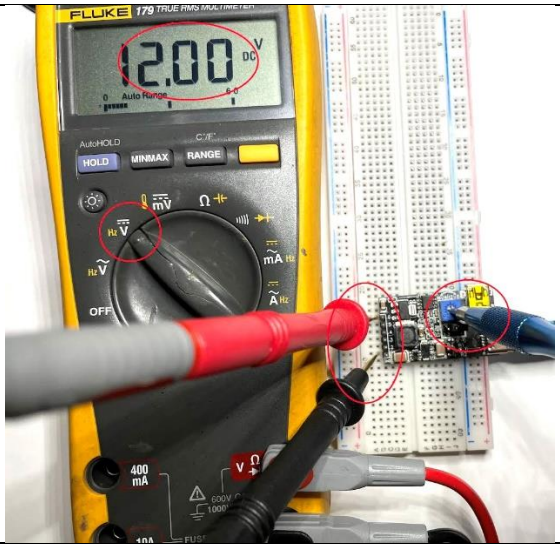
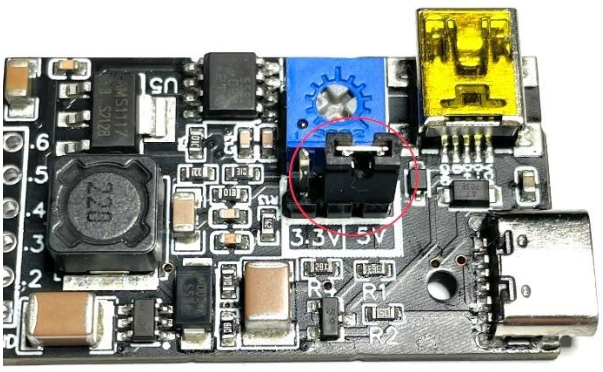
1. Scissor
2. Soldering iron
3. Multimeter

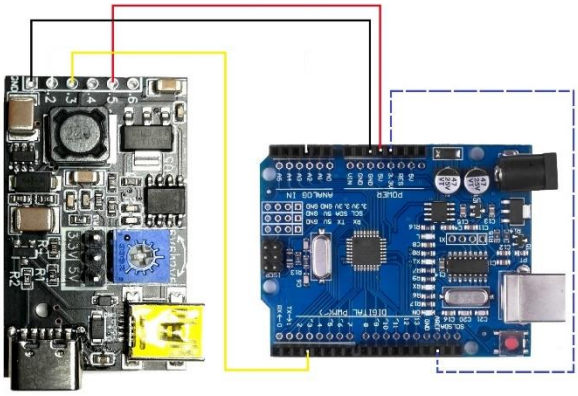
		
Scissor	Soldering iron	Multimeter

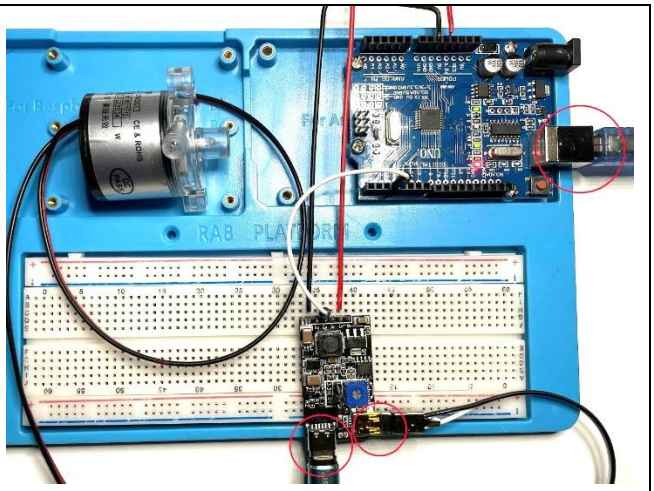
Software:

Arduino IDE V1.6.5 or later.
Download link: https://www.arduino.cc/en/software

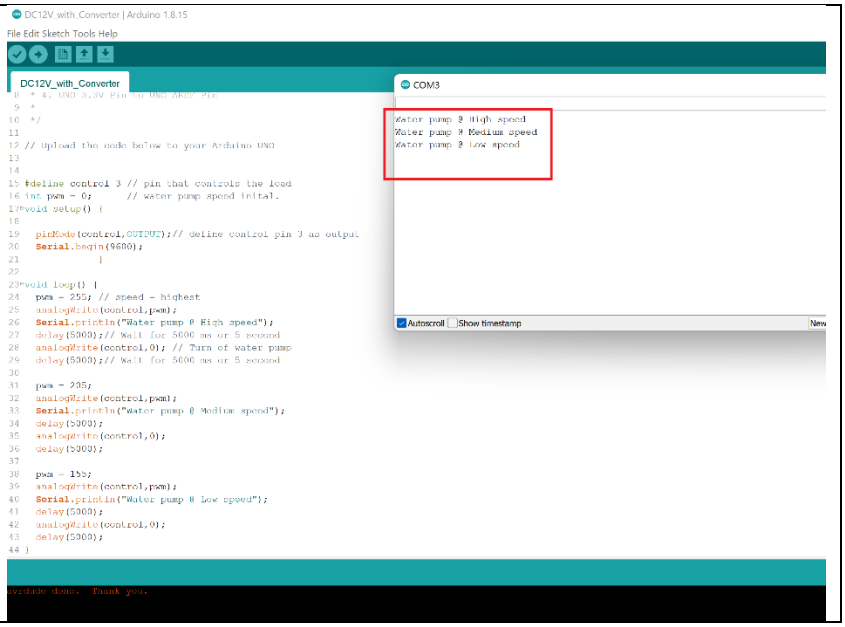
Get Things Ready:

1. Solder the water pump wire to Mini-USB male connector.	
2. Connect the USB-C to a 5V power supply. Set multimeter on DC Voltage range and put the positive probe (red cable) on module pin 6, and the Black cable (COM) on module pin 1. Adjust the potentiometer on the module board to have 12V output on Pin 6 to match the water pump voltage. 3. Disconnect the USB-C power supply.	
4. Connect the Jumper Cap on the 5V jumper pinhead while using a 5V MCU.	

5. Use the jumper wires to wire the Module and the Arduino UNO board.	

• Use the Arduino USB cable to connect with your computer; • Connect the water pump to the mini-USB adapter on the module board; • Connect the USB-C to the power supply. • Open the IDE program on your computer, make sure the Board and the Port on your IDE ->Tools drop-down menu are correct; • Copy the codes below and upload them to your Arduino UNO.	

```
/*
 *  DC 12V water pump with Plantmate DC 5V to 3.3V 5V 6.6-12.6V DC Converter & Water
Comparator Module
 * and Arduino UNO PIN connection:
 *
 * 1. Pin 1 to UNO GND
 * 2. Pin 3 to UNO D3
 * 3. Pin 5 to UNO 5V
 * 4. UNO 3.3V Pin to UNO AREF Pin (option)
 *
 */

// Upload the code below to your Arduino UNO


#define control 3 // pin that controls the load
int pwm = 0;      // water pump speed inital.
void setup() {

  pinMode(control,OUTPUT);// define control pin 3 as output
  Serial.begin(9600);
            }

void loop() {
  pwm = 255; // speed = highest
  analogWrite(control,pwm);
  Serial.println("Water pump @ High speed");
  delay(5000);// Wait for 5000 ms or 5 second
  analogWrite(control,0); // Turn of water pump
  delay(5000);// Wait for 5000 ms or 5 second

  pwm = 205;
  analogWrite(control,pwm);
  Serial.println("Water pump @ Medium speed");
  delay(5000);
  analogWrite(control,0);
  delay(5000);

  pwm = 155;
  analogWrite(control,pwm);
  Serial.println("Water pump @ Low speed");
  delay(5000);
  analogWrite(control,0);
  delay(5000);
}
```

Your water pump should be running at high speed for 5 seconds and stop for 5 seconds and so on. On the right-top corner of your IDE, click the Serial Monitor. You will see something like this picture in your pop-up window.	

The END!

8. The Module with Plantmate 6.6V Water Pump Example:

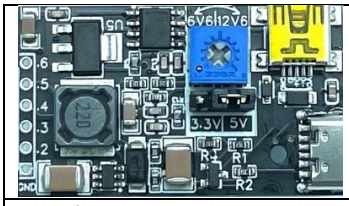
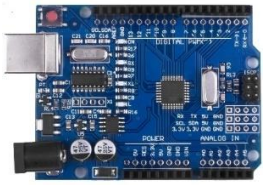
In this project, we show how to use the ‘Plantmate DC 5V to 3.3V, 5V, 6.6-12.6V converter & Water Comparator Module’ to control the ‘Plantmate DC 6.6V Mini Water Pump with Water Sensor Plate’ with an Arduino UNO board.

What’s the goal of this project?

We are going to use this module to stop the water pump from running when the water sensor detects there is no water and start running when the water sensor detects there is water.

Hardware:

1. Plantmate DC 5V to 3.3V, 5V, 6.6-12.6V converter & Water Comparator Module
2. Plantmate DC 6.6V Mini Water Pump with Water Sensor Plate
3. Arduino UNO board
4. Jumper wires

			
Plantmate Converter & Water Comparator Module	Plantmate DC 6.6V Mini Water Pump with Water Sensor Plate	Arduino UNO board	Jumper wires

Tools:

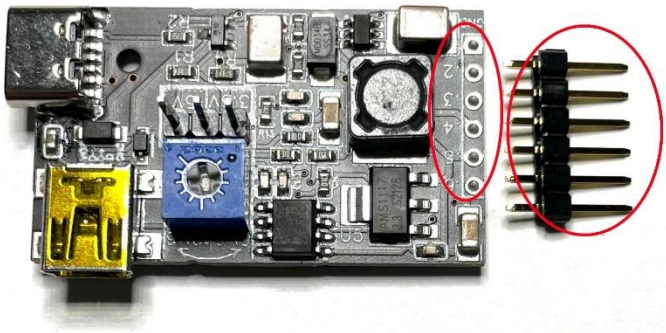
1. Soldering iron
2. Multimeter (option)

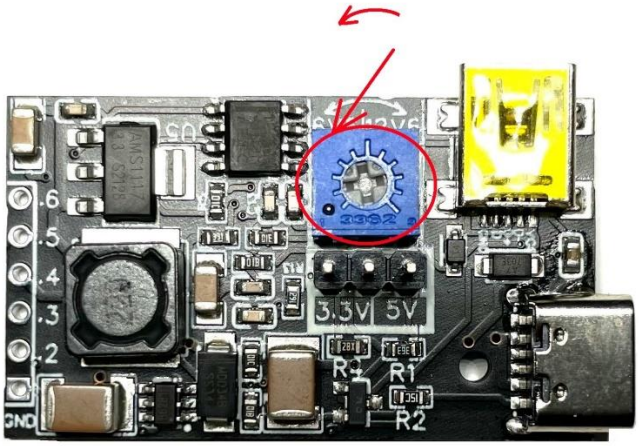
	
Soldering iron	Multimeter

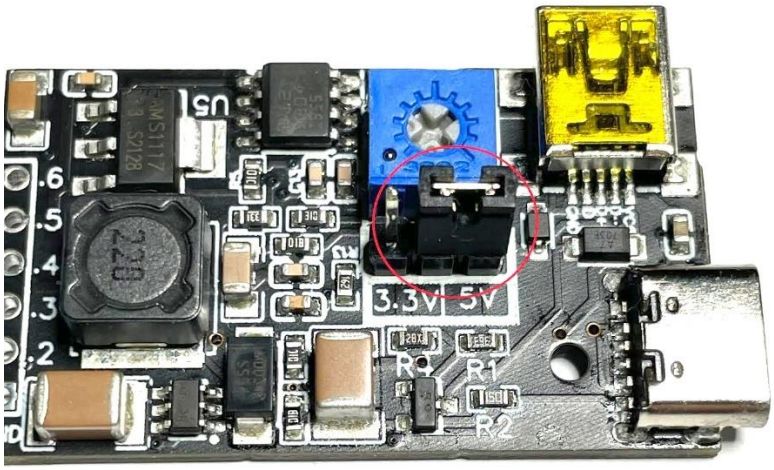
Software:

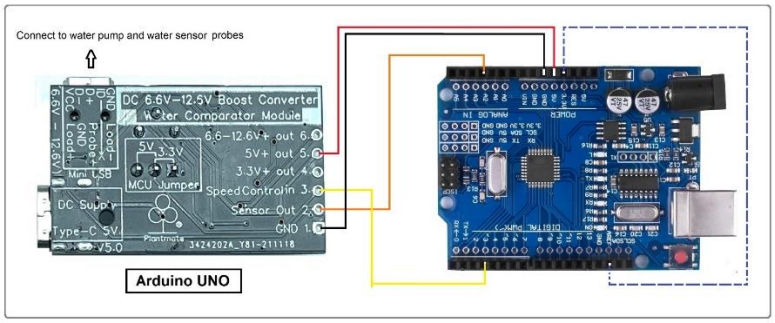
Arduino IDE V1.6.5 or later.
Download link: https://www.arduino.cc/en/software

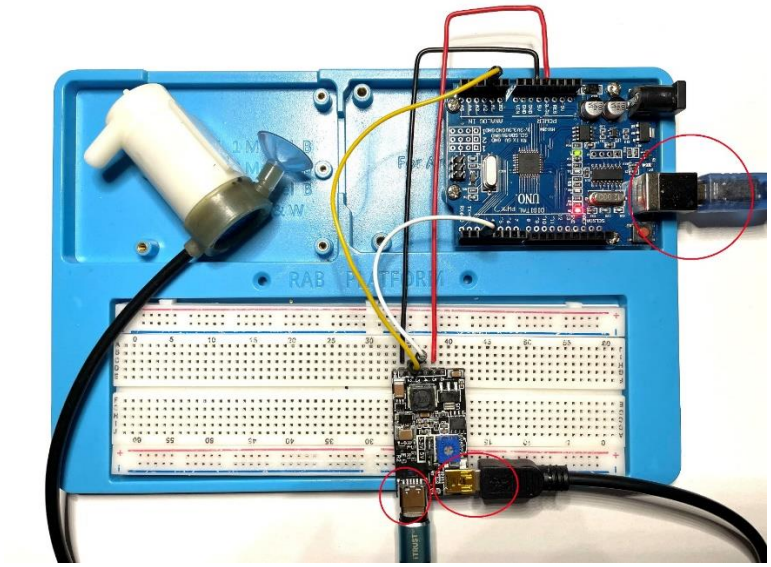
Get Things Ready:

3. Solder the 6 pins to the module pinholes if need.	

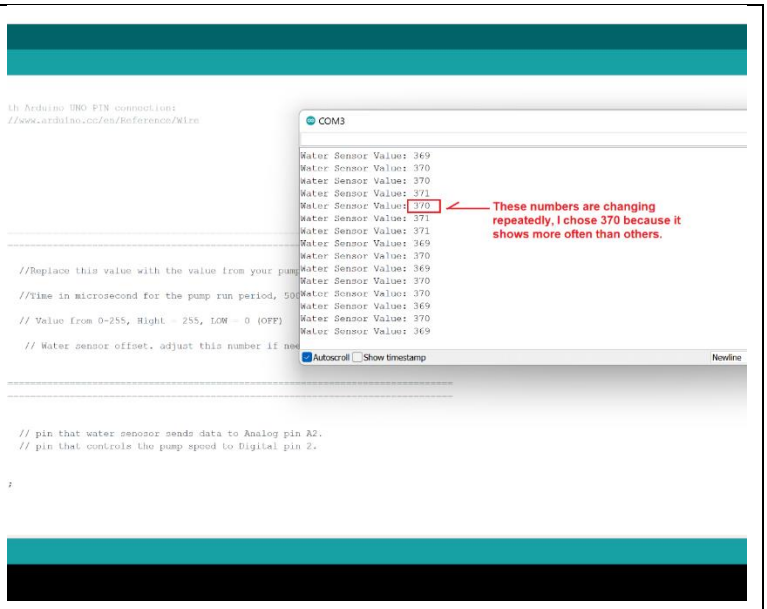
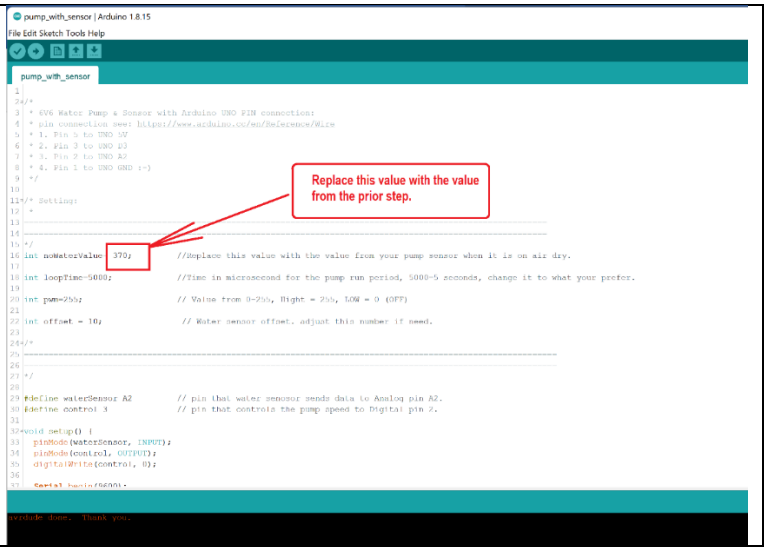
4. Connect the USB-C to a 5V power supply, set the output voltage to 6.6V by turning the potentiometer counterclockwise all the way. If you have a multimeter to make sure the output voltage is 6.6V 5. Disconnect the USB-C power supply.	

6. Connect the Jumper Cap on the 5V jumper pinhead while using a 5V MCU.	

7. Use the jumper wires to wire the Module and the Arduino UNO board. • Pin 5 to UNO 5V • Pin 3 to UNO D3 • Pin 2 to UNO A2 • Pin 1 to UNO GND	

• Use the Arduino UNO USB cable to connect with your computer; • Connect the water pump to the mini-USB adapter on the module board; • Connect the USB-C to the power supply. • Open the IDE program on your computer, make sure the Board and the Port on your IDE ->Tools drop-down menu are correct; • Copy the codes below and upload them to your Arduino UNO.	

```
/*
 * 6V6 Water Pump & Sensor with Arduino UNO PIN connection:
 * pin connection see: https://www.arduino.cc/en/Reference/Wire
 * 1. Pin 5 to UNO 5V
 * 2. Pin 3 to UNO D3
 * 3. Pin 2 to UNO A2
 * 4. Pin 1 to UNO GND :-)
 */

/* Setting:
 *
================================================================================
======================
================================================================================
======================
*/
int noWaterValue= 370;        //Replace this value with the value from your pump sensor when it is on air dry.

int loopTime=5000;            //Time in microsecond for the pump run period, 5000=5 seconds, change it to what
your prefer.

int pwm=255;                  // Value from 0-255, Hight = 255, LOW = 0 (OFF)

int offset = 10;              // Water sensor offset. adjust this number if need.

/*
================================================================================
========================
================================================================================
========================
*/

#define waterSensor A2        // pin that water senosor sends data to Analog pin A2.
#define control 3             // pin that controls the pump speed to Digital pin 2.

void setup() {
  pinMode(waterSensor, INPUT);
  pinMode(control, OUTPUT);
  digitalWrite(control, 0);

  Serial.begin(9600);

}

void loop() {

 int sensorVal = analogRead(waterSensor);

 Serial.print("Water Sensor Value: "); Serial.println(sensorVal); // print out water sensor value to monitor.

   if(sensorVal < noWaterValue - offset ) {
     analogWrite(control,pwm);     // Turn the pump on at pwm speed.
     delay(loopTime);              // Pump keeps on til this period end then continue the loop.
     }
    else{
        analogWrite(control,0);    // Turn the pump off.
        delay(1000);               // Wait for 1000 ms or 1 second then continue the loop
        }
 }
```

After you upload the codes above, don't put the water pump into the water yet. Leave the water pump in the air dry. On the right-top corner of your IDE, click the 'Serial Monitor'. You will see something like this picture in your pop-up window. Write down this 'Water Sensor Value' for the next step. Close the 'Serial Monitor' window.	
Now, replace the 'noWaterValue' with the value from the prior step on your IDE and upload it to your Arduino again.	

Finally, if you put the water pump into the water now, the water pump should run for 5 seconds and stop for 1 second and go on. If the water pump is not into the water, the water pump will stop running.

Summary

The water comparator in this module actually is a capacitive sensor, it detects water without the probes' contact with water directly and there is no DC current flowing which causes electrolysis of the sensor probes. There are many advanced benefits compared to resistive sensors.
You can use this module and the water pump for your own project purpose. The water pump will stop running once it detects there is no water. You can control the water pump speed by sending a different voltage to pin 3. If you connect it with a LED light, a speaker even a wi-fi module, you will get a notification by these options.
This module can handle up to a 12.6V water pump, and DIY the water sensor probes quite easily.
We see many application scenarios on these devices.

The END!