

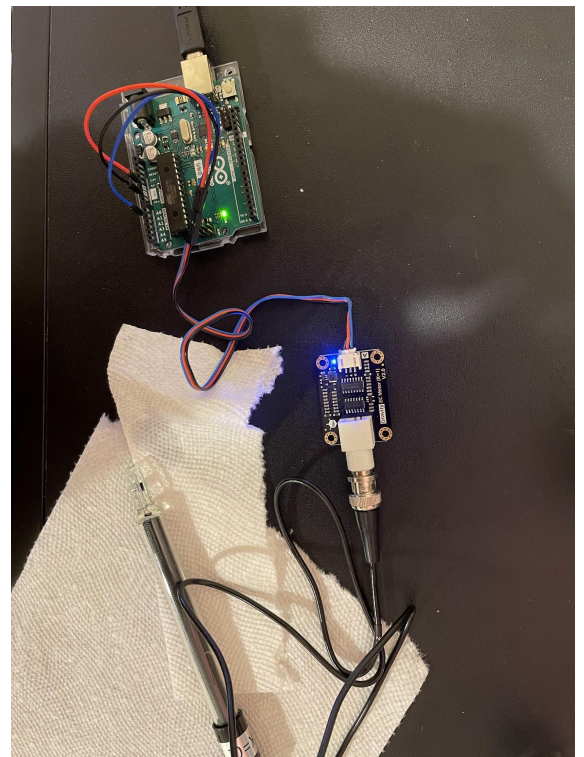
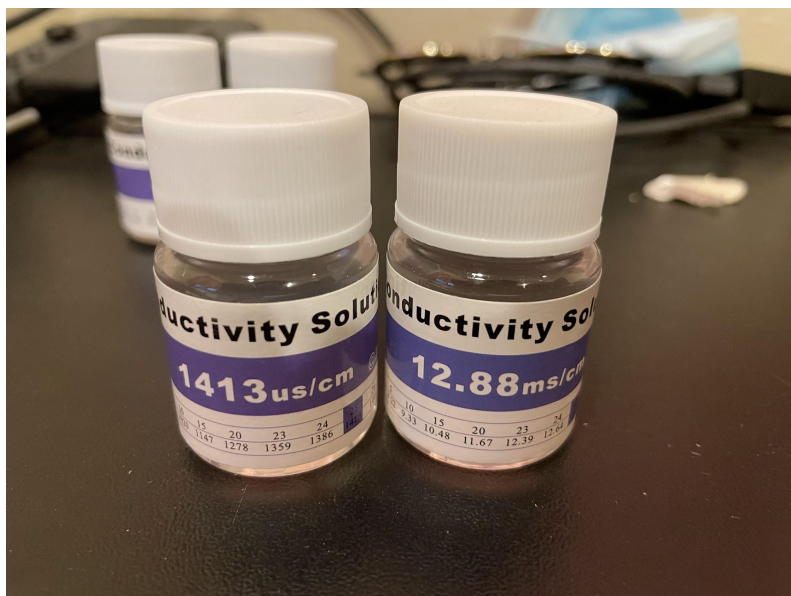
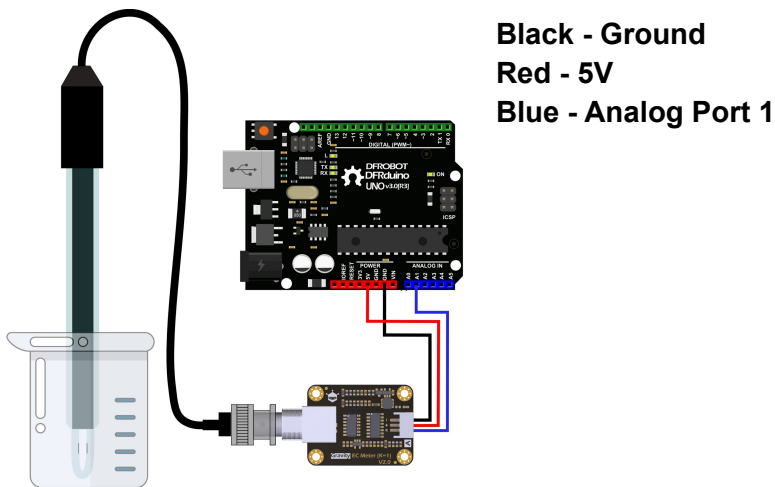
DFRobot EC Sensor Calibration (Updated 10/18/2021)

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Sensor Description:

This sensor uses two electrodes to run a small current through the liquid being tested to measure conductance, the reciprocal of resistance. This measurement is an indicator of how many ions are present in the water, as higher conductivity means more ions present. For the purposes of hydroponics, nutrients are presented as salts, which break down into ions, so the conductivity of the water can be used as a good measure of nutrient levels within the water, which can be adjusted as needed to promote plant growth. (OK State)

Schematic, Calibration Fluids, Configured Probe w/ Arduino:



Calibration Code (Provided by DFRobot):

```
#include "DFRobot_EC.h"
#include <EEPROM.h>

#define EC_PIN A1

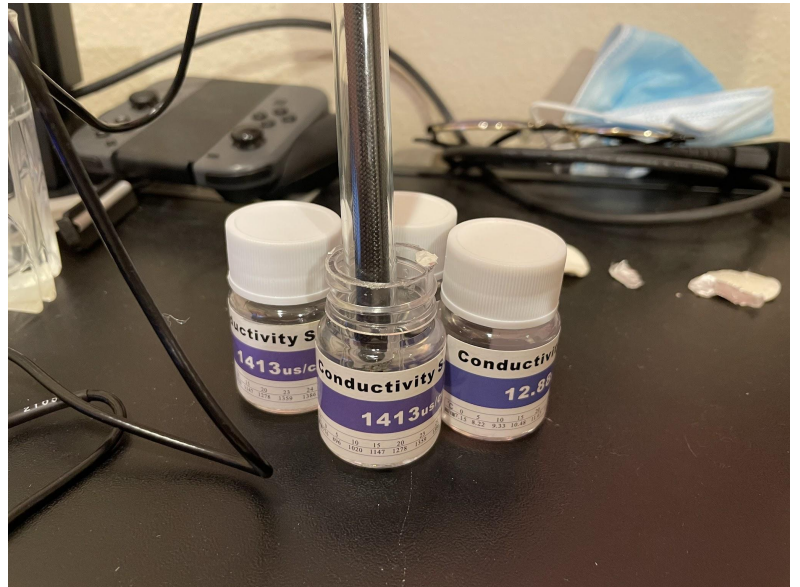
float voltage,ecValue,temperature = 25;
DFRobot_EC ec;

void setup() {
  Serial.begin(115200);
  ec.begin();
}

void loop()
{
  static unsigned long timepoint = millis();
  if(millis()-timepoint>1000U) //time interval: 1s
  {
    timepoint = millis();
    voltage = analogRead(EC_PIN)/1024.0*5000; // read the voltage
    temperature = 25; //Temporary value until temp sensor added
    //temperature = readTemperature(); // read your temperature sensor to execute
    temperature compensation
    ecValue = ec.readEC(voltage,temperature); // convert voltage to EC with temperature
    compensation
    Serial.print("temperature:");
    Serial.print(temperature,1);
    Serial.print("^C EC:");
    Serial.print(ecValue,2);
    Serial.println("ms/cm");
  }
  ec.calibration(voltage,temperature); // calibration process by Serail CMD
}
```

Pre Calibration(1413 us/cm)

COM3	
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.43ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.40ms/cm
temperature:25.0^C	EC:1.37ms/cm
temperature:25.0^C	EC:1.37ms/cm



Post Calibration (1413 us/cm)

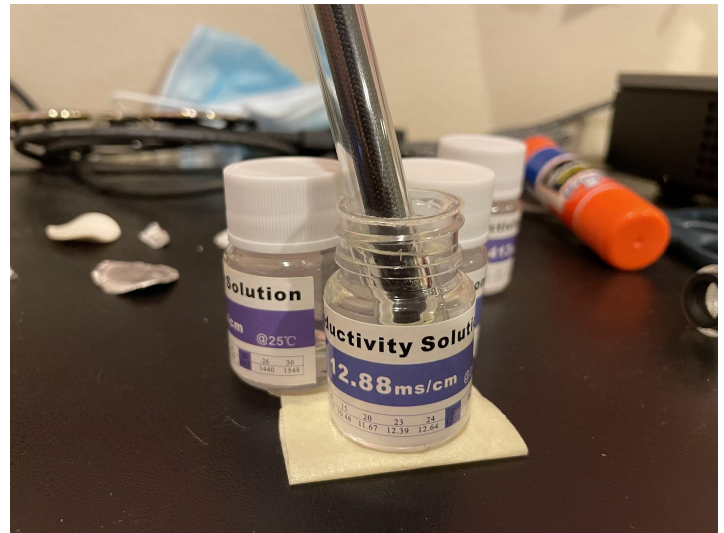
[illegible]

Pre Calibration (12.88 ms/cm)

COM3	
temperature:25.0^C	EC:10.51ms/cm
temperature:25.0^C	EC:10.63ms/cm
temperature:25.0^C	EC:10.75ms/cm
temperature:25.0^C	EC:10.84ms/cm
temperature:25.0^C	EC:10.90ms/cm
temperature:25.0^C	EC:10.93ms/cm
temperature:25.0^C	EC:10.99ms/cm
temperature:25.0^C	EC:11.02ms/cm
temperature:25.0^C	EC:11.05ms/cm
temperature:25.0^C	EC:11.05ms/cm
temperature:25.0^C	EC:11.11ms/cm
temperature:25.0^C	EC:11.14ms/cm
temperature:25.0^C	EC:11.11ms/cm
temperature:25.0^C	EC:11.16ms/cm
temperature:25.0^C	EC:11.19ms/cm
temperature:25.0^C	EC:11.22ms/cm
temperature:25.0^C	EC:11.19ms/cm
temperature:25.0^C	EC:11.25ms/cm
temperature:25.0^C	EC:11.25ms/cm
temperature:25.0^C	EC:11.28ms/cm
temperature:25.0^C	EC:11.28ms/cm
temperature:25.0^C	EC:11.34ms/cm
temperature:25.0^C	EC:11.34ms/cm
temperature:25.0^C	EC:11.34ms/cm
temperature:25.0^C	EC:11.34ms/cm
temperature:25.0^C	EC:11.37ms/cm
temperature:25.0^C	EC:11.40ms/cm
temperature:25.0^C	EC:11.40ms/cm
temperature:25.0^C	EC:11.40ms/cm
temperature:25.0^C	EC:11.40ms/cm
temperature:25.0^C	EC:11.43ms/cm
temperature:25.0^C	EC:11.40ms/cm
temperature:25.0^C	EC:11.40ms/cm
temperature:25.0^C	EC:11.43ms/cm
temperature:25.0^C	EC:11.37ms/cm
temperature:25.0^C	EC:11.43ms/cm
temperature:25.0^C	EC:11.43ms/cm
temperature:25.0^C	EC:11.49ms/cm
temperature:25.0^C	EC:11.46ms/cm
temperature:25.0^C	EC:11.46ms/cm
temperature:25.0^C	EC:11.46ms/cm
temperature:25.0^C	EC:11.43ms/cm
temperature:25.0^C	EC:11.49ms/cm
temperature:25.0^C	EC:11.46ms/cm
temperature:25.0^C	EC:11.49ms/cm

☒ Autoscroll ☐ Show timestamp

Newline



Post EC (12.88 ms/cm)

```
COM3

| Send

temperature:25.0^C EC:13.08ms/cm
temperature:25.0^C EC:13.04ms/cm
temperature:25.0^C EC:13.08ms/cm
temperature:25.0^C EC:13.08ms/cm

>>>Successful,K:1.08, Send EXITEC to Save and Exit<<<
temperature:25.0^C EC:12.88ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.88ms/cm
temperature:25.0^C EC:12.88ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.88ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.88ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.94ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.88ms/cm
temperature:25.0^C EC:12.94ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.88ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.94ms/cm
temperature:25.0^C EC:12.94ms/cm
temperature:25.0^C EC:12.94ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.88ms/cm
temperature:25.0^C EC:12.98ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.94ms/cm
temperature:25.0^C EC:12.94ms/cm
temperature:25.0^C EC:12.91ms/cm
temperature:25.0^C EC:12.98ms/cm

>>>Calibration Successful,Exit EC Calibration Mode<<<
```

Ending Notes:

Once calibrated, the values relatively stabilized with a 1-2% error margin. However, these measurements do not reflect the change in conductivity due to the temperature of the solutions, which we will be able to monitor and account for with the temperature probe. For these purposes, I used 25 C as the baseline, which definitely affected the calculated values. The DFRobot Libraries already have temperature compensation functions which I can use once the temperature probes come in and I start testing.

References:**Calibration Instructions from DFRobot Website:**

https://wiki.dfrobot.com/Gravity_Analog_Electrical_Conductivity_Sensor_Meter_V2_K%3D1_SKU_DFR0300

Info on Conductivity & Hydroponics:

<https://extension.okstate.edu/fact-sheets/electrical-conductivity-and-ph-guide-for-hydroponics.html>