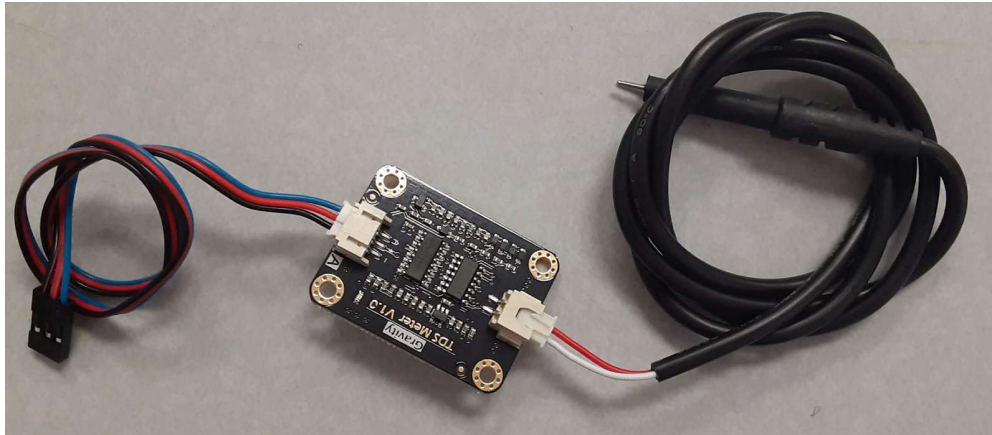


Objectives:

To calibrate the TDS sensor against known concentration solutions



Supplies Needed:

- SmartRock internals with battery and SD card (case not needed)
- DI rinse, 10 $\mu\text{S}/\text{cm}$, 447 $\mu\text{S}/\text{cm}$, 1413 $\mu\text{S}/\text{cm}$ pouches
- 3 x 30mL cups
- 1 pipette
- Paper towels
- Computer to read csv file off SD card
- EC_example_CUAHSI_SmartRock_2020.xlsx spreadsheet (found in Day 3 folder on Hydroshare)
- Scissors
- 5 gallon bucket (or other container of at least 20 ml volume)
- Sharpie or marker



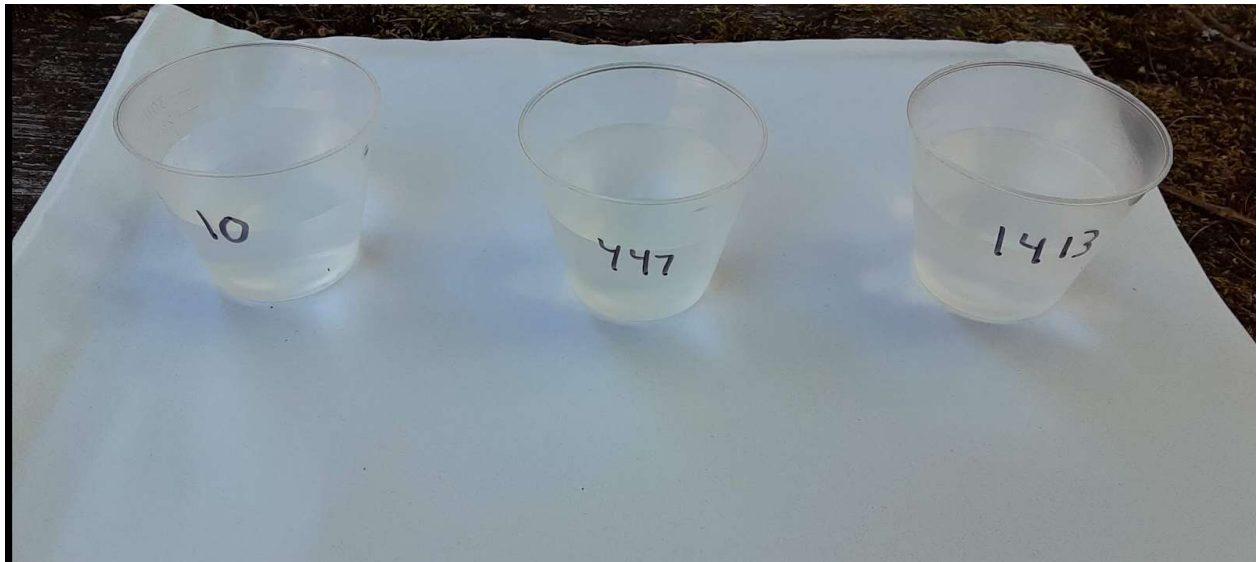
Procedure:

Do not use your DI water or calibration solutions until after re-programming your SmartRock Firmware.

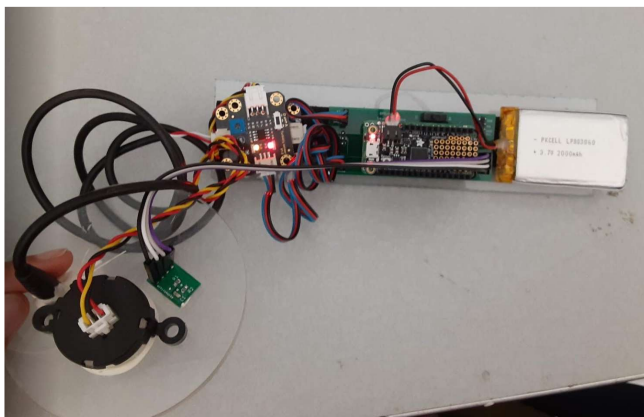
1. Fill each of the 3 30ml cups with tap water
2. Put no table salt in the first cup, 0.5 tablespoons of table salt in second cup, and 1 tablespoon of salt into the third cup

Steps for solutions after re-programming SmartRock Firmware

1. Label each 30mL cup with sharpie or tape with the three different concentrations - 10, 447, 1413 $\mu\text{S}/\text{cm}$
2. Open each pouch and pour each into its labeled 30mL cup



3. Open Smart Rock with sensors connected and slide out electronics with acrylic sensor end
4. Make sure all sensors are connected and SD card is in
5. Set switch to mode B (calibration mode)
6. Plug in battery



7. Fill pipette with 2 mL of tap water (or DI solution after re-programming)



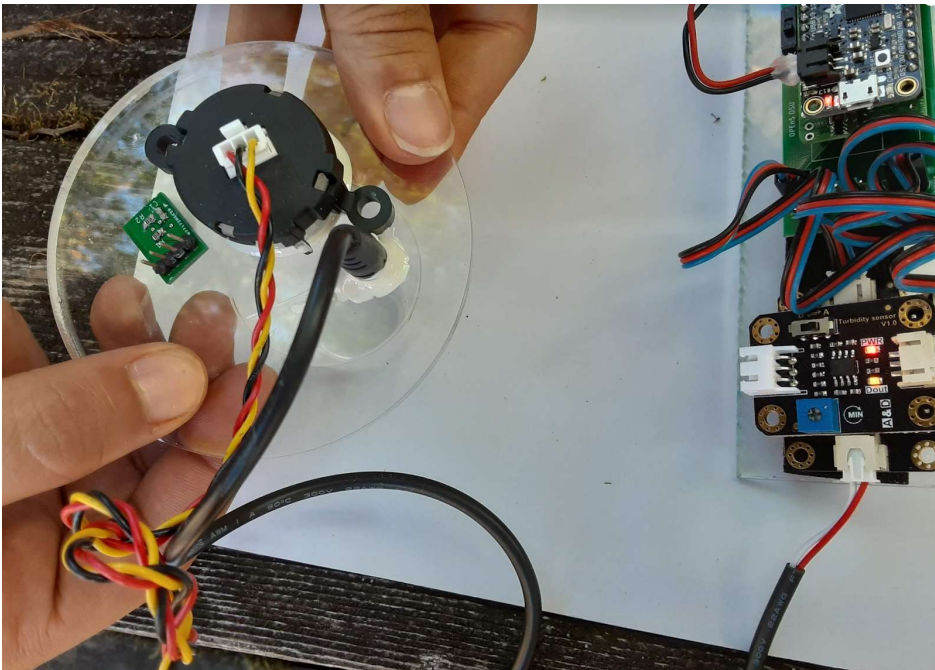
8. Use pipette with 2 mL of tap water (or DI solution after re-programming) to rinse TDS probe over a 5 gallon bucket (or other receptacle). Make sure to rinse any part that will get submerged in calibration solutions without letting the pipette touch the probe



9. Wipe probe with paper towel



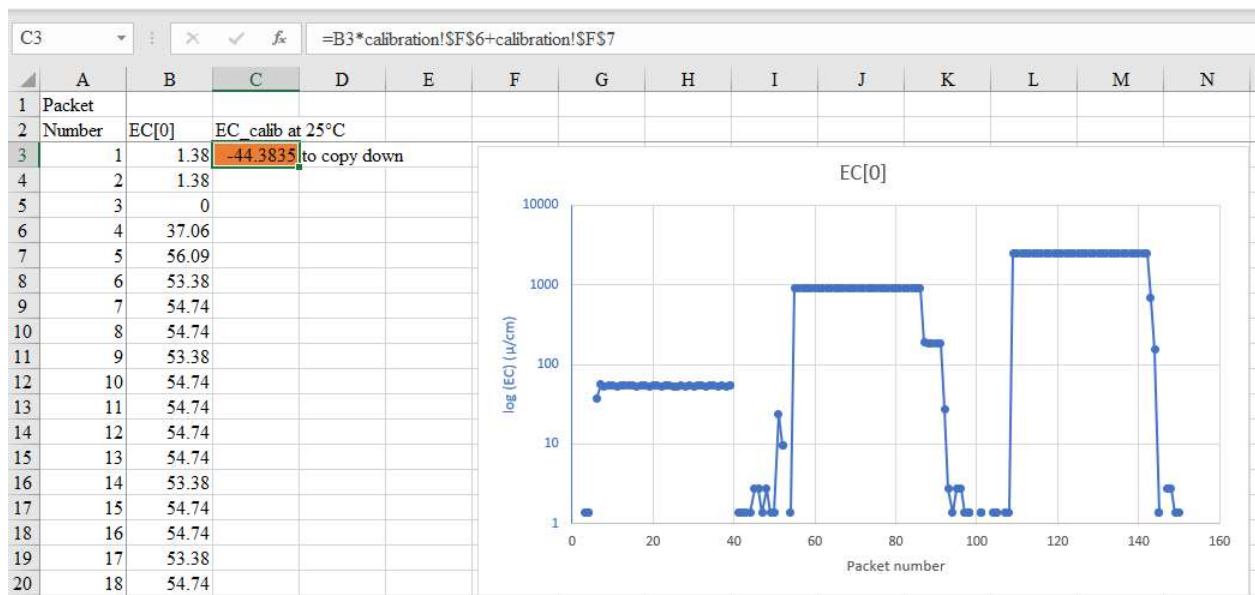
10. Insert probe in no salt solution (or 10 $\mu\text{S}/\text{cm}$ solution after programming), stir gently, then let sit for ~ 1 minute



11. Repeat steps 7-10 with remaining solutions
12. Unplug battery, take out SD and open csv file on computer

Calibrating with MS Excel:

1. Open your csv file and EC_example_CUAHSI_SmartRock_2020.xlsx
2. In the csv file, select all the data in the column for Packet Number by clicking on the letter at the top of the column
3. Use CTRL+c to copy the column
4. Select cell A1 in the “data” sheet of EC_example_CUAHSI_SmartRock_2020.xlsx
5. Use CTRL+v to paste into column A
6. Repeat with the EC column to transfer data from your csv file to columns B in the example spreadsheet. The graph will automatically plot all values of EC.



7. Use the graph to find the packet numbers for the three solutions

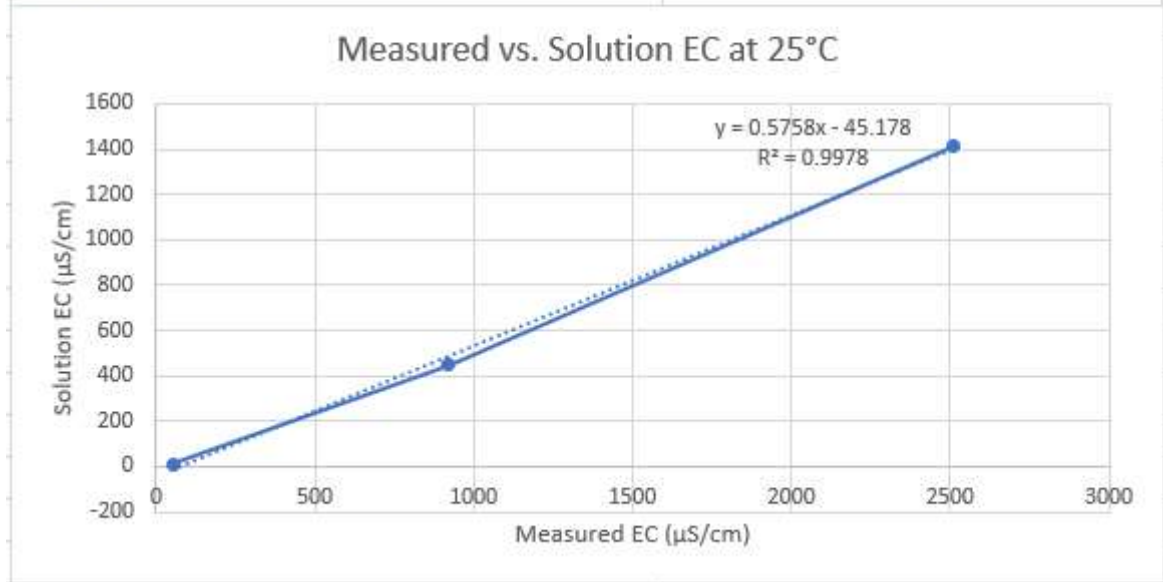
8. Copy five packet number and EC values from the “data” sheet for each solution into the respective green cells in the “calibration” sheet.

	A	B	C	D
1	Packet	Measured values - temp adj (μS/cm)	Solution concentration at 25°C	
2	10	54.74	10 μS/cm	
3	11	54.74		
4	12	54.74		
5	13	54.74		
6	14	53.38		
7				
8	60	920.49	447 μS/cm	
9	61	921.61		
10	62	921.61		
11	63	919.37		
12	64	919.37		
13				
14	110	2507.94	1413 μS/cm	
15	111	2507.94		
16	112	2511.35		
17	113	2513.05		
18	114	2509.64		

Results and troubleshooting:

- Use the graph in the “calibration” sheet to evaluate the calibration
- If satisfactory, use the slope and intercept in cells F6 and F7, respectively, as your calibration parameters for electrical conductivity by copying and pasting the formula in cell C3 ($=B3*\text{calibration!}\$F\$6+\text{calibration!}\$F\7) of the “data” sheet for all rows with data.

E	F
Average measured values at 25°C (μS/cm)	Solution value at 25°C (μS/cm)
53	10
921	447
2509	1413
Calibrated EC = Slope * Measured EC + Intercept	
Slope	0.58
Intercept	-45.18



- Double-clicking on the box in the bottom right corner of cell D3 will copy that formula to calculate calibrated EC for the entire column below.

✓	f_x	=B3*calibration!\$F\$6+calibration!\$F\$7			
C	D	E	F	G	
EC_calib at 25°C					
-44.3835	to copy down				

↑