SPARTA Field/Vacuum Bench

User Interface: Operation Guide

Matthew Duong (3223 Affiliate)

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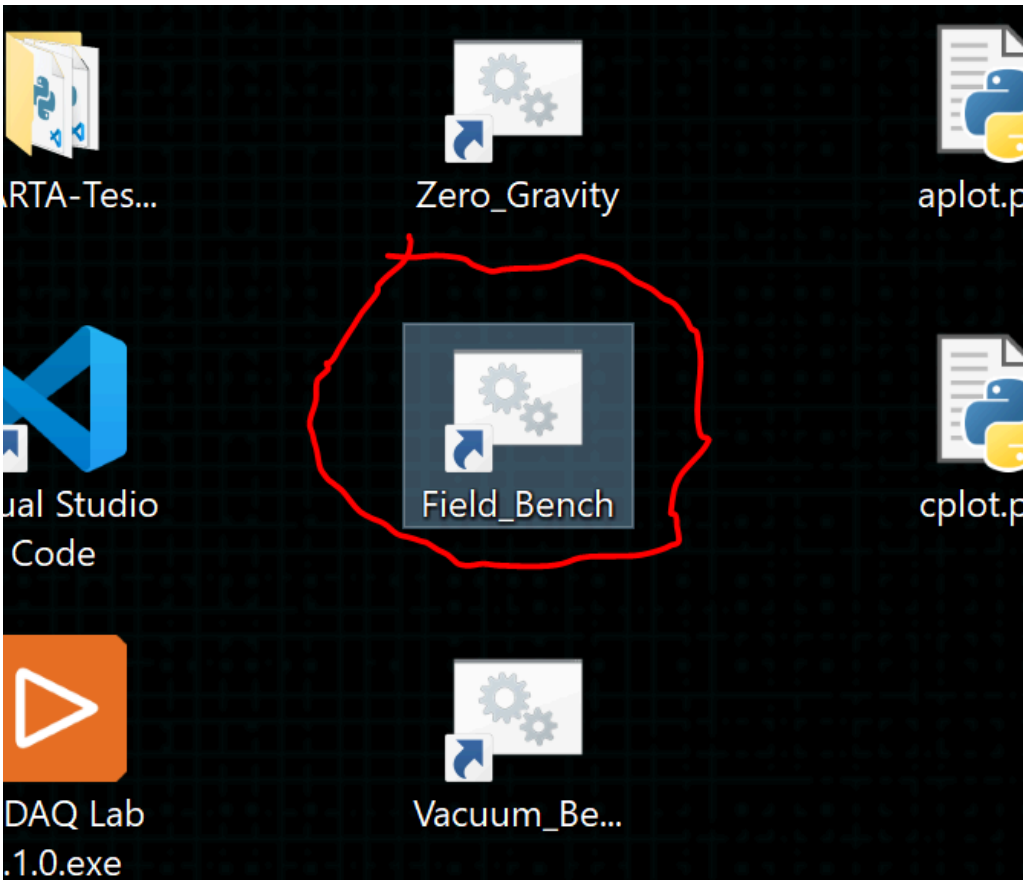
Last Updated: December 13th, 2024

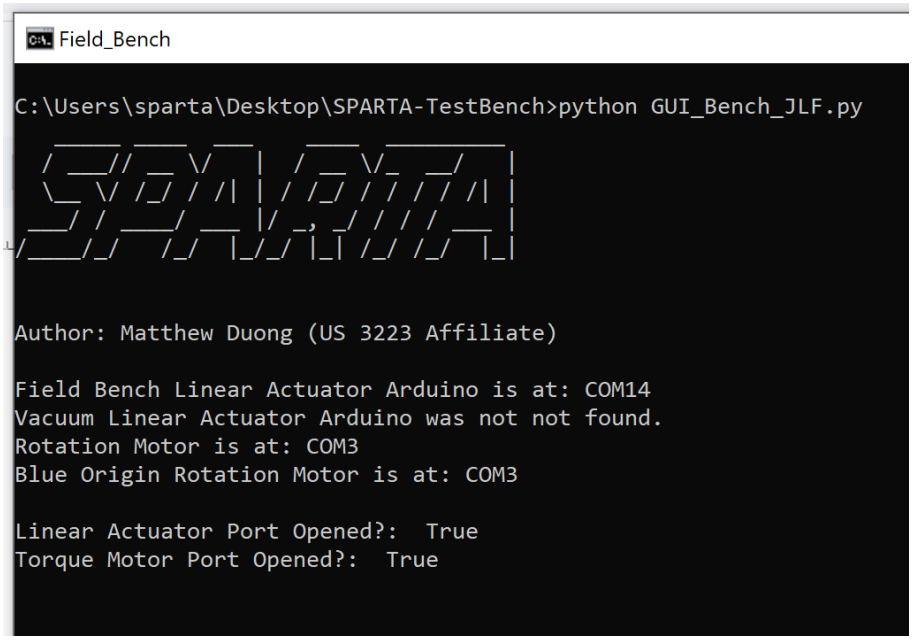
Opening The Interface:

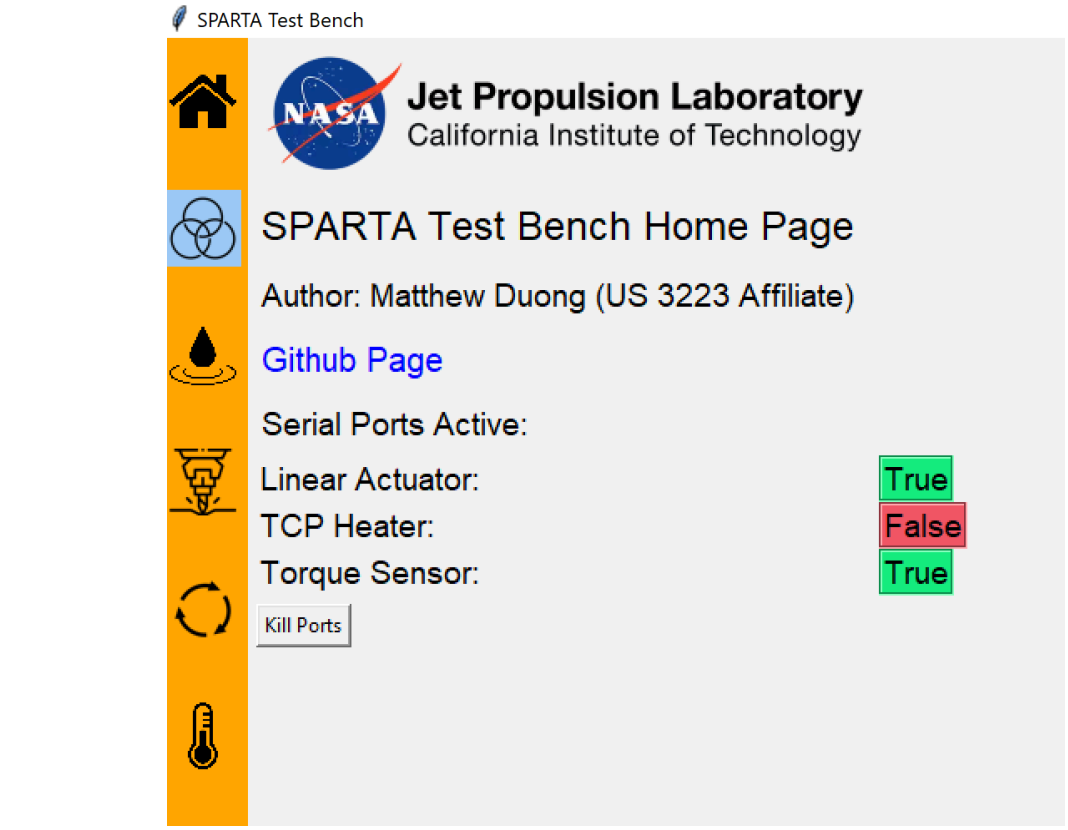
1. On the top right corner of the desktop, you'll see launchers for different versions of test benches. This is for the Field Bench/Vacuum, so open whichever you're using.



- MAKE SURE THE **MOTOR CONTROLLER** AND **LINEAR ACTUATOR ARDUINO** ARE NOT PLUGGED INTO THE SAME USB HUB! **KEEP THEM SEPARATED** OR ELSE **PORT RESETS WILL HAPPEN!**

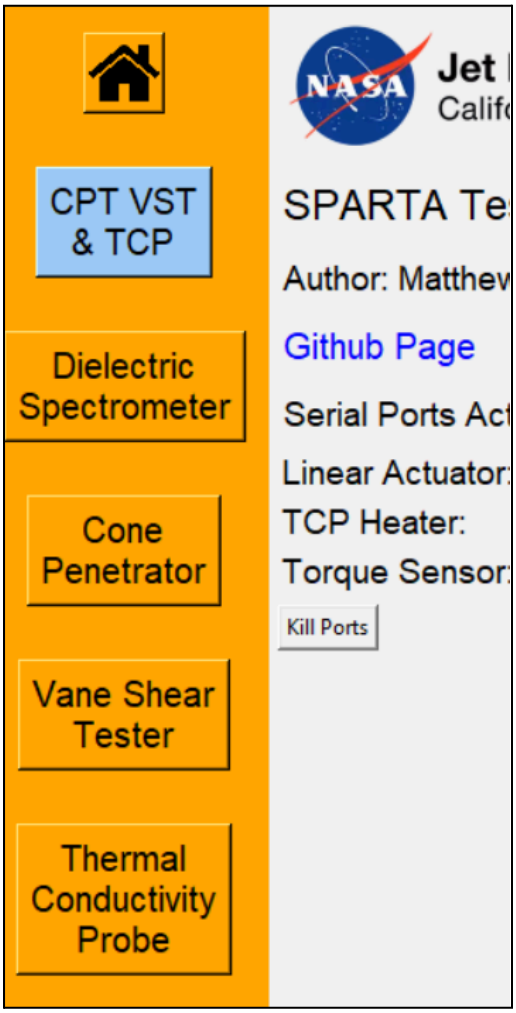
- The program will only open properly if the Linear Actuator, Torque Motor Controller, and DAQ chassis are all plugged into the PC. (TCP is still out of commission)
- Also, all ‘Serial Ports Active’ items should be lit up as green and marked ‘True’.
    - Otherwise, it will close very quickly and an error will appear on the console window.



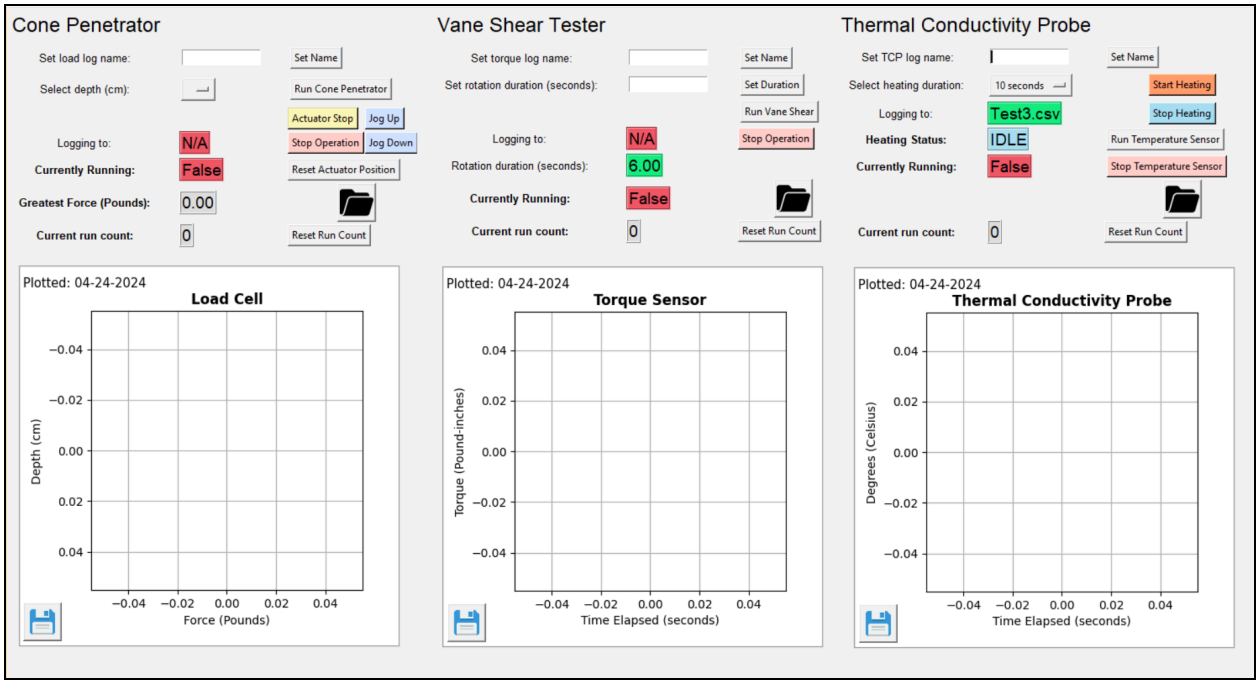

SPARTA Test Bench
Jet Propulsion Laboratory
California Institute of Technology
SPARTA Test Bench Home Page
Author: Matthew Duong (US 3223 Affiliate)
Github Page
Serial Ports Active:
Linear Actuator:
True
TCP Heater:
False
Torque Sensor:
True
Kill Ports

Interface Navigation Overview:

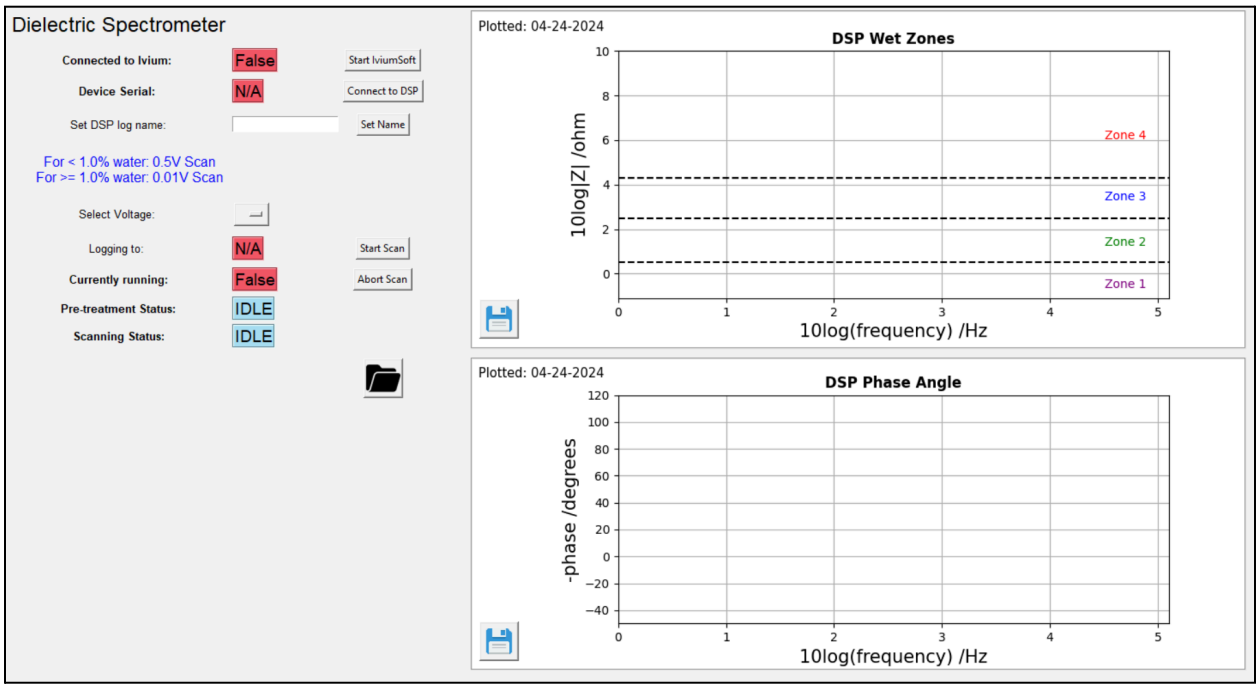
1. The left orange bar contains the navigation to switch between pages and components. All you need to do is hover over with the mouse and click to whichever page you want to go to.



2. The ‘CPT, VST, & TCP’ page has all three within the same page. They also have their own separate pages, but I’m mostly just keeping them for the sidebar to look more ‘complete’ and lively.



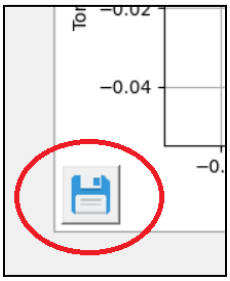
3. ‘Di-electric Spectrometer’ has the controls to operate the DSP’s external software, along with two live plots for the impedance and phase angle.



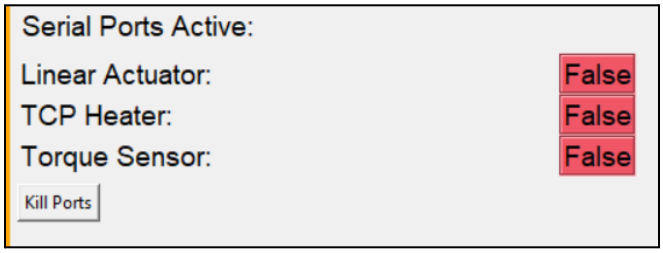
4. ‘Thermal Conductivity Probe’ contains the controls for the TCP

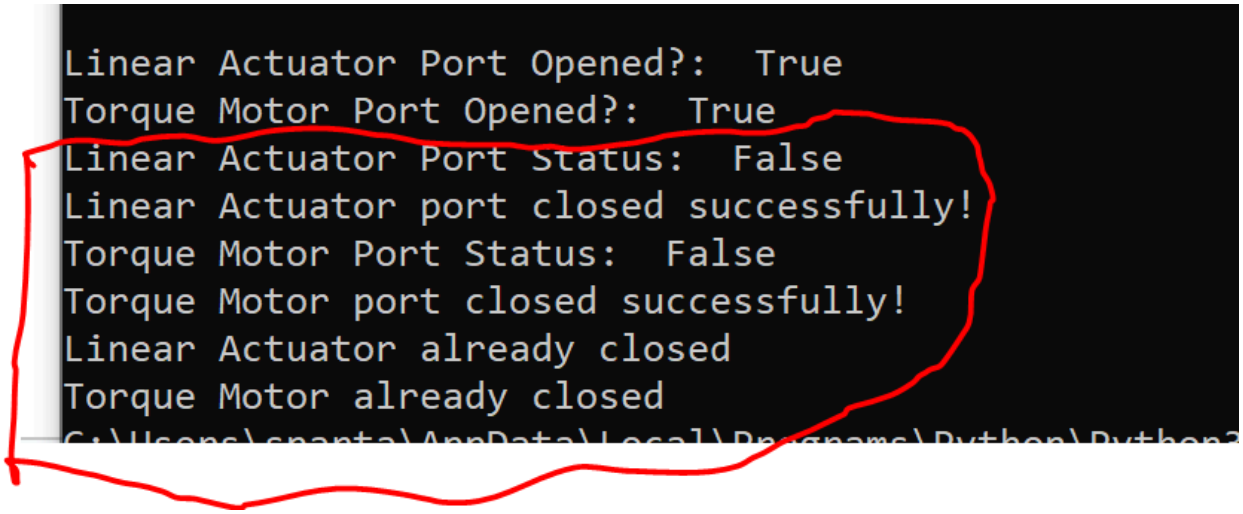
5. Each component should have its own folder button, which opens their respective data folders, which are organized by date.

6. Each component's plot figure should have a 'Save Image' button, which saves the particular plot that you click on. I left this as a manual operation because having it automatically save a new image after every run would cause a big clutter.



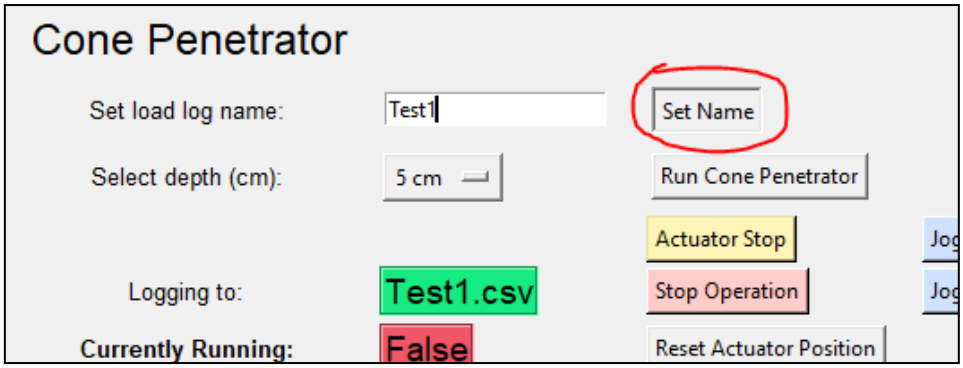
7. Lastly on the Home page, the 'Kill Ports' button will cut off all serial communication with the Linear Actuator, TCP Heater, and Torque Motor safely. It's used to safely close the device communication ports when you're done using the software.
8. This process will also be done automatically if you close the software window, sometimes I just like seeing it done manually so I kept it.



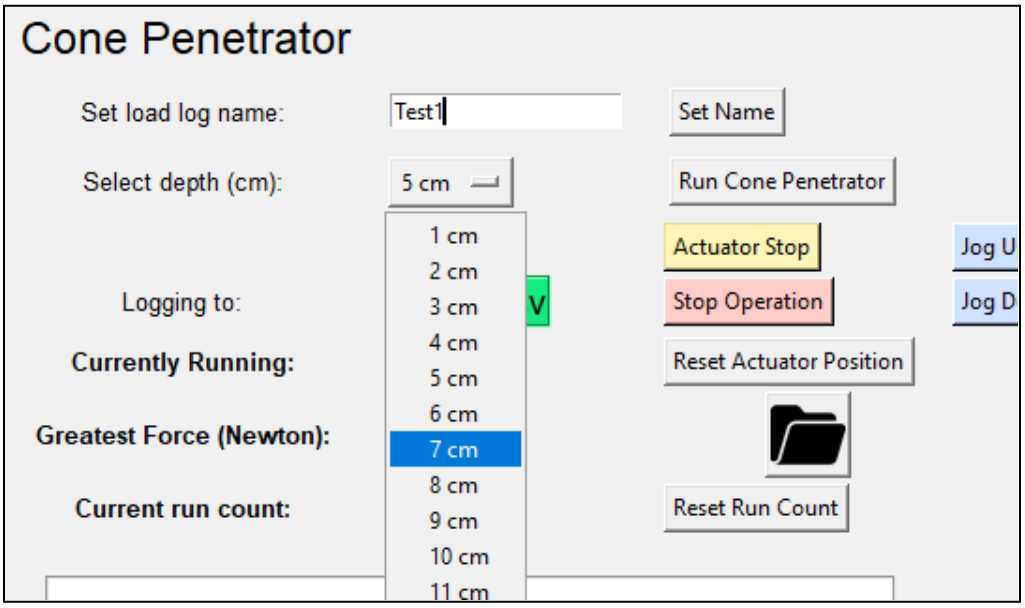

Linear Actuator Port Opened?: True
Torque Motor Port Opened?: True
Linear Actuator Port Status: False
Linear Actuator port closed successfully!
Torque Motor Port Status: False
Torque Motor port closed successfully!
Linear Actuator already closed
Torque Motor already closed

CPT Operating

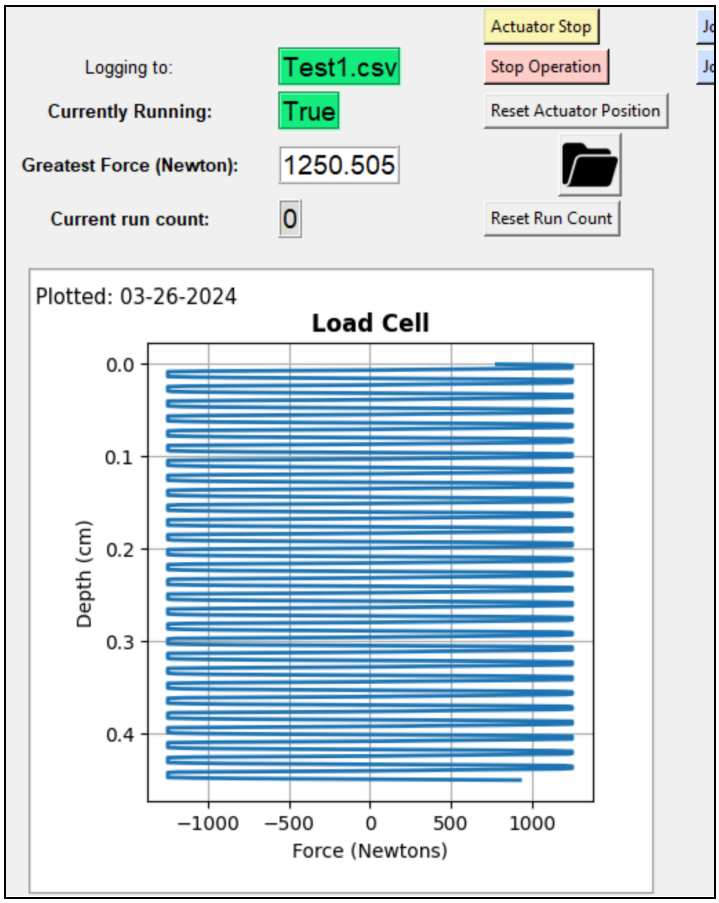
1. Type in a name for a CSV data file and click the ‘Set Name’ button.



2. Select the amount of depth/distance you want to move from the dropdown. Once you click a depth option, it should be set automatically.



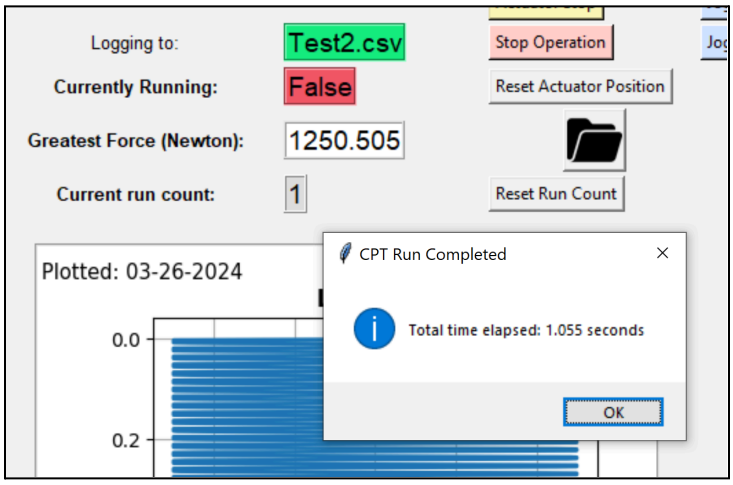
3. Once you’re ready to start a run, click the ‘Run Cone Penetrator’ button. The plot should begin updating and logging data in real time for you to view.



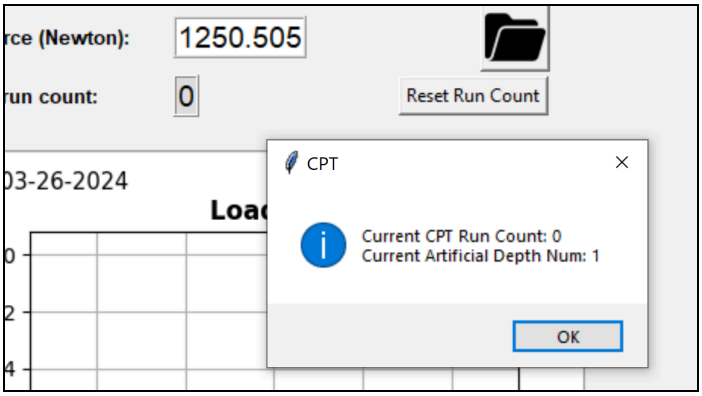
4. **If you start the operation but don't see anything running or logging,** open up the terminal window and check to see if a 'timeout' or 'COM port error' appears.
    a. If one of them does say that, I would suggest closing the program, unplugging and replugging in the USB hub, then restarting the program.

5. If at any point you need to stop the actuator during the operation (i.e. you think the probe is going to snap, etc.), you can use the 'Actuator Stop' or 'Stop Operation' buttons
    a. **'Actuator Stop'** will stop the actuator from moving, BUT the data logging will continue until it artificially reaches the target depth you selected.
    b. **'Stop Operation'** will stop the actuator from moving AND will end the data logging as well.
    c. **Honestly though I think it's better overall to just turn the power completely off by flipping the switch. Better safe than sorry**

6. At the end of the run, this small success window will pop up with the elapsed time and the actuator and logging should stop.

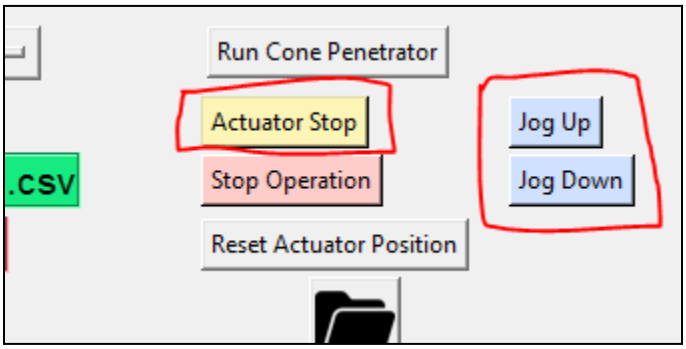


7. Then the ‘Run Count’ should increment by 1.
    a. The counter’s main purpose is to allow you to run the operation more than once, while appending to the same CSV file. This will also continue the live plo t on the same figure.
    b. The counter will continue to increment by 1 each time you do another run on the same CSV file.
    c. Once you’re finished logging to a CSV file and want to start a new one, click the ‘Reset Run Count’ button. A window should open confirming the reset back to 0.
        i. **IF YOU DO NOT RESET THE RUN COUNTER BEFORE YOU START LOGGING TO A NEW CSV, NO DATA WILL BE LOGGED AND THE ACTUATOR WILL MOVE INDEFINITELY UNTIL IT REACHES ITS END POSITION!**



d. If the counter is at 0, that's how you'll know you're about to write to a brand new file.

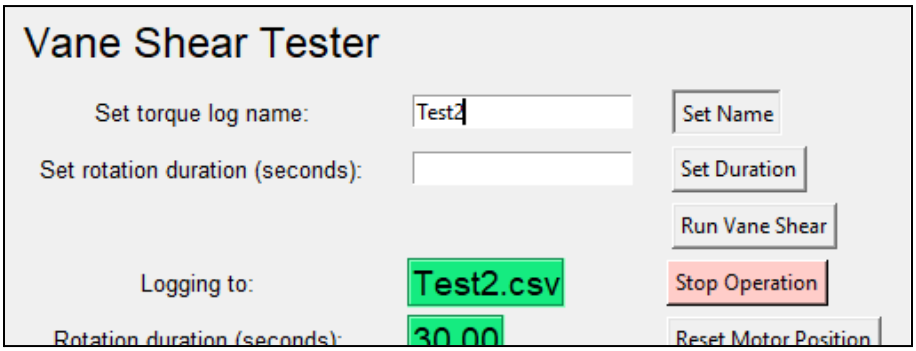
8. Once you're ready to reset the actuator and start a new run, click the 'Reset Actuator Position' button and wait until it retracts all the way.
    a. Also if you want to just move the actuator up and down without taking in any data, you can use the **'Jog Up'**, **'Jog Down'** and 'Actuator Stop' buttons.



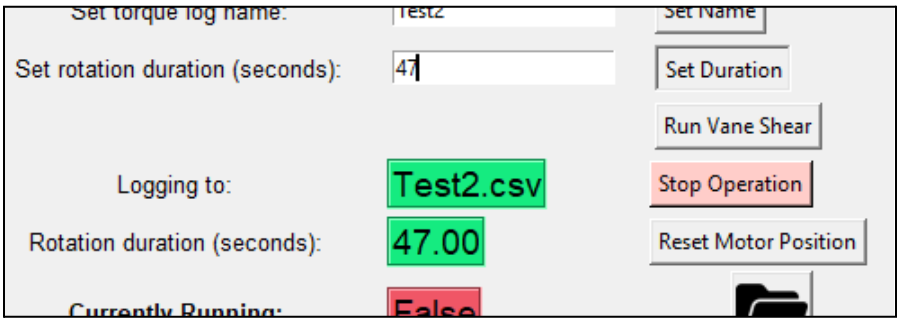
9. Once the actuator and run count is reset, you're ready to start over at step 1 with a new CSV.

VST Operating

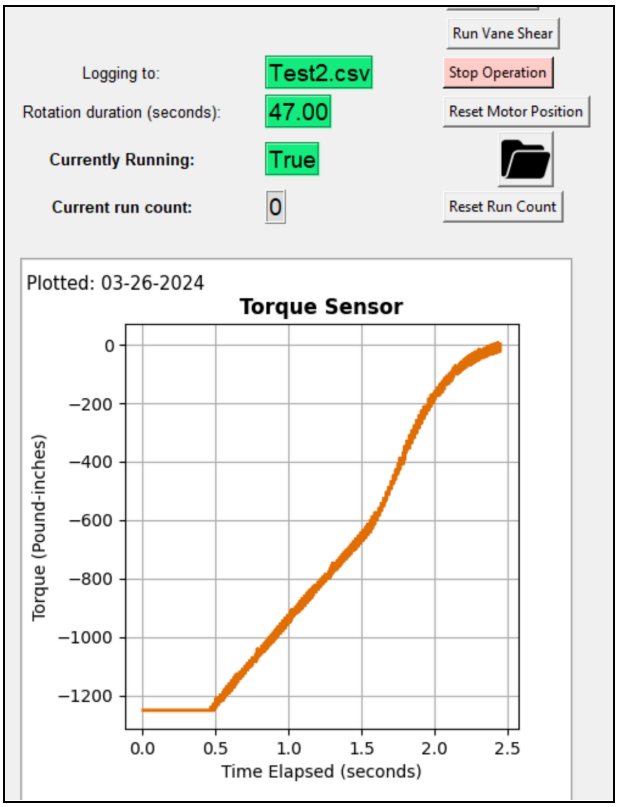
1. Typing in a name for a CSV data file and click the ‘Set Name’ button.



2. Type in the amount of time (in seconds) that you want the motor to rotate and click ‘Set Duration’.

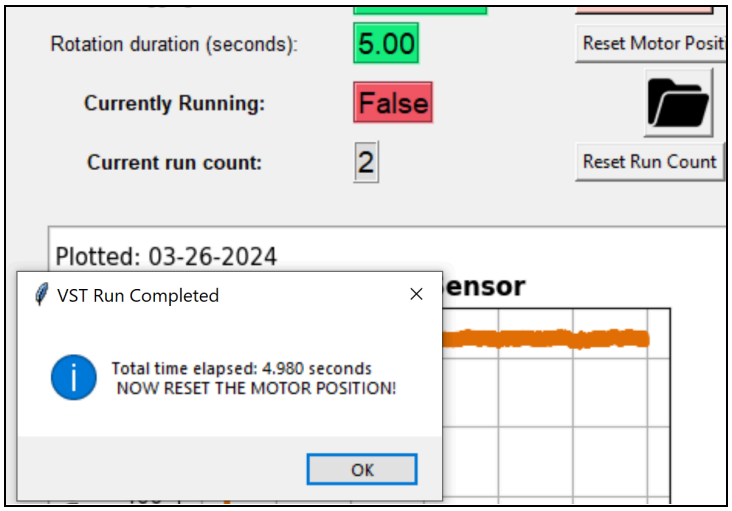


3. Once you’re ready to start a run, click the ‘Run Vane Shear’ button. The plot should begin updating and logging data in real time for you to view.



4. **If you start the operation but don't see anything running or logging,** open up the terminal window and check to see if a 'timeout' or 'COM port error' appears.
    a. If one of them does say that, I would suggest closing the program, unplugging and replugging in the USB hub, then restarting the program.

5. If at any point you need to stop the rotation during the operation (i.e. you hear a bad noise inside the motor, or you think something's going to break), click the 'Stop Operation' button. It should stop both the motor rotation, and the data logging.



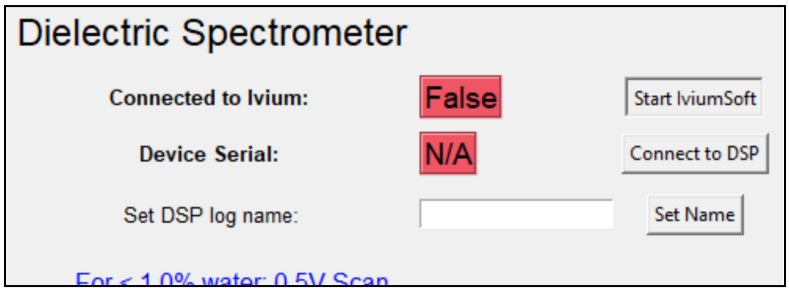
6. If you need to, reset the motor position by clicking the ‘Reset Motor Position’ button
    a. **If the motor doesn’t move/reset, refer to the same instructions on step 4.**

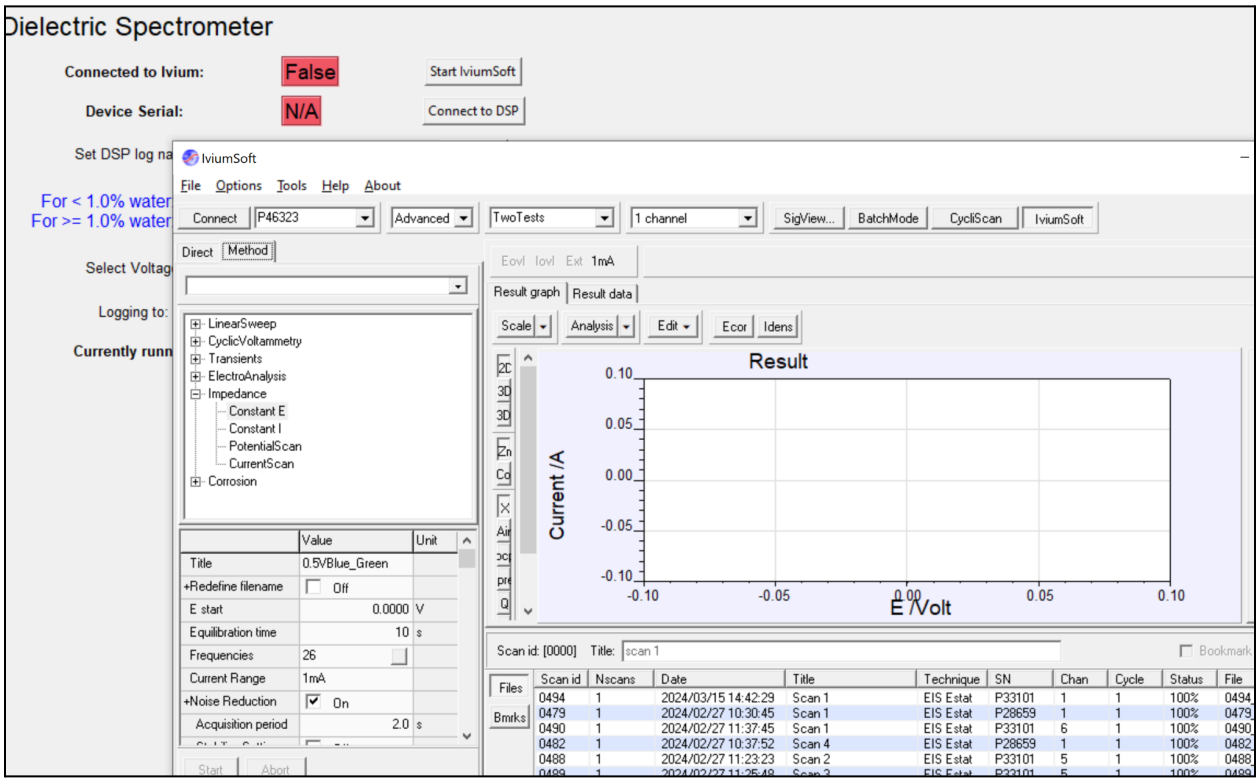
7. The ‘Run Count’ works the same way as it does for the CPT. Run as many operations as you need for a CSV file and **make sure to reset the count** once you’re ready to move onto a different file.

8. After that, you should be ready to start back at step 1 with a new file.

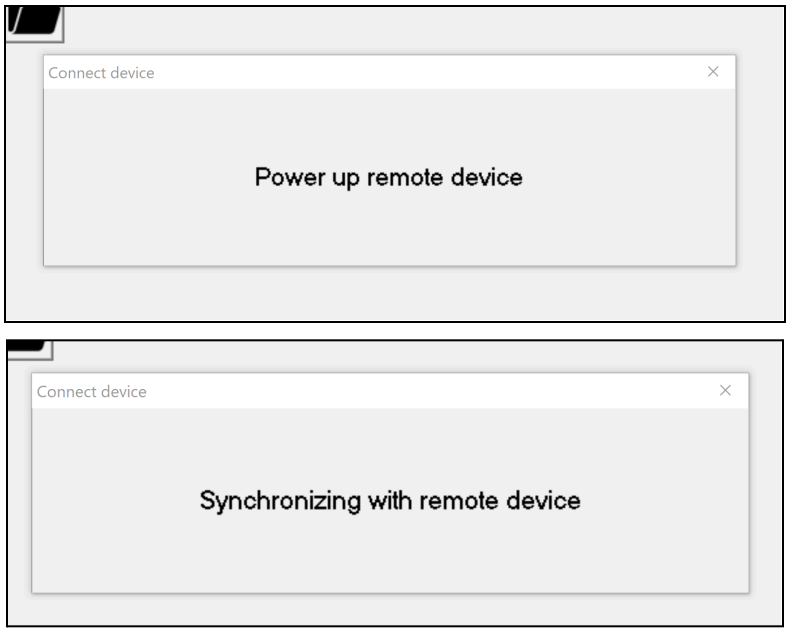
DSP Operating

1. Start by clicking the ‘Start IviumSoft’ button. This will open up the DSP’s external software program.

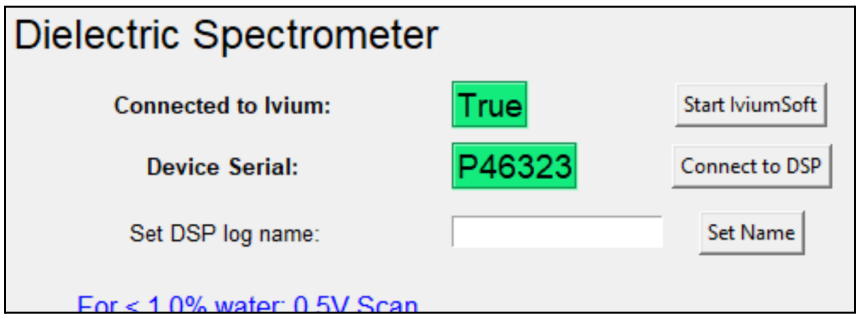


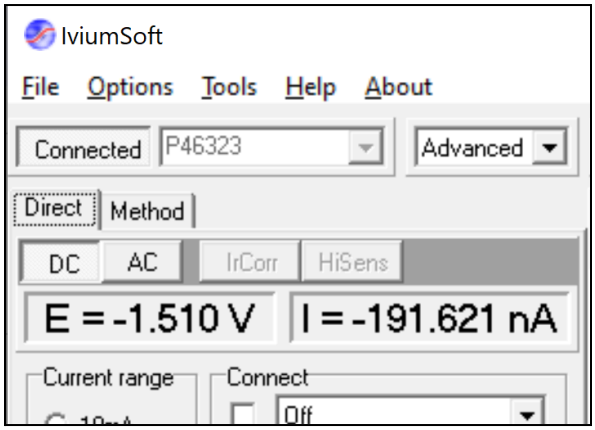


2. Make sure the DSP is connected by USB and the blue light is on. Then go back to the SPARTA software window and click ‘Connect to DSP’. A small window should open saying ‘Power up remote device’ then ‘Synchronizing with remote device’

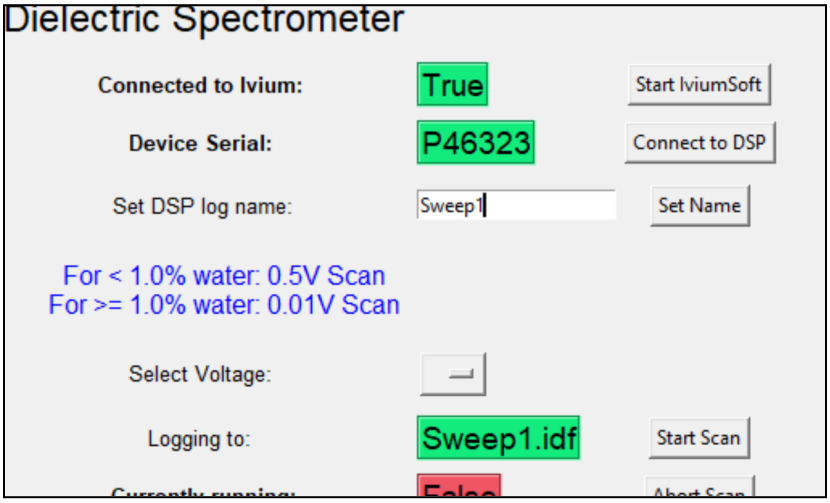


3. Once it's connected, the 'Device Serial' should update from a red 'N/A' to a green containing PXXXXX, where the X's are whatever the serial number is on that specific DSP. The device on IviumSoft should also say 'Connected'.

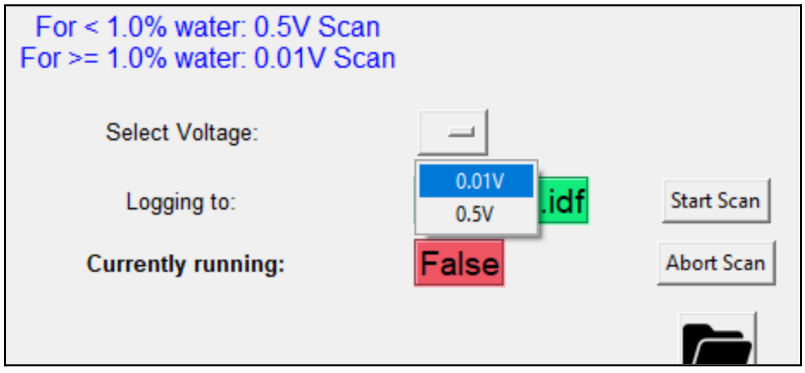




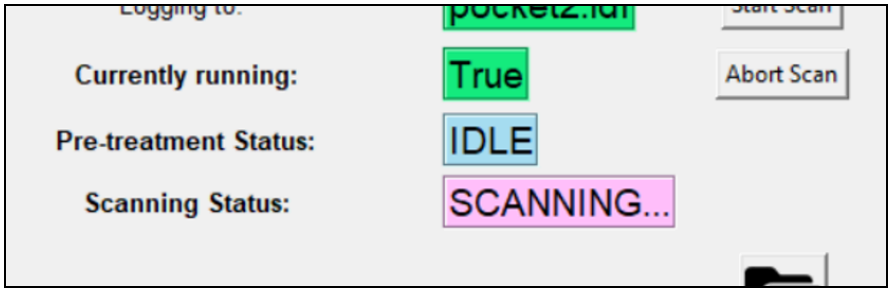
4. Type in a name for an IDF data file and click the ‘Set Name’ button. This should change the red ‘N/A’ in ‘Logging to:’ to green with the name you typed in. This will be the file the program will write to once it finishes a scan.



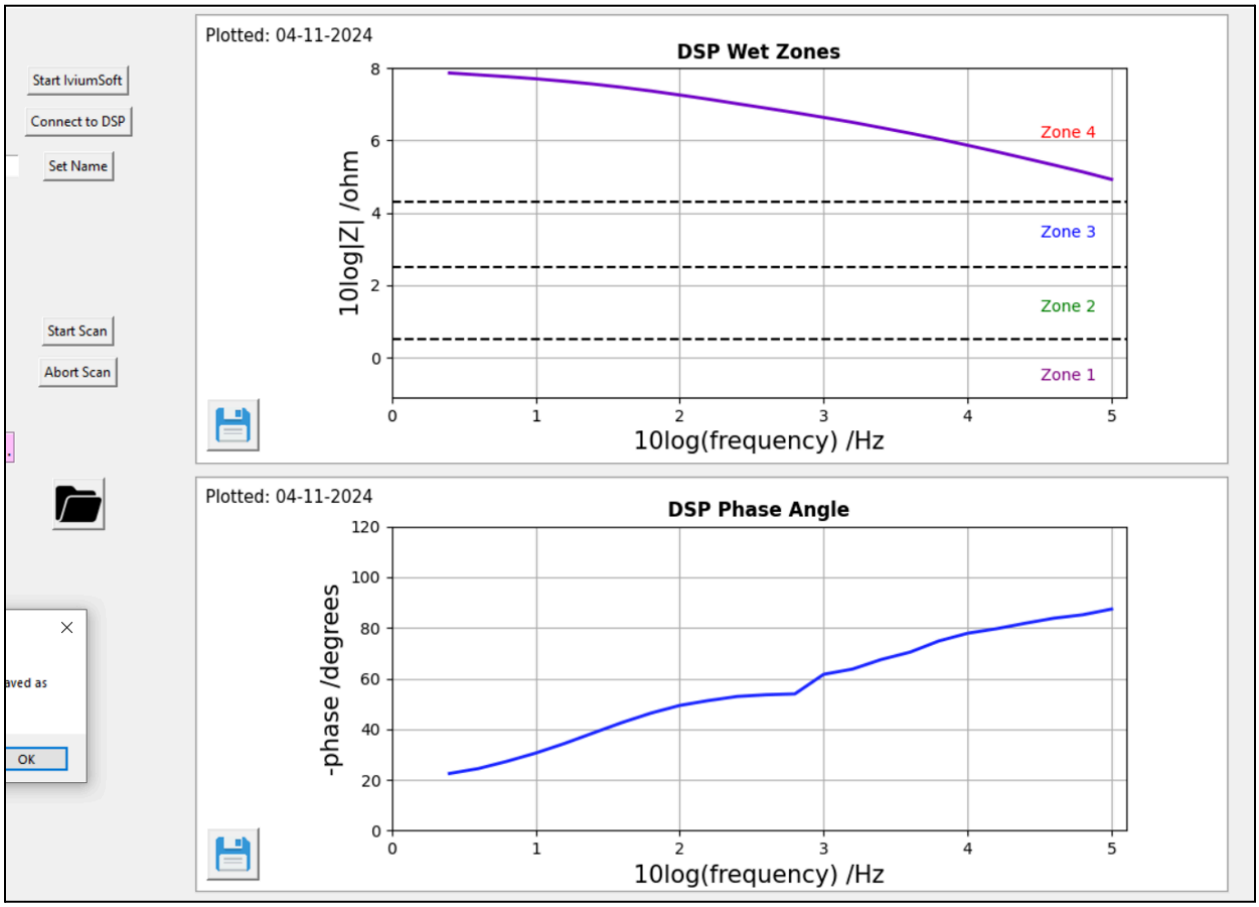
5. Depending on how much water is in the sample you’re going to test, select either 0.5V or 0.01V for the excitation.
    a. Choose 0.5V if there is less than 1.0% water
    b. Choose 0.01V if there is more than 1.0% water
    c. If it is unknown, it’s probably safer to just choose the 0.5V UNLESS it’s noticeably pretty wet. In that case, choose 0.01V.

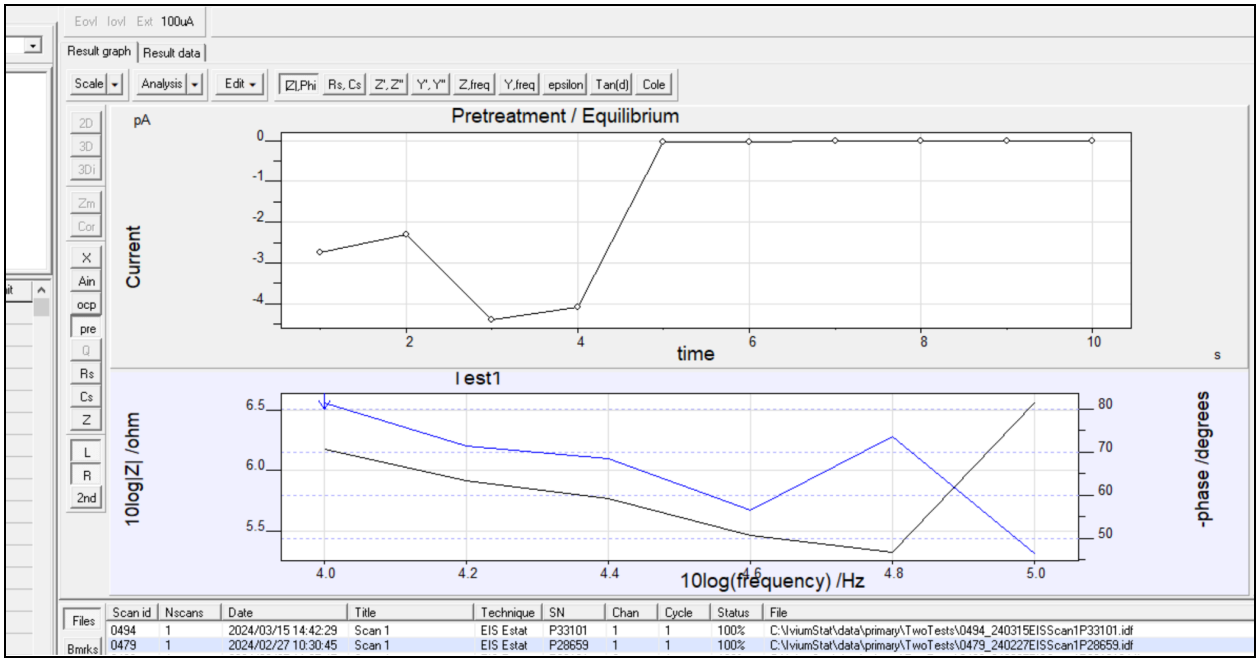


6. Once you’re ready to start, click the ‘Start Scan’ button. This will cause the DSP to click and flash a red LED, signaling that a new scan has started.
7. The ‘Pre-treatment Status’ should flash purple for about 10 seconds, then the actual scanning will start.

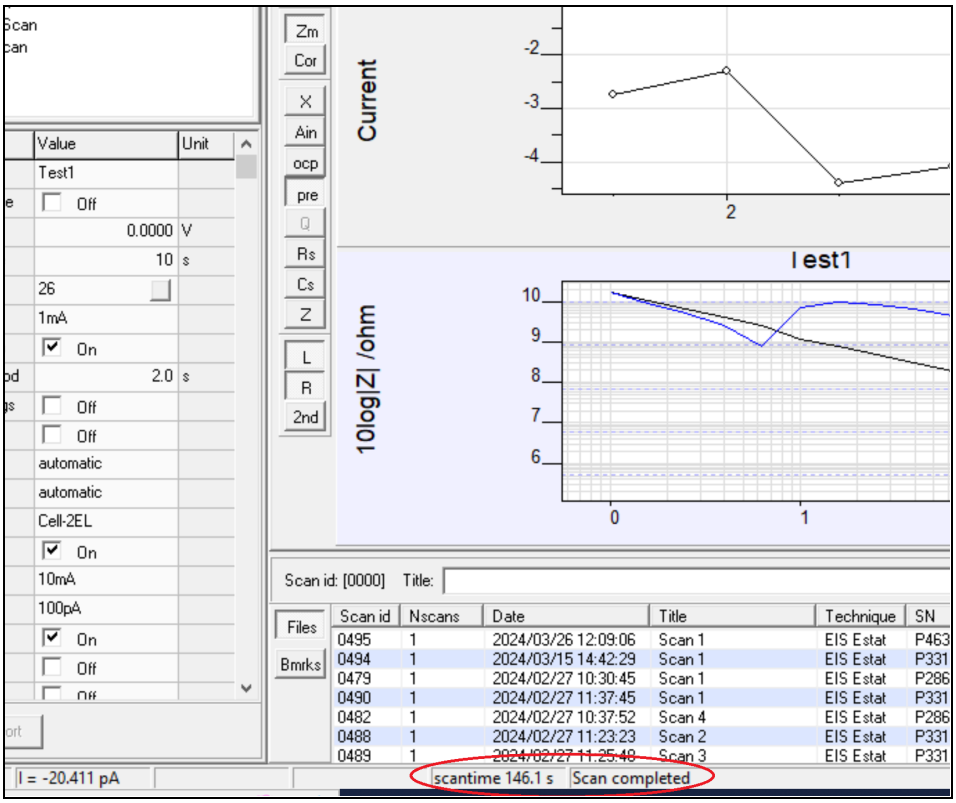


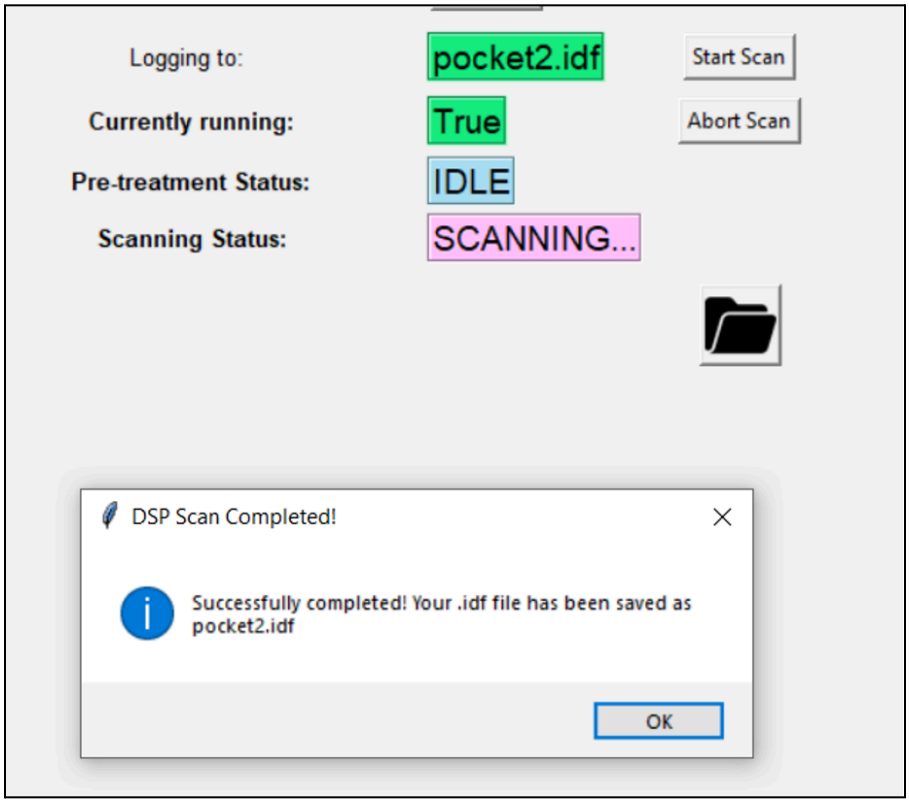
8. To view the live results, either just stay on the program OR switch back to the ‘IviumSoft’ window for direct results from their software.





9. Once the scan finishes, the DSP should click again and the LED should flash back to green. A window confirming the DSP has finished scanning should pop up momentarily.
    a. The pop up could be slightly delayed by a few seconds because the software is periodically checking every second to see if the scanning on an external software is done yet.
    b. After the window pops up, the IDF should be saved locally.

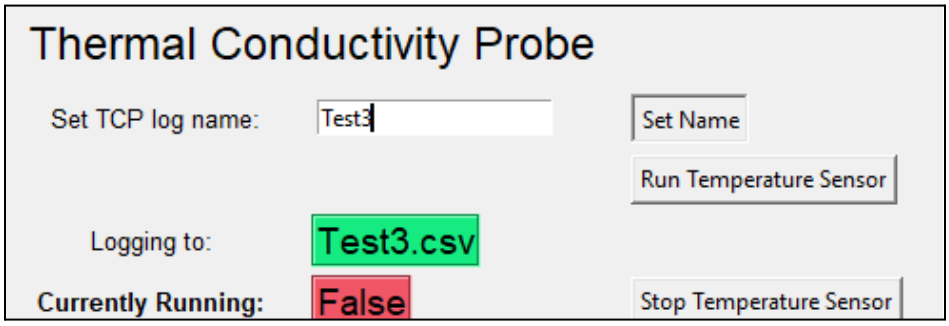

Value
Unit
Test1
Off
0.0000 V
10 s
26
1mA
On
2.0 s
Off
Off
automatic
automatic
Cell-2EL
On
10mA
100pA
On
Off
Zm
Cor
X
Ain
ocp
pre
Q
Rs
Cs
Z
L
R
2nd
Current
-2
-3
-4
2
I est1
10log|Z| /ohm
10
9
8
7
6
0
1
Scan id: [0000]
Title:
Files
Bmrks
Scan id
Nscans
Date
Title
Technique
SN
0495 1 2024/03/26 12:09:06 Scan 1 EIS Estat P463
0494 1 2024/03/15 14:42:29 Scan 1 EIS Estat P331
0479 1 2024/02/27 10:30:45 Scan 1 EIS Estat P286
0490 1 2024/02/27 11:37:45 Scan 1 EIS Estat P331
0482 1 2024/02/27 10:37:52 Scan 4 EIS Estat P286
0488 1 2024/02/27 11:23:23 Scan 2 EIS Estat P331
0489 1 2024/02/27 11:25:48 Scan 3 EIS Estat P331
I = -20.411 pA
scantime 146.1 s
Scan completed


Logging to:
pocket2.idf
Start Scan
Currently running:
True
Abort Scan
Pre-treatment Status:
IDLE
Scanning Status:
SCANNING...
DSP Scan Completed!
Successfully completed! Your .idf file has been saved as pocket2.idf
OK

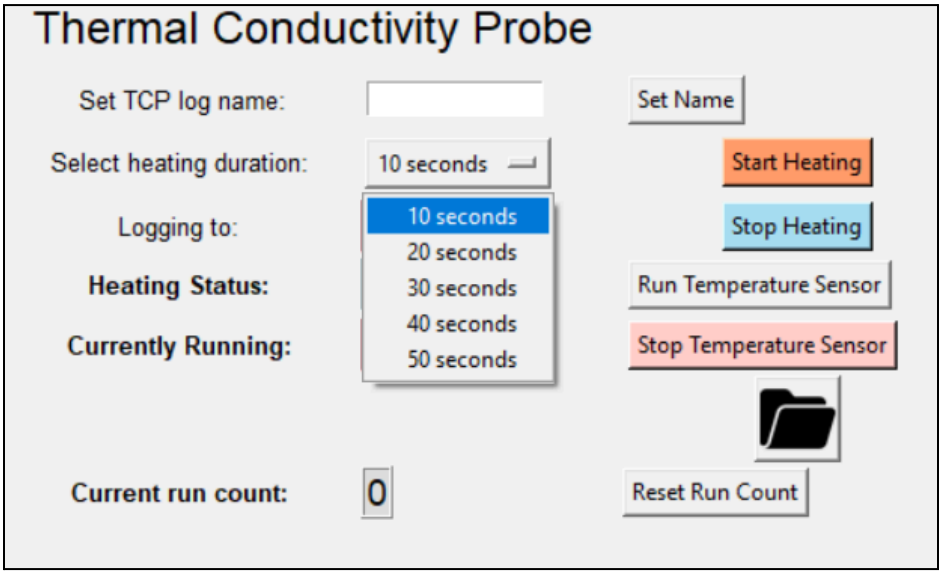
10. At this point, you should be ready to start back at step 4 (assuming you're leaving the DSP connected) by typing in a new name for a new IDF file.

TCP Operating:

1. Start by typing in a name for a CSV data file and click the ‘Set Name’ button. This should change the red ‘N/A’ in ‘Logging to:’ to green with the name you typed in. This will be the file the program will write to once you begin a run.



2. **[As of 4-24-24]** the heater has not been tested with the new 150 ohm resistor attached to the relay! The copper wires might already be burned out from overvolting with the Arduino 5 Volts
    a. If you want to try it, select a duration from the drop down and click ‘Start Heating’. The light on the relay should turn green if it is open.
    b. If you wish to stop it early in case of an emergency, just click ‘Stop Heating’ and the relay should close.
    c. Once it finishes, an indicator window should pop up, and the relay light will turn off.



3. Once you're ready to start a run, click the 'Run Temperature Sensor' button.

4. The plot should begin updating and logging data in real time for you to view.
    a. The TCP can run in the background while you run other operations (i.e. CPT, VST, DSP) since it should be connected on a separate RTD DAQ card within the chassis.

5. When you want to stop logging, click the 'Stop Temperature Sensor' button.

6. The 'Run Count' works the same way as it does for the CPT and VST. Run as many operations as you need for a CSV file and **make sure to reset the count** once you're ready to move onto a different file.

7. After that, you should be ready to start back at step 1 with a new file.