

SPARTA Field Bench

Python User Interface: Operation Guide

Matthew Duong (3223 Affiliate)

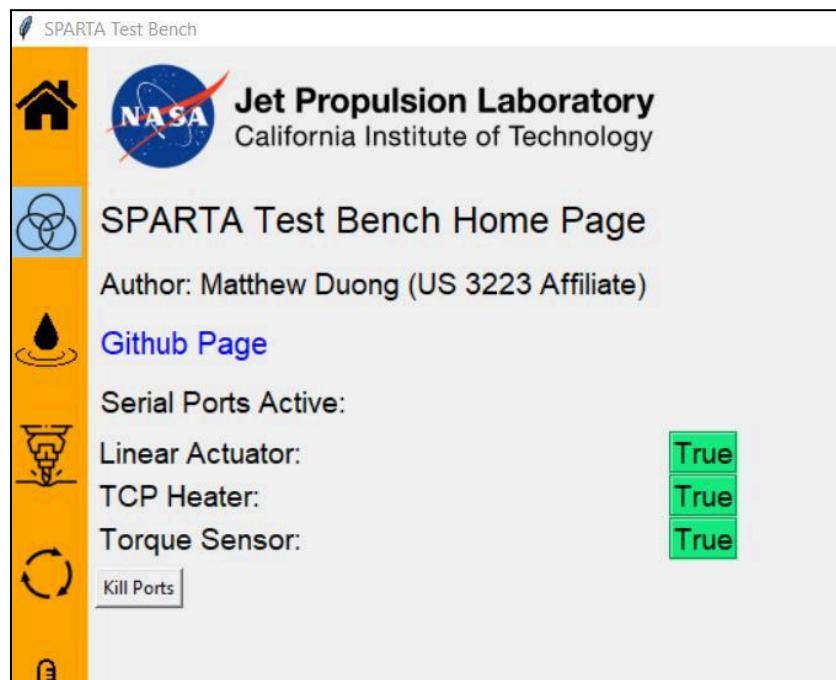
Created: March 25th, 2024

Last Updated: April 24th, 2024

Opening The Interface:

1. Open the 'SPARTA_TestBench' folder on the Desktop top right corner
2. Find the batch called 'start_Guibench_JLF.bat' and double-click to open

	3/25/2024 9:38 PM	MICROSOFT Edge H...	5 KB
start_ActuatorTester	1/8/2024 9:40 PM	Windows Batch File	1 KB
start_BlueOriginFinalVST	3/25/2024 9:38 PM	Windows Batch File	1 KB
start_BlueOriginGroundVST	3/25/2024 9:38 PM	Windows Batch File	1 KB
start_BlueOriginNIDevLoad	3/25/2024 9:38 PM	Windows Batch File	1 KB
start_BlueOriginVST	3/25/2024 9:38 PM	Windows Batch File	1 KB
start_Guibench_JLF	1/15/2024 11:18 PM	Windows Batch File	1 KB
start_IMU	Type: Windows Batch File Size: 30 bytes Date modified: 1/15/2024 11:18 PM	Windows Batch File	1 KB
start_ivium	3/25/2024 9:38 PM	Windows Batch File	1 KB
start_SocketListener	3/25/2024 9:38 PM	Windows Batch File	1 KB
start_StepperTester	1/8/2024 9:40 PM	Windows Batch File	1 KB
startBlueOriginDSP_IMU	3/25/2024 9:38 PM	Windows Batch File	1 KB



C:\Windows\system32\cmd.exe

```
C:\Users\sparta\Desktop\SPARTA-TestBench>python GUI_Bench_JLF.py
Linear Actuator Port Opened?: True
Torque Motor Port Opened?: True
```

- The program will only open properly if the Linear Actuator, Torque Motor Controller, and TCP heater are all plugged into the correct USB ports. 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.
- To avoid an issue like in the picture below, make sure to **ALWAYS** plug in the same USB cables into the same ports every time. Otherwise, the system might automatically reassign them new COM port names.

SKIP THIS NEXT SECTION IF YOU WERE ABLE TO START THE PROGRAM CORRECTLY!

Fixing Possible COM Port Issues

```
C:\Windows\system32\cmd.exe
```

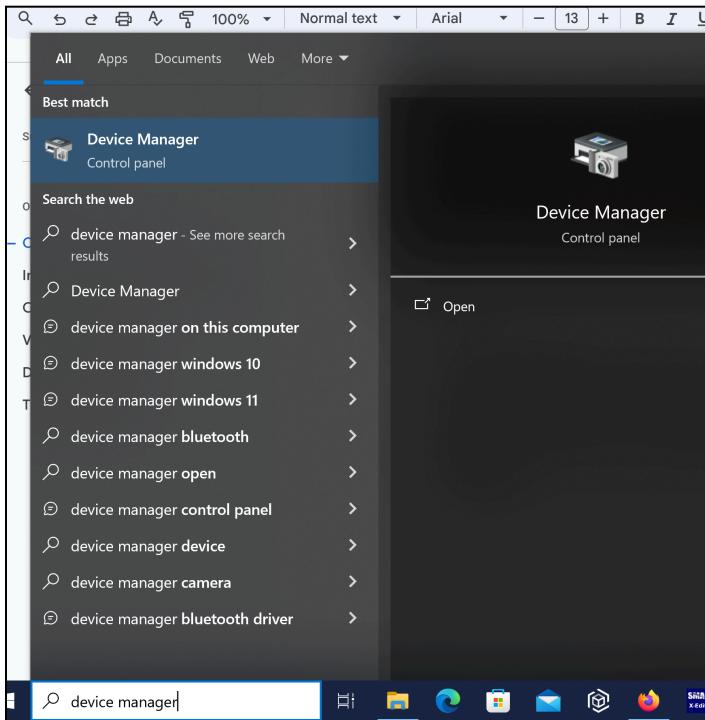
```
C:\Users\sparta\Desktop\SPARTA-TestBench>python GUI_Bench_JLF.py
Traceback (most recent call last):
  File "C:/Users/sparta/Desktop/SPARTA-TestBench/GUI_Bench_JLF.py", line 188, in <module>
    actuator = serial.Serial('COM4', baudrate=9600, timeout=1)
               ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
  File "C:/Users/sparta/AppData/Local/Programs/Python/Python311/Lib/site-packages/serial/serialwin32.py", line 33, in __init__
    super(Serial, self).__init__(*args, **kwargs)
  File "C:/Users/sparta/AppData/Local/Programs/Python/Python311/Lib/site-packages/serial/serialutil.py", line 244, in __init__
    self.open()
  File "C:/Users/sparta/AppData/Local/Programs/Python/Python311/Lib/site-packages/serial/serialwin32.py", line 64, in open
    raise SerialException("could not open port {!r}: {!r}".format(self.portstr, ctypes.WinError()))
serial.serialutil.SerialException: could not open port 'COM4': FileNotFoundError(2, 'The system cannot find the file specified.', None, 2)

C:\Users\sparta\Desktop\SPARTA-TestBench>pause
Press any key to continue . . .
```

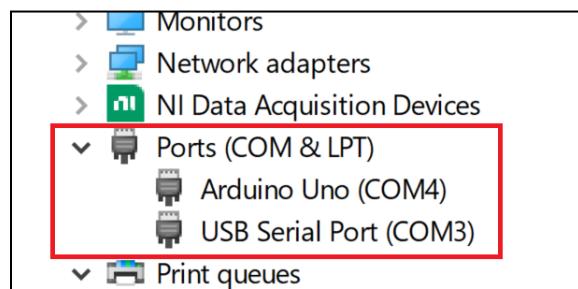
Example: This is what happens when the Linear Actuator/COM4 isn't plugged in OR the COM port number was incorrectly assigned, and you try to start the program.

- If something like this does happen, the first thing you should try is unplug the USB hub and re-plug it back in. Then try launching the program again.
 - If the error persists, you'll have to do a manual check on the COM port names.

4. Open the search bar in the bottom left, type 'Device Manager', and open the program.



5. Find the 'Ports and COM LPT' section and click the drop down arrow.



6. The 'Arduino Uno (COM4)' is the Linear Actuator Controller, the 'Arduino UNO (COM8)' is the TCP Heater, and the other 'USB Serial Port' is the Torque Motor Controller. Their COM port names and numbers should be listed as you see in the picture.
7. Open the 'SPARTA-TestBench' folder again and find the Python file called 'GUI_Bench_JLF.py' and double click to open the code.

console_log_socketlistener.txt	3/25/2024 2:55 PM	Text Document
console_log_vstflight.txt	3/25/2024 2:55 PM	Text Document
GUI_Bench_JLF.py	3/26/2024 10:30 AM	Python Source File
README.md	3/15/2024 3:27 PM	Markdown Source...
SPARTA_IPC.xml	Type: Python Source File Size: 48.5 KB	Microsoft Edge H...
start_ActuatorTest.bat	Date modified: 3/26/2024 10:30 AM	Windows Batch File
start_PlusOrignalFinalVCT.bat	2/25/2024 2:55 PM	Windows Batch File

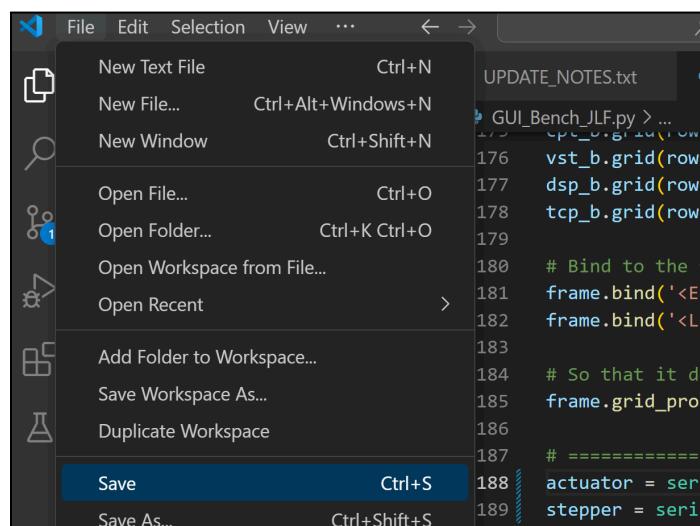
8. Scroll down to lines 195-197 to find the COM port assignments. Check to see if they match up to the ports you saw in ‘Device Manager’. If they don’t, change it in the code.

```

194 # =====
195 actuator = serial.Serial('COM4', baudrate=9600, timeout=1)
196 tcp_heater = serial.Serial('COM8', baudrate=9600, timeout=1)
197 stepper = serial.Serial('COM11', baudrate=38400, bytesize=8, parity='N', stopbits=1, xonxoff=False)
198 |
194 # =====
195 actuator = serial.Serial('COM4', baudrate=9600, timeout=1)
196 tcp_heater = serial.Serial('COM8', baudrate=9600, timeout=1)
197 stepper = serial.Serial(['COM12', baudrate=38400, bytesize=8, parity='N', stopbits=1, xonxoff=False])
198

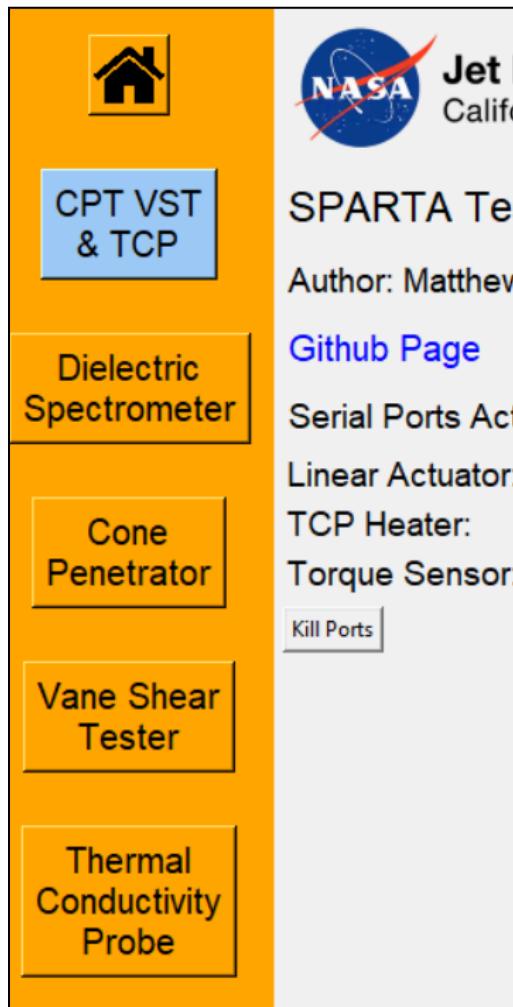
```

9. To save changes, either click CTRL and S, or go up to the top left corner in the ‘File’ dropdown and click ‘Save’.

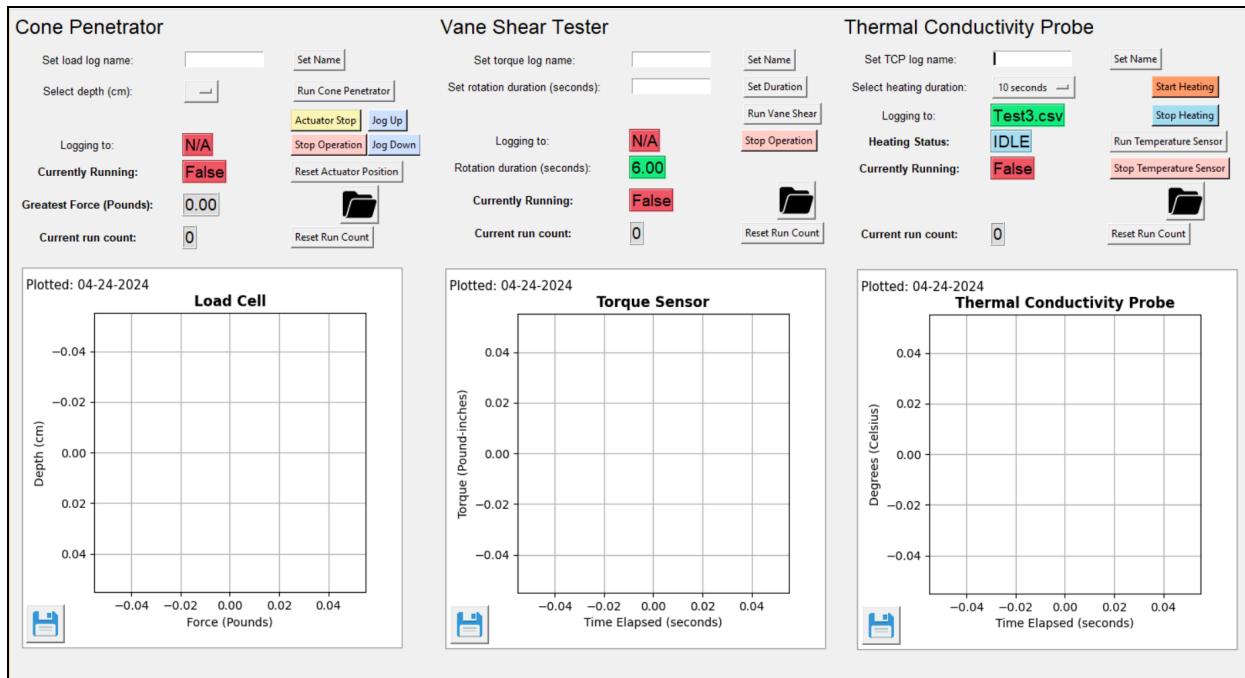


Interface Navigation Overview:

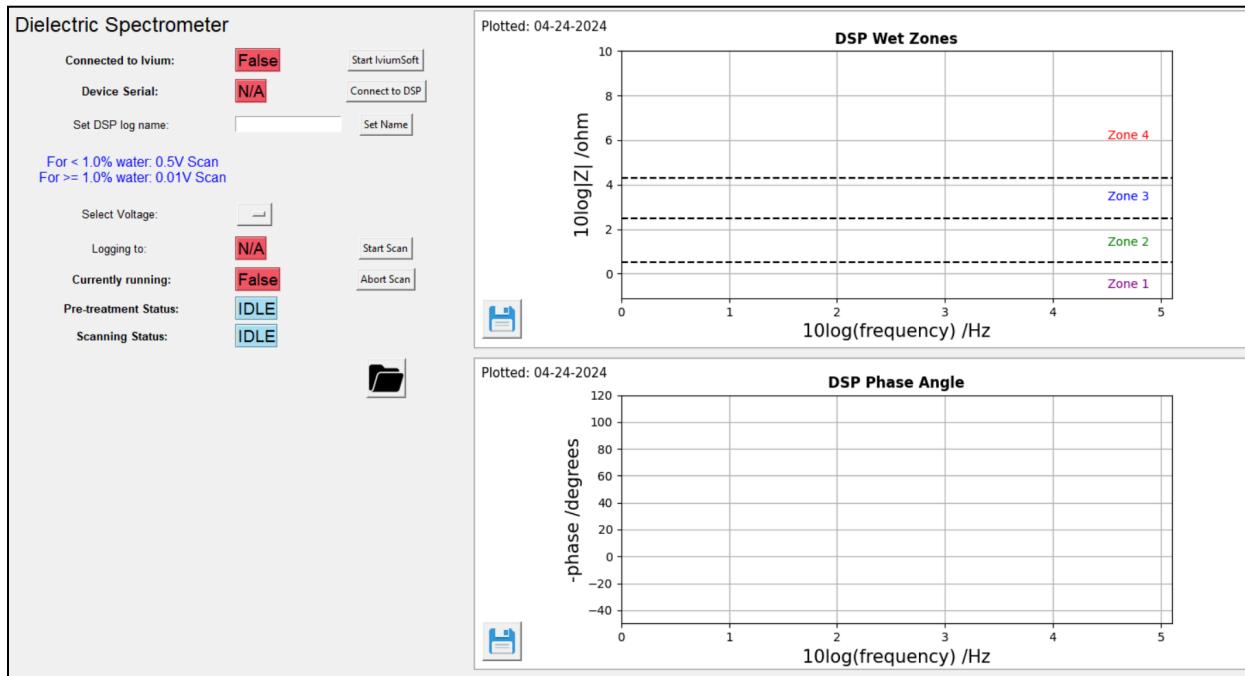
1. The left orange bar contains the navigation to switch between pages and components. All you need to do is hover over with the mouse and click to whichever page you want to go to.



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.

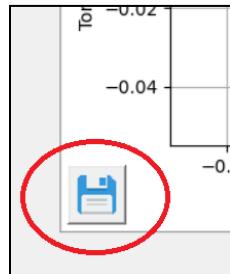


4. ‘Thermal Conductivity Probe’ contains the controls for the TCP

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 mainly just 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, I think I just like seeing it done manually so I kept it.

Linear Actuator:	True
TCP Heater:	True
Torque Sensor:	True
Kill Ports	

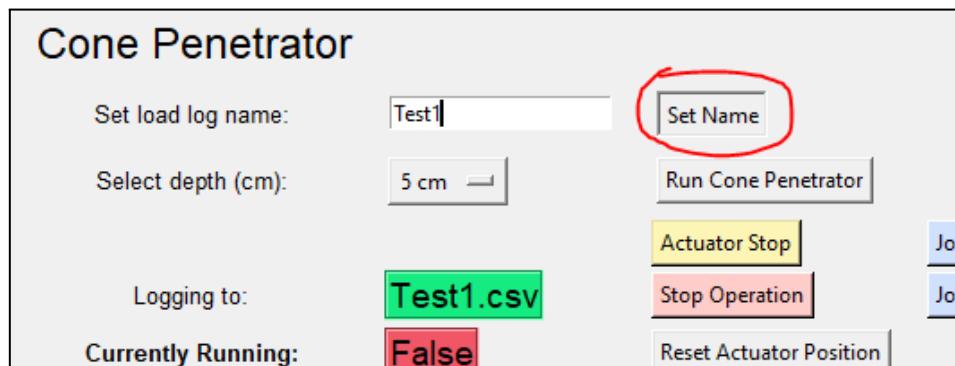
Serial Ports Active:	
Linear Actuator:	False
TCP Heater:	False
Torque Sensor:	False
Kill Ports	

```
C:\Windows\system32\cmd.exe

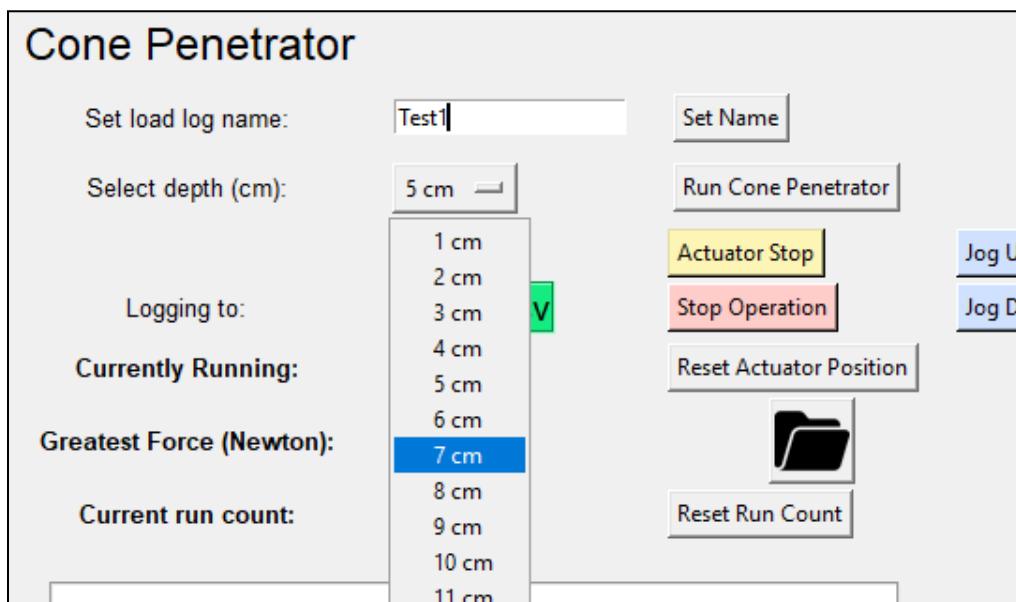
C:\Users\sparta\Desktop\SPARTA-TestBench>python GUI_Bench_JLF.py
Linear Actuator Port Opened?: True
Torque Motor Port Opened?: True
Linear Actuator Port Status: False
Linear Actuator port closed successfully!
Torque Motor Port Status: False
Torque Motor port closed successfully!
```

CPT Operating

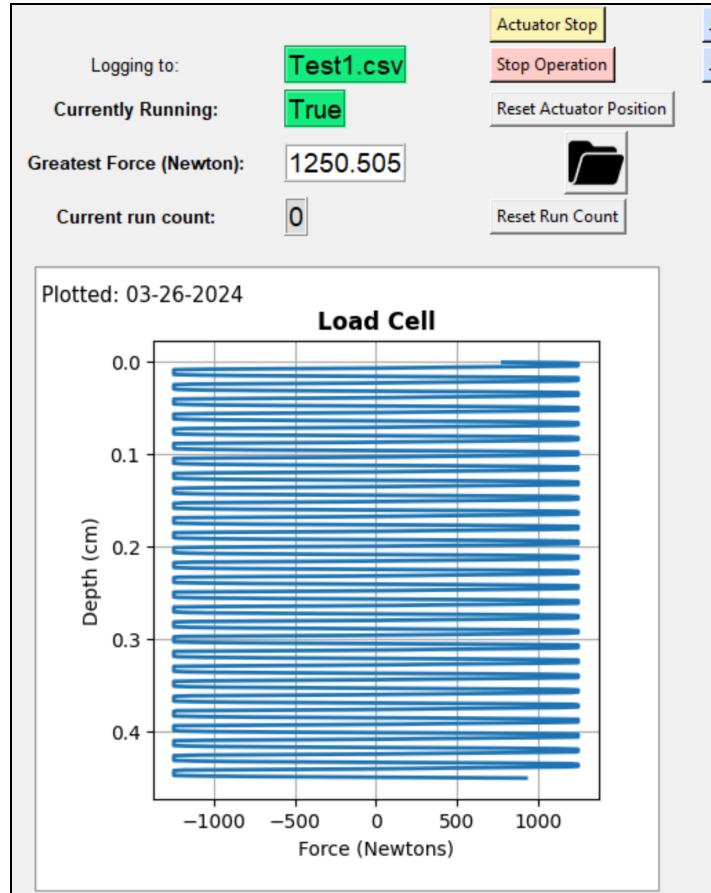
1. Start by typing in a name for a CSV data file and click the 'Set Name' button. This should change the red 'N/A' in 'Logging to:' to green with the name you typed in. This will be the file the program will write to once you begin a run.



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



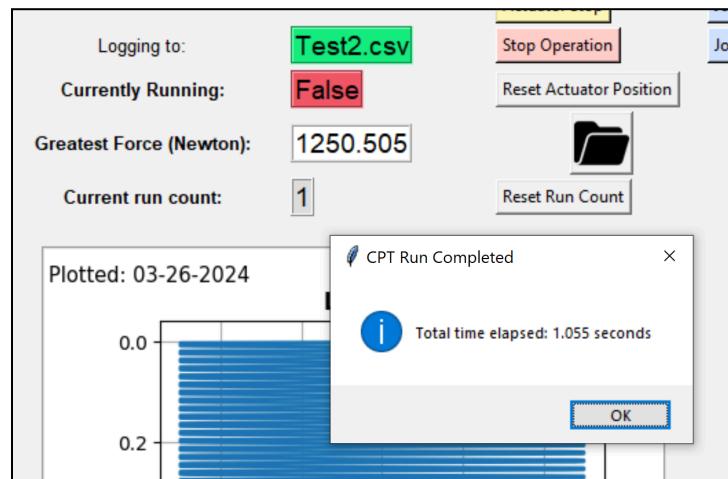
3. Once you're ready to start a run, click the 'Run Cone Penetrator' button. The plot should begin updating and logging data in real time for you to view.



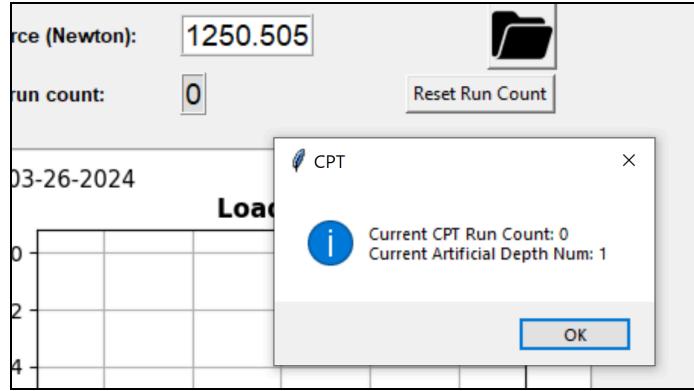
4. **If you start the operation but don't see anything running or logging,** open up the terminal window and check to see if a 'timeout' or 'COM port error' appears.
 - a. If one of them does say that, I would suggest closing the program, unplugging and replugging in the USB hub, then restarting the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

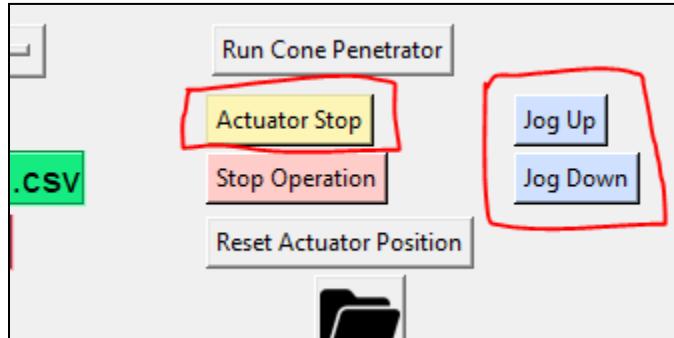
6. At the end of the run, this small success window will pop up with the elapsed time and the actuator and logging should stop. Also the ‘Greatest Force (Newton):’ should update with the current greatest value it recorded during that run.



7. Then the ‘Run Count’ should increment by 1.
- 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 plot on the same figure.
 - The counter will continue to increment by 1 each time you do another run on the same CSV file.
 - 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.
 - 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, first click the 'Reset Actuator Position' button and wait until it retracts all the way.
 - a. Also if for any reason 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. 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.

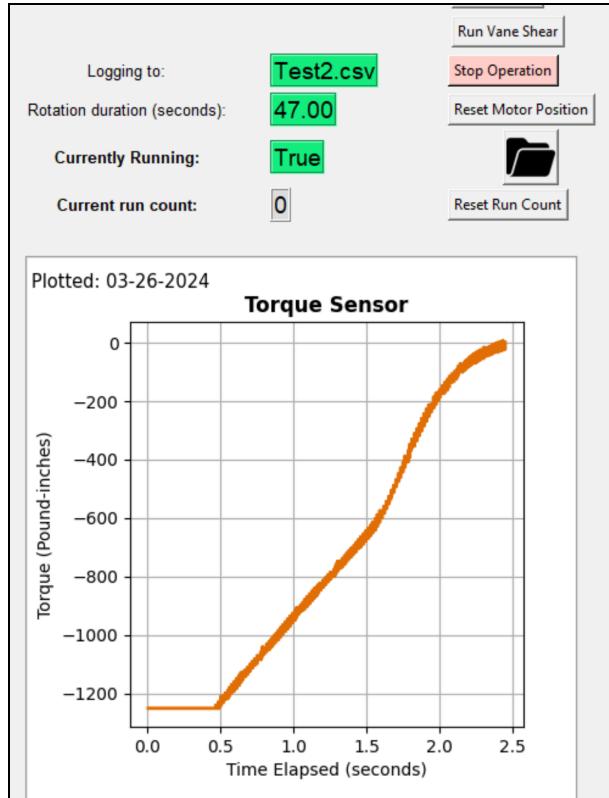
Vane Shear Tester

Set torque log name:	Test2	Set Name
Set rotation duration (seconds):		Set Duration
Logging to:	Test2.csv	Run Vane Shear
Rotation duration (seconds):	30.00	Stop Operation
		Reset Motor Position

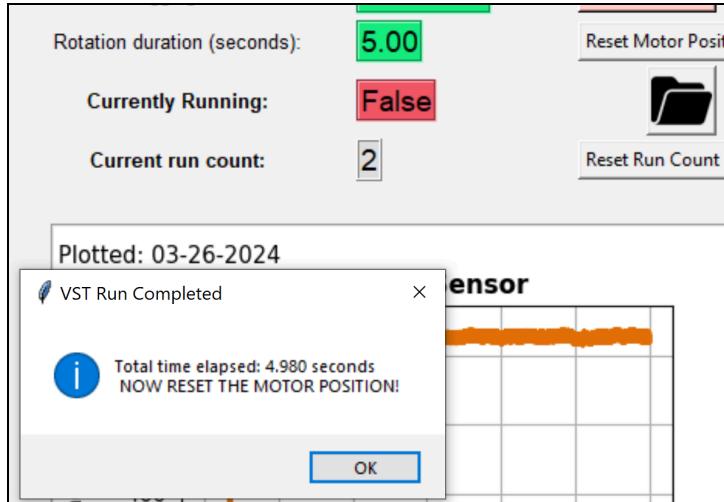
2. Type in the amount of time (in seconds) that you want the motor to rotate and click 'Set Duration'. The green display on 'Rotation duration (seconds):' should update to the time you typed in. The default should be set at 6 seconds.

Set torque log name:	Test2	Set Name
Set rotation duration (seconds):	47	Set Duration
Logging to:	Test2.csv	Run Vane Shear
Rotation duration (seconds):	47.00	Stop Operation
Currently Running:	False	Reset Motor Position

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.

Dielectric Spectrometer

Connected to Ivium: **False** **Start IviumSoft**

Device Serial: **N/A** **Connect to DSP**

Set DSP log name: **Set Name**

For < 1.0% water 0.5V Scan

Dielectric Spectrometer

Connected to Ivium: **False** **Start IviumSoft**

Device Serial: **N/A** **Connect to DSP**

Set DSP log name: **IviumSoft**

File Options Tools Help About

Connect IP46323 Advanced TwoTests 1 channel SigView... BatchMode CyclScan IviumSoft

Select Voltage

Logging to:

Currently running

- LinearSweep
- CyclicVoltammetry
- Transients
- ElectroAnalysis
- Impedance
 - Constant E
 - Constant I
 - PotentialScan
 - CurrentScan
- Corrosion

Title	Value	Unit
Title	0.5/Blue_Green	
+Redefine filename	<input type="checkbox"/> Off	
E start	0.0000	V
Equilibration time	10	s
Frequencies	26	
Current Range	1mA	
+Noise Reduction	<input checked="" type="checkbox"/> On	
Acquisition period	2.0	s

Result

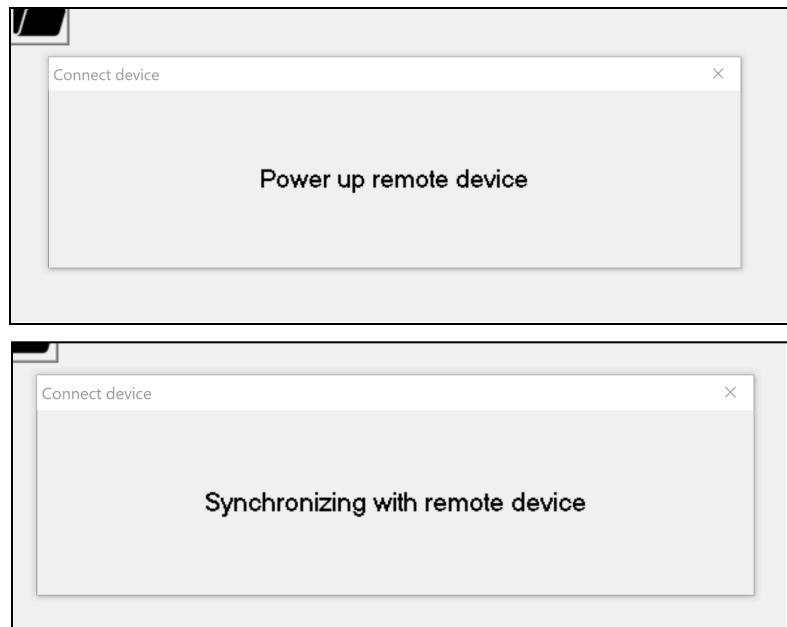
Current / A

E / Volt

Scan id: [0000] Title: scan 1

Files	Scan id	Nscans	Date	Title	Technique	SN	Chan	Cycle	Status	File
Bmks	0494	1	2024/03/15 14:42:29	Scan 1	EIS Estat	P33101	1	1	100%	0494
	0479	1	2024/02/27 10:30:45	Scan 1	EIS Estat	P28659	1	1	100%	0479
	0490	1	2024/02/27 11:37:45	Scan 1	EIS Estat	P33101	6	1	100%	0490
	0482	1	2024/02/27 10:37:52	Scan 4	EIS Estat	P28659	1	1	100%	0482
	0488	1	2024/02/27 11:23:23	Scan 2	EIS Estat	P33101	5	1	100%	0488
	0499	1	2024/02/27 11:25:49	Scan 2	EIS Estat	P223101	5	1	100%	0499

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'



- 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'.

Dielectric Spectrometer

Connected to Ivium:	True	Start IviumSoft
Device Serial:	P46323	Connect to DSP
Set DSP log name:	<input type="text"/>	Set Name

For < 1.0% water 0.5V Scan

IviumSoft

File Options Tools Help About

Connected: P46323 Advanced

Direct Method

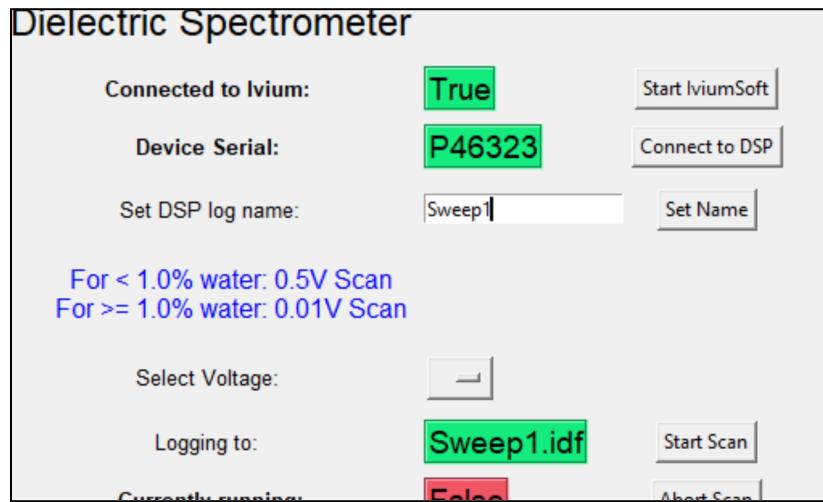
DC AC IrCorr HiSens

E = -1.510 V I = -191.621 nA

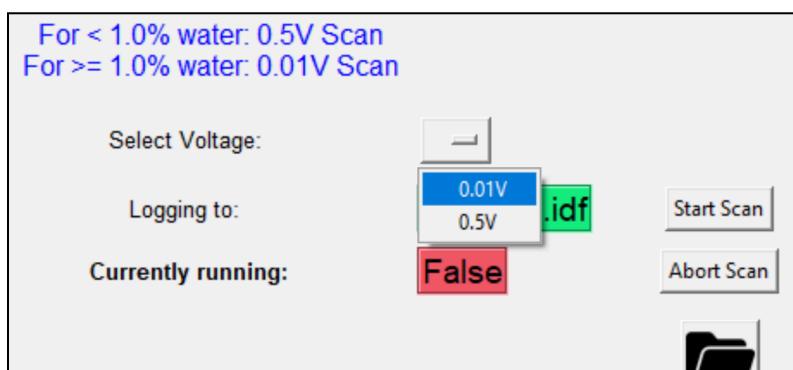
Current range Connect

10⁻⁴ Off

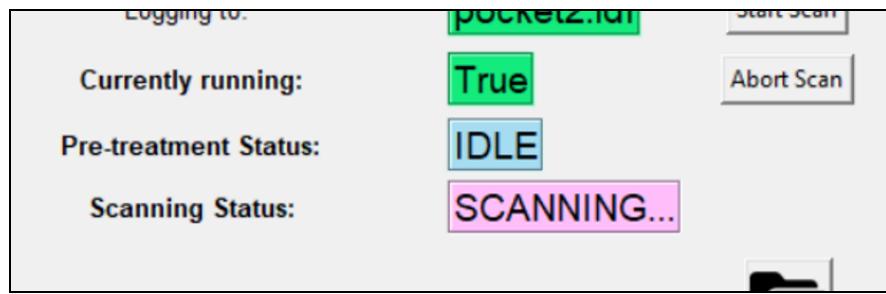
- Type in a name for an IDF data file and click the ‘Set Name’ button. This should change the red ‘N/A’ in ‘Logging to:’ to green with the name you typed in. This will be the file the program will write to once it finishes a scan.



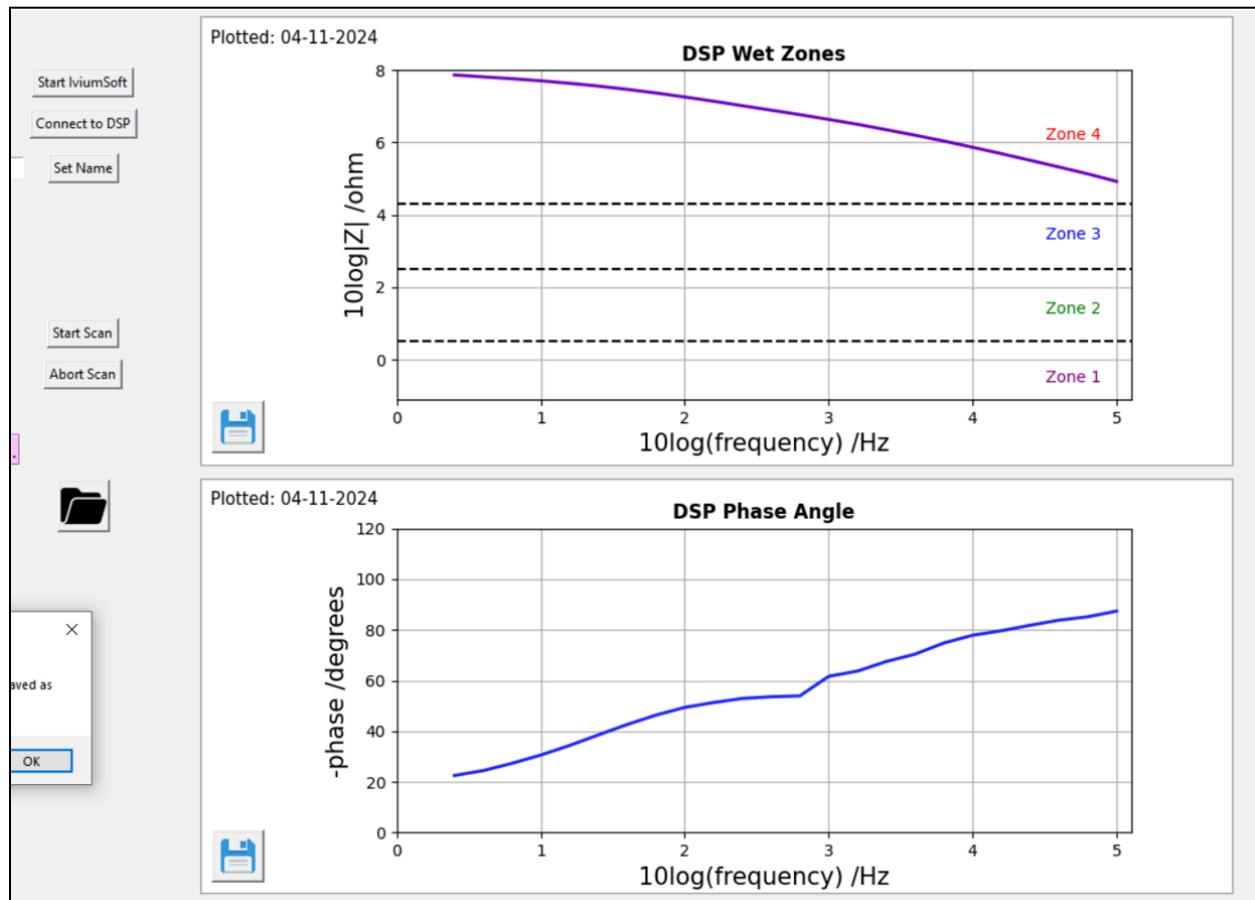
- Depending on how much water is in the sample you’re going to test, select either 0.5V or 0.01V for the excitation.
 - Choose 0.5V if there is less than 1.0% water
 - Choose 0.01V if there is more than 1.0% water
 - If it is unknown, it’s probably safer to just choose the 0.5V UNLESS it’s noticeably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

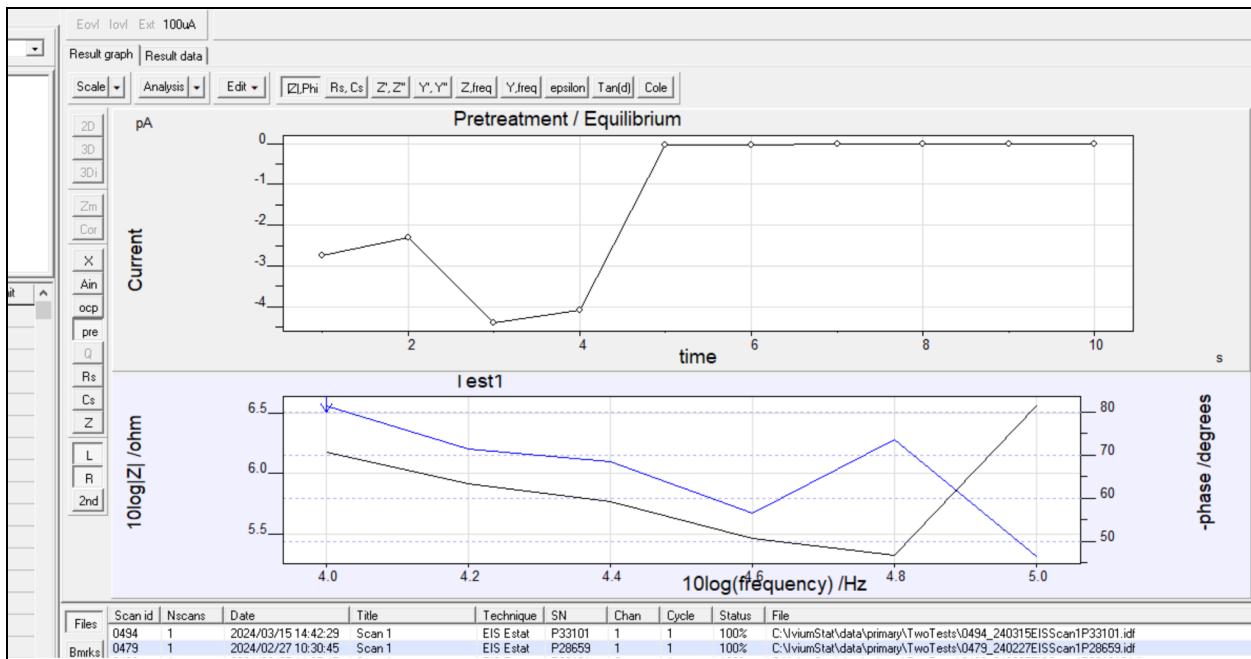


- Once you’re ready to start, click the ‘Start Scan’ button. This will cause the DSP to click and flash a red LED, signaling that a new scan has started.
- The ‘Pre-treatment Status’ should flash purple for about 10 seconds, then the actual scanning will start.

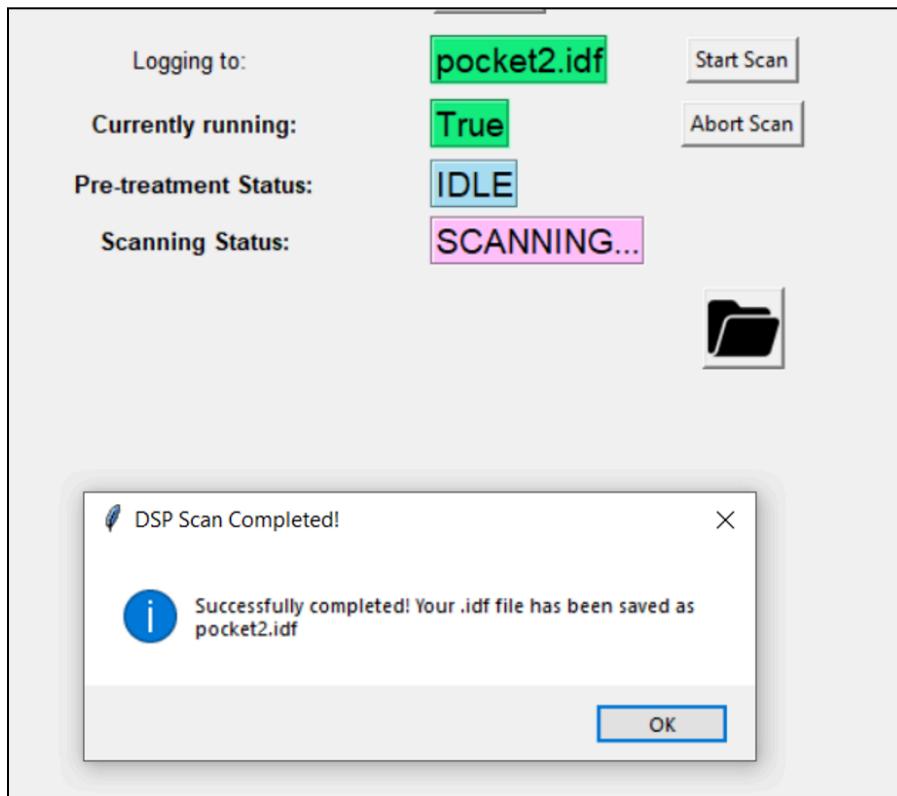
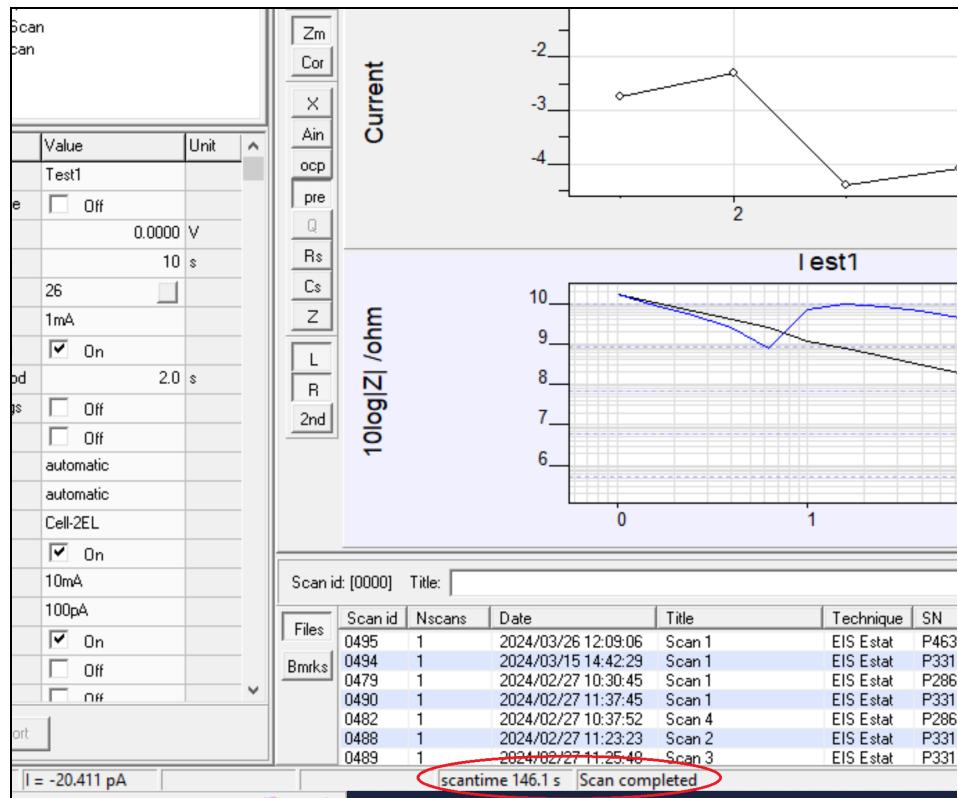


8. To view the live results, either just stay on the program OR switch back to the 'IviumSoft' window for direct results from their software.





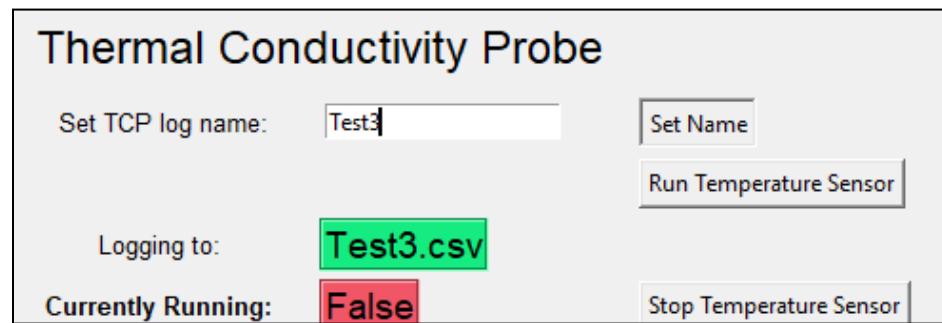
9. Once the scan finishes, the DSP should click again and the LED should flash back to green. A window confirming the DSP has finished scanning should pop up momentarily.
 - a. The pop up could be slightly delayed by a few seconds because the software is periodically checking every second to see if the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



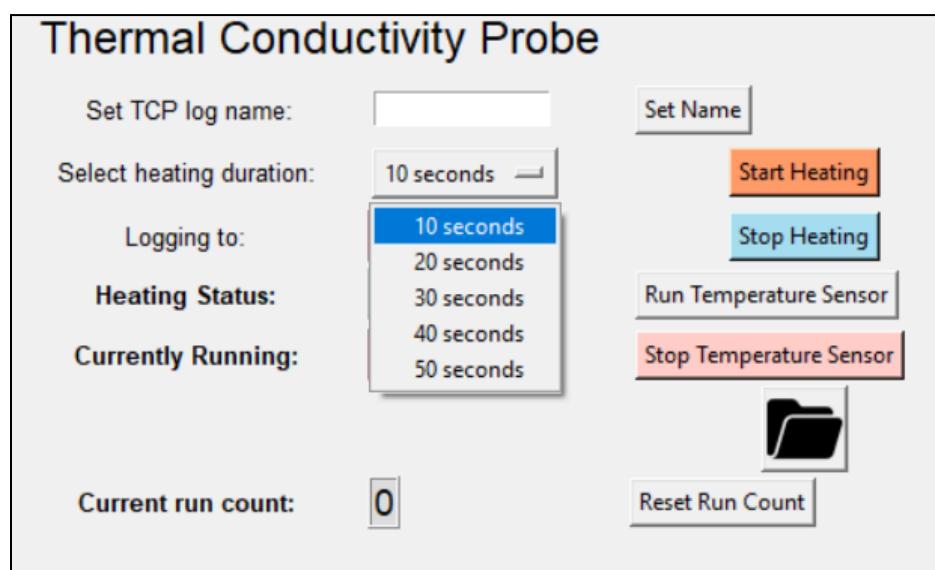
10. At this point, you should be ready to start back at step 4 (assuming you're leaving the DSP connected) by typing in a new name for a new IDF file.

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.