

## NGEE Tropics - ENSO leaf spectral collection: PSR+ Protocol

*Use this protocol document as a guide for unpacking, using and packing up the BNL TEST Spectral Evolution PSR+ spectroradiometer and plant probe*



The instrument manuals can be found on the NGT Google Drive at:

Instrument - [https://drive.google.com/open?id=0B\\_qFBZ6hyQLcanJ2aWNBczZRT0E](https://drive.google.com/open?id=0B_qFBZ6hyQLcanJ2aWNBczZRT0E)

Plant Probe - [https://drive.google.com/open?id=0B\\_qFBZ6hyQLcczdEODVVdWJsYkE](https://drive.google.com/open?id=0B_qFBZ6hyQLcczdEODVVdWJsYkE)

Software - [https://drive.google.com/open?id=0B\\_qFBZ6hyQLcaTQ1SHRwNFFhWms](https://drive.google.com/open?id=0B_qFBZ6hyQLcaTQ1SHRwNFFhWms)

## Using the Spectral Evolution PSR+



1. Unpack the PSR+ instrument case from the larger pelican case





2. Set spectrometer body on solid surface, such as a table / folding table, concrete floor, etc. **DO NOT SET ON THE GROUND OR THE SOIL!**
3. Insert spectrometer battery. Align the contacts on the battery with the contacts inside the battery slot on the spectrometer and fully insert the battery. You should hear a slight “click” noise and you should not be able to push the battery in any further.



4. Remove plant probe from the instrument pelican case and set aside on work surface.



5. Connect the fiber optic and power cables to the handheld plant/contact probe as shown below. Also see [https://drive.google.com/open?id=0B\\_qFBZ6hyQLcczdEODVVdWJsYkE](https://drive.google.com/open?id=0B_qFBZ6hyQLcczdEODVVdWJsYkE) for more information. Remove the rubber gasket from the end of the plant probe before using.



Installation



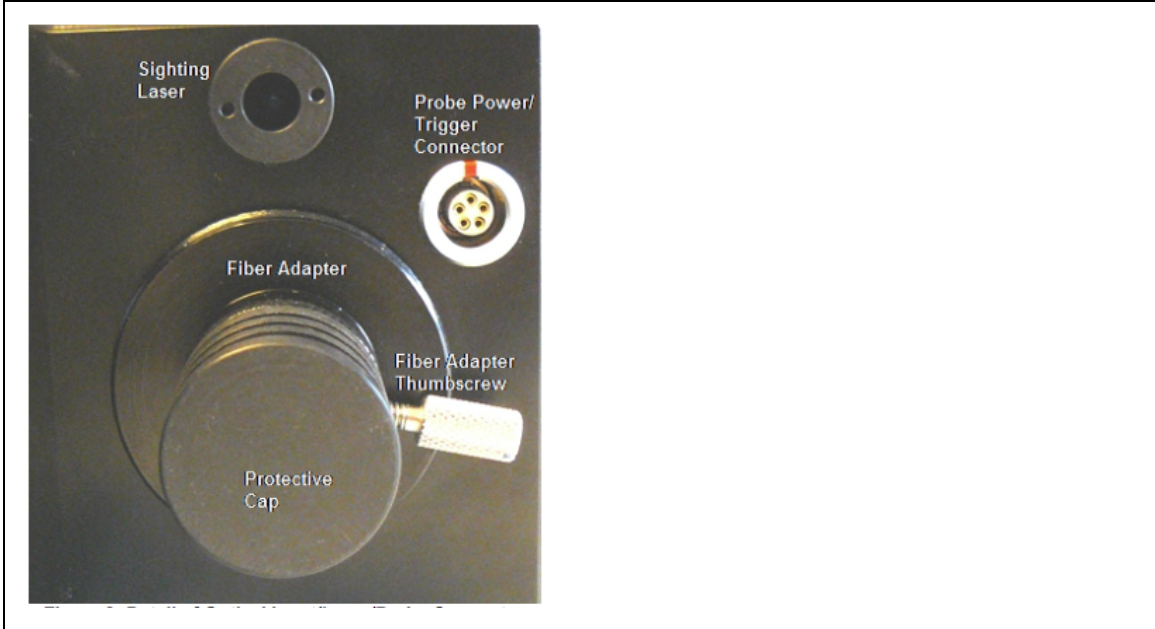
Removal

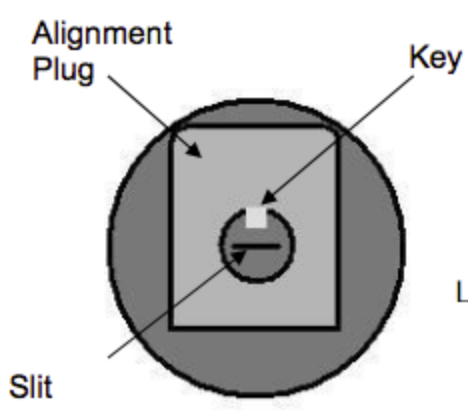




6. Connect the fiber optic and power cable to the PSR+ as shown below. Unscrew the fiber adapter thumb screw and align the slot or groove with the notch or “key” inside the fiber alignment plug (see below). Once the fiber is fully inserted tighten the thumb screw to hold the fiber in place. Then insert the probe power cable into the probe power slot









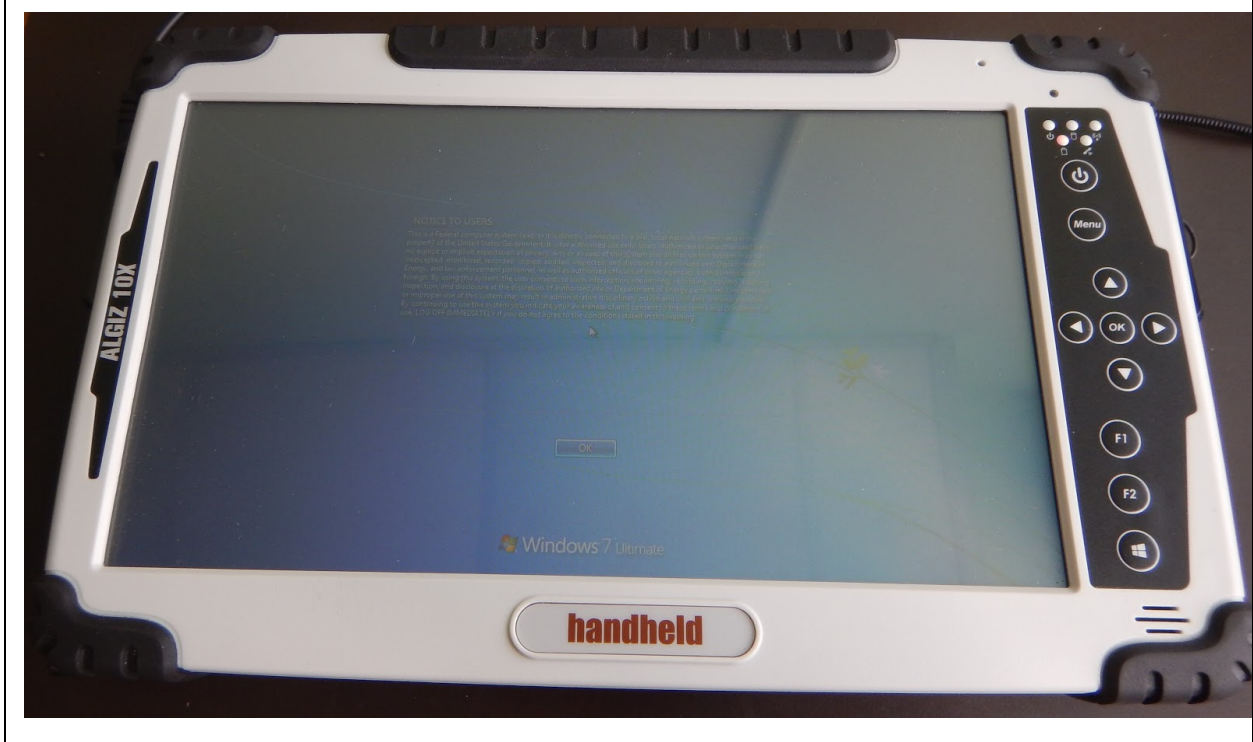
7. Turn on instrument and turn on probe (using the red power switch located on the back of the probe)



8. Install bluetooth adapter into the Algiz 10x tablet and boot up computer. NOTE: It is best to first setup spectrometer and begin warm up before starting computer. Then reverse the order when stopping for the day



- a. NOTE: You need to hold down the power button for about 30 seconds in order to boot the computer from a completely powered down state
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9. When the tablet gets to the ctrl+alt+delete screen simultaneously press the UP and DOWN arrows to get to the BNL security notification screen and then hit OK, either with your stylus or finger (*capacitive screen*)



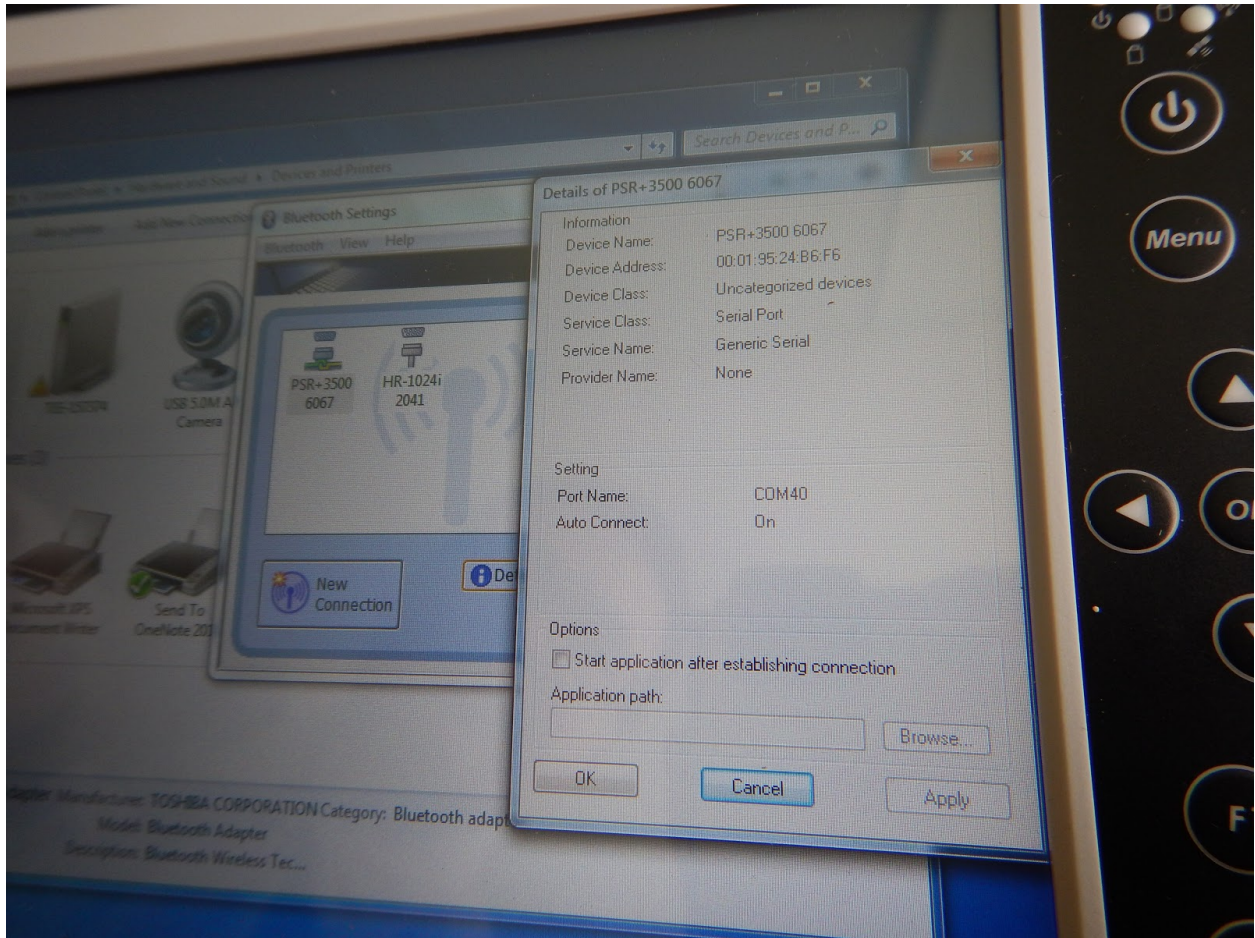
10. Once at the login screen enter in the username and password. NOTE: Until you are used to using the screen it can be bit tricky to “press” the correct buttons on the keyboard



11. Once logged onto the tablet, open up “Devices and Printers” and select the “Bluetooth Adapter” tool



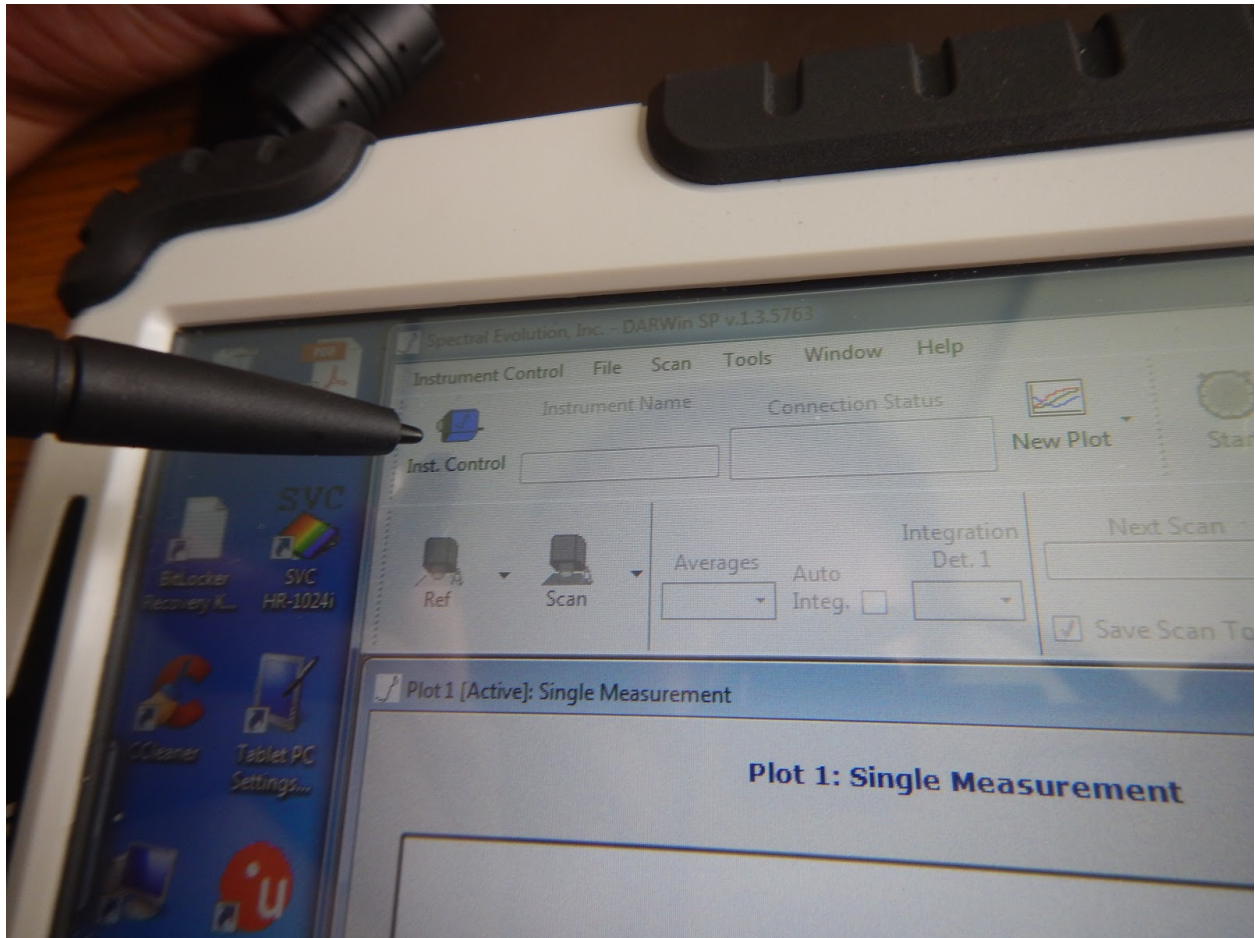
12. Once open, select the “PSR+ 3500 6067” option and “double click” it or double tap the screen to connect to the instrument. NOTE: This assumes that the instrument has already been powered on and warming up, if this isn't the case then you need to go back to step 7, wait for the spectrometer to turn on, then come back to this step and try again to connect
13. Once the tablet connects to the instrument you should see a new graphic below “PSR+ 3500 6067” which indicates a connection
14. Once connected within Windows, you can check which “port” the bluetooth is connection on. You will need this for connecting and using the instrument with the instrument software. To check the comm port click the “Detail” button. By default, the comm port is 40. This should not change but if it does you can use this to find the new port number.



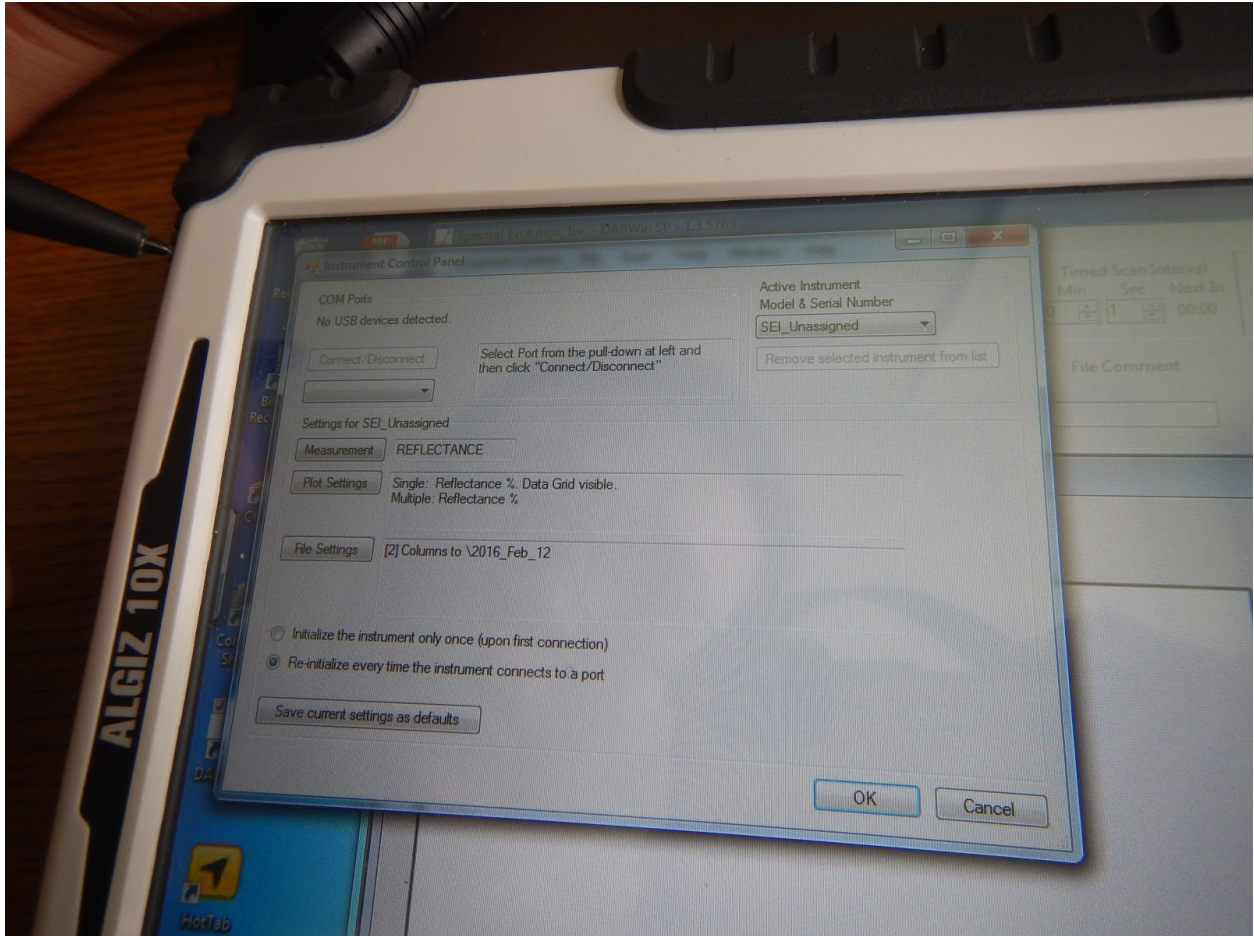
15. Once connected within Windows, launch the Spectral Evolution software called “DARWin SP” found on the desktop

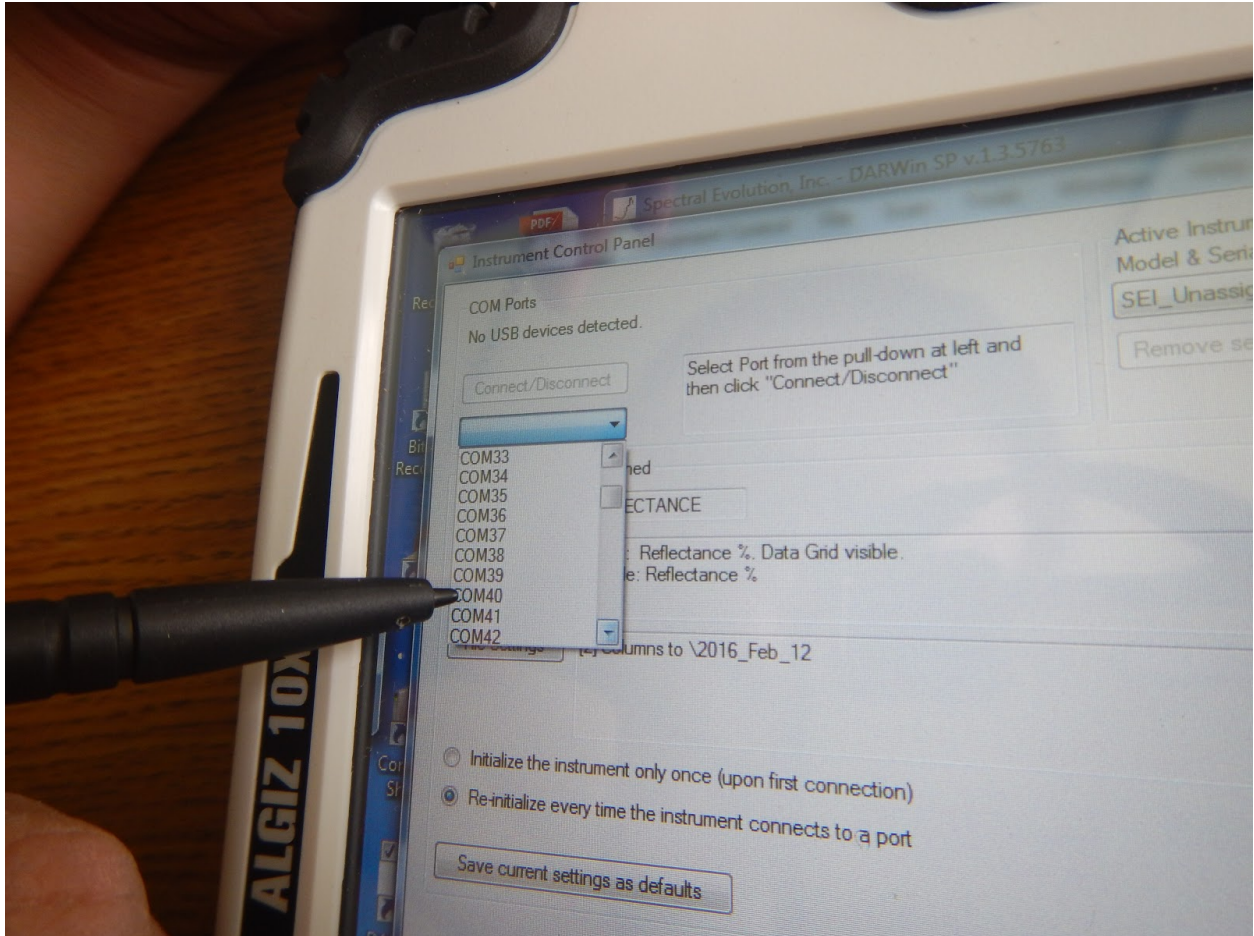
16. The next step is to connect to the instrument within the DARWin SP software. To do this go to the “Inst. Control” menu



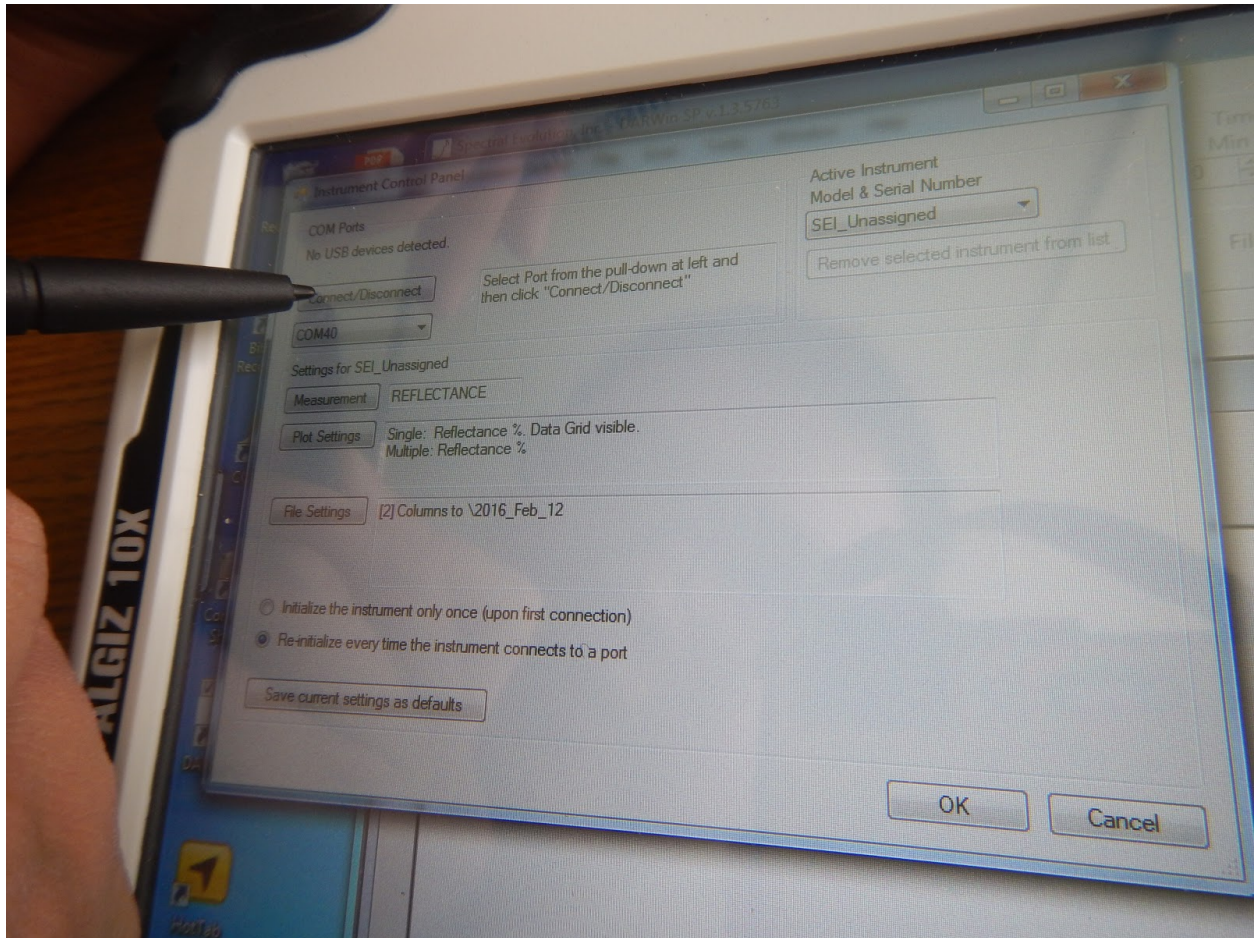


17. Next connect to the instrument within DARWin. Click on the dropdown menu and select port 40

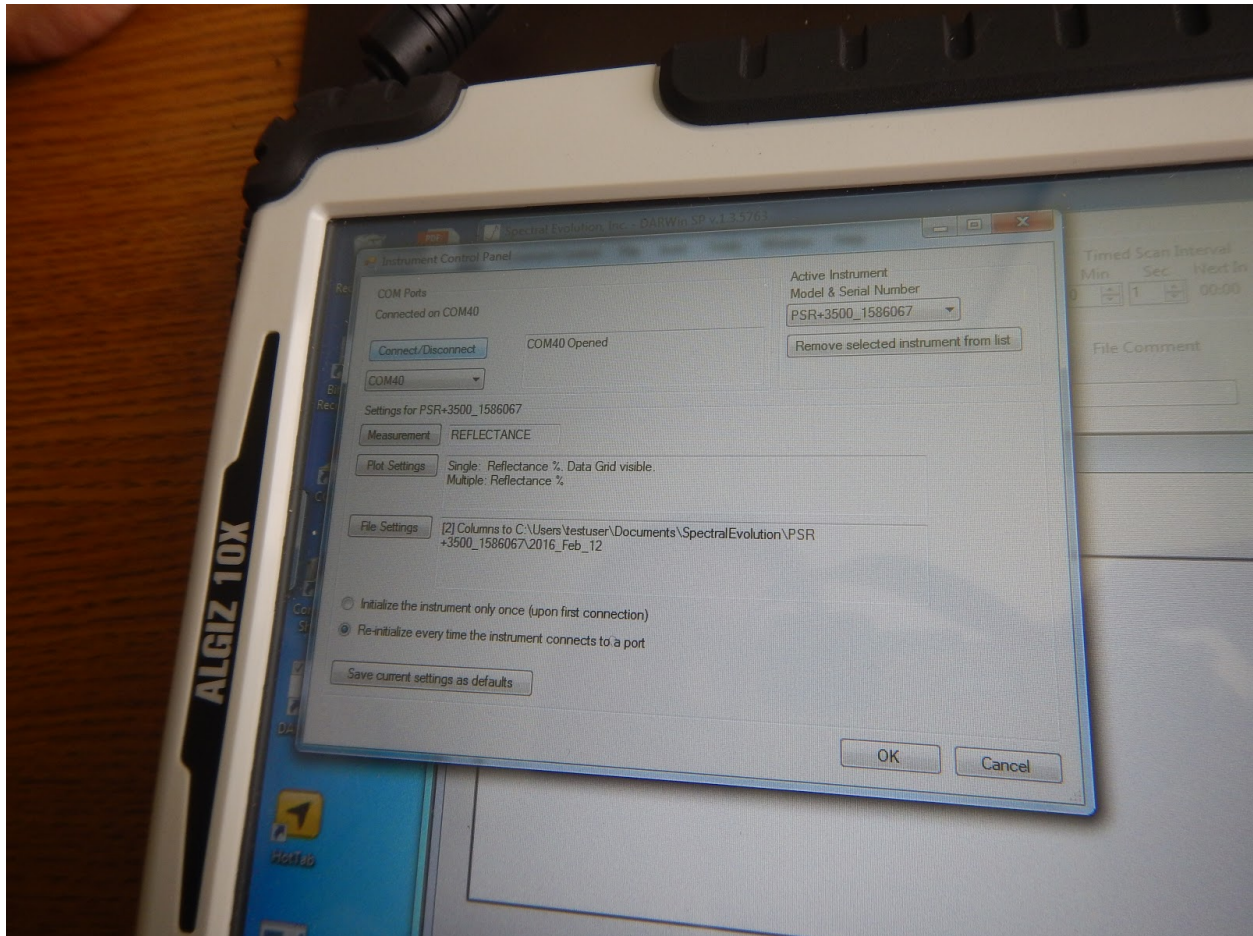




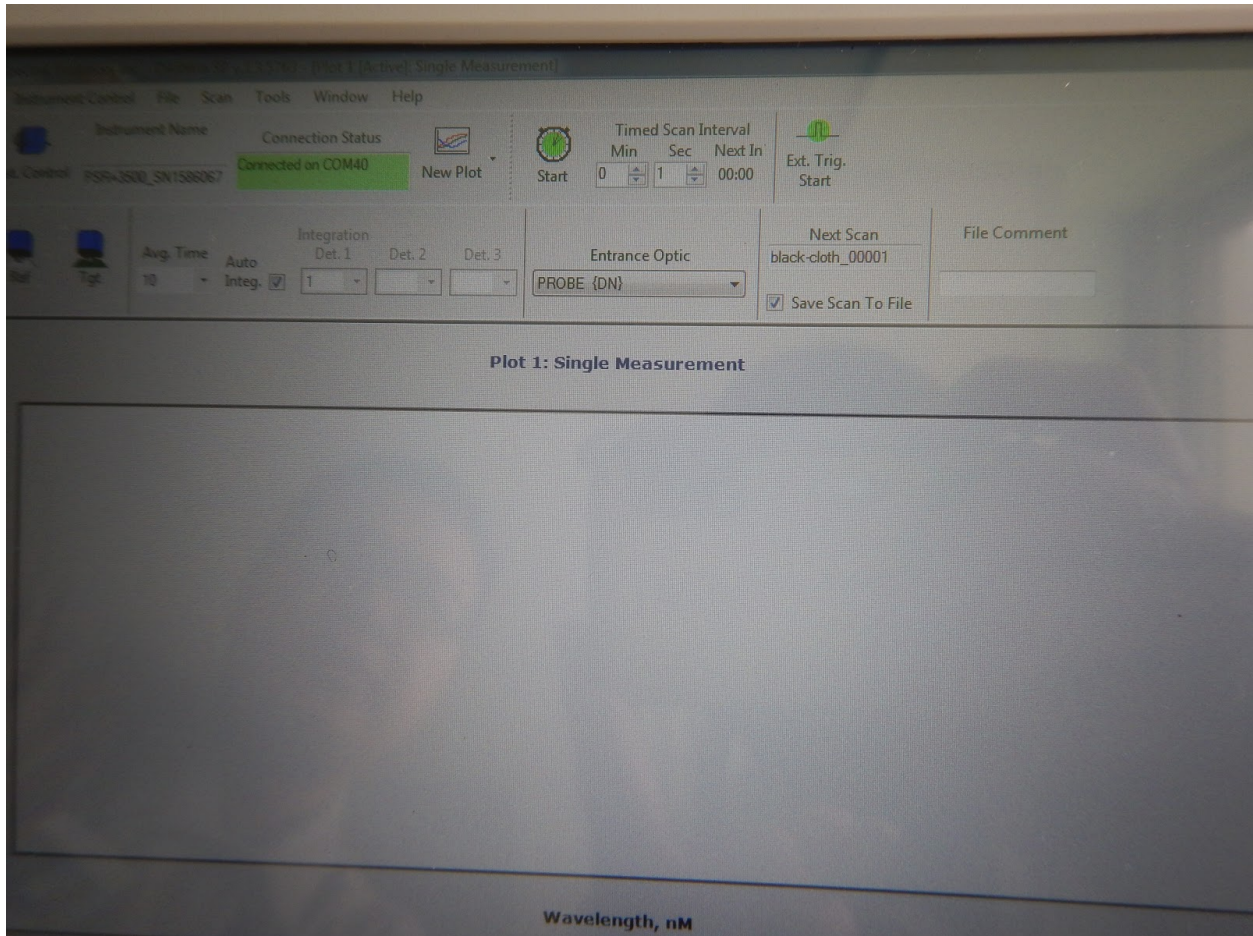
18. Click the connect/disconnect button



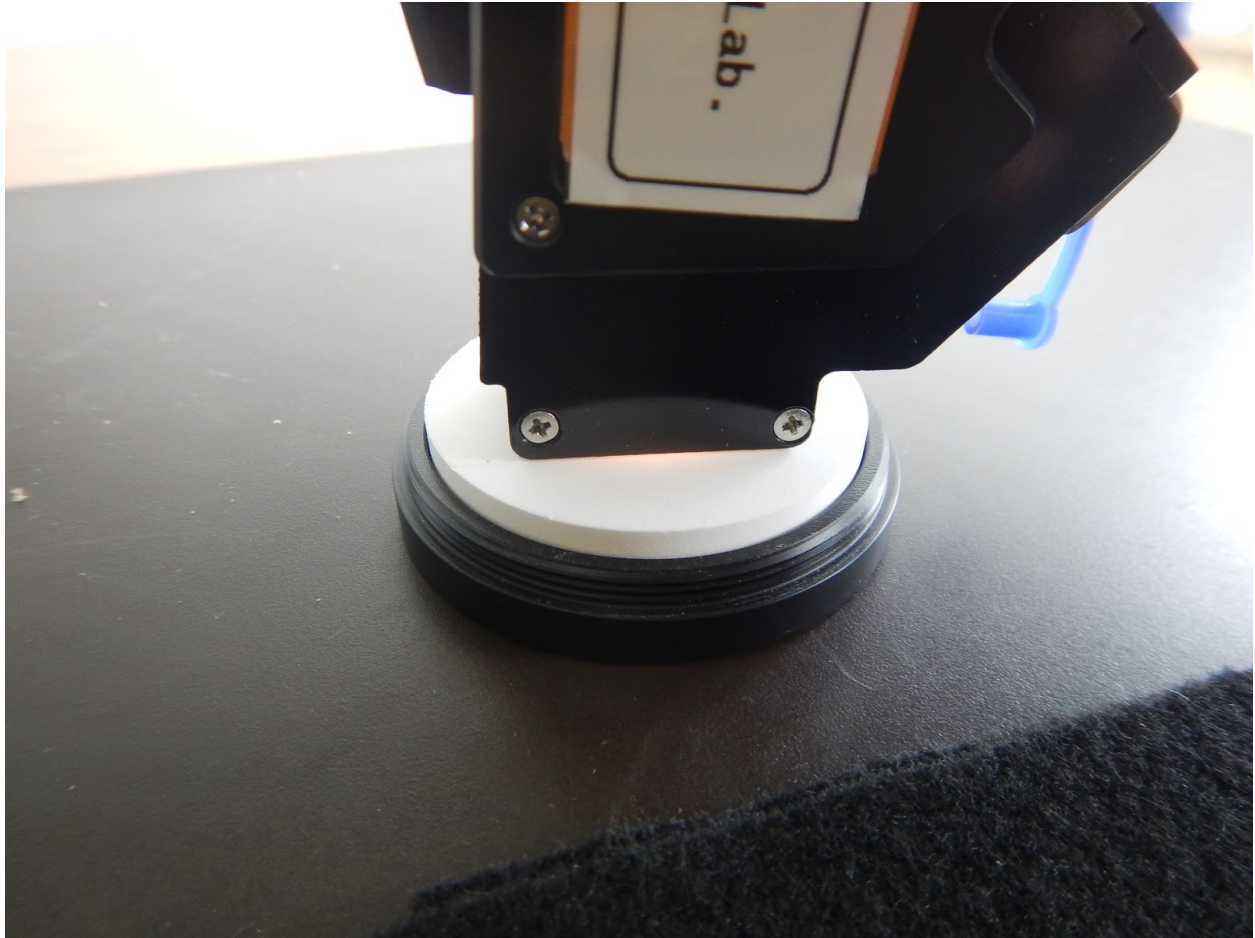
19. Port 40 should now show as “Opened”



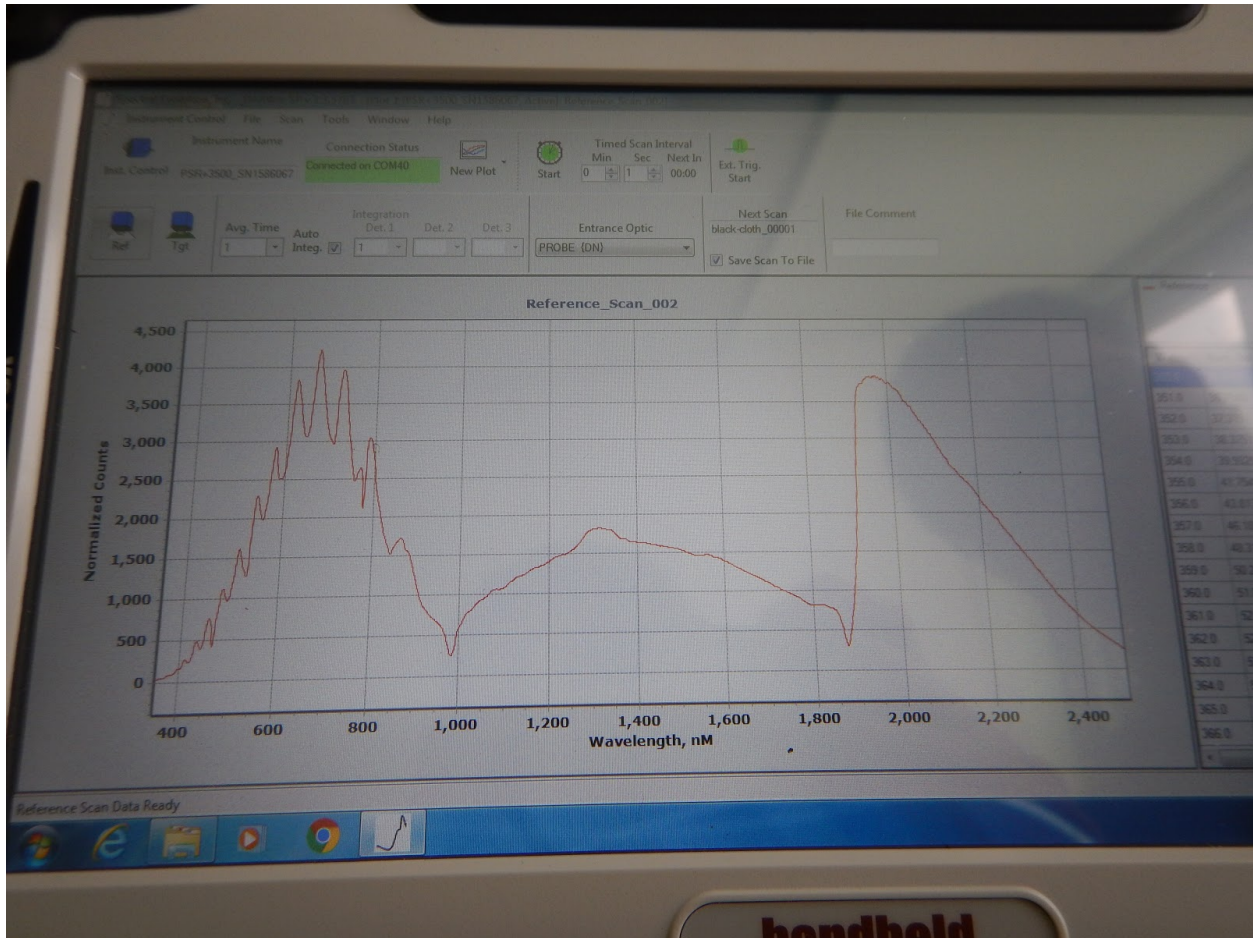
20. Set “Measurement” to REFLECTANCE, “Plot Settings” to Single: Reflectance % Data Grid Visible and Multiple: Reflectance %
21. Set “File Settings” to the location where you wish to save the spectra files
22. Select “Re-initialize every time the instrument connects to a port” and hit OK
23. Once in the instrument data collection screen, make sure to select the “Entrance Optic” option “PROBE {DN}”



24. To begin collecting data with the plant probe, you need to first calibrate the spectrometer to a Spectralon reference reflectance standard. Two of these standards are located in the spectrometer case labeled “0826” and “0827”. ***Always make note of which standard you use during collection so that we can apply the correct standard correction factors during later data processing.*** NOTE: It is advised not to mix standards during a single day's collection, unless necessary. If it is, make a new folder and note the change.
- Also note that you can put in the number of the ref scan into the header of each spectra file by typing in the number into the comment box labeled “File Comment” Anything you type into there will be in the header / comments on the files. Make sure you change this to reflect with reference you are using on a particular day.
25. To collect a good reference, first align the business end of the probe on the Spectralon disc as shown below



26. Next collect the white reference by “clicking” on the “Ref” button in the upper left of the screen above the plot window. The reference should look similar to below



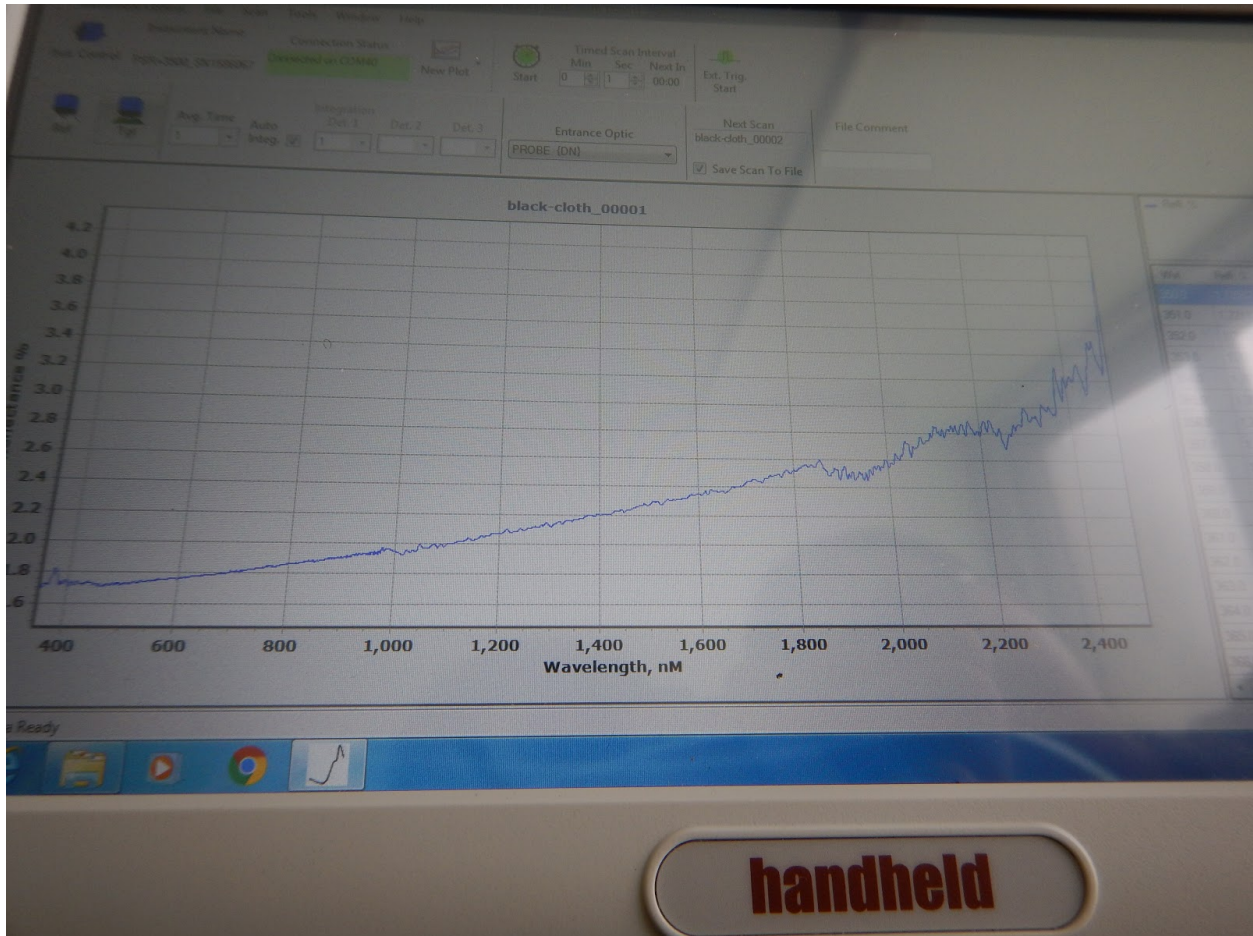
27. Now that you have completed the reference scan, place your sample (leaf) on the black cloth. The black cloth serves as an optically dark surface to minimize reflectance from the background when collecting the leaf spectra. The black cloth is provided in the spectrometer pelican case.





28. Start collecting spectra of your “target,” which will general be your sample leaves, by pressing the Target or “Tgt” button to collect the spectral data. You should now see a new plot showing the spectra of the “target”, in this case spectra of the black cloth. Once you hit “Tgt” the spectra file is saved to the directory on the tablet

- a. ***Note: To change the filename of the spectra you can double tap on the “Next Scan” window which will open up the screen to edit the filename. Use this to change the filename for each new leaf you measure.***



29. If you have a delay in your sampling, you can put the tablet to sleep and power down the spectrometer and plant probe to save battery or to cool down the instruments. To do this, first disconnect the instrument using the “Inst. Control” screen, and select “Disconnect” Hit “OK” at the bottom but DO NOT close the software. Instead put the tablet to “Sleep” and then power down the spec and the probe.

- a. To reconnect when you have new samples, repeat in reverse order. That is, turn on the spec and the probe. Wait 30 seconds, and then open “Inst Control” and hit “Connect” Then select “OK” and start collecting data.

**30. Important: Remember to collect a Spectralon reference between each sample to keep the instrument calibrated**

31. At the end of the day, first disconnect the instrument in the software and close. Then shutdown the tablet, followed by the plant probe and instrument.
32. Charge the spectrometer batteries before packing back into the pelican case
  - a. The chargers are located in the pelican case
33. Replace instrument, fiber optic, and plant probe to their respective cases and store for transport. ***Reminder: Do not coil fiber optic too tightly or bend beyond 90 degrees when handling.***