CTD Protocol
Author: Ryan McClure
Last Update: October 2019

This is a serious update from the 2014 CTD protocols. PLEASE REFER TO THESE DIRECTIONS FOR NOW ON AND NOT THE SOPs FROM 2014!

Equipment:

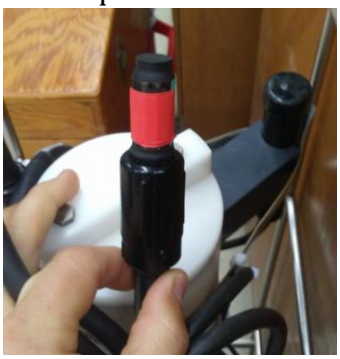
- CTD
- Winch → Its in the truck!
- Computer and cable
- 0.1% triton solution
- 1% triton solution
    - CLEANING PURPOSES ONLY
- 1000 ppm bleach
    - CLEANING PURPOSES ONLY
- pH/ORP reagent
- DI water

SECTION 1: PRELIMINARY CTD PREP FOR SEASON
The CTD has arrive from its' long overdue spa in Bellevue, WA, what do I do to prepare CTD ready for the field?

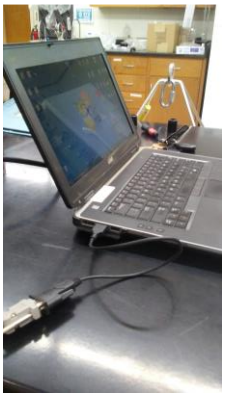
IF THIS IS NOT THE BEGINNING OF THE SEASON, refer to SECTION 2.

1. Install the Seabird Driver Software.
    a. Insert the provided disk from Seabird Scientific and follow the instructions to download the newest Seaterm versions. Once it is downloaded, place the applications Seaterm V2 and SBE Data Processing either onto the desktop or the command bar.
    b. In window, search the serial number of the CTD. This will be provided on the side of the main body of the instrument. The search will bring up a file that includes the serial number followed by .xmlcon (i.e. 17-4589.xmlcon). Place this in a separate folder in the documents labeled DATA. (OSDisk(C:) → Documents → DATA)
    c. Replace the existing .xmlcon file in that folder. THIS NEEDS TO BE DONE EACH TIME THE CTD RETURNS BECAUSE THE .xmlcon FILE HAS THE NEWEST CALIBRATION COEFFICIENTS OF EACH SENSOR ON THE CTD.

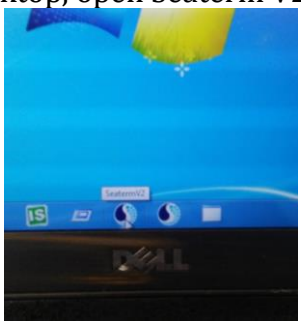
2. Communicate with the CTD to prepare for profiling in reservoirs.
    a. Unplug cap from the top of the CTD



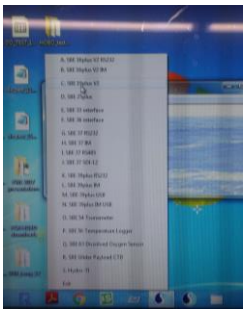
    b. Connect cable to CTD and computer. Line up bumps with the large prong and pinch the CTD cable and allow the air to burp out. This will ensure there is a secure connection.



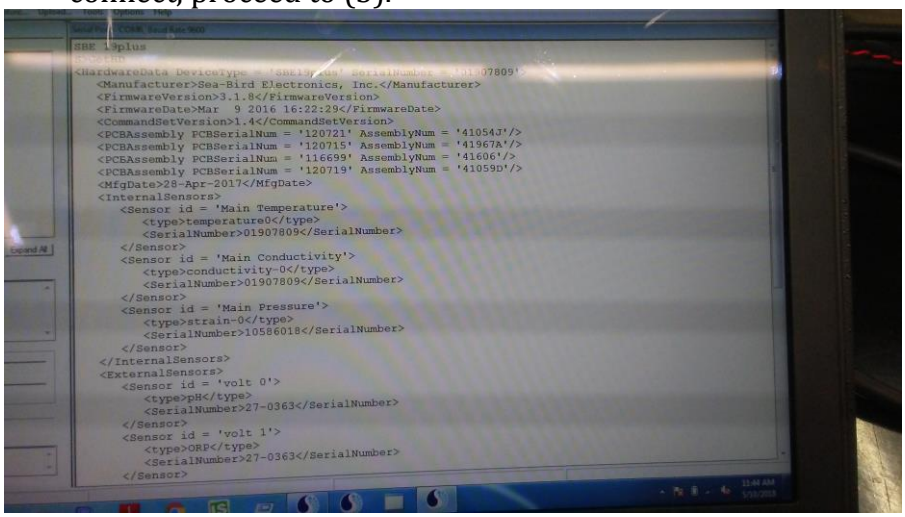
    c. On computer desktop, open Seaterm V2.



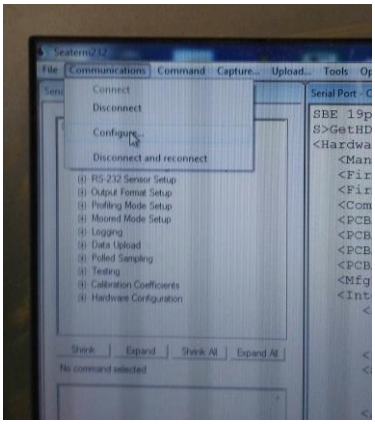
    d. Select (C), or, SBE 19 Plus V2



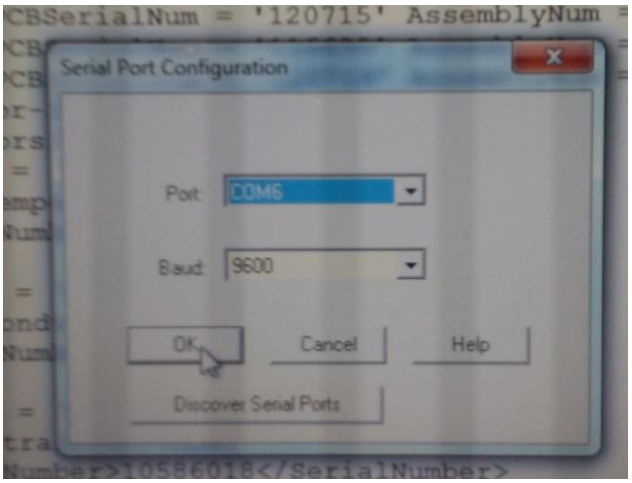
e. A new window will appear and the CTD SHOULD automatically connect! If it does not connect, follow the next steps, and if it does connect, proceed to (3).



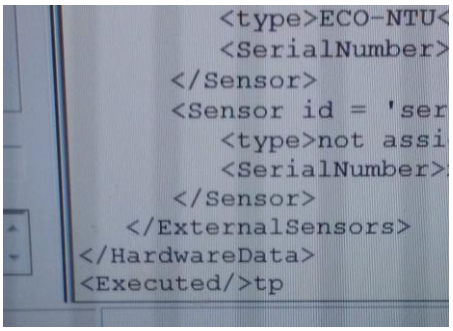
f. It didn't connect:
   i. Select COMMUNICATIONS → CONFIGURE



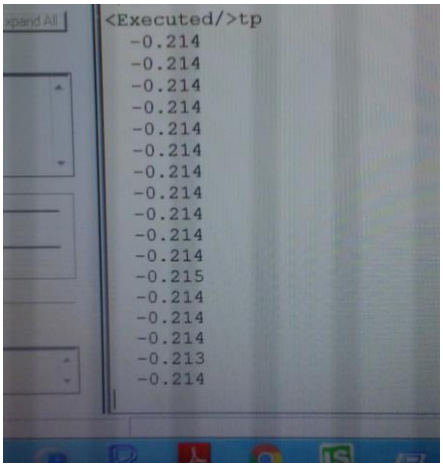
   ii. A new window will pop up. Make sure that a com port is selected (ANY NUMBER IS FINE) and the Baud Rate is at 9600! When this is the case, Click OK.



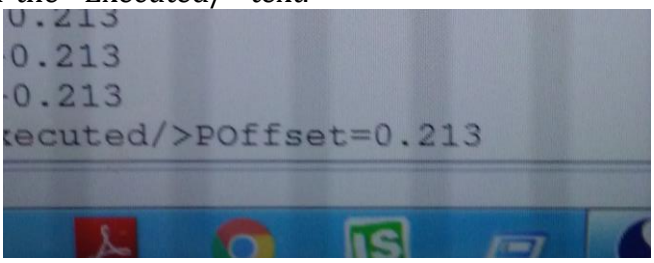
3. Preparing the CTD to deploy in the Local Reservoirs of our region (SW Virginia).
    a. Take the CTD to the reservoir you sample most (FCR) and set it right next to the water at the end of the boat ramp. There, use the computer to connect to the CTD as shown above.
    b. When the CTD and computer are connected, in the Seaterm V2 command prompt window, type “tp” right after the <Executed/> part on the bottom.



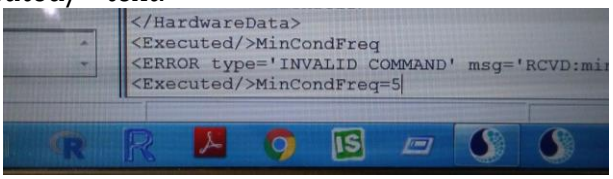
    c. The CTD will start to calculate the pressure based on the calibrations preformed in Washington. It will immediately start spitting out data that looks like this…



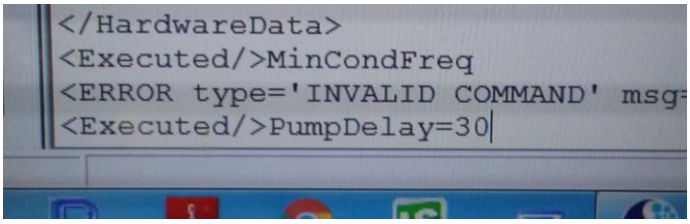
d. When it has finished, the final number will usually be a negative value followed by 3 decimals (i.e. -0.XXX). To correct for the pressure differential, type “POffset = 0.XXX” (the positive value of your number) after the <Executed/> text.



e. Not finished! Because most CTD profilers are built for the Ocean, we need to change the conductivity frequency to a low number so the CTD pump will recognize we are in a freshwater system and actually start up. Like the POffset command, type “MinCondFreq=5” after the <Executed/> text.



f. Still not finished. Now type “PumpDelay = 45” after the <Executed/> text in the command prompt window. The means whoever is taking the cast will have 45 seconds to get the CTD in the water before the pump turns on. MAKE SURE THAT HAPPENS and EVERYONE KNOWS THIS!



g. Select Communications and then Disconnect. Now the CTD is read to take casts in the field. Whoop!

SECTION 2: CTD PROFILING IN THE FIELD

Before one simply drops the CTD into the reservoir, many covers NEED to be removed and winches need to be set up before the cast can be completed!

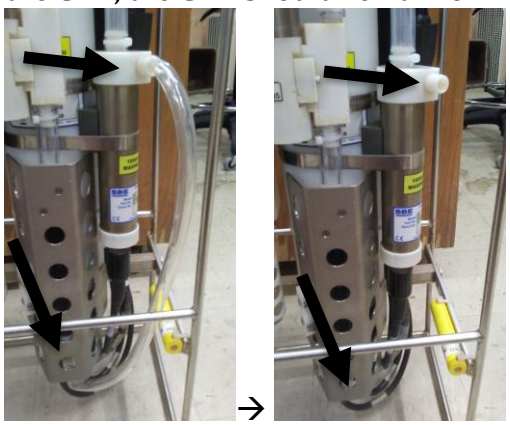
IN DERRING:

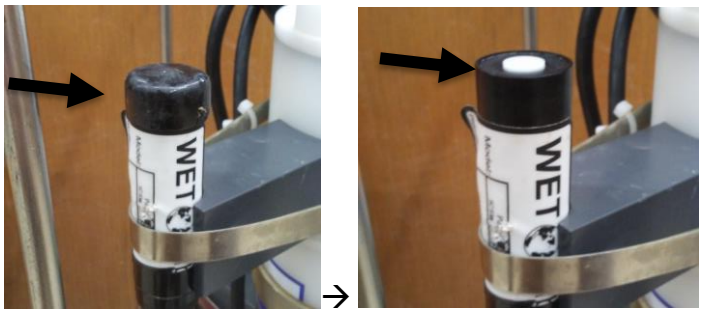
1. In 2029, the CTD is setting at the far end of the peninsula. It's hard to miss.
    a. A syringe is hanging off the metal cage. Pull the solution into the syringe and disconnect the tubing from the bottom of the CTD. Place the solution filled syringe on the shelf. If it spills and drains out, the solution is DI, so just refill it.
    b. Put the protective tubing over the open valve the syringe was attached to.
    c. Place the CTD in the truck bed on its' side.

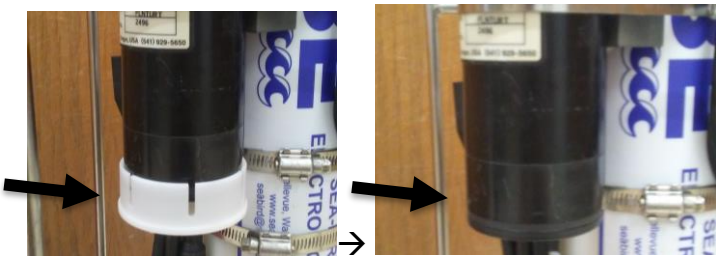
AT THE RESERVOIRS:

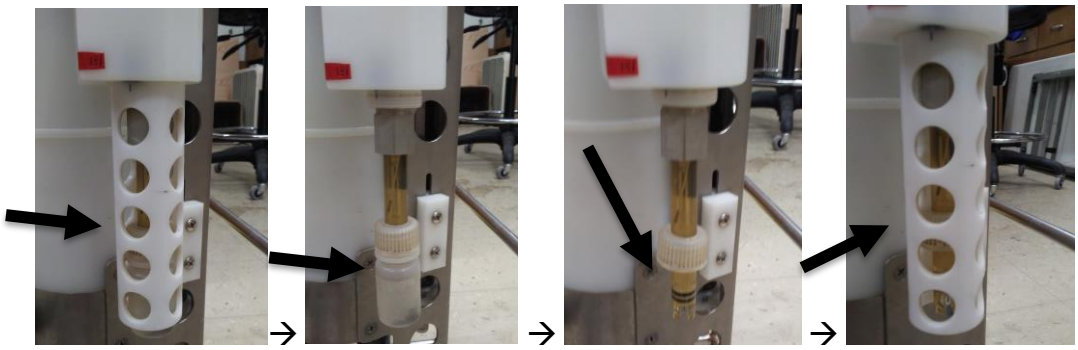
2. Set up the winch on the boat.
    a. Clamp and tightly screw on (using your hands) the winch bracket to the strongest and most stable part of the boat; add wooden blocks to outside of boat to build support if necessary.
    b. On the winch there is a lever that must be raised all the way up so the CTD can hang off the side of the boat; raise the lever by loosening and tightening the screws on the side of the winch with your hands.
    c. Loosen the tension using the **nob on top** of the winch until you can easily crank the winch.

3. Remove all the caps before the CTD profile!
    a. Remove the cap over the sensors on the CTD ***and*** detach the tube along the side of the CTD, the CTD should remain off.

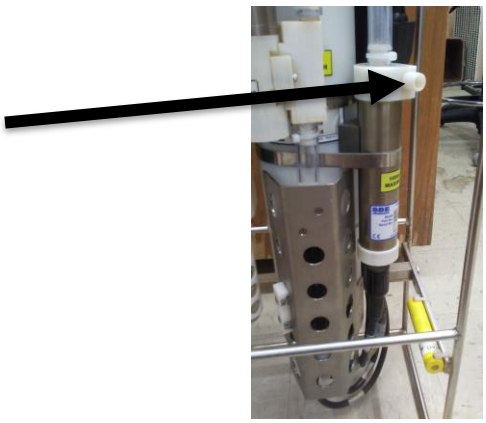








4. Attach the CTD to the winch using both carabiners!
5. At the first site, turn on the CTD using the on/off switch on the side, place the CTD in the water so the PAR sensor is left exposed above the surface of the water. Refer to sub directions below.
    a. The CTD is set on a 30 second delay so the moment you turn on the switch; the pump will not start for another 30 seconds. This will give you time to safely place the CTD in the water and get it into the position for the cast.
    b. You will hear the pump start and then see small bubbles start to come out of the white bleed valve on the side of the CTD. See next page.



c. Verify the pump is working by placing a finger over the bleed valve and feel a slight flow of water coming from the opening.
d. After verifying the pump is started and there is flow from the CTD bleed valve, let it equilibrate to the surface water temperature for another 30 seconds.
e. On a clear sunny day, position the CTD so the PAR sensor is not inhibited by the shadows from the CTD cage. This will generate weird dips in the PAR profiles that are difficult to interpolate through.

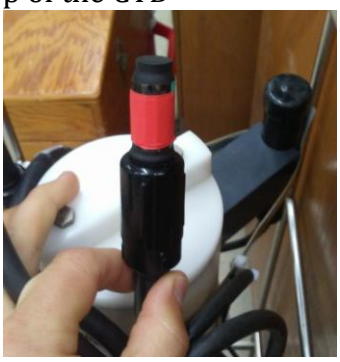
f. Refer to next number to lower the CTD.

6. Unhook the winch lock by lifting the piece of metal on top of the winch
7. Slowly (**approximately 4 seconds per full 360 degree crank**) lower the CTD to the bottom of reservoir; at bottom there will be a release of the weight- do not continue to lower, raise the CTD at a comfortable pace (**2 seconds per full 360 degree crank)**.
    a. NOTE: The CTD output files can determine the rate in which the CTD was lowered so those who skimp out and crank faster will be singled out! TRUST ME!
8. When the CTD has come back to the surface, turn off the CTD using the **on/off** switch on the side while it is still in the water. Place the CTD back in boat
9. Repeat for each site that you intend to sample in the reservoir**. Be sure to write down the order in which you collected the casts to make the post processing a little easier.**

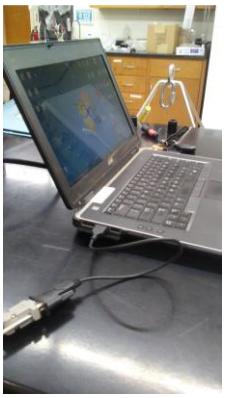
SECTION 3: UPLOADING CTD DATA

Connecting CTD after a day in the field:

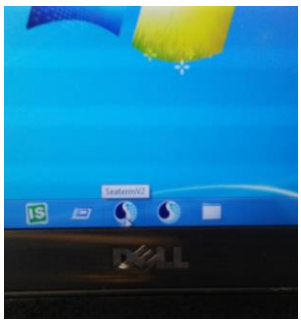
1. Unplug cap from the top of the CTD



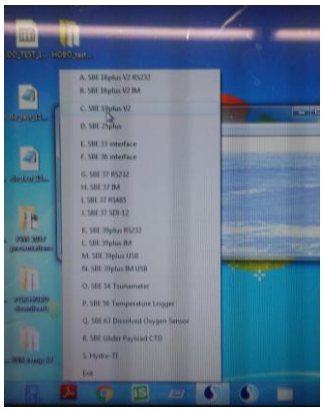
2. Connect cable to CTD and computer. Line up bumps with the large prong and pinch the CTD cable and allow the air to burp out. This will ensure there is a secure connection.



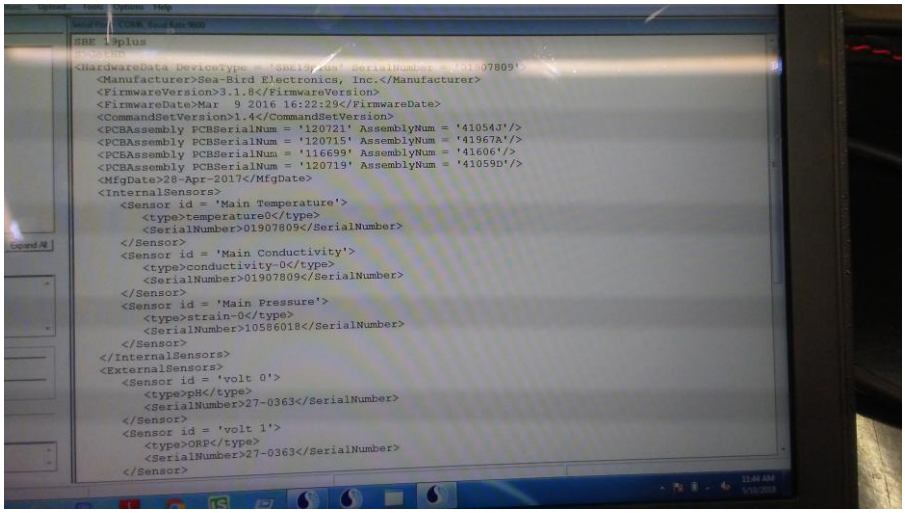
3. On computer desktop, open Seaterm V2.



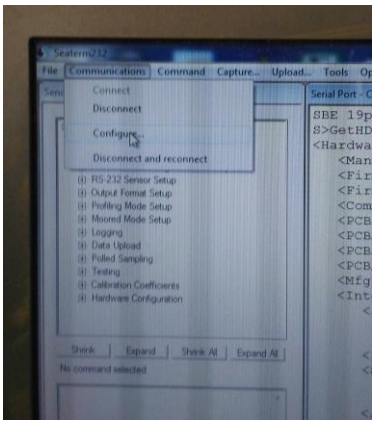
4. Select (C), or, SBE 19 Plus V2



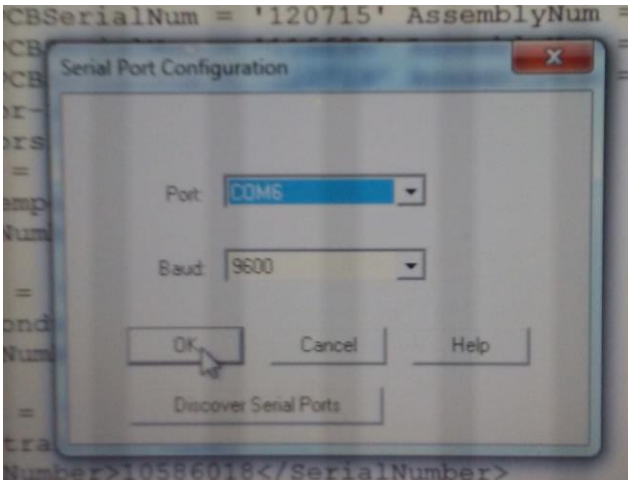
5. A new window will appear and the CTD *should* automatically connect! If it does not connect, follow the next steps, and if it does connect, proceed to **UPLOADING DATA**.



6. It didn't connect:
    a. Select COMMUNICATIONS → CONFIGURE

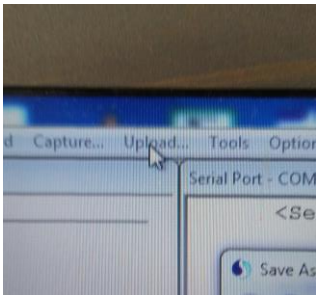


b. A new window will pop up. Make sure that a com port is selected (ANY NUMBER IS FINE) and the Baud Rate is at 9600! When this is the case, Click OK.

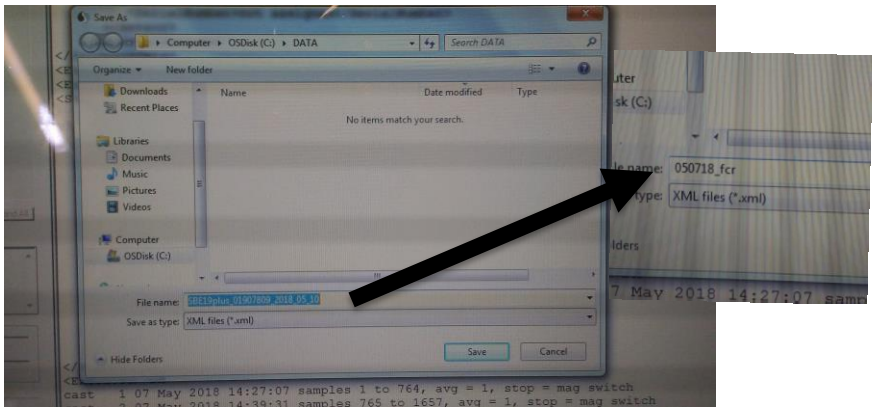


UPLOADING DATA

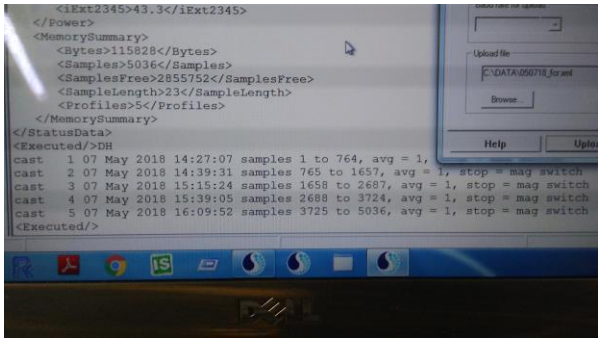
1. Select the "Upload" tab on the top of the Seaterm V2 window.



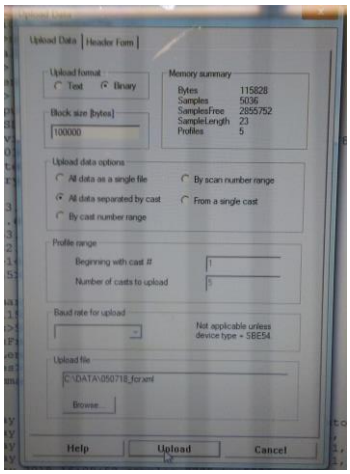
2. A new window will pop up that is automatically linked to the Folder that was set up in section 1 (See above). In the "File Name" section, highlight and rename the files to upload to in the format MMDDYY_res. (i.e. 050718_fcr).



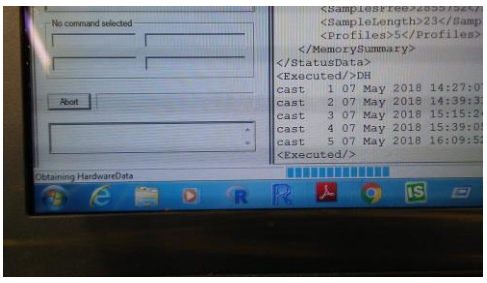
3. The command prompt window will then scroll through a bunch of information until eventually the line <Executed/>DH runs and all of the casts stored on the CTD are displayed. In the case of the image below, there are FIVE casts.



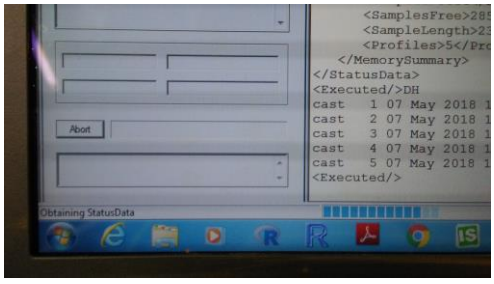
4. A new window will then pop up that lets the user select which casts to upload. Select all data separated by casts and KEEP all other formats the same. Select "Upload"



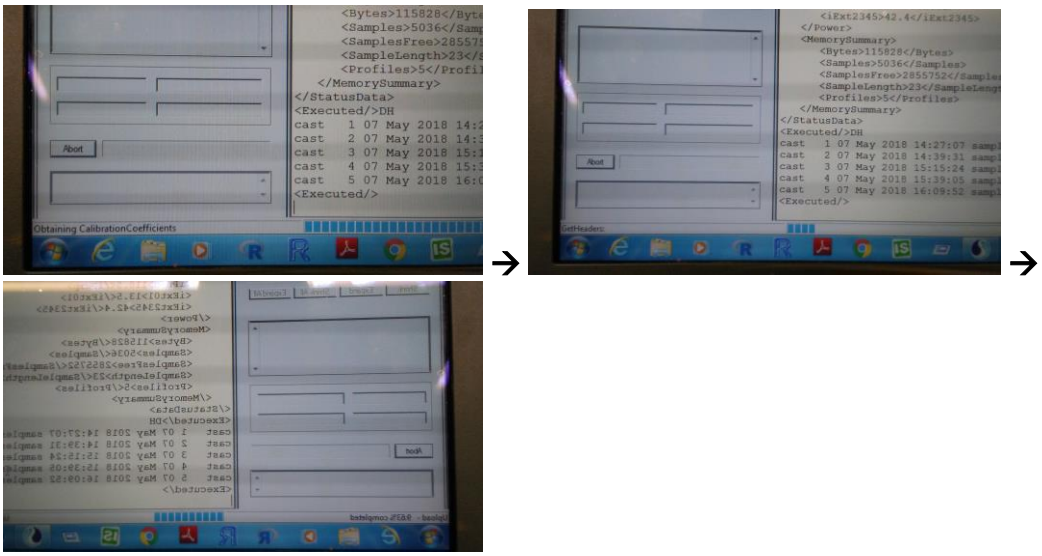
5. Seaterm V2 will go back to the original command prompt screen and then on the bottom left update the user on the status of the CTD uploads. It will upload each cast like this individually.



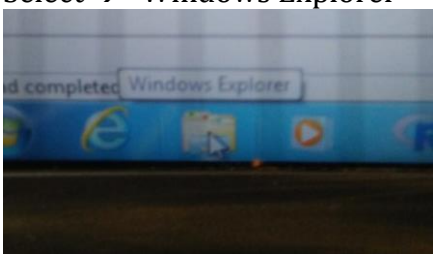
→



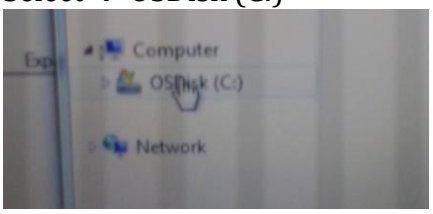
→



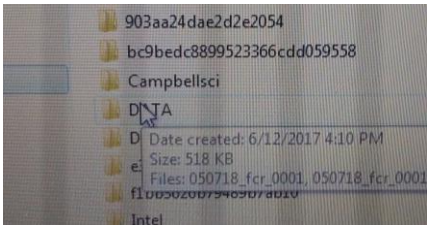
6. When the command prompt in Seaterm V2 specifies that the Upload is complete. Go to the DATA folder to verify that that casts have successfully been stored in the folder and change their names to match the cast order and sites they were taken.
    a. Select → "Windows Explorer"



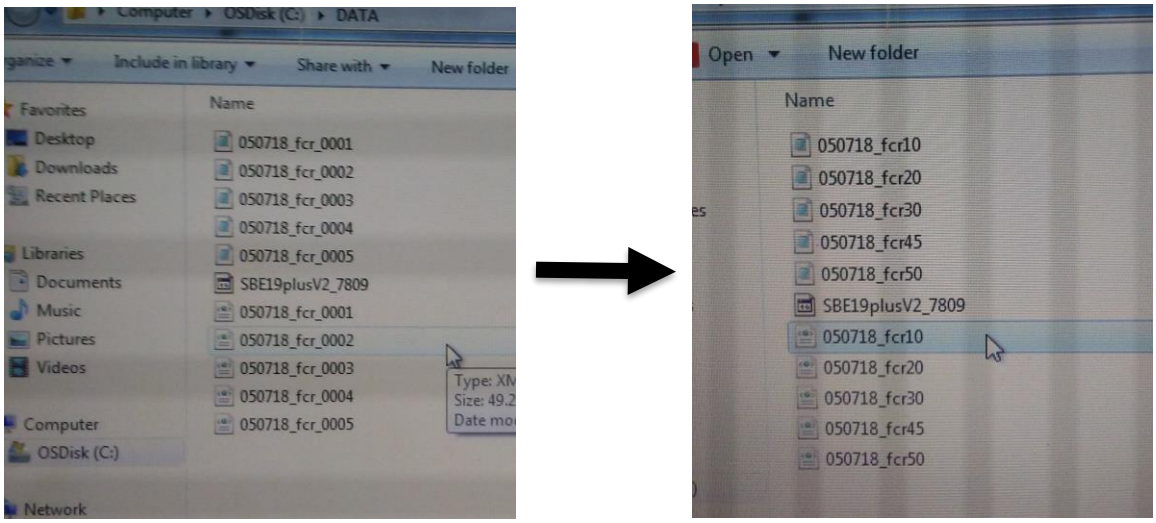
    b. Select → OSDisk (C:)



    c. Select → DATA

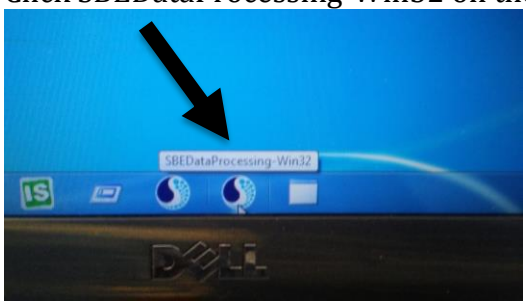


    d. All the files that were just downloaded will show up in this folder along with the SBE19PlusV2_7809.xmlcon file. Change the name of *every file except the .xmlcon file* to match the sites in the order in which the casts were taken. The CTD will automatically order the casts by cast number and not size.


Computer ▸ OSDisk (C:) ▸ DATA
Include in library
Share with
New folder
Favorites
Desktop
Downloads
Recent Places
Libraries
Documents
Music
Pictures
Videos
Computer
OSDisk (C:)
Network
Name
050718_fcr_0001
050718_fcr_0002
050718_fcr_0003
050718_fcr_0004
050718_fcr_0005
SBE19plusV2_7809
050718_fcr_0001
050718_fcr_0002
050718_fcr_0003
050718_fcr_0004
050718_fcr_0005
Open
New folder
Name
050718_fcr10
050718_fcr20
050718_fcr30
050718_fcr45
050718_fcr50
SBE19plusV2_7809
050718_fcr10
050718_fcr20
050718_fcr30
050718_fcr45
050718_fcr50

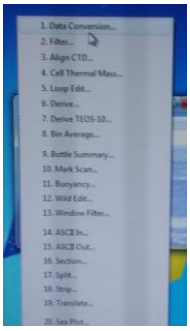
SECTION 4
Processing CTD files:

1. Click SBEDataProcessing-Win32 on the Taskbar.

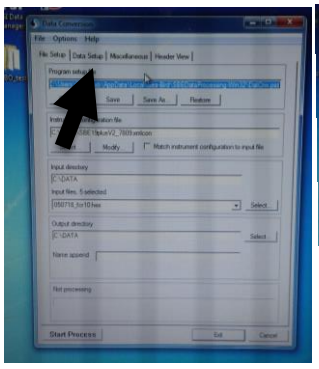


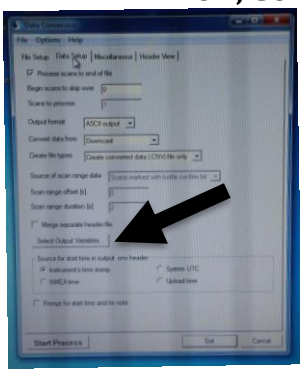
2. A selection window will automatically appear with A LOT of selections. Start at the very top.

    a. Run
        i. Data conversion



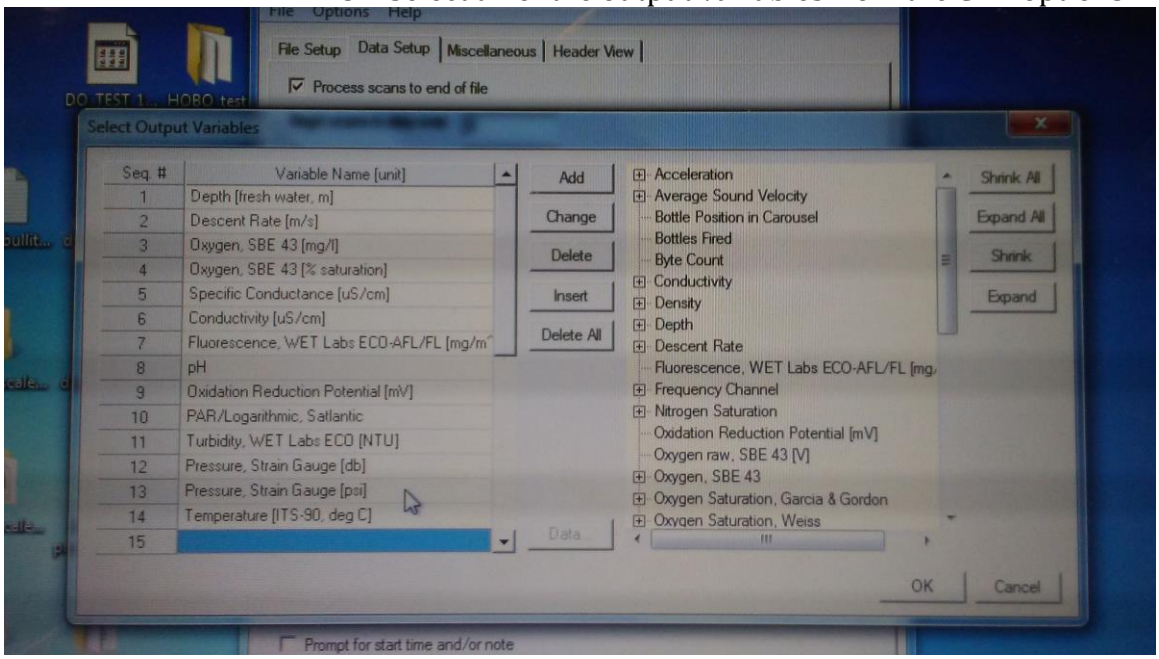
1. ******IF THIS IS THE FIRST TIME OF THE SEASON USING DATA CONVERSION ON THE CTD, SELECT THE "Data Setup" HEADER. IF NOT, CONTINUE to (ii). ******





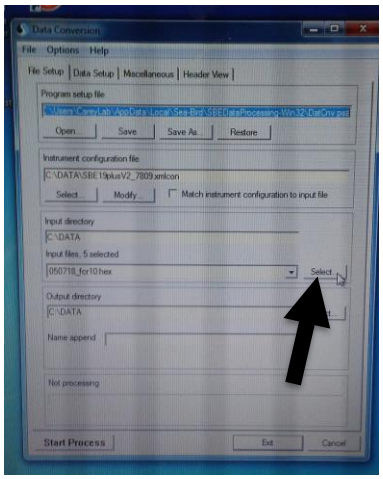
2. Make sure the output format is ASCII output, the converted data form is a Downcast, and that you are creating a CNV file type. If so, select "Select Output Variables."

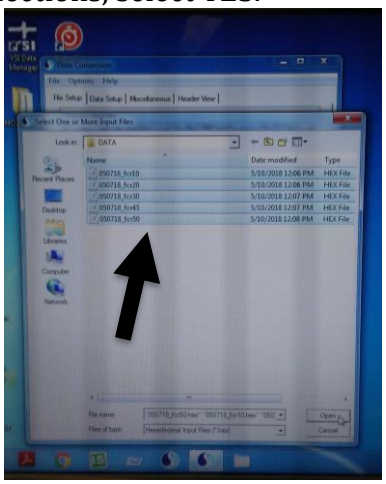
3. Select all of the output variables from the CTD options.



4. Click OK when all 14 of these Variable Name rows are filled. **Note: Temp (ITS-90) and Pressure (db) and (psi) are needed for the CNV processing later in R.**

ii. Select the input files, do not alter any other parameters. If you are asked to clear earlier selections, select YES.





iii. Click start process
iv. Once processing is complete click exit
v. Click no to save changes if this is not the first time in data conversion.

3. Repeat the process for two more options in SBEDataProcessing-Win32
    a. SELECT Filter – This automatically QC/QAs and flags outlier data.
        i. Select input files, do not alter any other parameters
        ii. Click yes to remove variables from the data setup
        iii. Click start process
        iv. Click yes to overwrite (yes to all if processing multiple files)
        v. Once processing is complete click exit
        vi. Click no to save changes

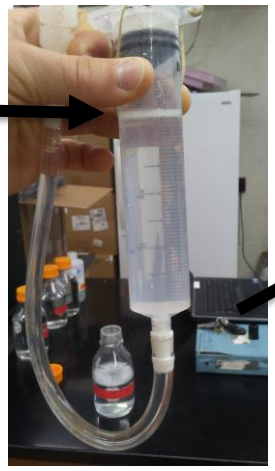
    b. SELECT Align CTD
        i. Select input files, do not alter any other parameters
        ii. Click yes to remove variables from the data setup
        iii. Click start process
        iv. Click yes to overwrite (yes to all if processing multiple files)
        v. Once processing is complete click exit
        vi. Click no to save changes
4. Close SBEDataProcessing-win32
5. Go to the DATA folder and move the .XML, .HEX, and .CNV files into the CTD 20XX folder on the Computer's Desktop.

SECTION 5
Delete the casts from the CTD
(only if data has been processed! And backed up in two places)

1. Open Seaterm V2
2. Connect to the CTD
3. In the command prompt window, type “InitLogging” after <Execute/>
4. The prompt will ask you to verify that this is OK and ask you to repeat the command.
5. Repeat the command by typing “InitLogging” again.
6. Click disconnect and close Seaterm V2

SECTION 6: STORAGE OF CTD IN LAB

1. Using a Syringe and Tubing, siphon 60 mL of DI solution into the syringe and then push the solution through the CTD's bottom intake valve.



2. Push the solution through until the solution is setting just above the SBE 43 DO Membrane senor.

3. Attach the Syringe with the DI to the CTD cage and store the instrument like this until the next time it goes into the field.

4. When going into the field, siphon the DI out of the CTD, place it back in the solution's container, and then replace the input valve with the cover tubing so no junk goes in during transport.