



IPHC Water Column Profiler Deployment Procedures and Maintenance Guide

Commissioners

Canada	United States of America
Paul Ryall	Glenn Merrill
Neil Davis	Robert Alverson
Peter DeGreef	Richard Yamada

Executive Director

David T. Wilson, Ph.D.



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Contact details:

International Pacific Halibut Commission
2320 W. Commodore Way, Suite 300
Seattle, WA, 98199-1287, U.S.A.
Phone: +1 206 634 1838
Fax: +1 206 632 2983
Email: secretariat@iphc.int
Website: <https://www.iphc.int/>



This guide contains the instructions IPHC field staff follow for deployment, maintenance, and data upload of the water column profilers during the IPHC Fishery Independent Setline Survey.

1. PREPARING FOR DATA COLLECTION

1.1 *Instrument and gear configuration*

The profiler is a suite of instruments housed in a steel cage. In order to cast and retrieve the profiler successfully, there are several components to ensure the unit stays connected to the vessel and does not impact the bottom.

1. Buoy line connecting the profiler to the vessel
2. Float assembly with locking carabineer
3. Profiler instrument
4. Bridle assembly
5. Weak link
6. Anchor weight and clipping carabineer assembly

Note all connections must be secure and checked before EVERY cast.

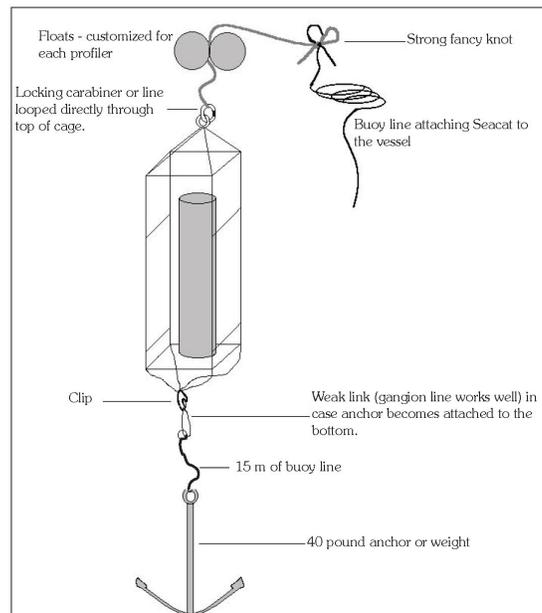


Figure 1.1 Basic configuration of the Seacat water column profilers.



1.2 *Beginning trip maintenance - tablet*

Perform these steps at the beginning of each trip. In this section, you will be working with a software program called Seaterm, which enables you to communicate with the profiler.

1. Make sure the profiler switch is in the “off” position.
2. Power up the tablet and log on.
3. Attach the communication cable to the tablet via the USB hub and then to the profiler.
4. Click on the SeatermV2 icon on the desktop. A window will open that looks similar to [Figure 1.2](#):

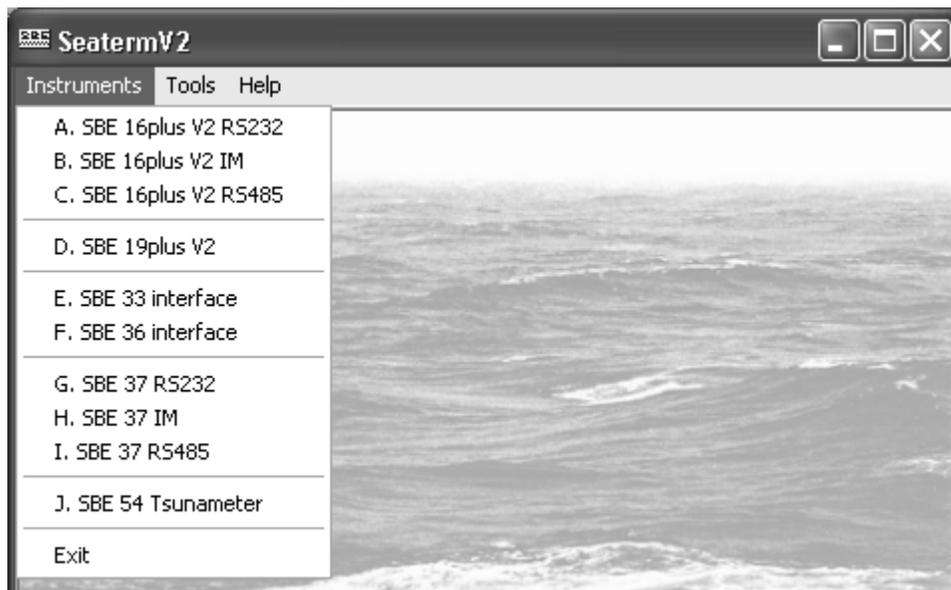


Figure 1.2 Choosing the correct profiler instrument in Seaterm.

5. Choose SBE 19plus V2. Your device and profiler will attempt to communicate with each other and if they are successful, your screen will now look something like [Figure 1.3](#) with either an <Executed/> prompt or an S> prompt at the bottom, which means the profiler is ready and waiting for a command.

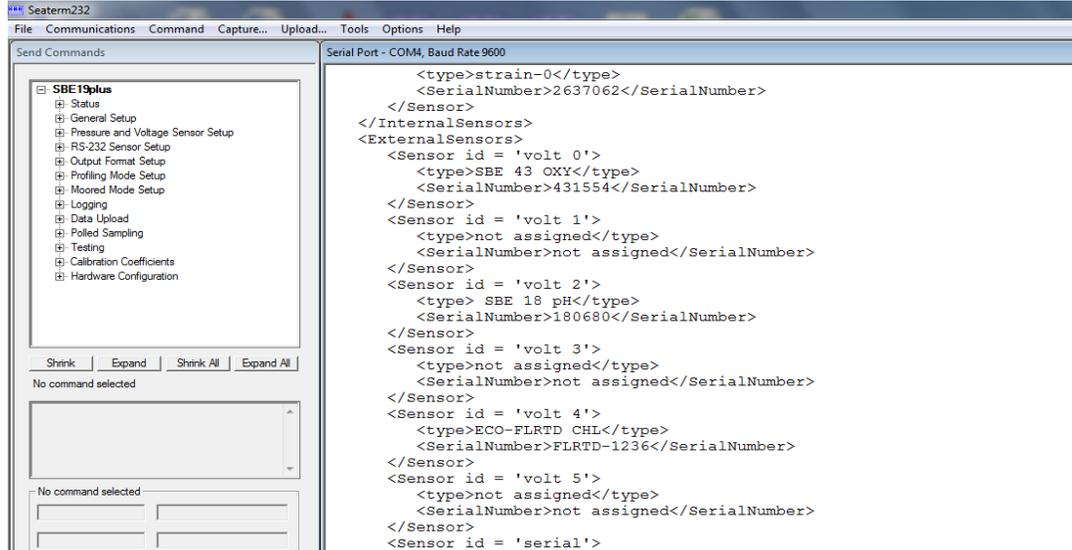


Figure 1.3 Establishing communication between Seaterm V2 and the profiler.

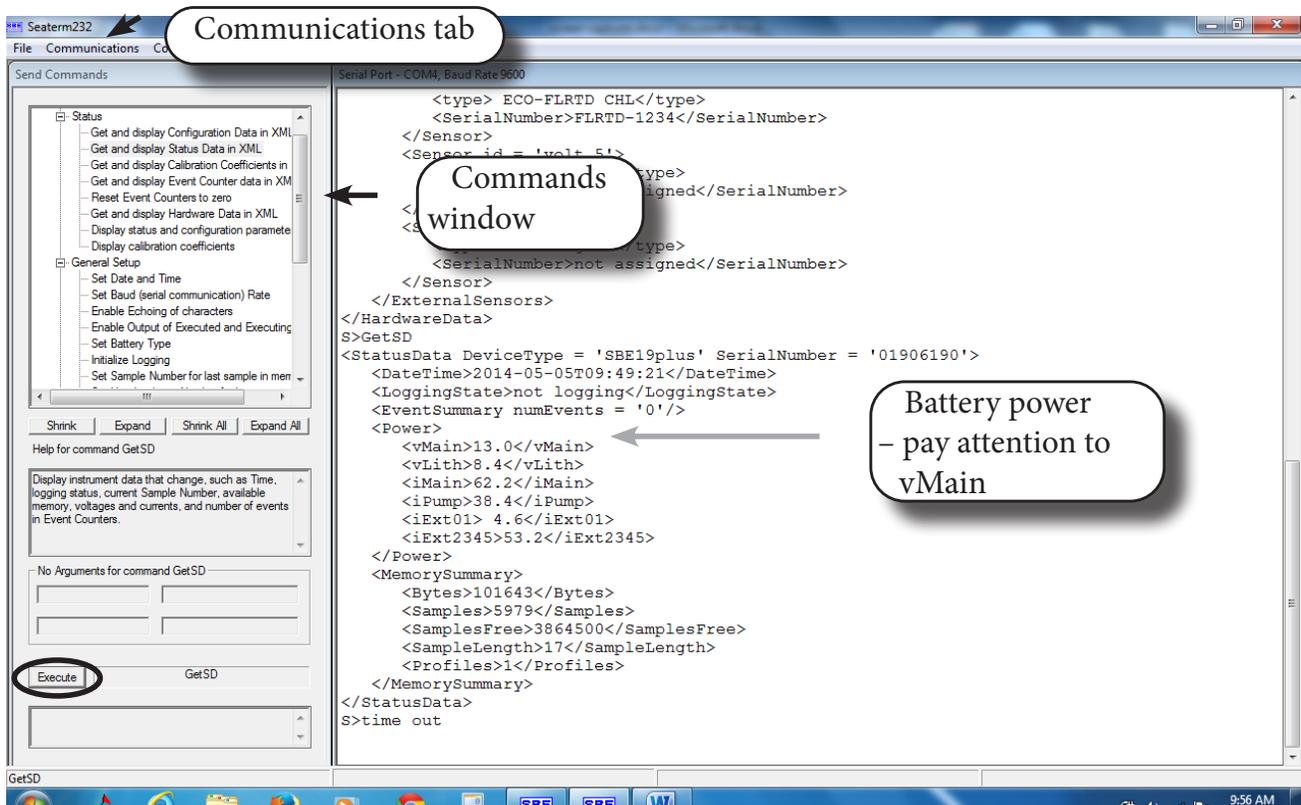


Figure 1.4 Seaterm V2 communication tab, command window execute button, and checking for battery power.

6. Once connected, check the status of the profiler. First, check the batteries. Find <vMain> (or <vbatt>) and then a number. That number is the volts that the alkaline batteries are currently providing. Brand new batteries supply 13.9 volts. If vmain (or vbatt) = 10.5 or less, the batteries are getting low and need to be changed before the profiler can be deployed.



If you change the batteries, you must go back to [Step 1 in this section](#) and start over. **Note** the date and time on the profilers is Pacific daylight savings time and may not match local time. Please do not try to change it.

7. Check to make sure you have uploaded all of the casts in the profiler memory.
8. When you are satisfied that everything has been uploaded, in the *Commands* window, select *General setup* then *Initialize logging*. Click the *Execute* key to send the command to the profiler. The profiler will require you to repeat this step in order to complete the command. The memory of the profiler is now reset.
9. Type in *QS*. This will put the profiler into sleep mode. Disconnect the cable and replace the black cap.

1.3 Beginning trip maintenance – mechanical

If the profiler has not been deployed for more than two days, or the conductivity sensor has been stored dry (except at the beginning of the first trip – see note below), perform the following treatment prior to the next cast.

Note the profilers are shipped dry from Seattle, but they are freshly cleaned and calibrated. If this is the beginning of the first trip, flush the conductivity sensor several times with 0.1% Triton solution, then rinse thoroughly with distilled water. There is no need to soak the cell for an hour.

1. Detach the tubing that connects the conductivity cell to the SBE 43 (oxygen sensor), and fill the tygon tubing that is connected to the bottom of the conductivity cell with 0.1% Triton solution. Loop the tubing over the top of the conductivity cell.
2. Let sit for one hour, then drain and rinse/flush thoroughly with fresh distilled water.
3. When finished, reconnect the tygon tubing that leads to the SBE 43. Reconnect the tygon tubing at the bottom of the conductivity cell and loop over the top.
4. Check all connecting bolts and tighten where necessary.

2. CASTING

Each cast takes place just prior to hauling a station. The Captain will take the vessel to the end of the string, and idle the vessel prior to pulling the flag aboard to allow for a profiler cast. It does not matter whether the string is being hauled from the beginning anchor or the end anchor.

The IPHC Survey Specialist who is designated to make the cast and a crew member will work together to deploy the unit.

2.1 Assemble the unit

1. Check all connecting bolts and tighten where necessary.
2. Attach float assembly to the top loop of the profiler cage using the locking carabineer. To the other end of the float assembly or directly to the loop at the top of the cage, secure enough buoy line to allow the unit to reach the bottom (crew should complete all knots to ensure they are secure). Remember that the depth is an estimate and can vary by several meters. Always allow a little extra line just in case.
3. Tie the buoy line off to the vessel.



4. Attach the 40-pound weight to 15 m of buoy line via a weak link. The weak link is achieved by using gangion line between the profiler bridle assembly and the weight assembly in a single loop. Use the clip carabineer to clip the weight assembly to the bridle. **Note** while it's not good to lose any gear, the loss of the anchor or cannonball is a more desirable outcome than the loss of the profiler unit. Take care to assemble the weak link to act as such in case the weight becomes attached to the bottom.
5. Floats and weights may be disassembled between casts depending on how they are stored. However, connections must be examined prior to every cast.

2.2 *Remove tubing and caps*

6. Remove the tygon tubing from the bottom of the conductivity cell.
7. Remove the soaker bottle from the pH probe. Do this by first unscrewing the metal protective cover, Remove the bottle by unscrewing the cap, then pulling down on the bottle, being careful not to spill the fluid or pull on the glass probe. **Note** that the cap and o-ring stay on the probe during deployment but should be pushed up on the probe so it doesn't impede readings. Screw the metal protective cover back into place. (It may be possible to detach and reattach the soaker bottle without removing the metal protector. In that case, just remember that the probe is glass and can break easily - care must be taken. Additionally, check the protective cage periodically to ensure it is securely in place, but do not over-tighten or it might seize up making it difficult to remove in the future.)
8. Remove the white cover from the WetLabs fluorometer.

2.3 *Turn the unit on*

9. Just prior to putting the profiler in the water, move the magnetic switch to the "on" position. The switch can be sticky so ensure it has been pushed all the way. It can also come loose, so if it seems loose, tighten the screw (just until the switch shows some resistance. Do not over tighten) in the middle of the switch prior to deployment.

Note the time between flipping the switch and submerging the profiler must be less than 60 seconds. This is because there is a 60 second delay between activating the magnetic switch and the pump turning on. The pump must not be run dry or costly damage can result. If the unit is still out of the water after 60 seconds, either prime the pump with a squirt of water if you are in the process of deployment or turn the magnetic switch off until ready.

2.4 *Follow launch and retrieval protocols exactly*

10. Post launch protocols on the deck and make sure everyone on deck who is involved with the cast knows and can see these protocols. Lower the profiler gently into the water - do not "toss".
11. Submerge the profiler approximately 3 m, or far enough below the surface so it is not impacting the side of the vessel, and **hold it there for 90 seconds. The full 90 seconds is necessary to prime the pump and ensure accurate readings.** If deployed too quickly, the first few meters may be discarded because the profiler pump may not be fully engaged.
12. Following acclimation, pull the unit back up via the buoy line to just below the surface, taking care to keep the entire profiler submerged, make sure the line is exiting via the hauler (and firmly attached to the vessel), then



gently let go of the line. **The line must be watched at all times to ensure that it does not drift beneath the vessel – this includes both descent and retrieval.**

13. Allow the profiler to free fall and watch the line for sign of slack. The profiler will naturally accelerate slightly as it descends.
14. Once the line goes slack on deck, it means that the profiler is on bottom. Immediately thread the buoy line through the gurdy and haul back aboard. The speed of ascent back to the vessel is not critical but try to keep it consistent. **The line must be watched at all times to ensure that it does not drift beneath the vessel.**
15. Pull the unit and its accessories back aboard.

2.5 Turn the unit off

16. Immediately move the profiler magnetic switch to the “off” position.

2.6 Maintenance, and replace caps and tubing

17. Flush the conductivity cell with 0.1% Triton solution using the syringe assembly. This rinses off the salt and any oils or contaminants left from the cast. Do not disconnect the tubing leading to the oxygen sensor at this time.
18. Follow with a rinse of fresh, distilled water the same way, then squirt distilled water into the pump exhaust until water flows out of the pump and is clear (i.e. free of dirt and/or plant material).
19. Replace the tygon tubing on the conductivity cell, fill tubing with weak bleach solution and loop around the top of the cell.
20. Rinse the sensor face of the WetLabs unit with clean, distilled water, then wipe clean with a soft dry cloth (use Kim Wipes provided). **Note** if there is any sign of oils or organic debris on the unit face, use a small amount of mild dish soap on a damp Kim Wipe and gently clean making sure to rinse thoroughly afterward. Never use an abrasive fabric or cleanser to clean the face because scratches can lead to inaccurate readings. Take care not to scratch the face, but if it becomes scratched, note it in your logbook and clean the face the best that you can.
21. Replace the white fluorometer cap.
22. Remove the metal protective cage from the pH sensor SBE 18 (or replace without removing the cage if possible), rinse the electrode and the soaker bottle cap and o-ring well with distilled water, replace the bottle of pH 4 buffer solution, screw cap on, and replace the metal protector. Soaker bottle should be $\frac{3}{4}$ full of pH 4 buffer solution. Top off bottle if needed. Change pH 4 solution in soaker bottle every 3-4 days at sea or sooner if it becomes contaminated. If leaving the metal cage in place, it is critical that you ensure the sensor is properly rinsed before the bottle is replaced. Unscrew the metal cage after every few casts and rinse to ensure that the connection threads remain clean of salt and debris.
23. Check and tighten cage bolts after every cast, and magnetic switch making sure it is snug.

2.7 Secure the Seacat

24. Use line and bungee cords to secure the Seacat on deck. Chosen spot should be out of the way of survey and fishing operations.



Note the Seacat can handle some weather and can be stored on the deck of the vessel between casts. Some crews prefer to outfit the profiler with the floats and anchors and then store the assembly, still attached, in a tub next to where the unit is stored. Make sure that line and connections are examined regularly to avoid the gear parting during deployment. Even though mild to moderate weather and sea spray should not harm the profiler, impact from other objects or strong waves can. Therefore, it should be stored in a semi-secure location where risk of impact from other gear, etc. is minimal. If expecting bad weather that could jar rigging loose or cause green water to come over the side, you will need to either crate the profiler until it passes or move it inside and secure it there.

2.8 Wheelhouse

25. On the Captain's set form (CSF) is a field to record the latitude, longitude, and depth of the profiler cast at each station. Even though you can likely see the flag on the end of the fishing string you are about to haul and may be tempted to use that location, it is important to record the exact latitude and longitude of the cast itself. The Captain will record this information during the cast. It is also useful to note when the Seacat appears to drift due to currents.

3. UPLOADING THE DATA AND QC

Data upload takes place once a day after all casts are completed. To complete this you will need the tablet and the Captain's Set Form.

3.1 Turn on the tablet

If possible, use external power when possible. Battery power can be unpredictable and lead to longer upload sessions.

3.2 Connect Seacat to tablet

1. Attach the cable to the profiler and tablet. When attaching to the USB Hub, handle the cables with care and make sure they are not bent or kinked, and that there is no strain on them or the connections.

3.3 Establish communication

2. Click on the SeatermV2 icon on your desktop.
3. Choose SBE 19plus V2 (probably item C or D). Your tablet and profiler will attempt to communicate and if they are successful, your screen will now look something like [Figure 3.1](#) with an <Executed/> prompt at the bottom, which means the profiler is ready for a command.

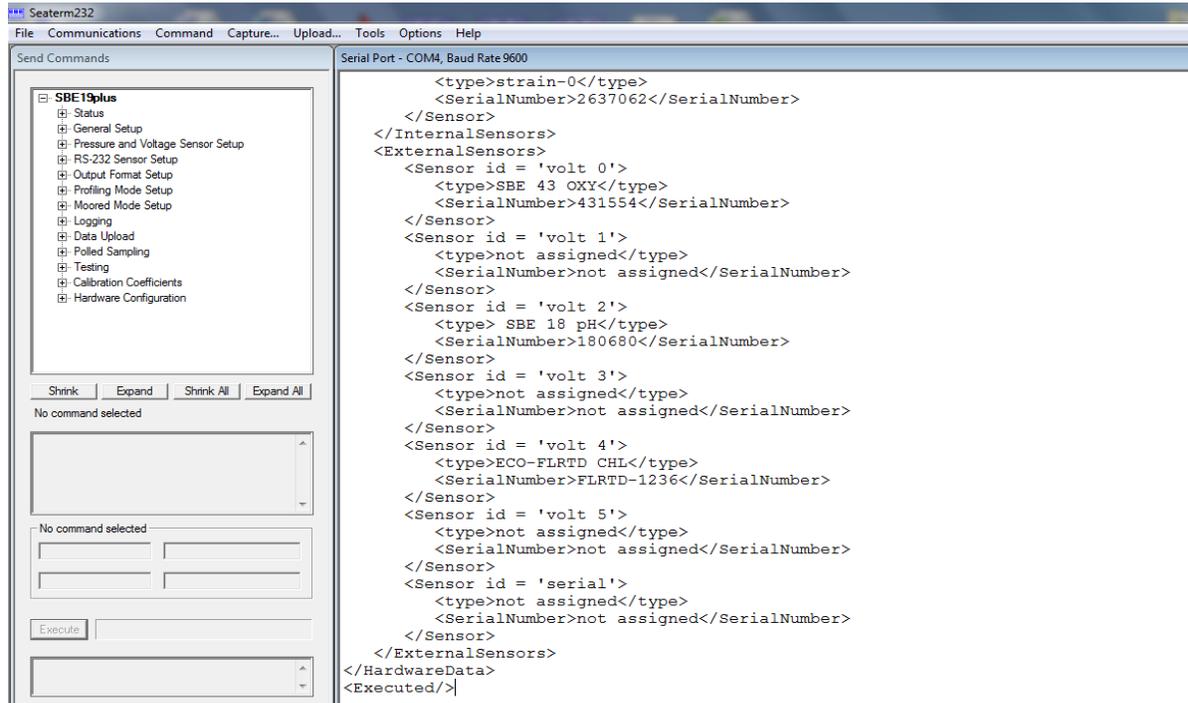


Figure 3.1 SeaTerm V2 establishing communication.

4. Once connected, check the status of the profiler. To do this, in the Command window, click the + next to *Status*, then *Get and display Status Data in XML*. **Note** that the number of profiles stored in the memory is listed.

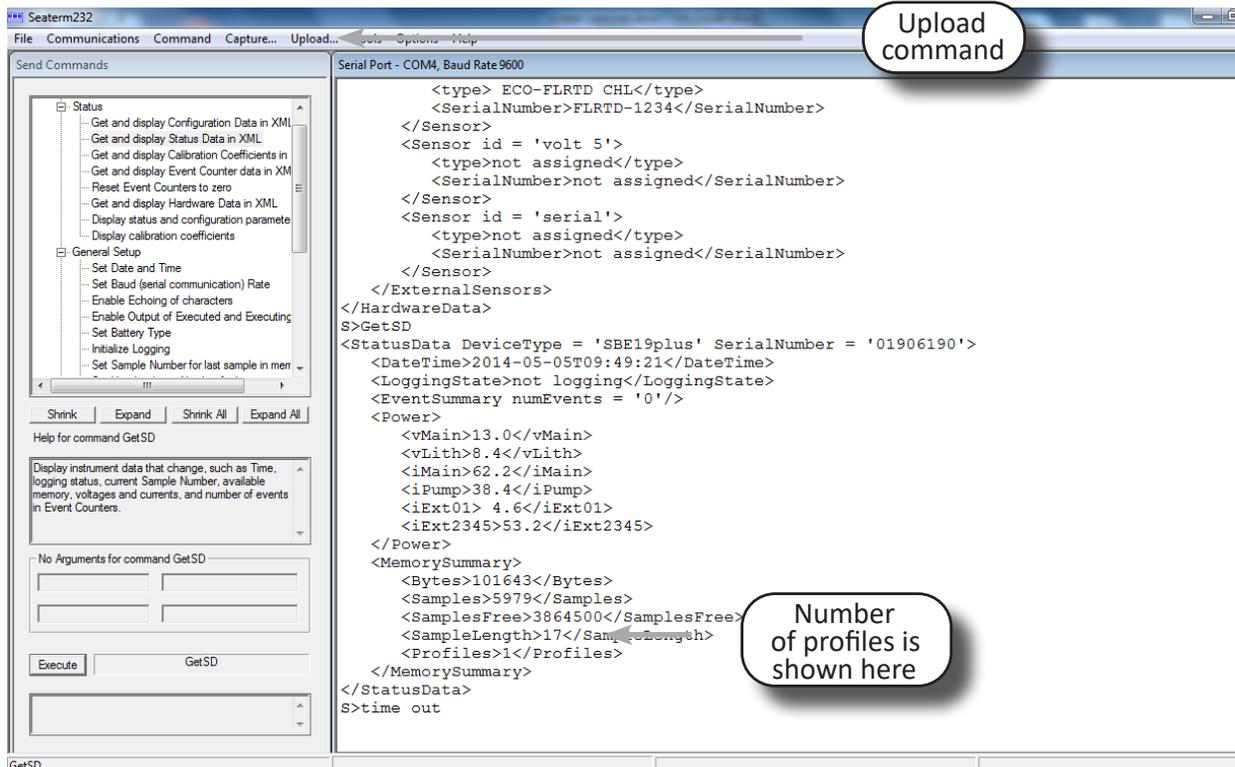


Figure 3.2 SeaTerm V2 uploading data.



3.4 Upload casts

5. Once communication is established click on *Upload* which is on the top menu bar. The screen will show how many casts are stored in the memory. **Note** that the profiler begins at cast 1 and you will need this number later.
6. You will be prompted to save the cast file.
7. In the Open Dialog box, enter the desired upload file name. The file name is VSLSetStationYear. E.g. for the *F/V Clyde* (CLD), at set 092 (three-digit set number), station 5013, in the year 2021 (21) will have this file name: CLD092501321.

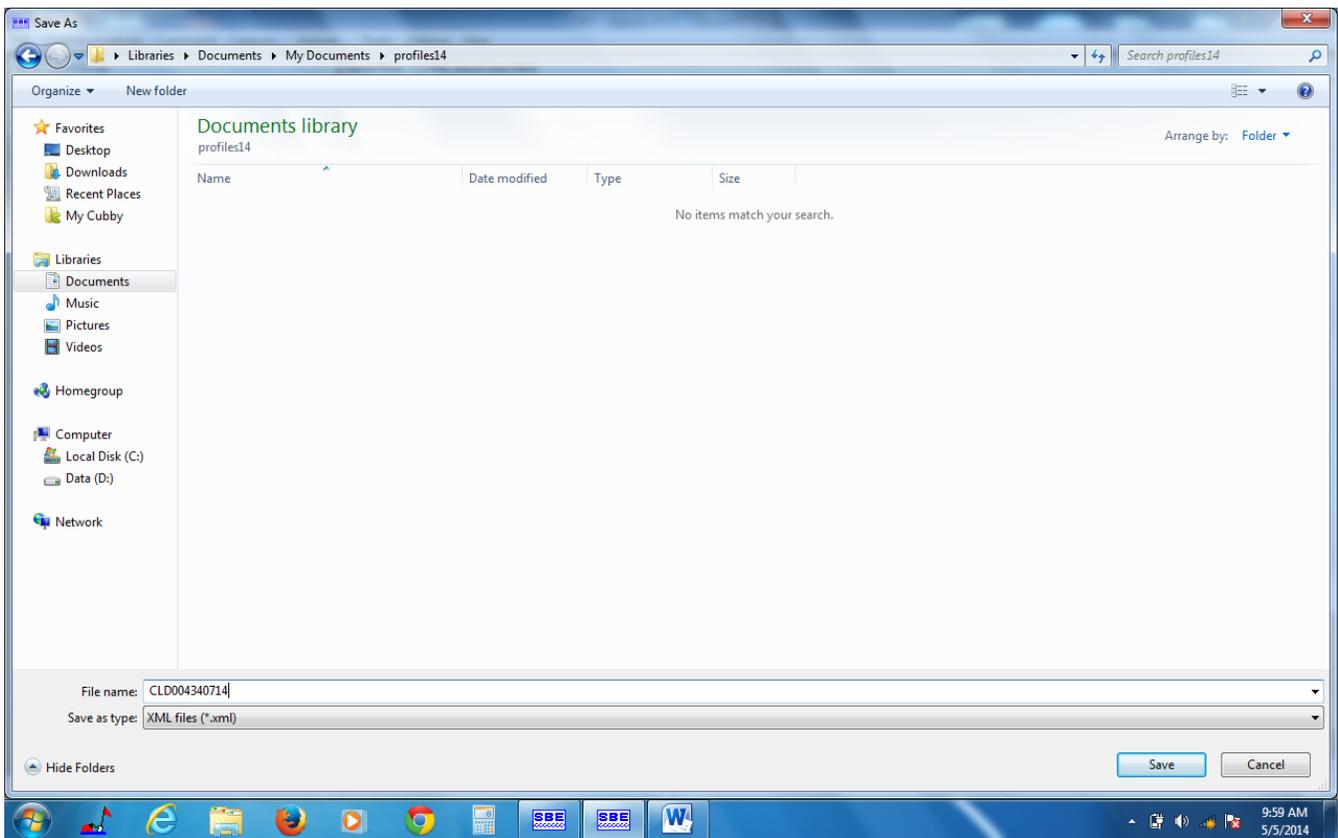


Figure 3.3 Giving the correct file name to the cast.

8. Select *Save* and another screen will pop up:
9. Select *From a single cast* under *Upload Data Options*. In the Profile box, specify the Cast #. This is the cast number the profiler assigned to that cast and cast numbers will begin at “1” each time you send the *Initialize logging* command to reset the memory. Click *Upload*.
10. You will be prompted to enter header information. If there is any additional relevant information about the cast, write it in the Notes box.
11. Note the cast header information is a series of free form fields.
 - latitude: Enter directly from CSF, but without the decimal
 - longitude: Enter directly from CSF, but without the decimal
 - setno: Three digit set number from CSF



- stnno: Four digit station number from CSF
- vslcde: The vessel code from your setline survey manual and CSF – all caps
- CSF bottom depth(m): **Convert the Seacat depth from fathoms to meters** following provided chart.

12. Press OK.

Note that your set number (setno) is the same set number you use on the CSF, but is different than the cast number assigned by the profiler as described above. This is because the profiler will begin counting from “1” each time you send the *Initialize logging* command and clear the memory and setno will be the set number for the vessel beginning at 1 and numbered consecutively for the duration of the survey.

13. If there are multiple casts stored, then you will need to repeat the steps for uploading data, changing the profiler cast number each time until all casts have been uploaded to the tablet.

14. Ensure that all data have been uploaded. Note that the lower left corner should indicate *Upload complete*.

3.5 Reset the Seacat and disconnect

15. Back in the SeatermV2 screen in the commands window, select *General setup*, then *Initialize Logging*. Click on *Execute*. The profiler will require this command twice so click on *Execute* again. Note: *Initialize logging* will reset the memory, essentially erasing the cast information from the profiler and freeing up the full memory of the unit.

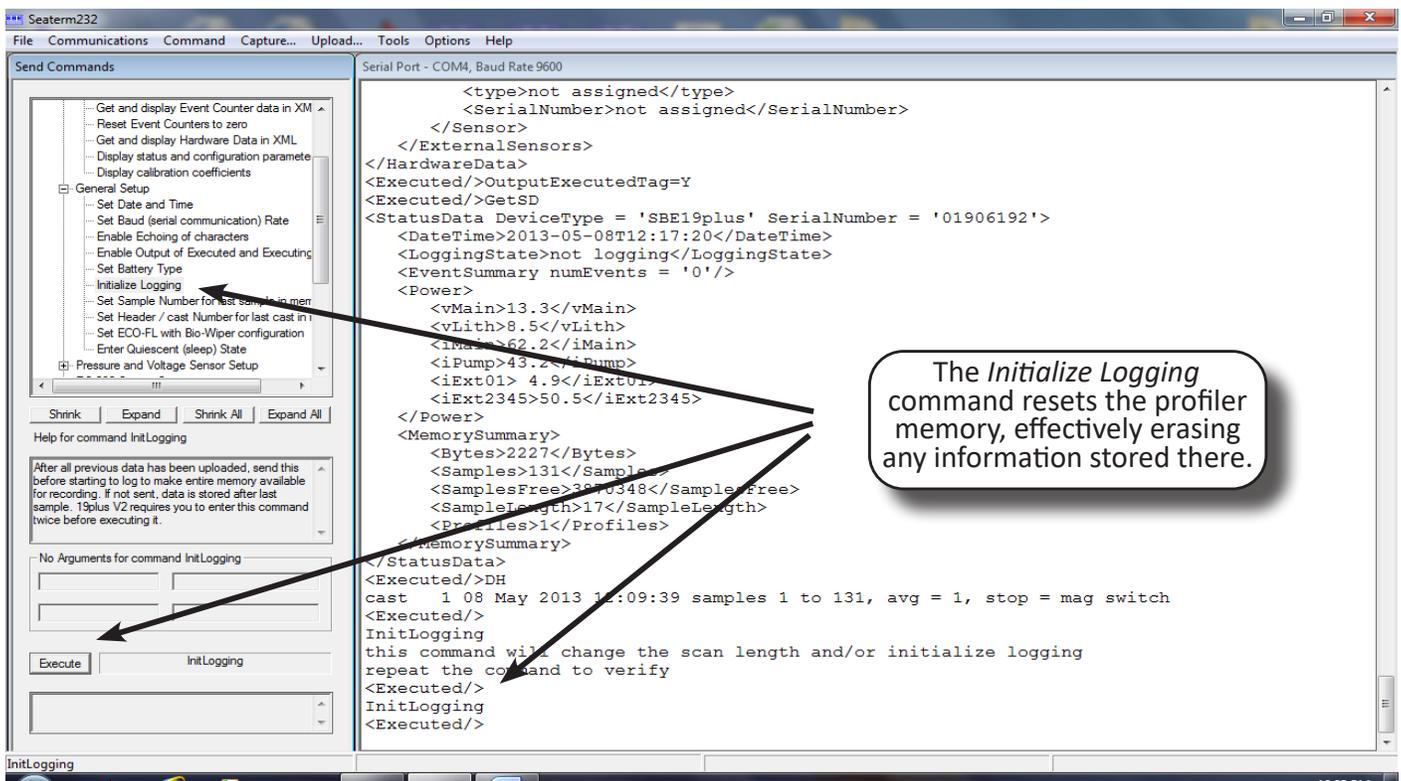


Figure 3.4 Executing the *Initialize Logging* command.



16. If Seaterm did not do it for you, at the <Executed/> prompt send the command *QS* to put the profiler to bed.
17. Under the *Communications* tab, select *Disconnect*.
18. Disconnect the cables, making sure to put the end cap securely back on the profiler cable.

3.6 *Quality control of the data*

You will be converting your profiles over to a readable format in order to double check your entered data and to make sure the profiler is operating as expected. The files that are uploaded from the profiler to the tablet are unreadable (hex and xml files) so you will have to convert them to something that you can interpret (cnv files).

1. Make sure the tablet is disconnected from the profiler.
2. Convert hex files to cnv files by doing the following:
 - a. Click on the *SBE Data Processing* icon on your desktop.
 - b. Choose Run/Data conversion.



Figure 3.5 Begin converting hex files to cnv files.

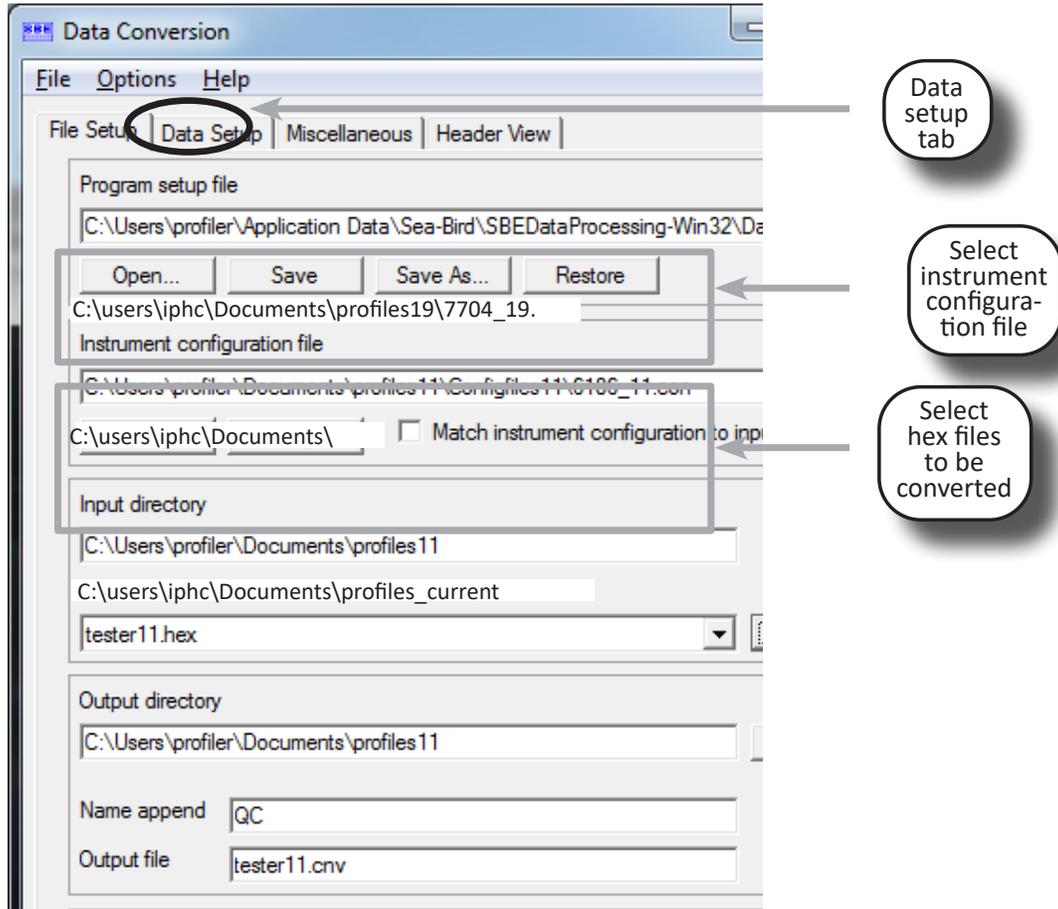


Figure 3.6 Data conversion

- c. In the Instrument configuration file box, make sure that the correct configuration file is selected. If needed, choose Select and browse for the correct .xmlcon (configuration) file.
- d. In the *Input directory* box, select all of the files you want to convert.
- e. Click on the Data Setup tab and make sure that “Downcast” is selected in the *Convert data from* box.



The screenshot shows the 'Data Conversion' application window. The 'Data Setup' tab is active. The 'Process scans to end of file' checkbox is checked. The 'Scans to skip over' field contains the value 0, and the 'Scans to process' field contains the value 1. The 'Output format' dropdown menu is set to 'ASCII output'. The 'Convert data from' dropdown menu is set to 'Downcast'. The 'Create file types' dropdown menu is set to 'Create converted data (.CNV) file only'. The 'Source of scan range data' dropdown menu is set to 'Scans marked with bottle confirm bit'. The 'Scan range offset [s]' field contains the value 0, and the 'Scan range duration [s]' field contains the value 2. The 'Merge separate header file' checkbox is unchecked. A 'Select Output Variables...' button is located at the bottom of the window.

Figure 3.7 Selecting *Downcast* data for conversion.

- f. When finished setting up the output, click on *Start Process* at the bottom. This instructs your program to convert the files over. Processing is completed when indicated as such under the *File Setup* tab near the bottom.
3. Check all profiles. These data will be used in the stock assessment spatial modeling and also made available to the public.
 - a. To take a look at each profile, double click on the first cnv file listed and it will open in Notepad.
 - b. You will notice that the first part is a lot of information that is necessary for programming, but you really do not need to pay attention to at this time. Scroll down until your screen looks more like [Figure 3.8](#), i.e. displays the data entered when uploaded:



```
KSU00452181B - Notepad
File Edit Format View Help
*
* </CalibrationCoefficients>
* <EventCounters DeviceType='SBE19plus' SerialNumber='01907704'>
*
*   <EventSummary numEvents='0' />
*
* </EventCounters></InstrumentState>
* <Headers>
*
* cast  4 30 May 2018 16:58:33 samples 3832 to 5034, avg = 1, stop = mag switch
*
* </Headers><UserHeaderInsert>
* <![CDATA[
** latitude: 544118
** longitude: 1604297
** setno: 884
** stno: 5219
** trpno: 86
** vsicde: KSU
** CSF bottom depth(m): 99
* ]]>
* </UserHeaderInsert>
# nquan = 7
# nvalues = 1283
# units = specified
# name 0 = prdM: Pressure, Strain Gauge [db]
# name 1 = tv298C: Temperature [ITS-90, deg C]
# name 2 = sal88: Salinity, Practical [PSU]
# name 3 = sbeox0ML/L: Oxygen, SBE 43 [ml/l]
# name 4 = ph: pH
# name 5 = f1ECO-AFL: Fluorescence, MET Labs ECO-AFL/FL [mg/m^3]
# name 6 = flag: 0.000e+00
# span 0 = -0.023, 86.324
```

The information that you input during upload is here.

Figure 3.8 Information inputs for data upload.

- c. Check to make sure the information contained inside the file matches the information included in the name of the file. Reminder: file name is three letter vessel code followed by 3-digit set number, followed by 4-digit station number, followed by two digit year.
 - d. Double check all of the information entered by hand. Do not try and change any information, but put any edits needed as a note below the CSF bottom depth(m):
4. Check the following information routinely in a minimum of 5-10 profiles per trip or more often if you suspect a sensor problem.
- a. Scroll down until you see columns of data. The columns are not labeled on the screen, but they are from left to right: pressure (depth), temperature, salinity, DO (dissolved oxygen), pH, chlorophyll, and descent rate (m/s) in that order. You can ignore the final column which is an error flag column.
 - b. Take a look at the values. Guideline values are listed in [Table 3.1](#). Your data may be slightly outside these ranges, but this will give you an idea of what you should be seeing. If your data is much different



than these ranges, or a sensor appears “stuck”, the sensor may be malfunctioning. Check several other casts to confirm, then notify the office.

Table 3.1. Seacat data value guidelines.

Min	Max	Normal	Notes
Pressure (depth in m)			
~0	~550	variable	Do not deploy the profiler at stations deeper than 550 m
Temperature (oC)			
~-2.0	~18	8-18 surface 0-7 at depth	warmer at surface, and colder below
Salinity			
~29	~34	31-33	Varies geographically and with fresh-water input (i.e. yields lower value)
DO (ml/L)			
0	8	3-6	DO <1.4 is hypoxia, can vary with depth
pH			
7.5	8.5	8.0	Higher at surface Lower at depth
chlorophyll (mg/m3)			
0	40	0-40	High values indicate high primary production. Slight negative values OK.
Descent rate (m/s)			
0	2.0	1.5	targeting 1-2 m/s

5. If you detect a problem of some kind that you can't explain through operator error (e.g. the magnetic switch didn't get pushed all the way on), then call or e-mail HQ at the first opportunity. Do a quick physical check of the unit itself so you can report any obviously broken or damaged pieces. Overall, we have found the profilers to be robust and they will continue to give accurate measurements if treated well. The most delicate piece of equipment seems to be the pH sensor. The probe is made of glass and impacts should be avoided.

4. CONCLUDING THE TRIP

1. Conductivity cell maintenance. Warm some of the weak bleach solution, the 1.0% Triton solution, and distilled water by placing the jugs inside (e.g. in the galley near the stove) about an hour before maintenance. Ideally, the solutions will be room temperature to warm. You must plan ahead on this, do not heat them on the stove.
2. Using the syringe assembly, flush the bleach solution gently through the conductivity cell several times. Allow the solution to sit in the tygon tubing for about two minutes, and flush with fresh distilled water several times.
3. Disconnect the oxygen sensor from the conductivity cell by gently disconnecting the tygon tubing between the two.



4. Agitate the 1.0% Triton solution through the cell several times using the syringe. Fill the tygon tubing with solution and let sit for 1 hour. Drain and flush with the warm (not hot) distilled water for 5 minutes. **Note** to reconnect the oxygen sensor tubing after flushing.
5. Replace the tygon tubing on the conductivity cell, fill with weak bleach solution, and loop the tubing.
6. Check the air bleed valve hole. Use the thin wire included in your kit to make sure the hole is clear of debris and build-up.
7. Check all bolts and connectors and tighten where necessary.
8. During or immediately after the first trip and once per month thereafter, you will perform a pH sensor field calibration.

5. GOALS AND OBJECTIVES OF THE PROFILER PROJECT

Pacific halibut are part of the larger eco-system which includes the environment in which they live. The IPHC currently uses a spatial model as one of the inputs to the stock assessment process and this model utilizes environmental covariates collected by the profilers. The broader picture is that the IPHC operates the largest annual survey platform in the North Pacific and the environmental data are important (and made readily available) to researchers worldwide. As global climate change continues, the IPHC oceanographic data will provide a look at how the ocean and its fish stocks are responding.

The technical goals of profiler deployment are fairly simple.

1. To deploy the profiler at each survey station according to protocol.
2. To retrieve the profiler and its accessories safely after each cast.
3. To keep the profiler in optimal condition throughout the season by maintaining strict maintenance procedures and adequately securing it between casts.
4. To upload the data from the profiler to the tablet once each day.
5. To deliver the data to FISS-HQ on a routine basis.

5.1 *How the profiler, floats, and anchor work together*

There are some things to consider when deploying a water column profiler. Although the instruments are somewhat protected by a metal cage, they are still vulnerable to impacts, and becoming attached to the bottom. Also, we don't want the profiler descending too rapidly through the water column because we might lose valuable information, or too slowly because it would eat up valuable survey time and possibly not sample water parcels correctly. A good goal is an average descent rate of about 1-2 m/s for most areas. Therefore, to provide optimal descent and minimal impact to the instruments, each profiler is equipped with a custom float system based on its weight, and an anchor and weak link assembly for the bottom to minimize risk of loss or damage ([Figure 1.1](#)).

The way it works is as follows. First, the float and carabineer system is attached to the top of the profiler and a sturdy line is attached to the other end of the float assembly or directly to the ring at the top of the profiler cage. This cable is the unit's permanent attachment to the vessel, and it's very important that this line stays secure and does not drift under the vessel where it can be severed. Second, without the pull of the anchor attached below, the floats will render the unit fully



buoyant. A 40-pound anchor or weight is attached to the bottom of the profiler via a weak link and about 15 m of buoy line. The line is tied off to the vessels, and the profiler, anchor, and float assembly are lowered into the water from the side of the vessel. The line is threaded into the gurdy and once the profiler is acclimated, it is pulled back to the surface, then the line is let go and the unit is allowed to freefall. With the anchor attached, the weight of the anchor and the profiler together are heavier than the floats are buoyant so it descends through the water column. When the anchor hits bottom first, the floats provide positive buoyancy and pull the profiler up and away from the bottom before it has a chance to impact. Up on the deck, the line goes slack when the floats kick in, so it's usually obvious when the profiler is on bottom. At that time, the unit is hauled back aboard. In the rare event that the anchor becomes attached to the bottom, the weak link allows for minimal gear loss by pulling the profiler and floats from the anchor, and safely retrieving them.

Hint If the weight/anchor you're using isn't heavy enough, add a sash weight.



Figure 5.1 Alternatives to anchors.

6. CALIBRATING THE pH SENSOR

Note this will be done on the first trip and once a month thereafter.

This section gives step by step instructions on how to perform a field calibration assessment on the pH sensor. Always refer to these instructions even if you have done this in the past.

You will need:

1. Buffer solutions – pH 7, pH 9.18, and pH 10.01
2. Thermometer
3. Distilled water in squirt bottle
4. Spare soaker bottle
5. Alligator clip and wire assembly, or coated wire
6. Phillips head screwdriver (in your regular survey box)
7. pH calibration form (on your desktop)
8. Tablet
9. Software program – Seasave V7

You will have to think ahead when calibrating the pH sensor. Do this tied to the dock or on a calm harbor day.

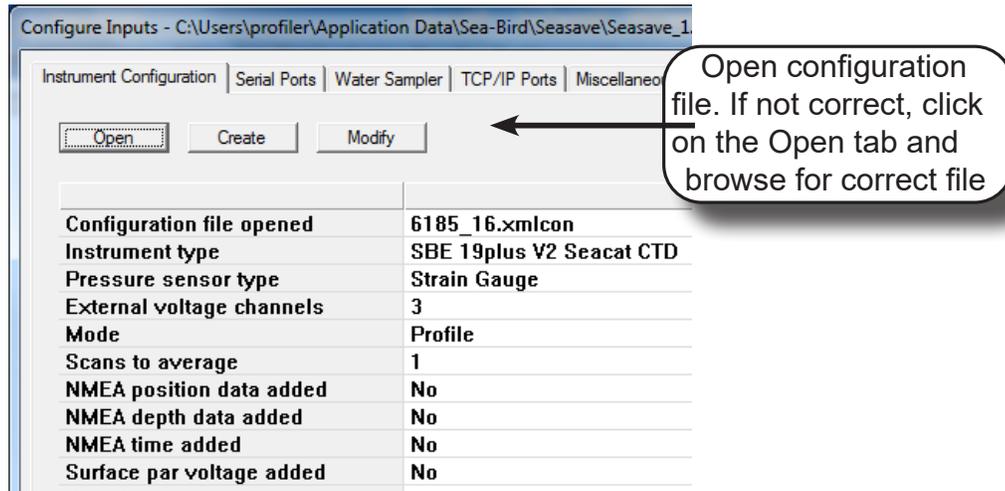


Figure 6.2 Opening the configuration file.

5. Check to make sure the configuration file that is open is the one for your profiler (top line).
6. The scrolled display and fixed display will be showing the same thing, just in slightly different ways: the pH field is the calculated pH from the instrument and voltage 1 is the voltage from which the pH is calculated. Fill the tygon tubing connected to the conductivity cell with a small amount of distilled water and loop the tubing over the top of the cell cage.
7. Squirt distilled water into the pump so that it does not run dry.
8. Detach the water-filled soaker bottle from the pH sensor, empty out the water, shake the bottle to get out droplets left inside the bottle, then fill it three quarters full with the buffer solution that you are testing and attach it to the sensor.
9. At the top of the pH sensor, back out one screw slightly so that you can attach the alligator clip or the looped end of the coated wire. Do not back the screw out too far. **Important: make sure that neither the clip nor wire touches another metal except the screw.**
10. Back at the computer screen click on *Real Time Data*, then *Start*. You will be prompted for a file name. Click *Output data file name* and name your file using the three letter vessel code followed by “pH”, the buffer name, and underscore followed by the calibration number. Click *Start*.

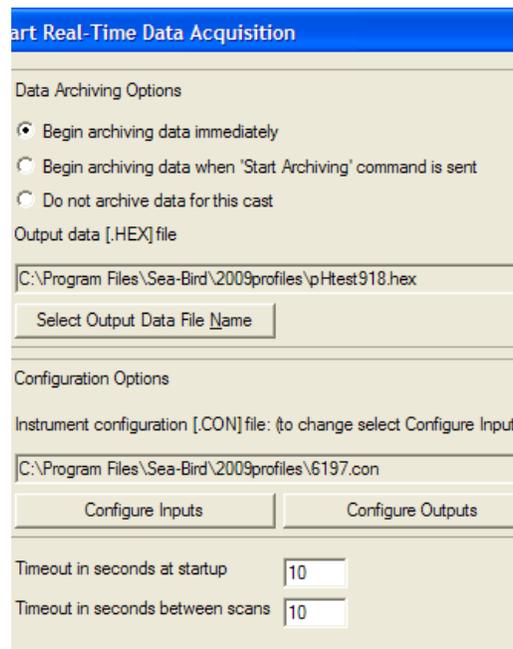


Figure 6.3 Start real-time data acquisition.

11. A second screen will come up asking for Header information. Fill out accordingly putting the date of the calibration in the notes field. Click OK.



Figure 6.4 Header information noting the date of the calibration.

12. Move the white magnetic switch to the “on” position.
13. Put the other end of the wire as a ground into the same buffer solution that is in the soaker bottle.
14. Wait one minute for stabilization (scan 240), switch off the profiler, then note the resulting pH and voltage from the computer display.
15. Rinse the electrode well with distilled water.
16. Repeat steps 8-15 with the other buffer solutions, rinsing the pH electrode and the soaker bottle with distilled water between measurements.
17. When you’re finished, rinse the electrode and place the pH 4 buffer solution bottle back on the pH electrode after rinsing. **Do not forget to re-tighten the screw at the top of the instrument and replace the protective cage.**