Washington State Department of Ecology

Environmental Assessment Program

Standard Operating Procedure for Field Service and Maintenance of Sea-Bird Electronics © (SBE) 16 and 16+ Marine Mooring Stations

Version 1.0

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Although Ecology follows the SOP in most instances, there may be instances in which Ecology uses an alternative methodology, procedure, or process.

SOP Revision History

Revision Date	Rev number	Summary of changes	Sections	Reviser(s)

Environmental Assessment Program

Standard Operating Procedure for Field Service and Maintenance of Sea-Bird Electronics © (SBE) 16 and 16+ Marine Mooring Stations

1.0 Purpose and Scope

1.1 This document is the Environmental Assessment Program (EAP) Marine Monitoring Unit Standard Operating Procedure (SOP) for servicing and maintaining its long term fixed, free-floating, and telemetered mooring conductivity, temperature and depth sensors (CTD's) in coastal and Puget Sound marine waters.

2.0 Applicability

2.1 This SOP should be followed for maintaining and servicing both fixed and free-floating CTD moorings utilized in marine monitoring. It includes the approved methods for sensor retrieval, data uploading, sensor servicing, package maintenance, and proper re-deployment. These sensor packages utilize various internal and attached sensors dependent upon application. The different sensor options we utilize include temperature, conductivity, pressure, dissolved oxygen, and fluorescence.

3.0 Definitions

3.1 Free-floating mooring: Any mooring consisting of a CTD unit that is designed to sample just below the water surface. Typical sensors consist of a conductivity cell, temperature gauge, and a flow through or optical type fluorometer. These units are housed by a protective stainless steel cage outfitted with floatation devices and mounted around a fiberglass I-beam to allow vertical movement with tidal variation (Fig.1).

Fig.1 Free-floating mooring

3.2 Fixed mooring: Any mooring consisting of a CTD unit that is attached to a weighted chain/line at a specific depth in the water column. The sensors sample for conductivity, temperature, and pressure with optional external sensors sampling dissolved oxygen and chlorophyll (Fig. 2).

Fig. 2 Fixed mooring

3.3 Telemetry: The process by which data is transmitted from a remote sensor to a data collection point via cabling and radio transmission in order to upload, record, and process the remote data. Fixed mooring telemetry is accomplished by cabling a fixed mooring to a radio transmitter, which then relays the data stream to a receiver attached to a computer. The computer then uploads the data stream to the appropriate URL for internet transmission. For free floating moorings to utilize telemetry the cable must be swapped with a serial port connector replacement. We choose to incorporate Bluetooth® type wireless connectors for cable replacement.

4.0 Personnel Qualifications/Responsibilities

4.1 This type of field servicing requires at least two technicians to safely perform.

4.2 Training in the use of Sea-bird equipment and software as well as experience with water sampling.

4.3 Training in safety procedures for working on floating structures and near/over open water and on boats as well as experience working with hazardous chemicals.

5.0 Equipment, Reagents, and Supplies

5.1 Approved life jackets and foul weather gear
5.2 Several sets of nitrile, leather, and neoprene gloves
5.3 Dedicated laptop computer equipped with Sea-bird (SBE) software
5.4 CTD communication cables (for 16 and/or 16+)
5.5 Dissolved oxygen and/or chlorophyll bottles and reagents
5.6 Cooler with ice
5.7 Niskin bottle able to sample to depth of mooring (varies dependent upon location)
5.8 D cell batteries for CTD (box of 12 per CTD)
5.9 Recovery line and hardware (station dependent)
5.10 Field Log Notebook with checklist and forms
5.11 Tool box with listed tools present (see checklist, appendix E, F)
5.12 Replacement anti-foulant inserts
5.13 Cleaning utensils (brushes, scrub-pads, bucket)
5.14 Cleaning agents for sensors **(**1:50 bleach solution, 10% Hydrochloric acid (HCl) sol'n, Triton-X detergent, Deionized (DI) water**)**
5.15 Zip-loc bags, Kim-Wipes, one 2L raw seawater bottle, and absorbent towels
5.16 Replacement parts for hardware (on checklist, appendix E, F)
5.17 Spare CTD package

6.0 Summary of Procedure

6.1 Trip Preparation

6.1.1 Make contact with the representative for each mooring station or group of moorings to coordinate appropriate scheduling (Appendix H)

6.1.2 Prepare before embarking a field/float plan, located on the Ecology Sharepoint site http://ecywblcyadxd0/sites/eap/Field%20Schedules/Forms/AllItems.aspx

6.1.3 Load vehicle according to each specific servicing checklist as different tools/hardware are required for maintenance of fixed –vs- free-floating equipment (Appendix E, F).

6.2 Servicing Free-Floating Mooring Stations

6.2.1 Each free-floating surface type mooring (CTD) is equipped with sensors that have been configured to sample temperature, conductivity, and fluorescence. These sensors are set to take a sample every fifteen minutes on the hour. Each floating surface mooring consists of a Sea-bird 16 or 16+ Sea-Cat with a peripheral SBE 5T pump and Wet Labs chlorophyll sensor incorporated.

6.2.2 Prior to arriving at mooring station: Prepare bow line to tie up to Nav-aid. Delegate a climber and rig up climbing apparatus to climber accordingly (Appendix I). Prepare boom vang rigging for package extraction, set up computer and appropriate cables, and prepare Niskin bottle for sampling.

Fig. 3 Securing a supplemental rigging

6.2.3 Once the boat is safely secured to the Nav-aid, have the climber ascend and attach the boom vang rigging to the anchor point for package recovery. If there is no locatable anchor point, use one of the climbers personal anchoring straps to attach an intermediate anchor point to facilitate the boom vang rigging (Fig. 3).

6.2.4 While climber is preparing to remove the package from the water, the technician on the boat should take a surface Niskin sample and collect three chlorophyll samples from it. Place the remaining collected seawater in the bottle labeled unfiltered sea water for sensor calibration. If you are servicing the last station of the day, keep the unfiltered seawater on ice and transport it back to the lab for filtering chlorophyll samples. All samples and seawater should be placed in the cooler. Return to the bow of the boat to assist climber.

6.2.5 After the climber is finished attaching the boom vang rigging to the anchor point pay out enough of its line to reach the package. Remove the plastic stopper block from the top of the I-beam. Attach the lower recovery carabineer on the boom vang rigging to the Willapa boat hook. Use the boat hook to attach the carabineer to the package through one of the package's cage rings located closest to the I-beam (Fig. 4 arrow).

Fig. 4 Carabineer setup and package extraction

6.2.6 The climber then needs to hand the line for the boom vang rigging to the remaining staff on the boat and have them haul the package off of the I-beam and on to the boat. Crew detaches boom vang rigging and climber then returns to the boat to assist with sensor cleaning and data upload (Fig. 4).

6.2.7 After cleaning the terminal area and plug on CTD unit, technicians must connect to the package via the 4 pin (16+) or 6 pin (16) comm. cable (Appendix A). Open the SBE terminal program "Seaterm" for windows and make sure the software is configured properly for the sensor you are connecting to (either the 16 or 16+). Refer to appendix for data acquisition and SBE software use (Appendix A). One of the technicians should clean the package while the other is downloading the data.

6.2.8 After downloading the data and clearing the memory from the CTD sensor you may begin field calibration of the fluorometer. If the sensor is a WetStar flow-through type fluorometer you need to remove the plumbing from both sides and replace them with tubing ends. Place a 500ml syringe on one end of the tubing (to act as a funnel/plunger). While one technician is doing this the other should replace the anti-fouls and zinc if needed (check log sheet).

6.2.9 Pull the plunger out of the syringe and fill with the collected seawater (do not replace the plunger!). Trickle the water slowly into the tubing until it fills the tubing and fluorometer then slowly rock the tubing back and forth to release any stuck bubbles.

6.2.10 Use the Seaterm software to take a voltage read of the instrument. This is done by typing VR ("voltage read" for the 16) or TV ("take voltage" for the 16+) then pressing enter. This will take a series of voltage measurements from the instrument. Record 12 continuous readings in the log sheet. Repeat this process using DI water.

6.2.11 If the sensor is a Wet Labs Ecometer type fluorometer you will need the pink fluorescent standard stick. Have a technician hold the pink stick in front of the lens of the meter which is located underneath the bio-wiper. Take care not to bump or interfere with the bio-wiper as this can alter the alignment of the wiper's copper shield. In Seaterm type the 'TV' command to run a voltage read and quickly hit escape as the wiper is closing. If you do not hit escape the sensor will continue to read when closed, resulting in a zero (or low) value reading. Take the four voltage values that are most similar (4.0854, 4.0880, etc) and record them.

6.2.12 (*For package swapping applications such as Willapa Bay)* - After calibration the conductivity cell and WetStar type fluorometers must have a tygon tube filled with DI water looped to them to keep them moist. Unplug the cable from the sensor, replace the dummy plug and transport back to the lab for cleaning and further maintenance (appendix J).

6.2.13 Plug the cable into the replacement package (if swapping) in the same manner as before and connect via Seaterm. Check the battery voltage and output format (if necessary) and take a fluorometer voltage read using DI water (as done in steps 6.2.8 - 6.2.10) and record the values. Repeat the procedure with seawater. Follow the Seaterm software deployment procedure discussed in appendix A, making sure to keep time in Greenwich mean-time (GMT). After initializing logging unplug the cable, lubricate the snap ring with silicone grease, replace the dummy plug and zip-tie the cables securely to the package housing.

6.2.14 (*If not package swapping)* - Technicians will need to clean sensors and package in the field. If using a Wet Star fluorometer: Sensor cleaning is done by soaking the fluorometer and conductivity cells with 10% HCl solution for 5-10 minutes. Repeat procedure with 1% Triton-X solution and thoroughly flush the sensors after cleaning with DI water. A simple non invasive rinse and wipe down with a DI water-soaked rag (or scrubbie if lightly done) is all that is necessary, making sure not to scratch the lens or bump the bio-wiper. Post-cleaning calibration must be done next, following the same steps in section 6.2.8 and 6.2.9 but using DI water first, then seawater. Record these values in log sheet to check for drift. Follow section 6.2.11 if the sensor is an Ecometer fluorometer.

6.2.15 If not swapping packages, one of the technicians will need to replace the batteries in the CTD. This is done by unscrewing the pressure cap located at the top of the CTD unit. This cap should be tight and difficult to remove. The aluminum bar can be used for added leverage. Upon opening, carefully unscrew the battery terminal screws and remove the top plate (Fig. 5).

Fig. 5 Top plate for CTD

Using the magnetic wand, remove the old batteries (paying attention to + and – orientation inside the package) and replace with new ones (Duracell Pro-Cell batteries are recommended). Carefully reattach the battery top plate taking care not to strip the threads. Inspect, clean, and replace or relubricate the O-rings in the package if

necessary. When rethreading the cap on the CTD, be sure to leave a thin gap (roughly the thickness of a fingernail) between the cap and the body of the CTD to avoid smashing the o-rings.

6.2.16 Follow the Seaterm software deployment procedure discussed in appendix A, making sure to keep time in GMT. After initializing logging unplug the cable, lubricate the snap ring with silicone grease, replace the dummy plug and zip-tie the cables securely to the package housing.

6.2.17 Send the climber back up the Nav-aid to reset the package. Using the boom vang rigging the remaining technician on the boat must haul in the line of the boom vang rigging in order to hoist the package up to the climber. The climber must then manipulate the package to fit back on the track of the I-beam, unclip the carabineer, and drop the package back to the water (Fig. 6). The climber must then reattach the plastic stopper block to the top of the I-beam and return to the boat.

Fig. 6 Redeploying serviced package

6.3 Servicing Fixed and Near-Bottom Moorings

6.3.1 Each near bottom and fixed type mooring is equipped with sensors that have been configured to sample temperature, conductivity, pressure, and dissolved oxygen. Some may be equipped with chlorophyll sensors if located near surface. These sensors are set to take a sample every fifteen minutes on the hour. Each near bottom mooring consists of a Sea-bird 16+ Sea-Cat with internal temperature, conductivity, and strain-gauge type pressure sensors as well as a peripheral Sea-bird SBE 43 dissolved oxygen sensor and

an SBE 5T pump. Fixed near-surface moorings consist of an SBE 16+ Sea-Cat with internal temperature, conductivity, and strain-gauge type pressure sensors with a Wet Labs Ecometer type fluorometer. Most of these moorings are telemetered, relaying each fifteen minute sample to a computer base station via broad spectrum radio. The data is then uploaded to the internet via Oregon Health Sciences University (OHSU) and Northwest Association of Networked Ocean Observing Systems (NANOOS) technicians.

6.3.2 Upon arriving at the mooring station you must check the time. A Niskin sample must be taken WHILE the package is sampling on the fifteen minute mark in order to compare values. No more than two minutes of grace time are allowed, otherwise the samples may not reflect the same conditions as the in situ sensor. If you must wait for the next fifteen minute mark, do so. Prepare the Niskin bottle for sampling near the sensor and get your sample bottles, salinity sample tag, log sheets, and get the YSI® sampler ready. After collecting the Niskin, take one salinity sample and other supplementary samples (DO, chlorophyll, nutrient) with replicates for each. If collecting DO samples, they must be taken first. See section 8.1 and seawater sampling SOP (Stutes and Bos, 2007) for details. Only one salinity sample (no replicates) is needed per package servicing.

6.3.3 Place the YSI® probe inside of the Niskin bottle and swirl the probe slightly to release any trapped air inside. Record sample readings after the values have stabilized and remain steady for at least fifteen seconds.

6.3.4 Set up the recovery davit over the mooring as shown (Fig. 7). While one technician is using davit to haul in the recovery line, the other technician should be neatly recovering the tethering chain, making sure not to strain or kink the I/O telemetry cable that is zip tied along it.

Fig. 7 Davit for mooring recovery

6.3.5 Once the mooring is on the dock/pier, one technician should clean off and disconnect the telemetry cable plug. Inspect and insert a dummy plug into the female end of the cable plug. Connect the CTD to the computer utilizing the four-pin cable for the SBE 16+ and using Seaterm software. Refer to appendix for data acquisition and SBE software use (Appendix B). Take a TV (voltage read) of the peripheral sensor after data is downloaded and record 12 consecutive values in log sheet. If the peripheral sensor is an Ecometer type fluorometer, follow steps discussed in section 6.2.11. The other technician should replace the anti-foulants and zinc if needed (check log sheet) and begin cleaning the instrument.

6.3.6 After downloading/checking the data and cleaning the instrument, the peripheral sensors can be cleaned. You will need to insert tubing ends into the pump inlet and conductivity cell outlet to allow for the sensors to soak. Place a 500ml syringe on one end of the tubing (to act as a funnel/plunger). Pull the plunger out of the syringe and fill with the 50:1 bleach solution try to eliminate as many bubbles as possible and allow solution to soak for 5-10 minutes. If the peripheral sensor is an Ecometer type fluorometer, a simple non invasive rinse and wipe down with a DI water-soaked rag (or scrubbie if lightly done) is all that is necessary, making sure not to scratch the lens or bump the bio-wiper.

6.3.7 Using Seaterm perform another TV (voltage read) and record twelve consecutive readings in the log sheet. The other technician may then begin changing the batteries in the CTD. This is done by unscrewing the pressure cap located at the top of the CT unit. This cap should be tight and somewhat difficult to remove. The aluminum bar can be used for added leverage (see servicing checklist for location). Upon opening, carefully unscrew the battery terminal screws and remove the top plate. (Fig. 4). Using a magnetic wand, remove the old batteries (paying attention to + and – orientation inside the package) and replace with new ones (Duracell Pro-Cell batteries are recommended). Carefully reattach the battery top plate taking care not to strip the threads. Inspect, clean, and replace or relubricate the O-rings in the package if necessary. When rethreading the cap on the CT, be sure to leave a thin gap (roughly the thickness of a fingernail) between the cap and the body of the CT to avoid smashing the o-rings.

6.3.8 Follow the Seaterm software deployment procedure for the SBE16+ discussed in appendix B, making sure to keep time in GMT and to prompt the CTD to STARTLATER. After initializing logging unplug the cable, lubricate the snap ring with silicone grease, replace the telemetry cable and zip-tie the cables securely to the mounting bracket.

6.3.9 Paying attention to the time, lower the package with the davit, and the chain by hand. Be careful not to allow the chain to drop lower than the package, as this could tangle and foul the sensors. After finishing, prepare the Niskin bottle and YSI for a post service sample. Collect this sample on the fifteen minute mark for comparison.

6.3.10 After collecting the Niskin, take the same samples as in the pre-servicing suite (DO, chlorophyll, nutrient, etc) with replicates for each. If collecting DO samples, they must be taken first due to sensitivity. Follow the previous steps for YSI® sampling in section 6.3.3.

6.3.11 Upon completion of servicing it is recommended to access the NANOOS pilot project site to verify that the sensor is operating normally. This can be done via the internet at http://www.ccalmr.ogi.edu/nanoos/ unless the specific package is not telemetered.

7.0 Records Management

7.1 For each site where fixed or telemetered moorings are stationed, the standardized field log sheets provided in appendix C and D should be used to record station information such as field conditions, location, serial numbers of equipment, and other relevant information are considered necessary. For salinity samples, a sample tag accompanies the bottle denoting location, time collected and sampling technician's initials. Upon returning to the Operations Center (OC) samples must be cataloged in the chain of custody forms, including date collected, sample numbers, expiration dates, and who collected/transferred/logged them. Log sheets are entered into the database by field staff after completion of field excursion.

7.2 For fixed South Sound moorings at: Y:\SEABIRD\Moorings\Servicing\(STATION01)

7.3 For free-floating Willapa Bay moorings at: Y:\SEABIRD\wb\WB Moorings\Servicing\Servicing Log sheets

7.4 Fluorometer field calibration data is entered into its own specific database at: :\SEABIRD\wb\WB Moorings\Servicing\Servicing Log sheets\Fluor Cal Field_Current Method.xls

8.0 Quality Assurance and Quality Control

8.1 Field quality Control for DO Samples

8.1.1 Collection of water from the Niskin bottle must be done soon after opening the Niskin, before any other samples have been drawn. This is necessary to minimize exchange of oxygen with the head space in the Niskin which typically results in contamination by atmospheric oxygen. Pre and post servicing Niskin samples should be taken to provide sample replicates and identify any possible drift in sensor performance.

8.1.2 Before the oxygen sample is drawn the spigot on the sampling bottle is opened while keeping the breather valve closed. If no water flows from the spigot it is unlikely that the bottle has leaked. If water does leak from the bottle it is likely that the Niskin has been contaminated with water from shallower depths. The sample therefore may be contaminated, and this should be noted on the cast sheet.

8.1.3 The oxygen samples are drawn into the individually numbered BOD bottles. It is imperative that the bottle and stopper are a matched pair. Two samples are drawn from each Niskin and the order of sampling is recorded.

8.1.4 When obtaining the water sample, great care is taken to avoid introducing air bubbles into the sample. A 30–50 cm length of Tygon tubing is connected to the Niskin bottle spout. The end of the tube is elevated before the spout is opened to prevent the trapping of bubbles in the tube. With the water flowing, the tube is placed in the bottom of the horizontally held BOD bottle in order to rinse the sides of the flask and the stopper. Rotate the bottle while rinsing to insure that all sides are rinsed thoroughly, draining the contents over the stopper to rinse it. The bottle is then turned upright and the side of the

bottle tapped to ensure that no air bubbles adhere to the bottle walls while filling. Four or five volumes of water are allowed to overflow from the bottle. The tube is then slowly withdrawn from the bottle while water is still flowing.

8.1.5 Immediately after obtaining the seawater sample, the following reagents are introduced into the filled BOD bottles via the tip of a pipette or automatic dispenser into the sample: 1 ml of manganese chloride ($MnCl_2$), followed by 1 ml of sodium iodide-sodium hydroxide (NaI-NaOH) solution.

8.1.6 The stopper is carefully placed in the bottle ensuring that no bubbles are trapped inside. The bottle is then vigorously shaken then stored upright in a cool, dark location until transferred to the DO refrigerator in the wet lab at the OC. The samples are stable at this stage. A field observation YSI sample is taken by inserting the YSI probe in the Niskin bottle after samples have been taken. This will give an on-site reference for comparison with Seasave data trends for the CTD sensors. Log the DO bottle numbers and time collected in the stations log sheet.

8.1.7 Upon returning from the field the samples must be re-shaken and the bottle necks water sealed with DI water. Sample bottles are wrapped in foil, labeled by sample site, date, and the technician's initials that collected them. Technicians must fill out the chain of custody sheet located in the wet lab before samples can be transferred to the refrigerator. Samples are then ready to be analyzed after a period of at least 6-8 hours. Samples will expire if not run within 4-5 days of collection/refrigeration. See the SOP for Seawater Dissolved Oxygen Analysis for details (Stutes and Bos, 2007).

8.2 Field Quality Control for Salinity Sample Collection

8.2.1 Only one salinity sample is needed per station. This sample is usually collected from the first Niskin bottle after the DO or chlorophyll samples are collected.

8.2.2 Rinse the salinity bottle three times with sample water to thoroughly remove any residual salts then fill the bottle to the shoulder with sample water. After collecting the sample it needs to be tagged, labeled, and cataloged in the log sheet. Stickers for the tags are located in the field log book.

8.2.3 Upon returning from the field the salinity sample must be placed in the storage locker box. The chain of custody sheet must be filled out for each sample. Samples will then be shipped to the University of Washington for analysis.

8.3 Field Quality Control for Chlorophyll Sample Collection

8.3.1 Three chlorophyll replicates must be taken before and after servicing for lab analysis. Rinse each bottle three times before collecting sample to remove any debris that may be present.

8.3.2 Carefully hold the sample bottle close to the spout of the Niskin bottle at an approximate angle of 45° when filling, allowing the water to flow down the inside wall of the bottle. This reduces the amount of damage to the cells present in the sample giving a more accurate chlorophyll count. Upon filling the sample bottle make sure that a positive water meniscus is present in the opening. Cap the sample and put it in the cooler for transfer to the lab. Do not freeze samples until filtered and processed at the lab. Samples have a freezer shelf life (after being filtered) of approximately 30 days. See the SOP for chlorophyll a analysis for details (Stutes and Bos, 2007).

8.4 Data Entry and Log Sheet Quality Control

8.4.1 Each log sheet that is entered into the database by one of the field staff is rechecked for errors by other staff after entry. Date and technician who entered the data is written on the log sheet for reference after entry. Log sheets are currently stored with the moorings coordinator at their desk.

9.0 Safety

9.1 All field staff must understand and comply with the Environmental Assessment Program (EAP) Safety Manual (2006) with extra emphasis on fall protection, working over water, chemical safety, and chapter 3 of the EAP safety manual 'Boating'. Proper use of protective barriers (e.g. latex gloves, leather gloves, etc.) is mandatory for field staff.

9.2 Knowledge of MSDS chemical information, storage, disposal, and safety precautions relating to the chemicals ($MnCl_2$, NaI-NaOH, HCl, Triton-X, and Bleach solution) is mandatory.

10.0 References

10.1 Environmental Assessment Program, 2006. Environmental Assessment Program Safety Manual. March 2006. Washington State Department of Ecology. Olympia, WA.

10.2 Sea-Bird Application Note No. 83, 2007. Deployment of Moored Instruments www.seabird.com/application_notes/AN83.htm

10.3 Sea-Bird Application Note No. 2D, 2006. Instructions for Care and Cleaning of Conductivity Cells. www.seabird.com/application_notes/AN02d.htm

10.4 Sea-Bird Application Note No. 64, 2007. SBE 43 Dissolved Oxygen Sensor -- Background Information, Deployment Recommendations, and Cleaning and Storage www.seabird.com/application_notes/AN64.htm

10.5 Stutes, A. and J. Bos, 2007. Standard Operating Procedure (SOP) for Seawater Sampling. Washington State Department of Ecology, Olympia, WA. www.ecy.wa.gov/programs/eap/qa/docs/ECY_EAP_SOP_SeawaterSampling_v_1_0.pdf

10.6 Stutes, A. and J. Bos, 2007. Standard Operating Procedure (SOP) for Seawater Dissolved Oxygen Analysis. Washington State Department of Ecology, Olympia, WA. www.ecy.wa.gov/programs/eap/qa/docs/ECY_EAP_SOP_DissolvedOxygenAnalysis.pdf

10.7 Stutes, A. and J. Bos, 2007. Standard Operating Procedure (SOP) for Chlorophyll *a* Analysis. Washington State Department of Ecology, Olympia, WA. www.ecy.wa.gov/programs/eap/qa/docs/ECY_EAP_SOP_ChlorophyllAnalysis_v_1_0.pdf

Appendix A

Technical Note for Willapa Mooring Service

Technical Note for Servicing SBE16/+ Moorings in Willapa Bay

(Revised January 2006)

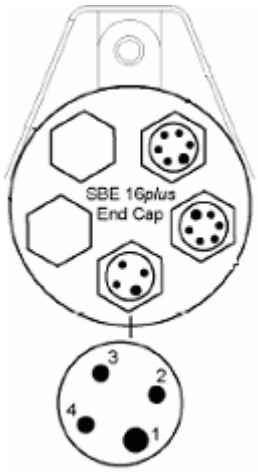
Each mooring has a sensor for temperature, conductivity, and fluorescence and takes measurements every 15 minutes on the hour (12:00, 12:15, 12:30, etc). We take calibration samples for chlorophyll. For servicing, you'll need a computer, both a 6-pin communication cable AND a 4-pin communication cable, chlorophyll sample bottles, Niskin bottle, cleaning tools, rigging, etc. (see packing list Y:\SEABIRD\wb\Checklists\ Supply List for Mooring Servicing.doc). **CTD IS SET TO UTC.**

1. Prior to arriving at the mooring:
   - Prepare bow line to tie up to piling. Prepare boom vang rigging, don climbing gear (check that harness buckles are doubled-back and locking-biner is in the locked position), and set-up computer.

2. Once boat is secured to piling:
   - Secure boom vang upper block to webbing loop on piling
   - Use "mooring-biner" and boat hook to attach lower block to CTD cage
   - Remove top guard from I-beam track
   - Bring CTD on board and detach boom vang from it

3. Once mooring is on deck:
   - Remove anti-fouls (place in ziplock bag). Clean off terminal area and plug in communication cable (use 4-pin comm cable for SBE 16+, and 6-pin comm cable for SBE 16; see diagram below)

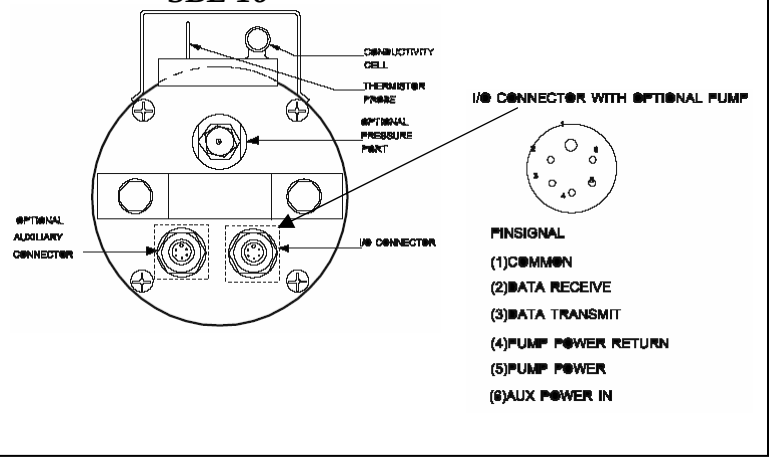
SBE 16+



Data I/O Connector

Pin	Signal
1	Common
2	Data receive
3	Data transmit
4	Auxiliary power in

SBE 16



4. CTD communication:
   - Open the SBE terminal program, "Seaterm" (for Windows) and make sure the software is configured properly for either the SBE 16+ or 16:
     - Click the "Configure" drop down list and select the appropriate instrument.
     - Configurations should appear as follows:
       - For SBE 16+; **COM1**, **9600** baud, **8** data bits, parity = **none**, **RS-232 serial**, upload baud rate = **9600**, **upload as single file**, and **prompt for header information** (see next section).
       - For SBE 16; **COM1**, **600** baud, **7** data bits, parity = **even**, **RS-232 serial**, upload baud rate = **9600**, **upload as single file**, and **prompt for header information** (see next section).
         - Header information is as follows:
           1. Station
           2. CTD serial #
           3. Upload time (UTC)
           4. Notes
   - Click the "Connect" button to open communications with the CTD.
   - Click the "Display Status" button to verify operation and logging status.
   - CTD settings should appear as follows in **bold**:

SBE 16+

SeacatPlus V 1.4a SERIAL NO. 4238 26 Jan 2006 21:40:47
* vbatt = 14.0, vlith = 8.4, ioper = 51.0 ma, ipump = 309.8 ma,
* iext01 = 0.5 ma,
* status = logging
* **sample interval = 900 seconds, number of measurements per sample = 4**
* samples = 2247, free = 696803
* **mode = moored, run pump during sample, delay before sampling = 10.0 seconds**
* **transmit real-time = no**
* **battery type = ALKALINE**, battery cutoff = 7.5 volts
* **pressure sensor = none**
* **SBE 38 = no, Gas Tension Device = no**
*** Ext Volt 0 = yes, Ext Volt 1 = no, Ext Volt 2 = no, Ext Volt 3 = no**
*** echo commands = yes**
*** output format = raw HEX**

SBE 16

SEACAT V4.1a SERIAL NO. 2210 01/19/06 03:10:55.555
* clk = 32767.266, iop = 139, vmain = 11.5, vlith = 5.2
* **sample interval = 900 sec**
*** delay before measuring volts = 10 seconds**
* samples = 3492, free = 170388, lwait = 0 msec
* SW1 = C9H, battery cutoff = 7.3 volts
* **no. of volts sampled = 1**
* **mode = normal**
* logdata = YES

   - Type **QL** and press **Enter** to quit logging, and immediately type **DS** or click "Display Status" button to verify instrument is no longer logging.
   - Upload data by clicking the "Upload" button and select location to save file.

    - Name file SSSSSyymmdd.hex; where "SSSSS" represents the 5-digit station identifier, followed by the 6-digit year-month-day. For example, Bay Center (WPA13) CTD data uploaded 9 March 2006 would be WPA13060309.hex.
    - Save file to D:\Seabird\Moorings\XXX (where XXX is the station folder)
- View data with Seasave program.
    - Click the "Configure" drop down menu and select "New Style Instrument Configuration," then "Select Instrument Configuration" and choose corresponding .con file for CTD serial number.
    - Click the "ScreenDisplay" drop down menu and select "Add New Display Window," then "Overlay Display." Choose appropriate .dso file.
    - Click the "ArchivedData" drop down menu and select "Start." Select .hex file and corresponding .con file, then click "Start Display."
        - Tip: press **Alt** + **F** to speed up the plotting
    - If data is corrupted and/or instrument does not respond, secure mooring and bring in for analysis at SBE.

5. Fluorometer field calibration (pre-cleaning).
    - Take Niskin grab and fill 4 chlorophyll bottles and a clean Nalgene bottle with seawater.
    - Remove plumbing around fluorometer and replace with tubing ends (with syringe on one end) to form "U"-shaped tube around fluorometer.
    - Fill syringe with seawater from Nalgene bottle, and "rock" tubing until all bubbles have escaped tubing – DO NOT PUSH WATER THROUGH – we want an accurate final deployment reading with all the fouling included.
    - Using Seaterm, type **TV** (for SBE 16+) or **VR** (for SBE 16) to measure fluorescence
        - **TV** will output converted data for all 4 voltage channels.
        - **VR** will output raw data for all 4 voltage channels.
            - Copy 12 continuous readings to log sheet (Y:\SEABIRD\wb\WB Moorings\Servicing\Servicing Log sheets\WetStarLog.xls)
    - Repeat process with DI water.
    - Remove com cable and replace dummy plug.
6. Clean mooring.
    - Pressure wash the mooring
        - Be careful around the conductivity cell, cable heads, and plumbing.
    - Remove plumbing (including "Y" valve) and conductivity cell guard and scrub any biofouling with green pads and bottle brush.
    - Replace any severely corroded hose clamps.
    - Replace severely corroded zincs.
    - Replace anti-fouls every other service (2-3 months).
    - Check cables for wear and tear.

7. Cleaning conductivity and fluorometer cells.
    - Loosely replumb conductivity cell and fluorometer, and place tubing on either end (with syringe on one end) to form "U"-shaped tube.
    - Fill syringe with dilute bleach solution (50:1 DI water : household bleach) and soak conductivity cell and fluorometer cell for 2 minutes.
        - Flush with water.
    - Repeat procedure with dilute Triton-X solution (1-2%).

8. Fluorometer field calibration (post-cleaning).
   - Take Niskin grab and fill 4 chlorophyll bottles and clean Nalgene bottle with seawater.
   - Connect com cable to CTD.
   - Remove plumbing around fluorometer and replace with tubing ends (with syringe on one end) to form "U"-shaped tube around fluorometer.
   - Fill syringe with DI water, and "rock" tubing until all bubbles have escaped tubing.
   - Using Seaterm, type **TV** (for SBE 16+) or **VR** (for SBE 16) to measure fluorescence
     - **TV** will output converted data for all 4 voltage channels.
     - **VR** will output raw data for all 4 voltage channels.
   - Repeat process with seawater.

9. Redeployment.
   - **KEEP AN EYE ON THE TIME!** – especially regarding the SBE 16, which must be given the command to start logging **ON THE 15 MINUTE MARK**. The SBE 16+ can accept a delayed start time, so it is not as critical.
   - **VERIFY CTD IS SET TO UTC.**
   - Using Seaterm, connect to instrument as before and note the new vmain (via **DS** or Display Status button).
   - Type **IL** to "initialize logging," which clears the memory and prepares the instrument to start logging.
   - To have instrument begin logging;
     - For SBE 16+ type **STARTMMDDYY=mmddyy** (for example, STARTMMDDYY=030906), immediately followed by **STARTHHMMSS=hhmmss**, followed by **STARTLATER**
     - For SBE 16 type **GL** to "go logging," which tells the instrument to begin logging in exactly 15 minutes – so you MUST tell it to go logging ON THE 15 MINUTE MARK!
     - Once the command is given hit enter a couple time to regain the S>, then immediately check the status to verify reception of commands.
   - Remove com cable.
   - Lubricate area with silicone grease.
   - Replace dummy plug.
   - Secure cables and plumbing with zip-ties.
   - Splash-down!
   - Don't forget to replace the track guard and retrieve rigging.

Appendix B

Technical Note for South Sound Mooring Service

Technical Note for Servicing SBE16+ Telemetry Moorings in Puget Sound

(Created October 2006)

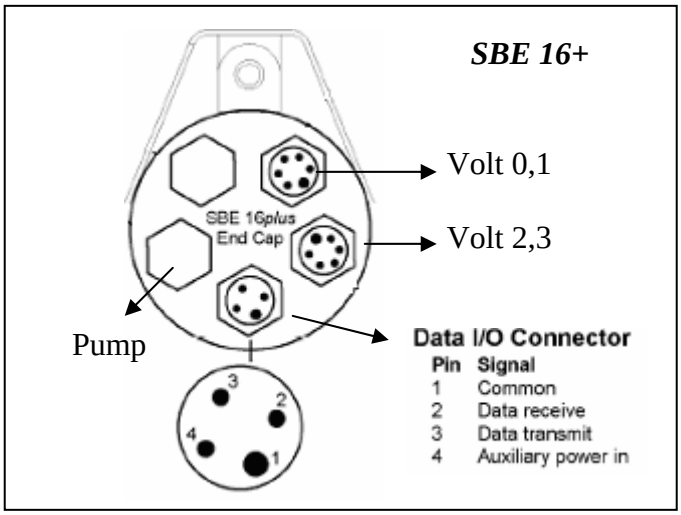
This note describes the servicing protocol for moorings set up for telemetry and deployed near the bottom of the seabed. These packages have sensors for temperature, conductivity, pressure and dissolved oxygen and take measurements every 15 minutes on the hour (12:00, 12:15, 12:30, etc), and relay each measurement to a computer base station via broad spectrum radio.

For servicing, you'll need a laptop, a 4-pin communication cable, DO sample flasks, Niskin bottle, cleaning tools, batteries, etc. (see packing list Y:\SEABIRD\Moorings \Checklists\ Supply List for Telemetry Mooring Servicing.doc). **CTD IS SET TO UTC/GMT.**

3. Cast a hand Niskin bottle near the bottom.
   - Collect a DO sample and other supplementary samples (salinity, nutrients) for each cast.
   - Cast should be as close to the mooring as possible, and triggered at a 15-min sampling interval.

4. Recover mooring by hauling up chain/line, with a pause at the surface.
   - Be careful not to pull on the data I/O telemetry cable. This black electrical cable can potentially be damaged by stress or load on the line.
   - Secure mooring near the surface and cast a hand Niskin bottle as close as possible at a 15-min interval for a pre-cleaning DO calibration sample.

4. Once mooring is on the dock:
   - Remove anti-fouls (place in ziplock bag). Clean off terminal area and plug in communication cable (use 4-pin com cable for SBE 16+; see diagram below)



5. CTD communication via direct connection to laptop:
   - Open the SBE terminal program, "Seaterm" (for Windows) and make sure the software is configured properly for the SBE 16+:
     - Click the "Configure" drop down list and select the appropriate instrument.

- Configurations should appear as follows:
  - For SBE 16+; **COM1**, **9600** baud, **8** data bits, parity = **none**, **RS-232 serial**, upload baud rate = **9600**, **upload as single file**, and **prompt for header information** (see next section).
    - Header information is as follows:
      10. Station
      11. CTD serial #
      12. Upload time (UTC)
      13. Notes

- Click the "Connect" button to open communications with the CTD.
- Click the "Display Status" button to verify operation and logging status.
- CTD settings should appear as follows in **bold**:
  SBE 16+

SBE 16plus V 1.6g SERIAL NO. 4826 13 Oct 2006 17:22:27
* vbatt = 12.8, vlith = 8.5, ioper = 60.8 ma, ipump = 126.5 ma,
* iext01 = 0.2 ma,
* status = logging
* **sample interval = 900 seconds, number of measurements per sample = 4**
* samples = 2247, free = 696803
* **mode = moored, run pump during sample, delay before sampling = 20.0 seconds**
* **transmit real-time = yes**
* **battery type = ALKALINE**, battery cutoff = 7.5 volts
* **pressure sensor = strain gauge, range = 508.0**
* **SBE 38 = no, SBE 50 = no, Gas Tension Device = no**
***** Ext Volt 0 = yes, Ext Volt 1 = no, Ext Volt 2 = no, Ext Volt 3 = no
*** echo commands = yes**
*** output format = converted decimal**
*** output salinity = yes, output sound velocity = no**
*** serial sync mode disabled**
*** append UCSD sigma-t, V, I**

- Type **STOP** and press **Enter** to quit logging, and immediately type **DS** or click "Display Status" button to verify instrument is no longer logging.
- Upload data by clicking the "Upload" button and select location to save file. NOTE: data is automatically converted to output raw hexadecimal (OUTPUTFORMAT=0).
  - Name file SSSSSyymmdd.hex; where "SSSSS" represents the 5-digit station identifier, followed by the 6-digit year-month-day. For example, Budd Inlet (BUD01) CTD data uploaded 9 March 2006 would be BUD01060309.hex.
  - Save file to D:\Seabird\Moorings\XXX (where XXX is the station folder)
- *After data upload, change back to converted data format for telemetry by entering **OUTPUTFORMAT=3,** and verify settings are back to originals above by typing **DS**
- View data with Seasave program.
  - Click the "Configure" drop down menu and select "New Style Instrument Configuration," then "Select Instrument Configuration" and choose corresponding .con file for CTD serial number.
  - Click the "ScreenDisplay" drop down menu and select "Add New Display Window," then "Overlay Display." Choose appropriate .dso file.

- Click the "ArchivedData" drop down menu and select "Start." Select .hex file and corresponding .con file, then click "Start Display."
    - Tip: press **Alt** + **F** to speed up the plotting
- If data is corrupted and/or instrument does not respond, secure mooring and bring in for analysis at SBE.

14. Oxygen sensor voltage (pre-cleaning).
    - Drain fluid from DO sensor chamber.
    - Using Seaterm, type **TV** to take continuous voltage readings in air, and record.

15. Clean mooring.
    - Scrub the mooring
        - Be careful around the conductivity cell, cable heads, and plumbing.
    - Remove plumbing (including "Y" valve) and conductivity cell guard and scrub any biofouling with green pads and bottle brush.
    - Replace any severely corroded hose clamps.
    - Replace severely corroded zincs.
    - Replace anti-fouls every other service (2-3 months).
    - Check cables for wear and tear.

16. Cleaning conductivity cell and DO sensor.
    - Loosely re-plumb conductivity and DO cells, and place tubing on either end (with syringe on one end) to form "U"-shaped tube.
    - Fill syringe with dilute bleach solution (50:1 DI water : household bleach) and soak conductivity cell and DO chamber for 5 minutes.
        - Flush thoroughly with deionized water.
    - Repeat procedure with dilute Triton-X solution (1%).

17. Oxygen sensor voltage (post-cleaning).
    - Drain fluid from DO sensor chamber.
    - Using Seaterm, type **TV** to take continuous voltage readings in air, and record.

18. Redeployment.
    - **KEEP AN EYE ON THE TIME!** – Make sure to give the command to start logging **ON THE 15 MINUTE MARK**.
    - **VERIFY CTD IS SET TO UTC.**
    - Using Seaterm, connect to instrument as before and note the new vmain (via **DS** or Display Status button).
    - Type **INITLOGGING** to "initialize logging," which clears the memory and prepares the instrument to start logging.
    - To have instrument begin logging;
        - For SBE 16+ type **STARTMMDDYY=mmddyy** (for example, STARTMMDDYY=030906), immediately followed by **STARTHHMMSS=hhmmss**, followed by **STARTLATER**
        - Once the command is given hit enter a couple time to regain the S> prompt, then immediately check the status (**DS**) to verify reception of commands.

- Remove com cable, lubricate area with silicone grease, and replace telemetry I/O cable.
- Secure cables and plumbing with zip-ties.
- Splash-down!
- Don’t forget to replace the chain and secure and lock to bracket.

10. Secure mooring package near the surface.
    - Cast a surface hand Niskin bottle as close as possible to the mooring at a 15-min interval for a post-cleaning DO calibration sample.

11. Lower mooring package to the bottom. Anchor should firmly be on the bottom.
    - Cast a near-bottom hand Niskin bottle as close as possible to the mooring at a 15-min interval for a post-cleaning DO calibration sample.

Appendix C

Example Free-Floating Mooring Field Log Sheet

Survey:	Date:	Tide:	Weather:	Operators:

Station	Calibration Samples			Instrument Servicing			
	Sample Time (Local)	Chl. A # Tube A #	Chl. B # Tube B #				
WPA004 MT001	Pre-service			File Name		SN # Retrieved	
						SN # Deployed	
				QL Time (Local)		WetStar SN#	
				QL Time (UTC)			
TokePt	Post-service			VMain		New batteries?	
						New VMain	
				# Samples		Memory Cleared?	
				# Free		GL Time (Local)	
						GL Time (UTC)	
	Comments:					CTD Sample Start (UTC)	
	Data:						
	Antifouls:						
Date_____	**Zinc:**						

Appendix D

Fixed Mooring Field Log Sheet Example

Mooring Log Sheet

Station ID:		
Deployment #	Date:	Technicians:
Tide:	Weather:	

CTD serial # (retrieved)		ql time (*local*)		vmain		# of samples	
		ql time (*GMT*)		# of free			
				file name			

CTD serial # (deployed)		CTD sample start (*GMT*)		cleared memory?		New antifouls?	
				new vmain		New zinc?	

Additional sensors:	type		serial #	
	type		serial #	

Discrete Samples

Pre-service			**DO**	**Chlorophyll**		**Nutrient**	**Salinity**
	Depth	Time	Bottle#	Bottle#	Tube#	Bottle#	Bottle#

Post-service			**DO**	**Chlorophyll**		**Nutrient**	**Salinity**
	Depth	Time	Bottle#	Bottle#	Tube#	Bottle#	Bottle#

Comments:

DO Voltage Readings

Pre-service		Post-service	

Appendix E

Packing List for Willapa Bay Moorings

Willapa Bay Checklist

Office & Electronics

- O Laptop Computer (w/ power cord)
- O Blanks Disks (pre-formatted) x3
- O Metal Clipboard
- O Float Plan x3 (Section Secretary, Contact, Field)
- O Sample Logs
- O Tide Table
- O Cell Phone (w/ charger)
- O Digital Camera
- O MSDS

OC Field Supplies

- O Batteries x 36 (9 per mooring)
- O Chlorophyll Filtration Rack
- O Life Jackets
- O Fuel Can
- O Pressure Washer
- O Goggles and ear protection
- O Niskin Bottle, w/ line and messenger
- O Buckets
- O Crate w/ Lines
  - o Pin & Shackle
  - o Pulley
  - o Lines
  - o Carabineers on Loops
  - o Hip Pack
  - o Helmet
  - o Harness
  - o Boom vang
  - o Mooring hook biners (2)
- O Boat hook
- O Beige Rubbermaid Action Packer, Large
- O "Chlorophyll Cooler"
  - o contains * items from wet lab
- O Blue Rubbermaid Tote, small
- O Tool Box
- O White "New Licor" box, small

From Wet Lab

- O DiW
- O Bleach solution (1:50)
- O Triton-X (1%)
- O 10% HCl
- O Chlorophyll Sample Bottles (x24) in box
- O Test Tubes and Caps (x45-50)
- O Test Tube Rack
- O Vacuum Pump
- O MgCO3 supersaturated solution in squirt bottle
- O Filtered Seawater (FSW) Squirt Bottle
- O 1-L or larger bottle for collection of seawater
- O 1-L Filter Flask, Plastic & Magnetic Filter Funnel
- O Acetone (90%) 4-L w/ 10-ml dispenser
- O *GF/F Filters (large, 1 box and small, 2 boxes)
- O *Forceps
- O *Aluminum Foil
- O *Plastic Bags
- O *Label, Electrical and Duct Tape
- O *Sharpies, Pencils and Pens
- O *Connectors
- O *Bottle Brushes & Paper Clip (straightened)
- O *Scissors
- O *Parafilm
- O *Diapers
- O Nitrile Gloves, Med and Large
- O *Extra Plastic Beaker
- O *Kimwipes
- O *Vacu-Shield (x3)
- O *Tubing for filtering with stopper top for F.F.
- O Large Glass 4-L Filter Flask

Chain of Custody Room

- O Cooler with Ice

o

Items packed morning of departure

Contents of Bins

Large Beige Action Packer

Hose Clamps
Electrical Tape
Duct Tape
Zip-Ties, various sizes
Y-Valves, New
Spare Parts to Fix Y-Valves
Gloves, Nitrile
Anti-fouls Box
Sandwich Box with Allen Wrench
Kimwipes
Misc Hardware (screws, nuts, washers, insulators, Teflon tape)
Plastic Beaker
DI Water (1 L)
10% HCl (1 L)
Seawater bottle (1 L)
Small Blue Box labeled "Big Tubing"
Scrapers
HCl Syringe & Tubing
Brushes
Heat Shrink Tubing
Fluid Film Rust Preventer
Teflon and Wooden Blocks

Blue Rubbermaid Bin

Batteries
Kimwipes
I/O Cable x2
Gloves, Nitrile
Telescoping Magnetic Battery Remover
Bag of Pens and Label Tape
Dummy Plugs
Spare SBE16 PC cable
SBE16 Manual & Calibration/Configuration Manual
WetStar Flourometer, User's Manual
Triton-X 50-mL
Hose Bars Adaptors
Spare O-ring and hardware kit
Dummy Plugs
Battery End Cap, w/ screws, washers, o-rings

Toolbox

Screwdrivers

- Large flathead
- Small flathead
- Large Philips (just in case)
- Stubby Philips (for CTD battery cap)

Pliers

- Large diagonal cutters (for large zip-ties)
- Small diagonal cutters (for small zip-ties)
- Needle nose
- Locking

Wrenches

- Adjustable
- Ratchet w/ drivers (various)
- Combo wrenches (various)
- Allen wrenches (for zincs, plus various)

Nut drivers (various, 7 mm for heavy duty hose clamps)
Hammer
Electrical tape
Magnetic battery wand (clipped under tool box lid)
Knife
Zinc Anodes
Extra Nuts and Bolts

Appendix F

Packing List for South Sound Moorings

Telemetry Mooring Servicing Checklist

Office & Electronics

- O Laptop Computer (w/ power cord)
- O USB Key
- O White binder and mooring keys
- O File Field Plan
- O Sample Logs
- O Tide Table
- O Cell Phone (w/ charger)
- O Digital Camera
- O MSDS
- O Freeware Radio Manual
- O SBE16+ Manual

OC Field Supplies

- O Batteries (9 per mooring)
- O Niskin Bottle, w/ long line and messenger
- O Buckets w/ Lines
- O Boat hook
- O Beige Rubbermaid Action Packer, Large
- O Blue Rubbermaid Tote, small
- O Tool Box
- O Extra mooring rope and shackles

Radio Telemetry

- O Monitor
- O Keyboard and mouse
- O Power and Ethernet cables
- O Spare radio receiver
- O Spare antenna and cable

From Wet Lab

- O Red Sample Tote
- O Nutrient sample bottles
- O Salinity bottles
- O DO bottle box w/ 10 DO bottles
- O Nutrient filters and syringes
- O DO sampling tubes, chemicals, pipetters, etc.
- O Extra ziplocks, absorbent towels
- O *Label, Electrical and Duct Tape
- O *Sharpies, Pencils and Pens
- O Nitrile Gloves, Med and Large
- O *Kimwipes
- O Syringe for CTD w/tubing
- O Beakers for waste

Fill Bottles…

- O 1% Triton-X sol'n
- O Deionized water
- O 2% Bleach

Chain of Custody Room

- O Cooler with Ice

Items packed morning of departure

Contents of Bins

Large Beige Action Packer

Hose Clamps
Electrical Tape
Duct Tape
Zip-Ties, various sizes
Y-Valves, New
Spare Parts to Fix Y-Valves
Gloves, Nitrile
Anti-fouls Box
Sandwich Box with Allen Wrench
Kimwipes
Misc. Hardware (screws, nuts, washers, insulators, Teflon tape)
Plastic Beaker
DI Water (1 L)
10% HCl (1 L)
Seawater bottle (1 L)
Small Blue Box labeled "Big Tubing"
Scrapers
HCl Syringe & Tubing
Brushes
Heat Shrink Tubing
Fluid Film Rust Preventer
Teflon and Wooden Blocks
Triton-X 50-mL

Blue Rubbermaid Bin

Batteries
Kimwipes
I/O Cable x2
Gloves, Nitrile
Telescoping Magnetic Battery Remover
Bag of Pens and Label Tape
Dummy Plugs
Spare SBE16 PC cable
SBE16 Manual & Calibration/Configuration Manual
WetStar Flourometer, User's Manual
Hose Bars Adaptors
Spare O-ring and hardware kit
Dummy Plugs
Battery End Cap, w/ screws, washers, o-rings

Toolbox

Screwdrivers

- Large flathead
- Small flathead
- Large Philips (just in case)
- Stubby Philips (for CTD battery cap)
- Pliers
- Large diagonal cutters (for large zip-ties)
- Small diagonal cutters (for small zip-ties)
- Needle nose
- Locking

Wrenches

- Adjustable
- Ratchet w/ drivers (various)
- Combo wrenches (various)
- Allen wrenches (for zincs, plus various)

Nut drivers (various, 7 mm for heavy duty hose clamps)
Hammer
Electrical tape
Magnetic battery wand (clipped under tool box lid)
Knife
Zinc Anodes
Extra Nuts and Bolts

Appendix G

Example Field/Float Plan

FIELD WORK PLAN & CONTACT PERSON FORM (page 1 of 2)

Field leader complete needed information on both pages. File the electronic copy and attachments in the appropriate folder. Field leader must add a *Float Plan* if Ecology boats are to be used. Field Leader must add information about non-Ecology boats if they are to be used.

Use the tab key to move through the fields.

Field Leader Name

Field Staff Name(s)

Vehicle Info (make, model, color, license)

Vehicle Phone Number

Non-Ecology Boat Name & Phone Number

Non-Ecology Boat Operator's Name & Phone Number

Date/Time of Departure

Estimated Date/Time of Return

Sampling "Run" or station list description (attach separate sheet or map if preferred):

Run/Station/Facility/Site and Location

Driving Directions (attach separate sheet or map if preferred):

Lodging Plan:
Date, Hotel/Motel, and Phone Number

FIELD WORK PLAN & CONTACT PERSON FORM (page 2 of 2)

Complete this page if field work goes after regular working hours or involves overnights stays.

Contact Person & phone to notify to close Field Work Plan

(Contact Person can be anyone able and willing to perform search operations).

Date/time to begin search operations if field crew hasn't checked in

Search Operations

The following steps should be taken by the contact person if the field crew doesn't check in by the time given above to close the Field Work Plan.

1. Call the vehicle or boat's phone (can try VHF ch.16 if boat).
2. Call the field leader. Office Home
3. Call other field staff. Office Home
4. Call the scheduled hotel(s).
5. Call other places or persons who may have information on whereabouts of field crew (e.g. friends, family, co-workers).
6. Check Ecology or other parking lots for the vehicle.
7. Call the Unit Supervisor or designated backup to inform them of the situation and reach a decision whether to contact the Washington State Patrol and/or pursue other search activities.

   Unit Supervisor: Name (Select) Home

   Designated Backup: Name Office # Home

If warranted, call the *Washington State Patrol Emergency Dispatch (800-283-7808)* and request a road check of the route the vehicle would take while doing field work. Give WSP a vehicle description (make, model, year, color, license plate number). Ask WSP dispatch whether you should contact the local County Sheriff's office.

8. In case of extended search operations or emergencies, the contact person should call the following persons designated by the field staff (e.g. family members, friends):

Name Phone

Name Phone

Name Phone

Name Phone

Appendix H

Sample Contact Sheet with Names and Numbers

SSH Network Settings and Contacts for Base Stations for Telemetry Moorings

(updated Nov. 20, 2006)

User passwords can be found in file "Mooring Network Settings and Passwords."

1. Budd Inlet at Port of Olympia pier

- Station ID = **BUD01**
- Hostname = **poly6.portolympia.com**
- Username = **root**
- Port number = **822**
- Password = **********
- IP address = **70.103.19.198**

Network is managed by Port of Olympia and DOT.

- Bart Adler - IT staff contact
  Cell phone: (360) 481-8260
  E-mail: adler@fel.com or IT@PortOlympia.com

- Kim Kawava - Port access security staff contact
  Office phone: (360) 528-8033
  Jennie Foglia-Jones (former contact): Cell phone: (360) 507-2631

2. Squaxin Passage at Carlyon Beach floating dock

- Station ID = **SQX01**
- Hostname = **71.227.132.104**
- Username = **root**
- Port number = **22**
- Password = **********

Network is established through COMCAST and managed by the Homeowner's Association of Carlyon Beach.

- See contact details in:
  Y:\SEABIRD\Moorings\Contact Information\Squaxin Contacts.doc

OTHER CONTACTS – Mooring Telemetry

IT Staff:

- Warren Opfer at Ecology – cell ph. (360) 485-8486

- Ethan van Matre at OGI/OHSU – office ph. (503) 748-1157

Technical:

- Michael Wilkin at OGI/OHSU	office. (503) 338-6574 cell. (503) 348-6828
- Mike Colyar (i.e. winch frame)	home. (360) 705-0183 cell. (360) 357-8830

Manufacturers:

- SeaBird Electronics	(425) 643-9866
- WetLabs	(541) 929-5650
- FreeWave Radios	1-800-548-5616

Contact Information for Squaxin Island Monitoring Station

Carlyon Beach Homeowners Association

- DOCK ACCESS: Stop by office if open. If driving down to dock, parking lot gate lock combo = 1 2 3 4. Otherwise use side gate with available carts. On the dock, fence gate is locked with a key located in the moorings field binder.

- For access to the computer and radio inside the office (during normal office hours) contact:

  Debbie Hendrickson, Office Manager
  Office phone: 360 866-0717
  Email: cbha_debbie@comcast

- For IT issues, such as router configuration or communication problems contact:

  Phil Turner*
  Work phone: 360 350-1250
  Cell phone: 360 561-8142
  Primary Email: Mail@olympiasystems.com
  Secondary Email: info@nwcs4u.com
  Website: www.nwcs4u.com

  * Phil is a volunteer who looks after the system for the homeowners association. He runs his own business installing web-based security systems, so he may not always be immediately available to answer questions or assist with problems. However, he usually responds very quickly to emails, so I recommend using email as the primary method of contact for him.

Web Address for CBHA router: http://cbhacameras.no-ip.info:8080

no log in just password cbha123

* Checking the router is useful when the base station computer is not responding. If the router isn't responding, then contact Phil. If it is and the router settings seem correct (ie. IP address and computer name haven't changed, port 22 is open), then the problem is probably with our computer.

NOTE: Although we've been given access to the CBHA router, it's best to contact Phil if you need assistance. The danger of making changes ourselves is that we'll knock out the whole system, including the CBHA office computers and security cameras.

Appendix I

Climbing Technical Note for Free-Floating Moorings

Climbing Safety and Gear Technical Note

Equipment.

You will be utilizing five key items for ascending a Coast Guard Nav-Aid:

Personal Anchoring Straps: These are robust nylon straps of varying lengths with carabiners attached to them. These straps are intended to replace the need for a fixed climbing line on the Nav-Aid, since environmental factors and wear will compromise the safety of fixed lines. Anchor straps are used to attach the climber to the Nav-Aid in order to act as a fall prevention device and as a working tether. You will be working in sometimes awkward positions where balance points and handholds may not be readily available; therefore these personal anchoring straps come in handy to assist in attaching you safely to the Nav-Aid. Carry several of them with you on your harness.

Harness: Along with the personal anchoring straps, a harness is a key factor in climber safety. A harness is what connects the climber to the anchor straps, and thus, it cannot be overlooked or hastily done. If you are unsure about how to strap up your harness, have someone experienced look at it when you are done. Generally, a climber should put their feet through the leg loops first, tighten the waist strap firmly, and then adjust all the smaller straps accordingly. Make sure you get a harness that fits you properly. Your harness should be snug, but not too tight.

Carabiners: The nuts and bolts of your climbing gear, carabiners connect your whole climbing apparatus together. Carabiners are also heavily tested in laboratory conditions, to ensure they will not break under common use, but climbers should double-check them before climbing just in case. As you prepare for a climbing trip, take a look at your carabiners for cracks or structural problems, and check that the gates are all working.

Helmet: You must wear an approved climbing helmet (Brands like Petzel, Black Diamond, etc.) at all times when climbing on a Nav-Aid.

Yourself: You are the most important safety factor involved with climbing. You should be well versed in the EAP safety manual and understand the concepts and mechanics of climbing. The most important rules to remember while climbing are:

1. Maintain at least three contact points (hands, feet, anchor strap) with what you are climbing on. One of the most common causes of slipping/falling is not having enough contact with the object you are climbing, resulting in less options to catch yourself from falling. This is especially true while climbing on a slippery surface such as a Nav-Aid.
2. Be aware of your surroundings. Look out for falling objects, pinch points, and sharp objects when climbing. Do not place yourself between the boat and the Nav-Aid, you could get crushed if the boat drifted in to you.
3. Think safety! Remember, you are responsible for yourself while climbing. Wear appropriate clothing, rain gear, boots, and gloves to prevent injury.
4. Ask questions! Your colleagues may be able to assist you or give advice to you before and while you climb. Do not be afraid to ask for help!
5. Do not panic. If you encounter a scary or unanticipated event while climbing remember to remain calm. While panicked, many people tend to rush to judgment or make rash decisions which could result in injury.
6. Have one of your colleagues prepared to climb in case of an emergency. While one technician is up in the Nav-Aid, the other should have the backup climbing harness on and be at ready in case of an incident.

Appendix J

Checklist for Servicing a Swapped Package

Post-Willapa Mooring Service Logsheet					
CTD: **Aux:**		**Date pulled:** **Date serviced:**		**New batt. volts:** **Checked data?:**	
Aux:		**Comments:**			
Check off if completed.					
	+ Detailed cleaning and freshwater rinse of entire unit?				
	+ Soaked sensors in 10% HCl, Triton-X, and DIW?				
	+ Changed batteries? Inspect and lube o-rings?				
	+ Removed conductivity cell and cleaned under unit?				
	+ Cleaned and inspected tubing and Y-valve?				
	+ New anti fouls?				
	+ Replaced DIW loop for soaking sensors in storage? + Inspected cables and bulkhead connectors?				
	+ Inspect Aux sensors for wear or damage?				
DI water clean voltage reading					
Additional notes:					

Appendix K

Technical note for initial set-up of mooring package

Technical Note for Initial Set-up of SBE16+ Telemetry Moorings

(created October 2006; revised February 2007)

This note describes the procedures and programming commands needed to set up Seabird Electronics (SBE) instruments. Submerged mooring packages are physically cabled to a surface water-tight transmitter box on site, and communicate via broad spectrum radio to a receiver station on shore with power and ethernet connection. These packages take measurements every 15 minutes on the hour (12:00, 12:15, 12:30, etc), and relay each measurement to a computer base station.

Test all components in the laboratory prior to scheduled deployment. Allow enough time to troubleshoot technical issues that may arise, and refer to instrument manuals for complete details.

I. Initial set-up of SBE16+/SBE43 mooring packages

1. Secure instruments together with hose clamps. Use tubing. (Figure for this configuration)

2. Test communication and instrument operation. Submerge pump head.

3. Program instrument for real-time moored operation. Record commands to a file.

- Reset day and time (be sure to use **UTC/GMT**) – cell phone works best for time on the minute
    - ddmmyy=ddmmyy
    - hhmmss=hhmmss

- Change sampling rate from factory defaults to collect 4 readings in 15 min intervals, with the pump running for 20 s before and during sampling. Also, set to transmit converted decimal data, which displays in a single comma-delimited row:

    T (deg C, ITS-90), C (S/m), P (db), voltage from DO sensor (V), S (psu), dd mm yyyy, hh:mm:ss, Sigma-t (kg/m^3), battery voltage (V), operating current (mA)

    Type the following commands in Seaterm:
    - sampleinterval=900
    - ncycles=4
    - pumpmode=2
    - delaybeforesampling=20
    - txrealtime=y
    - volt0=y
    - outputformat=3
    - outputsal=y
    - outputucsd=y

- Check status using “ds” command to be sure above settings were acquired. Battery voltage should be greater than 13 V. Change batteries if low.
- Just before deployment, clear memory and enable start time for sampling.
    - initlogging

- startddmmyy=ddmmyy
- starthhmmss=hhmmss
- startlater

4. Take sample and record readings. Create log of set-up.

5. Store instrument without antifouls (these are the last thing to install before deployment). If stored for greater than a few days, remove tubing. Conductivity cell should be dry and plugged, and oxygen membrane should be kept damp but not soaked (wet piece of sponge in looped tubing).

6. Create *.CON file for new instrument configuration. Verify calibration coefficients are programmed correctly.

II. Initial set-up of SBE16+/WetStar EcoFL-NTU mooring packages

SBE program settings:

- SBE16+ settings are the same as above, **except**:
  - volt1=y
  - volt0=y
  - biowiper=y

  (these fluorometers measure chlorophyll and turbidity in separate channels)

In addition, the ECO-meter needs to be set up **separately** using ECOView software:

- Connect (do NOT move biowiper by hand; see manual for details)