SEA·BIRD SCIENTIFIC

www.seabird.com
+1 425-643-9866
seabird@seabird.com

Application Note 83

Deployment of Moored Instruments

(Revised April 2017)

This Application Note applies to Sea-Bird instruments intended to provide time series data on a mooring or fixed site:

- SBE 16*plus*, 16*plus*-IM, 16*plus* V2, and 16*plus*-IM V2 SeaCAT Conductivity and Temperature Recorder
- SBE 19*plus* and 19*plus* V2 SeaCAT Profiler CTD (in moored mode)
- SBE 26*plus* Seagauge Wave and Tide Recorder
- SBE 37 (IM, IMP, SM, SMP, SI, SIP) MicroCAT CTD Recorder
- SBE 37 (IMP-IDO, SMP-IDO, SIP-IDO) MicroCAT CTD and (membrane-type) Dissolved Oxygen Recorder
- SBE 37 (IMP-ODO, SMP-ODO) MicroCAT CTD and Optical Dissolved Oxygen Recorder
- SBE 39, 39-IM, 39*plus*, 39*plus*-IM Temperature Recorder
- SBE 53 BPR Bottom Pressure Recorder
- SBE 56 Temperature Logger
- HydroCAT CTD and Optical Dissolved Oxygen Recorder
- HydroCAT-EP CTD, pH, Optical Dissolved Oxygen, Chlorophyll a fluorescence, and Turbidity Recorder

We have developed a check list to assist users in deploying moored instruments. **This checklist is intended as a guideline to assist you in developing a checklist specific to your operation and instrument setup.** The actual procedures and procedure order may vary, depending on such factors as:

- Instrument communication interface - RS-232, RS-485, inductive modem, USB, or SDI-12
- Deployment interface for RS-232 or RS-485 - with I/O cable for real-time data or dummy plug for self-contained operation
- Sampling initiation - using delayed start commands to set a date and time for autonomous sampling to automatically begin, starting autonomous sampling just before deploying the instrument, or taking polled measurements
- Sensors included in your instrument –
  - Pressure is optional in the SBE 16*plus*, 16*plus*-IM, 16*plus* V2, 16*plus*-IM V2, 37 (all), 39, 39-IM, 39*plus*, 39*plus*-IM, HydroCAT, and HydroCAT-EP, and is not provided in the SBE 56.
  - Conductivity is optional in the SBE 26*plus* and 53, and is not provided in the SBE 39, 39-IM, 39*plus*, 39*plus*-IM, or 56.
  - Oxygen is optional in the HydroCAT.
  - Oxygen, Chlorophyll a, and turbidity are optional in the HydroCAT-EP; pH is included.
  - Optional auxiliary sensors can be field- or factory-integrated with the SBE 16*plus*, 16*plus*-IM, 16*plus* V2, 16*plus*-IM V2, 19*plus*, and 19*plus* V2.
- Setup software used – most instruments use Seaterm or Seaterm V2 terminal program; HydroCAT and HydroCAT-EP use UCI.

Deployment Summary

Instrument serial number	
Mooring number	
Date of deployment	
Depth of instrument	
Intended date of recovery	
Capture file printout(s) or setup report attached, or file name and location (showing instrument setup and calibration coefficients)	
Actual date of recovery	
Condition of instrument at recovery	
Notes	

Preparation for Deployment

Task	Complete?
If applicable, upload existing data in memory. Perform preliminary processing / analysis of data to ensure you have uploaded all data, that data was not corrupted in upload process, and that (if uploading converted data) instrument EEPROM was programmed with correct calibration coefficients. If there is a problem with data, you can try to upload again now. Once you record over data in next deployment, opportunity to correct any upload problem is gone.	
Initialize memory to make entire memory available for recording. If memory is not initialized, data will be stored after last recorded sample.	
Calculate battery endurance to ensure sufficient power for intended sampling scheme. See instrument manual for example calculations (UCI does these calculations automatically for HydroCAT & HydroCAT-EP).	
Calculate memory endurance to ensure sufficient memory for intended sampling scheme. See instrument manual for example calculations.	
Install fresh batteries. Even if you think there is adequate battery capacity left for another deployment, cost of fresh batteries is small price to pay to ensure successful deployment.	
Establish setup / operating parameters. *With Seaterm or Seaterm V2 (most instruments):* 1. Click Capture in terminal program and enter file name to record instrument setup, so you have complete record of communication with instrument. 2. Set current date and time. 3. Establish setup / operating parameters. 4. If desired, set date and time for sampling to automatically begin. 5. Send *Status* command (**DS** or **#iiDS**) to verify and provide record of setup. ** 6. Send *Calibration Coefficients* command (**DC**, **#iiDC**, **DCal**, or **#iiDCal**) to verify and provide record of calibration coefficients. ** *With UCI (HydroCAT or HydroCAT-EP):* Set up instrument; run report to verify and provide record of setup.	
Get conductivity sensor ready for deployment: As applicable, remove protective plugs that were placed in Anti-Foulant Device caps **or** remove label that was placed over inlet / outlet **or** remove Tygon tubing that was looped end-to-end around conductivity cell to prevent dust / dirt from entering cell. *Note*: Deploying instrument with protective plugs, label, or looped Tygon tubing in place will prevent instrument from measuring conductivity during deployment, and may destroy cell.	
Install fresh AF24173 Anti-Foulant Devices for conductivity sensor. Rate of anti-foul use varies greatly, depending on location and time of year. If you think there is adequate capability remaining, and previous deployment(s) in this location and at this time of year back up that assumption, you may not choose to replace Anti-Foulant Devices for every deployment. However, as for batteries, cost of fresh Anti-Foulant Devices is small price to pay to ensure successful deployment.	
For instrument with external pump (16*plus*, 16*plus*-IM, 16*plus* V2, 16*plus*-IM V2, 19*plus*, 19*plus* V2), verify that system plumbing is correctly installed. See instrument manual for configuration.	
Start sampling (if you did not set up instrument with a delayed start command), or verify that sampling has begun (if you set up instrument with a delayed start command). *With Seaterm or Seaterm V2 (most instruments):* 1. Click Capture in terminal program and enter file name to record instrument setup, so you have a complete record of communication with instrument. 2. If you did not set up instrument with a delayed start command, send command to start sampling. 3. If instrument can communicate in real-time while sampling: Send *Status* command (**DS** or **#iiDS**) to verify and provide record that instrument is sampling. Send *Send Last* command (**SL** or **#iiSL**) to look at most recent sample and verify that output looks reasonable (i.e., ambient temperature, zero conductivity, atmospheric pressure). ** *With UCI (HydroCAT or HydroCAT-EP):* Set up instrument; run report to verify and provide record of setup. *Note:* For instrument with pump (external **or** integral), avoid running pump *dry* for extended period of time.	
If instrument has pressure sensor, record atmospheric pressure with barometer. Use this during data processing to check and correct for pressure sensor drift, by comparing to instrument's pressure reading in air (from above).	
If cable connectors or dummy plugs were unmated, reinstall as described in *Application Note 57: Connector Care and Cable Installation*. Failure to correctly install may cause connector leaking, causing data errors and damage to bulkhead connector.	
Install mounting hardware on instrument. Verify that hardware is secure.	

** **Note:** Actual instrument command is dependent on communication interface and instrument; see instrument manual.

Recovery

Immediately upon recovery

Task	Complete?
Rinse instrument with fresh water.	
Remove locking sleeve on dummy plug or cable, slide it up cable (if applicable), and rinse connection (still mated) with fresh water.	
For instrument with pump (external or integral), stop sampling. Stop sampling as soon as possible upon recovery to avoid running pump *dry* for an extended period of time (for *some* instruments, pump turns off automatically when conductivity frequency is below programmed minimum value). ** *With Seaterm or Seaterm V2 (most instruments):* Connect to instrument in terminal program and send command to stop sampling (**Stop** or **#iiStop**). *With UCI (HydroCAT or HydroCAT-EP):* Connect instrument to UCI; UCI sends command to stop sampling.	
If instrument has pressure sensor, record atmospheric pressure with barometer. You can use this information during data processing to check and correct for pressure sensor drift, by comparing to instrument's pressure reading in air.	
Gently rinse conductivity cell with clean de-ionized water, drain, and gently blow through cell to remove larger water droplets. • If cell is not rinsed between uses, salt crystals may form on platinized electrode surfaces. When instrument is used next, sensor accuracy may be temporarily affected until these crystals dissolve. • Note that **vigorous flushing is not recommended** if you will be sending instrument to Sea-Bird for post-deployment calibration to establish drift during deployment. • For instruments with integral pump or integral pump and dissolved oxygen sensor (37-SMP, SMP-IDO, SMP-ODO, SIP, SIP-IDO, IMP, IMP-IDO, IMP-ODO; HydroCAT, HydroCAT-EP): Rinse all internal plumbing in addition to conductivity cell. If not rinsed between uses, salt crystals may form on pump impeller and/or on oxygen sensor membrane or optical window.	
For instrument with external pump (16*plus*, 16*plus*-IM, 16*plus* V2, 16*plus*-IM V2, 19*plus*, 19*plus* V2): Remove Tygon tubing from pump head's hose barbs, and rinse inside of pump head, pouring fresh water through a hose barb. If pump head is not rinsed between uses, salt crystals may form on impeller. Over time, this may *freeze* impeller in place, preventing pump from working.	
As applicable, install protective plugs in Anti-Foulant Device caps, install label over inlet / exhaust, or loop Tygon tubing end-to-end around conductivity cell for *long term* storage. This will prevent dust / dirt from entering conductivity cell. *Note*: For short term storage, see: User manual for ODO MicroCATs, HydroCAT, or HydroCAT-EP; *Application Note 64: SBE 43 Dissolved Oxygen Sensor* for IDO MicroCATs; *Application Note 2D: Instructions for Care and Cleaning of Conductivity Cells* for all other instruments.	
Upload data in memory. *With Seaterm or Seaterm V2 (most instruments):* 1. Connect to instrument in terminal program. 2. If you have not already done so, send command to stop sampling (**Stop** or **#iiStop**). ** 3. Click Upload in terminal program to upload data in memory. 4. Perform preliminary processing / data analysis to ensure you have uploaded all data, data was not corrupted in upload process, and (if uploading converted data) instrument EEPROM was programmed with correct calibration coefficients. If there is a problem with data, you can try to upload again now. Once you record over data in next deployment, opportunity to correct any upload problem is gone. *With UCI (HydroCAT or HydroCAT-EP):* Connect to instrument and click Transfer Data.	

** **Note:** Actual instrument command is dependent on communication interface and instrument; see instrument manual.

Later

Task	Complete?
Clean conductivity cell, as needed: • Do not clean cell if you will be sending instrument to Sea-Bird for post-deployment calibration to establish drift during deployment. • Clean cell if you will not be performing a post-deployment calibration to establish drift. *Note*: See: User manual for ODO MicroCATs, HydroCAT, or HydroCAT-EP; *Application Note 64: SBE 43 Dissolved Oxygen Sensor* for IDO MicroCATs; *Application Note 2D: Instructions for Care and Cleaning of Conductivity Cells* for all other instruments.	
For instrument with external pump (16*plus***, 16***plus***-IM, 16***plus*** V2, 16***plus***-IM V2, 19***plus***, 19***plus*** V2): Clean pump as described in** *Application Note 75: Maintenance of SBE 5T and 5M Pumps*.	
(Annually) Inspect and (if applicable) rinse pressure port. See instructions in instrument manual.	
Send instrument to Sea-Bird for calibrations / regular inspection and maintenance. We typically recommend that instrument be recalibrated once a year, but possibly less often if used only occasionally. Return instrument to Sea-Bird for recalibration. Between lab calibrations, take field salinity samples to document conductivity cell drift. *Notes:* 1. We cannot place instrument in our calibration bath if heavily covered with biological material or painted with anti-foul paint. Remove as much material as possible before shipping to Sea-Bird; if we need to clean instrument before calibrating it, we will charge you for cleaning. To remove barnacles, plug ends of conductivity cell to prevent cleaning solution from getting into cell, then soak instrument in white vinegar *for a few minutes*. To remove anti-foul paint, use Heavy Duty Scotch-Brite pad or similar material. 2. If using lithium batteries, do not ship batteries installed in instrument. See the current version of the instrument manual for shipping details.	

Application Note Revision History

Date	Description
December 2005	Initial release.
April 2006	• Add information on cleaning instrument exterior before shipping for calibration. • Add reference to document governing shipping instruments with lithium batteries.
March 2008	• Add information on V2 SeaCATs. • Make references to terminal program more generic (Seaterm not used with V2 SeaCATs).
October 2010	• Add references to Application Note 64 for cleaning IDO MicroCATs (37-SMP-IDO, SIP-IDO, IMP-IDO). • Update address.
October 2012	Update for ODO MicroCATs.
January 2014	• Add information on SBE 39*plus* and 56. • Add information on removing label covering pumped MicroCAT inlet and exhaust.
May 2016	• Add information on SBE 39*plus*-IM. • Remove information on SBE 37-SIP-ODO (product never released).
April 2017	• Add information on HydroCAT and HydroCAT-EP.