The Cruise – Before, During, and After

- Pre-cruise inspections/checks of the equipment
- Spare parts and tools you may want to have on hand when on a cruise
- Care and maintenance of the equipment during the cruise and between casts
- Post-cruise equipment maintenance

Pre-Cruise Equipment Checks

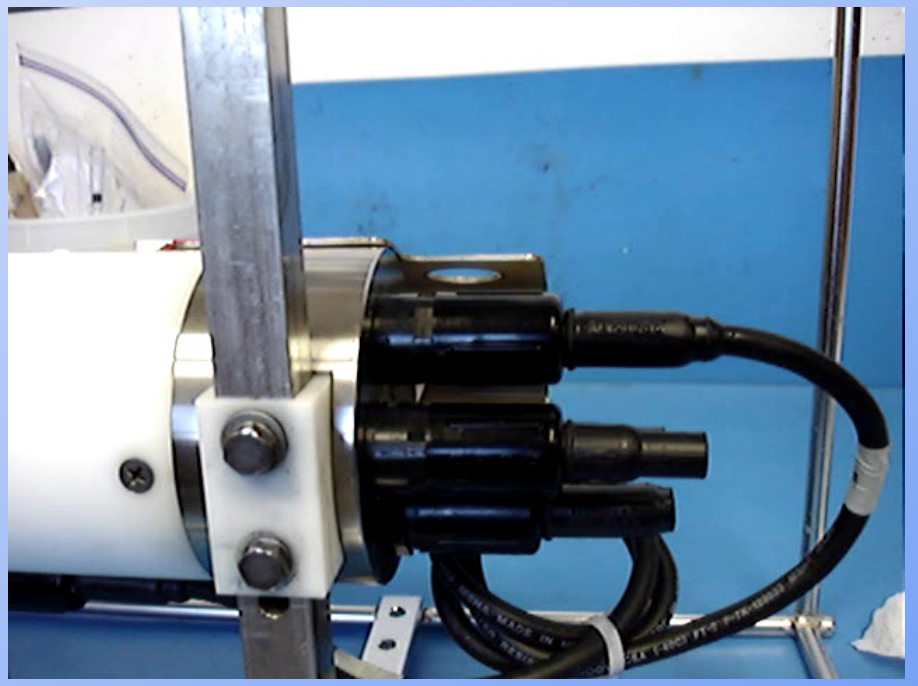
- Helps to prevent *last minute* problems that can delay or impact a cruise
- Especially important if you are not the *sole* user of the equipment
- Should be done as soon before the cruise as is reasonably possible

What should be checked? (Recommendations)

- All connectors and cabling
- All hardware/fasteners, mount clamps, and blocks
- Ferrites – Inductive Modem parts
- Instrument plumbing
- Pressure ports / plumbing
- Battery compartment(s) and batteries

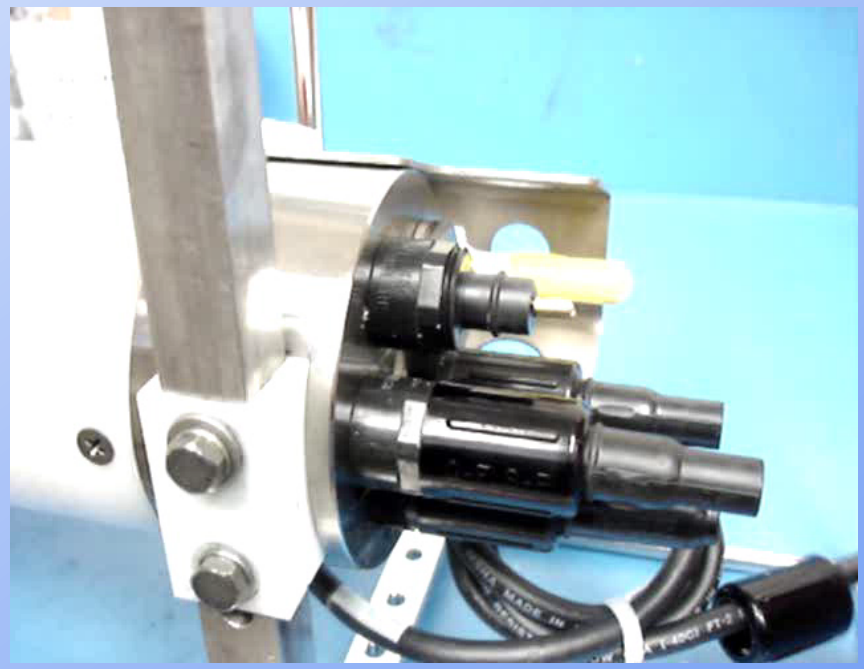
Check Connectors

- Disconnect each cable or dummy plug one at a time.
  - Inspect each exposed connector for corroded or damaged pins.
  - Make sure the connector isn't loose.



Check Cabling

- Inspect each cable boot or dummy plug for corrosion.
- Check the cable for cracks and abrasions in its outer jacket.

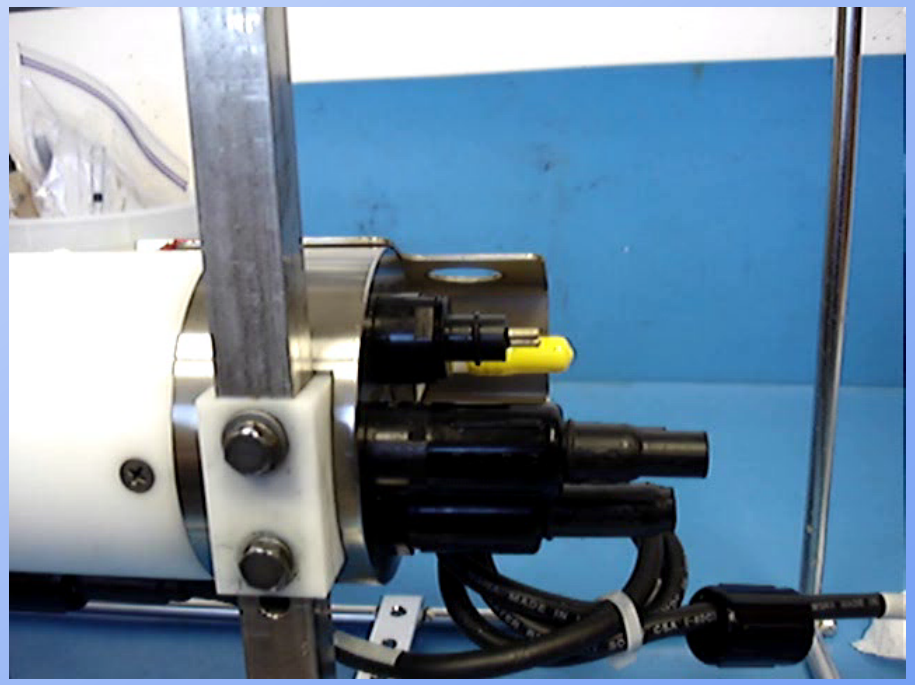


Re-Install Cables and Dummy Plugs

- Clean and re-lubricate connector boots, dummy plugs, and connectors.
  - Clean with Kimwipes or other lint free cloth or wipe.
  - SBE recommends Dow Corning® DC4 for lubrication.
- Never use petroleum-based products.

Proper Installation Technique

- Clean and very lightly lubricate the connector body and cable boot with DC4.
- Align the pins and press the connector boot onto the connector.
- *Burp* the connector to remove any trapped air.



Check the External Hardware

- Check that all external hardware, mounting bolts, mount straps, and cage clamps are tight.
  - Check for cracked mounting blocks.
- Check for corrosion damage to the hardware.
- Check the condition of the installed anodes.
  - Replace as necessary.
- Verify there are no dissimilar metals in contact with each other.
  - Look for mounting straps touching the cage or housing.

Inductive Instruments

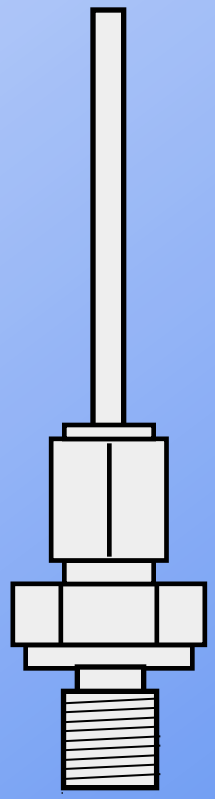
- Inductive instruments are equipped with an inductive coil comprising two ferrite-core halves.
- Check the ferrites for cracks or chips. It is important that the ferrite halves make good face-to-face contact when the clamps are assembled.
- Verify the clamp inserts are the correct size for your deployment cable.

Inspect the Instrument's Plumbing

- Plumbing should be clean and free of salt and biological deposits.
  - Clean/replace as necessary.
- Ensure the hole in the air bleed valve is open.
  - Use a piece of 26 awg wire.
- Make sure all plumbing connections are properly tie-wrapped.
  - DO NOT tie-wrap to the conductivity cell.
- Examine the conductivity cell for damage.

Instruments with Pressure

- Instruments with pressure capillaries
  - SBE 9*plus*
  - SBE 16
  - SBE 16*plus* with Digiquartz pressure sensor
  - SBE 16*plus*-IM with Digiquartz pressure sensor
  - SBE 19
  - SBE 29 (used on SBE 25 CTD)



- Verify that the pressure port is adequately filled with oil and that the pressure port is not blocked by salt build-up.
  - Re-fill as required.

Battery Compartment

- If the history of the installed batteries is unknown, SBE recommends that they be replaced.
- Check the battery pads and springs for corrosion damage.
- If using NiMH or NiCad batteries, verify that they will take and hold a charge.
- Clean and inspect the battery end cap O-rings and sealing surfaces, and re-install the end cap.
  - Replace O-rings as required.

Verify the Functionality

- Establish communications with the instrument.
- If possible, use the same computer that will be used on the cruise.
- Verify you have the most recent calibration coefficients
  - Check for both electronic and hard copies.

Record Some Data

- Log and check some data.
- A clean garbage can full of water is a good way to do this, but it can also be done in air.
- Verify the recorded values seem reasonable.

Prepare the Instrument for Shipping

- Make sure the instrument is dry.
  - See App Note 2D for conductivity cell care.
  - See App Note 64 for dissolved oxygen sensor care.
- If the instrument is equipped with a magnetic switch, place a piece of electrical tape across it in the OFF position.
- Verify all dummy plugs have been re-installed.
- Package the instrument for shipping.

Moored Instruments

- We request that moored instruments **NOT** be painted with marine anti-fouling bottom paint, as the paint will contaminate the calibration bath.
  - If the instrument is painted, all paint must be removed from the instrument prior to its return to SBE for re-calibration.

Tools & Spare Parts

Some factors in deciding what spares you need or want to take on a cruise:

- Your level of expertise / What level of service are you comfortable with?
- The duration of the cruise/transit time.
- The size / type of the vessel.
  - Is it a dedicated research vessel with well-equipped lab facilities?
  - Is it a vessel of opportunity with few if any facilities?
- Remoteness of the research area.
  - Will you have reliable and timely communications?
  - Is it possible to receive shipments of parts and material?

Tools

- Box and open-ended wrench set
- Allan wrench set
- Assorted screwdrivers
- Nut-drivers
- Cutters
- Pliers
- Crescent wrench (medium)
- Soldering iron (A small butane iron is good)
- Hand-held multimeter

Spare Parts

- O-rings
- Tygon® tubing
- Set(s) of cables
- Full set(s) of spare dummy plugs
- Mount straps / blocks
- Water sampler latch assembly
- Deck Unit fuses
- Pump parts (thrust washers & O-ring)
- Air bleed valve
- Connectors
- Back-up sensors or CTD (if possible)

Materials

- Spare batteries
- 1 L pre-mixed Triton X-100 solution, 0.1%
- 500 mL pre-mixed Triton X-100 solution, 1% - 2%
- 1 L pre-mixed Bleach solution, 500 – 1,000 ppm
- Several liters of DI Water
- T/C backfilling syringe(s)
- Oil backfilling kit
- Kimwipes or other lint-free wipes
- Parker Super O Lube
- DC4
- Blue Moly
- LocTite® (or equivalent)
- Solder
- Electrical tape
- Air bleed valve cleaning wire
- Assorted tie-wraps
- Hard copies of Calibration Sheets
- Copy of the instrument's manual
- Short *test* cable (real-time instruments)
- Small plastic pail

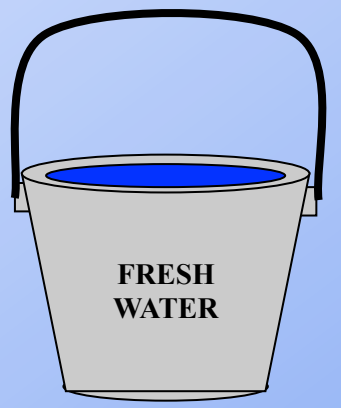
Instrument Care and Maintenance During the Cruise

- Keep the instrument as protected as possible during transit.
- If it must be stored on deck, out of the crate, during transit:
  - Avoid ship exhausts (main propulsion, galley vents, and compartment vents).
  - Avoid salt spray if possible.
  - Avoid prolonged UV exposure.
  - A cover for the CTD can be a good investment.

First Cast of the Day

- Wet the conductivity cell in accordance with Application Note 2D, approximately 1 hour before the cast.
- Before taking the first cast:
  - Verify all cables and dummy plugs are installed.
  - Verify all plumbing is properly connected.
  - Remember to remove the soaker tube from the conductivity cell, covers from PAR sensors, pH bottles, etc.
    - Making a checklist that includes all sensors in your configuration can help prevent things from being overlooked.

After / Between Casts



- Rinse the equipment thoroughly with fresh water.
  - On some vessels the amount of fresh water available for wash-down may be restricted; if so, use as much as the Ship's Master will allow.
  - Even a bucket full of fresh water is better than no wash-down at all.
- Rinse and store the conductivity cell in accordance with Application Note 2D.
- Rinse and store the dissolved oxygen sensor in accordance with Application Note 64.

SBE 32 Carousel and SBE 55 ECO Water Sampler Care

- Proper care and maintenance of the latch assemblies will help ensure reliable operation.
  - Never use any lubricants on the latches.
  - The latches are water lubricated.
  - Wash the latches thoroughly between casts.
  - (SBE 32 only) Depending on the time between casts, store the latches in a bucket of fresh water.
  - Removing the latches also permits proper washing of the actuator magnets.

Flooded Instruments

- While instrument flooding is rare, it does happen from time to time.
- A flooded instrument can be under extreme pressure.
- If you suspect an instrument has flooded, use extreme caution.
  - Point the instrument's end cap(s) in a safe direction.
  - **If applicable**, loosen the end cap hardware (1/2 turn for each screw/bolt). If the end cap *followed* the hardware out, the instrument may be under pressure.

Releasing the Pressure

- If the instrument is pressurized, the pressure can be released by *backing off* one of the installed I/O connectors several turns.
- This will break the connector's O-ring seal and allow the instrument to vent.
  - Look for signs of internal pressure
    - *Hissing*
    - Leaking water

What to Do with the Instrument if Flooded

- Pour out any water inside the housing.
- Remove the installed batteries.
- Return the instrument to SBE for evaluation.

Post-Cruise Maintenance

- Profiling instruments
  - Soak the instruments in a clean garbage can full of fresh water. This will help remove / dilute all salt water that may be trapped in gaps and crevices.
    - Install loops of Tygon® tubing on the conductivity cell and dissolved oxygen sensor to protect them.
    - Remove locking sleeves from the cables to allow flushing.
  - Soaking in fresh water especially applies to Carousel and ECO Water Samplers.
    - Actuator magnets need thorough cleaning.
    - Latches can be washed in a dishwasher.

Post-Recovery Maintenance for Moored Instruments

- Manually remove as much bio-fouling as possible.
  - Scotch-bright pads work well for this.
  - A **short** soak in white vinegar will make this easier.
    - Plug the cell ends or install a loop of Tygon®.
  - Be careful not to damage the conductivity cell if you remove the cell guard.
- Clean and inspect any installed cables.
- Finally, soak these instruments in the same way as the profiling instruments to remove / dilute any trapped saltwater and any remaining vinegar.

After Cleaning

- Allow the instrument to dry.
- Open the battery compartment and remove any exhausted batteries.
  - If the instrument is going to be stored for an extended period, do not replace the batteries.
- Follow all storage guidelines for any installed sensors and for the conductivity cell.
- Store the instrument in a clean, dry environment.