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 9plus
  - SBE 16
  - SBE 16plus with Digiquartz pressure sensor
  - SBE 16plus-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.