# Water Samplers, Water Sampling with Internal Recording, Cabling, and Deployment

- Water Samplers
  - Care and feeding
- SeatermAF
  - User interface for internally recording instruments firing water samplers with an auto-fire device
- Setting up Auto-Fire
- Extracting CTD data corresponding to water sampler closures
- Cabling for deployment
- Deployment issues

# Water Sampling Equipment

- SBE 32 Carousel

Air Vent

Water Valve
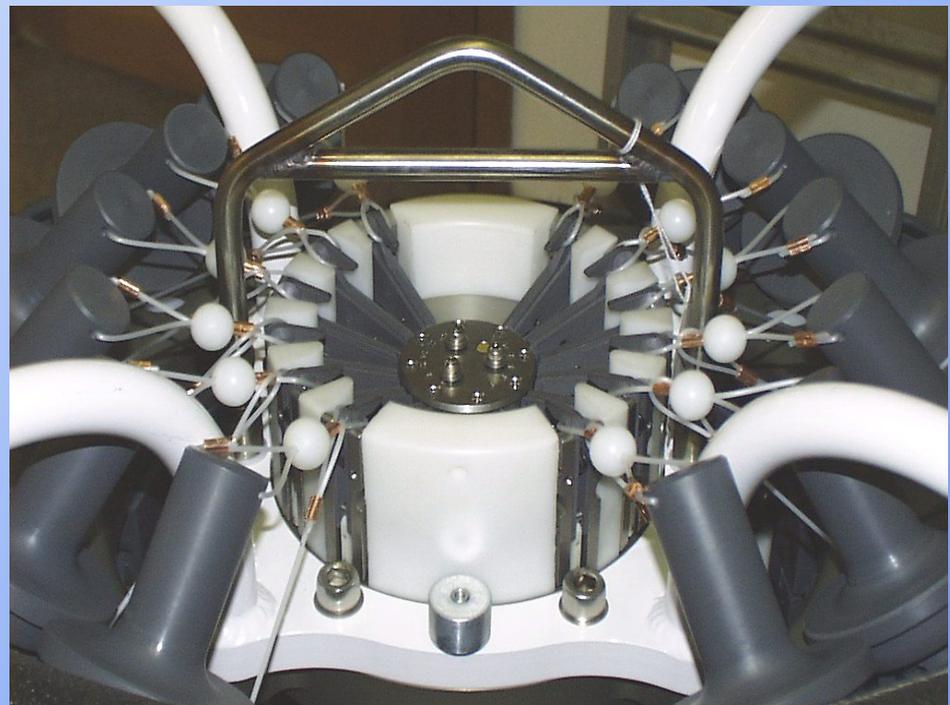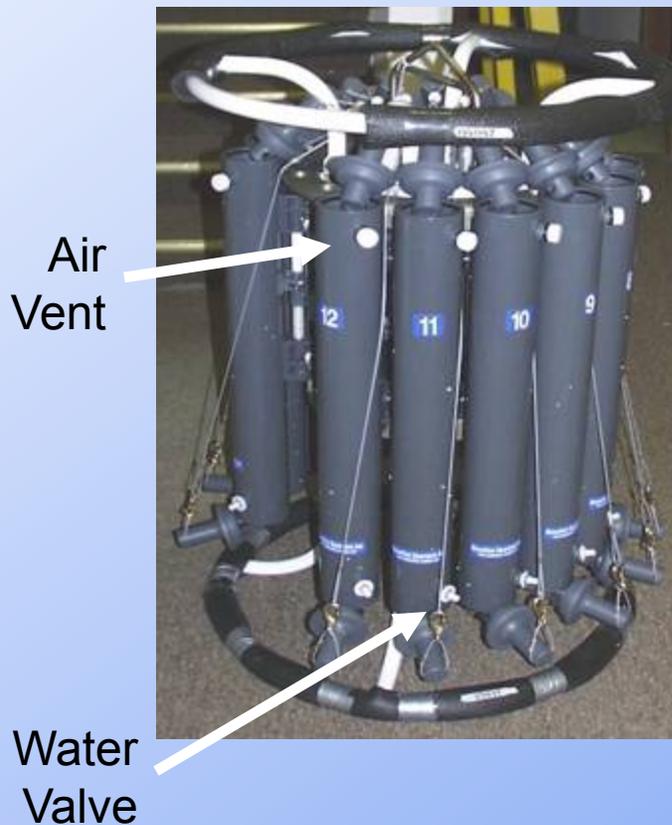
# Carousel and ECO Maintenance
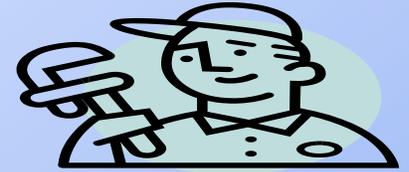
- Wash with fresh water after each use; Tiodized trigger surface is water lubricated

- Oil will gum triggers

- Replace worn lanyards

# Autonomous Water Sampling with Internally Recording Instruments

- Auto Fire Module (AFM) with SBE 32 Carousel
  - AFM receives pressure information from SBE 19, 19*plus*, 19*plus* V2, 25, or 50
- SBE 17*plus* Version 2 SEARAM with SBE 32 Carousel
  - SBE 17*plus* V2 receives pressure information from SBE 9*plus*
  - SBE 17*plus* V2 also provides battery power and internal data recording (16 Mbyte of memory) for SBE 9*plus*
- SBE 55 ECO Water Sampler
  - Receives pressure information from SBE 19, 19*plus*, 19*plus* V2, 25, or 50
  - Built-in capability similar to SBE 32 Carousel integrated with AFM
- All receive closure protocol from user via SeatermAF

**17*plus* V2**

# Setting Up Water Sampling Equipment: SeatermAF
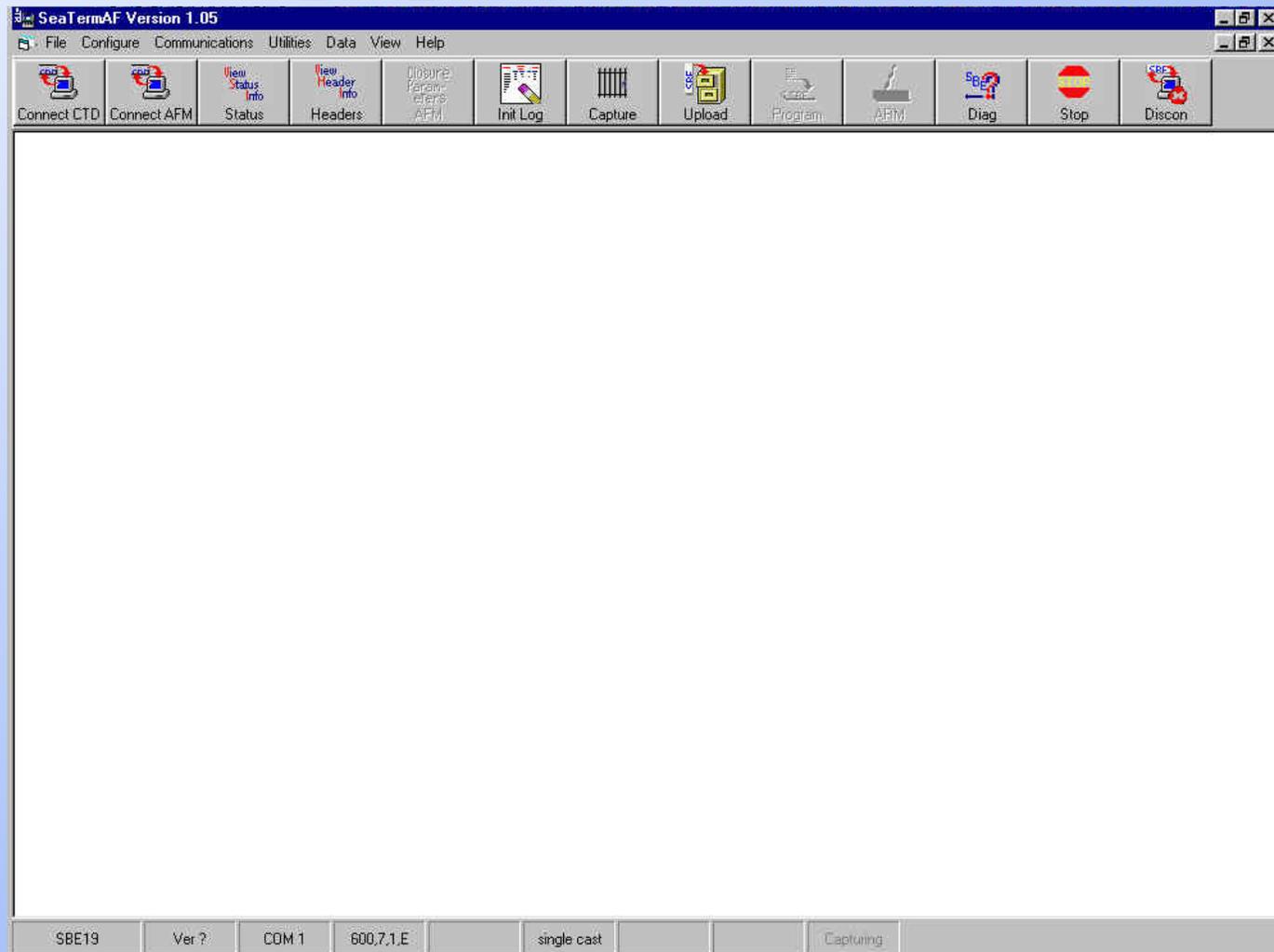
# Setting Up CTD Communications

- To access this dialog box, select the CTD and water sampling equipment in SeatermAF's Configure menu

# Bottle Closure Logic

# Bottle Closure Logic

- Downcast/Upcast Logic (downcast not applicable to SBE 17*plus* V2)

Surface

*Bottom P Window* — close bottom bottle if P stays within *Window* for *Bottom Stationary Time* after *Enable Upcast P* reached

*Enable Upcast P* **Change** — see notes

*Enable Upcast P* — set close to expected maximum cast depth
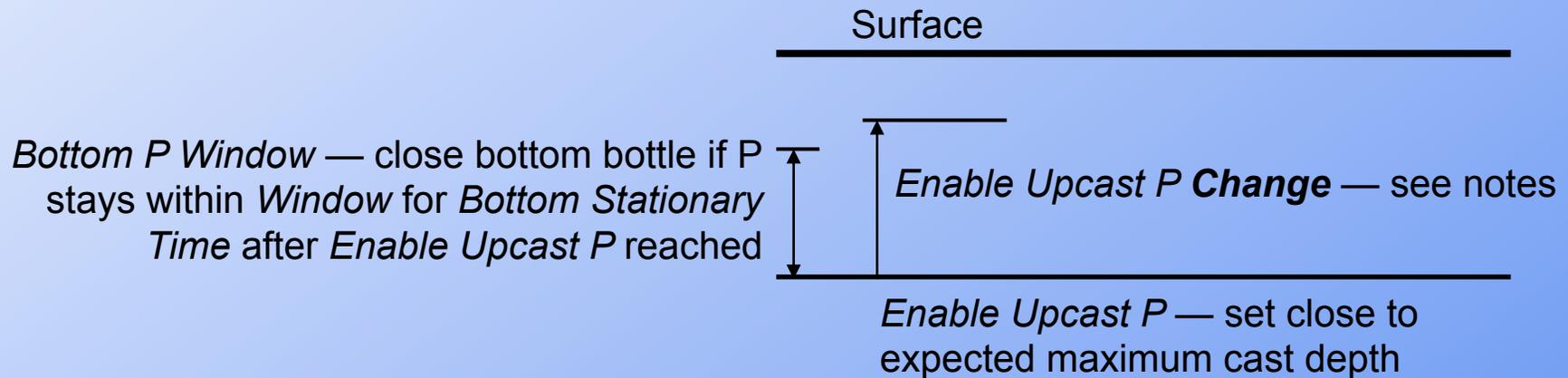
# Bottle Closure Logic

- Stationary logic (not applicable to SBE 17*plus* V2)
  - Once CTD has reached *Enable pressure for first bottle*, bottle closes each time P remains within *Pressure window size* for *Time to hold in Pressure window*

- Elapsed time (not applicable to SBE 17*plus* V2)

# Auto-Fire Setup

- AFM
  - With SBE 19 or 25: SeatermAF converts user-input closure parameters in decibars to raw pressure numbers using .con file coefficients, CTD transmits raw pressure data to AFM
  - With SBE 19*plus*, 19*plus* V2, or 50: Instrument transmits data in decibars to AFM
- SBE 17*plus* V2
  - SBE 9*plus* transmits raw pressure data, SBE 17*plus* V2 converts raw pressure data to decibars, using .con file coefficients
- SBE 55 ECO Water Sampler
  - Operation similar to AFM

# Bottle Closure Pressures or Times

- AFM, SBE 17*plus*, and SBE 55 ECO close bottles on pressure

- AFM and SBE 55 ECO can also close bottles on elapsed time in minutes from when armed

# Data Recorded in
# Auto Fire Instrument

- AFM
  - 5 CTD scans are recorded in AFM at time of each bottle closure

- SBE 17*plus* V2
  - Since 17*plus* V2 is also memory module for SBE 9*plus*, all 9*plus* CTD data is recorded in 17*plus* V2
  - Bottle closure bit in status byte is set for 36 scans to indicate time of each bottle closure

- SBE 55 ECO Water Sampler
  - 5 CTD scans are recorded in ECO at time of each bottle closure

# Telemetering and Water Sampling with Internally Recording Instrument: SBE 33

- Real-time interface SBE 32 Carousel:
  - receives power from SBE 33
  - converts it to power for SBE 19, 19*plus*, 19*plus* V2, or 25
  - telemeters data to deck
- Real-time interface SBE 55 ECO:
  - Operation with SBE 33 similar to that of SBE 32 Carousel with SBE 33

# Telemetering and Water Sampling with Internally Recording Instrument: SBE 33
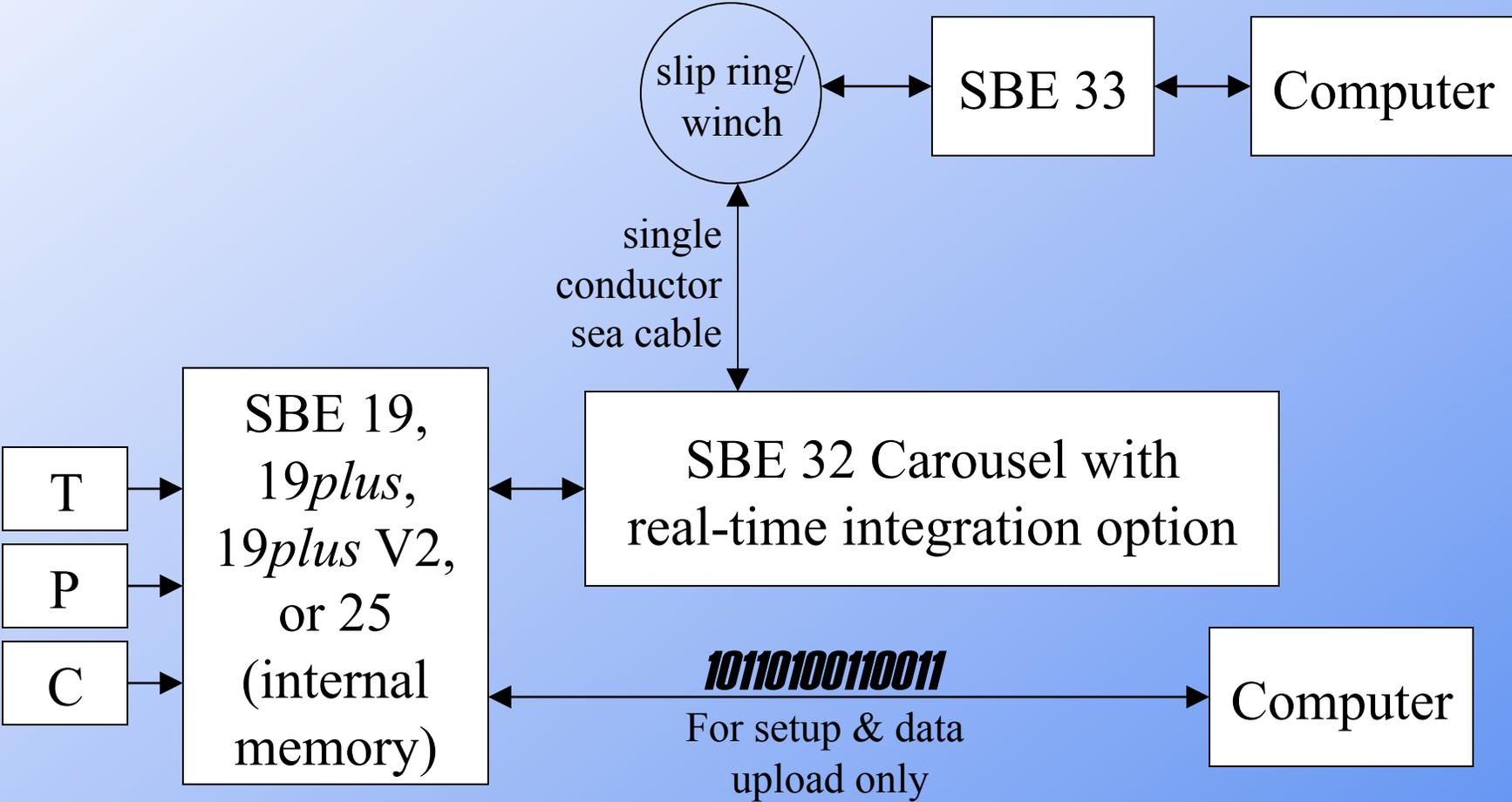
# Deployment Issues: Cabling Telemetered Instruments

**SBE**

slip ring/ winch → SBE 11*plus* Deck Unit ↔ Computer

single conductor sea cable

T → SBE 9*plus* (no memory)

P →

C →
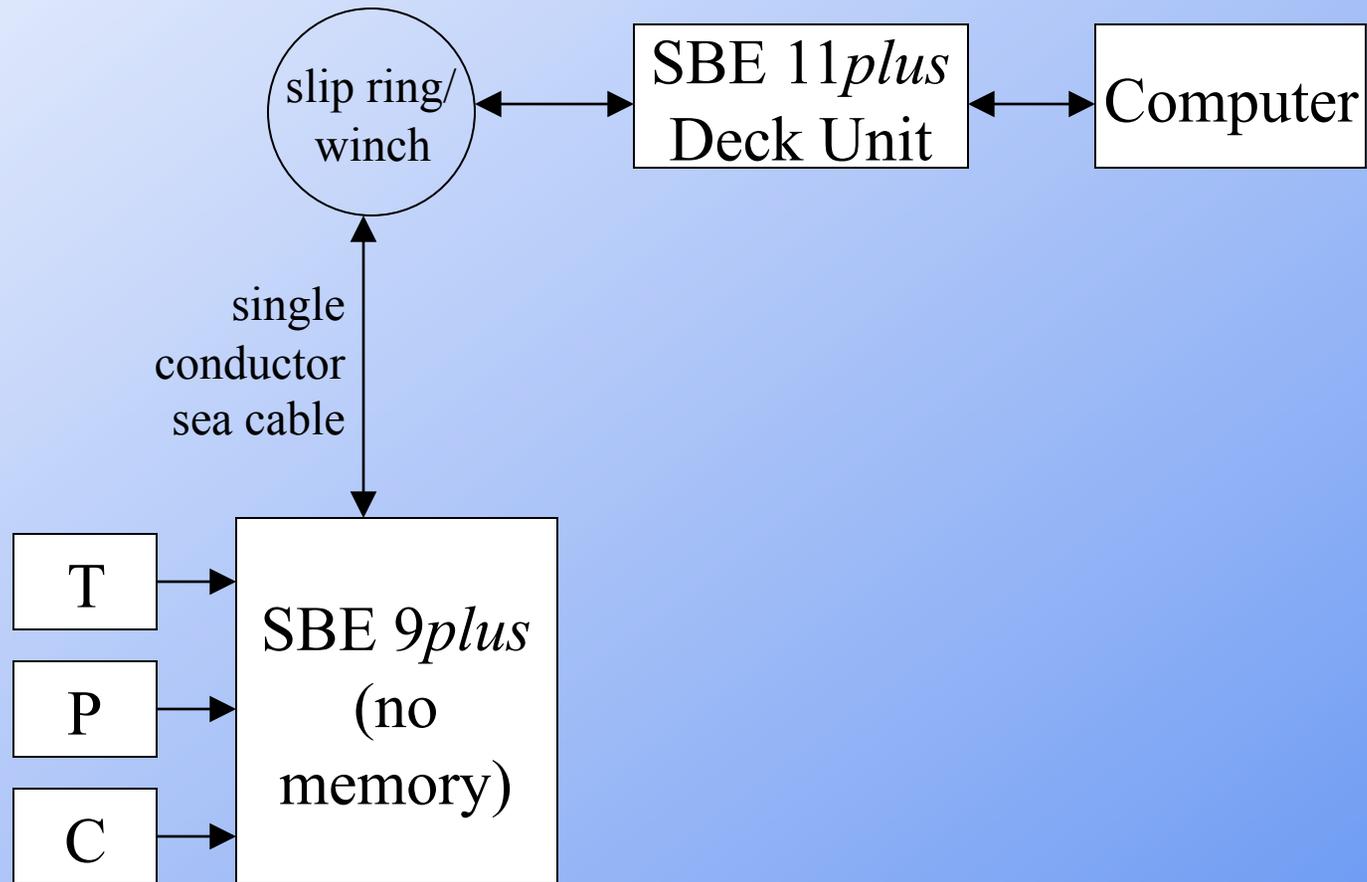
# What is a Slip Ring?
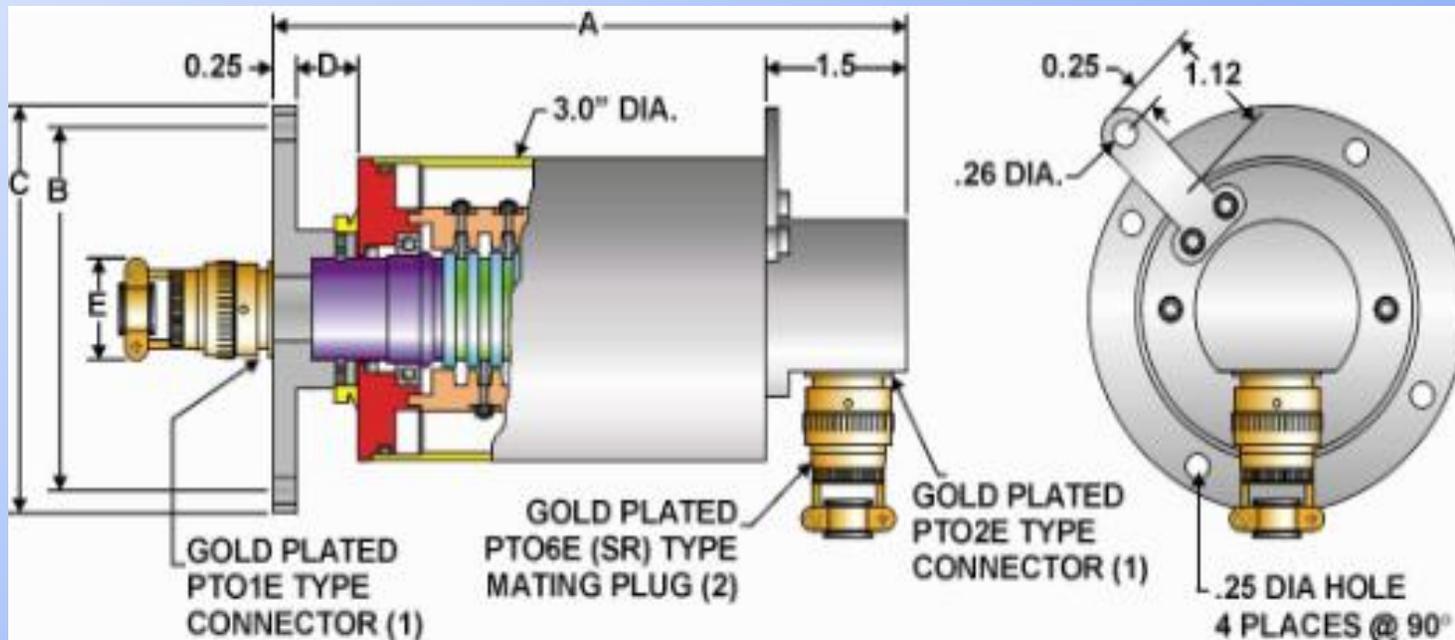
# Cabling the 9*plus* to the 11*plus*

- Use #20 twisted pair or coax to cable between SBE 11*plus* and winch
- Seacable is typically single or multi-conductor armored cable up to 10,000 meters, with less than 350 ohms resistance
- Grounding considerations
  - Use armor of sea cable for ground
  - Remember, salt water conducts, ship is metal (usually)
  - Ground chassis of your deck unit to hull of ship

# Cabling the *9plus* to the *11plus*

**Recommended Cabling**

250 V DC

Coax or twisted pair

Center conductor (power + data)

SBE 11plus

~220 V DC

Armor (ground)

Winch

Chassis connected to hull

PIN 2    PIN 1

Seacable bulkhead connector

9plus

---

250 V DC

Coax or twisted pair

Center conductor (power + data)

SBE 11plus

~220 V DC

Center conductor (ground)

Winch

PIN 2    PIN 1

~30 V DC

Seacable bulkhead connector

9plus
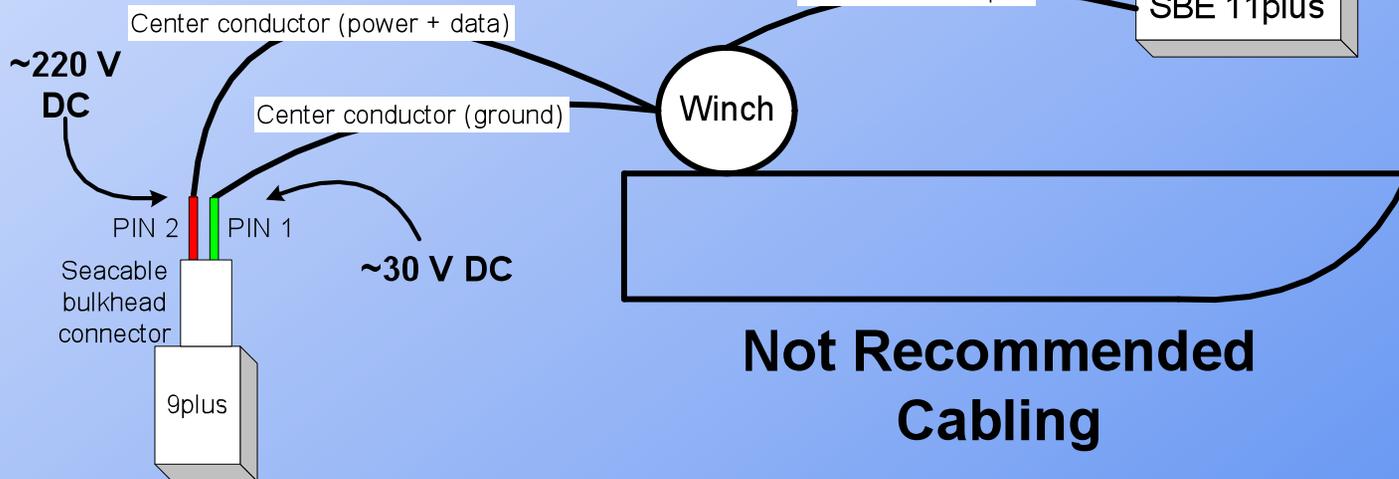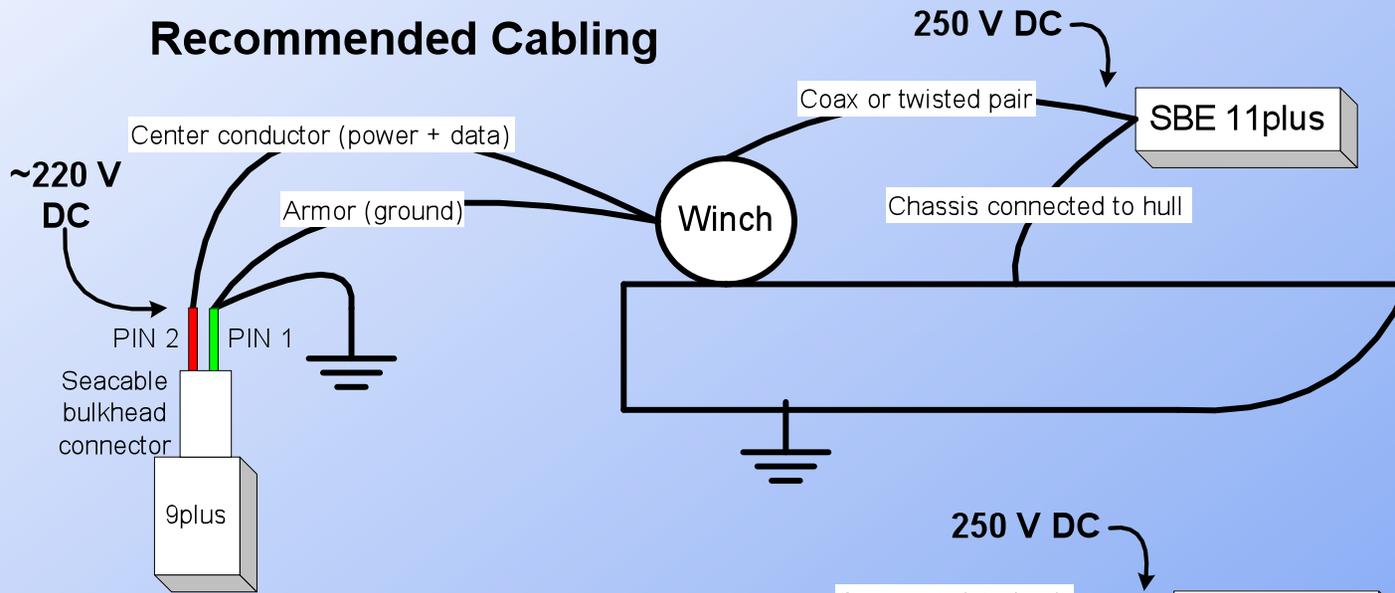
**Not Recommended Cabling**

# How Do I Make the Wet End Connection?



Armored cable

2 pin connector, RMF-2FS w/lock sleeve
pin 1 = armor
pin 2 = center conductor

Pigtail SBE #17027 RMF-2FS w/lock sleeve
pin 1 = armor
pin 2 = center conductor

P.M.I. Dam/Blok (Model 706-1202)
per sketch #M 3437-001 plus procedures

Rochester 1-H-255
(or equal)

Evergrip (P.M.I.)
Model 117-2C-L

12 inches of
cable (nominal)

18 inches from Blok
to pigtail (nominal)

Note: drawing not to scale

# Changing Batteries

NiMH Batteries

Ni-Cad Batteries
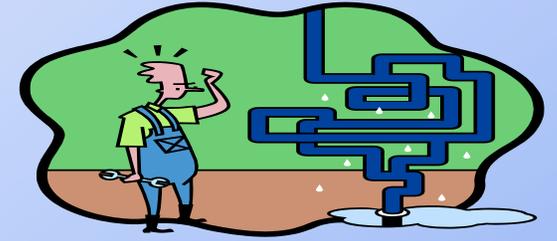
# Plumbing for Success

- Sea-Bird conductivity cells and oxygen plenums rely on water passing through them, usually via a pump

- Pump is magnetically coupled impeller type, not self-priming

- Arrange tubing on instrument package to allow all air to escape from plumbing

# Plumbing for Success

**Y Fitting Detail**

Vinyl Tubing

Air release valve

0.5 mm

UP
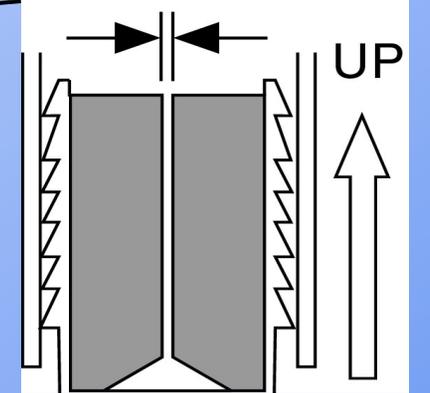
Vinyl Tubing

# Plumbing for Success
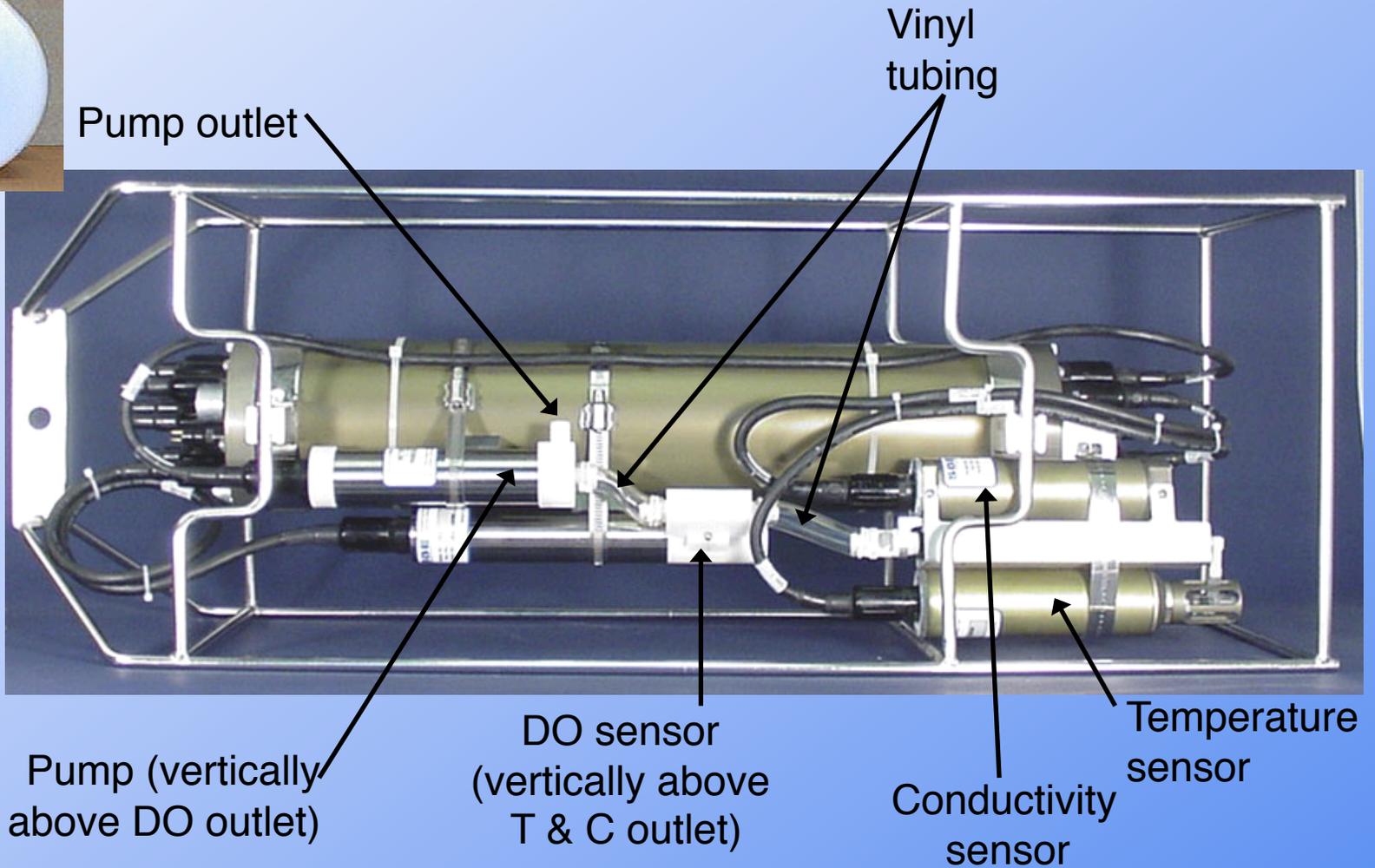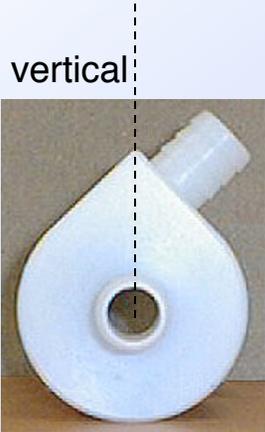
# Mating Habits of Underwater Connectors



Lubricate molded ridge on bulkhead connectors with 100% silicone grease

Slide hand toward end cap to *burp* air

Note bulge due to entrapped air
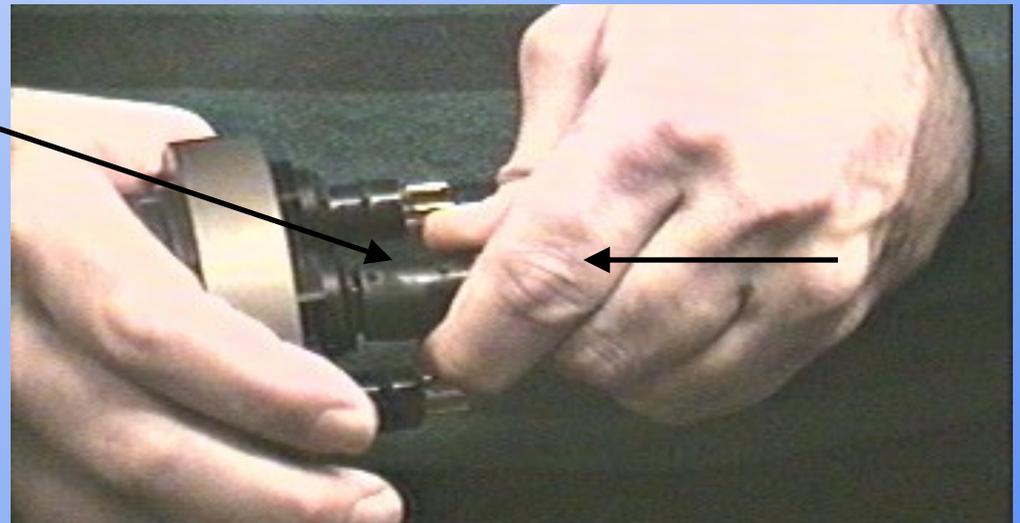
# When Underwater Connectors Go Bad
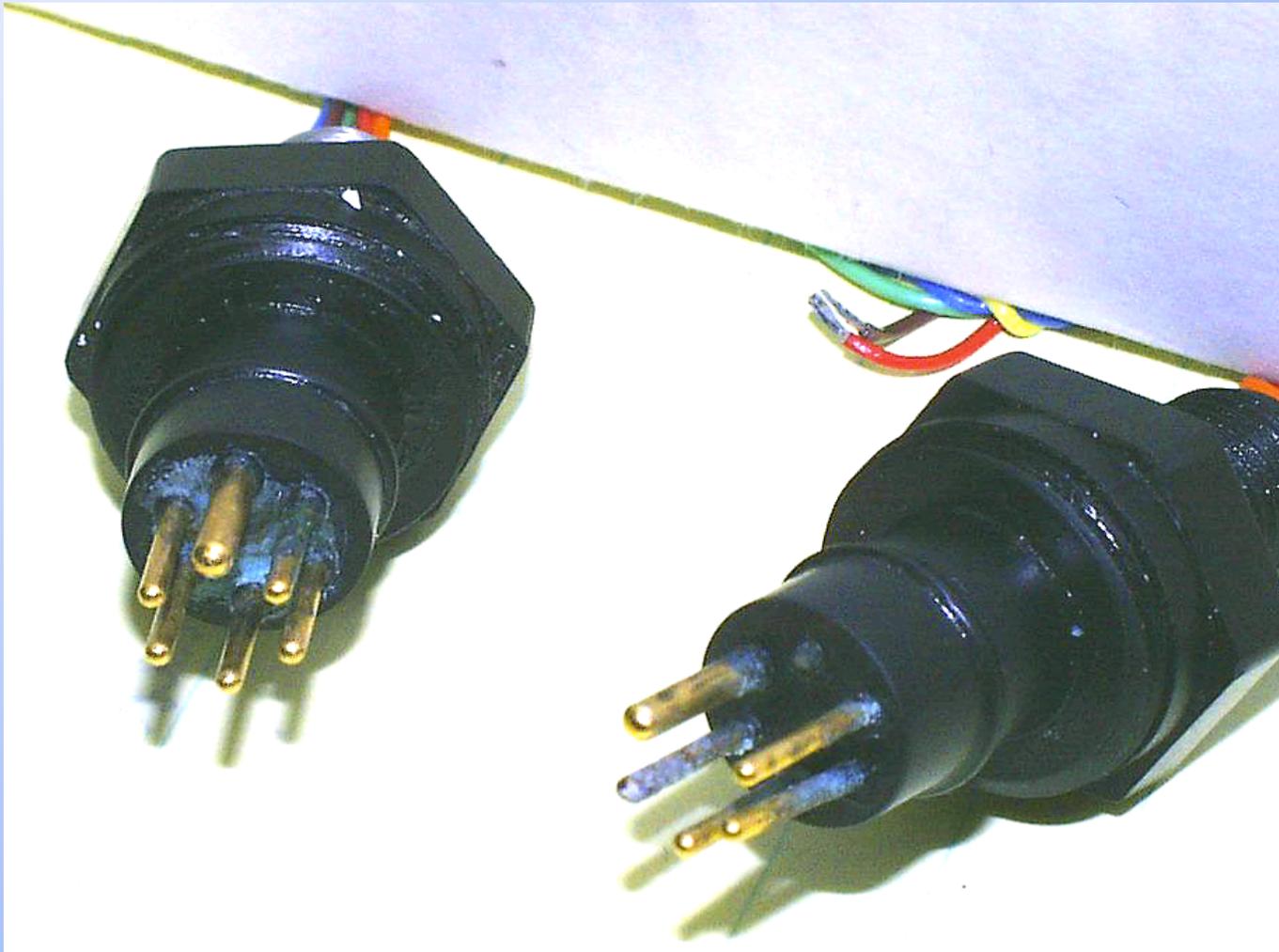
# Make a Neat Underwater Package

- Cable tie or tape all loose cabling to frame of package
  - Loose cables flap as package rises or drops, resulting in fatigue
- Make sure no cables are in path of inlet to temperature sensors
- Instrument with aluminum housing: check zinc anodes occasionally; grounding problems can cause them to disappear

# What Do You Mean, *Soak the Fish*?

- This is not done in the galley!
- Soaking means putting the instrument package over the side and into water at a safe but shallow depth (like 10 meters)
- Soaking tip: use 2 display types
  - Fixed or scrolled text display to check all sensors and other parameters on deck and during soak
  - Multi-line plot for the cast

# How Long Should I Soak?
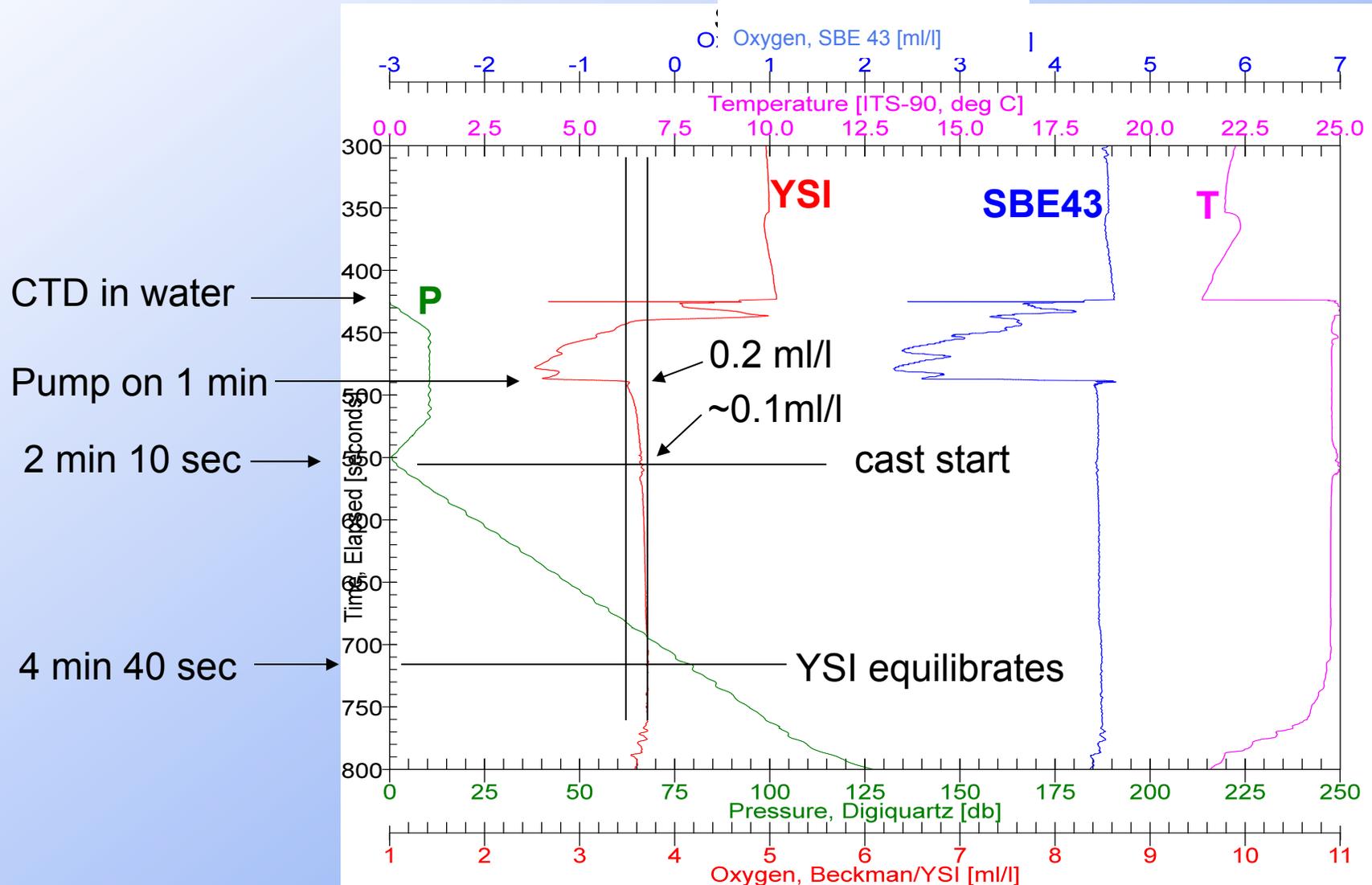
# Using Your CTD in Very Cold Places

- Glass conductivity cell is subject to breakage due to water freezing in cell

- Remove all water from conductivity cell
  - Repeated ice formation (film or droplets) on electrodes will degrade calibration at 0.001 - 0.020 PSU level

- Make a solution of 1% triton in sterile seawater
  - Use 0.5 micron filtered seawater or boiled seawater

- Never use anti-freezes like glycol or alcohol

- SBE 43 Oxygen Sensor – prevent freezing

# Correlating CTD Data with Water Samples

- Water sampler closure events are captured in data
  - GO 1015 systems mark the 9*plus* data stream with a status bit
  - SBE 32 Carousel and SBE 55 ECO systems use a list of scan numbers created by Seasave, *.bl* file
- This information is used by *Data Conversion* module to extract CTD data at time of water sampler closure into a *.ros* file
- Extracted data may be summarized into a table by *Bottle Summary* module

# Extracting CTD Data with Data Conversion

- You may create a *.cnv* and/or a *.ros* file

- The source of the data is your *.hex* or *.dat* file

- The indicator of what data to extract is a status bit in the data or a file of type *.bl*, *.afm*, or *.bsr*

- Data written to the *.ros* file is specified in the output variable selection dialog
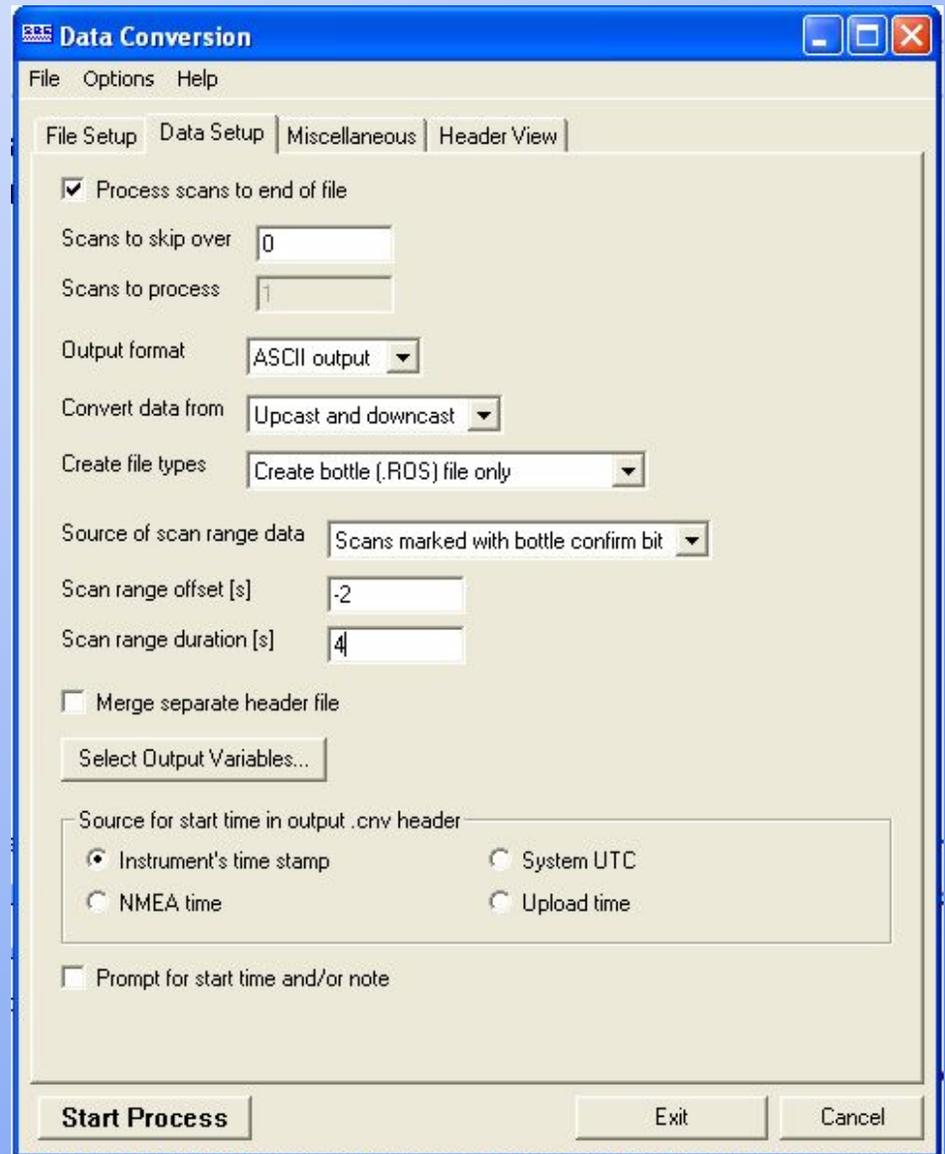
# Specifying How Much Data Per Bottle Closure

- Data extraction is referenced to the time of closure

- Scan range offset is how many seconds before the bottle closure to begin extracting data

- Scan range duration is how many seconds total to extract data

# Summarizing and Tabulating Data

- *Bottle Summary* module creates a table of averages and standard deviations from data in *.ros* file

  - *.ros* file must contain pressure, temperature, and conductivity or salinity

  - Additional parameters may be derived from averaged variables

  - Data is output to a *.btl* file

  - If a *.bl* file is present, bottle numbers are inserted in *.btl* file

# Bottle Summary

- Variables created by *Data Conversion* may be selected for inclusion in the *.btl* file

# Bottle Summary, Deriving Parameters

- Parameters derived from the averages may be added to the .btl list
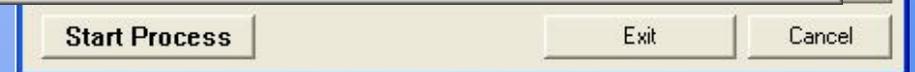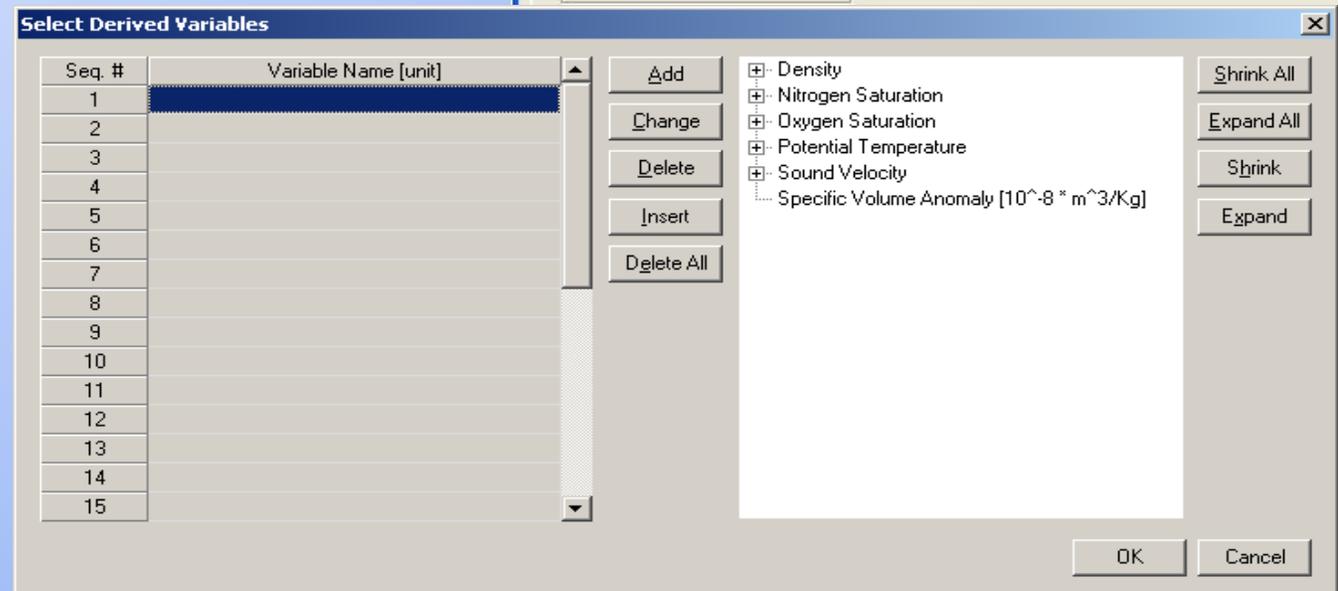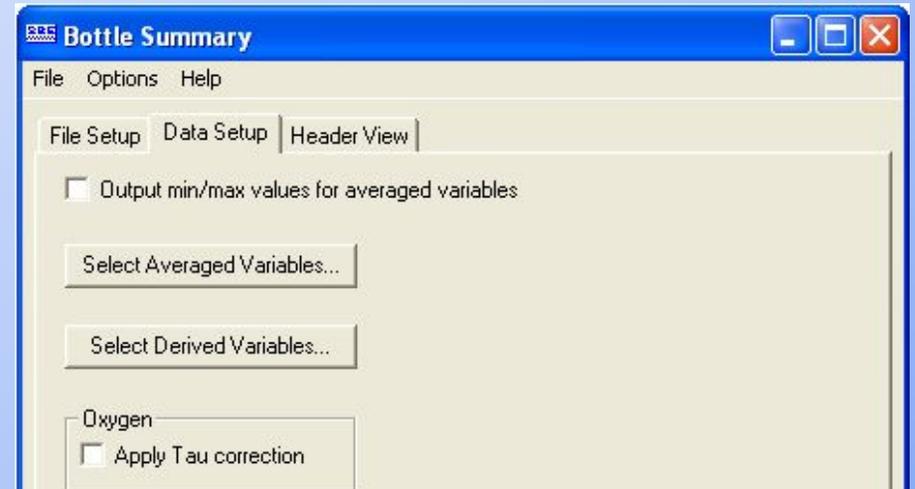
# Activity: Create *.ros* and *.btl* Files

- Use SBE Data Processing to convert data from an SBE *9plus* and create bottle files; see notes for instructions