

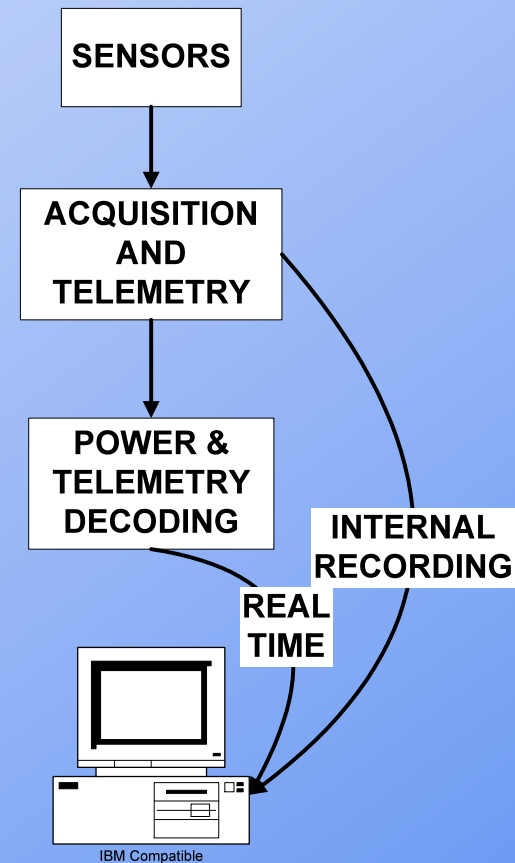


# Troubleshooting

- Real-time systems
  - SBE 911*plus*
    - Electrical problems – instrument(s), cabling
    - Physical problems
    - Pump
    - Instrument configuration / setup
    - NMEA
  - Carousel Water Sampler
  - SBE 33 or 36 Deck Unit
  - Opto / NMEA Boxes
- Internally recording CTDs
- Auto Fire Module (AFM)

# Troubleshooting: The Basics

- The first step is determining which part of the system has the problem:
  - Do the sensors have valid output?
  - Is the data properly acquired, formatted, and telemetered or stored?
  - Is the data properly received and converted to scientific units?



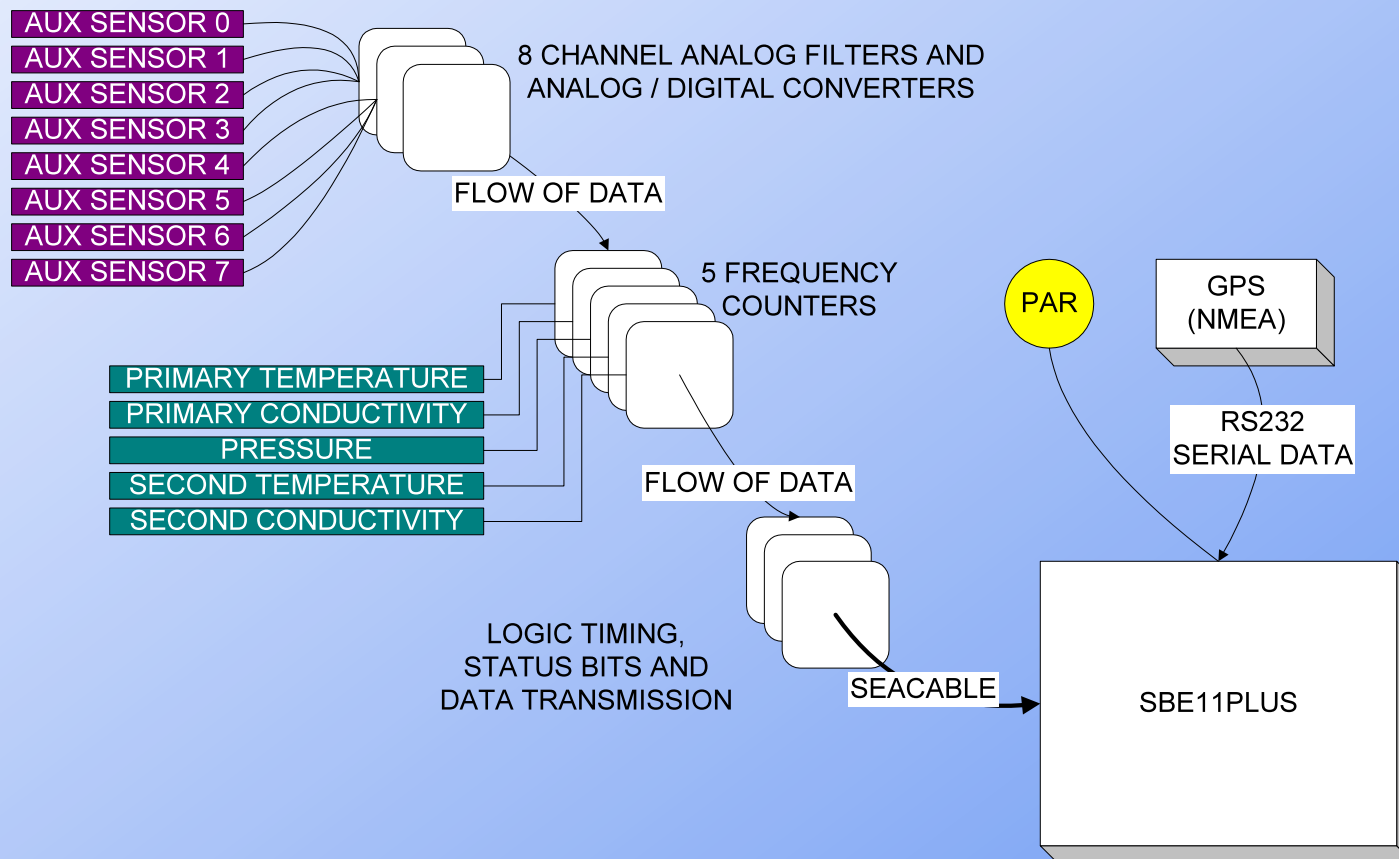


# Troubleshooting – Real-Time vs Internally Recording

- Real-time systems
  - SBE *9plus* with SBE *11plus* Deck Unit
  - SBE 33 or 36 Deck Unit with CTD
  - Opto/NMEA Boxes with CTD
  - etc.
- Internally recording instruments
  - SBE *16plus* /*19plus*
  - SBE 25
  - SBE 37
  - SBE 39
  - etc.



# SBE 9/11plus System Diagram





## Note about *9/11plus* Data Flow

- *9plus* data is transmitted serially
  - First are the status bits
  - Second are the frequency channels
  - Last are the A/D channels
- A bad printed circuit card will shorten the length of each data scan
  - A bad A/D board will result in no A/D data
  - If the first frequency counter is bad, there will be no A/D data and the first frequency will be missing
  - If the third frequency counter is bad, there will be no A/D data and the first and second frequency will be missing
  - And so on....



# SBE 11*plus* Deck Unit

- No lights on the deck unit front panel
  - Check the main power fuse (2 A slow blow for 120 V and 1A slow blow for 240 V supply).
  - Check that power is being supplied to the deck unit (120 or 240 VAC)!
- Most lights on, but green data light not lit
  - Check the sea cable fuse (1/2 A fast blow).
  - Check that the underwater unit is receiving power – *be careful* (250 VDC)!



# Auxiliary Sensor (0 – 5V analog) Not Working (no signal)

- Could be the sensor
  - Swap sensor for another on a working channel, check deck unit. Note: 4095 A/D counts = 0 V, 0 A/D counts = 5 V
- Could be the cable
  - Check bulkhead connectors for signs of corrosion
  - If possible, swap in a spare cable
- Could be the low pass filter card or the A/D card
  - Channels 0 – 3 are on one low pass filter card, 4 – 7 on other; try both cards
  - If no channels are working, it is probably A/D card or first frequency counter card is not passing A/D data to next counter card



# Auxiliary Sensor (0 – 5V analog) Not Working (no signal) (continued)

- Test the voltage channel with a ‘D’ Cell battery
  - Referencing the end cap drawing for the SBE *9plus*, connect the positive terminal to signal and the negative terminal to signal ground
  - A new ‘D’ cell should read approximately 2800 on the deck unit display or 1.5VDC for the voltage channel in Seasave
- Check that power is being supplied to the sensor
  - Referencing the end cap drawing for the SBE *9plus*, connect a voltmeter between pins 1 and 6 of the 6-pin connector
  - There should be approximately 14VDC between pins 1 and 6 with the deck unit powered on





# Temperature, Conductivity, or Pressure Not Working (no signal)

- Check the sensor
  - Swap the sensor for another on a working channel, check the deck unit
- Check the cable
  - If the sensor works on another channel, swap cables
- Check the counter card
  - If the primary T or C is affected, switch to the secondary T or C
  - If pressure is affected, open the SBE *9plus*, swap counter cards, and check the deck unit display
- Check that power is being supplied to the sensor
  - Referencing the end cap drawing for the SBE *9plus*, connect a voltmeter between pins 1 and 3 (for temperature or conductivity channel) of the 3-pin connector
  - There should be approximately 14VDC between pins 1 and 3 with the deck unit powered on



# Pump Not Working

- Could be the pump
  - Hook the pump up directly to a 12 VDC power supply, and verify the pump impeller is spinning
  - Swap the pump out if a spare is available
- Could be the cable
  - Install a spare cable if possible



# Pump Not Working (continued)

- Test the pump on deck (standard pump circuitry)
  - Temporarily connect the primary temperature sensor to the primary conductivity channel (JB2)
  - The primary conductivity frequency must be greater than 3500 Hz for 60 seconds to turn the pump on (monitor the frequency on the deck unit display)
  - Turn the deck unit on
  - The pump should be powered after 60 seconds
  - Verify the pump impeller is spinning



# Pump Not Working (continued)

- Test the pump on deck (water contact pin)
  - Connect a jumper from the contact pin to one of the end cap screws
  - Turn the deck unit on
  - After 60 seconds the pump should be powered
  - Verify the pump impeller is spinning
- Test the pump on deck (modem controlled turn-on)
  - Start real-time acquisition in Seasave (second communication port must be connected to the modem channel)
  - Select *Pump On* in the Real-Time Control menu
  - Verify the pump impeller is spinning



# Modulo Errors

- Modulo errors are normally a symptom of sea cable issues
  - A modulo error will normally cause a spike in **ALL** of the sensors installed on the *SBE 9plus*
  - If the number of modulo errors increases over time, it may be necessary to re-terminate the sea cable connection
  - All cables and connectors on the *SBE 9plus* and sensors should be inspected for any signs of corrosion or excessive wear



# How Can I Tell if My Wet End Termination Needs to be Replaced?

- Intermittent data dropouts, error light blinks on deck unit, check modulo errors
- Sea cable fuse blows in deck unit
- Fish works fine on test cable
- Fish works on deck, but not underwater



# How Do I Know It Isn't the Slip Ring?

- Disconnect fish and deck unit
- Connect volt meter to signal wire and sea cable armor; check for small DC voltage
  - Wet end terminations usually fail when seawater intrudes into splice between underwater connector and cable. Dissimilar metals and seawater will cause a battery to be formed. This manifests itself as a small DC voltage between signal wire and armor.



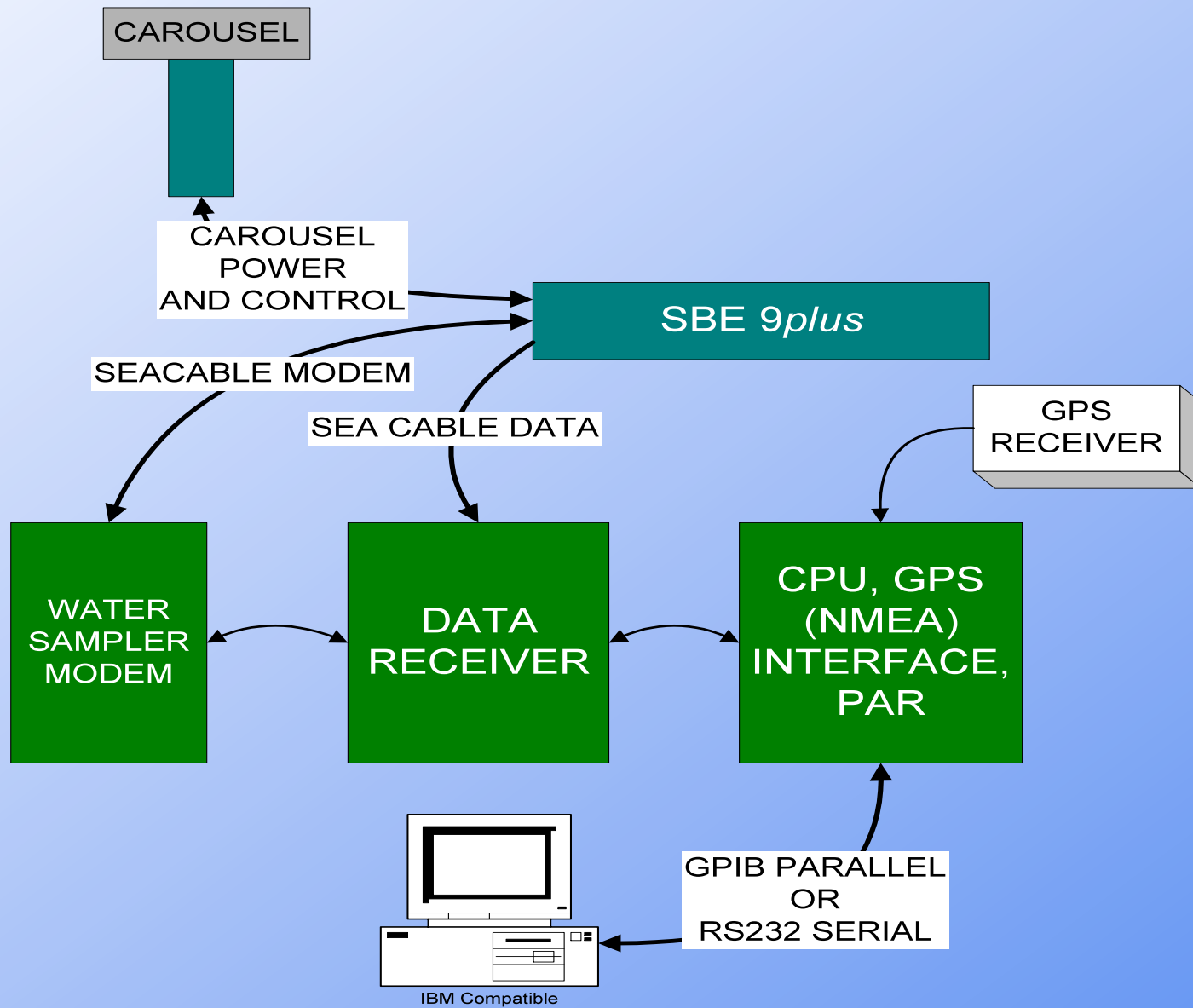
# Why Can't I Use the Ohm Setting on My Multimeter?

- You can BUT:
  - 10 kilometers of cable has capacitance, and when wound on winch spool may have some inductance
  - These properties can give confusing readings on your multimeter in Ohm setting





# SBE 9/11plus Communication





## SBE 11*plus* Fish/Tape Switch

- Fish/tape switch
  - If the fish/tape switch is accidentally moved to the tape position, the display will show all 0's



# SBE 11*plus* Deck Unit Communications

- Baud Rates
  - Normally 19200 baud from the computer to the deck unit
  - Modem channel is 300 baud from the computer to the deck unit
- Two communication ports must be available to acquire real-time data and fire bottles from the computer



# SBE 11*plus* Deck Unit, No Communication with Computer

- Green *Computer Interface Receive* LED does not flash
  - Check cable
  - Check serial port
  - Wrong interface selected
- Red *Underwater Unit Error* LED does not flash during initialization
  - Wrong baud rate



# SBE 11*plus* Keeps Blowing Fuses

- Main power fuse
  - If the main power fuse continues to blow when the deck unit is powered on and the sea cable is not connected, the main supply transformer could be bad
- Sea cable fuse
  - Disconnect equipment until fuse does not blow
    - Disconnect the SBE 9*plus*
    - Disconnect the sea cable
    - Connect the SBE 9*plus* to the deck unit using a test sea cable



# Troubleshooting NMEA Interface

- Navigational data must be in the proper format, NMEA 0183
- It must transmit at the proper speed, 4800 baud (9600 also available for SBE 11*plus*), with 8 data bits and 1 stop bit, no parity
- Use the NMEA simulator program NMEATest (supplied with the software CD and installed in the SBE Data Processing folder on your computer)
- Capture some data from your GPS for comparison



# NMEA Simulation

- Sea-Bird provides a simulation program that you can run on a second computer or on the same computer if the computer has a spare COM port
  - Cable your computer to the NMEA port on the deck unit
  - Run the simulator program; if it works, the problem is with your cabling or your GPS



# Capture Some Data for Comparison

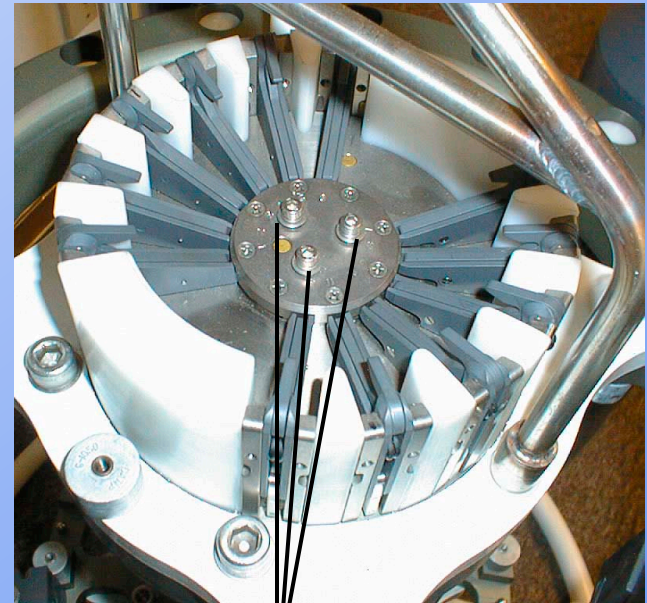
- Cable your computer to your GPS
- Use Seaterm to check the transmit speed, data bits, etc.
- Use Seaterm to capture some data to compare with the standard NMEA formats shown in the deck unit manual





# Water Sampler Physical Problems

- Soak triggers in soap and water
- Never lubricate triggers
- Check 3 screws holding trigger assembly to pylon for over-tightening, which causes distortion of trigger assembly
- Lanyards must run straight from trigger to water sampler



Check screws for  
over-tightening



# Water Sampler Electrical Problems

- SBE 11*plus* carrier detect LED must be lit and 9*plus* carrier detect bit must be set
- Computer must have a functioning second communication port for sampler control
- SBE 11*plus* modem board switch settings must match sampler type (G.O. 1016, SBE 32, etc.)
- Check cables
  - If the cable is suspected, install a spare cable if possible



# Deployment Problems

- All the air must be able to escape your plumbing
- The pump turn-on is triggered by the rising conductivity signal
- SBE 13 and SBE 23 dissolved oxygen sensors have a long turn-on transient, up to 10 minutes



# Troubleshooting Data Problems

- There are only two ways you can ruin your data:
  - Deleting your *.dat* or *.hex* file
  - Opening and then saving your *.dat* file with a word processor
- There are many ways you can produce useless data by making errors in processing
  - Mismatching instrument setup and configuration (*.con* or *.xmlcon*) file
  - Having errors in calibration coefficients in *.con* or *.xmlcon* file



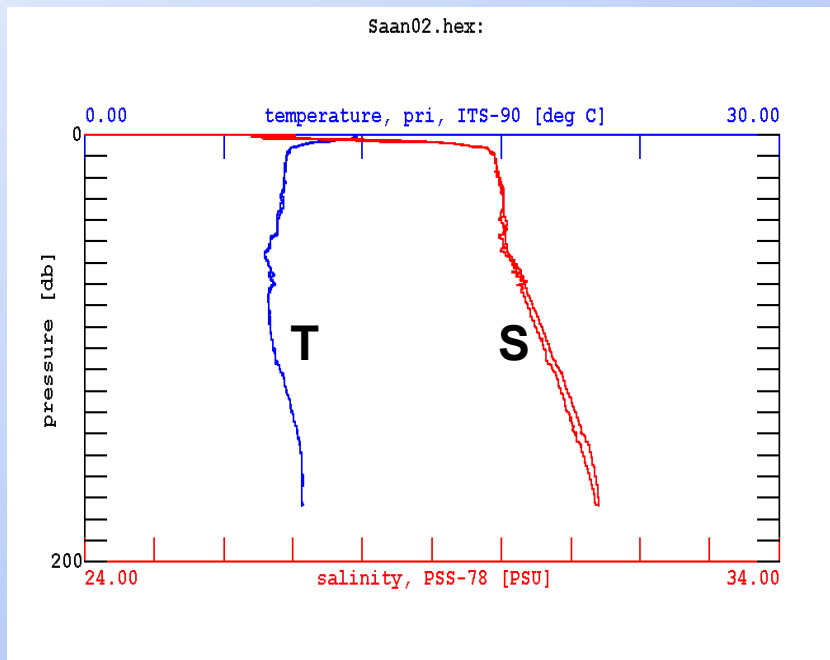
# Data Scan Mismatch

- Internally recording instruments have varying scan length depending on the number of voltages that are stored
- The SBE *9plus* has varying scan length, because unused voltage or frequency channels can be suppressed
- However, *Seasave* and *Data Conversion* both check the scan length of the configuration (*.con* or *.xmlcon*) file against the *.dat* or *.hex* file.

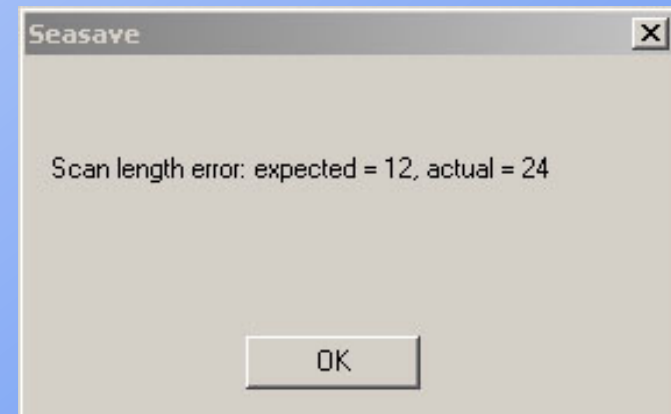
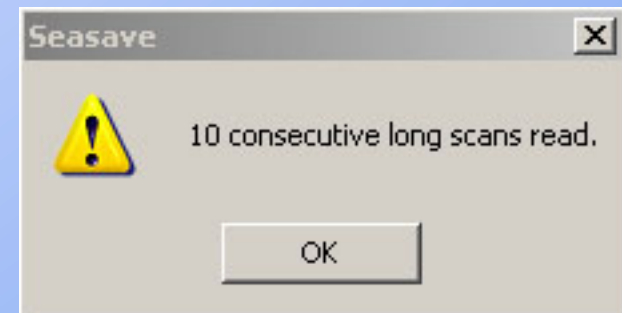


# Internal-Recording Scan Mismatch Example

Correct scan length



Incorrect scan length



# Troubleshooting Activity

- What is wrong with this instrument?

