


Module 5

Miscellaneous Applications and Troubleshooting

Overview



**Miscellaneous Applications
and Troubleshooting**

- Fresh water applications
- Sound velocity
- Adding navigational information to your data
- Collecting surface PAR while taking a cast
- Collecting data from instruments that are not supported by Seasave
- Adding a 9600 bps serial data stream to your 9/11*plus*
- Thermosalinographs
- Troubleshooting CTD systems

In this module we will discuss somewhat less common applications and troubleshooting.

By the end of this module you should be able to:

- Operate your CTD in fresh water.
- Speak knowledgeably about techniques of measuring sound velocity.
- Add navigational information to your CTD data.
- Collect surface PAR data with your cast.
- Display data collected from instruments not supported in Seasave in a meaningful way.
- Know what options to have installed if you need to add a serial instrument to your instrument package.
- Set up and operate an SBE 21 or SBE 45 thermosalinograph,
- Do some basic troubleshooting.

Fresh Water Applications



Fresh Water Applications

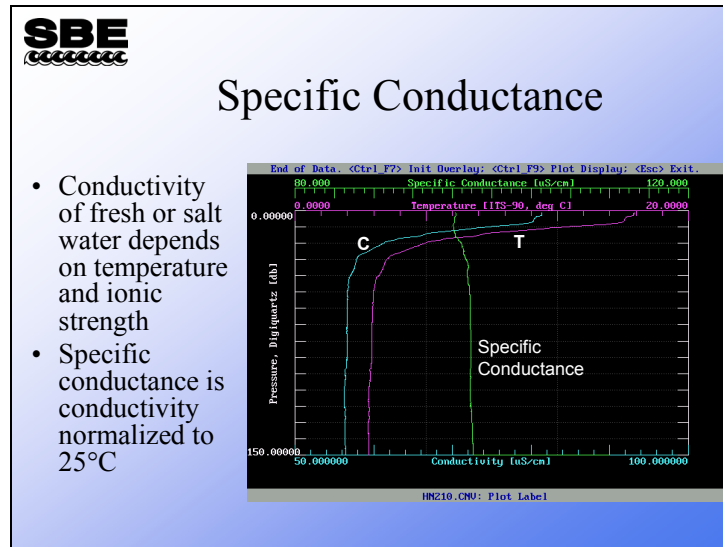
- Fresh water has much lower conductivity than salt water
- When the conductivity sensor frequency reaches a threshold, the pump is turned on
- The conductivity threshold may be set for the 19, 19*plus*, 25, and 49
- For a 9/11*plus*, the pump may be turned on from the computer keyboard

Using a CTD in fresh water requires some modification of the instrument setup for internally recording instruments or of hardware for the 9*plus*. The issue is the pump turn-on signal. As delivered, Sea-Bird instruments are configured for use in saltwater. They sense the rising conductivity frequency associated with immersion in saltwater, and turn on the pump after a short delay that allows the air in the plumbing to escape.

In internally recorded instruments and the SBE 49, the user can set the pump turn-on threshold frequency. For fresh water, this should be set to 5 Hz above the frequency seen at zero conductivity (wet cell rinsed with deionized water). However, values closer to the zero frequency may be required; check your data carefully to make sure the pump is turning on properly.

SBE 9*plus* CTDs may have optional hardware that allows the operator to turn on the pump from the computer keyboard.

Specific Conductance



- Conductivity of fresh or salt water depends on temperature and ionic strength
- Specific conductance is conductivity normalized to 25°C

The conductivity of fresh or salt water is strongly dependent on temperature. Specific conductance is used to visualize the conductivity without the temperature dependence. The equation shown below has the effect of normalizing the conductivity to 25° C.

$$\text{Specific Conductance } (\mu\text{mhos} / \text{cm}) = \frac{(C \times 10,000)}{(1 + A \times (T - 25))}$$


where:

A = 0.019 to 0.020 = thermal coefficient of conductivity for natural salt ion solutions (Seasoft uses this formula with A = 0.020)

C = conductivity [S/m]

T = temperature [°C]

Sound Velocity



CTD and Sound Velocity

- SV +/- 0.05 m/s calculated from temperature, salinity, and pressure requires:
 - Temperature at +/- 0.028 deg C
 - Salinity at +/- 0.040 PSU
 - Pressure +/- 3 decibars
- Direct measurement of SV (with typical 20 cm path length) to +/- 0.05 m/s requires:
 - Time of flight measurement of +/- 4 nanoseconds
 - Path length maintained within +/- 0.007 mm
 - Calibration against CTDs or same references used to calibrate CTDs


Sound velocity (SV) sensors measure the flight time of a pulse of sound between transducers. To meet the ± 0.05 m/s specification of a typical 20 cm path SV sensor, the time of flight must be measured to within about 4 nanoseconds. The electronics to perform this are difficult but feasible; however, the time delays associated with the acoustic transducers cannot be maintained over pressure and temperature.

While the dependence of SV on time and distance implies that calibration is not required, in practice the distance (within necessary accuracy of $20 \text{ cm} * [0.05 \text{ m/sec}/1500 \text{ m/sec}] = 0.0007 \text{ cm} = 0.007 \text{ mm}$, at nominal 1500 m/s SV) cannot be established from a physical measurement of path length. This is not caused by uncertainties in mechanical dimensions; but by uncertainties in how deep into the acoustic transducer the sound pulse is when the electrical signal is generated. Accordingly, all direct SV sensors are bath-calibrated (against a CTD or the usual references used to calibrate CTDs - SPRT, Autosal, etc.).

To meet a 0.05 m/s specification, a CTD can be wrong in temperature by 0.028 °C; in salinity by 0.04 PSU; and in pressure by 3 decibars.

The linkage between CTD and SV (Chen and Millero) is part of the equation of state 1980. This international usage and recognition not only leads to the highest level of accuracy, but ensures that CTD-based SV measurements are intercomparable no matter where and when taken.

Adding Navigational Data



**Adding Navigational
Information to Your Data**


- Latitude and Longitude transmitted from a GPS in NMEA format 0183 can be appended to each data scan in an SBE 11*plus*, 33, or 36 Deck Unit

```
SGPGGA,191133.191,3022.9781,N,08937.3574,W,1,08,1.1,037.1,M,026.1,M,,*73
SGPGXP,191133,3022.9781,N,08937.3574,W*51
SGPGLL,3022.9781,N,08937.3574,W,191133.191,A*23
```

In Seasave, navigational data transmitted in NMEA format 0183 is appended to real-time data if you select *NMEA position data added* in the instrument configuration (.con) file dialog box. Navigational data is also added to the file header at the start of the cast. And, navigational data can be written to a separate .nav file at user-selected points in the cast.

A NMEA interface is available in all Sea-Bird deck units – SBE 11*plus*, 33 (NMEA interface optional), and 36. The *Seacat/Sealogger RS-232 and Navigation Interface Box* (sometimes called the NMEA Interface Box or Opto-Box) that is used with internally recording instruments or the SBE 21 thermosalinograph also has a NMEA interface.

Adding Surface PAR



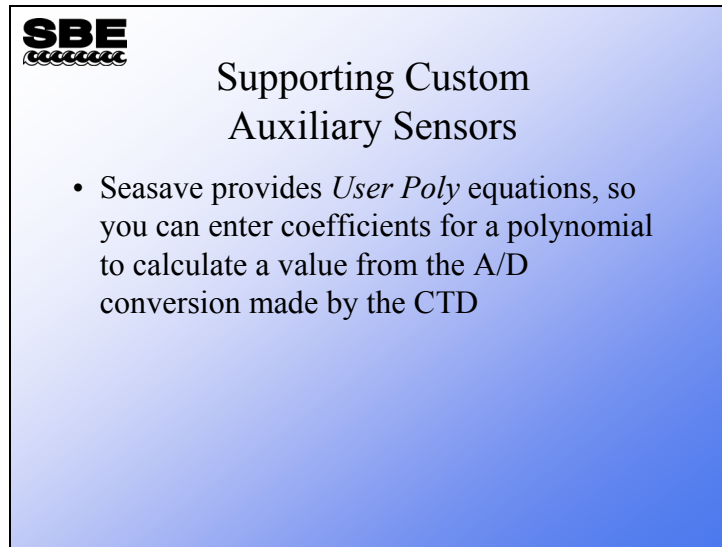
Collecting Surface PAR

- The SBE 11*plus*, 33 or 36 will sample a PAR (Photosynthetically Active Radiation) sensor that is on the ship, for comparison with a PAR sensor mounted on the instrument package
- Each sample is appended to a data scan from the CTD

Sea-Bird deck units may be equipped with an A/D interface intended to digitize the signal from a deck-mounted PAR sensor. This is standard equipment for the SBE 11*plus* and optional for the SBE 33 and 36. In Seasave, Surface PAR data is appended to real-time data if you select *Surface PAR voltage added* in the instrument configuration (.con) file dialog box.

The deck-mounted PAR sensor is used in conjunction with a PAR sensor mounted on the instrument package.

Supporting Custom Auxiliary Sensors



For instruments that are not supported in Seasave, a meaningful display of data can be made by specifying a *user polynomial* to be applied to the 0 – 5V data. The user polynomial can be up to 3rd order:

$$\text{Val} = a0 + (a1 * V) + (a2 * V^2) + (a3 * V^3)$$

where:

V = voltage from sensor

a0, a1, a2, and a3 = user-defined sensor polynomial coefficients, specified in the instrument configuration (.con) file

Adding 9600 Baud Data Channel to 911*plus*



Adding a 9600 Baud Data Channel to a 9/11*plus*

- A 9600 Baud data channel can be multiplexed into the 9*plus* data stream
- This data channel is an uplink only
- Commands may be sent down via water sampler channel
- Designed for multi-channel spectrometers
- May be used by any serial instrument
- Data is broken out separately at 11*plus*

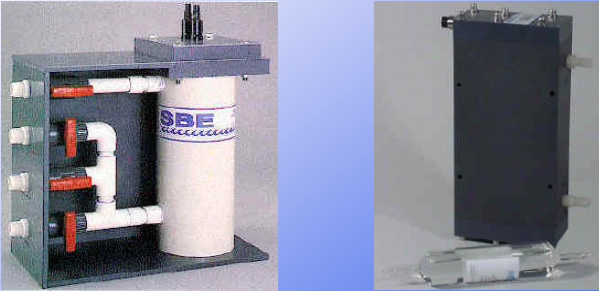
As optional equipment, a 9600-baud serial channel can be multiplexed into the 9*plus* data stream, allowing external instruments that transmit serial data at 9600 baud or less to send their data up the sea cable. This data channel was designed for multi-channel spectrometers; however, it has also been used with acoustic Doppler current meters.

The 9600 baud channel can also be used with an instrument that transmits at 19200 baud in *burst* mode, so that the overall rate of transmission does not exceed 9600 baud.

Thermosalinographs


SBE
Thermosalinographs

- SBE 21 and SBE 45
- Thermosalinographs are used aboard ships to map sea surface parameters



Thermosalinographs are used to collect information about the sea surface; typically in flow-through systems operating continuously throughout a cruise. They are included in the profiling section of the course because they are installed on many research vessels. Thermosalinographs are typically installed inside and near to the hull of a ship in order to make measurements on uncontaminated seawater. Optionally, you can plumb other types of sensors into the system for a wider range of measurements.

Thermosalinographs (*continued*)



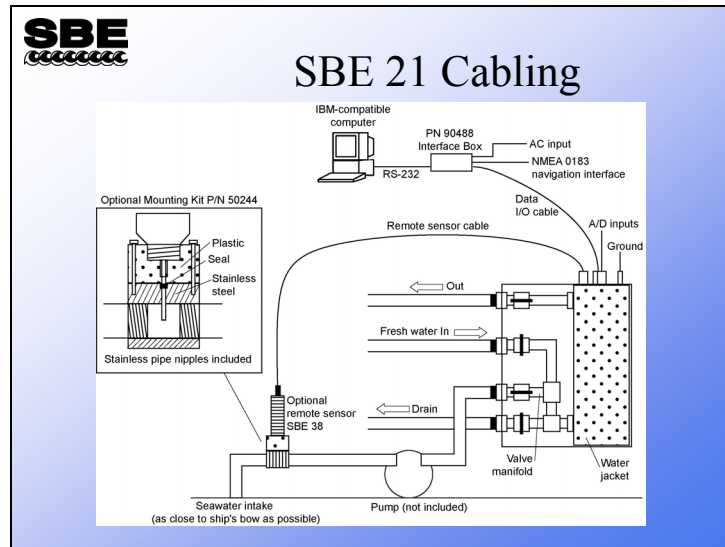
SBE 21 and SBE 45

- SBE 21
 - Storage in 8 MB internal memory
 - Sampling interval from 3 seconds – 10 minutes
 - Remote temperature port
 - Supports four 0 – 5V auxiliary instruments
 - Fluorometer, dissolved oxygen, pH, turbidity
 - Data transmission to remote computer via *Seacat/Sealogger RS-232 & Navigation Interface Box*
 - Navigational input via NMEA 0183 interface in Interface Box
- SBE 45
 - Temperature and salinity only
 - No memory or external sensors
 - Flexible sampling protocols
 - Remote temperature and/or NMEA 0183 navigational input via optional *SBE 45 Power, Navigation, & Remote Temperature Interface Box*

The SBE 21 is the more capable of Sea-Bird's thermosalinograph offerings, supporting a variety of auxiliary sensors and a remote temperature sensor, which is used when the thermosalinograph cannot be mounted close to the sea water inlet. The remote sensor allows a temperature measurement to be made on water that has not been warmed or cooled by a long trip through a pipe. Salinity, of course, does not change with temperature, so the conductivity measurement is valid even though the water may have changed temperature on its journey to the thermosalinograph. The SBE 21 also comes with an Interface Box, which accepts navigational data and appends the data to the SBE 21's data stream.

The SBE 45 does not have the capability to directly integrate remote temperature or navigational data. However, the SBE 45 can be used with an optional Interface Box, which accepts remote temperature and navigational data, and appends the data to the SBE 45's data stream.

Thermosalinographs (*continued*)



If you want to include navigational (GPS) information in your thermosalinograph data record, you will have to use a *PN 90488 Seacat/Sealogger RS-232 and Navigation Interface Box* (sometimes called an *Opto-Box* or *NMEA Interface Box*) and log your data with Seasave. The GPS data is very useful for mapping sea surface conditions. The *Interface Box* provides power and melds the SBE 21 data with the GPS data. Because the GPS data cannot be input directly to the SBE 21, you must devote a computer to data collection via Seasave.

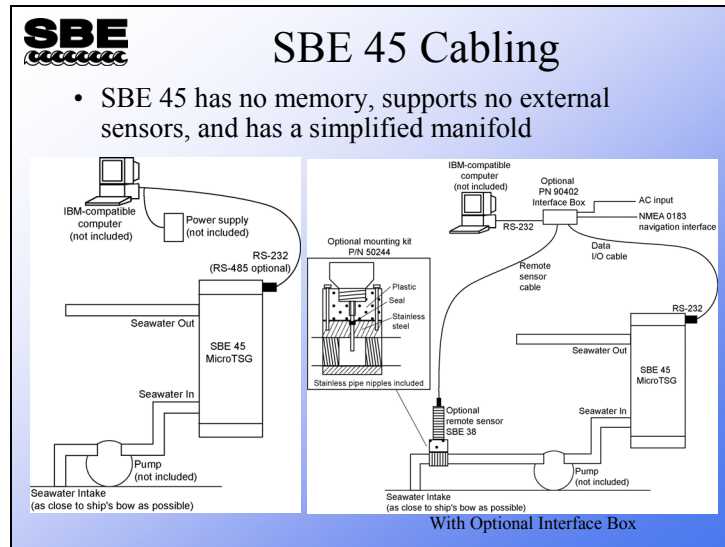
Thermosalinographs (*continued*)



SBE 21 Setup and Memory Endurance


- Use terminal program to:
 - Set time and date, and external sensors to log
 - Set sampling scheme and sample interval – continuous at 4 Hz (averaging every *sample interval* seconds) or 1 sample every *sample interval* seconds
 - Begin sampling with **GL** command
- Capture data with terminal program or view it with Seasave
- SBE 21 comes with 8 Mbytes of memory
 - Temperature and conductivity require 4 bytes
 - Each voltage adds 1.5 - 2 bytes (6 bytes total for 4 voltage inputs)
 - Remote temperature adds 3 bytes
- SBE 21 continues to transmit after memory is full
- Inter-record headers are written at 1000 scan intervals

Thermosalinographs (*continued*)



As mentioned previously, the SBE 45 does not have the capability to directly integrate remote temperature or navigational data. However, it can be used with an optional Interface Box, which accepts remote temperature and navigational data, and appends the data to the SBE 45's data stream.

Thermosalinographs (*continued*)



SBE 45 Sampling Protocols and Setup

- Sampling protocols:
 - Polled -- 1 sample is taken and sent to computer
 - Autonomous -- samples are taken on user-input time interval and sent to computer
 - Serial line sync -- pulse on serial line awakens SBE 45; it takes and transmits a sample and goes to sleep
- Use terminal program to:
 - Set time and date and data output (can output sound velocity and salinity, as well as temperature and conductivity)
 - Set sampling scheme and start sampling
- Capture data with terminal program or view it with Seasave

The SBE 45 offers three sampling modes:

- Your computer can ask for a sample; the SBE 45 will take one sample and send it to your computer.
- The SBE 45 will sample at regular intervals and transmit the data.
- A pulse on the serial line (your computer sends a character) causes the SBE 45 to send a sample.

Thermosalinographs (*continued*)




Thermosalinograph Calibration

- Temperature calibration is best done yearly
- Conductivity calibration depends on the environment that the thermosalinograph is used in
- Comparison to bucket samples or samples drawn off the manifold are best indicator

These are recommendations only; the conductivity calibration depends on the environment that the thermosalinograph is operated in.

Thermosalinographs (*continued*)

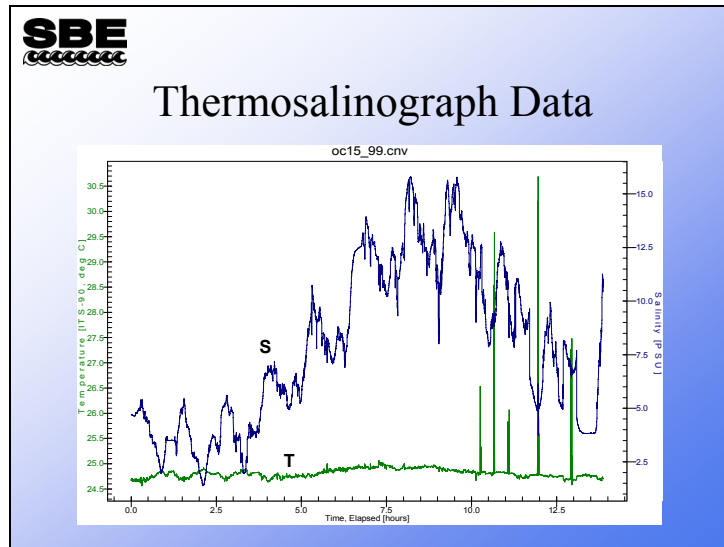


Thermosalinograph
Maintenance

- Flush with fresh water periodically
- Replace anti-foul cylinders every 6 months
- Rinse conductivity cell with non-ionic detergent weekly
- For prolonged storage of the SBE 21, remove electronics from manifold and loop a distilled water filled tube from inlet to outlet of conductivity cell

If you have a great deal of biological activity, you should provide more care for your thermosalinograph. Organisms really like pumped systems because they can settle in and have a 24-hour constant flow of seawater past them; it is *little-creature heaven*. Harbors and coastal areas tend to have more contaminants in the water. Use the bucket samples discussed in the last slide to decide when to clean and calibrate you equipment.

Thermosalinographs (continued)



Thermosalinographs – Example Installation and Data

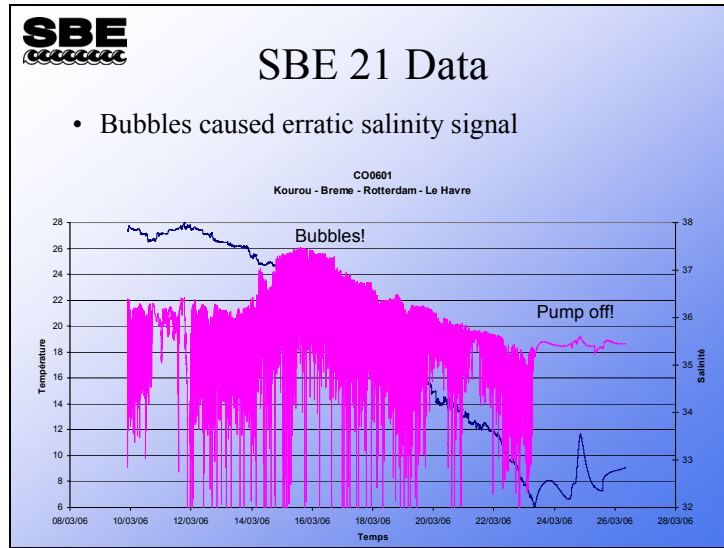
SBE
SBE

Typical SBE 21 Installation

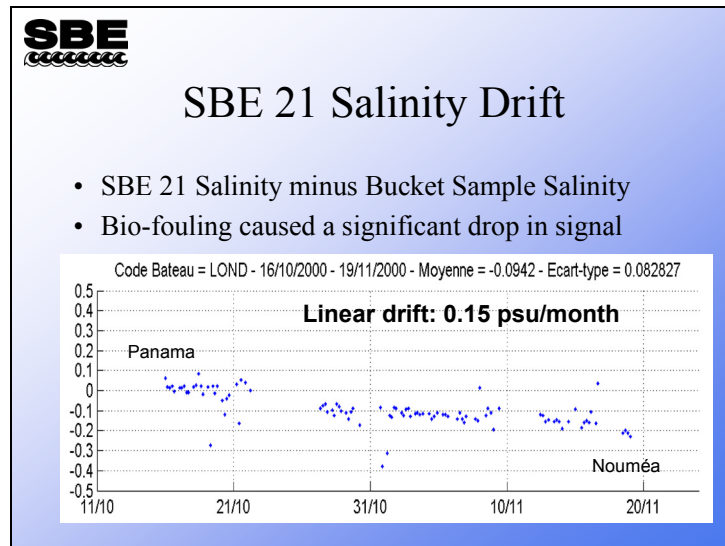


Installation on Nuka Arctica (with pCO2 system)

Thermosalinographs – Example Installation and Data (continued)



Thermosalinographs – Example Installation and Data (continued)



For sharing his photograph and data with us, we are grateful to Gilles Reverdin, a French scientist of CNRS, working at LOCEAN laboratory in Paris.

Troubleshooting

SBE
Sensors & Telemetry


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?

```
graph TD; S[SENSORS] --> A[ACQUISITION AND TELEMTRY]; A --> P[POWER & TELEMTRY DECODING]; P --> I[INTERNAL RECORDING]; P --> R[REAL TIME]; R --> M[Monitor];
```

Next we will discuss troubleshooting. Troubleshooting is an art based on a fundamental understanding of the way your equipment is supposed to work. We will attempt to cover the most common problems in this broad topic, ranging from problems with electronic circuits to mechanical parts that need to be cleaned.

Troubleshooting: Real-Time Systems

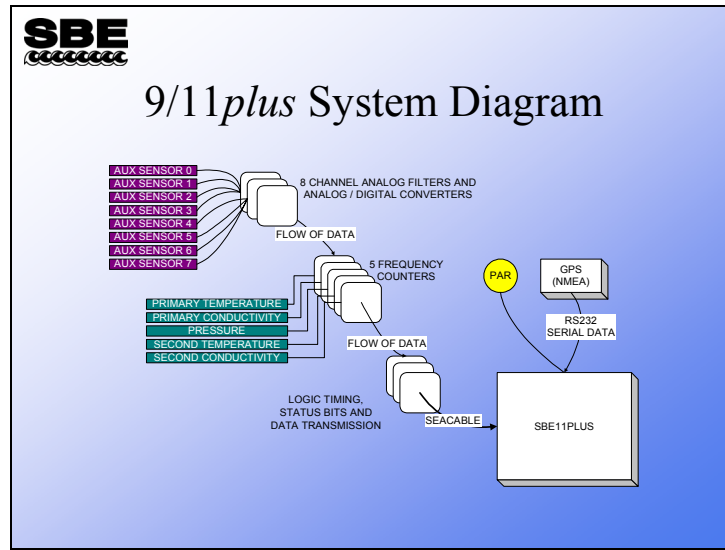


Real-Time Systems

- No lights on the deck unit front panel
 - Check the power fuse!
 - Check that power is being supplied to the deck unit.
- Most lights on, but green data light not lit
 - Check the sea cable fuse.
 - Check that the underwater unit is receiving power – **be careful** (220 VDC)!


After the obvious things, like checking the fuse and the power outlet the deck unit is plugged into, check that the underwater unit is receiving power. If you disconnect the sea cable underwater connector from the CTD, you should find a large DC voltage (150 – 250V) between the large pin and the small pin. Note that the large pin is ground. Real-time systems that are running via an *Interface Box* or *Opto-Box* will have only 10 – 15 volts across the sea cable connector.

Troubleshooting: 911plus



The 9/11plus is a highly modular system. You can exploit this characteristic of the instrument in troubleshooting. You can swap sensors, swap cables, and if necessary, swap printed circuit boards to see if trouble follows any one of these components.

Troubleshooting: 911plus (continued)



A Note About 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....

The 9plus transmits its data serially. A sensor, or in the case of analog channels a group of sensors, is measured and the data is passed from one circuit board to the next and through the output section onto the sea cable. Therefore, if one PCB malfunctions, the data from all the cards below it will be missing from the data stream. You can check out each channel in the data stream via the 11plus front panel display.

Troubleshooting: 911*plus* (continued)



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

The front end of the analog-to-digital system consists of 2 printed circuit boards with 4 channels on each. If you have problems in one channel, switch to the other analog input card. If the problem disappears, it is in the analog input PCB. If the problem persists, it may be in the analog-to-digital conversion PCB.

Troubleshooting: 911*plus* (*continued*)




Temperature, Conductivity, or Pressure Not Working (No Signal)

- Could be the sensor
 - Swap the sensor for another on a working channel, check the deck unit
- Could be the cable
 - If the sensor works on another channel, swap cables
- Could be the counter card
 - If the primary T or C is affected, switch to the secondary T or C
 - If pressure is affected, open the 9*plus*, swap counter cards, and check the deck unit display

Similarly, there are 5 frequency channels in the 9*plus*. These are interchangeable; you can quickly isolate a problem in the CTD section of the instrument by swapping cables and counter channels. By doing this you can determine if the problem lies with a sensor, a cable, or a counter card.

Troubleshooting: 911plus (continued)

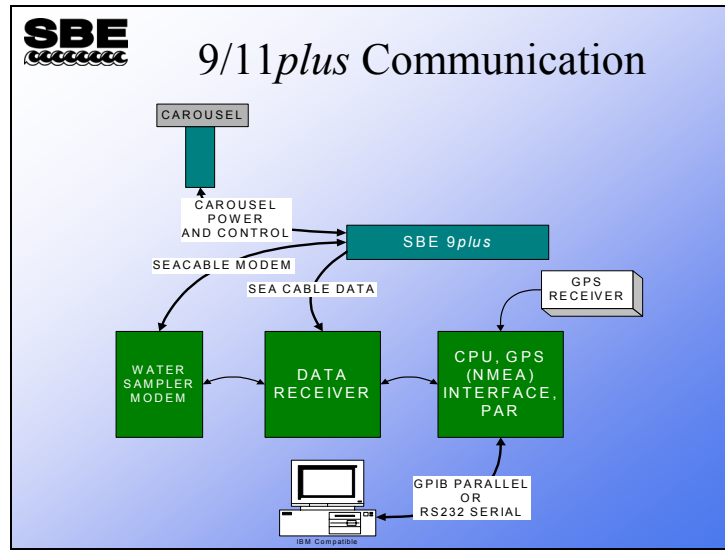


SBE 11plus Deck Unit,
No Communication with Computer

- 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

In considering the deck unit end of the system, first look to the cabling between the PC and 11plus. When Seasave starts, it communicates setup information to the 11plus. This data transmission causes the 11plus *Computer Interface Receive* LED to flash. If the 11plus is correctly receiving the setup information, the computer interface red *Underwater Unit Error* light will flash briefly during this time. If the red *Underwater Unit Error* LED does not flash, the baud rate is not correctly set in the *COMM Port Configuration* dialog found on the *Acquire and Display Real -Time Data Set Up* dialog in *Seasave*.

Troubleshooting: 911plus (continued)

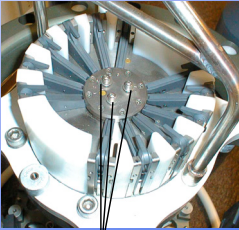


Here is a signal flow diagram for the circuit boards in the 11plus, the 9plus, the Carousel, and your PC. Note that water sampler commands pass from your computer to the 11plus CPU board, to the receiver board, to the modem board, to the 9plus, and into the Carousel.

Troubleshooting: Carousel Water Sampler

SBE
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

Many general water sampler problems such as *bottles don't close* can be traced to physical problems with the sampling system. The Carousel triggers are coated with an oxide-type layer that is meant to water lubricate. The coating absorbs oil and becomes gummed up and sticky. Often, giving the triggers a good soak in hot soapy water will return them to their original state. Conversely, honing the latch parts to remove the coating will remove the lubricating layer and make them more susceptible to sticking. If you do remove your triggers for cleaning, be sure that you don't over tighten the three screws that hold the triggers to the magnet assembly. Over tightening will cause the trigger plates to warp and will cause the triggers to bind.

Troubleshooting: Carousel Water Sampler (*continued*)

The logo for SBE (Scientific Business Electronics) features the letters 'SBE' in a bold, sans-serif font. Below the letters is a stylized, wavy line representing water or a signal waveform.

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 COM2 for sampler control
- SBE 11*plus* modem board switch settings must match sampler type
- Check cables

Water sampler control is carried out over a 300-baud modem channel. This channel is full duplex (both up and down communication) and shares the wire with the main data channel. Indications that the 9/11*plus* system has proper modem communication are found on the front panel of the 11*plus* and in the status bits of the 9*plus*. If the 11*plus* modem carrier frequency is detected in the 9*plus*, a status bit is set. If the 9*plus* carrier frequency is detected in the 11*plus*, a carrier LED is lit. For the SBE 33 Carousel deck unit, an LED flashes when communication is received from the SBE 32 Carousel.


Troubleshooting: Internally Recording Instruments



Troubleshooting Internally Recording Instruments

- Internally recording instruments' electronics are not modular like the *9plus*, especially those instruments with integrated sensors
- Most user-serviceable problems with internally recorded instruments involve instrument configuration or setup
- For the SBE 25 with external T and C, follow the SBE *9plus* procedures for sensor problems

Troubleshooting: Deployment Problems



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

A lot of deployment problems can be avoided by being careful when you prepare your instrument for deployment and by being patient and waiting for a surface soak.

- Secure loose cables and make sure your plumbing is going to properly vent air.
- Soak your instrument package near the surface for at least 2 -3 minutes before lowering away. If you are using an older dissolved oxygen sensor, soak for 10 minutes to ensure the electrode is properly polarized before beginning your cast.

Troubleshooting: Deployment Problems (*continued*)



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

The part of the sea cable that connects to the instrument package receives a lot of wear and is under a great deal of stress. The cross-sectional area of most instrument packages causes a huge load on the cable every time the ship rolls. The *9plus* data stream has an 8-bit counter that increments at each data scan, returning to 0 after 255. Missing scans show up as a missing number in the count. Because decoding the *9plus* counters requires a scan and the scan before it, missing scans show up as data spikes. Usually, data errors of this sort are caused by intermittent connection in the mating end of the sea cable.

Troubleshooting: Deployment Problems (*continued*)



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.

Like other troubleshooting activities, the solution here is *divide and conquer*. Check the sea cable as described above. If everything seems normal, disconnect the slip-ring from the sea cable and the cabling that runs into the computer room. The slip-ring should present very low resistance on all of its conductors through a whole rotation. Switch to another conductor if you find one that has high resistance or becomes intermittent.

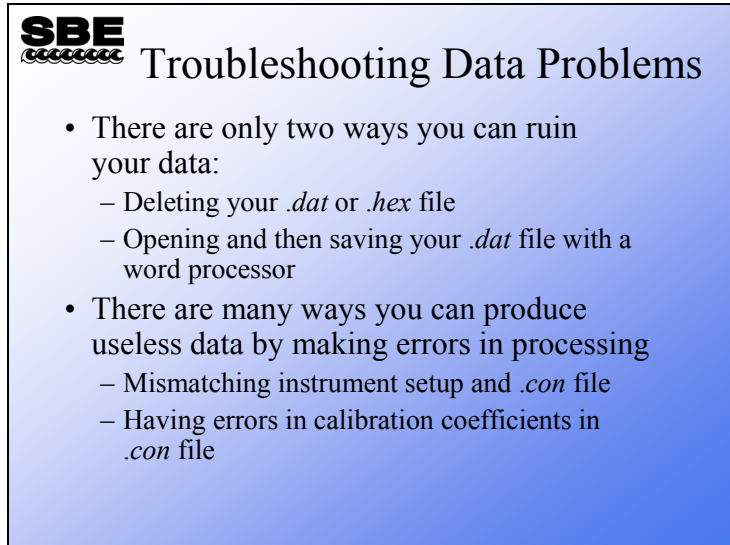
Troubleshooting: Deployment Problems (*continued*)



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

Troubleshooting: Data Problems

A blue gradient rectangular box containing the SBE logo and a list of data-related troubleshooting points.

SBE
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 *.con* file
 - Having errors in calibration coefficients in *.con* file

As we mentioned earlier, older (<6.0) versions of Seasave created a *.dat* file for data from an SBE 911*plus*. Versions 7.0 and later create a *.hex* data file for data from all supported instruments.

Troubleshooting: Data Problems (*continued*)

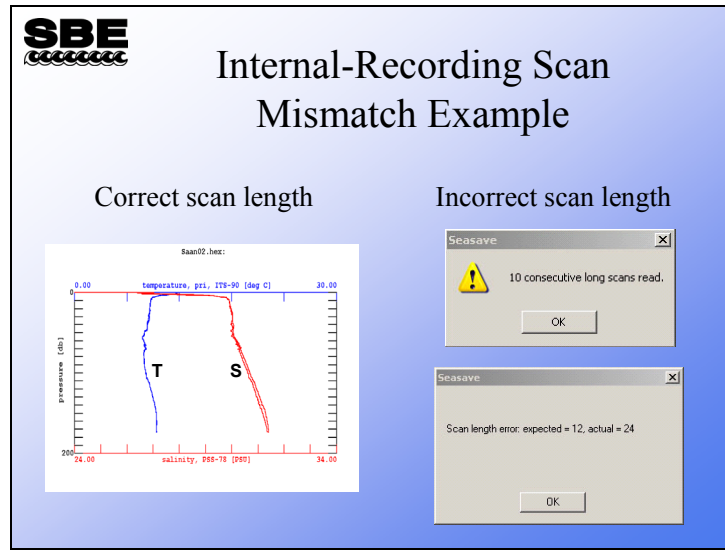


Data Scan Mismatch

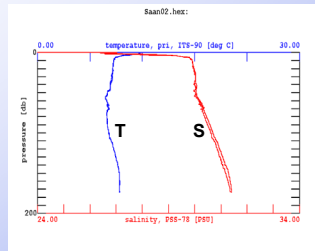
- Internally recording instruments have varying scan length depending on the number of voltages that are stored
- The SBE *9plus* has varying scan length, because unused voltage or frequency channels can be suppressed
- However, *Seasave* and *Data Conversion* both check the scan length of the *.con*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

You can only harm yourself with data scan mismatch with internally recording instruments. It is always good idea to take a look at your data before you initialize (erase) the memory in your internally recording CTD.

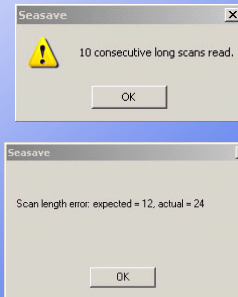
Troubleshooting: Data Problems (*continued*)



Correct scan length



Incorrect scan length



To check for incompatibility between the data file and the .con file, it is always a good idea to select *Options -> Check Scan Length*.

Troubleshooting: NMEA Problems




Troubleshooting Your 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 11*plus*), with 8 data bits and 1 stop bit, no parity
- Use the NMEA simulator program
- Capture some data from your GPS for comparison

Adding navigational information to your data can be troublesome. Manufacturers of GPS receivers are not scrupulous in following the NMEA data format. You can check the transmit rate, data bits, and parity as well as output format of your GPS with your PC and a terminal program. If these don't match the NMEA standard, then you may not get latitude and longitude appended to your data. If you think that there is a problem with the deck unit receiving data, you can use your PC and the simulation program found in Seasoft. NMEA and GPS installation and troubleshooting is discussed in detail in the deck unit(s) manual.

Troubleshooting: NMEA Problems (*continued*)



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

You can test the deck unit and Seasave with the NMEA simulation program, NMEATest. Cable the NMEA port on the deck unit to a second PC with the provided cable. Alternatively, you can run the simulation using only one computer if the computer has a spare COM port. The simulation program sends NMEA messages in the RMA, RMC, GGA, or GLL format.

Troubleshooting: NMEA Problems (*continued*)



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


Standard NMEA data formats are shown in the deck unit manual. You can use the capture facility to collect some data from your GPS. If the data is not in the proper format, check your GPS manual to determine the configuration that will yield the correct data format.

Activity

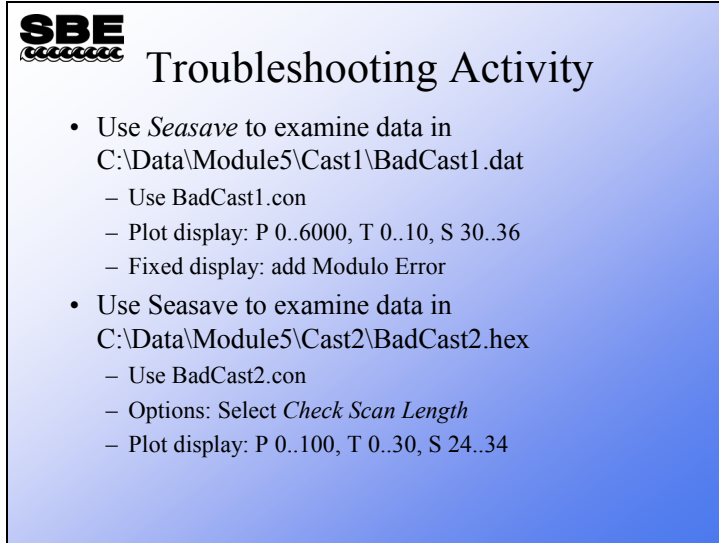
SBE
cccccc

Troubleshooting Activity

- What is wrong with this instrument?



Activity

A blue rectangular box with a black border containing the SBE logo and a list of troubleshooting steps. The SBE logo is in the top left corner, followed by the title "Troubleshooting Activity". Below the title is a bulleted list of instructions for using Seasave to examine data in two different files: BadCast1.dat and BadCast2.hex. Each file entry includes a list of specific actions like using a .con file, setting plot display parameters, and adding modulo error.

SBE
ccccccc Troubleshooting Activity

- Use *Seasave* to examine data in
C:\Data\Module5\Cast1\BadCast1.dat
 - Use BadCast1.con
 - Plot display: P 0..6000, T 0..10, S 30..36
 - Fixed display: add Modulo Error
- Use *Seasave* to examine data in
C:\Data\Module5\Cast2\BadCast2.hex
 - Use BadCast2.con
 - Options: Select *Check Scan Length*
 - Plot display: P 0..100, T 0..30, S 24..34

To speed up the playback, click *Archived Data -> No Wait*.