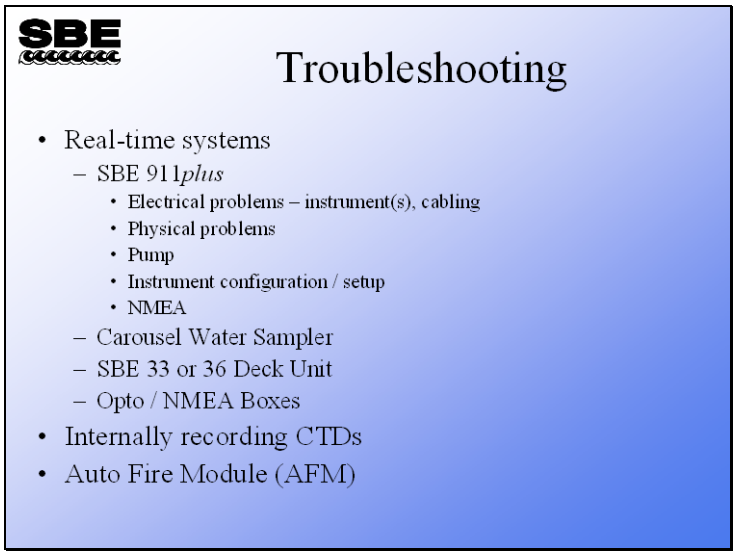
Module 15

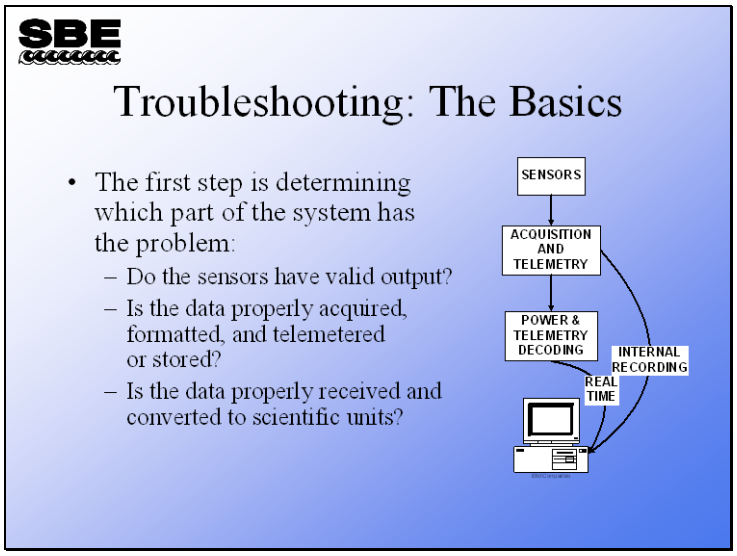
Troubleshooting

Overview

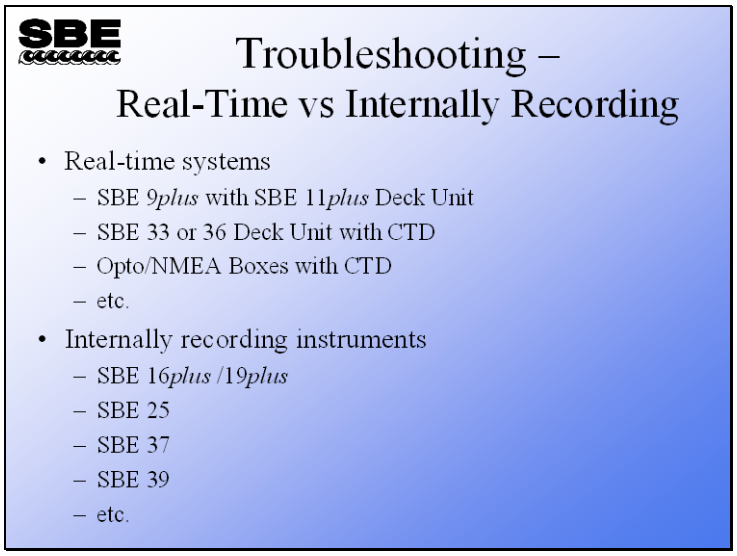


In this module we will discuss troubleshooting. Troubleshooting is an art based on a fundamental understanding of the way your equipment is supposed to work. We will attempt to cover the most common problems in this broad topic, ranging from problems with electronic circuits to mechanical parts that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

Troubleshooting

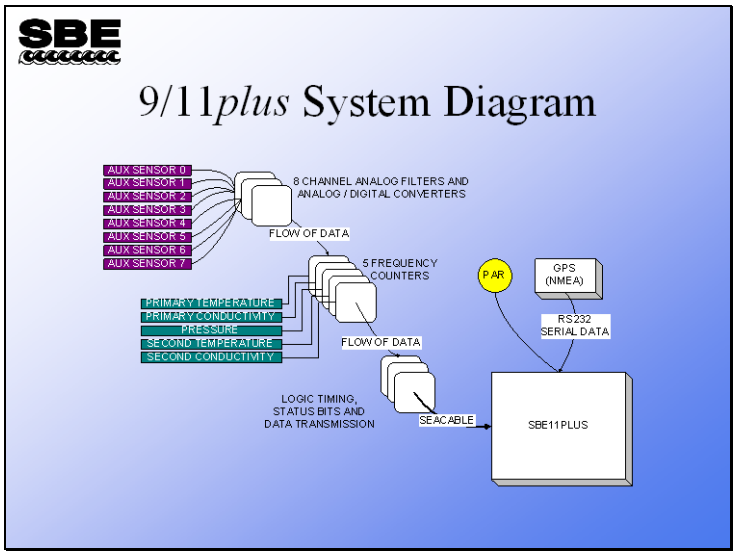


Troubleshooting



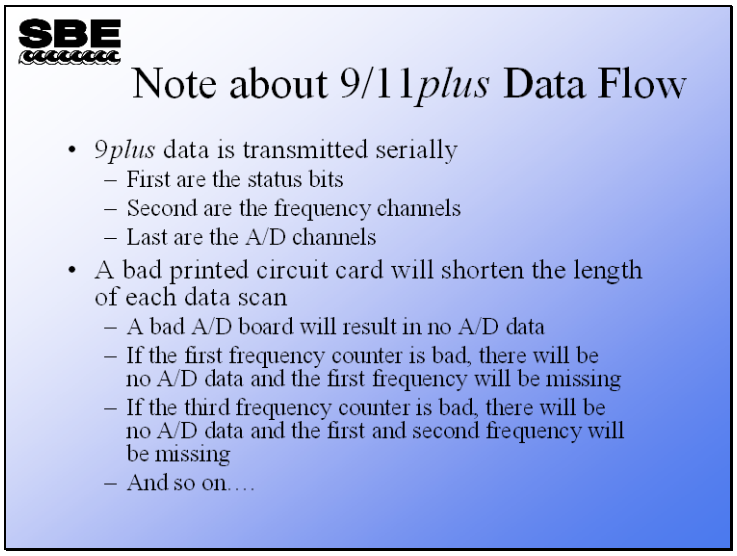
We will address troubleshooting by first looking at real-time acquisition systems, and then internally recording systems.

Troubleshooting: 911*plus*



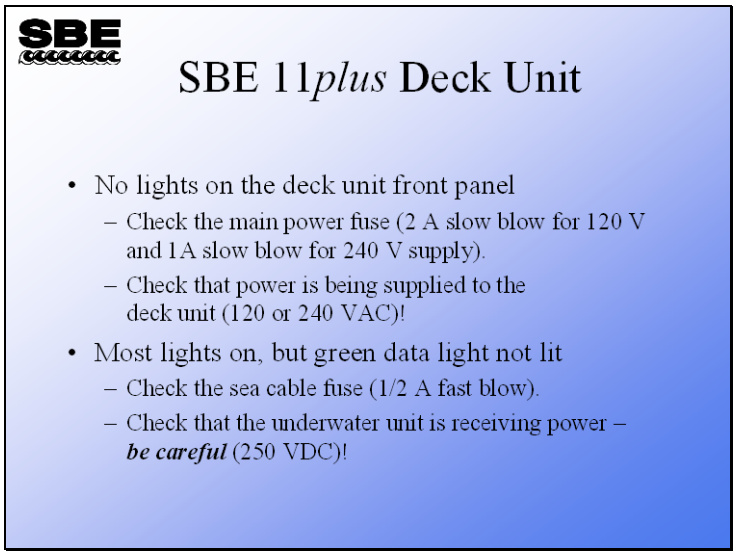
The 9/11*plus* is a highly modular system. You can exploit this characteristic of the instrument in troubleshooting. You can swap sensors, swap cables, and if necessary, swap printed circuit boards to see if trouble follows any one of these components.

Troubleshooting: 911*plus* (*continued*)



The 9*plus* 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 11*plus* front panel display.

Troubleshooting: Real-Time Systems

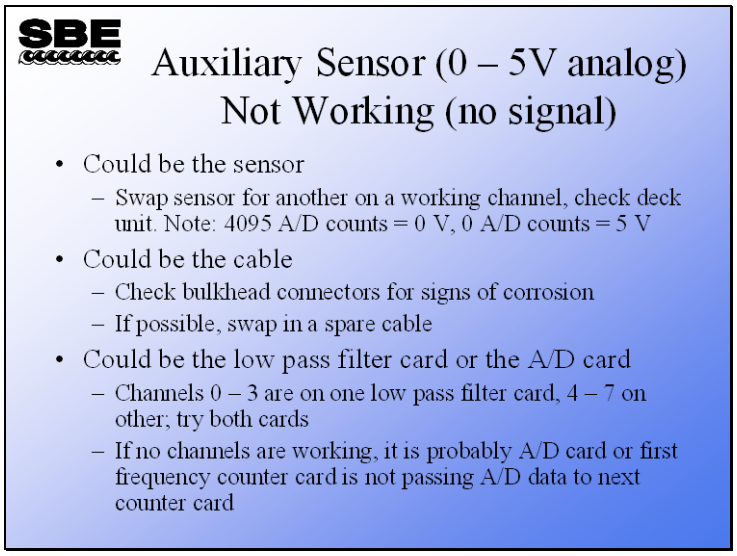


After the obvious things, like checking the fuse and the power outlet the deck unit is plugged into, check that the underwater unit is receiving power. If you disconnect the sea cable underwater connector from the CTD, you should find a large DC voltage (150 – 250V) between the large pin and the small 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.

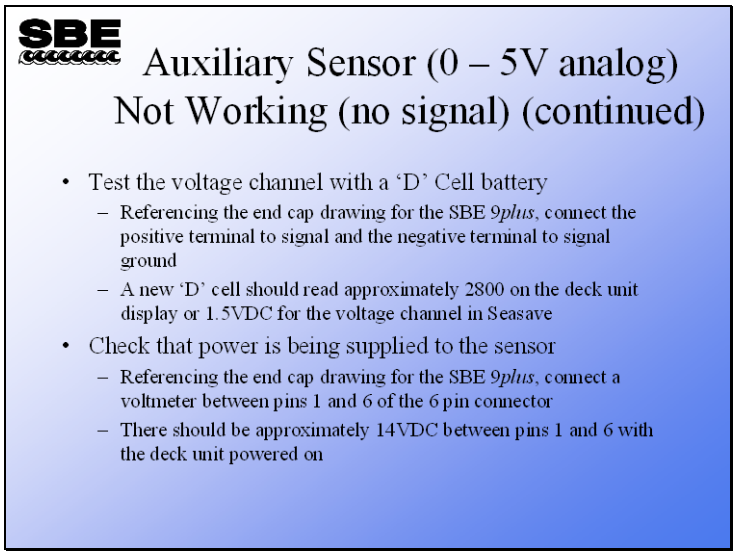
We'll talk more about some less common Deck Unit problems in a few minutes.

Troubleshooting: 911*plus* (*continued*)



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.

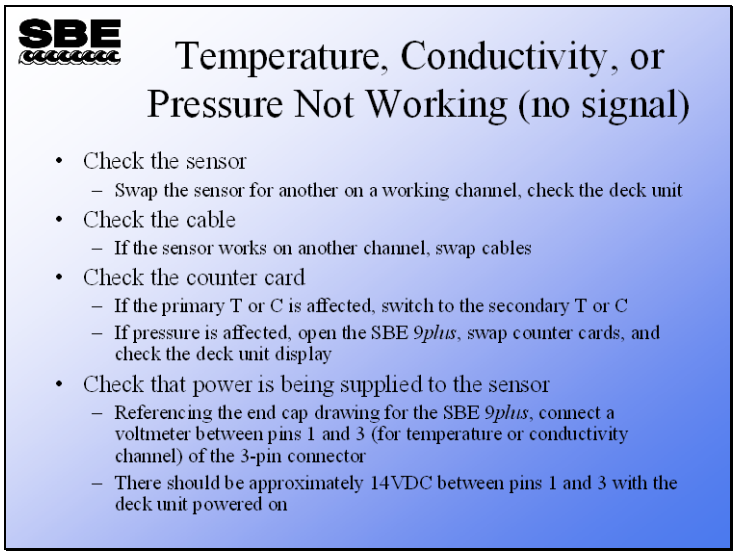
Troubleshooting: 911*plus* (*continued*)



The first test substitutes a D cell battery for the auxiliary sensor, and checks if the A/D card is interpreting the voltage from the battery correctly. If the 9*plus* fails this test, it is like that the 9*plus* A/D card needs to be replaced.

If the 9*plus* fails the second test, it is likely that the 9*plus* power supply needs to be replaced.

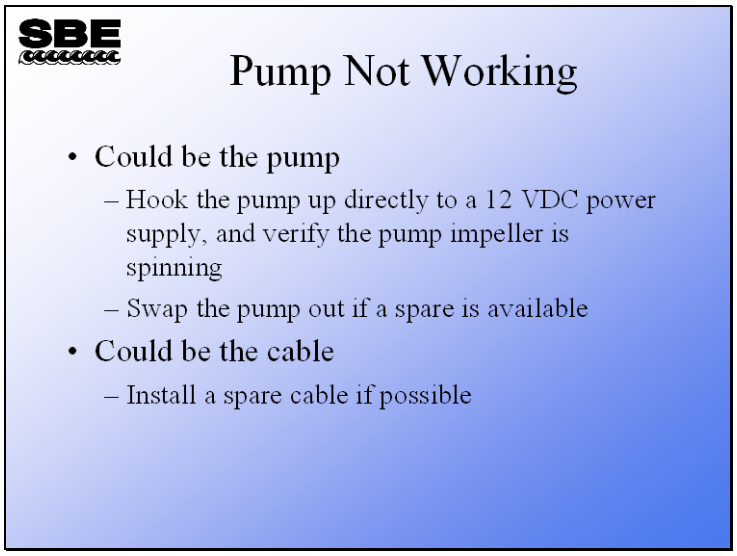
Troubleshooting: 911*plus* (*continued*)



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.

If the 9*plus* fails the power test, it is likely that the 9*plus* power supply needs to be replaced.

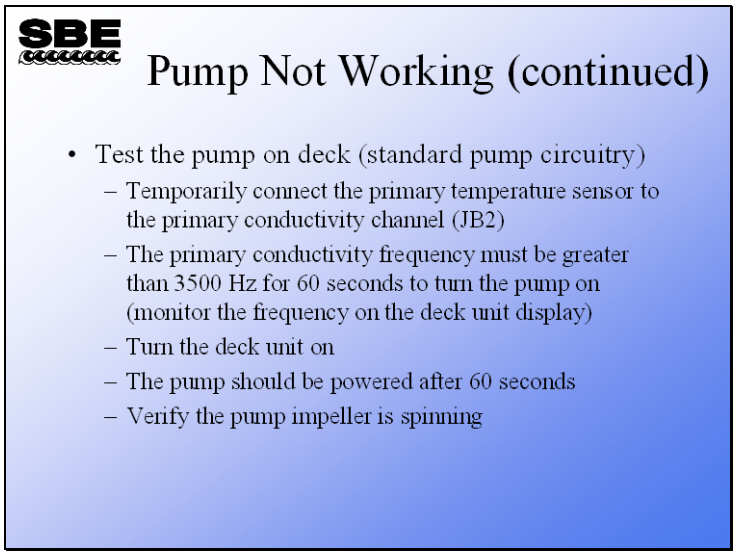
Troubleshooting: 911*plus* (*continued*)



Symptoms of pump malfunction include:

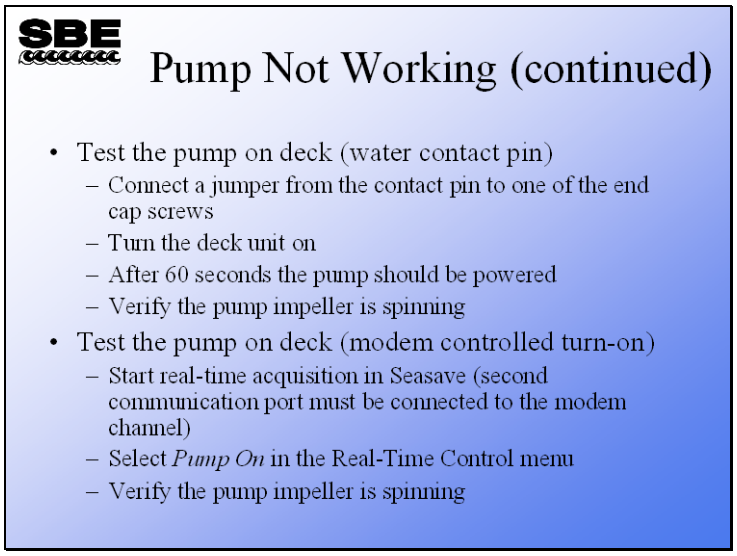
- A big mismatch between downcast and upcast data. Even with a non-functioning pump, on the downcast some water is forced through the plumbing by the movement of the system through the water. However, on the upcast, the forcing of water through the plumbing is reduced.
- Large differences in data from primary and secondary T and C sensors for 9*plus* with primary and optional secondary T and C sensors, indicating that one pump is malfunctioning.
- Erratic, undulating data.

Troubleshooting: 911*plus* (*continued*)



To test a pump on a 9*plus* with standard pump circuitry, we substitute a temperature sensor for the conductivity sensor. At temperatures above approximately 10 °C, the temperature sensor output is greater than the 3500 Hz required on the primary conductivity channel to turn on the pump.

Troubleshooting: 911*plus* (*continued*)

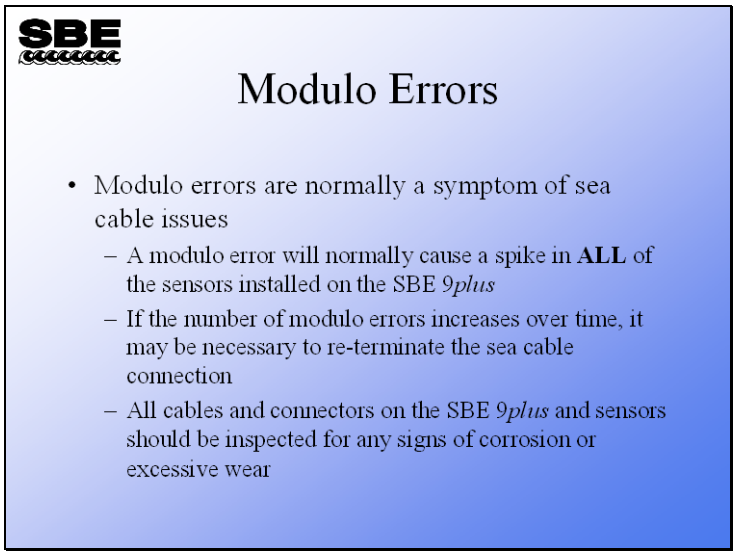


The SBE 9*plus* is available with custom modifications allowing pump turn-on to be independent of water conductivity, which can be useful for fresh water applications:

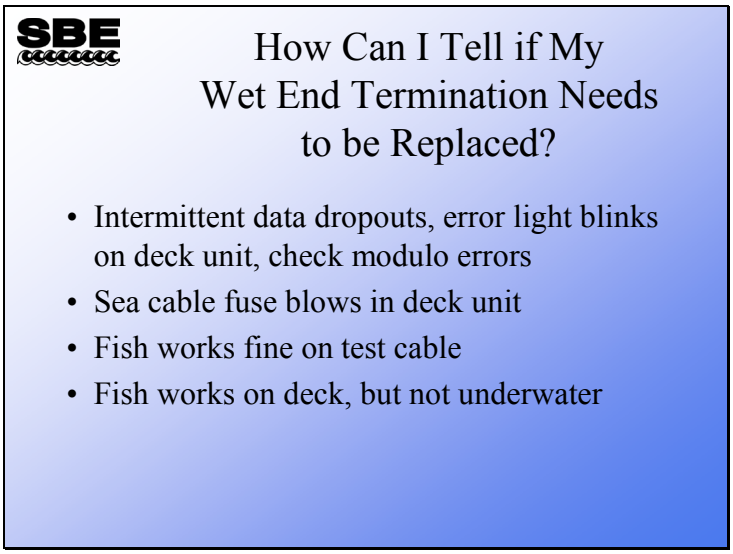
- Water contact pump control – This allows the pump to automatically turn on 60 seconds after a contact pin is immersed in water (salt **or** fresh), and automatically turn off when the contact pin is removed from the water. The contact pin is on a special dummy plug that connects to JB6 on the 9*plus* bottom end cap; modifications to the 9*plus* internal wiring to JB6 for this feature prevent use of JB6 for a bottom contact switch.

- Manual pump control - This allows you to manually turn the pump on and off. Pump control commands are sent through the SBE 11*plus* Deck Unit *Modem Channel* connector, but pump control does not interfere with water sampler operation. Seasave V7 supports this feature from within the user interface (enable/disable manual pump control on the Pump Control tab in the Configure Inputs dialog box; turn the pump on and off from the Real-Time Control menu). Earlier versions of Seasave supported this feature if the software was started with the *–pc* option from the command line.

Troubleshooting: 911*plus* (*continued*)

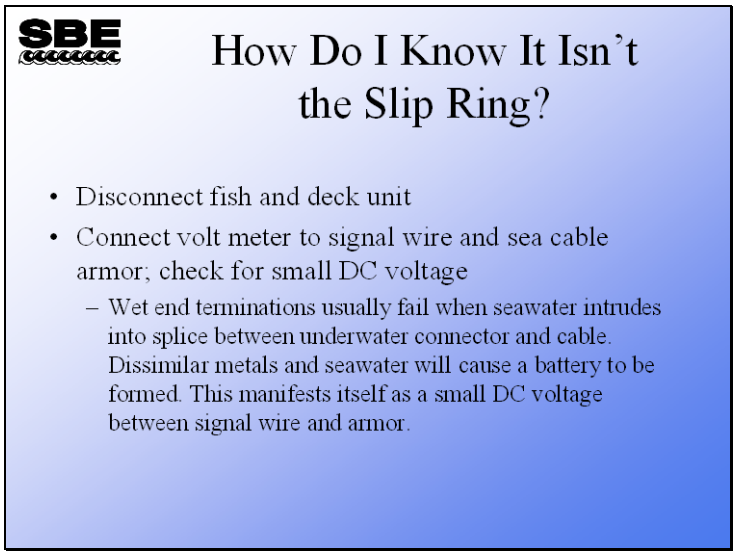


Troubleshooting: 911*plus* (*continued*)



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 9*plus* 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 9*plus* 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: 911*plus* (*continued*)



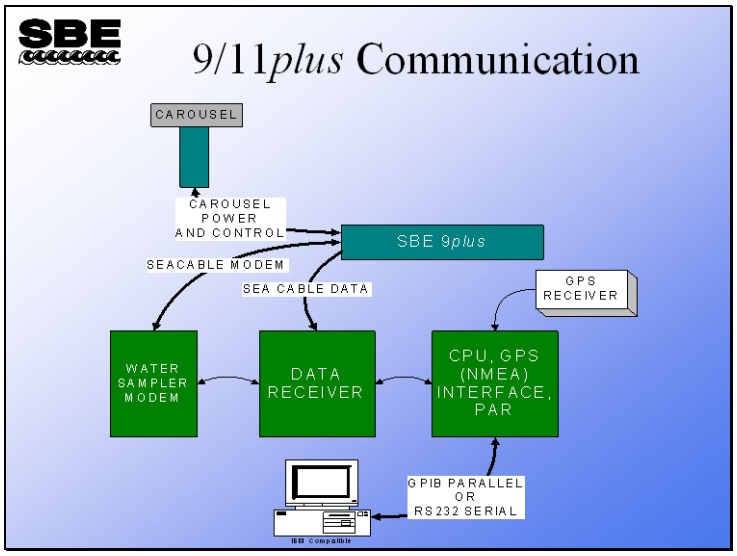
Like other troubleshooting activities, the solution here is *divide and conquer*. Check the sea cable as described above. If everything seems normal, disconnect the slip-ring from the sea cable and the cabling that runs into the computer room. The slip-ring should present very low resistance on all of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

Troubleshooting: 911*plus* (*continued*)

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

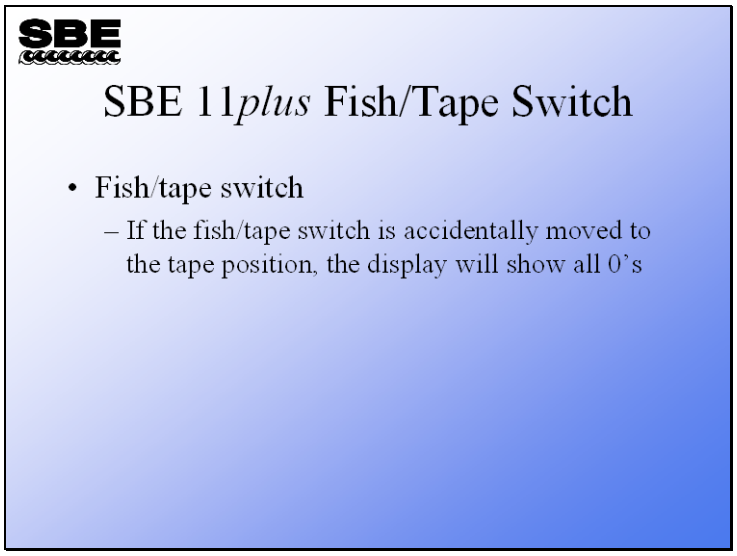
- You can BUT:
  - 10 kilometers of cable has capacitance, and when wound on winch spool may have some inductance
  - These properties can give confusing readings on your multimeter in Ohm setting

Troubleshooting: 911*plus* (*continued*)

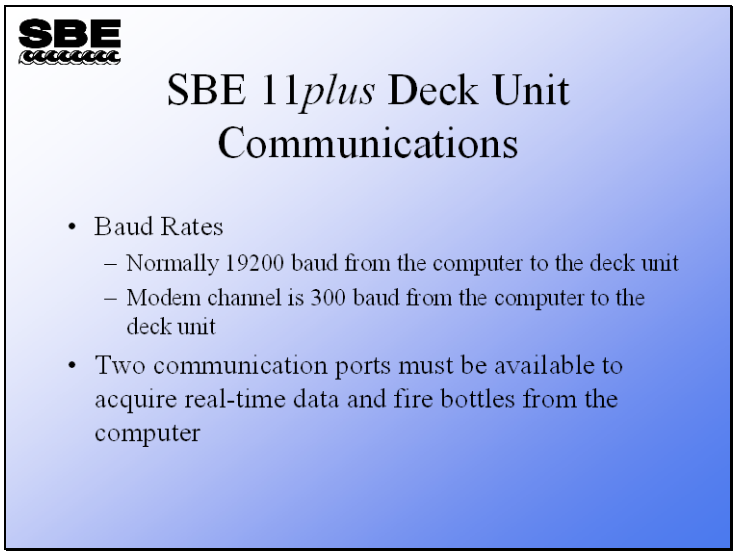


Here is a signal flow diagram for the circuit boards in the 11*plus*, the 9*plus*, the Carousel, and your PC. Note that water sampler commands pass from your computer to the 11*plus* CPU board, to the receiver board, to the modem board, to the 9*plus*, and into the Carousel.

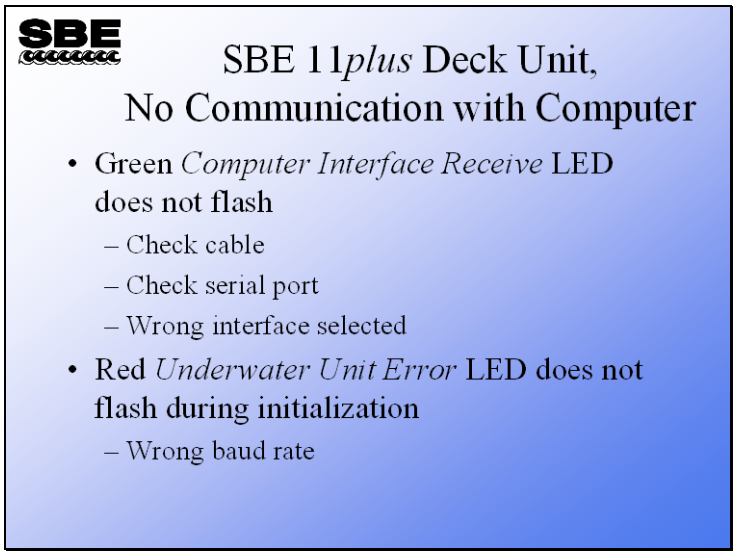
Troubleshooting: 911*plus* (*continued*)



Troubleshooting: 911*plus* (*continued*)

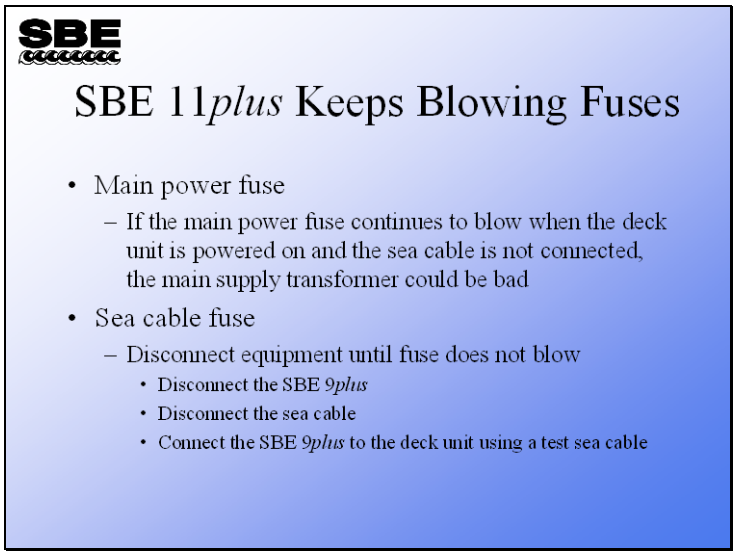


Troubleshooting: 911*plus* (*continued*)



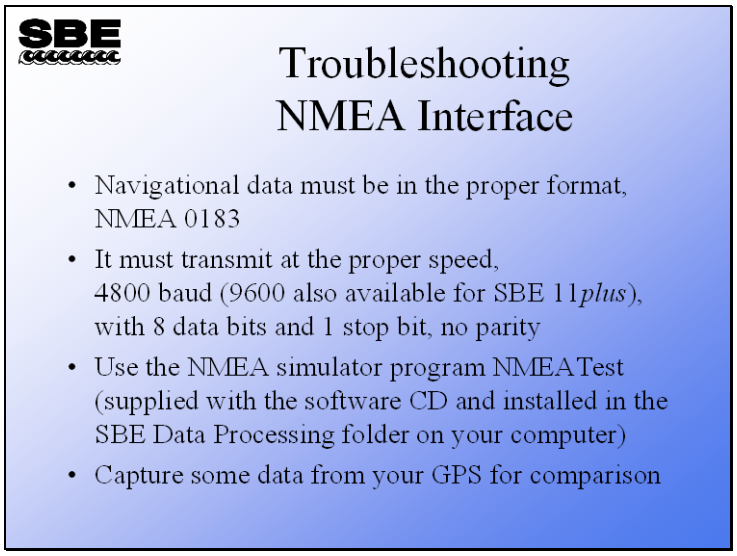
In considering the deck unit end of the system, first look to the cabling between the PC and 11*plus*. When Seasave starts, it communicates setup information to the 11*plus*. This data transmission causes the 11*plus Computer Interface Receive* LED to flash. If the 11*plus* is correctly receiving the 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. Check the Comm port setup on the Serial Ports tab in Configure Inputs in *Seasave*.

Troubleshooting: 911*plus* (*continued*)



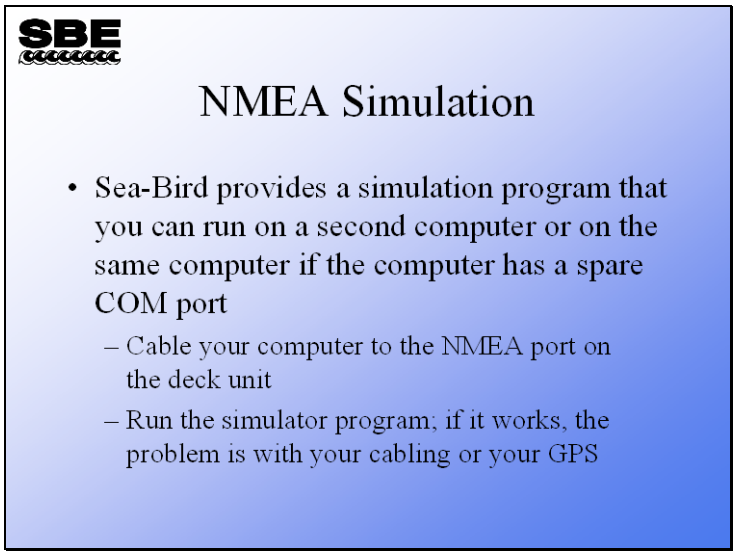
A bad main supply transformer is usually caused by installing a main power fuse with an incorrect rating - **do not try to solve the problem of blowing the fuse by installing a bigger one**!

Troubleshooting: NMEA Problems



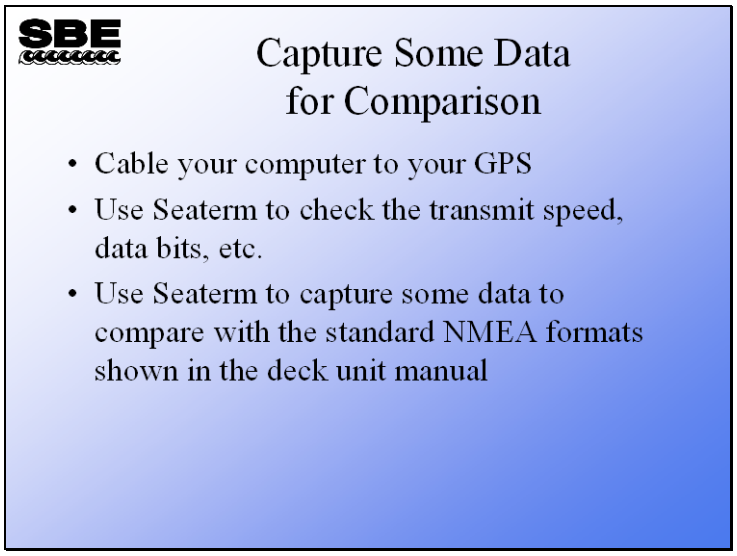
Adding navigational information to your data can be troublesome. Manufacturers of GPS receivers are not scrupulous in following the NMEA data format. You can check the transmit rate, data bits, and parity as well as output format of your GPS with your PC and a terminal program. If these do not match 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*)



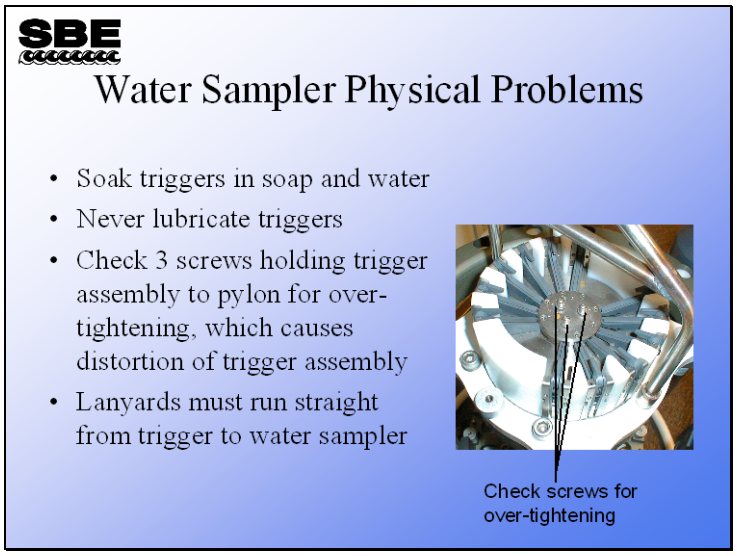
You can test the deck unit and Seasave with the NMEA simulation program, NMEATest. Cable the NMEA port on the deck unit to a second PC with the provided cable. Alternatively, you can run the simulation using only one computer if the computer has a spare COM port. The simulation program sends NMEA messages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

Troubleshooting: NMEA Problems (*continued*)



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.

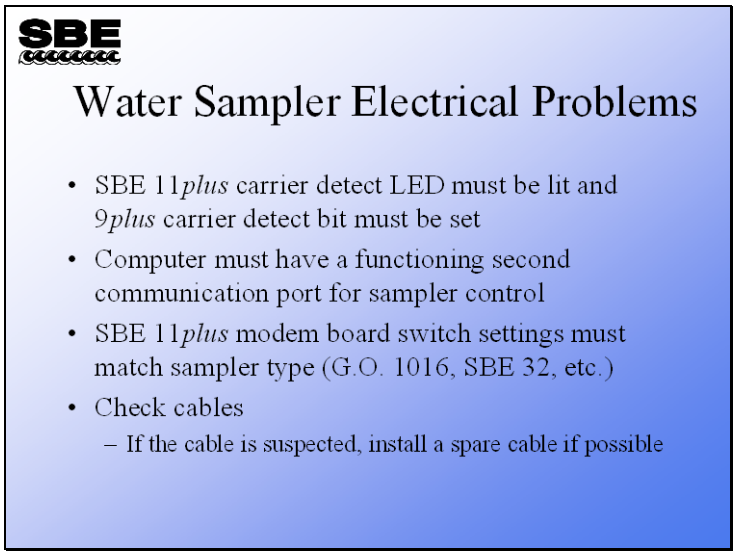
Troubleshooting: Carousel Water Sampler



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.

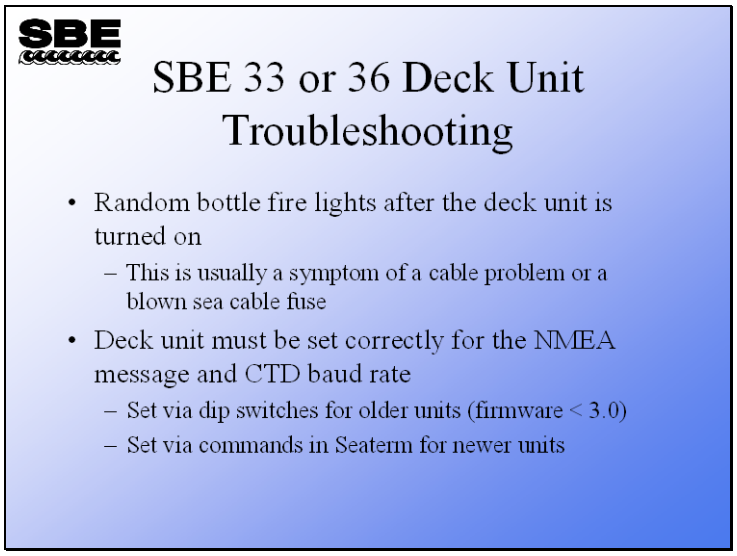
The SBE 55 ECO uses the same triggers as the SBE 32 Carousel. Follow the same maintenance procedures for cleaning the triggers.

Troubleshooting: Carousel Water Sampler (*continued*)



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 or SBE 55 ECO.

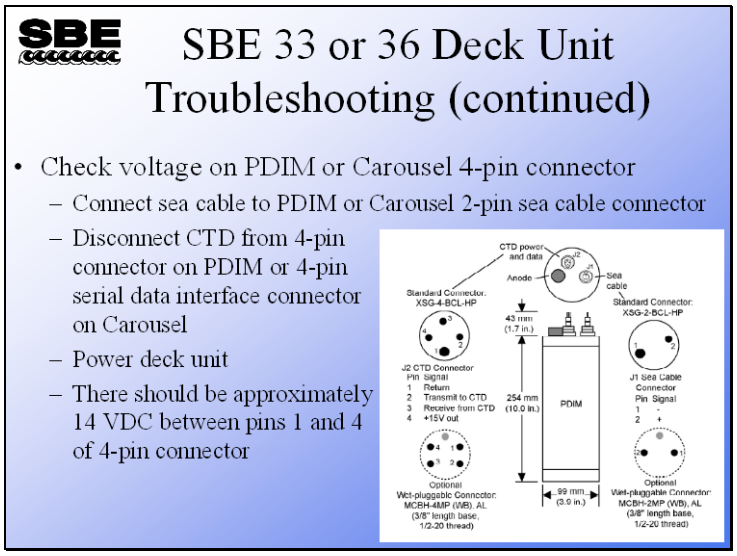
Troubleshooting: SBE 33 or SBE 36



Use the same procedure to isolate the cause of a blown sea cable fuse as we discussed for the SBE 11*plus* deck unit: disconnect equipment until the fuse does not blow.

- Disconnect the CTD
- Disconnect the sea cable
- Connect the CTD to the deck unit using a test sea cable

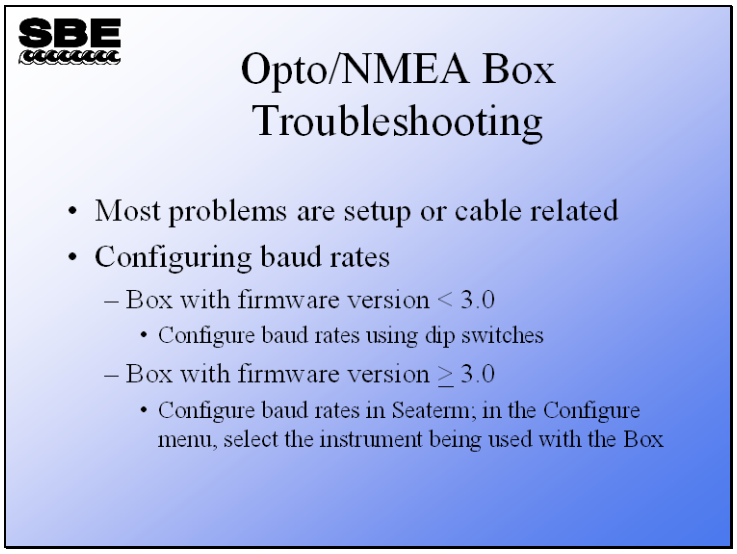
Troubleshooting: SBE 33 or SBE 36



This test is useful for checking if power is going to the CTD.

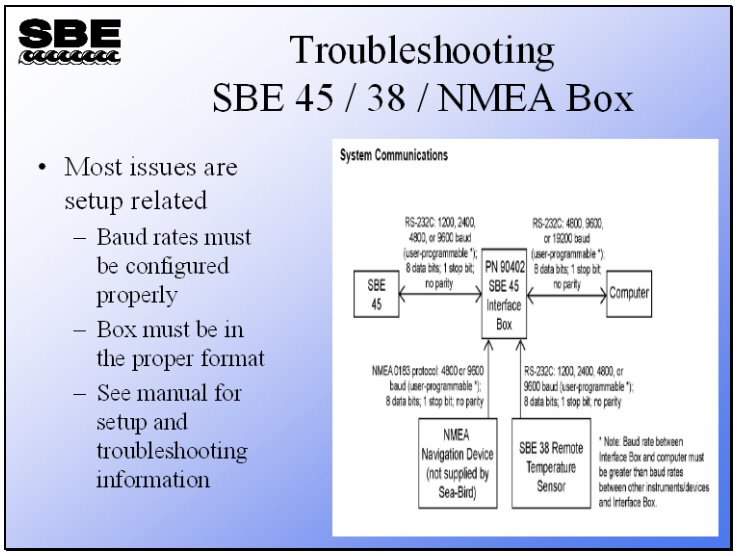
The diagram above is for a PDIM, which is used with the SBE 36 Deck Unit. The same test is used for a system including the SBE 33 Deck Unit – check the voltage between pins 1 and 4 on the optional serial data interface connector on the SBE 32 Carousel Water Sampler.

Troubleshooting: Opto / NMEA Boxes



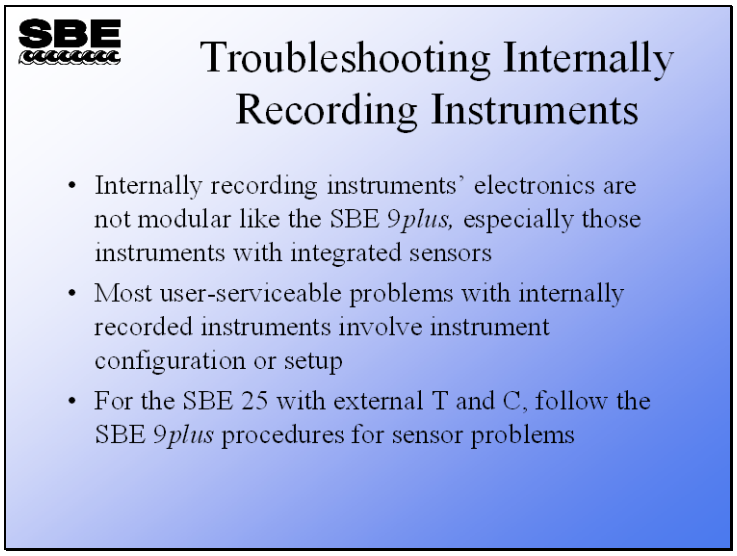
Sea-Bird has manufactured a variety of different models of Opto / NMEA Boxes over the years. The current production model is called the *Seacat/Sealogger RS-232 and Navigation Interface Box*, and is available in AC-powered (PN 90488) and DC-powered (PN 90545) versions. This Box is supplied as a standard component with the SBE 21 Thermosalinograph, and can also be used with an SBE 16, 16*plus*, 19, 19*plus*, or 25 CTD.

Troubleshooting: Opto / NMEA Boxes



Sea-Bird manufactures an interface box specifically for the use with SBE 45 MicroTSG thermosalinograph, called the *SBE 45 Power, Navigation, and Remote Temperature Interface Box*. Note that the **baud rate between the Interface Box and the computer must be greater than the baud rates between the other instruments / devices and the Interface Box**.

Troubleshooting: Internally Recording Instruments



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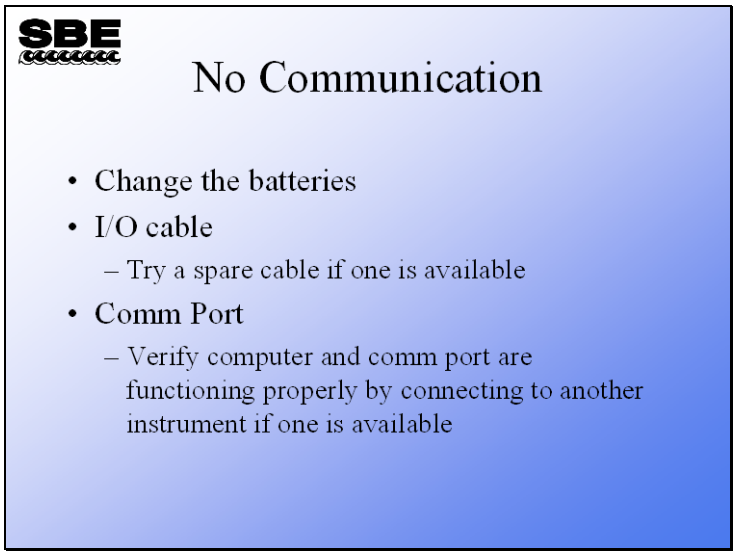
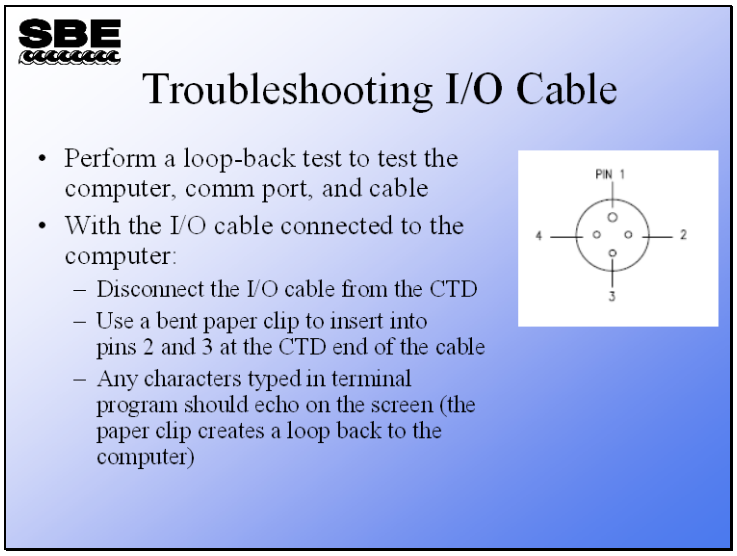
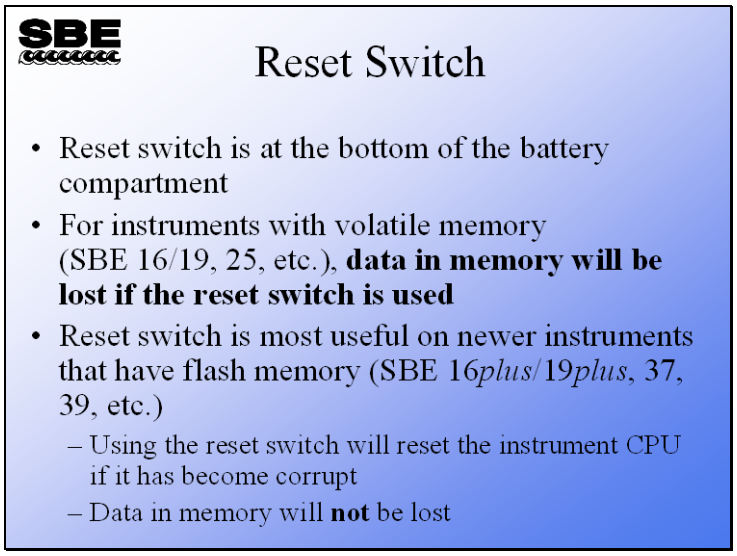


Troubleshooting: Internally Recording Instruments

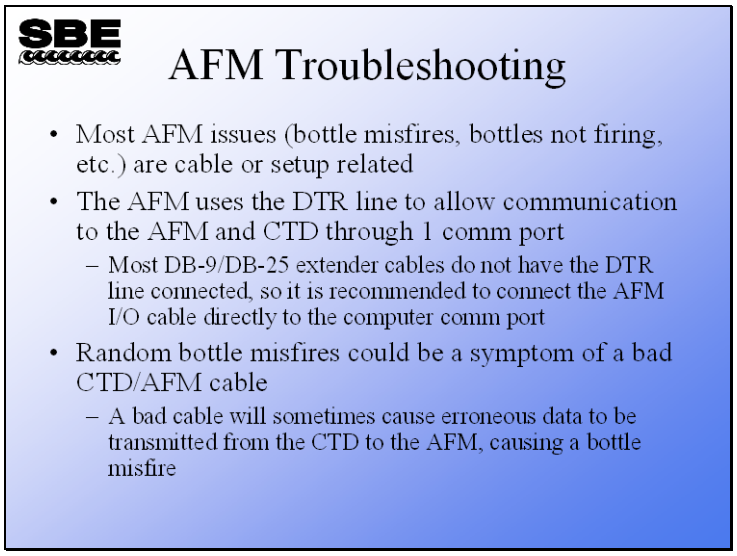


If the I/O cable fails this test, disassemble the hood part of the cable connector at the computer end of the cable, and check the solder connections.

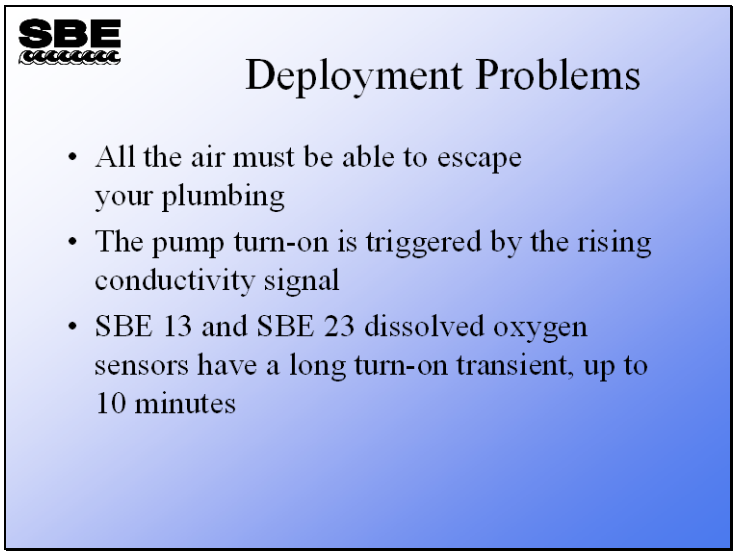
Troubleshooting: Internally Recording Instruments



Troubleshooting: Auto Fire Module (AFM)



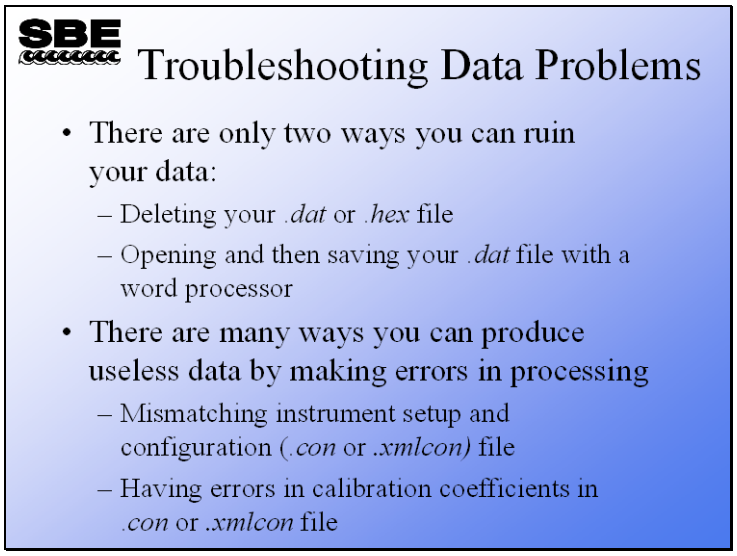
Troubleshooting: Deployment Problems



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.

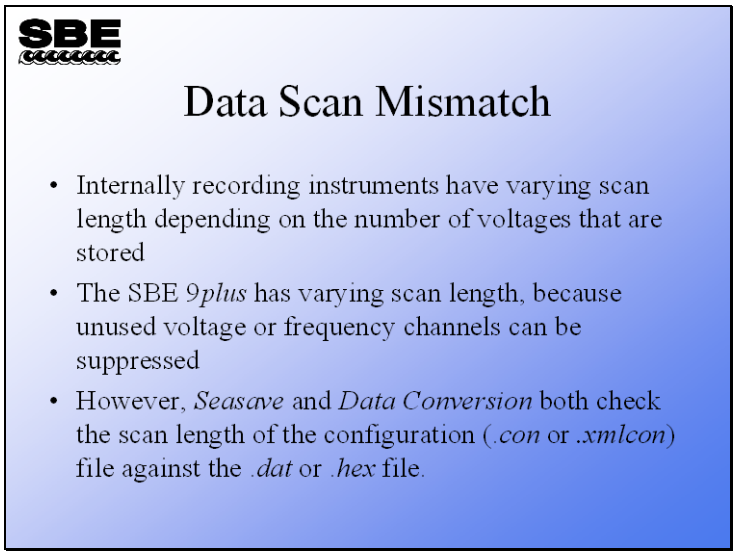
- Secure loose cables and make sure your plumbing is going to properly vent air.
- Soak your instrument package near the surface for at least 2 -3 minutes before lowering away. If you are using an older dissolved oxygen sensor, soak for 10 minutes to ensure the electrode is properly polarized before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

Troubleshooting: Data Problems



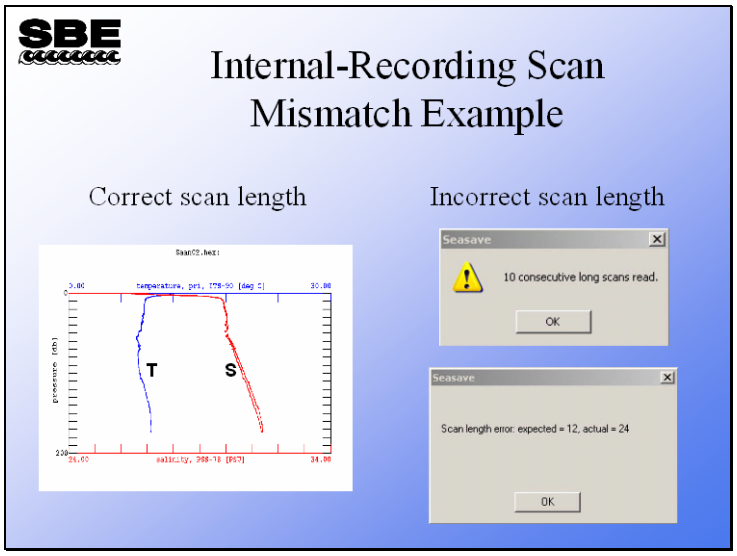
As we mentioned earlier, older (<6.0) versions of Seasave created a .dat file for data from an SBE 911*plus*. Versions 7.0 and later create a .hex data file for data from all supported instruments.

Troubleshooting: Data Problems (*continued*)



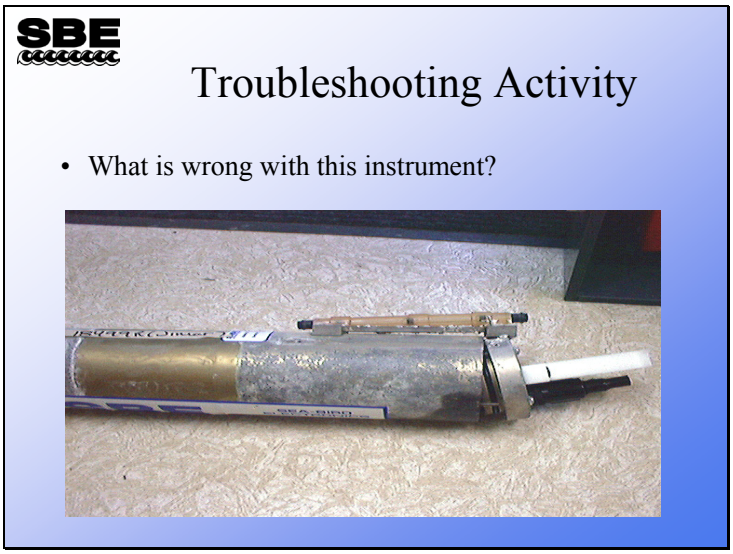
You can only harm yourself with data scan mismatch with internally recording instruments. It is always good idea to take a look at your data before you initialize (erase) the memory in your internally recording CTD.

Troubleshooting: Data Problems (*continued*)

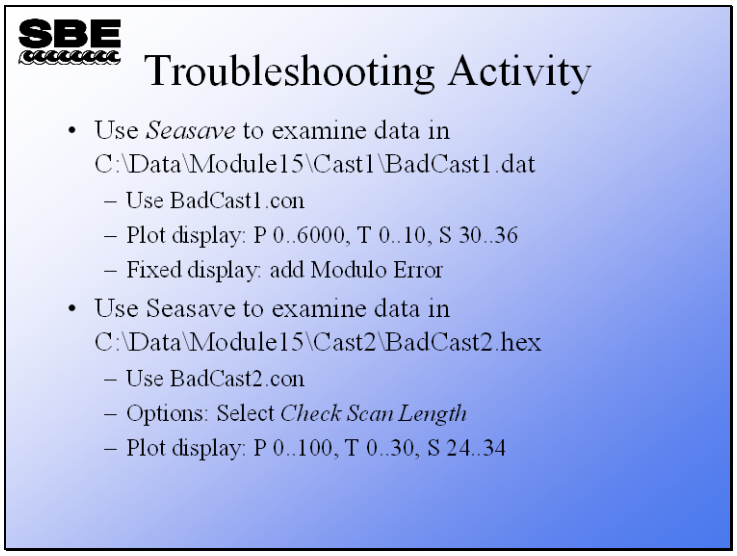


To check for incompatibility between the data file and the .con file, it is always a good idea to select *Options -> Check Scan Length* in Seasave.

Activity


SBE
Troubleshooting Activity
• What is wrong with this instrument?

Activity



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