

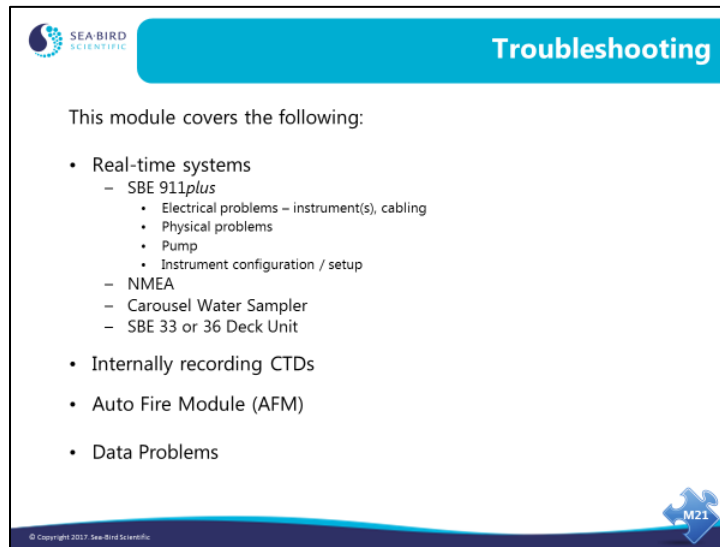


# Troubleshooting

Sea-Bird Scientific University Module 21



## Overview



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### Troubleshooting

This module covers the following:


- 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
- Internally recording CTDs
- Auto Fire Module (AFM)
- Data Problems

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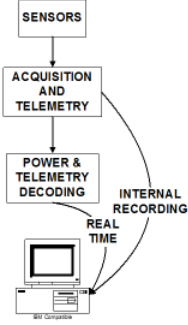
In this module we will discuss troubleshooting. Troubleshooting is an art based on a fundamental understanding of the way your equipment is supposed to work. We will attempt to cover the most common problems in this broad topic, ranging from problems with electronic circuits to mechanical parts that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

## Troubleshooting: The Basics




### Troubleshooting: The Basics

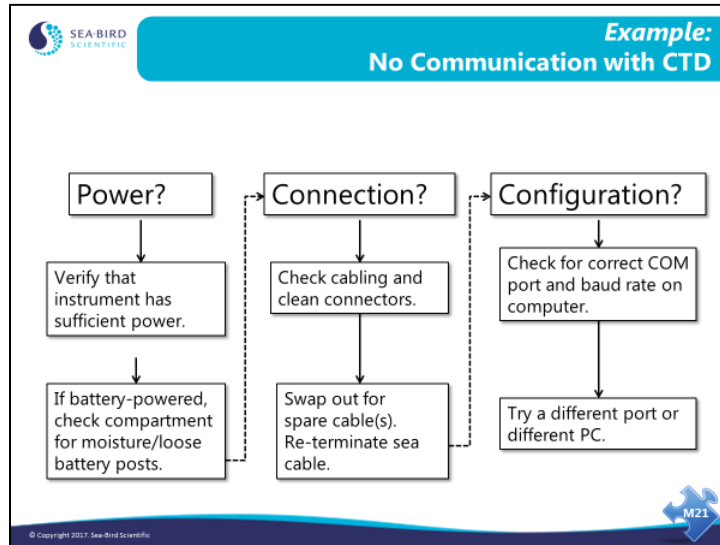
- The first step is determining which part of the system has the problem:
  - Do the sensors have valid output?
  - Is the data properly acquired, formatted, and telemetered or stored?
  - Is the data properly received and converted to scientific units?



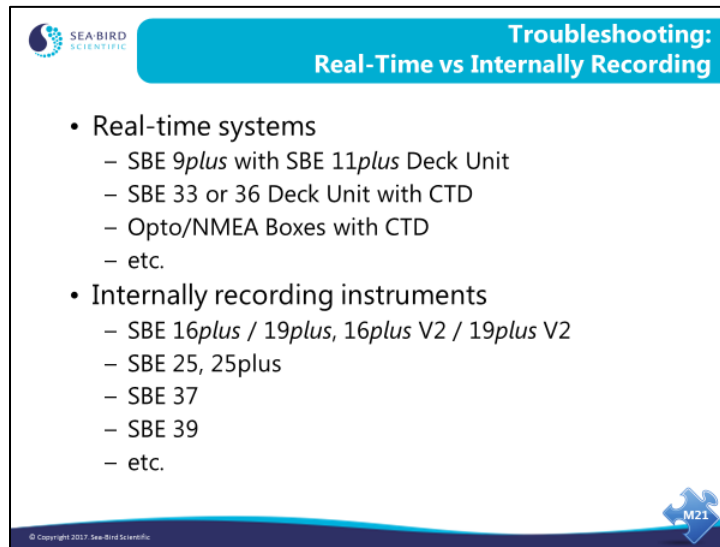
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## Troubleshooting: The Basics (*continued*)



## Troubleshooting: The Basics (*continued*)



The slide features the SEA-BIRD SCIENTIFIC logo in the top left corner. A blue header bar at the top right contains the text 'Troubleshooting: Real-Time vs Internally Recording'. The main content is a bulleted list of systems. At the bottom left, there is a small copyright notice: '© Copyright 2017 Sea-Bird Scientific'. At the bottom right, there is a blue puzzle piece icon with the text 'M21' inside it.

- 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*, *16plus* V2 / *19plus* V2
  - SBE 25, 25plus
  - SBE 37
  - SBE 39
  - etc.

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

## Checklist for Real-Time Systems

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**Troubleshooting:  
Real-time profiling systems**

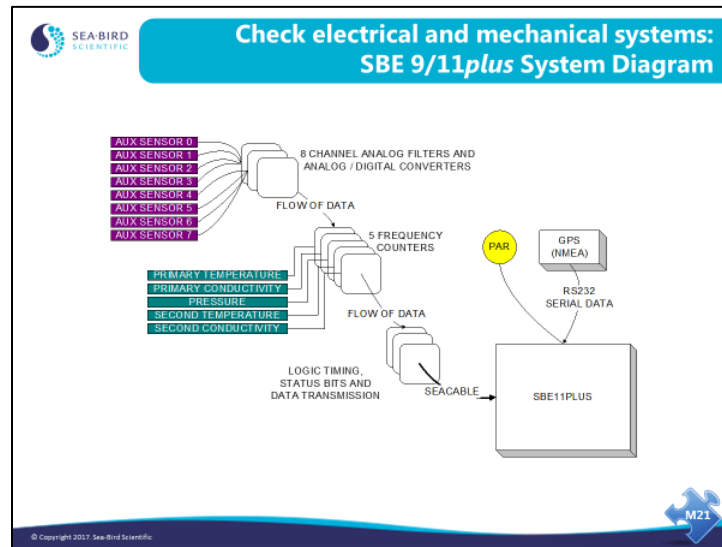
Troubleshooting checklist for profiling real-time systems

1. Data flow
2. Deck unit
3. Instruments and sensors
4. Pump
5. Sea cable
6. Communications
7. Water sampler

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## 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: 911*plus* (*continued*)

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**Check electrical and mechanical systems:  
Note about 9/11*plus* Data Flow**

- 9*plus* data is transmitted serially
  - First are status bits
  - Second are frequency channels
  - Last are A/D channels
- A bad printed circuit card will shorten 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....

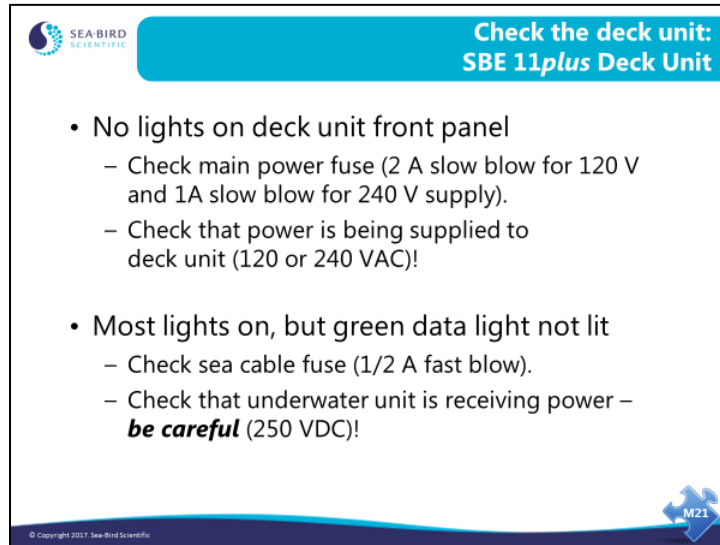
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The 9*plus* transmits its data serially. A sensor, or in the case of analog channels a group of sensors, is measured and the data is passed from one circuit board to the next and through the output section onto the sea cable. Therefore, if one PCB 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: 911 *plus* (continued)



**Check the deck unit:  
SBE 11*plus* Deck Unit**

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

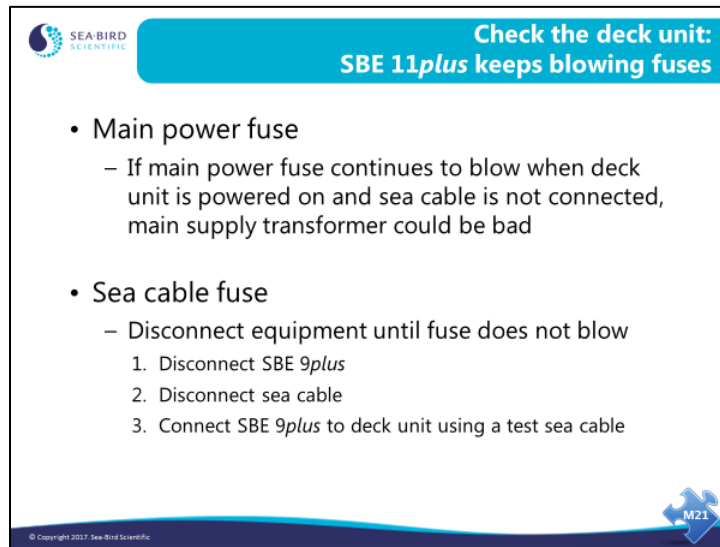
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After the obvious things, like checking the fuse and the power outlet the deck unit is plugged into, check that the underwater unit is receiving power. If you disconnect the sea cable underwater connector from the CTD, you should find a large DC voltage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



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**Check the deck unit:  
SBE 11*plus* keeps blowing fuses**

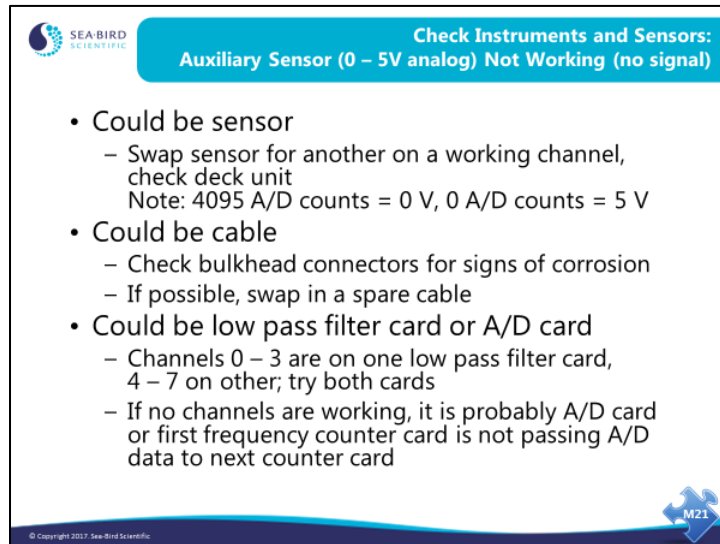
- Main power fuse
  - If main power fuse continues to blow when deck unit is powered on and sea cable is not connected, main supply transformer could be bad
- Sea cable fuse
  - Disconnect equipment until fuse does not blow
    1. Disconnect SBE 9*plus*
    2. Disconnect sea cable
    3. Connect SBE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

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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: 911 *plus* (continued)



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**Check Instruments and Sensors:  
Auxiliary Sensor (0 – 5V analog) Not Working (no signal)**

- Could be 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 cable
  - Check bulkhead connectors for signs of corrosion
  - If possible, swap in a spare cable
- Could be low pass filter card or 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

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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)

**SEA-BIRD SCIENTIFIC** Check Instruments and Sensors:  
**Auxiliary Sensor (0 – 5V analog) Not Working (no signal)**

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

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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 *9plus* fails this test, it is like that the *9plus* A/D card needs to be replaced.

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

## Troubleshooting: 911 *plus* (continued)

**SEA-BIRD SCIENTIFIC** Check Instruments and Sensors:  
Temperature, Conductivity, or Pressure Not Working (no signal)

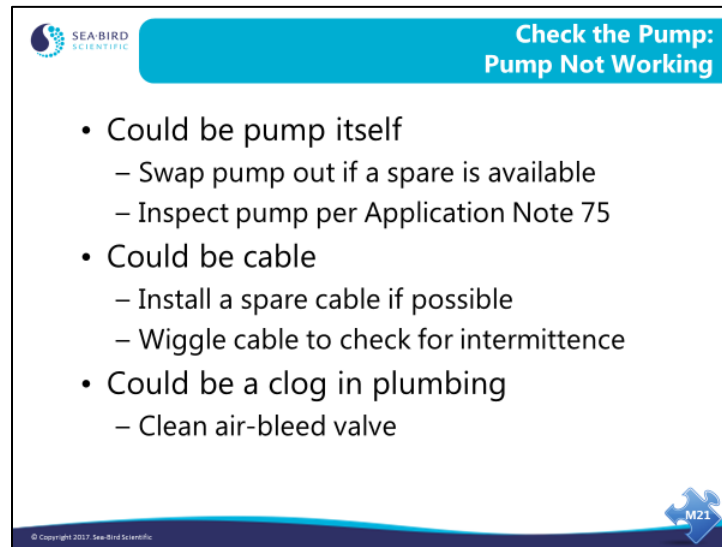
- Check sensor
  - Swap sensor for another on a working channel, check deck unit
- Check cable
  - If sensor works on another channel, swap cables
- Check counter card
  - If the primary T or C is affected, switch to secondary T or C
  - If pressure is affected, open SBE 9*plus*, swap counter cards,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

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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)



**Check the Pump:  
Pump Not Working**

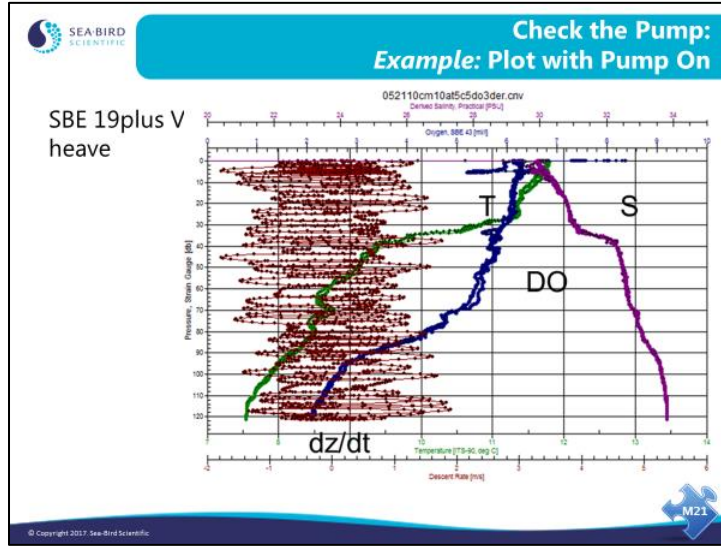
- Could be pump itself
  - Swap pump out if a spare is available
  - Inspect pump per Application Note 75
- Could be cable
  - Install a spare cable if possible
  - Wiggle cable to check for intermittence
- Could be a clog in plumbing
  - Clean air-bleed valve

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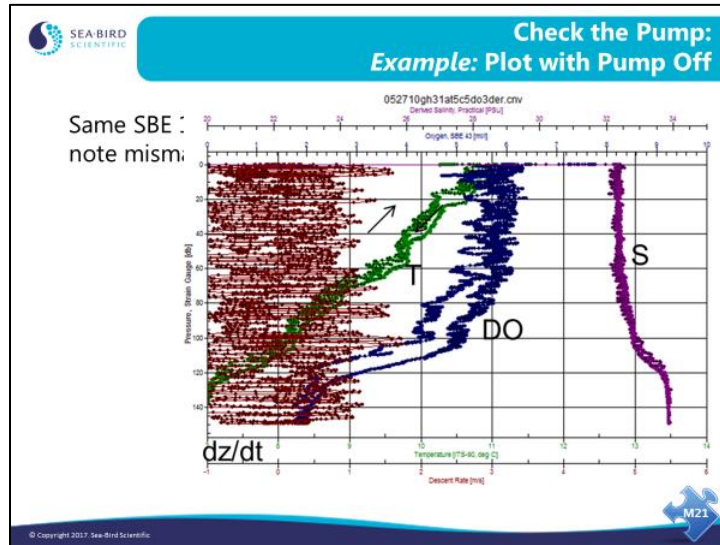
Symptoms of pump malfunction include:

- 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 *9plus* with primary and optional secondary T and C sensors, indicating that one pump is malfunctioning.
- Erratic, undulating data.

# Troubleshooting: 911 plus (continued)

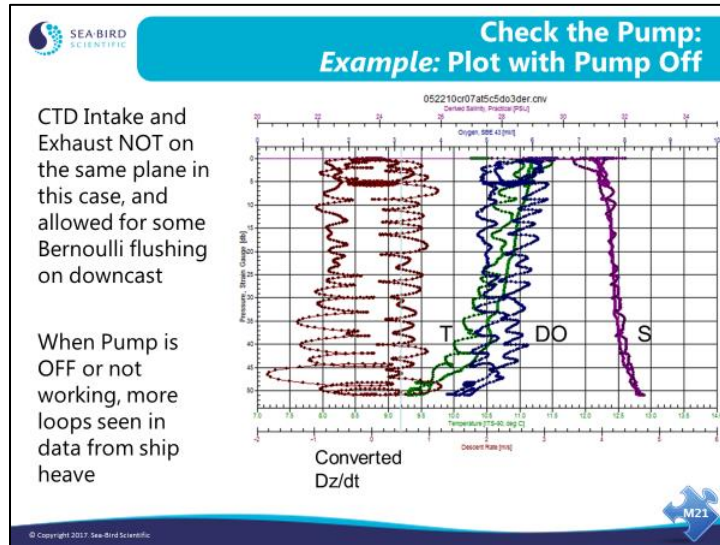


## Troubleshooting: 911 plus (continued)



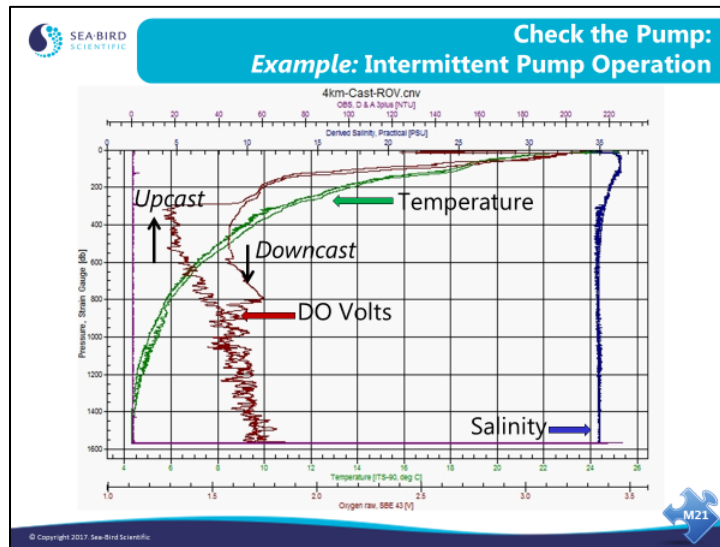


## Troubleshooting: 911 *plus* (continued)



This allowed for some Bernoulli flushing on the down cast, which is why the downcast and upcast appear different.

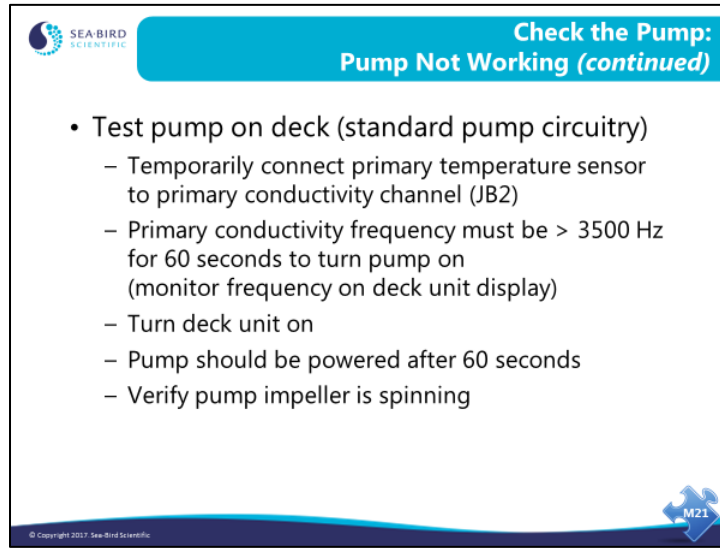
## Troubleshooting: 911 plus (continued)



Notice that the upper 800 meters of DO looks fine... then it drops at around 800 m and is noisy and stays low...

Still noisy on upcast, then recovers around 350 m.

## Troubleshooting: 911 *plus* (continued)



**Check the Pump:  
Pump Not Working (continued)**

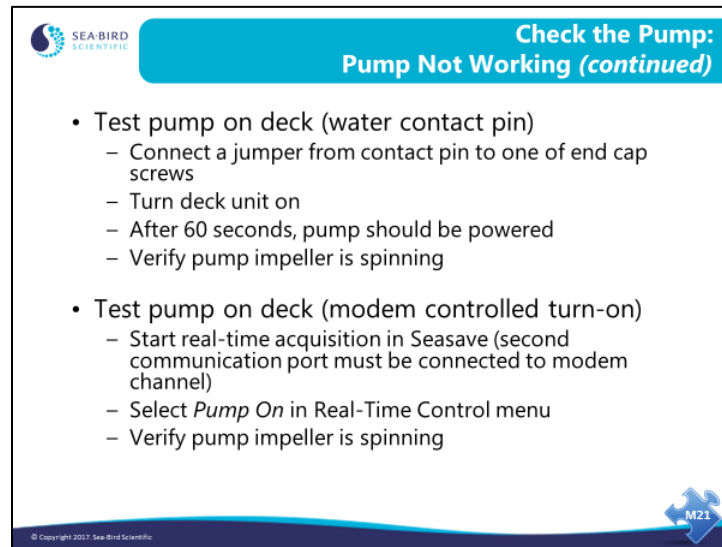
- Test pump on deck (standard pump circuitry)
  - Temporarily connect primary temperature sensor to primary conductivity channel (JB2)
  - Primary conductivity frequency must be > 3500 Hz for 60 seconds to turn pump on (monitor frequency on deck unit display)
  - Turn deck unit on
  - Pump should be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

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To test a pump on a *9plus* 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: 911plus (continued)



**Check the Pump:  
Pump Not Working (continued)**

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

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The SBE *9plus* 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 *9plus* bottom end cap; modifications to the *9plus* 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 *11plus* 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)

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**Check the Pump:  
Pump Deployment Problems**

- All the air must be able to escape plumbing prior to pump turn-on
- Pump turn-on is triggered by rising conductivity signal and after a pump delay
  - Pump delay = 60 sec for SBE *9plus*
  - Pump delay and trigger signal settings are configurable for other CTDs

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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: 911 *plus* (continued)

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### What if the Pump isn't Running?

- Pump impeller can become bound by sand, sediment, and salt crystals
- If pump is not running, remove pump head and inspect impeller and thrust washers to determine if a clogged impeller is the problem


SBE 5T with Pump Head Removed

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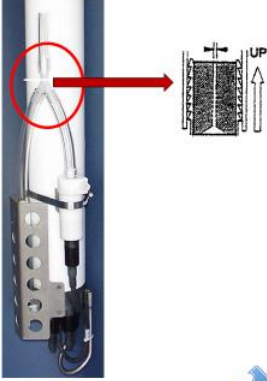
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It may be necessary to remove the O-ring and thrust washers to properly clean the pump impeller and impeller housing


## Troubleshooting: 911 *plus* (continued)

 **Check the Plumbing:  
Air Purge Bleed Y-Valve**


- Check air bleed in Y-valve to be sure it is free of salt/sediment
  - Soak in warm soapy water
- Use 0.4 mm diameter wire (#26 AWG wire) to clean valve. Remove Tygon tubing above valve, and use needle-nosed pliers to force wire through hole
- Blow through valve to ensure it is open



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## Troubleshooting: 911 *plus* (continued)



### Check the Sea Cable: Modulo Errors

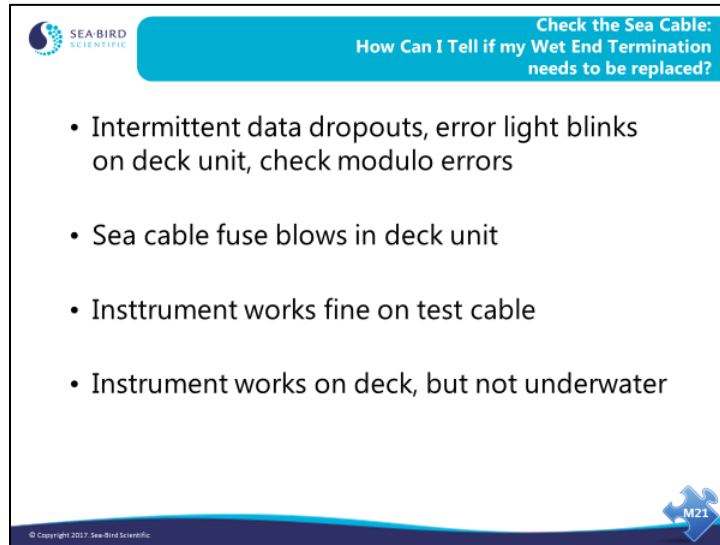
- Modulo errors are usually a symptom of sea cable issues
  - A modulo error will normally cause a spike in **ALL** sensors installed on SBE 9*plus*
  - If number of modulo errors increases over time, it may be necessary to re-terminate sea cable connection
  - Inspect all cables and connectors on SBE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

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## Troubleshooting: 911 *plus* (continued)



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Check the Sea Cable:  
How Can I Tell if my Wet End Termination  
needs to be replaced?

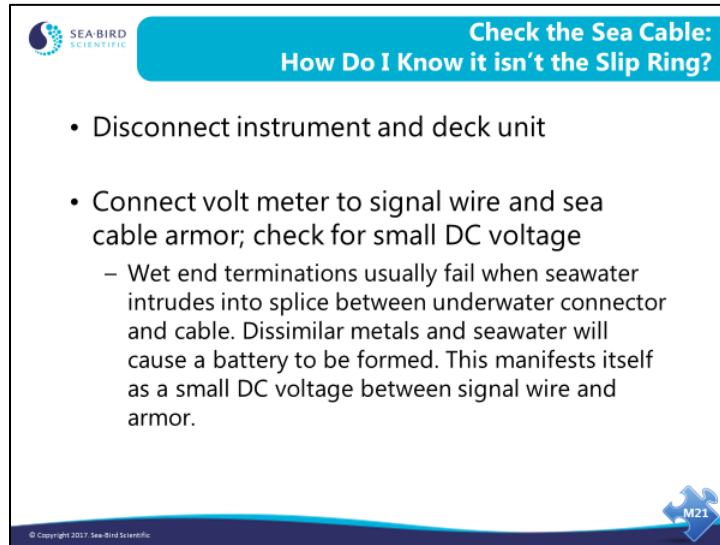
- Intermittent data dropouts, error light blinks on deck unit, check modulo errors
- Sea cable fuse blows in deck unit
- Instrument works fine on test cable
- Instrument works on deck, but not underwater

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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: 911 *plus* (continued)



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**Check the Sea Cable:  
How Do I Know it isn't the Slip Ring?**


- Disconnect instrument 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.

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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)



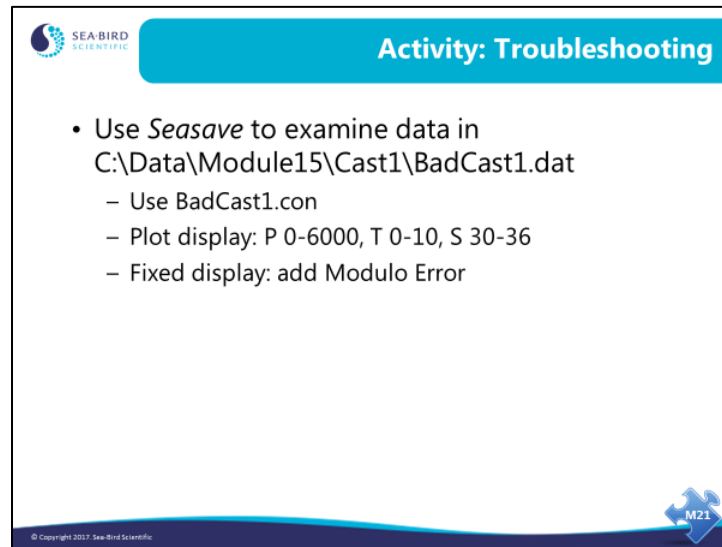
Check the Sea Cable:  
Why Can't I use the Ohm Setting on my Multimeter?

- 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

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## Activity

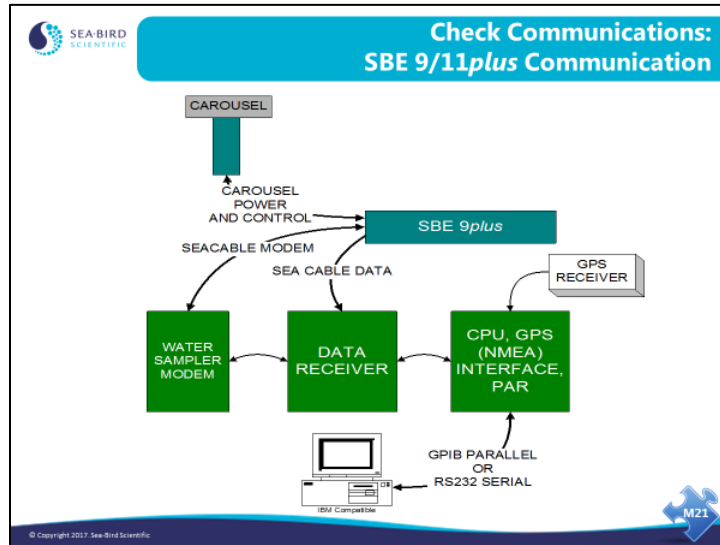


The slide features the SEA-BIRD SCIENTIFIC logo in the top left corner. A blue header bar at the top right contains the text "Activity: Troubleshooting". The main content area contains a bulleted list of instructions. In the bottom right corner, there is a blue puzzle piece icon with "M21" written on it. The bottom left corner contains a small copyright notice: "© Copyright 2017 Sea-Bird Scientific".

- Use *Seasave* to examine data in  
C:\Data\Module15\Cast1\BadCast1.dat
  - Use BadCast1.con
  - Plot display: P 0-6000, T 0-10, S 30-36
  - Fixed display: add Modulo Error


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

## 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: 911 *plus* (continued)




**Check Communications:  
SBE 11*plus* Fish/Tape Switch**

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





Customer installed deterrent


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## Troubleshooting: 911 *plus* (continued)

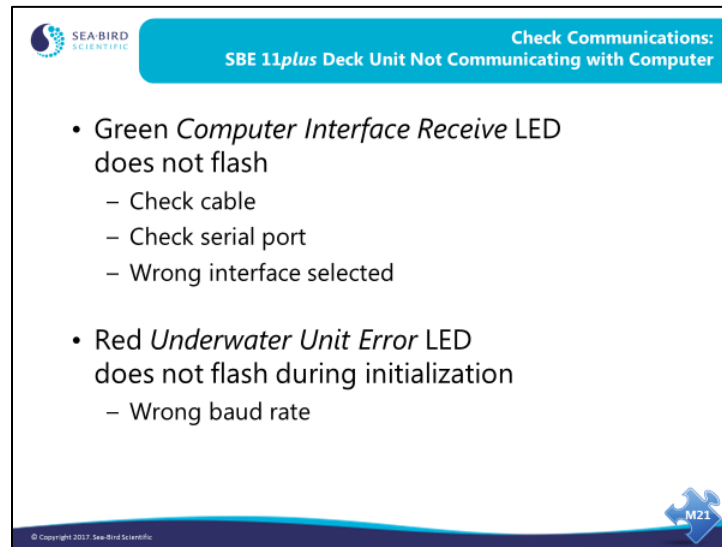


- Baud Rates
  - Usually 19200 baud from computer to deck unit
  - Modem channel is 300 baud from computer to deck unit
- Two communication ports must be available to acquire real-time data and fire bottles from computer



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## Troubleshooting: 911 *plus* (continued)



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Check Communications:  
SBE 11plus Deck Unit Not Communicating 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

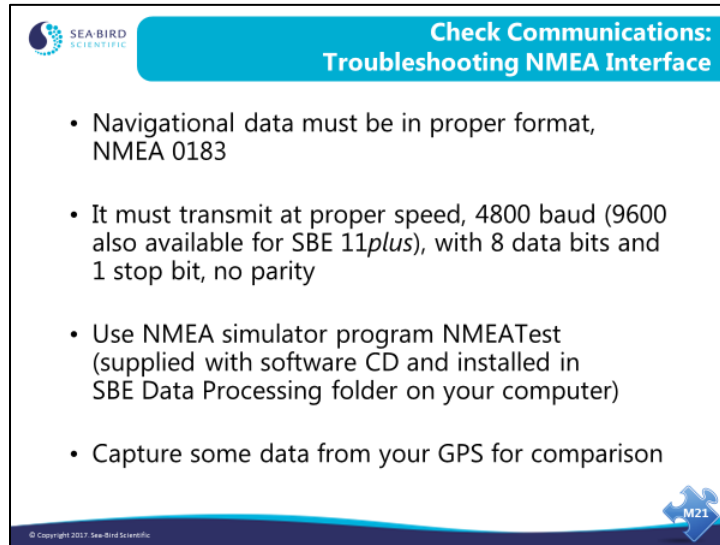
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In considering the deck unit end of the system, first look to the cabling between the PC and 11*plus*. When Seasave starts, it communicates setup information to the 11*plus*. This data transmission causes the 11*plus* *Computer Interface Receive* LED 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: NMEA Problems

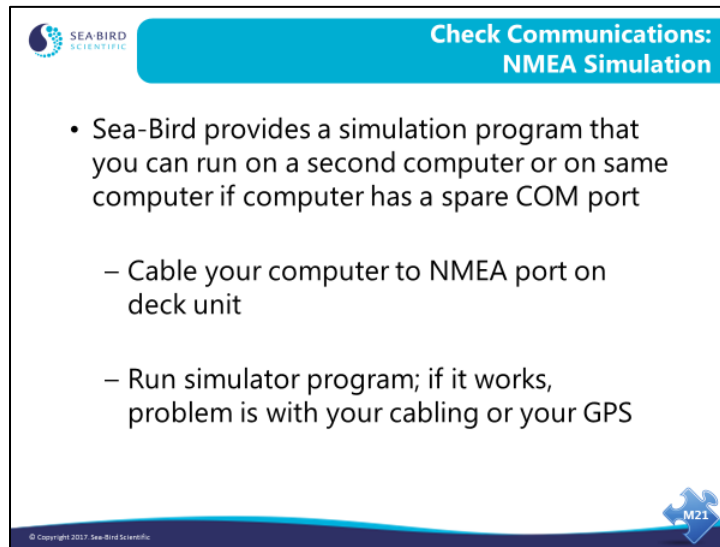


The slide features the SEA-BIRD SCIENTIFIC logo in the top left corner. The title 'Check Communications: Troubleshooting NMEA Interface' is displayed in white text on a blue background at the top. The main content is a bulleted list of four items. In the bottom right corner, there is a blue puzzle piece icon with 'M21' written on it. The bottom left corner contains the copyright notice '© Copyright 2017 Sea-Bird Scientific'.

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

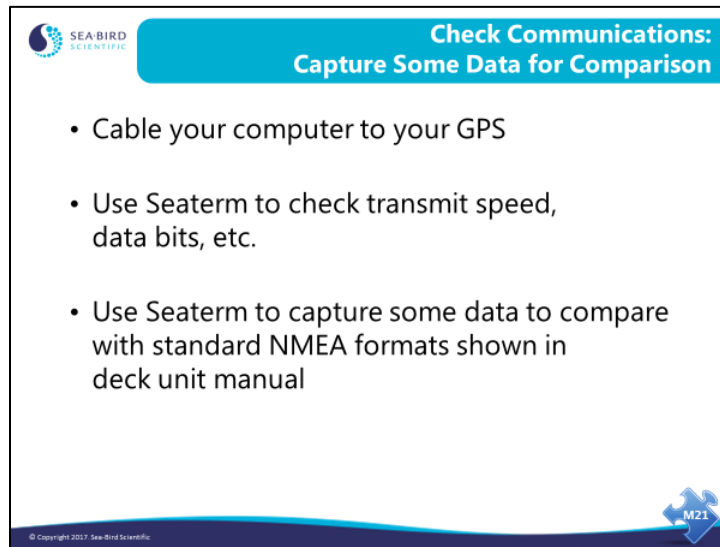


The slide features the Sea-Bird Scientific logo in the top left corner. The title 'Check Communications: NMEA Simulation' is displayed in a blue header bar. The main content consists of three bullet points: a primary point about running the simulation on a second computer or the same one with a spare COM port, followed by two sub-points: one about cabling the computer to the NMEA port on the deck unit, and another about running the simulator program to verify if the issue is with cabling or the GPS. The bottom right corner contains a blue puzzle piece icon with 'M21' written on it, and the bottom left corner has a small copyright notice: '© Copyright 2017 Sea-Bird Scientific'.

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



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**Check Communications:  
Capture Some Data for Comparison**


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

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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




**Check the Water Sampler:  
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

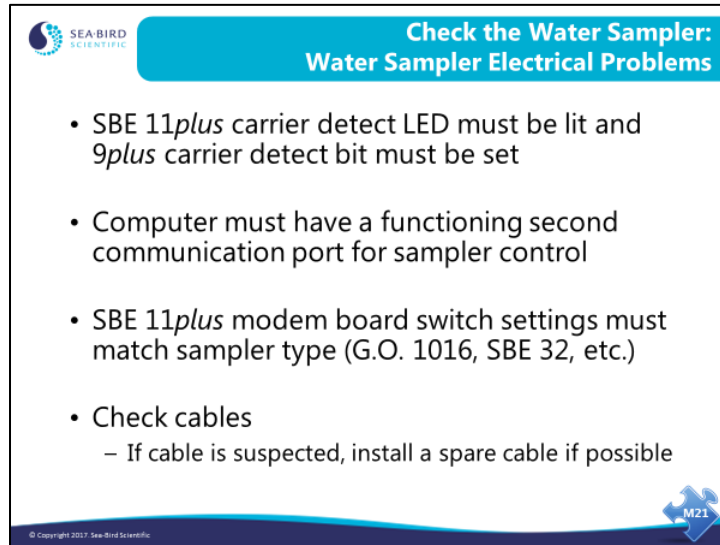
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Many general water sampler problems such as *bottles don't close* can be traced to physical problems with the sampling system. The Carousel triggers are coated with an oxide-type layer that is meant to water lubricate. The coating absorbs oil and becomes 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*)



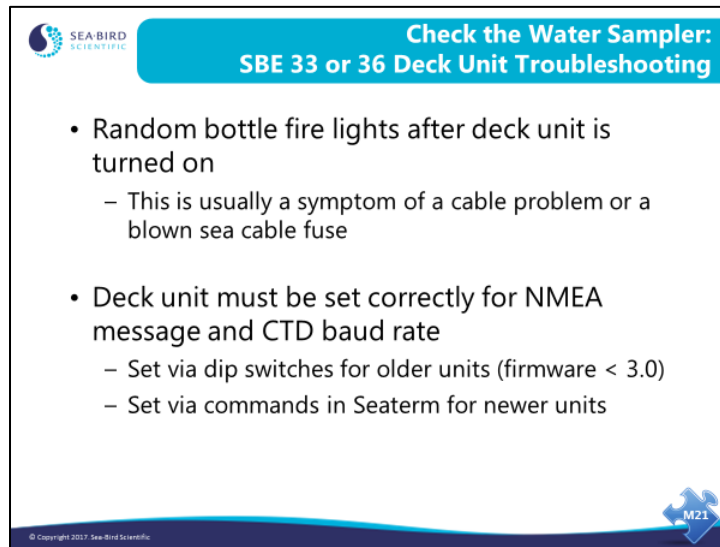
**Check the Water Sampler:  
Water Sampler Electrical Problems**

- 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 cable is suspected, install a spare cable if possible

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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




The slide features the SEA-BIRD SCIENTIFIC logo in the top left corner. A blue header bar contains the title "Check the Water Sampler: SBE 33 or 36 Deck Unit Troubleshooting". The main content consists of two bullet points with sub-points. In the bottom right corner, there is a blue puzzle piece icon with "M21" written on it. The footer contains the text "© Copyright 2017 Sea-Bird Scientific".

- Random bottle fire lights after deck unit is turned on
  - This is usually a symptom of a cable problem or a blown sea cable fuse
- Deck unit must be set correctly for NMEA message and CTD baud rate
  - Set via dip switches for older units (firmware < 3.0)
  - Set via commands in Seaterm for newer units

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 (continued)



**Check the Water Sampler:  
SBE 33 or 36 Deck Unit Troubleshooting**

- Check voltage on PDIM or Carousel 4-pin connector
  - Connect sea cable to PDIM or Carousel 2-pin sea cable connector
  - Disconnect CTD from 4-pin connector on PDIM or 4-pin serial data interface connector on Carousel
  - Power deck unit
  - There should be approximately 14 VDC between pins 1 and 4 of 4-pin connector





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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: Internally Recording Instruments




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



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## Troubleshooting: Internally Recording Instruments




**Internally recording instruments:  
No Communication**

- Change batteries
- I/O cable
  - Try a spare cable if one is available
- Comm Port
  - Verify computer and comm port are functioning properly by connecting to another instrument if one is available

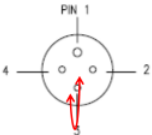


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## Troubleshooting: Internally Recording Instruments

 **Internally Recording Instruments:  
Troubleshooting I/O Cable**

- Perform a loop-back test to test computer, comm port, and cable
- With I/O cable connected to computer
  - Disconnect I/O cable from CTD
  - Use a bent paper clip to insert into pins 2 and 3 at CTD end of cable
  - Any characters typed in terminal program should echo on screen (paper clip creates a loop back to computer)




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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




### Internally Recording Instruments: Reset Switch

- Reset switch is at bottom of battery compartment
- For instruments with volatile memory (SBE 16/19, 25, etc.), **data in memory will be lost if reset switch is used**
- For instruments with FLASH memory (SBE 16*plus*/19*plus*), data in memory will **not** be lost if reset switch is used
- There is no reset switch for SBE 16*plus* V2/19*plus* V2 or 25*plus*



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## Troubleshooting: Auto Fire Module (AFM)




### Internally Recording Instruments: AFM Troubleshooting

- Most AFM issues (bottle misfires, bottles not firing, etc.) are cable or setup related
- AFM uses DTR line to allow communication to AFM and CTD through 1 comm port
  - Most DB-9/DB-25 extender cables do not have DTR line connected, so it is recommended to connect AFM I/O cable directly to computer comm port
- Random bottle misfires could be a symptom of a bad CTD/AFM cable
  - A bad cable will sometimes cause erroneous data to be transmitted from CTD to AFM, causing a bottle misfire

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## Troubleshooting: Data Problems



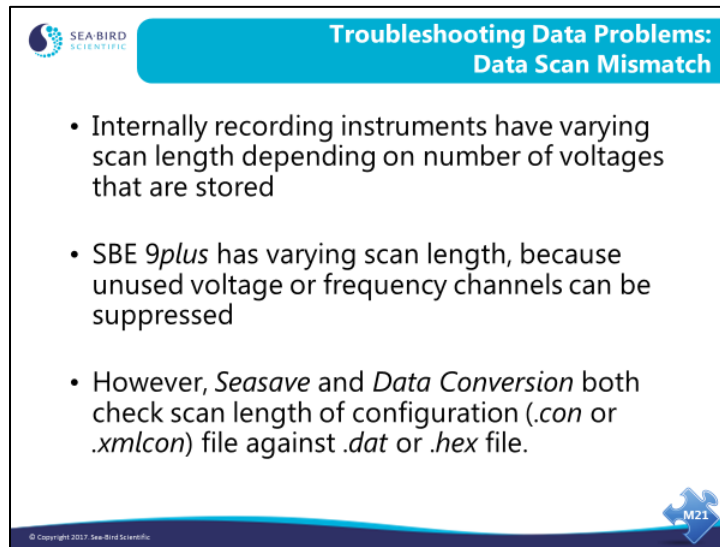
### Troubleshooting Data Problems

- Try to catch any problems with data collection early (such as no flow through sensors, low batteries, etc.)
- There are many ways you can produce useless data by making errors in data collection and data processing
  - Mismatching instrument setup and configuration (*.con* or *.xmlcon*) file
  - Having errors in calibration coefficients in *.con* or *.xmlcon* file (i.e., old calibrations)

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## Troubleshooting: Data Problems (*continued*)

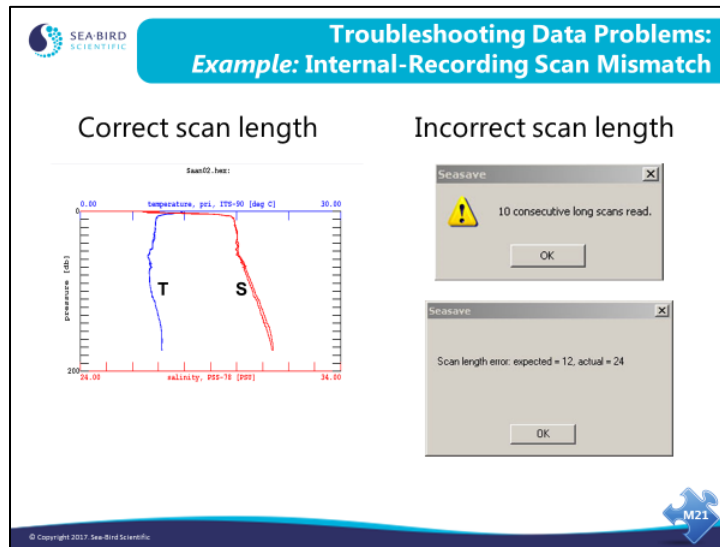


The slide features the SEA-BIRD SCIENTIFIC logo in the top left corner. The title 'Troubleshooting Data Problems: Data Scan Mismatch' is displayed in a blue header bar. The main content consists of three bullet points. In the bottom right corner, there is a blue puzzle piece icon with 'M21' written on it. The footer contains the copyright notice '© Copyright 2017 Sea-Bird Scientific'.

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

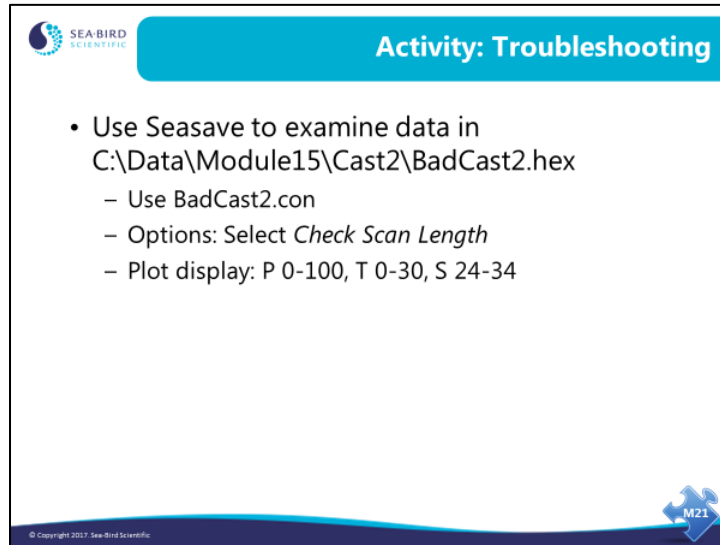
You can only harm yourself with data scan mismatch with internally recording instruments. It is always good idea to take a look at your data before you initialize (erase) the memory in your internally recording CTD.

## Troubleshooting: Data Problems (*continued*)



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

## Activity



The slide features a blue header with the SEA-BIRD SCIENTIFIC logo on the left and the title "Activity: Troubleshooting" on the right. The main content area contains a bulleted list of instructions. At the bottom left, there is a small copyright notice, and at the bottom right, there is a blue puzzle piece icon with the text "M21".

**Activity: Troubleshooting**

- Use Seasave to examine data in  
C:\Data\Module15\Cast2\BadCast2.hex
  - Use BadCast2.con
  - Options: Select *Check Scan Length*
  - Plot display: P 0-100, T 0-30, S 24-34

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