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APPLICATION NOTE NO. 94

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Wide-Range Conductivity Calibration

This application note is applicable to the SBE 4 conductivity sensor (used on SBE 9plus, 25, or 25plus CTD) and an SBE 19 SeaCAT CTD (old version; not applicable to 19plus or 19plus V2).

On request, Sea-Bird provides a conductivity sensor that has been modified to provide conductivity readings over a wider range than our standard conductivity range. The wide-range calibration is indicated by a ‘w’ at the end of the serial number on the conductivity calibration sheet (for example, 4216w); note that the serial number on the instrument label does not include the ‘w’.

The modification is implemented by inserting a precision resistor in series with the conductivity cell. Therefore, the equation used to fit the calibration data is different from our standard equation.

To fit the calibration data, pseudo-conductivity is calculated from true conductivity with the following formula:

$$\sigma' = \text{pseudo conductivity} = \frac{C\sigma}{C + R\sigma}$$

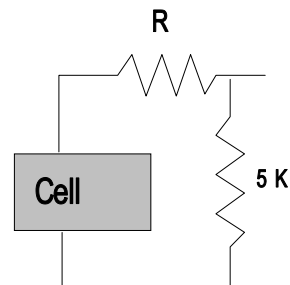
where

σ = true conductivity

σ' = pseudo conductivity

C = cell constant = 2000.0 (S/m)

R = series resistance (varies, depending on range; for example, 250 ohms for 70 S/m calibration)



The calibration coefficients are generated at Sea-Bird using pseudo-conductivity, water temperature, and sensor frequency.

Procedures are provided below for processing data from a conductivity sensor with a wide-range calibration, using:

- Your own software
- Sea-Bird software

Processing Data Using your own Software

If processing data using your own software, first calculate pseudo-conductivity using the coefficients on the calibration sheet, then convert pseudo-conductivity to true conductivity using the following formula:

$$\sigma = \text{true conductivity} = \frac{C\sigma'}{C - R\sigma'}$$

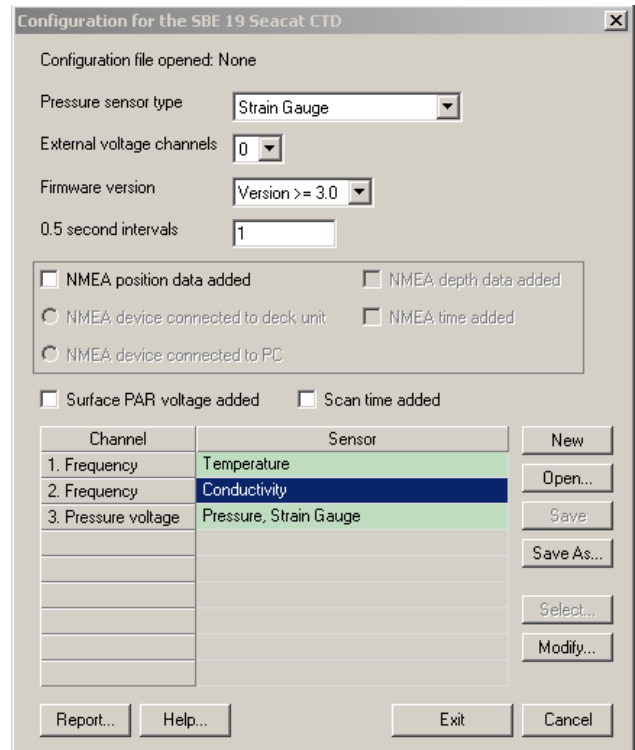
Processing Data Using Sea-Bird Software

Sea-Bird's Seasoft software (Seasave and SBE Data Processing) automatically calculates true conductivity (σ) for a sensor with a wide-range calibration. On the conductivity calibration sheet, the serial number for a conductivity sensor with a wide-range calibration has a 'w' at the end (for example, 4216w). The 'w' in the sensor serial number in the configuration (.con or .xmlcon) file indicates to Seasoft that this is a wide-range conductivity sensor, leading the software to prompt for the cell constant and the series resistor value. Sea-Bird provides a configuration file when you purchase a new instrument, and when the instrument is recalibrated. If you need to re-create the configuration file, proceed as follows (example shown is for SBE 19).

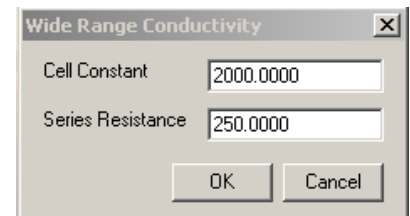
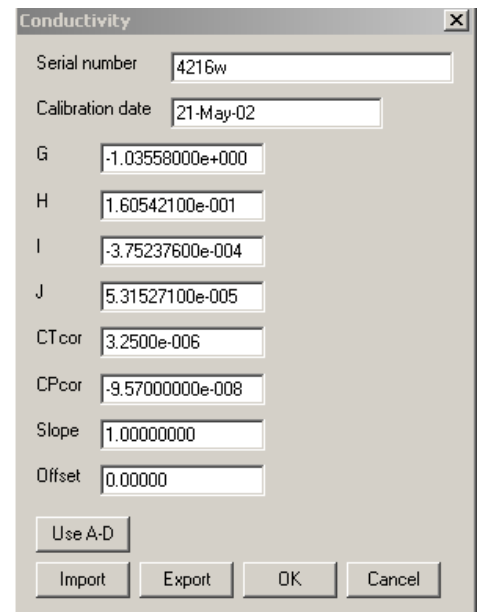
Note: You can create or modify the configuration file in SBE Data Processing (post-processing software) or Seasave V7 (real-time data acquisition software); both programs use the same configuration file.

SBE Data Processing

1. In SBE Data Processing's Configure menu, select the CTD. The configuration dialog box appears.
2. Double click on the conductivity sensor. The Conductivity calibration coefficients dialog box appears. Enter the serial number, making sure to include the 'w' at the end of the serial number; enter the remaining calibration coefficients, and click OK.



3. The Wide Range Conductivity dialog box appears if the sensor serial number ended with a 'w'. Enter the cell constant ($C = 2000$) and series resistance (R ; see configuration file and/or documentation provided with instrument), and click OK.
4. Make other changes to the configuration as needed, and click Save or Save As.



Seasave V7

1. Click Configure Inputs in Seasave V7. The Configure Inputs dialog box appears.
2. Select Create to make a new configuration file. Select the instrument in the Please Select an Instrument dialog box, and click OK. The configuration dialog box appears.
3. Follow Steps 2 through 4 from the SBE Data Processing section above.

Application Note Revision History

Date	Description
June 2013	Initial release.