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APPLICATION NOTE NO. 16

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Entering Calibration Coefficients for D&A Instrument (Campbell Scientific) OBS-3 Optical Backscatter Sensor

Note: See Application Note 81 for the OBS-3+ sensor.

Introduction

The OBS-3 output produces signal voltages in the range of 0 - 5 volts, as required by your Sea-Bird CTD. (Note: The gain is preset at Campbell's factory by adjusting resistors; see the calibration sheet for gain settings.) The OBS sensor sensitivity is dependent upon the characteristics of the particles in the water that are being measured. As a result, the sensor should be calibrated before and after use in different water types, using particles from the water that is being measured. Consult the OBS Instruction Manual for the correct calibration procedures. The resulting calibration information is entered in the CTD configuration (.con or .xmlcon) file.

The calibration coefficient format provided by Campbell has varied, depending on when the calibration was performed. Consult the information provided by Campbell with your sensor:

- **Older calibrations (before 2009)** – Campbell only provided information on the gain in **FTU (Formazin Turbidity Units)/volt**; thus, the calibration assumed a linear output of the form **FTU = gain*V + offset**.
- **Newer calibrations (after 2009)** – Campbell is providing a polynomial equation of the form **NTU = A2* V² + A1*V + A0**.

In our Seasoft V2 suite of programs, edit the CTD configuration (.con or .xmlcon) file using the Configure Inputs menu in Seasave V7 (real-time data acquisition software) or the Configure menu in SBE Data Processing (data processing software).

Older Calibrations (before 2009; linear form) - Configuration File Entry

Select **OBS/Nephelometers, OBS, Backscatterance (D & A)** as a voltage sensor when editing the configuration file; the software prompts for gain and offset, and calculates turbidity as:

$$\text{FTU} = \text{gain} * \text{V} + \text{offset}$$

where:

- V = voltage from sensor (**Volts**)
- Gain = OBS gain setting in FTU/volt from Campbell
- Offset = 0 (unless you have performed your own calibration and calculated an offset)

Example: From the Campbell information provided with your sensor, the sensor was factory set to a total range of 2000 FTU, providing a gain setting of 400 FTU/volt (2000 FTU / 5 volts). The software prompts for gain and offset. Enter 400 for the gain, and 0 for the offset.

Newer Calibrations (after 2009; polynomial form) - Configuration File Entry

Select **OBS, D & A OBS 3+ OBS/Nephelometer** as a voltage sensor when editing the configuration file. The software prompts for A0, A1, and A2, and calculates turbidity as:

$$\text{NTU} = (\text{A2} * \text{V}^2) + (\text{A1} * \text{V}) + \text{A0}$$

where:

- V = voltage from sensor (**milliVolts**)
- A0, A1, and A2 = **millivolt** calibration coefficients from Campbell calibration sheet

Notes:

- To enter the polynomial calibration coefficients, you must select the **OBS3+** (not OBS 3) in Sea-Bird software.
- Campbell provides calibration coefficients for both millivolts and volts; enter the **millivolt** coefficients.

Example: From the Campbell Calibration Certificate for a sensor with a nominal range of 250 NTU -

$$y (\text{NTU}) = (1.0681 \times 10^{-6} * \text{V}^2) + (4.4747 \times 10^{-2} * \text{V}) + 1.6343 \times 10^{-1} = (\text{A2} * \text{V}^2) + (\text{A1} * \text{V}) + \text{A0}$$

Therefore, $\text{A0} = 1.6343 \times 10^{-1}$, $\text{A1} = 4.4747 \times 10^{-2}$, $\text{A2} = 1.0681 \times 10^{-6}$

Application Note Revision History

Date	Description
1991	Initial release.
September 2001	Previously referred to SEACON in discussions of .con files. Add references to modifying .con file using Configure menu in Seasave or SBE Data Processing in Windows software.
May 2007	Incorporate Seasave V7.
March 2008	Update to include V2 Seacats (16plus V2, 16plus-IM V2, 19plus V2).
February 2010	<ul style="list-style-type: none">• Change Seasoft-Win32 to Seasoft V2.• Add information on .xmlcon files.• Update address.
October 2012	Update for 25 <i>plus</i> .
September 2014	<ul style="list-style-type: none">• Update for newer calibration sheets provided by Campbell Scientific, which now provide coefficients for a polynomial equation.• Remove information on the old SBE 9 (not 9<i>plus</i>).