



Sea-Bird Electronics, Inc.
13431 NE 20th Street
Bellevue, WA 98005
USA

Phone: (425) 643-9866
Fax: (425) 643-9954
E-mail: seabird@seabird.com
Web: www.seabird.com

APPLICATION NOTE NO. 41

Revised May 2011

**Calculating Calibration Coefficients for WET Labs WETStar Fluorometer
(voltage or RS-232 output sensor)**

Note: Procedures in this application note are valid for Seasave V7 and SBE Data Processing version 7.21d and later.

This Application Note applies to the use of the WET Labs WETStar fluorometer with Sea-Bird CTDs. The WETStar fluorometer is factory configured to measure Chlorophyll-*a*, CDOM, Uranine, Rhodamine, or Phycoerythrin concentration, and provides a linear output. See the WET Labs documentation provided with your WETStar for your instrument range.

Note:

The WETStar comes with a calibration sheet that lists values for Clean Water Offset and Scale Factor. Each of these values is supplied in terms of both voltage and counts.

- Use the **voltage values** in the Sea-Bird software if using a **voltage output WETStar**.
- Use the **counts values** in the Sea-Bird software if using an **RS-232 output WETStar** (compatible only with SBE 16*plus* V2, 16*plus*-IM V2, or 19*plus* V2 CTDs).

Setting Up Configuration (.xmlcon) File

1. Use the Configure Inputs menu in Seasave V7 (real-time data acquisition software), or the Configure menu in SBE Data Processing (post-processing software), to create / modify the .xmlcon file (see software Help files).
 - For the voltage (analog) output WETStar: Select *Fluorometer – WET Labs WETStar* for one of the **external voltage channels** on the CTD.
 - For the RS-232 (digital) output WETStar (SBE 16*plus* V2, 16*plus*-IM V2, or 19*plus* V2 CTDs only): Select *Fluorometer – WET Labs WETStar* for one of the **RS-232 channels on the CTD**.
2. The software prompts for Blank Output and Scale Factor, and calculates:
Concentration (µg/l or ppb, as applicable) = (Output – Blank Output) * Scale Factor
where:
 - Output (volts for analog output sensor; counts for digital output sensor) = in situ output of the fluorometer
 - Blank Output (volts for analog output sensor; counts for digital output sensor) = measured output for a seawater blank (pure, de-ionized water); called **Clean Water Offset** on WETStar calibration sheet
 - Scale Factor (µg/l – volt, µg/l – count, ppb/volt, or ppb/count, as applicable) = multiplier

Note: The configuration file can only be saved as an .xmlcon file (not a .con file) if the RS-232 output WETStar is one of the sensors.

Example Concentration Calculation in Sea-Bird Software:

Blank Output = 0.05 volts and Scale Factor = 14.10 µg/l-volts (from calibration sheet)

Measured voltage from WETStar= Output = 4.65 volts

Concentration = (Output – Blank Output) * Scale Factor = (4.65 - 0.05) * 14.10 = 64.9 µg/l

Field Calibrations

While the factory-supplied Scale Factor can be used to obtain approximate values, field calibration is highly recommended.

- For example, the relationship between fluorescence and chlorophyll-*a* is highly variable, and is not easy to determine in the laboratory. Species distribution, ambient light level, and health of the stock are just some of the factors that affect the relationship. To accurately measure chlorophyll-*a* concentration with a fluorometer, perform calibrations on seawater samples with concentrations of plankton populations that are similar to what is expected in situ. Determine chlorophyll-*a* concentrations independently, and use those concentrations, as well as readings from the fluorometer, to determine the correct Scale Factor. **The Scale Factor is correct as long as the condition of the plankton population does not change; the condition does change with season and geographic location.**

Example Calculation of Scale Factor from field calibration: Seawater sample analysis indicates chlorophyll-*a* is 50 µg/l when fluorometer reads 3.2 volts; measured signal for clean water offset is 0.05 volts.

Concentration = (Output – Blank Output) * Scale Factor → 50 = (3.2 - 0.05) * Scale Factor

Solving: Scale Factor = (50) / (3.2 - 0.05) = 15.87 µg/l → Enter new Scale Factor in configuration (.xmlcon) file.

Application Note Revision History

Date	Description
December 1996	Initial release.
March 2003	Update for new WET Labs calibration sheets, now providing Vblank and Scale Factor.
May 2007	Update for Seasave V7 software.
February 2010	<ul style="list-style-type: none">• Add info on .xmlcon.• Update address.
May 2011	SBE Data Processing and Seasave 7.21d software revision: WET Labs RS-232 output sensors, including WET Labs Triplet, are compatible with RS-232 sensor channel on SBE <i>16plus</i> V2, <i>16plus-IM</i> V2, and <i>19plus</i> V2 CTDs.