Use Biospherical Instruments Surface PAR Light Sensor with SBE 33 or SBE 36 Deck Unit

If the SBE 33 or 36 Deck Unit includes an A/D converter, it can acquire the output of a Biospherical Instruments Surface PAR sensor and integrate this into the CTD data stream (A/D converter in Deck Unit was optional prior to 2012; now standard). This application note applies to the following Surface PAR sensors (the corresponding underwater PAR sensor, mounted on the CTD or cage, is also shown):

Surface PAR Sensor	Corresponding Underwater PAR Sensor(s)	
	If underwater PAR sensor connected directly to CTD A/D voltage channel	If underwater PAR sensor: • Connected directly to CTD PAR connector, or • Interfacing to PN 90310 Log Amp Module (which is connected to CTD A/D voltage channel)
QSR-240 or QSR-2200	QSP-200L, QSP-2300L, or QSP-2350L	QSP-200(PD) or QSP-2200(PD)
QCR-240 or QCR-2200	QCP-200L, QCP-2300L, or QCP-2300L-HP	QCP-2200(PD)

Notes:

- QSR-240, QCR-240, QSP-200L, QSP-200(PD), and QCP-200L are no longer in production by Biospherical.
- See Application Note 11QSP-L for details on the QSP-200L, QCP-200L, QSP-2300L, QSP-2350L, QCP-2300L, and QCP-2300L-HP underwater PAR sensors.
- See Application Note 11QSP-PD for details on the QSP-200(PD), QSP-2200(PD), and QCP-2200(PD) underwater PAR sensors.

The Seasoft V2 software fully supports the acquisition and display of the data from these Surface PAR sensors and the corresponding underwater PAR sensor.

Configure SBE 33 OR 36 Deck Unit

1. Set up the Deck Unit to add Surface PAR voltage to the end of the CTD data stream, increasing the number of Hex data bytes by three. Setup varies, depending on the Deck Unit firmware version (refer to the Deck Unit manual).
   - **Deck Unit firmware < 3.0:** Locate the NMEA Interface PCB with optional A/D converter under the bottom cover panel of the Deck Unit. Verify that dip switch S1 position 8 is in the OFF position.
   - **Deck Unit firmware ≥ 3.0:** In Seaterm, verify that the SBE 33/36 status message on power-up shows `Surface PAR enabled`. If it does not, type `@` to access the setup menu, and then type `6` and press the Enter key to enable Surface PAR acquisition.
   2. Plug the cable connected to the Surface PAR sensor into the 4-pin MS connector labeled *PAR Input* on the back of the Deck Unit. A spare 4-pin MS-style connector (MS3106A14S-2P) was supplied if a cable was not provided. The Surface PAR bulkhead connector on the back of the Deck Unit is an MS3102A14S-2S.

Deck Unit	Function	Biospherical Surface PAR Sensor with Switchcraft Connector
Pin A	Signal (ground)	Pin 3
Pin B	Power (+12 volts)	Pin 4
Pin C	Power (ground): Deck Units with NMEA PCB Assembly 40785b/40786b or greater use Pin C. All previous versions do not use Pin C.	Pin 1
Pin D	Signal	Pin 2
-	-	Pin 5

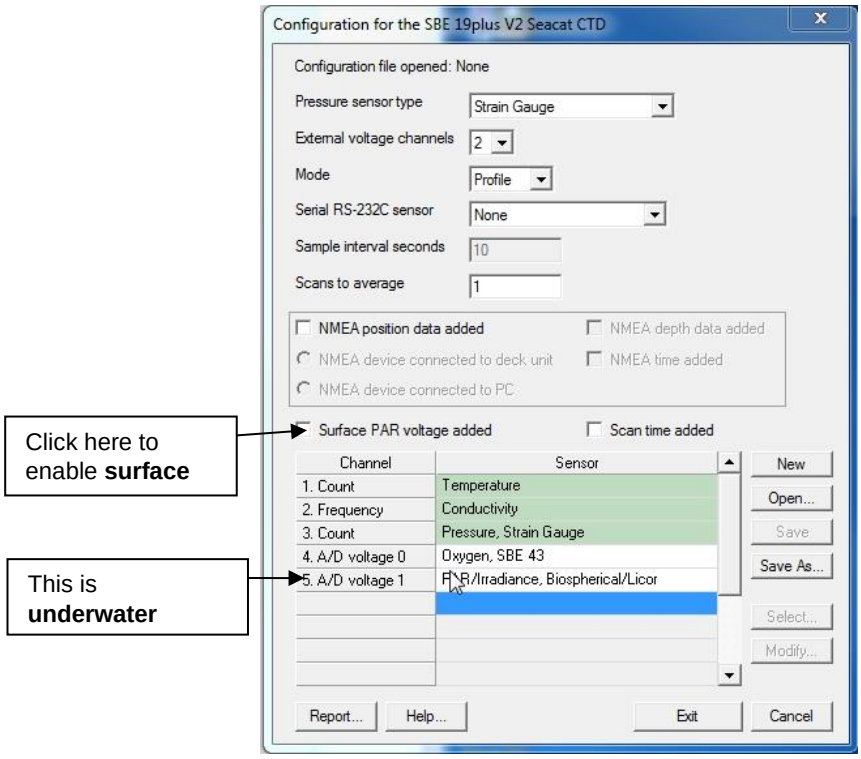
Note: Biospherical sold the Surface PAR sensor with other connector types in the past. See the appropriate drawing for pinout details if your sensor does not have a Switchcraft connector.

Configure Software

In the 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 SB Data Processing software.

Set up the configuration (.con or .xmlcon) file for the appropriate CTD (SBE 16/16*plus*/16*plus* V2/19/19*plus*/19*plus* V2/25/25*plus*/49). Example screens shown below are for the SBE 19*plus* V2.

1. Enable the Surface PAR sensor by selecting *Surface PAR voltage added*.



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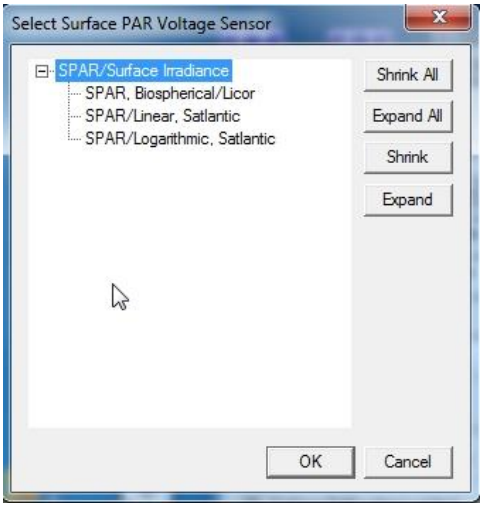
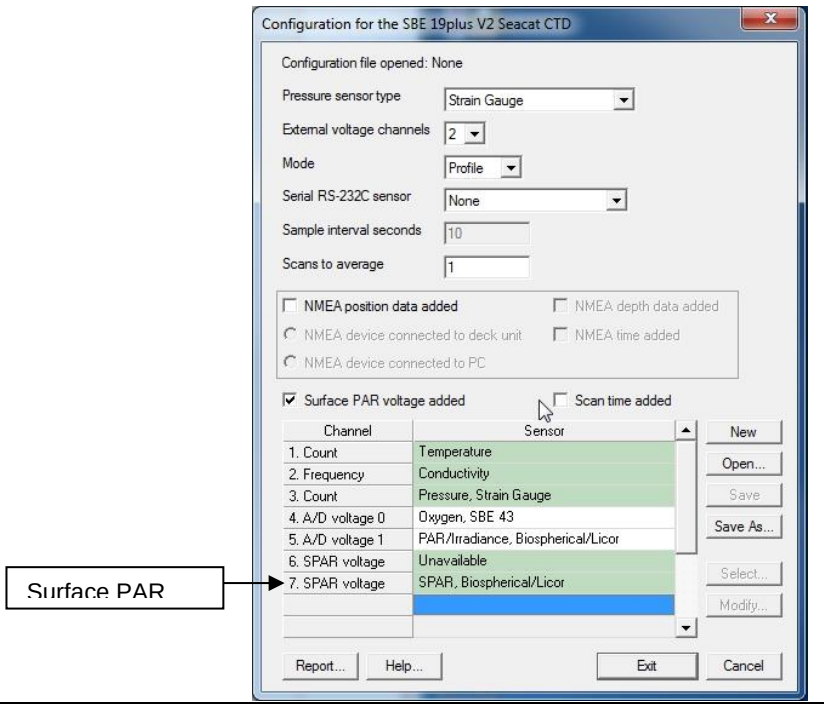
2. The Select Surface PAR Voltage Sensor dialog appears. Select *SPAR/Biospherical/Licor*, and click **OK**.



This alters the display by adding two additional external voltages. The highest numbered voltage is labeled *SPAR, Biospherical/Licor*.



3. Double-click on *SPAR, Biospherical/Licor* in the Channel/Sensor display. The calibration coefficient dialog box appears.
   A. Select the **conversion units** (which appears in the data file header; this selection does not modify the calculated values) and enter the surface light **conversion factor** corresponding to the desired units (see Application Note 11General).
   B. Enter the **ratio multiplier**.
   C. Click **OK**.

Equations

Seasoft calculates surface light as:

surface light (µEinsteins/m^2·sec) = volts * conversion factor

To compute the **conversion factor**, calculate the output of the Surface PAR sensor in µEinsteins/m^2·sec/volt using the data from the Surface PAR calibration sheet that was provided by Biospherical (located in the CTD manual).

Conversion factor = Output in Air / Probe Net Response

For example, if Probe Net Response = 85.6 mV (0.0856 volts) and Output in Air = 0.01384 µEinsteins/cm^2·sec:
Conversion factor = (0.01384 µEinsteins/cm^2·sec) * (10000 cm^2·/m^2) / 0.0856 volts = 1617 µEinsteins/m^2·sec/volt

Seasoft calculates corrected PAR as:

corrected PAR = 100 * ratio multiplier * underwater light / surface light

(underwater light is the calculated light output from the underwater sensor)

To compare the *shape* of data sets taken at disparate light levels, the **ratio multiplier** can be used to *scale* the data. For example, a ratio multiplier of 10 would make a 100 µEinsteins/m^2·sec light level plot as 1000 µEinsteins/m^2·sec. **The ratio multiplier should be set to 1 for normal operations.**

Notes:

- **Do not enter the Conversion factor from the Biospherical calibration sheet as the Conversion factor in Seasoft.**
- To output Surface PAR in units other than µEinsteins/m^2·sec, multiply the calculated Conversion factor to obtain the desired units. See Application Note 11General to convert units.
- See Application Note 11QSP-L or 11QSP-PD, as applicable, for instructions on entering the underwater PAR sensor coefficients.