



APPLICATION NOTE NO. 72-V2

Revised May 2013

Setting Up WET Labs ECO Sensor with Bio-Wiper™ for integration with SeaCATplus V2 CTDs (SBE 16plus V2, 19plus V2)

Notes:

- See Application Note 72 for integration with older SeaCATplus (16plus, 16plus-IM, 19plus).
- **DelayAfterSampling**= command was implemented in the SBE 16plus V2 firmware 2.5; we recommend that you update your firmware if using the CTD with a WET Labs ECO sensor.
- **DelayAfterSampling**= command was implemented in the SBE 19plus V2 firmware 2.5; we recommend that you update your firmware if using the CTD in moored mode with a WET Labs ECO sensor.
- **DelayAfterSampling**= command has not yet been implemented in the SBE 16plus-IM V2 firmware. See Application Note 72 for integration with the 16plus-IM V2.

This application note applies to the following models of the WET Labs ECO sensor with Bio-Wiper:

- **ECO-FLNTUS** chlorophyll and turbidity sensor
- **ECO-FLS** chlorophyll sensor
- **ECO-FLCDS** CDOM sensor

The ECO sensor can be configured to operate in Profiling or Moored mode:

- **Profiling mode** – The ECO opens the Bio-Wiper when power is applied and keeps it open continuously, even when power is removed. It samples continuously when powered, and outputs a voltage that changes as the data changes.
- **Moored mode** – The ECO opens the Bio-Wiper when power is applied, takes one or more samples, outputs voltage(s), closes the Bio-Wiper, and holds the last voltage until power is removed.

When Sea-Bird integrates the ECO with one of our CTDs, we set up the ECO to operate in the mode appropriate for the CTD. However, you may want to change the mode in the future, if:

- You purchased the ECO for use with an SBE 19plus V2, which can be field configured to operate in either profiling or moored mode.
- You want to use the ECO in the future with another CTD; for example, you purchased the ECO for use with an SBE 25 profiling CTD and now want to use it with an SBE 16plus V2 moored CTD.

Definitions

WET Labs ECO Setup

- \$pkt is the number of packets sent by ECO per set (defines ECO sampling duration).
- \$set is the number of sets of packets sent by ECO before shutting down (0 = continuous).
- \$int is the interval between sets of ECO packets.

Sea-Bird SeaCATplus V2 Setup

- **BioWiper=Y** defines that the CTD is integrated with a WET Labs sensor with Bio-Wiper; affects length of time that CTD is powered for status command (**DS** or **GetSD**), to allow time for Bio-Wiper to close.
- **NCycles**= measurements for SeaCATplus V2 to average per sample (requires 0.25 sec/measurement).
- **DelayBeforeSampling**= seconds to wait after applying power to auxiliary sensors and pump before sampling begins.
- **DelayAfterSampling**= seconds to wait after sampling is completed, before powering down auxiliary sensors and pump.
- **ParosIntegration**= seconds to integrate (optional) Paroscientific Digiquartz pressure sensor readings per sample. Not applicable to 19plus V2.

Changing ECO Setup (see www.wetlabs.com for details)

Connect the ECO **directly** to the computer and a 12 V power source, using the cable supplied by WET Labs. Configure the ECO using a terminal program or WET Labs' ECOView program.

The required comm port settings are: 19200 baud, 8 data bits, no parity.

<i>Configure ECO for Profiling Mode</i>	<i>Configure ECO for Moored Mode</i>
Send following commands: !!!! \$pkt 0 \$set 0 \$sto	Send following commands: !!!! \$pkt 1 (can be larger; see <i>Setting Up/Using CTD in Moored Mode</i>) \$set 1 \$int # (substitute value in seconds for #; must be >> SeaCATplus V2 total on-time/sample) \$sto

Notes:

1. Five exclamation points (!!!!) accesses the ECO command set.
2. For commands that set a value for a parameter, the space between the command and the number is important. For example, make sure that there is a space between \$set and 0 or 1 (\$set 0 is correct; \$set0 is incorrect).
3. The \$sto command stores the settings in memory. If you omit this command, the ECO defaults to its last stored settings.

After you configure the ECO for your CTD, reconnect the ECO to the CTD.

Setting Up / Using CTD in Moored Mode

General

Enabling the Bio-Wiper command ensures that the Bio-Wiper automatically closes after sending a status command:

Command	Description
BioWiper=x	<p>x=Y: Configuration includes WET Labs sensor with Bio-Wiper. CTD is powered longer (total of 8 sec) for status command (DS or GetSD), providing 4 sec for Bio-Wiper to open and then shut again if in Moored mode.</p> <p>Note: 4 sec for the Bio-Wiper to open and shut is sufficient for the typical application, with the ECO set up to take a single measurement for each sample. However, the ECO can be user-programmed to take and average a number of measurements for each sample; if averaging multiple measurements, 4 sec may not provide sufficient time for the Bio-Wiper to close. For those applications, use the TV, TVR, or TS command after the status command, and then wait at least 10 sec to cycle the Bio-Wiper open/close; verify that the Bio-Wiper has closed before deploying.</p> <p>x=N (default): Configuration does not include WET Labs sensor with Bio-Wiper.</p>

Delay before sampling (DelayBeforeSampling=) sets the amount of time to wait after switching on external voltages before sampling. The ECO requires approximately 4 seconds to provide time for the sensor to open the Bio-Wiper before sampling (sensor dependent; see WET Labs documentation). Set delay before sampling as follows:

- If \$pkt is set to 1: **DelayBeforeSampling=4**
- If \$pkt is set to >1: See *Setup when Multiple ECO samples are Desired* below.

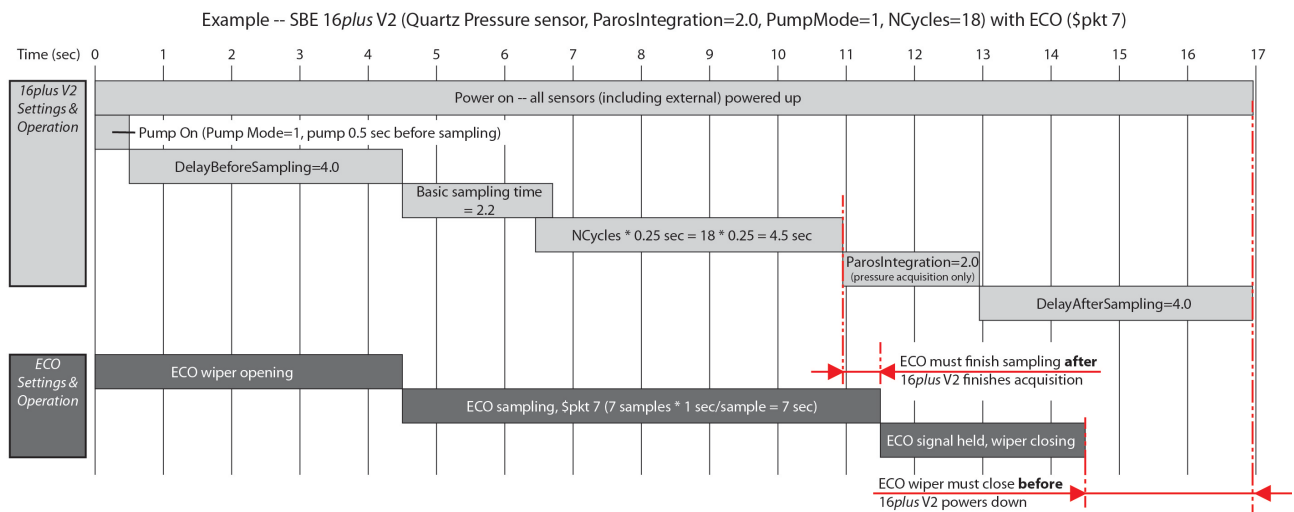
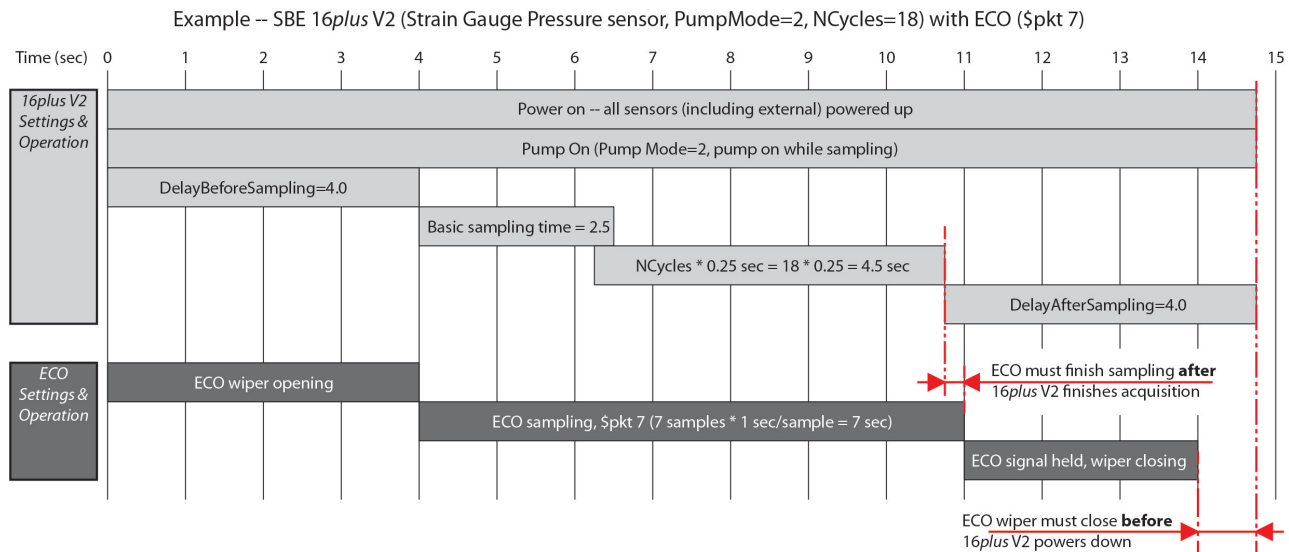
Delay after sampling (DelayAfterSampling=) sets the amount of time to wait after sampling is completed, before turning off power to external sensors. The ECO requires approximately 4 seconds to provide time to shut the Bio-Wiper after sampling is complete. Therefore, set **DelayAfterSampling=4**.

Setup when Multiple ECO samples are Desired (\$pkt > 1)

As described above, \$pkt is the number of packets sent by the ECO per set. The ECO samples at 1 Hz (1 sample /sec), and then holds the final voltage until power is removed. The SeaCATplus V2 averages all of the ECO data received during its own sampling cycle. Consequently, if the SeaCATplus V2 is still sampling when the ECO has finished, the final ECO voltage (which is held until power is removed) will bias the average toward the value of the last ECO sample. Therefore, if \$pkt > 1, a careful timing analysis is required to **ensure that the ECO sampling length extends beyond the end of the SeaCATplus V2 acquisition**. This can be accomplished by modifying NCycles= (number of A/D/ acquisition cycles, each at 0.25 sec) in the SeaCATplus V2.

Two examples are shown below:

- SBE 16plus V2 with a strain-gauge pressure sensor and **PumpMode=2** (pump during sampling),
- SBE 16plus V2 with a Quartz pressure sensor (integrated for 2 seconds) and **PumpMode=1** (pump for 0.5 sec before sampling).



Application Note Revision History

Date	Description
May 2013	Initial release of separate application note specific to V2 SeaCAT <i>plus</i> , incorporating information on sample timing and DelayAfterSampling= command. See Application Note 72 for earlier versions of SeaCAT <i>plus</i> .