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Setting Up Teledyne Benthos Altimeter with Sea-Bird Profiling CTD

This application note describes the use of a Teledyne Benthos PSA-916 altimeter integrated with a Sea-Bird CTD (SBE 9*plus*, 19, 19*plus*, 19*plus* V2, 25, or 25*plus*). The altimeter can be cabled to an A/D channel on the CTD end cap; a y-cable is required if you are connecting multiple sensors to one connector.

Seasoft calculates the altimeter height as follows:

altimeter height = [300 * voltage / scale factor] + offset

where

- scale factor = full scale voltage * 300/full scale range
- full scale range is dependent on the sensor (e.g., 50m, 100m, etc.)
- full scale voltage is nominally 5V
- offset is typically 0, but can be used to adjust the calculated height based on in-field testing

Example Calculation in Sea-Bird Software -
For a 100 m sensor with 5 V full scale voltage, calculate the scale factor for input in the software:
scale factor = full scale voltage * 300/full scale range = 5 * 300 / 100 = 15
If the altimeter is outputting 2.45 V, calculated height = [300 * voltage / scale factor] + offset = 300 * 2.45 / 15 = 49 m
If no echo is received (altimeter is out of range), the altimeter actually outputs 4.98 V (not 5 V), so the maximum calculated height in Seasoft = 300 * 4.98 / 15 = 99.6 m

Calculating and Entering Calibration Coefficients for Altimeter in Seasave V7

If Sea-Bird integrates the altimeter at the factory, we send it to you with a configuration file (.xmlcon or .con) that matches the factory setup. If you are integrating the altimeter yourself, you must update your existing configuration file to include the altimeter and to enter its calibration coefficients.

1. In Seasave V7, click Configure Inputs.
2. In the Configure Inputs dialog box, click Open. In the Select Instrument Configuration File dialog, browse to the desired configuration file, and click Open.
3. In the Configure Inputs dialog box, click Modify.
4. (SBE 19, 19*plus*, 19*plus* V2, 25, 25*plus*) Verify that *External voltage channels* corresponds to the number of voltage channels you are using for auxiliary sensors.
   (SBE 9*plus*) Verify that *Voltage words suppressed* is correct for the number of voltage channels you are using for auxiliary sensors.
5. To add the altimeter to the sensor list: Click on the voltage channel corresponding to the altimeter (see the CTD manual for details) and click Select. The Select New Voltage Sensor dialog appears; double click Altimeter. The Altimeter dialog box appears; enter the serial number, calibration date, scale factor, and offset, and click OK.
6. Make other changes to the configuration as needed, and click Save or Save As to save the configuration file.
7. (SBE 19, 19*plus*, 19*plus* V2, 25, 25*plus*) Using a terminal program, enable the voltage channel in the CTD by sending the appropriate command to the CTD; see the CTD manual for details. **If you do not enable the channel, the CTD will not output the sensor data.**

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

Viewing Altimeter Data and Setting Up Altimeter Alarms in Seasave V7

Viewing Altimeter Data

You can view the following data related to the altimeter output in Seasave's fixed, scrolled, and/or plot displays.
- altimeter height (distance from the seafloor, m or ft)
- seafloor depth (m or ft):
  Seafloor depth = depth (calculated from CTD's pressure sensor output) + altimeter output
  Note: For Seafloor depth, you must select salt water or fresh water. The depth calculation for salt water is dependent on gravity (which is dependent on latitude). Seasave uses the latitude from a NMEA navigation device, if NMEA is enabled in the .con or .xmlcon configuration file. If your system does not have NMEA, enter the desired latitude on the Miscellaneous tab in Configure Inputs.
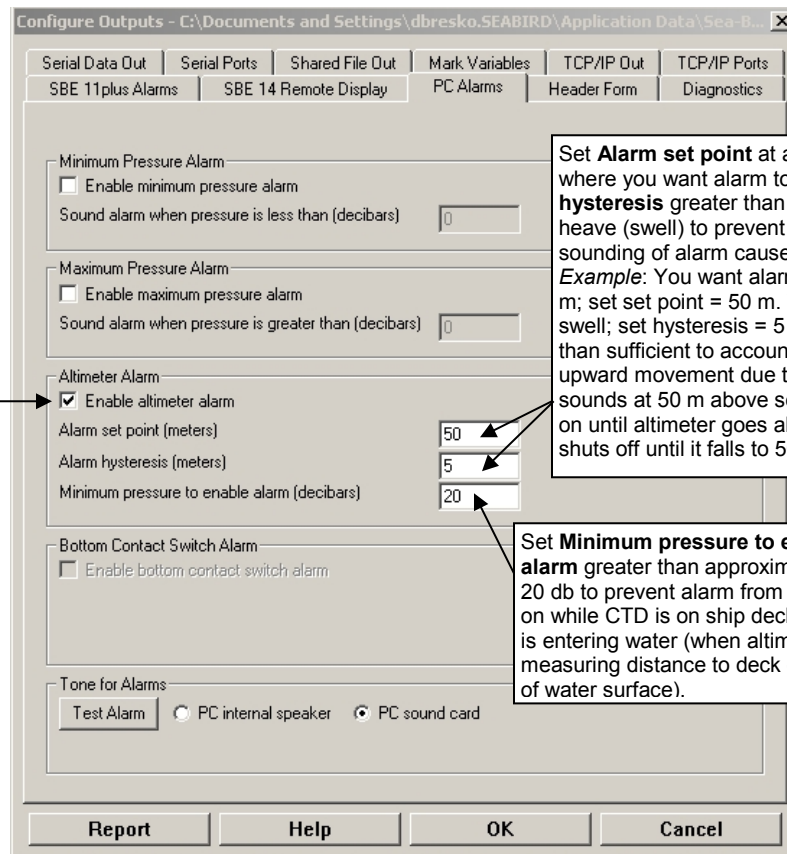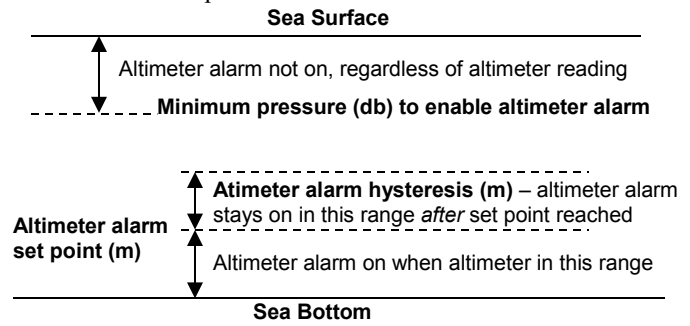
See the Seasave manual and/or Help files for details on setting up the displays.

Setting Up Altimeter Alarms

You can activate an **audible** alarm in the personal computer (PC) that is running Seasave, based on an altimeter, minimum and maximum pressures, and/or a bottom contact switch (pressure and bottom contact switch alarms are not covered in this application note; see the Seasave manual and/or Help files). To enable and set up the altimeter alarm:

1. In Seasave V7, click Configure Outputs.
2. In the Configure Outputs dialog box, click the PC Alarms tab.
3. Click Enable altimeter alarm, and enter the alarm set point, hysteresis, and minimum pressure. Click OK.

Note: You can set up similar alarms in an SBE 11*plus* Deck Unit (for SBE 9*plus* CTD) or SBE 14 Remote Display.

Sea Surface

Altimeter alarm not on, regardless of altimeter reading

Minimum pressure (db) to enable altimeter alarm

Atimeter alarm hysteresis (m) – altimeter alarm stays on in this range *after* set point reached

Altimeter alarm set point (m)

Altimeter alarm on when altimeter in this range

Sea Bottom

Click to enable altimeter alarm in PC.

Set **Alarm set point** at altimeter reading where you want alarm to sound. Set **Alarm hysteresis** greater than expected ship heave (swell) to prevent on-off-on-off sounding of alarm caused by ship heave. *Example*: You want alarm to turn on at 50 m; set set point = 50 m. There is a 2 m swell; set hysteresis = 5 m, which is more than sufficient to account for possible 2 m upward movement due to ship heave. Alarm sounds at 50 m above sea bottom and stays on until altimeter goes above 55 m, when it shuts off until it falls to 50 m again.

Set **Minimum pressure to enable alarm** greater than approximately 20 db to prevent alarm from turning on while CTD is on ship deck or as it is entering water (when altimeter is measuring distance to deck or to top of water surface).

After you enable one or more audible alarms on Configure Output's PC Alarms tab, you can also enable a **visual** alarm in Seasave.

    In the Display menu, select Alarms. The Alarms display appears.

    If **no** alarm is on when Seasave is collecting data or playing back archived data, the Alarms display looks like this:
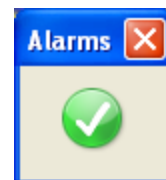
    If an **alarm is on** when Seasave is collecting data or playing back archived data, the display looks like this, with the two icons alternating every 0.5 seconds:

Cleaning and Testing Altimeter Prior to Deployment

Note: See the altimeter manual for details on cleaning and testing.

Cleaning

A major source of problems with acoustic equipment is that the transducer is not clean, resulting in masking of acoustic signals. Teledyne recommends that the user clean the exterior of the pressure casing and transducer with fresh water and a mild detergent, prior to each deployment. **Do not use glass cleaner**.

Testing

The analog output ranges from 0 VDC to 4.98 V (which represents 0.00 to 99.6 m). If no echo is received, the output will go to full scale (4.98 V). Teledyne recommends the following tests be performed prior to deployment:
1. In-air test.
2. Short range in-water test - Make sure the transducer is well below the keel of the boat and away from prop wash and noise. A test tank or barrel filled with water can be used if the water depth is at least 1 m.

These tests can be performed with the altimeter on the CTD, by observing the altimeter channel voltage output in a Seasave display.

Application Note Revision History

Date	Description
January 2014	Initial release.