Calibration of pressure transducer (Levelogger)

The steps below are for manual calibration of the pressure transducer (e.g., Solinst Levelogger). See documentation provided by Solinst for more details.

Steps

Export data

Export the raw data in `.csv` from both Barologger 5 and Levelogger 5 using Solinst program.

Convert Logger pressure (kPa) to water column equivalent (m)

Using the following equation to convert pressure readings to water column equivalent height in meters for both Levelogger and Barologger:

$$WaterHeight\ [mH_2O] = LoggerPressure\ [kPa] * ConversionFactor[mH_2O/kPa]$$

$$ConversionFactor[mH_2O/kPa] = 1[m]/(\rho g) = 1[m] * 1000/(1000[kg/m^3] * 9.81 m/s^2) = 0.102$$

E.g., where Levelogger 5 data is a pressure reading of 101.325 Kpa, the water column equivalent height is:

$$101.325\ [kPa] * 0.102\ [m/kPa] = 10.33515\ [m]$$

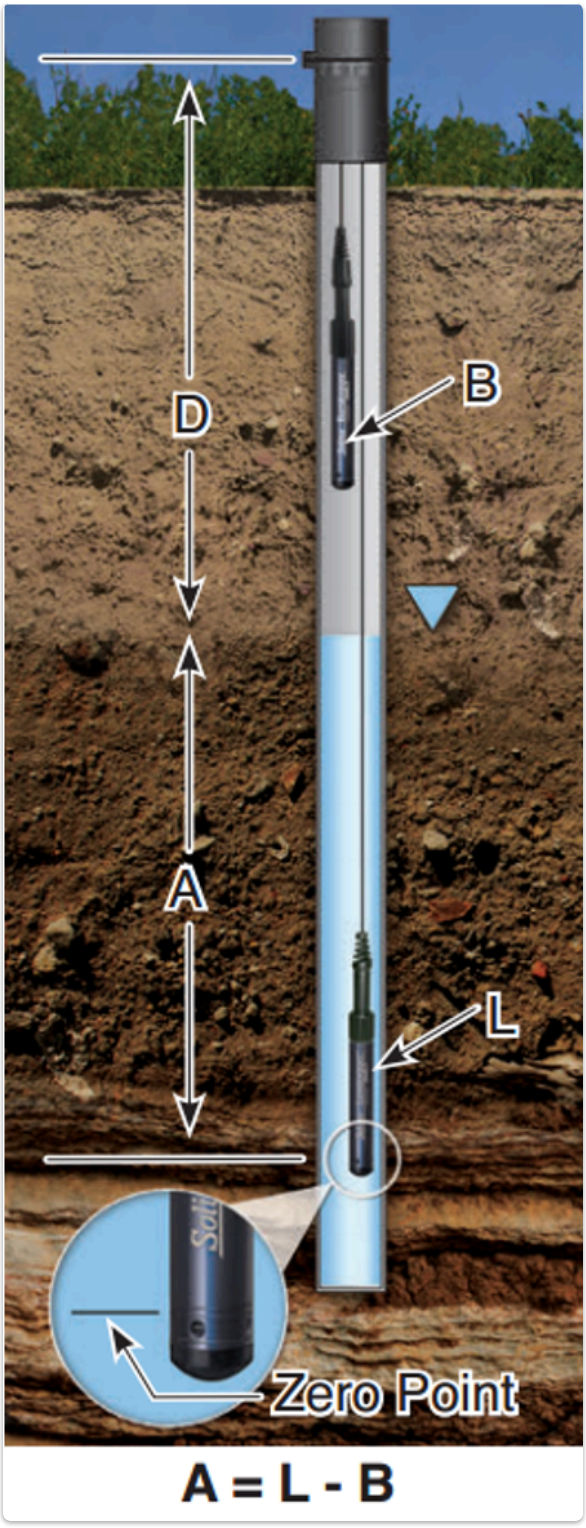
Actual water column height (A) --barometric compensation

Actual water column height (A) is calculated by subtracting Barometric Pressure in meter (B) from Levelogger Reading in meter (L). See figure below for symbols where Levelogger measures total pressure or water column equivalent height (L). In order to get the actual height of water column (A) just above logger sensor, barometric pressure in meter (B) needs to be subtracted from total pressure in meter (L).

$$A(t) = L(t) - B(t)$$

E.g., where Levelogger 5 data has water column equivalent height of 10.33515 m (see conversion above) and Barologger 5 data has water column equivalent height of 9.12515 m, the acutal water column height would be:

$$10.33515\ m - 9.12515\ m = 1.21\ m$$



Depth to water level (D)

We know that the height (H) from top of casing down to Levelogger is constant. And

$$H\ [m] = D\ [m] + A\ [m]$$

So if we can manually measure the depth to the water level (D) at time t_1 (usually before logger installed or after logger removed), we can calculate the total height H by using the actual water column height (A) from the previous step.

$$H = D(t_1) + A(t_1)$$

Using the known height H, depth to the water level at any time can be calculated as:

$$D(t) = H - A(t)$$

Elevation of water Level

If we survey the elevation of the top well casing (TWC), we can know the elevation of water level (WL) at any given time t by simply subtracting depth to water level (D):

$$\begin{aligned} WL(t) &= TWC - D(t) \\ &= TWC - (H - A(t)) \\ &= TWC - (D(t_1) + A(t_1) - A(t)) \\ &= TWC - D(t_1) - A(t_1) + A(t) \end{aligned}$$

where t_1 is the time when manual depth to water table is taken.

This manual calibration can be performed in Excel, or other external programs (e.g., Python/R)

Notes

- If an on-site Barologger is not available, your data can be compensated using alternate barometric data (e.g. from a local weather station). You will need to consider the elevation difference between the weather station and Levelogger. See documentation provided by Solinst for more details.