Notes on WPS, SSIFWC Oaktons
please read before device field use or re-calibration

Background

Our SSIFWC project Oaktons' are used in the field to measure basic freshwater chemistry: Ph (a measure of water acidity or alkalinity), conductivity (the ability of water to conduct an electrical current) and water temperature (in degrees Celsius). This basic field chemistry data provides useful information on the surface freshwater source(es). The Oakton data we are acquiring address questions on: is the freshwater being sampled from rainfall (recent precipitation), from groundwater (aquifer water reaching the surface somewhere "nearby"), or from a combination of the two?

We currently have some nineteen Oakton devices in circulation with our SSIFWC Oakton Hosts which are shared across the SSIFWC community and stored at selected locations (normally where the device gets the most use). If we are successful with grant applications for additional equipment funding (or if we receive more donations) we will have more Oaktons to share/use. "The Oakton" is a versatile and sophisticated field device and, while relatively robust, the device does need a little TLC (tender loving care) when in use or being stored. Please read on…

Tips on using the Oakton

Preparing for a field measurement

Our Oaktons are numbered "1", "2" (100, 200 for personal devices) etc for SSIFWC project logistics management and for checking on measured data consistency (calibration). When using the Oakton for field measurements please record the Oakton being used, and the most recent calibration week ("0 wk" "1 wk" etc. *We attempt to re-calibrate the Oakton before each field visit (recording week "0"),* this is required to avoid device/measurement drift (error).

Oakton device layout

The Oakton device has a four button keypad and a "sensor head" that contains:

1] a plastic gel-filled (non-refillable) small globe "electrode" probe, for measuring pH. These electrodes are low maintenance, though relatively fragile. A properly functioning new gel-filled electrode will take a reading in ca 60 to 90 seconds*.

2] two electrodes (prongs) for measuring conductivity. Voltage applied between two electrodes creates a drop in voltage (the resistance of the water) giving a conductivity (per microseimens per centimeter)*.

The Oakton also quickly measures water or air temperature (if dry). The device is waterproof,

but please try do not leave it fully immersed in water for too long, nor deploy the device in/near salt water conditions.

Oakton key pad

The keypad has four buttons, three of these buttons are dual purpose:

- cal | esc

  - *cal*, works only if the device is already in measurement mode (eg pH, Conductivity, TDS etc), and places the Oakton in re-calibration mode (for the last actual measurement made)
  - *esc* only works if the device is in a menu and flicks the device into a measurement mode that has previously been selected (eg pH, Conductivity, TDS etc) before recalibration

- menu | v

  - *menu*, brings up the available menu options (measure, reset etc)
  - *v*, allows you to scroll down when in a menu

- hold | ⏎

  - *hold,* locks the screen display for ease of reading measurements

  - ⏎, enter, (carriage return) confirms the change made (measurement or re-calibration)

Making a field measurement

When not in use the Oakton's measurement head is protected by a clear plastic cap. Remove and store this cap before use at a field location.

Immerse the Oakton in water and switch on the device (top left "main menu" key). The device will default to the last measurement made ("conductivity" or "pH"). You can toggle between conductivity and pH (and other data not being used) by selecting "menu/v", scroll down and press "hold/⏎" to select conductivity or pH and then "Cal/Esc" to leave the menu. Note temperature is always displayed at the bottom of the Oakton viewing LED screen.

**NB Field readings will take longer to reach equilibrium (owing to chemistry "drift") if the probe is recording chemistry directly in the creek. Taking a creek sample in a small (say 100ml to 200ml) clean container (eg a plastic cup) will be faster, and is less likely to give you back problems! But note record water temperature in the creek not in a container (the water gets hot)!*

Electrodes that are dirty or have dried out will give a sluggish response. Avoid using the Oakton in/near seawater.

When not in use the protective cap shields the two sensors used for field measurements. This cap should be kept in place when the device is being transported/stored.

A copy of the Oakton operating instructions are stored in the Oakton storage/transportation box.

Wear-and-tear

To eliminate touch-sensitive keypad damage (from fingernails…) please switch the Oakton on with your fingerprint, and (for the same reason) allow the device to switch itself off after use (the batteries are remarkable)!

Recording Oakton field data

Either record the Oakton field data directly in our dedicated SSI FWC app, or make a note in a field notebook for later entry. If the weather is “inclement” or you want to save time in the field the latter makes more sense. It is very easy to add, or update, field data into the App later (eg at home).

Oakton storage

When finished with the field sampling session, rinse in clean, cold water.

Oakton re-calibration

Ideally the device needs re-calibration before every field vist (or if you are a host before releasing the device to another volunteer).

Oakton Host - Oakton re-calibration simple steps

Ideally before each field visit - the Oakton's pH and Conductivity sensors require re calibration. The clear, protective, Oakton sensor cap can be used together with the appropriate calibration fluids for recalibration.

Oakton sensor probe head re-calibration.
Use the following steps to rinse the sensors, to re calibrate pH and then to re-calibrate conductivity:

1. Sensor head cleaning

Rinse the sensor probe head with tap water to ensure that the sensors are clean, as follows:
- fill sensor cap up to calibration mark with tap water. Replace cap on sensor head - shake gently for about 30 seconds , or longer to remove any particles on the sensors, - discard the water and gently shake Oakton and sensor cap to remove any residues.

2. pH re-calibration

• Re-calibrate pH with "pH 10.01" buffer as follows:
  - switch on Oakton and set measurement type to "pH" (menu/v, menu/v, hold/⏎, menu/v, scroll to pH, hold/⏎, esc), "pH ✔" should appear

• fill sensor cap up to calibration mark with "pH 10.01" calibration buffer solution(these calibration fluids are the closest to the freshwater pH typically sampled in the field, the device recognises "*10.01*" vs "7.00" or "4.01"), replace cap on sensor head. Check that this "fill cap to calibration" step is done correctly or you may get calibration errors (insufficient buffer liquid for the sensor head to operate properly).

• hit "calibrate" twice, the Oakton screen will flash and check the pH sensor calibration against the buffer solution being used.

• When complete (< 1minute) the pH "10" will flash up on the Oakton LED screen (bottom right small text).

• Dispose of buffer solution, rinse off the Oakton sensor head and sensor cap

3. Conductivity re-calibration

• Re-calibrate Conductivity with the "1413 µS/cm Conductivity Standard" buffer as follows: - switch on Oakton and set measurement type to "Conductivity" (menu/v, menu/v, hold/⏎, menu/v, scroll to Conductivity , hold/⏎, esc), "Conductivity ✔" should appear

• Fill sensor cap up to calibration mark with "1413 µS/cm Conductivity" calibration

solution(this calibration fluid is the closest to the freshwater conductivity range typically sampled in the field), replace cap with fluids on sensor head. Check that this “fill cap to calibration” step is done correctly or you may get calibration errors (insufficient buffer liquid for the sensor head to operate properly).

• Hit “calibrate” twice, the Oakton screen will flash and check the Conductivity sensor calibration against the calibration solution being used.

• The device will scroll through the accepted conductivity calibration fluids (small text flashing below the normal measurement text), until the 1413 µS/cm Conductivity standard being used is identified (the Oakton will circulate through the list of re-calibration fluids that might be used - eg “84”, “447”, “*1413*”).

• When complete (< 1minute) the relevant conductivity (1413 µS/cm conductivity and ✔✔) will flash up and temporarily hold on the Oakton LED screen (if you miss it the Oakton will go round the list of recalibration fluids again, so no worries!).

NOTE THIS NEXT CONDUCTIVITY CALIBRATION STEP DIFFERS FROM THE PROCEDURE FOR pH RE-CALIBRATION - THIS ADDITIONAL STEP IS IMPORTANT

• Hit hold/⏎ to accept this conductivity calibration at 1413 µS/cm . You should then see a confirmation ✔ and the Conductivity measurement display will return to the Oakton measurement window. At this point check that the conductivity calibration was successful (the Oakton should measure a conductivity around 1413 µS/cm

• Dispose of the buffer solution, rinse off the Oakton sensor head and sensor cap and allow to dry. The device is now re-calibrated and ready for field use.

If a “stable error”, “buffer error” or “slope error” appear while doing either the Ph or Conductivity re-calibrations check:

1) sensor head was cleaned as per above instructions

2) the Ph or Conductivity solution/buffer is fresh/uncontaminated

3) carry out a factory reset

If a measurement or display problem persists after following the above steps it’s likely that the sensor head is damaged, please contact the SSIFWC Project Coordinator.

Economy

To save on the costs of frequent re-calibration buffer solution purchases we ask that our Oakton hosts recycle the liquid from the above procedures into a separate labeled lidded container/jar (*please do not add it back into the original recalibration buffer container*). This recycled liquid can be used again for rec-calibration, two-three times, before the liquid becomes too contaminated to work effectively - a “buffer calibration error” indicates the recycled liquid is no longer usable.

Useful references and contacts

The Oakton supplied guidelines for typical device field use should be available in the Oakton’s storage box, these instructions are also available in the SSIFWC project Google Drive space, here

If you would like to know more about the Oakton (and what it measures) here is some additional reading material:

> https://archive.epa.gov/water/archive/web/html/vms59.html

If you think there is a problem with the Oakton you are using or hosting, please contact the: SSIFWC Project Coordinator

If you wish to borrow a “North”, “Central” or “South” Oakton, or think that the Oakton needs recalibrating please contact the relevant Oakton Custodian. The Oakton Custodian details and how to proceed with borrowing a device are available on our Oakton Hosts SSIFWC Website page.

More about the pH & Conductivity Buffers for Oakton calibration

Chemical calibration solutions or “buffers” are used to ensure that the sensors on the Oakton continue to read the correct freshwater chemistry value, and that values do not “drift” There are two buffers we use for calibration, a “pH buffer” and a “Conductivity Calibration solution”. NB in case of contact with either chemical flush the affected area with water.

1. pH Buffers

   pH 10 is an alkaline (basic) solution, similar to Great Salt Lake, and less alkaline than bicarbonate of soda.

   OAKTON pH Buffer Solutions (in both bottles and pouches) - pH 10.00 has a shelf life of 18 months from date of manufacture. This information holds true for opened bottles too though we have had no “re-calibration errors” with any “clean” re-calibration liquids to-date.

2. 1413 µS/cm Conductivity Standard Solution

This solution is a potassium chloride solution, with no known physical or health hazards

Both 1. and 2. are manufactured under ISO 9000 quality guidelines and traceable to NIST standards. The items are non hazardous, *the proper way to dispose of outdated/used buffer solutions is to flush these into your waste system diluted with ample water*.