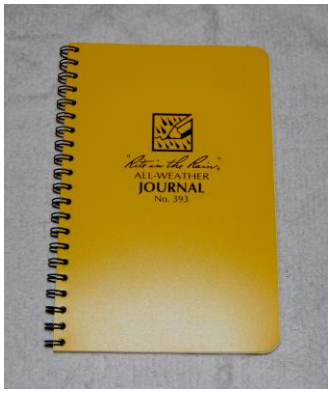
YSI Meter Protocol:
Specific Conductivity, pH, & Dissolved Oxygen



1. Check the log-book to see if somebody else has already checked the meter for accuracy within the timeframes below. If the meter hasn't been checked see **Part I**: Accuracy Checks and Calibration. If it looks good pack up and head to the river for **Part II**: River Sampling!

- **Conductivity** only needs to be checked once a week (1 x week) & should be within 7% of the standard solution.
- **pH** should be checked daily, once before it's first used, and again at the end of the day (2 x day) & should be within 0.2 units of standard 7.0 and 10.0 solutions.
- **Dissolved oxygen** should be calibrated onsite each day.

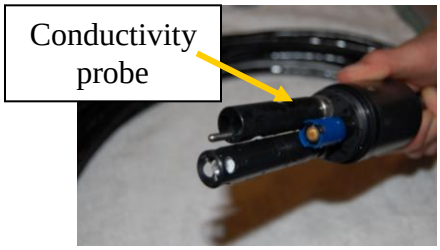
Part I: Accuracy Checks and Calibration:

If pH, conductivity, and oxygen haven't been recorded in the logbook within the timeframes listed above, follow procedures below:

1. <u>Conductivity Accuracy Check</u>: should be done once a week. If the cable is not already attached, attach it to the bottom of the handheld meter, DO NOT force it on. Line up the notches and gently push together, and then twist the outer ring until it clicks into place.

2. Rinse sensors and storage cup with distilled or deionized water

3. Rinse sensors and storage cup with a small amount of the conductivity standard provided (can rinse directly or put a small amount in the storage cup, screw it on and shake gently).



4. Fill the storage cup with enough conductivity standard solution to cover the hole in the side of the conductivity probe, and tap out any air bubbles. Screw the storage cap on.

5. Press the green "Power" button, and on the "Run" Menu Gently swirl the probe to circulate solution, check the microsiemens (µs/cm) reading for conductivity. Calculate the relative % difference (rpd) between the reading and the value written on the conductivity standard bottle (*ie* 1404 µs/cm) by using this equation:

R. % diff = ((Standard value – reading) / standard value) x 100

6. Record the <u>reading</u>, <u>standard value</u>, and <u>relative % difference</u> in the logbook (instructions on how to record information are on the front cover), and if it is equal or less than 7%, conductivity is good to go so move on to the **pH Accuracy Check**! If it's higher than 7% you'll need to do a **Conductivity Calibration**.

<u>Conductivity Calibration:</u>

7. From the "Run" menu, press the "ESC" or escape button to go to the "Main Menu", and using the arrow buttons scroll down to "Calibrate." Press "enter" (the arrow button), then choose "conductivity" and then "specific conductance."

8. Enter the value of the conductivity standard (written on the bottle) onto the screen in milliSiemans (mS/cm) <u>NOT</u> microSiemans (µS/cm). For example, 1404 µS/cm = 1.404 mS/cm (decimal point is moved 3 numbers left). Press "enter" (arrow button).

9. Continue gently swirling and wait until the sensor reading has stabilized and press "enter" to calibrate. Press "enter" again to continue.

10. Record the new conductivity <u>reading</u> of the calibrated meter into the logbook.

11. To exit, push "ESC" until you reach the "Run" screen with parameter values on it.

<u>pH Accuracy Check:</u> should be checked daily, once before it's first used, and again at the end of the day (2 x day). pH readings should be within 0.2 units of the temperature adjusted standard solutions for pH 7 (yellow) and 10 (blue).

1. Rinse sensors and storage cup with distilled or deionized water.

2. Rinse sensors and storage cup with a small amount of the yellow pH 7 standard provided.

3. Fill the storage cup with enough of the yellow pH 7 standard to cover the glass pH bulb (above the label) and the metal thermometer. Tap out any air bubbles.

4. Turn the meter on (green power button) and on the "Run" menu, while gently swirling the probe to circulate solution. Record the temperature of your pH solution. Check the original pH bottle to find the <u>temperature adjusted pH</u> for the temperature you have recorded. Check the pH reading for accuracy. Record the <u>reading</u> and the <u>temperature adjusted standard value</u> in the log book. Also record the pH millivolts reading in the logbook.

5. If pH reads more than 0.2 units from the temperature adjusted standard value, move on to **Calibrate pH**. If it's reading within 0.2 units above or below the temperature adjusted value, check to see that pH 10 is also accurate.

6. If the meter checks out well for accuracy on pH 7, empty the standard solution back into the field container.

7. Repeat steps 1 through 6 using the blue pH 10 standard solution instead of the yellow pH 7.0 solution. If the pH 10 readings are also within 0.2 units of the temperature adjusted value for pH 10, you're good to go and move on to **Oxygen Calibration**. If the pH readings are more than 0.2 units away from the temperature adjusted value you'll need to **Calibrate pH**.

<u>Calibrate pH</u>:

1. Make sure the storage cup has enough yellow pH 7 standard solution in it to cover the glass pH bulb (up to the label), and tap out any air bubbles.

2. Press "ESC" to go to the "Main Menu", and scroll down to "Calibrate." Press "enter" (the arrow button), then "pH" and then "Two-point calibration".

3. Enter the temperature adjusted value for pH7 and press "enter." Wait until the pH reading stabilizes (it's neither increasing nor decreasing but just oscillating between a couple of numbers) record that number if you have not already recorded your reading and press "enter" again to calibrate. If the meter says the pH is "Out of Range" DO NOT accept anyway.

4. Record the calibrated pH reading and record the <u>pH mv (millivolts) reading</u>.

5. Empty the pH 7 standard into the field container. Rinse sensors and storage cup with distilled water and refill with pH blue 10 standard solution (up to the storage cup label).

6. Enter the temperature adjusted value for pH 10 for the 2nd pH, press "enter" and wait until the pH value stabilizes (it's neither increasing nor decreasing but just oscillating

between a couple numbers). Record this number if you have not already recorded your initial reading. Press "enter" again to calibrate.

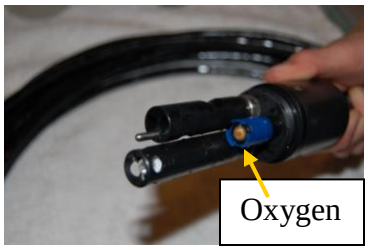
7. Record the calibrated pH reading and temperature adjusted standard pH 10 solution in the logbook. Also, record the pH mv (millivolt) reading in the logbook. Millivolts are the raw electrical readings from the pH sensor. If the difference between the pH mv for pH 7 and pH 10 drifts below 155 mv, the sensor needs to be changed and you should contact CRK staff.

8. Press "enter" (arrow button) to continue, and keep pressing "ESC" until you reach the main "Run" screen (empty the pH 10 solution back into the field container).

Oxygen Calibration: needs to be calibrated onsite as an increase in elevation by just 100 to 200 ft can change the Barometric (atmospheric) pressure.

1. Rinse the sensor and storage cup with distilled or deionized water, then add 1 cm of water to the bottom of the storage cup (water shouldn't touch probes!)

2. Rest the sensors lightly in the storage cup with a crack open to allow air exchange (**DO NOT** screw on!). The hole in the YSI bag (look at picture for reference) is great for this, don't bump!



3. If the meter is not already on, press the green "power" button. Let the probes sit in the storage cup for **10 min**. to allow the barometric pressure to equilibrate. This is a good time to do something else!

4. After 10 min, record the DO % Sat (or percent saturation) reading in the logbook.

5. Press "ESC" to get to the "Main Menu" and use the arrow keys to highlight "Calibrate" and press "enter," or the arrow button.

6. Highlight "DO 2 mil PE (Blue)" and press "enter." Then highlight DO % and press "enter."

7. Enter the barometric pressure that is listed in the lower right hand corner of the screen in the 'Enter Baro mmHg' field - ie. 760.2 mmHg - and press "enter."

8. Wait until the DO % Sat value has stabilized (it's neither decreasing nor increasing, but just oscillating between a couple numbers), and press "enter" to calibrate. Press "enter" to continue, and record the calibrated DO % Sat reading in the logbook. (in the river we'll record DO in mg/l).

9. You're now good sample the river now!

Part II. River Sampling: If the cable is not already attached, attach the cable to the bottom of the handheld meter, DO NOT force it on. Line up the notches and gently push them together, and then twist the outer ring until it clicks into place.

1. Unscrew the clear storage cup from the sensor, and replace it with the sensor guard. This protects the fragile sensors in the river! Wade into the river about 3 ft deep.

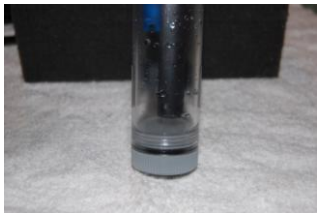
2. Press the green "Power" button, and the screen should read "Run" at the top. You can push "ESC," the escape button at anytime to return to the "Run" menu.

3. Although the handheld screen is waterproof, hold it securely in one hand and dangle the sensor into the water. The sensor needs a water flow of 1ft/sec to read correctly, so gently pull it up and down between 2 ft deep and 1 ft if you can. In shallow creeks, keep sensors off the bottom.

4. Wait until the values have stabilized (no more than 5 min!) - stabilized means the values are neither steadily increasing nor decreasing, but hovering around a tenth of a decimal point – and record values on your datasheet along with your equipment ID name.

- **Temperature (˚C)**,
- **Specific Conductivity (µS/cm)**
- ***Total Dissolved Solids (TDS g/L) is optional**
- **Dissolved Oxygen (DO mg/L)**
- **pH**
- ***Ignore the pH mv reading***
- ***Barometric Pressure (mmHg) is optional**

5. Each sampling trip, choose one parameter to record as a **duplicate**; choose a different parameter every time. A duplicate simply measures something twice; immediately after recording the primary result just read it again. Acceptable differences between the primary and duplicate readings are on your datasheet.



6. Press the green "Power" button again to turn it off. Store the meter with a wet sponge and a bit of water at the bottom of the storage cup to keep the sensors humid & moist. The water level shouldn't touch the probes. Gently twist on the storage cup, and pack up!

THANKS FOR YOUR TIME AND COMMITMENT TO THE RIVER!