YSI Pro Calibration

Overview:

Horizons Regional Council's Catchment Data Team uses YSI Professional Plus handheld meters for determining and recording the following field parameters at all SoE, point discharge and groundwater sites where possible (the exception being sewage treatment ponds). Horizon Regional Council (HRC) also use these meters for lake profiling and to provide check data for continuous water quality sites.

HRC generally records the following parameters with the YSI Professional Plus (YSI):

Parameter	Sensor Type	Range	Accuracy	Resolution	NEMS
Temperature (field rugged Cables)		-5 to 70°C	± 0.2°C	0.1°C	**Yes**
Barometric Pressure	Piezioresistive	500 to 1100 mbar	± 2.0 mbar (0-50^{0}C)	0.13 mbar	**N/A**
Dissolved Oxygen (%)	Galvanic	0-200% 200-500 %	± 2% ± 6%	1% or 0.1% (user selectable)	**Yes**
Dissolved Oxygen (mg/l)	Galvanic	0-20 mg/L 20-50 mg/L	±2% ±6%	0.1mg/L or 0.01mg/L (use selectable)	**Yes**
Conductivity	4-Electrode Cell	0 to 200000 µs/cm	± 1µs/cm or ± 0.5%	0.1µs/cm to 100µs/cm	**N/A**
pH	Glass Combination Electrode	0 to 14 units	± 0.2 units	0.01 units	**N/A**
ORP	Platinum button	-1999 to +1999 mV	± 20mV	0.1mV	**N/A**

Field meter calibration:

Calibration of handheld field meters must be carried out prior to each sampling run. Record the calibration and complete the end of day checks (*form: 14.2 Appendix 1*) which must be filled out by the operator. Record the ID number of the YSI (e.g. YSI Pro 1). All parameters need to be calibrated on the same day as; and prior to any data acquisition. Conductivity and pH readings must be checked and recorded at the end of the day using the calibration check solution (pH 7 and conductivity 0.001M).

Barometer calibration:

Record the barometric pressure at the time of calibration. This is checked against the Manawatu at Victoria Avenue traceable barometer. Note we use true (raw) barometric pressure.

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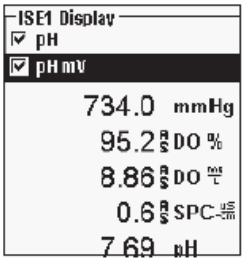
pH calibration:

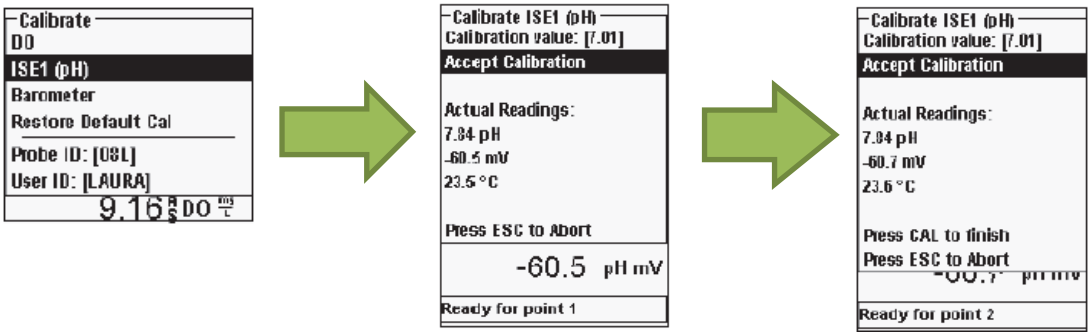
HRC uses a three point calibration method; always calibrate to the pH7 standard solution first followed by the pH4 standard solution and finishing with the pH10 standard solution. Be sure to immerse the entire bulb of the pH probe in each solution and rinse well between buffer solutions. **During this calibration ensure that the perforated metal cover is attached to protect the probes at all times.**

Ensure pH mV is displayed:

1) Press Sensor button (to the immediate left of the Cal button)
2) Highlight *Display* and press ENTER
3) Highlight *ISE (pH)* and press ENTER
4) Highlight *pH mV* and press ENTER to tick the box



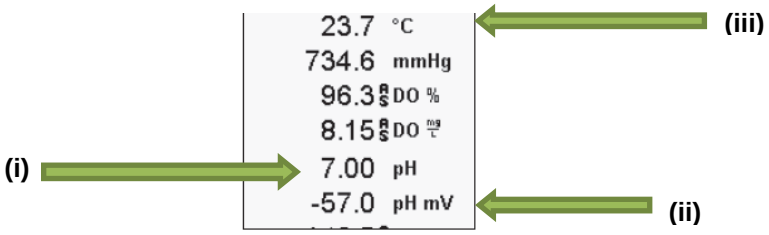
3 point pH Calibration:



1) Press Cal, highlight *ISE (pH)* and press ENTER
2) Place the sensor into the pH7 standard solution. The YSI should automatically recognise the standard solution. The calibration value represents the temperature corrected value that the YSI shall calibrate to. The actual readings, both in pH units and mV, represent the raw value.
3) Allow for the pH and temperature to stabilise for a minimum of 5 minutes.
4) Record the Calibration value, temperature and the pH mV reading.
5) Highlight '*Accept Calibration'* and press ENTER to accept the first calibration point. The message line at the bottom of the screen will then display '*Ready for point 2'*.
6) To continue to the second point place the sensor (after rinsing and drying) into the pH4 standard solution, again the YSI should recognise the solution.
7) Allow for the pH and temperature to stabilise for a minimum of 5 minutes.
8) Record the Calibration value, temperature and the pH mV reading.
9) Highlight *'Accept Calibration'* and press ENTER to accept the second calibration point. The message line at the bottom of the screen will then display *'Ready for point 3'*.
10) Continue to the third calibration point by placing the sensor (after rinsing and drying) into the pH10 standard solution, again the YSI should recognise the solution.
11) Allow for the pH and temperature to stabilise for a minimum of 5 minutes.
12) Record the Calibration value, temperature and the pH mV reading.
13) Highlight '*Accept Calibration'* and press ENTER to accept the first calibration point. The message line at the bottom of the screen will then display *'Ready for point 4'*.
14) At this point highlight '*Press CAL to finish'* and press ENTER.

YSI Pro Calibration

pH 7 End of Day Check



After completing the field use of the YSI an end of Day pH check is required, using the pH7 standard solution

1) Place the sensor into the Ph7 standard solution.
2) Allow for the pH and temperature to stabilise for a minimum of 5 minutes.
3) Record: (i) The pH values as displayed by the handheld unit
   (ii) The pH mV value
   (iii) The Temperature
4) For the end of day check to be successful the value displayed by the YSI should be between 6.8-7.2 pH. Document whether the check passed as appropriate.
5) If the check fails repeat the process with fresh standard solution and a re-rinsed sensor and allow sufficient time to stabilise. If the check is still a failure document the calibration form as appropriate and notify the Discrete WQ portfolio holder as soon as possible.

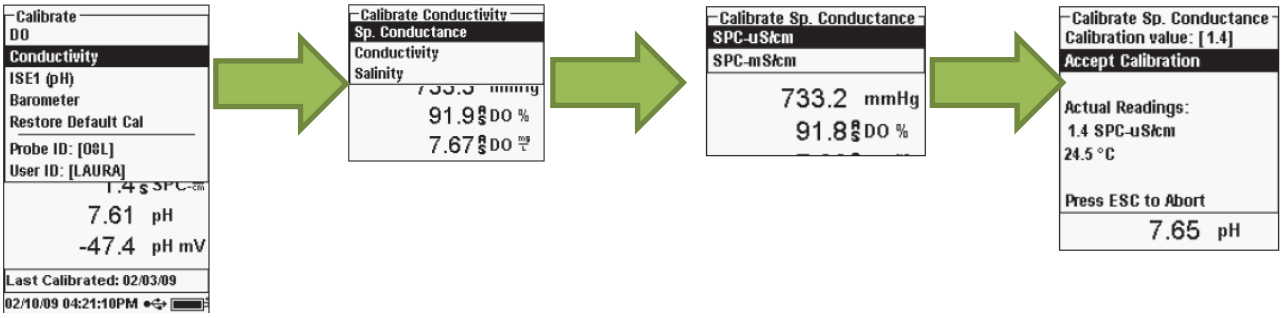
Conductivity Calibration:

HRC use Potassium Chloride Standard solutions to complete a one point calibration (0.01M) and a pre and post calibration check value (0.001M). For the calibration documentation and analysis the solutions are to be recorded in their µS/cm units (both values are listed on the Standard Solution containers). However the solutions values, when expressed as µS/cm do vary from batch to batch. Below the solutions expressed as M and a typical corresponding µS/cm value are shown:

0.01M	1412 µS/cm
0.001M	148 µS/cm

During this calibration ensure that the perforated metal cover is attached to protect the probes at all times. When using the YSI's HRC calibrate to and record the Specific (Sp.) Conductivity.

1 point Specific Conductivity Calibration:

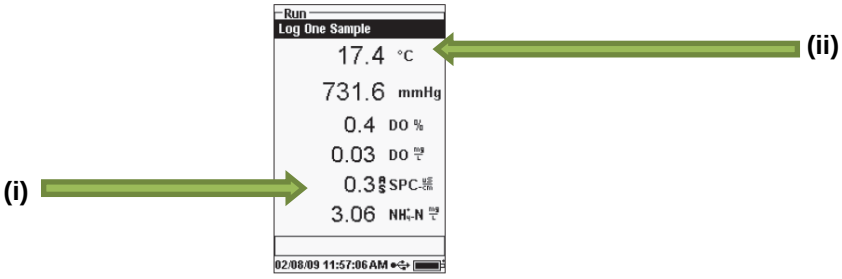


YSI Pro Calibration

1) **0.001M Pre-Calibration Check Value:** Rinse and dry the sensor and place into some fresh 0.001M solution – ensure the sensor is fully submerged.
2) Allow to stabilise; record the values displayed on the unit and corresponding temperature.
3) **0.01M Calibration:** Rinse and dry the sensor and place into some fresh 0.01M solution– ensure the sensor if fully submerged.
4) Press *Cal* and highlight '*Conductivity'* and press ENTER
5) Highlight '*Sp. Conductance*' and press ENTER
6) Highlight '*SPC µS/cm'* and press ENTER
7) Highlight the '*Calibration value'* (near the top of the screen) and manually enter the value of the standardised calibration solution in µS/cm (this will take you into a sub-screen) and press ENTER when the value has been typed in.
8) Allow for the Sp. Conductance and temperature values to stabilise. Record the calibration value.
9) Highlight '*Accept Calibration*' and press ENTER
10) The unit will display '*calibrating channel'* and then '*saving configuration'* and will return to the main screen.
11) **0.001M Post-Calibration Check Value:** Rinse and dry the sensor and place into some fresh 0.001M solution– ensure the sensor is fully submerged.
12) Allow to stabilise, record the values displayed on the unit and corresponding temperature.
13) **Assess whether the calibration has been successful:** the 0.001M Post-Calibration Check Value displayed by the unit should be within 120-175µs/cm.

The Potassium Chloride standard solutions are prone to contamination. If a check value fail occurs repeat the check using fresh solution and thoroughly rinsing and drying the sensor. If the check continues to fail contact the Discrete WQ portfolio holder and/or use a different Handheld meter.

Specific Conductivity Calibration End of Day Check



After completing the field use of the YSI an end of day Specific Conductivity Calibration check is required, using the 0.001M standard solution:

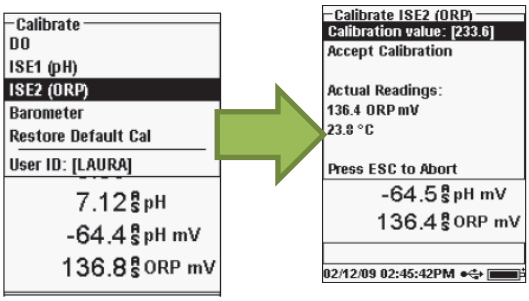
1) Place the sensor into the 0.001M Standard Solution – ensure the sensor is fully submerged.
2) Allow for the Specific Conductivity to stabilise.
3) Note: (i) The Specific Conductance value as displayed by the unit
   (ii) The Temperature
4) For the end of day check to be successful the actual value displayed by the YSI should be between 120-175µs/cm.
5) Complete the calibration form as appropriate.
6) If the check fails repeat the process with fresh buffer solution and a re-rinsed sensor and allow sufficient time to stabilise. If the check is still a failure document the calibration form as appropriate and notify the Discrete WQ portfolio holder as soon as possible.

YSI Pro Calibration

ORP calibration

HRC requires the recording of Oxidation Reduction Potential (ORP) for groundwater sampling. HRC uses a Standardised Zobells ORP Solution; typically green/yellow in colour and of +229mV at 25ºC. The YSI professional plus handheld meters require a one point calibration. The move to Zobells ORP solution has occurred after the first set of Handheld Meter Calibration Forms was purchased. Thoroughly mix the solution prior to use and discard the solution after use. Not all YSI's will be equipped with an ORP sensor; this can be checked by looking at the sensors (ORP equipped YSI's have sensors fitted to all four ports) or by checking if values for ORP mV are displayed on the screen. **During this calibration ensure that the perforated metal cover is attached to protect the probes at all times.**

1 point ORP Calibration

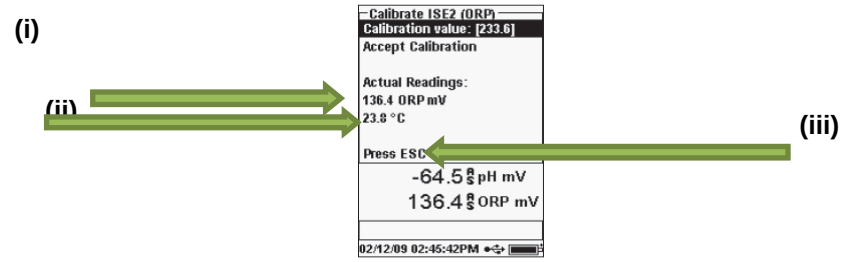


1) Press *Cal*, highlight *ISE (ORP)* and press ENTER
2) Place the sensor into the ORP standard solution (ensure the solution is well mixed). By using Zobell's ORP Solution the YSI should automatically determine the calibration value, in the same way that it recognises pH Standardised Solutions – refer to the below table. The calibration value **(i)** represents the temperature corrected value that the YSI shall calibrate to. The actual readings **(ii)** represent the raw value.
3) Allow for the ORP and temperature to stabilise for a minimum of 5-10 minutes.
4) Record the *'Calibration value'* (**(i)** below), which is in mV and temperature (**(iii)** below).
5) Highlight '*Accept Calibration'* and press ENTER to accept the calibration.

Zobell ORP Calibration/Solution Value vs. Temperature

Temperature ºC	Zobell Solution Value mV
-5	267.0
0	260.5
5	254.0
10	247.5
15	241.0
20	234.5
25	228.0
30	221.5
35	215.0
40	208.5
45	202.0
50	195.5

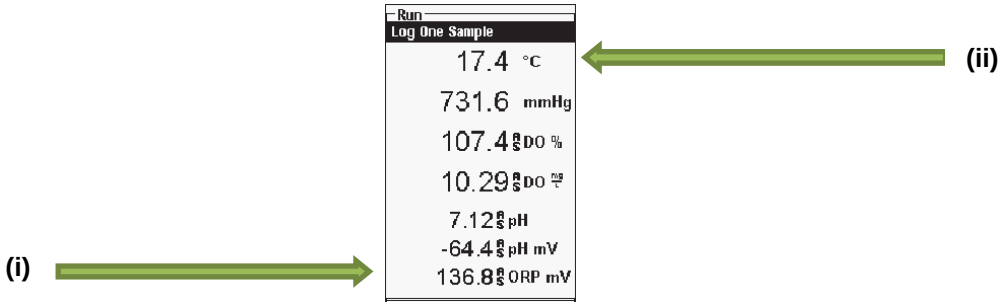
YSI Pro Calibration



ORP End of Day Check

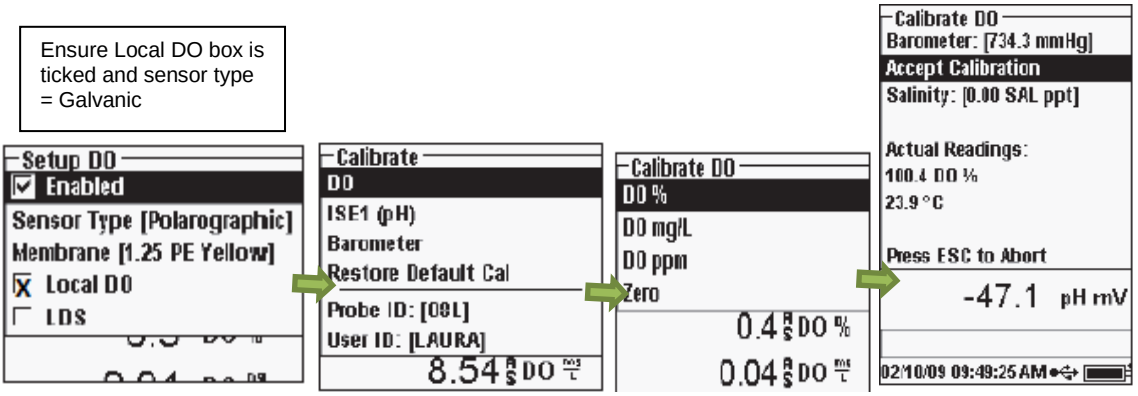
After completing the field use of the YSI an end of Day ORP check is required, using the ORP standardised solution:

1) Place the sensor into the ORP standard solution.
2) Allow for the ORP mV and temperature to stabilise for a minimum of 5-10 minutes.
3) Record: (i) The ORP Reading (mV) as displayed by the YSI
   (ii) The Temperatur



4) Press ESC to get back to the main menu.
5) **Assess if the check has been successful;** the current handheld calibration form has an allowable range appropriate for ORP Quinhydrone Standard Solution and so its values are not correct. The allowable range for ORP when using Zobell's Standard Solution is **200.0mV-280.0mV**. If the YSI fails, rinse the ORP Probe thoroughly, replace the Zobell's Standard Solution with fresh and repeat. If it fails for a second time contact the Discrete Water Quality Portfolio Holder as soon as possible.
6) Mark the Handheld Calibration Form and overwrite the incorrect allowable range with **200.0mV-280.0mV**.

Dissolved Oxygen Calibration



YSI Pro Calibration

The YSI handheld meters have galvanic DO sensors installed. The YSI's incorporate a "local DO" setting – ensure this is selected. The YSI meters are calibrated in 100% water saturated air.

1) To calibrate ensure the sponge is moist.
2) Ensure that the DO membrane and the temperature/conductivity sensor are dry.
3) Place the sensor in the cup and screw the cup one or two threads to allow venting.
4) Wait a minimum of 10 minutes for the cup to become fully saturated and to allow the sensors to stabilize before calibration.
5) Press the Cal key
6) Highlight DO and press ENTER
7) Record the value on the Calibration Form. The Value should be between 99.7%-100.3% to constitute a successful calibration. Also note the temperature.

If either an unsuccessful calibration occurs or evidence of crystallisation is present on the bottom of the membrane, replace the membrane and repeat the calibration, otherwise calibrate another unit if available. The membranes are required to be changed monthly; this is done by the Discrete Water Quality Portfolio holder.

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Calibration Form

Once the end of day checks are completed double check all fields are completed in the Handheld Meter Calibration Form, including adding any comments, prior to finishing for the day.

YSI Storage

Once all checks are finished and deemed satisfactory turn the YSI off by holding down the power button. For safe storage ensure that the sponge is still moist and screw the cup on by just a few threads (as if carrying out a DO calibration). Carefully coil the cable up, using the Velcro cable tie and place the YSI back in its case with the metal field cover and rubberised sleeve. Leave the case open to prevent any moisture being trapped in the case and YSI.

If both the case and protective foam inserts are damp or wet, dry out the case and pull out the foam inserts to allow them to dry out – in this instance place the YSI itself carefully in the case.

If the YSI or cable has got covered in mud or sand please clean the unit and cable, immediately after completing all end of day checks.