

Calibration Session Checklist

- Fill out calibration sheet
 - Time and date
 - Calibration solution values
 - Expiration dates
 - Standard reference material values
- Calibrate the probes using the [Sensor-Specific Calibration Checklists](#) below, first doing conductivity then pH, where applicable.
- After you've finished, be sure to uncheck boxes!
- Export the calibration record

Guidelines and Tips

[Source: SOP For Calibration, Maintenance, and Use of Multiparameter Water Quality Sondes](#)

- Inspect sensors and perform any necessary cleaning or maintenance.
- Wash sensor guard with a cloth soaked in a mild solution of clean water and dish soap. If you can see hard water deposits, soak the sensor guard in vinegar and use a plastic scrub brush to remove any remaining fouling, then rinse with clean water.
- Gently flush the depth sensor ports on the top of the bulkhead with clean water (maybe DI?) using the syringe.
- Don't re-use calibration standards or use expired calibration standards
- Protect buffer solutions from extreme temperatures--discard if they are exposed to extreme temperatures.
- Calibration standards and equipment should be stored at the same temperature prior to calibration, and calibration should be performed in a temperature-controlled setting
- Never insert a sensor into a buffer stock solution bottle during calibration--pour the buffer solution into a separate clean container. Calibrate conductivity solutions first, and then pH solutions.
- Triple rinse procedure
 - DI water
 - Fill halfway, don't tighten, move up and down
 - Move probe up and down

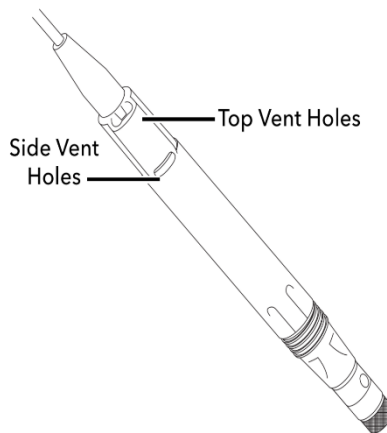
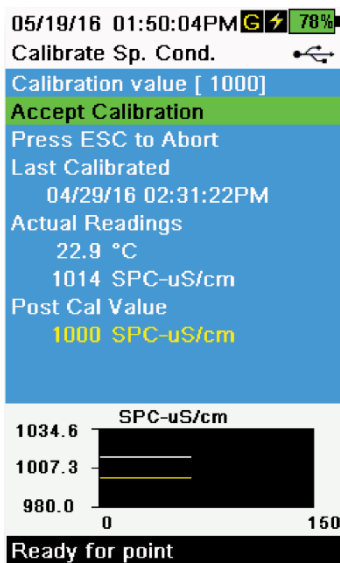
*for Utah Lake, they calibrate to 1413 $\mu\text{S}/\text{cm}$, and verify conductivity against 500 $\mu\text{S}/\text{cm}$. If verification reading is not within 10% of 500, re-do the calibration

Calibration order

Sensor-Specific Calibration Checklists

Conductivity

- Make sure the conductivity sensor is clean prior to calibration. Use normal water and then DI water. If necessary, remove the probe guard and clean the conductivity cell with the supplied soft brush and DI water (a clean pipe cleaner also works, just be sure to bend the ends over so that the pipe cleaner doesn't scratch the sensors). Once cleaned, immediately replace the probe guard.
- Triple rinse the calibration cup and sensors with the conductivity standard (rinse standard bottle). Discard the used rinse standard down the sink.
- Fill the cal cup to the second line with fresh conductivity standard.
- With the probe guard installed, carefully immerse the probe into the solution. Make sure the solution is above the vent holes on the side of the conductivity sensor.
- Gently rotate and/or move the sensor up and down to remove any bubbles from the conductivity cell. Wait at least 40 seconds for temperature equilibration.
- Push the Cal button, select **Conductivity**, then select **Specific Conductance**
- Before calibrating the sensor, record the "Actual Reading" specific conductance (SPC- $\mu\text{S}/\text{cm}$) in the [Probe Calibration Records](#) spreadsheet. This is to track sensor drift.
- Select **Calibration value** then enter the calibration value of the conductivity standard, using the temperature-dependent chart on the bottle. The [Probe Calibration Records](#) spreadsheet can also dMake sure the units on the handheld match the units of the calibration value you are entering!
- Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds), then select **Accept Calibration**. "Calibration successful!" should be displayed in the message area on the bottom of the screen.
- Pour the used conductivity standard into the rinse standard bottle (don't pour it down the sink!). This will be used as the rinse standard for the next calibration.
- Triple rinse the calibration cup and sensors with deionized (DI) water?
- Verify the calibration and the accuracy of the sensor with appropriate SRM (?)
- Record verification value on the calibration sheet

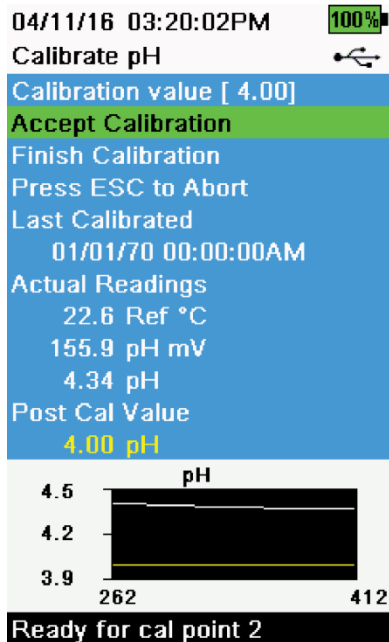


pH

- Triple rinse the cal cup and sensors with deionized water.
 - Fill the cal cup halfway with DI water, then put the probe with the probe guard attached into the cal cup and move the probe up and down. Do this three times.
- Triple rinse the probe and calibration cup with pH 7 buffer (rinse standard bottle). Discard the used rinse standard down the sink.
- Fill the calibration cup to the first line with fresh pH 7 buffer solution.
- With the probe guard installed, carefully immerse the probe into the solution. Make sure both the pH sensor and temperature sensor are submerged.
- Push the Cal button, then select **pH**.
- Before calibrating the sensor, record the “Actual Readings” of both pH and pH mV in the [Probe Calibration Records](#) spreadsheet. This is to track sensor drift, as well as the slope.
- The **Calibration value** should automatically adjust based on the temperature and selected buffer. If it does not automatically adjust, select **Calibration value** then enter the calibration value of pH buffer manually, making sure to adjust this value for the temperature of the buffer. The [Probe Calibration Records](#) spreadsheet can also calculate the calibration value for a given temperature input. This will result in it saying it’s questionable but just ignore?
- Wait for the pH mV and temperature readings to stabilize; the white line on the graph should be flat for about 40 seconds.
- Select **Accept Calibration** and press the Enter button. “Ready for cal point 2” should be displayed in the message area on the bottom of the screen.
- Pour the used pH 7 buffer into the rinse standard bottle (don’t pour it down the sink!). This will be used as the rinse standard for the next calibration.
- Triple rinse the probe and calibration cup with pH 10 buffer solution (rinse standard bottle). Discard the used rinse standard down the sink.
- Fill the calibration cup to the first line with fresh pH 10 buffer solution.
- Immerse the probe into the buffer solution.
- Before calibrating the sensor, record the “Actual Readings” of both pH and pH mV in the [Probe Calibration Records](#) spreadsheet. This is to track sensor drift, as well as the slope.
- The **Calibration value** should automatically be adjusted to pH 10 or thereabouts, depending on the temperature. If it does not automatically adjust, select **Calibration value** then enter the calibration value of pH buffer manually, making sure to adjust this value for the temperature of the buffer.
- Wait for the pH mV and temperature readings to stabilize; the white line on the graph should be flat for about 40 seconds.
- Select **Accept Calibration** and press the Enter button. “Ready for cal point 3” should be displayed in the message area on the bottom of the screen.
- Select **Finish Calibration** to complete a 2-point calibration. “Calibration successful!” should be displayed in the message area on the bottom of the screen.

Note: If you see a calibration error message, ignore it if you manually entered Calibration values. Otherwise, repeat the calibration?

- Pour the used pH 10 buffer into the rinse standard bottle (don't pour it down the sink!). This will be used as the rinse standard for the next calibration.
- Triple rinse the calibration cup and sensors with deionized (DI) water? 1
- Verify calibration with pH 9.0
- Record verification value on calibration sheet



ORP (Oxidation Reduction Potential)

- Ensure clean with DI water?
- Triple rinse the probe and calibration cup with ORP standard (rinse standard bottle). Discard the used rinse standard down the sink. (manual does not say this?)
- Fill the calibration cup to the first line with fresh ORP standard.
- With the probe guard installed, carefully immerse the probe into the standard solution. Make sure both the ORP sensor and temperature sensor are submerged.
- Push the Cal button, then select **pH/ORP**, then **ORP**.
- Before calibrating the sensor, record the "Actual Readings" of ORP mV in the [Probe Calibration Records](#) spreadsheet. This is to track sensor drift.
- If using YSI Zobell solution, the **Calibration value** will automatically be adjusted based on the temperature. Otherwise, refer to the table included with the standard solution and enter the mV value that corresponds to the temperature of the solution. The [Probe Calibration Records](#) spreadsheet can also calculate the calibration value for a given temperature input.
- Wait for the ORP mV and temperature readings to stabilize; the white line on the graph should be flat for about 40 seconds.

- Select **Accept Calibration** and press the Enter button. “Calibration successful!” should be displayed in the message area on the bottom of the screen.
- Pour the used ORP standard into the rinse standard bottle (don’t pour it down the sink!). This will be used as the rinse standard for the next calibration.
- Triple rinse the calibration cup and sensors with deionized (DI) water?



NH₄⁺ (Ammonium)

- Ensure clean with DI water?
- Triple rinse the probe and calibration cup with 1 mg/L NH₄⁺ standard (rinse standard bottle). Discard the used rinse standard down the sink.
- Fill the calibration cup to the first line with fresh 1 mg/L NH₄⁺ standard.
- With the probe guard installed, carefully immerse the probe into the solution.
- Push the Cal button, then select **NH₄**.
- Before calibrating the sensor, record the “Actual Readings” of both NH₄ mV and NH₄-N mg/L in the [Probe Calibration Records](#) spreadsheet. This is to track sensor drift.
- Select **Calibration value** then enter the value that corresponds to the first calibration standard (1 mg/L).
- Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds).
- Select **Accept Calibration**. “Ready for cal point 2” should be displayed in the message area on the bottom of the screen.
- Pour the used 1 mg/L NH₄⁺ standard into the rinse standard bottle (don’t pour it down the sink!). This will be used as the rinse standard for the next calibration.
- Triple rinse the probe and calibration cup with 100 mg/L NH₄⁺ standard (rinse standard bottle). Discard the used rinse standard down the sink.

- Fill the calibration cup to the first line with fresh 100 mg/L NH_4^+ standard. Immerse the probe in the standard.
- Before calibrating the sensor, record the “Actual Readings” of both pH and pH mV in the [Probe Calibration Records](#) spreadsheet. This is to track sensor drift.
- Select **Calibration value** then enter the value that corresponds to the second calibration standard (100 mg/L).
- Observe the actual measurement readings for stability, and then select **Accept Calibration**. “Reading for cal point 3” should be displayed in the message area on the bottom of the screen.
- Select **Finish Calibration** to complete a 2-point calibration.
- Pour the used 100 mg/L NH_4^+ standard into the rinse standard bottle (don't pour it down the sink!). This will be used as the rinse standard for the next calibration.
- Triple rinse the calibration cup and sensors with deionized (DI) water?
- Verify calibration with SRM?
- Record verification value on calibration sheet

NO_3^- (Nitrate)

- Ensure clean with DI water?
- Triple rinse the probe and calibration cup with 1 mg/L NO_3^- standard (rinse standard bottle). Discard the used rinse standard down the sink.
- Fill the calibration cup to the first line with fresh 1 mg/L NO_3^- standard for the first calibration point.
- With the probe guard installed, carefully immerse the probe into the solution.
- Push the Cal button, then select **NO3**.
- Before calibrating the sensor, record the “Actual Readings” of both NO_3^- mV and NO_3^- -N mg/L in the [Probe Calibration Records](#) spreadsheet. This is to track sensor drift.
- Select **Calibration value** then enter the value that corresponds to the first calibration standard (1 mg/L).
- Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds).
- Select **Accept Calibration**. “Ready for cal point 2” should be displayed in the message area on the bottom of the screen.
- Pour the used 1 mg/L NO_3^- standard into the rinse standard bottle (don't pour it down the sink!). This will be used as the rinse standard for the next calibration.
- Triple rinse the probe and calibration cup with 100 mg/L NO_3^- standard (rinse standard bottle). Discard the used rinse standard down the sink.
- Fill the calibration cup to the first line with fresh 100 mg/L NO_3^- standard for the second calibration point. Immerse the probe in the standard.
- Before calibrating the sensor, record the “Actual Readings” of both pH and pH mV in the [Probe Calibration Records](#) spreadsheet. This is to track sensor drift.
- Select **Calibration value** then enter the value that corresponds to the second calibration standard (100 mg/L).
- Observe the actual measurement readings for stability, and then select **Accept Calibration**. “Reading for cal point 3” should be displayed in the message area on the bottom of the screen.
- Select **Finish Calibration** to complete a 2-point calibration.
- Pour the used 100 mg/L NH_4^+ standard into the rinse standard bottle (don't pour it down the sink!). This will be used as the rinse standard for the next calibration.

- Triple rinse the calibration cup and sensors with deionized (DI) water?
- Verify calibration with SRM?
- Record verification value on calibration sheet

Turbidity

Turbidity calibrations, more than most other parameters, are susceptible to interference from contamination. It is critical for calibrations to be performed with very clean sensors, guards, and cups.

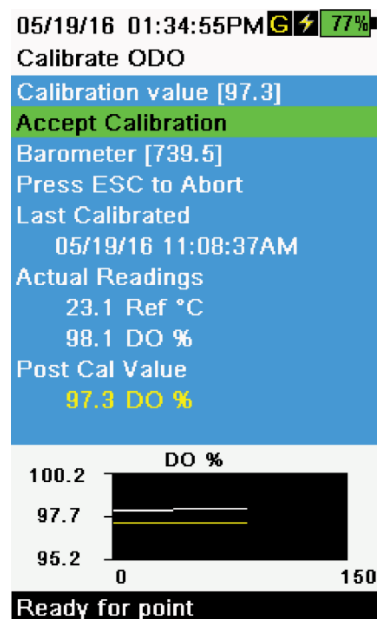
- Ensure the probe is clean before calibration. If necessary, triple rinse with DI water.
- Fill the calibration cup to the first line with fresh 0 FNU standard for the first calibration point (deionized water may be used as a substitute).
- The sensor guard must be installed to ensure an accurate calibration. Make sure the guard is installed and immerse the probe in the zero standard. Make sure there are no air bubbles on the turbidity sensory lens. If present, lightly tap the guard against the cup to dislodge any bubbles.
- Push the Cal button, then select **Turbidity**.
- Before calibrating the sensor, record the “Actual Readings” of FNU in the [Probe Calibration Records](#) spreadsheet. This is to track sensor drift.
- Select **Calibration Value** and enter 0.00.
- Observe the actual measurement readings for stability (white line on graphs shows no significant change for 40 seconds), and then select **Accept Calibration**. “Ready for cal point 2” should be displayed in the message area on the bottom of the screen.
- Pour the used 0 FNU standard into the rinse standard bottle (don’t pour it down the sink!). This will be used as the rinse standard for the next calibration? If you used DI water for the first point, you can pour that down the sink.
- Triple rinse the probe and calibration cup with 12.4 FNU or 124 FNU rinse standard (rinse standard bottle). Discard the used rinse standard down the sink.
- Fill the calibration cup to the first line with fresh 12.4 FNU or 124 FNU standard for the second calibration point. With the probe guard installed, carefully immerse the probe into the solution.
- Before calibrating the sensor, record the “Actual Readings” of FNU in the [Probe Calibration Records](#) spreadsheet. This is to track sensor drift.
- Select **Calibration Value** and enter the value of the second calibration standard.
- Make sure there are no air bubbles on the turbidity sensor lens. Observe the actual measurement readings for stability, and then select **Accept Calibration**. “Ready for cal point 3” should be displayed in the message area on the bottom of the screen.
- Triple rinse the probe and calibration cup with 1010 FNU rinse standard (rinse standard bottle). Discard the used rinse standard down the sink.
- Fill the calibration cup to the first line with fresh 1010 FNU standard for the second calibration point. With the probe guard installed, carefully immerse the probe into the solution.
- Before calibrating the sensor, record the “Actual Readings” of FNU in the [Probe Calibration Records](#) spreadsheet. This is to track sensor drift.
- Select **Calibration Value** and enter 1010.
- Make sure there are no air bubbles on the turbidity sensor lens. Observe the actual measurement readings for stability, and then select **Accept Calibration**. “Calibration successful!” should be displayed in the message area on the bottom of the screen.

- Pour the 1010 FNU standard into the rinse standard bottle (don't pour it down the sink!). This will be used as the rinse standard for the next calibration?
- Verify with a SRM?
- Record verification value on calibration sheet

Dissolved Oxygen 100.4

- Make sure the barometer is accurately reading the current “true” barometric pressure. Use [this website](#) to find the current barometric pressure (“Station Pressure”) in kPa (click on the button on the bottom left to change to metric). Enter the actual probe reading in the [Probe Calibration Records](#) spreadsheet.
 - If the probe is reading differently than the website, make a note of it on the spreadsheet.
- Place 5 mL of tap water in the calibration cup.
- Make sure there are no water droplets on the ODO sensor cap or temperature sensor.
- With the probe guard installed, carefully slide into the calibration cup. Make sure a seal is not created around the probe. Atmospheric venting is required for accurate calibration.
- Turn the instrument on and wait approximately 5 to 15 minutes for the air in the storage container to be completely saturated with water.
- Push the Cal button, then select **ODO**. Select **DO%**.
- Before calibrating the sensor, record the “Actual Readings” of DO% in the [Probe Calibration Records](#) spreadsheet. This is to track sensor drift.
- Observe the actual measurement readings for stability (white line on graph shows no significant change for 40 seconds), then select **Accept Calibration**. “Calibration successful!” should be displayed in the message area on the bottom of the screen.

Note: If you see a calibration error message, verify the barometer reading and inspect the sensor cap. Clean and/or replace the sensor cap as needed, and repeat the calibration.



Questions:

“Best practice is to calibrate with solutions similar to the temperature of the water to be sampled, except don’t equilibrate the temperature of a conductivity solution to that of water to be sampled if the water temp is less than 6C or higher than 40C.

Total Algae/Chl-a

Our sensor is a TAL-PC this means that we have Chlorophyll and Phycocyanin sensors. Each of these sensors need to be calibrated separately. Both are calibrated in RFU units.

- Make sure that the sensors and the call cup are triple rinsed before beginning the calibration
- Transfer 5.0mL of the 125 mg/L solution (in brown fridge in a brown amber bottle) into a 1000 mL volumetric flask. Fill the flask to the volumetric mark with DI water.
- Calibrate the Phycocyanin channel first
- Fill the cal cup will DI water to the first line
- Push the “Cal” key on the handheld and select **TAL-PC** then **PC RFU**
- Select the **Calibration Value** and enter 0.00
- Make sure that there are no air bubbles on the sensor lens. If present, lightly tap the guard against the cup to dislodge any bubbles
- Wait at least 1 minute for the sensors to reach a temperature equilibrium
- Record the DI “actual reading”, DI ref C and, a calibration value in the [calibration records](#)
- Make sure that the white line on the graph makes no significant change for 40 seconds- then accept the calibration
 - “Ready for cal point 2” will be displayed in the message area at the bottom of the screen of the handheld
- Triple rinse the cal cup and probes with a small amount of the diluted RHodamine WT dye solution
- Fill the cal cup to the first level with the diluted Rhodamine WT dye solution
- Allow the sensors to wait at least 1 minute to reach temperature equilibrium
- Look at the temperature to identify the appropriate value for calibration solution
- Select **Calibration Value** and enter the value of the second calibration standard - based off of the chart below
- Record the “actual” measurement readings in the [calibrations records](#)
- Make sure that the white line on the graph makes no significant change for 40 seconds- then accept the calibration
- Triple rinse the probes and the sensors
- Repeat all of the previous steps for the **Chlorophyll RFU** channel

Temp (°C)	Chlorophyll		Phycocyanin		Phycoerythrin	
	RFU	µg/L	RFU	µg/L	RFU	µg/L
30	14.0	56.5	11.4	11.4	37.3	104.0
28	14.6	58.7	13.1	13.1	39.1	109.0
26	15.2	61.3	14.1	14.1	41.0	115.0
24	15.8	63.5	15.0	15.0	43.0	120.0
22	16.4	66	16.0	16.0	45.0	126.0
20	17.0	68.4	17.1	17.1	47.0	132.0
18	17.6	70.8	17.5	17.5	49.2	138.0
16	18.3	73.5	19.1	19.1	51.4	144.0
14	18.9	76	20.1	20.1	53.6	150.0
12	19.5	78.6	21.2	21.2	55.9	157.0
10	20.2	81.2	22.2	22.2	58.2	163.0
8	20.8	83.8	22.6	22.6	60.6	170.0