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ACTIVITY/PROJECT SPECIFIC PROCEDURE

SP 12-15
CALIBRATION OF WATER QUALITY MEASUREMENT INSTRUMENTATION
Revision 1

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1.0 Purpose and Scope

This document describes the Sandia National Laboratories (SNL) Waste Isolation Pilot Plant (WIPP) procedure for calibration of pH, conductivity and analytical water quality measurement instruments. Calibration and operation guidelines are included in the procedure. This SP is in support of activities described in several WIPP Test Plans (TPs). Both SNL and contractor personnel will use this SP.

Acronyms and definitions for terms used in this procedure may be found in the Glossary located at the Sandia National Laboratories (SNL) WIPP Online Documents web site.

2.0 Implementation Actions

Several different models and brands of water quality measurement instruments will be used for the experimental work in support of the WIPP-related studies. This document is not meant to substitute for the manufacturer instruction manuals for these instruments. The user is responsible for reading and understanding the appropriate manuals. Guidelines for implementing and documenting quality assurance (QA) procedures are presented in this document, and follow the general guidelines given in Nuclear Waste Management Procedure (NP) 12-1 "Control of Measuring and Test Equipment."

2.1 Safety and Training

The activities described in this SP shall conform to SNL Environmental Health and Safety Programs (ES&H). All activities described in this SP are subject to ES&H requirements governed by the WIPP Industrial Safety Program and the WIPP Industrial Hygiene Program.

Disposal of the pH and conductivity solutions used during the performance of this procedure will adhere to the SNL/Carlsbad lab practices.

As defined in the SNL ES&H manual, personnel will not be exposed to hazardous voltages. The voltage levels expected in the performance of this procedure should be 24 VDC or less.

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2.2 Responsibility

The Person in Charge (PIC), whose activities warrant the use of this procedure, is responsible for implementing the requirements of this procedure. The PIC may be a Principal Investigator (PI), Well Testing Lead (WTL) or their designee.

The PIC is responsible for directing or performing the calibrations and measurements following the requirements of this procedure, documenting calibrations, and assuring that the latest revision of this document is followed.

2.3 Water Quality Measurement Instrument Selection

The PIC will ensure that the water quality measurement instruments are of the proper type, design, range, accuracy, and tolerance to accomplish their required function.

2.4 Identification

The water quality measurement instruments are identified by manufacturer, model number, and serial number, if applicable. When not supplied with a serial number, the instruments will each be assigned a permanent number that will be recorded in the scientific notebook, scientific notebook supplement and/or logbook, when that instrument is used.

2.5 Instrument Preparation

Prior to calibration of any instrument, inspect the instrument for damage, wear or excess dirt. If the instrument is damaged or in disrepair, notify the PIC and implement corrective actions following their direction. Prior to the calibration of all instruments and following manufacturer's recommendations, clean the instrument and any sensor electrodes.

2.6 Calibration

2.6.1 Standards

Calibration will be performed using commercially obtained solutions that are traceable to NIST or other nationally recognized standards. The use of room air as a zero value conductance standard is a normal, acceptable, and manufacturer recommended practice for GLI Conductivity Instruments. The identity, manufacturer, lot number and expiration date of the standards used shall be recorded (N/A for room air). A calibration solution will not be used past its expiration date listed on the container by the manufacturer.

As a general guideline, the solution(s) to be used during a calibration should be close to or bracket the expected measurement ranges for that instrument. During Calibration Adjustments or As-Left Calibrations the upper value solution should match or exceed 50% of the full range of the instrument.

A minimum of one standard shall be used for calibration of water quality measurement instruments. The use of two or more standards is recommended when a wide range of measurement values may be encountered. The following table summarizes the recommendations for each type of instrument. The basis for this table is the manufacturers' recommendations combined with previous calibration history and experience with these instruments. These recommendations are subject to adjustment by the PIC.

Instrument / Calib. Type	GLI pH	Oakton pH	Troll 9500 pH	GLI Conductivity	YSI Conductivity	Troll 9500 Conductivity
As-found / As-left Calib.	2	1	2	2	1	2
Calibration Adjustments	2	1	2	1	1	1

Table 1. Minimum Number of Standards Required During Calibrations

2.6.2 Temperature & Stability of Readings

During the calibration, the temperature of the area and solutions will be monitored and recorded. Prior to the start of the calibration, all solutions shall be given sufficient time to equilibrate to room temperature. The temperature of a solution will be measured and recorded in the applicable Scientific Notebook or supplement to the Scientific Notebook.

When an instrument is placed into a calibration solution, rapid changes in values will be observed while the instrument acclimatizes (temperature equalization is a significant part of this process). This process cannot be rushed and requires sufficient time to allow completion (recommended times are specified within the procedure section for each instrument). Stable readings will indicate that full equalization of the solution and instrument has occurred. A change of less than 1% in subsequent readings demonstrates that stability has been achieved.

2.6.3 Frequency

The instrument will be calibrated prior to initial use in the collection of qualified data and on a frequency identified by the PIC and the manufacturer's recommendations. After being used in a testing activity for the collection of data, the instruments will undergo an As-Found calibration check to establish the accuracy of the recent data collection quality. If the user of the instrument observes any irregularities in the instrument, tag the instrument documenting the concern and return for immediate recalibration.

2.6.4 Acceptance Criteria

The water quality measurement instruments calibration results are acceptable when they meet or exceed (better than) the uncertainty specifications identified by the manufacturer or the PIC. The acceptance criteria used to approve or reject the calibration results will be listed in the applicable Scientific Notebook or supplement to the Scientific Notebook.

2.6.5 Troubleshooting

If the water quality measurement instrument cannot meet the acceptance criteria (see section above), the calibration solution should be replaced and a subsequent re-calibration attempted. If the instrument still does not meet the acceptance criteria, the instrument will be removed from service, labeled with an 'Out of Service' tag and returned for repair or removed from permanent service.

2.7 pH Meter Calibration As-Found or As-Left Check

For all pH measuring instruments, perform an As-Found calibration check to determine the accuracy of the device prior to performing any adjustments. If the pH instrument has been adjusted, perform an As-Left calibration check to document the instrument's accuracy. The steps are the same whether it's an As-Found or As-Left calibration check.

2.7.1 For all As-Found or As-Left Calibrations, a minimum single point solution check shall be performed. Additional buffer solutions may also be incorporated into the check as directed by the PIC.

2.7.2 For all pH buffer solutions, following placement on the instrument probe, allow sufficient time for the instrument to equilibrate to the applied solution. The Oakton instrument requires a minimum dwell time of 3 minutes; the GLI and Troll 9500 instruments may require 60 minutes or more. Stable pH readings indicate that the pH instrument and solution have equilibrated.

2.7.3 Place the the pH instrument being calibrated into the first and lowest value pH buffer solution. Once the value being measured by the pH instrument has stabilized, record the value of the buffer solution and the value displayed by the pH instrument in the applicable Scientific Notebook or supplement to the Scientific Notebook.

2.7.4 Rinse the probe with deionized water and dry it with clean wipes and lab-grade compressed air or equivalent. If this is a single-point calibration, proceed to step 2.7.6, otherwise place the pH instrument into the next pH buffer solution. Once the value being measured by the pH instrument has stabilized, record the value of the buffer solution and the value displayed by the pH instrument in the applicable Scientific Notebook or supplement to the Scientific Notebook.

2.7.5 Repeat step 2.7.4 for any additional pH buffer solutions being used for the applicable calibration.

2.7.6 For the pH instrument being calibrated, the results of the calibration check shall be compared against the expected uncertainty or accuracy requirement of the instrument.

2.7.7 If the calibration check is an As-Found calibration and the results do not fall within the expected uncertainty or accuracy requirements, a Corrective Action Request (CAR) will be issued to document the results and impacts related to the change in pH instrument's performance. Corrective action could include evaluation and adjustment to any data collected by this transducer, re-evaluation of the calibration interval or an assessment of the process in which the instrument is being utilized. Results of all activities related to the out-of-tolerance will be summarized in the CAR.

2.7.8 If the As-Found results are out of tolerance or if improved performance is desired, perform the complete calibration adjustment section related to the type instrument being calibrated.

2.7.9 If the calibration check was an As-Left calibration and the results are out of tolerance, repeat the applicable calibration adjustment section related to the type instrument being calibrated. Remove the instrument from service, if the calibration adjustment has been performed more than two times and the instrument still does not meet the expected uncertainty or accuracy requirements Tag and label the pH instrument accordingly, and if practical, return it to the manufacturer for repair.

2.8 GLI pH Meter Calibration Adjustment

NOTE: An in-progress calibration can always be aborted by pressing the **ESC key**. After the "ABORT: YES?" screen appears, do one of the following:

1. Press **ENTER key** to abort. After the "CONFIRM ACTIVE?" screen appears,
2. Press **ENTER key** again to return the analog output to its active state
3. Use ⇑ **or** ⇓ **key** to choose "ABORT: NO?" screen, and press **ENTER key** to continue calibration.

NOTE: If at any time during calibration, the "2 POINT BUFFER: CONFIRM FAILURE?" screen appears, press **ENTER key** to confirm. Then, use the ⇑ **or** ⇓ **key** to select between "CAL: EXIT" or "CAL: REPEAT" and do one of the following: **ENTER key** to return the analog output to its active state. With the "2 POINT BUFFER? (CAL: REPEAT)" screen selected, press **ENTER key** to repeat calibration of this point.

2.8.1 Immerse the sensor in the first buffer (preferably pH 7). Important: Allow the sensor and buffer temperatures to equalize. Depending on their temperature differences, this may take 60 minutes or more. Stable pH readings indicate equalization of temperatures.

2.8.2 Press MENU key to display a "MAIN MENU" screen. If the screen is not showing, use the ⇑ or the ⇓ key to display it.

2.8.3 Press ENTER key to display CALIBRATE | SENSOR screen.

2.8.4 Press ENTER key again to display SENSOR | 2 POINT BUFFER screen.

2.8.5 Press ENTER key again to display 2 POINT BUFFER | IN 1st SOLUTION screen. With the sensor in the first buffer, press ENTER key again to confirm this.

NOTE: During calibration, the analog output is automatically "held" at the last measured value.

2.8.6 While the "2 POINT BUFFER: | PLEASE WAIT" screen is displayed, the transmitter waits for the pH and temperature signals to stabilize, measures the buffer value, and automatically calibrates this point. Thereafter, the "2 POINT BUFFER: | PT1=7.00 pH" screen appears for 5 seconds to confirm calibration of this point.

NOTE: Any time the "PLEASE WAIT" screen appears during calibration you can manually complete calibration of the point by pressing the ENTER key. However, this is not recommended because the pH and temperature signals may not be fully stabilized, resulting in a less accurate calibration.

2.8.7 After the screen appears, remove the sensor from the first buffer, rinse it with deionized water and dry it with clean wipes and lab-grade compressed air or equivalent, and immerse it in the second buffer (typically pH 10). Wait for a minimum of 60 minutes, then press ENTER key to confirm this.

2.8.8 While the screen is displayed, the transmitter waits for the pH and temperature signals to stabilize, measures the buffer value, and automatically calibrates this point. Thereafter, the "2 POINT BUFFER: | PT2=10.00 pH" screen appears for 5 seconds to confirm calibration of this point.

2.8.9 A "pH SLOPE XX.X mV/pH" screen appears, indicating a slope value to gauge sensor performance. The slope should be between 54 and 62 mV/pH for optimal sensor performance. Record this value in the applicable Scientific Notebook or supplement to the Scientific Notebook.

2.8.10 Press ENTER key to end calibration ("2 POINT BUFFER: CONFIRM CAL OK?" screen appears).

2.8.11 This completes the two point buffer solution calibration adjustment. The transmitter is now ready for a pH As-Left calibration check; perform section 2.7 of the procedure.

2.9 Oakton pH Testr Meter Calibration Adjustment

2.9.1 Clean the probe and assess if the electrode of the probe was stored dry for long periods of time. A dry electrode will give fluctuating readings while it rehydrates in a buffer, causing errors. If the probe was dry, let set in a pH buffer solution of 7.00 for 4 hours before initiating the calibration.

2.9.2 To start the calibration, press **ON/OFF** button to switch unit on.

2.9.3 Dip electrode ½" to 1" into buffer (pH 4.01, 7.00, or 10.00). Let the Testr stabilize in the pH solution, if the Testr does not have a long enough exposure to the buffer solution, a stable calibration point will not be reached.

2.9.4 Press **CAL** button to enter Calibrate (CAL) mode. 'CAL' flashes on the display. Then, a pH value close to the pH buffer value will flash repeatedly.

2.9.5 After at least 3 minutes press **HOLD/CON** to confirm calibration. The display will show 'CO' and then switch to the buffer value reading. If you fail to press the HOLD/CON button, and

instead press the CAL button, the Testr will resume measuring mode but will not enter the calibration value.

2.9.6 Rinse the probe with deionized water, then repeat with other buffers if necessary. Rinse electrode in water and dry before dipping into next buffer.

2.9.7 Following adjustment of the Oakton Testr, return to section 2.7 to perform an As-Left Calibration.

2.10 In-Situ Troll 9500 pH Calibration Adjustment

2.10.1 Insert the front end of the MP TROLL 9500 into the open end of the Cal Cup. Thread the Cal Cup onto the body until seated against the o-ring, then back off slightly to avoid over tightening. To stabilize the instrument, you may wish to use a calibration stand or other support.

2.10.2 Connect the MP TROLL 9500 to a PC and establish a connection in Win-Situ or Pocket-Situ. Win-Situ screens are illustrated here. The Pocket-Situ interface is similar, with the Navigation tree at the top of the screen and the Information pane below it.

2.10.3 Select the MP TROLL 9500 in the Navigation tree. The software will automatically detect and display the installed sensors. If one or more sensors are installed in the wrong port, an error message will be displayed. Simply remove the sensor and install it in the correct position, then “refresh” the device before continuing.

2.10.4 Click to select pH in the Parameters list. The sensor serial number (SN) and recent calibration information is displayed as shown in Figure 1.

2.10.5 Select **Calibrate** button as displayed in Figure 1. The pH Calibration Wizard starts. A screen like Figure 2 is displayed.

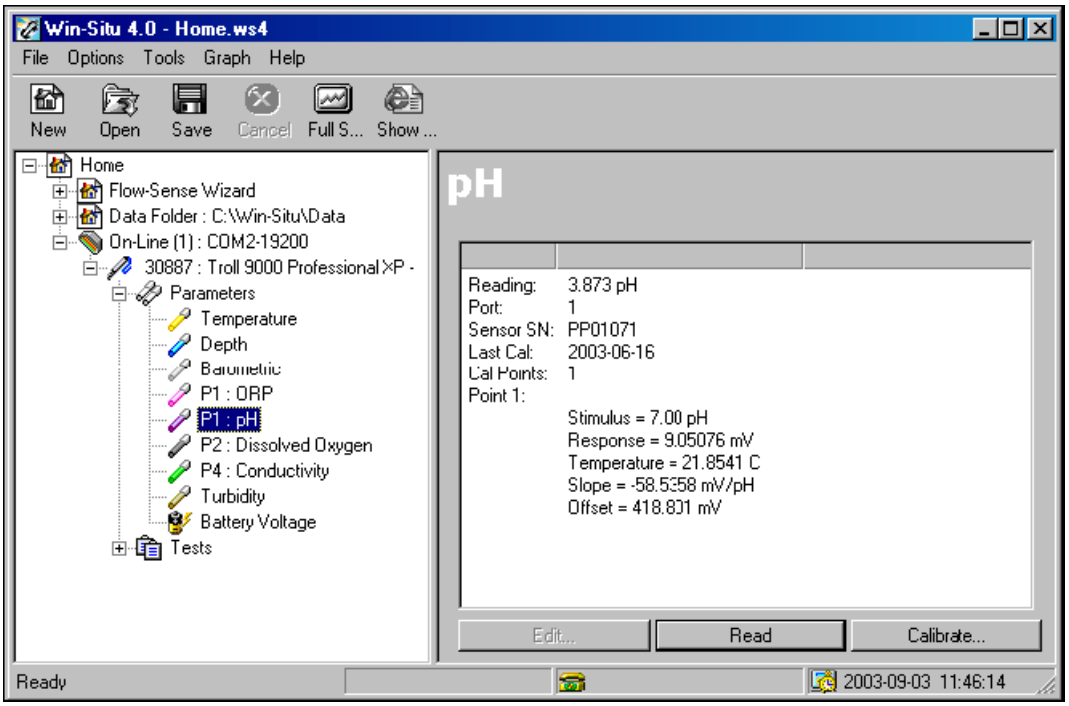

Figure 1. Calibration Step 2.10.4 & 2.10.5

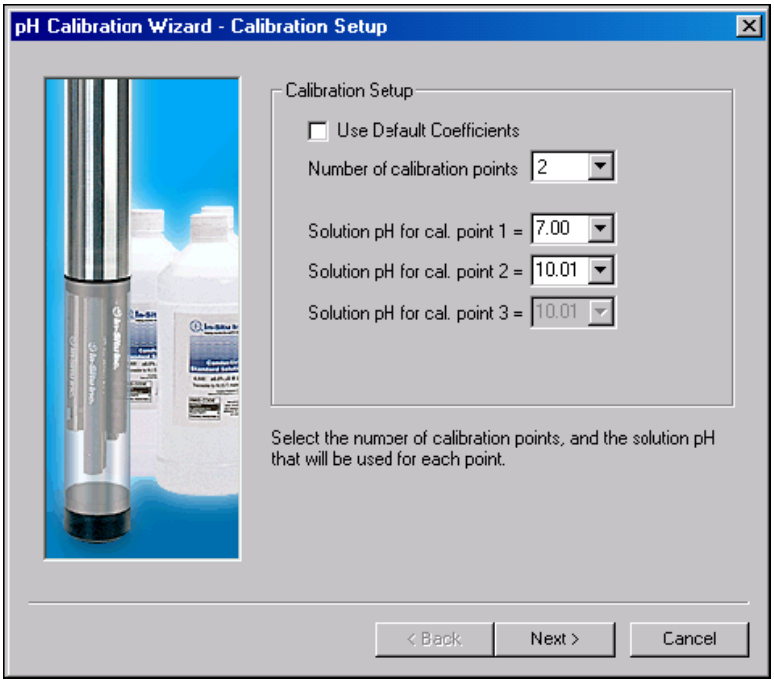

Figure 2. Calibration Steps 2.10.5 through 2.10.7

2.10.6 Select the number 2 for the calibration points for this calibration, and the pH value of the calibration solution for each point. Cal point 1 is the solution the sensor is soaking in now.

2.10.7 Select **Next** to continue to the next screen as shown in Figure 3, then select **Run** to begin the stabilization process. The display will continuously update as readings are taken and compared against the stabilization criteria and the following Status indicators will be progressively shown:

NOT TESTED is displayed until you begin the calibration by selecting Run.

UNSTABLE indicates the sensor response does not meet the criteria for a valid calibration point.

NOMINAL indicates the sensor deviation meets early stabilization criteria. The Accept button becomes available when nominal stability is achieved. Do not accept the early value, but wait for complete stability.

STABLE is displayed when the readings have stabilized sufficiently to take a valid calibration point. The calibration proceeds automatically to the next screen.

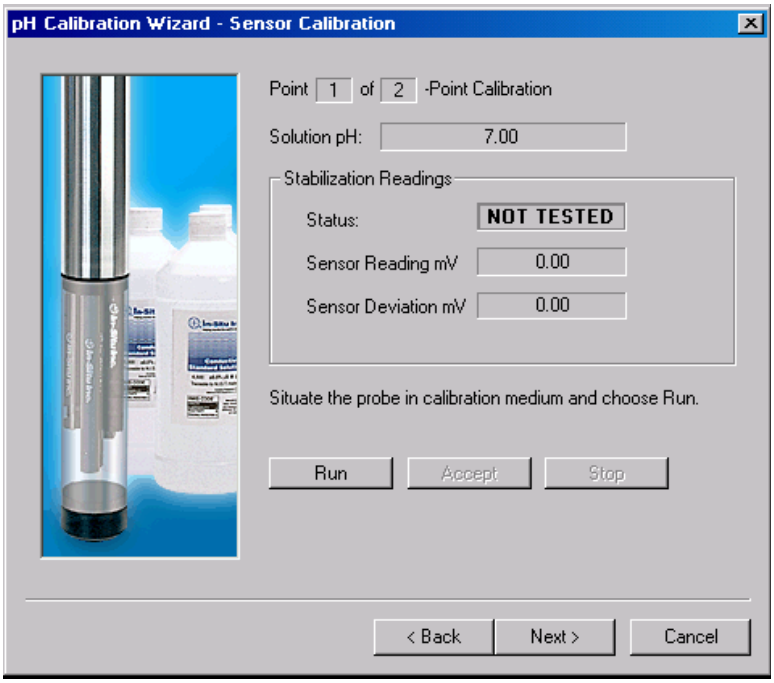

Figure 3. Calibration Steps 2.10.7

2.10.8 For a two-point calibration, the Wizard returns to the screen shown in Figure 3, and waits for you to situate the probe in the next calibration solution and click Run.

2.10.9 Remove the Cal Cup, discard the first solution, rinse the Cal Cup and the front end of the instrument, refill the Cal Cup with the second buffer solution, and attach it to the instrument.

2.10.10 Select **Run** to begin the stabilization for the second calibration point. Status indicators and controls are the same as for the first calibration point (step 2.10.8).

2.10.11 The final screen shows the sensor slope and offset calculated during the calibration process, refer to Figure 4. Record these values in the applicable Scientific Notebook or supplement to the Scientific Notebook. Select the **Finish** button as shown in Figure 4 to complete the calibration.

2.10.12 This completes the calibration adjustment of the Troll 9500 instrument, return to section 2.7 and perform an As-Left calibration check to verify the performance of the instrument.

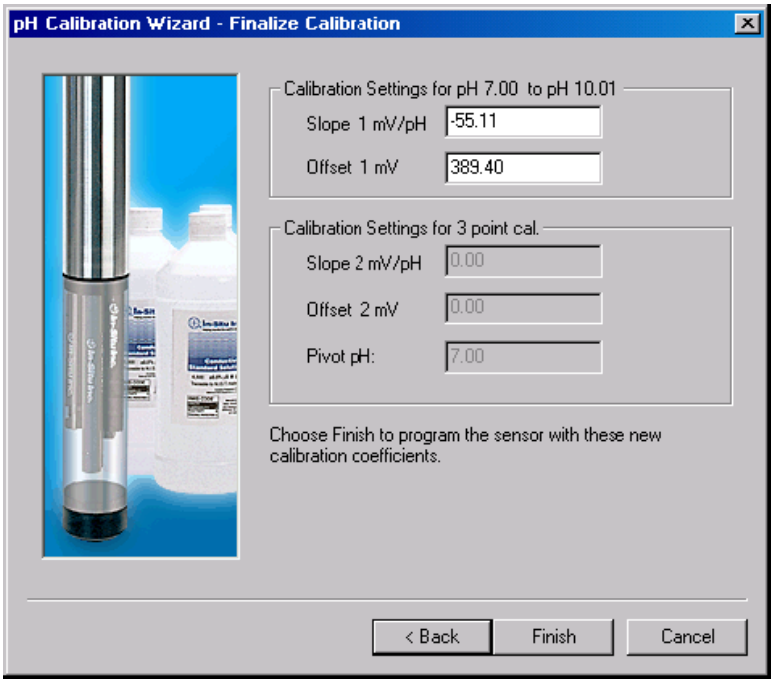

Figure 4. Calibration Steps 2.10.11

2.11 Conductivity Sensor As-Found or As-Left Calibration Check

For all Conductivity measuring instruments, perform an As-Found calibration to determine the accuracy of the device prior to performing any adjustments. If the conductivity instrument has been adjusted, perform an As-Left calibration to document the instrument's accuracy. The steps are the same whether its an As-Found or As-Left calibration.

2.11.1 The minimum requirement for all As-Found or As-Left Calibrations is a single point calibration check. Additional checks with other conductivity solutions may also be performed. The specific number and the solutions used will be identified by the PIC.

2.11.2 For all conductivity solutions, following placement on the instrument probe, allow sufficient time to equilibrate with the applied solution. The YSI instrument requires a minimum dwell time of 1 minute; the GLI and Troll 9500 instruments may require 60 minutes or more. Stable conductance readings indicate that the conductivity instrument and solution have equilibrated.

2.11.3 Clean the instrument with deionized water and dry it with clean wipes and lab-grade compressed air or equivalent and place it into the first and lowest conductivity solution. Once the value being measured by the conductivity instrument has stabilized, record the solution value and the value displayed by the conductivity instrument in the applicable Scientific Notebook or supplement to the Scientific Notebook.

2.11.4 Rinse the probe with deionized water and dry it with clean wipes and lab-grade compressed air or equivalent. If this is a single-point calibration proceed to step 2.11.6, otherwise place the conductivity instrument being calibrated into the next conductivity solution. Once the value being measured by the conductivity instrument has stabilized, record the value of the conductivity solution and the value displayed by the conductivity instrument in the applicable Scientific Notebook or supplement to the Scientific Notebook.

2.11.5 Repeat step 2.11.4 for any additional conductivity solutions being used in the calibration.

2.11.6 For the conductivity instrument being calibrated, the results of the calibration check shall be compared against the expected uncertainty or accuracy requirement of the instrument.

2.11.7 If the calibration check is an As-Found calibration and the results do not fall within the expected uncertainty or accuracy requirements, a Corrective Action Request (CAR) will be issued to document the results and impacts related to the change in conductivity instrument's performance. Corrective action could include evaluation and adjustment to any data collected by this transducer, re-evaluation of the calibration interval or an assessment of the process in which the instrument is being utilized. Results of all activities related to the out-of-tolerance will be summarized in the CAR.

2.11.8 If the As-Found results are out of tolerance or if improved performance is desired, perform the calibration adjustment section related to the type instrument being calibrated.

2.11.9 If the calibration check was an As-Left calibration and the results are out of tolerance, repeat the applicable calibration adjustment section related to the type instrument being calibrated. Remove the instrument from service, if the calibration adjustment has been performed more than two times and the instrument still does not meet the expected uncertainty or accuracy requirements. Tag and label the conductivity instrument accordingly, and if practical, return it to the manufacturer for repair.

2.12 GLI Conductivity Instrument Calibration Adjustment

NOTE: When using a new sensor, always perform a "RESET CALIBRATE" using the TEST/MAINT menu (PART THREE, Section 5.8) of the GLI Conductivity Instrument Manual before zeroing and calibrating. Steps 2.12.1 through 2.12.8 may be skipped if the sensor has been zeroed previously (an analyzer reading of 0.0 in room air indicates that the sensor has been through these steps previously).

2.12.1 Make sure that the sensor is dry before zeroing. Press **MENU key** to display a "MAIN MENU" screen. If the MAIN MENU | CALIBRATE screen is not showing, use ⇑ **or** ⇓ **key** to display it.

2.12.2 Press the **ENTER key** to display CALIBRATE | SENSOR screen.

2.12.3 Press the **ENTER key** again to display SENSOR | 1 POINT SAMPLE screen.

2.12.4 Press ⇓ **key** once to display SENSOR | ZERO screen.

2.12.5 Press the **ENTER key** to display the "ZERO: IN DRY AIR?" screen.

2.12.6 With the dry sensor held in air, press the **ENTER key** again to start automatic zeroing. (During zeroing, the analog output is automatically "held" at the last measured value.)

2.12.7 After the "ZERO: CONFIRM ZERO OK?" screen appears, press the **ENTER key** to end zeroing.

2.12.8 After the "ZERO: CONFIRM ACTIVE?" screen appears, press the **ENTER key** to return the analog output to its active state (MEASURE screen appears).

2.12.9 Thoroughly rinse the clean sensor in de-ionized water and dry it with clean wipes and lab-grade compressed air or equivalent, and then immerse the sensor into a properly prepared conductivity reference solution of known value. **Important: Allow the sensor and solution temperatures to equalize.** Depending on their temperature differences, this may require 60 minutes or more; a stable conductance reading indicates temperature equalization.

NOTE: Suspend the sensor to prevent its electrodes from touching the container. Remove any bubbles clinging to the outer and center electrodes by gently stirring the sensor in the solution. Sensors with a deeper recessed center electrode require more vigorous stirring.

2.12.10 Press **MENU key** to display a "MAIN MENU" screen. If the MAIN MENU | CALIBRATE screen is not showing, use ⇑ **or** ⇓ **key** to display it.

2.12.11 Press the **ENTER key** to display CALIBRATE | SENSOR screen.

2.12.12 Press the **ENTER key** again to display SENSOR | 1 POINT SAMPLE screen.

2.12.13 Press the **ENTER key** again to display SENSOR : SAMPLE READY ? . With the sensor in the conductivity solution, press the **ENTER key** to confirm. The active screen appears showing the measurement reading. (During calibration, the analog output is automatically "held" at the last measured value.)

2.12.14 Wait 60 minutes or more; a stable conductance reading indicates temperature equalization. Then press the **ENTER key**. The "PLEASE WAIT" screen may appear if the reading is still too unstable. After the reading has stabilized, the static screen appears showing the "last measured" value.

2.12.15 Use **arrow keys** to adjust the displayed value to exactly match the known value of the conductivity solution.

2.12.16 Press the **ENTER key** to enter the value and complete calibration ("CONFIRM CAL OK?" screen appears).

2.12.17 This completes the calibration adjustment of the GLI conductivity instrument, return to section 2.11 and perform an As-Left calibration check to verify the performance of the instrument.

2.13 YSI Conductivity Instrument Calibration Adjustment

2.13.1 Turn the instrument on and allow it to complete its self test procedure.

2.13.2 Select a calibration solution which is most similar to the sample you will be measuring.

2.13.3 Place at least 3 inches of solution in a clean glass beaker.

2.13.4 Insert the probe into the beaker deep enough to completely cover the oval shaped hole on the side of the probe.

2.13.5 Do not rest the probe on the bottom of the container – suspend it above the bottom at least ¼ inch. Press the **MODE** key until the instrument is reading conductivity or specific conductance.

2.13.6 Allow at least 60 seconds for the temperature reading to become stable.

2.13.7 Move the probe vigorously from side to side to dislodge any air bubbles from the electrodes.

2.13.8 Press and release both the **UP ARROW** and **DOWN ARROW** keys at the same time. The **CAL** symbol will appear at the bottom left of the display to indicate that the instrument is now in Calibration mode.

2.13.9 Use the **UP ARROW** or **DOWN ARROW** key to adjust the reading on the display until it matches the value of the calibration solution you are using.

2.13.10 Once the display reads the exact value of the calibration solution being used (the instrument will make the appropriate compensation for temperature variation from 25°C), press the **ENTER** key. The word "**SAVE"** will flash across the display for a second indicating that the calibration has been accepted.

2.13.11 This completes the calibration adjustment of the YSI conductivity instrument, return to section 2.11 and perform an As-Left calibration check to verify the performance of the instrument.

NOTE: If the up or down arrow keys are not pressed during the calibration process, the "SAVE" message will not be displayed since the calibration value has not changed. If an error occurs during calibration, see the YSI Operators Manual, Section 9, *Troubleshooting*.

2.14 In-Situ Troll 9500 Conductivity Calibration Adjustment

2.14.1 With a conductivity sensor installed and plugs or sensors in the other sensor ports, rinse the front end of the MP TROLL 9500. To calibrate using a medium- to high-range solution, rinse in tap water and shake to dry.

2.14.2 To calibrate using a low-range solution, it is important to rinse well; rinse with tap water, then with deionized water, followed by a rinse with the solution to be used for calibration.

2.14.3 Insure the black PVC base is attached to the Cal Cup, and fill the Cal Cup with the selected calibration solution. • Low-range sensor: Fill to the lower or upper line depending on the number of sensors installed (fewer sensors require more solution). • High-range sensor: Fill to or above the upper line, depending on the sensor load. You need enough solution to immerse the sensor's side ports.

2.14.4 Insert the front end of the MP TROLL 9500 into the open end of the Cal Cup. Thread the Cal Cup onto the body until seated against the o-ring, then back off slightly to avoid over tightening. • Low-range sensor: the open area of the sensor should be completely immersed. • High-range sensor: the side openings should be completely immersed. • The temperature sensor should be immersed in about an inch of liquid. • If any air bubbles are visible on the sensor, tap the sides or bottom of the Cal Cup to dislodge them, or invert the Cal Cup a couple of times.

2.14.5 Connect the MP TROLL 9500 to a PC and establish a connection in Win-Situ or Pocket-Situ. Win-Situ screens are illustrated here. The Pocket-Situ interface is similar, with the Navigation tree at the top of the screen and the Information pane below it.

2.14.6 Select the MP TROLL 9500 in the Navigation tree, Figure 5. The software will detect and display the installed sensors. If any sensor is installed in the wrong port, an error message will be displayed. Simply remove the sensor and install it in the correct position, then "refresh" the device before continuing.

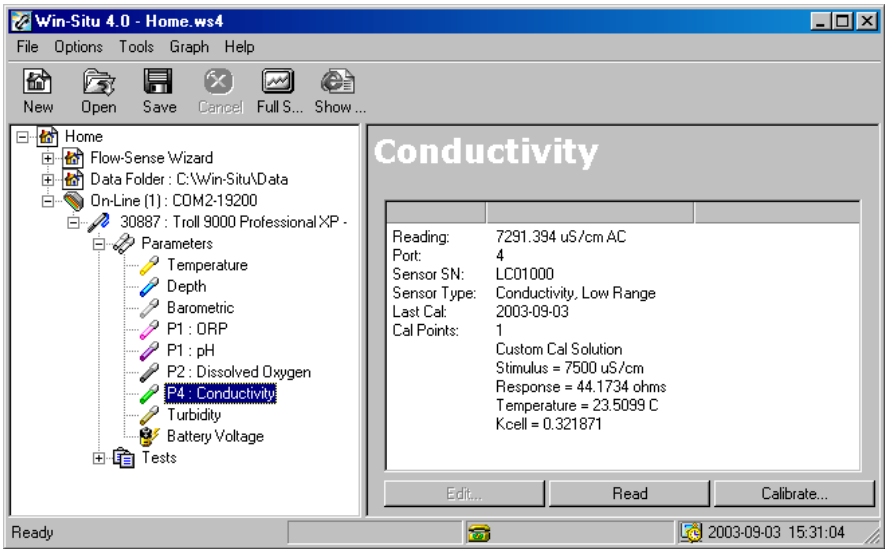

Figure 5. Calibration steps 2.14.6 thru 2.14.8

2.14.7 Select conductivity in the Parameters list. The sensor serial number (SN), type, and recent calibration information is shown.

2.14.8 Select **Calibrate**. The Conductivity Calibration Wizard starts. Available calibration ranges will depend on the sensor installed (high or low range)

2.14.9 Select the calibration solution the sensor is soaking in. For a custom solution, select **Other** as displayed in Figure 6, and enter the Specific Conductance of the solution (conductivity corrected to 25°C) in µS/cm.

2.14.10 Select **Next** to continue.

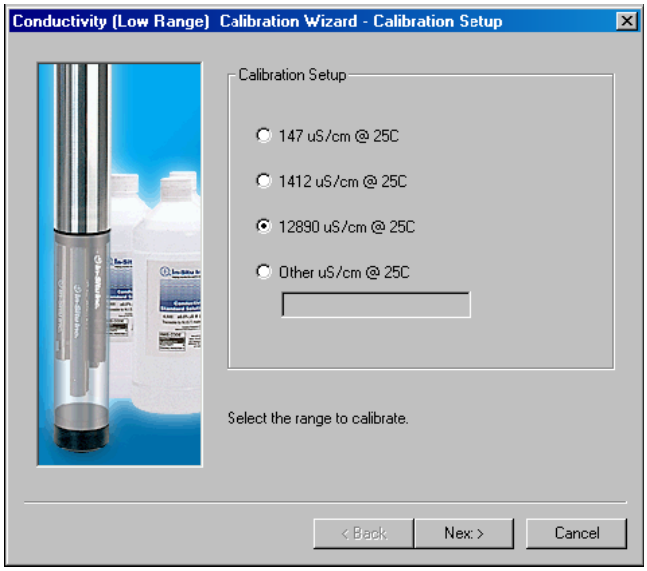

Figure 6. Calibration Steps 2.14.9 & 2.14.10

2.14.11 In the next screen, select **Run** as displayed in Figure 7**,** to begin the stabilization. The display will continuously update as readings are taken and compared against the stabilization criteria.

- Status indicators:

NOT TESTED is displayed until you begin the calibration by selecting Run.
UNSTABLE indicates the sensor does not meet the criteria for a valid calibration point.
NOMINAL indicates the sensor deviation meets early stabilization criteria.

2.14.12 **The Accept** button as displayed in Figure 7 becomes available when nominal stability is achieved. You may accept the early value, or wait for complete stability. If you accept the early value, the calibration point will be designated “USER SET” in the calibration report. **STABLE** is displayed when the readings have stabilized sufficiently to take a valid calibration point. The calibration proceeds automatically to the next screen as displayed in Figure 8.

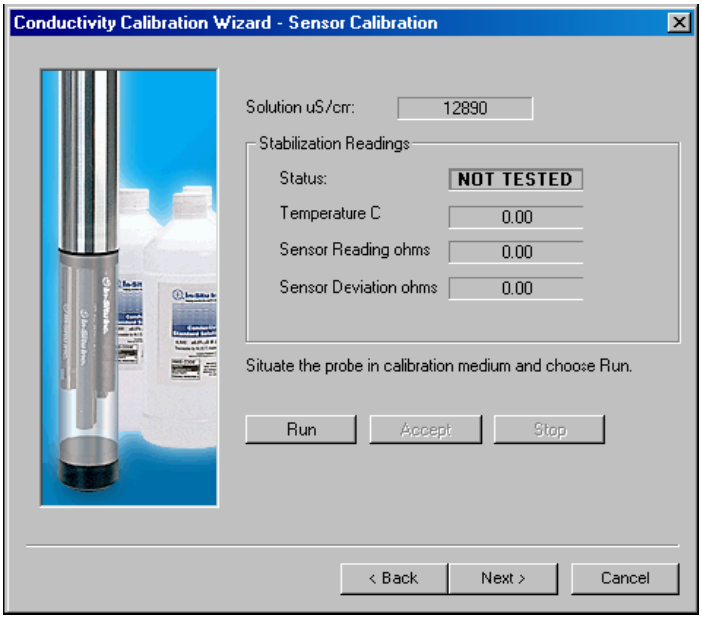

Figure 7. Calibration Step 2.14.11 & 2.14.12

2.14.13 The final screen, Figure 8, shows the new cell constant (Kcell) calculated for the selected range during the calibration process. Typical cell constants: Low-range sensor 0.33 – 0.39 High-range sensor 4.4 – 5.8. The displayed cell constant may be edited.

2.14.14 Select **Finish** as displayed in Figure 8**,** to program the sensor with the displayed cell constant.

2.14.15 This completes the calibration adjustment of the Troll 9500 Conductivity instrument, return to section 2.11 and perform an As-Left calibration check to verify the performance of the instrument.

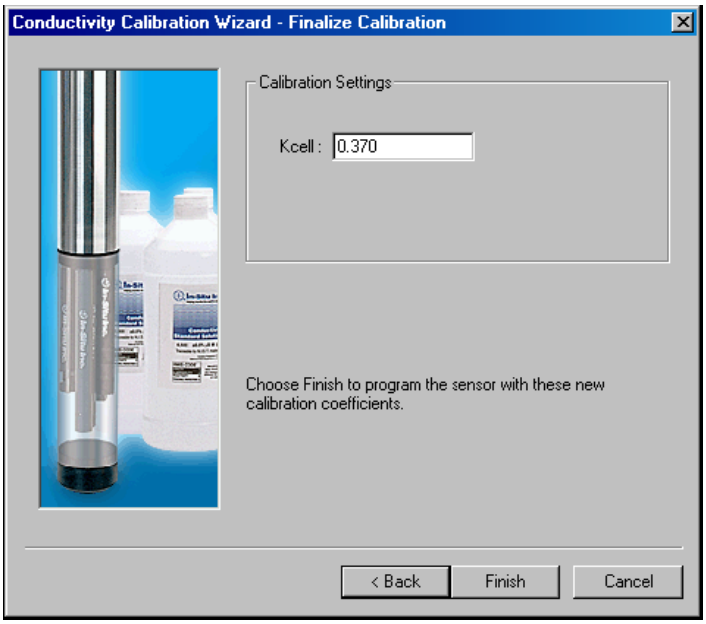

Figure 8. Calibration Steps 2.14.14 & 2.14.15

2.15 References

- Operating Manual, pH/ORP Pro-Series Model P3 Transmitter, GLI International, Inc., Rev 1-202.
- Operating Manual, Conductivity Pro-Series Model C3 Transmitter, GLI International, Inc., Rev 1-202.
- Multi-Parameter Troll 9500 Operating Manual, WQP-100, In-Situ, INC. October 2005.
- Operations Manual, YSI Model 30 Handheld Salinity, Conductivity and Temperature System, YSI Incorporated.
- Operating Instructions, Waterproof pH Testr 3 & 3+ Double Junction Probe, Oakton Inc.

3.0 Records

The following QA records generated through implementation of this procedure shall be prepared and submitted to the WIPP Records Center in accordance with NP 17-1, “Records”.

QA Record

- Scientific Notebook
- Scientific Notebook Supplement

4.0 Appendices

There are no appendices associated with this document.

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