Advanced Sensor Technologies, Inc.
TEL: 714-978-2837 TOLL FREE: 1-888-WOW-ASTI (969-2784) FAX: 714-978-6339

IMPORTANT NOTES FOR CALCIUM ISE SYSTEM WITH 3TX-ISE ION SELECTIVE TRANSMITTERS

Calibration, Installation, Cleaning & Use of High Level Calcium Ion Selective (ISE) Measurement Systems for Applications Such As:

- **Industrial Ionized Calcium Monitoring & Control to Minimize Scaling Build-up**
- **Environmental Monitoring of Calcium Ion Levels for Water Quality Analysis**

Before proceeding further, it is recommended that a review of the following technical documents that describes the general provisions for online ion selective measurements:

http://www.astisensor.com/GENERAL_GUIDE_TO_ONLINE_ISE_MEASUREMENTS.pdf

All calibration solutions and process grab sample should be calibrated and tested at identical temperatures to the process temperature for optimal results. The actual temperature of the process solution (and thereby the calibrating solutions as well) is not as critical as the fact that they are calibrated at the same temperature to eliminate all potential sources of uncertainty. For greatest overall accuracy of the calcium (NH_4^+) measurement, however, all tests should be performed as close to 25 degrees Celsius (room temperature process solutions) as possible. The valid (permissible) temperature range for all calcium ion selective sensors is five to fifty (+5 to +40) degrees Celsius (41 to 104 degrees Fahrenheit).

Calibration Point 1 (always the lower concentration value) and Calibration Point 2 (always the higher concentration value) determines the response curve of any given calcium Ion Selective Sensor (AB 6440, AB 5440 or AB 8440). The 3TX-ISE transmitter as supplied has already been preconfigured with the characteristic sensor slope for your application and range of interest. In the absence of suitable calcium calibration standard solutions at the job site it is recommended to use the ASTI factory pre-programmed characteristic 2-point slope and to perform only a 1-point grab sample offset field calibration. The 1-point grab sample offset calibration provides concurrence with the process sample analysis and is the most important calibration to be performed in the field to ensure meaningful trending between grab sample times.

The calibration value for point 1 is the low ppm solution and point 2 is high ppm solution. The one point offset calibration using a process grab sample is always performed by using the offset calibration option only. The calibration solutions should be kept clean and out of direct sunlight and/or other high-energy radiation sources to maximize accuracy of their ppm values. New sensors should be conditioned in calcium high standard solution for at least 5 minutes before beginning the calibration procedure as described in this guide. If necessary, special conditioning may be required for sensors in stock long periods of time and assistance with such needs can be obtained from the ASTI factory. All sensors should be rinsed with deionized (DI) water prior to conditioning in any standard solution.

The acceptable pH range for any of the calcium ion selective installation is 2.5 to 11. Any calibration standards should be background stabilized prevent errors in the 2-point slope calibration. There are currently no known commercially available calcium calibration standards that can be used since none are known to meet these criteria. The last page of this ISE addendum contains the procedures for how to prepare suitable calcium ISE standards in your laboratory. It is **NOT** recommended to use any calibration standard solution to perform the 1-point offset calibration. Note that adjusting the inline reading to agree with a grab sample determined value of the process sample should ALWAYS be the used as the 1-point calibration scheme.

Although pH compensation is not required for calcium ion measurement, the role of pH should still be considered. Many calcium salts are sparingly soluble. The percent of ionized calcium present for a given solution with such calcium salts is dependent upon both pH and temperature as well as the equilibrium constants for the forms present. Recall that the calcium ion selective sensor only detects IONIZED CALCIUM. That is to say that any forms of calcium present in complexes or ionically bond cannot be detected. This is important to keep in mind since other analytical method for offline determination of calcium involving reagent addition may well liberate such bond forms of calcium in the process of the analysis itself. It is acceptable to have such an asymmetry provided that the ratio of ionized calcium to total calcium species is characteristic for the given system. It is very important, however, to have consistent with the grab sample method employed to have consistent units and trending for the inline system. Since the sensor slope is independent of the units or species employed it will properly trend so long as there is consistency in the offline grab sample method used.

Analogously, the presence of potential interfering ions such as sodium, potassium and magnesium need to be considered as they may skew the values of calcium detected by the ion selective sensor. For higher level measurements the interfering ion concern is largely mitigated but still must not exceed the permissible limits.

Advanced Sensor Technologies, Inc.

TEL: 714-978-2837 TOLL FREE: 1-888-WOW-ASTI (969-2784) FAX: 714-978-6339

FOLLOWING STEPS ARE REQUIRED FOR AN INSTALLATION OF A NEW CALCIUM SENSOR:

1) Perform a reset of the existing calibrations. This is accomplished by calling the P21 calibration reset.
2) Perform a two-point calibration to empirically determine slope if desired or required. See the following procedure to ensure that a valid 2-point calibration is accomplished. In very many cases using the factory predefined slope is perfectly acceptable alternative to performing a 2-point slope calibration in the field.
3) Place sensor into process and allow it to find electrochemical and thermal equilibrium. The time required for this may vary depending upon the particular application as well as the calcium ion selective sensor type.
4) To account for any differences between the ionic strength and interfering ions between calibration and measured solution, a grab sample should be taken and analyzed by a suitable analysis system, and the online calcium ion selective measurement system adjusted to read the grab sample analyzed value. The sensor should be left continuously in service and this grab sample offset calibration performed as may be required, unless the sensor seems to be losing sensitivity, giving erratic readings or requires cleaning. The 1-point grab sample 1-point offset calibration is simply called "Offset" in the 3TX-ISE analyzer LED main menu.

Please refer to the 3TX-ISE manual for instructions on how to perform both 1-point and 2-point calibrations using the three-button operation. Only issues specific to your given ion selective measurement are covered in this ISE addendum and all general use topics are discussed in the 3TX-ISE manual and specification sheet.

INSTALLATION OF A NEW CALCIUM SENSOR THAT IS OUT OF RANGE OUT OF THE BOX:

For ion selective sensors, getting out of range is much easier than for pH sensors. The reason is the ppm scale is very different from the pH value. The mV response of a pH sensor is linear to the pH units displayed. The mV response of the ISE sensor is not linear to the ppm units displayed. Non-linear manipulations are required to convert the ISE sensor mV response to the ppm units displayed. If the reading is below 0ppm the display will flash as "UFL". If the reading is over 999 the display will flash 999 or "OFL". Before proceeding toggle to the temperature mode and ensure that the reading is reasonable. If desired perform a temperature offset calibration to a reference value. The P01 software lock must be disabled before any calibrations can be performed.

GETTING BACK ON-SCALE QUICKLY

Place your ISE sensor into a standard solution that is the same as the isopotential concentration. In the case of the calcium ion selective sensor this occurs at approximately 80ppm. Place your calcium ISE sensor into the 80ppm calcium ion standard solution (see last page for preparation instructions). Use the 'Down' key to view the absolute mV potential. Toggle to P14 (Isopotential Voltage) and adjust this to agree with the absolute mV in the 80ppm calcium ion standard solution. The P01 software lock must be disabled before this can be done.

Advanced Sensor Technologies, Inc.

TEL: 714-978-2837 TOLL FREE: 1-888-WOW-ASTI (969-2784) FAX: 714-978-6339

Configuring 3TX-ISE Analyzers for Calcium Measurements

Your 3TX-ISE has been preconfigured at the ASTI factory for your ion selective measurement requested at your time of order. The ISE measurement type configured for the 3TX-ISE transmitter cannot be modified in the field. You can use the last parameter on the 3TX-ISE transmitter (P20) to reset the unit back to the factory-dispatched configuration (see 3TX-ISE specification sheet and manual for details about this). The only two variables that will change when you perform a calibration will be the slope parameter (P15) and the mV offset at the isopotential point (P14). Below are the nominal values for the parameter P14 and P15 for the calcium ion selective measurement:

Slope (Parameter P15 on 3TX-ISE): +29.1 mV per decade

The slope parameter will only be changed when a 2-point slope calibration is performed (see later in this addendum for details). Parameter P15 allows you to both view and manually modify the working slope. This slope may vary depending upon your application and range and has been preconfigured at the ASTI factory.

Offset (Parameter P14 on 3TX-ISE): +78 mV

The offset parameter will be changed both when a 2-point slope or 1-point offset calibration is performed. Parameter P14 allows you to both view and manually modify the offset. This offset may vary depending upon your application and range as preconfigured at the ASTI factory. Limits are ± 320mV from value shown above. ***Note that flashing digits when in the P14 display mode indicate negative mV values.***

Formula Weight of Ion (Parameter P13 on 3TX-ISE): 40.08 grams per mol (FIXED)

The value is a display only variable that clearly denotes the ISE measurement type. In this case the value for the formula weight of the ion measured is 40.08 grams per mole for calcium.

To modify the slope (or any other parameter) the software lock (P01) must be disabled.

You should check that your ASTI ISE sensor is properly wired according to the official ASTI hook-up schematic for ASTI sensors with and without preamplifiers to the 3TX analyzer (also provided later in this guide for convenience). All common wiring configurations are found in this ISE addendum for your convenience or installation and commissioning.

The 3TX-ISE transmitter supports ISE sensors without preamplifiers and the 3TX-ISE-X transmitter supports ISE sensor with preamplifiers. The use of preamplifiers is not generally not required for cable lengths of less than 20 feet (6 meters). Consult the ASTI factory for further assistance with best configuration for your use.

CALIBRATION ONLY RESET (Parameter P21)

If the P21 reset is invoked, the slope and isopotential voltage will be restored to the values as detailed on the previous page. This is recommended before installing any new ISE sensor as the previously installed sensors may well have had an isopotential voltage that differs significantly from that for a brand new ISE sensor. This P21 reset will not affect any parameters except the P14 isovoltage and P15 slope. If you either have performed or wish to perform your own slope calibration rather than using the ASTI factory programmed slope value you will need to the 2-point calibration procedure as outlined in the ISE addendum. In addition, you will need to once again place the ISE sensor back into service and allow it to equilibrate. You will then also need to repeat your 1-point grab sample offset calibration. This means taking a sample from the process and determining the ISE concentration (in ppm) for the grab sample and then using the 1-point offset calibration feature of the 3TX-ISE analyzer to bring the online reading in accordance with the laboratory grab sample determination.

COMPLETE FACTORY RESET (Parameter P20)

This should be reserved for situations where this is recommended by ASTI factory. All changes to all parameters will be lost and restored back to the factory defaults. Upon request, the default values for nearly all parameters than can preset to any value desired to make the use of the P20 full reset back to your exact desired configuration. This can be especially convenient if there will be very many operators using the transmitters that might potentially accidentally misconfigure the unit. The customized ASTI defined factory defaults capability of the 3TX-ISE transmitters allows for calling the P20 full reset to very quickly get back to the exact desired configuration. For installation of a new ISE sensor only the P21 calibration only reset should be required. If you are unsure of the default values you can invoke the P20 full reset to find this information. You should take note of your existing parameter values performing this P20 reset in case you wish to return back to your previous settings on the transmitter.

Advanced Sensor Technologies, Inc.

TEL: 714-978-2837 TOLL FREE: 1-888-WOW-ASTI (969-2784) FAX: 714-978-6339

Connection Diagram of Iotron™ pH, ORP and Ion Selective (ISE) Sensors WITH Preamplifiers to 3TX-pH-X pH/ORP Transmitters and 3TX-ISE-X Ion Selective Transmitters

ASTI Cable Color Coding	Instrument Terminal Value	3TX-pH/ISE Terminal Number
Green	+5V Power (Green)	1
White	pH/ISE Sensor *mV Signal*	2
Black	-5V Power (Black)	3
Yellow	TC (Yellow)	4
Blue & Red	TC (Blue) & Common–Ground–Reference (Red)	5

Note 1: The 3TX-pH transmitter can be used for either pH or ORP measurement and wiring connections are the same for both pH and ORP sensors (only the Parameter No. 03 needs to be changed/toggled to select between the two input types). For ORP sensors select mV as the input type in P03.

Note 2: For 3TX-ISE the ion measurement type (ammonium, fluoride, nitrate, calcium..etc) must be defined at time of purchase an cannot be changed after receipt of transmitter (see label on 3TX-ISE for which ion measurement type is supported for that given unit).

Note 3: Depending upon the TC ordered it may be necessary to change the parameter 04 from Pt1000 (default) to Pt100 (selectable). The wiring is identical whether Pt100/Pt1000 are used.

Note 4: Mating pH/ORP/ISE sensor must have the appropriate type of preamplifier integrated inside the sensor or using an external preamplifier in a waterproof J-Box to interface with the 3TX-pH-X or 3TX-ISE-X transmitter. These 3TX-pH-X & 3TX-ISE-X are different hardware from the 3TX-pH and 3TX-ISE transmitter that can directly interface pH/ORP/ISE sensors WITHOUT preamplifiers. The software and functionality is identical for both types of 3TX transmitter; the only difference is whether the sensor to interface must or must not have a preamplifier. The maximum recommended cable length for sensors with preamplifiers is 300 feet (in conduit).

Advanced Sensor Technologies, Inc.

TEL: 714-978-2837 TOLL FREE: 1-888-WOW-ASTI (969-2784) FAX: 714-978-6339

Connection Diagram of Iotron™ pH, ORP and Ion Selective (ISE) Sensors without Preamplifiers (Tinned Leads Only) to 3TX-pH pH/ORP Transmitters and 3TX-ISE Ion Selective Transmitters

ASTI Cable Color Coding	Instrument Terminal Value	3TX-pH/ISE Terminal Number
Red	pH/ISE Sensor (-) *a.k.a Reference*	1
Clear	pH/ISE Sensor (+) *a.k.a mV Signal*	2
Black	Pt100 or Pt1000	4
Black	Pt100 or Pt1000	5

Note 1: The 3TX-pH transmitter can be used for either pH or ORP measurement and wiring connections are the same for both pH and ORP sensors (only the Parameter No. 03 needs to be changed/toggled to select between the two input types). For ORP sensors select mV as the input type in P03.

Note 2: For 3TX-ISE the ion measurement type (ammonium, fluoride, nitrate, calcium..etc) must be defined at time of purchase an cannot be changed after receipt of transmitter (see label on 3TX-ISE for which ion measurement type is supported for that given unit).

Note 3: Depending upon the TC ordered it may be necessary to change the parameter 04 from PT1000 (default) to PT100 (selectable).

Advanced Sensor Technologies, Inc.

TEL: 714-978-2837 TOLL FREE: 1-888-WOW-ASTI (969-2784) FAX: 714-978-6339

Single Point (1-Point) Offset Calibration – Grab Sample

This is the Correct method to Adjust for Sensor Drift

Calcium Sensor One Point Calibration ("Production Offset")

Only use "Offset" function in Calibrate Menu.

Can be performed as frequently as may be required**.**

If the calcium sensor has been calibrated by the 2-point method then a "single point" grab sample offset calibration should be required thereafter. Generally only the 1-point offset is required in field use.

THE "HOLD" FEATURE IS AUTOMATICALLY ACTIVATED EACH TIME THAT ANY 2-POINT OR 1-POINT CALIBRATION IS PERFORMED. THIS MEANS THAT THE LAST PROCESS VALUE WILL CONTINUE TO BE SENT VIA THE ANALOG 4-20 mA AND MODBUS DIGITAL OUTPUT BEFORE ENTERING THE CALIBRATION MODE. THIS IS THE DEFAULT BEHAVIOR AND CAN ONLY BE MODIFIED AT THE ASTI FACTORY IF THIS IS NOT DESIRED.

Set-up requirements:

Two 250 mL GLASS OR PLASTIC BEAKERS

Process Grab Sample Solution

Parameter No. 01 is a "lock" which must be set to 'Off' to change ANY parameter, including the temperature, offset and slope calibrations.

A grab sample should be taken from the process and analyzed by an alternate method for calcium ion concentration. There are a variety of ways to perform the grab sample analysis including the commonly employed portable photometers method. In some cases where there is significant turbidity in the sample, a dilution scheme may be advisable for best results. This grab sample determined concentration of the process sample (by whatever method employed) will then be entered into the standardize menu as further described below. Using this recommended procedure, the online calcium sensor can be standardized to agree with the grab sampling method chosen without ever having to remove the sensor from process service.

Important Notes about 1-point "Standardize" Calibration:

The sensor should be left in service and obtain a stable reading with the process solution. It is not necessary in any way to remove the sensor from service to perform a 1-point grab sample offset "Standardize" calibration.

Calibration of the ion selective sensor is done with Up/Down keys. To perform a 1-point slope calibration using the 'Mode' key select 'Offset' and adjust the reading the Up/Down keys until the display shows the correct value in accordance with the concentration determined by analysis of the grab sample. The ISE sensor should be left in service for the production 1-point 'Offset' calibration. All settings are stored in EEProm so unit can be powered down without loss of configuration or calibration. The P12 step change parameter determines how quickly or slowly the ppm value changes each time the 'Up' or 'Down' button is depressed. If you wish for the ppm values to change more quickly adjust the P12 parameter to a high setting. If you wish for the ppm values to change less quickly adjust the P12 parameter to a lower setting. The available settings for the P12 step change parameter are 0=0.02mV, 1=0.05mV, 2=0.10mV, 3=0.20mV, 4=0.5mV, 5=1.0mV, 6=2.0mV. For divalent ions the step change parameter should be generally lower than for monovalent ions. This step change parameter default value can be defined to any settings of your choice prior to dispatch from the ASTI factory.

THERE IS A TIME AVERAGING (DAMPEN) FUNCTION THAT IS SET IN THE 3TX-ISE AT THE ASTI FACTORY. THIS VALUE IS CONFIGURABLE FOR BOTH THE EXTENT OF TIME AVERAGING FOR THE MEASURE AND CALIBRATE MODES SEPARATELY. IF YOU FIND THAT YOU WISH TO HAVE MORE OR LESS TIME AVERAGING THAN WHAT IS PROVIDED ON YOUR UNIT AT PRESENT, CONTACT THE FACTORY FOR ASSISTANCE WITH THIS. THESE VALUES CANNOT BE MODIFIED IN THE FIELD BUT RATHER NEED TO BE CHANGED AT THE ASTI FACTORY. THE PRESET VALUES ARE FINE FOR THE VAST MAJORITY OF USERS AND APPLICATIONS ALTHOUGH THEY CAN BE MODIFIED UPON REQUEST WITHOUT INCURRING ANY COST.

Advanced Sensor Technologies, Inc.
TEL: 714-978-2837 TOLL FREE: 1-888-WOW-ASTI (969-2784) FAX: 714-978-6339

Calcium (Ca^{++}) Probe Two Point Calibration

This calibration method should not need to be performed frequently. **All new calcium ion selective sensors can generally simply use the factory defined 2-point slope calibration.** This two-point calibration determines the sensitivity or slope of each sensor, which is then stored in the analyzer. Subsequent 1-point offset calibrations can be made using only the offset option. An offset calibration must be performed after every 2-point calibration (without exception).

THE "HOLD" FEATURE IS AUTOMATICALLY ACTIVATED EACH TIME THAT ANY 2-POINT OR 1-POINT CALIBRATION IS PERFORMED. THIS MEANS THAT THE LAST PROCESS VALUE WILL CONTINUE TO BE SENT VIA THE ANALOG 4-20 mA AND MODBUS DIGITAL OUTPUT BEFORE ENTERING THE CALIBRATION MODE. THIS IS THE DEFAULT BEHAVIOR AND CAN ONLY BE MODIFIED AT THE ASTI FACTORY IF THIS IS NOT DESIRED.

Set-up requirements:

Two 250 mL GLASS OR PLASTIC BEAKERS

(Preferably heavy enough so that the ISE sensor does not tip over the beaker!)

Low Calcium Standard Solution (low ppm)

High Calcium Standard Solution (high ppm)

Parameter No. 01 is a "lock" which must be set to 'Off' to change ANY parameter, including the temperature, offset and slope calibrations.

Calibration of the ion selective sensor is done with Up/Down keys. To perform a 2-point slope calibration using the 'Mode' key select 'Offset' and adjust the reading the Up/Down keys until the display shows the correct value for the first low value ISE standard. Next use the 'Mode' key to select 'Slope' and use the Up/Down keys until the display reads the second desired value for the second high value ISE standard. After this 2-point slope calibration is performed it is always necessary to perform a production 'Offset' calibration to ensure agreement with grab sample analysis (described on the previous pages).

The exact values for these low and high calcium standard solutions will depend upon your particular needs. The last page of this addendum details a typical calcium calibration standard formulation. Alternative customized recommendations may be made by the ASTI factory should your application require it.

Advanced Sensor Technologies, Inc.

TEL: 714-978-2837 TOLL FREE: 1-888-WOW-ASTI (969-2784) FAX: 714-978-6339

Important Notes about Two-Point Slope Calibration:

- Fill a 250 mL GLASS beaker with enough standardization solution such that the entire tip of the Calcium sensor will be submersed
- Please read sheet on the cleaning procedure for this ion selective sensor. The cleaning procedure should usually be performed when transferring a sensor in or out of solution. Sensors can also be cleaned before being placed into different concentration standardization solutions and/or grab sample solutions. Cleaning is only required if fouling appears on the ISE membrane or on the reference junction. If no contamination is apparent, then the simple rinsing procedure can be used (see following sections for details).
- Thoroughly rinse the sensors with DI water and gently blot dry with a clean paper towel or lint-free Kimwipe. Be careful not to scratch or damage the sensitive calcium ion selective membrane
- Allow a minimum of about 5 minutes for the sensor to stabilize once it has been removed from the process and placed into the low standard solution (low ppm).
- Allow a minimum of about 5 minutes for the sensor to stabilize between the low and high Calibration Solutions (low ppm to high ppm).

YOU CAN VIEW THE SENSOR SLOPE AND OFFSET RESULTING FROM A 2-POINT CALIBRATION WITH PARAMETER P15 (SLOPE) AND PARAMETER P14 (OFFSET).

IF YOU PERFORM 1-POINT GRAB SAMPLE OFFSET ONLY PARAMETER P14 WILL CHANGE WHEREAS THE SENSOR SLOPE (P15) WILL REMAIN FROM YOUR PREVIOUS 2-POINT SLOPE CALIBRATION.

All settings are stored in EEProm so unit can be powered down without loss of configuration or calibration. The P12 step change parameter determines how quickly or slowly the ppm value changes each time the 'Up' or 'Down' button is depressed. If you wish for the ppm values to change more quickly adjust the P12 parameter to a high setting. If you wish for the ppm values to change less quickly adjust the P12 parameter to a lower setting. The available settings for the P12 step change parameter are 0=0.02mV, 1=0.05mV, 2=0.10mV, 3=0.20mV, 4=0.5mV, 5=1.0mV, 6=2.0mV. For divalent ions the step change parameter should be generally lower than for monovalent ions. This step change parameter default value can be defined to any settings of your choice prior to dispatch from the ASTI factory.

Advanced Sensor Technologies, Inc.
TEL: 714-978-2837 TOLL FREE: 1-888-WOW-ASTI (969-2784) FAX: 714-978-6339

Cleaning and Maintenance of ASTI Calcium (Ca^{++}) Probe

Before a major 2-point calibration is performed the sensor may need to be cleaned each time. The frequency of cleaning will depend on the process water and build up of process reagents on the probe tip.

Note:

Any noticeable deposits on the tip of the sensor will result in a less accurate calibration and measurement.

CLEANING:

1. Thoroughly rinse the sensor tip with DI water. Gently blot the sensor tip dry.
2. The calcium sensor tip can be cleaned with isopropyl alcohol to remove any oily or waxy build-up. No other solvents or reagents should be used without contacting ASTI to ensure that it is suitable.
3. Scrape the entire reference area clean with a sharp blade or Stanley knife. This reference is solid-state and cannot be damaged with ordinary cleaning techniques. **Do not scratch the membrane.**
4. Once the reference junction has been cleaned the entire sensor tip can be soaked in either the low or high standardization solution. After allowing sufficient time for conditioning before proceed to perform a 2-point calibration if this is desired or required.
5. Any compatible solution can serve as conditioning media for extended storage. It is NOT necessary to store the sensor in a media containing calcium for proper storage. Do not allow sensor to be exposed to air for prolonged periods of time as this will cause the reference junction to become dehydrated (meaning that a reconditioning period will be required to restore it to normal operation).
6. Always store the sensor in a suitable media when not in use. At time of dispatch, the cap was filled with suitable conditioning solution sealed onto sensor tip with TEFLON tape.

Advanced Sensor Technologies, Inc.
TEL: 714-978-2837 TOLL FREE: 1-888-WOW-ASTI (969-2784) FAX: 714-978-6339

Miscellaneous

The decimal place on the 3TX-ISE display with automatically move as appropriate based upon the ppm value of the sensor reading. Note that the displays will always auto-range from 0.00 to 9.99, 00.0 to 99.9 and 000 to 999 ppm. Your analog and digital MODbus output will, however, be defined as selected in parameters governing this aspect of operation. This means that your output may be maxed out and not reflect the exact process reading if you selected too low a range for your output scaling. In addition, it should be noted that the output and display are altogether decoupled meaning that any limit imposed by the output scaling will not limit the value shown on the local LED display.

Do not to allow air bubbles to get trapped near the calcium ion selective membrane. This is will cause erroneous readings and drift. In some cases air bubbles may become entrapped within the ISE sensor itself. A firm shake down of the sensor should alleviate any internal air bubbles and proper installation of the sensor (including having the line be completely full and degassed) will ensure that there are no air bubbles on the measuring tip. Contact ASTI factory for details regarding optimal process installation approaches.

The calcium sensor is comprised of a high-impedance ion selective membrane system. Care should be taken not to move or touch the cable once a value is being stabilized (even if an integral preamplifier is employed). Touching the sensor cable can cause a noisy signal that may result in erroneous values and calibrations. For best results the sensor cable should be run in conduit. For noisy environments and/or longer cable runs a preamplifier should be employed either integral to the sensor or else an external preamplifier used in a waterproof J-Box assembly. In some cases, it may be desirable to both use a preamplifier and to run the cable in conduit (for rather noisy environment or else in combination with longer cable runs, or both).

Please see the specification and hook-up schematics found in the AB 6440, AB 5440 or AB 8440 calcium ion selective sensor shipping box. This data is included in this ISE addendum for convenience as well in case the hard copy was lost or misplaced.

Advanced Sensor Technologies, Inc.

TEL: 714-978-2837 TOLL FREE: 1-888-WOW-ASTI (969-2784) FAX: 714-978-6339

Procedures for Preparation of High Value Calcium Ion Standard Solutions

Materials

Calcium Chloride Anhydrous - CAS # 10043-52-4 (ACS Grade or better, new sealed bottle preferred)
Sodium Chloride - CAS # 7647-14-5 (ACS Reagent Grade or better)
1 Liter Volumetric Flask (one each)
2 Liter Volumetric Flask (one each)
1 mL volumetric pipette
10 mL volumetric pipette
1 liter opaque plastic bottles with air-tight sealing cap (three each)
DI Water (15 MegaOhms or higher resistivity grade)

- ENSURE THAT ALL GLASSWARE IS CLEAN AND DRY BEFORE PROCEEDING.
- THOROUGHLY CLEAN EACH VOLUMETRIC FLASK AFTER PREPARING ANY SOLUTION
- SOLUTIONS PREPARED WILL STAY GOOD FOR 1 YEAR FROM DATE OF MANUFACTURE IF STORED IN AN SEALED, OPAQUE PLASTIC BOTTLE IN A COOL DRY LOCATION

Stock Solution Preparation Procedures:

Preparation of 0.01 Molar Sodium Chloride Solution ***-- Ionic Strength Adjustor Background --*** *:*

1. Measure out 1.169 grams of sodium chloride.
2. Place this sodium chloride into a 2 liter volumetric flask.
3. Dilute with DI water to 2 liter mark. Mix solution well until all sodium chloride is dissolved.
4. Seal 2 liter volumetric flask with glass stopper.

Preparation of 4,000 ppm Calcium Ion Stock Solution:

1. Measure out 11.076 grams of calcium chloride anhydrous salt.
2. Place this calcium chloride anhydrous into 1 liter volumetric flask.
3. Dilute with DI water to the 1 liter mark. Mix solution well until it is completely homogeneous.
4. Transfer this 4,000 ppm calcium ion stock solution to a 1 liter plastic bottle and label appropriately.

Ammonium Calibration Solution Preparation Procedures:

Preparation of 40.0 ppm Calcium Ion Standard Solution

1. Draw 10.0 mL of 4,000 ppm calcium ion stock solution and transfer to a 1 liter volumetric flask.
2. Dilute with 0.01 Molar sodium chloride solution to 1 liter mark. Mix thoroughly until homogeneous.
3. Transfer this 40.0 ppm calcium ion calibration solution to a 1 liter plastic bottle and label appropriately.

Preparation of 80.0 ppm Calcium Ion Standard Solution

4. Draw 20.0 mL of 4,000 ppm calcium ion stock solution and transfer to a 1 liter volumetric flask.
5. Dilute with 0.01 Molar sodium chloride solution to 1 liter mark. Mix thoroughly until homogeneous.
6. Transfer this 80.0 ppm calcium ion calibration solution to a 1 liter plastic bottle and label appropriately.

Preparation of 400 ppm Calcium Ion Standard Solution

7. Draw 100 mL of 4,000 ppm calcium ion stock solution and transfer to a 1 liter volumetric flask.
8. Dilute with 0.01 Molar sodium chloride solution to 1 liter mark. Mix thoroughly until homogeneous.
9. Transfer this 400 ppm calcium ion calibration solution to a 1 liter plastic bottle and label appropriately.