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

IMPORTANT NOTES FOR FLUORIDE ISE SYSTEM WITH 3TX-ISE FLUORIDE TRANSMITTER & CONTROLLER

Calibration, Installation, Cleaning & Use of Fluoride ISE Measurement Systems

For Applications Including:

- **Monitoring & Control of Acid Fluoride Etching Baths**
- **First-Stage & Batch Wastewater Fluoride Treatment Systems**
- **Tailing Discharge Monitoring for Fluoride Remediation & Waste Treatment**
- **Potable (clean) municipal water fluoridation monitoring & control applications**
- **Inline monitoring of fluoride levels for discharge compliance to minimize required sampling frequency**

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

TEMPERATURE CONSIDERATIONS

All calibration solutions and process grab sample should be calibrated and tested at identical temperatures to the process temperature for optimal results. It should be noted that the actual temperature of the process solution (and the calibrating solutions) is not as critical as the fact that the sensor is calibrated and used at the same temperature (as best as possible) to eliminate many potential sources of uncertainty. For greatest overall accuracy of the fluoride (F^-) measurement, however, all tests should be performed as close to 25 degrees Celsius (room temperature process solutions) as possible. The valid (permissible) temperature ranges for the AB 6100A, AB 6100H & AB 8100 fluoride ISE sensors is five to fifty (5-50) degrees Celsius (41 to 122 degrees Fahrenheit) whereas the AB 6100 can go as high as 70 degrees Celsius (160 degrees Fahrenheit Max).

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

pH CONSIDERATIONS

The acceptable pH range of the AB 6100 sensors is 0 to 6, although measurement above 6 is quite possible and commonly used for such applications. If acid cleaning is to be conducted the sensor (typically with HCl to remove various types of calcium fluoride and fluorosilicate build-up) you **MUST** use the AB 6100 sensor. Conversely, acid cleaning should NEVER be used on the AB 6100A, AB 6100H or AB 8100 sensors (these are rated for continuous use from 5.5 to 9.5 pH condition). For continuous long-term use of the neutral pH service fluoride ISE sensors (in short all except the AB 6100 model), ASTI recommends a pH greater than 5.5 to eliminate the need for compensation of the pH effects on fluoride concentration and for optimum sensor lifetime and less than 9.5 (max 11.0) to minimize aging on the crystal. **If the pH will be below 5.5, you MUST use the AB 6100 fluoride ion selective (ISE) sensor designed for such conditions and NOT the AB 6100A, AB 6100H or AB 8100 sensors that are only suitable for neutral pH service. It is also recommended to employ the 3TX-TOT pH compensation module for pH less than 5.5 conditions with more details below regarding when the TOT module is recommended (required) and much more information can also be found on our 3TX webpage as well (specification sheet & manual).**

At pH levels below 5.5, the fluoride sensor will not detect the total fluoride content, as some of the fluoride ion will be converted into the form of dissolved HF gas form. To use the measured fluoride ion activity (free fluoride) and compute the total unbound fluoride in solution the free fluoride measurement must be "compensated" for pH. See the pH dependent extent of ionization curve for HF dissolved gas and fluoride ions (F^-) for a graphical representation of this phenomenon in the following pages. Compensation for the effect of pH on the extent of ionization for HF may be required for pH values below 5.5 to provide complete total fluoride data. Please also note that these pH effects are a temperature dependent phenomenon. The provided extent of ionization curve is only completely valid for pure two component systems with deionzied (DI) water. Real world water solutions of a much more complex makeup may vary somewhat from these idealized curves, although the deviation is not expected to be vast for most typical systems. The 3TX-TOT module is capable of performing such pH compensation to find the "Total Fluoride" as defined by the sum of the free ionized fluoride ion species together with the protonated HF bound form. For further information please refer to the 3TX-TOT specification sheet and manual or contact ASTI directly.

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

CALIBRATION PROCEDURES & CONSIDERATIONS

Calibration Point 1 (always the lower concentration value) and Calibration Point 2 (always the higher concentration value) determines the response curve of a given fluoride Ion Selective Sensor (neutral pH service AB 6100A, AB 6100H, AB 8100 sensors or low pH acid service AB 6100). The calibration value for point 1 is the low ppm solution and point 2 is high ppm solution. 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 fluoride calibration standards at the job site (more below) it is recommended to use the ASTI factory pre-programmed characteristic 2-point slope and to perform only a 1-point grab sample offset calibration. The calibration to synchronize the inline reading to the grab sample analyzed value is always performed by using the 'offset' calibration option in the main LED menu (see 3TX-ISE manual for more details). The fluoride ion 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 fluoride ion selective (ISE) sensors should be conditioned in fluoride calibration standard solution for at least three to five (3-5) minutes before beginning the calibration procedure as described in this guide. The ASTI factory recommended fluoride calibration standard using TISAB-II background is detailed on the last page of this addendum. All sensors should be rinsed with deionized (DI) water prior to conditioning in any standard solution.

The following steps are required for an installation of a new fluoride sensor:

1) Perform a two-point calibration to empirically determine slope. 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.
2) 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.
3) 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 fluoride 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 grab sample offset calibration is called "Offset" in the 3TX-ISE transmitters LED menu.

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 Fluoride 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 fluoride ion selective measurement valid for any application and fluoride sensor model:

Slope (Parameter P15 on 3TX-ISE): **(-) 57.2 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.

Offset (Parameter P14 on 3TX-ISE): **-47 mV**

The slope parameter will be changed both when a 2-point slope or 1-point offset calibration is performed (see later in this addendum for details). Parameter P14 allows you to both view and manually modify the offset.

Formula Weight of Ion (Parameter P13 on 3TX-ISE): **19.00 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 19.00 grams per mol for fluoride.

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

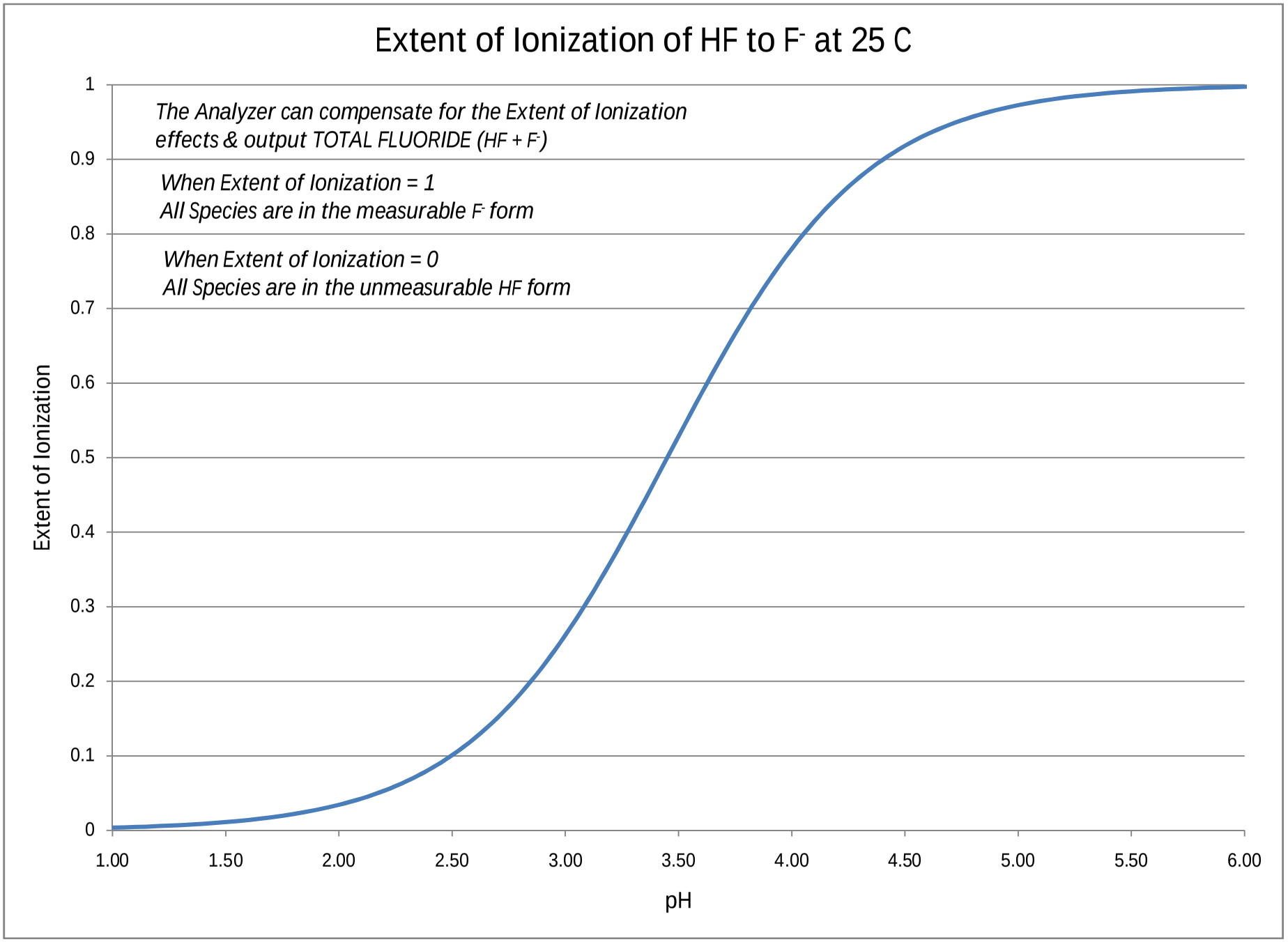
You should check that your ASTI ISE sensor is properly wired according to the official ASTI hook-up schematic for ASTI sensors with and without preamplifiers to the 3TX analyzer (also provided later in this guide for convenience). All three common wiring configurations are found in this ISE addendum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

The 3TX-ISE analyzer and transmitter will support both ASTI ISE sensors with and without preamplifiers, although preamplifiers are generally not required for cable length of less than 20 feet. If you require an installation where a preamplifier is to be used, please consult the ASTI factory for further assistance.

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

Please note that if you perform a reset to factory defaults (P20), you will need to repeat your 2-point calibration using calibration solutions that are one decade (10X) apart in value. 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 for the same.

Please also note that the activity of free fluoride ions in solutions is pH and temperature dependent over some pH and temperature ranges. The extent of ionization (HF) conversion to the measurable (F^-) ion form is a pH and temperature dependent process. The following page describes such dependence. If you have purchased the 3TX-TOT module, you will be able to compensation for the pH induced effects on the extent of ionization. It should be noted that any temperature induced equilibrium shifts other than this pH influence on the extent of ionization cannot be compensated explicitly and are instead handled through the grab sample offset calibration. Depending upon your exact pH and temperature conditions, you may or may not need to have this 3TX-TOT module. Contact the factory for additional assistance with this technical issue. Note that the 3TX-TOT can be added after the initial time of commissioning although it is generally recommended for this module to be supplied complete as part of the initial package used for installation since ASTI can then prewired, preconfigure and test the 3TX-TOT as part of the supplied package (without any additional cost).


Extent of Ionization of HF to F- at 25 C
The Analyzer can compensate for the Extent of Ionization effects & output TOTAL FLUORIDE (HF + F-)
When Extent of Ionization = 1
All Species are in the measurable F- form
When Extent of Ionization = 0
All Species are in the unmeasurable HF form
Extent of Ionization
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
5.50
6.00
pH

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).

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).

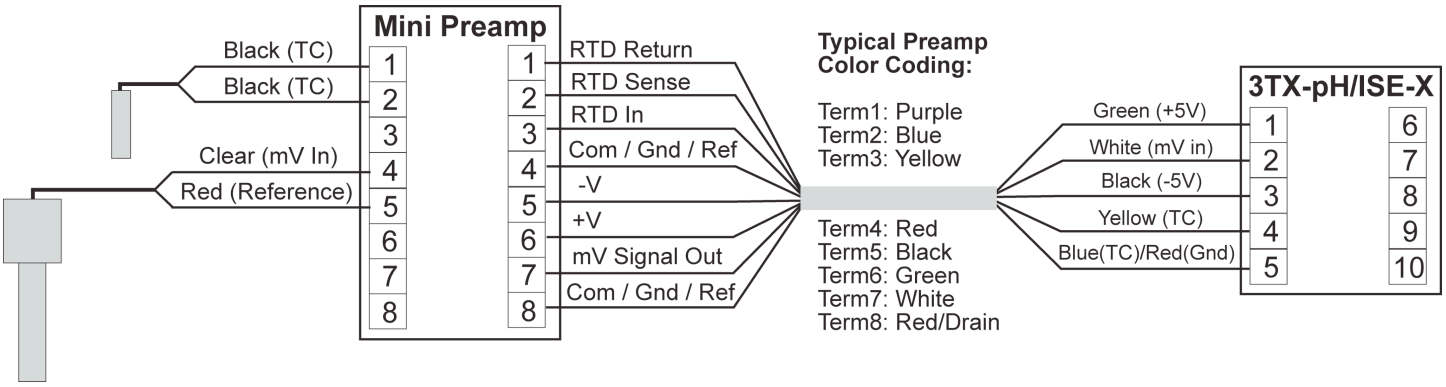
Note 3: Depending upon the TC ordered it may be necessary to change the parameter 04 from Pt1000 (default) to Pt100 (selectable). The wiring is identical whether Pt100/Pt1000 are used.

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).

Connection Diagram of ASTI Sensors WITHOUT PREAMPLFIERS (Input) to External "Mini" Conventional Preamplfier (Output) to ASTI 3TX-pH-X and 3TX-ISE-X Preamp Style Transmitters

Input from ASTI pH / ORP / ISE Sensors Without Preamp
(Inside J-Box Connections)

Output from ASTI "Mini" Conventional External Preamplfier
(Inside Transmitter Assembly Connections)



Connection from ASTI "Mini" External Conventional Preamplifier Output (Schematic on Left) to Input Terminal Block on ASTI 3TX Transmitter (Schematic on Right)

Note 1:
The temperature compensation element input shown on the far left as the input side to the "Mini" external preamp terminal 1 & 2 can be 100 or 1000 Ohm Platinum (selectable in 3TX-pH-X or 3TX-ISE-X transmitter).

Note 2:
When using the "Mini" external conventional preamplifier with the 3TX-pH-X and 3TX-ISE-X it is not necessary to interface with the output side terminal 1 (RTD Return). This is not required because the 3TX transmitters do not support 3-wire TC inputs. As such the blue terminal 2 and yellow terminal 3 output connections provide the 2-wire Pt100 or Pt1000 TC inputs.

Note 3:
When using the "Mini" external conventional preamplifier with the 3TX-pH-X and 3TX-ISE-X it is not necessary to interface with the output side terminal 8 (duplicate common/ground/reference). This is because the 3TX transmitters do not require two common input leads (as some transmitter do) but rather just a single common/ground/reference connection from terminal 4 (red color coded lead).

Note 4:
This "Mini" external conventional preamplifier can interface quite a number of additional transmitters besides the 3TX-pH-X and 3TX-ISE-X units. Please inquire to ASTI factory for wiring schematics to other transmitter types.

Note 5:
It is possible to power this "Mini" external preamplifier from a two-sided battery pack power source if it is to be mated with a pH/ORP transmitter that does not support preamplifiers. Inquire to ASTI factory this type of alternate wiring schematic.

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

Fluoride (F^-) Probe Two Point Calibration

This calibration method should not need to be performed frequently. All new fluoride ion selective sensors should have a 2-point calibration performed unless you wish to use the factory defined 2-point slope calibration (all new system have this done automatically). 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. Details for the 1-point calibration are given in the proceeding page. **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 Fluoride Standard Solution (low ppm)

High Fluoride 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 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 ISE standard. After this 2-point slope calibration is performed it is always necessary to perform a production grab sample 'Offset' calibration to ensure agreement with grab sample analysis (described on the following page).

The exact values for these low and high fluoride standard solutions will depend upon your exact needs. Fluoride calibration solutions are commercially available from a variety of chemical supply houses or else procedures to prepare your own are attached in the last page of this addendum.

Advanced Sensor Technologies, Inc.

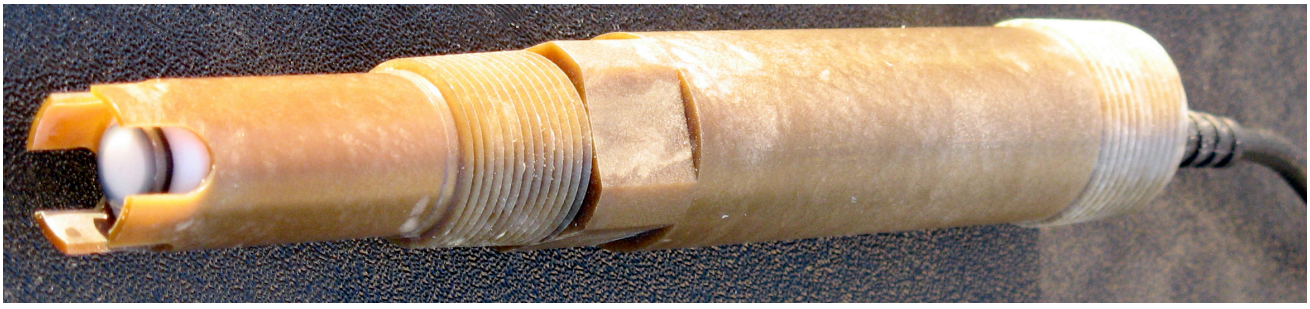
TEL: 714-978-2837 TOLL FREE: 1-888-WOW-ASTI (969-2784) FAX: 714-978-6339

Be sure before purchasing any such commercial calibration solutions that they have a TISAB-II background and that they values will bracket you desired measurement range. Instructions on how to prepare your own fluoride calibration standards using the typical in-house ASTI procedure are included in this addendum for convenience. Using commercially available fluoride calibration standards (w/ TISAB-II) or ASTI style fluoride standards (w/ TISAB-II) allow you to successfully perform a two-point slope calibration.

Important Notes about Calibration:

- Fill a 250 mL GLASS beaker with enough solution such that the entire tip fluoride sensor will be submersed
- The cleaning procedure should be performed when transferring a sensor in or out of solution (see later in this addendum). Cleaning is only required if fouling appears on the ISE membrane or reference junction. If no contamination is apparent, then a simple rinse can be used (see following sections for details). Sensors should be cleaned before being placed into different standardization solutions and/or grab sample solutions.
- Thoroughly rinse the sensors with DI water and gently blot dry with a clean paper towel. Be careful not to scratch or damage the sensitive fluoride ion selective membrane (crystal).
- Allow a minimum of 3 – 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 3 – 5 minutes for the sensor to stabilize between the low and high Calibration Solutions (low ppm to high ppm).

YOU CAN VIEW AND/OR EDIT THE SENSOR SLOPE RESULTING FROM A 2-POINT CALIBRATION WITH PARAMETER P15 AND THE SENSOR OFFSET RESULTING FROM A 2-POINT CALIBRATION WITH PARAMETER P14. IF YOU PERFORM A 1-POINT GRAB SAMPLE OFFSET SUBSEQUENTLY THE OFFSET (P14) WILL CHANGE WHEREAS THE SENSOR SLOPE (P15) WILL REMAIN FROM YOUR 2-POINT SLOPE CALIBRATION.



The ion selective sensor shown above is a representative picture for visualization purposes. Your particular sensor may appear somewhat different to that shown above for a variety of reasons

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!!

Fluoride Sensor One Point Calibration ("Production Offset")

Only use "Offset" function in main LED Menu.

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

When the fluoride sensor has been calibrated by the 2-point method previously described only a "single point" grab sample offset calibration should be required thereafter. **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.

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.

A grab sample should be taken from the process and analyzed by an alternate method for fluoride ion concentration. There are a variety of ways to perform the grab sample analysis including laboratory fluoride ion selective electrode methods adding the TISAB-II to the unknown sample to adjust for all background ion effects. When this method is used, it is typical to add the TISAB-II on a one to one volume basis to the unknown, and then to determine the fluoride concentration of this diluted sample. The actual fluoride concentration will then just simply be double the TISAB-II diluted unknown sample. Alternatively there are

some portable photometer that are also capable of measuring fluoride concentration in such unknown samples. In some cases a dilution may be required when using photometer to achieve good results with such optical or colorimetric instruments. 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 fluoride sensor can be standardized and be in agreement with the grab sampling method chosen without ever having to remove the sensor from process service. Note that depending upon your grab sample analysis method, the use of certain reagents may liberate fluoride that is normally bound in the process media (such as certain components of TISAB-II). Efforts should be made to perform the analysis for the grab sample in a very timely manner to ensure that the process reading and sample do not change between the time that the sample is taken and when it is entered into the 3TX-ISE transmitter via the 'Offset' calibration.

Important Note 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.

THERE IS A TIME AVERAGING (DAMPEN) FUNCTION THAT IS SET IN THE 3TX-ISE AT THE ASTI FACTORY. THIS VALUE IS SEPARATELY CONFIGURABLE FOR BOTH THE EXTENT OF TIME AVERAGING FOR THE MEASURE AND CALIBRATE MODES. 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

Cleaning and Maintenance of ASTI Fluoride (F^-) 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 quality of the process water and the 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 fluoride 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 standard solution. Allow sufficient time for conditioning before proceed to perform a 2-point calibration.
5. Any calibration standard solution can serve as conditioning solution for extended storage. Do not allow sensor to be exposed to air for prolonged periods of time (this will cause the reference junction to become dehydrated). Always store sensor in standardization solution when not in service in process. The cap should be filled with a calibration standard sealed onto sensor tip with TEFLON tape.
6. If you have left your sensor dry in air for a prolonged period of time please contact the ASTI factory for a recuperation procedure that may be able to revitalize your sensor back for some additional service life after such a situation.

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 display with automatically move as appropriate based upon the ppm value of the sensor reading. Note that while the display will always auto-range from 0.00 to 9.99, 00.0 to 99.9 and 000 to 999 ppm, however your analog and digital MODbus output will, however, be based upon your selection in parameter P09. 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 P09 or else scaled your analog 4-20mA output too narrowly in P10 (4mA) and P11 (20mA). Please confirm that you have selected the correct overall range with P09 and refined your scaling with P10 and P11 as appropriate without truncating the actual measured values.

Do not to allow air bubbles to get trapped near the fluoride 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 fluoride sensor is comprised of a high-impedance ion selective membrane (crystal) system. Care should be taken not to move or touch the cable once a value is being stabilized. 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 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 sheet and hook-up schematics found in the AB 6100, AB 6100A, AB 6100H and AB 8100 fluoride 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.

Procedures for Preparation of Fluoride Standard Solutions

Materials

Sodium Fluoride (Analytical or ACS Reagent Grade or better, brand new sealed dry bottle preferred)
- *Spectrum Catalog # S1280*
TISABII (Total Ionic Strength Adjustor Buffer)
- *Spectrium Catalog # 246-25171, Orion # 940909*
1 Liter Volumetric Flask (one each minimum, four each recommended)
5 Liter Volumetric Flask (one each) or 2 Liter Volumetric Flask (two each)
1 mL volumetric pippete
10 mL volumetric pippete
1 liter opaque plastic bottles with air-tight sealing cap (five each)
DI Water (15 MegaOhms or higher resistivity grade recommended but not critical)

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

Stock Solution Preparation Procedures:

Preparation of Diluted TISAB II background stock solution (DO THIS FIRST!):

1. Measure out 2 liters of TISAB II solution and pour into a 5 liter volumetric flask.
2. Dilute with DI water to 5 liter mark. Mix solution well until all the two solutions are completely miscible and the resulting solution is homogeneous.
3. Seal 5 liter volumetric flask with glass stopper.

Preparation of 10,000 ppm Fluoride stock solution (DO THIS FIRST!):

1. Measure out 22.101 grams of sodium fluoride salt.
2. Place this sodium fluoride into 1 liter volumetric flask.
3. Dilute with DI water to the 1 liter mark. Mix solution well until it is completely homogeneous (dissolved).
4. Transfer this 10,000 ppm fluoride stock solution to a 1 liter plastic bottle and label appropriately.

Fluoride Calibration Solution Preparation Procedures:

Preparation of 10 ppm Sodium Fluoride Standard Ion Solution

1. Draw 1 mL of 10,000 ppm fluoride stock solution and transfer to a 1 liter volumetric flask.
2. Dilute with TISAB II diluted background solution to 1 liter mark. Mix solution well until completely homogeneous.
3. Transfer this 10 ppm fluoride calibration solution to a 1 liter plastic bottle and label appropriately.

Preparation of 100 ppm Sodium Fluoride Standard Ion Solution

4. Draw 10 mL of 10,000 ppm fluoride stock solution and transfer to a 1 liter volumetric flask.
5. Dilute with TISAB II diluted background solution to 1 liter mark. Mix solution well until completely homogeneous.
6. Transfer this 100 ppm fluoride calibration solution to a 1 liter plastic bottle and label appropriately.

Preparation of 20 ppm Sodium Fluoride Standard Ion Solution

7. Draw 2 mL of 10,000 ppm fluoride stock solution and transfer to a 1 liter volumetric flask.
8. Dilute with TISAB II diluted background solution to 1 liter mark. Mix solution well until completely homogeneous.
9. Transfer this 20 ppm fluoride calibration solution to a 1 liter plastic bottle and label appropriately.

Preparation of 200 ppm Sodium Fluoride Standard Ion Solution

10. Draw 20 mL of 10,000 ppm fluoride stock solution and transfer to a 1 liter volumetric flask.
11. Dilute with TISAB II diluted background solution to 1 liter mark. Mix solution well until completely homogeneous.
12. Transfer this 200 ppm fluoride calibration solution to a 1 liter plastic bottle and label appropriately.