AUTOMATIC CALIBRATION INSTRUCTIONS FOR SMART DIGITAL pH SENSORS WITH INTELLIGENT 3TX-HiQ-pH TRANSMITTERS

If softwarelock (P01) is "On" then no changes can be made. Set P01 to "Off " to allow calibrations & configuration modifications. The P01 software lock will automatically reset back to "On" if no key is pressed for 60 seconds.

- Using the 'Mode' button toggle to the 'Offset' or 'Slope' LED calibration mode
- **Enter autocal mode by simultaneously holding 'Up' & 'Down' in Offset or Slope LED mode.** The display then toggles between dashes on the left & right LED until autoread algorithm is complete. If all criterion of autoread algorithm were met the autobuffer recognition feature then displays the suggested pH buffer. If all autoread criteria were not meet then an 'Err' message is returned.
- To acept the suggested pH buffer value from the auto buffer recognition feature press the 'Mode' key. Alternatively you can use the 'Up' or 'Down' keys to pick a different pH buffer followed by pressing 'Mode' key. If the user selected pH buffer exceeds the calibration limits for the given offset or slope mode then an 'Err' message will also be shown and the calibration aborted.
- If P08 three-point calibration (dual-slope) mode is enabled, the calibration will need to be performed twice in the Slope LED mode. Once for a pH buffer below 7 (only 4.00 in autocal) and once above 7 (9.18 or 10.00 in autocal). Intelligent calibration features on the 3TX-HiQ-pH transmitter automatically assign acidic slope (P17) and alkaline slope (P18) based upon buffers used in autocal.
- The pH buffer shown is nominal rather than the exact value of the pH buffer at the current temperature. Intelligent calibration of 3TX-HiQ-pH includes automatic retrieval of the exact value for the pH buffer at any temperature from 0 to 60°C as sensed by the integral platinum temperature element for the 4.00, 6.86, 7.00, 9.18 & 10.00 buffers. The pH buffer solution bottle shows the exact value of pH value of the buffer at various temperatures (see graph for visualization of temperature dependence). The exact values of these pH buffers are programmed in the 3TX-HiQ-pH for intelligent, automatic & accurate pH calibration.
- If autocal was successful 'YES' is displayed or 'Err' message is displayed if the autocal failed at any stage.
  - For offset LED mode the 6.86 and 7.00 pH buffers are the choices in the automatic calibration mode
  - For slope LED mode the 4.00, 9.18 & 10.00 pH buffer are the choices in the autocal mode
  - To calibrate to any pH buffer or grab sample value not available autocal use the manual mode
- Windows software performs auto-calibration without setting/changing initial install or last used date.

There is a 2 second averaging for ALL pH calibrate modes & 10 second averaging for the pH measure mode.

TEMPERATURE CALIBRATION INSTRUCTIONS
Temperature calibrated by pushing the 'Up' or 'Down' buttons when in the temperature display (°C) mode. *

DISPLAY FEATURES IN MAIN pH/MV LED MODE:
- The absolute mV value * of sensor is displayed with 'Down' key in pH/mV LED mode.
- The current mA output selected scaling displayed by pressing the 'Up' key in pH/mV LED display mode.

DISPLAY FEATURES REQUIRING 3TX-HiQ TO HAVE P01 SOFTWARE LOCK 'ON' TO BE ENABLED
- If 'Down' is pushed in °C LED mode offset in °C units * for current temperature offset calibration is shown.
- If 'Down' is pushed in 'Offset' LED mode, the current offset calibration in units of mV * (P16) is shown
- If 'Down' button in 'Slope' LED mode is pushed, the current slope for the live pH value is shown in units of mV per decade. The Slope1 (P17) is shown unless both P18 (dual slope mode) is enabled & the current pH value is above 7, in which case P18 is shown.

Negative values shown as flashing.

MANUAL pH CALIBRATION INSTRUCTIONS

If softwarelock (P01) is "On" then no changes can be made. Set P01 to "Off " to allow calibrations & configuration modifications. The P01 software lock will automatically reset back to "On" if no key is pressed for 60 seconds.

- Use the 'Mode' button to toggle to the 'Offset' LED and calibrate to first desired value using 'Up' and 'Down' keys. For this offset calibration the pH buffers supported in autocal mode are 6.86 or 7.00 although in manual mode it is not necessary to use any specific pH buffer or value for the offset calibration. In the manual mode the offset calibration can be performed anywhere in the full -2 to +16 pH operating range.

- Use the 'Mode' button to toggle to the 'Slope' LED and use 'Up' and 'Down' keys until the display reads the second desired value. This is most typically pH buffer 4.00 for applications that are typically acidic to neutral and pH buffer 9.18 or 10.00 for applications that are typically neutral to alkaline. In the manual mode you can select calibrate to any desired pH buffer such as 1.68 for more acidic conditions and 12.45 for more alkaline applications (be sure to set P23 to 'On' if performing calibration with this 12.45 pH buffer).

- Check exact value of pH buffer on bottle at the current temperature displayed on the 3TX-HiQ-pH transmitter and ensure that both the pH sensor and the pH buffer are at a stable equilibrium temperature.

- Set P08 to 'On' to enable the three-point calibration mode that allows for a dual slope operation. Parameter P17 slope is then used for acidic range & P18 is actived and is used measurements in the alkaline range.
  - The pH sensor is calibrated at three points to create the dual slope operating scheme:
    - One calibration typically near pH 7 in 'Offset' LED mode → P16 mV offset
    - Second calibration in pH buffer below pH7 in 'Slope' mode → P17 Slope 1 for Acidic pH
    - Third calibration in pH buffer above pH7 in 'Slope' mode → P18 Slope 2 for Alkaline pH
  - Exit 'Slope' mode after completing acidic slope calibration (below pH7) by pressing the 'Mode' before re-entering to perform the second 'Slope' calibration for the alkaline (above pH7) calibration.

- The sensor offset and slope values can be both viewed and manually entered/adjusted using the params **P16**, **P17 & P18.** All calibration settings are stored inside the IOTRON™ & ZEUS™ smart digital pH sensor in EEPROM it can be powered down or moved to a different transmitter without any loss of calibration information meaning true plug and play hot-swappable use with any intelligent 3TX-HiQ-pH transmitter.

- The optional grab sample offset type calibration is done with sensor left in service and allowed to stabilize. The grab sample is analyzed offline by the prefer method. The inline field reading is then adjusted in 'Offset' calibration mode such that the inline value agrees with the offline grab sample analyzed value.

There is a 2 second averaging for ALL pH calibrate modes & 10 second averaging for the pH measure mode.

HISTORICAL CALIBRATION VALUES FOR pH SENSORS (DISPLAY / READ ONLY PARAMETERS)

- The working mV offset * (P16), slope1 (P17) & slope2 (P18) can be viewed whether you perform automatic or manual calibrations. **If P01 lock is 'Off', the live P16-P18 values can also be manually adjusted but this feature is only recommend to be used for quite experienced users.**
- The historical calibration values can only be downloaded to file via the free ASTI HiQ Windows software
- Use P34 define calibration number shown for mV offset (P35), slope1 (P36), slope2 (P37) and temp (P38)
- The historical mV offset * calibrations shown with P35 (Valid for pH sensors & ORP sensors)
- The historical slope1 calibrations shown with P36 (Only valid for pH sensors)
- The historical slope2 calibrations shown with P37 (Only valid when P08 three-point cal mode set to 'On")
- The historical temperature offset calibrations shown with P38 (Valid for all measurement and modes)
- The date associated with each calibration can be viewed as a display feature (see **** explanation below)

Negative values shown as flashing.

***** *Calibration reference number (P34) associated with P35-P38 calibrations is accessed by pushing 'Down' button while value is shown. Date associated with calibration is accessed by pushing 'Up' button while value is shown: Date format is "H"+ last two digits of year, then "m.dd" where "m" is month shown as 1-9 for Jan-Sept & A=Oct, b=Nov, C=Dec & "dd" is day of month (October 8th 2015 shown as "H15" followed by "b.08")*

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