PT2 / ST2
PROCESS TRANSMITTER SYSTEM

June 20, 2014

Insite Instrumentation Group, Inc
80 Whisperwood Blvd.
Suite 107
Slidell, LA 70458
Phone: (985) 639-0006
Fax: (985) 639-0014
E-mail: info@insiteig.com
www.insiteig.com

Table of Contents

PRODUCT DESCRIPTION

The PT2 Process Transmitter is the heart of the wireless mesh network that is comprised of up to sixteen Series 20 sensors for the continuous measurement of dissolved oxygen, suspended solids, pH and/or ORP in an aqueous solution. The microprocessor-based electronics of the PT2 transmitter provide a high degree of flexibility and ease of use. The instrument is designed to operate with any combination of InsiteIG Series 20 sensors in a variety of applications. The DO sensor to be used with this analyzer is an optical type sensor that measures the fluorescence and quenching reactions of a ruthenium complex that is immobilized in a sol-gel matrix. The SS sensor operates on the principle of single gap light absorption as a means of detecting the presence of suspended solids. The pH and ORP sensors are flat glass electrodes.

All Series 20 sensors are connected to a ST2 sensor transmitter. The ST2 is located at the sensor location and is connected to a 120/240 VAC source. The ST2 supplies power to the sensor, transmits the sensor data to the host PT2, supplies isolated 4 to 20 milliamp outputs, and contains both a setpoint relay and auto-clean relay. The sensor address within the network is defined by the sensor address selector switch located in the ST2. There is also a selector switch that determines the network identification labeled “PT2 ID”. This switch must match the setting in the host PT2. There is a DC power cutoff to be used when connecting or disconnecting the sensor.

The Model 20 Dissolved Oxygen sensor is designed for the continuous monitoring of dissolved oxygen in water and wastewater where parts per million accuracy is required. The unit will display dissolved oxygen content in PPM or %SAT. The resolution in PPM mode is 0.01 over a range of 0.00 to 3.99 and 0.1 over a range of 4.0 to 25.0. The resolution in %SAT mode is 0.1%SAT over a range of 0.0 to 99.9%SAT and 1%SAT over a range of 100 to 300%SAT. Temperature is displayed in 0.1 degree Celsius increments over a 0.0 to 50.0 degree Celsius range or 1 degree Fahrenheit increments over a 32 to 122 degree Fahrenheit range. It is capable of self-cleaning via air or water jet. The sensor models 20HT, 20PI, and 20T have the same operational specifications but have been designed to be inserted into pipes in different configurations.

The Model 25 TSS sensor has been designed for medium ranges (250 to 30,000 mg/l) as commonly found in aeration basins of wastewater treatment plants. The Model 25L sensor has been designed for low ranges (0 to 1500 mg/l) as commonly found in effluent streams. Both sensors utilize an infrared emitter to minimize color effects and compensates for emitter variations due to temperature by measuring source brightness. They are capable of self-cleaning via air or water jet. The sensor Model 25HT, 25PI, and 25T have the same operational specifications as the Model 25 but have been designed to be inserted into pipes in different configurations.

The Model M28 holder is a microprocessor based preamp interface for the M51 and M52, pH and ORP electrodes. The Model 28 also has the temperature sensing circuitry and the analog to digitial convertor circuitry. The unit will measure the pH value in 0.01 pH resolution over a range of zero to 14.00 pH. However, the pH electrode is only rated for a pH range of 2 to 12. The unit will measure the ORP value in 1 mV resolution over a range of -2000 to 2000 mV. Water temperature may also be measured for automatic temperature compensation. The temperature may be displayed in degrees Celsius or degrees Fahrenheit. Temperature is displayed in 0.1 degree Celsius increments over a 0.0 to 50.0 degree Celsius range or 1 degree Fahrenheit increments over a 32 to 122 degree Fahrenheit range. The Model 28 is capable of self-cleaning via air or water jet.

INSTALLING THE PT2

The PT2 transmitter is housed in a NEMA 4X enclosure (see Drawing IIG08N001 for Outline and Mounting) and should be positioned for convenient access for an operator to read. Outline and mounting for the PT2 is shown in drawing IIG08N001. Because of the wireless sensor network the PT2 does not need to be on the basin, so a location out of the sun and rain is recommended. There is however, a Sunshade mounting kit available for the PT2 enclosure (see Drawing IIG08N110) if the desired location is on the basin handrail, See Figure 2. This mounting kit is design for a standard 2" handrail and is equipped with a translucent sun visor. It can also be adapted to square or angle handrails as well.

DO NOT! Locate the analyzer where it is likely to be damaged during unrelated or other periodic maintenance such as pressure washing catwalks.

WARNING! – Before opening analyzer cover; switch off the analyzer line power at the circuit breaker to avoid risk of shock. Line power is present on analyzer terminals.

WARNING! – Circuit breaker meeting IEC-947-3 must be on line supply, in close proximity to equipment and shall be marked as the disconnecting device for the equipment.

Once the PT2 is mounted in the desired location, open the lower door of the PT2 enclosure. Pass all connection cables through glands or ½" conduit in the bottom of the enclosure (gland and conduit are not supplied). Power connections should now be made on the lower left-hand side to terminal block J1, labeled L1, GND, and L2. The Power Supply is auto switching from 115 to 230 so there is no selector switch. See **Figure 1**.

Modbus connections are made to terminal block J7 labeled +, -, and GND. See the Modbus section of this manual for specifics on the modbus protocol.

Close enclosure door and secure the cover screws. Switch the circuit breaker on and the unit will now power up.

Once the unit is turned on, the unit will initialize and then jump into the "RUN" mode.

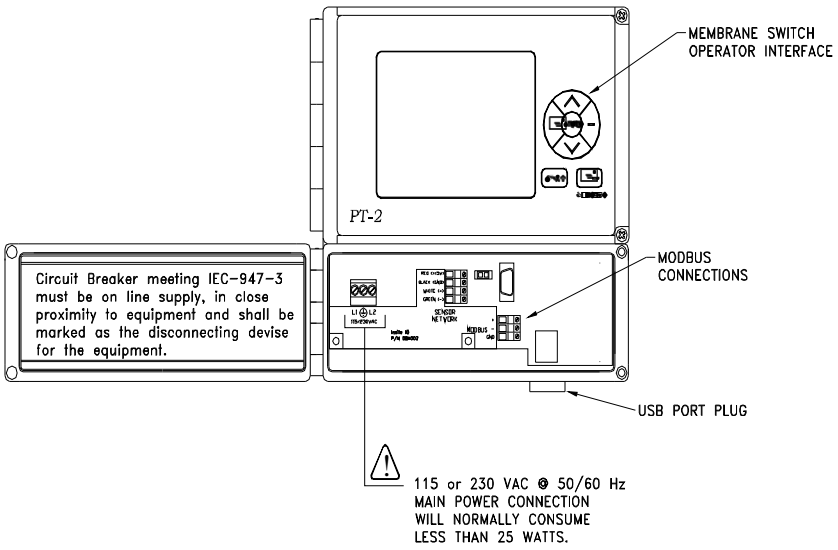


Figure 1 – PT2 CUSTOMER CONNECTIONS

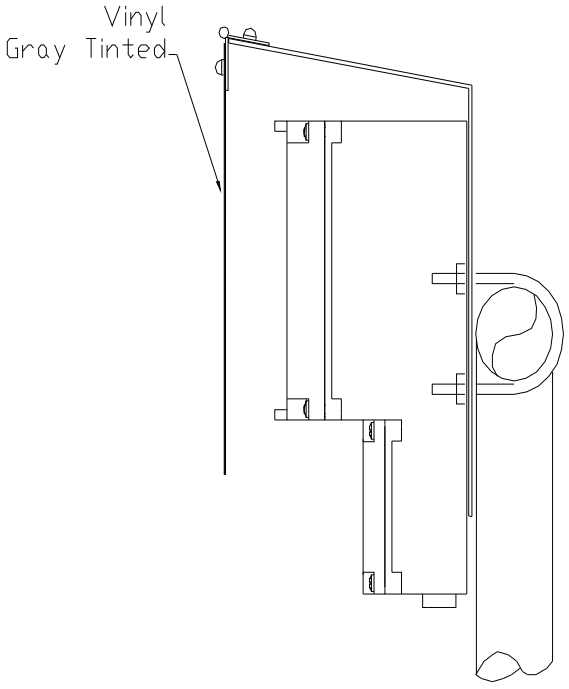


Figure 2 – PT2 HANDRAIL/SUNSHADE MOUNTING

The ST2 transmitter is housed in a NEMA 4X enclosure (see Drawing IIG08N101 for Outline and Mounting) and is designed for outdoor mounting. The ST2 transmitter should be mounted as close as possible to the desired sensor location. InsiteIG can supply a TM1 handrail mounting kit for the ST2 and a DO1 sensor handrail mounting kit (see Figure 4) that easily mounts to most handrails and slide locks the sensor into place without the use of tools. (See drawings IIGO8N102, IIG02N004, IIG02N005, IIG03N004 and IIG03N005). These mounting kits are design for a standard 2" diameter handrail but can be adapted to square or angle handrails as well.

The ST2 enclosure comes with range conduit knockouts from 3/8" through 1". The unit is shipped with the ½" and 1" facing the bottom. If a different size is desired, the enclosure should be rotated with respect to the transmitter PC Board such that the knockouts are facing down and the PC Board is in the upright position as shown. (See drawing IIG08N101)

DO NOT! Locate the ST2 where it is likely to be damaged during unrelated or other periodic maintenance such as pressure washing catwalks.

WARNING! – Before opening ST2 cover; switch off the analyzer line power at the circuit breaker to avoid risk of shock. Line power is present on analyzer terminals.

WARNING! – Circuit breaker meeting IEC-947-3 must be on line supply, in close proximity to equipment and shall be marked as the disconnecting device for the equipment.

Once the ST2 is mounted in the desired location, remove the cover of the ST2 enclosure. Pass all connection cables through glands or conduit in the bottom of the enclosure (gland and conduit are not supplied). The sensor input connections are made to terminal blockTB3 labeled SENSOR. Connect the sensor wire to corresponding terminals, RED, GRN, WHT, BLK, SHLD. Power connections should now be made on the lower left-hand side to the terminal block TB1 labeled L1, L2, and GND. The Power Supply is auto switching from 115 to 230 so there is no switch. See Figure 3 for connection diagram.

The ST2 also houses the programmable relay, clean relay and isolated analog outputs as shown in Figure 3 – ST2 CUSTOMER CONNECTIONS. The programmable relay is rated at 6 AMP and 230 volt and is a form C with connections for normally open and normally closed and is located at terminal block TB4. There are 2 isolated, 4 to 20mA analog outputs rated for 600ohms load at terminal block TB5. Please refer to the appropriate section in this manual for setup and programming details.

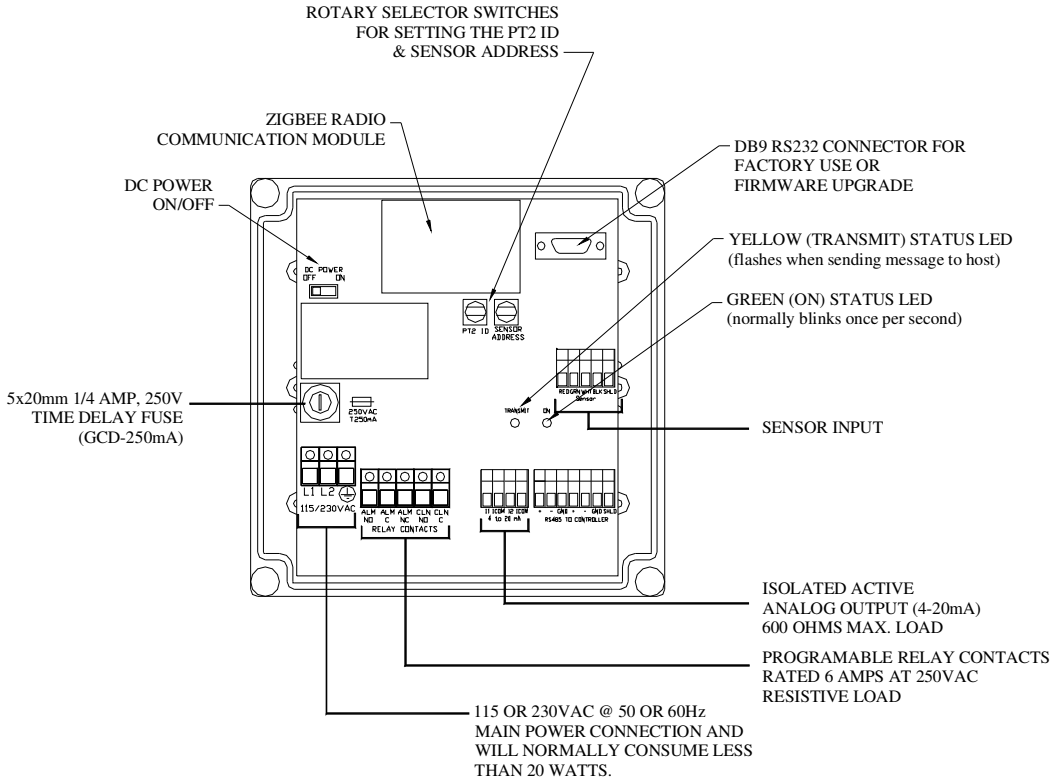


Figure 3 – ST2 CUSTOMER CONNECTIONS

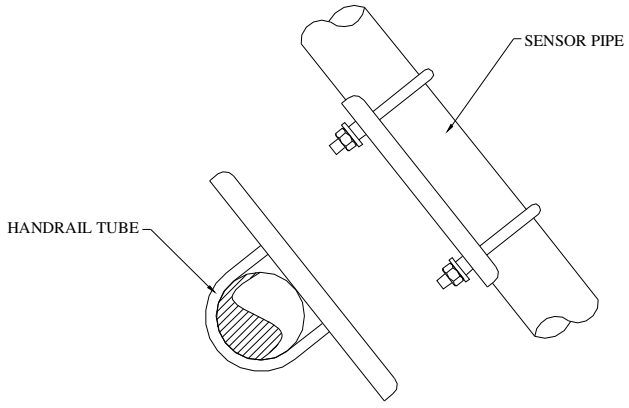
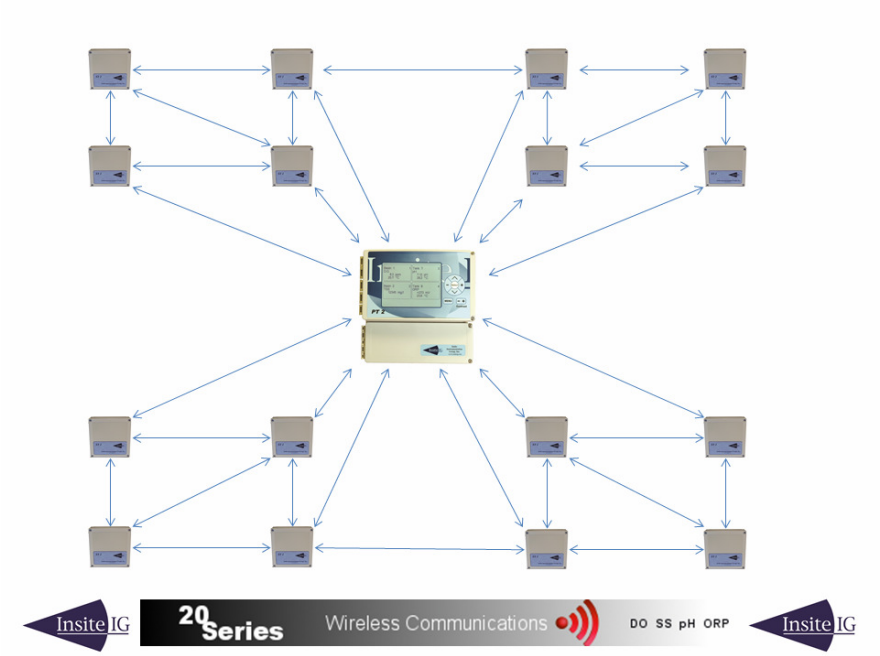


Figure 4 – SENSOR HANDRAIL MOUNTING

The Insite IG wireless self-healing mesh network is a multihop system in which sensor transmitters assist each other in transmitting packets through the network, especially in adverse conditions. You can drop these networks into place with minimal preparation, and they provide a reliable, flexible system that can be extended to 16 devices.

The wireless mesh network topology for industrial control and sensing is a point-to-point-to-point, or peer-to-peer, system called an ad hoc, multihop network. A node can send and receive messages, and in a mesh network, a node also functions as a router and can relay messages for its neighbors. Through the relaying process, a packet of wireless data will find its way to its destination, passing through intermediate nodes with reliable communication links.



In a wireless mesh network, multiple nodes cooperate to relay a message to its destination. The mesh topology enhances the overall reliability of the network, which is particularly important when operating in harsh industrial environments.

Figure 5 – Wireless Mesh Network Diagram.

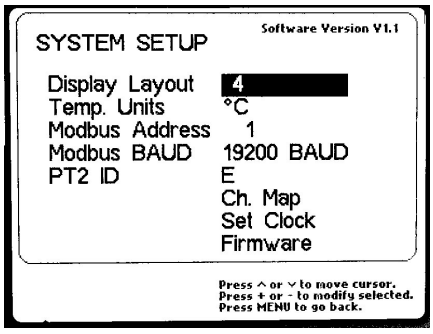
Like the Internet and other peer-to-peer router-based networks, a mesh network offers multiple redundant communications paths throughout the network. If one link fails for any reason (including the introduction of strong RF interference), the network automatically routes messages through alternate paths, see Figure 5 – Wireless Mesh Network Diagram.

In a mesh network, you can shorten the distance between nodes, which dramatically increases the link quality. If you reduce the distance by a factor of two, the resulting signal is at least four times more powerful at the receiver. This makes links more reliable without increasing transmitter power in individual nodes. In a mesh network, you can extend the reach, add redundancy, and improve the general reliability of the network simply by adding more nodes.

Wireless Network Setup

1. Install the PT2 and all ST2 / sensor combinations to be included in this network. Connect all sensors to their respective ST2. With the ST2 DC power switch in the OFF position, supply the PT2 and ST2's with AC power.

2. At the PT2 go to the system setup menu by pressing the menu button while in the main run screen.



3. Using the arrow buttons scroll until the PT2 ID field is highlighted

4. Using the +/- buttons select the unique address for this wireless network. This PT2 ID will be common in all ST2 units communicating with this PT2. There are fifteen options for this setting, 0 through E in hexadecimal notation.

5. Go to the first ST2 / sensor location and set the PT2 ID rotary switch to match the setting selected in the PT2.

6. Give this sensor location a unique address within this network by using the sensor address rotary switch. There are sixteen options for this setting, 0 through F in hexadecimal notation. It is important that no two sensor locations within the same network have the same sensor address.

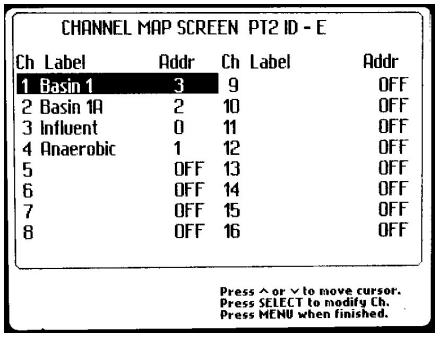
7. Fill out the wireless worksheet supplied in this manual for this location noting the PT2 ID number in the top left of the page, the unique sensor address for this location, the sensor type, and a location name of up to twelve characters.

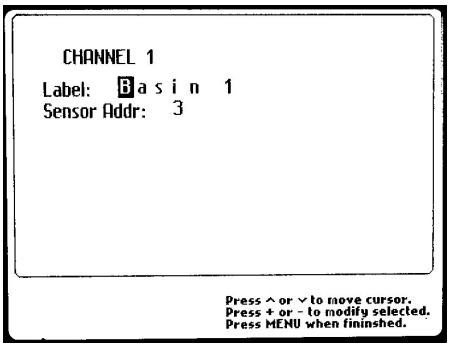
8. Turn the DC PWR switch ON and replace the cover of the ST2.

9. Go to all remaining ST2 / sensor locations in this network and repeat steps 5 through 8.

10. After setting up all ST2's, return to the host PT2 and highlight the channel map option in the system setup menu. Press the select button.

11. With the highlight on the first channel, press the select button.





12. The first character of the label field will be highlighted. Use the +/- buttons to select the first character from the location name field on the wireless installation worksheet.

13. Once the correct character is displayed press the down arrow to move to the next character location, again using the +/- buttons to get the correct character displayed.

14. Repeat until the entire location name is displayed. Press the down arrow to highlight sensor address field.

15. From the worksheet, enter the address assigned to this location by using the +/- buttons.

16. Repeat steps 11 through 15 for all remaining locations.

PT2 ID#_____ **WIRELESS INSTALLATION WORKSHEET**

Sensor Address	Sensor type	Location Name – limit of 12 characters

Display Layout

After applying power, the PT2 analyzer will display the Main screen. The Main screen can be configured in one of five display layouts: one channel, two channels, four channels, eight channels, or sixteen channels. When the display layout is set to 1, a trend graph of the last 24 hours is displayed.

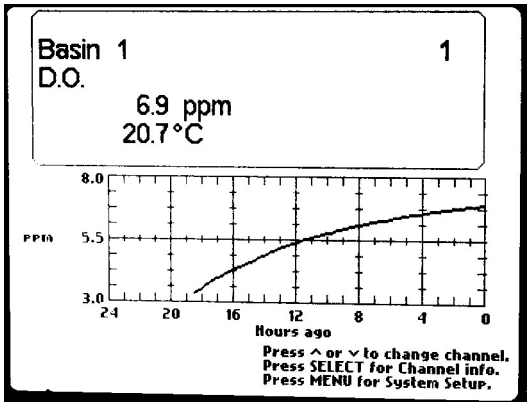


Figure 6 - Main Screen Display Layout 1

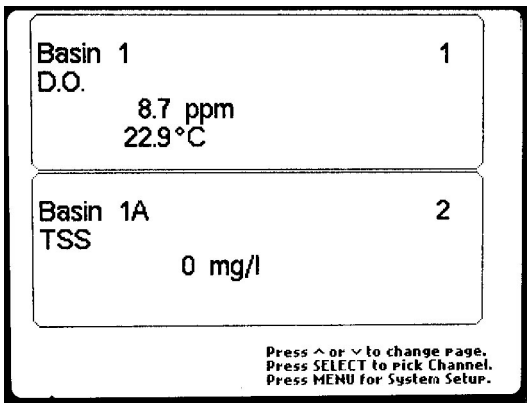


Figure 7 - Main Screen Display Layout 2

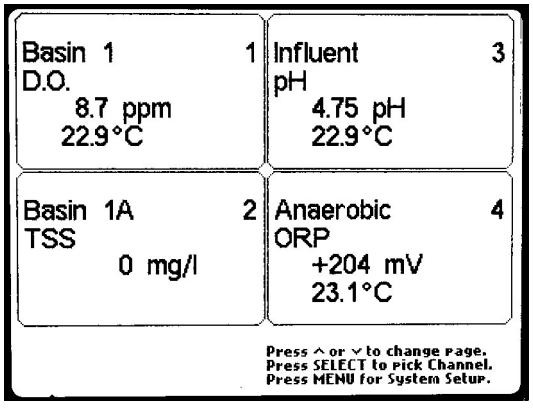


Figure 8 - Main Screen Display Layout 4

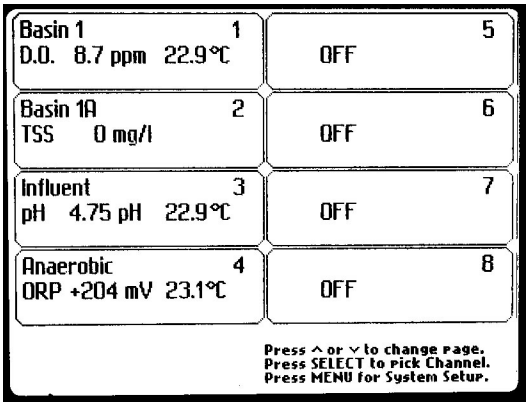


Figure 9 - Main Screen Display Layout 8

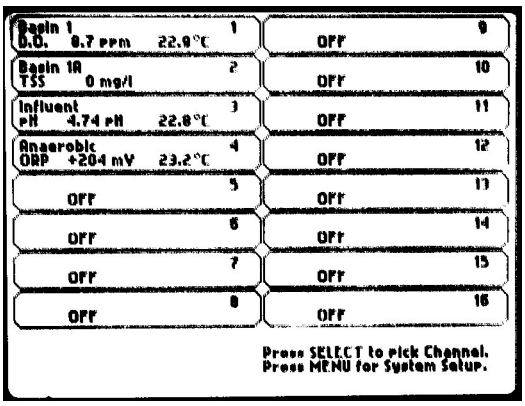


Figure 10 - Main Screen Display Layout 16

Screen Navigation: MAIN SCREEN

When the MAIN SCREEN is displayed, there are 3 options for screen navigation. Pressing the MENU key will switch to the SYSTEM SETUP SCREEN (Figure 19 - System Setup Screen). Pressing the DOWN key will display the next page of channels and pressing the UP key will display the previous page of channels. Pressing the SELECT key will activate the Channel Select mode which highlights one of the displayed channels (see Figure 11).

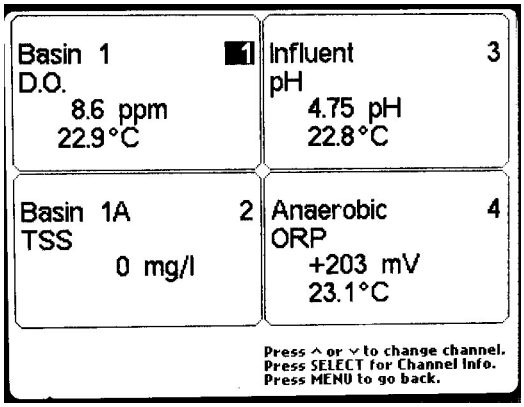


Figure 11 – Main Screen with Channel Select Activated

In this mode, pressing the DOWN key will highlight the next displayed channel and pressing the UP key will highlight the previous displayed channel. Pressing the SELECT key will switch to the CHANNEL INFO SCREEN (Figure 12 – Channel Info Screen) of the highlighted channel. Pressing the MENU key will deactivate the Channel Select mode.

> Note: When the Display Layout is set to 1, pressing the SELECT key will bypass the Channel Select mode and go directly to the CHANNEL INFO SCREEN for the displayed channel.

CHANNEL INFO SCREEN:

The CHANNEL INFO SCREEN (see Figure 12) provides the channel's sensor reading along with the sensor's serial number, the channel's relay status, and the channel's analog output status. Any error condition will also be reported on this screen. Pressing the MENU key will return to the MAIN SCREEN. The UP or DOWN keys are used to highlight the desired channel submenu. Press the SELECT key to switch to the highlighted channel submenu.

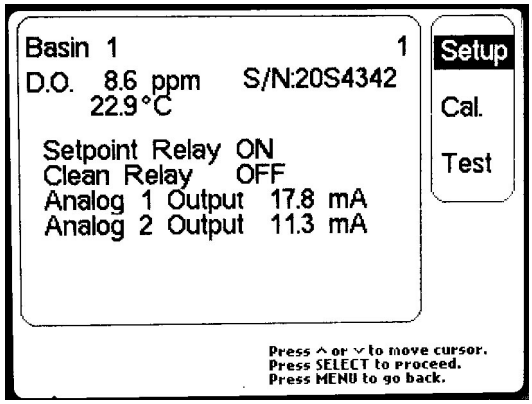


Figure 12 – Channel Info Screen

PASSCODE SCREEN:

If the passcode is set to a value other than 000, the PASSCODE SCREEN will appear before allowing access to the CHANNEL SETUP SCREEN, CHANNEL CALIBRATION SCREEN, or CHANNEL TEST SCREEN. Entering the correct passcode will allow access.

CHANNEL SETUP SCREEN (Setup):

The CHANNEL SETUP SCREEN (see Figure 13) is used to change the parameters for the selected channel. Use the UP or DOWN keys to highlight the desired parameter. Use the + or – keys to modify the highlighted parameter. Press the MENU key when finished to save the parameters and return to the CHANNEL INFO SCREEN. See Alarm/Setpoint Relay section for details on programming the relay parameters. See the Analog Output section for details on programming the analog output parameters. See Sensor Setup section for details on programming sensor specific parameters. The passcode parameter is a 3-digit value used to provide security from unauthorized access to the channel setup screen, channel calibration screen, and channel test screen. A value of 000 will disable this security feature. This screen also allows the channel's trend data to be cleared by pressing the + or – keys when Clr Trend is highlighted.

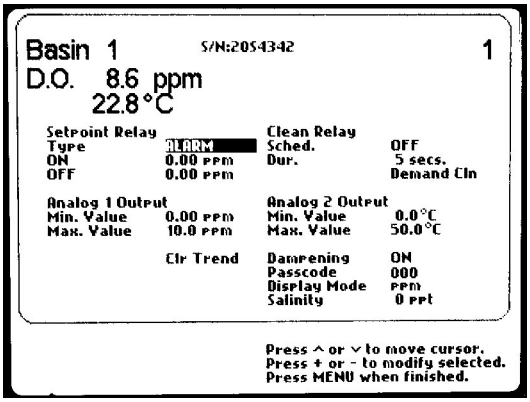


Figure 13 - Channel Setup Screen

CHANNEL CALIBRATION SCREEN (Cal):

The CHANNEL CALIBRATION SCREEN (see Figure 14) has a list of calibration procedures for specific sensor types. Use the UP or DOWN keys to highlight the desired calibration procedure, then press SELECT to perform the procedure. See the Sensor Calibration section for details on sensor calibration for a specific type of sensor. See Analog Outputs section for details on calibrating the analog outputs.

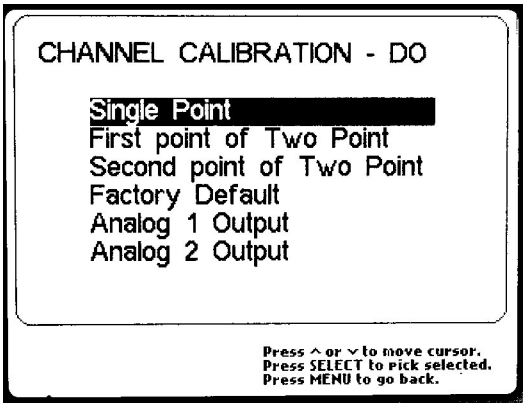


Figure 14 - Channel Calibration for D.O. sensor

CHANNEL TEST SCREEN (Test):

The CHANNEL TEST SCREEN provides troubleshooting information and access to the channel setpoint relay failsafe and analog output failsafe parameters and access to sensor specific setup parameters. The parameter's value may be changed by pressing the + or – keys when highlighted. The Setpoint Failsafe parameter defines the behavior of the channel setpoint relay during an error condition. This parameter may be set to force ON, force OFF, or NO CHANGE. The Analog Failsafe parameter defines the behavior of the channel analog outputs during an error condition. This parameter may be set to force 0 mA, force 4 mA, force 20 mA, or NO CHANGE.

The CHANNEL TEST SCREEN for a channel with a **D.O.** sensor is shown in Figure 15.

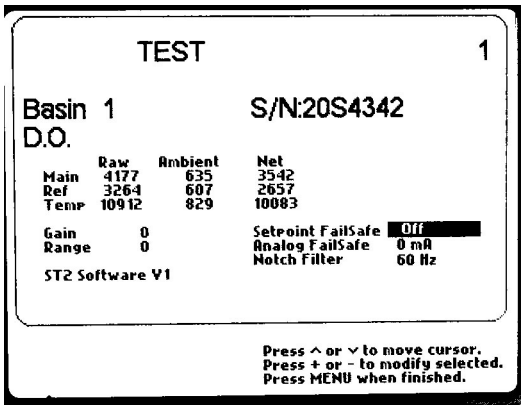


Figure 15 - Test Screen for a D.O. sensor

In addition to the failsafe parameters, the Notch Filter parameter must be set to comply with the power source frequency of 50 Hz or 60 Hz.

The CHANNEL TEST SCREEN for a channel with a **TSS** sensor is shown in Figure 16.

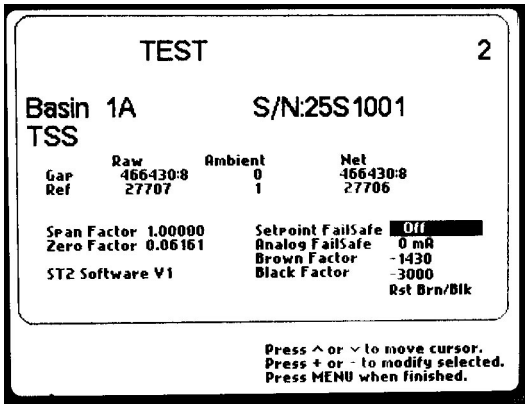


Figure 16 - Test Screen for a TSS sensor

In addition to the failsafe parameters, the brown and black factors may be set. For a standard range Model 25 sensor, a brown factor of -1430 and black factor of -3000 should be used for most applications. For a low range Model 25 sensor, a brown factor of -310 and a black factor of -4000 should be used for most applications. Contact the factory before changing these

parameters. To restore these parameters to the factory default values, highlight Rst Brn/Blk and press either the + or - on the PT2 keypad.

The CHANNEL TEST SCREEN for a channel with a **pH** sensor is shown in Figure 17.

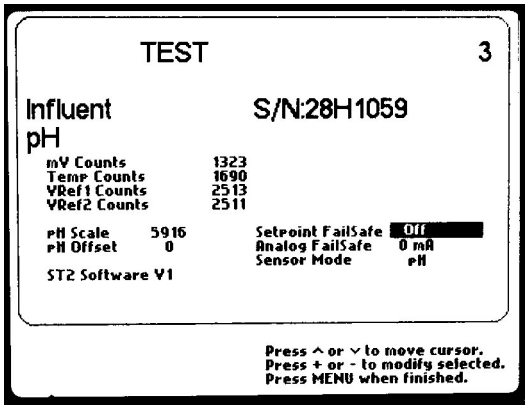


Figure 17 - Test Screen for a pH sensor

In addition to the failsafe parameters, the Sensor Mode parameter may be set. The three sensor modes are pH, U.S. ORP, and Europe ORP. This parameter is used by the PT2 to determine which type of sensing cartridge is installed in the Model 28 holder.

The CHANNEL TEST SCREEN for a channel with an **ORP** sensor is shown in Figure 18.

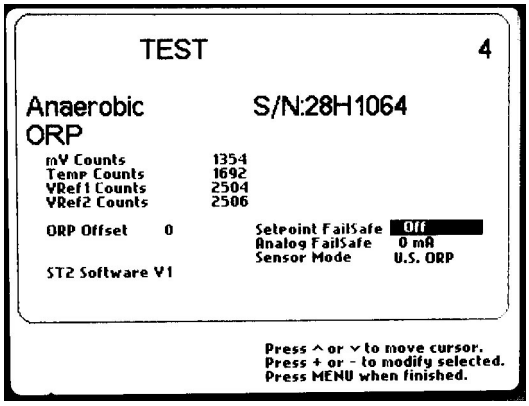


Figure 18 - Test Screen for an ORP sensor

In addition to the failsafe parameters, the Sensor Mode parameter may be set. The three sensor modes are pH, U.S. ORP, and Europe ORP. This parameter is used by the PT2 to determine which type of sensing cartridge is installed in the Model 28 holder.

System Setup Screen:

The SYSTEM SETUP SCREEN is shown in Figure 19.

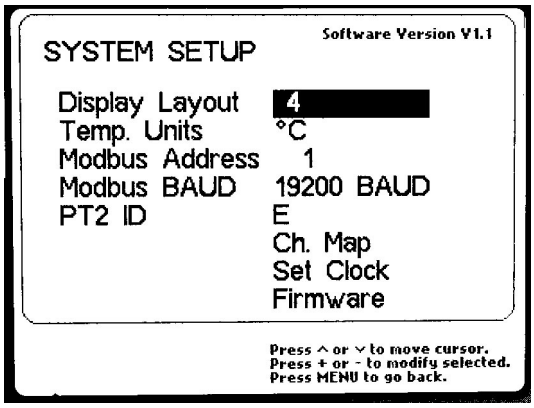


Figure 19 - System Setup Screen

The Display Layout parameter defines how many channels are displayed on the MAIN SCREEN. The possible values of Display Layout are 1, 2, 4, 8 or 16.
The Temp. Units parameter defines which units (^{o}C or ^{o}F) will be used to display sensor temperature .
The Modbus Address parameter is the PT2's slave address on the Modbus interface. The possible values of Modbus Address are 1 to 240.
The Modbus BAUD parameter is the BAUD rate used for the Modbus interface. The possible values of Modbus BAUD are 9600 or 19200. The Modbus interface uses 8 bits, no parity, 1 stop bit.
The PT2 ID parameter is used to associate the PT2 with a group of sensors (up to 16). See the "Wireless Network Setup" section for more details.
If Ch. MAP is selected the display will switch to the CHANNEL MAP SCREEN. See the "Wireless Network Setup" section for more details.
If Set Clock is selected the display will switch to the SET CLOCK SCREEN (see Figure 20).

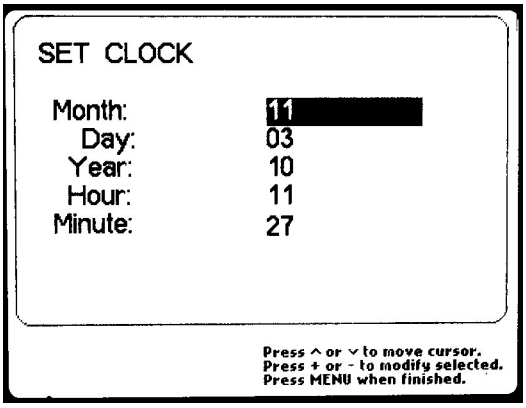


Figure 20 - Set Clock Screen

To change the clock settings, highlight the parameter to change by pressing the UP or DOWN keys and press + or – to modify the value.

Dissolved Oxygen Sensor Setup and Calibration:

General D.O. Sensor Setup Info

Once the sensor network has been set up as described earlier in the manual, any Model 20 sensors should automatically begin reporting dissolved oxygen and temperature values to the associated channel display without any further configuration. Changes will only be required if the user would like to alter the default settings for display units, output dampening, AC noise notch filter, or make adjustments to salinity compensation. The sensor is pre-calibrated at the factory, however, this calibration could be affected by conditions encountered during shipping, storage, or installation. A single-point calibration check is therefore encouraged at start-up.

Display Units

By default, Dissolved Oxygen will normally be reported by the analyzer as parts per million (ppm, same as mg/l). The user may change the display units for individual channels to display oxygen as a percentage of saturation (%sat) by the following procedure:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.
2. The CHANNEL INFO screen (Figure 21), should have the word SETUP highlighted on the upper right corner of the screen. Press SELECT.

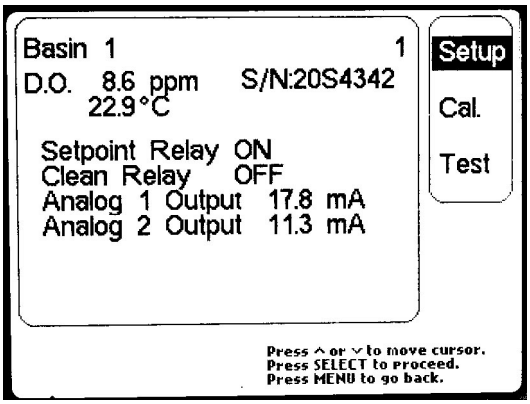


Figure 21 - Channel Info (D.O.)

3. On the CHANNEL SETUP screen (Figure 22), use the up or down arrow keys to change the highlighted field to DISPLAY MODE (located near the lower right corner of this CHANNEL SETUP screen).
4. Once DISPLAY MODE is highlighted, use the + or – keys to change the highlighted field to the desired display mode (ppm or %sat).
5. Press MENU twice to return to the MAIN screen.

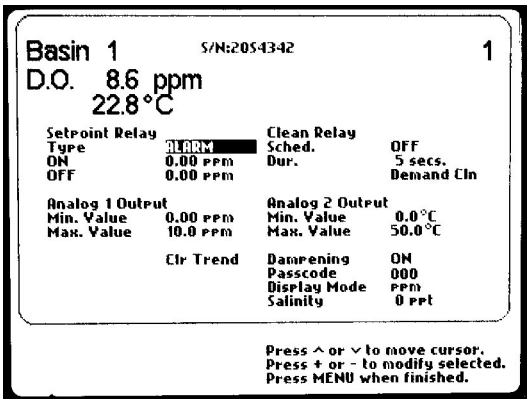


Figure 22 - Channel Setup (D.O.)

Temperature may be displayed as degrees Celsius (default) or degrees Fahrenheit, but this selection is a single system global setup value that will affect all D.O., pH and ORP channels. To change the system temperature units:

1. From the MAIN screen, press the MENU key to change to the SYSTEM SETUP screen.
2. Use the up or down arrows to change the highlighted field to the TEMP UNITS field.
3. Use the + or – keys to change the highlighted value to the desired temperature units (°C or °F).
4. Press the MENU key to exit back to the MAIN screen.

Dampening

By default, all dissolved oxygen sensor output values are averaged over a constantly sliding 40 second time window in order to reduce the fluctuation in readings normally found in aerated water scenarios. It is highly recommended that this dampening function be left ON in typical wastewater treatment plant applications. If necessary, the dampening may be turned off for individual channels as follows:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.
2. The CHANNEL INFO screen (Figure 21) should have the word SETUP highlighted on the upper right corner of the screen. Press SELECT.
3. On the CHANNEL SETUP screen (Figure 22), use the up or down arrow keys to change the highlighted field to DAMPENING, located near the lower right corner of this screen.
4. Once the DAMPENING field is highlighted, use the + or – keys to change the dampening to ON or OFF.
5. Press MENU twice to return to the MAIN screen.

Salinity Compensation

If the D.O. application requires salinity compensation, (extremely rare in wastewater treatment plants) the salt content value of the water may be entered individually for each D.O. channel. This value is entered as Salinity in parts per thousand (NOT Chlorinity) where average sea water would have a value of about 34 ppt. It should be noted that the PT2 will only apply a salinity compensation value to the D.O. reading if it is reported in ppm units. If D.O. is reported as %sat,

salinity compensation is automatic by the nature of the sensing mechanism of the sensor itself, so no calculated compensation is required and the value will not be used by the PT2. To enter a salinity value for a particular channel:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.
2. The CHANNEL INFO screen (Figure 21) should have the word SETUP highlighted on the upper right corner of the screen. Press SELECT to enter the CHANNEL SETUP screen for that D.O. channel.
3. On the CHANNEL SETUP screen (Figure 22), use the up or down arrows to change the highlighted field to SALINITY, located near the lower right corner of this screen.
4. Once the SALINITY value is highlighted, use the + or – keys to change the value for this channel.
5. Press MENU twice to return to the MAIN screen.

AC Noise Notch Filter

In most applications, the main source of electrical noise that may affect a D.O. sensor is the AC power lines. For this reason, the sensor uses an internal filter to reject noise from these sources. By default, the sensor is normally set to reject noise produced by 60 Hz power lines. In countries that use 50 Hz as a power standard, this NOTCH FILTER value should be changed. The value of the NOTCH FILTER frequency is stored in the nonvolatile memory of the Model 20 sensor itself. It can be changed as follows:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.
2. From the CHANNEL INFO screen (Figure 21), use the up or down arrow keys to highlight the word TEST on the right side of the screen, then press SELECT.
3. On the CHANNEL TEST screen (Figure 23), use the up or down arrow keys to change the highlighted field to the NOTCH FILTER field located in the lower right side of the screen.

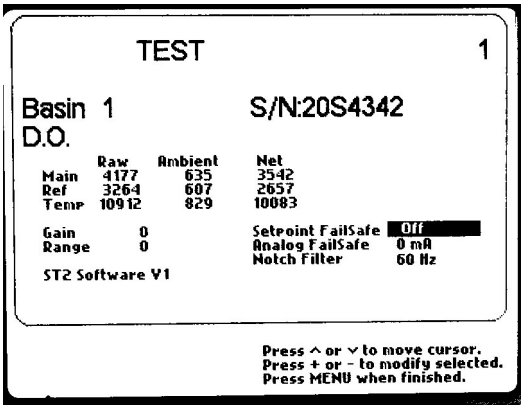


Figure 23 - Channel Test (D.O.)

4. Use the + or – keys to change the value to the correct value (50Hz or 60Hz).
5. Press MENU twice to return to the MAIN screen.

D.O. Sensor Calibration General Info

The Model 20 sensor has been designed to require very infrequent calibration. Unlike polarographic systems, light fouling of the sensing element should not affect the accuracy of the reading, but should only slow the response time of the system. However, heavy biological fouling that prevents reasonable sensor contact with the water will cause erroneous readings. With the sensor kept reasonably clean, the calibration should hold for 6 months to 2 years, depending upon conditions.

The PT2 allows the user to perform two types of calibration. The normal preferred calibration is a single-point calibration procedure. However, a more thorough 2-point calibration option is available, but is generally unnecessary and should only be used if it is apparent that the sensor output has been significantly altered.

Calibration values are stored in the nonvolatile memory of the Model 20 sensor itself, so a calibrated sensor may be moved to a different PT2 unit and retain its calibration status. The original factory calibration values for the sensor are never erased from the sensor memory, so a sensor may be restored to its original factory calibration condition if it is believed that the current calibration condition is erroneous.

Single Point D.O. Calibration

The single point D.O. Calibration method is the normally preferred method of calibration for a Model 20 D.O. sensor. This method allows the user to make adjustments to the D.O. reading to agree with any other source of D.O. information. Although any known D.O. level may be used, InsiteIG strongly urges its customers to use a zero dissolved oxygen solution as a reference for this calibration because it is easy to prepare a very accurate solution. Sodium Sulfite powder can be dissolved in clean water at about 2% concentration by weight to create a solution that will remain at the zero dissolved oxygen level for several days. Practically speaking, this amounts to about 1 tablespoon of this powder dissolved in 1 quart of clean water. For best accuracy, use water that is already at the ambient temperature level.

THIS CALIBRATION PROCEDURE MUST ONLY BE USED ON A CLEAN SENSOR. IF THE SENSOR IS READING ERRONEOUSLY DUE TO HEAVY BIOLOGICAL FOULING, USE OF THIS CALIBRATION METHOD WILL RESULT IN UNRELIABLE RESULTS.

The sensor must be stable in the water to be used as a reference before beginning this procedure. At the PT2, proceed as follows:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.
2. From the CHANNEL INFO screen (Figure 21), press the down arrow key once to highlight the word CAL, then press SELECT.
3. On the CHANNEL CAL menu screen (Figure 24), SINGLE POINT Calibration should already be the highlighted option, press SELECT.

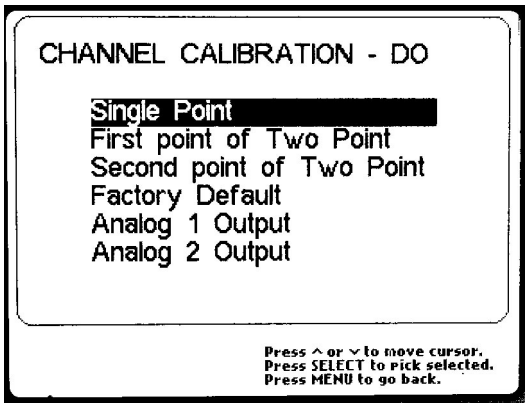


Figure 24 - Channel Calibration (D.O.)

4. From the SINGLE POINT D.O. CALIBRATION screen (Figure 25), use the + or – keys to adjust the highlighted value to agree with the known reference solution. If a sodium sulfite solution is being used as a reference, InsiteIG recommends entering a value of 0.02 PPM.

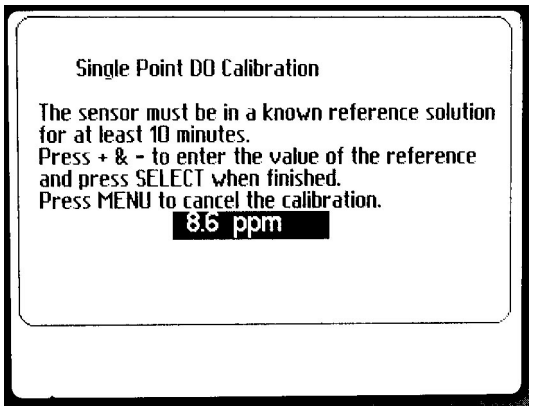


Figure 25 - Single Point D.O. Calibration

5. Press SELECT when finished, or press MENU to cancel the calibration.
6. Press MENU twice to return to the MAIN screen.

Two Point D.O. Calibration

If performed correctly, the previously described Single Point Calibration procedure should be all that is required by the user. Two point calibration should only be attempted if it is apparent that a major shift in calibration has occurred. The procedure requires 3 steps that MUST be performed in the following order:

1. Erase all previous field calibration data by restoring factory defaults.
2. Calibrate the first point, which MUST be a zero oxygen solution.
3. Calibrate the second point, which should be near saturation levels.

As with the Single Point Calibration, the sensor must be clean in order for this procedure to be successful. The first calibration point will use the same sodium sulfite zero oxygen solution described in the previous section (1 tablespoon of sodium sulfite dissolved in 1 quart of water at ambient temperature). Allow the sensor to soak in this solution for at least 10 minutes before proceeding. A step-by-step procedure follows:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once

to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.

2. From the CHANNEL INFO screen (Figure 21), press the down arrow key once to highlight the word CAL, then press SELECT.
3. From the CHANNEL CAL menu screen (Figure 24), press the down arrow key until the FACTORY DEFAULT option is highlighted, then press SELECT
4. The PT2 will be on the RESTORE FACTORY DEFAULTS screen (Figure 26). Press SELECT again to erase all previous field calibration data from the sensor. The PT2 will return to the CHANNEL CAL menu screen.

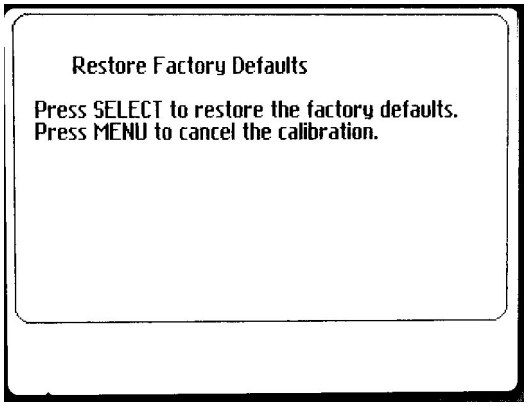


Figure 26 - Restore Factory Defaults (D.O.)

5. From the CHANNEL CAL menu screen (Figure 24), use the up arrow key to highlight the FIRST POINT OF TWO POINT option, then press SELECT.
6. The FIRST POINT OF A TWO POINT D.O. CALIBRATION screen (Figure 27) will appear. Once the sensor has been in the zero solution for at least 10 minutes, press SELECT to perform the first calibration point. The PT2 will return to the CHANNEL CAL menu screen.

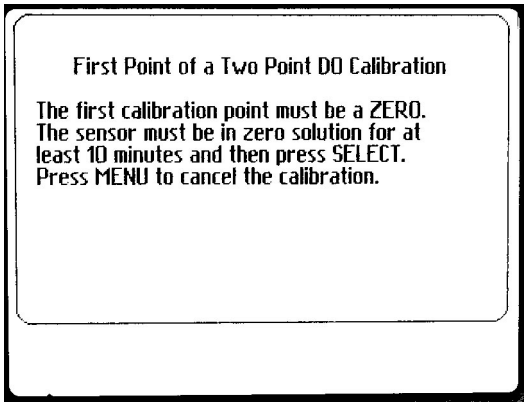


Figure 27 - First Point of a Two Point D.O. Calibration

7. If desired at this point, the PT2 may be returned to the MAIN screen while the sensor is made ready for the second calibration point. (Press MENU twice to return to the MAIN screen). When everything is ready for the second point, return to the CHANNEL CAL menu by repeating steps 1 and 2 of this procedure.
8. Although water of any known D.O. concentration may be used as the second calibration point, InsiteIG strongly encourages the user to create an air saturated solution of clean water as the second calibration point. A bucket of very clean water, heavily aerated for at least 20 minutes with a normal aquarium style aeration stone, will make a good 100% saturation reference. Otherwise, if another known oxygen level is used, this level should be near or above the maximum reading expected of the sensor in normal operation. The sensor should be rinsed to remove all zero

solution before placing it in an aerated container. The sensor should be allowed to stabilize for at least 10 minutes before proceeding.

9. From the CHANNEL CAL menu screen (Figure 24), use the up and down arrow keys to highlight the SECOND POINT OF TWO POINT option, then press SELECT.
10. The highlighted field of the SECOND POINT OF TWO POINT D.O. CALIBRATION screen (Figure 28) will first read 100%SAT. If the sensor is submerged in a saturated solution as recommended, press SELECT now and continue to step 11. If another reference is being used, pressing the + or – key will switch to a ppm value display that can be adjusted to the reference value with the + and – keys. Once the correct value is shown, press SELECT and continue with step 12.

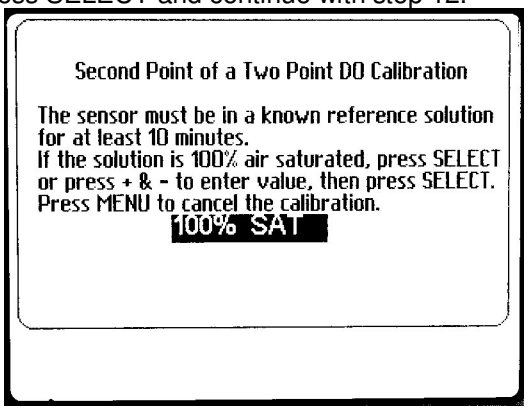


Figure 28 - Second Point of a Two Point D.O. Calibration

11. For best accuracy, a saturated solution's value should be corrected for elevation above sea level to account for the density of the atmosphere. To do this, enter the approximate elevation of your location using the + or – keys, then press SELECT.
12. Calibration is complete. Press MENU twice to return to the MAIN screen.

Suspended Solids Sensor Setup and Calibration

General SS Sensor Setup Info

Once the sensor network has been set up as described earlier in the manual, any Model 25 sensors should automatically begin reporting TSS values to the associated channel display without any further configuration.

SS Sensor Calibration

The sensor is shipped from the factory with an "average" calibration that will usually result in numbers that are in rough agreement with the actual SS readings. However, for good accuracy, the sensor must be calibrated to the actual process being measured in order to account for optical variations (primarily due to particle size) that are present in every plant.
Calibration values are stored in the nonvolatile memory of the Model 25 sensor itself, so a calibrated sensor may be moved to a different PT2 unit and retain its calibration status.
Complete calibration requires the setting of two calibration points: one for zero TSS and one to control the span.

Calibrating SS Sensor Zero

Establishing the zero point for a Model 25 sensor is simply a matter of submerging the *clean* sensor in a container of *clean* water. Potable water is generally OK for this use, but distilled water is ideal. Never use plant process water as a zero reference. Let the sensor soak in this water for about 10 minutes before beginning the analyzer procedure to allow time for temperature stabilization and complete wetting of the sensor surfaces. Just before beginning the following procedure, check to see if air bubbles have formed on the interior sensor faces, and dislodge any that may have appeared. At the PT2:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.
2. From the CHANNEL INFO screen (Figure 29), press the down arrow key once to highlight the word CAL on the right side of the screen. Then press SELECT.

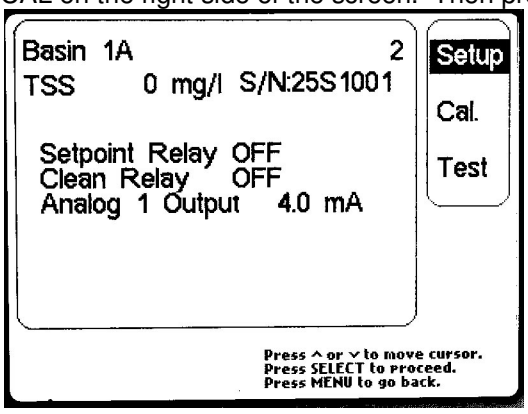


Figure 29 - Channel Info Screen (TSS)

3. On the CHANNEL CALIBRATION – TSS menu screen (Figure 30), the ZERO SENSOR option should already be highlighted. Press the SELECT key again.

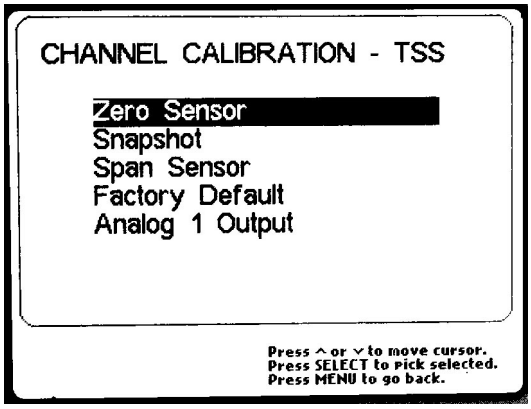


Figure 30 - Channel Calibration - TSS Menu

4. From the TSS ZERO CALIBRATION screen (Figure 31), press SELECT again to cause the zero point calibration to be stored. The PT2 will return to the previous CHANNEL CALIBRATION – TSS menu screen.

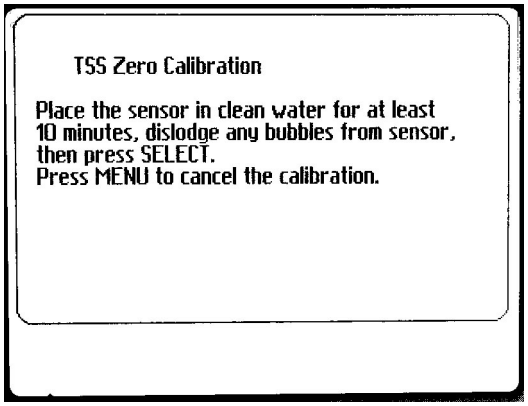


Figure 31 - TSS Zero Calibration

5. Press MENU twice to exit back to the MAIN screen now if desired.

Calibrating SS Sensor Span

For a truly meaningful calibration of the span of the sensor, the sensor should be calibrated in the process water itself against a number derived from laboratory analysis of that water. Since the laboratory analysis takes considerable time, the span process has been divided into 2 separate procedures in the PT2. The sensor remains in the process water throughout both procedures. The first step, called the SNAPSHOT, is used when a sample of the process water is physically taken from a site near the sensor for laboratory analysis. The SNAPSHOT procedure causes the PT2 to store the optical conditions seen by the sensor at the time the physical sample is taken. The SNAPSHOT does not yet alter the calibration, but merely stores information for later use. After the laboratory analysis of the physical sample has determined an accurate TSS value for that sample, the second procedure, called SPAN SENSOR, is used to adjust the sensor's internal calibration based upon the stored snapshot and the lab number.
The SNAPSHOT procedure is as follows:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.

2. From the CHANNEL INFO screen (Figure 29), press the down arrow key once to highlight the word CAL on the right side of the screen. Then press SELECT.
3. From the CHANNEL CALIBRATION – TSS screen (Figure 30), press the down arrow key once to highlight the SNAPSHOT menu item. Press the SELECT key again.
4. On the resulting TSS SNAPSHOT PROCEDURE screen (Figure 32), press the SELECT key when the physical sample is taken from a site near the sensor. Conditions are stored and the PT2 will return to the previous menu screen.

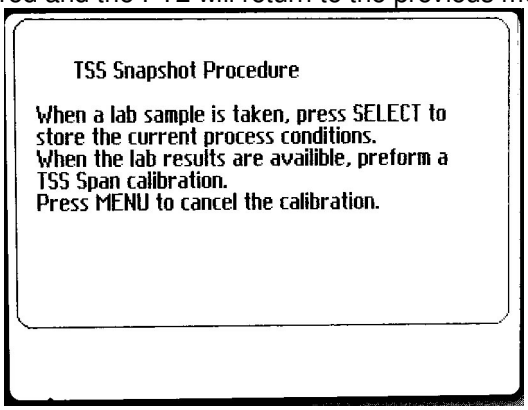


Figure 32 - TSS Snapshot Procedure

5. If desired, the PT2 can be returned to the MAINscreen by pressing the MENU key twice.

Once the laboratory analysis of the sample is ready, the value may be used to perform a SPAN SENSOR as follows:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.
2. From the CHANNEL INFO screen (Figure 29), press the down arrow key once to highlight the word CAL on the right side of the screen, then press SELECT.
3. From the CHANNEL CALIBRATION – TSS screen (Figure 30), press the down arrow key twice to highlight the SPAN SENSOR menu item. Press the SELECT key.
4. On the TSS SPAN CALIBRATION screen (Figure 33), use the + or – keys to change the highlighted value to agree with the laboratory TSS value. Press SELECT to complete the SPAN SENSOR process. The PT2 will return to the previous menu.

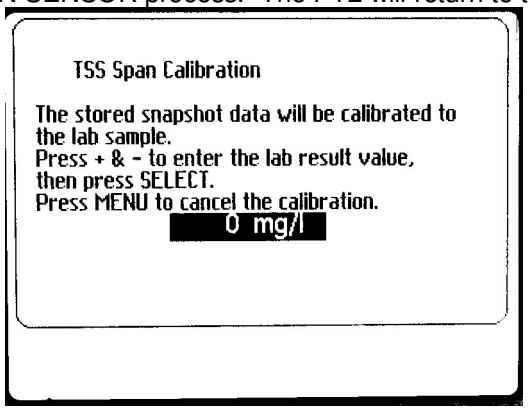


Figure 33 - TSS Span Calibration

5. The PT2 can be returned to the MAIN screen by pressing the MENU key twice.

SS Sensor Factory Default Span

If it appears that the TSS sensor span has been set to a questionable value, it may be desired to return the span to its original factory "average" span until a new calibration can be performed. This procedure restores the SPAN but does NOT alter the zero calibration.

1. From the above SS calibration procedures, perform steps 1 and 2 to navigate to the CHANNEL CALIBRATION – TSS menu screen (Figure 30).
2. Press the down arrow key three times to highlight the FACTORY DEFAULT menu item. Press Select.
3. From the RESTORE FACTORY DEFAULTS screen (Figure 34), press SELECT. The PT2 will return to the previous menu.

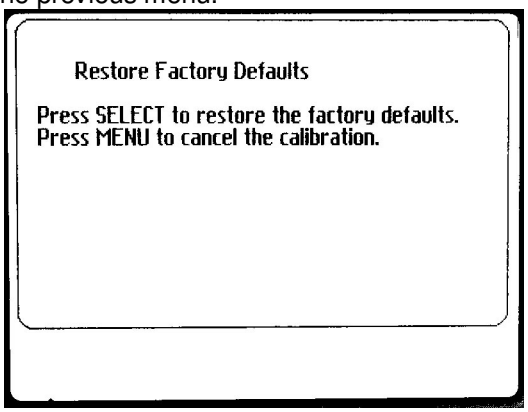


Figure 34 - Restore Factory Defaults - TSS

4. The PT2 can be returned to the MAIN screen by pressing the MENU key twice.

SS Dampening

By default, all Model 25 TSS sensor values are averaged over a constantly sliding 1 minute time window in order to reduce fluctuations in the readings. It is highly recommended that this dampening function be left ON in typical wastewater treatment plant applications. If necessary, the dampening may be turned off for individual channels as follows:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.
2. The CHANNEL INFO screen (Figure 29) should have the word SETUP highlighted on the upper right corner of the screen. Press SELECT.
3. On the CHANNEL SETUP screen, use the up or down arrow keys to change the highlighted field to DAMPENING, located near the lower right corner of this screen.
4. Once the DAMPENING field is highlighted, use the + or – keys to change the dampening to ON or OFF.
5. Press MENU twice to return to the MAIN screen.

Model 28 pH/ORP Sensor Setup and Calibration

General pH/ORP Sensor Setup Info

Once the sensor network has been set up as described earlier in the manual, any Model 28 pH/ORP holder units should begin reporting values to their associated channel display. However, the user should insure that the Model 28 holder has been properly configured for the type of electrode that has been installed in the holder. To access and/or change this information:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.
2. From the CHANNEL INFO screen (Figure 35), press the down arrow key twice to highlight the word TEST on the right side of the screen. Then press SELECT.

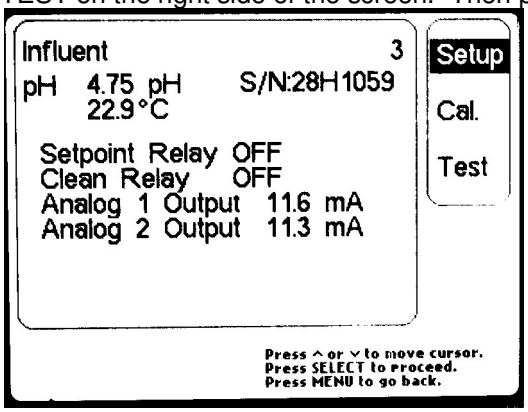


Figure 35 - Channel Info (pH/ORP)

3. From the pH/ORP TEST screen (Figure 36), press the down arrow key twice to highlight the SENSOR MODE menu item located at the bottom right of this screen.

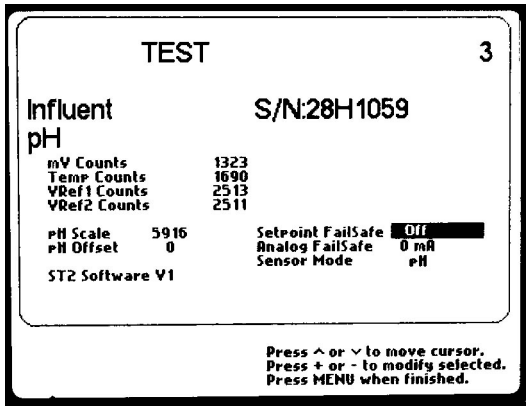


Figure 36 - pH/ORP Test Screen

4. Use the + or – keys to select the proper option:
   - pH – for a Model 51 pH electrode
   - U.S.ORP – for a Model 52 ORP electrode using the U.S. convention of positive readings during the oxidation of platinum
   - Europe ORP – for a Model 52 ORP electrode using the European convention of

positive readings for the reduction of platinum.

5. Press MENU twice to return to the MAIN screen.

General pH Calibration Info

pH buffers are special solutions which are used in the standardization or calibration of pH measuring electrode systems. They are special because they have the ability to resist changing pH due to contamination or dilution. The most common pH buffer solutions are 4, 7 and 10 pH values. Other special values can be purchased, and buffers for special biological and chemical applications are common. Buffer values are normally chosen to bracket the measurement range of interest when performing a 2 point calibration, or a single buffer within the range of interest can be used for a simpler single point calibration.
pH buffers are supplied in either a powdered form to be mixed with distilled water or a premixed liquid form. For pH buffers greater than 7, it is recommended that liquid buffer solutions be used because they tend to be more accurate. However, liquid buffer solutions have a short shelf life (typically 3 months) which must be considered when ordering.

Single Point pH Calibration

The PT2 has a single point calibration procedure available for pH electrodes. This procedure will make adjustments to the pH "offset" value, but will not adjust the "slope" of the sensor. The single point calibration method can be used for quick updates to electrodes that have been responding well to process water changes. However, for a full assessment of the health of the electrode, and for maximum accuracy, the 2-point calibration procedure is preferred.
Before proceeding at the PT2, submerge the electrode in the chosen buffer solution for at least 10 minutes to allow complete stabilization.

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.
2. From the CHANNEL INFO screen (Figure 35), press the down arrow key once to highlight the word CAL on the right side of the screen. Then press SELECT.
3. From the CHANNEL CALIBRATION – pH menu screen (Figure 37), the SINGLE POINT cal option should already be highlighted. Press SELECT.

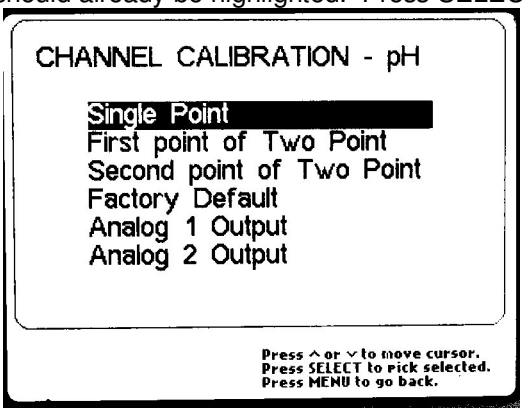


Figure 37 - Channel Calibration - pH Menu

4. From the SINGLE POINT pH CALIBRATION screen (Figure 38), use the + or – keys to change the pH value to agree with the buffer value. Press SELECT when done.

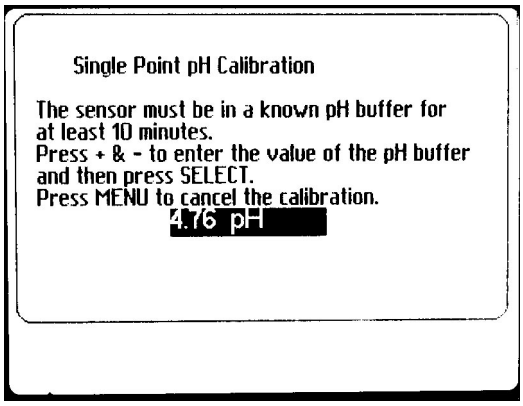


Figure 38 - Single Point pH Calibration

5. Press MENU twice to return to the MAIN screen.

Two Point pH Calibration

The two point calibration procedure of the PT2 provides an adjustment to both the "offset" and the "slope" of the pH electrode. The adjustment is calculated and made AFTER both points have been entered, so it is not necessarily required to use a pH 7 buffer as the first "offset" buffer as in older pH systems. Simply choose any 2 convenient buffers that come close to bracketing the measurement range of interest. They may be used in any order.
Begin by submerging the electrode in the first buffer solution and waiting at least 10 minutes for stabilization.

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.
2. From the CHANNEL INFO screen (Figure 35), press the down arrow key once to highlight the word CAL on the right side of the screen. Then press SELECT.
3. From the CHANNEL CALIBRATION – pH screen (Figure 37), press the down arrow key once to highlight the FIRST POINT OF TWO POINT option. Press SELECT.
4. From the FIRST POINT OF A TWO POINT pH CALIBRATION screen (Figure 39), use the + or – keys to change the pH value to agree with the buffer value. Press SELECT when done. The PT2 will return to the previous menu.

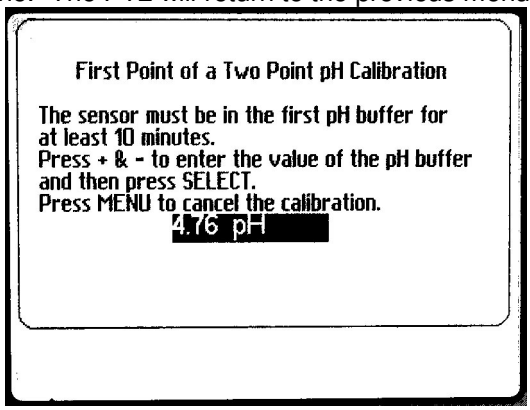


Figure 39 - First Point of a Two Point pH Calibration

5. Rinse the electrode in clean water and move it to the second buffer solution. Wait 10

minutes for stabilization.

6. From the CHANNEL CALIBRATION – pH screen (Figure 37), use the down arrow key to highlight the SECOND POINT OF TWO POINT option. Press SELECT
7. From the SECOND POINT OF A TWO POINT pH CALIBRATION screen (Figure 40), use the + or – keys to change the pH value to agree with the buffer value. Press SELECT when done. The PT2 will perform the calibration and return to the previous menu.

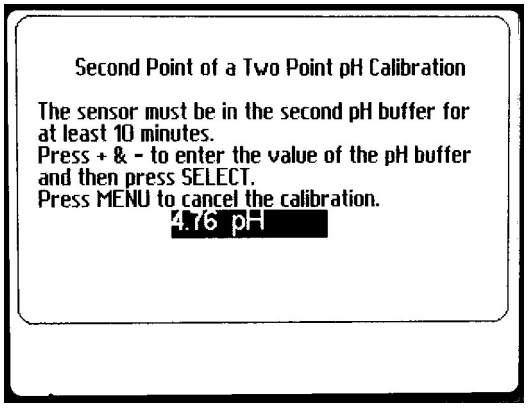


Figure 40 - Second Point of a Two Point pH Calibration

8. Press MENU twice to return to the MAIN screen.

The resulting slope and offset values may be viewed by navigating to the CHANNEL TEST screen for this electrode.

Factory Default pH Calibration

The PT2 contains the option of returning the pH calibration to the standard "new electrode" values of 0 mV offset and 59.16 mV/pH slope.

1. From the previous pH calibration procedures, perform steps 1 and 2 to navigate to the CHANNEL CALIBRATION – pH menu screen.
2. Use the down arrow to highlight FACTORY DEFAULT. Press SELECT.
3. From the RESTORE FACTORY DEFAULTS screen, press SELECT.
4. Press MENU twice to return to the MAIN screen.

ORP Offset Adjustment

For ORP electrodes, an offset voltage may be applied to the reading. With the ORP electrode stabilized in the ORP buffer solution, proceed as follows:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down arrow keys to display the channel of interest, then press the SELECT key
   - If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.
2. From the CHANNEL INFO screen (Figure 35), press the down arrow key once to highlight the word CAL on the right side of the screen. Then press SELECT.
3. From the CHANNEL CALIBRATION – ORP screen (Figure 41), the OFFSET ADJUST option should already be highlighted. Press SELECT.

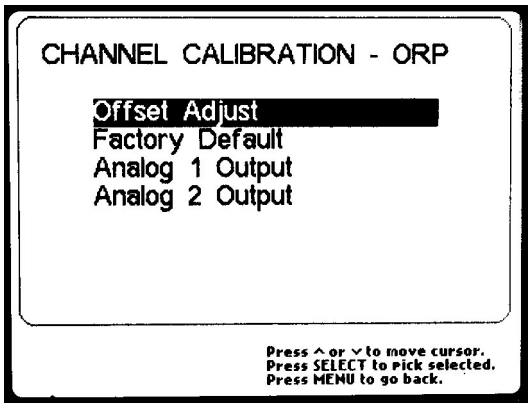


Figure 41 - Channel Calibration - ORP

4. From the ORP OFFSET ADJUSTMENT screen (Figure 42), use the + or – keys to change the ORP value to agree with the desired buffer value. Press SELECT when done.

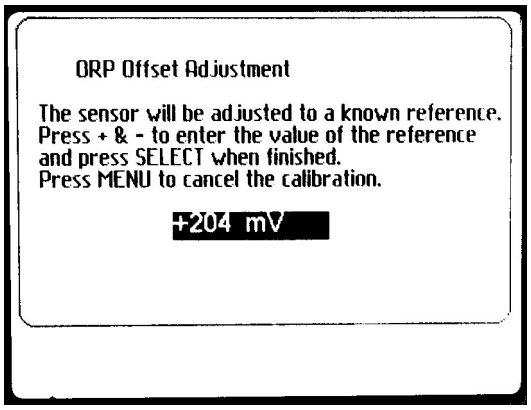


Figure 42 - ORP Offset Adjustment

5. Press MENU twice to return to the MAIN screen.

Restoring Default ORP Offset

Any ORP offset adjustments that have been made to an ORP channel may be erased by using the FACTORY DEFAULT option:

1. From the previous ORP offset adjustment procedure, perform steps 1 and 2 to navigate to the CHANNEL CALIBRATION – ORP menu screen.
2. Use the down arrow key to highlight the FACTORY DEFAULT menu item and press SELECT.
3. On the RESTORE FACTORY DEFAULTS screen for ORP, press SELECT. The ORP offset will be reset to zero and the PT2 will return to the previous menu
4. Press MENU twice to return to the MAIN screen.

pH/ORP Dampening

By default, all Model 28 pH/ORP electrode values are averaged over a constantly sliding 40 second time window in order to reduce fluctuations in the readings. It is highly recommended that this dampening function be left ON in typical wastewater treatment plant applications. If necessary, the dampening may be turned off for individual channels as follows:

1. From the MAIN screen, change to the CHANNEL INFO screen by one of the following methods:
   - If the unit is in the single channel DISPLAY LAYOUT mode, use the up and down

arrow keys to display the channel of interest, then press the SELECT key

- If the unit is in a multiple channel DISPLAY LAYOUT mode, press SELECT once to cause a channel number to be highlighted, then use the arrow keys to highlight the channel number of interest, then press SELECT again.

2. The CHANNEL INFO screen (Figure 35) should have the word SETUP highlighted on the upper right corner of the screen. Press SELECT.
3. On the CHANNEL SETUP screen (Figure 43), use the up or down arrow keys to change the highlighted field to DAMPENING, located near the lower right corner of this screen.

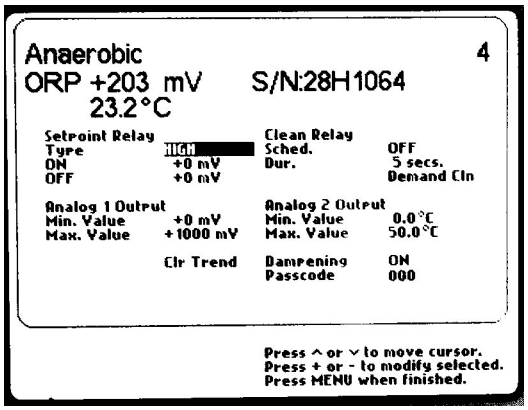


Figure 43 - Channel Setup - pH /ORP

4. Once the DAMPENING field is highlighted, use the + or – keys to change the dampening to ON or OFF.
5. Press MENU twice to return to the MAIN screen.

Two isolated 4-20 mA analog outputs capable of driving 600 ohms are provided as part of the ST2 Sensor junction box. The first analog outputs is associated with the channel's main measurement and the second analog output is associated with the channel's temperature measurement if applicable. For connection details, see the ST2 section.
Analog output Min and Max values may be set on the Channel Setup Screen (see Figure 44).

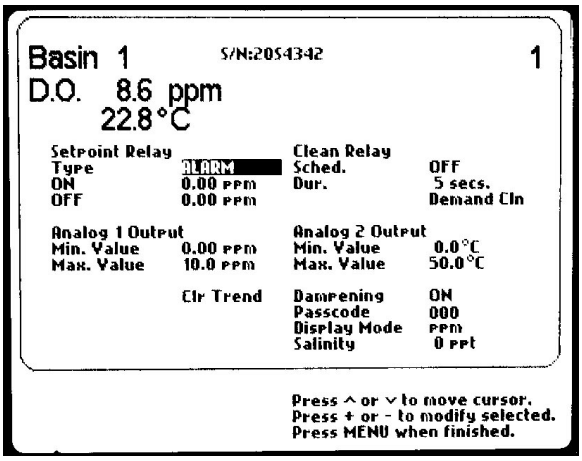


Figure 44 - Channel Setup Screen

The analog output MIN value is the value at 4 mA. The analog output MAX value is the value at 20 mA.

The analog output behavior during an error condition may be left unchanged from last value or forced to 0 mA, 4 mA, or 20 mA. See the Sensor Test Mode section for details on setting this parameter.

The analog outputs may be calibrated using the procedure on the CHANNEL CALIBRATION SCREEN (see Figure 45). When the analog output procedure is performed, a full scale 20 mA signal is output. The mA output may be adjusted by using the + or – keys to enter the value of the adjustment and then pressing SELECT to make the adjustment.

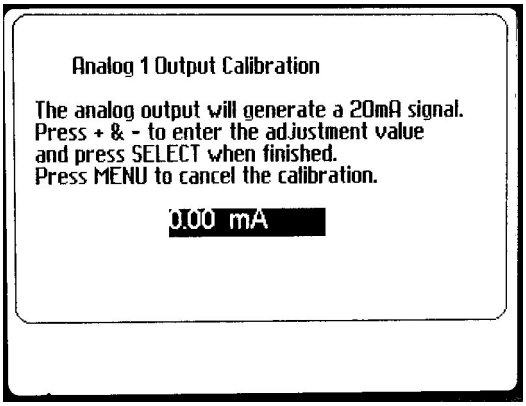


Figure 45 - Analog Output Calibration Screen

A single alarm/setpoint relay associated with each channel's main measurement is provided as part of the ST2 Sensor junction box. For connection details, see the ST2 section.
The relay Type, along with its ON and OFF values, may be set on the Channel Setup Screen (see Figure 46).

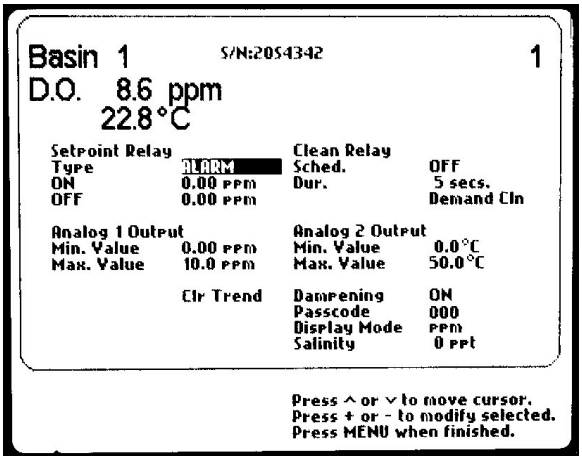


Figure 46 - Channel Setup Screen

The relay type may be set to LOW, HIGH, or ALARM.

In LOW setpoint mode, the relay will energize if the reading falls below the value in the ON parameter. Once the relay has been energized by a low reading, it will not be de-energized until the reading rises above the value in the OFF parameter. The relay OFF parameter value must be greater than or equal to the ON parameter value in this mode.

In HIGH setpoint mode, the relay will energize if the reading rises above the value in the ON parameter. Once the relay has been energized by a high reading, it will not be de-energized until the reading falls below the value in the OFF parameter. The relay OFF parameter value must be less than or equal to the ON parameter value in this mode.

In ALARM mode, the relay is normally energized and will de-energize if the reading falls below the value in the ON parameter. Once de-energized by a low reading, it will not be energized until the reading rises above the value in the OFF parameter. The relay OFF parameter value must be greater than or equal to the ON parameter value in this mode.

Insite IG analyzers support communication with other devices via the Modbus protocol using RTU transmission mode. The Modbus protocol defines a message structure that controllers will recognize and use, regardless of the type of networks over which they communicate. It establishes a common format for the layout and contents of message fields. Transactions use a master-slave technique, in which only one device (the master) can initiate transactions (called queries). The other devices (the slaves) respond by supplying the requested data to the master and by taking the action requested in the query. Insite IG analyzers operate as slaves to other modbus devices.

Message framing
Messages start with a silent interval of at least 3.5 character times followed by 4 fields and then followed by another silent interval of at least 3.5 character times. The first field contains the device address. The second field contains the function code. The third field contains the data. The fourth field contains the CRC value. Each byte has 1 start bit, 8 data bits, no parity, and 1 stop bit.

Address field
The address field contains one byte. Valid slave device addresses are in the range of 1 to 247 decimal.

Function code field
The function code field contains one byte. See the section titled “Function codes supported by the PT2”.

Data field
The data field contains one or more bytes. This information is used by the analyzers to take the action defined by the function code.

CRC field
The CRC (cyclical redundancy check) field is two bytes, containing a 16-bit binary value. The CRC value is calculated by the transmitting device, which appends the CRC to the message. The receiving device recalculates a CRC during receipt of the message, and compares the calculated value to the actual value it received in the CRC field. If the two values are not equal, the message will be discarded.

The CRC is started by first preloading a 16-bit register to all 1’s. Then a process begins of applying successive 8-bit bytes of the message to the current contents of the register. During the generation of the CRC, each 8-bit character is exclusive ORed with the register contents. Then the result is shifted in the direction of the least significant bit (LSB), with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined. If the LSB was a 1, the register is then exclusive ORed with a preset fixed value. If the LSB was a 0, no exclusive OR takes place.

The process is repeated until eight shifts have been performed. After the last (eight) shift, the next 8-bit byte is exclusive ORed with the register’s current value, and the process repeats for eight more shifts as described above. The final contents of the register, after all the bytes of the message have been applied, is the CRC value.
When the CRC is appended to the message, the low-order byte is appended first, followed by the high-order byte.

Function codes supported by the PT2

01 Read Coil Status

Description
Reads the ON/OFF status of the setpoint relays being controlled by the PT2 analyzer.

Query
The query message specifies the starting channel setpoint relay and quantity of channel setpoint relays to be read. Channel setpoint relays are addressed starting at zero. Channel setpoint relays 1 – 16 are addressed as 0 – 15. The setpoint relay status of unused channels is undefined.

Below is an example of a request to read channel setpoint relays 1 – 8 with slave address 1.

Field Name	Example
Slave Address	01
Function	01
Starting Address Hi	00
Starting Address Lo	00
No. of Relays Hi	00
No. of Relays Lo	08
CRC	--

The coil status in the response message is packed as one relay per bit of the data field. Status is indicated as: 1 = ON; 0 = OFF. The LSB of the first data byte contains the relay addressed in the query. The other relays follow toward the high order end of this byte.

Below is an example of a response to the previous query.

Field Name	Example
Slave Address	01
Function	01
Byte Count	01
Data	05
CRC	--

The status of channel setpoint relays 1 and 3 is ON and the status of channel setpoint relays 2, 4, 5, 6, 7 and 8 is OFF.

04 Read Input Registers

Reads the binary contents of input registers in the PT2 analyzer.

Query
The query message specifies the starting register address and the quantity of registers to be read.

The PT2 input registers are as follows:

Address	Modbus Reference	Register
0000	30001	Channel 1 status
0001	30002	Channel 1 primary measurement
0002	30003	Channel 1 secondary measurement
0003	30004	Channel 2 status
0004	30005	Channel 2 primary measurement
0005	30006	Channel 2 secondary measurement
0006	30007	Channel 3 status
0007	30008	Channel 3 primary measurement
0008	30009	Channel 3 secondary measurement
0009	30010	Channel 4 status
000A	30011	Channel 4 primary measurement
000B	30012	Channel 4 secondary measurement
000C	30013	Channel 5 status
000D	30014	Channel 5 primary measurement
000E	30015	Channel 5 secondary measurement
000F	30016	Channel 6 status
0010	30017	Channel 6 primary measurement
0011	30018	Channel 6 secondary measurement
0012	30019	Channel 7 status
0013	30020	Channel 7 primary measurement
0014	30021	Channel 7 secondary measurement
0015	30022	Channel 8 status
0016	30023	Channel 8 primary measurement
0017	30024	Channel 8 secondary measurement
0018	30025	Channel 9 status
0019	30026	Channel 9 primary measurement
001A	30027	Channel 9 secondary measurement
001B	30028	Channel 10 status
001C	30029	Channel 10 primary measurement
001D	30030	Channel 10 secondary measurement
001E	30031	Channel 11 status
001F	30032	Channel 11 primary measurement
0020	30033	Channel 11 secondary measurement
0021	30034	Channel 12 status
0022	30035	Channel 12 primary measurement
0023	30036	Channel 12 secondary measurement
0024	30037	Channel 13 status
0025	30038	Channel 13 primary measurement
0026	30039	Channel 13 secondary measurement
0027	30040	Channel 14 status
0028	30041	Channel 14 primary measurement
0029	30042	Channel 14 secondary measurement
002A	30043	Channel 15 status
002B	30044	Channel 15 primary measurement
002C	30045	Channel 15 secondary measurement
002D	30046	Channel 16 status
002E	30047	Channel 16 primary measurement

002F	30048	Channel 16 secondary measurement

The Model 20 sensor will report the channel status as follows:

Status	Description
Bits 15-8	0x01 (Model 20)
Bits 7-0	0 = normal;
Bit 7	Reserved
Bit 6	Factory Mode Flag
Bit 5	Temperature Out of Range
Bit 4	Temperature Overflow
Bit 3	Reference Negative
Bit 2	Reference Overflow
Bit 1	Main Negative
Bit 0	Main Overflow

The Model 20 sensor will report D.O. as the primary measurement and temperature as the secondary measurement. The units for D.O. are hundredths of ppm or hundredths of %Saturation and the units for temperature are tenths of °C.

The Model 25 sensor will report the channel status as follows:

Status	Description
Bits 15-8	0x02 (Model 25)
Bits 7-0	Status code
0	Normal
1	Reserved
2	Faulty reference
3	TSS > 30000
4	Sensor requires a zero calibration

The Model 25 sensor will report TSS as the primary measurement and the secondary measurement is undefined. The units for TSS are mg/l.

The Model 28 pH/ORP sensor will report the channel status as follows:

Status	Description
Bits 15-8	0x03 (pH) or 0x04 (ORP)
Bits 7-0	0 = normal;
Bit 7-4	Reserved
Bit 3	pH Out of Range
Bit 2	Temperature Out of Range
Bit 1	mV Out of Range
Bit 0	Reserved

The Model 28 pH sensor will report pH as the primary measurement and temperature as the secondary measurement. The units for pH are hundredths of pH and the units for temperature are tenths of °C.
The Model 28 ORP sensor will report ORP as the primary measurement and temperature as the secondary measurement. The units for ORP are mV and the units for temperature are tenths of °C.

Below is an example of a request to read the channel 2 status and channel 2 primary and secondary measurement registers from an analyzer with the slave address of 1.

Field Name	Example
Slave Address	01
Function	04
Starting Address Hi	00
Starting Address Lo	03
No. of Regs. Hi	00
No. of Regs. Lo	03
CRC	--

Below is an example of a response to the previous query where channel 2 is connected to a Model 20 D.O. sensor measuring 8.3 ppm at 25.0°C.

Field Name	Example
Slave Address	01
Function	04
Byte Count	06
Data Hi (Reg 3)	01
Data Lo (Reg 3)	00
Data Hi (Reg 4)	03
Data Lo (Reg 4)	3E
Data Hi (Reg 5)	00
Data Lo (Reg 5)	FA
CRC	--

Exception Responses

If the PT2 analyzer receives a query without a communication error, but cannot handle it, an exception response will be returned.

In a normal response, the PT2 echoes the function code of the original query in the function code field of the response. In an exception response, the PT2 sets the MSB of the function code to 1. This makes the function code value in an exception response exactly 80 hexadecimal higher than the value would be for a normal response.
The data field in an exception response contains an exception code. The exception codes supported by the PT2 are:

Exception code	Description
01	Illegal function code
02	Illegal data address

SELF-CLEANING

The jet clean system is intended to clean one sensor and is connected to the Clean Relay in the ST2. The Clean Relay is connected to the InsiteIG CA1 compressor or to a customer supplied solenoid valve connected to an air or water supply. See drawing IIG08R112 and IIG08R113 for details. The self-cleaning has two parameters that are set on the Channel Setup Screen (see Figure 46).

The Schedule parameter determines how often the clean cycle will occur. This parameter can be set to values between 10 minutes and 4 hours or it can be turned Off. Typically, a clean schedule of every 2 hours works well for aeration basins. In colder climates, condensation may form then freeze in the cleaning tubing. To prevent this, set the clean schedule to 10 or 20 minutes.

The Duration parameter determines how long the clean cycle will last. The clean pulse can be set to values of 5 seconds to 90 seconds with a 1 second resolution. Typically, a clean pulse of 30 seconds works well for aeration basins. The PT2 analyzer will hold the measurement reading during the clean cycle and the recovery period which is equal to twice the duration time.

A Demand Clean cycle may be performed by highlighting Demand Cln on the Channel Setup Screen (see above) and pressing either the + or – on the PT2 keypad (if the Clean Schedule is not set to OFF). Performing a demand clean cycle doesn't affect the normal clean schedule.

The InsiteIG Model CA-1 Compressor consists of a compressor pump which delivers a sufficient blast of air to clean debris from the optics in most wastewater treatment plant basins. It is housed in a UL, NEMA 4X, polycarbonate enclosure (see drawing IIG01N030) with quick disconnect ¼" tubing fittings provided on the bottom of the enclosure. A ¼" OD flexible tube with a 70 psi rating (customer supplied) connects the sensor to the compressor assembly. Quick disconnect fittings are supplied on both the sensor head and compressor. The tubing length should be as short as possible. (If over 100' please consult the factory)

The compressor system should be mounted as close to the sensor as possible. The tubing connection, input power and relay connection to the ST2; are on the bottom of the enclosure. Handrail brackets are available for the compressor enclosure.

If plant water is being used, or shop air, the customer must supply clean water at 35 to 50 psig or air at 40 to 60 psig. The supply water (or air) is connected to the solenoid valve and the analyzer need only open the valve to provide the cleaning blast.

All of the InsiteIG sensors have the jet clean design built-into the sensor housing. The sensors are constructed of impact resistant epoxies and polyurethanes, suitable for most waste treatment. The nozzle aims the water, or air, stream across the measuring surface of the sensor, removing any debris that may cause fouling. A ¼" quick disconnect fitting is supplied with the sensor.

When using plant water, a 2-way solenoid valve (customer supplied) may be used to turn on and off the water to the sensor head. See drawing IIG08R113 for wire details. There are no changes required in the sensor head for use with water or shop air.

GUARANTEE AND REPAIR POLICY

The Models PT2 and ST2 are guaranteed for two years against defective materials and workmanship. All 20 series sensors are guaranteed for five years against manufacturing defects. They will be replaced or repaired free of charge during the guarantee period. Call the factory at 985-639-0006 for a return authorization number for traceability. Mark the package to the attention of the R/A number and address it to the factory at 80 Whisperwood Blvd., Suite 107, Slidell, LA 70458. Freight to the factory is to be paid by the customer and items should be insured in case of damage or loss of shipment.

All shipments are insured. If you receive a damaged unit, please notify InsiteIG immediately at 985-639-0006.

Repairs to the equipment not covered by the guarantee will be billed per standard service charges.

MAINTENANCE

The PT2 and ST2 do not require any periodic maintenance. However, it may be necessary to periodically clean the exterior of the enclosures. This may be done with a soft brush, broom or low pressure water rinse.

> **DO NOT! use hi-pressure water or a pressure washer to clean the enclosures. They are likely to be damaged during pressure washing.**

The sensor must be kept clean for accurate readings. Normally, the jet clean system will adequately perform this function.

Model 20 series D.O. Sensor: In normal wastewater aeration basins the Model 10 Sensor will not require a jet clean system; however it is important that the aqueous sample to be measured be allowed to come in contact with the measuring surface. The sensor should be visually inspected on a monthly basis to insure that rags and hair have not completely covered the measuring surface. During this time InsiteIG recommends rinsing the sensor with a water hose.

In systems with high bio-slim and scaling, the integrated jet clean system is recommended to prevent the slim and scale from attaching itself to the measuring surface. If wiping the sensing element is required, use a wet cloth, do not use a brush.

Fouling conditions at wastewater treatment facilities vary considerably from plant to plant. Experience gained during the first few months of sensor operation will allow the plant operators to determine their own reasonable schedule of sensor inspection. In no case should this inspection interval exceed one year.

Model 25 series TSS Sensor: The sensor must be kept clean for accurate readings. Normally, the jet clean system will adequately perform this function. However, the sensor should be retrieved and cleaned manually on a periodic basis to remove the heaviest fouling that may impair the performance of the sensor. The frequency of this cleaning will vary depending on the application.

Model 28 series pH/ORP electrode holder: The housing should be kept reasonably clean. The holder should never be put into service without an electrode installed. Doing so will cause failure and will void the warranty. The frequency of cleaning will vary depending on the application.

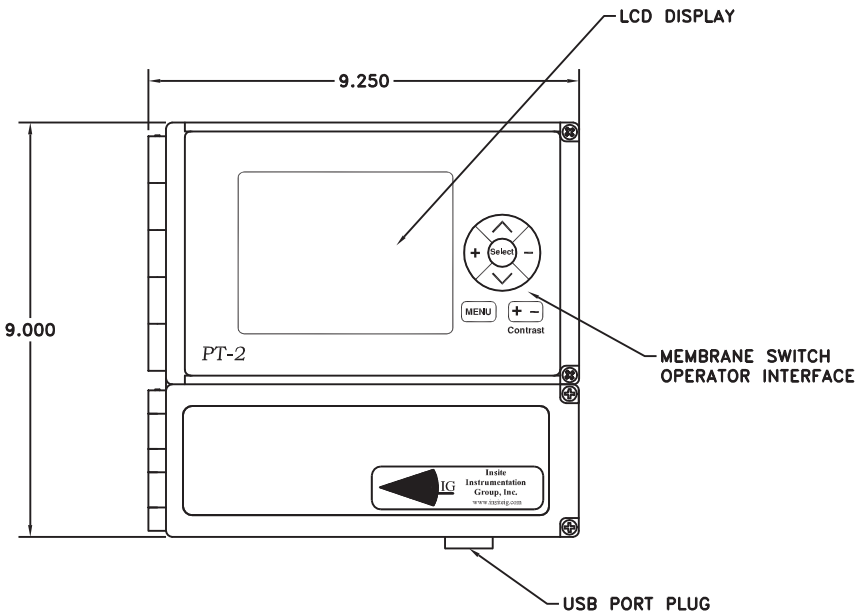
Model 51/52 pH/ORP Electrode: The electrodes are shipped with a protective boot over the pH glass. This boot should be used to keep the electrode glass wet while the electrode is out of service. If the electrode system has been unused for a long period of time, immerse the flat glass end of the electrode(s) in tap water for at least 30 minutes. This hydrates the pH flat glass and prepares the liquid junction of the reference electrode for contact with the test solution. To maintain response, the electrode system should always remain wet. The preferred storage solution is pH 4.0 buffer with saturated KCl added. Tap water will suffice for short term storage.

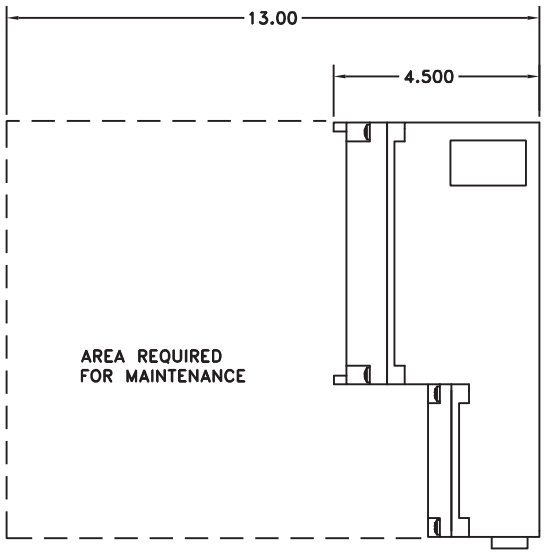
NOTE: Do not soak in distilled water. Utilize the pliable storage boot provided with the electrode(s) for storage.

Electrodes which are not broken or cracked can be restored, or rejuvenated, to full response by the following procedures:

- **Inorganic Scale Deposits -** Dissolve the deposit by immersing the electrode first in 0.1M HCl, then in 0.1M NaOH, and again in 0.1M HCl. Each immersion should be for a 5 minute period.
- **Organic Oil or Grease Films -** Wash electrode tip in a liquid detergent and water. If film is known to be soluble in a particular organic solvent, wash with this solvent. Rinse electrode tip in tap water.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED





Notes:

1. Construction: Polycarbonate (PC), NEMA 4X, IP66, IP67, IP68 Enclosure is UL Listed BE-097461
2. Approximate Weight: 6 LB..

In "Normal Operation" the hinged cover is to remain tightly screwed closed. Under no circumstance is it necessary for the operator to open the enclosure.

Warning! – Before opening; switch off the analyzer power at the circuit breaker to avoid risk of shock.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .XX ±.010 .XXX ±.005 ANGULAR X° ±1° DO NOT SCALE DRAWING	CONTRACT NO.	
	DRAWN	DATE
	CHECK	
MATERIAL –	DESIGN	
FINISH –	APPROVED	
SPEC.	CUSTOMER	

InsiteIG
80 Whisperwood Blvd.
Suite 107
Slidell, LA 70458

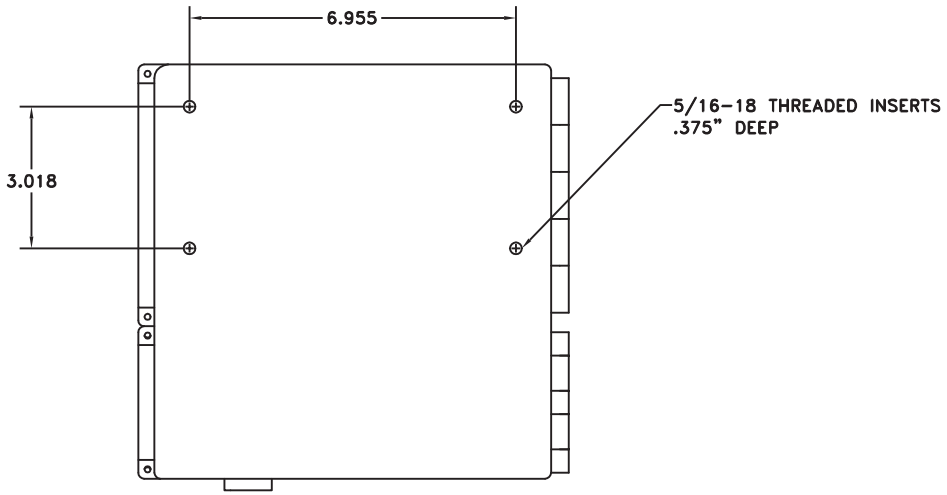
TITLE: Outline & Mounting PT 2

SIZE	DWG NO.	REV
C	IIG08N001	–

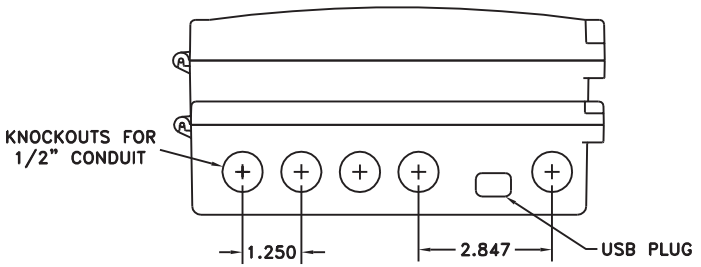
SCALE NTS | SHEET 1 OF 2

DWG. No IIG08N001 REV. 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



BACK VIEW

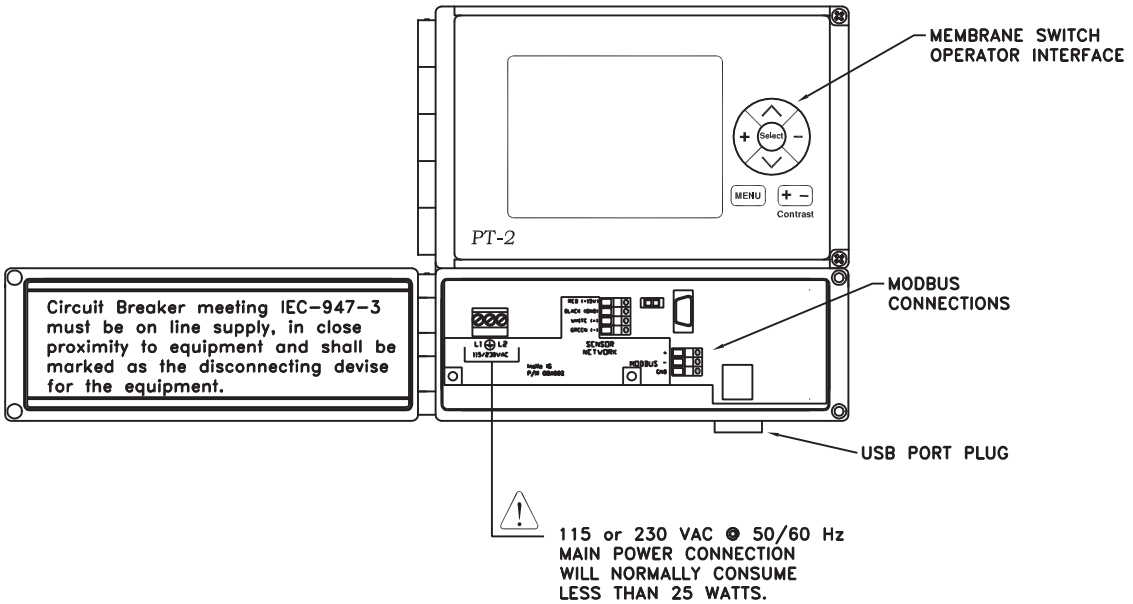


FRONT VIEW

SIZE	DWG NO.	REV
C	IIG08N001	—
SCALE NTS		SHEET 2 OF 2

DWG. NO IIG08N001 REV. 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



Notes:

1. Construction: Polycarbonate (PC), NEMA 4X, IP66, IP67, IP68
   Enclosure is UL Listed BE-097461
2. Approximate Weight: 6 LB..

In "Normal Operation" the hinged cover is to remain tightly screwed closed. Under no circumstance is it necessary for the operator to open the enclosure.

Warning! – Before opening; switch off the analyzer power at the circuit breaker to avoid risk of shock.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .XX ±.010 .XXX ±.005 ANGULAR X° ±1° DO NOT SCALE DRAWING	CONTRACT NO.	
	DRAWN	DATE
	CHECK	
MATERIAL –	DESIGN	
FINISH –	APPROVED	
SPEC.	CUSTOMER	

InsiteIG
80 Whisperwood Blvd.
Suite 107
Slidell, LA 70458

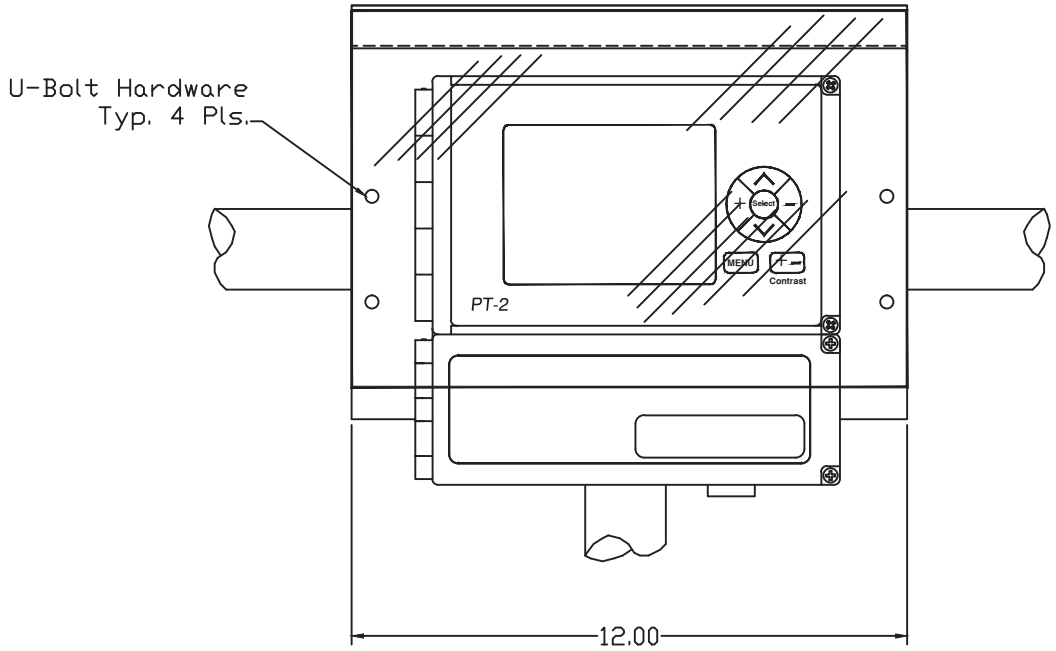
TITLE
Customer Connections
PT 2

SIZE	DWG NO.	REV
C	IIG08R001	–

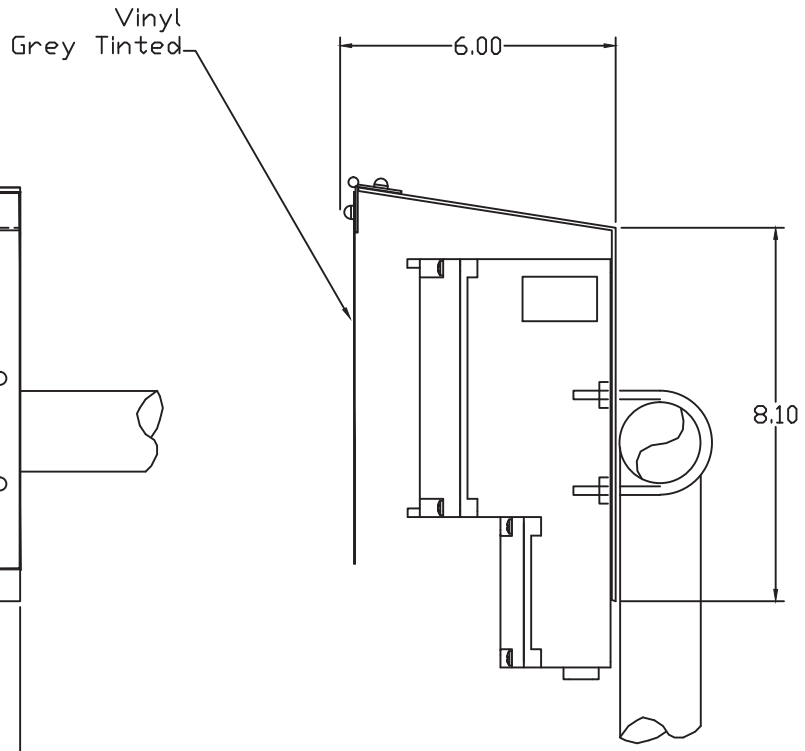
SCALE NTS | SHEET 1 OF 2

DWG. No IIG08R001 REV. 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



Front View



Right Side View

NOTES:

1. Weight Without Analyzer 4.0 lbs
2. Material - 304 SS
3. Material Gauge - 14 Gauge
4. Finish - Passivated

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .XX ±.010 .XXX ±.005 ANGULAR X° ±1° DO NOT SCALE DRAWING	CONTRACT NO.	
MATERIAL –	DRAWN	DATE
FINISH –	CHECK	
SPEC.	DESIGN	
	APPROVED	
	CUSTOMER	

InsiteIG
80 Whisperwood Blvd.
Suite 107
Slidell, LA 70458

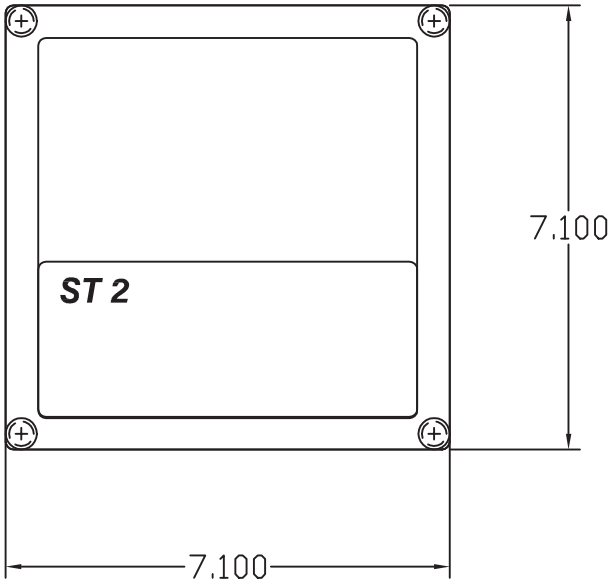
TITLE
SUN SHADE O&M
PT2 SS1

SIZE	DWG NO.	REV
C	IIG08N022	–

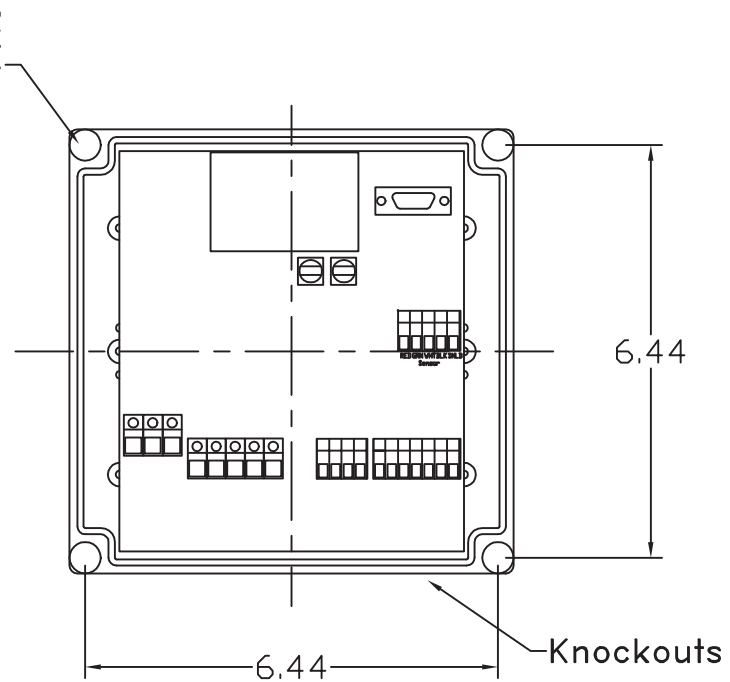
SCALE NTS | SHEET 1 OF 1

REV. –
DWG. No IIG08N022

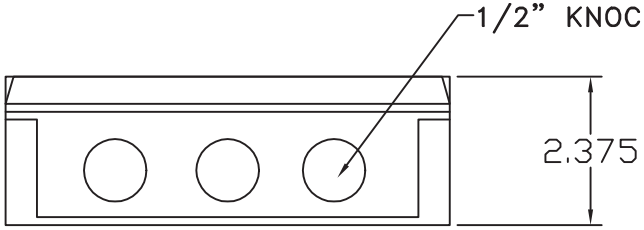
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



PLAN VIEW



PLAN VIEW
W/ COVER REMOVED



BOTTOM VIEW

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS ANGULAR
.XX ±.010 X° ±1°
.XXX ±.005
DO NOT SCALE DRAWING

MATERIAL –

FINISH –

SPEC.

CONTRACT NO.

	DATE
DRAWN	
CHECK	
DESIGN	
APPROVED	
CUSTOMER	

InsiteIG
80 Whisperwood Blvd.
Suite 107
Slidell, LA 70458

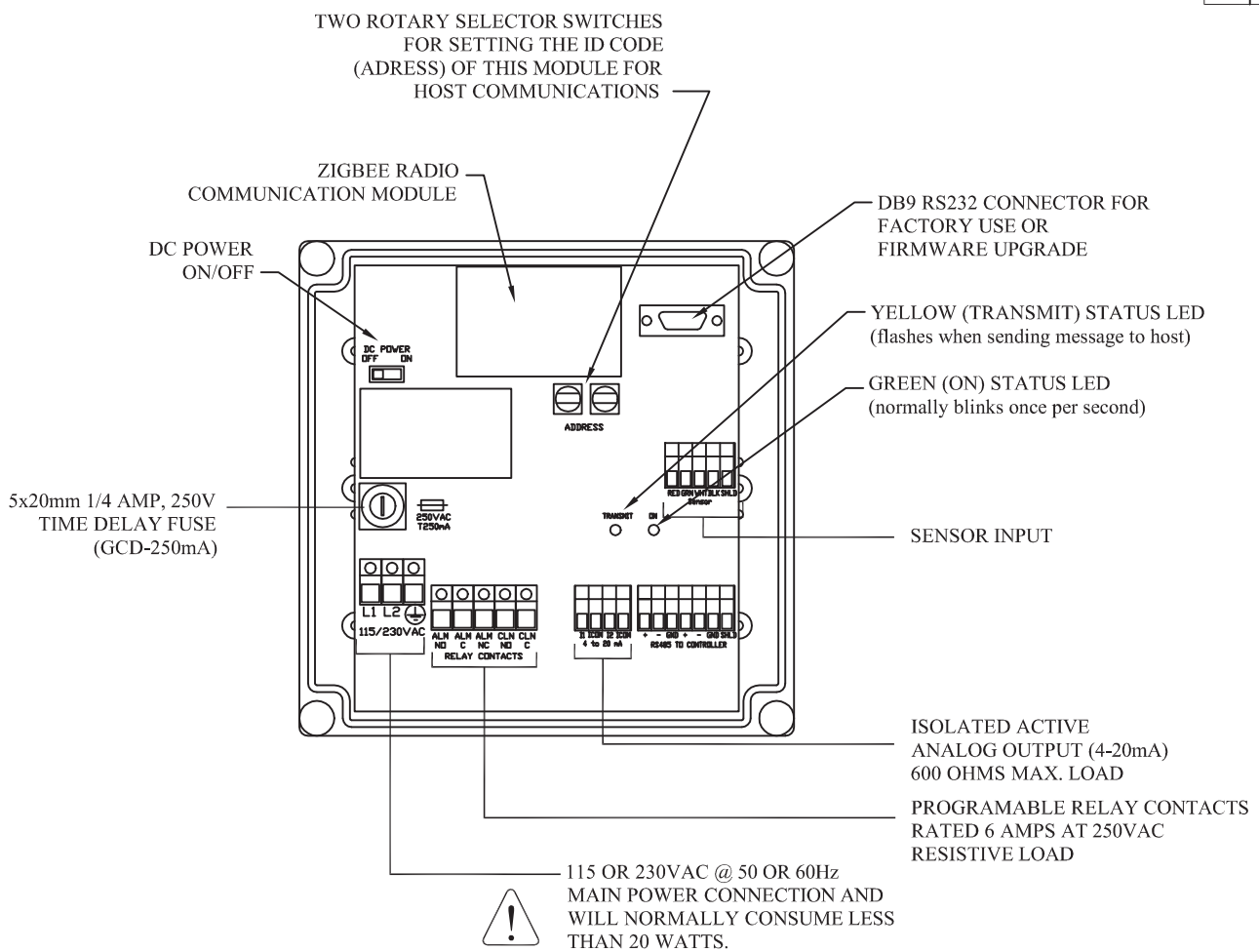
TITLE
ST 2
OUTLINE & MOUNTING

SIZE	DWG NO.	REV
C	IIG08N101	–

SCALE NTS SHEET 1 OF 1

REV. –
DWG. No IIG08N101

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



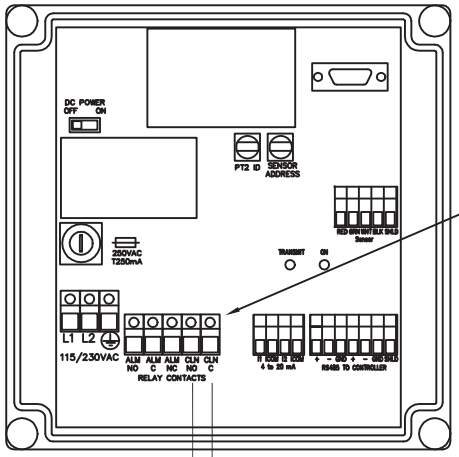
In "Normal Operation" the hinged cover is to remain tightly screwed closed. Under no circumstance is it necessary for the operator to open the enclosure.

Warning! - Before opening; switch off the analyzer power at the circuit breaker to avoid risk of shock.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .XX ±.010 .XXX ±.005 ANGULAR X° ±1° DO NOT SCALE DRAWING	CONTRACT NO.	InsiteIG 80 Whisperwood Blvd. Suite 107 Slidell, LA 70458
MATERIAL –	DRAWN / DATE	TITLE: ST 2 CUSTOMER CONNECTIONS
FINISH –	CHECK	SIZE C / DWG NO. IIG08R101 / REV –
SPEC.	DESIGN	SCALE NTS / SHEET 1 OF 1
	APPROVED	
	CUSTOMER	

DWG. No IIG08R101 REV. –

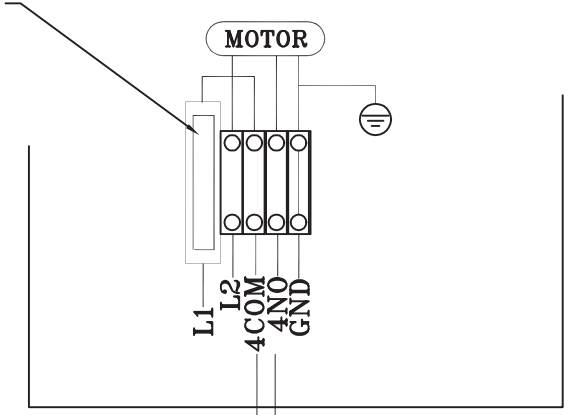
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



CLEAN RELAY

1-1/4" x 1/4"
3 AMP FUSE
MAX WITH
TIME DELAY
(GDC TYPE)

CUSTOMER SUPPLIED
2 CONDUCTOR CONNECTION
18 AWG OR LARGER (3AMP)
RATED FOR 115/230 VAC



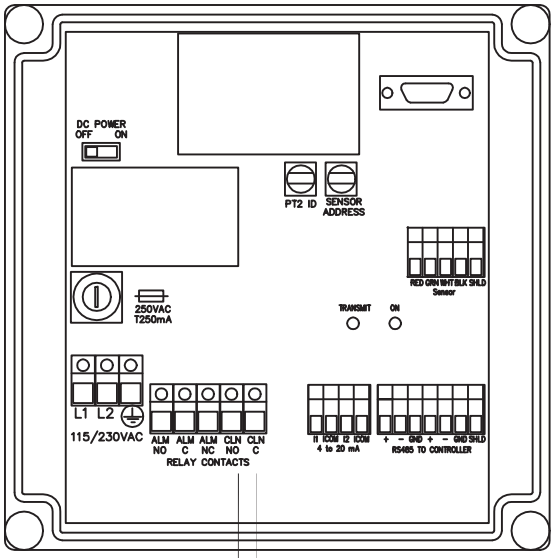
ST2 CONNECTIONS

COMPRESSOR CONNECTIONS
INSITE IG – MODEL CA1

REV. –
DWG. No IIG08R112

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS ANGULAR .XX ±.010 X° ±1° .XXX ±.005 DO NOT SCALE DRAWING	CONTRACT NO.	Insite IG 80 Whisperwood Blvd. Suite 107 Slidell, LA 70458
MATERIAL –	DRAWN / DATE	TITLE COMPRESSOR CONNECTION TO ST2
FINISH –	CHECK D. RADLE	SIZE C / DWG NO. IIG08R112 / REV –
SPEC.	DESIGN / APPROVED D. RADLE	SCALE NTS / SHEET 1 OF 1
	CUSTOMER	

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



NOTES:
1. **All solenoid wiring should be per National Electric Code.**
2. **Solenoid is general duty suitable for air and water to maximize flow at maximum pressure of 60 psi.**

L1 TO CLN RELAY "C"

Solenoid L1 to 4NO

L2

2–Way Shutoff Valve
ASCO P/N 8262G220–115VAC
OR EQUIVALENT
1/4" FNPT Connection

ST2 CONNECTIONS

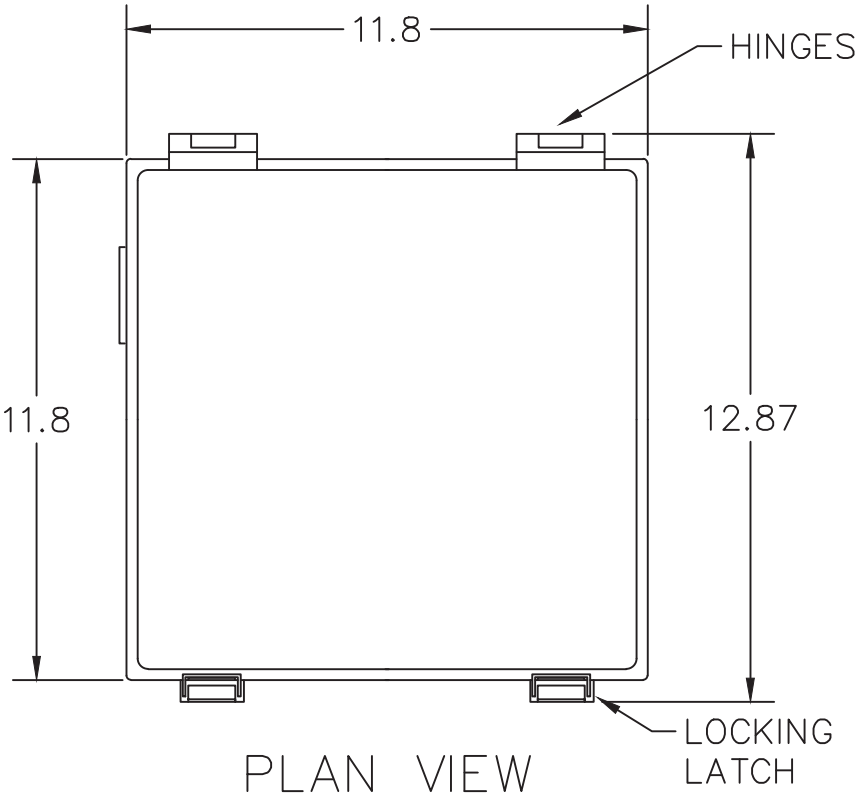
FOR SENSOR JET CLEAN

REV. 1

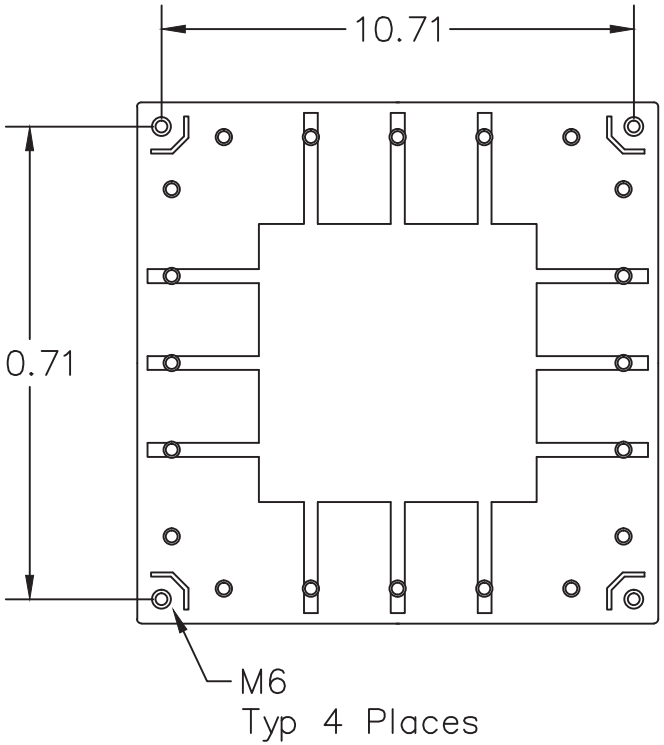
DWG. No IIG08R113

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS ANGULAR .XX ±.010 X° ±1° .XXX ±.005 DO NOT SCALE DRAWING	CONTRACT NO.	Insite IG 80 Whisperwood Blvd. Suite 107 Slidell, LA 70458
	DRAWN D. RADLE — DATE	TITLE: SOLENOID JET CONNECTION TO ST2
	CHECK	
MATERIAL –	DESIGN D. RADLE	
FINISH –	APPROVED	SIZE C — DWG NO. IIG08R113 — REV –
SPEC.	CUSTOMER	SCALE NTS — SHEET 1 OF 1

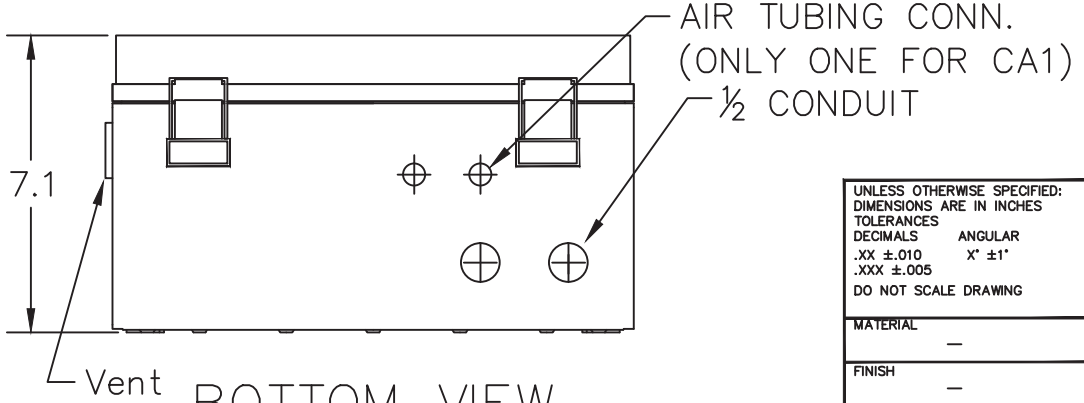
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



PLAN VIEW



BACK VIEW



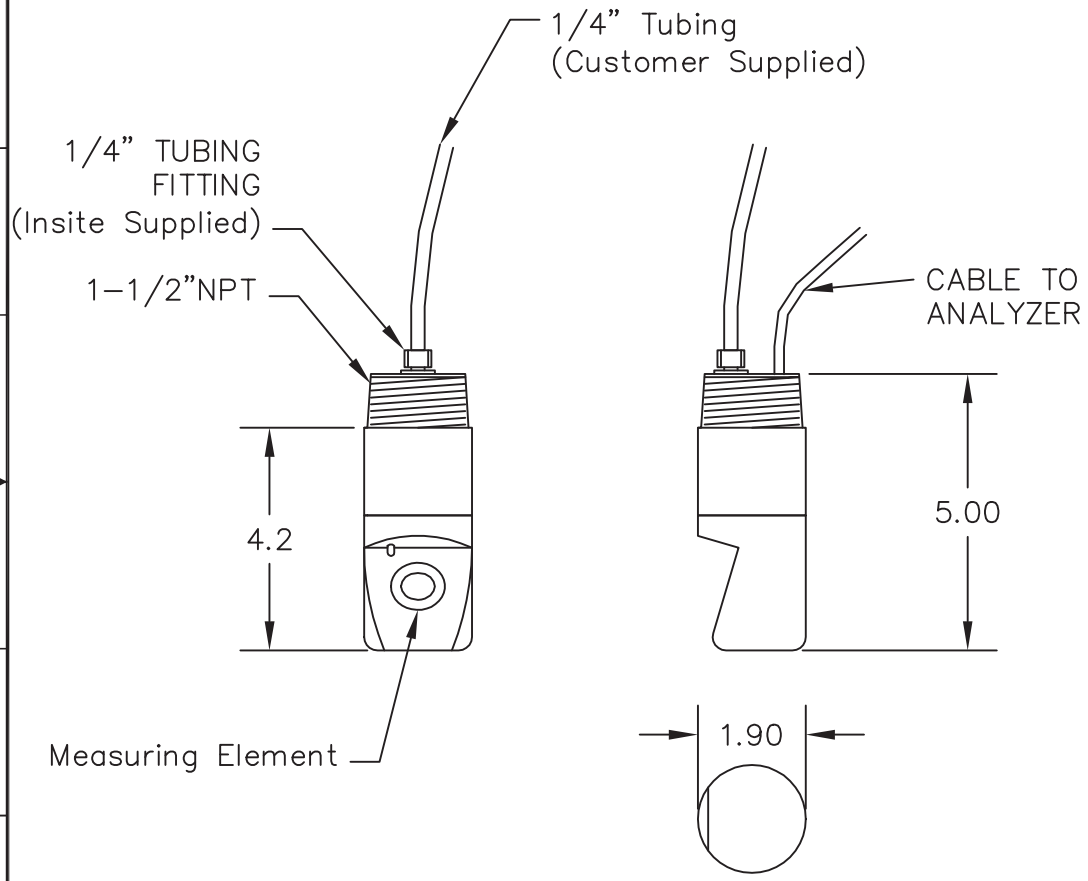
BOTTOM VIEW

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .XX ±.010 .XXX ±.005 ANGULAR X° ±1° DO NOT SCALE DRAWING	CONTRACT NO.		Insite IG 1550 W. Lindburg Dr. Slidell, LA 70458
	DRAWN D. RADLE	DATE 1/29/02	TITLE OUTLINE & MOUNTING MODEL CA1 & CA2 COMPRESSOR
	CHECK		
MATERIAL –	DESIGN D. RADLE	1/29/02	
FINISH –	APPROVED		SIZE C DWG NO. IIG01N030 REV A
SPEC.	CUSTOMER		SCALE NTS SHEET 1 OF 1

DWG. No IIG01N030 REV. A

IIG02N004 | C

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



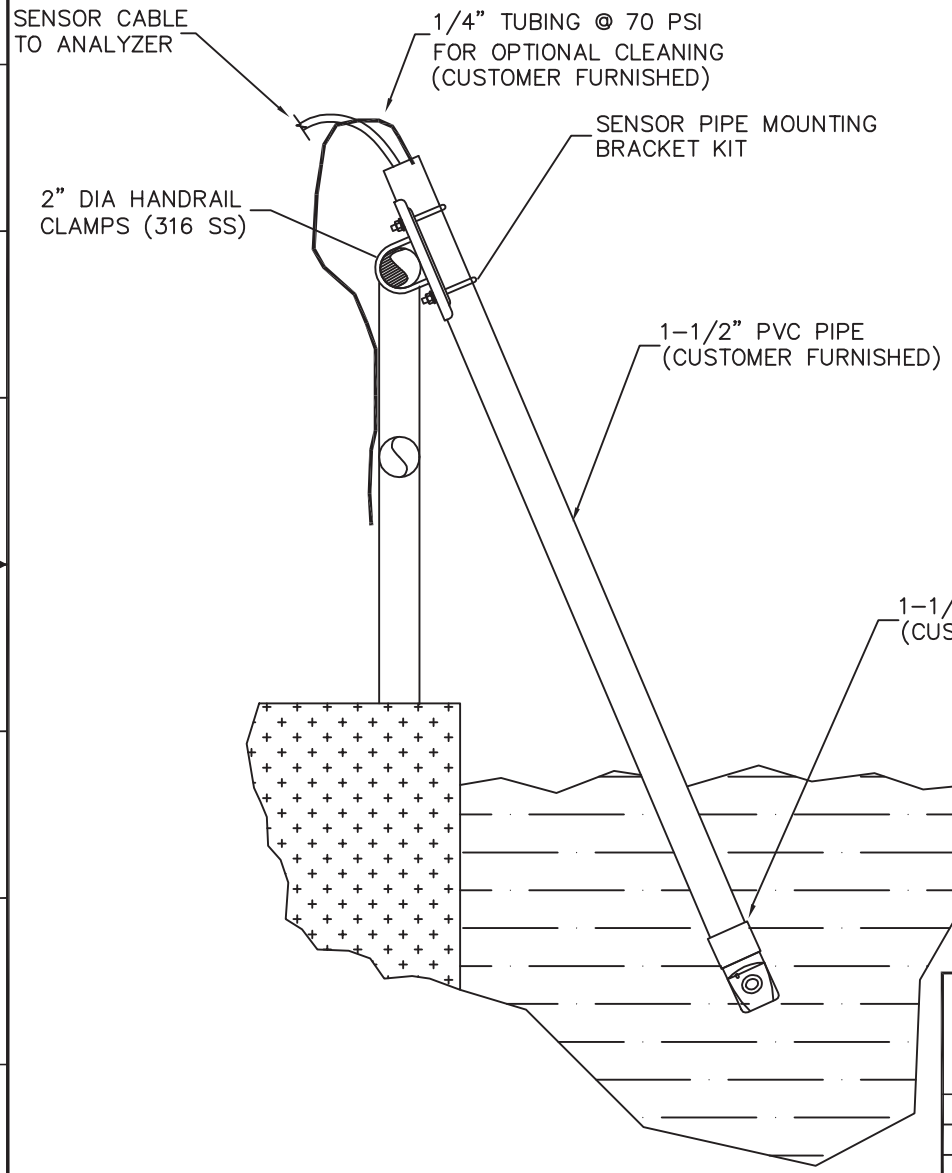
Notes:

1) Sensor Material: Epoxy, Polyurethane, PVC, 316 SS
2) Oxygen measurements should be take 2ft. below the surface and 3ft. from the wall.
3) Measurement element surface should not be facing downward in order to avoid collecting air bubbles.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES ON: FRACTIONS DECIMALS ANGLES MATERIAL _ SPEC FINISH _	CONTRACT NO.	InsiteIG 80 Whisperwood Blvd. Suite 107 Slidell, LA 70458
	SIGNATURES / DATES DRAFTSMAN CHECKER DESIGNER PROJ. ENGR. RELEASED APPROVAL	DO SENSOR OUTLINE & MOUNTING
		SIZE B | FSCM NO. | DRAWING NO. IIG02N004 | REV C
		SCALE NTS | SHEET 1 OF 1

IIG02N005 | A

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



Notes:

1) For best accuracy, Oxygen measurements should be taken 2ft. below the surface and 3ft. from the wall.
2) Measurement element surface should not be facing directly upward or downward. Sensor should be clocked to the 3 or 9 o'clock position as shown.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS
DECIMALS
ANGLES
MATERIAL _
SPEC
FINISH _

CONTRACT NO.

SIGNATURES	DATES
DRAFTSMAN	
CHECKER	
DESIGNER	
PROJ. ENGR.	
RELEASED	
APPROVAL	

InsiteIG
80 Whisperwood Blvd.
Suite 107
Slidell, LA 70458

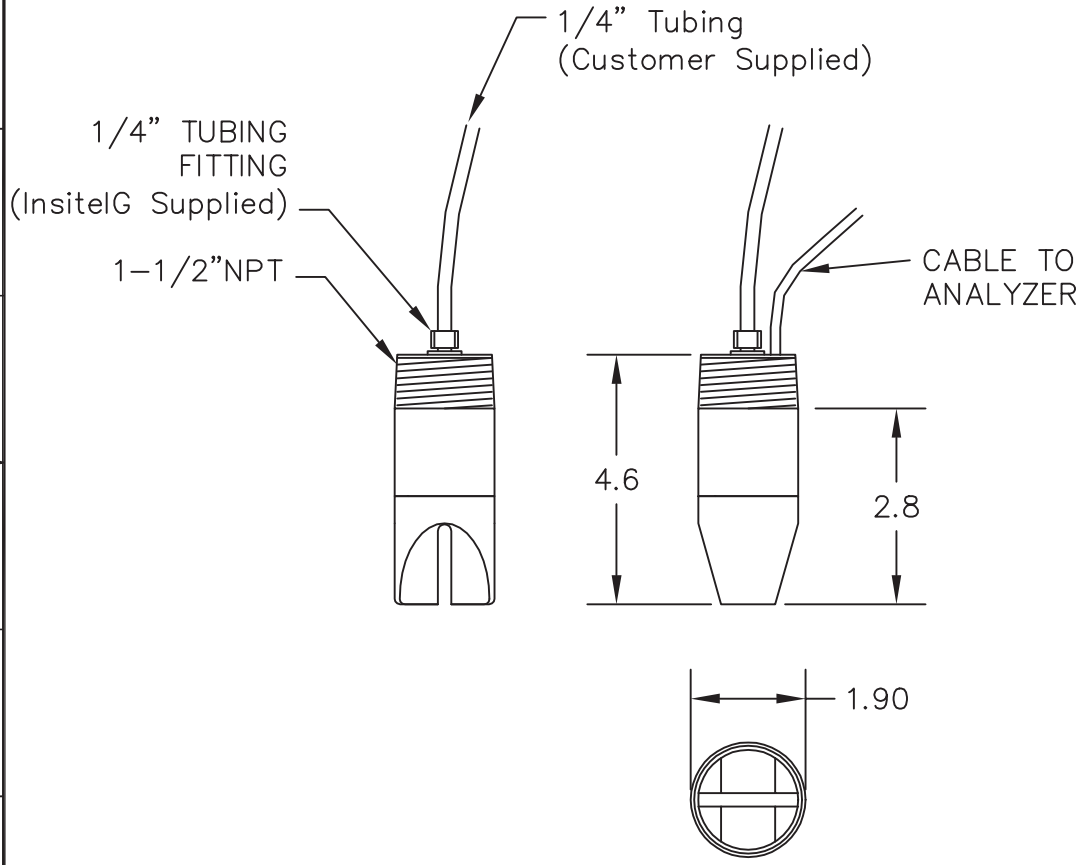
DO SENSOR MOUNTING

SIZE	FSCM NO.	DRAWING NO.	REV
B		IIG02N005	A

SCALE NTS | SHEET 1 OF 1

IIG03N004 | A

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



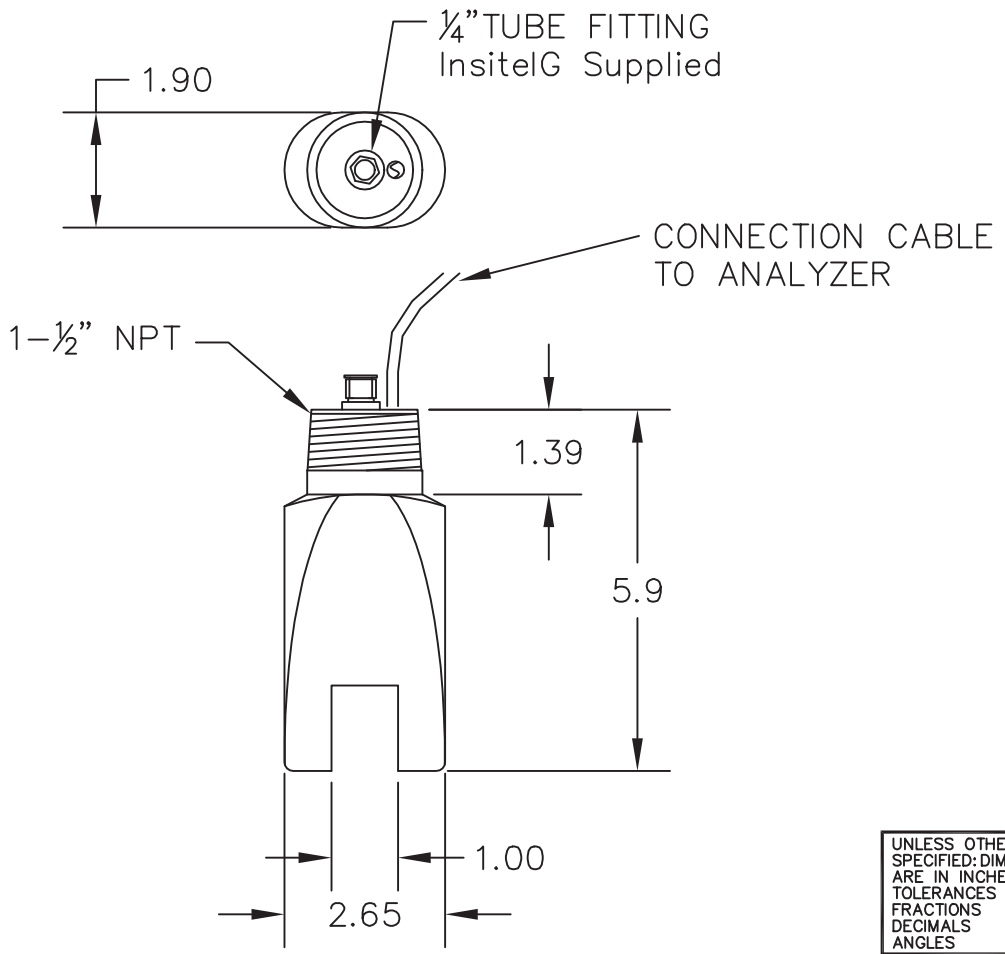
Notes:

1) Material: Epoxy, Polyurethane, & PVC
2) For best accuracy, Suspended Solids measurements should be taken 2ft. below the surface and 3ft. from the wall.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES ON: FRACTIONS DECIMALS ANGLES MATERIAL _ SPEC FINISH _	CONTRACT NO. SIGNATURES / DATES DRAFTSMAN CHECKER DESIGNER PROJ. ENGR. RELEASED APPROVAL	InsiteIG 80 Whisperwood Blvd. Suite 107 Slidell, LA 70458 TSS SENSOR OUTLINE & MOUNTING SIZE B | FSCM NO. | DRAWING NO. IIG03N004 | REV A SCALE NTS | SHEET 1 OF 1

IIG03N010 | –

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



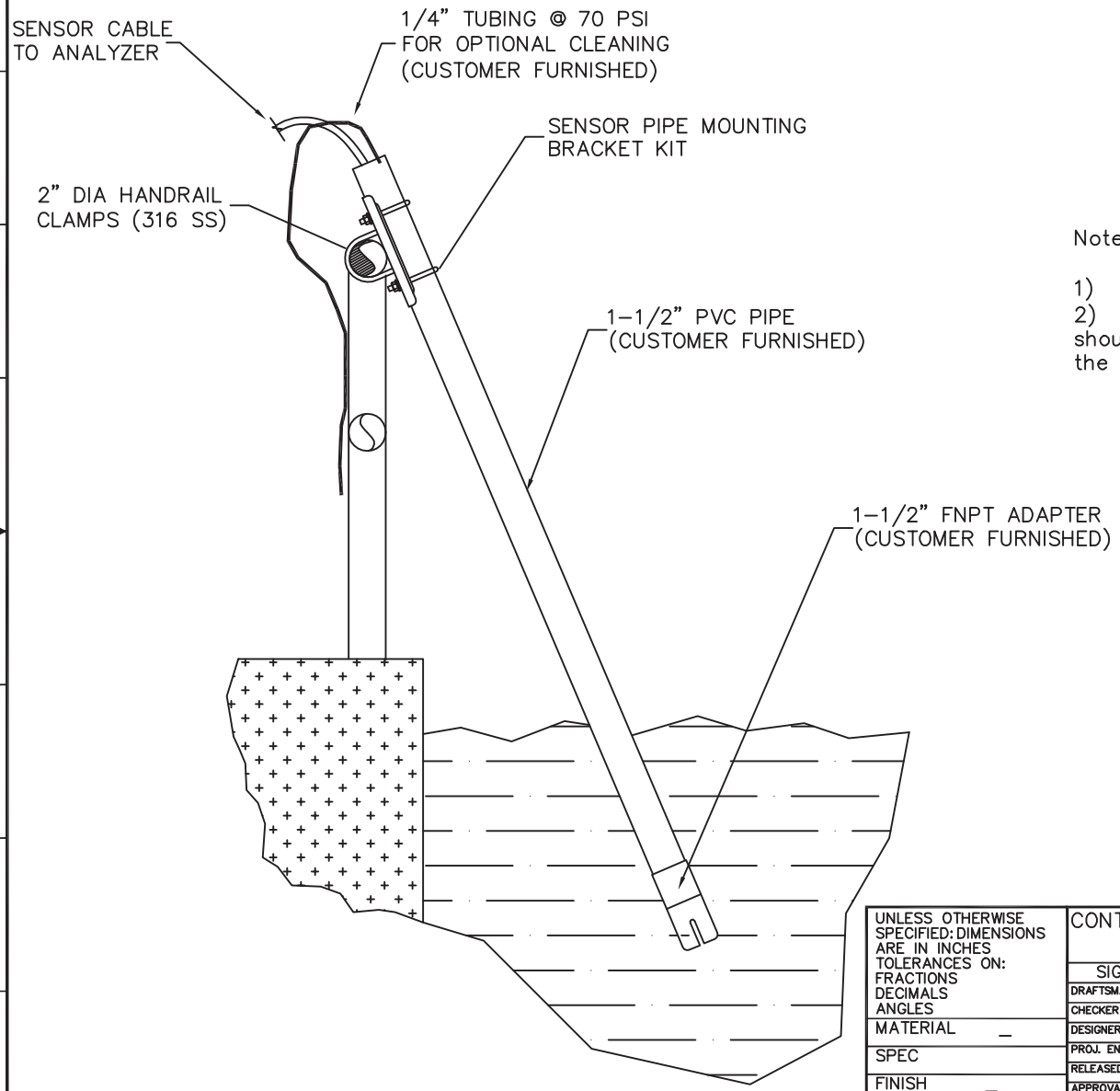
Notes:

1) Material: Epoxy, Polyurethane, & PVC
2) For best accuracy, Suspended Solids measurements should be taken 2ft. below the surface and 3ft. from the wall.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES ON: FRACTIONS DECIMALS ANGLES	CONTRACT NO.	InsitelG 80 Whisperwood Blvd. Suite 107 Slidell, LA 70458
MATERIAL Listed	SIGNATURES / DATES	Outline & Mounting Low Range 15L/25L Sensor
SPEC	DRAFTSMAN	SIZE B | FSCM NO. | DRAWING NO. IIG03N010 | REV –
FINISH –	CHECKER	SCALE NTS | SHEET 1 OF 1
	DESIGNER	
	PROJ. ENGR.	
	RELEASED	
	APPROVAL	

IIG03N005 | A

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



Notes:

1) Material: Epoxy, Polyurethane, & PVC
2) For best accuracy, Suspended Solids measurements should be taken 2ft. below the surface and 3ft. from the wall.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES
TOLERANCES ON:
FRACTIONS
DECIMALS
ANGLES
MATERIAL _
SPEC
FINISH _

CONTRACT NO.

SIGNATURES	DATES
DRAFTSMAN	
CHECKER	
DESIGNER	
PROJ. ENGR.	
RELEASED	
APPROVAL	

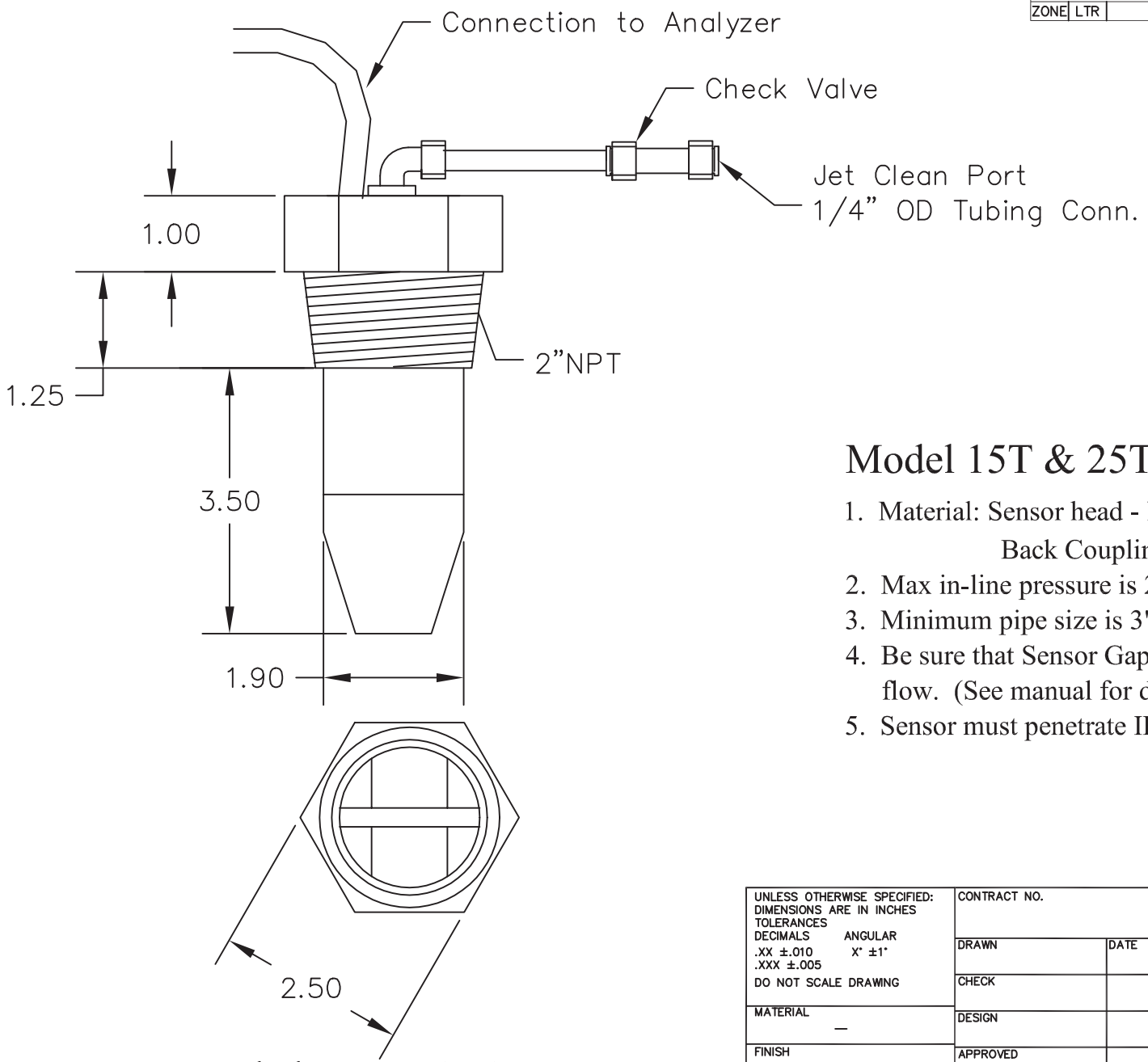
InsiteIG
80 Whisperwood Blvd.
Suite 107
Slidell, LA 70458

TSS SENSOR MOUNTING

SIZE	FSCM NO.	DRAWING NO.	REV
B		IIG03N005	A

SCALE NTS | SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



Model 15T & 25T

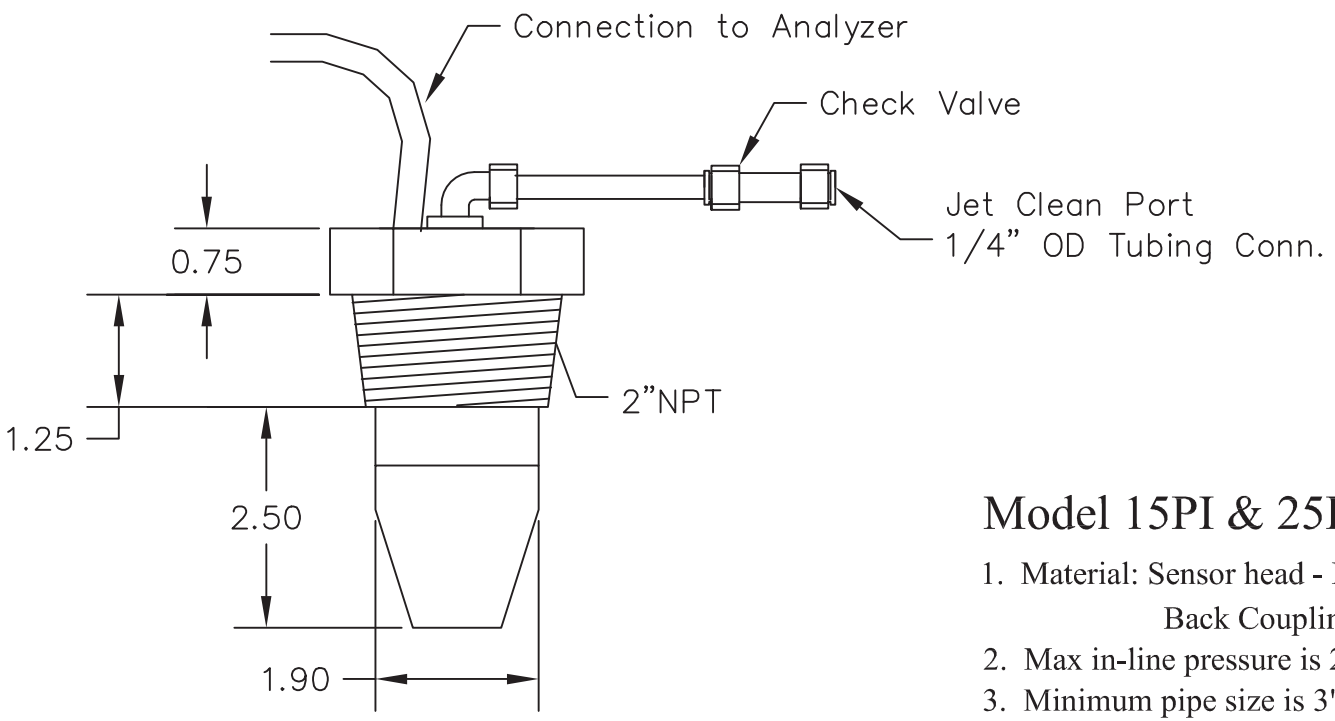
Model 15T & 25T Notes:

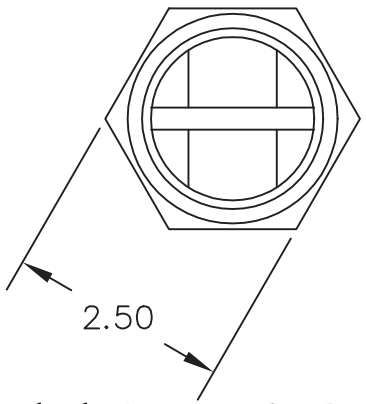
1. Material: Sensor head - Epoxy and Polyurethane
   Back Coupling - Gray PVC
2. Max in-line pressure is 20psi
3. Minimum pipe size is 3" nominal dia.
4. Be sure that Sensor Gap is in-line with sample flow. (See manual for details.)
5. Sensor must penetrate ID of the pipe by 1.5".

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS ANGULAR .XX ±.010 X° ±1° .XXX ±.005 DO NOT SCALE DRAWING	CONTRACT NO.	InsiteIG 80 Whisperwood Blvd. Suite 107 Slidell, LA 70458
MATERIAL –	DRAWN / DATE	TITLE: OUTLINE & MOUNTING MODEL 15T/PI & 25T/PI
FINISH –	CHECK	SIZE C / DWG NO. IIG03N006 / REV B
SPEC.	DESIGN	SCALE NTS / SHEET 1 OF 3
	APPROVED	
	CUSTOMER	

DWG. No IIG03N006 REV. B

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED





Model 15PI & 25PI

Model 15PI & 25PI Notes:

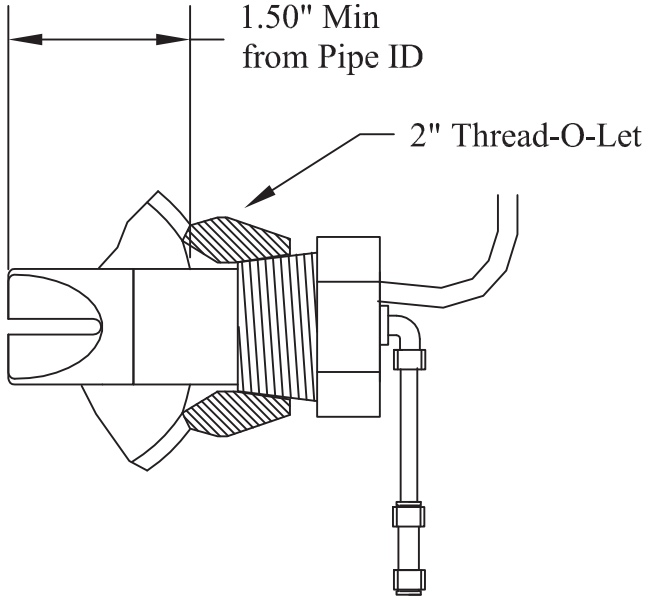
1. Material: Sensor head - Epoxy and Polyurethane
   Back Coupling - 316 Stainless Steel, Passivated
2. Max in-line pressure is 20psi
3. Minimum pipe size is 3" nominal dia.
4. Be sure that Sensor Gap is in-line with sample flow. (See manual for details.)
5. Sensor must penetrate ID of the pipe by 1.5".

SIZE	DWG NO.	REV
C	IIG03N006	B
SCALE NTS		SHEET 2 OF 3

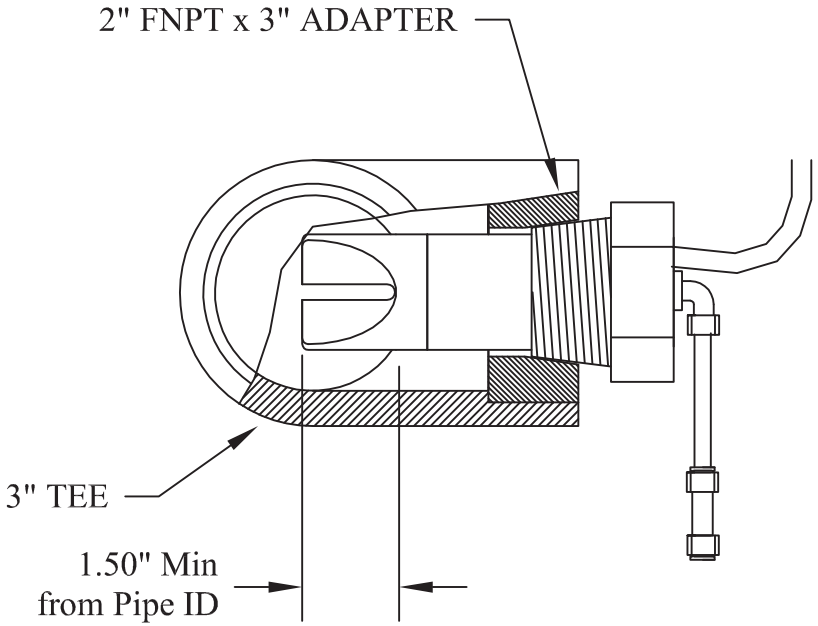
REV. D

DWG. No IIG03N006

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



Thread–O–Let
Installation



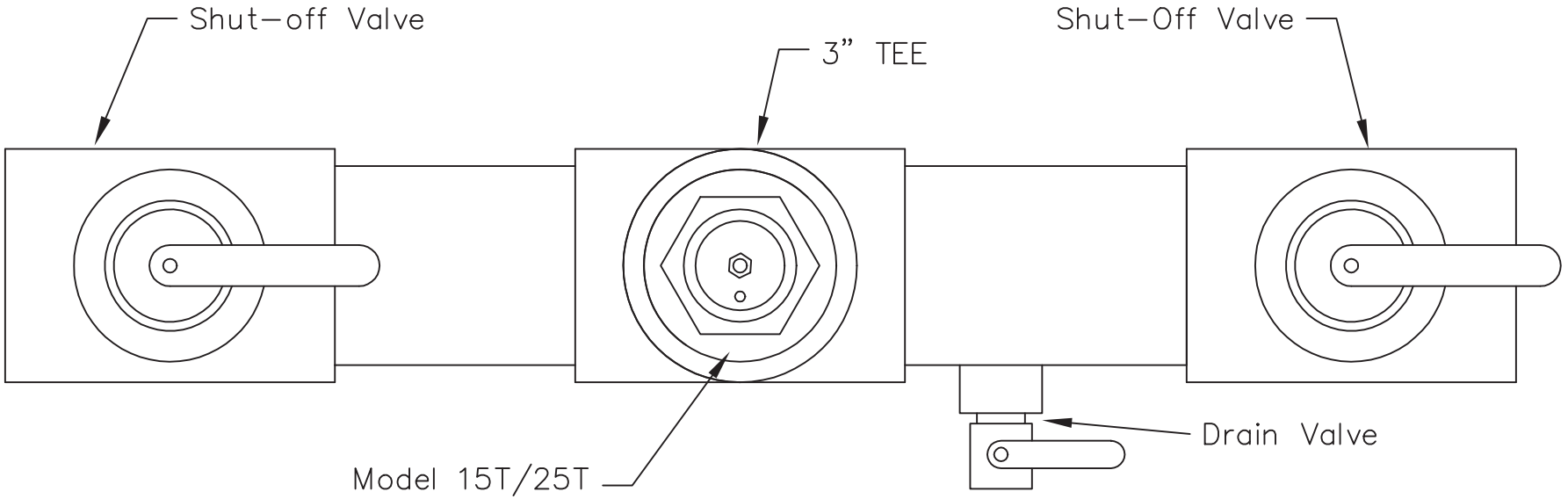
PVC TEE Installation

SIZE	DWG NO.	REV
C	IIG03N006	B
SCALE NTS		SHEET 3 OF 3

REV. D

DWG. No IIG03N006

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



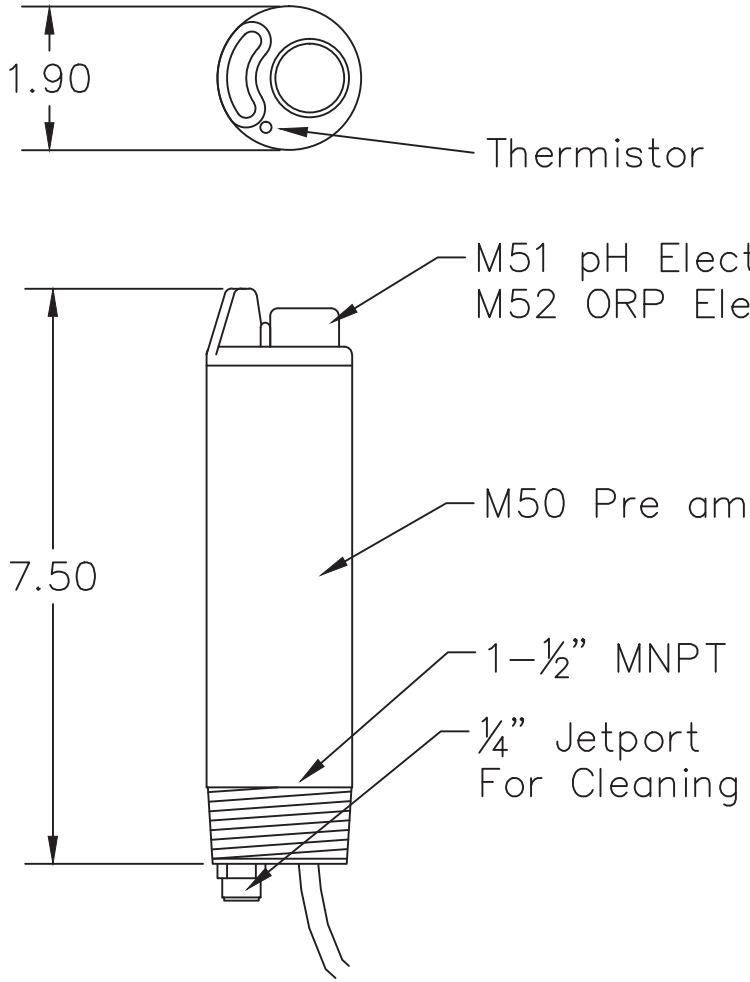
Sample By–Pass Line

REV. –

DWG. No IIG03N007

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS ANGULAR .XX ±.010 X° ±1° .XXX ±.005 DO NOT SCALE DRAWING	CONTRACT NO.	InsiteIG 80 Whisperwood Blvd. Suite 107 Slidell, LA 70458
MATERIAL –	DRAWN / DATE	TITLE INSTALLATION DIAGRAM MODEL 15T/25T
FINISH –	CHECK	SIZE C / DWG NO. IIG03N007 / REV –
SPEC.	DESIGN	SCALE NTS / SHEET 1 OF 1
	APPROVED	
	CUSTOMER	

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



Notes:
1) Material:
   M50 – PVC, Polyurethane and Viton O–rings
   M51 – Flat Glass Double Junction w/Viton O–rings
   M52 – Flat Glass Double Junction w/Viton O–rings
2) Temperature Range – 10 to 100°C
3) Cable length 33'
4) Operating Range:
   M51 – 2 to 12pH
   M52 – ±2000mV

REV. A
DWG. No IIG07N201

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .XX ±.010 .XXX ±.005 ANGULAR X° ±1° DO NOT SCALE DRAWING	CONTRACT NO.	InsiteIG 80 Whisperwood Blvd. Suite 107 Slidell, LA 70458
MATERIAL –	DRAWN / DATE	TITLE OUTLINE & MOUNTING 28 & 50 SERIES pH/ORP
FINISH –	CHECK	SIZE C / DWG NO. IIG07N201 / REV A
SPEC.	DESIGN	SCALE NTS / SHEET 1 OF 1
	APPROVED	
	CUSTOMER	