MODEL 1000CE
DISSOLVED OXYGEN ANALYZER

MODEL 10
OPTICAL DISSOLVED OXYGEN SENSOR

REVISION – October 15, 2013

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Product Description

The Model 1000 Dissolved Oxygen Analyzer is a digital instrument designed for the continuous monitoring of dissolved oxygen in water and wastewater where parts per million accuracy is required. The instrument is designed to be used with the InsiteIG Model 10 sensor. The unit will display dissolved oxygen content in ppm, mg/l or %SATURATION. The resolution in ppm and mg/l mode are 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 over a range of 0.0 to 99.9%SAT and 1% 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.

The microprocessor based electronics of the Model 1000 analyzer provide a high degree of flexibility and ease of use. Calibration is not required on a routine basis, nor is calibration required after initial startup and commissioning. The Model 1000 has two isolated analog outputs and a Modbus interface. Also included are three programmable set-point relays and one relay to control self-cleaning.

The 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.

Packaging

The analyzer is housed in a UL Listed, NEMA 4X enclosure (see Drawing IIG01N111) and is designed for outdoor mounting.

INSTALLATION

1. Mounting the Analyzer: A rear rail mounting kit is available to mount the standard enclosure to 2" handrail (see Drawing IIG01N110).

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

2. Mounting the Sensor: Choose a sensor location away from the side walls and obstructions that will cause low DO zones. InsiteIG can supply a sensor handrail mounting kit that easily mounts to most handrails and slide locks the sensor into place with out the use of tools (see drawing IIG02N005 & IIG02N004). This sensor mounting kit is design for a standard 2" handrail but can be adapted to square or angle handrails as well.

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

   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.

3. Input/ Output Connections: Open the enclosure of the Dissolved Oxygen Analyzer. Pass all connection cables through conduit or glands in the bottom of the enclosure (conduit and glands not supplied). The sensor input connections are made to the terminal block labeled TB5 (see drawing IIG01R111). The four wires are color coded and there is a cable shield. Connect the RED wire to the terminal labeled "RED". Connect the GREEN wire to the terminal labeled "GRN". Connect the WHITE wire to the terminal labeled "WHT". Connect the BLACK wire to the terminal labeled "BLK". Connect the cable SHIELD to the terminal labeled "SHLD". The analog outputs are available on the terminal block labeled TB1 and the relay outputs are available on the terminal block labeled TB6.

4. Power Selector Switch: Check switch S4 on the circuit board to be sure that it is set for the type of power being used (115 volts or 230 volts). Power connections can now be made to the terminal block labeled TB3. Turn power "on" by using switch S3. Close and secure the enclosure.

5. Switch the circuit breaker to "on" and the unit will now power up.

6. Once the unit is turned on, the unit will initialize and then jump into the "RUN" mode and begin displaying the Dissolved Oxygen content and the temperature.

Note: In order for the Model 10 sensor to operate properly, the frequency select parameter must be set to the power line frequency (50/60 Hz). See sensor setup section for details.

7. The first time the unit is powered up with the sensor in the process, 15 minutes are required for the sensor to stabilize. The reading will drift slightly during this period. After approximately 15 minutes the sensor will respond correctly. In the event the sensor is removed from the process for a short period of time, the sensor should be allowed to stabilize for approximately 10 minutes after it is put back in the process.

Note: The Model 10 sensor undergoes a thorough and accurate test and calibration procedure before shipment from the factory. Calibration of the system at startup is not necessary and is not recommended.

Analog Outputs

Two isolated 4-20 or 0-20 milliamp signal capable of driving 600 ohms are available from the terminal block labeled TB1. See drawing IIG01R111 for details. The analog output for D.O. is labeled "I 1". The common or ground for this signal is labeled "ICOM". The analog output for temperature is labeled "I 2". The common or ground for this signal is labeled "ICOM".

Digital Output

A Modbus communications (RS-485) output is available from TB2. This is a three wire signal with a transmit plus (labeled X+), a transmit minus (labeled X-), and a transmit ground or common (labeled X COM). The Modbus interface uses 8 bits, no parity, 1 stop bit. See drawing IIG01R111 for details. The communications protocol for the Digital Output is fully described in Appendix A.

Relay Outputs

There are three independently programmable set point control relays and one jet clean relay. Relay 1 & 2 are Form-C with contacts rated 10/6 amps resistive load at 125/250 VAC and relay 3 & 4 are Form-A with contacts rated 10/6 amps resistive load at 125/250 VAC. The output for these is available from TB6. See drawing IIG01R111 for connection details.

Note! – In "Normal Operation" the hinge cover is to remain tightly screwed closed. Under no circumstance is it necessary for the operator to open the enclosure during normal operation.

Main Menu

The main menu is accessed by pressing the "MENU" key while in the run mode of operation. There are three branches from the main menu. Use the "ARROW" keys to select either Run, Setup, or Test, then press the "ENTER" key. If no keys are pressed within a 30 second period, the analyzer will return to the RUN mode.

Run Mode

The RUN mode is the normal operating mode of the analyzer. The display is continuously updated with the current Dissolved Oxygen level and temperature. Also the analog output and the relays are updated according to the current conditions and their programmed functions. In the event of an error or alarm condition the display will indicate the problem in plain English text.

Setup Mode

This mode of operation allows the user to customize the unit to the specific operation and needs of the facility. There are a total of four subcategories that may be adjusted.

Operation of the SETUP MODE proceeds as follows:

a. After pressing the "MENU" key, use the "ARROW" keys to move the cursor to the setup option, and then press the "ENTER" key. A menu with four options will be displayed. The options are;
   1- Relays
   2- Analog Outputs
   3- Modbus
   4- Sensor Setup

b. Use the "ARROW" keys to move the cursor to the desired setup function, then press the "ENTER" key. The sub-menu for that group will be displayed. Use the "ARROW" keys to move the cursor to specific item to be changed, then press the "ENTER" key. When the user is finished making the adjustment, press the "MENU" key to return to the previous page.

c. To return to the RUN MODE, press the "MENU" key until the MAIN MENU is displayed. Use the "ARROW" keys to move the cursor to the run option, then press the "ENTER" key.

Relays

From the setup menu, use the “ARROW” keys to move the cursor to the “1-Relays” option, press the “ENTER” key. There are 14 menu options for configuring the relays.

1. #1 Op Mode – defines operation mode of relay number one
2. #1 ON Setpt – defines when relay one will energize
3. #1 OFF Setpt – defines when relay one will de-energize
4. #1 FAIL MODE – defines the relay one state during an alarm condition
5. #2 Op Mode – defines operation mode of relay number two
6. #2 ON Setpt – defines when relay two will energize
7. #2 OFF Setpt – defines when relay two will de-energize
8. #2 FAIL MODE – defines the relay two state during an alarm condition
9. #3 Op Mode – defines operation mode of relay number three
10. #3 ON Setpt – defines when relay three will energize
11. #3 OFF Setpt – defines when relay three will de-energize
12. #3 FAIL MODE – defines the relay three state during an alarm condition
13. Cln Schedule – defines how often relay four will energize cleaning
14. Cln Jet Time – defines duration of time relay four will be energized
15. Cln Recovery – defines the recovery duration time (seconds)

The following section is a brief discussion of considerations for configuring the relays.

Low Setpoint

If a relay “Op Mode” has been set as a LOW setpoint, then the corresponding relay will energize if the D.O. reading falls below the value set in the “ON Setpt” parameter. Once the relay has been energized by a low D.O. reading, it will not be deenergized until the D.O. reading rises above the value set in the “OFF Setpt” parameter. Obviously, the relay “OFF Setpt” value **MUST** be greater than or equal to the “ON Setpt” value in this mode.

High Setpoint

If a relay “Op Mode” has been set as a HIGH setpoint, then the corresponding relay will energize if the D.O. reading rises above the value set in the “ON Setpt” parameter. Once the relay has been energized by a high D.O. reading, it will not be deenergized until the D.O. reading falls below the value set in the “OFF Setpt” parameter. Obviously, the relay “OFF Setpt” value **MUST** be less than or equal to the “ON Setpt” value in this mode.

Alarm

If the relay “Op Mode” is set to alarm mode, then the relay will function to indicate alarm or error conditions. In this mode, the relay is energized for normal operation and will become deenergized if an error condition occurs. Consequently, loss of power can be sensed remotely as an alarm condition. In this mode, the relay can also indicate low D.O. conditions as an alarm. The relay will deenergize if the D.O. level drops below the value set in the “ON Setpt” parameter. Once the relay has been deenergized by a low D.O. reading, it will not be reenergized until the D.O. reading rises above the value set in the “OFF Setpt” parameter. Obviously, the relay “OFF Setpt” value **MUST** be greater than or equal to the “ON Setpt” value in this mode.

Clean Mode

The jet clean system is intended to be controlled by the Model 1000 through relay 4. Relay 4 is connected to the InsiteIG compressor (CA1) or to a customer supplied solenoid valve connected to an air or water supply. See drawing IIG01R112 and IIG01R113 for details.

The CLEAN SCHEDULE program parameter determines how often the jet clean cycle will occur. This parameter can be set to values of 10 minutes to 24 hrs. Typically, a clean interval of 2 hrs works well for aeration basins. In colder climates, condensation may form then freeze in the jet-clean tubing. To prevent this, set the clean interval to 10 or 20 minutes. If this is set to "0" then cleaning is turned off.

The CLEAN JET TIME program parameter determines how long the jet clean cycle will last. It 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. A clean cycle will consist of the sensor being cleaned for the programmed clean jet time immediately followed by the analyzer holding the measurement reading during the clean cycle and the recovery period.

The CLEAN RECOVERY parameter determines how long the analyzer will hold the DO reading after the cleaning jet time has expired. The default setting is 60 seconds which is adequate in most applications. However, increased recovery time may be required for applications where the sensor is in stagnant water or dead zones.

Analog Output Setup Mode

From the SETUP menu, use the ARROW keys to select the "2-Analog Output" option, then press the ENTER key. The ANALOG OUTPUT SETUP menu has 5 parameters for configuring these outputs.

1- Analog 1 Type: choose either 4-20 milliAmp or 0-20 milliAmp operation for the Analog 1 (D.O.) output.
2- DO Full Scale: defines the DO value that will cause the output to go to 20 milliAmps. (The minimum scale output value is fixed at 0 ppm of D.O. and cannot be changed.)
3- Ana1 Fail Mode: defines the value of the D.O. output during an alarm or error condition. Choose between holding the last good reading, or dropping to 0 or 4 milliAmps.
4- Analog 2 Type: choose either 4-20 milliAmp or 0-20 milliAmp operation for the Analog 2 (Temperature) output. This output scale is fixed at 0 to 50 degrees C.
5- Ana2 Fail Mode: defines the value of the temperature output during an alarm

Modbus Setup Mode

From the setup menu, use the "ARROW" keys to select the "3-Modbus" option, then press the "ENTER" key. There are 2 menu options for configuring the serial digital output.

1- Comm Address: defines the address of the analyzer
2- Comm Baud Rate: defines the baud rate of the digital output

Appendix – A describes the Modbus protocol implementation in the Model 1000.

Note: The Model 10 sensor undergoes a thorough and accurate test and calibration procedure before shipment from the factory. Calibration of the system at startup is not necessary and is not recommended.

To prevent unauthorized access of the sensor setup parameters, entry of a three-digit passcode is required. The passcode is entered one digit at a time. Use the UP and DOWN arrows keys to change the highlighted digit, then press ENTER to proceed to the next digit or MENU to move to the previous digit. If all three digits are correct the sensor setup menu will be displayed. The factory default passcode is 000. The passcode may be changed within the sensor setup menu.

The Model 10 sensor has been designed to require very infrequent calibration. Unlike polaragraphic 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 3 months to a year, depending upon conditions.

The Model 1000 analyzer allows the user to select from 2 different calibration procedures. The procedure can be selected by choosing SETUP from the main menu. Once the SETUP menu appears, use the arrow keys to choose the “4: SENSOR SETUP” option. Under the SENSOR SETUP menu, the calibration procedures are options 1 and 2.

1. Sensor Calibration to a Reference

Calibration to a known reference is the easiest, simplest, and also the preferred method of calibration when calibration is required. Calibration option number 1 “Sens Ref Cal” allows the operator to make adjustments to the D.O. reading to agree with any other source of D.O. information. 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. From the SENSOR SETUP menu, choose the “1:Sens Ref Cal” option, and press ENTER. The analyzer will now read the sensor for the period of time indicated by the “dampening” parameter, and display the result as D.O. in ppm. If this result matches the reference, simply press ENTER to exit. Otherwise, use the arrow keys to adjust the reading to match the reference value, and then press ENTER to store this new value. This procedure is primarily an adjustment to the offset value of the sensor, but an adjustment in slope will also be made when this procedure is performed.

2. Sensor Slope Adjustment (NOT RECOMMENDED)

If performed correctly, the previously described “Sensor Calibration to a Reference” should be all that is required by the user. “Sensor slope adjustment” should only be attempted upon recommendation from the factory.

Sensor calibration option 2 “Sens Slope Adj” allows the user to adjust the span of the sensor, but this procedure must only be used immediately AFTER the sensor has been “zeroed” using calibration option 1 with the sensor submerged in a zero oxygen solution. This zero solution may be prepared by adding

one tablespoon of sodium sulfite salt per liter of tap water in an open container (bucket). The sodium sulfite salt will remove all oxygen from the water as it dissolves. Stir the water for about one minute to dissolve the salt. Submerge the Model 10 sensor in this water and allow it to rest for at least 30 minutes. Make sure that no air bubbles are trapped on the face of the sensing element during the soak. Once the sensor is stable, use the "Sensor Calibration to a Reference" procedure described previously to set the D.O. reading to 0.03 ppm. YOU MUST ACTUALLY PERFORM THE CAL TO REFERENCE PROCEDURE IN ZERO WATER EVEN IF THE SENSOR READS ZERO FROM THE RUN MODE. [NOTE: If the user's application requires a zero that is absolutely accurate (frequent readings below 0.5 ppm), then the zero solution needed for this procedure should be mixed 12 to 24 hours before use, and distilled water should be used in place of tap water. Freshly mixed solution actually has a value of about 0.04 ppm, but a calm solution at rest for 12 hours will drop down very close to absolute zero.

Once a sensor has been properly zeroed, a slope adjustment may be made. Place the sensor in a solution of known D.O. concentration, and allow about 15 minutes to fully stabilize. Choose the sensor slope adjustment calibration procedure as option 2 "Sens Slope Adj" from the SENSOR SETUP menu, and press ENTER. Press ENTER again to bypass the "!Warning! Proper Zero Required" message. The analyzer will now read the sensor for the period of time indicated by the "dampening" parameter, and display the result as D.O. in ppm. If this result matches the reference, simply press ENTER to exit. Otherwise, use the arrow keys to adjust the reading to match the reference value, and then press ENTER to store this new value.

3. Fact. Default

The Factory Default parameter allows the user to restore the sensor characteristic values of zero and slope to the original factory settings.

4. TEMP. Units

The temperature units parameter allows the user to specify Celsius or Fahrenheit for the displayed temperature units.

5. Dampening

The dampening parameter will allow the adjustment of the amount of averaging taking place. This is entered in the amount of time it will take to achieve a stabilized reading, in seconds. This may be useful when using the system in a new application or trouble shooting.

6. Salinity

This option allows for the correction of salts in the water. The salinity correction range is 0 to 45 ppt with a resolution of 1 ppt. Average sea water is about 34 ppt.

7. Display Mode

This option allows the dissolved oxygen to be displayed in ppm, mg/l or %SAT.

8. Freq. Select

This option allows the power line notch filter to be set for 50Hz or 60 Hz.

9. Passcode

The passcode parameter will allow the operator to limit access to the sensor setup parameters. The

passcode may be set to any three-digit number.

Test Mode

This mode of operation allows the user to perform basic test functions to aid in troubleshooting. There are a total of 13 tests which may be performed.

Operation of the TEST MODE proceeds as follows. From the Main Menu use the “ARROW” keys to move the cursor to the Test option, then press the “ENTER” key. Use the “ARROW” keys to select the desired test, then press the “ENTER” key.

1. View Sensor Data

This test is intended primarily to aid the InsiteIG technical support engineers in troubleshooting. The following raw sensor data is displayed: MAIN, REF, TEMP, with the corresponding values displayed beneath. Press the MENU key to exit.

2. View Sensor Serial Number

View Sensor S/N#, displays the serial number for the sensor currently connected. Press the MENU key to exit.

3. View Sensor Clk

View Sensor Clk displays the power line frequency which is used to filter the sensor data. Press the MENU key to exit.

4. Cal Analog 1

Cal analog 1 will cause the analyzer to generate full scale output of 20mA on analog output 1. Use the UP and DOWN arrows keys to adjust the output, then press the ENTER key to save.

5. Cal Analog 2

Cal analog 2 will cause the analyzer to generate full scale output of 20mA on analog output 1. Use the UP and DOWN arrows keys to adjust the output, then press the ENTER key to save.

6. Test Relay 1

Test Relay 1 displays the current status of relay 1. To toggle relay 1, press the "ENTER" button. The new status of relay 1 will be displayed. To exit, press the "MENU" key.

7. Test Relay 2

Test Relay 2 displays the current status of relay 2. To toggle relay 2, press the "ENTER" button. The new status of relay 2 will be displayed. To exit, press the "MENU" key.

8. Test Relay 3

Test Relay 3 displays the current status of relay 3. To toggle relay 3, press the "ENTER" button. The new status of relay 3 will be displayed. To exit, press the "MENU" button.

9. Test Clean Relay

Test Clean Relay (Relay 4) displays the current status of relay 4. To toggle relay 4, press the "ENTER" button. The new status of relay 4 will be displayed. To exit, press the "MENU" button.

10. Test Modbus

Test Modbus will test the RS-485 communication port.

11. Software Version

Software Version displays the current version of software in the analyzer. To exit, press the "MENU" button.

12. View Sensor Characteristics

This test displays the sensor characteristics. This is primarily to aid the InsiteIG technical support engineers in troubleshooting.

13. Tau Values

This test is intended primarily to aid the InsiteIG technical support engineers in troubleshooting. The Tau value for the sensor is displayed.

MAINTENANCE

The analyzer does not require any periodic maintenance. The sensor must be kept free of debris for accurate readings.

Model 10 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 we recommend rinsing the sensor with a water hose.

In systems with high bio-slim and scaling, the integrated jet clean system is recommended to be used 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 varies 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.

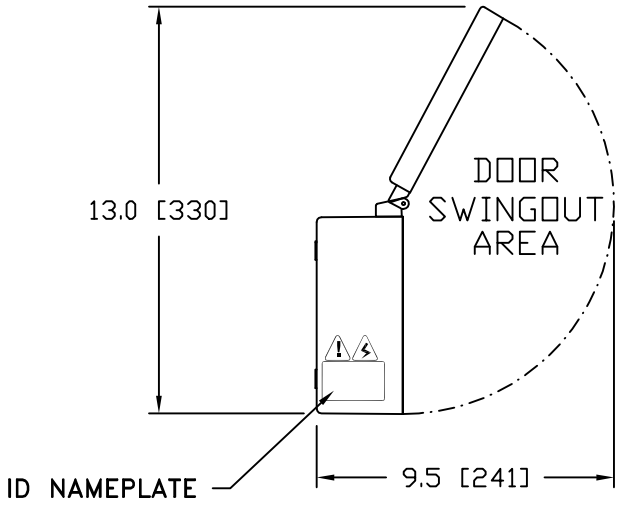
GUARANTEE AND REPAIR POLICY

The InsiteIG Model 1000 Digital Dissolved Oxygen Analyzer is guaranteed for two years against manufacturing defects. The Model 10 Dissolved Oxygen Sensor is 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.

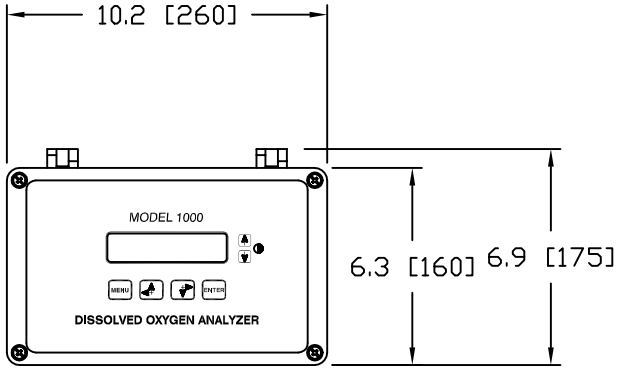
All shipments are insured. If you receive a damaged unit, please notify InsiteIG Instrument immediately at 985-639-0006.

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

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



SIDE VIEW



PLAN VIEW

Notes:
1. Construction: Fiberglass, 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 ANGULAR .XX ±.010 X° ±1° .XXX ±.005 DO NOT SCALE DRAWING	CONTRACT NO.	
MATERIAL –	DRAWN	DATE
FINISH –	CHECK	
SPEC.	DESIGN	
	APPROVED	
	CUSTOMER	

Insite IG
80 Whisperwood Blvd.
Suite 107
Slidell, LA 70458

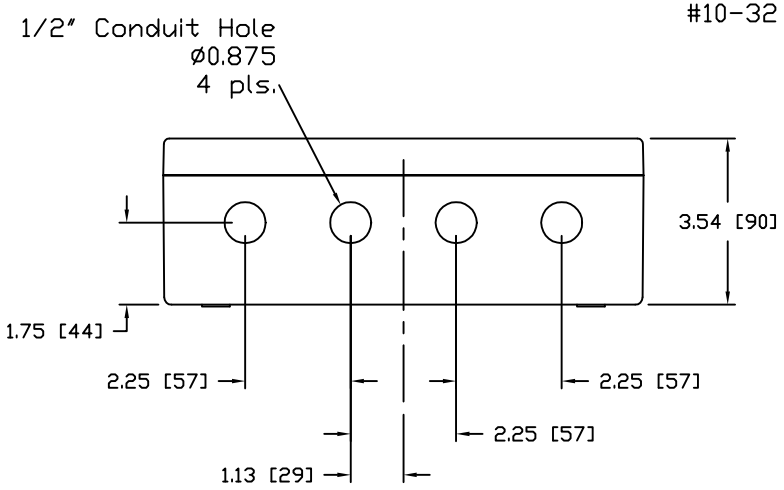
TITLE: OUTLINE & MOUNTING INSITE ANALYZER

SIZE	DWG NO.	REV
C	IIG01N111	–

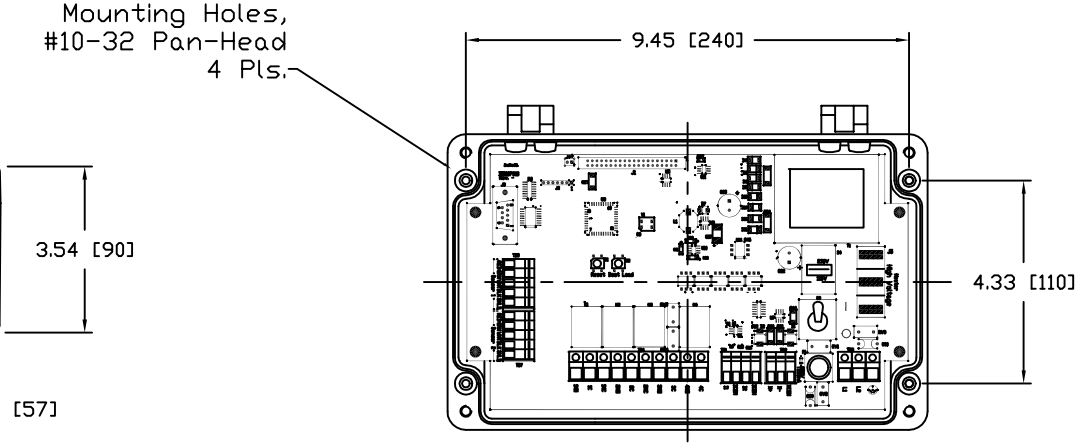
SCALE NTS | SHEET 1 OF 2

DWG. No IIG01N111 REV. –

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



Bottom View

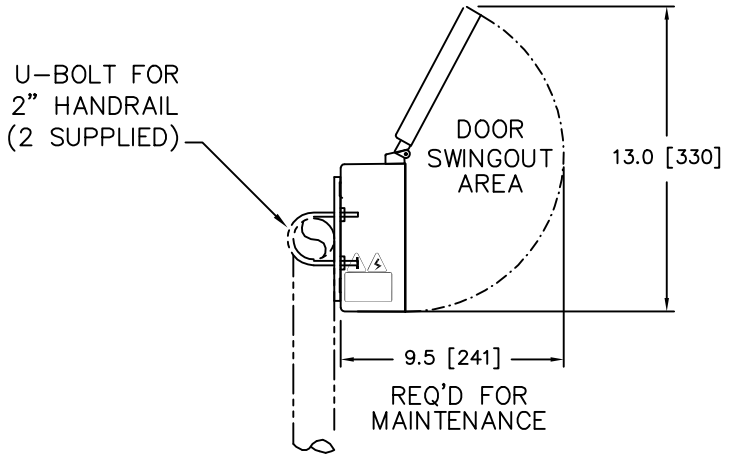


Plan View w/o Cover

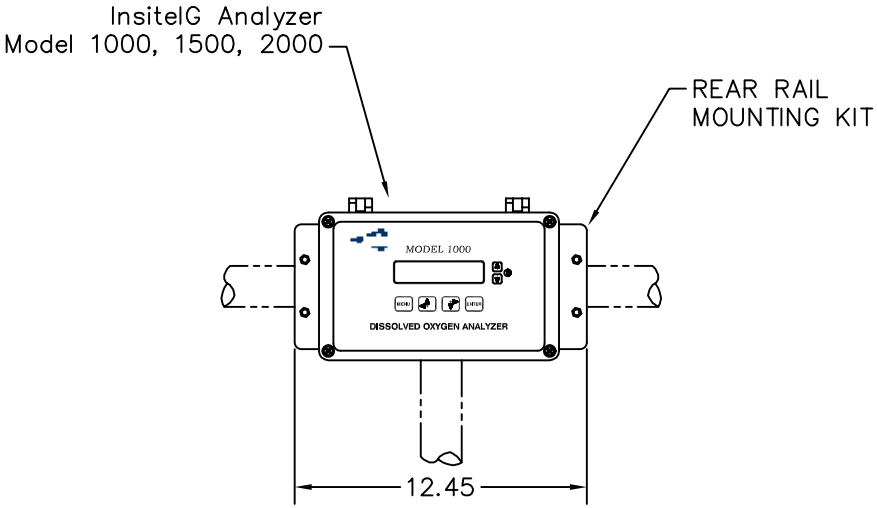
DWG. No IIG01N111 REV. –

SIZE	DWG NO.	REV
C	IIG01N111	–
SCALE NTS		SHEET 2 OF 2

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



SIDE VIEW



PLAN VIEW

NOTES:

1. CONSTRUCTION: FIBERGLASS, NEMA 4X TYPE ENCLOSURE MOUNTED ON .125" PASSIVATED STAINLESS STEEL BRACKETS.

2. APPROXIMATE WEIGHT: 7 LBS.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .XX ±.010 .XXX ±.005 ANGULAR X° ±1° DO NOT SCALE DRAWING	CONTRACT NO.	
MATERIAL —	DRAWN D. RADLE	DATE 1/29/02
FINISH —	CHECK	
SPEC.	DESIGN D. RADLE	1/29/02
	APPROVED	
	CUSTOMER	

Insite IG
80 Whisperwood Blvd.
Suite 107
Slidell, LA 70458

TITLE: REAR RAIL MOUNTING INSITE ANALYZER

SIZE	DWG NO.	REV
C	IIG01N110	—

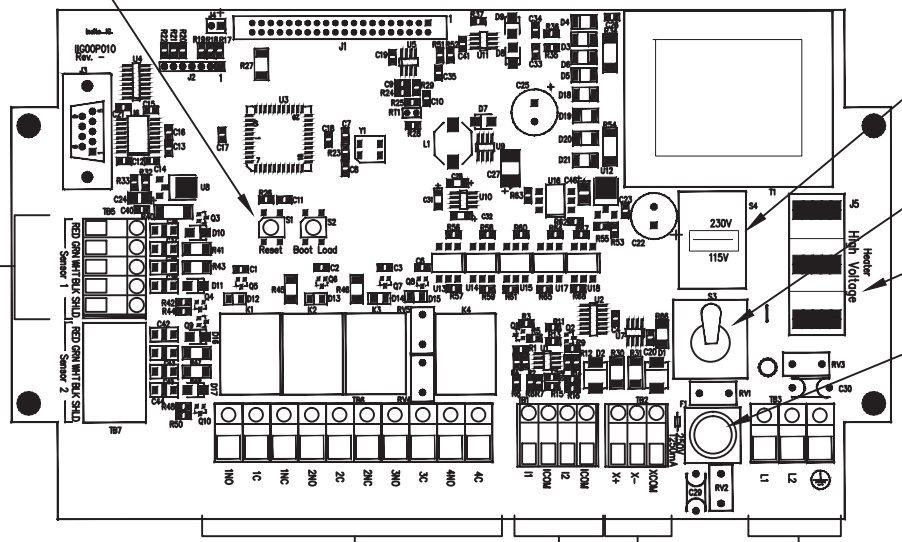
SCALE NTS | SHEET 1 OF 1

DWG. No IIG01N110 REV. —

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

RESET SWITCH

SENSOR INPUT



115/230 VAC
SELECTOR SWITCH

ON/OFF SWITCH

HEATER CONNECTOR (OPTIONAL)
HEATER CONSUMES 20 WATTS.

5x20mm, 1/4 AMP, 250V
TIME DELAY FUSE
(GCD-250mA)

PROGRAMABLE RELAY CONTACTS
RATED 6 AMPS AT 250 VAC
RESISTIVE LOAD.

⚠ 115 OR 230 VAC @ 50 OR 60 HZ
MAIN POWER CONNECTION
AND WILL NORMALLY CONSUME LESS
THAN 25 WATTS.

MODBUS INTERFACE (RS-485)

ANALOG OUTPUT (0-20 or 4-20mA)
600 OHMS MAX. LOAD

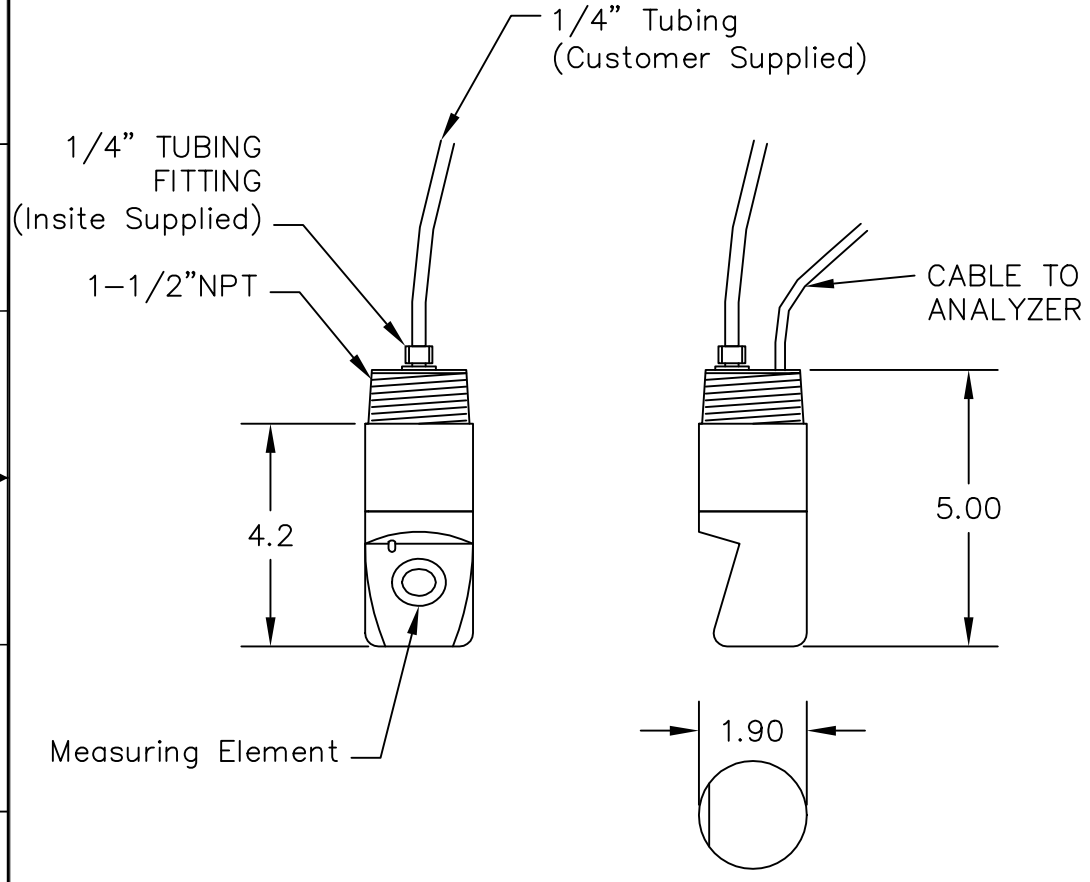
⚠ Circuit Breaker meeting IEC-947-3 must be on line supply, in close proximity to equipment and shall be marked as the disconnecting device for the equipment.

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: CUSTOMER CONNECTION INSITE IG ANALYZER
FINISH —	CHECK D. RADLE	SIZE C / DWG NO. IIG01R111 / REV —
SPEC.	DESIGN	SCALE NTS / SHEET 1 OF 1
	APPROVED D. RADLE	
	CUSTOMER	

REV. —
DWG. No IIG01R111

IIG02N004 | C

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



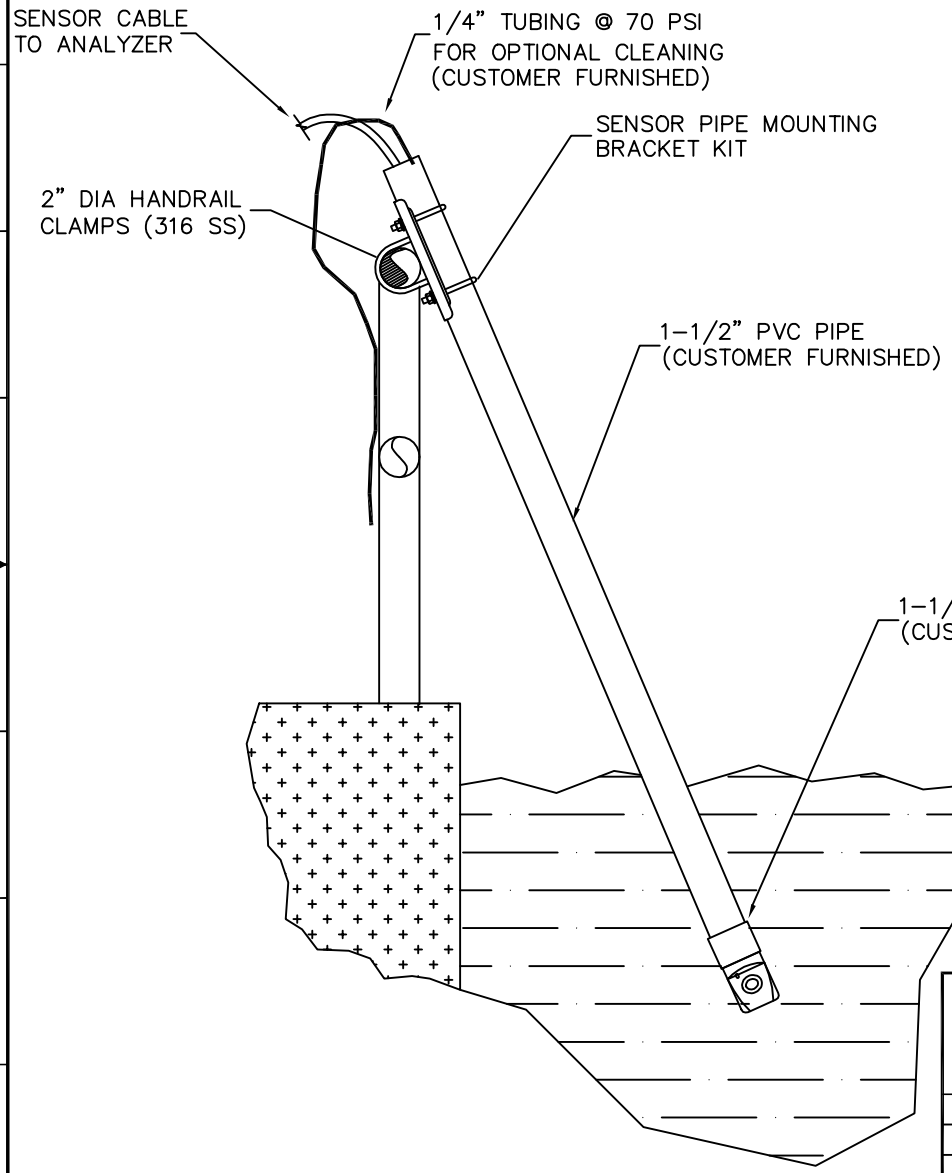
Notes:

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

Appendix A – Modbus Protocol

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 range 1 to 247 decimal.

Function code field

The function code field contains one byte. See the section titled Function codes supported by the Model 2000.

Data field

The data field contains one or more byte. 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 Model 1000

01 Read Coil Status

Description
Reads the ON/OFF status of the relays in the Model 1000 analyzer.

Query
The query message specifies the starting relay and quantity of relays to be read. Relays are addressed starting at zero. Relays 1 – 4 are addressed as 0 – 3.

Below is an example of a request to read relays 1 – 4 from Model 1000 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	04
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 relays 1 and 3 is ON and the status of relays 2 and 4 is OFF.

04 **Read Input Registers**

Reads the binary contents of input registers in the Model 1000 analyzer.

Query

The query message specifies the starting register address and the quantity of registers to be read. The Model 1000 input registers are as follows:

Address	Register
0000	Sensor status (see below)
0001	D.O. measurement (as hundredths of a ppm)
0002	Temperature measurement (as tenths of ℃)
0007	Last 4 digits of the Sensor Serial Number (as in SN 10Sxxxx)

The Model 10 sensor will report the status as follows:

Status	Description
0000	Normal
0001	Sensor not responding
0002	Sensor error
0003	New sensor codes needed

Input Registers 3, 4, 5, and 6 are internal calculation values used by the factory for testing.

Below is an example of a request to read the sensor status, D.O. measurement, and temperature 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	00
No. of Regs. Hi	00
No. of Regs. Lo	03
CRC	--

Below is an example of a response to the previous query where the sensor is a Model 10 D.O. sensor measuring 8.3 ppm at 25.0℃.

Field Name	Example
Slave Address	01
Function	04
Byte Count	06
Data Hi (Reg 0)	00
Data Lo (Reg 0)	00
Data Hi (Reg 1)	03
Data Lo (Reg 1)	3E
Data Hi (Reg 2)	00
Data Lo (Reg 2)	FA
CRC	--

06 **Preset Single Register**

Presets a value into a single register of the Model 1000 analyzer.

Query
The query message specifies the register to be preset. The demand clean cycle register is the only register in the Model 1000 which can be written to. When any value is written to this register, a clean cycle is initiated. The address of the demand clean cycle register is 238C (hex).

Below is an example of a request for a demand clean cycle on an analyzer with the slave address of 1.

Field Name	Example
Slave Address	01
Function	06
Reg. Address Hi	23
Reg. Address Lo	8C
Data Hi	00
Data Lo	00
CRC	--

The normal response is an echo of the query.

17 **Report Slave ID**

Returns a description of the type of device at the slave address.

Query
Below is an example of a request to report the ID and status of slave address 1.

Field Name	Example
Slave Address	01
Function	11
CRC	--

The normal response of the Model 1000 is shown below.

Field Name	Example
Slave Address	01
Function	11
Byte Count	02
Slave ID	00
Run status	00=Off, FF = On
CRC	--

Exception Responses

If the Model 1000 analyzer receives a query without a communication error, but cannot handle it, an exception response will be returned.

In a normal response, the Model 1000 echoes the function code of the original query in the function code field of the response. In an exception response, the Model 1000 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 Model 1000 are:

Exception code	Description
01	Illegal function code
02	Illegal data address

Appendix B – CA-1 Jet Clean System

The InsiteIG cleaning system uses a pressurized stream of air or water to remove bio growth or other debris from the optical surfaces of our sensors. The InsiteIG analyzers control the frequency and duration of the clean cycle through relay #4. (see drawing IIG01R112 & IIG01R113) This relay is programmable through the setup menu, see Relays section of this manual for more detail.

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. The power requirements are 110/120 VAC @ 50/60 Hz and 1.8A. The unit is fused at 3 amps with a 1¼ x ¼" time delay fuse. The ambient operating conditions are a temperature of 0 degree Celsius to 55 degree Celsius and 0 to 100% humidity. 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 and possible. (If over 100' please consult the factory)

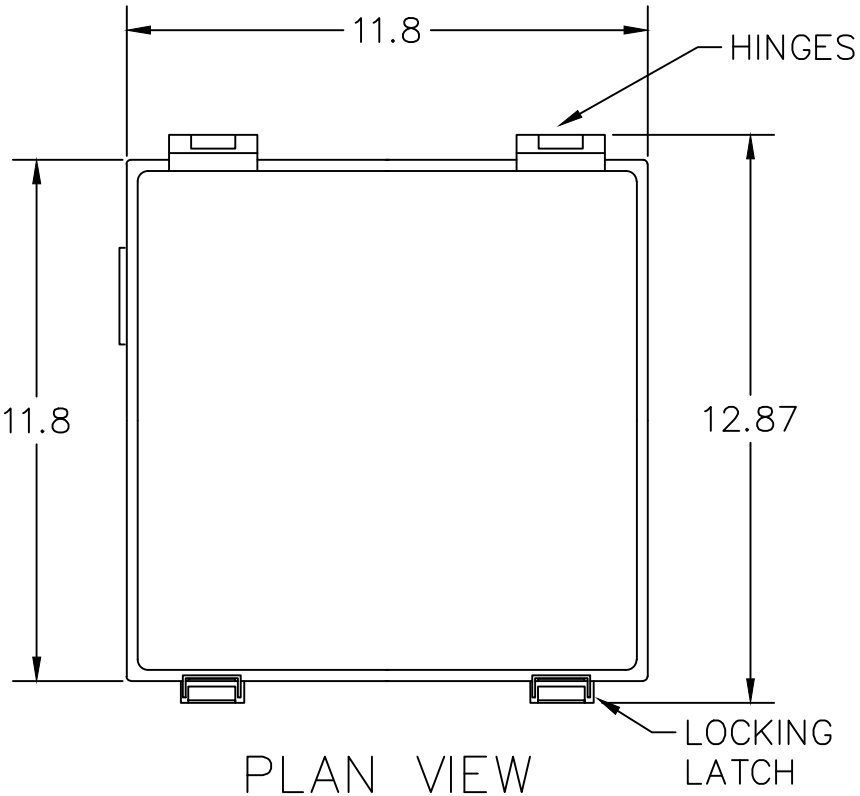
The compressor system should be mounted as close to the sensor as possible. The tubing connection, input power and relay connection to the analyzer are on the bottom of the enclosure. Handrail brackets are available for the compressor enclosure. See drawing IIG01N030 and IIG01R112.

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.

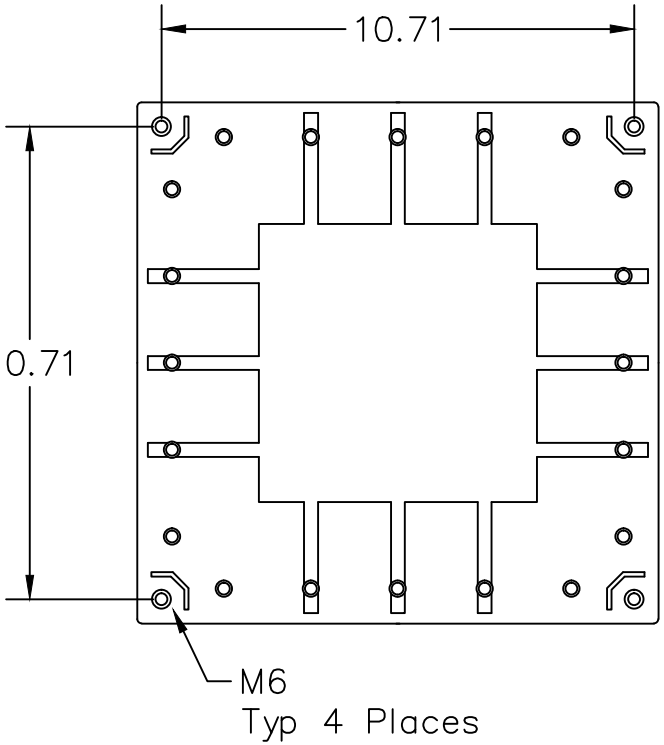
All of the InsiteIG sensors have the jet clean design built-into the sensor housing. The sensors are constructed of impact resistant epoxies and polyurethanes, suitable for most waste treatment. The nozzle aims the water, or air, stream across the optics of the sensor, removing any debris that may cause fouling.

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. A ¼" quick disconnect fitting is supplied with the sensor. See drawing IIG01R113 for wire details. There are no changes required in the sensor head for use with water or shop air.

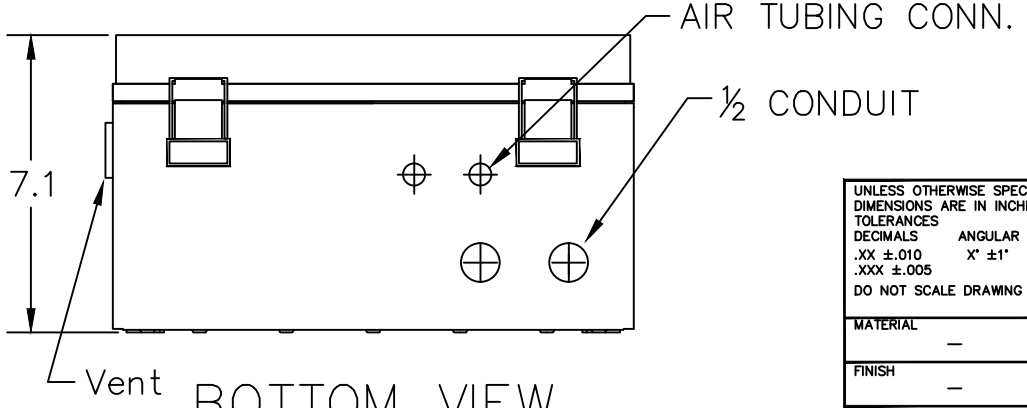
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



PLAN VIEW



BACK VIEW



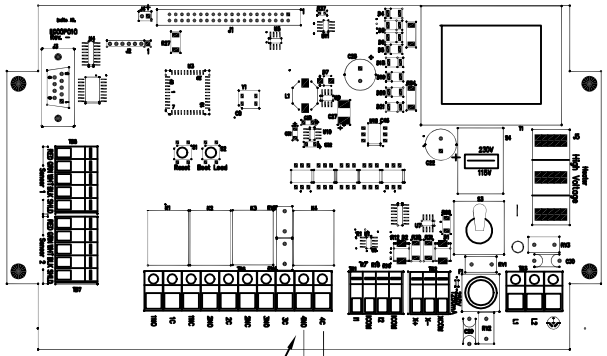
BOTTOM VIEW

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 COMPRESSOR
	CHECK		
	DESIGN D. RADLE	1/29/02	
MATERIAL –	APPROVED		SIZE C DWG NO. IIG01N030 REV A
FINISH –	CUSTOMER		SCALE NTS SHEET 1 OF 1
SPEC.			

REV. A

DWG. No IIG01N030

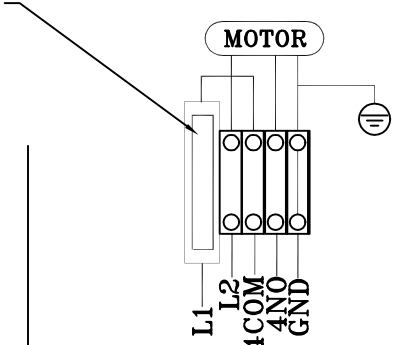
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



RELAY #4
CLEANING RELAY

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

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



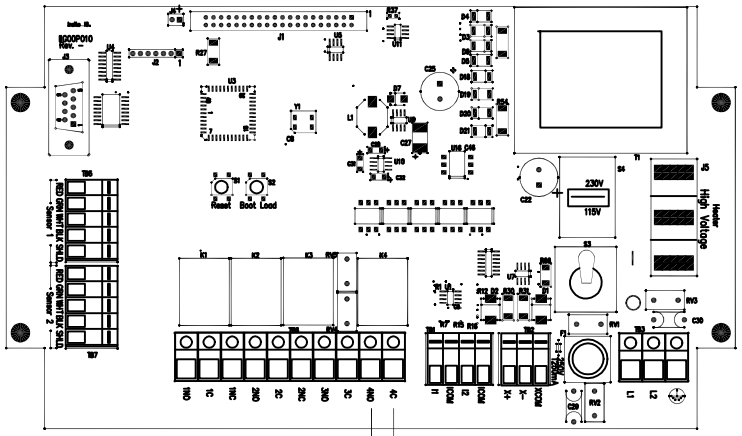
ANALYZER CONNECTIONS

COMPRESSOR CONNECTIONS
INSITE IG - MODEL CA1

DWG. No IIG01R112 REV. —

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 INSITE IG ANALYZER
FINISH —	CHECK D. RADLE	SIZE C / DWG NO. IIG01R112 / REV —
SPEC.	DESIGN	SCALE NTS / SHEET 1 OF 1
	APPROVED D. RADLE	
	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.**

Rely 4C TO L1

Solenoid L1 to 4NO

L2

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

ANALYZER CONNECTIONS

FOR SENSOR JET CLEAN

REV. 1
DWG. No IIG01R113

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES DECIMALS .XX ±.010 .XXX ±.005 ANGULAR X° ±1° DO NOT SCALE DRAWING	CONTRACT NO.	Insite IG 80 Whisperwood Blvd. Suite 107 Slidell, LA 70458
	DRAWN D. RADLE / DATE	TITLE SOLENOID JET CONNECTION INSITE IG ANALYZER
MATERIAL –	CHECK	
	DESIGN D. RADLE	
FINISH –	APPROVED	SIZE C / DWG NO. IIG01R113 / REV –
SPEC.	CUSTOMER	SCALE NTS / SHEET 1 OF 1