

Aurora H₂O

User's Manual



GE
Measurement & Control Solutions

Aurora H₂O

Moisture Analyzer for Natural Gas

User's Manual

910-284 Rev. D
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www.ge-mcs.com

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[no content intended for this page]

Information Paragraphs

- **Note** paragraphs provide information that provides a deeper understanding of the situation, but is not essential to the proper completion of the instructions.
- **Important** paragraphs provide information that emphasizes instructions that are essential to proper setup of the equipment. Failure to follow these instructions carefully may cause unreliable performance.
- **Caution!** paragraphs provide information that alerts the operator to a hazardous situation that can cause damage to property or equipment.
- **Warning!** paragraphs provide information that alerts the operator to a hazardous situation that can cause injury to personnel. Cautionary information is also included, when applicable.

Safety Issues

WARNING! It is the responsibility of the user to make sure all local, county, state and national codes, regulations, rules and laws related to safety and safe operating conditions are met for each installation.

Auxiliary Equipment

Local Safety Standards

The user must make sure that he operates all auxiliary equipment in accordance with local codes, standards, regulations, or laws applicable to safety.

Working Area

WARNING! Auxiliary equipment may have both manual and automatic modes of operation. As equipment can move suddenly and without warning, do not enter the work cell of this equipment during automatic operation, and do not enter the work envelope of this equipment during manual operation. If you do, serious injury can result.

WARNING! Make sure that power to the auxiliary equipment is turned OFF and locked out before you perform maintenance procedures on the equipment.

Qualification of Personnel

Make sure that all personnel have manufacturer-approved training applicable to the auxiliary equipment.

Personal Safety Equipment

Make sure that operators and maintenance personnel have all safety equipment applicable to the auxiliary equipment. Examples include safety glasses, protective headgear, safety shoes, etc.

Unauthorized Operation

Make sure that unauthorized personnel cannot gain access to the operation of the equipment.

Environmental Compliance

Waste Electrical and Electronic Equipment (WEEE) Directive

GE Measurement & Control Solutions is an active participant in Europe's *Waste Electrical and Electronic Equipment* (WEEE) take-back initiative, directive 2002/96/EC.



The equipment that you bought has required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

In order to avoid the dissemination of those substances in our environment and to diminish the pressure on the natural resources, we encourage you to use the appropriate take-back systems. Those systems will reuse or recycle most of the materials of your end life equipment in a sound way.

The crossed-out wheeled bin symbol invites you to use those systems.

If you need more information on the collection, reuse and recycling systems, please contact your local or regional waste administration.

Visit <http://www.ge-mcs.com/en/about-us/environmental-health-and-safety/1741-weee-req.html> for take-back instructions and more information about this initiative.

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Appendix A. MODBUS RTU / RS485 Communications

Chapter 1. Features and Capabilities

1.1 Overview

GE's **Aurora H₂O** Moisture Analyzer for Natural Gas makes it possible for natural gas processing and transportation facilities to monitor moisture content in real-time with high precision and reliability.

The **Aurora H₂O** analyzer uses tunable diode laser absorption spectroscopy (TDLAS) to measure moisture in natural gas at the speed of light. The analyzer is suitable for installation in hazardous areas and operates over a wide range of environmental conditions. **Aurora**'s fast response quickly alerts and documents when moisture concentrations are out of compliance. Once process upsets are corrected and the gas dries out, the fast response quickly enables natural gas to be cleared for entry into the "energy grid".

CLASS 1 LASER PRODUCT



WARNING!

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser exposure.

1.2 Features

- Optical response: <2 seconds once flow cell is purged.
- No cross sensitivity to glycols or amines.
- Direct readout in lbs/mmscf, mg/m³ or ppm.
- Reads process pressure dewpoint (with user programmable constant or live auxiliary input for process pressure).
- Turnkey sampling system specifically designed natural gas applications ensures measurement integrity.
- Magnetic Stylus enables through-glass programming – hot permit not required to field program.
- Explosionproof/Flameproof design
- 4-20 mA signals and RS-232/485 MODBUS RTU for connection to SCADA or plant monitoring system.
- Supplied with **AuroraView** software for remote configuration, data logging and data retrieval capacity.
- NIST traceable calibration.
- In conformance with IEC 60825-1 Edition 2.0, Safety of Laser Products.

1.3 Theory of Operation

The GE **Aurora H₂O** (Tunable Diode Laser Absorption Spectroscopy) hygrometer for natural gas is a system designed to continuously monitor the moisture content in natural gas. It fundamentally measures the partial pressure of water vapor (water in the gas state), and with the simultaneous measurement of pressure and temperature, provides readings and both analog and digital signal transmission of user-selectable moisture parameters including dew point temperature, volume ratio and absolute humidity (lbs/MMSCF or mg/m³) in addition to temperature and pressure.

The **Aurora H₂O** is supplied with an integrated sampling system which includes an optional pipe-mounted liquid separator and pressure reducing valve/regulator, and the following components mounted within a stainless steel enclosure: isolation valve, coalescing filter, coalescer flow control valve, sample cell control valve, second pressure reducing valve/regulator, and flow indicator (rotameter), as well as an optional electrical heater and thermostat.

The fundamental water vapor pressure measurement is based on the Beer-Lambert Law:

$$A = \ln\left(\frac{I_0}{I}\right) = SLN$$

where:

A = Absorbance

I = Light intensity transmitted through a sample gas

I₀ = Incident light intensity

S = Absorption coefficient*

L = Absorption path length (a constant)

N = Concentration of the water vapor in the absorption cell

* The absorption coefficient is a constant for a specific gas composition at a given pressure and temperature.

The concentration of the water is directly related to the partial pressure. At certain specific frequencies, light energy will be absorbed by water molecules. As the concentration of water increases, the absorption also increases. The **Aurora H₂O** sweeps the diode laser output across a narrow band in the near infrared spectrum and, by measuring the light intensity with a photo detector, is able to provide a direct indication of the partial pressure of water. The partial pressure, multiplied by 10⁶ and divided by the total pressure, yields the volume ratio in ppm_v (parts per million by volume).

The laser diode is housed in a hermetically sealed and dry housing. The light is transmitted through a window made of proprietary transparent material. The light travels through a stainless steel cell and is reflected off a gold-plated mirror and returned to a photo detector, where the light intensity is measured.

1.3 Theory of Operation (cont.)

Since only light comes in contact with the sample of natural gas, and all of the wetted materials are made of non-corrosive and inert materials, this technology does not exhibit the drift associated with gas contacting sensor-based hygrometers. The diode laser emits low energy light. Therefore the system will not ignite the gas. The complete system is rated explosion-proof. The **Aurora H₂O** provides very fast response time. Once the absorption cell is purged, the response time is a matter of a few seconds.

The control of the laser, power supply and signal conditioning circuitry are housed in an explosion-proof transmitter enclosure. A backlit, three-parameter, LCD display provides digital indication of user-programmable parameters. The **Aurora H₂O** has three user-programmable (4-20mA) analog outputs and two programmable digital ports that may be configured as either RS-485 or RS-232 with Modbus protocol. The analyzer has an auxiliary analog input (4-20mA) input that is used for connection to an optional process pressure transmitter. Measurement of the process pressure enables the **Aurora H₂O** to display and transmit the process dewpoint. **AuroraView** software is provided and enables remote readings, programming data logging and data logging with a personal computer.

The **Aurora H₂O** hygrometer is calibrated against an NIST (or other national metrological institute) traceable reference dew/point generator and hygrometer. Each system is supplied with a certificate of calibration with functional test data.

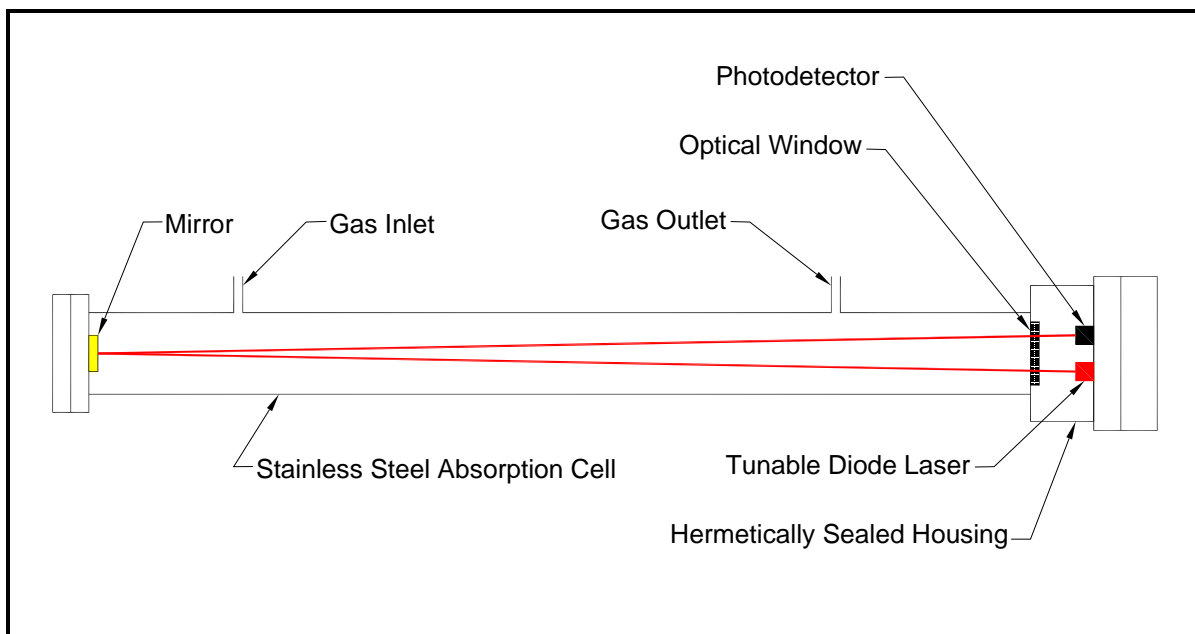


Figure 1: Laser Absorption Cell, Basic Elements

1.4 System Components

Note: Refer to Table 1 on page 6 for part descriptions.

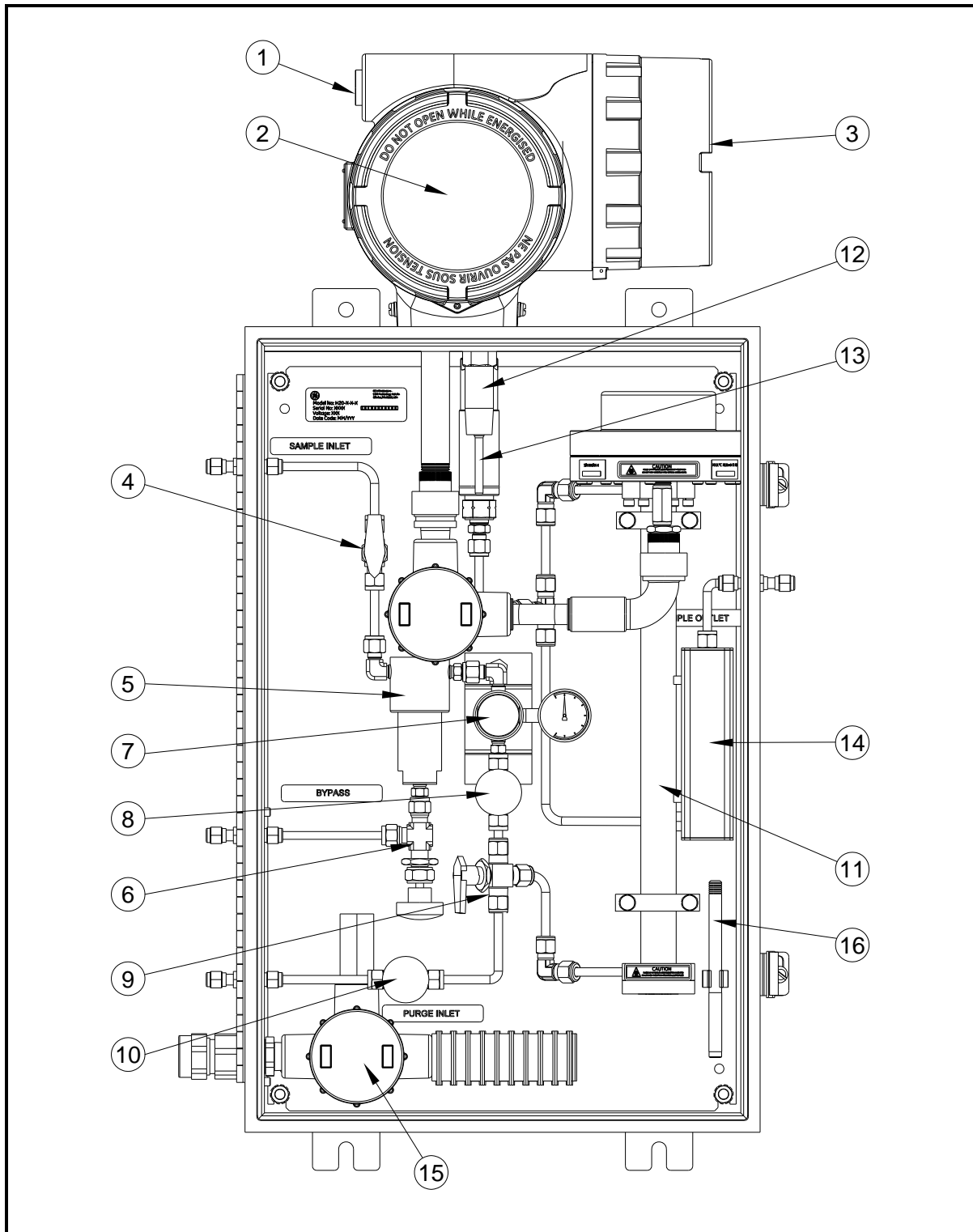


Figure 2: Aurora H₂O System Assembly with Optional USA/CAN Heater

1.4 System Components (cont.)

Note: Refer to Table 1 on page 6 for part descriptions.

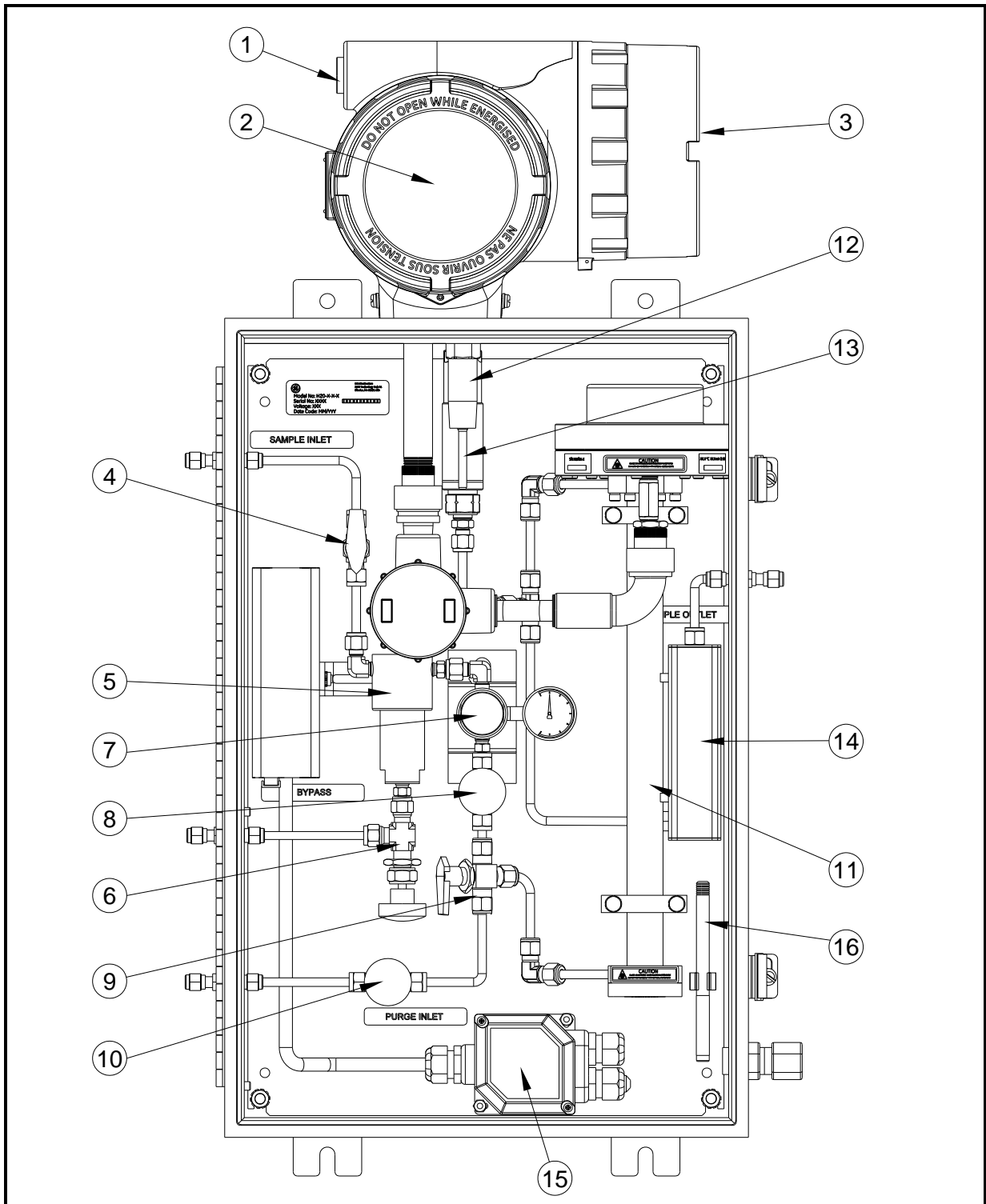


Figure 3: Aurora H₂O System Assembly with Optional EU/ATEX Heater

1.4 System Components (cont.)

Table 1: Aurora H₂O System Parts List

No.	Description	No.	Description
1	Conduit I/O	9	Process or Purge Gas Selector
2	Display and Magnetic Stylus Keypad	10	Purge Gas Inlet Needle Valve
3	Wiring Terminals	11	Absorption Cell
4	Isolation Valve (ball valve)	12	Temperature Sensor
5	Coalescing Filter	13	Pressure Sensor
6	Coalescing Filter Drain & Fast Loop Vent	14	Rotameter
7	Pressure Regulator w/ 0-10 psig outlet pressure gauge	15	Optional Heater, thermostat, junction box
8	Flow Control Needle Valve	16	Magnetic Stylus

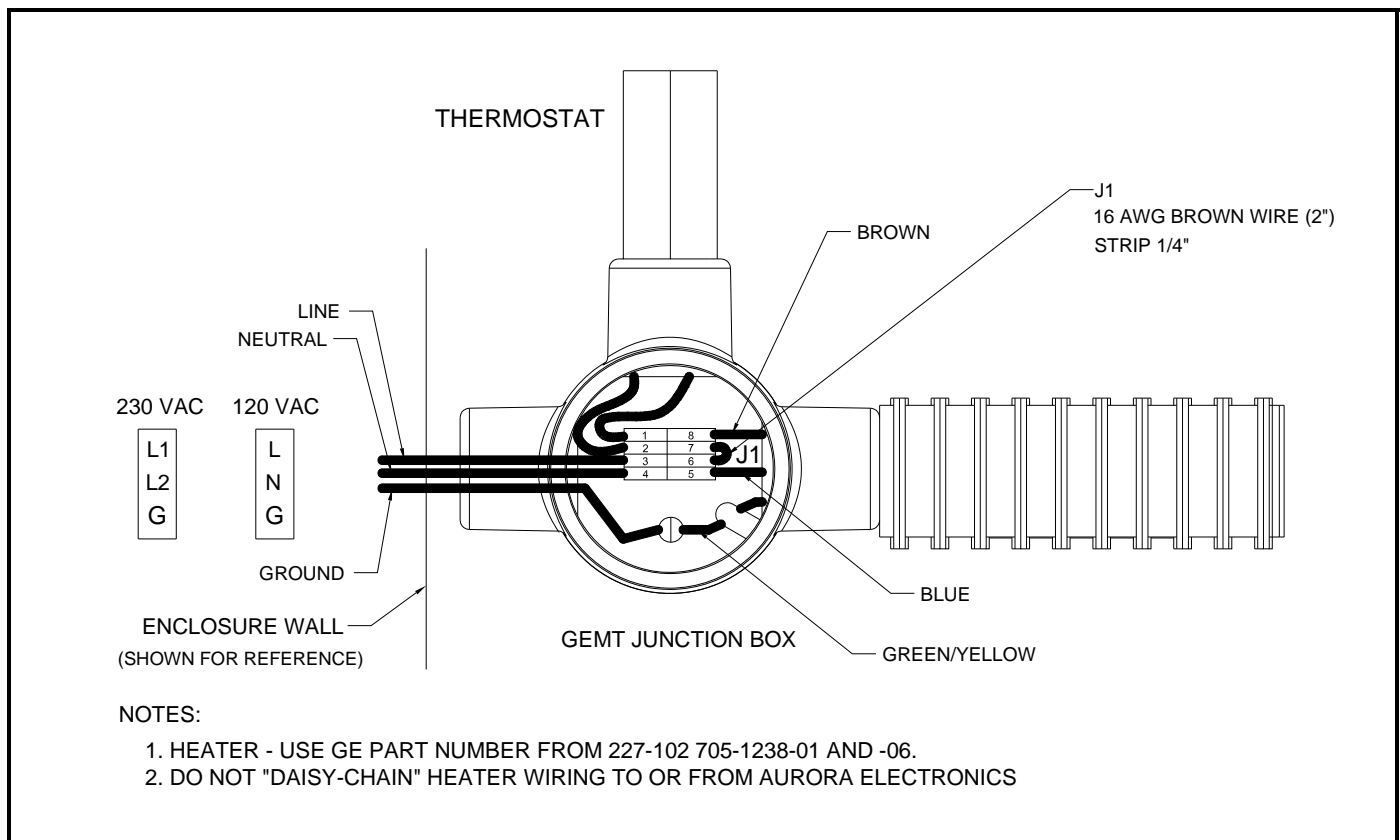


Figure 4: USA/CAN Heater Wiring Diagram

1.4 System Components (cont.)

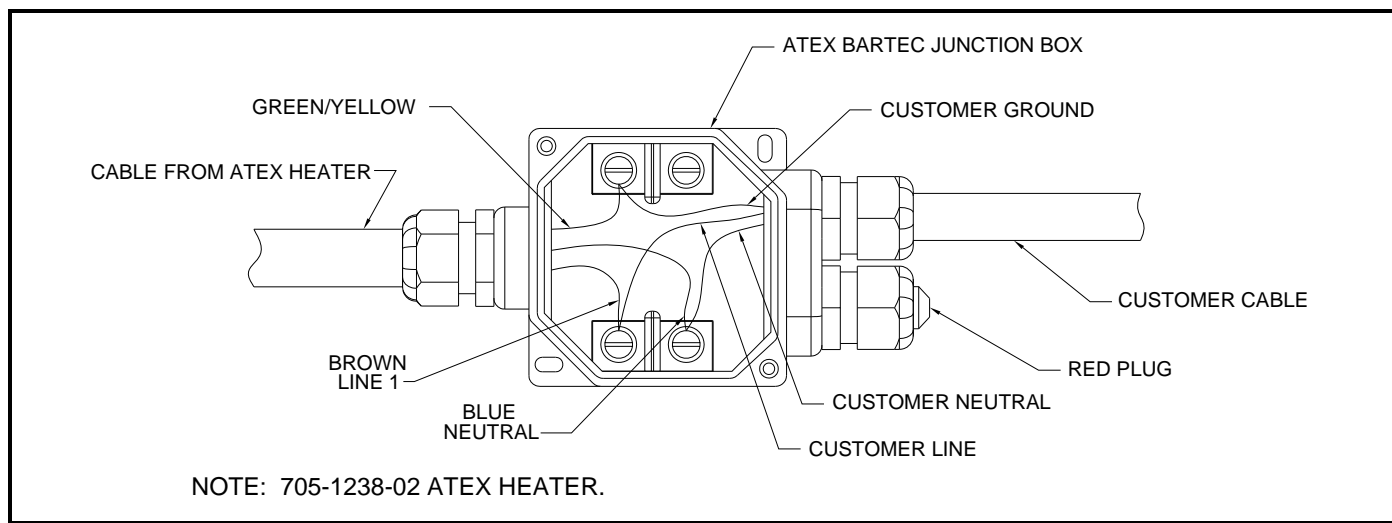


Figure 5: EU/ATEX Heater Wiring Diagram

1.5 Specifications

Power:

Universal Power Supply: 100-240VAC, 50-60Hz, 10W max. power

Optional Power Supply: 18-32VDC (24VDC), 10W

Optional Enclosure Heater Power: 120VAC, 120W or 230VAC, 75W

Moisture:

Parts per Million by Volume: $\pm 2\%$ of reading in ppm_v or 4 ppm_v. Accuracy of other parameters derived from ppm_v

Dew/Frost Point: -65.5°C to -2.6°C (-85.9°F to 27.3°F)*

Absolute Humidity: 3.8 to 3803 mg/m³ (0.24 to 237 lbs/MMSCF)

Process or Equivalent Dew/Frost Point: by calculation with process pressure signal (4-20mA) or constant

*Readings below 0°C (32°F) are in “Frost Point” Temperature, and above 0°C (32°F) are in “Dewpoint” Temperature.

Sample Pressure:

Range: 69 to 172 kPa (10 to 25 psia)

Maximum: 1380 kPa (200 psig) Higher pressure available using additional sampling system components.

Process Pressure:

10,342 kPa (1500 psig) maximum. Higher pressure available with application of additional sample system components.

Storage Temperature: -20° to $+70^{\circ}\text{C}$ (-4° to $+158^{\circ}\text{F}$)

1.5 Specifications (cont.)

Operating Temperature:

Electronics: -20° to $+65^{\circ}\text{C}$ (-4° to 149°F)

Sample Gas: -20° to $+65^{\circ}\text{C}$

Optional Heater/Thermostat Setpoint: 25°C (77°F)

Accuracy:

Moisture: $\pm 2\%$ of reading or 4 PPMv

Calibration Certification: NIST Traceable

Response Time:

Optical: < 2 seconds once sample cavity is fully purged

Note: *Total system response is dependent upon the change in moisture concentration, length of sample tubing, sample system components, flowrate and pressure.*

Flow:

Sample Cell Flow Rate: 10 to 60 SLH (0.4 to 2 SCFH); 30 SLH (1 SCFH) nominal

By-pass Flow Rate: 5 to 10X of flowrate through sample cell.

Display: Backlit LCD digital display of up to three process parameters

Analog Outputs: Three 0/4-20mA DC (source), 500 Ω maximum load. User programmable and scalable.

Analog Input: Loop powered 4-20mA input for remote pressure transmitter. **Aurora H₂O** supplied 24 VDC.

Digital Interface: Two programmable digital communications ports;

RS-232 and RS-485 with multidrop capability and assignate address. Modbus RTU protocol.

Software: Displays all key parameters. Provides time-base graphing. Data logging. Ability, export data as ASCII text. Software has lockout/passcode.

Local User Interface: "Through the glass" magnetic keys. Ability to configure and scale unit in hazardous area without opening the enclosure. Local display/interface has a lockout and pass code.

Ingress Rating: IP-66

Dimensions (overall): 34"H x 18"W x 14"D (87 cm x 46 cm x 36 cm). See drawings.

Weight: approximately 45 kg (100 lbs)

1.5 Specifications (cont.)

Electrical Classifications:



For use in the USA and Canada;

Explosion-Proof for Class I, Division 1, Groups C, D; Dust-Ignition Proof for Class II/III, Groups E, F, G; T6; Tamb = -20° to +65°C; IP66.



ATEX and IECEx: Ex de IIB T6; Tamb = -20° to +65°C. Flameproof with increased safety compartment.

Laser Certification: USA FDA & IEC 60825-1 Edition 2.0, Safety of Laser Products.

European Certification: Complies with EMC Directive 2004/108/EC, Low Voltage Directive 2006/95/EC, and Pressure Directive 97/23/EC for DN <25.

Sampling System: Integrated sampling system to filter out physical contaminants, remove glycol carry over, control temperature condition, regulate pressure and flow rate. Optional thermostatically controlled heater.

Wetted Components: 316/316L stainless steel for tubing and fittings. Other wetted components such as the optical window and mirror are proprietary materials and are compatible with natural gas and typical contaminants found in natural gas. Other sample system components wetted parts include PTFE, PFA, Inconel, Hastelloy, PVDF, glass, viton.

CLASS 1 LASER PRODUCT



WARNING!

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser exposure.

CAUTION! CLASS 1M INVISIBLE LASER RADIATION WHEN OPEN. DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS.

[no content intended for this page]

Chapter 2. Installation

2.1 Introduction

The **Aurora H₂O** analyzer provides direct indication of moisture concentration in natural gas. Temperature and pressure sensors are used to provide high precision enhancement. It may be installed in a wide variety of environmental conditions, and meets the requirements for operation in hazardous areas.

Be sure that the ambient temperature is at least 10°C higher than the maximum dew/frost point temperature you expect to measure. This will ensure that you will not have liquid condensation in the sample transport line or the **Aurora H₂O** sampling system components. Heat tracing the sample line will aid in elevating the sample temperature above the dewpoint. An optional heater installed within the enclosure is also available.

2.2 Bill of Materials

The following should have been received with the shipment:

- **Aurora H₂O** Unit
- **Aurora H₂O** Calibration Data Sheet
- **Aurora H₂O** User's Manual on CD ROM
- Maintenance/Accessories Kit
- **AuroraView** Software on CD ROM
- Optional: Pipeline Insertion Filter/Regulator Assembly

2.3 Unpacking



The **Aurora H₂O** will be shipped in a packing box with a plywood base. The **Aurora H₂O** analyzer will be secured to the plywood base with mounting bolts. Transport the shipping package with the plywood base down, and according to the warning labels on the exterior packaging. Open the packing box from the top. Remove the foam packing material. Collect piece parts such as the **AuroraView** CD, the User Manual CD, and other items contained in the shipment.

Remove the mounting studs at the bottom of the enclosure. Using two people, lift the **Aurora H₂O** from the bottom of the enclosure and from top of the enclosure where the analyzer electronics is located. A typical **Aurora H₂O** weighs approximately 100 pounds (45kg). Use a proper lifting technique to avoid injury.

Check all the received pieces and record the model numbers and serial numbers for your records. If anything is missing, contact GE immediately.

Figure 6: Unpacking the Aurora H₂O

2.4 Choosing A Site for Installation

You should have discussed environmental and installation factors with a GE Sales, Applications or Service Engineer by the time you receive the analyzer.

Before installing the analyzer, read the guidelines below on installation recommendations for consideration:

1. Choose an installation site for the **Aurora H₂O** analyzer as close to the actual sample point (sample take-off point) as possible, to minimize transport time to the analyzer.
2. Avoid unnecessarily long lengths of sample transport tubing to minimize transport time to the analyzer.
3. Avoid dead-legs in the sample transport tubing to minimize the possibility of liquid build-up.
4. Use stainless steel tubing. Avoid using copper tubing, as the water molecule has greater absorption capabilities for copper compared to stainless steel. Avoid rubber tubing at all costs, as water molecules interact with the rubber, and ambient moisture can permeate through the tube wall into the sample gas.
5. Mount the **Aurora H₂O** analyzer at grade, or at a location that is easily accessible for maintenance (on a platform or other structure).
6. Be sure that the ambient temperature is at least 10°C higher than the maximum dew/frost point temperature you expect to measure. This will ensure that you will not have liquid condensation in the sample transport line nor in the **Aurora H₂O**. Heat tracing the sample line will aid in elevating the sample temperature above the dewpoint. An optional heater installed within the enclosure is also available.

An **Aurora H₂O** system for monitoring moisture off a natural gas pipeline is shown in Figure 7 on page 13.

2.4 Choosing A Site for Installation (cont.)

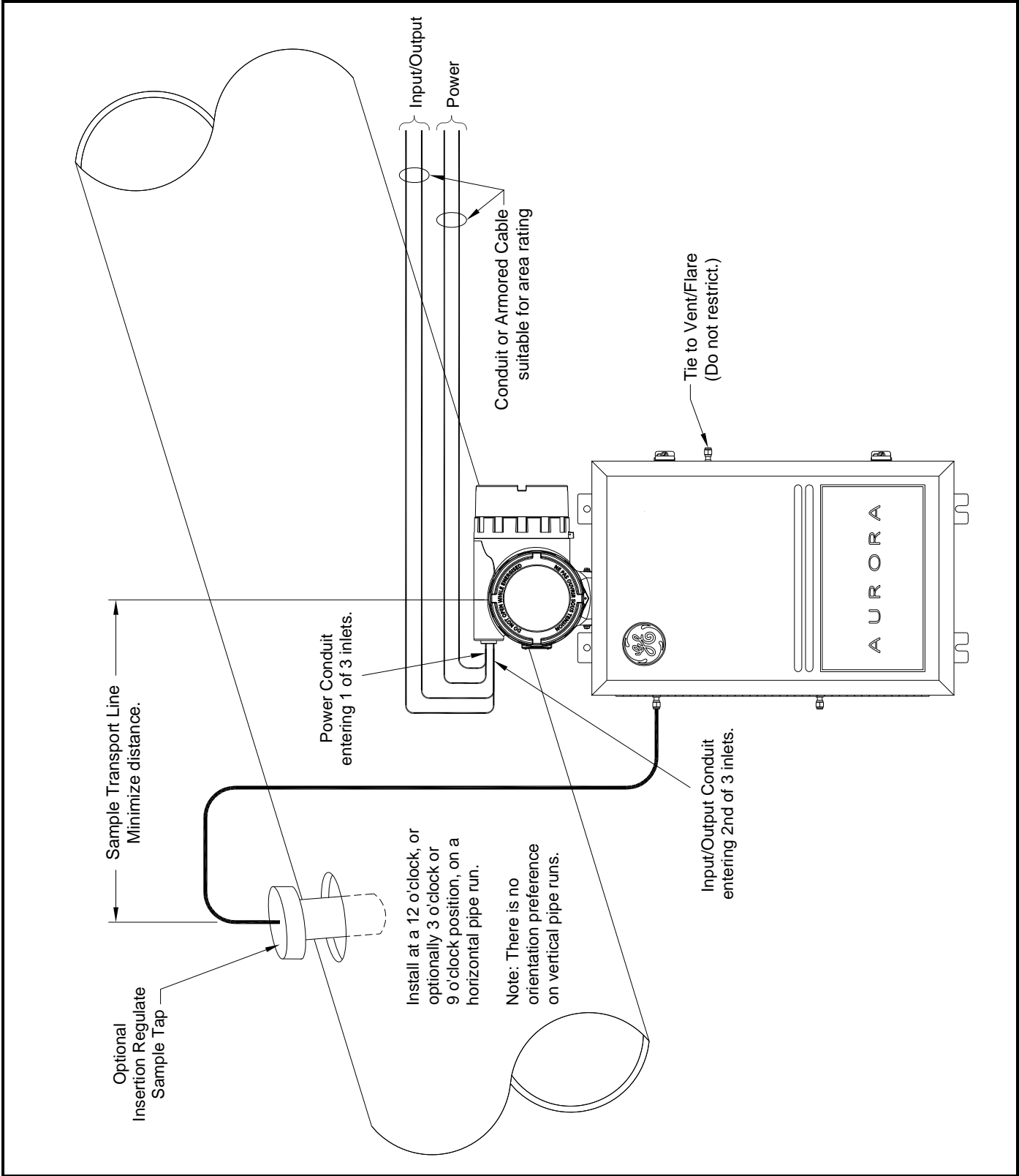


Figure 7: Aurora H₂O Analyzer Monitoring Moisture Off a Natural Gas Pipeline

2.5 Low Voltage Directive

To comply with the Low Voltage Directive, you must install a switch or circuit breaker on the input power line. For greatest safety, locate the circuit breaker or power switch near the electronics console.

IMPORTANT: *Installation must be done in accordance with the National Electrical Code, the Canadian Electric Code, and/or any other applicable local codes.*

2.6 Mounting

Use the four mounting tabs to mount the **Aurora H₂O** System Assembly in the desired location (see Figure 30 on page 29).

IMPORTANT: *The Aurora H₂O should only be mounted vertically.*

2.7 Optional Insertion Probe/Regulator

2.7.1 Description

For natural gas applications that may have entrained particulate and liquid contaminants (especially TEG carry-over from TEG dryers), GE recommends the use of a *Insertion Probe/Regulator* to serve as the first part of particulate and condensate filtration where the gas is sampled off the pipe. The device combines the features of a sample tap, a membrane filter and an integral pressure regulator (0-500psig outlet), adjustable at the sample take-off point. The sample tap housing includes a foot-valve so that, once installed, the assembly can be removed from a line under pressure for membrane filter replacement as needed.

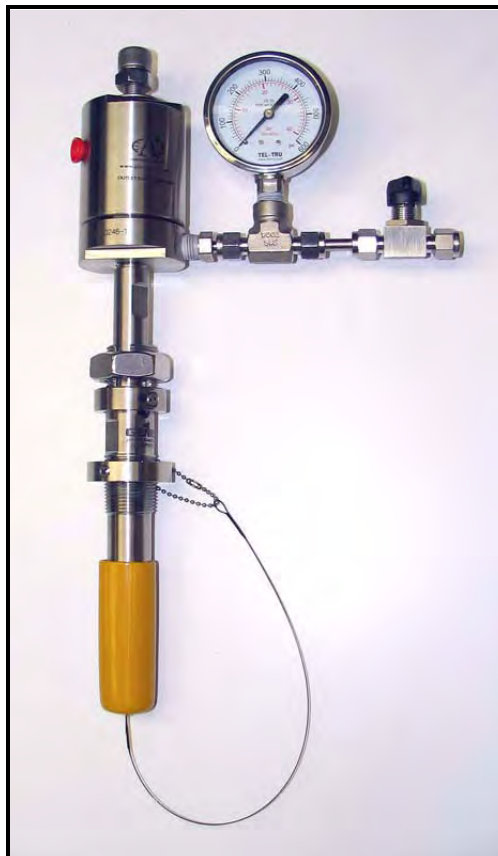


Figure 8: Insertion Probe/Regulator

Note: A 29/32" (0.907 inch, 23.1 mm) minimum bore-through clearance is needed on the customer nozzle for insertion of a 3/4" NPT insertion membrane liquid separator/pressure regulator.

2.7.2 Installation

Note that the *Optional Insertion Probe/Regulator* can be installed only on depressurized lines. There is no hot-tap installation for this device.

This procedure is broken down into two steps:

- Installing the Housing
- Installing the Insertion Probe/Regulator Assembly

2.7.2a Installing the Housing

A picture of the housing is supplied below. The housing is supplied with a *Locking Mechanism* to ensure that housing can only be removed intentionally.

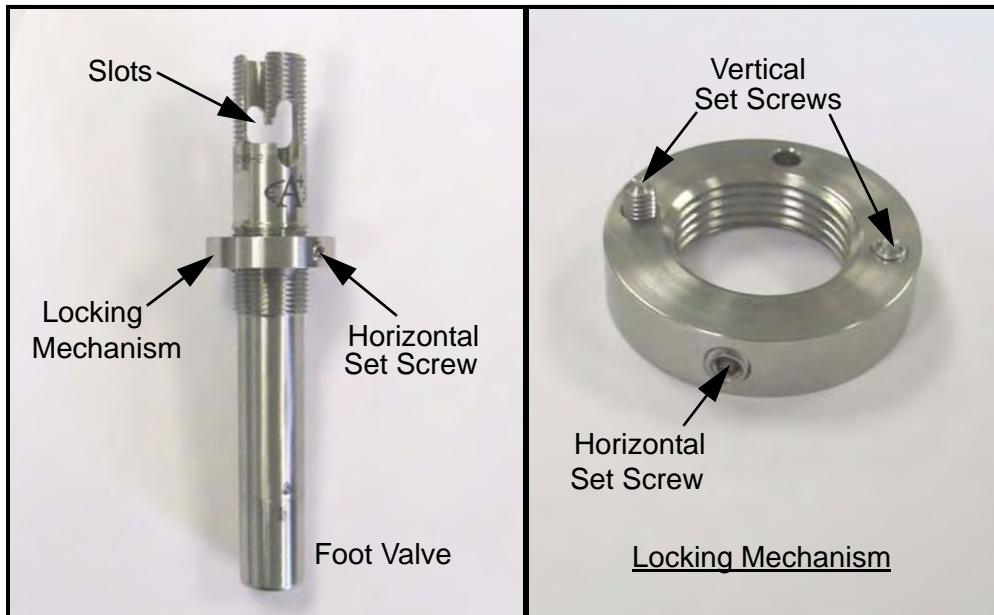


Figure 9: Installing the Housing and Locking Mechanism

1. Turn the locking mechanism counter-clockwise until it is at its extreme upper position. Apply thread sealant to the threaded area below vertical slots in the threads. Do not allow the thread sealant to invade the slot, as it may interfere with the mechanism.

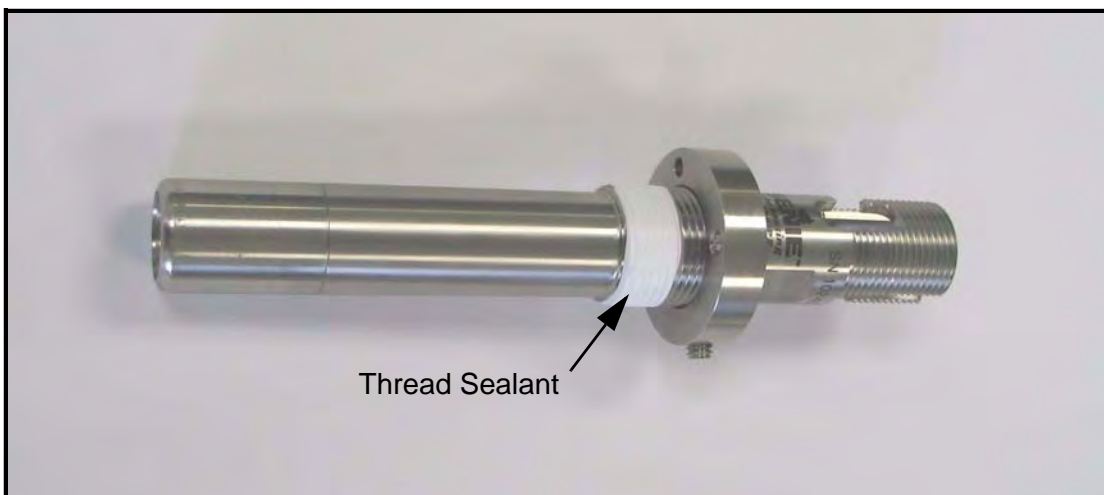


Figure 10: Applying Thread Sealant

2.7.2a Installing the Housing (cont.)

2. Confirm that the pipeline has been depressurized. Insert the housing into the pipeline through a $\frac{3}{4}$ " NPTF thread-o-let (The minimum ID of the thread-o-let is 0.91").

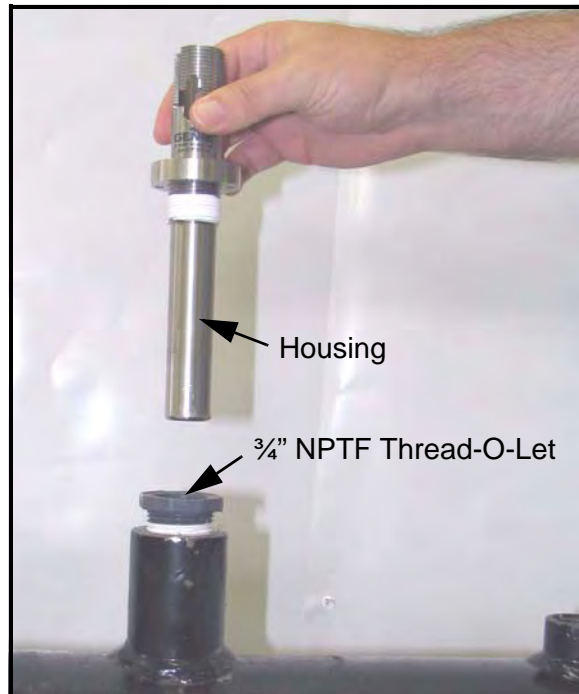


Figure 11: Inserting Housing into Pipeline

3. Using a wrench with wrench flats, turn the housing until it is secure and sealed. This will require between three and five turns. **DO NOT OVERTIGHTEN.** The housing may be damaged if it is over-tightened, causing the housing to swage.

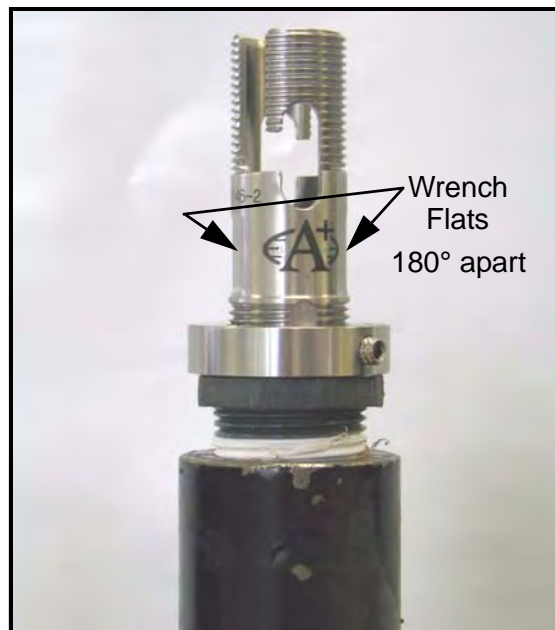


Figure 12: Tightening the Housing

2.7.2a Installing the Housing (cont.)

4. Turn the locking mechanism clockwise until it first touches the top of the thread-o-let.
5. Turn the locking mechanism counterclockwise until the Allen screw is aligned with the thread slot. Using a 1/8" Allen wrench, tighten the Allen screw until its tip is tight against the slot. **DO NOT OVERTIGHTEN THE ALLEN SCREW** as this will cause the housing wall to be indented.



Figure 13: Aligning and Tightening the Allen Screw

6. Using a 3/32" Allen wrench, tighten the Allen screws on the locking mechanism's surface until their tips are firmly set into the thread-o-let's upper surface.



Figure 14: Tightening the Allen Screws

The housing is now installed. The locking mechanism should prevent the housing from becoming unintentionally unscrewed from the thread-o-let. The pipeline may now be pressurized.

2.7.2b Installing the Insertion Membrane Liquid Separator/Pressure Regulator Assembly

1. Confirm that the allen cap screw head's hex cavity is clean and free from foreign material. Confirm that the allen cap screw that holds the membrane ferrule is torque-wrench tight. The torque value should be 10 inch lbs. If the allen cap screw is only hand-tight, the screw may protrude excessively, which could result in foot valve actuation when the probe is installed into the housing.



Figure 15: Checking/Tightening the Allen Cap Screw

2. Rotate the pressure adjustment screw on the pressure regulator fully counterclockwise until it rotates freely. Close the isolation ball valve.

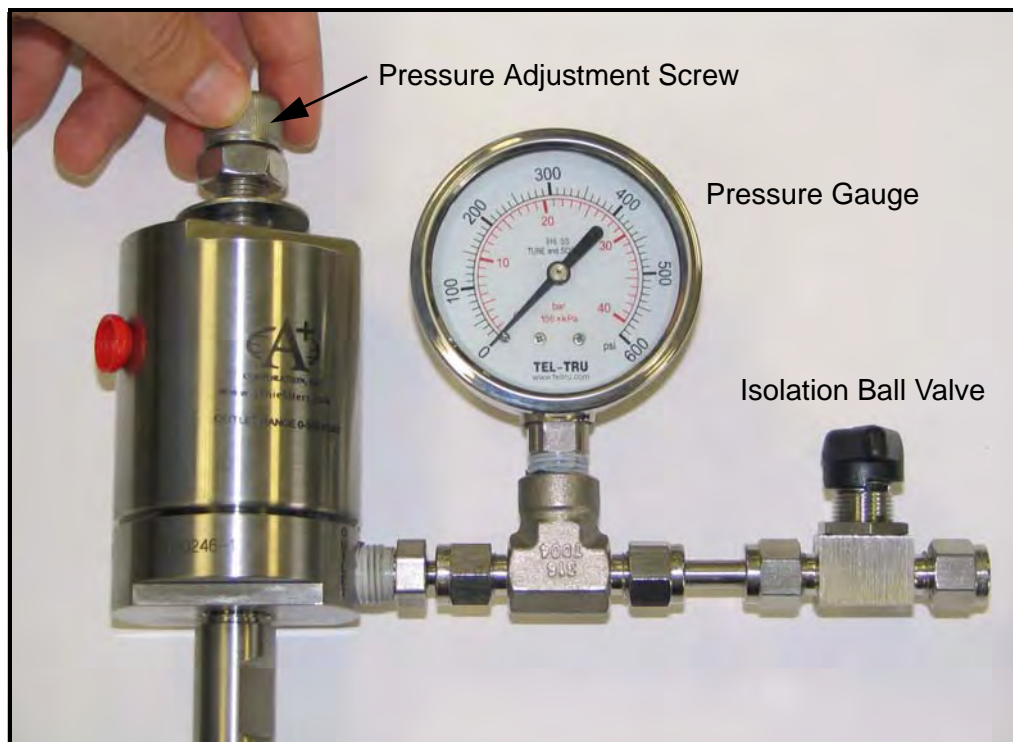


Figure 16: Rotating the Pressure Adjustment Screw

2.7.2b Installing the Insertion Membrane Liquid Separator/Pressure Regulator Assembly (cont.)

- Position the membrane end of the probe above the installed housing. Slowly lower the probe into the housing. Avoid membrane contact with the upper section of the housing. **DO NOT APPLY DOWNWARD FORCE.** The probe should slide easily into the housing. Lower the probe only enough to thread the insertion nut one complete turn of thread engagement.

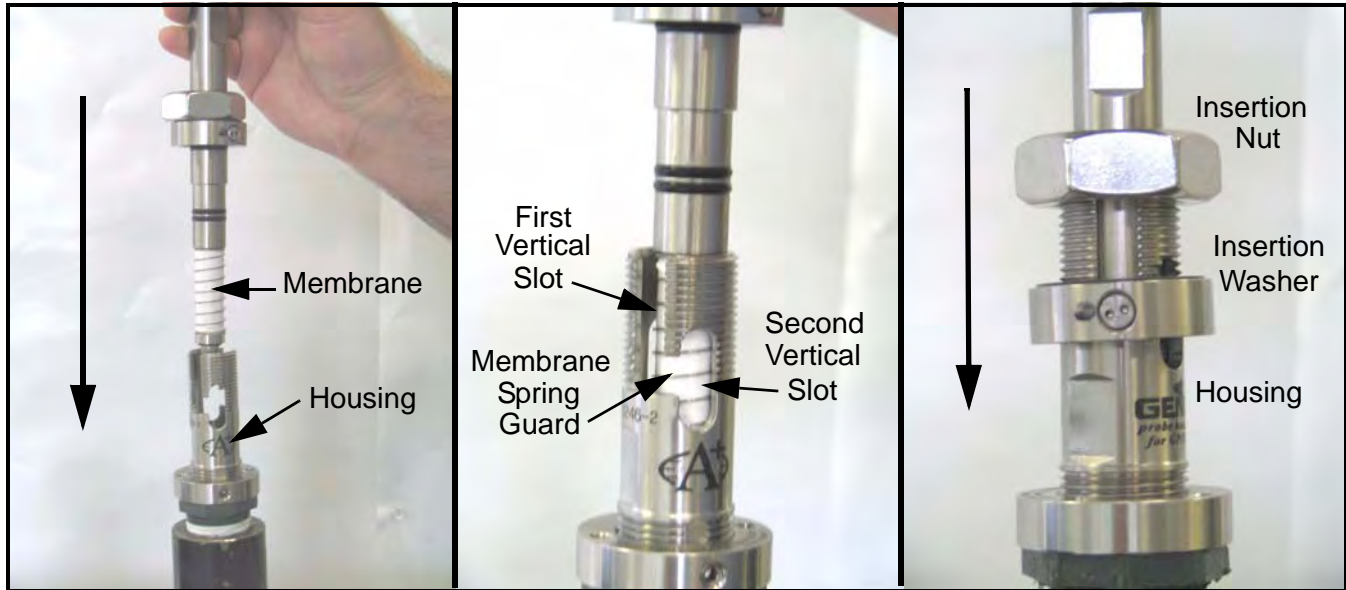


Figure 17: Installing the Probe

- Thread the insertion nut down by hand, lowering the probe until the insertion washer pins slide to the bottom of the first vertical slot.

Note: *The threaded nut on the housing ensures that if all other safety procedures are disregarded, it is mechanically impossible to remove the probe.*

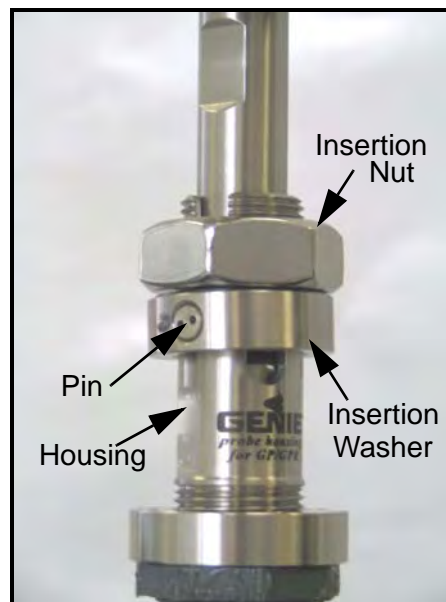


Figure 18: Threading the Insertion Nut

2.7.2b Installing the Insertion Membrane Liquid Separator/Pressure Regulator Assembly (cont.)

5. Rotate the probe counterclockwise until the pins are to the far right in the horizontal slot. At this point, the probe is sealed against the housing interior wall. The pins will be in the middle of the second vertical slot.



Figure 19: Rotating the Probe

6. Loosen the insertion nut until it is above the top of the second vertical slot. The probe should not rise to the top of the second vertical slot. If the probe rises in the slot, the foot valve o-ring may have been damaged or attacked by the process.

Note: *The threaded nut on the housing ensures that if all other safety procedures are disregarded, it is mechanically impossible to remove the probe. Perform the next step regardless of the status of the foot valve o-ring.*



Figure 20: Loosening the Insertion Nut

2.7.2b Installing the Insertion Membrane Liquid Separator/Pressure Regulator Assembly (cont.)

7. Tighten the insertion nut by hand until it is against the insertion washer again. Using a wrench, tighten the insertion nut against the insertion washer so that the pins are at the bottom the second vertical slot. At this point the foot valve opens and the insertion process is complete.



Figure 21: Tightening the Insertion Nut

2.7.3 Setting the Pressure

Note: Perform these steps only after the entire system is plumbed up, including the **Aurora H₂O**.

1. Ensure the inlet sample gas isolation valve on the **Aurora H₂O** sample system is closed. Open the isolation ball valve at the Optional Pipeline Insertion Membrane Liquid Separator/Pressure Regulator.
2. Turn the pressure adjustment screw clockwise to increase the pressure. The optional pipeline insertion membrane liquid separator/pressure regulator is the **FIRST STAGE** pressure reduction of the system when used. Depending upon your source pressure, you should step down the pressure to a value in the range given in the table below.

Source Pressure	Outlet Pressure Setting
750 psig < source < 1500 psig	400-500 psig
500 psig < source < 750 psig	300 psig
< 500 psig	50% of the average source pressure

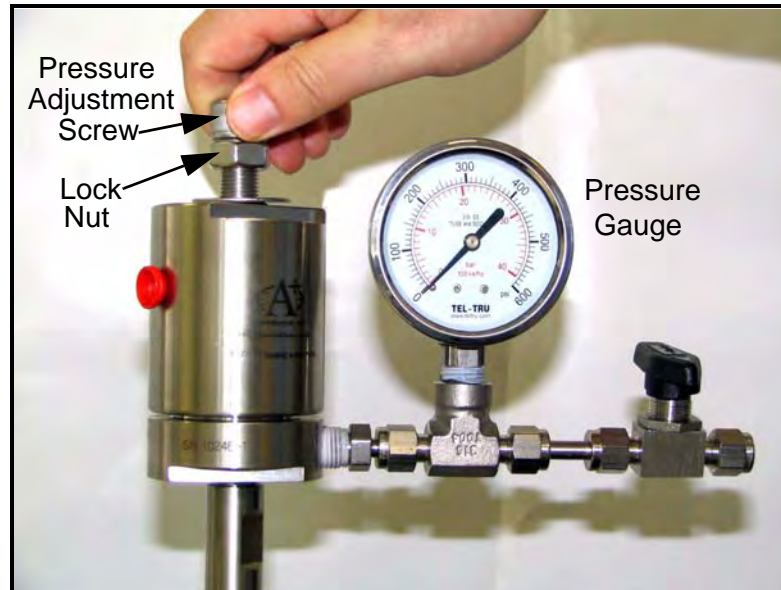


Figure 22: Turning the Pressure Adjustment Screw

3. Tighten the lock nut down to the top of the pressure regulator to avoid future possible changes in pressure regulator setting, once the pressure is set.

2.8 Making Electrical Connections

Refer to Figure 31 on page 30 for wiring connections.

1. **Aurora H₂O** has three ¾" NPT conduit inlet ports for power and I/O. These will normally be shipped plugged from the factory. Follow the applicable wiring code and requirements for wiring the unit.



Figure 23: Conduit Inlet Ports

Note: Use one conduit inlet for power. Use the two other conduit inlets for input/output as needed. All unused conduit inlet ports should be sealed with suitable blanking elements.

2. Use one conduit for inlet power to the **Aurora H₂O** based on your configuration. The **Aurora H₂O** comes with a universal power supply, or optionally, as a 24VDC powered unit. Remove the wiring cover to view the wiring terminal block.

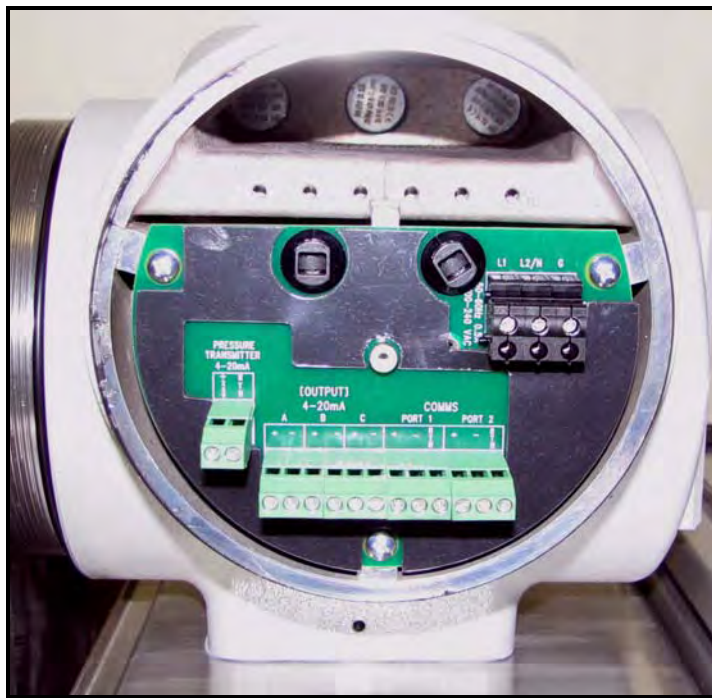


Figure 24: Wiring Terminal Blocks

2.8 Making Electrical Connections (cont.)

Note: All wires shall have a temperature rating suitable for the installation, be stripped back 5/16 in. (8 mm) and torqued to a minimum of 4.4 in. lb. (0.5 Nm).

- Run the AC power connections to the Power Terminal Block shown in Figure 25. It is recommended to use 12-18 AWG (3.3 - 0.82 mm²) power wiring.



Figure 25: Power Terminal Block

- Use wiring conduit runs, separate from the **Aurora H₂O** main power, for all I/O (Input/Output) leads. Wire up to three 4-20mA outputs to the terminals labeled A, B, and C. The three analog outputs A, B and C (0-20mA or 4-20mA) are internally powered by the **Aurora H₂O**. Use shielded 18-22 AWG (0.82–0.33 mm²) twisted pair wire, and ground the shield at one end only. Wire up digital communications to Port 1 and/or Port 2 as labeled.
- Either digital port may be configured for RS-232 or RS-485. Port 1 is designated as “SCADA.” Port 2 is designated as “SERVICE.”
 - For operation on RS-485, 2-wire, half-duplex bus, attach the RS-485(+) to (+), and the RS-485(–) to (–). Make no connection to RTN.

Note: For an RS-485 Multidrop Network, a terminating resistor must be installed across the **Aurora H₂O** RS-485 terminals, or an internal terminating resistor can be applied. See below.

When using the **Aurora H₂O** in RS-485 mode, and to prevent signal reflections on the high-speed RS-485 connections, it is recommended that the far end of the RS-485 lines be terminated properly. The termination can be accomplished in one of two ways:

- Connect 120Ω ¼W leaded resistors across the + and – terminals of ports 1 and 2 (both ports or whichever one will be in use), or
- Using long-nose pliers, move jumpers J15 and J16 from pins 2 and 3 (default setting from factory) to pins 1 and 2 (see Figure 26 on page 26). J16 is the termination for port 1 and J15 is the termination for port 2. It is also recommended that basic ESD precautions such as grounded wrist straps be used for this procedure.

2.8 Making Electrical Connections (cont.)

Multi-drop RS-485:

For multiple **Aurora H₂O** units connected in daisy-chain fashion to the RS485 interface, it is important that the farthest unit away from the transmitting device be the only unit incorporating any termination. All other units must have jumpers J15 and J16 in positions 2 & 3 (default setting from the factory). For more details on RS-485 wiring or operation, refer to TIA/EIA-485-A Specification.

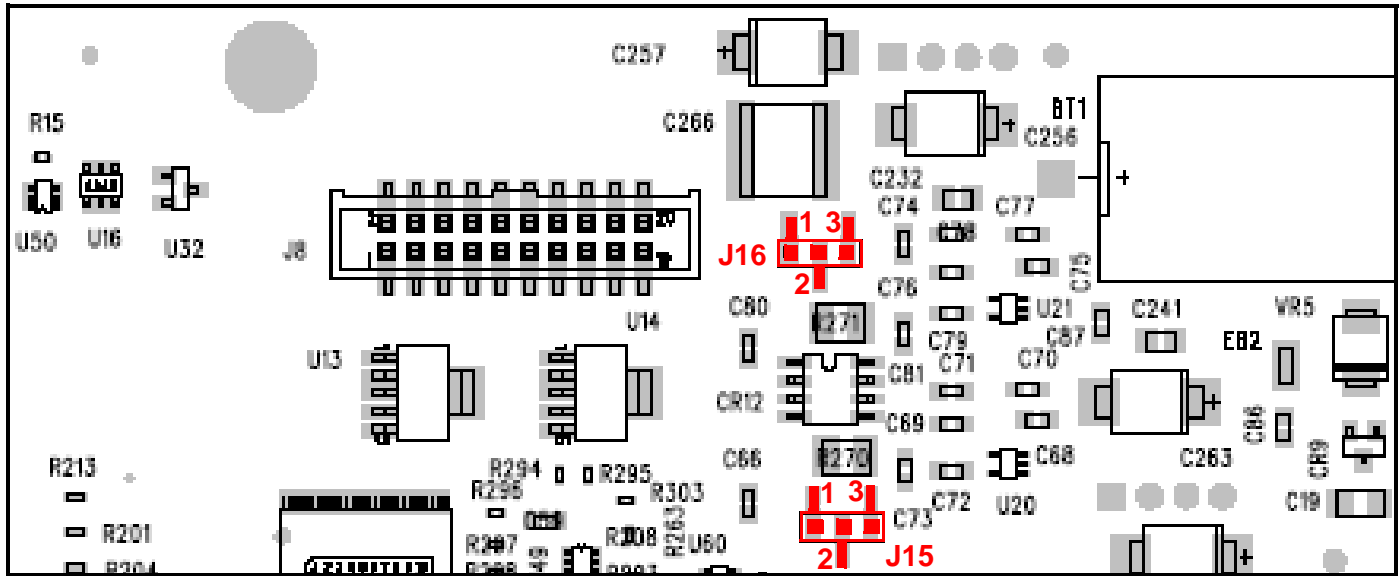


Figure 26: RS-485 Mode Termination - Install Jumpers at J15 and J16, Pins 1 and 2

Note: Terminations are NOT required when using ports in RS-232 mode.

- For operation on RS-232, connect RS-232(TXD) to (+), RS-232(RXD) to (-), and RS-232(GND) to RTN.

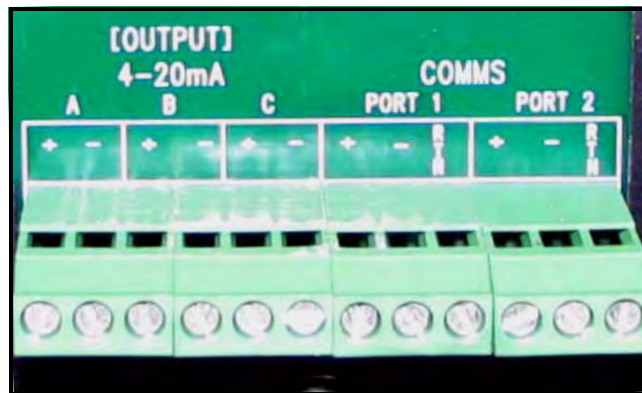


Figure 27: Input/Output Connections

2.8 Making Electrical Connections (cont.)

6. For connection to a PC to interface with AuroraView Software, you may use the supplied 704-688 cable (RS-232 w/ SUB-D-9 connector to tinned leads). Wire the cable as follows:

Color Code		Aurora H ₂ O Terminal
White	Tx	+
Red	Rx	-
Green	Ground	RTN

Note: The default configuration is as shipped:

BAUD Rate	115,200
Parity	Even
ID Note	1 for Port 1, 2 for Port 2

7. Use a separate wiring conduit run for any 4-20mA pressure transmitter input. This input is used when a live input pressure reading for the main process pressure is desired, to determine an equivalent dewpoint by the **Aurora H₂O** analyzer. Wire the 4-20mA pressure transmitter to the Pressure Transmitter terminal block. The **Aurora H₂O** supplies 24VDC for use with a loop-powered, 2-wire pressure transmitter.



Figure 28: Pressure Transmitter Connections

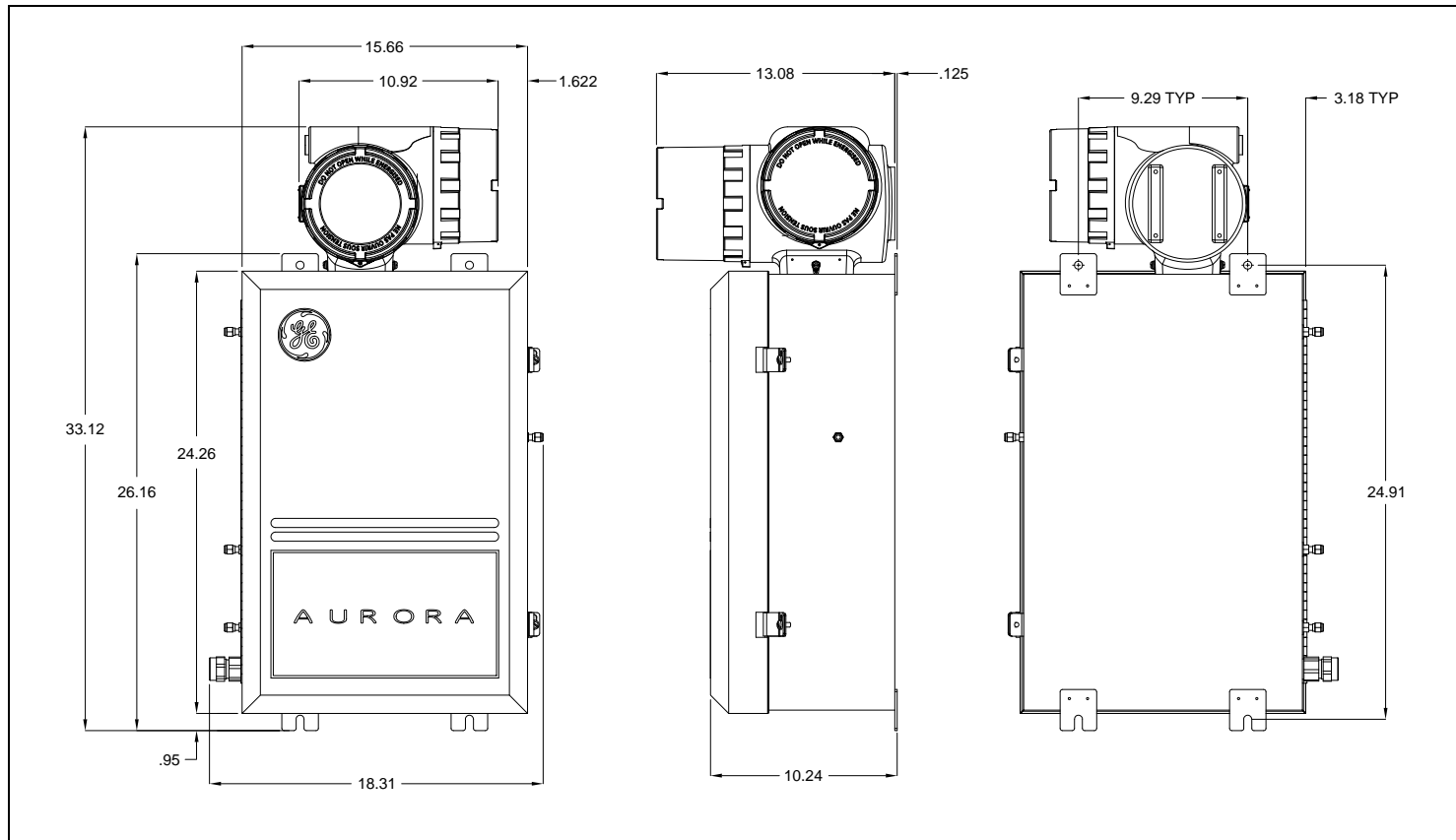
Note: Use of an external pressure transmitter is not covered by the **Aurora H₂O** hazardous area certifications. The external pressure transmitter should be suitably rated for the area classification. Its associated wiring should be done in accordance with local codes and regulations, and suitably rated for the area classification.

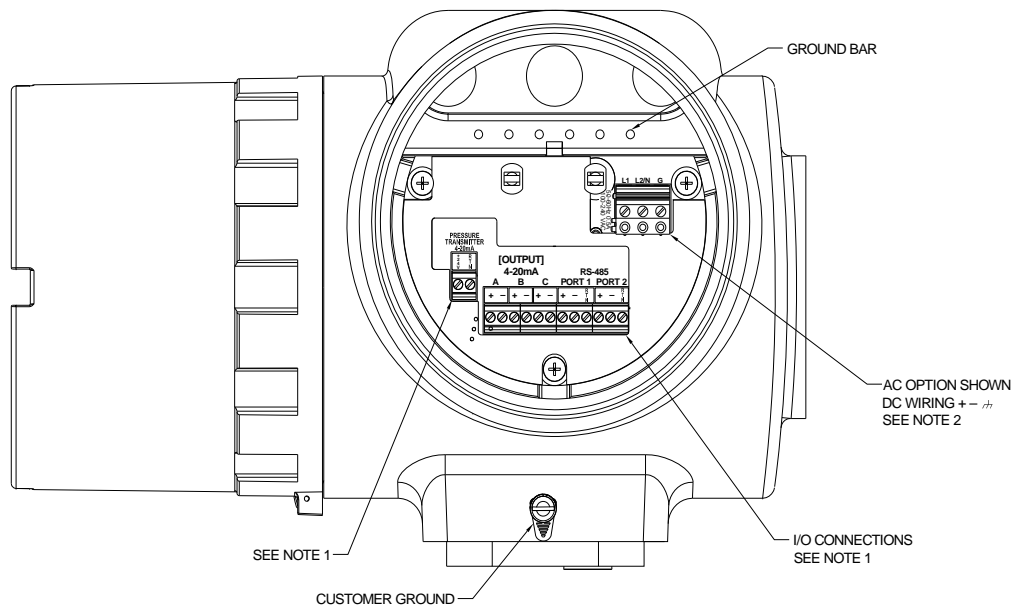
8. If the **Aurora H₂O** has been supplied with an optional electrical heater, there are two possible configurations: USA/CAN or EU. Connect the AC power using a separate conduit from the power for the **Aurora H₂O** analyzer. The heater is equipped with a thermostat preset to 25°C (77°F) nominal. Use 12-18 AWG (3.3 - 0.82 mm²) wires. The heater terminals are located within a junction box (item 15 in Figure 2 on page 4 or Figure 3 on page 5).

9. Lastly, the **Aurora H₂O** analyzer requires a connection to ground from the electronics explosion-proof/flame-proof enclosure. There are two external ground connections available for the user (on the left and right hand sides of the enclosure). Wire this connection to earth ground, local to the **Aurora H₂O** analyzer installation site.



Figure 29: Earth Ground Connection

Figure 30: Aurora H₂O Outline and Mounting (ref. dwg #712-1456)



NOTES:

1. I/O CONNECTIONS AND PRESSURE TRANSMITTER WIRE GAUGE RANGE 12-24 AWG.
2. AC AND DC CONNECTION WIRE GAUGE RANGE 12-18 AWG.

Figure 31- Aurora H₂O Electronic Assembly Wiring Diagram (ref. dwg #702-8976)

Chapter 3. Operation and General Programming

3.1 Using the Aurora H₂O

Follow the information in this chapter to operate the **Aurora H₂O** system.

CLASS 1 LASER PRODUCT



WARNING! Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser exposure.

3.2 Sample System

See the instructions below and Figure 32 on page 32 to operate the **Aurora H₂O** sample system.

3.2.1 Startup

1. Start with all valves in closed position and the pressure regulator turned fully counter-clockwise.
2. Turn the Sample/Purge 3-way ball valve to point towards the sample needle valve.
3. Sample Inlet gas pressure should be <400 psig (2760 kPa).
4. Confirm that there are no pressure restrictions downstream of the sample outlet flowmeter.
5. Open the inlet isolation ball valve.
6. Crack open the bypass needle valve approximately 1/4 turn to establish coalescer bypass flow for those installations requiring glycol removal. Otherwise, leave it closed for filtration only.
7. Turn the pressure regulator clockwise until the pressure gauge reads approximately 3-5 psig.
8. Open the sample needle valve until the flowmeter reads 30 SLPH (1 SCFH).

3.2.2 Shut Down

1. Close the inlet isolation ball valve.
2. Turn the pressure regulator fully counter-clockwise.
3. Close the sample needle valve.
4. Close the bypass needle valve.

3.2.3 Purge

1. Hook up the purge gas.
2. Regulate the pressure externally to 3-5 psig.
3. Turn the sample/purge 3-way ball valve towards the purge inlet.
4. Crack the purge inlet needle valve to set the to 30 SLPH (1 SCFH).

3.2 Sample System (cont.)

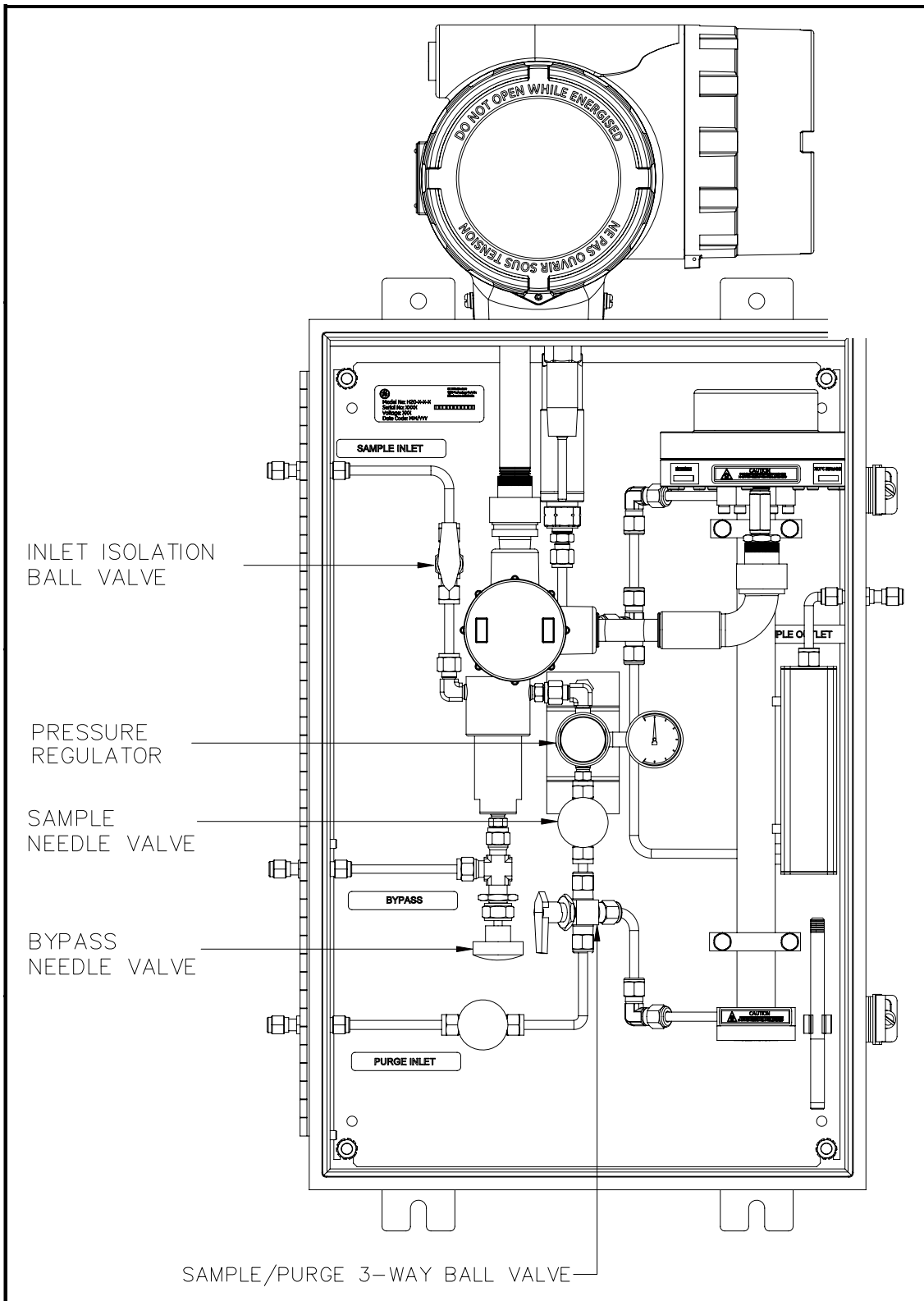






Figure 32: Aurora H₂O Sample System Quick Startup Guide (ref. dwg #902-004)

3.3 Keypad Features



Figure 33: Aurora H₂O Keypad

The Aurora H₂O has seven keys: a **Menu** key, four arrow keys, a **Cancel**  key, and an **Enter**  key.

- Use the **Menu** key to open the main menu on the display.
- Use the arrow keys to navigate among menu choices and to increment/decrement numeric entries.
- Use the **Cancel**  key to cancel a numeric entry change, or exit a menu.
- Use the **Enter**  key to accept a numeric entry or select a menu option.

3.3.1 Indicator Lights

If the **Fault Indicator** is lit, an instrument fault is detected. A message will be displayed in the Main Display, top/right.

If the **Information Indicator** is lit, the instrument is still operating, but a message will appear in the Main Display top/right, with information about the instrument.

The **Keypad Lock Indicator** will be lit if either: A) the Keypad Lock-Out Switch, internal to the instrument, has been engaged, or B) the instrument keypad has not been used for a period of several minutes, engaging a software feature to lock-out inadvertent key usage. Type (B) keypad lock-out is overcome by pressing **Cancel**, **Enter**, **Cancel** in sequence.

If the **Laser Indicator** is lit, the laser is powered and operating normally. This indicator will be off if there is a laser-specific fault. This indicator will also be off for a brief period when the instrument is first powered. After initial power-up, this indicator may blink several times as the laser temperature is stabilized. The laser indicator will be lit constantly in normal operation.

The **Power Indicator** is normally lit when the instrument is powered.

3.3.2 The Magnetic Stylus

Each of the keys can be selected using a hand-held magnet called a *Magnetic Stylus*, which is included with the meter. By touching the clear window at a key location, that key will be selected and will flash a red light to verify the contact.



Figure 34: Magnetic Stylus

3.3.3 The Default Display

Figure 35 shows the default display of the Aurora H₂O window.

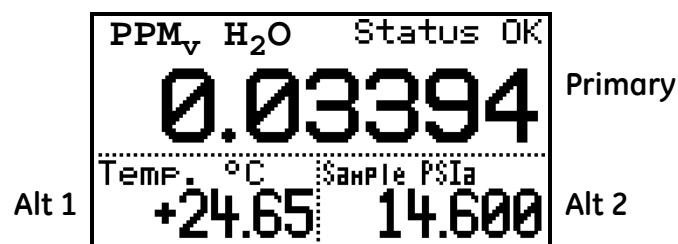



Figure 35: Default Display

3.3.4 Unlocking the Keypad

After power-on, the **Aurora H₂O** keypad is locked as indicated by the symbol , lit up with a red backlight. It is necessary to enter the keypad unlock sequence to make any changes to the **Aurora H₂O**.

Similar to a mobile phone, the **Aurora H₂O** will prompt the operator to unlock if any key is pressed. A passcode is required to use certain factory service features only.

To unlock the keypad, press **Cancel** , **Enter** , **Cancel**  in sequence.

3.3.5 Keypad Lock-Out Switch







Figure 36: Keypad Lock-Out Switch Location

Note: If the Keypad Lock-Out Switch is in the “down” position (towards the **Aurora H₂O** sample system), the keypad is locked out and the **RED** LED on the Keypad Lock Indicator is on all the time.

WARNING! Do not open or remove the cover with the power on, unless the area is non-hazardous.

3.3.6 Accessing the Menus

After successfully unlocking the keypad, press the  Menu key. The **Aurora H₂O** will display the Main Menu (see Figure 37). Use the arrow keys to highlight the menu item desired. Refer to *Menu Map*, Figure 40 on page 63.

Press **Enter**  to select the highlighted item. Many menu items will display another menu. Use **Cancel**  to return to the previous menu page. Pressing **Cancel**  from the Main Menu will return the screen to the Measurement Display.

Note: *Menu items displayed with an ellipsis (shown as a series of three dots after the menu item) will bring up more choices, while those without take immediate action.*

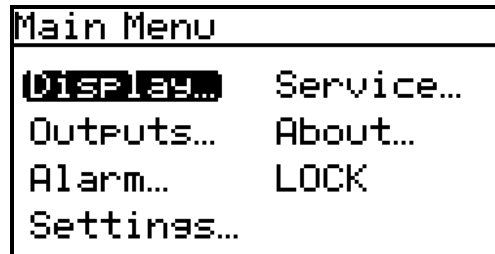







Figure 37: Main Menu

3.3.7 Entering Numeric Values

Since the **Aurora H₂O** has no numeric keypad, numeric values are entered using a “combination lock” style of entry:

Use the **left**  and **right**  arrow keys to select the digit to change. The digit selected will be indicated with a .

Use the **up**  and **down**  arrow keys to increment or decrement the digit.

Note: *If incrementing or decrementing a digit would cause the numeric value to exceed its allowable range (maximum/minimum value), the digit will not change.*

Press **Enter**  to save the new value and return, or **Cancel**  to return, leaving the original value intact.

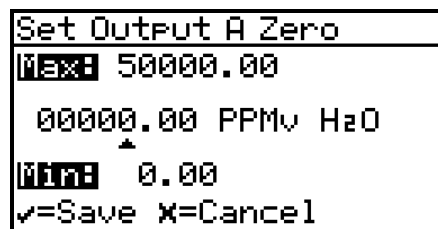


Figure 38: Numeric Entry

3.3.8 Starting Up

After proper installation, the **Aurora H₂O** Transmitter can be set up to accommodate the user's requirements. Typically, the user may need to configure the analog outputs, trim the analog outputs, and program the digital outputs. Refer to the Menu Map, Figure 40 on page 63, and complete the following steps. Upon startup, the **Aurora H₂O** proceeds through several displays until a screen similar to the following appears:

PPM _v H ₂ O	Status OK
0.03664	
Temp. °C	Sample PSIa
+24.64	14.600

After startup, the screen will need to be unlocked. To unlock the screen, select

  
Cancel, Enter, Cancel.

Note: In most instances, use the **Enter** key to save an entry and/or move ahead to the following screen; use the **Cancel** key to reject an entry and/or return to the previous screen.

3.4 Setting Up the Display

Main Menu	
Display...	Service...
Outputs...	About...
Alarm...	LOCK
Settings...	

When the screen is unlocked, touch the **Menu** key and the Main Menu appears with several options. To set up the display, select Display... and press **Enter**. The following screen appears:

3.4.1 Selecting Primary Units

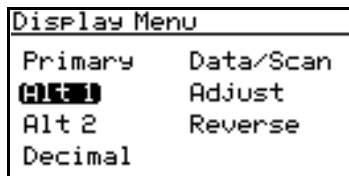
Display Menu	
Primary	Data/Scan
Alt 1	Adjust
Alt 2	Reverse
Decimal	

To select units for the primary display, select Primary and press **Enter**. The following screen appears:

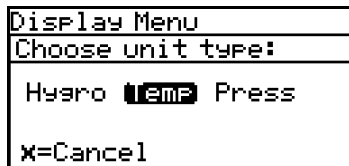
Select Primary Unit:	
PPM_v H₂O	Dew Pt. °C
Lbs/MMSCF	Dew Pt. °F
mg/m ³ H ₂ O	Eq. DP °C
Pw. kPa	Eq. DP °F

Use the arrow keys to highlight the desired units and press **Enter**. The screen returns to the Display Menu.

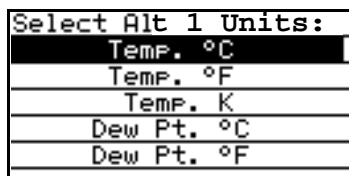
3.4.2 Selecting Alt 1 and Alt 2 Units



To set the units for Alt 1 and/or Alt 2, use the arrow keys to highlight the one to be set, and press **Enter**. The following screen appears:

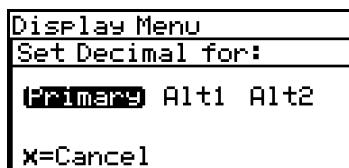


Use the arrow keys to highlight the desired unit type (Hygro, Temperature or Pressure) and press **Enter**. If Temp is selected, the following screen appears.



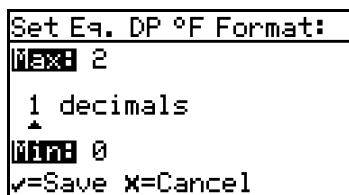
Use the arrow keys to highlight the desired unit and press **Enter**. The screen returns to the Display Menu. Use the same procedure to change other units.

3.4.3 Setting Decimal Places



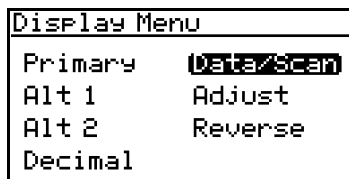
To set the decimal places for unit values, from the Display Menu use the arrow keys to highlight Decimal and press **Enter**. Then select the type of display and press **Enter**.

The decimal places setting determines the number of digits displayed for the value to the right of the decimal symbol (“.”), if possible.

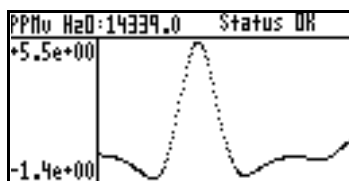


Use the arrow keys to change the number of decimal places and press **Enter**, or press **Cancel** if no changes are necessary. The screen returns to the Display Menu.

3.4.4 Data/Scan

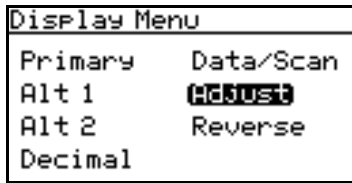


To toggle the display between showing the numeric values (data), and a graphic plot of the 2f waveform (scan), from the Display Menu use the arrow keys to highlight Data/Scan and press **Enter**. A screen similar to the following appears.

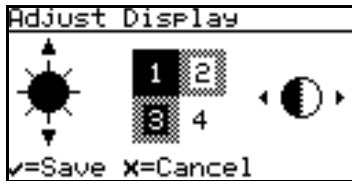


Note: The scan can be used for diagnostic purposes when a PC with **AuroraView** is not readily available.

3.4.5 Adjust

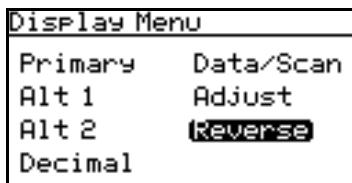


To modify the display contrast and brightness, from the Display Menu use the arrow keys to highlight Adjust and press **Enter**. The following screen appears.

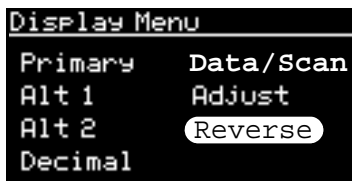


Use the Up/Down arrow keys to increase/decrease display brightness. Use the Right/Left arrow keys to increase/decrease display contrast. Press **Enter** to save the changes, or press **Cancel** to return to the previous setup. The screen returns to the Display Menu.

3.4.6 Reverse



To reverse the text and background shades, from the Display Menu use the arrow keys to highlight Reverse and press **Enter**. The following screen appears.



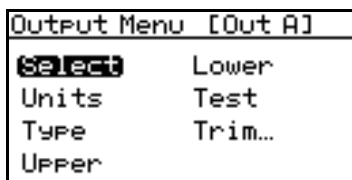
To return to the previous shade setup, select Reverse and press **Enter**. The previous screen appears.

3.5 Setting Up Outputs

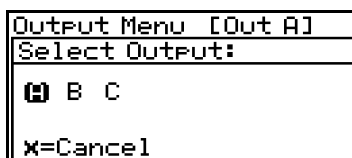
3.5.1 Selecting an Output for Setup



To set up outputs, from the Main Menu choose Outputs... and press **Enter**. The following screen appears.



From the Output Menu choose Select and press **Enter**. The following screen appears.



Use the arrow keys to select the output (A, B or C) to be set up, and press **Enter**.

3.5.2 Selecting Output Units

```

Output Menu [Out A]
Choose unit type:
[PPMv] Temp Press
X=Cancel

```

From the Output Menu, select Units and press **Enter**. Use the arrow keys to select the unit type and press **Enter**. A screen similar to the following appears:

```

Select Out A Units:
PPMv H2O | Dew Pt. °C
Lbs/MMSCF | Dew Pt. °F
mg/m³ H2O | Eq. DP °C
Pw, kPa   | Eq. DP °F

```

Use the arrow keys to select a new unit. Press **Enter** to save (or **Cancel** to keep the previous value), and return to the Output Menu.

3.5.3 Selecting an Output Type

```

Output Menu [Out A]
Select      Lower
Units      Test
[TYPE]     Trim...
Upper

```

To change the output type, from the Output Menu select Type and press **Enter**. A screen similar to the following appears:

```

Output Menu [Out A]
Select Output Type:
[0-20mA] 0-20mA
X=Cancel

```

Use the arrow keys to select a new output type. Press **Enter** to save (or **Cancel** to keep the previous value), and return to the Output Menu.

3.5.4 Changing the Upper Output Span

```

Output Menu [Out A]
Select      Lower
Units      Test
Type       Trim...
[UPPER]

```

To adjust the upper output span, from the Output Menu select Upper and press **Enter**. A screen similar to the following appears.

```

Set Output A Span
[50000] 50000.00
00100.00 PPMv H2O
[0.00] 0.00
√=Save X=Cancel

```

Use the left and right arrow keys to select each digit to be changed and the up and down arrow keys to increase or decrease its value. Press **Enter** to save (or **Cancel** to keep the previous value), and return to Output Menu.

3.5.5 Changing the Lower Output Span

```

Output Menu [Out A]
Select      Lower
Units      Test
Type       Trim...
Upper
  
```

To adjust the lower output span, from the Output Menu select Lower and press **Enter**. A screen similar to the following appears.

```

Set Output A Zero
XXXX 50000.00
 00000.00 PPMv H2O
  ^
XXXX 0.00
✓=Save X=Cancel
  
```

Use the left and right arrow keys to select each digit to be changed and the up and down arrow keys to increase or decrease its value. Press **Enter** to save (or **Cancel** to keep the previous value), and return to Output Menu.

3.5.6 Testing the Output

```

Output Menu [Out A]
Select      Lower
Units      Test
Type       Trim...
Upper
  
```

The Test Menu causes the **Aurora H₂O** to generate a 0- or 4-20mA output at the percent of scale selected. For example, in 4-20 operation, 0% = 4mA, 50% = 12mA, 100% = 20mA. This allows the proper function of recording or SCADA equipment to be verified. In 0-20 operation, 0% = 0mA, 50% = 10mA, 100% = 20mA.

```

Output A Test Value:
XXXX +110.00
+050.00 %
  ^
XXXX -25.00
✓=Save X=Cancel
  
```

To test system output, from the Output Menu select Test and press **Enter**. The **Aurora H₂O** will proceed to check the settings, and a screen similar to this display will appear.

Use the left and right arrow keys to select each digit to be changed, and the up and down arrow keys to increase or decrease its value. Press **Enter** to save (or **Cancel** to keep) the previous value, and return to the Output Menu.

Check your output wiring. If the reading on your SCADA or DCS is off slightly, then you may use the Trim feature to trim the output zero or span.

3.5.7 Trimming the Outputs

The Trim Menu enables the operator to compensate for differences in measurement of the 0/4-20 mA outputs by connected recorders or SCADA equipment. To trim the output:

```
Output Menu [Out A]
Select      Lower
Units       Test
Type        Trim
Upper
```

Select Trim from the Output Menu and press **Enter**. The following screen appears.

```
Trim Menu [Out A]
Select Trim Output
Reset Trim
Trim Zero
Trim Span
```

To select an output to be trimmed, highlight Select Trim Output and press **Enter**. The following screen appears

```
Trim Menu [Out A]
Select Trim Output:
  B C
X=Cancel
```

Use the left and right arrow keys to select an output (A, B or C) and press **Enter**. The screen returns to the previous display.

```
Trim Menu [Out A]
Select Trim Output
Reset Trim
Trim Zero
Trim Span
```

When performing a Trim operation, the **Aurora H₂O** unit requires you to first reset the trim. To reset the trim output, highlight Reset Trim and press **Enter**. The following screen appears.

```
Trim Menu [Out A]
Reset Out A Trim?
YES NO
X=Cancel
```

Use the left or right arrow keys to highlight YES and press **Enter**. This cancels any previous trim values, and returns the **Aurora H₂O** to its factory adjustment. The display returns to the previous screen with Trim Zero highlighted.

```
Trim Menu [Out A]
Select Trim Output
Reset Trim
Trim Zero
Trim Span
```

To trim the zero value, press **Enter**. A screen similar to the following appears.

This will cause the **Aurora H₂O** to output 4.000 mA on the output being trimmed. The output value should then be read using the connected recorder, SCADA equipment, or DVM. Enter the value read from the connected equipment as the Zero Trim value, as follows:

3.5.7 Trimming the Outputs (cont.)

Note: Since you cannot trim 0 mA for negative offsets, trim for the lower end of the scale is at the 4 mA output level.

```

Enter Out A Reading:
Max: 5.2000
  04.0000 mA
  ^
Min: 3.0000
✓=Save X=Cancel
  
```

Use the left and right arrow keys to select each digit to be changed, and the up and down arrow keys to increase or decrease its value. Press **Enter** to save (or **Cancel** to keep the previous value).

```

Trim Menu [Out A]
Select Trim Output
Reset Trim
Trim Zero
Trim Span
  
```

The Trim Menu returns with Trim Span highlighted. To change the span value, press **Enter**. A screen similar to the following appears.

This will cause the **Aurora H₂O** to output 20.000 mA on the output being trimmed. The output value should then be read using the connected recorder, SCADA equipment, or DVM. Enter the value read from the connected equipment as the Span Trim value.

```

Enter Out A Reading:
Max: 22.2000
 20.0000 mA
  ^
Min: 10.0000
✓=Save X=Cancel
  
```

Use the left and right arrow keys to select each digit to be changed, and the up and down arrow keys to increase or decrease its value. Press **Enter** to save (or **Cancel** to keep the previous value).

Trimming is complete. Accuracy can be verified using the Test Menu, above.

Example: Trim is reset, then Trim Zero is selected. The SCADA input reports 3.977 mA.

The operator enters “3.977” as the Zero Trim value.

Trim Span is selected. The SCADA input reports 19.985 mA.

The operator enters “19.985” as the Span Trim value.

Aurora H₂O will adjust the output accordingly to true the output as read by the customer recorder, SCADA or DVM.

Using the Test Menu, the operator verifies that a test value of 0% now reads 4.000 mA at the SCADA equipment, and a test value of 100% now reads 20.000 mA.

3.6 Setting Up Alarms

Note: The **Aurora H₂O** is *not* equipped with alarm relays. The Alarm function is useful only when reading the alarm status via Modbus.

3.6.1 Selecting an Alarm Output

```

Alarm Menu [A]
Select Upper
Status Lower
Units
Type...
  
```

To set up alarm outputs, on the Main Menu choose Alarm and press **Enter**. From the Alarm Menu choose Select and press **Enter**. A screen similar to the following appears.

```

Alarm Menu [A]
Select Alarm:
  (A) B C
X=Cancel
  
```

Use the arrow keys to select the output (A, B or C) to be set up and press **Enter**. The display returns to the Alarm Menu.

3.6.2 Selecting Alarm Status

```
Alarm Menu [A]
Select      Upper
Status     Lower
Units
Type...
```

To select the alarm status, from the Alarm Menu select Status and press **Enter**. The following screen appears:

```
Alarm Menu [A]
Set Alarm Status:
OFF ON
X=Cancel
```

Use the arrow keys to select OFF or ON and press **Enter**. The display returns to the Alarm Menu.

3.6.3 Selecting Alarm Units

```
Alarm Menu [A]
Choose unit type:
Hygro Temp Press
X=Cancel
```

To select alarm units, from the Alarm Menu select Units and press **Enter**. Use the arrow keys to select the unit type and press **Enter**.

```
Select Alarm A Units:
PPMv H2O Dew Pt. °C
Lbs/MMSCF Dew Pt. °F
mg/m³ H2O Eq. DP °C
Pw, kPa Eq. DP °F
```

If Hygro was selected, this display appears. Use the arrow keys to select a unit. Press **Enter** to save (or **Cancel** to keep the previous value), and return to the Alarm Menu.

```
Select Alarm A Units:
Temp. °C
Temp. °F
Temp. K
Dew Pt. °C
Dew Pt. °F
```

If Temperature was selected, this display appears. Use the arrow keys to select a unit. Press **Enter** to save (or **Cancel** to keep the previous value), and return to the Alarm Menu.

```
Alarm Menu [A]
Choose pressure type:
Sample Line
X=Cancel
```

If Pressure was selected, this display appears. Use the arrow keys to select a unit. Press **Enter** to save (or **Cancel** to keep the previous value), and return to the Alarm Menu.

3.6.4 Selecting an Alarm Type

```
Alarm Menu [A]
Select      Upper
Status     Lower
Units
Type...
```

To change the alarm type, from the Alarm Menu select Type and press **Enter**. A screen similar to the following appears:

```
Select Alarm Type:
Setpoint
In Band
Out Band
```

Use the arrow keys to select an alarm type. Press **Enter** to save (or **Cancel** to keep the previous value), and return to the Alarm Menu.

- SetPoint: Alarm activates when parameter exceeds upper limit, and deactivates when parameter is less than lower limit.
- Inner Band: Alarm activates when parameter is between upper and lower limits.
- Outer Band: Alarm activates when parameter is outside upper and lower limits.

3.6.5 How the Alarm Types Work

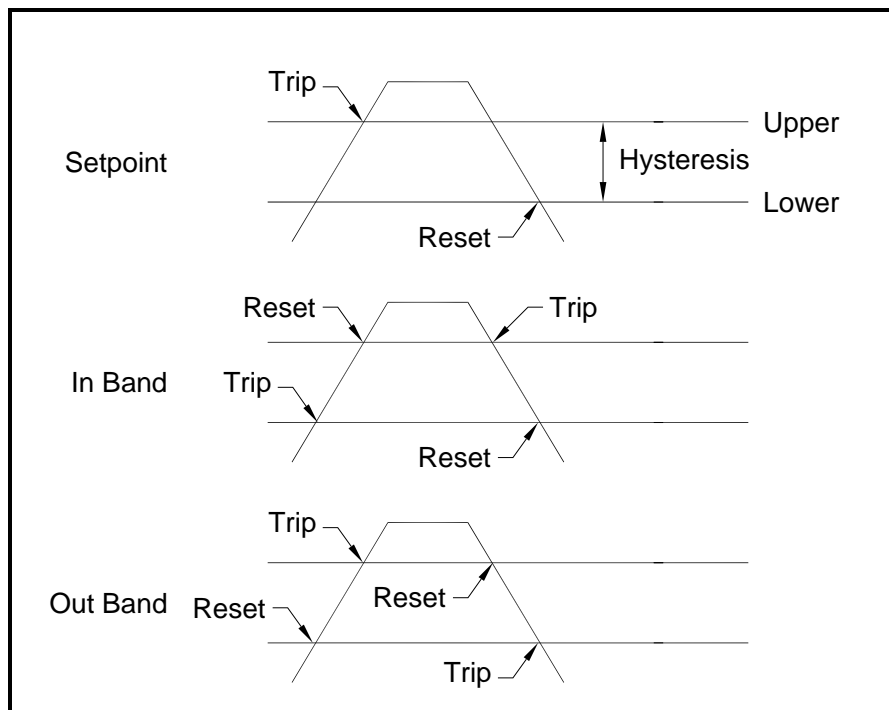


Figure 39: Example of Alarm Types

3.6.6 Changing the Upper Alarm Span

```
Alarm Menu [A]
Select   UPPER
Status   Lower
Units
Type...
```

To adjust the upper alarm span, from the Alarm Menu select Upper and press **Enter**. A screen similar to the following appears.

```
Enter MAX Alm Value
MAX 413.680
50.000 kPa
MIN 0.000
✓=Save X=Cancel
```

Use the left and right arrow keys to select each digit to be changed and the up and down arrow keys to increase or decrease its value. Press **Enter** to save (or **Cancel** to keep the previous value), and return to Output Menu.

3.6.7 Changing the Lower Alarm Span

```
Alarm Menu [A]
Select   Upper
Status   LOWER
Units
Type...
```

To adjust the lower alarm span, from the Alarm Menu select Lower and press **Enter**. A screen similar to the following appears.

```
Enter MIN Alm Value
MAX 413.680
50.000 kPa
MIN 0.000
✓=Save X=Cancel
```

Use the left and right arrow keys to select each digit to be changed and the up and down arrow keys to increase or decrease its value. Press **Enter** to save (or **Cancel** to keep the previous value), and return to Output Menu.

Chapter 4. Programming Advanced Features

4.1 Comm Port Settings

Main Menu	
Display...	Service...
Outputs...	About...
Alarm...	LOCK
Settings...	

To access the communication port settings, from the Main Menu select Settings and press **Enter**. The following screen appears:

Settings Menu	
Comms...	Pressure...
Adjust...	Locale...
Gas	External...
Clock...	

To access the communications port settings, select Comms... and press **Enter**. The following screen appears:

4.1.1 Selecting a Comm Port

Comm Port: [SCADA]	
Select	Network ID
Baud Rate	
Parity	
Protocol	

There are two physical comm ports in the **Aurora H₂O**. Comm Port 1 is aligned to *SCADA* in the instrument program and Comm Port 2 is aligned to *SERVICE*. This setup enables the user to have Comm Port 1 set up for the primary digital output (for example, RS-485 to the customer SCADA system), and Comm Port 2 to be used for service (for example, to enable a service engineer to interface with the **Aurora H₂O** using an RS-232 cable connected to a lap top in the field, running **AuroraView** software).

To select a communication port, use the arrow keys to highlight Select and press **Enter**. The following screen appears.

Comm Port: [SCADA]	
Select Comm Port:	
SCADA	SERVICE
X=Cancel	

Select SCADA or SERVICE and press **Enter**. The screen returns to the Comm Port Menu.

4.1.2 Setting the Baud Rate

Comm Port: [SCADA]	
Select	Network ID
Baud Rate	
Parity	
Protocol	

To set the baud rate, from the Comm Port Menu select Baud Rate and press **Enter**. The following screen appears.

Select Baud Rate:	
115.2k	19.2k
57.6k	9600
38.4k	4800

Use the arrow keys to highlight the desired baud rate and press **Enter**. The screen returns to the Comm Port Menu.

IMPORTANT: If you are using version 1A of the **Aurora H₂O**, do not select 1200 or 2400 baud rate.

4.1.3 Setting Parity

```
Comm Port: [SCADA]
Select   Network ID
Baud Rate
Parity
Protocol
```

To set parity, from the Comm Port Menu select Parity and press **Enter**. The following screen appears.

```
Comm Port: [SCADA]
Select Parity:
(=) ODD NONE
X=Cancel
```

Use the arrow keys to highlight the desired parity and press **Enter**. The screen returns to the Comm Port Menu.

4.1.4 Selecting Protocol

```
Comm Port: [SCADA]
Select   Network ID
Baud Rate
Parity
Protocol
```

To select protocol, from the Comm Port Menu select Protocol and press **Enter**. The following screen appears.

```
Comm Port: [SCADA]
Select Protocol:
(RS-485) RS-485
X=Cancel
```

Use the arrow keys to highlight the desired protocol and press **Enter**. The screen returns to the Comm Port Menu.

4.1.5 Setting the Network ID

```
Comm Port: [SCADA]
Select   Network ID
Baud Rate
Parity
Protocol
```

To set the network ID, from the Comm Port Menu select Network ID and press **Enter**. The following screen appears.

```
Set Node ID:
[Hex] 247
001
[Hex] 1
✓=Save X=Cancel
```

Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the Comm Port Menu.

4.2 Adjust Offset Values

```
Settings Menu
Comms...      Pressure...
Adjust...  Locale...
Gas           Ethernet...
Clock...
```

To adjust offset values, from the Settings Menu select Adjust... and press **Enter**. The following screen appears.

4.2.1 Adjusting the PPMv Offset

```
User Adjustments
PPM Level
Filter
Dew Pt Calc
```

To adjust the PPMv offset, select PPM Level and press **Enter**. The following screen appears.

```
PPMv Offset:
Next: +25.00
+00.00 PPM
  ^
Min: -25.00
√=Save X=Cancel
```

Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the User Adjustments Menu.

4.2.2 Adjusting the Smoothing Filter Offset

```
User Adjustments
PPM Level
Filter
Dew Pt Calc
```

To adjust the smoothing filter offset, from the User Adjustments Menu select Filter and press **Enter**. The following screen appears.

```
Smoothing Filter:
Next: 200
 040 samples
  ^
Min: 10
√=Save X=Cancel
```

The smoothing filter setting is used to change the system responsiveness. It is a moving average filter to smooth the moisture readings. 1 sample = 1 scan. Generally, **Aurora H₂O** can perform up to 12 samples per second. The minimum setting is 10 samples. The maximum setting is 200 samples. The default is set at the factory. A typical default value is 40.

Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the User Adjustments Menu.

4.2.3 Setting the Dew Point Calculation Method

- The **dew point** is the temperature at which the air is saturated with respect to water vapor over a **liquid** surface.
- The **frost point** is the temperature at which the air is saturated with respect to water vapor over an **ice** surface.

There can be a difference of several degrees C between the dew and frost point.

- When set for Dew/Frost, the Aurora will report the Dew Point if the reading is above freezing, and report the Frost Point if the reading is below freezing.
- When set for Dew Point, the Aurora will calculate the Dew Point temperature, even if that temperature is below freezing.

```

User Adjustments
PPM Level
Filter
Dew Pt Calc
  
```

To set the dew point calculation method, from the User Adjustments Menu select Dew Pt Calc and press **Enter**. The following screen appears.

```

User Adjustments
Calc Dew Point as:
Dew Dew/Frost
X=Cancel
  
```

Use the arrow keys to highlight the desired dew point setting and press **Enter**. The screen returns to the User Adjustments Menu.

- The Dew calculation should be used for compatibility with ASTM-1142/IGT-8. The tables and calculations in those reports require measurements and provide results in dew point, regardless of the actual phase (dew or frost).
- The Dew/Frost calculation should be used for compatibility with ISO-18453:2004, or when using a chilled mirror apparatus as a check standard..

4.3 Set Up the Background Gas

4.3.1 Background Gas Options

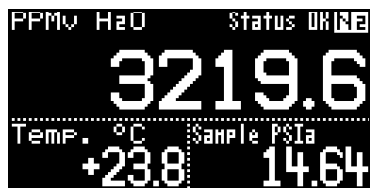
The **Aurora H₂O** is supplied with the ability to select one of three background gas settings at a given time.

1. Nitrogen
2. 90% Methane, 6% N₂ and 4% CO₂ (default setting)
3. 100% Methane

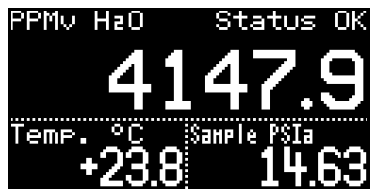
For the majority of natural gas streams, the 90% Methane, 6% N₂ and 4% CO₂ will be suitable and the **Aurora H₂O** will maintain its accuracy specification in gas ranging from 80-100% Methane and 0-10% CO₂. In some cases, the unit may have been calibrated for customized mixtures. In those cases, the custom mixture will also appear in the menu in addition to or instead of the Methane, 6% N₂ and 4% CO₂.

4.3.2 Selecting the Type of Gas

Beginning with firmware version **H2O.001.C.**, the background gas is selectable from the Settings Menu. For normal operation in natural gas service, **Methane** should be selected as the background gas. For verification testing, it may be desirable to use **Nitrogen** with a known moisture concentration. In this application, **Nitrogen** should be selected as the background gas.



The **Aurora H₂O** provides a positive indication if it is operating in Nitrogen mode. An **N2** indicator will appear in the upper right corner of the LCD, adjacent to the status message.

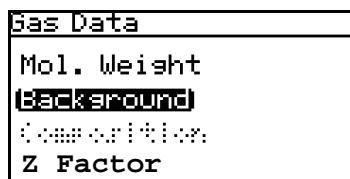


In normal Methane operation, only the status message is displayed.

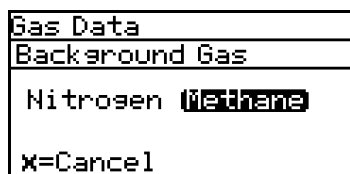
Unless otherwise requested, the **Aurora H₂O** is shipped from the factory configured for Methane operation.



To change the type of background gas, from the Settings Menu select **Gas** and press **Enter**. The following screen appears.



From the Gas Data menu, select **Background** and press **Enter**. The following screen appears.



Use the arrow keys to select the desired background gas, and press **Enter**. The background gas selection is now complete. Press **Cancel** to return to the display page.

4.3.3 Setting the Gas Composition

Note: The Gas Composition option is available only if Methane is selected as the Background Gas.

```
Gas Data
Mol. Weight
Background
Composition
Z Factor
```

To set the gas composition, from the Gas Data Menu select Composition and press **Enter**. The following screen appears.

```
Gas Data
Current: v.Standard
STD CH4
X=Cancel
```

The first choice is STD, the composition of our standard calibration mixture (90.0% CH₄, 6.0% N₂ and 4.0% CO₂). To set the standard mixture, select STD and press **Enter**. The screen returns to the previous menu.

```
Gas Data
Current: v.Standard
STD CH4
X=Cancel
```

The second choice is CH₄, a composition of 100.0% Methane (CH₄), for use when using bottled gas for verification. To set the Methane composition, select CH₄ and press **Enter**. The screen returns to the previous menu.

Note: A third and/or fourth choice is optional, and will appear only if the customer has requested a custom gas composition.

4.3.4 Setting the Z Factor

The Z factor is a number that accounts for the non-ideal compressibility of natural gas, and is vital for accurate calculation of mass/volume (lbs/MMSCF, mg/m³).

```
Gas Data
Mol. Weight
Background
Composition
Z Factor
```

To set the Z factor, from the Gas Data Menu, select Z Factor and press enter. The following screen appears.

```
Compress. Factor (Z)
Max 1.5000
0.9987
Min 0.5000
√=Save X=Cancel
```

Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the Settings Menu.

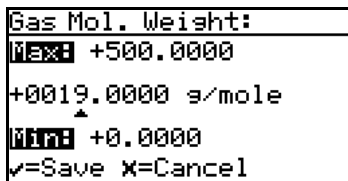
4.3.5 Adjusting the Gas Offset



The input information for gas molecular weight is not currently used for any moisture calculations and is reserved for future use.

- lbs/MMSCF is calculated using IGT Research Bulletin #8 and ASTM D-1142-95 referenced at 60°F, 1 ATM.
- mg/cm³ is based on ideal gas law derivation referenced at 15°C, 1.01325 kPa.

To adjust the gas molecular weight offset, from the Settings Menu select Gas and press **Enter**. From the Gas Data menu select Mol. Weight and press **Enter**. The following screen appears.



Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the Settings Menu.

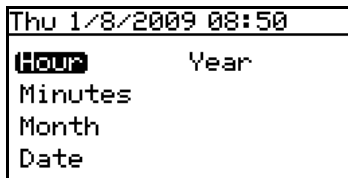
4.4 Clock Settings



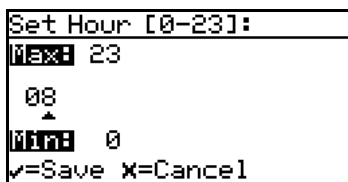
The clock settings are for informational purposes. They are used to keep track of the test analyzer start time and the laser operational time.

To reset the clock, from the Settings Menu select Clock and press **Enter**. The following screen appears.

4.4.1 Resetting the Hour



To reset the hour, from the Clock Menu select Hour and press **Enter**. The following screen appears.



Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the Clock Menu.

4.4.2 Resetting the Minutes

```
Thu 1/15/2009 08:39
Hour      Year
Minutes
Month
Date
```

To reset the minutes, from the Clock Menu select Minutes and press **Enter**. The following screen appears.

```
Set Minutes [0-59]:
Next: 59
 52
  ^
Next: 0
✓=Save X=Cancel
```

Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the Clock Menu.

4.4.3 Resetting the Month

```
Thu 1/15/2009 08:39
Hour      Year
Minutes
Month
Date
```

To reset the month, from the Clock Menu select Month and press **Enter**. The following screen appears.

```
Set Month [1-12]:
Next: 12
 01
  ^
Next: 1
✓=Save X=Cancel
```

Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the Clock Menu.

4.4.4 Resetting the Date

```
Thu 1/15/2009 08:39
Hour      Year
Minutes
Month
Date
```

To reset the date, from the Clock Menu select Date and press **Enter**. The following screen appears.

```
Set Date:
Next: 31
 08
  ^
Next: 1
✓=Save X=Cancel
```

Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the Clock Menu.

4.4.5 Resetting the Year

```
Thu 1/15/2009 08:39
Hour      Year
Minutes
Month
Date
```

To reset the year, from the Clock Menu select Year and press **Enter**. The following screen appears.

```
Set Year:
Next: 2100
 2009
Prev: 2008
✓=Save X=Cancel
```

Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the Clock Menu.

4.5 Pressure Settings

```
Settings Menu
Comms...  Pressure...
Adjust... Locale...
Gas      Ethernet...
Clock...
```

To reset the pressure settings, from the Settings Menu, select Pressure... and press **Enter**. The following screen appears.

4.5.1 Setting the Source

```
Pressure Settings
Source
Constant
Cal Data...
```

To reset the source, from the Pressure Menu, select Source and press **Enter**. The following screen appears.

```
Pressure Settings
Line Pressure Source:
Constant Live
X=Cancel
```

Use the left and right arrow keys to select the line pressure source. To change the constant, select Constant. Press **Enter**. The screen returns to the Pressure Menu.

4.5.2 Changing the Constant

```
Pressure Settings
Source
Constant
Cal Data...
```

If the pressure source selected is Constant, to reset its value, select Constant from the Pressure Menu and press **Enter**. The following screen appears.

```
Enter Line Pressure:
Next: +3500.000
+0101.325 kPa
Prev: +0.000
✓=Save X=Cancel
```

Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the Pressure Menu.

Note: Data entry for this setting is only in kPa.

4.5.3 Editing Pressure Calibration

```

Pressure Settings
Line Pressure Source:
Constant Live
X=Cancel

```

Pressure input in this section is used only for equivalent dewpoint calculations.

Equivalent dewpoint is the dewpoint of the process gas at the process pressure. Input a “constant” value if the line pressure is at a normal pressure, or use an external pressure transmitter to input a “live” pressure input into the **Aurora H₂O** analyzer.

To edit the pressure calibration, from the Line Pressure Source Menu, select Live and press **Enter**. The following screen appears.

```

Line Pressure Value
Source
Constant
Cal Data..

```

To edit the Calibration Data, use the arrow keys to select Cal Data and press **Enter**. The following screen appears.

```

Edit Pressure Cal
Select Cal Point
Edit Pressure Value
Edit Input Value

```

To select the Calibration Point, use the up and down arrow keys to highlight Select Cal Point and press **Enter**. The following screen appears.

```

Edit Pressure Cal
Select Cal Point:
Zero Span
X=Cancel

```

Use the left and right arrow keys to select Zero or Span and press **Enter**. The screen returns to the previous menu.

```

Live Pressure Zero
Select Cal Point
Edit Pressure Value
Edit Input Value

```

To edit the Pressure Value, use the up and down arrow keys to select Edit Pressure Value and press **Enter**. The following screen appears.

```

Enter Line Pressure:
Max: +3500.000
+0000.000 kPa
Min: +0.000
✓=Save X=Cancel

```

Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the previous menu.

```

Live Pressure Zero
Select Cal Point
Edit Pressure Value
Edit Input Value

```

To edit the Input Value, use the up and down arrow keys to select Edit Input Value and press **Enter**. The following screen appears.

```

Enter Line Signal:
Max: 22.000
04.000 mA
Min: 0.000
✓=Save X=Cancel

```

Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the previous menu.

4.6 Regional Settings

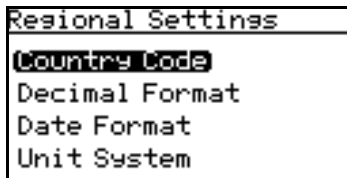
This section enables the setting of regional information, depending on the location of the **Aurora H₂O**.



To reset the regional settings, from the Settings Menu, select Locale... and press **Enter**. The following screen appears.

Note: *Locale settings for your order have been set at the factory and are access code protected. If you determine a need to access Regional Settings, contact the factory for assistance.*

4.6.1 Setting the Country Code



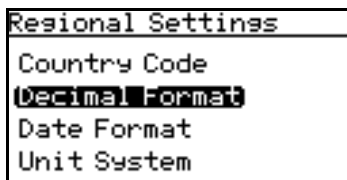
To edit the country code, from the Regional Settings Menu select Country Code and press **Enter**. The following screen appears. A passcode is required to make changes.



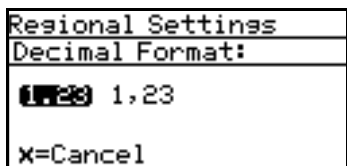
Use the left and right arrow keys to select each digit to be changed. Use the up and down arrow keys to change the value. When finished, press **Enter**. The screen returns to the Regional Settings Menu.

- Country Codes = international phone country codes.
- Default = 1 for U.S.
- Option = 81 for Japan is available to conform to METI requirements.

4.6.2 Setting the Decimal Format



The Decimal Format option determines whether a decimal [.] or a comma [,] is used as the decimal separator. To edit the decimal format, from the Regional Settings Menu select Decimal Format and press **Enter**. The following screen appears.



Use the left and right arrow keys to select a decimal [.] or a comma [,] as the decimal separator and press **Enter**. The screen returns to the Display Menu.

4.6.3 Setting the Date Format

```

Regional Settings
Country Code
Decimal Format
Date Format
Unit System
  
```

To edit the date format, from the Regional Settings Menu select Date Format and press **Enter**. The following screen appears.

```

Regional Settings
Date Format:
M/D/Y D/M/Y Y-M-D
X=Cancel
  
```

Use the left and right arrow keys to select the desired date format and press **Enter**. The screen returns to the previous display.

4.6.4 Setting the Unit System

```

Regional Settings
Country Code
Decimal Format
Date Format
Unit System
  
```

To select the unit system to be used for measurements, select Unit System and press **Enter**. The following screen appears.

```

Regional Settings
Unit System:
SI SI US
X=Cancel
  
```

Use the left and right arrow keys to select the Unit System desired [SI = metric (only unit types), SI + US = metric + English (unit types such as °F, psig, etc.)] and press **Enter**. The screen returns to the Regional Settings Menu.

4.7 Service Settings

The Service Settings Menu should be used by factory-trained personnel only.

4.8 Aurora H₂O Information

```

Main Menu
Display...  Service...
Outputs...  About...
Alarm...    LOCK
Settings...
  
```

To check **Aurora H₂O** information, from the Main Menu select About and press **Enter**. The following screen appears.

4.8.1 Checking the ID

```

About Aurora
ID
System Status
Software Versions
Gas Composition
  
```

To check identification information, select ID and press **Enter**. A screen similar to the following appears.

```

Menu:X
GE Sensing Aurora/H2O
Copyright © 2008
General Electric Co.
Unit SN:
Laser SN:Unknown.
  
```

To return to the About Menu, press **Enter**.

4.8.2 Checking the System Status

```

About Aurora
ID
System Status
Software Versions
Gas Composition
  
```

To view the status of the **Aurora H₂O** system, from the About Menu select System Status and press **Enter**. A screen similar to the following appears.

```

Menu:X
Uptime: 0d 00h
Started: 5/11/2009 14:07
Start Temp: 24.32 °C
Laser Hours: 1399
  
```

Uptime: is the elapsed time since the **Aurora H₂O** was powered on or reset.

Started: is the date and time that the **Aurora H₂O** was last powered on/reset.

Start Temp: is the laser housing temperature as measured at the last startup/reset.

Laser Hours: indicates the total lifetime that the laser has been energized.

To return to the About Menu, press **Enter**.

4.8.3 Checking the Software

```
About Aurora
ID
System Status
Software Versions
Gas Composition
```

To view the software versions being used, from the About Menu select Software Versions and press **Enter**. A screen similar to the following appears.

```
Menu: X
BOOT: 1.C
PROG: H2O.196.A
```

To return to the About Menu, press **Enter**.

4.8.4 Checking the Gas Composition

```
About Aurora
ID
System Status
Software Versions
Gas Composition
```

To view the gas content, from the About Menu select Gas Composition and press **Enter**. A screen similar to the following appears.

```
Menu: X
Standard
CH4: 90.0%
N2: 6.0%
CO2: 4.0%
```

To return to the About Menu, press **Enter**.

4.8.5 Checking the Alternate Gas Composition

The **Aurora H₂O** TDLAS is normally calibrated to a standard gas mixture that is representative of “typical” natural gas. The primary components and concentrations of this gas mixture are:

Component	Concentration
Methane (CH ₄)	90.0%
Nitrogen (N ₂)	6.0%
Carbon Dioxide (CO ₂)	4.0%

For special applications, where the composition of the gas to be measured differs significantly from the standard, GE can provide an alternate calibration. If this service has been ordered, the **Aurora H₂O** will be shipped from the factory with both the standard and a custom calibration installed.

```

Main Menu
Display...  Service...
Outputs...  About...
Alarm...   LOCK
Settings...
  
```

The calibration in use can be verified at any time using the **Aurora H₂O** About... menu. From the Main Menu, select About and press **Enter**. The following screen appears.

```

About Aurora
ID
System Status
Software Versions
Gas Composition
  
```

From the About Aurora menu, select Gas Composition and press **Enter**. The following screen appears.

An identifier label for the gas composition will be displayed above the components:

```

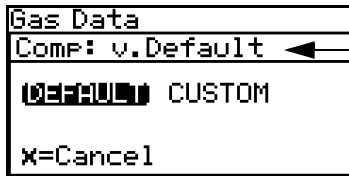
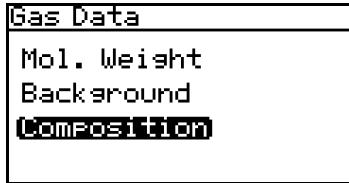
Menu: X
Standard ←
CH4: 90.0%
N2: 6.0%
CO2: 4.0%
  
```

Gas Composition Identifier

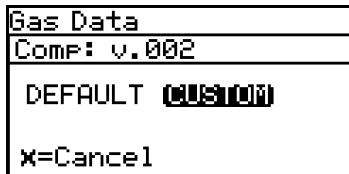
4.9 Custom Gas Composition

If a custom Gas Composition has been installed, an additional Composition menu selection will appear in the Settings/Gas Data menu.

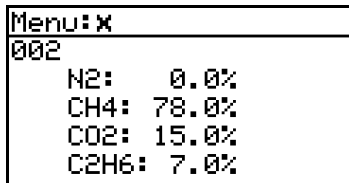
Note: *If no alternate composition is available, the menu selection will be disabled and “grayed out”.*



Gas Composition Identifier



The new composition can be verified by selecting About... Gas Composition:



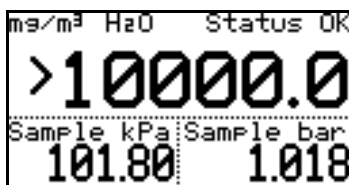
Note: *Unless otherwise requested, the Aurora H₂O is shipped from the factory configured to use the custom gas composition.*

4.10 Locking/Unlocking the Display



To lock the Aurora H₂O against any future changes, from the Main Menu select Lock and press **Enter**. The screen returns to the standard display.

Note: *This menu option is the same as exiting the programming menu and waiting for a keypad time-out to lock the keypad.*



To unlock the Aurora H₂O for changes, press **Cancel, Enter, Cancel** as instructed in *Unlocking the Keypad* on page 35.

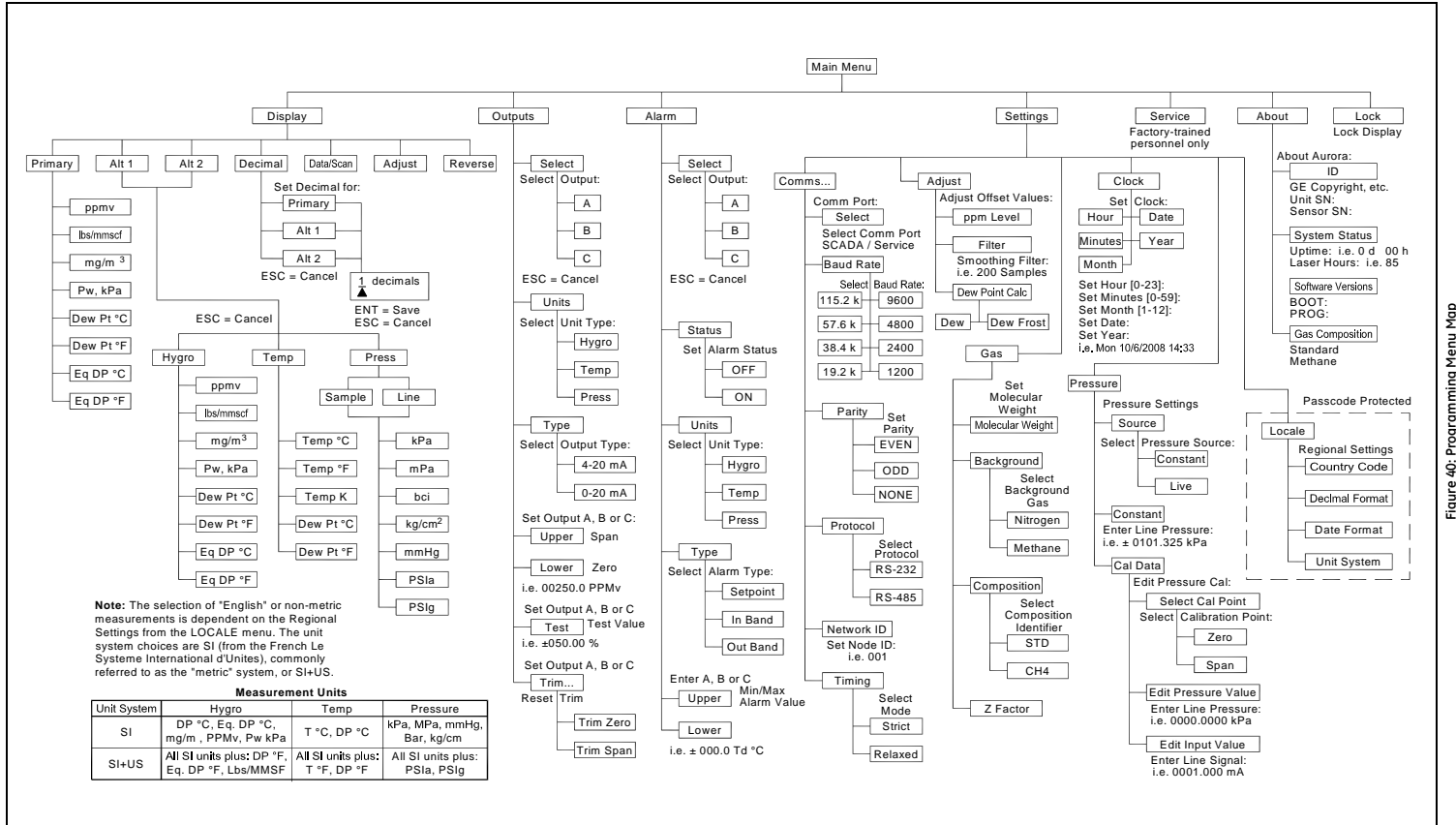


Figure 40: Programming Menu Map

Note: The selection of "English" or non-metric measurements is dependent on the Regional Settings from the LOCALE menu. The unit system choices are SI (from the French Le Systeme International d'Unites), commonly referred to as the "metric" system, or SI+US.

Measurement Units

Unit System	Hygro	Temp	Pressure
SI	DP °C, Eq. DP °C, mg/m ³ , PPMv, Pw kPa	T °C, DP °C	kPa, MPa, mmHg, Bar, kg/cm
SI+US	All SI units plus: DP °F, Eq. DP °F, Lbs/MMSF	All SI units plus: T °F, DP °F	All SI units plus: PSia, PSig

Chapter 5. AuroraView Interface Software

5.1 Capabilities

Your **Aurora H₂O** Analyzer is shipped with a CD which includes a PC-Software Application called **AuroraView**. With **AuroraView**, you can:

- View **Aurora H₂O** Configuration Items Like Alarms & Outputs.
- DataLog data to a comma delimited .txt file, that can be opened by spreadsheet applications like MicroSoft Excel.
- Plot real-time data for one or more **Aurora H₂O** parameters
- Manipulate plotted data in a variety of ways: color, line type, zoom in/out, etc.
- Trend tabular data in real-time.
- Show Scan Plots of the moisture absorption spectra.
- Copy plots from **AuroraView** to other Window applications like Microsoft Powerpoint or Word.

AuroraView does not provide functionality for the following:

- **Aurora H₂O** Software Updates.
- Save the **Aurora H₂O** Configuration. The **Aurora H₂O** is designed in a robust manner where the meter should recover from fault conditions without the need to upload the configuration of the meter using external software.

5.2 Requirements

AuroraView leverages a National Instruments Run-Time environment. This environment is supported on the following operating systems with the necessary requirement minimum installation requirements:

- 260Mb of available hard disk space
- 64Mb Ram or more
- 300 MHz Pentium CPU
- Windows NT 4.0 SP6 or higher, Windows ME, Windows 2000, Windows XP
- Internet Explorer v5.0 or higher

AuroraView supports the following interfaces:

- RS232
- RS485 Modbus

5.3 Installing AuroraView

1. Install the Installation CD in your PC.
2. The Installation program should auto-run. If it does not, select Start → Run → Browse.

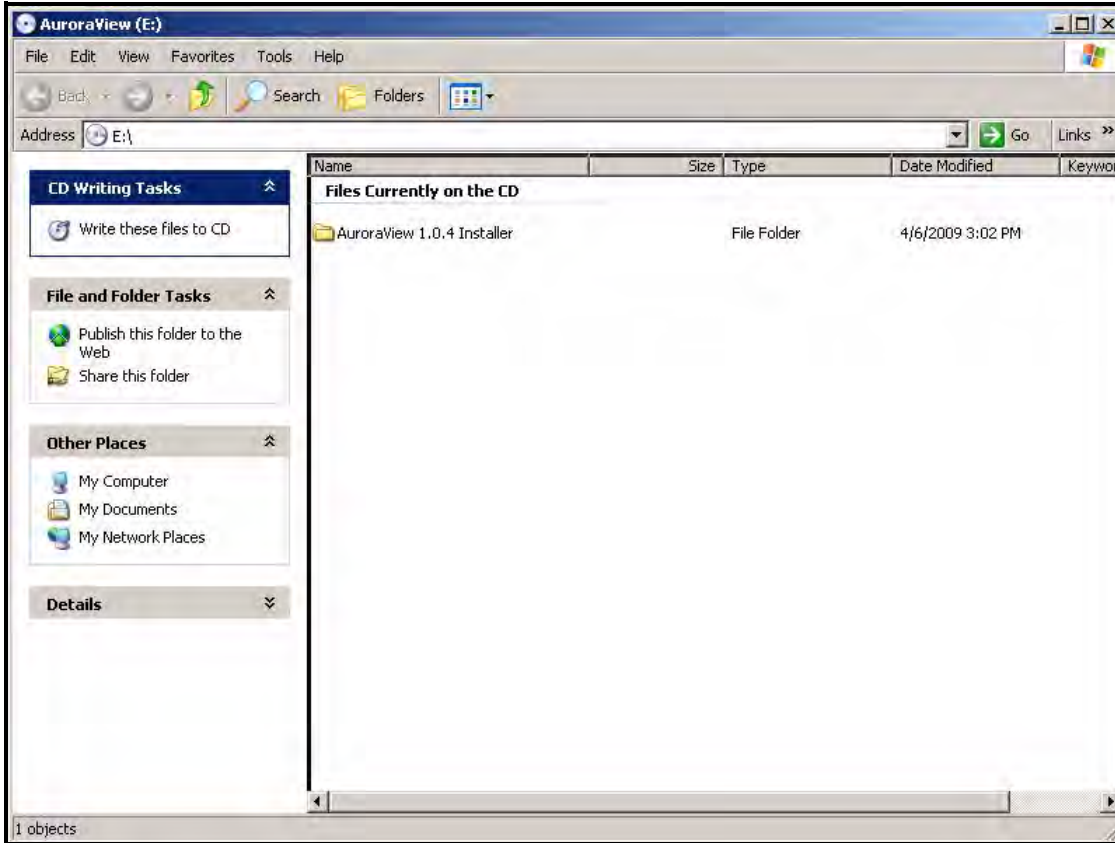


Figure 41: Initial Screen

5.3 Installing AuroraView (cont.)

3. Browse to the file named “setup.exe” in the root directory. Click Open and then OK to start the setup file.

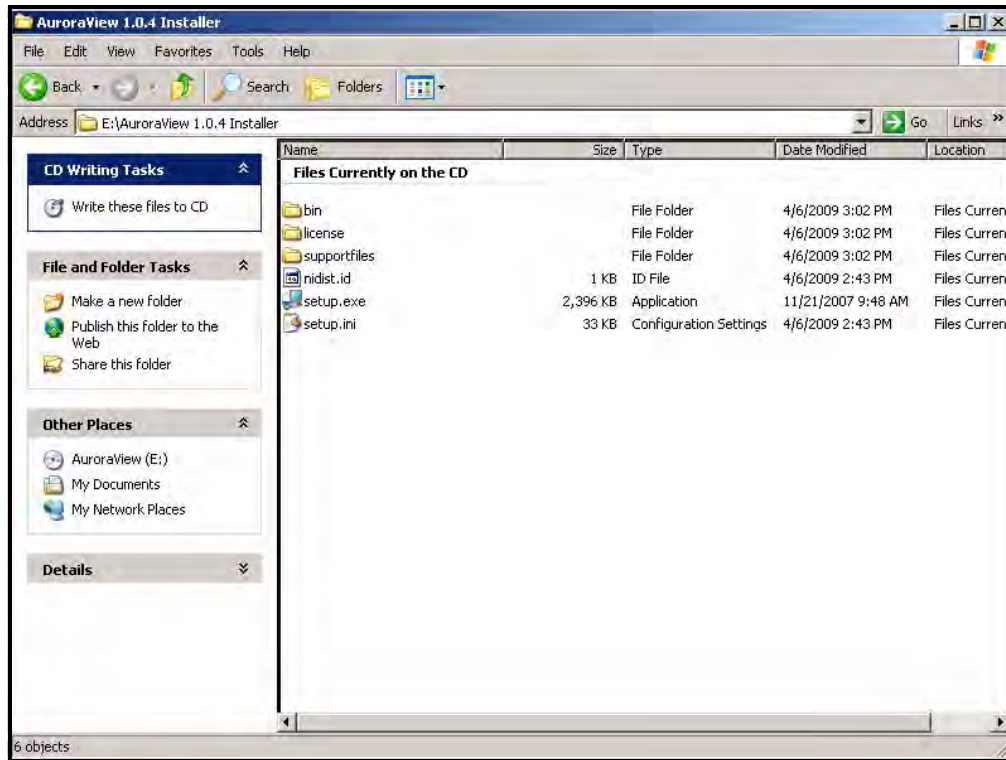


Figure 42: AuroraView Installer

5.3 Installing AuroraView (cont.)

4. Exit all other programs before running the installer.

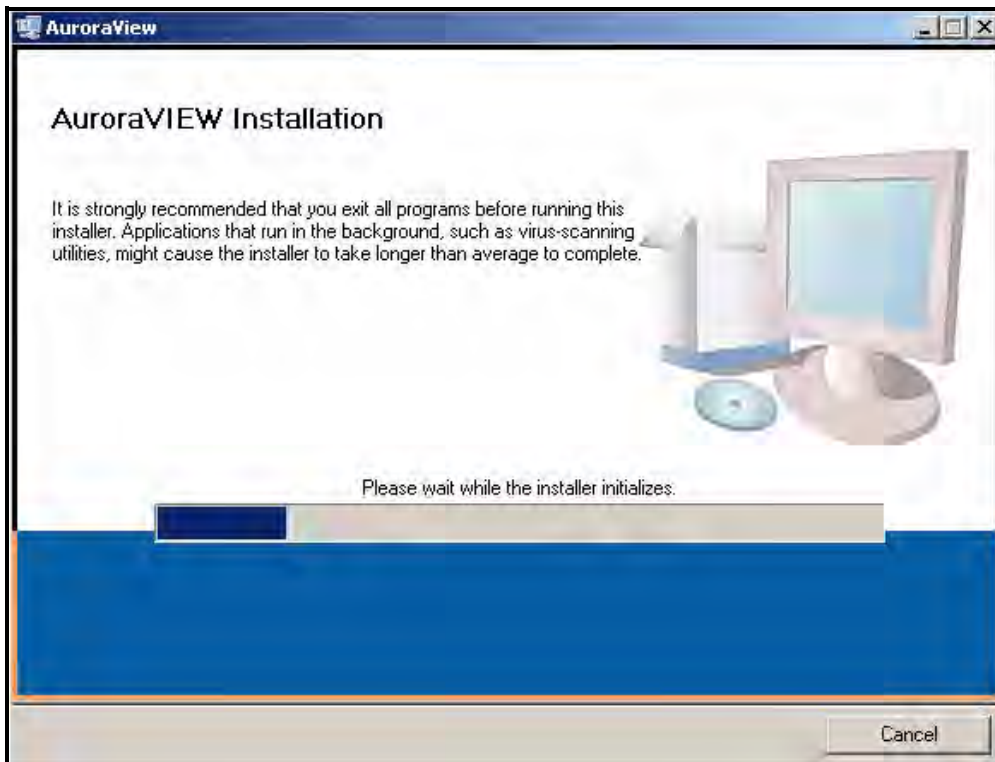


Figure 43: Installation Recommendation

5.3 Installing AuroraView (cont.)

5. The next screen provides the opportunity to change installation locations if necessary. When complete, click Next.

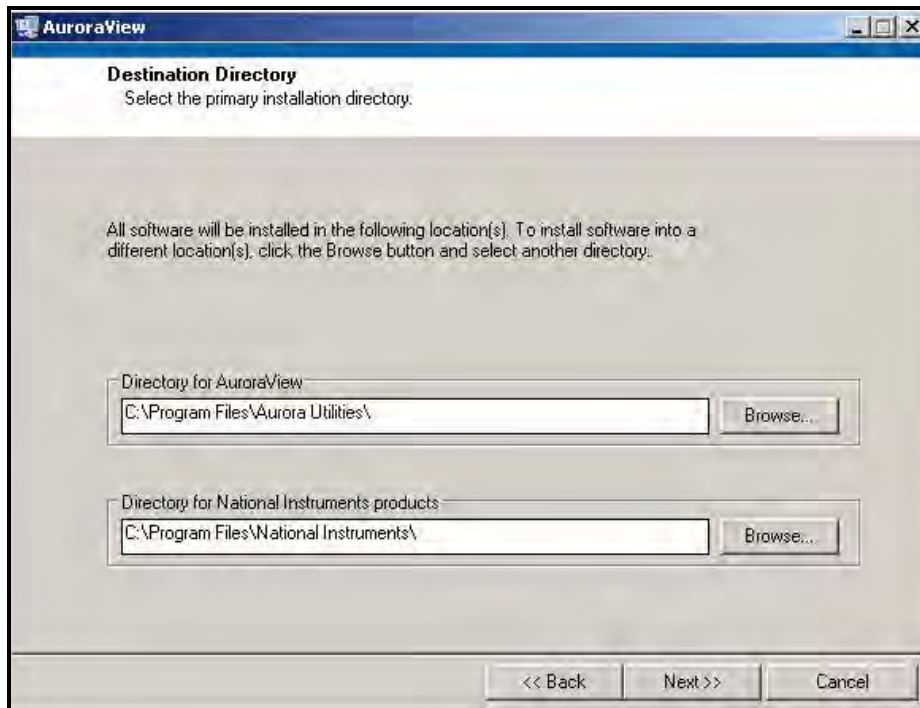


Figure 44: Destination Directory

6. The next screen shows the Software License Agreement. Select "I accept the License Agreement" and click Next.

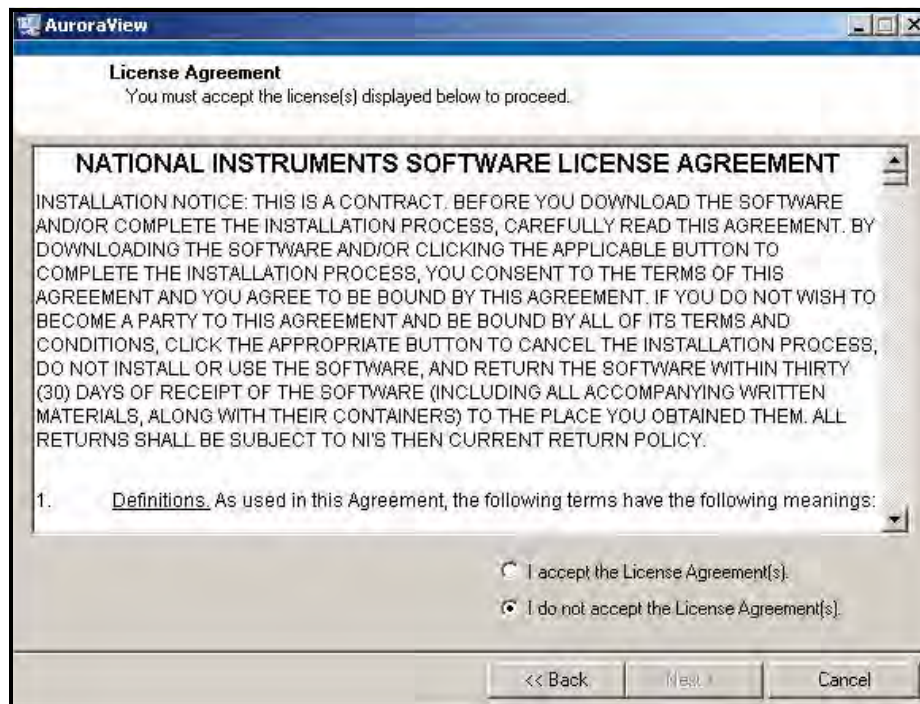


Figure 45: Software License Agreement

5.3 Installing AuroraView (cont.)

7. The next screen gives instructions to initiate the installation. When complete, click Next. The installation begins.

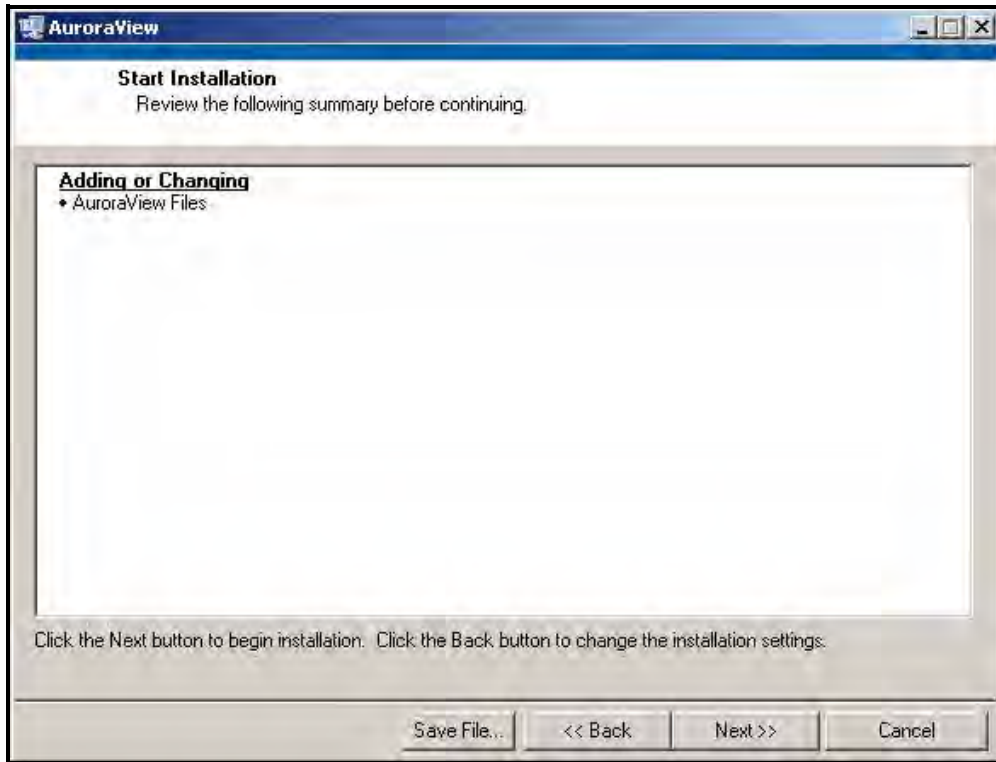


Figure 46: Starting Installation

5.3 Installing AuroraView (cont.)

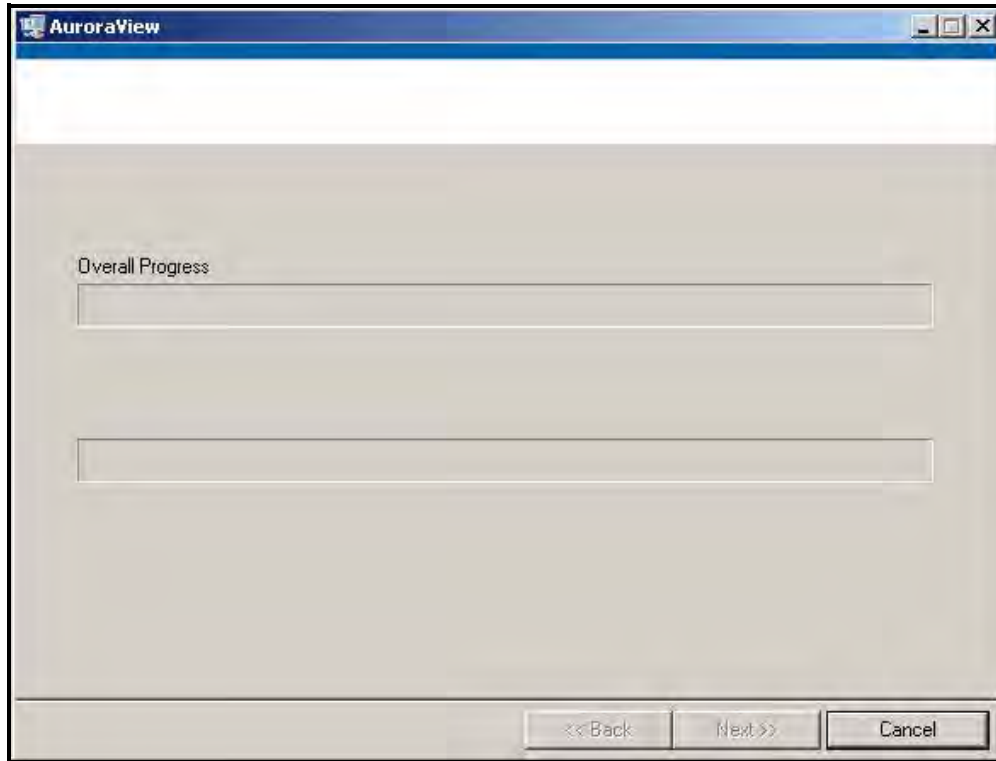


Figure 47: Overall Progress

5.3 Installing AuroraView (cont.)

8. The following screen appears when the installation is complete.

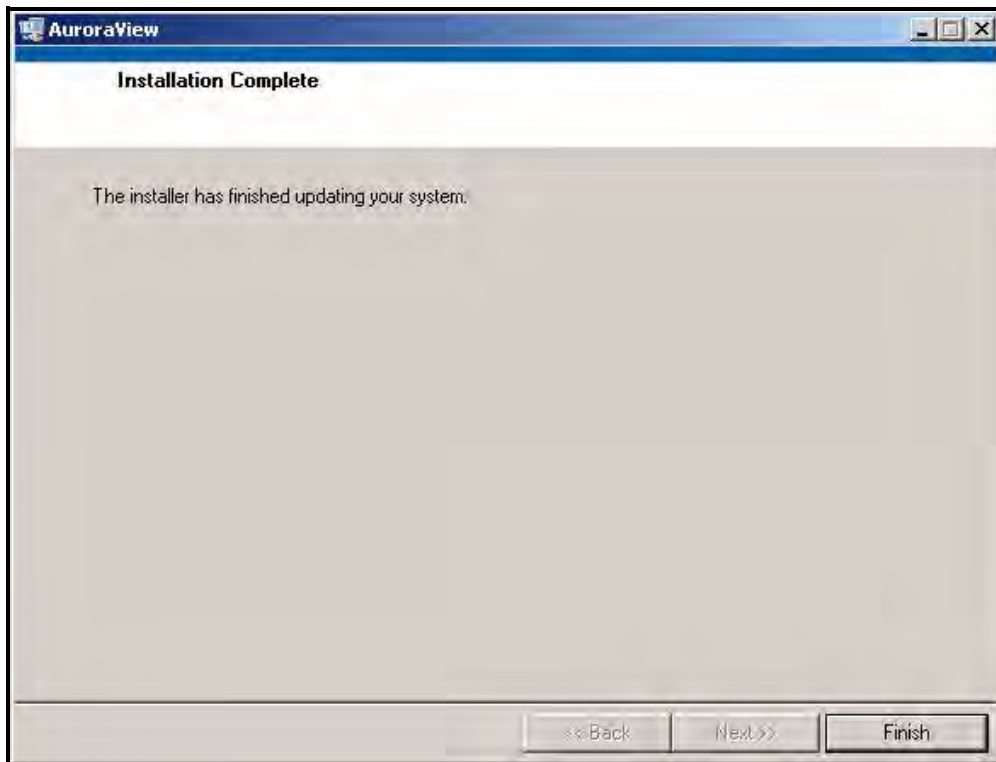


Figure 48: Installation Complete

5.4 Starting AuroraView

1. From the Start menu, click Programs → AuroraView → AuroraView.

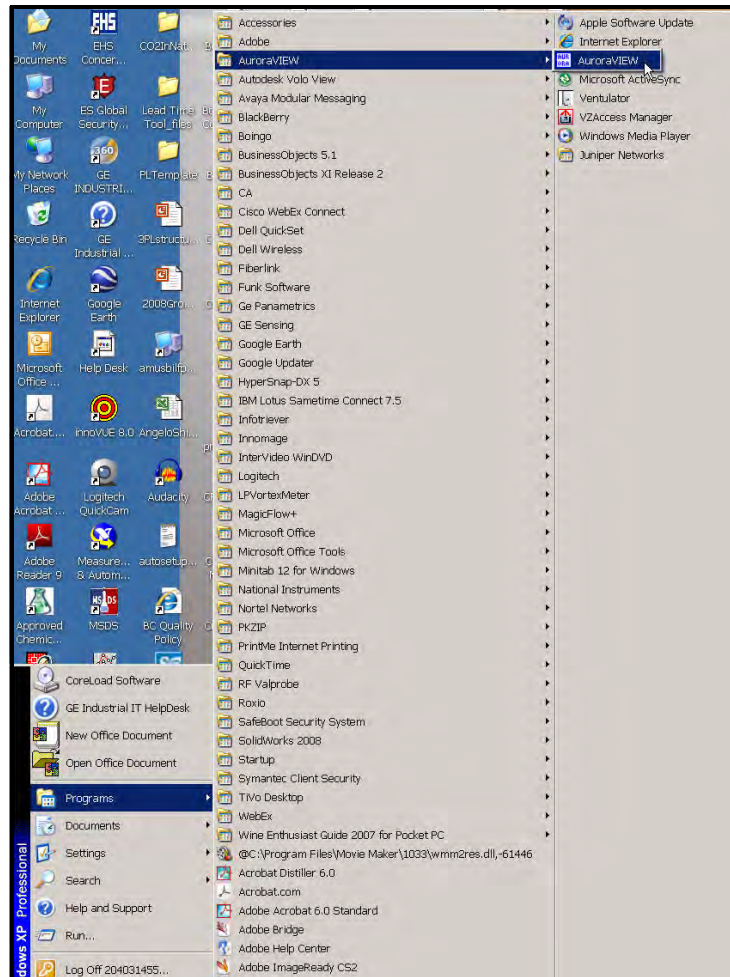


Figure 49: AuroraView in Programs Menu

5.4 Starting AuroraView (cont.)

2. AuroraView will boot up and display a screen similar to Figure 50.

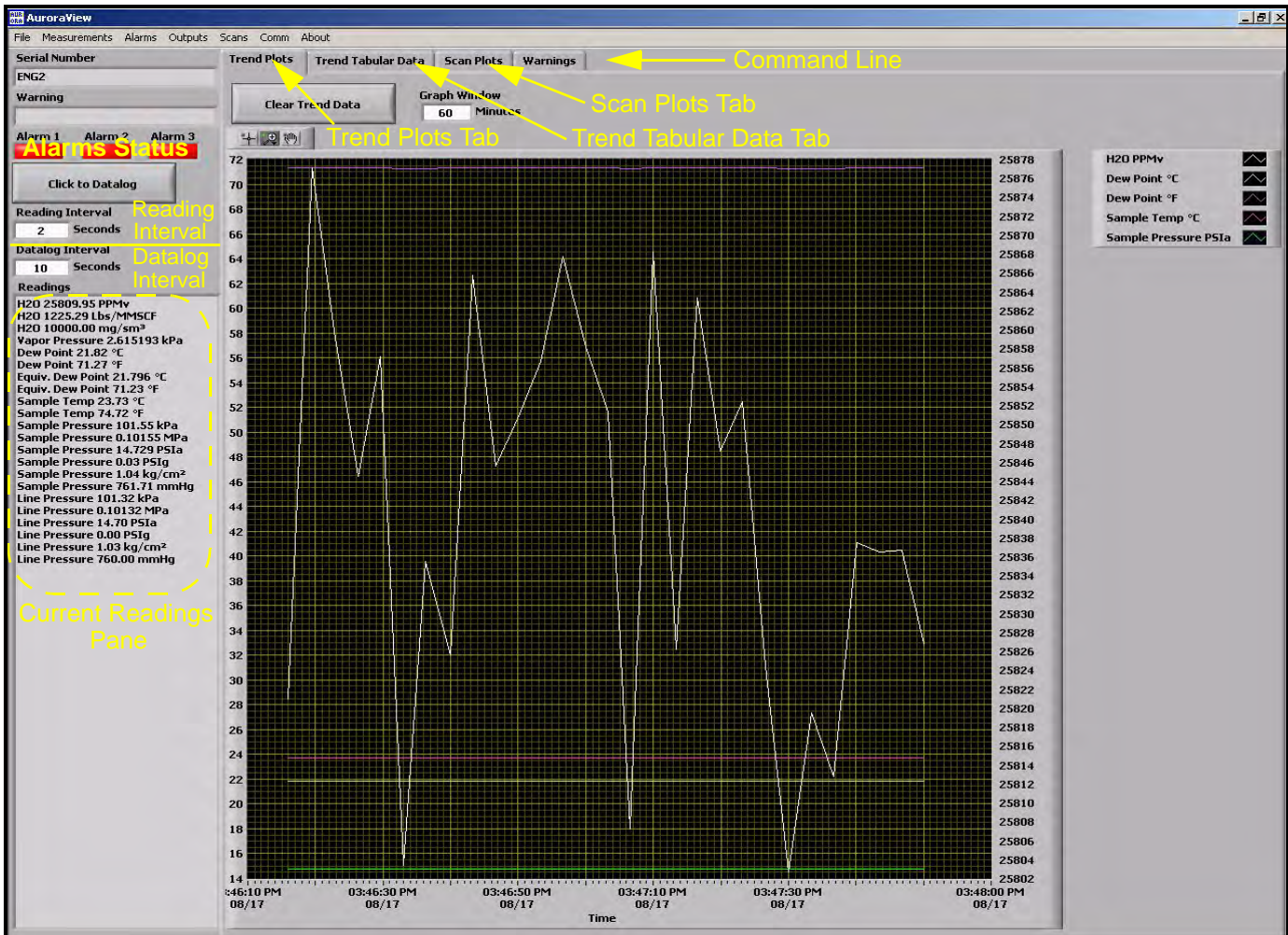


Figure 50: AuroraView Main Screen

5.5 Using the Main Menus

1. Click Measurements → Config

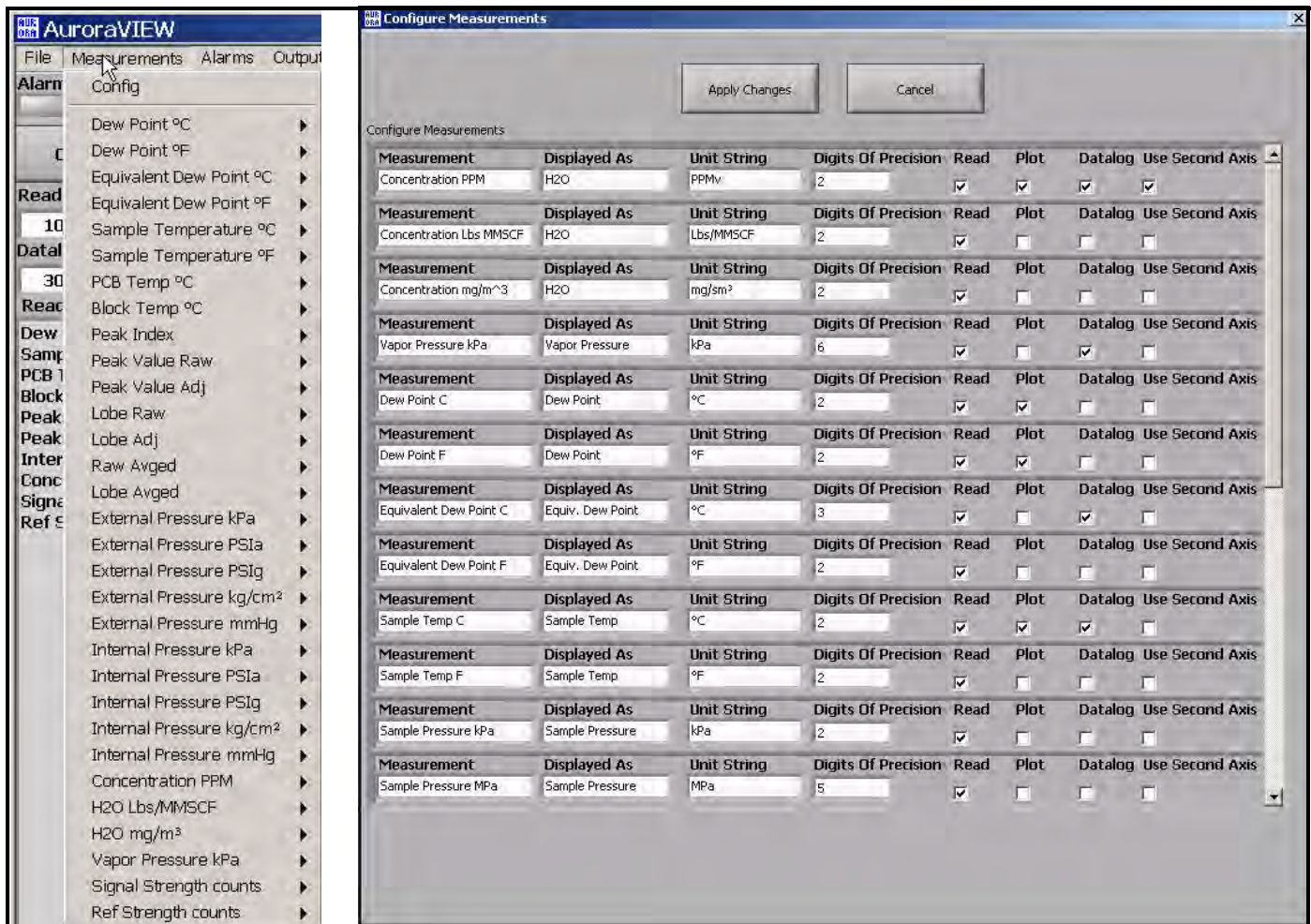


Figure 51: Configuration Measurements

- Unit String: Set this value to the value you want to read, plot or datalog.
- Digits of Precision: Set a numerical value (typically 0, 1, 2). This sets the resolution of the displayed measurement units to the right of the decimal place (i.e. "20.78" would be a setting of 2).
- Read: Check this box if you want to show the value in the current Readings pane.
- Plot: Check this box if you want to show the value in the Trend Plots graph AND the Trend Tabular Data tab.

5.5 Using the Main Menus (cont.)

Note: The other options under MEASUREMENTS are for individual unit types and perform the same function as checking a box under the CONFIG pop-up window.

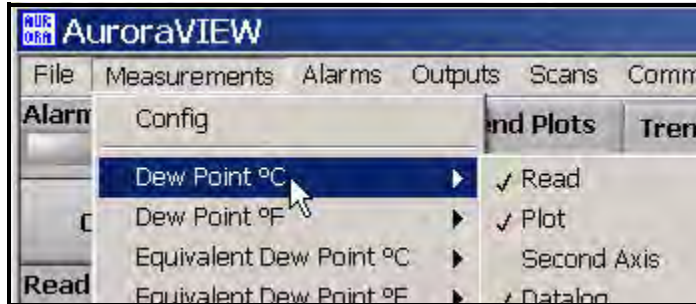


Figure 52: Other Measurement Options

2. Click Alarms → Config

This window enables the user to configure the alarm status within the **AuroraView** application. This feature allows you to remotely configure **Aurora H₂O**'s alarms, which are used only with Modbus RTU digital output. The **AuroraView** Alarms are shown below.



Figure 53: Alarms Configuration

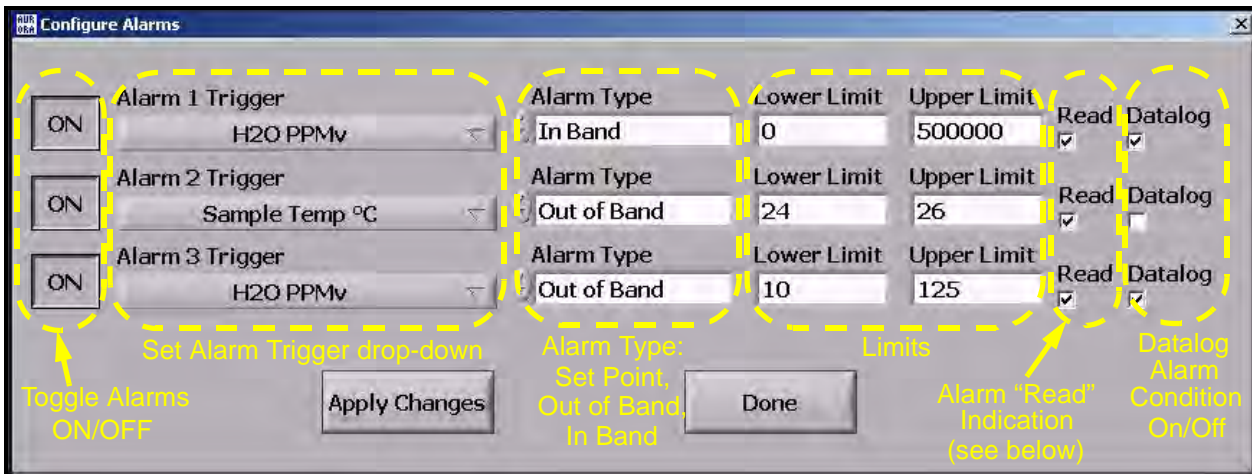


Figure 54: Other Measurements Options



Figure 55: Alarm Status Indicators

5.5 Using the Main Menus (cont.)

3. Click Outputs → Config



Figure 56: Outputs Configuration

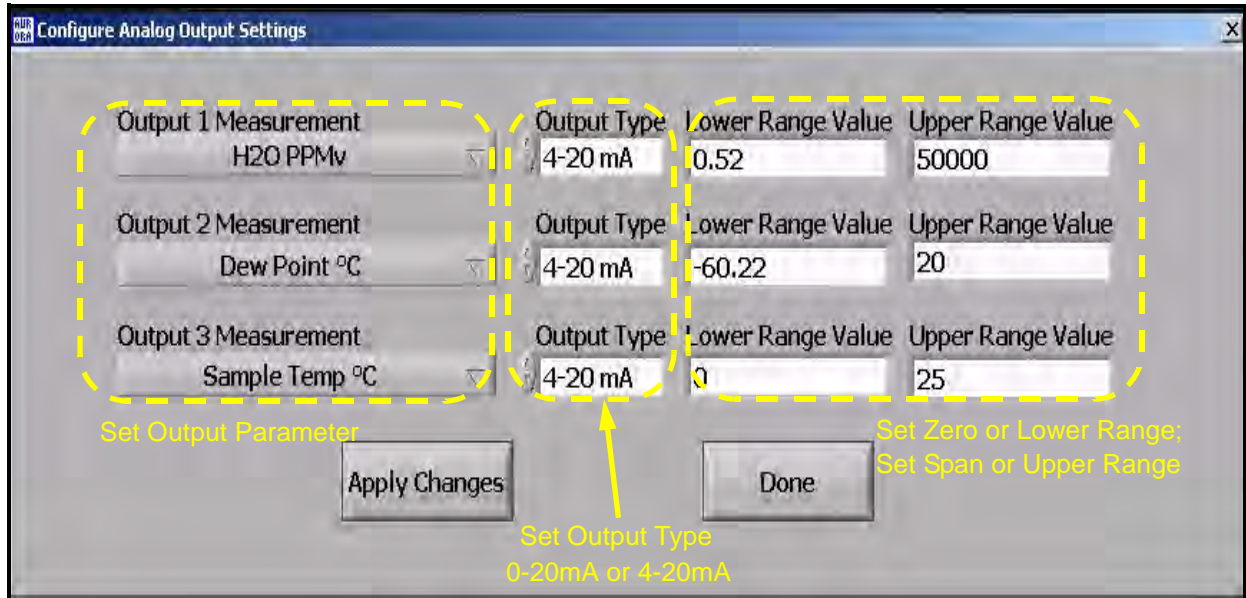


Figure 57: Other Output Options

5.5 Using the Main Menus (cont.)

4. Click Scan

This section will enable you to pick the type of scan you want to see. The default scan is the SPECTRA scan, which shows the 2f spectral scan. This is the processed signal waveform that the **Aurora H₂O Analyzer** uses to determine the moisture concentration. Viewing this scan may be helpful in certain troubleshooting situations. A typical 2f spectra scan is shown in Figure 59 on page 79. You may select the scan interval in minutes. This will be the refresh rate at which **AuroraView** updates the scan plot. To enter a scan interval, click on the Click to Save Scans Periodically button, and the following screen appears. Enter the interval and click on Continue to save or Cancel to reject the change.

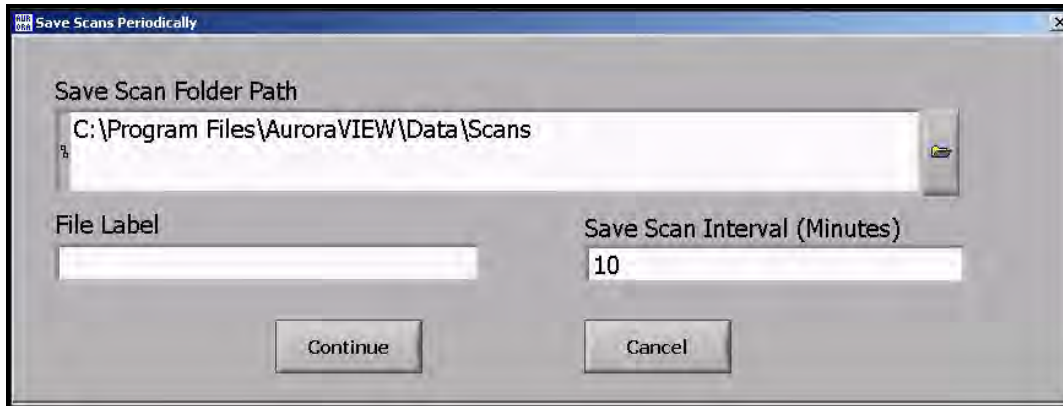


Figure 58: Save Scans Periodically

5.5 Using the Main Menus (cont.)

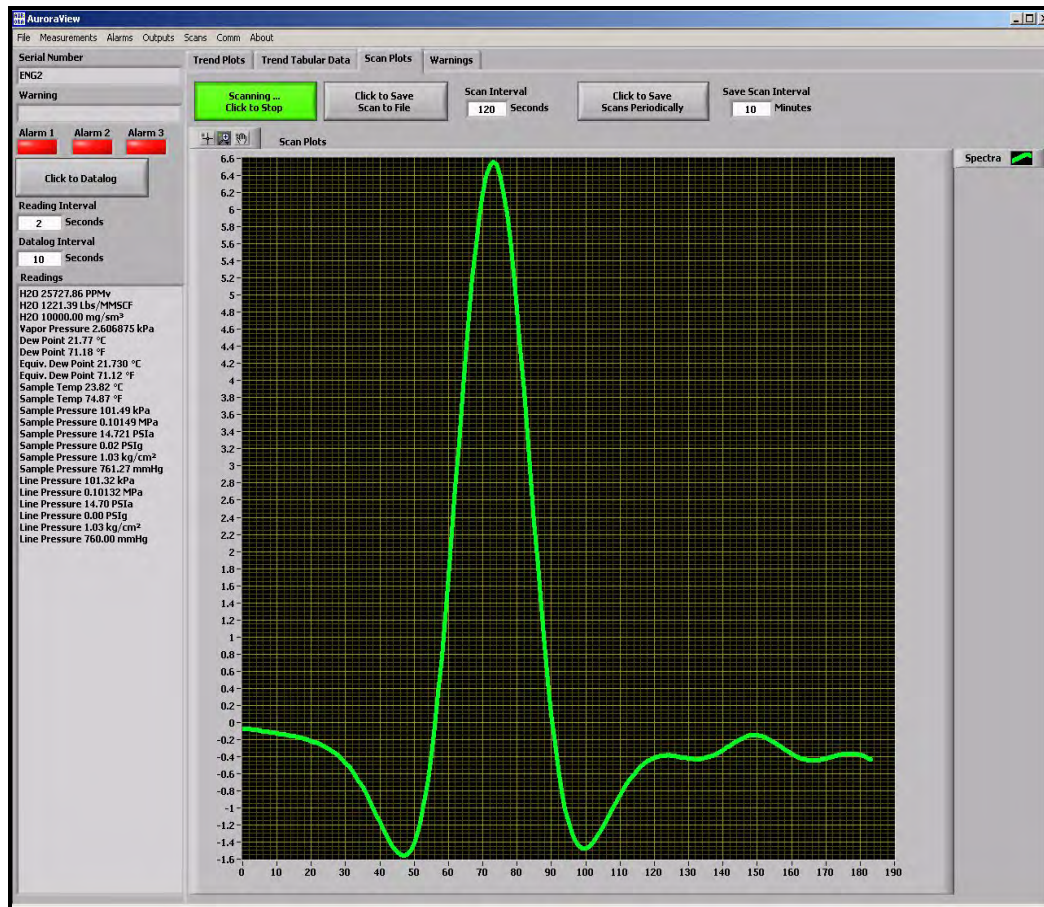


Figure 59: Scan Plot Tab

5.5 Using the Main Menus (cont.)

5. Click Comms

This window enables you to configure communication options. If you have more than one **Aurora H₂O** on your network, you will have to establish different NETWORK ID's for each analyzer using the main keypad on the **Aurora H₂O**. For your PC system, you will have to select which comm port to use. This is typically COM1. The default baud rate is 115200 baud.

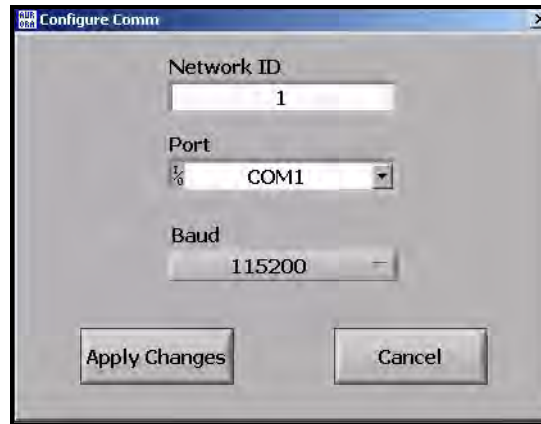


Figure 60: Configure Communication Options

6. Click Help

This screen indicates the revision level of **AuroraView**.



Figure 61: Software Information

5.6 Datalogging with AuroraView

1. In the main view, click on the button Click to Datalog.

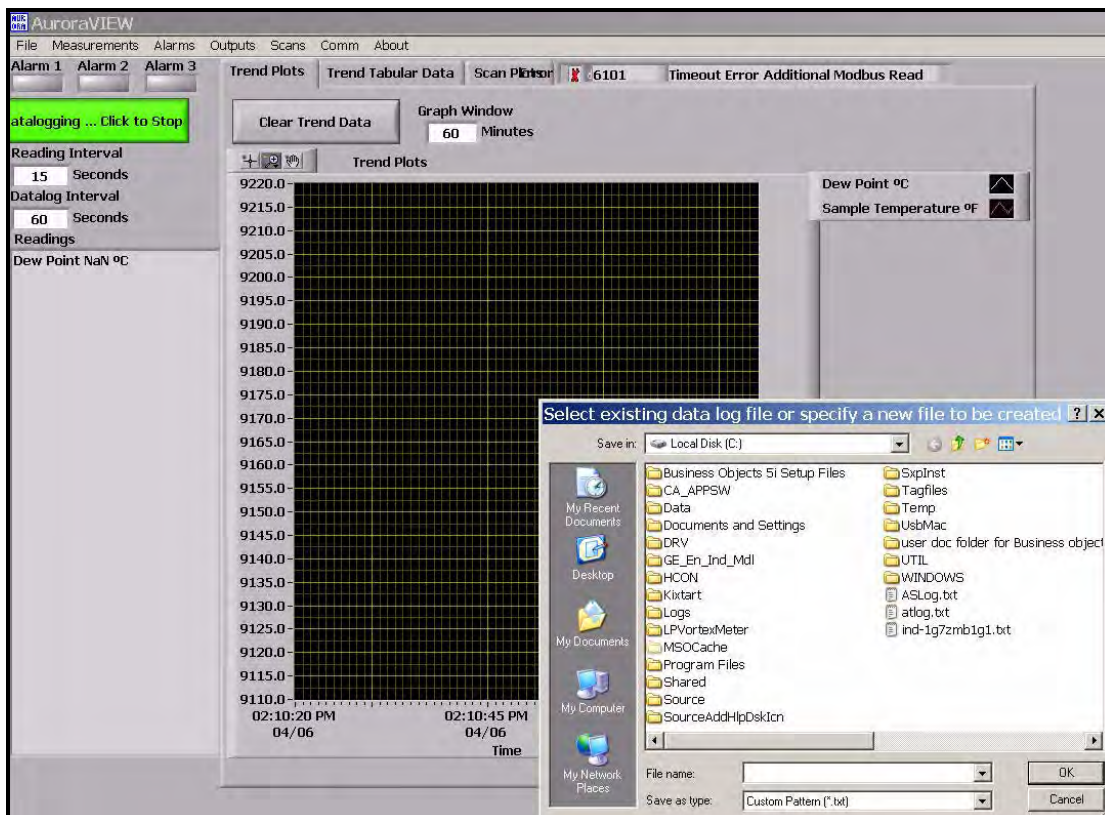


Figure 62: Datalogging with AuroraView

2. **AuroraView** will request a file location. Pick a file location and a file name to save your data log file. All data log files are comma delimited .txt files by default.
3. Once you pick a file location, **AuroraView** will write any parameter that has a check box with Datalog checked in the main Config window at the time interval set in the Datalog Interval box, and the button in the main window will change to Datalogging...Click to Stop.
4. When you are done datalogging, click the button to stop logging. You may now open your .txt datalog file in any application, such as Microsoft Excel, so that you can analyze that data.

Note: When datalogging multiple parameters at intervals of five seconds or less, it is recommended to use baud rates of 57.6K or 115.2K.

5.7 Working with Trend Plots, Trend Tabular Data & Scan Plots

1. Trend Plots is a powerful graphing feature in AuroraView. You can graph many parameters at the same time.

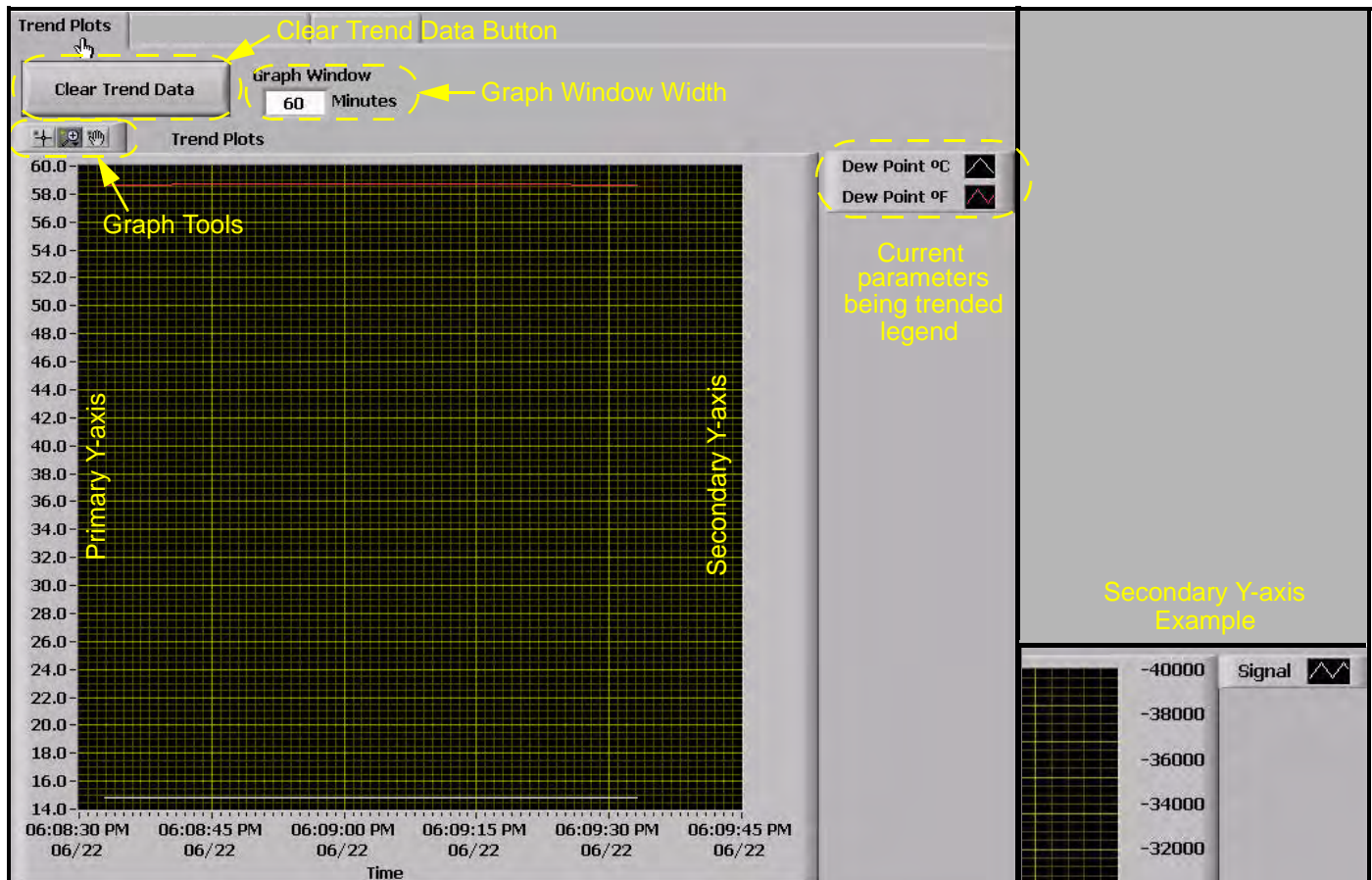


Figure 63: Using Trend Plots

Note: If you use the secondary y-axis, you may see “-” tick marks preceding the value. These are tick marks from the graphical applet and not an indication of negative values.

5.7 Working with Trend Plots, Trend Tabular Data & Scan Plots (cont.)

2. If you right-click on any series of data within the graph, or you click on the current parameter being-trended item in the legend, you will see a variety of options for graphing data. You can change to a variety of common plots and adjust color, line style, and line width. For some data sets with lots of finite points, you may want to click Anti-Aliased which will smooth the plot line. You can also change bar plots, fill base line, interpolation and point style. X-Scale adjusts the x-scale. Y-Scale adjusts the y-scale and enables the secondary y-axis.

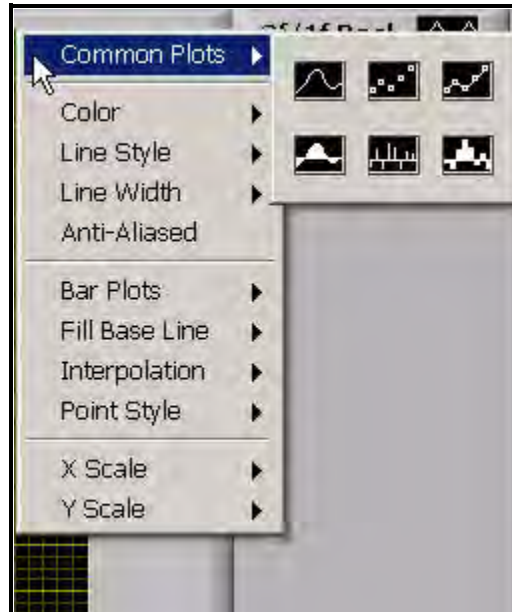


Figure 64: Options for Graphing Data

3. There is a series of Graph Tools available at the top left of the trend plot area.



Figure 65: Graph Tools

- Pointer
- Zoom Tool - gives you six options as shown in Figure 66.

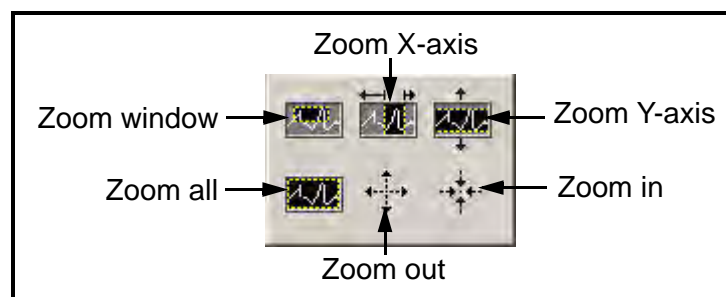


Figure 66: Zoom Tool

- Hand Tool - Enables you to graph the trend plot area and move it around without rescaling.

5.7 Working with Trend Plots, Trend Tabular Data & Scan Plots (cont.)

4. Copying and Pasting a Trend Plot can be done from **AuroraView**. One way to do this quickly is to simply right click over the data area and choose Copy. In another application, like Microsoft Word, simply paste.

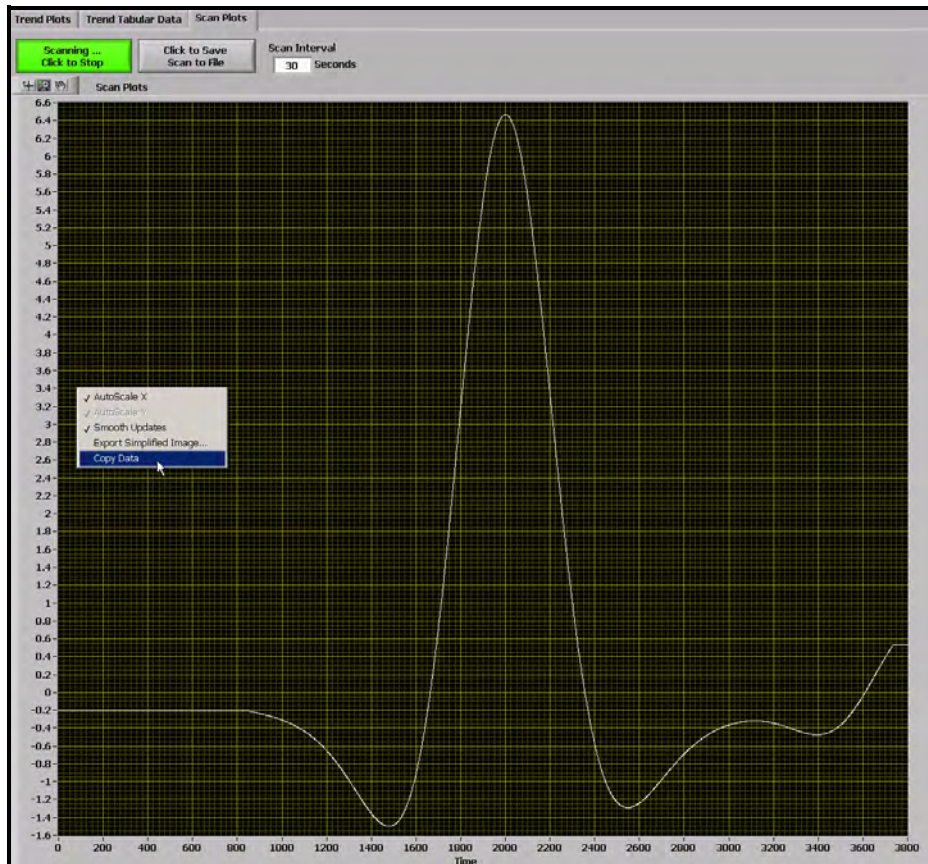


Figure 67: Copying a Trend Plot

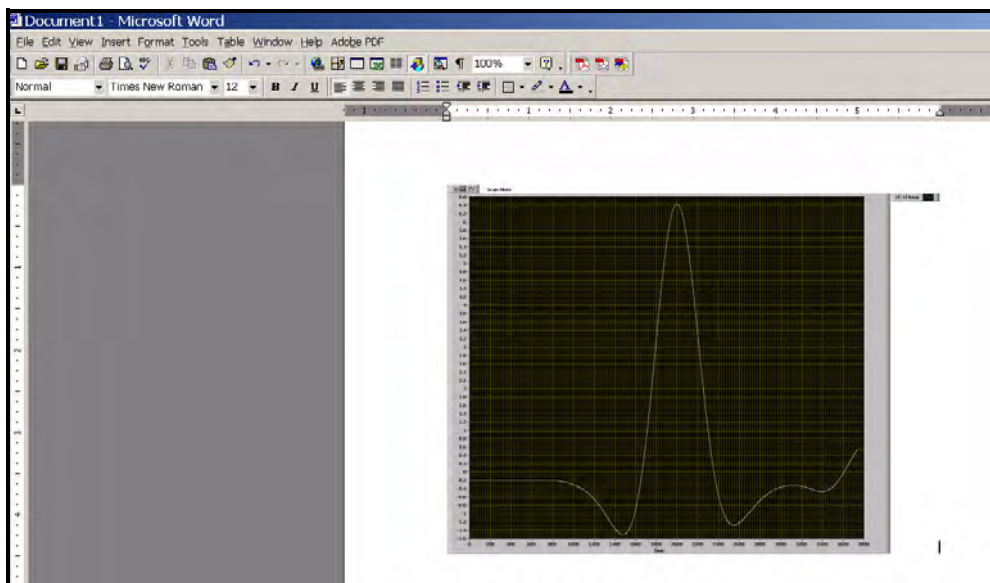


Figure 68: Pasting a Trend Plot

5.7 Working with Trend Plots, Trend Tabular Data & Scan Plots (cont.)

Another option is to right-click and chose the option Export Simplified Image. When you do this, a variety of image file formats will appear. A good universal option is Enhanced Metafile. Pasting an enhanced metafile will give you the ability to paste an image with an inverted color scheme as shown in the second example posted into Word (see Figure 71 on page 86).

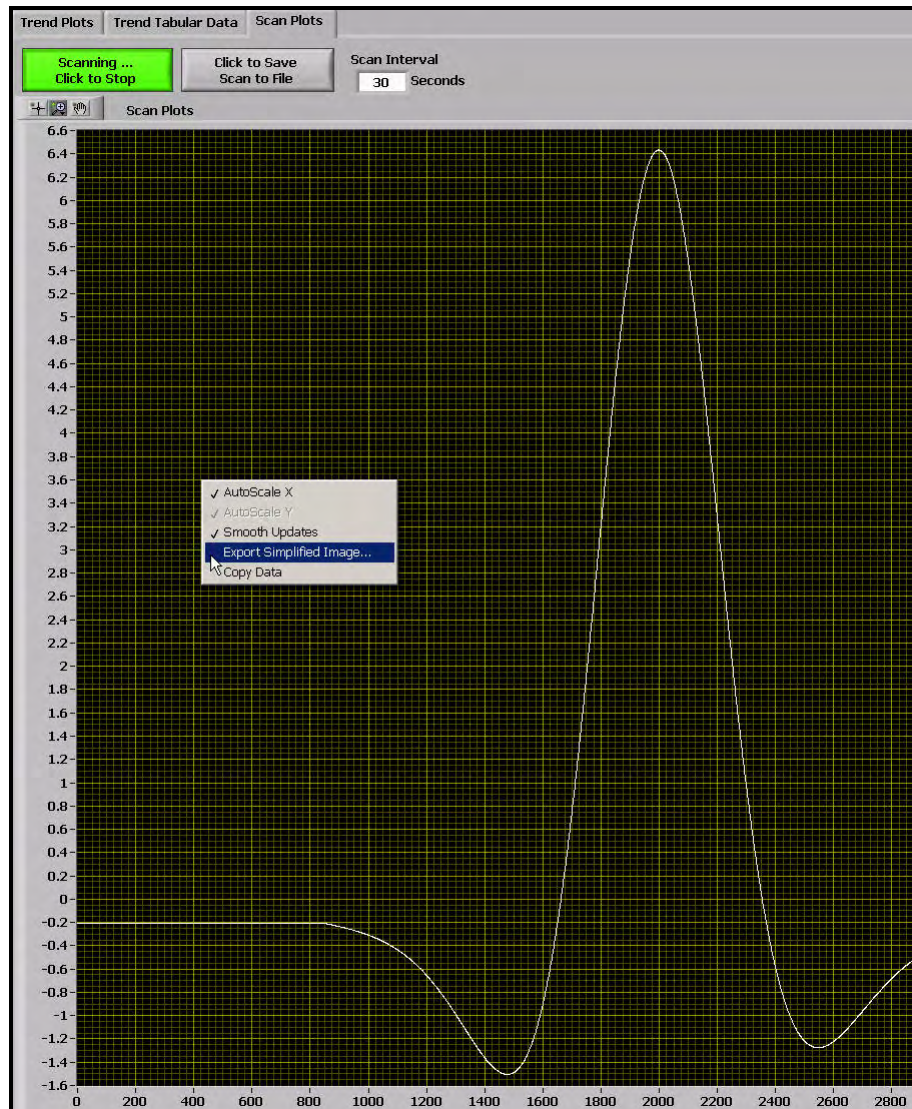


Figure 69: Exporting a Simplified Image

5.7 Working with Trend Plots, Trend Tabular Data & Scan Plots (cont.)

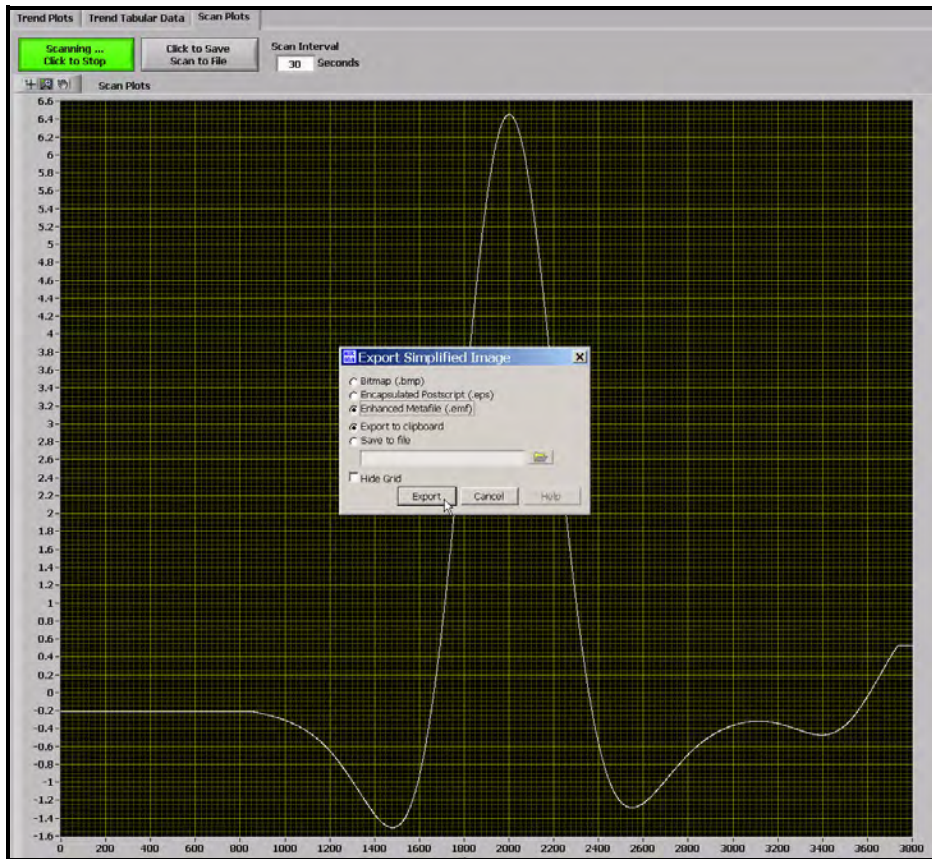


Figure 70: Selecting Enhanced Metafile

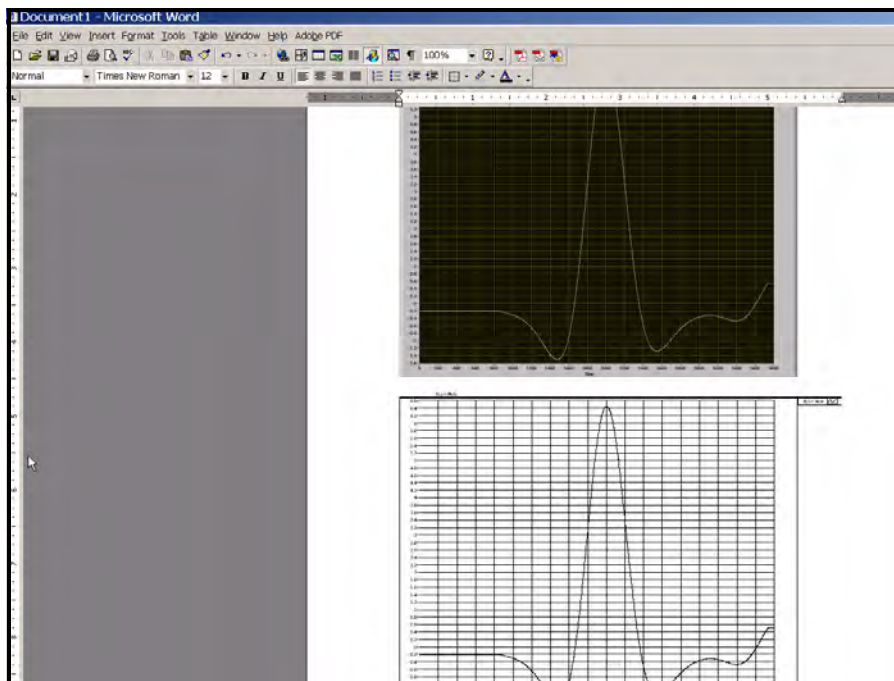


Figure 71: Pasting an Enhanced Metafile

[no content intended for this page]

Chapter 6. Maintenance

6.1 Spare Parts

Table 2: Aurora H₂O Spare Parts List

Part No.	Description	Qty.
704-688-12	RS-232 Cable; SUB-9-F to Tinned Leads; 12 ft.	1
Aurora H₂O Maintenance Kit		
N/A	Plastic Case with Foam Inserts	1
421-3230	Magnetic Stylus	1
240-199	Air Blower	1
403-161	Lens Tissue Package	1
440-023	Replacement Coalescing Filter Elements	2
240-201	Allen Wrench, 5/32"	1
240-200	Allen Wrench, 3/32"	1
S40046393	Small Screw Driver	1
403-163	Gloves	4



CAUTION! CLASS 1M INVISIBLE LASER RADIATION WHEN OPEN. DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS.

WARNING! Use of controls or adjustments or performance of procedures other than those specified herein may result in radiation exposure that is more hazardous than specified.

6.2 Recommended Factory Verification Period

Aurora H₂O technology is designed for long life without calibration. There are no wetted sensing surfaces, which might degrade over time due to direct sample gas contamination. The optical components are designed to be stable over the span of many years. GE recommends that **Aurora H₂O** analyzers may be returned to the factory for verification on a five (5) year periodic basis. GE will inspect, clean, replace filter elements and calibrate the unit to traceable standards as part of the factory service for **Aurora H₂O** analyzers.

6.3 Cleaning the Mirror

The **Aurora H₂O** analyzer may provide the message Weak Signal Return - Check Mirror on the top line of the display, along with the red light “!” to the left of the main display. If this occurs, the mirror and/or the optical window of the measuring cell may be contaminated due to liquid or particulate coating/deposition.

Note: *Reagent grade Acetone (Cas no. 67-64-1) may be needed for the cleaning process. The reagent is not supplied as part of the Aurora maintenance kit. Obtain the reagent from a local chemical supplier.*

6.3 Cleaning the Mirror (cont.)

If the error condition Check Mirror is indicated, the first step is to clean the mirror. The process is as follows:

1. Turn the power to the **Aurora H₂O** off.



CAUTION! CLASS 1M INVISIBLE LASER RADIATION WHEN OPEN. DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS.

WARNING! Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser exposure.

2. Shut down the flow through the measuring cell.
 - a. Turn the inlet isolation ball valve (item 4 in Figure 2 on page 4 or Figure 3 on page 5) to the closed position.
 - b. Ensure that the sample flow rotatmeter indicates zero flow.
3. Wear a pair of disposable latex gloves.

Note: A 5/32 inch allen wrench is required to accomplish this task.

4. Remove the 6 hex bolts securing the mirror (see Figure 73). A 5/32 inch allen wrench is required to accomplish this task. Hold the stainless steel base of the mirror with one hand while removing the last retaining bolts. The mirror is removed straight down. There is one alignment pin which will facilitate proper removal.

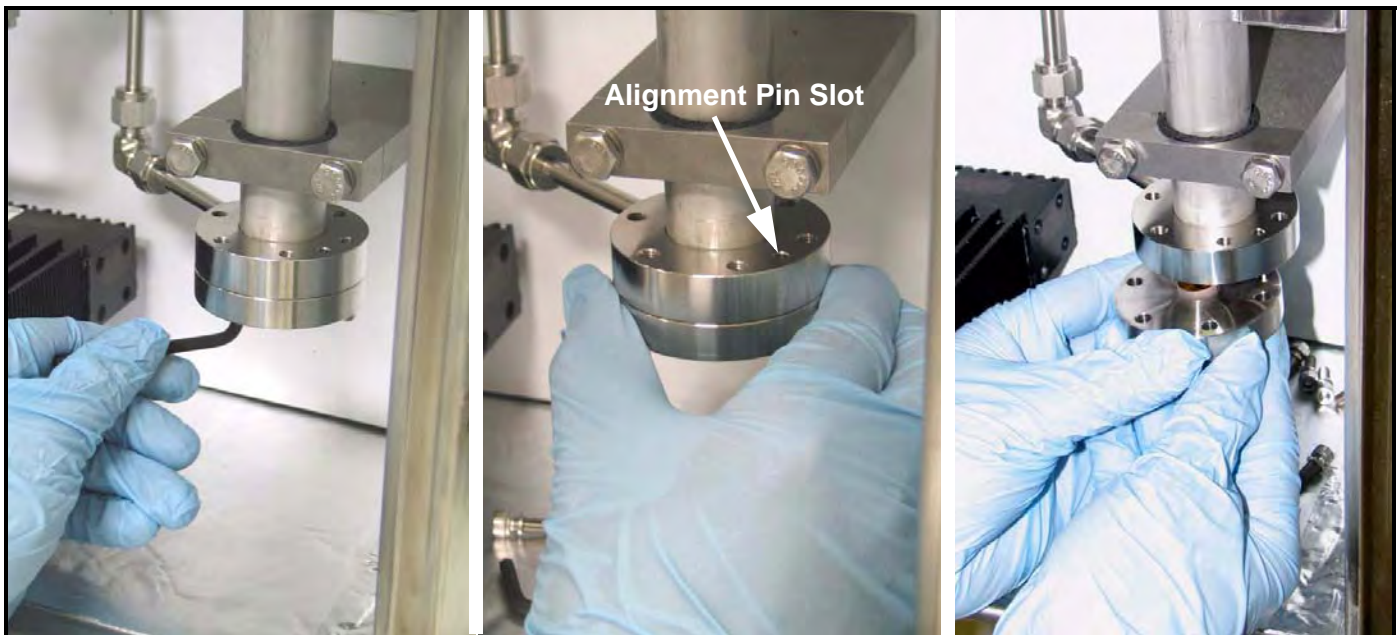


Figure 73: Removing the Aurora H₂O Mirror

6.3 Cleaning the Mirror (cont.)

CAUTION! Handle the mirror with extreme care. Performance of the analyzer is dependent upon the mirror integrity. Do not touch the mirror surface with any tools, objects or hands/fingers.

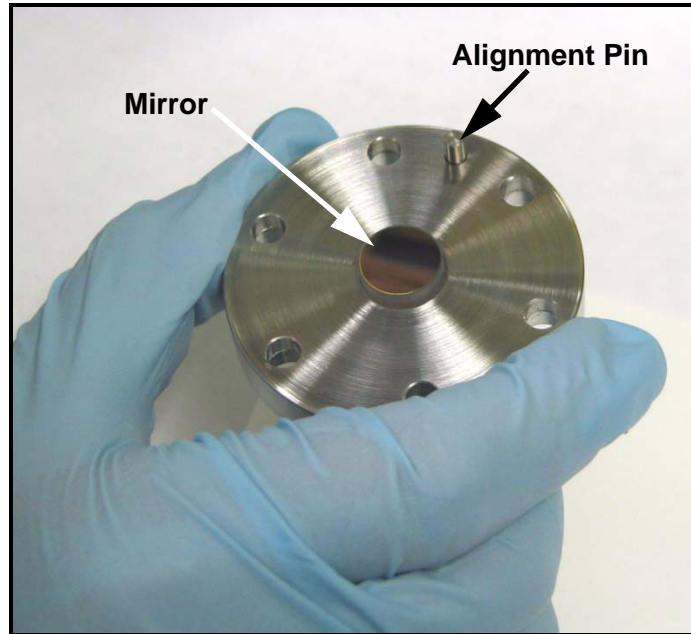


Figure 74: Handling the Mirror Assembly

5. Make a visual inspection of the mirror surface. Record any observation of gross contamination. If the mirror appears to be clean, do not clean it. Instead, reinstall it into the system.

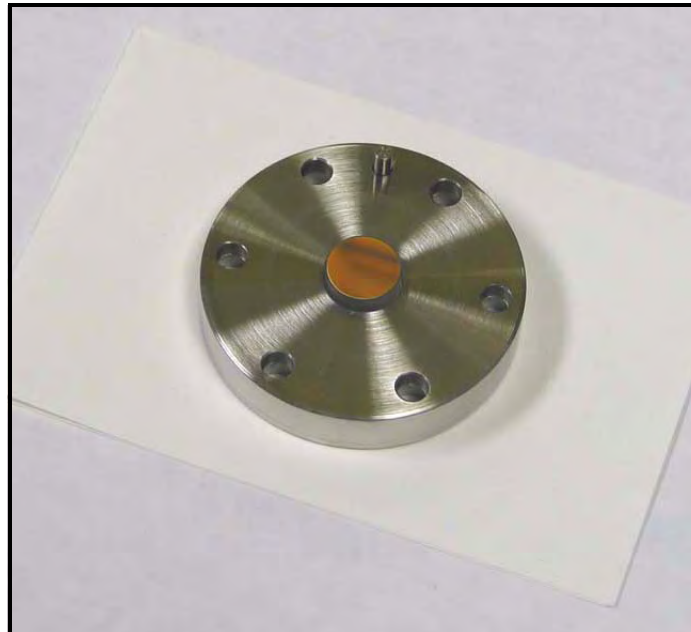


Figure 75: Examining the Mirror

6.3 Cleaning the Mirror (cont.)

6. If the mirror is contaminated, the first step in cleaning it is to use the air blower to blow away any particulate matter on the mirror surface. Place the mirror assembly on a flat surface and repeatedly puff the air blower to force dry clean air onto the mirror surface (see Figure 76).

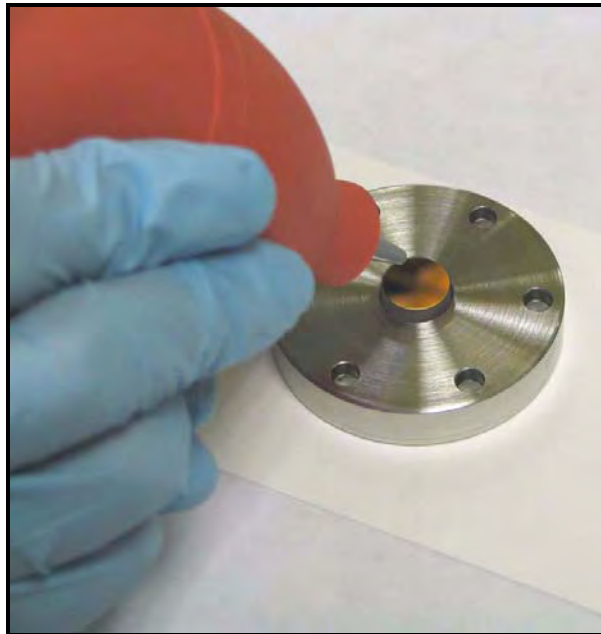


Figure 76: Blowing Air onto the Mirror

7. Using a piece of lens tissue, wet a small area with a very small amount of Analytical Grade Acetone. (Barely wet the lens tissue. Typically, one drop of Acetone will suffice.) Tilt the lens tissue so that the acetone drop is absorbed by the lens paper along the length of the piece (see Figure 77).



Figure 77: Using Analytical Grade Acetone

6.3 Cleaning the Mirror (cont.)

- Place the wet lens tissue on top of the mirror and drag it horizontally across the surface of the mirror (see Figure 78).

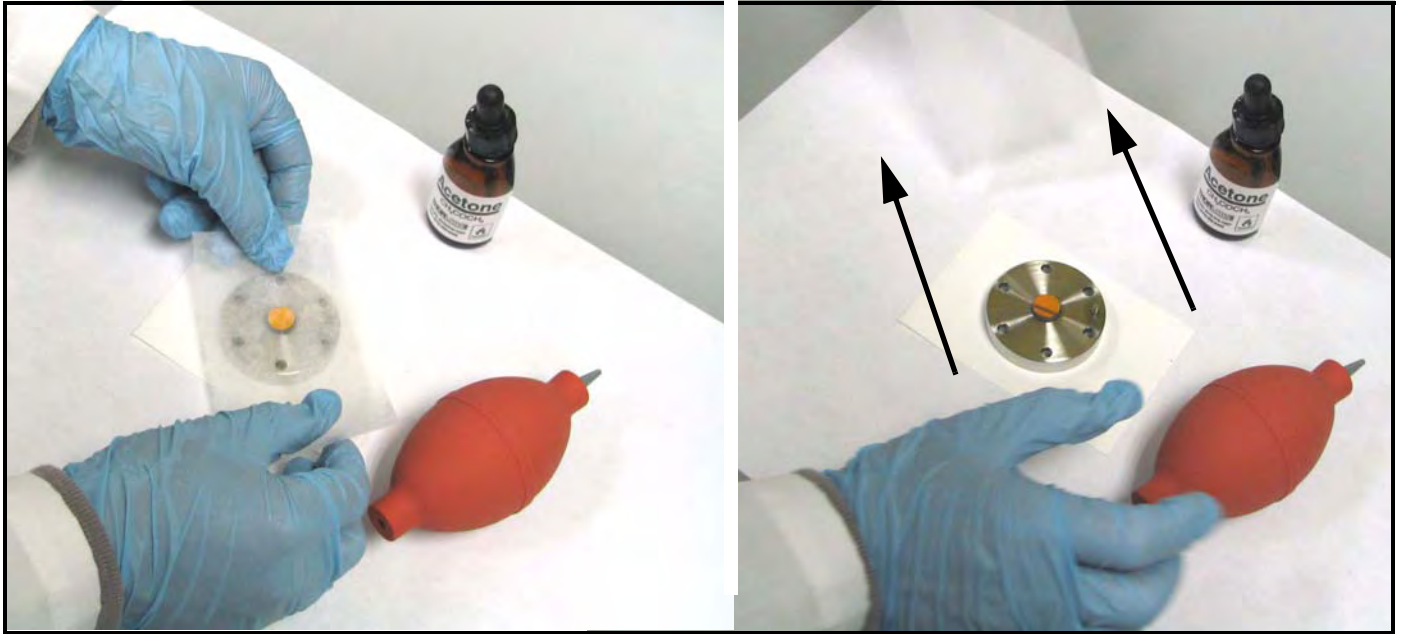


Figure 78: Dragging the Wet Lens Tissue Across the Mirror

- Use the air blower to blow dry air onto the surface of the mirror. Puff repeatedly until the mirror surface appears dry (see Figure 79).

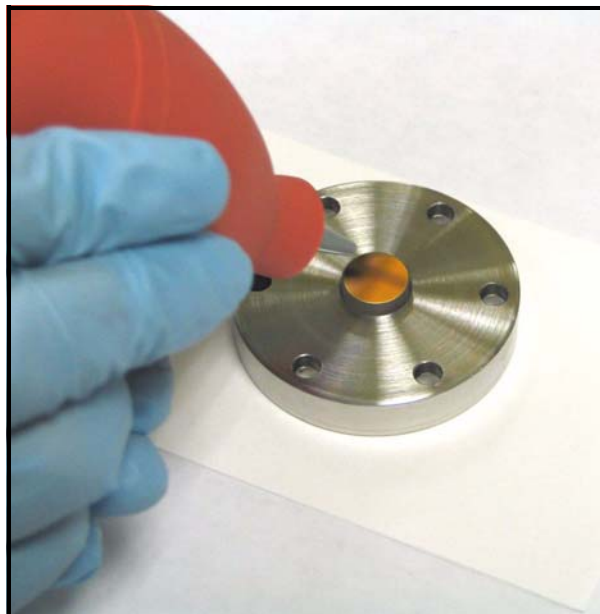


Figure 79: Drying the Mirror

- Repeat steps 7-9 at least three times. Each time, use a new lens tissue.

6.3 Cleaning the Mirror (cont.)

11. Visually inspect the mirror. Record any observation of gross contamination.
12. If the mirror does not appear to be clean, contact the factory for further assistance.
13. If the mirror appears to be clean, re-install it onto the measurement cell.
14. As you line up the mirror to the measurement cell, note the “key” for properly connecting the two pieces. The mirror will align in only one position for mounting. Rotate the mirror assembly to line up the alignment pin with the alignment pin slot (see Figure 80).

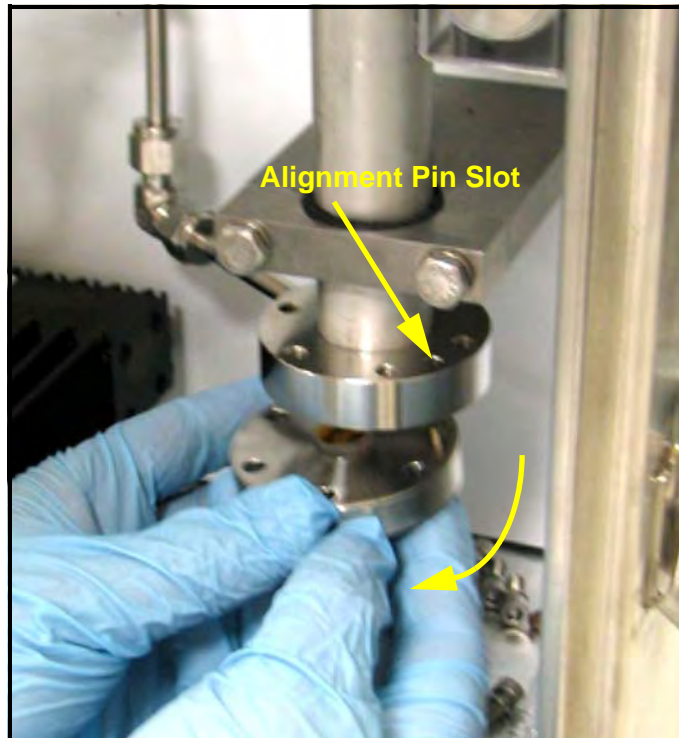


Figure 80: Reinstalling the Mirror Assembly

15. Reinstall the six retaining bolts.
16. Tighten the six bolts in a star pattern. Hand tighten to achieve integral metal-to-metal contact.
17. Re-establish power to the **Aurora H₂O** analyzer.
18. Re-establish the flow through the sample system.
19. If the **Aurora H₂O** still indicates a Check Mirror, contact the factory for further assistance.

6.4 Replacing the Coalescer/Filter

The coalescer/filter (see Figure 2 on page 4 or Figure 3 on page 5) may require periodic replacement. Use the following steps to replace the coalescer/filter:

1. Turn the inlet isolation ball valve (item 4 in Figure 2 on page 4 or Figure 3 on page 5) to the closed position.
2. Close the coalescer/filter by-pass needle valve (item 6 in Figure 2 on page 4 or Figure 3 on page 5).
3. Break the outlet tubing connection on the by-pass of the coalescer filter and remove the tubing section for clearance (see Figure 81).

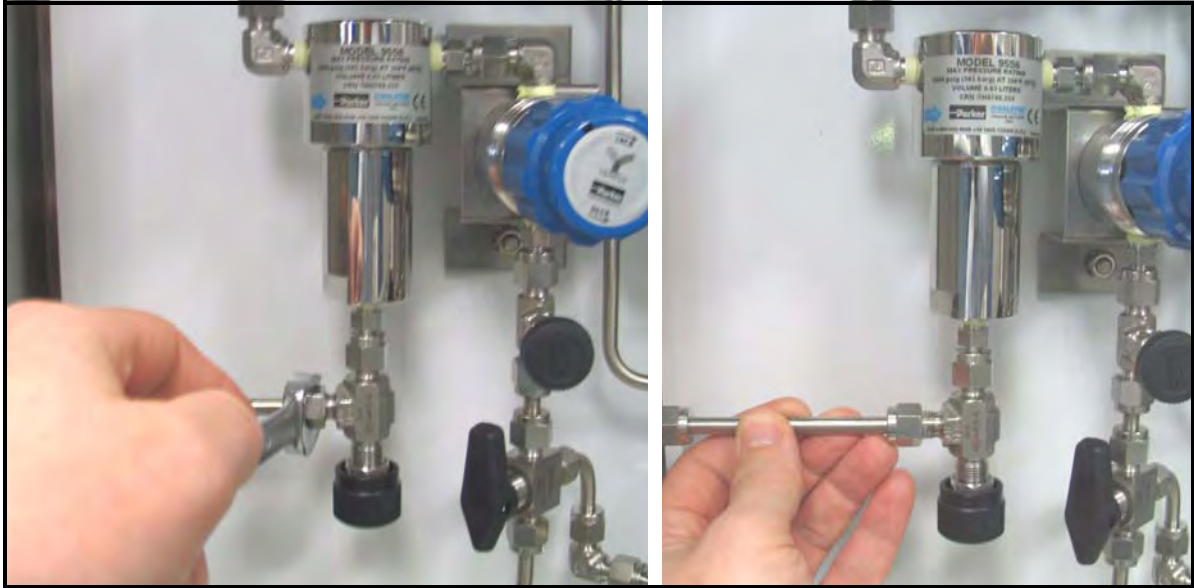


Figure 81: Breaking the Outlet Tubing Connection

4. Remove the lower section of the coalescer/filter assembly with an adjustable wrench (see Figure 82).

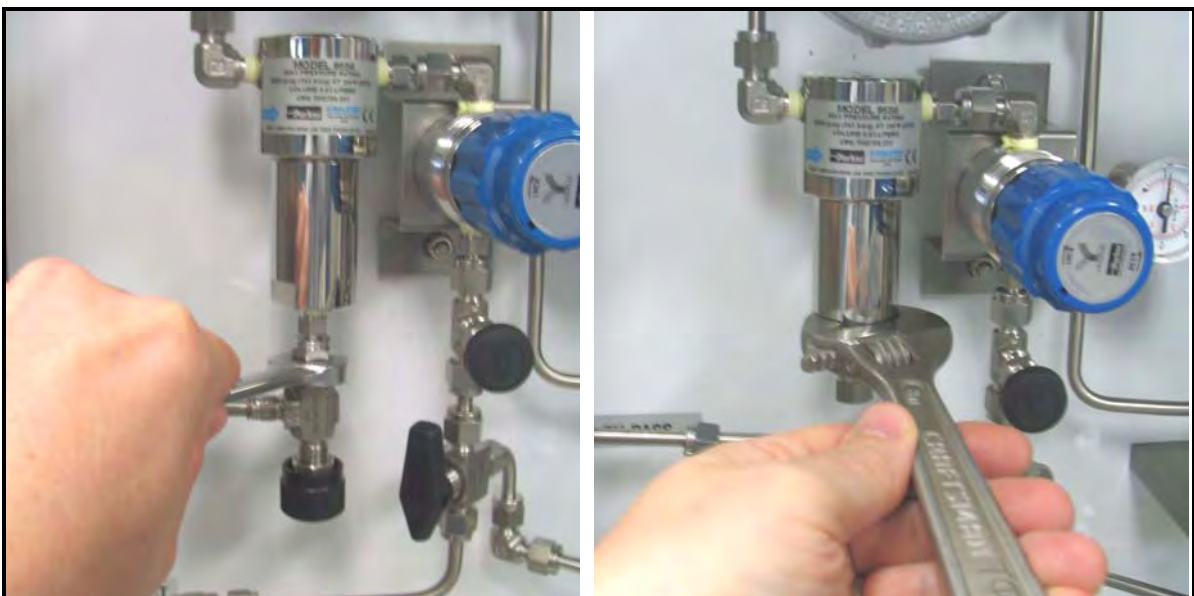


Figure 82: Removing the Lower Section of the Coalescer/Filter Assembly

6.4 Replacing the Coalescer/Filter (cont.)

5. Remove the old coalescer/filter element (see Figure 83).

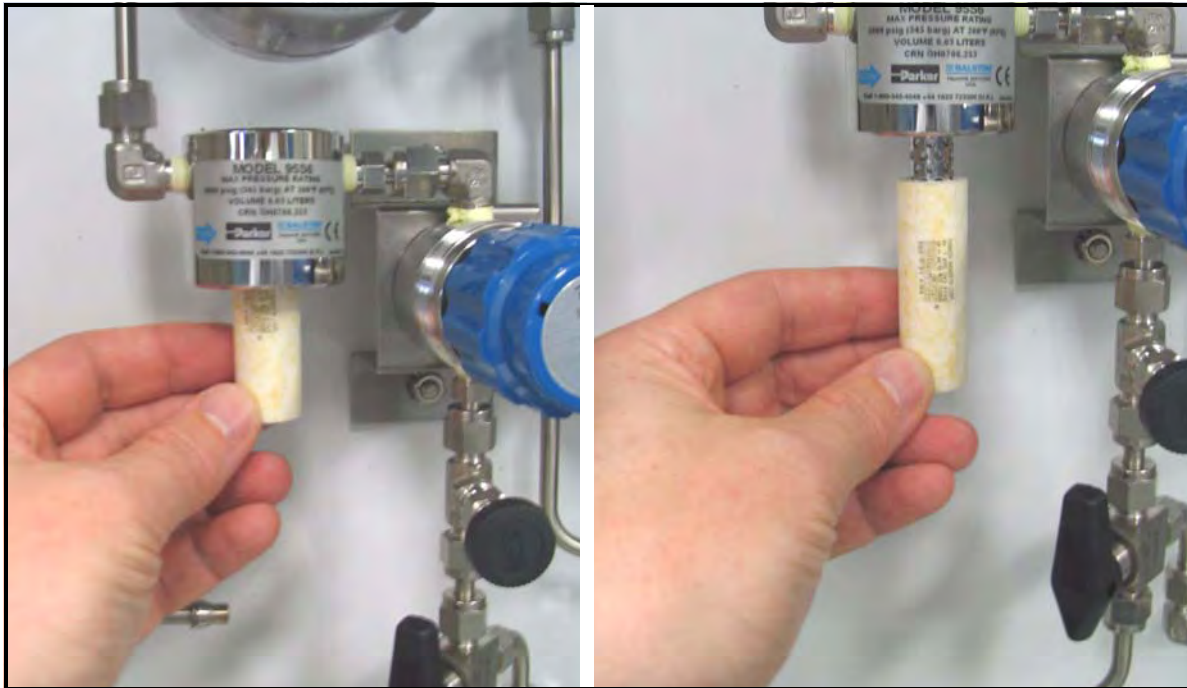


Figure 83: Removing the Coalescer/Filter Element

6. Install a new coalescer/filter element (part no. 440-023).

Note: *It is recommended that you wear gloves when installing a new coalescing filter.*

7. Re-attach the lower section of the coalescer/filter assembly. Tighten it with an adjustable wrench
8. Re-attach the outlet tubing connection to the by-pass flow control valve. Tighten the compression fittings.
9. Re-establish flows through the system.

Chapter 7. Troubleshooting

7.1 Introduction

The following are possible **Aurora H₂O** analyzer conditions with details on how to deal with them.

7.2 Blank Display

1. Is the green POWER LED lit?
 - a. Yes - proceed to 2.
 - b. No - Check wiring and fuse
2. Are the four arrow keys illuminated?
 - a. Yes - If the keys remain illuminated for more than 12 seconds, the Boot Loader cannot find a valid Instrument Program to run.
 - b. No - contact the factory for service.

7.3 Display Dim or Hard to Read

1. Adjust the LCD brightness and contrast using the Display/Adjust menu.

7.4 Status Messages and Indicators

1. The **Aurora H₂O** categorizes status messages as either Faults, Warnings, or Information. Status messages are displayed in the upper right corner of the display. Messages that are longer than the message area continuously scroll from right to left.
2. A fault is a non-recoverable condition that can affect the quality of measurement by the **Aurora H₂O**. Fault messages are accompanied by a slow flashing (!) indicator.
3. A warning is a recoverable condition that can affect the quality of measurement by the **Aurora H₂O**. Warning messages are accompanied by a rapid flashing (!) indicator.
4. Information messages alert the operator to a condition that is abnormal, but does not affect the quality of measurements. Info messages are accompanied by a slow flashing (i) indicator.
5. **Aurora H₂O** fault and status messages are prioritized; in case of more than one fault/status condition, the condition with the highest priority will be displayed. When that condition is resolved, the next highest priority condition will display.

7.4 Status Messages and Indicators (cont.)

Table 3: Status Messages and Indicators

Message	Condition	Description
Status OK	Info	Aurora H₂O is operating normally, no faults or other indications.
No CH ₄ detected	Info	Aurora H₂O is reading moisture, but cannot detect the presence of methane.
H ₂ O Under Range	Info	The moisture level is below the system detection limits.
Warning - System Overheating	Fault	The temperature inside the electronics module exceeds 85°C or the air temperature inside the sample system enclosure exceeds 68°C. The laser is powered off until the electronics module temperature is below 80°C, and the sample system enclosure temperature is below 65°C.
FAULT: Temperature	Fault	The temperature transducer is operating out of limits, is disconnected, or has failed.
FAULT: Sample Pressure	Fault	The internal (sample) pressure transducer is operating out of limits, is disconnected, or has failed.
FAULT: Line Pressure	Fault	The external (line) pressure transmitter is operating out of limits, is disconnected, or has failed. Occurs if source of the line pressure measurement is set to "Live", and no pressure transmitter is attached.
Laser Temp Unstable...	Warning	The temperature of the laser is not stable. This warning occurs briefly at power on, as the Aurora H₂O sets the correct operating temperature. The laser is powered off until the temperature has stabilized.
Laser Adjust at Limits	Info	Aurora H₂O has reached the limit for adjusting the laser power. Contact the factory for assistance.
Laser Reference Fail	Fault	Aurora H₂O could not detect any signal from the laser. Contact the factory for assistance.
Weak Signal Return - Check Mirror	Info	Aurora H₂O could not detect a signal returned from the sample cell, or the signal is below allowed limits. Check mirror for contamination.
FAULT: TEC FAIL	Fault	Aurora H₂O has detected a failure in the laser temperature control. Contact the factory for assistance.
WARNING - Sample Pressure TOO HIGH	Warning	The pressure in the Aurora H₂O sample cell is greater than 212 kPa (30.75 psia). Verify regulator and flow settings; check for blocked vent line or excessive back pressure.
ERROR: TEC Setpoint out of Range	Fault	The Aurora H₂O temperature controller is was set beyond its operating limits. Contact the factory for assistance.
Service Req: ###	Fault	Aurora H₂O has detected a fault condition that has no associated status message. Contact the factory for assistance.

7.5 No Flow Measurement Indicated on Aurora H₂O Measurement Cell Outlet

Check to make sure that the outlet of the **Aurora H₂O** is venting to atmospheric pressure. Ensure that the sample system valves are configured correctly and that the **Aurora H₂O** internal pressure regulator is capable of a barely positive pressure setting. Check/Replace the filter element in the coalescer/filter as detailed in Chapter 5, *Maintenance*.

7.6 Verifying Aurora H₂O Performance in the Field

There are two methods for verifying the performance of the **Aurora H₂O** in the field. The first method is to use a portable hygrometer such as *GE's PM880* portable hygrometer. The second method is to use a moisture generator or gas standard cylinder.

7.6.1 Using A Portable Hygrometer

One quick spot check that can be done, that is relatively easy to do and requires minimal set-up time and no consumables, is to use a second hygrometer. *GE* recommends using a *PM880 Portable Hygrometer* for this requirement with a recently calibrated *Aluminum Oxide Moisture Probe*.



Figure 84: PM880 Portable Hygrometer

The *PM880* can be hooked up to the outlet of the **Aurora H₂O** analyzer, using the portable sample system with the aluminum oxide moisture probe, and verify the system. The response time of the portable hygrometer is limited, as the sensor is typically exposed to air during movement to the sample point, so it is recommended to leave the sample gas flowing through the portable sample system on the sample outlet of the **Aurora H₂O** for a period of time until it reaches equilibrium with the moisture concentration of the sample gas. You can use the data-logging capability in the *PM880* to determine steady-state conditions. Consult *GE* if you have application questions regarding this process.

7.6.2 Using a Moisture Standard

The best moisture standard to use is one generated by a moisture generator as a flowing reference, due to the fact that static moisture standards in cylinders have limited capability and reliability. A moisture generator such as *GE's MG101* moisture generator could be used.



Figure 85: MG101 Moisture Generator

However, a moisture generator is typically used only in an indoor location with reasonably good temperature control. In the field this is not always practical, so a more convenient option would be to use a moisture standard in a cylinder. Consult with your local specialty gas supplier about standards for moisture. Based on application experience, *GE* recommends the following guidelines regarding moisture standards in cylinders

- Use passivated, aluminum cylinders only.
- Do not use when pressure falls below 50% of original pressure supplied by the vendor (typically 1500-1800psig).
- Use for moisture values 50–100PPM.
- Moisture standard in a background of nitrogen (N₂).
- Mix the moisture standard for 10 minutes prior to use, following the manufacturer's guidelines (rolling typically).
- Use at the nominal temperature at which the cylinder was tested by the manufacturer.

7.6.2 Using a Moisture Standard (cont.)

When verifying the Aurora H₂O with certified cylinders, the background gas is typically 100% Methane. Follow the directions in *Setting the Gas Composition* on page 52 to set the aurora for 100% Methane background gas. If your moisture readings are in lbs/mmscfh (pounds per million standard cubic feet), set the pressure constant value to 101.3 KPA (see *Pressure Settings* on page 55).

Whether using a moisture generator or a moisture standard cylinder, the source gas can be connected to the **Aurora H₂O** using the PURGE INLET on the analyzer. Ensure the sample gas pressure is regulated to just barely positive pressure and establish gas flow from the PURGE INLET to the **Aurora H₂O** measurement cell.

7.7 Background Selection Lockout

To prevent accidental selection or tampering, the Background selection can be disabled using a mechanical switch located behind the **Aurora H₂O** display. Access to the switch requires removal of the cover, and should be performed only in the absence of hazardous conditions.

Note: *Unless otherwise requested, the Aurora/H₂O is shipped from the factory with the Background Selection unlocked.*

The Lockout switch is positioned to the right of the Laser Indicator (see Figure 86).

When the switch is in the UP position, the Background Selection menu is **unlocked**. When the switch is in the DOWN position, the Background Selection menu is **locked**.



Figure 86: Background Selection Lockout Switch Location

Attempting to access the Background Gas Selection menu with the switch in the Locked Out (down) position will result in the following message displayed:

```
Menu: X
Gas select is locked.
Use Gas Lockout
switch to unlock.
```

Appendix A. MODBUS RTU / RS485 Communications

The **Aurora H₂O** supports digital communications using the Modbus/RTU protocol, with 2-wire RS-485 or 3-wire RS-232C as the physical layer. Data rate can be specified from 1200 to 115200 bits per second (bps), with selectable parity.

Aurora H₂O has two physically separate communications ports. Both ports can be selected for either RS-232 or RS-485 operation. **Aurora H₂O** can communicate with both ports simultaneously.

Aurora H₂O supports the Modbus/RTU protocol as defined in:

MODBUS Application Protocol Specification, V1.1b
&
MODBUS over Serial Line Specification and Implementation Guide V1.02.

These specifications are available from the Modbus Organization at <http://modbus-ida.org/>

The functions supported by **Aurora H₂O** are:

- (0x03) Read Holding Registers
- (0x04) Read Input Registers
- (0x08) Diagnostics (Serial Line only) - only supports Echo subcommand
- (0x10) Write Multiple registers
- (0x11) Report Slave ID (Serial Line only)
- (0x2B/0x0E) Read Device Identification - only supports Basic Device Identification tags, which are:
 - VendorName
 - Product code
 - Revision number

Aurora H₂O supports data types of Integer and Double/Float. Integers are always four (4) bytes and should be read with request for two registers (two bytes per each register, two registers total) at the address. Double/Float type will provide eight (8) byte double precision data or four (4) byte single precision data. This depends on how many registers are requested; four registers for double, two registers for single precision reading.

All registers denoted with a bullet (•) in the Read-Only column are read-only registers and should be read with function “Read Input Registers.” All other registers can be read and written with “Read Holding Registers” or “Write Multiple Registers.”

Table 4 on page 104 is the Modbus Register Address map supported by **Aurora H₂O**.

Table 4: Modbus Register Map

Function	Parameter		Range/State	Addr	Data Type	Read Only	
System Status ¹	Status Register			0	Integer	•	
	Status Register, Latched	Write 0 to clear		1000	Integer		
Analog Output	Output 1	Trim Sequence Start/Resume Live Output ²		2100	Integer		
		Units	Reg. address of Meas.	2110	Integer		
		Type	0 = 4-20mA, 1 = 0-20mA	2120	Integer		
		Trim Reading Zero	3.0 ~ 5.2	2140	Double/Float		
		Trim Reading Span	10.0 ~ 22.2	2150	Double/Float		
		Upper of Value	-10000 ~ 10000	2160	Double/Float		
		Lower of Value	-10000 ~ 10000	2170	Double/Float		
		Test	% value of output, 0~100	2180	Double/Float		
	Output 2	Trim Sequence Start/Resume Live Output ²			2200	Integer	
		Units	Reg. address of Meas.		2210	Integer	
		Type	0 = 4-20mA, 1 = 0-20mA		2220	Integer	
		Trim Reading Zero	3.0 ~ 5.2		2240	Double/Float	
		Trim Reading Span	10.0 ~ 22.2		2250	Double/Float	
		Upper of Value	-10000 ~ 10000		2260	Double/Float	
		Lower of Value	-10000 ~ 10000		2270	Double/Float	
		Test	% value of output, 0~100		2280	Double/Float	
	Output 3	Trim Sequence Start/Resume Live Output ²			2300	Integer	
		Units	Reg. address of Meas.		2310	Integer	
		Type	0 = 4-20mA, 1 = 0-20mA		2320	Integer	
		Trim Reading Zero	3.0 ~ 5.2		2340	Double/Float	
		Trim Reading Span	10.0 ~ 22.2		2350	Double/Float	
		Upper of Value	-10000 ~ 10000		2360	Double/Float	
		Lower of Value	-10000 ~ 10000		2370	Double/Float	
		Test	% value of output, 0~100		2380	Double/Float	
Alarm	All Alarm Status		0 ~ 7 (Bitfield)	3000	Integer	•	
	Alarm 1	Status	0 = Not tripped, 1 = Tripped	3100	Integer	•	
		Switch	0 = OFF, 1 = ON		3110	Integer	
		Units	Reg. address of Meas.		3120	Integer	
		Type	Set Point = 0, In Band = 1, Out Band = 2		3130	Integer	
		Upper	Depends on unit type		3140	Double/Float	
		Lower	Depends on unit type		3150	Double/Float	

Table 4: Modbus Register Map

Function	Parameter		Range/State	Addr	Data Type	Read Only
Alarm (cont.)	Alarm 2	Status	0 = Not tripped, 1 = Tripped	3200	Integer	•
		Switch	0 = OFF, 1 = ON	3210	Integer	
		Units	Reg. address of Meas.	3220	Integer	
		Type	Set Point = 0, In Band = 1, Out Band = 2	3230	Integer	
		Upper	Depends on unit type	3240	Double/Float	
		Lower	Depends on unit type	3250	Double/Float	
	Alarm 3	Status	0 = Not tripped, 1 = Tripped	3300	Integer	•
		Switch	0 = OFF, 1 = ON	3310	Integer	
		Units	Reg. address of Meas.	3320	Integer	
		Type	Set Point = 0, In Band = 1, Out Band = 2	3330	Integer	
		Upper	Depends on unit type	3340	Double/Float	
		Lower	Depends on unit type	3350	Double/Float	
Settings	Adjust	PPM Level offset adjust	-25.00 ~ +25.00	5210	Double/Float	
		Moisture reading average filter size	10 ~ 200 samples	5230	Integer	
	Clock	Hour	0~23	5410	Integer	
		Minutes	0~59	5420	Integer	
		Month	1~12	5430	Integer	
		Date	1~28/29/30/31	5440	Integer	
		Year	2000~2099	5450	Integer	
	External Pressure	Constant	0 ~ 3500.00 kPa	5510	Double/Float	
		Pressure Zero Calibration, mA	0~22 mA	5520	Double/Float	
		Pressure Span Calibration, mA	0~22 mA	5525	Double/Float	
		Pressure Zero Calibration, kPa	0~3500 kPa	5530	Double/Float	
		Pressure Span Calibration, kPa	0~3500 kPa	5535	Double/Float	
Pressure Source		Constant Value = 0, Live Sensor = 1	5540	Integer		
Device ID	Aurora H ₂ O Serial Number	-----	-----	8100	8 Character Bytes	•
	Laser Serial Number	-----	-----	8200	8 Character Bytes	•
	Calibration Date	Month	1~12	8310	Integer	•
		Date	Depends on month	8320	Integer	•
		Year	2000~2100	8330	Integer	•
	System Up Time	MSDate	Uptime, in days	8400	Double/Float	•

Table 4: Modbus Register Map

Function	Parameter		Range/State	Addr	Data Type	Read Only
Measurements	Dew Point	Dew Point °C	-----	9110	Double/Float	•
		Dew Point °F	-----	9120	Double/Float	•
		Equivalent Dew Point °C	-----	9130	Double/Float	•
		Equivalent Dew Point °F	-----	9140	Double/Float	•
	Temp	Sample Temperature °C	-----	9210	Double/Float	•
		Sample Temperature °F	-----	9220	Double/Float	•
	External Pressure	kPa	-----	9510	Double/Float	•
		MPa	-----	9512	Double/Float	•
		PSIa	-----	9520	Double/Float	•
		PSIg	-----	9530	Double/Float	•
		kg/cm ²	-----	9540	Double/Float	•
		Bars	-----	9550	Double/Float	•
		mmHg	-----	9560	Double/Float	•
	Internal Pressure	kPa	-----	9610	Double/Float	•
		MPa	-----	9612	Double/Float	•
		PSIa	-----	9620	Double/Float	•
		PSIg	-----	9630	Double/Float	•
		kg/cm ²	-----	9640	Double/Float	•
		Bars	-----	9650	Double/Float	•
		mmHg	-----	9660	Double/Float	•
H ₂ O Concentration	PPM	-----	9710	Double/Float	•	
	Lbs MMSCF	-----	9720	Double/Float	•	
	mg/sm ³	-----	9730	Double/Float	•	
Vapor Pressure	kPa	-----	9800	Double/Float	•	

¹Address 0 is System Status register, and 1000 is latching version of System Status register. That is, both registers will show the error bit if the error is currently present, but only the latching register will show it if the condition is no longer present. Writing 0 to latching register will clear the error code it contains.

²The “Trim Sequence Start/Resume Live Output” registers for the three outputs, (address 2100, 2200, 2300) accept certain values through Write Multiple Register to trim the output current:

1. Write 0 to 2x00 to select the normal mA output (proportional to measurement).
2. Write 1 to 2x00 to reset the mA output trim to factory defaults.
3. Write 2 to 2x00 to output the “zero” current (~4.000 mA) and accept a calibration value written to 2x40.
4. Write 3 to 2x00 to output the “span” current (~20.000 mA) and accept a calibration value written to 2x50.

Note: Attempting to write to Trim registers 2x40/2x50 without first writing to Trim State register 2x00 will fail with Modbus exception 4.

At the end of calibration, write 0 to 2x00 to make **Aurora H₂O** exit trim mode.

Table 5 lists the System Status codes with corresponding descriptions. It is possible for multiple status codes to be present; the hexadecimal values represent the bit set for a given condition.

Table 5: System Status Codes

Status	Description
0x00000000	Aurora H₂O is operating normally, no faults or other indications.
0x00000008	Aurora H₂O is reading moisture, but cannot detect the presence of methane.
0x00000010	The moisture level is below the system detection limits.
0x00000020	The temperature inside the electronics module exceeds 85°C. The laser is powered off until the temperature drops below 80°C.
0x00000040	The temperature transducer is operating out of limits, is disconnected, or has failed.
0x00000080	The internal (sample) pressure transducer is operating out of limits, is disconnected, or has failed.
0x00000100	The external (line) pressure transmitter is operating out of limits, is disconnected, or has failed. Occurs if source of the line pressure measurement is set to "Live", and no pressure transmitter is attached.
0x00000200	Power supply under voltage
0x00000400	System ground fault
0x00000800	The temperature of the laser is not stable. This warning occurs briefly at power on, as the Aurora H₂O sets the correct operating temperature. The laser is powered off until the temperature has stabilized.
0x00001000	Aurora H₂O has reached the limit for adjusting the signal gain. Contact the factory for assistance.
0x00002000	Aurora H₂O has reached the limit for adjusting the laser power. Contact the factory for assistance.
0x00004000	Aurora H₂O could not detect any signal from the laser. Contact the factory for assistance.
0x00010000	Aurora H₂O could not detect a signal returned from the sample cell, or the signal is below allowed limits. Check the mirror for contamination.
0x00020000	Aurora H₂O has detected a failure in the laser temperature control. Contact the factory for assistance.
0x00040000	The pressure in the Aurora H₂O sample cell is greater than 212 kPa (30.75 psia). Verify regulator and flow settings; check for blocked vent line or excessive back pressure.
0x00000000	The Aurora H₂O temperature controller is was set beyond its operating limits. Contact the factory for assistance.
0x1yyyyzzzz	Extended Error Code

[no content intended for this page]

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Warranty

Each instrument manufactured by GE Sensing is warranted to be free from defects in material and workmanship. Liability under this warranty is limited to restoring the instrument to normal operation or replacing the instrument, at the sole discretion of GE Sensing. Fuses and batteries are specifically excluded from any liability. This warranty is effective from the date of delivery to the original purchaser. If GE Sensing determines that the equipment was defective, the warranty period is:

- one year from delivery for electronic or mechanical failures
- one year from delivery for sensor shelf life

If GE Sensing determines that the equipment was damaged by misuse, improper installation, the use of unauthorized replacement parts, or operating conditions outside the guidelines specified by GE Sensing, the repairs are not covered under this warranty.

The warranties set forth herein are exclusive and are in lieu of all other warranties whether statutory, express or implied (including warranties or merchantability and fitness for a particular purpose, and warranties arising from course of dealing or usage or trade).

Return Policy

If a GE Sensing instrument malfunctions within the warranty period, the following procedure must be completed:

1. Notify GE Sensing, giving full details of the problem, and provide the model number and serial number of the instrument. If the nature of the problem indicates the need for factory service, GE Sensing will issue a RETURN AUTHORIZATION NUMBER (RAN), and shipping instructions for the return of the instrument to a service center will be provided.
2. If GE Sensing instructs you to send your instrument to a service center, it must be shipped prepaid to the authorized repair station indicated in the shipping instructions.
3. Upon receipt, GE Sensing will evaluate the instrument to determine the cause of the malfunction.

Then, one of the following courses of action will then be taken:

- If the damage is covered under the terms of the warranty, the instrument will be repaired at no cost to the owner and returned.
- If GE Sensing determines that the damage is not covered under the terms of the warranty, or if the warranty has expired, an estimate for the cost of the repairs at standard rates will be provided. Upon receipt of the owner's approval to proceed, the instrument will be repaired and returned.

[no content intended for this page]

We,

GE Sensing
1100 Technology Park Drive
Billerica, MA 01821
USA

declare under our sole responsibility that the

Aurora H₂O Moisture Analyzer

to which this declaration relates, is in conformity with the following standards:

- EN 60079-0: 2006
- EN 60079-1: 2007
- EN 60079-7: 2007
- EN 60529: 1991 +A1: 2000
- II 2 G Ex de IIB T6, T_g = -20°C to +65°C, IP66; FM09ATEX0065X (FM Global, UK)
- EN 61326-1: 2006, Class A, Table 2, Industrial Locations
- EN 61326-2-3: 2006
- EN 61010-1: 2001, Overvoltage Category II, Pollution Degree 2
- IEC 60825-1

following the provisions of the 2004/108/EC EMC, 2006/95/EC Low Voltage and 94/9/EC ATEX Directives.

The unit listed above and any ancillary equipment supplied with it do not bear CE marking for the Pressure Equipment Directive, as they are supplied in accordance with Article 3, Section 3 (sound engineering practices and codes of good workmanship) of the Pressure Equipment Directive 97/23/EC for DN<25.

Billerica - August 2010

Issued



Mr. Gary Kozinski
Certification & Standards, Lead Engineer



Customer Support Centers

U.S.A.

The Boston Center
1100 Technology Park Drive
Billerica, MA 01821
U.S.A.
Tel: 800 833 9438 (toll-free)
978 437 1000
E-mail: sensing@ge.com

Ireland

Sensing House
Shannon Free Zone East
Shannon, County Clare
Ireland
Tel: +353 (0)61 470291
E-mail: gesensingsnnservices@ge.com

An ISO 9001:2008 Certified Company

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