



THE BARRACUDA MODEL 4010BR

TUNABLE DIODE
LASER ABSORPTION SPECTROMETER



Operator Manual

THE BARRACUDA OPERATOR MANUAL

MODEL 4010BR



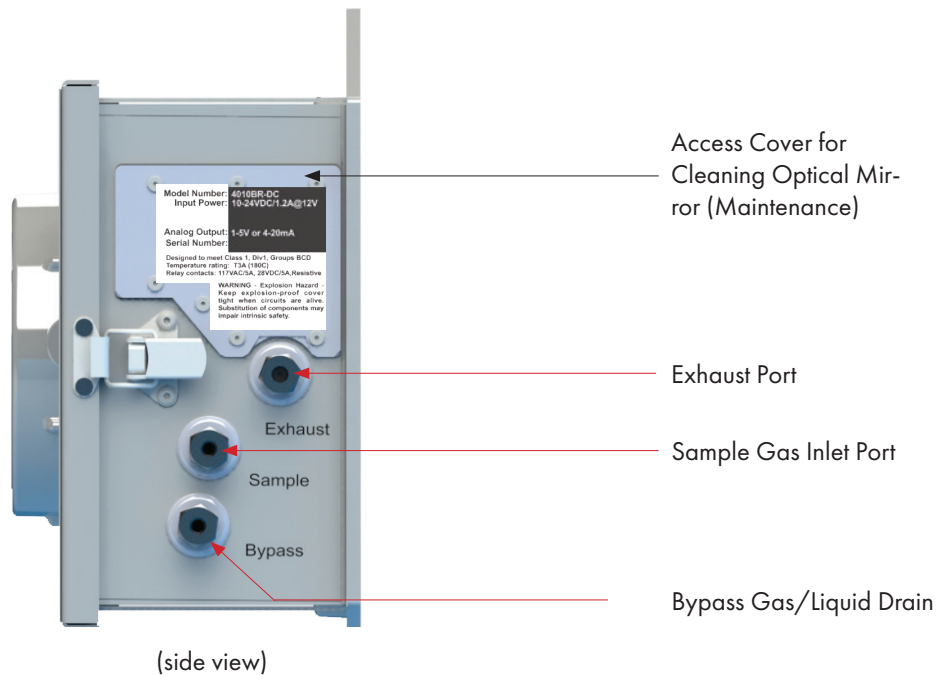
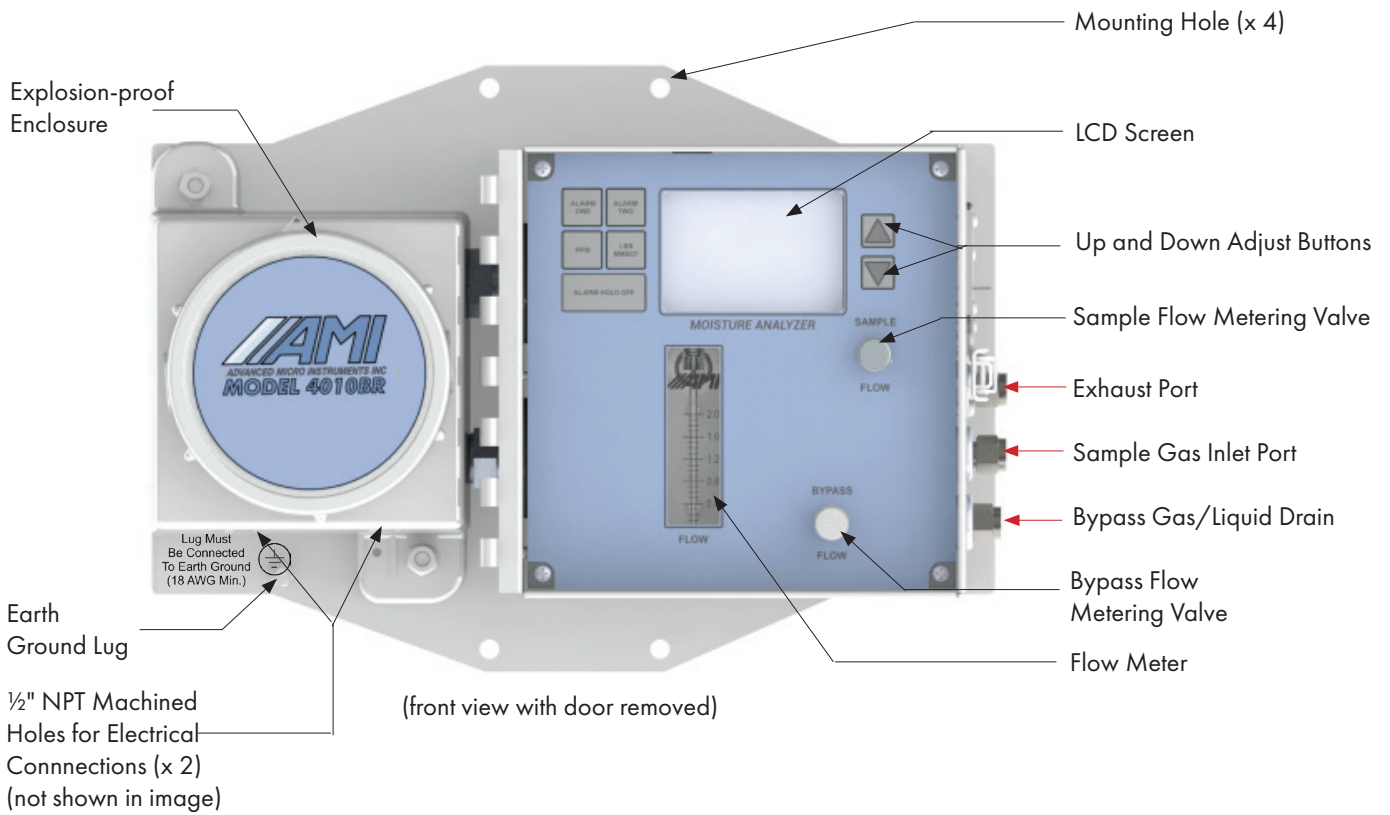
Special Message from Advanced Micro Instruments (AMI):

Thank you for purchasing this **BARRACUDA MODEL 4010BR** for your trace moisture measurement needs. It has a state-of-the-art design and is the industry's most advanced TDL Moisture Analyzer. You will find that this Analyzer will set a new bar for high performance, reliability and intuitive design.

TABLE OF CONTENTS

| | |
|---|----|
| THE BARRACUDA MODEL 4010BR Overview _____ | 2 |
| Method of Measurement _____ | 3 |
| Key Innovations _____ | 4 |
| Safety, Warnings & Cautions _____ | 5 |
| Analyzer Installation _____ | 6 |
| Part I: Mounting the Analyzer _____ | 6 |
| Part II: Gas Connections _____ | 6 |
| Initiation of Sample Flow to the Analyzer _____ | 10 |
| Part III: Electrical Connections for the Analyzer _____ | 11 |
| Calibration _____ | 16 |
| Analyzer Operation _____ | 16 |
| COMMAND CENTER™ Set-up _____ | 18 |
| Remove the Explosion-proof Cover _____ | 18 |
| Establish a Communication Link between your Laptop & the Analyzer _____ | 18 |
| Analyzer Setup Area & Syncing with EFM _____ | 20 |
| Alarm Logic & Setup _____ | 23 |
| Setup of the Controls for Both Alarms _____ | 25 |
| Datalog Interval & Setup _____ | 26 |
| Download Data _____ | 27 |
| Troubleshooting _____ | 30 |
| Error Status Display: Error Reference Guide _____ | 34 |
| Smart Realignment _____ | 35 |
| Specifications _____ | 39 |
| AMI® Warranty & Support _____ | 40 |
| Limited Warranty/Disclaimer _____ | 40 |
| Limitation of Liability _____ | 40 |
| Limitation of Remedies _____ | 40 |
| Approvals _____ | 41 |

ANALYZER OVERVIEW



PRIMARY METHOD OF MEASUREMENT

THE BARRACUDA MODEL 4010BR employs Tunable Diode Laser Absorption Spectroscopy (TDLAS), which is a highly accurate non-contact measurement technique that relies on the *Beer-Lambert Law*.

**TUNABLE DIODE LASER
ABSORPTION SPECTROSCOPY (TDLAS)**

The Beer-Lambert Law

$$A = \log_{10} \frac{I_o}{I} = \epsilon l c$$

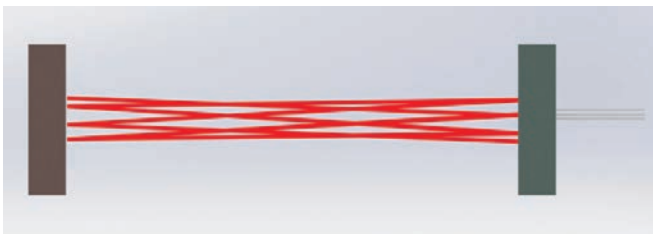
A = Absorbance
I_o = Incident Laser Intensity
I = Laser Intensity transmitted through the Sample

Absorption Coefficient
Moisture Partial Pressure
Absorption Path Length (that the laser passes through)

The *Beer-Lambert Law* states that the amount of light absorbed by the natural gas sample is proportional to the amount of water vapor in the path of the laser. Hence, by measuring the amount of absorbed light and the total pressure, the concentration of moisture in a particular sample can be accurately determined.

THE BARRACUDA MODEL 4010BR is designed to provide continuous measurement of the moisture content of natural gas from a pressurized pipeline, expressed as pounds per million standard cubic feet (lbs/mmscf) or parts per million (ppm).

The moisture readings can be displayed in either unit of measurement. The user can make that selection on the front panel of **THE BARRACUDA** or through the **COMMAND CENTER™**.



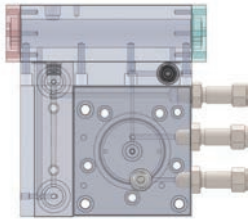
The innovative **Herriott Cell** design inside **THE BARRACUDA** is compact but yet still provides for a long absorption path length (as shown in the above graphic). This longer absorption path bolsters the Analyzer's ability to measure even the smallest trace amounts of H₂O in a natural gas sample.

And according to the *Beer-Lambert Law*, this effectively increases the sensitivity of **THE BARRACUDA MODEL 4010BR**'s measurement capability.

KEY INNOVATIONS

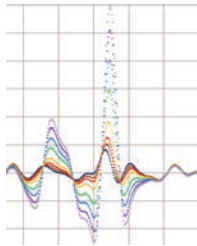
THE BARRACUDA MODEL 4010BR has been designed to provide the Natural Gas Industry with the most advanced TDL Moisture Analyzer that can deliver fast, accurate, continuous trace moisture measurements. It utilizes Tunable Diode Laser Absorption Spectroscopy (TDLAS) to measure the concentration of H₂O vapor in a gas sample. The unit contains some of AMI's most innovative technologies.

ELIMINATOR CELL BLOCK™



This represents the next generation of innovative, proprietary Cell Block Technology, developed by AMI. Our patent-pending, compact, complete sample system approach virtually eliminates all potential leak paths while optimizing flow efficiency. The volume and distance that the sample gas travels prior to entering the laser chamber are drastically reduced. This is achieved by integrating all sample handling components as well as the Herriott Cell into a series of solid compact blocks with machined, intersecting passages instead of long lengths of tubing and 'off-the-shelf' components, including the flow meter, metering valves and liquid-separation accessories. The Liquid **ELIMINATOR CELL BLOCK™** features internal liquid separator technology. Using a unique liquid rejection membrane sealed between blocks, liquids are effectively removed and expelled without ever reaching the critical laser optics.

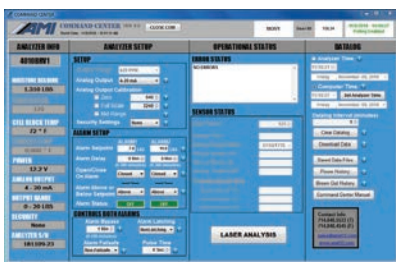
MEASUREMENT ALGORITHM AND SMART REALIGNMENT™



THE BARRACUDA MODEL 4010BR is programmed with a proprietary measurement algorithm to carry out trace moisture measurements. Not only will **THE BARRACUDA** complete multiple scans every second for the signature H₂O peak and CH₄ (methane) peak, its algorithm contains a compensation function to account for pressure and temperature. This ensures maximum stability and accuracy regardless of the methane levels at the location where the measurement is taking place.

SMART REALIGNMENT™ is also available on **THE BARRACUDA** through the **COMMAND CENTER™**. Over time, laser-based Moisture Analyzers eventually see a gradual movement of their signature peaks on the x-axis of the measurement waveform. **THE BARRACUDA MODEL 4010BR** can easily realign the laser to the critical H₂O peak and CH₄ peak through several keystrokes.

COMMAND CENTER™



This powerful interface platform comes standard with every purchase and provides users with advanced functions and capabilities, including:

- Fully Adjustable & Programmable Alarm Contacts
- Datalogger for Moisture Readings, Brownouts and Power Failures
- Error Status Display which shows any error(s) detected by the Analyzer
- Isolated analog outputs: 1–5 VDC and 4–20 mA
- USB Virtual COMport and Modbus bi-directional RS485 Communication

SAFETY, WARNINGS & CAUTIONS

DANGER

Make sure no hazardous gas is present in the area before and during installation.

Violation of the National Electrical Code requirements (especially Article 500 that deals with hazardous areas) may cause a fire or explosion with the potential for serious injury or loss of life.

WARNING

The MODEL 4010BR is a Class I laser product, containing a Class IM laser. NEVER OPEN THE ANALYZER and look into the light path of any fiber optics.

Drilling any holes in the enclosure will violate the safety approval and may create risk of harm.

CAUTION

You must follow the National Electrical Code (NEC) in your installation. Consult the NEC Handbook for the correct guidelines and standards.

Rigid conduit with seal-offs must be used for Class I, Div. 1 areas.

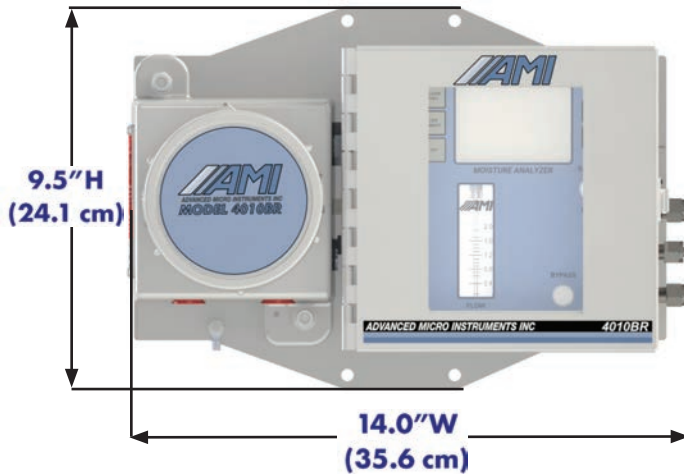
Flexible conduit with seal-offs may be used for Class 1, Div. 2 areas.

The Analyzer is designed to meet certain CSA ordinary and hazardous location requirements. To comply with these requirements you need to assure the following:

- The ground lug on the front lower left of the Analyzer mounting bracket must be connected to the Earth Ground with an 18-gauge wire. Please refer to the photograph on page 2 of the front view of the Analyzer for the location of the Earth Ground Lug
- You must include a disconnect means and a current limiting means, such as a switch and fuse. A circuit breaker can be used to provide both of these functions. This disconnect means must be easily accessible near the 4010BR so that the instrument can be quickly shut off in case of an emergency. The disconnect and current limiting means must be housed in an enclosure rated for the area classification. Conduit seals may be required on the enclosure, depending on the area classification. **For the DC-powered version**, the disconnect and current limiting means must be rated for 1.5 Amp at >30VDC. **For the AC-powered version**, the disconnect and current limiting means must be rated for 1 Amp at >130VAC
- The voltage rating of the DC Analyzer is 10–28V. Voltages outside these ranges may cause the Analyzer to malfunction
- The voltage rating of the AC Analyzer is 117VAC/60Hz, including a tolerance of +/- 10% (105 to 129VAC). Any AC voltages outside this may cause the Analyzer to malfunction

ANALYZER INSTALLATION

Part I: Mounting the Analyzer



*** weighs only 17 lbs (7.7 kg)**

Key Points

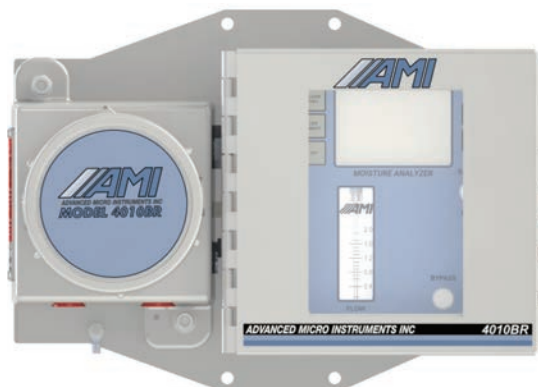
- **THE BARRACUDA** is designed for operation between 20°F and 120°F **AMBIENT TEMPERATURE** (-6.7°C to 49°C)
- We recommend that **THE BARRACUDA MODEL 4010BR** be mounted inside a meter building
- Leave enough room on the right side of the analyzer for the gas connections
- Leave enough room under the Analyzer for installing the electrical connections, seal-offs and conduit runs
- NEVER MOUNT THE ANALYZER DIRECTLY ABOVE A HEAT SOURCE, SUCH AS A CATALYTIC HEATER. Doing so can cause extreme temperature swings and the measurement readings of the Analyzer to drift

STEPS

1. Determine a convenient location to place the Analyzer. The location should ideally be eye-level.
2. Mount the Analyzer to a wall or bulkhead using the 4 mounting holes using (4) ¼" screws or to a 2-inch pipe using ¼" x 2" U-brackets with ¼" nuts.

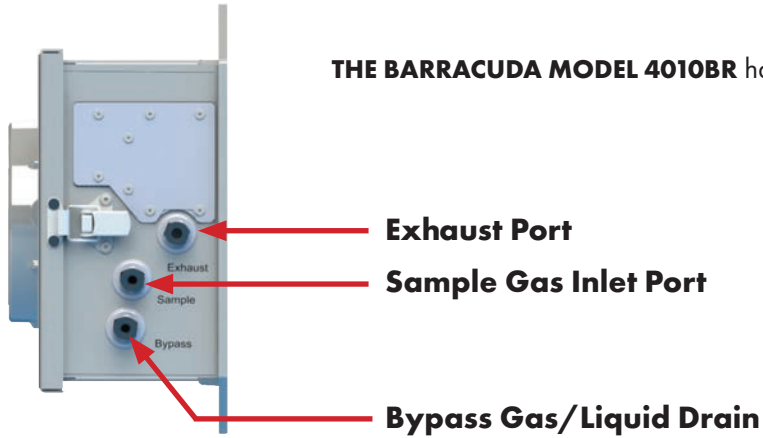
IMPORTANT: To meet the CSA ORDLOC Safety Requirement, the location of where the Analyzer is mounted must be able to withstand a weight equal to 4 times the weight of Analyzer. The Analyzer weighs 17 lbs. So your location must be able to withstand 64 lbs vertically through the center of gravity.

Part II: Gas Connections



THE BARRACUDA MODEL 4010BR is shipped from the factory with 3 stainless steel caps on all 3 gas connection ports.

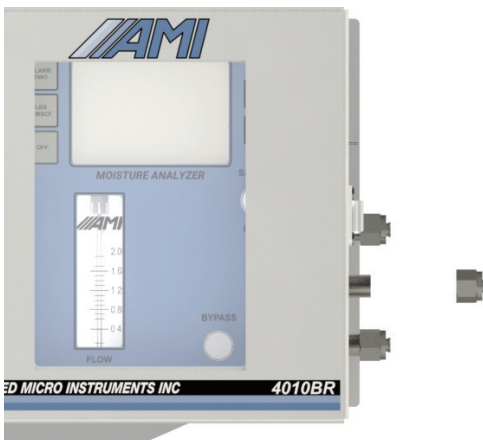
Stainless Steel Caps



Key Points:

- Sample Gas Inlet Pressure to the Analyzer should be regulated down to the range of 1.0 to 20.0 psig (0.07–1.4 bar), depending on line pressure
- **THE BARRACUDA MODEL 4010BR** comes fully equipped with a complete Sample System, including a Liquid Separator that effectively removes liquids and particulates
- However, it is highly recommended that you install a regulated Insertion Gas Probe with Filter Feature into the pipeline at the Sample Point. An Insertion Probe dramatically reduces pipeline liquids, condensation and particulates from reaching both the Sample Gas Line and Moisture Analyzer
- We recommend the Genie® 755 Direct Drive Probe™ (offered by A+ Corporation) or equivalent product
- All gas connections will require using the supplied double ferrule ¼" stainless steel compression fittings and tubing

STEPS



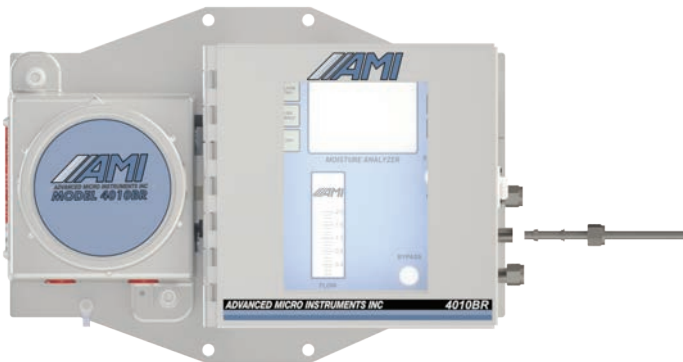
1. Unscrew and remove the Sample Gas Cap from the Sample Port.

2. Take one set of the ¼" stainless steel nut and ferrules supplied in the sealed bag.

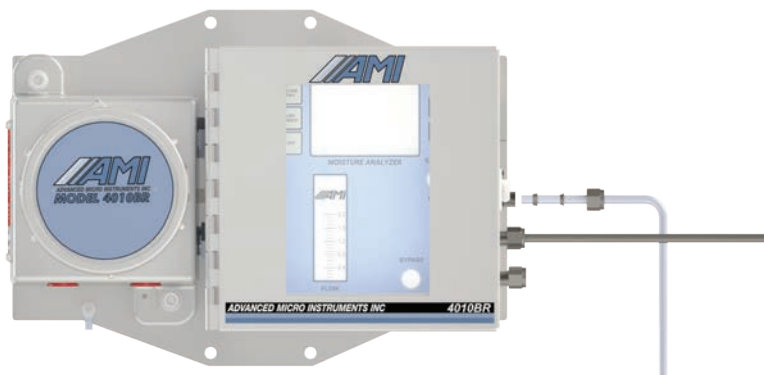


Shown: Proper alignment and orientation of the compression nut and ferrules to each other for installation

3. Make sure the nut and ferrules are properly aligned and oriented for installation.



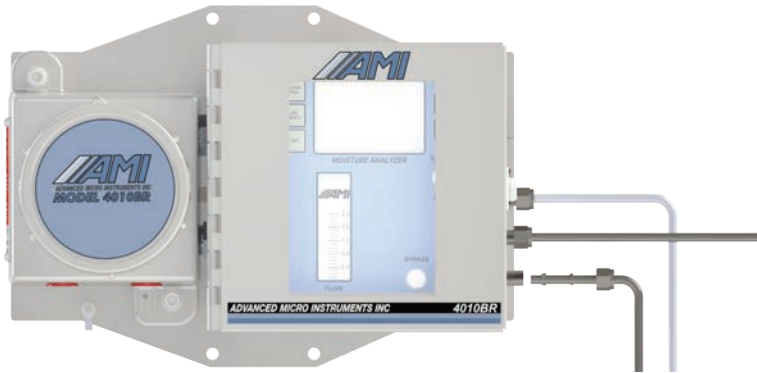
4. Along with a length of ¼" stainless steel tubing, connect to the Sample Gas Inlet Port of the Analyzer and back to the Insertion Probe. Make sure the ¼" stainless steel tubing slips all the way into the Compression Fitting until it bottoms out.
5. Now tighten the compression nut with 1 & ¼ turns.
6. Continue by removing the Exhaust Cap on the Exhaust Port.



7. Take another set of ¼" nut and ferrules and properly orientate them for installation.
8. Along with a length of ¼" stainless steel tubing, connect to the Exhaust Port. This becomes your Vent Line. Make sure the ¼" stainless steel tubing slips all the way into the compression fitting until it bottoms out.
9. Now tighten the compression nut with 1 & ¼ turns.

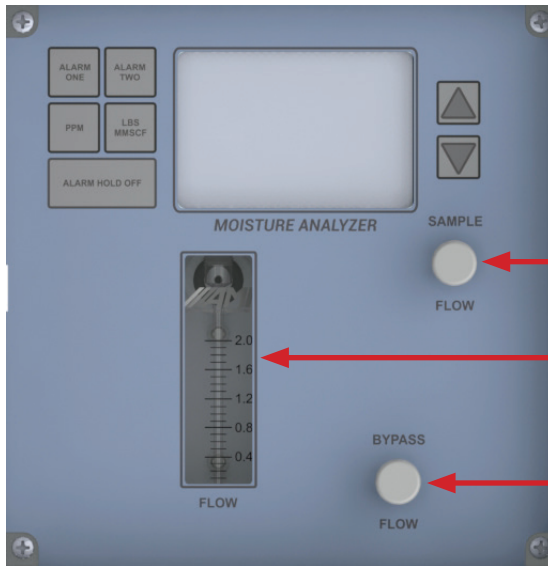
NOTE: The Vent Line needs to run slightly downhill all the way to a safe area outside of a Meter Building as its termination point to drain any condensed liquid that may accumulate. If you must run the Vent Line in a vertical direction, install a 'knock-out pot' to capture liquid condensate in the area prior to the line going vertical.

10. Remove the remaining stainless steel cap from the Bypass /Drain Port.
11. Gather the last set of 1/4" stainless steel nut and ferrules from the sealed bag. Properly align and orientate them for installation.



12. With a length of 1/4" stainless steel tubing, connect to the Bypass/Drain Port. This becomes your Bypass Line. Make sure the 1/4" stainless steel tubing slips all the way into the compression fitting until it bottoms out.
 13. Now tighten the compression nut with 1 & 1/4 turns.
- NOTE: Run the Bypass Line to the outside of the Meter Building in a downhill direction all the way to a safe location. This will prevent water traps from forming and later freezing in cold weather, creating a back pressure. A 24" H₂O column will create 1 lb of back pressure and cause readings to fluctuate. A 48" H₂O column will create 2 lbs of back pressure and cause readings to fluctuate even more.

INITIATION OF SAMPLE FLOW TO THE ANALYZER



WARNING:
DO NOT OVERTIGHTEN
THE METERING VALVES or
you will damage them. They
are not ON/OFF VALVES!

Sample Flow Metering Valve

Flow Meter
(always shows the flow rate in real-time)

Bypass Flow Metering Valve

Sample Gas Flow Rate

This can be adjusted using the SAMPLE FLOW METERING VALVE Knob. To increase the Flow Rate, turn the SAMPLE FLOW METERING VALVE Knob counterclockwise. To decrease, turn the SAMPLE FLOW METERING VALVE Knob clockwise.

Bypass Gas Flow Rate

This can be adjusted using the BYPASS FLOW METERING VALVE Knob. To increase the Flow Rate, turn the BYPASS FLOW METERING VALVE Knob counterclockwise. To decrease, turn the BYPASS FLOW METERING VALVE Knob clockwise.

STEPS

Note: SCFH = standard cubic feet per hour

1. Turn the SAMPLE FLOW METERING VALVE to the full clockwise position to the Off Position. Do not overtighten it! Turn until finger tight only.
2. Turn the BYPASS FLOW METERING VALVE to the full clockwise position to the Off Position. Do not overtighten it! Turn until finger tight only.
3. Apply a gas pressure of approximately 20 psig (1.4 bar) and check all fittings back to the Sample Tap while looking for tiny bubbles (We recommend using SNOOP®). *DO NOT USE the spray bottle as this technique produces bubbles and does not achieve the best results.*
4. Once the installation has passed the Leak Test, slowly turn the SAMPLE FLOW METERING VALVE Knob counterclockwise until the Flow Meter reads approximately 2.0 SCFH (1.0 Lpm).
5. Now open the BYPASS METERING VALVE by turning the Knob counterclockwise until the FLOW METER drops to 1.5 SCFH (0.75 Lpm).

Note: By doing so, you automatically set the bypass flow to 0.5 SCFH (0.25 Lpm). We use this technique to set the bypass flow to 0.5 SCFH (0.25 Lpm) because all bypass flow meters are prone to getting wet and filled with particulates and can quickly become plugged.

Part III: Electrical Connections for the Analyzer

Key Points:

- In order to meet electrical codes for Class 1, Div 1, Groups C,D or Class 1, Div 2, Groups C,D, you must use electrical seal-offs in your installation
- The explosion-proof side of the Analyzer contains two red plastic caps that protect the threads during shipping. Both these plastic caps must be removed from the ½" NPT conduit holes
- We recommend that you install conduit unions between the explosion-proof housing of the Analyzer and the seal-offs. This will prove very useful in the event that you have to remove the Analyzer without cutting wires
- We provide 2 (two) separate ½" NPT conduit holes to accommodate all electrical connections. The first conduit opening should be used for power and alarm relay connections. The second is for analog output and RS485 connections

Note: AC Power and the opening and closing of alarm relays produce both electrical noise and large inductive spikes that can have an undesirable effect on the measurement readings. This is why we provide two conduit openings and strongly recommend separating the sensitive analog signal wiring from the power and relay wiring.

- Analyzer must be connected to a solid Earth Ground for the highest level of RFI protection and safety. This is accomplished by connecting an 18 gauge wire from the grounding point to a 8 ft (2.4 meters) ground rod or equivalent quality ground. (The Grounding Lug is located just below the explosion-proof housing; refer to page 2 to view its location on the Analyzer)
- All green terminal connectors are combination connectors, which allows you to unplug the connector while wiring
- If you decide to use a 2-conductor wire with shield for the power supply connection, AMI provides a quality earth ground terminal connection next to the + positive and - negative terminals
- Combination connectors can accommodate 22 to 16 gauge wire for your electrical connections
- Verify the operating voltage of your Analyzer and the correct power requirements before you begin
- **THE BARRACUDA MODEL 4010BR** is available with either AC or DC Power (you must request your desired power at the time of your purchase).

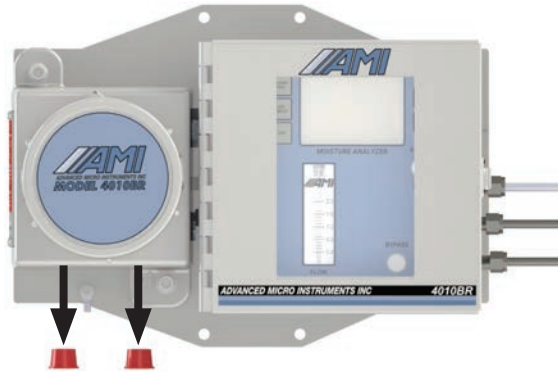
Note: A white metal cover indicates DC, while a black metal cover indicates AC.

Both versions will draw 350mA during operation. However, the Analyzer will require a power supply that can handle up to 1.5A for a few seconds during start-up as the TEC ramps up

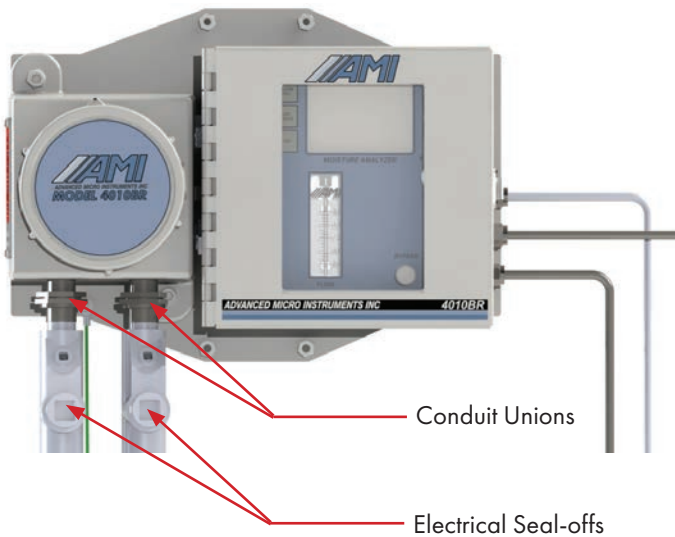
Note: The relays of the Analyzer are rated for 5A @117VAC or 24VDC.

- Your Analyzer is provided with both 1–5 VDC and 4–20mA isolated analog signals. It has been setup at the factory per your analog output requirements at the time of purchase. However, this can be changed in the field by following simple instructions

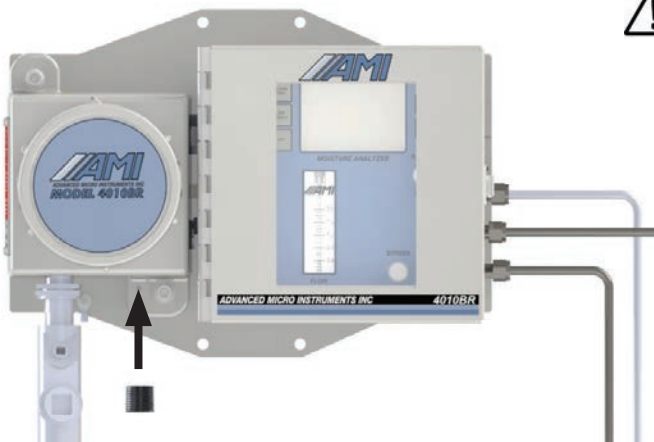
STEPS



1. Remove the two red plastic protective caps from the 1/2" NPT conduit holes.

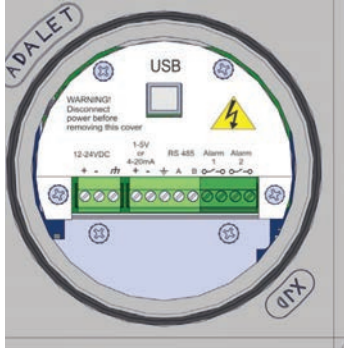


2. Install the conduit unions between the explosion-proof housing of the Analyzer and the electrical seal-offs. DO NOT fill the electrical seal-offs yet.

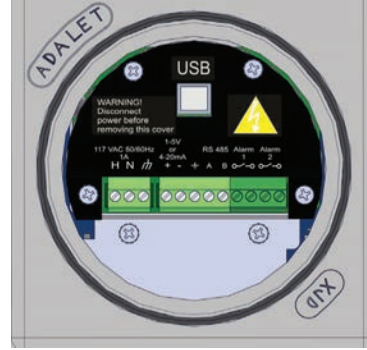


DANGER:

*If you are using DC Power and intend on using the analog output only feature (which is the same as using 'NO RELAYS', you can safely run both DC Power and Analog Output Signal in a single conduit. However, you must install a steel plug in the unused 1/2" NPT. **FAILURE TO DO SO WILL VIOLATE ALL SAFETY REQUIREMENTS AND POTENTIALLY RESULT IN AN EXPLOSION!***



(DC Version has a white sheet metal cover)

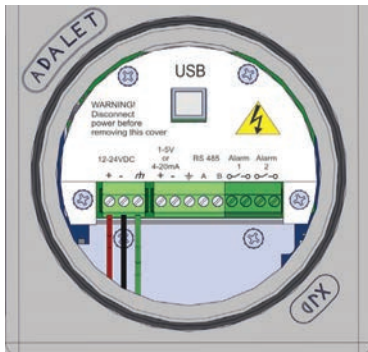


(AC Version has a black sheet metal cover)

3. Remove the explosion-proof cover to access the electrical connections of the Analyzer.
4. Verify the operating voltage of your Analyzer and the correct power requirements before you continue.
5. Turn off the source of power to the Analyzer.

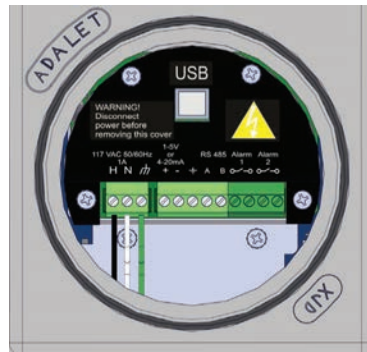
1st CONDUIT:

For DC Power:



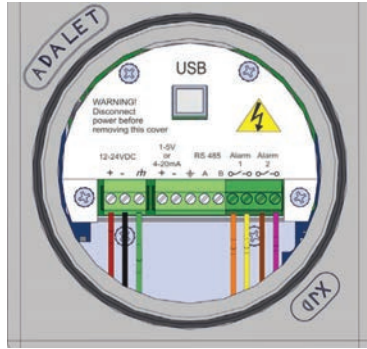
6. Connect the wires for power to the appropriate terminals on the left.
 - Connect the 12-24DC Power Supply Wires to the appropriate combination connector
 - The + positive and - negative are clearly marked on the sheet metal cover
 - Connect the wire to the right of the Negative Terminal to the same Earth Ground that is connected to the Analyzer's Earth Ground Lug

For AC Power:



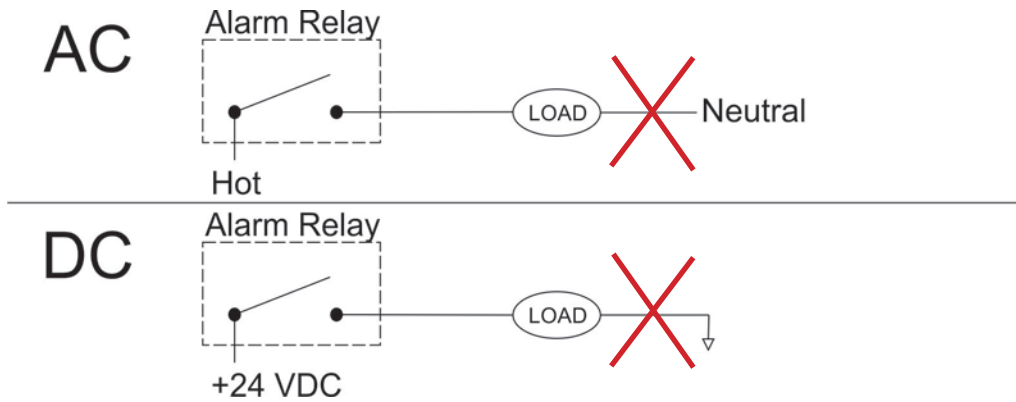
6. Connect the wires for power to the appropriate terminals on the left. The wire designations are clearly marked on the black metal cover.
 - Connect the 117VAC Power Supply Wires to the appropriate combination connector
 - H is for the Hot Wire
 - N is for the Neutral Wire
 - Connect the wire to the right of the Neutral Terminal to the same Earth Ground that is connected to the Analyzer's Earth Ground Lug

IMPORTANT: IF YOU DESIRE TO USE ALARM CONTACT FEATURES, MAKE SURE THAT YOU PULL WIRES FOR THE 1ST CONDUIT.



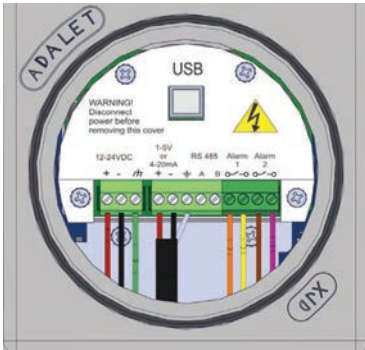
(DC Power Version is shown. Instructions are the same for the AC Power Version)

- Connect the wires for the two fully adjustable moisture concentration alarm contact relays to their proper terminals (these relays are rated for 5 Amps @24VDC or 117VAC).



IMPORTANT: The relay contacts act like a simple switch breaking only a single leg of the load. In keeping with good electrical practices while wiring the alarm contacts, **ALWAYS SWITCH/BREAK THE HOT LEG, NOT THE GROUND LEG OF YOUR CIRCUIT.**

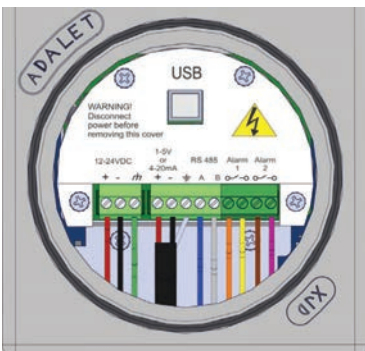
2nd CONDUIT:



(DC Power Version is shown. Instructions are the same for the AC Power Version)

7. If you desire to use Analog Output, connect wires to their proper terminals. Then connect the Analog Output to your desired device using a 2-conductor, twisted, shielded wires.

NOTE: Always use a 2-conductor wire with shield for the analog output connection. AMI provides a quality earth ground terminal connection next to the + positive and - negative terminals.



(DC Power Version is shown. Instructions are the same for the AC Power Version)

8. Last, connect the wires for RS485 communication to their proper terminals.
9. Turn on the source of power and the Analyzer will power-up. The LCD will blink for a few seconds during power-up. You may see some LEDs blinking within the explosion-proof housing and NEMA 4X box as this is normal during operation.

END OF INSTALLATION

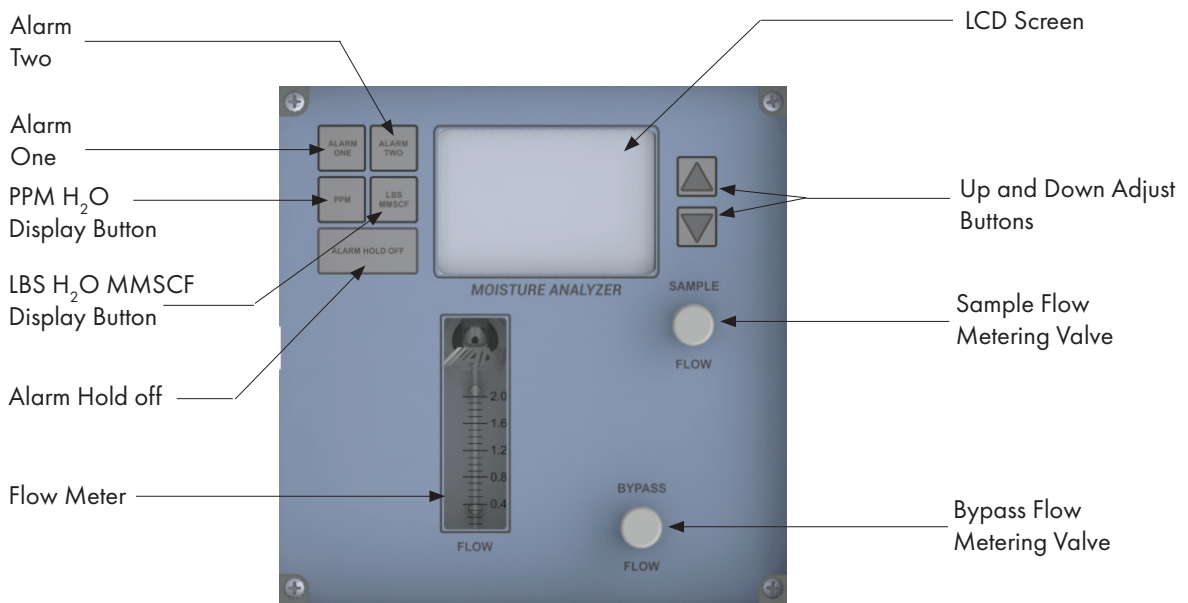
CALIBRATION

THE BARRACUDA MODEL 4010BR is a very stable instrument and does not require calibration.

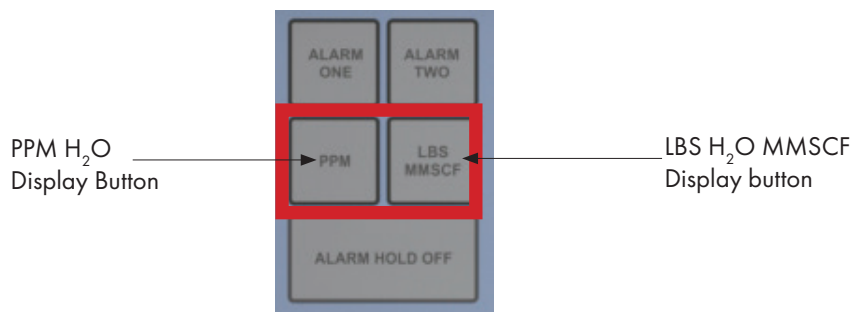
Note: Every Barracuda unit undergoes rigorous internal quality tests before shipping to customers. This includes testing each unit through the entire published temperature / pressure specifications and a complete linearity test over its entire measurement range.

ANALYZER OPERATION

Front Panel Interface

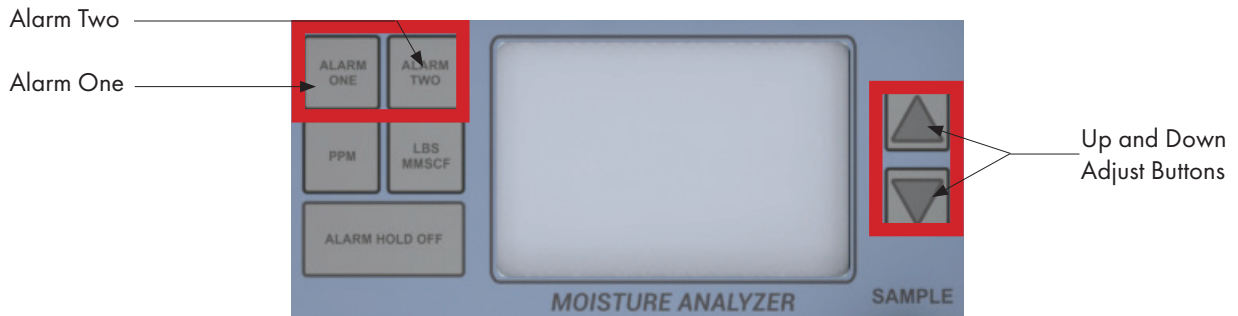


How to change the measurement units of the moisture readings displayed on the LCD screen?



Moisture readings on **THE BARRACUDA MODEL 4010BR** are shown in units of pounds per million standard cubic feet (lbs/mmscf) by default. To display in parts per million (ppm), press the PPM H₂O DISPLAY BUTTON. To display the moisture readings in lbs/mmscf, simply press the LBS H₂O MMSCF DISPLAY BUTTON.

How to set the Alarms on THE BARRACUDA MODEL 4010BR?



THE BARRACUDA MODEL 4010BR comes standard with two fully, adjustable independent alarms (ALARM ONE and ALARM TWO) that can be adjusted over **THE BARRACUDA**'s entire moisture measurement range.

To set ALARM ONE, press the ALARM ONE Button and quickly release. The LCD alarm flag will blink, and within 3 seconds, press either the UP and DOWN buttons to set your alarm setpoint. Once pressed, just hold the button until you reach your desired alarm setpoint. The longer you hold, the faster the alarm setpoint adjusts. If no buttons are pressed within 3 seconds, the Analyzer will revert to measurement mode.

If you make a mistake at any time, simply let go of the button for 3-4 seconds, and the LCD will return to measurement mode. Then try again.

To set ALARM TWO, repeat the same steps as used in ALARM ONE.

*Note: If you want to adjust any other alarm settings, you must do so through the **COMMAND CENTER™**.*

How to set the Alarm Hold Off ?



Press the ALARM HOLD OFF button, and the Alarm Hold Number will appear. And within 3-4 seconds, push either the UP or DOWN Button to adjust the duration of your ALARM HOLD OFF. The ALARM HOLD OFF can be engaged from 0 to 120 minutes.

After the time for setting the ALARM HOLD OFF expires, both Alarms and the Analog Output will revert to measurement mode.

ADDITIONAL NOTES:

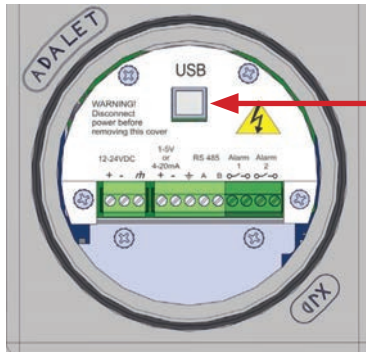
If you need more time for the setup, simply push the ALARM HOLD OFF Button again, and it will automatically reset to the original Hold Off Time.

If you want to use a verification gas before the 'Hold Off' Set Time elapses and want the Alarms and Analog Output to become functional immediately, you can simply run the Hold Off Time to zero by pushing the Hold Off Button until the LCD blinks and then pushing the DOWN ARROW until the LCD shows zero.

To access the more sophisticated features available on **THE BARRACUDA MODEL 4010BR** requires installing the current version of the **COMMAND CENTER™**.

COMMAND CENTER™ SET-UP

Step 1: Remove the explosion-proof cover to access the USB Port (Type B) of the Analyzer



USB Port (Type B)

(DC Power Version is shown. Instructions are the same for the AC Power Version)

Step 2: Establish a Communication Link between your Laptop and the Analyzer

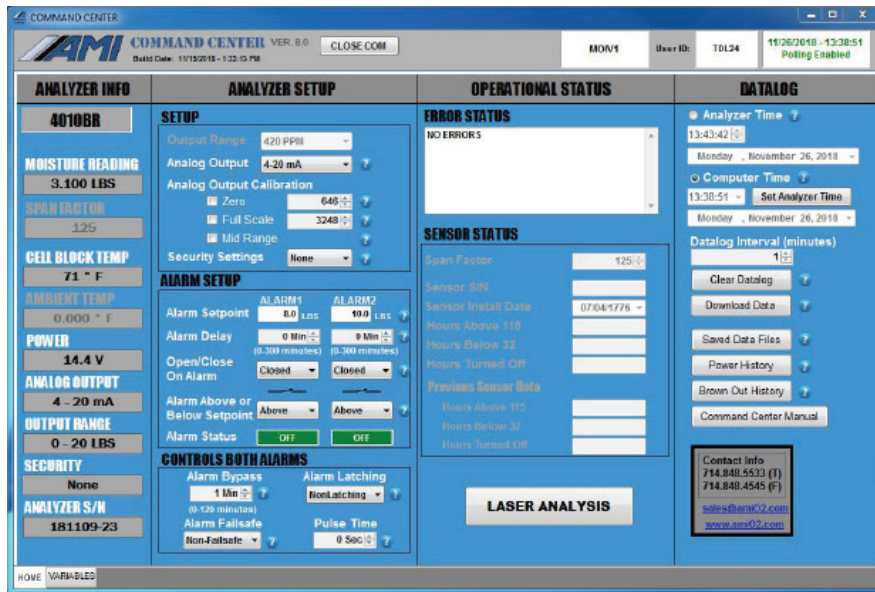


USB Type A Connector



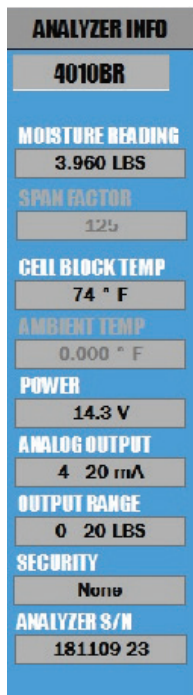
USB Type B Connector

a) Power up your Laptop and open the current version of the **COMMAND CENTER™**.



Left: **COMMAND CENTER™** window shown

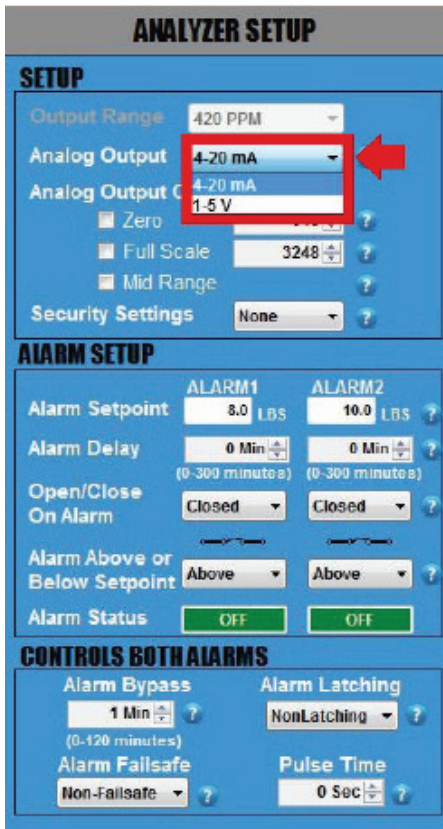
- b) Using a USB cable with a Type A Connector on one end and a Type B Connector on the other, insert the Type A Connector into the USB port of your laptop and the Type B Connector into the USB port of the Analyzer on the Explosion-proof side.
- c) Once the link is established, the software will automatically recognize the Analyzer and populate the Analyzer Info Column with information specific to your Analyzer.



View of the Left Status Column of the User Interface

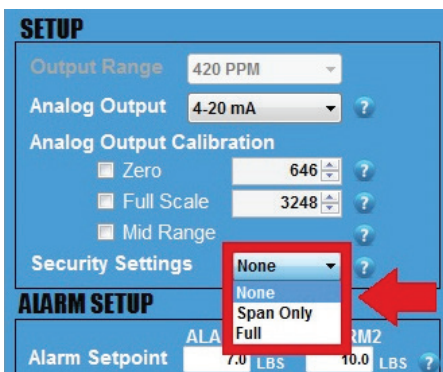
- d) The Analyzer Info Column will display the following information about your Analyzer:
 - Analyzer Model Number
 - Moisture Reading in either lbs or ppm, depending on your selection
 - Cell Block Temperature
 - Input Power, either AC or DC
 - Analog Output Setting (4–20mA or 1–5 VDC)
 - Output Range Selection
 - Security Selection
 - Analyzer Serial Number

Step 3: Selection of Options in Analyzer Setup Area & Syncing with EFM



- a) View ANALOG OUTPUT Setting.
This is set and calibrated at the factory per your order requirements prior to shipping. If you wish to change the analog output from 4–20mA or 1–5 VDC or vice versa, refer to the instructions shown on page 22.

Note: The max full scale value should never exceed 3400.



- b) Set your desired SECURITY SETTINGS.
You have 3 options available to select from:
- NONE allows anyone to make changes to the Analyzer's settings using the front panel
 - SPAN ONLY (this setting is NOT AVAILABLE on **THE BARRACUDA MODEL 4010BR**)
 - FULL **prevents** anyone from changing the Analyzer's settings using the front panel. However, you can still use the front panel to check the Analyzer's status values by pushing any of the buttons (i.e., pressing the ALARM ONE Button displays the setpoint for ALARM ONE, pressing the ALARM TWO Button displays the setpoint for ALARM TWO, and so on)

ANALYZER SETUP

SETUP

Output Range: 420 PPM

Analog Output: 4-20 mA

Analog Output Calibration

Zero: 646

Full Scale: 3248

Mid Range

Security Settings: None

ALARM SETUP

Alarm Setpoint: ALARM1: 7.0 LBS, ALARM2: 10.0 LBS

Alarm Delay: 0 Min (0-300 minutes)

Open/Close On Alarm: Closed

Alarm Above or Below Setpoint: Above

Alarm Status: OFF

CONTROLS BOTH ALARMS

Alarm Bypass: 1 Min (0-120 minutes)

Alarm Latching: NonLatching

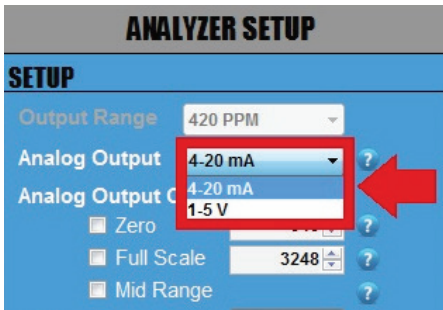
Alarm Failsafe: Non-Failsafe

Pulse Time: 0 Sec

c) Sync your EFM (electronic flow meter) or similar device to your Moisture Analyzer.

The following steps are critical because they will ensure that both devices display the same moisture readings and, thereby, prevent unnecessary confusion in the future.

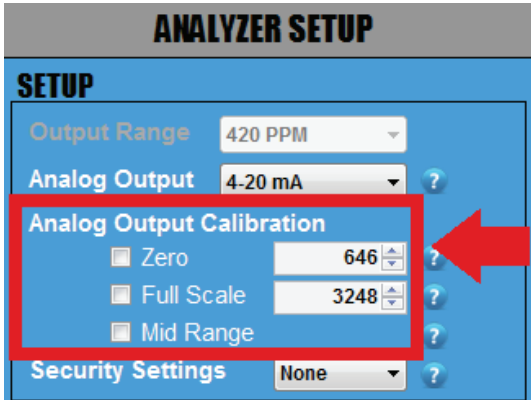
1. By now, you have already wired your EFM or similar device to the Moisture Analyzer using the Analyzer's analog output terminals.
2. Click on the small square box next to ZERO and the reading of the Analyzer should display the low end of your output range (this will either be 0.00ppm or 0.25 lbs, depending on your selected unit of measurement). Confirm that the reading on your EFM or similar device matches the reading on the Analyzer. If it does not, use the UP and DOWN ARROWS to the right of ZERO to adjust the readings of the Analyzer until the reading for the EFM or similar device is now the same.
3. Once this is done, click on the square next to FULL SCALE. The reading of the Analyzer should display the high end of your output range (this will either be 420ppm or 20.0 lbs, depending on your selected unit of measurement). Confirm that the reading on your EFM or similar device matches the reading on the Analyzer. If it does not, use the UP and DOWN ARROWS to right of FULL SCALE to adjust the reading of the Analyzer until the reading of the EFM or similar device is now the same.
4. Repeat Step 2 (ZERO) and Step 3 (FULL SCALE) once more to confirm that both your EFM or similar device and the Moisture Analyzer are displaying the same readings.
5. Last, click on MID RANGE. This will check the linearity. There are no values to adjust as this is just a midpoint validation.



OPTIONAL

- d) Changing your ANALOG OUTPUT from 4–20mA to 1–5 VDC or vice versa. (Skip this step if you DO NOT want to change your ANALOG OUTPUT.)

Click on the drop down menu of ANALOG OUTPUT and select the output option that you wish to change to.



IMPORTANT

Whenever you change the ANALOG OUTPUT from 4–20mA to 1–5 VDC or vice versa, you will need to complete the following steps to verify your ANALOG OUTPUT.

1. Attach a multimeter to the Green Analog Out Terminal Connector of your Analyzer. Make sure your multimeter is set appropriately, either current for 4–20mA or voltage for 1–5 VDC .
2. Click on the square box next to ZERO to confirm that your multimeter is displaying either 4mA or 1VDC (the number of digits displayed on the screen will depend on the multimeter that you use). If the reading of the multimeter does not match the reading of the Analyzer, use the UP and DOWN ARROWS to the right of ZERO to adjust the values until the reading of the multimeter is either 4mA or 1VDC.
3. Once this is completed, click on the square box next to FULL SCALE to confirm that your multimeter is displaying either 20mA or 5VDC. If the reading of the multimeter does not match the reading of the Analyzer, use the UP and DOWN ARROWS to the right of FULL SCALE to adjust the values until the reading of the multimeter is now either 20mA or 5VDC .
- 4.. Repeat Step 2 (ZERO) and Step 3 (FULL SCALE) again until you can confirm that your multimeter is displaying 4mA or 1VDC for ZERO and 20mA or 5VDC for FULL SCALE.
5. Last, click on MID RANGE. This will check the linearity. There are no values to adjust as this is just a midpoint validation.
6. Once you have completed this section, disconnect the multimeter.

Step 4: Alarm Logic & Setup

| ALARM SETUP | |
|-------------------------------|---|
| Alarm Setpoint | ALARM1: 7.0 LBS ALARM2: 10.0 LBS ? |
| Alarm Delay | 0 Min (0-300 minutes) 0 Min (0-300 minutes) ? |
| Open/Close On Alarm | Closed Closed ? |
| Alarm Above or Below Setpoint | Above Above ? |
| Alarm Status | OFF OFF |
| CONTROLS BOTH ALARMS | |
| Alarm Bypass | 1 Min (0-120 minutes) ? |
| Alarm Latching | NonLatching ? |
| Alarm Failsafe | Non-Failsafe ? |
| Pulse Time | 0 Sec ? |

The Analyzer features 2 independent Moisture Concentration Alarms – one for ALARM 1 and one for ALARM 2. The settings for these alarms, including setpoints, relay contacts, close/open logic and alarm delays, are adjusted through the **COMMAND CENTER™**.

It is important that you plan out how you want your ALARM LOGIC to work for each ALARM before you start adjusting the settings discussed in this section.

| ALARM SETUP | |
|-------------------------------|---|
| Alarm Setpoint | ALARM1: 7.0 LBS ALARM2: 10.0 LBS ? |
| Alarm Delay | 0 Min (0-300 minutes) 0 Min (0-300 minutes) ? |
| Open/Close On Alarm | Closed Closed ? |
| Alarm Above or Below Setpoint | Above Above ? |
| Alarm Status | OFF OFF |

a) Set the ALARM SETPOINTS.

Enter your desired value for each setpoint and then press the ENTER key on your laptop. Keep in mind that your values cannot exceed the limit of the Measurement Range that you previously selected.

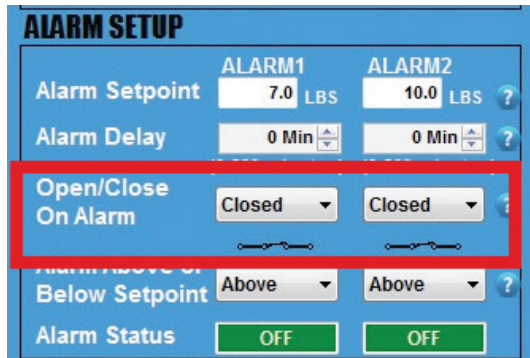
| ALARM SETUP | |
|-------------------------------|---|
| Alarm Setpoint | ALARM1: 7.0 LBS ALARM2: 10.0 LBS ? |
| Alarm Delay | 0 Min (0-300 minutes) 0 Min (0-300 minutes) ? |
| Open/Close On Alarm | Closed Closed ? |
| Alarm Above or Below Setpoint | Above Above ? |
| Alarm Status | OFF OFF |

b) Set the ALARM DELAYS.

There are 2 ALARM DELAYS. Each ALARM DELAY setting is located beneath the corresponding ALARM that it controls.

Enter your desired time duration for each ALARM DELAY and press the ENTER key on your laptop. You can also adjust using the UP and DOWN ARROWS. The range is from 0 to 300 minutes.

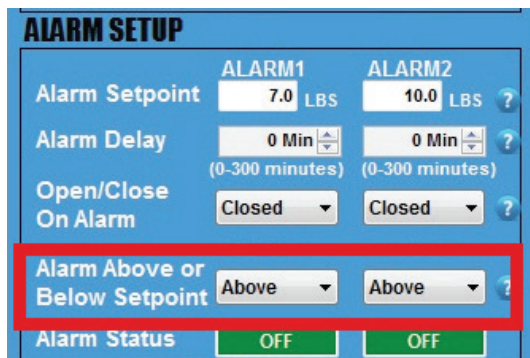
*This feature is especially helpful at custody transfer points when customers are allowed to exceed contractual limits for a predetermined amount of time.



c) Click on the drop-down menu and set the relay contact of each individual ALARM to OPEN or CLOSE when its respective ALARM is triggered.

Each setting corresponds to a schematic symbol below. When the OPEN ON ALARM is selected, the schematic symbol opens. When the CLOSE ON ALARM is selected, the schematic symbol closes.

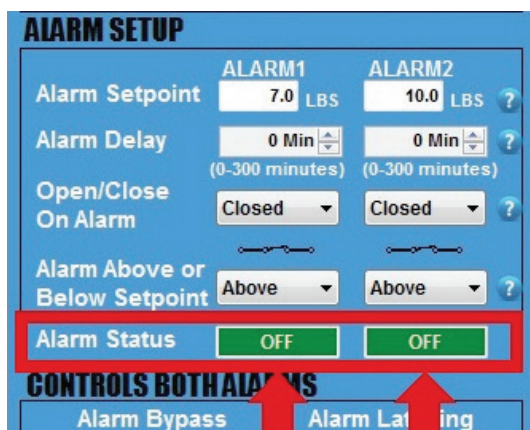
The setting also corresponds to the ALARM column that it lies underneath.



d) Click on the drop-down menu and set the ALARM to trigger ABOVE SETPOINT or BELOW SETPOINT.

For ALARM ABOVE SETPOINT, the ALARM will trigger if your readings rise above your ALARM SETPOINT.

For ALARM BELOW SETPOINT, the ALARM will trigger if your readings fall below your ALARM SETPOINT.



e) View the ALARM STATUS.

Both independent ALARMS have their own ALARM STATUS.

If an ALARM is not triggered, the ALARM STATUS will display 'OFF' in green.

If an ALARM is triggered, its ALARM STATUS will display 'ON' in red.

*For an ALARM to be triggered, it will take into account the complete logic of how the ALARM was set up. This includes SETPOINT, DELAY, OPEN/CLOSE CONTACT ON ALARM, and ALARM ABOVE OR BELOW SETPOINT.

Step 5: Setup of the Controls for Both Alarms

IMPORTANT:

For this section, the adjustments discussed below affect both ALARMS and **CANNOT** be set independently for each ALARM.



- a) Set the ALARM BYPASS. Use the UP and DOWN ARROWS to set the duration of your ALARM BYPASS (HOLDOFF).

* This is a helpful feature if you want to use a verification gas or have an 'upset' event to deal with.

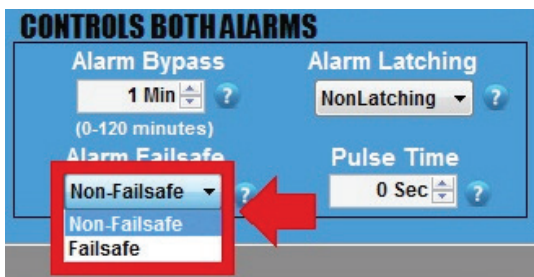
* This feature disables both ALARMS and ANALOG OUTPUTS for those of you using the analog output for control..



- b) Click on the drop-down menu and set the ALARM relay contacts to LATCHING or NONLATCHING.

-If set to NONLATCHING, the relay contacts will energize when the measurement readings exceeds the ALARM SETPOINTS and then de-energize when the measurement readings drop below the ALARM SETPOINTS.

- If this is set to LATCHING, the relay contacts will energize when the measurement readings exceeds the ALARM SETPOINTS but also remain engaged when the reading drops below the ALARM SETPOINTS. A person will have to press the ALARM HOLDOFF Button for 1 second on the front panel of the Analyzer to disengage the relay contacts.



- c) Click on the drop-down menu and set the ALARMS to FAILSAFE or NON FAILSAFE.

- If set to FAILSAFE, the ALARMS will trigger if the power supplied to the Analyzer drops below 8.5V. However, the ALARMS will not clear until the power moves back up and exceeds 12V.

- If set to NONFAILSAFE, the ALARMS will not trigger if the power supplied to the Analyzer drops below 8.5V.



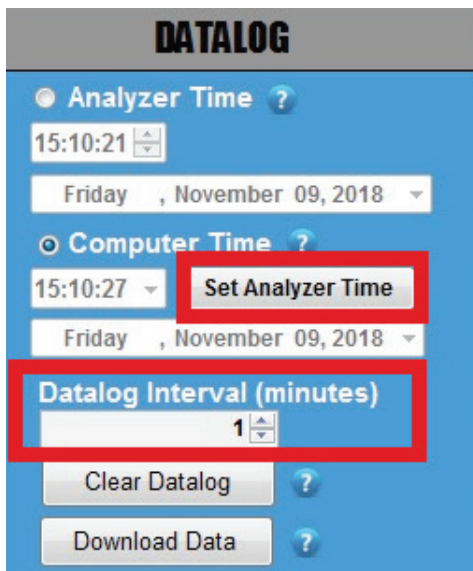
WARNING: DO NOT adjust this setting unless you are using a pulse-latch slam valve!

- d) CHECK WITH THE VALVE MANUFACTURER for the correct pulse time and then set your desired PULSE TIME using the UP and DOWN Arrows.

This sets the duration of time that the Analyzer sends power to the relay contacts to open or close the valve when an ALARM is triggered. The Alarm 1 Contact will open the slam valve, while the Alarm 2 Contact will close the valve.

This features is helpful because it eliminates the need to continually draw power while the valve is closed.

Step 6: Datalog Interval & Setup



- a) SET ANALYZER TIME
Click the Analyzer Time and manually set the time. Or click Computer Time and then the SET ANALYZER TIME Button. The time should automatically adjust and closely match the time shown on your laptop.

- b) DATA COLLECTION INTERVAL (minutes)
Then set your desired collection interval for the DATALOGGER by adjusting the time (in minutes). The DATALOGGER allows you to store a time-stamped recording that contains the moisture reading, average temperature of the Cell Block, average power supply voltage and minimum voltage supplied to the Analyzer.

Note: The default setting has the DATALOGGER collects data for 5 days in 1-minute intervals. If you increase the duration of the interval, the data collection period also increases proportionally. Therefore, if you increase the interval to 2 minutes, the data collection period adjusts to 10 days. Every 3 minutes will increase the collection period to 15 days and so forth.

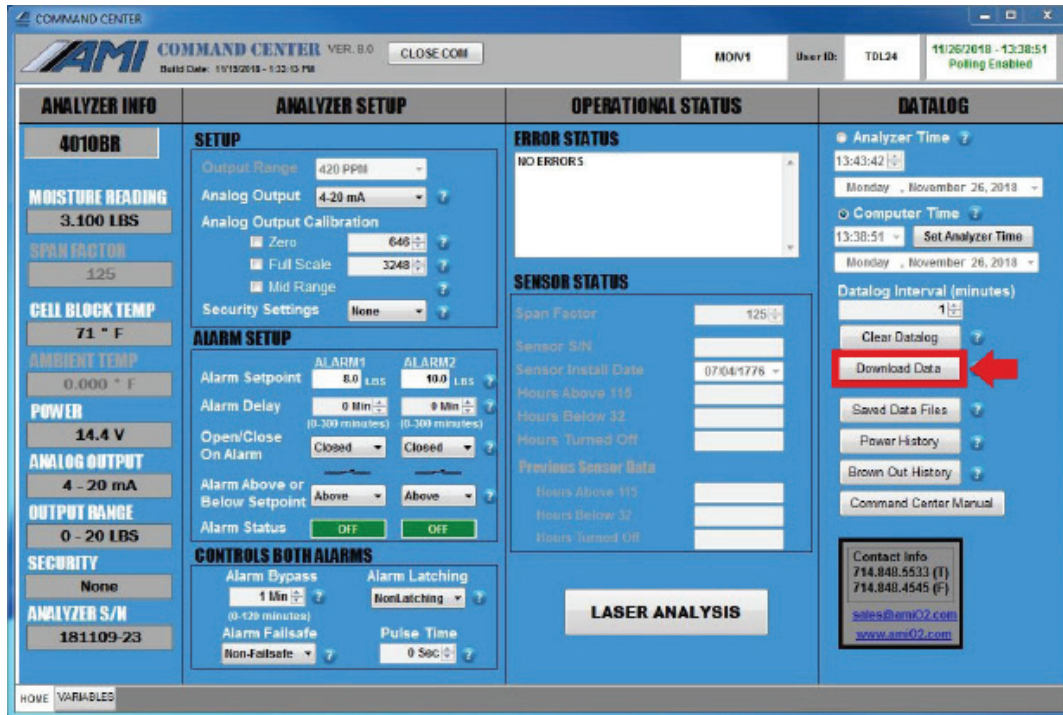


- c) CLEAR DATA LOG
Press the CLEAR DATA LOG Button to clear any recorded data performed at the factory.

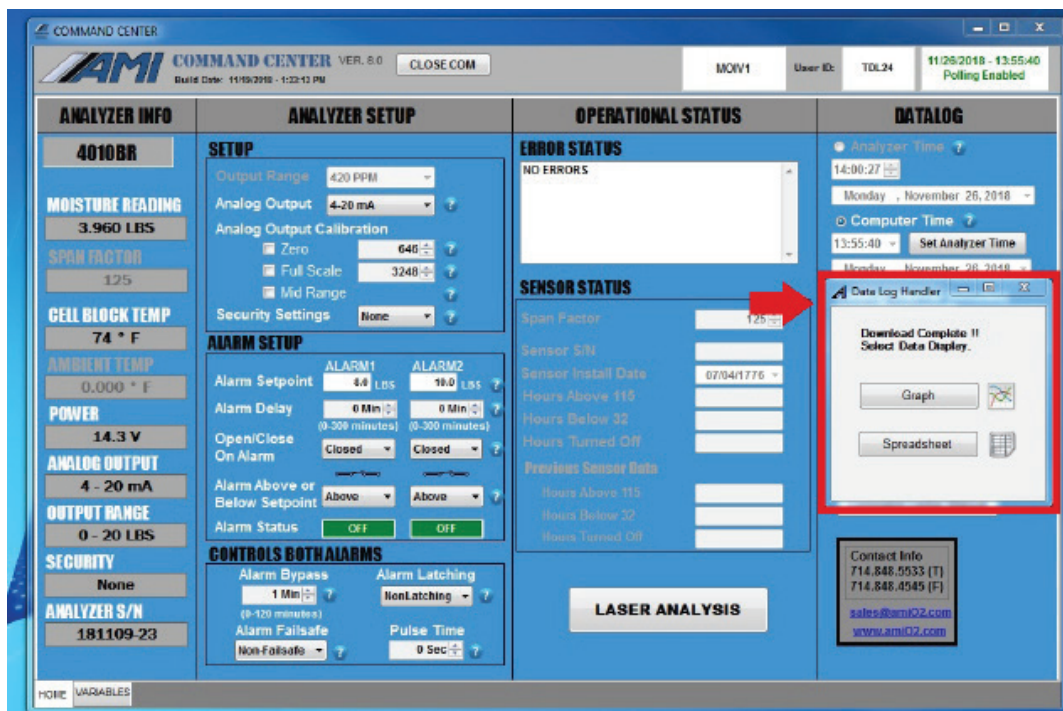


You can also view Saved Data Files, Power History, Brown-out History, and the Manual by pressing their respective buttons in this column.

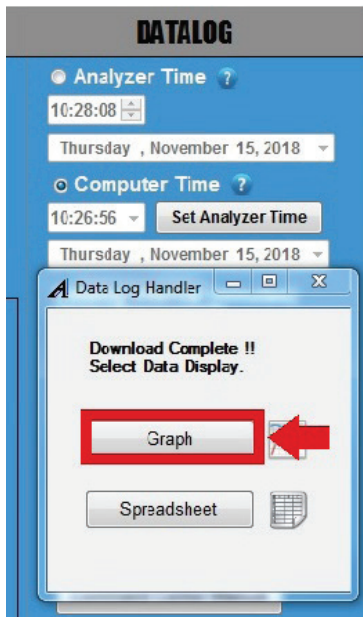
DOWNLOAD DATA



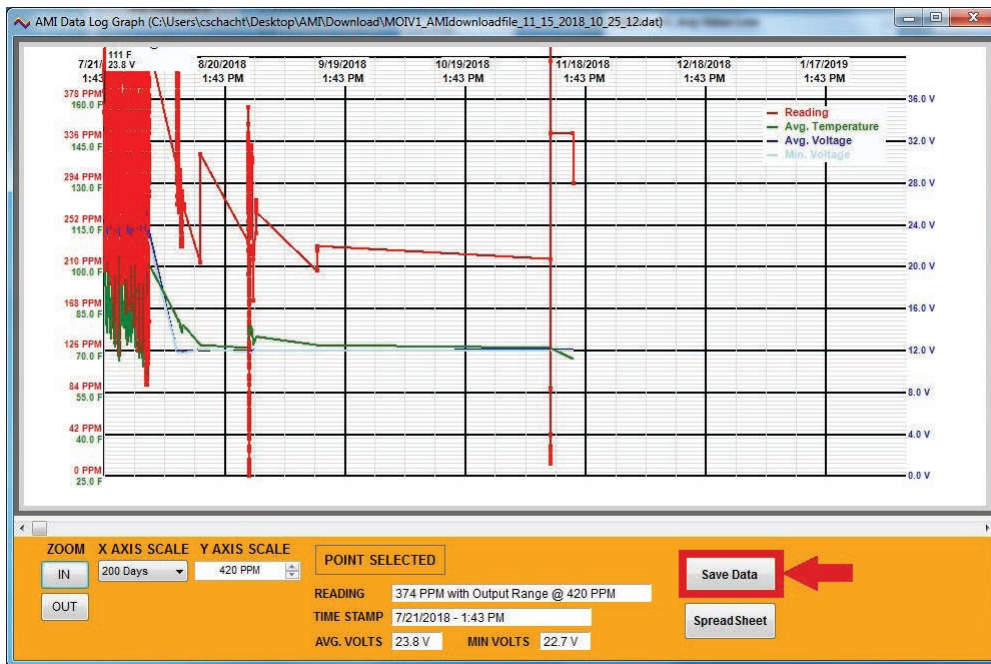
To begin, click the **DOWNLOAD DATA** Button located on the **COMMAND CENTER™**.



A **DATALOG HANDLER** window will appear, giving you the options of seeing your downloaded data as either a graph or spreadsheet.

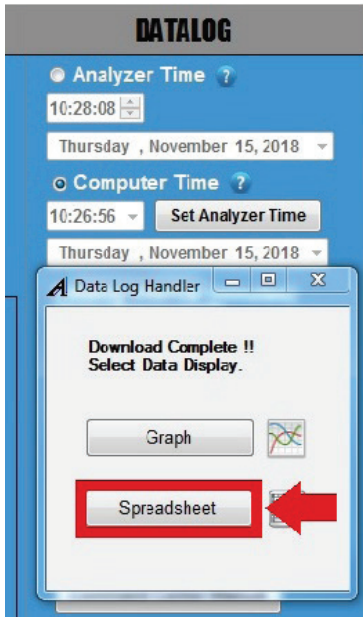


To see the graph, click the GRAPH Button.



(Sample Graph of Downloaded Data)

You can save your graph to a file by clicking the SAVE DATA Button.



To see your downloaded data as a spreadsheet instead, click the SPREADSHEET Button. on the DATALOG HANDLER Window.

| Date | Time | Output Range | Log Period | Output Reading | Avg. Voltage | Min Voltage | Avg. Temp. |
|-----------|----------|--------------|------------|----------------|--------------|-------------|------------|
| 8/09/2018 | 04:44:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:45:13 | 420 PPM | 1 min | 290 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:46:13 | 420 PPM | 1 min | 277 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:47:13 | 420 PPM | 1 min | 286 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:48:13 | 420 PPM | 1 min | 294 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:49:13 | 420 PPM | 1 min | 286 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:50:13 | 420 PPM | 1 min | 277 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:51:13 | 420 PPM | 1 min | 294 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:52:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:53:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:54:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:55:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:56:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:57:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:58:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 04:59:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 05:00:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 05:01:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 05:02:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 05:03:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 05:04:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 05:05:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 05:06:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 05:07:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |
| 8/09/2018 | 05:08:13 | 420 PPM | 1 min | 302 PPM | 11.9 V | 11.8 V | 81 F |

(Sample Spreadsheet of Downloaded Data)

You can save your spreadsheet to a file by clicking the SAVE DATA Button.

TROUBLE SHOOTING

Viewing the Moisture Readings

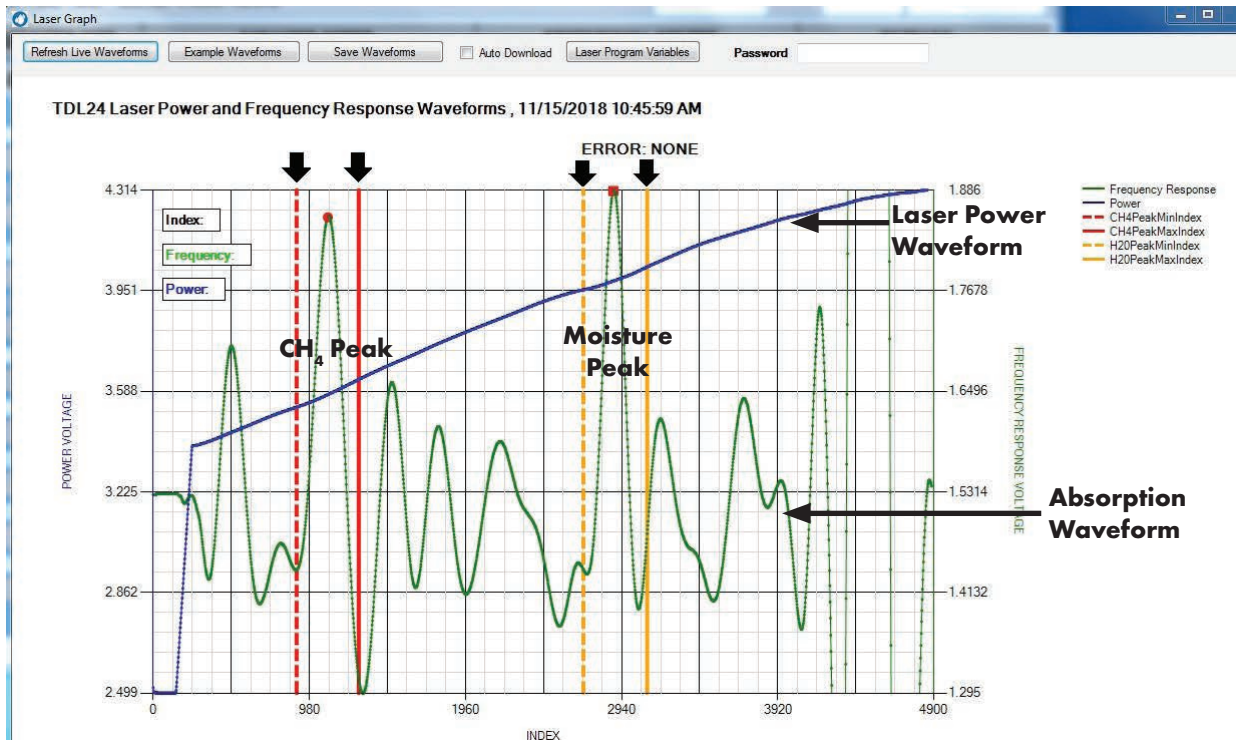
The screenshot displays the AMI Command Center software interface, version 8.0, with a build date of 11/9/2018 - 10:01:51 AM. The interface is divided into four main columns: ANALYZER INFO, ANALYZER SETUP, OPERATIONAL STATUS, and DATALOG.

- ANALYZER INFO:** Shows device ID 4010BRV1, moisture reading of 1.310 LBS, span factor of 125, cell block temp of 72 ° F, ambient temp of 0.000 ° F, power of 12.2 V, analog output of 4 - 20 mA, output range of 0 - 20 LBS, security set to None, and analyzer S/N of 181109-23.
- ANALYZER SETUP:** Includes sections for SETUP (Output Range: 420 PPM, Analog Output: 4-20 mA, Calibration: Zero 646, Full Scale 3248, Mid Range), ALARM SETUP (Alarm Setpoint: ALARM1 7.0 LBS, ALARM2 10.0 LBS; Alarm Delay: 0 Min; Open/Close On Alarm: Closed; Alarm Above or Below Setpoint: Above), and CONTROLS BOTH ALARMS (Alarm Bypass: 1 Min, Alarm Latching: NonLatching, Alarm Failsafe: Non-Failsafe, Pulse Time: 0 Sec).
- OPERATIONAL STATUS:** Shows ERROR STATUS (NO ERRORS) and SENSOR STATUS (Span Factor: 125, Sensor S/N, Sensor Install Date: 07/04/1776, Hours Above 115, Hours Below 32, Hours Turned Off, Previous Sensor Data). A red box highlights the **LASER ANALYSIS** button at the bottom of this column, with a red arrow pointing to it.
- DATALOG:** Shows Analyzer Time (15:10:21), Computer Time (15:10:27), Datalog Interval (1 minutes), and various data management options like Clear Datalog, Download Data, Saved Data Files, Power History, Brown Out History, and Command Center Manual. Contact info for AMI is also provided.

To view the waveform of your measurement readings, click the LASER ANALYSIS Button located on the bottom of the Operational Status Column of the **COMMAND CENTER™**.

A separate Laser Graph Window will appear and display the waveform of the current moisture measurement.

Sample Waveform Displayed in the Laser Graph Window

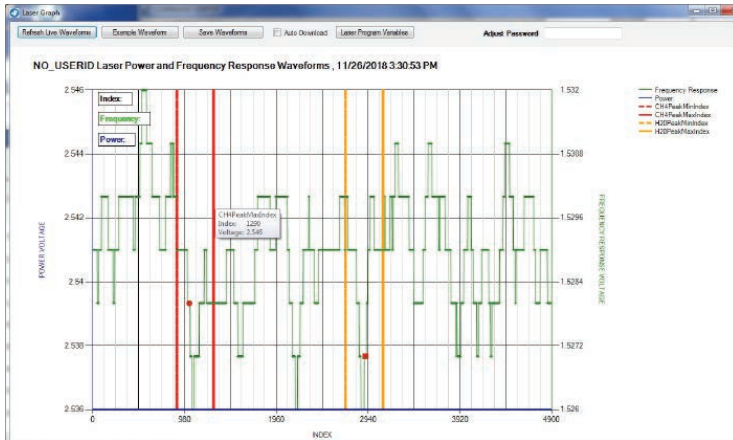


The graph above shows a typical waveform that a user should see when **THE BARRACUDA** is measuring the concentration of H₂O in a sample.

- The size of the Moisture Peak will vary, depending on the concentration of H₂O vapor in the sample. The greater the concentration of H₂O vapor in the gas sample, the larger the height and size of the peak.
- The vertical dashed yellow line and solid yellow line represent the acceptable range for your signature water peak
- The CH₄ (methane) peak is a signature portion of the Laser Frequency Absorption Waveform and should always appear in every moisture reading. Its amplitude will be consistent from reading to reading unless there are changes in pressure. If the CH₄ peak is missing, it is an indication that something is likely wrong with your sample gas or how it enters **THE BARRACUDA**
- The vertical dashed red line and solid red line represent the acceptable range for your signature methane peak
- The Laser Power Waveform shows that the laser is working and functional
- The Absorption Waveform shows the absorption that is occurring while the moisture measurement is being performed.

The following section identifies potential system issues and provides possible resolutions. The waveforms on the graph of each moisture measurement can indicate whether an issue needs to be addressed. If you are unable to resolve an issue after following the suggestion shown in this section, contact AMI for further support.

Graph with No Discernable Peaks or Waveforms



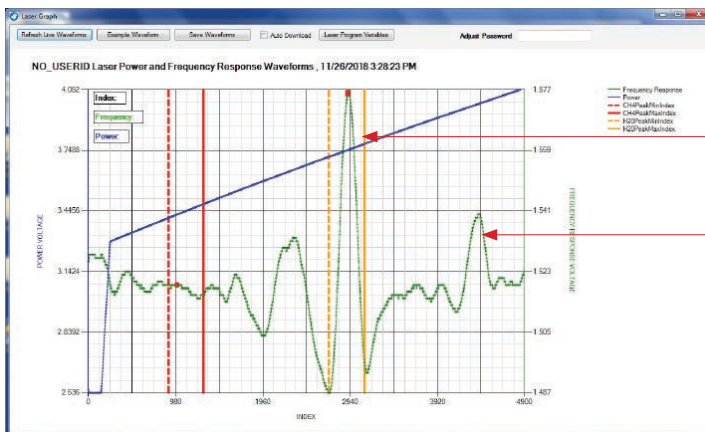
Potential Issue:

A graph with no visible waveforms and having no signature H_2O and CH_4 peaks is indicative of either **Laser Failure**, **Detector Failure** or **Detector Misalignment**.

Resolution:

Stop using **THE BARRACUDA MODEL 4010BR** for trace moisture measurements and contact AMI for support.

Waveform with Signature Moisture Peak but No Signature CH_4 (Methane) Peak



Moisture Peak is present

Absorption Waveform is normal

Potential Issue:

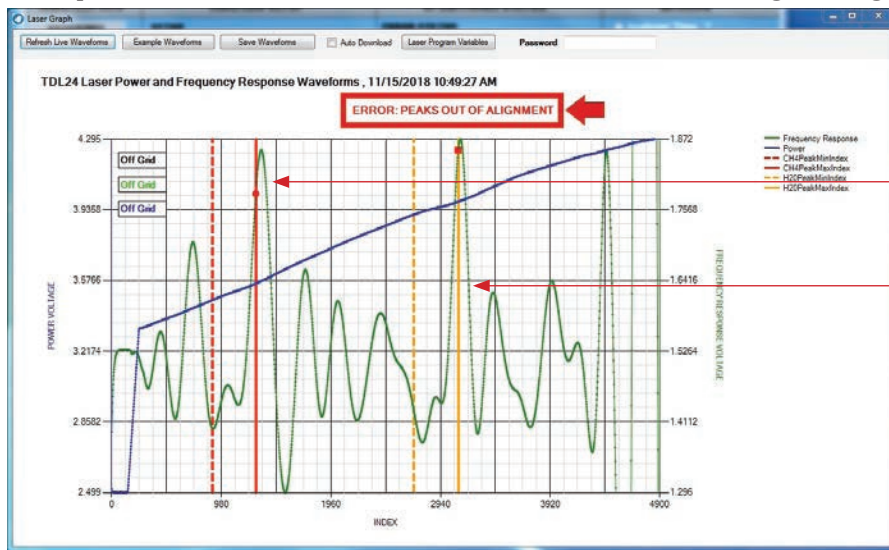
Whenever a waveform appears with the signature moisture peak but is missing the signature CH_4 peak, it may indicate an issue with the **Laser Power** or the **Gas Sample** entering the Analyzer.

Resolution:

First, check to verify that the laser power is present. The blue waveform represents the laser power of **THE BARRACUDA MODEL 4010BR**. If its pattern appears, as shown above, it means that the laser is functioning properly.

Then check your Sample Inlet from the pipeline to **THE BARRACUDA**, making sure that all connections are secured and have no leaks. Also, purge the Sample Line for a few minutes before resuming taking moisture measurements.

Graph with Shifted Waveforms Out of Tuning Range



CH₄ Peak has slightly moved from the frequency range that **THE BARRACUDA** targets

Moisture Peak has also moved from the frequency range that the Analyzer targets

Potential Issue:

Over time, laser-based Moisture Analyzers eventually see a gradual movement of their signature peaks on the x-axis of the measurement waveform. This shift can potentially affect the moisture measurement.

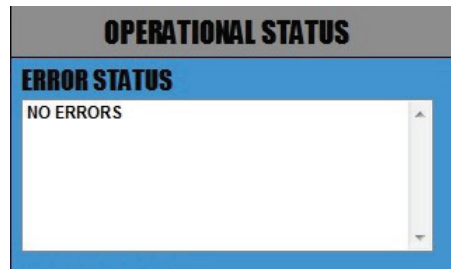
Resolution:

Use **SMART REALIGNMENT™** on the **COMMAND CENTER™** to realign the critical H₂O and CH₄ peaks.

Error Status Display: Error Reference Guide

The following section shows the existing error(s) that can be detected by the Analyzer and displayed on the Error Status Display. Each error has an assigned number and message.

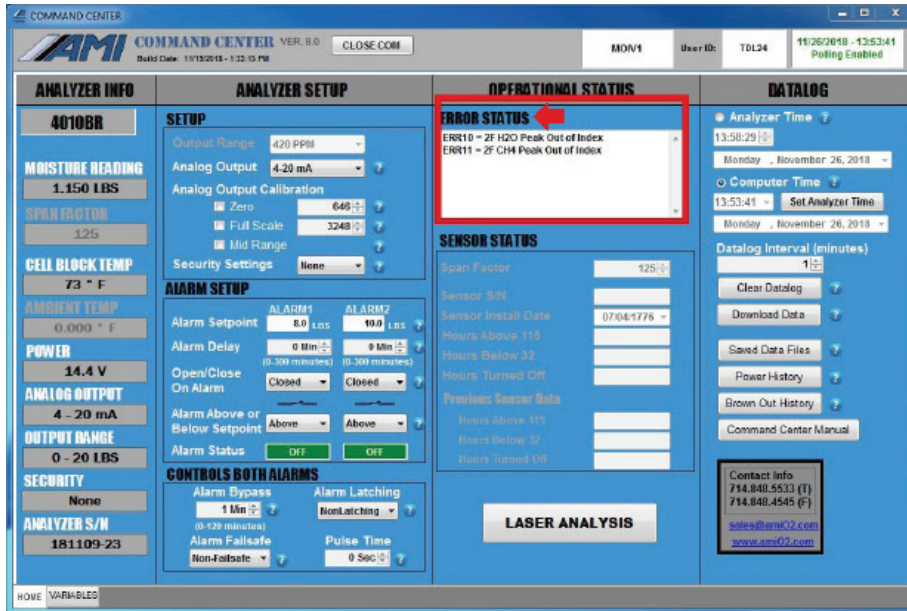
| Error Number | Message |
|--------------|--------------------------|
| 0 | No 2F Trigger |
| 1 | No DC Trigger |
| 2 | TEC Set Pt Low |
| 3 | TEC Set Pt High |
| 4 | DC Avg Value Low |
| 5 | 2F Avg Value Low |
| 6 | Power Supply Low |
| 7 | PPM OverRange |
| 8 | LBS Over Range |
| 9 | 2F MaxtoMin Too Low |
| 10 | 2F H2O Peak Out of Index |
| 11 | 2F CH4 Peak Out of Index |
| 12 | Over/Under Pressure |
| 13 | H2O DC Peak Too Large |
| 14 | Over/Under Temperature |
| 15 | |
| 16 | FPGA Bad Read |
| 17 | Memory Bad Read |
| 18 | Memory Bad Write |
| 19 | Analytical Timeout |
| 20 | |
| 21 | |
| 22 | |
| 23 | |
| 24 | |
| 25 | |
| 26 | |
| 27 | |
| 28 | |
| 29 | |
| 30 | |
| 31 | |
| 32 | ADC Sample High |
| 33 | ADC Sample Low |
| 34 | ADC Conversion TimeOut |
| 35 | DC SAMPLE TO LOW |
| 36 | |
| 37 | |
| 38 | |
| 39 | |
| 40 | |
| 41 | |
| 42 | |
| 43 | |
| 44 | |
| 45 | |



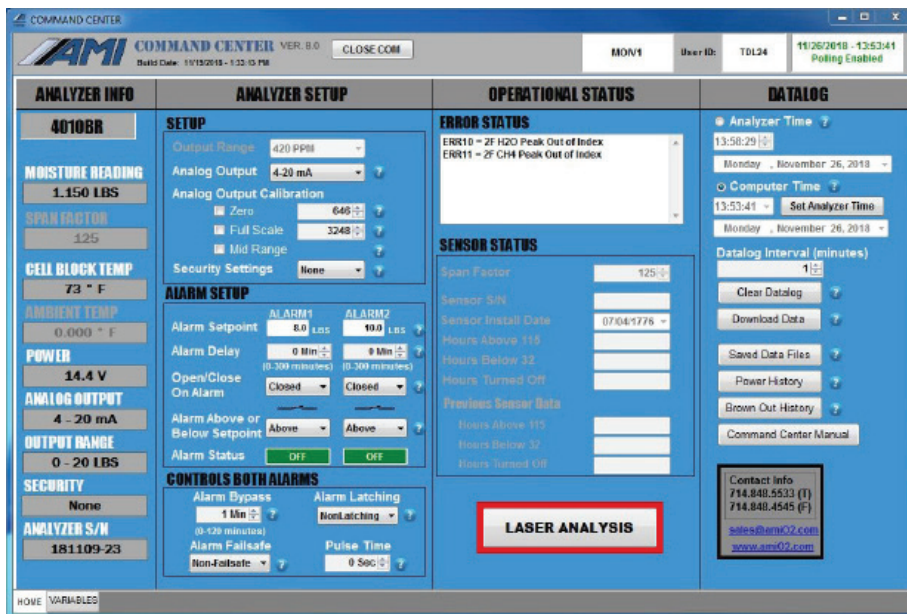
Note:
Once troubleshooting is completed and the error is resolved, the message will automatically be removed from the Error Status Display by the Analyzer.

SMART REALIGNMENT™

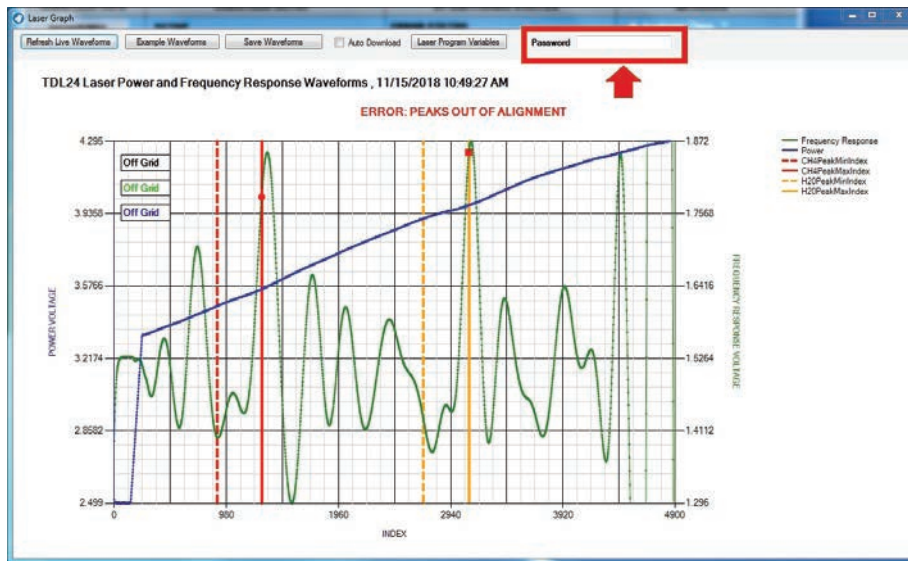
Using SMART REALIGNMENT™ to Realign the Signature Peaks



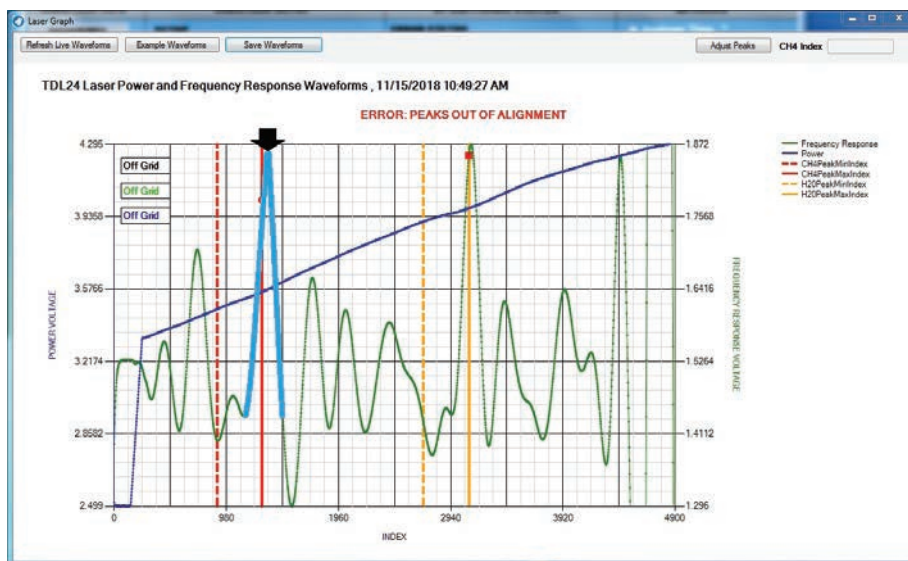
If your signature peaks have shifted, the ERROR STATUS DISPLAY will automatically display the error messages, alerting you to the need to realign your peaks.



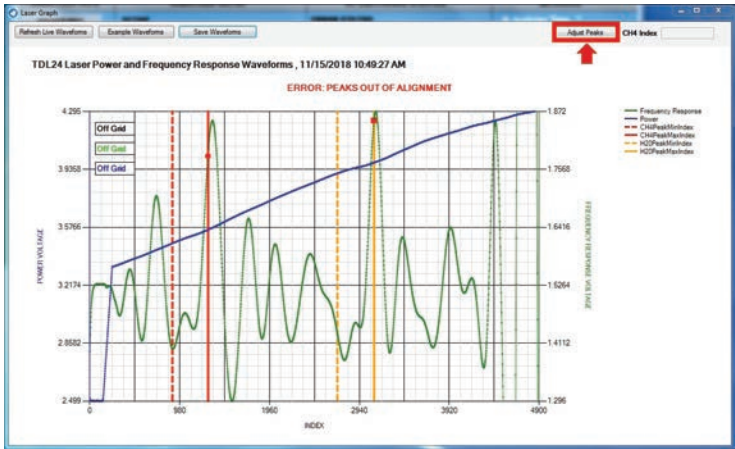
STEP 1: To begin, click on the LASER ANALYSIS Button at the bottom on the Operational Status Column. A new window will appear and display the current measurement waveform.



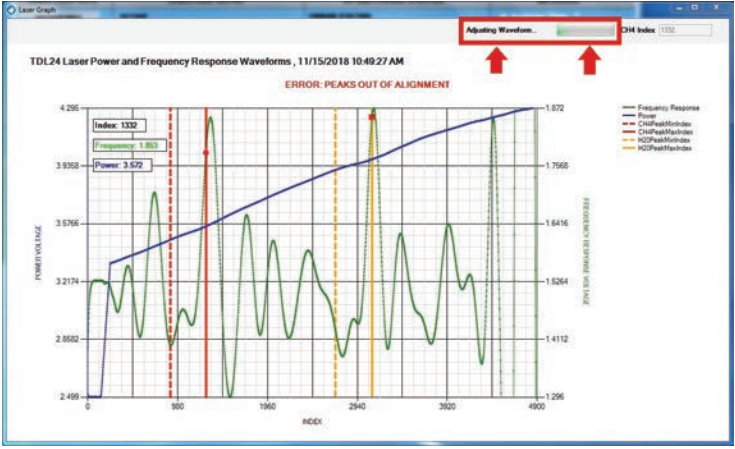
STEP 2: Type in the correct password that you received from AMI in the password entry area. The display window will slightly change.



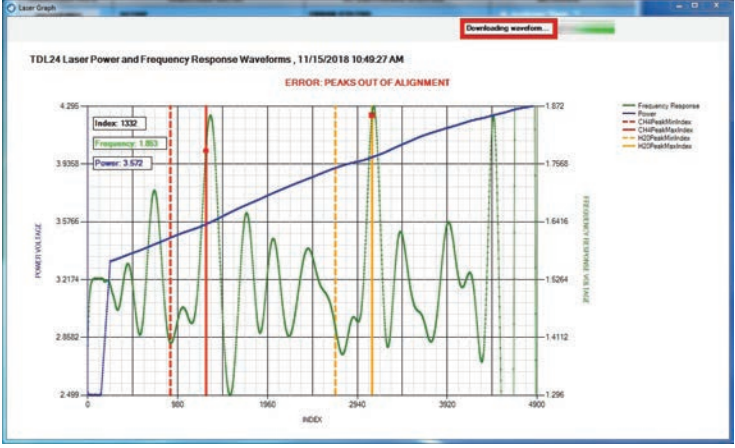
STEP 3: Click on the **TIP** of the misaligned methane signature peak.
Note: This peak is in the left area of the waveform and separated from the signature weak peak by 3 non-designated peaks. It is critical that you click on the tip and no where else on the waveform during this step.



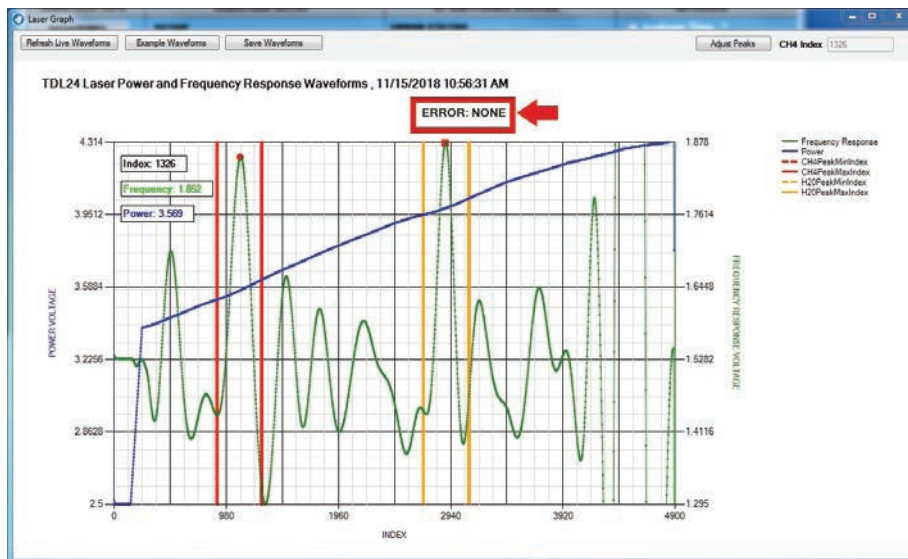
STEP 4: Click on ADJUST PEAKS on the upper right-hand corner of the screen. The display will slightly change again.



While the realignment process is taking place, you will see the screen displaying ADJUSTING WAVEFORM and an adjacent 'working bar' in the upper right-hand corner, highlighted by the red box.



When the process is nearing completion, the screen will adjust once more and display DOWNLOADING WAVEFORM.



Once everything is done, a new waveform will appear, displaying the fully adjusted signature methane peak and water peak. The Red Error Message will also disappear and be replaced with ERROR: NONE.

You have now successfully completed **SMART REALIGNMENT™**. At this point, you can close the **COMMAND CENTER™** Window.

END OF SMART REALIGNMENT

SPECIFICATIONS

PHYSICAL

Dimensions _____ 14.0"W x 9.5"H x 5.0"D (35.6 cm x 24.1 cm x 12.7 cm)
Weight _____ 17.0 lbs (7.7 kg)
Digital Display _____ 4-digit LCD
Mounting _____ Wall mount or 2.0" pipe
Gas Connections _____ 1/4" 316 S.S. compression fittings
Wetted Parts _____ 316 S.S. fittings, electro-less nickel-plated cell block, acrylic-flow meter & Vitron O-rings

TECHNOLOGY

Principle of Measurement _____ Tunable Diode Laser Absorption Spectroscopy (TDLAS) *specific to moisture only
Key Technologies _____ Patent-pending Wavelength, **ELIMINATOR CELL BLOCK™**, **MEASUREMENT ALGORITHM** and **SMART REALIGNMENT™**, and **COMMAND CENTER™** (which includes the following: Datalogger, Error Status Display, Brown-out History, Power-up History, USB Virtual Comport, and Modbus RS485 and Modbus TCP/IP)

PERFORMANCE

Measurement Range _____ 0.25 – 20.0 lbs of H₂O (5.25 – 420 ppm)
Low Minimum Detection Threshold _____ 0.25 lbs (5.25 ppm) of H₂O
Response Time _____ 90% < 2 sec, Incredibly fast upscale/downscale
Repeatability _____ ±1% of range or ±0.25 lbs (±5.25 ppm) of H₂O, whichever is greater
Data Collection Capacity _____ 5 days of data recording @1 datapoint per minute
Sample Cell Pressure Range _____ 700 – 1100 mBarA
Inlet Gas Pressure _____ 1.0 – 20.0 psig (0.07–1.4 bar)
Protection _____ RFI-protected

OPERATION

Ambient Operating Temperature Range _____ 20°F to 120°F (-6.7°C to 49°C)
Recommended Sample Gas Flow Rate _____ 1.0 to 2.0 SCFH* (0.5 to 1.0 Lpm)
Recommended Bypass Flow Rate _____ 0.5 SCFH* (0.25 Lpm)
*SCFH = standard cubic feet/hour
Isolated Analog Output Signals _____ 1–5 VDC and 4–20 mA
Syncing with an EFM or other external device _____ Advanced Analog Output Calibration available

ALARMS

Number of Alarms _____ 2 Fully, Adjustable Moisture Concentration Alarms
Alarm Delays _____ Programmable from 0 – 300 minutes
Alarm Hold-off / Bypass _____ Programmable from 0 – 120 minutes

AREA CLASSIFICATION

Area Classification _____ Class 1, Div 1, Groups C & D, T3A

POWER

Requirements _____ Choice of DC Power 10 – 28 VDC <1A @12VDC or AC Power 117VAC < 0.75A
(note: 1 second surge at start-up to 1 Amp)

AMI[®] WARRANTY & SUPPORT

LIMITED WARRANTY/DISCLAIMER

The warranty period is **TWO YEARS** for the Analyzer. Any failure of material or workmanship will be repaired free of charge for that specified period from the original purchase (shipping date) of the instrument. AMI will also pay for 1-way ground shipment back to the customer.

Any indication of abuse or tampering of the instrument will void the warranty.

Receiving the Analyzer

When you receive the instrument, check the package for evidence of damage and if any is found contact the shipper. Although every effort has been made to assure that the Analyzer meets all performance specifications, AMI takes no responsibility for any losses incurred by reason of the failure of this analyzer or associated components. AMI's obligation is expressly limited to the Analyzer itself.

EXCEPT FOR THE FOREGOING LIMITED WARRANTY, AMI MAKES NO WARRANTIES, EXPRESS, IMPLIED OR STATUTORY, AS TO THE NON-INFRINGEMENT OF THIRD-PARTY RIGHTS, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE. IF APPLICABLE LAW REQUIRES ANY WARRANTIES WITH RESPECT TO THE SYSTEM, ALL SUCH WARRANTIES ARE LIMITED IN DURATION TO TWO (2) YEARS FROM THE DATE OF DELIVERY.

LIMITATION OF LIABILITY

IN NO EVENT WILL AMI BE LIABLE TO YOU FOR ANY SPECIAL DAMAGES, INCLUDING ANY LOST PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, EVEN IF THE COMPANY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY OTHER PARTY.

LIMITATION OF REMEDIES

AMI's entire liability and your exclusive remedy under the Limited Warranty (see above) shall be the replacement of any Analyzer that is returned to the Company and does not meet the Company's Limited Warranty.

APPROVALS



Certificate of Compliance

Certificate: 70185090

Master Contract: 227773

Project: 70185090

Date Issued: January 15, 2019

Issued to: Advanced Micro Instruments Inc.
225 Paularino Ave
Costa Mesa,
CA 92626
USA

Attention: Charles Schacht

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US (indicating that products have been manufactured to the requirements of both Canadian and US Standards) or with adjacent indicator 'US' for US only or without either indicator for Canada only



Issued by:

James Jarman

PRODUCTS

CLASS 2258 02 – Process Control Equipment - For Hazardous Locations

Class I, Division 1, Groups C & D, T3A

-20°C ≤ Ta ≤ + 49°C

AMI BARRACUDA MODEL 4010BR-AC and 4010BR-DC Trace moisture measuring device

Explosionproof with intrinsically safe output to attached external measurement section;

AC Input rated: 117Vac~, 60Hz, 0.5A (Analogue Output: 1-5V or 4-20mA and USB)

DC Input rated: 10-28Vdc, 1.2A @ 12V

CLASS 2258 82 – Process Control Equipment - For Hazardous Locations Certified to U.S. Standards

Class I, Division 1, Groups C & D, T3A

-20°C ≤ Ta ≤ + 49°C

AMI BARRACUDA MODEL 4010BR-AC and 4010BR-DC Trace moisture measuring device

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HIGH PERFORMANCE

RELIABILITY

INTUITIVE DESIGN

www.**amio2**.com

Tel 714.848.5533
Fax 714.848.4545

OM-300-027 Rev A

© Advanced Micro Instruments, Inc.

ADDRESS:

Advanced Micro Instruments, Inc.
225 Paularino Avenue
Costa Mesa, CA 92626

