

Operating Manual

Series 2400 & 2400-CM Total Hydrocarbon Analyzer

Series 2400: 120 V, 50/60 Hz
Series 2402: 230 V, 50/60 Hz

December 2022

Rev. 2

**READ INSTRUCTIONS
BEFORE OPERATING**



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IMPORTANT WARNING

THIS MANUAL MUST BE CAREFULLY READ BY ALL INDIVIDUALS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR INSTALLING, USING, OR SERVICING THE PRODUCT. Like any piece of complex equipment, the TOTAL HYDROCARBON ANALYZER will perform as designed only if it is installed, used and serviced in accordance with the manufacturer's instructions. OTHERWISE IT COULD FAIL TO PERFORM AS DESIGNED AND PERSONS WHO RELY ON THIS PRODUCT FOR THEIR SAFETY COULD SUSTAIN SEVERE BODILY INJURY OR DEATH.

The warranties made by GOW-MAC Instrument Co. with respect to the product are voided if the product is not installed, used and serviced in accordance with the instructions in this manual.

Please protect yourself and your employees by following these operating instructions. We encourage our customers to write or call for any additional information relative to the use or repair of this instrument.

Technical Support

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GENERAL WARNINGS AND SAFETY

1. The Series 2400 Total Hydrocarbon Analyzer should be installed, operated and maintained in strict accordance with its labels, cautions, warnings, instructions, and within the limitations stated.
2. The Total Hydrocarbon Analyzer housing must be located in a non-hazardous area.
3. Use genuine GOW-MAC replacement parts when performing any maintenance procedures provided in this manual. Failure to do so may seriously impair instrument performance. Repair or alteration of the Total Hydrocarbon Analyzer, beyond the scope of these instructions or by anyone other than GOW-MAC or a GOW-MAC Representative could cause the product to fail to perform as designed, and persons who rely on this product for their safety could sustain severe bodily injury or death.
4. DISCONNECT the instrument from **ALL** power sources **BEFORE** removing chassis from instrument housing and exposing potentially dangerous voltages.
5. **DO NOT** overload the AC outlet with other electrical equipment.
6. Adhere to the color coding descriptions when hooking up electrical connections.
7. Repair or replace faulty or frayed wiring.
8. Ensure that the actual line voltage is the value for which the instrument was designed. Ensure that the power cord is plugged into the correct voltage source.
9. Perform periodic leak checks on all fitting areas.
10. **DO NOT** allow flammable and/or toxic wastes to accumulate.
11. Keep combustibles away from gas cylinders and eliminate ignition sources.
12. Maintain adequate ventilation around Total Hydrocarbon Analyzer.
13. Dispose of wastes properly.

GENERAL PRECAUTIONS FOR HANDLING AND STORING HIGH PRESSURE GAS CYLINDERS

Compressed gases have properties that can cause serious accidents, injuries, and even death if proper precautions and safety practices are not followed. Therefore, during handling and use of these gases, be certain to use applicable safety precautions described by your local compressed gas supplier, the Compressed Gas Association, and/or O.S.H.A. regulations.

1. Read the label on all cylinders **BEFORE** using to identify the cylinder contents. If the label is illegible, return the cylinder to the supplier. **DO NOT ASSUME THE CONTENTS.**
2. Secure cylinders in storage and in use to an immovable structure to prevent accidental falling or movement. Read the relevant safety codes.
3. Store or move cylinders **ONLY** in the vertical position. **DO NOT** move or transport cylinders with regulators attached.
4. Store cylinders in a well ventilated area away from heat or ignition sources.
5. When installing tubing, provide **ONLY** approved, adequate pressure reducing regulators and pressure relief devices to prevent over-pressurizing of tubing and equipment.
6. Never drop cylinders or permit them to strike each other violently.
7. Cylinders may be stored in the open but, in such cases, should be protected against extremes of weather and from damp ground (to prevent rusting). In areas where extreme temperatures are prevalent, store cylinders in the shade.
8. The valve protection cap should be left on each cylinder until cylinder has been secured against a wall or bench, or placed in a cylinder stand and is ready for use.
9. Avoid dragging, rolling or sliding cylinders even for a short distance. Move cylinders by using a suitable hand truck.
10. Never tamper with safety devices in valves or cylinders.
11. Do not store full and empty cylinders together. Serious suck-back can occur when an empty cylinder is attached to a pressurized system.
12. No part of a cylinder should be subjected to a temperature higher than 52 °C (125 °F). Do not permit flame to come in contact with any part of a compressed gas cylinder.

PRINCIPLE OF OPERATION

The Series 2400 Total Hydrocarbon Gas Analyzer with flame ionization detector continuously measures the total concentrations of hydrocarbons in a gas stream.

The Series 2400-CM flow system adds a catalytic methanizer and actuated valve to switch sample flow through the methanizer. The 2400-CM can operate in basic THA only mode and as a THA w/ methanizer, which converts CO and CO₂ to CH₄ providing total concentration of CO plus CO₂.

This manual contains operating information for the Total Hydrocarbon Analyzer Models shown below. Identify your model, and disregard those portions that do not apply to your unit.

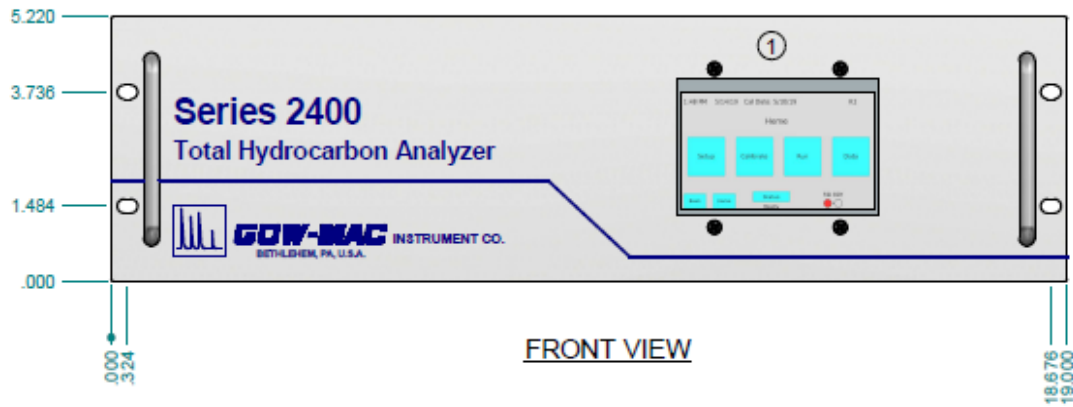
Total Hydrocarbon Analyzer Models

		<u>Model</u>
<u>115 V</u>	<u>230 V</u>	
2400	2402	Total Hydrocarbon Analyzer
2400-CM	2402-CM	Total Hydrocarbon Analyzer with catalytic methanizer

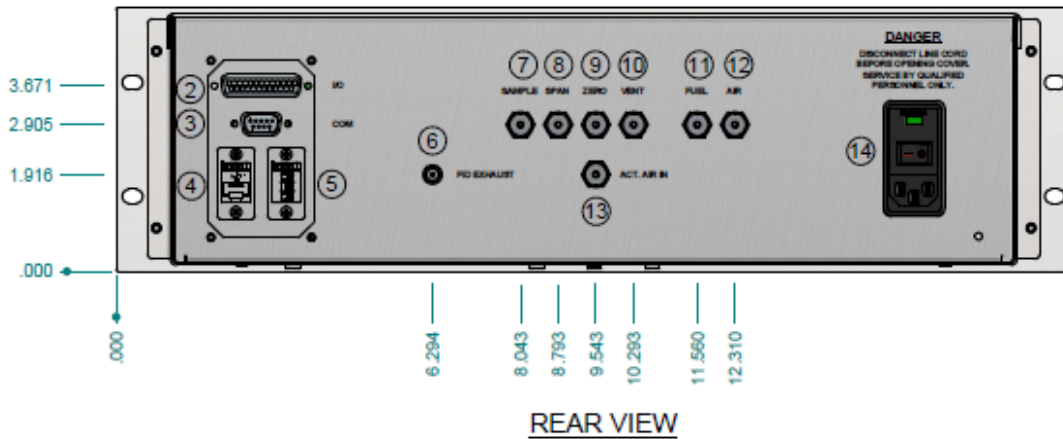
Detector

All Series 2400 analyzers utilize the flame ionization (FID) method of detection. Ionized carbon atoms are produced when hydrocarbons are burned in the hydrogen flame. The ionized electrons formed in the flame enter a gap between a pair of electrically charged electrodes. The gap resistance between the electrodes changes in the presence of ions and the current is measured by an electrometer amplifier. This current is directly proportional to the hydrocarbon concentration in the flame. The electrometer amp puts out a DC voltage signal.

OPERATING CONTROLS



2400/2400-CM Front Panel



2400/2400-CM Back Panel

- | | |
|---------------------------------|---|
| 1. Screen Display | 8. Span In (1/8" Compression) |
| 2. 25-pin I/O Connector | 9. Zero In (1/8" Compression) |
| 3. 9-pin Serial Connection | 10. Vent (1/8" Compression) |
| 4. Ethernet Connection | 11. Fuel In (1/8" Compression) |
| 5. USB Connection | 12. Air In (1/8" Compression) |
| 6. FID Exhaust | *13. Actuator Gas In (1/8" Compression) |
| 7. Sample In (1/8" Compression) | 14. Power Switch/Receptacle |

NOTE: "ACT. AIR IN" PORT USED WITH 2400-CM ONLY

GASES REQUIRED

NOTE: ALL REGULATORS MUST BE EQUIPPED WITH METALLIC DIAPHRAGMS

1. Fuel

The FUEL can either be 100% Hydrogen or a pre-mixed fuel mixture.

100% Hydrogen - Pure hydrogen as fuel provides maximum sensitivity and the cylinder will last longer due to lower flow rate. The H₂ should have a maximum total hydrocarbon content of 0.2 ppm or less.

Pre-mixed fuel mixture - 40%/60% (H₂/N₂) or 40%/60% (H₂/He) may be used. Either fuel mixture should have maximum total hydrocarbon content 0.5 ppm or less.

NOTE: IF THE SAMPLE IS OXYGEN, FUEL MIX MUST BE USED. THE SAMPLE VENT MUST BE VENTED PROPERLY ACCORDING TO REGULATORY AGENCIES WITH RESPECT TO OXYGEN.

NOTE: IF THE SAMPLE IS HYDROGEN, THE SAMPLE VENT MUST BE VENTED PROPERLY ACCORDING TO REGULATORY AGENCIES WITH RESPECT TO HYDROGEN.

2. Air

The AIR should be an Air cylinder of UPC or Zero Grade having a maximum total hydrocarbon content of 1.0 ppm or less.

3. Zero

The ZERO gas should be a “zero grade” of the major component of your SAMPLE with total hydrocarbon content of 0.5 ppm or less.

4. Span

The CALIBRATION gas is recommended to be a mix of the SAMPLE components at 100% to 125% of SAMPLE hydrocarbon concentration.

5. Act. Air In (2400-CM Only)

The ACTUATOR gas should be “Instrument” grade Air, Nitrogen or compressed Air.

6. Sample

NOTE: THE RESPONSE FROM YOUR SAMPLE IS DETERMINED BY THE AMOUNT OF CARBON MOLECULES PRESENT IN EACH COMPONENT. THIS WILL AFFECT THE SELECTION OF THE PROPER RANGE TO SET UP THE CALIBRATION AND OPERATION OF THE ANALYZER

4 INSTALLATION

1. Location

Install the analyzer in a location that is secure, vibration free, and has a stable ambient temperature. For optimum instrument stability, the ambient operating air temperature should be maintained as steady as possible within the range 15 to 35 °C (59 to 95 °F). Ambient temperature change during an analysis or preparation may cause a shift of the instrument baseline (zero).

2. Tubing

The use of 1/8" diameter, "hydrocarbon-free", stainless steel tubing is strongly recommended for all external gas lines. GOW-MAC strongly recommends installation using tubing with inside surface pre-cleaned to free of hydrocarbon residue.

GOW-MAC Instrument Co. can supply a "clean" gas installation kit. Call for details.

NOTE: ANY KIND OF PLASTIC TUBING, INCLUDING TEFLON, IS NOT ACCEPTABLE FOR INSTALLATION

3. Gas Connections

	Recommended Incoming PSIG
FUEL	60
AIR	60
ZERO	60
SPAN	60
ACTUATOR AIR FOR "-CM" MODELS ONLY	60
SAMPLE	60

- a. All gas connections should be made with 1/8" Swagelok compression fittings.
- b. Be sure NOT to block the FID exhaust outlet in any way. Allow at least 6 inches of clearance.

Leak Testing

After all connections have been made and tightened, test each connection for leaks. Leaks in the system will cause baseline drift and noise, and may reduce sensitivity.

WARNING
LEAKS IN THE HYDROGEN LINE (FUEL) ARE HAZARDOUS.
HYDROGEN IS AN EXTREMELY EXPLOSIVE GAS.

The lower explosive limit (LEL) of Hydrogen in air is 4% and the upper explosive limit (UEL) in air is 75%. When oxygen is used, the LEL remains the same but the UEL increases to 94%. CARE MUST BE EXERCISED in handling this gas and the system must be free of leaks. When using a hydrogen or oxygen span/zero gas the sample vent MUST be vented according to regulation(s).

WARNING

HYDROGEN SHOULD BE TURNED OFF AT THE CYLINDER WHEN NOT IN USE

This instrument has been completely leak-tested and checked out prior to shipping. It is possible, but unlikely, that internal leaks have developed during shipment. The most likely source of leaks will be where subsequent connections or reconnections are made by the user.

NOTE: ALL CONNECTIONS SHOULD BE LEAK-TESTED, WITH THE GASES FLOWING, BEFORE THE INSTRUMENT IS OPERATED

Each gas must be flowing to check for leaks. The use of soap or other organic substances to check for leaks ARE NOT recommended. If there are leaks, the soap and/or organic substances will be aspirated into the leak and contaminate the system. The easiest way to locate leaks is with the GOW-MAC Model 21-070 Mini Gas Leak Detector if the tubing can be pressurized with helium.

NOTE: DO NOT ATTEMPT TO PRESSURIZE THE SYSTEM BY PLUGGING OFF THE EXHAUST PORT ON THE FID. THE FID IS NOT GAS TIGHT UNDER PRESSURE

4. Power

Connect the provided AC power cord to the receptacle on the back of the analyzer.

Model 2400 - 200 Watts at 115 V, 60 Hz Model 2400-CM - 225 Watts at 115 V, 60 Hz

Model 2402 - 200 Watts at 230 V, 50 Hz Model 2402-CM - 225 Watts at 230 V, 50 Hz

CAUTION: The Sample Vent flows with or without power. Be sure to have proper venting before power is applied to the analyzer. The Sample Vent will flow approximately 100 mL/min when the incoming sample pressure is 60 psi.

A grounded electric outlet should be in the 2400 installation area within reach of the 2400 power cord. The instrument shipped with a power cord plug that is specific for the destination country noted on the equipment order.

An extension cord should NOT be used for the 2400 because extension cords may not be rated for the instrument power. For best results, use a dedicated service receptacle to prevent disruption from transient loads. The electric power must be steady to provide optimum instrument stability. If necessary, install a stabilizing power transformer between the receptacle and the 2400. In addition, a surge/noise suppressor with lightning arrestor should be installed between the receptacle and the 2400. The minimum capacity/ratings for a surge/noise suppressor are 2 A at 115 V and 1 A at 230 V.

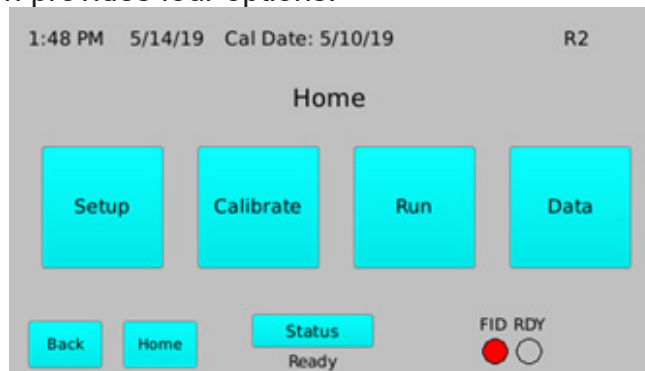
Grounding: A proper earth ground is required for instrument operation. Any interruption of the grounding conductor or disconnection of the power cord could cause a shock that could result in personal injury. The metal instrument panels and cabinet are grounded through the three-conductor power cord that, when plugged into a properly grounded receptacle, grounds the instrument and minimizes shock hazard. A properly grounded receptacle is one that is connected to a suitable earth ground. Be sure to verify proper receptacle grounding.

GENERAL OPERATION

1. Start Up

- a. Re-check gas flows and power connections as stated in the installation section
- b. Turn power "ON" using the power switch on REAR panel
- c. The LCD Digital Touchscreen will run through a self-diagnostic program and start at the HOME screen when completed. The software version will be listed on the GOW-MAC start-up screen for future reference. HOME screen can be easily accessed at any time by pressing the HOME button on the bottom panel

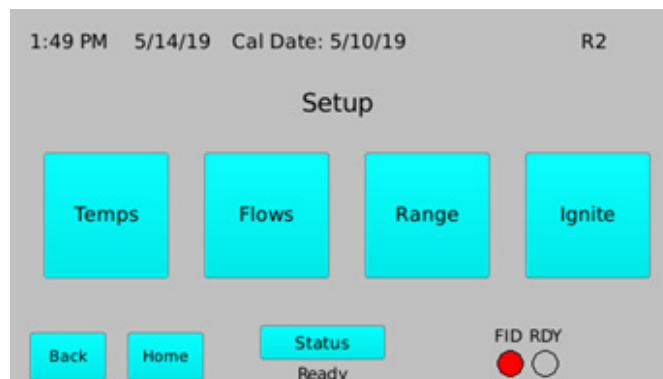
The HOME screen provides four options:



- I. Set Up- Parameter settings for temperatures, flow rates, range and FID ignition
- II. Calibrate- THA can be calibrated for zero, calibrated for span, set scheduled zero intervals, and span check
- III. Run- Place the THA in operation to analyze total hydrocarbons
- IV. Data-Sets data logging options through desired output and interval

2. Set Up

The setup option **MUST** be selected first to insure the temperatures, flowrates, and flame is ignited before continuing to sample analysis.



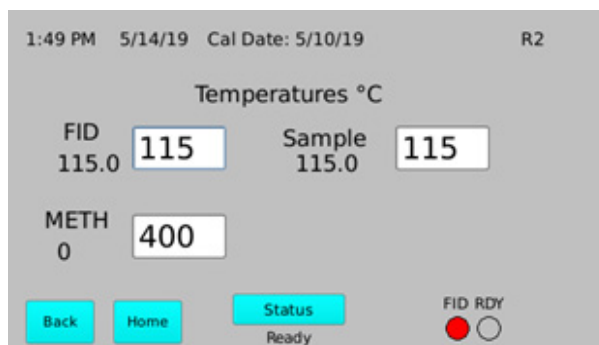
3. Temperature

The temperatures for the FID and SAMPLE must be set and established before continuing with the setup. (There is also a setting for Methanizer temperature for use on 2400-CM)

I. Recommended FID temperature should be 105° – 120° C

II. Recommended Sample temp should be 100° – 120° C.

An error message will be displayed under the status box until the temperatures have been achieved. Once the temperatures reach their set values and are stable, the message will read “Ready”.

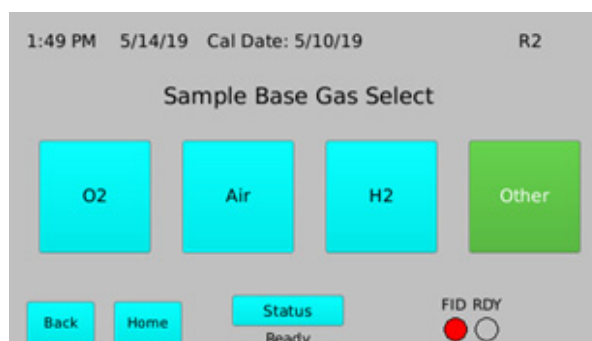
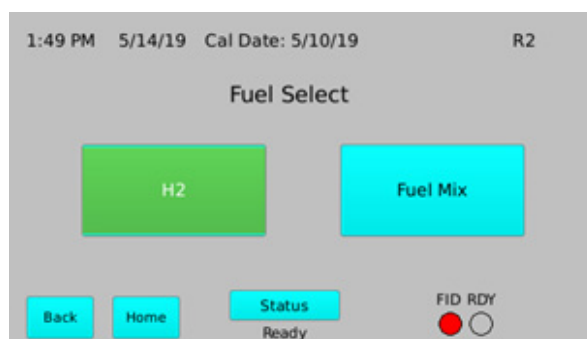


4. Flows

There are two choices under FLOW for fuel selection; 100% H₂ (Hydrogen) or Fuel Mix (40%H₂/60%N₂ or 40%H₂/60% He). The sample base gas selection will follow after the fuel type is chosen.

The sample base selections are:

- 1) Oxygen
- 2) Air
- 3) Hydrogen
- 4) Other (nitrogen, argon, carbon dioxide, etc).



Each sample base gas has its own stored parameters for Air, Fuel and Sample flowrate settings (sccm). The default values that are initially stored under each bulk gas are recommended starting flows. They can be changed to optimize the flame before operation. The settings will be automatically stored as 'last found' values for future use.

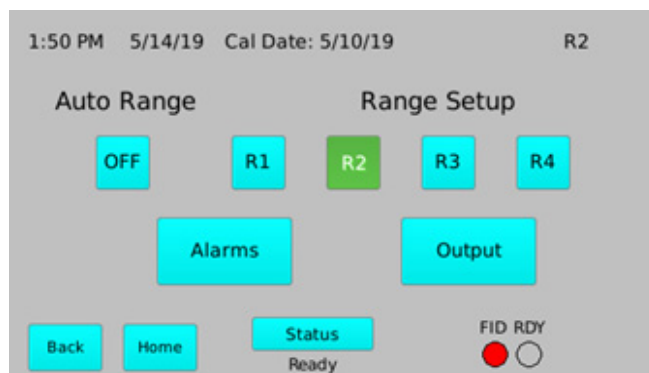
* Refer to the QC Data sheet for recommended flow settings for your instrument.

5. Range

There are four ranges to select with R1 being the lowest concentrations (approximately 0 – 10 ppm), R2 (approximately 0 -100 ppm), R3 (approximately 0 -1,000 ppm) and R4 (approximately 0 -10,000 ppm).

The software will calculate the raw signal versus known set values and assign the best calculated range. This will result in values that are close to the expected 0 -10, 10-100, 100-1000, and 1,000- 10,000 ppm, but will not be those exact values. (Example: it may be 0-18 ppm with optimal calculation)

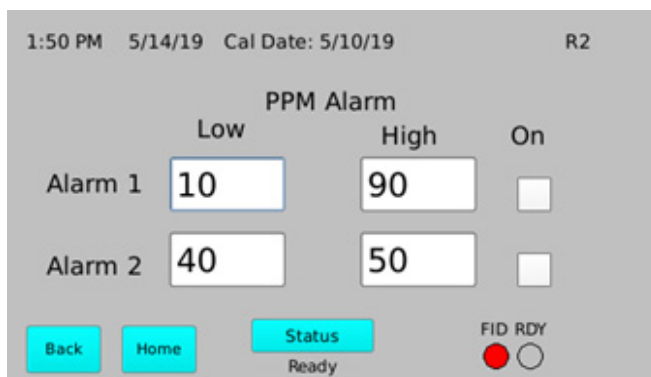
The selection range is displayed on the top right corner of the display.



Auto Range can be selected and turned ON/OFF using the toggle button.

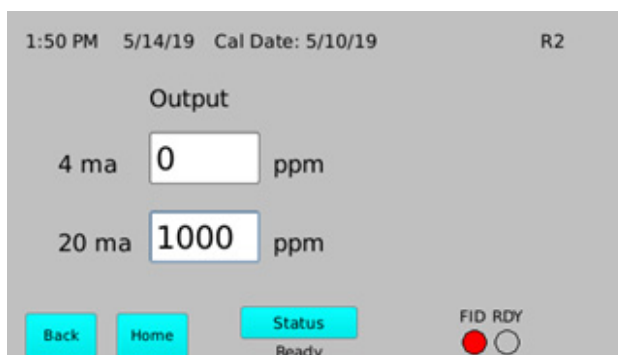
6. Alarms

There are 2 alarms that can be set on the THA. Alarm 1 and Alarm 2 each have a Low and High value. The desired values can be entered and enabled by using ON box. A1L (Alarm 1 Low), A1H (Alarm 1 High), A2L (Alarm 2 Low), and A2H (Alarm 2 High) will be displayed when active on the top right panel of the display



7. Output

The 4-20 mA output concentrations are entered based on desired range of measurement



8. Ignite

Press IGNITE to ignite the flame of the FID. Once the igniting process is complete, the 'red' indicator will illuminate on the bottom right panel. If the indicator is gray, repeat the process by pressing the IGNITE button again.

Tip: If the flame will NOT light after multiple tries, stop the SAMPLE flow by entering "0" in the set box under SETUP – FLOWS - *selected fuel and base gas. Press IGNITE to light without base sample flow. Once the FID is lit, re-enter the operating SAMPLE flow.

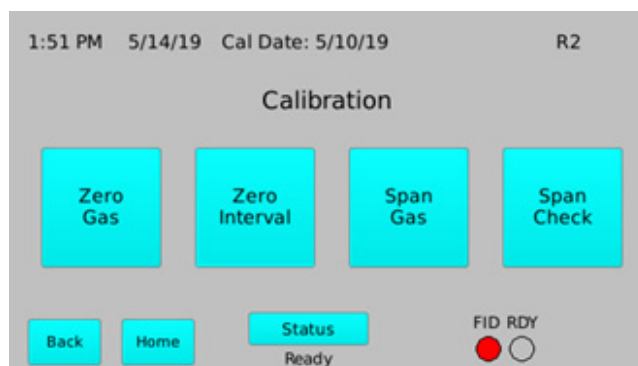
*** Note: There may be a need to adjust the flow-rates for the flame so as to keep it lit and also optimize the sensitivity. While igniting, any flow-rate can be adjusted by entering the desired flow in the corresponding set-point box.

9. Calibration

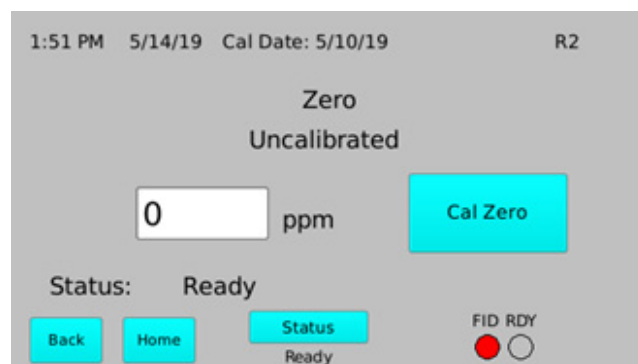
Both Zero and Span calibrations MUST be performed before running sample gas. This will set the low and high range of the expected analysis. Zero calibration MUST occur before Span calibration. Failure to initially perform these steps in order will result in range errors.

NOTE: FOR BEST RESULTS, ALL TEMPERATURES AND IGNITED FLAME SHOULD BE ALLOWED TO STABILIZE FOR AT LEAST 4 HOURS PRIOR TO CALIBRATING.

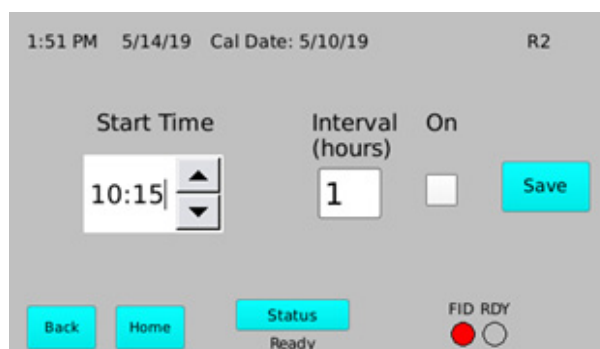
NOTE: Gases have various properties and effects on the stoichiometric combustion of the flame ionization detector. These properties will affect the FID in various ways by heating or cooling the temperature of the flame and will have a direct result on the accuracy, sensitivity, and ignition. It is **strongly recommended** that the Zero Gas, Span Gas and Sample Gas are composed of the same base gas. Example: When testing argon sample, the Series 2400 should be zeroed and spanned with an argon-based zero and span gas. If the Series 2400 is zeroed and spanned with a helium-based gas, the argon sample may extinguish the flame, have poor accuracy, or have an unstable and drifting baseline.



a. **ZERO GAS** – The actual concentration of the zero gas must be entered into the set window. The value will be 0 ppm most of the time, but the option exists to offset zero if there is a known concentration of hydrocarbon (reported as methane) present. Press the Cal Zero button to initiate the zero sequence. The Cal Zero will zero the signal at each of the four ranges (R1, R2, R3, R4). The Cal Zero process takes 240 secs (4 mins) and the screen cannot be changed or exited during this process.

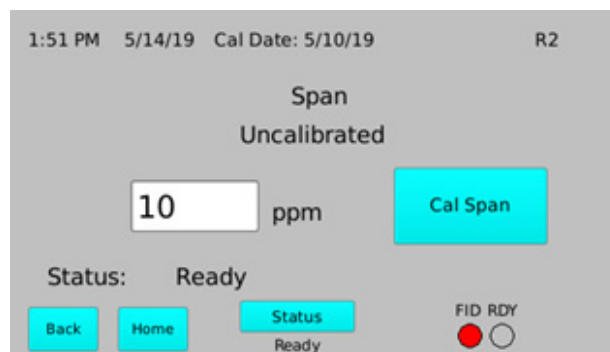


b. **ZERO INTERVAL** – A set zero interval can be set to insure the THA maintains the zero point without any baseline drift. The start time will be set according to a 24:00 hour clock and a repeating set hourly interval by hours. This feature is enabled by an ON/OFF box and Save.



c. **SPAN GAS** - The actual concentration of the span gas must be entered into the set window. It is recommended to use a calibration standard of methane impurity that exceeds the expected sample results by 20%. Example: If the specification of the sample gas is 100 ppm, it is recommended to span it to 120 ppm. Press the Cal Span button to initiate the span sequence. The Cal Span will only calibrate the signal at the set range it is in (R1, R2, R3, or R4). The Cal Span process takes 240 secs (4 mins) and the screen can not be changed or exited during this process.

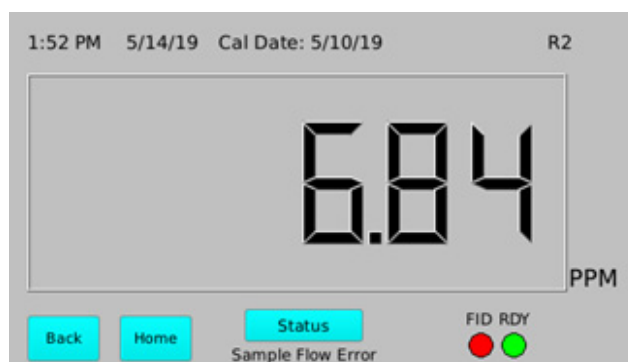
NOTE: THE “UNCALIBRATED” MESSAGE WILL CHANGE TO “CALIBRATED” ONCE BOTH ZERO AND SPAN CALIBRATION PROCESSES HAVE BEEN COMPLETED. THE CAL DATE ON TOP PANEL WILL ALSO BE UPDATED TO THE ACTUAL DATE.



d. **SPAN CHECK** – This feature will allow the Span signal to be checked for drift without having to initiate the SPAN GAS sequence. A Check Pass or Check Fail message will be displayed by Status.

10. RUN

This will place the THA into a measurement screen and display the concentration in ppm values. The 'green' ready indicator will illuminate to show the output signal is being sent (normally open (NO) contacts).

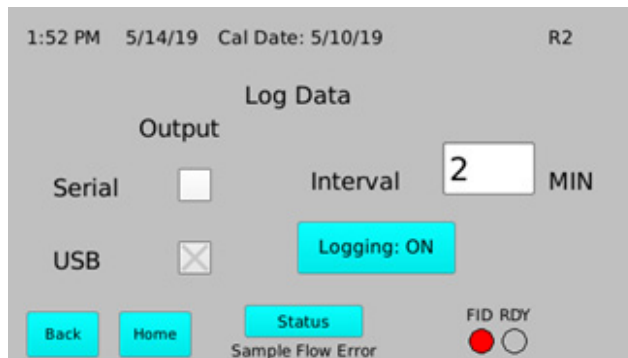


NOTE: IF THE MEASUREMENT DISPLAY AREA READS “OR”, THE FLAME HAS BEEN SATURATED WITH HYDROCARBONS AND IS OVERRANGED. SELECT THE NEXT HIGHER RANGE UNTIL THE “OR” MESSAGE GOES AWAY.

NOTE: IF THE RED FID LIGHT GOES GRAY, THE FLAME HAS BEEN EXTINGUISHED. PROCEED TO THE “IGNITE” SEQUENCE (3. SET-UP D. IGNITE) TO RE-IGNITE THE FID. IF AIR, FUEL, OR SAMPLE NEED TO BE ADJUSTED TO KEEP THE FID LIGHT, THE CALIBRATION PROCESS SHOULD BE REPEATED AS THE STORED CALCULATIONS HAVE CHANGED

11. DATA

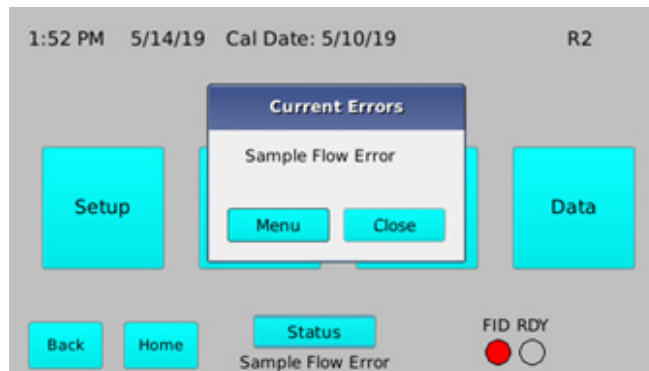
The THA provides a data logger option via Serial output or USB port. A flash drive must be inserted into the USB port to activate the option and will collect and store the data on that drive. The logging option must be turned ON using the toggle button and a record interval must be set in minutes



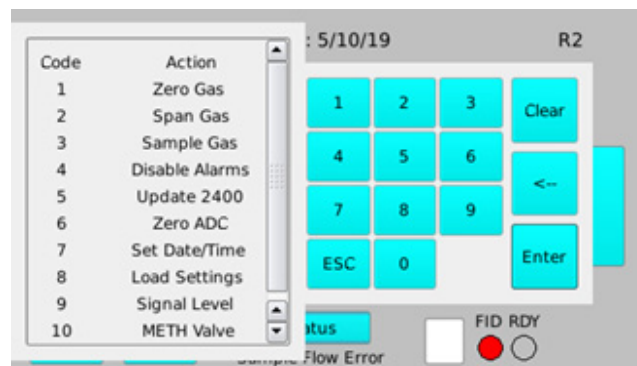
12. STATUS

The Status box at the bottom center will provide information on any errors and provide access to a menu options

- a. Press the Status button to view any active errors on the Series 2400
- b. You can close this status box by pressing CLOSE or continue to the MENU options



- c. The MENU will present a keypad with ten (10) actions that can be activated at any time. Select the Code number that corresponds to the action and enter that number in the white box below the keypad. Press “Enter” to accept the code or “ESC” to exit the menu



Codes/Actions

1. Zero Gas: Will turn on the zero gas solenoid and provide zero gas to the FID. The “Ready” signal (green indicator) will turn off stopping external signal.
2. Span Gas: Will turn on the span gas solenoid and provide span gas to the FID. The “Ready” signal (green indicator) will turn off stopping external signal.
3. Sample Gas: Will turn on the sample gas solenoid and provide sample gas to the FID. The “Ready” signal (green indicator) will turn on and send out external signal.
4. Disable Alarms: Will disable an active alarm from the RUN screen.

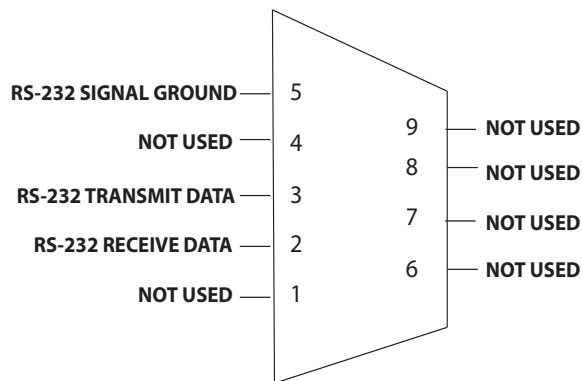
5. Update 2400: A firmware update to the Series 2400 can be installed via USB Flash Drive. Download the latest firmware on a flash drive, plug it into the USB port on the back of instrument and enter code 5. If the firmware version is newer than the current installed version, the firmware will be accepted. The Series 2400 version can be seen on the open flash screen upon instrument start-up.
6. Zero ADC: A manual hardware zero of the electronics.
7. Set Date/Time: Allows the current date and time to be updated. Displayed on top right of screen.
8. Load Settings: Restores previous settings. "Default" will restore to original factory settings. "Last" will restore to
9. Signal Level: Displays raw voltage from FID Detector
10. METH Valve: Turns Methanizer ON/OFF (on Series 2400-CM). Will be displayed in lower right corner when ON

USB Connection

The USB port can be used for Data Logging storage and future GOW-MAC firmware updates. A thumb drive or external hard drive can be connected here to save the Data Log text files. It is important to keep track of how much space is used when collecting data. Once the storage device is full, the data log will STOP collecting data.

1. Serial Data Output

DB9M Pin connections



Communication Settings:

Baud Rate: 9600

Number of data bits: 8

Parity: None

Number of Stop Bits: 1

Data Format: (5 data fields, space delimited)

- 1 Date
- 2 Time (24hr)
- 3 ppm (display reading only no unit)
- 4 Alarm1_state
- 5 Alarm2_state

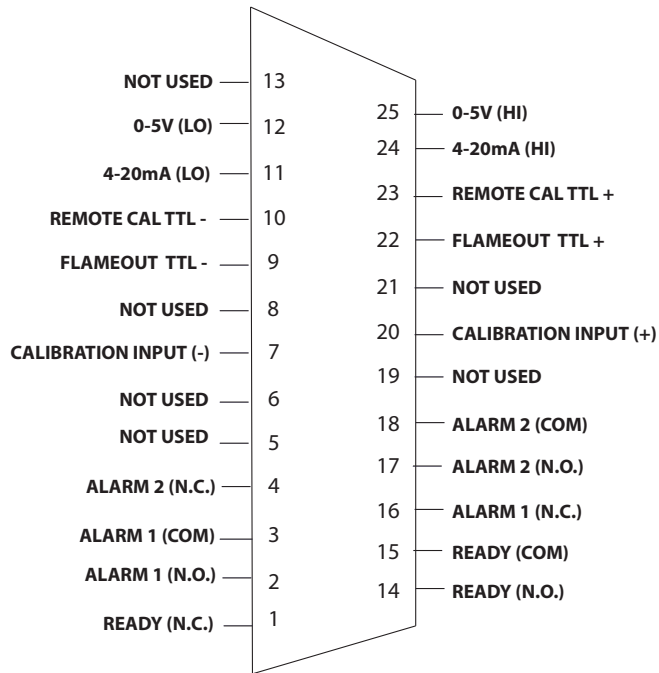
Example set @ 10min Interval

7/01/21 11:10:30 103.018 A1_High A2_Low

7/01/21 11:20:30 105.374 A1_High A2_High

Ethernet Connection Factory use only.

DB25 I/O Connector



2. Analog Outputs

Description: For connection to external data system (Manual Section 5.7)

- a. 4-20mA analog output (* This output is active in "Run Mode" only)
Rating: output protection 240V RMS, 1000 Ohm Load Max

Connections:

Pin 11 (4-20mA) Lo

Pin 24 (4-20mA) Hi

- b. 0-5 Volt analog output (* Active in "Run Mode" only):
Rating: Analog Signal Output: 5V compliance w/ 10Kohm Minimum load

Connections:

Pin 12 (0-5V) Lo-(gnd)

Pin 25 (0-5V) Hi

3. **Status Relay Outputs**

Description: For monitoring system status

Ratings: 30VDC @ 300mA

- a. High / Low alarms (Manual Section 5.6)

Connections:

Pin 4 Alarm 2 N.C.

Pin 17 Alarm 2 N.O.

Pin 18 Alarm 2 Common

Connections:

Pin 2 Alarm 1 N.O.

Pin 16 Alarm 1 N.C.

Pin 3 Alarm 1 Common

- b. Ready Status Relay

Description: Instrument operational status indicator

Operation: Normally Open contact

Normally Open Relay contact will be closed when the 2400 system is calibrated and in "Run Mode"

Connections:

Pin 1 Ready N.C.

Pin 14 Ready N.O.

Pin 15 Ready Common

4. **Flame Monitor Output**

Description : TTL Logic (0-5V) Indicator of flame status

Operation:

TTL (0-5V) "low" – When flame is lit

TTL (0-5V) "high" – When the flame is not lit

Connections:

Pin 9 Flameout TTL –

Pin 22 Flameout TTL +

5. **Calibration Input**

Description: Used to perform remote calibration sequence

Operation: apply (0-5V) TTL "low" or contact closure to activate

Connections:

Pin 10 Calibration input –

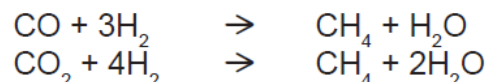
Pin 23 Calibration input +

RUTHENIUM METHANIZER

(Series 2400-CM only)

1. Principle of Operation

- a. The GOW-MAC Ruthenium Methanizer is designed to be used with an FID for the in-line conversion and sensitive determination of CO and CO₂. The conversion is:

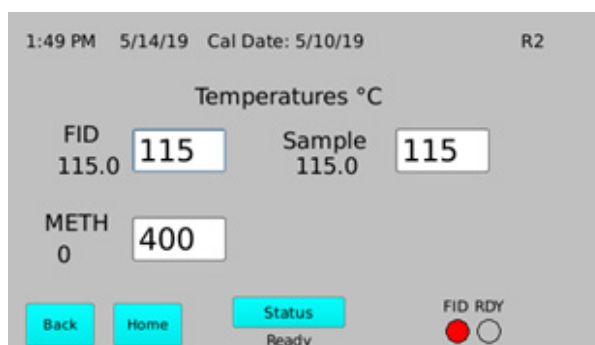


CAUTION: SAMPLES CONTAINING HIGH CONCENTRATIONS OF OXYGEN (% LEVEL) SHOULD NOT BE RUN THROUGH THE METHANIZER AS IT WILL CAUSE DAMAGE TO THE METHANIZER.

TEMPERATURE

- The temperatures for the METH must be set and established before continuing with the setup
- Recommended METH temperature should be 350° C

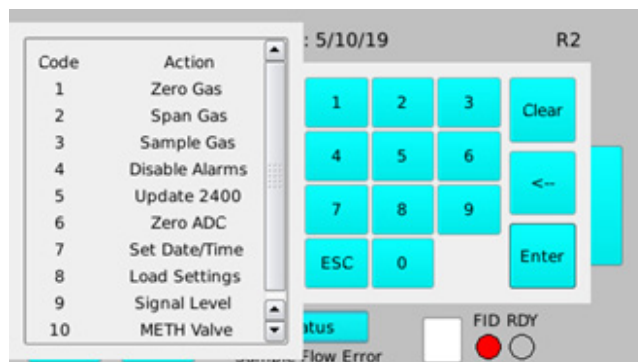
An error message will be displayed under the status box until the temperatures have been achieved. Once the temperatures reach their set values and are stable, the message will read "Ready".



NOTE: FOR BEST RESULTS, THE METHANIZER TEMPERATURE SHOULD BE ALLOWED TO STABILIZE FOR AT LEAST 12 HOURS PRIOR TO CALIBRATING.

2. Methanizer Operation

The Methanizer can be turned ON/OFF from “Status” key and then selecting “Menu”. Enter Code 10 into the white box and press “Enter”. This will open the Methanizer valve and send sample flow through the Methanizer. A METH light will appear and illuminate at the bottom right to indicate the Methanizer is being used.



3. Calibration

Calibrate the 2400 as per Section 4. Calibration using a certified standard containing CO and/or CO₂. If the standard contains both compounds, the calibration point should include both concentrations together. (i.e. If a given standard contains 2ppm CO and 2ppm CO₂, the calibration point will be 4ppm total.) Once calibrated, samples containing CO and CO₂ can now be run through the 2400.

NOTE: THE “METH” FLOW-RATE DOES NOT NEED TO BE CHANGED WHEN OPERATING WITH THE METHANIZER.

4. Methanizer Maintenance

Should the Methanizer lose sensitivity or become contaminated it is recommended that the temperature of the Methanizer be raised 50°C ABOVE operating temperature for 4 hours with a hydrogen (fuel) flow through the catalyst set to 30 mL/min. At the end of the 4 hours, reset the Methanizer to operating temperature. Allow the system to stabilize and run another sample.

CAUTION: THE METHANIZER TEMPERATURE SHOULD NEVER EXCEED 450°C.

If, after several sample runs, the Methanizer still shows low sensitivity, contact the nearest GOW-MAC representative for technical advice.

Contaminants

There are several compounds that will contaminate the catalyst and render it inoperative. They are sulfur and hydrocarbon related compounds, i.e. SO₂, H₂S and ethylene.

Should the methanizer come in contact with these compounds, it is recommended that the unit be replaced by an authorized GOW-MAC representative.

Health and Safety Declaration for the Return of GOW-MAC Instrument Co. Equipment

In order to protect our employees from exposure to various hazards, the following statements and/or questions **MUST** be answered by you. Fill out this document in its entirety and either fax or e-mail it to GOW-MAC Instrument Co., Attn: Repair Dept, **BEFORE** returning the product.

The instrument/part being returned **will not** be accepted into GOW-MAC's facility until we receive this completed document, along with a **PO or Credit Card**. Once approved for return by our Chemical Safety Officer, a **Return Materials Authorization (RMA) number** and shipping instructions will be issued. *All applicable regulations should be followed when returning instrumentation, and/or parts.*

Customer to Record the Following:

Model # / Part # _____

Serial #: _____

Service Technician spoken to: _____

Today's Date: _____

IF THIS FORM IS NOT APPROVED BY OUR CHEMICAL SAFETY OFFICER, THE INSTRUMENT/PART WILL NOT BE PERMITTED INTO OUR FACILITY FOR SERVICING!

- A) Brief explanation of issue: _____
- B) Briefly list the application(s) for which the instrument/part was used, as well as any and all chemicals, gases, and/or materials analyzed and their concentrations. **(Must be filled in):** _____
- C) Is there the possibility of internal or external contamination on or in this instrument/part?
 Yes – see below No – proceed to D.

Please check the appropriate box.

- Chemicals or Substances That Are Hazardous to Health
- Blood, Body Fluids, (e.g. Urine, Secretions), Pathological Specimens
- Regulated Medical Wastes
- Infectious Substances or other Bio-Agents (e.g. Protein, Enzymes, Antibodies)
- Radioactive Isotopes used in the area. Detail type (ECD, Isotopic Labels, etc) and Activity in Micro Curies
- Biodegradable Material That Could Become Hazardous
- Other Hazards _____

If any of the above boxes are checked the following statements and/or questions must be answered.

1. Specifically describe where (on or in) the instrument/part there could be any residual contamination (for example: blood spill on the surface). _____
2. Provide details of these hazards. Include names, Material Safety Data Sheets (MSDS), and concentration of contaminants, where possible. _____
3. Describe the method of decontamination used. Attach Procedure. _____

- D) I declare that the above information is true and complete to the best of my knowledge. I acknowledge that any inconsistencies between the condition of the instrument and the statements made on this form will delay the repair process.

Authorized signature _____ Date: _____

Name (Printed) _____ Phone number: _____

Company name: _____ Fax number: _____

Shipping address: _____

City: _____ State/Country: _____ Zip: _____

E-mail address: _____

BEFORE item can be shipped, fax completed form to: (610) 954-0599 or e-mail it to: repairs@gow-mac.com

For GOW-MAC Use Only:	Signed: _____	Date ____/____/____
<input type="checkbox"/> Passed Safety Inspection. OK to proceed to Repair Dept.	Chemical Safety Officer	Comments: () None
<input type="checkbox"/> Failed safety Inspection. DO NOT proceed to Repair Dept.	RMA No: _____	() On Back >>>>



REP-005
Health-Safety Declaration Doc – ONLINE
Rev.7 1/28/2022, kj

