



IR-208

Gas Monitoring System

USERS GUIDE

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Introduction

The IR-208 is capable of monitoring up to five gases within the same gas sample stream. Because the analysis uses many common parts to do these measurements, a substantial savings can be made when compared to separate analyzers.

The IR-208 utilizes a multiple detector, single beam infrared optical system. The analyzer is sensitized to the selected gases by limiting the infrared spectral energy using specially selected bandpass optical filters and comparing them to a reference filter. Comparing the reactive gas filter transmittance to the non-reactive reference filter characterizes a measure of the gas concentrations. The measured transmittance levels are electronically processed to develop the displayed gas concentration readings. Up to three gases may be measured using IR spectroscopy. The IR-208 utilizes the chemical cell method to measure up to two more gases.

Voltage and/or current analog outputs of each gas for recorded monitoring are optional. Other options for the IR-208 include:

- Pump – Pumps gas through the sample cell
- Filtering – Adds filtering to gas before entering the sample cell
- Probe and Hose Assembly – For insertion in to gas to be sampled
- Printer – Prints readings
- Flow Meter – Indicates if there is an obstruction in the sampling system
- PC Software – Controls IR-208 through a PC and can capture data.

Setup

This section provides a description of the set-up of the analyzer. When you setup the analyzer for the first time, check for any damage that may have occurred during shipping.

POWER UP

The analyzer can be operated from AC power sources. The analyzer will accept 90 – 260 VAC.

The AC power-input connection is a standard 3-wire recessed computer-type connector. Various types of power cords may be used to connect to wall power. Each will have a different connector to be compatible with the various supply voltages and wall sockets throughout the world.

Attach the power cord to the rear of the analyzer and plug the end of the cord into the appropriate power source [1] (in Figure 2.1 on page 10).

Make sure that the sample probe has been placed in an area where there is only air to be drawn into the sample line or that your sampling selector switch is set to “ZERO” on your sampling conditioner.

Connect the sampling conditioners output line to the inlet port on the back of the analyzer.

Tap a line off your zero gas supply line going to your sampling conditioner and connect it to the “zero” port on the back of your analyzer. This line will supply the zero gas to the automated electronic solenoid valve located inside the analyzer.

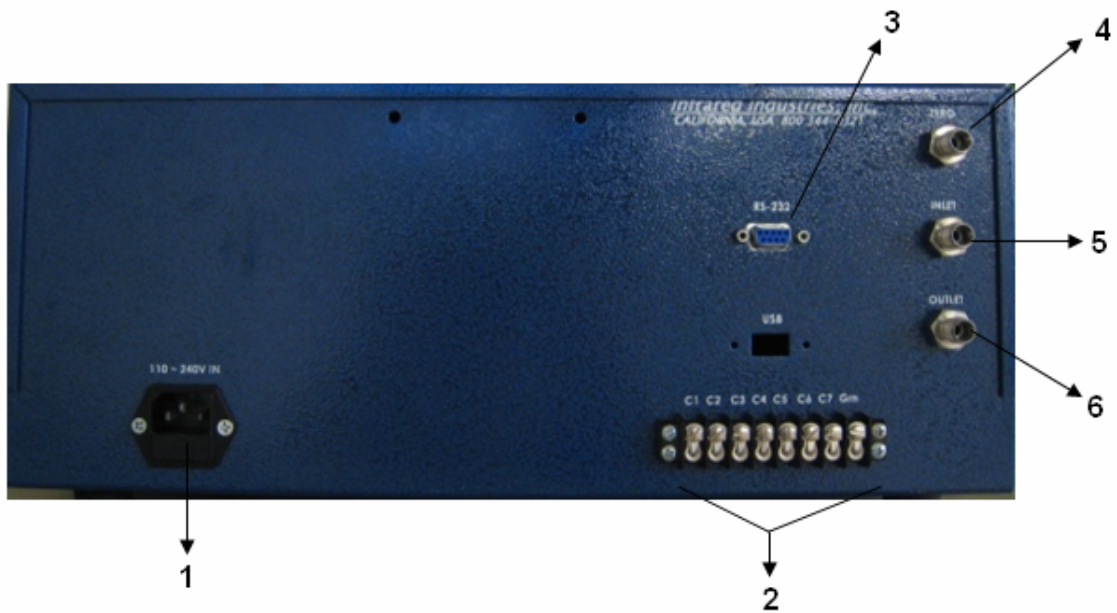
Press the Power button to turn on the unit.

The front panel will then display Please Standby while the analyzer is warming up. The warm-up times may vary depending on analyzer’s internal temperature. The Zero enunciator will remain on for approximately 30 seconds after warm-up period. The zero gas should flow continuously during warm-up if not this could severely affect the accuracy of the analyzer.

After the warm-up cycle is completed press the MEASURE button to begin measurements.

Once the analyzer is warmed up, it is ready to begin measuring gas concentrations. Select the sample line you wish to measure, sample line #1 or #2, and turn on the pump on your sampling conditioner. Press the Measure button [4] (in Figure 3.1 on page 11) to begin measuring the sample stream gases. Allow a few seconds for the gases to reach the analyzer. While in measure mode, you can hold or freeze the display values by pressing the Hold button [1] (in Figure 3.1 on page 11).

Figure 2.1 – Backside of Unit



Power

Analog Outputs

Serial RS232 Connector

Zero Port

Sample Gas Inlet Port

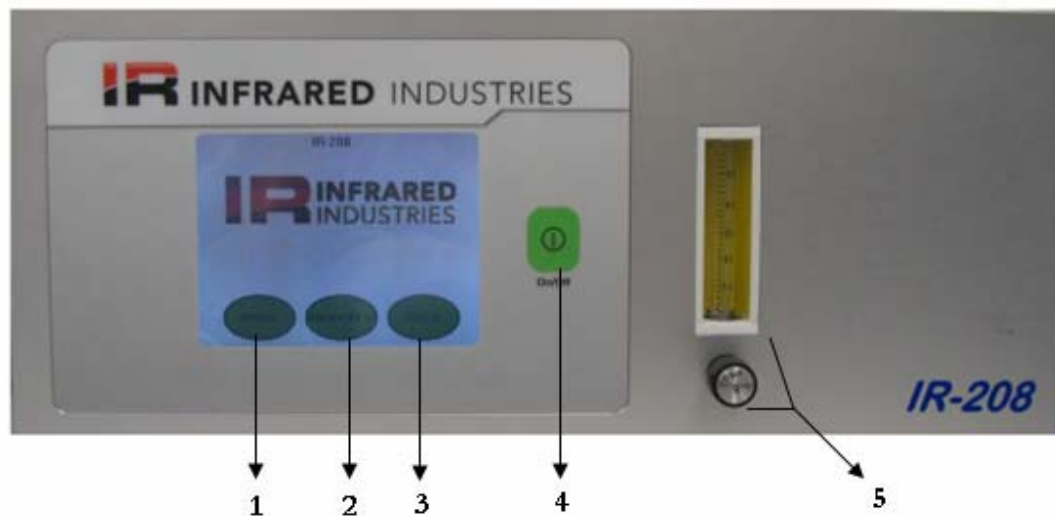
Sample Gas Exhaust Port

- **Fuses** - The fuses installed below the AC power connection provides protection of the analyzer electronics from electrical overload.
- **Serial Communication Port** - The serial Communication Port allows the analyzer to be connected to a PC-compatible computer system or printer (optional).

Display Features

Before attempting to operate the analyzer, review the system features described below as well as all warning labels. Identification and understanding of the physical features of the instrument will make operation easier.

Figure 3.1 Front Panel



1. **Menu** – configuration options.
2. **Measure** – shows measurements.
3. **Zero** – zeroes analyzer.
4. **On/Off** – turns power on and off.
5. **Flow Meter** – regulates flow to the sample cell.

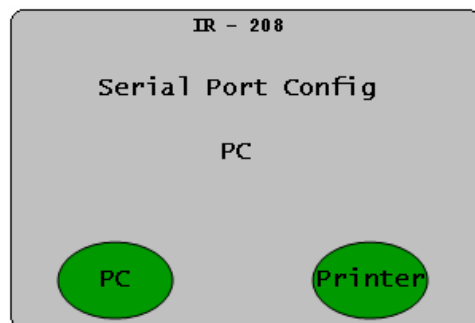
Configuring the Analyzer

The IR-208 has various configuration options that can be set by the operator. This chapter describes each of these options.



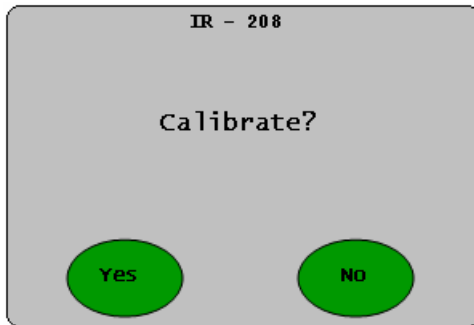
After powering on the analyzer this screen will appear. This is the Home Screen. To enter the configuration options press the **MENU** button when the analyzer is at the Home Screen..

Serial Port Communication

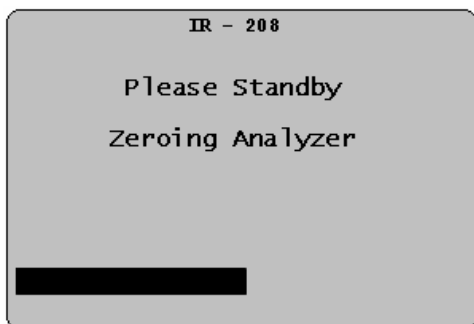


This option defines what is connected to the serial port. The two choices are a PC or an external printer. Simply press the button (PC or Printer) accordingly.

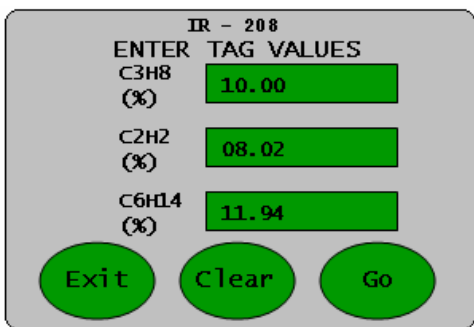
Calibration



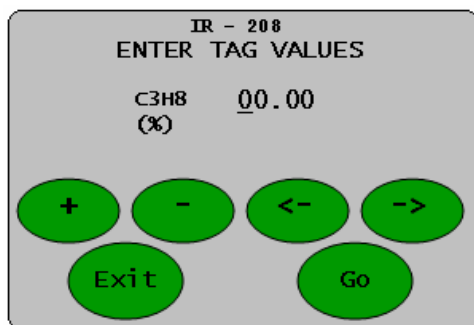
When you have finished your selection you can exit the setup mode by pressing MODE EXIT or go to the next calibration step by pressing MODE.



This window is displayed as the system purges the gas lines. The bar at the bottom of the screen will move from left to right as it completes the task.

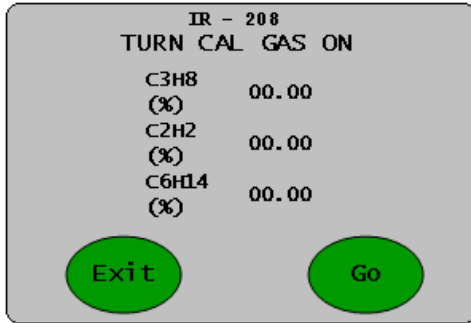


When the purge is complete the next screen will appear. This window is prompting you that the next step will be to enter your tag values. If you want to proceed with the calibration setup press MODE otherwise if you would like to exit without calibrating press MODE EXIT.

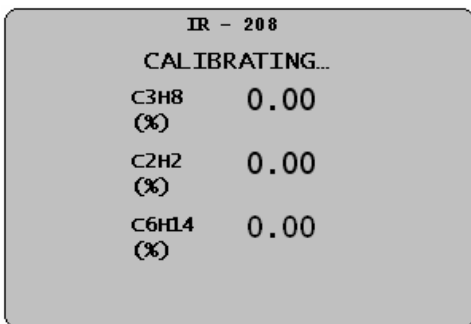


The tag values should be entered just as they are on the calibration bottle. Any gas you do not want to calibrate should be left with a value of zero. O2 does not get calibrated. Fields containing a decimal point require tag values to be entered as percentages. Fields without a decimal point should be entered as ppm.

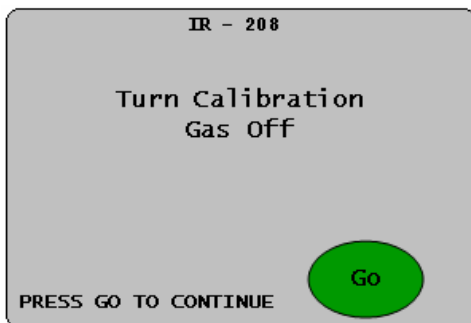
Use ▼, and ▲, to change the number that is currently underlined. To move to another digit or field use the ◀ or ▶ button. You can move to the next window by pressing the **MODE** button. When you are done entering the tag values press the **MODE** button once more until the underline disappears. If you want to proceed with the calibration press **MODE** otherwise if you would like to exit without calibrating press **MODE EXIT**.



At this point you must turn on your calibration gas. When the gas is on press GO otherwise once again you can exit the calibration by pressing EXIT.

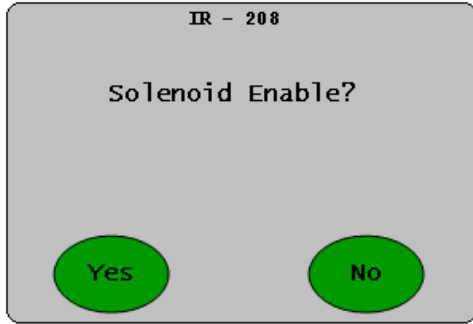


This window will now display the current concentration values for the gases. By watching this window you can see when the gas is stabilized within the analyzer.

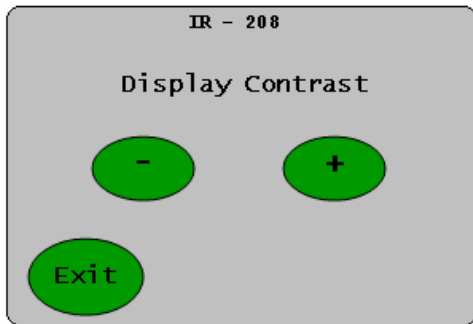


You must press MODE for the calibration to begin. When you press the MODE button, the timeline will display along the bottom of the screen. This tells you calibration is in process. When the calibration is complete you will see:

Press GO. You have now completed the calibration process and the analyzer will do a purge and return to a standby state.



Normally the solenoid is enabled and will turn on when the analyzer is zeroed. The solenoid can be disabled by selecting NO at this screen.



This window allows the user to increase (+) or decrease (-) the contrast for the display.

Using the Analyzer

Warm-Up

PRE WARM-UP LOCKOUT PHASE

The system enters the **PRE-WARM-UP LOCKOUT** phase when power is first applied by pressing the **POWER ON/OFF** switch (main front panel). The system goes into this state for five minutes. During **PRE-WARM-UP LOCKOUT**, the system turns on all the display segments and indicators. All the digital displays show 8888, the decimal points and all the indicators are lit. This is referred to as **LAMP TEST**. The operator should use this phase to ensure that all lights and display segments are functional. Inoperative display segments can easily lead to inaccurate visual readings. The pump runs during this phase to purge any residual gases from the sample hose. During this phase the operator should have the probe exposed to ambient air. The probe should not be near any exhaust. No other modes of operation can be initiated from During **PRE-WARM-UP LOCKOUT**. Warm-up Operate Phase

After the **PRE-WARM-UP LOCKOUT** phase, five-minute time period expires; the unit goes into the **WARM-UP OPERATE** phase. The first function in this phase is an **AUTO ZERO**. After the auto zero, the system tests itself. If the system is stable, it will leave the **WARM-UP OPERATE** phase and move to **STANDBY** mode. If the stability test indicates that the system requires more warm-ups the system will enter the **WARM-UP OPERATE** phase.

In the **WARM-UP OPERATE** phase of the **WARM-UP** state, the system will allow the operator to initiate a measurement. A measurement is initiated in the normal fashion. The system will make the measurement in this mode, and may be at full accuracy. .

In the **WARM-UP OPERATE** phase the operator will also be able to turn the pump on and off by the use of the PUMP switch. The pump can be used normally in this mode to purge the probe or any other purpose.

In the **WARM-UP OPERATE** phase the operator will be able to enter **AUTOZERO** mode

If the operator does not initiate any of the functions allowed in the **WARM-UP OPERATE** phase, the system will wait for five minutes, **AUTOZERO** itself and test again for stability. If the system is stable at the end of that time the system will move into **STANDBY** mode. If the system is still not stable, the system will remain in the **WARM-UP OPERATE** phase, and begin to wait for another five minutes. If during the **WARM-UP OPERATE** phase the operator initiates an allowable operation, the five-minute time period will be restarted when the allowable operation is complete.

The **WARM-UP OPERATE** phase allows measurements to be made quickly after power-up and only slightly outside the specified accuracy limits of a fully warmed up unit.

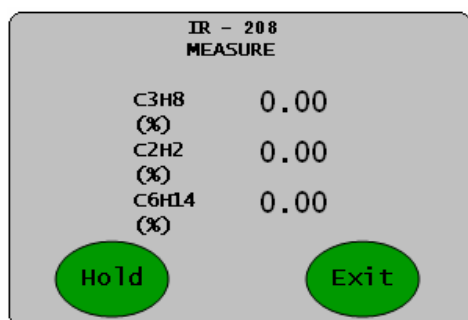
Measuring Gas

MEASURE INITIATION

Pressing the **MEASURE** button will start the **MEASURE** sequence. The first push of the **MEASURE** button lights the **MEASURE** indicator, takes the analyzer out of the **STANDBY** mode and puts it in the **MEASURE** mode. The operator can tell the system in a **MEASURE** sequence because the **MEASURE** indicator is on.

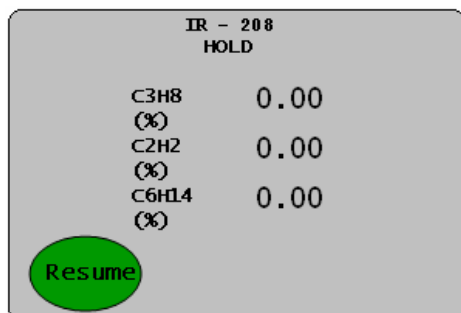
MEASURING

In the **MEASURE** mode, the system is processing the analyzer signals, converting them to concentrations and displaying these concentrations (and Lambda when this option is present) in the digital displays. The **AUTO ZERO** function and the **PUMP** key are locked out in this mode. The **SAMPLE/ZERO** solenoid will be in the **SAMPLE** state which is de-energized or in the normally open position. The pump will be on in this mode. This is when the actual sample stream or exhaust gas is being measured provided the sample probe is inserted into the sample stream. The **MEASURE** indicator will be illuminated; the sample stream will be drawn into the analyzer and measured.



FREEZE DISPLAYS

If it is desired to "freeze" the readings in the **MEASURE** mode, press the **HOLD** push button while in the **MEASURE** mode. This will "freeze" the display and the concentration values will not be updated while the displays are "frozen". Pushing the **HOLD** button while the display is in "frozen" state deactivates this feature.



PRINTER OPTION

Full systems can be ordered with the printer option. The printer is attached to the serial port of the system. The printer is passive and cannot send any serial characters to the system. Therefore the printer will never initiate a protocol command. In the full system configuration the software will send ASCII characters to the serial port when the print button is depressed. If a printer is attached to the serial port these characters will print. The output will represent the value of all the parameters that system measures and calculates at the instant the print button is depressed. The output will be the value of the parameters that were displayed on the front panel displays. The format of the output depends on the options that are in the system.

Calibration

The analyzer as shipped has been calibrated at the factory and is designed to maintain calibration accuracy for extended periods of operation. Due to the sophisticated circuitry used in the analyzer, frequent calibration is not required. However, we recommend a gas calibration about every three months to ensure the integrity of the analyzer. Some regulatory agencies have mandates governing the time intervals between calibrations. It is important to comply with the governing regulations for your industry.

NOTE: *When using calibration gas, the bottle should be kept at about 21°C [70°F] for 8 hours prior to use. Sudden temperature changes can condense some of the components in the bottle, changing their concentration.*

Calibration Gas and Regulator

A bottle of calibration gas is required to check analyzer calibration and to perform calibration. For the high-pressure cylinders of gas, a regulator is needed to monitor the pressure of the calibration gas bottle and to regulate it to the pressure required for testing and calibration.

Calibration gas for your particular analyzer will have a known concentration of gas. The gas is available in a range of concentrations suitable to your application. The recommended calibration gas for your analyzer will be listed in the back of your owner's manual. These values are the default values for the analyzer, which are automatically displayed when initiating the calibration procedure. Using calibration gas with these concentrations eliminates having to enter new values during the calibration procedure.

If you choose to use cal gas with different concentrations, it must be entered under **TAG VALUES** within the calibration menu.

Field Calibrating the Analyzer with Certified Calibration Gases

The analyzer does not need regular field calibration. However, field calibration can be performed when there is reason to believe that the factory calibration is no longer producing accurate analysis results.

The gas analyzer does not require gas calibration very often. Therefore the gas calibration tanks are normally closed. It will be assumed in the calibration process described below that the calibration gas is turned off at the tank.

CAUTION: WHEN CALIBRATING OXYGEN WITH CAL GAS (other than ambient air), THE INTERVALS BETWEEN CALIBRATIONS FOR THE OXYGEN SENSOR WILL BE CONSIDERABLY FURTHER APART - DAYS, WEEKS, OR MONTHS DEPENDING ON HOW OFTEN THE UNIT IS GAS CALIBRATED, AS COMPARED TO THE AUTO ZERO CYCLE PERIODS (MINUTES). BECAUSE THE ANALYZER IS INHERENTLY SPAN STABLE, IT IS BEST IF THE OXYGEN SENSOR IS ALLOWED TO SELF CALIBRATE AUTOMATICALLY ON AMBIENT AIR DURING THE AUTO ZERO CYCLE RATHER THAN TO USE CAL GAS. WHEN ZEROING WITH NITROGEN IT WILL BE NECESSARY TO HAVE AN OXYGEN COMPONENT IN THE CALIBRATION GAS.

***NOTE:** The oxygen sensor and circuitry do not need calibration; they are checked automatically during zeroing. If the sensor deteriorates to the point of needing replacement, a Zero Failure may occur after zeroing. This note does not apply when zeroing with nitrogen.*

In order to calibrate the analyzer press the Mode button [8] repeatedly until you see **FIELD CAL NO** appear on the screen. Press the Up arrow button once to select **YES** and then press Mode. The CAL indicator [4] will be on and the analyzer will enter a purge and zero sequence. Please wait until you see **ENTR TAGS –GO**. Press the Mode button [8] and begin entering the Tag values in each of the windows displaying a gas entity. Use the Up or Down arrow keys to increment or decrement each digit and Left or Right arrows to move to individual digits. Press the Mode button [8] to advance to the next window. Enter all zeros if you do not wish to calibrate a particular gas. We recommend always entering all zeros for O2 window unless you intend on using nitrogen as a zero gas. By pressing the Mode button after entering the last tag value, you will see the message: **TURN CALIBRATION GAS ON –GO**. Make sure the Cal Gas is connected to the **CAL** port in the sampling conditioner. For use with other than an IRI sampling conditioner make sure the calibration gas line is either connected to the sample **INLET** or is “T” into the inlet sample line. Turn on the gas mixture and press the Mode button. You will see concentrations rising on the display. Wait until all the values have stabilized. This may take a few seconds. When the values are stable press the **MODE** button [8] to continue. The **CAL** indicator will be blinking. Do not disturb the gas flow at this point. When the **CAL** indicator turns off, you will see the message: **TURN CALIBRATION GAS OFF –GO**. You can turn off the Cal Gas and turn on your **ZERO GAS**. Within a minute the analyzer will purge the Cal Gas and re-zero itself. The Field calibration will then be complete. Turn off your zero gas, disconnect the hose from the sample inlet and reconnect your sample line or simply select it on your sample conditioner.

Zeroing

Manual Auto-Zero

The operator may initiate an auto-zero cycle any time the system is in **STANDBY**. If the operator pushes the **ZERO** push button when the system is in **CAL** mode (the CAL indicator is ON), the **AUTO-ZERO** indicator will flash to indicate that this may well be a bad time to zero the system (because in **MEASURE** mode the cell is likely to have gas other than air in it).

Auto-Zero Sequence

In the **AUTO ZERO** mode:

1. The sample pump is turned on, (optional)
2. The **SAMPLE/ZERO** solenoid is switched to the **ZERO GAS** and the sample cell is purged completely,
3. The system acquires and stores new zero data

The **AUTO ZERO** cycles last about 25 seconds.

Maintenance

The analyzer requires very little maintenance. The following chart itemizes the schedule for those items that do require periodic maintenance.

Component	Interval
Sample System Supply Line	Check As Required
Sample Conditioner Filter	When a LOW FLOW indication appears*
Calibration	Check Every Three Months or As Required

*Service filters more frequently if analyzer is operating continuously.

Front Panel and Exterior

To maintain the appearance of the analyzer, periodically clean the exterior with a soft damp cloth. Use a mild detergent to remove grease.

CAUTION: DO NOT USE CLEANERS SUCH AS ACETONE, BENZENE, CARBON TETRACHLORIDE, GASOLINE, OR TOLUENE, AS THEY CAN DAMAGE PLASTIC COMPONENTS AND AFFECT ANALYZER ACCURACY IF THEY CONTAMINATE THE SAMPLING SYSTEM.

Gasoline, brake fluid, and penetrating oil spills should be immediately cleaned from the analyzer surface to protect its finish.

Routine Cleaning

The analyzer should be cleaned routinely to prevent the build up of dirt, which can contaminate samples and mar the appearance of the instrument. Clean the exterior case and other accessible parts of the analyzer with a cloth dampened with warm water and mild soap.

Returning the Analyzer for Service

If the analyzer needs service, contact your dealer for complete instructions. If you need to ship the analyzer, pack it in its original container. We recommend that you insure the shipment.

To help in getting effective service, follow these guidelines:

1. Follow all instructions in this manual to be sure that the problem is with the analyzer and not with other equipment, sample purity, or cable connections.
2. If you determine that repair is required, contact Infrared Industries at (800)344-0321 to receive Return Materials Authorization (RMA) number. This is required prior to sending the unit in for repair. Also, be sure to include the following items when returning the analyzer for service:
 - A description of the precise sample and operating circumstances.
 - A brief description of the symptoms.
 - The serial number.
 - Your name, address, and telephone number.

Ship to:

Infrared Industries
25590 Seaboard Lane
Hayward, CA 94545

Voice - 510-782-8100 • Fax – 510-782-8101

Troubleshooting

Analyzer Troubleshooting

There are three failure modes that the analyzer might encounter: General Failure, Zero Failure, and Failure to Calibrate.

For a General Failure and Zero Failure, perform the following procedure:

1. Verify that all the back panel ports are unobstructed, including:
 - Cal gas
 - Zero
 - Sample hose
 - Drain hose
2. Check the sample conditioner filters and pneumatics.
3. If a failure is still indicated, service is required by an authorized Infrared Industries service center.

For a Failure to Calibrate, perform the following procedure:

1. Repeat calibration.
2. If the analyzer still fails to be calibrated, the analyzer can still be used but it will be at reduced accuracy. It should be sent in for service when convenient.

When the default cal values are in use, the analyzer can still be used but the displayed values will be less accurate. It is recommended that the gas calibration procedure be performed to ensure accuracy.

SYMPTOM	PROBABLE CAUSE	SOLUTION
Low sample flow	<ol style="list-style-type: none"> 1. Restrictions in sample hose or probe. 2. Restrictions in sample filter. 	<ol style="list-style-type: none"> 1. Check for kinked, plugged or pinched hose or probe. Clean probe tip with a small pointed tool. Disconnect hose from sample inlet and blow out if necessary. 2. Service filter elements.
Low sample flow during zeroing.	Restriction in Zero port.	Check for obstructions in zero port on the back of the analyzer. (Zero port is under the CAL port.)
All function keys inoperative.	Microprocessor latch-up.	Turn analyzer power switch OFF and then back ON.



Specifications

The following specifications are subject to change without notice:

Repeatability / Accuracy (1)	+/- 1% of Full Scale
Linearity	+/- 1% of Full Scale
Noise Level	1% of Full Scale
Zero Drift (2)	+/- 1% of Full Scale / 24 hr.
Span Drift (2)	+/- 1% of Full Scale / 24 hr.
<u>Speed of Response</u>	
Display	90% of reading in 1 sec (updated every 1 sec)
Output	90% of reading in 1 sec (updated every 1 sec)
<u>Outputs</u>	
Analog – Recorder	Digital Data RS 232 0-100 mV Standard, 4-20mA Optional (others available)
Power	120/240 VAC; 50/60 Hz.
Operating Temperature	0* - 50*C (32* – 122*F)
Storage Temperature	-40* - 75*C (-40* - 166*F)
Warm-up Time	5 Minutes
Power Consumption	< 20 Watts
<u>Size</u>	
Cabinet	9" X 11" X 24.6"
Display	3.6" X 4.75" – Graphic .25" High Digits; 3-5 Digits

Accuracy specifications dependant upon absolute accuracy of the certified calibration gas.

Performance specifications based on stable ambient conditions, and a sample stream that is clean, dry, and regulated to a flow rate of 2-6 SCFH.



Warranty

NOTICE TO BUYER AND/OR USER OF THE ANALYZER:

Exclusion of warranties and limitation of damages and remedies

This analyzer is warranted against defects in materials and workmanship under normal use and service for one year from the date of delivery to the original purchaser.

The sole obligation of the seller and/or manufacturer under this warranty is limited to repairing or replacing as the seller or manufacturer may elect, free of charge at the place of business of the seller or manufacturer, any parts that prove, in the seller or manufacturers judgment, to be defective in materials or workmanship within one year after delivery to the original purchaser.

This warranty shall not apply and is void if, in the opinion of the seller and/or manufacturer, the portable analyzer or any component thereof has been damaged by accident, other causes not arising out of defects in materials or workmanship.

Before purchasing and using this analyzer, the user should determine the suitability of the product for his or her intended use and, the user assumes all risks and liabilities whatsoever in connection therewith.

If a product malfunction should occur, you may contact the seller or the manufacturer at:

Infrared Industries, Inc.
25590 Seaboard Lane
Hayward, Ca. 94545
Voice: 510-782-8100 or 800-344-0321
E-mail: service@infraredindustries.com

If it is necessary to return the analyzer, notify the seller in your area or Infrared Industries at the address above. Contact Infrared Industries for an RMA number, which is your authorization to send the unit. Note the RMA number on the outside of the box. Package the instrument carefully and securely. Do not ship the instrument with accessories. Please include a written description of any observation of the malfunction along with your name, address, and phone number. Then proceed to ship the instrument with freight prepaid to the address above.

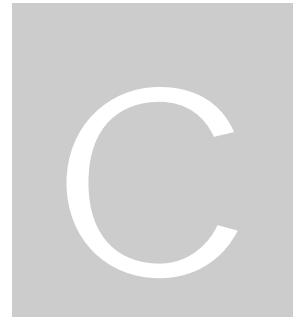
Warranty Exclusions

THIS WARRANTY AND THE SELLER AND/OR MANUFACTURER'S OBLIGATION HEREUNDER IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ALL OTHER REPRESENTATIONS CONCERNING THE SALE, USE AND/OR PERFORMANCE OF THE ANALYZER.

No person is authorized to give any other warranties or to assume any other liability on behalf of the seller or manufacturer. This warranty shall not be extended, altered or varied except by written agreement signed by the seller and the buyer.

Limitations of Damage

IN NO EVENT SHALL THE MANUFACTURER OR SELLER OF THE PORTABLE ANALYZER BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH ANY OBLIGATION IMPOSED UPON THE SELLER OR MANUFACTURER IN CONNECTION WITH THIS WARRANTY. SUCH INCIDENTAL AND CONSEQUENTIAL DAMAGES SHALL INCLUDE, WITHOUT LIMITATION, LOSS OF USE, LOSS OF INCOME, LOSS OF PROFIT (INCLUDING LOSSES TO BUSINESS INTERRUPTION), LOSSES SUSTAINED AS THE RESULT OF INJURY (INCLUDING DEATH) TO ANY PERSON, AND LOSS OF OR DAMAGE TO PROPERTY. THE LIABILITY OF THE SELLER AND/OR MANUFACTURER ON THIS WARRANTY IS LIMITED TO ACCEPTING RETURN OF THE PORTABLE ANALYZER, REFUNDING ANY AMOUNT PAID THEREON AND CANCELING ANY BALANCE STILL OWING ON THE EQUIPMENT. THIS REMEDY IS EXCLUSIVE-REPAIR OR REPLACEMENT PROCEDURE



INSTRUMENT IDENTIFICATION SHEET

MODEL NUMBER: _____

SERIAL NUMBER: _____

CONFIGURATION:	GAS	FULL SCALE VALUE
CH1	_____	_____
CH2	_____	_____
CH3	_____	_____
CH4	_____	_____
CH5	_____	_____

RECORDER OUTPUT: _____

SPECIAL DATA: _____

RECOMMENDED CALIBRATION GAS: _____

ORIGINAL PURCHASER:

DATE OF ORIGINAL SHIPMENT: _____