

IR-400 Series Bench

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OVERVIEW

The IR-400 Gas Analyzer Bench employs NDIR technology offering the capability of measuring up to three (3) gases by Infrared Absorption in a single sample stream. Additional inputs allow for up to three (3) more auxiliary sensors (Chem-Cell for example). The output will provide integrated information on all measured gases. The control and command communication is via RS232.

Infrared Industries provides an Interface Kit which includes an application to aide in control of Bench functions such as configuration, zero, and display of measurements. Alternatively, Infrared Industries will provide tools to assist in developing your own user interface including protocol reference and sample code.

Gas readings are available through the serial interface or through the analog outputs.

GETTING STARTED

REQUIRED MATERIALS

1. Power supply: 12 Volt DC, 4 amp
2. Calibration / Test Gas: Cylinder may be an individual gas or a mix
 - Regulator for Calibration Gas: 0 – 30 PSI recommended
 - Sample Hose: 1/4" ID (material is gas dependent)
3. Flow Meter : Range 0-5 lpm or 0-10 scfh
4. RS232 Serial cable - Male to Female, straight through extension cable (for PC connection).

INTERFACE KIT

- Personal computer with RS232 and Windows Platform (owner supplied).
- InfraView software (included)

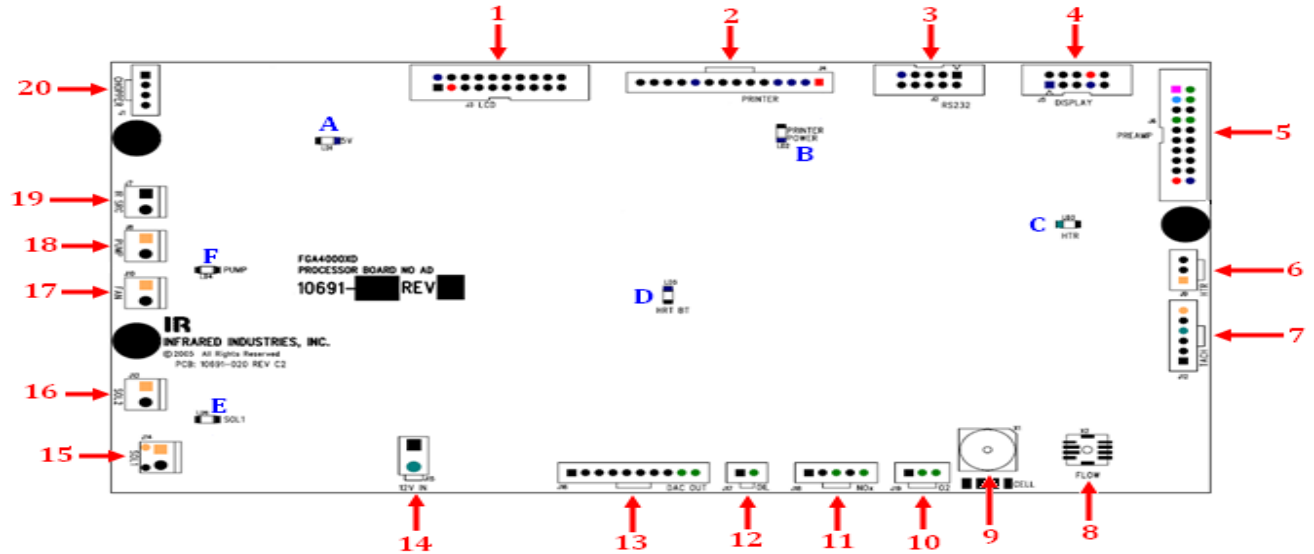
This application package is provided to enable communication with the IR-400 Bench during your initial testing and integration. It is custom labeled for a single Bench configuration. If you have more than one Bench configuration the following applies:
Each bench configuration will have a different "Configuration File" which InfraView reads when it is started. You will need to manually select the "Configuration File" each time you start InfraView based on the bench you want to communicate with so that the appropriate labels and concentration units appear for each gas channel.
- User Developed Interface

If you plan to develop your own User Interface, the following tools are available:

 - Protocol Documentation (Sent upon request)
"Gas Analyzer Instrumentation Command Set and Communication Protocol Description"
 - .dll File (Sent upon request)
Implements the protocol to help ease with your development.
 - Sample Code (Sent upon request)
If you are using C/C++ or Visual Basic as your development language, we can supply examples on interfacing with the serial port through the protocol.

SYSTEM FEATURES

IR-400 Bench Processor Board



CONNECTOR'S

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. LCD Display Driver Pad (optional) 2. Manual Zero 3. RS232 Serial Port – Connection to PC 4. LED Display Connector (optional) 5. Preamp Ribbon Connector 6. Detector Heater Connector 7. Auxiliary Input (Optional) 8. Pressure Transducer Input for Inbound Flow 9. Pressure Transducer Input for Sample Cell Pressure 10. Analog Inputs for auxiliary sensor (optional) 11. Analog Inputs for auxiliary sensor (optional) 12. Analog Inputs for auxiliary sensor (optional) 13. Analog Outputs: 8 Channels maximum, 0-1/0-5/0-10 VDC Output 14. Input Power Connector, 12VDC In 15. Solenoid Power, 10-12 VDC Output (optional) 16. Sample Cell Heater (optional) 17. Fan Power, 12VDC (optional) | <ul style="list-style-type: none"> 18. Pump Power, 12~14 VDC Output
<i>(CAUTION-NEVER CONNECT #19)</i> 19. IR Source Power, 4.2 VDC Output
<i>(CAUTION-NEVER CONNECT #18)</i> 20. Connector for IR Chopper Motor 21. Connection for Sample Cell Temp Sensor
(Location J20 on backside of board) |
|---|---|

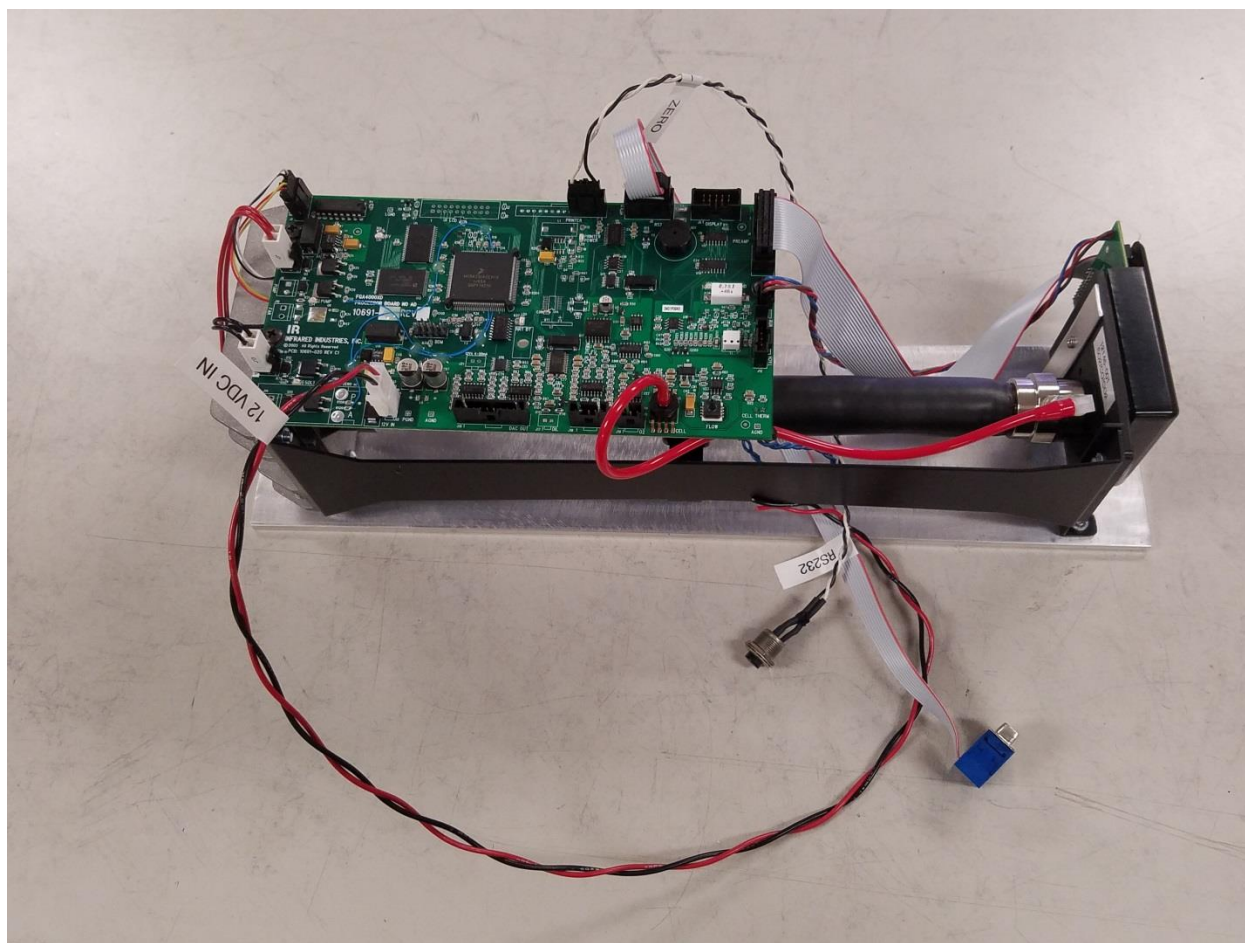
LEDs

- A. 5V – shows VCC is available to the logic section
- B. Zero Signal
- C. Detector Heater Power
- D. Heart Beat – shows CPU has power
- E. Solenoid Power
- F. Pump Power

BENCH SETUP

This section provides a description of the set-up of the bench. Before setting up the bench, check for any damage or loose parts that may have occurred as a result of shipping. Contact INFRARED INDUSTRIES with any questions.

The Bench operates from DC power; the range of input voltage is 12-15VDC. The power connector is at the far side of the bench as pictured below and is labeled “12VDC IN”.



1. Connect Power to Input Power Connector (page 6, connector 14)
2. Connect serial cable between the bench and your PC (if used). You may need an RS232 to USB adapter. (Infrared Industries part #12267-001)
3. Connect analog outputs to your system (if used).
4. Connect gas sample lines (tubing) to sample cell Inlet and Outlet (the tubing from the outlet port should carry the exhaust well away from the bench).
5. The bench must be installed in an enclosure where the temperature can be regulated. The temperature inside the enclosure must be in the range 0 – 40C. Changes in temperature will cause the gas readings to fluctuate.

POWER ON

1. Turn on the power supply. The heartbeat LED on the evaluation PCB should pulse. This shows that the bench is correctly powered.
2. Listen for 5 beeps, which indicate the bench has correctly completed its start-up sequence.
3. Allow approximately 5 minutes for the bench to warm up. The warm-up time may vary depending on the environmental temperature.

ZERO FUNCTION

Once the bench is warmed-up a “Zero” should be performed before measuring gases with the bench. There are two ways to accomplish this function.

1. Zero - Manual

The optical bench is supplied with a contact switch or button which can be used for zeroing the bench. To perform a “Zero” using the switch, the optical bench will first need to be purged of any gas remaining in the sample cell. This can be accomplished by running zero gas (Nitrogen) through the bench for a minimum of one (1) minute, then press the zero button for 5 seconds, release, and wait for two (2) minutes at the end of which time the “Zero” will be completed and you will hear a beep.

2. Zero – Serial Interface

Infrared Industries has a defined serial protocol interface. You can zero through custom software using the serial protocol or through the InfraView Software (provided).

CALIBRATION

CALIBRATION INFORMATION

The bench 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 bench, frequent calibration is not required. However, if a significant change in temperature or pressure has occurred, calibrating will help to adapt to these changes. We recommend using the calibration gas as a test gas to periodically check the accuracy of the bench and perform a calibration if needed. Some locations have regulations governing the time intervals between calibrations. It is important to comply with the governing regulations for your locality.

To initiate a calibration you will need a software program. You may use the InfraView application supplied by Infrared Industries or you may use a custom application which you have developed.

***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 the bench's accuracy 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. An output pressure from the gas cylinder should be 10psi and flow into the bench at a rate of 1-2 lpm. Factory calibration is performed at a flow rate of 1 lpm. The key to a good calibration is to wait for the reading of the calibration gas on the bench to stabilize before issuing the command to calibrate.

Calibration gas has a known concentration of gas. As a default, we recommend using calibration gas concentrations of 80% of the full calibration range (balance Nitrogen). Alternatively, you may choose a Calibration gas that falls into the range expected for your typical sample readings.

CALIBRATION PROCEDURE

Calibration (also referred to as Span) can be accomplished by issuing commands through the serial interface or running InfraView. Below are the steps needed to perform a calibration.

- 1) Run zero gas through the “warmed up” bench for a minimum of one minute.
- 2) Zero the bench. (Bench Zero command).
- 3) Enter the Tag Values
If you are using single gas cylinders to calibrate a multiple gas bench, you must enter zeros for the Tag Value of the gases not in that cylinder.
- 4) Run calibration gas through the bench until the reading is stable.
- 5) Issue a calibration command and wait for the cycle to complete.

ANALOG OUTPUT

Up to 8 Analog outputs are available for connection to other display or recording devices. The range of the outputs is configurable at the factory.

The default configuration is 0 – 10VDC

Also available: 0-1VDC, 0-5VDC

DAC Connector Pin Positions: (page 6, connector 13)

Voltage Signals (1 – 8), Ground Signals (9 & 10)

Available as an option is an add-on 4-20mA board

SAMPLE CONDITIONING

Sample Gas (not from a cylinder) entering the bench must meet the following requirements:

- The incoming sample gas must be cooled to near ambient and any condensate removed. Gas temperature should be between 0 – 40C and stable.
- Water vapor absorbs Infrared light and must also be removed since it can affect the gas readings. This is particularly important when measuring gases that absorb Infrared at or near the same wavelength as water such as NO and SO₂.
- Particulates must be filtered to prevent contamination of the Sample Cell.
- Sample gas should be controlled at a stable flow rate. The ideal flow rate is 1-2 liters per minute. The Bench is calibrated at the factory at a flow rate of 1 lpm at sea level.

OPTIONS

- **Low Concentration Package:**
This option adds a sample cell heater to aide in the stabilization of low concentration measurements, typically 10000ppm and below, particularly helpful with gases that are weak absorbers of Infrared light.
- **Caustic Gas Package:**
This option changes all fittings to stainless steel and the seals to resist specific corrosive gases such as NO, NO₂, & SO₂.
- **4-20mA Output**
An alternative to Voltage Output
- **Special Order Detector:**
If your Infrared gas configuration is a unique combination, it is possible to have a Detector ordered to your specification.

WARRANTY

NOTICE TO BUYER OR USER

Exclusion of warranties and limitation of damages and remedies

This product 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 product or any component thereof has been damaged by accident or other causes not arising out of defects in materials or workmanship.

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 PRODUCT.

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