Instruction Manual

AccuSafe Solo (I-901D)

Fixed Point Gas Detection Instrument

Contents

Interscan
1554 NE 3rd Ave
Camas, WA 98607, USA

Phone: +1 (360) 833-8835
Fax: +1 (360) 833-1914

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Sales@Gasdetection.com

Section 1 – Introduction

1.1. OVERVIEW

The AccuSafe Solo (I-901D) is a cutting-edge fixed gas analyzer tailored for safety and quality management professionals in industrial and laboratory settings. Engineered to continuously monitor up to 21 distinct gases, it boasts an automatic sensor replacement program, ensuring unwavering accuracy. Unlike conventional detectors, its innovative Modular Sensor Cartridge allows seamless sensor interchangeability, enhancing flexibility and efficiency. With features like a vivid PPM display, robust alarms, it ensures resilience against corrosives and particulates.

1.2. IMPORTANT SAFEGUARDS

To reduce the risk of fire, electrical shock, injury to persons or permanent damage to this device, these safety precautions should always be followed:

- Use the included 12VDC power supply or specified power connector to operate this device. Inappropriate voltage supply or power connector could cause irreparable damage to this device.
- Make sure the power plug and Modbus cable are plugged in and secured before powering up the device. The power connector will not make connection to GND if not fully plugged into the socket.
- If sampling via tubing, make sure that the tubes are securely attached to the device before operating.
- Do not operate the device with an obstructed flow path. Obstruction during air sampling will damage the internal micropump.
- Do not expose this device to any liquids.
- Sensors must not be exposed to temperature, humidity and pressure that are outside the operating range.

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1.3. ACCUSAFE I-901D SPECIFICATIONS

Measurements	**Target Gas, RH, Temperature, Barometric Pressure**
Air Sampling Rate	50-350 ccm
Measuring Rate	1 sample per second
Communication	Modbus via RTU/RS485 & TCP/IP
Sampling Port	Inlet/outlet with Luer lock fittings
Operating Environment	0°C - 50°C, 15-90% relative humidity non-condensing
Power Input	12VDC regulated
Avg. Power Consumption	2.5W
Dimensions	8 in x 4.7 in x 2.2 in (includes mounting flanges)
Weight	0.98kg
Enclosure	Powder-coated aluminum

Type	**3 electrode electrochemical**
Nominal Range	See section 1.2.1 below
Accuracy	± 5% of reading ± least significant digit
Response Time (T90)	< 2 minutes (varies widely by gas type)
Temperature Range	-20 °C to 50 °C (varies by gas type)
Pressure Range	atmospheric ± 10 %
Relative Humidity Range	15 % to 90 % R.H. non-condensing
Long Term Output Drift	< 2 - 5 % per month in continuous exposure (varies by gas type)
Lifetime	2 – 3 years (varies by gas type)

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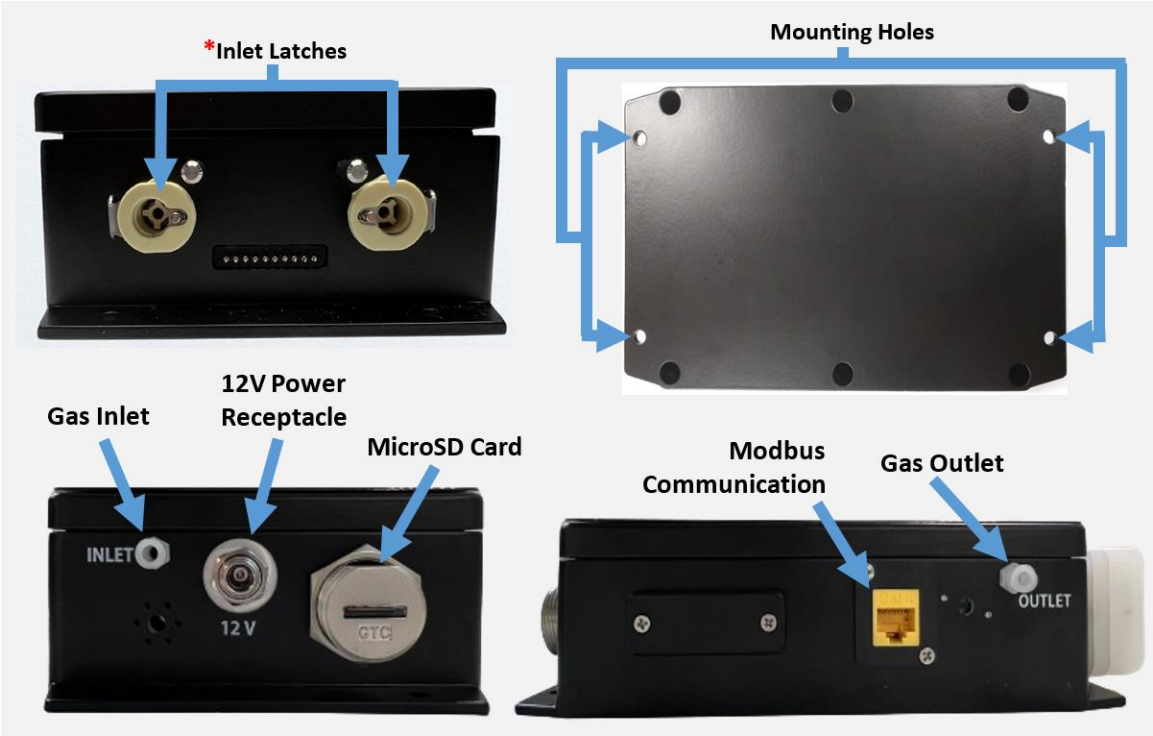
Section 2 – Installation

2.1. ENCLOSURE WALL MOUNTING



AccuSafe Solo Breakdown

The module is wall mountable using M5 or #10 screws. Install the module in the immediate area from which you want to draw the sample. Although consideration should be given to whether the target gas is heavier or lighter than air, generally the AccuSafe Solo should be mounted with the inlet at nose level for the average person. **Allow for 18" total horizontal space to accommodate pneumatic and cabling connections to the sides of the enclosure.**

2.2. WIRING AND PNEUMATIC CONNECTIONS

2.2.1. POWER, CARTRIDGE AND MODBUS CONNECTIONS

To connect the device to power, connect the 12V power adapter, included with your device, to the AccuSafe Solo by inserting the plug into the 12V power receptacle and tightening the lock ring snugly. There is no power switch on the AccuSafe Solo.

Verify that the sensor cartridge is fully seated, though a ~2mm gap between the cartridge and the to the metal case of the AccuSafe Solo is expected.

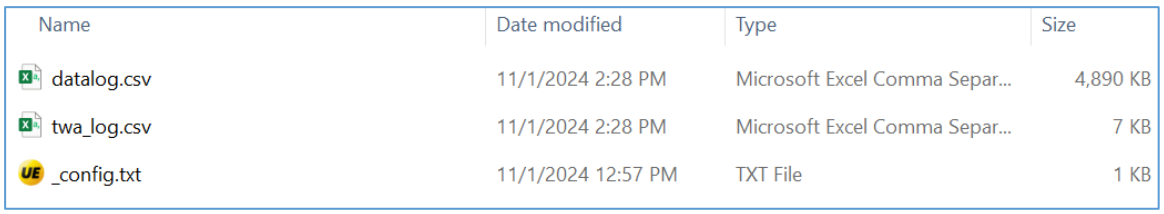
If other devices are to be connecting the AccuSafe Solo, make sure the RJ-45 plug is fully inserted into the RJ-45 jack.

2.2.2. PNEUMATIC CONNECTIONS

Make sure there is no flow obstructions at the inlet or outlet before powering up device, the instrument could get damaged as a result.

2.3. CONFIGURATION, DATA AND TWA FILES

Keep the microSD card inserted at all times except for exporting data file(s) to a PC. The contents of the microSD card is usually the datalog.csv and _config.txt. When TWA is enabled the twa_log.csv is created. If the microSD card is not inserted changes to setting cannot be saved



Name	Date modified	Type	Size
datalog.csv	11/1/2024 2:28 PM	Microsoft Excel Comma Separ...	4,890 KB
twa_log.csv	11/1/2024 2:28 PM	Microsoft Excel Comma Separ...	7 KB
_config.txt	11/1/2024 12:57 PM	TXT File	1 KB

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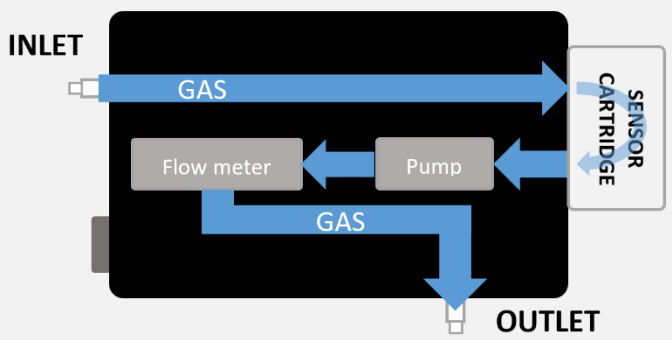
Section 3 - Operation

3.1. PNEUMATIC OPERATION MODES



The AccuSafe Solo is configured to run continuously. The pump draws the gas into the inlet, through the sensor cartridge, and into the flow meter. Gas concentration values are displayed continuously in real time. The sensor cartridge's output signal is communicated via Modbus to the controller which then displays this signal in graphical and numeric forms.

3.1.1. GAS SENSOR CATEGORIES

The durability of the **AccuSafe** gas sensor cartridge varies depending on its exposure to specific target gases. Continuous exposure to these gases may shorten the cartridge's effective lifespan, influencing how often their sensor cartridge need to be replaced. Below, we categorize sensors and gases according to their impact on sensor longevity and the recommended operational approach. For information on cartridge reordering please refer to Section 5 - *AccuSafe Solo Maintenance*.

Sensors for the following gas types rapidly deplete by being exposed to continuous ***HIGH concentration levels***. These are suitable in applications where continuous exposure of ***LOW concentration***, or **occasional spot measurements over the full measuring range** of target gas is expected:

- **CH_2O:** Formaldehyde
- **Cl_2:** Chlorine
- **ClO_2**: Chlorine dioxide
- **CS_2:** Carbon disulfide
- **NO_2:** Nitrogen dioxide
- **O_3:** Ozone
- **SO_2:** Sulfur dioxide

These other gas types rapidly deplete by continuous exposure to the target gas at **ANY** level. **These sensor types should only be used in detection applications where presence of target gas is brief or abnormal:**

- **C_2H_4:** Ethylene
- **C_2S:** Dicarbon monosulfide
- **H_2S:** Hydrogen sulfide
- **H_2O_2:** Hydrogen peroxide
- **HCl:** Hydrogen chloride
- **HCN:** Hydrogen cyanide
- **NH_3:** Ammonia

- **PH_3:** Phosphine
- **SiH_4:** Silane

3.1.2. FLOW RATE

The instrument regulates the sample flow rate by adjusting the micropump speed and monitoring the air flow sensor. The set flow rate used during sensor calibration is programmed into he sensor cartridge**.**

NOTE: It is NOT recommended that the flow rate be altered from its factory setting. Consult with the Interscan service dept. regarding any concerns about flow rate.

3.2. MODBUS CONNECTIVITY

3.2.1. AVAILABLE CONNECTIVITY MODES

The AccuSafe Solo supports the standard Modbus protocol in both RTU and TCP/IP modes. As a stand alone instrument it does not require communicating to external PCs nor other devices. But if there is the desire to do so, 3 communication modes are available and detailed below:

- **AUTO Mode (factory preset mode) –**

  This is the recommended mode and is factory set prior to shipment. In this mode, if the sensor detects a connection to an active Ethernet device, it will initialize Modbus TCP/IP protocol via the default static IP address 192.168.1.50. If not connected to an Ethernet connection, it will initialize in RTU mode.

- **Fixed TCP/IP mode –**

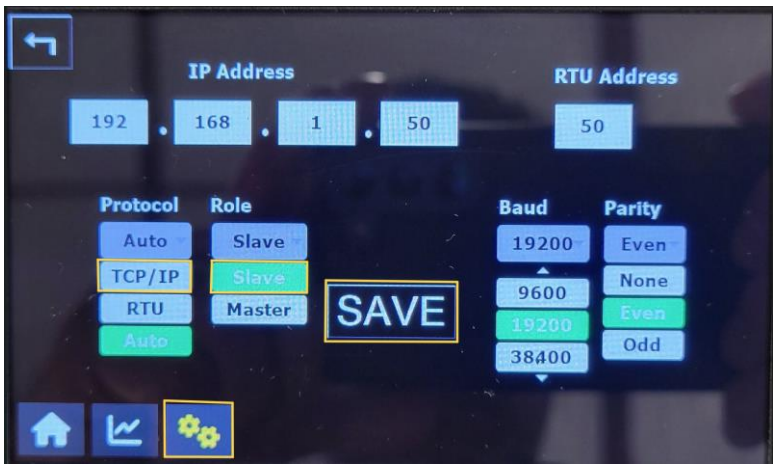
  Upon powering up, the AccuSafe Solo always initializes the Modbus TCP/IP protocol via the default static IP address 192.168.1.XX port 502.

- **Fixed RTU mode -**

  Upon powering up, the AccuSafe Solo always initializes the Modbus RTU protocol via the default static address 50.

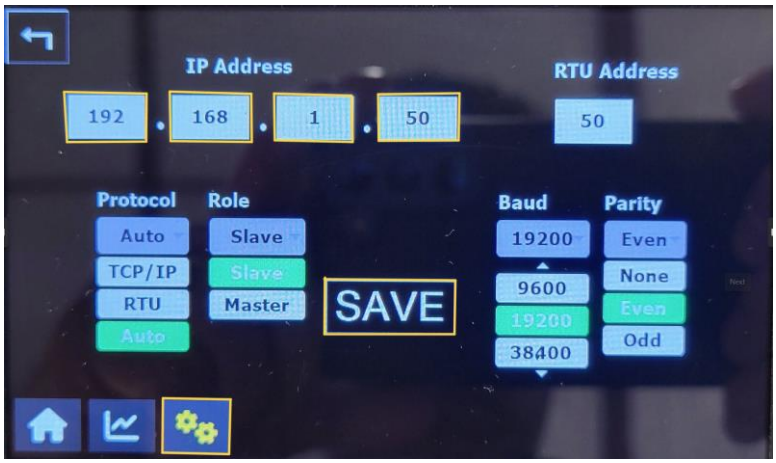
3.2.2. SELECTING CONNECTIVITY MODES

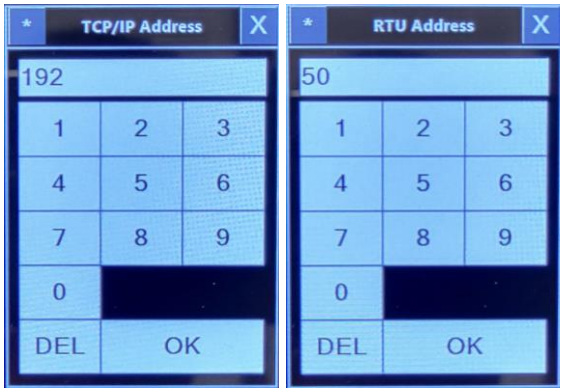
For selecting TCP/IP go to Settings (Gears icon) > System > select TCP/IP > select Slave > SAVE.



To change the IP address go to Settings and update IP Address sections that need change > SAVE > and power-cycle.

NOTE: If any setting in this menu is adjusted, then the device will need a power cycle.





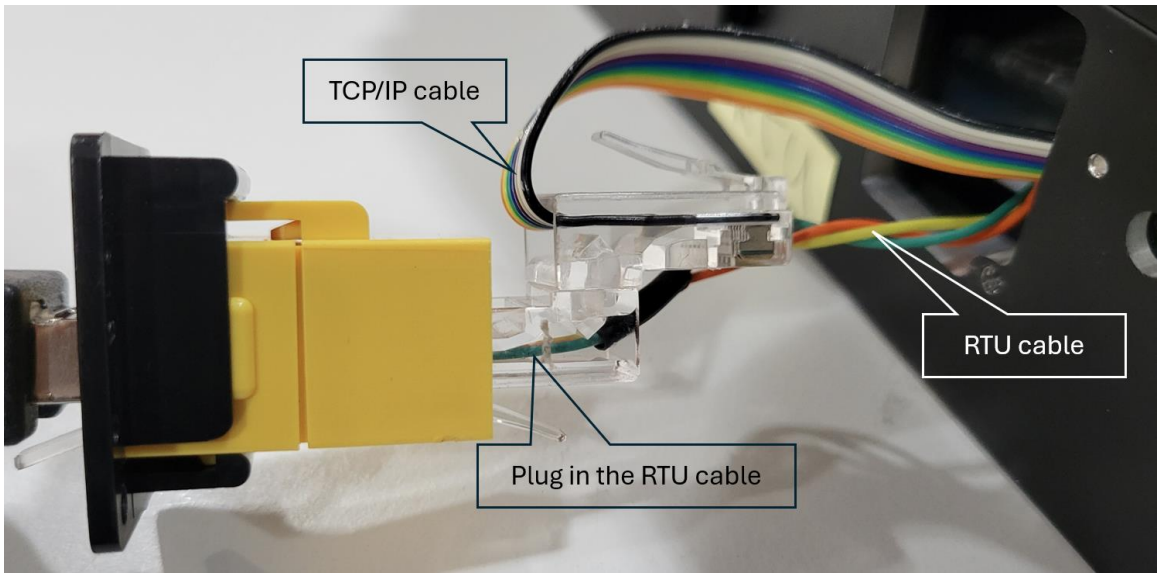
For Selecting RTU go to Settings (Gears icon) > System > select RTU > select Slave > SAVE.

3.2.3. CABLING CHANGES FOR CONNECTIVITY MODES

For TCP/IP communication: The AccuSafe Solo's internal communications cabling is factory configured to operate in TCP/IP mode. Connect a standard CAT5 Ethernet cable between the Ethernet jack of the AccuSafe Solo and the blue Ethernet jack of the AccuSafe Controller.

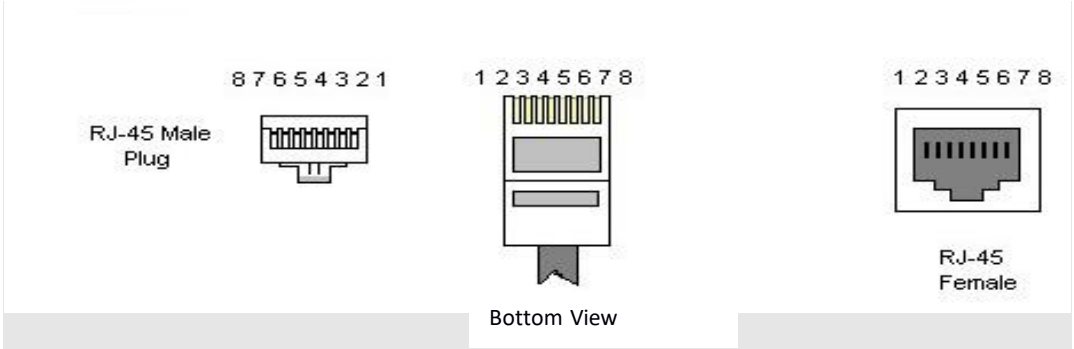
For RTU communication: If operating in RTU mode is desired, the internal communications cabling will need to be reconfigured. Follow these steps:

- Unscrew the yellow RJ45 connector assembly.
- Swap the TCP/IP ribbon cable for the RTU cable.
- Fasten back the connector assembly into the case, do not overtight the screws.
- Connect a standard CAT5 Ethernet cable between the Ethernet jack of the AccuSafe Solo and the yellow Ethernet jack of the AccuSafe Controller.



3.2.4. RTU RS485 PINOUT AND PARAMETERS

RS485 cabling configuration is shown in the diagram and table 3-1 below.



Pin	Name	Type	Description
1			
2	GND	Reference potential	Local device ground
3			
4	B (D-)	Bus In/Out	Driver output and receiver input
5	A (D+)	Bus In/Out	Driver output and receiver input
6			
7			
8			

Absolute Maximum Rating

Voltage range at A or B …… -8V to 12V

Electrostatic discharge at A and B …… ±8kV

RS485 Modbus Parameters

Parameter	Value
Default address	50
Baud Rate	19200
Data bits	8
Parity	Even
Stop bits	1

3.2.5. MODBUS SPECIFICATIONS

- Operates as a slave, half-duplex mode
- Modbus functions supported:
  - 0x01 - Read Coils
  - 0x03 - Read Holding Registers
  - 0x04 - Read Input Registers
  - 0x05 - Write Single Coil
  - 0x06 - Write Single Register
  - 0x0F - Write Multiple Coils
  - 0x10 - Write Multiple Registers

3.2.5. MODBUS RTU IMPLEMENTATION EXAMPLE

See application note "Controlling the DATEXEL DAT3130 Relays With The AccuSafe Solo Over Modbus RTU" for an implementation example.

Section 4 – Device Operations

4.1. MEASUREMENT SCREEN

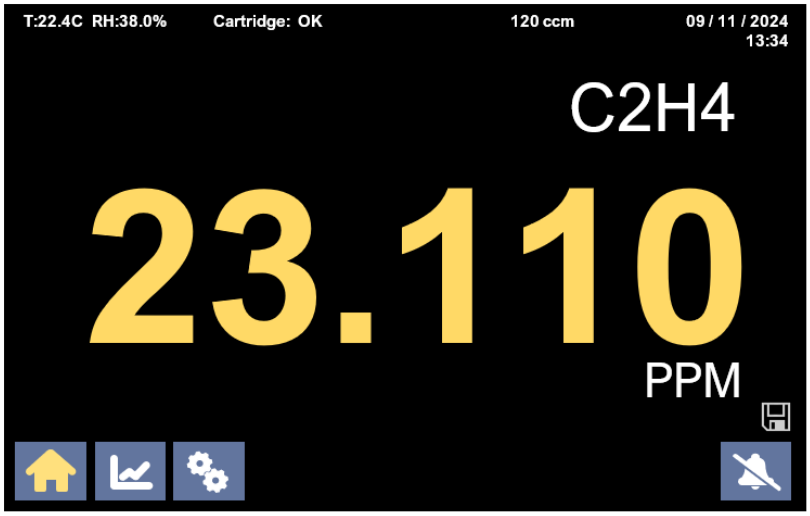
The Home or *Measurement Screen* will appear upon device startup, providing immediate access to real-time gas concentration readings displayed in the center of the screen in parts per million (ppm). For increased precision, the decimal places of these readings can be customized in the *Settings* menu, allowing for more detailed monitoring as needed.

Please refer to the diagram below for a detailed view of the features on the Measurement Screen:

Real-Time Environmental Data: Displays temperature and room humidity. Toggle this feature on or off in Settings.

Volumetric Flow Rate: Shows the current gas flow rate for precise monitoring.

Date, Time, and Firmware: Device date, time, and firmware version display here.



Save Icon: Displays in yellow when measurement data is actively saving to the micro SD card. If the icon appears white, confirm the SD card is correctly inserted and restart the device if necessary.

Menu Bar: Contains options for Home/Measurement (current screen), Graphing Screen, Settings, and Time-Weighted Average screen.

Alarm Button: Toggle to enable or disable the audible alarm.

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1554 NE 3rd Ave
Camas, WA 98607, USA

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Fax: +1 (360) 833-1914

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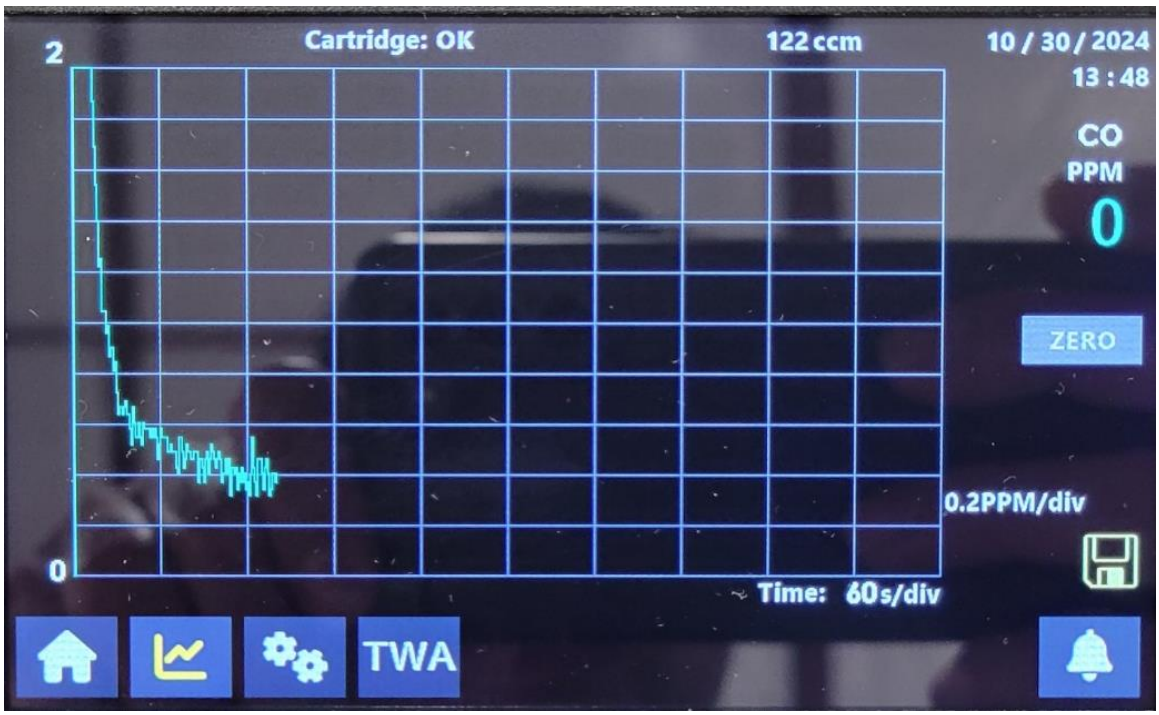
4.2. GRAPHING SCREEN

The Graphing Screen displays real-time gas concentration levels in ppm through a continuous, responsive graph. Users can observe changes in concentration instantly, with the ppm scale adjusting automatically to maintain accurate, up-to-date readings. Upper limit can be set directly on the display to trigger alarms if concentration exceeds it. See Section 4.3.1 – *Alarm Settings* for instructions on how to set them.



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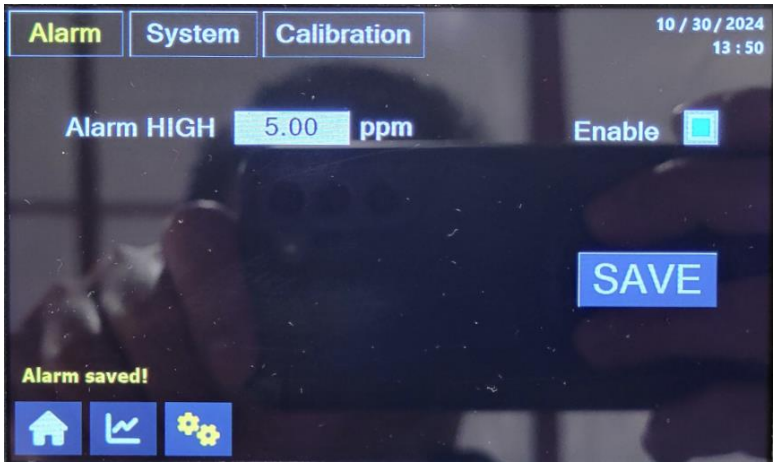
4.3. SETTINGS MENU

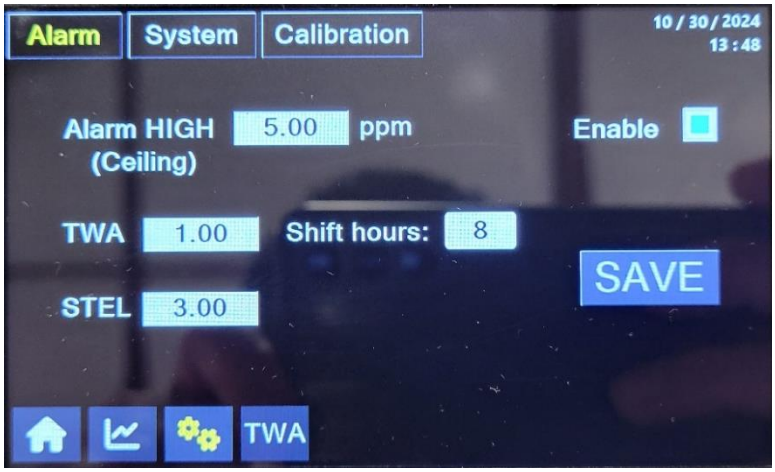
The Settings Menu (Gear) is organized into three sub-menus: Alarm, System, and Calibration.

4.3.1. ALARM SETTINGS

Configure concentration high limit here. Set specific ppm limits to trigger visual or auditory alerts when gas levels exceed safe parameters.



If TWA is enabled, the Alarm screen will include TWA parameters as shown below. More informatioin on TWA can be found in Section 4.4.



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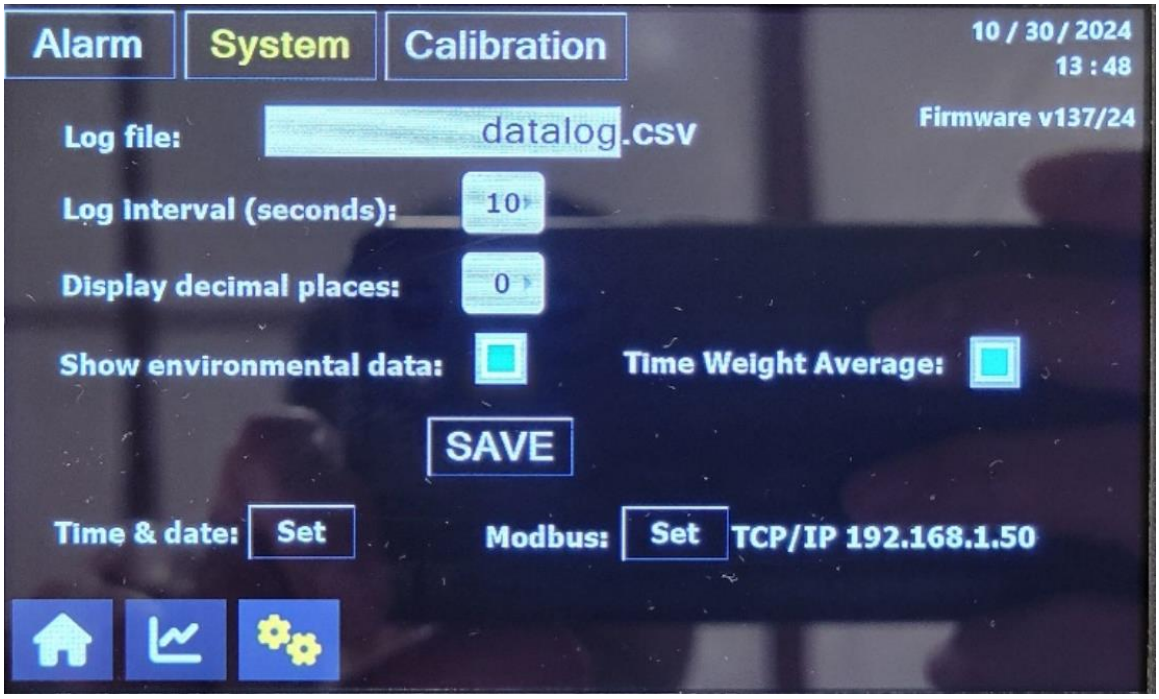
4.3.2. SYSTEM SETTINGS

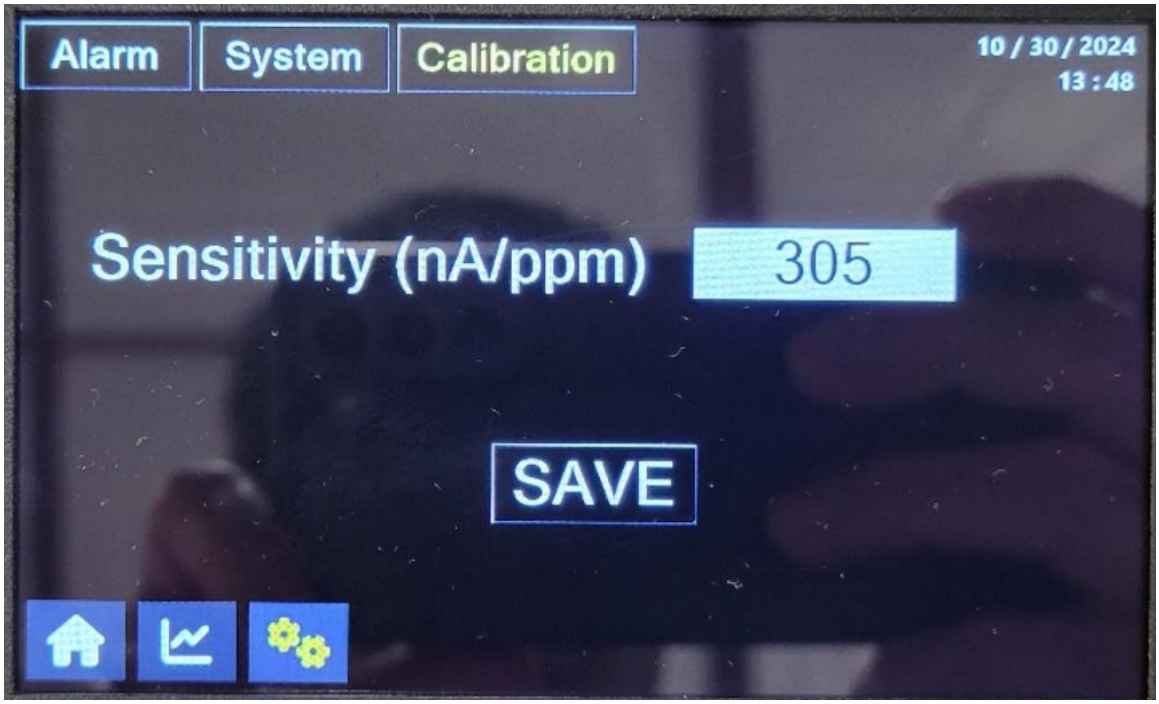
- **Log file:** Specify a custom file name for exported data files.
- **Display decimal places:** Adjust the decimal precision of gas concentration readings displayed on the measurement screen and in exported data.
- **Show environmental data:** Enable this option to display real-time temperature and humidity readings in the upper-left corner of the Home or measurement screen.
- **Time Weighted Average:** Enable this option to track workplace gas exposure limits.
- **Time & Date**: Adjust the device's date and time manually; the device includes a real-time clock for accurate timestamping.
- **Modbus:** Tap on Set to view or reconfigure Modbus TCP/IP or RTU addresses. See Section 3.2 for details.
- **SAVE:** After adjusting any settings, click the **SAVE** button to ensure all changes are applied.



4.3.2. CALIBRATION SETTINGS

All sensor cartridges are shipped factory calibrated. There is a recommended 3-month (quarterly) recalibration interval for all gas types to compensate for natural sensor sensitivity loss. The performance of a sensor or the whole instrument should be checked occasionally with calibration gas. When there is a significant accuracy error in response, calibration may be indicated. Calibration performance depends on several factors including application, environmental conditions, local regulations, and accuracy requirements.

NOTE: Because environmental conditions may differ between factory calibration and installation, it is a good idea to challenge the sensor with a known concentration of gas upon installation to confirm the calibration integrity following shipping. Re-calibration may be indicated if reading error is significant.



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4.4. TIME WEIGHTED AVERAGE SCREEN (TWA)

The AccuSafe Solo provides charts and logs used for monitoring workplace gas exposure limits, referred to as the Ceiling, STEL and TWA.

Ceiling: Is the upper limit of concentration that should never be exceeded for any instant during the working day, without personal protective equipment (PPE).

STEL (Short-Term Exposure Limit): Is the average concentration over any 15-minute interval.

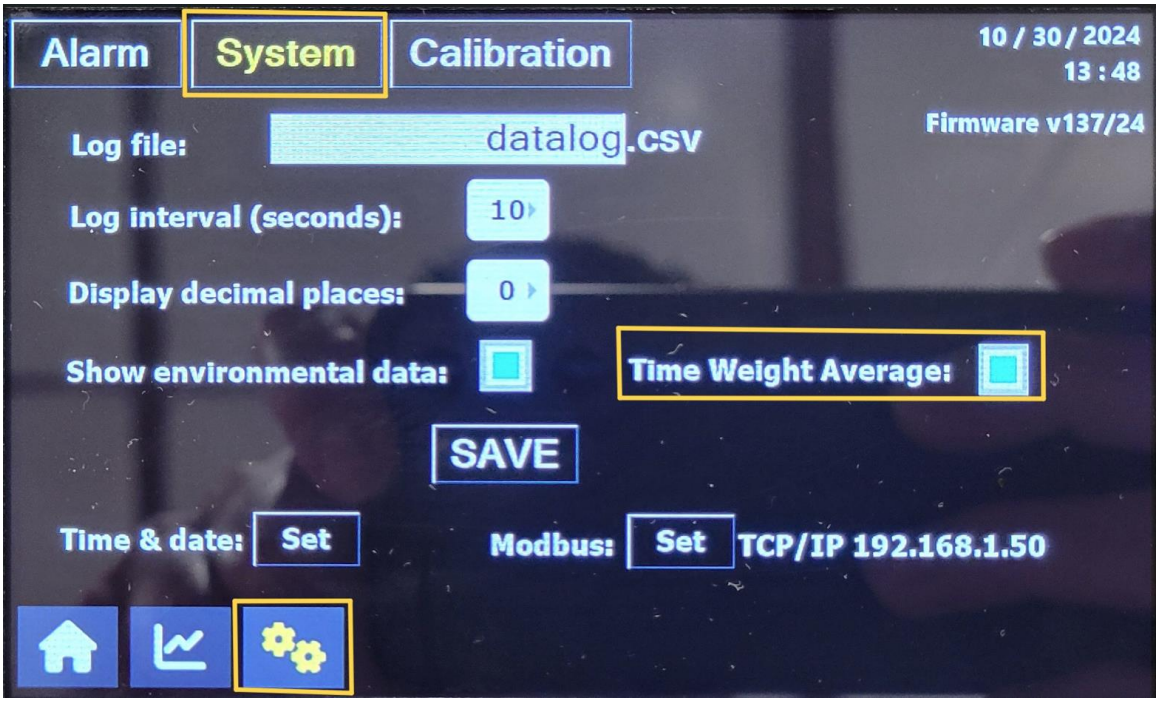
TWA (Time-Weighted Average): Is a cumulative value, it never decreases. The TWA Dose is calculated as follows for an 8 hours work day shift:

$$TWA\ Dose\ =\ Avearge\ Concentration\ x\ hours\ exposed\ /\ 8\ hours$$

The work day shift can be changed anywhere between 1 to 24 hours on the AccuSafe Solo.

Enabling workplace gas exposure limit monitoring (often referred to as TWA for simplicity):

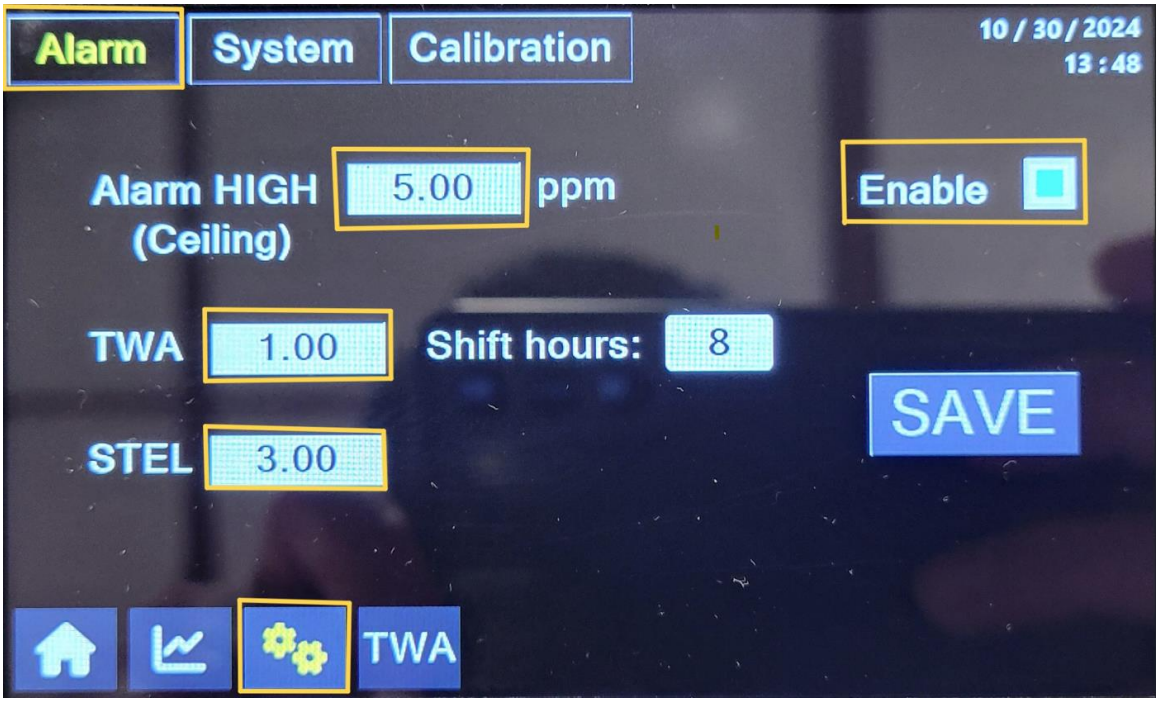
Gears > System > Time Weighted Average checkbox > Save



Setting the TWA gas exposure limit fields:

Gears > Alarm > Enable checkbox

Update the Ceiling, STEL and TWA limits > SAVE. Note: Follow the regulations for your area.



Press on the Play icon to start the TWA capture, and enable the audible alarm to be warned of concentrations going over any of the 3 limits; Ceiling, STEL and TWA.

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- The LIVE indicator is the measurement taken every second; a copy of the value displayed in the HOME screen.
- The numbers on the upper and lower left next to the Y-axis are based off the Ceiling value.
- The Runtime is for how long data have been captured.
- The capture can be Pause and Played as well as Stopped.

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Section 5 – AccuSafe Solo Maintenance

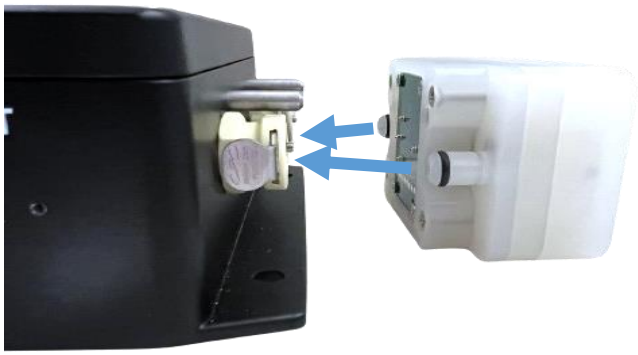
5.1. REORDERING SENSOR CARTRIDGES

Sensor cartridge replacements can be reordered from **Interscan**. Either follow the **Sensor Reorder** link or email us at **sales@gasdetection.com.**

5.2. SENSOR CARTRIDGES REPLACEMENT

To install the cartridge:

1) Align the inlets of the cartridge with the inlet latches on the AccuSafe Solo.
2) Apply pressure and push until you hear a clicking sound. This sound indicates that the cartridge is securely installed.



To remove the cartridge:

1) Press inward on the latches until you hear a click while firmly pulling the cartridge away from the device.

5.3. RECYCLING SENSOR CARTRIDGES

In the USA & Canada to recycle sensor cartridge, **email Interscan at sales@gasdetection.com** to request a prepaid return label. Include your name and shipping address. Outside USA and Canada follow local regulations for recycling.

Section 6 - Warranty

INTERSCAN CORPORATION warrants any AccuSafe series instrument and gas sensor to be free from defects in material and workmanship for a period of one year from date of shipment.

INTERSCAN CORPORATION*'s* sole obligation under this warranty is limited to repairing or replacing, at its option, any item covered under this warranty, when such item is returned intact, prepaid to the Factory (or designated service center).

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons, or which have been subject to misuse, negligence, or accident, incorrect wiring by others, installation or use not in accordance with instructions furnished by the manufacturer, or which have had the serial numbers altered, effaced, or removed. The sensors are factory-sealed and must not be opened or modified in the field for the warranty to remain in effect. This warranty is in lieu of all other warranties whether expressed or implied.

This warranty does not apply to any of our products, that have had any program and/or software changes incurred, without written authorization from ***INTERSCAN CORPORATION***.

Additionally, warranty on any component shall not exceed the manufacturer's warranty given to ***INTERSCAN CORPORATION***.

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Section 7 - Customer Service

The **INTERSCAN** Customer Service Department can be reached at the numbers listed below:

Toll-Free: **360-833-8835 x215**

FAX: **360-833-1914**

E-Mail: service@gasdetection.com

7.1. RETURN AUTHORIZATION

All units being returned for repair or service require a RETURN AUTHORIZATION NUMBER issued by the INTERSCAN Customer Service Department upon request. This is required to ensure the problem truly needs factory service.

In many cases, problems can be resolved in the field by the user. Contact the INTERSCAN Customer Service Department as noted below to acquire a RETURN AUTHORIZATION NUMBER. The RMA will expedite prompt return of the repaired unit.

The RMA request form can be found at the following link online:
http://www.gasdetection.com/contact-interscan/rma-request/