SuperSystems
incorporated

Single Gas Analyzer For CO, CO_2, or CH_4

OPERATIONS MANUAL

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Introduction

SSi provides single gas analysis technology for use in heat treating and other production environments. The Single Gas Analyzer (SGA) includes a color touch screen and detection cell with intelligent electronics contained in a metal enclosure designed for rugged industrial environments. The SGA is preconfigured for detection of CO, CO_2, or CH_4, depending on customer needs. Trend charting is available via the touch screen. Control and monitoring are possible with the touch screen interface and Ethernet-based web interface.
The SGA also includes onboard datalogging and communications via serial connection, USB, or Ethernet.

Specifications

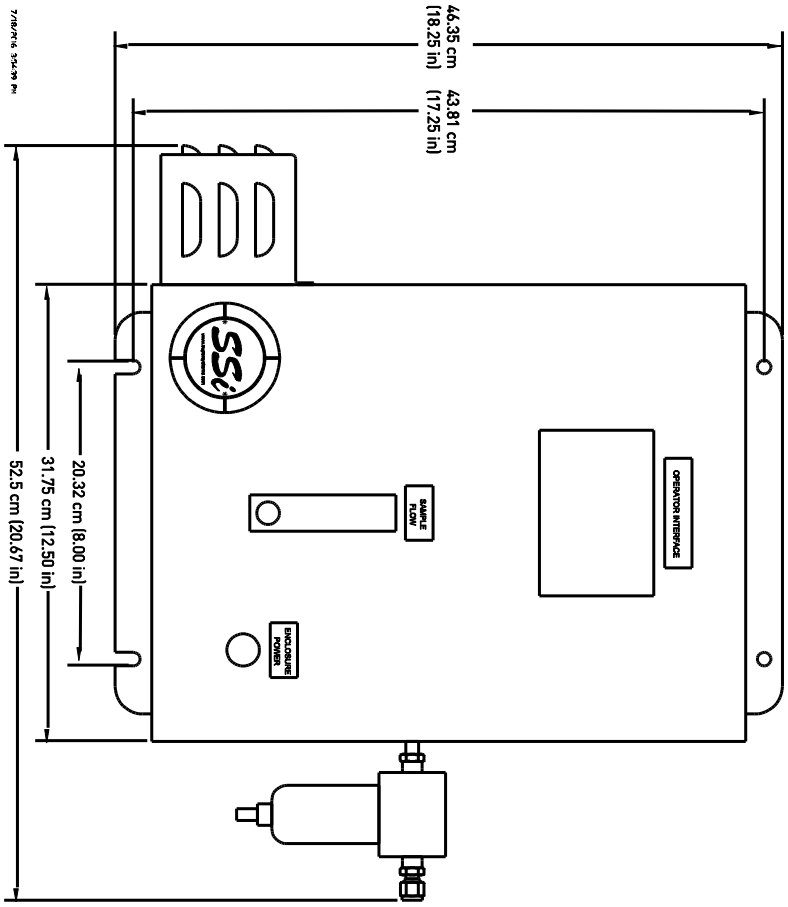
Gas Measurement Specifications

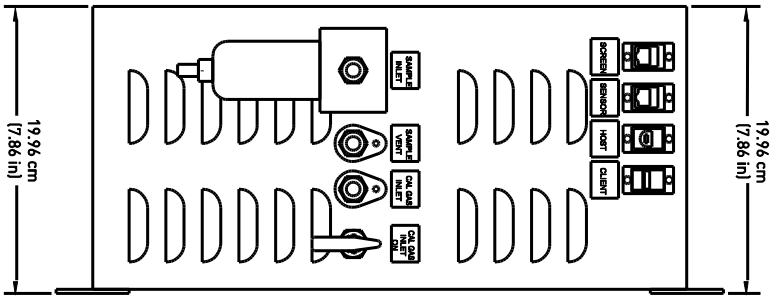
CO_2 Sensor	
Standard Range	0 – 2.000%
Optional High Range	0 – 20.00%
Accuracy (Standard Range)	±0.006%
Accuracy (High Range)	±0.2%
Resolution (Standard Range)	±0.001%
Resolution (High Range)	±0.01%
Measurement Method	Non-Dispersive Infrared (NDIR)
CO Sensor	
Range	0 – 100.00%
Accuracy	±0.2%
Resolution	±0.01%
Measurement Method	Non-Dispersive Infrared (NDIR)
CH_4 Sensor	
Range	0 – 100.00%
Accuracy	±0.2%
Resolution	±0.01%
Measurement Method	Non-Dispersive Infrared (NDIR)

Single Gas Analyzer (SGA)

Response Time	0 – 6 seconds
Power Supply Input Voltage	110VAC or 230VAC
Maximum Operating Temperature	122 °F (50 °C)
Analog Outputs	2 (4-20mA or 0-5 V)
Serial Communications	2 RS485 ports using Modbus RTU, configurable baud rate
Ethernet	1 port
USB	1 Type A port, 1 Type B port

Mechanical Diagrams





Initial Network Configuration

This section is intended for use by persons familiar with Ethernet network setup.

In order to work correctly, the unit must be properly configured for the network to which it is connected. To locate the unit's IP address, first connect the unit to an Ethernet network using the appropriate cable.

If you already know the IP address of the web interface, skip to the Network Configuration section on page 28. The network configuration is described in this section.

The IP address of the unit can be found by using SSi's *nLocateIP* software. This method is described in the following subsection.

nLocateIP Method

Once the unit is connected to the network, you should be able to locate it on the network using SSi's *nLocateIP* software. This program is available from SSi. To use it in locating the unit on the network, follow these steps on a Windows-based PC:

1. Ensure that the unit is connected to the network.
2. Open the *nLocateIP* program.

Figure 1 - Opening nLocateIP program

3. Once the program opens, click the **Search** button. The program will begin searching for SSi devices connected to the network.

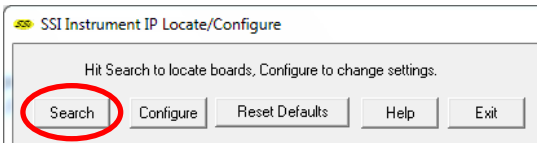
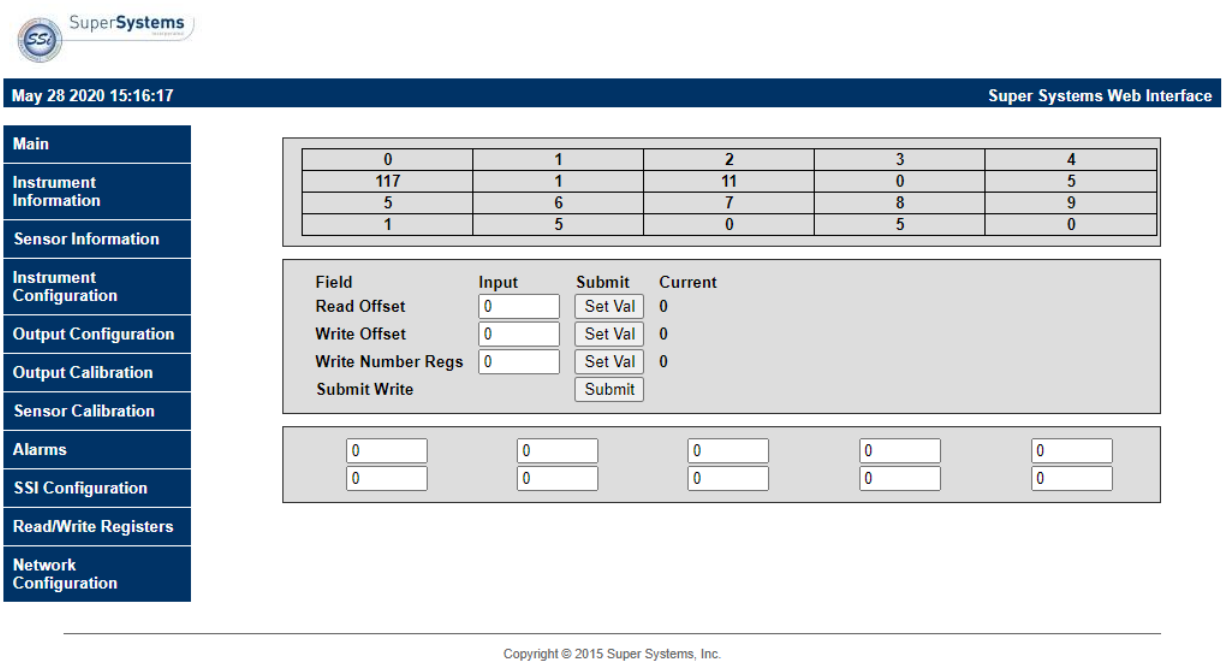


Figure 2 - Search button in nLocateIP

4. Look for identifying text in the list of instruments. The corresponding IP address is the IP address that you will want to use.

Once you have found the IP address, you should be able to complete any additional network configuration using the web interface. See the

Read/Write Registers



The Read/Write Registers page gives access to the underlying Modbus registers of the SGA. This page is primarily intended for testing and troubleshooting purposes.

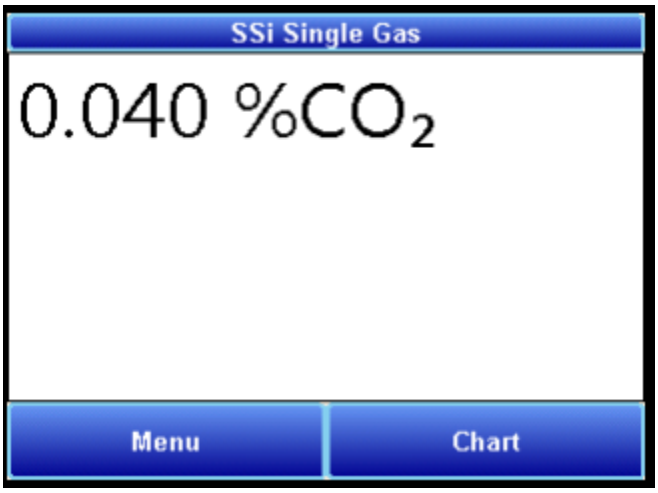
Please contact SSi before attempting to make any changes to the settings on this page.

Network Configuration section on page 28.

If you are unable to find the unit in the list of devices, it is possible that a network setting (such as subnet mask) may be different, the unit may be connected to a different network, or the unit may not be powered on. SSi recommends consulting an IT engineer or network administrator. If needed, call SSi at (513) 772-0060.

Touch Screen Interface

Main Screen



The Main screen shows the current percentage of CO_2. From here the user can enter the **Menu** screen or the **Chart** screen.

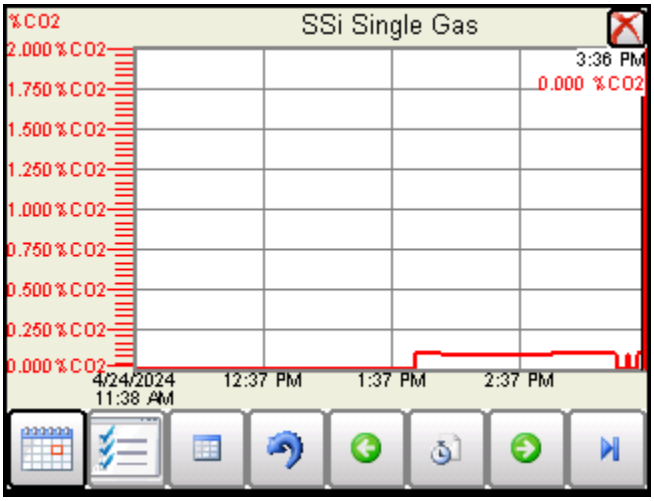
Menu Screen

The **Menu** screen allows the user to log in to gain access to additional functions. Pressing the **Login** key at the bottom of the screen will allow the user to enter a login user and password. User names and passwords are case sensitive. There are three levels of security for the menu system: **Operator**, **Supervisor**, and **Administrator**. Pressing the **Login** button will allow the user to enter a user name and numeric password to log in. When the menu screen is first displayed, the operator-level menu options are visible. The supervisor menu options will be displayed with the login number 1. The Administrator menu options will be displayed with the login number 2.

To select a menu option, tap on the touch screen to highlight it, then tap the **Detail** button.

The Menu options are described later in the manual.

Trend Chart

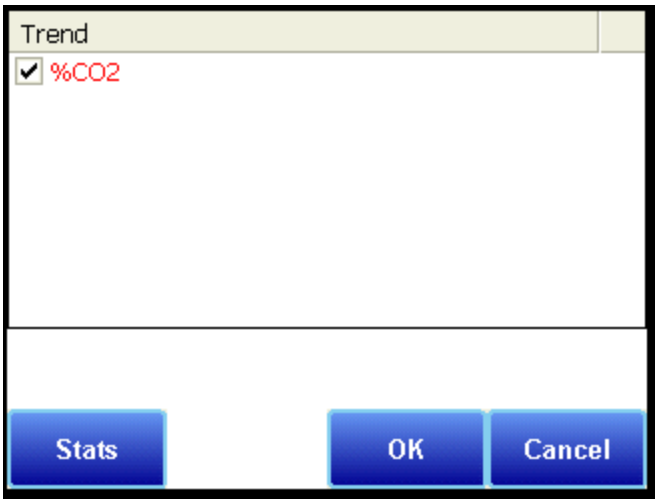


The Chart Display shows between 1 hour and 24 hours of chart data on the screen and can be scrolled back to view all of the data stored on the hard drive. The vertical timelines change as the time changes on the screen.

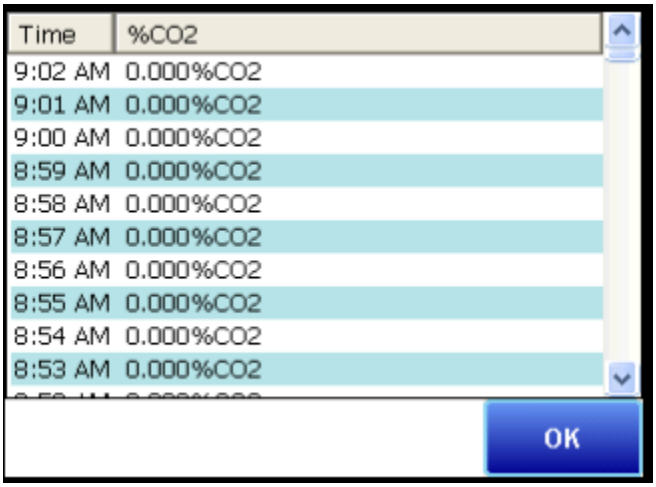
The function buttons run along the bottom of the screen.

The calendar button - - allows the user to view information for a specific date.

The Trend Lines button - - will allow the user to select or de-select the trend lines on the trend chart to display. If the checkbox next to each trend line is checked, then that trend line will be displayed.



The Datagrid View button - - will display a screen with the trend data in a grid format instead of with trend lines. The trend data is shown in 1-minute intervals.

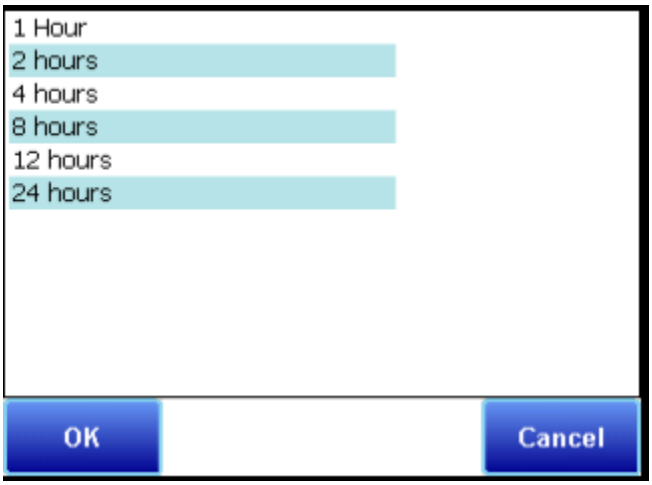


Clicking on the **OK** button on this screen will close the screen down and return to the Chart Display screen.

The Refresh button - - will refresh the screen's trend data if the screen is not in real-time mode.

The left-pointing green arrow button - - will move the chart's view backward in time by the specified chart interval.

The chart interval button - - will determine the number of hours displayed on the trend chart.



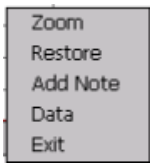
The options are: **1 Hour**, **2 Hours**, **4 Hours**, **8 Hours**, **12 Hours**, or **24 Hours**.

The right-pointing green arrow button - - will move the chart's view forward in time by the specified chart interval.

The play/pause button - - will put the chart into real-time mode if it is not in real-time mode, or take the chart out of real-time mode if it is. When in real-time mode, the chart will automatically be updated once a minute.

Chart Sub Menu

There is a sub-menu available by putting a finger or a stylus anywhere on the chart and holding it there for two seconds.



The sub-menu will have the following options available: **Zoom**, **Restore**, **Add Note**, **Data**, and **Exit**.

The **Zoom** option will allow the user to zoom in on a particular part of the screen. Once this has been selected, the user can take a stylus or a finger and create a box around the desired data. Once the user releases the stylus or finger, a zoom is no longer possible, and the user will need to re-select the option from the sub-menu to zoom in again.

The **Restore** option will back out of any zoom options that have been performed and display the chart screen as it initially was.

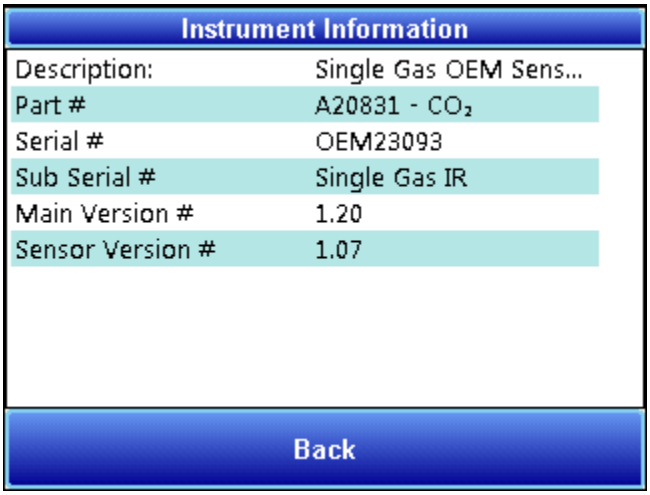
The **Add Note** option allows the operator to enter a note on the chart, similar to writing on a paper chart. The note shows up when the chart is printed out using the utility software included with the Series 9220 instrumentation. Pressing the **Add Note** option displays a screen where the operator can enter the operator ID or initials and a note. The user has the option to enter a note using the operator interface keyboard, where he or she will be able to type in the note; or the user can use the Signature mode, which will allow them to write a note using a stylus.

The **Data** option will show the trend data as a data grid instead of the trend lines on a chart. This functionality is exactly the same as if the user pressed the Datagrid View button - - from the chart screen.

Exit will close out the sub-menu without selecting an item.

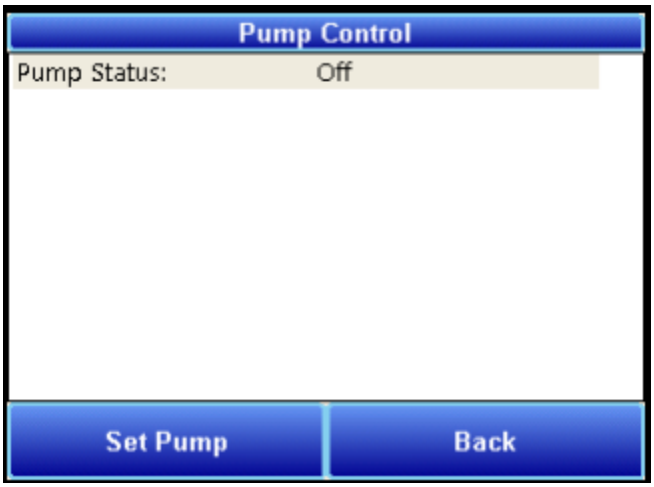
Pressing the red 'X' in the top right-hand corner of the screen will take the user back to the status screen.

Instrument Information (Menu Option)



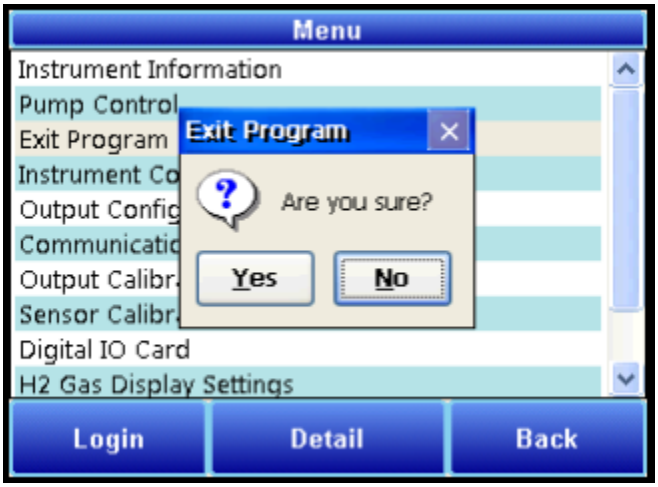
The Instrument Information screen provides basic information about the unit, including **Desciption, Part #, Serial #, Sub Serial #, Main Version #, and Sensor Version #.**

Pump Control (Menu Option)



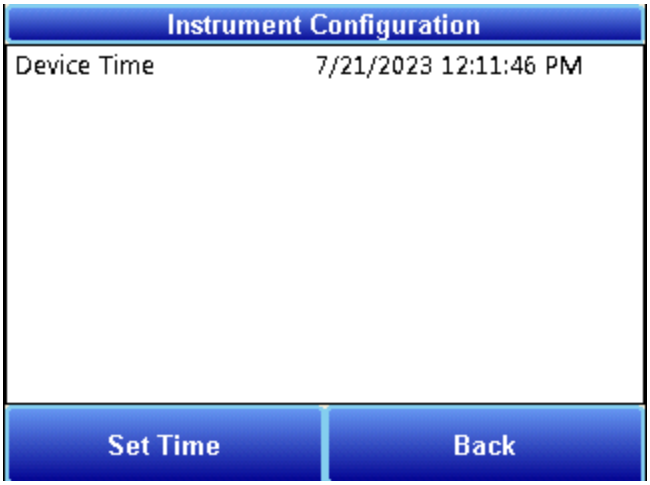
The Pump Control screen allows the user to turn the pump on or off. The current pump status will be displayed on the screen. To change the status, tap the "**Set Pump**" button, select "**On**" or "**Off**," and tap "**Select**." To exit the screen without changing the pump status, tap "**Cancel**."

Exit Program (Menu Option)



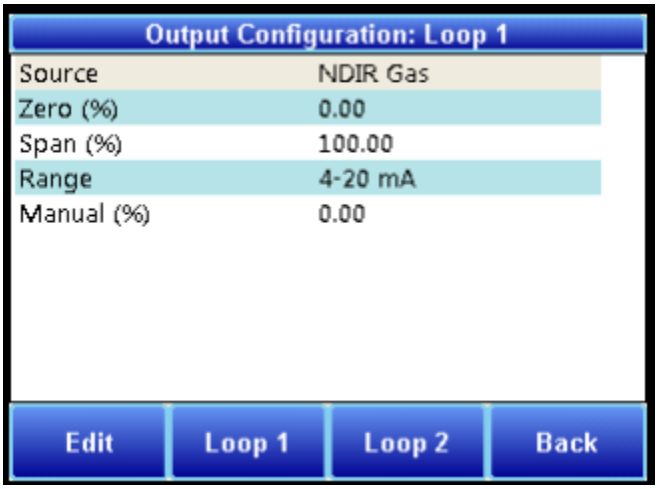
The Exit Program option allows the user to shut down the SGA touchscreen, after a confirmation dialog box is displayed.

Instrument Configuration (Menu Option)



Select Device Time to set the internal time of the sensor.

Output Configuration (Menu Option)



The SGA has two outputs. These can be configured for **Source**, **Zero Value**, **Span Value**, **Range**, and **Manual**.

The **Source** is the gas that applies to that output (**NDIR Gas** or **External**).

The **Zero Value** is the NDIR gas % value that corresponds to 4mA on a 4-20mA scale. (4-20mA is the default **Range** setting. If **Range** is set to 0-20mA, then the **Zero Value** refers to 0mA.)

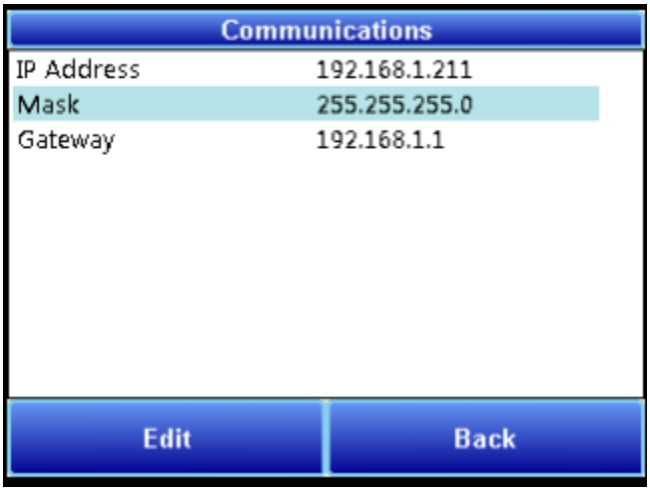
The **Span Value** is the NDIR gas % value that corresponds to 20mA on a 4-20mA scale. (4-20mA is the default **Range** setting. If **Range** is set to 0-20mA, then the **Span Value** still refers to 20mA.)

Range allows the user to choose between an output signal of 4-20mA (default) and 0-20mA.

Manual allows the user to enter an output value to test the analog output. In order for this option to function, **Source** must be set to **External**.

To change an item, tap the desired row, then tap "**Edit**." Enter the desired value in the "**Input**" box (or make a selection from the dropdown menu) and click the "**OK**" button. Your new value will be displayed on the Output Configuration screen.

Communications (Menu Option)



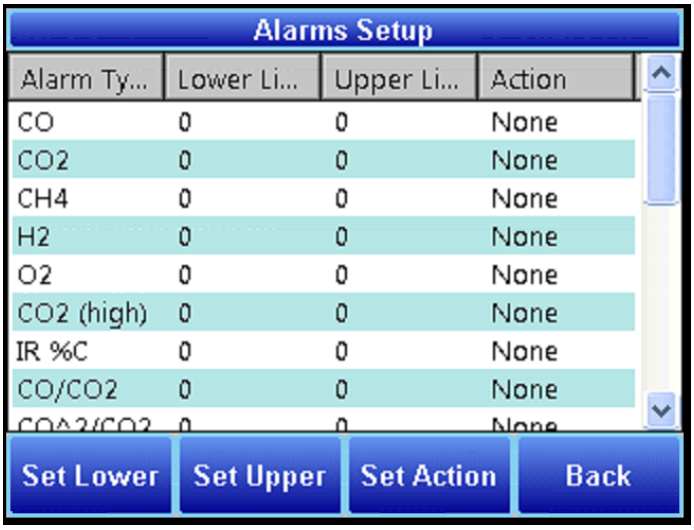
NOTE: Please consult with your network administrator or an IT professional before making changes to the Communications screen.

The Communications menu allows the user to set the **IP Address**, **Subnet Mask**, and **Gateway** for the SGA. To change these values, tap the desired row, then tap "**Edit**." Enter the new value

on the ensuing screen, then tap "OK." Your new value will be displayed on the Communications screen.

Do not change these values without consulting your IT professional. Doing so could cause IP conflicts and other network issues.

Alarms Setup



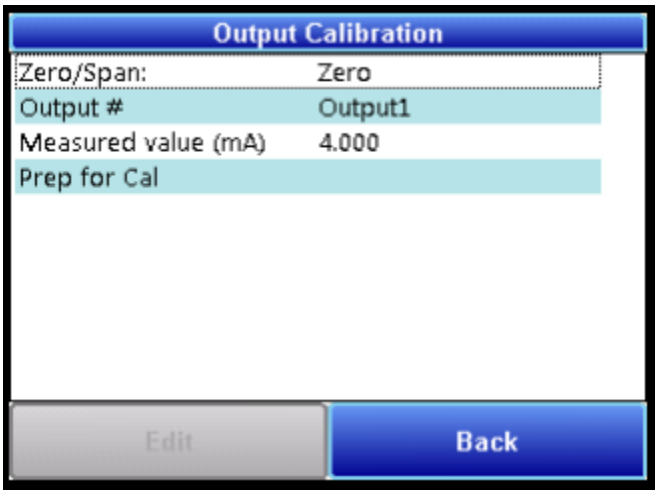
The Alarms option allows you to set lower and upper limits and assign actions to readings for the SGA.

Tap to highligh the desired gas type. Then tap the appropriate buttons to enter a Lower Limit and an Upper Limit. To select an Action, tap "Set Action" to cycle through the available options.

There are four possible actions for the alarms:

- "None" will not energize any relays.
- "AL1" will energize Relay 3;
- "AL2" will energize Relay 4;
- "Both" will energize Relays 3 and 4.

Output Calibration (Menu Option)



Overview

The Output Calibration screen allows the user to perform a zero/span calibration on the analog outputs.

The Output Calibration screen allows the user to perform a zero/span calibration. The SGA is equipped with two analog outputs. These outputs require calibration to ensure that the mA signal corresponds to a given output value (zero value for the lowest value and span value for the highest value). SSi recommends output calibration be performed on each output at least once per year, or as needed.

To calibrate each output, first make sure that you have a multimeter (or other appropriate testing instrument) available. Then follow these steps.

Zero Calibration

To calibrate the zero/span range for an output:

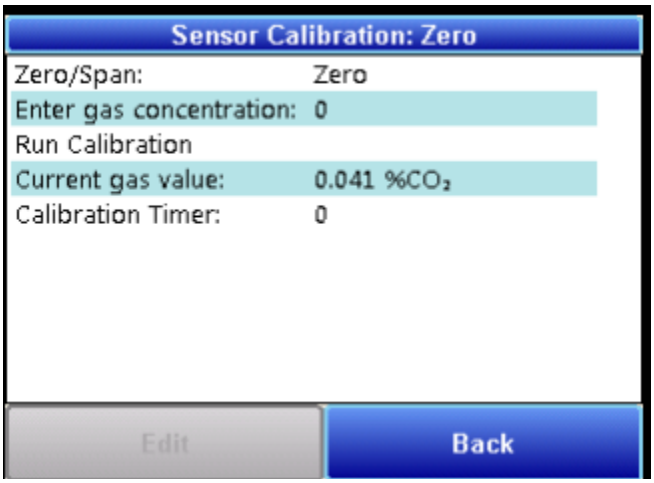
1. Attach a measuring device to the selected output.
2. Select "Output Calibration" from the Main Menu.
3. Once this is done, tap to highlight "**Zero/Span**," then tap the "**Toggle Zero/Span**" button to select "Zero." "Zero" will now be displayed in the Zero/Span row.
4. To select the desired output, tap to highlight "**Output#**," then tap the "**Toggle Output Number**" button to select the appropriate setting. The current value will be displayed in the "**Output#**" row.
5. Tap to highlight "**Prep for Cal**" and tap the "**Prep for Cal**" button.
6. Let the unit output what it has set for the zero measurement, and note the reading on your attached measuring device.
7. Tap "**Measured value (mA)**" and tap the "**Edit mA**" button.
8. Enter the measured value and tap "**OK**."
9. Then, tap "**Run Cal**" and tap the "**Run Cal**" button.

Span Calibration

To calibrate the span:

1. Use the "**Toggle Zero/Span**" button to select "**Span**."
2. Tap to highlight "**Prep for Cal**" and tap the "**Prep for Cal**" button.
3. Let the unit output what it has set for the span measurement, and note the reading on your attached measuring device.
4. Tap "**Measured value (mA)**" and tap the "**Edit mA**" button.
5. Enter the measured value and tap "**OK**."
6. Then, tap "**Run Cal**" and tap the "**Run Cal**" button.

Sensor Calibration (Menu Option)



Overview

BEFORE YOU BEGIN:

Never perform a span calibration without first performing a zero calibration.

The Zero calibration should be performed with a gas that is not measured by the SGA. Ideally this would be pure Nitrogen or Argon.

The concentration of the Span calibration gas should closely resemble the gas that is being measured.

NOTE: Since the accuracy of the calibration gas directly influences the resulting accuracy of the instrument, the highest possible accuracy grade should be obtained. Some gas suppliers refer to this as a "Certified Primary Standard". The high degree of accuracy is not required to obtain nominal values that exactly match the values shown above. The accuracy is required to know the exact composition of the gas in the cylinder. The actual composition will be shown on the bottle when it is delivered.

When flowing calibration gas into the analyzer, turn the pump off. The amount of flow from the gas cylinder should be approximately 1.5 SCFH at no pressure. The gas cylinders will be under high pressure, so it is recommended that a two stage regulator with a low pressure secondary stage be used. It is good practice to begin the flow of gas before attaching the calibration gas to the instrument. This will prevent any high pressure bursts from entering the instrument.

Calibration gases can be obtained from Super Systems, however they can also be obtained from any supplier of custom gases.

Zero Calibration Procedure

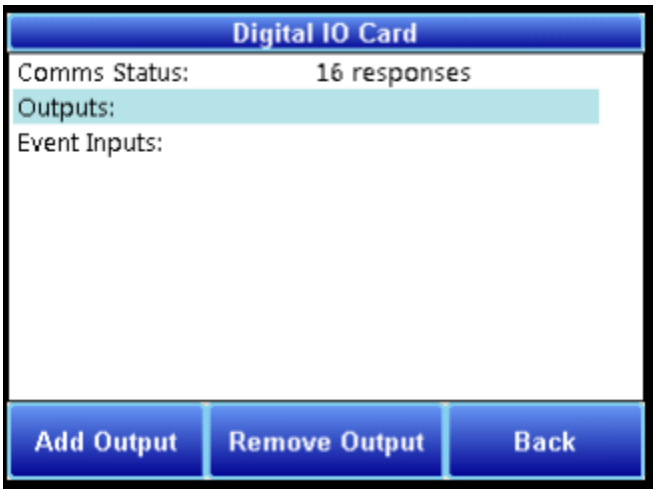
1. Connect the gas to the "Cal Gas Inlet" on the side of the SGA enclosure. It is recommended to let everything (gas and SGA) sit for approximately thirty minutes to allow the temperature to achieve equilibrium.

2. Select "Sensor Calibration" from the Main Menu.
3. Tap "**Zero/Span**" and use the "**Toggle Zero/Span**" button to select **Zero.**
4. Tap to highlight "**Enter Gas Concentration**" and tap the "**Enter Gas %**" button.
5. Enter the appropriate concentration of the calibration gas (in this case 0% since it is a zero calibration).
6. Begin the flow of gas and allow the readings to come to equilibrium. This occurs when the actual values are not moving in a specific direction, and they display only slight movements up and down. This should take several minutes.
7. At this point, tap to highlight "**Run Calibration**" and tap the "**Run Calibration**" button.
8. The Calibration Timer on the screen will count down, and when it reaches zero the Current gas value will adjust to match the Gas concentration.

Span Calibration Procedure

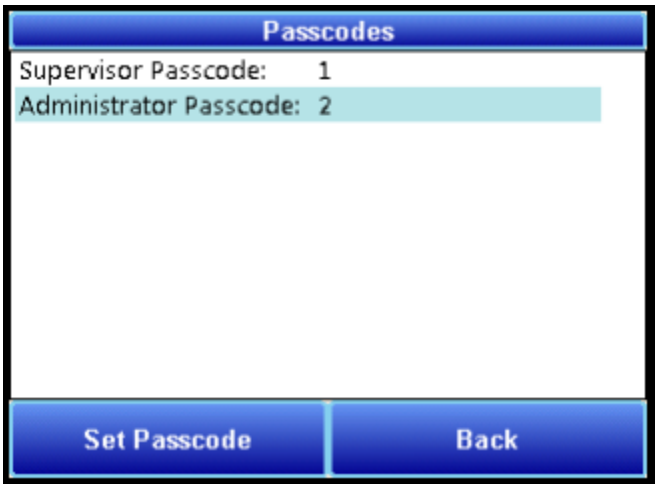
1. First tap "**Zero/Span**" and use the "**Toggle Zero/Span**" button to select **Span.**
2. Tap to highlight "**Enter Gas Concentration**" and tap the "**Enter Gas %**" button.
3. Enter the appropriate concentration of the calibration gas (see note on p.15).
4. Begin the flow of gas and allow the readings to come to equilibrium. This occurs when the actual values are not moving in a specific direction, and they display only slight movements up and down. This should take several minutes.
5. At this point, tap to highlight "**Run Calibration**" and tap the "**Run Calibration**" button.
6. The Calibration Timer on the screen will count down, and when it reaches zero the Current gas value will adjust to match the Gas concentration.

Digital IO Card (Menu Option)



The Digital IO Card menu displays **Communication Status**, **Outputs**, and **Event Inputs**. It also allows the user to set and reset outputs. Tap the **Set Output** button to turn on an output, or tap the **Reset Output** button to turn off an output. Then enter the desired information on the ensuing screen.

Passcodes (Menu Option)



The Passcodes menu allows the user to set Supervisor and Administrator Passcodes. To change the passcodes, tap to highlight the desired access level, then tap "**Set Passcode**." Enter the new passcode on the ensuing screen and tap "**OK**."

Control Interface via Web Browser

The SGA can be controlled using a web browser on your computer. The web browser connects to the unit through an Ethernet connection. The computer you are using and the unit need to be on the same network with the same subnet mask. Contact your IT administrator if you have network setup questions.

Main

The main page displays the percentage composition of the gas for which the SGA is configured. In the example below, the percentage composition of the gas is displayed.

Figure 3 - Main Page (with CO_2 Percentage Shown)

Instrument Information

The Instrument Information page provides a description of the SGA, the part number, the serial number of the main board, the sub-serial number of the sensor board, the main board version number, sensor board version number, and web page version number. This information can be useful for troubleshooting purposes.

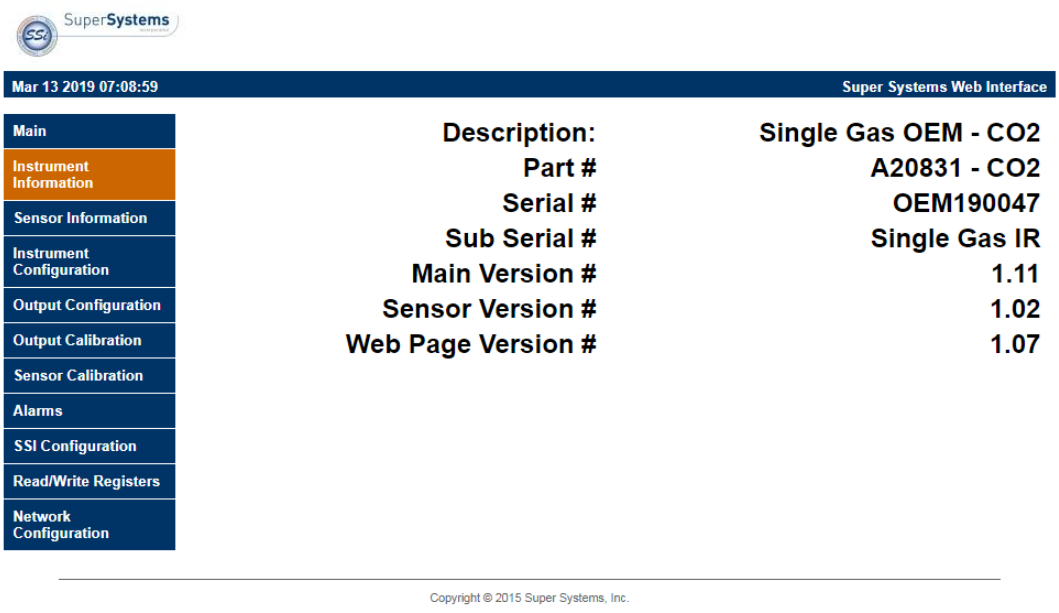


Figure 4 - Instrument Information Page

Sensor Information

The first five lines display live values that are used to calculate the gas %.

The remainder of the information provided is derived from the most recent zero and span calibrations. These figures are a snapshot of the live data when this calibration was performed.

Note that this is for diagnostic use only. Call SSi at (513) 772-0060 with questions.

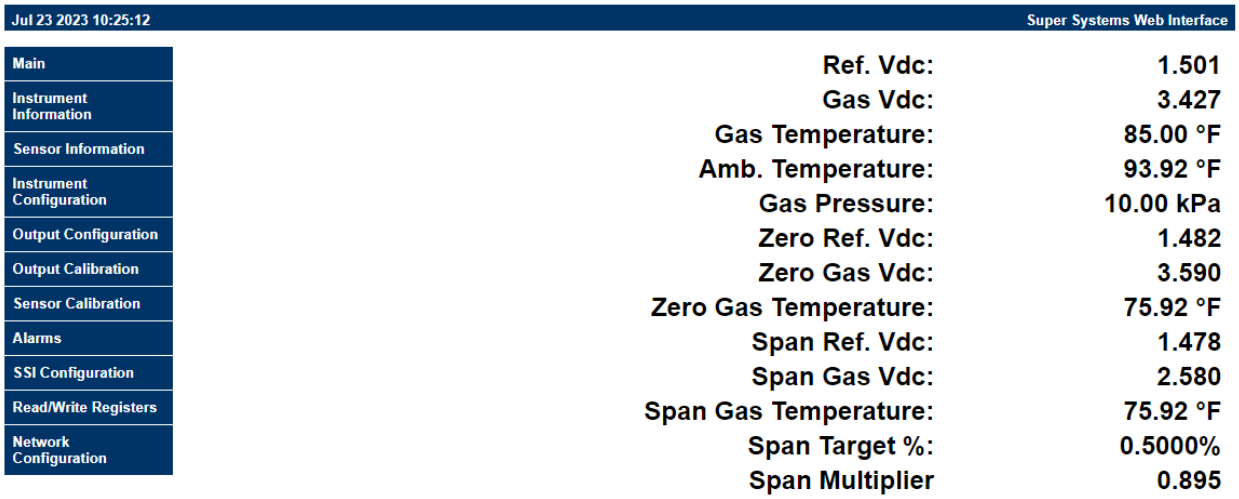


Figure 5 - Sensor Information Page

Instrument Configuration

Set Date/Time: Click "Set Val" to set the Date and Time of the sensor.

Web Access Code: Enter the desired login code for accessing the website and click "Set Code" to save.

Min %CO2: This Value is set in the factory; do not change without contacting SSi.

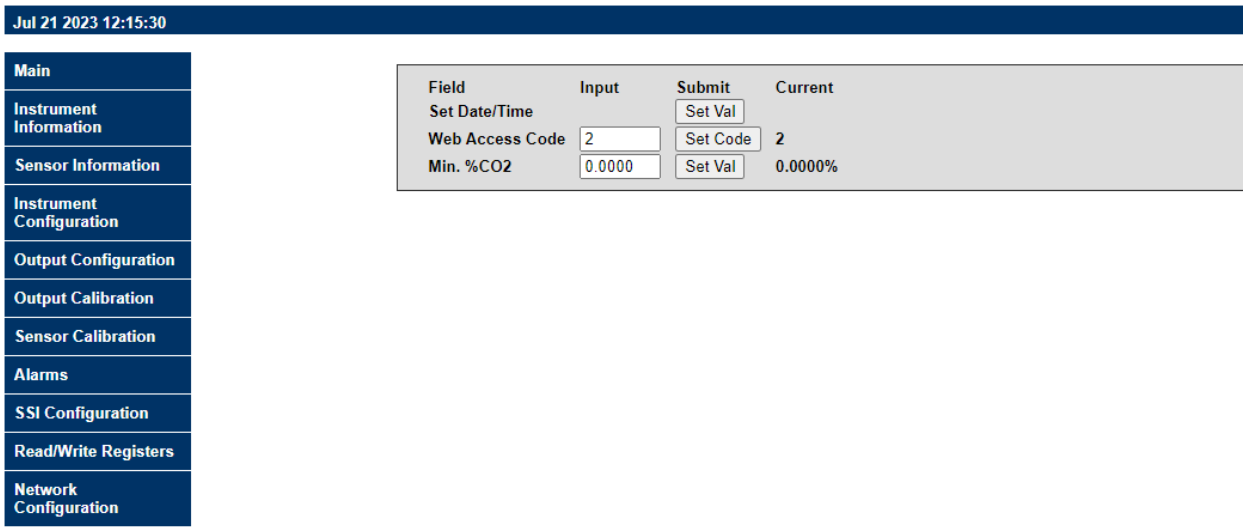


Figure 6 - Instrument Configuration Page

Output Configuration

The Output Configuration screen allows you to adjust output parameters for loops 1 and 2.

For each loop, the following parameters can be adjusted:

- Source: A selected source: External or NDIR Gas.
- Zero (%): The NDIR gas % output at the lowest end of the applicable range.
- Span (%): The % output at the highest end of the applicable range.
- Range: The output mode: 4-20 mA or 0-20 mA.
- Manual (%): A %Output entered manually.

Use the applicable "Set" button to set each parameter (for example, use "Set Source" to set the source).

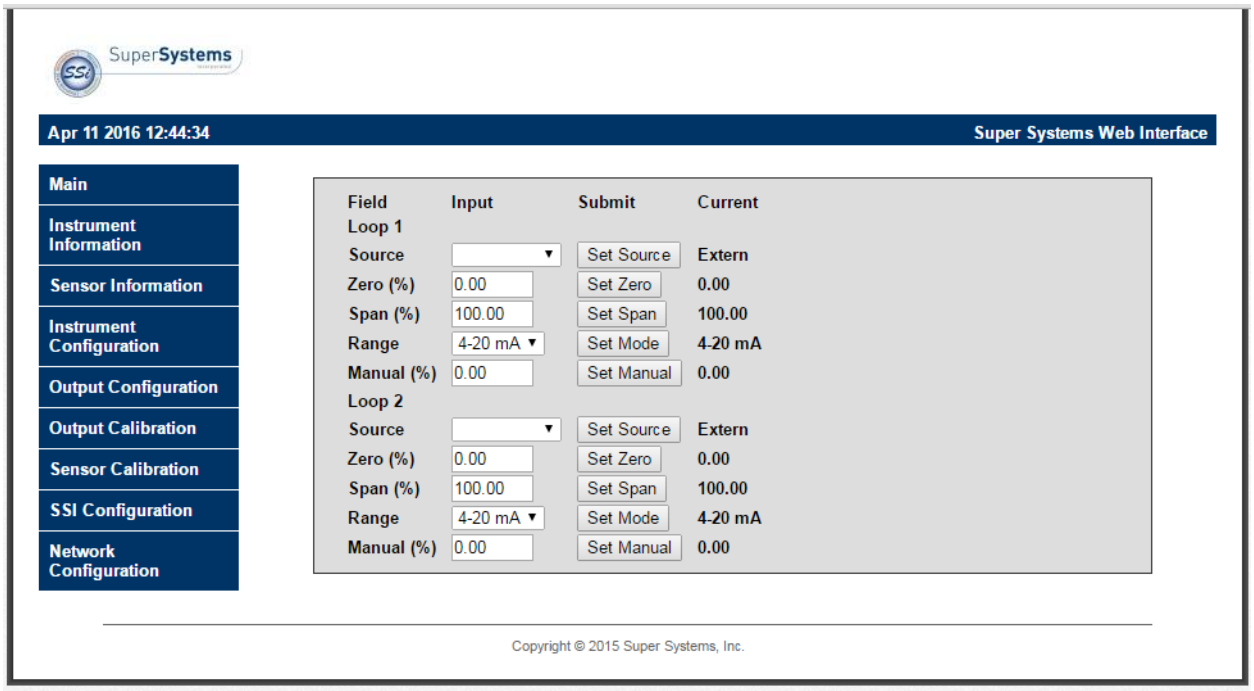


Figure 7 - Output Configuration Page

Output Calibration

The Output Calibration screen allows the user to perform a zero/span calibration. The SGA is equipped with two analog outputs. These outputs require calibration to ensure that the mA signal corresponds to a given output value (zero value for the lowest value and span value for the highest value). SSi recommends output calibration be performed on each output at least once per year, or as needed.

To calibrate each output, first make sure that you have a multimeter (or other appropriate testing instrument) available.

(Never perform a span calibration without first performing a zero calibration.)

1. Select the output value that you wish to calibrate (Zero Output 1 or, Zero Output 2).
2. Press "Prep for Cal" to enter calibration mode.
3. Ensure that the output signal is being sent for the span or zero value (whichever you are calibrating for).
4. With a multimeter, measure the mA value at the output. Enter that value in the "Entered Measured value" field and press "Calibrate".
5. Repeat the process above for the appropriate Span Output.

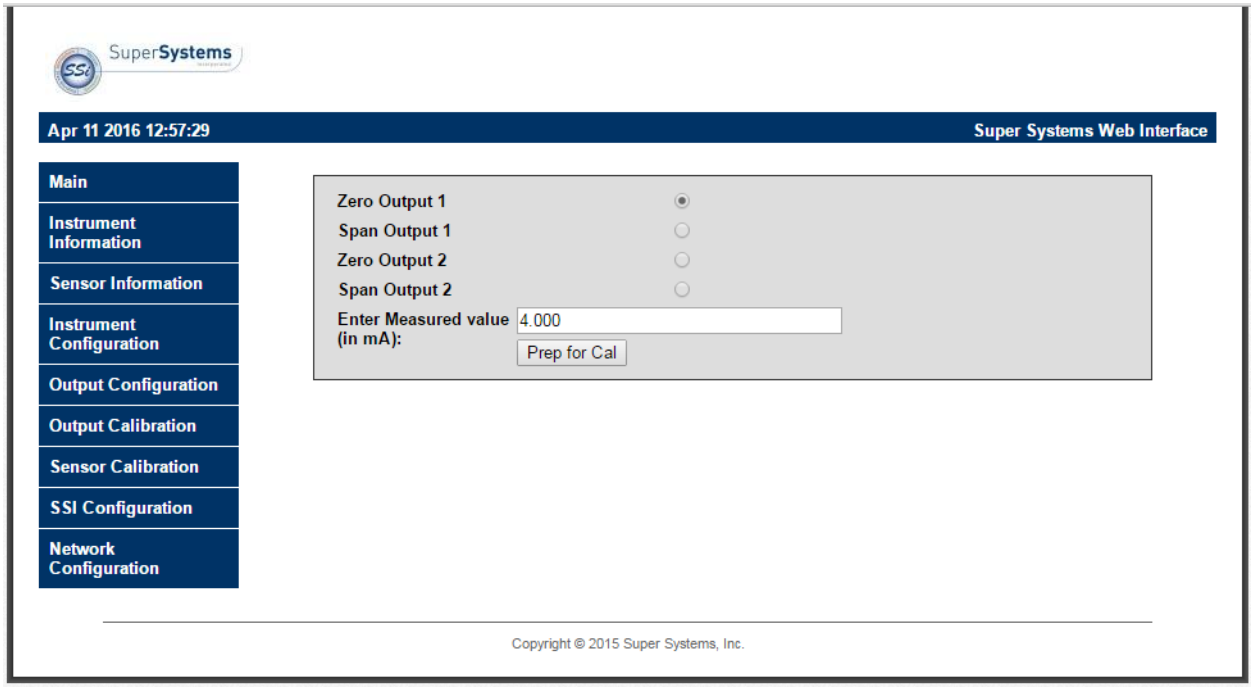


Figure 8 - Output Calibration Page

Sensor Calibration

To ensure accurate readings, the gas sensor must be calibrated at the low end and high end of the measured gas composition range. SSi recommends calibration be performed at least once per year, or as needed.

Connect the gas to the "Cal Gas Inlet" on the side of the SGA enclosure and open the valve. It is recommended to let everything (gas and SGA) sit for approximately thirty minutes to allow the temperature to achieve equilibrium.

To perform a sensor calibration, make sure that the system is set up to flow both zero gas (with 0% of the gas the sensor is designed to detect) and span gas when needed. The gases should be "Certified Primary Standards" or equivalent accuracy. Then follow these steps.

1. Note the percentages of the sensor gas in each gas source (zero and span).
2. Ensure that the system is purged of any latent gas.
3. Flow the zero gas. Wait two minutes, and then enter the target gas concentration in the "Enter gas concentration" field.
4. Press "Calibrate". A Calibration Timer will count down.
5. Once the Calibration Timer has counted down, the zero value will be calibrated.

NOTE: The remaining steps for the span gas will be very similar to the steps performed for the zero gas calibration.

6. Ensure that the system is purged of any latent gas.
7. Flow the span gas. Wait two minutes, and then enter the target gas concentration in the "Enter gas concentration" field.
8. Press "Calibrate". A Calibration Timer will count down.
9. Once the Calibration Timer has counted down, the span value will be calibrated.

NOTE: The Zero (Emitter) button is located on this page for use when the emitter is replaced. For more information on the function of this button, contact SSi personnel.

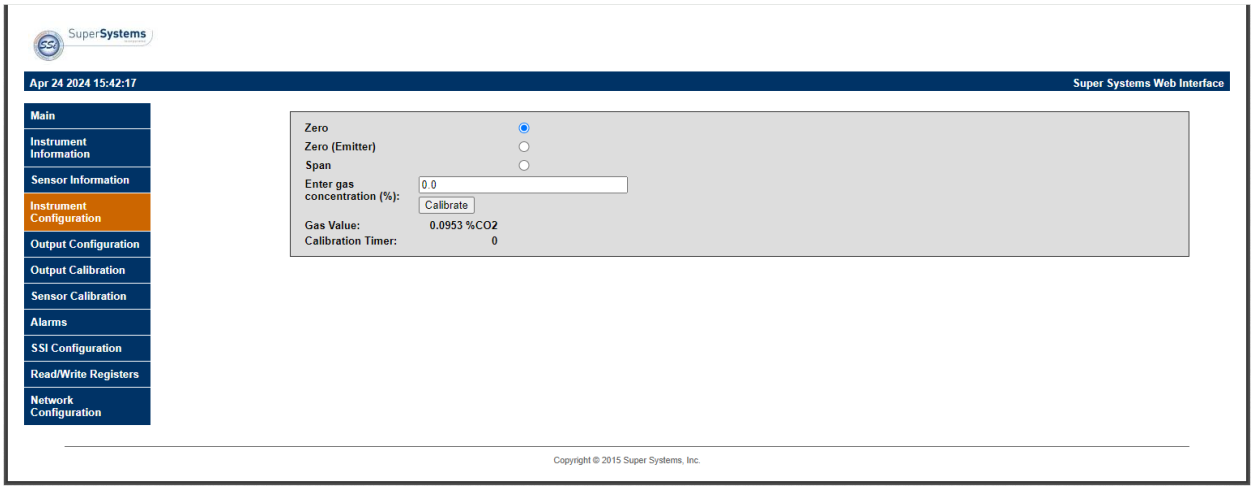
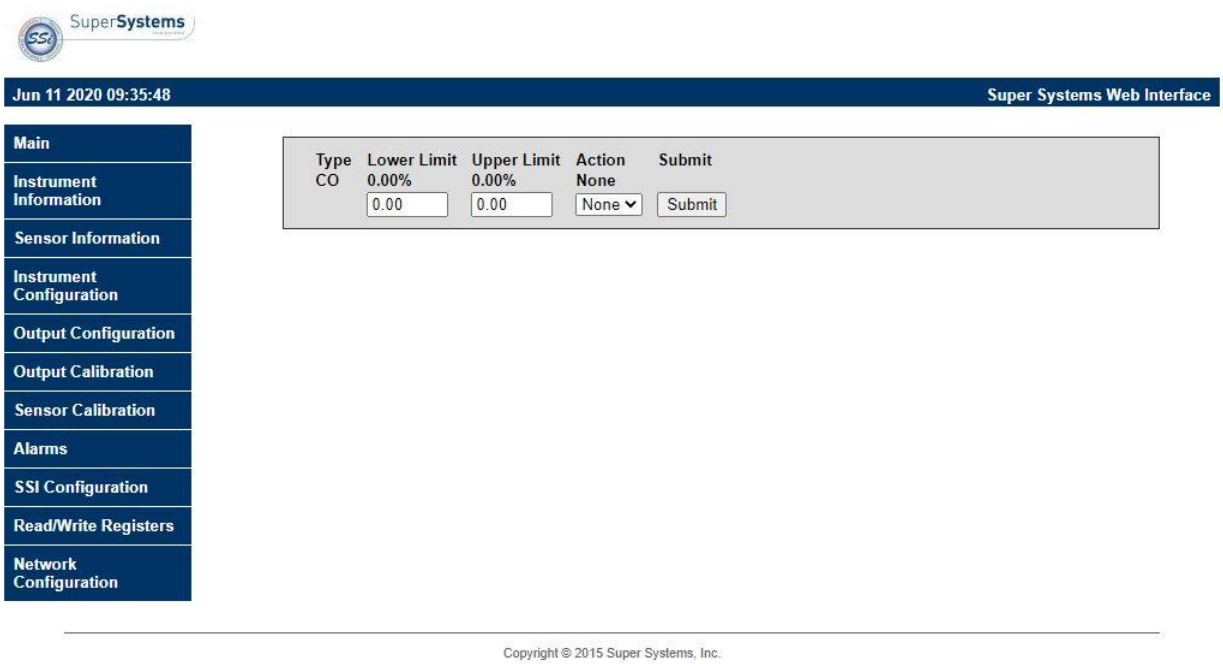


Figure 9 - Sensor Calibration Page

Alarms



The Alarms page allows you to set lower and upper limits and assign actions to readings for the sensor.

For the desired gas type, enter a Lower Limit, an Upper Limit, select an Action from the dropdown menu, and click "Submit" to save that information.

When connected to a digital card, if desired, one of the two relays (or both simultaneously) can be energized. There are four possible actions for the alarms:

- "None" will not energize any relays.
- "AL1" will energize Relay 3;
- "AL2" will energize Relay 4;
- "Both" will energize Relays 3 and 4.

SSI Configuration

IMPORTANT!

It is highly recommended that changes on this page be made only in consultation with SSi technical personnel. Call (513) 772-0060 for more information.

The SSi Configuration page contains fields that can be adjusted to change various strings contained in memory and also change certain functions.

- Main Serial: The serial number of the main board.
- Sub Serial: The serial number of the sensor board.
- En. Card: Enable Card. This option allows a digital I/O card to be added.
- Relay Input: This option allows a value to be written to enable relays. Possible values are 0 to 255, and they are binary values corresponding to one of the eight relays.
- Set FD: This option resets the sensor board to factory defaults.
- Set Reg: This option allows a value to be written to the main board. The first value is the register location that will be written to; the second value is the value that will be written to the specified register location. The "Set Val" button, when pressed, will commit the entered value to the specified register location.

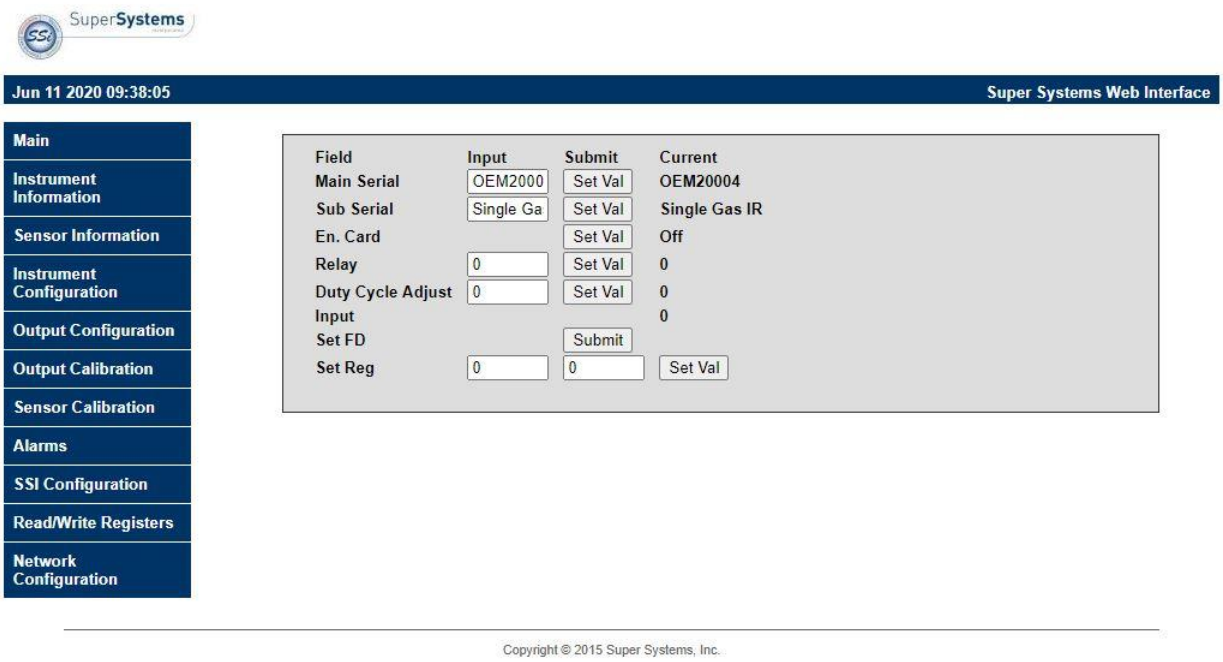
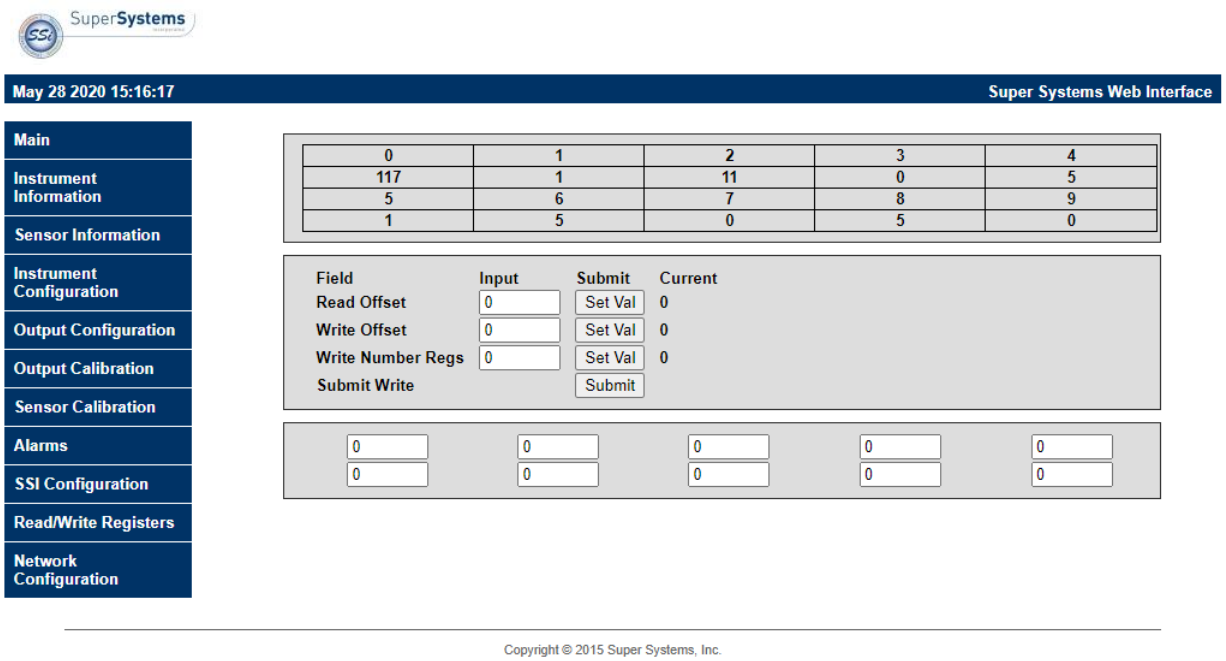


Figure 10 - SSI Configuration Page

Read/Write Registers



The Read/Write Registers page gives access to the underlying Modbus registers of the SGA. This page is primarily intended for testing and troubleshooting purposes.

Please contact SSi before attempting to make any changes to the settings on this page.

Network Configuration

The Network Configuration page allows you to view network settings and change certain settings as well. **SSi recommends consulting an IT engineer or network administrator before changing any of these settings.**

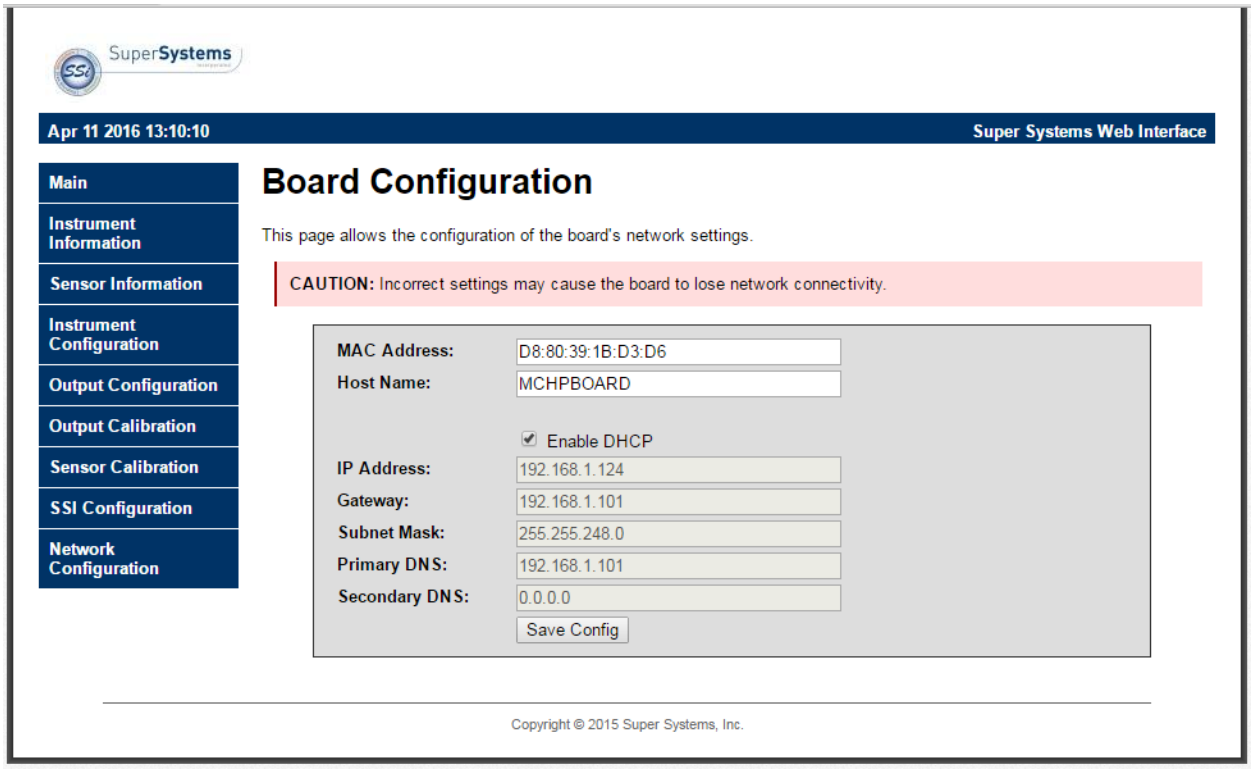


Figure 11 - Network/Board Configuration Page

The first two fields on the page show the MAC address and Host Name. The MAC address should not be changed. The Host Name can be changed as needed.

To enable dynamic assignment of IP addresses, click on the **Enable DHCP** checkbox. Dynamic assignment means that the unit's IP address on the network will be assigned automatically, preventing IP address conflicts. The network must support dynamic IP assignment in order for this to work.

If Enable DHCP is not checked, IP and other settings can be changed manually. **These settings should be verified with your network administrator before being changed.** Failure to do so could result in IP conflicts and other network issues.

Modbus Registers

The following table shows the Modbus registers for the sensor module. The name of the register, address location, and description are provided.

Register Name	Register Location	Description
VERSION_NUMBER	0	current version number of the firmware
UART_1_MODE	1	0 = slave, 1 = Sensor Driver
UART_1_BAUD_RATE	2	Baud Rate: 0=1200,...,5=19200,...10=115200.
UART_2_MODE	3	0 = slave, 1 = Sensor Driver
UART_2_BAUD_RATE	4	Baud Rate: 0=1200,...,5=19200,...10=115200.
UART_3_MODE	5	0 = slave, 1 = Sensor Driver
UART_3_BAUD_RATE	6	Baud Rate: 0=1200,...,5=19200,...10=115200.
UART_4_MODE	7	0 = slave, 1 = Sensor Driver
UART_4_BAUD_RATE	8	Baud Rate: 0=1200,...,5=19200,...10=115200.
UART_5_MODE	9	0 = slave, 1 = Sensor Driver
UART_5_BAUD_RATE	10	Baud Rate: 0=1200,...,5=19200,...10=115200.
BOARD_ADDR	14	Board modbus address (important for slave only)
MODEL_NUM	15	MODEL number Map as reg 900
SET_FACT_DEF	16	23205 = Full Defaults, 23206 = H2 Defaults, 23207 = Loop 1 Defaults, 23208 = Loop 2 Defaults
DEGREE_REG	17	0 = °F, 1 = °C, 2 = °R, 3 = K
CUR_LOOP_CAL_REG	18	Calibration state. 0 = normal, 1 = prep zero, 2 = store zero, 3 = prep span, 4 = store span
CUR_LOOP_CAL_CHN	19	Calibration channel
CUR_LOOP_CAL_VAL	20	Cal value. 20.12 mA would be 20120
CUR_LOOP_TARGET_VALUE	22	Actual request value
CUR_LOOP_ZERO_TO_TWENTY	24	0-20 mA enable

Register Name	Register Location	Description
CUR_LOOP_SOURCE	26	0 = H2, 1 = DA, 2 = NH3, 3 = KN, 4 = External, 5 = Standard Kn, 6 = NDIR gas
CUR_LOOP_ZERO	28	Zero value. This value equates to either 4 mA or 0 mA
CUR_LOOP_SPAN	30	Span value. This value equates to either 20 mA
CUR_LOOP_MANUAL	32	If manual mode is set, then this register controls (0-20000)
INST_PV_MODE	34	0 = H2, 1 = DA, 2 = NH3, 3 = KN, 4 = Standard Kn, 5 = NDIR single gas
PV_VARIABLE	35	Actual process variable.
H2_SELECTION	36	0 = Single gas OEM, 1 = In-Situ Sensor
DISP_OPT	37	Display option bitmap: bit 0 = H2, 1 = DA, 2 = NH3, 3 = Super KN, 4 = Standard KN
SER_NUM_REG	444	actual mapping from Advantech
MB_SET_TIME_WRITE	506	1 = SNTP server write, 2 = manual write
MB_SET_TM_YEAR	507	set year
MB_SET_TM_MON	508	set month
MB_SET_TM_MDAY	509	set day of month
MB_SET_TM_WDAY	510	set day of week, 0 = Sunday
MB_SET_TM_HOUR	511	set hour
MB_SET_TM_MIN	512	set minute
MB_SET_TM_SEC	513	set second
MB_TM_YEAR	514	year
MB_TM_MON	515	month
MB_TM_MDAY	516	day of month
MB_TM_WDAY	517	day of week, 0 = Sunday
MB_TM_HOUR	518	hour
MB_TM_MIN	519	minute

Register Name	Register Location	Description
MB_TM_SEC	520	second
MB_COMP_TIME_YEAR	580	compile year
MB_COMP_TIME_MON	581	compile month
MB_COMP_TIME_MDAY	582	compile day of month
MB_COMP_TIME_WDAY	583	compile day of week, 0 = Sunday
MB_COMP_TIME_HOUR	584	compile hour
MB_COMP_TIME_MIN	585	compile minute
MB_COMP_TIME_SEC	586	compile second
MODEL_NUM_OLD	900	MODEL number
RESET_FACT_DEFAULTS	909	Resets everything to factory settings
MB_IP_ADDR	914	IP Address
MB_IP_MASK	918	Subnet Mask
MB_IP_GTWY	922	Gateway
SENSOR_COMM_STATUS_REG	1100	H2O2 comm status (0-16)
SENSOR_N2_FLOW	1101	N2 flow
SENSOR_NH3_FLOW	1102	NH3 flow
SENSOR_DA_FLOW	1103	DA flow
SENSOR_H2_FLOW	1104	H2 Flow
SENSOR_PV_MODE	1105	Process variable (0 = H2, 1 = DA, 2 = NH3, 3 = Kn, 4 = Standard Kn)
SENSOR_INPUT_TYPE_REG	1106	Input for voltage inputs
SENSOR_MIN_H2	1108	minimum H2 value
SENSOR_CO2_PRESENT	1109	concentration of CO2 present. Important for H2 measurement only
SENSOR_PV_REMOVE_NEGATIVE	1110	Makes any negative number zero
SENSOR_GEN_QUEUE_ENABLE	1150	Allows for a generic write
SENSOR_NH3_FLOW	1102	NH_3 flow
SENSOR_DA_FLOW	1103	DA flow

Register Name	Register Location	Description
SENSOR_H2_FLOW	1104	H_2 Flow
SENSOR_PV_MODE	1105	Process variable (0 = H_2, 1 = DA, 2 = NH_3, 3 = Kn, 4 = Standard Kn)
SENSOR_INPUT_TYPE_REG	1106	Input for voltage inputs
SENSOR_MIN_H2	1108	minimum H_2 value
SENSOR_CO2_PRESENT	1109	concentration of CO_2 present. Important for H_2 measurement only
SENSOR_PV_REMOVE_NEGATIVE	1110	Makes any negative number zero
SENSOR_GEN_QUEUE_ENABLE	1150	Allows for a generic write
SENSOR_GEN_QUEUE_START	1151	Start of write. E.g., register 45.
SENSOR_GEN_QUEUE_ADDRESS	1152	Address of board to write to.
SENSOR_GEN_QUEUE_NUM_WORDS	1153	Number of words to write down up. Up to 30
SENSOR_GEN_QUEUE_BLOCK	1154	write up to 30 words
SENSOR_READ_REGISTERS	1200	just designates where to start writing
MB_READ_VERSION_NUMBER	1200	current version number of the firmware
MB_READ_PELLISTOR_AVDD	1201	A/D analog voltage supply
MB_READ_PELLISTOR_EXCV	1202	Pellistor bridge excitation voltage
MB_READ_PELLISTOR_VDC	1203	Pellistor voltage
MB_READ_PELLISTOR_NA	1204	Pellistor Normalized Absorbance
MB_READ_PERC_H2	1205	H2 x 10000
MB_READ_PER_H2_MANT	1206	H2 mantissa
MB_READ_PER_H2_EXP	1207	H2 exponent
MB_READ_PER_DA	1208	DA value
MB_READ_PER_NH3	1209	NH3 value
MB_READ_PER_SUPER_KN	1210	Super Kn
MB_READ_STANDARD_KN	1211	Standard Kn
MB_READ_PROC_VAR	1212	Process variable

Register Name	Register Location	Description
MB_READ_GAS_TEMP	1213	Gas temperature
MB_READ_BOARD_ADDR	1214	Board modbus address (important for slave only)
MB_READ_MODEL_NUM	1215	MODEL number Map as reg 900
MB_READ_SET_FACT_DEF	1216	23205 = Full Defaults
MB_READ_DEGREE_REG	1217	Sets the unit used to display temperature.
MB_READ_N2_FLOW	1218	N2 flow
MB_READ_NH3_FLOW	1219	NH3 flow
MB_READ_DA_FLOW	1220	DA flow
MB_READ_H2_FLOW	1221	H2 Flow
MB_READ_PV_MODE	1222	Process variable (0 = H2, 1 = DA, 2 = NH3, 3 = Kn, 4 = Standard Kn)
MB_READ_INPUT_TYPE_REG	1223	Input for voltage inputs
MB_READ_MIN_H2	1225	minimum H2 value
MB_READ_CO2_PRESENT	1226	Amount of CO2 present up to 10%.
MB_READ_PV_REMOVE_NEG	1227	Remove negative number
MB_READ_SET_TAPS_REG	1228	Sets the digital trim pot
MB_READ_UART_1_BAUD_RATE	1229	Baud Rate: 0=1200,...,5=19200,...10=115200.
MB_READ_UART_2_BAUD_RATE	1230	Baud Rate: 0=1200,...,5=19200,...10=115200.
MB_READ_PV_FP	1231	Process variable in floating point
MB_READ_PELLISTOR_DIAG	1233	Pellistor Diagnostics
MB_READ_AMBIENT_TEMP	1234	Ambient temperature
MB_READ_CJ_TEMP_REG	1235	Cold junction temperature
MB_READ_AD_RAW_VDC	1237	Raw VDC
MB_READ_GAIN_REG	1239	Gain
MB_READ_AD_SCALED_VDC	1241	Scaled VDC
MB_READ_TC_PROC_VAR	1243	TC process variable

Register Name	Register Location	Description
MB_READ_PERC_O2	1245	Based on Nernst equation
MB_READ_PERC_O_DP	1246	decimal point for O2
MB_READ_PERC_O2_FP	1247	floating point value for O2 (w registers)
MB_READ_LAMBDA_TEMP	1249	Typically 800F
MB_READ_LAMBDA_CNV_MV_EN	1250	Convert mV to probe mV
MB_READ_AMB_PRESSURE_REG	1251	Ambient pressure (absolute)
MB_READ_GAS_PRESSURE_REG	1252	Gas pressure (absolute)
MB_READ_NDIR_GAS_SELECTION	1253	[0-7]. TBD
MB_READ_NDIR_GAS_VPP	1254	Peak-peak voltages
MB_READ_NDIR_GAS_VPP_SF	1258	Peak-peak voltages. No high/low values
MB_READ_NDIR_GAS_VPP_FIR	1262	Peak-peak voltages FIR filtered
MB_READ_NDIR_GAS_NA	1266	Gas Normalized absorbance
MB_READ_NDIR_GAS_NA_TC	1269	Gas Normalized absorbance, temperature compensated
MB_READ_NDIR_GAS_CONC	1272	Gas concentration
MB_READ_NDIR_GAS_CONC_DP	1275	Gas concentration decimal point
MB_READ_NDIR_GAS_CONC_FP	1278	Gas concentration floating point
MB_READ_CAL_ENABLE_REG	1284	enables a calibration
MB_READ_CAL_REQUEST_REG	1285	CJ cal or zero/span voltage cal
MB_READ_CAL_RANGE_REG	1286	Calibration Range register. Sets the voltage gain for a calibration.
MB_READ_CAL_CHANNELS_REG	1287	bitmap of channels to be calibrated
MB_READ_CAL_VALUE_REG	1288	Calibration value
MB_READ_CAL_TIMER_REG	1293	First of 5 calibration timers
MB_READ_CAL_PROGRESS_REG	1294	0 = no calibration, 1 = calibration in progress
MB_READ_CAL_ERROR_REG	1295	First of 5 calibration error calculations
MB_DIGIO_OUTPUT_SET	1600	Bitmap that sets the output of a digital I/O card

Register Name	Register Location	Description
MB_DIGIO_COMM_STATUS_REG	1601	Communication status for digital I/O card
MB_DIGIO_VERSION_NUMBER	1610	current version number of the firmware
MB_DIGIO_UART_1_MODE	1611	Determines mode: modbus slave = 0, modbus master = 1
MB_DIGIO_UART_1_BAUD_RATE	1612	Baud Rate.
MB_DIGIO_UART_2_MODE	1613	Determines mode: modbus slave = 0, modbus master = 1
MB_DIGIO_UART_2_BAUD_RATE	1614	Baud Rate.
MB_DIGIO_BOARD_ADDR	1615	Board modbus address (important for slave only)
MB_DIGIO_MODEL_NUM	1616	MODEL number Map as reg 900
MB_DIGIO_RESET_FACT_DEFAULTS	1618	SFD 23205 sets factory defaults Map as reg 909
MB_DIGIO_UART_3_MODE	1619	Determines mode: modbus slave = 0, modbus master = 1
MB_DIGIO_UART_3_BAUD_RATE	1620	Baud Rate. 0=1200 ,..., 10=115200
MB_DIGIO_SER_NUM_0	1621	Start of Serial number
MB_DIGIO_SER_NUM_1	1622	serial number 1
MB_DIGIO_SER_NUM_2	1623	serial number 2
MB_DIGIO_SER_NUM_3	1624	serial number 3
MB_DIGIO_SER_NUM_4	1625	serial number 4
MB_DIGIO_SER_NUM_5	1626	serial number 5
MB_DIGIO_SER_NUM_6	1627	serial number 6
MB_DIGIO_SER_NUM_7	1628	serial number 7
MB_DIGIO_SER_NUM_8	1629	serial number 8
MB_DIGIO_SER_NUM_9	1630	serial number 9
MB_DIGIO_EVENT_IN_CP	1636	Copy of Event Input
MB_DIGIO_EVENT_OUT_ACT_CP	1637	Actual Output
MB_DIGIO_EVENT_OUT_SP_CP	1638	Copy of Output setpoint
SENSOR_SUB_SERIAL_NUM	1700	serial number of sensor board

Replacement Parts

Part	Part Number
Fitting, KF-16 Adapter, 1/8 Female NPT	34699
Fitting, KF-16 Adapter, Clamp Assembly	34700
Terminal Block, Pluggable 2-Position, Plug	33312
Terminal Block, Pluggable 6-Position	33305
Terminal Block, Pluggable 4-Position, Vertical	33353
Terminal Block, Pluggable 3-Position	33310
Sensors	
Hydrogen Sensor, In-Situ	A20829
Oxygen Sensor, 4-Wire Analog	31435
CO Sensor	13672-CO
CO_2 Sensor	13672-CO2
CH_4 Sensor	13672-CH4

Warranty

Limited Warranty for Super Systems Products:

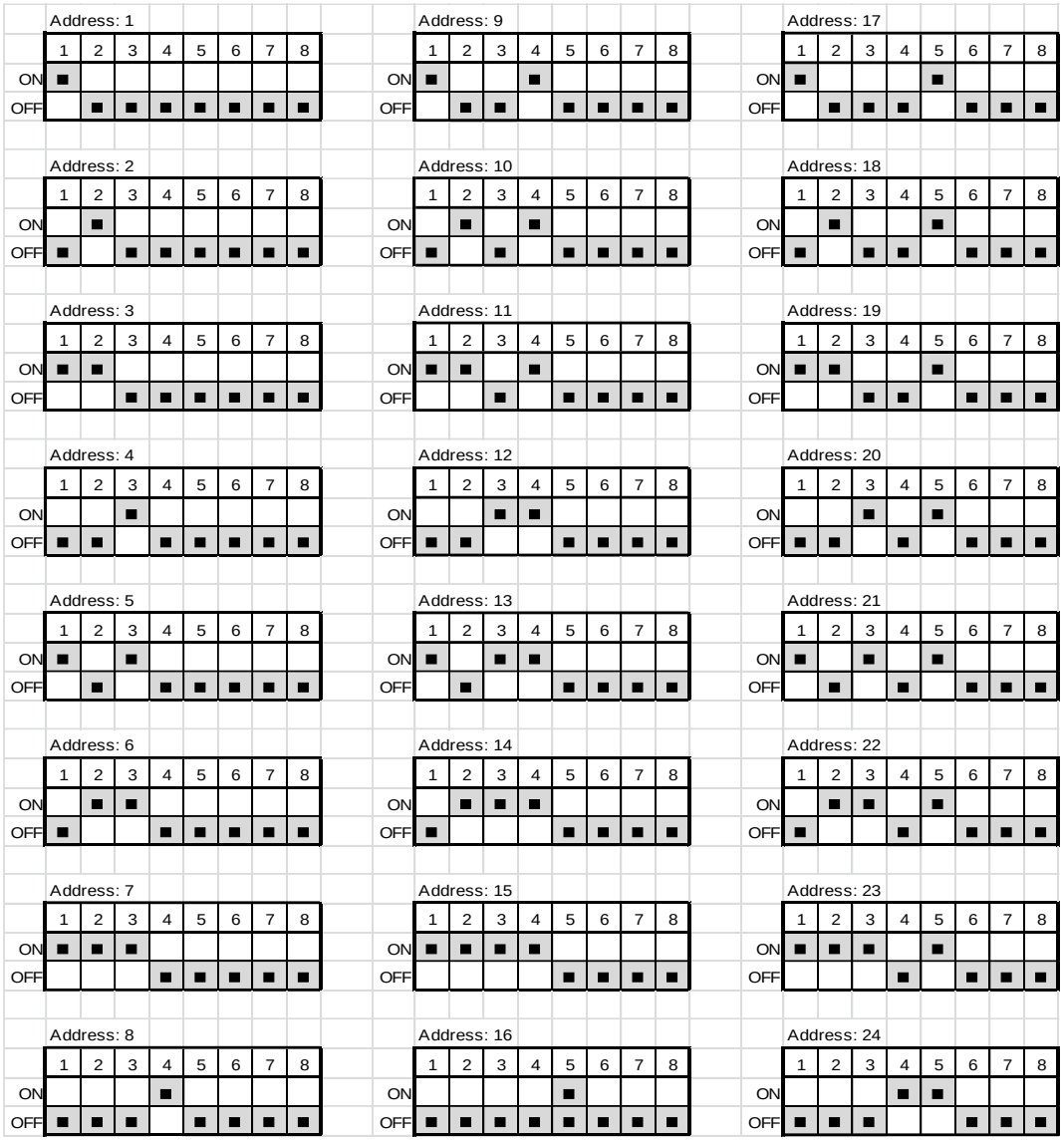
The Limited Warranty applies to new Super Systems Inc. (SSI) products purchased direct from SSI or from an authorized SSI dealer by the original purchaser for normal use. SSI warrants that a covered product is free from defects in materials and workmanship, with the exceptions stated below.

The limited warranty does not cover damage resulting from commercial use, misuse, accident, modification or alteration to hardware or software, tampering, unsuitable physical or operating environment beyond product specifications, improper maintenance, or failure caused by a product for which SSI is not responsible. There is no warranty of uninterrupted or error-free operation. There is no warranty for loss of data—you must regularly back up the data stored on your product to a separate storage product. There is no warranty for product with removed or altered identification labels. SSI DOES NOT PROVIDE ANY OTHER WARRANTIES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME JURISDICTIONS DO NOT ALLOW THE LIMITATION OF IMPLIED WARRANTIES, SO THIS LIMITATION MAY NOT APPLY TO YOU. SSI is not responsible for returning to you product which is not covered by this limited warranty.

If you are having trouble with a product, before seeking limited warranty service, first follow the troubleshooting procedures that SSI or your authorized SSI dealer provides.

SSI will replace the PRODUCT with a functionally equivalent replacement product, transportation prepaid after PRODUCT has been returned to SSI for testing and evaluation. SSI may replace your product with a product that was previously used, repaired and tested to meet SSI specifications. You receive title to the replaced product at delivery to carrier at SSI shipping point. You are responsible for importation of the replaced product, if applicable. SSI will not return the original product to you; therefore, you are responsible for moving data to another media before returning to SSI, if applicable. Data Recovery is not covered under this warranty and is not part of the warranty returns process. SSI warrants that the replaced products are covered for the remainder of the original product warranty or 90 days, whichever is greater.

Revision History

Rev.	Description	Date	MCO #
New	First release	7/11/2023	2338
A	Various corrections and updated screenshots	5/1/2024	2354

Appendix A: Dip Switch Setting Examples