



# SuperSystems

incorporated



# Single Gas Sensor Module

CO, CO<sub>2</sub>, or CH<sub>4</sub> measurement

## OPERATIONS MANUAL

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## Introduction

SSi provides single gas analysis technology for use in heat treating and other production environments. This manual covers the Single Gas Sensor Modules (SGSM), SSi's compact single gas detection modules, which are preconfigured for use with a specific gas. This manual covers the SGSMs configured for detection of CO (carbon monoxide), CO<sub>2</sub> (carbon dioxide), or CH<sub>4</sub> (methane). An Ethernet-based web interface provides a broad range of control options. The SGSM also includes onboard datalogging and communications via serial connection, USB, or Ethernet.

## Specifications

Specifications for gas measurement and SGSM operation are included below.

### Gas Measurement Specifications

<b>CO<sub>2</sub> Sensor (Low)</b>	
Range	0 – 2% of gas concentration
Accuracy	±1% of full scale (±0.02% of gas concentration, based on 2%)
Resolution	0.001%
Measurement Method	Non-Dispersive Infrared (NDIR)
<b>CO<sub>2</sub> Sensor (High)</b>	
Range	Range: 0 – 20% of gas concentration
Accuracy	Accuracy: ±1% of full scale (±0.2% of gas concentration, based on 20%).
Resolution	0.01%
Measurement Method	Non-Dispersive Infrared (NDIR)
<b>CO Sensor</b>	
Range	0 – 100% of gas concentration
Accuracy	±1% of full scale (±0.2% of gas concentration, based on 100%)
Resolution	0.01%
Measurement Method	Non-Dispersive Infrared (NDIR)
<b>CH<sub>4</sub> Sensor</b>	
Range	Range: 0 – 100% of gas concentration
Accuracy	Accuracy: +/-1% of full scale (+/-0.2% of gas concentration, based on 20%)
Resolution	0.01%
Measurement Method	Non-Dispersive Infrared (NDIR)

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Response Time	0 - 6 seconds
Power Supply Input Voltage	10 - 30 VDC
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
Calibration	Field calibration via web interface

### Connections Diagram

The following diagram shows the connections for the SGSM. Connections will be identical for all four models (A20831-CO<sub>2</sub>, A20831-CO<sub>2</sub>H, A20831-CO, and A20831-CH<sub>4</sub>)

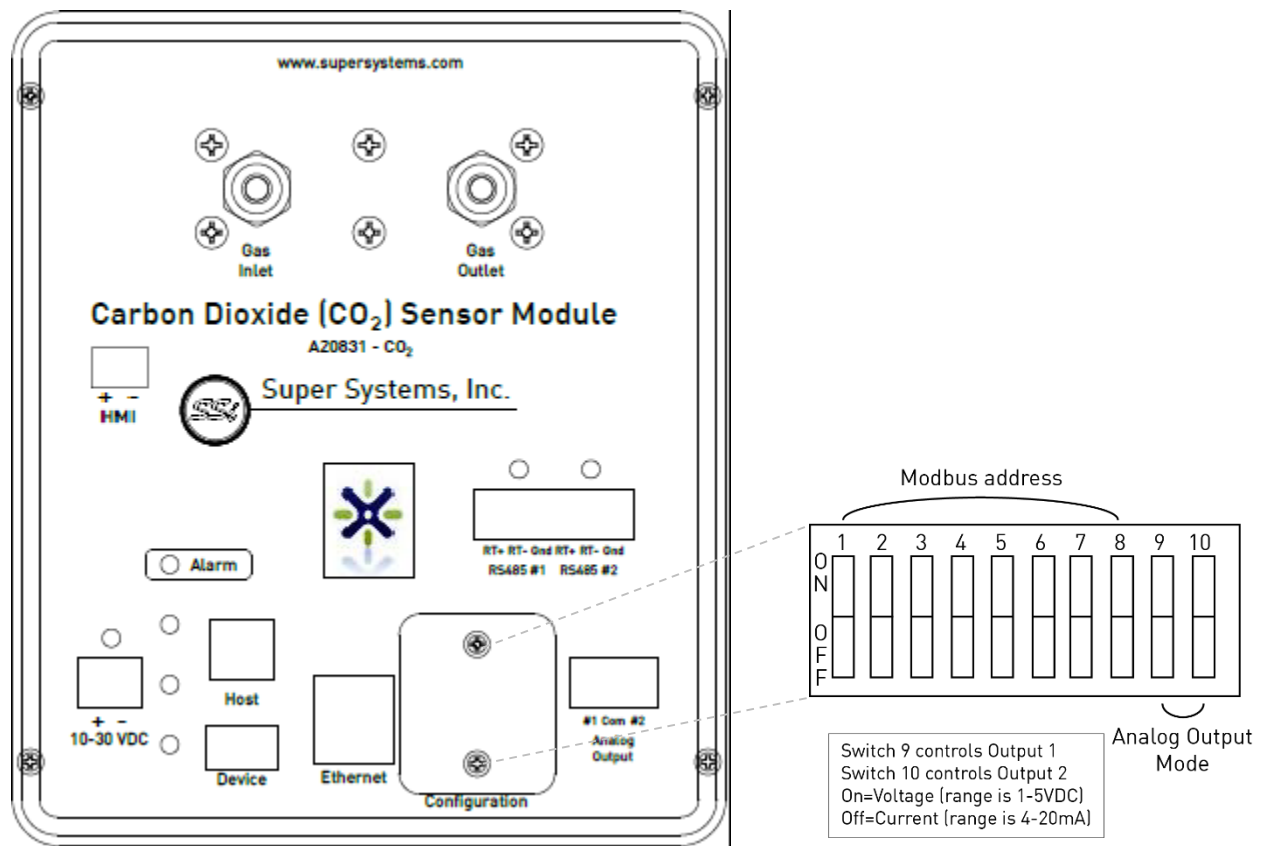


Figure 1: Electrical & communications diagram for SGSM

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## Connection Ports & Function

HMI: This is the connection for an HMI.

RS485 #1: This is a communications port used for when this device is the Client.

RS485 #2: This is a communications port used for when this device is the Host to another device.

10-30 VDC: This is the port to supply power to the SGSM.

Host: This is the USB Host port.

Device: This is the USB Client port.

Ethernet: This is the Ethernet port.

Configuration: This is where dip switch settings can be changed for the Modbus communications address.

Analog Output: These ports are for analog output #1 and #2.

## **Mounting**

The flow-through sensor requires gas flow past the sensor. The unit has specific inlet and outlet ports, which are labeled on the unit and shown in the figure below.

The unit comes with 1/8" FNPT threaded ports in which two stainless steel compression fittings have been plumbed. The compression fittings are sized to handle 1/4" OD tubing.

This unit is designed to be mounted to 35mm DIN rail.

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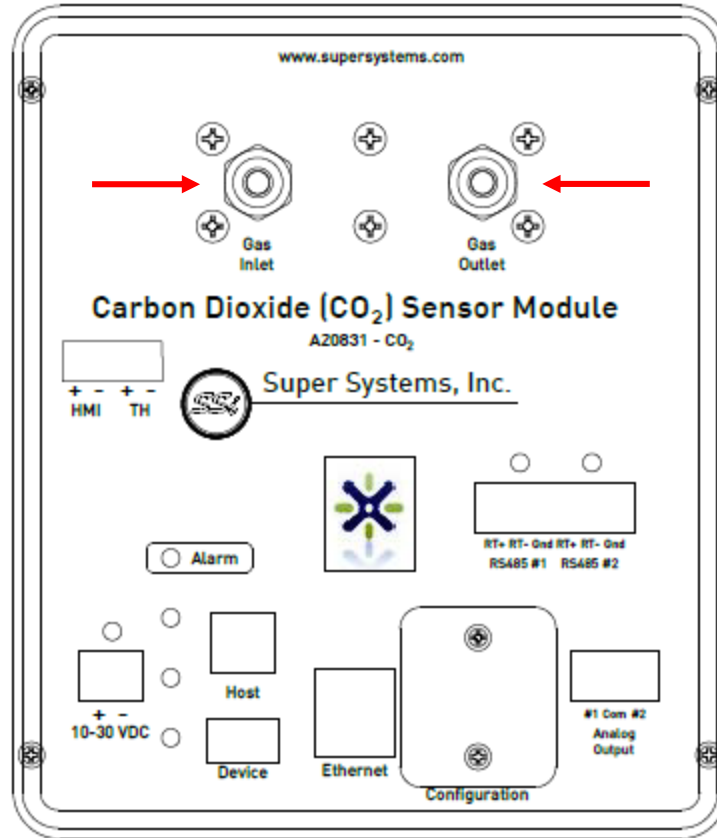


Figure 2: Connection diagram for gas inlet & outlet

## Modbus

The DIP switches are accessible from the front of the unit without having to remove the cover plate (Refer to Figure 1 above).

1. Verify that the unit is not powered. Unplug the power connector to remove power.
  2. Remove the two (2) 6-32 screws from the access plate labeled, "Configuration." This will expose the DIP switches.
  3. Move the DIP switches accordingly for the Modbus address listed in Appendix A.
- Secure the cover plate with the two screws.

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**Modbus Registers**

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

NOTE: The gas percentage (multiplied by 10000) is located in register 1272.

Register Name	Register Location	Description
VERSION_NUMBER	0	current version number of the firmware
UART_1_MODE	1	0 = slave, 1 = Sensor Driver
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.
PV_VARIABLE	11	Actual process variable.
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



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Register Name	Register Location	Description
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
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
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
EEPROM_WRITER_COUNT	38	Counts how many times the EEPROM has been written
CUR_LOOP_OUTPUT_CNTRS	39	Counts being output for each current loop.
MB_LO_ALARM_BITMAP	96	First of two words containing the low threshold alarm bit map
MB_HI_ALARM_BITMAP	98	First of two words containing the high threshold alarm bit map
MB_ALARM_1_LOWER_LIMIT	100	Lower Limit for a given type (first of 30)

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Register Name	Register Location	Description
MB_ALARM_1_UPPER_LIMIT	130	Upper Limit for a given type (first of 30)
MB_ALARM_1_ACTION	160	Action for a given type (first of 30)
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
MB_TM_SEC	520	second
MB_TM_LEAP	521	1 = leap year, 0 = otherwise
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

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Register Name	Register Location	Description
WEBPAGE_ACCESS_CODE	910	Settable register that allows access to the webpages
SECOND_TIMER_VALUE	911	First of two bytes, memcpy'd 32 bit unsigned integer that increments every second forever
MB_IP_ADDR	914	IP Address
MB_IP_MASK	918	Subnet Mask
MB_IP_GTWY	922	Gateway
0	930	Max Round robin time (ms)
RESET_ROUND_ROBIN	931	Resets the round robin time
SENSOR_APP_RR_TIME	932	Round robin time (ms)
SENSOR_APP_RR_TIME_MAX	933	Max Round robin time (ms)
DIGIO_RR_TIME	934	Round robin time (ms)
DIGIO_RR_TIME_MAX	935	Max Round robin time (ms)
UART_1_PARITY	940	0 = 8N1, 1 = 8E1, 2 = 8N2
UART_2_PARITY	941	0 = 8N1, 1 = 8E1, 2 = 8N2
UART_3_PARITY	942	0 = 8N1, 1 = 8E1, 2 = 8N2
UART_4_PARITY	943	0 = 8N1, 1 = 8E1, 2 = 8N2
UART_5_PARITY	944	0 = 8N1, 1 = 8E1, 2 = 8N2
UART_1_MB_ADD_DELAY	955	Additional Intermessage delay
UART_2_MB_ADD_DELAY	956	Additional Intermessage delay
UART_3_MB_ADD_DELAY	957	Additional Intermessage delay
UART_4_MB_ADD_DELAY	958	Additional Intermessage delay
UART_5_MB_ADD_DELAY	959	Additional Intermessage delay
UART_1_MB_ADD_TO	960	Additional Timeout delay
UART_2_MB_ADD_TO	961	Additional Timeout delay
UART_3_MB_ADD_TO	962	Additional Timeout delay
UART_4_MB_ADD_TO	963	Additional Timeout delay
UART_5_MB_ADD_TO	964	Additional Timeout delay
SENSOR_COMM_STATUS_REG	1100	H2O2 comm status (0-16)
SENSOR_N2_FLOW	1101	N2 flow

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Register Name	Register Location	Description
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_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

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Register Name	Register Location	Description
MB_READ_PER_SUPER_KN	1210	Super Kn
MB_READ_STANDARD_KN	1211	Standard KN
MB_READ_PROC_VAR	1212	Process variable
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

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Register Name	Register Location	Description
MB_READ_GAIN_REG	1239	Gain
MB_READ_AD_SCALED_VDC	1241	Scaled VDC
MB_READ_TC_PROC_VAR	1243	TC process variable
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

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Register Name	Register Location	Description
MB_READ_CAL_ERROR_REG	1295	First of 5 calibration error calculations
MB_READ_ZERO_VOLT_CAL	1300	volts at zero (for NDIR cell, 100 = ref, 101 gas)
MB_READ_ZERO_TEMP_CAL	1302	temperature at zero
MB_READ_SPAN_VOLT_CAL	1303	volts at span (for NDIR cell, 103 = ref, 104 gas)
MB_READ_SPAN_TEMP_CAL	1305	temperature at span
MB_READ_SPAN_TARG_CAL	1306	Target value at span
MB_READ_MAX_ROUND_ROBIN	1307	Max Round robin time (ms)
MB_READ_MAX_ROUND_ROBIN_US	1308	Max Round robin time (us)
MB_READ_EEPROM_WRITER_COUNT	1309	Counts the number of times EEPROM has been written (not saved)
MB_READ_SPAN_MULTIPLIER	1310	Shows the span multiplier
MB_DIGIO_OUTPUT_SET	1600	Bitmap that sets the output of a digital I/O card
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

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Register Name	Register Location	Description
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

### Initial Network Configuration

This section is intended for use by persons familiar with Ethernet network setup. The SGSM has a static IP Address so that the web interface can be accessed easily. The default IP Address of the sensor is 192.168.1.200.

If the default IP Address does not allow you to connect to this device through the web browser (see [Control Interface via Web Browser](#) section), the IP Address of the sensor 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 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:

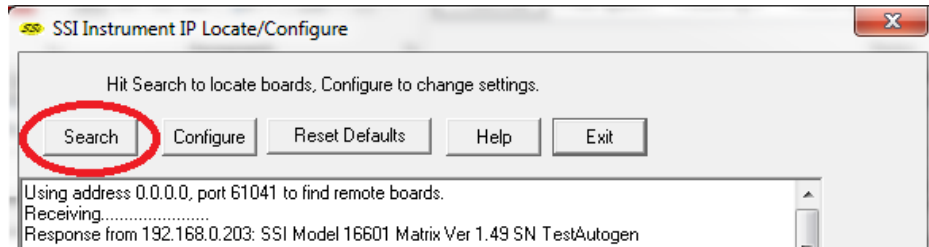
1. Ensure that the unit is connected to the network.
2. Open the nLocateIP program



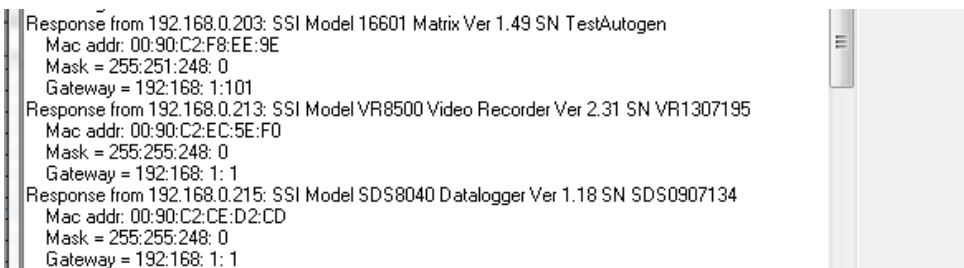


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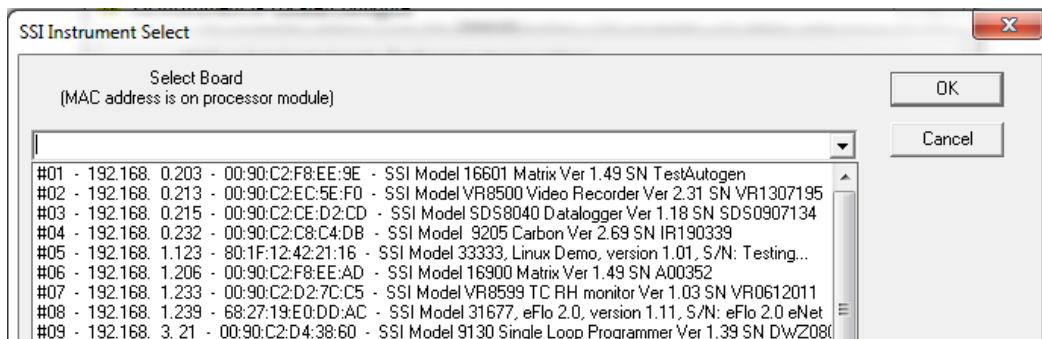
- Once the program opens, click the **Search** button. The program will begin searching for SSI devices connected to the network.



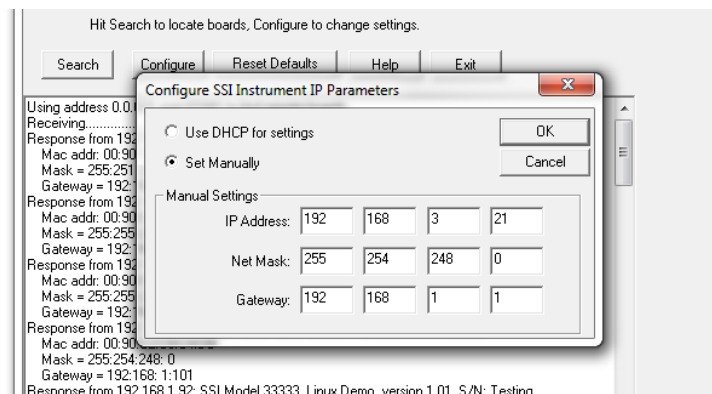
- Look for identifying text in the list of instruments. It includes the type of instrument and serial number. It also provides the IP Address information for the sensor.



- Click the **Configure** button and choose the sensor to change its IP Address settings.



- Click on the device description to highlight it and click the **OK** button. This will display the device's IP settings, which can be changed to match the network to which it's connected.



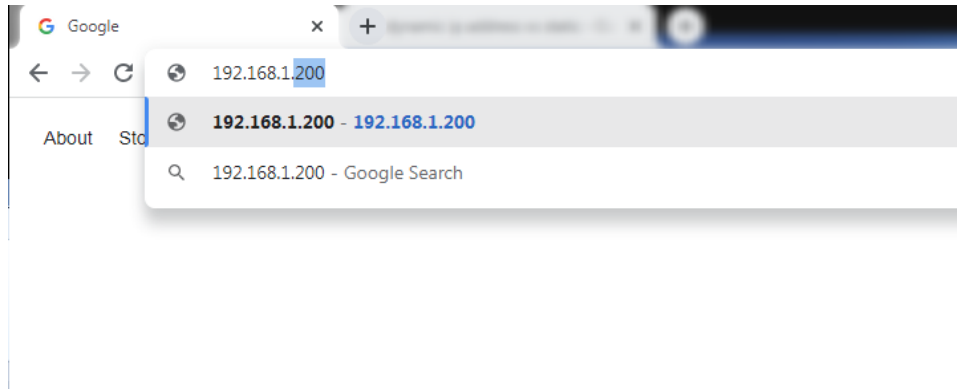
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The sensor's IP Address settings will be changed immediately to allow it to communicate. If you are unable to find the unit in the list of devices, it is possible that a network setting (such as subnet mask) may be different, the unit may be connected 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

### Control Interface via Web Browser

The SGSM 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.

Enter the IP Address into the search bar of the web browser.



***Access Password:*** Contact SSi at (513) 772-0060 for more information on the password used to access secured options.

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## Main

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



Figure 3 - Main Page (with CO/CO<sub>2</sub>/CH<sub>4</sub> Percentage Shown)

## Instrument Information

The Instrument Information page provides a description of the SGSM, 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 webpage version number.

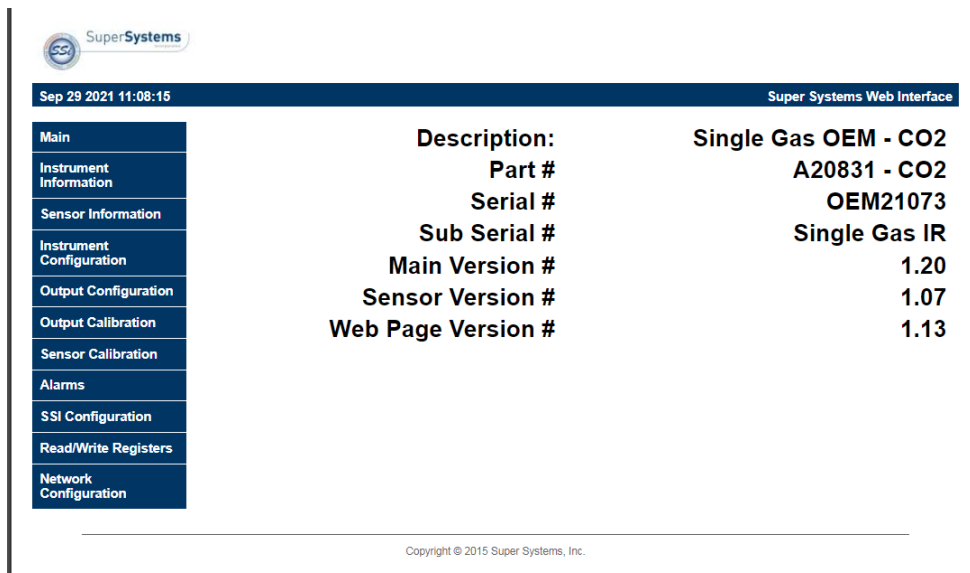


Figure 4 - Instrument Information Page

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## Sensor Information

The Sensor Information page displays information that is useful for SSI technicians and engineers when troubleshooting.

- Ref Vdc: Voltage present value (PV) of the NDIR reference channel.
- Gas Vdc: Voltage PV of the NDIR sensing channel.
- Gas Temperature: There is a thermistor located in the gas stream of the unit to measure the temperature of the sample gas. This measurement is used for compensation of the IR reading.
- Amb. Temperature: There is a thermistor located inside of the SGSM enclosure measuring the temperature inside the enclosure.
- Gas Pressure: Gas pressure measured inside of the NDIR chamber.
- Zero Ref. Vdc: Voltage PV of the NDIR reference channel during a zero calibration.
- Zero Gas Vdc: Voltage PV of the NDIR sensing channel during a zero calibration.
- Zero Gas Temperature: This is the temperature of the zero gas at the time of the zero gas calibration.
- Span Ref. Vdc: Voltage PV of the NDIR reference channel during a span calibration.
- Span Gas Vdc: Voltage PV of the NDIR sensing channel during a span calibration.
- Span Gas Temperature: This is the temperature of the span gas at the time of the span gas calibration.
- Span Target %: This is the user entered value of the span gas percentage during the span gas calibration.
- Span Multiplier: This is a diagnostic tool for internal use only.

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

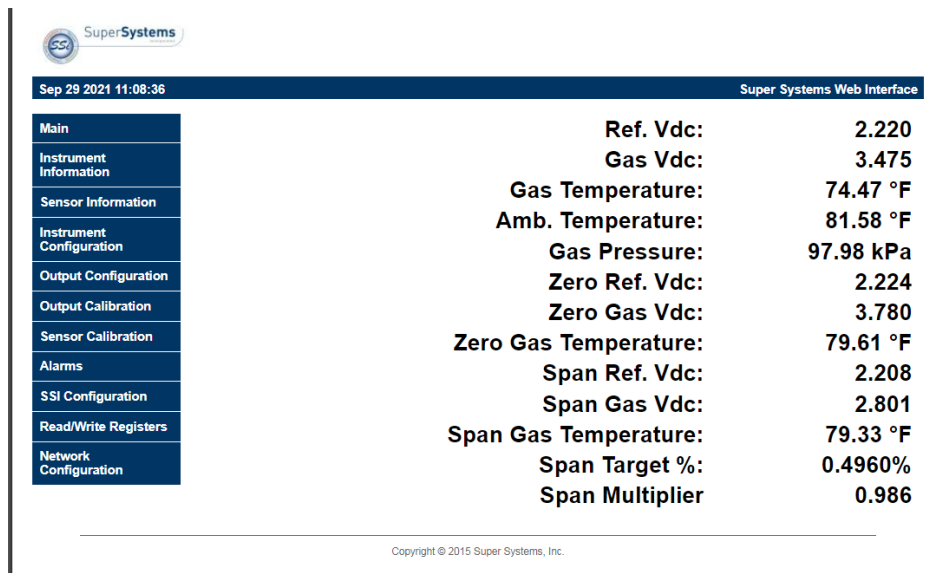


Figure 5 - Sensor Information Page

# Single Gas Sensor Module (SGSM) Operations Manual

## Instrument Configuration

This page allows the user to make changes to the sensor's configuration.

- Set Date/Time: This option, when pressed, will sync the current time of the main board to the computer on which the web interface is running.
- Web Access Code: This is the code that allows the user to have access to all of the webpages, except the SSI Configuration page.
- Min. %CO/%CO<sub>2</sub>/%CH<sub>4</sub>: This is a gas percentage value, below which will always display a 0.00% to prevent false or negative values.

Field	Input	Submit	Current
Set Date/Time		Set Val	
Web Access Code	2	Set Code	2
Min. %CO2	0.0000	Set Val	0.0000%

Figure 6 - Instrument Configuration Page

## Output Configuration

The Output Configuration options allows the user to set up an analog output milliamp signal from the SGSM to a chart recorder or other device for recording or controlling another process. There are two outputs that can be set up for the gas being measured (the options are *External & NDIR Gas*).

When "NDIR Gas" is selected, the user can choose a 0 – 20 mA or 4 – 20 mA output range for the gas percentage calibration range.

The "External" option is for special cases where an additional analog output is required from an external source. Contact SSI for additional details about this option.

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.

## Single Gas Sensor Module (SGSM) Operations Manual

- **Zero (%):** Is the selected source's minimum calibrated zero value that corresponds to 4 mA on a 4-20 mA scale. (4-20 mA is the default Range setting. If Range is set to 0-20 mA, then the Zero % refers to 0 mA.).
- **Span (%):** Is the selected source's maximum calibrated span value that corresponds to 20 mA on a 4-20 mA scale. (4-20 mA is the default Range setting. If Range is set to 0-20 mA, then the Span % still refers to 20 mA.).  
Range: Allows the user to choose between an output signal of 4-20 mA (default) and 0-20 mA.
- **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*.

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

Field	Input	Submit	Current
<b>Loop 1</b>			
Source	External	Set Source	NDIR Gas
Zero (%)	0.00	Set Zero	0.00
Span (%)	100.00	Set Span	100.00
Range	4-20 mA	Set Mode	4-20 mA
Manual (%)	0.00	Set Manual	0.00
<b>Loop 2</b>			
Source	External	Set Source	NDIR Gas
Zero (%)	0.00	Set Zero	0.00
Span (%)	100.00	Set Span	100.00
Range	4-20 mA	Set Mode	4-20 mA
Manual (%)	0.00	Set Manual	0.00

Figure 7 - Output Configuration Page

### Output Calibration

The SGSM is equipped with two analog outputs. These outputs are ranged for 4 – 20 milliamp (mA) signal. They 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 suggests that this device should be calibrated on a routine basis, such as once a year or as prescribed by the user's quality system requirements.

To calibrate each output, first make sure that you have a multimeter (or other appropriate testing instrument) available. SSI recommends that each time an output is calibrated that a zero calibration is performed first and the span calibration is performed second. SSI also recommends that both a zero and span always be performed together. Calibrations steps are provided below.

## Single Gas Sensor Module (SGSM) Operations Manual

1. Select the output value that you wish to calibrate (Zero Output 1, Span Output 1, Zero Output 2, or Span Output 2).
2. Press “Prep for Cal” to enter calibration mode.
3. With a calibrated multimeter, measure the mA value of the corresponding output.
4. Enter the measured value into the “Entered Measured value” field on the webpage and press “Calibrate”. Note: The zero output signal from the analyzer will always be approximately 4 mA even if the output has been configured for a 0 – 20 mA range.

Note: The common (“Com”) terminal of the output is the positive side of the mA signal and the “1” or “2” terminals of the output are the negative side of the mA signal.

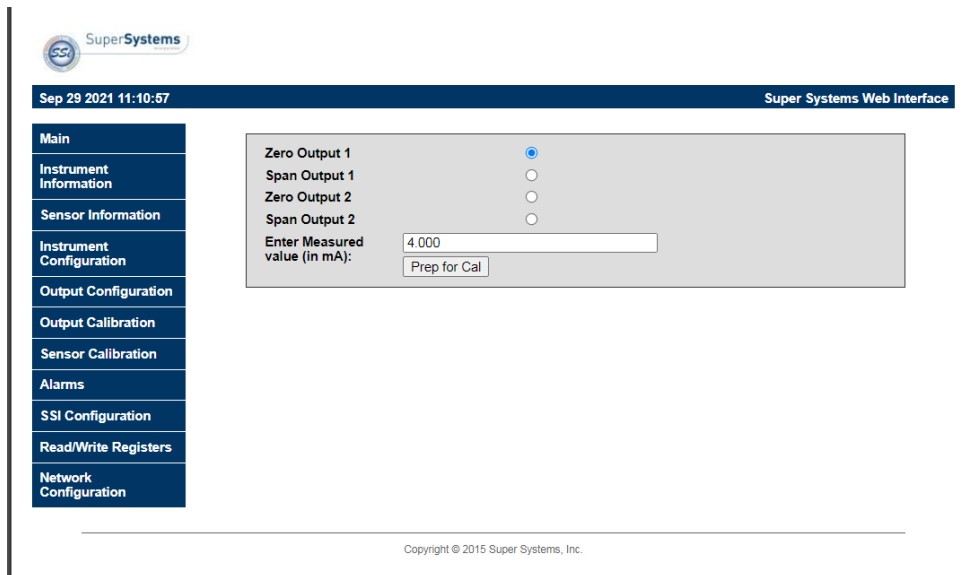


Figure 8 - Output Calibration Page

### 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. **Never perform a span calibration without first performing a zero calibration.** Performing only a zero or span calibration will also cause the sensor to give an erroneous reading. The gas flow through the sensor must be carefully controlled in order to maximize the accuracy of the sensor. The flow of gas during calibration needs to be the same as the sample gas flow during normal operation. That flow is generally 1 to 2 cfh, but may be different for each application. SSI suggests that this device should be calibrated on a routine basis, such as once a year or as prescribed by the user’s quality system requirements.

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.

## Single Gas Sensor Module (SGSM) Operations Manual

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 until the gas reading on the web page stabilizes.
4. Enter the target gas concentration in the “Enter gas concentration (%)” field.
5. Press “Calibrate”. A Calibration Timer will count down.
6. 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.

7. Ensure that the system is purged of any latent gas.
8. Flow the span gas until the gas reading on the web page stabilizes.
9. Enter the target gas concentration in the “Enter gas concentration (%)” field.
10. Press “Calibrate”. A Calibration Timer will count down.
11. Once the Calibration Timer has counted down, the span value will be calibrated.

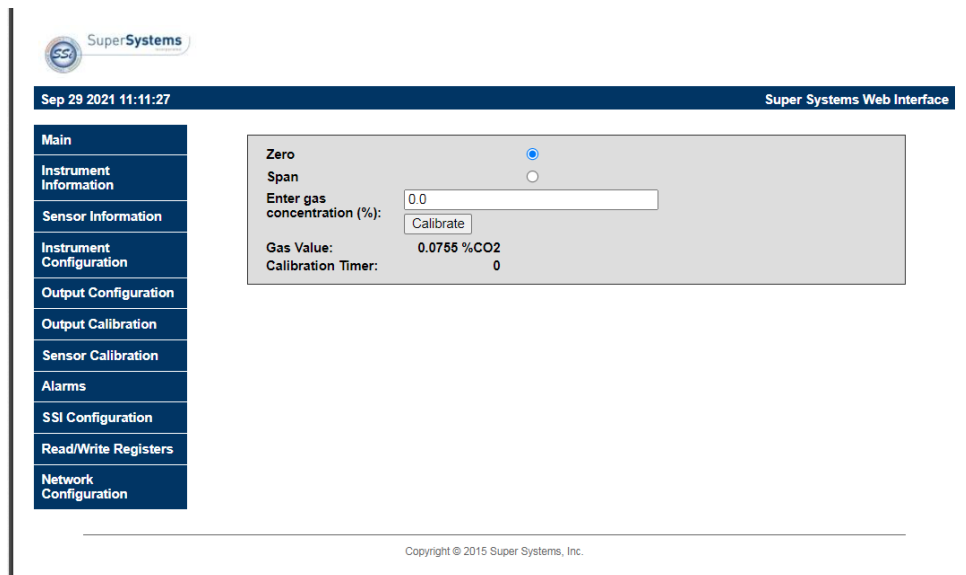


Figure 9 - Sensor Calibration Page

### Alarms

The Alarms page allows the user to set lower and upper limits to create an alarm condition that can be setup and communicated through a Modbus register.

For the desired gas type, enter a Lower Limit and/or an Upper Limit for an alarm condition. Select an Action from the dropdown menu and click the Submit button to save that information.

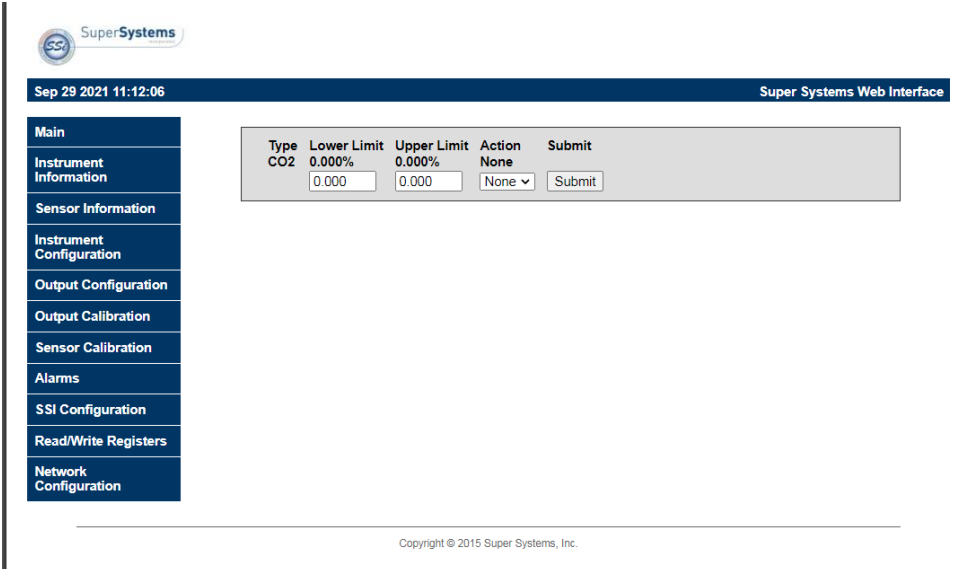


## Single Gas Sensor Module (SGSM) Operations Manual

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

- “None” will not use any of the alarm features (i.e. no alarms are used).
- “AL1” will activate the first set of Modbus registers associated with Alarm 1.
- “AL2” will activate the second set of Modbus registers associated with Alarm 2.
- “Both” will activate both sets of Modbus registers associated with the alarms.

Additionally, a red indicator light illuminates on the front of the enclosure when any alarm condition is met. Contact SSI for additional information on the alarm feature for this product.



The screenshot displays the 'Alarms Page' in the Super Systems Web Interface. The page title is 'Super Systems Web Interface' and the date/time is 'Sep 29 2021 11:12:06'. A navigation menu on the left includes: Main, Instrument Information, Sensor Information, Instrument Configuration, Output Configuration, Output Calibration, Sensor Calibration, Alarms, SSI Configuration, Read/Write Registers, and Network Configuration. The main content area contains a table with the following data:

Type	Lower Limit	Upper Limit	Action	Submit
CO2	0.000%	0.000%	None	Submit
	<input type="text" value="0.000"/>	<input type="text" value="0.000"/>	<input type="text" value="None"/>	<input type="button" value="Submit"/>

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Figure 10 - Alarms Page

### 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. Accessing this page requires a special code.

- 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.

# Single Gas Sensor Module (SGSM) Operations Manual

- 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.

Field	Input	Submit	Current
Main Serial	<input type="text" value="OEM2107"/>	<input type="button" value="Set Val"/>	OEM21073
Sub Serial	<input type="text" value="Single Gas"/>	<input type="button" value="Set Val"/>	Single Gas IR
En. Card	<input type="text" value=""/>	<input type="button" value="Set Val"/>	Off
Relay	<input type="text" value="0"/>	<input type="button" value="Set Val"/>	0
Temp. Units	<input type="text" value="Fahr"/>	<input type="button" value="Set"/>	Fahrenheit
Duty Cycle Adjust	<input type="text" value="3400"/>	<input type="button" value="Set Val"/>	3400
Input	<input type="text" value=""/>	<input type="button" value="Submit"/>	0
Set FD	<input type="text" value=""/>	<input type="button" value="Set Val"/>	
Set Reg	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="button" value="Set Val"/>

Figure 11 - SSI Configuration Page

## Read/Write Registers

The Read/Write Registers page is used for troubleshooting, verification, and setup of the instrument. Modifications to the SGSM can also be written from this page. Its use is intended for SSI personnel and SSI support personnel who have been trained and authorized.

Call SSI at (513) 772-0060 with questions or additional help with setting up these alarms.

# Single Gas Sensor Module (SGSM) Operations Manual

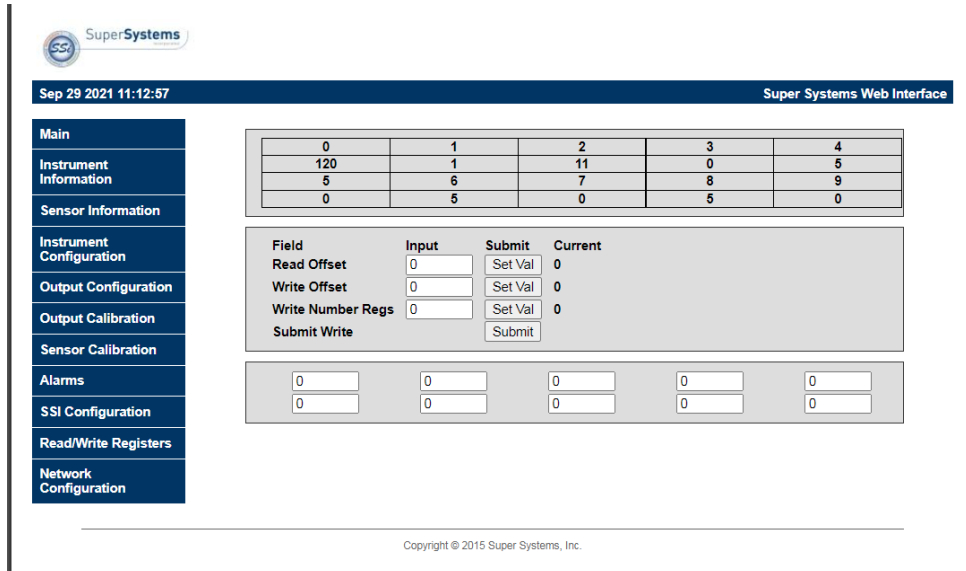


Figure 12 – Read/Write Registers Page

## 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.**

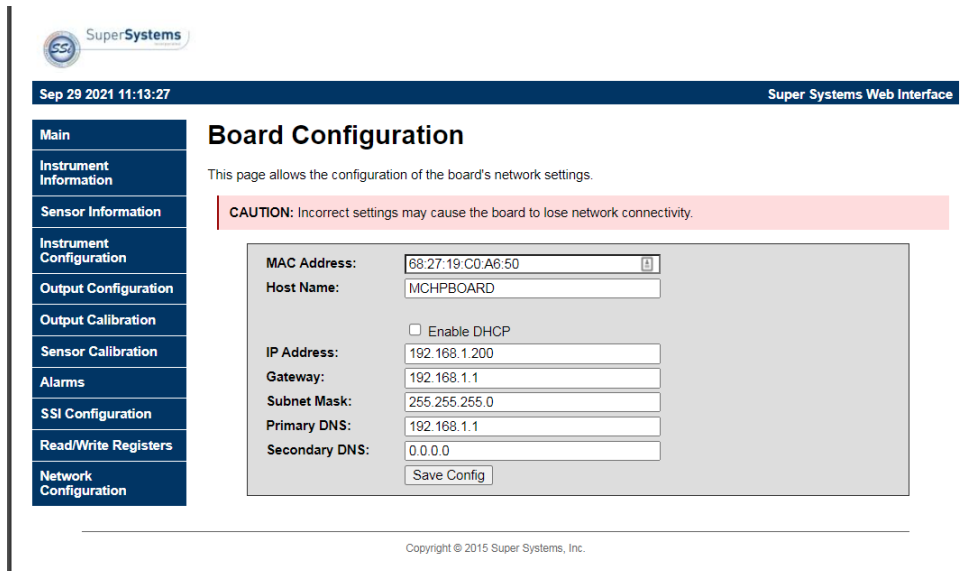


Figure 13 - Network/Board Configuration Page

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.

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Operations Manual

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.

### Replacement Parts

Part	Part Number
Terminal Block, 6-Position	33305
Terminal Block, 3-Position	33310
Terminal Block, 2-Position	33312
Fitting, 1/4 OD comp x 1/8 mpt 316 SS	34547

## 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.

# Single Gas Sensor Module (SGSM) Operations Manual

## Appendix A: DIP Switch Setting Examples

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Single Gas Sensor Module (SGSM)  
Operations Manual

Revision History

Rev.	Description	Date	MCO #
New	Initial release	1/6/2017	2204
A	Added Configuration Board Diagram and DIP Switch Example Appendix	6/1/2017	2218
B	Added Calibration instructions and information on new web pages, updated Modbus chart, various other minor corrections	1/19/2022	2317
C	Updated specifications	2-15-2022	2319