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cGas-SD Sample Draw System

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NEED MORE INFORMATION?

This is the **Operation Manual** for the cGas-SD Sample Draw System.

For information on the following topics, please refer to the **cGas-SD Installation Manual**:

- Instrument Specifications
- Mounting and Installing
- Recommended Maintenance
- Wiring Connections
- Relay Connections

If you would like to view or download the **cGas-SD Installation Manual** from our website [Click here](#)

If after reading through the manual, you have any questions, please do not hesitate to contact Technical Support at help@cetci.com

The most up-to-date version of any manual will always be on our website.

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1 POLICIES

1.1 Important Note

Read and understand this manual prior to using this instrument. Carefully read the warranty policy, service policy, notices, disclaimers and revisions on the following pages.

This product must be installed by a qualified electrician or factory trained technician and according to the instructions indicated in this manual. This instrument should be inspected and calibrated regularly by a qualified and trained technician.

This instrument has not been designed to be intrinsically safe. For your safety, **do not** use it in classified hazardous areas (explosion-rated environments).

INSTRUMENT SERIAL NUMBER:

PURCHASE DATE:

PURCHASED FROM:

1.2 Warranty Policy

Critical Environment Technologies Canada Inc. warrants the products we manufacture (excluding sensors, battery packs, batteries, pumps, and filters) to be free from defects in materials and workmanship for a period of two years from the date of purchase from our facility. Sensors are consumable items and once they leave our factory, we cannot reuse or resell them. As such, all sensor sales are final. Should the sensor itself be faulty, there is a one-year pro-rated warranty that would apply from the date of purchase from our facility.

The warranty status may be affected if the instrument has not been used and maintained as per the instructions in the manual or has been abused, damaged, or modified in any way. The product is only to be used for the purposes stated in the manual. Critical Environment Technologies is not liable for auxiliary interfaced equipment or consequential damage.

Due to ongoing research, development, and product testing, the manufacturer reserves the right to change specifications without notice. The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data.

1.3 Service Policy

CET maintains an instrument service facility at the factory. Some CET distributors / agents may also have repair facilities; however, CET assumes no liability for service performed by anyone other than CET personnel. Repairs are warranted 90 days after the date of shipment (sensors have individual warranties). Should your instrument require non-warranty repair, you may contact the distributor from whom it was purchased, or you may contact CET directly.

Prior to shipping equipment to CET, contact our office for an RMA #. All returned goods, regardless of reason, must be accompanied by an RMA number. Please read our Warranty and Returns Policy and follow our RMA Instructions and Form.

If the product is deemed repairable, for liability reasons, CET will perform all necessary repairs to restore the instrument to its full operating condition.

1.4 Copyrights

This manual is subject to copyright protection; all rights are reserved. Under international and domestic copyright laws, this manual may not be copied or translated, in whole or in part, in any manner or format, without the written permission of CET.

Modbus® is a registered trademark of Gould Inc. Corporation. BACnet® is a registered trademark of American Society of Heating, Refrigeration and Air Conditioning (ASHRAE).

1.5 Disclaimer

Under no circumstances will CET be liable for any claims, losses or damages resulting from or arising out of the repair or modification of this equipment by a party other than CET service technicians, or by operation or use of the equipment other than in accordance with the printed instructions contained within this manual or if the equipment has been improperly maintained or subjected to neglect or accident. Any of the foregoing will void the warranty.

Under most local electrical codes, low voltage wires cannot be run within the same conduit as line voltage wires. It is CET policy that all wiring of our products meets this requirement. It is CET policy that all wiring be within properly grounded (earth or safety) conduit.

1.6 Revisions

This manual was written and published by CET. The manufacturer makes no warranty or representation, expressed or implied including any warranty of merchantability or fitness for purpose, with respect to this manual.

All information contained in this manual is believed to be true and accurate at the time of printing. However, as part of its continuing efforts to improve its products and their documentation, the manufacturer reserves the right to make changes at any time without notice. In addition, due to improvements made to our products, there may be information in this manual that does not exist in the version of the product the user has. Should you detect any error or omission in this manual, or should you want to inquire regarding upgrading the device's firmware, please contact CET at the following address:

Critical Environment Technologies Canada Inc.

Unit 145, 7391 Vantage Way, Delta, BC, V4G 1M3, Canada

Toll Free: +1.877.940.8741
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Email: help@cetci.com
Website: www.critical-environment.com

In no event will CET, its officers or employees be liable for any direct, special, incidental or consequential damages resulting from any defect in any manual, even if advised of the possibility of such damages.

The most up-to-date version of the manual will always be on our website.

2 SAFETY INFORMATION

The cGas-SD complies with:

- CSA-C22.2 No 61010-1
- UL 61010-1 (Edition 3)
- Overvoltage Category II, Pollution Degree 2
- FCC. This device complies with part 15 of the FCC Rules, Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
- CERTIFIED FOR ELECTRIC SHOCK & ELECTRICAL FIRE HAZARD ONLY. LA CERTIFICATION ACNOR COUVRE UNIQUEMENT LES RISQUES DE CHOC ELECTRIQUE ET D'INCENDIE D'ORIGINE ELECTRIQUE.

2.1 General Safety Warnings

The cGas-SD is intended for indoor use. It should be mounted outside the sampling room at viewing height. Sample tubing inside the room should be fixed at the appropriate height for the gas being sampled.

NOTE: For wet environment applications, use liquid tight conduit hubs wherever conduit enters the enclosure.

2.2 Protection Against Electrical Risks



Caution



ISO 7000- 0434B (2004-01)
Caution, possibility of electric shock

Disconnect all power before servicing. There may be multiple power sources.

Power supply shall have a building installed circuit breaker / switch that is suitably located and easy to access when servicing is required and should be labelled as cGas-SD supply

(disconnecting power to the cGas-SD). Appropriate markings should be visible at the circuit breaker / switch that is supplying power to the cGas-SD.

If the equipment is used in a manner not specified in this manual, the protection provided by the instrument may be impaired.

This device may interfere with pacemakers. Modern pacemakers have built-in features to protect them from most types of interference produced by other electrical devices you might encounter in your daily routine. If you have a pacemaker, follow your healthcare provider's instructions about being around this type of equipment.

2.3 Protection Against Mechanical Risks

The enclosure has a screw in each corner to secure the door to the base for electrical safety. Be aware that the hinged door that could potentially pinch fingers and the sharp edges and/or jumper pins on the board could potentially prick or cut fingers if not handled carefully.

3 SENSOR LIFESPAN INFORMATION

Sensors have an operational life expectancy, a shelf life for storage and a recommended calibration frequency that is commonly dependent on the type of sensor, type of application and particular environment. Most sensors will suffer general wear and tear and it may not always be easy to detect the damage caused, making regular maintenance important to help keep the sensors in good working order. CET does not accept any liability for mishaps, misuses or damages that could occur to a sensor, reducing its performance or lifespan.

3.1 Sensor End of Life (EOL) Notification

The cGas-SD Sample Draw System has a sensor end of life notification feature that tracks the number of days the sensor has been powered since installation. This is a useful feature that helps users keep track of the sensor's lifespan and plan for its replacement in advance.

When the sensor is within a year of expiring a message will appear before each Span Calibration stating the lifetime remaining. Once the maximum age has been exceeded the display will show an EOL fault and the backlight will blink on and off. The fault will clear itself when a new smart sensor board is installed.

NOTE: The EOL fault does not prevent operation of the controller including detection, alarming and calibration.

NOTE: An expired sensor should be replaced immediately.

3.1.1 View Sensor Life Remaining

You can see the life remaining for each installed sensor in the Sensor Life menu item in the Calibration menu.

Enter passcode 2020 and press the OK button.

Enter Passcode 2020

Navigate to the Calibration parent menu and press OK.

Choose Menu >Calibration	Selected Channel CH1 CO
-----------------------------	----------------------------

Navigate to the Sensor Lifespan menu item. Total # Months is the lifespan of the sensor. Press OK and the DOWN button to see how many months remain of the sensor lifespan.

Sensor Lifespan Total 36 Months	Sensor Lifespan >Left 26 Months
------------------------------------	------------------------------------

Press OK and navigate to EXIT.

NOTE: The countdown will change from months to days when the remaining lifespan reaches 30 days.

The sensor end of life information can be tracked in the holding register if required.

3.1.2 Enable/Disable Sensor EOL Notification

The factory default setting for the sensor end of life notification feature is Enabled. It can be disabled if desired.

Enter passcode 2019 and press the OK button.

Enter Passcode 2019

Navigate to the Configuration parent menu and press OK.

Choose Menu >Configuration	Selected Channel CH1 CO
-------------------------------	----------------------------

Navigate to the Sensor EOL menu item and press OK. Change Enabled to Disable and press OK.

Sensor EOL Enabled	Channel En/Dis >Disabled
-----------------------	-----------------------------

Press OK and navigate to EXIT.

3.2 Factors Affecting Lifespan and Performance of Sensors

3.2.1 Electrochemical Sensors

- Typically designed to operate between -10°C and +50°C, do not expose to extreme temperatures for prolonged periods of time. Repeated or prolonged exposure to temperatures like 60-65°C / 140-149°F can lead to evaporation of the electrolyte and shifts in baseline readings. Operation in very low temperature environments can impede the sensitivity of the sensor and slow its the response to the target gas.
- Continuous operation in low relative humidity environments can dry out the electrolyte and extended periods of exposure to high moisture environments can cause the electrolyte to absorb the moisture, causing dilution and inaccurate measurements.
- Prolonged exposure to extremely high gas concentrations can compromise sensor performance.
- Paint fumes, cleaning products, dust, sand, water and insects can reduce lifespan and compromise performance.
- Avoid exposure to high concentrations of solvent vapors during storage, installation and operation. Organic solvents may block the sensing electrodes, create false baselines

and in some cases damage the electrodes and physically damage the body of the sensor.

- Negative cross-sensitivities may cause the sensor to produce lower readings than the true concentration of gas in ambient air.
- Before initial use after production may be stored at room temperature ideally at 20°C / 68°F and 60%RH or preferably in the fridge for up to 6 months. Beyond this period, the sensor performance is likely to deteriorate, such as with longer response time and lower sensitivity regardless of whether sensor has been used or not.
- AMMONIA (NH₃): Background concentrations of ammonia might shorten the lifetime of the sensor. Exposure to a high concentration all at once will poison the sensor and render it useless.
- OXYGEN (O₂): Continuous exposure to high concentrations of sulphide compounds like hydrogen sulphide can poison the sensor. Oxygen sensors require 99.9% nitrogen (N₂) for a true zero. During calibration, recommend doing the span first, followed by zeroing.

3.2.4 Infrared Sensors

- Do not use in locations where corrosive chemicals such as chlorine, ammonia and other oxidizers are present, especially if there is a higher humidity level.
- High humidity can affect response and promote corrosion.
- Water or vapour condensation can impair sensor performance.
- Dust and dirt can compromise sensor performance.
- Excessive vibration or impact can damage the sensor.
- Continuous exposure to gas will not poison the sensor but it may require a long time to clear before accurate readings can be taken again.

4 BASIC SYSTEM OPERATION

The cGas-SD is intended for monitoring select toxic gases, oxygen and refrigerants.

WARNING: The cGas-SD is **not** available with solid state refrigerant sensors or combustible sensors such as methane or propane. Solid state refrigerant sensors do not provide adequate stability; combustible gases can be an ignition source. The material of the valves and diaphragm is not compatible with combustible gases; should there be a blockage, the pump will pressurize the system, increasing the possibility of combustion/explosion. Additionally, the cGas-SD is not approved for use in classified hazardous areas, as the sample draw pump is not intrinsically safe.

The cGas-SD has a pump that pulls air from the target location through the tubing, in the inlet port and over the sensor. The air is then exhausted through the outlet port. If the gas readings are higher than a specified set point, the cGas-SD will go into alarm. It can operate as a standalone system or connect to another controller, control panel or BAS / BMS / DDC system.

When powered up, the LCD display of the cGas-SD will turn on and rotate through several info screens that differ depending on the configuration of the device. The cGas-SD will be visible on the controller / BAS / DDC system during the power up countdown and will output a default value to prevent alarms until the system is fully powered up. After that time, the system may exhibit gas alarm condition(s) if the sensor has not gone through the recommended warm up time. The time it takes for a sensor to warm up and stabilize is dependent on several factors.

NOTE: It is important to make sure that the tubing is securely sealed around the inlet and outlet fittings and not leaking air. If needed, use a little liquid soap on the outer surface of the end of the tubing to help it slip onto the fitting easily. To test for a leak, block the other end of the tubing with your finger. If the pump stalls and the alarm comes on, the line is sealed. If the pump keeps running, the tubing is not fastened properly.

NOTE: The vacuum switch is intended to shut off the pump in the case of a blockage in the inlet tubing. If the inlet tube becomes blocked and/or the becomes dirty, the display will show Flow Alarm, the buzzer will sound, and the pump will shut off. Remove the blockage or replace the dirty air filter and press the OK push-button to stop the buzzer, restart the pump and clear the latching.

NOTE: The vacuum switch is factory calibrated prior to shipping and should function properly upon arrival. However, it should be tested prior to using the system. Refer to Section 9 MAINTENANCE for more information.

4.1 General Info Screens

Pressing the UP or DOWN buttons during normal operation allows you to scroll through a series of information screens showing the model name and firmware version; the gas type and AD counts; the communications ID number, gas type and gas level.

4.2 Navigating the Menu Structure

The three programming push-buttons on the outside of the enclosure are used to navigate through the cGas-SD menu structure.

Push-Button Operation

The UP and DOWN buttons are used to scroll through screens, menus or setting choices depending on the screen displayed. The OK button is used to initiate menu operation, choose a setting or confirm a choice depending on the screen displayed.

Numeric Entry

On any screen where a number will be directly entered (such as passcode entry) the following operation applies. Numbers are entered left to right 1 digit at a time with an underline/cursor indicating the digit currently being edited. Use the UP/DOWN buttons to change the currently selected digit. Press OK to move to the next digit. Except for where you enter the passcode, all other settings requiring numeric entry will be followed with a Yes/No confirmation once the entire number is entered in case any mistakes are made.

4.2.1 Accessing the Menu with Passcodes

From any normal operation screen press OK to bring up the passcode entry screen. Enter one of the following passcodes using the Numeric Entry method described in the previous section.

- Service Passcode: 2020
- Admin Passcode: 2019

NOTE: Service Passcode 2020 is ideal for service technicians or anyone who only needs quick access to Testing and Calibration.

The menu structure is broken into the following 3 levels:

- Top Menu
- Parent Menu
- Menu Items

The Top Menu will allow you to choose a Parent Menu that lists specific settings and operations that you want to access. For example, Testing, Calibration, Alarm, Relays, etc. Navigate to the desired Parent Menu and press OK.

Once in a Parent Menu a list of available Menu Items is shown. Each Menu Item will have a title on the top line and the current setting on the bottom line. Use the UP/DOWN buttons to scroll through the available Menu Items. The Menu Items that are displayed will depend on your device's configuration as well as the selected channel or relay.

Pressing OK on any Menu Item screen will add a > to the bottom line. This indicates that you are now able to change the setting. Use the UP/DOWN buttons to change the value and OK to select. Once a selection is made the > will disappear, indicating that you are back in the Parent Menu.

NOTE: After 5 minutes of inactivity in any of the menus, the display will return to normal operation.

NOTE: Except when conducting test functions, the gas detection and alarm reactions of the cGas-SD will continue to function as normal during menu use.

4.3 Display Settings

The LCD display can display up to 2-lines of 16-characters. After warm-up and upon normal operation, the display will show the current gas level reading for each channel that has been configured.

4.3.1 Adjust Display Brightness

The brightness of the display can be changed in increments of 10. The factory default is 50 (50%). You cannot enter a number higher than 100. Entering a value of 0 turns the backlight off completely but with ambient light the text can still be read on the display.

Enter passcode 2019 and press the OK button.

Enter Passcode
2019

Navigate to the Display parent menu, press OK. Navigate to the Brightness menu item and press OK.

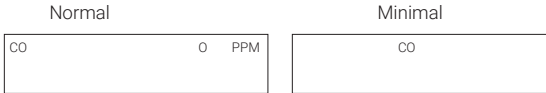
Choose Menu	Brightness
>Display	50

Choose the desired numeric value and press OK.

Brightness	Brightness
>100	100

4.3.2 Display Configurations

The factory default display setting is Normal, which displays the gas type, gas reading and gas units for configured channels. The information can be reduced to just the gas type by changing the setting to the minimal mode display.



Enter passcode 2019 and press the OK button.



Navigate to the Display parent menu, press OK. Navigate to the Display Type menu item and press OK.



Choose the preferred display setting and press OK.



4.4 Alarm Status, Fault Detection and Communication Failure Notifications

If a channel is in alarm, the following letters will be displayed at the end of the line for that channel.

- low for low alarm
- mid for mid alarm
- high for High alarm



The cGas-SD has built in fault detection, and in the event of a problem with the measurement circuitry the device will indicate a fault condition on the display and the display backlight will blink. Normal operation will resume once the fault condition has been corrected.

NOTE: If a question mark ? is displayed, the system is reading slightly negative but not enough to adversely affect the alarm functionality; a re-zeroing is recommended.

If there is a communication failure between the cGas-SD and the controller or BAS, the screen will display COMM at the end of the line.



For a list of Fault Codes, refer to Section 11 Troubleshooting.

4.5 Setting Channel Alarm Setpoints, Direction and Hysteresis

The cGas-SD can be configured with 3 gas alarm setpoints. LOW, MID and HIGH are names we use to describe the alarm setpoints but each one can be set to any level. The number entered as the setpoint is the exact number/level of gas concentration at which the device will indicate an alarm condition on the display and trigger the relays and internal buzzer as configured.

The alarm set points can be changed at any time. The sensor does not require calibration before or after changing them.

For most gas sensors, the alarm setpoint should be configured as Ascending. An Ascending alarm is used when monitoring a gas that becomes hazardous with increasing quantity. The normal/safe gas level is below the alarm setpoint and when the gas level increases, reaching and exceeding the alarm setpoint, the alarm is tripped.

An oxygen sensor should be configured with both an Ascending and a Descending alarm setpoint. The factory default ascending set point is 23.0% volume and the descending is 19.5% volume (normal atmospheric oxygen content is 20.9% vol).

Most installations will use the following factory default alarm setpoints:

SENSOR GAS TYPE	STANDARD RANGE	LOW ALARM	MID ALARM	HIGH ALARM
Ammonia (NH ₃)	0 - 500 ppm	25 ppm	35 ppm	200 ppm
Carbon Monoxide (CO)	0 - 200 ppm	25 ppm	50 ppm	100 ppm
Hydrogen Sulphide (H ₂ S)	0 - 50 ppm	10 ppm	12 ppm	15 ppm
Nitric Oxide (NO)	0 - 100 ppm	25 ppm	35 ppm	50 ppm
Oxygen (O ₂)	0 - 25% Vol	19.5 %vol descending	23 %vol ascending	18.5 %vol descending
Sulphur Dioxide (SO ₂)	0 - 20 ppm	2 ppm	3 ppm	5 ppm
Refrigerants (except R123)	0 - 2,000 ppm	250 ppm	500 ppm	1,000 ppm
R123 Refrigerant	0 - 500 ppm	50 ppm	75 ppm	150 ppm

NOTE: Standard range and alarm setpoints are subject to change when required and may differ depending on the application requirements and local regulatory authorities.

Setting a hysteresis value determines at what gas concentration the alarm condition will stop when the gas reading goes below the alarm setpoint. For example, if the alarm setpoint is 100 ppm and the hysteresis is 5 ppm, when the gas concentration reaches or exceeds 100 ppm, the cGas-SD will display an alarm condition. The alarm condition will remain displayed until the gas concentration reduces to 95 ppm (5 ppm below the alarm setpoint).

Using hysteresis prevents the alarm condition from coming on and going off repetitively if the gas fluctuates just above and just below 100 ppm (which would happen if the hysteresis is set to 0).

To Set Alarm Setpoints, Direction and Hysteresis:

Enter passcode 2019 and press the OK button.

Enter Passcode 2019

Navigate to the Alarms parent menu, press OK.

Choose Menu >Alarms

Navigate to the Selected Alarm menu item and confirm the correct alarm level is showing or choose a different alarm level (ie. Mid or High).

Selected Alarm Low Alarm

Selected Alarm >Mid Alarm

Navigate to the Alarm Setpoint menu item and change the value as required and press OK.

Alarm Setpoint 50 PPM

Alarm Setpoint >50 PPM

Press OK to confirm the value is correct.

Confirm?	N
>50 PPM	>Y

Alarm Setpoint 50 PPM

Navigate to the Alarm Direction menu item and confirm the correct direction is set for the gas sensor. Ascending is used for most sensors, ascending and descending are used for Oxygen sensors.

Alarm Direction ASCENDING

Navigate to the Alarm Hysteresis menu item and confirm the desired value is showing or press OK to change it as required.

Alarm Hysteresis 000 PPM CO

Alarm Hysteresis >005 PPM CO

Press OK to confirm and continue.

Confirm?	N
>5 PPM	>Y

Alarm Hysteresis 005 PPM CO

4.6 Enable / Disable Alarm Blink

The display can be configured to blink when the channel goes into any level of alarm. The factory default setting is enabled for Alarm 3 / High Alarm.

Enter passcode 2019 and press the OK button.

Enter Passcode 2019

Navigate to the Alarms parent menu, press OK.

Choose Menu >Alarms

Navigate to the Selected Alarm menu item and confirm the correct alarm level is showing or choose a different alarm level (ie. Mid or High).

Selected Alarm
Low Alarm

Selected Alarm
>High Alarm

Navigate to Alarm Blink menu item and press OK. Change value to Enabled and press OK.

Alarm Blink
>Disabled

Alarm Blink
>Enabled

4.7 Enable / Disable Channel

NOTE: Factory default setting is enabled.

This setting allows you to enable or disable the gas channel. A disabled channel will not display gas readings. A disabled channel will also no longer cause any output reactions (drive an analog output or relay) and will output the "default reading" setting over digital communications.

CO ---- PPM

CO 0 PPM

Enter passcode 2019 and press the OK button.

Enter Passcode
2019

Navigate to the Configuration parent menu and press OK.

Choose Menu
>Configuration

Navigate to the Channel En/Dis menu item and press OK.

Channel En/Dis
Enabled

Change Enabled to Disable and press OK.

Channel En/Dis
>Disable

Channel En/Dis
Disabled

4.8 Relay, Buzzer and Strobe Settings

The cGas-SD has one dry contact relay that is designed to operate fan starters or coils to control equipment that draws no more than 5 amps @ 240 V start-up and / or operational current. The system does not provide any power from the terminal. Dry contacts operate like a switch to simply activate (switch on) or de-activate (switch off) equipment to be controlled, such as fan starters.

The system relay is SPDT (single pole, double throw) thereby providing one set of usable dry contacts for the relay. The cGas-SD Sample Draw System is designed to be fail-safe. Equipment to be controlled by the relay should be wired to the "NC" (Normally closed) and "COM" (Common) terminals. With this wiring, the connection will be open under normal, low gas concentration conditions. When the gas concentration rises to the configured alarm point or if there is a power failure, the relay NC connection will close to the relay COM. The relay coils are normally energized in a non-alarm state for failsafe operation.

Relay settings are user configurable in the field. The default factory settings for the relays are as follows:

- Enabled
- 10 seconds ON Delay
- 10 seconds OFF Delay
- Relay latching disabled
- Relay silencing disabled
- Relay activated on channel LOW alarm level, failsafe enabled

The cGas-SD comes with an internal audible alarm/buzzer that can be enabled or disabled. The buzzer is enabled by default and linked to the channel HIGH alarm point.

Pressing the OK button will stop sounding the buzzer or any external audible device the cGas-SD is connected to for 2 minutes, the factory default set amount of time. If a different set amount of time is required, this needs to be specified at the time of order.

The internal buzzer settings are user configurable in the field. The default factory settings for the buzzer are as follows:

- Enabled
- 0 seconds ON Delay
- 0 seconds OFF Delay
- Relay latching disabled
- Relay silencing enabled
- Temporal 4 sound disabled
- Activated on channel HIGH alarm level, failsafe disabled

The cGas-SD has a terminal connection on the main board for a remote 24 VDC horn and/or strobe combination (ie. RSH-24VDC), 0.5 Amps max. The strobe settings are user configurable in the field. The default factory settings for the strobe are as follows:

- Enabled
- 10 seconds ON Delay
- 10 seconds OFF Delay
- Relay latching disabled
- Relay silencing enabled
- Activated on channel HIGH alarm level, failsafe disabled

4.8.1 Enable / Disable the Relay, Buzzer or Strobe

The factory default for the relay, buzzer and strobe settings are enabled. If a relay or buzzer or strobe is disabled it will not trip.

Enter passcode 2019 and press the OK button.

Enter Passcode

2019

Navigate to the Relay parent menu and then to the Selected Relay menu item and press OK.

Choose Menu

>Buzzer

Choose the relay, buzzer or strobe you would like to disable and press OK.

Selected Relay Relay 1	Selected Relay >Buzzer
---------------------------	---------------------------

OR

Selected Relay Relay 1	Selected Relay >Strobe
---------------------------	---------------------------

Navigate to the Relay En/Dis menu item and press OK.

Relay En/Dis Enabled

Change the value and press OK.

Relay En/Dis >Enable	Relay En/Dis Disable
-------------------------	-------------------------

Repeat for whichever Relay, Buzzer or Strobe you want to disable.

4.8.2 Set Relay ON / OFF Delays

The cGas-SD Sample Draw System has configurable ON and OFF delays for its relay, internal buzzer and strobe, if connected. The relay timers functionality offer a high degree of flexibility, allowing for many variations in settings for turning on and off relay triggered events such as fans and/or signaling a Building Automation System.

ON Delays are useful for addressing spikes in gas levels that only occur for short moments during which there is no need to turn on the fans. The ON Delay tells the system to wait a specified length of time before taking the gas level seriously and turning on the fans.

If an ON DELAY has been set, the relay, buzzer or strobe will remain unchanged until the time delay has expired, at which time the relay will "trip" and the action will be triggered. If the gas level falls below the set alarm level before the delay has finished, the triggered response will be cancelled and the delay will be reset.

OFF Delays are useful for clearing a full cycle of air in the area that caused the gas level alarm. Instead of turning off the fans as soon as the gas level drops below the alarm setpoint, the system keeps the fans activated for a specified amount of time to allow the air to clear completely and then turns them off. This is especially useful in situations where the fan is farther away from the area of gas and clearing the air takes more time.

The OFF Delay does not start until the alarm condition ends. For example, if the gas level is in alarm for 5 minutes and the OFF Delay is 5 minutes then the relay will be tripped for a total of 10 minutes.

The ON Delay and OFF Delay are entered in seconds. The maximum length of time that either can be set to is 1200 seconds (20 min). The default setting from the factory for the relay and the strobe is a 10 second ON Delay and a 10 second OFF Delay. The default setting from the factory for the buzzer is 0 seconds, indicating no ON or OFF Delays are set.

Set ON Delay

Enter passcode 2019 and press the OK button.

Enter Passcode

2019

Navigate to the Relays parent menu and then to the Selected Relay menu item and press OK.

Choose Menu

>Relay

Choose the relay or buzzer you would like to set ON delay for and press OK.

Selected Relay

Relay 1

Selected Relay

>buzzer

Navigate to the Relay ON Delay menu item. Press OK and enter the number of seconds of the ON Delay and press OK.

Relay ON Delay

10

Relay ON Delay

>0020

Press OK to confirm the value is correct.

Confirm?

>20

N

>Y

Relay ON Delay

20

Set OFF Delay

Enter passcode 2019 and press the OK button.

Enter Passcode

2019

Navigate to the Relays parent menu and then to the Selected Relay menu item and press OK.

Choose Menu

>Relays

Choose the relay or buzzer you would like to set OFF delay for and press OK.

Selected Relay

Relay 1

Selected Relay

>Buzzer

Navigate to the Relay OFF Delay menu item. Press OK and enter the number of seconds of the OFF Delay.

Relay OFF Delay

10

Relay OFF Delay

>0020

Press OK to confirm the value is correct.

Confirm?

>20

N

>Y

Relay OFF Delay

20

4.9 Relay, Buzzer and Strobe Priority Logic

A priority has its own set of alarm and fault flags that mirror the state of the channels reporting to it. This setting enables you to assign priorities to the relay, strobe, horn and/ or buzzer and choose the alarm condition the relay, strobe or buzzer will react to. One relay, strobe, horn or buzzer can be assigned to 3 priorities in combinations of:

- AND (both priorities must be met to activate the relay)
- OR (either priority can activate the relay)

Using this AND and OR logic, the priorities can be combined in multiple ways, increasing the number of possible configurable relay combinations.

You can choose to configure the priority logic for gas concentration settings and/or system faults. The gas channel can be configured to report to any of the 8 priorities.

Factory default - Channel 1 reports to Pri 1 and 8

Factory default configuration for the relays priority is:

- 8L ### ## ### ## - Relay is any Low
- 8H ### ## ### ## - Strobe is any High
- 8H ### ## ### ## - Buzzer is any High

Enter passcode 2019 and press the OK button.

Enter Passcode 2019

Navigate to the Relays parent menu and then to the Selected Relay menu item and press OK.

Choose Menu >Relays

Choose the relay, buzzer or strobe you would like to assign a priority to and press OK.

Selected Relay Relay 1

Selected Relay >Buzzer

OR

Selected Relay Relay 1

Selected Relay >Strobe

Navigate to the Relay Priority menu item and press OK.

Relay Priority 1H ### ## ### ##

Choose the priority the relay will respond to:

- 1, 2, 3, 4, 5, 6, 7 or 8
- # = none

Choose the alarm condition upon which the relay will be activated:

- L = Low
- M = Mid
- H = High
- F = Fault
- # = none

Assign the type of logic condition(s). Up to three levels of logic can be assigned to each relay. Choose from ###, OR, AND.

- If no additional condition needs to be met, choose ###.
- If one OR another condition needs to be met, use OR.
- If one AND another condition needs to be met, choose AND.

Relay Priority >1H OR 1F ### ##

Press OK and you can go back to Selected Relay menu to repeat the process for whichever relay buzzer or strobe you want to assign a priority to.

Relay Priority Settings Examples:

1. 1H OR 1F ### ## means the relay will trip if Channel 1 goes into High alarm or Fault.
2. 1H OR 1M ### ## means the relay will trip if Channel 1 goes into High alarm or Mid alarm. This would be an appropriate priority setting for Oxygen as one is ascending and the other is descending.

4.10 Relay Mode of Operation

The relay, internal buzzer and remote horn/strobe terminal are configured with modes of operation that include, normal or failsafe, latching or not latching, silencing or not silencing. The factory defaults can be changed if needed.

4.10.1 Failsafe / Normal

The cGas-SD is designed to be failsafe whereby the relay is normally energized in a non-alarm state for failsafe operation. If required, the failsafe operation can be disabled and the relay will be energized in an alarm state.

Enter passcode 2019 and press the OK button.

Enter Passcode 2019

Navigate to the Relays parent menu and then to the Selected Relay menu item and press OK.

Choose Menu >Relays

Choose the relay or buzzer you would like to turn off the failsafe operation for and press OK.

Selected Relay Relay 1	Selected Relay >Buzzer
---------------------------	---------------------------

Navigate to the Relay Failsafe menu item and press OK.

Relay Failsafe Enabled

Change the value and press OK.

Relay Failsafe >Enable	Relay Failsafe Disable
---------------------------	---------------------------

4.10.2 Silenceable / Non-Silenceable

The factory default setting for the relay and horn/strobe terminal is non-silenceable. The default setting for the internal buzzer is silenceable. When in alarm, to silence the buzzer (or any silenceable relay) press the OK push-button on the front of the unit. If the alarm condition is still present at the end of 2 minutes, the buzzer will sound again. If required, you can change these settings.

Enter passcode 2019 and press the OK button.

Enter Passcode 2019

Navigate to the Relays parent menu and then to the Selected Relay menu item and press OK.

Choose Menu >Relays

Choose the relay or buzzer you would like to turn off or on the silenceable operation and press OK.

Selected Relay Relay 1

Selected Relay >Buzzer

Navigate to the Relay Silencing menu item and press OK.

Relay Silencing Enabled

Change the value and press OK.

Relay Silencing >Enable

Relay Silencing Disable

4.10.3 Latching / Not Latching

A latched relay is a relay that has been triggered by an event; it is active and it will remain so until it is manually cleared/turned off. The factory default setting is Not Latching. If required, you can change these settings.

Enter passcode 2019 and press the OK button.

Enter Passcode 2019

Navigate to the Relays parent menu and then to the Selected Relay menu item and press OK.

Choose Menu >Relays

Choose the relay or buzzer you would like to turn off or on the latching operation and press OK.

Selected Relay Relay 1

Selected Relay >Buzzer

Navigate to the Relay Latching menu item and press OK.

Relay Latching Enabled

Change the value and press OK.

Relay Latching >Enable

Relay Latching Disable

4.11 Test Menu Functions

4.11.1 Test Digital Output

To test the connection and configured responses between the cGas-SD and the DDC/BAS you can manually enter a gas reading value of your choice (within the range of the sensor) to be sent over the digital network.

Enter passcode 2020 and press OK.

Enter Passcode 2020

Navigate to the Testing parent menu and press OK.

Choose Menu >Testing

To test the channel reading navigate to the Test Reading menu item. Enter the desired output value and press OK.

Test Reading 0 PPM CO

Test Reading >100 PPM CO

Press OK to confirm the value is correct.

Confirm?	N
>100 PPM CO	>Y

Test Reading 100 PPM CO

The test will start as soon as you press OK to confirm. To stop the test, press any button.

4.11.2 Test Analog Output

Testing the analog output allows you to determine if the installation was successful. The test forces the cGas-SD to output a predetermined signal to the controller or DDC/BAS to test that the correct signal is being transmitted and the controller responds as configured (ie. if analog output is configured for VFD control, the fans operate as expected).

NOTE: The factory configured default entry is 4 mA. If the analog output type has been changed to voltage, the default entry is 0.0 volts.

NOTE: The minimum and maximum output values are 0 to 30 mA (or 0 to 10 volts).

Enter passcode 2020 and press OK.

Enter Passcode 2020

Navigate to the Testing parent menu and then to the Test AO menu item and press OK.

Choose Menu >Testing

Enter the desired analog output value and press OK.

Test AO 4.0 mA

Test AO >14.0 mA

Press OK to confirm the value is correct.

Confirm?	N
>14.0 mA	>Y

Test AO
14.0 mA

The test will start as soon as you press OK to confirm. To stop the test, press any button. To test another analog output value repeat the process by pressing OK.

4.11.3 Test Relay, Buzzer and/or Strobe

NOTE: Before testing the relay, buzzer or strobe, notify the appropriate people so unnecessary distress or response is not caused by activating fans or equipment or inadvertently calling the fire department or other emergency response team.

Enter passcode 2020 and press OK.

Enter Passcode
2020

Navigate to the Testing parent menu and then to the Selected Relay menu item and press OK.

Choose Menu
>Testing

Choose the relay you want to test by pressing OK and selecting it.

- Relay
- Buzzer
- Strobe

Selected Relay
Relay 1

Selected Relay
>Buzzer

Navigate to the Test RLY: menu item change and Untripped to Tripped and press OK. You will hear a soft click and the relay will activate accordingly, respecting its failsafe setting. Or the internal buzzer will sound if you are testing the buzzer, or the strobe will turn on.

Test RLY: Buzzer
Untripped

Test RLY: Buzzer
>Tripped

To stop the relay test, press any button. You will hear a soft click and the relay will deactivate, the buzzer will go quiet or the strobe will turn off.

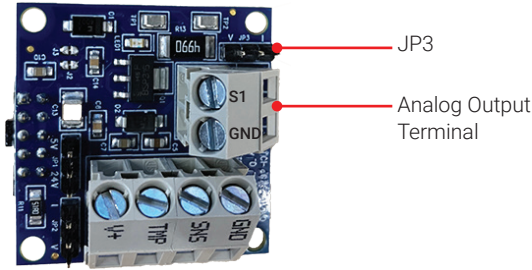
Test RLY: Buzzer
>Untripped

NOTE: The OFF Delay will apply if it is set.

5 ANALOG OUTPUT CONFIGURATIONS

The cGas-SD has one configurable analog output available on CH1. The default output mode is 4-20 mA current loop.

Analog output board on main board:

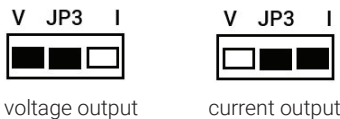


A gas concentration of zero will output 4 mA and a full-scale concentration will output 20 mA. For oxygen, a zero concentration of oxygen will output 4 mA and a full-scale concentration (ie. 25% Oxygen) will output 20 mA. In normal operation (ie. 20.9% oxygen) the output is equal to 17.4 mA.

5.1 Change Analog Output (Milliamps - Voltage)

The cGas-SD comes with one analog output that can be user configured for current output or voltage output. The factory default setting is 4 - 20 mA. The analog output type can be changed to voltage in the field using jumpers.

Find JP3 on the board and move the jumpers as indicated by the black area for current and voltage.



5.1.1 Set Analog Output Type

The factory default analog output type is current. The analog output type can be changed from current to voltage and vice versa in the field.

NOTE: Make sure the jumper is in the correct position for the output you are choosing. See the previous section.

Enter passcode 2019 and press the OK button.

Enter Passcode

2019

Navigate to the Analog Outputs parent menu and press OK.

Choose Menu

>Analog Outputs

Navigate to the Set AO Type menu item and change the Current (mA) to Voltage (V). Press OK.

Set AO Type

>Current (mA)

Set AO Type

Voltage (V)

If you want 0-10 volt output, you are finished. If you want 2-10 volt output or other values you need to set the analog output range. Refer to Section 5.1.2 Set Analog Output Range.

5.1.2 Set Analog Output Range

The factory default analog output for the cGas-SD is 4-20 mA. The default voltage output value is 0-10 volts. The output range can be changed, for example to 0-20 mA or 2-10 volts. The maximum level of output for voltage is 10 volts and the maximum for current output is 23 mA.

Enter passcode 2019 and press the OK button.

Enter Passcode

2019

Navigate to the Analog Outputs parent menu and press OK.

Choose Menu

>Analog Outputs

Navigate to Set AO Zero menu item. Press OK and enter the value as required.

Set AO Zero

>0

Set AO Zero

>02.0 V

Press OK to confirm the value is correct.

Confirm?

>02.0 V

N

>Y

Navigate to Set AO Range menu item. Press OK and enter the value as required.

Set AO Range

>10

Set AO Range

>08.0 V

Press OK to confirm the value is correct.

Confirm?

>08.0 V

N

>Y

Set AO Range

8.0 V

The Set AO Zero value is the current or voltage at which the device signals no (zero) gas. The Set AO Range value is the current or voltage at which the device signals maximum gas.

NOTE: When changing the AO limits the firmware automatically calibrates itself to the new limits. If the values aren't as accurate as desired, refer to Section 5.2 Calibrating the Analog Output.

5.1.3 Set Analog Output Mode

The factory default analog output mode is PEAK with the analog output following a single channel. You can set the analog output to OFF which will result in a 4mA current output and will stop the analog output from sending a signal to the controller or control panel. This may be useful if you need to perform maintenance on or replace the unit. Or you can set

the analog output mode to STEP which is useful for controlling variable speed fans (VFD) and electrically commutated motors (ECM) used in many applications including variable refrigerant flow (VRF) systems.

Mode Settings:

- PEAK - factory default, the analog output is attached to the channel through priorities
- STEP - the analog output can be configured with 5 steps to output a specific real world value (mA or V) when triggered by Low, Mid, High alarms or a Fault or when no alarms are present (None)
- OFF - the analog output will have 4mA current output

NOTE: If the analog output mode is OFF, the cGas-SD will still detect gas and display readings. It will not send an analog signal back to the controller but will send the digital output signal.

NOTE: While in Step Mode the analog output will take NO ACTION during a Fault unless a step has been set to react to the Fault flag. The factory default setting is Step4: 20mA output on any Fault.

5.1.4 PEAK Mode

In the single channel cGas-SD the default PEAK mode setup results in the analog output tracking the gas reading in a basic 1:1 setup where 0 concentration = 4mA and max concentration = 20mA. For an oxygen reading of 20.9% the analog output will be 17.4 mA.

To change STEP Mode to PEAK mode, enter passcode 2019 and press the OK button.

Enter Passcode

2019

Navigate to the Analog Outputs parent menu and press OK.

Choose Menu

>Analog Outputs

Navigate to the Set AO Mode menu item and press OK. Choose the mode desired and press OK.

Set AO Mode

>STEP

Set AO Mode

PEAK

5.1.4 Configuring AO STEP Mode

For the analog output there are 5 steps that can be configured with an analog output value and set to be activated by the following step flags:

- None - the step is active when no alarm or fault is present and outputs the configured value
- Low - the step is triggered on the Low Alarm and outputs the configured value
- Mid - the step is triggered on the Mid Alarm and outputs the configured value
- High - the step is triggered on the High Alarm and outputs the configured value
- Fault - the step is triggered on a Fault and outputs the configured value
- Unused Step - the step is not being used, it is completely disabled

Each step number takes precedence over the step before it regardless of the output value with step 5 being the highest precedence and step 1 being the lowest.

There are 8 priorities to which each step can be set to reference. The priorities are not exclusive, each step could have the same priority number if desired. For the specified priority, for example, if the channel reporting to that priority goes into Low Alarm, the step set to that priority and the Low Alarm flag will show the output value.

The factory default priority settings are:

- Pri 1-5 track single channels 1-5
- All Channels report to Pri 8

Enter passcode 2019 and press the OK button.

Enter Passcode
2019

Navigate to the Analog Outputs parent menu and press OK.

Choose Menu
>Analog Outputs

Navigate to the Pick AO Step menu item and choose the step (1 to 5) you want to configure.

Pick AO Step
>1

Pick AO Step
5

Navigate to the Set Step Pri menu item and press OK. Choose the priority number (1 to 8, with 8 being the highest priority) you want the step to react to and press OK.

Set Step5 Pri
>8

Navigate to the Set Step Flag menu item and press OK. Choose the flag (None, Low, Mid, High, Fault, Unused Step) within the priority that will trigger that step and press OK.

Set Step5 Flag
>Low

Navigate to the Set Step Value menu item and press OK. Enter a real-world value (mA or V) with 1 decimal place to output when the step is active and press OK.

Set Step Value
>08.0 mA

Confirm?	N
>8.0 mA	>Y

NOTE: If the analog output is type is voltage the display will show the correct unit of measure (ie. 2.0 V).

5.2 Recalibrate the Analog Output (requires a 4 - 20 mA meter)

NOTE: The analog output is calibrated at the factory prior to shipping and should not require re-calibration in the field.

The output mode of the cGas-SD is a current loop. If you find the instrument is not outputting what is expected, you can recalibrate the analog output. The values entered in the Set Analog Output Zero and Set Analog Output Range are the values the device will be calibrated to (by default 4 mA and 20 mA respectively).

To calibrate the analog output you will need an electronic multi-meter that measures current. The multi-meter connects to the S1 and G position on the terminal block.

Follow the same steps - first for calibrating the zero output (Cal AO 4.0 mA) and then the range output (Cal AO 20.0 mA).

Enter passcode 2019 and press OK.

Enter Passcode 2019

Navigate to the Analog Outputs parent menu and press OK.

Choose Menu >Analog Outputs

Navigate to the Cal AO 4.0 mA item menu and use the UP and Down buttons to adjust the AD count number as required.

Cal AO 4.0mA 355

Cal AO 4.0mA >0500

Press OK to confirm.

Confirm ? >500	N >Y
-------------------	---------

Press OK to make another adjustment to the number, confirm and repeat until the desired current output is reached on the multi-meter (in this example, keep adjusting the number until the multimeter reads 4.0 mA).

Repeat the steps above in the Cal AO 20.0 mA screen, adjusting the AD count number until the multi-meter reads 20.0 mA.

6 MODBUS® & BACNET® CONFIGURATION

The cGas-SD can be changed from Modbus® to BACnet® or vice versa in the field.

6.1 Changing Digital Communication Type in the Field

When the communication type is changed from/to Modbus® or BACnet®, the device will reset. This will briefly interrupt communications on the network it is connected to.

Enter passcode 2019 and press the OK button.

Enter Passcode 2019

Navigate to the Communications parent menu and press OK.

Choose Menu >Communications

Navigate to the Comm Type menu item and press OK and change the communication type.

NOTE: You can choose Cancel if you didn't intend to make any changes.

Comm Type MODBUS

Comm Type >BACNET

NOTE: If you change the Comm Type, make sure you make the necessary changes to the corresponding MAC, Baud and Instance ID as appropriate. Refer to the following Sections 6.2 Configuring Modbus® Settings and 6.3 Configuring BACnet® Settings.

Once all the changes have been made, navigate to Reset Device. Press OK to implement the changes.

Reset Device

6.2 Configuring Modbus® Settings

If cGas-SD Sample Draw Systems are being ordered by themselves (not part of a system), the factory default Modbus® settings are:

- Modbus® ID = 100
- Baud rate =19,200
- Data bits = 8
- Stop bits = 1
- Parity = none

If you add the cGas-SD to an existing system, the factory default Modbus® settings may require changes for communication to be successful between the devices on your network. Make sure your network connection is complete, the network termination switches are set appropriately, and all the devices are configured with the same baud rate, character format, etc. Each device must have its own unique Modbus® ID.

6.2.1 Change Modbus® MAC Address

All devices on the same network must have a unique Modbus® ID. The range of numbers that can be used as a Modbus® MAC address is 001 to 247.

Enter passcode 2019 and press the OK button.

Enter Passcode
2019

Navigate to the Communications parent menu and press OK.

Choose Menu
>Communications

Navigate to the Comm Type menu item and confirm that it is showing MODBUS.

Comm Type
MODBUS

Navigate to the Comm MAC menu item. Press OK and enter the value as required.

Comm MAC
100

Comm MAC
>101

Press OK to confirm the value is correct.

Confirm?
>101

N
>Y

Comm MAC
101

6.2.2 Change Modbus® Baud Rate

All devices on the same network must have the same baud rate. The default Modbus® baud rate for all CET Modbus® devices is 19,200. The available baud rates are:

- 9,600
- 14,400
- 19,200 (default, configurable)
- 38,400
- 57,600
- 76,800
- 115,200

Enter passcode 2019 and press the OK button.

Enter Passcode
2019

Navigate to the Communications parent menu and press OK.

Choose Menu
>Communications

Navigate to the Comm Type menu item and confirm that it is showing MODBUS.

Comm Type
MODBUS

Navigate to the Comm Baud menu item. Press OK and scroll to the appropriate baud rate.

Comm Baud
>19,200

Comm Baud
>14,400

Press OK to select.

Comm Baud
14,400

NOTE: You can choose Cancel if you didn't intend to make any changes.

6.2.3 Modbus® Holding Registers

If you have specific requirements, have any questions or require clarification about the Modbus® holding registers, please contact CET for assistance or refer to the Modbus® Holding Registers Manual at <https://www.critical-environment.com/media/download/manuals/Holding-Registers-CGAS.pdf>

6.3 Configuring BACnet® Settings

6.3.1 Change BACnet® MAC Address

The factory set default BACnet® MAC address is 100. The MAC ID along with the Instance ID make up the complete ID for the device. Each device requires a unique ID to communicate with the BAS / DDC. A MAC address should be set for each cGas-SD Sample Draw System during installation.

Enter passcode 2019 and press the OK button.

Enter Passcode
2019

Navigate to the Communications parent menu and press OK.

Choose Menu
>Communications

Navigate to the Comm Type menu item and confirm that it is showing BACnet.

Comm Type
BACnet

Navigate to the Comm MAC menu item. Press OK and enter the value as required.

Comm MAC
100

Comm MAC
>111

Press OK to confirm the value is correct.

Confirm?	N
>111	>Y

Comm MAC
111

6.3.2 Change BACnet® Instance ID

Every device on a BACnet® network must have a unique Instance ID. An Instance ID is the Vendor ID (or Base ID) followed by the device's MAC address. CET's Vendor ID is 270. If the device's MAC ID is 100, then the Instance ID would be 270100.

Enter passcode 2019 and press the OK button.

Enter Passcode
2019

Navigate to the Communications parent menu and press OK.

Choose Menu
>Communications

Navigate to the Comm Type menu item and confirm that it is showing BACnet.

Comm Type
BACnet

Navigate to the Instance ID menu item. Press OK and enter the value as required.

Instance ID
270100

Instance ID
>0270111

Press OK to confirm the value is correct.

Confirm?	N
>0270111	>Y

Instance ID
0270111

6.3.3 Change BACnet® Baud Rate

All devices on the same BACnet® network must have the same baud rate. The default BACnet® baud rate is 76,800. The available baud rates are:

- 9,600
- 14,400
- 19,200
- 38,400

- 57,600
- 76,800 (default, configurable)
- 115,200

Enter passcode 2019 and press the OK button.

Enter Passcode 2019

Navigate to the Communications parent menu and press OK.

Choose Menu >Communications

Navigate to the Comm Type menu item and confirm that it is showing BACnet.

Comm Type BACnet

Navigate to the Comm Baud menu item. Press OK and enter the value as required.

Comm Baud 19200

Comm Baud >14,400

Press OK to confirm the value is correct.

Confirm?	N
>14,400	>Y

Comm Baud 14,400

6.3.4 BACnet® PICS Information

Critical Environment Technologies Canada Inc. (CET) has been granted the BACnet® Testing Laboratories (BTL) certification for the CGAS Product Line upon passing the BTL requirements for the BACnet® Smart Actuator (B-SA) designation.

For a copy of the BACnet® Protocol Implementation Conformance Statement (PICS) information, go to BACnet® International website: <https://www.bacnetinternational.net/btl/index.php?m=81>

or visit our website: <https://www.critical-environment.com/media/download/btlpics/CGAS-Family-BACnet-PICS.pdf>

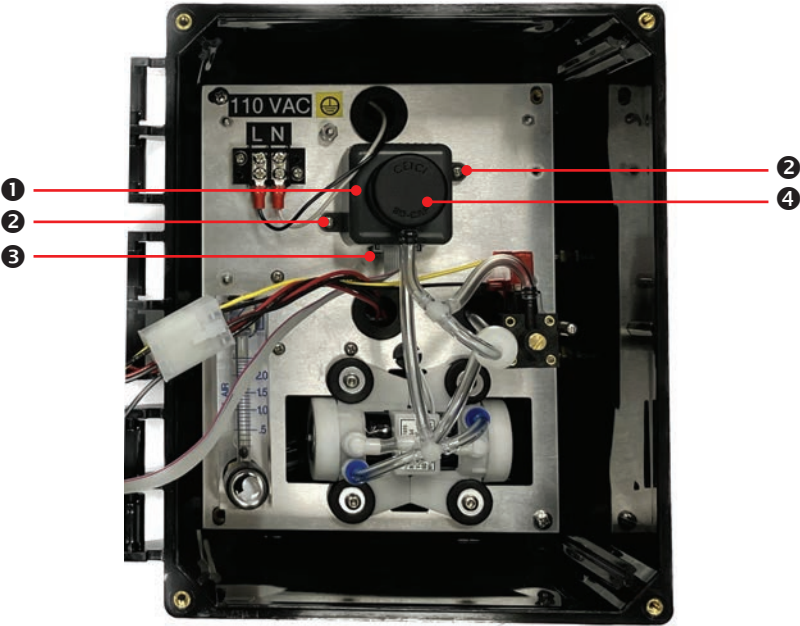
If you have specific requirements, have any questions or require clarification about the BACnet® PICS information, please contact CET for assistance.

7 PLUG & PLAY SMART SENSORS

A Plug & Play Smart Sensor is a sensor that is installed on a small circuit board with a memory chip that contains the sensor's calibration and configuration information. Plug & Play smart sensor boards can be ordered to:

- Replace an existing, expired smart sensor board (same gas type)
- Change the type of gas being monitored in an existing device

The smart sensor board is located inside the smart sensor board cover which is secured to the metal plate in the base with 2 screws.



NUMBER	FEATURE	FUNCTION
❶	Sensor Board Cover	Houses the smart sensor board.
❷	2 screws	Secures the sensor board cover to the metal plate. Unscrew to when replacing the sensor.
❸	Ribbon Cable	Cable that connects the sensor board to the main board.
❹	Sample Draw Cap	Remove and use the CET-CAL-CAP to calibrate

7.1 How to Replace an Installed, Expired Smart Sensor Board

A sensor will need to be replaced when it does not have enough sensitivity to respond to a bump test or it repeatedly fails calibration or it has reached is end of life. Plug & Play smart board replacement sensors arrive pre-calibrated and factory configured.

1. Power OFF the cGas-SD.
2. Open the enclosure and unscrew the 2 screws securing the smart sensor board cover to the metal plate.
3. Remove the 3 screws securing the smart sensor board to the cover. Gently remove the smart sensor board and pull the ribbon cable out of the socket.
4. Plug the ribbon cable into the new smart sensor board socket. Place the board into

- the sensor cover and secure with the three screws.
5. Power up the cGas-SD.
6. After 24 - 48 hours you should do a bump test to confirm response from the sensor. The backlight of the display may blink on and off until the gas reading becomes stable.

7.2 How to Change the Type of Gas Being Monitored

Follow this process if you want to change the type of gas being monitored by the device. This may be necessary if, for example, you want to use the sample draw system in a different location that needs a different type of gas to be monitored.

1. **Power OFF the cGas-SD.**
2. Open the enclosure and unscrew the 2 screws securing the smart sensor board cover to the metal plate.
3. Remove the 3 screws securing the smart sensor board to the cover. Gently remove the smart sensor board and pull the ribbon cable out of the socket.
4. Plug the ribbon cable into the new smart sensor board socket. Place board into the sensor cover and secure with the three screws.
5. Power up the cGas-SD. The display will show a fault code.
6. Proceed with the Read from Sensor operation.

7.3 Read from Sensor

During this process, the main board reads from the smart sensor board and uploads the calibration and configuration information stored in the smart sensor board, saving the information and overwriting the existing calibration and configuration information for that sensor in the main board.

Make sure the unit is powered ON and the new smart board is installed.

Enter passcode 2019 and press the OK button.

Enter Passcode 2019

Navigate to the Configuration parent menu and press OK.

Choose Menu >Configuration

Navigate to the Read from Sensor menu item and press OK. Choose YES and press OK.

Read from Sensor CH1 (Left)	Read from Sensor >YES
--------------------------------	--------------------------

The system will upload and save the new calibration information to the main board. Press OK to exit.

After an appropriate warm up period (24 - 48 hours, depending on the gas type), you should do a bump test to confirm the response from the sensor.

NOTE: When replacing an Oxygen sensor, if after a 24 hour warm up, the reading is not within 2% of 20.9%, recalibrate the span. Environmental conditions during shipping and installation can cause a shift in the sensor that can be corrected with a recalibration.

7.4 Write to Sensor

This process forces an upload of the calibration and configuration information that is stored in the main board to the sensor smart board. Every time a change is made on the cGas-SD, the main circuit board saves the change to the smart sensor board automatically. However, there may be instances when you may want to force save the changes to the smart sensor board, such as if the memory of the smart sensor board gets corrupted.

Enter passcode 2019 and press the OK button.

Enter Passcode 2019

Navigate to the Configuration parent menu and press OK.

Choose Menu >Configuration

Navigate to the Write to Sensor menu item and press OK. Choose YES and press OK.

Write to Sensor CH1 (left)

Write to Sensor >YES

The system will write the sensor configuration information from the main board to the smart sensor board.

8 CALIBRATION

Calibration is the exposing of the sensor to a certified concentration of gas for a particular length of time. The calibration process verifies that the gas detector is providing accurate readings. Part of the calibration process requires a process called zeroing. Zeroing sets the sensor to recognize the ambient air as clean air. If the gas detector is in a clean air environment, (meaning there are no other gases present and relevant to that sensor type), then the air in the room can be used to zero the sensor. If the environment is contaminated then measuring and reading that air as zero will provide inaccurate readings. The sensor in this type of environment requires zeroing with a zero air cylinder.

Calibration will correct any degradation or drift that the sensor may have experienced over time and let you know that the readings are accurate. Without regular calibrations, the gas level readings will become less and less true as time passes. If a sensor does not respond as expected after a full calibration, then the sensor probably needs to be replaced.

8.1 Calibration Specifications

8.1.1 Gas

Calibration span gas cylinders should have at least $\pm 5\%$ accuracy and have a current date stamp. Gas generators should have a current dated cell installed.

Service personnel should flow zero emissions air or 20.9% volume O_2 (scrubbed of hydrocarbons) before attempting to zero toxic gas sensors. In some cases, nitrogen (N_2) can be substituted for zero air when null adjusting electrochemical sensors. Contact CET for clarification.

The type of gas mixture, how old the gas is and what temperature it has been stored at will affect repeatability during field calibration.

NOTE: Temperature affects calibration. It is important to ensure the gas is at the appropriate temperature during calibration. If the sensor is being used in an extreme temperature range, calibration should be done in that same temperature range.

IMPORTANT NOTES:

- Oxygen sensors require 99.9% nitrogen (N₂) for a true zero. We recommend doing the span first, followed by zeroing.

8.1.2 Calibration Adapter

When calibrating the cGas-SD with a fixed flow regulator, you must remove the sample draw cap, replace it with the black calibration adapter cap (p/n: CET-CAL-CAP) and connect the tubing to its nozzle and the regulator. Refer to the image in Section 7 Plug & Play Smart Sensors for the location of the sample draw cap. **Do not use the grey adapter plug (p/n: CET-7000-CAP) to calibrate the cGas-SD - it will lead to inaccurate readings and will seriously affect the performance of the unit.**

8.1.3 Calibration Frequency

- OHS applications: Once every 6 months (OHS: Occupational Health & Safety)
- Any time the detector fails a bump test
- Any time the detector is not functioning as expected

NOTE: A calibration label should be applied after every calibration to confirm work performed and the date it was confirmed. If a controller is involved, the alarm set points should be indicated on a label on the front door of the enclosure so anyone working in the environment can be aware.

Equipment: Calibration Kit, Calibration gases

Users can order the calibration kit, calibration accessories and / or gases from any CET authorized distributor or you can supply your own gas and equipment as long as the gas meets the minimum specifications. **NOTE:** CET cannot ship gas cylinders outside of Canada.

8.1.4 Gas Testing Frequency (Bump Testing)

For the purpose of safety in OHS applications, sensors should be gas tested (bump tested) once every month to confirm response and alarm activation. If the detector fails the bump test, a full calibration should be done. Bump tests should be conducted with the CET-CAL-CAP adapter. **Do not use the grey adapter plug (p/n: CET-7000-CAP) to bump test the cGas-SD, the response of the unit will be inaccurate.**

8.2 Calibrating the Sensor

NOTE: If you are calibrating an Oxygen sensor, refer to Section 8.3 Calibrating an Oxygen Sensor.

Calibration has three processes:

- Set Calibration Gas Value
- Span
- Zero

The Span and Zero calibrations can be done in any order. However, when calibrating an Oxygen sensor CET suggests the Zero calibration be done before the Span calibration. Refer to Section 8.3 Calibrating an Oxygen Sensor.

8.2.1 Set Calibration Gas Value

Check to make sure that the calibration gas value configured in the device matches the gas concentration of the calibration gas cylinder you are using. This is especially important if you are not using the same Cal gas concentration that was used previously to calibrate the device. How much gas the sensor detects is directly related to the Cal gas setting and the actual concentration of calibration gas used during calibration.

The factory default calibration gas concentrations are:

SENSOR GAS TYPE	CALIBRATION GAS LEVEL*
Ammonia (NH ₃)	300 ppm
Carbon Monoxide (CO)	100 ppm
Oxygen (O ₂)	20.9 %vol
IR Refrigerants (except R123)	1,000 ppm
R123	100 ppm

*Subject to change depending on sensor manufacturer

Enter passcode 2020 and press the OK button.

Enter Passcode

2020

Navigate to the Calibration parent menu and press OK.

Choose Menu

>Calibration

Navigate to the Calibration Gas menu item and press OK. Enter the gas concentration of the calibration gas cylinder you are using and press OK.

Calibration Gas

50 PPM CO

Calibration Gas

>100 PPM CO

Press OK to confirm the value is correct.

Confirm?

N

>100 PPM

>Y

Calibration Gas

100 PPM CO

8.2.2 Zero (Null) Calibration

Before trying to zero toxic gas sensors, zero emissions air or 20.9% volume O₂ (scrubbed of hydrocarbons) should be flowed over the sensors. In some cases, nitrogen (N₂) can be substituted for zero air when zeroing electrochemical sensors. Oxygen sensors require 99.9% N₂ for a true zero.

If using ambient air to zero the gas detector, make sure the environment has clean air or the process could result in a Zero Fault. Solid state refrigerant gases require an in-line humidifier.

Using a fixed flow regulator, you need to remove the sample draw cap that is on top of the smart sensor board cover with a gentle pull and press the CET-CAL-CAP adapter on

in its place. Attach the calibration tubing to the nozzle of the CET-CAL-CAP and follow the calibration procedure.

NOTE: To exit the Zero Calibration at any time, press OK.

Enter passcode 2020 and press OK.

Enter Passcode

2020

Navigate to the Calibration parent menu and press OK.

Choose Menu

>Calibration

Navigate to the Calibrate Zero menu item.

Calibrate Zero

100 AD

If using ambient air press OK. Or attach the regulator to the cylinder of zero air and press OK. The display will show a countdown from 20 seconds.

Zeroing

47 AD 18s

Zero Success

56 AD

When the process has finished and the Zero calibration was accepted remove the cylinder of zero gas. If the Zero calibration was not successful refer to Section 8.4.1 Zero Fault.

8.2.3 Span Calibration

Span calibration is flowing a known concentration of the target gas over the sensor to adjust the output signal to match the gas concentration. It resets the sensor's electronic circuit against a known concentration of target gas to correct drift and keep linearity.

NOTE: Make sure you have set the Calibration Gas Value and are flowing the appropriate concentration of span gas. Refer to Section 8.2.1 Set Calibration Gas Value.

To exit the Span Calibration at any time, press OK.

Enter passcode 2020 and press the OK button.

Enter Passcode

2020

Navigate to the Calibration parent menu and press OK.

Choose Menu

>Calibration

Navigate to the Calibrate Span menu item and press OK.

Calibrate Span

4000 AD

Attach the regulator to the span gas cylinder and flow the span gas. You have 120 seconds to start flowing the gas. If the gas isn't detected, the display will return to Calibrate Span.



When the gas is detected the display will show that it is stabilizing for a countdown between 2 to 5 minutes and then a spanning for a countdown from 60 seconds.



When the process has finished and the Span calibration was accepted, remove the cylinder of span gas. If the Span calibration was not successful, refer to Section 8.4.2 Span Fault.

NOTE: If an inappropriate concentration of span gas is applied during calibration, it may succeed but it does not mean the equipment has been calibrated properly. CET is not responsible for improperly calibrated equipment. Follow manual instructions carefully.

NOTE: After 5 minutes of inactivity on any screen, the display will return to normal operation.

8.3 Calibrating an Oxygen Sensor

When calibrating an Oxygen sensor, a Span calibration should be done first, then a Zero calibration. The Zero calibration is done using a cylinder of 99.9% Nitrogen (N₂) gas.

NOTE: During calibration, flowing the Nitrogen gas will cause the Oxygen readings to decrease which may trigger the alarms to go off. You may want to disable the alarms during the calibration of an Oxygen sensor.

Using a fixed flow regulator, you need to remove the sample draw cap that is on top of the smart sensor board cover with a gentle pull and press the CET-CAL-CAP adapter on in its place. Attach the calibration tubing to the nozzle of the CET-CAL-CAP and follow the calibration procedure.

The factory default calibration gas concentration is:

SENSOR GAS TYPE	CALIBRATION GAS LEVEL
Oxygen (O ₂)	20.9% VOL

To calibrate the Oxygen sensor, enter passcode 2020 and press the OK button.



Navigate to the Calibration parent menu and press OK.



Navigate to the Calibrate Span menu item and press OK.



Either use a cylinder of 20.9% Oxygen or if you are confident of the air quality, the oxygen in the breathing environment can be used as a fairly accurate source of span gas (be careful not to exhale in the direction of the Oxygen sensor vent). It is not recommended to use this procedure for all span adjustments of Oxygen sensors.

Attach the regulator to the span gas cylinder and flow the span gas. You have 120 seconds to start flowing the gas. If the gas isn't detected, the display will return to Calibrate Span.

Waiting for Gas	35s
53AD	

When the gas is detected the display will show that it is stabilizing for a countdown from 120 seconds and then spanning for a countdown from 60 seconds.

Stabilizing	82s
1961AD	

Spanning	21s
1957AD	

Span Success
1956 AD 19

When the process has finished and the Span calibration was accepted, remove the cylinder of span gas. Refer to Section 8.4.4 Span Override if the Span calibration was not successful.

Attach the regulator to the cylinder of Nitrogen (N_2). Flow the gas for a couple minutes and continue flowing while you navigate to the Calibrate Zero menu item. Press OK to start the Zero calibration.

Calibrate Zero
100 AD

The display will show a countdown from 19 seconds.

Zeroing	18s
47AD	

When the process has finished and the Zero calibration was accepted, press OK to Exit and remove the Nitrogen (N_2) gas cylinder.

Zero Success
56AD

Refer to Section 8.4.3 Zero Override if the Zero calibration was not successful.

8.4 Trouble Shooting Calibration

This section is intended to help in correcting issues that may arise during the calibration procedure. **If you are unable to correct a problem or have questions, please contact our Technical Service Department at: help@cetci.com or 604-940-8741 (Local) or 1-877-940-8741 (Toll Free)**

8.4.1 Zero Fault

If the zeroing process fails, the cGas-SD will show a Zero fault. This will happen if the ambient gas readings are at an unacceptable level due to not having enough clean air - there is enough residual target gas in the environment or other gases that are interfering with the sensor seeing oxygen.

8.4.2 Span Fault

If the cGas-SD shows a Span fault after trying to calibrate, it is possible that the sensor is dead or the device isn't seeing the gas (cylinder is empty, regulator or CET-CAL-CAP is not attached properly, tube is blocked, kinked, pump has poor vacuum draw and needs replacing, etc.).



Check all connections and possible interferences and try a complete calibration procedure from the beginning again to see if this corrects the fault. If a second calibration does not resolve the fault then the sensor needs to be replaced. Over time, a sensor degrades and when it has gone beyond an acceptable level, it has reached its end of life and will no longer pass a calibration. If replacing the sensor does not correct the fault, please contact Technical Service at help@cetci.com.

8.4.3 Zero Override

If the gas level (possible residual gas) is too high, but still within the override range, the display will indicate that an override is required.



To override the value use the UP button to select Y and press OK. To keep the original zero value, leave the indicator on N and press OK.

8.4.4 Span Override

During the Span calibration, readings are taken and from the results sensitivity is calculated and compared to the original sensitivity of the sensor at the time of installation. If this sensitivity is below the override range, but above the fault limit, the display will indicate that an override is required. To override the value use the UP button to select Y and press OK. To keep the original value, leave the indicator on N and press OK.



9 MAINTENANCE

Regular inspection and maintenance are essential to keep the cGas-SD Sample Draw System functioning at peak performance. General maintenance of the cGas-SD should be part of a regular scheduled program that includes, but is not limited to the following tasks:

- Regular calibration of the sensor. Calibration frequency depends on factors such as gas type, application, regulatory laws, sensor response and exposure levels to the target gas.
- Monthly bump tests to ensure the device is performing as expected.
- Sensor replacement if the device doesn't respond to bump tests, repeatedly fails calibration or the sensor has reached its end of life.
- Ensure excess water and/or dust is not somehow entering the enclosure and physically damaging the circuit board or internal components.

- Keep a maintenance log. All bump tests and calibration functions along with notes about performance, anomalies or otherwise should be noted in a logbook. This information could prove useful for troubleshooting or proving due diligence, etc.

9.1 Checking and Adjusting the Flow Rate

Check the flow meter frequently to ensure there has not been a drop in the flow rate. There is no automatic detection of a decreased flow rate. The flow rate can be checked by looking at the flow meter inside the unit and adjusted by turning the knob until the desired rate is displayed. The flow rate should remain between 0.5 - 1 LPM.

9.2 Checking for Air Leaks

Make sure the tubing is tightly sealed around both the inlet and outlet fittings to prevent air leaks. If needed, apply a small amount of liquid soap to the outside of the tubing end to help it slide onto the fitting more easily.

Checking for leaks should be part of the routine maintenance schedule. It is recommended that two people conduct this test, one person blocks the open end of the inlet tubing and the other watches the flow meter.

- If the flow meter shows 0 and the pump stalls and the alarm activates, the line is properly sealed.
- If you see any flow and the pump continues running, the tubing is not securely fastened and there is a leak somewhere.

9.3 Testing the Vacuum Switch / Pump Shut Off

The vacuum switch is intended to shut off the pump in case of a blockage in the inlet tubing. If the inlet tube becomes blocked and/or the filter becomes dirty, the display will show Flow Alarm, the buzzer will sound and the pump will shut off.

The vacuum switch is factory calibrated prior to shipping. However, it should be tested prior to use and recalibrated if necessary and subsequent testing of the vacuum switch should be part of the routine maintenance schedule.

To test, restrict the flow of air of the INLET tubing by capping it or pinching it together. The pump should shut off within 20-30 seconds. The display should show Flow Alarm and the alarm should sound. If the pump doesn't shut off within the specified time, call our Technical Support Department

To restart the pump, press the OK button for 5 seconds then release. It is best to wait 10-30 seconds after the pump initially shuts off as the error signal from the vacuum switch takes a few seconds to go away.

9.4 Filter Cartridge Maintenance and Replacement (p/n: SD-IFA)

Regularly inspect the filter cartridge and replace it if it becomes dirty or clogged. A clogged filter can place unnecessary strain on the pump and may lead to damage. The replacement frequency will vary depending on the sampling environment. CET does not recommend using a sample draw unit in areas with high levels of particulate matter.

To replace the filter cartridge:

1. Open the enclosure and locate the filter cartridge.
2. Disconnect the tubing from both ends of the existing cartridge.
3. Attach the tubing to each end of the new cartridge (orientation does not matter.).
4. To test the filter connection, perform a bump test at the sample draw inlet to confirm the system is detecting the gas.

10 OPTIONS & ACCESSORIES

10.1 Calibration Kit (p/n: CET-715A-CK1)

The Calibration Kit contains the items necessary for common field and shop calibrations. It comes in a durable, hard plastic carrying case and includes a regulator, adapters, humidification chamber, brass fitting, hand tools and tubing. It does not include cylinders of gas. These must be ordered separately.



Calibration Kits and a good selection of gases are available from the CET factory. Check with any CET authorized distributor for availability of specific gas types. **Gas cylinders cannot be shipped from Canada to other countries, including the USA.**

10.2 Calibration Adapter (p/n: CET-CAL-CAP)

The CET-CAL-CAP adapter is used for calibration and bump testing. It comes with standard yellow gas flow tubing (3/16" ID / 5/16" OD) of 3.5 ft / 1 m length. Appropriate calibration gas and regulator are required. **Do not use the grey adapter plug (p/n: CET-7000-CAP) to calibrate the cGas-SD - it will lead to inaccurate readings and will seriously affect the performance of the unit.**



10.3 Fixed Flow Regulator (p/n: CET-FFLO-CK3)

When performing a calibration you need a fixed flow regulator and the calibration adapter (p/n: CET-CAL-CAP). Connect the tubing from the calibration gas cylinder to the nozzle of the adapter, which is then attached to the smart sensor board. The fixed flow regulator flows @0.5 LPM, can be used for 34, 58, 74 and 100 litre cylinders and has a male thread and adapter with a brass fitting that threads on to accommodate 15 and 17 litre cylinders.



10.4 Sample Draw Tubing

The cGas-SD does not come with sample tubing. It must be purchased separately. The type of gas, as well as the diameter and length of the tubing, will influence the airflow rate. To ensure optimal performance, keep the sample tubing between the sample point and the inlet port as short as possible.

p/n: CET-8000-CKFT: Standard flexible Tygon polymer tubing (3/16" ID x 5/16" OD), 15 m / 50 ft roll, recommended for all models except the CGAS-SD-7NH3.

p/n: CET-8000-CTRL: Teflon lined sample draw tubing (3/16" ID x 5/16" OD), 15 m / 50 ft roll, for use with the CGAS-SD-7NH3 sample draw system. Ammonia is somewhat sticky and can be absorbed by the standard tubing, slowing the gas flow to the sensor and resulting in inaccurate gas level readings.

NOTE: The device has been tested with a maximum tubing length of 15 m / 50 ft. Using tubing longer than this is not recommended.

11 TROUBLE SHOOTING

Noisy pump.

1. Check to ensure the cGas-SD enclosure is securely mounted to a flat wall surface.
2. Check to ensure the flow rate has been properly adjusted after sample line and exhaust line (if used) has been installed. A long sample line reduces flow rate and will require adjustment of the flow meter. Too much or too little air flow to the pump will cause the diaphragms to vibrate more, creating more noise.
3. Check to ensure pump diaphragm caps are tight. They are shipped from the factory tightly installed but vibration could potentially partially loosen them. If they are loose they could allow the diaphragms to float slightly and that will increase the vibration and create more noise level.
4. Check to ensure pump securing bolts are tight. Vibration over time could have loosened them causing excessive vibration noise from the pump.

- 5. Check to ensure the white inlet filter is not plugged or partially plugged. This will reduce the air flow through the flow meter and can cause the pump to make more noise.
- 6. The pump diaphragms may need to be replaced. Contact your local authorized distributor or CETCI.

The Pump stops working when you don't think it should. The vacuum switch may need adjusting if the pump turns off for no reason (tube isn't blocked, length of hose is no more than 50 ft, not located in extreme temperatures, device was manufactured less than 5 years ago, etc.). To start the pump, gently turn the switch (screw) clockwise all the way and then back it off slowly while pressing the Enter button.

cGas-SD won't power up. (blank display) Is the power properly connected? Check the wiring connections. Refer to Sections 4.5 Line Voltage or 4.6 Low Voltage Wiring Connections in the cGas-SD Installation Manual.

Device cannot be seen by the Controller and/or the BAS / DDC on the Modbus® network. Check the Baud rate. All devices in the network must have the same Baud rate.

- Check that local area network wiring is correct, especially the A and B lines to make sure they are not swapped between devices on the network.
- Check the Modbus® ID. Each device must have a unique ID assigned to it.

Device cannot be seen by the Controller and/or the BAS / DDC on the BACnet® network.

- Check the Baud rate. All devices in the network must have the same Baud rate.
- Check to make sure the device has a unique ID assigned to it, the factory default is made up of the MAC ID and the Base ID
- Check that local area network wiring is correct, especially the A and B lines to make sure they are not swapped between devices on the network.

Frequent, unexpected alarm reading reported to BAS/DDC. Check to see if EMI and RF interference is causing the equipment to react this way.

Error Codes. The error code will appear on the display in place of the units for a channel.

List of Possible cGas-SD Error Codes

CODE		DESCRIPTION
COMM	Communication Fault	The controller or BAS has not read the current gas concentrations in more than the preset time (default 5 minutes).
		Could be an address miss-matched between cGas-SD and controller / BAS. MAC value on MODBUS or MAC value or Device ID on BACnet
		Check for wiring problems. A and/or B wires broken somewhere in the network or ground connection between cGas-SD and controller / BAS (using cable shield as ground is not recommended).

F01	Negative Fault Reading	Check to make sure the smart sensor board is present and installed properly in the socket. If installed, the cGas-SD detects the sensor signal is too far below its zeroAD. May be caused by a sensor that is temperature or humidity sensitive or the device wasn't warmed up for a minimum 24 hours. After an appropriate warm up period, zeroing the sensor will normally resolve this.
F03 F07 F11 F12	Sensor Faults	cGas-SD cannot communicate with the sensor. Ensure the smart board is installed correctly. If unresolved, contact our Technical Support Department.
F02 F04 F09 F20	Smart Board Faults	Ensure the smart board is seated properly and installed on the correct side (left) if a single channel unit. If a power cycle does not resolve this, replace the sensor smart board.
F05	Error in reading Smart Board	cGas-SD detected an error in the smart board ID. Use "Write to Sensor" for the indicated channel (passcode 2019, Configuration menu).
F06	SB ID Mismatch	Firmware expected a different smart board than what is in the sensor socket. Confirm the correct smart board is installed in the correct socket. ie. CH1 gas should be in the left socket. When confirmed, if still in error, use "Write to Sensor" for the indicated channel (passcode 2019, Configuration menu).
F07	RH & Temp Fault	cGas-SD cannot communicate with the sensor. Ensure the smart board is installed correctly. If unresolved, contact our Technical Support Department.
F08	ADC COMM	This is a daughter board hardware failure. Contact our Technical Support Department.
F80-99	Internal Memory Faults	The cGas-SD has detected a critical memory failure of the main board. This can be corrected by boot loading a valid configuration onto the unit. If unresolved, contact our Technical Support Department.

NOTES

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