Critical Environment Technologies

Operation Manual

Rev. F | 2024.03

cGas-SC Self-Contained Controller

www.critical-environment.com

NEED MORE INFORMATION?

This is the **Operation Manual** for the cGas-SC Self Contained Controller.

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

- Instrument Specifications
- Instrument Features
- Mounting and Installing
- Wiring Connections
- Relay Connections

If you would like to view or download the **cGas-SC 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 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.

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

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 dataon data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data.

1.3 Service Policy

CETCI maintains an instrument service facility at the factory. Some CETCI distributors / agents may also have repair facilities; however, CETCI assumes no liability for service performed by anyone other than CETCI personnel. Repairs are warranted for 90 days after 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 CETCI directly.

Prior to shipping equipment to CETCI, contact our office for an RMA #. All returned goods, regardless of reason, must be accompanied with 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, CETCI 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 CETCI.

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1.5 Disclaimer

Under no circumstances will CETCI 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 CETCI 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 forgoing 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 CETCI policy that all wiring of our products meet this requirement. It is CETCI policy that all wiring be within properly grounded (earth or safety) conduit.

1.6 Revisions

This manual was written and published by CETCI. 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 CETCI 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
Telephone: +1.604.940.8741
Email: help@cetci.com
Website: www.critical-environment.com

In no event will CETCI, 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-SC 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-SC requires no assembly and virtually no maintenance other than regular calibration and replacement of the internal and/or remote sensors. There are no serviceable elements other than the calibration instructions outlined in this manual. There are no replaceable components except the smart sensor boards.

The cGas-SC is intended for indoor use, permanently mounted upright at a height that is appropriate for the type of gas being monitored. Care should be take to ensure that excess water or dust are not somehow entering the enclosure and physically damaging the circuit board or internal components. Should the cGas-SC be mounted outside, it should be protected from extreme weather conditions.

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

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 a have a pacemaker, follow your healthcare provider's instructions about being around this type of equipment.

2.3 Protection Against Mechanical Risks

The door of the enclosure can be removed if absolutely necessary to facilitate installation of the base but it is not recommended on this version. Extreme care and caution must be exercised when removing the door to avoid damaging the hinges. The door should only be removed when absolutely required. Any damage occurring from door removal procedure will not be covered under warranty.

Grasp the door with one hand, being careful not to make contact with any of the internal components (circuit board), and grasp the base with your other hand. Tug on the base and pull straight apart. **DO NOT TWIST**. The section of the hinges located on the base should "snap" apart from the part of the hinges located on the door.

After installation, simply locate the lid hinges over the installed base hinges and pull toward you. The hinges should easily "snap" back into place.

The enclosure has two screws securing the door to the base for electrical safety and provides an opening to allow the user to apply a padlock or tie wrap if they desire the transmitter to be locked.

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 Calibration Extending Firmware (CEF) and Sensor Aging

cGgas-SC systems with integral electrochemical sensors have been programmed with our Calibration Extending Firmware. This firmware takes into consideration the aging of the electrochemical CO and NO_2 sensors so that less frequent calibrations are required in less-critical applications such as parking garages. The system tracks the age of the sensor and automatically compensates for the reduced output of the sensor as it ages.

3.2 Sensor End of Life (EOL) Notification

The cGas-SC Self Contained Controller 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.

3.2.1 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.

Navigate to the Calibration parent menu and then to the Selected Channel menu item.

If there is more than 1 channel, confirm the correct channel is showing.

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.

Press OK and navigate to EXIT or to the next channel to view its sensor lifespan following the same steps.

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.

3.2.2 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.

Navigate to the Configuration parent menu and then to the Selected Channel menu item.

If there is more than 1 channel, confirm the correct channel is showing.

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

Repeat for each channel as required.

3.3 Factors Affecting Lifespan and Performance of Sensors

3.3.1 Electrochemical Sensors

Target gas: Ammonia, Carbon monoxide, Chlorine, Ethylene, Ethylene oxide, Formaldehyde, Hydrogen, Hydrogen fluoride, Hydrogen sulphide, Nitric oxide, Nitrogen dioxide, Oxygen, Ozone, Sulfur dioxide

- 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.
- The more exotic gases (chlorine, ozone etc.) tend to have shorter life spans than the more common gases (CO, nitrogen dioxide)
- 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.
- CHLORINE DIOXIDE (ClO2): Negative cross-sensitivities may cause this sensor to produce lower readings than the true concentration of gas in ambient air. ClO2 sensors may underestimate the ClO2 concentration if hydrogen sulphide is present.
- ETHYLENE OXIDE (C2H4O): Should be zeroed on site if the ambient temperature is above 22°C (71.6°F). This particular sensor has a drift factor that can be as much as 1 ppm if the temperature rises to 25°C (77°F).
- OZONE (O3): Sensitive and reactive to temperature and humidity changes, may cause sensor to drift.
- HYDROGEN CHLORIDE HCl): High humidity causes HCl absorption. Sensor should be stored with filter side facing down. Storage time should not exceed 4 weeks.
- FORMALDEHYDE (CH2O): Abrupt changes in RH causes a short term transient signal. CH2O has moderate to high cross-sensitivity to other gases like hydrogen sulphide, isobutylene, phosphine, sulphur dioxide and hydrogen cyanide.
- 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.

3.3.2 Catalytic Bead Sensors

Target gas: Methane, Propane, Butane, Ethanol, Methanol, Dimethyl ether, Hydrogen, Ammonia

- Typically designed to operate within specific temperature ranges. High temperatures can accelerate wear and reduce lifespan.
- Excessive humidity can affect sensor components, leading to corrosion or malfunction. Maintaining optimal humidity levels is crucial.
- Paint fumes, cleaning products, sand, water and insects can reduce lifespan and compromise performance.
- Dust and dirt can compromise sensor performance lifespan, both during storage and operation.
- Silicone, lotions, hair products, lubricants, gas additives, lead, sulfur compounds and chlorinated hydrocarbon vapours can poison catalytic sensors. Other compounds, especially hydrogen sulphide, halogenated hydrocarbons and anything containing astatine, bromine, fluorine, chlorine, and iodine can be absorbed or form compounds

that are absorbed by sensor which can result in the temporary loss of sensitivity. Sensor might recover after a period of operation in clean air. Even when the sensor is not powered, exposure to compounds that poison or inhibit the sensor can impact its lifespan.
- Requires calibration gas with air balance.
- When storing, package securely in a sealed container.
- Excessive vibration or impact can damage the sensor.

3.3.3 Solid State Sensors

Target gas: Refrigerants, TVOC

- Typically designed to operate within a range of -20 to 50°C / -4 to 122°F.
- Sensitive to changes in temperature and humidity. Changes of 10°C / 18°F or 10% RH can impair sensor performance requiring a couple hours of re-stabilization. Calibration should be done after any significant changes in temperature and/or humidity. If the location of the sensor has seasonal changes in temperature or humidity a recalibration after each change will be required to meet published specification.
- Wet environments will shorten lifespan.
- Dirty and dusty environments will shorten lifespan and require more frequent calibration.
- Requires oxygen, minimum 18% vol, for proper functioning.
- Sensitive to many other gases, vapours and chemicals such as silicone, paint, alcohol-based cleaners, fumes from running engines, fuel storage containers, etc.
- Continuous exposure to gas will make the sensor reading unreliable (will read higher than calibrated value).
- Must be calibrated in the environment it will be operating in.
- Flowing dry gas over a solid state sensor can result in a negative a reaction and inaccurate readings. Requires gas with air balance and a humidification chamber during calibration.
- Requires regular calibration to compensate for drift/aging.
- When storing, package securely in a sealed container.

3.3.4 Infrared Sensors

Target gas: Carbon dioxide, Refrigerants

- 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.

3.3.5 PID Sensors

Target: TVOCs

- Dust and dirt can compromise sensor performance lifespan, both during storage and operation.
- Protect from extreme temperatures and being physically damaged.

- High humidity environments may affect senor performance.
- Paint fumes, cleaning products, dust, sand, water, insects can compromise performance.
- The presence of interfering compounds may affect sensor accuracy.
- When storing, package securely in a sealed container.

3.3.6 Optical Photo Ion Sensors

Target: Particulates

- Sensor lifespan will be affected by continuous vs intermittent use.
- The dirtier the environment, the shorter the lifespan.
- The fan inside the unit can get clogged by the particulates and dirt in the air being sampled.

4 BASIC SYSTEM OPERATION

The cGas-SC continuously monitors target gas concentrations on up to three configured channels. It can operate as a standalone system or connect to another controller, control panel or BAS / BMS / DDC system.

Upon application of power to a cGas-SC shipped from the factory, the LCD display will turn on and rotate through several info screens that differ depending on the configuration of the device. The cGas-SC 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(s) have 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: Read the Installation Manual for more information on the length of time it takes for sensors to warm up and the cGas-SC to provide accurate gas readings.

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; and temperature and relative humidity (if option -RHT is installed).

4.2 Navigating the Menu Structure

The three programming push-buttons on the outside of the enclosure are used to navigate through the cGas-SC 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 incase any mistakes were 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 are 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 currently 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 the normal operation.

NOTE: Except when conducting test functions, the gas detection and alarm reactions of the cGas-SC 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 it 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.

Navigate to the Display parent menu and then to the Brightness menu item.

Enter the numeric value as desired and press OK.

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.

Normal

Minimal

Enter passcode 2019 and press the OK button.

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

Choose the preferred display setting and press OK.

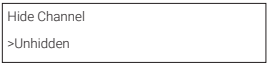
4.3.3 Display or Hide Gas Channel, RH and/or Temperature Readings

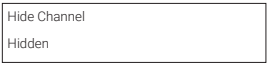
You can choose what reading(s) you want displayed on the screen by hiding or unhiding lines.

Enter passcode 2019 and press the OK button.

Navigate to the Display parent menu and then to the Selected Channel menu item. Press OK to choose the channel you want to hide.

Press OK and navigate to Hide Channel menu item. Press OK to change to Hidden.





Press OK. Repeat for each channel you want to hide or unhide.

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

CO	0	PPM
NO2	0.7	low

CO	0	PPM
NO2	1.0	mid

CO	0	PPM
NO2	1.5	high

The cGas-SC has built in fault detection, and in the event of a problem with the measurement circuitry the transmitter 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-SC and the controller or BAS, the screen will display COMM at the end of the line.

CO	0	COMM
NO2	0	COMM

For a list of Fault Codes, refer to Section 12 Troubleshooting.

4.5 Change Units (°C or °F) of Temperature Readings

NOTE: This menu item only applies if the cGas-SC has the -RHT option installed.

You can change the factory configured temperature unit type from Celsius to Fahrenheit (or vice versa) very easily.

Enter passcode 2019 and press OK.

Enter Passcode
2019

Navigate to the Calibration parent menu and then to the Selected Channel menu item.

Choose Menu
>Calibration

Make sure Temperature is selected and navigate to the Temperature Unit menu item and press OK.

Selected Channel
CO2

Selected Channel
>Temperature

Change the value to the desired unit type and press OK.

Temperature Unit
>Celsius

Temperature Unit
Fahrenheit

NOTE: All settings for the Temperature channel will automatically update to the equivalent value in the chosen unit. For example: an alarm point of 0°C will change to 32°F.

4.6 Temperature and / or Relative Humidity Offset

NOTE: This menu item only applies if the cGas-SC has the -RHT option installed.

NOTE: Depending on the configuration, the device will show the temperature in either Celsius or Fahrenheit. The units can be changed at any time, refer to Section 4.5 Change Units (°C or °F) of Temperature Readings.

The temperature and relative humidity sensor is calibrated prior to shipping. If the readings on the cGas-SC are higher or lower than another device measuring the ambient temperature or relative humidity, you can adjust the reading by setting an offset value so the reading is more accurate. The Temperature and humidity offset value is a number +/-0 that represents degrees or percentage.

Enter passcode 2019 and press OK.

Navigate to the Calibration parent menu and then to the Selected Channel menu item.

Make sure Temperature (or Humidity) is selected and navigate to the Temperature Adj (or Humidity Adj) menu item and press OK.

Enter the desired offset value and press OK.

Press OK to confirm the value is correct.

4.7 Setting Channel Alarm Setpoints, Direction and Hysteresis

The cGas-SC 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
Carbon Dioxide (CO_2)	0 - 5,000 ppm	1,000 ppm	1,250 ppm	1,500 ppm
	0 - 5.0% vol	0.5% vol	1.5% vol	3% vol
Carbon Monoxide (CO)	0 - 200 ppm	25 ppm	50 ppm	100 ppm
Nitrogen Dioxide (NO_2)	0 - 10 ppm	0.7 ppm	1.0 ppm	1.5 ppm
Combustibles (catalytic)	0 - 100% LEL	10% LEL	15% LEL	20% LEL
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-SC 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.

Navigate to the Alarms parent menu, press OK and navigate to the Selected Channel menu item.

If there is more than 1 channel, in the Selected Channel menu item, choose the correct channel.

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).

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

Press OK to confirm the value is correct.

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

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

Press OK to confirm and continue.

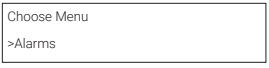
Repeat for each channel / alarm as required.

4.8 Enable / Disable Alarm Blink

The display can be configured to blink for each channel that 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.

Navigate to the Alarms parent menu, press OK and navigate to the Selected Channel menu item.



If there is more than 1 channel, confirm the correct channel is showing.

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	Selected Alarm
Low Alarm	>High Alarm

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

Alarm Blink	Alarm Blink
>Disabled	>Enabled

Repeat for each channel and each alarm as required.

4.9 Enable / Disable Channels

NOTE: Factory default setting is enabled for all installed channels.

This setting allows you to enable or disable the gas channel(s) and the temperature and RH readings if configured in the device. Disabling a channel does not mean information won't show on the display. If you want the disabled channel information not to show on the display, you must hide the channel. Refer to Section 4.3.3 Display or Hide Gas Channel, RH and/or Temperature Readings.

A disabled channel will not display gas or temperature/RH 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 comm.

CO2 ---- PPM	CO2 0 PPM
	76.4 degF ----%RH

Enter passcode 2019 and press the OK button.

Enter Passcode
2019

Navigate to the Configuration parent menu and then to the Selected Channel menu item.

Choose Menu
>Configuration

If there is more than 1 channel, confirm the correct channel is showing.

Selected Channel	Channel En/Dis
CH1 CO2	Enabled

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

Channel En/Dis	Channel En/Dis
>Disable	Disabled

Repeat for each channel as required.

4.10 Deleting a Channel

It may be necessary to remove a channel, if for example it is a faulty channel. When a channel is deleted, it is removed from the devices configuration. A deleted channel cannot be brought back without reloading the configuration. Please contact Technical Support for assistance.

NOTE: A channel can be hidden and/or disabled instead of deleted.

Enter passcode 2019 and press the OK button.

Navigate to the Configuration parent menu and then to the Selected Channel menu item.

If there is more than 1 channel, confirm the correct channel is showing then navigate to the Delete Channel menu item and press OK.

Change NO to YES and press OK.

Repeat for each channel as required.

NOTE: If you delete all the channels, the display will show “No Sensors Installed. You can check the sensor count by pressing the DOWN button from the main operation screen. You cannot bring back a channel without reloading the correct configuration. Please contact Technical Support for assistance.

4.11 Relays, Buzzer and Strobe Settings

The cGas-SC has two dry contact relays that are 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 these terminals. 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 relays are SPDT (single pole, double throw) thereby providing one set of usable dry contacts for each relay. The cGas-SC Self Contained Controller 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
- RLY1 activated on any channel LOW alarm level, failsafe enabled
- RLY2 activated on any channel HIGH alarm level, failsafe enabled

The cGas-SC comes with an internal audible alarm/buzzer that can be enabled or disabled. The buzzer is enabled by default and linked to the HIGH alarm point for each installed channel. An optional, door mounted, extra loud 24V buzzer or water tight buzzer is available in place of the standard buzzer.

Pressing the OK button will stop sounding the buzzer or any external audible device the cGas-SC 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.

NOTE: The buzzer delay is local to the buzzer and applies regardless of the channel causing the alarm.

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 any channel HIGH alarm level, failsafe disabled

The cGas-SC 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. Alternatively the cGas-SC can be ordered with a side mount strobe (Option -L2).

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 any channel HIGH alarm level, failsafe disabled

4.11.1 Enable / Disable the Relays, 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.

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

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

	Selected Relay Relay 1	Selected Relay >Relay 2
or		
	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 1, Relay 2, Buzzer or Strobe you want to disable.

4.11.2 Set Relay ON / OFF Delays

The cGas-SC Self Contained Controller has configurable ON and OFF delay for its relays, internal buzzer and side mounted strobe. 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. For example, a car that is parked near the gas detector is stationary idling for a few moments before leaving. The gas level in that area could increase above the alarm setpoint and then drop a few moments later when the car leaves. The ON Delay tells the system to wait a specified length of time before taking the gas level seriously and to turn on the fans.

If an ON DELAY has been set, the relay/buzzer/strobe will remain unchanged until the time delay has expired, at which time the relay will “trip” and the buzzer sound. 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 Relay

1, Relay 2 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.

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

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

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

Press OK to confirm the value is correct.

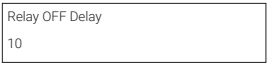
Set OFF Delay

Enter passcode 2019 and press the OK button.

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

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

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



Press OK to confirm the value is correct.

4.12 Relay Mode of Operation

The relays, 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.

4.12.1 Failsafe / Normal

The cGas-SC 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.

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

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

Navigate to the Relay Failsafe menu item and press OK.

Change the value and press OK.

4.12.2 Silenceable / Non-Silenceable

The factory default setting for the relays and horn/strobe terminal is non-silenceable. The default setting for the internal buzzer is silenceable. If required, you can change these settings.

Enter passcode 2019 and press the OK button.

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

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

Navigate to the Relay Silencing menu item and press OK.

Change the value and press OK.

4.12.3 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.

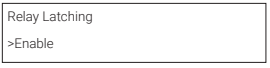
Enter passcode 2019 and press the OK button.

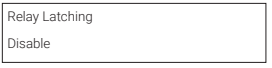
Navigate to the Relays parent menu and then to the Selected Relay menu item and press OK.

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

Navigate to the Relay Failsafe menu item and press OK.

Change the value and press OK.





4.13 Test Menu Functions

The available test functions will depend on the configuration of the individual cGas-SC.

4.13.1 Test Digital Output

For each gas channel, you can manually enter a gas reading value of your choice (within the range of the sensor) that will be sent over the digital network to test the connection and configured responses between the cGas-SC and the DDC/BAS. You can do the same for relative humidity and temperature if the -RHT option is installed.

Enter passcode 2020 and press OK.

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

Confirm the correct channel is showing. The list to choose from will depend on how many channels there are and what options are included:

- Gas Type (ie. CO)
- Gas Type (ie. NO2)
- Temperature
- Humidity

Enter the desired value and press OK.

Press OK to confirm the value is correct.

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

4.13.2 Test Analog Output

NOTE: This functionality is available only when Option -2AO is installed or the cGas-SC has 3 gas channels.

Testing the analog output allows you to determine if the installation was successful. The test forces the cGas-SC 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.

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

Selected the desired AO, enter the value and press OK.

Press OK to confirm the value is correct.

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.

4.13.3 Test Relays, Buzzer and/or Strobe

NOTE: Before testing the relays, 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.

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

Confirm the correct relay is showing.

- Relay 1
- Relay 2
- Buzzer
- Strobe

Navigate to the Test RLY:2 menu item change 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.

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.

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

5 ANALOG OUTPUT CONFIGURATION

NOTE: The cGas-SC does not have analog outputs unless it is ordered with Option -2AO or it has 3 gas channels installed. 3 channel models inherently have 1 analog output and cannot have Option -2AO.

The factory default analog output for the cGas-SC is 4-20 mA. The analog output can be changed to voltage in the field.

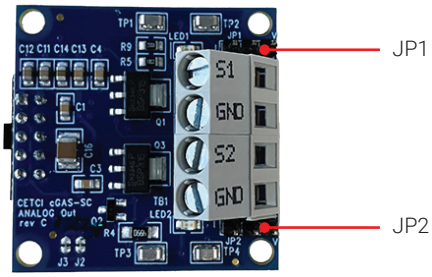
5.1 Change Analog Output (Milliamps - Voltage)

The basic models of the cGas-SC do not come standard with any analog outputs. If analog output is required, Option -2AO can be installed in most models at time of order.

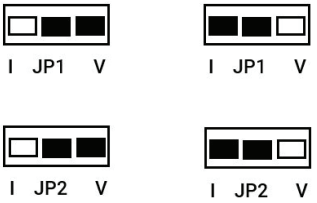
NOTE: Option -2AO cannot be added to 3 gas channel models. 3 gas channel models inherently include 1 analog output.

Option -2AO provides two 4-20 mA analog outputs that can be user configured for current output or voltage output. The factory default setting is 4 - 20 mA.

Option 2AO Board



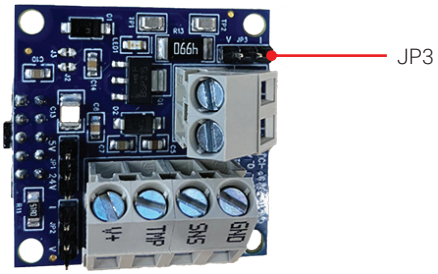
Find JP1 and JP2 on the 2AO board and move the jumpers as indicated by the black area for current and voltage.



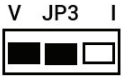
voltage output current output

All 3 channel cGas-SC models come with 1 analog output. It is located on the remote sensor daughter board in the middle of the main board. The factory default is 4 - 20 mA. The analog output can be changed to voltage in the field using the jumpers on jumper bank 3.

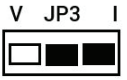
Remote Sensor Board (AIAO board)



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



voltage output



current output

5.1.1 Set the 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 previous section.

Enter passcode 2019 and press the OK button.

Navigate to the Analog Outputs parent menu and press OK.

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

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 the Analog Output Range.

5.1.2 Set the Analog Output Range

The factory default analog output for the cGas-SC 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.

Navigate to the Analog Outputs parent menu and press OK.

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

Press OK to confirm the value is correct.

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

Press OK to confirm the value is correct.

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 you can calibrated the analog output. Refer to Section 5.2 Calibrating the Analog Output.

5.1.3 Set the Analog Output Mode

The factory default analog output mode is PEAK with the analog output attached to a single channel.

You can set the analog output to OFF which will result in a 0 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 transmitter.

Mode Settings:

- OFF - the analog output will have 0 current output
- PEAK - factory default, each analog output is attached (through priorities) to a single channel*

*It is possible for one analog output to be set to track two channels and the analog output will transmit a signal according to the highest gas concentration reading of the cGas-SC.

NOTE: If the analog output mode is OFF, the cGas-SC is still detecting gas and will display readings BUT it will not be sending an analog signal back to the controller.

Enter passcode 2019 and press the OK button.

Navigate to the Analog Outputs parent menu and press OK.

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

5.2 Calibrating 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. Only cGas-SC models with Option -2AO installed or with 3 remote sensors can have analog output.

The output mode of the cGas Detector 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 Ouput 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).

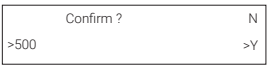
Enter passcode 2019 and press OK.

Navigate to the Analog Outputs parent menu and then to the Pick AO menu item.

Choose the analog output you want to calibrate and press OK

Use the UP and Down buttons to adjust the AD count number as required.

Press OK to confirm.



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-SC 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.

Navigate to the Communications parent menu and press OK.

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.

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, the navigate to Reset Device. Press OK to implement the changes.

6.2 Configuring Modbus® Settings

If cGas-SC Self Contained Controllers are being ordered by themselves (not part of a system), the factory default Modbus® setting are:

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

If you add the cGas-SC to an existing system the factory default Modbus® settings may require changes in order 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.

Navigate to the Communications parent menu and press OK.

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

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

Press OK to confirm the value is correct.

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 CETCI 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.

Navigate to the Communications parent menu and press OK.

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

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

Press OK to select.

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 CETCI 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 in order to communicate with the BAS / DDC. A MAC address should be set for each cGas-SC Self Contained Controller during installation.

Enter passcode 2019 and press the OK button.

Navigate to the Communications parent menu and press OK.

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

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

Press OK to confirm the value is correct.

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. CETCI'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.

Navigate to the Communications parent menu and press OK.

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

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

Press OK to confirm the value is correct.

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.

Navigate to the Communications parent menu and press OK.

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

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

Press OK to confirm the value is correct.

6.3.4 BACnet® PICS Information

Critical Environment Technologies Canada Inc. (CETCI) 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 CETCI for assistance.

7 LOGIC AND PRIORITY SETTINGS

You can choose to configure the priority logic for gas concentration settings and/or system faults. Channels can be configured to report to any of the 8 priorities. Analog outputs can be configured to react to to 1 priority. Relays (including strobe, horn and/or audible buzzer) can each be configured to react to up to 3 priorities.

7.1 Set Channel Priority

This setting enables you to choose which priority each channel reports to. One channel can be assigned to none through 8 priorities and multiple channels can be assigned to the same priority. A priority can be used to indicate a physical location (zoning) or a set of logic (if this happens, do this or if that happens, do that). Factory default configuration for priorities has CH1 reporting to Pri1, CH2 reporting to Pri2, etc. and all channels reporting to Pri8.

Enter passcode 2019 and press the OK button.

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

Choose the channel you would like to assign a priority to and press OK.

Navigate to the Channel Priority menu item and press OK.

The 8 binary digits represent the status of each priority (1 through 8). Priority 8 is the left most digit and Priority 1 is the right most digit. The status is indicated by a 1 or a 0. 1 meaning the channel reports to that priority and 0 meaning it does not report to that priority. So 10100000 would indicate CH2 NO2 reports to priority 8 and priority 6 only.

Select the priority or priorities the channel is to report to and press OK. Repeat as required for each channel.

7.2 Set Number of Required Channels

Priorities have their own alarm flags, same as the channels. You can set the number of reporting channels that have to be in alarm before the corresponding alarm flag within the priority will trip. For example, you could configure Priority 1 to trigger a horn/strobe but only if 2 gas channels go into low alarm. If only 1 gas channel goes into low alarm, the horn/strobe will not be triggered.

Enter passcode 2019 and press the OK button.

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

Choose the channel you would like to be able to add to the priority and press OK.

Navigate to the Selected Pri menu item and press OK.

Choose the priority (1 through 8) for which you want to set the number of channels that report to it. Press OK.

Navigate to the Pri CH Required menu item and press OK.

Choose the number of channels that are required to be in alarm in order to trigger the priority's alarm flag.

NOTE: Setting the required channels to a number greater than the amount of channels set to report to a priority will cause it's alarm & fault flags to never trip.

7.3 Set Analog Output(s) Priority

Depending on the model, the cGas-SC could have none, 1 or 2 analog outputs. If 1 or more analog outputs are installed, this setting enables you to assign 1 priority to each. Each AO can be assigned to the same or to different priorities. The actual value output will be based on the highest value (as % range) of the channels reporting to the priority the AO is watching. A priority can indicate a physical connection to a device (controlling that device) or a set of logic (if this happens, do this or if that happens, do that).

Enter passcode 2019 and press the OK button.

Navigate to the Analog Outputs parent menu and then to the Pick AO menu item and press OK.

Choose the analog output you would like to assign a priority to and press OK.

Navigate to the Set AO Priority menu item and press OK.

Choose the priority the analog output will respond to 1, 2, 3, 4, 5, 6, 7 or 8 and press OK.

Press OK and go back to Pick AO item menu to repeat the process for the second analog output.

7.4 Set Relays, Buzzer and Strobe Priority

This setting enables you to assign priorities to each relay, strobe, horn and/or audible buzzer and choose the alarm condition the relay, strobe or horn will react to. One relay, strobe, horn or audible 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.

Factory default configuration for the relays priority is:

- Relay1 is any Low (8L)
- Relay2 is any High (8H)
- Strobe is any High (8H, non-failsafe)
- Buzzer is anyHigh (8H, non-failsafe, silencable, no delays)

Enter passcode 2019 and press the OK button.

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

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

or

or

Navigate to the Relay Priority menu item and press OK.

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.

Press OK and you can go back to Selected Relay menu to repeat the process for whichever Relay 1, Relay 2, Buzzer or Strobe you want to assign a priority to.

8 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
- Add a second gas channel to a device in the field
- Add smart sensor board(s) to a sensorless stock order when ready to be installed

8.1 How to Replace an Exisiting, 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 transmitter.
2. Open the transmitter and unscrew the 3 screws securing the smart sensor board to

the main board.
3. Gently pull the smart sensor board out of the socket.
4. Place the new smart sensor board into the same socket and secure with the three screws.
5. Power up the transmitter.

After an appropriate warm up period (24 - 48 hours, depending on the gas type), CET recommends a bump test to confirm the response from the sensor. The backlight of the display may blink on and off until the gas reading becomes stable.

NOTE: Make sure the part code of the replacement smart board is the same as the original smart baord you are replacing. If you are unsure of what the original part code is, contact Technical Support at help@cetci.com.

8.2 How to Add a New Smart Sensor Board

Follow this process if you need to:

- Add a second gas channel to a device in the field
- Add smart sensor board(s) to a sensorless stock order that has been installed

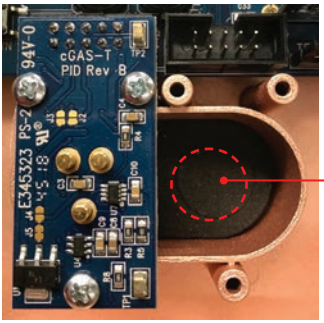
NOTE: You cannot add a 3 channel to a cGas-SC in the field that does not already have an existing 3rd channel.

1. Power OFF the transmitter.
2. Open the transmitter and install the new smart sensor board into the socket of the desired channel and secure with the three screws.
3. Power up the transmitter.
4. The cGas-SC will read the sensor and automatically load the configuration and load the channel

NOTES for cGas-SC Self Contained Controller:

- With the door open, look at the smart sensor boards, CH1 is the socket on the left side and CH2 is the socket on the right side.

- If adding a new smart sensor to an empty socket, make sure to remove the perforated foam circle in the sensor cavity, then insert the smart board and screw it in place. Some smart sensor boards are shipped with a small plastic short sensor adapter - after removing the foam, insert the short sensor adapter before plugging the new smart sensor board into the socket.



When installing a second smart sensor after initially ordering a single smart sensor model, you will need to remove the center circular cut out of the foam in the second sensor vent area before installing the smart board.

8.3 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 then to the Selected Channel menu item and press OK.

Choose Menu
>Configuration

Selected Channel
CH1 CO

Confirm the correct channel is showing. 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. Repeat for the second channel if required.

NOTE: Make sure you are reading from the correct sensor - left vs right.

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.

8.4 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 Detector, 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.

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

Confirm the correct channel is showing. Navigate to the Write to Sensor menu item and press OK. Choose YES and press OK.

The system will write the sensor configuration information from the main board to the smart sensor board. Repeat for the second channel if required.

NOTE: Make sure you are writing to the correct sensor - left vs right.

9 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.

9.1 Calibration Specifications

9.1.1 Gas

Calibration span gas cylinders should have at least ± 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 CETCI 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.

IMPORTANT NOTES:

- Oxygen sensors require 99.9% nitrogen (N2) for a true zero. We recommend doing the span first, followed by zeroing.
- Ethylene Oxide should be zeroed on site if the ambient temperature is above 22°C (71.6°F). This particular sensor has a drift factor that can be as much as 1 ppm if the temperature rises to 25°C (77°F).
- Carbon dioxide sensors require 99.9% nitrogen (N2) for a true zero. If the cGas Detector has a splash guard you will need to flow the nitrogen for approximately 4 minutes BEFORE you enter the Calibrate Zero menu. Same when flowing CO2 calibration gas, flow for 4 minutes BEFORE you enter the Calibrate Span menu.
- Catalytic sensors require min 18% oxygen to work and thus the user MUST flow clean air or oxygen to obtain a true zero and the span gas must have "air" balance, not N2 balance.
- Solid State sensors must be calibrated in the environment they will be operating in.
- Flowing dry gas over a solid state refrigerant or TVOCs sensor can result in a negative reaction and inaccurate readings. Using a humidification chamber adds humidity and assists in recreating a "real-world" environment for the sensor.

9.1.2 Regulators & Flow

Calibration gases that are lighter than or the same weight as air (CO, O_2, etc.) should be flowed at 0.5 LPM. Gases heavier than air (NO_2, etc.) should be flowed between 0.5 and 1.0 LPM. Fixed flow regulators provide more accuracy.

9.1.3 Adapters

The proper calibration adapter should be utilized to allow the gas to properly diffuse around the sensor. The calibration adapter plug for a cGas Detector with an internal sensor without a splash guard is part number CET-7000-CAP. For a cGas Detector with a splash guard, use part number CET-4700-SCC or use the Cal Clip hands free adapter, part number CET-SGC.

9.1.4 Calibration Frequency

- Parking garage detectors: Once every 12 months
- OHS applications: Once every 6 months (OHS: Occupational Health & Safety)
- For best performance and to meet published specifications: once every six months
- 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 CETCI authorized distributor or you can supply your own gas and equipment as long as the gas meets the minimum specifications. CETCI does not ship gas cylinders outside of Canada.

9.1.5 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.

9.1.6 Sticky Gases
Sticky gases, such as Ozone (O_3), Chlorine (Cl_2) Chlorine Dioxide (ClO_2), Hydrogen Chloride (HCl), Hydrogen Cyanide (HCN), Nitrogen Dioxide (NO_2) and Phosphine (PH_3) adhere to surfaces such as tubing and splash guards. The cGas Detector can be ordered with a special splash guard if configured with a sticky gas sensor.

When calibrating with sticky gases we suggest using Teflon lined tubing so the gas doesn't adhere to the tubing, reducing the concentration of the flow of gas. Also keep the length of the tubing as short as possible, no more than 0.91 to 1.22 m / 3 - 4 ft so the gas flow concentration doesn't lessen over the distance from the gas cylinder to the sensor. Furthermore, when calibrating a Chlorine sensor, use a chlorine gas generator. Chlorine gas in a cylinder can be highly unstable and it is difficult to get accurate readings from that source.

NOTE: A dual channel cGas-SC with internal CO + NO_2 sensors that requires a splash guard should be ordered with the special splash guard for sticky gases.

9.2 Calibrating the Internal Sensor(s)
Calibration has three processes - Set Calibration Gas Value, Span and Zero. The Span and Zero calibrations can be done in any order. However, when calibrating an Oxygen sensor we suggest the Zero calibration be done before the Span calibration. Refer to Section 9.5 Calibrating an Internal Oxygen Sensor. When calibrating a CO_2 sensor, flow the nitrogen gas and the span gas for 4 minutes before entering the Calibrate Zero and Calibrate Span menus.

9.2.1 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*
Carbon Dioxide (CO_2)	1,000 ppm
Carbon Dioxide (CO_2)	2.5% VOL
Carbon Monoxide (CO)	100 ppm
Nitrogen Dioxide (NO_2)	5 ppm
Combustibles	20% LEL
Solid State Refrigerants	1,000 ppm
IR Refrigerants (except R123) R123	1,000 ppm 100 ppm

*subject to change depending on sensor supplier

Enter passcode 2020 and press the OK button.

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

Confirm the correct channel is showing. 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.

Press OK to confirm the value is correct.

9.2.2 Zero (Null) Calibration

Before trying to zero toxic gas sensors, zero emissions air or 20.9% volume O_2 (scrubbed of hydrocarbons) should be flowed over the sensors. In some cases, nitrogen (N_2) can be substituted for zero air when zeroing electrochemical sensors. Oxygen and CO_2 sensors require 99.9% N_2 for a true zero. Catalytic sensors require oxygen to work and thus the user MUST flow clean air or oxygen to obtain a true zero and the span gas must have “air” balance, not N_2 balance. 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.

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

Enter passcode 2020 and press OK.

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

Confirm the correct channel is showing. Navigate to the Calibrate Zero menu item.

If using ambient air press OK. Or attach the regulator to the cylinder of zero air, insert the calibration adapter into the sensor opening on the front of the enclosure door and press OK. Refer to Section 9.3.1 Calibration Adapter Plug if the adapter will not fit.

The display will show a countdown from 20 seconds.

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 9.3.2 Zero Fault.

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

Enter passcode 2020 and press the OK button.

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

Confirm the correct channel is showing. Navigate to the Calibrate Span menu item and press OK.

Confirm the correct concentration of calibration gas that you are using to calibrate the sensor is displayed. Change the value if it is incorrect. If the value is correct, press OK to confirm.

Attach the regulator to the span gas cylinder and flow the span gas over the sensor. 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 9.3.3 Span Fault.

Repeat the calibration steps above for each enabled gas channel.

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

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

9.3 Trouble Shooting Calibration

This section is intended to aid 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)**

9.3.1 Calibration Adapter Plug Doesn't Fit

Use a slight twisting motion as you gently push the calibration adapter plug (p/n: CET-7000-CAP) into the sensor opening. If it is hard to insert, moisten the O-ring seal slightly then try re-inserting it. If the splash guard is installed, use the Cal Clip (p/n: CET-SGC).

NOTE: Response time will be slower with the splash guard installed.

9.3.2 Zero Fault

If the zeroing process fails, the cGas Detector 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.

9.3.3 Span Fault

If the cGas 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 adapter plug is not attached properly, tube is blocked, kinked, 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.

9.3.4 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.

9.3.5 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.

9.4 Calibrating an ESH-A Remote Sensor Connected to a cGas Detector

There are two different processes for calibrating an ESH-A Remote Sensor. One process is for a new or replacement sensor and the other is for a properly functioning sensor. For either process, first ensure that the sensor has been continually powered for at least 24 hours.

9.4.1 Zero and Span Calibration of a Responsive ESH-A Remote Sensor (done at the cGas Detector)

If the sensor does not need to be replaced and is responding correctly, the Zero and Span calibrations will need to be done at CGAS transmitter that the ESH-A is connected to.

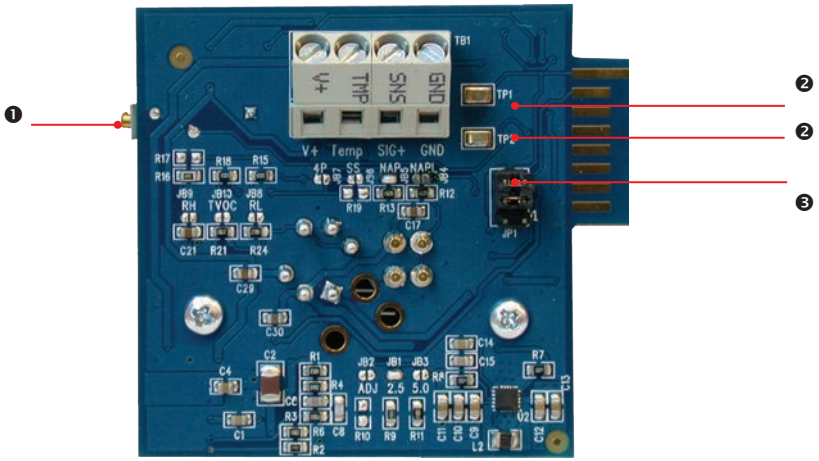
In the Calibrate Menu (passcode 3032), press UP button to scroll through the menu and select the channel the ESH-A is assigned to. Follow the instructions in Section *6.2 Calibrating the Internal Sensor(s)* with the exception of applying the gas to the ESH-A sensor opening instead of the CGAS sensor opening.

9.4.2 Zero Calibration of a New or Replacement ESH-A Remote Sensor

If a new replacement sensor has been installed, the ESH-A will require a zero calibration of its sensor. This process will normally be required if the sensor has been replaced or there is concern that the sensor is not responding correctly.

Make sure the ESH-A Remote Sensor is powered up and has been warmed up for a 48-hour period prior to calibration.

The indicated features on the ESH-A are required for calibration.



NUMBER	FEATURE	FUNCTION
❶	POT RN1 (Potentiometer)	Used for Zero calibration of a new or replacement sensor. TP1 and TP2 calibrate to 0.40 VDC with Null gas applied.
❷	Test Points: TP1 & TP2	For adjusting a new or replacement sensor to Zero. TP1 and TP2 calibrate to 0.40 VDC with Null gas applied.
❸	JP1 Jumper Bank	JP1-1 and JP1-2 are used to calibrate a new sensor

Step 1
Open the ESH-A Remote Sensor enclosure. Move the jumpers from their resting position to JP1-1 and JP1-2 (bottom two jumper positions).

Step 2
Apply the correct Null gas for the type of sensor installed, for a minimum of 2 minutes.

Step 3
Attach a voltmeter to TP1 and TP2. Using the POT RN1 potentiometer (located on the left underside of the ESH-A board), adjust the voltage to read 0.40 VDC. Verify that the voltage output from digital multi-meter leads attached to test points TP1 and TP2 on the cGas Detector is reading 0.0 VDC (a Zero and Span Calibration of the cGas Detector will be required if this is not the case).

Step 4
Return the jumpers to their original positions and close the ESH-A.

Step 5
On the cGas Detector, in the Calibrate Menu (passcode 2020), press the UP button to scroll through the menu and select the channel the ESH-A has been assigned to. Follow the

instructions in Section *6.2 Calibrating the Internal Sensor(s)* with the exception of applying the gas to the ESH-A sensor opening instead of the CGAS sensor opening.

9.5 Calibrating an Internal 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 (N_2) gas.

NOTE: During calibration, flowing the Nitrogen 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.

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 then to the Selected Channel menu item and press OK.

Confirm the correct channel is showing. Navigate to the Calibrate Span menu item and press OK.

Confirm the correct concentration of calibration gas that you are using to calibrate the sensor is displayed. Change the value if it is incorrect. If the value is correct, press OK to confirm.

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 over the sensor. 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 from 120 seconds and then spanning for a countdown from 60 seconds.

When the process has finished and the Span calibration was accepted, remove the cylinder of span gas. Refer to Section 9.3.5 Span Override if the Span calibration was not successful.

Attach the regulator to the cylinder of Nitrogen (N_2), insert calibration adapter into the sensor opening on the front of the enclosure door (refer to Section 9.3.1 Calibration Adapter Plug if the adapter will not fit).

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.

The display will show a countdown from 19 seconds.

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

Refer to Section 9.3.4 Zero Override if the Zero calibration was not successful.

10 OPTIONS & ACCESSORIES

10.1 Splash Guard (Option -S)

The splash guard attaches to the front of the enclosure to protect the sensor during water spray or washdown applications. It is factory installed and when attached the enclosure meets IP54 standards. To calibrate a device with a splash guard, use the Cal Clip. This type of splash guard can be used with any gas type except sticky gases.

NOTE: The splash guard will slow down the response time of the sensor.

NOTE: To ensure proper calibration, units configured with an internal CO and internal NO_2 that require a splash guard should use Option -SN, splash guard for sticky gases or the metal guard with splash cover (p/n: SCS-8000-WSG).

10.2 Calibration Adapter Clip “Cal Clip” (p/n: CET-SGC)

To calibrate a cGas Detector with a factory installed splash guard (Option -S), attach the Cal Clip around the splash guard to allow the use of both hands during calibration. The small barb hose fitting accommodates standard or Teflon tubing of 1/8” (3.175 mm) ID and 3/16” (4.762 mm) ID.

NOTE: The Cal Clip is designed to prevent entry or exit of air except via the hose barb fitting, therefore it **must be removed during normal operation** or else the gas readings will not be accurate.

10.3 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 CETCI factory. Check with any CETCI authorized distributor for availability of specific gas types. **Gas cylinders cannot be shipped from Canada to other countries, including the USA.**

10.4 Side Mounted Strobe with Audible (Option -L2)

Red flashing beacon with audible, factory installed on the side of the cGas-SC enclosure. Offers 80 flashes per minute and a siren volume of 85 dB.

Size	40 mm / 2 in dia
Enclosure	PC cover and ABS base, rated IP40
Lens Colour	Red
Siren Volume	85 dB
# of Flashes	80 per minute

MAINTENANCE

Regular maintenance includes inspecting, cleaning if necessary, bump testing and calibration. Check the unit for wear and tear, tampering, accidental or deliberate damage; for cracks, water damage, loose screws or wires and make sure there isn't a buildup of dust on the outside or inside of the enclosure. It is important to ensure that excess water and/or dust is not somehow entering the enclosure and physically damaging the circuit board or internal components.

Each device should be monitored for possible damaging conditions:

- The sensor vents should be kept free of dirt or soot build up.
- If in a damp location, source of water should be shielded from contacting the top of the transmitter.
- If located in a working area, the front of the detector should be kept clear.
- If painting is to be done in the same area as the detector, it needs to be protected from

over spray and the sensor vent should be covered so as to not receive paint fumes. Paint fumes may damage and / or reduce the life of the sensor.

Monthly maintenance at minimum requires a bump test, especially for applications involving more dangerous gases and interactions with people, such as Ammonia sensors in ice rinks and Chlorine or Ozone sensors in swimming pools. If the bump test fails or if 6 months have passed since the last calibration, a full calibration should be done.

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

12 TROUBLE SHOOTING

cGas-SC won't power up. (blank display)
Is the power properly connected? Check the wiring connections. Refer to Wiring Connections in the Installation Manual.

Display shows "SPAN FAULT" message.
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. Check to make sure the gas cylinder isn't empty.

Frequent, unexpected alarm signal sent to BAS/DDC.
Check to see if EMI and RF interference is causing the equipment to react this way. Refer to EMI and RF Interference Considerations in the Installation Manual for more information.

Device cannot be seen by the Controller and/or the BAS / DDC on the Modbus® network.
This fault should be accompanied by a COMM Fault on the display. If it is not displayed it means the cGas-SC is seeing and responding to communication and the issue maybe on on the Controller's side.

- 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.

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

List of Possible cGas 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-SC 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 at somewhere in the network or ground connection between cGas-SC 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-SC 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-SC 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-SC 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-SC 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-SC has detected a critical memory failure of the main board. This can be corrected by bootloading a valid configuration onto the unit. If unresolved, contact our Technical Support Department.

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