Operation Manual

Rev. C | D | 2025.11

Critical Environment Technologies™

cGas Detector

Analog Transmitter | Digital Transmitter

www.critical-environment.com

NEED MORE INFORMATION?

This is the **Operation Manual** for the cGas Detector models CGAS-A (analog transmitter) and CGAS-D (digital transmitter) models. If you would like to make sure you have the most current version or want to save it in pdf form, click here to open or download it from our website.

If you need more information, refer to the **cGas Detector Installation Manual**, which covers topics such as:

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

If you would like to view or download the **cGas Detector 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 the 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 CET, 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 data.

1.3 Service Policy

CET maintains an instrument service facility at the factory. Some CET distributors / agents may also have repair facilities; however, CET assumes no liability for service performed by anyone other than CET personnel.

Repairs are warranted 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 CET directly.

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

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

1.4 Copyrights

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

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

1.5 Disclaimer

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

products meet this requirement and all wiring be within properly grounded (earth or safety) conduit.

1.6 Revisions

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

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

Critical Environment Technologies Canada Inc.
Unit 145 - 7391 Vantage Way,
Delta, BC V4G 1M3 Canada

Toll Free: +1.877.940.8741
Telephone: +1.604.940.8741
Email: help@cetci.com
Website: www.critical-environment.com

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

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

2 SAFETY INFORMATION

The CGAS-A and CGAS-D comply with:

- CSA-C22.2 No. 205-12
- UL508 (Edition 18):2018
- EMC Directive 2014/30/EU
- EN 50270:2015, Type 1, EN61010
- 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.
- CO and NO2 Sensors UL2075, 2nd Edition, Standard for Gas and Vapour Detectors and Sensors
- Listed by BTL (CGAS-D)
- RoHS compliant circuit boards

2.1 General Safety Warnings

The cGas Detector is intended for indoor use, permanently mounted at a height that is appropriate for the type of gas being monitored. The cGas Detector should be protected from extreme weather conditions.

The cGas Detector requires no assembly. There are no serviceable elements other than the calibration instructions outlined in this manual. There are no replaceable components except the sensors.

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. Keep the gas detector, including the vents free of dirt, dust and debris.

If in a damp location, source of water should be shielded from entering the enclosure.

Check for physical damage, tampering, etc. on a consistent basis.

If painting is to be done in the same area, the gas detector needs to be protected from overspray 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.

2.3 Protection Against Electrical Risks

Disconnect all power before servicing. There may be multiple power sources. The power supply may 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 Detector supply (disconnecting power to the cGas Detector). Appropriate markings should be visible at the circuit breaker / switch that is supplying power to the cGas Detector.

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 model. 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 the door removal procedure will not be covered under warranty.

If the unit is installed on a wall, open the enclosure fully, grasp the door, keeping it open and being careful not to make contact with any of the internal components (circuit board). If the base is not mounted, grasp the base with your other hand. Tug on the door, pulling towards you making sure the door is still open and straight. **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, place the door hinges over the installed base hinges, with the unit fully open and push towards the wall. The hinges should easily "snap" back into place.

The enclosure has one screw 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

cGas Detectors 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 Detector 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.

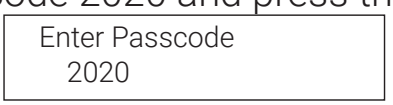
NOTE: The EOL fault does not prevent operation of the controller including detection, alarming and calibration.

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 ENTER 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.

Selected Channel >CH1 CO

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

Sensor Lifespan Total 36 Months

Sensor Lifespan >Left 26 Months

Press ENTER 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 ENTER button.

Enter Passcode 2020

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 >CH1 CO

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

Sensor EOL Enabled	Channel En/Dis >Disabled

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 exposed 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, 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 3a 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, causing them 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, insects can reduce lifespan and compromise performance.
- Dust and dirt can compromise sensor performance lifespan, both during storage and operation. When storing, package securely in a sealed container.
- 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 and in most cases a sensor will 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 Non-Dispersive Infrared (NDIR) 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.

3.3.4 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.

4 BASIC SYSTEM OPERATION

The cGas Detector is a low maintenance, continuous gas monitoring device that offers flexible customization options with the purpose of meeting your specific application and budgetary requirements. It is ideal for monitoring toxic, combustible and refrigerant gases in non-hazardous (non-explosion rated) environments such as enclosed parking facilities, commercial HVAC, greenhouses, recreational facilities, refrigeration plants, manufacturing plants and other light industrial applications. It can be connected to a controller (FCS, cGas-SC, DCC or SCC), a control panel or a BAS / BMS / DDC system. If the relay and buzzer is installed, the cGas Detector can operate as standalone device.

NOTE: If the cGas Detector is not installed and powered up, refer to the *cGas Detector Installation Manual*.

The sensors utilized in this device are accurate enough to measure to Occupational Health & Safety (OHS) hazardous levels for toxic gases. The transmitter operates by diffusion.

This manual covers the basic system operation, plug & play smart sensor replacement and calibration of both the CGAS-A and CGAS-D because they are very much the same. **The two main differences are:**

1. The **CGAS-A is an analog device** and can only have **one gas channel**. It sends an analog signal (4-20 mA, 0-10 v or 2-10 v) to a Controller or BAS/DDC.
2. The **CGAS-D is a digital device** and can have up to **two gas channels**. It communicates with the FCS System Controller using Modbus® RTU RS-485 or can be field configured to communicate with a BAS/DDC using Modbus® RTU RS-485 or BACnet® MS/TP RS-485. The cGas Detector is used to continuously monitor gas concentrations on one (or two) configured channel(s). It offers flexible customization options and Plug & Play Smart Sensor Technology.

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 main circuit board inside the enclosure are used to navigate through the cGas Detector 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 ENTER 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 ENTER to move to the next digit. Except for where you enter the passcode, all other settings requiring numeric entry will be followed with a Yes/No confirmation once the entire number is entered in case any mistakes were made.

4.2.1 Accessing the Menu with Passcodes

From any normal operation screen press ENTER 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 CGAS 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

ENTER.

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 currently displayed items will depend on your device's configuration as well as the currently selected channel or relay.

Pressing ENTER 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 ENTER 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.

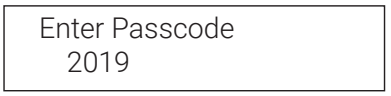
4.3 Display Settings

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. Pressing the UP or DOWN buttons 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).

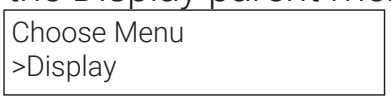
4.3.1 Adjust Display Brightness

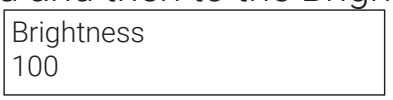
The brightness of the display can be changed in increments of 10. The factory default is full brightness (100). You cannot enter a number higher than 100. Entering a value of 0 turns the backlight off completely but with ambient light the text can still be read on the display.

Enter passcode 2019 and press the ENTER button.



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



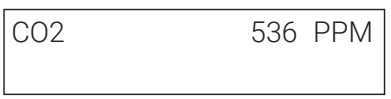


Enter the numeric value as desired and press ENTER.

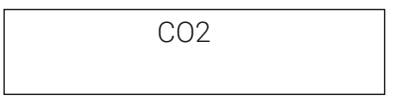
4.3.2 Display Configurations

The factory default display setting is Normal, which displays the gas type, gas reading and gas units for CH1. The information can be reduced to just the gas type by changing the setting to the minimal mode display.

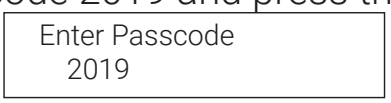
Normal



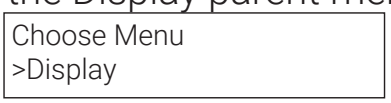
Minimal

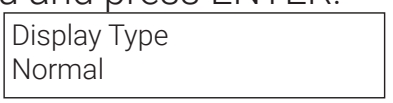


Enter passcode 2019 and press the ENTER button.

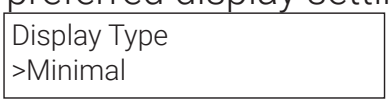


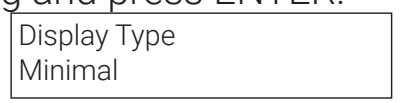
Navigate to the Display parent menu and press ENTER.





Choose the preferred display setting and press ENTER.

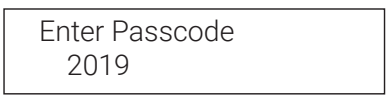




4.3.3 Display or Hide Gas Channel, RH and/or Temperature Readings

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

Enter passcode 2019 and press the ENTER button.



Navigate to the Display parent menu and then to the Selected Channel menu item. A CGAS-A will have 1 channel only. A CGAS-D may have 2 gas channels and a Temperature and Humidity if installed. Press ENTER to choose the channel you want to hide.

Choose Menu >Display	Selected Channel CO

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

Hide Channel >Unhidden	Hide Channel Hidden

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

4.4 Setting Channel Alarm Setpoints, Direction and Hysteresis

The cGas Detector can be configured with LOW, MID and HIGH gas alarm setpoints. 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 relay and internal buzzer (if installed).

The alarm set points can be changed at any time and the gas detector does not require calibration before, during 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 in 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
IR Refrigerants (except R123)	0 - 2,000 ppm	250 ppm	500 ppm	1,000 ppm
R123 IR 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 Detector 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 ENTER button.

Enter Passcode 2019

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

Choose Menu >Alarms

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

Selected Channel CO2

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

Selected Alarm Low Alarm	Selected Alarm >Mid Alarm

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

Alarm Setpoint 800 PPM	Alarm Setpoint >1000 PPM

Press ENTER to confirm the value is correct.

Confirm? N >1000 PPM >Y	Alarm Setpoint 1000 PPM

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

Alarm Direction ASCENDING

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

Alarm Hysteresis 005 PPM CO2	Alarm Hysteresis >010 PPM CO2

Press ENTER to confirm and continue.

Confirm? N >10 PPM >Y	Alarm Hysteresis 010 PPM CO2

Repeat for each channel / alarm as required.

4.5 Alarm Status, Fault Detection and Communication Failure Alerts

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

CO2 800 low	CO2 1000 mid	CO2 1200 high

The cGas Detector 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. 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.

4.6 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 disabled.

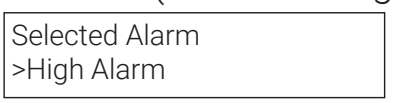
Enter passcode 2019 and press the ENTER button.

Enter Passcode 2019

Navigate to the Alarms parent menu, press ENTER 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).



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

Repeat for each channel and each alarm as required.

4.7 Enable / Disable Channels

NOTE: Factory default setting is enabled.

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 line. Refer to Section *4.3.3 Display or Hide Gas Channel, RH and/or Temperature Readings*.

NOTE: The CGAS-A Detector only has one gas channel. If the CGAS-A has the Option -RHT, enabling the temperature and RH only allows the information to be displayed on the display, it will not be sent to a Controller or BAS/DDC.

A disabled channel will not display gas, temperature or RH readings. A disabled channel will show on the normal display with four dashes in the middle of the

line:

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

Enter passcode 2019 and press the ENTER 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 CH1 CO2	Channel En/Dis Enabled

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

Channel En/Dis >Disable	Channel En/Dis Disabled

Repeat for each channel as required.

4.8 Deleting a Channel

One or both channels can be deleted from the cGas Detector if it is necessary to remove the channel, if for example it is a faulty channel. Deleting a channel removes the configured flag in the holding registers. To bring it back requires the holding registers to be edited. Please contact Technical Support for further assistance.

NOTE: A channel can be hidden instead of deleted.

Enter passcode 2019 and press the ENTER 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 then navigate to the Delete Channel menu item and press ENTER.

Selected Channel CH1 CO2	Delete Channel >CH1 CO2 NO

Change NO to YES and press ENTER.

Delete Channel >CH1 CO2 YES	Delete Channel CH1 CO2

Repeat for each channel as required.

NOTE: If you delete all the channels, the display will be blank. You can check the sensor count by pressing the DOWN button from the main operation screen. You cannot bring back a channel without changing the holding registers or reloading appropriate configuration files.

4.9 Relay and Buzzer Operation (if installed)

The cGas does not provide any power from the relay terminal. The relay is single pole, double throw thereby providing two sets (NC/COM or NO/COM) of usable dry contacts for the relay. A dry contact relay operates like a switch to simply activate (switch on) or de-activate (switch off) equipment to be controlled, such as a remote horn and fan starters. The SPDT dry contact relay is rated 30 volts, 2 amps max.

The internal buzzer is rated 90dB @ 10 cm / 4in.

The cGas Detector 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 relay are as follows:

- Enabled
- 10 seconds ON Delay
- 10 seconds OFF Delay
- Activated on any channel LOW alarm level, failsafe

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
- Activated on any channel HIGH alarm level, failsafe

cGas sensors that come standard with relay and buzzer:

- 7 series electrochemical toxic and sticky gas sensors
- IR refrigerant gas sensors

These cGas models do not come standard with a relay and buzzer. If a relay and buzzer is required, you must add **Option RBZ**:

- 4 series electrochemical toxic gas sensors
- CO_2 gas sensors
- Combustible (catalytic) gas sensors
- PID TVOC gas sensors

If only a relay is needed, **Option RLY** can be added to single channel model with a:

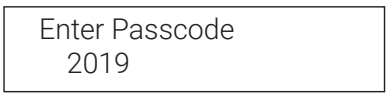
- 4 series electrochemical toxic gas sensor
- Combustible (catalytic) gas sensor
- Solid state refrigerant gas sensor
- PID TVOC gas sensor

NOTE: 4 series sticky gas sensor cannot have a relay and buzzer. 7 series sticky gases come standard with a relay and buzzer.

4.9.1 Enable / Disable the Relay or Buzzer

The relay in the cGas Detector can be enabled or disabled. The factory default for the relay setting is enabled. If the relay is disabled it will not trip.

Enter passcode 2019 and press the ENTER button.

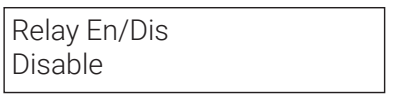


Navigate to the Relays parent menu and then to the Selected Relay menu item and press ENTER.

Choose the relay or buzzer you would like to disable and press ENTER.

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

Change the value and press ENTER.



Repeat for each relay you want to disable.

4.9.2 Set Relay ON / OFF Delays

The cGas Detector has configurable ON and OFF delay for its relay and buzzer. In the event of a gas build up in excess of the level set for the specified alarm level, the relay and/or the buzzer will be triggered.

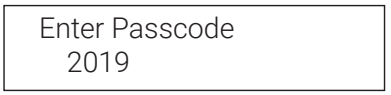
If an ON DELAY has been set, the relay or buzzer will remain unchanged until the time delay has expired, at which time the relay will “trip” and the buzzer sound. If the gas level falls below the set alarm level before the delay has finished, the triggered response will be cancelled and the delay will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

If an OFF DELAY has been set, the relay or buzzer will stay tripped for the duration of the RELAY OFF DELAY.

The ON Delay and OFF Delay are entered in seconds. The maximum length of time that either can be set to is 1200 seconds (20 min). The default setting from the factory for the relay 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.

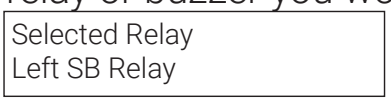
Set ON Delay

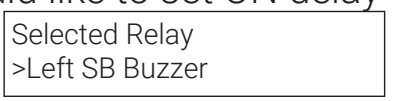
Enter passcode 2019 and press the ENTER button.



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

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





Navigate to the Relay ON Delay menu item. Enter the number of seconds of the ON Delay and press ENTER.

Relay ON Delay 0	Relay ON Delay >0010

Press ENTER to confirm the value is correct.

Confirm? N >10 >Y	Relay ON Delay 10

Set OFF Delay

Enter passcode 2019 and press the ENTER button.

Enter Passcode 2019

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

Choose Menu >Relays

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

Selected Relay Left SB Relay	Selected Relay >Left SB Buzzer

Navigate to the Relay OFF Delay menu item. Enter the number of seconds of the OFF Delay and press ENTER.

Relay OFF Delay 0	Relay OFF Delay >0010

Press ENTER to confirm the value is correct.

Confirm? N >10 >Y	Relay OFF Delay 10

4.9.3 Relay Mode of Operation (FAILSAFE Enabled or Disabled)

The cGas Detector 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 ENTER button.

Enter Passcode 2019

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

Choose Menu >Relays

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

Selected Relay Left SB Relay

Selected Relay >Left SB Buzzer

Navigate to the Relay Failsafe menu item and press ENTER.

Relay Failsafe Enabled

Change the value and press ENTER.

Relay Failsafe >Enable

Relay Failsafe Disable

4.9.4 Set Relay and Buzzer Priority

A priority has its own set of alarm and fault flags that mirror the state of the channels reporting to it. For dual channel devices, priorities also have a “required number of channels” setting that decides how many reporting channels must be in alarm or fault before the priority trips it’s own corresponding flag.

This setting enables you to assign priorities to the relay and/or buzzer and choose the alarm condition the relay or buzzer will react to. The relay or buzzer can be assigned to 3 priorities in combinations of:

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

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

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

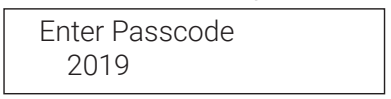
Factory default settings:

- Channel 1 reports to Pri 1 and 8
- Channel 2 reports to Pri2 and Pri8 (CGAS-D only)

Factory default configuration for the relays priority is:

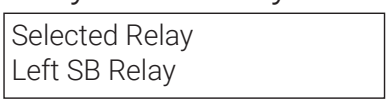
- 8L ### ## ### ## - Relay is any Low
- 8H ### ## ### ## - Strobe is any High
- 8H ### ## ### ## - Buzzer is any High

Enter passcode 2019 and press the OK button.



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 assign a priority to and press OK.



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.

Relay Priority
>8H OR 2L ### ##

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

Relay Priority Settings Examples:

1. **1H OR 1F ### ##** means the relay will trip if Channel 1 goes in to High alarm or Fault.
2. **1M AND 2M OR 8H** means the relay will trip if Channel 1 and Channel 2 go in to Mid alarm OR any channel in High alarm.
3. **1H OR 1M ### ##** means the relay will trip if Channel 1 goes into high or mid alarm. This setting would be appropriate for Oxygen as one is ascending and one is descending.

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

NOTE: This menu item only applies if the cGas Detector 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 ENTER.

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 ENTER.

Selected Channel CO	Selected Channel >Temperature

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

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.

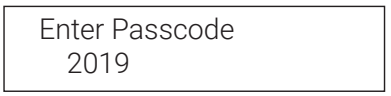
4.11 Temperature and/or Relative Humidity Offset

NOTE: This menu item only applies if the cGas Detector 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 *4.10 Change Units (°C or °F) of Temperature Readings*.

The temperature and relative humidity sensors are calibrated prior to shipping. If the readings on the cGas Detector 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 offset value is a number of degrees in either direction of 0 and the Humidity offset value is a percentage between 0 or 100.

Enter passcode 2019 and press ENTER.

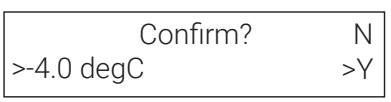


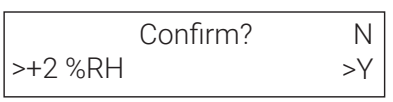
Navigate to the Calibration parent menu and then to the Selected Channel menu item.

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

Enter the desired offset value and press ENTER.

Press ENTER to confirm the value is correct.





4.12 Test Functions

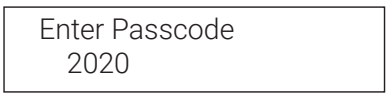
4.12.1 Test Analog Output (for CGAS-A only)

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

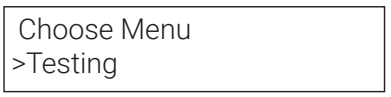
NOTE: The factory configured default entry is 4 mA. If the analog output type has been changed to voltage, the default entry is 0.0 volts.

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

Enter passcode 2020 and press ENTER.

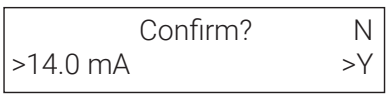


Navigate to the Testing parent menu and then to the Test AO menu item and press ENTER.



Enter the desired value and press ENTER.

Press ENTER to confirm the value is correct.

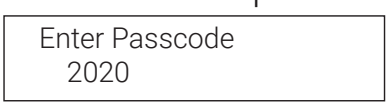


The test will start as soon as you press ENTER to confirm. To stop the test, press the UP or DOWN button. To test another analog output value repeat the process by pressing ENTER.

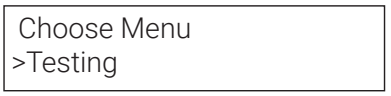
4.12.2 Test Digital Output (CGAS-D only)

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 Detector 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 ENTER.



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

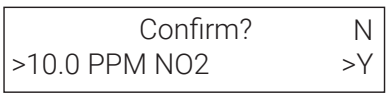


Confirm the correct channel is showing. The list to choose from will depend on how many channels there are and what options are included:

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

Enter the desired value and press ENTER.

Press ENTER to confirm the value is correct.

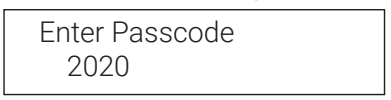


The test will start as soon as you press ENTER to confirm. To stop the test, press the UP or DOWN button.

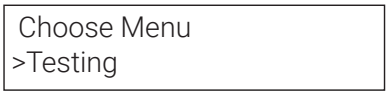
4.12.3 Test Relay or Buzzer (if installed)

NOTE: Before testing the relay, 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 ENTER.



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



If you want test the relay, make sure the relay item is chosen. Change the value to the buzzer item if that is what you want to test.

Navigate to the Test RLY menu item change Untripped to Tripped and press ENTER. 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.

To stop the relay test change the value to Untripped. You will hear a soft click and the relay will deactivate or the buzzer will go quiet.

4.13 Updating Firmware in the Field

Every cGas is shipped with the current firmware version at that time. CET may suggest upgrades to resolve issues or enhance functionality. The firmware version can be upgraded in the field using the USB port on the cGas main board.

To ensure the upload process works smoothly, when you order the CGAS FW UPGRADE KIT, we will send you a USB stick with the CGASimag.bin file already saved on it. You can then simply take the USB stick to the cGas unit(s) and perform the upload.

In an exceptional situation we may email you the CGASimag.bin file. You will need access to a computer to save the file to the root directory of a USB stick. The USB stick needs to be less than 32GB and formatted to FAT32.

Uploading the CGASimag.bin file:

1. Unscrew the door screw and open the enclosure.
2. Unplug the power/signal terminal from the cGas main board.
3. Hold the UP and ENTER buttons at the same time and continue holding as you plug the power back into the cGas.
4. The display will show the message “Insert USB Stick”.
5. Plug the USB stick into the USB port and it will automatically load the files.
6. When finished, unplug the USB stick.

To confirm that the upgrade was successful, you can scroll through the cGas display and see if the firmware version has upgraded to the new one.

NOTE: You cannot upgrade a device from firmware version 1.## to version 2.##. Upgrades are only possible within the same major version, meaning you can only move from one version 1.## to another version 1.##. For example, you can upgrade from version 1.01 to 1.27, but not from 1.01 to 2.13.

5 ANALOG OUTPUT CONFIGURATION

NOTE: This entire section is applicable to the CGAS-A only.

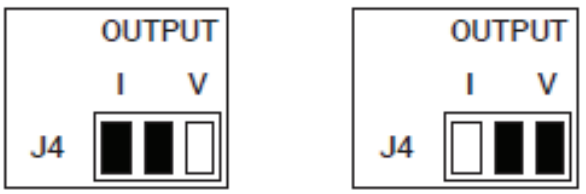
NOTE: The CGAS-A is shipped from the factory with 4-20 mA output unless otherwise specified at time of order.

5.1 Change Analog Output Type (Milliamps - Voltage)

The analog output can be changed from current to voltage and vice versa in the field. To change the analog output type **move the Output Jumper on jumper bank J4** to the desired current or voltage output pins. The jumper bank is located on the bottom right corner of the main circuit board from I to V.

The black area in the following image represents the positions of the jumpers

for current and voltage.



current voltage

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.

Enter passcode 2019 and press the ENTER button.

Enter Passcode 2019

Navigate to the Analog Outputs parent menu and press ENTER.

Choose Menu >Analog Outputs

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

Set AO Type >Current (mA)

Set AO Type Voltage (V)

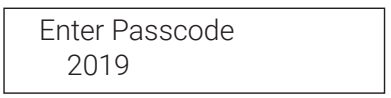
If you want 0-10 volt output, you are finished. If you want 2-10 volt output or other values you need to set the analog output range. Refer to Section 5.1.2 Set the Analog Output Range.

5.1.2 Set the Analog Output Range

The factory default analog output for the cGas detector 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.

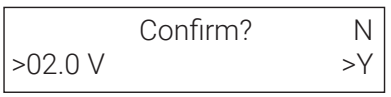
Enter passcode 2019 and press the ENTER button.



Navigate to the Analog Outputs parent menu and press ENTER.

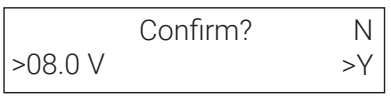
Navigate to Set AO Zero menu item. Press ENTER and enter the value as required.

Press ENTER to confirm the value is correct.



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

Press ENTER 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, please contact Technical Service at help@cetci.com.to discuss how to calibrate the analog output.

5.2 Set Analog Output Mode

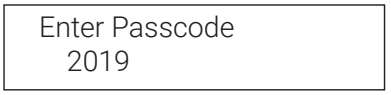
The cGas Detector has one analog output, which is factory configured to output a signal to a controller or control panel. You can set the analog output to OFF which will result in a 0 current output and will stop the analog output from sending a signal to the controller or control panel. This may be useful if you need to perform maintenance on or replace the transmitter. The factory default is set to PEAK.

Mode Settings:

- OFF - the analog output will have 0 current output
- PEAK - the analog output will transmit a signal according to the highest gas concentration reading of the cGas Detector

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

Enter passcode 2019 and press the ENTER button.



Navigate to the Analog Outputs parent menu and press ENTER.

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

6 MODBUS & BACNET CONFIGURATION

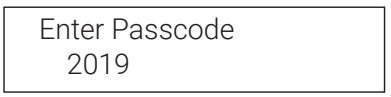
NOTE: This entire section is applicable to the CGAS-D only.

NOTE: The CGAS-D can be changed from Modbus® to BACnet® or vice versa in the field.

6.1 Changing Digital Communication Type in the Field

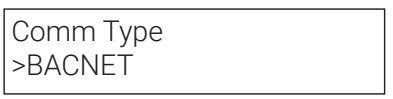
When the communication type is changed from/to Modbus® or BACnet®, the device will reset. This will briefly interrupt communications on the network it is connected to.

Enter passcode 2019 and press the ENTER button.



Navigate to the Communications parent menu and press ENTER.

Navigate to the Comm Type menu item and press ENTER 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 display will show Reset Device. Press ENTER to implement the changes.

Reset Device

6.2 Configuring Modbus® Settings

If a complete system (FSC Controller with digital transmitters and peripherals) is ordered from the factory, it will be shipped preconfigured with the appropriate Modbus® settings. The Modbus® ID of the transmitters will start at 101 and continue sequentially for each transmitter.

If CGAS-D transmitters are being ordered by themselves (not part of a system), the factory default Modbus® setting are:

- Modbus® ID = 100
- Baud rate =19,200 (default, configurable)
- Data bits = 8
- Stop bits = 1
- Parity = none, odd or even

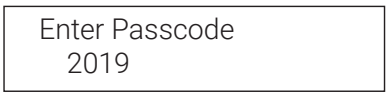
If you add the CGAS-D transmitters to an existing system the factory default Modbus® settings may require changes in order for communication to be successful between the devices on your network. Make sure your network connection is complete, the network termination switches are set appropriately and 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

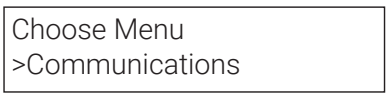
All devices on the same network must have a unique Modbus® ID. The range of numbers that can be used as a Modbus® MAC address is 001 to 247.

NOTE: A preconfigured system with FCS Controller and digital transmitters is limited to the range of 100 to 228.

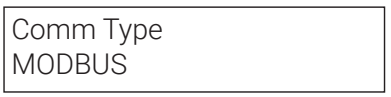
Enter passcode 2019 and press the ENTER button.



Navigate to the Communications parent menu and press ENTER.



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



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

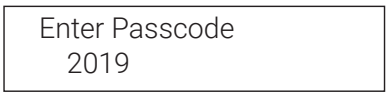
Press ENTER to confirm the value is correct.

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 CET Modbus® devices is 19,200. The available baud rates are:

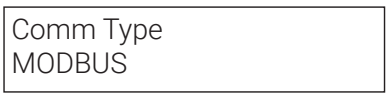
- 9,600
- 14,400
- 19,200 (default, configurable)
- 38,400
- 57,600
- 76,800
- 115,200

Enter passcode 2019 and press the ENTER button.



Navigate to the Communications parent menu and press ENTER.

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



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

Press ENTER 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 CET for assistance or refer to the Modbus® Holding Registers Manual at https://www.critical-environment.com/media/download/manuals/Holding-Registers-LPT-M-LPT-P-CGAS-D.pdf

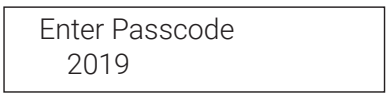
6.3 Configuring BACnet® Settings

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 digital cGas Detector during installation.

Enter passcode 2019 and press the ENTER button.

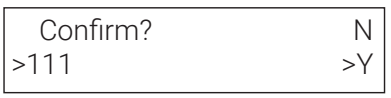


Navigate to the Communications parent menu and press ENTER.

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

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

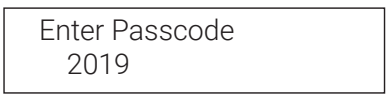
Press ENTER to confirm the value is correct.



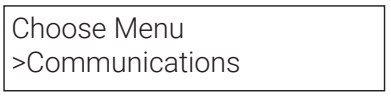
6.3.2 Change BACnet® Instance ID

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. CET's Vendor ID is 270. If the device's MAC ID is 100, then the Instance ID would be 270100.

Enter passcode 2019 and press the ENTER button.



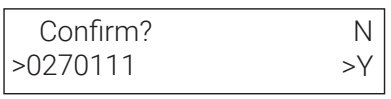
Navigate to the Communications parent menu and press ENTER.



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

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

Press ENTER to confirm the value is correct.

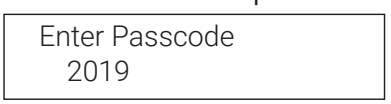


6.3.3 Change BACnet® Baud Rate

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 ENTER button.



Navigate to the Communications parent menu and press ENTER.

Choose Menu >Communications

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

Comm Type BACnet

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

Comm Baud 19200	Comm Baud >14,400

Press ENTER to confirm the value is correct.

Confirm? N >14,400 >Y	Comm Baud 14,400

6.3.4 BACnet® PICS Information

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

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

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

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

7 PLUG & PLAY SMART SENSOR REPLACEMENT

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 unit when ready to be installed

NOTES for CGAS-D Digital cGas Detector:
When replacing smart sensor boards for CGAS-D models with two sensors make sure you replace the correct sensor channel. With the enclosure door open, CH1 is the socket or the smart board that is on the left side and CH2 is the socket or smart board that is on the right side.

7.1 How to Replace an Installed, Expired Smart Sensor Board

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

1. Unscrew the door screw and open the enclosure.
1. Unplug the power/signal terminal from the cGas main board.
2. Open the enclosure and unscrew the smart sensor board you want to replace.
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 screws.
5. Plug the power back into the cGas Detector.

After an appropriate warm up period 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.

7.2 How to Add a New or Second Channel Smart Sensor Board

Follow this process if you need to:

- Add a second gas channel to a device in the field (CGAS-D only)
- Add smart sensor board(s) to a sensorless unit that has been installed

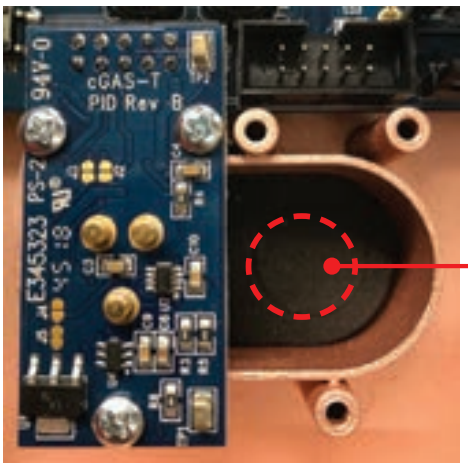
1. Unscrew the door screw and open the enclosure.
2. Unplug the power/signal terminal from the cGas main board.
3. Make sure the foam circle has been removed from the side/channel you are installing the sensor. (see NOTES farther along in this section).
4. Place the new smart sensor board into the socket of the desired side/channel and secure with the three screws.
5. Plug the power back into the cGas Detector.
6. The transmitter will read the sensor and automatically load the configuration and load the channel.

After an appropriate warm up period, you should do a bump test to confirm the response from the sensor. If there is no response from the bump test, make sure you have removed the foam plug.

NOTES:

- With the door of the enclosure 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.

7.3 How to Change the Type of Gas Being Monitored

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

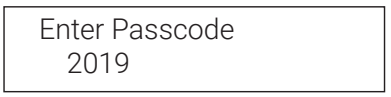
1. Unscrew the door screw and open the enclosure.
2. Unplug the power/signal terminal from the cGas main board.
3. Open the enclosure, unscrew the 3 screws and gentle pull the smart sensor board that is already installed out of the socket.
4. Plug the new smart sensor board into the socket and replace the screws.
5. Plug the power back into the cGas Detector. The display will show a fault.
6. Proceed with the Read from Sensor operation.

7.4 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.

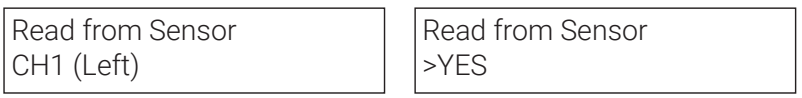
Make sure the unit is powered ON.

Enter passcode 2019 and press the ENTER button.



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

Confirm the correct channel is showing. Navigate to the Read from Sensor menu item and press ENTER. Choose YES and press ENTER.



The system will upload and save the new calibration information to the main board. Press ENTER to exit. Repeat for the second channel if required.
NOTE: Make sure you are reading from the correct sensor - left vs right.

7.5 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 ENTER button.

Enter Passcode 2019

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

Choose Menu >Configuration

Selected Channel CH1 CO

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

Write to Sensor CH1 (left)

Write to Sensor >YES

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

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

8 CALIBRATION

8.1 Calibration Specifications

8.1.1 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 null adjust (zero) toxic gas sensors. In some cases, nitrogen (N_2) can be substituted for zero air when null adjusting electrochemical sensors. Contact CET for clarification.

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

IMPORTANT NOTES:

- Oxygen sensors require 99.9% nitrogen (N_2) 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 CO_2 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 N_2 balance.
- Solid State sensors must be calibrated in the environment they will be operating in, using “air” balance, not N_2 balance.
- Solid state refrigerant sensors and solid state TVOC sensors need to be calibrated using a humidification chamber. Flowing dry gas over these sensors can result in a negative a reaction and inaccurate readings.
- The type of gas mixture, how old the gas is and what temperature it has been stored at will affect repeatability during field calibration.

8.1.2 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.

8.1.3 Adapters

A calibration adapter needs to be used during calibration to make sure the gas diffuses around the sensor properly. The adapter fits the sensor vent for cGas Detector models without a splash guard. For models with a splash guard, the Cal Clip adapter needs to be used. The Cal Clip clips around the splash guard

WARNING: Remember to remove the Cal Clip after calibration. 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.

8.1.4 Humidification Chamber

Flowing dry gas over a solid state refrigerant or TVOCs sensor can result in a negative a reaction and inaccurate readings. Using a humidification chamber adds humidity and assists in recreating a “real-world” environment for the sensor. cGas Detector models that should be calibrated with a humdification chamber are:

- CGAS-A-STVOC and CGAS-D-STVOC
- All ESH-A catalytic sensor models: ESH-A-CCH4-100, ESH-A-CC3H8-100, ESH-A-CC2H2-100, ESH-A-CH2-100, etc.

8.1.5 Calibration Frequency

Calibrate every 6-12 months depending on application, standards and local regulations. A calibration should always be done immediately following a failed bump test.

- 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 calibrate once every six months

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

Equipment: Calibration Kit, Calibration gases

Users can order the calibration kit, calibration accessories and / or gases from

any CET authorized distributor or you can supply your own gas and equipment as long as the gas meets the minimum specifications. CET does not ship gas cylinders outside of Canada.

8.1.6 Gas Testing Frequency (Bump Testing)

CET recommends regular bump testing depending on application, standards and local regulations. Low-occupancy or non-occupancy areas—such as parking garages—present a different risk profile than other applications. While CO can still accumulate due to vehicle emissions, the transient nature of human presence reduces the immediate exposure risk. The risk level increases significantly in workplace and other occupied spaces, such as schools, offices, kitchens, chemical labs, and vehicle maintenance garages, where prolonged exposure to CO can pose serious health hazards. Monthly bump tests are recommended for sensors used to monitor toxic gases (ammonia, chlorine, refrigerants, etc.) in environments that are unfrequented like chiller rooms, cylinder storage rooms and in areas where workers are exposed for extended periods of time. A bump test should be performed after installation (after the warm up period) and after a prolonged period of unpowered time. If the sensor has been exposed to extreme environmental conditions, a high level of target gas, solvents or corrosive gases, etc. it should be bump tested.

8.1.7 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-D Detector with internal CO + NO_2 sensors that requires a splash guard should be ordered with the special splash guard for sticky gases.

8.2 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 *8.5 Calibrating an 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.

8.2.1 Set Calibration Gas Value

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

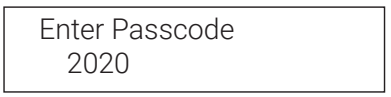
The factory default calibration gas concentrations are:

SENSOR GAS TYPE	CALIBRATION GAS LEVEL*
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
IR Refrigerants except R123	1,000 ppm 100 ppm

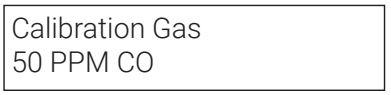
*subject to change depending on sensor supplier

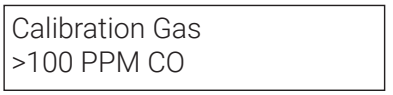
Enter passcode 2020 and press the ENTER button.



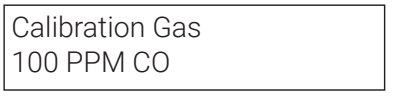
Navigate to the Calibration parent menu and then to the Selected Channel menu item and press ENTER.

Confirm the correct channel is showing. Navigate to the Calibration Gas menu item and press ENTER. Enter the gas concentration of the calibration gas cylinder you are using and press ENTER.





Press ENTER to confirm the value is correct.

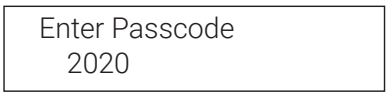


8.2.2 Zero (Null) Calibration

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 null adjusting 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 ENTER.

Enter passcode 2020 and press the ENTER button.

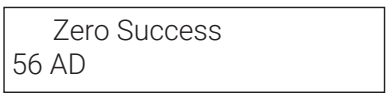


Navigate to the Calibration parent menu and then to the Selected Channel menu item and press ENTER.

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

If using ambient air press ENTER. 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 ENTER.

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 *8.3.1 Zero Fault*.

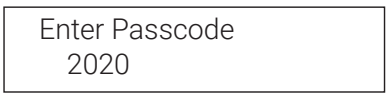
8.2.3 Span Calibration

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

NOTE: To exit the Span Calibration at any time, press ENTER.

NOTE: When the sensor is within a year of expiring a message will appear before each Span Calibration stating the lifetime remaining and asking if you want to continue.

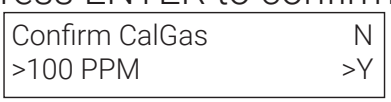
Enter passcode 2020 and press the ENTER button.



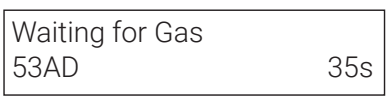
Navigate to the Calibration parent menu and then to the Selected Channel menu item and press ENTER.

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

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 ENTER 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 from 120 seconds and then spanning for a countdown from 60 seconds.


```
   Span Success
1956 AD  19
```

When the process has finished and the Span calibration was accepted, remove the cylinder of span gas. If the Span calibration was not successful, refer to Section *8.3.2 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. CET 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.

8.3 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)**

8.3.1 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.

8.3.2 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.).

Span Fault	
197 AD 1	0s

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

8.3.3 Zero Override

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

Override?	N
-1PPM	>Y

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

8.3.4 Span Override

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

Override?	N
1953 AD 19	>Y

8.4 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.

ESH-A models with a catalytic sensor must be calibrated using a humidification chamber. Flowing dry gas over the catalytic sensor used in the ESH-A can result in a negative a reaction and inaccurate readings. Using a humidification chamber adds humidity and assists in recreating a “real-world” environment for the sensor. All ESH-A catalytic sensor models should be calibrated with a humdification chamber are:

- ESH-A-CCH4-100
- ESH-A-CC3H8-100
- ESH-A-CC2H2-100
- ESH-A-CH2-100, etc.

8.4.1 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.

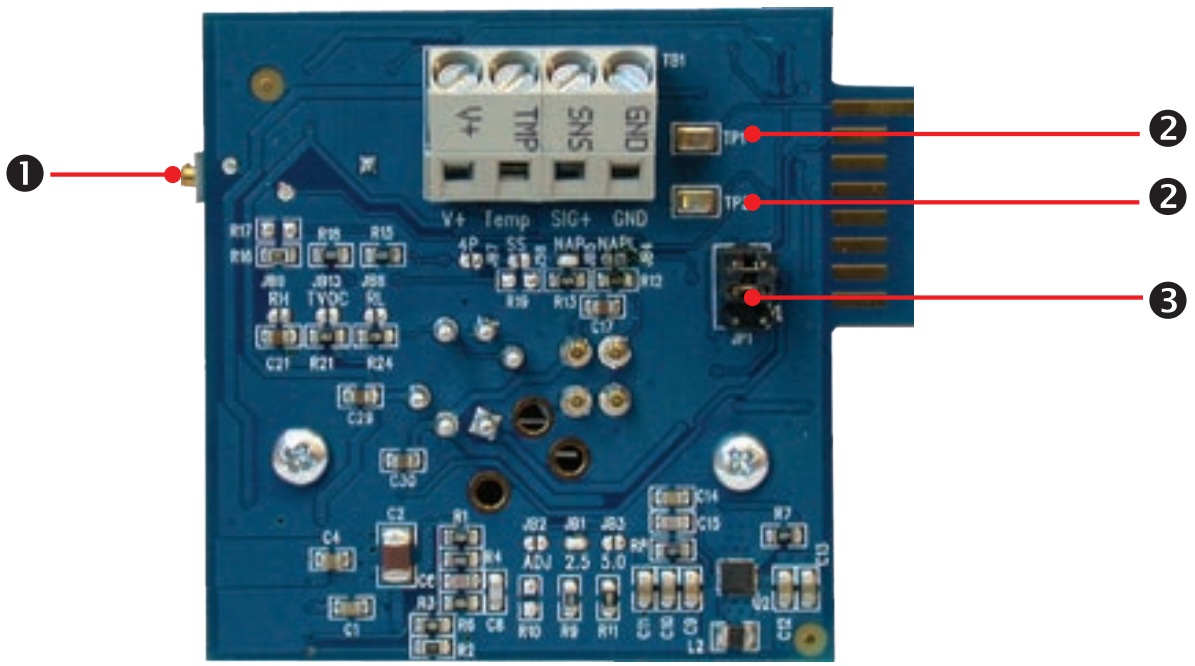
In the Calibration Menu (passcode 2020), press UP button to scroll through the menu and select the channel the ESH-A is assigned to. Follow the instructions in Section *6.2 Calibrating the Internal Sensor(s)* with the exception of applying the gas to the ESH-A sensor opening instead of the CGAS sensor opening.

8.4.2 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 Calibration 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.

8.5 Calibrating an Oxygen Sensor

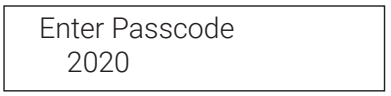
When calibrating an Oxygen sensor, a Span calibration should be done first, then a Zero calibration. The Zero calibration is done using a cylinder of 99.9% Nitrogen (N_2) gas.

NOTE: During the Span 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 ENTER button.



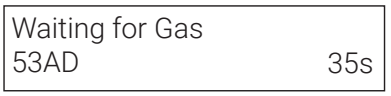
Navigate to the Calibration parent menu and then to the Selected Channel menu item and press ENTER.

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

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 ENTER 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.

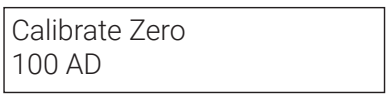


When the gas is detected the display will show that it is stabilizing for a countdown from 120 seconds and then spanning for a countdown from 60 seconds.

When the process has finished and the Span calibration was accepted, remove the cylinder of span gas. Refer to Section *8.3.4 Span Override* if the Span calibration was not successful.

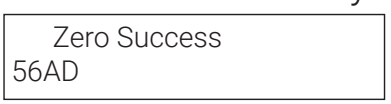
Attach the regulator to the cylinder of Nitrogen (N_2), insert calibration adapter onto the sensor opening on the front of the enclosure door.

Flow the gas for a couple minutes and continue flowing while you navigate to the Calibrate Zero menu item. Press ENTER 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 ENTER to Exit and remove the cylinder of Nitrogen (N_2) gas.



Refer to Section *8.3.3 Zero Override* if the Zero calibration was not successful.

9 ACCESSORIES

9.1 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. Refer to Section *9.4 Metal Protective Guards* for more information.

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).

9.2 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.

9.3 Splash Guard for Sticky Gases

This specially designed Splash Guard (Option -SN) for sticky gases is an optional factory installed accessory for protection of a sticky gas sensor in wet and/or wash down environments.

Sticky Gases: Chlorine (Cl_2) Chlorine Dioxide (ClO_2), Hydrogen Chloride (HCl), Hydrogen Cyanide (HCN), Hydrogen Fluoride (HF), Ozone (O_3), Phosphine (PH3).

In addition, units configured with an internal NO_2 or internal CO + internal NO_2 that require a splash guard should also use Option -SN.

9.4 Metal Protective Guards

The metal protective guard (p/n: SCS-8000-RSG) is made of heavy-duty metal and helps protect against abrasive damage, theft and vandalism to the transmitters. The 16-gauge powder coated steel has 13 mm (½ in) square openings in the front to allow gas and air to flow through to the sensor. With

four slotted mounting holes, installation and removal for gas detector servicing is easy. In applications where sticky gases are being monitored, such as Ozone, Chlorine, Hydrogen Chloride, etc. and frequent wash-downs are required, the metal splash guard can be ordered (p/n: SCS-8000-WSG). The splash cover is made powder coasted steel with louvres that allow the sticky gas to reach the sensor, plus protects the sensor from water ingress.

Material	16 gauge powder coated steel
Weight	800 g (28 oz)
Size	178 mm W x 160 mm H x 91 mm D (7.0” W x 6.3” H x 3.6” D)

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

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

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

10 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 transmitter should be kept clear.
- If painting is to be done in the same area as the transmitter, the transmitter 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.

10 TROUBLESHOOTING

cGas Detector 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.

Display shows "COMM" message. Modbus® or BACnet output signal has not been connected properly; will also occur if no requests are being made from the controller to the transmitter, ie addressing is not proper. Check the wiring connections and the network settings.

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

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

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

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

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 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 & 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 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 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 detected an error in the smart board ID. Use “Write to Sensor” for the indicated channel
F06	SB ID Mismatch	Firmware expected a different smart board than what is in the sensor socket.
F07	RH & Temp Fault	cGas cannot communicate with the sensor. Ensure the smart board is installed correctly. If unresolved, contact our Technical Support Department
F08	DAC COMM	This is a hardware fault. Contact our Technical Support Department.
F30	AO DAC is not responding	cGas has detected a problem with its configuration or analog output (4-20 mA) a main board replacement may be required. Contact our Technical Support Department.
F80-99	Internal Memory Faults	The cGas has detected a configuration miss-match between cGas and installed sensors. Contact our Technical Support Department.

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Unit 145, 7391 Vantage Way, Delta, BC V4G 1M3 Canada
Tel: +1.604.940.8741 Toll Free: +1.877.940.8741