Operation Manual

Rev. A | B | 2022.03

Critical Environment Technologies™

cGas Detector
Digital Transmitter | Analog Transmitter

www.critical-environment.com

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1 POLICIES

1.1 Important Note

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

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

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

INSTRUMENT SERIAL NUMBER:

_____

PURCHASE DATE:

_____

PURCHASED FROM:

_____

1.2 Warranty Policy

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

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

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

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

1.3 Service Policy

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

Repairs are warranted for 90 days after date of shipment (sensors have individual warranties). Should your instrument require non-warranty repair, you

may contact the distributor from whom it was purchased, or you may contact CETCI directly.

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

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

1.4 Copyrights

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

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 CETCI be liable for any claims, losses or damages resulting from or arising out of the repair or modification of this equipment by a party other than CETCI service technicians, or by operation or use of the equipment other than in accordance with the printed instructions contained within this manual or if the equipment has been improperly maintained or subjected to neglect or accident. Any of the forgoing will void the warranty.

Under most local electrical codes, low voltage wires cannot be run within the same conduit as line voltage wires. It is CETCI policy that all wiring of our

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

1.6 Revisions

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

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

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Website: www.critical-environment.com

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

2 IMPORTANT INFORMATION

The cGas Detector is a low maintenance gas monitoring device designed for use in non-explosion rated, commercial applications and is ideal for monitoring toxic, combustible and refrigerant gases. It is available in an analog model (CGAS-A) or a digital model (CGAS-D). Each model has its own Installation Manual that covers:

- Instrument Specifications
- Sensor Specifications
- Instrument Features
- Mounting and Installation
- Wiring Connections

View the CGAS-A Installation Manual

View the CGAS-D Digital Manual

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 to any 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.

3 BASIC SYSTEM OPERATION

The cGas Detector continuously monitors gas concentrations on one (or two) configured channel(s). It must be connected to a controller (FCS, DCC or SCC), a control panel or a BAS / BMS / DDC system; **the cGas Detector is not a standalone gas detection system.**

3.1 Power Up and Warm-up Process from the Factory

Upon application of power to a cGas Detector shipped from the factory, the LCD display will turn on and rotate through several info screens that differ depending on the configuration of the transmitter. The warm-up period takes between 2 and 5 minutes depending on the gas sensors type.

NOTE: The cGas Detector will be visible on the controller / BAS / DDC system during the warm-up countdown but a correct reading will not show up until the unit has finished the warm-up period and the sensor(s) has stabilized.

All alarms will be disabled during the system warm-up period. After the warm-up period, the system may exhibit gas alarm condition(s) if the sensor has not completely stabilized during the warm-up period. This is normal and the length of time the gas alarms exist is dependent upon the length of time since the unit was last powered up, and the state of the environment it is installed in.

Upon power-up, all sensors* should be left to warm up for 24 hours prior to considering the gas readings to be accurate.
*except, Ammonia, which should be left to warm up for 48 hours.

All sensors are calibrated in the factory prior to shipping and should not require calibration at the time of a routine installation or replacement.

3.2 Navigating the Menu Structure

The three programming push-buttons inside the enclosure are used to navigate through the cGas Detector menu structure.

ENTER begins a process or moves you to the next screen in the same menu.

The UP or DOWN buttons are used to enter characters/numbers and to navigate to the next menu item. For simplicity's sake, directions in this manual use the UP button.

A line under a character or number indicates that is the space into which you are entering a character or number. Use the ENTER button to move to the next space. Or use the UP or DOWN button to change the value in that space.

The > symbol indicates that you are in the edit mode as opposed to scrolling through available menu items.

After entering and confirming a value you can either Exit the menu or press the UP button to move to the next item in that menu. All menus are circular and will bring you back to the Exit screen. Press ENTER to Exit.

3.3 Accessing the Menu with Passcodes

You must enter a passcode to access the menu. From the normal operation screen, press ENTER to access the password entry screen. Use the UP or DOWN arrow to scroll to the desired number. Press ENTER to move to the next position. Continue until the full code is entered and press ENTER when finished.

Legend:

   [d] for digital models only
   [a] for analog models only
   * Option must be installed

CODE	NAME	DESCRIPTION
0001	Test Menu	• Test Reading [d] / Test Analog Output [a] • Test Relay *
1001[d]	Basic Menu	If configure as a Modbus® device • Comm Type • Comm Mac • Comm Baud • Comm Parity If configured as a BACnet® device • Comm Type • Comm Mac • Comm Baud • Instance ID • Comm Parity
1014	Display Menu	• Display Type • Brightness • Hide Channel • Scroll Delay [d]
2012	Alarms Menu	• Set Alarm Setpoint • Set Alarm Direction (Ascending/ Descending) • Set Alarm Hysteresis • Fault Reading

3022	Config Menu	• Enable/Disable Channel • Read from Sensor • Write to Sensor • Relay ON Delay • Relay OFF Delay • Relay Failsafe • Relay Priority • Enable/Disable Relay
3032	Calibrate Menu	• Set Calibration Gas • Calibrate Zero • Calibrate Span • Set Analog Output Mode [a] • Set Analog Output Priority [a] • Calibrate Analog Output [a] • Set Analog Output Zero [a] • Set Analog Output Range [a] • Temperature Offset * • Humidity Offset * • Temperature Units *

3.4 Display Settings

The LCD display can display up to 2-lines of 16-characters. The backlight can be turned off, but in normal operation, as configured from the factory, the display is backlit. 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 button allows you to scroll through a series of information screens showing the model name, serial number and firmware version; the gas type and AD counts; the channel number, gas type and gas level; and temperature and relative humidity (if option -RHT is installed). For a CGAS-D

communication type, ID and baud rate will also appear on these screens.

3.4.1 Adjust Display Brightness
The brightness of the display and the information displayed can be changed as per your preference.

From the main display, press ENTER.
Enter passcode 1014 using the UP button and ENTER button.

> Enter Password
> 1014

Press ENTER to access the Display Menu.

> DisplayMenu   Brightness
> Press Enter   100

Press ENTER. Use the UP button to change the numeric value. Move to the next digit by pressing ENTER. When finished, press ENTER to confirm and Exit.

> Brightness   Confirm?   N
> >050   50   >Y

NOTE: You cannot enter a number higher than 100. Entering a value of 000 turns the backlight off completely. With ambient light the text can still be read on the display.

3.4.2 Display Configurations
The default display set from the factory is normal mode which displays the gas type, gas reading and gas units for the configured channel.

> CO2   536 PPM

The information can be reduced to just the gas type by changing the setting to the minimal mode display.

> ********-CO2-********

From the main display, press ENTER.

Enter passcode 1014 using the UP button and ENTER button.

```
Enter Password
   1014
```

Press ENTER to access the Display Menu.

```
DisplayMenu          Display Type
Press Enter          Normal
```

Press ENTER. Use the UP button to change the display type and press ENTER to save and Exit.

```
Display Type
>Minimal
```

3.4.3 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.

From the main display, press ENTER.
Enter passcode 1014 using the UP button and ENTER button.

```
Enter Password
   1014
```

Press ENTER to access the Display Menu.

```
Display Menu
 Press Enter
```

Press ENTER. Press the UP button until you see Selected Channel.

```
Selected Channel
>CO
```

Press ENTER. Using the UP or DOWN buttons, scroll through the item you want to apply changes to:

- Gas Type(s)
- Temperature (if installed)
- Humidity (if installed)

Press ENTER. Press the UP button until you see Hide Channel.

```
Hide Channel
>Unhidden
```

If you want to change its present condition, press ENTER. Use the UP button to choose Hidden (or Unhidden) and press ENTER to save and Exit.

Repeat for each channel you want to hide or unhide.

3.5 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.

3.6 Enable / Disable Channels

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

Section *3.4.3 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 units. 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 |

From the main display, press ENTER.
Enter passcode 3022 using the UP button and ENTER button.

| Enter Password |
| 3022 |

Press ENTER to access the Config Menu.

| Config Menu |
| Press Enter |

In the Selected Channel menu, confirm the correct channel is showing.

| Selected Channel |
| CH1 CO2 |

If you want to choose a different channel, press ENTER and use the UP button to scroll to the next value. Press ENTER and continue.

| Selected Channel |
| >Temperature |

The list to choose from will depend on the configuration of the device:
- Gas Type(s)
- Temperature (if installed)
- Humidity (if installed)

Press the UP button to find Channel En/Dis. To make a change, press ENTER and then the UP button to choose Enable or Disable and press ENTER to select

and Exit.

ChannelEn/Dis
Enabled

ChannelEn/Dis
>Disable

CO2	0 PPM
----degF	38%RH

3.7 Setting Channel Alarm Setpoints, Direction and Hysteresis

NOTE: The cGas Detector DOES NOT HAVE an internal alarm. Alarm setpoints should be configured at the controller or BAS/DCC. Configuring them in the cGas Detector will be for display purposes only.

The LOW, MID and HIGH gas alarm setpoints can be configured in the cGas Detector. 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.

The alarm set points can be changed at any time and do not require a 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
Solid State Refrigerants	0 - 2,000 ppm	250 ppm	500 ppm	1,000 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:

From the main display, press ENTER.

Enter passcode 2012 using the UP button and ENTER button.

Enter Password
2012

Press ENTER to access the Alarms Menu.

Alarms Menu
Press Enter

In the Selected Channel menu, confirm the correct channel is showing.

Selected Channel
CO2

Press the UP button until you see Selected Alarm, confirm the correct alarm level is showing.

Selected Alarm
Low Alarm

If you want to choose a different alarm level (ie. Mid or High), press Enter and use the UP button to scroll to the next alarm level. Press ENTER and continue.

Selected Alarm
>Mid Alarm

Press the Up button until you see Alarm Setpoint, confirm the desired number is showing.

Alarm Setpoint
800 PPM

If you want to enter a different alarm setpoint, press Enter and use the UP and ENTER buttons to change the number. Press ENTER to confirm and continue.

Alarm Setpoint
>1000 PPM

Confirm?   N
>1000 PPM   >Y

Press the Up button until you see Alarm Direction, confirm the correct direction - ascending is used for the gas sensor.

Alarm Direction
ASCENDING

Press the Up button until you see <u>Alarm Hysteresis</u>, confirm the desired value is showing.

> Alarm Hysteresis
> 005 PPM CO2

If you want to change the value, press Enter and use the UP and ENTER buttons to change the value. Press ENTER to confirm and continue.

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

3.8 Relay Operation

NOTE: The relay (Option -RLY) **cannot** be added to CO_2 or sticky gas sensor configurations.

Option -RLY is a plug and play smart board that offers an SPDT dry contact relay rated 30 volts, 2 amps max. It is factory installed in the second socket to allow access for wiring and should not be moved to the other socket.

The cGas does not provide any power from the relay terminal. 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 relay is single pole, double throw thereby providing one set of usable dry contacts for the relay. The cGas Detector is designed to be fail-safe. Equipment to be controlled by the system relays 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 connection relay will close. The relay coils are normally energized in a non-alarm state for failsafe operation.

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

> • Enabled
> • 0 seconds ON Delay
> • 0 seconds OFF Delay
> • Activated on CH1 HIGH alarm level, failsafe

3.8.1 Enable / Disable the Relay

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.

From the main display, press ENTER.
Enter passcode 3022 using the UP button and ENTER button.
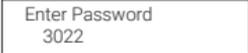
```
Enter Password
   3022
```

Press ENTER to access the Config Menu.

```
Config Menu
 Press Enter
```

Use the UP button to scroll to find Relay En/Dis. Press ENTER.

```
Relay En/Dis
Enabled
```
```
Relay En/Dis
>Enable
```

Use the UP button to change to Disable. If you want to disable the relay press ENTER. Press ENTER to exit.

```
Relay En/Dis
Disable
```

3.8.2 Set Relay ON / OFF Delays

The cGas Detector has configurable ON and OFF delay for its relays. In the event of a gas build up in excess of the level set for the specified alarm level, the relay will be triggered. If an ON DELAY has been set, the relay will remain unchanged until the time delay has expired, at which time the relay will "trip". If the gas level falls below the set alarm level before the delay has finished, the

---

alarm will be cancelled and the delay will be reset for the next alarm. If an OFF DELAY has been set, the relay will stay tripped for the duration of the RELAY OFF DELAY.

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

Set ON Delay
From the main display, press ENTER.
Enter passcode 3022 using the UP button and ENTER button.

> Enter Password
> 3022

Press ENTER to access the Config Menu.

> Config Menu
> Press Enter

Use the UP button to scroll to find Relay ON Delay. Press ENTER.

Relay ON Delay	Relay ON Delay
0	>0000

Use the UP / DOWN buttons to enter the number of seconds of the ON Delay. Press ENTER and choose Y to confirm. Press ENTER to exit.

Confirm?	N
>1200	>Y

Set OFF Delay
From the main display, press ENTER.
Enter passcode 3022 using the UP button and ENTER button.

> Enter Password
> 3022

Press ENTER to access the Config Menu.

> Config Menu
> Press Enter

Use the UP button to scroll to find Relay ON Delay. Press ENTER.

Relay OFF Delay	Relay OFF Delay
0	>0000

Use the UP / DOWN buttons to enter the number of seconds of the OFF Delay.
Press ENTER and choose Y to confirm. Press ENTER to exit.

Confirm?	N
>1200	>Y

3.8.3 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.

From the main display, press ENTER.
Enter passcode 3022 using the UP button and ENTER button.

Enter Password
3022

Press ENTER to access the Config Menu.

Config Menu
Press Enter

Use the UP button to scroll to find Relay En/Dis. Press ENTER.

Relay Failsafe	Relay Failsafe
Enabled	>Enable

Use the UP button to change to Disable. If you want the relay configured for
normal operation, press ENTER and ENTER to exit.

Relay Failsafe
Disable

3.9 Change Units (ºC or ºF) 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.

From the main display, press ENTER.
Enter passcode 3032 using the UP button and ENTER button.

```
Enter Password
   3032
```

Press ENTER to access the Calibrate Menu.

```
Calibrate Menu
Press Enter
```

In the Selected Channel menu, if Temperature is not displayed, press ENTER and use the UP button to scroll to find Temperature. Press ENTER.

```
Selected Channel          Selected Channel
CO2                       >Temperature
```

Use the UP button to find Temperature Unit. If you want to change the unit type, press ENTER.

```
Temperature Unit
Celsius
```

Press the UP button to choose Fahrenheit press ENTER and ENTER to exit.

```
Temperature Unit
>Fahrenheit
```

3.10 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 *3.9 Change Units ($^\circ$C or $^\circ$F) of Temperature Readings*.

The temperature and relative humidity sensor 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.

From the main display, press ENTER.
Enter passcode 3032 using the UP button and ENTER button.

> Enter Password
> 3032

Press ENTER to access the Calibrate Menu.

> Calibrate Menu
> Press Enter

In the Selected Channel menu, if Temperature (or Humidity) is not displayed, press ENTER and use the UP button to scroll to find the item you are looking for. Press ENTER.

> Selected Channel
> CO2

> Selected Channel   Selected Channel
> >Temperature   >Humidity

Use the UP button to find Temperature Adj (or Humidity Adj). If you want to change the offset value, press ENTER. Change the offset value using the UP or DOWN and ENTER buttons.

Temperature Adj	Humidity Adj
>-4.0 degC	>+02 %RH

Press ENTER to confirm the value is correct. If you entered the wrong value, press the UP button to move the cursor to N and press ENTER and reenter the value.

Confirm? N	Confirm? N
>-4.0 degC >Y	>+2 %RH >Y

3.11 Set Analog Output Mode (for CGAS-A only)

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.

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.

To set the analog output mode, from the main display, press ENTER.
Enter passcode 3032 using the UP button and ENTER button.

Enter Password
3032

Press ENTER to access the Calibrate Menu.

Calibrate Menu	Selected Channel
Press Enter	CO2

Press the UP button to find Set AO Mode. Press ENTER and change the value using the UP or DOWN buttons.

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

Set AO Mode	Set AO MOde
OFF	>PEAK

When finished pressed ENTER and then ENTER again to exit.

3.12 Test Functions

3.12.1 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).

From the main display, press ENTER.
Enter passcode 0001 using the UP button and ENTER button.

Enter Password
0001

Press ENTER to access the Test Menu.

Test Menu
Press Enter

In the Test AO menu, the default entry is 4 mA. Press ENTER.

Test AO
4.0 mA

Enter the preferred output value between 0 and 30 mA by using the UP, DOWN and ENTER buttons, or to continue with 4 mA press ENTER to the end.

Test AO
>14.0 mA

When finished, press ENTER and then again to Confirm Y.

Confirm?	N	Test AO
>14.0 mA	>Y	14.0 mA

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.

3.12.2 Test Reading / 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.

From the main display, press ENTER.
Enter passcode 0001 using the UP button and ENTER button.

```
Enter Password
   0001
```

Press ENTER to access the Test Menu.

```
Test Menu
Press Enter
```

In the Selected Channel menu, confirm the correct channel is showing.

```
Selected Channel
CO
```

If you want to choose a different channel, press ENTER and use the UP button to scroll to the next value. Press ENTER and continue.

```
Selected Channel
>NO2
```

The list to choose from will depend on included sensors and options:

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

Press the UP button to find Test Reading. To make a change, press ENTER and then use the UP, DOWN and ENTER buttons to enter the value.

Test Reading	Test Reading
0 PPM NO2	>10.0 PPM NO2

Press ENTER and then again to Confirm Y.

Confirm? N	Test Reading
>10.0 PPM NO2 >Y	10.0 PPM NO2

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.

3.12.3 Test Relay (models with Option -RLY 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.

From the main display, press ENTER.
Enter passcode 0001 using the UP button and ENTER button.

Enter Password
0001

Press ENTER to access the Test Menu.

Test Menu
Press Enter

In the Test Relay menu, the default entry is Untripped. Press ENTER and use the UP button to change to Tripped. Press ENTER. You will hear a soft click and the relay will activate accordingly, respecting its failsafe setting.

Test Relay	Test Relay
Untripped	>Tripped

To stop the relay test, press the UP or DOWN button. You will hear a soft click and the relay will deactivate.

```
Test Relay:SB
>Untripped
```

When finished, press the UP button and press ENTER on the Exit menu item.

4 MODBUS & BACNET CONFIGURATION

NOTE: This entire section is applicable to the CGAS-D only.
The CGAS-D can be changed from Modbus® to BACnet® or vice versa in the field.

4.1 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.

From the main display, press ENTER.
Enter passcode 1001 using the UP button and ENTER button.

```
Enter Password
   1001
```

Press ENTER to access the Basic Menu.

```
Basic Menu          Comm Type
Press Enter         MODBUS
```

Press ENTER. Use the UP or DOWN buttons to choose MODBUS or BACNET or Cancel. Press ENTER. If you have changed the communication type, the device will display Reset Device.

```
Comm Type           Reset Device
>BACNET
```

Press ENTER and the cGas Detector will power off and on. This will cause a brief interruption in communications if the cGas Detector is on a network.

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 4.2 Configuring Modbus® Settings or 4.3 Configuring BACnet® Settings.

4.2 Configuring Modbus® Settings

If a complete system (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 only CGAS-D transmitters are being ordered, by themselves, 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 adding the 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.

4.2.1 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 100 to 255.

From the main display, press ENTER.
Enter passcode 1001 using the UP button and ENTER button.

> Enter Password
> 1001

Press ENTER to access the Basic Menu.

> Basic Menu
> Press Enter

The Comm Type displayed should be MODBUS. Press the UP button until you see Comm MAC.

Comm Type	Comm MAC
MODBUS	000

Press ENTER. Use the UP or DOWN buttons to change the numeric value. Move to the next digit by pressing ENTER. When finished, press ENTER to confirm and again to Exit.

Comm MAC	Confirm? N
>101	>101 >Y

4.2.2 Change Modbus® Baud Rate
All devices on the same network must have the same baud rate. The default Modbus® baud rate for all CETCI Modbus® devices is 19,200.
From the main display, press ENTER.
Enter passcode 1001 using the UP button and ENTER button.

> Enter Password
> 1001

Press ENTER to access the Basic Menu.

> Basic Menu
> Press Enter

The Comm Type should be Modbus. Press the UP button until you see Comm Baud.

Comm Type	Comm Baud
MODBUS	19,200

Press ENTER. Use the UP or DOWN buttons to scroll through the baud rates to choose from:

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

Select the preferred baud rate by pressing ENTER to save. Press the UP buttons and ENTER to Exit.

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

4.3 Configuring BACnet® Settings
4.3.1 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.

From the main display, press ENTER.
Enter passcode 1001 using the UP button and ENTER button.

> Enter Password
> 1001

Press ENTER to access the Basic Menu.

> Basic Menu
> Press Enter

The Comm Type should be BACnet. Press the UP button until you see Comm MAC.

Comm Type	Comm MAC
BACnet	100

Press ENTER. Use the UP button to change the numeric value. Move to the next digit by pressing ENTER. When finished, press ENTER to confirm and Exit.

Comm MAC	Confirm? N
>111	>111 >Y

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

From the main display, press ENTER.
Enter passcode 1001 using the UP button and ENTER button.

> Enter Password
> 1001

Press ENTER to access the Basic Menu.

> Basic Menu
> Press Enter

The Comm Type should be BACnet. Press the UP button until you see Instance ID.

Comm Type	Instance ID
BACnet	270100

Press ENTER. Use the UP button to enter the numeric value. Move to the next digit by pressing ENTER. When finished, press ENTER to confirm and Exit.

Instance ID	Confirm? N
>0270111	>270111 >Y

4.3.3 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.

From the main display, press ENTER.

Enter passcode 1001 using the UP button and ENTER button.

Enter Password
1001

Press ENTER to access the Basic Menu.

Basic Menu
Press Enter

The Comm Type should be BACnet. Press the UP button until you see Comm Baud.

Comm Type	Comm Baud
BACnet	>19200

Press ENTER. Using the UP or DOWN buttons, scroll through the baud rates to choose from:

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

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

Select the preferred baud rate by pressing ENTER to save. Press the UP button and ENTER to Exit.

4.3.4 BACnet® PICS Information

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

5 PLUG & PLAY SMART SENSOR REPLACEMENT

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. Similarly, the sensor may need to be replaced if the application requirements change and a different gas needs to be monitored.

A Plug & Play Smart Sensor Board is a sensor that is fastened to a small circuit board with a memory chip that contains the sensor's calibration and configuration information. When a replacement smart sensor board or a brand new gas smart sensor board is installed, the information it contains must be written to the main circuit board.

5.1 How to Replace or Add a New Smart Sensor Board

Smart board replacement sensors arrive pre-calibrated and factory configured. The order of events to successfully replace or add a new smart sensor board are:

- **Step 1 - POWER OFF THE CGAS**
- Step 2 - Replace the Smart Sensor Board
- Step 3 - Read From Sensor
- Step 4 - Write to Sensor
- Step 5 - Allow sensor to warm up
- Step 6 - Bump test

Step 1 - POWER OFF THE CGAS

Power OFF the unit during the physical replacement of the sensor boards.

Step 2 - Replace the Smart Sensor Board

If replacing an existing sensor, unscrew the smart sensor board you want to replace and gently pull it out of the socket. Insert the new smart sensor board and screw it in place.

NOTES for CGAS-D Digital cGas Detector:

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

• If adding a new smart sensor to an empty socket, make sure to remove the perforated foam circle in the sensor cavity, then insert the smart board and screw it in place. If the new smart sensor is a CO sensor smart board, it will be shipped with a small plastic short sensor adapter. After removing the foam, insert the short sensor adapter before plugging the CO smart sensor board into the socket.
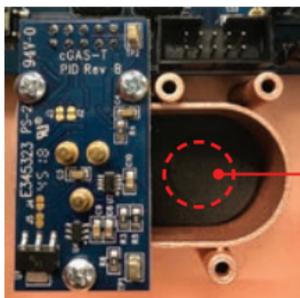
When installing a second smart sensor after initially ordering a single smart sensor model, you will need to remove the center circular cut out of the foam in the second sensor vent area before installing the smart board.

5.2 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.

With the unit powered ON, from the main display, press ENTER.
Enter passcode 3022 using the UP button and ENTER buttons.

Enter Password
3022

Press ENTER to access the Config Menu.

Config Menu
Press Enter

In the Selected Channel menu, confirm the desired channel is showing. If you

want to choose a different channel, press ENTER and use the UP button to
scroll to the next value. Press ENTER and continue.

> Selected Channel
> CH1 CO2

Press the UP button to find Read From Sensor. Press ENTER.

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

Press the UP button to change from NO to YES and press ENTER to select. 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 reading from the correct sensor - left vs right.

5.3 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.

From the main display, press ENTER.
Enter passcode 3022 using the UP button and ENTER buttons.

> Enter Password
>   3022

Press ENTER to access the Config Menu.

> Config Menu
> Press Enter

In the Selected Channel menu, confirm the desired channel is showing.

> Selected Channel
> CH1 CO2

Press the UP button to find Write to Sensor. Press ENTER.

Write to Sensor CH1 (left)	Write to Sensor >YES

Press the UP button to change from NO to YES and press ENTER to select. The system will write the sensor configuration information fromthe main board to the smart sensor board. Press ENTER to exit. Repeat for the second channel if required. Repeat for the second channel if required.

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

After you physically replace the smart sensor board, you have to Read the data stored in the new sensor board up to the main board, overwriting the old sensor's calibration information.

After an appropriate warm up period (24 hours), you may want to do a bump test to confirm the response from the sensor.

6 CALIBRATION

6.1 Calibration Specifications

6.1.1 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 CETCI for clarification.

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

IMPORTANT NOTES:

- Oxygen sensors require 99.9% nitrogen (N2) for a true zero. We recommend doing the span first, followed by zeroing.
- Carbon dioxide sensors require 99.9% nitrogen (N2) for a true zero. If the cGas Detector has a splash guard you will need to flow the nitrogen for approximately 4 minutes BEFORE you enter the Calibrate Zero menu. Same when flowing CO2 calibration gas, flow for 4 minutes BEFORE you enter the Calibrate Span menu.
- Catalytic sensors require oxygen to work and thus the user MUST flow clean air or oxygen to obtain a true zero and the span gas must have "air" balance, not N2 balance.

6.1.2 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.

6.1.3 Adapters

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

6.1.4 Calibration Frequency

- Parking garage detectors: Once every 12 months
- OHS applications: Once every 6 months (OHS: Occupational Health & Safety)
- For best performance and to meet published specifications: once every six months

NOTE: A calibration label should be applied after every calibration to confirm

work performed and the date it was confirmed. If a controller is involved, the alarm set points should be indicated on a label on the front door of the enclosure so anyone working in the environment can be aware.

Equipment: Calibration Kit, Calibration gases

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

6.1.5 Gas Testing Frequency (Bump Testing)
For the purpose of safety in OHS applications, sensors should be gas tested (bump tested) once every month to confirm response and alarm activation.

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

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

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

6.2 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 6.4 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.

6.2.1 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.

From the main display, press ENTER.
Enter passcode 3032 using the UP button and ENTER button.

```
Enter Password
   3032
```

Press ENTER to access the Calibrate Menu.

```
Calibrate Menu
Press Enter
```

In the Selected Channel menu, confirm the desired channel is showing.

```
Selected Channel
CO
```

If you want to choose a different channel, press ENTER and use the UP button to scroll to the next channel. Press ENTER and continue.

```
Selected Channel
>NO2
```

Press the UP button to accept the displayed calibration gas value if it is correct.

Or press ENTER and change the value using the UP or DOWN buttons.

| Calibration Gas | | Calibration Gas |
| 50 PPM CO | | >100 PPM CO |

When finished pressed ENTER and then ENTER again to confirm and ENTER to exit.

| Confirm? | N |
| >100 PPM | >Y |

The factory default calibration gas concentrations are:

SENSOR GAS TYPE	CALIBRATION GAS LEVEL*
Carbon Dioxide (CO_2)	1,000 ppm
Carbon Dioxide (CO_2)	1.0 % VOL
Carbon Monoxide (CO)	100 ppm
Nitrogen Dioxide (NO_2)	5 ppm
Combustibles	20% LEL
Solid State Refrigerants	1,000 ppm

* subject to change depending on sensor supplier

6.2.2 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.

From the main display, press ENTER.
Enter passcode 3032 using the UP button and ENTER button.

> Enter Password
> 3032

Press ENTER to access the Calibrate Menu.

> Calibrate Menu
> Press Enter

In the Selected Channel menu, confirm the desired channel is showing.

> Selected Channel
> CO

If you want to choose a different channel, press ENTER and use the UP button
to scroll to the next channel. Press ENTER and continue.

> Selected Channel
> >NO2

Press the UP button to find Calibrate Zero.

> Calibrate Zero
> 100 AD

Press ENTER if using ambient air 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 (refer to **Section 6.3.1 Calibration Adapter Plug** if the adapter
will not fit). Press ENTER to start the Zero calibration. The display will show a
countdown from 20 seconds.

> Zeroing
> 47AD   18s

> Zero Success
> 56AD

When the process has finished and the Zero calibration was accepted, press
ENTER and use the UP button navigate to Exit and press ENTER to exit. Remove

the cylinder of zero gas. If the Zero calibration was not successful refer to
Section 6.3.2 Zero Fault.

6.2.3 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.

From the main display, press ENTER.
Enter passcode 3032 using the UP button and ENTER button.

> Enter Password
> 3032

Press ENTER to access the Calibrate Menu.

> Calibrate Menu
> Press Enter

In the Selected Channel menu, confirm the desired channel is showing.

> Selected Channel
> CO

If you want to choose a different channel, press ENTER and use the UP button
to scroll to the next channel. Press ENTER and continue.

> Selected Channel
> >NO2

Use the UP button to find Calibrate Span. Press ENTER.

> Calibrate Span
> 4000 AD

Confirm the span calibration gas level. It is important to make sure that the
span gas level value matches the calibration gas concentration you are using to
calibrate the sensor. Press ENTER to confirm value is correct. (If the value is not

correct, press the UP button to move the cursor to N and press ENTER. Change the cal gas level using the UP and ENTER buttons.)

Confirm CalGas	N
>100 PPM	>Y

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.

Waiting for Gas	
53AD	35s

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

Stabilizing			Spanning	
1961AD	82s		1957AD	21s

Span Success	
1956 AD 19	

When the process has finished and the Span calibration was accepted, press ENTER and use the UP button navigate to Exit and press ENTER to exit. Remove the cylinder of span gas. If the Span calibration was not successful, refer to **Section 6.3.3 Span Fault.**

Repeat the calibration steps above for each enabled gas channel.

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

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

6.3 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 you have questions, please contact our Technical Service Department at help@cetci. com or 604-940-8741 (Local) or 1-877-940-8741 (Toll Free).**

6.3.1 Calibration Adapter Plug Doesn't Fit

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

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

6.3.2 Zero Fault

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

6.3.3 Span Fault

If the cGas shows a Span fault after trying to calibrate, it is possible that the sensor is dead or the device isn't seeing the gas (cylinder is empty, regulator or adapter plug is not attached properly, tube is blocked, kinked, etc.).

```
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.

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

```
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.

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

```
Override?            N
1953 AD  19        >Y
```

6.4 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.

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

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

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

6.4.2 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.
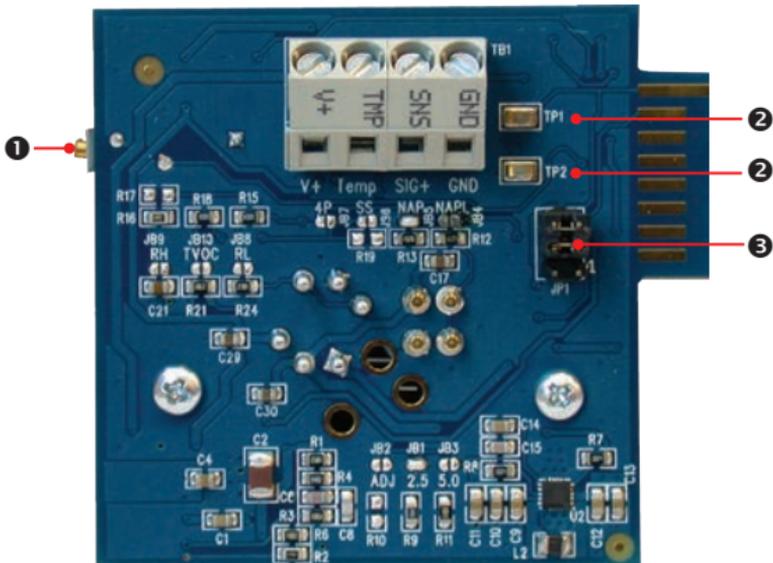
NUMBER	FEATURE	FUNCTION
❶	POT RN1 (Potentiometer)	Used for Zero calibration of a new or replacement sensor. TP1 and TP2 calibrate to 0.40 VDC with Null gas applied.
❷	Test Points: TP1 & TP2	For adjusting a new or replacement sensor to Zero. TP1 and TP2 calibrate to 0.40 VDC with Null gas applied.
❸	JP1 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 volt meter to TP1 and TP2. Using the POT RN1 potentiometer (located on the left underside of the ESH-A board), adjust the voltage to read 0.40 VDC. Verify that the voltage output from digital multi-meter leads attached to test points TP1 and TP2 on the cGas Detector is reading 0.0 VDC (a Zero and Span Calibration of the cGas Detector will be required if this is not the case).

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

Step 5
On the cGas Detector, in the Calibrate Menu (passcode 3032), 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.

6.5 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.

To calibrate the Oxygen sensor, from the main display, press ENTER.
Enter passcode 3032 using the UP button and ENTER button.

```
Enter Password
 3032
```

Press ENTER to access the Calibrate Menu.

```
Calibrate Menu
Press Enter
```

In the Selected Channel menu, confirm the O2 channel is showing.

```
Selected Channel
O2
```

\If you need to choose a different channel, press ENTER and use the UP button
to scroll to the next channel. Press ENTER and continue.

Press Enter to continue. Use the UP button to find Calibrate Span. Press ENTER.

```
Calibrate Span
4000 AD
```

Confirm the span calibration gas level. It is important to make sure that the
span gas level value matches the calibration gas concentration you are using to
calibrate the sensor. Press ENTER to confirm value is correct. (If the value is not
correct, press the UP button to move the cursor to N and press ENTER. Change
the cal gas level using the UP and ENTER buttons.)

```
Confirm CalGas        N
>20.9 %VOL          >Y
```

The factory default calibration gas concentration is:

SENSOR GAS TYPE	CALIBRATION GAS LEVEL
Oxygen (O_2)	20.9% VOL

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.

```
Waiting for Gas
53AD                35s
```

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

```
Stabilizing              Spanning
1961AD          82s      1957AD          21s
```

```
Span Success
1956 AD    19
```

When the process has finished and the Span calibration was accepted, remove the cylinder of span gas. Refer to **Section 6.3.5 Span Override** if the Span calibration was not successful.

Attach the regulator to the cylinder of Nitrogen (N_2), insert calibration adapter into the sensor opening on the front of the enclosure door (refer to **Section 6.3.1 Calibration Adapter Plug** if the adapter will not fit). Flow the gas for a couple minutes and continue flowing while you press the UP button to find Calibrate Zero.

```
Calibrate Zero
100 AD
```

Press ENTER to start the Zero calibration. The display will show a countdown from 19 seconds.

```
Zeroing
47AD                          18s
```

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

```
Zero Success
56AD
```

Refer to **Section 6.3.4 Zero Override** if the Zero calibration was not successful.

7 ACCESSORIES

7.1 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 7.4 Metal Protective Guard** 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).

7.2 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.

7.3 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.

7.4 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. <u>and</u> 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)

7.5 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 gases are available from the CETCI factory. Many gases, but not all are carried in inventory. Check with any CETCI authorized distributor for availability of specific gas types. **Gas cylinders cannot be shipped from Canada to other countries, including the USA.**

8 MAINTENANCE

The cGas Detector transmitter requires virtually no maintenance other than regular calibration of the sensor(s). There are no replaceable components except the sensors.

The transmitter 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.

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.

9 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.

List of Possible cGas Error Codes:
(appears on the display in place of the units for a channel)

CODE		DESCRIPTION
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 appropriage warm up period, zeroing the sensor will normally resolve this.
F02	Smart Board Fault	cGas cannot communicate with the smart board. Ensure the smart board is installed and installed on the correct side (left) if a single channel unit. Otherwise power cycle or replace the sensor smart board.
F03	CO2 Communication Fault	cGas cannot communicate with the CO_2 sensor even though it can communicate with the smart board. Power cycle or replace the sensor smart board.

F04	POT chip has failed	The internal smart sensor board gainPOT chip has failed. 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 (passcode 3022).
FO6	SB ID Mismatch	Firmware expected a different smart board than what is in the sensor socket.
FO7	RH & Temp Fault	cGas cannot communicate with the sensor. Ensure the smart board is installed correctly. If unresolved, contact our Technical Support Department
FO8	DAC COMM	This is a hardware fault. Contact our Technical Support Department.
F20	RLY GPIO chip is not responding	Check to make sure the relay board is present and installed properly in the socket. If installed, main board is unable to communicate with the relay board and may be damaged A replacement relay board may be required.

NOTES

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