Critical Environment Technologies™

Operation Manual

For Indoor Public Spaces

cGas™ DETECTOR

R410A   0 PPM

CO2   556 PPM

www.critical-environment.com

Rev. A | 2019.11

CGAS-AP & CGAS-DP Transmitters

TABLE OF CONTENTS

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, **<u>do not</u>** 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. (the manufacturer) warrants this gas monitoring instrument, (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**. The sensors have a warranty period of **one year on a pro-rated basis from the date of purchase from our facility**. This warranty is limited to the mechanics of the physical sensor components and as such, should the sensor become defective within this warranty period, we will repair or replace it at our discretion. This warranty does not extend to sensors that have been poisoned by external compounds such as, but not limited to, extreme gas concentrations, paint fumes, excessive dust, debris, etc. or to sensors that have been improperly zeroed, calibrated or altered in any way. If it is determined **within 90 days of purchase** that a sensor is malfunctioning or unable to remain calibrated due to no fault of its placement or treatment, the instrument may be sent back to the factory for a free calibration service.

The warranty status may be affected if the instrument has not been operated, calibrated or maintained as per the instructions in the instrument's Operation Manual or if the instrument has been abused, damaged or altered in any way. This instrument is only to be used for purposes stated herein. The manufacturer is not liable for auxiliary interfaced equipment or consequential damage.

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

All goods must be shipped to the manufacturer by **prepaid freight**. All returned goods (whether under warranty or not) must be pre-authorized by obtaining a return merchandise authorization (RMA) number. Contact the manufacturer for an RMA number and the procedures required for product transport.

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 must be accompanied with an RMA number.

If CETCI is to do the repair work, you may send the instrument, prepaid, to:

Attention: Service Department
Critical Environment Technologies Canada Inc.
Unit 145, 7391 Vantage Way
Delta, BC, V4G 1M3

Always include your Returned Merchandise Authorization (RMA) number, address, telephone number, contact name, shipping / billing information, and a description of the defect as you perceive it. You will be contacted with a cost estimate for expected repairs, prior to the performance of any service work.

For liability reasons, CETCI has a policy of performing all needed repairs to restore the instrument to full operating condition.

Pack the equipment well (in its original packing if possible), as we cannot be held responsible for any damage incurred during shipping to our facility.

7

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.

It is CETCI policy that all wiring be within properly grounded (earth or safety) conduit.

1.6 Revisions

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

All information contained in this manual is believed to be true and accurate at the time of printing. However, as part of its continuing efforts to improve its products and their documentation, the

manufacturer reserves the right to make changes at any time without notice. In addition, due to improvements made to our products, there may be information in this manual that does not exist in the version of the product the user has. Should you detect any error or omission in this manual, or should you want to inquire regarding upgrading the device's firmware, please contact CETCI at the following address:

Critical Environment Technologies Canada Inc.
Unit 145, 7391 Vantage Way, Delta, BC, V4G 1M3, Canada
Toll Free: +1.877.940.8741
Telephone: +1.604.940.8741
Fax: +1.604.940.8745
Email: marketing@cetci.com
Website: www.critical-environment.com

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

2 INTRODUCTION

2.1 General Description

Thank you for purchasing our low profile cGas Detector Transmitter. The cGas Detector is designed for use in publicly occupied spaces:

- where integrated demand controlled ventilation (DCV) is used for air quality and energy savings
- for continuous monitoring of refrigerants where high-efficiency, high volume refrigerant cooling and heating systems (VRF) are used to keep the indoor environment comfortable
- for other continuous monitoring of hazardous gases in publicly frequented areas

The low profile, aesthetically pleasing enclosure is designed to reduce the noticeability of the device by the public eye. It is secured by a mounting plate that can be mounted proud of the wall or flush with the wall using a junction box.

Both the analog and digital models are powered by 24 VDC or ground referenced AC, come with an LCD display, temperature compensation and thermal resetting fuse. Sensor replacement is easy with true Plug & Play smart sensors that arrive pre-calibrated. The firmware and configuration can be upgraded in the field using the USB connection.

The digital models (CGAS-DP) are user configurable in the field for BACnet® MS-TP RS-485 or Modbus® RTU RS-485 output for communicating with a controller, Building Automation System or other control panel.

The analog models (CGAS-AP) have one analog output signal.

Both the analog and digital models may be configured with an internal gas sensor or a remote refrigerant sensor (dongle). The internal sensor model is ideal for mounting flush with the wall. The remote refrigerant sensor model has a 9m / 29.5 ft dongle cable that is ideal for use in packaged terminal air conditioner (PTAC) applications.

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.

2.2 Key Features

- 1 or 2 gas channel operation (depends on model)
- One 4-20 mA analog output, or user configurable Modbus® RS-485 RTU or BACnet® MS/TP communication protocols for communication with a Controller or Building Automation System (BAS)

- Easy Plug & Play Smart sensor replacement at end of life
- Customizable sensor and option combinations to meet specific application requirements
- 24 volt DC or (ground referenced) AC power
- In field upgradable firmware/configuration via USB connection
- Bright LCD display
- Option -RLY: One SPDT dry contact, rated 30 volts, 2 amps max
- Option -RHT *: Relative Humidity and Temperature sensor
- Internal PM2.5 particulate sensor available
- Low profile to reduce noticeability in public spaces
- RoHS compliant circuit boards
- Auto resetting fuse

NOTE: * Analog models have <u>one</u> analog output. Factory default analog output is the gas reading

If after reading through the manual, you have any questions, please do not hesitate to contact our service department for technical support.

3 INSTRUMENT SPECIFICATIONS

3.1 Technical Specifications

MECHANICAL

Enclosure	White ABS / Polycarbonate, low profile with mounting plate
Weight	400 g / 14 oz
Size	127.7 mm x 119 mm x 40 mm / 5.0 in x 4.7 in x 1.6 in

Dongle Cable Length	9 m / 29.5 ft *(only available with the CGAS-AP-RD and CGAS-DP-RD models)*

USER INTERFACE

Display	2-line by 16 character graphic LCD
Push Buttons	Initiate calibration and menu options with internal UP, DOWN and ENTER push buttons
USB Port	Internal port for USB memory stick connection for field configuration/firmware upgrades
Audible Alarm	none

ELECTRICAL

Power Requirement	16 - 30 VDC, 3 W, Class 2 12 - 27 VAC, 50-60 Hz, 3 VA, Class 2 24V recommended
Digital Wiring	VDC or VAC (ground referenced) four-conductor shielded 16 AWG stranded within conduit, network wiring (daisy-chain)
Analog Wiring	VAC (ground referenced) three-conductor shielded 18 AWG (or larger) stranded
Fuses	Automatic resetting thermal

INPUT/OUTPUT

Digital Output (CGAS-DP models) Communication Modbus® RTU (version 1.1b3) RS-485	Modbus® ID: 100 (default, configurable) Baud rate: 19,200 (default, configurable) Data bits: 8 Start bits: 1 Stop bits: 1 Parity: none
Digital Output (CGAS-DP models) Communication BACnet® MS/TP (version 1 rev 14) RS-485	BACnet® MS/TP; ANSI/ASHRAE standard 135 BACnet® Communication protocol: 135-2012 Baud Rate: 76,800 (default) Base Address: 270 (default) MAC Address: 100 (default) Parity: no parity Stop bits: 1 Data bits: 8
Analog Output (CGAS-AP models)	One linear 4 - 20 mA output
Relay (Option - RLY)	One SPDT dry contact, rated 30 volts, 2 amps max
RH and Temperature (Option -RHT)	Available with CO or CO_2 gas configurations User selectable units Selectable analog output (default is gas reading)

ENVIRONMENTAL

Operating Temperature	0°C to 40°C / 32°F to 104°F (standard)
Operating Humidity	15 - 90% RH non-condensing

Pollution Degree	Degree 2
Altitude	below 2,000 m

CERTIFICATION

Model: CGAS-DP-XXX
      S/N: CGASDP1909A0010
Model: CGAS-AP-XXX
      S/N: CGASAP1909A0010
Rating: 16-30 VDC, 3W, Class 2
      12-27 VAC, 50-60 Hz, 3VA, Class 2

CERTIFIED FOR ELECTRIC SHOCK & ELECTRICAL FIRE HAZARD ONLY. LA CERTIFICATION ACNOR COUVRE UNIQUEMENT LES RISQUES DE CHOC ELECTRIQUE ET D'INCENDIE D'ORIGINE ELECTRIQUE.

Conforms to: CSA-C22.2 No. 205-12, UL508 (Edition 18):2018
Conforms to: EMC Directive 2014/30/EU, EN 50270:2015, Type 1, EN61010
Conforms to: 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.

3.2 Enclosure Dimensions
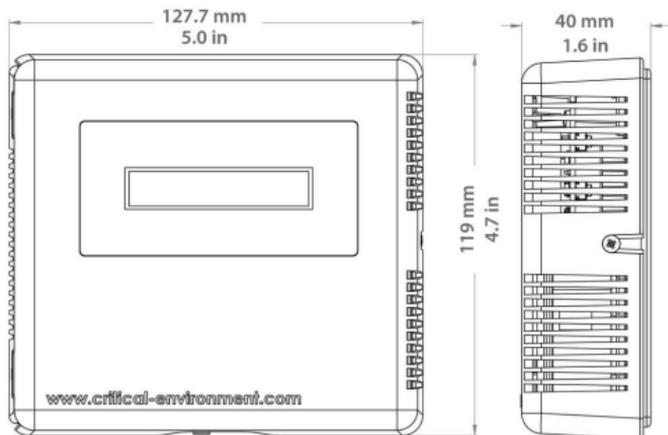
4 SENSOR SPECIFICATIONS

4.1 Analog - Single Channel Sensors

PART NUMBER	SENSOR	RANGE	LIFESPAN
CGAS-AP-CO2-5K	Infrared Carbon Dioxide (CO_2)	0 - 5,000 ppm	± 8 years
CGAS-AP-CO2-5%	Infrared Carbon Dioxide (CO_2)	0 - 5% vol	± 8 years
CGAS-AP-LCO	Electrochemical Carbon Monoxide (CO)	0 - 200 ppm	± 6 years
CGAS-AP-SR410A *	Solid State R410A Refrigerant (internal)	0 -2,000 ppm	± 5 years

CGAS-AP-RD + ESH-B-SR410A *	Solid State R410A Refrigerant (remote dongle)	0 -2,000 ppm	$\pm$ 5 years
CGAS-AP-PM	PM2.5 Particulate sensor	2.5 µg/m^3	

4.2 Digital - Single Channel Sensors

PART NUMBER	SENSOR	RANGE	LIFESPAN
CGAS-DP-CO2-5K	Infrared Carbon Dioxide (CO_2)	0 - 5,000 ppm	$\pm$ 8 years
CGAS-DP-CO2-5%	Infrared Carbon Dioxide (CO_2)	0 - 5% vol	$\pm$ 8 years
CGAS-DP-LCO	Electrochemical Carbon Monoxide (CO)	0 - 200 ppm	$\pm$ 6 years
CGAS-DP-SR410A *	Solid State R410A Refrigerant (internal)	0 -2,000 ppm	$\pm$ 5 years
CGAS-DP-RD + ESH-B-SR410A *	Solid State R410A Refrigerant (remote dongle)	0 -2,000 ppm	$\pm$ 5 years
CGAS-DP-PM	PM2.5 Particulate sensor	2.5 µg/m^3	

*Other Refrigerants may be available upon request.

4.3 Digital - Dual Channel Sensors

PART NUMBER	SENSOR	RANGE	LIFESPAN
CGAS-DP-LCO-CO2-5K	Electrochemical Carbon Monoxide (CO) and Infrared Carbon Dioxide (CO_2)	0 - 200 ppm 0 - 5,000 ppm	$\pm$ 6 years $\pm$ 8 years

CGAS-DP-LCO-CO2-5%	Electrochemical Carbon Monoxide (CO) and Infrared Carbon Dioxide (CO_2)	0 - 200 ppm 0 - 5% vol	$\pm$ 6 years $\pm$ 8 years
CGAS-DP-CO2-5K-PM	Infrared Carbon Dioxide (CO_2) and PM2.5 Particulate sensor	0 - 5,000 ppm 2.5 µg/m^3	$\pm$ 8 years
CGAS-DP-CO2-5%-PM	Infrared Carbon Dioxide (CO_2) and PM2.5 Particulate sensor	0 - 5% vol 2.5 µg/m^3	$\pm$ 8 years
CGAS-DP-LCO-PM	Electrochemical Carbon Monoxide (CO) and PM2.5 Particulate sensor	0 - 200 ppm 2.5 µg/m^3	$\pm$ 6 years

4.4 RH & Temperature Sensor (Option -RHT)
NOTE: The optional RH & temperature sensor is only available with analog or digital models that have a Carbon monoxide (CO) or a Carbon dioxide (CO_2) gas sensor.

For analog CGAS-AP models with an internal gas sensor and the optional RH & Temperature sensor, the analog output default is the gas reading. Because the CGAS-AP is a <u>single channel device</u> (it has only one analog output), the RH and temperature readings are for display purposes only; there is no current output or signal back to a controller or BAS/DDC for RH or temperature readings.

For digital models the gas, RH and temperature readings can be sent to a controller or BAS/DDC via the Modbus® or BACnet® communication protocol.

5 INSTRUMENT FEATURES

5.1 Exterior Enclosure
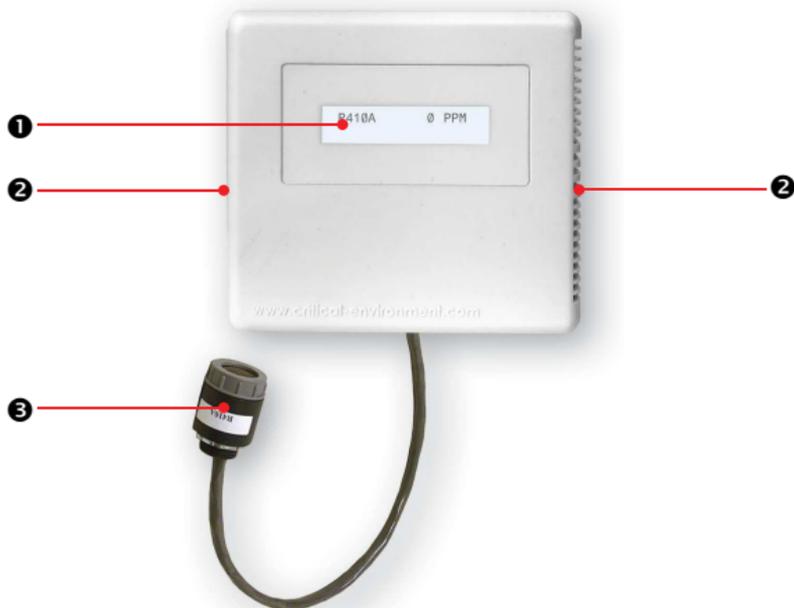
NUMBER	FEATURE	FUNCTION
❶	Display	LCD Display
❷	Sensor Vents	Allows gas diffusion into sensor
❸	Remote Dongle	Remote refrigerant sensor for hotel applications *(for CGAS-AP-RD and CGAS-DP-RD models only)*

5.2 Analog - Interior System Layout

Front Side of
Circuit Board

Back Side of
Circuit Board
(removed from
enclosure)

NUMBER	FEATURE	FUNCTION
❶	Hinge Assembly	Screws hold hinges together, fastened from the back of the enclosure
❷	Wiring Terminal	Pluggable terminal for 3-wire power and analog signal output
❸	Two Extra Screws	Just in case you need them
❹	Circuit Board Mount Connection	Remove this screw and slide the mount to the right to remove the entire circuit board with display and smart boards attached
❺	3 Programming Buttons	Access menu options and program functions using buttons inside the enclosure at the side of circuit board. (Arrow up, Enter, Arrow down)
❻	LCD Display	Indicates transmitter operations
❼	Sockets for sensors and Options boards	Smart sensor boards and Options boards plug into the main board using these sockets
❽	Particulate Sensor Mount	Holds the PM2.5 Particulate Sensor in place inside the enclosure (only included with Option -PM)
❾	Circuit Board Mount Tabs	Slide into matching openings on interior back of the enclosure to keep the circuit board mount connected to the enclosure, secure with singular screw (see ❹)
❿	USB Connection	For firmware and configuration upgrades

5.3 Digital - Interior System Layout

Front Side of
Circuit Board

Back Side of
Circuit Board
(removed from
enclosure)

NUMBER	FEATURE	FUNCTION
❶	Hinge Assembly	Screws hold hinges together, fastened from the back of the enclosure
❷	Wiring Terminal	Pluggable terminal for 4-wire daisy chain power and digital signal output
❸	Two Extra Screws	Just in case you need them
❹	Circuit Board Mount Connection	Remove this screw and slide the mount to the right to remove the entire circuit board with display and smart boards attached
❺	3 Programming Buttons	Access menu options and program functions using buttons inside the enclosure at the side of circuit board. (Arrow up, Enter, Arrow down)
❻	LCD Display	Indicates transmitter operations
❼	Sockets for sensors and Options boards	Smart sensor boards and Options boards plug into the main board using these sockets
❽	Particulate Sensor Mount	Holds the PM2.5 Particulate Sensor in place inside the enclosure (only included with Option -PM)
❾	Circuit Board Mount Tabs	Slide into matching openings on interior back of the enclosure to keep the circuit board mount connected to the enclosure, secure with singular screw (see ❹)
❿	USB Connection	For firmware and configuration upgrades
⓫	Termination Jumper	End of line termination jumper/network termination resistor

6 SYSTEM OPERATION & CONFIGURATION

The cGas Detector continuously monitors target gas concentrations on one or two configured channels. It must be connected to a controller, control panel or BAS / BMS / DDC system; the cGas Detector is not a standalone gas detection system.

6.2 Navigating the Menu Structure

The three programming push-buttons inside the enclosure to the right of the display are used to navigate through the cGas Detector menu structure. Refer to *Section 5.1 Exterior Enclosure* for location photo.

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 can edit the menu line item.

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.

6.2 Accessing the Menu with Passcodes

You have to 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 Digital Output [d] • Test Analog Output [a] • Test Relay *
1001[d]	Basic Menu	If configure as a Modbus® device • Comm Type • Comm Mac • Comm Baud If configured as a BACnet® device • Comm Type • Comm Mac • Comm Baud • Instance ID

1014	Display Menu	• Display Type • Brightness • Display Line 1 • Display Line 2
2012	Alarms Menu	• Selected Channel • Selected Alarm Level • Set Alarm Setpoint • Set Alarm Direction (Ascending/Descending) • Set Alarm Hysteresis
3022	Config Menu	• Selected Channel • Enable/Disable Channel • Read from Sensor • Write to Sensor
3032	Calibrate Menu	• Selected Channel • 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 *

6.3 Display Settings

The LCD display can display up to 2 lines of 16 characters. It is backlit with black text. 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 four splash screens showing the model name, serial number and firmware version; the communication type, ID and baud rate, the gas type and AD counts; and the channel number, gas type and gas level.

6.3.1 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.

6.3.2 Main Display Configurations

The default display set from the factory is normal mode which displays the gas type, gas reading

and gas units for each configured channel.

```
CO2         Ø PPM
```

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

```
********-CO2-********      ********-CO2-********
                           *******-T/RH-********
```

From the main display, press ENTER.

Enter passcode 1014 using the UP button and ENTER button.

```
Enter Password
     1Ø14
```

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
```

6.3.3 Display or Hide Line 1 and/or 2

The display can show a maximum of two lines of data. Choose what you want to see on line 1 and line 2 from four available options.

From the main display, press ENTER.

Enter passcode 1014 using the UP button and ENTER button.

```
Enter Password
     1Ø14
```

Press ENTER to access the Basic Menu.

```
Display Menu
Press Enter
```

Press the UP button until you see Display Line 1 (or Display Line 2).

```
Display Line 1
>CO2
```

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

- Gas Type (ie. CO2)
- Temp + Humidity (if installed)
- Off

The factory default is to display the gas types for the sensors installed. If only one gas sensor is installed, Display Line 2 will show the Temp + Humidity (if installed) or it will be blank.

NOTE: The Temp + Humidity option is only available with CO and CO_2 gas sensors, or by itself.

6.4 Alarm Status, Fault Detection and Communication Failure Notifications

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

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

```
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 then the system is in a minor fault and a re-zeroing is recommended.

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

```
CO2            Ø COMM
```

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

6.5 Enable / Disable Channels

This setting allows you to enable or disable the channel(s) that are already configured in the device. If the device has one channel, you can enable or disable that one channel. If the devices has two channels you can independently enable or disable each channel. 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 hid the line. Refer to Section *6.3.3 Display or Hide Line 1 and/or 2*.

NOTE: If the device has one channel, enabling the second channel does not automatically add an operational channel to the device.

A disabled channel will have four dashes in place of its respective readings - gas, temperature or RH values:

```
CO2         ---- PPM    CO2            Ø PPM
                        76.4 degF   ----%RH
```

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

```
    Enter Password
        3Ø22
```

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 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
>Temperature
```

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

- CH1
- CH2 (depends on model)
- 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            Ø PPM
----degF     38%RH
```

NOTE: If the cGas has two gas sensors and Option -RHT installed and configured for both gases to show on the display (on line 1 and line 2), the temperature and RH can be viewed at anytime by opening the enclosure and pressing the up or down arrow to scroll through the info screens until you see the temp/RH info screen.

6.6 Setting Channel Alarm Setpoints, Direction and Hysteresis

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 and trigger a predetermined response from the controller or control panel. The alarm set points can be changed at any time and do not require a calibration before,

during or after changing them.

NOTE: The cGas Detector DOES NOT HAVE an internal alarm. If gas readings (digital) or the signal (analog) sent to the BAS or DDC hit an alarm setpoint the BAS or DDC will trigger whatever type of alarm device or emergency protocol it has been configured to trigger.

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
Carbon Dioxide (CO_2)	0 - 5.0% vol	1% vol	2% vol	3% vol

For a CO_2 sensor, 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.

Hysteresis is the difference between the ON point and OFF point of the alarm and the value entered will determine at what gas concentration the alarm will stop. If the alarm setpoint is 100 ppm and the hysteresis is 5 ppm, when the gas concentration reaches or exceeds 100 ppm, the alarm will come on. The alarm will stay on until the gas concentration reduces to 95 ppm (5 ppm below the alarm setpoint).

The purpose of hysteresis is to prevent the alarm from chattering on and off repetitively if the gas fluctuates just above and just below 100 ppm, which would happen if the hysteresis is set to 0. Likewise, if the device triggers relays, repetitive turning on and off could cause them to burn out.

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 <u>Selected Channel</u> menu, confirm the correct channel is showing.

```
Selected Channel
CO2
```

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

```
Selected Channel
>Temperature
```

Press the UP button until you see <u>Selected Alarm</u>, 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 <u>Alarm Setpoint</u>, confirm the desired number is showing.

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

Press the Up button until you see <u>Alarm Direction</u>, confirm the correct direction (ascending is used for a CO_2 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
```

6.7 Relay Operation

The cGas Detector can be ordered with Option -RLY, an SPDT dry contact relay rated 30 volts, 2 amps max. The relay components are connected to a circuit board that plugs into one of the plug & play smart sensor sockets. Do not try to change the socket that the relay comes factory configured in.

The system does not provide any power from the relay terminal. A dry contact relay operate like a switch to simply activate (switch on) or de-activate (switch off) equipment to be controlled, such as fan starters.

The relay is SPDT (single pole, double throw) therby providing one set of usable dry contacts for the relay. The cGas Detector is designed to be fail-safe, any 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.

The default factory settings for the relay are as follows and are currently not user configurable:

- Enabled
- 10 second ON Delay

- 10 second OFF Delay
- Activated on MID alarm level

NOTE: For information on LOW, MID and HIGH alarm setpoints, refer to Section *6.6 Setting Channel Alarm Setpoints, Direction and Hysteresis*.

6.8 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.

IMPORTANT: Analog models have <u>one</u> analog output. If an analog model is ordered with Option -RHT, the information is for display purposes only; the one analog output would be used for the gas readings, not the RH and temperature readings.

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

6.9 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 *6.8 Change Units (°C or °F) of Temperature Readings*.

There is no way to calibrate a temperature or relative humidity sensor. However, if you find that the temperature or humidity reading on the cGas Detector is 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
```

6.10 Set Analog Output Mode (CGAS-AP models)

For analog cGas Detector models (CGAS-AP), you can set the analog output to OFF which will result in a 0 current output and will stop the analog output from controlling whatever it is configured to control (ie. fans). Or you can set the analog output to follow the gas concentration reading of the cGas Detector and it will react accordingly.

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.

```
Set AO Mode            Set AO MOde
OFF                    >PEAK
```

- OFF - the analog output will have 0 current output
- PEAK - the analog output will follow the gas concentration reading of the cGas Detector

When finished pressed ENTER and then ENTER again to exit.

6.11 Test Functions

6.11.1 Test Analog Output (CGAS-AP models)

For analog cGas Detector models (CGAS-AP), testing the analog output allows you to determine if the installation was successful. Do this by sending a predetermined analog signal to the DDC or BAS to test that the correct signal is being sent out and the configured outcome occurs (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   4.0 mA
```

The test will start as soon as you press ENTER to confirm and will remain in the test mode as long as the Test AO screen remains untouched. To stop the test, press the UP or DOWN button. To test another analog output value repeat the process by pressing ENTER.

6.11.2 Test Digital Output (CGAS-DP models)

For digital cGas Detector models, 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 and will remain in the test mode as long as the Test Reading screen remains untouched. To stop the test, press the UP or DOWN button. Test another reading value or press ENTER to Exit.

6.11.3 Test Relay (models with Option -RLY)

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 and ON/OFF delays.

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

To stop the relay test, Press ENTER and the UP button to change to Untripped. Press ENTER. You will hear a soft click and the relay will deactivate.

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

When finished, press ENTER and then UP to Exit.

7 MODBUS & BACNET CONFIGURATION
NOTE: This entire chapter applies to CGAS-DP (digital) models only.

7.1 Changing Communication Type (Modbus®/ BACnet®) in the Field

The digital cGas Detector models (CGAS-DP) can be changed from Modbus® to BACnet® or vice versa in the field. When the communication type is changed, the device will reset, which 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 *7.2 Configuring Modbus® Settings* or *7.3 Configuring BACnet® Settings*.

7.2 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.

Factory Default Modbus® Settings

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

If you are adding the cGas Detector to an existing system, the transmitters may require changes to the default Modbus® settings in order for communication to be successful between devices. 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.

7.2.1 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.
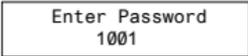
```
Enter Password
    1001
```

Press ENTER to access the Basic Menu.
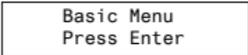
```
Basic Menu
Press Enter
```

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
```

7.2.2 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 and Exit.

7.2.3 Modbus® Holding Registers

If you have specific requirements, have any questions or require clarification about the Modbus® holding registers, please contact CETCI for assistance.

7.3 Configuring BACnet® Settings

7.3.1 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
```

7.3.2 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
```

7.3.3 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             76,800
```

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.

7.3.4 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. To follow is the BACnet® Protocol Implementation Conformance Statement (PICS) information that can also be found on the BACnet® International website at http://www.bacnetinternational.org

Date: April 2019

Vendor Name: Critical Environment Technologies Canada Inc.

Product Name: CGAS Detector Family

Product Model Numbers: CGAS-D, CGAS-DP, CGAS-SC

Application Software Version: 1.1

Firmware Revision: 3.7.12.0

BACnet® Protocol Version/Revision: 14

Product Description:

The CGAS Detector product line is a group of customizable two channel gas detectors featuring a range a possible gases and options. The various gases are added to the device using plug and play "smart sensor" boards, which attach to the main board within the enclosure. The main board handles communication back to a controller or building management system via field configurable Modbus® RTU or BACnet® MS/TP.

BACnet® Standardized Device Profile (Annex L):

☐ BACnet® Operator Workstation (B-OWS)

☐ BACnet® Building Controller (B-BC)

☐ BACnet® Advanced Application Controller (B-AAC)

☐ BACnet® Application Specific Controller (B-ASC)

☑ BACnet® Smart Sensor (B-SS)

☑ BACnet® Smart Actuator (B-SA)

List all BACnet® Interoperability Building Blocks Supported (Annex K):

BIBB	Service	Responds to
DS-RP-B	ReadProperty-B	X
DS-WP-B	WriteProperty-B	X
DM-DDB-B	Dynamic Object Device Binding-B	X
DM-DOB-B	Dynamic Object Binding-B	X

Segment Capability:

Segment requests supported   Window Size <u>480</u>

Segment requests supported   Window Size <u>480</u>

Standard Object Types Supported:

An object type is supported if it may be present in the device. For each standard Object Type supported provide the following data:

1. Whether objects of this type are dynamically creatable using the CreateObject service
2. Whether objects of this type are dynamically deletable using the DeleteObject service
3. List of the optional properties supported
4. List of all properties that are writable where not otherwise required by this standard
5. List of proprietary properties and for each its property identifier, datatype, and meaning
6. List of any property range restrictions

NOTE: None of the object types listed in this section is dynamically creatable or dynamically deletable.

NOTE: The BACnet conformance codes are as follows:

O - Optional (may be required under some conditions)

R - Required, but not required to be writable (may be required to be writable under some conditions)

W - Not only required, but also required to be writable

The following codes are used in this document to describe how the properties are implemented:

R/W	Read/write
R/O	Read-only
R/O=value	Implemented as a read-only with the indicated value

Device Object

Property	Conf Code	Implementation
Object_Identifier	R	R/O
Object_Name	R	R/O
Object_Type	R	R/O="device"
System_Status	R	R/O="operational"
Vendor_Name	R	R/O
Vendor_Identifier	R	R/O
Model_Name	R	R/O
Firmware_Revision	R	R/O
Application_Software_Version	R	R/O
Location	O	R/W

Protocol_Version	R	R/0=1
Protocol_Revision	R	R/0=14
Protocol_Services_Supported	R	R/0
Protocol_Object_Types_Supported	R	R/0
Object_List	R	R/0
Max_APDU_Length_Accepted	R	R/0=480
Segmentation_Supported	R	R/0="none"
APDU_Timeout	R	R/W=7000
Number_Of_APDU_Retries	R	R/W=1
Max_Master	0	R/0=127
Device_Address_Binding	R	R/0=empty list
Data_Base_Revision	R	R/0
Max-Info-Frames	0	R/0=1

Analog Input

Property	Conf Code	Implementation
Object_Identifier	R	R/0
Object_Name	R	R/0
Object_Type	R	R/0="analog input"
Present_Value	R	R/0
Status_Flags	R	R/0
Event_State	R	R/0="normal"
Out_Of_Service	R	R/0=FALSE
Units	R	R/0
Property_List	R	R/0
Description	0	R/W

Analog Output

Property	Conf Code	Implementation
Object_Identifier	R	R/O
Object_Name	R	R/O
Object_Type	R	R/O="analog-output"
Present_Value	W	R/W
Status_Flags	R	R/O="all normal"
Event_State	R	R/O="normal"
Out_Of_Service	R	R/O=FALSE
Units	R	R/O
Priority_Array	R	R/O
Relinquish_Default	R	R/W
Property_List	R	R/O
Description	O	R/W

Binary Output

Property	Conf Code	Implementation
Object_Identifier	R	R/O
Object_Name	R	R/O
Object_Type	R	R/O="binary-output"
Present_Value	W	R/W
Status_Flags	R	R/O="all normal"
Event_State	R	R/O="normal"
Out_Of_Service	R	R/O=FALSE
Polarity	R	R/W
Priority_Array	R	R/O
Relinquish_Default	R	R/O
Description	O	R/W

Data Link Layer Options:

☐ BACnet® IP, (Annex J)
☐ BACnet® IP, (Annex J), Foreign Device
☐ ISO 8802-3, Ethernet (Clause 7)
☐ ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
☐ ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s) _____
☑ MS/TP Master Node (Clause 9), baud rate(s): <u>9600, 19200, 38400, 57600, 76800, 115200</u>
☐ MS/TP Slave (Clause 9), baud rate(s):
☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s):
☐ Point-To-Point, modem, (Clause 10), baud rate(s):
☐ LonTalk, (Clause 11), medium: _____
☐ Other:

Device Address Binding:

Is static device binding supported? (This is currently necessary for two-way communication with
MS/TP slaves and certain other devices.)   ☑ Yes   ☐ No

Networking Options:

☐ Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet,
   Ethernet-MS/TP, etc.
☐ Annex H, BACnet Tunneling Router over IP
☐ BACnet®/IP Broadcast Management Device (BBMD)
      Does the BBMD support registrations by Foreign Devices?   ☐ Yes   ☑ No

Character Sets Supported:

Indicating support for multiple character sets does not imply that they can all be supported
simultaneously.

☑ ANSI X3.4   ☐ IBM™/Microsoft™ DBCS   ☐ ISO 8859-1   ☐ ISO 10646 (UTF-8)
☐ JIS C 6226   ☐ ISO 10646 (UCS-2)   ☐ ISO 10646 (UCS-4)

Network Security Options:
☑ Non-secure Device - is capable of operating without BACnet® Network Security

BACnet® Communications Defaults:
Baud rate = 78,800 (default, configurable)
Base address = 270 (default, configurable)
MAC address = 100 (default, configurable)
Parity = no parity
Stop bits = 1
Data bits = 8

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

8 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.

8.1 How to Replace or Add a New Smart Sensor Board

Smart board replacement sensors arrive pre-calibrated and factory configured. 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.

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

Open the enclosure door, loosen the screw at the top right corner (refer to #4 in Sections *5.2 Analog - Interior System Layout* or *5.3 Digital - Interior System Layout*) and slide the circuit board mount out of the enclosure. Turn it over and gently pull the smart sensor board you want to replace out of the socket. Insert the replacement smart sensor board and slide the circuit board mount back into the enclsoure slots and tighten the screw.

If adding a new smart board sensor to an empty socket, remove the circuit board mount as described above, insert the the new smart board sensor and secure the circuit board mount.

8.2 Read from Sensor Smart Board

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
```
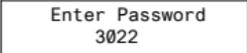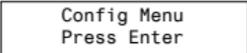
In the Selected Channel menu, confirm the desired channel is showing. If you want to choose a different channel, press ENTER and use the UP button to scroll to the next value. Press ENTER and

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 the UP button and ENTER to exit. Repeat for the second channel if required.

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

8.3 Write to Sensor Smart Board

This process forces an upload of the calibration and configuration information that is stored on 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.

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

9 CALIBRATION

9.1 Calibration Specifications

9.1.1 Gas

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

Service personnel should flow zero emissions air or 20.9% volume O_2 (scrubbed of hydrocarbons) before attempting to 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: Carbon dioxide sensors require 99.9% nitrogen (N_2) for a true zero. Flow the nitrogen for approximately 2 minutes BEFORE you enter the Calibrate Zero menu. Same when flowing CO_2 calibration gas, flow for 2 minutes BEFORE you enter the Calibrate Span menu.

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9.1.2 Regulators & Flow
Calibration gases that are lighter than or the same weight as air (CO, CO_2) should be flowed at 0.5 LPM. Fixed flow regulators provide more accuracy.

9.1.3 Sensor Shroud
Make sure the calibration tubing is affixed securely to the small barb hose fitting of the sensor shroud so the gas diffuses fully into the sensor cavity. Remember to remove tubing after calibrating.

Barb hose fittings. Image shown has two, one for each gas sensor. If only one gas sensor is install, only one barb hose fitting will exist.
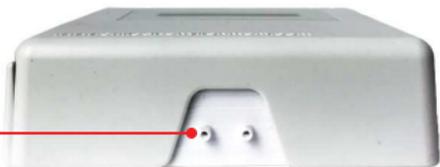
9.1.4 Calibration Frequency
- Follow local codes and regulations
- OHS applications: Once every 6 months (OHS: Occupational Health & Safety)
- For best performance and to meet published specifications: once every six months

Equipment: Calibration Kit, Calibration gases

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

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

9.2 Calibrating the Internal Sensor

Calibration has three processes - Set Calibration Gas Value, Span and Zero. The Span and Zero calibrations can be done in any order. When calibrating a CO_2 sensor, flow the nitrogen gas and the span gas for 2 minutes before entering the Calibrate Zero and Calibrate Span menus.

9.2.1 Set Calibration Gas Value

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

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
```

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	RANGE	CALIBRATION GAS LEVEL*
Carbon Dioxide (CO_2)	0 - 5,000 PPM	1,000 PPM
Carbon Dioxide (CO_2)	0 - 5% VOL	1.0 % VOL
Carbon Monoxide (CO)	0 - 200 PPM	100 PPM
Solid State Refrigerants	0 - 2,000 PPM	1,000 PPM

* subject to change when required

9.2.2 Zero (Null) Calibration

A zero calibration clears the target gas from the sensor, creating a null gas base for span calibration process. For Carbon monoxide (CO) and solid state refrigerant sensors zero emissions air should be used and Carbon dioxide (CO_2) sensors require 99.9% N_2 for a true zero.

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
```

Press the UP button to find Calibrate Zero.

```
Calibrate Zero
100 AD
```

Attach the regulator to the cylinder of zero air and secure the calibration tubing to the correct small barb hose fitting at the base of the enclosure. Press ENTER to start the Zero calibration. The display will show a countdown from 20 seconds.

```
        Zeroing
47AD               18s
```

```
      Zero Success
56AD
```
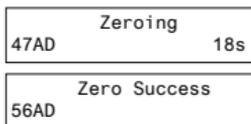
When the process has finished and the Zero calibration was accepted, press ENTER and use the UP button navigate to Exit and press ENTER to exit. Remove the cylinder of zero gas.

If the Zero calibration was not successful refer to Section *9.3.2 Zero Fault*.
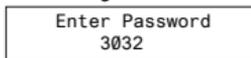
9.2.3 Span Calibration
Span calibration is flowing a known concentration of the target gas over the sensor to adjust the output signal to match the gas concentration. It resets the sensor's electronic circuit against a known concentration of target gas to correct drift and keep linearity.
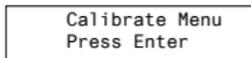
NOTE: To exit the Span Calibration at any time, press ENTER.
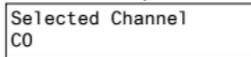
From the main display, press ENTER.
Enter passcode 3032 using the UP button and ENTER button.

```
     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
```

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 cylinder of zero air and secure the calibration tubing to the correct small barb hose fitting at the base of the enclosure. 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 *9.3.3 Span Fault.*

Repeat the calibration steps above for each enabled gas channel.

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

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

9.3 Trouble Shooting Calibration

This section is intended to aid in correcting issues that may arise during the calibration procedure. If you are unable to correct a problem or you have questions, please contact our Technical Service Department at help@cetci.com or 604-940-8741 (Local) or 1877-940-8741 (Toll Free).

9.3.2 Zero Fault

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

9.3.3 Span Fault

If the cGas shows a Span fault after trying to calibrate, it is possible that the sensor is dead or the device isn't seeing the gas (cylinder is empty, regulator or calibration tubing is not attached properly, tubing 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 our Technical Service Department at help@cetci.com.

9.3.4 Zero Override

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

```
          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.

9.3.5 Span Override

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

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

10 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.

11 TROUBLE SHOOTING

cGas Detector won't power up. (blank display)

Is the power properly connected? Check the wiring connections. Refer to Section *6.5 Wiring Connection in the cGas-AP and cGas-DP Installation Manual*.

Display shows "ZERO FAULT" message.

If the zeroing process fails, the cGas Detector will show a Zero fault., which means the cGas Detector was unable to complete the zeroing (null) process. 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 the zero air.

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.

cGas Detector display shows "COMM" message.

Modbus® or BACnet output signal has not been connected properly. Check the wiring connections and the network settings.

Device cannot be seen by the Controller and/or the BAS / DDC on the <u>Modbus® network</u>.

- 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 <u>BACnet® network</u>.

- 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, which is made up of the MAC ID and the Base ID.
- Check that local area network wiring is correct, especially the A and B lines to make sure they are not swapped between devices on the network.

Frequent, unexpected alarm reading reported to BAS/DDC. Check to see if EMI and RF interference is causing the equipment to react this way. Refer to Section *6.3.2 EMI and RF Interference Considerations in the cGas-AP and cGas-DP Installation Manual* for more information.

When calibrating a CO_2 sensor, Calibrate Zero keeps failing or the Calibrate Span passes but the gas level reading keeps climbing.
Start the calibration process over. Flow the nitrogen gas for 2 minutes <u>before</u> entering the Calibrate Zero menu. Then flow the span gas for 2 minutes <u>before</u> entering the Calibrate Span menu.

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. 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 (without relay). 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).
F06	SB ID Mismatch	Firmware expected a different smart board than what is in the sensor socket.
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.
F30	AO DAC is not responding	Indicates a hardware failure in the analog output circuit. A replacement main board may be required.

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