

Operation Manual



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cGas Detector Indoor Public Spaces

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.

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:

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Toll Free: +1.877.940.8741
Telephone: +1.604.940.8741
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)
- Internal PM2.5 particulate sensor available
- One 4-20 mA analog output, or field 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
- Low profile to: reduce noticeability in public spaces
- RoHS compliant circuit boards
- Auto resetting fuse

NOTE: *Option may be restricted to certain models and/or gas configurations. Analog models have one analog output. Factory default analog output is the gas reading.

Option -RHT is an RH & Temperature sensor (°C or °F)

- Available with single channel configurations
- Available with dual channel configurations that have the standard CO sensor

Option -RLY is a 1 SPDT dry contact relay, rated 30 volts, 2 amps max

- Available with single channel configurations

Options -RHT and -RLY (both together) are available with CO and CO₂ configurations only.

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)	Modbus® ID*: 100 (default, configurable) Baud rate: 19,200 (default, configurable)
Communication	Data bits: 8
Modbus® RTU (version 1.1b3)	Start bits: 1
RS-485	Stop bits: 1
	Parity: none, odd or even

*100 is the default for transmitters only
 *101 increasing sequentially is the default for a
 system controller and transmitters

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, configurable) Base Address: 270 (default, configurable) MAC Address: 100 (default, configurable) Parity: no parity (default, configurable) 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

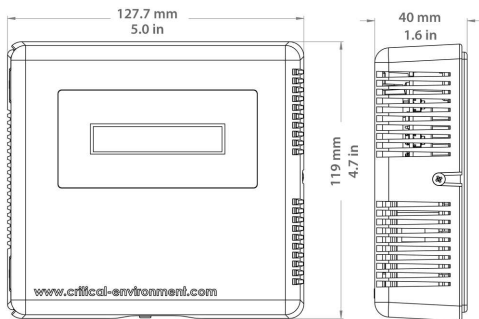
Rating: 16-30 VDC, 3W, Class 2
12-27 VAC, 50-60 Hz, 3VA, Class 2



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-CO	Electrochemical Carbon Monoxide (CO)	0 - 200 ppm	~ 6 years
CGAS-AP-CH2O	Electrochemical Formaldehyde (CH ₂ O)	0 - 5 ppm	~ 2 years
CGAS-AP-CCH4-100	Catalytic Methane (CH ₄) sensor	0 - 100% LEL	~ 5 years

CGAS-AP-PM	User selectable PM1, PM2.5 (default) or PM10 Particulate sensor		
CGAS-AP-SLP	PID TVOC sensor	0 - 30 ppm	
CGAS-AP-SR410A	Solid State R410A Refrigerant (internal)	0 -2,000 ppm	~ 5 years
CGAS-AP-SR507A	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	~ 5 years
CGAS-AP-RD + ESH-B-SR507A	Solid State R410A Refrigerant (remote dongle)	0 -2,000 ppm	~ 5 years
CGAS-AP-STVOC	Solid State TVOC sensor	0 - 500 ppm	~ 5 years

4.2 Digital - Single Channel Sensors

PART NUMBER	SENSOR	RANGE	LIFESPAN
CGAS-DP-CO2-5K	Infrared Carbon Dioxide (CO ₂)	0 - 5,000 ppm	~ 8 years
CGAS-DP-CO2-5%	Infrared Carbon Dioxide (CO ₂)	0 - 5% vol	~ 8 years
CGAS-DP-CO	Electrochemical Carbon Monoxide (CO)	0 - 200 ppm	~ 6 years
CGAS-DP-CH2O	Electrochemical Formaldehyde (CH ₂ O)	0 - 5 ppm	~ 2 years
CGAS-DP-CCH4-100	Catalytic Methane (CH ₄) sensor	0 - 100% LEL	~ 5 years
CGAS-DP-PM	User selectable PM1, PM2.5 (default) or PM10 Particulate sensor		

CGAS-DP-SLP	PID TVOC sensor	0 - 30 ppm	
CGAS-DP-SR410A	Solid State R410A Refrigerant (internal)	0 -2,000 ppm	~ 5 years
CGAS-DP-SR507A	Solid State R410A Refrigerant (internal)	0 -2,000 ppm	~ 5 years
CGAS-DP-RD + ESH-B-SR410A	Solid State R410A Refrigerant (remote dongle)	0 -2,000 ppm	~ 5 years
CGAS-DP-RD + ESH-B-SR507A	Solid State R410A Refrigerant (remote dongle)	0 -2,000 ppm	~ 5 years
CGAS-DP-STVOC	Solid State TVOC sensor	0 - 500 ppm	~ 5 years

Other Refrigerants may be available upon request.

4.3 Digital - Dual Channel Sensors

PART NUMBER	SENSOR	RANGE	LIFESPAN
CGAS-DP-CO-CO2-5K	Electrochemical Carbon Monoxide (CO) and Infrared Carbon Dioxide (CO ₂)	0 - 200 ppm 0 - 5,000 ppm	± 6 years ± 8 years
CGAS-DP-CO-CO2-5%	Electrochemical Carbon Monoxide (CO) and Infrared Carbon Dioxide (CO ₂)	0 - 200 ppm 0 - 5% vol	± 6 years ± 8 years
CGAS-DP-CO2-5K-PM	Infrared Carbon Dioxide (CO ₂) and Particulate sensor	0 - 5,000 ppm user selectable	± 8 years

CGAS-DP-CO2-5%-PM	Infrared Carbon Dioxide (CO ₂) and Particulate sensor	0 - 5% vol user selectable	± 8 years
CGAS-DP-CO-PM	Electrochemical Carbon Monoxide (CO) and Particulate sensor	0 - 200 ppm user selectable	± 6 years

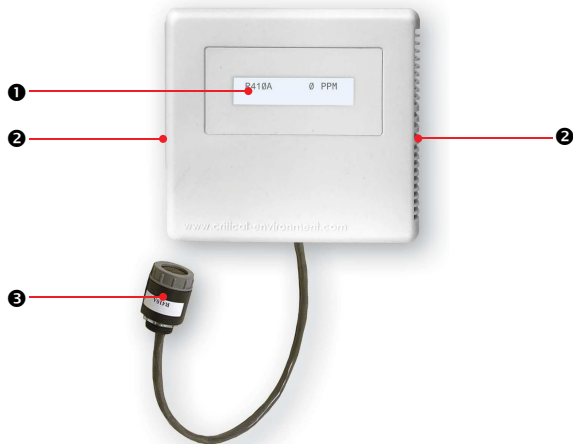
4.4 RH & Temperature Sensor (Option -RHT)

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 [single channel device](#) (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.

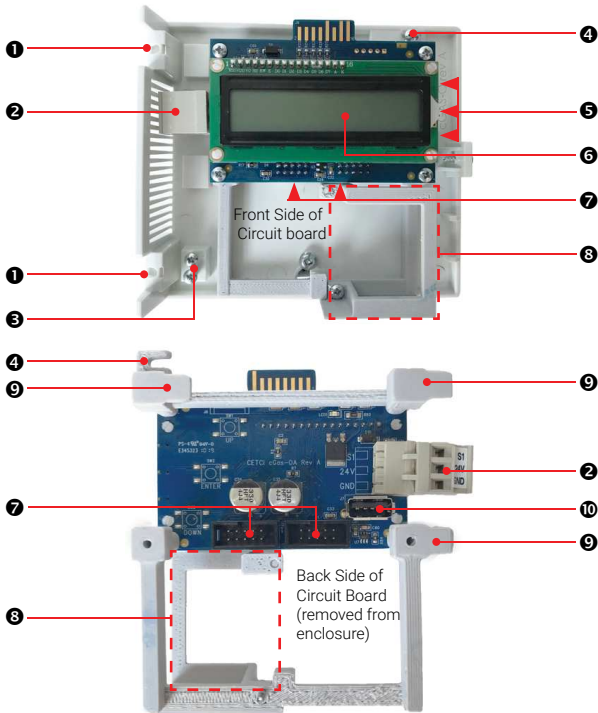
5 INSTRUMENT FEATURES

5.1 Exterior Enclosure



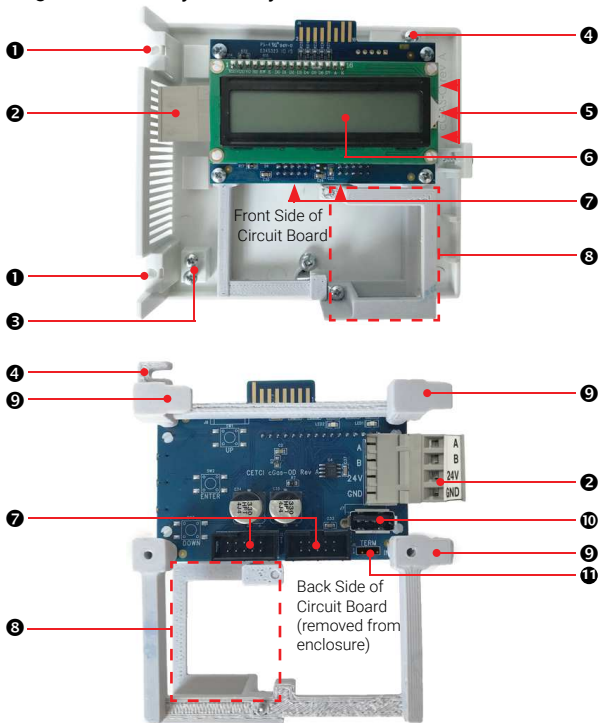
NUMBER	FEATURE	FUNCTION
1	Display	LCD Display
2	Sensor Vents	Allows gas diffusion into sensor
3	Remote Dongle (ie. ESH-B-SR410A)	Remote refrigerant sensor for hotel applications (for CGAS-AP-RD and CGAS-DP-RD models only)

5.2 Analog - Interior System Layout



NUMBER	FEATURE	FUNCTION
1	Hinge Assembly	Screws hold hinges together, fastened from the back of the enclosure
2	Wiring Terminal	Pluggable terminal for 3-wire power and analog signal output
3	Two Extra Screws	Just in case you need them
4	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
5	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)
6	LCD Display	Indicates transmitter operations
7	Sockets for sensors and Options boards	Smart sensor boards and Options boards plug into the main board using these sockets
8	Particulate Sensor Mount	Holds the Particulate Sensor in place inside the enclosure (only included with Option -PM)
9	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 4)
10	USB Connection	For firmware and configuration upgrades

5.3 Digital - Interior System Layout



NUMBER	FEATURE	FUNCTION
1	Hinge Assembly	Screws hold hinges together, fastened from the back of the enclosure
2	Wiring Terminal	Pluggable terminal for 4-wire daisy chain power and digital signal output
3	Two Extra Screws	Just in case you need them
4	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
5	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)
6	LCD Display	Indicates transmitter operations
7	Sockets for sensors and Options boards	Smart sensor boards and Options boards plug into the main board using these sockets
8	Particulate Sensor Mount	Holds the Particulate Sensor in place inside the enclosure (only included with Option -PM)
9	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 4)

10	USB Connection	For firmware and configuration upgrades
11	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	<ul style="list-style-type: none"> • Test Digital Output ^d • Test Analog Output ^a • Test Relay *
1001 ^d	Basic Menu	If configure as a Modbus® device <ul style="list-style-type: none"> • Comm Type • Comm Mac • Comm Baud • Modbus Parity If configured as a BACnet® device <ul style="list-style-type: none"> • Comm Type • Comm Mac • Comm Baud • Instance ID • Comm Parity

1014	Display Menu	<ul style="list-style-type: none"> • Display Type • Brightness • Selected Channel • Hide Channel • Scroll Delay
2012	Alarms Menu	<ul style="list-style-type: none"> • Selected Channel • Selected Alarm Level • Set Alarm Setpoint • Set Alarm Direction (Ascending/Descending) • Set Alarm Hysteresis • Fault Reading
3022	Config Menu	<ul style="list-style-type: none"> • Selected Channel • Enable/Disable Channel • Read from Sensor • Write to Sensor
3032	Calibrate Menu	<ul style="list-style-type: none"> • 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 green 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 a series of information screens showing the model name, serial number and firmware version; the communication type, ID and baud rate, the gas type and AD counts; the channel number, gas type and gas level and the temperature and relative humidity levels (if option is installed).

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 Press Enter	Brightness 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 >050	Confirm? N 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.

```
C02          0 PPM
```

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

```
*****-C02-*****  
*****-T/RH-*****
```

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  
Press Enter  
Display Type  
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 Gas Channel, RH and/or Temperature Readings

You can choose what reading(s) you want displayed on the screen by hiding or un hiding lines. If more than two items are unhidden, you can set a scroll rate of your choice.

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
>CO2
```

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

- Gas Type (ie. CO2)
- Gas Type (ie. CO)
- 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.

The factory default is to display the gas types for the sensors installed and the temperature and humidity readings if Option -RHT is installed.

If you have more than two channels unhidden, you can set the scroll rate of the information on the display. In the Display Menu, press the UP button until you see Scroll Delay.

```
Scroll Delay
>002
```

Press ENTER. Use the buttons to enter the number of seconds you want it to take to scroll to the next line.

6.4 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

C02	800	low
-----	-----	-----

C02	1000	mid
-----	------	-----

C02	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.

C02	Ø COMM
-----	--------

For a list of Fault Codes, refer to **Section 12 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. You may also hide the lines of disabled channels. Refer to *Section 6.3.3 Display or Hide Gas Channel, RH and/ or Temperature Readings*.

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

A disabled channel acts as if it does not exist, it will not show gas readings.

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

C02	----	PPM	C02	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 C0

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

C02	0	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

NOTE: The cGas Detector DOES NOT HAVE an internal alarm.

The cGas Detector is configurable as a one or two channel gas detector and each channel can be configured with LOW, MID and HIGH gas alarm setpoints. The number entered as the setpoint is the exact number/level of gas concentration at which the device will indicate an alarm condition on the display and communicate with the controller or control panel to trigger a predetermined response such as horn and strobe or other emergency protocol.

The alarm set points can be changed at any time and do not require a calibration before, during or after changing them.

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
Carbon Monoxide (CO)	0 - 200 ppm	25 ppm	50 ppm	100 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.

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.

A Descending alarm is used when monitoring a gas that becomes hazardous in decreasing quantity, such as oxygen. The normal gas level for oxygen is above the alarm setpoint so if the oxygen level starts to deplete and reaches/goes below the alarm setpoint, the alarm will trip. You can set a hysteresis value that will be common for all alarm setpoints on that channel.

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 indicate an alarm condition. It will remain in alarm condition 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). Sending in alarm and out of alarm communications to the control panel could trigger relays to repetitive turn on and off, causing them to burn out and equipment to suffer unnecessary wear and tear.

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
```

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 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
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
>1000 PPM
```

```
Confirm?      N
>1000 PPM     >Y
```

Press the Up button until you see Alarm Direction, confirm the correct direction (ascending or descending) is showing.

```
Alarm Direction
ASCENDING
```

Press the Up button until you see Alarm Hysteresis, 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 >010 PPM CO2

Confirm?	N
>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 move the relay board to the other socket.

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) thereby 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 (°C or °F) of Temperature Readings

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

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

IMPORTANT: Analog models have one 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 Celcius or Fahrenheit. The units can be changed at any time, refer to *Section 6.8 Change Units (°C or °F) of Temperature Readings*.

The temperature and relative humidity sensors come pre-calibrated from the factory. If you find that the readings on the cGas Detector are higher or lower than another measurement device, 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 and the Humidity offset value is a percentage, both in either direction of 0.

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
>Temperature

Selected Channel
>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 >-4.0 degC	Humidity Adj >+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 >-4.0 degC >Y	Confirm? N >+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 Press Enter	Selected Channel C02
-------------------------------	-------------------------

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

Set AO Mode OFF	Set AO M0de >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

Use the test functions to make sure the connection and configured responses are working as expected.

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
>N02
```

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

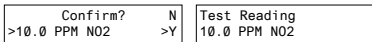
- Gas Type (ie. CO)
- Gas Type (ie. CO2)
- Temperature
- Humidity

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
0 PPM N02
```

```
Test Reading
>10.0 PPM N02
```

Press ENTER and then again to Confirm Y.



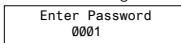
The test will start as soon as you press ENTER to confirm and will remain in the test mode as long as the Test Reading screen remains untouched, up to 5 minutes. To stop the test, press the UP or DOWN button. Test another reading value or press ENTER to Exit.

6.11.3 Test Relay (models with Option -RLY)

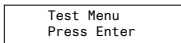
NOTE: Before testing the relay, notify the appropriate people so unnecessary distress or response is not caused by activating fans or equipment or inadvertently calling the fire department or other emergency response team.

From the main display, press ENTER.

Enter passcode 0001 using the UP button and ENTER button.



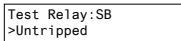
Press ENTER to access the Test Menu.



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.



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.



When finished, press ENTER and then UP to Exit.

7 MODBUS AND BACNET CONFIGURATION

NOTE: This entire chapter applies to CGAS-DP (digital) models only.

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

7.1 Changing Digital Communication Type 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
Press Enter

Comm Type
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
>BACNET

Reset Device

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. The Modbus® ID of the transmitters will start at 101 and continue sequentially for each transmitter.

If individual CGAS-DP transmitters are being ordered (ie. they are not part of a system), the factory default Modbus® setting are:

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

If you adding the transmitters to an existing system in the field 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.

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.

NOTE: 100 is the default for individual transmitters that are not set up in the factory as part of a system. The default for a system controller with transmitters is 101 increasing sequentially.

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 digital 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

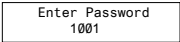
The cGas Detector (CGAS-DP) can be configured with BACnet® output to communicate with a BAS, DDC or similar control panel.

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 BACnet	Comm MAC 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 >111	Confirm? N >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 BACnet	Instance ID 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 >0270111	Confirm? N >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 BACnet	Comm Baud 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.

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.

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. Depending on the model, you can replace a smart sensor board with a new smart sensor board of a different gas type or add a second smart sensor board to a single channel device.

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.

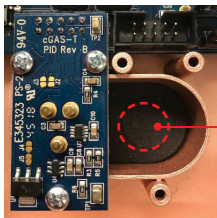
Power OFF the unit during the physical replacement of the sensor boards.

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 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.

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.

NOTE: If the second 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.

8.2 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
CH1 (Left)

Read from Sensor
>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 are reading from the correct sensor - left vs right.

8.3 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 from the 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.

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.

Oxygen sensors require 99.9% nitrogen (N_2) for a true zero. We recommend doing the span first, followed by zeroing.

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.

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.

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

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 CO₂ 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
50 PPM CO
```

```
Calibration Gas
>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 (CO₂) sensors require 99.9% N₂ 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 N₂ 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

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.

47AD	Zeroing	18s
------	---------	-----

56AD	Zero Success
------	--------------

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.

<p>Calibrate Menu Press Enter</p>

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

<p>Selected Channel CO</p>

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

<p>Calibrate Span 4000 AD</p>

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.)

<p>Confirm CalGas N >100 PPM >Y</p>

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.

<p>Waiting for Gas 53AD 35s</p>
--

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.

<p>Stabilizing 1961AD 82s</p>
--

<p>Spanning 1957AD 21s</p>

<p>Span Success 1956 AD 19</p>

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

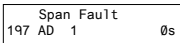
This section is intended to aid in correcting issues that may arise during the calibration procedure. If you are unable to correct a problem or you have questions, please contact our Technical Service Department at help@cetci.com or 604-940-8741 (Local) or 1877-940-8741 (Toll Free).

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.).



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 entering the enclosure.
- 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 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, 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 CO₂ 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 before

entering the Calibrate Zero menu. Then flow the span gas for 2 minutes before 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	CO ₂ 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.

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

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