



edaphic scientific

environmental research & monitoring equipment

User Manual and Installation Guide



ESCM-900

Industrial CO2 Detector



edaphic scientific

environmental research & monitoring equipment

Distributed & Supported By:
Edaphic Scientific Pty Ltd
www.edaphic.com.au
info@edaphic.com.au
Ph: 1300 430 928

Warning!

This product should only be used as described in this manual. If the equipment is used outside of the manner specified, the protection provided by the equipment may be diminished. This equipment should be installed/serviced by qualified personnel only.

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GENERAL INFORMATION ON *Carbon Dioxide* SAFETY

According to the **Occupational Health and Safety (OHS)** guidelines, carbon dioxide is a Class A, compressed gas. At low concentrations, the gas is not hazardous. However, as concentration levels increase, so do the severity of potential health effects. CO₂ gas does not support life and in concentrations above 4% it has dangerous effects and negative implications. Health implications consist of headaches, fatigue, nausea, unconsciousness, and even fatality.

PHYSICAL SYMPTOMS OF CO₂ LEVELS



0.1% | 1,000 PPM

Prolonged exposure can affect concentration



0.5% | 5,000 PPM

The International Safety Limit (HSE, OSHA)



1.0% | 10,000 PPM

Rate of breathing increases slightly



3.0% | 30,000 PPM

An increase in heart rate, blood pressure, and headaches. Hearing can become impaired.



10-100%

Labored breathing, headaches, eventual unconsciousness, and suffocation

CO₂ SAFETY CODES AND STANDARDS



International Fire Code

5,000 ppm CO₂ Concentration or Fault Indicator - Awareness Indication



NFPA 55 and OSHA

5,000 ppm (0.5%) 8-hour Time Weighted Average (TWA) - Indication



NBIC Part 1 and Supplement 3

Pre-set 15,000 ppm (1.5%) and 30,000ppm (3.0%) High Alarms.

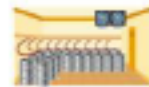
As noted by the National Board Inspection Code part 1 supplement 3 and short term exposure limit defined by ACGIH and NIOSH.



OSHA and NIOSH

OSHA and NIOSH for CO₂ exposure for workers that is no lower than 5,000ppm TWA for first alarm, 15,000ppm as the half STEL (short term exposure limit).

HAZARD AREAS



Confined Spaces or Low Lying Areas



Areas Where CO₂ is Transported or Used



Areas Where CO₂ is Vented and Stored



Areas Where CO₂ is Enriched or Implemented



Areas Where CO₂ is Filled, Including Adjacent Areas.



Introduction to the ESCM-900

The ESCM-900 Industrial Carbon Dioxide Storage Safety Alarm is a (12-24) VDC powered monitor that is designed to reliably and accurately sense the CO2 levels present in confined spaces, harsh environments, or industrial settings. The safety alarm uses nondispersive infrared (NDIR) sensing technology to measure CO2 levels in areas of potential risk. The monitor is designed to notify workers of potential CO2 exposure risks prior to compromising the health or wellbeing of those workers. The ESCM-900 is equipped with (3) configurable safety alarms that trigger across the 0-5% (or 0-50,000ppm) measurement range. CO2Meter, Inc. is committed to delivering quality safety solutions that allow its partners to operate without the added layer of CO2 safety causing workflow distractions.

Key Features

- (3) Configurable safety alarms (Audible and Visible)
- NDIR sensor with extended lifespan
- Rugged powder coated aluminum enclosure (IP64)
- Quick-release connectors design to last in harsh environments
- Push button configuration (NO CONTROL PANEL NEEDED)
- 4-20mA output for communication with **Building Maintenance Systems**
- (3) Dry contact relays triggered by each alarm level (NO or NC)
- Back-up battery connection available
- Easy calibration function
- Barometric pressure compensation
- Temperature compensation
- Alarm latching function
- Internal heating element for improved air flow
- Hydrophobic filters to prevent water intrusion

Display



Icons and Symbols

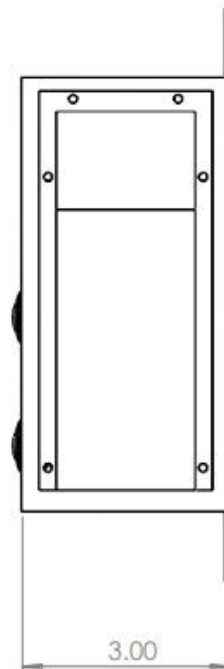
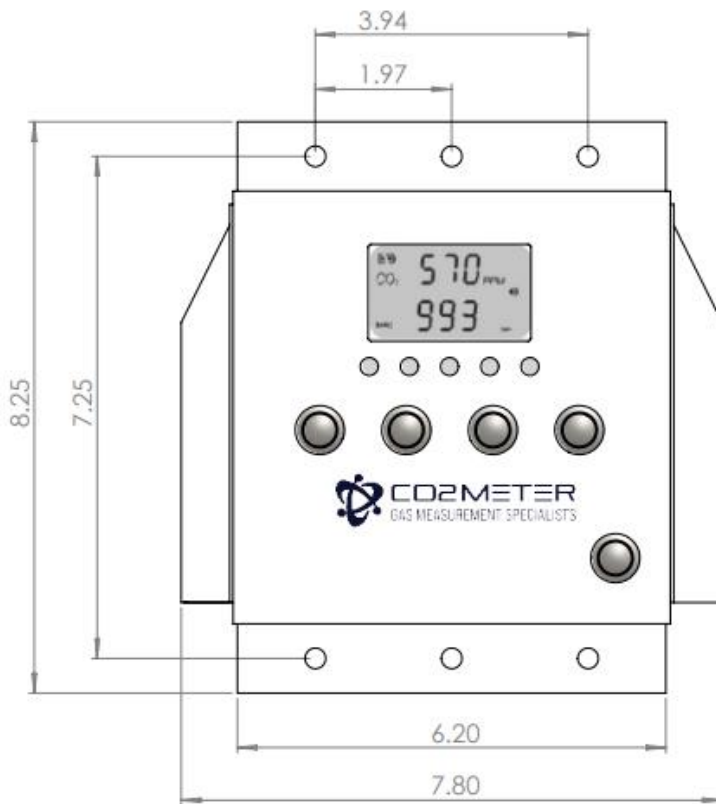
Icon/Symbol	Description
1216 PPM	CO2 Level Icon: Displays the live ambient carbon dioxide levels of the area being monitored. Updates every 2 seconds.
DIAG	Technician diagnostics feature. Communication test.
AL1	1 st Alarm Icon: 1 st alarm. (5,000TWA) LED Flash Frequency : 2Hz
AL2	2 nd Alarm Icon: Configurable 2 nd alarm. (Default 5000ppm or 0.5% CO2) LED Flash Frequency : 4Hz Buzzer Frequency: 4Hz
AL3	3 rd Alarm Icon: Configurable 3 rd alarm. (Default 30,000ppm or 3% CO2) LED Flash Frequency : 6Hz Buzzer Frequency: 6Hz
CALI	Calibration Icon: (See page 14 for calibration instructions)
RCFS	Reset Factory Setting Icon: (See page 15 for reset instructions)
HI	High CO2 Icon: Indicated CO2 levels greater than 5%
	Alarm Icon: Appears after AL1 is triggered and will remain on display while the monitor is in alarming state
	Ventilation Icon: CO2 Levels exceed AL2 and Relay2 has been triggered.

Specifications

CO2 Specification	
Measurement Range	0 - 50,000ppm (5%) display
Display Resolution	10ppm at 0~10,000ppm; 0.01% at 1-5%
Accuracy	+/-200ppm or +/-10% reading
Pressure Dependence	Auto pressure compensation, built in barometer. (50 to 110 kPa)
Response Time	CO2: <2min by 90%
CO2 AL1 (TWA)	5000TWA
CO2 AL2	5000ppm Default (5000ppm, 1.0%, 1.5%, 2.0%, 2.5%, 3.0%.)
CO2 AL3	3.0% Default (2.0%, 2.5%, 3.0%, 3.5%, 4.0%)
Sound Alarm	80db@10cm
Warm-Up Time	<60 seconds at 22°C
Monitor Specification	
Power Input	9~32VDC (12~24VDC recommended), 2A.
Backup Battery	6VDC (5.4V~7.0V), recommended capacity is 12AH
Relay 1	Dry contact relay controlled by AL1 (2Amp) (NO or NC)
Relay 2	Dry contact relay controlled by AL2 (2Amp) (NO or NC)
Relay 3	Dry contact relay controlled by AL3 (2Amp) (NO or NC)
4-20mA CO2	CO2: Range 0-50,000ppm
4-20mA TEMP	Temp: Range 32 to 122° F (0-50°C)
Dimensions	8.25-inch x 7.8-inch x 3-inch
Weight	1.5lbs (Monitor only)
Ingress Protection	IP64
Temperature Specification:	
Temperature Range	32°F to 122°F (0°C to 50°C)
Display Resolution	0.1°F (0.1°C)
Display Options	°C/°F
Accuracy	Reading represents device temperature (NOT environment)
Response Time	20-30 minutes (Enclosure must equalize with environment)
Operating Conditions:	
Temperature	32°F to 122°F (0°C to 50°C)
Humidity Range	0 ~ 95% RH non-condensing
Storage Conditions:	
Storage Temperature	-4°F to 140°F (-20°C to 60 °C)

Dimensional Drawings

(Dimensions are in inches)



Installation

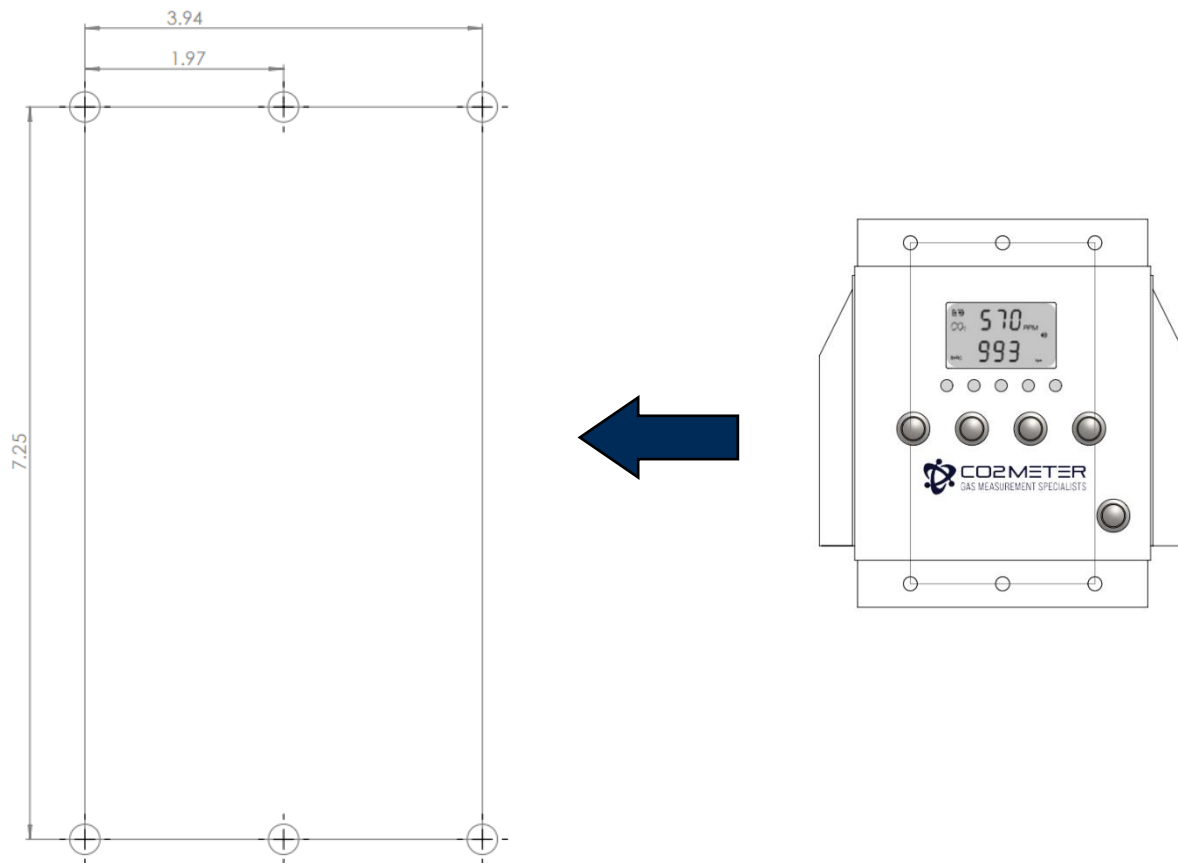
Choosing Mounting Location

The ESCM-900 is designed to withstand harsh environments that would compromise other comparable safety monitors. Varying temperature, humidity, and dust/debris levels will not negatively impact the performance of the ESCM-900. For optimal use, a few considerations should be reviewed while selecting a mounting location:

- Avoid a location that risks high pressure washdown directed at the monitor.
- Avoid a location that would subject the monitor to impact or continuous vibration.
- Mount the monitor 12 inches from the ground.
- Avoid low/high temperature applications without consulting with a product specialist.
- Be sure to mount in a location where 12~24VDC is available to power the monitor.

Mounting Hole Pattern

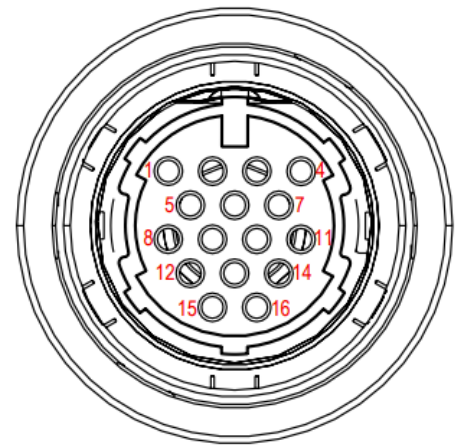
(Dimensions are in inches)



Wiring

The ESCM-900 can be hardwired using (1 of 2) available accessories purchasable with the monitor. **The ESCM-900-CON** or the **ESCM-900-CBL** are available to wire and configure the monitor based on the requirements of the installation. The following diagram represents the pinout of the 16pin connector located on the bottom of the monitor. Once the cable or connector is properly wired and verified with the below diagram, remove the weather cap from device connector and mate the cable or connector. The connection can be confirmed with press fit and snap sound. The ESCM-900 is now ready to be powered and begin taking measurements.

Position	Function	Wire Color
1.	(Temp) 4-20mA	White
2.	GND	Green
3.	(CO2) 4-20mA	Yellow/Brown
4.	Battery -	Blue
5.	Battery + 6VDC 7V max	Brown
6.	GND	Black
7.	12-24 VDC IN	Red
8.	Relay3_NO	Yellow
9.	Relay3_COM	Grey
10.	Relay3_NC	Pink
11.	Relay2_NO	Violet
12.	Relay2_COM	Grey/Pink
13.	Relay2_NC	Red/Blue
14.	Relay1_NO	White/Green
15.	Relay1_COM	Brown/Green
16.	Relay1_NC	White/Yellow



16 Positions



ESCM-900-CON



ESCM-900-CBL

Operation

Start-up

Verify that the ESCM-900 is properly wired, and 12-24VDC power is being supplied to the correct pin positions in the mating connector (see page 10). Check all wiring connections before powering. After power-up, the monitor provides accurate CO₂ measurements after a 5 second warm up.

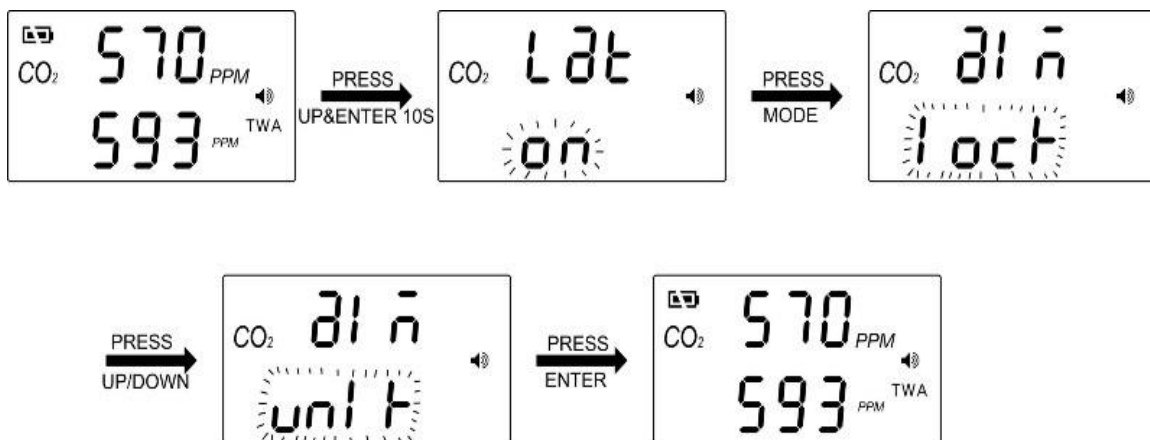
Quick Test the System

- 1) Apply 5% Carbon Dioxide to the vents on the side of the device. Check that all alarms trigger and the display will eventually read HI.
- 2) Alm1 will trigger Relay 1.
- 3) Alm2 will trigger Relay 2.
- 4) Alm3 will trigger Relay 3.
- 5) The device will sound and flash audible and visual alarms.
- 6) If a Strobe Siren is connected, it will sound and flash.
- 7) Remove gas supply.

Allow 5 minutes for the device to come out of the HI CO₂ alarm status.

Unlocking/Locking Settings

- 1) Press Up & Enter button for 10 seconds.
- 2) Press Mode until Aln is displayed.
- 3) Use Up/Down arrow to change lock to unlock.
- 4) Press Enter to save.

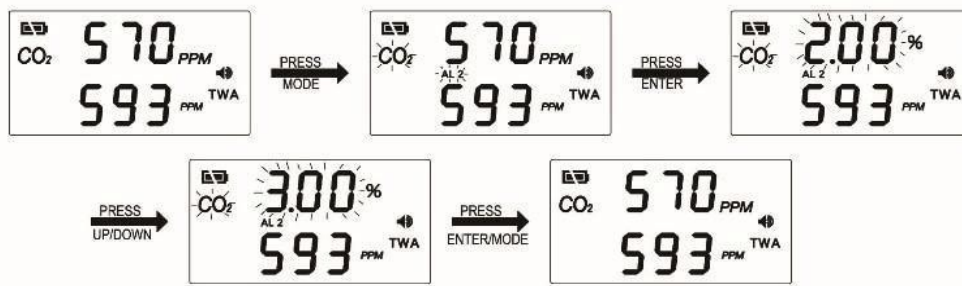


Configuring AL1

1. AL1 is hard set to 5000TWA.

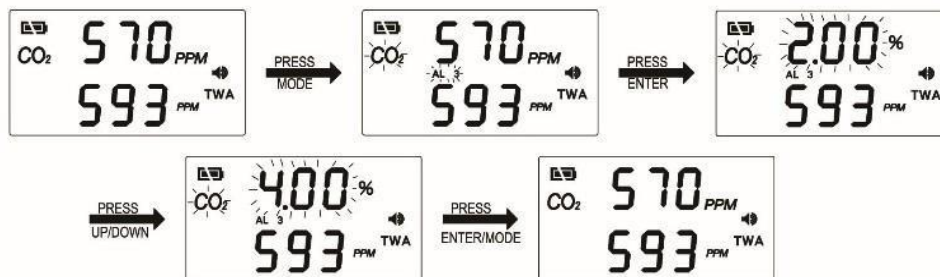
Configuring AL2

1. Press Mode until the "AL2" & "CO2" icon flash
2. Press Enter to select alarm 2. AL2 level will now flash.
3. Use Up/Down arrow to select new alarm level.
4. Press Enter to confirm.



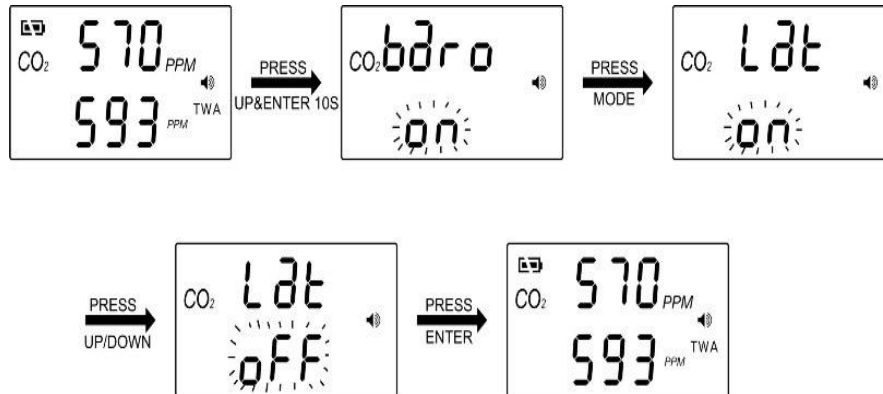
Configuring AL3

1. Press Mode until the "AL3" & "CO2" icon flash
2. Press Enter to select alarm 3. AL3 level will now flash.
3. Use Up/Down arrow to select new alarm level.
4. Press Enter to confirm.



Latch ON/OFF

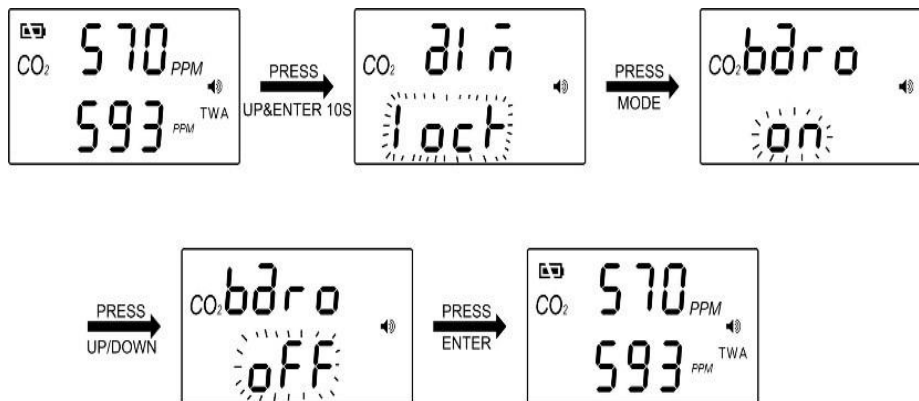
1. Press Up & Enter button for 10 seconds
2. Change to Advance Mode by pressing Mode, and choose Lat Mode
3. Press Up/Down to set Latch Mode On or Off.
4. Press Enter to Save



(Fault light will keep flashing if AL3 is activated, indicating unit went into alarm status.)

Baro ON/OFF

1. Press Up & Enter button for 10 seconds
2. Press Mode, and choose Baro Mode
3. Press Up/Down to set Baro Mode On/Off.
4. Press Enter to Save.



Calibration

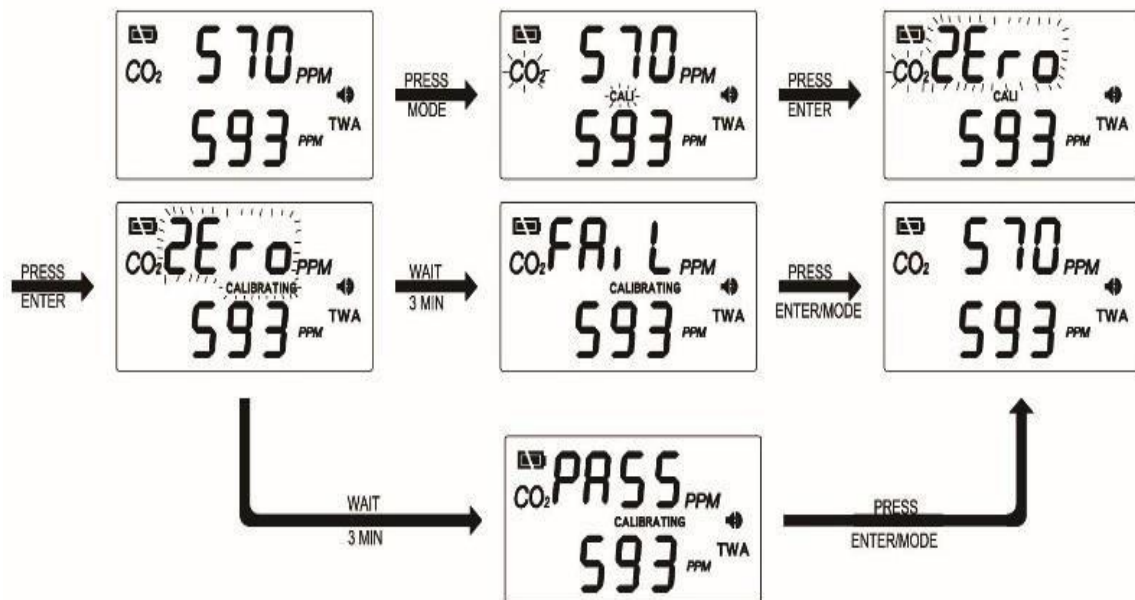
1. Flow 100% Pure Nitrogen (N₂) (0% CO₂) into one of the 2 venting slots on the side of the aluminum enclosure. Wait 3-5 minutes before starting calibration, then execute the "ZEro" calibration.

(Continue to flow calibration gas throughout entire process)

2. Press Mode until CALI is flashing in small print under the CO₂ reading.
3. Press Enter to view the calibration settings.
4. "ZEro" and "CO₂" will be flashing.
5. Press Enter again to begin the calibration. "CALIBRATING" will begin flashing.

(Continue to flow N₂ throughout the entire calibration)

6. After approximately 3 minutes, "PASS" or "FAIL" will be displayed.
7. If "PASS" press Enter to save.
8. If "FAIL" repeat the process.
9. If "FAIL" more than twice, contact CO₂Meter technical support.



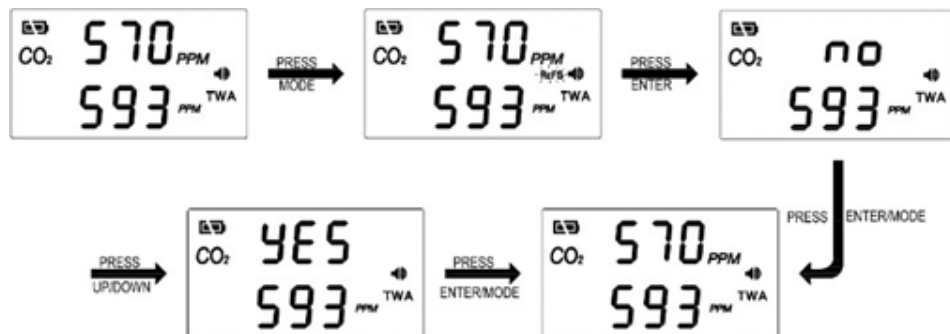
System Test

1. Press Mode until the “DIAG” icon flashes
2. Press Enter, the five LEDs will blink, and the buzzer will sound.



Factory Reset

1. Press Mode until the “ReFactSet” icon flashes.
2. Press Enter Up/Down to choose either “Yes” or “No”.
3. Press Enter again to save the setting or press Mode to quit the setting.



Maintenance

Contact Edaphic Scientific

Edaphic Scientific Pty Ltd
www.edaphic.com.au
info@edaphic.com.au
Ph: 1300 430 928

Fault Codes

Fault Icon/Code	Indicator	Reason	Suggested Actions
Er3	"Er3" flash, Fault LED blink	Temperature reading out of temperature range.	This error will disappear when the temperature returns to the range between 0°C and 50°C (32°F to 122°F)
Er5	"Er5" flash, Fault LED blink	System data error.	Power cycle or press the reset button. IF the Er5 displays again, contact CO2Meter.
Er7	"Er7" flash, Fault LED blink	Sensor communication issue.	Press reset button or power cycle the unit.



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