Gas Measurement Instruments Ltd

CO_2 Multi Monitor

Operator's Guide

Q 09760

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Part Number: 85256

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WARRANTY

The product is guaranteed for a period of 12 months from the date of original purchase provided that the instrument has been installed, commissioned and serviced in accordance with the operating instructions. This does not include damage caused by misuse, for example: mechanical impact or water ingress.

SOFTWARE

Software supplied (on EPROM or similar device for use in a particular product) may only be used in that product and may not be copied without the written permission of GMI Ltd. Reproduction or disassembly of such embodied programmes or algorithms is prohibited. Ownership of software is not transferable and GMI does not warrant that the operations of the software will be error free or that the software will meet the customer's requirements.

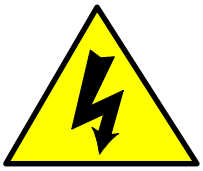
CALIBRATION VALIDITY

Calibration validity is the responsibility of the user. Under normal operating conditions a 6 months period can be expected. This is not guaranteed, however, as the precise application of the product is unknown to GMI. Individual codes of practice may dictate shorter periods.

DISPOSAL ADVICE

When no longer in use, dispose of the system carefully and with respect for the environment. GMI will dispose of the system without charge if returned to the factory.

SAFETY



Warning: Mains operated equipment. Always isolate the mains supply before working on the CO_2 Multi Monitor. Care must be taken as relay connections may still be live.

It is the user's responsibility to make sure that procedures are in place to deal with any emergency situations that occur.

- Gases are dangerous. Care should always be taken when monitoring gases.
- The user should have a set of procedures/actions appropriate to varying gas/alarm levels before the system is used.
- The user should produce a notice (and display it next to the system unit) listing actions to be taken in the event of alarms or faults.
- The CO_2 Multi Monitor enclosure is not suitable for use in a hazardous atmosphere.
- The system must be regularly serviced and calibrated.
- Only GMI replacement parts should be used.
- Users should satisfy themselves that the system is suitable for their application.
- Any right of claim relating to product liability consequential damage to any third party against GMI is removed if the above warnings are not observed.

INSTALLATION AND OPERATION

To make sure that the system is safe both for the user and property it must be installed, commissioned and maintained by or under the supervision of qualified persons. Regard should be taken of local wiring regulations, codes of practice, statutory requirements and any specific instructions issued by GMI. Any operating or installation queries relating to this product should be directed to Gas Measurement Instruments Limited, Customer Support, Renfrew.

Caution: The CO_2 Multi Monitor is fitted with printed circuit boards (pcb's) that contain static sensitive devices. Observe static precautions at all times when installing, servicing or maintaining the system unit. Maintain grounding by wearing a wrist strap attached to the system unit's earthing stud.

EUROPEAN DIRECTIVES

The components have been assessed to be in compliance with the relevant Directives and standards. However complete compliance particularly with the EMC Directive requires the installation to be in compliance, care should therefore be taken to make sure that the installation is appropriate to the EMC requirements, in line with GMI instructions and with best working practice.

Unless the installation is undertaken by GMI or a GMI technically approved installer there is no guarantee of compliance to European Directives on the total installation in common with other electrical goods.

For details of special conditions of use, please consult the relevant certificate, manual or systems specification.

The GMI CO_2 Multi Monitor meets the following European Standards:

- Low Voltage Directive: 73/23/EEC
  EN60065 (1994).
- EMC Directive: 89/336/EEC
  EN50081-1 and EN50082-1.

The product is therefore in compliance with the appropriate Directives and has the CE mark applied.

REVISION RECORD

Date	Issue	Pages	Description Of Change
22/12/1998	Issue 1	All	New Operator's Guide.
12/01/2000	Issue 2	10-12	Diagrams updated to include Latching/Non-Latching alarm indication.
		16	Diagram updated as above (p10-12).
		17	"Latching" added after first three chapter headings and paragraph on Auto Reset added.

TABLE OF CONTENTS

INTRODUCTION

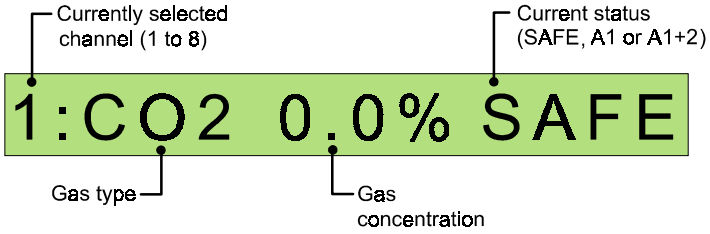
The GMI Carbon Dioxide (CO_2) Multi Monitor is a mains powered, fixed system, designed to provide sequential monitoring of CO_2 gas concentrations in the range 0 to 5% and O_2 gas concentrations in the range 0 to 25%. Up to eight gas points (GAS 1 to GAS 8) can be sampled. The CO_2 Multi Monitor can be set up for specific user requirements and linked to alarm devices and other systems within your facility.

An internal pump draws the sample gas into the sample chamber where infrared (IR) absorption techniques are used to determine the CO_2 sample gas concentration(s). O_2 measurement is performed using an electrochemical cell. Fault detection is an integral part of the CO_2 Multi Monitor including monitoring of the IR source and gas flow, both of which ensure reliable gas measurements. The CO_2 Multi Monitor is equipped with Alarm and Fault relays that can be configured to provide remote audible and visual warning should an alarm or system fault occur.

The LCD display can show gas type, gas level, alarm settings and channel location information. Status Light Emitting Diodes (LEDs) on the front panel show high priority alarm (A2), low priority alarm (A1), FAULT, CAL (when the monitor is being calibrated) and POWER on conditions.

OPERATION

During normal operation, the display shows the status of the individual channels, as well as the overall system. A sample display is shown below:



Using the 

button on the front panel, the user can check the gas levels in each zone and the common A1 and A2 gas alarm levels. Display cycling can be enabled so that the display automatically cycles through each of the enabled channels. Alarms and system faults are clearly indicated on the LCD display, and status LEDs on the front panel. The CO_2 Multi Monitor can be configured (via relays on the main pcb) to drive external audible and visual alarms. The LCD display also shows the location of the alarm and any fault messages.

CALIBRATION AND SETUP

Calibration is designed to be user friendly and is performed using an Active-8-or hand-held unit, as shown below:

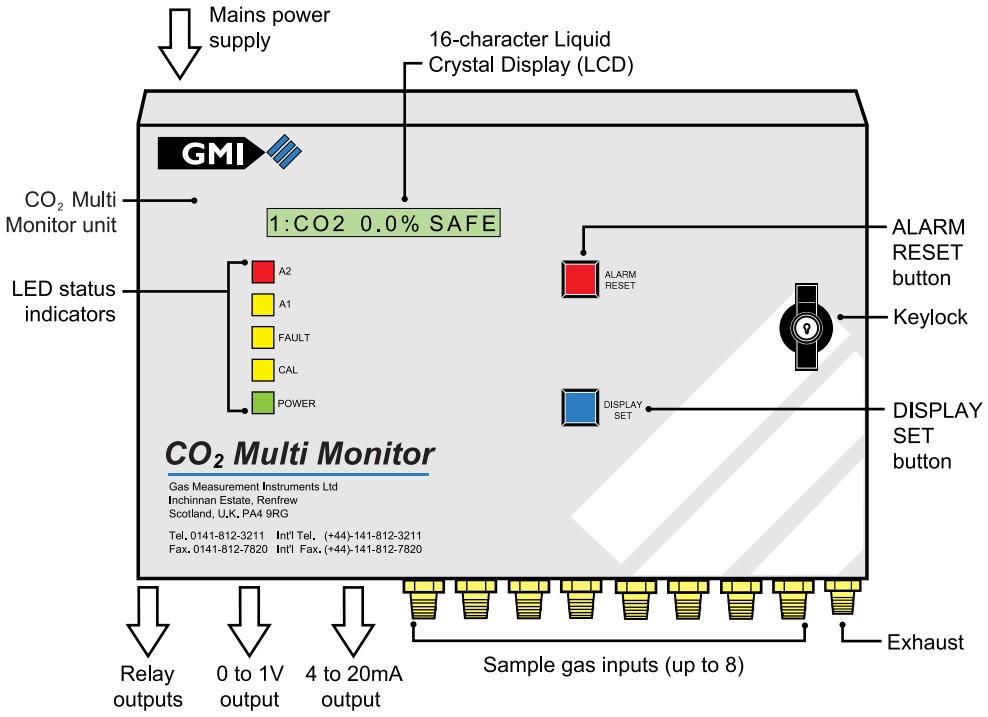
Without the Active-8-or (and key to open the unit), calibration and setup access is impossible, ensuring that there can be no tampering with the system.

See the "*CO_2 MULTI MONITOR INSTALLATION AND SETUP GUIDE*" (Part Number 85257) for further information.

FEATURES

- Up to 8 sample inputs.
- Configurable to measure CO_2 and/or O_2.
- Easy setup and calibration.
- Operating details can be viewed quickly and easily on the display
- 3 relay outputs (A1, A2 and FAULT) are provided to drive external devices.
- Can be factory set for 230Vac or 110Vac.
- Unit protected to IP 54 rating.
- The system is microprocessor controlled and can be configured to suit individual user requirements.
- 0 to 1V analogue output (for CO_2) for a single channel.
- 4 to 20mAmp analogue output (for CO_2) for a single channel.

CO_2 MULTI MONITOR DESCRIPTION



The CO_2 Multi Monitor consists of:

- CO_2 Multi Monitor unit
- LED status indicators
- 16-character Liquid Crystal Display (LCD)
- Front panel operator push buttons,  ALARM RESET and  DISPLAY SET
- 3 Relay outputs (A1, A2 and FAULT)
- 8 sample gas input channels (GAS 1 to GAS 8)
- Exhaust
- 0 to 1V analogue output (for CO_2 only)
- 4 to 20mAmp analogue output (for CO_2 only)
- Keylock.

CO_2 MULTI MONITOR UNIT

The unit is housed in a sheet metal enclosure and must be located in a non-hazardous area. The unit contains the main printed circuit board (pcb), status LED pcb, sampling chamber, pump, mains terminal board, mains input terminal and associated electronics.

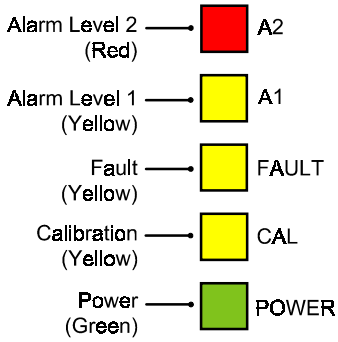
Main pcb

The main pcb contains connections for:

- Active-8-or connector for connecting the Active-8-or hand-held unit for calibration and setup.
- Relay output connections.
- Analogue output connections (both 0 to 1V and 4 to 20mA).
- Reset button.

LED STATUS INDICATORS

The CO_2 Multi Monitor has five status indicators on the front panel, as shown below:



- A2 (illuminates if an A2 alarm is detected on any channel)
- A1 (illuminates if an A1 alarm is detected on any channel)
- FAULT (illuminates if any faults are detected)
- CAL (flashes during calibration mode)
- POWER (remains illuminated whilst the system is switched on).

SAMPLE CHANNELS AND EXHAUST

The CO_2 Multi Monitor can sample up to eight gas inputs (GAS1 to GAS 8) from various locations around the facility. The sample gases are drawn into the unit by the internal pump, analysed and then exhausted. The measured gas concentrations from each sampling point can then be viewed on the display.

INTERNAL ALARM BUZZER

The CO_2 Multi Monitor has an internal alarm buzzer (located on the main pcb) that sounds when an A1, A2 or FAULT alarm occurs.

LIQUID CRYSTAL DISPLAY (LCD)

The LCD provides information on the gas readings as well as alarm status for all channels. The display can cycle round each channel in sequence or display the status of one individual channel. See "*DISPLAY CYCLING*" in the "*BASIC OPERATION*" section for further information.

The display is also used during calibration to enable the user to setup the individual alarm levels and relay configurations.

OPERATOR PUSH BUTTONS

The front panel has 2 operator push buttons (shown below) to allow you to view individual channels and reset alarms and faults:

See the "*BASIC OPERATION*" section for further details.

RELAY OUTPUTS

Three relay outputs are provided on the main pcb:

- RL 1 - A1 relay (switches if any A1 alarm is detected)
- RL 2 - A2 relay (switches if any A2 alarm is detected)
- RL 3 - FAULT relay (switches if a fault is detected).

Note: Relays are shown in all documentation in the normally de-energised position (as is convention).

The relays operate and the internal buzzer sounds when an A1, A2 or Fault occurs. The relays can be programmed to be normally energised or normally de-energised to provide fail safe operation.

MAINS INPUT VOLTAGE

The CO_2 Multi Monitor can be factory set for 230Vac or 110Vac.

0 TO 1V OUTPUT

A single 0 to 1V analogue output is available for the CO_2 range only.

4 TO 20mA OUTPUT

A single 4 to 20mA analogue output is available for the CO_2 range only.

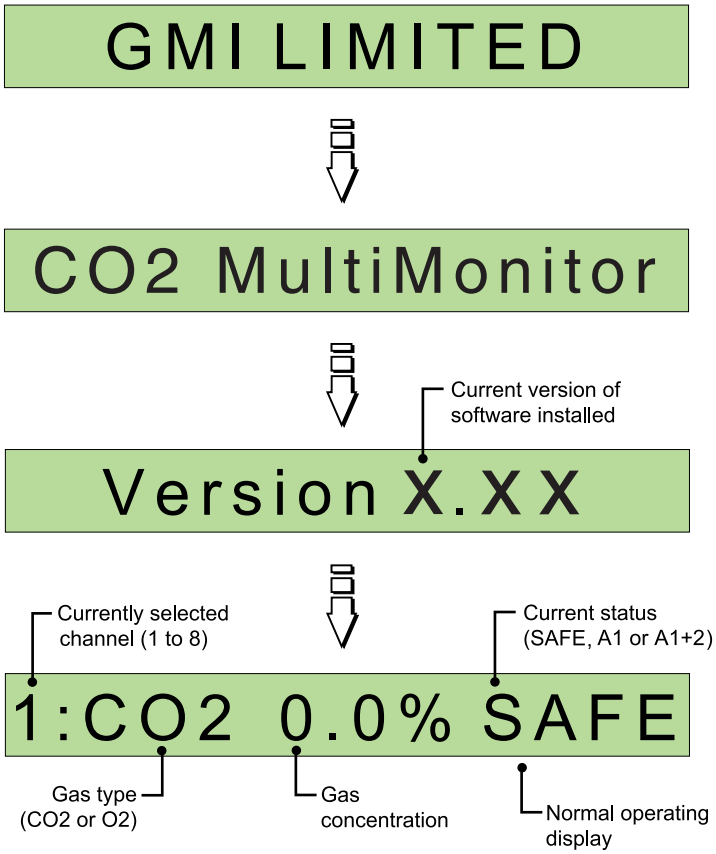
KEYLOCK

The keylock allows authorised personnel to access the unit to alter system setup and calibration.

BASIC OPERATION

SWITCHING THE CO_2 MULTI MONITOR ON

Switch the power on at the ac outlet. See the "*CO_2 MULTI MONITOR INSTALLATION AND SETUP GUIDE*" (Part Number 85257) for further information. The POWER LED on the front panel illuminates, it remains illuminated while the ac power is connected to the unit and switched on. The CO_2 Monitor enters its warm-up cycle, this takes approximately 60 seconds to complete. During warm-up the following screens appear on the display:



The normal operating display (shown above) appears when the warm-up checks are completed successfully.

If during switch-on the system detects a system error, the following screen is displayed:

If this screen appears, call for an authorised service engineer.

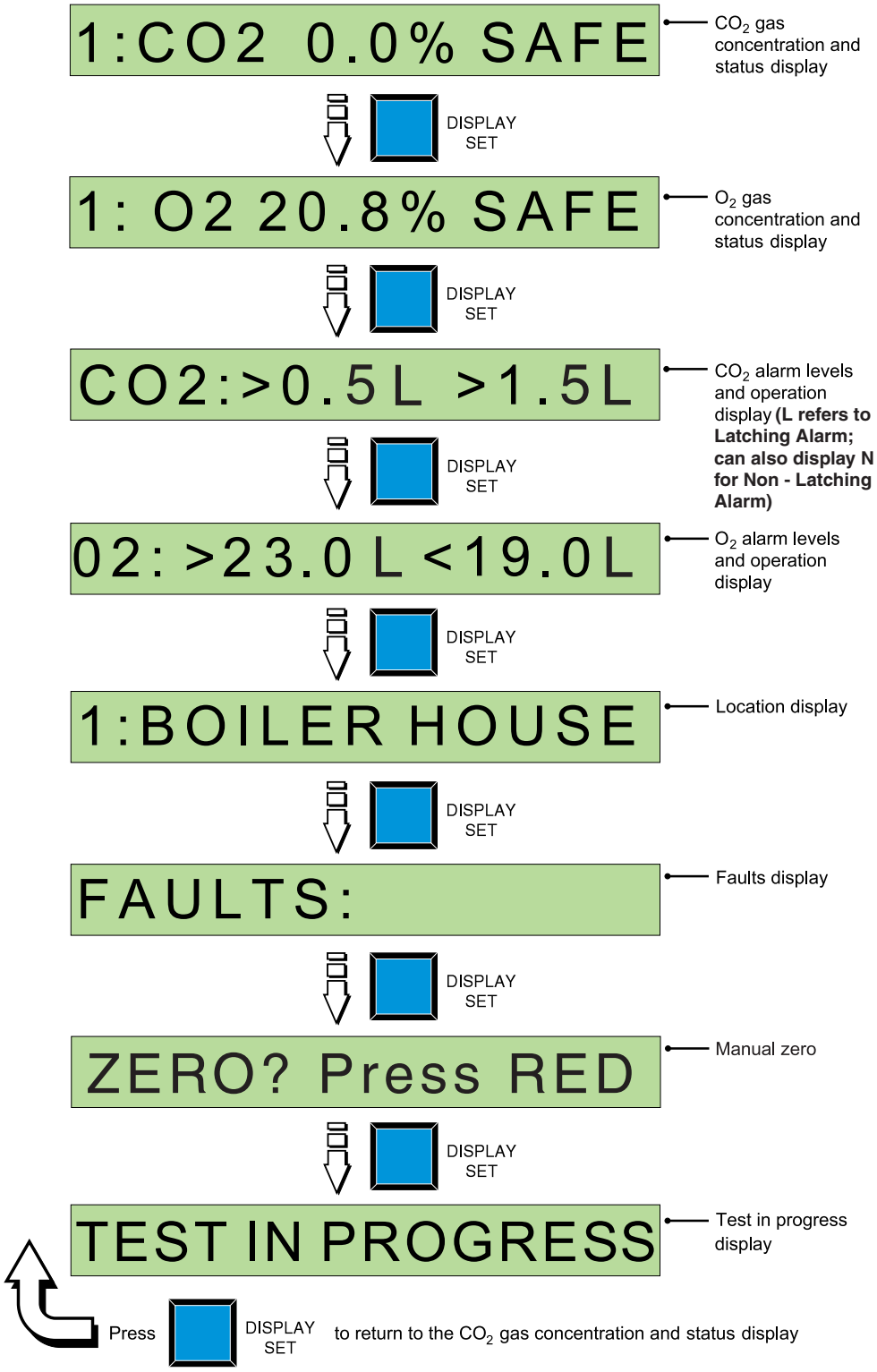
VIEWING MONITOR DETAILS

The CO_2 Multi Monitor's settings and operating values are viewed as a series of displays. Press and hold the 

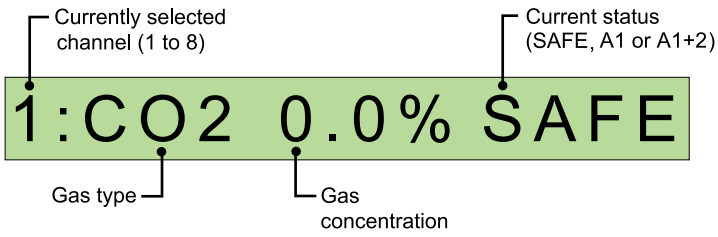
button (for one second) to step through and view each of the operating displays (shown over the page) in turn. Each display is explained in more detail in the sections that follow.

Note: Gas displays appear for configured gases only. CO_2 and O_2 related displays can only be accessed if CO_2 and O_2 are configured. The CO_2 Multi Monitor will revert to the gas values display after 60 seconds if the 

button is not pressed.


1:CO2 0.0% SAFE
CO_2 gas concentration and status display
DISPLAY SET
1: O2 20.8% SAFE
O_2 gas concentration and status display
DISPLAY SET
CO2:>0.5L >1.5L
CO_2 alarm levels and operation display (L refers to Latching Alarm; can also display N for Non - Latching Alarm)
DISPLAY SET
02: >23.0 L <19.0 L
O_2 alarm levels and operation display
DISPLAY SET
1:BOILER HOUSE
Location display
DISPLAY SET
FAULTS:
Faults display
DISPLAY SET
ZERO? Press RED
Manual zero
DISPLAY SET
TEST IN PROGRESS
Test in progress display
Press
DISPLAY SET
to return to the CO_2 gas concentration and status display

CO_2 Gas Concentration And Status



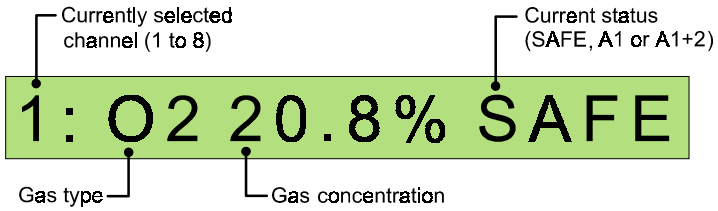
The CO_2 gas concentration and status display appears on the LCD display during normal operation.

The display identifies:

- Channel number (a number from 1 to 8 depending upon the number of channels enabled when the system was set up)
- Gas type
- Gas concentration (the current CO_2 reading for the selected channel)
- Current channel status (SAFE, A1 or A1+2 alarm).

O_2 Gas Concentration And Status

The O_2 gas concentration and status display appears if the CO_2 Multi Monitor is configured for O_2. An example display is shown below:

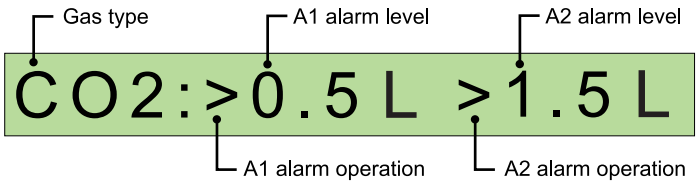


The display identifies:

- Channel number (a number from 1 to 8 depending upon how many channels were enabled when the system was set up)
- Gas type
- Gas concentration (the current O_2 reading for the selected channel)
- Current channel status (SAFE, A1 or A1+2 alarm).

CO_2 Alarm Levels and Operation

The CO_2 Monitor has two adjustable alarm levels (A1 and A2). The alarm levels are set up and adjusted using the Active-8-or hand-held unit.

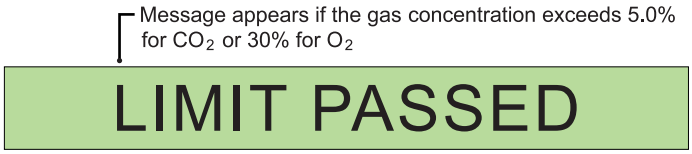


In the example display, the lower alarm level (A1) is activated and the A1 relay energised if the CO_2 gas concentration is greater than (>) 0.5%. The upper alarm level (A2) is active and the A2 relay energised if the CO_2 gas concentration is greater than (>) 1.5%.

When an alarm occurs, the internal buzzer sounds, the A1/A2 status LED illuminates and the appropriate alarm relay operates.

Limit Passed

If the CO_2 gas concentration exceeds 5.0% (or 30% for O_2) the display will change to read "LIMIT PASSED" (shown below) and the internal buzzer sounds:



The "LIMIT PASSED" message remains displayed until the gas concentration falls below 5.0% (or 30% for oxygen), the 

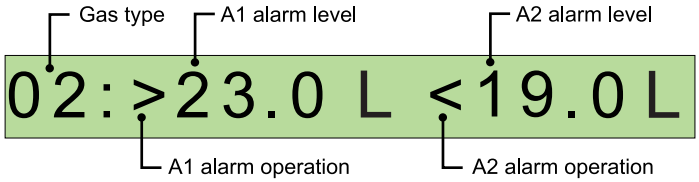
button is pressed and the channel has been re-sampled.

Note: The sampling time is the time that each channel is sampled for. It could therefore take eight sample times for a channel to be re-sampled and for the "LIMIT PASSED" message to clear.

O_2 Alarm Levels and Operation

The O_2 alarm levels and operation display only appears if the CO_2 Multi Monitor is configured for O_2.

The CO_2 Multi Monitor has two adjustable alarm levels (A1 and A2). The alarm levels are set up using the Active-8-or unit.



In the example display (shown above), the A1 alarm is activated and the A1 relay energised if the atmosphere becomes enriched with O_2 gas, that is, if the O_2 gas concentration is greater than (>) 23.0%. An A2 alarm is active and the A2 relay energised if an O_2 gas deficiency occurs, that is, if the gas concentration drops to less than (<) 19.0%.

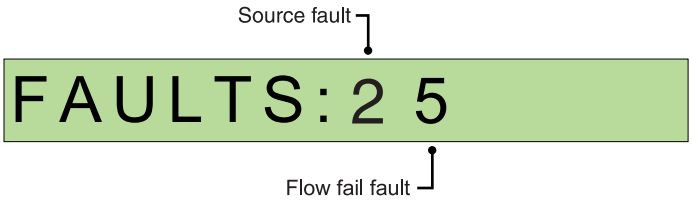
When an alarm occurs, the internal buzzer sounds, the A1/A2 status LED illuminates and the appropriate alarm relay operates.

Location

This display details where the gas sample is taken from in your facility for currently selected channel. Location text can be entered for each gas channel enabled. Up to 14 characters can be entered for each location using the Active-8-or hand-held unit. A sample display is shown below:

Faults

If a system fault occurs, the FAULT status LED illuminates, the FAULT relay operates and internal buzzer sounds.



A fault code appears on the display identifying the cause of the fault condition. See "*FAULTS DISPLAY*" in the "*ALARMS AND FAULTS*" section for further details.

Manual Zero

This option (if enabled) allows the CO_2 channel to be manually zeroed using ambient air (that is, air containing typically 300ppm CO_2).

Manually zeroing the CO_2 Multi Monitor will overcome minor zero shifts introduced by effects like condensation, contamination and bulb ageing.

To manually zero the CO_2 Multi Monitor, proceed as follows:

1) Repeatedly press and hold the 

button (for one second) until the Manual zero display appears, as shown above.

2) Check that the unit is sampling fresh air and then press the 

button to manually zero the CO_2 Multi Monitor.
The " ** ZERO PASS **" display appears:

Note: If manual zero fails, the " ** ZERO FAIL **" display appears. Re-zero the unit. If this display appears repeatidly, call for an authorised service engineer.

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3) Press the 

or 

button to return to the "ZERO? Press RED" display.

Test In Progress

Whilst a lamp test is in progress all relays and sounders operate as normal, only the status LEDs and internal buzzer are temporarily affected.

The following message appears on the display when a test is in progress:

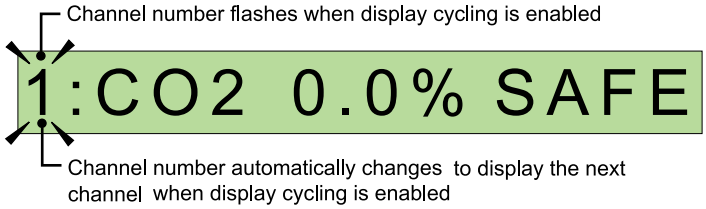
Each of the status LEDs on the front panel switch on and then off in turn whilst the test in progress display is selected. The status LEDs switch on and off, continually cycling, until the next display is selected. The internal buzzer also switches on and then off intermittently until the next display is selected. After the test the LEDs and buzzer will return to their pretest status.

Note: The green Power LED is not included in the lamp test. It remains illuminated throughout the test.

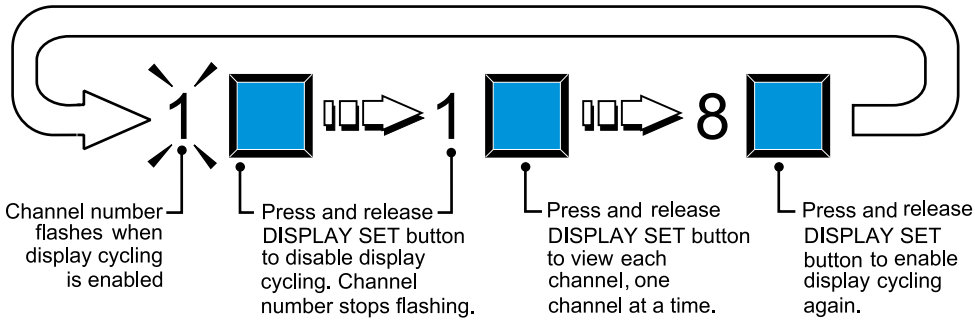
DISPLAY CYCLING

Display cycling allows the value of each channel to be displayed (in sequence, one after the other). The channel sampling time is set up and altered using the Active-8-or hand-held unit. See the "*CO_2 MULTI MONITOR INSTALLATION*

AND SETUP GUIDE" (Part Number 85257) for further information. A typical CO_2 gas concentration and status display is shown below with display cycling enabled:



Display cycling is enabled by default (if more than one channel is enabled). It can be enabled or disabled by briefly pressing the DISPLAY SET button as shown below:



Note: When display cycling, the sampling time (which is user configurable) must elapse before the next channel is displayed. More than one channel must be enabled before display cycling can be enabled.

When display cycling is disabled the CO_2 Monitor continues to sample in turn from each sampling point, but the display remains static. Alarm operation is unaffected.

SWITCHING THE CO_2 MULTI MONITOR OFF

The CO_2 Monitor is designed to be powered continuously. If you do require to switch the CO_2 Multi Monitor off, isolate or switch the power off at the ac outlet (the green POWER status LED on the front panel extinguishes).

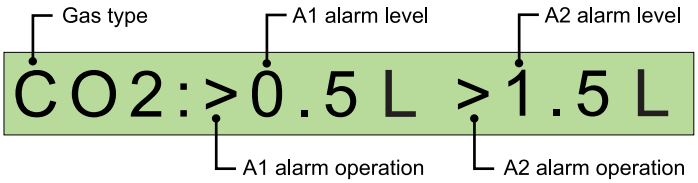
Warning: The unit must only be opened by fully trained and qualified personnel. Care must be taken as relay connections may still be live.

GAS ALARMS

A1 (low priority) and A2 (high priority) alarm levels are set using the Active-8-or hand-held unit. See the "*CO_2 MULTI MONITOR INSTALLATION AND SETUP GUIDE*" (Part Number 85257) for further information.

Alarm levels are viewed by pressing (and holding) the 

button to select the appropriate alarm level display, as described in the previous section. A typical alarm level display is shown below:



Alarm operation can be set to greater than (>) or less than (<). If ">" is selected, the alarm condition occurs when the gas level exceeds the alarm level. If "<" is selected, the alarm condition exists when the gas concentration falls below the alarm limit. In the above example, the A1 alarm is active when the measured gas value is greater than 0.5% Carbon Dioxide (CO_2) and the A2 alarm is active when the measured gas value is greater than 1.5% CO_2.

The "L" character shown next to each alarm limit in the example above signifies that a Latching Alarm occurs if the limit is exceeded (see "*DEALING WITH GAS ALARMS (LATCHING)*). If the character "N" is shown instead of the "L" for either limit then the alarm condition is Non-Latching (see "*AUTO RESET (NON-LATCHING)*)

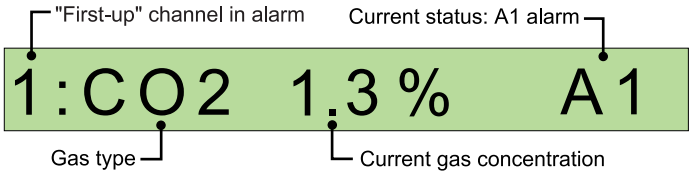
When a gas alarm occurs:

- the details of the channel in alarm and the alarm type (A1, A2 or A1+A2) appear on the display
- the A1 and/or A2 status LED(s) illuminate
- the A1 and/or A2 alarm relay energises/de-energises
- the internal buzzer sounds.

Note: A1 and A2 alarms on one or more channels can exist simultaneously.

DEALING WITH GAS ALARMS (LATCHING)

When a gas alarm occurs the display will be latched to the alarming channel. In the example display shown below, the current gas concentration has exceeded the preset A1 alarm level:



If more than one channel is in alarm the display will show the channel where the first alarm was detected (that is, the “first-up” alarm). Alarms can be either acknowledged or reset.

Acknowledging Gas Alarms (Latching)

Press the 

button (brief single press) to acknowledge the alarm and silence the internal buzzer. This does not reset the alarm but allows other alarms to be viewed and/or returns the operation of the LCD to its pre-alarm status.

Note: When multiple alarms occur simultaneously, the display shows the “first-up” alarm. All alarms must be acknowledged individually before the display returns to its normal pre-alarm operation.

Resetting Gas Alarms (Latching)

Alarms can only be reset by pressing and holding the 

button on the front panel. This initiates the process of resetting all existing alarms.

Note: Alarms will only be reset after the channel in alarm is re-sampled and the measured gas level is below the alarm set point. It could therefore take up to 8 sample times before the channel is re-sampled.

AUTO RESET (NON-LATCHING)

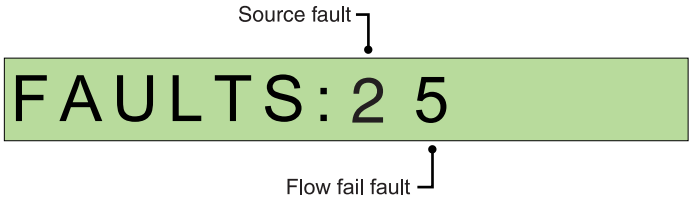
If any alarm is set to Non-Latching (shown as N instead of L on the display) then the alarm condition will reset automatically if all channels return a low gas condition when next sampled.

FAULTS DISPLAY

When a fault occurs:

- the FAULT status LED on the front panel illuminates
- the FAULT relay (RL3) operates
- FAULT code(s) appear on the Fault display for all system faults.

An example FAULTS display is shown below. See "*BASIC OPERATION, VIEWING MONITOR DETAILS*" in the previous section for details on how to view the FAULTS display:



Fault Codes, their Meaning and Actions to be taken are detailed in the following table:

Code	Meaning	Action
1	Not Used	
2	Source fault	Contact an authorised service engineer.
3	Not Used	
4	Temperature fault	Temperature is outwith the CO_2 Multi Monitor's operating range. Adjust ambient temperature to within the CO_2 Multi Monitor's operating range. If problem persists, contact an authorised service engineer.
5	Flow fail fault	Check the filters are clean and in good condition. Check the sample line for blockages or damage.
6	CO_2 ADC fault	CO_2 gas signal is out of range. Contact an authorised service engineer.
7	Negative zero drift fault	Contact an authorised service engineer.
8	O_2 ADC fault	Contact an authorised service engineer.

DEALING WITH FAULTS

To accept/clear a fault, proceed as follows:

1) Press the 

button on the front panel to accept each system fault. The internal buzzer is silenced when the last remaining active fault is accepted.
2) Select the Fault display, see "*VIEWING MONITOR DETAILS*" in the previous section for further details.
3) Check the fault Code(s) using the table detailed on the previous page and follow your in-house procedures to correct the fault(s).

When the fault(s) are rectified:

- the FAULT status LED switches off
- the system automatically enters safe status and "SAFE" is displayed on the Normal Operating display
- the FAULT relay is restored automatically.

TROUBLESHOOTING

This section provides troubleshooting information for the CO_2 Multi Monitor. If you experience any problems with the system, check the troubleshooting table provided before calling for service.

Read (and adhere to at all times) the safety section at the front of this guide before attempting to troubleshoot the CO_2 Multi Monitor.

Problem	Possible Cause	Action
Green power LED on the front panel is OFF.	Problem with the ac power to the CO_2 Multi Monitor unit.	Check ac power supply to CO_2 Multi Monitor unit. The unit is normally wired to a local non-switched fused spur.
	Fuse in terminal block may have blown.	Call for authorised service engineer.
Green power LED on the front panel is illuminated but the display is off.		Call for authorised service engineer.
CO_2 Multi Monitor does not respond or does not appear to be working correctly.		Call for authorised service engineer.
A1 or A2 alarm LED lluminated.	A1/A2 alarm limit has been exceeded on one or more channels.	Follow your in-house procedure for dealing with alarms.
Suspect a faulty status LED or the buzzer is faulty.	Status LED or buzzer damaged.	Carry out a status LED and buzzer test. See "*VIEWING MONITOR DETAILS - Test In Progress"* in the "*BASIC OPERATION*" section before calling for an authorised service engineer.
FAULT LED illuminated.		Check the "*FAULTS DISPLAY*" section for further details.
"CAL ERROR" on the display.	Memory corrupted.	Recalibration required. Call for authorised service engineer.
"ZERO FAIL" on the display.	Zero has not been successful.	Check the "fresh air" supply and re-zero. Call for authorised service engineer if message re-appears.

ADDITIONAL INFORMATION

TRAINING

All personnel who operate or maintain safety systems should be trained in the correct procedures by the manufacturer.

GMI are happy to support our customers by providing training courses on all our products. Contact our Customer Support Department for further details.

SERVICE

GMI offers inclusive service contracts with guaranteed response times to contract customers, for details contact the Service Department.

Field Service Engineers

GMI operates a field service department who have trained engineers fully conversant with all of their products. These engineers operate from fully equipped vehicles and can be contacted via their service base. The engineers are backed up by Customer Service Units at Glasgow and Milton Keynes to whom requests for service should be directed.

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24 Hour Service

In addition GMI operate a 24 hour service system for contract customers whereby service engineers can be contacted anytime 365 days a year.

WORLD WIDE WEB

Visit the GMI web site at: http://www.gmiuk.com.

PARTS LIST

Comprehensive parts lists are available on request from the Sales Department at GMI.

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Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.

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