Parasense
A BACHARACH. COMPANY

GRM2 CO2

REFRIGERANT MONITOR

OPERATION & MAINTENANCE MANUAL

Models
GRM2-104D2-1xxCO2

Doc. Ref. MNGRM2CO2 REV. 3

reliability ° efficiency ° performance

GRM2 CO2
Refrigerant Monitor

Models
GRM2-104D2-1xxCO2

Disclaimer

The information contained within this document is subject to change without notice.

While Parasense continue to make the information within this document as accurate as possible, it may contain unintentional typographical or technical errors. Any errors found are changed and incorporated into a revised edition of this document.

Parasense assumes no responsibility for its use, or for any infringements on the rights of third parties that may result from its use.

Contact

Parasense Limited

Phone: +44 (0) 1452 724123
Email: salesuk@parasense.com
Web: www.parasense.com

Parasense, Inc

Phone: +1 (540) 948 9919
Email: sales@parasense.com
Web: www.parasense.com

‘Caution, Risk of Electric Shock’ Please isolate elsewhere before opening Monitor door.

Please read this manual before installing or servicing the equipment.

TABLE OF CONTENTS

Revision	Details	Checked
2-0: 17th April 2014	RS485 networked sensor information added.	AK
2-1: 6th Nov 2015	Clarified display and behaviour in relation to RS485 networked SAMMs measuring oxygen. Added note to explain that ATM2R must be located next to the gas sensor. Further information added regarding networked gas sensors. More details added to door and network module replacement procedure. Checked column added to this table. Styx replacement procedure updated. Multiple corrections.	DG
2-2: 7th Sept 2016	System test section updated. Quality management logos added. Optional ADC terminal panel details updated.	DG
2-3: 25th Jan 2017	Improved instructions for making a network connection to the GRM2. System test instructions updated. Zero calibration instructions for smartGAS sensors added.	AK
2-4: 4th Apr 2017	Field calibration instructions for two types of CO2 sensor added. Field calibration routine for a GDS sensor on RS-485 SAMM added.	JW
2-5: 21st Apr 2017	Revisions to field calibration instructions for CO2 sensor.	JB
2-6: 30th May 2017	Wiring schematics for Clairair CO2 sensor added. Amended field calibration instructions for CO2 sensor.	JB
2-7: 8th March 2018	Calibration and test procedures added for Bacharach MGS.150 sensor PS0778 updated to include Bacharach MGS.150 details Parasense logos updated	JB
5 March 2020	Updated addresses	JH

1 INTRODUCTION

The Parasense GRM2 CO2 series monitors are advanced refrigerant leak detection devices utilising infrared absorption sensors to analyse air samples.

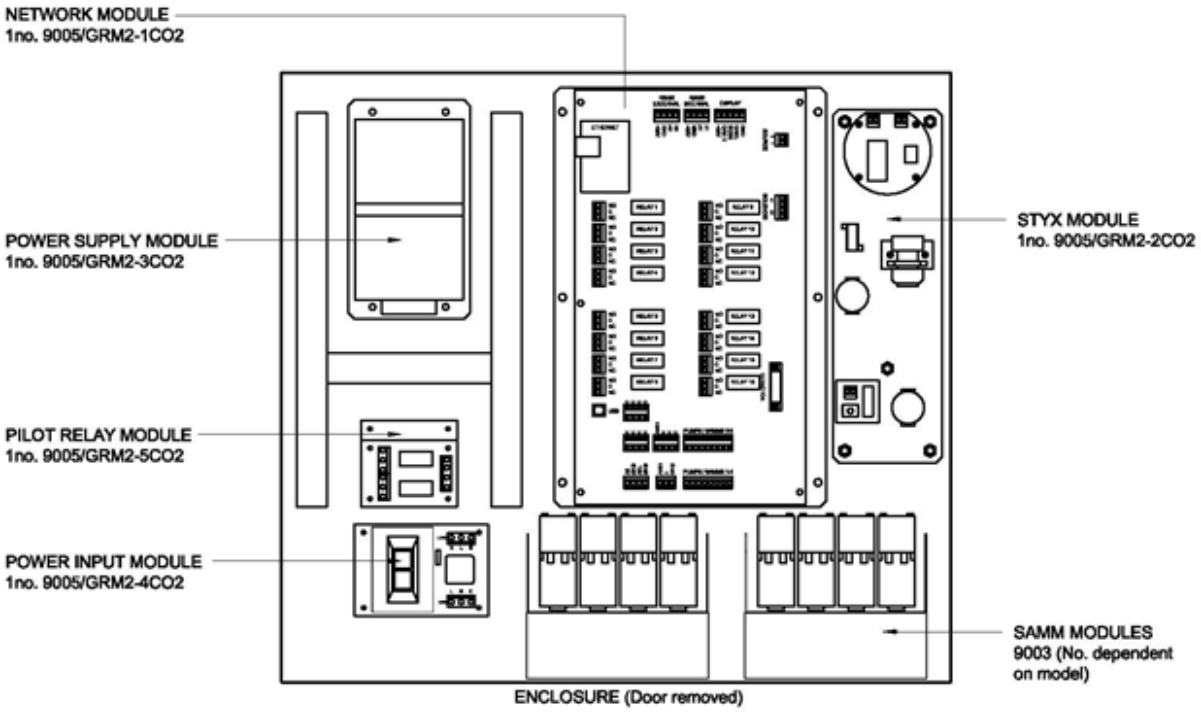
Dependent on model, the monitor will have 4, 8, 12, or 16 individual internal SAMMs (SAMpling Module), each having their own pump and filter. Each SAMM is connected to the area to be sampled by semi-rigid nylon pipework, referred to as freeway. The specific area can then be further subdivided into small regions using a manifold with multiple sampling pipes, known as spur kits (refer to the installation guide within this manual). This multi sampling technique ensures that likely sources of refrigerant leakage can be specifically targeted.

An additional method of leak sensing is also available. Local gas sensors can be connected via the RS485 network terminals. Samples are gathered locally and the information relayed back to the GRM2 CO2 via the RS485 network connection. A Parasense ATM2R cluster module is required for each network sensor; together these are referred to as an RS485 networked SAMM. An additional beacon/sounder can be connected to the ATM2R cluster module. The total number of network gas sensors that can be used is dependent on the individual application. Please contact Parasense for further information.

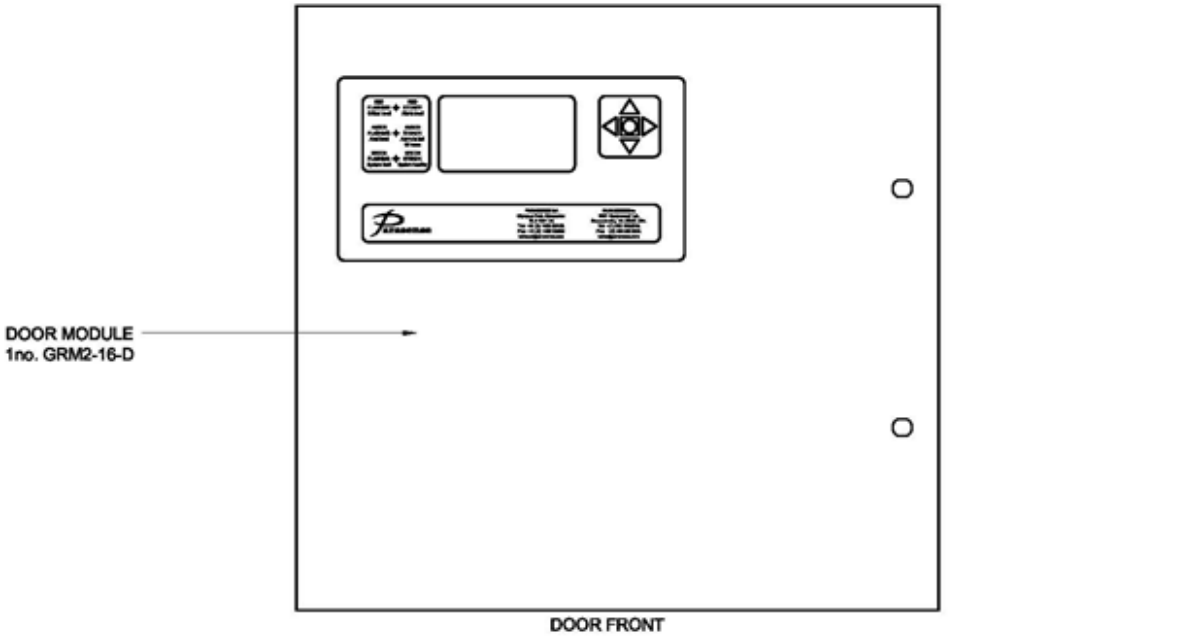
For both internal SAMMs and RS485 networked SAMMs, Alarms can be generated at three different levels described as ‘Alert’, ‘Alarm’ and ‘Critical’, these alarms can be signalled to other devices using the 16 configurable relays. The current alarm status is indicated on the 169mm (6.5”) TFT LCD display.

The ADC-104 is an optional terminal panel used in conjunction with the GRM2 CO2 to increase the available number of beacon/sounders, terminal connections and integration with onsite facility management systems. For full details of the ADC-104 please refer to the O&M Manual.

GENERAL ARRANGEMENT



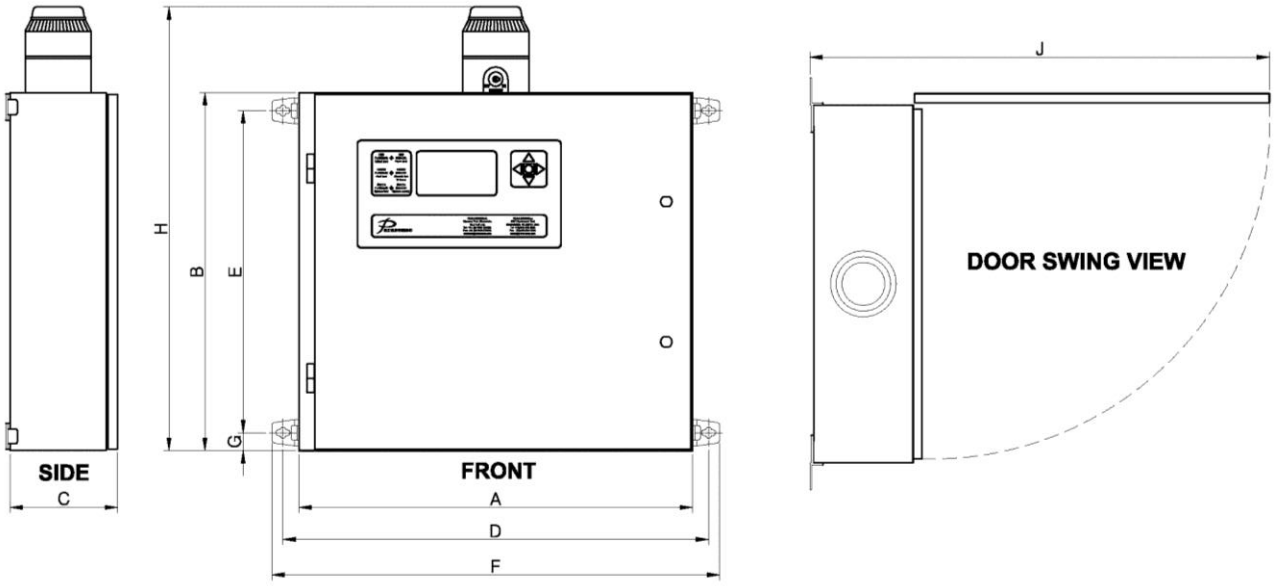
ENCLOSURE (Door removed)



DOOR FRONT

2 INSTALLATION GUIDE

ENCLOSURE DIMENSIONS



GRM2-104D2-116CO2	A	B	C	D	E	F	G	H	J	WEIGHT
Metric (mm)	550	500	150	600	450	650	25	620	700	22Kg
Imperial (In)	21.7	19.7	5.9	23.6	17.7	25.6	1.0	24.4	27.5	48.4lb

The monitor enclosure is not intended for external use. Where possible the enclosure and pipework should be positioned in areas with similar environmental conditions.

MONITOR FITTING INSTRUCTIONS

As the installation will require the disconnection and reconnection of main electrical circuits, work must be carried out by **SUITABLY QUALIFIED PERSONNEL ONLY**, and must be in accordance with the current regulations.

Four fixing brackets are supplied loose, choose orientation (horizontal / vertical), insert expanding nuts (if an internal fixed nut is not fitted) into holes in back of enclosure, push bolt through bracket to nut and tighten.

Mount the monitor on a solid vertical surface in a non-exposed area, in a position where the L.C.D screen can be easily and safely accessed, and where the environmental conditions are within;

Temperature	-9°C to 50°C (15°F to 123°F)
Relative Humidity	0% to 95% (non-condensing)

Space should be available around the unit to allow the opening of the door and fitting of sampling pipework, power and communications cables.

ELECTRICAL REQUIREMENTS

Each monitor requires an earthed, AC single phase mains supply in the range 100 to 240 volts, 50 to 60 Hz, protected by a 5 amp fuse or similar over current circuit breaker. Power consumption for this monitor is 65 watts.

The final connection should be made as indicated, incorporating a water tight strain relief bush with a smoothly rounded opening, through the detector enclosure.

Cable used shall be RATED for the maximum current of the equipment, and shall be certified or approved by a recognized testing authority.

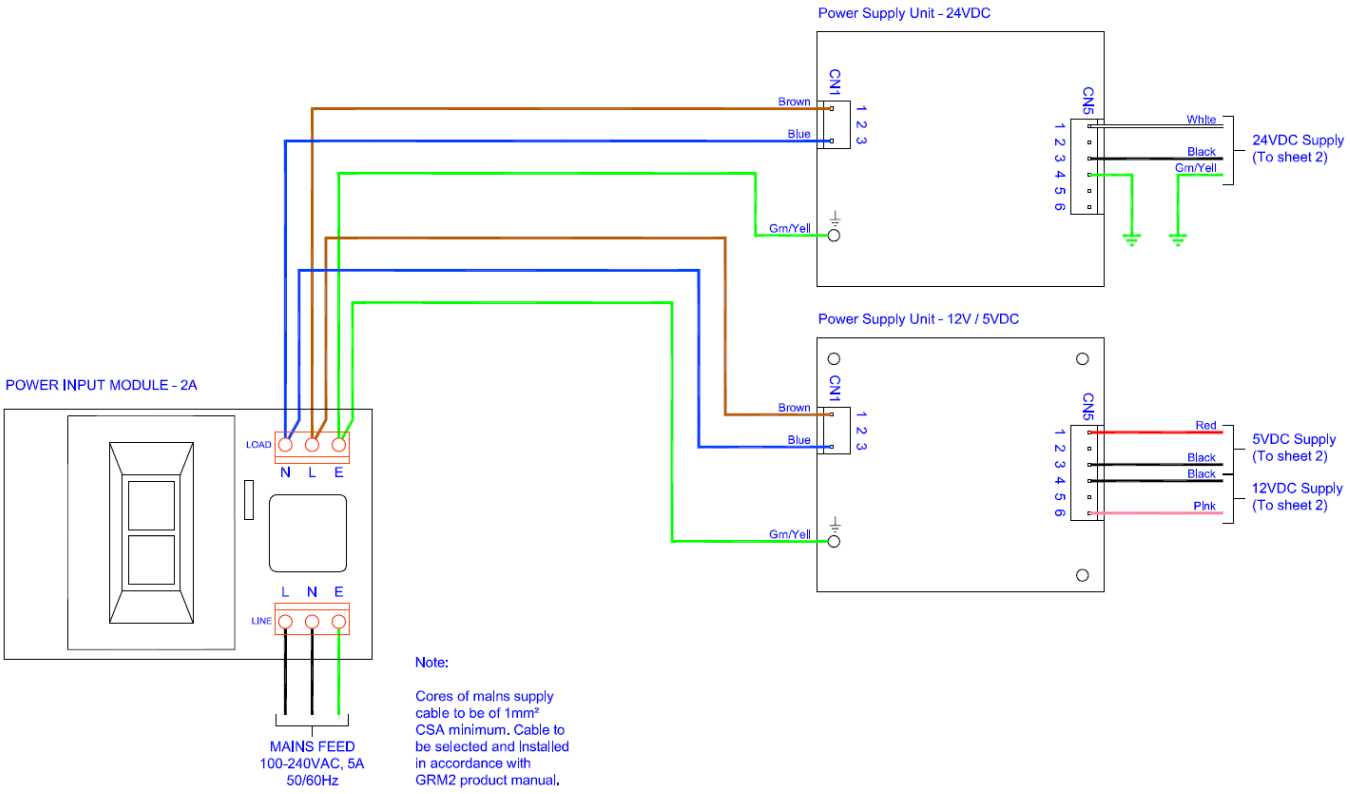
The cable anchorage shall relieve the conductors of the cable from strain, including twisting, where they are connected within the equipment, and shall protect the insulation of the conductors from abrasion. The protective earth conductor, if any, shall be the last to take the strain if the cable slips in its anchorage.

Cable anchorages shall meet the following requirements:

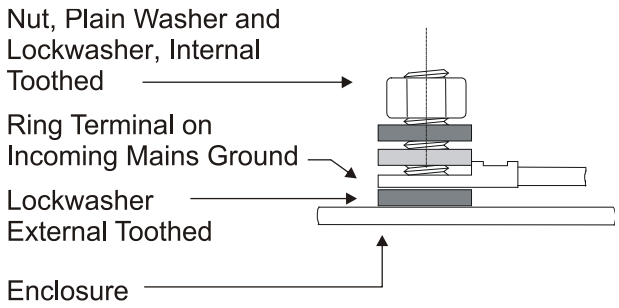
1) The cable shall not be clamped by a screw which bears directly on the cable.
2) Knots in the cable shall not be used.
3) It shall not be possible to push the cable into the equipment to an extent which could cause a hazard.
4) Failure of the cable insulation in a cable anchorage which has metal parts shall not cause accessible conductive parts to become hazardous live.
5) It shall not be possible to loosen the cable anchorage without the use of a tool.
6) It shall be designed so that cable replacement does not cause a hazard, and it shall be clear how the relief from strain is provided.

A compression bushing shall not be used as a cable anchorage unless it is suitable for use with the mains supply cable supplied with it or specified for it by the manufacturer.

MAINS INPUT CONNECTIONS



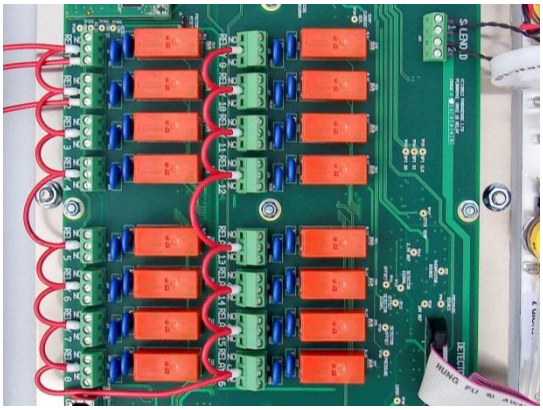
SINGLE GROUND EARTH SCREW CONNECTION



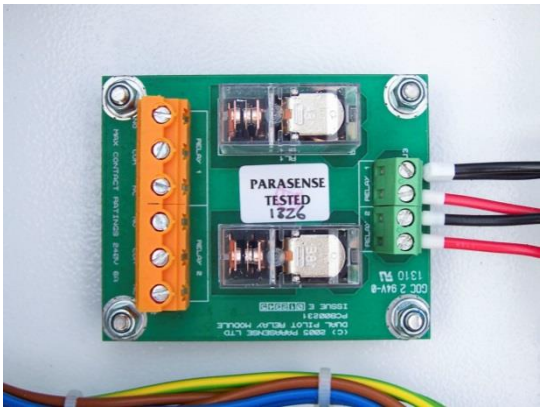
RELAY CONNECTIONS

16 separate, volt-free, configurable change-over relays are provided rated at 5.0 amps (resistive). We recommend that contact voltages should not exceed a nominal 24Vac/dc.

Two pilot relays are also provided on the power input module, voltages should not exceed 240 volts, rated at 5 amps (resistive). These are activated using relays 1 & 2 on the network module in conjunction with the 24Vdc auxiliary supply.



16 Configurable Relays on Network Module



Dual Pilot Relay Module

The relays are configured using the configuration tool. Refer to the monitor setup section of this manual for more information.

Relays become energised when the monitor is 'powered up', i.e. 'C' and 'NO' are linked, 'C' and 'NC' are open circuit. On loss of power or an alarm situation (see the monitor setup section of this manual) the relays become de-energised, i.e. 'C' and 'NC' are linked, 'C' and 'NO' are open circuit.

If a fault relay has been allocated, this relay will de-energise if a fault is detected. The fault cause will be shown on the display screen, and the green traffic light will flash. This condition will remain until the fault has been rectified.

Refer to 'cable connections, main PCB (network module)' for more information.

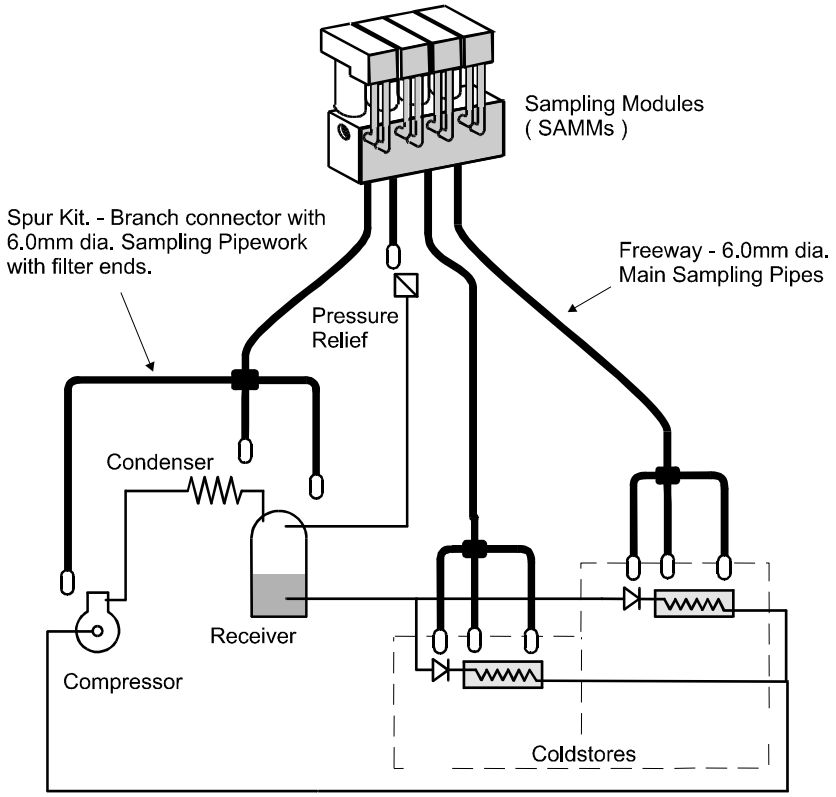
EXTERNAL COMMS

An Ethernet socket is available for local area network (LAN) or wide area network (WAN) communications. Connection to the GRM2 CO2 is via the network module mounted RJ45 connector.

Internal Ethernet Socket on network module

FREEWAY INSTALLATION GUIDELINES

Parasense sampling pipework, known as freeway, is used to draw samples of air from areas of potential leakage to the respective internal SAMM of the GRM2 CO2 monitor. A typical installation is shown below:



NOTE: Spur kit lengths shown are indicative only. Spur kit freeway pipe lengths must always be 5m/16ft (coil excess freeway)

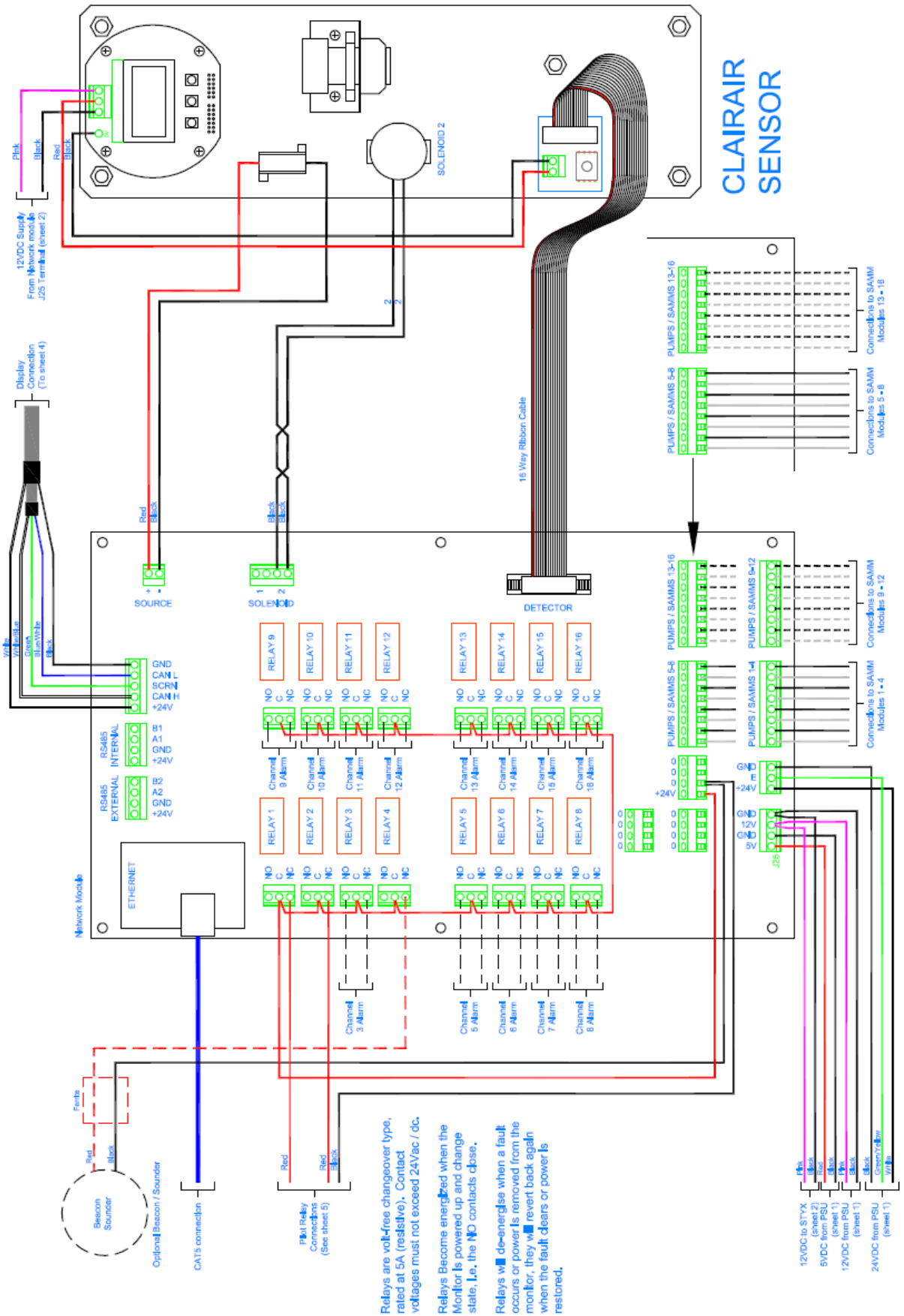
INSTALLATION – DO'S

- Maximum of one spur kit per internal SAMM.
- Maximum of 4 way split.
- Spur kit freeway pipe lengths must always be 5m/16ft (coil excess freeway). No exceptions.
- Ensure that the freeway is pushed fully into the connectors on the SAMM and spur kit branch connectors.
- Support and clip all freeway and spur kit branch connectors.
- Ensure that the freeway filters always point downwards.
- Attach identity markers to both ends of the pipework.
- Use continuous lengths of freeway (DO NOT JOIN).
- Sample points from a single SAMM must all be in the same room.
- Locate sample points as close as possible to the potential leakage areas.
- Cut the freeway straight using the Parasense supplied cutter.

INSTALLATION – DON'T'S

- Exceed 150m/492ft of freeway (including all spur freeway; E.g. for an installation with 100m/330ft of freeway + 4-way 5m/16ft spur kit, the length would be 120m/394ft).
- Flatten or kink the freeway.
- Bend the freeway at a radius of less than 150mm/6".
- Run the freeway from a warm place through a very cold space.
- Expose the freeway or spur kit to temperatures in excess of 60°C/140°F, or less than -30°C/-22°F.
- Let the spur kit filters ever be immersed in water or any other liquids.
- Mix spur kit freeway of different lengths on the same SAMM.
- Run freeway in areas where it may be stood on or restrict access to other equipment.

NETWORK MODULE CONNECTIONS



BEACON INSTALLATION

Remote beacon/sounders may be installed. The maximum number of beacon/sounders that can be powered by the GRM2 CO2 is determined by the following information:-

Internal 24V DC PSU spare capacity:

1.2A up-to 50°C (122°F) enclosure temperature
(max 10 Parasense Beacon/sounders)

0.6A between 50-60°C (122-140°F) enclosure temperature
(max 5 Parasense Beacon/sounders)

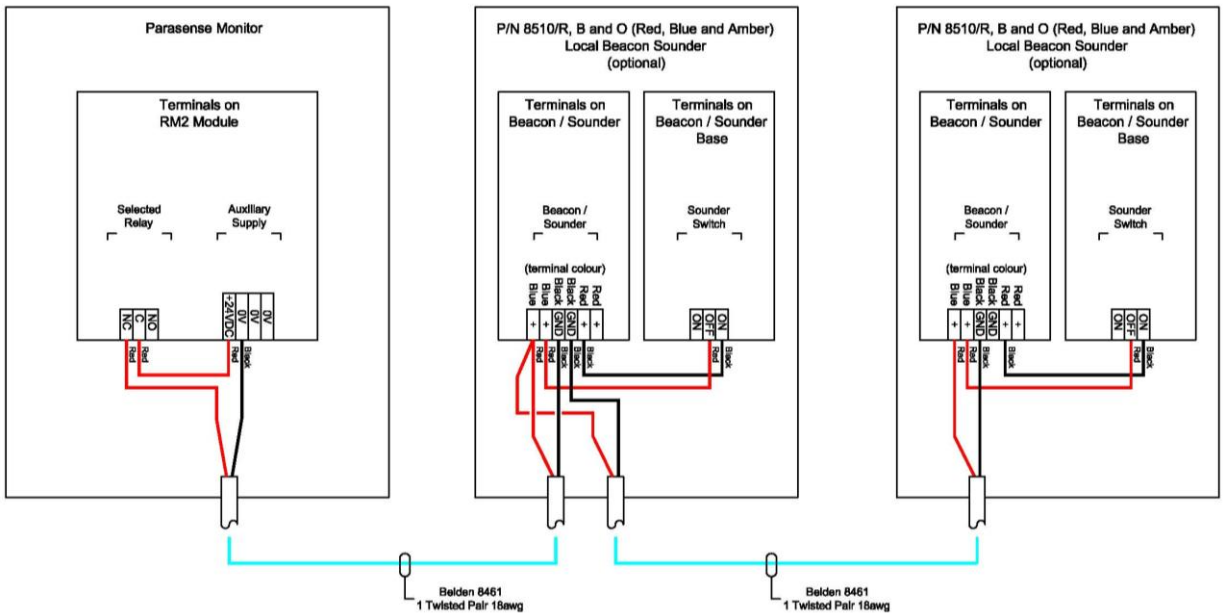
No spare capacity above 60°C (140°F)

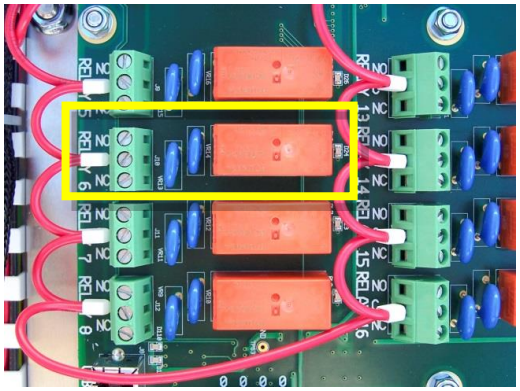
Parasense Beacon/sounder I_{max} at 24V DC:

When wired C-NC = 110mA

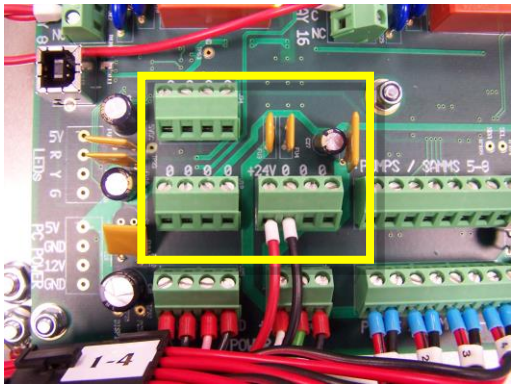
If the optional ADC auxiliary terminal panel is installed, refer to the wiring schematics in the appendix of this manual.

If no ADC auxiliary terminal panel is installed, beacon connection details are as follows:





Relay Connection on Network Module

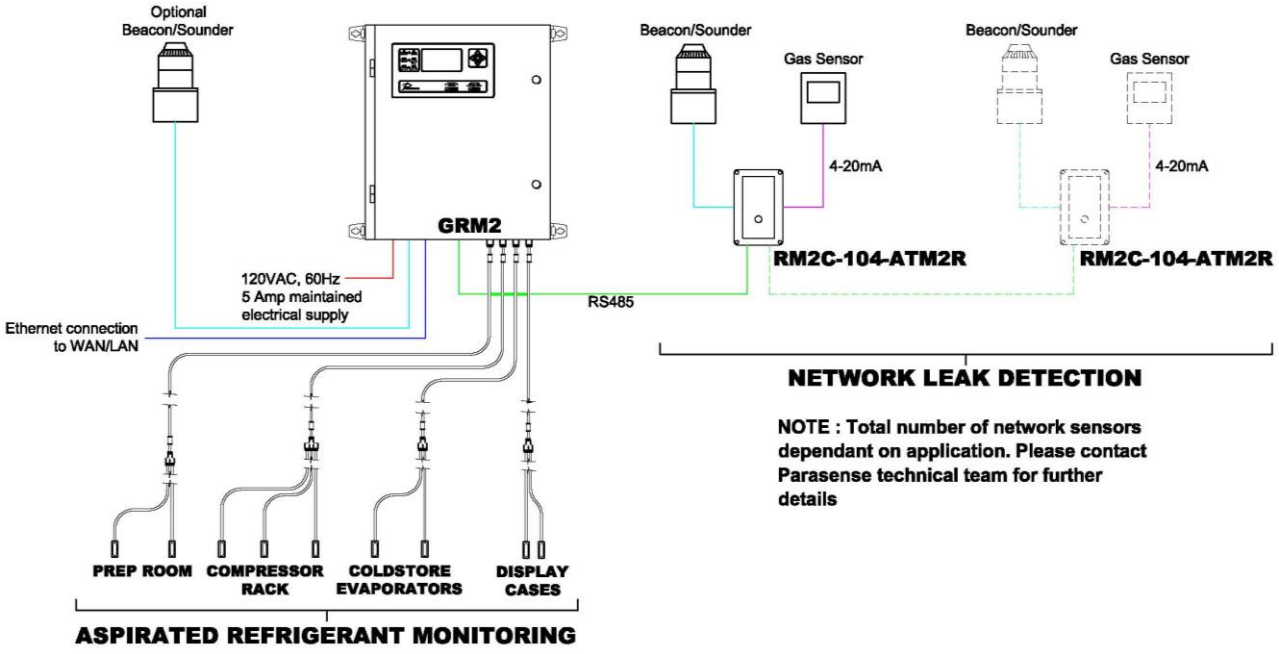


Auxiliary Supply and additional 0V landing points on network module

OPTIONAL RS485 NETWORKED GAS SENSORS

Optional network gas sensors are hard-wired to the GRM2 using the RS485 connections on the main network module.

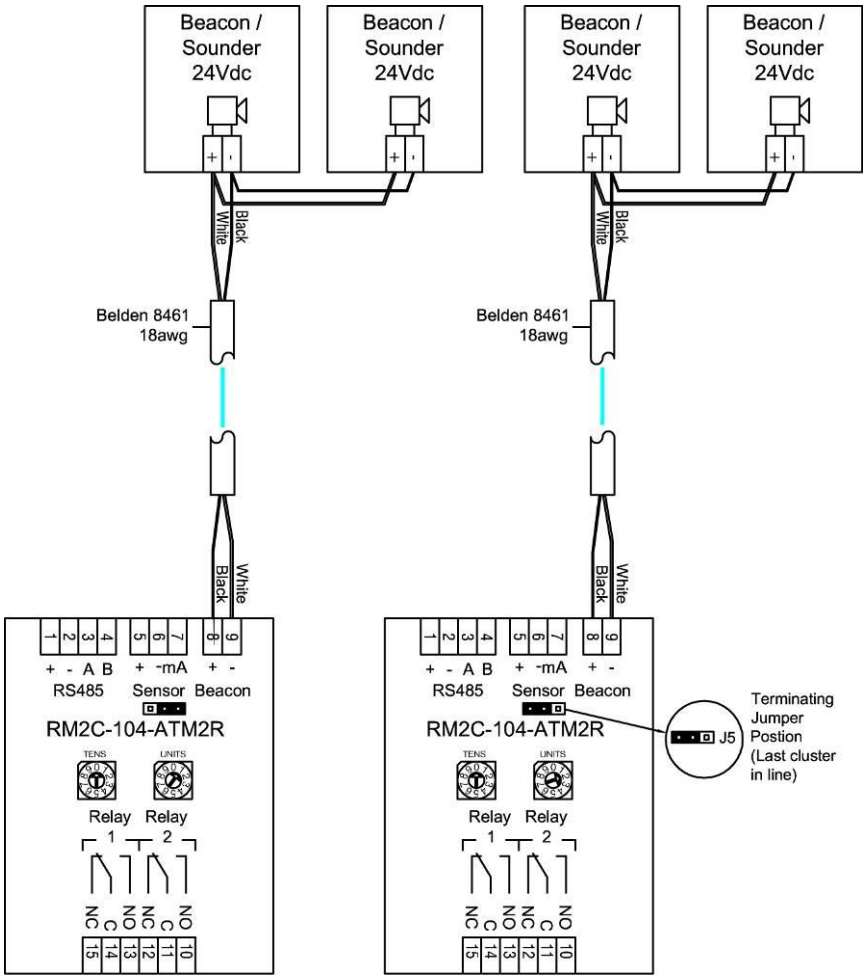
An overview of a GRM2 system using RS485 networked gas sensors is shown below. The analogue sensor trip module (RM2C-104-ATM2R) must be installed at the gas sensor end of the installation, either inside or outside the room being monitored or as near as possible to the area being monitored (in order to keep the connection between the analogue sensor trip module and gas sensor as short as possible). For further installation instructions please refer to PS0768 in the appendix.



OPTIONAL ATM2R SINGLE/MULTIPLE BEACON INSTALLATION

Each analogue sensor trip module (RM2C-104-ATM2R) can accommodate up to two beacon/sounders

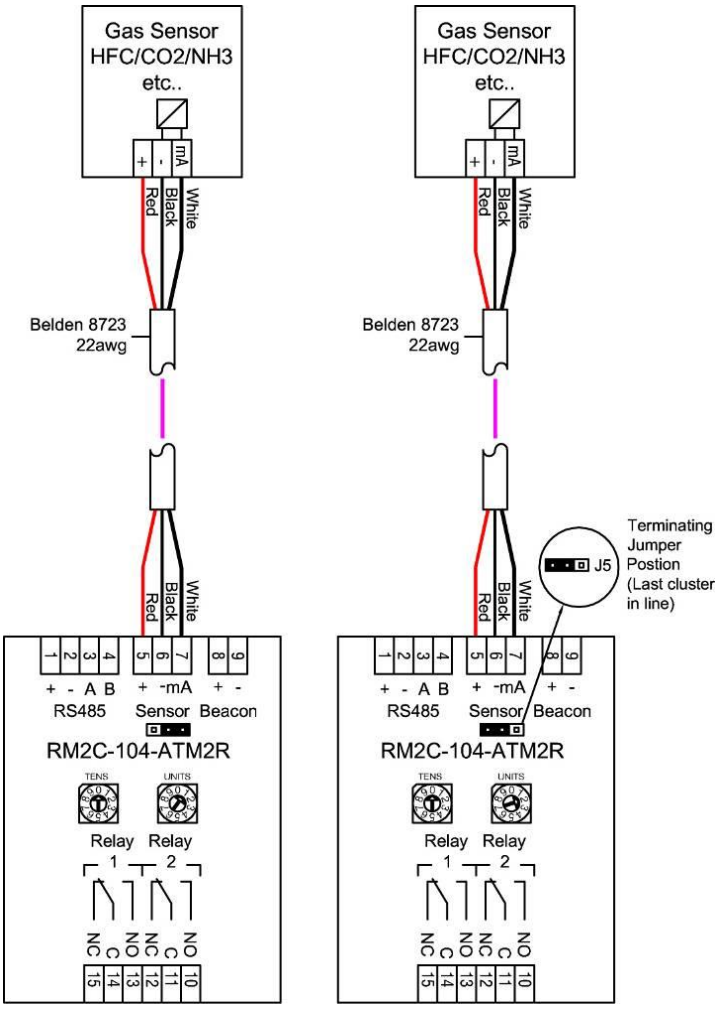
Below is the diagram for the connection of beacon/sounders:



Parasense Beacon

OPTIONAL NETWORKED GAS SENSORS

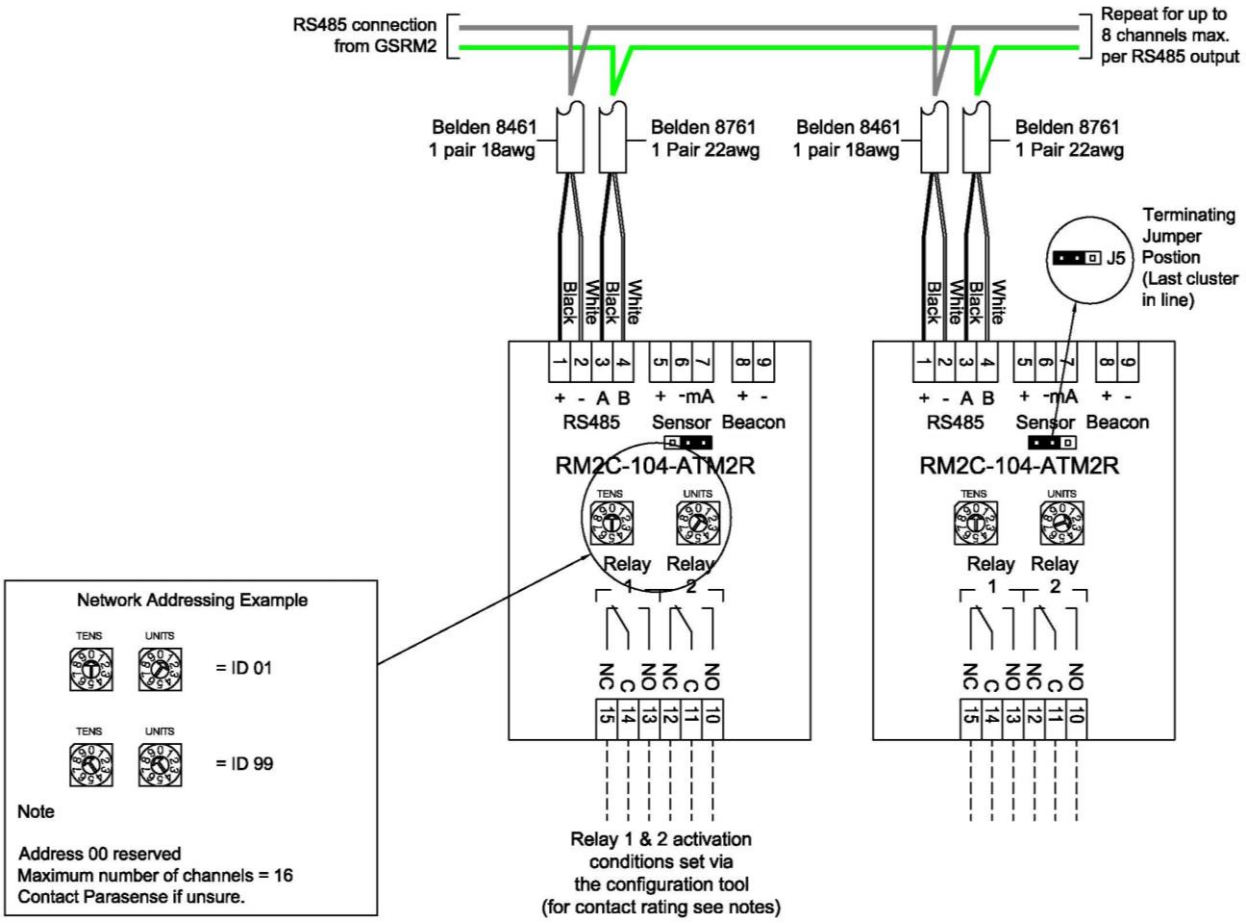
The gas sensors are wired to the analogue sensor trip modules (RM2C-104-ATM2R) as detailed below:



Some examples of the gas sensors are pictured below:

OPTIONAL ANALOGUE SENSOR TRIP MODULE

The analogue sensor trip module (RM2C-104-ATM2R) is wired as follows on the RS485 network:

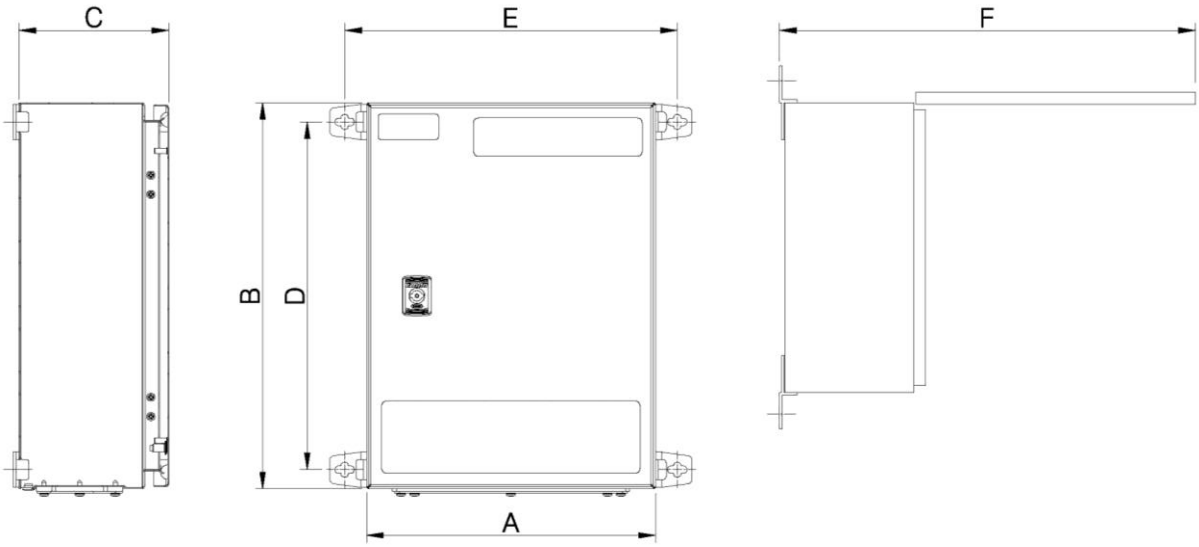


The analogue sensor trip module, with beacon test button:

3 ADC-104 TERMINAL PANEL (OPTIONAL)

The ADC-104 terminal panel is used in conjunction with the GRM2 CO2 to increase the available number of beacon/sounders, terminal connections and integration with onsite facility management systems.

ADC-104 DIMENSIONS



ADC Terminal Box	A	B	C	D	E	F	WEIGHT
Metric (mm)	300	400	150	360	345	440	10kg
Imperial (Inches)	11.8	15.7	5.9	14.2	13.6	17.3	22lb

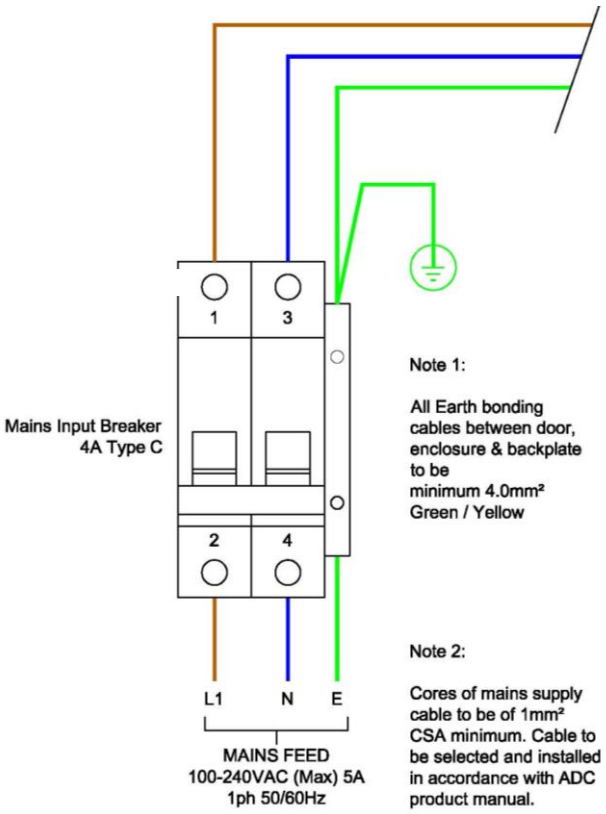
ADC-104 FITTING INSTRUCTIONS

As the installation will require the disconnection and reconnection of main electrical circuits, work must be carried out by **SUITABLY QUALIFIED PERSONNEL ONLY**, and must be in accordance with the current regulations.

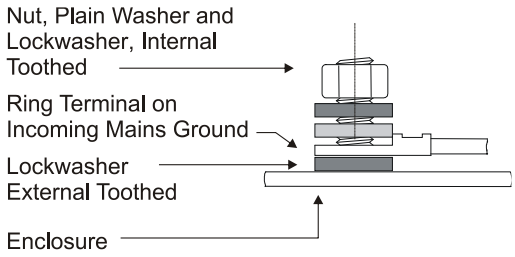
Enclosure Fitting Guide

1. It must be mounted to a solid vertical surface or structure capable of supporting the stated weight. We recommend the surface be built from concrete blocks or brick. It must be positioned where the door can be fully opened and in a location that facilitates easy service and maintenance.
2. The panel should be mounted using the fixed brackets as shown in the ‘Front View’ above.
3. Fixings should be 4mm (1/8”) or 5mm (3/16”) screws or bolts minimum 40mm (1.5”) long with plain washers and suitable wall plugs.
4. The panel should be located adjacent to the GRM2 or 3300RM2 that it is to be connected to as the factory supplied interconnection looms are only 1.5M (5ft) long. The gap between the GRM2 and ADC-104 should be no greater than 150mm (6”) as shown on the ‘Installation Overview’ below.

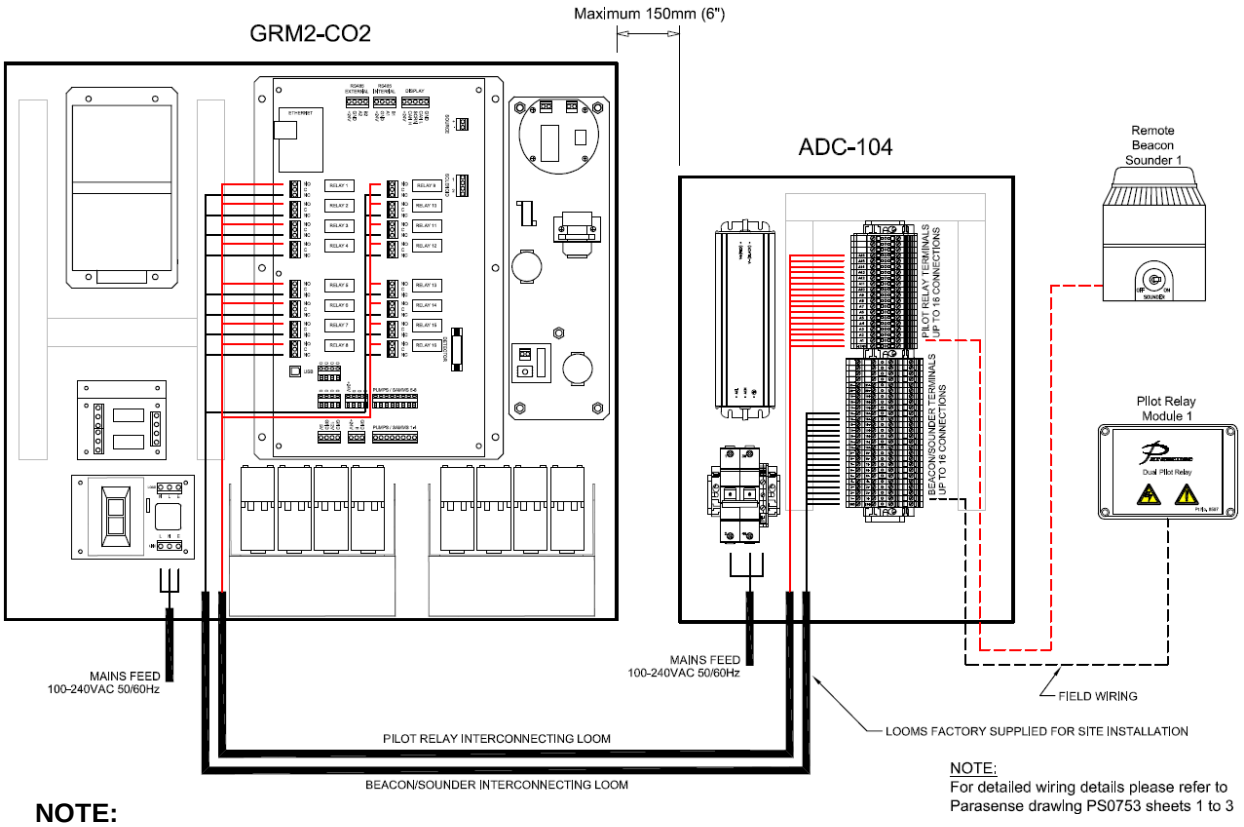
ADC-104 MAINS POWER INPUT CONNECTIONS



Single Ground Earth Screw Connection



GRM2 CO2 WITH ADC-104 INSTALLATION OVERVIEW



NOTE:
For full installation and maintenance details please refer to the ADC-104 O&M Manual

4 SETTING A WINDOWS PC TO COMMUNICATE WITH A GRM2 CO2

Communication with the GRM2 CO2 utilises the Ethernet socket mounted on the network module. A Cat5/Ethernet cable can then be plugged into the Ethernet socket, with the other end plugged into the Ethernet port of a PC running Windows XP or later.

The PC must have its local area network information configured to a range that will allow it to communicate with the GRM2 CO2. The exact terminology varies slightly between different versions of the Windows operating system. The instructions below are for Windows 10/Windows 8 with variations for Windows 7. Windows XP is covered separately.

WINDOWS 10, 8 and WINDOWS 7

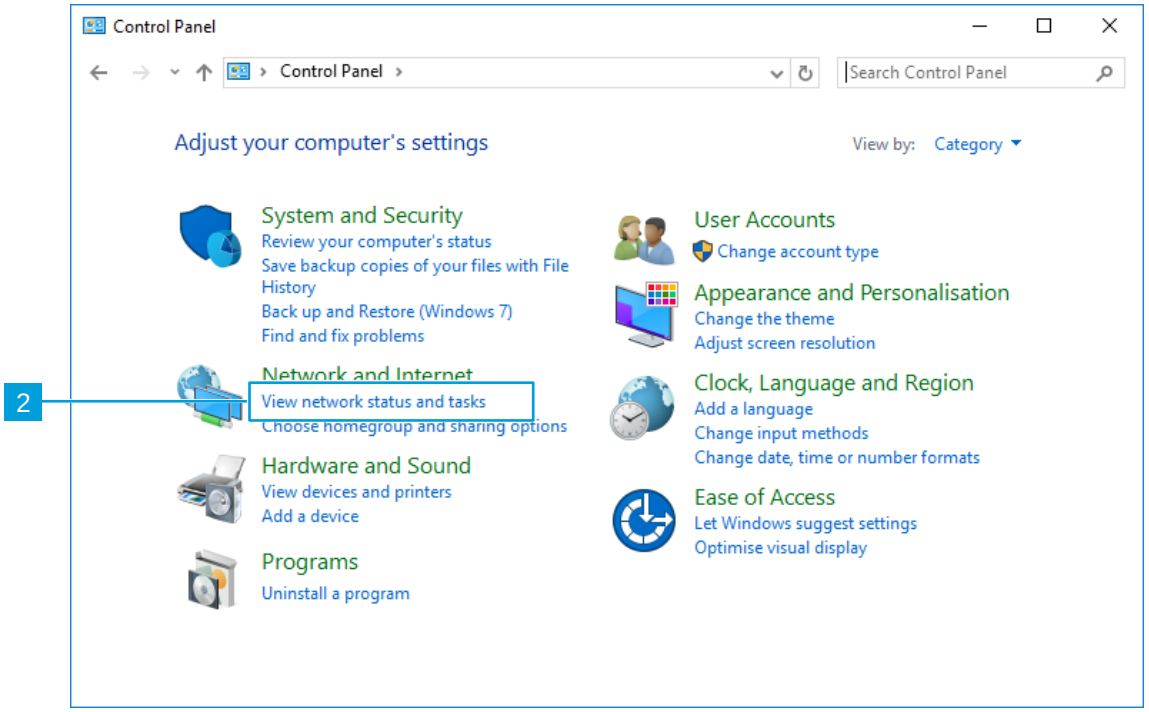
1) Take a note of the current network settings of the GRM2 CO2 system (please refer to the Network Settings menu of the Monitor Setup/Management Menu section for information).

2) From the PC Desktop, access the control panel:-

   Using Windows 10 or 8: Press and release both the 'Windows' key and 'X' key at the same time. Click 'Control Panel'.

   Using Windows 7: Click 'Start', 'Control Panel'.

3) Under 'Network and Internet' of the control panel, click 'View network status and tasks'.

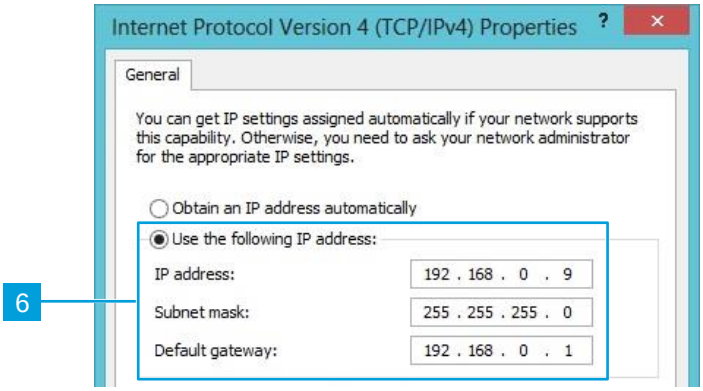


4) Click 'Change adapter settings' in the left hand menu. Right-click 'Ethernet' or 'Local Area Connection' and choose 'Properties' from the popup menu.

5) From the list shown, select 'Internet Protocol Version 4 (TCP/IPv4)' then click the 'Properties' button.

6) The existing settings for your PC will be shown. If the option 'Use the following IP address' is set, take a note of the values that are shown onscreen. This information will be required at step 9 of these instructions.

7) Click on 'Use the following IP address'. Enter the Gateway setting noted in step 1 into the Default Gateway field. Enter the first 3 parts of the Address setting noted in step 1 into the first 3 parts of the IP address field (e.g. if the Address noted was 192.168.0.50, then enter 192.168.0). In the 4th IP address field, enter a value which is different to the 4th value of the Address noted in step 1 (e.g. if the Address noted in step 1 was 192.168.0.50, then enter any value other than 50).



Note: there must be no other device connected to the same network with the same IP address you have used (e.g. using the above screenshot as an example, there must be no other device connected to the same network with an IP address of 192.168.0.9).

8) Click 'OK', and close all previously opened windows.

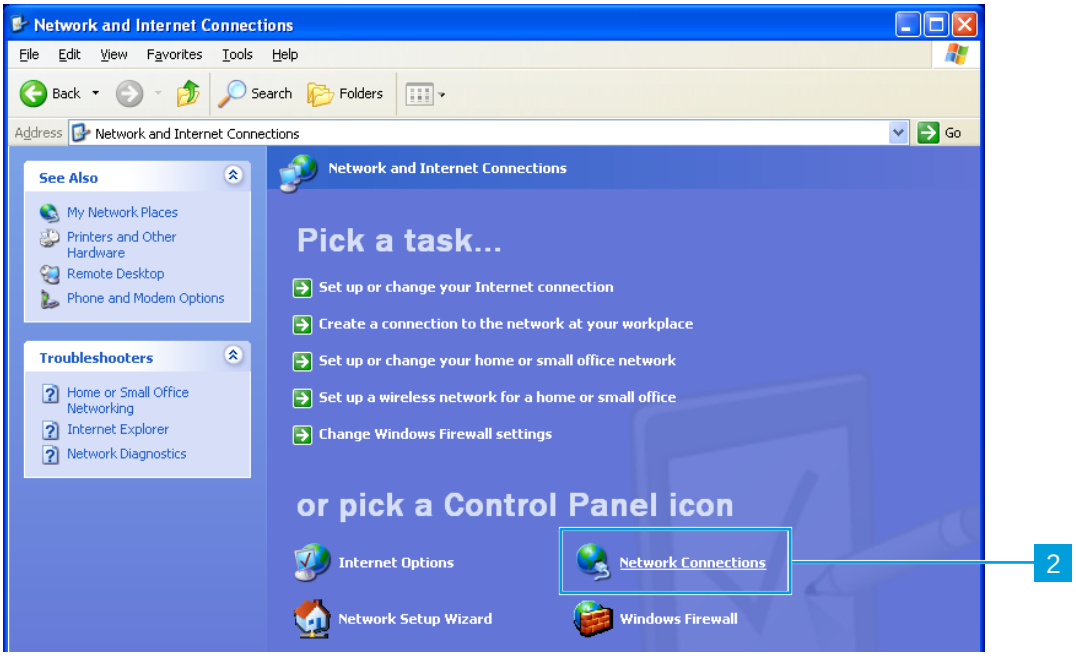
9) Once all communication with the GRM2 CO2 is complete, change the PC settings back to the previous settings by following the instructions above from step 2 to 7. The information noted in step 6 must replace the data in step 7.

WINDOWS XP

1) Take a note of the current network settings of the GRM2 CO2 system (please refer to the Network Settings menu of the Monitor Setup/Management Menu section for information).

2) From the PC Desktop, access the control panel by clicking 'Start', 'Control Panel'.

3) Click 'Network and Internet Connections' followed by 'Network Connections'.



4) Right-click the ‘Local Area Connection’ option and choose ‘Properties’ from the popup menu.

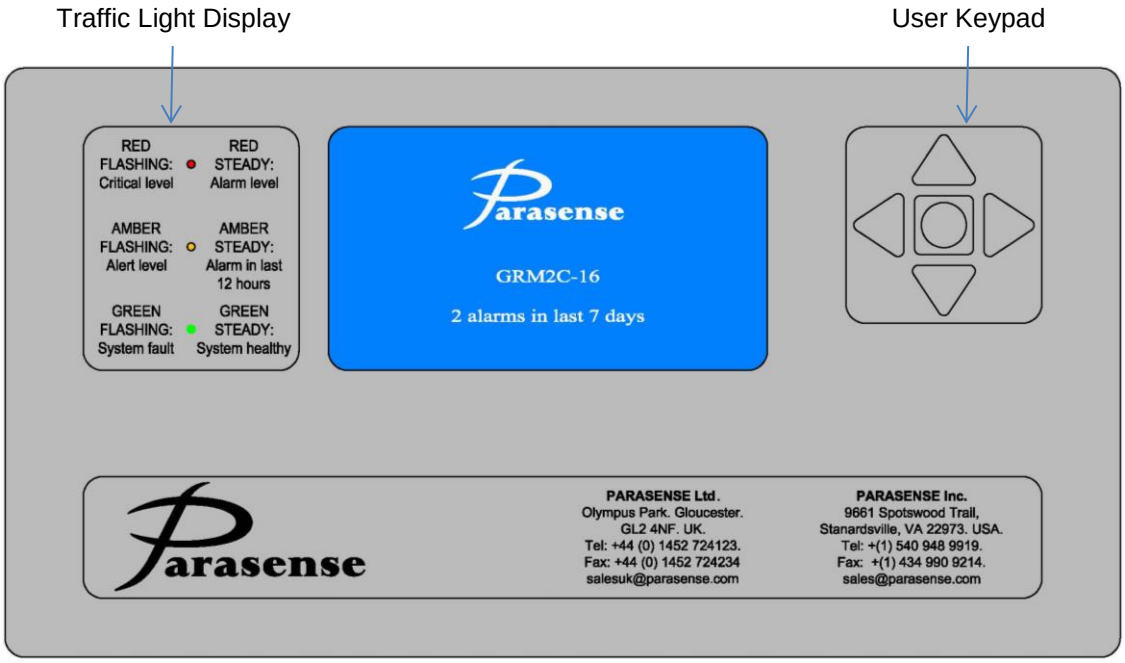
5) Scroll down the list in the middle of the form and click on ‘Internet Protocol (TCP/IP)’ then click the ‘Properties’ button.

Continue with steps 5 to 8 of the Windows 10, 8 and 7 instructions.

5 MONITOR SETUP

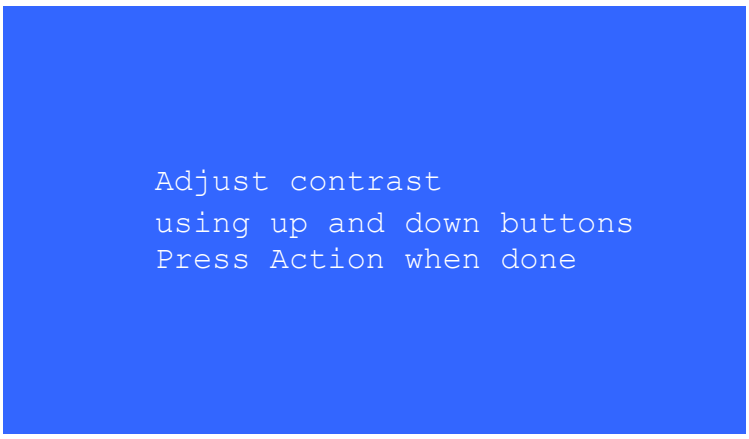
The GRM2 CO2 refrigerant leak detection system is controlled using a 5 button panel on the outside of the enclosure. The △▽◁▷ buttons can be used to move the cursor between options. When the appropriate option is shown, pressing the ◯ button will confirm the selection.

The buttons can be used to move the cursor between options. When the appropriate option is shown the centre button will confirm the selection.



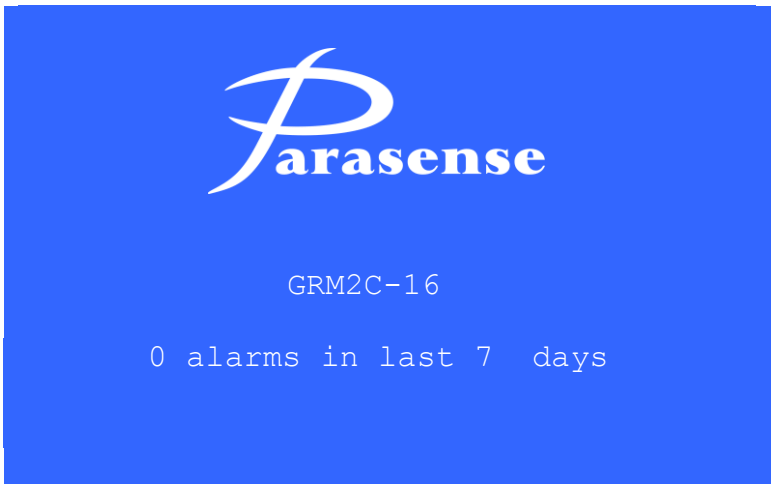
If the system is left unattended for a period of 3 minutes the LCD backlight will switch off. After a further period of 4 minutes, the display will return to the home screen. The LED's will continue to indicate the current status of the system. As soon as a button is pressed the display will illuminate and the home screen will be displayed.

To adjust the LCD contrast, simultaneously press the △ & ▽ buttons. The display LED's will cycle through ON/OFF in sequence to indicate that you are in contrast mode. Using the △ & ▽ buttons, you may now adjust the contrast of the LCD to the desired level. If the screen is completely blue, press the △ button until text is visible. If the screen is white, press the ▽ button. Once the required contrast level is achieved press the ◯ button to confirm and close the contrast menu.

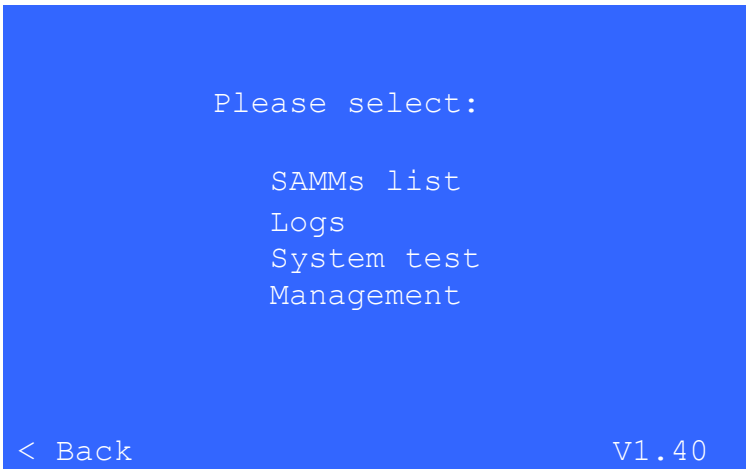


HOME SCREEN

The home screen is shown when the system is first accessed, or if no buttons have been pressed for more than 3 minutes. The home screen displays the product name and number of configured channels. Also displayed is the number of alarms (maximum of 100) that have occurred over the recording period (1 to 14 days as set during configuration).



Pressing the centre button on the keypad accesses the main menu:

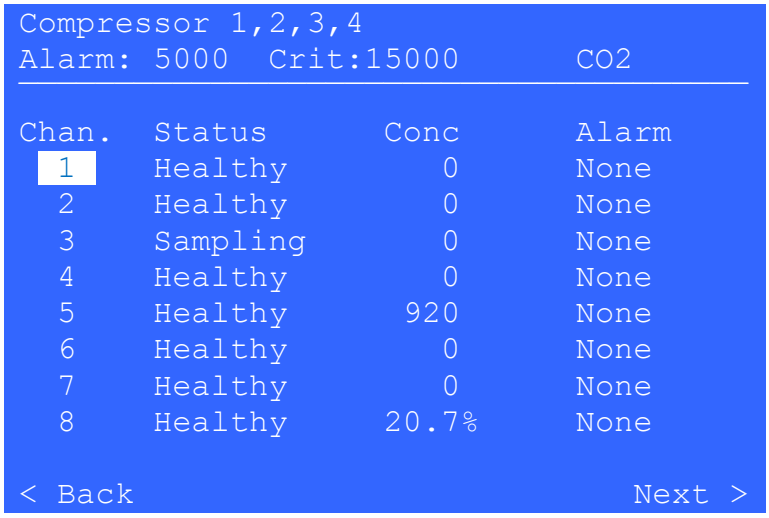


There are four menu options available:

- SAMMs list : Shows a summary of all channels.
- Logs : Allows you to view alarms, faults and events logs of the GRM2 CO2.
- System test : Provides a facility to verify the detection capability of the system.
- Management : Gives access to system maintenance tools.

SAMMS LIST

The SAMMs list shows each of the channels along with its ID, sampling or fault status, most recent sample concentration (reported as PPM for all gases except oxygen which is reported as a percentage accurate to 1 decimal place) and current alarm condition. The top two lines of this screen give a summary of the highlighted channels' configuration. The first line is the name assigned to the channel; the second line shows the alarm & critical threshold levels and the chosen gas type. If a custom gas is chosen, the word 'Custom' is displayed (This is because the name given during configuration is not available to the display).



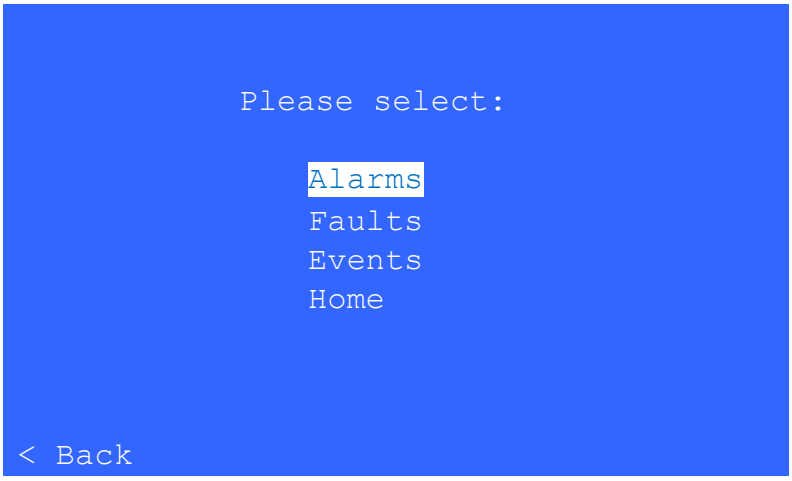
Select a channel using the △▽ buttons to move the cursor. The summary information at the top of the screen will change to display the currently highlighted channels configuration.

When there are more than 8 channels in use, the ◁▷ buttons are used to move between pages. When the first page is shown, 'Back' will return to the main menu.

On pressing the ◎ button, a pop-up menu window is displayed, offering the choice "Manual sample: Yes/No". Selecting "Yes" initiates a manual sample (the status, ppm and alarm fields update accordingly as the sampling process takes place).

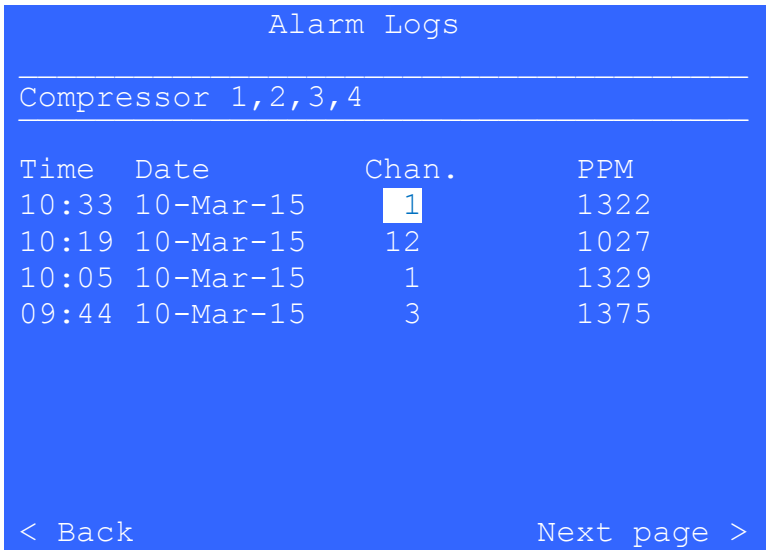
LOGS MENU

The logs menu enables you to view logs that are held on the GRM2 CO2. There are 3 types of log; alarms, faults and events. Use the △▽ buttons to select the log to view, then press the ◯ button to access the information.



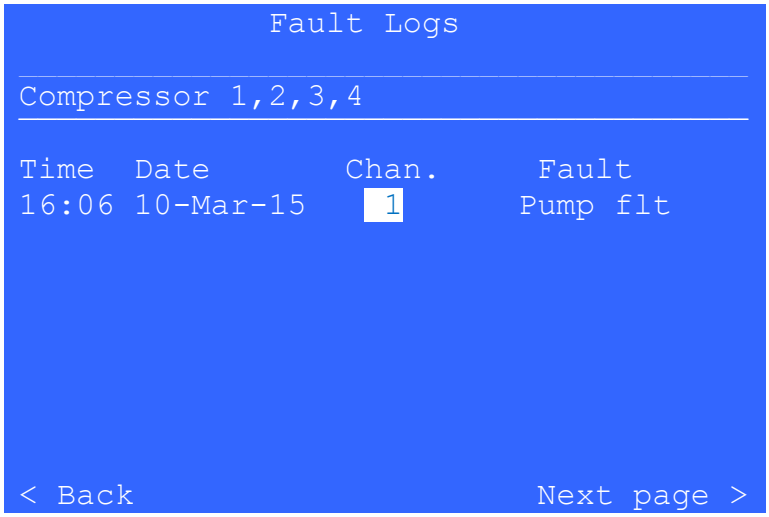
ALARMS LOG

The alarms log allows the user to view the most recent 100 alarms. Eight entries are displayed on each page. Use the △▽ buttons to highlight the desired channel. The name of the selected channel is displayed at the top of the screen. The ◁ and ▷ buttons carry out the function of 'Back' and 'Next page'. These may be used to move between pages. When the first page is shown, 'Back' will return to the log selection menu.



FAULTS LOG

The faults log allows the user to view the most recent 100 faults. Function buttons perform in the same way as for the alarm logs. Use the △▽ buttons to highlight the desired channel. The name of the selected channel is displayed at the top of the screen. The ◁▷ buttons carry out the function of 'Back' and 'Next page'. These may be used to move between pages. When the first page is shown, 'Back' will return to the log selection menu.

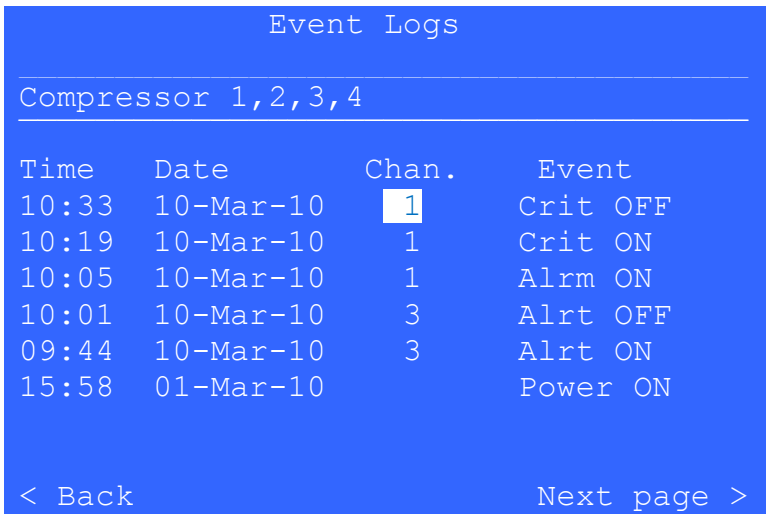


Because of the restricted space available on-screen, all fault descriptions are given an abbreviated format. A full list of abbreviations and their description is shown below:

Abbreviation	Full Description
STYXcold	STYX not at working temperature
Pump flt	Insufficient flow detected
Prsr flt	Over-pressure condition detected
RScksum **RStime** **RSwakeup** **RSwrite**	RS485 ATM2R module communication failure
Sens flt	RS485 ATM2R module detected the signal from the gas sensor was outside the manufacturers operating range
24V flt	RS485 ATM2R module detected low 24V supply
5V flt	RS485 ATM2R module detected low 5V
mem flt	RS485 ATM2R module failed to save its configuration information

EVENTS LOG

The events log allows the user to view the most recent 100 events. Function buttons perform in the same way as for the alarm and fault logs. Use the △▽ buttons to highlight the desired channel. The name of the selected channel is displayed at the top of the screen. The ◁ and ▷ buttons carry out the function of 'Back' and 'Next page'. These may be used to move between pages. When the first page is shown, 'Back' will return to the log selection menu.

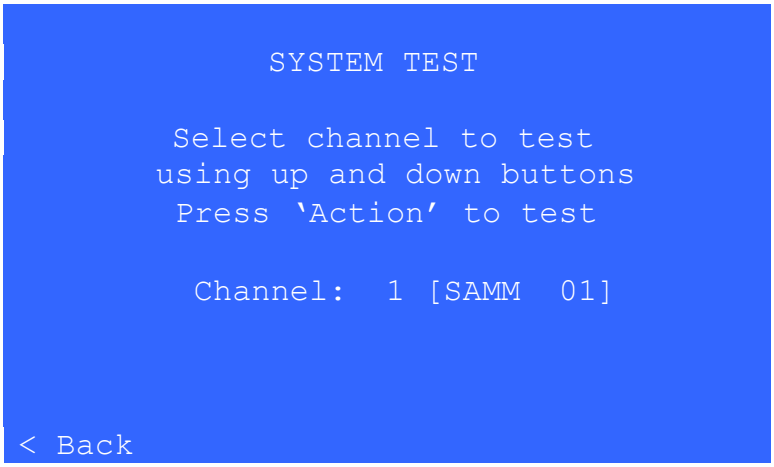


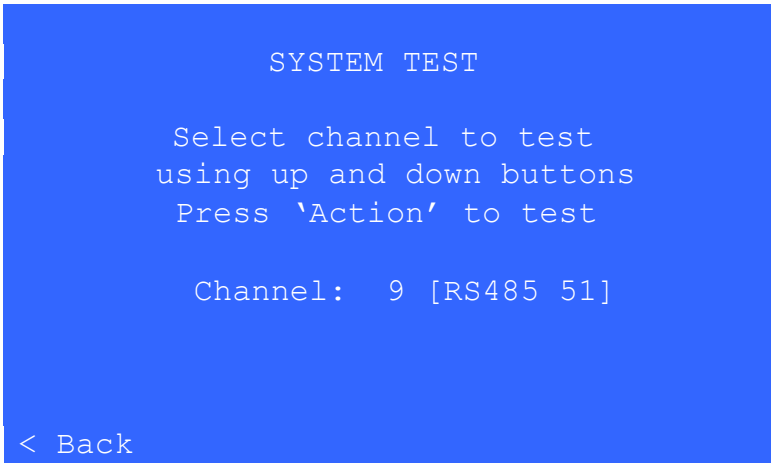
Because of the restricted space available on-screen, each event description is shown in an abbreviated format.

Abbreviation	Full Description
Power ON	System powered on
Verify	Sample was at or above Alarm threshold so a verification sample is being performed
Ver stop	Verification sample was below Alarm threshold, preceding sample has been discarded
Man.Samp	Manual sample initiated
Sys.test	System test initiated
Flt ON	Fault condition activated
Flt OFF	Fault condition de-activated
Alrt ON	Alert condition activated
Alrt OFF	Alert condition de-activated
Alrm ON	Alarm condition activated
Alrm OFF	Alarm condition de-activated
Crit ON	Critical condition activated
Crit OFF	Critical condition de-activated

SYSTEM TEST

'System Test' will enable you to carry out a test sample of a chosen channel. Selecting this option from the 'Management' menu will forward you to a channel select screen. Choose a channel to be sampled using the △▽ buttons. The type of channel ('SAMM' for internal aspirated channel, or 'RS485' for a network channel) is indicated after the channel number, along with the internal SAMM (freeway inlet) number or RS485 network ID for the selected channel.



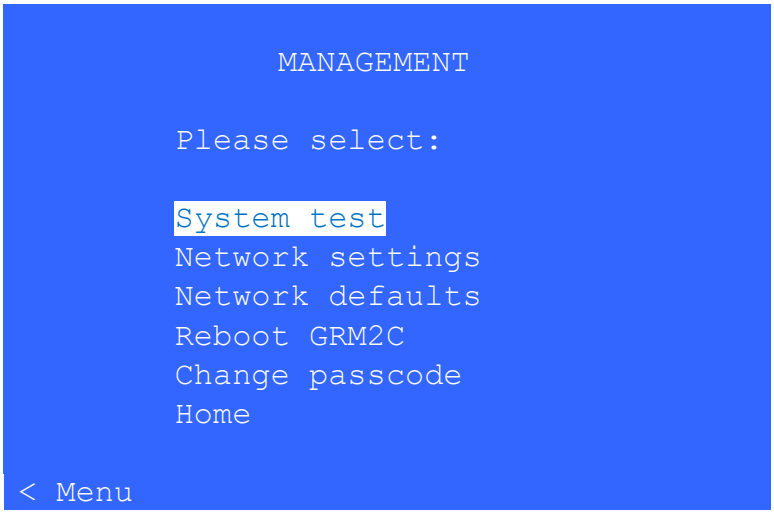


Pressing the ◯ button will start a sample sequence lasting up to 90 seconds. The "< Back" function is not available during the sample process and the buttons have no effect. When the sample is complete, the "<Back" function re-appears and the sample result is displayed. If the sample exceeds the configured thresholds, any associated relays will be actuated.

Please refer to the system test section for comprehensive instructions of the step-by-step test procedure.

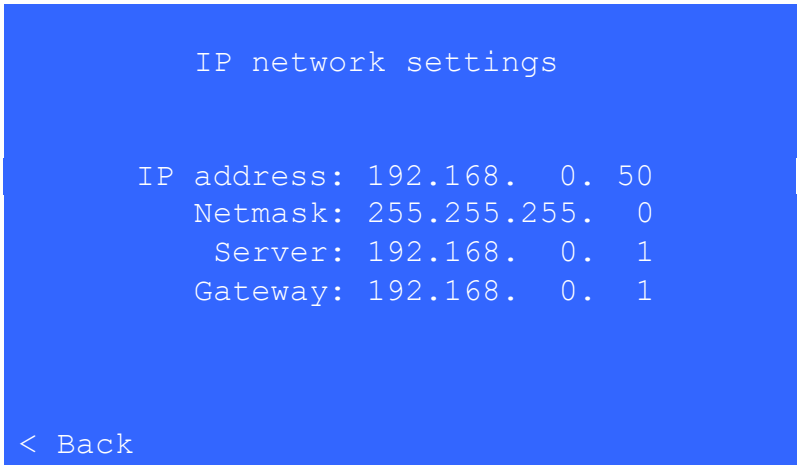
MANAGEMENT FUNCTIONS

Selecting ‘Management’ from the menu displays a passcode entry keypad (unless the correct passcode has been entered within the previous 10 minutes). When the correct passcode has been entered, the management menu is displayed.



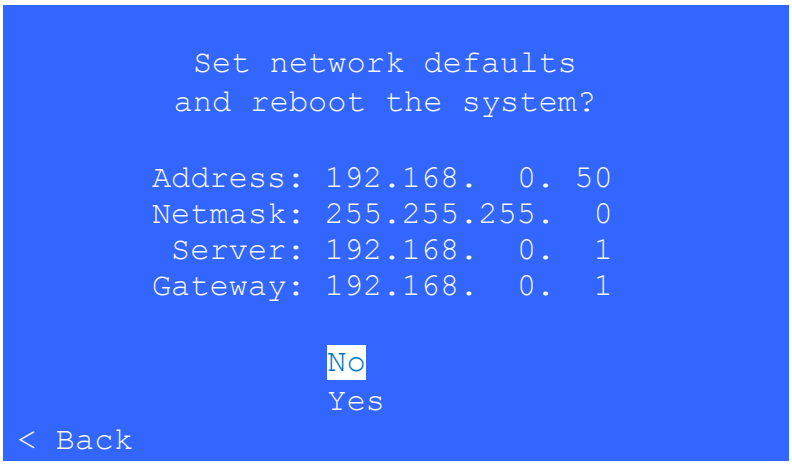
NETWORK SETTINGS

‘Network Settings’ will display the current IP network settings of the monitor. Select ‘Network Settings’ from the management menu. The following page will display the IP network settings. By pressing the ◁ button, you will return to the management menu.



NETWORK DEFAULTS

Selecting ‘Network Defaults’ will show the default IP network settings and ask for confirmation.

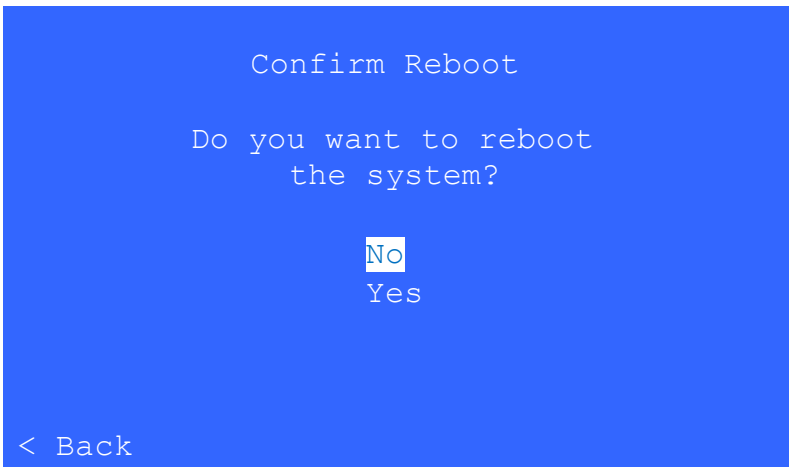


Confirm that you want to set the IP networks settings as displayed on the screen by selecting ‘Yes’. If you wish to abort this function, select No and press the ◯ button to return to the management menu, leaving the network settings unchanged. Pressing the ◁ button will also abort this function and return to the management menu leaving the network settings unchanged.

REBOOT GRM2C

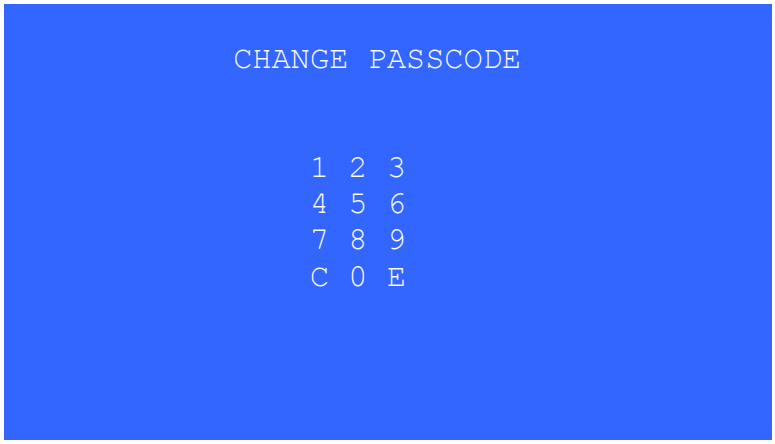
If required, you can reboot the monitor from here (Note: this function does not change any settings, but simply reboots the monitor).

From the management menu, select ‘Reboot GRM2C’. Highlight ‘Yes’ using the △▽ buttons and press the ◯ button. The monitor will now reboot. If you do not wish to continue with this function, highlight No and press the ◯ button, or press the ◁ button. This will cancel the reboot and return to the management menu.



CHANGE PASSCODE

From the management menu, select ‘Change Passcode’. On the ‘Change Passcode’ keypad, enter the new passcode by highlighting each character and pressing the ◯ button to select. If you wish to delete the characters, highlight ‘C’ (clear) and press the ◯ button. All characters entered will be deleted.



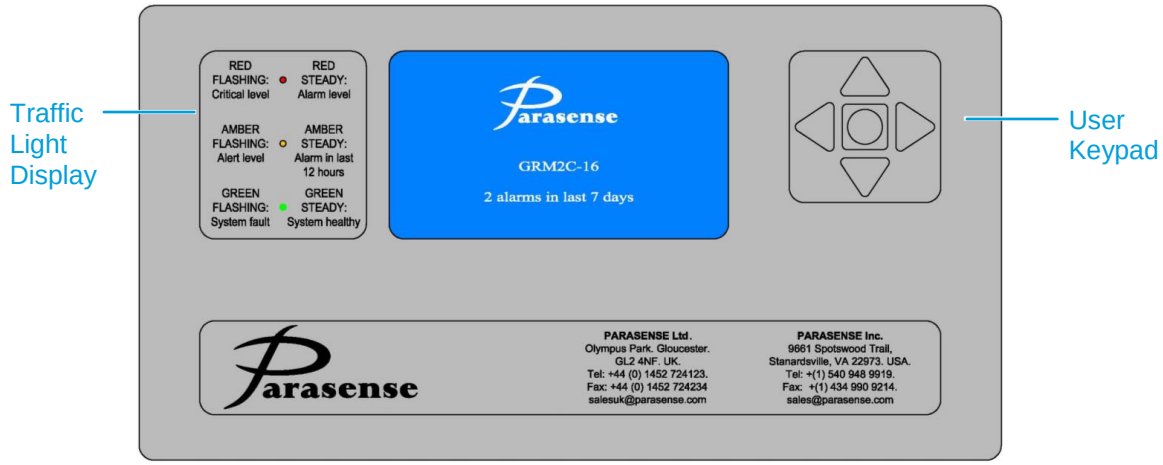
Once you have entered the new passcode, highlight ‘E’ and press the ◯ button.

From now on, the new passcode will be used to access the management menu. If it is decided not to continue with the passcode change, simply enter the current passcode and highlight ‘E’ to confirm.

6 USER GUIDE

The GRM2 CO2 series monitor is operated via a door mounted user interface. This includes a traffic light alarm display, an LCD panel and a 5 button keypad.

On power up of the monitor, self-diagnostics are carried out. This will cause the traffic lights to flash and some messages may appear on the screen. If the monitor is starting from cold, it is suggested that it is left to warm up for 24 hours to ensure correct readings. Following power up, you are presented with the home screen where the current status of the monitor is shown.



The monitor's features can be accessed or viewed via the keypad functions as described below.

Local and remote access to this information is also available via the network module RJ45 Ethernet connector. Please contact Parasense for more information (see back page of this manual for contact details).

If there is no keypad activity for 3 minutes the LCD back-light will switch off and the display will go dark. The traffic light display will still function to the present status of the system. Any keypad activity will cause the LCD back-light to switch on.

To adjust the LCD contrast, simultaneously press and hold the △ & ▽ buttons. This will activate the contrast function. Using the △ & ▽ buttons, you may now adjust the contrast of the LCD to the desired level.

Once complete press the ◎ centre button to close the contrast menu. If the screen is completely blue, press the △ button until text is visible. If the screen is white, press the ▽ button.

KEYPAD FUNCTIONS

To navigate through menus on the monitor, there are four directional arrow buttons. Use the △▽ buttons to move the cursor up and down to the required option. Pressing the action button ◎ of the keypad, whilst the cursor is on the required option, will action the request. The ◁▷ buttons will move the cursor to the left and the right where applicable, but can also be used to view the previous and next page of data where available.

TRAFFIC LIGHT DISPLAY

The traffic light display gives an “at a glance system status” of the monitor. The significance of the traffic lights is as follows:

Red Flashing Light:	The most recent measurement of refrigerant concentration has exceeded the ‘Critical’ threshold.
Red Steady Light:	The most recent measurement of refrigerant concentration has exceeded the ‘Alarm’ threshold.
Amber Flashing Light:	The most recent measurement of refrigerant concentration has exceeded the ‘Alert’ threshold.
Amber Steady Light:	A measurement of refrigerant exceeding one of the alarm thresholds has been detected during the last 12 hours.
Green Steady Light:	The refrigerant monitor is operating to design specification.
Flashing/No Green Light:	A fault exists on the refrigerant monitor.

ALARM OR FAULT ON THE SYSTEM

If a reading has been detected in excess of the configured alarm thresholds, the traffic light display will indicate the level of that alarm. The alarm count on the home screen will be incremented, and the alarm will be logged.

If multiple alarms have been triggered, the traffic lights will indicate the highest alarm level. Individual alarm information can be obtained from the SAMMs list and Alarms log.

DEFAULT CONFIGURATION SETTINGS

Monitors are supplied programmed with “ready to use” default configuration data. Modifications to this data can only be carried out through a connected PC running the Parasense configuration software. Please contact Parasense for more information.

Network Settings		**SAMM Settings**			
IP Address:	192.168.20.168	**Alert Level:**	3000ppm	**Pipe Length:**	150m/492ft
Netmask:	255.255.255.0	**Alarm Level:**	5000ppm	**Refrigerant:**	CO2
Server:	192.168.20.1	**Critical Level:**	15000ppm		
Gateway:	192.168.20.1				

Channel Name/State	**General Settings**		**Relay Settings**	
CHANNEL 1	**Units:**	Metric	**Relay 1 – 16:**	Any Critical
thru to	**Sample Interval:**	30 Minutes		
CHANNEL 16				

7 SERVICE AND MAINTENANCE

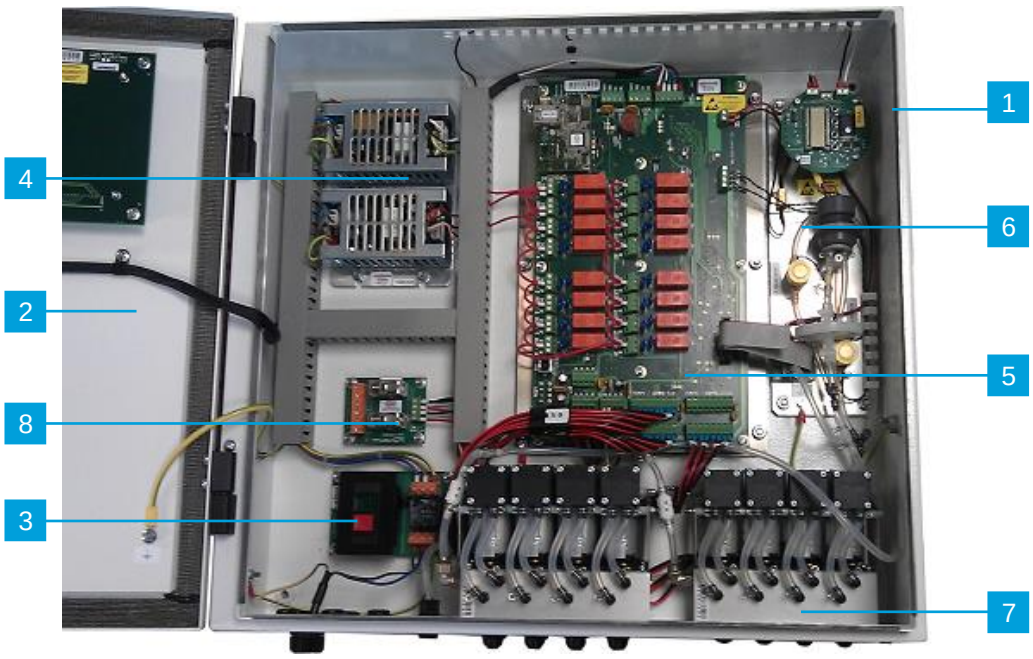
The Parasense refrigerant detection monitor has been designed to automatically collect and analyse samples of air, to record and report the time, presence and concentration of refrigerants, in accordance with the set configuration.

Parasense warrants the monitor for a period of one year from the date of purchase against defects in materials and workmanship. This warranty will not apply to defects resulting from the non-compliance with this manual, over voltage, physical abuse, ingress of water or tampering with individual items. Use of equipment in a manner not specified by the manufacturer may impair the protection afforded by the equipment.

Parasense offers a wide range of service and maintenance contracts, remote access software and management reporting packages. Details and cost of service exchange units can be obtained from Parasense or their approved distributor.

The monitor has no user serviceable components, but comprises of eight basic 'building blocks'.

1) **Monitor Enclosure**.
2) **Enclosure Door** incorporating the operator keypad and LCD display.
3) **Power Input Module**.
4) **Power Supply Module**.
5) **Network Module** incorporating mounting plate and PCB with connectors for remote communications, data storage and processing capabilities for the SAMM modules.
6) **Styx Module** incorporating mounting plate, infrared absorption sensor, pneumatic solenoids, flexible pipework and filter.
7) **Sampling Module (SAMM) Block** incorporating four individual SAMMs, each with their own pump and filter.
8) **Pilot Relay Module**.



SYSTEM FAULT DIAGNOSIS

In the event of a fault occurring with the system, the green LED will flash. The SAMMs list will show which SAMM is involved and the nature of the fault. Bear in mind that more than one SAMM may have a fault. The fault logs will also show faults with the most recent shown first. During the course of checking the system it may be necessary to switch off the system. When this is done the relays will change to their 'alarm/fault' state. It may be necessary to isolate these alarm systems or make others aware that an alarm will occur.

For all faults A visual check on all screw-in terminals may provide the solution, ribbon cables and pneumatic hoses may provide the solution.

The pneumatic hoses within the monitor should be clean and clear. Should there be excessive dark-coloured contamination within the pneumatic hoses, there may be a problem with contamination. Water ingress will also have a detrimental effect on the Styx module. In either case, this will need to be investigated.

Prior to carrying out these checks, switch off the external mains supply to the monitor and wait for a few seconds while the power supply to discharges. Open the door with the key provided and switch off at the internal power input module by pressing the red button.

Having checked all connections are secure, switch on at the internal power input module by pressing the green button, close and lock the door and reinstate the mains power supply.

If the fault does not clear, refer to the following fault messages and procedures;

Note: only a suitably qualified person observing the relevant safety precautions should carry out work on this equipment.

The green "Healthy" display LED is not on or flashing/the display does not illuminate

It is possible that no flashing Green LED is indicated on the Display due to a failure of the electrical supply to the display. This can first be identified if none of the LEDs are illuminated.

Fault finding steps:

1) Press the action key (round central button on the display). The display backlight should normally come on. If the backlight does not come on then follow the steps below with external power still present to the monitor. If the backlight does come on cycle the power to the monitor and check the monitor.
2) Open the door to the monitor and measure the V AC between L1 & L2 at the bottom of the power input module. If the voltage is less than 100V AC check the external supply breaker and cabling.
3) If the incoming voltage across the lower L1 & L2 terminals is between 100~240V AC measure the V AC between L1 & L2 at the top of the power input module. If the voltage is not within 100~240V AC switch off the mains supply externally and wait for a few seconds for the power supply to discharge. Replace the power input module. (Parasense P/N: ASY00263. Description: 1 Phase input module 2A).

4) Reinstate the mains power, switch on at the internal power input module (green button pressed) and confirm there is between 100~240V AC across the top L1 & L2 terminals. Measure the DC voltage across the “POWER” terminals [J17 24V & GND] at the lower left of the network module. If 24V DC is found then proceed to the next step. If 24V DC is not present, replace the PSU.
5) Measure the DC voltage across J13 terminals [+24V & GND] at the top of the network module. If the voltage is less than 22V DC then switch off at the internal power input module and disconnect the cables connected at J13, making sure the terminal colours are noted. Switch on the monitor and measure the DC voltage across J13 terminals [+24V & GND] again. If the voltage is still less than 22V DC replace the network module, otherwise switch off the monitor, reconnect the cables at J13 and switch on again.
6) Measure the DC voltage on the display module across J1 [V+ & V-] at the top left of the PCB. If 24V DC is still not detected the display wiring loom is faulty. If 24V DC is found then the display module will need to be replaced.

FAULT MESSAGES

In the event of a fault occurring as well as the flashing green LED, a fault message will be displayed on the SAMMs list. The faults log will show all fault messages with the most recent first.

Overrange

‘Overrange’ is not shown in the faults log as it is a result of a PPM reading. If only one SAMM is showing ‘Overrange’ then that area has a higher CO2 concentration than the system is designed to monitor. In exceptional circumstances it is possible that the network module AND the PSU have developed a fault. All fault finding steps must be followed to confirm the exact nature of the problem.

Fault finding steps:

1) Check all screw-in terminals and ribbon cable connections are secure.
2) Check that the display is functioning normally (this proves whether the 24V DC supply is present). If the display backlight is not lit and the display is unresponsive, refer to the previous section “**The green “Healthy” display LED is not on or flashing/the display does not illuminate**” to continue the fault finding process.
3) If the display is functioning normally, check that 24V DC exists across the ‘PL2’ terminals on circular PCB on the Styx module. If there is no 24V DC, check that 24V DC exists across J3 +24V and 0 terminals on the network module. If 24V DC exists, the wiring to Styx module is faulty. If 24V DC is not present, the network module and/or Styx module may need to be replaced.
4) Check that the LCD display on the Styx module is showing a 4 digit value in the range 0.000 to 2.000. If the value indicated is greater than 1.950, but the CO2 level is known to be normal (typical atmospheric CO2 levels are around 400ppm) then the Styx will need to be replaced. If the display is not showing a 4 digit value, the Styx module will need to be replaced.

Prsr Flt

This message is shown if excessive pressure was detected in the Styx module during a sample cycle.

Fault finding steps:

1) Check all screw-in terminals and ribbon cable connections are secure.
2) With the door open, check for kinks/blockages in the internal (clear) pipework.

3) Initiate a manual sample and confirm solenoid 1 has 0V DC across it and solenoid 2 has 24V DC across it when the pump has just started running. After a period of pump operation, solenoid 1 and solenoid 2 should both change state (such that solenoid 1 has 24V DC across it and solenoid 2 has 0V DC across it) and the pump should be heard to lower in tone. Approximately 5 - 10 seconds after the pump stops, solenoid 1 should change state (such that it has 0V DC across it). If the voltages are incorrect then the network module will need to be replaced. If the voltages are correct then the Styx module will need to be replaced.

Pump Flt

This message is shown if the pressure in the Styx module did not rise to the expected level during the purge stage of a sample cycle.

If all SAMMs are affected it is probably the Styx or network module. If an individual SAMM is showing a fault it could be a blockage in either the freeway or spur.

Fault finding steps:

1) Check all screw-in terminals and ribbon cable connections are secure.
2) Disconnect the freeway for the affected SAMM at the monitor and initiate a manual sample. If this rectifies the problem check/replace the freeway or spur for kinks or blockages.
3) If disconnecting the freeway did not rectify the problem, it will be necessary to initiate a manual sample with the door open before making the following additional checks:
4) Confirm solenoid 1 has 0V DC across it and solenoid 2 24V DC across it when the pump has just started running. After a period of pump operation, solenoid 1 and solenoid 2 should both change state (such that solenoid 1 has 24V DC across it and solenoid 2 has 0V DC across it) and the pump should be heard to lower in tone. Approximately 5 - 10 seconds after the pump stops, solenoid 1 should change state (such that it has 0V DC across it). If the voltages are incorrect then the network module will need to be replaced. If the voltages are correct then the Styx module will need to be replaced.

STYXCold / Warming

At startup, the monitor waits for 2 minutes before commencing sampling in order to allow the Styx and any optional RS485 network sensors to stabilise. During this time, this fault state may be indicated.

Note: The monitor door must be kept closed and locked to maintain the correct operating temperature.

Fault finding steps:

1) Check all screw-in terminals and ribbon cable connections are secure.
2) If the fault persists contact your service representative

RScksum/RStime/RSwakeup/RSwrite

These messages are shown if an RS485 network communication failure was detected during a sample cycle on an RS485 network SAMM. The wiring of the RS485 network should be verified to ensure that all modules are correctly powered, RS485 A & B signals are orientated correctly and the network is terminated (by way of the ATM2R termination jumper) only on the final ATM2R module in the chain.

REPLACING THE ENCLOSURE DOOR

IMPORTANT: Before powering off the system to remove the door:

1. If you have changed the default passcode, make a note of your passcode.
2. Using the latest version of the GRM2 configuration tool, 'Load' the configuration from the GRM2. In order to do this you will need a working network connection to the GRM2 (refer to section 4) and you will need to know the IP address of the GRM2 (refer to section 5-8)

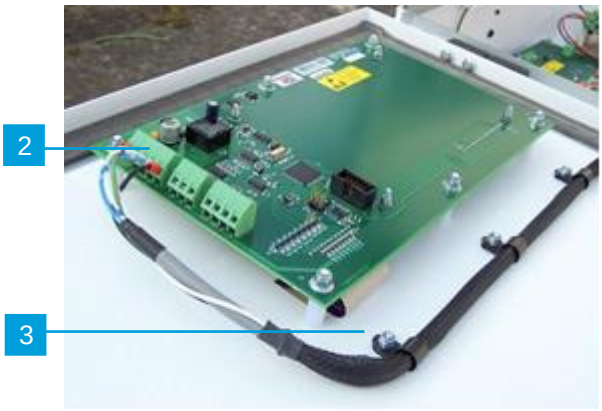
You can now follow the below procedure for removal and refitting. When the door replacement is finished, and the system is powered back on:

3. Adjust the display contrast as required (refer to section 5-1)
4. Using the latest version of the GRM2 configuration tool, 'Load' the configuration obtained in step 2 above and send this to the GRM2. You will need a working network connection to the GRM2. The IP address of the GRM2 should be unchanged from that used in step 2 above.
5. Using the GRM2 display, enter the management menu and change the default passcode to your passcode (as noted in step 1), refer to section 5-10

Procedure for removal and refitting:

Switch off the mains supply to the monitor and wait for a few seconds while the power supply discharges. Open the enclosure door with the key provided and switch off at the internal power input module by pressing the red button **(1)**.

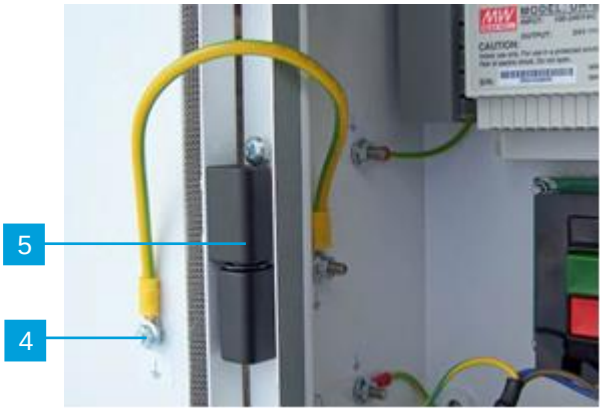
Disconnect the display lead **(2)**. Unscrew the clips holding the cable in position **(3)** and remove cabling from the enclosure door.



Disconnect the earth strap **(4)**.

If there is one fitted, remove the anti-lift peg located above the lower hinge **(5)**, the enclosure door can now be lifted off and a new one hung in place.

Replace the anti-lift peg. Reconnect the earth strap and display power lead. Fit the display lead clips to the enclosure door. Check all connections are secure. Switch on at the internal power input module by pressing the green button. Close and lock the enclosure door and reinstate the mains supply.



REPLACING THE NETWORK MODULE (INC. INSERT PLATE)

IMPORTANT: Before powering off the system to change the network module:

1. Using the latest version of the GRM2 configuration tool, 'Load' the configuration from the GRM2. In order to do this you will need a working network connection to the GRM2 (refer to section 4) and you will need to know the IP address of the GRM2 (refer to section 5-8)

You can now follow the below procedure for removal and refitting. When the network module replacement is finished, and the system is powered back on:

2. Using the latest version of the GRM2 configuration tool, 'Load' the configuration obtained in step 1 above from your local file system and send this to the GRM2. You will need a working network connection to the GRM2. The IP address of the GRM2 should be unchanged from that used in step 1 above.

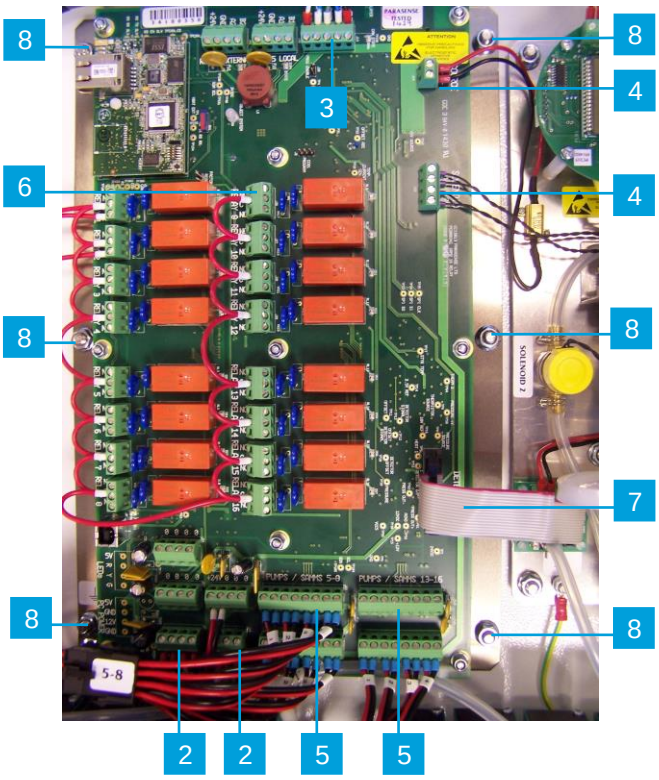
Procedure for removal and refitting:

Switch off the mains supply to the monitor and wait for a few seconds while the power supply discharges. Open the enclosure door with the key provided and switch off at the internal power input module using the red button **(1)**.

Noting the sequence - Disconnect the power supply cables **(2)**, cables to the enclosure door **(3)**, the Styx module cables **(4)**, including the ribbon cable **(7),** SAMM connections **(5)**, ADC terminal panel cables **(6)** and any remaining wired in connections.

Unscrew the six nuts holding the network module in position **(8)**, located around the edge of the insert plate, and remove the module complete with insert plate.

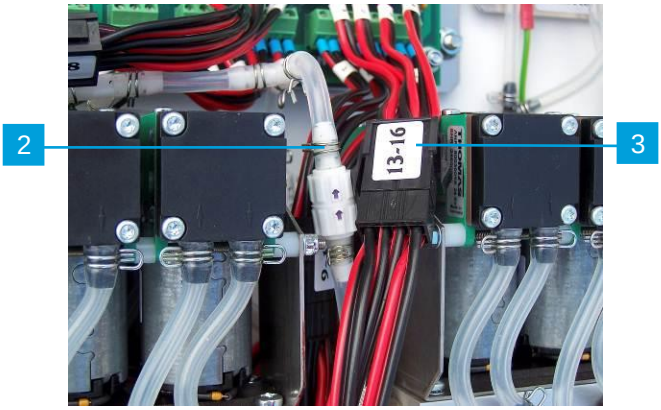
Fit the new network module complete with insert plate. Fit the shake-proof washers and securing nuts and tighten. Reconnect all cables previously disconnected. Check all connections are secure. Switch the internal power input module on by pressing the green button. Close and lock the enclosure door and reinstate the mains supply.



REPLACING A SAMM BLOCK

Switch off the mains supply to the monitor and wait for a few seconds while the power supply discharges. Open the enclosure door with the key provided and switch off at the internal power input module using the red button **(1)**.

Disconnect the hose from the faulty SAMM block **(2)** leaving the white non-return valve connected to the SAMM block. Unplug the SAMM block wiring connector **(3)**.



Remove the four fixing screws **(4)** that hold the faulty SAMM block to the base of the enclosure, being careful not to damage the gasket between the SAMM and the inside of the enclosure.

To install the new SAMM block, fit the new SAMM block in the vacant position. (Note: It will only fit with the 8 short sampling pipes facing towards the front of the enclosure.) Fit the shake-proof washers and fixing screws and tighten. Re-attach the hose to the non-return valve of the new SAMM block and plug in the SAMM block wiring connector.

If you are wiring the new SAMM block directly to the network module for pump 5-8, 9-12 or 13-16, then you must connect the wiring for the new SAMM block pump marked 1 to the far left pair of terminals on the associated network module connector and the wiring for pump 2 to the next pair of terminals to the right and so on.

Switch on at the internal power input module using the green button. Close and lock the enclosure door and reinstate the mains supply.

REPLACING THE STYX MODULE

Switch off the mains supply to the monitor and wait for a few seconds while the power supply discharges. Open the enclosure door with the key provided and switch off at the internal power input module using the red button **(1)**.

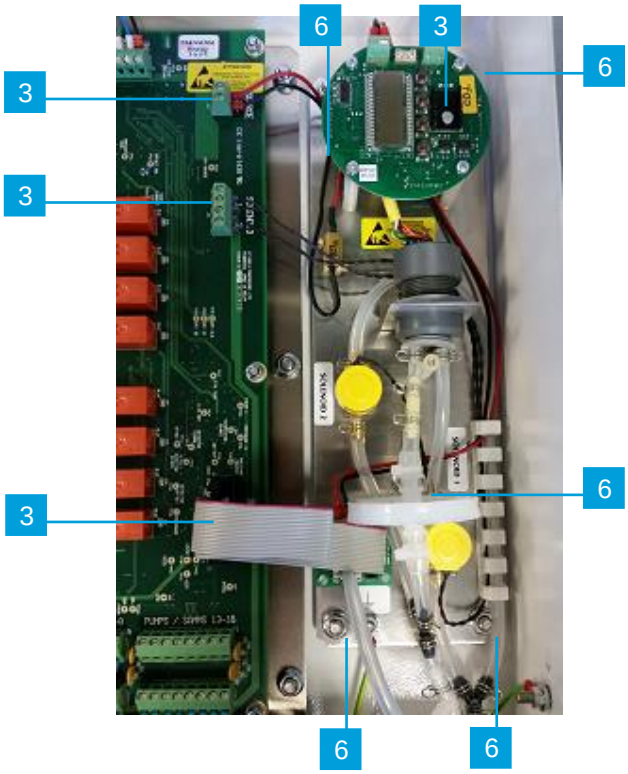
Disconnect the earth cable from the mounting plate **(2)** and disconnect the cables to the network module **(3)**.

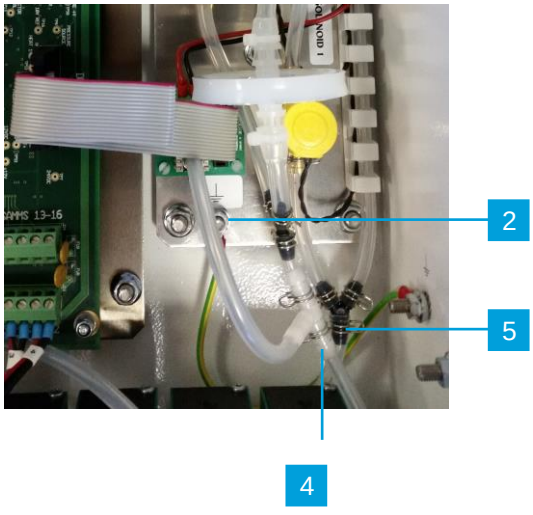
Disconnect the pneumatic hoses at the Styx module white tee **(4)** and the black Y **(5)**.

Remove the 5 fixing nuts and shake-proof washers on the Styx module base plate **(6)**. Lift the Styx module out of the monitor.

Fit the new Styx module in the vacant position. Fit the shake-proof washers and fixing nuts **(6)** and tighten.

Securely reconnect all cables and hoses previously disconnected. Switch on at the internal power input module using the green button. Close and lock the enclosure door and reinstate the power supply.





REPLACING THE POWER SUPPLY MODULE

Switch off the mains supply to the monitor and wait for a few seconds while the power supply discharges. Open the enclosure door with the key provided and switch off at the internal power input module using the red button **(1)**.

Noting the sequence - Disconnect the mains power supply cables to the power input module **(2)**, and power output cables **(3)**. Disconnect the earth strap **(4)**. Unscrew the four nuts **(5)** holding the power supply module, located around the edge of the insert plate and remove the module complete with insert plate.

Fit the new power supply module complete with insert plate. Fit the shake-proof washers and securing nuts and tighten. Securely reconnect all cables previously disconnected.

Switch on at the internal power input module using the green button. Close and lock the enclosure door and reinstate the mains supply.

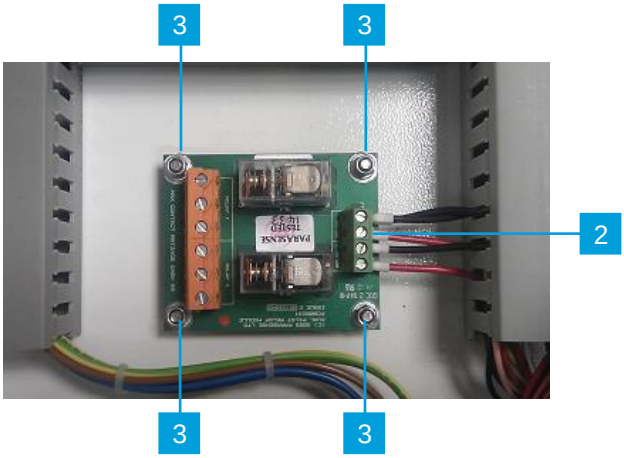
REPLACING THE DUAL PILOT RELAY MODULE

Switch off the mains supply to the monitor and wait for a few seconds while the power supply discharges. Open the enclosure door with the key provided and switch off at the internal power input module using the red button **(1)**.

Disconnect the cables to the dual pilot relay module **(2)**. Unscrew the four nuts **(3)** holding the dual pilot relay module in position and remove the module.

Fit the new module by following the instructions in reverse order.

Switch on at the internal power input module using the green button. Close and lock the enclosure door and reinstate the mains supply.



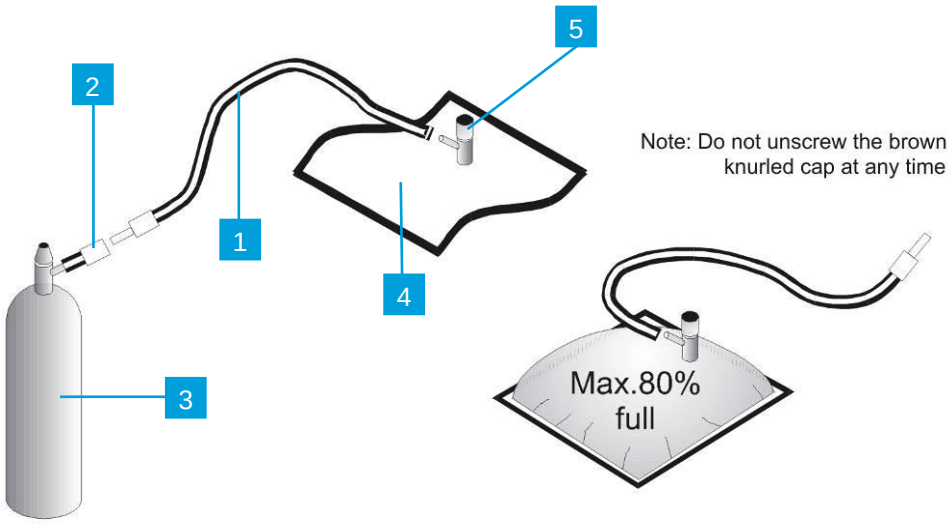
SYSTEM TEST – INTERNAL SAMMS

The purpose of the system test is to provide the operator with a method of verifying the operation and functionality of the monitor, alarm relays, associated field wiring and beacon/sounders using a known concentration of gas.

System test should be carried out after the initial installation and commissioning of the equipment and after any maintenance is undertaken on the system. The below equipment is available in a Parasense service kit.

The reservoir bag should be filled with Parasense calibration gas only and attached to any of the internal SAMM inlets. When the system test is initiated, the monitor will start sampling the SAMM of the chosen channel. During this test the Styx module is automatically configured for the minimum purge time to suit the calibration gas sample tube and reservoir.

The routine is as follows: -



a) Before commencing a system check, confirm that the monitor has been running continuously for a period of at least four hours, with the door closed and locked, this will ensure that the system is operating at the correct temperature. The door must be kept closed throughout the system check.

b) Remove the plastic cap from the Parasense calibration gas cylinder (3). Ensure the knurled knob on valve (2) is fully unwound (anti-clockwise) and screw valve on to the gas cylinder.

c) Open the calibration reservoir (4) by unwinding the upper white section of valve (5) two revolutions anticlockwise and expel any air present, (note: do not unscrew the brown knurled cap at any time) then close.

d) Connect the flexible end of hose (1) to the stem of valve (5), insert the rigid end of hose (1) in to the socket attached to valve (2). Unwind the upper white section of valve (5) two revolutions, anticlockwise.

e) Open valve (2) clockwise on the Parasense calibration gas cylinder and allow sufficient gas flow to inflate the reservoir to approximately 80% capacity. Close valve (2) anti-clockwise. Turn the

upper section of valve (5) clockwise to close. Disconnect hose (1) from the gas cylinder valve (2), unscrew valve (2) from the gas cylinder and safely store the gas cylinder in the service kit case.

f) Disconnect the freeway/sampling pipe from the required SAMM inlet using the pipe release tool and insert the rigid end of pipe from the Parasense calibration reservoir. Unwind the upper section of valve (5) two revolutions, anticlockwise.

g) From the main menu on the Parasense GRM2 CO2 monitor use the △▽ buttons to select the 'Management' section, enter the Management security code.

h) When in the 'Management' menu, select System Test.

i) Follow the onscreen prompts to select the required internal SAMM and begin the test.

j) Make a record of the concentration shown on the display at the end of a successful system test.

k) When the system test is complete, disconnect the Parasense calibration reservoir using the pipe release tool and replace the freeway/sampling pipework.

In order to maintain a high degree of confidence Parasense recommends that a system test is carried out on internal SAMMs at a maximum of 12 month intervals.

AIR FLOW – INTERNAL SAMMS

Disconnect the freeway/sampling pipe from SAMM/channel 1 using the Parasense pipe release tool and insert into the connector on the pipe from the lower port of the gauge supplied with the "Parasense Air Flow Kit". Insert the pipe from the upper port on the gauge into SAMM/channel 1. Locate the gauge in a vertical position on the monitor using the magnetic pad.

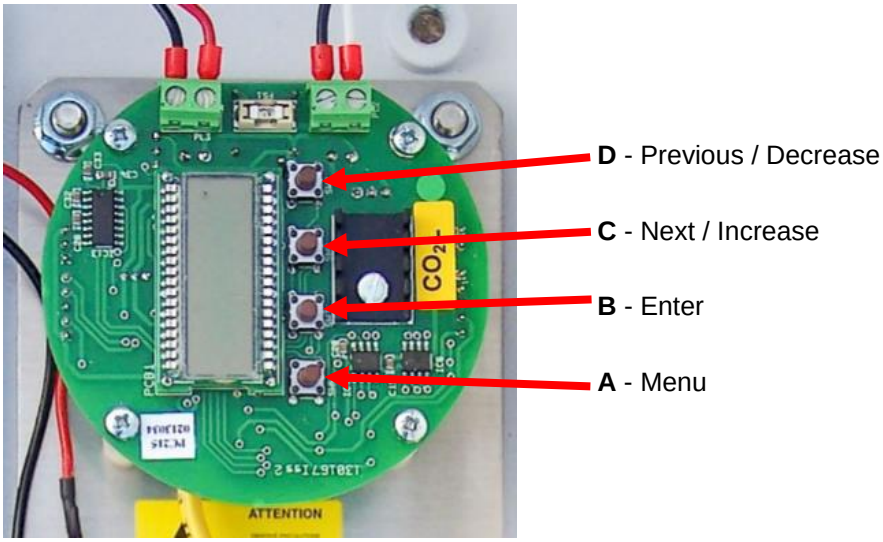
Re-boot the monitor. This will cause the monitor to start sampling from SAMM 1. During the initial (freeway) purge stage the gauge should indicate an air flow of approximately 2ltrs per minute. If the reading is satisfactory, disconnect the gauge and re-connect the sampling pipework. Repeat the exercise for the remainder of the SAMMs/channels. From the point the pump stops, there will be a delay of approximately 20 seconds before the next SAMM/channel is sampled.

If the pump is running but the reading is less than 2ltrs per minute, disconnect the sampling pipe from the lower port on the gauge and repeat the test. If the gauge now reads in excess of 3ltrs per minute, check the sampling pipework, fittings and filters for kinks or blockage. Should lower readings persist the SAMM module should be changed.

If a sample is required from a specific channel, enter SAMMS list select the required channel, press the action key and select 'Yes' to perform a manual sample.

FIELD CALIBRATION (CO2 DYNAMENT SENSOR)

Field calibration should be performed annually. The process involves calibrating the CO2 sensor zero and span outputs. For the purposes of these instructions the round shaped PCB mounted on the CO2 styx module is referred to as the 'sensor PCB'. The sensor PCB has an LCD display and a row of 4 push buttons. Each button has a different function, as indicated.



Sensor PCB

The Parasense CO2 calibration kit includes:

- 1 x 10 litre cylinder of 100% Nitrogen test gas, labelled "**CO2 ZERO**".
- 1 x 3 litre sample bag, labelled "**CO2 ZERO**".
- 1 x 10 litre cylinder of 10,000ppm CO2 test gas, labelled "**CO2 10,000PPM**".
- 1 x 3 litre sample bag, labelled "**CO2 10,000PPM**".

NOTE: The actual concentration of the gas in the cylinder labelled "**CO2 10,000PPM**" is printed on the label attached to the cylinder and can vary slightly from the ideal 10,000PPM. This is acceptable and the variation is noted as part of the procedure.

Sensor Zero Calibration

1. Ensure the "**CO2 ZERO**" sample bag is completely empty.
2. Fill (to 75% full) the "**CO2 ZERO**" sample bag with "**CO2 ZERO**" test gas.
3. On the GRM2 CO2 display/keypad, navigate to the **System Test** screen.
4. Use the Up/Down keys to select a channel on which to perform the System Test.
   NOTE: The calibration process applies to all channels. The ability to choose a channel is provided here for convenience (due to installation restrictions, it may be easier to access freeway connections on certain channels).
5. Disconnect the freeway from the channel selected for System Test and connect the sample bag.
6. Open the GRM2 CO2 door, on the sensor PCB:
   6.1. Press the **A** button to open the menu system.
   6.2. Use the **C** and **D** buttons to select menu option: **E:1** on the sensor PCB screen.
   6.3. Press **B**.
7. Open the valve on the sample bag.
8. On the GRM2 CO2 display/keypad, press the ◯ key to begin the System Test sample. The sample process is complete when the measured concentration is reported.
9. Wait for the sample process to complete.
10. Press the ◯ key again to begin the System Test sample for a second time.
11. Wait for the sample process to complete.
12. On the sensor PCB:
    12.1. Press **B** to zero the sensor; '- - - -' will be displayed to confirm the sensor zero calibration has been performed.
    *NOTE: Pressing **A** rather than **B** exits without performing sensor zero calibration.*
    12.2. Press **A** to close the menu system.
    *NOTE: The sensor zero calibration value will be displayed on exit while the **A** key is pressed.*
13. Close the valve on the sample bag and disconnect the bag from the system.
14. The Sensor Span Calibration will now need to be followed.

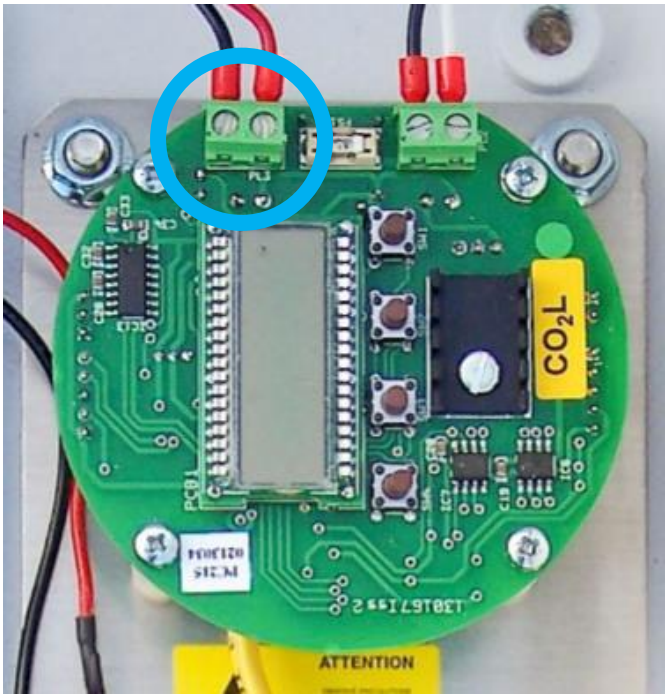
Sensor Span Calibration

1. Ensure the "**CO2 10,000PPM**" sample bag is completely empty.
2. Fill (to 75% full) the "**CO2 10,000PPM**" sample bag with "**CO2 10,000PPM**" test gas.
3. On the GRM2 CO2 display/keypad, navigate to the **System Test** screen.
4. Use the Up/Down keys to select a channel on which to perform the System Test.
   NOTE: The calibration process applies to all channels. The ability to choose a channel is provided here for convenience, since (due to installation restrictions) it may be easier to access freeway connections on certain channels.
5. Connect the sample bag to the channel selected for System Test.
6. On the sensor PCB:
   6.1. Press the **A** button to open the menu system.
   6.2. Use the **C** and **D** buttons to select menu option: **E:2** on the sensor PCB screen.
   6.3. Press **B**.
7. Open the valve on the sample bag.

8. On the GRM2 CO2 display/keypad, press the ⊙ key to begin the System Test sample. The sample process is complete when the measured concentration is reported.
9. Wait for the sample process to complete.
10. Press the ⊙ key again to begin the System Test sample for a second time.
11. Wait for the sample process to complete.
12. On the sensor PCB:
    12.1. Confirm the sensor display reads **1.00**. If it is different use the **C** and **D** buttons to adjust it.
    12.2. Press **B** to span the sensor; '- - - -' will be displayed to confirm the sensor span calibration has been performed.
    *NOTE: Pressing **A** rather than **B** exits without performing sensor span calibration.*
    12.3. Press **A** to close the menu system.
    *NOTE: The sensor span calibration value will be displayed on exit while the **A** key is pressed.*
13. Press the ⊙ key again to begin another System Test sample. This should show the correct PPM of the calibration gas (+/-100 PPM) on the GRM2 CO2 display.
14. Close the valve on the sample bag and disconnect the bag from the system.
15. Reconnect the freeway to the GRM2 CO2 and use the ◁ key to exit the System Test function.

Additional calibration

In rare circumstances, it may be necessary to perform calibration of the Sensor Analogue output. **If calibration is deemed to be required, both calibration steps outlined below must always be performed**.



Analogue output terminal

Sensor 4mA Calibration

1. On the GRM2 CO2 display/keypad, navigate to the **System Test** screen. This will halt the sampling activity on the system for a few minutes.
   NOTE: This is not required, but the sampling activity of the system may prove distracting whilst performing the subsequent steps.
2. Connect a CC01 programming/debug lead to the CC01 programming/debug port on the GRM2 CO2 network module PCB.
3. Open a terminal program and connect to the CC01 using 9600 baud, 8 data bits, 1 stop bit, No parity, No flow control.
4. In the terminal program:
   4.1. Enter the 'ver' command to confirm successful communication has been established.
5. On the Sensor PCB:
   5.1. Press the **A** button to open the menu system.
   5.2. Using the **C** and **D** buttons select menu option: **E:4** on the sensor PCB screen.
   5.3. Press **B**.
6. In the terminal program:
   6.1. Enter the 'adc' command a few times and note the ADC 12 0: value reported (highlighted below in yellow).

```
Channel      Bits   mVolts Value.
-------------------------------------
Pressure     187    456    1111
Detector     2      4
Source       5      12
ADC 3:       786    1918
DAC offset   518    1264
Amb. Temp.   210    512    307
ADC12 0: 400
ADC12 1: 2
ADC12 2: 1
```

7. On the Sensor PCB:
   7.1. Use the **C** and **D** buttons to adjust the 4mA output.
8. Repeat steps 6 & 7 until the 'adc' command output reads 400 +/- 1.
9. On the Sensor PCB:
   9.1. Press **B**.
   *NOTE: Pressing the **A** button rather than the **B** button exits without performing the calibration.*
   9.2. Press the **A** button to close the menu system.
   NOTE: The Sensor 4mA calibration value will be displayed on exit.

Sensor 20mA Calibration

1. On the GRM2 CO2 display/keypad, navigate to the **System Test** screen. This will halt the sampling activity on the system for a few minutes.
   NOTE: This is not required, but the sampling activity of the system may prove distracting whilst performing the subsequent steps.
2. Connect a CC01 programming/debug lead to the CC01 programming/debug port on the GRM2 CO2 network module PCB.
3. Open a terminal program and connect to the CC01 using 9600 baud, 8 data bits, 1 stop bit, No parity, No flow control.

4. In the terminal program:

    4.1. Enter the ‘ver’ command to confirm successful communication has been established.

5. On the Sensor PCB:

    5.1. Press the **A** button to open the menu system.

    5.2. Using the **C** and **D** buttons select menu option: **E:5** on the sensor PCB screen.

    5.3. Press **B**.

6. In the terminal program:

    6.1. Enter the ‘adc’ command a few times and note the ADC 12 0: value reported (highlighted below in yellow).

```
Channel      Bits    mVolts Value.
-------------------------------------
Pressure      187    456    1111
Detector      2      4
Source        5      12
ADC 3:        786    1918
DAC offset    518    1264
Amb. Temp.    210    512    307
ADC12 0: 2000
ADC12 1: 2
ADC12 2: 1
```

7. On the Sensor PCB:

    7.1. Use the **C** and **D** buttons to adjust the 20mA output.

8. Repeat steps 6 & 7 until the ‘adc’ command output reads 2000 +/- 1.

9. On the Sensor PCB:

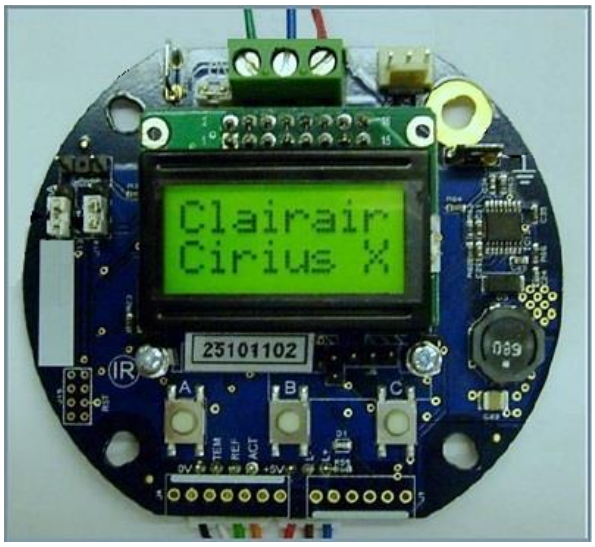
    9.1. Press **B**.
    *NOTE: Pressing the **A** button rather than the **B** button exits without performing the calibration.*

    9.2. Press the **A** button to close the menu system.
    NOTE: The Sensor 20mA calibration value will be displayed on exit.

FIELD CALIBRATION (CO2 CLAIRAIR SENSOR)

NOTE:

- ***You need to hold the sensor PCB buttons for at least 2 seconds for them to respond.***



Sensor PCB

The Parasense CO2 calibration kit includes:

- 1 x 10 litre cylinder of 100% Nitrogen test gas, labelled "**CO2 ZERO**".
- 1 x 3 litre sample bag, labelled "**CO2 ZERO**".
- 1 x 10 litre cylinder of 10,000ppm CO2 test gas, labelled "**CO2 10,000PPM**".
- 1 x 3 litre sample bag, labelled "**CO2 10,000PPM**".

NOTE: The actual concentration of the gas in the cylinder labelled "**CO2 10,000PPM**" is printed on the label attached to the cylinder and can vary slightly from the ideal 10,000PPM. This is acceptable and the variation is noted as part of the procedure.

Sensor Zero Calibration.

1. Ensure the "**CO2 ZERO**" sample bag is completely empty.
2. Fill (to 75% full) the "**CO2 ZERO**" sample bag with "**CO2 ZERO**" test gas.
3. On the GRM2 CO2 display/keypad, navigate to the **System Test** screen.
4. Use the Up/Down keys to select a channel on which to perform the System Test.
   NOTE: The calibration process applies to all channels. The ability to choose a channel is provided here for convenience (due to installation restrictions, it may be easier to access freeway connections on certain channels).
5. Disconnect the freeway from the channel selected for System Test and connect the sample.
6. Open the GRM2 CO2 door, on the sensor PCB:
   - 6.1 Press the **A** button to show "Cal mode"
   - 6.2 Press the **B** button (**Y** on the display) to show "Set Zero".
   - 6.3 Press the **B** button again (**Y** on the display) to select "Zero Cal" mode.
7. Open the valve on the sample bag.
8. On the GRM2 CO2 display/keypad, press the ◯ key to begin the System test sample and allow the channel to purge and sample. Do this twice to ensure the Nitrogen has fully displaced

the original air. Monitor the sensor PCB display, ensuring the display reads to its lowest possible value. This can take about 2 minutes.

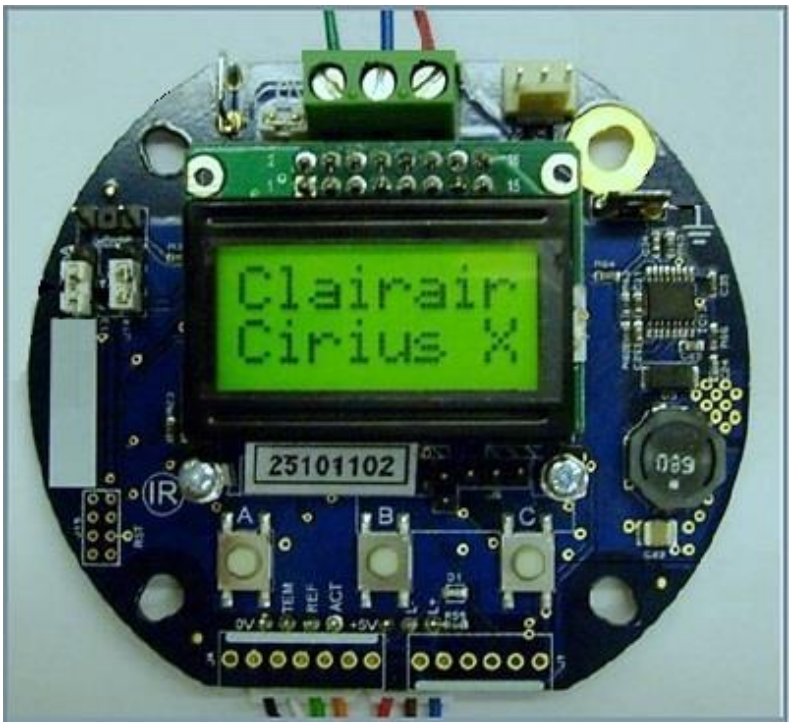
9. Press the **B** button (**Z** on the display) to set the zero calibration.
10. Press the **A** button (**X** on the display) 3 times until you return to the main display. The sensor display should read close to 0.00%.
11. Close the valve on the sample bag and disconnect the bag from the system.
12. The Sensor Span Calibration will now need to be followed.

Sensor Span Calibration

1. Ensure the "**CO2 10,000PPM**" sample bag is completely empty.
2. Fill (to 75% full) the "**CO2 10,000PPM**" sample bag with "**CO2 10,000PPM**" test gas.
3. On the GRM2 CO2 display/keypad, navigate to the **System Test** screen.
4. Use the Up/Down keys to select a channel on which to perform the System Test.
   NOTE: The calibration process applies to all channels. The ability to choose a channel is provided here for convenience, since (due to installation restrictions) it may be easier to access freeway connections on certain channels.
5. Connect the sample bag to the channel selected for System Test.
6. On the sensor PCB:
   - 6.1 Press the **A** button to show "Cal Mode".
   - 6.2 Press the **B** button (**Y** on the display).
   - 6.3 Press the **C** button (→ on the display) to show "Set Span".
   - 6.4 Press the **B** button (**Y** on the display) to enter "Set Span" mode.
   - 6.5 Confirm the sensor display reads 1.00. If it is different use the **A** and **C** buttons (+ and – on the display) to adjust it.
   - 6.6 Press the **B** button (**Y** on the display) to enter the Calibration Mode.
7. Open the valve on the sample bag.
8. On the GRM2 CO2 display/keypad, press the ◯ key to begin the System Test sample.
9. Wait for the sample process to complete.
10. Repeat a System Test and monitor the sensor PCB display. When the sensor PCB display reading gets stabilised press the **B** button (**S** on the display) to set the Span. The "% Vol" value should update.
11. Press the **A** button until you are back to the main display.
12. The sensor PCB display should now show the calibration gas value in %.
13. Press the ◯ key again to begin another System Test sample. This should show the correct PPM of the calibration gas (+/-100 PPM) on the GRM2 CO2 display.
14. Close the valve on the sample bag and disconnect the bag from the system.
15. Reconnect the freeway to the GRM2 CO2 and use the ◁ key to exit the System Test function.

Additional calibration

NOTE: The following calibration is not required during lifetime of the unit. Only attempt this if all else fails



Sensor PCB

Sensor 4mA Calibration

1. On the GRM2 CO2 display/keypad, navigate to the **System Test** screen. This will halt the sampling activity on the system for a few minutes.
   NOTE: This is not required, but the sampling activity of the system may prove distracting whilst performing the subsequent steps.
2. Connect a CC01 programming/debug lead to the CC01 programming/debug port on the GRM2 CO2 network module PCB.
3. Open a terminal program and connect to the CC01 using 9600 baud, 8 data bits, 1 stop bit, No parity, No flow control.
4. In the terminal program:
   4.1. Enter the 'ver' command to confirm successful communication has been established.
5. On the Sensor PCB:
   5.1. Press the **A** button to enter "Cal Mode".
   5.2. Press the **B** button (→ on the display) three times to show "Sys Menu".
   5.3. Press the **B** button (**Y** on the display) to show "Set 4mA".
   5.4. Press the **B** button (**Y** on the display) to enable adjustment.
   5.5. Use the **A** and **C** buttons (+ and – on the display) to change the display reading until 4.00mA is shown on the display.

6. In the terminal program:

   6.1. Enter the ‘adc’ command a few times and note the ADC 12 0: value reported (highlighted below in yellow).

```
Channel      Bits   mVolts Value.
-------------------------------------
Pressure     187    456    1111
Detector     2      4
Source       5      12
ADC 3:       786    1918
DAC offset   518    1264
Amb. Temp.   210    512    307
ADC12 0: 400
ADC12 1: 2
ADC12 2: 1
```

7. On the Sensor PCB:

   7.1. Use the **C** and **D** buttons to adjust the 4mA output.

8. Repeat steps 6 & 7 until the ‘adc’ command output reads 400 +/- 1.

9. On the Sensor PCB:

   9.1. Press the **B** button (**Y** on the display) to save the value and return to the “Sys Menu”.

   9.2. To return to normal monitoring press the **A** button repeatedly until you are back to the main display.

10. Close the terminal application and disconnect the CC01 programming/debug lead from the GRM2 CO2 network module PCB.

11. On the GRM2 CO2 display/keypad, use the ◁ key to exit the System Test function. Normal sampling will resume.

Sensor 20mA Calibration

1. On the GRM2 CO2 display/keypad, navigate to the **System Test** screen. This will halt the sampling activity on the system for a few minutes.
   NOTE: This is not required, but the sampling activity of the system may prove distracting whilst performing the subsequent steps.

2. Connect a CC01 programming/debug lead to the CC01 programming/debug port on the GRM2 CO2 network module PCB.

3. Open a terminal program and connect to the CC01 using 9600 baud, 8 data bits, 1 stop bit, No parity, No flow control.

4. In the terminal program:

   4.1. Enter the ‘ver’ command to confirm successful communication has been established.

5. On the Sensor PCB:

   5.1. Press the **A** button to show “Cal Mode”.

   5.2. Press the **B** button (→ on the display) three times to show “Sys Menu”.

   5.3. Press the **B** button (**Y** on the display) to show “Set 20mA”.

   5.4. Press the **B** button (→ on the display) to enable adjustment.

   5.5. Use the **A** and **C** buttons (+ and – on the display) to change the display reading until 20.00mA is shown on the display.

6. In the terminal program:

   6.1. Enter the ‘adc’ command a few times and note the ADC 12 0: value reported (highlighted below in yellow).

```
Channel      Bits   mVolts Value.
-------------------------------------
Pressure     187    456    1111
Detector     2      4
Source       5      12
ADC 3:       786    1918
DAC offset   518    1264
Amb. Temp.   210    512    307
ADC12 0: 2000
ADC12 1: 2
ADC12 2: 1
```

7. On the Sensor PCB:

   7.1. Use the **C** and **D** buttons to adjust the 4mA output.

8. Repeat steps 6 & 7 until the ‘adc’ command output reads 2000 +/- 1.

9. On the Sensor PCB:

   9.1. Press the **B** button (**Y** on the display) to save the value and return to the “Sys Menu”.

   9.2. To return to normal monitoring press the **A** button repeatedly until you are back to the main display.

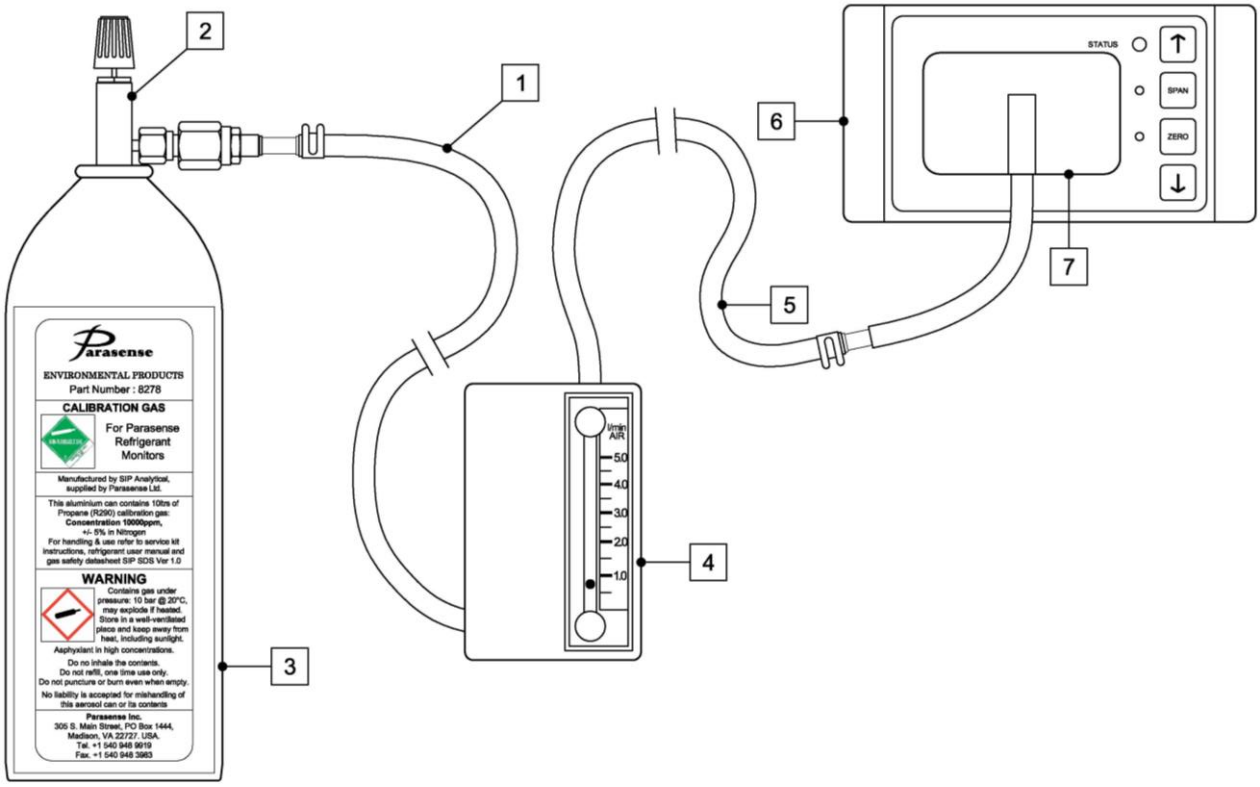
10. Close the terminal application and disconnect the CC01 programming/debug lead from the GRM2 CO2 network module PCB.

11. On the GRM2 CO2 display/keypad, use the ◁ key to exit the System Test function. Normal sampling will resume.

SYSTEM TEST - RS485 NETWORKED SAMMS

The purpose of the system test is to provide the operator with a method of verifying the operation and functionality of the monitor, alarm relays, associated field wiring and beacon/sounders using specific concentrations of the target gas, referred to here as the **test gas**. The concentration of the test gas should be greater than the critical threshold value configured for the channel being tested. The test gas should be applied directly to the gas sensor module using a feed adapter appropriate for the sensor module (an example of such a feed adapter is shown below).

The routine is as follows:



a) Before commencing a system test, confirm that the monitor and associated sensor modules have been powered and running continuously for a period of at least 1 hour, with all doors/covers closed/fitted and secured. This will ensure that the system and associated sensor modules are operating at a stable temperature. All doors/covers must be kept closed/fitted throughout the system test.

b) **At the remote gas sensor -** remove the plastic cap from the Parasense calibration gas cylinder (3). Ensure the knurled knob on valve (2) is fully unwound (anti-clockwise) and screw valve on to the gas cylinder

c) Connect the inlet tube (1 - the bottom tube) of the flow meter (4) to the valve (2).

d) Connect the outlet tube (5 - the top tube) of the flow meter (4) to the tube on the feed adaptor (7).

e) Push the feed adaptor (7) onto the diffusion input of the sensor (6) as shown in the above diagram and photograph. **A firm and straight seat must be ensured when attaching the adaptor.**

f) Turning clockwise, open the test gas cylinder valve (2) sufficiently to allow a continuous flow of test gas to the sensor. **The flow rate shown at the flow meter (4) should be between 0.5 l/min and 1.0 l/min for a successful system test**. **Ensure the flow meter (4) is upright while the test gas is flowing to obtain an accurate flow rate reading**

g) Allow the test gas to flow for a period of 60 seconds. After 60 seconds has elapsed, close valve (2) on the test gas cylinder (3). At this point, if the measured concentration exceeds the critical threshold, any beacon/sounders and peripheral alarms configured for activation based on a critical threshold breach on that channel will be activated.

h) When the test is complete disconnect the feed adaptor from the sensor module.

i) **At the GRM2 CO2 monitor** – The 'SAMMs List' screen allows you to see the current concentration of each channel, including the channel used for the system test. From the primary menu, select 'SAMMs List' using the △▽ keys to highlight, then press the ◯ key.
Note: If there is an exclamation mark next to the channel number in the 'Chan' column, this indicates that one or more latched condition is active on that channel

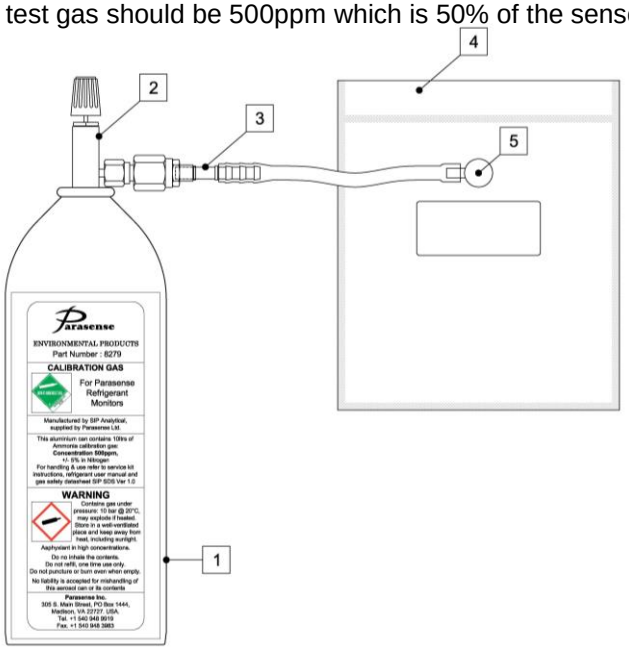
j) The 'Alarms Log' allows you to see recent concentrations that have breached any configured thresholds. From the primary menu select 'Logs' using the △▽ keys to highlight, then press the ◯ key. From the 'Logs' menu select 'Alarms' and press the ◯ key.

k) Repeat the test for other channels in the system as desired.

In order to maintain a high degree of confidence Parasense recommends that a system test is carried out on all channels at a maximum of 12 month intervals.

SYSTEM TEST – RS485 AMMONIA NETWORKED SAMMS

The concentration of the test gas should be 500ppm which is 50% of the sensor range. The routine is as follows:



a) **At the remote gas sensor -** before commencing system test, confirm the monitor and associated sensors have been powered and running for a period of at least 1 hour with all doors/covers closed/fitted and secured.

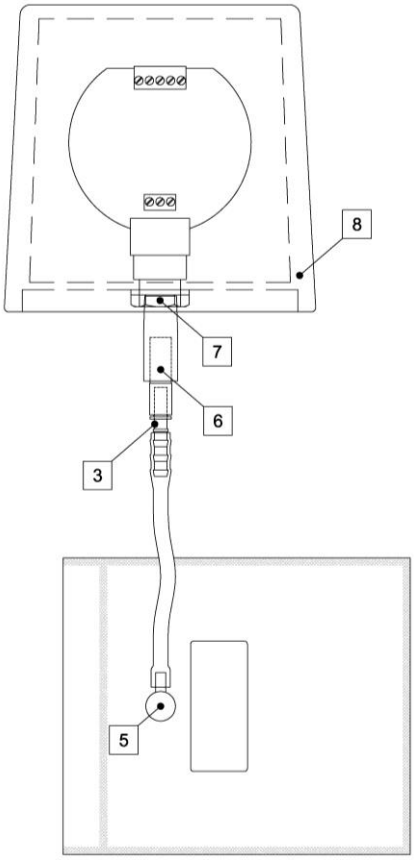
b) Remove the plastic cap from the Parasense test gas cylinder (1). Ensure the knurled knob on valve (2) is fully unwound (anti-clockwise) and screw valve on to the gas cylinder. Ensure the sample bag valve (5) is fully shut.

c) Connect the inlet tube (3) of the sample bag (4) to the gas cylinder valve (2).

d) Open the sample bag valve (5) by turning the knob 360^0 (one turn) anti-clockwise.

e) Open the gas cylinder valve (2) by slowly turning the knurled knob clockwise, fill the sample bag (4) to approximately 66% full with test gas, then shut the cylinder valve (2) by fully unwinding it anti-clockwise.

f) Fully shut the sample bag valve (5) and then disconnect the inlet tube (3) from the gas cylinder valve (2).



g) Attach the sensor adaptor (6) to the inlet tube (3) of the sample bag.

h) Open the sample bag valve (5) by turning it 360^0 (one turn) anti-clockwise and insert the sensor adaptor (6) into the ammonia sensor port (7).

i) Apply the test gas to the sensor by gently squeezing the sample bag for a period of 60 seconds. It is important to gently squeeze the bag to ensure a steady flow of test gas for the full 60 seconds. After 60 seconds has elapsed, close valve (5) on the sample bag. At this point, if the measured concentration is registered and exceeds the critical threshold, and beacon/sounders and peripheral alarms configured for activation based on a critical threshold breach on that channel will be activated.

j) When the test in complete ensure valve (5) is fully closed and disconnect from the gas sensor.

k) **At the GRM2 CO2 monitor –** The 'SAMMs List' screen allows you to see the current concentration of each channel, including the channel used for the system test. From the primary menu, select 'SAMMs List' using the △▽ keys to highlight, then press the ◯ key.
Note: If there is an exclamation mark next to the channel number in the 'Chan' column, this indicates that one or more latched condition is active on that channel.

l) The 'Alarms Log' allows you to see recent concentrations that have breached any configured thresholds. From the primary menu select 'Logs' using the △▽ keys to highlight, then press the ◯ key. From the 'Logs' menu select 'Alarms' and press the ◯ key.

m) Repeat the test for other channels in the system as desired.

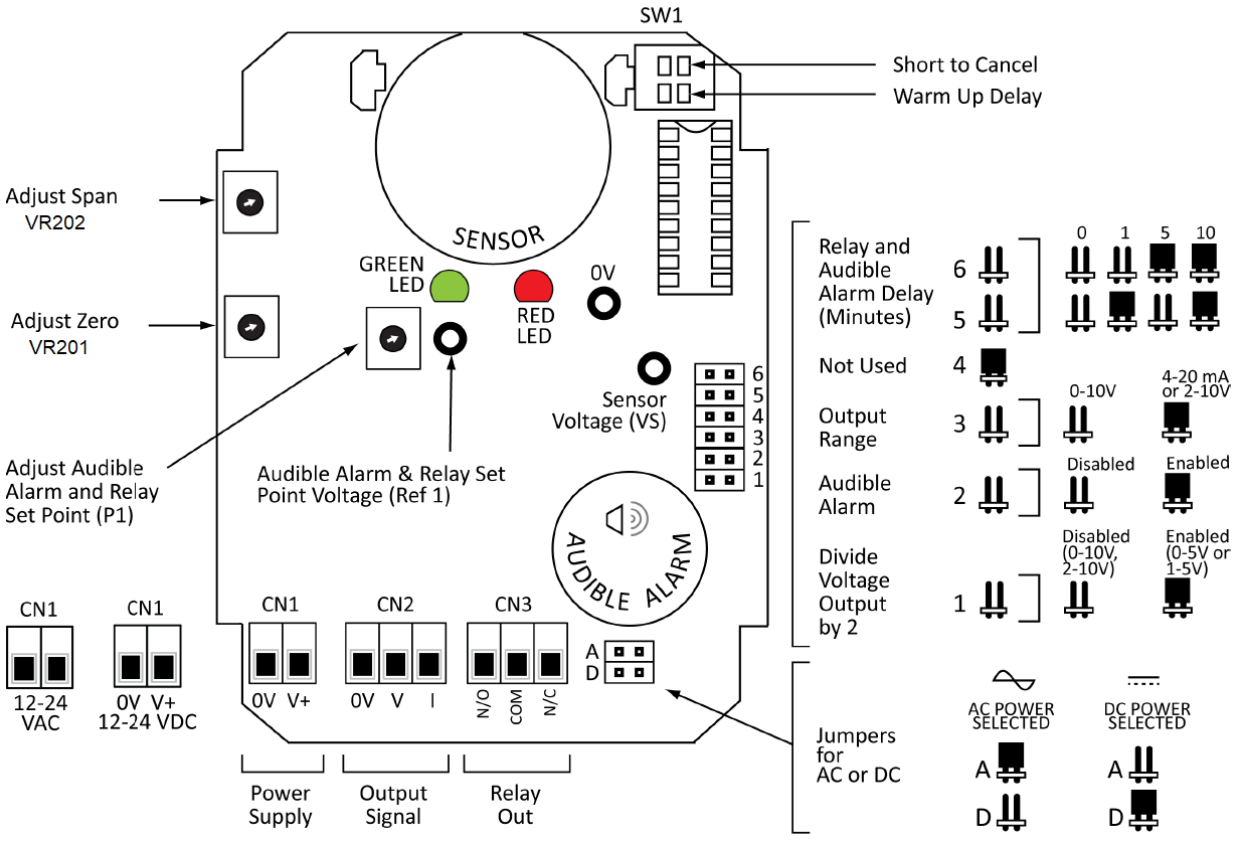
In order to maintain a high degree of confidence Parasense recommends that a system test is carried out on all channels at a maximum of 12 month intervals

SYSTEM TEST – BACHARACH MGS.150 SENSORS

To comply with the requirements of EN378 and the European F-GAS regulation, sensors must be tested annually. However, local regulations may specify the nature and frequency of this test.

IMPORTANT: Failure to test or calibrate the unit in accordance with applicable instructions and with industry guidelines may result in serious injury or death. The manufacturer is not liable for any loss, injury, or damage arising from improper testing, incorrect calibration, or inappropriate use of the unit.

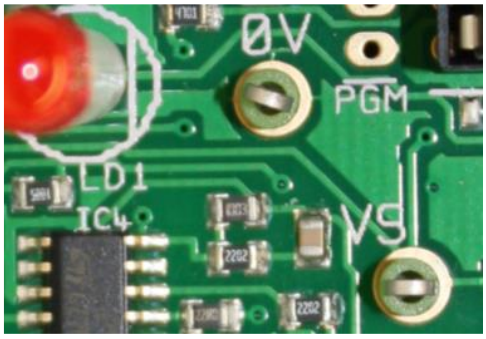
- Check local regulations on calibration or testing requirements
- The MGS contains sensitive electronic components that can be easily damaged. Do not touch nor disturb any of these components
- If the MGS is exposed to a large leak it should be tested to ensure correct functionality by electrically resetting the zero setting and carrying out a bump test. See procedures below.
- Annual checks and gas calibration are recommended. It is also recommended that sensors are replaced every 3 years or as required. Calibration frequency may be extended based on application, but should never exceed 2 years.
- The testing of the unit must be carried out by a suitably qualified technician, and must be done in accordance with this manual and in compliance with locally applicable guidelines and regulations.
- In applications where life safety is critical, calibration should be done quarterly (every 3 months) or on a more frequent basis. Parasense is not responsible for setting safety practices and policies. Safe work procedures including calibration policies are best determined by company policy, industry standards, and local codes.
- Before testing the sensors on-site, the MGS must have been powered up and allowed to stabilize.
- Prior to carrying out a bump test, check and adjust the zero setting as described in the Calibration section.
- To test the audible alarm and/or relay function, check the delay is set at zero and expose to gas. You can mute the audible alarm by removing the respective jumper (refer to picture below).



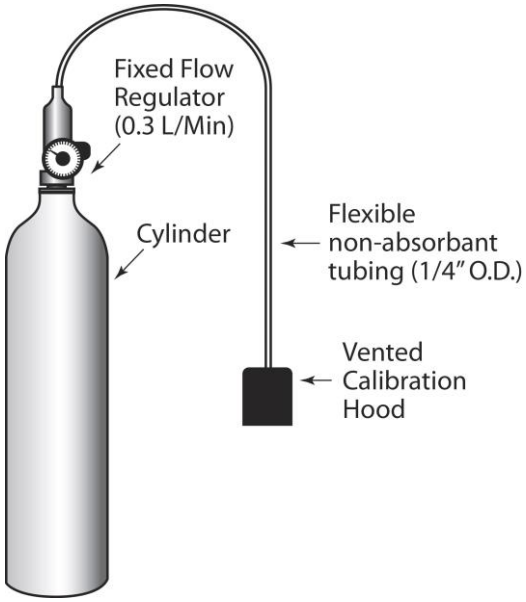
After installation, the units should be bump tested. Expose the sensors to appropriate test gas. The system will alarm when the test gas ppm value is above the alarm level. The gas should put the system into alarm and light the red LED. The delay prevents the audible alarm from sounding and the relay from switching (if delay is set).
With a bump test you can see the functions of the sensor - the red LED will light, the relay and audible alarm will function, and the output (0-5V, for example) will show the gas level. Ideally bump tests are conducted on site in a clean air atmosphere. The bump test may be carried out by utilizing either a calibration gas cylinder or calibration ampoules.

The bump test procedure utilizing Calibration Gas Cylinders to be conducted as follows:

1. Remove the enclosure lid of the sensor.
2. Connect a voltmeter to monitor sensor response (in Volts DC). Monitor the response between pins 0V and VS, please see the picture below:



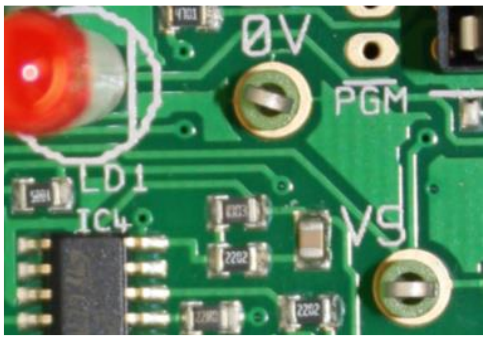
3. Expose the sensor to gas from the cylinder. You can place the entire MGS into a plastic bag or use a plastic hose/hood to direct gas to the sensor head. A response of above 80% is acceptable.



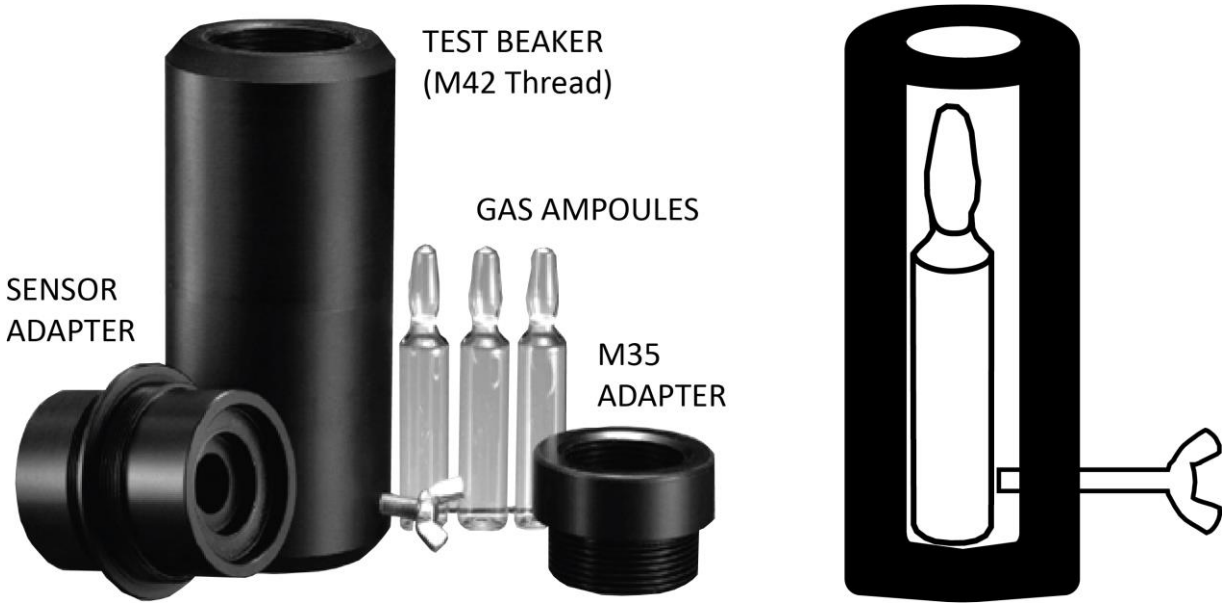
Gas Cylinder and Test Hardware

The bump test procedure utilizing Calibration Gas Ampoules to be conducted as follows:

1. Make sure that both the ampoules and the calibration beaker are clean and dry.
2. Unscrew the beaker hold screw and place the ampoule so that it sits in the base of the beaker.
3. Tighten the wing-nut screw onto the ampoule without breaking it.
4. Remove the enclosure lid of the gas detector.
5. Connect a voltmeter to monitor sensor response (in Volts DC). Monitor the response between pins 0V and VS, please see the picture below:



6. Place the beaker over the sensor head using the multi sensor adaptor to fit the sensor, or, if an Exd, IP66 or Remote sensor head version, screw the beaker on the remote sensor head M42 thread or M35 thread adaptor. It should be as tight fitting as possible to allow maximum gas exposure.
7. Tighten the wing-nut screw onto the ampoule until it shatters allowing the gas to diffuse in the beaker. It should be left in place for approximately 5 min.
8. The voltage output will increase. This confirms that the sensor is responding. A response equivalent to at least 50% of the test gas (typical) will confirm that the system is in order if tested with the unit's specified span gas.
9. Remove the beaker from the sensor. Carefully remove any ampoule remains from the gas detector and beaker.



Gas Ampoules for Bump Testing

ZERO CALIBRATION OF SMARTGAS RS485 NETWORK SAMMS

It is very important that the smartGAS sensors (shown below) have a zero calibration performed after installation to ensure no spurious readings are registered by the system. The zero calibration can be performed without a specific test gas providing they are located in fresh air. The air around the sensor must be free from additional gases other than those normally found in air.

a) The front of the sensor will need to be removed for this process. Carefully open the hinges using a slotted screwdriver in the locations shown below. The front section can now be lifted out, taking care not to damage the internal wiring.

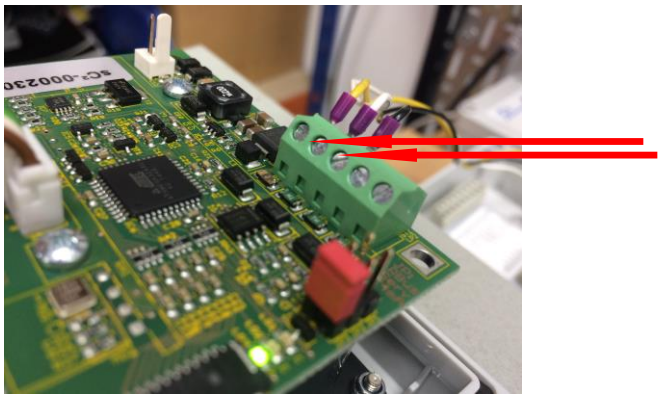
b) The sensor must be put into service mode. This is carried out by pressing the following keys in this order within 6 seconds :

UP, UP, SPAN, ZERO, DOWN, DOWN

If the code is input correctly the sensor switches to the first service mode level and the STATUS LED will illuminate steady yellow. If the code is incorrect or not entered in time, the STATUS LED will flash red for 3 seconds to indicate an error and the sensor will remain in normal mode.

c) Once service mode has successfully been activated, press the ZERO key for 3 seconds. If this is successful, the STATUS and ZERO LED will flash yellow.

d) Within a time frame of 60 seconds, if a stable concentration of air is detected by the sensor the ZERO LED will become steady. At this point the analogue output of the sensor, shown below, should measure 4mA. If it does not, the reading can be adjusted using the UP and DOWN keys on the sensor until the current measures 4mA.



Analogue output terminals

e) Once the output measures 4mA, press ZERO for 3 seconds to exit zero calibration and return to service mode level one. If done successfully, the STATUS LED will change from flashing yellow to flashing green for 3 seconds before returning to steady yellow.

f) To exit service mode and save the changes – press DOWN for 3 seconds. The STATUS LED will flash green for 3 seconds and then illuminate steady green.

To exit service mode without saving the changes – press UP for 3 seconds. The STATUS LED will flash red for 3 seconds and then illuminate steady green.

g) Replace the front of the sensor and close the hinges.

h) **At the GRM2 CO2 monitor** – The 'SAMMs List' screen allows you to see the current concentration of each channel, including the channel used for the zero calibration. From the primary menu, select 'SAMMs List' using the △▽ keys to highlight, then press the ◯ key. The reading should be 0ppm. Note: If there is an exclamation mark next to the channel number in the 'Chan' column, this indicates that one or more latched condition is active on that channel.

i) Repeat the zero calibration for any other sensors as required

FIELD CALIBRATION OF GDS RS485 NETWORK SAMMS

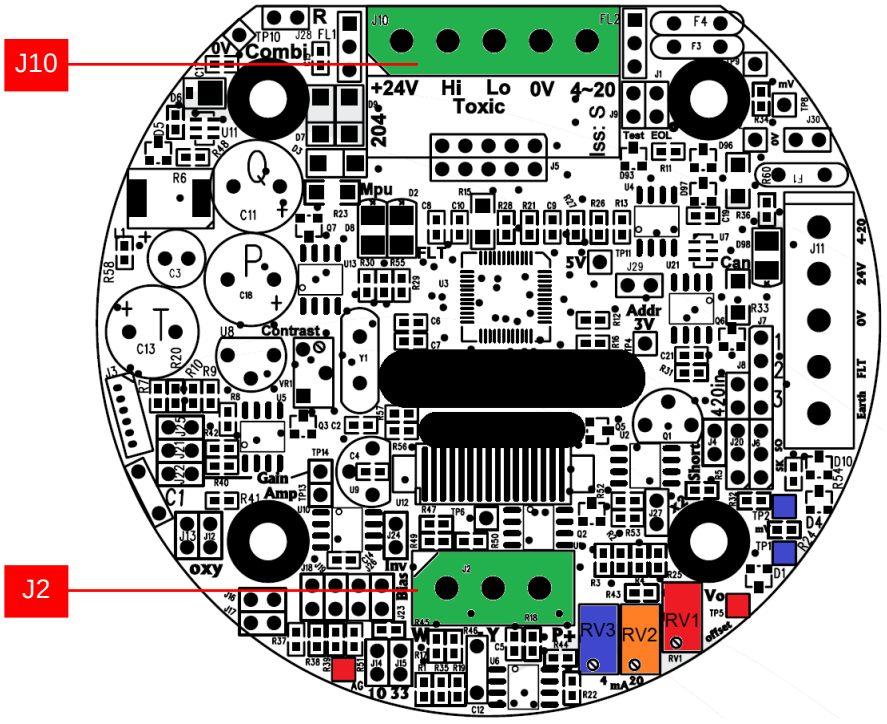
THIS PROCEDURE SHOWS HOW TO RECALIBRATE AS PART OF ROUTINE MAINTENANCE OR INTERNAL SENSOR CELL REPLACEMENT.

The GDS Sensor is able to be calibrated in the field. **It is essential that the Calibration gas is not present until step 4**. You will require a multi-meter with clips to connect to the test pins and a "small flat screwdriver" to adjust the potentiometers. Coloured text is used below to indicate the position of the respective items on the PCB.

1 At the GDS sensor, confirm the cell sensor is connected to **J2** at the base of the PCB and the Analogue Sensor Trip Module (RM2C-104-ATM2R) is connected and supplies power via **J10** at the top of the PCB.

2 Measure Vdc across the Test Pins **AG** & **Vo**. Use the Offset potentiometer **RV1** to adjust the voltage to zero.

3 Measure Vdc across the Test Pins **TP1** & **TP2**. Use the 4mA potentiometer **RV3** to adjust the voltage to 4mV.



4 Apply test gas to the sensor and adjust **RV2** to give the following
   a. 50% test gas **TP1** & **TP2** = 12mV.
   b. Voltage **AG** & **Vo** should not exceed 1vdc.

5 Remove the test gas and wait 1 minute for the sensor to stabilise.

6 IF necessary re-adjust the 4mA potentiometer **RV3** to adjust the voltage to 4mV.

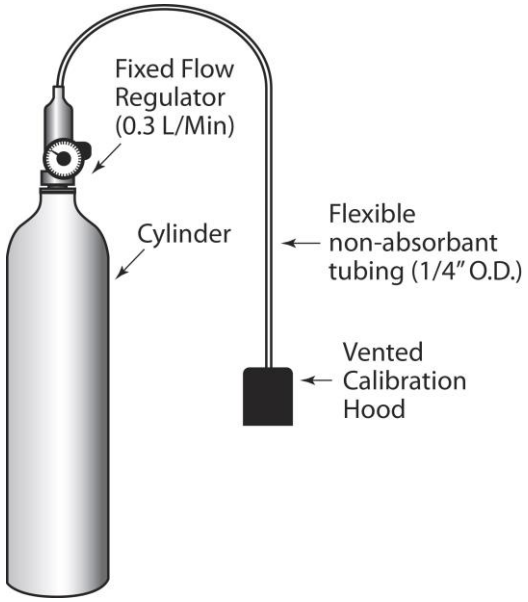
CALIBRATION OF BACHARACH MGS.150 NETWORK SENSOR

IMPORTANT: Failure to test or calibrate the unit in accordance with applicable instructions and with industry guidelines may result in serious injury or death. The manufacturer is not liable for any loss, injury, or damage arising from improper testing, incorrect calibration, or inappropriate use of the unit.

- Check local regulations on calibration or testing requirements
- The MGS contains sensitive electronic components that can be easily damaged. Do not touch nor disturb any of these components
- The MGS is calibrated at the factory. After installation, a zero adjustment maybe required due to differences in environmental conditions.
- The calibration of the unit must be carried out by a suitably qualified technician, and must be done in accordance with this manual and in compliance with locally applicable guidelines and regulations.
- Annual checks and gas calibration are recommended. It is also recommended that sensors are replaced every 3 years or as required. Calibration frequency may be extended based on application, but should never exceed 2 years.
- For improved accuracy and response, the instrument should be zeroed and calibrated in the environment in which it is being installed.

There are two adjustments required: zero and span. They are monitored at 0V and VS using a 0-5V scale. If the sensor range is 0-1000 ppm, then 5V=1000 ppm. You will require a multi-meter with clips to connect to the test pins and a “small flat screwdriver” to adjust the potentiometers.

Parasense offers a calibration kit that consists of a calibration gas cylinder, a flow regulation valve with flexible non-absorbent tubing and vented calibration hood:



Calculating Calibration Voltage:

Sensor outputs are linear. As long as you have a gas cylinder of known concentration you can calibrate to any desired range.

Example: For a sensor range of 0-1000 ppm and a cylinder of the target gas at 800 ppm:

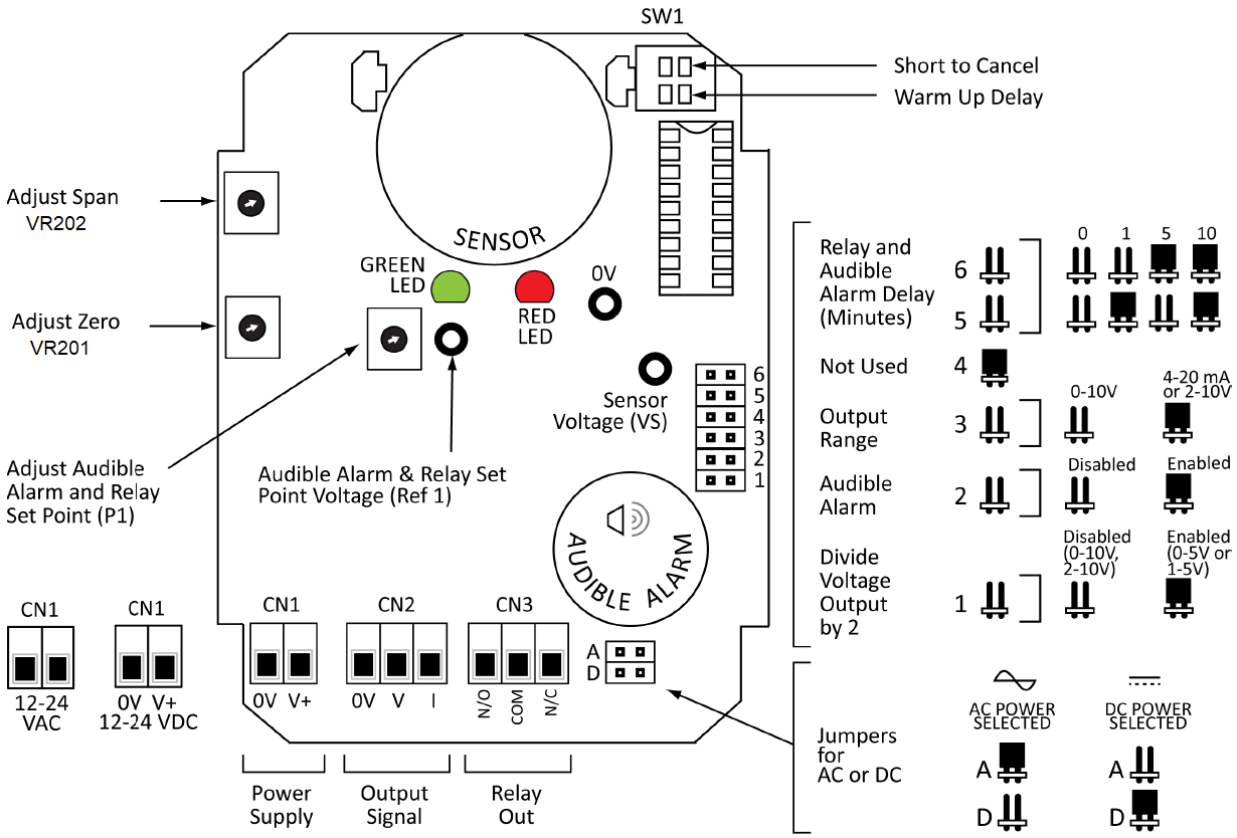
$$\text{Voltage} = \text{Target Gas Value} \times \frac{5\ \text{V}}{\text{Sensor Range}}$$

$$\text{Voltage} = 800\ \text{ppm} \times \frac{5\ \text{V}}{1000\ \text{ppm}} = 4\ \text{V}$$

So the output voltage signal should be adjusted to 4V.

The calibration procedure to be conducted as follows:

1. Open the sensor enclosure and locate Pot VR201 on the sensor PCB. VR201 is used to adjust the zero point (refer to the picture below).
2. Monitor the output between 0V (negative) and VS (positive).
3. Adjust Pot VR201 to 0V or slightly positive (0.01 V is acceptable).
4. Locate Pot VR202 which is used to calibrate the range (span) of the sensor (refer to the picture below).
5. Monitor the output between 0V (negative) and VS (positive).
6. Expose the sensor to calibration gas and allow to stabilize (approximately 6 minutes).
7. Adjust pot VR202 to the voltage calculated on the previous page.



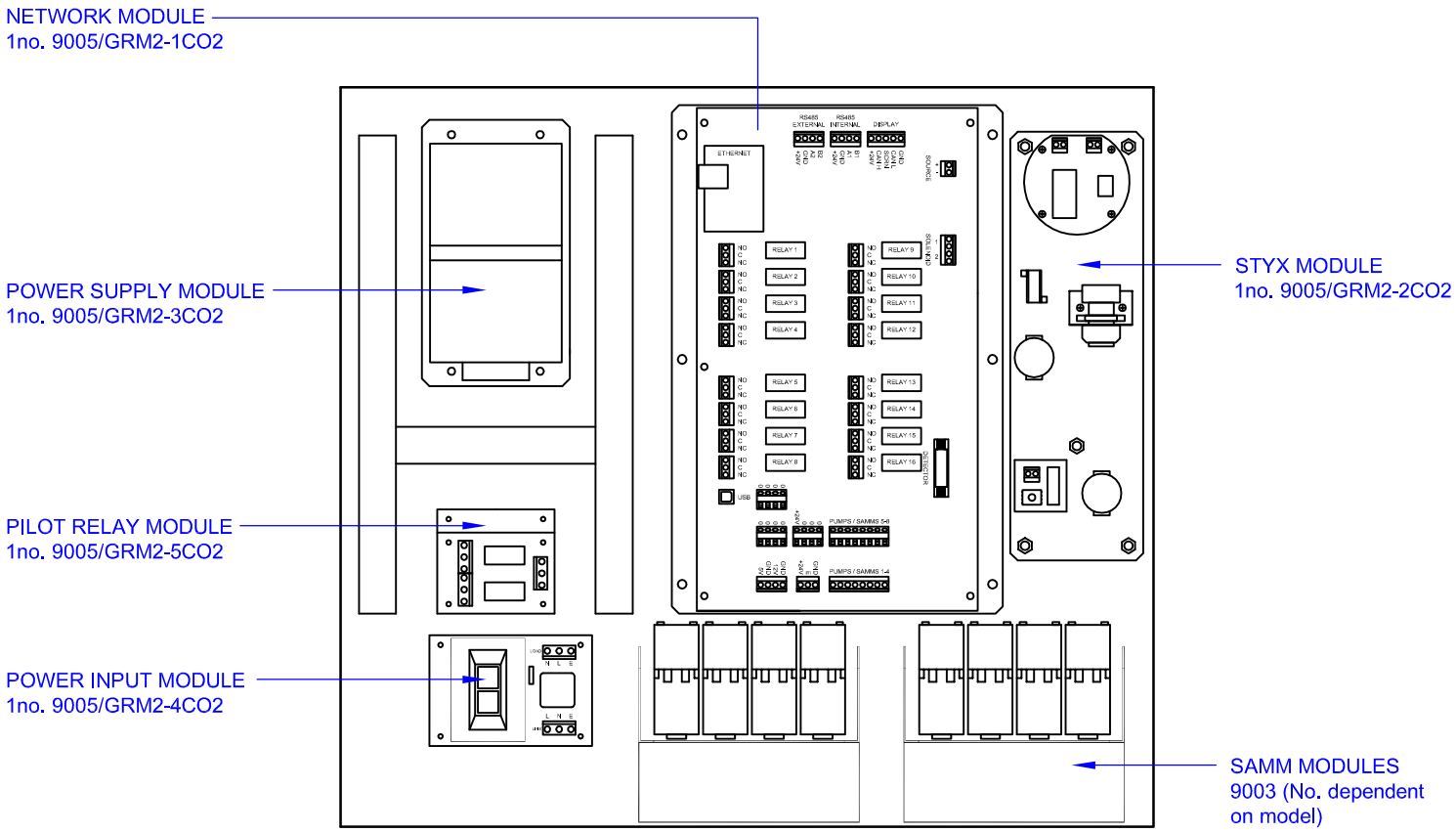
8 SPECIFICATION

Model GRM2-104D2-1xxCO2	
Power	100V to 240V, 100W, 50/60Hz or
Over-current Protection	4A DP MCB
Mains Filter	Overvoltage Protection
Ethernet	10 Base-T RJ45 Socket
USB	USB2.0, Type B Socket
Fault, Alarm Relay	Volt free, change-over Max switching voltage: 250V AC/100V DC Max switching current: 10A AC/5A DC, resistive
Pilot Relays	Volt free, change-over Max switching voltage: 250V AC/100V DC Max switching current: 10A AC/5A DC, resistive
Display & Operator Controls Options	Traffic lights, LCD status display & navigation keypad
Cluster Networks	RS485, 32 devices per network Network power: 24V DC max 650mA
Sensor, CO2 (0 – 2%)	Styx infrared absorption sensor 24V DC plus serial comms
Sample Pumps	4, 8, 12 or 16 pumps 24V DC, 360mA
Freeway	150m/492ft length max (including all spur freeway) 1 spur kit/4 way split max per SAMM All spur lengths to be 5m/16ft (coil excess freeway)
Max available 24V DC power supply capacity for Remote Beacon/Sounders and/or RS485 Networked SAMMs	1.2A up-to 50°C (122°F) enclosure temperature 0.6A between 50-60°C (122-140°F) enclosure temperature No spare capacity above 60°C (140°F)
Parasense Beacon/sounder I_{max} at 24V DC	Wired C-NC = 110mA
Parasense RS485 Networked SAMM I_{max} at 24V DC	120mA (for sensors without built-in heater) 420mA (for sensors with built-in heater) *NOTE: no beacon/sounder connected to ATM2R module*
Environmental Conditions	Operating temperature: 0°C to 50°C (15°F to 123°F) Storage temperature: -23°C to 65°C (-10°F to 150°F) Relative Humidity: 0 to 95% RH (non-condensing)

9 APPENDIX

GRM2 CO2 GENERAL ARRANGEMENT (PM2067)

GRM$_2$ CO2



PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK.
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

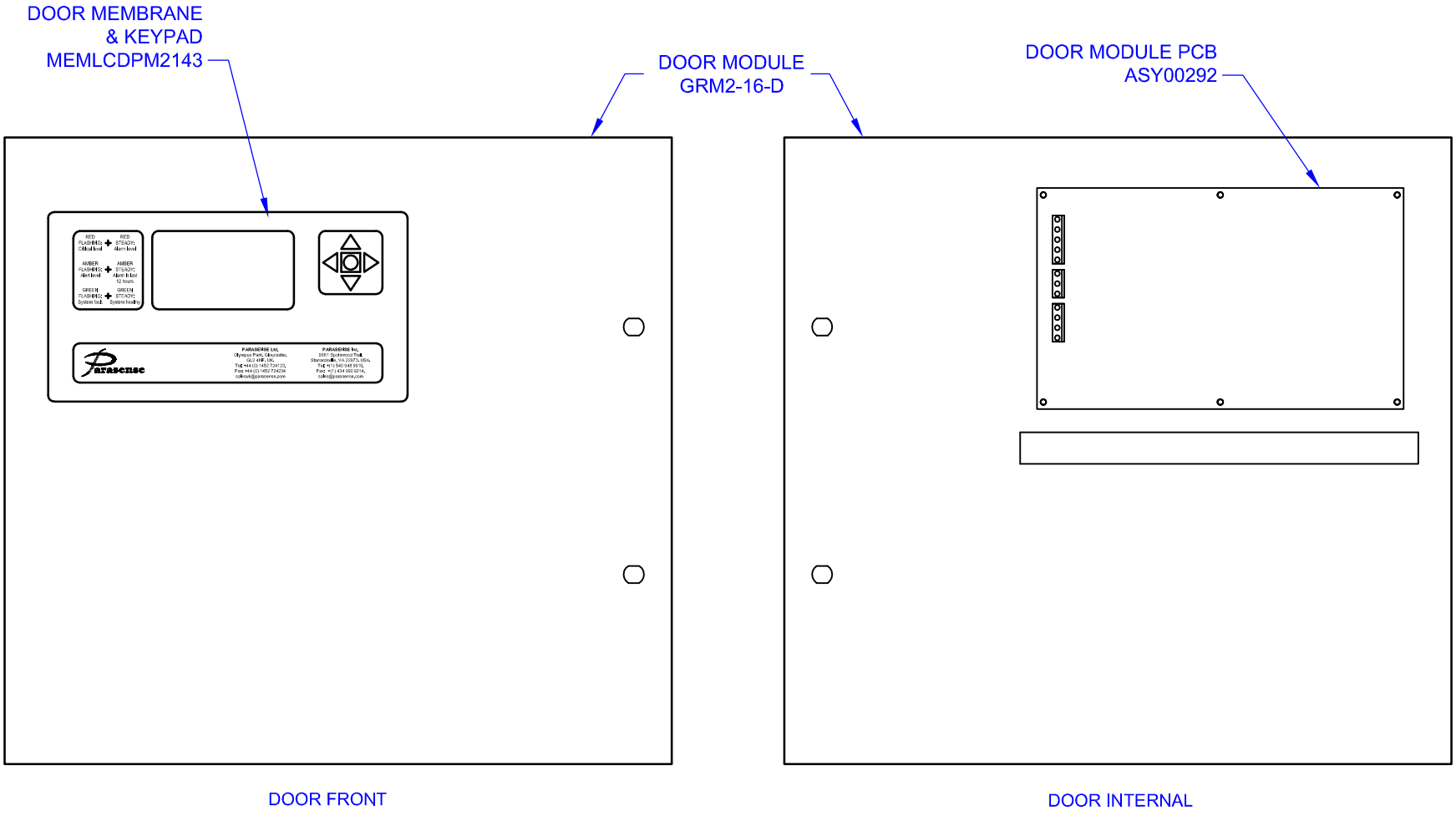
PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

Doc. Ref: H105-4 09/03/18

title: GRM2-104D2-CO2 General Arrangement			drawing number: **PM2067**
drawn: Scott Brindley	date: 5th Mar 2013	part number:	revision: **5** / sheet: **1 of 2**

revision:	checked:
4. Drawing border updated. JW 25th January 2017	AK
5. Drawing border updated. JW 27th March 2018	JB

GRM$_2$ CO2



PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK.
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

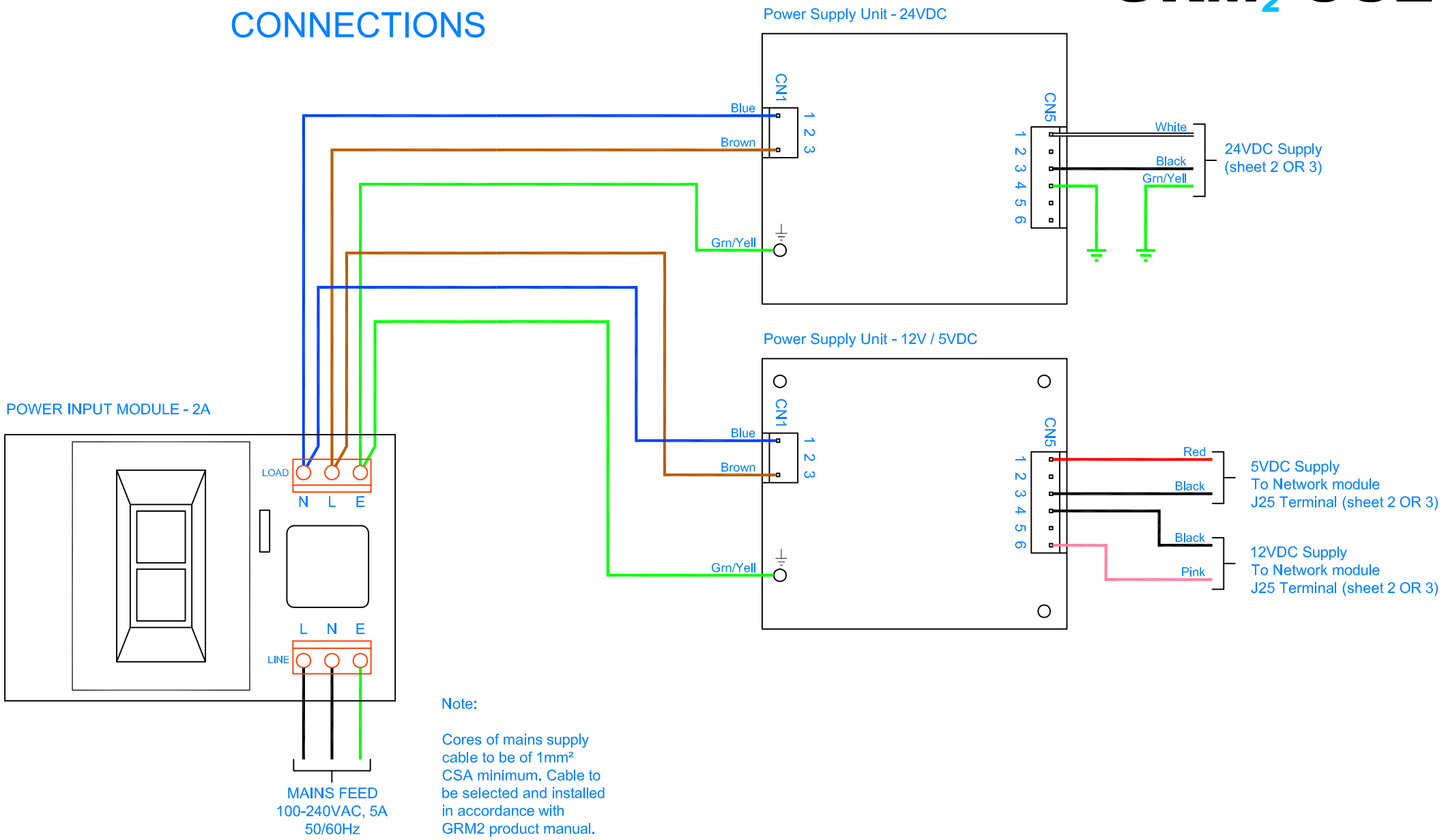
title: GRM2-104D2-CO2 General Arrangement			drawing number: **PM2067**	
drawn: Scott Brindley	date: 5th Mar 2013	part number:	revision: **5**	sheet: **2 of 2**

revision:	checked:
4. Drawing border updated. JW 25th January 2017	AK
5. Drawing border updated. JW 27th March 2018	JB

GRM2 CO2 CONNECTION SCHEMATICS (PS0748)

POWER INPUT MODULE / PSU CONNECTIONS

GRM$_2$ CO2



Note:

Cores of mains supply cable to be of 1mm² CSA minimum. Cable to be selected and installed in accordance with GRM2 product manual.

PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK.
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

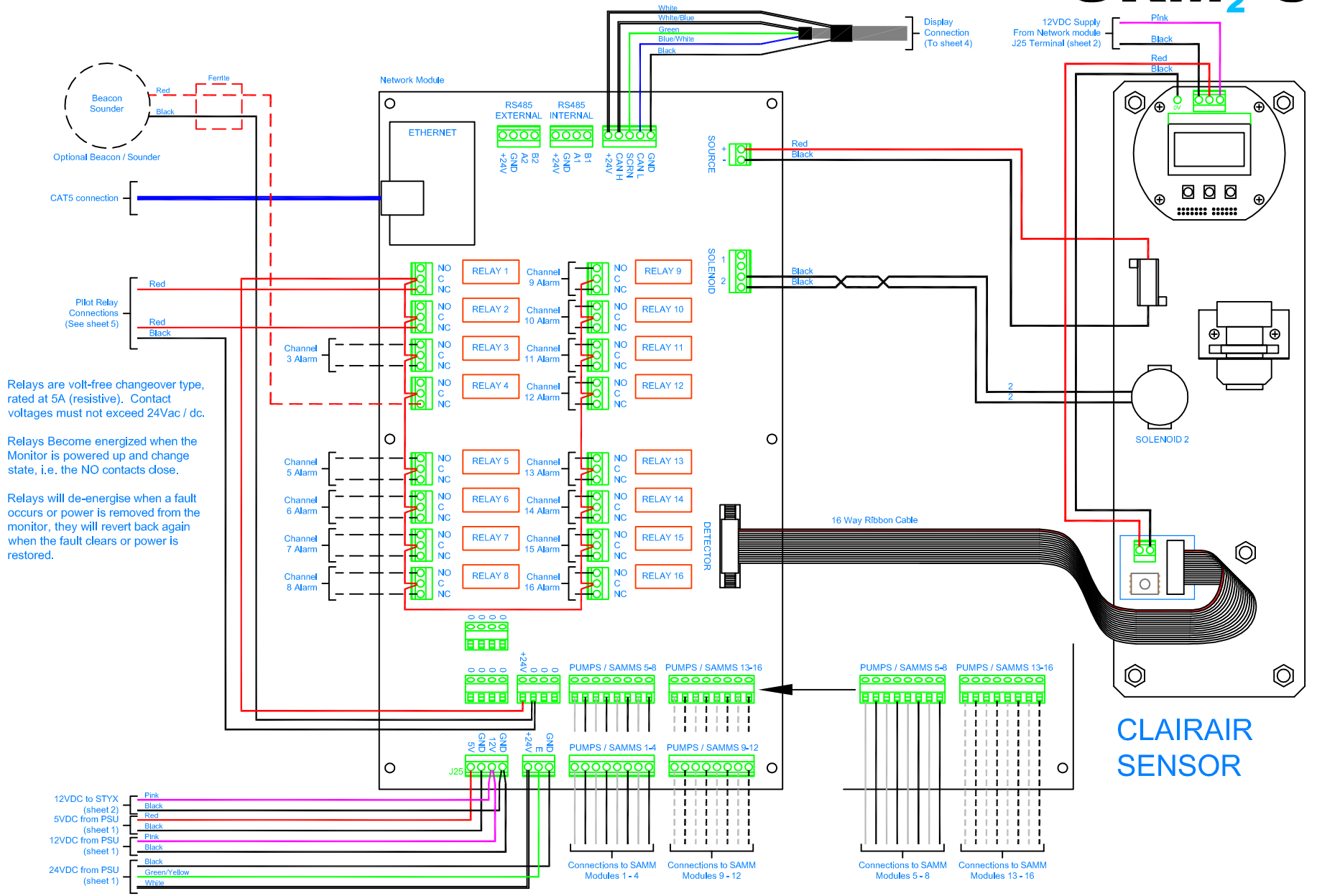
Doc. Ref: H105-4 09/03/18

title:	GRM2-104D2-CO2 Connection Schematic
drawing number:	**PS0748**
revision:	**8**
sheet:	**1 of 5**
drawn:	S. BRINDLEY
date:	5th Mar 2013
part number:	GRM2-104D2-CO2

revision:	checked:
6. Drawing border updated. JW 25th January 2017	AK
7. CO2 STYX wiring changed to account for both Dynament & Clairair sensors - ANK 24/05/2017	JW
8. Drawing border updated. JW 27th March 2018	JB

NETWORK MODULE CONNECTIONS

GRM$_2$ CO2



PARASENSE Ltd.
Olympus Park, Gloucester, GL2 4NF, UK.
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

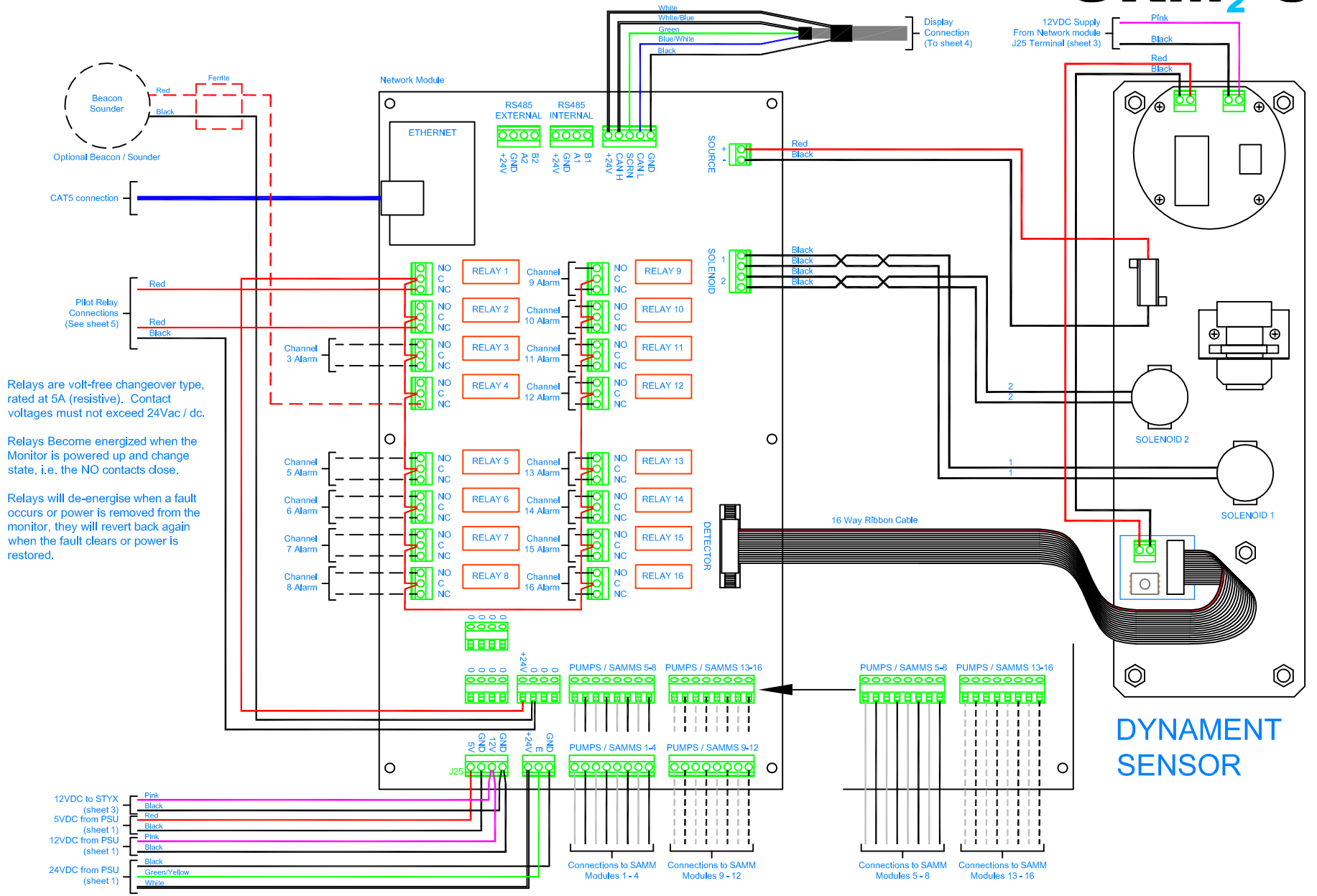
Doc. Ref: H105-4 09/03/18

title:	GRM2-104D2-CO2 Connection Schematic
drawing number:	**PS0748**
revision:	**8**
sheet:	**2 of 5**
drawn:	S. BRINDLEY
date:	5th Mar 2013
part number:	GRM2-104D2-CO2

revision:	checked:
6. Drawing border updated. JW 25th January 2017	AK
7. CO2 STYX wiring changed to account for both Dynament & Clairair sensors - ANK 24/05/2017	JW
8. Drawing border updated. JW 27th March 2018	JB

NETWORK MODULE CONNECTIONS

GRM$_2$ CO2



PARASENSE Ltd.
Olympus Park, Gloucester, GL2 4NF, UK.
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

Doc. Ref: H105-4 09/03/18

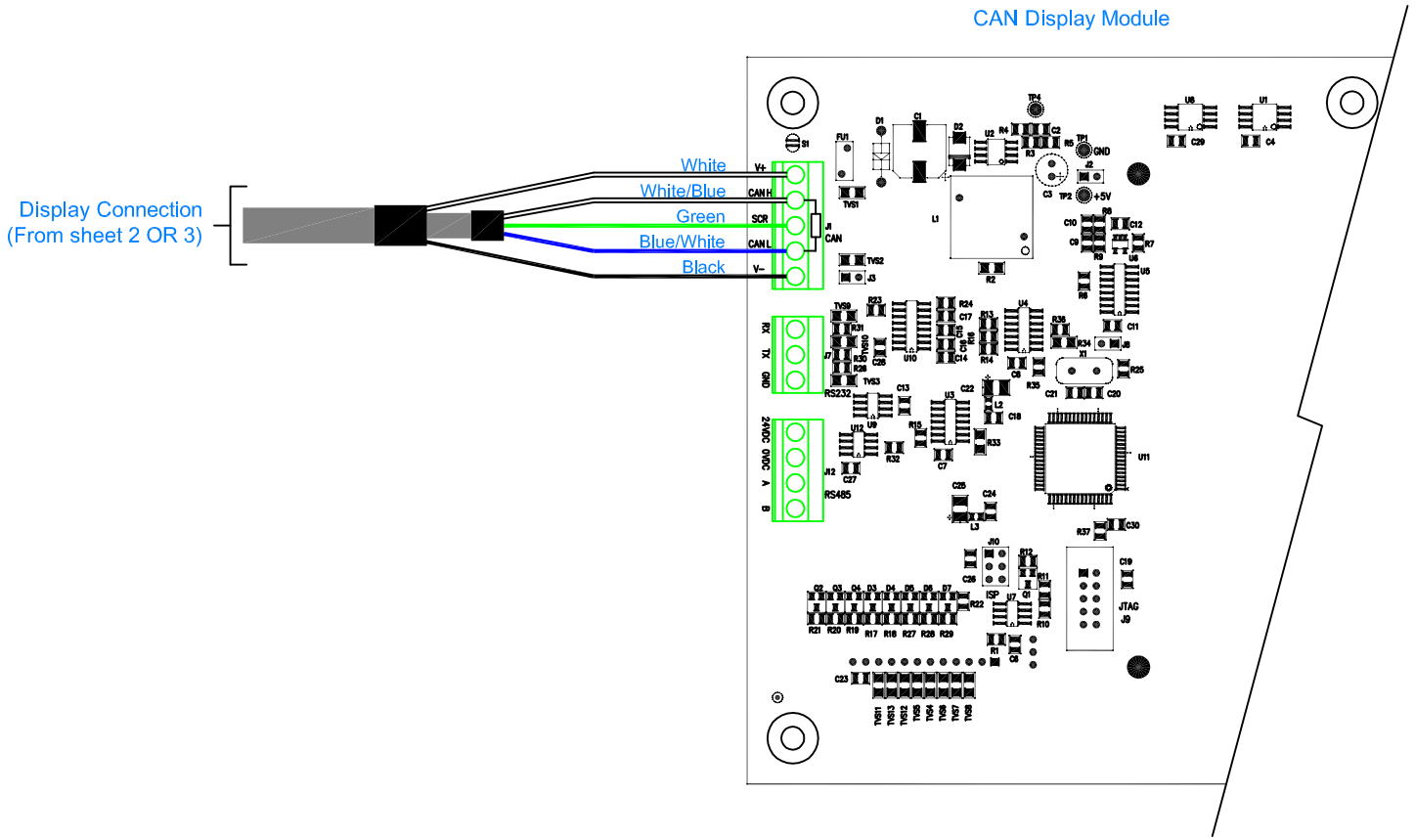
title:	drawing number:	revision:	sheet:
GRM2-104D2-CO2 Connection Schematic	**PS0748**	**8**	**3 of 5**

drawn:	date:	part number:
S. BRINDLEY	5th Mar 2013	GRM2-104D2-CO2

revision:	checked:
6. Drawing border updated. JW 25th January 2017	AK
7. CO2 STYX wiring changed to account for both Dynament & Clairair sensors - ANK 24/05/2017	JW
8. Drawing border updated. JW 27th March 2018	JB

DISPLAY CONNECTIONS

GRM$_2$ CO2



PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK.
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

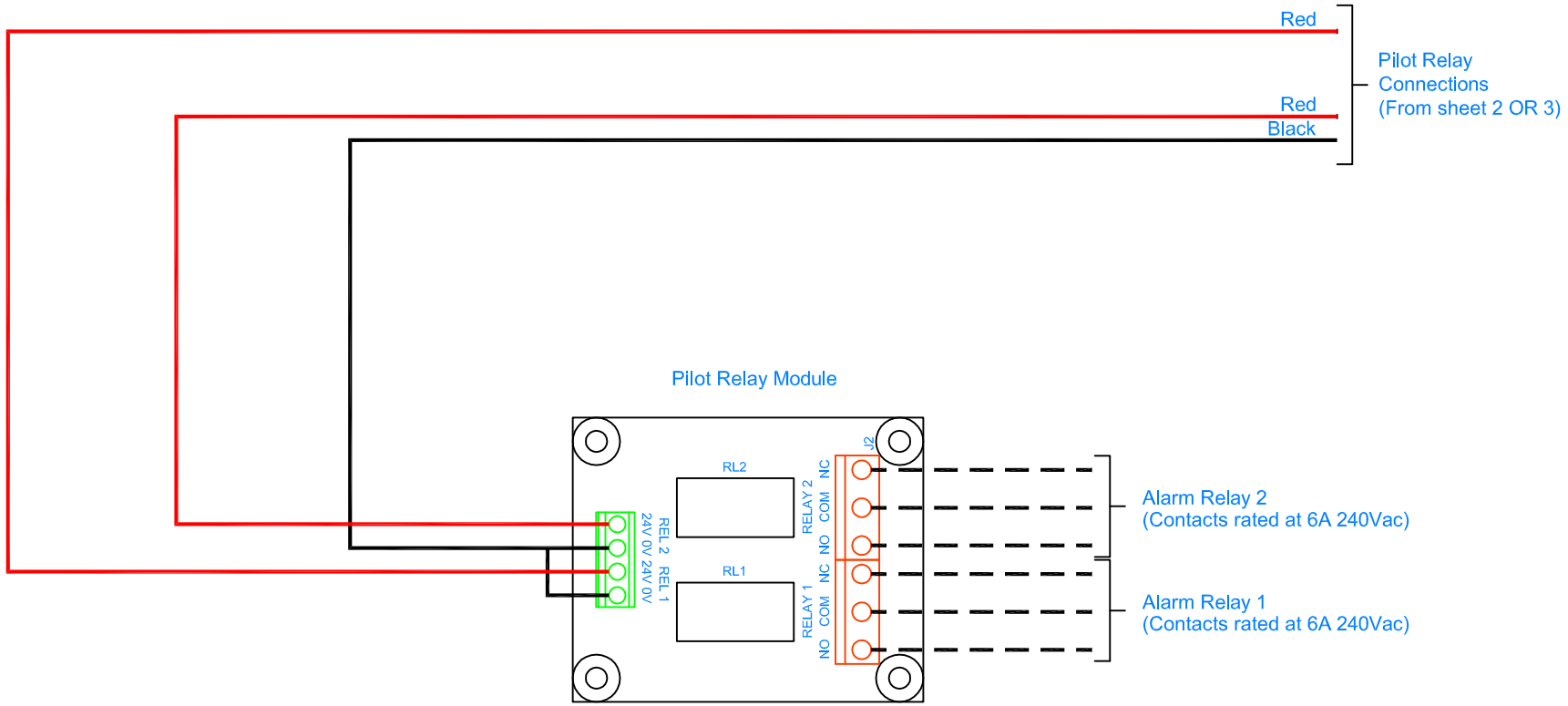
Doc. Ref: H105-4 09/03/18

title: GRM2-104D2-CO2 Connection Schematic			drawing number: **PS0748**
drawn: S. BRINDLEY	date: 5th Mar 2013	part number: GRM2-104D2-CO2	revision: **8** / sheet: **4 of 5**

revision:	checked:
6. Drawing border updated. JW 25th January 2017	AK
7. CO2 STYX wiring changed to account for both Dynament & Clairair sensors - ANK 24/05/2017	JW
8. Drawing border updated. JW 27th March 2018	JB

PILOT RELAY MODULE CONNECTIONS

GRM$_2$ CO2



Parasense
A BACHARACH. COMPANY

PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK.
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

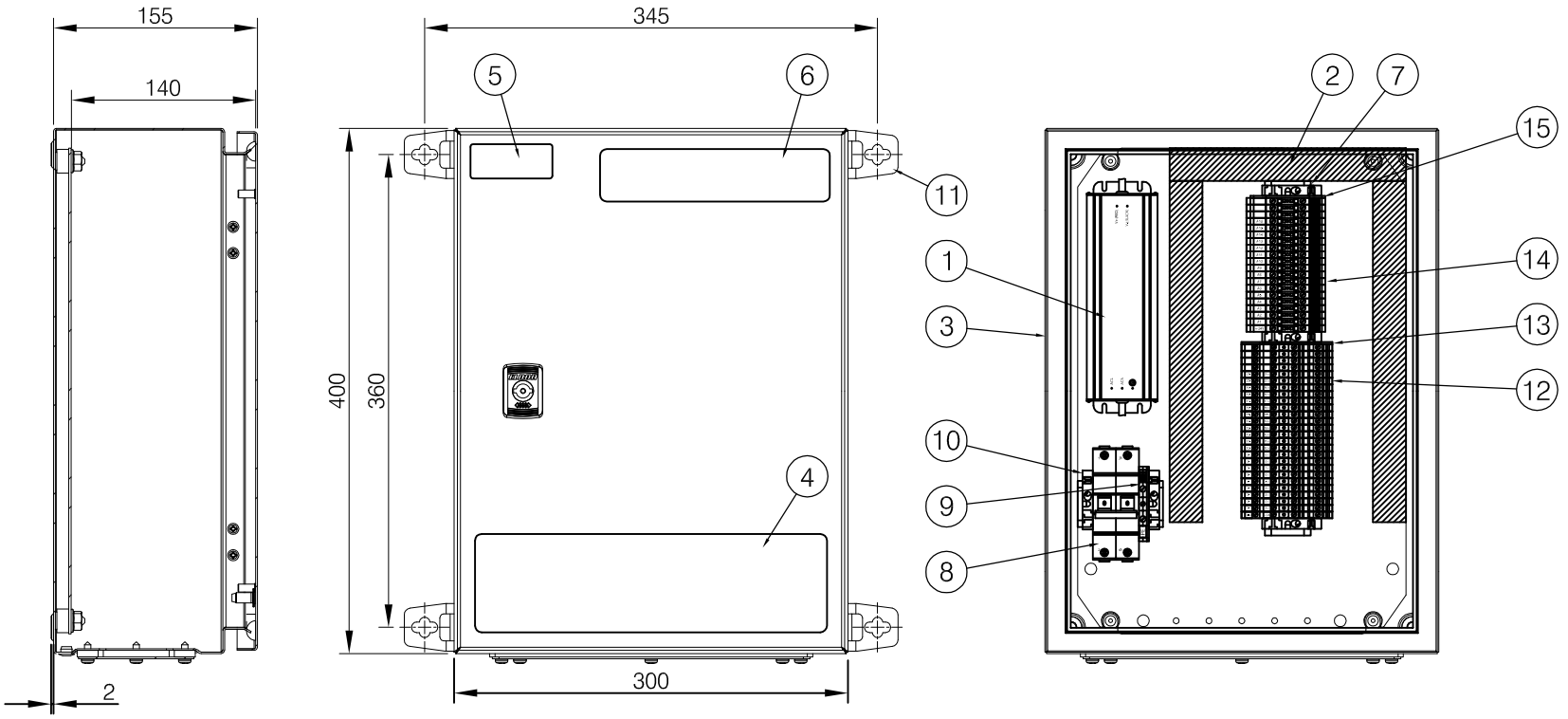
Doc. Ref: H105-4 09/03/18

title: GRM2-104D2-CO2 Connection Schematic			drawing number: **PS0748**
drawn: S. BRINDLEY	date: 5th Mar 2013	part number: GRM2-104D2-CO2	revision: **8** / sheet: **5 of 5**

revision:	checked:
6. Drawing border updated. JW 25th January 2017	AK
7. CO2 STYX wiring changed to account for both Dynament & Clairair sensors - ANK 24/05/2017	JW
8. Drawing border updated. JW 27th March 2018	JB

ADC-104 GENERAL ARRANGEMENT (PM2098)

GRM$_2$



Item	Description	Part Number	Qty
1	Power Supply	PSU-DLG75PS24	1
2	Trunking 25 x 80	TRUNK-25X80PVC	700mm
3	Enclosure 400 x 300 x 155	ENC-MAS0403015	1
4	Stepwise Product Label	LABPM2099	1
5	Warning Label	LABPM559	1
6	Parasense Address Label	LABPM1878	1
7	DIN Rail	KLI067620	360mm
8	2 pole Circuit Breaker 6A	MCB-S201-C4NA	1

Item	Description	Part Number	Qty
9	Earth terminals	KLI101010	2
10	Terminal End Stops	KLI038356	5
11	Mounting Brackets	ENC-AMWB0240	1
12	Double Terminal 2.5mm	KLI102150	26
13	Double Terminal End Plate	KLI105910	1
14	Control Terminal 2.5mm	KLI102000	20
15	Control Terminal End Plate	KLI105000	1
16			

Parasense
A BACHARACH. COMPANY

PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK.
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

Doc. Ref: H105-4 09/03/18

title: ADC-104 General Assembly

drawing number: **PM2098**

drawn:	date:	part number:
ANK	25th Nov 2013	ADC-104

revision: **3**

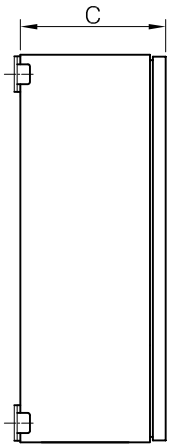
sheet: **1 of 1**

revision:	checked:
2. Drawing border updated. JW 24th January 2017	AK
3. Drawing border updated. JW 27th March 2018	JB

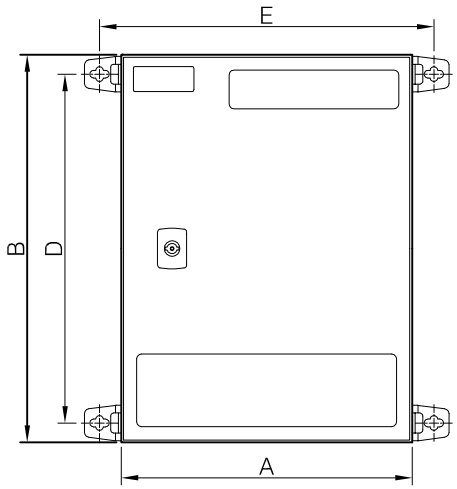
ADC-104 PANEL MOUNTING DETAILS (PM2247)

RM2

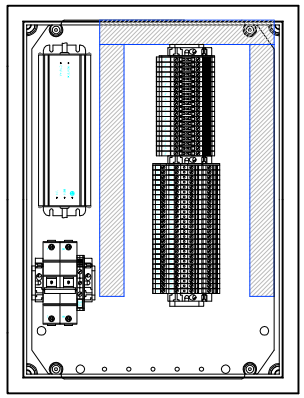
SIDE VIEW



EXTERNAL VIEW

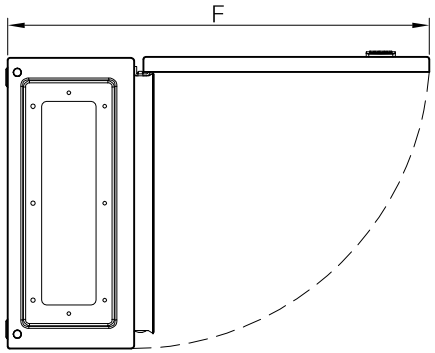


INTERNAL VIEW



DIMENSIONS

MODEL : ADC-104	A	B	C	D	E	F	WEIGHT
Metric (mm)	300	400	150	360	345	440	10kg
Imperial (inches)	11.8	15.7	5.9	14.2	13.6	17.3	22lb



DOOR SWING VIEW

1. The ADC-104 is housed in an IP54 / NEMA 12 rated enclosure. It must be mounted to a solid vertical surface or structure capable of supporting the stated weight. We recommend the surface be built from concrete blocks of brick. It must be positioned where the door can be fully opened, and in a location that facilitates easy service and maintenance.
2. Four fixing brackets are supplied loose with the monitor. They can be fitted vertically or horizontally. Choose the appropriate orientation, insert the bolt and nylon washer through the enclosure from the inside and tighten the bolts into the mounting brackets.
3. Fixings should be 4mm (1/8") or 5mm (3/16") screws or bolts minimum 40mm (1.5") long with plain washers suitable for wall plugs.
4. The panel should be located adjacent to the GRM2 that it is to be connected to as the factory supplied interconnection looms are 1.5M (5ft) long. The gap between the GRM2 and ADC-104 should be no greater than 150mm (6").
5. The enclosure is designed for cable entry from below. It has pre-drilled knock-outs for cabling. Ensure the mains cable uses the knock-out in the left end of the enclosure directly below the circuit breaker. If access is required from the sire or above then the fitting must be of such a type to prevent ingress of moisture or dust. Failure to do so could invalidate the warranty
6. Ensure the panel is mounted where the environmental conditions are within; Temperature -9°C/+15°F to +41°C/+106°F. Humidity: 0% to 95%, non-condensing

Parasense
A BACHARACH. COMPANY

PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

Doc. Ref: H105-4 09/03/18

title:
ADC-104
Panel Mounting Details

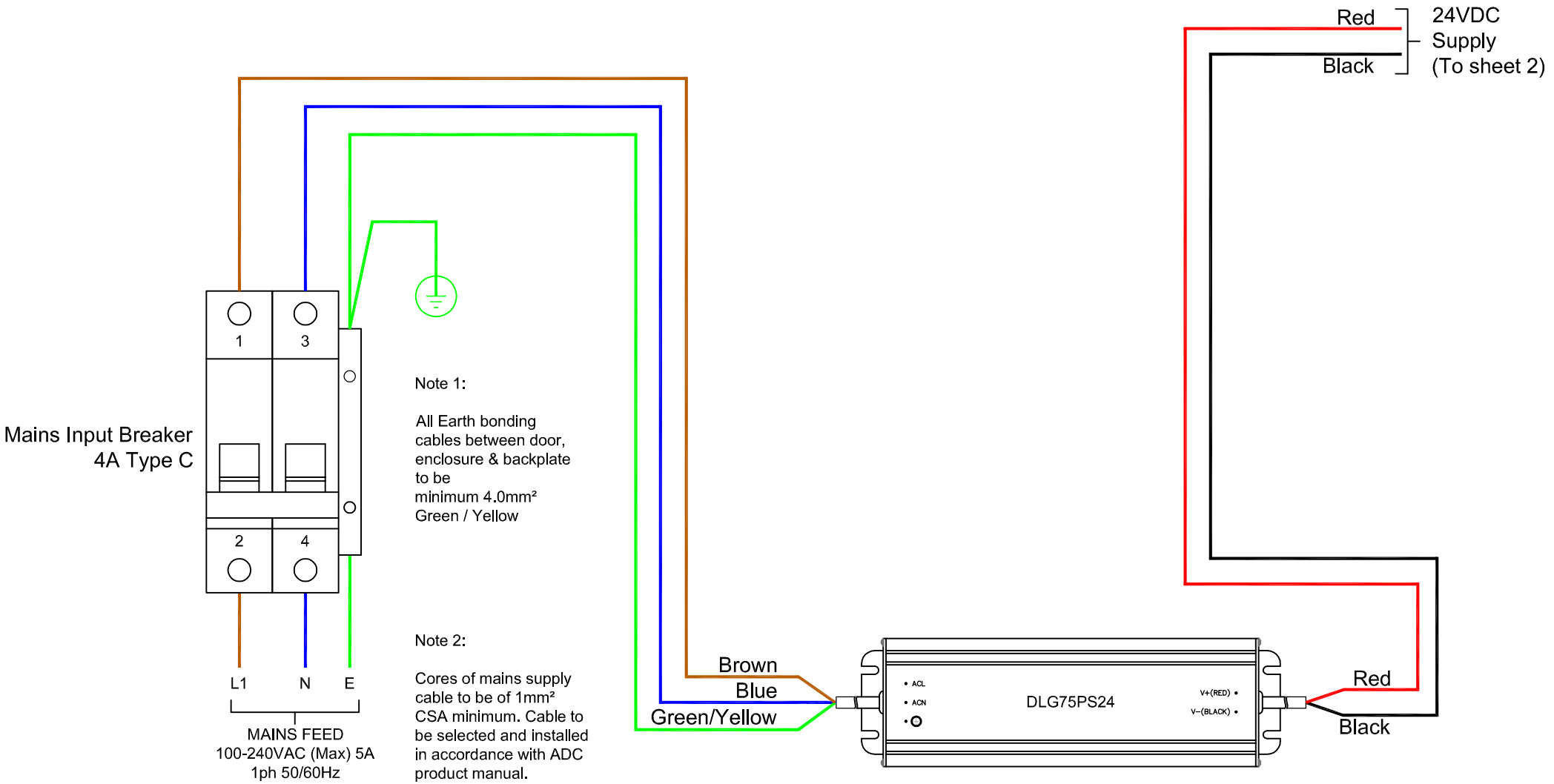
drawn: James Wilkinson
date: 26th July 2016
part number: .....

drawing number: **PM2247**
revision: **2**
sheet: **1 of 1**

revision:	checked:
1. Drawing border udpated. JW 16th January 2017	AK
2. Drawing border udpated. JW 27th March 2018	JB

ADC-104 CONNECTION SCHEMATIC (PS0753)

RM2



PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

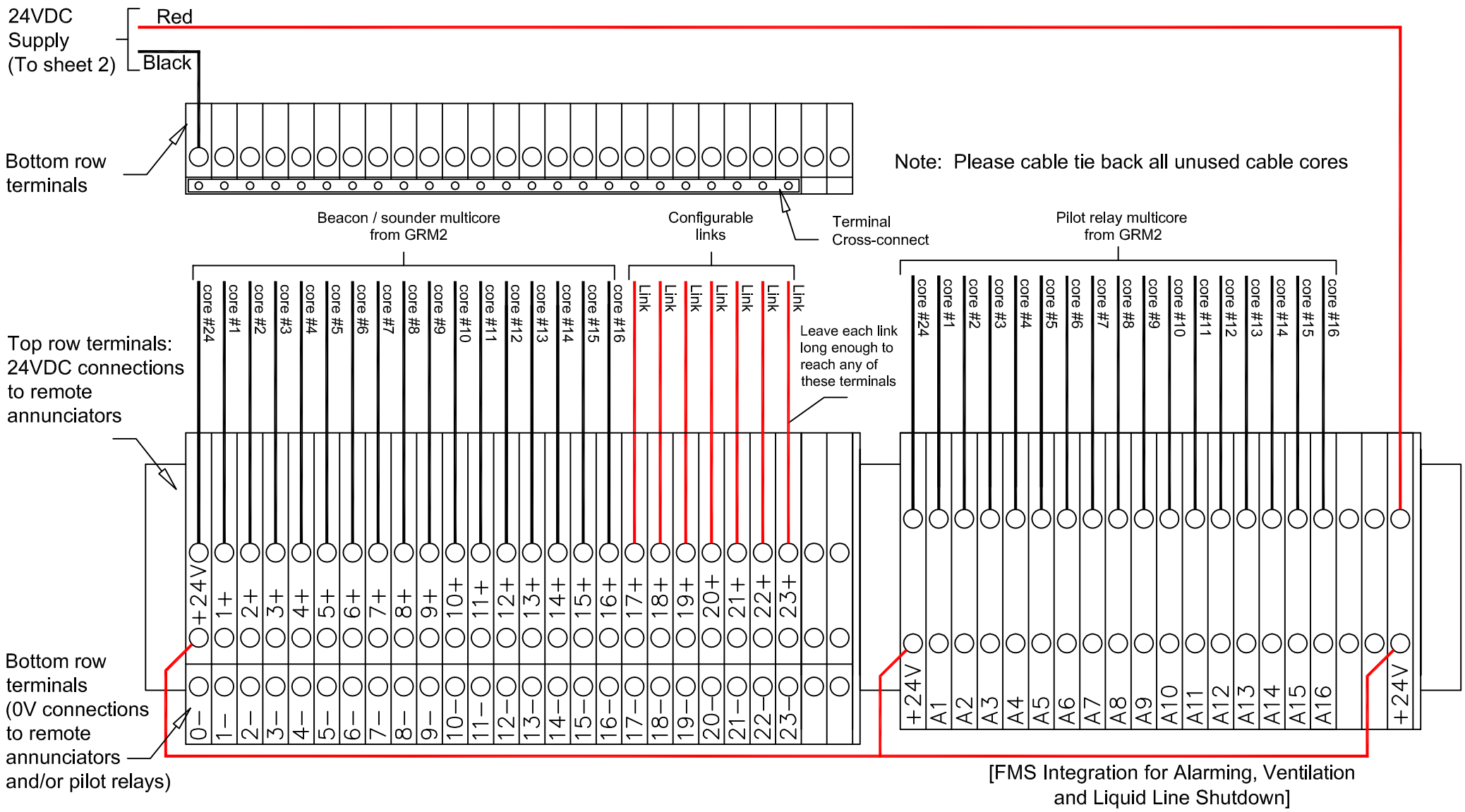
Doc. Ref: H105-4 09/03/18

title:	ADC-104 Schematic Wiring Diagrams
drawing number:	**PS0753**
revision:	**8**
sheet:	**1 of 3**
drawn:	ANK
date:	15th Nov 2013
part number:	ADC-104

revision:	checked:
6. Notes updated. AK 12/12/2016	JW
7. Drawing border updated. JW 16th January 2017	AK
8. Drawing border updated. JW 22nd March 2018	JB

GRM2 remote terminal box connections

RM2



Parasense
A BACHARACH. COMPANY

PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

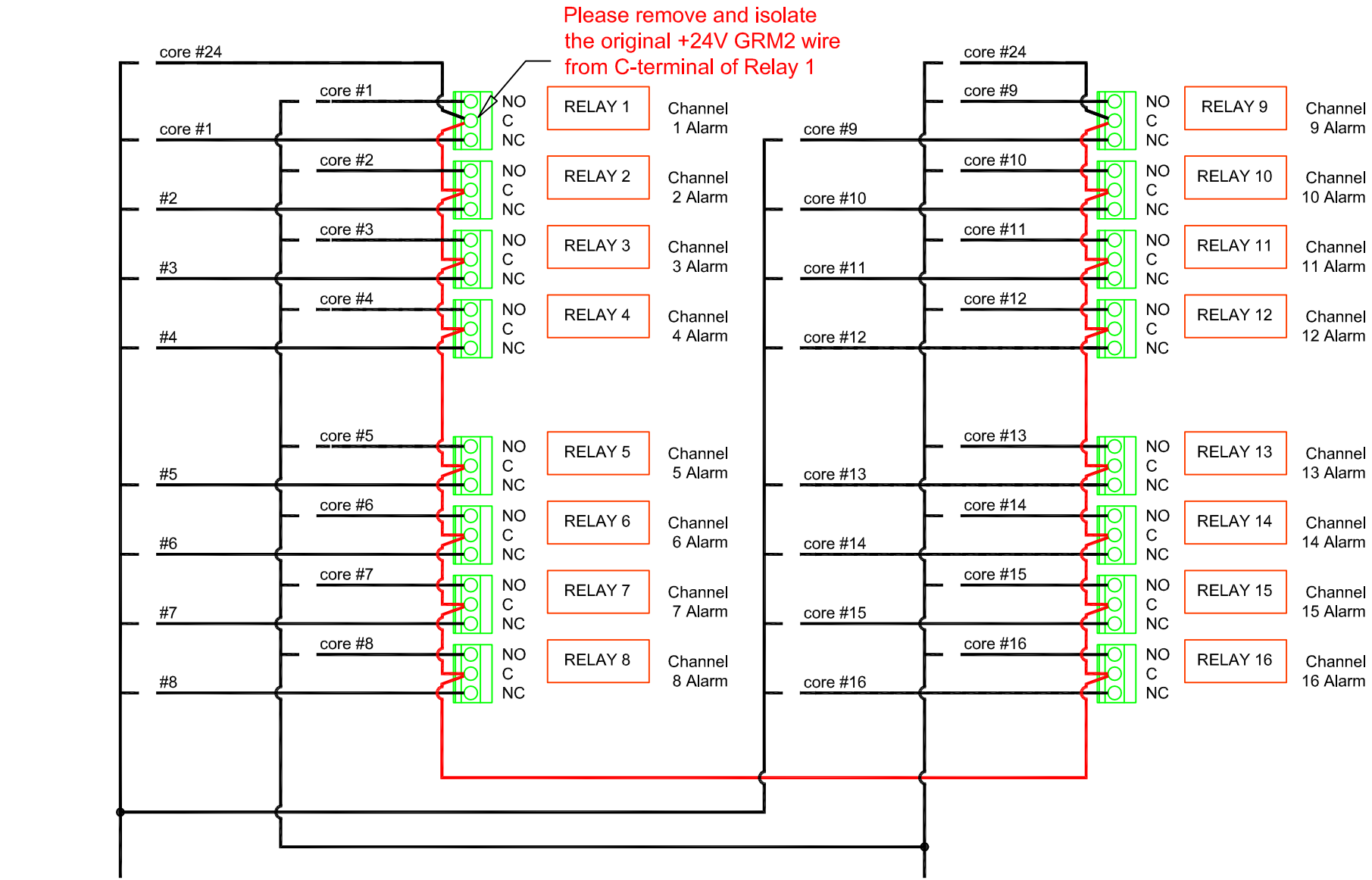
Doc. Ref: H105-4 09/03/18

title: ADC-104 Schematic Wiring Diagrams			drawing number: **PS0753**
drawn: ANK	date: 15th Nov 2013	part number: ADC-104	revision: **8** / sheet: **2 of 3**

revision:	checked:
6. Notes updated. AK 12/12/2016	JW
7. Drawing border updated. JW 16th January 2017	AK
8. Drawing border updated. JW 22nd March 2018	JB

GRM2 Relay Connections to remote terminal box

RM2



Parasense
A BACHARACH. COMPANY

PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

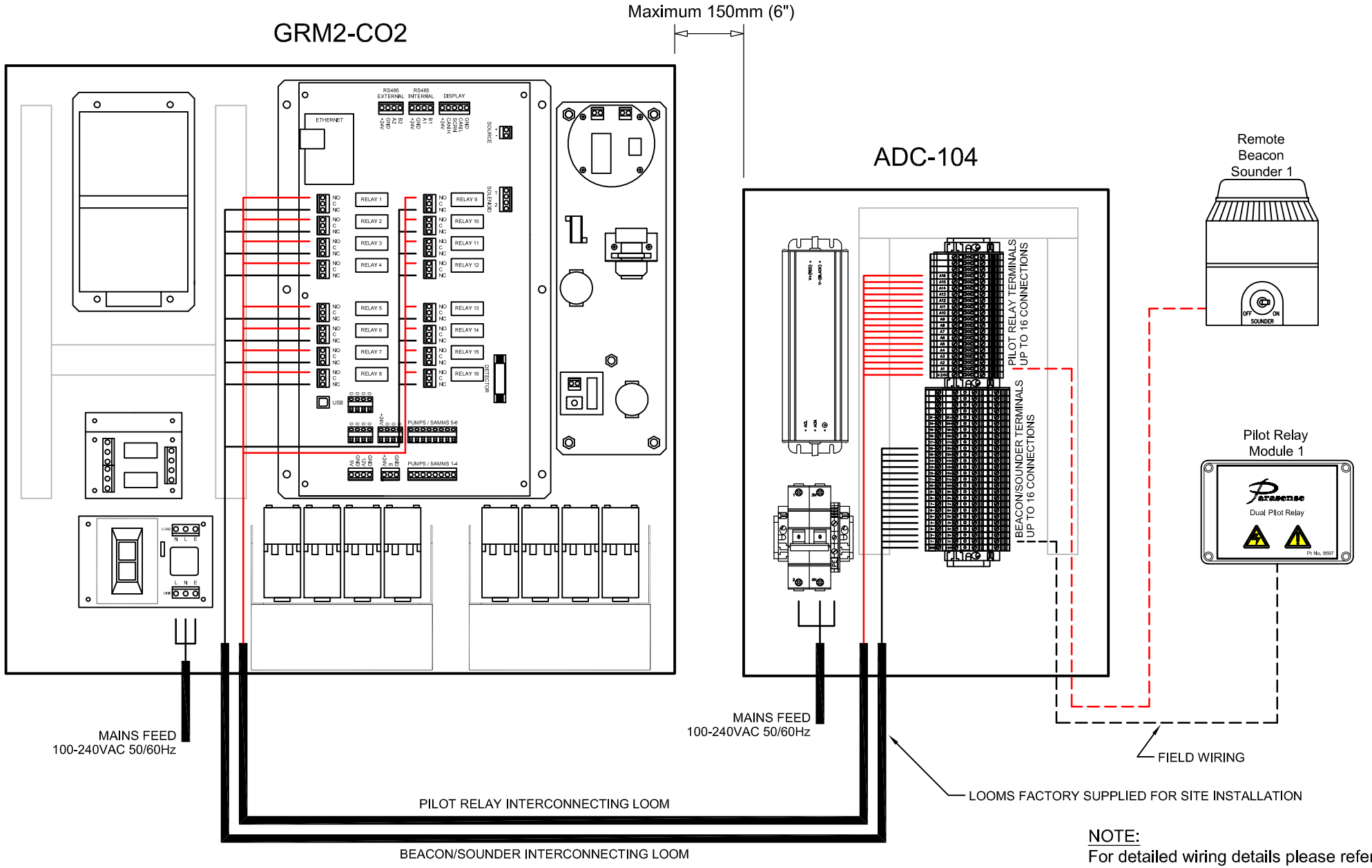
Doc. Ref: H105-4 09/03/18

title:	drawing number:	revision:	sheet:
ADC-104 Schematic Wiring Diagrams	**PS0753**	**8**	**3 of 3**

drawn:	date:	part number:
ANK	15th Nov 2013	ADC-104

revision:	checked:
6. Notes updated. AK 12/12/2016	JW
7. Drawing border updated. JW 16th January 2017	AK
8. Drawing border updated. JW 22nd March 2018	JB

GRM2 CO2 WITH ADC-104 INSTALLATION OVERVIEW (PS0790)



NOTE:
For detailed wiring details please refer to Parasense drawing PS0753 sheets 1 to 3

Parasense
A BACHARACH. COMPANY

PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK.
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

Doc. Ref: H105-4 09/03/18

title: GRM2 CO2 with ADC-104 block diagram

drawn: James Wilkinson | date: 7th Sept 16 | part number: ADC-104

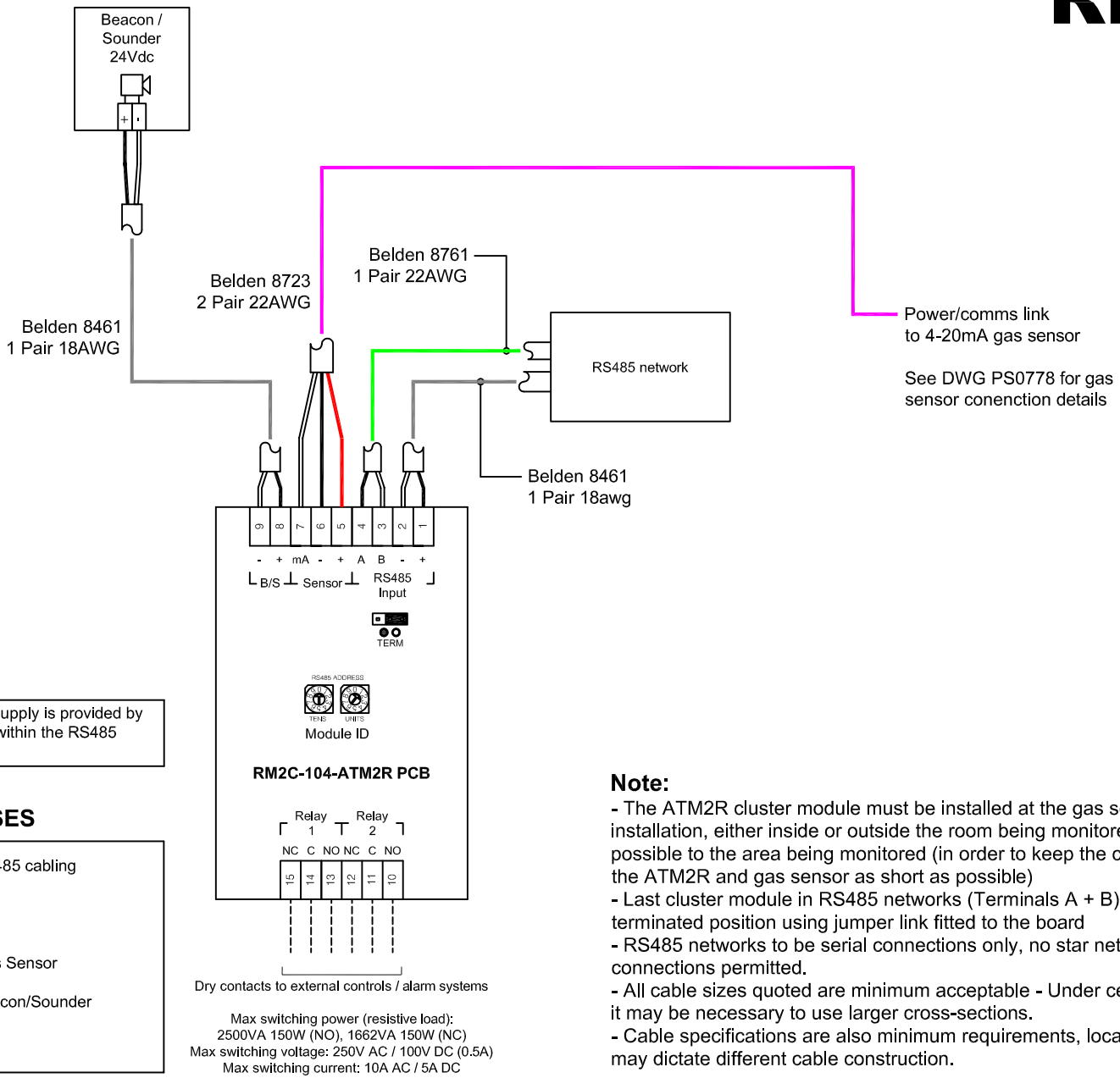
drawing number: **PS0790**

revision: **3** | sheet: **1 of 1**

revision:	checked:
1. Drawing border updated. JW 25th January 2017	AK
2. Pilot relay PCB updated to show 4 terminals rather than 3 - ANK 31/05/2017	JW
3. Drawing border updated. JW 27th March 2018	JB

RM2C-104-ATM2R CONNECTION DETAILS (PS0768)

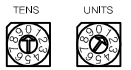
RM2C



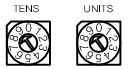
RS485 Termination Jumper setting

Terminated Open

RS485 Network Addressing switches (Each cluster to have unique ID)



= ID 01



= ID 99

Note

Address 00 reserved
Maximum number of addresses limited by application - Contact Parasense if unsure.

POWER REQUIREMENTS

RM2C-104-ATM2R	24Vdc	24 Vdc supply is provided by 2 cores within the RS485 cable.

CABLE KEY

	USES
RS485:- **Up to 990m (3250ft)** Signal - Belden 8761 - 1 Twisted Pair, 22AWG Power - Belden 8461 - 1 Twisted Pair, 18AWG	RS485 cabling
Belden 8723 - 2 Twisted Pairs, 22AWG	Gas Sensor
Belden 8461 - 1 Twisted Pair, 18AWG	Beacon/Sounder

Note:

- The ATM2R cluster module must be installed at the gas sensor end of the installation, either inside or outside the room being monitored or as near as possible to the area being monitored (in order to keep the connection between the ATM2R and gas sensor as short as possible)
- Last cluster module in RS485 networks (Terminals A + B) to be set in the terminated position using jumper link fitted to the board
- RS485 networks to be serial connections only, no star networks or parallel connections permitted.
- All cable sizes quoted are minimum acceptable - Under certain conditions it may be necessary to use larger cross-sections.
- Cable specifications are also minimum requirements, local regulations may dictate different cable construction.

Parasense A BACHARACH. COMPANY

PARASENSE Ltd.
Olympus Park, Gloucester, GL2 4NF, UK.
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

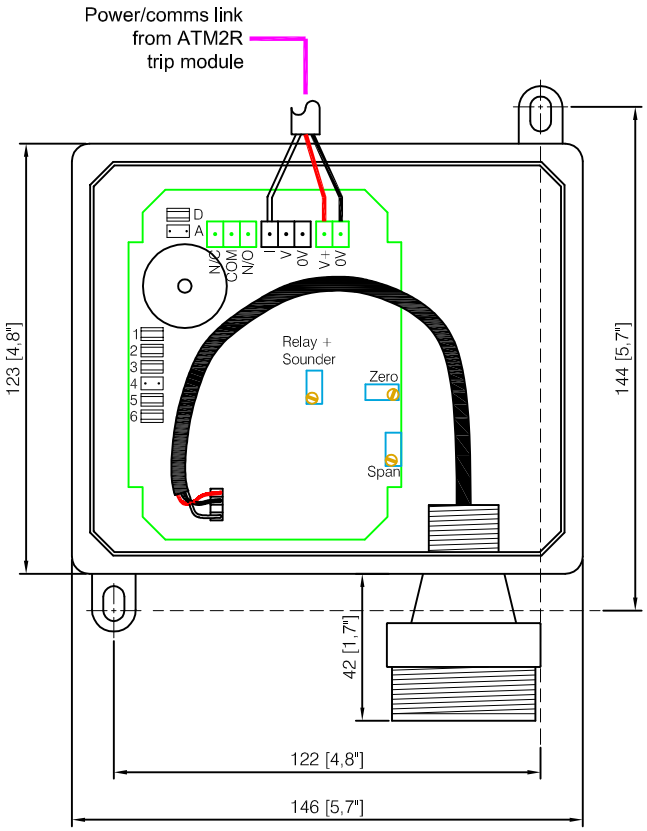
Doc. Ref: H105-4 09/03/18

title: RM2C-104-ATM2R			drawing number: **PS0768**
drawn: James Wilkinson	date: 18th Sept 2014	part number: RM2C-104-ATM2R	revision: **8** sheet: **1 of 1**

revision:	checked:
6. Relay ratings updated. JW 8th July 2016	AK
7. Drawing border updated. 13th January 2017	AK
8. Drawing border updated. 27th March 2018	JB

NETWORK SENSOR MOUNTING AND CONNECTIONS (PS0778)

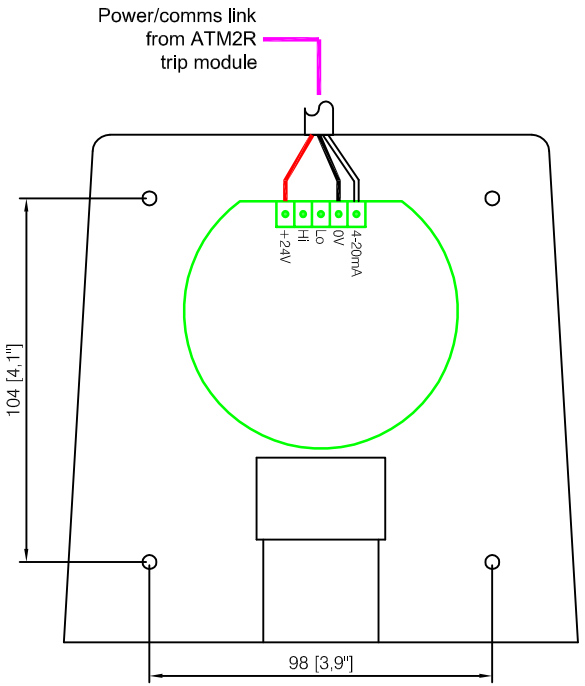
BACHARACH MGS-150 SENSORS



Connections and Fixing Centres

NOTE:
For detailed information on jumper settings and calibration please refer to Parasense User Manual and Bacharach Manual

GDS SENSORS



Connections and Fixing Centres

PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK.
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

Doc. Ref: H105-4 09/03/18

title: Network gas sensors mounting and connections

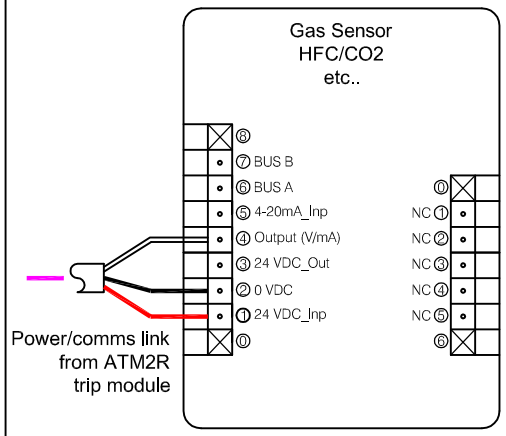
drawn: James Wilkinson | date: 12th May 2015 | part number: .....

drawing number: **PS0778**

revision: **5** | sheet: **1 of 2**

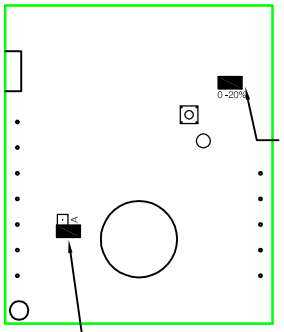
revision:	checked:
3. Drawing border updated. GDS sensors details modified. JW 13th January 2017	AK
4. Bacharach MGS-150 details added. JW 7th March 2018	JB
5. Drawing border updated. JW 27th March 2018	JB

MSR SENSORS



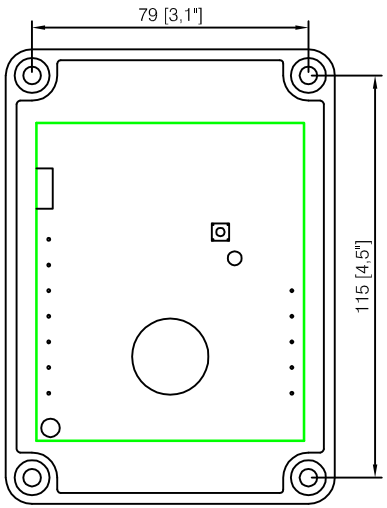
Connections

PCB to be carefully removed (pull upwards) and safely stored while terminations are made. Ensure PCB is installed all the way back in to the terminals after wiring is complete.

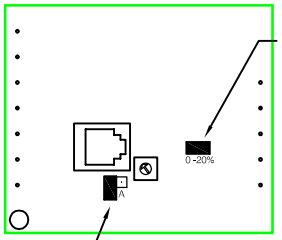


Ensure 0-20% jumper is closed (factory default)

Ensure V-A jumper is open (factory default)



Fixing Centres

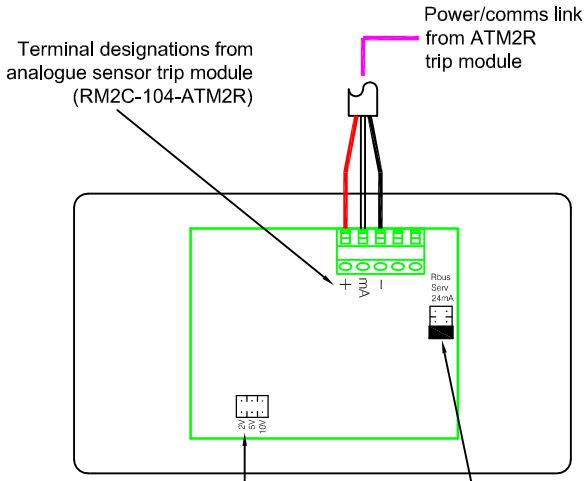


Ensure 0-20% jumper is closed (factory default)

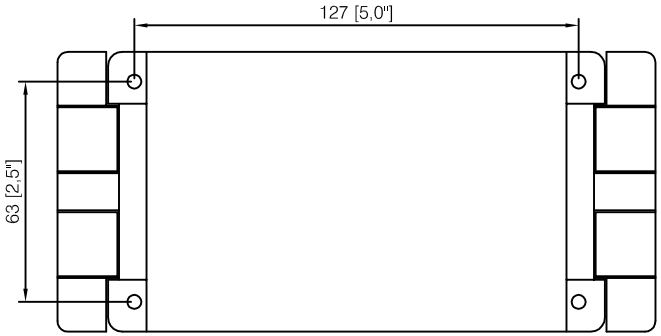
Ensure V-A jumper is open (factory default)

NOTE:
The MSR sensors have two different types of PCB fitted depending on the gas being detected. The connections and jumper configurations remain the same for both styles (shown above)

smartGAS SENSORS



Connections



Fixing Centres

PARASENSE Ltd.
Olympus Park, Gloucester,
GL2 4NF, UK.
Tel: +44 (0) 1452 724123.
Fax: +44 (0) 1452 724234

PARASENSE Inc.
9661 Spotswood Trail,
Stanardsville, VA 22973, USA
Tel: +(1) 540-948-9919.
Fax: +(1) 434-990-9214.

Doc. Ref: H105-4 09/03/18

title: Network gas sensors mounting and connections

drawn: James Wilkinson | date: 12th May 2015 | part number: .....

drawing number: **PS0778**

revision: **5** | sheet: **2 of 2**

revision:	checked:
3. Drawing border updated. GDS sensors details modified. JW 13th January 2017	AK
4. Bacharach MGS-150 details added. JW 7th March 2018	JB
5. Drawing border updated. JW 27th March 2018	JB

Parasense Limited

Phone: +44 (0) 1452 724123
Email: salesuk@parasense.com
Web: www.parasense.com

Parasense, Inc

Phone: +1 (540) 948 9919
Email: sales@parasense.com
Web: www.parasense.com