GRM2

REFRIGERANT MONITOR

OPERATION & MAINTENANCE MANUAL

Models
GRM2-104D2-1xx

Doc. Ref. MNGRM2 REV. 4

reliability ° efficiency ° performance

**GRM2
Refrigerant Monitor**

**Models
GRM2-104D2-1xx**

Approvals

UL   CSA   CE

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'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
2-1: 9th January 2014	Multiple changes throughout	AK
3-0: 13th April 2015	RS485 networked sensor information added	AK
3-1: 3rd June 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	AK
3-2: 5th Nov 2015	• Further information added regarding networked gas sensors • More details added to door and network module replacement procedure • Checked column added to this table • Multiple corrections	DG
3-3: 15th August 2016	Quality management logo added. Optional ADC terminal panel details updated.	AK
3-4: 8th Sept 2016	Connection schematics for ADC-104 updated. System test section updated.	JW
3-5: 24th Jan 2017	Improved instructions for making a network connection to the GRM2. System test instructions updated. Zero calibration instructions for smartGAS sensors added.	AK
3-6: 7th April 2017	GDS sensor field calibration routine added.	JW
3-7: 25th April 2017	Minor formatting changes.	JB
3-8: 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
3-9: 27th March 2018	Photos and drawing branding updated. Ethernet cable detail modified.	JB
4 March 2020	Updated addresses	JH

1 INTRODUCTION

The Parasense GRM2 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 via the RS485 network connection. A Parasense ATM2R analogue sensor trip 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 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

NETWORK MODULE
1no. 9005/GRM2-1

POWER SUPPLY MODULE
1no. 9005/GRM2-3

PILOT RELAY MODULE
1no. 9005/GRM2-5

POWER INPUT MODULE
1no. 9005/GRM2-4
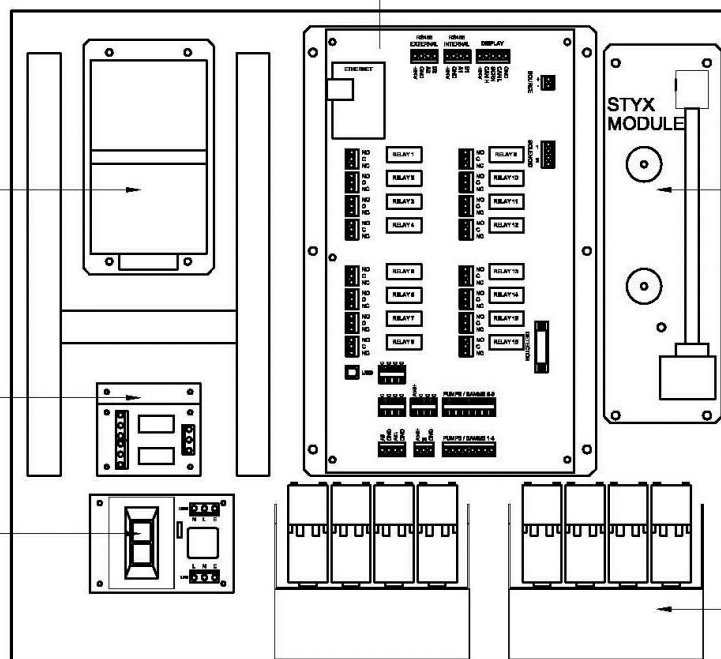
STYX
MODULE

STYX MODULE
1no. 9005/GRM2-2

SAMM MODULES
9003 (No. dependent
on model)

ENCLOSURE (Door removed)
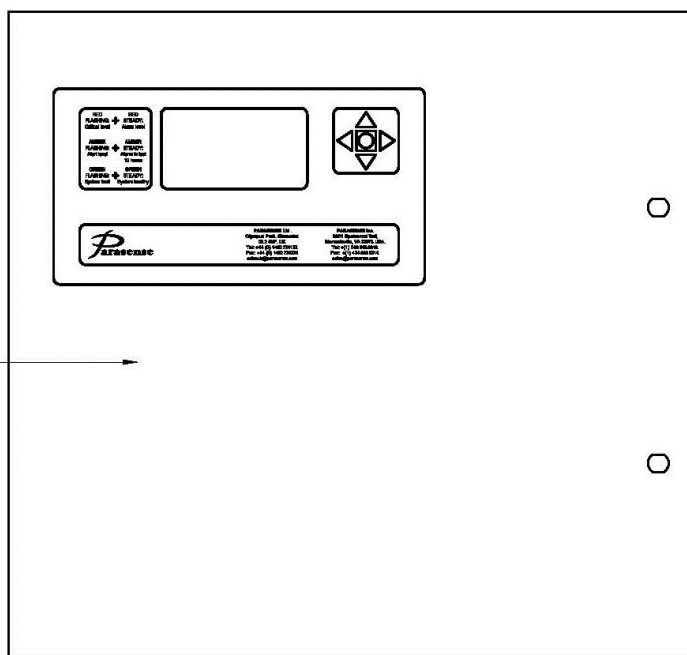
DOOR MODULE
1no. GRM2-16-D

DOOR FRONT

2 INSTALLATION GUIDE

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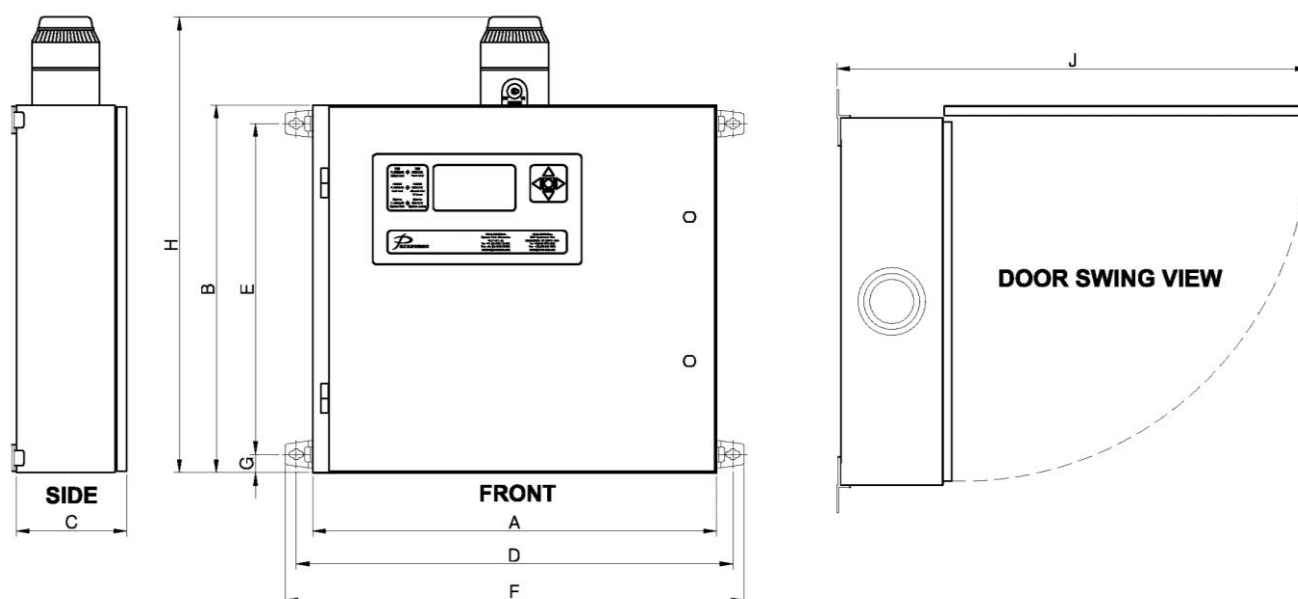
GRM2-104D2	A	B	C	D	E	F	G	H	J	WEIGHT
Metric (mm)	550	500	150	600	450	650	25	620	700	22Kg
Imperial (In)	21.7	19.7	5.9	23.6	17.7	25.6	1.0	24.4	27.5	48.4lb

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% RH (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.

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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 a GRM2 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

Nut, Plain Washer and Lockwasher, Internal Toothed

Ring Terminal on Incoming Mains Ground

Lockwasher External Toothed

Enclosure
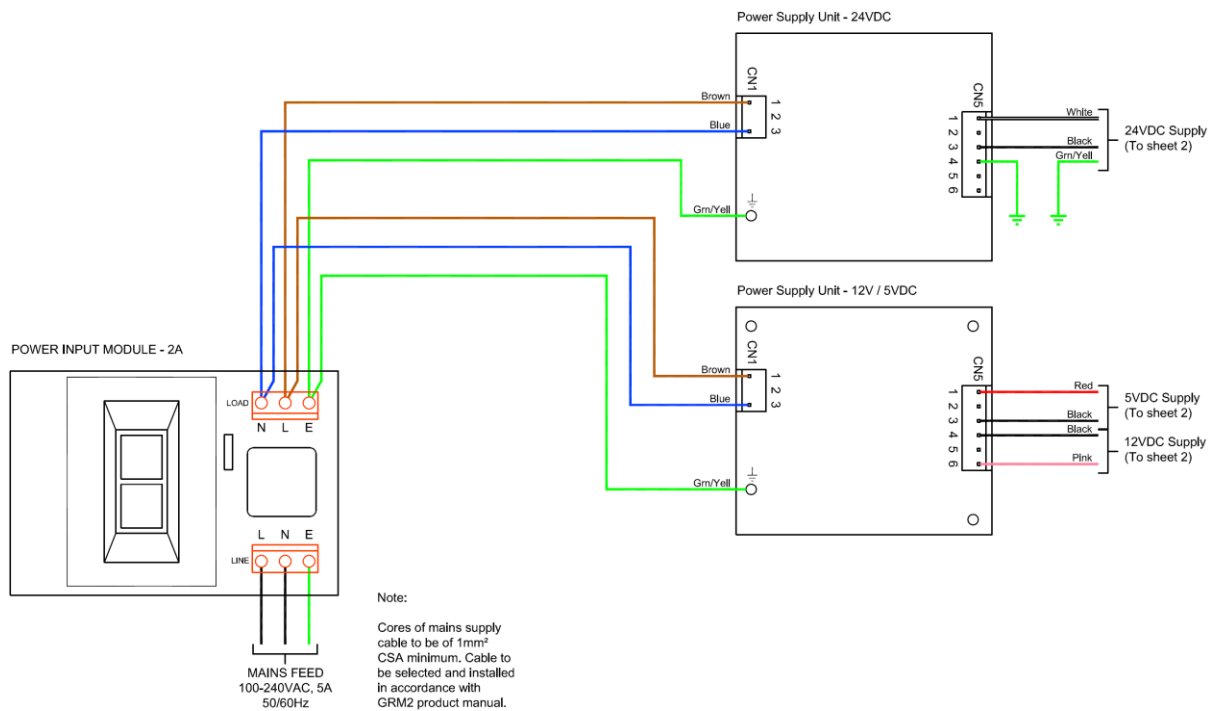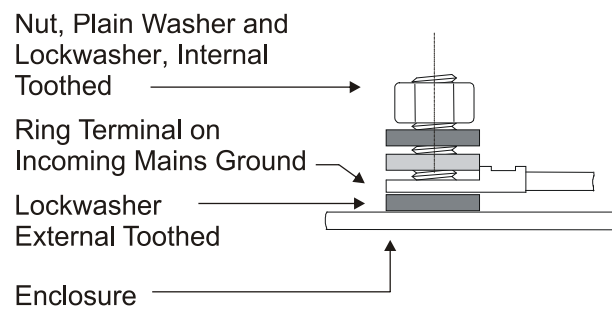
RELAY CONNECTIONS

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 24V AC/DC.

Two pilot relays are also provided on the dual pilot relay module, voltages should not exceed 240V, rated at 5.0 amps (resistive). These are activated using relays 1 & 2 on the network module in conjunction with the 24V DC auxiliary supply.
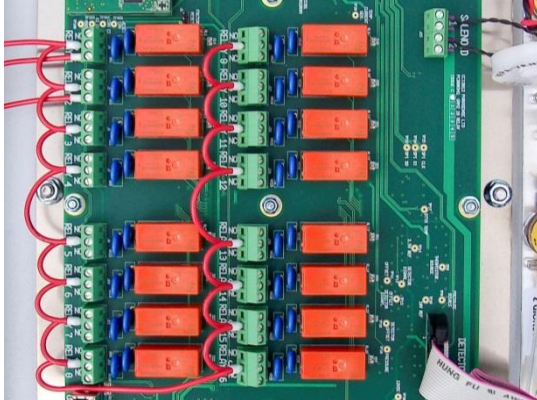
16 Configurable Relays on Network Module
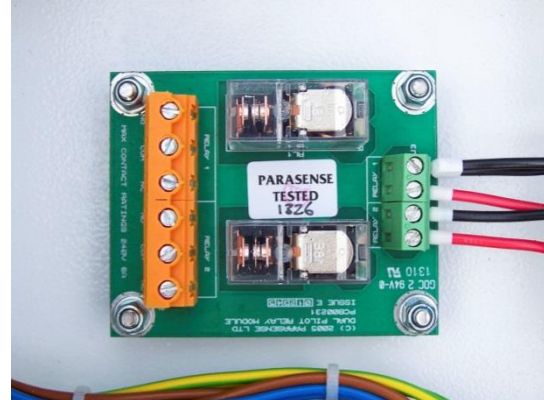
Dual Pilot Relay Module

The relays are configured using the setup wizard. 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 (refer to 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 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 monitor. A typical installation is shown below:
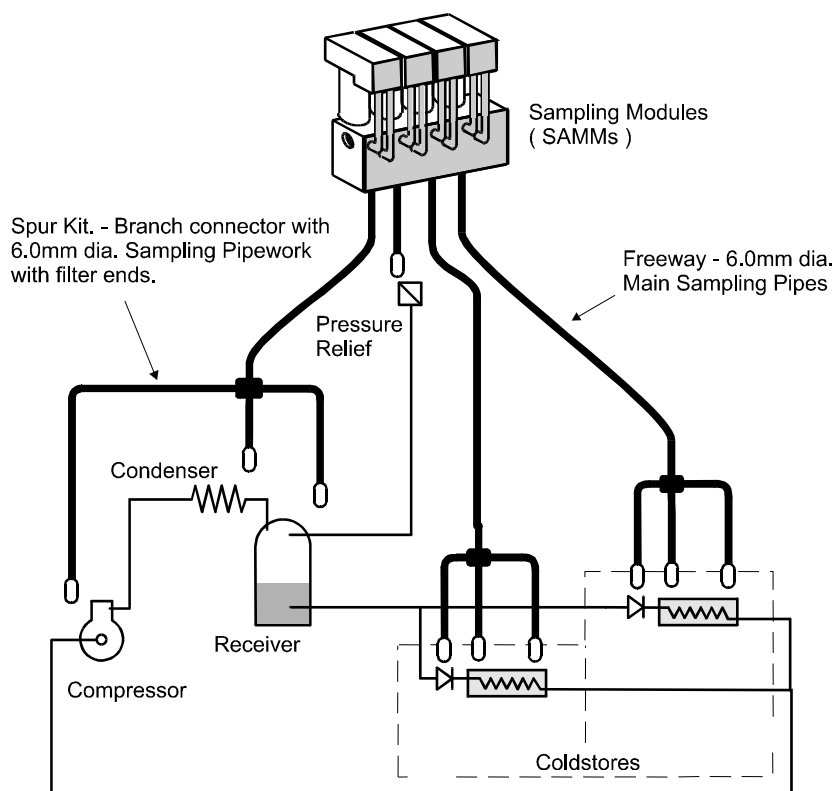
NOTE: Spur kit lengths shown are indicative only. Spur kit freeway pipe lengths must always be 5m/16ft (coil excess freeway)

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

Relays are volt-free changeover type, rated at 5A (resistive). Contact voltages must not exceed 24Vac / dc.

Relays Become energized when the Monitor is powered up and change state, i.e. the NO contacts close.

Relays will de-energise when a fault occurs or power is removed from the monitor, they will revert back again when the fault clears or power is restored.

BEACON INSTALLATION

Remote beacon/sounders may be installed. The maximum number of beacon/sounders that can be powered by the GRM2 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:
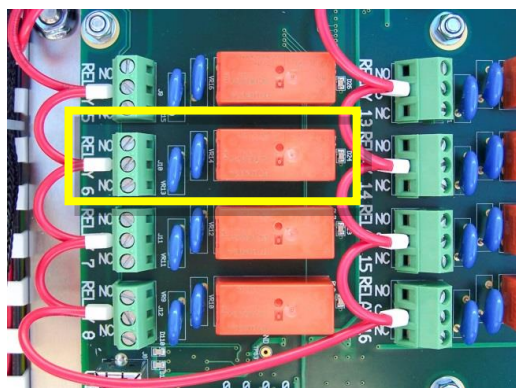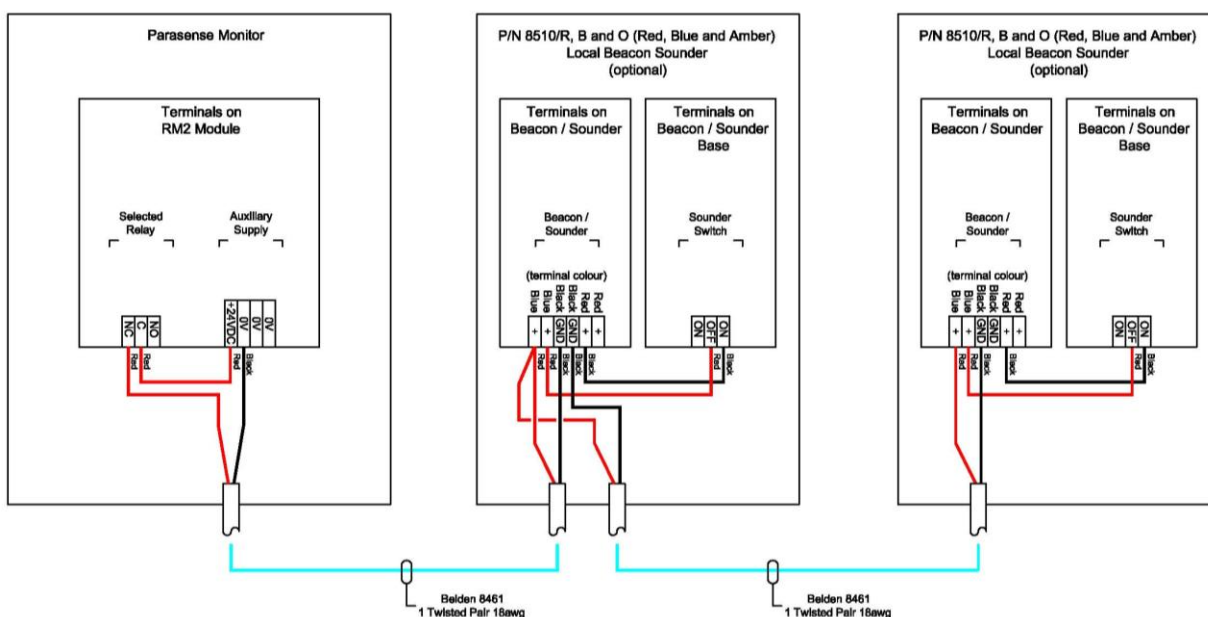
Relay connection on network module
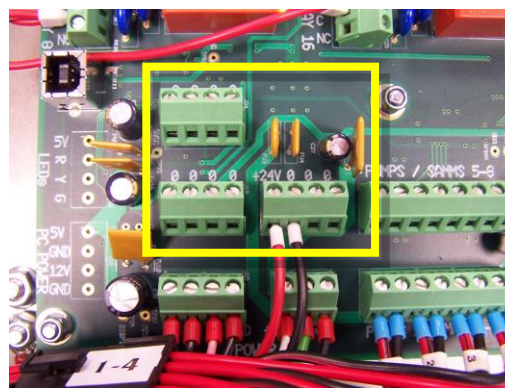
Auxiliary supply and additional 0V landing points on network module

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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.

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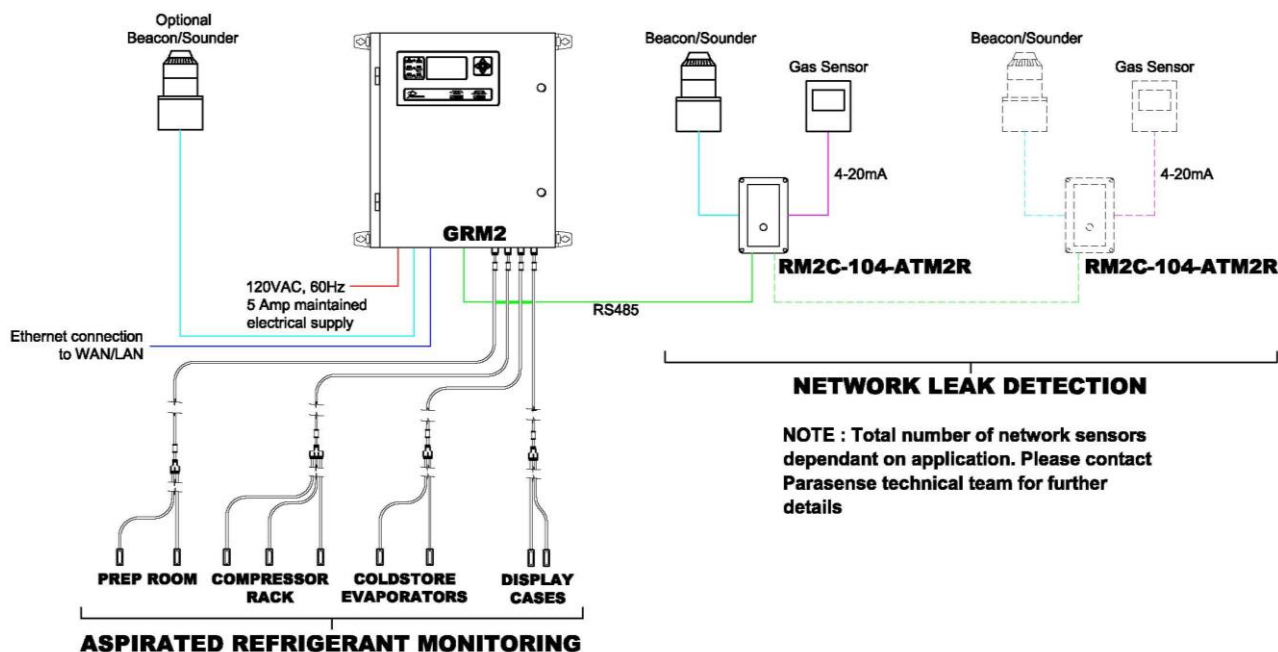
OPTIONAL ATM2R SINGLE/MULTIPLE BEACON INSTALLATION

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:
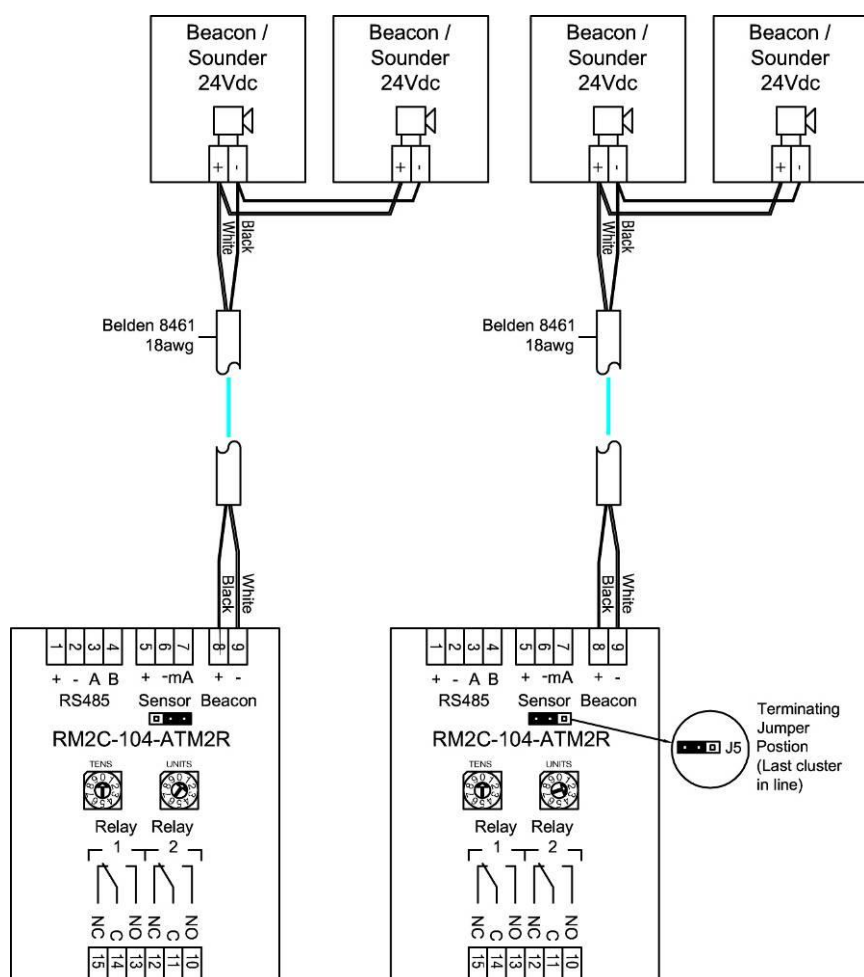
Parasense Beacon

OPTIONAL NETWORKED GAS SENSORS

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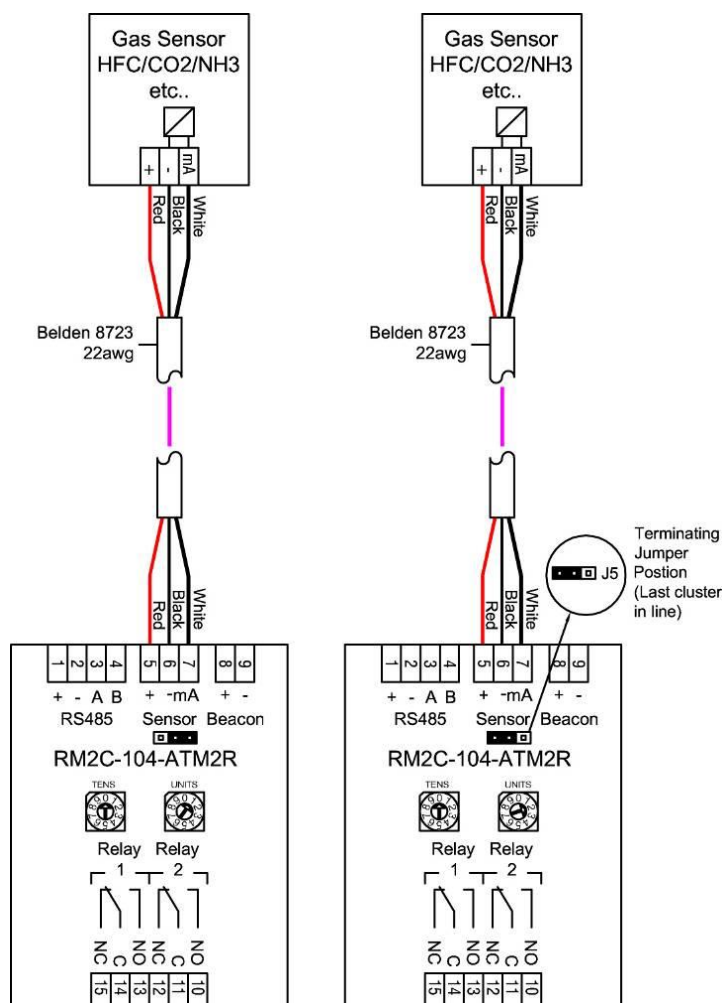
Some examples of the gas sensors are pictured below:

OPTIONAL ANALOGUE SENSOR TRIP MODULE

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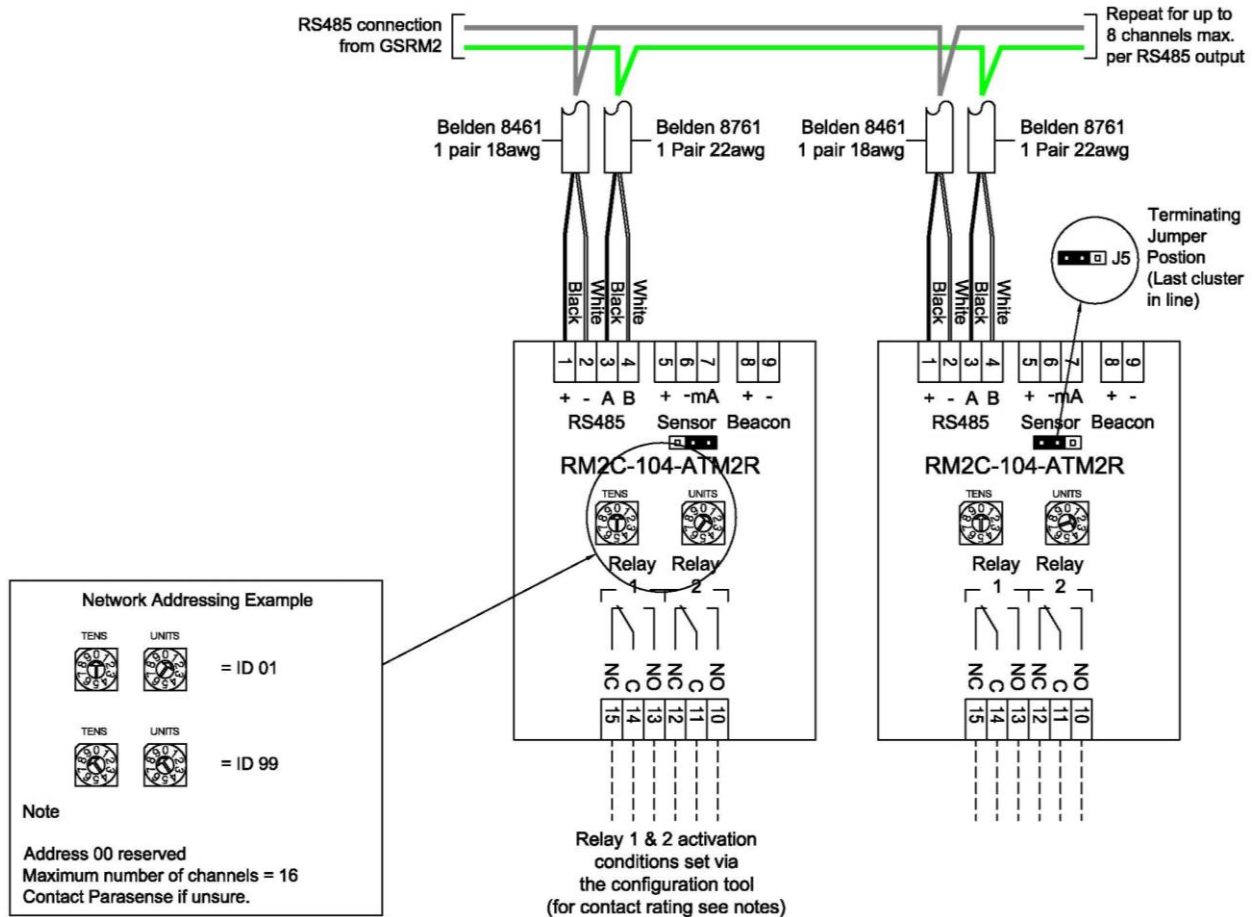
The analogue sensor trip module, with beacon test button:

3 ADC-104 TERMINAL PANEL (OPTIONAL)

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

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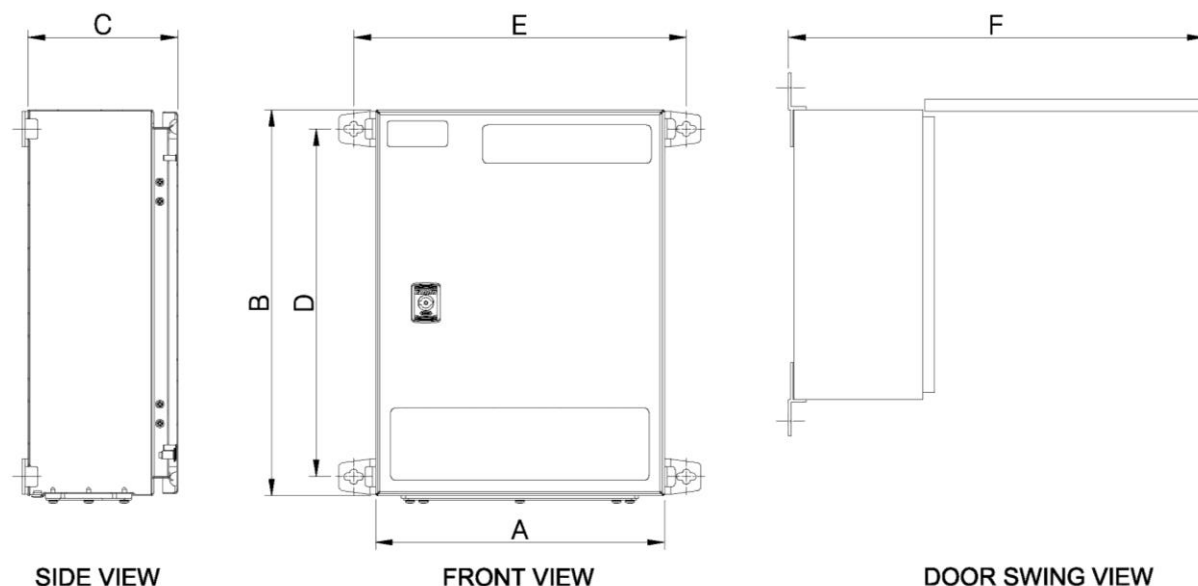
ADC Terminal Box	A	B	C	D	E	F	WEIGHT
Metric (mm)	300	400	150	360	345	440	10kg
Imperial (Inches)	11.8	15.7	5.9	14.2	13.6	17.3	22lb

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

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ADC-104 MAINS POWER INPUT CONNECTIONS

Single Ground Earth Screw Connection

Nut, Plain Washer and Lockwasher, Internal Toothed

Ring Terminal on Incoming Mains Ground

Lockwasher External Toothed

Enclosure

Mains Input Breaker 4A Type C

Note 1:

All Earth bonding cables between door, enclosure & backplate to be minimum 4.0mm² Green / Yellow

Note 2:

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

L1   N   E

MAINS FEED
100-240VAC (Max) 5A
1ph 50/60Hz

GRM2 WITH ADC-104 INSTALLATION OVERVIEW
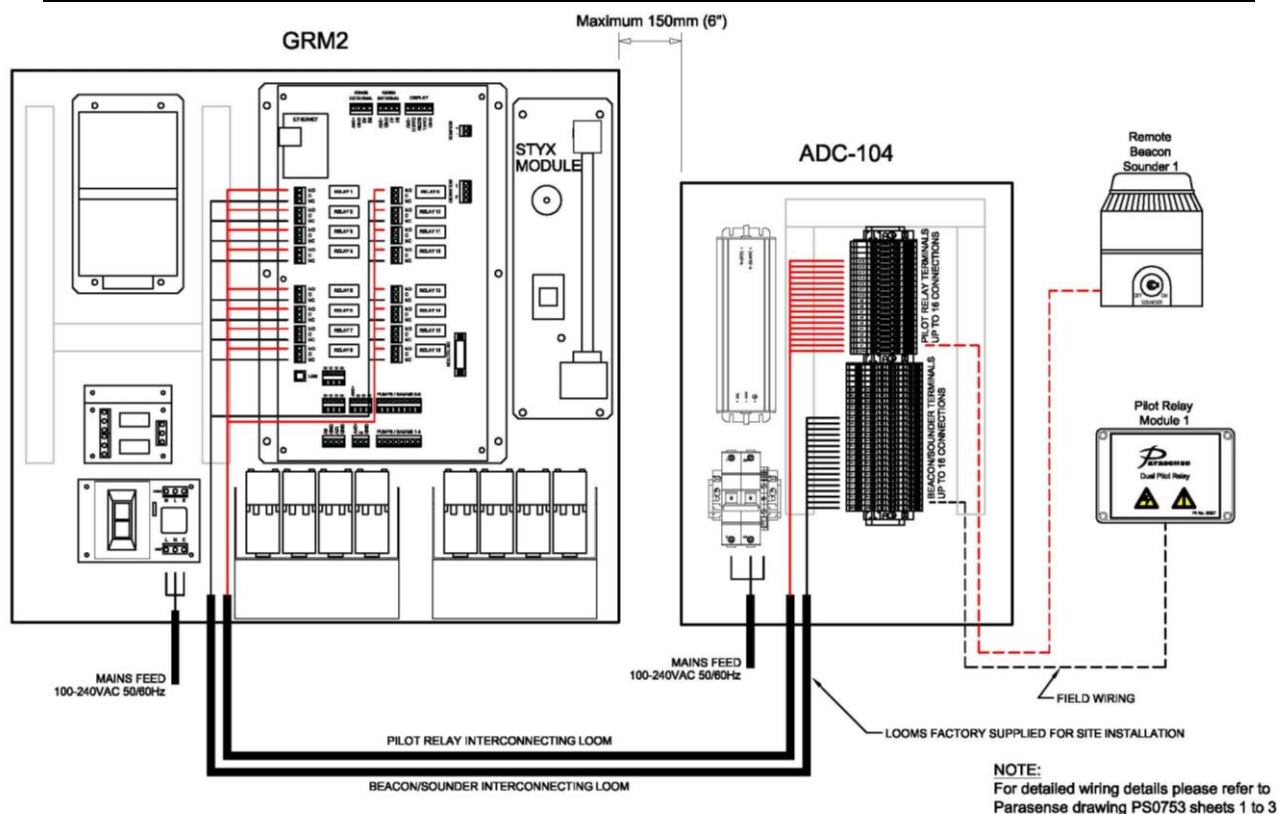
NOTE:
For full installation and maintenance details please refer to the ADC-104 O&M Manual

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4 SETTING A WINDOWS PC TO COMMUNICATE WITH A GRM2

Communication with the GRM2 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. 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 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'.
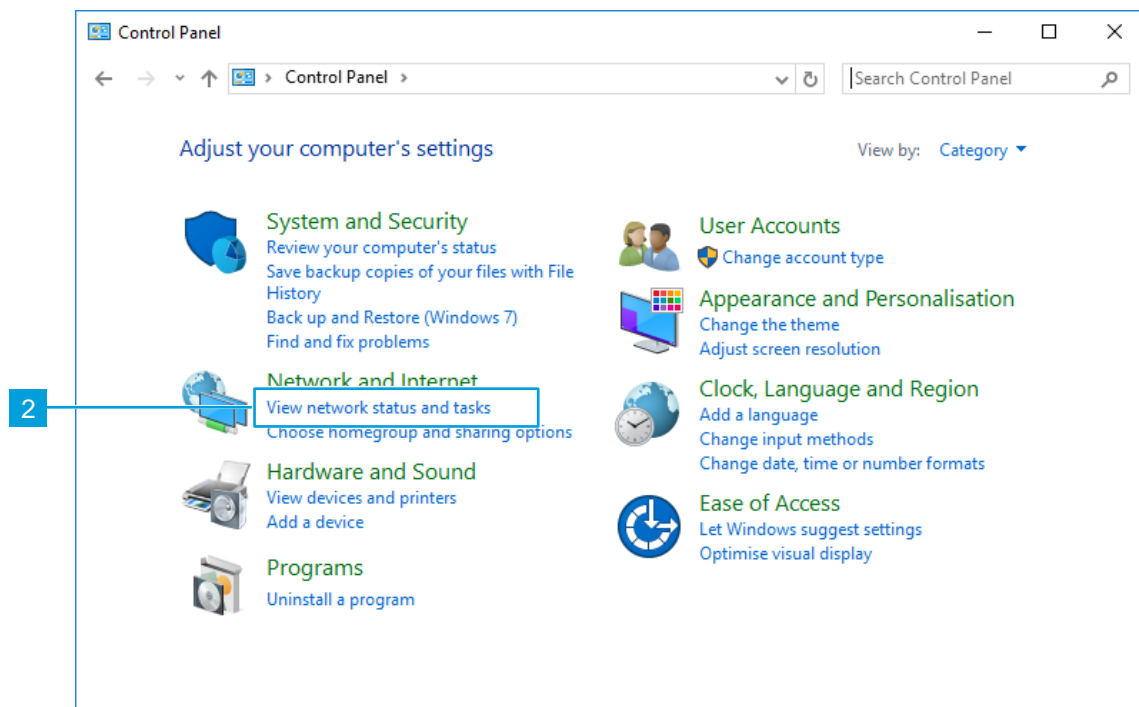
4) Click 'Change adapter settings' in the left hand menu. Right-click 'Ethernet' or 'Local Area Connection' and choose 'Properties' from the popup menu.

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

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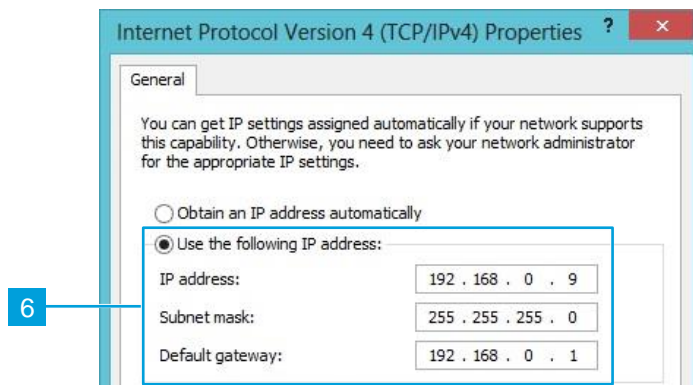
Note: there must be no other device connected to the same network with the same IP address you have used (e.g. using the above screenshot as an example, there must be no other device connected to the same network with an IP address of 192.168.0.9).

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

9) Once all communication with the GRM2 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.

<u>**WINDOWS XP**</u>

1) Take a note of the current network settings of the GRM2 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'.
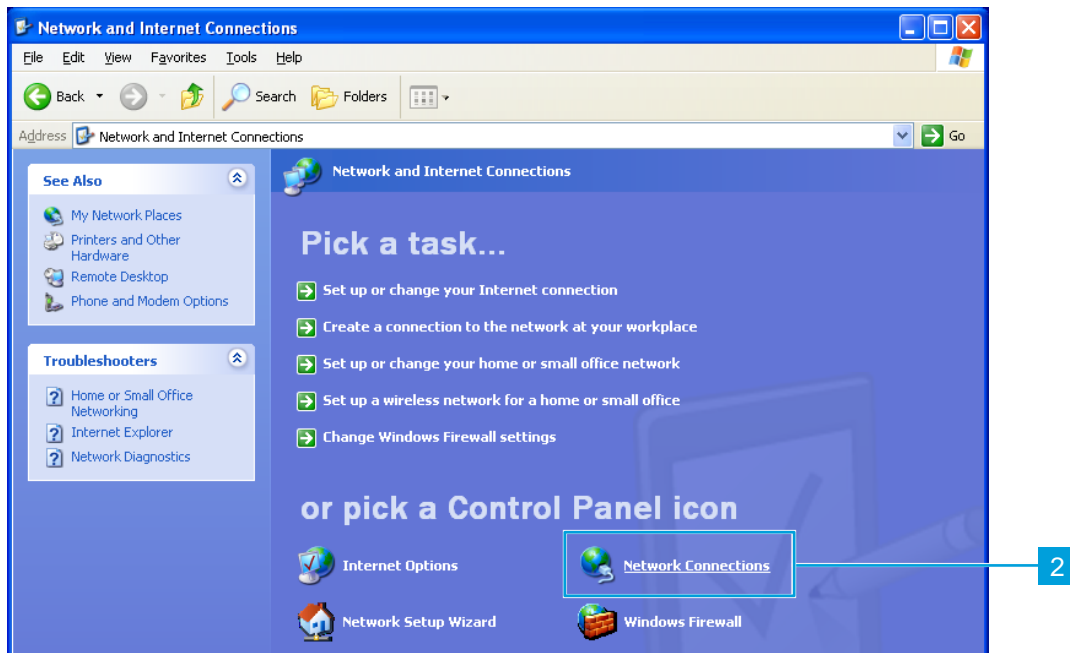
4) Right-click the 'Local Area Connection' option and choose 'Properties' from the popup menu.

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 refrigerant leak detection system is controlled using a 5 button panel on the outside of the enclosure. The $\triangle \triangledown \triangleleft \triangleright$ 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.

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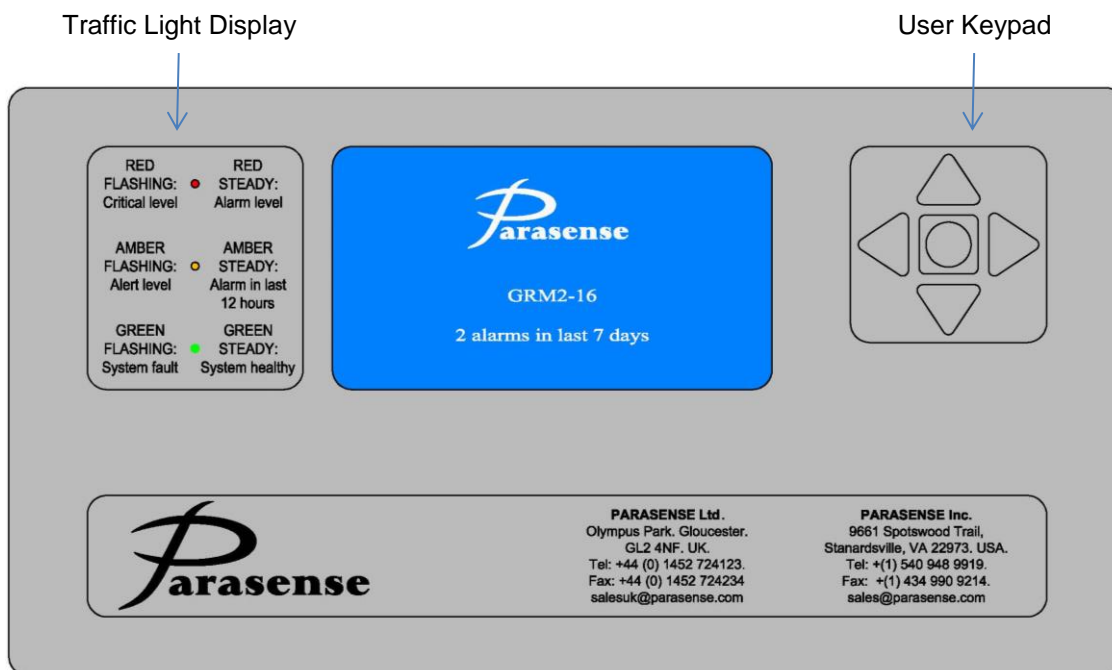
If the system is left unattended for a period of 3 minutes the LCD backlight will switch off After a further period of 4 minutes, the display will return to the home screen. The LED's will continue to indicate the current status of the system. As soon as a button is pressed the display will illuminate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

To adjust the display contrast, navigate to the home screen and press the $\triangle \triangledown$ buttons simultaneously. The display LEDs will cycle through ON/OFF in sequence to indicate that you are in contrast mode. The contrast can now be adjusted using the $\triangle \triangledown$ buttons. Once adjusted, press the ▢ button.

HOME SCREEN

The home screen is shown when the system is first accessed, or if no buttons have been pressed for more than 7 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 a primary selection menu:

Pressing the centre button on the keypad accesses the main menu:
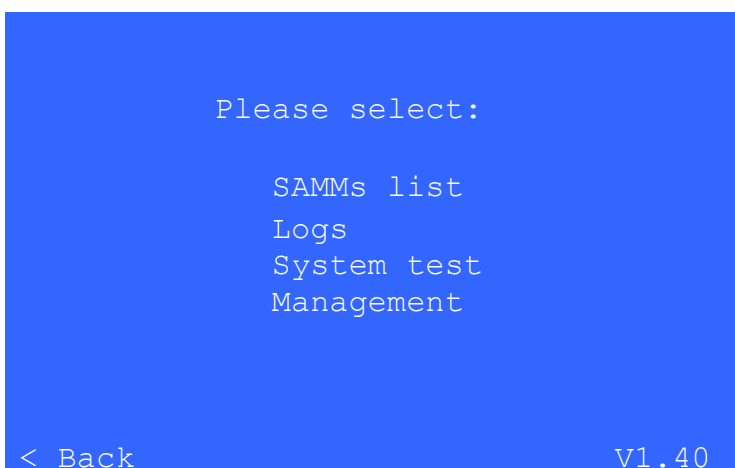
There are four menu options available:

- SAMMs list : Shows a summary of all channels.
- Logs : Allows you to view alarms, faults and events logs of the GRM2.
- 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

```
Compressor 1,2,3,4
Alarm  5000  Crit  3000         R134A

Chan.   Status          Conc      Alarm
  1     Healthy             0       None
  2     Healthy             0       None
  3     Sampling            0       None
  4     Healthy             0       None
  5     Healthy           920       None
  6     Healthy             0       None
  7     Healthy             0       None
  8     Healthy         20.7%       None

< Back                          Next >
```

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, conc and alarm fields update accordingly as the sampling process takes place).

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LOGS MENU

The logs menu enables you to view all logs that are held on the GRM2. 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.

```
           Please select:

                Alarms
                Faults
                Events
                Home




< Back
```
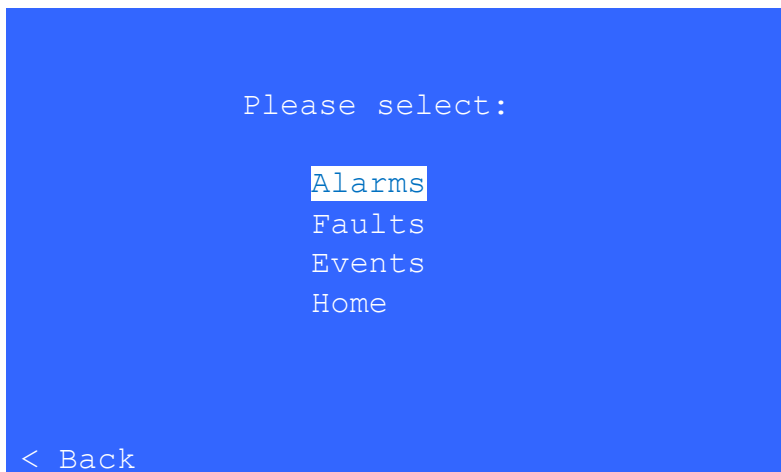
ALARMS LOG

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.

```
              Alarm Logs

Compressor 1,2,3,4

Time  Date        Chan      Conc
10:33 10-Mar-15     1        1322
10:19 10-Mar-15    12        1027
10:05 10-Mar-15     1        1329
09:44 10-Mar-15     3        1375




< Back                  Next page >
```

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.

```
                  Fault Logs
    _____
    Compressor 1,2,3,4
    _____

    Time  Date        Chan      Fault
    16:06 10-Mar-15    1        Pump flt




    < Back                      Next page >
```

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:

FAULT MESSAGES

Abbreviation	Full Description
Psr leak	System pressure leak
OverTemp	Ambient temperature too high (>50C)
Src flt	STYX Source fault (no output)
Cal reqd	12 month calibration required
Overheat	STYX over temperature
STYXcold	STYX not at working temperature
STYX flt	STYX detector fault
Pump flt	No flow detected
Prsr flt	STYX did not pressurise
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.

```
              Event Logs
_____
Compressor 1,2,3,4
_____

Time    Date       Chan       Event
10:33   10-Mar-10    1      Crit OFF
10:19   10-Mar-10    1      Crit ON
10:05   10-Mar-10    1      Alrm ON
10:01   10-Mar-10    3      Alrt OFF
09:44   10-Mar-10    3      Alrt ON
15:58   01-Mar-10           Power ON



< Back                        Next page >
```

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

EVENT MESSAGES

Abbreviation	Full Description
Power ON	System powered on
Verify	Sample breached the configured Alarm threshold so a verification sample is being performed
Ver stop	Verification sample did not breach the configured Alarm threshold, preceding sample has been discarded

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Man.Samp	Manual sample initiated
Sys.test	System test initiated
Cal	Calibration initiated
Cal OK	Calibration successful
Cal Fail	Calibration failed
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 $\triangle\triangledown$ 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.

```
              SYSTEM TEST

         Select channel to test
       using up and down buttons
         Press 'Action' to test


          Channel:  1 [SAMM  01]




< Back
```

```
            SYSTEM TEST

      Select channel to test
     using up and down buttons
      Press 'Action' to test


      Channel:  9 [RS485 51]




< Back
```
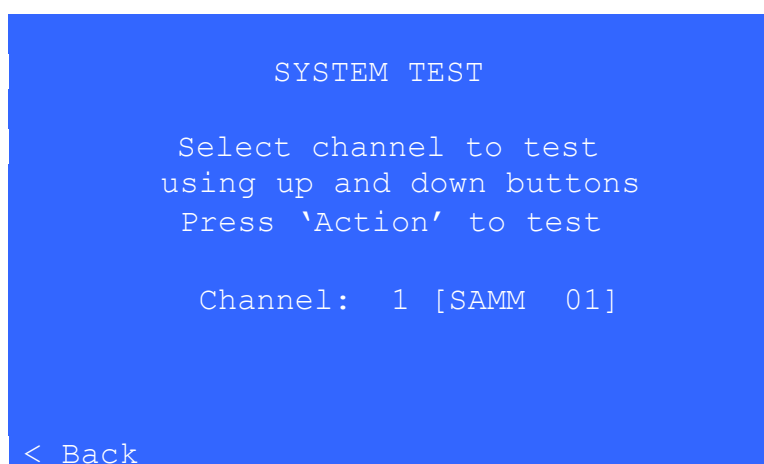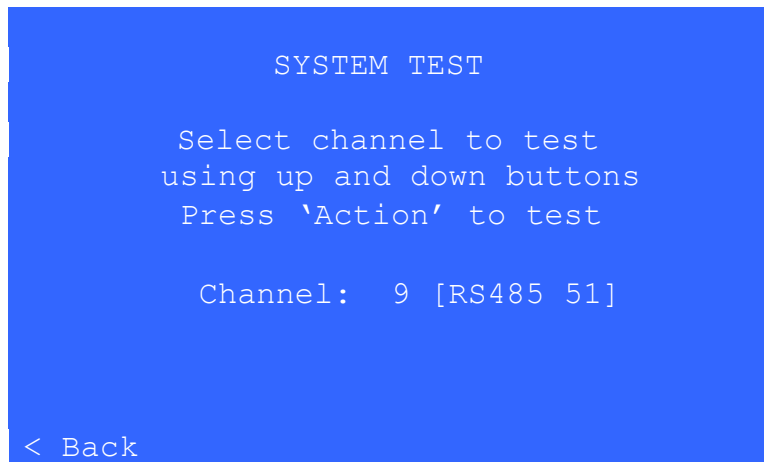
Pressing the ▢ button will start a sample sequence lasting up to 90 seconds. The "< Back" function is not available during the sample process and the buttons have no effect. When the sample is complete, the "<Back" function re-appears and the sample result is displayed. If the sample breaches the configured 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.

```
                  MANAGEMENT

           Please select:


           System test
           Calibration
           Network settings
           Network defaults
           Reboot GRM2
           Change passcode
           Home


  < Menu
```
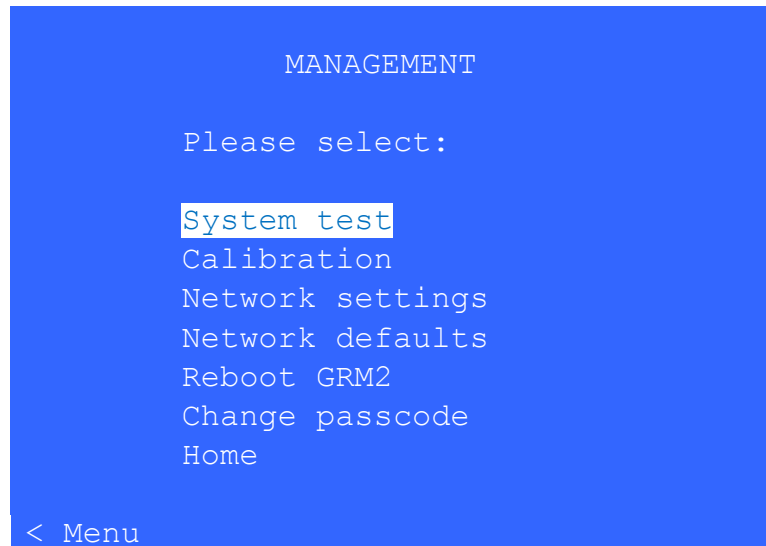
CALIBRATION

The calibration function performs a sample with the assumption that a suitably filled sample bag is attached to the selected channel (a Parasense service kit is required). The value obtained will be used to create a scale factor that will be saved to the GRM2 on completion.

```
              CALIBRATION

            Select channel
       using up and down buttons
         Press 'Action' to start

         Channel:  1 [SAMM  01]




< Back
```
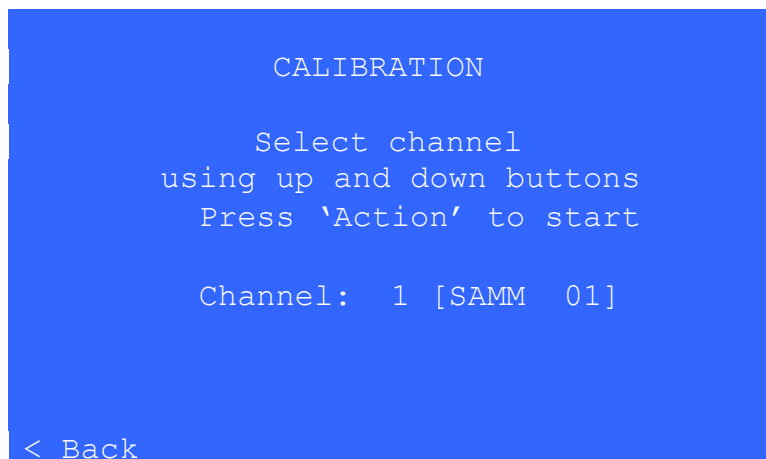
While calibration is in progress, the "< Back" option is hidden, the buttons have no effect and a message "Calibrating" is shown. When calibration has completed, the "< Back" option re-appears and a calibration result message will appear on-screen indicating success or failure.

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.

```
          IP network settings


     IP address: 192.168.  0. 50
        Netmask: 255.255.255.  0
         Server: 192.168.  0.  1
        Gateway: 192.168.  0.  1




< Back
```

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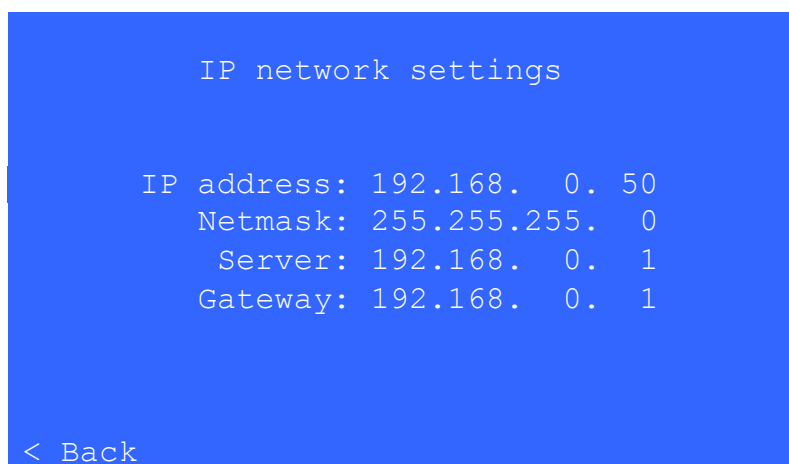
NETWORK DEFAULTS

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

```
          Set network defaults
         and reboot the system?

       Address: 192.168.  0. 50
       Netmask: 255.255.255.  0
        Server: 192.168.  0.  1
       Gateway: 192.168.  0.  1

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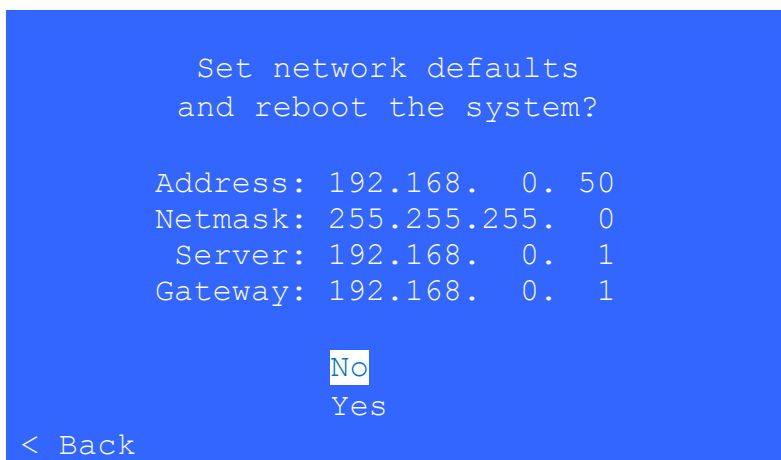
Confirm that you want to set the IP networks settings as displayed on the screen by selecting 'Yes'. If you wish to abort this function, select No and press the ⬜ button to return to the management menu, leaving the network settings unchanged. Pressing the ◁ button will also abort this function and return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

REBOOT GRM2

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 GRM2'. 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.

```
            Confirm Reboot

          Do you want to reboot
              the system?

                  No
                  Yes




 < Back
```

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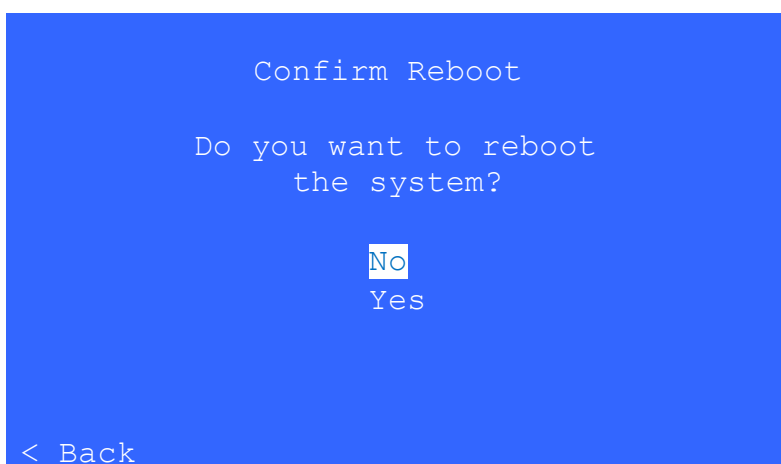
CHANGE PASSCODE

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.

```
              CHANGE PASSCODE


                 1  2  3
                 4  5  6
                 7  8  9
                 C  0  E
```
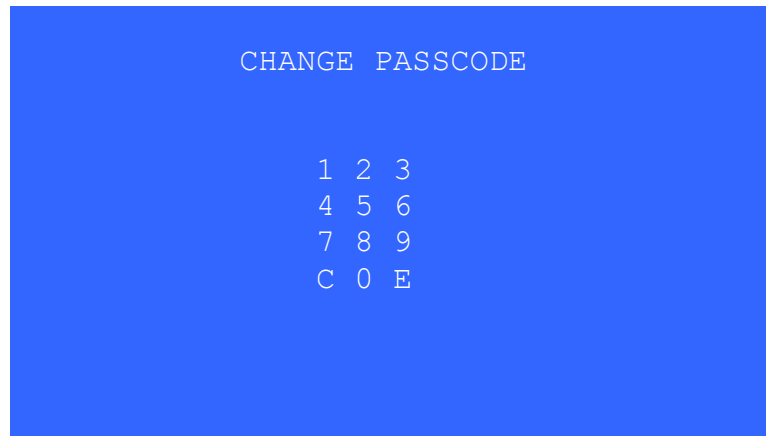
Once you have entered the new passcode, highlight 'E' and press the ⬚ button.

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.

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6 USER GUIDE

The GRM2 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.
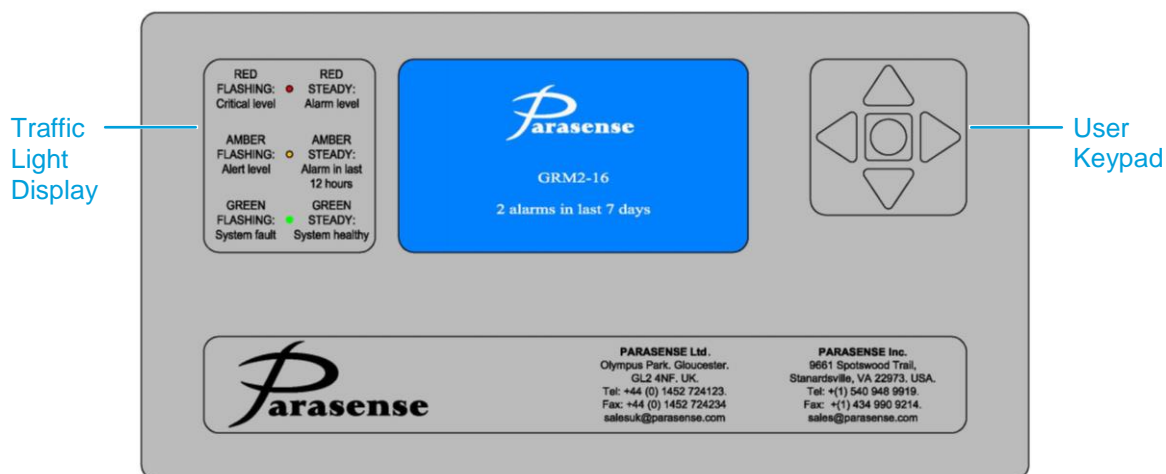
The monitor's features can be accessed or viewed via the keypad functions as described below.

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 $\triangle$ & $\triangledown$ buttons. This will activate the contrast function. Using the $\triangle$ & $\triangledown$ buttons, you may now adjust the contrast of the LCD to the desired level.

Once complete press the $\boxed{\bigcirc}$ centre button to close the contrast menu. If the screen is completely blue, press the $\triangle$ button until text is visible. If the screen is white, press the $\triangledown$ button.

KEYPAD FUNCTIONS

Navigate the information onscreen by use of the 5 button keypad. There are four directional buttons and one action button. Use the $\triangle\triangledown$ buttons to highlight the required item. Pressing the action button $\boxed{\bigcirc}$ of the keypad, whilst the cursor is on the required option, will action the request. The $\triangleleft \triangleright$ buttons will move the cursor to the left and 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:	On one or more SAMMs, the most recent measurement of refrigerant concentration breached the configured 'Critical' threshold.
Red Steady Light:	On one or more SAMMs, the most recent measurement of refrigerant concentration breached the configured 'Alarm' threshold.
Amber Flashing Light:	On one of more SAMMs, the most recent measurement of refrigerant concentration breached the configured 'Alert' threshold.
Amber Steady Light:	A measurement of refrigerant breaching one of the configured 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 breach 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 via a connected PC running Parasense configuration software. Please contact Parasense for more information.

Network Settings		SAMM Settings			
IP Address:	192.168.20.168	Alert Level:	100ppm	Pipe Length:	150m/492ft
Netmask:	255.255.255.0	Alarm Level:	300ppm	Refrigerant:	R134a
Server:	192.168.20.1	Critical Level:	950ppm		
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 28				

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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 offer 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**.
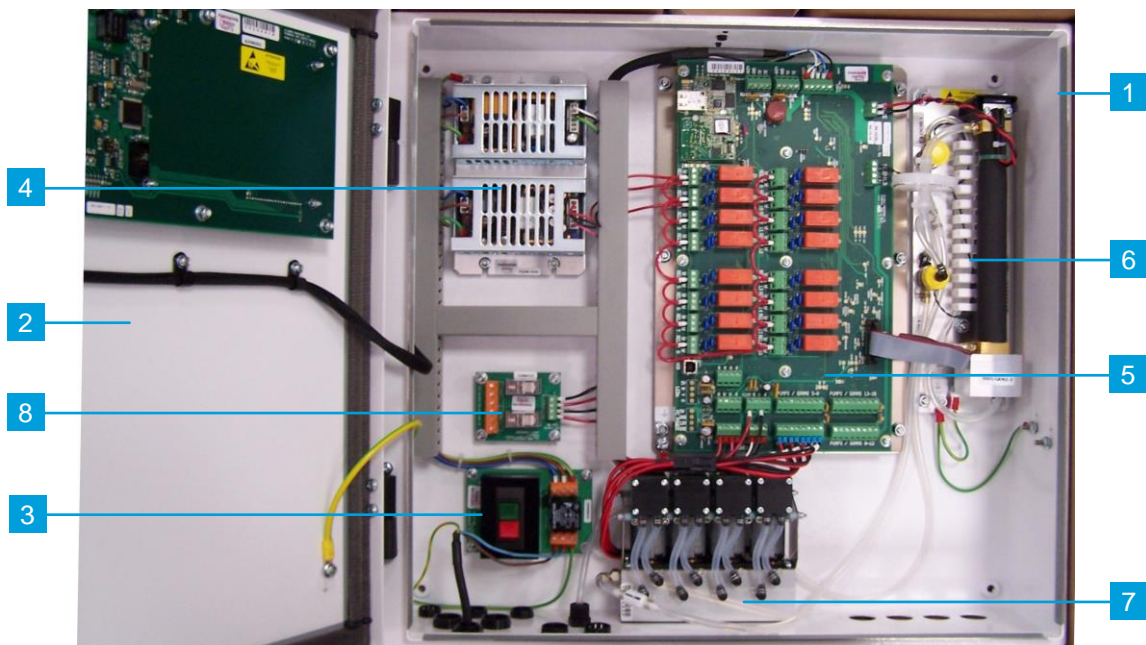
SYSTEM FAULT DIAGNOSIS

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 circuit breaker (red button pressed).

Having checked all connections are secure, switch on at the internal circuit breaker (green button pressed), 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 circuit breaker (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

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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 the upper PPM limit has been reached 'Overrange' will be logged in the alarm log indicating the measured PPM concentration was beyond the measuring range of the monitor. If only one SAMM is showing 'Overrange' then that area has a higher refrigerant leak than the system is designed to monitor. In exceptional circumstances it is possible that the network module AND the mains power supply 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 5V DC exists across the 'SOURCE' Terminals [J14 **+** and **-**] at the top right of the network module. This may modulate between 4.5V DC and 5.5V DC, this is expected.
3) If 5V DC is present then the Styx module will require replacement.
4) If there is no 5V DC but there IS 5V DC across the 'POWER' terminals [J25 5V & GND] at the lower left of the network module then the network module will require replacing.
5) If there is also no 5V DC across the 'POWER' terminals [J25 5V & GND] at the lower left of the network module, then the PSU is faulty.
6) Measure the AC voltage across L1 & L2 of the power input module. This should be approximately 110V AC. Switch off the mains supply externally and wait for a few seconds for the power supply to discharge. Switch off at the internal power input module (red button pressed). Measure across the L1 & L2 terminals of the power input module again to confirm no AC voltage is present. Remove the conductors on the 'POWER' terminals [J25 5V & GND] and measure the resistance across J25 5V & GND. A reading of 400-450 Ω is expected. If the resistance is lower than this then contact Parasense for further assistance.

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PrsrLeak

This fault is shown if the Styx was successfully pressurised to the required high pressure, but within 15-20 seconds the pressure had dropped by more than 60mBar.

If the message is shown for all internal SAMMs on the same SAMMs block, the SAMMs block may be faulty.

If the message is shown for all internal SAMMs, except for one, the fault may be with the internal SAMM that is not reporting a fault.

If the message is shown for all internal SAMMs, except for those on one specific internal SAMM block, the fault may be with the internal SAMM block that is not reporting a fault.

If all internal SAMMs indicate 'PrsrLeak' then check all internal pipework/clamps on the Styx module for leaks. If none can be found then the problem is probably with the Styx module.

Fault finding steps:

1) Check all screw-in terminals and ribbon cable connections are secure.
2) If no internal leaks can be found clamp the inlet pipe just after the non-return valve on the SAMM block as soon as the pump stops.
   If this solves the problem the Styx module will need to be replaced. Otherwise clamp the Styx outlet pipe just before the exhaust port as soon as the pump stops. If this solves the problem the Styx module will need to be replaced.
3) If only one SAMM is not showing a fault, clamp the pump outlet pipe of the 'healthy' SAMM whilst a full sample is taking place on all other SAMMs. If the fault clears then the clamped SAMM is faulty.
4) Check that solenoid 1 is energised (24V DC) from the beginning of a sample until the pump stops (the Styx is pressurised). It should then remain de-energised (0V DC) for approximately 30 seconds before energising (24V DC) for approximately 3 seconds at the end of the sample cycle. If this does not occur then the network module will require replacing.
5) Check that solenoid 2 is only energised (24V DC) for 5-10 seconds at the end of the purge stage (the pump should be heard to struggle just prior to it stopping and the voltage returns to 0V DC). If this is not the case then the network module will require replacing. If it is being energised correctly then the Styx module will need to be replaced.

Prsr Flt

This fault is shown if the Styx could not be pressurised to the required high pressure.

If all internal SAMMs are affected it is probably the Styx or network module.

If the four internal SAMMs on the same internal SAMM block are indicated, the SAMM block will need to be replaced.

If the message is shown for all internal SAMMs, except for the SAMMs on one specific SAMM block, the fault may be with the SAMM block that is not reporting a fault.

If the message is shown for all internal SAMMs, except for one, the fault may be with the internal SAMM that is not reporting a fault.

If an individual SAMM is showing a fault it could be a blockage in either the freeway or spur else an individual pump could be the cause.

Fault finding steps:

1) Check all screw-in terminals and ribbon cable connections are secure.
2) Remove the freeway for the affected internal SAMM and initiate a manual sample. If this rectifies the problem check the freeway or spur for kinks or blockages and replace as required.
3) With the freeway disconnected use the airflow gauge to check the airflow for the SAMM. If it is <3 litres/min, measure across the relevant pump terminals [J21- J22] to confirm 24V DC is present when the pump is requested. If 24V DC is not found the network module will need to be replaced. If 24V DC is found but the pump is not running the fault is with the SAMM block.
4) If only one SAMM is not showing a fault, clamp the outlet pipe of the 'healthy' SAMM whilst a full sample is taking place on all other SAMMs. If the fault clears then the clamped SAMM is faulty.
5) If the airflow gauge is showing >3 litres/min check the internal pipework for leaks. If none can be found it will be necessary to initiate a manual sample with the door open before making the following additional checks.
6) Confirm solenoid 1 has 24V DC across it when the pump is running and that solenoid 2 is only energised for 5-10 seconds at the end of the purge stage (the pump should be heard to struggle just prior to it stopping and the voltage returns to 0V DC). 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.

Src Flt
This fault is shown if the infrared source on the Styx module is operating incorrectly. It would usually be shown for all SAMMs. 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 5V DC exists across the 'SOURCE' terminals [J14 **+** and **-**] at the top right of the network module. This may modulate between 4.5V DC and 5.5V DC, this is expected.
3) If 5V DC is present then the Styx module will require replacement.
4) If there is no 5V DC but there is 5V DC across the 'POWER' terminals [J25 5V & GND] at the lower left of the network module then the network module will require replacing.
5) If there is also no 5V DC across the 'POWER' terminals [J25 5V & GND] at the lower left of the network module, then the mains power supply is faulty.
6) Measure the AC voltage across L1 & L2 of the power input module. This should be approximately 110V AC. Switch off the mains supply externally and wait for a few seconds for the power supply to discharge. Switch off at the internal power input module (red button pressed). Measure across the L1 & L2 terminals of the power input module again to confirm no AC voltage is present. Remove the conductors on the 'POWER' terminals [J25 5V & GND] and measure the resistance across J25 5V & GND. A reading of 400-450 Ω is expected. If the resistance is lower than this then contact Parasense for further assistance.

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STYXCold / Warming

This fault indicates that the monitor is not at its minimum operating temperature (40°C). This will normally appear if the unit has been switched off for a while. When the monitor is operating correctly, this fault will clear once the required temperature is achieved.

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 the Styx module will need to be replaced.

STYX Flt

The Styx assembly is not functioning.

Fault finding steps:

1) Check all screw-in terminals and ribbon cable connections are secure.
2) If the fault persists, the Styx module will need to be replaced.

RScksum/RStime/RSwakeup/RSwrite

These messages are shown if an RS485 network communication failure was detected during a sample cycle on an RS485 networked 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.

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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 5-10)

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 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 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 5-12

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)**.
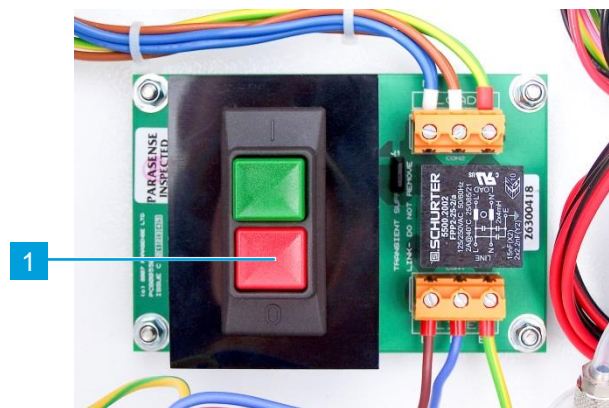
Disconnect the display lead **(2)**. Unscrew the clips holding the cable in position **(3)** and remove cabling from the enclosure door.
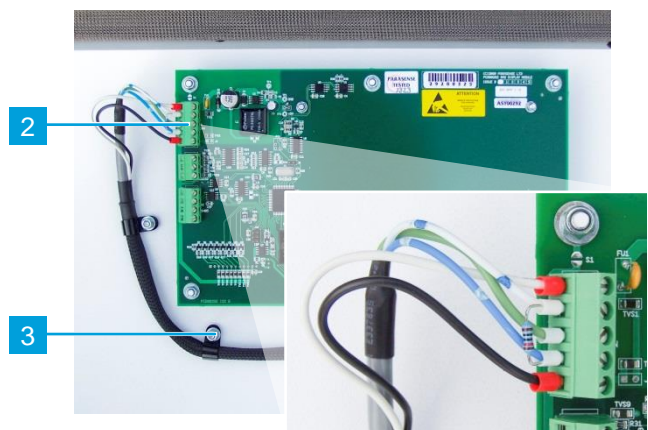
Disconnect the earth strap from the enclosure door **(4)**.

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 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.
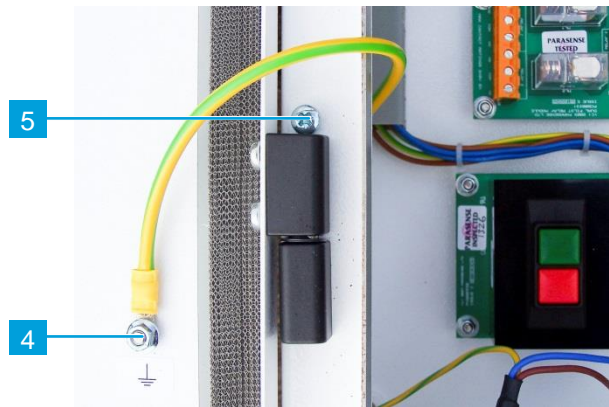
REPLACING THE NETWORK MODULE (INC. INSERT PLATE)

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 5-10)

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 by pressing the red button **(1)**.
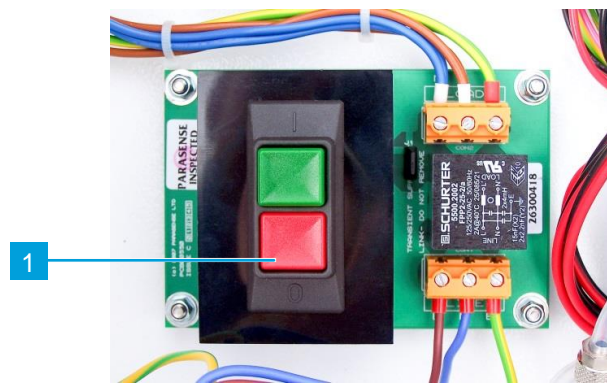
Noting the sequence - Disconnect the mains power supply cables **(2)**, cables to the enclosure door **(3)**, the Styx module cables **(4)** including the ribbon cable **(5)**. Disconnect the earth wire **(6)**. Disconnect any remaining wired in connectors **(7)**. Unscrew the six nuts holding the network module in position **(8)**, located around the edge of the insert plate. Remove the network 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.

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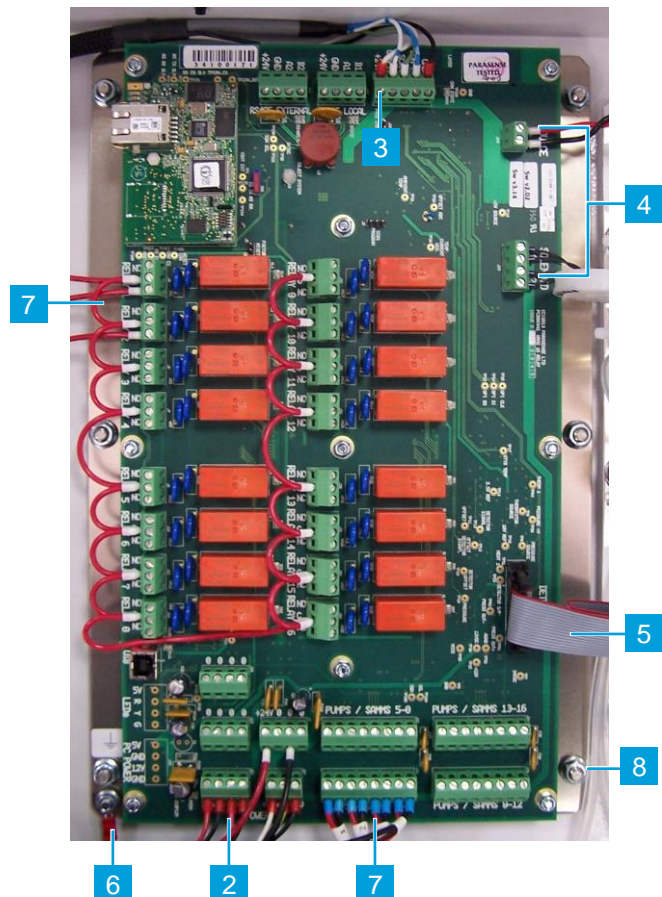
REPLACING A SAMM BLOCK

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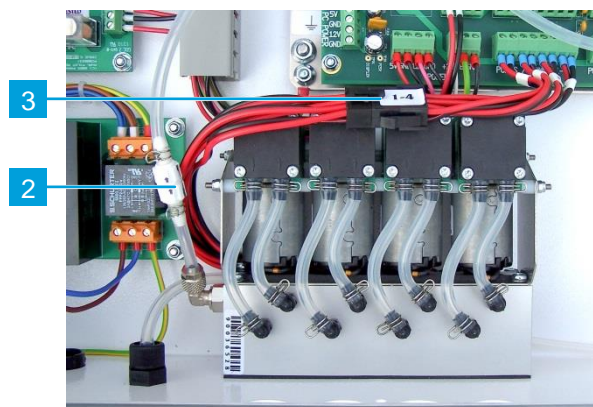
Remove the four fixing screws **(4)** that are holding the SAMM block to the base of the enclosure, being careful not to damage the gasket between the SAMM and the inside of the enclosure.

To install the new SAMM block, locate 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 by pressing the green button. Close and lock the enclosure door and reinstate the mains supply.

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REPLACING THE STYX MODULE

Switch off the mains supply to the GRM2 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)**.
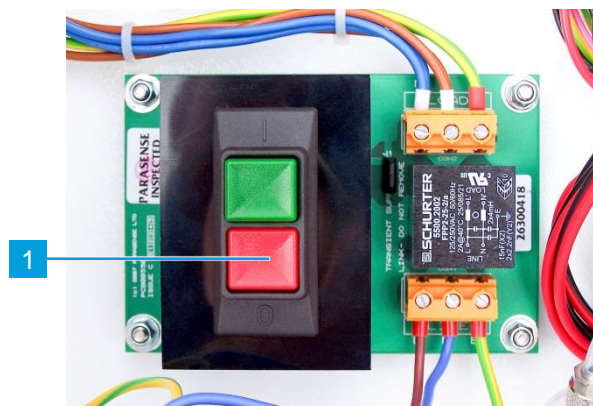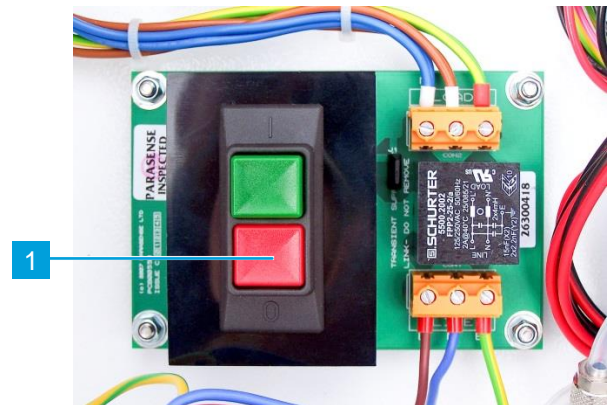

Disconnect the hose from the SAMM modules, leaving the white filter assembly connected to the SAMM module **(4)**. Disconnect the air exhaust fitting **(5)**.
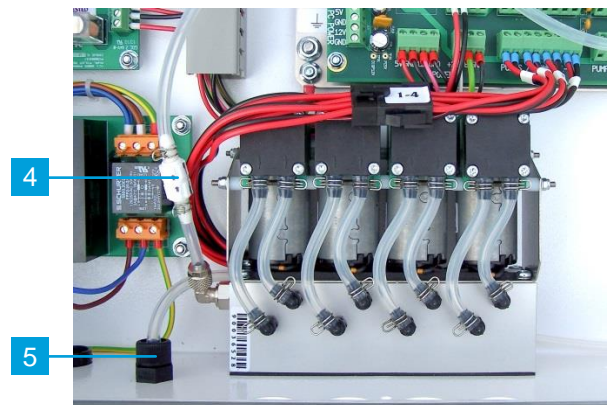
Disconnect the earth cable from the Styx module **(2)**. Unplug the ribbon cable and wired connections from the network module **(3)**.

Loosen the two fixing nuts on the right side of the Styx module **(6)** and remove the remaining three fixing nuts and shake-proof washers **(7)**. Tilt the left side of the Styx module upwards and slide the Styx module to the left and out of the monitor.

Fit the new Styx module in the vacant position by sliding under the loosened fixing nuts and shake-proof washers **(6)**. Fit the 3 remaining shake-proof washers and securing nuts **(7)** and tighten all 5 fixing nuts.

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 mains supply.

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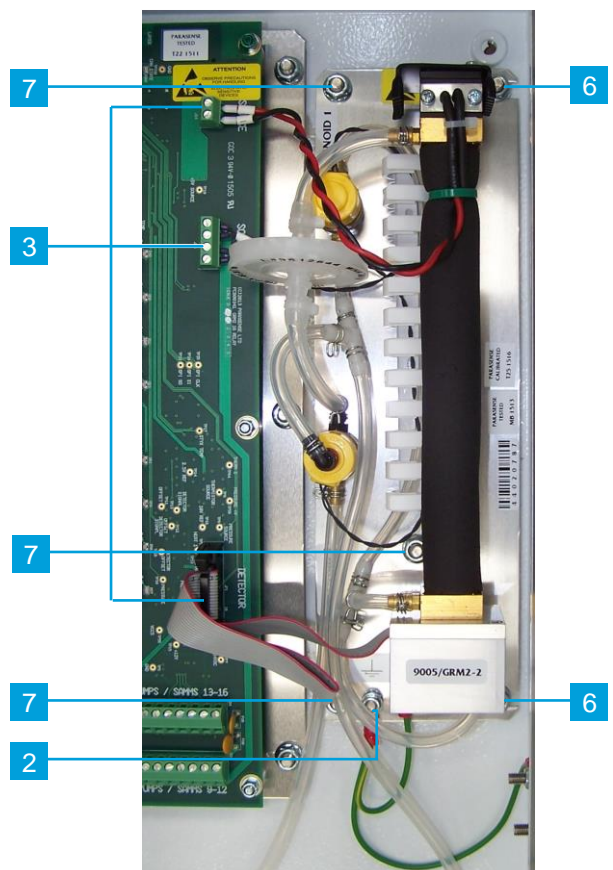
REPLACING THE POWER SUPPLY MODULE

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 by pressing the red button **(1)**.
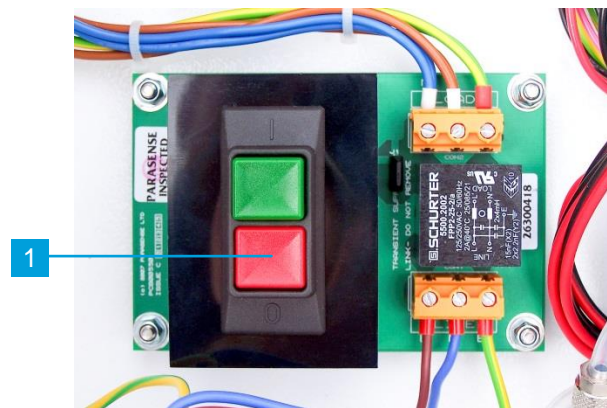
Noting the sequence - Disconnect the mains power supply cables to the power input module **(2)** and the power output cables **(3)**. Disconnect the earth strap **(4)**. Unscrew the four nuts **(5)** holding the power supply module, located around the edge of the insert plate and remove the module complete 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.
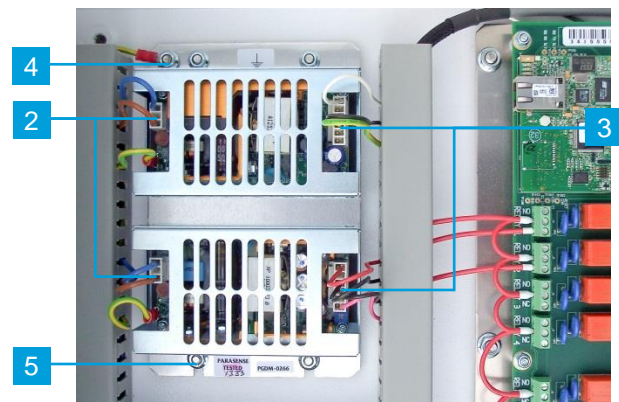
REPLACING THE DUAL PILOT RELAY MODULE

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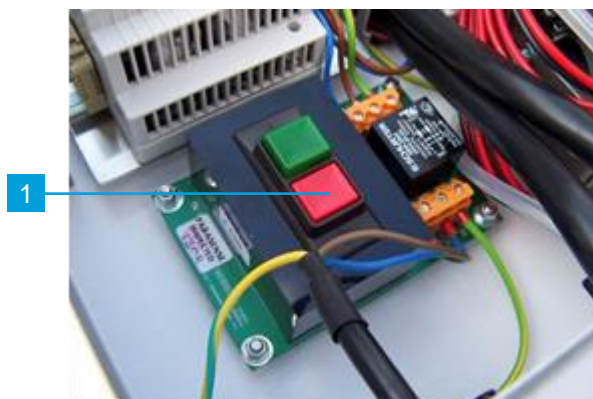
Disconnect the cables to the dual pilot relay module **(2)**. Unscrew the four nuts **(3)** holding the dual pilot relay module in position and remove the module.

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.
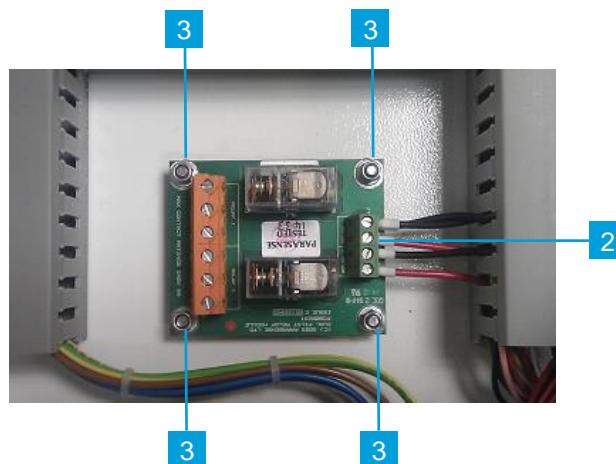
SYSTEM TEST – INTERNAL SAMMS

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: -

Note: Do not unscrew the brown knurled cap at any time

Max.80% full
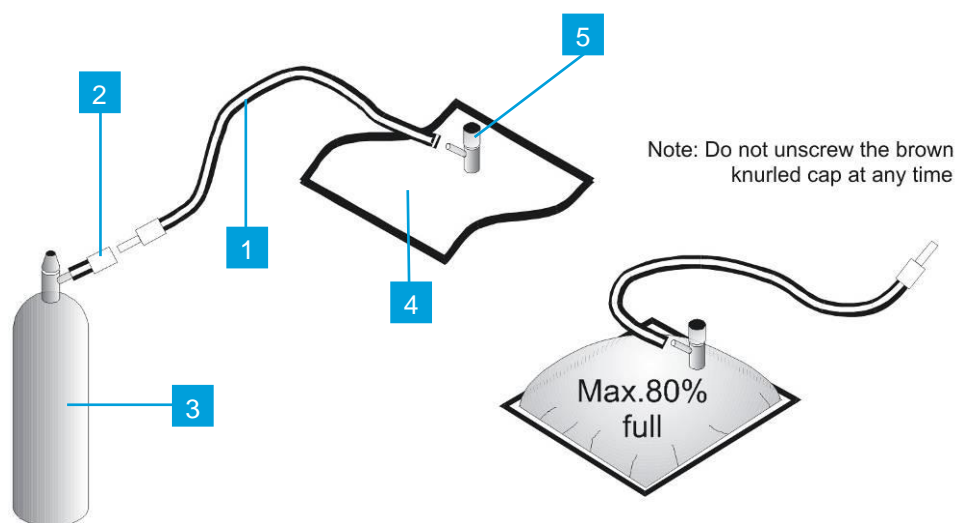
a) Before commencing a system check, confirm that the monitor has been running continuously for a period of at least four hours, with the door closed and locked, this will ensure that the system is operating at the correct temperature. The door must be kept closed throughout the system check.

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

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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 monitor use the $\triangle \triangledown$ 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.

SYSTEM TEST - RS485 SMARTGAS 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:

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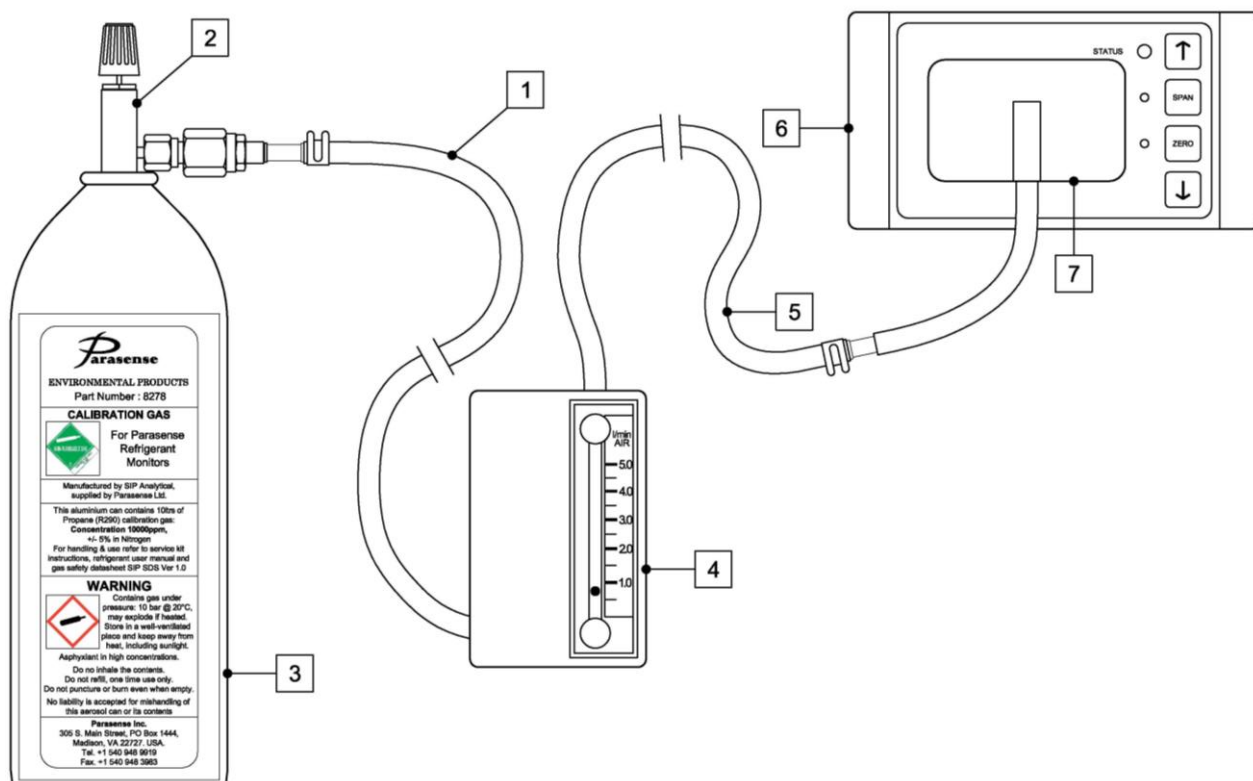
a) Before commencing a system test, confirm that the monitor and associated sensor modules have been powered and running continuously for a period of at least 1 hour, with all doors/covers closed/fitted and secured. This will ensure that the system and associated sensor modules are operating at a stable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

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:

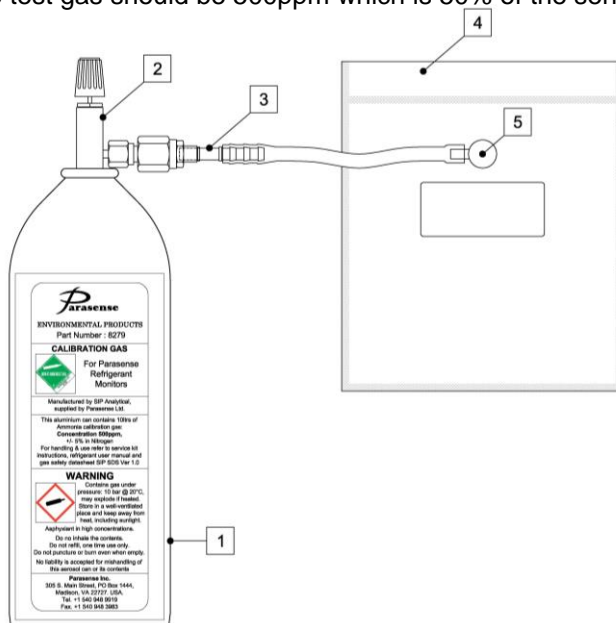a) **At the remote gas sensor -** before commencing system test, confirm the monitor and associated sensors have been powered and running for a period of at least 1 hour with all doors/covers closed/fitted and secured

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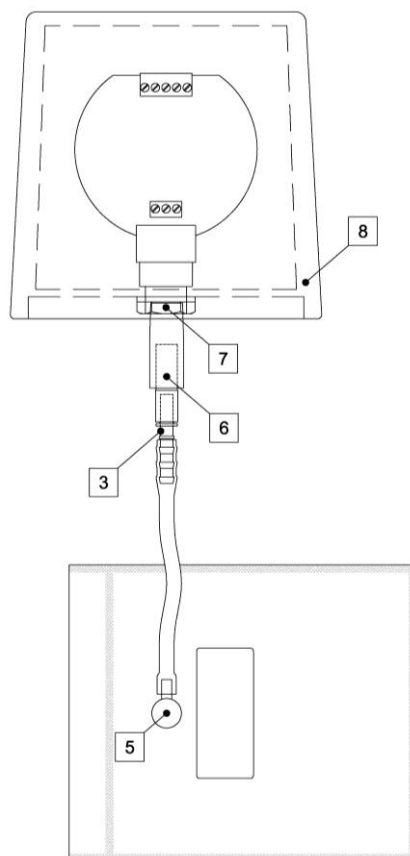
g) Attach the sensor adaptor (6) to the inlet tube (3) of the sample bag

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.

l) **At the GSRM2 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.

m) 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.

n) 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).

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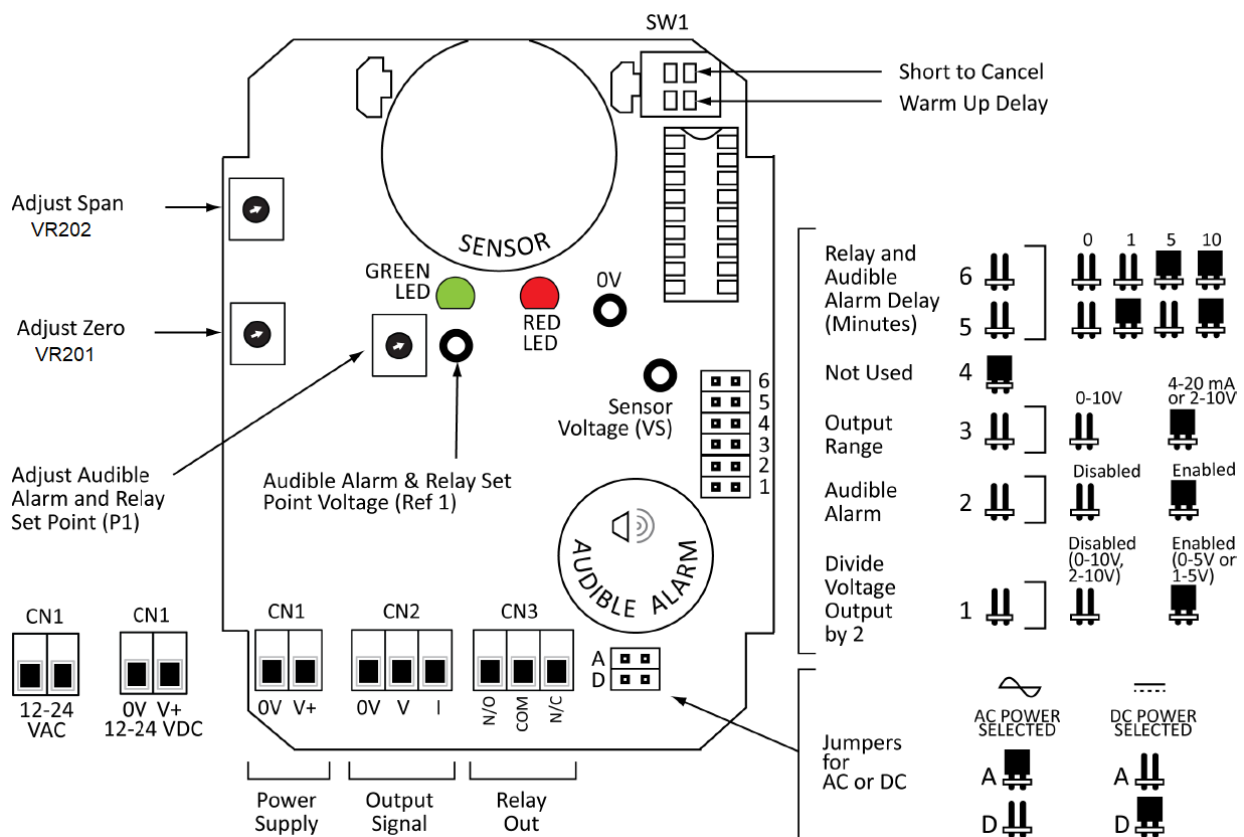
After installation, the units should be bump tested. Expose the sensors to appropriate test gas. The system will alarm when the test gas ppm value is above the alarm level. The gas should put the system into alarm and light the red LED. The delay prevents the audible alarm from sounding and the relay 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:
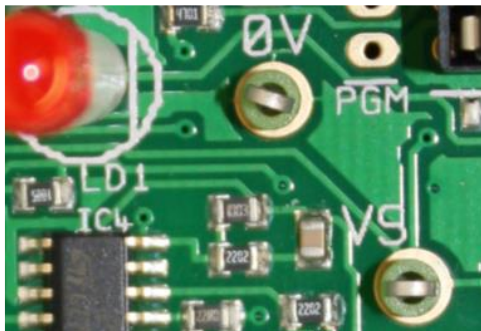
3. Expose the sensor to gas from the cylinder. You can place the entire MGS into a plastic bag or use a plastic hose/hood to direct gas to the sensor head. A response of above 80% is acceptable.
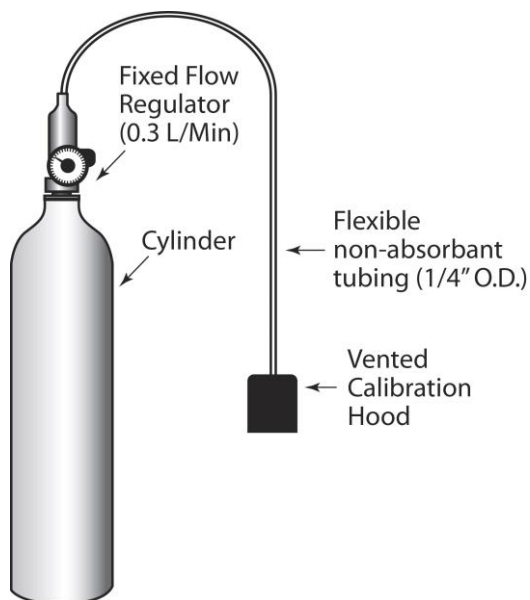
Gas Cylinder and Test Hardware

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:
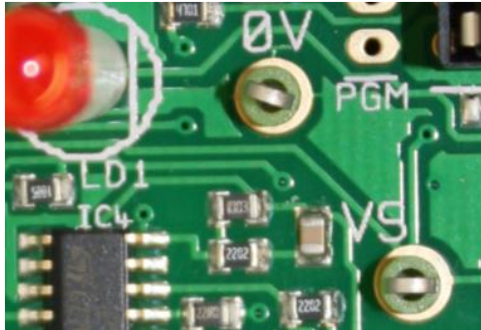
6. Place the beaker over the sensor head using the multi sensor adaptor to fit the sensor, or, if an Exd, IP66 or Remote sensor head version, screw the beaker on the remote sensor head M42 thread or M35 thread adaptor. It should be as tight fitting as possible to allow maximum gas exposure.
7. Tighten 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

CALIBRATION (INTERNAL SAMMS)

The calibration function should only be used to check the integrity of the Styx module after approx.18 months run time. Its function is to allow the operator to offset the Styx module calibration to compensate for any difference. In the event that maintenance is not carried out, the calibration function should be implemented.

The routine is as follows: -
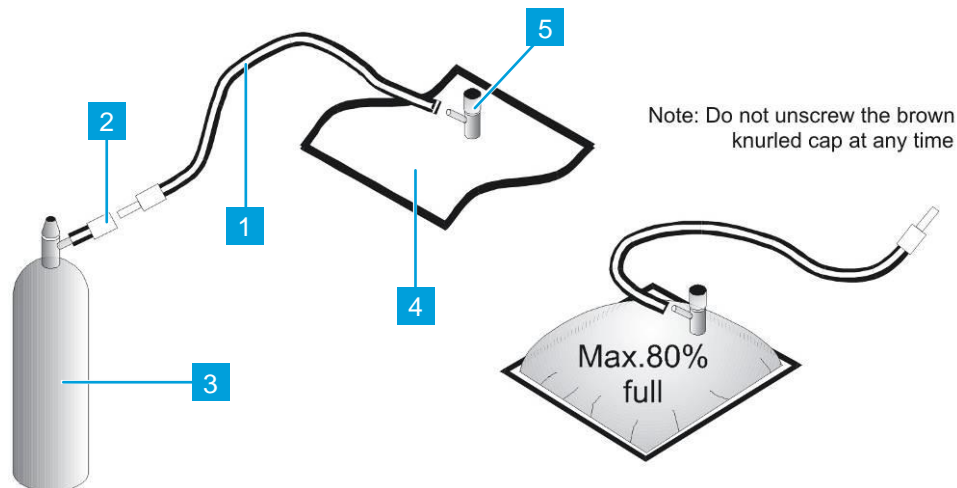
Note: Do not unscrew the brown knurled cap at any time

Max.80% full

a) 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. Open the calibration reservoir **(4)** by unwinding the upper white section of valve **(5)** one revolution anticlockwise and expel any air present, (note: do not unscrew the brown knurled cap at any time) then close. Connect the open end of hose **(1)** to the stem of valve **(2)**, insert the plug end of hose **(1)** in to the socket attached to valve **(2)**. Unwind the upper white section of valve **(5)** one revolution, anticlockwise.

b) 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 **(3)**, unscrew valve **(2)** from the gas cylinder and safely store the gas cylinder in the service kit case.

c) From the main menu on the Parasense GRM2 monitor use the $\triangle\triangledown$ buttons to select the 'Management' menu, enter the Management security code. When in the 'Management' menu, select 'Calibration'. Follow the on-screen instructions.

d) Disconnect the freeway/sampling pipe from SAMM/channel 1 using the pipe release tool and insert the plug end of pipe from the Parasense calibration reservoir.

e) Unwind the upper section of valve **(5)** one revolution, anticlockwise.

f) A calibration will start when ▢ is pressed, and if required, the system will be automatically re-calibrated. Following re-calibration a system test must be carried out. Ensure that the reservoir is full, press ▢ to display the system test screen. Move the cursor to 'Start' and press ▢, the first sample will be taken on SAMM 1, the reading displayed must be within 15% of 1000PPM, if not the Styx should be replaced.

g) Remove the Parasense calibration reservoir and replace the freeway/sampling pipe.

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

In order to maintain a high degree of accuracy Parasense recommends that a calibration is carried out after approx. 18 months use and repeated annually, and that air flow and system tests are carried out on all SAMM modules at maximum 12 month intervals. Information regarding maintenance packages and service exchange modules is available from Parasense.

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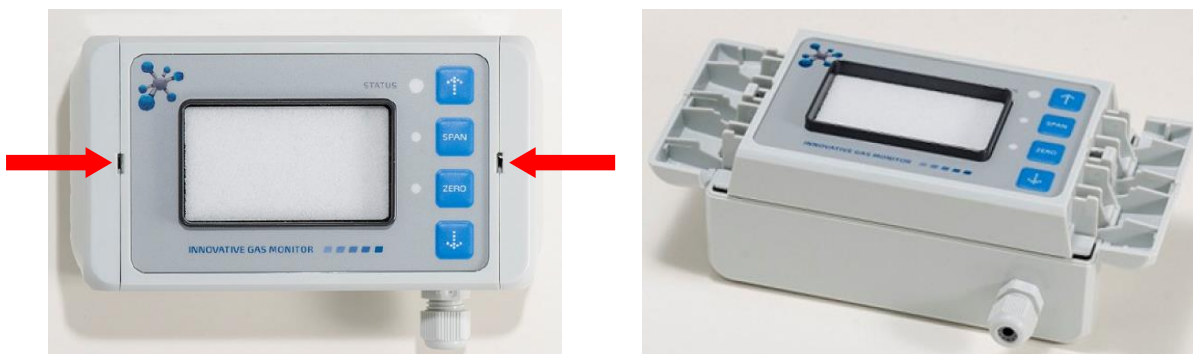
b) The sensor must be put into service mode. This is carried out by pressing the following keys in this order within 6 seconds :

       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.
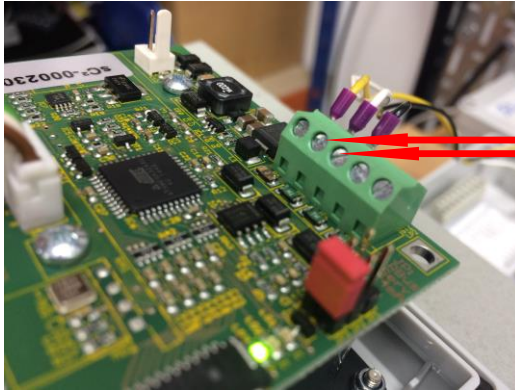
Analogue output terminals

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 <u>and save</u> 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 <u>without saving</u> 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 GSRM2 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. <u>Note:</u> 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 require

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 Vdc to zero.

3   Measure Vdc across the Test Pins **TP1** & **TP2**. Use the 4mA potentiometer **RV3** to adjust the reading 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 reading 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:
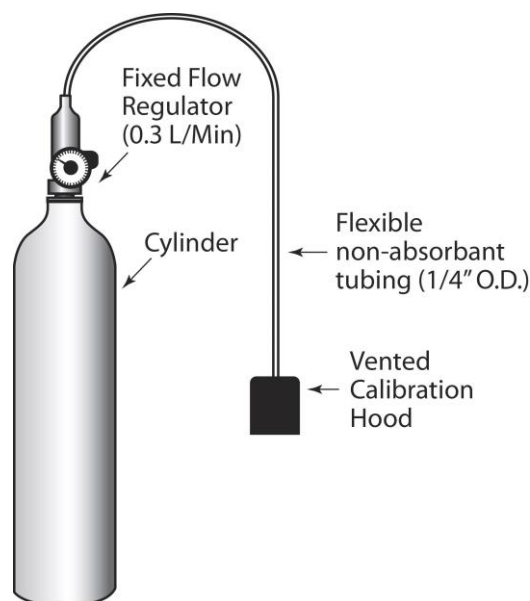
Calculating Calibration Voltage:

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:

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

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

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.

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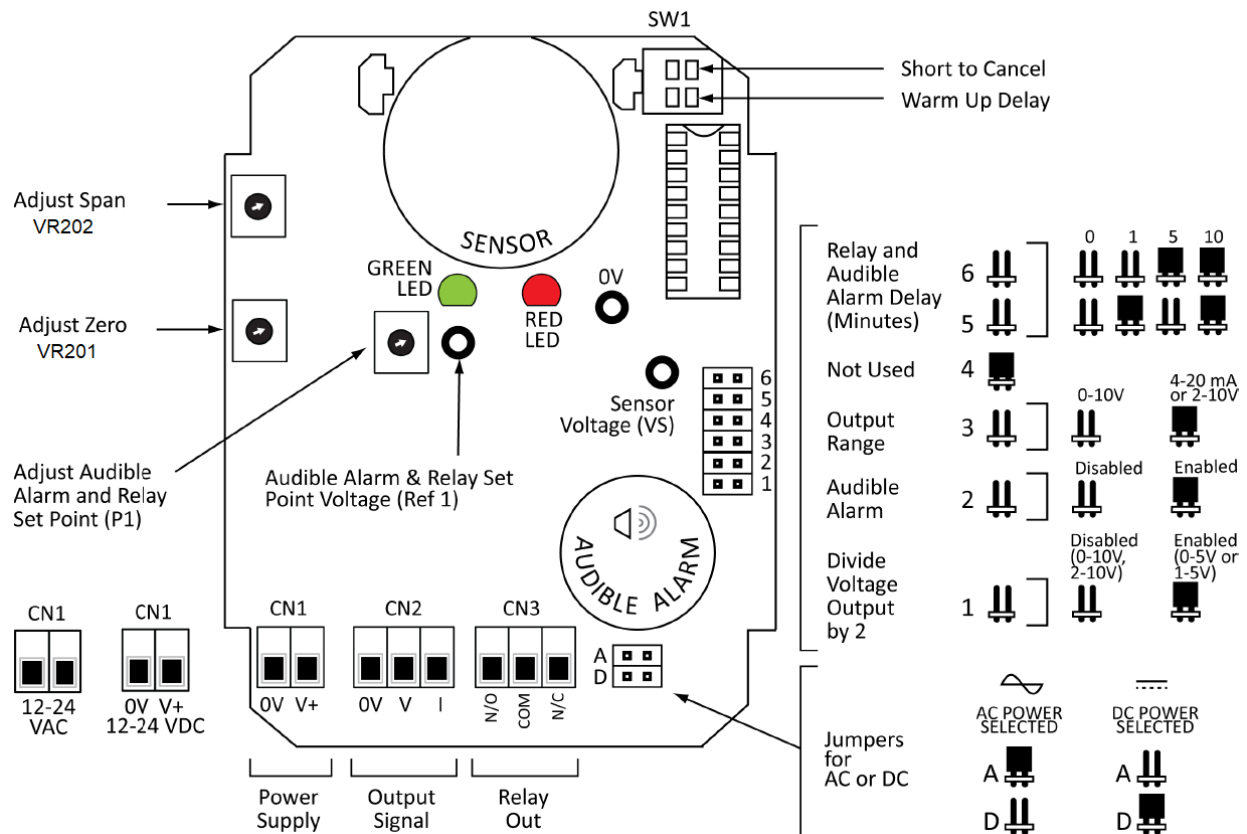
8 SPECIFICATION

Model GRM2-104D2-1xx	
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, CFC, HCFC, HFC	Styx infrared absorption sensor 24V DC plus serial coms Resolution: 1ppm Accuracy: better than 15% (species dependant)
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 current at 24V DC	Wired C-NC = 110mA
Parasense RS485 Networked SAMM current 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: -9°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)
Approvals	UL CSA CE

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9 APPENDIX

GRM2 GENERAL ARRANGEMENT (PS0622)

GRM₂

STYX MODULE
1no. 9005/GRM2-2

STYX MODULE

SAMM MODULES
9003 (No. dependent on model)

SOURCE

SOLENOID

DETECTOR

RS485 INTERNAL / DISPLAY
GND CAN L SCRN CAN H +24V

RS485 INTERNAL
B1 GND A1 +24V

RS485 EXTERNAL
B2 GND A2 +24V

RELAY 9 RELAY 10 RELAY 11 RELAY 12
RELAY 13 RELAY 14 RELAY 15 RELAY 16

RELAY 1 RELAY 2 RELAY 3 RELAY 4
RELAY 5 RELAY 6 RELAY 7 RELAY 8

ETHERNET

PUMPS SWMS 5-8
PUMPS SWMS 1-4

ENCLOSURE (Door removed)

NETWORK MODULE
1no. 9005/GRM2-1

POWER SUPPLY MODULE
1no. 9005/GRM2-3

PILOT RELAY MODULE
1no. 9005/GRM2-5

POWER INPUT MODULE
1no. 9005/GRM2-4

title:
GRM2-104D2
General Arrangement

drawn:
Scott Brindley

date:
19th Jan 2010

part number:
....

drawing number:
PS0622

revision:
7

sheet:
1 of 2

revision:
6. Drawing border updated. JW 24th January 2017
7. Drawing border updated. JW 27th March 2018

checked:
AK
JB

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

GRM₂

DOOR MODULE PCB
ASY00292

DOOR MODULE
GRM2-16-D

DOOR INTERNAL

DOOR MEMBRANE
& KEYPAD
MEMLCDPM2143

DOOR FRONT

title:	GRM2-104D2 General Arrangement
drawn: Scott Brindley	date: 19th Jan 2010	part number: ……………………

drawing number:	PS0622
revision: **7**	sheet: **2 of 2**

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

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

GRM2 CONNECTION SCHEMATICS (PS0618)

9-2

RM₂

Power Supply Unit - 24VDC

24VDC Supply (To sheet 2)

White
Black
Grn/Yell

CN5
1 2 3 4 5 6

CN1
1 2 3

Blue
Brown
Grn/Yell

Power Supply Unit - 12V / 5VDC

5VDC Supply (To sheet 2)
12VDC Supply (To sheet 2)

Red
Black
Black
Pink

CN5
1 2 3 4 5 6

CN1
1 2 3

Blue
Brown
Grn/Yell

Note:

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

POWER INPUT MODULE - 2A

N L E
LOAD

L N E
LINE

MAINS FEED
100-240VAC, 5A
50/60Hz

title:
GRM2-104 CONNECTION SCHEMATICS

drawn: DAVID SEAL
date: 29th Sept 09
part number:

drawing number:
PS0618

revision: 8
sheet: 1 of 4

checked:
AK
JB

revision:
7. Drawing border updated. JW 24th January 2017
8. Drawing border updated. JW 27th March 2018

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

RM₂

Display Connection
(To sheet 3)

White
White/Blue
Green
Blue/White
Black

GND
CAN L
SCRN
CAN H
+24V

B1
A1
GND
+24V
RS485 INTERNAL

B2
A2
GND
+24V
RS485 EXTERNAL

Network Module

ETHERNET

Ferrite

Red
Black

Beacon
Sounder

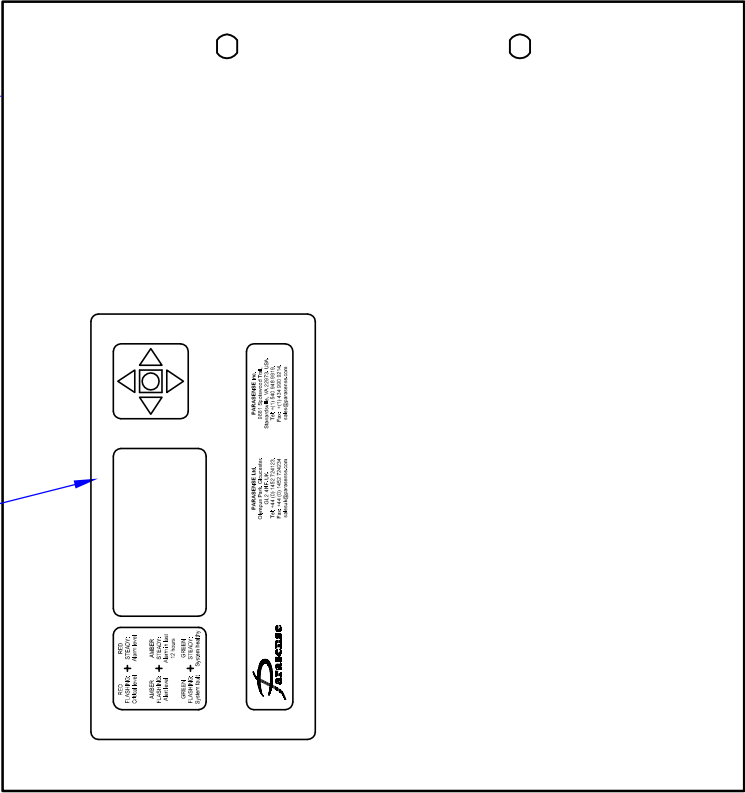Optional Beacon / Sounder

CAT5 connection
to door mounted PC

Red
Black

SOURCE

Black
Black
Black
Black

1
2
SOLENOID

SOURCE

SOLENOID 1

SOLENOID 2

16 Way Ribbon Cable

DETECTOR

DETECTOR

PUMPS / SAMMS 13-16
PUMPS / SAMMS 5-8

Connections to SAMM Modules 13 - 16
Connections to SAMM Modules 5 - 8

PUMPS / SAMMS 13-16
PUMPS / SAMMS 9-12
PUMPS / SAMMS 5-8
PUMPS / SAMMS 1-4

Connections to SAMM Modules 9 - 12
Connections to SAMM Modules 1 - 4

RELAY 9   RELAY 10   RELAY 11   RELAY 12
NO C NC   NO C NC   NO C NC   NO C NC

RELAY 13   RELAY 14   RELAY 15   RELAY 16
NO C NC   NO C NC   NO C NC   NO C NC

Channel 9 Alarm   Channel 10 Alarm   Channel 11 Alarm   Channel 12 Alarm
Channel 13 Alarm Channel 14 Alarm   Channel 15 Alarm   Channel 16 Alarm

RELAY 1   RELAY 2   RELAY 3   RELAY 4
NO C NC   NO C NC   NO C NC   NO C NC

RELAY 5   RELAY 6   RELAY 7   RELAY 8
NO C NC   NO C NC   NO C NC   NO C NC

+24V

GND
E
+24V

GND
12V
GND
5V

Channel 3 Alarm

Channel 5 Alarm   Channel 6 Alarm   Channel 7 Alarm   Channel 8 Alarm

Pilot Relay Connections (See sheet 4)

Red   Red
Black

Red
Black
Pink
Black
Green/Yellow
White

5VDC from PSU (See sheet 1)
12VDC from PSU (See sheet 1)
24VDC Supply (From sheet 1)

Relays are volt-free changeover type,
rated at 5A (resistive). Contact
voltages must not exceed 24Vac /
dc.

Relays Become energized when the
Monitor is powered up and change
state, i.e. the NO contacts close.

Relays will de-energise when a fault
occurs or power is removed from
the monitor, they will revert back
again when the fault clears or power
is restored.

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

drawing number: **PS0618**

sheet: **2 of 4**

revision: **8**

title: **GRM2-104 CONNECTION SCHEMATICS**

drawn: DAVID SEAL

date: 29th Sept 09

part number:

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Parasense

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

RM₂

CAN Display Module

White
White/Blue
Green
Blue/White
Black

V+
CAN H
SCR
CAN L
V-

RX TX GND

24VDC 0VDC A B

RS232
RS485
CAN
JTAG

Display Connection
(From sheet 2)

title: GRM2-104 CONNECTION SCHEMATICS

drawn: DAVID SEAL
date: 29th Sept 09
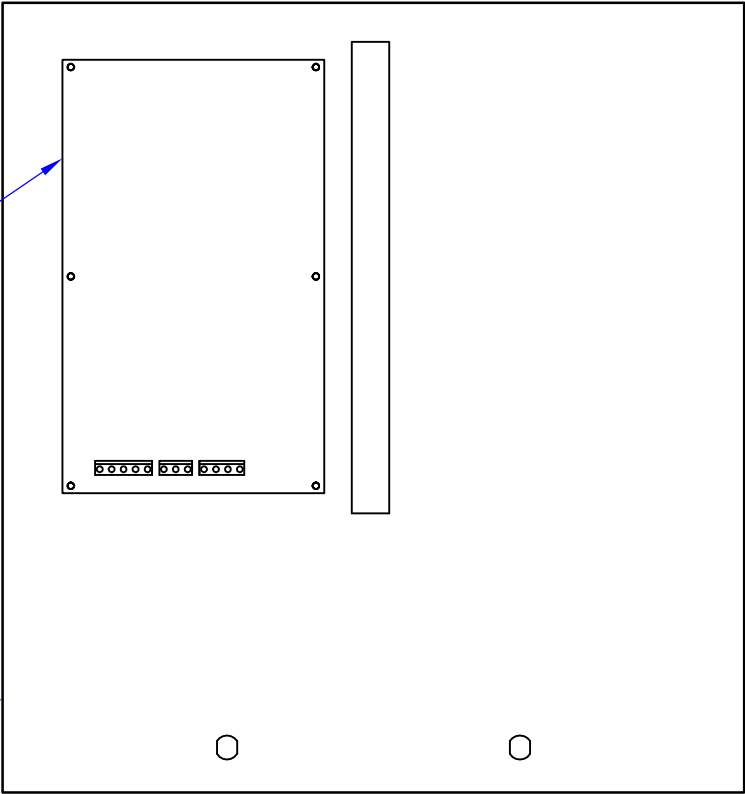part number:

drawing number: **PS0618**

revision: **8**
sheet: **3 of 4**

revision:
7. Drawing border updated. JW 24th January 2017
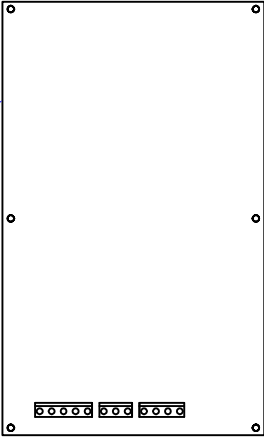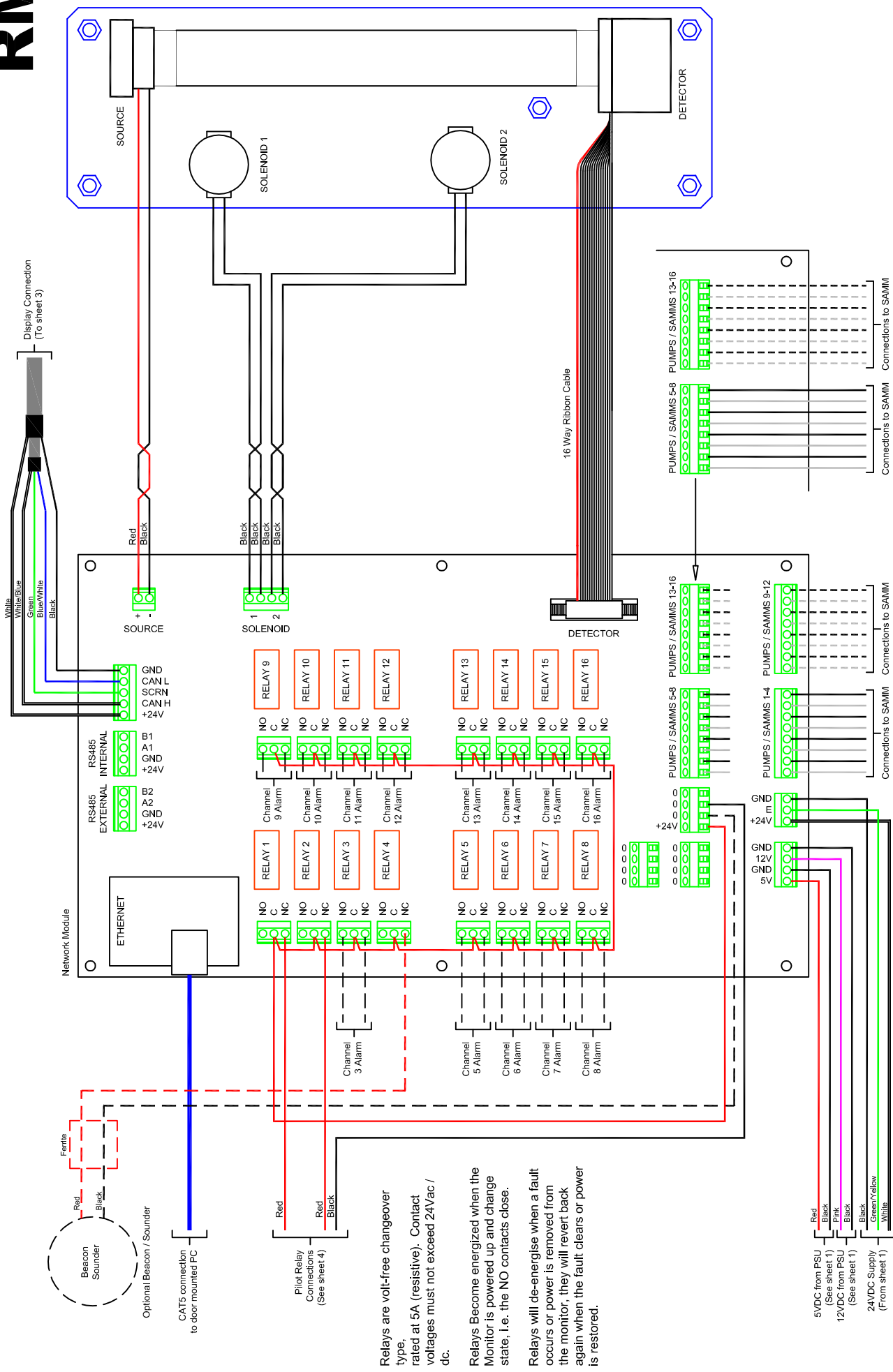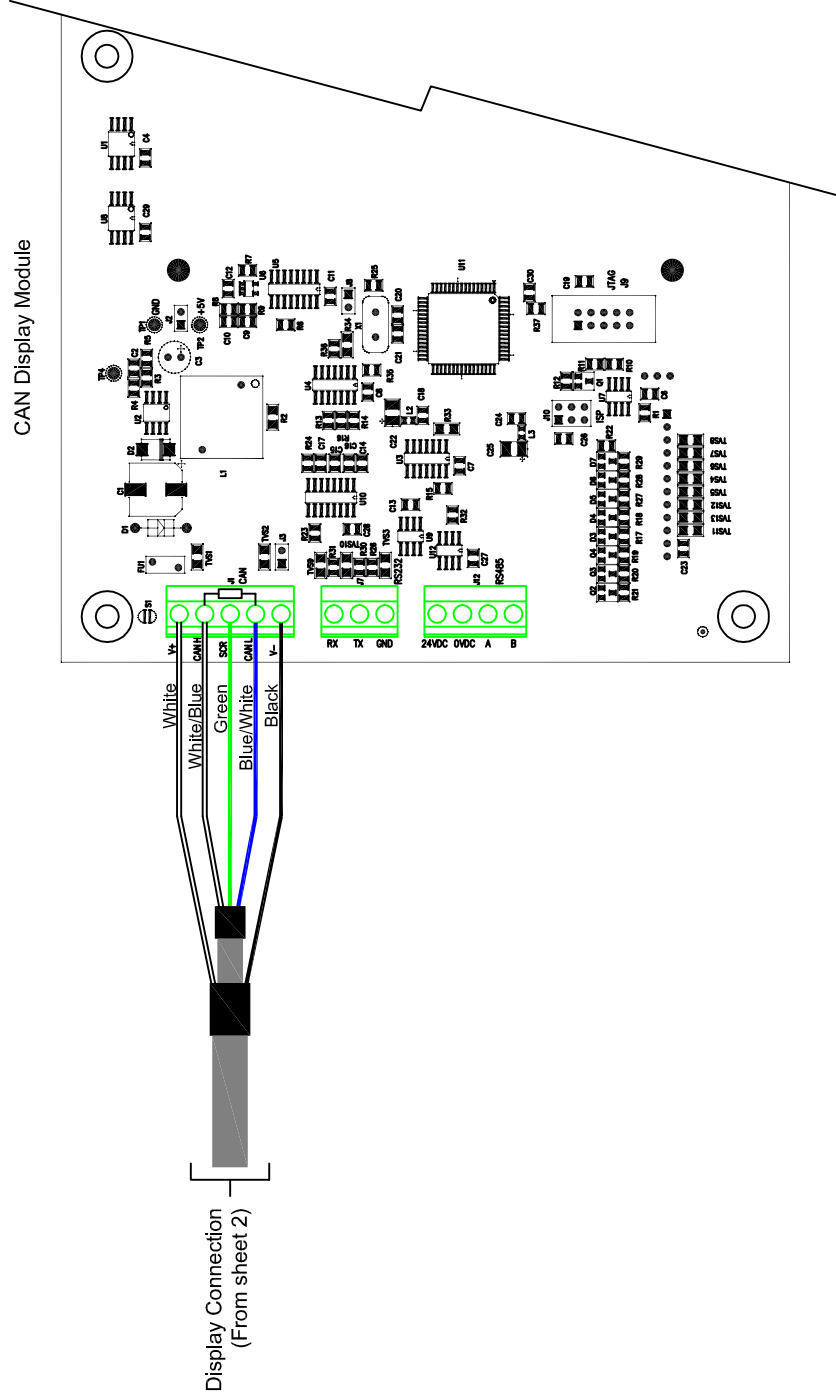8. Drawing border updated. JW 27th March 2018

checked:
AK
JB

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

RM₂

Pilot Relay Connections (From sheet 2)

Red

Red
Black

Alarm Relay 2
(Contacts rated at 6A 240Vac)

Alarm Relay 1
(Contacts rated at 6A 240Vac)

Pilot Relay Module

J2

NC | NO | COM | NC | NO | COM
RELAY 2 | RELAY 1

RL2 | RL1

REL 2 | REL 1
24V 0V | 24V 0V

title:			
GRM2-104 CONNECTION SCHEMATICS			
drawn: DAVID SEAL	date: 29th Sept 09	part number:	

drawing number:		
PS0618		
revision: **8**	sheet: **4 of 4**	

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

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

ADC-104 GENERAL ARRANGEMENT (PM2098)

GRM₂

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			
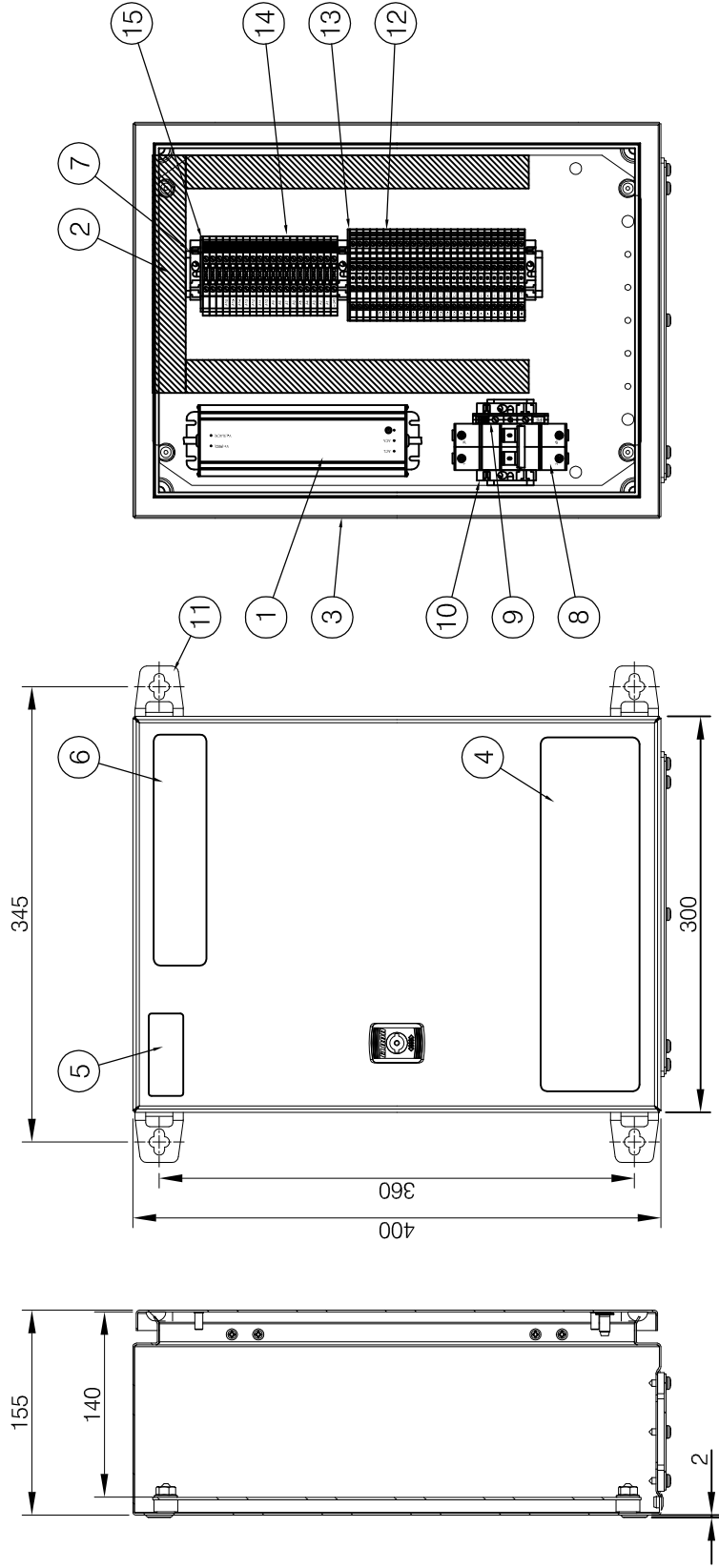
Item	Description	Part Number	Qty
1	Power Supply	PSU-DLG75PS24	1
2	Trunking 25 x 80	TRUNK-25x80PVC	700mm
3	Enclosure 400 x 300 x 155	ENC-MAS0403015	1
4	Stepwise Product Label	LABPM2099	1
5	Warning Label	LABPM559	1
6	Parasense Address Label	LABPM1878	1
7	DIN Rail	KLI067620	360mm
8	2 pole Circuit Breaker 6A	MCB-S201-C4NA	1

title: ADC-104 General Assembly

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

drawing number: PM2098

revision: 3 | sheet: 1 of 1

checked: AK | JB

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

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

ADC-104 PANEL MOUNTING DETAILS (PM2247)

Parasense
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RM₂

INTERNAL VIEW

EXTERNAL VIEW

SIDE VIEW
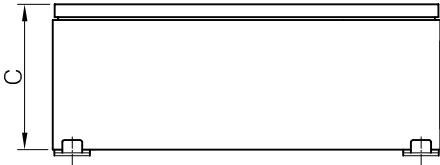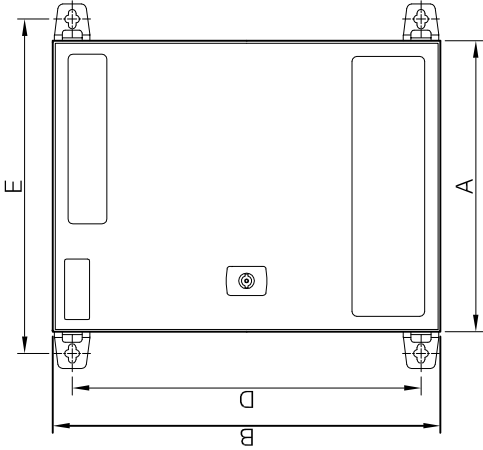
DOOR SWING VIEW
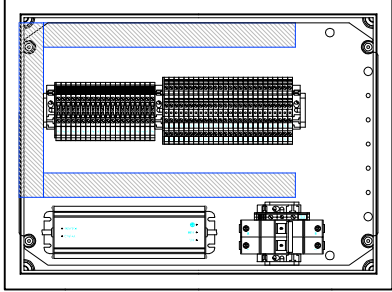
DIMENSIONS

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

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

title:		drawing number:	
ADC-104 Panel Mounting Details		**PM2247**	

| drawn: James Wilkinson | date: 26th July 2016 | part number: .... | revision: **2** | sheet: **1 of 1** |

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

checked: AK   JB

Doc. Ref: H105–4 09/03/18

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ADC-104 CONNECTION SCHEMATIC (PS0753)

RM₂

24VDC Supply (To sheet 2)

Red

Black

Red

Black

DLG75PS24

V+(RED)
V-(BLACK)

ACL
ACN

Brown
Blue
Green/Yellow

Note 1:

All Earth bonding cables between door, enclosure & backplate to be minimum 4.0mm² Green / Yellow

Note 2:

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

Mains Input Breaker 4A Type C

3

1

4

2

E

N

L1

MAINS FEED
100-240VAC (Max) 5A
1ph 50/60Hz

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

		checked:
		JW
		AK
		JB

revision:

6. Notes updated. AK 12/12/2016

7. Drawing border updated. JW 16th January 2017

8. Drawing border updated. JW 22nd March 2018

drawing number:

PS0753

revision:	sheet:
8	**1 of 3**

title:

ADC-104 Schematic Wiring Diagrams

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

RM₂

GRM2 remote terminal box connections

24VDC Supply (To sheet 2) — Red / Black

Bottom row terminals

Note: Please cable tie back all unused cable cores

Pilot relay multicore from GRM2

core #16
core #15
core #14
core #13
core #12
core #11
core #10
core #9
core #8
core #7
core #6
core #5
core #4
core #3
core #2
core #1
core #24

+24V
A16
A15
A14
A13
A12
A11
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
+24V

[FMS Integration for Alarming, Ventilation and Liquid Line Shutdown]

Terminal Cross-connect

Top row terminals: 24VDC connections to remote annunciators

Leave each link long enough to reach any of these terminals

Link — 23+ — 23−
Link — 22+ — 22−
Link — 21+ — 21−
Link — 20+ — 20−
Link — 19+ — 19−
Link — 18+ — 18−
Link — 17+ — 17−

Configurable links

Beacon / sounder multicore from GRM2

core #16 — 16+ — 16−
core #15 — 15+ — 15−
core #14 — 14+ — 14−
core #13 — 13+ — 13−
core #12 — 12+ — 12−
core #11 — 11+ — 11−
core #10 — 10+ — 10−
core #9 — 9+ — 9−
core #8 — 8+ — 8−
core #7 — 7+ — 7−
core #6 — 6+ — 6−
core #5 — 5+ — 5−
core #4 — 4+ — 4−
core #3 — 3+ — 3−
core #2 — 2+ — 2−
core #1 — 1+ — 1−
core #24 — +24V — 0−

Bottom row terminals (0V connections to remote annunciators and/or pilot relays)

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

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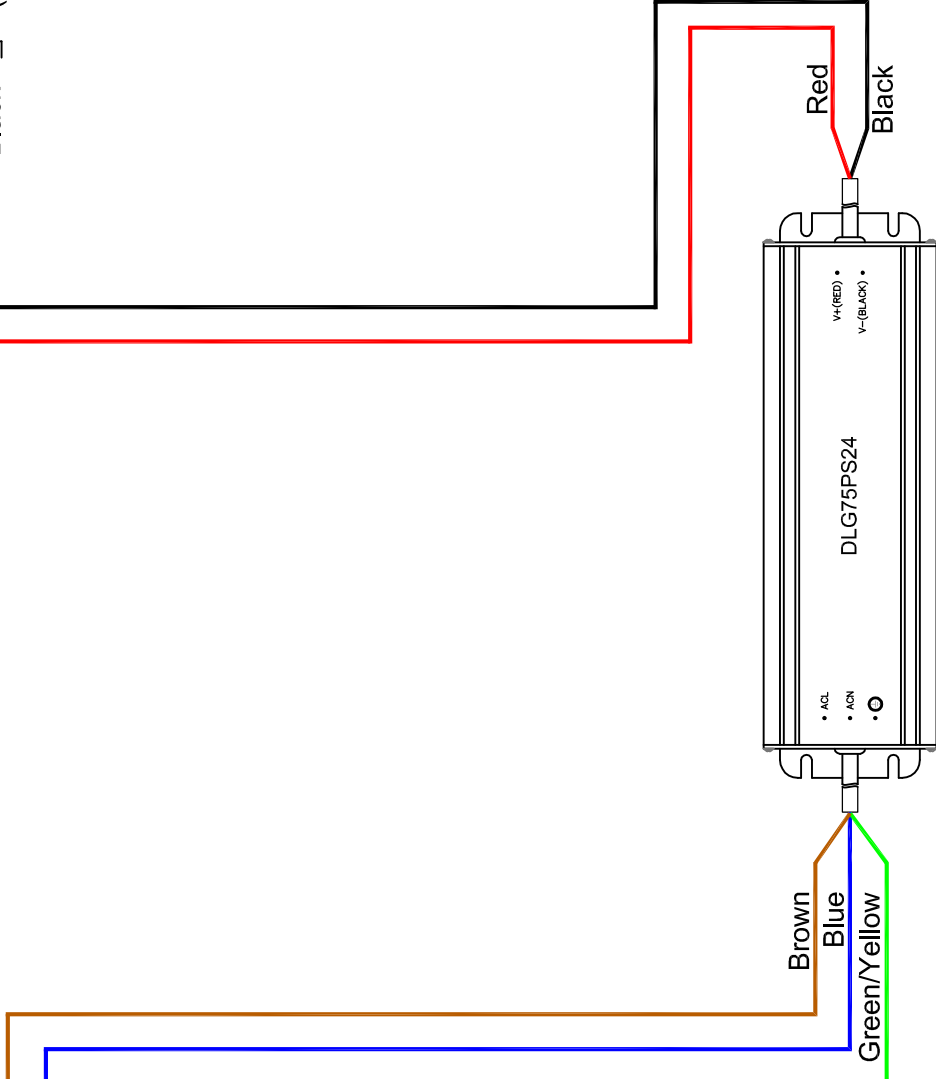7. Drawing border updated. JW 16th January 2017
8. Drawing border updated. JW 22nd March 2018

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

RM₂

GRM2 Relay Connections to remote terminal box

Please remove and isolate the original +24V GRM2 wire from C-terminal of Relay 1

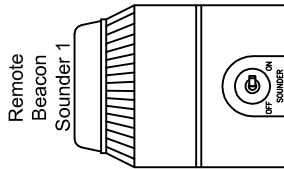| Relay	NO/C/NC	Channel
RELAY 9	NO C NC	Channel 9 Alarm
RELAY 10	NO C NC	Channel 10 Alarm
RELAY 11	NO C NC	Channel 11 Alarm
RELAY 12	NO C NC	Channel 12 Alarm
RELAY 13	NO C NC	Channel 13 Alarm
RELAY 14	NO C NC	Channel 14 Alarm
RELAY 15	NO C NC	Channel 15 Alarm
RELAY 16	NO C NC	Channel 16 Alarm
RELAY 1	NO C NC	Channel 1 Alarm
RELAY 2	NO C NC	Channel 2 Alarm
RELAY 3	NO C NC	Channel 3 Alarm
RELAY 4	NO C NC	Channel 4 Alarm
RELAY 5	NO C NC	Channel 5 Alarm
RELAY 6	NO C NC	Channel 6 Alarm
RELAY 7	NO C NC	Channel 7 Alarm
RELAY 8	NO C NC	Channel 8 Alarm

core #24, core #9, core #10, core #11, core #12, core #13, core #14, core #15, core #16

core #9, core #10, core #11, core #12, core #13, core #14, core #15, core #16

Pilot Relay
Multi-core cable
(To remote terminal box, sheet 2)

core #24, core #1, #2, #3, #4, #5, #6, #7, #8

core #1, core #2, core #3, core #4, core #5, core #6, core #7, core #8

Beacon Sounder
Multi-core cable
(To remote terminal box, sheet 2)

title: ADC-104 Schematic Wiring Diagrams

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

checked:	
JW	
AK	
JB	

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

Pilot Relay
Module 1

Pt No. 8597

Dual Pilot Relay

Parasense

Remote
Beacon
Sounder 1

OFF ON
SOUNDER

FIELD WIRING

LOOMS FACTORY SUPPLIED FOR SITE INSTALLATION

ADC-104

PILOT RELAY TERMINALS
UP TO 16 CONNECTIONS

BEACON/SOUNDER TERMINALS
UP TO 16 CONNECTIONS

+V (BLACK)
+V (RED)

ADJ
OK

MAINS FEED
100-240VAC 50/60Hz

Maximum 150mm (6")

GRM2

STYX
MODULE

SOURCE

SOLENOID

DETECTOR

GND
CAN L
SCRN
CAN H
+24V

DISPLAY

RS485
INTERNAL

B1
A1
GND
+24V

RELAY 9
RELAY 10
RELAY 11
RELAY 12

RELAY 13
RELAY 14
RELAY 15
RELAY 16

RS485
EXTERNAL

B2
A2
GND
+24V

NO
C
NC

PUMPS / SAMMS 5-8

PUMPS / SAMMS 1-4

ETHERNET

RELAY 1
RELAY 2
RELAY 3
RELAY 4

RELAY 5
RELAY 6
RELAY 7
RELAY 8

+24V

GND
E
+24V

GND
12V
GND
5V

USB

NO
C
NC

PILOT RELAY INTERCONNECTING LOOM

BEACON/SOUNDER INTERCONNECTING LOOM

GND
N L E

L N E

MAINS FEED
100-240VAC 50/60Hz

A BACHARACH. COMPANY
Parasense

title:		
GRM2 with ADC-104 block diagram		
drawn:	date:	part number:
James Wilkinson	30th Jan 2015	ADC-104

drawing number:	checked:
PS0773	AK
	JB

revision:		
4. Drawing border updated. JW 24th January 2017		
5. Drawing border updated. JW 22nd March 2018		

revision:	sheet:
5	1 of 1

RM2C-104-ATM2R CONNECTION DETAILS (PS0768)

RM2C

Power/comms link to 4-20mA gas sensor

See DWG PS0778 for gas sensor conenction details

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.

RS485 network

Belden 8461
1 Pair 18awg

Belden 8761
1 Pair 22AWG

Belden 8723
2 Pair 22AWG

Belden 8461
1 Pair 18AWG

Beacon /
Sounder
24Vdc

RM2C-104-ATM2R PCB

RS485 Input

1 2 3 4 5 6 7 8 9

B/S ┴ Sensor ┴
- + mA - + A B - +

TERM

RS485 ADDRESS
TENS UNITS
Module ID

Relay 1   Relay 2
NC C NO NC C NO
10 11 12 13 14 15

Dry contacts to external controls / alarm systems

Max switching power (resistive load):
2500VA 150W (NO), 1662VA 150W (NC)
Max switching voltage: 250V AC / 100V DC (0.5A)
Max switching current: 10A AC / 5A DC

RS485 Termination Jumper setting

Terminated   Open

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

TENS UNITS = ID 01

TENS UNITS = ID 99
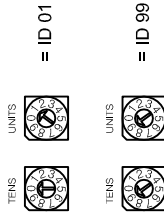
Note
Address 00 reserved
Maximum number of addresses limited by application - Contact Parasense if unsure.

POWER REQUIREMENTS

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

CABLE KEY

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	

USES

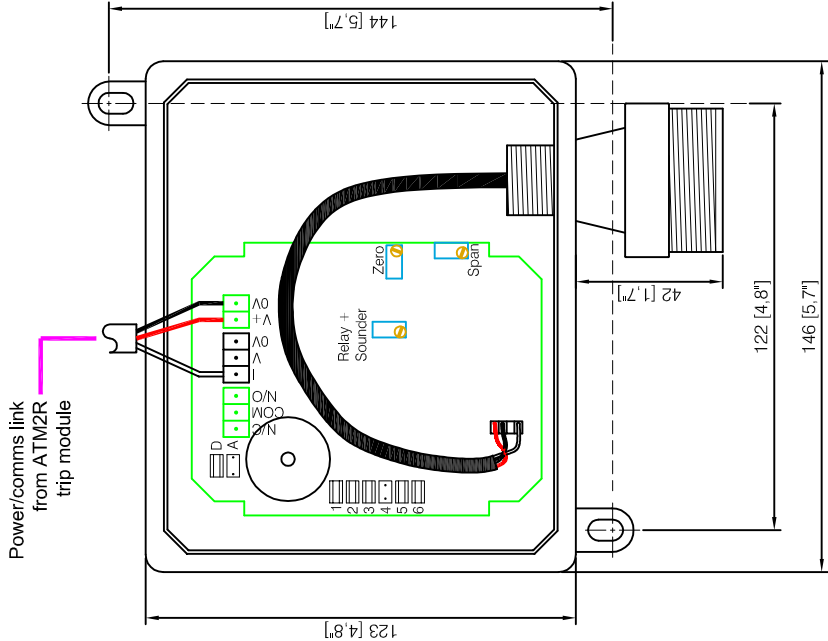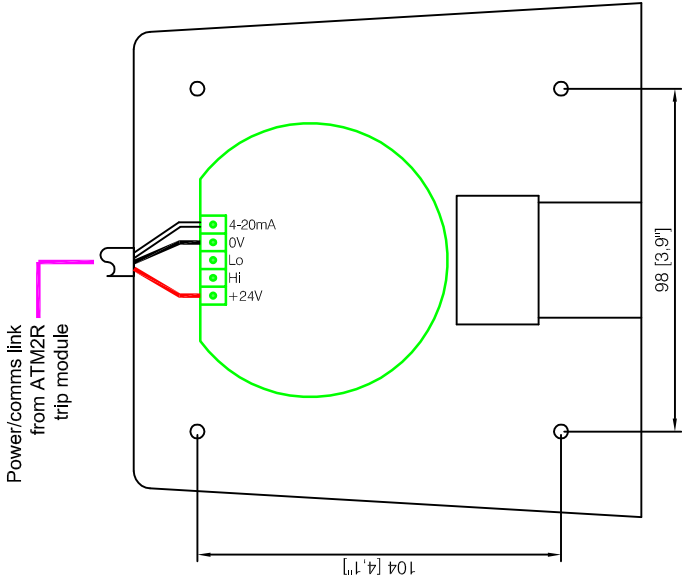|	checked:
revision:	
6. Relay ratings updated. JW 8th July 2016	AK
7. Drawing border updated. 13th January 2017	AK
8. Drawing border updated. 27th March 2018	JB

drawing number:	
PS0768	
revision:	sheet:
8	**1 of 1**

title:	RM2C-104-ATM2R	
drawn: James Wilkinson	date: 18th Sept 2014	part number: RM2C-104-ATM2R

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

GDS SENSORS

Power/comms link
from ATM2R
trip module

4-20mA
0V
Lo
Hi
+24V

98 [3.9"]

104 [4.1"]

Connections and Fixing Centres

BACHARACH MGS-150 SENSORS

Power/comms link
from ATM2R
trip module

0V
+V
0V
V
N/O
COM
N/C

Zero
Span

Relay +
Sounder

D
A

1 2 3 4 5 6

144 [5.7"]

146 [5.7"]

122 [4.8"]

42 [1.7"]

123 [4.8"]

Connections and Fixing Centres

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

	checked:	
	AK	JB
		JB

revision:

3. Drawing border updated. GDS sensors
details modified. JW 13th January 2017

4. Bacharach MGS-150 details added. JW
7th March 2018

5. Drawing border updated. JW 27th March
2018

drawing number:

PS0778

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

title:

Network gas sensors
mounting and connections

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

smartGAS SENSORS

Power/comms link from ATM2R trip module

Terminal designations from analogue sensor trip module (RM2C-104-ATM2R)

Rbus
Smv
24mA

mA
+   −

10V
5V
2V

Connections

Ensure J3 is closed: 4-20mA output (factory default)

Ensure J4-J6 are open (factory default)

127 [5.0"]

63 [2.5"]

Fixing Centres

MSR SENSORS

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)

0-20%

Ensure V-A jumper is open (factory default)

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

0-20%

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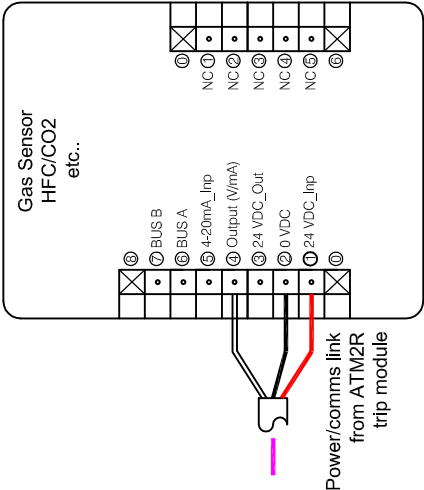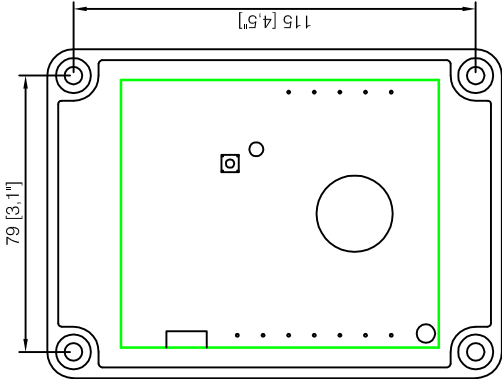
NOTE:
The MSR sensors have two different types of PCB fitted depending on the gas being detected. The connections and jumper configurations remain the same for both styles (shown above)

Gas Sensor HFC/CO2 etc..

① NC
② NC
③ NC
④ NC
⑤ NC

⑦ BUS B
⑧ BUS A
⑤ 4-20mA_Inp
④ Output (V/mA)
③ 24 VDC_Out
② 0 VDC
① 24 VDC_Inp

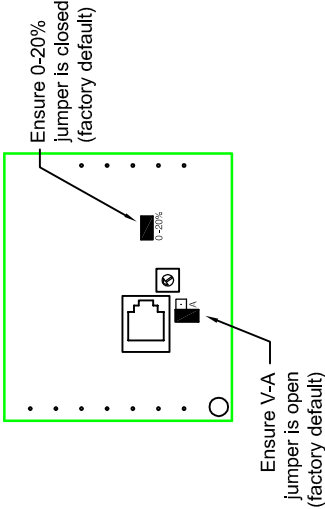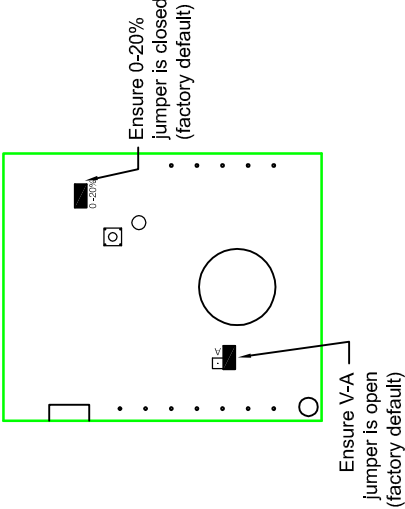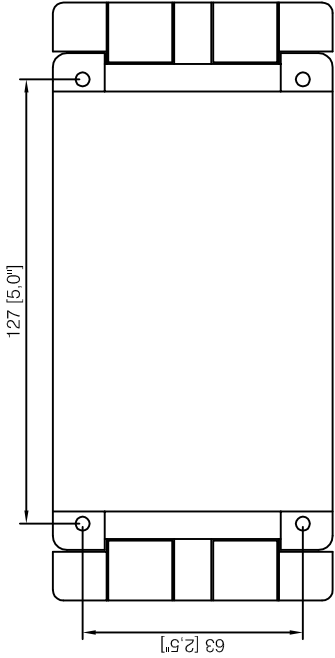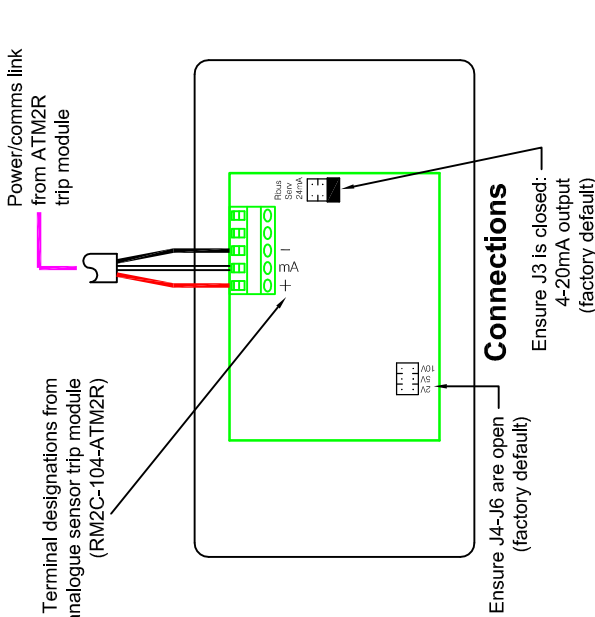Power/comms link from ATM2R trip module

Connections

115 [4.5"]

79 [3.1"]

Fixing Centres

title: Network gas sensors mounting and connections

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

drawing number: **PS0778**

sheet: **2 of 2**

revision: **5**

checked: AK JB JB

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

Parasense
A **BACHARACH** COMPANY

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