Phasefale's RAMiv
Refrigerant Air Monitor

INSTALLATION AND OPERATING INSTRUCTIONS

The Refrigerant Air Monitor is a precision electronic instrument and while designed and built to withstand normal commercial handling and storage conditions, it should be treated with care. Strict attention must be paid to the Installation and Operating Instructions outlined in this document.

Attention to the following sections will ensure that your Refrigerant Air Monitor will function correctly and give long reliable service.

INDEX

1. INTRODUCTION

The Refrigerant Air Monitor monitors the concentration of specific gases.

The concentration is shown in PPM on the display.

An alarm sequence can be set to occur when the gas reaches a specific concentration. Time delays can be set before an alarm occurs to prevent false alarms.

The gas concentration is logged in memory at a routine interval. These logs can be recalled at any time and viewed on the display.

2. OPTIONS AND FEATURES

The Refrigerant Air Monitor is supplied with the provision to monitor one gas sensor (not included) and operate outputs for alarms.

The following accessories are available to enhance the operation of the RAMiv.

- Sensors: A wide range of sensors suitable for monitoring most gases.
- Alarm Light: a red, 240V panel mount alarm indicator (additional to the bright built in LED).
- Alarm Buzzer: a loud 12V buzzer suitable for direct connection to the RAMiv.
- Voice Dialler: AD2 telephone dialler that calls a list of numbers and plays a pre-recorded message.
- RAMiv/4: Multi-Sensor Board: allows the RAMiv to use up to four separate sensors.
- mdPCB: allows a control output which comes on when the concentration reaches a programmed point and a ventilation output to control ventilation in the sensed environment.
- PSB30: Battery backup to allow sensing to continue through power outages.

- Complog Software: PC windows software to connect to a RAMiv to log and graph the concentrations. Includes facility to dial a RAMiv via phone lines.
- Modem: suitable for Complog software communications.

3. INSTALLATION

Location of Air Monitor

The unit should be located in a position where the display can be readily observed. Ambient temperature should be between 0 and 40°C.

Location of Sensors

The position of the sensor is critical for the correct operation of the unit. The sensor can only monitor the air that flows over it.

The key to proper sensor location is to determine the airflow in the room. The sensor should be located so any gas being detected will flow towards the sensor. Pay attention to whether the gas will rise or fall to the ground.

If the sensor is not temperature compensated it will need to be kept at a fairly constant temperature. If the temperature varies from that at which it was calibrated the accuracy of the reading will decrease. Ambient temperature should be between 10 and 30°C.

Mounting the Air Monitor

The air monitor can be secured by four screws through the mounting points on the back of the housing. Refer to the separate enclosure mounting instructions for further information.

3a. Wiring

Wiring to Air Monitor

The unit requires 240VAC to the A and N terminals. (110VAC version is available)

The L terminal (internally connect to the A terminal via normally open relay contacts) will flash on and off when the unit is in alarm, and is intended for a 240VAC flashing alarm light.

The B1- terminal (switched ground) and the +12V terminal provide a 12VDC output that is on while the unit is in alarm. A load up to 30mA, such as a buzzer, may be connected.

The D1 and D2 terminals are normally closed circuit. They open circuit while the unit is in alarm and are suitable for connection to telephone diallers or security systems.

Wiring to Gas Sensor

The sensor is connected via two sets of cables.

The heater set supplies power for the heater element in the sensor and must be adequately sized to avoid voltage drop in the cable. The voltage at the sensor must not be less than 4.80 Volts.

The sensor signal cable can be of a lighter gauge than the heater cable. All joins in both cables must be kept dry and have no resistance. The following table shows recommended sizes.

Cable Gauge	A.W.G.	SI Metric	mm2
Heater < 100m	No. 16	16/0.30	1.5
Heater > 100m	Not rec.		
Sensor Signal	No. 22	7/0.30	

If the sensor wires are run near mains voltage cable they must be shielded.

The heater set connects to GND and S4.

The sensor signal connects to GND and S1.

Wiring to Multi-Sensor Board (Optional)

When using the RAMiv/4 Multi-Sensor Board, all gas sensors (up to 4) connect to it instead of the RAMiv.

All gas sensors connected to the one unit must be the same type, sensing the same gas, with the same alarm parameters.

To use the Multi-Sensor Board, the removable jumper on the RAMiv must be removed. The jumper is located near the S4 and D1 terminals under the top edge of the circuit board.

Five low voltage connections must be made between the Multi-Sensor Board and the RAMiv. These are pins 1 to 5 on the Multi-Sensor Board 6 way header, to terminals GND, S1, S2, S3 and S4 respectively on the RAMiv.

The Multi-Sensor Board requires Active and Neutral mains power that should be looped to the mains power on the RAMiv.

The gas sensors connect as described above except to S, S1 & S, S4 of the respective inputs on the Multi-Sensor Board.

Wiring to mdPCB (Optional)

The mdPCB adds a control output that uses a programmable gas concentration as its setpoint. This output is F1 and F2.

A ventilation control output (H1 and H2) is also available to run ventilation fans in the sensed area

The mdPCB requires the three way cable to be plugged into the three way header located just to the right of the > button circuit board pad on the RAMiv.

Wiring to Complog [Single sensor only]

This output provides a constant 5V output suitable for heater power when a single sensor only is used. Where more than 1 sensor is used, the RAMiv does not have enough on board power and the RAMiv/4 must be used.

Note this output is for units supplied after September 2009, for earlier units please refer instruction Issue 1.

Functions Test

When the Air Monitor is operating a test of the outputs is available. Press **M** and $\ominus$ buttons simultaneously for 5 seconds. The outputs will then cycle in the following order:

Display	Action	Duration
AO/AF	Alarm Light On/Off	3 sec.
bO	Alarm Buzzer On, Dialler Open Circuit	3 sec.
bF	Alarm Buzzer Off, Dialler Closed	3 sec.
HO/HF	Ventilation On/Off	3 sec.
FO/FF	Control O/P On/Off	3 sec.

9. Wiring Diagram

mdPCB FAN HEATER OPTION BOARD

20 amp outputs up to 1Hp

F1 F2   H1 H2   MDPCB option

to telephone socket

Security System BMS, DDC or AD2 Dialler

Gas Sensor Gas Sensor Gas Sensor Gas Sensor

Sensor 4 Sensor 3 Sensor 2 Sensor 1

RAMiv/4 Option Board

SUPPLY A N

Fan Point Control

Ventilation Control

CLOSE FOR ALARM

NOTE: Between S & S4 is Heater ~50 Ohms
S & S1 is sensor (varies ~ 2k-200k)

12 DC
JAVAC ALARM OPTION

12v 15mA max.

Buzzer

Gas Sensor

Where only ONE sensor used, CLG 5V output can be used.

10 Amp Resistive max

SUPPLY
A N   C1 C2   L

Alarm Light

SP +12 GND CLG B1- D2 D1 S4 S3 S2 S1 GND

EXTRA LOW VOLTAGE WIRING TOP EDGE OF PCB

Ref: RAMiv iss2.dwg

A N
240VAC

LOW VOLTAGE WIRING BOTTOM EDGE OF PCB

---

4. PROGRAMMING

All settings that determine the operation of the Air Monitor are set by programming. Once set they are stored in memory that will be retained even if power is lost.

The Air Monitor is programmed via its four buttons and the display. The buttons are as follows:

M   View settings
⊝   Increase setting
⊜   Decrease setting
⊚   Cancel / Override

Programming is divided into two sections, normal and advanced programming.

To begin normal programming, press and hold **M** and ⊚ simultaneously for five seconds until **UL** is displayed. **UL** means the unit is unlocked and ready for programming. Once the buttons are released the display will scroll to the first programmable setting. A code to identify the setting is displayed for a couple of seconds followed by the setting itself, (for example **AP** followed by **40** means Alarm Point and it's current setting of 40 PPM). Settings are adjusted with ⊝ or ⊜. They are then saved with **M**. The next setting will then be displayed automatically. Pressing ⊚ will cancel programming and leave the current setting unchanged.

The normal program settings are,

Setting	Description	Range	Units	Default
AP	Alarm Point	1 to 900	PPM	50
At	Alarm Delay Time	0 to 99	min.	10
Ct	Cancel Alarm Time	1 to 24	hrs.	24
Lt	Logging Time	1 to 60	min.	60
CA	Calibrate Unit	On, Off		On

To begin advanced programming press and hold **M** and ⊚ simultaneously, **UL** will be displayed then continue to press both buttons until **tr** is displayed. This is the first setting in advanced programming. The settings available are [*only applicable for tr=0]:

Setting	Description	Range	Units	Default
tr	Type of Gas	0 to 19		14
*t1	Custom 0 val1	0 to 99		
*t2	Custom 0 val2	0 to 99		
*t3	Custom 0 val3	0 to 99		
*t4	Custom 0 val4	0 to 99		
*t5	Custom 0 val5	0 to 99		
*t6	Custom 0 val6	0 to 99		
*t7	Custom 0 val7	0 to 99		
rt	Relaxation Time	0.5 to 99	min.	10
Sn	No. of Sensors	1 to 4		01
FP	Fan Point	1 to 900	PPM	1h

5. GAS TYPE

IMPORTANT

New gas types are regularly added to the Air monitors capabilities. Refer to the Bulletin "Gas sensor programming" supplied with sensors for the latest information on available sensors and monitoring capabilities....

If more than one sensor is used on the one Air Monitor they must all be the same type.

The **tr** setting determines the gas sensor and particular gas being sensed. **tr** settings **1** to **19** are for pre-set gas types. **tr** set to **0** is for custom types and settings **t1** to **t7** must then be set as specified with the sensor to define the custom gas type.

The following table lists the gas types.

tr	Gas Sensor	Gas Type
0	custom	custom
1	P328	R123
2	P318	R21
3	P318	R22
4	P308	Ethanol, R502
5	P308	R11
6	P308	R113
7	P308	R12
8	P308	R22
9	P308	R123
10	P228	Carbon Monoxide
11	P248	R717 (Ammonia)
12	P258	Hydrogen Sulphide
13	P328	R134a
14	P328	R404a (HP-62)
15	P328	R402a (HP-80)
16	P328	R410a (9100)
17	P717	R717 (Ammonia)
18	P328	R407b
19	P328	R401

NOTE: most gas sensors will detect more than one gas type and readings may be influenced by the presence of other gases, particularly those of similar chemical composition.

6. CALIBRATION

Because Gas Sensors and Air Monitors are supplied separately they must be calibrated before accurate sensing can occur. The calibration process is automatically activated whenever the **tr** setting is changed.

Calibration involves running the unit for seven days in normal (0 PPM) air. During these seven days the display will show **nt** meaning 'not tuned', no alarms will occur. If more than one sensor is connected they are all calibrated at the same time. The calibration can be stopped by changing the **CA** setting to **Of**f or started by changing it to **On**.

The unit must be calibrated for at least eight hours, the longer the better. Because some sensors are temperature dependant the calibration should be done at typical operating temperatures.

7. OPERATION

Gas Concentration

The concentration is the normal item displayed by the Air Monitor. When more than one sensor is used the display shows **P1**, **P2**, **P3** or **P4** before the numeric concentration to show which sensor (1 to 4 respectively) is being displayed. Press **M** to show the next sensor.

The reading is in PPM. If the reading is above 100 the display shows **1h**, **2h**, **3h** etc. up to **9h**, (one hundred through to nine hundred respectively). If the reading is above 1000 the display shows **Hi**. If the reading is below 0 (usually because the unit needs calibration) the display shows **Lo**. If the sensor is not connected or has failed the display shows **Er**.

Gas Concentration Logs

Logs are made of each sensor at the interval specified by the **Lt** setting. To view the logs press ⊖ while the desired sensor is being displayed. **Lo** will appear to show we are in log mode. Press ⊖ again to show the first log, continue pressing ⊖ to show previous logs. Press ⊖ to show the number of hours since the log was taken (4.2 means 4 hours 20 minutes).

Press ⊘ to return to normal operation.

Alarm Sequence

When the gas concentration exceeds the **AP** setting on any sensor, the alarm timer starts. The right hand side decimal point flashes when the alarm timer has started counting.

If the concentration falls back below **AP** before the alarm occurs, the alarm timer is frozen and the relaxation timer starts. This continues until one of the following occurs:

- The concentration rises above **AP** again, in this case the relaxation timer is cleared and the alarm timer continues from its previous value.
- The relaxation timer reaches the **rt** setting, in this case the alarm timer is cleared.

When the alarm timer reaches the **At** setting an alarm occurs.

An alarm is indicated by the following actions:

- The display flashes;
- The alarm light flashes;
- The alarm buzzer sounds;
- The dialler output operates.

It will continue until either the concentration falls below **AP** for the relaxation time or the ⊘ key is pressed for a few seconds. When ⊘ is pressed no alarms will occur for the **Ct** setting and the display alternates **or** for over-ride.

Typical alarm point settings are:

Gas Type	Alarm Point
R12	50 PPM
R22	50 PPM
R502	50 PPM
R11	50 PPM
R123	30 PPM
R134a	30 PPM
R717	30 PPM
MP39	50 PPM
HP81	50 PPM

View Settings

Press **M** for a few seconds and the display will start scrolling through the program settings. The settings cannot be altered in this mode.

Control Output

With the addition of an mdPCB option (F1, F2) a control output based on sensor 1 is available. When the sensor 1 concentration is above the **FP** setting the output will be on. When it falls below **FP** it will be off. This output is useful in hazardous areas where ventilation may be required when concentrations exceed acceptable limits. A typical application is car parks. The control output works independently of the alarm function.

Ventilation Control

With the addition of an mdPCB option (H1, H2) an output is available to control the ventilation in the sensed area. The ventilation is shut down periodically to allow the air to stabilise and a more accurate reading to be made. The ventilation will be on for the **rt** setting and off for the **At** setting.

8. COMPLOG [CLG output]

This output provides a constant 5V output suitable for heater power when a single sensor only is used. Where more than 1 sensor is used, the RAMiv does not have enough on board power and the RAMiv/4 must be used.

TABLE OF DISPLAYED SYMBOLS AND THEIR MEANING				
SYMBOL	**DESCRIPTION**	**DEFAULT**	**RANGE**	**UNIT**
1h	100 PPM			
2h	200 PPM			
3h	300 PPM			
4h	400 PPM			
5h	500 PPM			
6h	600 PPM			
7h	700 PPM			
8h	800 PPM			
9h	900 PPM			
AF	Alarm Output Off			
AO	Alarm Output On			
AP	Alarm Point Concentration Setting	50	1 - 900	PPM
At	Alarm Time Delay	10	0 - 99	min.
bF	Buzzer Off and Dialler Output Closed Circuit			
bO	Buzzer On and Dialler Output Open Circuit			
CA	Calibrate Setting	On	Off - On	
Ct	Cancel Alarm Time	24	1 - 24	hour
Er	Sensor Error			
FF	Fan Output Off			
FO	Fan Output On			
FP	Fan Point Setting	100	1 - 900	PPM
HF	Ventilation Output Off			
Hi	Sensor reading greater than 1000 PPM			
HO	Ventilation Output On			
Lo	Logging Mode			
LO	Sensor reading low, Unit needs calibration.			
Lt	Logging Time Setting	60	1 - 60	min.
nt	Unit being calibrated			
OF	Setting Off			
ON	Setting ON			
or	Over-ride			
P1	Sensor One Reading			
P2	Sensor Two Reading			
P3	Sensor Three Reading			
P4	Sensor Four Reading			
rt	Relaxation Time	10	0.5 - 99	min.
Sn	Number of Sensors	1	1 - 4	
t1	Custom Type Setting One	90	0 - 99	
t2	Custom Type Setting Two	80	0 - 99	
t3	Custom Type Setting Three	70	0 - 99	
t4	Custom Type Setting Four	60	0 - 99	
t5	Custom Type Setting Five	50	0 - 99	
t6	Custom Type Setting Six	40	0 - 99	
t7	Custom Type Setting Seven	30	0 - 99	
tr	Type Of Gas	14	0 - 19	
UL	Unit Unlocked and ready for programming			