

# INSTALLATION & PROGRAMMING

## Phasefale's RAMiv9 with Data Logging and Real Time Clock!

The Refrigerant Air Monitor is designed to monitor refrigerant levels and detects leaks in refrigeration plant. For correct operation 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.

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- 1) Introduction - An overview of the Air Monitor.
  - 2) Options and Features- Description of the accessories available for the Air Monitor.
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  - 5) Gas Type - How to set the unit for the correct gas type
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  - 7) Operation - Guide to using the Air Monitor.
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**1. INTRODUCTION**

The Refrigerant Air Monitor monitors the concentration of specific gases, RAMiv9 can accept up to 5 sensors (of the same type) The concentration is shown in parts per million ( ppm) on the display from 0 to 990ppm.

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. With the new model released in Q3 2012, RAM now includes a USB port used for data logging. Logs are time and date stamped because the new model includes a real time clock ( RTC).

**2. OPTIONS AND FEATURES**

The Refrigerant Air Monitor is supplied with the provision to monitor 1-5 gas sensors (not included) and operate outputs for alarms.

The following accessories are available to enhance the operation of the RAMiv9.

- 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 RAMiv9 augments the onboard piezo.
- Voice Dialler: AD3 telephone dialler that calls a list of numbers and plays a pre-recorded message.

- RAMiv9/4: Multi-Sensor Board: allows the RAMiv9 to use from one 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.
- TACm/PSB30: Battery backup to allow sensing to continue through power outages.

**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 to Air Monitor**

The unit requires 240VAC to the A and N terminals. 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.

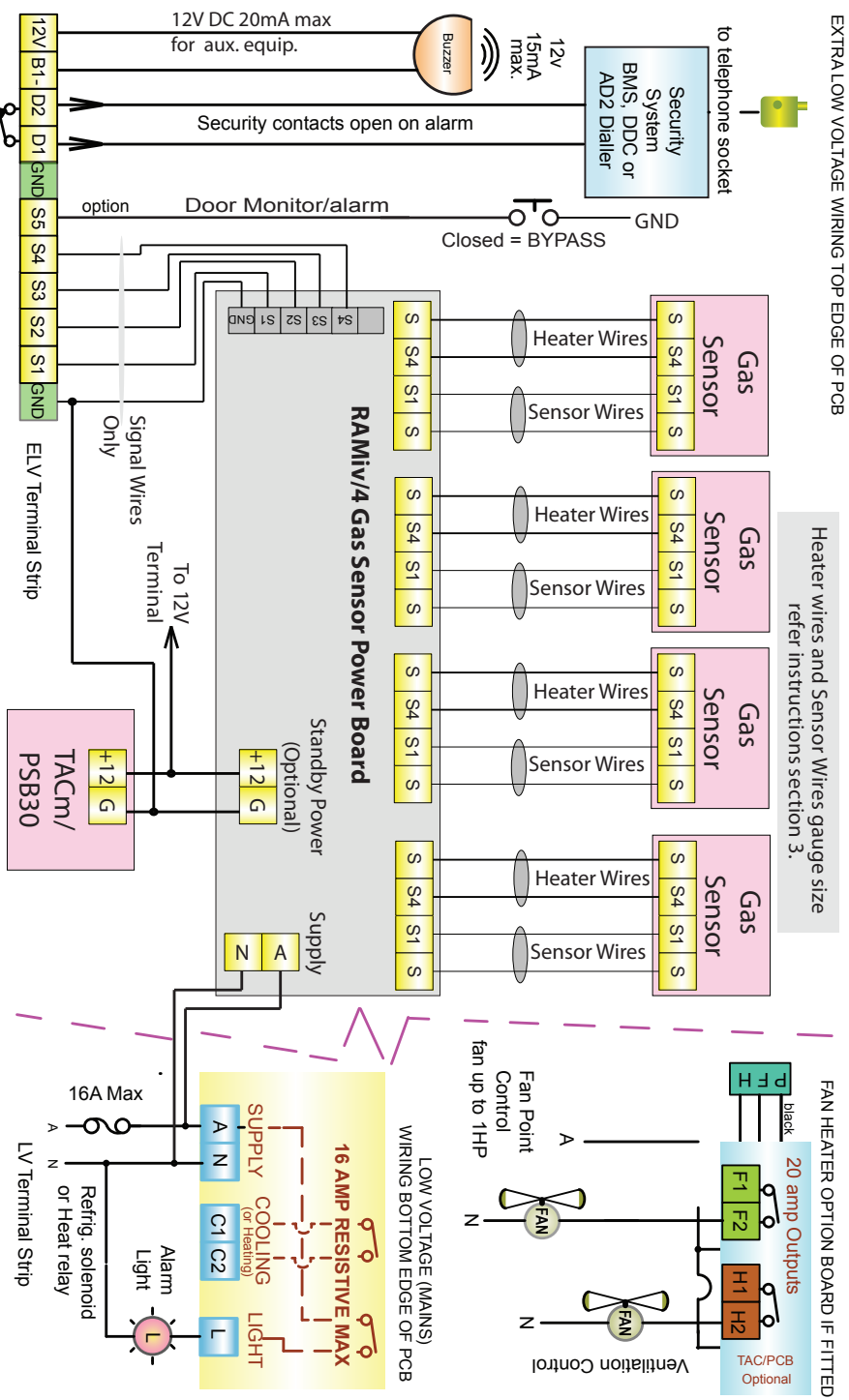
The D1 and D2 terminals are normally closed circuit. They open circuit while the unit is in alarm and are suitable for connection to telephone diallers or security systems.

**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 4.90 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	
Heater < 100m	No.16	16/0.30	1.5mm <sup>2</sup>
Heater > 100m	Not rec.		
Sensor	No.22	7/0.30	.75mm <sup>2</sup>

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 Single sensor – RAMiv9/4 Required!

For RAMiv9 supplied after October 2012 the onboard 5V is not suitable to power a single sensor only. RAMiv9/4 must be used in all installations!

#### Wiring to RAMiv9/4 Sensor Board (Required)

The RAMiv9/4 Multi-Sensor Board, all gas sensors

( 1 to 4) connect to it and not the RAMiv9. All gas sensors connected to the one unit must be the same type, sensing the same gas, with the same alarm parameters.

Low voltage connections must be made between the RAMiv9/4 Multi-Sensor Board and the RAMiv9. These are pins 1 to 5 on the Multi-Sensor Board 6 way header, to terminals GND, S1, S2, S3 and S4 & S5 respectively on the RAMiv9.

The RAMiv4 Multi-Sensor Board requires Active and Neutral mains power that should be looped to the mains power on the RAMiv9.

The gas sensors connect as described above except to S, S1 & S, S4 of the respective inputs on the RAMiv9/4 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 RAMiv9.

#### Functions Test

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

Display	Action	secs.
AO/CF	Alarm On & Off	3/3
bO	Alarm buzzer on,dialler open circuit	3
bF	Alarm buzzer off,dialler closed cct.	3
HO/HF	Ventilation On & Off	3/3
FO/FF	Control Output On & Off	3/3

#### . 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

v 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 **v**. 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	Deflt
<b>AP</b>	Alarm Point	1-900	ppm*	50
<b>At</b>	Alarm Time	0-99	mins	10
<b>Ct</b>	Cancel alarm Time	1-24	hours	24
<b>Lt</b>	Logging Time	1-60	mins	60
<b>CA</b>	Calibrate Unit	On/Off		On

\*ppm = part per million

#### 4a Advanced Programming

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 time setting in advanced programming. ( only applicable if data logging is used.

Setting	Meaning, adjustable range
<b>t1n</b>	Minutes (0-59)
<b>t1h</b>	Hours (0-23)
<b>dtD</b>	Day (1-31)
<b>dtN</b>	Month (1-12)
<b>dtY</b>	Year (10-20)

Followed by te settings available are [\*only applicable for tr=0]:

Setting	Description	Range	Units	Deflt
<b>tr</b>	Type of Gas	0-20		14
<b>*t0</b>	Custom 0 val1	0-99		
<b>*t1</b>	Custom 0 val2	0-99		
<b>*t2</b>	Custom 0 val3	0-99		
<b>*t3</b>	Custom 0 val4	0-99		

#### List of Display Indications

Symbol	Description	Default	Range	Unit
<b>0-990</b>	Gas Concentration reading 0-990 parts per million			ppm
<b>AF</b>	Alarm output Off ( Function test only)			
<b>AO</b>	Alarm output On ( Function test only)			
<b>AP</b>	Alarm Point Concentration Setting	50	1-990	ppm
<b>At</b>	Alarm Time Delay	10	0-99	mins
<b>bF</b>	Buzzer Off/Dialler Closed ( Function test only)			
<b>bO</b>	Buzzer On/Dialler Open ( Function test only)			
<b>CA</b>	Calibrate Setting	On	On/Off	
<b>Ct</b>	Cancel Alarm Time	24	0-24	hours
<b>Er</b>	Sensor Error			
<b>FF</b>	Fan Off ( Function test only)			
<b>FO</b>	Fan On ( Function test only)			
<b>FP</b>	Fan Point Setting	100	1-900	ppm
<b>HF</b>	Ventilation Off ( Function test only)			
<b>HO</b>	Ventilation On ( Function test only)			
<b>Lo</b>	Logging Mode			
<b>LO</b>	Sensor reading LOW unit needs calibration			
<b>Lt</b>	Logging Time setting			
<b>nt</b>	"not tuned" unit being clibrated			
<b>OF</b>	Setting Off calibration Function ( exiting calibration)			
<b>On</b>	Setting On calibration Function ( entering calibration)			
<b>or</b>	Over-ride alarm after > key is pressed			
<b>P1</b>	Sensor One reading ( to follow)			
<b>P2</b>	Sensor Two reading ( to follow)			
<b>P3</b>	Sensor Three reading ( to follow)			
<b>P4</b>	Sensor Four reading ( to follow)			
<b>P5</b>	Sensor Five reading ( to follow)			
<b>P1c</b>	Sensor 1 is in calibration mode			
<b>P2c</b>	Sensor 2 is in calibration mode			
<b>P3c</b>	Sensor 3 is in calibration mode			
<b>P4c</b>	Sensor 4 is in calibration mode			
<b>P5c</b>	Sensor 5 is in calibration mode			
<b>b<sup>v</sup>P</b>	Bypass - alarm inhibited ( for a total of 3x alarm time)			
<b>rt</b>	Relaxation Time ( see Alarm sequence)	10	0.5-99	mins.
<b>Sn</b>	No. of Sensors	1	1-5	
<b>t0-t5</b>	Custom Type Setting from 1-7		0-99	
<b>tr</b>	Type of Gas Sensor ( 0 is custom)	14	0-20	
<b>UL</b>	Unlocked for programming ( first level of programming)			

- 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.

#### Cancel/ Override ( or )

When is pressed no alarms will occur for the **Ct** setting and the display alternates or for over-ride.

#### Bypass ( bYP )

A bypass function switch can be wired from S5 to ground (closed=bypass). If 5 sensors are programmed this option is NOT available. This is useful for when cleaning chemicals are used and the alarm is to be inhibited during cleaning. Bypass is alternatively displayed with the reading while active.

It can be wired as a momentary switch ( active after 3 seconds closed) in which case the bypass time is equal to TWICE the alarm time ( **At** ) + the normal alarm time.

If wired as a closed switch the bypass remains while the switch is closed.

Typical alarm point settings are:

Gas Type	Alarm Point
R12, R22, R502,R11,	50 PPM
R123a, R134a R717	30 PPM
MP39, 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. Data Logging Gas Concentration

The RAMiv9 will automatically start logging gas concentration a soon as you plug a USB memory stick into the USB port. The sensor concentration and time will be logged once per minute to a file called **LOG.TXT**. Events such as alarms and programming will be appended with the current time to a file called **EVENTLOG.TXT**. For data logging applications it is important that the time and date is set correctly to ensure records are correct. ( see 4a advanced programming) Removing the USB memory is not a problem and RAMiv9 will resume logging when the USB stick is re-inserted.

The USB plug provided can be left as is when logging is Not required and no memory stick fitted.



When logging is employed, cut 3 sides of the plug to allow a flap which raises for the memory stick.

The real time clock (RTC) must be set correctly for logging- by removing the insulator AND set the correct time and date.

#### The Log.txt File

The log file stored to the memory stick is In text format with date and time followed by the channel ppm readings ( from 1 to 4 readings depending on how many channels are active. Open the file using a standard text file editor , word or Excel. To use the data in Excel, open the file in CSV ( comma separated variable) a mode and select the separator as a comma.

## 7. FIRMWARE UPGRADES

Make a backup of settings first: firmware updates over-rite all programmed settings!

It is possible to upgrade the firmware to units in the field with a USB memory stick. Load tacmv2\_xx.hex\* (\* Version 41 & higher; if this does not work, rename file to tacmv2.hex & retry) file onto a USB memory stick and then plug your memory stick into the USB port. Power down the TACm and power back up again while holding all 4 keys down and with the USB in the USB port. After 5 seconds the display will toggle between the bottom two segments, then chase, then tAc will appear on the display before going into normal mode of operation. The new firmware will then be automatically loaded into the processor. Recycle power before re-programming.

#### Note.

This instruction V2 2013 Q1 refers to Version 1 software. with the USB Port For later versions with new features,

visit our website and download the latest instruction sheet:

[www.phasefale.com.au/docs/](http://www.phasefale.com.au/docs/)

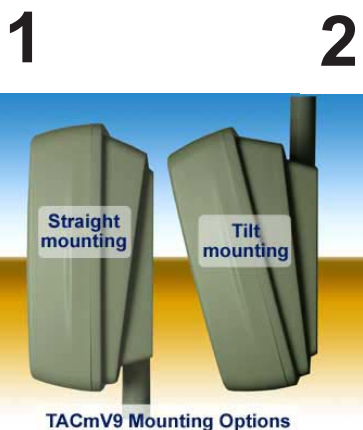
For Technical assistance please contact :

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### 3. RAMiv9: Enclosure installation/ Cable Routing



Decide if you want straight (left picture) or tilt mounting. The wall mount conduit entry points are at the bottom for straight mount and at the top for tilt (approx 15 degrees) mounting.

**2** Mount the wall mount base using the 4 off 6mm mounting holes, centers are 90mm high x 72mm wide. (Fixings not included). For conduit entry, the cables for the RAMiv9 can enter through the 2 x 19mm conduit entry points placed 30mm apart. Use a knife as shown to open out the holes. Alternatively, the cables can come through the rear of the mounting surface, simply drill a hole in the wall mount base.



**4**

For maximum safety, bring LV mains cables (e.g. 240 V AC supply, compressor/evaporator control, fan, heater and alarm light) in through a different conduit than the Extra Low voltage cables (e.g. Sensor cable, alarm isolate, defrost terminate, alarm buzzer and security etc.)

For an electric defrost system, the optional board is fitted at the bottom of the enclosure base using the 3 screws supplied. When fitting the Quick connect cable connectors, ensure they face upwards and are fully seated to prevent fouling the enclosure when it is fitted later



**3** Before fitting the enclosure base over the wall mount base, feed the ELV cabling through the opening under the circuit board and up to the top of the board. The hole can be enlarged as required with a sharp knife. For maximum environmental protection, keep the hole as small as possible and later it can be silicone sealed. Similarly feed the LV mains cables through the rectangular slot, enlarging as required. For maximum safety, ensure LV and ELV cables are segregated. Locate the enclosure base over the wall mount base with the top 2 lugs and bottom screws provided

**5** After all electrical connections have been made, with the ELV cables along the top of the main PCB and LV connections across the bottom, the enclosure cover can be fitted in the following sequence:

- ensure the circular rubber gasket is snug in the channel around the base.
- tilt the cover and locate it under the lug across the bottom of the enclosure base.
- swing the cover against the base and secure with the 2 supplied screws, for a complete seal tightening them so the gap between the base and cover is even around the whole perimeter.

Setting	Description	Range	Units	Deflt
*t4	Custom 0 val5	0-99		
rt	Relaxation Time	0.5-99	mins.	10
Sn	No. of Sensors	1-5		1
FP	Fan Point	1-900	ppm	100

\*ppm = part per million

#### 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.

**NOTE:** Metal Oxide gas sensors as used in RAMiv9 will detect more than one gas type and readings may be influenced by the presence of other gases. In particular those of similar chemical composition including hydrocarbons. The "bypass" function on S5 can be used to stop alarms during cleaning where cleaning chemicals can raise alarms,

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 - see supplemental instr.
8	P308	R22 - see supplemental instr.
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
20	P328	R507a

#### 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 **Off** 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 from 0 to 990. 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:

# INSTALLATION & PROGRAMMING

## Supplemental Information P308 Sensor for R12 and R22

For New Model RAMiv9 (with USB plug) - Supplied after February 2013

P308 Sensor used for R12 R22

Fit sensor as per instructions and program as follows;

Set type of gas tr=0 [ custom settings ]

Setting	Description	Range	R12	R22
tr	Type of Gas	0-20	0	0
*t0	Custom 0 val1	0-199	175	175
*t1	Custom 0 val2	0-199	170	165
*t2	Custom 0 val3	0-199	160	127
*t3	Custom 0 val4	0-199	97	34
*t4	Custom 0 val5	0-199	60	4
rt	Relaxation Time	0.5-99	mins.	10
Sn	No. of Sensors	1-5		1
FP	Fan Point	1-900	ppm	100
*ppm = part per million				

### Old Style RAMiv9- replacement

Fit Sensor as per instruction and fit supplied 12k resistor across S4 and S1 terminals.

Programming should have been either for R12 ( tr=7) or R22 ( tr=8) and should not be changed.

Phasefale Controls P/L 2013

Designers & Manufacturers of Refrigeration & HVAC Control Systems

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PHASEFALE

### Product Bulletin:

## RAMiv/P308 Product Discontinued

This letter announces the discontinuation of part RAMiv/P308

This refrigerant sensor is no longer available. P328 sensor can be used to replace P308 for R22 and R123.

For more information please contact Phasefale Controls Pty Ltd.

Sincerely,



PHASEFALE CONTROLS PTY. LTD.  
Brett Reaby