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iPAMM

Version 2.0

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User Manual

v1.0

Intelligent Plenum Air Management Module

1 Welcome

Congratulations on becoming the proud owner of an iPAMM, we believe you have made the right choice and hope you will enjoy all of its capabilities. The iPAMM provides outstanding performance in all criteria of server racks – energy efficiency, reliability, security and price. This is achieved with a patented air management system which has been engineered and manufactured entirely in Australia.

This document is subject to change without notice. We recommend obtaining the latest version from the Server Racks Australia Website: www.srasolutions.com.au

If you have difficulty using this RMS User Manual please contact SRA for advice.

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For Firmware Version 1.3

Please Note -
The term iPAMM is used throughout this document and refers in the majority of cases to the collective family of iPAMM Ready, iPAMM and iPAMM Plus models.



2 iPAMM Models

The iPAMM comes in either a top mount or bottom mount configuration. The bottom mount is suited to server rooms which have under floor cooling. The top mount is suited to server rooms / rooms which have above floor cooling. The whole room can be cooled or cool air can be ducted directly into the top of the iPAMM. Cooling is not essential; however, it increases the capacity of the iPAMM to remove heat from the rack. The top mount or bottom mount iPAMM comes in three models.

These are described below:

iPAMM Ready

The iPAMM Ready includes a plinth and sealed plenum. In the bottom mount configuration, when installed in a server room with under floor cooling, the plinth ducts the cool under floor air which pressurises the plenum at the front of the rack. This cool air travels from the front to the rear of the rack which significantly increases the heat dissipation from the rack. The efficiency of the iPAMM is directly proportional to the pressure of the under floor air. The iPAMM Ready in top mount configuration with ducted cooling operates in a similar manner to the bottom mount configuration described. Due to the sealed plenum an iPAMM Ready should not be used in applications which do not have pressurised air entering the plinth.

The iPAMM Ready offers significant increased cooling capacity compared to a standard (non-iPAMM) rack. The iPAMM Ready is fitted for but not with a controller and cassette. However, it is fitted with a docking station which quickly allows the iPAMM Ready to be upgraded to the iPAMM or iPAMM plus model. The plinth and docking station are not installed when shipped. A digital display showing the temperature within the rack is not a feature of the iPAMM Ready as it does not have a cassette. A controller and the RMS are not standard items delivered with the iPAMM Ready. However, a controller and the RMS can be installed to allow remote monitoring of the rack temperature. Monitoring the rack temperature provides the data to determine if the iPAMM Ready needs to be upgraded to an iPAMM or iPAMM Plus model.

iPAMM

The iPAMM is superior to the iPAMM Ready as it self pressurises the plenum thereby increasing the cooling capacity of the iPAMM over that offered by the iPAMM Ready. The iPAMM can be used in all applications; including rooms which do not have pressurised air entering the plinth. The cassette installed in the plinth contains a digital display which shows the rack temperature and a single fan. The plinth, docking station and cassette are not installed when shipped.

iPAMM Plus

The iPAMM Plus is identical to the iPAMM in all respects except that the cassette contains two fans which increases the cooling capacity.

RMS Capability

All of the iPAMM models are capable of being fitted at the time of manufacture or post manufacture with the Remote Monitoring System (RMS). The RMS allows the remote monitoring of the rack temperature and for the iPAMM and iPAMM Plus it allows for the fan speed and fan duty cycle to be monitored. The maximum and minimum temperature settings can also be adjusted using the RMS.

Delivery

The iPAMM Ready, iPAMM and iPAMM Plus are all shipped with the iPAMM components (plinth, cassette, docking station, controller, RMS, etc) uninstalled. The components are not installed in order to reduce the possible occurrence of damage during transit and assist with delivery and installation.

2 iPAMM Models (continued)

The following table details the iPAMM components (standard and optional) that are shipped with the iPAMM Ready, iPAMM and iPAMM Plus.

Part No.	Component	iPAMM Ready	iPAMM	iPAMM Plus
1	Cable Entry Frame	X	X	X
2	Plinth	X	X	X
3	Front Cover	X	N/A	N/A
4	Cassette (1 x fan)	N/A	X	N/A
5	Cassette (2 x fan)	N/A	N/A	X
6	Foam (black or white)	X	X	X
7	Docking Station	Optional	X	X
8	Controller	Optional	X	X
9	Controller with RMS	Optional	Optional	Optional
10	Temperature Sensor	Optional	X	X
11	Serial Cable	Optional	X	X
12	Accessory Bag*	X	X	X
13	Power Cord (IEC/3 pin x2)	X	X	X
14	Power Cord (IEC/IEC x2)	Optional	Optional	Optional
15	Safety Grill (B/M)	N/A	Optional	Optional
16	Safety Grill (T/M)	N/A	Optional	Optional
17	Ducting Grill (T/M)	Optional	Optional	Optional
18	Plinth Blanking Panel	Optional	Optional	Optional

*The contents of the Accessory Bag include:

- 12a – cable ties (4)
- 12b – thumb securing screw (1)
- 12c – M6 bolt and M6 washer (4)
- 12d – M6 bolt and M6 washer (6)
- 12e – 8g Tek screw (4)
- 12f – M5 button screw (4) or M5 nuts (4)

3 ATS Operation

A section about the operation of the ATS (a new feature)

4 Configuration

Terminal Emulator

The iPAMM is able to be configured using the serial port on a computer running a terminal emulator such as HyperTerminal (Windows), TeraTerm(Windows), Minicom (Linux) or iTerm (MAC OSX). To do this the following parameters are to be used for configuring the terminal emulator. It is also recommended that characters be echoed locally.

The below example is for HyperTerminal (Windows):

1. In Windows, to setup a HyperTerminal, click on start – All Programs – Accessories – Communications – HyperTerminal

Alternatively, click on start – Run – type in "hypertm.exe" (without quotation marks).

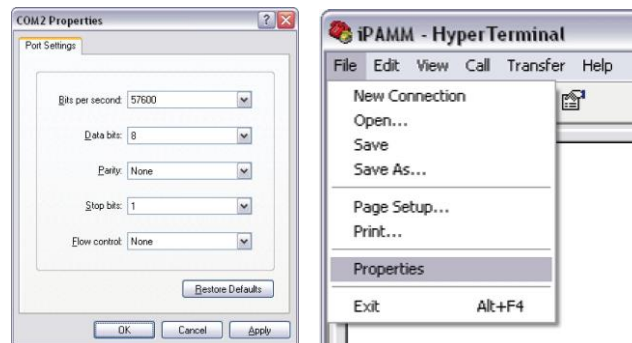
2. Type a name in the Name filed, eg iPAMM. Select an icon and click on OK.

3. Select the COM port in the Connect using drop down list (the port varies on different computers, see appendix I for how to change COM port) and click on OK.



4. In the COM Properties dialog box, choose the options as detailed in the screen shot below and click on OK.

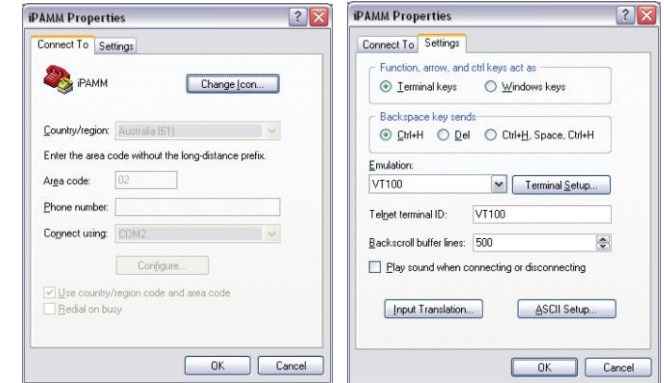
5. To change the Properties for the iPAMM, click on File on the HyperTerminal main interface, choose Properties.



4 Configuration (continued)

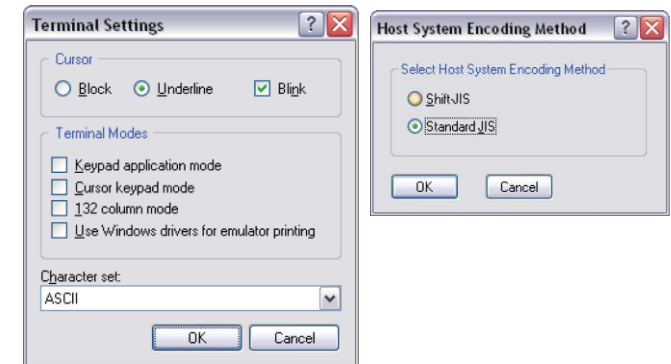
6. Choose the Settings tab.

7. Setup all the properties as detailed in the screen shot below.



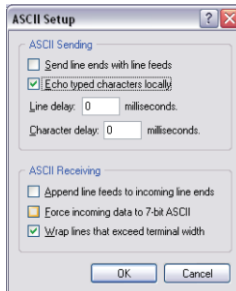
8. Click on Terminal Setup on iPAMM Properties, setup all the properties as detailed in the screen shot below and click on OK.

9. Click on Input Translation on iPAMM Properties, choose Standard JIS in the Host.



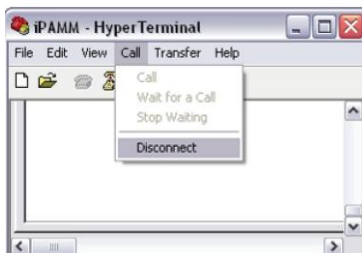
4 Configuration (continued)

- Click on ASCII Setup on iPAMM Properties. Setup all the properties as detailed in the screen shot below and click on OK. The following screen will be displayed.



Changing the COM port

- Ensure HyperTerminal is disconnected. To do this, click on Call – Disconnect in the HyperTerminal window.
- Click on File – Properties
- Under Connect Using change the COM port and select OK.



iPAMM Configuration

The Serial Communication Cable should remain connected to the Controller and remain in the bottom of the rack. Connect the Serial Communication Cable to the COM port on the computer. Open and connect the terminal emulator. When the terminal emulator is first connected, the screen may need to be refreshed. To reset the iPAMM and the terminal, press 'space' followed by '5'. The iPAMM status screen which can be seen below will be displayed.

4 Configuration (continued)

iPAMM Configuration

The Serial Communication Cable should remain connected to the Controller and remain in the bottom of the rack. Connect the Serial Communication Cable to the COM port on the computer. Open and connect the terminal emulator. When the terminal emulator is first connected, the screen may need to be refreshed. To reset the iPAMM and the terminal, press 'space' followed by '5'. The iPAMM status screen which can be seen below will be displayed.

```
*****iPammv1.3*****
*
*
*
* Controller A           Controller B           Configuration
*
*
*
* Temperature   = 18.8   Temperature   = 18.7   Min Temperature = 25
*
*
*
* Fan Speed     = 0      Fan Speed     = 0      Max Temperature = 30
*
*
*
* Fan Duty Cycle = 0.0%  Fan Duty Cycle = 0.0%  Min Duty Cycle  = 0.0%
*
*
*
*****
```

Press space to enter the configuration menu.

- The information displayed can be placed into two categories. These are discussed below.

Fan Controller Status

- These values are specific to each controller.
- Temperature – This shows the exhaust air temperature in degrees Celsius.
- Fan Speed – This shows the speed of the fan connected to the controller.
- Fan Duty Cycle – This shows how much of the fan's power is being used.

Configuration Parameters

- Min Temperature – This is the temperature at which the fan will turn on. This is also known as the Full-Speed Temperature.
- Max Temperature – This is the temperature at which the fan will be running at full speed. This is also known as the Fan-Off Temperature.
- Min Duty Cycle – This is the minimum percentage of the fan's power that will be applied to the fan.

4 Configuration (continued)

To configure the iPAMM, press the 'space bar' while the status screen is shown. The following screen will then be displayed.

iPAMM Management Console

- 1: Change full-speed temperature.
- 2: Change fan-off temperature.
- 3: Change minimum fan power.
- 4: Display System Information.
- 5: Save, Quit and Reset.

Enter a menu choice (1-5):

By pressing a menu number (1 – 5), the iPamm will display the appropriate menu choice. These are discussed below.

1. On selecting the first menu option the following screen is displayed:

Existing Full-Speed Temperature is 30 degrees Celsius.
Enter a value between 0 and 100.

By entering a value that is larger than or equal to the Turn-On Temperature (Min temperature) and between 0 and 100 the Full-Speed Temperature (Max Temperature) will be changed. Pressing 'Enter' after the numbers have been entered will confirm the choice. If the change has been accepted, the Main Menu will be displayed. If the changes were invalid, an error message will be shown.

2. On selecting the second menu option the following screen is displayed:

Existing Turn-Off Temperature is 25 degrees Celsius.
Enter a value between 0 and 100.

By entering a value that is less than or equal to the Turn-On Temperature (Min Temperature) and between 0 and 100 the Full-Speed Temperature (max Temperature) will be changed. Pressing 'Enter' after the numbers have been entered will confirm the choice. If the change has been accepted, the Main Menu will be displayed. If the changes were invalid, an error message will be shown.

3. On selecting the third menu option, the following is displayed:

Existing Minimum Fan Power is: 0.
Enter a value between 0 and 1023.

By entering a value that is larger than or equal to 0 and less than or equal to 1023 the Minimum Fan Power will be changed. Note that the range 0 – 1023 maps linearly to 0% – 100%. Pressing 'Enter' after the numbers have been entered will confirm the choice. If the change has been accepted, the Main Menu will be displayed. If the changes were invalid, an error message will be shown.

It should be noted that the minimum fan duty cycle that will allow the fans to turn on is 15%. This limit is enforced automatically. As such a duty cycle between 0% and 15% will always be increased to 15%.

4. On selecting the fourth menu option, the following information is displayed:

System Information

iPAMM Software Version : 1.2
Bootloader Version : 1.1

4 Configuration (continued)

Current System Up-Time : 2d 0h 4m 2s
Cumulative System Up-Time : 28d 6h 2m 19s
Cumulative Fan A On-Time : 22h 46m
Cumulative Fan B On-Time : 23h 4m

Press Enter to continue...

5. By selecting the fifth menu option, the system will save the configuration parameters and reset.

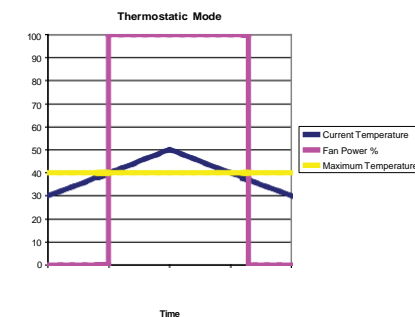
5 Temperature Control System

The iPAMM can operate in two modes:

Thermostatic Mode operates in the classic On-Off manner seen in household heating. In this case the Maximum Temperature and the Minimum Temperature are set at the same temperature. If the temperature is over the Maximum Temperature, the fans will run at full speed. If the temperature is below the Minimum Temperature, the fans will turn off. The following points should also be noted:

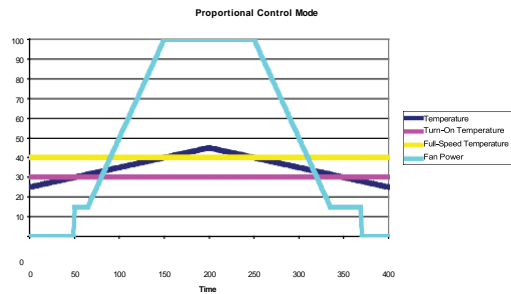
- Note that there is a 2°C hysteresis as the temperature drops below the Maximum Temperature.
- The Minimum Duty Cycle will still be observed in Thermostatic Mode.

The following diagram demonstrates the operation of the iPAMM in Thermostatic Mode with the Turn-on (Min Temperature) and Full-Speed temperatures (Max Temperatures) both set to 40 degrees Celsius. Note that the fan turns on as the temperature intersects the maximum temperature while the temperature is increasing. However as the temperature decreases, the fan only turns off when the temperature is 2 degrees below the maximum temperature.



Proportional Control Mode increases the power applied to the fans linearly as the exhaust temperature increases. The fans will turn on when the temperature reaches the Turn-On Temperature (Min Temperature) and will run at full power at the Full-Speed Temperature (Max temperature). The action of the Proportional Control Mode is demonstrated in the following diagram. It should also be noted that whenever the duty cycle is calculated to be between 0% and 15%, it is increased to 15%.

5 Temperature Control System (continued)



6 Trouble Shooting

Hints and tips for effective iPAMM cooling:

1. Ensure that fan air intakes are clear.
2. Keep the front door of the cabinet closed.
3. Minimize cable clutter at the front of the equipment.
4. Ensure the vented section at the base of the front of the cabinet is unobstructed.
5. Ensure that both power inlets are plugged in.
6. Place the temperature sensor high in the cabinet near the rear door.
7. Set the "fan on temperature" (Min Temperature) as high as practical 25°C is recommended.
8. Set the "fan maximum temperature" (Max Temperature) as least 10°C above the "fan on temperature".
9. Blank off all vacant rack units in the cabinet. This maintains plenum pressure and forces cold air through the equipment, not around it.
10. Use the foam supplied to blank off the rear cable entry and prevent cold air from entering the rear of the cabinet. This will maintain and maximise the delivery of air from the plinth to the plenum.

6 Trouble Shooting (continued)

Front Display:

Enter a menu choice (1-5):

The front display contains four status LEDs and four alpha-numeric characters. Together, these can be used to determine the state of the iPAMM.



Alpha Numeric Display:

During normal operation, the highest temperature of the two temperature sensors is shown. When a fault has been detected, this is replaced with an error code. Error codes are shown as ErrX where X indicates the error code. Note that if more than one fault condition is present, each error code will be displayed in sequence.

The following list contains the six possible error codes and a brief description of the error.

Error 0 – Controller A is reporting an invalid temperature. This can be a symptom of a disconnected temperature sensor.

Error 1 – Controller B is reporting an invalid temperature. This can be a symptom of a disconnected temperature sensor.

Error 2 – Fan A has a speed of zero while the duty cycle is not zero.

Error 3 – Fan B has a speed of zero while the duty cycle is not zero.

Error 4 – Controller A is not active. This may indicate a failed controller.

Error 5 – Controller B is not active. This may indicate a failed controller.

Status LED's:

The four status LED's can be used to determine the following information.

1. If this light is flashing, controller A is active. If this light is not flashing, a fault may exist in the iPAMM.

2. If this light is flashing, controller B is active. If this light is not flashing, a fault may exist in the iPAMM.

3. If this light is flashing, the Ethernet controller (RMS) is active. If this light is not flashing, this may indicate a fault in the iPAMM. If no Ethernet controller (RMS) is installed, this light will remain off.

4. If this light is on a fault has been detected.

6 Trouble Shooting (continued)

Trouble Shooting:

The following trouble shooting may assist if the iPAMM is not functioning correctly:

Fans do not function - Swap the fan controller cables plugged into the controller

Terminal Emulator display does not appear - Change the COM port

Terminal Emulator displayed not fully shown - Refresh the screen by pressing 'space' followed by '5'

7 Warranty

SRA shall not be liable for any loss or damage direct or indirect or howsoever in relation to the fitness for use, merchantable quality or lack of correspondence with any sample or description or arising from the failure of the customer to satisfy itself that the goods supplied are of the description, quality and character ordered and gives no warranty as to the subsequent use of those goods under those specifications.

SRA warrants all goods from faulty workmanship for a period of 12 months from the date of manufacture.

SRA shall be limited in its liability to the replacement of or supply of equivalent goods.

SRA shall not be liable for any loss or damage (including without limitation consequential loss, damage, injury or installation) resulting from the supply or use of such goods. The warranty does not apply to defects due to normal wear and tear, improper installation by persons other than SRA representatives, or to products or components thereof which are intentionally or negligently damaged or where products or components thereof have been subjected to operating or environmental conditions contrary to any applicable specifications or reasonable intended use.

SRA will be responsible (at SRA's discretion) for the return of defective goods to SRA and delivery of replacement goods only to the extent of the original delivery. This warranty does not extend to any person other than the customer.

Conditions contrary to any applicable specifications or reasonable intended use.

8 Specifications

Model	42RU 1050	42RU 1200	45RU 1050	45RU 1200
Cable Entry Frame - Weight (kg)	4.8	5.5	4.8	5.5
Plinth - Weight (kg)	15.0	15.0	15.0	15.0
Cassette - Weight (kg)	16.0	16.0	16.0	16.0
Rack - Height (mm) (including iPAMM)	2141	2141	2274	2274
Rack - Width (mm) (including iPAMM)	600	600	600	600
Rack - Depth (mm) (including iPAMM)	1050	1200	1050	1200
Power Consumption (@max. revolutions per fan) (W)	123	123	123	123
Power Consumption (max. per fan) (W)	160	160	160	160

9 Glossary of Terms

iPAMM - Intelligent Plenum Air Management Module

B/M - Bottom Mount

RMS - Remote Monitoring System

SCEC - Security Construction Equipment Committee

SRA - Server Racks Australia

T/M - Top Mount