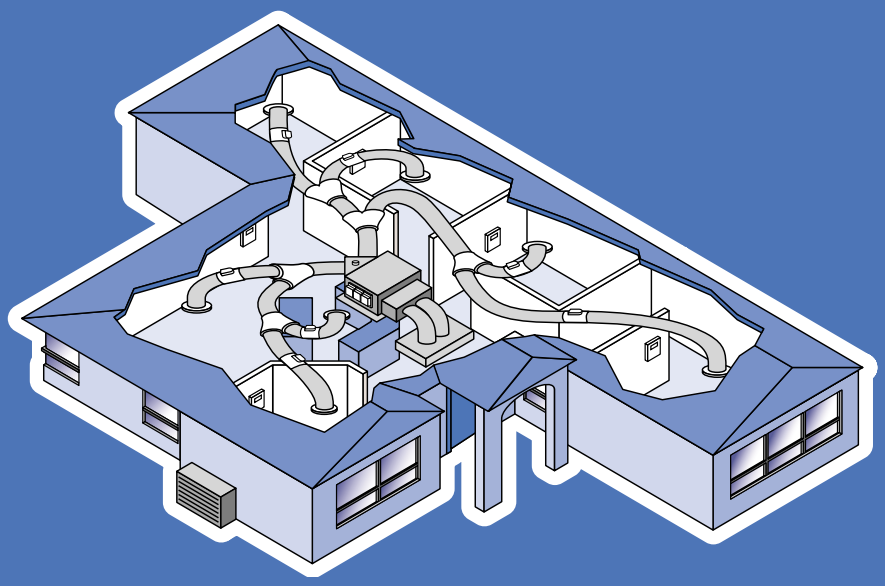
Smartzone
VAV zoning system



TECHNICAL MANUAL

ias

Publisher
Innovative Air Systems Pty Ltd (IAS)
Phone 1300 306 125
Fax 07 3870 8270
Internet www.ias.net.au
Email info@ias.net.au

Revision 07.06
This Technical Reference Manual describes the specifications and operation of the Low Profile Smartzone Plus control system.

Disclaimer
IAS reserves the right to make changes and improvements to any of the products described in this document without prior notice. Under no circumstances shall IAS be responsible for any loss of income or any special, incidental, consequential or indirect damages howsoever caused.

Warranty
The contents of this document are provided “as is”. Except as required by applicable law, no warranties of any kind, either express or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose, are made in relation to the accuracy, reliability or contents of this document. IAS reserves the right to revise this document or withdraw it at any time without prior notice.

Sourcing
Proudly designed and manufactured in Australia by Innovative Air Systems Pty Ltd, an independent Australian-owned company.

Product support
Freecall 1800 354 434 (Australia-wide)

Contents

1 INTRODUCTION

The Smartzone zoning system has been developed to provide an effective VAV (variable air volume) zoning system at lower capital and ongoing costs than traditional methods. The Smartzone system is designed for use with any HVAC system with a centralized cooling and/or heating source. Smartzone is not suitable for applications utilising individual zone reheat.

Smartzone like many other IAS products utilises plug and perform technology to eliminate the requirement for difficult site-specific hardware and software configuration. The modular nature of the Smartzone system delivers climate control solutions tailored to satisfy the specific requirements of each application. Supporting up to eight zones per main processing module and multiple touchpads, Smartzone can indirectly interface with any OEM controller. For an even higher level of control, modules are available to enable direct communication to compatible IAS HVAC plant controllers. Although the algorithms are complex the installation, commissioning and operation of the system is remarkably straight forward.

At first impressions the level of innovation associated with Smartzone seems incredible, however we have no doubt that if microprocessor technology had been available at the same time reverse cycle (heat pump) air conditioning evolved all zoning would be done in a similar fashion. After all the entire concept is simple even though the hardware is hi-tech.

2 SYSTEM OVERVIEW

Smartzone is ideally suited for any structure with dynamic heat loads, especially those where a constant or exact temperature is required across different areas or zones. The system can be implemented independently of the plant controller or with a bypass/spill air interface. It can also communicate, via a bridge module, with some IAS HVAC plant controllers. Designed primarily for residential applications, Smartzone is also used extensively in commercial office tenancies.

Recommended guidelines mentioned in this document generally assume the total system air flow is being controlled by the Smartzone system. Special consideration may be required for individual applications.

2.1 How it Works

Although the installation, commissioning and operation of the system are simple the actual control process is ingenious. The operation can be separated into four areas:

1. Zone Temperature Management
2. Total Airflow Management
3. Plant Control
4. Safety Modes

2.1.1 Zone Temperature Management

One of the strengths of the Smartzone is the way it handles each zone as an independent entity. There are three variables that influence the damper position for each zone. Two of these are measured (actual zone temp and supply air temp) and the third is set (setpoint or target temp). The damper will remain in the closed (or minimum vent) position unless the supply air temperature is such that it will cause the actual zone temp to move towards the setpoint.
When this condition is satisfied the Smartzone incrementally opens the damper proportional to the difference between actual zone temperature and setpoint, until this difference exceeds 2 °C at which time the damper is fully open. These calculations take place for every zone once every second.

2.1.2 Total Airflow Management

The influence of the zone temperature management function on system pressure results in the requirement for a control strategy to maintain acceptable pressure levels. The Smartzone bypass/spill function is responsible for this aspect of system performance. A time proportional damper positioning algorithm (TPDP) is used to modulate and monitor damper position. A spill setpoint, expressed as a percentage of total dampers open, is entered into the Smartzone during commissioning. When this point is reached the Smartzone begins incrementally opening the bypass/spill damper to maintain acceptable system pressures. This function may not be required depending on the proportion of the total system air flow under direct Smartzone control.

2.1.2.a Bypass Damper

A duct can be installed connecting the supply duct to the return duct via the bypass damper. The Smartzone's main processor module provides an output dedicated to this function. This then leaves all other motor outputs free to control up to eight zones. The plant controllers return air sensor must be placed in a position between the bypass inlet to the return air duct and the A/C plant.

2.1.2.b Spill Zone

If a bypass solution is not desirable for any reason, one or more zones may be designated as spill zones. It is recommended that the zone(s) adjacent the return air grille be selected for this purpose. Consideration should be given to duct sizing to handle excess air when spill is activated.

2.1.2.c Zone Weight Factor

The heat load for zones of different size or aspect can vary. Smartzone includes an adjustable zone weight factor for each zone to enable the bypass algorithm to compensate for this variation. Refer to Appendix C for more information.

2.1.3 Plant Control

Smartzone requires no electrical connection to the HVAC plant controller. Plant control (compressor cycling only) is influenced by the effect of the total airflow management function on the system return air temperature.

The options for HVAC plant control are as follows:

a. No direct connection
b. Using the run relay
c. With a Bridge Module to a compatible IAS Plant Controller

2.1.3.a No direct connection

The Smartzone has been designed to operate independently of the plant controller. The HVAC plant controller should be equipped with mode selection and an adjustable dead-band as well as minimum run and short cycle timers.

The Smartzones ability to cycle the HVAC plant compressor revolves around the bypass. When the bypass setpoint is reached the Smartzone begins incrementally opening the bypass damper, the bypassed supply air then mixes with the return air, stimulating the plant controller return air sensor and cycling the unit.

The system continues to regulate zone temperatures even when the compressor is cycled off, due to the thermal bank effect of the coil. As the thermal bank effect is depleted the return/bypass mix increases in temperature and the compressor cycles back on.

⚠ It is recommended that the Smartzone system remain on at all times when using this method.

2.1.3.b Using the run relay

The Smartzone system is equipped with a voltage free run relay to provide on/off control for the HVAC plant. The relay is energised when the Smartzone system is on. Compressor cycling is controlled as per Section 2.1.3.a.

2.1.3.c With a Bridge Module to a compatible IAS Plant Controller

More sophisticated plant control operations are possible when using a bridge module to establish a communication link between the Smartzone and compatible IAS HVAC plant controllers. This mechanism operates in the following way:

- If all zones are turned off manually the HVAC plant controller is also switched off.
- The fan output is energised whenever there is an active zone.
- Each zones requirement for cooling or heating is constantly evaluated, with the greatest demand imposing its required mode of operation on the plant controller. In the event of an equal demand for heating and cooling, the call for cooling mode takes precedence.

- The setpoint on the plant controller is altered to equal the highest zone setpoint in heating mode & the lowest zone setpoint in cooling mode.

Smartzone can provide fan speed control for multi-speed fan units in the following manner:

- High speed is selected if all zones are active and all dampers are fully open.
- Medium speed is selected when some dampers are closed or partially closed but the spill/ bypass setpoint has not been reached.
- Low speed is selected whenever the bypass is active.

It is recommended that the majority of the total system airflow be directly controlled by Smartzone when using the Bridge Module.

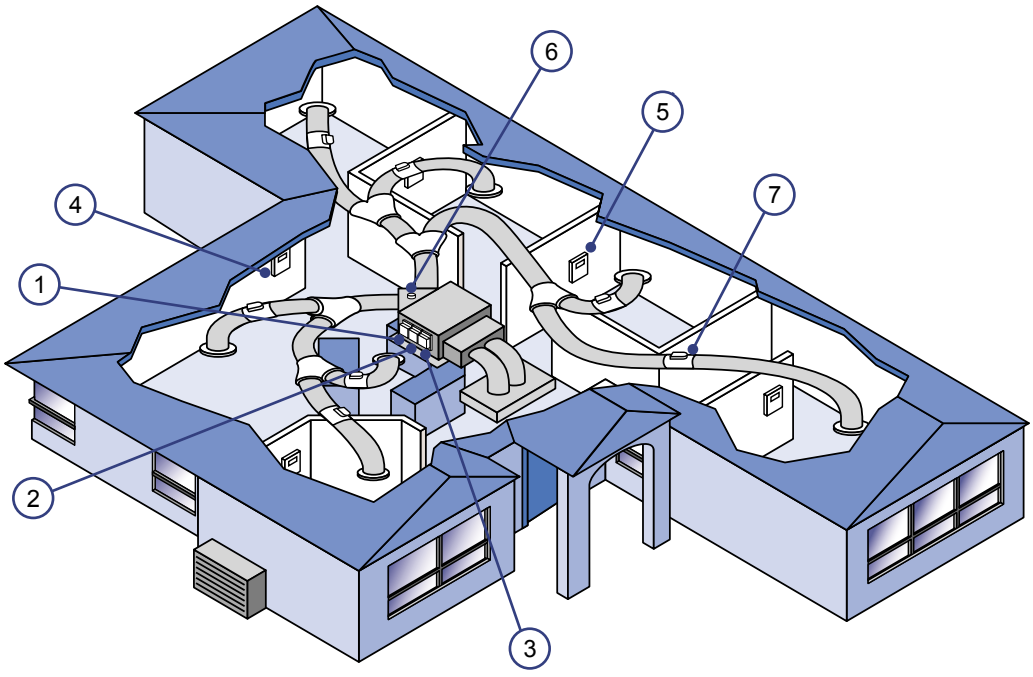
2.1.4 Safety Modes

It is anticipated the Smartzone system will be widely used with reverse cycle (heat pump) air-conditioning units. The majority of these units utilise scroll, rotary or reciprocating compressors. Although some of these compressors can pump liquid or operate at excessive discharge pressures for periods of time it is not desirable. The Smartzone monitors the supply air temperature of the system and relates this to a suction pressure in the cooling mode and a discharge pressure in the heating mode.

- If the supply air temperature moves outside of acceptable parameters (heating and cooling) all system dampers are forced open.
- The supply air minimum setpoint is adjustable from 4-12 °C (in 1 °C increments)
- The supply air maximum setpoint is adjustable from 45-75 °C (in 5 °C increments)

2.2 System Components

The Smartzone system is tailored to suit each application by incorporating some or all of the following components into a standard ducted HVAC system:



1. Main Processor Module
2. 1234 Expansion Module
3. 5678 Expansion Module (required for 5...8 zone systems)
4. LCD Touchpad
5. Room Controller with sensor
6. Supply Air Sensor
7. Motorised Barrel Damper
8. Clock Module (Optional)
9. Touchpad Expansion Module (Optional)
10. Bridge Module (Optional)

2.2.1 Main Processor Module

The main processor module gathers and processes all the information required to control the temperature for all the zones. This information comes from the supply air sensor, the touchpad and the 1234/5678 modules.

2.2.2 1234 Expansion Module

The 1234 module reads the zone sensor values for the first four zones, passing them on to the main processing module. The main processing module then sends commands back through the 1234 module to the zone dampers instructing them to open or close depending on each individual zones requirements. The motor outputs are all DO/DC (drive open, drive close) and stop driving in many different positions. This gives full control over each dampers position with the TPDP system.

2.2.3 5678 Expansion Module

As per the 1234 expansion module for zones five to eight.

2.2.4 LCD Touchpad

The touchpad accepts commands from the user, to turn each zone on or off and to change each zones set point, and sends this information to the main processor module for processing. Two LCD touchpads can be connected to the Smartzone Main Processor Module without the need for additional hardware. Refer to 2.2.9.

2.2.5 Room Controller

The room controller sensors send information about each zones temperature to the 1234/5678 modules for processing. Each zone must have one room controller.

2.2.6 Supply Air Sensor

The supply air sensor sends information about the temperature of conditioned air directly off the fan coil unit to the main processing module.

2.2.7 Motorised Barrel Damper

The barrel dampers receive drive signals from the 1234/5678 modules causing them to modulate the airflow to each zone.

2.2.8 Clock Module (Optional)

The optional clock module may be plugged into the main processor module to enable the use of weekly timer programs for individual zones. Each zone may be programmed with a start and stop time for selected days of the week.

A zone timer program must meet the following conditions to be valid.

- Be active for at least one day of the week.
- Have EITHER a Start or Stop time, OR both.

For example: The timer program for Zone 1 may be set up to be active on Saturday and Sunday with no start time and a stop time of 6.00 pm.

In this instance Zone 1 must be turned on manually at all times but will automatically turn off at 6.00 pm on weekends only. Zones must be turned off manually at all other times.

2.2.9 Touchpad Expansion Module (Optional)

The optional touchpad expansion module amplifies the communications signal to allow up to nine touchpads to be connected to the Smartzone system. Additional touchpad expansion modules may be added if more touchpads are required.

2.2.10 Bridge Module (Optional)

The optional bridge module is an interface between the Smartzone communications protocol and that used by selected IAS HVAC plant controllers. This device has the ability to dynamically adjust some of the settings on the HVAC plant controller based on the status of the Smartzone system.

3 TECHNICAL SPECIFICATIONS

3.1 Electrical Requirements

Power input to system .....24 Volts AC ± 10 %
Line Frequency .....50 Hz

3.2 System Power Consumption

Number of Zones	ZONE DAMPER ACTUATOR MODEL		
	AB-DM3-IC	AM-DM4C-IC	AB-DM6-IC
2	11.2 VA	9.8 VA	11.2 VA
3	16.4 VA	12.8 VA	16.4 VA
4	21.5 VA	15.8 VA	21.5 VA
5	26.7 VA	18.8 VA	26.7 VA
6	31.8 VA	21.8 VA	31.8 VA
7	37.0 VA	24.8 VA	37.0 VA
8	42.2 VA	27.8 VA	42.2 VA
Add for Bypass Damper	5.2 VA	3.0 VA	5.2 VA

The power consumption data in this table represents maximum values with all motors driving and 2 x LCD touchpads with backlighting on. Typical loads will be less than this.

3.3 Environmental Requirements

Operating Temperature .....0 ºC to 60 ºC
Altitude .....0 m to 2000 m
Operating Relative Humidity .....10 % to 80 %

⚠ Avoid exposure to:

- static electricity
- intense electromagnetic radiation
- dusty conditions
- highly corrosive environments
- excess vibration

3.4 Inputs/Outputs

3.4.1 24 VAC Power Input

3 x Terminal – Main Processor Module Active, Neutral, Earth

3.4.2 24 VAC Zone Motor Outputs

1 x InnoCAB socket – Main Processor Module bypass motor
4 x InnoCAB socket – 1234 Zone Expansion Module zone motor
4 x InnoCAB socket – 5678 Zone Expansion Module zone motor

3.4.3 Digital Output

2 x Terminal – Main Processor Module voltage free plant controller run contact

3.4.4 Touchpad I/O

2 x InnoCAB socket – Main Processor Module asynchronous data bus

3.4.5 Sensor Inputs

1 x InnoCAB socket – Main Processor Module supply air sensor
4 x InnoCAB socket – 1234 Zone Expansion Module zone sensors
4 x InnoCAB socket – 5678 Zone Expansion Module zone sensors

3.4.6 Spill Zone I/O

8 x Dipswitches – spill zone settings

3.4.7 Expansion I/O

1 x DB9 Connector (Female) – Main Processor Module SideBus Connector
1 x DB9 Connector (Male) – 1234 Zone Expansion Module SideBus Connector
1 x DB9 Connector (Female) – 1234 Zone Expansion Module SideBus Connector
1 x DB9 Connector (Male) – 5678 Zone Expansion Module SideBus Connector

3.4.8 Clock I/O

1 x IDC 10 Connector (Female) – Main Processor Module
1 x IDC 10 Connector (Male) – Clock Module

3.4.9 LED Indicators

1 x Red – Main Processor Module bypass motor fault
1 x Green – Main Processor Module run relay status
4 x Red – 1234 Zone Expansion Module zone motor fault
4 x Green – 1234 Zone Expansion Module zone motor open
4 x Yellow – 1234 Zone Expansion Module zone motor closed
4 x Red – 5678 Zone Expansion Module zone motor fault
4 x Green – 5678 Zone Expansion Module zone motor open
4 x Yellow – 5678 Zone Expansion Module zone motor closed

3.5 Zone Motor Ratings

The Smartzone system is specifically designed for operation with IAS 24 Volt motors. All dampers in a Smartzone system must have the same actuator type. Please refer to the relevant Actuator Data Sheet for more details.

4 INSTALLATION

Zoning systems seem complex, however this is often due to a large number of zones being controlled by one device. When this is compounded by the control wiring for the main plant control it becomes nearly impossible to keep track of what goes where regardless of how carefully you label your cables.

The Smartzone system has been designed to dramatically simplify the cabling process. The key to it's simplicity is the way the different processes have been separated.

a. The control of the main plant has been excluded. The Smartzone interfaces with the plant controller through the use of it's ingenious bypass / spill system.
b. The supply air sensor, touchpad and spill/bypass damper, all connect to the main processor module.
c. Zone sensors and motors connect to the 1234 & 5678 expansion modules.

4.1 Wiring

Shielded cable to all touchpads and sensors is recommended to minimise the effects of external interference. Cabling regulations apply. Cables are to be kept the maximum practical distance from any power cables ≥ 240 volts. (Minimum distance 300 mm)

Maximum cable length is not to exceed 50 m.

Suggested cabling: IAS supplies and recommends the following cable

RM-CAB-6-100 - six core flat cable for damper motors

RM-CAB-S-100 - five core + shield flat cable for all touchpads and sensors.

Refer to Appendix B for crimping instructions.

4.2 Component Positioning

The following are recommended positions for each of the required components for a Smartzone Plus system.

4.2.1 Main Processor Module

The main processor module is best installed within the ceiling space either mounted on the fan coil unit or on the supply air duct. The mounting point should be a relatively clean, dry and free of excess vibration.

Maintain a minimum distance of 300 mm from sources of electromagnetic interference (EMI) such as fan motors etc.

4.2.2 1234/5678 Zone Expansion Module

The 1234/5678 expansion modules must be connected to the right hand side of the main processor module via the DB9 connectors.

These modules should be fixed in place with the main processor module to ensure the modules cannot come apart during operation.

4.2.3 LCD Touchpad

The LCD touchpad has no sensor and so is independent of any zone. It is best installed 1.5 m off the floor, in a central location within the occupied area of the premises. In cases where more than one touchpad is used it may be appropriate to position touchpads in zones to facilitate remote

control. One touchpad on each floor or in each zone is often the case. The touchpad has been designed to be flush mounted to a cavity wall, or if necessary it can be surface mounted through the use of a 15 mm mounting block.

4.2.4 Room Controllers

The room controllers must be mounted within the target zone. The ideal position is 1.5 m off the floor in the return air path. Do not mount touchpads on exterior walls or near sources of heat and avoid mounting them near direct wash from a supply register or in direct sunlight.

4.2.5 Supply Air Sensor

The supply air sensor must be mounted in the main section of the supply air duct, as close to the fan coil as possible. Ensure that, regardless of zoning conditions, the supply air sensor has consistent contact with the active air supply.
NOTE: The supply air sensor comes standard with a 2.5 m cable. This can be extended on site if necessary.

4.2.6 Motorised Damper

The motorised barrel dampers should be fitted in line in the flexible duct.

4.3 Smartzone Spill System Overview

The Smartzones ingenious spill system is the secret behind how it cycles the main plant without the need for complex wiring. The Smartzone constantly monitors the position of the dampers via the time proportional damper positioning (TPDP) system. When the spill set point is achieved, the Smartzone opens the spill/bypass damper and stimulates the main plant controllers return air sensor with conditioned air (supply air).
If the main plant controller is operating in heating mode the warm supply air causes the controller to believe it has achieved heating set point.
If the main plant controller is operating in cooling mode the cool supply air causes the controller to believe it has achieved cooling set point.
This synchronises the thermostat to cycle off when the Smartzone is cycling the zones off. The spill/bypass damper can be connected in one of two ways.

4.3.1 Bypass Damper

Bypass dampers should be sized to take between 20% and 25% of total airflow at a velocity of 6 m/s (actual air velocity may be considerably higher according to system conditions). The design of the bypass duct should be such that the bypassed supply air shall enter the return air duct upstream of the return air sensor attached to the plant controller.

NOTE: If the main plant controller cycles the indoor fan off between heating cycles (auto fan on heat), any sensor positioned in the return air duct will be isolated from the room condition when the air flow is halted. THE SPILL OPTION MUST BE USED IN THIS SITUATION, with the sensor for the A/C plant mounted in the spill zone.

4.3.2 Spill Zone

One or more spill dampers can be used to control the temperature of zones immediately adjacent the return air grille. Under normal operation the spill damper(s) will operate as normal zones, but when the spill set point is reached the spill zone(s) open to relieve duct pressure and cycle the main plant off.

NOTE: When the spill zone option is used, the spill zone(s) immediately adjacent the return air grille may experience temperature variations, of between 0.5 °C and 1 °C, either side of set point. Therefore it is necessary to set the temperature of the spill zone higher than the main plant controller set point in cooling mode and lower than the main plant controller set point in heating mode.

4.4 Methods for Calculating Spill/Bypass Setpoint

Spill air is used for two main reasons - to relieve duct pressure when all zones are closed, and to stimulate the return air with supply air. For more details, read the information listed earlier in this document.

The spill air set point can be determined by utilising one or all of the following methods:

1. Air Quantity
2. Supply Air Temperature
3. Diffuser Noise

Once the spill air set point has been determined read further on for instruction on how to adjust the spill air set point. The factory default spill setpoint is 33% of total zones open which is the same as saying 33% of total airflow across the fan coil.

4.4.1 Air Quantity

Contact the unit manufacturer and ascertain the minimum approved air quantity for the system.
Place an anemometer and hood at the return air grille and commence turning off zones.
When the minimum approved air quantity is reached, calculate the number of open dampers as a percentage of the total number of zones. This is your spill air set point.

4.4.2 Supply Air Temperature

Contact the unit manufacturer and ascertain the minimum approved air off coil temperature.
Place an accurate digital thermometer in the supply air stream as close to the coil as possible and commence turning off zones.
When the minimum approved air off coil temperature is reached, calculate the number of open dampers as a percentage of the total number of zones. This is your spill air set point.

4.4.3 Diffuser Noise

Commence turning off dampers and check each zone for excessive diffuser noise.
When diffuser noise is on the verge of being excessive, calculate the number of open dampers as a percentage of the total number of zones. This is your spill air set point.

E.G. No. of Dampers Open X 100
Total No. of Dampers

For best results, test all three methods above and use the highest value.

5 COMMISSIONING

CAUTION: Making adjustments to systems setting may adversely affect system operation.

INSTALLER TIP: Make up a short cable and perform steps 5.1 to 5.5 with the LCD touchpad in the ceiling space next to the main modules.

5.1 Before Connecting System Power Supply

1. Ensure that all core modules are firmly connected together via the DB9 connector and that the modules are fixed in place so they cannot come apart.
   THESE MODULES MAY BE DAMAGED IF THEY ARE SEPARATED WHILE POWER IS APPLIED TO THE SYSTEM.
2. Ensure that all touchpads, sensors and motors are connected as per the connection diagram supplied.
   DO NOT CONNECT SENSORS TO MOTOR OUTPUTS. SENSORS MAY BE DAMAGED IF POWER IS APPLIED IN THIS CASE.
3. Ensure the air conditioning system is OFF.

5.2 Spill Zone Configuration

1. If there is no dedicated bypass damper installed, a spill zone(s) may be designated by turning on one or more of the spill DIP switches on the Main Processor Module.

5.3 Initial Power Check

When power is applied to the system, the startup routine will drive all zone damper motors to the fully open position, the dedicated bypass damper (if installed) will drive to the fully closed position, then all dampers will drive to the appropriate position as dictated by the zone status, and, if the zone is on, the system conditions.

1. Connect the 24 VAC power supply to the Smartzone system.
2. Check the main modules for fault LEDs (any red LED indicates an excess current fault on the output - generally a cable short)

5.4 System Configuration

The following system configuration steps must be completed to ensure the system will operate correctly with the motors supplied, and that the system safety mechanisms are operating as intended.

5.4.1 Set Motor Time

Smartzone utilises a time proportional damper positioning algorithm. For the system to function correctly all zone damper motors must be the same type.
IAS offers 3 motors with different drive speeds for use with Smartzone:
The DM3-IC requires the motor drive time to be set to 20 seconds.
The DM4C-IC requires the motor drive time to be set to 100 seconds.
The DM6-IC requires the motor drive time to be set to 17 seconds (default).

For backward compatibility the times listed below should be used with the following superseded motors.
The DM2-IC motor with manual clutch requires a drive time of 170 seconds.
The DM2-IC motor without a clutch requires the drive time to be 20 seconds.

1. Press ZONE or ↑ or ↓ to select the global screen. The display should read `Active: x` (where x is the number of zones currently on).
2. Press and hold both ↑ and ↓ for 10 seconds until the LCD display reads `Mot Time` on the top line. The default drive time is 17 seconds.
3. Use ↑ and ↓ to alter the motor drive time to the correct value, then press SET to proceed to the next step.

5.4.2 Set Spill Air Setpoint

The Spill Air Setpoint value can be determined by one of the methods described in Section 4.3.

1. The display should now read `SpillSet` on the top line.
2. Use ↑ and ↓ to alter the spill air setpoint, then press SET to proceed to the next step.

5.4.3 Set Minimum Ventilation Parameters

The Smartzone can be programmed to allow a minimum airflow to all zones that are ON. This is adjustable from 0 to 30 % open and defaults to zero. This value effects all ON zones equally.
The zone motors will close fully when the zone is turn turned OFF.

1. The display should now read `Min Vent` on the top line.
2. Use ↑ and ↓ to alter the minimum ventilation setting and press SET to proceed to the next stage.

5.4.4 Set Supply Air Safety Setpoints

The supply air safety minimum & maximum set points reduce the risk of damage to the system due to over cooling or heating. When these points are reached, all dampers open to maximise airflow across the coil.
Refer to the unit manufacturers documentation to ascertain the minimum and maximum air off coil temperature.

1. The display should now read `LoSA=xx` (where xx is the current supply air safety minimum temperature. Default = 8°C. Below this is the current supply air temperature in brackets).
2. Use ↑ and ↓ to change the minimum supply air safety set point and then press SET to proceed to the next step.
3. The display should now read `HiSA=xx` (where xx is the default supply air safety maximum temperature. Default = 65°C).
4. Use ↑ and ↓ to change the maximum supply air safety set point and then press SET to save and exit system configuration.

5.5 Zone Configuration - Set Zone Weights

Each zone on the Smartzone is assigned a virtual zone weight. The default value for all zones is 5. Adjusting the zone weights enables the system to compensate for differences in zone size. Changing the zone weight for a zone effects the balance of the spill algorithm.
For more information on zone weighting refer to Appendix C.

1. Press ZONE or ↑ or ↓ to select the target zone.
2. Press and hold both ↑ and ↓ for 10 seconds until the LCD display reads zWeight= on the top line.
3. Use ↑ and ↓ to adjust the zone weight value, then press SET to save and exit.
4. Repeat for each zone as required.

5.6 Sensor Check

Verify each sensor is sending accurate temperature data.
An open circuit sensor will not be displayed when cycling through the zones.
An extreme temperature reading (over 60°C) indicates a short circuit on the cable, plugs or sockets connecting the sensor.

1. Position an accurate temperature probe adjacent to the relevant sensor.
2. Press ZONE or ↑ or ↓ to select the zone, then press SET to check the sensor reading (displayed on the bottom line).
3. Use ↓ to make each zone's setpoint 15°C, then press SET to save and exit.
4. Repeat for each zone.

5.7 Damper Motor Check

TIP: The zone dampers to each zone will not open until the supply air temperature is less than the actual zone temperature when the system is in cooling mode.

1. Select the global screen and press ⏻ to turn all zones on.
2. Turn on the A/C system and set the thermostat to maximum cooling.
3. Ensure there is air flow to each zone in the ON state.
4. Turn off one zone at a time starting with the spill zone(s).
5. Ensure there is no airflow to zones in the OFF state.
6. Verify and record the address of each zone in the Zone Address Table provided in Section 5.11 to ensure accurate labelling.

5.8 Spill Check

Check to make sure the spill zone opens.

1. Turn all zones OFF one at a time.
2. Verify the spill/bypass zone(s) activates when the spill setpoint is reached.

5.9 Name the Zones

Zone names must be eight characters in length. A blank character must be used to fill spaces where no letters are required.

Tip: To choose one of the preset zone names, press SET repeatedly to accept each character including any blanks until the controller reverts to the standard display.

1. Press ZONE or ↑ or ↓ to select the zone to be named.
2. Press and hold SET for approximately ten seconds, until the top line of the display reads `Z1 Name:` .
3. Use ↑ and ↓ to view all of the preset zone names.
4. Press SET on your choice (e.g. `Lounge`, `Games` or `Custom`).
5. Use ↑ or ↓ to change the first character of the zone name if required.
6. Press and hold ↑ or ↓ to scroll quickly through the available characters.
7. Press SET to move to the next character. Press ZONE to return to the previous character to correct a mistake.
8. Repeat for all eight character spaces.
9. Pressing SET to accept the final character will save the zone name and the controller will return to the standard display.

5.10 Touchpad Configuration

If more than one LCD touchpad has been installed, each touchpad can be configured to restrict access to a subset of the total number of zones.

Set the touchpad DIP switches on the back of the touchpad to allow access to the required zones as per the following table.

LCD Touchpad Zone Access Configuration

SWITCH 1	SWITCH 2	SWITCH 3	SWITCH 4	ZONES ACCESSED
OFF	OFF	OFF	OFF	All Zones (default)
ON	OFF	OFF	OFF	1 only
OFF	ON	OFF	OFF	2 only
ON	ON	OFF	OFF	3 only
OFF	OFF	ON	OFF	4 only
ON	OFF	ON	OFF	5 only
OFF	ON	ON	OFF	6 only
ON	ON	ON	OFF	7 only
OFF	OFF	OFF	ON	8 only
ON	OFF	OFF	ON	1 & 2 only
OFF	ON	OFF	ON	3 & 4 only
ON	ON	OFF	ON	5 & 6 only
OFF	OFF	ON	ON	7 & 8 only
ON	OFF	ON	ON	1, 2, 3 & 4 only
OFF	ON	ON	ON	5, 6, 7 & 8 only
ON	ON	ON	ON	1, 2 & 3 only

5.11 Final Check

Verify all zones are approaching set point.
Complete the table below to ensure an accurate record of the physical zone layout is available.

Zone Address Record

Zone Number	Zone Name (e.g. Living, Bed 1, etc.)	Zone Weight
1		
2		
3		
4		
5		
6		
7		
8		
Spill Zone(s) =		

6 LCD TOUCHPAD OPERATION

The Smartzone Zoning System, when installed with the optional Smartzone Bridge module and a compatible IAS unit controller (thermostat), communicates with the thermostat to automatically control the thermostat's mode selection and setpoint adjustment.

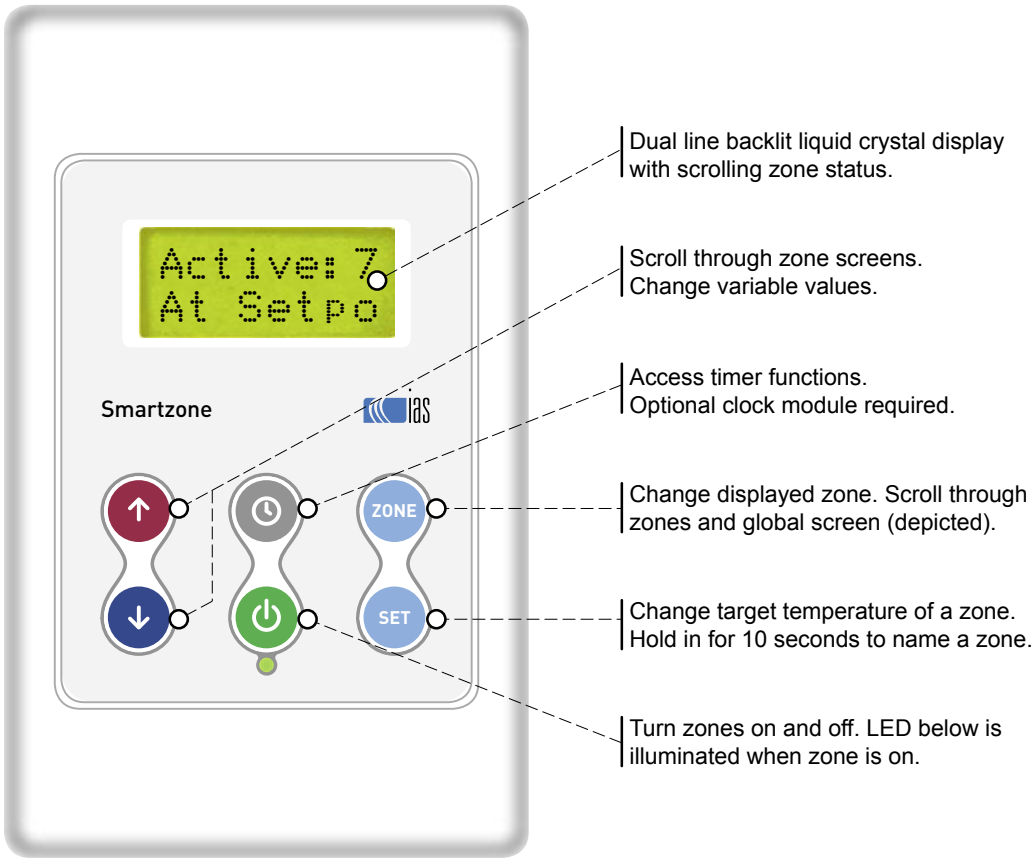
Without these modules it is necessary to set the A/C operating mode (heating or cooling) and the A/C system setpoint from the thermostat that was supplied with the A/C unit as follows (refer to the instructions for the thermostat for details).

If the majority of zones require cooling, set the operating mode of the thermostat to cooling and make the setpoint of the thermostat 0.5°C less than the lowest zone setpoint.

If the majority of zones require heating, set the operating mode of the thermostat to heating and make the setpoint of the thermostat 0.5°C more than the highest zone setpoint.

This additional 0.5°C ensures that all zones can reach setpoint before the spill / bypass mechanism causes the air conditioning plant to cycle off.

6.1 TOUCHPAD AND DISPLAY LAYOUT



6.2 Selecting the operating mode

The Smartzone system has two operating modes.

- Auto On - (Default)
  In the default operating mode the Smartzone system controls the zone temperature by incrementally opening and closing the zone damper, varying the volume of conditioned air delivered to each area according to the demand.
- Auto Off - Manual vent mode.
  In manual vent mode no temperature control takes place. The Smartzone system fully opens the damper to any zone that is turrned on. The status of any on zone will be displayed as Vent .

1. Press ZONE or ↑ or ↓ until the global screen is displayed (depicted in the image on the previous page).
2. Press SET to access the mode selection screen.
3. Use ↑ or ↓ to select the desired mode.
4. Press SET to save and exit.

6.3 Turning all zones On or Off

1. Press ZONE or ↑ or ↓ until the global screen is displayed.
2. Press ⏻ to turn all zones On or off as required.

6.4 Turning one zone On or Off

1. Press ZONE or ↑ or ↓ to select the zone. The current status of the selected zone is displayed on the second line of the LCD read-out. If the zone is on the current temperature and setpoint scrolls across the bottom of the display.
2. Press ⏻ to turn the zone On or off as required.

6.5 Setting a zone temperature (setpoint)

1. Press ZONE or ↑ or ↓ to select the target zone.
2. Press SET to edit the setpoint for the zone.
3. Use ↑ or ↓ to adjust the target temperature.
4. Press SET to save and exit.

6.6 Naming zones

Zone names must be eight characters in length. A blank character must be used to fill spaces where no letters are required.

Tip: To choose one of the preset zone names, press SET repeatedly to accept each character including any blanks until the controller reverts to the standard display.

1. Press ZONE or ↑ or ↓ to select the zone to be named.
2. Press and hold SET for approximately ten seconds, until the top line of the display reads `Z1 Name:` .
3. Use ↑ and ↓ to view all of the preset zone names.
4. Press SET on your choice (e.g. `Lounge`, `Games` or `Custom`).
5. Use ↑ or ↓ to change the first character of the zone name if required.
6. Press and hold ↑ or ↓ to scroll quickly through the available characters.
7. Press SET to move to the next character. Press ZONE to return to the previous character to correct a mistake.
8. Repeat for all eight character spaces.
9. Pressing SET to accept the final character will save the zone name and the controller will return to the standard display.

6.7 Setting the system clock

1. Press ZONE or ↑ or ↓ to select the global screen.
2. Press ◷ to display the current time and date.
3. Use ↑ or ↓ to alter the highlighted hours value then press SET .
4. Repeat for the minutes and day values.
5. Pressing SET after the day value will return you to the global screen.

6.8 Setting the system timer program

1. Press ZONE or ↑ or ↓ to select the global screen.
2. Press ◷ to display the clock.
3. Press SET three times to accept the current time and access the global timer screen.
4. A CAPITAL letter indicates that the on/off times will apply to that zone on that day. Press ↑ to activate, or ↓ to deactivate each day, then press SET to move to the next day. Repeat for each day.
5. Press SET after the final day value to enter the Start time screen. (Note: If no days have been selected the configuration routine will exit at this point)
6. Use ↑ or ↓ to alter the start time to the correct value (in 10 minute intervals) then press SET to proceed to the Stop time screen. PM is indicated by a “`p`” after the time.
7. Repeat for the Stop time then press SET to complete setting the global timer programme and return to normal operation.

6.9 SETTING INDIVIDUAL ZONE TIMER PROGRAMS

1. Press ZONE or ↑ or ↓ to select the required zone.
2. Press 🕒 to display the current program days for that zone.
3. A CAPITAL letter indicates that the on/off times will apply to that zone on that day. Press ↑ to activate, or ↓ to deactivate each day, then press SET to move to the next day. Repeat for each day.
4. Press SET after the final day value to enter the Start time screen. (Note: If no days have been selected the configuration routine will exit at this point)
5. Use ↑ or ↓ to alter the start time to the correct value (in 10 minute intervals) then press SET to proceed to the Stop time screen. PM is indicated by a "P" after the time.
6. Repeat for the Stop time then press SET to complete setting the program for that zone and return to normal operation.
7. Repeat for each zone as required.

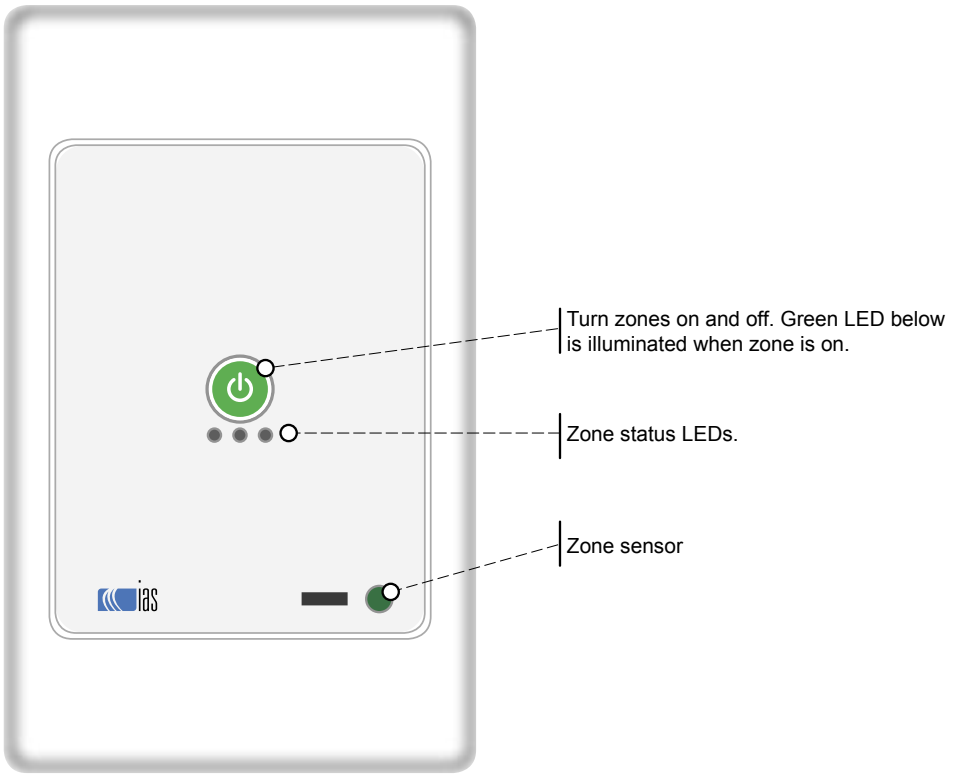
7 ROOM CONTROLLER OPERATION

The room controllers house the temperature sensors, and provides On / Off control and zone status indication for each zone.

The LEDs below the power button indicate the zones status.

- The green LED is illuminated when the zone is on.
- The blue LED is illuminated when the zone requires cooling.
- The red LED is iluminated when the zone requires heating.

7.1 Touchpad Layout

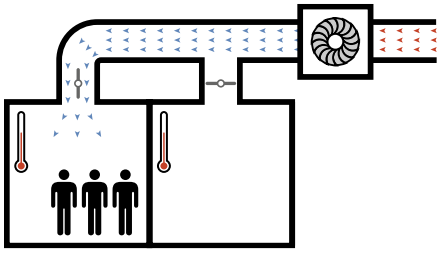


APPENDIX A CALCULATING ZONE WEIGHTS

Each individual zone is assigned a virtual setting called the zone weight. By adjusting the zone weight setting, the system's airflow management algorithm may be fine tuned to compensate for variations in room size and heat load when optimising the airflow.

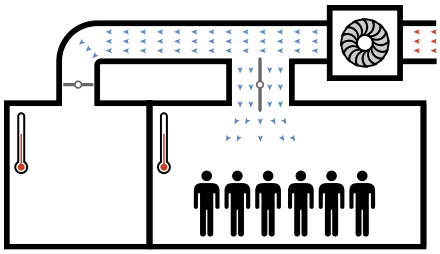
The default value for each zone is 5, therefore all zones are treated equally when calculating the total percentage of open dampers. The zone weight for each zone may be adjusted from 1 to 10.

Consider the following simple example:
A system is made up of two zones of equal size, with the same zone weight. The damper to one segment is fully closed and the damper to the other is fully open.



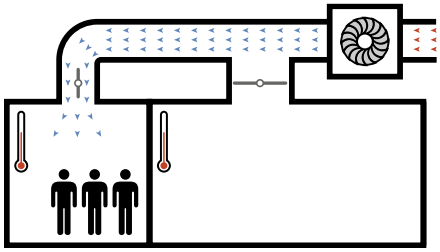
(Actual system open ≈ 50%)

If one of the zones is larger (one is twice the size of the other), but, both have the same zone weight value, the system would treat the large zone being fully open and the smaller one fully closed,



(Actual system open ≈ 67%)

exactly the same as the small zone being fully open and the large one fully closed.



(Actual system open ≈ 33%)

By adjusting the zone weight setting for each zone, the system can be tuned to ensure optimum operation of the airflow management algorithm.

In this example the following settings will produce the desired effect.
Large zone - Zone weight = 10 Small zone - Zone weight = 5

The zone weight for each zone should be revised whenever the system is altered (zones added or removed). Refer to Commissioning Instructions section 5.5 for details on how to adjust the zone weight for each zone.

Methods for Calculating Zone weight

Zone weight values can be determined by utilising one of the following methods:

a. Heat Load

b. Zone Area

Heat Load Method

Record the heat load (calculated at system design/unit selection stage) for each zone in the table below.

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
Zone Heat Load (ZHL)								
Zone Weight (ZW)								
Zone Weight Factor (ZWF)								

Calculate the zone weight factor (ZWF) for the system by dividing 10 (the highest possible zone weight) by the highest zone heat load (ZHLmax).

E.G. ZWF = 10 ÷ ZHLmax

To determine the zone weight for each zone, multiply the heat load of each zone by the zone weight factor and round to the nearest whole number.

E.G. ZW = ZHL x ZWF

Record the zone weight for each zone in the space provided.

Zone Area Method

Calculate the area for each zone and record in the table below.

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
Zone Area (ZA)								
Zone Weight (ZW)								
Zone Weight Factor (ZWF)								

Now calculate the zone weight factor (ZWF) for the system by dividing 10 by the largest zone area (ZAmax).

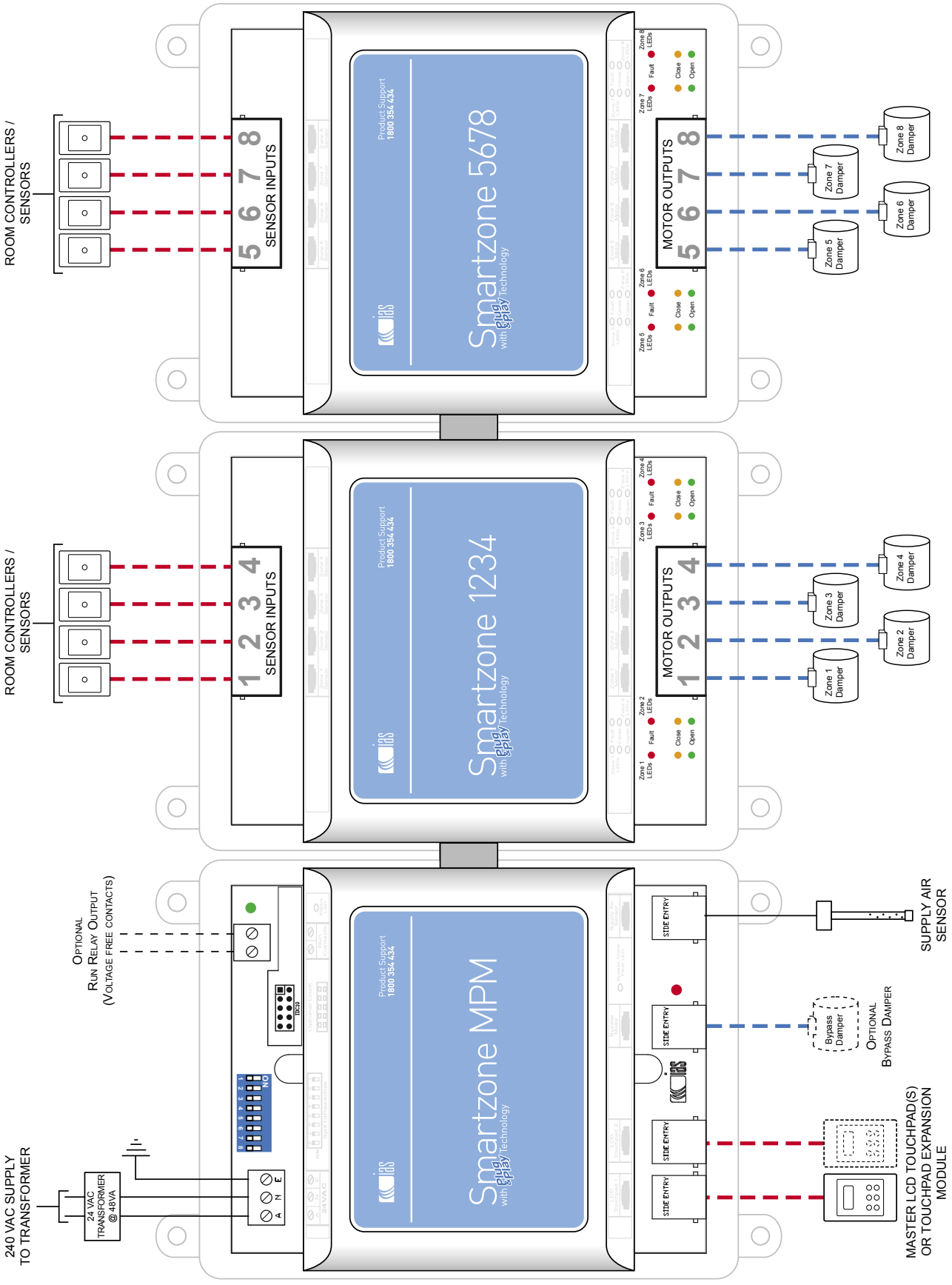
E.G. ZWF = 10 ÷ ZAmax

To determine the zone weight for each zone multiply the zone area of each zone by the zone profile factor and round to the nearest whole number.

E.G. ZW = ZA x ZWF

Record the zone weight for each zone in the space provided.

APPENDIX B TYPICAL EIGHT ZONE SYSTEM SETUP



Appendix C Innocab Crimping Instructions

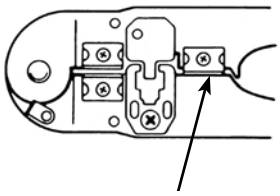
⚠ ***Never insert uncrimped plugs into the sockets.***

This may cause damage to the socket contacts. Crimped plugs should insert easily into sockets until the locking tab clicks into place. Plugs that have been incorrectly crimped may be difficult to insert, and may cause damage to the socket contacts if forced into place.

⚠ ***InnoCAB connections are polarity conscious.***

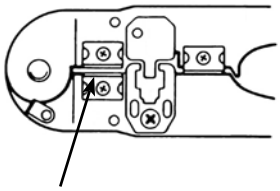
It is essential that every cable termination for each installation is performed with the coloured inner conductors in the same order and position in the plug. Any two cable ends should appear identical if held side by side (provided they are of the same cable type - i.e. shielded or unshielded).

Step 1



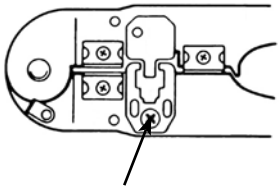
- Cut the InnoCAB cable to the desired length. Take care to ensure the ends are cut square.

Step 2



- Insert the cable between the stripper blades of the crimping tool so that it touches the metal stop.
- Squeeze the handles and pull the tool to remove the cables outer sheath and expose the insulated inner conductors.
- Ensure the insulation on the inner conductors is not damaged.

Step 3



- Insert a plug into the plug holder of the crimping tool. It will click into place.
- Insert the prepared cable end into the plug, taking care to ensure the coloured inner conductors are in the same order and position each time.
- Squeeze the handles firmly to set the contacts and secure the cable.

APPENDIX D TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSES / SUGGESTED ACTION
LCD touchpad is blank.	Check the cable to touchpad. Check the 24 VAC power supply from the transformer (If failed see next).
Transformer has failed.	Prior to connecting the new transformer, verify the new transformer is capable of supplying 24 volts AC @ 2 amperes (48 VA). Measure the current draw of the system at startup. ***If the current draw exceeds 2 amperes, disconnect the power supply immediately to prevent damage to the new transformer.*** Disconnect all touchpads and zone sensors. Re-apply power and measure the current draw of the transformer as the touchpad and sensors are re-connected one at a time to identify the problem connection (usually a cable fault). ***Unplug the cable at the MPM*** (to avoid shorting input) then re-terminate and repeat test to verify the problem has been rectified.
LCD touchpad displays “Init...” all the time.	Fault on touchpad cable. ***Unplug the cable at the MPM*** (to avoid shorting input) then re-terminate plug back in to retest. Take care not to touch the back of the LCD while testing.
Incorrect number of zones displayed on the touchpad, and, the touchpad DIPswitches are set correctly.	Zone sensor/cable fault - open circuit. Check sensor cables for a bad connection. If room sensors are being used instead of room controllers, check the sensor box jumper, this should be in the “normal” position.
LCD touchpad displays Active:0 and will not turn on. There is at least 1 good sensor connected & cabled correctly.	Test the zone sensor inputs by plugging the supply air sensor into Zone 1 sensor input. If Zone 1 now appears on the display the problem is as per above. Check DIPswitch settings on the back of the touchpad as per Section 5.10 - Table 1. If the fault persists with all DIPswitches OFF, check the connection between MPM and 1234 modules.
Room Controller reads the wrong temperature.	Do not mount touchpads on exterior walls or near sources of heat, also avoid mounting them near direct wash from a supply register or in direct sunlight. Allow touchpad temperature to settle for 10 minutes if it has been handled or 30 minutes if it has just been installed.
68 degrees displayed as a zone sensor reading.	Room controller or Room sensor cable/crimp short circuit. Locate and correct
Damper drives the wrong direction when the supply air would help reach setpoint	One end of the damper motor cable is crimped backwards to the other. Re-terminate cable as per the crimping instructions.
Dampers not driving.	Check the fault indicator LEDs at the motor output sockets (see next issue). Check the appropriate zone is turned ON. Check zone sensor reading is correct. Check the supply air temperature (refer to Section 5.4.1 - 5.4.4 to access SA temp) Check cable connections and ensure crimp is correct. Check mechanical connection to actuator and damper. Check after a power outage to the MPM, all zone motors drive fully open, then drive to the correct regulating position. (Spill-bypass motor drives fully closed first)
The red fault LED is on at the zone motor output socket.	There is a short somewhere in that zone motors cable, plugs or sockets (usually a cable fault). Check that the plugs are crimped correctly with no tiny shorts between the conductors.
Damper driving at the wrong time or temperature.	2 touchpad cables are mixed up or 2 motor cables are mixed up. Verify that zone touchpad x and zone motor x both run to zone x (Trace cables)

PROBLEM	POSSIBLE CAUSES / SUGGESTED ACTION
Incorrect zone operating as spill zone.	Check main processor module dipswitch settings. Turning any dipswitch on will make that zone become a spill zone. e.g. 6 on=zone 6. Check that the bypass output is not in fault mode if being used.
Zone motors drive open all the time, power has been applied for more than 3 continuous minutes & at least 1 zone is turned off.	Supply air sensor/plug fault, or, supply air maximum or minimum temperature exceeded. If this sensor drops below 8 degrees or above 65 degrees (default), all zone motors drive open (extreme coil temp detected) and the optional bypass motor will drive closed.
Zone 5 and above do not operate correctly.	Disconnect 24VAC power supply and check that the 1234 module is plugged into the 5678 module. There are no cables between the modules, they plug from one module to the next directly. Ensure all modules are screwed down to prevent separation.
58 degrees displayed as a zone sensor reading.	Incompatible Room controller or Room sensor. Replace with compatible unit.

Product Support
Freecall **1800 354 434**
www.ias.net.au
support@ias.net.au

National Sales
Phone: 1300 306 125
sales@ias.net.au

Designed and manufactured in Australia by
Innovative Air Systems Pty Ltd