Satchwell

IAC420

WIRING AND COMMISSIONING INFORMATION FOR

UNIVERSAL MULTI-LOOP INTELLIGENT ADVANCED CONTROLLER

Specification No. 581-4-253 (fixed wiring terminals)
581-4-254 (plug-in wiring terminals)

GENERAL CONTROLLER DETAILS

The IAC has been designed to be a very flexible controller and can be configured for use in a large number of different applications.

The IAC comes with a number of preset applications that can be selected by the user. These applications may then be further customised by the user if required. Once an IAC has been customised it is possible to save this new configuration in Satchnet and use it on any other IACs as required.

The IAC configuration and setting of parameters is carried out from a computer running the Satchnet Bubbleland software. See your Satchnet User Guide for details of using Bubbleland. In the event of a power failure, the IAC clock will stop until it is reset by the computer, a Touch-screen or re-synchronized by the digital input. The computer and Touch-screen broadcast the time on a regular basis. On restoration of power, the IAC will utilise the last known time before power failure.

If optional RTC board is fitted, the clock will continue to run in the event of a power failure and the parameters such as values are stored.

The IAC is made up from a number of discrete modules as shown below:-

MODULE LIST

INPUT/OUTPUT MODULES **Page No.**

Configurable Input Module 3
Digital Input Mode 3
Temperature (Resistive) Input Mode 3
Analogue Input Mode (Voltage) 3
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Limiter Module 4
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Threshold Module 5
Variable Threshold Module 5
Rate Limiting Module 5

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System Module 11

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Digital Monitor Module 11
Digital Reference Module 11
Analogue Monitor Module 12
Analogue Reference Module 12
Flasher Module 12
Digital One Module 12
Digital Zero Module 12
Power On Reference Module 12

All the modules are described in full from Page 3. This listing includes the module parameters, their default values and ranges.

The modules are linked together either by choosing a preset application or by customising applications from a computer running the Satchnet Bubbleland software. The software employs a graphical interface that allows you to use a mouse to point at the various modules and link them together, any links that do not make sense or that will cause problems are rejected by the software. The various settable parameters within each module have standard default values that may easily be modified from the module menus. This method of configuring the controller guides the user through the configuration process in a logical manner.

DS 2.801 - Specification Information
DS 2.501A - Commissioning Details
MLI 2.801 - Mounting Details
Sensors
DS 1.001 - DRT, DDT
DS 1.020 - DU, DUS, DUSF
DS 1.030 - DDU
DS 1.201 - DWT, DST
DS 1.501 - DRH, DDH
DS 1.401 - DOT, DOW
DS 1.901 - RPW
Actuators
DS 3.001 - AVUE
DS 3.010 - AVU
DS 3.201/215 - ARX, ARE
DS 3.401 - ALX, ALE
DS 3.501 - ALXS, ALES
DS 24.020 - AVX

CE

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INSTALLATION

LOCATION

Select a position that is reasonably clean and free from damp and condensation. A minimum of 50 mm clearance is required above and below the controller to allow for wiring. Ambient temperature limits should be within 0 to 50°C.

For mounting instructions see MLI 2.801, as supplied with the controller.

DO NOT SWITCH ON THE POWER SUPPLY UNTIL COMMISSIONING PROCEDURES HAVE BEEN CARRIED OUT.
To avoid inadvertent damage, it is recommended that the 24 Volt supply fuse is removed from the control panel and refitted after the site wiring and commissioning have been completed.

COMMISSIONING

See DS 2.501A for details on commissioning the full Satchnet Networking system.

1. Ensure the IAC controller has no mains Voltages connected to any of its terminals before any commissioning checks are carried out.
2. Refer to the system diagram and check that all wiring is correctly connected to the terminal blocks.
3. Ensure IAC terminal 1 is earthed.
4. Check that the terminal sockets are correctly aligned with the terminal plugs on the IAC.
5. Check that the controller inputs are configured correctly for the scheme to be used. Fig.19 shows the default inputs. When using preset applications the inputs must be reconfigured. See the 'Configurable Inputs' section of 'Applications' for details of the jumper settings required.
6. If any Output wiring is greater than 100 metres long ensure it is screened. All Input wiring **MUST** be screened. The screen should be earthed only at the IAC controller using the earth terminal supplied - Terminal 1 is an earth.
7. Ensure that the serial link connection is screened. The LAN screen must be connected to a verified good earth. See Fig.24 for details.
8. GENERAL:- Do not connect/disconnect any input, output or LAN with the power connected as this could damage the IAC.
9. Disconnect all outputs to the plant. Replace the 24Vac supply fuse.
10. Set the correct preset application for the system. If the configuration is to be loaded from a computer then select preset 0 (software preset) on the bit switch.
11. Set the correct address for the IAC (see Fig.20, Page 20 for setting details).
12. Remove the 24Vac fuse and re-connect all the outputs to the plant. Replace the 24Vac supply fuse.
13. Configure the IAC from a computer running ver 6.3 (or later) Satchnet Networking software. See configuration details starting on Page 3.

BACKWARD COMPATIBILITY

The IAC420 controller is backward compatible. The terminations are in exactly the same positions as in the IAC400 and the existing IAC 400 Bubbleland configurations can be converted to work with IAC420.

The following procedure must be followed when the configuration is converted using Satchnet Pro (Ver 6.3) or Satchnet Plus. When Satchnet Plus is used, Satchnet support files for the IAC420 must first be installed. Please contact your local sales office for your copy, or download the files from Satchwell BBS under conference no. 9 sales office file area.

1. In Satchnet create IAC400 controller symbol.
2. Enter the configuration library, select load a configuration from disk and note the file name of the application you wish to upgrade.
3. Enter Bubbleland and for each module used make a note of it's instantiation number and the value/state of all the associated parameters.
4. Exit from Satchnet. At the DOS prompt rename the IAC400 configuration files VAV2$xxx.lib and VAV2$xxx.bub to be DAC1&xxx.lib and DAC1$xxx.bub (SATCHNET/LOG directory).
5. In Satchnet create IAC420 icon.
6. Enter Bubbleland and select the system module. Put the controller into 'NULL OUTPUT'.
7. Select the option load a configuration from disk from the configuration library menu, and select the renamed configuration file.
8. Satchnet Pro asks if the configuration is downloaded to the controller. Answer No.
9. Get data from the controller to allow the selection of new modules.
10. Enter Bubbleland and Satchnet Pro prompts 'Links Changed! Transmit!'. Answer No.
11. Enter Bubbleland. Delete input modules and the clock module (if they exist). Select from the Bubbleland library new input and clock modules and link them. Using notes made in (2) re-enter the module parameter data.
12. Take the controller out of 'NULL OUTPUT'.
13. Select the configuration library option from the controller main menu and perform 'get data from controller'.
14. SAVE THE NEW CONFIGURATION ON THE DISK.

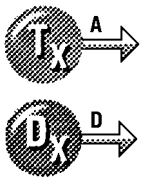
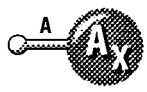
GENERAL NOTES

1. The IAC uses two types of signal internally. They are as follows:-
   Analogue Values from –10,000 to +10,000 these represent temperature (°C, °F), Voltages, Ohms, Lux and control outputs.
   Digital signals, these signals are either On or Off.
2. Analogue inputs or outputs cannot be directly connected to Digital inputs or outputs. To convert an analogue value to a digital signal use a threshold module.
3. When handling Voltage or controller output signals you should note that values are in the range of 0 to 100 where 0 = Off or Volts and 100 = full On or 10 Volts.
4. °C, °F, Ohms and Lux are all displayed as actual values e.g. 20°C = 20, 68°F = 68, 2000Ω = 2000 etc.
5. When using a two stage controller for single stage only the unused stage should be set as follows:-
   Proportional Band = 10,000
   Integral Action Time = 0
   Derivative Action Time = 0
   Ramp Time = 0
6. Maximum of 200 links between modules per IAC420. If Satchnet 6.21 is used, the maximum number of links/text symbols is 255. If this is exceeded, problems may occur.
7. **Configurable Inputs**
   The IAC420 inputs can be configured independently by using jumper links on the controller PCB to be either Resistive, Digital or Analogue (Voltage) inputs. The table below gives information on the jumper setting required for each input to be configured as well as the default input configuration. Fig.19 also shows the inputs in their default configuration set up. This default set up matches the earlier IAC400 controllers fixed set up so that upgrades are easier.

Input Number	Input Terminal Number	Default	Resistive	Digital	Analogue (Voltage)
1	10	Resistive	Fit Jumper P	Fit Jumper Q	Fit Jumper R
2	9	Resistive	Fit Jumper M	Fit Jumper N	Fit Jumper O
3	8	Resistive	Fit Jumper J	Fit Jumper K	Fit Jumper L
4	7	Analogue	Fit Jumper G	Fit Jumper H	Fit Jumper I
5	6	Analogue	Fit Jumper D	Fit Jumper E	Fit Jumper F
6	4	Digital	Fit Jumper A	Fit Jumper B	Fit Jumper C

When using preset applications the inputs must be reconfigured. See the 'Configurable Inputs' section of 'APPLICATIONS' for details of the jumper settings required.

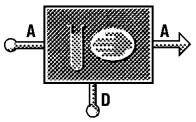
MODULES AND FUNCTIONS

Bubbleland Symbol	Module	Range	Default
INPUT/OUTPUT MODULES			
	**CONFIGURABLE INPUT MODULE** x 6 The IAC420 has 6 configurable inputs set by hardware jumpers on the PCB (see table for details). The functions available will depend on the input mode selected for each configurable input. The options are listed below as Digital input mode, Temperature (resistive) input mode and Analogue input mode (Voltage). The input number will be shown on the module.		
	DIGITAL INPUT MODE		–
	Current State of Input (review only) This parameter displays the current input state.	On or Off	
	Latch Input This parameter allows the digital input to be latched so that a momentary input will switch the module on and a second input will switch it off.	Yes or No	No
	Toggle This parameter switches a latched input into the opposite state.	On or Off	–
	TEMPERATURE (RESISTIVE) INPUT MODE		–
	Current Measured Value (review only) This parameter displays the current input value in the selected units.	–40 to 150°C –40 to 302°F 250 to 9750 Ω 0 to 10,000 Lux	
	Units Selection This parameter selects the units that can be used for the input.	°C, °F,Ω or Lux	°C
	ANALOGUE INPUT MODE (VOLTAGE)		
	Current Measured Value as a percentage of 10 Volts (review only)	0 to 100%	–
	**DIGITAL (TRIAC) OUTPUT MODULES** x 6		
	Output State (review only)	On or Off	–
	Override State	None, On or Off	None
	**ANALOGUE OUTPUT MODULES** x 3		
	Current Output Value as a percentage of 10 Volts (review only)	0 to 100%	–
	Override Value e.g. 0 = 0V, 50 = 5V, 100 = 10V	0 to 100%	0%
	Enable Override	On or Off	Off
MATHS MODULES			
	**SUBTRACTION, MULTIPLICATION, DIVISION AND ADDITION MODULES** (x 10 total number of any combination) These modules allow mathematical operations to be carried out on values within the controller. Each module can accept two value inputs and the module will produce a value output. The addition module is shown, left.		

MODULES AND FUNCTIONS

Bubbleland Symbol	Module	Range	Default

MATHS MODULES (Cont.)



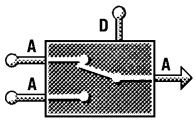
SAMPLE AND HOLD MODULE x 3

This module is used to sample an Analogue value when the Digital input on the module is momentarily switched on. The sample module will then output the current sample value. The module will keep the value until the next time the Digital input is set to on at which point another sample is taken. If the Digital input is left set at on, the output of the module will follow the module input.

HYSTERESIS MODULE x 6

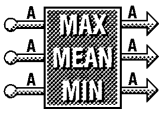
This module is used to pass on a change in value only when that change is greater than the value set in the module. When a change is passed through the digital output is switched on briefly. This can be used to drive the Logging module for event based logging.

Hysteresis	0 to 10,000	1



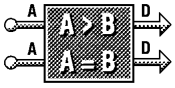
ANALOGUE SWITCH MODULE x 10

This module switches an analogue output between two analogue inputs. The switching is triggered by a digital input state.
Possible applications are sensor selection, override of fan speeds/actuator position etc.



ANALOGUE AVERAGING MODULE x 3

This module requires no setting and is used to average upto 3 inputs. The module supplies a maximum, minimum and average output value.

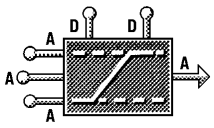


COMPARATOR MODULE x 6

The Comparator module is used to compare two analogue inputs and give two Digital outputs if certain conditions are true. If the inputs are referred to as A and B then the required conditions are:-

A ≥ B then output 1 is on
A = B + or - the set tolerance then output 2 is on

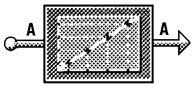
Tolerance A tolerance can be set for the A = B output such that the condition will trigger when A = B '+ or –' the tolerance	0 to 10,000	1



LIMITER MODULE x 6

The Limiter module is used to limit the range of an Analogue signal. The upper and lower limits can be set either from within the module or by feeding an analogue signal into the two analogue inputs. The value of these inputs sets the corresponding upper and lower limits. Digital inputs on the module override the module output to the upper or lower set limit respectively.

Minimum Value	–10,000 to 10,000	0
Maximum Value	–10,000 to 10,000	100



LOOK-UP TABLE MODULE x 8

The Look-up table module is used to scale any analogue signal to a set of units, for instance pressure. The input and corresponding output value can be entered.

Input Value 1 and Output Value 1 There are eleven of these pairs to allow for non linear sensor characteristics. If all eleven pairs are not required unused pairs are set to - - -.	–10,000 to 10,000	IN 0 10 20 30 40 50 60 70 80 90 100	OUT 0 2 3 4 6 10 16 25 40 63 100

NOTE:- The 'IN' value must increase in size from input 1 upto input 11 for the look-up table to function correctly.

SCALING MODULE x 6

The scaling module is used to re-scale an analogue signal based on minimum and maximum input and output values. From these values the IAC scales all the points in between linearly.
For example for values of 0 in 0 out and 50 in 100 out a 0 to 5 Volt input is expanded to a 0 to 10 Volt output.
Signals can be reversed by using this module by setting, for example 0, 100 and 100, 0 this would reverse a 0 to 10Vdc input signal.
NOTE:- The Input Minimum Value must be less than the Input Maximum for the Scaling Module to function correctly.

Input Minimum Value	–10,000 to 10,000	0
Output Minimum Value	–10,000 to 10,000	0
Input Maximum Value	–10,000 to 10,000	100
Output Maximum Value	–10,000 to 10,000	100

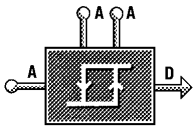
MODULES AND FUNCTIONS

Bubbleland Symbol	Module	Range	Default

MATHS MODULES (Cont.)

THRESHOLD MODULE x 10
The Threshold module is used to provide a switched output from an analogue input. If both the on and off values are set the same the module will act as a simple switch. If the off value is set below the on value then the switch will have a hysteresis on it.
The Off threshold must be less than or equal to the On threshold.

On Threshold	–10,000 to 10,000	0
Off Threshold	–10,000 to 10,000	0



VARIABLE THRESHOLD MODULE x 10
This module has an ON and OFF threshold value set on the first and second nodes respectively on the top of the module. When the input value is greater than or equal to the ON threshold the digital output will be ON. When the input value is less than or equal to the OFF threshold value the digital output will be OFF.

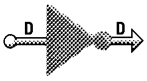
RATE LIMITING MODULE x 3
This module allows any varying analogue signal to be slowed down or smoothed. The time (in seconds) and a value are set. The output value will then follow the input as long as it changes at/or slower than the set value per set time period. If it changes faster than the values set then the output will change only at the rate set. For example, the module may be set at 5°C per 1 second, if the input changes by 10°C in 1 second and stabilizes then the output will take two seconds to equal the input.

Time	1 to 10,000 Seconds	0 Secs
Deviation	–10,000 to 10,000	0

LOGIC MODULES

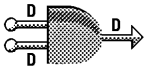
LOGIC MODULES (x 20 total number of any combination of 'NOT', 'AND' and 'XOR' Gates)

'NOT' Modules



This module requires no setting and is used to reverse the digital inputs i.e. On/Off inputs. This can be any On or Off signal within the IAC. For example, if a digital signal is Off when it goes into the inverter it will be transmitted out as On and vice versa. In conjunction with the 'AND' gates, and 'XOR' Gates these inverters can perform interlock functions.

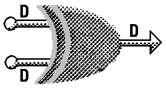
'AND' Gate Modules



This module is used to take 2 digital inputs and 'AND' them together to give a new digital output. The gate must have both digital signals as On before it will give an On output. In conjunction with the 'NOT' gates and 'XOR' gates these gates can perform interlock functions.

'OR' Gate Modules
Digital input modules act as an or gate.

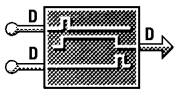
XOR (EXCLUSIVE OR) Gates



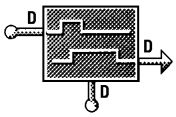
XOR GATE, one input only must be On to give an On out. E.g. Off, On = On out

NOTE:- All digital inputs work as a normal OR GATE within normal modules when multiple digital signals are applied to a single digital input. That is any number of the inputs are On then the output is On. E.g. Off, On, Off, On, On in = On out.

By placing a NOT GATE after an AND Gate the output is inverted thus providing a NAND gate equivalent. A 'NOR' gate is created by connecting two or more inputs into a 'NOT' gate. By placing a NOT Gate after an XOR Gate an EQUIV Gate is created (if both inputs are the same then the output is ON, if not the output is OFF).



LATCH MODULES x 6
The Latch module is used to take a momentary Digital input and give a latched output. The output will now stay on until it is cleared by the reset input being set momentarily to on.
This module is used to monitor a pulse type signal and create a longer signal.

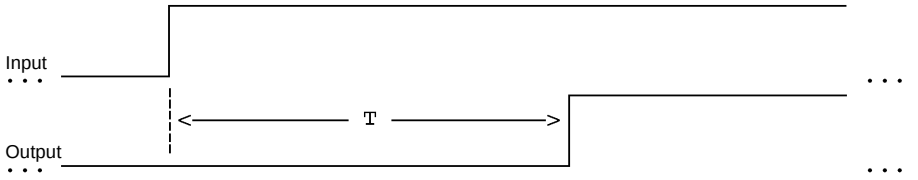


DELAY MODULES x 10
The delay module enables an incoming digital signal to be manipulated. By delaying the on state you can ensure that the incoming signal must be on for a minimum amount of time before it is recognised. By delaying the off state of the incoming signal a minimum on time can be guaranteed. The output from the module can then be used as an output to another module. See overleaf for examples.

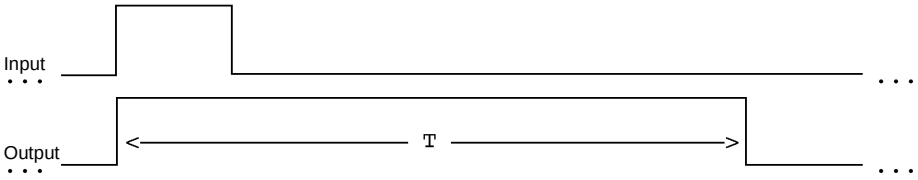
MODULES AND FUNCTIONS

Bubbleland Symbol	Module	Range	Default
LOGIC MODULES (Cont.)			
Period		0 to 10,000 Seconds	0 Secs
Hold On/Off		On or Off	On
Rising Edge/Falling Edge		Rising or Falling	Falling
Re-trigger		Yes or No	No

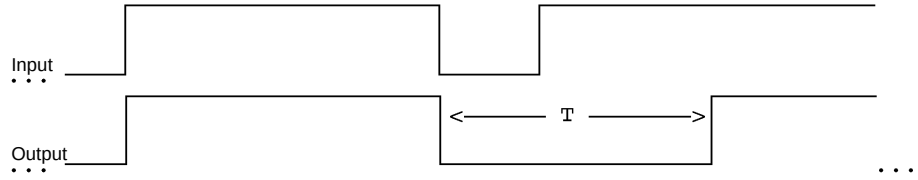
Example 1: Start Up Delay:
Period = T
Delay Type = Hold Off
Edge = Rising
Re-trigger = No

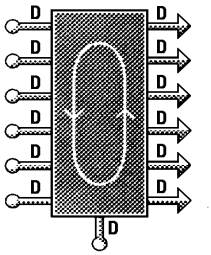


Example 2: Minimum Run Time:
Period = T
Delay Type = Hold On
Edge = Rising
Re-trigger = No



Example 3: Minimum Off Time:
Period = T
Delay Type = Hold Off
Edge = Falling
Re-trigger = No

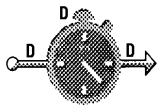




ROTATION MODULE x 2

The rotation module is used to rotate upto six digital inputs in sequence. Rotation is triggered by a digital pulse on the rotate input. Only those inputs connected are rotated. This is typically used to rotate modular plant such as boilers, chillers, pumps etc to even out the wear on the individual items of plant.

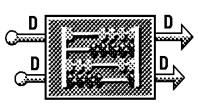
Current Lead (review only)	1 to 6	–
Rotate Allows the module to be manually rotated. Each selection rotates to the next item of plant.	On or Off	Off



STOP-WATCH MODULE x 4

The stop-watch module has a digital input that when set to on will run the stop-watch. The stop-watch will stop when the input is set to off. A second digital input on the module is used to reset the module to zero. A typical use for this module is plant hours run, boiler/chiller rotation, switching the logging module for timed logs etc.

Current Count This parameter is usually used to review the current count but it also allows the user to set an initial count value if required.	0 to 10,000	0
Roll-over Time The digital output will produce a pulse at the set roll-over time and the stop-watch will reset to zero and start counting again.	0 to 10,000	3600
Selected Count Units	Seconds, Minutes, Hours or Days	Secs



COUNTER MODULE x 4

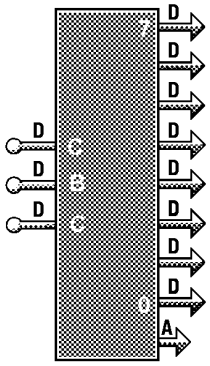
The counter module is used to count pulsed digital inputs on either the rising edge of the momentary digital input or on both the rising and falling edges. The secondary output will be pulsed each time a count is made. This includes the falling edge if that has been set in the counter. The secondary digital input is used to zero the counter at a time other than when the roll-over count is reached.

Current Count This parameter is usually used to review the current count but it also allows the user to set an initial count value if required.	0 to 10,000	0
Roll-over Count At a preset roll-over count the module will give a momentary output from the primary output, reset to zero and start counting again.	0 to 10,000	1000
Count Rising and Falling Edges Sets the module to count both the rising and falling edges of the pulsed input.	Yes or No	No

MODULES AND FUNCTIONS

Bubbleland Symbol **Module** **Range** **Default**

LOGIC MODULES (Cont.)

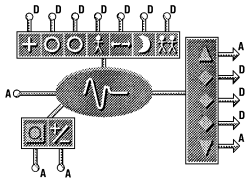


BINARY DECODER MODULE x 3

This module is used to decode a 3 bit binary encoded input and provide a single output on one of the digital outputs as shown in the table below. An analogue output is used to provide a numerical representation of the binary encoded input.

Input A	Input B	Input C	Decoded Output State	Value Output
OFF	OFF	OFF	0 ON the rest OFF	0
ON	OFF	OFF	1 ON the rest OFF	1
OFF	ON	OFF	2 ON the rest OFF	2
ON	ON	OFF	3 ON the rest OFF	3
OFF	OFF	ON	4 ON the rest OFF	4
ON	OFF	ON	5 ON the rest OFF	5
OFF	ON	ON	6 ON the rest OFF	6
ON	ON	ON	7 ON the rest OFF	7

CONTROL MODULES



CONTROLLER MODULE 2 STAGE x 3

Calculated Set Value (review only) –10,000 to 10,000 –
This parameter displays the calculated set value. This may differ from the main set value if reset is used.

Current Input Value (review only) –10,000 to 10,000 –
This parameter displays the current value of the main control sensor.

Schedule Mode (review only) Occupied 1, Occupied 2, Relaxed or Night –
This parameter shows the time schedule mode the control module is currently operating in.

Override None, Occupied 1, Relaxed, Occupied 2 or Night None
This parameter is used to override the controller.

Stage 1 Level 0 to 100% –
This parameter displays the Stage 1 output position as a percentage, where 0 = Full Off and 100 = Full On. In Temperature Control schemes Stage 1 is used for heating.

Stage 2 Level 0 to 100% –
This parameter displays the Stage 2 output position as a percentage, where 0 = Full Off and 100 = Full On. In temperature control schemes Stage 2 is used for cooling.

Set Value –10,000 to 10,000 19
This parameter is used to set the desired controller set value.

Set Value Minimum –10,000 to 10,000 –10,000
This value sets the lowest set value the controller is allowed to use.

Set Value Maximum –10,000 to 10,000 10,000
The value sets the highest set value the controller is allowed to use.

RPW Setting (review only) –10,000 to 10,000 –
This parameter displays the remote set value from the RPW input to the controller. When this input is used it will override the set value.

Reset Setting (review only) –10,000 to +10,000/10 Volts –
This parameter displays the influence that the reset input is having on the set value.

Reset Ratio –10,000 to +10,000/10 Volts 10
This setting is used to determine the influence that an analogue input connected to the reset input of the controller has over the main set value. By setting the value as a positive number the set value will be increased as the analogue input is increased. The opposite is true if it is set to a negative value.

Stage 1 Deadzone Occupied 0 to 10,000 1
The deadzone is the difference between the set value and the point at which the stage starts to control. This parameter is used whilst the controller is in occupied mode.

Stage 2 Deadzone Occupied 0 to 10,000 1
The deadzone is the difference between the set value and the point at which the stage starts to control. This parameter is used whilst the controller is in occupied mode.

Stage 1 Deadzone Relaxed 0 to 10,000 3
As for the occupied deadzone but only used whilst the controller is in relaxed mode.

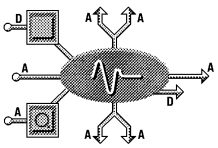
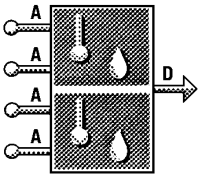
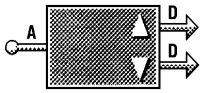
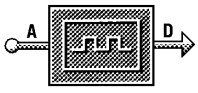
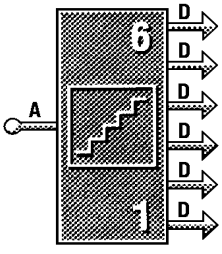
Stage 2 Deadzone Relaxed 0 to 10,000 3
As for the occupied deadzone but only used whilst the controller is in relaxed mode.

Stage 1 Deadzone Night 0 to 10,000 6
As for the occupied deadzone but only used whilst the controller is in night mode.

MODULES AND FUNCTIONS

Bubbleland Symbol	Module	Range	Default
CONTROL MODULES (Cont.)			
	Stage 2 Deadzone Night As for the occupied deadzone but only used whilst the controller is in night mode.	0 to 10,000	6
	Upper Deadzone (review only) This parameter displays the upper deadzone value that the IAC is currently using.	–10,000 to 10,000	–
	Lower Deadzone (review only) This parameter displays the lower deadzone value that the IAC is currently using.	–10,000 to 10,000	–
	Stage 1 Proportional Band This setting is the range over which the Stage 1 output moves proportionally across its full stroke.	0 to 10,000	10
	Stage 1 Integral Action Time (0 = Off) This parameter is the set time interval necessary for integral action time to increase the Stage 1 output by the current proportional level. Set to 0 for purely proportional control.	0 to 10,000 Seconds	300 Secs
	Stage 1 Derivative Action Time (0 = Off) This is usually left at zero. It is used where a faster control action is required and reducing the Proportional Band and/or Integral time causes hunting. As a guide, the derivative time must be set at less than a tenth of the Integral Time as a start point.	0 to 10,000 Seconds	0 Secs
	Stage 1 Ramp Time This determines the time in seconds for the output stage to change from fully closed to fully open (given a continuous demand).	0 to 10,000 Seconds	60 Secs
	Stage 2 Proportional Band This setting is the range over which the Stage 2 output moves proportionally across its full stroke.	0 to 10,000	10
	Stage 2 Integral Action Time (0 = Off) This parameter is the time interval necessary for integral action time to increase the Stage 2 output by the current proportional band. Set to 0 for purely proportional control.	0 to 10,000 Seconds	300 Secs
	Stage 2 Derivative Action Time (0 = Off) See Stage 1 Derivative Action Time	0 to 10,000 Seconds	0 Secs
	Stage 2 Ramp Time This determines the time in seconds for the output stage to change from fully closed to fully open (given a continuous demand)	0 to 10,000 Seconds	60 Secs
	Sample Time (0 = as fast as possible) This is the interval between successive readings of the measured values at the connected sensors. A short interval of say 10 seconds permits rapid response but only a small amount of corrective action. It is suited to systems having short time constants. A longer interval such as 20 seconds is slower to react but permits a larger amount of corrective action. For this reason it is suited to systems having medium length time constants. If control action tends to be too slow reduce the setting and if it tends to hunt increase it. This fine tuning should be done in small steps of around 10 to 20%.	0 to 10,000 Seconds	10 Secs
	Integral Action Method This setting determines the method of control by the IAC. Mode 'A' controls such that the IAC takes into account the deadzone and uses the end of the appropriate stage deadzone as the set value point. Mode 'B' controls using the actual set value.	Mode A or B	A
	Integral Action Dumping The IAC allows the use of integral action in two different modes. If the parameter is set to Off then the IAC holds the current control level when it enters its deadzone. This is done to avoid the IAC dropping straight back out of the deadzone again. Therefore, if the IAC enters its deadzone with Stage 1 in operation, the IAC will hold the Stage 1 as its current position rather than force the stage to a zero position. If the controller exits the deadzone back to Stage 1, the control action will resume at the previous point. If the controller exits the deadzone in Stage 2, then Stage 1 and its integral time would be forced to zero before Stage 2 was allowed to run. The opposite would be true if the controller went into deadzone with Stage 2 operating. If the parameter is set to On then the IAC zeros the operational stage as the controller enters the deadzone. In some systems this may cause hunting.	On or Off	Off
	Boost Stage This parameter selects which stage is boosted when the controller is in a boost condition.	1 or 2	1
	Boost in Occupied Period 1 This parameter selects whether the controller stage should be boosted to 100% when it enters the first occupied period of each day. The boost will be held until the set value is reached if Integral Action Dumping is OFF. Controls to deadzone if Integral Action Dumping is ON.	Yes or No	No
	Boost in Occupied Period 2 As for Boost in Occupied Period 1 but for the second occupied period of each day.	Yes or No	No

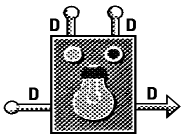
MODULES AND FUNCTIONS

Bubbleland Symbol	Module	Range	Default
CONTROL MODULES (Cont.)			
	Boost (review only) This parameter shows the influence boost is having on the currently active stage. As boost overrides the stage fully on, the level can only ever be 0 or 100%.	0 or 100%	–
	**CASCADE CONTROL MODULE** x 3 The cascade control module provides a single stage P + I + D controller. This control module can be linked to other cascade controller modules within the same IAC to provide more than one stage of control. The cascade controller modules are cascaded together by using the special double nodes. When cascaded together the software ensures that only one module (stage) is active at any one time. Control is passed between the modules to ensure a smooth transition from one to the next. Integral and/or derivative action can be disabled by setting them to zero.		
	Set Value	–10,000 to 10,000	55
	Proportional Band	0 to 10,000	40
	Integral Action Time	0 to 10,000	20
	Derivative Action Time	0 to 10,000	0
	Stage Type - This parameter is used to set either Htg = RA = 0 or Clg = DA = 1	0 to 1	0
	Actuator Stroke Time	0 to 1	0
	**ENTHALPY COMPARATOR MODULE** x 1 The Enthalpy Comparator module consists of two pairs of temperature and humidity inputs. The Enthalpy is calculated from each pair of temperature/humidity inputs. The output is on if the top pair of inputs have a greater enthalpy (total heat content) than the bottom pair. Typically this module is used to compare the enthalpy of the recirculated air and fresh air and to override the controller to minimum or maximum fresh air depending on application.		
	**PULSED PAIR DRIVER MODULE** x 3		
	Stroke Time This parameter allows the actuator stroke time to be set and is used by the IAC to determine the position of the actuator on the output stage.	0 to 10,000 Seconds	65 Secs
	Run On Time This parameter sets the maximum actuator run on time. The output will be turned off if the pulse pair driver has been running in one direction for longer than the programmed Run On Time.	0 to 10,000 Seconds	600 Secs
	Action (review only) This parameter displays the current output state of the stage.	Stopped, Increasing, Decreasing, at Minimum or at Maximum	–
	Current Position as a percentage of stroke (review only) This parameter displays the approximate position of the actuator as a percentage of its full stroke, where 0 = fully Closed and 100 = fully Open.	0 to 100%	–
	Current Run Time (review only) This parameter displays the number of seconds that the actuator has been running in one direction. The number of seconds is reset to zero when the direction of movement changes.	0 to 10,000 Seconds	–
	**PULSE WIDTH MODULATION MODULE** x 4		
	Cycle Period The length of the cycle the period corresponds to the pulse time required for 100% opening of the wax actuator. This parameter allows the cycle period to be set. The IAC then uses this time to work out the length of pulse required to position the actuator when it is being controlled.	1 to 3,600 Seconds	20 Secs
	**STEP DRIVER MODULE** x 3 When driving the step driver module from a voltage or control module stage output then values between 0 and 100 should be set where 0 = 0V or fully Off and 100 = 10V or fully On.		
	Step 1 Switch on Point (Bottom Step) This parameter is used to set the switch on point for the step.	–10,000 to 10,000	10
	Step 2 Switch on Point This parameter is used to set the switch on point for the step.	–10,000 to 10,000	20
	Step 3 Switch on Point This parameter is used to set the switch on point for the step.	–10,000 to 10,000	40
	Step 4 Switch on Point This parameter is used to set the switch on point for the step.	–10,000 to 10,000	60
	Step 5 Switch on Point This parameter is used to set the switch on point for the step.	–10,000 to 10,000	80
	Step 6 Switch on Point (Top Step) This parameter is used to set the switch on point for the step.	–10,000 to 10,000	90
	Switching Hysteresis This allows the hysteresis to be set for all the stages and should always be set to less than the smallest gap between steps, this should be done to avoid erratic control.	0 to 10,000	5

MODULES AND FUNCTIONS

Bubbleland Symbol	Module	Range	Default

CONTROL MODULES (Cont.)

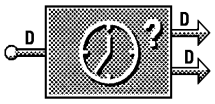


LIGHTING CONTROL MODULE x 1

This module is used to switch the lighting on and off. The primary input is normally connected to the time schedule on output(s). The two override inputs can be used to override the lighting On or Off. The digital output is then used to switch the lights.

Status (review only) This parameter displays the actual lighting output state.	Off or On	–
DIP 1 The lights can be set up to dip off at a point before they are set to go off. This parameter allows the point for the dip to occur to be set. Set to 0 to disable the dip.	0 to 10,000 Seconds	0 Secs
DIP 2 A second dip is allowed as a final warning that the lighting is about to be switched off. The point at which this dip occurs is set from this parameter. Set to 0 to disable the dip.	0 to 10,000 Seconds	0 Secs
DIP Time This sets the length of time that the lights dip off for.	0 to 10,000 Seconds	1 Sec
Computer Override This parameter is used to override the lighting schedule from the computer. The lights will not dip they will be turned off immediately the IAC receives the signal.		

MISCELLANEOUS MODULES



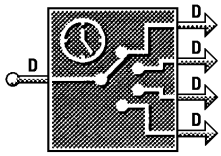
CLOCK MODULE x 1

The clock module is used by the IAC to keep the time. The digital input is used to re-synchronize the clock when the IAC is used in a standalone mode. The digital outputs are used to show the clock state e.g. time lost (labelled '?') and clock running.
The clock module also includes summer/winter changeover. However, this function is only enabled (within the controller) if the real time clock board is fitted.

NOTES:

1. Touch-screen
   The Touch-screen will update the time on all IACs on its SUB LAN once per day (at midnight). The Touch-screen monitors the IAC clocks for time lost, on seeing this the time is updated on all the IACs.
   The Touch-screen will update all the IACs if its own time is updated.
2. Computer Running Satchnet
   The computer will update the time on LAN sites every 5 minutes. WAN sites are updated when they are contacted.

Re-synchronization Time If the IAC is operating in a standalone mode and does not have an RTC board fitted, then it is desirable to re-synchronize the clock on a regular basis. This is achieved from an external time switch momentary contact and this setting tells the IAC at what time this will occur.	0000 to 2359	0000
Re-synchronization Day of the Week This parameter tells the IAC on what day the re-synchronization contact will operate. If the clock is set to be re-synchronized every day set this parameter to All.	Monday to Sunday or All	Monday

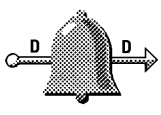


TIME SCHEDULE MODULES x 3

The 'Time Schedule' module has a single digital input which should be connected to the 'Clock running' output of the 'Clock' module.
The time schedules consist of seven individual day schedules, each day having four separate switching points. Each of the four output nodes corresponds to a switching point and consequently only one node will be 'ON' at any given time.

The times must be set in 24 hour format i.e. 3:00 AM is set as 0300.

If only one ON/OFF is required for a day then the first switching point is set to the ON time and the remaining switching points are set to the OFF time.	0000 to 2359	1st Switching Point 0800 2nd Switching Point 1700 3rd Switching Point 1700 4th Switching Point 1700



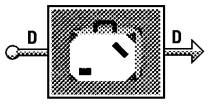
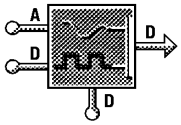
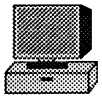
ALARM MODULES x 6

The alarm module is used to monitor a digital signal, when the signal is on the alarm module registers an alarm present and gives a digital signal out. When the alarm is acknowledged from the computer, the output is turned off.

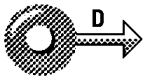
NOTE:- The alarm is triggered by the input to the module being on. For temperature/voltage alarms use a threshold module to give a switched output.

Alarm Status (review only) This parameter shows the state of the alarm.	No Alarm, Alarm, Accept Alarm or Alarm Acknowledge	–

MODULES AND FUNCTIONS

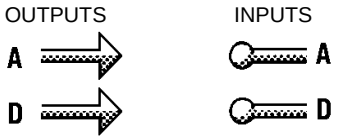
Bubbleland Symbol	Module	Range	Default
MISCELLANEOUS MODULES (Cont.)			
	Accept Alarm This parameter allows the alarms to be acknowledged.	Yes or No	–
	**HOLIDAY MODULE** x 6 The holiday module allows a holiday to be set in advance. The Holiday Enable Digital input must be on to allow the preset holiday to take place. This input would normally be connected to the clock running output. When a holiday condition exists the module output will be on and could be connected to, for instance, the night or relaxed override input of one or more control modules. **NOTE:-** The holiday schedule will only operate if it is connected and set before the holiday start date.		
	Current State (review only) Shows the current state of the holiday module digital output.	On or Off	–
	Holiday Enable Manual override to disable the holiday from the computer if required	Yes or No	Yes
	Start of Holiday Week Number This sets the week number that the holiday is to start in.	1 to 53	1
	Start of Holiday Day This sets the Day that the holiday is to start on.	Monday to Sunday	Monday
	End of Holiday Week Number This sets the week number that the holiday will finish in.	1 to 53	1
	End of Holiday Day This sets the Day that the holiday will finish on.	Monday to Sunday	Monday
	**LOGGING MODULE** x 2 The logging module will log 50 analogue values and 50 digital states. Each value/state log will be taken when a second digital input is momentarily set to ON. A digital output is switched ON when the logging module is full. This output can be used to disable the logging module. If the logging module is not disabled it will continue to log and overwrite the oldest logged information. Logged data can be viewed via the IAC600 Touch-screen or on Satchnet PRO (V6.21 or later).		
	**SYSTEM MODULE** - (See Note 1 Page 12) (This module may be placed on screen as often as required) This module has no inputs or outputs and is intended to give information on system settings and allow them to be changed. This module would normally only be used when commissioning		
	Preset Application (0 = Software Preset) This displays the current preset application number and allows a new one to be loaded.	0 to 8	–
	Detector Speed This allows the detector sensing speed to be set. The Fast speed should only be set when using simulators for the detector inputs. **NOTE:-** This must be set to Normal for normal controller operation.	Fast or Normal	Normal
	Force Reset This button is used to force the controller to reset.	Yes or No	No
	Reload Defaults This button is used to force the controller to reload all of its default values. **NOTE:-** This will overwrite any parameters set by the user originally. The controller is also automatically reset.	Yes or No	No
	Null Outputs This button is used to send the controller into its Null Output Mode. In this mode all controller outputs are turned off and all module links are disconnected. On leaving this mode, the module links are re-connected and the outputs resume normal operation. Null Output is the highest priority override on the controller. If the IAC keeps sending itself into Null Output Mode, reload defaults should be used. This will overwrite any parameters set by the user.	Yes or No	No
	Detector Sequence This setting selects the sequence in which the detectors are read. The default setting is 0 and this setting gives an equal priority to all detectors. Selecting 1 will give priority to temperature (resistive) input 1 and 2 gives priority to analogue (Voltage) input 1. Sequences 1 or 2 should be used when a fast reacting loop must be controlled.	0 to 2	0
REFERENCE MODULES			
	**DIGITAL MONITOR MODULE** x 16 This module displays the state of any digital output connected to it. This would generally be used for checking module operation.		
	Current State (review only) This parameter displays the current input state of the module.	On or Off	–
	**DIGITAL REFERENCE MODULE** x 16 This module gives a single digital output that can be turned on or off by clicking on the module. This would generally be used for checking module operation.		
	Current State This parameter allows the user to change the output of the module.	On or Off	Off

MODULES AND FUNCTIONS

Bubbleland Symbol	Module	Range	Default
REFERENCE MODULES (Cont.)			
	**ANALOGUE MONITOR MODULE** x 16 This module displays the current analogue value of any analogue output connected to it. The value can be scaled in the same way as with scaling modules however there is no physical output just a value. This would generally be used for checking module operation or presenting a scaled value. For instance, to display temperatures to 1 decimal place, set the input minimum to –40, the output minimum to –400, the input maximum to 150 and the output maximum to 1500. The **Value/10** parameter will now display temperature to 1 decimal place.		
	Value (review only) This parameter displays the analogue input value AFTER the scaling has been calculated.	–32,000 to 32,000	–
	Value/10 This parameter displays the analogue input value AFTER the scaling has been carried out. This value is divided by 10.	–32,000 to 32,000	–
	Input Minimum Value	–32,000 to 32,000	0
	Output Minimum Value	–10,000 to 10,000	0
	Input Maximum Value	–32,000 to 32,000	100
	Output Maximum Value	–10,000 to 10,000	100
	**ANALOGUE REFERENCE MODULE** x 16 This module gives an analogue value output that can be set by the user. The output value can be scaled in the same way as on a scaling module to allow input of values to a number of decimal places or in different units. This would generally be used for checking module operation.		
	Reference Value This parameter displays and allows the user to set the analogue output value BEFORE the scaling has been calculated.	–10,000 to 10,000	–
	Input Minimum Value	–32,000 to 32,000	0
	Output Minimum Value	–10,000 to 10,000	0
	Input Maximum Value	–32,000 to 32,000	100
	Output Maximum Value	–10,000 to 10,000	100
	**FLASHER MODULE** - (See Note 1 below) (The module may be placed on screen as often as required) The flasher module gives a pulsed digital output the rate of which can be set by the user. As the rate is arbitrary and will vary with the controller workload, it should be used for non critical applications only.		
	Flash Rate The flash rate is set in arbitrary units 0 being the fastest and 100 the slowest. The on and off times are of similar length.	0 to 100	5
	**DIGITAL ONE MODULE**- (See Note 1 below) (The module may be placed on screen as often as required) This module gives a digital output that is always ON. This would generally be used for checking module operation.		
	**DIGITAL ZERO MODULE**- (See Note 1 below) (The module may be placed on screen as often as required) This module gives a digital output that is always OFF. This would generally be used for checking module operation.		
	**POWER ON REFERENCE MODULE**- (See Note 1 below) (The module may be placed on screen as often as required) This module gives a single pulsed on digital output each time the controller power is switched on or the controller is reset. This can be used to enable a sequence of events to occur each time power to the controller is reinstated. These events could, for instance, be start up delays etc. The output can be latched if required.		

NOTE 1:
A combination of the System Module, Flasher Module, Digital One, Digital Zero and Power on Ref. Module, not totalling more than 100, is available i.e. 20 of each, or 50 each of 2 types.

PERMISSIBLE CONNECTIONS



A = Analogue–10,000 to 10,000

D = Digital ON or OFF

Voltage signals 0 = 0V, 50 = 5V, 100 = 10V
Controller output signals 0 = off, 100 = full on

EXAMPLE COMPENSATION SET-UP

To configure a controller module to operate a compensation scheme connect the modules as follows:

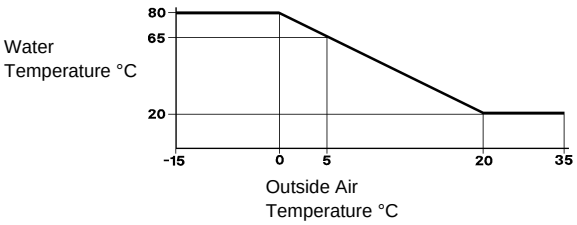
Water/Air Supply sensor connected to controller module main sensor input.

Outside sensor connected to RPW input via a look-up table module.

Wind sensor connected to the 0 to 10 Volt reset input (optional).

Other inputs and outputs would be connected as for normal control schemes.

Example Look-Up Table settings for the graph below:-



OUTSIDE TEMP.	SUPPLY SET VALUE
1: IN0	OUT 80
2: IN5	OUT 65
3: IN20	OUT 20
Settings 4 to 11 set to '---' (unused).	

APPLICATIONS

The IAC has a number of preset applications built in. The preset applications are selected from the 8 way bit switch on the IAC.

It is important to note that **any** application may be customised by using the computer and it will be stored in the IAC even in the event of a power failure. The supplied applications are merely a starting point for a system but if the supplied application suits your system it may be used as it stands.

Hardware Preset Applications

There are currently 8 preset applications that can be selected from the 8 way bit switch and they are as follows:-

Preset 0 – Fully configurable

No links are made between modules. This preset should be chosen if you wish to configure the IAC completely.

APPLICATION NOTES

If an application is to be used on an IAC via a computer select software preset 0. Use the configuration library in the Satchnet Computer Software to load the required preset application from disk. Then send the configuration to the controller.

Most applications include one or more time schedules. If the IAC is connected to a computer then the IAC will operate on its own time schedule. If it is not then the IAC will default to its comfort state.

Most applications can be used as single stage if required by setting the unused stage as follows:

Proportional Band = 10,000
Integral Action Time = 0
Derivative Action Time = 0
Ramp Time = 0

Many applications have a number of options in most cases these are selected via Satchnet but in some cases selection is automatic when, for instance, a sensor is not fitted.

Operating Modes

The controller operating modes are shown in the graph below:

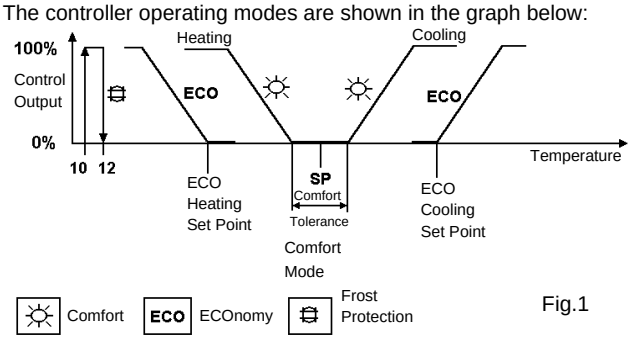


Fig.1

Comfort (Day) Mode - Comfort mode is the mode that the controller will normally be operating when the space is occupied. The controller has a dead zone between the heating and cooling stage and cools to the comfort set point. The dead zone is determined by the Comfort Tolerance setting. This tolerance is divided in two and one half is added to the cooling set value and half is subtracted from the heating set value. One of three things will put the controller in comfort mode; the time schedule, the software override or the hardware (PIR) override.

ECOnomy Mode - This mode is used when the space is temporarily unoccupied. It is initiated if the time schedule is inactive, if the hardware override (PIR) has been OFF for more than the set time (15 Minutes default) or if the software override is ON. When the controller is in ECO mode it will effectively operate on a wider dead zone.

Night (OFF) Mode - When night mode is active all outputs will be OFF unless frost protection is activated. Night mode is initiated by the hardware override (for example a window contact) or the software override.

Hardware/Software Overrides

The controller can be overridden by various hardware and software overrides, the table below lists the priority of each of those overrides on the controller.

Override Type	Priority
Night override	1
Comfort override	2
ECO override	3

FUNCTIONS

Application presets have some or all of the following general functions. See the appropriate application for information on which functions are available.

Set Point Adjustment

The comfort set point is set on the controller via Satchnet but can also be set remotely by using an adjustable sensor or RPW.

Frost Protection

When the controller is running in Night mode with all the outputs OFF the room temperature is monitored for a frost temperature condition (room <10°C). If a frost condition occurs the heating output is set to 100% and the fan speed (if used) is set to 1.

When the room temperature rises above the frost off limit (room >12°C) the heating output is set to OFF and the fan will stop once the fan overrun timer is satisfied.

Fan Speed Control

When the controller is operating in comfort mode and the fan is in automatic control the speed will be determined by the heating/cooling output shown below. The fan will always run at speed 1 if the control output is zero.

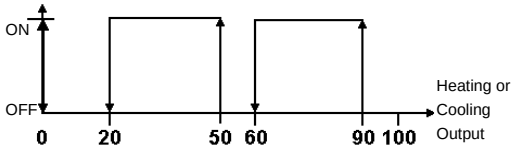


Fig.2

When the controller is switched to ECO mode the fan will be switched OFF 5 minutes after the heating and cooling outputs have returned to zero. The fan is also controlled from the heating/cooling demand and so is not always off.

When the controller is switched to night mode the fan will be switched OFF 5 minutes after the heating and cooling outputs have returned to zero. In the event of a frost condition the fan will be switched to speed 1 until the frost condition clears at which point the fan will be switched OFF 5 minutes after the heating output has returned to zero.

Change-Over Function

The change-over function is used when the fan coil unit has only one valve and is capable of operating in a heating or cooling mode. The water temperature supplied to the valve determines whether the fan coil unit heats or cools. A sensor is used to sense the supply water temperature and reverses the control action of the controller.

When the supply is above 25°C the controller will operate in a heating mode. If the water supply drops below 15°C the controller will operate in a cooling mode.

If heating only is required on a change-over system then do not fit the change-over sensor and select heating only by setting the digital reference module to ON. This will disable the cooling stage and allow the heating stage to function normally.

If cooling only is required on a change-over system then do not fit the change-over sensor and select cooling only by setting the digital reference module to OFF. This will disable the heating stage and allow the cooling stage to function normally.

Night Override Contact

A contact can be used to switch the controller in to Night (OFF) mode. This can, for example, be a window contact. When the contact is open the override is active.

ECO Override Contact

An ECO override contact is used to switch the controller between comfort and ECO modes. This can be, for example, an occupancy/presence switch such as a PIR. When the contact is open the override is active.

Condensation Monitoring

A switching sensor is used to monitor the room for condensation. If condensation occurs then the controller is overridden to night until the condensation is removed (effectively the cooling output is set to zero).

Actuators

Actuators may be the Satchwell 24Vac type that are driven open on one triac and closed on the other, the Satchwell 0 to 10Vdc type or thermic Pulse Width Modulated (PWM) actuators that are driven from a single triac. The 0 to 10Vdc output will always operate but a selection must be made if you wish to use PWM or pulsed pair actuators. This option is selected from the digital reference module with ON selecting pulse pair and OFF selecting PWM. This selection is carried out during commissioning.

Configurable Inputs

The configurable inputs are set up as shown in the table for all of the preset applications.

Input Number	Terminal Number	Jumper Setting - Type
1	10	P - Resistive (Default)
2	9	M - Resistive (Default)
3	8	J - Resistive (Default)
4	7	H - Digital
5	6	E - Digital
6	4	C - Voltage

APPLICATION DETAILS

2 PIPE FAN COIL UNIT CONTROL WITH AUTO CHANGE-OVER - PRESET 1

Other Applications available in preset 1:
2 Pipe fan coil unit control, heating only
2 Pipe fan coil unit control, cooling only
For 2 pipe fan coil unit control with auto change-over and fan speed control use preset 2

This is a simple 2 pipe fan coil unit application with auto change-over. The water temperature supplied to the valve determines whether the fan coil unit heats or cools. A sensor is used to sense the supply water temperature and reverses the control action of the controller.

When the supply is above 25°C the controller will operate in a heating mode. If the water supply drops below 15°C the controller will operate in a cooling mode.

To select single stage heating only do not fit the change-over sensor and select heating only by setting the digital reference module to ON. This will disable the cooling stage and allow the heating stage to function normally.

To select single stage cooling only do not fit the change-over sensor and select cooling only by setting the digital reference module to OFF. This will disable the heating stage and allow the cooling stage to function normally.

The time schedule will switch the controller between comfort and ECO modes. An occupancy sensor/presence switch can be connected to override the controller to ECO mode when the room is unoccupied. By using a window switch the controller can be overridden to Night mode. Frost protection is active when the controller is operating in Night mode. In the event of a frost condition being detected the controller output is set to 100% (assuming the controller is capable of running in heating mode).

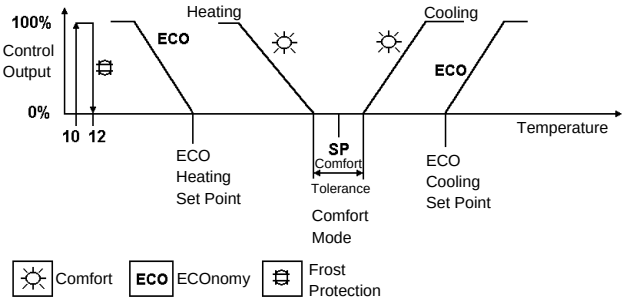
Available Functions

Change-over function

External ECO override (Occupancy sensor/presence switch)

External Night override (Window contact)

RPW - Remote set point



APPLICATION DIAGRAM

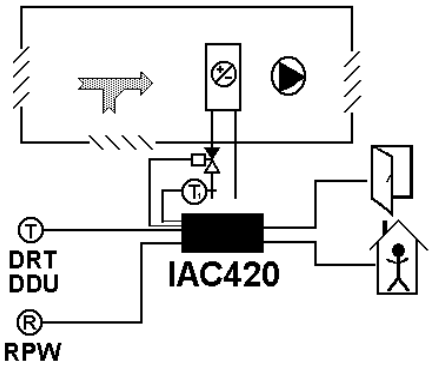


Fig.3

WIRING DIAGRAM

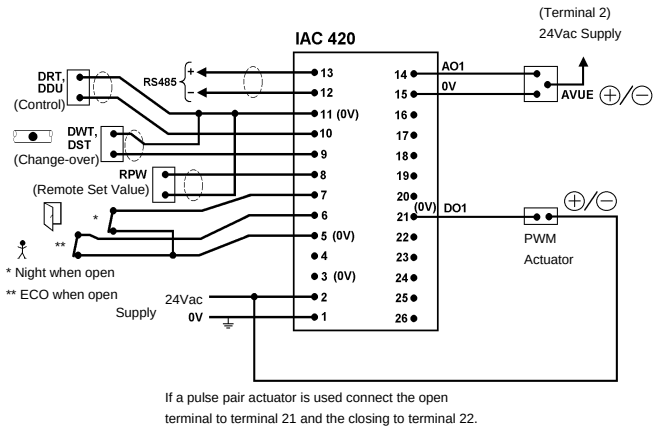


Fig.4

2 PIPE FAN COIL UNIT WITH AUTO CHANGE-OVER AND 3 SPEED FAN CONTROL - PRESET 2

Other Applications available in preset 2:
2 Pipe fan coil unit control, heating only
2 Pipe fan coil unit control, cooling only
If 3 speed fan control is not required used Preset 1.

This is an application for a 2 pipe fan coil unit controller with auto change-over and 3 speed fan control. The water temperature supplied to the valve determines whether the fan coil unit heats or cools. A sensor is used to sense the supply water temperature and reverses the control action of the controller.

When the supply is above 25°C the controller will operate in a heating mode. If the water supply drops below 15°C the controller will operate in a cooling mode.

To select single stage heating only do not fit the change-over sensor and select heating only by setting the digital reference module to ON. This will disable the cooling stage and allow the heating stage to function normally.

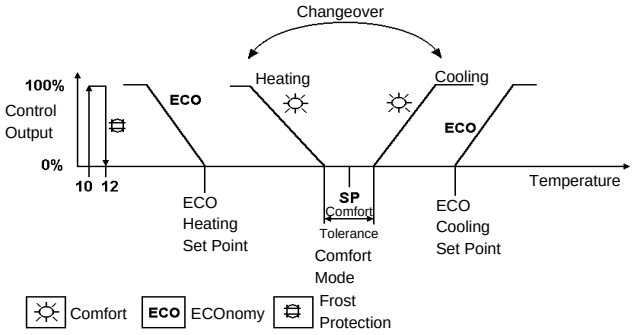
To select single stage cooling only do not fit the change-over sensor and select cooling only by setting the digital reference module to OFF. This will disable the heating stage and allow the cooling stage to function normally.

The time schedule will switch the controller between comfort and ECO modes. An occupancy sensor/presence switch can be connected to override the controller to ECO mode when the room is unoccupied. By using a window switch the controller can be overridden to Night mode. Frost protection is active when the controller is operating in Night mode. In the event of a frost condition being detected the controller output is set to 100% (assuming the controller is capable of running in heating mode).

When the controller is in Comfort or ECO mode the fan speed is controlled based on the heating/cooling demand. When the controller is in comfort mode the fan always runs at a minimum of speed 1. The fan has a 5 minute run on time after the heating/cooling demand has reached zero.

Available Functions

Change-over function
3 Speed fan
External ECO override (Occupancy sensor/presence switch)
External Night override (Window contact)
RPW - Remote set point



APPLICATION DIAGRAM

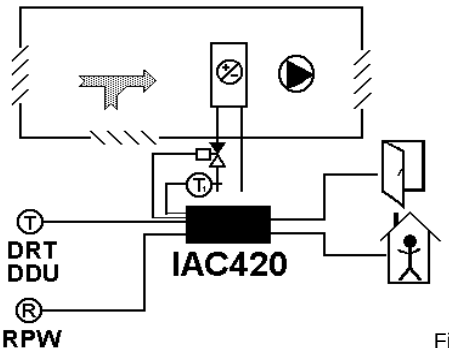
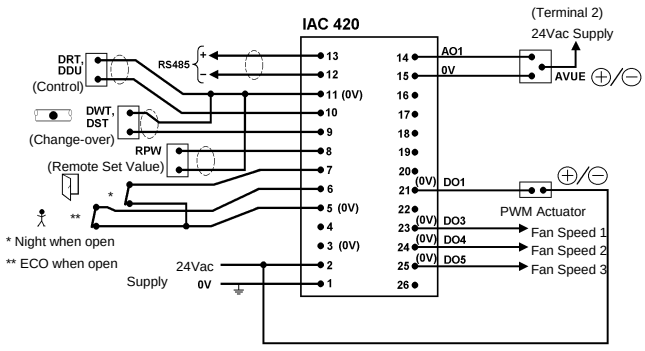


Fig.5

WIRING DIAGRAM



If a pulse pair actuator is used connect the open terminal to terminal 21 and the closing to terminal 22.

Fig.6

FOUR PIPE FAN COIL UNIT CONTROL - PRESET 3

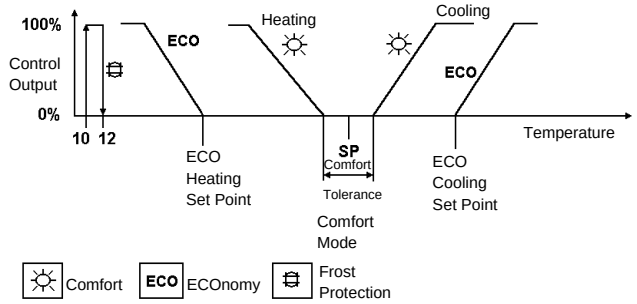
Other Applications available in preset 3:
None.
For a four pipe fan coil unit with fan speed control use Preset 4.
For single stage operation use Preset 1.

This is an application for a simple 4 pipe fan coil unit controller. The application controls a heating and cooling stage.

The time schedule will switch the controller between comfort and ECO modes. An occupancy sensor/presence switch can be connected to override the controller to ECO mode when the room is unoccupied. By using a window switch the controller can be overridden to Night mode. Frost protection is active when the controller is operating in Night mode. In the event of a frost condition being detected the controller output is set to 100%.

Available Functions

External ECO override (Occupancy sensor/presence switch)
External Night override (Window contact)
RPW - Remote set point



APPLICATION DIAGRAM

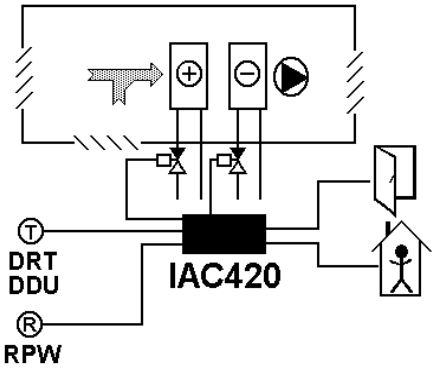
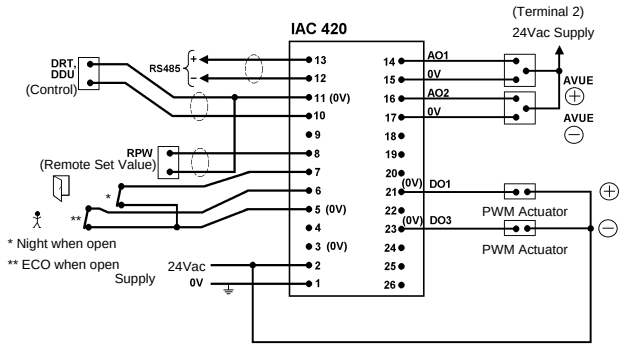


Fig.7

WIRING DIAGRAM



If a pulse pair actuator is used connect the open terminal to terminal 21 (23 cooling) and the closing terminal to terminal 22 (24 cooling).

Fig.8

FOUR PIPE FAN COIL UNIT CONTROL WITH 3 SPEED FAN CONTROL - PRESET 4

Other Applications available in preset 4:
None.
For a four pipe fan coil unit without fan speed control use Preset 3.
For single stage operation use Preset 2.

This is an application for a simple 4 pipe fan coil unit controller with 3 speed fan control.

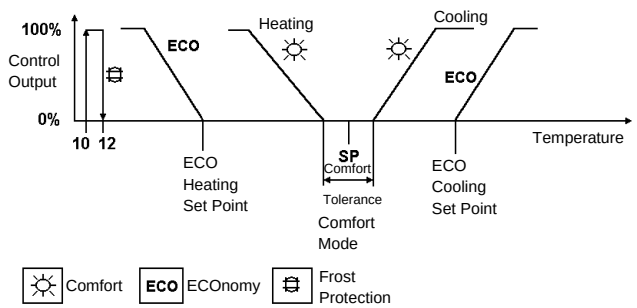
The time schedule will switch the controller between comfort and ECO modes. An occupancy sensor/presence switch can be connected to override the controller to ECO mode when the room is unoccupied. By using a window switch the controller can be overridden to Night mode. Frost protection is active when the controller is operating in Night mode. In the event of a frost condition being detected the controller output is set to 100%.

When the controller is in Comfort or ECO mode the fan speed is controlled based on the heating/cooling demand. When the controller is in comfort mode the fan always runs at a minimum of speed 1. The fan has a 5 minute run on time after the heating/cooling demand has reached zero.

This application can only use PWM or 0 to 10Vdc type actuators there is no option for pulsed pair actuators.

Available Functions

External ECO override (Occupancy sensor/presence switch)
External Night override (Window contact)
RPW - Remote set point
3 Speed fan control



APPLICATION DIAGRAM

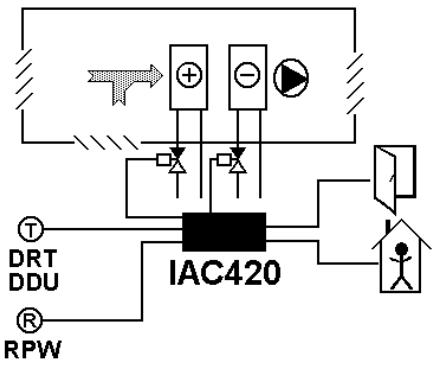


Fig.9

WIRING DIAGRAM

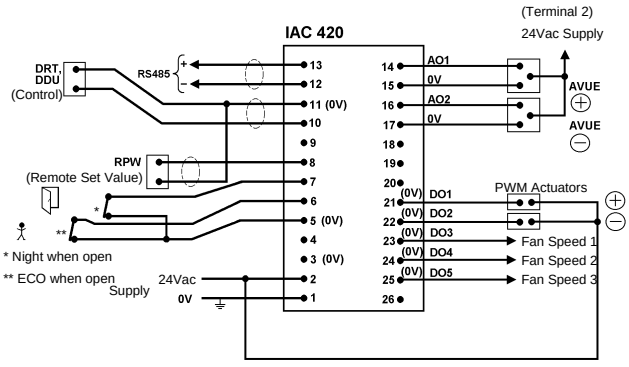


Fig.10

CHILLED CEILING/BEAM, ZONE HEATING AND CONDENSATION MONITORING - PRESET 5

Other Applications available in preset 5:
Room with zone heating
Room with chilled ceiling/beam

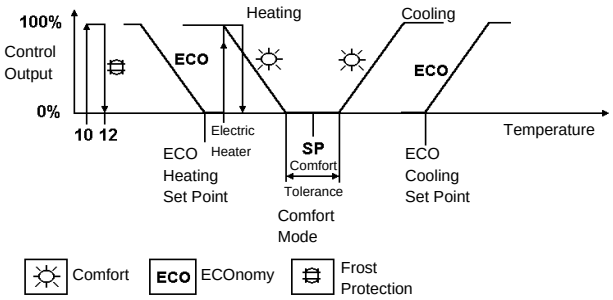
This application is designed to control chilled ceilings/beams with zone heating. The application includes condensation monitoring that is connected in parallel with the Night override (window switch) input. The condensation switch will operate so that its contact is open when condensation is sensed putting the controller into night mode. The heating and cooling outputs are set to zero until the condensation is removed.

The time schedule will switch the controller between comfort and ECO modes. An occupancy sensor/presence switch can be connected to override the controller to ECO mode when the room is unoccupied. By using a window switch the controller can be overridden to Night mode. Frost protection is active when the controller is operating in Night mode. In the event of a frost condition being detected the controller output is set to 100%.

Contact TAC for details of the condensation switch.

Available Functions

Condensation monitoring
External ECO override (Occupancy sensor/presence switch)
External Night override (Window contact)
RPW - Remote set point



APPLICATION DIAGRAM

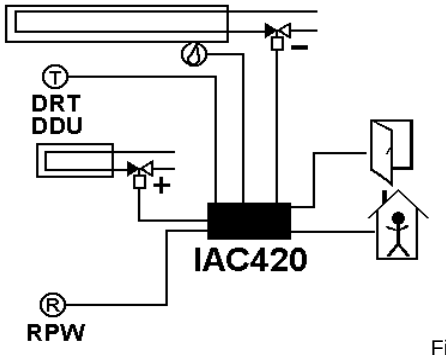
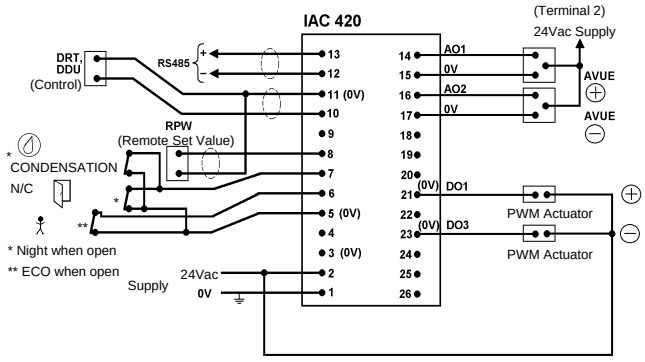


Fig.11

WIRING DIAGRAM



If a pulse pair actuator is used connect the open terminal to terminal 21 (23 cooling) and the closing terminal to terminal 22 (24 cooling).

Fig.12

ZONE HEATING - PRESET 6

Other Applications available in preset 6:
None

This is simple single stage zone heating application.

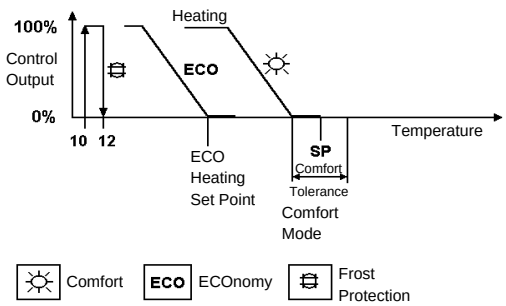
The time schedule will switch the controller between comfort and ECO modes. An occupancy sensor/presence switch can be connected to override the controller to ECO mode when the room is unoccupied. By using a window switch the controller can be overridden to Night mode. Frost protection is active when the controller is operating in Night mode. In the event of a frost condition being detected the controller output is set to 100%.

Actuators may be the standard Satchwell 24Vac type that are driven open on one triac and closed on the other, the Satchwell 0 to 10Vdc type or thermic Pulse Width Modulated (PWM) actuators that are driven from a single triac. The 0 to 10Vdc output will always operate but a selection must be made if you wish to use PWM or pulsed pair actuators. This option is selected from the digital reference module with ON selecting pulse pair and OFF selecting PWM. This selection is carried out during commissioning.

The controller set point can be remotely adjusted from an RPW.

Available Functions

External ECO override (Occupancy sensor/presence switch)
External Night override (Window contact)
RPW - Remote set point



APPLICATION DIAGRAM

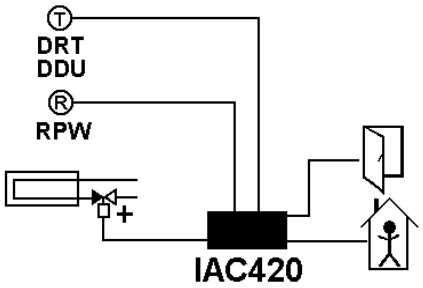
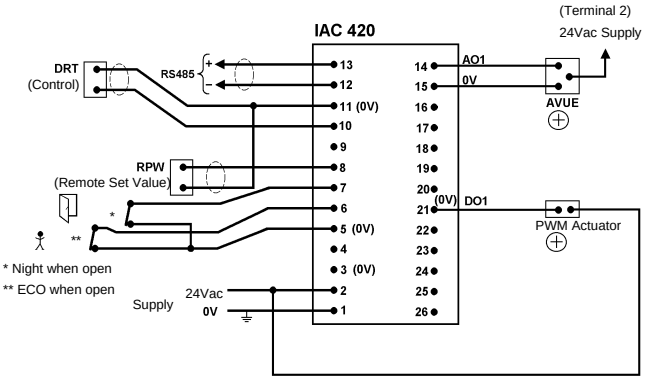


Fig.13

WIRING DIAGRAM



If a pulse pair actuator is used connect the open terminal to terminal 21 and the closing terminal to terminal 22.

Fig.14

PRESSURE DEPENDANT VAV, AIR COOLING and HEATING COIL - PRESET 7

Other Applications available in preset 7:
Pressure dependant VAV, Air cooling

This is a simple pressure dependant VAV application in which a heating coil and a damper controlling cool air are controlled.

The time schedule will switch the controller between comfort and ECO modes. An occupancy sensor/presence switch can be connected to override the controller to ECO mode when the room is unoccupied. By using a window switch the controller can be overridden to Night mode. Frost protection is active when the controller is operating in Night mode. In the event of a frost condition being detected the controller output is set to 100%.

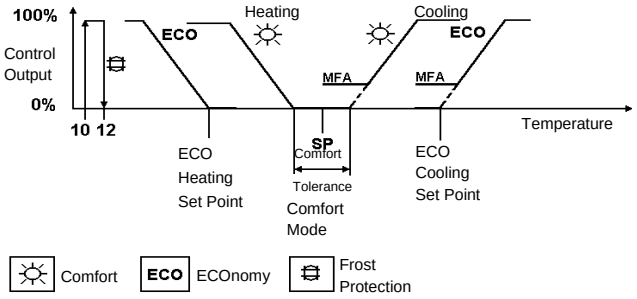
The heating actuator may be the Satchwell 24Vac type that is driven open on one triac and closed on the other, the Satchwell 0 to 10Vdc type or thermic Pulse Width Modulated (PWM) actuators that are driven from a single triac. The 0 to 10Vdc output will always operate but a selection must be made if you wish to use a PWM or pulsed pair actuator. This option is selected from the digital reference module with ON selecting pulse pair and OFF selecting PWM. This selection is carried out during commissioning.

As the cooling output is driving a damper it is not possible to use a PWM actuator on the cooling output.

The controller set point can be remotely adjusted from an RPW.

Available Functions

External ECO override (Occupancy sensor/presence switch)
External Night override (Window contact)
RPW - Remote set point



APPLICATION DIAGRAM

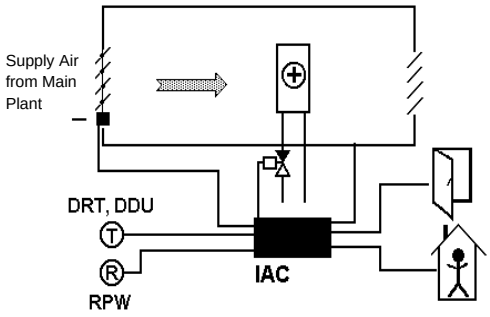
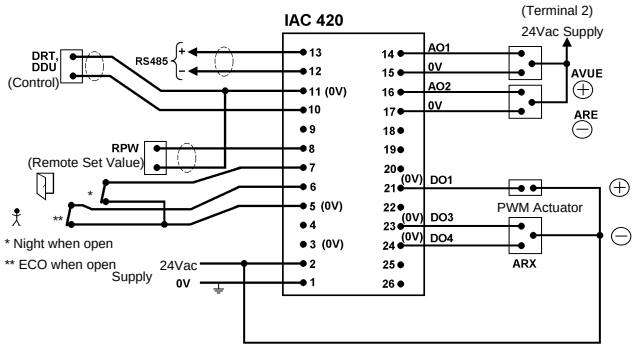


Fig.15

WIRING DIAGRAM



If a pulse pair actuator is used connect the open terminal to terminal 21 and the closing terminal to terminal 22. It is not possible to use a pulse pair actuator on the cooling (damper) output.

Fig.16

LIGHT ON/OFF CONTROL - PRESET 8

Other Applications available in preset 8:
None

This is a simple on/off lighting control application which can be operated by either occupancy/presence sensors or on an optional time schedule.

With the occupancy sensor the lights are switched on when movement is detected. If no movement is detected for 15 minutes, the lights are switched off. The lights can be permanently switched on with the use of a presence sensor.

if the optional time schedule is selected for control, the on and off times can be pre-programmed.

APPLICATION DIAGRAM

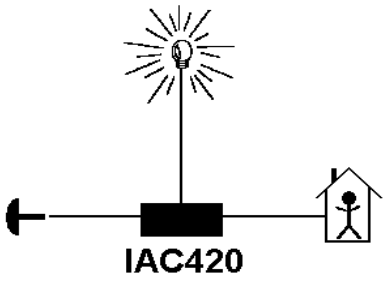


Fig.17

WIRING DIAGRAM

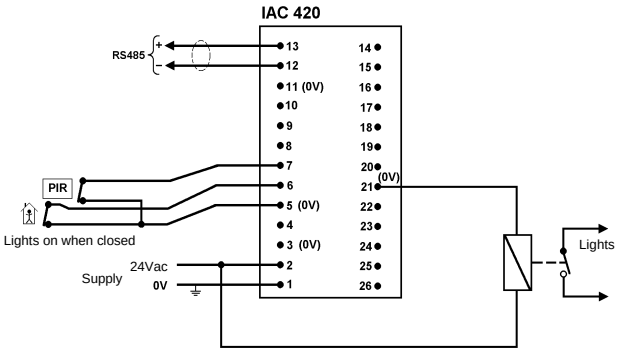


Fig.18

REMOTE OPERATION AND INTERROGATION

The IAC is connected, as part of a network, to a remote computer via the Serial Link, all of the setting and interrogation functions are carried out at the computer terminal.

Each IAC will be identified by a unique Address Code which is set up via switch SW1 located to the right of the upper terminal block. This allows the computer to select the desired IAC on the network. Up to a maximum of 32 IAC Controllers (or similar compatible devices) may be connected to a LAN (more if a separate MIU or IAC Touch-screen is used).

TOUCH-SCREEN SUB LAN ADDRESS

If the IAC is on a Touch-screen Sub LAN then the address which the computer uses is as follows:-

((Touch-screen address – 64) x 100) + IAC set address

e.g. Touch-screen address = 68
IAC address = 3
Computer address for the IAC = ((68 – 64) x 100) +3 = 403

In this way it is possible for large sites to have a unique address for every network controller.

COLD STARTING THE IAC

The following instructions will Cold start your IAC, clear out the memory and set all the parameters to their default values.

1. Ensure all IAC outputs are disconnected from the plant.
2. Set bit switch 1 'ON'. Set all other bit switches to 'OFF' - see Fig.19.
3. Set bit switch 8 to 'ON' and then back to 'OFF', this will load preset 1.
4. Set all bit switches to 'OFF'. Set bit switch 8 to 'ON' and then back to 'OFF', this will load preset 0.

SETTING THE APPLICATION

1. If you are using preset 0 you should now set the controller address (See below).
2. If you are using a hardware preset application, set the application number on bit switches 1 to 6 and ensure that bit switch 7 is set to 'OFF'.
3. Once the Application Number is set, it must be entered into the IAC by setting bit switch 8 to 'ON' and then setting bit switch 8 back to 'OFF'.
4. If the IAC is not going to be connected to a computer it isn't necessary to set an address for it.

SETTING THE ADDRESS

1. Set the IAC address on bit switches 1 to 6 and set bit switch 7 to 'ON'. See Fig.20.
2. Once the address has been set it must be entered into the IAC by setting bit switch 8 to 'ON' and then setting bit switch 8 back to 'OFF'.

BAUD RATE

1. The baud rate is automatically set to 1200 Baud (this is done whenever the controller is cold started). It is only possible to alter the Baud rate through SatchNet Networking Software.

SW1 SWITCH (Increment No.)	POSITION	
	Off/ Open/0	On/ Closed/I
1	0	1
2	0	2
3	0	4
4	0	8
5	0	16
6	0	32
7	Set Application	Set Address
8	Run	Cold Start

Set Application Number

Example:

Switch settings as shown in Fig.19.

Switch	Represents
1	1
2	0
3	4
4	0
5	0
6	0
TOTAL =	5 Application Number
7	0 = Set Application
8	0 = Run

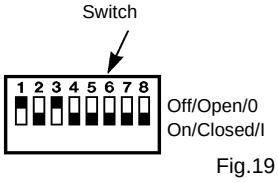


Fig.19

SW1 SWITCH (Increment No.)	POSITION	
	Off/ Open/0	On/ Closed/I
1	0	1
2	0	2
3	0	4
4	0	8
5	0	16
6	0	32
7	Set Application	Set Address
8	Run	Cold Start

Set IAC Address

Example:

Switch settings as shown in Fig.20.

Switch	Represents
1	1
2	0
3	4
4	0
5	0
6	32
TOTAL =	37 Address
7	1 = Set
8	0 = Run

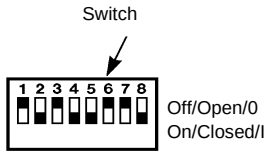


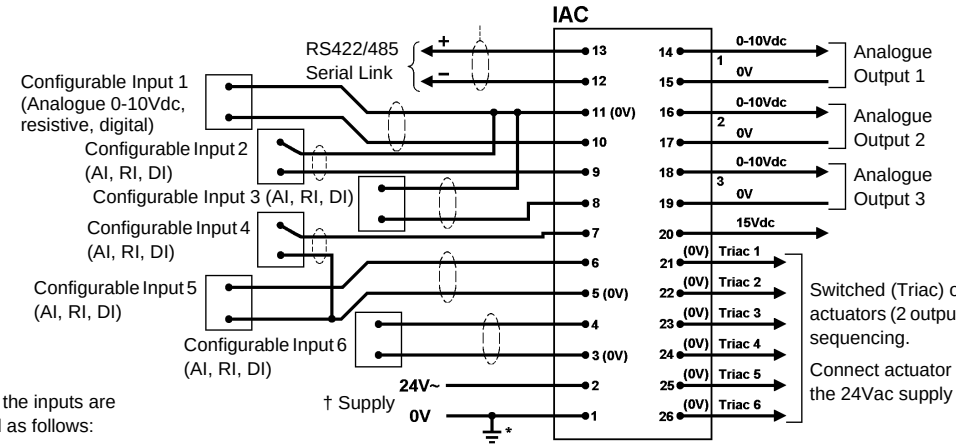
Fig.20

Notes:

1. Do not set more than one network device to the same address.
2. Protocol and wiring information for OEM communications programmes are available from Marketing Department, Slough Office.
3. The IAC operates at 1200 Baud by default.
4. After each toggle of bit switch 8, allow the LED to settle back to a steady flash rate.

CONNECTION DIAGRAMS (Refer to Wiring Precautions on Page 22)

BASIC WIRING DIAGRAM (Default Inputs Shown)



†The 24Vac transformer must conform to EN61558.

*Ensure terminal 1 is earthed.

Input wiring screened. Connect screens separately to a single earth point at the controller only.

Terminal 1 is an Earth Terminal.

Switched (Triac) outputs for lights, actuators (2 outputs for each actuator) And sequencing.

Connect actuator or contactor common to the 24Vac supply (terminal 2).

As default the inputs are configured as follows:

Input 1 - Resistive (temperature)
Input 2 - Resistive (temperature)
Input 3 - Resistive (temperature)
Input 4 - Analogue (0-10Vdc)
Input 5 - Analogue (0-10Vdc)

Fig.21

REMOTE SETTING

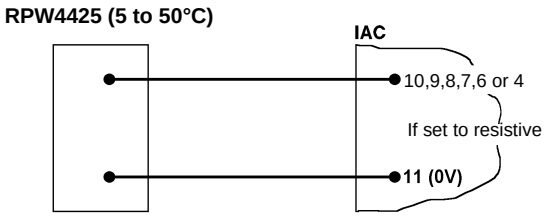
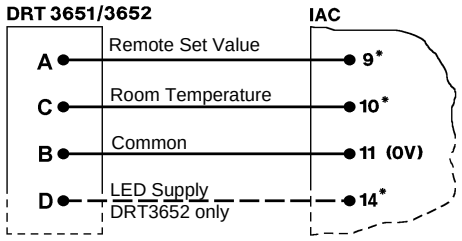


Fig.22

TEMPERATURE SENSING AND REMOTE SET VALUE FROM COMMON ROOM SENSOR



* Example shown for inputs for 1 and 2 and Analogue Output 1 other Temperature (resistive) inputs and Analogue Outputs may be substituted if required.

Fig.23

SENSOR CHARACTERISTICS
(for all temperature applications)

Temperature °C	Resistance Ω	Temperature °C	Resistance Ω
–40	9711	60	2056
–35	9604	65	1792
–30	9465	70	1563
–25	9288	75	1364
–20	9067	80	1193
–15	8796	85	1047
–10	8472	90	921
–5	8093	95	815
0	7661	100	722
5	7182	105	643
10	6667	110	575
15	6126	115	517
20	5573	120	466
25	5025	125	423
30	4492	130	386
35	3987	135	353
40	3518	140	324
45	3089	145	300
50	2702	150	278
55	2358		

COMMUNICATION WIRING DIAGRAM

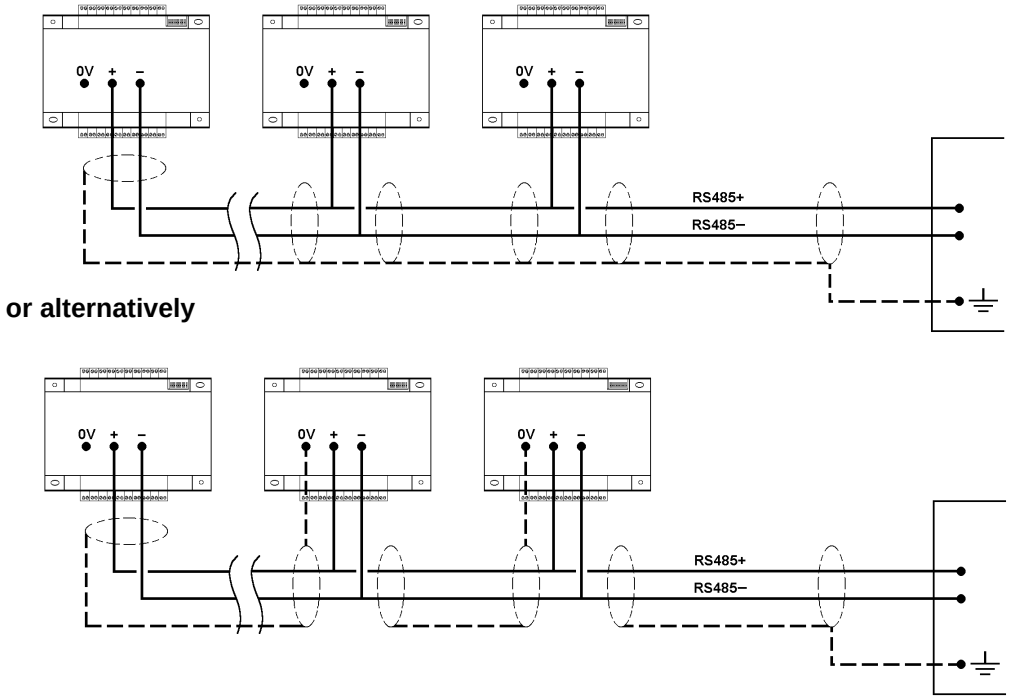


Fig.24

WIRING PRECAUTIONS

Wiring from IAC controller to:	Maximum length for 1.5mm^2 core unscreened cable	Maximum resistance per conductor
Sensors		
DRT (non-adjustable), DDT,	Screened only	15Ω
DWT, DST, DOT, DDU	Screened only	15Ω
Analogue inputs	Screened only	15Ω
Remote Settings Units		
RPW	Screened only	10Ω
Actuators		
AVU, ADU	50m	1Ω
ALX, ALXS, ARX, AVUX, ARUX	100m	5Ω
ALE, ALES, ARE, ARES, AVUE, ARUE		
24V~ Supply	100m	3Ω
0–10V dc Signal	100m	50Ω
Triac Outputs	100m	3Ω
Relays, time switches, override contacts etc.	Screened only	5Ω
Serial Link (terminals 12–13) to EIA Standard RS 422/485	Screened twisted pair, run separately from any other cables dc resistance <30 ohm per 300 metre e.g. 24 AWG; 25 SWG (0.21mm^2). Maximum length 1000 metres (240Ω max. dc loop resistance.) Mutual capacitance <60pF per metre.	

All temperature, analogue sensor and digital inputs must be screened with the screens connected separately to a common earth point. This earth point should be connected to the controller earth (0V terminal) by a single cable which should be as short as possible and no more than 150mm long.

Terminal 1 on the IAC can be used as an earth terminal. Earth wire minimum 30/0.25 (1.5mm^2) stranded cable.

Note 1: Where length exceeds figures in column 2 up to a maximum of 300m select cable size to comply with resistance in column 3 and use one of the following screening options:-

- Screened cable. Earth screen at controller end only. (Terminal 1 is an earth terminal)

Note 2: The resistance between terminal 1 and Earth must not exceed 0.5 ohm. Where several controllers are mounted in a group a separate wire should be run from 1 to a common earth terminal nearby. Do not loop the terminal 1's together in a chain.

Note 3: Do not run low voltage (24V or less) wiring in same harness as mains wiring, in control panels.

Note 4: Do not switch 0V side of 24V power supply to the IAC.

Note 5: Maximum Supply Voltage is 24Vac ±10%. Maximum Voltage on Analogue Inputs is 10Vdc with respect to 0V. 24Vac devices must be supplied by a transformer conforming to EN61558. Do not connect 240Vac to any terminal.

Note 6: The 24Vac supply must be fused with a 2A fuse.

IMPORTANT: Low voltage unscreened signal wiring must be run in a separate loom or trunk from any mains wiring and spaced as far as possible away from it (230Vac 45cm min, 415Vac 58cm min, both Voltages are with respect to earth and a maximum current of 15A). For other Voltages/currents refer to the IEE report titled 'Electro Magnetic Interference' September 1987 (ISBN85296353X).

WARNING -

THE RTC BOARD CONTAINS A LITHIUM CHLORIDE BATTERY WHICH IS COMPLETELY SAFE WHILST IN NORMAL USE. THE BATTERY MUST BE DISPOSED OF IN AN AUTHORISED LAND FILL SITE.

Cautions

- **This is a 24Vac device. Do not exceed rated Voltage. Local wiring regulations and usual safety precautions must be observed.**
- **Ensure good earthing.**
- **24Vac devices must be supplied by a transformer conforming to EN 61558.**
- **Do not apply any voltages until a qualified technician has checked the system and the commissioning procedures have been completed.**
- **If any equipment covers have to be removed during the installation of this equipment, ensure that they are refitted after installation to comply with UL and CE safety requirements.**
- **Observe wiring precautions above.**
- **Do not exceed maximum ambient temperature.**
- **Interference with parts under sealed covers invalidates guarantee.**
- **Design and performance of Schneider Electric equipment is subject to improvement and therefore liable to alteration without notice.**
- **Information is given for guidance only and Schneider Electric does not accept responsibility for the selection or installation of its products unless information has been given by the Company in writing relating to a specific application.**
- **A periodic system and tuning check of the control system is**

On October 1st, 2009, TAC became the Buildings business of its parent company Schneider Electric. This document reflects the visual identity of Schneider Electric, however there remains references to TAC as a corporate brand in the body copy. As each document is updated, the body copy will be changed to reflect appropriate corporate brand changes.

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