
nuaire
Take control with...ecosmart
Energy Efficient Controls
ecosmart Doesn't cost the Earth...ecosmart Doesn't cost the Earth.

A LEGACY OF ENERGY EFFICIENCY AND COST SAVINGS

Nuaire and ventilation controls go back a long way, starting from the days when the then-owner Brian Moss was a leading figure in the Building Services Industry eventually becoming Chairman of CIBSE.

In the early 1970s the world was facing the first oil crisis, and it became obvious that the high quantities of carbon emissions being released into the atmosphere were destroying the planet. A fair proportion of these emissions could be attributed to electric motors running inefficiently without controls and wasting valuable energy resources.

Historically, fans and motors had to have a transformer or electronic speed controller fitted remotely and wired back to the unit, introducing additional cost and wasting time on site when energy seemed cheap and plentiful and no one knew about the damage to the environment, many contractors and consultants would select a fan product as close as they could to the design duty and not install the speed control. This saved the wiring and control costs but didn't make the energy savings needed.

Brian Moss, as a leader of CIBSE and with an understanding of these wasteful practices, had the foresight to instruct his Nuaire Engineering team to develop a simple control system that could be fitted to the fans we produced that would give contractors and consultants the tools needed to operate fans at the correct speed, providing a simple and cost effective way to save energy and reduce running costs.

MICROSAVE was born in 1972 as a control concept for Nuaire's market leading Twin fan range and incorporated 'extra low voltage' wiring between fans and controllers, auto changeover facility and simple speed controls. Not only did this save in wiring costs but it also provided the customers and contractors with the ability to correctly set the speed for the fan - therefore saving energy and running costs. The Microsave concept was 'less wiring, less space, less expense' - something that Nuaire has kept as its key principle for all of its controls since 1972.

MICROSAVE NETLINK followed in the early 80s, as customers demanded more accurate energy control, improved comfort in buildings and ever lower installation costs. Netlink was designed to fully integrate with a range of matched sensors and detectors and to offer an inexpensive control solution providing comfortable conditions delivering energy savings for a fraction of the price of an Energy Management System.

SMART, developed in 1992 saw the introduction of a full range of room and duct mounted sensors combined with wall mounted controllers linked by our 'Safe extra low voltage' (SELV) wiring to fans and heat recovery units with on-board speed controls. A revolution in comfort control and energy saving for ventilation products used in decentralised spaces. **SMART** became the UK's most used energy saving control for this type of application, as consultants, contractors and clients realised they could have the same control functions of a Building Management System on smaller schemes, without the additional cost of complicated controls. **SMART** could link several fans together, speed control them in proportion to the temperature or humidity provide on/off timed sequences and still report fan failures to a control panel.

ECOSMART was a natural evolution from **SMART** controls. Launched in 2002, it has now become one of the UKs leading energy efficient control systems for the decentralised ventilation market. This early era was a time of change as consultants worked with architects to produce buildings with lower energy footprints and improved building envelopes in an effort to reduce energy and conserve fuels. Large AHU systems went out of fashion and individual room/zone ventilation became common, which is where **ECOSMART** found its natural home.

It was obvious that the way forward was for consultants to have the ability to specify a fan/HRU that could be installed with its own control system and that could have a wide range of sensors 'plugged in' to give control over CO2, temperature and humidity. The fact that this **ECOSMART** system is a stand-alone control fitted to nearly all Nuaire products, featuring time clocks, presence detectors and sensors, with the option to be linked to a BMS at an affordable cost was not missed by the consultants and contractors and **ECOSMART** became synonymous with on-board control systems, and created a bench mark for the industry.

In recent years, ever increasing energy bills and tighter controls on emissions have led to stricter Building Regulations, raising the bar required to deliver sweeping improvements to the built environment. This, coupled with an ever growing demand for tighter control and closer integration of building services equipment has led Nuaire, once again drive the market forward with a ground breaking control solution, **ECOSMART CONNECT**.

Nuaire was the first ventilation manufacturer to introduce low voltage energy saving control systems onto its products. Nuaire continues to lead the industry by expanding the proven **ECOSMART** controls platform with new **ECOSMART CONNECT** and **ECOSMART ADAPT** network control solutions.

ECOSMART CLASSIC was the first 'plug and play' control on the market and has been a core Nuaire product for the last 13 years.

ECOSMART CONNECT enhances Nuaire's offering with full BMS integration via BACnet MS/TP (expandable to IP with additional router). Multifunction sensors are available in one small compact unit.

ECOSMART ADAPT provides a totally ADAPTABLE solution specific to site requirements allowing other leading controllers such as Siemens, Cylon and Schneider to be incorporated. All controllers are functionally tested before leaving Nuaire's manufacturing facility.

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ECOSMART CONTROLS
LEGISLATION

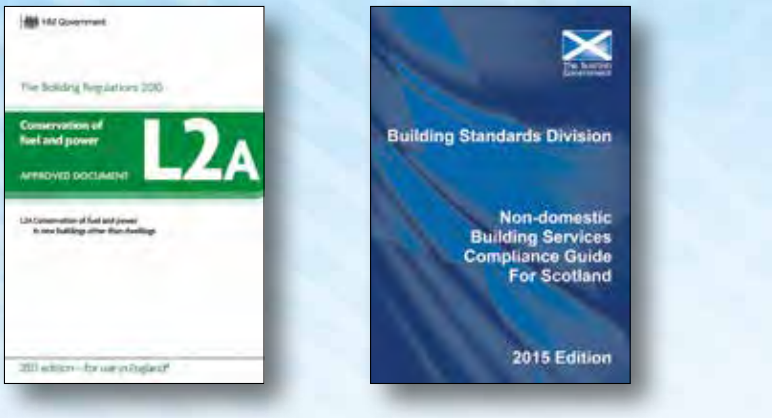
Approved Document Part L (2013) and section 6 (2015) of the Scottish Building Regulations states that **"Fixed building services shall have effective controls"** and that **"control strategies should be organised such that priority is given to the least carbon intensive energy source."**

Building controls are being asked to moderate and minimise energy use in a building, with the regulations stating that building service systems should be provided with appropriate controls to enable the achievement of reasonable standards of energy efficiency in use.

Under normal circumstances, this legislation suggests that the following features would be appropriate for heating, ventilation and air conditioning system controls:

- The systems should be subdivided into separate control zones to correspond with each area of the building that has a significantly different solar exposure, usage pattern or type of use.
- Each separate control zone should be capable of independent timing and temperature control and, where appropriate, ventilation and air recirculation rate.
- The provision of the service should respond to the requirements of the space it serves. If both heating and cooling are provided, they should be controlled so as not to operate simultaneously.
- Central plant should operate only as and when the zone systems require it. The default condition should be off.

In accordance with the requirements of Part L and section 6 of the Scottish Building Regulations, Nuaire provide the optimum control available, combined with the most efficient use of energy.



Example:
For a central mechanical ventilation system with heating and cooling, and heat recovery via a plate heat exchanger plus return air filter:
SFP = 1.6 + 0.3 + 0.1 W/(l/s)
= 2.0 W/(l/s)

Table 37: Recommended minimum controls for air distribution systems in new and existing buildings from BS EN 15232:2012. Refer to Ecosmart Control Platform for full range (see opposite).

System type package		Controls
Central mechanical ventilation with heating, cooling or heat recovery	Air flow control at room level	Time control
	Air flow control at air handler level	On/off time control
	Heat exchanger defrosting control	Defrost control so that during cold periods ice does not form on the heat exchanger
	Heat exchanger overheating control	Overheating control so that when the system is cooling and heat recovery is undesirable, the heat exchanger is stopped, modulated or bypassed
	Supply temperature control	Variable set point with outdoor temperature compensation
Central mechanical ventilation with heating, or heat recovery	Air flow control at room level	Time control
	Air flow control at air handler level	On/off time control
	Heat exchanger defrosting control	Defrost control so that during cold periods ice does not form on the heat exchanger
	Heat exchanger overheating control	Overheating control so that when the system is cooling and heat recovery is undesirable, the heat exchanger is stopped, modulated or bypassed
	Supply temperature control	Demand control
Zonal	Air flow control at room level	On/off time control
	Air flow control at air handler level	No control
	Supply temperature control	No control
Local	Air flow control at room level	On/off
	Air flow control at air handler level	No control
	Supply temperature control	No control

029 2085 8200

DEMAND VENTILATION SOLUTIONS – DESIGNED FOR EFFICIENCY AND PERFORMANCE

Nuaire have a pedigree for designing and manufacturing energy efficient ventilation equipment and matched control systems. Our very first control was produced in 1972.

Nuaire was the first manufacturer to introduce low voltage energy saving control systems. Its fans with 'Smart' technology varied the ventilation rate to suit occupant levels. Ecosmart was launched in 2002 and revolutionised the industry by providing the first "plug and play" control system.

Nuaire continues to lead in the industry with the expansion of their Ecosmart Controls Platform.

ecosmart adapt

Designed to meet site/project requirements - Ecosmart Adapt (with Trend) is the standard control. For other options contact Nuaire.
Ecosmart Adapt (with Trend) is fitted with an IQ422/12/LAN/BAC/230 controller allowing for unitary control and full BMS integration via BACnet IP (by others).
Controller software is basic and ready for 'project specific' program to be loaded.
Ecosmart Adapt (with Trend) has a 5 year warranty.

ecosmart CONNECT

NEW Energy efficient demand based control providing network connectivity and advanced functionality. Full BMS integration via BACnet MS/TP (by others).
Ecosmart Connect is expandable to IP network
(separate connection box) contact Nuaire for details.
Ecosmart Connect has a 5 year warranty.

ecosmart classic

The UK's leading Energy Efficient 'plug and play' solution for over 13 years.
Ecosmart Classic provides 0-10V BMS interface, trickle and boost as standard.
Ecosmart Classic has a 5 year warranty.

THE MOST SUCCESSFUL ENERGY CONTROL EVER - DEMAND VENTILATION AT YOUR FINGER TIPS

BASIC CONTROL

Supplied with a simple terminal box for supply and extract fan motor wiring and for interfacing to custom built control panels (by others).
Basic control has a 2 year warranty.

BASIC & ECOSMART CONTROLS

PLATFORM

	BASIC CONTROL (BC)	ecosmart classic (ES)	ecosmart CONNECT (CO) BACnet (MS/TP)	ecosmart adapt (AT) Based on TREND IQ422 BACnet (IP)
CONTROLLER SOFTWARE				
Controller Software		N/A	Advanced Software	Basic Software (Can be re-written by others)
Heat Exchange Bypass Control Strategy		Basic	Optimised	Basic
Supply Temperature Control Strategy		Yes	Yes	Yes
Room Temperature Control Strategy		No	Yes	No
Switched Live Enable Input		Yes	Yes	Yes
Switched Live Fan Boost		No	No	Yes
Switched Live Configurable Input (Heat or Fan Boost)		No	Yes	No
Volt Free Enable Input		No	Yes	Yes
Volt Free Fan Boost		No	No	Yes
Volt Free Configurable Input (Heat or Fan Boost)		No	Yes	No
Trickle Mode		Yes	Yes	Yes
Fan Run-On		Yes	Yes	Yes
Fan Run-On (Intelligent)		No	Yes	No
Run/Fault/Heat/Cool Volt Free Outputs		Yes	Yes	Yes
I/O Damper control		Yes	Yes (via run relay)	Yes (via run relay)
Heat Dissipation Run-on		Yes	Yes	Yes
Frost Protection Routine		Yes	Yes	Yes
Low Supply Temp Fan Cut-out		No	Yes	Yes
Scheduling		Yes via ES-LCD	Yes	Yes
CO2 Based Fan PID Loop		ES Co2	Yes	Yes
Humidity Based Fan PID Loop		ES-HUM	Yes	No
Pressure Based Fan PID Loop		CP version available	Yes	No
Night Cooling Mode		No	Yes	Yes
Purge Mode		No	Yes	Yes
Hibernate Mode (Open all valves)		No	Yes	No
Fan Speed Adjustment		Yes	Yes	Yes
Fan Speed Control only	Yes	No	No	No
0 - 10V Fan speed Input		Yes	Yes	Yes
0 - 10V Temperature Sensor Input		No	Yes	No
0 - 10V Humidity Sensor Input		No	Yes	No
0 - 10V Pressure Sensor Input		No	Yes	No
0 - 10V CO2 Sensor Input		No	Yes	No
CONTROLLER HARDWARE				
Fail safe thermal trip		Yes	Yes	Yes
Condensate Pump Monitoring		Yes	Yes	Yes
Din Rail Mounted Control		No	Yes	Yes
Quick Connect Terminals		No	Yes	Yes
24VAC Auxiliary		No	Yes	Yes

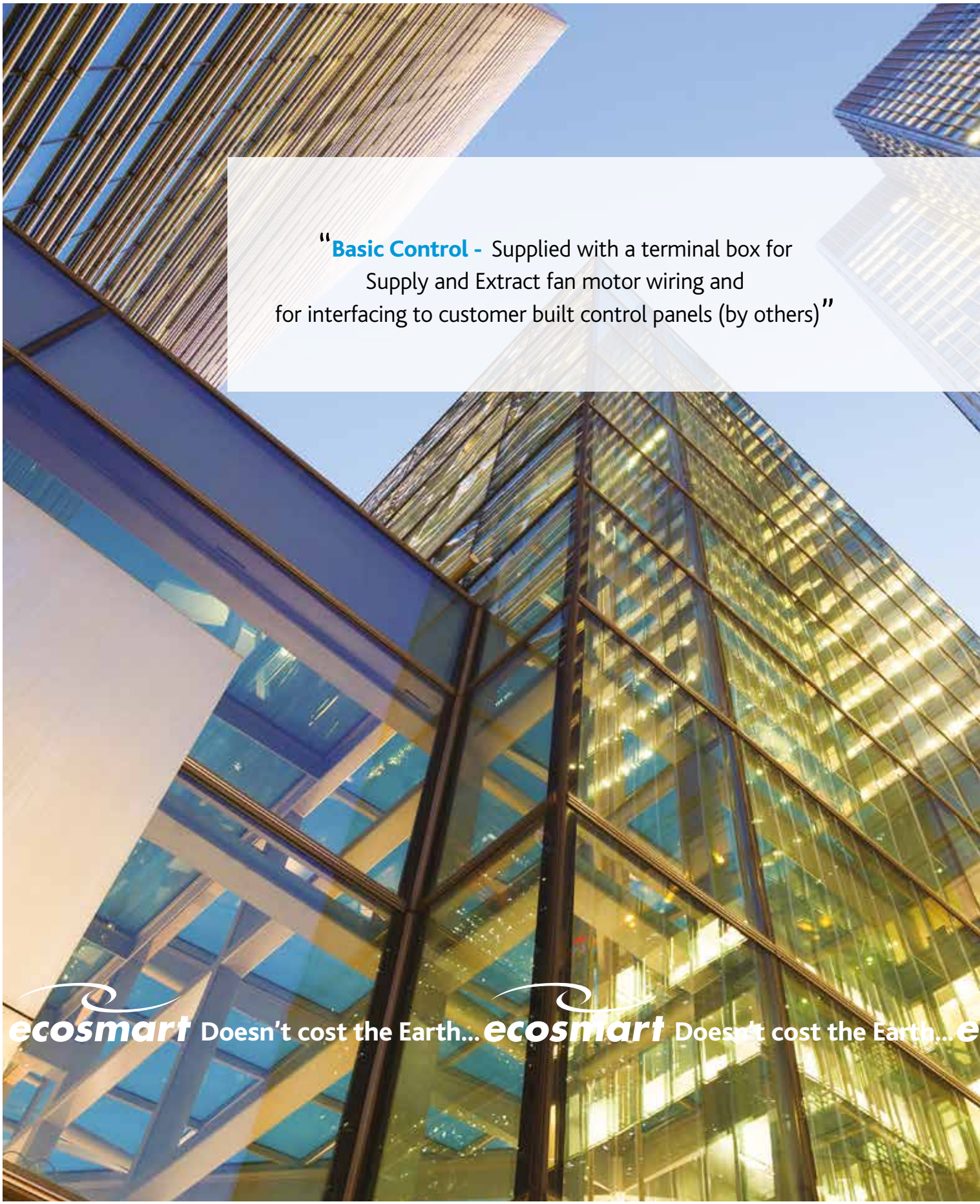
BASIC & ECOSMART CONTROLS

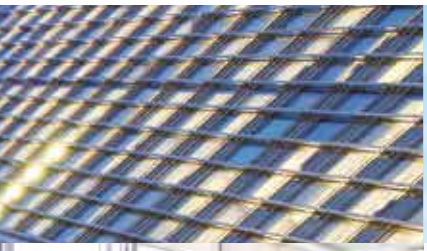
PLATFORM

	BASIC CONTROL (BC)	ecosmart classic (ES)	ecosmart CONNECT (CO) BACnet (MS/TP)	ecosmart adapt (AT) Based on TREND IQ422 BACnet (IP)
HMI				
Commissioning Display		Yes only Via commissioning PCB	Yes	By Others
BACnet LCD Touch Screen Display		No	Yes	By Others
ROOM MODULES				
Plug & Play Sensors		Yes	Yes	No
Max Number of Sensors		31 devices on any system	4 sensor modules*	By Others
Quick connect plugs		Yes	Yes	By Others
Twisted pair cable compatible		No	Yes	By Others
Commissioning Port		No	Yes	By Others
Temperature		Yes	Yes	By Others
CO2		Yes	Yes	By Others
Humidity		Yes	Yes	By Others
3-Speed Override		No	Yes	By Others
PIR		Yes	Yes	By Others
Setpoint Adjust		Yes (on sensor)	Yes	By Others
Multiple Setpoints Supported		No	Yes	By Others
Room Temperature Display		No	Yes	By Others
Room Humidity Display		No	Yes	By Others
Fan Speed Display		No	Yes	By Others
Occupancy Status Display		No	Yes	By Others
Network Error Display		Yes	Yes	By Others
NETWORKING				
BEMS compatible		No	Yes	Yes
BMS compatible		0-10V Input	BACnet via MS/TP (BACnet via IP optional)	(BACnet via IP)
MONITORING				
Web connectivity		NA	Yes	Yes
Energy Monitoring		NA	Yes	Participation via Trend network
Energy Metering		NA	Yes	Participation via Trend network
			*Each sensor module can have multiple sensors. (up to 3 per module).	

For further details of Ecosmart Controls Platform, refer to website: www.nuaire.co.uk

BASIC CONTROL OPTION (BC)





BASIC CONTROL CONSULTANTS SPECIFICATION

BASIC CONTROL OPTION - FAN SPEED ONLY

Basic control is fan speed only and are suitable for 2-10V adjustment (by others). The heat recovery (XBC) or packaged air handling unit (BPS) will have a side mounted terminal box for connection to the fans (230V, 50Hz LNE and 2-10V*) and bypass actuator (where applicable).

Basic control is for BMS by others.

Basic control has a 2 year warranty.

*For XBC 75 and XBC 85 (400V 3ph, 50Hz LNC and 2 - 10V).

BASIC CONTROL OPTION - XBC RANGE

Unit is provided with side access terminal boxes for direct supply and extract fan motor wiring and for interfacing to custom built control panels.

The control assembly is side mounted with a 90° rotation facility (XBC only) for wiring and commissioning adjustments in restricted access conditions. (260mm access allowance is required).

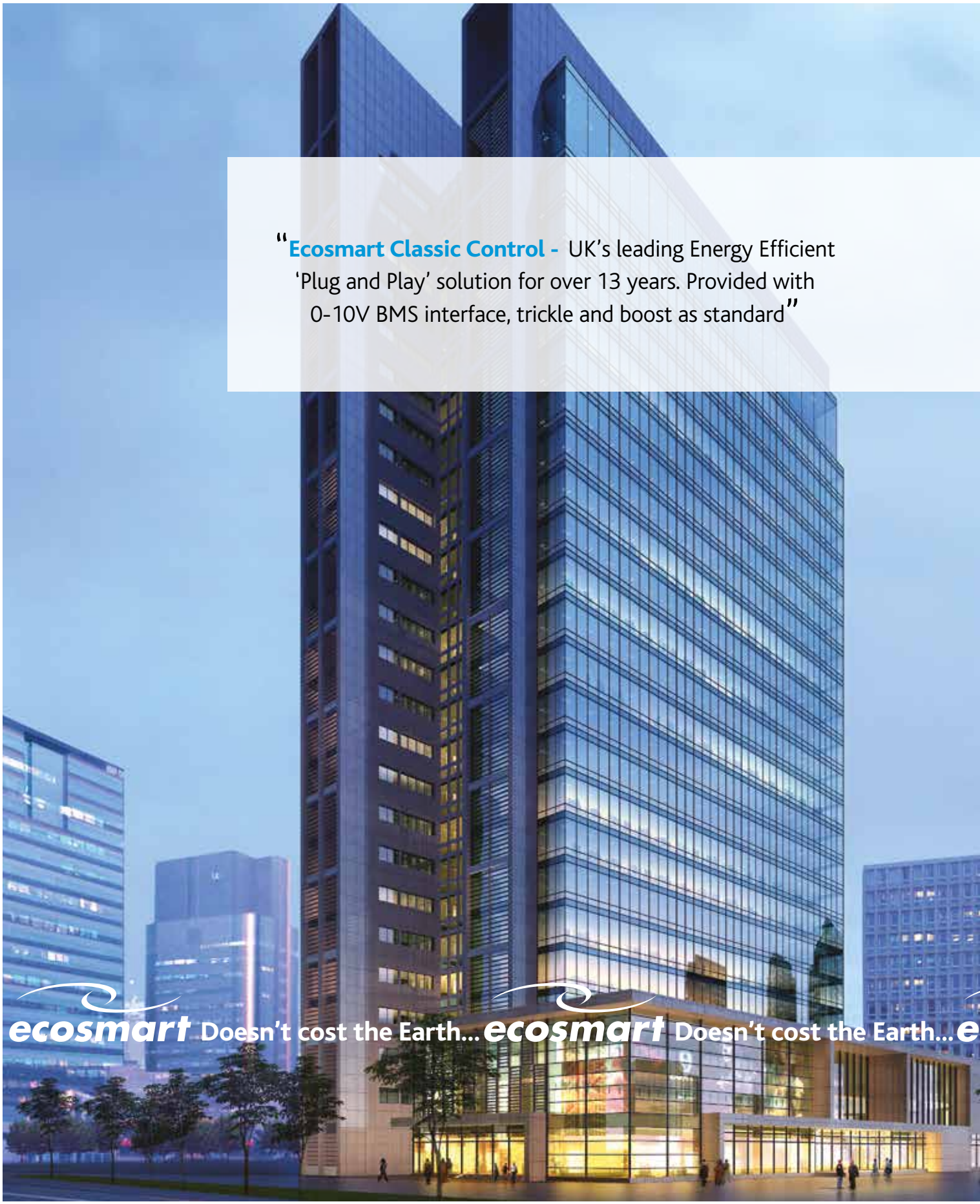
A side mounted terminal box is provided for the connections to the fans (230V 50Hz LNE and 2-10V), and Electric heater terminal and thermal protection (where specified).

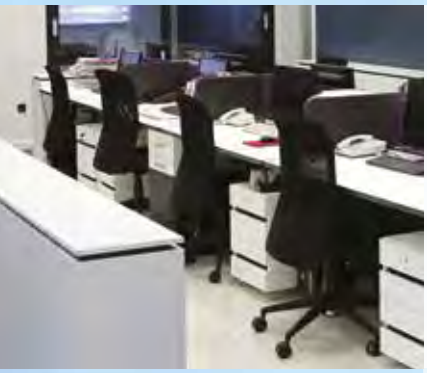
For this option, no sensors are fitted to the unit, but note that the plate heat exchanger bypass damper actuator is included suitable for 230V standard (24V available).

Units fitted with Basic Control (code example XBC25-H-EBC or BPS17-T-EBC) have a 2 year warranty.

The unit shall be the XBC (Heat Recovery Range) or BPS (Boxer Packaged Solution) as manufactured by Nuaire.

ECOSMART CLASSIC (ES)
CONTROL OPTION





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ECOSMART CLASSIC CONTROL (ES)

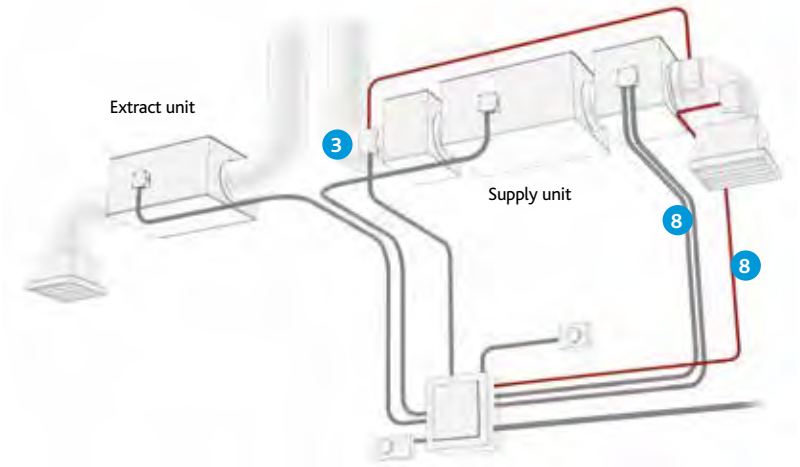
FEATURES & BENEFITS

- **QUICK & EASY TO INSTALL -** All controls are pre-assembled, configured and installed directly into the fan or air handling unit, this includes 2, 3 or 4-port motorised valves and actuators, pipework, off coil thermostats and sensors, frost protection, etc. Site time kept to a minimum, quality and efficiency maintained.
- **EASILY ADJUSTABLE -** No need for main VCD, which means no wasted energy or noise generation because the air volume can be precisely set via the integrated speed control, minimum and maximum speeds easily adjusted via Ecosmart commissioning panel.
- **SIMPLE, PRECISE COMMISSIONING -** As recommended in Part L, Ecosmart Classic enables the system to be accurately commissioned via an integrated speed control, minimum and maximum speeds easily adjusted via commissioning panel integral to the control.

	Ventilation mode	Cooling mode*	Heating mode*
Local control	0.00	-	-
OFF / trickle	0.25	-	-
Speed 1	0.50	0.75	1.00
Speed 2	1.50	1.75	2.00
Speed 3	2.50	2.75	3.00
Speed 4	3.50	3.75	4.00
Speed 5	4.50	4.75	5.00
Speed 6	5.50	5.75	6.00
Speed 7	6.50	6.75	7.00
Speed 8	7.50	7.75	8.00
Speed 9	8.50	8.75	9.00
Speed 10	9.50	9.75	10.00

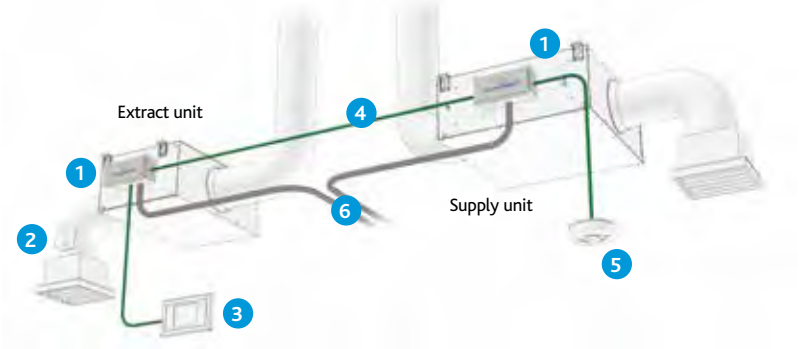
* Only available on relevant unit.

- **QUIETER SYSTEM -** With Ecosmart Classic your system (when combined with sensor) is only at maximum design duty when absolutely necessary. The noise levels within your systems are lower because the fans or air handling units are rarely at full speed.
- **IMPROVED LIFECYCLE -** Ecosmart Classic enables the fan or air handling unit to be run at lower speeds. This reduces the maximum load and wear and therefore increases the overall working life of the units.
- **DEMAND VENTILATION -** To achieve maximum potential savings and the lowest possible energy consumption, combine Ecosmart Classic with sensors to link the fan speed directly to demand. For example by using ES-CO2 or temperature sensors to control fan speed when a room is occupied.
- **HEALTHY ATMOSPHERE -** Ecosmart Classic has a trickle function as standard which when activated, via a simple switch, enables you to set a background ventilation rate, keeping the rooms fresh when unoccupied, whilst still saving energy. System will boost or ramp to maximum design duty when triggered by an Ecosmart or other external device.
- **PLUG IN CONTROLS -** Simple low voltage sensors complete with pre-plugged cable means that any control function is easily achieved. You decide which conditions to monitor and the system will operate at the optimum speed.
- **BASIC BMS INTERFACE -** Integrated BMS features enable any central system to control and monitor the fan or air handling unit via 0-10V signal. This enables full speed control and heating or cooling enable if installed and volt free status indication as standard.
- **PEACE OF MIND -** Warranty is extended to 5 years with Ecosmart Classic. Basic control units only carry a 2 year warranty.



'CONVENTIONAL' SUPPLY & EXTRACT VENTILATION SYSTEM

1. PVC tubing
2. Filter
3. Air pressure switch
4. Temperature switch
5. Control panel
6. User control
7. 230V Electricity supply
8. Electrical cabling 230V
9. Electrical heater
10. Time clock

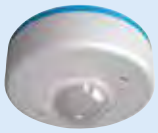


ECOSMART SUPPLY & EXTRACT VENTILATION SYSTEM

1. Integrated control
2. Optional CO_2 sensor
3. User control
4. (SELV) 12V cable
5. Optional PIR sensor
6. 230V Electricity supply

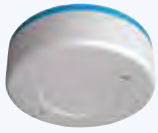
ECOSMART CLASSIC CONTROL (ES)
SENSORS & ENABLERS

All Ecosmart Classic Systems must include at least one enabler.
(N.B. when used, BMS control and time clocks take over all other enablers).



ES-PIR2 (Enabler)
Detects movement and activates system. Incorporates a system status LED, overrun timer and timer adjustment.

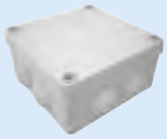
ES-TEMP2 TEMPERATURE (Sensor)
Modulate fan speed based on room temperature. Incorporates two system status LEDs. (Green = OK, Red = Failure) and temperature set point level adjustment.



ES-THERMOSTAT2 (Enabler)
Activates the system when the temperature is above set point. Incorporates two system status LEDs. (Green = OK, Red = Failure) and temperature set point level adjustment.

ES-RH2 RELATIVE HUMIDITY (Sensor)
Modulate fan speed based on RH level. Incorporates two system status LEDs. (Green = OK, Red = Failure) and RH set point level adjustment.

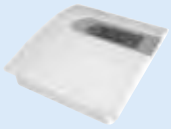
ES-AVI2 (Enabler)
When fan failure occurs the AVI will flash a warning. Supplied with pre-plugged 10m length of communication cable.



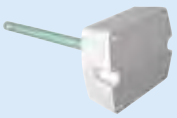
ES-CI SEMI-AUTOMATIC USER CONTROL
Fan, heating & cooling selected by external volt free switch, speed selected by 0-10V signal.

ES-HUMIDISTAT2 (Enabler)
Activates the system when the RH level is above set point. Incorporates two system status LEDs. (Green = OK, Red = Failure) and RH set point level adjustment.

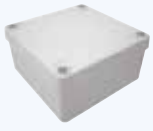
ES-JB JUNCTION BOX
Designed to be compatible with Ecosmart System this unit is supplied with a pre-plugged 10 metre length of communications cable and has 8 further ports.



ES-CO2RM (Sensor)
ES-CO2RMPP (Sensor)
Surface mounted room carbon dioxide (CO_2) sensors incorporate a temperature sensor. RM = SELV option, RMPP complete with SELV AC powers supply.



ES-CO2 (Sensor)
Duct mounted sensor to modulate fan speed based on CO_2 levels. Connect to fan directly. Pre-wired with 2m cable (not adjustable).



ES-HTCSIG (Enabler)
Signal conditioning circuit for humidity, temperature and CO_2 sensors.

SWITCHED LIVE (by others)
Any mains voltage signal connected to the switched live terminal (S/L) in the unit. This affects the connected fan only.

TOUCH SCREENS & MANUAL USER CONTROLS

ES-LCD (Enabler) Touch screen user control in white incorporating time clock facility. This can control the function of the fan by manual setting or using a set of timed programs.

ES-UCF Manual 'on' and 'off' system user/ speed control.
Incorporates two system status LEDs (Green = OK, Red = Failure).

ecosmart classic ECOSMART CLASSIC CONTROL (ES)

SENSORS & ENABLERS

ECOSMART, BMS AND COMMISSIONING CONTROL OPTIONS

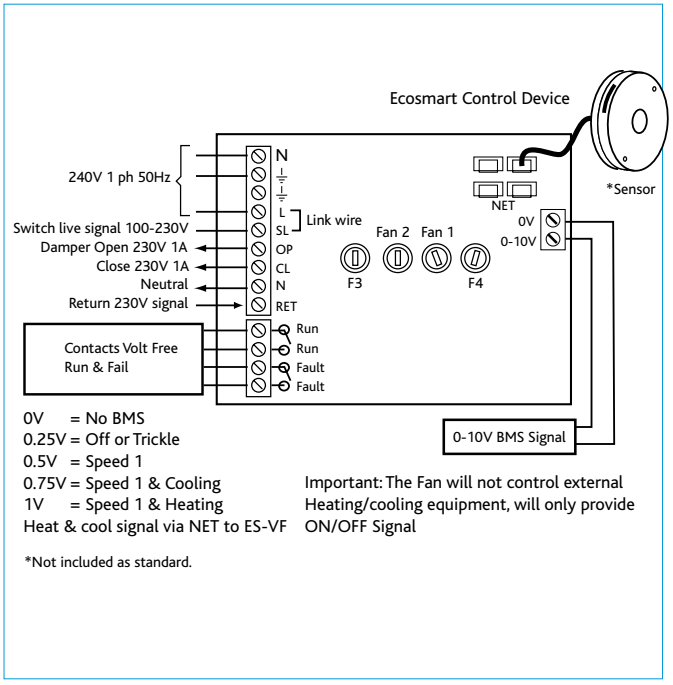
Nuaire fans and Air Handling Units can be provided with the following pre-selected control options, simply and easily by adding letters to the end of the fan code, there is no need to select or specify the controls individually if one of these options are chosen :

ES ECOSMART CONTROLS

The compact Ecosmart control module comes complete with a factory fitted Ecosmart PCB which will control the fan unit within the desired design parameters and provide the interface between all external control devices detailed on these pages.

The Ecosmart control module has the following energy saving components integrally mounted, pre-wired to interface with the purpose made PCB, all components pre-wired, configured and factory fitted by the manufacturer: (Not pre-wired to eg. SQF, Airmover).

- Integral Frequency inverter/speed controller
- Integral maximum and minimum speed adjustment for commissioning.
- Integral adjustable run on timer.
- Integral BMS interfaces - 0- 10V speed adjustment.
- Integral BMS interfaces - Volt free failure and status indication.
- Integral background ventilation switch (trickle switch).
- Multiple IDC sockets for interconnection of sensors or fans using pre-plugged 4-core low voltage cable.
- Pre-programmed with soft start function

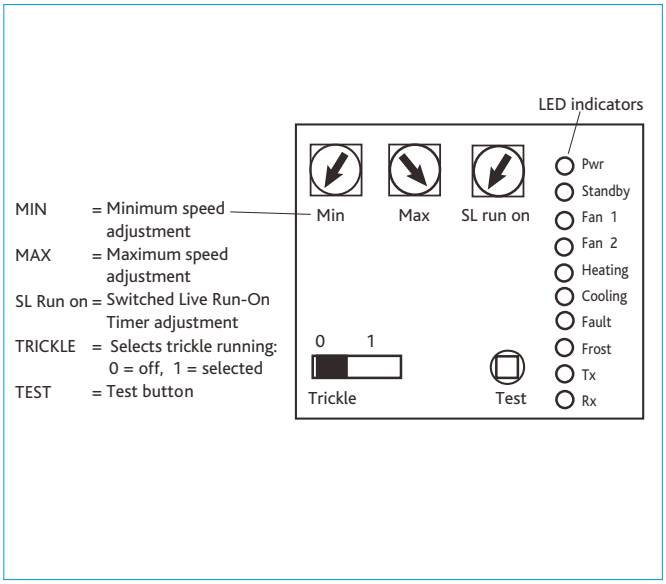


0V = No BMS
0.25V = Off or Trickle
0.5V = Speed 1
0.75V = Speed 1 & Cooling
1V = Speed 1 & Heating
Heat & cool signal via NET to ES-VF

Important: The Fan will not control external Heating/cooling equipment, will only provide ON/OFF Signal

*Not included as standard.

SET UP/COMMISSIONING BOX



The Ecosmart control module has the following two options fitted as standard.

1) BMS INTERFACES

The Ecosmart control module can be pre-configured to provide the following integrated BMS interfaces.

- 0 - 10 volt input to provide a full BMS interface. This will enable the following functions:-
  Switch the unit ON/OFF.
  Switch heating or cooling ON/OFF (AHUS with relevant coils).
  Switch from low speed to high speed - variable.
  Switch from low speed to high speed - trickle and boost principle. Full speed control facility.
- 2 No. Volt free contacts to provide fan run and failure indication to provide system status.
- An integrated commissioning/speed control to accurately commission the system, with minimum and maximum speeds easily adjusted via a miniature dial, as recommended in Part L. This will enable the unit to be configured to run between set parameters thus saving motor power and limiting noise.
- Pre-programmed with soft start function.

2) COMMISSIONING SET UP

The Ecosmart control module can be pre-configured to provide the following integrated commissioning features only.

- An integrated commissioning/speed control to accurately commission the system, with minimum and maximum speeds easily adjusted via a miniature dial, as recommended in Part L. This will enable the unit to be configured to run between set parameters thus saving motor power and limiting noise.
- Minimum and max speeds easily adjusted via miniature dial. The commissioning set up facility directly controls the integrated speed control/ frequency inverter.

ENABLING SENSORS

ES-PIR2 SENSOR

The sensor operates with Safe Extra Low Voltage (SELV) with power supplied from the fan unit via the communications cable. The ES-PIR sensor will activate the system when movement is detected. An adjustable 1-60 minute timer is incorporated to provide a run on facility.
When adjustments are made to the sensor, the LED light on the sensor front will flash on and off to show the set point. First, green flashes will indicate the set point in TENS, then red flashes will indicate UNITS.
For example 1 green flash and 5 red flashes show you that the PIR timer is set to fifteen minutes.

ES-THERMOSTAT2

The ES-Thermostat will enable the fan when the ambient temperature is 1°C above the set point and will stop the fan when the temperature is at or below set point. The sensor operates with Safe Extra Low Voltage (SELV) with power supplied from the fan unit via the communications cable. Adjusting the sensor set points. Adjustable temperature setting 10 - 35°C.
After adjustments are made to the sensor, the LED light on the sensor front will flash on and off to show the set point. First, green flashes will indicate the set point in TENS, then red flashes will indicate UNITS.
For example 2 green flashes and 3 red flashes show a temperature set point of 23°C.

ES-HUMIDISTAT2

The ES-Humidistat will enable the Ecosmart fan when the measured humidity level is 2% above the set point and will stop the fan when the humidity is at or below set point. The sensor operates with Safe Extra Low Voltage (SELV) with power supplied from the fan unit via the communications cable. Adjusting the sensor set points - Adjustable RH setting 65 - 85%.

After adjustments are made to the sensor, the LED light on the sensor will flash indicating via a small aperture on the side of the sensor the set point. First, green flashes will indicate the set point in TENS, then red flashes will indicate UNITS.
For example 7 green flashes and 3 red flashes show a RH set point of 73%.

SPEED CONTROLLING DEVICES

ES-RH2 HUMIDITY SENSOR

The ES-RH Sensor will vary the ventilation rate automatically according to the measured humidity. The sensor operates with Safe Extra Low Voltage (SELV) with power supplied from the fan unit via the communications cable. The sensor has an adjustable 65-85% RH set point.
After adjustments are made to the sensor, the LED light on the sensor front will flash on and off to show the set point. First, green flashes will indicate the set point in TENS, then red flashes will indicate UNITS.
For example 7 green flashes and 5 red flashes show a set point of 75% RH.
Note: fan speed = 0 (i.e. off) at or below the set point

ES-CO2 CARBON DIOXIDE SENSOR - OPERATION

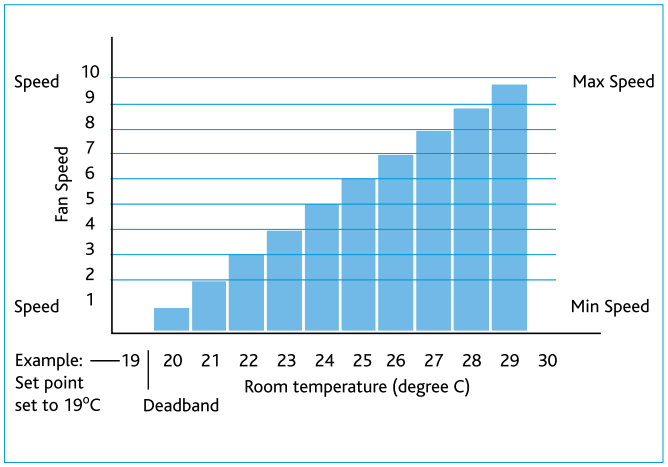
The CO2 Sensor will adjust the fan speed in response to the CO2 concentration in the airflow.The fan speed is divided into 10 steps from minimum (step 1) to maximum (step 10). See table below for response details.

Speed	1	2	3	4	5	6	7	8	9	10
CO2 PPM	502	580	659	737	834	902	980	1059	1137	1215

ES-TEMP2 TEMPERATURE SENSOR

This will modulate fan speed based on room temperature. The sensor operates with Safe Extra Low Voltage (SELV) with power supplied from the fan unit via the communications cable.

After adjustments are made to the sensor, the LED light on the sensor front will flash on and off to show the set point. First, green flashes will indicate the set point in TENS, then red flashes will indicate UNITS.
For example 2 green flashes and 3 red flashes show a temperature set point of 23°C.
Note: fan speed = 0 (i.e. off) at or below the set point.



SENSOR RESPONSE - Normal operation (Proportional band over ten 10°C steps)

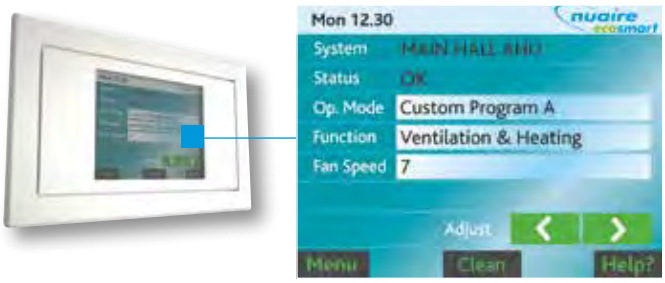
When temperature rises, the fans will increase speed. (See above) which shows a set point at 19°C. For single phase fans, the speed steps are approximate and actual running speeds will be dictated by the operating pressure of the system and the type of impeller used in the blower. Fan is switched off at set point unless the trickle switch is selected.

ES-LCD (TIME CLOCK INCLUDED)

The ES-LCD Time clock will switch the system on and off at pre-determined times set by the user. This digital time clock will override the user control for effective on/off operation or any other enabling device eg. PIR. The time clock operates on Safe Extra Low Voltage and is powered from the fan control module. The connection is made into any 'NET' socket on the fans integral control module. See I&M for further details.

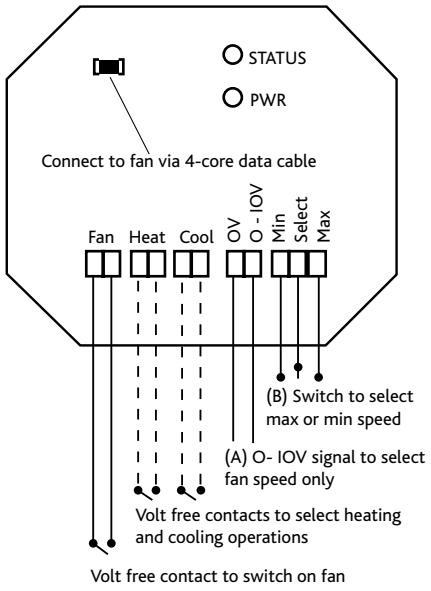
ES-LCD INCLUDES:

Ventilation, Automatic Heating & Cooling Enable/Disable.
Air off temperature in devices with coils is pre-set within the commissioning tools and cannot be controlled remotely.



ES-CI (ECOSMART CONTROL INTERFACE)

Enables any Ecosmart unit to be controlled via any remote non Ecosmart switching device or item of plant.



ES-CO2RMPP TEMPERATURE SENSOR

CO_2 and temperature sensor supplied with (SELV) AC power supply.
The sensor will monitor the carbon dioxide (CO2) and temperature (see note 1) is designed to be wall mounted within the room. If either reading reaches the low threshold values (i.e. C1 & T1) see opposite, then a signal will be sent to start running the fan at minimum speed. The ES-CO2RMPP is supplied with (SELV) AC power supply.

As the room CO_2 and temperature rises, the fan speed will progressively increase in steps until the upper threshold values are reached. When both CO_2 and temperature readings are in operation, whichever reading that results in higher fan speed will be used by the fan unit.

The threshold values and other operations can be adjusted by setting DIL switches on the PCB to different positions.

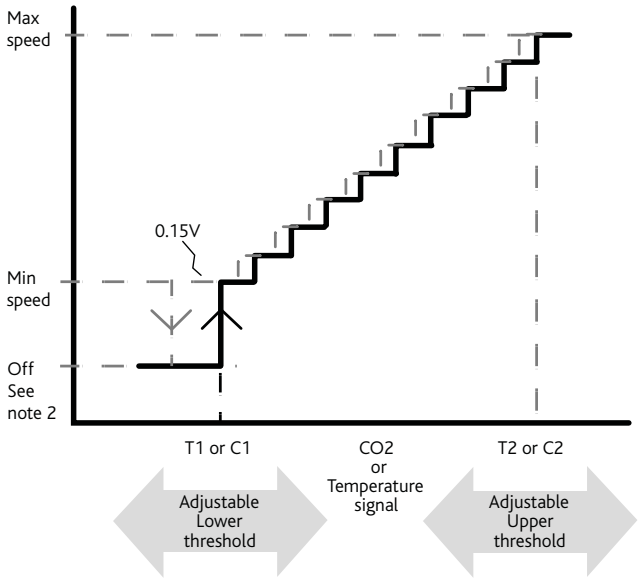
Note 1: As supplied; the default operation of the sensor will be based on carbon dioxide reading. If operation with both carbon dioxide and temperature is desirable then change position of switch 7 to 'ON'.

Note 2: use switch 8 to change the off state (see table below).

TEMPERATURE THRESHOLD SWITCHES 1-9

Switch settings	3	2	1	Threshold temperatures T1 (°C)	T2 (°C)
	Off	Off	Off	25	28
	Off	Off	On	24	28
	Off	On	Off	23	28
	Off	On	On	22	28
	On	Off	Off	25	30
	On	Off	On	24	30
	On	On	Off	23	30
	On	On	On	22	30

The lower and upper threshold values can be adjusted as shown in the following table.



Note: Default operation is CO_2 only. To select temperature option as well please refer to I&M.

ES-CO2RM TEMPERATURE SENSORS

CO_2 and temperature sensor requires SELV power supply by others.

ecosmart classic CONSULTANTS SPECIFICATION

ECOSMART CLASSIC - DEMAND CONTROLLED VENTILATION

Provides the facility for energy saving via an intelligent stand-alone AHU function with local diagnostic status indication, or allows convenient integration with the client BMS with a minimal co-ordination requirement.

The factory fitted Ecosmart Classic control includes:-

Integral infinitely variable speed /duty control for the supply and extract fans, with independent minimum, maximum and offset adjustment (up to 40%) for accurate commissioning.

- The control assembly is side mounted with a 90° rotation facility (XBC Range only) for wiring and commissioning adjustments in restricted access conditions. (260mm access allowance is required).
- The control features a run on timer and "background" ventilation function, and is provided with unit status indication, run and fail relays and interface connections for Ecosmart Classic sensors/enablers and system dampers.
- The heat exchanger bypass is automatically operated according to temperature and a pre-defined strategy. ***The heating output (LPHW or electric) is automatically regulated to control the Air - Off condition.
- The Ecosmart control module can additionally be connected to provide the following integrated BMS interfaces.
- 0 - 10 volt inputs will enable the following functions:- Switch the unit on/off, variable speed / duty control, switch from low speed to high speed, enable heating / cooling.
- 2 No. Volt free contacts give fan run and failure unit status indication.

Units fitted with Ecosmart Classic control have a 5 year warranty.

ECOSMART CONNECT (CO)

CONTROL OPTION

029 2085 8200

INDEX FOR ecosmart CONTROL CONNECT

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• ECOSMART CONNECT - FEATURES AND BENEFITS	20
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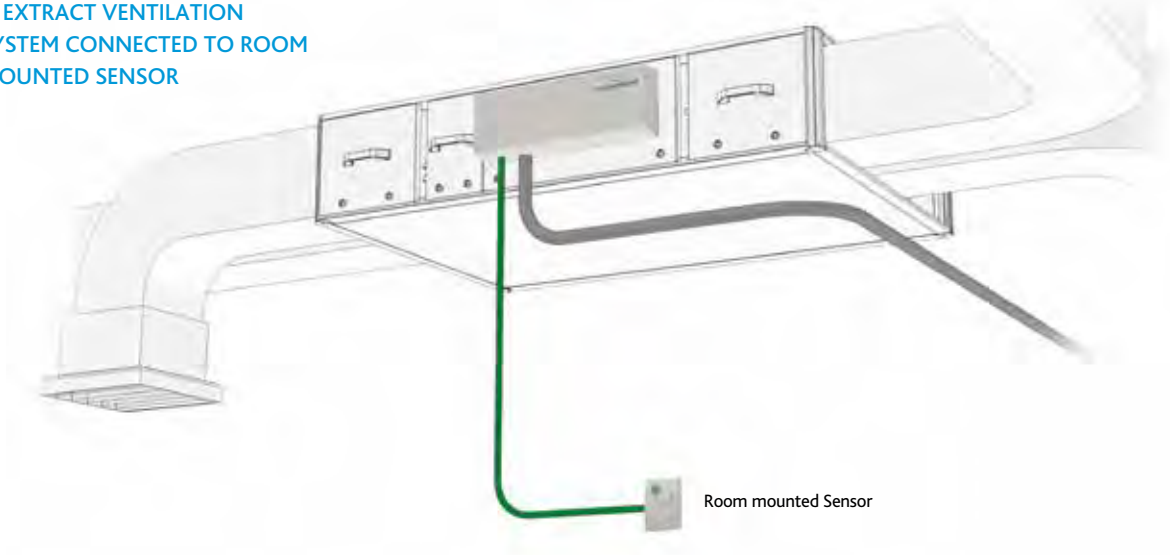
ECOSMART CONNECT CONTROL (CO)

FEATURES & BENEFITS

- **QUICK & EASY TO INSTALL -** All controls are pre-assembled, configured and installed directly into the fan or air handling unit, this includes two 4-port motorised valves and actuators, pipework, off coil thermostats and internal sensors, frost protection, etc. Site time is kept to a minimum, quality and efficiency maintained.
- **EASILY ADJUSTABLE -** No wasted energy or noise generation because the air volume can be precisely set via the LCD commissioning tool or by a wall mounted LCD panel.
- **SIMPLE, PRECISE COMMISSIONING -** Ecosmart Connect enables the system to be accurately commissioned via an integrated speed control, minimum and maximum speeds easily adjusted via a remote LCD panel.
- **QUIETER SYSTEM -** With Ecosmart Connect your system is only at maximum design duty when absolutely necessary. The noise levels within your systems are lower because the fans or air handling units are rarely at full speed.
- **IMPROVED LIFECYCLE -** Ecosmart Connect enables the fan or air handling unit to be run at lower speeds. This reduces the maximum load and wear and therefore increases the overall working life of the units.
- **DEMAND VENTILATION -** To achieve maximum potential savings and the lowest possible energy consumption, combine Ecosmart Connect with sensors to link the fan speed directly to demand. For example by using ESCO-CL or temperature sensors to control fan speed when a room is occupied.
- **HEALTHY ATMOSPHERE -** Ecosmart Connect has a trickle function as standard which when activated, via a commissioning tool which enables you to set a background ventilation rate, keeping the rooms fresh when unoccupied, whilst still saving energy. System will boost or ramp to maximum design duty when triggered by an Ecosmart or other external device.
- **PLUG IN CONTROLS -** Simple low voltage sensors complete with pre-assembled cable means that any control function is easily achieved. You decide which conditions to monitor and the system will operate at the optimum speed. No commissioning is required for these sensors.
- **MULTIFUNCTION SENSORS -** Ecosmart Connect sensors are available with multiple sensor functions in one small compact unit. Such as PIR and temperature, or 3 Speed Fan Override, temperature and setpoint adjust.
- **ROOM TEMPERATURE CONTROL -** The Ecosmart Connect control strategy is set by default to regulate the supply air temperature, but if a suitably sized heater is fitted, the strategy can be modified to regulate the room air temperature instead. This allows Ecosmart Connect to be more efficient and economical at maintaining a constant room temperature.
- **LCD PANEL -** Ecosmart Connect is available with a remote LCD panel that can operate a network of Ecosmart Connect controllers. It is BACnet compatible and can read/write any BACnet variables on the network. This allows the installation of networks of Ecosmart Connect controllers without the need of any extra complex components such as servers or network hubs. This is ideal for single installations or small networks alike.
- **BACnet INTERFACE -** Integrated BACnet features enable any central system to control and monitor the fan or air handling unit via MS/TP (IP Ethernet optional router available). This enables monitoring of every BACnet variable including individual room sensors. Variables can also be written allowing full control of the unit from a centralised remote location.
- **BACKWARDS COMPATIBILITY -** Although Ecosmart Connect is equipped with a modern BACnet network interface, it still comes as standard with switched live inputs, volt free inputs, 0-10V inputs and volt free outputs for simpler requirements.
- **PEACE OF MIND -** Ecosmart Connect has a 5 year warranty.

ECOSMART CONNECT SUPPLY & EXTRACT VENTILATION SYSTEM CONNECTED TO ROOM MOUNTED SENSOR



Room mounted Sensor

BACnet (MS/TP)

ecosmart CONNECT ECOSMART CONNECT CONTROL (CO)

BACnet ROOM MODULES

ESCO-TDFS
Ecosmart Connect Room Module - Temperature, Display and Fan Speed Override.

ESCO-THPL
Ecosmart Connect Room Module - Temperature, Humidity and PIR.

ESCO-TS
Ecosmart Connect Room Module - Temperature.

ESCO-TDPL
Ecosmart Connect Room Module - Temperature, Display and PIR.

ESCO-THS
Ecosmart Connect Room Module - Temperature and Humidity.

ESCO-TDHPL
Ecosmart Connect Room Module - Temperature, Display, Humidity and PIR.

ESCO-TDS
Ecosmart Connect Room Module - Temperature and Display.

ESCO-TDHL
Ecosmart Connect Room Module - Temperature, Display and Humidity.

ESCO-TDHS
Ecosmart Connect Room Module - Temperature, Display and Humidity. (Humidity is not displayed).

ESCO-PL
Ecosmart Connect Room Module - PIR Sensor.

ESCO-TPL
Ecosmart Connect Room Module - Temperature and PIR.

ESCO-CL
Ecosmart Connect Room Module - CO2 Sensor.

Refer to page 22 for specifications and page 43 for sensor dimensions.

ESCO-LCD TOUCH SCREEN DISPLAY
The ESCO-LCD is a user friendly operator interface featuring BACnet® communication and a colourful, graphic display with touch-screen interface. It is powered by 12-24VAC / VDC.

ESCO-IPN
The BACnet IP to MS/TP Router exchanges information between networks and allows the controller to communicate on an IP network. One router is required for each MS/TP network.

CODE DESCRIPTION - ROOM MODULES

ESCO-TDHL
1 2 34 56

1. Ecosmart
2. Connect
3. Temperature
4. Display
5. Humidity
6. L = Long length S = Short length

SA BUS DEVICES - ROOM MODULES SPECIFICATIONS

The following room modules are available.

Group	Nuaire Part Number	Size (mm)	Temp-erature Sensor	Humid ity Sensor	LCD, Setpoint Adjust & Occupancy Display	PIR	Fan Speed Override	Fan Status Display	CO2 Sensor	Network Address Range	Notes	Model ref.
Group 1 Max of 1 Per Controller	ESCO-TDFS	80x80	YES		YES		YES	YES		199 (fixed)	Max of 1 per controller	NS-ATC7005-2 
Group 2 Max of 4 Per Controller	ESCO-TS	80x80	YES							200-203		NS-ATN7004-2 
	ESCO-THS	80x80	YES	YES						200-203		NS-AHN7004-2 
	ESCO-TDS	80x80	YES		YES					200-203		NS-ATA7004-2 
	ESCO-TDHS	80x80	YES	YES	YES					200-203	Relative Humidity is not displayed	NS-AHA7004-2 
	ESCO-TPL	80x120	YES			YES				200-203		NS-MTN7004-2 
	ESCO-THPL	80x120	YES	YES		YES				200-203		NS-MHN7004-2 
	ESCO-TDPL	80x120	YES		YES	YES				200-203		NS-MTB7004-2 
	ESCO-TDHPL	80x120	YES	YES	YES	YES				200-203	Relative Humidity is not displayed	NS-MHB7004-2 
	ESCO-TDHL	80x120	YES	YES	YES					200-203	Relative Humidity is displayed	NS-BHR7104-2 
	ESCO-PL	80x120				YES				200-203		NS-MNN7004-2 
Group 3 Max of 4 Per Controller	ESCO-CL	120x80							YES	212-219	Powered via separate 24vac/ dc supply	NS-BCN7004-2 

ECOSMART CONNECT CONTROL (CO)

DESCRIPTION OF CONTROL SOFTWARE STRATEGY

GENERAL

The system incorporates a pre-configured MS/TP enabled controller.

THE NUAIRE UNIT CONTAINS THE FOLLOWING CONTROLLABLE ITEMS:

- Inlet Damper (if fitted).
- Exhaust Damper (if fitted).
- Heat Recovery and Bypass Damper.
- Heating Coil (if fitted).
- Cooling Coil (if fitted).
- Supply Fan Speed.
- Extract Fan Speed.

ENABLE SIGNAL

The unit can be enabled via the following methods:

- Software switch (ENABLE) via local display or network.
- Switched live (230VAC) input, PIR etc.
- Volt free input contacts.
- Night cooling / summer free-cooling strategy.
- Scheduled via weekly calendar. (Schedule are accessed and adjusted via the ESCO-LCD)
- Fan Speed Override
- Room Module PIR sensor
- Room Module 3-Fan Speed Button (While in low, med or high state)

When the enable signal is removed, the unit will run on for a time defined by the run-on setpoint.

If auto run-on is enabled, the unit will measure the each enable period and set a dynamic run-on time proportionally to this value. This time is scaled by the network input "Auto run-on Scale Factor" and limited by the input "Auto Run-on Max Time".

ASHRAE BACnet **(MS/TP)**

ROOM MODULES

Ecosmart Connect allows the connection of multiple Room Modules which are automatically detected and connect to the controller via a SA (Sensor Actuator) MS/TP bus. See Network Accessory section for more connection details.

ROOM MODULE PIR

When a Room Module PIR sensor is connected via the SA bus, the control will automatically use this as an enable signal by default. There is a non-adjustable minimum run-on time of 15mins for Room Module PIRs. This is in addition to any software run-on times.

RM 3-SPEED FAN OVERRIDE (ESCO-TDFS ONLY)

When a RM fan speed override is available it will override fan speed functions.

This function overrides any run-on time (except for electric heater heat dissipation). While in override mode, the unit will ignore return air temperature and set the supply air to the setpoint. Multiple fan override sensors are not supported.

Whenever a fan-speed override Room Module is connected, the display will automatically show the fan speed status at all times. **Warning: If a RM Fan Speed override button is left in any position (apart from auto), the unit will stay in override mode indefinitely. This includes off mode.**

Mode	Operation	Display
"Auto"	The controller will ignore the fan speed override. Current fan speed will still be displayed.	AUTO / AUTO / AUTO / AUTO
"Off"	The controller will override all functions and stop the fans.	OFF
"Low"	The fans run at low speed.	
"Medium"	The fans run at medium speed.	
"High"	The fans run at high speed.	

ECOSMART CONNECT CONTROL (CO)

DESCRIPTION OF CONTROL SOFTWARE STRATEGY

RM OCCUPANCY DISPLAY

If an RM sensor with occupancy display is connected, it will automatically display the occupancy state as follows.

State	Description	RM Display
Occupied	An enable signal is present i.e. Fans are running.	
Unoccupied	No enable & no trickle. i.e. Fans are stopped.	
Standby	No enable signal but fans are trickling	

MULTIPLE SENSORS

Where multiple sensors are connected the following options are available.

Network Input Name	Options
Temp Sensor Operation	Room module average (Default) Return Air only Room Module & Return Air Average
Setpoint Operation	Last Value Changed (Default) Software Setpoint Only (ignore room module)
Humidity Sensor Operation	Average (Default) Max Ignore
CO2 Sensor Operation	Average (Default) Max Ignore
Pressure Sensor Operation	Average (Default) Max Ignore

AUXILIARY INPUTS 4 & 5 (0-10V INPUTS)

The function of IN4 & IN5 can be set by the network inputs IN4 Function & IN5 Function. The available options are as follows.

Function	Description	Available Ranges
None	The signal is ignored	N/A
Fan Speed Control	A 0-10V input is used as a fan speed demand. 0V = Min Speed 10V = Max speed	N/A
EGG (Ecosmart Gateway Gadget)	0-10V from the EGG PCB is Control used as a fan speed demand. The optional EGG PCB can be used for back-wards compatibility with some Ecosmart Classic sensors.	N/A
0-10V CO2 Sensor	0-10V is scaled as defined by the network input "CO2 0-10V Output Range"	0-2,000ppm 0-4,000ppm 0-5,000ppm 0-10,000ppm 0-20,000ppm
0-10V Temperature Sensor	0-10V is scaled as defined by the network input "Temperature Sensor 0-10V Output Range"	0 to 50°C 0 to 40°C 0 to 100°C 0 to 80°C 0 to 90°C
0-10V Pressure Sensor	0-10V is scaled as defined by the network input "Pressure Sensor"	0-25Pa 0-50Pa 0-100Pa 0-300Pa 0-500Pa 0-1000Pa 0-1600Pa 0-2500Pa 0-3000Pa
0-10V Humidity Sensor	0-10V is scaled to 0-100% humidity	0-100% only

FAN SPEED CONTROL INPUT

Once assigned to either input 4 or 5, the 0-10V input is scaled to 0-100% fan speed demand.

ECOSMART GATEWAY GADGET (EGG)

If an EGG PCB is installed on the system this will give an enable signal and also a 0-10V fan speed demand. The EGG allows an existing NET sensor network to give a fan speed demand to a controller.

CO_2 CONTROL

When a CO_2 sensor is assigned to the system and an enable signal is received, ventilation will increase fans speeds to reduce CO_2 concentration. The target CO_2 sensor setpoint can be changed as one of the commissioning setpoints. Room Module CO_2 sensors are detected automatically. 0-10V CO_2 sensors need to be assigned to input 4 or 5.

HUMIDITY CONTROL

When a humidity sensor is assigned to the system and an enable signal is received, ventilation will increase fans speed to reduce humidity. The target humidity setpoint setpoint can be changed as one of the commissioning setpoints. Room Module humidity sensors are detected automatically. 0-10V humidity sensors need to be assigned to input 4 or 5.

CONSTANT PRESSURE CONTROL

When a pressure sensor is assigned to the system and an enable signal is received, ventilation will increase fans speeds to increase pressure to the target setpoint.

The target pressure setpoint can be changed as one of the commissioning setpoints. 0-10V pressure sensors need to be assigned to input 4 or 5. Room Module pressure sensors are not available.

ASHRAE BACnet (MS/TP)

CONFIGURABLE MODE (VIA SWITCHED LIVE 2)

The switched live 2 input is a configurable input that can be set to perform a number of functions. The function is set via the network input Configurable Mode SL2.

These functions will include the following:

- **Fan Boost (Default Setting)**

This enables Fan Boost mode

- **Heater Boost**

The heater function will be enabled. Fan speeds will be increased where necessary to keep supply temp at the heater boost setpoint. (Default 35°C).

- **Limit Extract Fan**

When this SL2 is selected and active, the unit will force the extract fan to run at trickle speed, regardless of all other demands. Supply fan will operate at the normal speed. If increased demand is required (E.g via CO2 or 0-10v IN4/5 some other input) the supply fan speed will increase but the extract fan speed will not.

This mode can be used when the unit is used in conjunction with a separate air extraction system.

FAN BOOST

When the control receives a boost signal, from either the network input "Boost" or "Configurable SL2" configured to boost the fans will run at their individual boost speeds. Once the signal is removed the fans will run on for a time defined by the boost run-on setpoint. Any demand in excess of the boost speed will be ignored (apart from 3 speed override and purge schedule).

HEAT BOOST

When the control receives a heat boost signal, from either the network input "Heat Boost" or "Configurable SL2" configured to "heat boost", the heater output will increase to 100%. The fan speed will be increased as required to reach the heat boost setpoint.

TEMPERATURE CONTROL

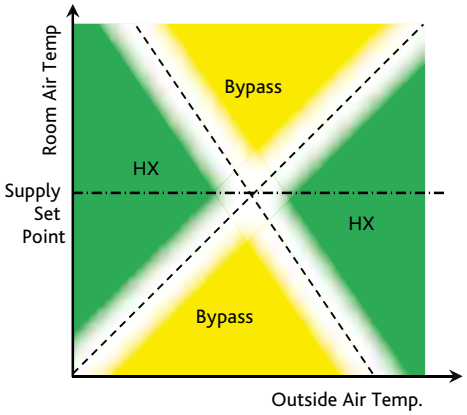
SUPPLY TEMPERATURE CONTROL (DEFAULT)

While an enable signal is present, this mode modulates heating, cooling & heat exchanger bypass dampers with the aim of the supply air reaching the temperature setpoint. Please note that heating and cooling outputs will only function if the "Heating Type" or "Cooling Type" network inputs are set to heating or cooling options.

The heat exchange bypass damper operates by calculating the supply air temperature based on the return air temperature, the outside air temperature and the heat exchanger efficiency. (Eg. A 13°C outside air temperature with a 23°C return air temperature will give a supply air temperature of 20.5°C).

The control then chooses the damper position which requires the minimal heat/cool tempering in order to achieve the setpoint.

Note that the white areas indicate regions where either heat exchanging or bypassing will achieve the same supply temperature.



ROOM TEMPERATURE CONTROL

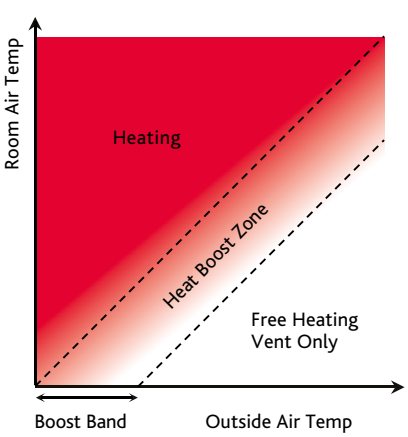
While an enable signal is present, this mode modulates heating, cooling & heat exchanger bypass dampers with the aim of the room air reaching the temperature setpoint. Please note that heating and cooling outputs will only function if the "Heating Type" or "Cooling Type" network inputs are set to heating or cooling options.

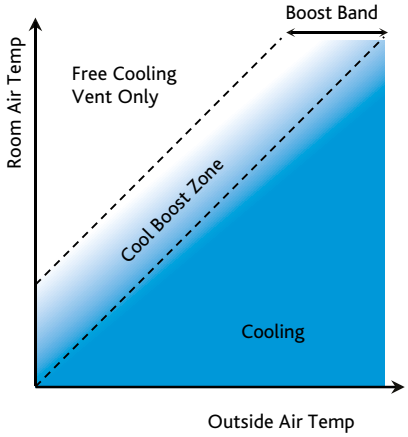
When heating or cooling is required achieve the room setpoint, the output of the heat/cool loops are split between ventilation demand or heat/cool demand according to the following graphs. The intermediate "boost" zone is the area in which a small amount of free-heat/cooling is available. In this zone, heating/cooling is used to boost the free-heating/cooling.

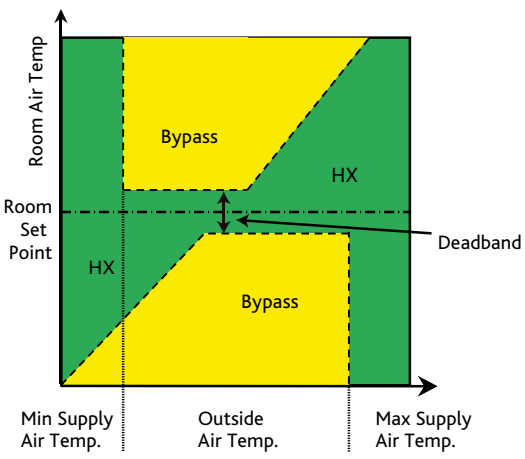
In room temperature control mode, the bypass damper is controlled according to the following chart. A minimum supply air temperature limit is included to stop the heat exchanger being bypassed when the air temp is uncomfortably cold, even though cooling is required. In this case the heat exchanger will temper the air for comfort. The reverse applies for the maximum supply air temperature limit.

If the supply air temperature exits the min-max supply temperature range, the unit will adjust ventilation, heating or cooling to compensate.

Note: Room temperature control will only be effective if the heater unit is sized correctly for the space. If the unit is undersized, heating from an external source may be required.







OVERRIDES

When the following conditions occur, the system will temporarily exit "Room Temperature Mode" and enter "Supply Temperature Mode".

- Trickle Mode with no enable signal. (Trickle deadband applies)
- Heat Boost Active
- Fan Boost Active
- Purge Mode Active
- 3-Speed override by Room Module

TRICKLE MODE

When trickle mode is active, the fans will run at their minimum speed even when there is no enable signal. Heating and cooling will also function in this mode if available. While in trickle mode, the unit will function in "Supply Temperature Control Mode" but with a different, wider deadband, set by the network input Trickle Deadband.

FROST PROTECTION

Should the internal temperature of the unit fall below a value defined in the commissioning variables, the control will override all heating/cooling logic to open the LPHW or CW control valves, if fitted. This is to allow any protective flow through the heating/cooling coils. The supply fan will also stop and the appropriate frost protection software module will enter an alarm state. This period will last for a minimum of 5 minutes by default. The fault relay will also open. Heat and cool demand relays will operate and the software frost alarm will enter an alarm state.

Please note that frost protection will only function if the Heating Type or Cooling Type setpoints are set to LPHW or CW.

NIGHT COOLING / SUMMER FREE COOLING

Once enabled in software, this routine uses an individual time schedule to cool the fabric of the building at night using only the external air. This mode only functions if the daytime temperature is above the setpoint, cooling is possible and if the cooling air is not too cold.

PURGE MODE

Once enabled in software, this routine uses an individual time schedule to provide a period of increased air change throughout a space. This mode only functions if the inlet air is above a minimum temperature of 12°C. While purge is in progress, the unit will function in "Supply Temperature Control Mode" but with a different, wider deadband, set by the network input "Trickle Deadband".

HIBERNATE

This mode is available for LPHW and CW units where the valves are required to be driven open in anticipation of a period where the unit is electrically isolated and inactive. When enabled via the network input "Hibernate Mode" this will stop the fans and open all LPHW & CW valves fully. The unit can then be powered down. This mode activation is reset upon power cycle so when restarted the unit will function as normal.

This mode is for periods when to building is left dormant and will stop the coils trapping water and causing a freeze risk. It will be the buildings responsibility to provide freeze-preventative heating during this time. This can also be used for a cleaning or flushing cycle.

ALARMS

CRITICAL ALARM LATCHING

Once in critical alarm state the unit will drive all heating and cooling outputs to 0V. In the event of fan fail other functions continue as normal. The critical alarm is latched and required manual reset or power cycle to clear.

Causes of critical alarm:

- Fan fail via fault circuit 1
- Heater overtemp via fault circuit 1

MAINTENANCE ALARMS (NON-LATCHING)

Once in maintenance alarm state the only action taken is de-energising of the fault relay. Once the trigger is removed, the alarm will reset automatically.

Causes of maintenance alarm:

- Condensate pump fault (This bypasses the heater exchanger automatically via relay)
- Sensor Failure
- Low supply temperature, default 8°C. This can be set to stop fans if required
- Frost protection routine active, default 4°C (This only runs if water valves are selected as fitted)
- Excessively high supply temperature reading (this will stop heating)
- Filter dP fault (if fitted)

All alarms have a hold off period set by the setpoint "Alarm Delay".

THERMAL TRIP

In case of software failure, as a final resort, the electric heater is protected by a fail-safe thermal overload switch. This switch disables the heater controller once the temperature reaches 80°C. When this occurs, the critical alarm will latch in software.

Once the unit cools, the contactor will re-engage but the heater signal will remain at 0V until the critical fault is reset in software or by power cycle.

7.14.4 CONFIGURABLE RELAY 8 (RL8)

Relay 8 is a configurable relay output which can be set to the following functions. It can be set by the multi-state object "RL8 Mode".

- Cooling Demand (Default Setting)
  This option will run the Relay as a cooling command relay. This output will only function if a cooling type is selected.
- Window Actuator

This option will run a Window Indication routine with a dual CO2 setpoint strategy. Relay 8 will be used to indicate to the end user whether it is appropriate to open the windows or not. This relay can be wired to an end user's signal lamp or other signal. This relay is SPST so an additional relay is required if a light is required for each state. A multistate object, 'Window Mode Status', exists with two states, 'Open' and 'Close'.

At external temperatures less than the 'Window Open Threshold' (14°C default) the indicator will signal close windows.
The 'CO2 Winter Target' will be used as the setpoint. (1000ppm default).

At external temperatures greater than the 'Window Open Threshold' (14°C default) and CO2 level higher than the 'CO2 Winter Target', the indicator will signal open windows. The 'CO2 Summer Target' will be used as the setpoint. (1500ppm default).

If the HX bypass damper is driven to bypass while fans are enabled, the indicator will signal open windows. (HX Bypass due to Condensate pump failure will not affect windows status).

The 'Window Mode Status' will indicate close windows when the unit is not enabled and at all other times.

CONFIGURABLE ANALOGUE OUTPUT 4 (OUT4)

OUT4 is a configurable analogue output which can be set to the following functions via the multi-state object "OUT4 Mode".

- Cooling Demand (Default Setting)
  This will provide a standard 0-10V cooling output. This output will only function if a cooling type is selected.
- ESClassic BMS

This option will provide a 0-10V ESClassic BMS output based on ventilation demand. This can then be used in conjunction with the fan run relay to run multiple slave Classic units from a master Connect control.

The type of BMS output can be selected by the muti-state object 'ECS BMS Thermic Output'.

Auto - The BMS output will switch between heating and cooling depending on outdoor air temperature.
None - The unit will only supply 'Vent Only' voltages
Heating - The unit will only supply 'Heating' voltages
Cooling - The unit will only supply 'Cooling' voltages

ES CLASSIC BMS OUTPUT TABLE

	Vent Only	Cooling	Heating
Off/Trickle	0.25V	-	-
SPEED 1	0.5V	0.75V	1V
SPEED 2	1.5V	1.75V	2V
SPEED 3	2.5V	2.75V	3V
SPEED 4	3.5V	3.75V	4V
SPEED 5	4.5V	4.75V	5V
SPEED 6	5.5V	5.75V	6V
SPEED 7	6.5V	6.75V	7V
SPEED 8	7.5V	7.75V	8V
SPEED 9	8.5V	8.75V	9V
SPEED 10	9.5V	9.75V	10V

FIRE ALARM

Once the Fire Alarm object is switched to the Alarm State, all fans, heating and cooling elements will stop instantly. The fault relay will de-energise and a fault message will be sent to the ESCO-LCD. Once the fire alarm status is released, the units will continue running automatically.

EXPOSED BACNET OBJECT LIST (BY CATEGORY)

ENABLE

LCD Browser Page	BACnet Object	Description	Object Type	Object ID	Default Value	Units
33	Enable	Software enable switch	MSV	10218	Off	Off/On
20	SL Enable	The state of the enable input	BI	10161	N/A	Off/On
10	Run-on (Enable)	Run-on timer value	AV	10267	0	Seconds
26	Time Schedule	Local Time Schedule	SCH	10496	N/A	N/A
33	Enable via Schedule	Enabled via Schedule	MSV	10219	N/A	Off/On

TRICKLE MODE

36	Trickle Mode	Enable trickle mode	MSV	10250	Off	Off/On
16	Trickle Deadband	Trickle mode deadband	AV	10316	5	Degrees-Celsius

IO DAMPERS

43	IO Damper Fitted	Selects whether IO dampers are fitted on alarm circuit 2	MSV	17669	No	Yes/No
13	IO Damper Delay	Delay between starting the fan relay and the fan output	AV	10279	0	Seconds

ANALOGUE INPUTS

2	IN4	The 0-10 voltage at input 4	AI	10032	N/A	Volts
30	IN4 Function	Function of the UI4 input	MSV	10209	None	None Fan Speed Control EGG 0-10V CO2 Sensor 0-10V Temperature Sensor 0-10V Humidity Sensor 0-10V Pressure Sensor
2	IN5	The 0-10 voltage at input 5	AI	10035	N/A	Volts
31	IN5 Function	Function of the UI5 input	MSV	10210	None	None Fan Speed Control EGG 0-10V CO2 Sensor 0-10V Temperature Sensor 0-10V Humidity Sensor 0-10V Pressure Sensor

CONFIGURABLE INPUTS

20	SL2 Input	The state of the configurable input (IN9)	BI	10164	N/A	Off/On
29	SL2 Mode	Set the function of switched live 2	MSV	10202	Fan Boost	None/Fan Boost/Heater Boost

FAN BOOST

33	Fan Boost	Software enabled Fan boost	MSV	10240	Off	Off/On
11	Run-on (Boost)	Boost run-on time	AV	10272	0	Seconds
11	Supply Fan boost spd	Supply Fan boost speed	AV	10273	100	Percent
19	Extract Fan boost spd	The extract fan boost speed	AV	17419	100	Percent

HEAT BOOST

29	Heat Boost	Software enabled Heater boost	MSV	10205	Off	Off/On
12	Heat Boost Setpoint	Setpoint Heater Boost Setpoint	AV	10276	35	Degrees-Celsius

EXPOSED BACNET OBJECT LIST (BY CATEGORY)

FAN OUTPUTS

LCD Browser Page	BACnet Object	Description	Oject Type	Object ID	Default Value	Units
7	Supply Fan Output	The 0-10V signal to the supply fan	AO	10182	N/A	Volts
7	Extract Fan Output	The 0-10V signal to the extract fan	AO	10176	N/A	Volts
21	Fan Enabled Cmd	The state of the fan enabled relay	BO	10191	N/A	Off/On

FAN COMMISSIONING

10	Extract Fan Max	Individual fan maximum speed setting	AV	10268	100	Percent
11	Extract Fan Min	Individual fan minimum speed setting	AV	10270	20	Percent
16	Supply Fan Max	Individual fan maximum speed setting	AV	10312	100	Percent
16	Supply Fan Min	Individual fan minimum speed setting	AV	10314	20	Percent

TEMPERATURE CONTROL

15	Software Setpoint	Software Setpoint	AV	10309	22	Degrees-Celsius
10	Deadband	Deadband for temp control	AV	10266	3	Degrees-Celsius
32	SetPoint Op	Setpoint operation	MSV	10214	Last Value Chg	Last Value Changed /Software Only
32	T Sens. Op	Temperature sensor operation	MSV	10215	NS Average	NS Average/Return Air Only/ NS & Return Average
32	0-10V Temp Range	Temperature sensor range	MSV	10216	0 to 50°C	0 to 50°C/0 to 40°C/ 0 to 100°C/0 to 80°C/ 0 to 90°C
34	Temp Control Mode	Temperature control mode STC/RTC	MSV	10245	ReturnTempCtrl	Supply Temperature Ctrl/ Return Temperature Ctrl
15	STC H/C Pref	STC Heat/Cool Pref	AV	10310	50	No units
16	STC HX Efficiency	STC HX Efficiency	AV	10311	0.8	No units
14	RTC Boost Band	Return Temperature Control Boost Band	AV	10306	15	Degrees-Celsius
15	RTC Max Supply Temp	Max supply temp when in RTC mode	AV	10307	35	Degrees-Celsius
15	RTC Min Supply Temp	Min supply temp when in RTC mode	AV	10308	12	Degrees-Celsius

HEATING OUTPUT

30	Heating Type	Set the type of heating fitted	MSV	10206	As per build	None/LPHW/Electric
7	Heating Output	The 0-10V signal to the heating output	AO	10179	N/A	Percent
22	Heating Demand Cmd	The state of the heating demand relay	BO	10197	N/A	Off/On

COOLING / CONFIGURABLE OUTPUTS

42	RL8 Mode	Chooses the mode of Relay 8	MSV	17429		Cooling Demand/ Window Actuator
29	Cooling Type	Set the type of cooling fitted	MSV	10203	None	None/Cold Water/DX
21	Relay 8	The state of configurable relay 8	BO	10194	N/A	Off/On
43	OUT4 Mode	Chooses the mode of Analogue output 4	MSV	17608	Cooling Dmd	Cooling Demand/ESClassic BMS Mode
7	Output 4	The state of configurable output 4	AO	10173	N/A	Percent
43	ESC BMS Thermic Output	Chooses whether to demand thermal output in 0-10V ESClassic BMS mode	MSV	17610	Auto	Auto/None/Heating/Cooling

HX BYPASS DAMPER

21	Bypass Damper Cmd	The controller's signal to the bypass damper (Active = Bypass)	BO	10185	N/A	Active/Inactive

EXPOSED BACNET OBJECT LIST (BY CATEGORY)

FAN DEMANDS INPUTS

LCD Browser Page	BACnet Object	Description	Object Type	Object ID	Default Value	Units
10	CO2 Target	Target CO2 Value	AV	10265	650	Parts-Per-Million
28	0-10V CO2 Range	CO2 sensor output range	MSV	10200	0-2,000ppm	0-2,000ppm/0-4,000ppm/ 0-5,000ppm/0-10,000ppm/ 0-20,000ppm
28	CO2 Sensor Op	CO2 sensor operation in case of multiple sensors	MSV	10201		Average CO2/MaxCO2/ Ignore CO2
12	Humidity Target	Relative HumidityTarget	AV	10278	60	Percent-relative-Humidity
30	Humidity Sensor Op	Humidity Sensor Operation in case of muliple sensors	MSV	10207	Average RH%	Average RH%/Max RH%/Ignore RH%
14	Pressure Target	Target pressure value	AV	10303	400	Pascals
31	0-10V Press Range	Pressure sensor range	MSV	10212	0 to1000Pa	0-25Pa/0-50Pa/0-100Pa /0-300Pa/0-500Pa/0-1000Pa /0-1600Pa/0-2500Pa/ 0-3000Pa
31	P sens. Op	Pressure sensor operation in case of multiple sensors	MSV	10213	Average Value	Average Value/ Max Value

SELECTED PROCESS VARIABLES

17	Room Air Temp	The room air temperature	AV	11296	N/A	Degrees--Celsius
17	CO2 Level	The CO2 Level	AV	13980	N/A	ppm
17	Humidity	The Humidity Level	AV	14297	N/A	% RH
17	Active Setpoint	The setpoint currently used	AV	14534	N/A	Degrees-Celsius

XBC TEMPERATURE SENSORS

1	Supply Air Temp (B)	The supply air temperature	AI	10005	N/A	Degrees-Celsius
1	Fresh Air Temp (H)	The fresh air temperature	AI	10008	N/A	Degrees-Celsius
1	Extract Air Temp (C)	The extract air temperature	AI	10011	N/A	Degrees-Celsius

ZONE SENSORS

2	RM199 Temp	The temperature at RM address 199	AI	10029	N/A	Degrees-Celsius
2	RM199 Humidity	The Humidity at RM address 199	AI	10017	N/A	Percent-Relative-Humidity
8	RM199 Setpoint	The setpoint at RM address 199	AV	10023	N/A	Degrees-Celsius
27	RM199 Fan Speed	Fan Speed Override Status of RM199	MSV	10014	N/A	Off/Auto/Low/Medium/HIgh
36	RM199 Fan Display	Fan Speed Override Display at RM address 199	MSV	14703	N/A	No Status/Off/Low/Medium /High/Auto-Off/Auto-Low /Auto-Medium/Auto-High
3	RM200 Temp	The temperature at RM address 200	AI	10050	N/A	Degrees-Celsius
3	RM200 Humidity	The Humidity at RM address 200	AI	10053	N/A	Percent-Relative-Humidity
8	RM200 Setpoint	The set point at RM address 200	AV	10074	N/A	Degrees-Celsius
3	RM201 Temp	The temperature at RM address 201	AI	10065	N/A	Degrees-Celsius
4	RM201 Humidity	The Humidity at RM address 201	AI	10077	N/A	Percent-Relative-Humidity
8	RM201 Setpoint	The setpoint at RM address 201	AV	10083	N/A	Degrees-Celsius
3	RM202 Temp	The temperature at RM address 202	AI	10068	N/A	Degrees-Celsius
4	RM202 Humidity	The Humidity at RM address 202	AI	10092	N/A	Percent-Relative-Humidity
8	RM202 Setpoint	The setpoint at RM address 202	AV	10098	N/A	Degrees-Celsius

EXPOSED BACNET OBJECT LIST (BY CATEGORY)

ZONE SENSORS (Continued from previous page)

LCD Browser Page	BACnet Object	Description	Object Type	Object ID	Default Value	Units
4	RM203 Temp	The temperature at RM address 203	AI	10071	N/A	Degrees-Celsius
4	RM203 Humidity	The Humidity at RM address 203	AI	10107	N/A	Percent-Relative-Humidity
9	RM203 Setpoint	The setpoint at RM address 203	AV	10113	N/A	Degrees-Celsius
5	RM212 CO2	The CO2 at RM address 212	AI	10137	N/A	Parts-Per-Million
6	RM212 Temp	The temperature at RM address 212	AI	10149	N/A	Degrees-Celsius
5	RM213 CO2	The CO2 at RM address 213	AI	10140	N/A	Parts-Per-Million
6	RM213 Temp	The temperature at RM address 213	AI	10152	N/A	Degrees-Celsius
5	RM214 CO2	The CO2 at RM address 214	AI	10143	N/A	Parts-Per-Million
6	RM214 Temp	The temperature at RM address 214	AI	10155	N/A	Degrees-Celsius
5	RM215 CO2	The CO2 at RM address 215	AI	10146	N/A	Parts-Per-Million
6	RM215 Temp	The temperature at RM address 215	AI	10158	N/A	Degrees-Celsius

FROST PROTECTION

11	Frost Prot. Fan Off	Minimum time the supply fan will stop in a frost protection state	AV	10274	300	Seconds
12	Frost Prot.Temp	Supply temperature at which frost protection becomes active	AV	10275	4	Degrees-Celsius

HIBERNATE

33	Hibernate Mode	Unit is ready for hibernation. Resets on powercycle	MSV	10241	Off	Off/On

PURGE MODE

34	Purge Active	This input will enable purge mode	MSV	10243	Off	Off/On
14	Purge Fan Speed	Purge Fan Speed	AV	10304	60	Percent
14	Purge Min Temp	The minimum temperature that will stop puge mode	AV	10305	12	Degrees-Celsius
26	Purge Time Schedule	Purge Time Schedule	SCH	10499	N/A	N/A
36	Purge via Schedule	Purge Time Schedule State	MSV	10512	N/A	Off/On

NIGHT COOL MODE

34	Night C Mode	This input will enable night cool mode	MSV	10242	Off	Off/On
13	Night C Fan Speed	The night cool fan speed	AV	10281	60	Percent
13	Night C Min Temp	The minimum temperature that will stop night cooling	AV	10302	12	Degrees-Celsius
26	Night C Schedule	Night Cooling Schedule	SCH	16014	N/A	N/A
37	Night C Schedule	Night Cool Schedule State	MSV	16014	N/A	Off/On
26	Night C Sample	Daytime schedule for winter or summer decision making	SCH	15875	N/A	N/A
37	Night C Sample	Night Cool Sampling Schedule State	MSV	16008	N/A	Off/On

AUTO RUN-ON

32	Auto Run-on	Auto run-on mode	MSV	10217	Off	Off/On
9	Auto-Run-on Max Time	Maximum Run-on Max Time	AV	10263	900	Seconds
9	Auto-Run-on Scale Factor	Scale Factor for automatic run-on time	AV	10264	2	No Units

EXPOSED BACNET OBJECT LIST (BY CATEGORY)

FIRE ALARM

LCD Browser Page	BACnet Object	Description	Object Type	Object ID	Default Value	Units
42	Fire Alarm	Engage Fire Alarm Mode	MSV	17365	Normal/Alarm	N/A

WINDOW INDICATION MODE

19	Window Open Threshold	The outdoor air temp for Window Indication Mode to open the windows	AV	17482	14	Degrees-Celsius
19	CO2 Summer Target	CO2 summer target for Window Indictaion Mode	AV	17484	1500	ppm
19	CO2 Winter Target	CO2 winter target for Window Indictaion Mode	AV	17486	1000	ppm
43	Window Mode Status	Indicates the state the windows are to be in Window Actuator Mode	MSV	17445	N/A	Open/Close

ALARM

21	Fault Relay Cmd	The state of the fault relay (Fault = De-energised)	BO	10188	N/A	Alarm/Normal
9	Alarm Delay	Alarm hold off period	AV	10262	10	Seconds
23	Reset Alarms	Changing this value will reset any latched alarms	BV	10332	FALSE	True/False
20	Alarm Circuit 1	The state of Alarm Circuit 1	BI	10167	N/A	Normal/Alarm
20	Alarm Circuit 2	The state of Alarm Circuit 2	BI	10170	N/A	Normal/Alarm
12	High Temp Alarm	Supply temp which will trip the high supply alarm	AV	10277	50	Degrees-Celsius
13	Low Temp Alarm	Supply temp which will trip the low supply alarm	AV	10280	8	Degrees-Celsius
31	Low Temp Action	Action taken when the low supply alarm is engaged	MSV	10211	Alarm Only	Alarm only / Alarm and stop fans
36	Critical Alarm	Unit is latched in critical alarm	MSV	15309	N/A	Normal/Alarm
37	Maint. Alarm	Maintenance Alarm	MSV	15310	N/A	Normal/Alarm
37	XBC Sensor Alarm	XBC Sensor Out of Range	MSV	17009	N/A	Normal/Alarm
38	Low SA-T Alarm	Low Supply Air Alarm	MSV	17011	N/A	Normal/Alarm
38	High SA-T Alarm	High Supply Air Alarm	MSV	17012	N/A	Normal/Alarm
38	Frost Alarm	The unit is in frost mode	MSV	17013	N/A	Normal/Alarm

LCD EVENT SIGNAL

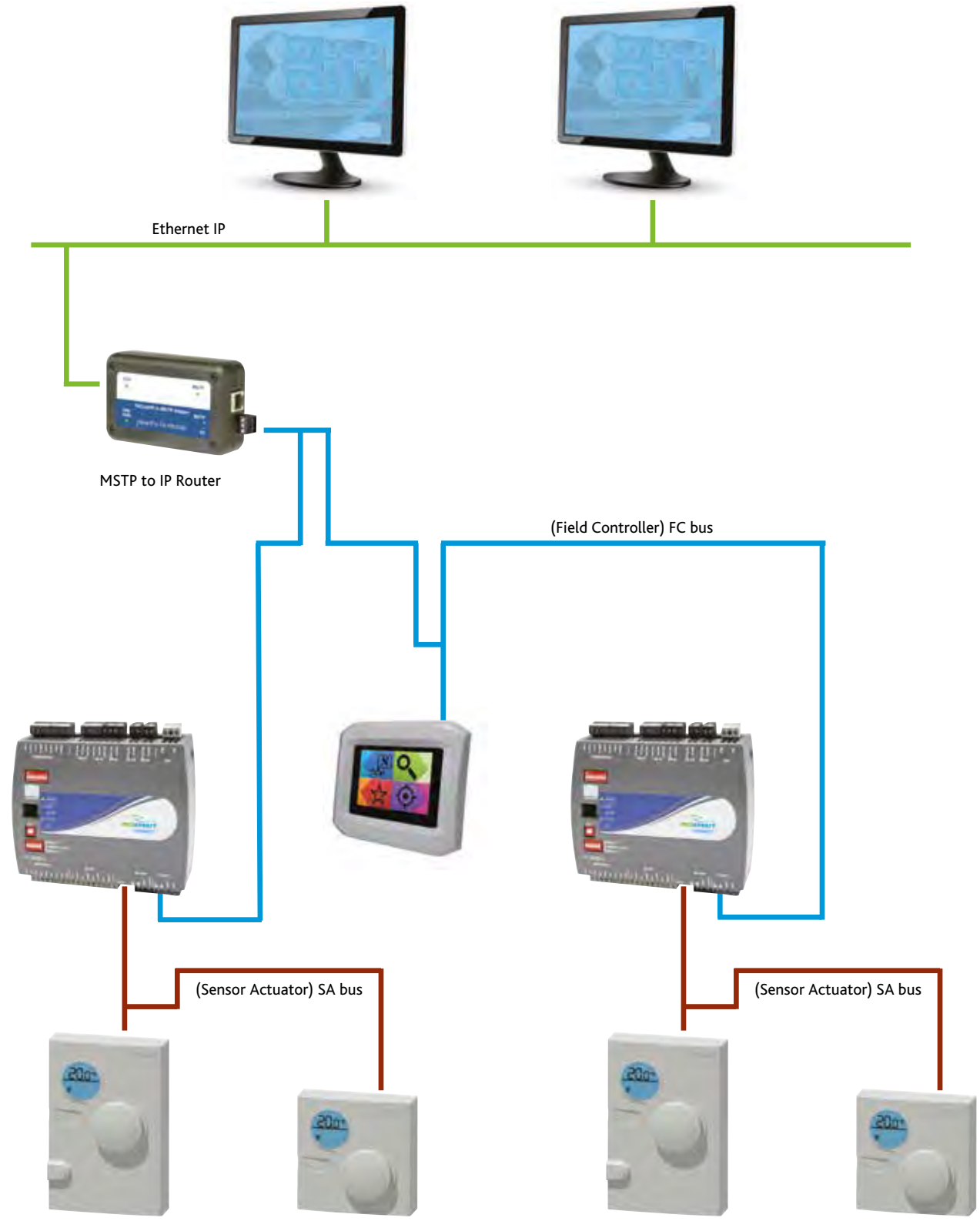
38	Ala(A Circ 1)	For LCD Event Signal only	MSV	17281	N/A	Alarm/Normal
39	Nor(A Circ 1)	For LCD Event Signal only	MSV	17282	N/A	Seconds
39	Ala(Low Supply Temp)	For LCD Event Signal only	MSV	17285	N/A	True/False
39	Nor(Low Supply Temp)	For LCD Event Signal only	MSV	17286	N/A	Normal/Alarm
39	Nor(High Supply Temp)	For LCD Event Signal only	MSV	17289	N/A	Normal/Alarm
40	Ala(High Supply Temp)	For LCD Event Signal only	MSV	17290	N/A	Degrees-Celsius
40	Ala(A Circ 2)	For LCD Event Signal only	MSV	17293	N/A	Degrees-Celsius
40	Nor(A Circ 2)	For LCD Event Signal only	MSV	17294	N/A	Alarm only / Alarm & stop fans
40	Ala(Frost)	For LCD Event Signal only	MSV	17316	N/A	Normal/Alarm
41	Nor(Frost)	For LCD Event Signal only	MSV	17317	N/A	Normal/Alarm
41	Ala(XBC Sensor)	For LCD Event Signal only	MSV	17320	N/A	Normal/Alarm
41	Nor(XBC Sensor)	For LCD Event Signal only	MSV	17321	N/A	Normal/Alarm
42	Ala (Fire Alarm)	For LCD Event Signal Only	MSV	17409	N/A	Normal/Alarm
42	Norm (Fire Alarm)	For LCD Event Signal Only	MSV	17411	N/A	Normal/Alarm

EXPOSED BACNET OBJECT LIST (BY CATEGORY)

FACTORY SETTINGS

LCD Browser Page	BACnet Object	Description	Object Type	Object ID	Default Value	Units
29	Damper Override	Override bypass damper position	MSV	10204	Auto	Auto/Heat Exchange/Bypass
34	Tacho PCB Fitted	Is a "Taco Bell" PCB fitted	MSV	10244	As per build	Yes/No
23	Tuning Reset	Resets the PID auto tuning loops	BV	12880	FALSE	True/False
30	Ignore PIR Sensors	Ignore all MSTP network PIR sensors	MSV	10208	No	Yes/No
18	EF Max Volt	The upper voltage for the extract fan	AV	17273	10	volts
18	EF Start Volt	The voltage required to start the extract fan	AV	17274	1	volts
18	SF Max Volt	The upper voltage for the supply fan	AV	17275	10	volts
18	SF Start Volt	The voltage required to start the extract fan	AV	17276	1	volts
41	SW-FAC2612-2-12A	Strategy Version	MSV	17340	Off	Off/On

NETWORK CONNECTION DIAGRAM



For best results, use a linear network and switch on the EOL resistors at each end of the FC bus.

FAC CONTROLLER

A FAC controller is used to control the unit. The controller can connect to the FC bus via the 4 pin FC connection.

MAC Address

The physical MAC address of the FAC adjustable between 4-127 and is set via the DIP switch on the front of the unit. When multiple controllers are connected on the same FC bus, each controller 's MAC address must be unique.

BACnet Instance Number

The BACnet instance number of the FAC is factory-set to a random unique value from 0-4,194,304. This ensures that every controller will have a unique BACnet instance number on any possible network.

End Of Line (EOL) Resistor

When an FAC controller is used as a terminator at the end of a FC bus line, the EOL resistor dip switch can be switched on for best performance.

Fault Light Status

Blink 5Hz - Not all possible room modules are connected. This is normal.
Blink 2Hz - Startup in progress
Off Steady - No Faults
On Steady - No Software

BACNET IP TO MS/TP ROUTER (ESCO-IPN)

The BACnet IP to MS/TP Router exchanges information between networks and allows the controller to communicate on an IP network. One router is required for each MS/TP network.

The BACnet router has a USB 2.0, Type B receptacle which is only used to obtain power from a computer or USB adapter. A mains adapter and cable is supplied. The router connects to the FC bus via screwed terminals.

Address Type	Default Address
IP Address	192.168.92.68
Subnet Mask	255.255.255.0 (/24)

A reset switch is available inside a small hole located on the side of the case. If you press the reset switch with a paper clip (or similar device) for at least 1 second, the switch resets to the default values of the IP address, gateway address, and netmask. After you use the reset switch, you need to reboot the router. The BACnet/IP to MS/TP Router contains a Web server. You can access the Web server from any Internet-compatible computer on the local network To configure the router, you need a computer with an Ethernet connection, router, and standard Web browser.

INTERCONNECTION

The FC bus connects via the following MSTP cabling:

ESCO-MSTPC30M	Ecosmart Connect MSTP cable reel 30m
ESCO-MSTPC150M	Ecosmart Connect MSTP cable reel 150m

Suggested Wiring Colouring

White	+
Green	-
Black	COM
Red	Unused

Note: On the SA Bus, the + and - wire are one twisted pair, and the COM and SA PWR are the second twisted pair of wires.
These cannot be used with RJ12 connections and must be stripped and connected using screwed terminals. The shield must be earthed at the control panel end only and be made continuous along the bus length.
Room Modules must not be fitted more than 150metres (cable length) from the controller.

ASHRAE BACnet **(MS/TP)**

ECOSMART CONNECT CONTROL (CO)

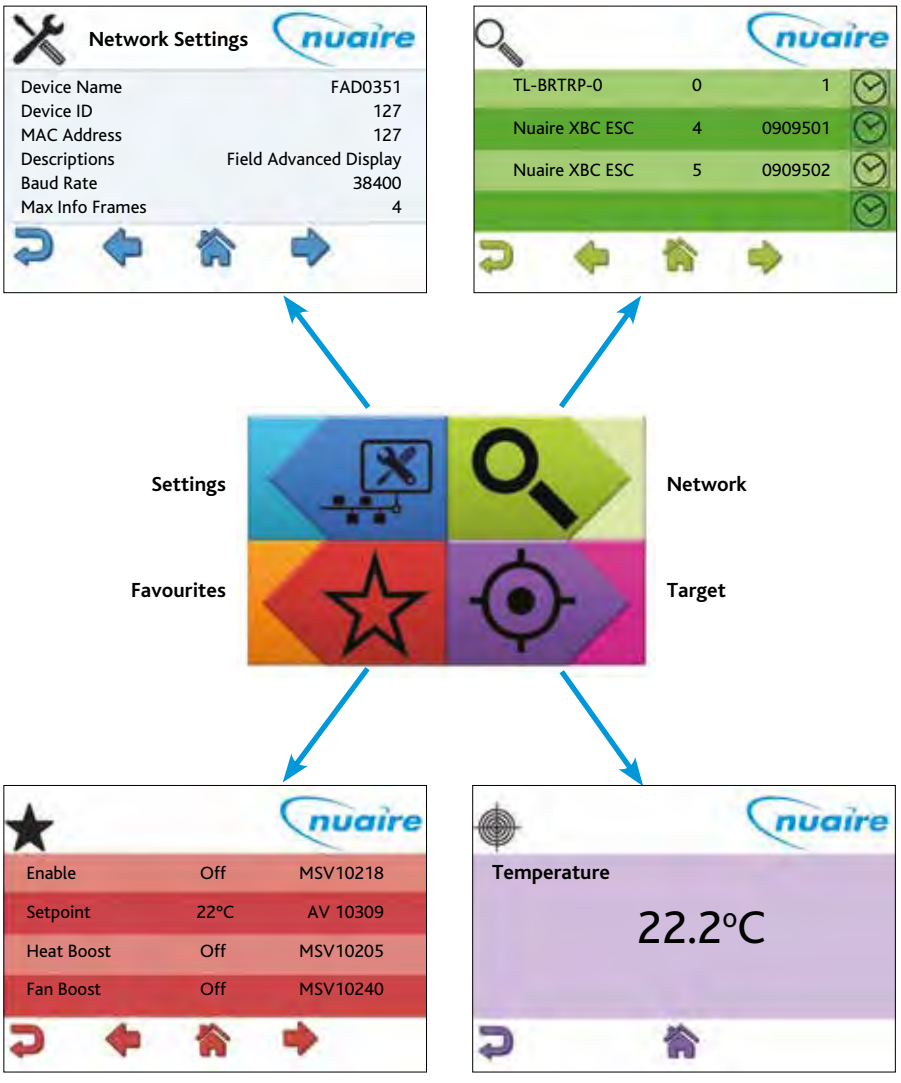
DESCRIPTION OF CONTROL SOFTWARE STRATEGY

TOUCH SCREEN (ESCO-LCD) FIELD ADVANCED DISPLAY (FAD)

The ESCO-LCD is a user friendly operator interface featuring BACnet® communication and a colourful, graphic display with touch-screen interface. It is powered by 12-24VAC / VDC and connected via the FC bus.

NAVIGATION

	Cancel – Quit and moves to the previous section
	Home – Shortcut to the configured Home Page
	Back – Moves to the previous page in the same section
	Forward – Moves to the next page in the same section
	Enter – Applies changes



QUICK SETUP

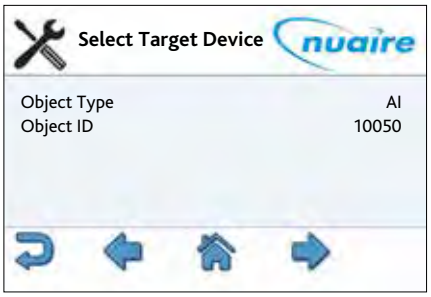
The following section explains how to quickly set-up the FAD with a target object and some favourites.

SETTING UP A TARGET OBJECT

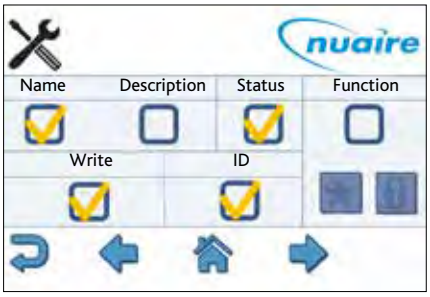
Target objects allow the user to view a "target" device and object within the entire network.

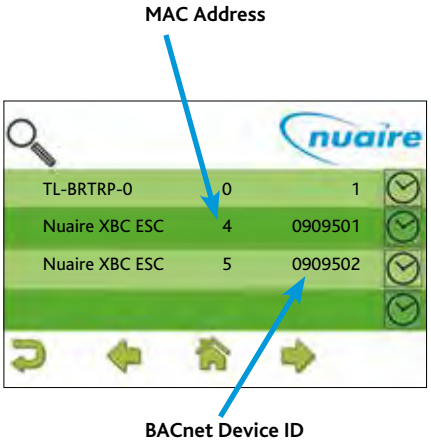
To choose a target object

- Navigate to the settings page.
- Select the right arrow four times to reach the Select Target Device screen.
- Enter the physical MAC address* of the controller (Device names or BACnetIDs can also be used but MAC addresses are shorter)
- Select the right arrow once
- Enter the object type of the required object (Eg AI, AO, MSV)**
- Enter the BACnet ID** of the object. (0-4194304)
- Select the home icon.



* This is the setting of the DIP switch on the front of the FAC controller. This can also be discovered by browsing to the network screen while ID is selected in the View Config settings screen.





** Popular object details are listed below, or use the network browser or see "Exposed BACnet Object List" for a full list.

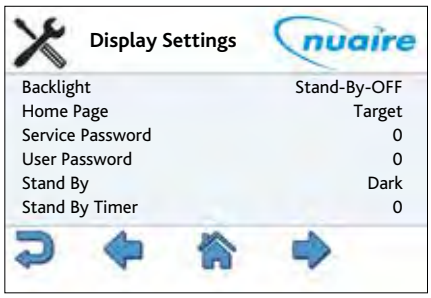
Network Page	Description	Object Type	Object ID
17	Room Air Temp	AV	11296
17	CO_2 Level	AV	13980
17	Humidity	AV	14297
17	Active Setpoint	AV	14534
1	Fresh Air Temperature	AI	10008

ASHRAE BACnet (MS/TP)

SETTING UP A TARGET OBJECT CONT.

To set the target object page as the default home page.

- Navigate to the settings page.
- Select the right arrow twice to reach the display settings screen.
- Select Home Page
- Select Target
- Select the enter icon
- Select the home icon



Note: The BACnet type & ID will be displayed on the target page if 'ID' is selected on the 'View Config' settings screen.

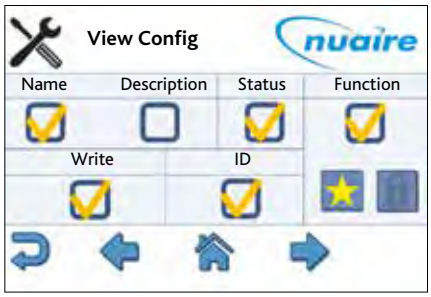
Note: If the target page is selected as the home page and a security password is set the home page will be locked. The only way to exit the target screen in this case is to press the Nuaire logo to the top right of the screen for 5 seconds.

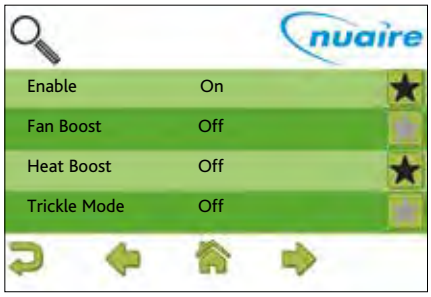
SETTING UP FAVOURITES

The "Favourite" screen displays a list of favourite objects.

To add or remove favourites.

- Navigate to the settings page
- Select the right arrow six times to reach the View Config screen.
- Select the function tickbox and favourite star.
- Select the home icon
- Navigate to the network page.
- Select the appropriate controller
- Navigate to the required object. See "Exposed BACnet Object List" for a full list.
  (Pressing for 3 seconds on an object will display the full name.)
- Select the star to turn it black
- Navigate and select any other required favourites
- When finished, navigate back to the View Config screen in the settings section and remove the function tick





Favourites can be removed by browsing the favourites page, selecting an object and then selecting the trashcan.

Favourites can be re-ordered by uploading the favourite settings to a usb memory stick and changing the order of the items in the favourites.csv file. This file can then be downloaded back to the LCD.

Network Page	Description	Object Type	Object ID
17	Room Air Temp	AV	11296
17	CO2 Level	AV	13980
17	Humidity	AV	14297
17	Active Setpoint	AV	14534
32	Enable	MSV	10218
25	Time Schedule	SCH	10496
32	Fan Boost	MSV	10240
28	Heat Boost	MSV	10205
1	Fresh Air Temperature	AI	10008
15	Software Setpoint	AV	10309

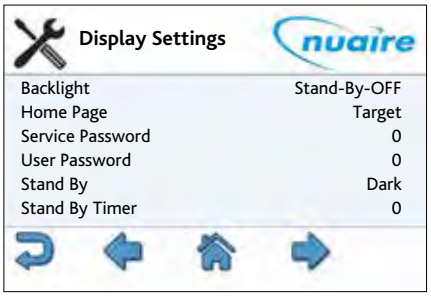
ASHRAE BACnet (MS/TP)

SETTING UP SECURITY

Note: If the target page or favourite page is selected as the home page and a security password is set, the home page will be locked. The only way to exit the target screen in this case is to press the Nuaire logo to the top right of the screen for 5 seconds. A security password will then be requested to access the main menu. The security password timeout is the same as the standby timer and set via the display settings.

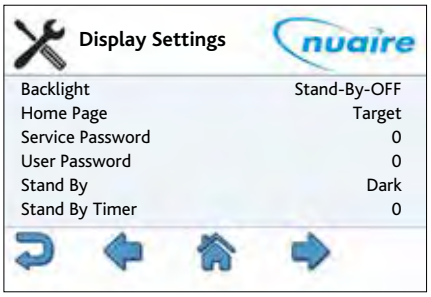
TO SET A USER PASSWORD

- Navigate to the settings page
- Select the right arrow twice to reach the display settings screen
- Change the user password a 4 digit number
- The user password will now be requested each time a locked object is written
- The user password is also needed to exit the target page. (When the home page is set to target)



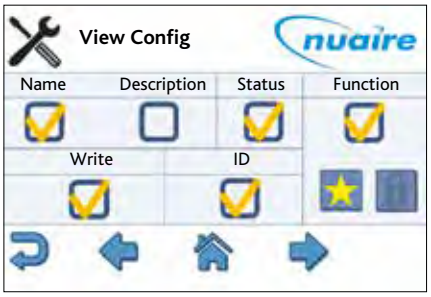
TO SET A SERVICE PASSWORD

- Navigate to the settings page
- Select the right arrow twice to reach the display settings screen
- Change the service password a 4 digit number
- The service password will now be requested each time the settings page is accessed



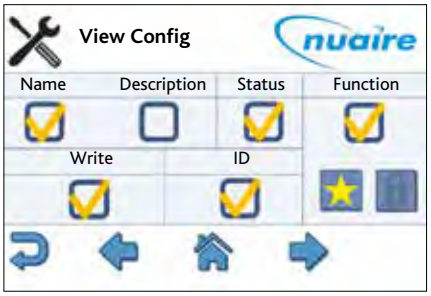
TO DISABLE WRITING OF VALUES

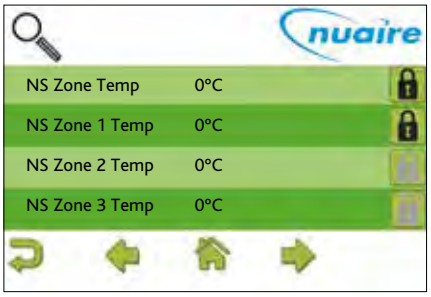
- Navigate to the settings page
- Select the right arrow six times to reach the View Config screen
- De-select the write tickbox. All controller points are now read only
- A service password will need to be set to stop users re-enabling the write function



TO ALLOW BASIC VALUES TO BE WRITTEN BY THE USER

- Navigate to the settings page
- Select the right arrow six times to reach the View Config screen
- Select the function tickbox and lock
- Select the home icon
- Navigate to the network page.
- Select the appropriate controller.
- Navigate to the required object. See "Exposed BACnet Object List" for a full list.
- Select any values that need password protection. A black lock indicates a locked value
- When finished, navigate back to the View Config screen in the settings section. Remove the Function tick and enable writing of values
- A user password will need to be set to stop writing of locked values. It is recommended that all values are locked except the following;





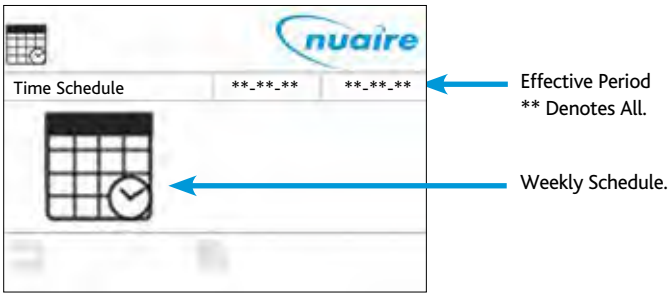
Network Page	Description	Object Type	Object ID
32	Enable	MSV	10218
25	Time Schedule	SCH	10496
32	Fan Boost	MSV	10240
28	Heat Boost	MSV	10205
15	Software Setpoint	AV	10309

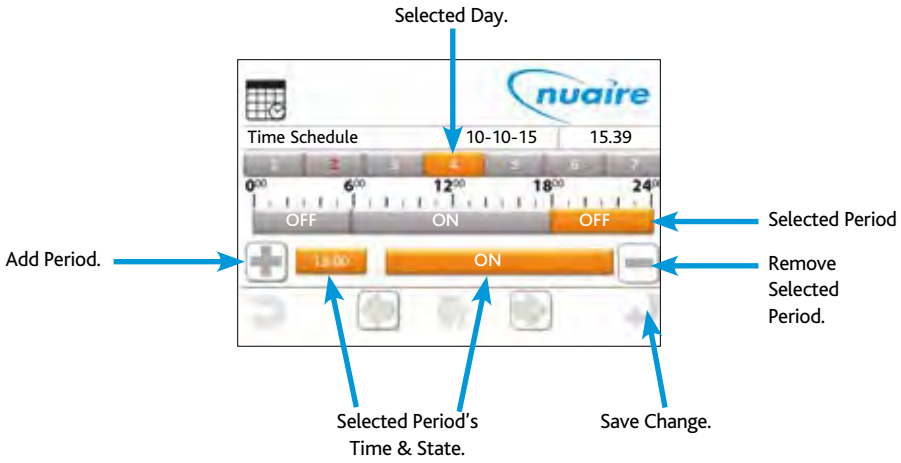
SCHEDULING PAGE

Standard BACnet schedule objects can be adjusted in the same way as any other BACnet object.

The BACnet schedule function consists of an array of singular time values with a corresponding ON/OFF state. In order to end an 'ON' period, a new value must be created with a value of 'OFF'. This new value's time can be adjusted to the desired end time.

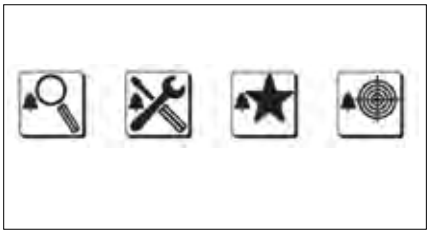
Select a schedule object via object browser or the favourites menu to access the following screens.





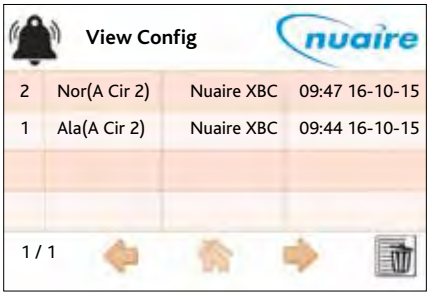
ALARM LOG

When an XBC alarm changes state, a signal is sent to the LCD display and logged on the alarm page. If there are items on the alarm page the standard top left page icons change to one of the following, depending on the current page. The alarm page can be accessed by selecting the alarm icon.



Alarm events are logged with a date and time.
'Nor' represents a change to a normal state.
'Ala' represents a change to an alarm state.

The text in parentheses denotes the alarm the event applies to. The log can hold up to 40 events.



Logged alarm events can be deleted by using the delete icon. If all events are deleted, alarm states can still be checked by navigating to the BACnet alarm objects via the network browser page. See the BACnet alarm list for alarm objects.

The LCD can be set to sound a continuous beep when a new item is added to the alarm log. This beep is silenced by any user interaction, but the alarm event is still logged. This option can be changed via the settings page.

BACK-UP

The LCD settings, favourites and locked items can be backed up to a usb drive by plugging a usb into the rear of the LCD. The screen will automatically change to a download screen. Select the item required and choose upload.
To download data to the LCD select the data type and choose download.
If a user or service password is forgotten, they can be reset by re-downloading a backup file to the LCD that has no set password. It is recommended that a backup is made of a LCD with no password set.

ASHRAE BACnet (MS/TP)

SETTINGS PAGES

These set of pages allow the user to configure the technical functions of the LCD both from the BACnet and user interface perspectives.
The settings page requires a service password for access.

NETWORK SETTINGS PAGE

Allow the user to discover all devices connected on the MS/TP network and browse all objects exposed within these devices.

Parameter Name	Description	Default Setting
Device Name	It defines the BACnet Device Object Name	FAD0351
Device ID	It defines the BACnet Device Object Identifier	127
MAC Address	MSTP Address of FAD	127
Descriptions	BACnet Description of FAD	Field Advanced Display
Baud Rate	It defines the FAD communication speed over the BACnet local network.	38400
Max Info Frames	It defines the BACnet Device Object Max_Info_Frames	3
Adjust Priority	The Adjust priority parameter defines with which priority the display will command AV / BV / MV values.	16
Override Priority	The Override priority parameter defines with which priority the display will command AO / BO / MO values	8
Page Refresh Time	It defines the polling speed at which the FAD will refresh the values shown on the screen	30 sec
Max Master	This parameter represents the value of the Max_Master property of the node's Device object	127
APDU Time	The APDU Timeout property defines the amount of time, in seconds, the FAD waits for responses from other devices.	3

DISLAY SETTINGS PAGE

Parameter Name	Description	Default Setting
Backlight	It defines whether the back light remains ON or turns OFF during Standby	Stand-By ON
Homepage	It defines which page to show at power up or pressing the "Home" shortcut button	Main Menu
Service Password	Password required to enter settings page	0
User Password	Password Required to change locked values (All values are locked by default)	0
Stand By	It defines the behaviour of the display once the "Stand By Timer" has expired without interactions from the user	-
Stand By Timer	It defines the inactivity period, in minutes, required to force the display in Stand By mode and for both Service and User passwords expiration. Defining this parameter to Zero, the passwords request (if any) is prompted at any access to pages requiring them	0 min
Feedback Sound	It defines whether the device shall provide a sound feedback during user interaction	OFF
Alarm	It defines whether the device shall provide a sound feedback when receiving a new Alarm. The notification sound can be continuous (ON) or intermittent (BEEP)	OFF
Date	It adjusts settings related to the Day, Month and Year of the FAD integrated clock	
Time	It adjusts settings related to the Hour and Minute of the FAD integrated clock	
Day Of Week	It adjusts settings related to the Day of Week (1-7) of the FAD integrated clock	

SELECT TARGET DEVICE PAGE

Parameter Name	Description	Default Setting
Device Name	Name of the device where the object resides	
MAC Address	The MSTP address of the device where the object resides	
Device ID	The BACnet ID of the device where the object resides	
Object Type	The object type	
Object ID	The object BACnet ID	

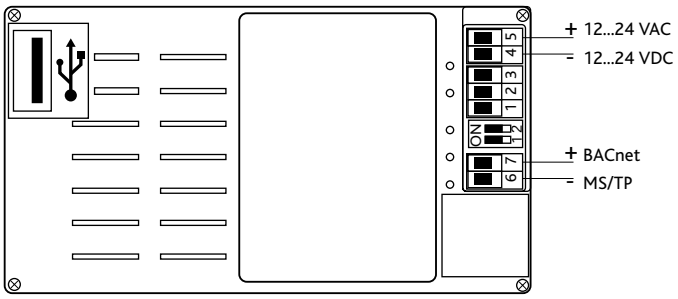
9.6.4 VIEW CONFIG

Parameter Name	Description	Default Setting
Name /Description	Chooses whether objects are described by their name or description	Name
Write	Allows editing of objects	Yes
ID	This will display the BACnet ID next to all BACnet objects on the network, favourites and target pages	Yes
Function (Favourite/Lock)	This option allows objects to be added to the favourite or locked list. Once it is selected, navigate to the network page and choose which objects are required. A user password is required to change any locked object, if set. All values are unlocked by default.	None

MULTIPLE CONTROLLERS

When accessing the Network View the FAD launches a Network Discovery function. The purpose of this function is to find other BACnet devices residing on the same MS/TP trunk. The maximum number of devices supported by the FAD discovery function is 32.

WIRING



Terminal Block	Description
1-3	Unused
4	Power Supply (-) 12...24 VAC / VDC
5	Power Supply (+) 12...24 VAC / VDC
6	BACnet MS/TP Port (RT-)
7	BACnet MS/TP Port (RT+)
	Programming USB Port
DIP Switch 1	BACnet MS/TP Line Terminator (End of Network 120 resistor switch)
DIP Switch 2	Unused

There are two ways of connecting the LCD.

1. Connected to the FC bus using screwed terminals. A separate power supply is required.
2. If the controller is standalone, the LCD display can be connected to the RJ12 FC bus port on the front of the FAC controller. This FC port will also power the LCD, so in this case, a separate power supply is not required.

One of the following cables is required to do this.

ESCO-LCD-3M	Ecosmart-Connect LCD RJ12 Connection Cable 3m
ESCO-LCD-5M	Ecosmart-Connect LCD RJ12 Connection Cable 5m
ESCO-LCD-10M	Ecosmart-Connect LCD RJ12 Connection Cable 10m
ESCO-LCD-20M	Ecosmart-Connect LCD RJ12 Connection Cable 20m
ESCO-LCD-30M	Ecosmart-Connect LCD RJ12 Connection Cable 30m

ASHRAE BACnet (MS/TP)

ECOSMART CONNECT CONTROL (CO)

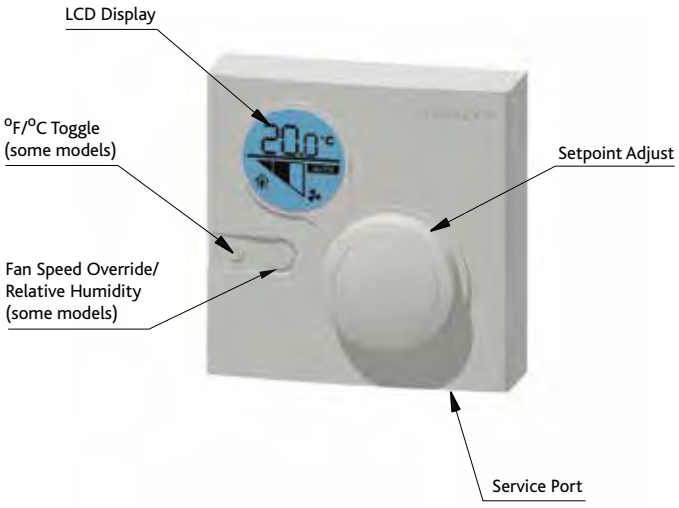
DESCRIPTION OF CONTROL SOFTWARE STRATEGY

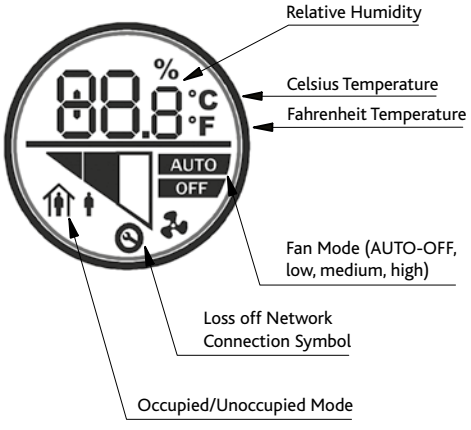
ROOM MODULES

Room Modules are electronic, wall-mountable sensors designed to work directly with the Nuaire control panel.

Room modules are automatically detected and require no set-up. The majority of RM modules monitor room temperature; however, options are available to also monitor zone humidity, carbon dioxide (CO2), local temperature setpoint adjustments, PIR, and other variables. This data is transmitted to a controller on the Sensor Actuator (SA) Bus.

FEATURES





Backlit LCD Display - All LCD display versions of Room Modules include a dial to adjust room setpoint. While the setpoint is being adjusted the backlight will switch on and the display will update to show the setpoint. While inactive the display will revert to display the current room temperature. The occupancy status is also displayed on the LCD. On fan speed override models the fan speed and override status is also displayed. A maintenance icon will display if there is a sensor network error.

Service Port - A RJ12 service port is provided at the base of each Room Module. This allows the temporary connection of an extra module to the sensor network.

Fan Speed Override/Room Humidity - This button cycles through fan speed override settings.

Room Humidity - The ESC-RM-2-TDH-120 model includes a push button on the face of the network sensor to allow occupants to view the temperature and relative humidity of the zone. Pressing the push button toggles between temperature and RH on the LCD. The LCD defaults to temperature 5 seconds after the push button is released. Following this procedure to permanently change the default display:

1. **If the display backlight is off, press and release the push button to illuminate the backlight. If the display backlight is already on, proceed to Step 2.**
2. **Press and hold the push button for 5 seconds to switch to the desired default display (either temperature or RH). Note: The desired default display will flash for 5 seconds. After the display stops flashing, the new default display is in effect.**
3. **Release the push button; the desired display is now the new default display.**

The humidity setpoint cannot change via RM sensors. This must be changed through a commissioning tool.

INSTALLATION

Location Considerations

Locate the network sensor:

- on a partitioning wall, approximately 5 ft (1.5 m) above the floor in a location of average temperature
- away from direct sunlight, radiant heat, outside walls, outside doors, air discharge grills, or stairwells; and from behind doors
- away from steam or water pipes, warm air stacks, unconditioned areas (not heated or cooled), or sources of electrical interference

To remove the rear cover

1. Use a pozi screwdriver to loosen the screw on the top of the unit.
2. Insert a coin into the slot next to the security screw location, pressing the tab that keeps the unit closed. Then carefully pry the top edge of the sensor assembly away from its mounting base and remove.

Modular Jack:

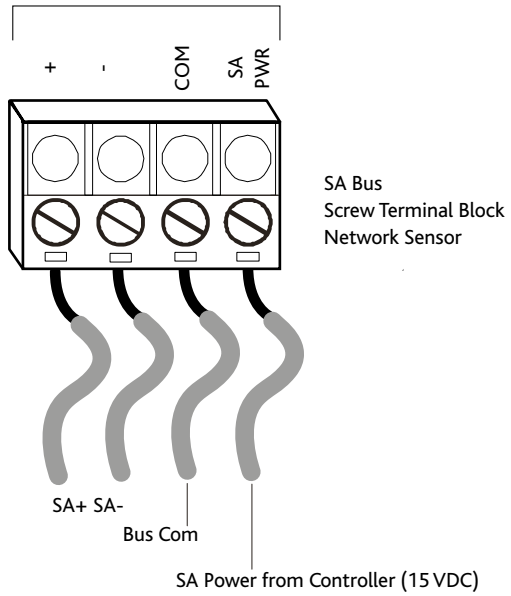
For the modular jack, simply snap the wiring plug into the jack. A modular jack requires a straight-through, one-to-one connection (not a crossover).
See interconnection section for details.

ROOM MODULES WIRING

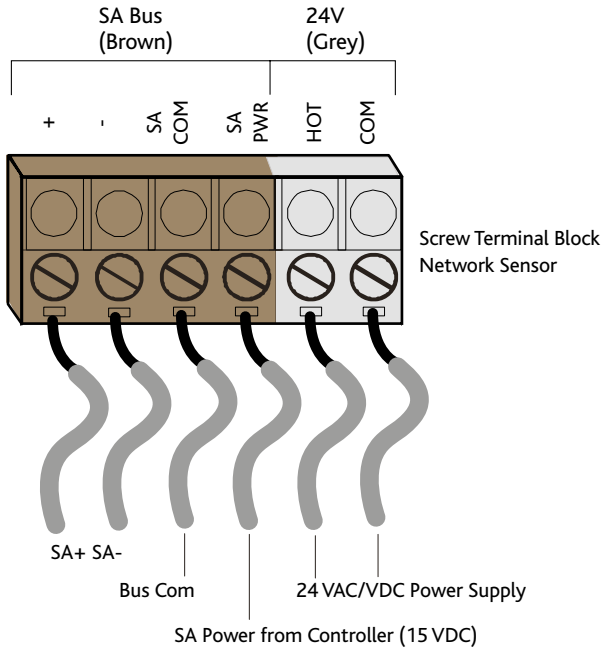
Screw terminal wiring:

If RJ11 cables are not used, the screw terminal connections on the Room Modules can be used.

Standard Sensor Wiring.

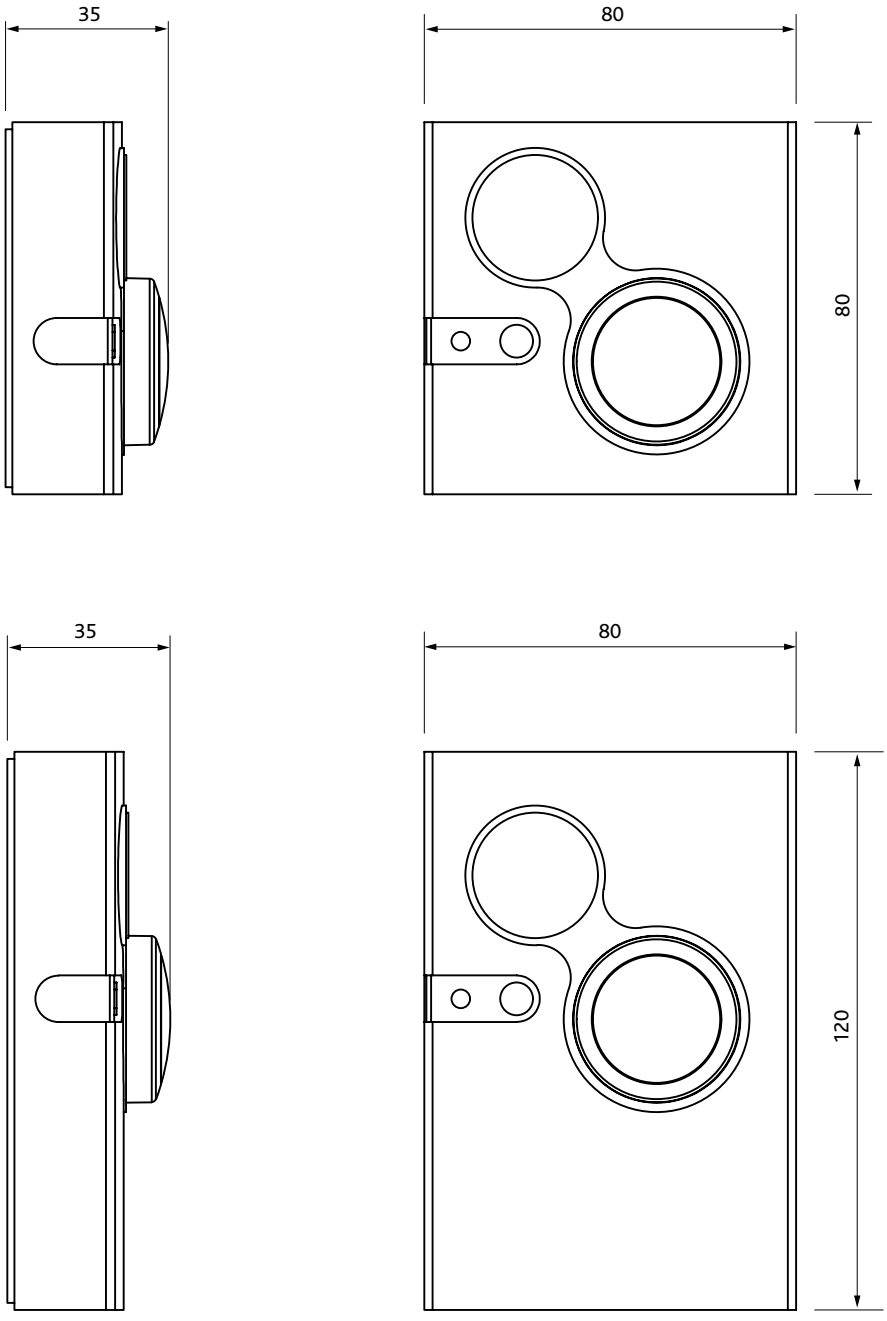


CO2 Sensor Wiring.



BACnet (MS/TP)

DIMENSIONS ROOM MODULES (MM)



ECOSMART CONNECT CONTROL (CO)

DESCRIPTION OF CONTROL SOFTWARE STRATEGY

SENSOR ADDRESSING

ESCO-TDFS has a fixed device address of 199 on the SA Bus. The address can be changed on other models via DIP switches on the PCB rear.

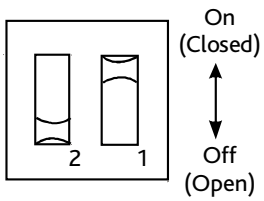
The designation of each address is shown in the following table.

Address Range	Type	Module Type
199	Fixed	Multi-function (with Fan Speed Override)
200-203	Adjustable	Multi-function
212-219	Adjustable	Room CO2 Sensor Module

Each sensor on the SA bus must have a unique address. The default controller strategy is preconfigured to automatically detect all Room Modules on the network and react accordingly.

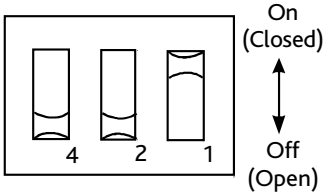
200-203 Address Switch Settings

Address		Switch Settings	
		Switch 2	**Switch 1**
200		OFF	OFF
201		OFF	ON
202		ON	OFF
203		ON	ON



212-219 Address Switch Settings

Address		Switch Settings		
		Switch 4	**Switch 2**	**Switch 1**
212		OFF	OFF	OFF
213		OFF	OFF	ON
214		OFF	ON	OFF
215		OFF	ON	ON
Not supported		ON	ANY	ANY



ROOM MODULES TECHNICAL SPECIFICATIONS

Supply Voltage	15VDC (Powered from SA bus)
Temperature Measurement Range	0 to 40°C
Humidity Measurement Range	0 to 100% (Full) 10 to 90% (Calibrated)
Temperature Sensor Type	Local 1k ohm Platinum Resistance Temperature Detector (RTD); Class A per IEC 60751
Humidity Sensor Type	Thin Film Capacitive Sensor
Temperature Resolution (Models with LCD)	±0.5C°
Default Temperature Setpoint Adjustment Range	10°C to 30°C
PIR Occupancy Sensor Motion Detection Based on a clear line of sight	Minimum 94 Angular Degrees up to a Distance of 15 ft (4.6m);
Ambient Operating Conditions	10°C to 30°C 10 to 90% RH (Temp Probe -10°C to 60°C)
Ambient Storage Conditions	-20 to 60°C 5 to 95% RH
CO2 Sensor Warmup time	Less than 1 Minute; less than 10 minutes for full accuracy

BACnet (MS/TP)

029 2085 8200

ECOSMART CONNECT CONTROL (CO)

DESCRIPTION OF CONTROL SOFTWARE STRATEGY

INTERCONNECTION

The sensors or other devices on the SA bus network connect either by modular RJ12 connections or by screwed terminals using plain ended cable. All sensors are fitted with both.

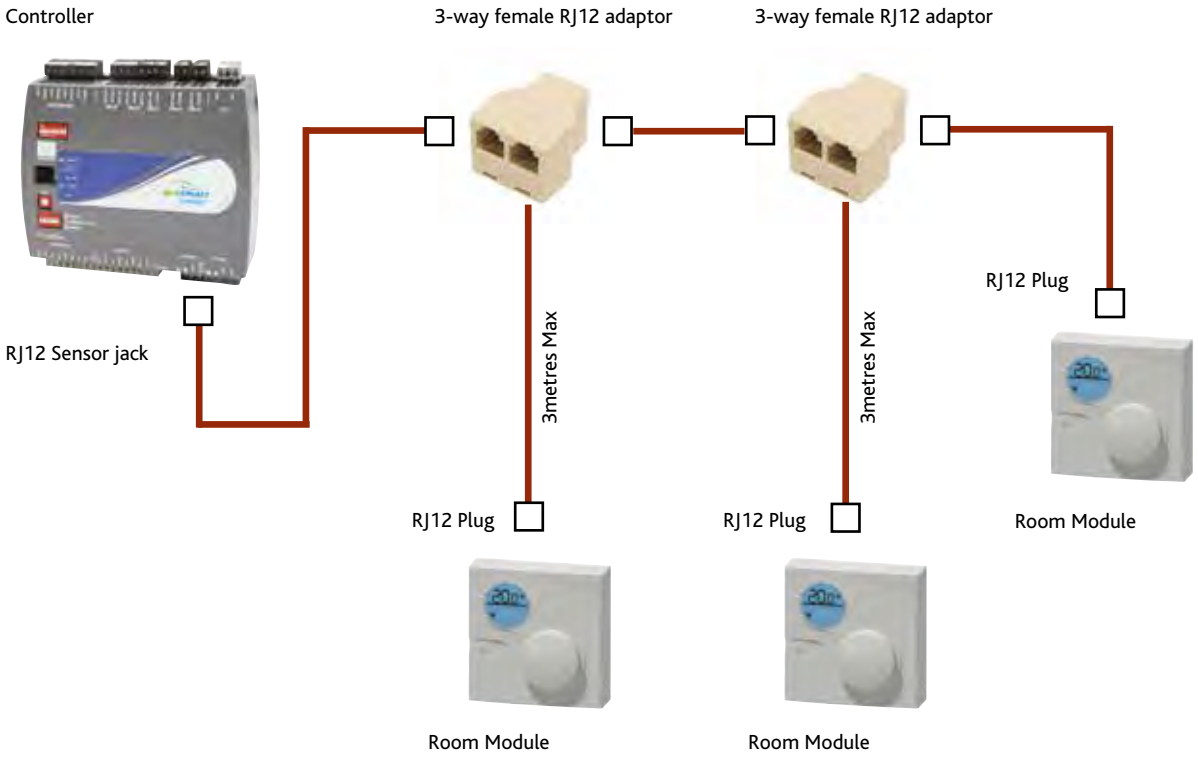
MODULAR CABLE (UP TO 30 METRES)

The Room Modules can connect using a 24AWG twisted 3-pair cable with RJ12 connections over the Sensor Actuator (SA) bus. the following items are available.

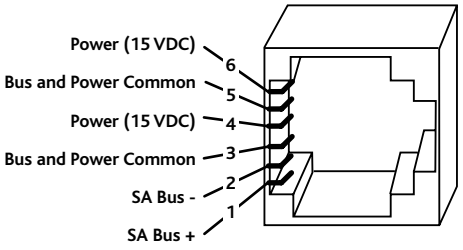
ESCO-C3M	3m Prefabricated sensor cable with modular jacks
ESCO-C5M	5m Prefabricated sensor cable with modular jacks
ESCO-C10M	10m Prefabricated sensor cable with modular jacks
ESCO-C20M	20m Prefabricated sensor cable with modular jacks
ESCO-C30M	30m Prefabricated sensor cable with modular jacks
ESCO-2WA	3-port adapter
ESCO-3WA	2-port extension adapter

Room Modules must not be fitted more than 30metres (cable length) from the controller when using this connection method.

MODULAR JACK NETWORK



Sensor, SA Bus (RJ-12 Modular Jack)



Cable type: Pre-fabricated 3 twisted pair with RJ12 plugs, 26AWG

PLAIN CABLE (30 TO 150 METRES)

If a Room Module is to be fitted more than 30metres (cable length) from a controller, the following cable is recommended.

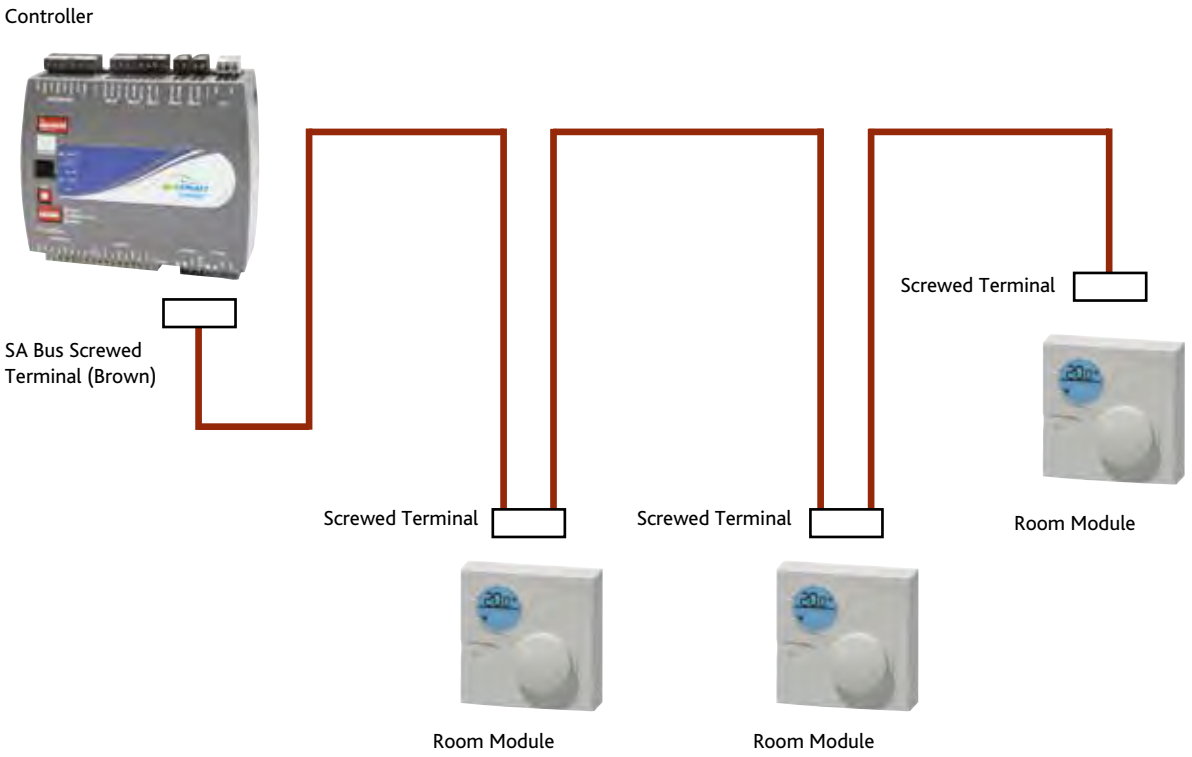
ESCO-MSTPC30M	Ecosmart Connect MSTP cable reel 30m
ESCO-MSTPC150M	Ecosmart Connect MSTP cable reel 150m

Note: On the SA Bus, the + and - wire are one twisted pair, and the COM and SA PWR are the second twisted pair of wires.

These cannot be used with RJ12 connections and must be stripped and connected using screwed terminals. The shield must be earthed at the control panel end only and be made continuous along the bus length.

Room Modules must not be fitted more than 150metres (cable length) from the controller.

SCREWED TERMINAL NETWORK 150M MAX NETWORK LENGTH



Cable type: Plain-ended shielded 2 twisted pair 22AWG

BACnet (MS/TP)

ECOSMART CONNECT CONTROL (CO)

DESCRIPTION OF CONTROL ELECTRICAL DETAILS

SUPPLY

The control is powered by a 240VAC supply. This must be isolated local to the unit and fitted with appropriate overcurrent and fault protection.

ELECTRIC HEATER SUPPLY

For models with electric heating, the heating circuit is powered by a separate, higher current, 240VAC supply. This must be isolated local to the unit and fitted with appropriate overcurrent protection. The main supply is still required.

ELECTRICAL SUPPLY DETAILS

Unit Code	Main Circuit (FLC)	Electric Heater Circuit (FLC) (Electric Models Only*)
XBC10-H-*CO	3.2 A	13 A
XBC15-H-*CO	4.5 A	13 A
XBC25-H-*CO	8 A	19 A
XBC45-H-*CO	8 A	19 A
XBC55-H-*CO	8 A	38 A
XBC65-H-*CO	8 A	38 A

*Electric Heater models require two separate supplies, each with an appropriate overcurrent current protection device.

VOLT FREE CONTACTS

Note that the volt free contacts are not fused. If these are used to power any external equipment, the installer must provide adequate fusing or other protections.

These contacts are rated at 3A resistive, 0.5A inductive.

Run connections - The relay is powered when the fan is running. (These contacts are used when an I/O damper is installed.

Fault connections - No fault = the relay is powered.

Fault - the relay is unpowered.

Heat demand - the relay is powered when heating is selected.

Cool demand - the relay is powered when cooling is selected.

SWITCHED LIVE

Switch Live (SL) terminal - A signal of 100-230V a.c. will activate the switched live signal.

Switch Live 2 (SL2) terminal - A signal of 100-230V a.c. will activate the switched live 2 (Fan Boost) signal.

Note that a signal from an isolating transformer will produce an unpredictable result and is not recommended.

Volt free versions of the switched live signals are also available at terminals T33-T34 & T35-T36. Link two contacts to activate the signal.

DAMPER CONNECTIONS

A fan start delay can be imposed to allow the damper time to open. This is adjustable via display screens or commissioning tools.

If an I/O damper is fitted, it must be wired to the fan run relay, and the relay supplied with the relevant supply voltage.

If required the damper end point relay can be connected in series with alarm circuit 2 to monitor for damper faults. The multi-state value 'IO Damper Fitted' must be set to yes. This will allow the system to ignore alarm circuit 2 if the fans are not running and dampers are closed.

See I/O Damper connection diagram for details.

NETWORK SETTINGS

Default MS/TP Address: 4
BACnet Instance Number: Randomised & Unique for each controller (0 to 4,194,304)

CONNECTION CHART

Description	Controller Terminal No	Din Rail Terminal No	DI	AI	Relay Output	AO
Fresh Air Sensor	IN 1			1		
Supply Air Sensor	IN2			1		
Return/Room Air Sensor	IN3	25-26		1		
Input 4	IN4			1		
Input 5	IN5	31-32		1		
Alarm Circuit 1 (Fan, Heater)	IN6	27-28 (Some Models)	1			
Alarm Circuit 2 (Pump, Filter)	IN7	29-30	1			
Volt-Free Enable Input Signal	IN8	33-34	1			
Volt-Free Boost Input Signal	IN9	35-36	1			
Extract Fan 0-10V	OUT1					1
Supply Fan 0-10V	OUT2					1
Heat Demand 0-10V	OUT3					1
Cool Demand 0-10V	OUT4					1
Bypass Damper Relay	OUT5				1	
Volt-Free Healthy Relay	OUT6				1	
Volt-Free Fan Run Relay	OUT7				1	
Volt-Free Cool Demand Relay	OUT8				1	
Volt-Free Heat Demand Relay	OUT9				1	
230V Enable Input		10	1			
230V Fan Boost Input		11	1			

ECOSMART CONNECT CONTROL (CO)

DESCRIPTION OF CONTROL ELECTRICAL DETAILS

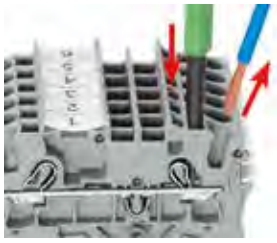
TERMINALS - WIRE CONNECTIONS

This control unit utilises WAGO's CAGE CLAMP® S terminal blocks, allowing for quick and easy connection.

PUSH IN TERMINATION - Stripped solid conductors, fine-stranded conductors with ferrules, or ultrasonically "bonded" conductors are simply pushed in until they hit the backstop.
No tool required.

TERMINATION OF FINE-STRANDED CONDUCTORS - Open the clamp by inserting an operating tool (as shown below) until it clicks into position. Then insert the conductor and remove the operating tool to complete the connection.

CONDUCTOR REMOVAL - Insert an operating tool in to the operating slot to remove the conductor, just like the original CAGE CLAMP® terminal blocks.



JUMPERS - Terminal blocks can be commoned together to increase the number of terminals at the same potential using push-in jumpers. In these cases the terminals are treated as one conductor.

JUMPER REMOVED - Insert the operating tool blade between the jumper and the partition wall of the dual jumper slots, then lift up the jumper.

DOUBLE DECK TERMINAL BLOCK - Each deck has a different potential (2-conductor), which creates a space saving on the rail. Decks can be commoned to adjacent terminal blocks and/or the top to the bottom deck.

EARTH TERMINAL BLOCKS - The earth terminal block (green/yellow) has a direct electrical connection to the DIN rail, with the earthing foot (earth connection only).

FUSE TERMINALS - Replaceable cartridge fuses are housed in quick release fuse terminals.

BACnet (MS/TP)

ecosmart CONNECT CONSULTANTS SPECIFICATION

ECOSMART CONNECT - CONTROLLER BASED VENTILATION

Ecosmart Connect is preconfigured with a flexible software strategy.

The control features include the following functions as standard

- Individual Fan Speed Adjustment
- Trickle Mode
- Run-on
- Intelligent Run-on (Occupancy Sensitive)
- Weekly Scheduling
- Night Cooling
- Purge Mode
- Frost Protection
- Fault Monitoring

- All commissioning features are adjustable remotely without direct access to the AHU. This can be via a service port on any room sensor or over the network.
- The temperature control can be set to regulate supply air or to regulate room air temperature to a defined setpoint.
- The heat exchanger bypass (where applicable) is automatically operated according to temperature and a pre-defined strategy.
- Nuaire room sensor modules are automatically detected and actioned upon accordingly. Multiple sensor options are available in a single module.
- A single ESCO-LCD panel can commission/monitor a single controller or multiple controllers on the network.
- The Ecosmart Connect control module can be connected to provide the following integrated BMS interfaces.

Higher Level (BACnet)

- Nuaire Room Sensor Network
- BACnet MS/TP (As standard)
- BACnet Ethernet IP optional (via converter box)

Lower Level

- Switched Live & Volt Free Enable
- Switched Live & Volt Free Fan Boost / Heat Boost (Configurable)
- 2x 0-10V input. Configurable to accept Temperature, CO2, Humidity and Pressure.
- 4 x Volt free relay outputs. Fan run, Heat, Cool & Fault.

Units fitted with Ecosmart Connect control have a 5 year warranty.

ECOSMART ADAPT CONTROL WITH TREND (AT)
CONTROL OPTION

"**Ecosmart Adapt Control** - Ecosmart Adapt is project/site specific and can be adapted to utilise other controllers such as Siemens, Johnson's etc. for further details contact Nuaire".

From November 2015 Ecosmart2 will be rebranded as an Adapt option.
The Ecosmart Adapt (with Trend) option is fitted with an IQ422/12/LAN/BAC/230 controller allowing for unitary control and full BMS integration via BACnet IP (by others).
Controller software is basic and ready for 'project specific' program to be loaded.

INDEX FOR ecosmart adapt CONTROL

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• ECOSMART ADAPT (with TREND) - FEATURES AND BENEFITS	52
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• ECOSMART ADAPT (with TREND) - DESCRIPTION OF CONTROL	54 - 56
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If you have a requirement for Ecosmart Adapt contact Nuaire.

ECOSMART ADAPT CONTROL WITH TREND (AT)

CONTROL FEATURES & BENEFITS

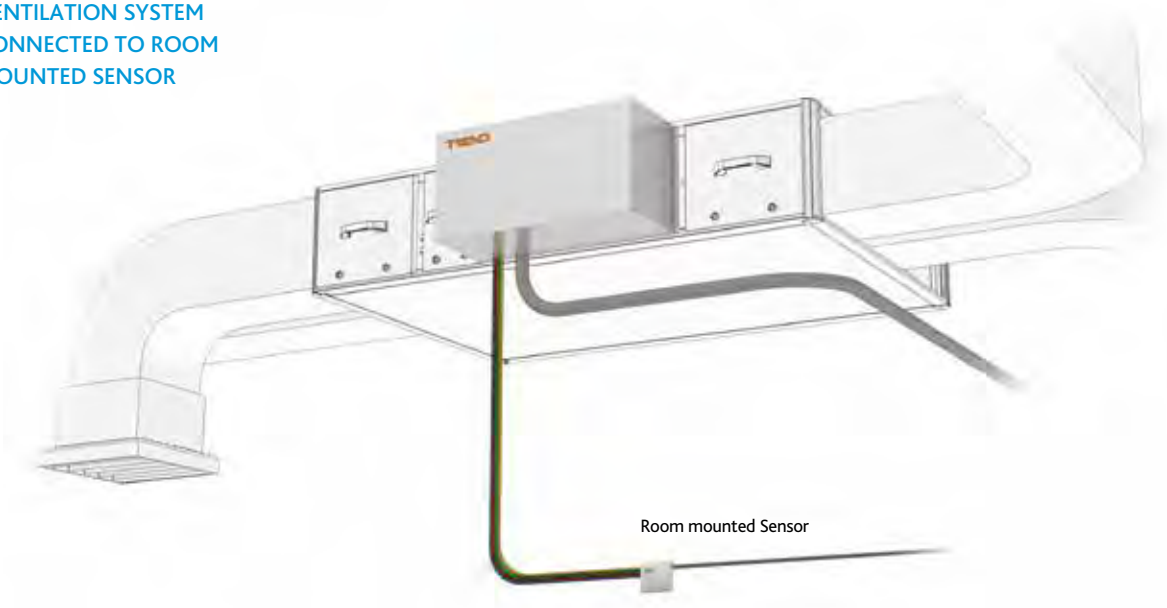
The Adapt range of controls are project specific as an example we have used the Trend IQ422/12/LAN/BAC/230 controller but Nuaire can also offer other control options. For further details contact Nuaire.

"The management and control of modern buildings grow ever more sophisticated. A Building Energy Management system (BEMS) must be tailored to suit each customer's specific control requirements. It must provide efficient HVAC control, coupled with the flexibility to accommodate changes in occupancy status and staff relocation at short notice; whilst simultaneously delivering improved comfort conditions. A BEMS must also provide real time management information and control, enabling customers to achieve significant energy savings"
(Trend).

Adapt Trend provides control of the ventilation including the heating, or cooling allowing unitary control and full BMS integration via BACnet IP. The Adapt Trend control system includes an IQ422/12/LAN/BAC/230 controller which is pre-configured and the unit and control assembly is functionally tested at Nuaire before customer delivery.

- **REDUCED INSTALLATION TIME -** The Adapt Trend IQ422/12/LAN/BAC/230 has software configurable inputs and addressing with automatic baud rate selection and IQTool compatibility. This greatly reduces engineering and commissioning time and therefore reducing the cost of the install.
- **COST EFFECTIVE MEANS OF CONTROLLING A VARIETY OF APPLICATIONS -** Provides intelligent control of a wide range of plant. Power to support advanced control applications including remote web supervision with graphical representation and control adjustments.
- **BAUD RATE -** Is automatically detected and applied to the network.
- **SOFT CONFIGURABLE UNIVERSAL INPUTS -** No need for jumper settings.
- **BARCODE ADDRESSING -** Makes for quick and easy commissioning.
- **NETWORK ADDRESSING -** Via SET, no DIP switch setting required.
- **PEACE OF MIND -** Ecosmart Adapt with Trend has a 5 year warranty.

ECOSMART ADAPT (TREND)
SUPPLY & EXTRACT
VENTILATION SYSTEM
CONNECTED TO ROOM
MOUNTED SENSOR



Room mounted Sensor

BACnet (IP)

ECOSMART ADAPT CONTROL WITH TREND (AT)
SENSORS & ENABLERS

To help you select the appropriate control solution for your application, simply refer to one of the options below.
For the full range and technical details, please visit www.nuaire.co.uk

THERMISTOR TEMPERATURE SENSORS

Low cost thermistor sensors comprising insertion, clamp-on, and outside air versions. The insertion sensor may be used for duct or immersion purposes. It has a 6mm diameter brass probe which is suitable for retrofit immersion applications and will fit most existing pockets (universal fitting kit option).

Code: TB/T1/S – For duct or immersion use. Short 150mm.
TB/T1/L – For duct use only. Long 400mm

FEATURES

- Low cost
- High quality thermistors
- Brass probes
- M20 conduit entry with M16 cable gland
- IP67 housing
- Quarter turn quick release lid
- Easy to wire
- Universal kit option for retrofit of immersion sensors
- Adjustable insertion depth flange option for duct sensors

DUCT HUMIDITY & TEMPERATURE SENSORS

Duct mounted relative humidity and temperature sensors for HVAC applications.
The certified 2% high accuracy (/2%) and standard 3% versions offer excellent linearity and stability over a wide humidity range (10 to 90 %RH).

Code: HT/D – Duct and thermistor sensor (+/-3%).

FEATURES

- Pre-calibrated for ease of commissioning
- IP65
- Operates over 10 to 100 %RH non-condensing
- ± 3% accuracy versions
- 2 part connectors for ease of installation
- Humidity sensor element protected by replaceable filter
- Capacitive humidity sensing element provides excellent long term stability
- Adjustable depth duct mounting flange option

CO2 SENSORS

The CO2 duct and space sensors monitor the carbon dioxide concentration and temperature of the air.
The space sensors have additional options of humidity monitoring and a 4 digit display. The display will show the measured values in succession.
The duct sensor has a quick-release lid to facilitate installation.

Code: CO2/T/D – Duct sensor.
Code: CO2/T/S – Space carbon dioxide concentration and temperature sensor.

FEATURES

- Low cost, high quality thermistor temperature sensor
- Humidity monitoring option for space sensor
- Optional digital display for space sensor
- IP67 housing (duct sensor)
- Quarter turn quick release lid (duct sensor)
- Two part terminals to facilitate wiring
- 24 Vac/dc supply
- Adjustable depth duct mounting flange option

TOUCH SCREENS

IQVIEW4 TOUCH SCREEN DISPLAY
(6 x 4 inch). FPK/Plate – Mounting plate.
IQVIEW4/SM BOX – Surface mount box for wall or panel.
Transformer for IQVIEW4 included.
ACC/24V - 230/24 VAC, 36 VA

IQVIEW8 TOUCH SCREEN DISPLAY
(10 x 6 inch).
IQVIEW8/SM BOX – Surface mount box for flat surfaces.
Transformer for IQVIEW8 included.
ACC/24V – 230/24 VAC, 36 VA

SDU DISPLAY
RD/SDU-IQ2COMMSCABLE/3m – RJ11 plug to RJ11 plug cable (3m) for SDU.

ECOSMART ADAPT CONTROL WITH TREND (AT)

DESCRIPTION OF CONTROL SOFTWARE STRATEGY

GENERAL

The system incorporates a web enabled Trend IQ422/12/LAN/BAC/230 controller.

A comprehensive unit control specification - factory fitted and tested to provide guaranteed operation from a single supplier.

THE NUAIRE UNIT CONTAINS THE FOLLOWING CONTROLLABLE ITEMS:

- Inlet Damper (if fitted).
- Exhaust Damper (if fitted).
- Heat Recovery and Bypass Damper.
- Heating Coil.
- Cooling Coil.
- Supply Fan Speed.
- Extract Fan Speed.

ENABLE SIGNAL

The unit can be enabled via the following methods:

- Software switch (ENABLE) via SDU, IQView4, IQView8 or network.
- Switched live (230VAC) input, PIR etc.
- Low voltage contacts.
- Night cooling / summer free-cooling strategy.
- Scheduled via weekly calendar.

When the enable signal is removed, the unit will run on for a time defined by the run-on setpoint.

If an electric heater is fitted, the fans will automatically run-on for an extra 2 minutes, without heating, in order to dissipate residual heat.

OCCUPANCY CONTROL

When a Trend occupancy sensor is selected via UI4 & 5 software module, the control will look for a Trend OCC-U sensor in the appropriate input.

An occupied signal will give an enable signal.

0V = Occupied

14V = Unoccupied

BOOST

When the control receives a boost signal the fans will run at boost speed. Once the signal is removed the fans will run on for a time defined by the boost run-on setpoint.

TRICKLE MODE

When trickle mode is active, the fans will run at their minimum speed even when there is no enable signal. Heating and cooling will also function in this mode if available.

CO_2 CONTROL

When a CO2 sensor is selected via UI4 & 5 function knobs, and an enable signal is received, ventilation will increase to reduce CO2 concentration the target CO2 setpoint. The target CO2 sensor setpoint can be changed as one of the commissioning setpoints.

SUPPLY TEMPERATURE CONTROL

While an enable signal is present, this mode modulates heating, cooling & heat exchanger bypass dampers with the aim of the supply air reaching the temperature setpoint. Please note that heating and cooling outputs will only function if the HeatingType or CoolingType setpoints are set to heating or cooling options.

FROST PROTECTION

Should the internal temperature of the unit fall below a value defined in the commissioning variables, the control will override all heating/cooling logic to open the LPHW or CW control valves, if fitted. This is to allow any protective flow through the heating/cooling coils. The supply fan will also stop and the appropriate frost protection software module will enter an alarm state. This period will last for a minimum of 5 minutes by default. The fault relay will also open. Heat and cool demand relays will not operate but digital inputs "Frost Protecting LPHW" or "Frost protecting CW" will enter an alarm state. Please note that frost protection will only function if the HeatingType or CoolingType setpoints are set to LPHW or CW.

NIGHT COOLING / SUMMER FREE COOLING

Once enabled in software, this routine uses an individual time schedule to cool the fabric of the building at night using only the external air. This mode only functions if the daytime temperature is above the setpoint, cooling is possible and if the cooling air is not too cold.

ALARMS

CRITICAL ALARM (LATCHING)

Once in critical alarm state the unit will drive all heating and cooling outputs to 0V. Other functions continue as normal. The critical alarm is latched and required power cycle to clear.

Causes of critical alarm:

- Fan fail via fault circuit 1.
- Heater overtemp via fault circuit 1.

BACnet (IP)

MAINTENANCE ALARMS (NON-LATCHING)

Once in maintenance alarm state the only action taken is de-energising of the fault relay. Once the trigger is removed, the alarm will reset automatically.

Causes of maintenance alarm:

- Condensate pump fault via alarm circuit 2 (This bypasses the heater exchanger automatically)
- Sensor Failure
- Low supply temperature, default 8°C. (This can be set to stop fans if required)
- Frost protection routine active, default 4°C (This only runs if water valves are selected as fitted)
- Excessively high supply temperature reading (this will stop heating)

All alarms have a hold off period set by the setpoint "Alarm Delay".

THERMAL TRIP

In case of software failure, as a final resort, the electric heater is protected by a fail-safe thermal overload switch. This switch disables the heater controller once the temperature reaches 80°C. When this occurs, the critical alarm will latch in software.

Once the unit cools, the contactor will re-engage but the heater signal will remain at 0V until the critical fault is reset in software or by power cycle.

SETPOINTS

All the following are user adjustable within engineered limits:

Point Name	Description	Range	Default
ENABLE	Software enable switch	Off / On	Off
RUNONTIME	Run-on timer value	0-3600 Seconds	0
TRICKLEMODE	When On, fans will trickle even with no enable signal	Off / On	Off
SETTEMP	Desired temperature setpoint	10 to 30°C	22
DEADBAND	Dead-band for temp control	0.5°K to 10°K	3
BOOST	Software boost switch	Off/On	Off
BOOSTRUNON	Boost Run On	0-3600 Seconds	0
FROSTPROTEMP	Temperature, below which, any water valves will be overridden open	-40°C to 10°C	4
MINFROSTPROTECTPERIOD	Minimum time frost protection will be enabled	0-600 Seconds	300
DAMPERDELAY	Startup delay to allow I/O dampers to open	0-300 Seconds	0
ALARMDELAY	Alarm hold-off delay	0-20 Seconds	5
HIGHAIRTEMPALARM	High supply air temp alarm temperature	30 to 70°C	50
LOWTEMPALARM	Low supply air temp alarm temperature	-40°C to 20°C	8
FORCESTOPONLOWTEMP	Stops fans upon LOWTEMPALARM	Off/On	Off
ALARMRESET	Resets any latched alarms (Resets to Off Automatically)	Off/On	Off
SUPPLYFANMAX	Individual fan maximum speed setting	20-100%	100
SUPPLYFANMIN	Individual fan minimum speed setting. (Trickle speed)	0-100%	20
EXTRACTFANMAX	Individual fan maximum speed setting	20-100%	100
EXTRACTFANMIN	Individual fan minimum speed setting. (Trickle speed)	0-100%	20
SUPPLYFANBOOST	Supply fan boost speed	20-100%	100
EXTRACTFANBOOST	Extract fan boost speed	20-100%	100
SUPPLYFANSTARTVOLTAGE	The voltage threshold of passing 0% rotational speed	0-5V	1
EXTRACTFANSTARTVOLTAGE	The voltage threshold of passing 0% rotational speed	0-5V	1
SUPPLYFANVOLTAGELIMIT	The maximum voltage to be supplied to the fan motor	6-10V	10
EXTRACTFANVOLTAGELIMIT	The maximum voltage to be supplied to the fan motor	6-10V	10
CO2TARGET	The target setpoint for CO_2 control	0-10000PPM	650
CO2RANGEMIN	The lower limit CO_2 value corresponding to the limit voltage	0-10000PPM	0
CO2VOLTAGEMIN	The lower limit voltage corresponding to the limit of range	0-10VDC	0
CO2RANGEMAX	The upper limit CO_2 value corresponding to the limit voltage	0-10000PPM	2000
CO2VOLTAGEMAX	The upper limit voltage corresponding to the limit of range	0-10VDC	10
CO2-LOOPGAIN	CO_2 Loop Gain	0 to -30	-0.5
CO2-LOOPINTEGRAL	CO_2 Loop Integral	0 to 30	10
CO2-LOOPDERIVATIVE	CO_2 Loop Derivative	0 to 30	0

SETPOINTS (CONTINUED)

All the following are user adjustable within engineered limits:

Point Name	Description	Range	Default
SUMMERNIGHTFREECOOLACTIVE	Set night cooling mode as active	Off / On	0
SUMMERNIGHTFREECOOLMINTEMP	Night cooling lower cut-off temperature	5-30°C	10
SUMMERNIGHTFREECOOLFANSPEED	Night cool fan speed	20-100%	80
STC-COOLLOOPGAIN	Supply Temp Control - Cool Loop Gain	0 to -30	-5
STC-COOLLOOPINTEGRAL	Supply Temp Control - Cool Loop Integral	0 to 30	2
STC-COOLLOOPDERIVATIVE	Supply Temp Control - Cool Loop Derivative	0 to 30	0
STC-HEATLOOPGAIN	Supply Temp Control - Heat Loop Gain	0 to -30	-5
STC-HEATLOOPINTEGRAL	Supply Temp Control - Heat Loop Integral	0 to 30	2
STC-HEATLOOPDERIVATIVE	Supply Temp Control - Heat Loop Derivative	0 to 30	0
HEATINGTYPE	Heating Type 0=None, 1=LPHW, 2=Electric	0-2	0
COOLINGTYPE	Cooling Type 0=None, 1=CW, 2=DX	0-2	0
UI4FUNCTION	Input 4 Function, 0 = None, 1 = CO_2/T/D, 2 = Trend Occ, 3=FSC	0-3	0
UI5FUNCTION	Input 5 Function, 0 = None, 1 = CO_2/T/D, 2 = Trend Occ, 3=FSC	0-3	0
TACHOFITTED	Is a tacho signal monitor PCB fitted?	Off / On	Model Dependant
SOFTWAREVERSION	Shows the software number & Version	N / A	0
FANANDHEATERTEST	Factory Use Only (This resets on power cycle)	Off / On	Off
WIRINGVERIFICATION	Factory Use Only (This resets on power cycle)	Off / On	Off
FORCEOVERHEAT	Factory Use Only (This resets on power cycle)	Off / On	Off
DAMPERBYPASS	Force bypass damper into bypass mode (This resets on power cycle)	Off / On	Off
DAMPEROUTOFBYPASS	Force bypass damper out of bypass mode (Pump failure or DAMPERBYPASS switch will override this) (This resets on power cycle)	Off / On	Off
FANDAMPERTEST	Factory Use Only	Off / On	Off

ECOSMART ADAPT CONTROL WITH TREND (AT)

DESCRIPTION OF CONTROL ELECTRICAL DETAILS

SUPPLY

The control is powered by a 240VAC supply. This must be isolated local to the unit and fitted with appropriate overcurrent and fault protection.

ELECTRIC HEATER SUPPLY

For models with electric heating, the heating circuit is powered by a separate, higher current, 240VAC supply. This must be isolated local to the unit and fitted with appropriate overcurrent protection. The main supply is still required.

ELECTRICAL SUPPLY DETAILS

Unit Code	Main Circuit (FLC)	Electric Heater Circuit (FLC) (Electric Models Only*)
XBC10-H-*AT	3.2 A	13 A
XBC15-H-*AT	4.5 A	13 A
XBC25-H-*AT	8 A	19 A
XBC45-H-*AT	8 A	19 A
XBC55-H-*AT	8 A	38 A
XBC65-H-*AT	8 A	38 A

*Electric Heater models require two separate supplies, each with an appropriate overcurrent current protection device.

VOLT FREE CONTACTS

Note that the volt free contacts are not fused. If these are used to power any external equipment, the installer must provide adequate fusing or other protections.

These contacts are rated at 3A resistive, 0.5A inductive.

Run connections - The relay is powered when the fan is running. (These contacts are used when an I/O damper is installed.

Fault connections - No fault = the relay is powered.

Fault - the relay is unpowered.

Heat demand - the relay is powered when heating is selected.

Cool demand - the relay is powered when cooling is selected.

SWITCHED LIVE

Switch Live (SL) terminal - A signal of 100-230V a.c. will activate the switched live signal. Switch Live 2 (SL2) terminal - A signal of 100-230V a.c. will activate the switched live 2 (Fan Boost) signal.

Note: a signal from an isolating transformer will produce an unpredictable result and is not recommended.Volt free versions of the switched live signals are also available at terminals T33-T34 & T35-T36. Link two contacts to activate the signal.

DAMPER CONNECTIONS

A fan start delay can be imposed to allow the damper time to open.

This is adjustable via display screens or commissioning tools. If an I/O damper is fitted, it must be wired to the fan run relay, and the relay supplied with the relevant supply voltage. See I/O Damper connection diagram for details.

NETWORK SETTINGS

IP address is 192.168.11.12
Subnet mask 255.255.255.0
Lan 011, node 012

CONNECTION CHART

	Description	IQ422 Terminal No.	Expansion Module Terminal No.	Din Rail Terminal No.	DI	AI	DO	AO
	Fresh Air Sensor	1 (4,5)				1		
	Supply Air Sensor	2 (6,7)				1		
	Return/Room Air Sensor	3 (8,9)		25-26		1		
	Input 4	4 (10,11)				1		
	Input 5	5 (12,13)		31-32		1		
4DIX Input	Alarm Circuit 1 (Fan, Heater)	6 (14,15)	4DIX Terminal A	27-28 (Some Models)	1			
	Alarm Circuit 2 (Pump, Filter)		4DIX Terminal B	29-30	1			
	Volt-Free Enable Input Signal		4DIX Terminal C	33-34	1			
	Volt-Free Boost Input Signal		4DIX Terminal D	35-36	1			
	Extract Fan 0-10V	7 (16,17)						1
	Supply Fan 0-10V	8 (18,19)						1
	Heat Demand 0-10V	9 (20,21)						1
	Cool Demand 0-10V	10 (22,23)						1
3RM-1 Relay Module (TRM Mode wired for binary switching)	Bypass Damper	11 (24,27)	Wired for binary switching. See 3RM Datasheet for info.				1	
	Healthy signal to Relay 4						1	
	Link from IQ422 GND to AC GND	11 (25)		23				
3RM-2 Relay Module (HRM Mode)	Volt-Free Fan Run Relay	12 (26,27)	3RM-2 Relay 1				1	
	Volt-Free Cool Demand Relay		3RM-2 Relay 2				1	
	Volt-Free Heat Demand Relay		3RM-2 Relay 3				1	
	230V Enable Input			10	1			
	230V Fan Boost Input			11	1			
	Volt-Free Healthy Relay			13-14			1	

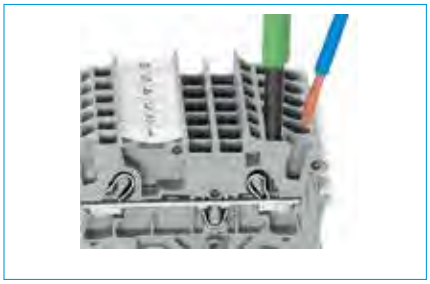
ECOSMART ADAPT CONTROL WITH TREND (AT)
DESCRIPTION OF CONTROL ELECTRICAL DETAILS

TERMINALS - WIRE CONNECTIONS

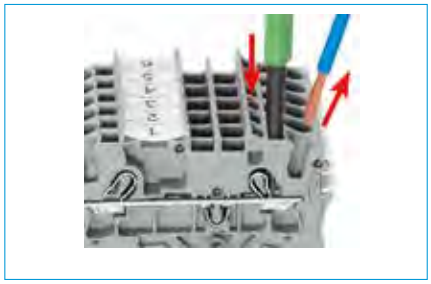
This control unit utilises WAGO's CAGE CLAMP® S terminal blocks, allowing for quick and easy connection.

PUSH IN TERMINATION - Stripped solid conductors, fine-stranded conductors with ferrules, or ultrasonically "bonded" conductors are simply pushed in until they hit the backstop.
No tool required.

TERMINATION OF FINE-STRANDED CONDUCTORS - Open the clamp by inserting an operating tool (as shown below) until it clicks into position. Then insert the conductor and remove the operating tool to complete the connection.



CONDUCTOR REMOVAL - Insert an operating tool in to the operating slot to remove the conductor, just like the original CAGE CLAMP® terminal blocks.



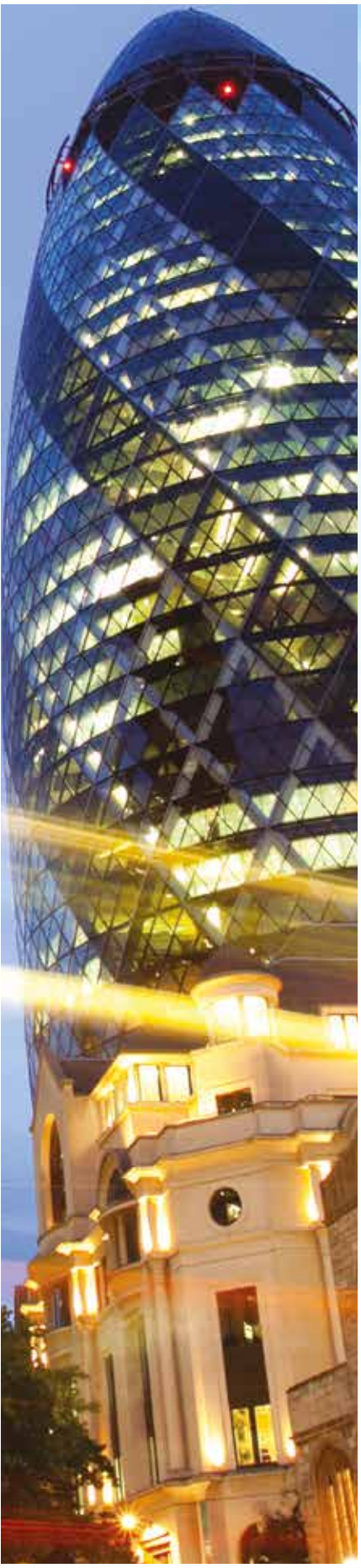
JUMPERS - Terminal blocks can be commoned together to increase the number of terminals at the same potential using push-in jumpers. In these cases the terminals are treated as one conductor.

JUMPER REMOVED - Insert the operating tool blade between the jumper and the partition wall of the dual jumper slots, then lift up the jumper.

DOUBLE DECK TERMINAL BLOCK - Each deck has a different potential (2-conductor), which creates a space saving on the rail. Decks can be commoned to adjacent terminal blocks and/or the top to the bottom deck.

EARTH TERMINAL BLOCKS - The earth terminal block (green/yellow) has a direct electrical connection to the DIN rail, with the earthing foot (earth connection only).

FUSE TERMINALS - Replaceable cartridge fuses are housed in quick release fuse terminals.



ecosmart adapt CONSULTANTS SPECIFICATION

ECOSMART ADAPT WITH TREND - ENHANCED DEMAND CONTROLLED VENTILATION

A comprehensive unit control specification - factory fitted and tested to provide guaranteed operation from a single supplier – one who will take responsibility.

The unit integrated Ecosmart Adapt system provides the facility for operational efficiency and energy saving by allowing a comprehensive range of unitary control functions and / or full BMS integration (by others) via standard BACnet IP configuration.

The system incorporates a web access enabled Trend IQ422/12/LAN/BAC/230 controller, and is augmented by application specific unit interface and diagnostic circuits. Controller software is optimised and pre-configured, and each unit / control assembly is fully functionally tested at works (Refer to technical documentation for full controller functional specification).

Units fitted with Ecosmart Adapt control have a 5 year warranty.

NOTES

NOTES

FOR MORE INFORMATION
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