

BPS H-CO

Horizontal Boxer Packaged Solution with Connect (CO) Control Installation Manual



1.0 SAFETY INFORMATION

- The provision of the electrical supply and the connection of the unit to the mains must be carried out by a qualified electrician.
- Isolate from power supply before removing any covers. During installation / maintenance ensure all covers are fitted before switching on the mains supply.
- All-pole disconnection from the mains as shown in the wiring diagram must be incorporated within the fixed wiring and shall have a minimum contact separation of 3mm in accordance with latest edition of the wiring regulations.
- This unit must be earthed.
- Ducting must be securely fixed with screws to the spigot to prevent access to live parts. Duct runs terminating close to the fan must be adequately protected by suitable guards.
- If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.
- Precautions must be taken to avoid the back-flow of gases into the room from the open flue of gas or other fuel-burning appliances.
- This appliance should not be used by children or persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge, unless they have been given supervision or instruction concerning the safe use of the appliance by a person responsible for their safety. Children shall not play with the appliance. Cleaning and user maintenance shall not be carried out by children.

1.1 Symbols



GENERAL WARNING

Signifies a general warning regarding hazard specified by supplementary information.



ELECTRIC SHOCK

This unit must be completely electrically isolated before any panels are removed. Check mains supply and control connections.



ROTATING PARTS

This unit contains fast moving rotational parts which may start automatically. It is the sole responsibility of the installer to adequately guard these components.



REFER TO INSTRUCTION MANUAL

Read and understand the installation and maintenance manual before installing, operating or maintaining this product.

1.2 Important Information

This manual contains important information on the safe and appropriate assembly, transport, commissioning, operation, maintenance, disassembly and simple troubleshooting of the product.

While the product has been manufactured according to the accepted rules of current technology, there is still a danger of personal injury or damage to equipment if the following general safety instructions and the warnings contained in these instructions are not complied with.

- **Read these instructions completely and thoroughly before working with the product.**
- **Keep these instructions in a location where they are accessible to all users at all times.**
- **Always include the operating instructions when you pass the product on to third parties.**

1.3 Personal Protective Equipment

The following minimum Personal Protective Equipment (PPE) is recommended when interacting with Nuaire products:

- **Protective Steel Toed Shoes** - when handling heavy objects.
- **Full Finger Gloves (Marigold PU800 or equivalent)** - when handling sheet metal components.
- **Semi Fingerless Gloves (Marigold PU3000 3DO or equivalent)** - when conducting light work on the unit requiring tactile dexterity.
- **Safety Glasses** - when conducting any cleaning/cutting operation or exchanging filters.
- **Reusable Half Mask Respirators** - when replacing filters which have been in contact with normal room or environmental air.

Nuaire would always recommend a site specific risk assessment by a competent person to determine if any additional PPE is required.

2.0 INTRODUCTION

The information contained in this document provides details of installation, operation and maintenance for installers and users of the BOXER PACKAGED SOLUTION (BPS) AHU units with heat recovery.

The BPS AHU range, is manufactured from Aluzinc corrosion resistant steel, with 50mm double skinned panels and anodized aluminium frame of a totally thermally-broken design, complying with the following specification in accordance with BS EN 1886: Mechanical strength, D1; Leakage class, L1; Thermal transmittance, T2; Thermal bridging, TB1.

This range includes high efficiency centrifugal fans with EC motors, a plate heat exchanger, G4 pre-filtration and F7 main filtration of the supply air and M5 filtration of the extract air.

Optional heating (LPHW, Electric or Reverse Cycle DX) and cooling (Chilled Water or Reverse Cycle DX) model variants are available. The Reverse Cycle coils are supplied as standard with inbuilt PAC Control and optional matched Mitsubishi Mr Slim Condenser(s). Note: control wiring and piping by others, thermistor wiring (included). Installation must be carried out by F-Gas approved installer.

Ancillaries include but not limited to attenuators, dampers, weather terminals and frost modules are available from Nuaire.

These units are supplemented with the Connect (CO) control platform. General information regarding performance and specification for the equipment is available via our technical literature, and/or project specific documentation.

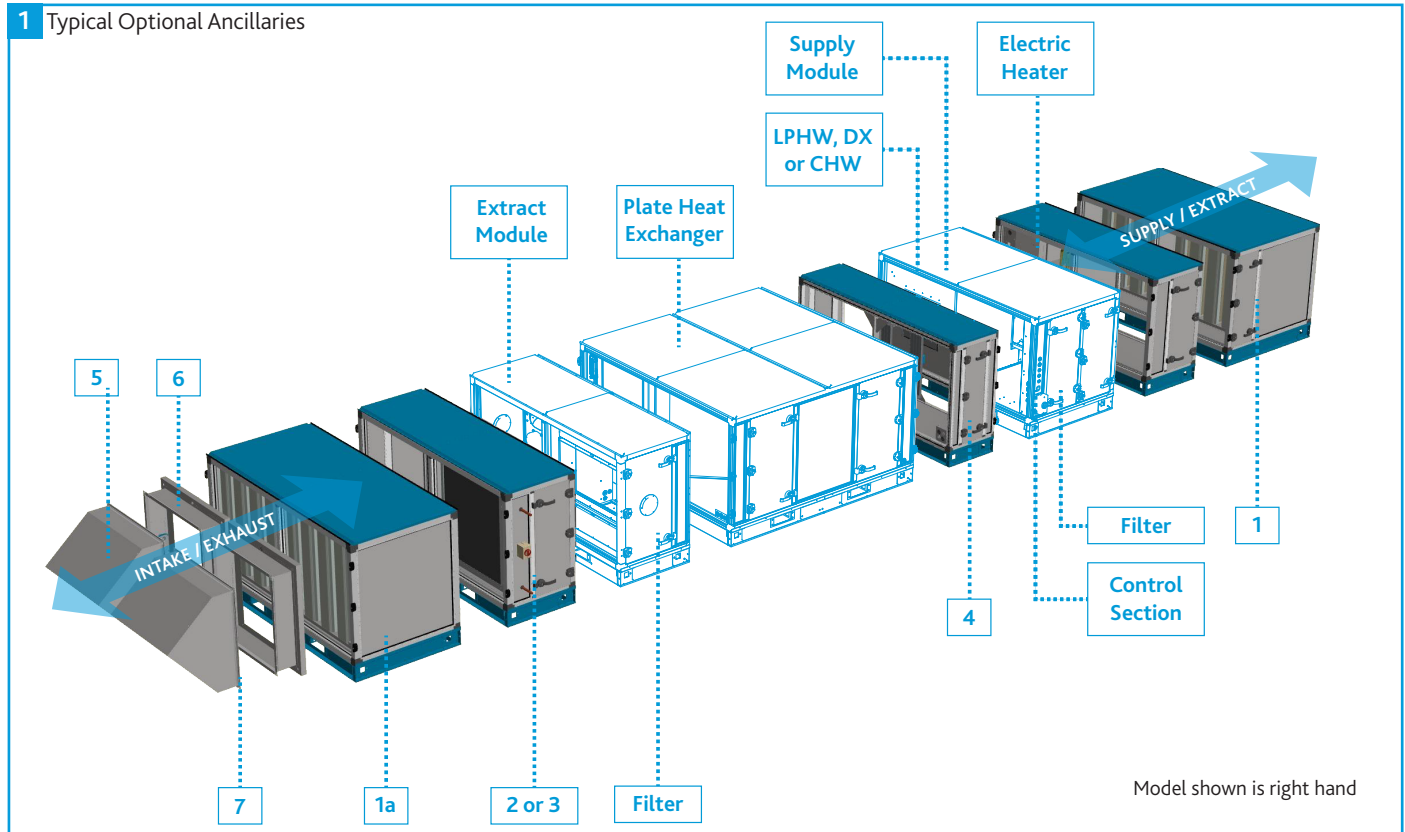
2.1 Code Description:

B	8	15	H	/	L	R	/	CO	-	L
1	2	3	4	/	5	6	/	7	-	8

- 1. Range: **B** = Boxer Packaged Solution
- 2. ErP Compliance Year: **6** = 2016
8 or No Affix = 2018
- 3. Unit Size: **05, 10, 15 or 20**
- 4. Heat Recovery Type: **H** = Horizontal
- 5. Heating Type: **E** = Electric
L = Low Pressure Hot Water (LPHW)
N = No Heating
- 6. Cooling Type: **C** = Chilled Water (CW)
N = No Cooling
R = Reverse Cycle DX (matched condenser available)
X = Reverse Cycle DX (condenser unit and controls by others)
- 7. Control Type: **CO** = Connect
- 8. Access Handing (in direction of supply airflow) **L** = Left Hand
R = Right Hand

3.0 OPTIONAL ANCILLARIES

1 Typical Optional Ancillaries



Quick Selection Guide BPS BOXER PACKAGED AHU's - ANCILLARIES

BPS Unit Module	Part Number	Description
Attenuator 1	B**AH/AR900-R	BPS size **. Attenuator for Supply/Extract, Right Handed, for Horizontal PHX Units.
	B**AH/AR900-L	BPS size **. Attenuator for Supply/Extract, Left Handed, for Horizontal PHX Units.
Attenuator 1a	B**AH/AA900-R	BPS size **. Attenuator for Intake/Exhaust, Right Handed, for Horizontal PHX Units.
	B**AH/AA900-L	BPS size **. Attenuator for Intake/Exhaust, Right Handed, for Horizontal PHX Units.
Frost Coil - Electric 2	B**AH/FE-R	BPS size **. Frost Coil Electric, 36kW, Right Handed, for Horizontal PHX Units.
	B**AH/FE-L	BPS size **. Frost Coil Electric, 36kW, Left Handed, for Horizontal PHX Units.
Frost Coil - LPHW 3	B**AH/FL-R	BPS size **. Frost Coil LPHW, Right Handed, for Horizontal PHX Units.
	B**AH/FL-L	BPS size **. Frost Coil LPHW, Left Handed, for Horizontal PHX Units.
Recirculation Module 4	B**AH/RM-R	BPS size **. Recirculation Module, Right Handed, for Horizontal PHX Units.
	B**AH/RM-L	BPS size **. Recirculation Module, Left Handed, for Horizontal PHX Units.
Weather Terminal 5	B**AH/RT	BPS size **. Weather Terminal, for Horizontal PHX Units.
Inlet/Outlet Damper 6	B**AH/D	BPS size **. Inlet/Outlet Dampers suitable for right or left handed Horizontal PHX Units.
Weather Terminal & Inlet/Outlet Damper 7	B**AH/RTD-R	BPS size **. Weather Terminal & Damper, Right Handed, for Horizontal PHX Units.
	B**AH/RTD-L	BPS size **. Weather Terminal & Damper, Left Handed, for Horizontal PHX Units.

** Insert one of the following for the relevant BPS unit.

4.0 DELIVERY & RECEIPT OF EQUIPMENT

All equipment is inspected prior to despatch and leaves the factory in good condition. Upon receipt of the equipment an inspection should be made and any damage indicated on the delivery note.

Particulars of damage and/or incomplete delivery should be endorsed by the driver delivering the goods before offloading by the purchaser.

No responsibility will be accepted for damage sustained during the offloading from the vehicle or on the site thereafter.

All claims for damage and/or incomplete delivery must be reported to Nuair within two days of receipt of the equipment.

4.1 Unit Offloading and Handling

The weight of unit modules and palletised items is displayed on the packaging. Some of the modules have an uneven weight distribution and this will be indicated by labelling where appropriate.

Offloading and positioning of the equipment is the responsibility of the purchaser, and should only be performed by competent personnel following an appropriate risk assessment.

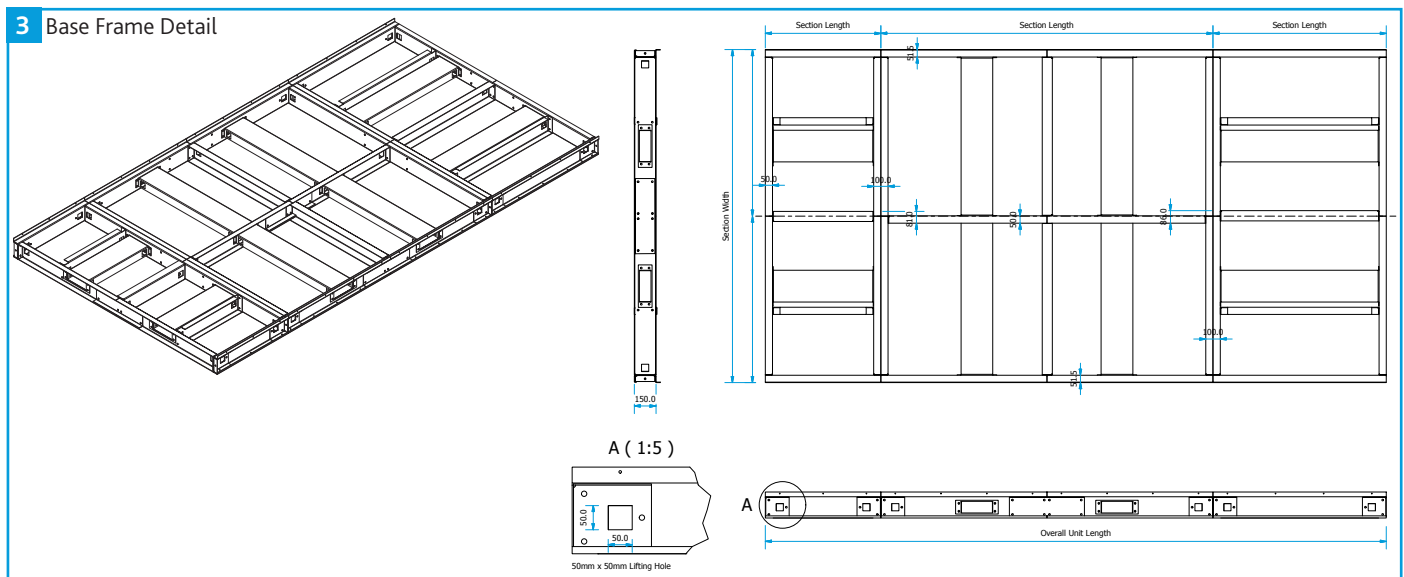
To ensure that the delivery vehicle is loaded according to the planned method of offloading, Nuair must be notified to ensure coordination. When offloading, care must be taken to ensure that the AHU is kept level at all times.

To ensure that no roof damage occurs additional timber packaging must be used.

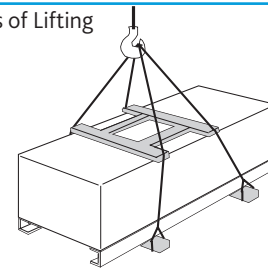
4.2 Base Frame Lifting Points

When units are constructed of multiple modules each module will have it's own individual base frame, which is then connected to the next to assemble the full system. **Only individual modules should be lifted or manoeuvred. The units must not be lifted or manoeuvred pre-assembled.**

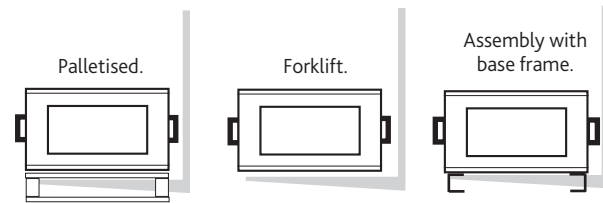
All base frame sections will have 50mm square lifting holes at the end of each side to enable lifting. In addition to this, covered fork lifting channels are located across the width of the base frame, if the module length is sufficient to allow this. For shorter modules the fork lifting points will be along the length of the section, without a covered channel (Figure 3).



2 Typical Methods of Lifting



Slings via spreaders fitted to unit with base frame.



4.3 Unit Packaging

Unless otherwise specified, unit sections will be delivered to site covered in "shrink wrap" polythene, which should provide a more than adequate level of protection against inclement weather.

Should alternative methods of unit protection be required (i.e. timber, Corex, or flame retardant materials), Nuair Limited should be notified of the specific requirements at the pre- contract stage. Waste must be disposed of by a registered waste carrier in accordance to national regulations.

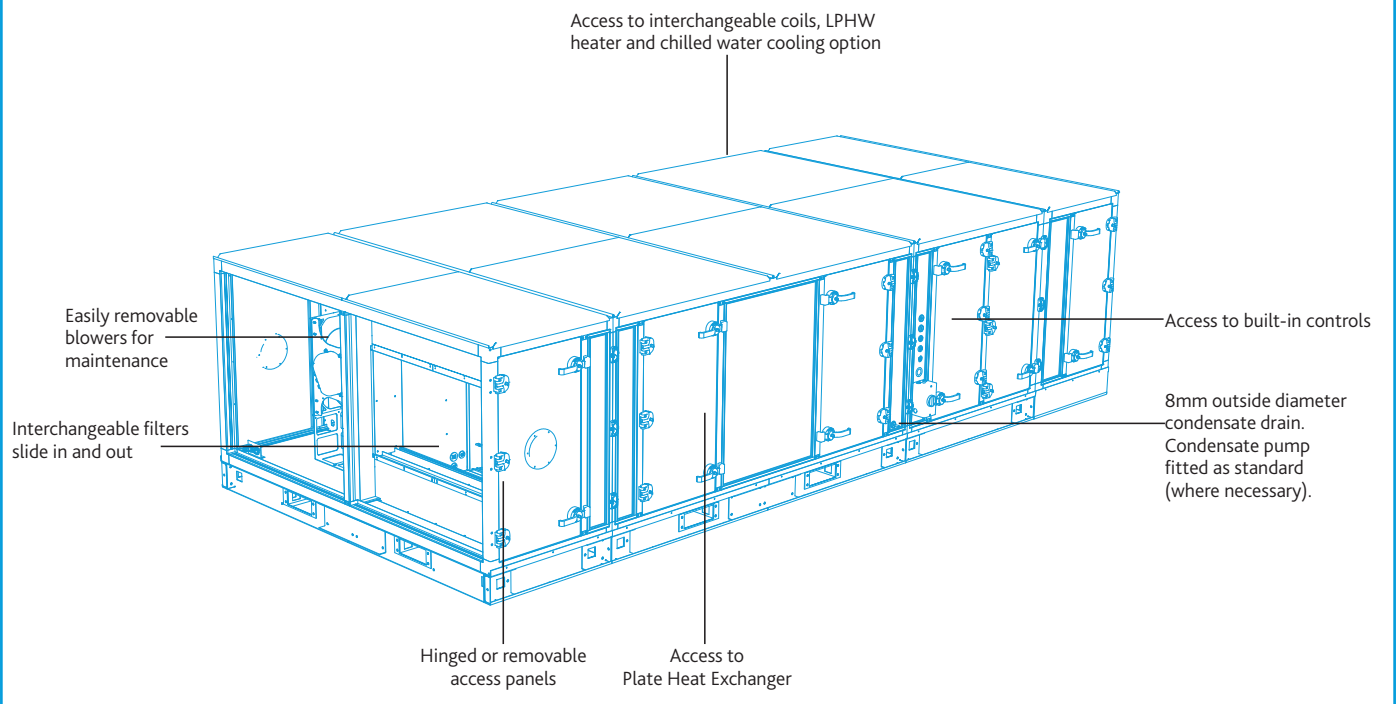
4.4 Unit Storage

The equipment must be stored in a dry, internal location. Ductwork connection apertures should be sealed against the ingress of dust, water and vermin. Note that units that are intended for external locations are generally not fully weatherproofed until their installation, including ductwork connections, is complete.

If the storage period is to exceed two months, contact Nuair for guidance on the appropriate 'mothballing' procedures. Do not stack units, modules or components.

5.0 UNIT ACCESS

4 Unit Access



In this product range, several unique concepts have been implemented with a view to simplifying the installation design.

- The unit must be installed with at least 600mm clearance from a wall/barrier. With this absolute minimum clearance, the unit may be connected to the power supply and control connection.
- With this clearance, unit filters may be changed, and the fans coils, heat exchanger and condensate tray may be inspected and cleaned if necessary.
- The LPHW and Electrical heater settings, coil bleed and drain, and all other control adjustments are similarly accessible.
- Side access, where possible, is preferred in all cases in terms of safe working access to the equipment under the CDM regulations.
- Note however, that access in the situation is difficult and additional time should be allocated. For convenience it is preferred that wherever possible, this minimum access provision is not adopted, and it is recommended that a minimum of around 600mm clearance (as stated in ADF 2010) is allowed.
- Where these arrangements are not suitable, the Consultant's and Contractor's project specific requirements will always be accommodated where possible.

5.1 Hinged / Removable Panel Access

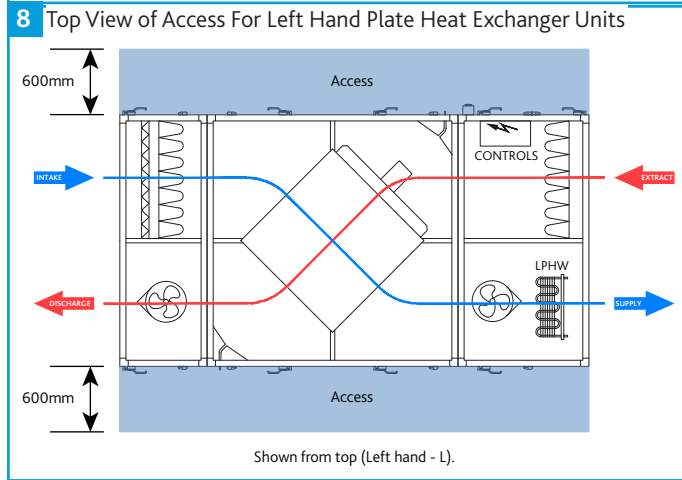
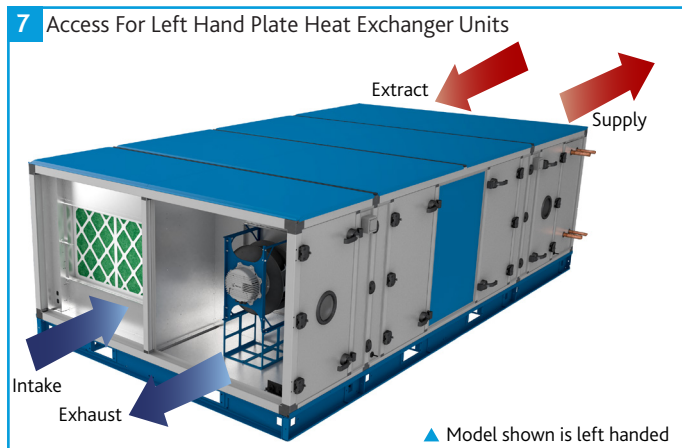
All hinged access panels will be lockable and removable via locked hinges which can be opened for panel removal. All keys are identical and will open any handle or hinge.

The hinges do not need to be unlocked in normal operation of opening and closing.

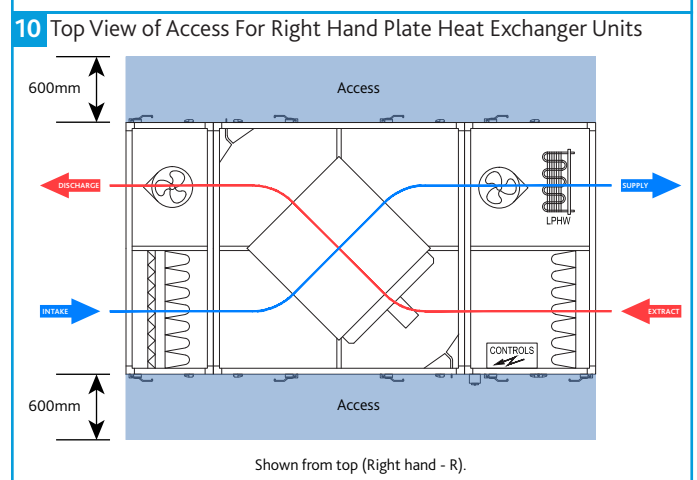
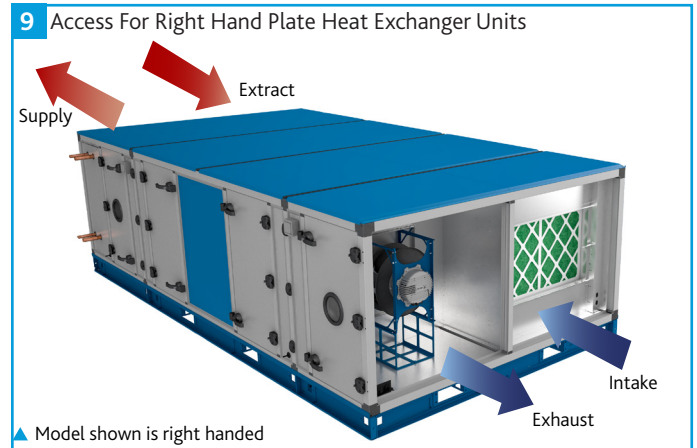


5.2 Access Areas

5.2.1 Left Hand Plate Heat Exchanger Units



5.2.2 Right Hand Plate Heat Exchanger Units



6.0 MECHANICAL INSTALLATION

Installation must be completed by competent persons, in accordance with good industry practice and should conform to all governing and statutory bodies i.e. IEE, CIBSE, etc.

The unit should stand upright and level on the floor, foundation or supporting steelwork which should be rigid, flat and level and should be capable of supporting the weight of the unit including water or refrigerant in the coils. Nuair takes no responsibility for the coordination of support.

6.1 Unit Location

To prevent possible reintroduction of contaminated air through the outside air intake, the unit should be located away from building flue stacks or exhaust ventilators.

Once assembled and in position, sufficient free space must be available adjacent to the unit for future inspection, maintenance, component service, repair and replacement and connection of services. It is recommended that at least the unit width (vertically arranged units) + 100mm be allowed. A minimum of 600mm is required for regular maintenance.

Sufficient clearance for U-traps on condensate drain and overflow connections should also be considered by the purchaser.

6.2 Air Leakage

Loading, transportation, off loading and site positioning can cause the air handling unit structures to move, therefore panel seals will not always remain fully intact.

It is inevitable that in such cases, re-sealing of the units panels and joints may have to be carried out on site for the air-handling units to achieve the required leakage classification. Door locking mechanisms may also have to be adjusted.

Nuair cannot be held responsible for the units failing a site leakage test if the above have not been carried out correctly.

6.3 Module Joints

After unwrapping, temporarily remove the rubber weatherproof cover strip and M10 base frame bolts from any modules and store in a safe location for later use.

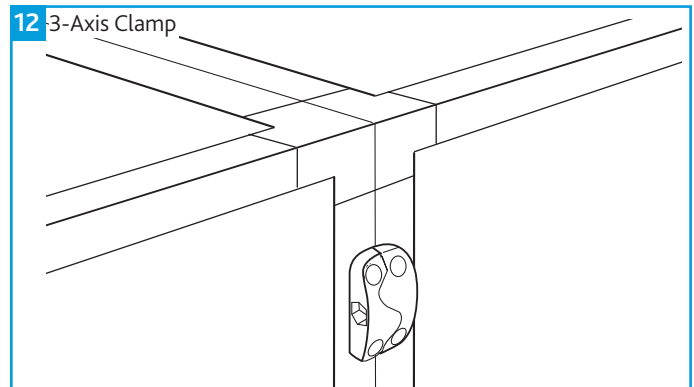
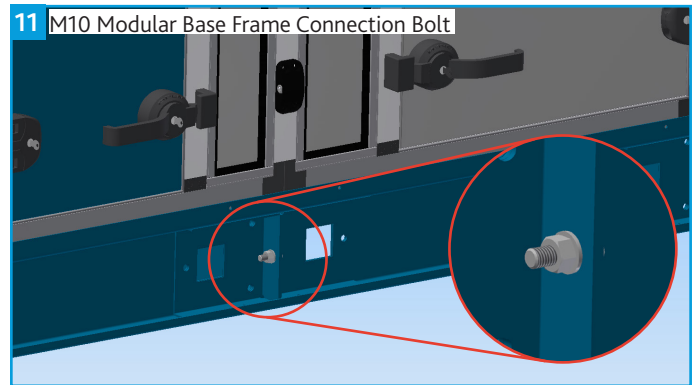
Apply the sealing gasket as necessary to the mating faces of the unit frames. Typically the sealing gaskets are pre-fitted to the heat exchanger module; ancillary modules will be provided with a roll of sealing gasket for on-site fitting.

Make the unit joints in the following order:

- Left and right hand side M10 bolts between the modules' base frames (Figure 11).
- Left and right hand side M6 Lower 3 axis alignment clamps (Figure 12).
- Left and right hand side M6 Middle 3 axis alignment clamps.
- Left and right hand side M6 Upper 3 axis alignment clamps.

Air leakage, air blow marks to the unit casings and unacceptable noise levels could result if the correct installation procedures are not employed.

Prior to making the unit joints, you must ensure the base frames of adjoining modules are fully touching along the width of the unit. Failure to do so can result in deformation of the unit frame when using the three axis alignment clamps.



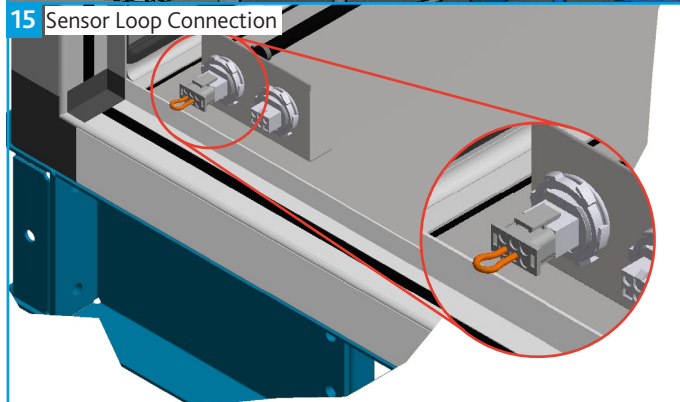
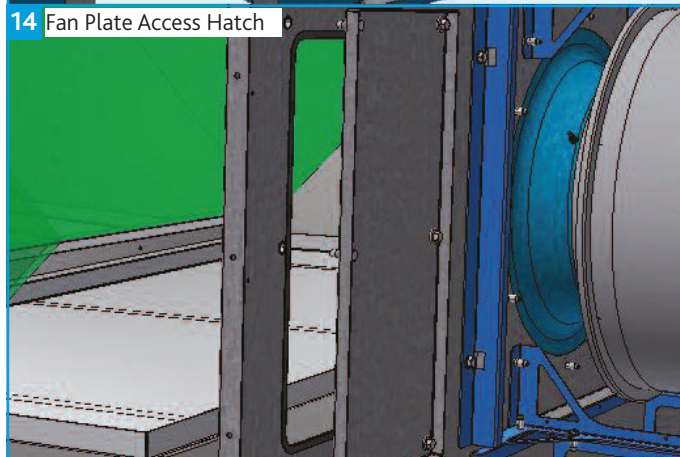
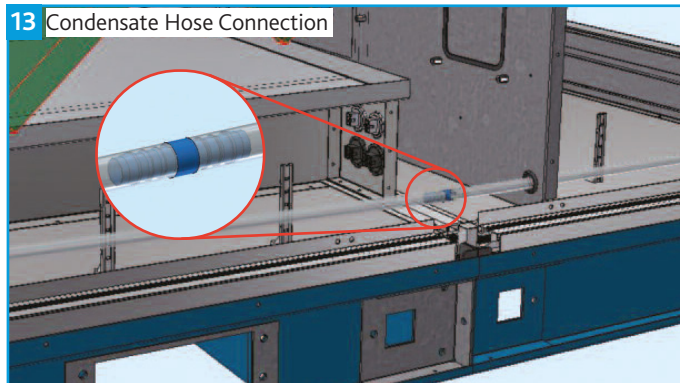
6.4 Internal Connections

There are a number of internal connections that need to be completed prior to starting/commissioning the unit. These consist of all the wiring connections and the condensate hose (plate heat exchanger option only).

Please ensure that the condensate hose is connected between modules. Care must be taken to ensure a constant fall in gradient is maintained and the hose is kept taught (Figure 13).

Access is available in the fan plate to allow electrical/wiring connections to be made between modules (Figure 14).

When making the wiring connections, the sensor loop (Figure 15) must be removed and relocated to the end of the unit.



6.5 Condensate Drain

Plate heat exchanger components and modules that incorporate cooling coils may produce condensation during use. An insulated drip tray and condensate pump is provided where necessary. The drain connection must be connected to a suitable drainage point.

Condensate pump specification:

Maximum flow rate = 50 L/H

Maximum head = 20m Vertical, 100m Horizontal

Pipe Connection size (Low Pressure Condensate connection) = 8 mm

6.6 Weather Resistant Units

The units are supplied in multiple sections and have weather resistant roof components that must be fitted and sealed after the unit sections are bolted together. All necessary fixings are supplied with each unit and are normally bagged and located within the fan section. Suitable mastic sealant is to be provided by others.

Where the weatherproof roof assembly of two sections meet, the metal hinged weatherproof cover strip must be closed to seal the seam between unit sections and fixed with the bolts provided.

The equipment must not be exposed to the weather in an unassembled or partially assembled state. All roof terminal, ductwork, sealing and assembly work must be completed before the unit can be considered weather resistant.

6.7 Unit Connections

6.7.1 Ducting

Nuaire do not provide ductwork connections with units, instead the open ended framework should be utilised. Flanged connections are available as an option, refer to technical documents for information relating specifically to the manufactured unit.

6.7.2 Coil

When connecting coils, special care is needed to allow for expansion and contractions. Prior to any equalising connection, ensure that the thermostatic expansion valve for the DX coil is securely fitted.

Additional care must be taken when using R32 or other flammable refrigerants: your commissioned system must comply with the requirements of BS EN 378. Units must be fitted with gas detection systems (or deploy other suitable control method) to ensure that, in the event of a refrigerant leak, the Lower Flammability Limit is not exceeded.

Each coil section should be trapped and special care should be taken to ensure that there are no vertical rising condense lines, unless pumped.

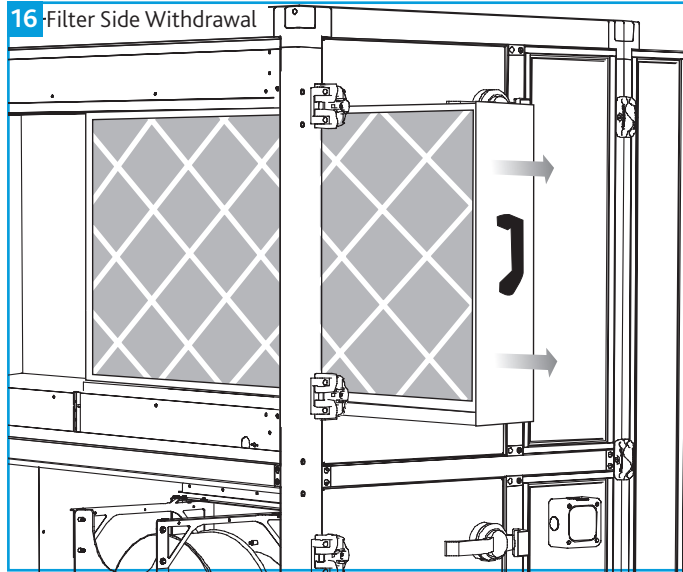
Wet pipe connections sizes are listed in the table below.

Care should be taken to ensure that all pipework is adequately supported, therefore ensuring that no additional weight is added to the unit. Extra precaution should be taken to prevent pipe damage on site, as the fragile pipework will protrude from the side of the unit.

If a frost coil is not fitted then appropriate control methods must be taken to prevent the coils, filters and other equipment from freezing (by others).

Unit Size	Frost Coil (LPHW)		Heating Coil (LPHW)		Cooling Coil (CHW)	
	Flow	Return	Flow	Return	Flow	Return
05	15 mm	15 mm	15 mm	15 mm	22 mm	22 mm
10	22 mm	22 mm	22 mm	22 mm	22 mm	22 mm
15	22 mm	22 mm	22 mm	22 mm	28 mm	28 mm
20	28 mm	28 mm	28 mm	28 mm	35 mm	35 mm

6.8 Filters



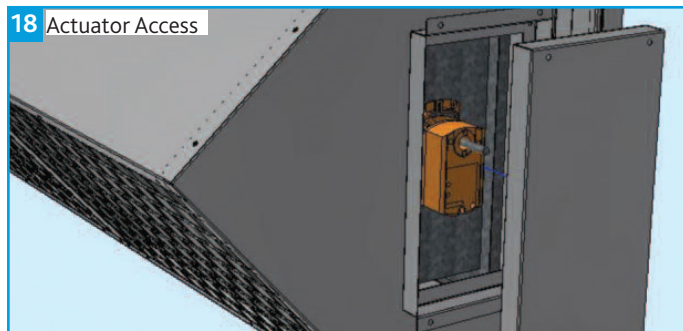
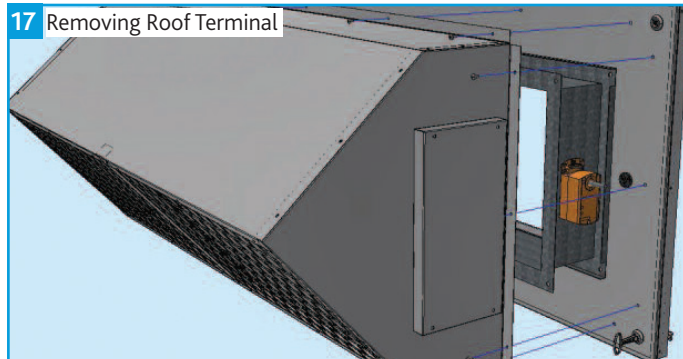
6.8.1 Filter Removal

Filters will be provided in banks on suitable slide rails, so that they can be withdrawn from the access side of the unit. Differential "Dirty Filter" pressure switches are fitted as standard.

6.8.2 Spare Filters

If specified with order, spare sets of filters will be provided and should be stored in a clean, dry environment. Should you require spare filter media, please contact Nuair.

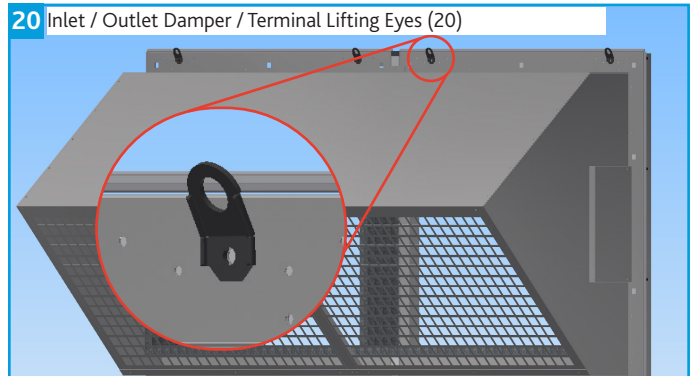
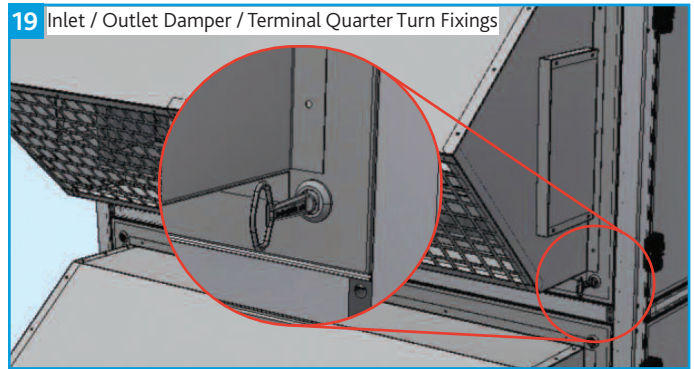
6.9 Control Dampers



6.10 Damper / Roof Terminal Assembly

The inlet/outlet dampers and roof terminals are pre-assembled (for BPS sizes **05**, **10** and **15**) on a double skinned and insulated panel. The panel is easily fitted to the unit with a series of quarter turns (provided with a locking key) (Figure 19).

For the larger size BPS units (**20**) the pre-assembled dampers and terminals are provided with lifting eyes for on-site hoisting into position (Figure 20).



6.11 Supporting Ancillary Items

All ancillary items that are supplied without individual base frames require safe suitable support (supplied by others). This includes but is not limited to single attenuators, terminals and dampers etc.

6.12 Installation Inspection

- Thoroughly inspect the unit after installation is complete.
- The inside of the unit should be checked; any objects which may have been left should be cleared.
- Check fan impellers, scrolls and outlets.
- Remove any transit protection fittings that may be attached to the fan or motor base frame, and that all traps are primed.
- Close all access door seals for damage, and replace any panels that have been removed.

7.0 ELECTRICAL INSTALLATION

The electrical wiring must be carried out by competent persons, in accordance with good industry practice and should conform to all governing and statutory bodies i.e. IEE, CIBSE etc.

7.1 Main Unit Power Supply

The control is powered by a 400Vac 50Hz 3 phase & Neutral supply. This must be isolated local to the unit and fitted with appropriate over-current and fault protection.

7.3 Unit Power Supply Details - FLC

Unit Size	Unit (FLC)	Unit with Electric Heater (Electric Heater Models Only)	Unit with Condenser(s) (Condenser(s) Models only)	Units with both Condenser and Electric Heater
B*05H/**CO	4.2 A	4.2 A + 18 A †	8.7 A	8.7 A + 18 A †
B*10H/**CO	13 A	13 A + 27 A †	17.5 A	17.5 A + 27 A †
B*15H/**CO	6.8 A	6.8 A + 35 A †	13.9 A	13.9 A + 35 A †
B20H/**CO	12.8 A	12.8 A + 53 A †	17.3 A	17.3 A + 53 A †
B820H/**CO	9.6 A	9.6 A + 53 A †	14.1 A	14.5 A + 53 A †

* Denotes any Character.

† These heater models require a separate power supply for the electric heater section, with an appropriate over-current protection device.

‡ These heater models require two separate power supplies for the two (2) electric heater sections, each with an appropriate over-current protection device.

Unit Size	Condenser Units Required	Maximum Current	Power Supply	Mitsubishi Part Number
05	BPS-CU-MIT-14 x1	13A	3phase, 50Hz, 400V	PUHZ-P140YHAR2
10	BPS-CU-MIT-14 x1	13A	3phase, 50Hz, 400V	PUHZ-P140YHAR2
15	BPS-CU-MIT-20 x1	19A	3phase, 50Hz, 400V	PUHZ-P200YKAR1
20	BPS-CU-MIT-25 x1	21A	3phase, 50Hz, 400V	PUHZ-P250YKAR1

7.4 Condenser Power Supply Details - FLC

See condenser manual for more information.

7.5 Wiring

All inter-connections between circuit boards, blowers and sensors are made at the factory. This diagram only shows the essential field wiring points for clarity.

Remove link wire if switched live signal, an enabler or BMS signal is connected.

If inlet and outlet dampers are fitted, remove the damper link wires. This will allow a 1 minute delay before starting the fans.

7.6 Emergency Shut Down Circuit

Emergency Shutdown Circuit. Break to Remove power. Remove Jumper bar between T6 & T7 to use.

7.6.1 Switch Live

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

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

A signal from an isolating transformer will produce an unpredictable result and is not recommended.

Extra low voltage versions of the switched live signals are also available. Link two contacts to activate the signal.

7.2 Electric Heater Power Supply

For models with electric heating, the heating circuit is powered by 1 or 2 separate, higher current, 400Vac 50Hz 3 phase & Neutral supplies. This must be isolated to the unit and fitted with appropriate over-current protection. The main supply is still required. Electric heater elements are protected by a fail-safe over-temperature switch which will disconnect the heater supply if a temperature of 80°C is reached. Once the elements cool, the switch will reset but a power cycle is required to reset the heater supply contactor.

7.6.2 Volt Free Contacts

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.

Fault - The relay is unpowered when a fault is present.

Heat Demand - The relay is powered when heating is selected.

Cool Demand - The relay is powered when cooling is selected.

7.6.3 Fan Start Delay

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.

7.6.4 Network Settings

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

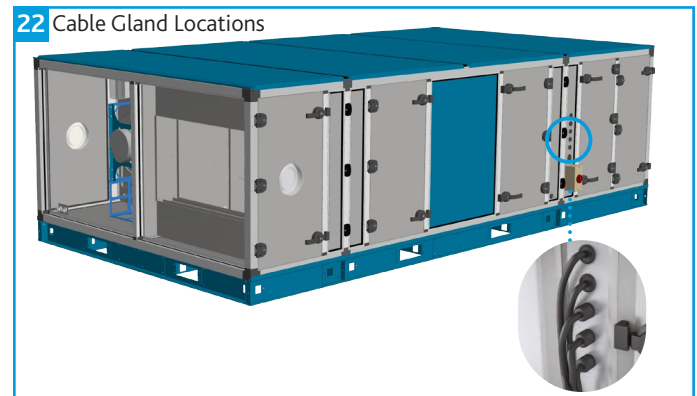
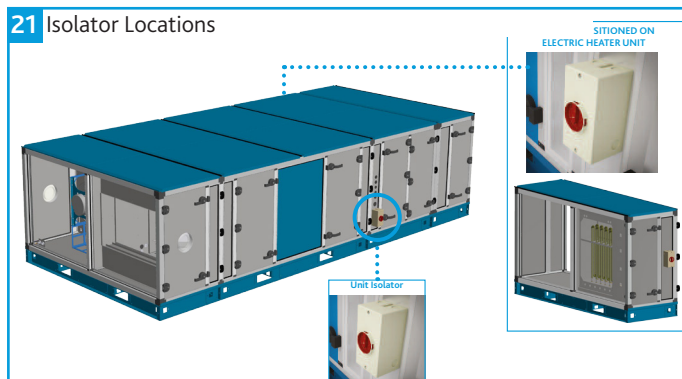
7.7 Connection Chart

Description	Controller Terminal No	Din Rail Terminal No	DI	AI	Relay Output	AO (0-10v)
Fresh Air Sensor	IN1			1		
Supply Air Sensor	IN2			1		
Return/Room Air Sensor	IN3	30,31		1		
Input 4 (Pressure Sensor)	IN4			1		
Input 5	IN5	36,37		1		
Alarm Circuit 1 (Fan, Heater)	IN6	32,33	1			
Alarm Circuit 2 (Pump, Filter, IO Damper)	IN7	34,35	1			
Enable Input Signal	IN8	38,39	1			
Configurable Input Signal (SL2)	IN9	40,41	1			
Extract Fan 0-10V	OUT1					1
Supply Fan 0-10V	OUT2					1
Heat Demand 0-10V	OUT3					1
Cool/Reverse-Cycle Demand 0-10V	OUT4					1
HX Bypass Relay	OUT5				1	
Fault Relay (De-energise on fault)	OUT6				1	
Fan Run Relay	OUT7				1	
Cool/Reverse-Cycle Demand Relay	OUT8				1	
Recirculation Damper Relay	OUT9				1	
230V Enable Input		10				
230V Configurable Input		11				

7.8 Isolator Wiring Points

Main wiring points for the customer is to the isolators situated on the sides of the units as shown below.

Cable glands are for additional ancillary cabling and are located on the sides of the units.



7.9 Terminal Wire Connections

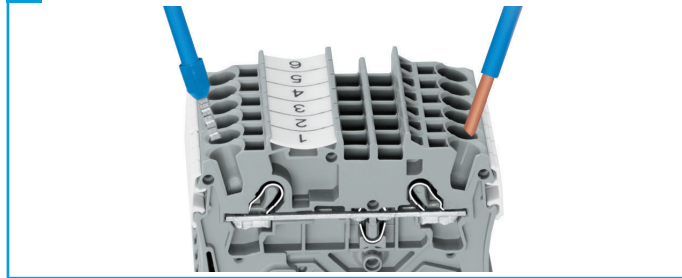
7.9.1 Push In Termination

Stripped solid conductors, fine-stranded conductors with ferrules, or ultrasonically “bonded” conductors are simply pushed in until they hit the backstop. No tools are required.

7.9.2 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.

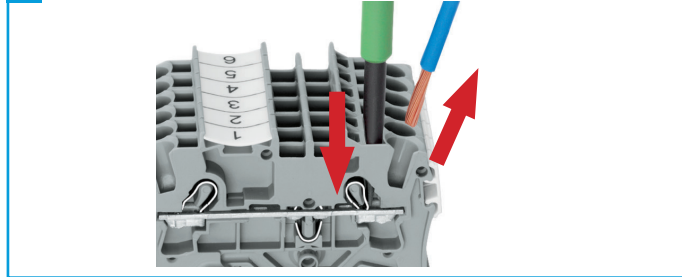
23 Wiring a Conductor to a Terminal



7.9.3 Conductor Removal

Insert an operating tool in to the operating slot to remove the conductor, just like the original CAGE CLAMP® terminals blocks.

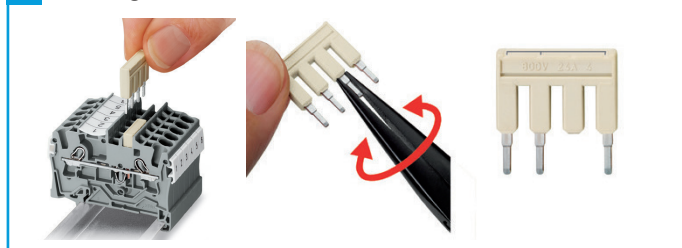
24 Removing a Conductor from a Terminal



7.9.4 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.

25 Removing a Conductor from a Terminal



7.9.5 Jumper Removal

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

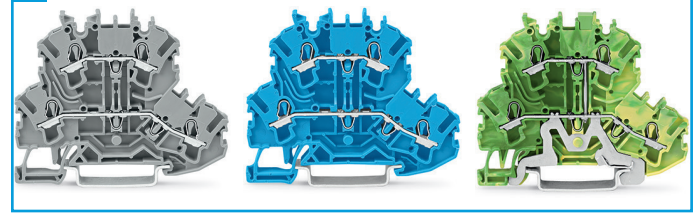
26 Removing a Jumper



7.9.6 Double Deck Termination 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.

27 Double Deck Conducting Paths



7.9.7 Earth Terminals

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

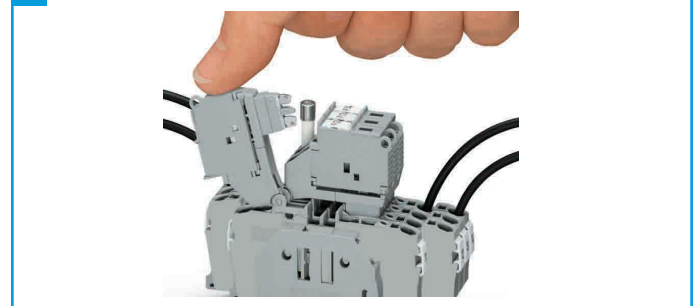
28 Earth Terminal Block



7.9.8 Fuse Terminals

Replaceable cartridge fuses are housed in quick release fuse terminals.

29 Fuse Terminal Block



7.10 Wiring Diagrams

A series of basic connection wiring diagrams have been provided to assist on-site wiring. In order to reference the relevant diagrams please use the code breakdown opposite to determine:

- Unit size
- If an electric heater is present
- If Reverse Cycle DX heating or cooling is present.

The below tables can then be used to reference the required connection and wiring diagrams.

Example:

Unit onsite has code **B820H/ER/AT-L**. This indicates a size 20 unit with electric heating and Reverse Cycle DX cooling. Section 7.10.8 includes the unit wiring diagram.

7.10.1 Code Description:

B	8	20	H	/	L	R	/	CO	-	L
1	2	3	4	/	5	6	/	7	-	8

1. Range: B = Boxer Packaged Solution
2. ErP Compliance Year: 6 = 2016
8 or No Affix = 2018
3. Unit Size: 05, 10, 15 or 20
4. Heat Recovery Type: H = Horizontal Plate Exchanger

5. Heating Type: E = Electric
L = Low Pressure Hot Water (LPHW)
N = No Heating
6. Cooling Type: C = Chilled Water (CW)
N = No Cooling
R = Reverse Cycle DX
X = DX*
7. Control Type: CO = Connect
8. Access Handing (in direction of supply airflow) L = Left Hand
R = Right Hand

*Condenser Unit and control by others.

7.10.2 Wiring Diagram Reference Table

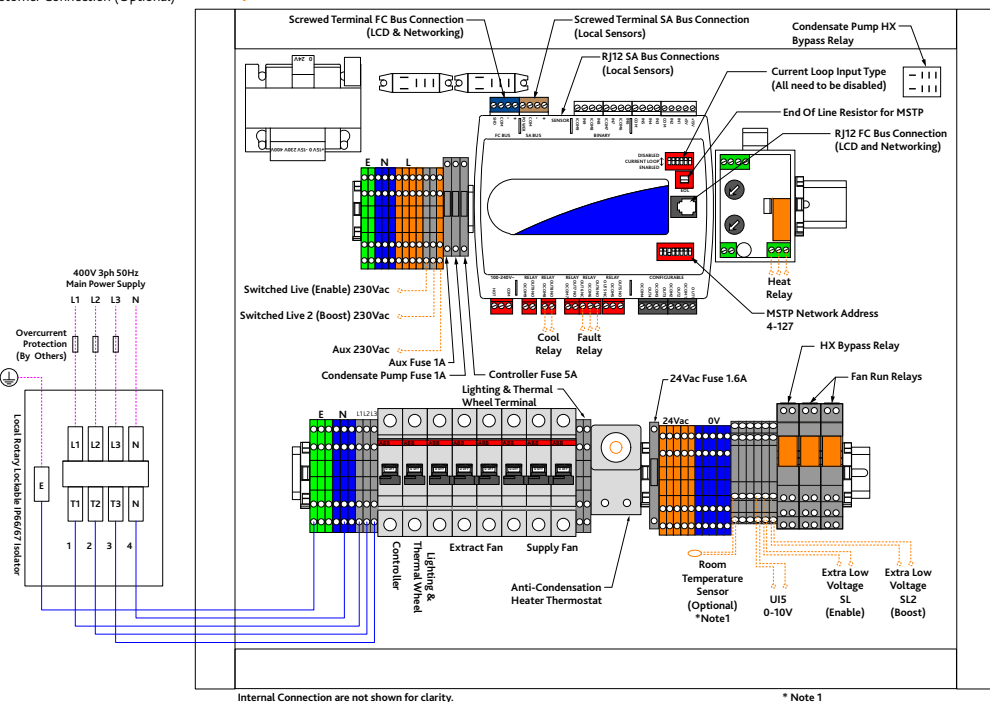
Unit Size	No Electric Heater or Reverse cycle DX	Unit with Electric Heater	Unit with Reverse Cycle DX	Unit with Electric Heater & Reverse Cycle DX
05	Section 7.10.3	Section 7.10.4	Section 7.10.5	Section 7.10.7
10	Section 7.10.3	Section 7.10.4	Section 7.10.5	Section 7.10.7
15	Section 7.10.3	Section 7.10.4	Section 7.10.6	Section 7.10.8
20	Section 7.10.3	Section 7.10.4	Section 7.10.6	Section 7.10.8

7.10.3 Unit Sizes 05 - 20 with No / LPHW Heating & No / CHW Cooling

30 Unit Sizes 05 - 20 with No /LPHW Heating & No / CHW Cooling Wiring Diagram

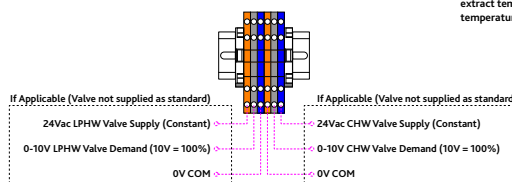
Key:

- Factory Connection
- Customer Connection (Mandatory)
- Customer Connection (Optional)



Internal Connection are not shown for clarity.

* Note 1
Connect space temperature sensor in place of extract temperature sensor for space temperature control.

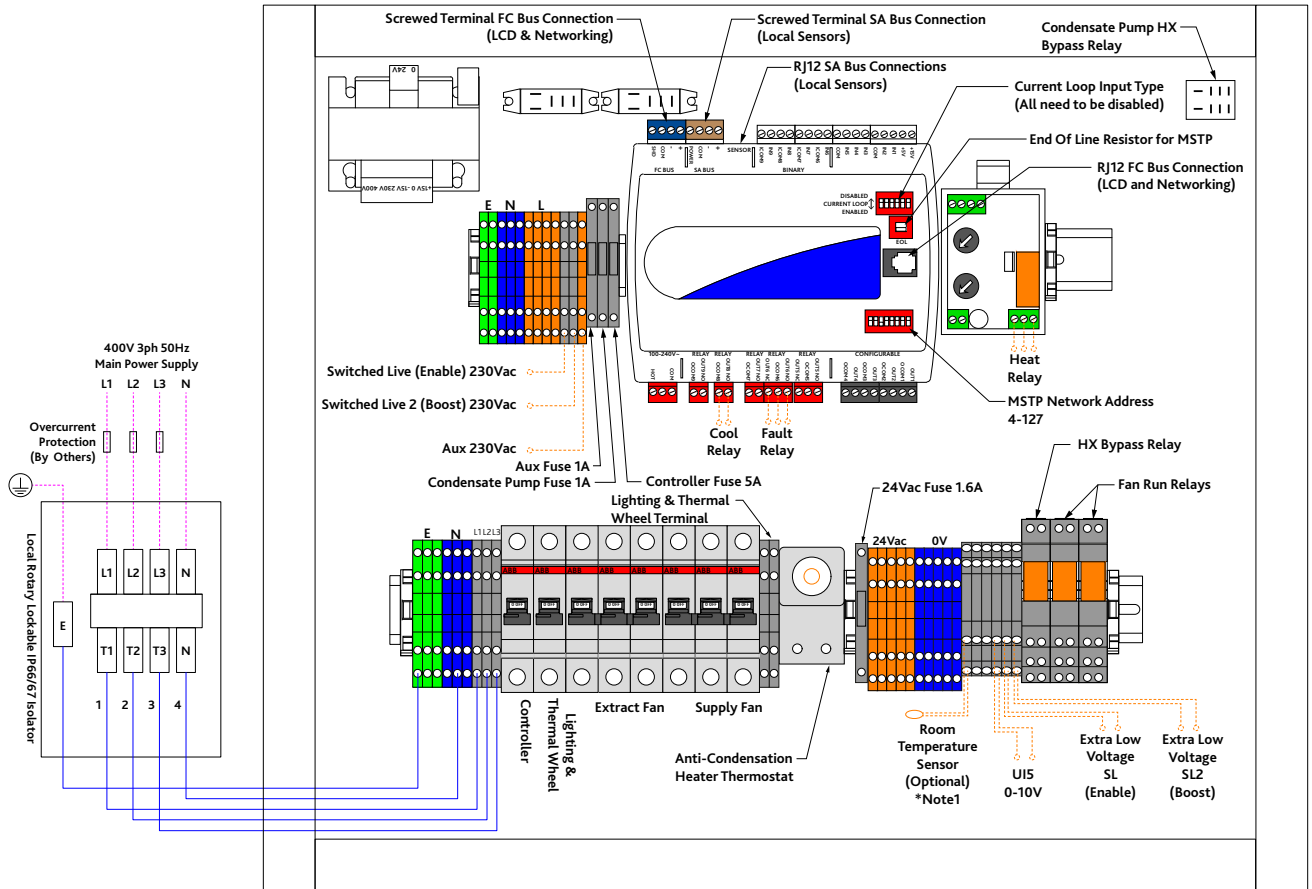


7.10.4 Unit Sizes 05 - 20 with Electric Heating & No / CHW Cooling

31 Unit Sizes 05 - 20 with Electric Heating & No / CHW Cooling Wiring Diagram

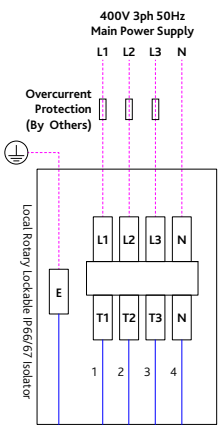
Key:

- Factory Connection —○
- Customer Connection (Mandatory) —○
- Customer Connection (Optional) —○



Internal Connection are not shown for clarity.

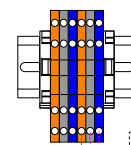
* Note 1
Connect space temperature sensor in place of extract temperature sensor for space temperature control.



All internal connections between the heater section and the main section are made via interconnection looms. No external connections need to be made.

The electric heater air off temperature is set by an adjustment knob inside the electric heater section.

Electric Heater Section 1 Supply Required



If Applicable (Valve not supplied as standard)

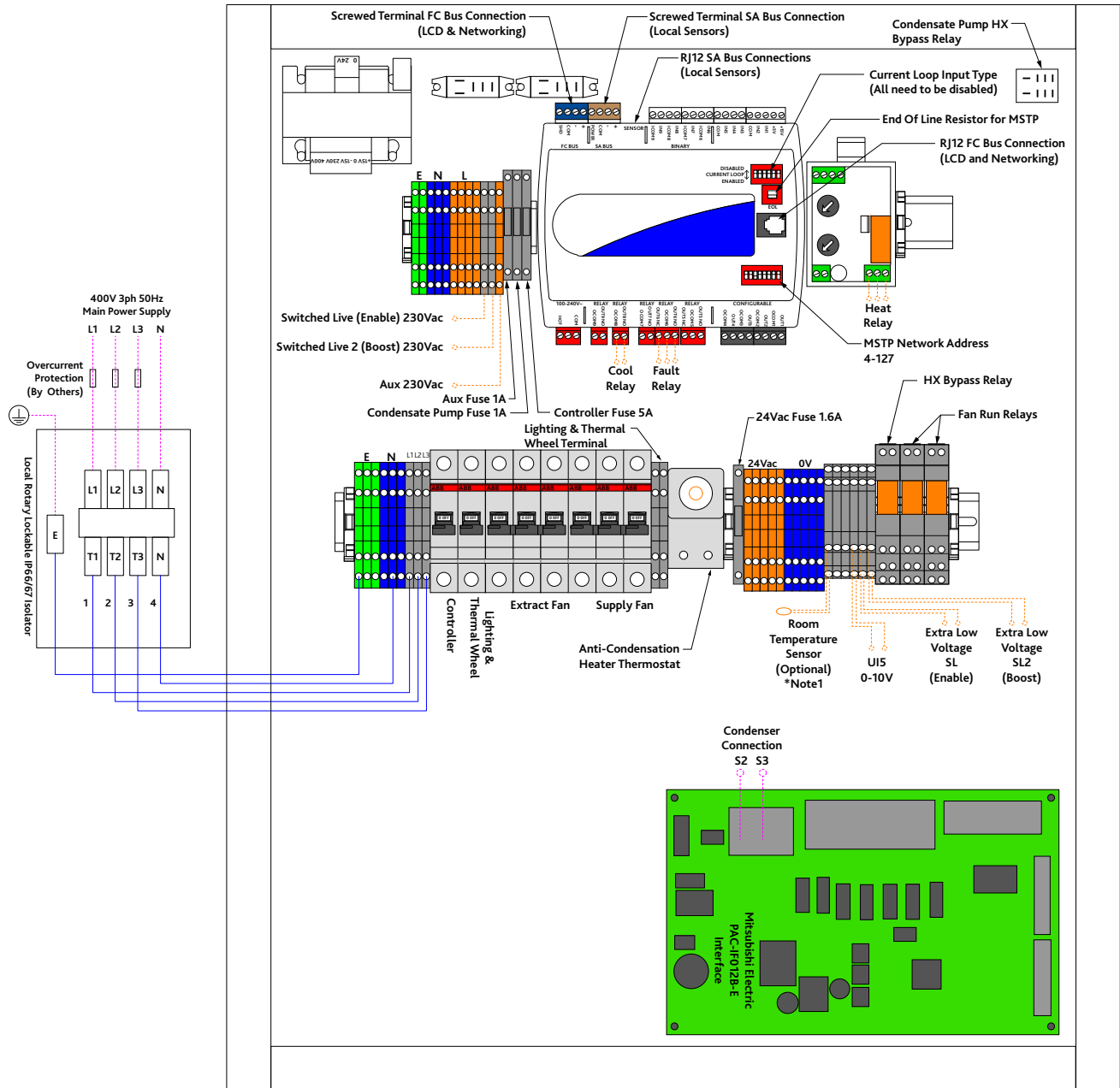
- 24Vac CHW Valve Supply (Constant)
- 0-10V CHW Valve Demand (10V = 100%)
- 0V COM

7.10.5 Unit Sizes 05 - 10 with No / LPHW Heating & Reverse Cycle DX

32 Unit Sizes 05 - 10 with No / LPHW Heating & Reverse Cycle DX

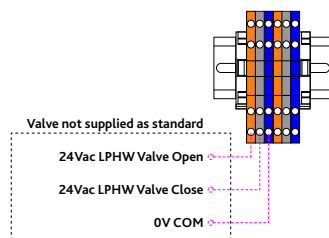
Key:

- Factory Connection —○—
- Customer Connection (Mandatory) —○—
- Customer Connection (Optional) —○—



Internal Connections are not shown for clarity.

* Note 1
Connect space temperature sensor in place of extract temperature sensor for space temperature control.

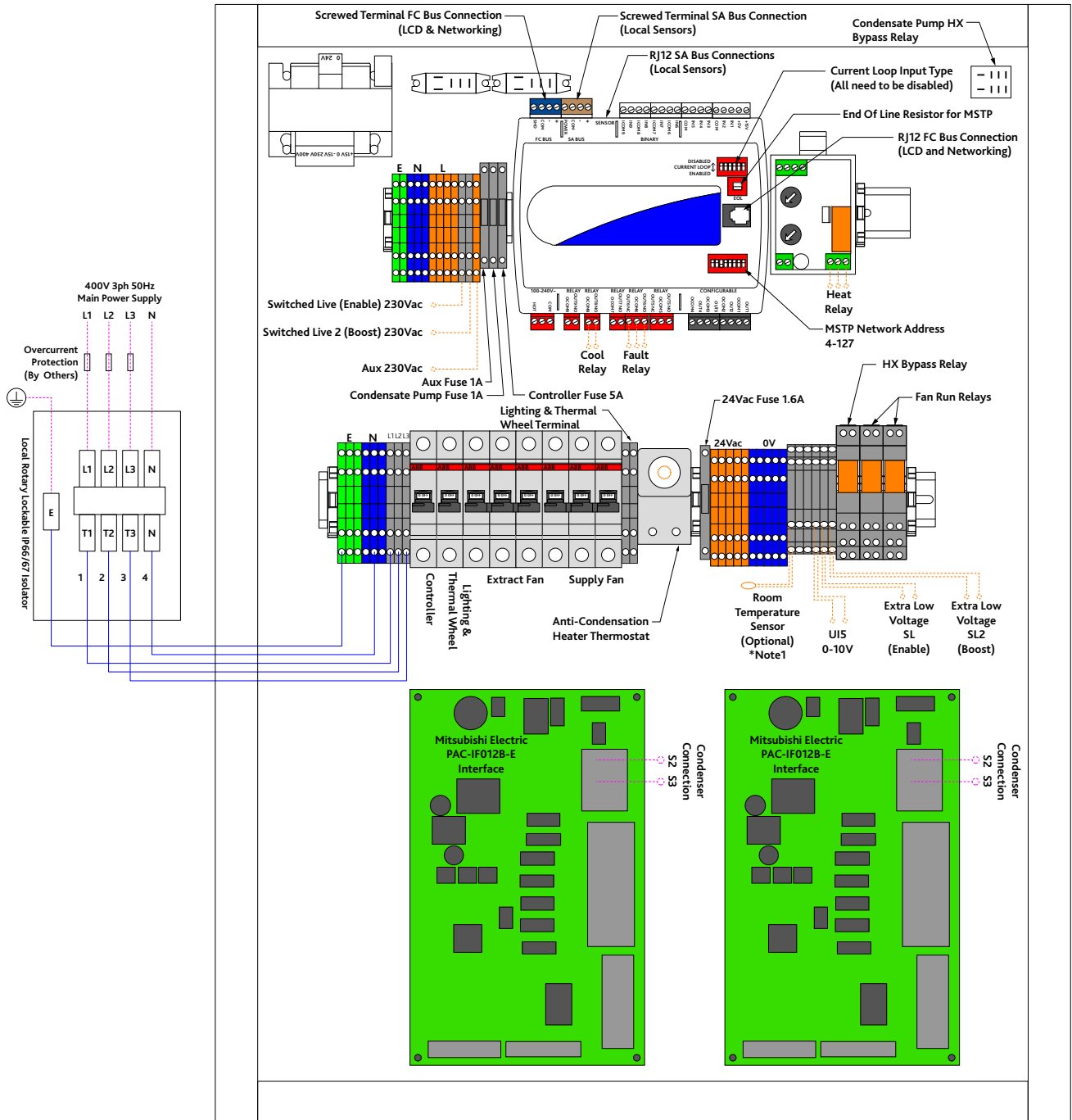


710.6 Unit Sizes 15 - 20 with No / LPHW Heating & Reverse Cycle DX

33 Unit Sizes 15 - 20 with No / LPHW Heating & Reverse Cycle DX

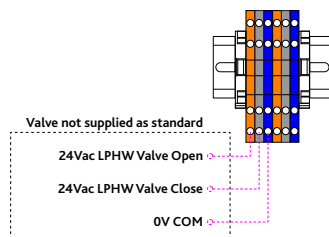
Key:

- Factory Connection
- Customer Connection (Mandatory)
- Customer Connection (Optional)



Internal Connection are not shown for clarity.

* Note 1
Connect space temperature sensor in place of extract temperature sensor for space temperature control.

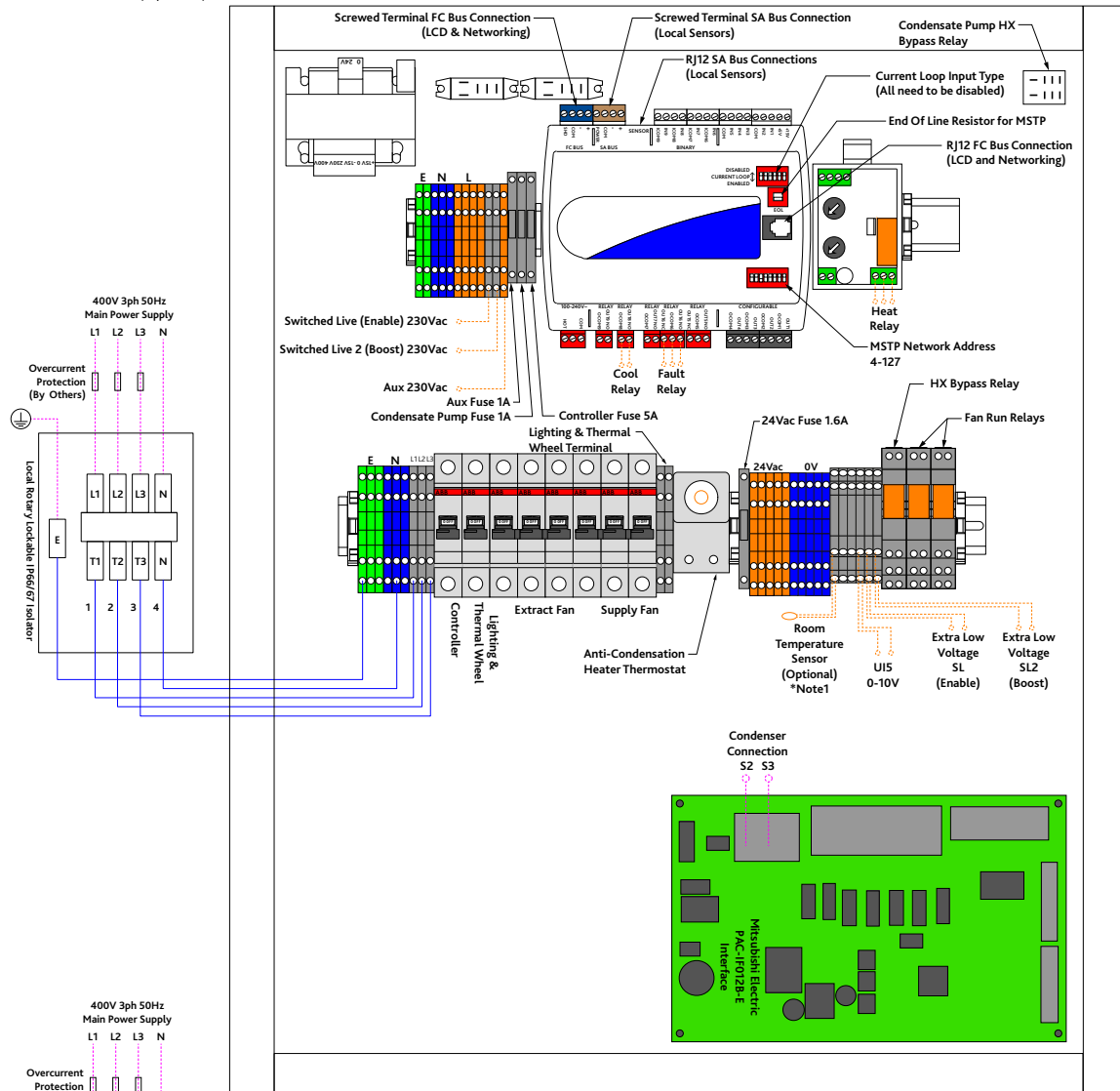


710.7 Unit Sizes 05 - 10 with Electric Heating & Reverse Cycle DX

34 Unit Sizes 05 - 10 with Electric Heating & Reverse Cycle DX

Key:

- Factory Connection —○—
- Customer Connection (Mandatory) —○—
- Customer Connection (Optional) —○—



Internal Connection are not shown for clarity.

All internal connections between the heater section and the main section are made via interconnection looms. No external connections need to be made.
The electric heater air off temperature is set by an adjustment knob inside the electric heater section.

* Note 1
Connect space temperature sensor in place of extract temperature sensor for space temperature control.

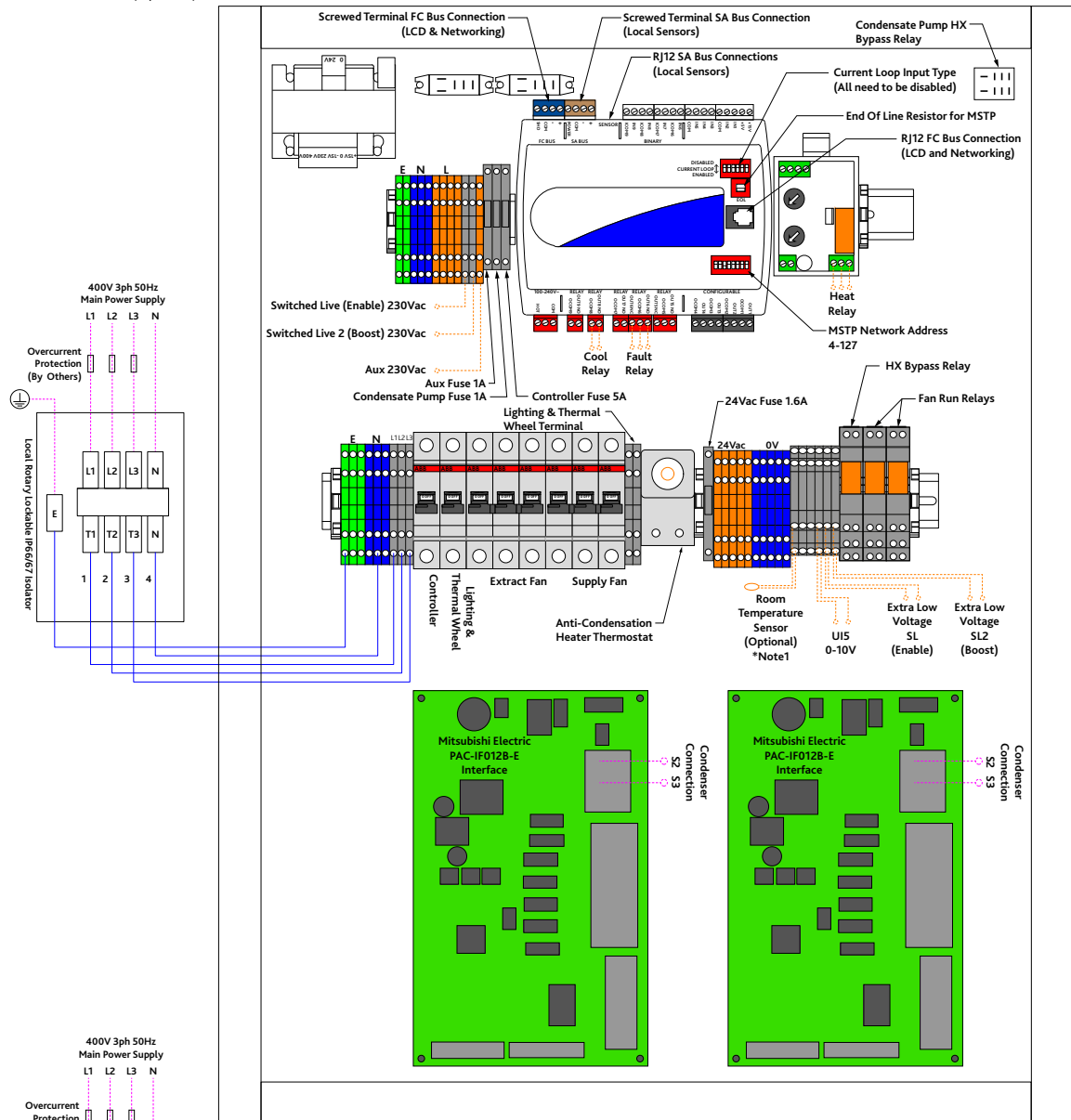
**Electric Heater Section
1 Supply Required**

7.10.8 Unit Sizes 15 - 20 with Electric Heating & Reverse Cycle DX

35 Unit Sizes 15 - 20 with Electric Heating & Reverse Cycle DX

Key:

- Factory Connection —○—
- Customer Connection (Mandatory) —○—
- Customer Connection (Optional) —○—



Internal Connection are not shown for clarity.

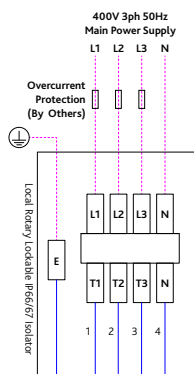
* Note 1
Connect space temperature sensor in place of extract temperature sensor for space temperature control.

All internal connetions between the heater section and the main section are made via interconnection loops. No external connections need to be made.

The electric heater air off temperature is set by an adjustment knob inside the electric heater section.

Electric Heater Section

1 Supply Required

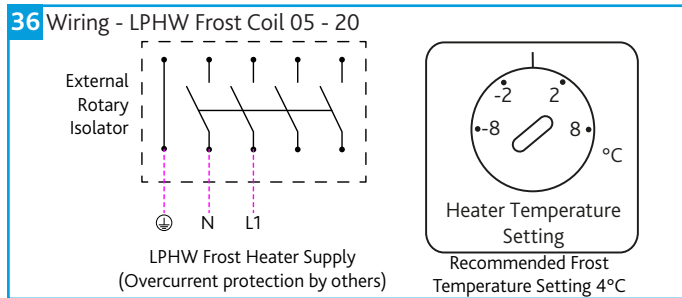


8.0 FROST COIL INSTALLATION (OPTIONAL ANCILLARY)

8.1 LPHW Frost Coil

LPHW frost coils are fitted with a frost stat on the air in side and an on/off 230v valve actuator (Unit size 32 & 42 are NOT provided with valve and actuator). If the frosts stat switches to a frost condition, the valve actuator will open. The valve will open whether the fans are running or not. This is for pipe freeze protection. The LPHW section requires its own supply in order to power the valve actuator.

8.2 Wiring - LPHW Frost Coil Unit Sizes 05 - 20

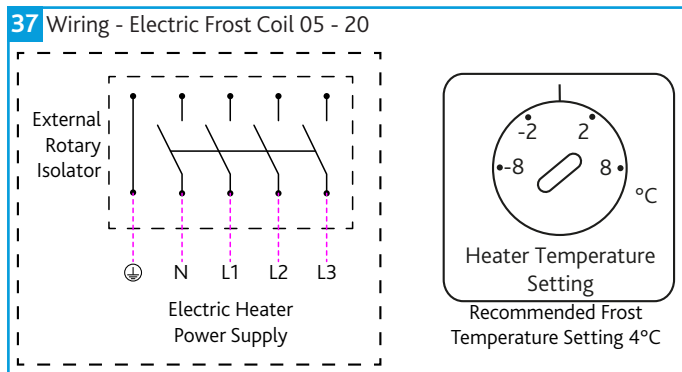


8.3 Electric Heater Frost Coil

Electric heater frost coils are fitted with its own internal control panel. The control is powered by a 400Vac 50Hz 3 phase & Neutral supply. This must be isolated local to the unit and fitted with appropriate overcurrent and fault protection. It connects to the main unit via "plug and play" interconnecting looms. (See interconnection section for details). No external connections are required. Electric heater elements are protected by a fail-safe over-temperature switch which will disconnect the heater supply if a temperature of 80°C is reached. Once the elements cool, the switch will reset but a power cycle is required to reset the heater supply contactor.

The frost coil is fitted with a burst fired controller with integral set point, air off thermistor, air in frost stat, thermal cut-out and contactor. The burst fired controller is only enabled if the frost stat reads a frost condition, the over-temperature cut-out is healthy AND a 24vac fan run signal is received from the main control panel. Once enabled the burst fired controller will increase heating output to achieve the set point set by the physical dial on the unit.

8.4 Wiring - Electric Heater Frost Coil Unit Sizes 05 - 20



8.5 Electrical Supply FLC's

Unit Size	Electric Frost Heater FLC (Ancillary)	LPHW Frost Coil FLC (Ancillary)
B*05H/**CO	17.5 A	0.1 A
B*10H/**CO	35 A	0.1 A
B*15H/**CO	52.5 A	0.1 A
B*20H/**CO	52.5 A	0.1 A

9.0 CONTROLS

The system incorporates a preconfigured BACnet MS/TP enabled controller.

38 Connect Controller



9.1 Controllable Items

- Supply Fan
- Extract Fan
- Heat Recovery Bypass Damper (if applicable).
- Thermal Wheel (if applicable).
- Heating Coil (if fitted).
- Cooling Coil (if fitted).
- DX coil (If fitted).
- Inlet Damper (If fitted).
- Exhaust Damper (If fitted).
- Recirculation damper (If fitted).

9.2 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 (Schedules 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".

9.3 Occupancy Control

Ecosmart Connect control 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.

9.3.1 PIR Room Sensor

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 PIR's. This is in addition to any software run-on times.

9.3.2 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.

A timeout can be set for the fan mode to revert back to auto after a predetermined time period. The setting Fan Override Operation and Fan Override Timeout can be adjusted to achieve this.

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

9.3.3 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.	

9.4 Plate Heat Exchanger Bypass

The plate heat exchanger bypass damper run on FAC relay 5. Energised = Bypass. See the temperature control section for info on the bypass strategy.

•Plate Heat Exchanger

The HX bypass damper opens on a 24 Vac signal which is produced from the bypass damper relay.

9.5 Multiple Sensors

Where multiple sensors are connected the following options are available.

State	Description
Temp Sensor Operation	Room module average (Default) Return Air only Room Module & Return Air Average
Setpoint Operation	Last Value Changed (Default) Software Setpoint Only Last Value Changed With Timeout
Humidity Sensor Operation	Average (Default) Max Ignore
CO2 Sensor Operation	Average (Default) Max Ignore
Pressure Sensor Operation	Average (Default) Max Ignore

9.6 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 controls used as a fan speed demand. The optional EGG PCB can be used for backwards 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 - 40°C 0 - 50°C 0 - 80°C 0 - 90°C 0 - 100°C
0-10V Pressure Sensor	0-10V is scaled as defined by the network input "Pressure Sensor"	0 - 25 Pa 0 - 50 Pa 0 - 100 Pa 0 - 300 Pa 0 - 500 Pa 0 - 1000 Pa 0 - 1600 Pa 0 - 2500 Pa 0 - 3000 Pa
0-10V Humidity Sensor	0-10V is scaled to 0-100% humidity	0 - 100% only

9.7 Fan Speed Control Input

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

9.8 Ecosmart Gateway Gadget

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.

9.9 CO2 Control

When a CO2 sensor is assigned to the system and an enable signal is received, ventilation will increase fans speeds to reduce CO2 concentration. The target CO2 sensor setpoint can be changed as one of the commissioning setpoints. Room Module CO2 sensors are detected automatically. 0-10V CO2 sensors need to be assigned to input 4 or 5.

9.10 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 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.

9.11 Constant Pressure Control

An extract air pressure sensor is fitted to IN4 standard. IN4 is disabled by default but constant pressure control can be enabled by setting IN4 function to 0-10v pressure sensor.

When enabled, the unit will increase the fans speeds as required until the pressure differential between the extract air and atmosphere reaches the constant pressure setpoint.

The target pressure setpoint can be changed as one of the commissioning setpoints. Room Module pressure sensors are not available.

9.12 Dirty Filter Switch

3 Filter differential pressure switches are fitted as standard. These monitor the Extract filter, Supply filter and Supply pre-filter. These are connected in series with Alarm Circuit 2 (orange wires) and will break the circuit on overpressure. The adjustable range is 0.5 to 4mbar and is set by the default to 2mbar.

9.13 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

- Heat 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 system.

9.13.1 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).

9.13.2 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.

9.14 Temperature Control

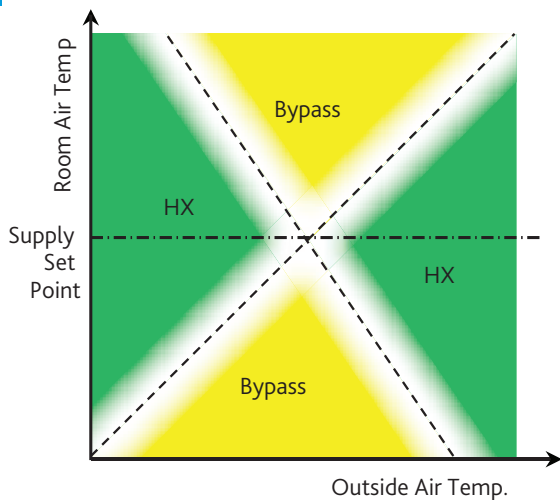
9.14.1 Supply Temperature Control (Default)

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. 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 (e.g. 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.

39 Supply Temperature Control - HX Bypass



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

9.14.2 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.

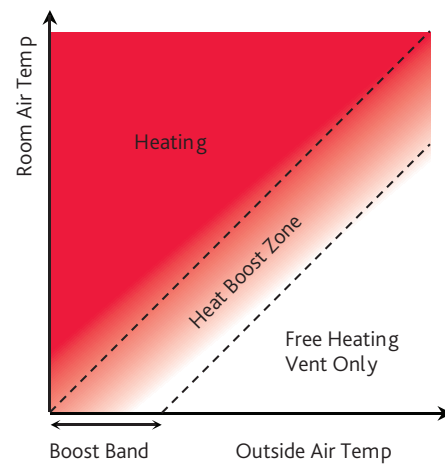
In room temperature control mode, the bypass damper is controlled according to the following chart. A minimum supply air temperature

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.

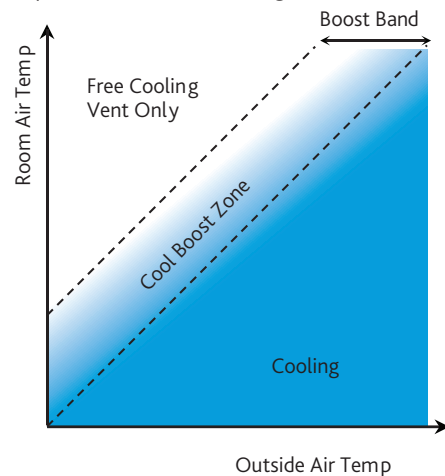
If the supply air temperature exits the minimum - maximum supply temperature range, the unit will adjust ventilation, heating or cooling to compensate.

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.

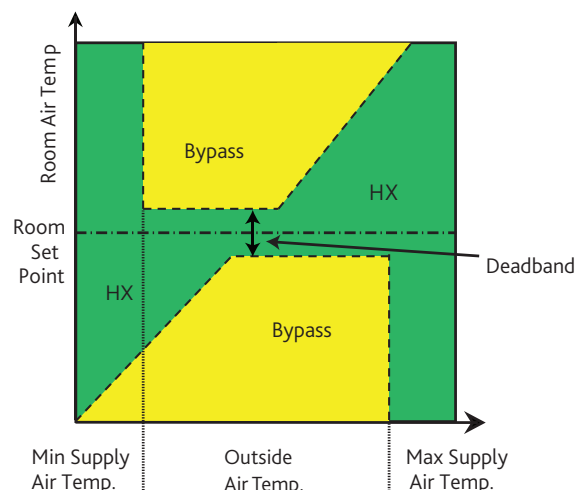
40 Room Temperature Control - Heating



41 Room Temperature Control - Cooling



42 Room Temperature Control - HX Bypass



9.14.3 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

9.15 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.

9.16 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.

Frost protection will only function if the Heating Type or Cooling Type setpoints are set to LPHW or CW.

9.17 Mitsubishi Reverse Cycle DX (Optional)

For units for use with Mitsubishi reverse cycle condenser units, one or more PACIF012B-E Interface boards are fitted inside the control panel. The controller interacts with this board in the following ways:

- Digital Output Heat/Cool selection from FAC relay 8. Another relay is used to split output over multiple boards.
- 0-10c Heat/Cool demand from FAC OUT4 .
- Faults are monitored via iQ4 input 8 (Alarm circuit 2).

When Mitsubishi Reverse Cycle DX is fitted, this is selected in software by setting the cooling type "Reverse Cycle". A heating type is not required unless another heating type is fitted (e.g. LPHW).

Once this is selected cooling and heating demand will share FAC OUT4 and heat/cool is decided on the state of FAC Relay 8 (Energised = Cool Demand).

For the cases where Reverse Cycle DX and another heating type are both fitted, the schedule object "Reverse Cycle backup Heating" can be set to revert to the other heating option at certain times of the day.

Although the controller outputs a variable 0-10v heating/cooling voltage, the Mitsubishi condenser can only run at 7 discrete levels and so cannot supply an accurate supply air temperature. For this reason, it is recommended that the control is set to operate in room temperature control mode. This will regulate the room air temperature rather than supply air temperature.

The PAC boards are powered from the BPS control so the only connections required to the Outdoor condenser are S2 & S3. For the same reason, SW8-3 must be set to "ON" on the outdoor unit.

The enable run-on time must be set to 3 minutes for reverse cycle units. This is required in order to keep the compressor running for at least 3 minutes for each period.

9.18 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.

9.19 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".

9.20 Hibernate Mode

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 the 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.

9.21 Inlet / Outlet Dampers (Optional)

Inlet and outlet dampers are 24vac and controlled by the fan run relay. When energised it gives a 24vac signal to both I/O dampers to open. A fan start delay can be imposed to allow the damper time to open. This is adjustable via display screens or commissioning tools.

When installed, there is the option of connecting the internal damper close switch to the fault circuit alarm circuit 2 (orange wires).

When IO dampers are fitted the software object "IO Damper Fitted" must be set to "Yes". This will cause the software to delay the fans starting for the IO Damper delay period. It will also ignore faults on Alarm Circuit 2 if the fans are stopped and the dampers are closed intentionally. See Internal connection section for physical damper connections.

9.22 Partial Recirculation Damper (Optional)

If a partial recirculation module is fitted, the recirculation damper will open / close via FAC Relay 9 according to the following strategy.

If the room temperature is more than 5°C (adjustable via recirc-offset variable) from the setpoint and free-cooling or free-heating is not available then partially recirculate the air. This aids heating and cooling elements and also avoids thermal loss from the room.

9.23 Alarms

9.23.1 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 requires power cycle or reset via the "Reset Alarms" variable.

Causes of critical alarm:

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

9.23.2 Maintenance Alarm (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:

- 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".

9.23.3 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 via a contactor once the temperature reaches 80°C. When this occurs, the critical alarm will latch in software and the supply contactor will latch in the off position.

Once the unit cools, the contactor will remain latched off until power cycle.

9.24 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.

9.25 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.

•ES Classic 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 multi-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.

9.25.1 ES Classic BMS Output Table

Function	Ventilation 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

9.26 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.

9.27 BACnet Overview

BACnet is a data communication protocol for Building Automation and Control Networks. It allows compatibility between devices of different manufacturers.

In BACnet, any device on the network has the ability to browse the network and discover devices.

9.28 Writing Values

It is best practice to only write to AV, BV & MSV (Analogue Variables, Binary Variables, and Multistate Variables). When writing to these, it is best to write at priority level 16.

9.29 Typical Basic Commissioning

- Set the analogue variables "Extract Fan Min Speed" "Supply Fan Min Speed" "Extract Fan Max Speed" "Supply Fan Max Speed" during commissioning.
- If flow measurements are required enable the unit using the "Enable" MSV and boost the unit using the "Fan Boost" MSV.

9.30 Typical Basic Operation

- Enable the unit using the MSV "Enable" object. The fan runs at min speed.
- Increase the fan speeds using the AV "Fan Speed Demand" 0-100% (0% = Min Commissioned Speed, 100%= Max Commissioned Speed).
- Adjust setpoint using the AV "Software Setpoint".

9.31 Writing Directly To Outputs

- It is not recommended to write directly to outputs since the internal logic of the control will be bypassed and some features will not function. The unit may also start without an enable signal.
- However, if this is required for test purposes (or otherwise), priority level 8 must be used.
- The internal control logic writes at priority level 16 so any data written to the outputs at this level is at risk of being overwritten.
- These values must be relinquished or nulled once used, otherwise the outputs will be locked at that value, even if the value is "0".

9.32 Priority Array Storage

- Priority levels 8 & 16 are stored in the controller following a power cycle. All other levels are reset to null.
- Level 16 is not to be used for controller outputs since it will be overridden by the internal logic during operation.

9.33 Devices

A BACnet network can consist of a number of "device objects". Each device is given a unique "Device Instance Number". A typical example of a device is a controller or BACnet compatible LCD. EcoSmart Connect controllers are assigned a random device instance number at the factory and do not need to be changed. The instance number range is 1 - 4,194,303 (2²²).

EcoSmart Connect controllers use a MSTP network for communication and are assigned a MSTP address (4 -127) by the dip switch located on the front of the controller. The MSTP address must not be confused with the Device Instance Number.

Most network browsers can identify a device by the Device Instance Number or the MSTP address.

9.34 Objects

In BACnet, information is stored within devices as a number of 'virtual' objects. Some examples of these are Fresh Air Temperature, Extract Fan Speed, CO2 Target, etc.

Each object has a number of properties but the most important are shown in the table below. The maximum number of objects in a device is 4,194,303 (2²²) of each type.

Object Name	The name of the object. E.g. Setpoint
Object Instance Number	A unique number which represents the object within the device. E.g. 12544
Object Type	The type of object. E.g. Analogue Variable (AV)
Description	A short description of the object. E.g. The room setpoint
Present Value	The current value of the object. E.g. 20
Units	The units of the present value. E.g. °C

9.35 Object Types

A list of some typical object types is shown below.

AI	Analogue Input	An analogue object which is a physical input to a device.
AO	Analogue Output	An analogue object which is a physical output from a device.
AV	Analogue Variable	An analogue object which exists within a device.
BI	Binary Input	A true/false object which is a physical input to a device.
BO	Binary Output	A true/false object which is a physical output from a device.
BV	Binary Variable	A true/false object which exists within a device.
MSV	Multi-State Variable	This is an enumerated object which can have a number of states, each represented by a number. This is similar to a dropdown menu in windows forms. The State_Text property is an array containing the text for each value. Some browsers may not be able to read the text values so both are provided in this manual. E.g. 1=Off, 2=Low, 3=High, 4=Auto
SCH	Schedule Object	This is a special object with the ability to have a changing value depending on the time of date or day of the week.

9.36 Writing Of Values (Priority Array)

Any device on the BACnet network has the ability to write values to other device objects.

To resolve conflicts, BACnet uses a 16 position priority array to work out who gets priority. Any request to change the present value is stored in the priority array at the priority level of the received request. The object then chooses the highest priority value to become the present value. Examples of priority array decision making are shown below.

Case 1		Case 2		Case 3		Case 4		Case 5	
Priority 1	null	Priority 1	null	Priority 1	null	Priority 1	null	Priority 1	null
Priority 2	null	Priority 2	null	Priority 2	null	Priority 2	null	Priority 2	null
Priority 3	null	Priority 3	null	Priority 3	null	Priority 3	null	Priority 3	null
Priority 4	null	Priority 4	null	Priority 4	null	Priority 4	null	Priority 4	null
Priority 5	null	Priority 5	null	Priority 5	null	Priority 5	null	Priority 5	null
Priority 6	null	Priority 6	null	Priority 6	null	Priority 6	null	Priority 6	null
Priority 7	null	Priority 7	null	Priority 7	null	Priority 7	null	Priority 7	null
Priority 8	null	Priority 8	null	Priority 8	null	Priority 8	null	Priority 8	null
Priority 9	null	Priority 9	null	Priority 9	7	Priority 9	7	Priority 9	null
Priority 10	null	Priority 10	null	Priority 10	null	Priority 10	null	Priority 10	null
Priority 11	null	Priority 11	null	Priority 11	null	Priority 11	null	Priority 11	null
Priority 12	null	Priority 12	null	Priority 12	null	Priority 12	null	Priority 12	null
Priority 13	null	Priority 13	null	Priority 13	null	Priority 13	null	Priority 13	null
Priority 14	null	Priority 14	null	Priority 14	null	Priority 14	null	Priority 14	null
Priority 15	null	Priority 15	null	Priority 15	null	Priority 15	null	Priority 15	null
Priority 16	null	Priority 16	5	Priority 16	5	Priority 16	0	Priority 16	0
Relinquish Default	0	Relinquish Default	0	Relinquish Default	0	Relinquish Default	0	Relinquish Default	0
Present Value	0	Present Value	5	Present Value	7	Present Value	7	Present Value	0

- **Case 1** - The object looks down the list until it gets to the first non-null value. In this case, all priority levels are empty so the (relinquish) default value of 0 is used as the present value.
- **Case 2** - Priority 16 is now 5 so the present value becomes 5.
- **Case 3** - Priority 9 is now 7. Priority 9 overrules priority 16 so the present value becomes 7. Note that priority 16 is still calling for 5 but it is being ignored.
- **Case 4** - Priority 16 is changed to 0 but this has no effect on the present value. It is still at 7 because of priority 9.
- **Case 5** - Priority 9 is relinquished back to null. This allows priority 16 to take priority again and the present value becomes 0.

The priority array is stored inside the device itself. This means that an external device can write to a priority position and the value will stay there even if the device is disconnected.

AI and BI object types are read only and therefore do not have a priority array.

AO & BO values are typically changed by the strategy at priority level 16. Any override must occur above this level and is not recommend. Be sure to relinquish all overrides once finished to minimise confusion and undesirable operation.

AV, BV & MSV values are generally not changed by the strategy so an external command at priority level 16 is sufficient to change the value permanently.

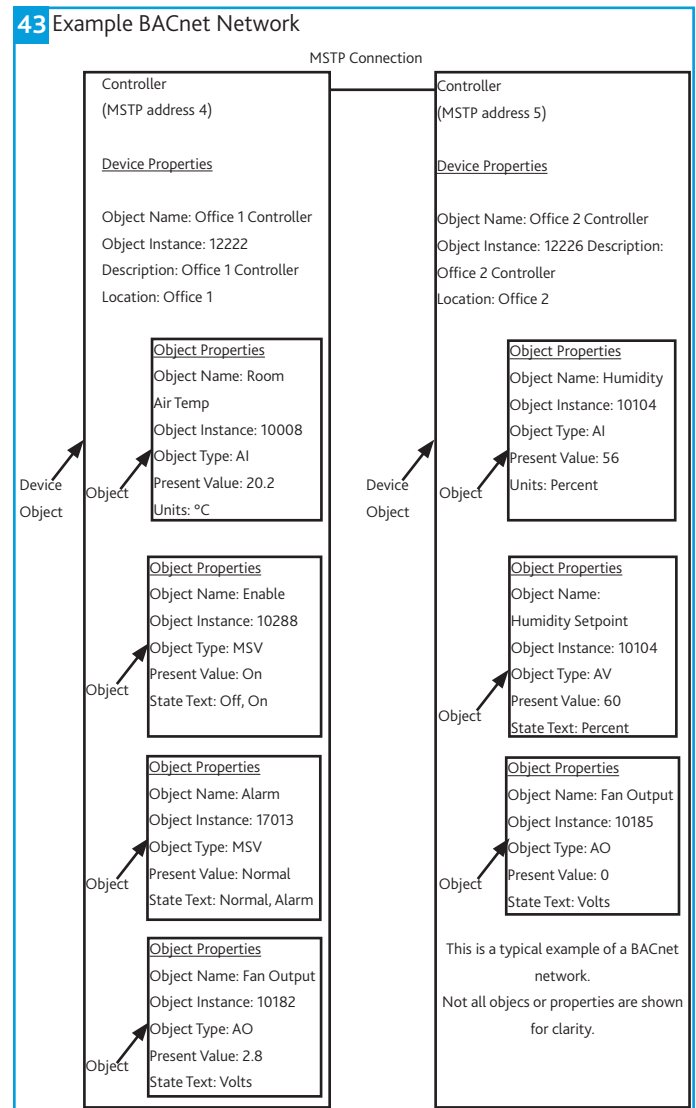
The following table shows the standard use of the priority array.

Priority	Application
1	Manual Life Safety
2	Automatic Life Safety
3	Available
4	Available
5	Critical Equipment Control
6	Minimum On/Off
7	Available
8	Manual Operator
9	Available
10	Available
11	Available
12	Available
13	Available
14	Available
15	Available
16	Available

9.37 Inter-Networking

Inter-networking is used to connect two BACnet networks operating on different physical mediums (e.g. MSTP & IP). This is possible because no matter the physical medium, BACnet messages are always the same. A router can be fitted to the network to translate BACnet between different physical media.

9.37.1 Example BACnet Network



9.38 BACnet Object List (By Category)

9.38.1 Enable

LCD Browser Page	BACnet Object	Description	Object Type	Object ID	Default Value	Units
34	Enable	Software enable switch	MSV	10218	Off	(1)Off (2)On
20	SL Enable	The state of the enable input (IN8)	BI	10161	N/A	(1)Off (2)On
9	Run-on (Enable)	Run-on timer value	AV	10267	0	Seconds
24	Local Calendar	0	CAL	10496	N/A	0
34	Enable via Schedule	Enabled via Schedule	MSV	10219	N/A	(1)Off (2)On

9.38.2 Trickle Mode

37	Trickle Mode	Enable trickle mode	MSV	10250	Off	(1)Off (2)On
15	Trickle Deadband	Setpoint deadband used when trickling with no enable signal.	AV	10316	5	Degrees-Celsius

9.38.3 IO Dampers

44	IO Damper Fitted	Selects whether IO dampers are fitted on alarm circuit 2	MSV	17669	No	(1)No (2)Yes
12	IO Damper Delay	Delay between starting the fan relay and the fan output.	AV	10279	0	Seconds

9.38.4 Analogue Inputs

2	IN4	The 0-10 voltage at input 4	AI	10032	N/A	volts
31	IN4 Function	Function of the UI4 input	MSV	10209	None	(1)None (2)N/A (3)N/A (4)0-10V CO2 Sensor (5)0-10V Temperature Sensor (6)0-10V Humidity Sensor (7)0-10V Pressure Sensor
2	IN5	The 0-10 voltage at input 5	AI	10035	N/A	volts
32	IN5 Function	Function of the UI5 input	MSV	10210	None	(1)None (2)Fan Speed Control (3)0-10v BMS (4)0-10V CO2 Sensor (5)0-10V Temperature Sensor (6)0-10V Humidity Sensor (7)0-10V Pressure Sensor

9.38.5 Configurable Inputs

20	SL2 Input	The state of the configurable input (IN9)	BI	10164	N/A	(1)Off (2)On
30	SL2 Mode	Set the function of switched live 2	MSV	10202	Fan Boost	(1)None (2)Fan Boost (3) Heater Boost (4)Extract Setback

9.38.6 Fan Boost

34	Fan Boost	Software enabled Fan boost	MSV	10240	Off	(1)Off (2)On
10	Run-on (Boost)	Boost run-on time	AV	10272	0	Seconds
10	Supply Fan Boost Speed	Supply Fan boost speed	AV	10273	100	Percent
18	Extract Boost Speed	The extract fan boost speed	AV	17419	100	Percent

9.38.7 Heat Boost

30	Heat Boost	Software enabled Heater boost	MSV	10205	Off	(1)Off (2)On
11	Heat Boost Setpoint	Heater Boost Setpoint	AV	10276	35	Degrees-Celsius

9.38.8 Extract Setback

LCD Browser Page	BACnet Object	Description	Object Type	Object ID	Default Value	Units
44	Extract Setback	Puts the extract fan to setback speed	MSV	17769	Off	(1)Off (2)On
20	Extract Setback Speed	The extract fan speed when Extract Setback is enabled.	AV	18258	30	Percent

9.38.9 Fan Outputs

6	Supply Fan Output	The 0-10v signal to the supply fan	AO	10182	N/A	volts
6	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	(1)Off (2)On

9.38.10 Fan Commissioning

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

9.38.11 Temperature Control

14	Software Setpoint	Software Setpoint	AV	10309	22	Degrees-Celsius
9	Deadband	Dead band for temp control	AV	10266	3	Degrees-Celsius
33	SetPoint Op	Setpoint operation	MSV	10214	Software Only	(1)Last Changed (2)Software Only (3)Last Changed with Timeout
19	Setpoint Timeout	The time before reverting to software setpoint when last changed with timeout is selected.	AV	17971	3600	seconds
27	Setpoint Schedule	A schedule for setpoint adjustment.	SCH	18215	N/A	0
19	Setpoint Schedule	Current state of the Setpoint Schedule object.	AV	18215-	22	Degrees-Celsius
33	T Sens. Op	Temperature sensor operation	MSV	10215	NS Average	(1)NS Average (2)Return Air Only (3)NS & Return Average
33	0-10v Temp Range	Temperature sensor range	MSV	10216	0 to 50°C	(1)0 to 50°C (2)0 to 40°C (3)0 to 100°C (4)0 to 80°C (5)0 to 90°C
35	Temp Control Mode	Temperature control mode	MSV	10245	Supply Temp	(1)Supply Temp (2)Room Temp
14	STC H/C Pref	STC Heat/Cool Pref	AV	10310	50	No units
15	STC HX Efficiency	STC HX Efficiency	AV	10311	0.8	No units
13	RTC Boost Band	The Return Temperature Control Boost Band	AV	10306	15	Degrees-Celsius
14	RTC Max Supply Temp	Maximum supply temp when in RTC mode	AV	10307	35	Degrees-Celsius
14	RTC Min Supply Temp	Minimum supply temp when in RTC mode	AV	10308	12	Degrees-Celsius

9.38.12 Heating Output

31	Heating Type	Set the type of heating fitted.	MSV	10206	As Per Build	(1)None (2)LPHW (3)Electric (4)3rd-Party
6	Heating Output	The 0-10v signal to the heating output.	AO	10179	N/A	Percent

9.38.13 Cooling / Configurable Outfits

LCD Browser Page	BACnet Object	Description	Object Type	Object ID	Default Value	Units
30	Cooling Type	Set the type of cooling fitted.	MSV	10203	None	(1)None (2)Chilled Water (3)3rd-Party (4)Reverse Cycle DX
22	Cooling Demand Cmd	The state of the cooling demand relay.	BO	10194	N/A	(1)Off (2)On
43	OUT4 Mode	Chooses the mode of Analogue Output 4	MSV	17608	Cooling Demand	(1)Cooling Demand (2)ESClassic BMS Mode
6	Output 4	Configurable output 4 (OUT4)	AO	10173	N/A	Percent
44	ESC BMS Thermic Output	Chooses whether to demand thermal output in 0-10v ESClassic BMS mode	MSV	17610	Auto	(1)Auto (2)None (3)Heating (4)Cooling

9.38.14 HX Bypass Damper

21	Bypass Damper Cmd	The controller's signal to the HX bypass. (Active = Bypass, Inactive = Heat Exchange)	BO	10185	N/A	(1)Inactive (2)Active
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9.38.15 Fan Demand Inputs

18	Fan Speed Demand	A user entered fan speed demand. 0% = trickle speed	AV	17761	0	Percent
18	BMS 0-10v Input	A virtual BMS voltage input using an ESClassic BMS table	AV	17773	0	Volts
27	Fan Speed Schedule	A schedule for fan speed demand (0% = Trickle speed)	SCH	17798	N/A	0
18	Fan Speed Schedule	Current state of the Fan Speed Demand Schedule object.	AV	17830	0	Percent
44	Fan Override Operation	Chooses the operation of the 3-speed fan override.	MSV	17975	Override Has Priority	(1)Override Has Priority (2)Revert to Auto after Timeout
19	Fan Override Timeout	The time before reverting to auto fan speed when revert to auto with timeout is selected.	AV	17977	3600	seconds
9	CO2 Target	Target CO2 Value	AV	10265	650	Parts-per-million
29	0-10 v CO2 Range	CO2 sensor output range	MSV	10200	N/A	(1)0-2,000ppm (2)0-4,000ppm (3)0-5,000ppm (4)0-10,000ppm (5)0-20,000ppm
29	CO2 Sensor Op	CO2 sensor operation	MSV	10201	N/A	(1)Average CO2 (2)Max CO2 (3)Ignore CO2
11	Humidity Target	Relative Humidity Target	AV	10278	50	Percent-relative-Humidity
31	H Sensor Op	Humidity Sensor Operation	MSV	10207	Average RH%	(1)Average RH% (2)Max RH% (3)Ignore RH%
13	Pressure Target	Target pressure value	AV	10303	400	Pascals
32	0-10v Press. Range	Pressure sensor range	MSV	10212	0 to 1000Pa	(1)0-25Pa (2)0-50Pa (3)0-100Pa (4)0-300Pa (5)0-500Pa (6)0-1000Pa (7)0-1600Pa (8)0-2500Pa (9)0-3000Pa
32	P sens. Op	Pressure sensor operation	MSV	10213	Average Value	(1)Average (2)Max (3)Ignore

9.38.16 Selected Process Variables

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

9.38.17 Unit Temperature Sensors

LCD Browser Page	BACnet Object	Description	Object Type	Object ID	Default Value	Units
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

9.38.18 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
7	RM199 Setpoint	The setpoint at RM address 199	AV	10023	N/A	Degrees-Celsius
28	RM199 Fan Speed	Fan Speed Override Status of RM199	MSV	10014	N/A	(1)Auto (2)Off (3)Low (4)Medium (5)High
37	RM199 Fan Display	Fan Speed Override Display at RM address 199	MSV	14703	N/A	(1)No Status (2)Off (3)Low (4)Medium (5)High (6)Auto-Off (7)Auto-Low (8)Auto-Medium (9)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
7	RM200 Setpoint	The setpoint 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
7	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
7	RM202 Setpoint	The setpoint at RM address 202	AV	10098	N/A	Degrees-Celsius
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
8	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
5	RM213 CO2	The CO2 at RM address 213	AI	10140	N/A	Parts-Per-Million
5	RM214 CO2	The CO2 at RM address 214	AI	10143	N/A	Parts-Per-Million
5	RM215 CO2	The CO2 at RM address 215	AI	10146	N/A	Parts-Per-Million

9.38.19 Frost Protection

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

9.38.20 Hibernate Mode

34	Hibernate Mode	Unit is ready for hibernation	MSV	10241	Off	(1)Off (2)On
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9.38.21 Purge Mode

35	Purge Active	This input will enable purge mode	MSV	10243	Off	(1)Off (2)On
13	Purge Fan Speed	Purge Fan Speed	AV	10304	60	Percent
13	Purge Min Temp	The minimum temperature that will stop night cooling	AV	10305	12	Degrees-Celsius
26	Purge Time Schedule	Purge Time Schedule	SCH	10499	N/A	0
37	Purge Time Schedule	State of the Purge Time Schedule	MSV	10512	N/A	(1)Off (2)On

9.38.22 Night Cool Mode

LCD Browser Page	BACnet Object	Description	Object Type	Object ID	Default Value	Units
35	Night C Mode	This input will enable night cool mode.	MSV	10242	Off	(1)Off (2)On
12	Night C Fan Speed	The night cool fan speed	AV	10281	60	Percent
12	Nigh C Min Temp	The minimum temperature that will stop night cooling	AV	10302	12	Degrees-Celsius
27	Night C Schedule	Night Cooling Schedule	SCH	16014	N/A	0
27	Night C Schedule	Night Cooling Schedule	SCH	16014	N/A	0
26	Night C Sample	Daytime schedule for winter or summer decision making	SCH	15875	N/A	0
38	Night C Sample	Night Cooling Sample Schedule	MSV	16008	N/A	(1)Off (2)On

9.38.23 Auto Run-On

33	Auto Run-on	Auto-run on mode	MSV	10217	Off	(1)Off (2)On
8	Auto-Run on Max-Time	Maximum Run-on Max Time	AV	10263	900	Seconds
8	Auto-run-on Scale Factor	Scale Factor for automatic run-on time	AV	10264	2	No units

9.38.24 Fire Alarm

43	Fire Alarm	Engage Fire Alarm Mode	MSV	17365	N/A	(1)Normal (2)Alarm
----	------------	------------------------	-----	-------	-----	--------------------

9.38.25 Alarm

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

9.38.26 LCD Event Signal

LCD Browser Page	BACnet Object	Description	Object Type	Object ID	Default Value	Units
39	Ala (A Cir 1)	For LCD Event Signal Only	MSV	17281	N/A	(1)Normal (2)Alarm
40	Norm (A Cir 1)	For LCD Event Signal Only	MSV	17282	N/A	(1)Normal (2)Alarm
40	Ala (Low Supply Temp)	For LCD Event Signal Only	MSV	17285	N/A	(1)Normal (2)Alarm
40	Norm (Low Supply Temp)	For LCD Event Signal Only	MSV	17286	N/A	(1)Normal (2)Alarm
40	Norm (High Supply Temp)	For LCD Event Signal Only	MSV	17289	N/A	(1)Normal (2)Alarm
41	Ala (High Supply Temp)	For LCD Event Signal Only	MSV	17290	N/A	(1)Normal (2)Alarm
41	Ala (A Cir 2)	For LCD Event Signal Only	MSV	17293	N/A	(1)Normal (2)Alarm
41	Norm (A Cir 2)	For LCD Event Signal Only	MSV	17294	N/A	(1)Normal (2)Alarm
41	Ala (Frost)	For LCD Event Signal Only	MSV	17316	N/A	(1)Normal (2)Alarm
42	Norm (Frost)	For LCD Event Signal Only	MSV	17317	N/A	(1)Normal (2)Alarm
42	Ala (Sensor Fault)	For LCD Event Signal Only	MSV	17320	N/A	(1)Normal (2)Alarm
42	Norm (Sensor Fault)	For LCD Event Signal Only	MSV	17321	N/A	(1)Normal (2)Alarm
43	Ala (Fire Alarm)	For LCD Event Signal Only	MSV	17409	N/A	(1)Normal (2)Alarm
43	Norm (Fire Alarm)	For LCD Event Signal Only	MSV	17411	N/A	(1)Normal (2)Alarm

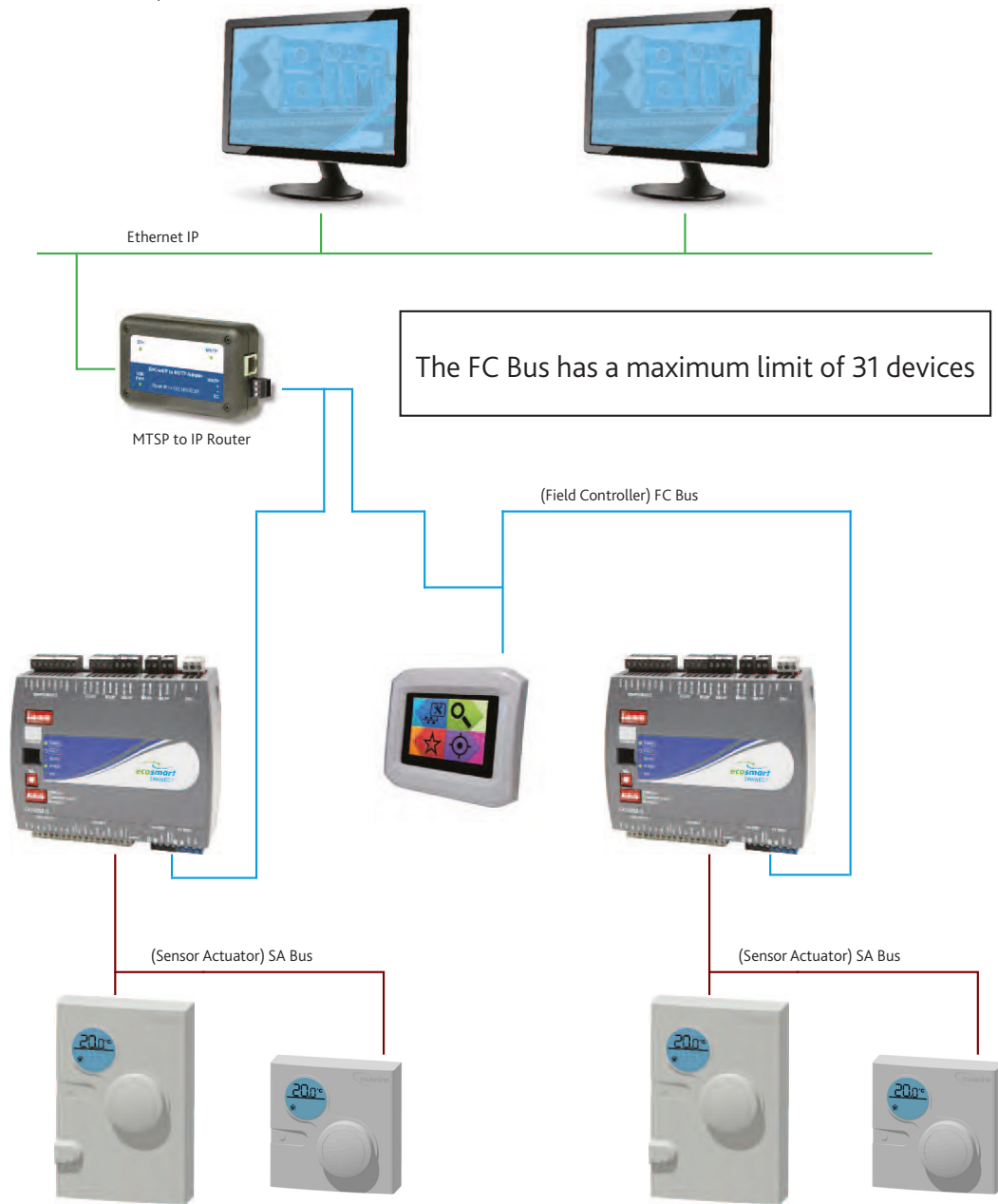
9.38.27 Factory Settings

30	Damper Override	Override bypass damper position	MSV	10204	Auto	(1)Auto (2)Heat Exchange (3) Bypass
35	Tacho PCB Fitted	Is a "Taco Bell" PCB fitted.	MSV	10244	As per Build	(1)No (2)Yes
24	Tuning Reset	Resets the PID auto tuning loops	BV	12880	FALSE	(1)False (2)True
31	Ignore PIR Sensors	Ignore all MSTP network PIR sensors	MSV	10208	No	(1)No (2)Yes
17	EF Max Volt	The upper voltage for the extract fan	AV	17273	10	Volts
17	EF Start Volt	The voltage required to start the extract fan	AV	17274	1	Volts
17	SF Max Volt	The upper voltage for the supply fan	AV	17275	10	Volts
17	SF Start Volt	The voltage required to start the extract fan	AV	17276	1	Volts
42	SW-FAC2612-2-9A	Strategy Version	MSV	17340	Off	(1)Off (2)On

10.0 FC BUS DEVICES

10.1 Networking Connection Example

4.4 Networking Connection Example



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

10.2 FAC Controller

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

45 FAC Controller



10.2.1 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.

10.2.2 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.

10.2.3 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.

10.2.4 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

10.2.5 Current Loop DIP Switches

These should all be set to disabled. Enabling these switches will cause incorrect sensor values.

10.3 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.

46 ESCO-IPN



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.

10.4 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

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.

10.5 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.

47 ESCO-LCD



10.5.1 ESCO-LCD Navigation

48 ESCO-LCD 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

Network Settings

Device Name	FAD0351
Device ID	127
MAC Address	127
Descriptions	Field Advanced Display
Baud Rate	38400
Max Info Frames	4

TL-BRTRP-0	0	1	<input checked="" type="checkbox"/>
Nuaire BPS ESC	4	0909501	<input checked="" type="checkbox"/>
Nuaire BPS ESC	5	0909502	<input checked="" type="checkbox"/>

Favourites

Enable	Off	MSV 10218
Setpoint	22°C	AV 10309
Heat Boost	Off	MSV 10205
Fan Boost	Off	MSV 10240

Target

Temperature

22.2°C

10.5.2 Writing of Values

The ESCO-LCD can browse all devices and objects on the network. By default, it writes variables (BV, AV, MSV) at level 16 and outputs (BO, AO) at level 8. No BACnet device can write inputs (BI, AI). It is highly recommended that the write levels are left at the default settings of 16 for Adjust Priority and 8 for Override Priority.

The ESCO-LCD will only display the present value of the object. If required, the complete priority arrays can be viewed by connecting to the network with a computer via a router and using any BACnet browser software to browse the network.

Object Types:

AI and BI object types are read only. An error will be displayed if an attempt is made to change these object types.

AO & BO values are changed by the strategy at priority level 16. By default, the ESCO-LCD will override these values at priority level 8. Overriding these values is not recommended and may cause undesirable operation. Be sure to relinquish all overrides once finished to minimise confusion.

AV, BV & MSV values are generally not altered by the strategy. By default, the ESCO-LCD will change this value at priority level 16. This is sufficient to change the value permanently.

Relinquishing:

The ESCO-LCD allows the relinquishing of values by selected an empty value for analogue values or the '---' value for discrete values. Setting an analogue value to "0" does not relinquish the command. The relinquish command will only apply to the priority level set in the settings.

10.6 Quick Setup

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

10.6.1 Selecting Target Object

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

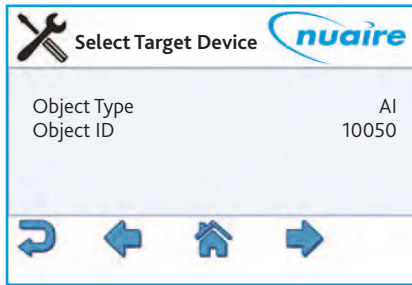
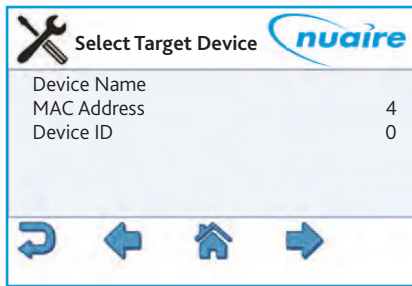
Selecting A Target Object:

- 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 (e.g. AI, AO, MSV)**.
- Enter the BACnet ID** of the object (0-4194304).
- Select the home icon.

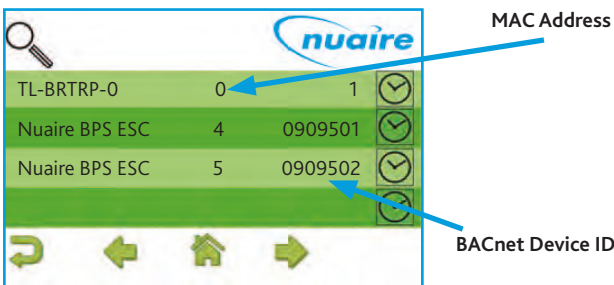
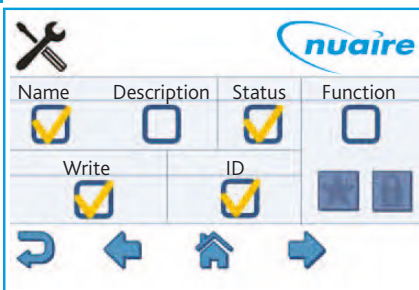
* This is the setting of the DIP switch on the front of the FAC controller. This can also be discovered by browsing to the network screen while ID is selected in the View Config settings screen.

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

49 Selecting Target Object



50 Entering Object Information



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

10.6.2 Setting Default Home Page

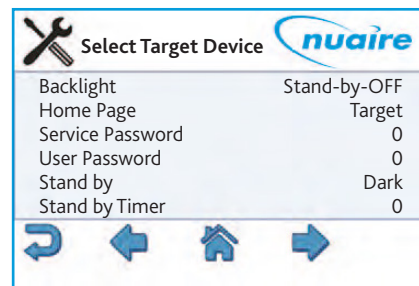
Setting Target Object Page As Default Home Page:

- 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.

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

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 Nuair logo to the top right of the screen for 5 seconds.

51 Setting Default Homepage



10.6.3 Setting Favourites

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

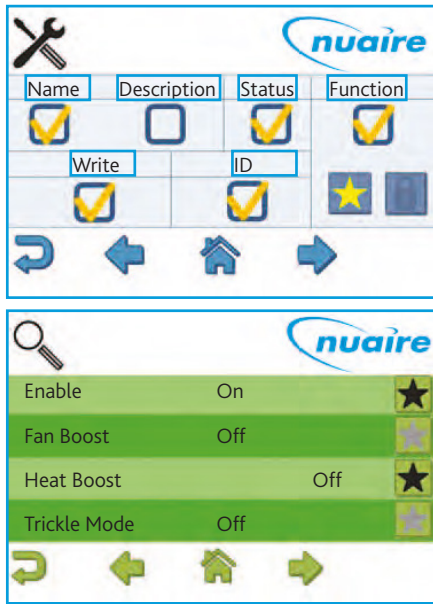
To add or remove favourites:

- 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 trash can.

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.

52 Setting Favourites



10.7 Security

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.

10.7.1 Setting 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 homepage is set to target).

10.7.2 Setting 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.

10.7.3 Disable Writing Values

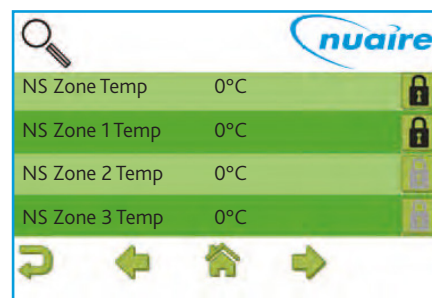
- Navigate to the settings page.
- Select the right arrow six times to reach the View Config screen.
- De-select the write tickbox, all controller points are now read only.
- A service password will need to be set to stop users re-enabling the write function.

10.7.4 Allow Writing Of Basic User Values

- Navigate to the settings page.
- Select the right arrow six times to reach the View Config screen.
- Select the function tick box 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.

53 Allowing 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:

- Enable
- Time Schedule
- Fan Boost
- Heat Boost
- Software Setpoint

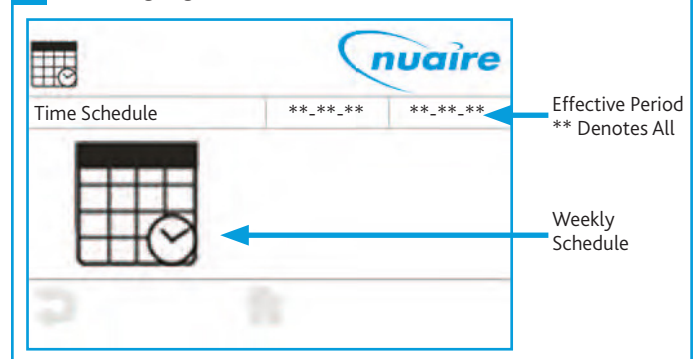
10.7.5 Setting Schedule

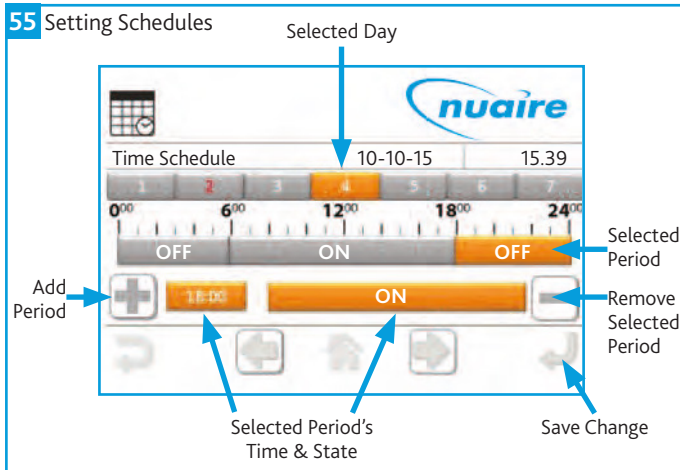
Standard BACnet schedule objects can be adjusted in the same way as any other BACnet object.

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.

54 Scheduling Page





10.7.6 Alarm Log

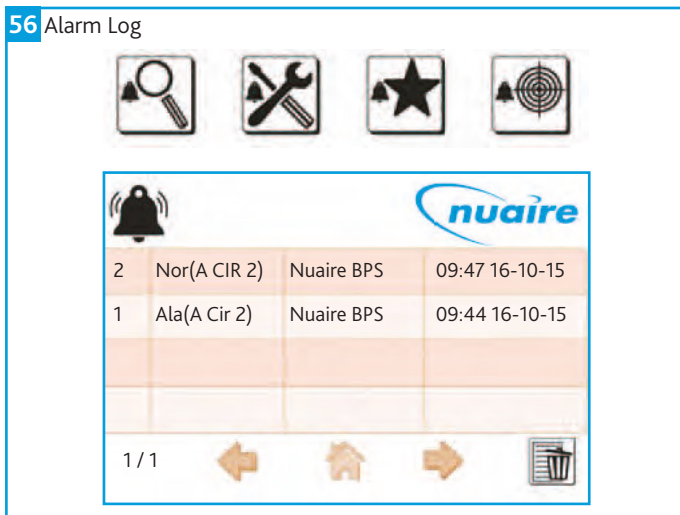
When an XBC alarm changes state, a signal is sent to the LCD display and logged on the alarm page. If there are items on the alarm page the standard top left page icons change to one of the following, depending on the current page. The alarm page can be accessed by selecting the alarm icon.

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.



10.7.7 Backup

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.

10.8 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.

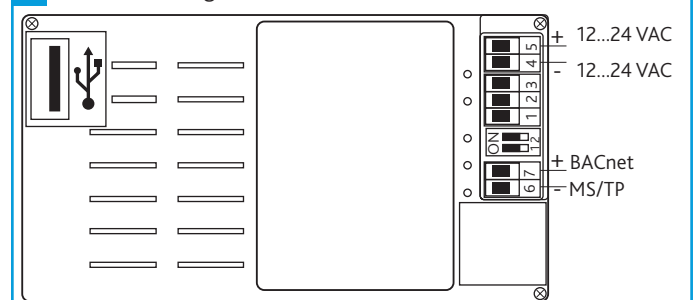
10.9 Controller Wiring

There are 2 ways of connecting the LCD controller:

- Connected to the FC bus using screwed terminals. A separate power supply is required.
- 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 achieve 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

57 Controller Wiring



Terminals	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 120Ω resistor switch)

DIP Switch 2 Unused

10.10 Setting 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.

10.10.1 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

10.10.2 Display 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	

10.10.3 Selecting 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	

10.10.4 View Configuration Page

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

11.0 SA BUS DEVICES

11.1 Room Module

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

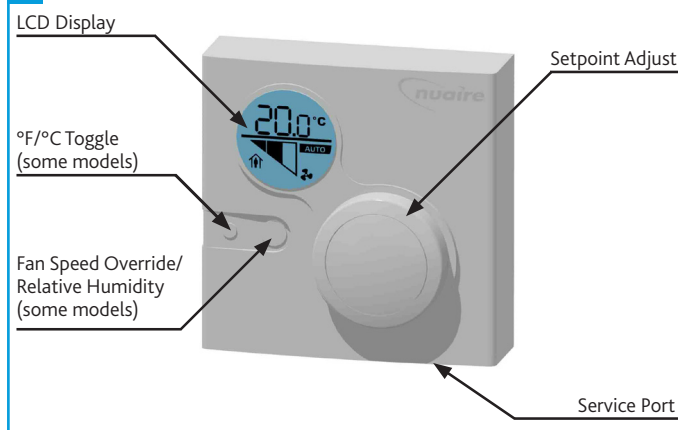
Room modules are automatically detected and require no set-up. The majority of RM modules monitor room temperature; however, options are available to also monitor zone humidity, carbon dioxide (CO2), local temperature setpoint adjustments, PIR, and other variables. This data is transmitted to a controller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

58 Room Modules

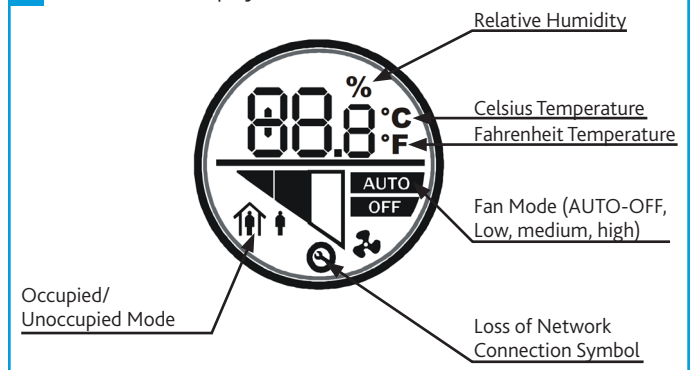


11.2 Features

59 Room Module Overview



60 Room Module Display



11.2.1 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.

11.2.2 Service Port

An 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.

11.2.3 Fan Speed Override

This button cycles through fan speed override settings.

11.2.4 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:

- 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.
- 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.
- 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.

11.3 Installation

11.3.1 Removing Rear Cover

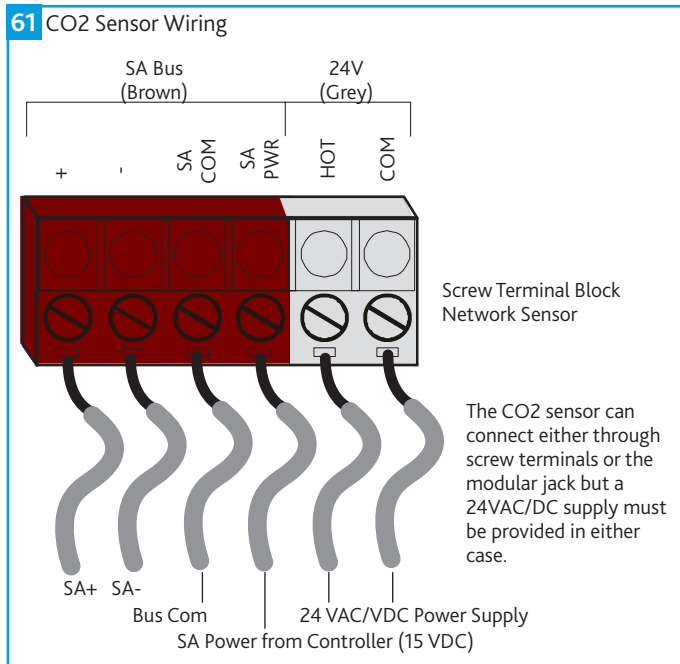
- Use a pozi screwdriver to loosen the screw on the top of the unit.
- Insert a coin into the slot next to the security screw location, pressing the tab that keeps the unit closed. Then carefully pry the top edge of the sensor assembly away from its mounting base and remove.

11.3.2 Modular Jack

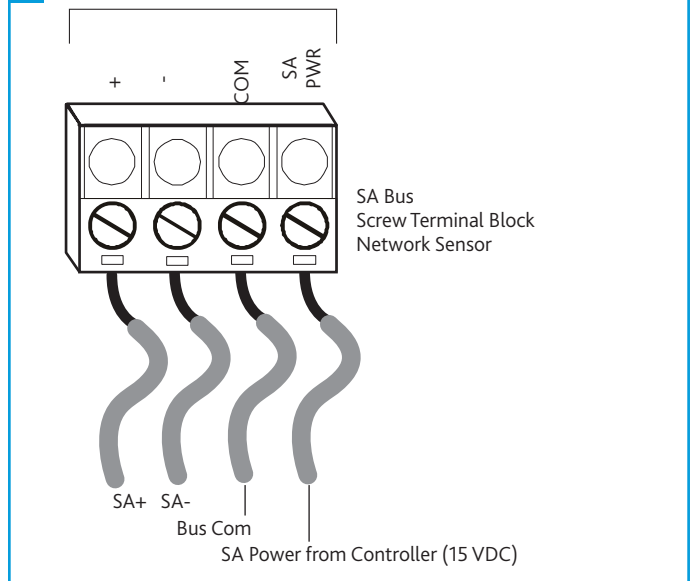
For the modular jack, simply snap the wiring plug into the jack. A modular jack requires a straight-through, one-to-one connection (not a crossover). See interconnection section for details.

11.3.3 Room Module Wiring

If RJ12 cables are not used, the screw terminal connections on the Room Modules can be used.

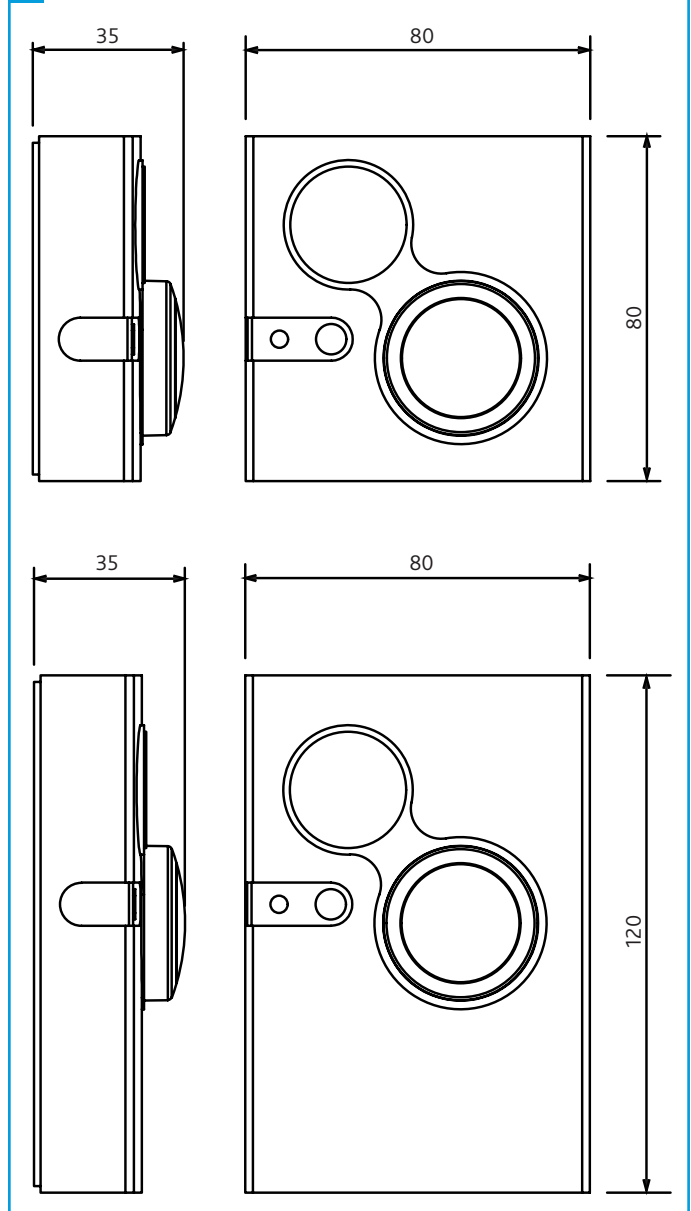


62 Standard Sensor Wiring















11.3.4 Room Module Dimensions

63 Sensor Dimensions (mm)



11.4 Available Room Modules

The following room modules are available:

Group	Nuaire Part Number	Size (mm)	Temperature Sensor	Humidity Sensor	LCD, Setpoint Adjust & Occupancy Display	PIR	Fan Speed Override	Fan Status Display	CO2 Sensor	Network Address Range	Notes	
Group 1 Max of 1 Per Controller	ESCO-TDFS	80x80	YES		YES		YES	YES		199 (fixed)	Max of 1 per controller	
Group 2 Max of 4 Per Controller	ESCO-TS	80x80	YES							200-203		
	ESCO-THS	80x80	YES	YES						200-203		
	ESCO-TDS	80x80	YES		YES					200-203		
	ESCO-TDHS	80x80	YES	YES	YES					200-203	Relative Humidity is not displayed	
	ESCO-TPL	80x120	YES			YES				200-203		
	ESCO-THPL	80x120	YES	YES		YES				200-203		
	ESCO-TDPL	80x120	YES		YES	YES				200-203		
	ESCO-TDHPL	80x120	YES	YES	YES	YES				200-203	Relative Humidity is not displayed	
	ESCO-TDHL	80x120	YES	YES	YES					200-203	Relative Humidity is not displayed	
ESCO-PL	80x120					YES			200-203			
Group 3 Max of 4 Per Controller	ESCO-CL	80x120							YES	212-219	Powered via separate 24vac/ dc supply	

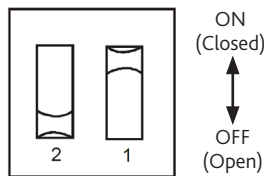
11.5 Sensor Addressing

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.

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

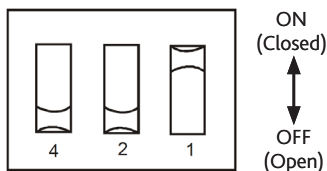
Each sensor on the SA bus must have a unique address. The default controller strategy is preconfigured to automatically detect all Room Modules on the network and react accordingly.

64 200-203 Address Switch Settings



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

65 212-215 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

11.6 Room Module 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)	±0.5°C
Default Temperature Setpoint Adjustment Range	10 to 30°C
PIR Occupancy Sensor Motion Detection	Minimum 94 Angular Degrees up to a distance of 15 ft (4.6m); Based on a clear line of sight.
Ambient Operating Conditions	10 to 30°C, 10 to 90% RH (Temp Probe -10 to 60°C)
Ambient Storage Conditions	-20 to 60°C, t to 95% RH
CO2 Sensor Warmup Time	Less than 1 Minute; less than 10 minutes for full accuracy.

11.7 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.

11.7.1 Modular Cable (Up To 30m)

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	2-port extension adapter
ESCO-3WA	3-port extension adapter

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

11.7.2 Plain Cable (30 - 150m)

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

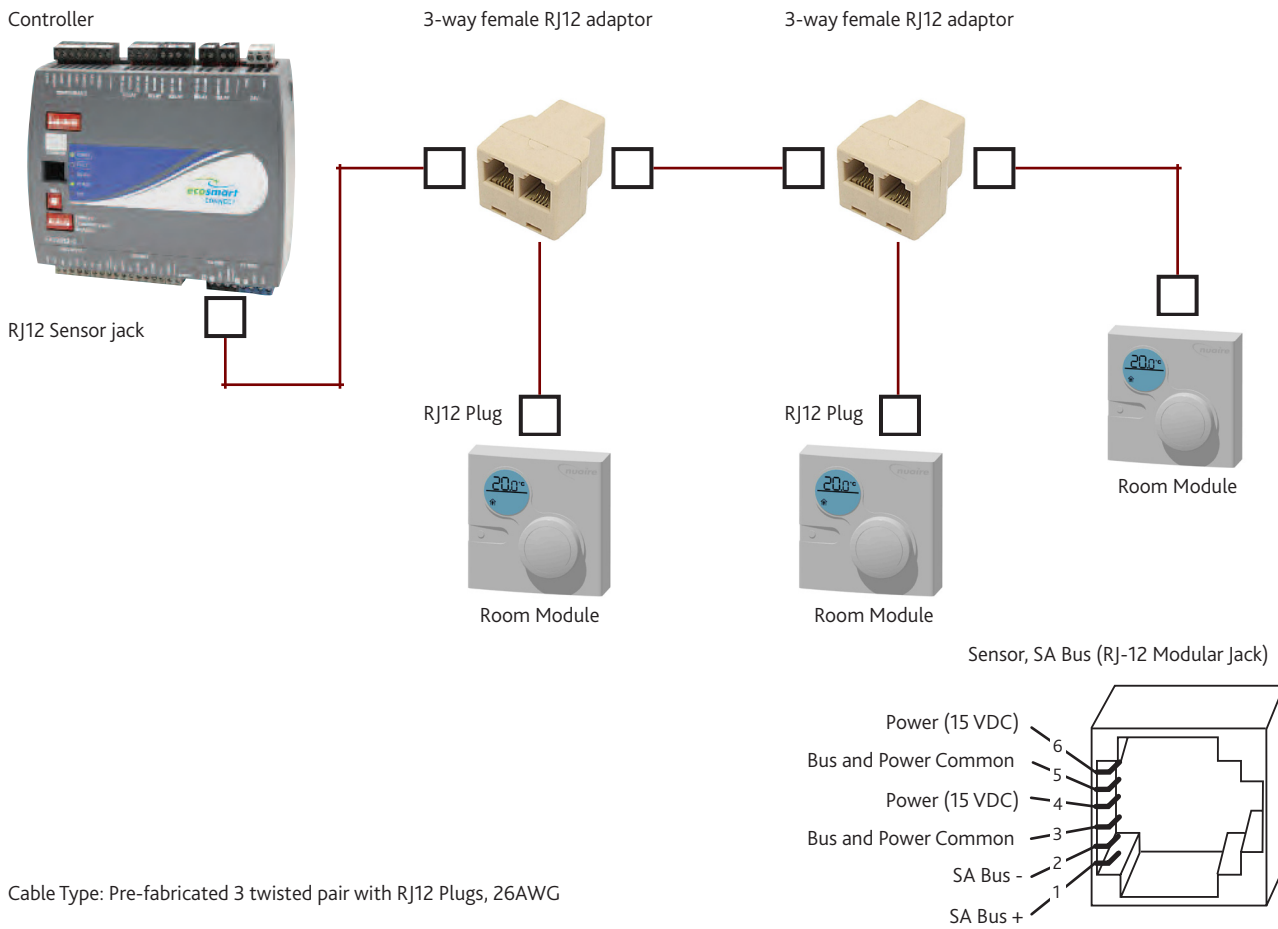
ESCO-MSTPC30M	Ecosmart Connect MSTP cable reel 30m
ESCO-MSTPC150M	Ecosmart Connect MSTP cable reel 150M

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

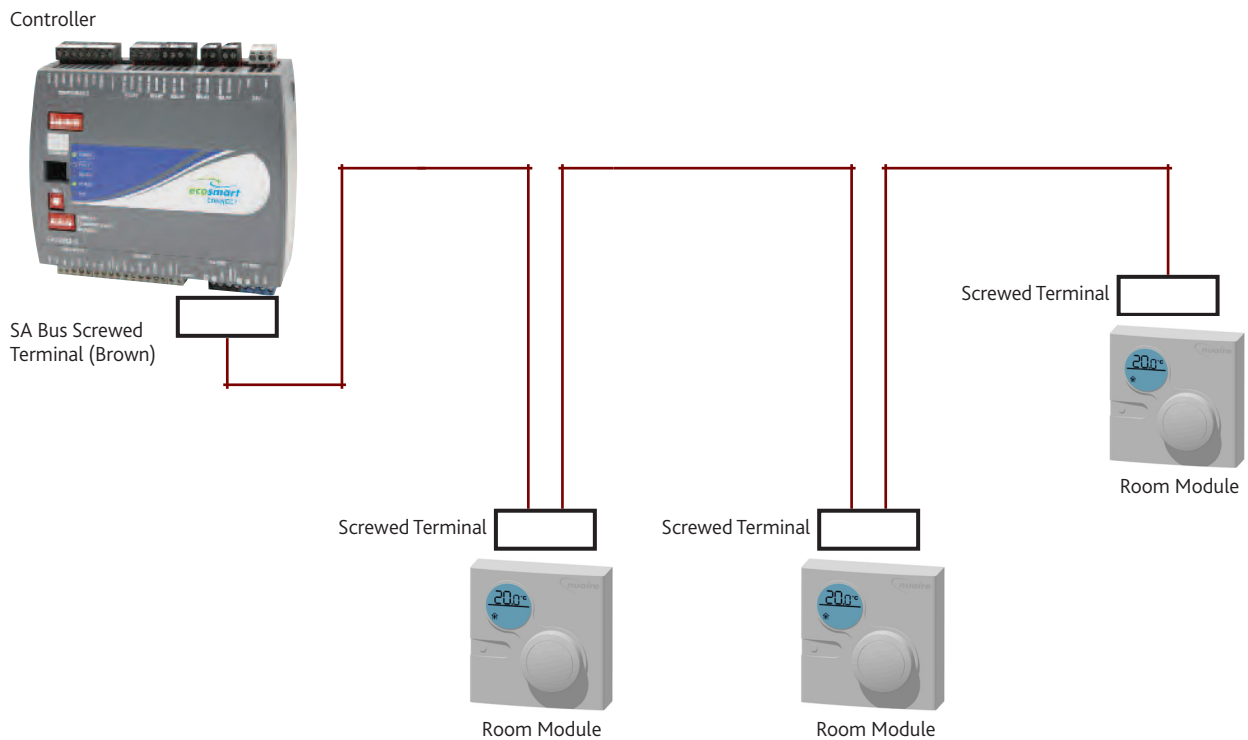
These cannot be used with RJ12 connections and must be stripped and connected using screwed terminals. The shield must be earthed at the control panel end only and be made continuous along the bus length.

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

66 Modular Network



67 Plain Cable Network



12.0 COMMISSIONING

Before commissioning the unit, ensure that all equipment has been assembled in accordance with the installation procedure all instances where the unit is in operation the access doors should remain closed; at no time, during maintenance or otherwise, should anyone be inside a unit whilst it is in operation.

12.1 Fan & Motor

Care should be taken to ensure that the fan and motor run freely and that the fan is rotating in the correct direction.

The electrical current being drawn by motors should not exceed the manufacturers recommendations (specified on the motor plate). If the current exceeds this, check the fan volume flow rate and the static resistance.

12.2 Commissioning Checklist

- All equipment received is according to specification/order.
- Any damage to unit identified.
- Fan base shipping restraints / Fixing Brace removed (if applicable).
- The correct installation procedure has been carried out in accordance to Nuair's recommendations.
- Any fan and thermal wheel motor pulleys are properly aligned.
- Anti-vibration mounts are adjusted accordingly.
- Check / adjust fan and thermal wheel belt tension.
- Rotate fan impellers and motors to ensure they run freely.
- Check any additional bearings and couplings (where fitted manually).
- Condensate drain traps are checked. Check all filters are correctly fitted.
- Ensure ductwork is complete.
- Check electrical supply voltage and tightness of all electrical connections.
- Ensure control damper operation.
- Ensure access panels and doors are fitted properly and secure.
- Check fan motor current draw.

13.0 MAINTENANCE

It is important that maintenance checks are recorded and that the schedule is always adhered to, in all cases, the previous report should be referred to.

13.1 Fans

Please refer to general arrangement drawings for details of the type of fan and drive that is fitted. Maintenance guidelines for all fans are beyond this manual, please contact Nuair for specific documents.

- Before any work is carried out, please ensure that:
- The power supply to the motor is switched off.
- The fan impeller is at rest.

Measures are taken to ensure that the accidental, uncontrolled running of the fan is prevented during maintenance work.

In general, fans should be inspected twice a year, and care should be taken to ensure that any unusual vibration or sound is investigated as an urgent matter.

Access to the fan section is via hinged or lift-off panels. Cable entry must be made through the apertures provided. Screwed glands with cable restraint devices should be used.

13.2 General Fan Maintenance

Access to the fan is normally gained by opening the hinged access doors.

Care should be taken to remove any build up of dust (a light vacuum or light brushing will normally take care of this) Do not use a steam or any other high pressure cleaners.

Inspect the connection between the fan and unit for any damage or wear and tear.

13.3 Bearings

The bearings that are fitted will be (unless otherwise specified) "sealed for life", therefore consequence maintenance is not required.

Fan bearings are lifelong; up to 40,000 hours of operation. In cases of heavy duty operation, maintenance intervals are to be established by the operator.

13.4 Filters

When removing the filter access panels, pay attention to the airflow direction marked on the panel, this must be replaced to the exact position prior to being removed. Disposable filters should be checked, and changed when they become fully laden with dust. Washable filters should be removed and washed in a mild detergent, flushed with clean water and allowed to dry before refitting.

13.5 Coils

Coils should be connected to ensure that full counter flow exists i.e. the entering airflow meets the return connection.

All coils should be connected with the flow at the bottom and the return at the top unless otherwise advised. Drain and bleed valves are located on the coil, others may be required in the system pipe-work depending on the installation.

Frost protection must be incorporated on shut down and fresh air conditions to avoid coil freezing. Ideally, where the system is at risk of frost damage, the addition of a proprietary antifreeze solution to the water is recommended.

Pipe-work connections should be made to the unit using appropriate techniques, and must be independently supported. The connections should be pressure tested.

All coils sit in a common drip tray connected to the pre-fitted condensate pump.

The coil panel has been pre-drilled and fitted with appropriate grommets for pipe connections. Do not drill or cut the unit casing for this purpose.

Coils should have their finned surface examined for accumulation of dirt, lint and biological contaminants or similar. If necessary, wash down affected areas with a mild detergent solution and a soft brush. Care should be taken not to damage the finned surface, and any cleaning fluids should be rinsed away with water.

A compressed air line may be used to blow out any solids between fins. Do not probe the coil fin block with metal objects as damage may cause leaks. Drain lines should be checked to ensure that they are unobstructed and free draining. Drain pans should be flushed out periodically to remove contamination.

The unit application may require particular attention to this item – Check with Building Management personnel for details.

13.6 Legionella Check

Legionella risk management should be undertaken by a competent person appointed by the duty holder in accordance with the latest edition of the HSE approved code of practice L8 Legionnaires' disease, the control of legionella bacteria in water systems. Particular attention should be given to:

- Cooling coil.
- Thermal Wheel.
- Drain trays.
- Water reservoirs.

13.7 Electric Heaters

An air handling unit would normally require no heater maintenance. However a periodic check is advised to ensure that the fasteners and electrical connections are operating correctly.

The electric heater unit is fitted with fail-safe thermal switches (self-resetting) which will isolate the electric heater supply if a temperature of 80°C is detected. This action is performed independently of any controls fitted. Nuair fitted controls will also stop heating if a fan or heater failure is detected.

13.8 Bulkhead Lights

Ensure that lights are switched off and isolated before checking or changing the lamp.

13.9 General

Inspect all internal and external surfaces to check for corrosion or peeling of painted surfaces.

Thoroughly clean affected areas with a wire brush, apply a coat of zinc rich primer or similar, and re-touch with suitable finishing paint. Ensure tightness of all nuts, bolts, and fixings.

Check all components for general condition.

13.10 Specialist Equipment

Contact Nuair for maintenance of specialised equipment that would have been specified during design stage. A breakdown of the component parts can be found on the design specification documents, additional maintenance literature is available, please contact Nuair.

This applies to any components not specifically mentioned in this document.

13.11 Maintenance Schedule

13.11.1 Routine Maintenance

- Clean all areas of unit and treat any areas of corrosion.
- Check all access doors for leakage and if necessary locks should be adjusted and any replacement gasket materials should be replaced as required.
- Any drain trays should be cleaned and repaired if necessary.

13.11.2 Every 3 Months

- Check filters and change/clean if required, failure to do so may impair the performance and energy efficiency of this unit.
- Ensure condensate drains are cleaned clear and that water can flow freely from unit.
- Check fin coil banks and heat exchangers. If necessary clean with a soft brush or vacuum. Check for signs of contamination.

13.11.3 Annually

- Thoroughly inspect the unit and its components for corrosion, acting immediately to treat/restore any damaged areas.
- All electrical terminals within the unit should be tightened.
- Check all earth connections.
- Check control dampers blades.
- Check operation of damper actuators and linkages and adjust as necessary.
- Coil faces should be inspected and any dust removed.
- Check any thermal wheel belt, motor, bearings, seals and if necessary clean with a soft brush or vacuum cleaner.

14.0 WARRANTY

The 5 year warranty starts from the day of delivery and includes parts and labour for the first year. The remaining period covers replacement parts only.

This warranty is void if the equipment is modified without authorisation, is incorrectly applied, misused, disassembled, or not installed, commissioned and maintained in accordance with the details contained in this manual and general good practice.

The product warranty applies to the UK mainland and in accordance with Clause 14 of our Conditions of Sale. Customers purchasing from outside of the UK should contact Nuaire International Sales office for further details.

Failure to maintain the unit as recommended will invalidate the warranty.

15.0 END-OF-LIFE AND RECYCLING

Where possible Nuaire use components which can be largely recycled when the product reaches its end-of-life:

- Fans, motors, controls, actuators, cabling and other electrical components can be segregated into WEEE recycling streams.
- Sheet metal parts, aluminium extrusion, heating/cooling coils and other metallic items can be segregated and fully recycled.
- EPP, plastic ducting, nylon corner pieces, plastic heat exchangers, packaging material and other plastic components can be segregated into mixed plastic and widely recycled.
- Cardboard packaging, wood, used filters and other paper components can be largely recycled or fully processed in energy from waste centres.
- Remaining Items can be further segregated and processed in accordance with the zero waste hierarchy. Please call After Sales Support for further information on items not listed above.

Ensure that Nuaire product is made safe from any electrical / water / refrigerant supplies before dismantling commences. This work should only be undertaken by a qualified person in accordance with local authority regulations and guidelines, taking into account all site based risks.

16.0 AFTER SALES AND REPLACEMENT PARTS

For technical assistance or further product information, including spare parts and replacement components, please contact the After Sales Department.

If ordering spares please quote the serial number of the unit together with the part number, if the part number is not known please give a full description of the part required. The serial number will be found on the identification plate attached to the unit casing.

Telephone 02920 858 400
aftersales@nuaire.co.uk

Technical or commercial considerations may, from time to time, make it necessary to alter the design, performance and dimensions of equipment and the right is reserved to make such changes without prior notice.

DECLARATION OF INCORPORATION AND INFORMATION FOR SAFE INSTALLATION, OPERATION AND MAINTENANCE

We declare that the machinery named below is intended to be assembled with other components to constitute a system of machinery. All parts except for moving parts requiring the correct installation of safety guards comply with the essential requirements of the Machinery Directive. The machinery shall not be put into service until the system has been declared to be in conformity with the provisions of the EC Machinery Directive.

Designation of machinery: Boxer BPS Models



Machinery Types: Supply and Extract Fans with Heat Recovery

Relevant EC Council Directives: 2006/42/EC

Applied Harmonised Standards: BS EN ISO 12100-1, BS EN ISO 12100-2, EN60204-1, BS EN ISO 9001, BS EN ISO 13857

Applied National Standards: BS848 Parts 1, 2.2 and 5

Signature of manufacture representatives:

Name:	Position:	Date:
1) A. Thomas	 Engineering Director	18. 06. 16
2) C. Sargent	 Manufacturing Director	18. 06. 16

Note: All standards used were current and valid at the date of signature.

INFORMATION FOR SAFE INSTALLATION, OPERATION AND MAINTENANCE OF NUAIRE VENTILATION EQUIPMENT

To comply with EC Council Directives 2006/42/EC Machinery Directive and 2014/30/EU (EMC).
To be read in conjunction with the relevant product documentation (see 2.1)

- | | |
|---|--|
| <p>1.0 GENERAL</p> <p>1.1 The equipment referred to in this Declaration of Incorporation is supplied by Nuairé to be assembled into a ventilation system which may or may not include additional components. The entire system must be considered for safety purposes and it is the responsibility of the installer to ensure that all of the equipment is installed in compliance with the manufacturers recommendations and with due regard to current legislation and codes of practice.</p> <p>2.0 INFORMATION SUPPLIED WITH THE EQUIPMENT</p> <p>2.1 Each item of equipment is supplied with a set of documentation which provides the information required for the safe installation and maintenance of the equipment. This may be in the form of a Data sheet and/or Installation and Maintenance instruction.</p> <p>2.2 Each unit has a rating plate attached to its outer casing. The rating plate provides essential data relating to the equipment such as serial number, unit code and electrical data. Any further data that may be required will be found in the documentation. If any item is unclear or more information is required, contact Nuairé.</p> <p>2.3 Where warning labels or notices are attached to the unit the instructions given must be adhered to.</p> <p>3.0 TRANSPORTATION, HANDLING AND STORAGE</p> <p>3.1 Care must be taken at all times to prevent damage to the equipment. Note that shock to the unit may result in the balance of the impeller being affected.</p> <p>3.2 When handling the equipment, care should be taken with corners and edges and that the weight distribution within the unit is considered. Lifting gear such as slings or ropes must be arranged so as not to bear on the casing.</p> <p>3.3 Equipment stored on site prior to installation should be protected from the weather and steps taken to prevent ingress of contaminants.</p> <p>4.0 OPERATIONAL LIMITS</p> <p>4.1 It is important that the specified operational limits for the equipment are adhered to e.g. operational air temperature, air borne contaminants and unit orientation.</p> <p>4.2 Where installation accessories are supplied with the specified equipment e.g. wall mounting brackets. They are to be used to support the equipment only. Other system components must have separate provision for support.</p> <p>4.3 Flanges and connection spigots are provided for the purpose of joining to duct work systems. They must not be used to support the ductwork.</p> <p>4.4 Local Environment - Humidity. Ambient humidity (the humidity at the unit's installed location) shall be within the range: 10 to 95% (for controls, non-condensing). Air humidity (the humidity of the air passing through the unit) shall be within the range: 10 to 95% (for controls, non-condensing).</p> | <p>5.0 INSTALLATION REQUIREMENTS</p> <p>In addition to the particular requirements given for the individual product, the following general requirements should be noted.</p> <p>5.1 Where access to any part of equipment which moves, or can become electrically live are not prevented by the equipment panels or by fixed installation detail (e.g. ducting), then guarding to the appropriate standard must be fitted.</p> <p>5.2 The electrical installation of the equipment must comply with the requirements of the relevant local electrical safety regulations.</p> <p>5.3 For EMC all control and sensor cables should not be placed within 50mm or on the same metal cable tray as 230V switched live, lighting or power cables and any cables not intended for use with this product.</p> <p>6.0 COMMISSIONING REQUIREMENTS</p> <p>6.1 General pre-commissioning checks relevant to safe operation consist of the following:
Ensure that no foreign bodies are present within the fan or casing.
Check electrical safety e.g. Insulation and earthing.
Check guarding of system.
Check operation of Isolators/Controls.
Check fastenings for security.</p> <p>6.2 Other commissioning requirements are given in the relevant product documentation.</p> <p>7.0 OPERATIONAL REQUIREMENTS</p> <p>7.1 Equipment access panels must be in place at all times during operation of the unit, and must be secured with the original fastenings.</p> <p>7.2 If failure of the equipment occurs or is suspected then it should be taken out of service until a competent person can effect repair or examination. (Note that certain ranges of equipment are designed to detect and compensate for fan failure).</p> <p>8.0 MAINTENANCE REQUIREMENTS</p> <p>8.1 Specific maintenance requirements are given in the relevant product documentation.</p> <p>8.2 It is important that the correct tools are used for the various tasks required.</p> <p>8.3 If the access panels are to be removed for any reason the electrical supply to the unit must be isolated.</p> <p>8.4 A minimum period of two minutes should be allowed after electrical disconnection before access panels are removed. This will allow the impeller to come to rest.
NB: Care should still be taken however since airflow generated at some other point in the system can cause the impeller to "windmill" even when power is not present.</p> <p>8.5 Care should be taken when removing and storing access panels in windy conditions.</p> |
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