BPS HP/CO
BPS EHP/CO
(with electric back-up heater)

Boxer Packaged Solution with Heat Pump

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.

WORK IN CONFINED SPACES (WORKING WITHIN THE UNIT)

Personnel carrying out any works within a confined space otherwise than in accordance with a system of work which, in relation to any relevant specified risks, renders that work safe and without risks to health, according to the “The Confined Spaces Regulations 1997”.

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

2.1 OPERATION

The packaged supply and extract unit shall be manufactured from Magnelis corrosion resistant steel, with 50mm double skinned panels and anodized aluminium frame. All external fittings and fixings shall be stainless steel, aluminium or non-metallic. All panels and frames will be of a totally thermally broken design, complying with the following specification in accordance with The unit shall include the following items: -

- Thermal Wheel HX: A high efficiency, ERP compliant heat exchanger with automatic bypass, complete with condensate trays.
- G4 pre-filter and F7 main supply filters shall be fitted with a single M5 bank present on the extract side. Slides for alternative panel and bag options shall be present and pressure drop monitoring for maintenance notification will be included. Performance optimised backward curved impellers and IP54 EC motors shall be used to provide low specific fan powers and stepless speed control without tonal noise generation.
- Fan pressure transducers shall be fitted for constant pressure/flow control and energy monitoring.
- Internal lighting and inspection portholes shall be present on all fan modules.
- An electric -up heater battery shall be fitted on EHP units, complete with power controller to allow output modulation from the unit control.
- A fail-safe auto-reset safety device shall be present.
- Internally installed Heat recovery ASHP with dual compressor operation.

All hinged access panels shall be lockable and removable (with a common key for all) allowing full maintenance access from the side. The unit has the option of left hand or right hand arrangements in direction of supply air flow.

Each Ecosmart heat pump system is charged with R32 refrigerant gas and is controlled via Carel C.pco plc controllers, each heat pump system will operate to control the supply air temperature (set via the BPS Ecosmart control).

Each system will recover and utilise heat from the exhaust air DX coil of the BPS unit and transfer this heat/energy efficiently via the refrigeration cycle to the supply air DX coil in heating mode. Each system will also offer pre-cooling of the supply air (set temperature by BPS Ecosmart controller).

The heat pump systems are installed between the thermal wheel allowing for very efficient heat recovery system. The complete Heat pump system can slide out for easy of service and maintenance works.

1 BPS-ECO-HP Animation QR Code

or CLICK HERE to see the animation

2.2 Dual Compressor System

Automatic Defrost Control strategy – when the build-up of frost in the exhaust coil reaches a limit the dual system will automatically respond and start warming up the second system (on completion of system that is in defrost, it will not start when the defrost is active) to ensure the unit provides continuous ventilation.

In very cold conditions an electric back-up heater is installed in the supply air reducing any risk of cold air being supplied to the building, this heater can also be used as backup in case of a heat pump system failure.

Lower Energy Consumption – A dual compressor system uses less energy than one large single system providing the opportunity to make energy savings whilst ensuring the total energy consumed is minimized.

Greater longevity – A dual system with duty share will prolong the working life of the components.

- Guaranteed ventilation 24/7 – A dual system will still provide 50% ventilation to the building if the one system fails.

- Increased control range – A dual system provides improved 'turndown ratio' and therefore increased controllability.

Structural base frames shall be fitted, powder coated with covered forklift slots and 50mm square lifting bar holes for site manoeuvrability. Three axis alignment clamps shall be fitted externally.

All modules and ancillaries shall be individual weatherproofed with nanotech hydrophobic roofing, providing unparalleled corrosion resistance and aesthetic longevity.

An IP66/67 lockable isolator shall be present for power connection on the frost heater module and back-up heater, where present. Sealing grommets will be present for control cable access to the unit internals without the need for drilling on site. Module electrical interconnection shall be made using pre-fitted plug and socket arrangements.

Modules shall be provided with identification labelling to aid assembly and QR coded badges to simplify document retrieval via portable devices.

Autodesk REVIT files shall be provided for Building Information Modelling and all units shall be based on performance testing carried out within an AMCA certified test laboratory

2.3 Code Description

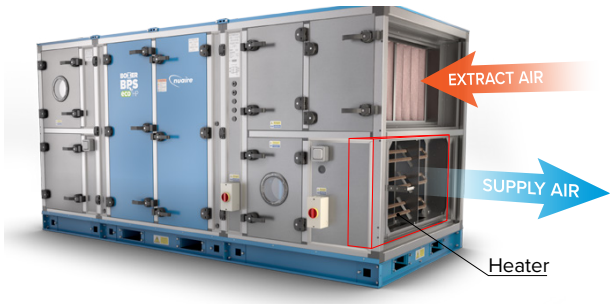
1	2	3	/	4	/	5	-	6
B	07	T	/	HP	/	CO	-	R

1. Range:	**B** = Boxer Packaged Solution
2. Unit Size:	**07**, **12** or **17**
3. Heat Recovery Type:	**T** = Thermal Wheel
4. Heating/Cooling Type:	**HP** = Heat Pump (Reverse Cycle DX Coil) **EHP** = Heat Pump (Reverse Cycle DX Coil plus Electric Back-up Heater
5. Control Type:	**CO** = Connect
6. Access Handing (in direction of supply airflow)	**L** = Left Hand **R** = Right Hand

3.0 ELECTRICAL BACK-UP HEATER

An additional electric back-up heater is available to be installed either at factory or field install, the purpose of the heater is to eliminate any cold drafts when the heat pump is in defrost.

2 Location of Electrical back-up heater



The heater can also be used as a backup heat source in case of any issue with either heat pump system.

The heater is positioned in the supply fan section after the supply fan and is accessed from the fan motor access door (Figure 2).

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 Nuaire 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.

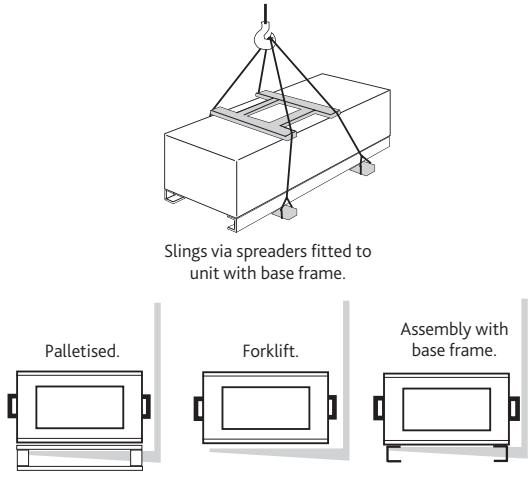
To ensure that the delivery vehicle is loaded according to the planned method of offloading, Nuaire must be notified to ensure coordination. When offloading, care must be taken to ensure that the AHU is kept level at all times.
To ensure that no roof damage occurs additional timber packaging must be 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 13).

3 Typical Methods of Lifting



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), Nuaire 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 Nuaire 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.

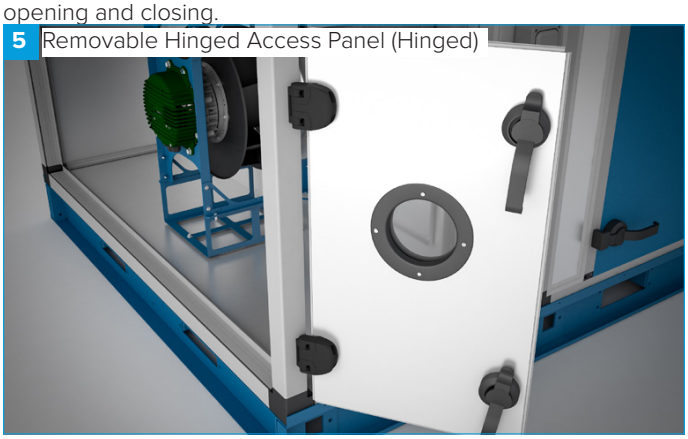
- The unit must be installed with at least 750mm clearance from a wall/barrier. With this absolute minimum clearance, the unit may be connected to the power supply and control connection.
- With this clearance, unit filters may be changed, and the fans coils, heat exchanger and condensate tray may be inspected and cleaned if necessary.
- The electrical heater settings, 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 Removable Hinged Access Panel (Hinged)



6 Removable Hinged Access Panel (Removed)

5.2 Heat Pump Skid Withdrawal Video

7 Skid Withdrawal 3D Model Viewer QR Code

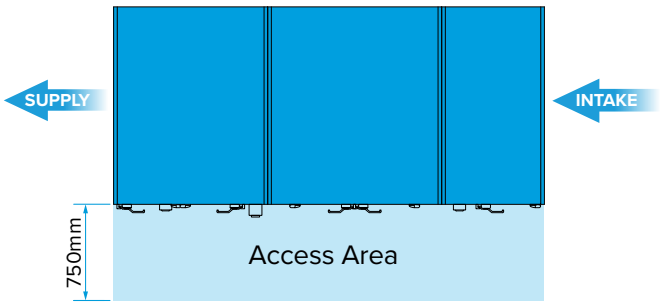
or CLICK HERE to go to the 3D model viewer.

5.3 Access Areas

5.3.1 Left Hand Units

8 Left Hand Heat Pump Unit

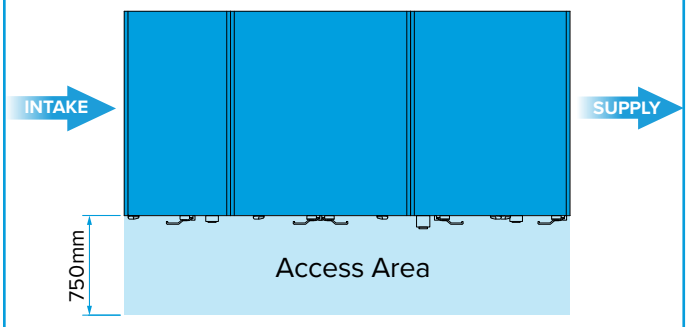
9 Top View of Access For Left Hand Heat Pump Units



5.3.2 Right Hand Units

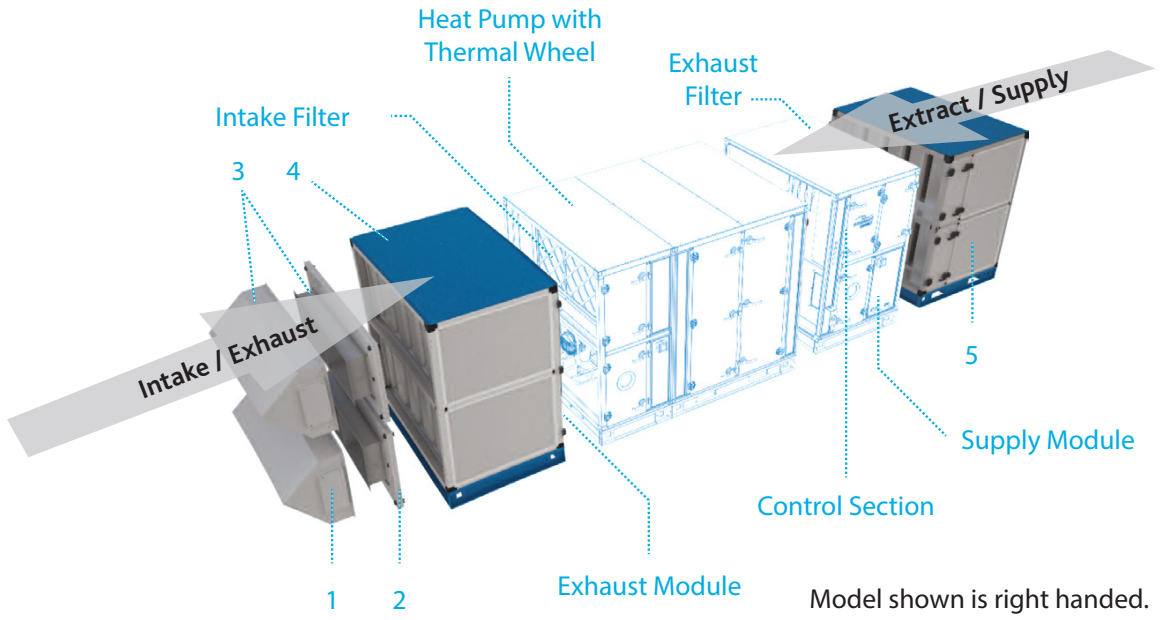
10 Right Hand Heat Pump Unit

11 Top View of Access For Right Hand Heat Pump Units



6.0 OPTIONAL ANCILLARIES

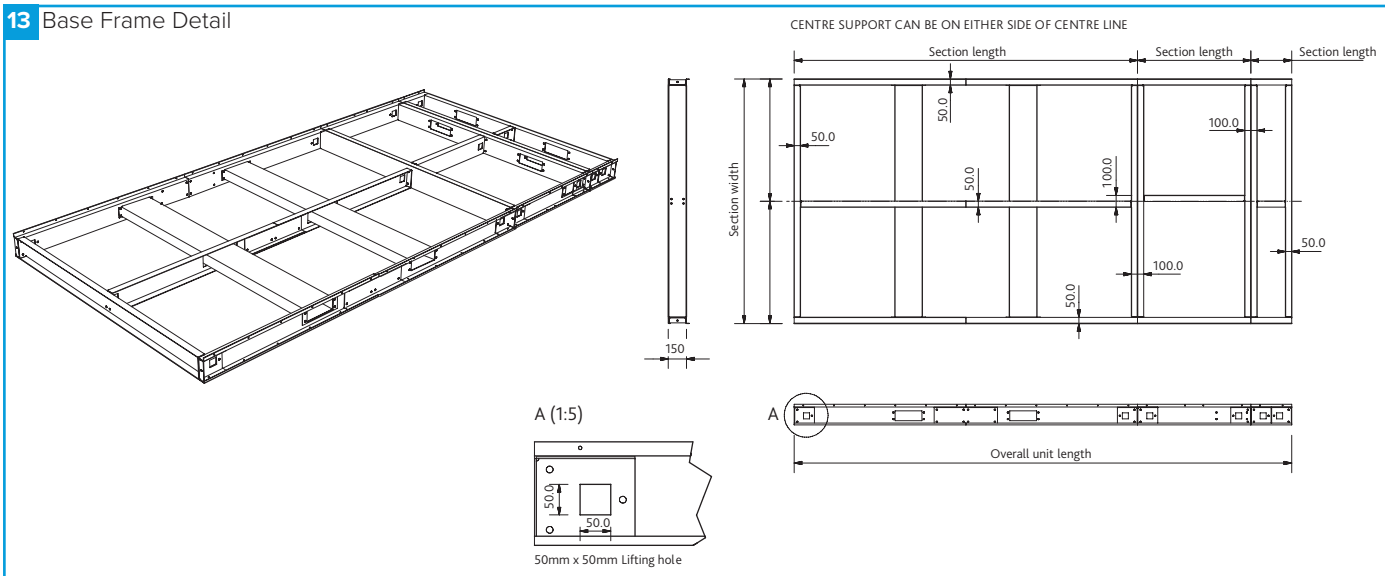
12 Typical Optional Ancillaries



Quick Selection Guide BPS Boxer Packaged Solution AHU Ancillaries		
BPS Unit Module	**Part Number**	**Description**
Weather Terminal **1**	**B**AT/RT**	BPS size **. Weather Terminal, for Thermal Wheel Units.
Inlet/Outlet Damper **2**	**B**AT/D**	BPS size **. Inlet/Outlet Dampers suitable for right or left handed Thermal Wheel Units.
Weather Terminal & Inlet/Outlet Damper **3**	**B**AT/RTD-R**	BPS size **. Weather Terminal & Damper, Right Handed, for Thermal Wheel Units.
	BAT/RTD-L**	BPS size **. Weather Terminal & Damper, Left Handed, for Thermal Wheel Units.
Attenuator **4**	**B**AT/AA900-R**	BPS size **. Attenuator for Intake/Exhaust, Right Handed, for Thermal Wheel Units.
	BAT/AA900-L**	BPS size **. Attenuator for Intake/Exhaust, Right Handed, for Thermal Wheel Units.
Attenuator **5**	**B**AT/AR900-R**	BPS size **. Attenuator for Supply/Extract, Right Handed, for Thermal Wheel Units.
	BAT/AR900-L**	BPS size **. Attenuator for Supply/Extract, Left Handed, for Thermal Wheel Units.

** Insert the relevant BPS-HP unit size (07, 12, 17) for the matching BPS ancillary.

13 Base Frame Detail



7.0 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. Nuaire takes no responsibility for the coordination of support.

7.1 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.

7.2 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.

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

7.3 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.

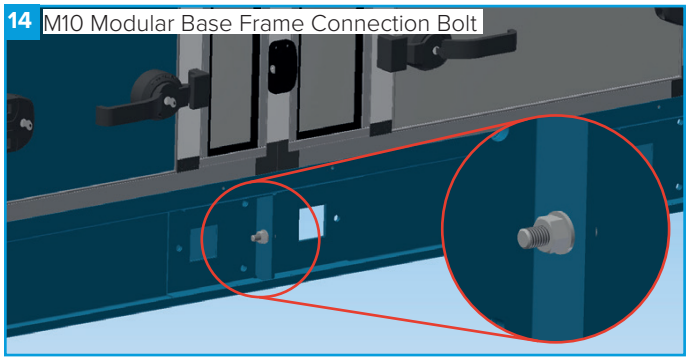
Make the unit joints in the following order:

- Left and right hand side M10 bolts between the modules' base frames (Figure 14).
- Left and right hand side M6 Lower 3 axis alignment clamps (Figure 15).
- Left and right hand side M6 Middle 3 axis alignment clamps.
- Left and right hand side M6 Upper 3 axis alignment clamps.

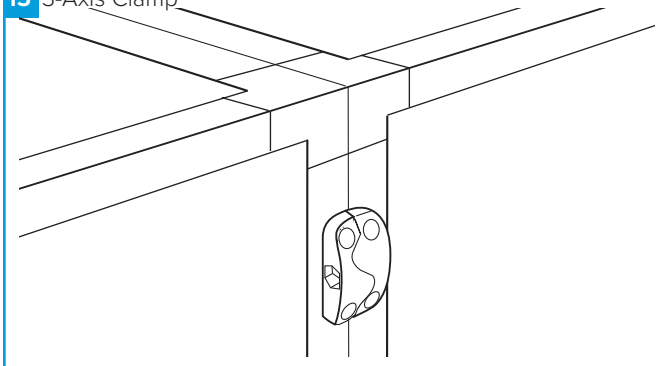
Air leakage, air blow marks to the unit casings and unacceptable noise levels could result if the correct installation procedures are not employed.

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.

14 M10 Modular Base Frame Connection Bolt

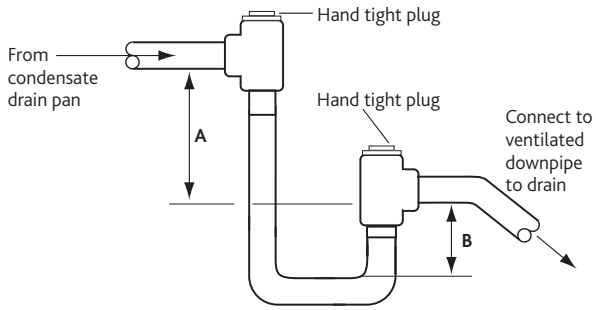


15 3-Axis Clamp



7.4 Condensate Drain

16 Condensate Trap Dimensions



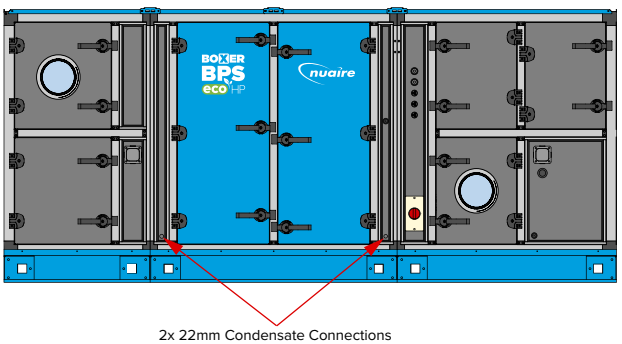
The condensate tray is under negative pressure, therefore, to calculate the values of A & B (as per Figure 16 above), do the following:

10Pa = 1mm H2O

A = Fan inlet pressure (mm H2O) +25mm (minimum). Allow for 100mm for these units if pressure is unknown.

B = A/2 (minimum)

17 Location of Condensate Drain Connections



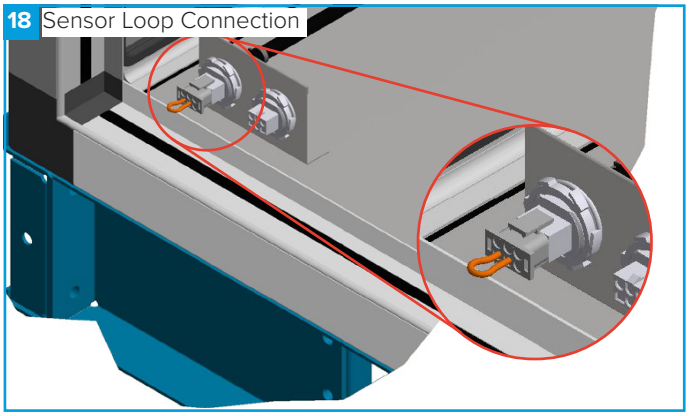
7.5 Internal Connections

There are a number of internal electrical connections that need to be completed prior to starting /commissioning the unit.

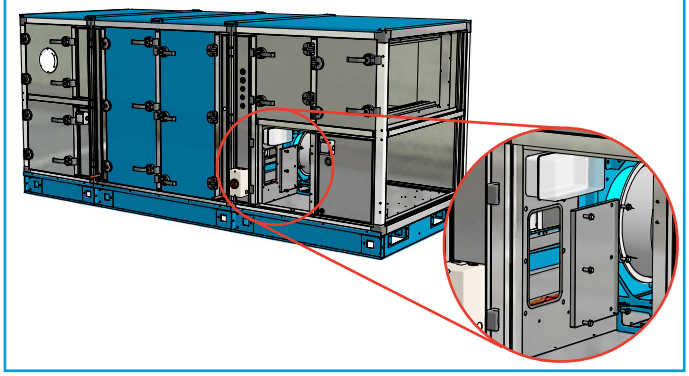
When making the wiring connections, the sensor loop (Figure 18) must be removed and relocated to the end of the unit.

Access is available in the fan plate to allow electrical/wiring connections to be made between modules (Figure 19).

18 Sensor Loop Connection



19 Fan Plate Access Location



7.6 Thermal Wheel Drive / Belt Tension

Thermal wheel modules can be delivered with transport packing blocks, ensure any transport blocks are removed prior to operation of the thermal wheel.

The thermal wheel belt is unhooked to prevent the thermal wheel belt from stretching during transportation.

The thermal wheel motor is attached via a hanging motor bracket. To install the belt lift the spring motor upwards, hook the belt onto the pulley and slowly release the motor.

Ensure that the rotation sensor is aligned with the sensing studs, as this can become misaligned during transport/ installation thus causing a fault signal.

7.7 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.

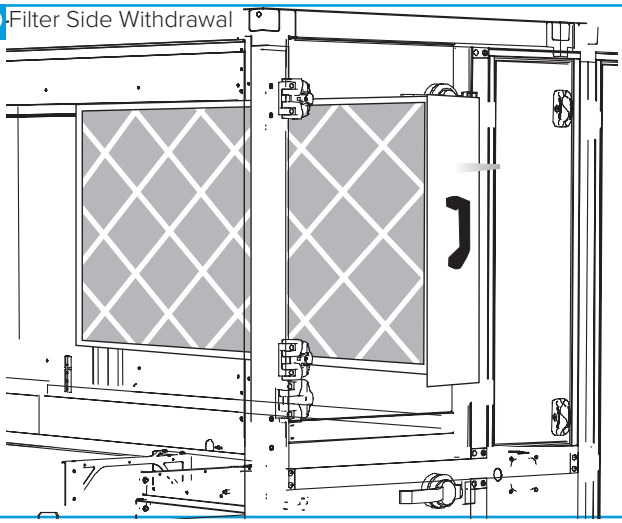
7.8 Unit Connections

7.8.1 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.

7.9 Filters

20 Filter Side Withdrawal



7.9.1 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.

7.9.2 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 Nuaire.

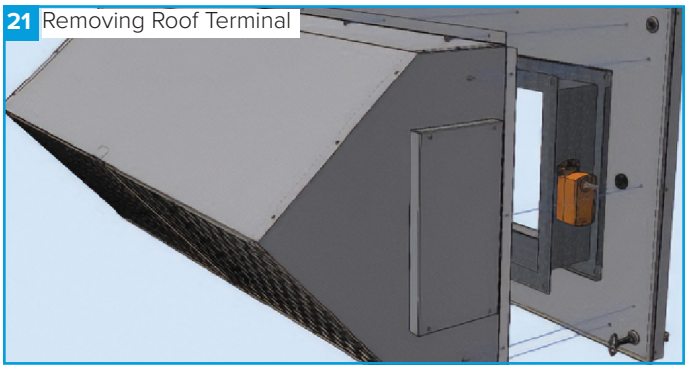
7.10 Control Dampers

Care should be taken to ensure that all spring return actuators have stopped running and completed their stroke. If not, the connection needs to be loosened and the actuator should be left to drive until the motor stops running.

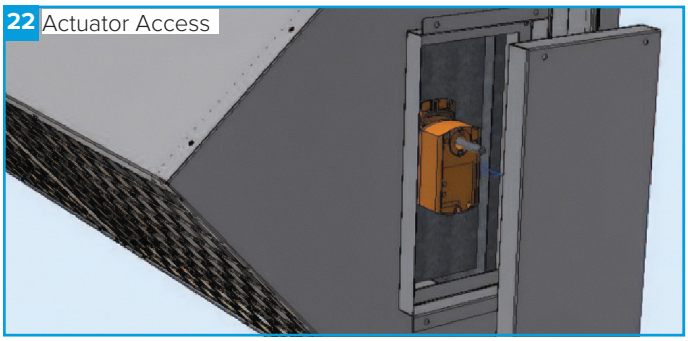
When the unit is powered, dampers should be checked to ensure that they operate freely and close tightly.

Where dampers are protected with a roof terminal, the roof terminal can be removed for access to the main damper. Access to the actuator can be from the side of the roof terminal without the requirement of removing the roof terminal (Figure 21).

21 Removing Roof Terminal



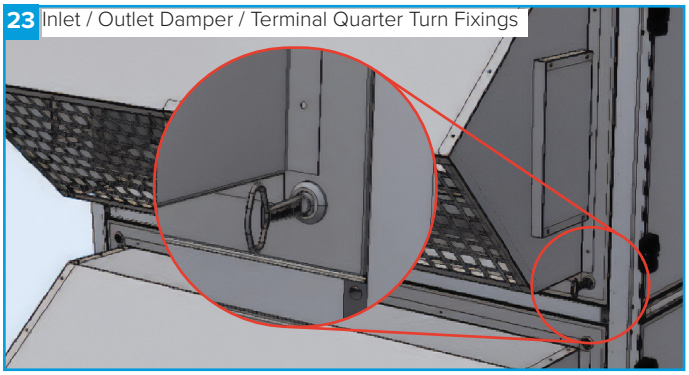
22 Actuator Access



7.11 Damper / Roof Terminal Assembly

The inlet/outlet dampers and roof terminals are pre-assembled (for BPS sizes **07**, **12** and **17**) 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 23).

23 Inlet / Outlet Damper / Terminal Quarter Turn Fixings



7.12 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.

7.13 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.

8.0 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.

8.1 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.

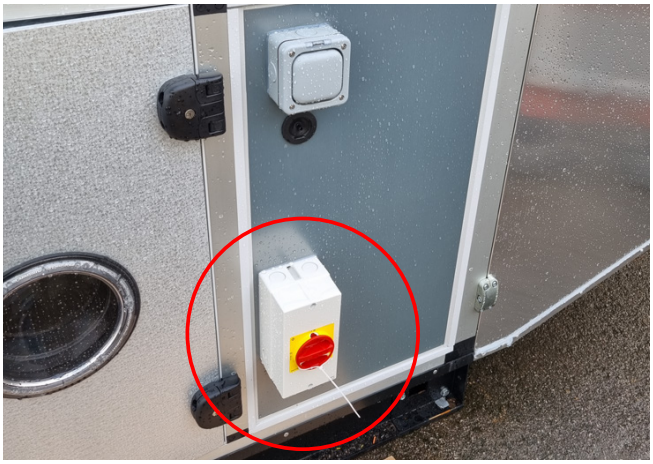
8.2 Electric Back-Up Heater Installation

The back-up heater, if factory fitted, is installed within the unit and just requires a separate power supply to the isolator.

The back-up heater's isolator is mounted on the supply fan section
(Figure 24).

Please check the power rating of the heater before selecting the cable size.

24 Location of the top-up heater isolator



8.3 Top-up Heater Operation

The heater output is controlled via a 0-10v signal from the Ecosmart controller. The temperature setting of the controller is automatically set to a 2°C lower offset of the supply air temperature setting.

i.e. If the supply air setpoint is 22°C, then the top-up heater setpoint will be 20°C.

This 2°C offset is factory set and cannot be changed, for further information please contact the Nuaire aftersales team.

The electric top-up heater will only operate when a heating signal is sent to the heat pumps. When a cooling signal is sent to the heat pumps the function of the heater is prohibited.

8.4 BPS Unit Power Supply Details

Unit Code	Voltage	Full Load Current	Starting Current
B07T/HP/*	415v	33.9A	33.9A
B07T/EHP/*	415v	33.9A	33.9A
B12T/HP/*	415v	36.4A	36.4A
B12T/EHP/*	415v	36.4A	36.4A
B17T/HP/*	415v	50.6A	50.6A
B17T/EHP/*	415v	50.6A	50.6A

* Denotes any character.

8.5 Electric Back-up Heater Electrical Data

Heater Code	Description	Voltage	Full Load Current	Power
B07-EBU-L	B07 Ancillary 6kW electric back-up heater. Left hand Unit.	415v	9A	6kW
B07-EBU-R	B07 Ancillary 6kW electric back-up heater - Right hand Unit.	415v	9A	6kW
B12-EBU-L	B12 Ancillary 9kW electric back-up heater - Left hand Unit.	415v	12A	9kW
B12-EBU-R	B12 Ancillary 9kW electric back-up heater - Right hand Unit.	415v	12A	9kW
B17-EBU-L	B17 Ancillary 12kW electric back-up heater - Left hand Unit.	415v	17.5A	12kW
B17-EBU-R	B17 Ancillary 12kW electric back-up heater - Right hand Unit.	415v	17.5A	12kW

8.6 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.

8.7 Emergency Shut Down Circuit

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

8.7.1 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.

8.7.2 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.

8.7.3 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.

8.7.4 Network Settings

Default MS/TP Address: 4

BACnet Instance Number: Randomised & Unique for each controller (0 to 4,194,304).

8.8 Connection Chart

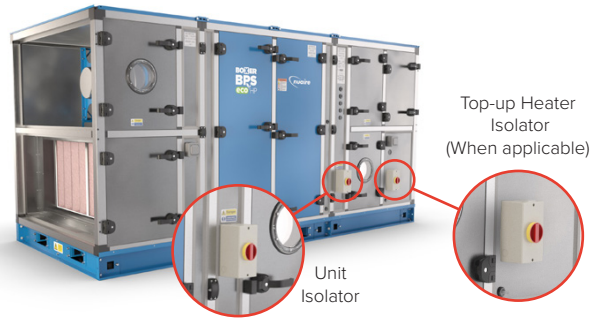
Description	Controller Terminal No	DI	AI	Relay Output	AO (0-10v)
Supply Fan Fault	IN1	1			
Extract Fan Fault	IN2	1			
SL Enable	IN5	1			
SL2 Input	IN6	1			
EH Overtemp Fault (If Present)	IN7	1			
Tacho Alarm Feedback (If Present)	IN8	1			
Supply Filter Fault & IO Damper Alarm	IN9	1			
Extract Filter Fault	IN10	1			
Thermal Wheel Fault	IN11	1			
Fresh Air Temp Sensor	IN13		1		
Supply Air Temp Sensor	IN14		1		
Return / Room Air Temp Sensor	IN15		1		
Configurable Input 16	IN16				
Configurable Input 17	IN17		1		
Extract Fan Output	OUT1				1
Supply Fan Output	OUT2				1
Heating Output	OUT3				1
Cooling Output	OUT4				1
Bypass Damper Cmd	OUT6			1	
Cooling Demand Cmd	OUT7			1	
Heating / Recirc Cmd	OUT8			1	
Fault Relay Cmd	OUT9			1	
Fan Enable Cmd	OUT10			1	

8.9 Isolator Wiring Points

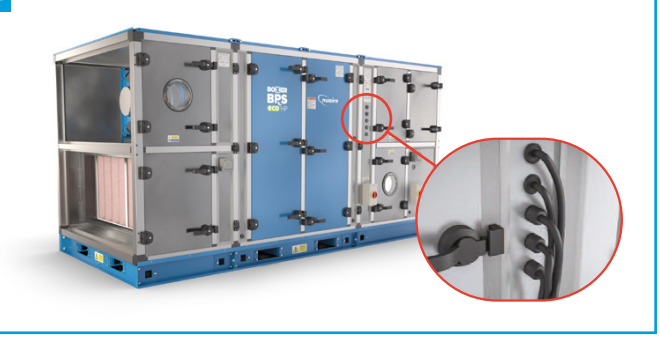
Main wiring points for the customer is to the isolators situated on the sides of the units as shown below.

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

25 Isolator Locations



26 Cable Gland Locations



8.10 Terminal Wire Connections

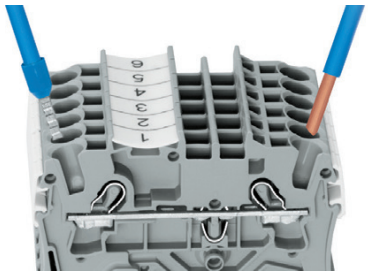
8.10.1 Push In Termination

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.

8.10.2 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.

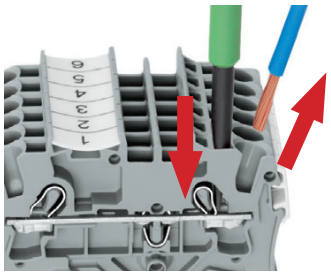
27 Wiring a Conductor to a Terminal



8.10.3 Conductor Removal

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

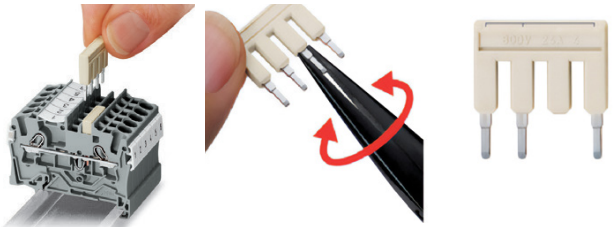
28 Removing a Conductor from a Terminal



8.10.4 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.

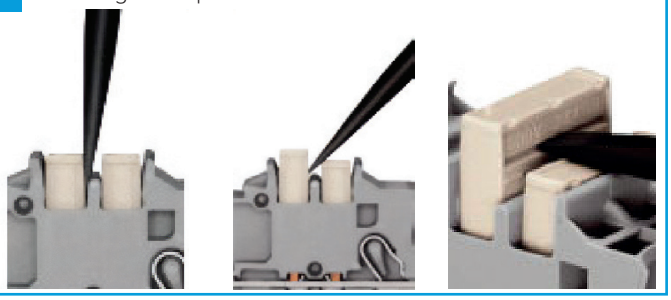
29 Removing a Jumper Pin



8.10.5 Jumper Removal

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

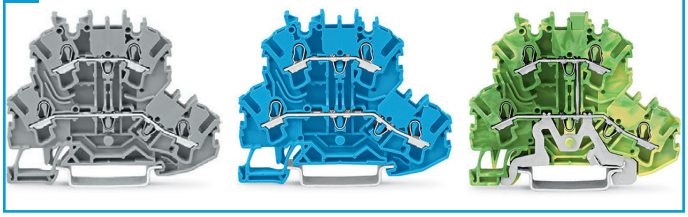
30 Removing a Jumper



8.10.6 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.

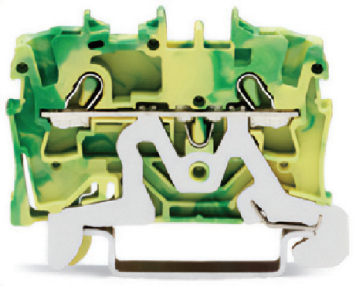
31 Double Deck Conducting Paths



8.10.7 Earth Terminals

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

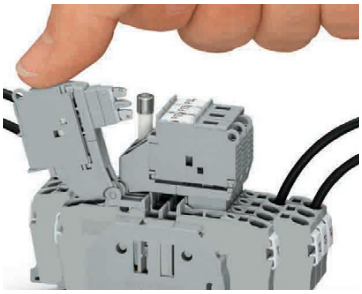
32 Earth Terminal Block



8.10.8 Fuse Terminals

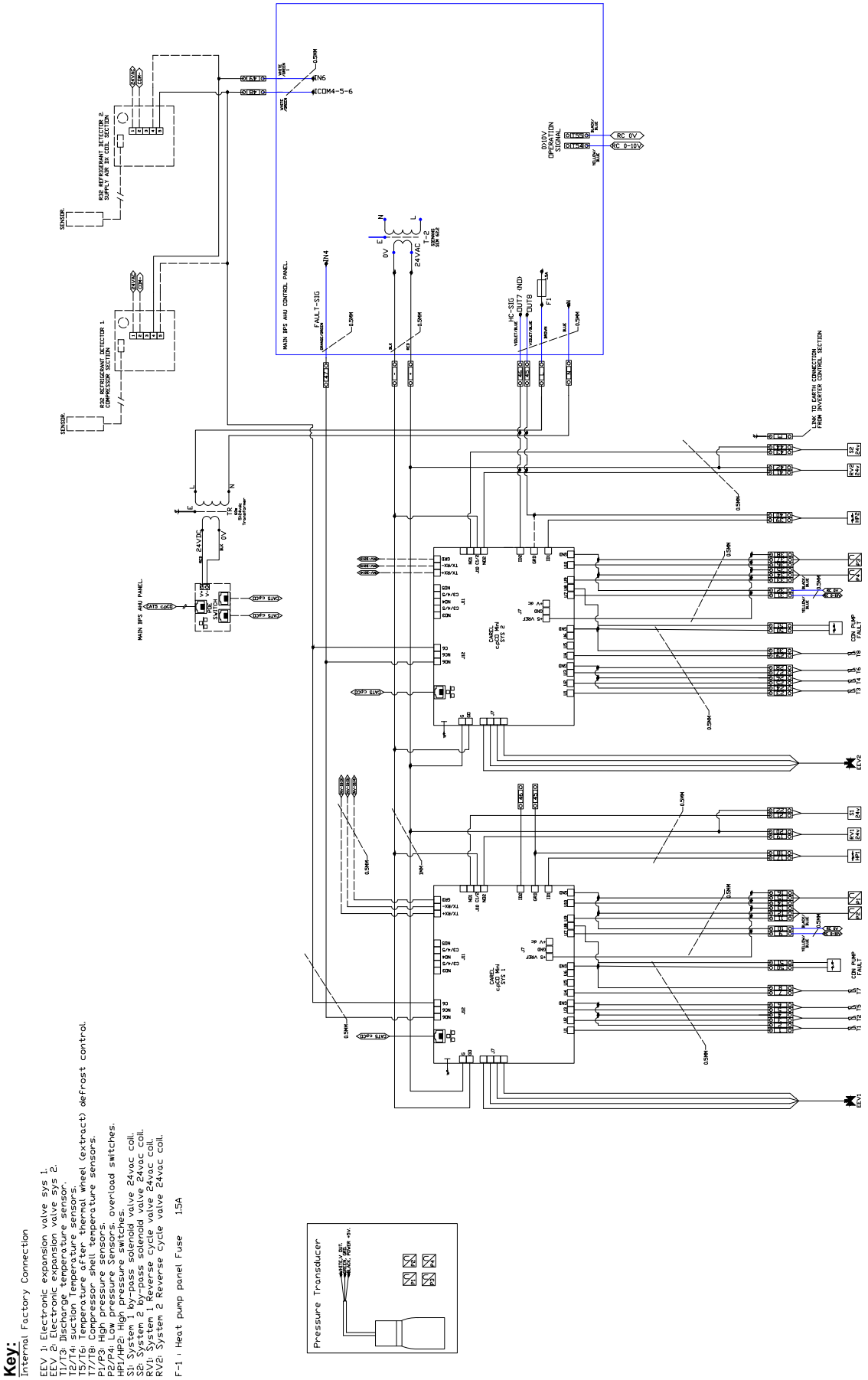
Replaceable cartridge fuses are housed in quick release fuse terminals.

33 Fuse Terminal Block

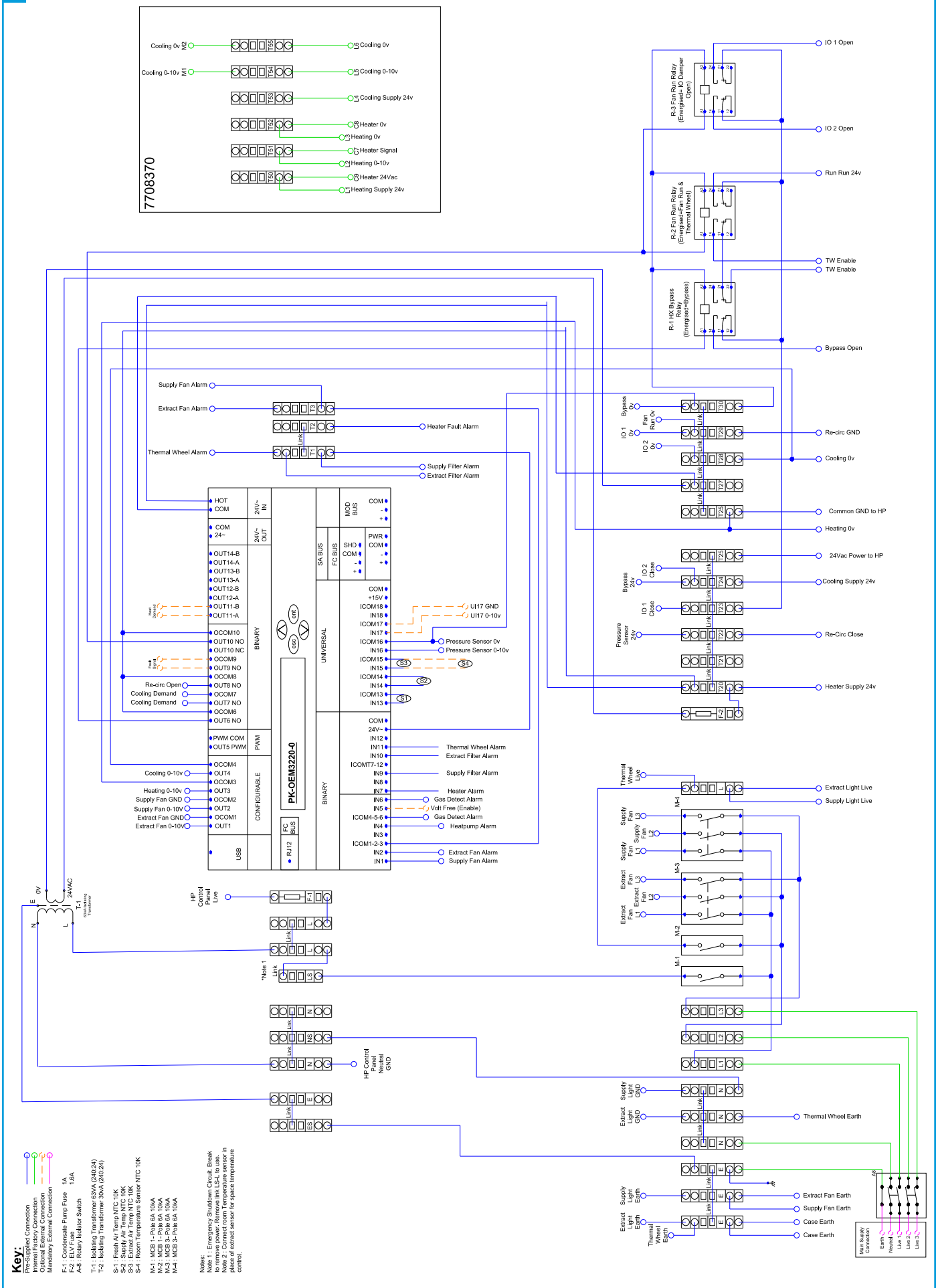


9.0 WIRING DIAGRAMS

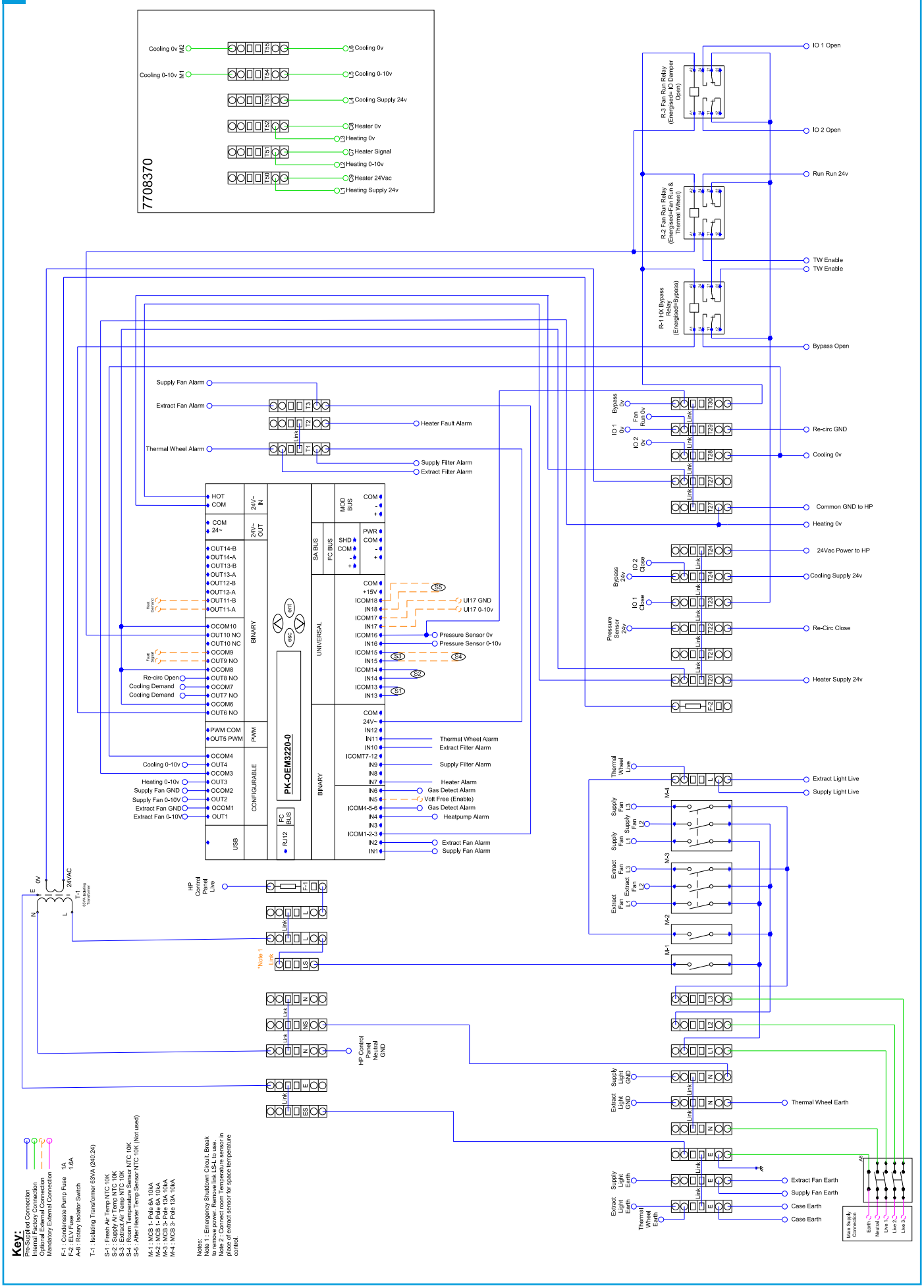
34 Heat Pump Panel Wiring Diagram (all models)



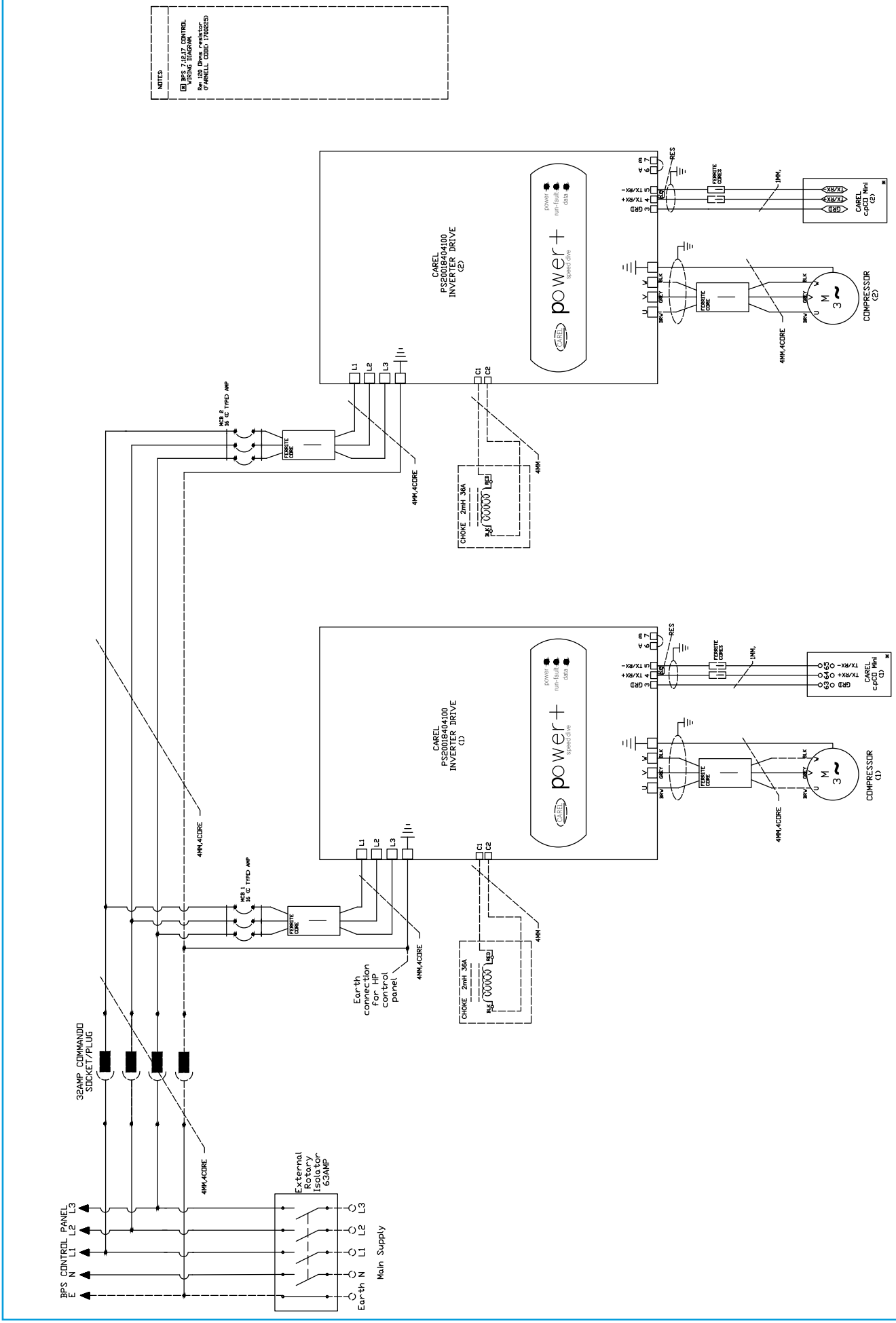
35 Full Wiring - BPS-HP 07-12



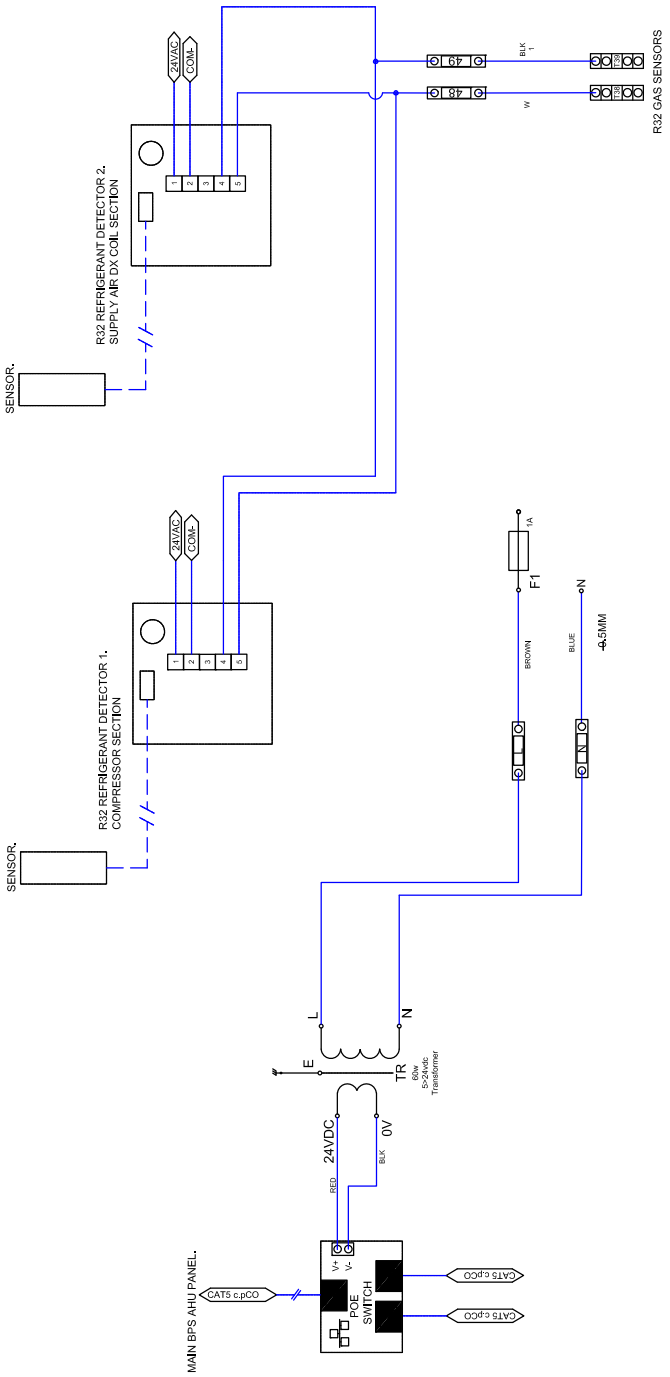
36 Full Wiring - BPS-HP 17



37 Full Wiring - BPS-HP 07, 12 & 17 Inverter Wiring



38 Condensate & Refrigerant Gas Detection Wiring



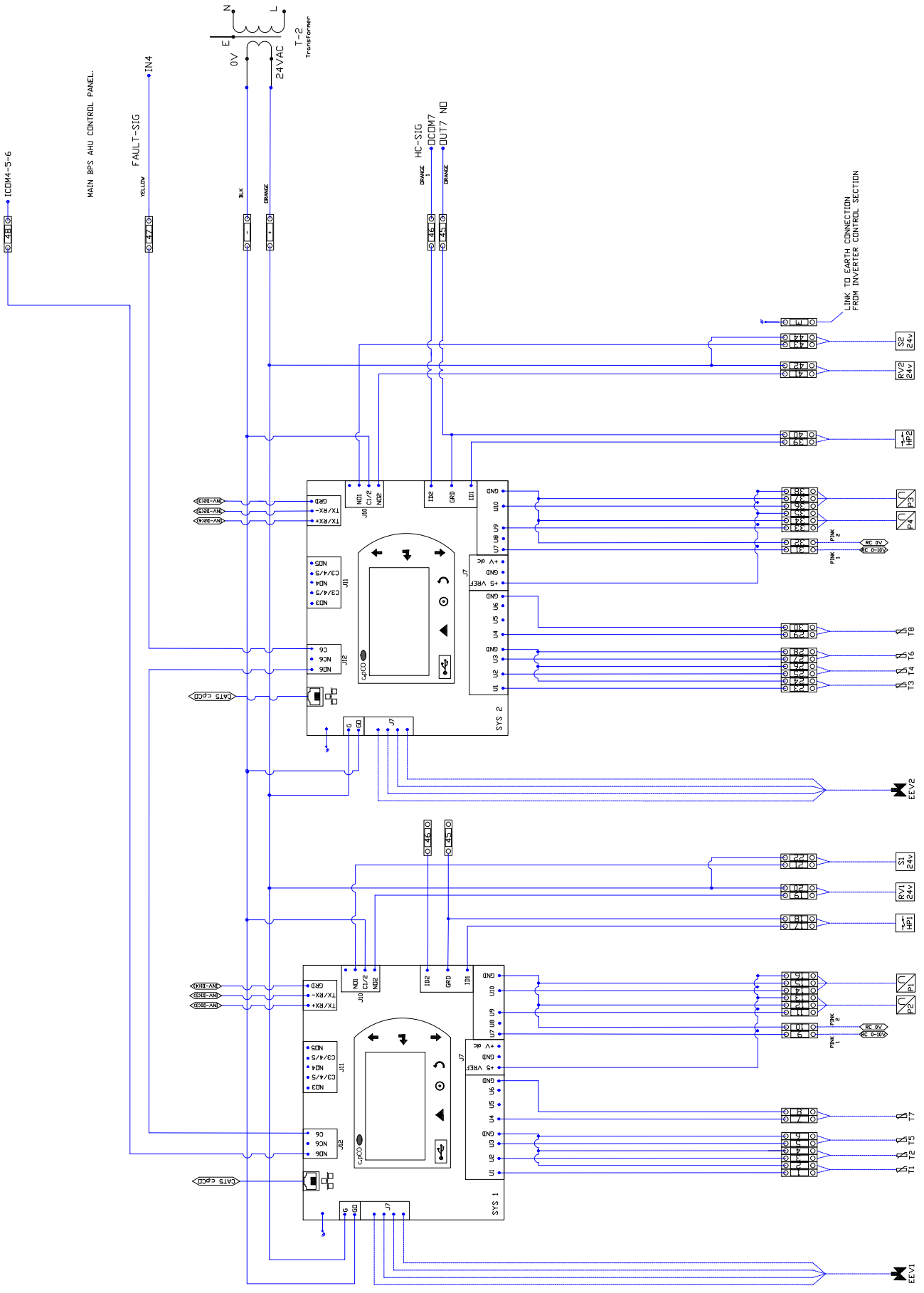
Key:

Internal Factory Connection

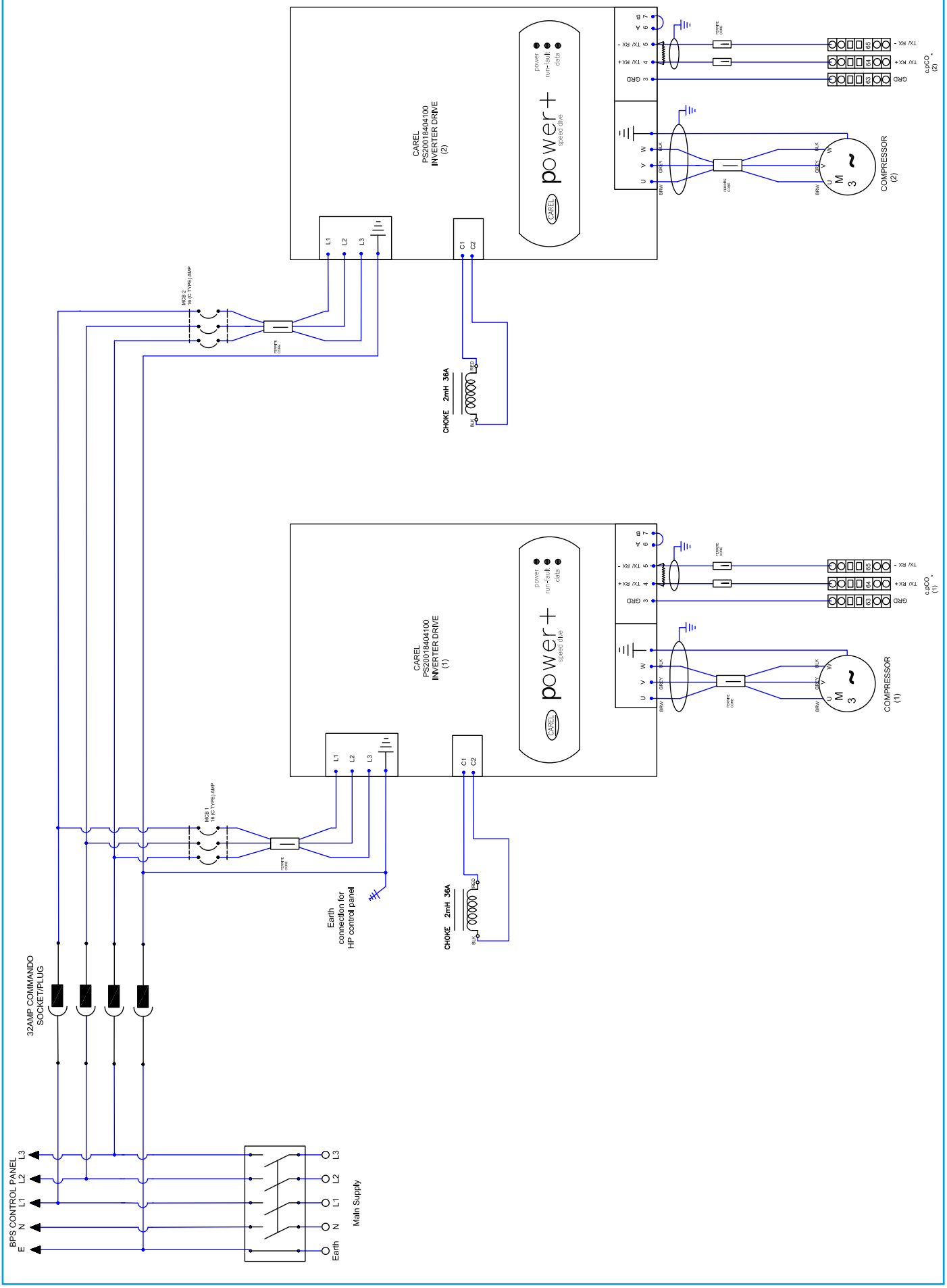
EEV 1: Electronic expansion valve sys 1.
EEV 2: Electronic expansion valve sys 2.
T1/T3: Discharge temperature sensor.
T2/T4: suction Temperature sensors.
T5/T6: Temperature after thermal wheel (extract) defrost control.
T7/T8: Compressor shell temperature sensors.
P1/P3: High pressure sensors.
P2/P4: Low pressure Sensors. overload switches.
HP1/HP2: High pressure switches.
S1: System 1 by-pass solenoid valve 24vac coil.
S2: System 2 by-pass solenoid valve 24vac coil.
RV1: System 1 Reverse cycle valve 24vac coil.
RV2: System 2 Reverse cycle valve 24vac coil.

F-1 : Heat pump panel Fuse 1.5A

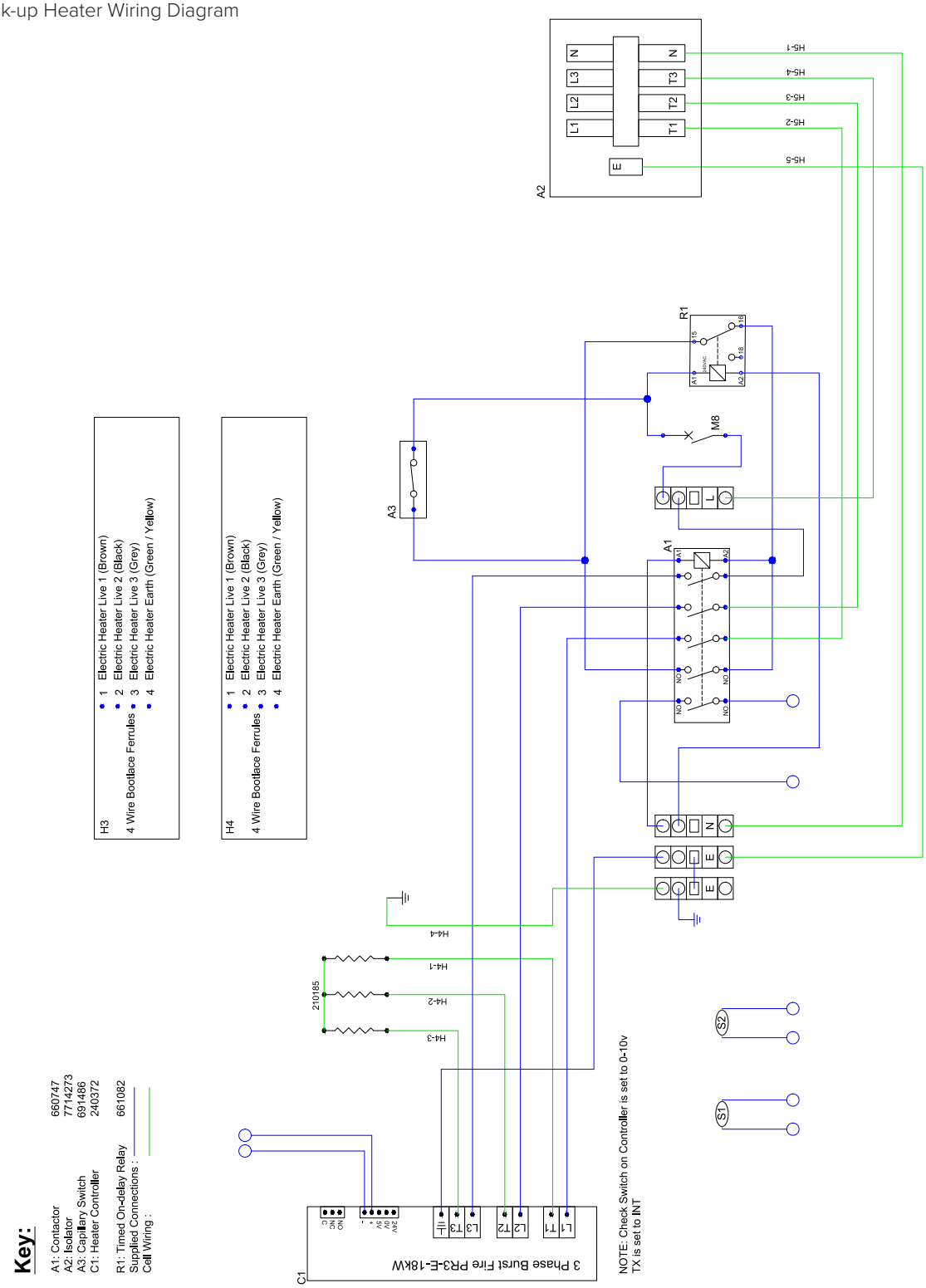
39 Heat Pump Controller Wiring



40 Mains Power & Inverter Wiring



41 Electric Back-up Heater Wiring Diagram



10.0 Electric Back-up Heater Electrical Data

Heater Code	Description	Voltage (V)	Current (A)	Power (kW)
B07-EBU-L	B07 Ancillary 6kW electric back-up heater. Left hand Unit.	415	14.5	6
B07-EBU-R	B07 Ancillary 6kW electric back-up heater - Right hand Unit.	415	14.5	6
B12-EBU-L	B12 Ancillary 9kW electric back-up heater - Left hand Unit.	415	21.7	9
B12-EBU-R	B12 Ancillary 9kW electric back-up heater - Right hand Unit.	415	21.7	9
B17-EBU-L	B17 Ancillary 12kW electric back-up heater - Left hand Unit.	415	29	12
B17-EBU-R	B17 Ancillary 12kW electric back-up heater - Right hand Unit.	415	29	12

11.0 CONTROLS

See EcoSmart Connect control operation manual (document number 672040) for detailed controls information. A quick controls guide is also available (document number 671868).

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 Nuaire'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 Nuaire 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 gravity drainage system.

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 Thermal Wheel

After 2-3 weeks of operation, and at least once per year, ensure the following maintenance is performed.

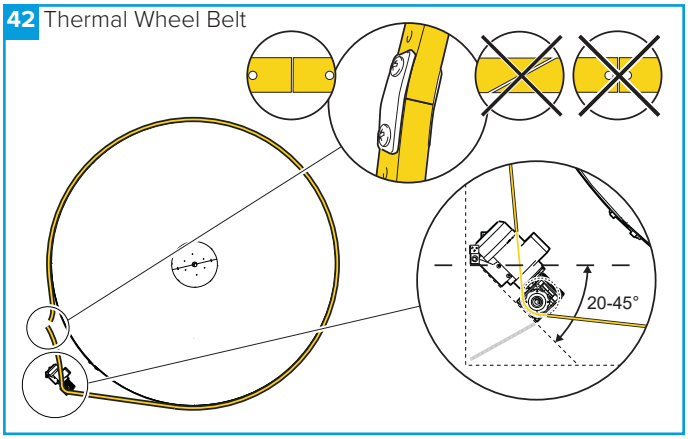
- Check that rotor is vertical and centred in casing. Adjust vertical and horizontal position if needed.
- Check the thermal wheel spins freely.
- Adjust sealing to ensure contact with the rotor and side plates. Replace brush sealing if it is worn.
- Check that motor bracket is in 20-45° angle from horizontal line.
- Adjust length of drive belt if needed.
- Check condition of belt and belt lock (joint).

Experience shows that clogging of heat exchangers is not expected in normal cooling and air-conditioning systems. However, if deposits accumulate on the exchanger when used for special applications, it can be cleaned as follows:

Remove dust and fibres with a soft brush or vacuum cleaner. Use caution when blowing dirt out with compressed air to avoid damage to the wheel. Keep at a distance!

Oils, solvents etc. can be removed with hot water (max. 70 °C) or grease-removing solvents or immersion.

42 Thermal Wheel Belt



13.7 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.
- Tundish.

13.8 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.

Both the electric frost heater and electric top-up heater are 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. Nuaire fitted controls will also stop heating if a fan or heater failure is detected.

13.9 Bulkhead Lights

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

13.10 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.

13.11 Specialist Equipment

Contact Nuaire 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 Nuaire.

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

13.12 Heat Pump

See Boxer Packaged Solution with Heat Pump Service Manual (document number 672055) for detailed heat pump maintenance information.

13.13 Maintenance Schedule

13.13.1 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.

13.13.2 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.

13.13.3 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.

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

All parts except for moving parts requiring the correct installation of safety guards or incorporation into ducts or building fabrications acting as 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 1.3.7 to 1.3.8.2 relating to guards/moving parts.

Product:	Supply and Extract Fans with Heat Recovery
Type:	Boxer BPS-HP/EHP Models
Installation Manual Serial no.:	672048
Relevant EU Council Directives:	2006/42/EC (MACHINERY DIRECTIVE);
Applied EU Harmonised Stds:	EN 60204-1; EN ISO 12100; EN ISO 13857; EN 378-2.
Relevant Directives specified in EU Declaration of Conformity:	2014/30/EU (EMC); 2011/65/EU (RoHS) incl. (EU) 2015/863; 2009/125/EC (ErP) Reg (EU) no. 327/2011; 2014/68/EU (PED)

Signature of manufacture representatives:

Name:		Position:	Date:
1) A. Thomas		Engineering Director	12. 09. 22
2) C. Sargent		Manufacturing Director	12. 09. 22

Basis of Self Attestation: BS EN ISO 9001, BSI Cert No. FM 665203

Nuaire: A Trading Division of Polypipe, Weatern Industrial Estate, Caerphilly, CF83 1NA.

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 EU Council Directives: 2014/30/EU(EMC); 2006/42/EC (Machinery Directive).

To be read in conjunction with the relevant Product Documentation (see 2.1)

1.0 GENERAL

1.1 The equipment referred to in this Declaration of Incorporation is supplied by Nuaire to be assembled into a ventilation system which may or may not include additional components. The entire system must be considered for safety and EMC 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.

2.0 INFORMATION SUPPLIED WITH THE EQUIPMENT

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.

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 Nuaire.

2.3 Where warning labels or notices are attached to the unit the instructions given must be adhered to.

3.0 TRANSPORTATION, HANDLING AND STORAGE

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.

3.2 When handing 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.

3.3 Equipment stored on site prior to installation should be protected from the weather and steps taken to prevent ingress of contaminants.

4.0 OPERATIONAL LIMITS

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.

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.

4.3 Flanges and connection spigots are provided for the purpose of joining to ductwork systems. They must not be used to support the ductwork.

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).

5.0 INSTALLATION REQUIREMENTS

In addition to the installation leaflet requirements given for the individual product the following general requirements should be noted:

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.

5.2 The electrical installation of the equipment must comply with the requirements of the relevant local electrical safety regulations.

5.3 For good EMC engineering practice all control and sensor cables should not be placed within 50mm of 230V cables.

5.4 For fans with electronic speed control, protection against surges L/N-E is recommended on the supply.

5.5 Warning: The unit specified in this DoI is not to be used in a public low voltage network which supplies residential premises unless via a private distribution transformer. In a residential environment, this product may cause radio interference, in which case supplementary mitigation measures may be required.

6.0 COMMISSIONING REQUIREMENTS

6.1 General pre-commissioning checks relevant to safe operation consist of the following:

6.1.1 Ensure that no foreign bodies are present within the fan or casing.

6.1.2 Check electrical safety, e.g. Insulation and earth.

6.1.3 Check guarding of system.

6.1.4 Check operation of Isolators/Controls.

6.1.5 Check fastenings for security.

6.2 Other commissioning requirements are given in the relevant product documentation.

7.0 OPERATIONAL REQUIREMENTS

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.

7.2 If failure of the equipment occurs or is suspected then it should be taken out of service until a competent person can affect repair or examination (Note that certain ranges of equipment are designed to detect and compensate for fan failure).

8.0 MAINTENANCE REQUIREMENTS

8.1 Specific maintenance requirements are given in the relevant product documentation.

8.2 It is important that the correct tools are used for the various tasks required.

8.3 If the access panels are to be removed for any reason the electrical supply to the unit must be isolated.

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.

8.5 Care should be taken when removing and storing access panels in windy conditions.