Compact Make-up Air Unit
Specification and Installation Instructions

Description

The Neptronic Compact Make-up Air Unit (CMU) is designed to pull in fresh, tempered air from outside a building in order to replace existing air and continuously provide comfortable ventilation throughout the building.

Equipped with intelligent control strategies and the patented Neptronic EAS (Electronic Air Flow Sensors), the CMU maximizes efficiency and optimizes indoor air quality.

The advanced control strategies and optional BACnet MS/TP and Modbus RTU communication modules make it the ideal product for integration with the automation system of intelligent buildings, by enhancing user comfort and reliability.

CMU Series

Features

- Air flow range of 50 to 750CFM (85 to 1274m³/h)
- Sizes from 6" to 12" (152 to 305mm)
- Wide power range (1kW to 20kW)
- Voltage from 120V/1ph to 600V/3ph
- ΔT between 22°F (11°C) and 86°F (45°C)
- Multiple I/O support for advanced control strategies
- Patented Neptronic EAS (Electronic Air Flow Sensors)
- Ease of operation and maintenance, and enhanced comfort with Neptronic TDF digital room sensors
  - Display supply temperature
  - Configure CFM and temperature setpoints
  - Monitor alarms
- ECM and AC fan strategies
- Intelligent control strategies
  - Indoor air quality applications with integrated temperature, humidity, CO_2 and occupancy sensor
  - Dehumidification logic
  - Interlock with extraction fans
  - Outside air sensors prime heater coils for fast response and comfort
  - Static pressure PID algorithms, control of fresh air and return air
- Integrate with BMS and intelligent buildings via BACnet MS/TP or Modbus RTU
- Safety interlocks and thermal cutouts
- Schedule support

Network Communication

- BACnet MS/TP or Modbus communication (selectable via DIP switch)
- Select MAC address via DIP switch or via network
- BMS integration via BACnet MS/TP or Modbus
- Multiple BACnet/Modbus points to propel you towards the Internet of Things (IoT)
- Remote monitoring (status, alarms, diagnostics, and trending)
- Real-time feedback of output capacity
- Provides real-time temperature measures and power consumption data

BACnet MS/TP®

- MS/TP @ 9600, 19200, 38400, 57600 or 76800 bps
- Automatically assigns device instance
- Automatic Baud Rate Detection

Modbus

- Modbus @ 9600, 19200, 38400, 57600 or 76800 bps
- RTU Slave, 8 bits (configurable parity and stop bits)
- Connects to any Modbus master

Specifications

Technical data	CMU Series
Maximum outlet air temperature	200˚F (93˚C)
Maximum operating outlet temperature	95˚F (35˚C)
Inlet bushing	2 knockouts of 1 ⅜'' (35mm) or 1 ¾" (44.5mm)
Control signal	Modulating or Vernier control (select models)
Fan	AC or ECM fan
Air flow direction	Horizontal with reversible installation
Voltage, Current, Power, and Minimum air flow	See name plate
Certification	Intertek 4011008 — Complies to standards UL 60335-1 & UL 60335-2-40, CSA C22.2 No. 60335-1 & CSA C22.2 No. 60335-2-40

Models

Model	Collar Size	Voltage Code	Heating Capacity	Fan Type	Power Switch
CMU	**06**	**A**	**010**	**A**	**D**
CMU = Compact Make-Up Air Unit	**06 =** 6" **08 =** 8" **10 =** 10" **12 =** 12"	**A =** 120VAC/1ph **B =** 208VAC/1ph **C =** 220, 240VAC/1ph **D =** 347VAC/1ph **E =** 480VAC/1ph **F =** 600VAC/1ph **G =** 208VAC/3ph **H =** 400VAC/3ph* **I =** 480VAC/3ph **J =** 600VAC/3ph	**010 =** 1kW **015 =** 1.5kW **020 =** 2kW **030 =** 3kW **040 =** 4kW **045 =** 4.5kW **050 =** 5kW **060 =** 6kW **070 =** 7kW **080 =** 8kW **090 =** 9kW **100 =** 10kW **120 =** 12kW **140 =** 14kW **160 =** 16kW **180 =** 18kW **200 =** 20kW	**A =** AC Axial Fan **C =** ECM Axial Fan **D =** ECM Centrifugal Fan	**D =** Disconnect Switch **=** None

***** = *This option does not have ETL Certification*

Warnings

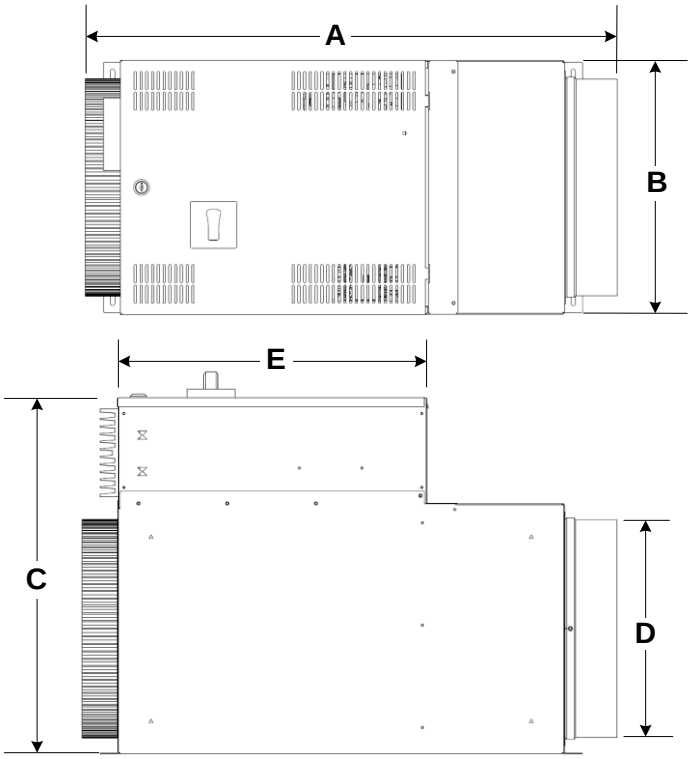
	**Caution, Risk of malfunction,** In case of alteration (drilling holes or other) to the electrical compartment, ensure proper protection of all electrical components installed. Chips may cause short circuit or affect operation of electrical components.
	Caution, Risk of damage and malfunction, Ensure minimum air flow, insufficient air flow will lead to opening of mechanical air flow switch (PDN or PDA) or electronic air flow sensors (EAS) and automatic thermal cutout. This may damage heating elements and controls.
	**Caution, Risk of malfunction**, Do not proceed with modification or alteration to internal electric connections or components of the make-up air unit. Any non-authorized modification will void the warranty.
	Important, This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children must be supervised to ensure that they do not play with the appliance.

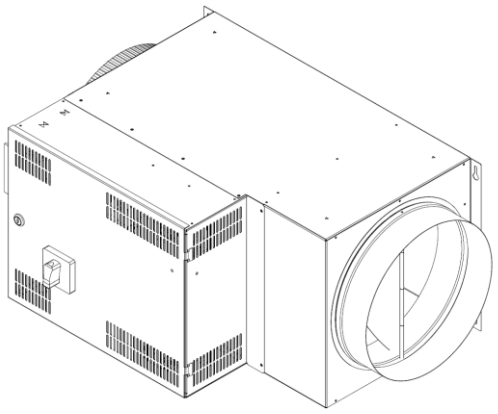
Handling

Warning, Risk of failure or malfunction. Do not operate the CMU if heating elements have been damaged during transport or handling.

- Protective packaging must be kept until installation.
- Product must be handled with care.

Dimensions





Models with Axial Fan

Models	Dimensions (inch) [mm]			Collar Size (inch) [mm]	Door Length (inch) [mm]	Maximum Air Flow (CFM) [m³/h]	Maximum Power (kW)
	A	B	C	D	E		
CMU06 (Small)	23 [584]	7.6 [193]	13.3 [338]	6 [152]	14.7 [373]	125 [212]	3
CMU06 (Large)	28.9 [734]				20.7 [526]		
CMU08 (Small)	24 [610]	9.6 [244]	15.3 [389]	8 [203]	14.7 [373]	320 [544]	8
CMU08 (Large)	30 [762]				20.7 [526]		
CMU10	27.7 [704]	11.6 [295]	17.3 [439]	10 [254]	16.7 [424]	650 [1104]	12
CMU12	28.8 [732]	13.8 [351]	19.3 [490]	12 [305]	16.7 [424]	750 [1274]	20

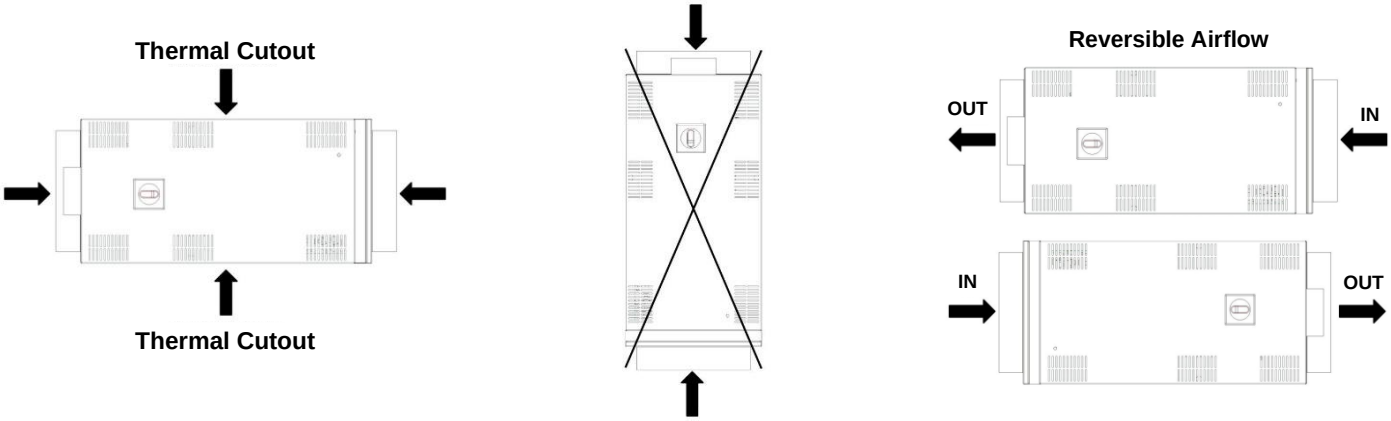
Models with Centrifugal Fan

Models	Dimensions (inch) [mm]			Collar Size (inch) [mm]	Door Length (inch) [mm]	Maximum Air Flow (CFM) [m³/h]	Maximum Power (kW)
	A	B	C	D	E		
CMU06	34.2 [869]	9.9 [252]	15.3 [389]	6 [152]	25.9 [658]	250 [425]	3
CMU08	31.5 [800]	11.9 [302]	17.3 [439]	8 [203]	22.2 [564]	350 [595]	8
CMU10	37.9 [963]	13.9 [353]	19.3 [490]	10 [254]	26.8 [681]	500 [850]	12
CMU12	41 [1041]	15.9 [404]	21.3 [541]	12 [305]	28.9 [734]	700 [1189]	20

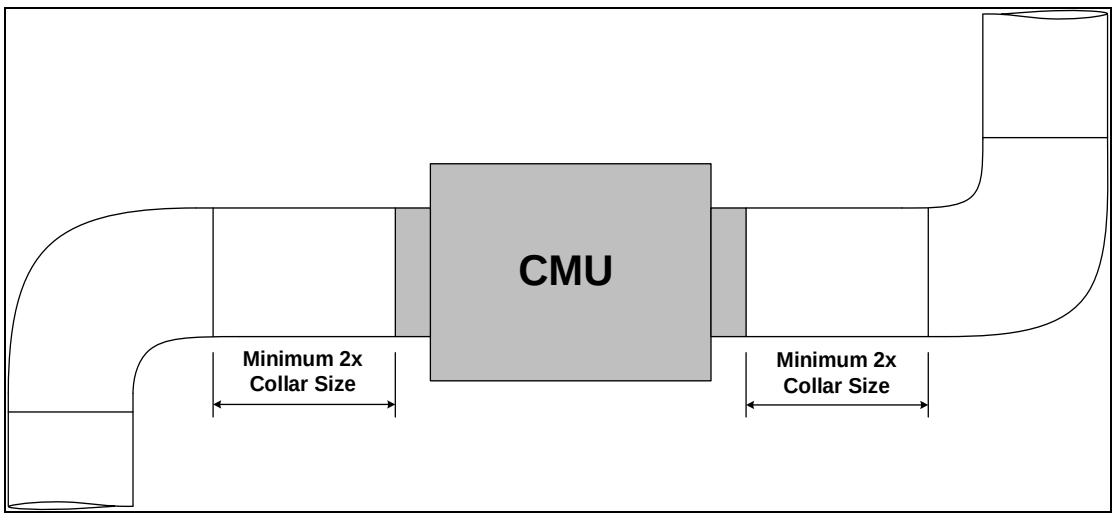
Mechanical Installation

Caution, **Risk of electric shock and burns.** Personnel must use appropriate personal protective equipment to protect themselves from risk of electric shock and burns due to contact with heating elements and bare live parts. Always proceed with caution when handling and servicing the CMU by following the appropriate lock-out procedures to ensure safety.

Caution, Risk of damage and malfunction. Do not block air flow to heating elements and ventialtion slots, as insufficient air flow may damage heating elements and controls.

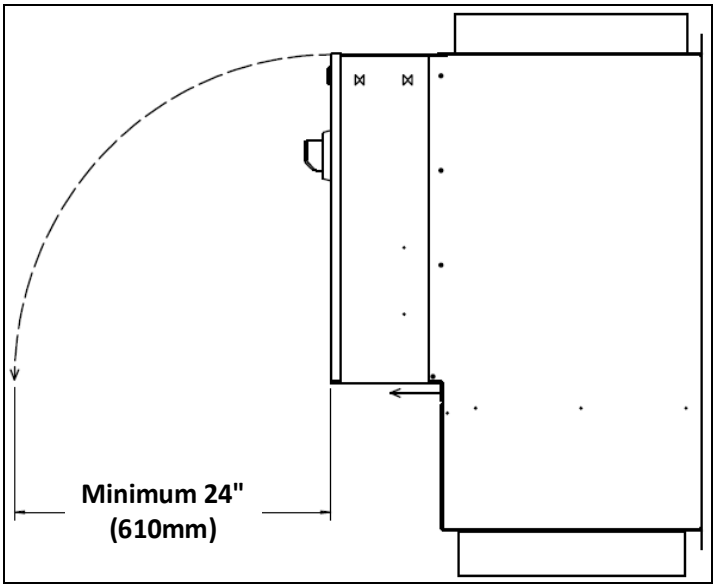


- The compact make-up air unit is designed to be installed for horizontal air flow only. Vertical installation is not recommended.
- The CMU is equipped with thermal cutouts both on top and bottom of the unit, which allow it to simply be rotated 180º to change the air flow direction without modifying the fan or wiring. The air flow direction from the fan itself is fixed and cannot be reversed. Before mounting the make-up air, determine the direction of air flow required and rotate the unit accordingly.
- The CMU is designed to preheat fresh air and not ambient air.
- For proper air flow, a minimum straight duct distance of 2x the collar size/duct diameter must be maintained upstream and downstream the CMU, between the unit and any obstacle, such as dampers, louvers and elbows.
- Use round insulated ducts for the inlet connection and uninsulated ducts for the outlet, while ensuring to minimize the use of elbows.
- When taking air directly from outside, install the inlet duct at an incline, in order to prevent condensation or melted snow from flowing into the unit.
- It is recommended to have a secondary damper before the inlet of the make-up air unit, in order to prevent a strong draft of wind from opening the damper in the unit. The secondary damper can be a gravity damper or a damper with an actuator.
- A louver with a bird protection grille must be installed on the air inlet.



Clearance

- Leave a minimum clearance of 24" (610mm) or equivalent to the length of the front access panel/door (see dimension E on page 3) + 1.5" (38mm) at the front of the unit, in order to provide sufficient space for accessing the electrical compartment and air filter, to ensure proper servicing.
- Other surfaces require zero clearance.

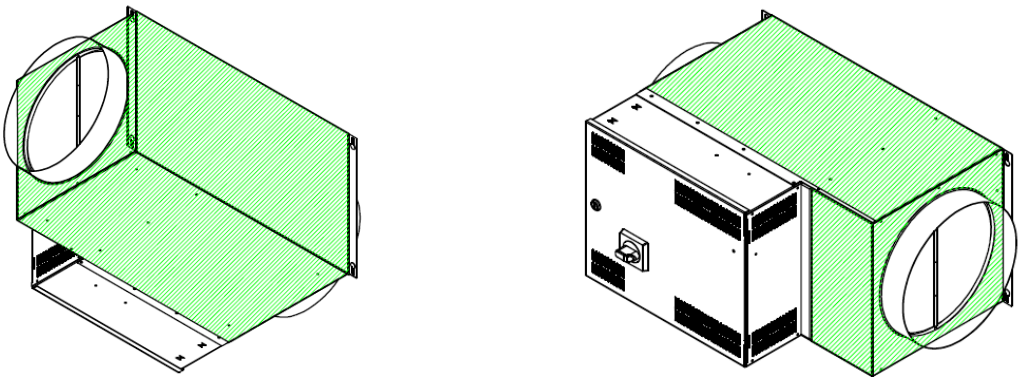


Insulation

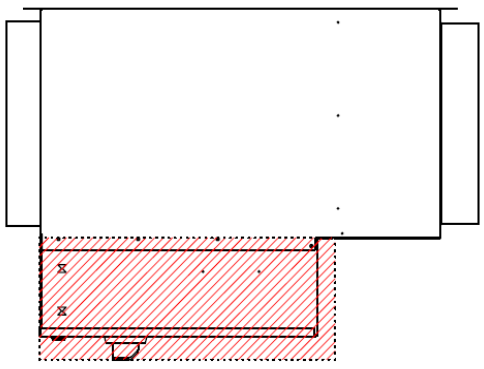
- Insulation may be added around the main surfaces of the CMU for energy conservation and noise reduction. The collars and ductwork preceding and following the CMU may be insulated.
- Insulation must be rated for temperatures of minimum 250°F (121°C) and must not have an R-value greater than 8 (typical R-value for 2" [51mm] thick fiberglass insulation).

Warning, Do not apply insulation on the control box, front access panel, heat sinks and filter of the CMU.

Surfaces that can be insulated

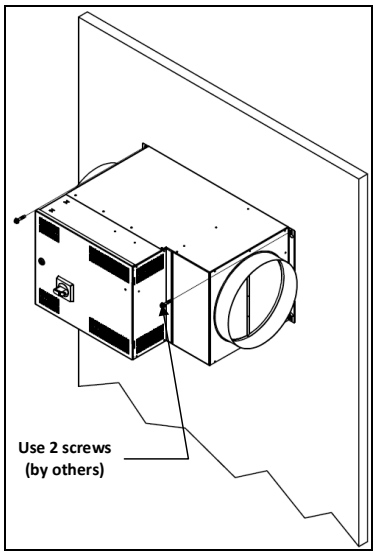


Surfaces that cannot be insulated



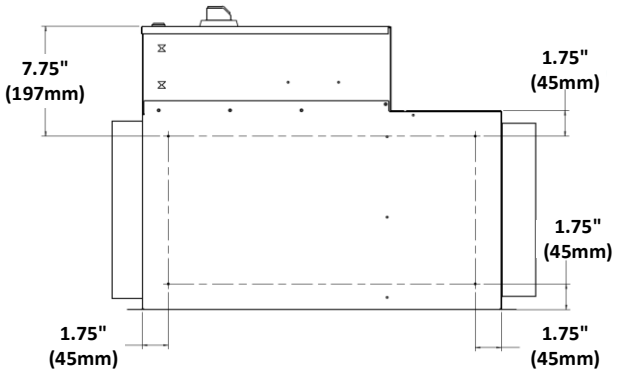
Wall Mounting

- Prior to installation, ensure that the strength of the chosen wall and supports conform to the requirements of local codes and regulations. The use of metal strut channels is recommended when wall mounting the unit (by others).
- Mount the unit at a minimum height of 6.5ft (2m) above the floor level.
- Mount the CMU using at least 2 screws of minimum #10 (M5) size (by others) using the keyholes located in the back of the unit and ensure that the installation is secure.

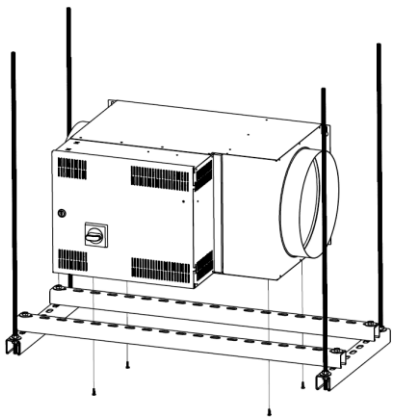


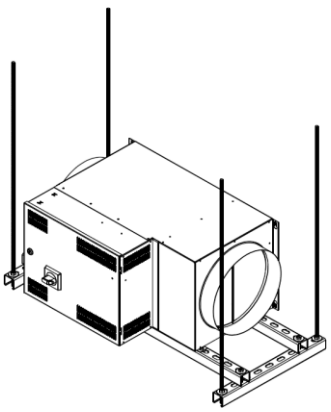
Ceiling Installation

- The CMU can be hung by the ceiling using an appropriate support platform (by others). Consult local codes and regulations for minimum structural requirements for such platforms.
- The CMU must be attached to the platform by use of 4 self-drilling screws of #10 (M5) size fixed at the designated locations indicated by the dimples on the bottom of the unit, as per the image below.
- The screws must not be inserted into the CMU at a depth of more than ¾" (20mm).
- Ensure not to install the bottom of the unit's front access panel directly onto the platform, as this will prevent it from opening.



Bottom View: Location of Mounting Holes





Electrical Installation

- **DANGER: Risk of electric shock**. Disconnect all electrical supplies before working on any circuit.
- **CAUTION: Risk of malfunction**. Use only copper wires suitable for 221˚F (105˚C).
- **CAUTION**: Electric installation must be done by qualified electrician and must conform to local electrical code.
- **CAUTION**: If a disconnect switch has not been supplied with control panel of the unit, an external disconnect switch must be installed on the supply.
- **CAUTION**: Gauge of electric supply wires must be of appropriate section, function of line current, as per local electrical code.

Power Supply Wiring

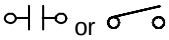
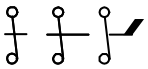
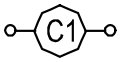
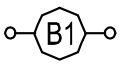
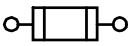
See the name plate for information for voltage and current.

- Connect all wires to appropriate terminals as per the **electrical diagram** affixed inside the control panel door.
- Correct connection and proper tightening must be verified before start-up, and after a short period of operation (typically after 2 weeks).

To quickly calculate the amperage, use the following formulas:

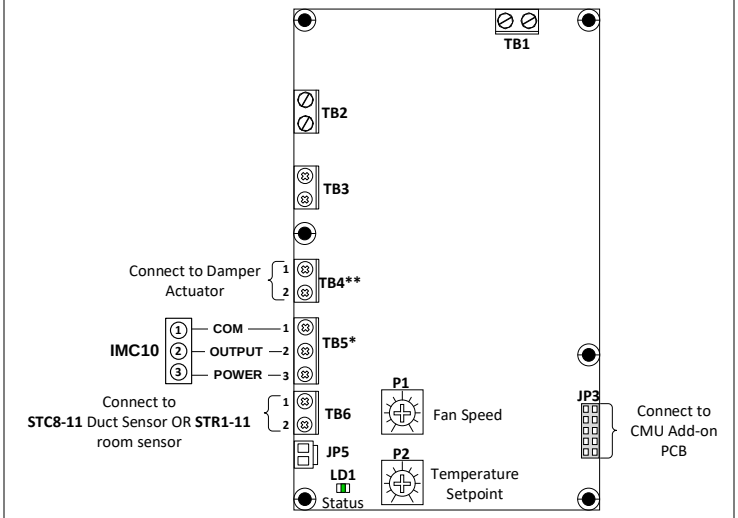
- Single phase: Amperage = Watts / Voltage.
  ex.: 10 kW at 240V/1 is equal to: 10,000 / 240 = 41.7A
- Three phases: Amperage = Watts / (1.732 x Voltage).
  ex.: 20 kW at 600V/3 is equal to: 20,000 / (1.732 x 600) = 19.2A

Electrical Diagram Legend

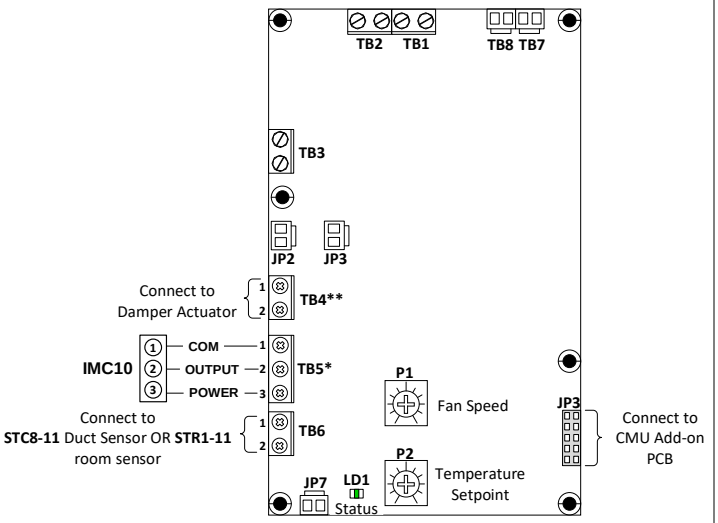
	Thermal cut-out automatic reset		Normally open contact	or L1 L2 L N	Single phase power supply terminals
	Thermal cut-out Manual reset		Disconnect switch	L1 L2 L3	3 phases power supply terminals
	Contactor coil		Heating element		Ground terminal
	Back-up safety contactor coil		Transformer	C	Common
	Normally closed contact		Fuse		Light

Main PCB Overview

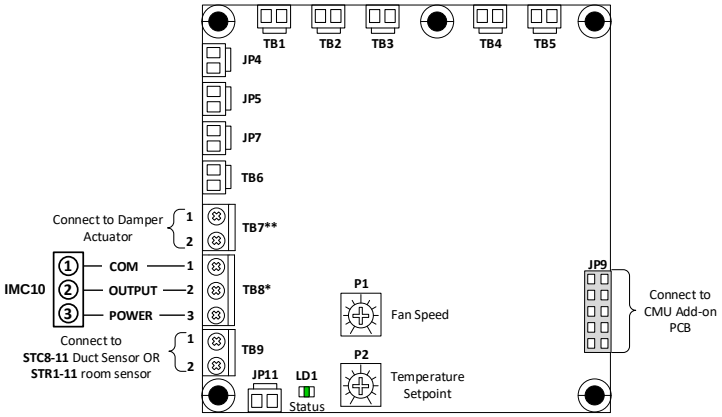
MAC1



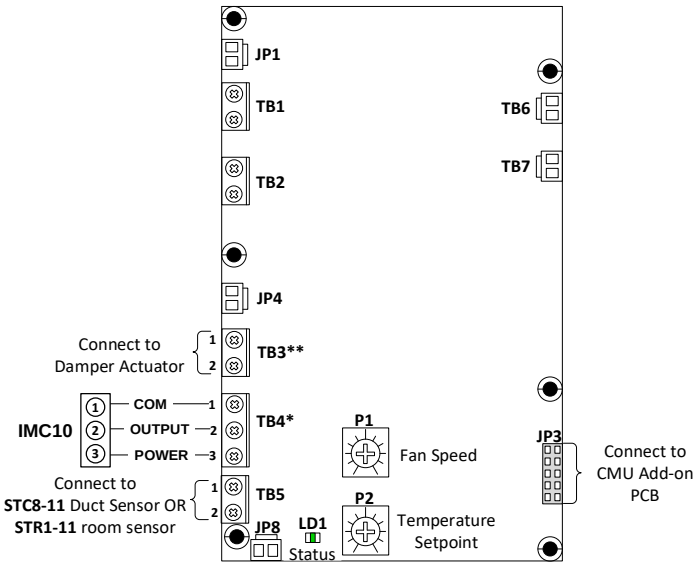
MAC2



MAC3



MAC4



** If the IMC10 Room Control Switch is not used, place a jumper or a dry contact for interlock between pins 1 & 2.*

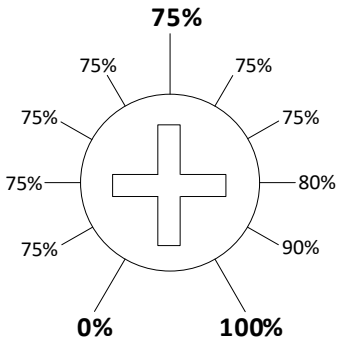
***This is a normally open dry contact that is rated for 24VAC and up to 1A, it closes when the CMU is in normal operation mode.*

Temperature and Air Flow Adjustment

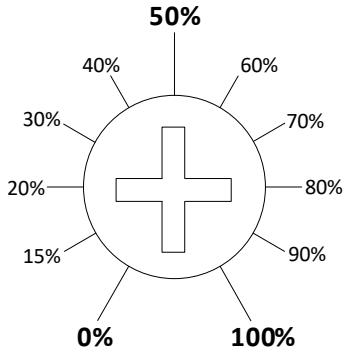
After installing and wiring the system, use the potentiometers on the PCB to adjust the desired temperature setpoint (P2) and the fan speed control (P1) to adjust the air volume. The fan speed must be adjusted based on the application to compensate for the specific static pressure of the installation.

For models with the optional add-on board with thermostat connection, the setpoint for air flow and temperature from the thermostat will override the physical setting of the potentiometers on the PCB.

Potentiometer P1 = Fan Speed Control

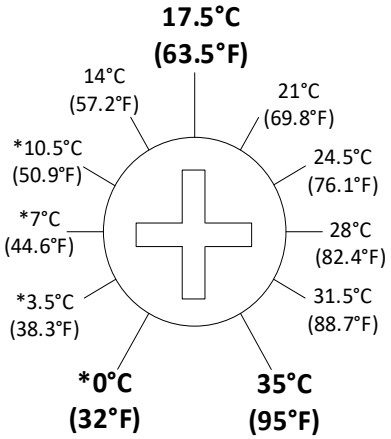


AC Fan Speed Settings



ECM Fan Speed Settings

Potentiometer P2 = Temperature Setpoint



**A minimum temperature of 12°C (53.6°F) will be maintained, even if the setpoint on the potentiometer is set to a lower value.*

Operational Conditions

Air Flow

- Air flow must not be lower than the minimum air flow indicated on name plate.
- Air flow going through the unit must be free of combustible particles, flammable vapour or gas.
- **Open Coil**: Air flow going through the unit must be free of dust.

Temperature Control

- For optimal and accurate measurement, it is recommended to use a duct sensor, especially in worst case scenarios in which the CMU is operating at its lowest speed with a high static pressure, for example, at a 75% speed with a static pressure of 0.2" WC (50 Pa) for AC axial fans.
- Install the STC8-11 duct temperature sensor at a minimum straight duct distance of 2-3 times the duct diameter between the sensor and any obstacle, such as the CMU's outlet, an elbow, a transition, etc., for accurate discharge air temperature rise detection.
- If the optional STR1-11 room temperature sensor is used instead of the STC8-11 duct sensor, install the STR1-11 at a location where it can accurately detect temperature rise.
- If the optional TDF thermostat is used for remote temperature control and its temperature control mode is set to "RAT" (room air temperature), make sure the TDF is installed at a location where it can accurately detect temperature rise.

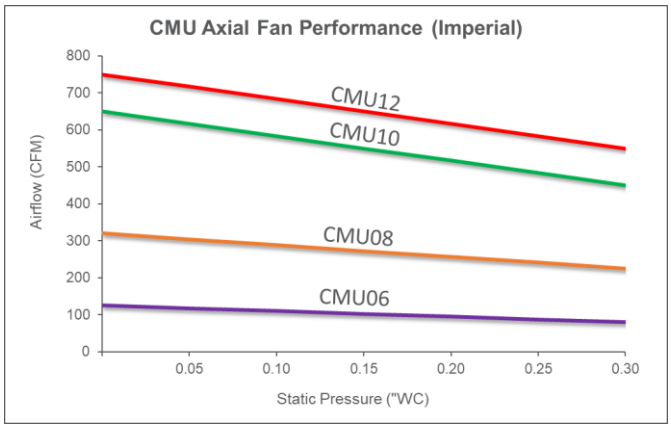
Zero Clearance Construction

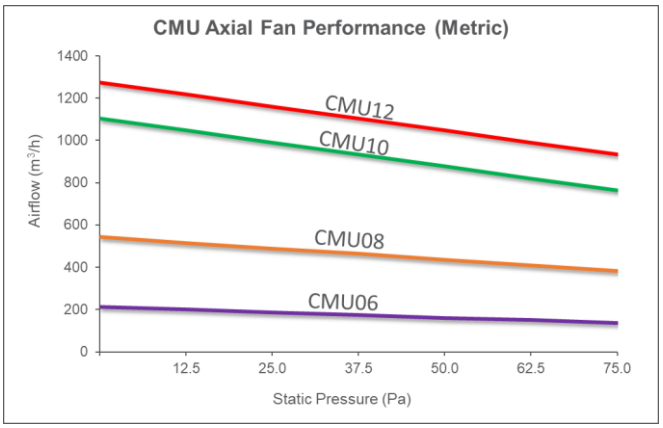
- Neptronic compact make-up air units are designed and approved for zero clearance to combustible material. Insulation material may be installed directly onto the CMU surfaces or onto air duct. However, the control panel must be accessible for maintenance.

Warning, Risk of fire and/or malfunction, Do not install insulation directly on heating elements.

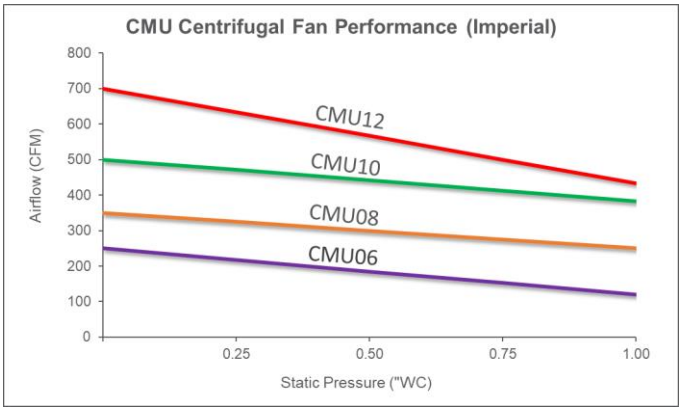
Fan Performance

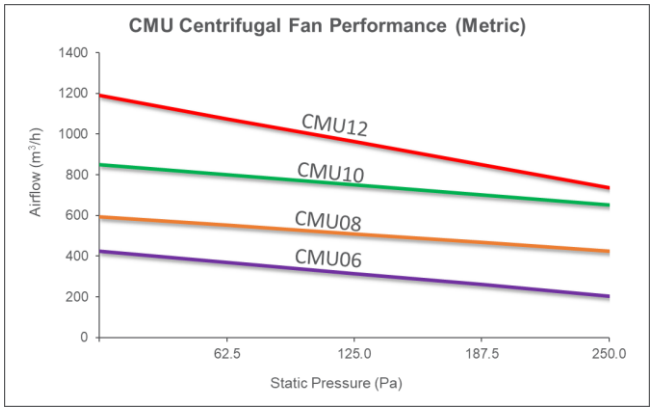
Axial Fan Performance



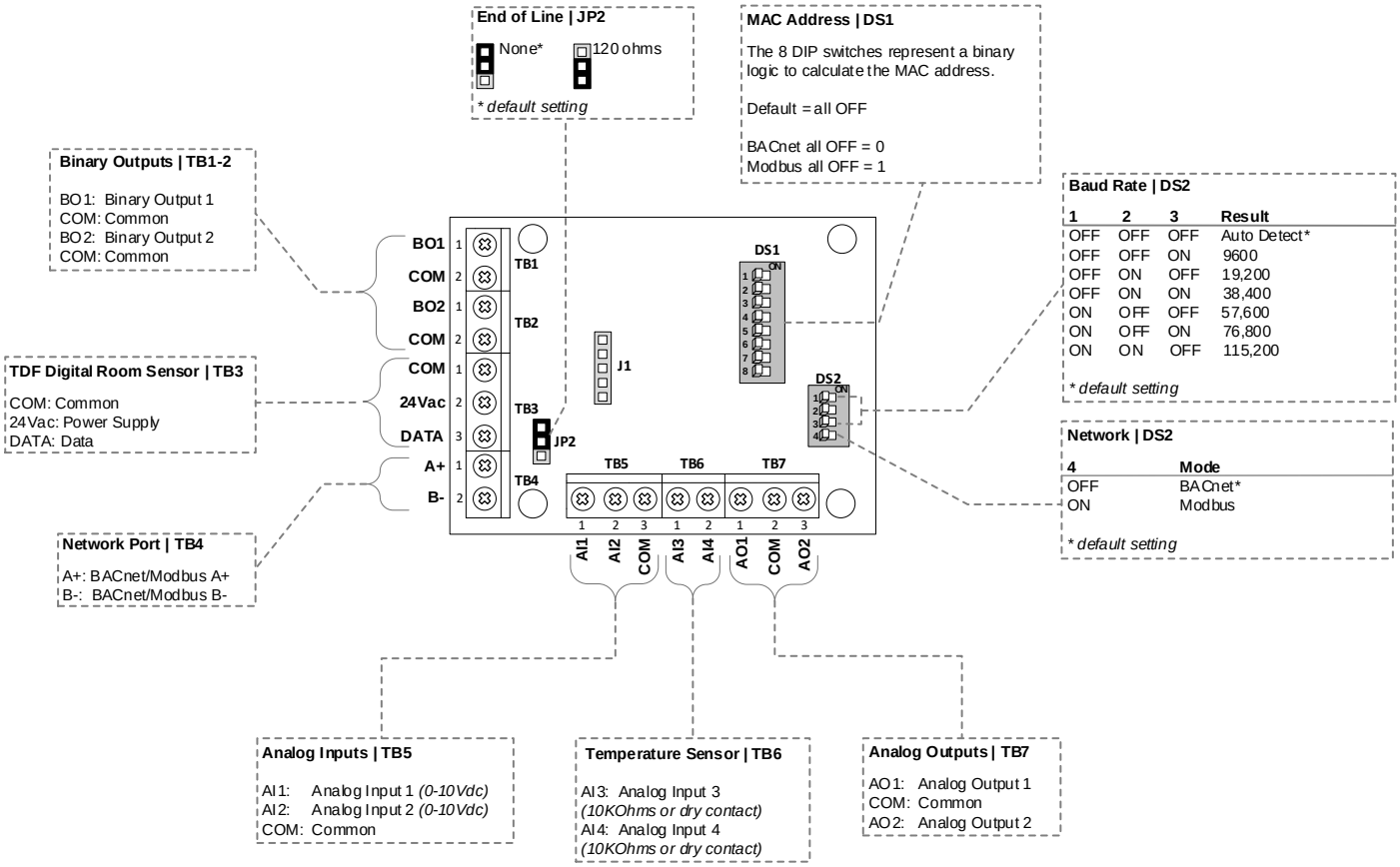


Centrifugal Fan Performance





Add-on PCB Overview (Option)



MAC Address DIP Switch (DS1)

MAC address for BACnet and Modbus communication, are selectable by DIP switch DS1 using binary logic.

BACnet

- Highest MAC address is 254.
- Default is all switches OFF = MAC address 0
- If you do not change device instance in program mode, it will be automatically modified according to the MAC address.

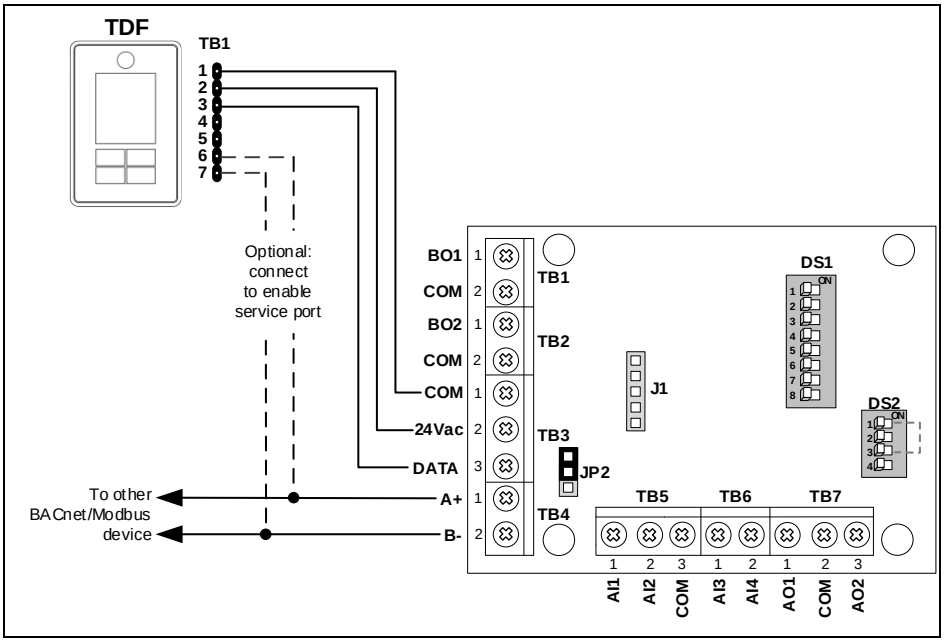
MAC Address	DS.1 = **1**	DS.2 = **2**	DS.3 = **4**	DS.4 = **8**	DS.5 = **16**	DS.6 = **32**	DS.7 = **64**	DS.8 = **128**	**Default Device Instance**
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	153000
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	153001
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	153002
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	153003
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	153004
…	…	…	…	…	…	…	…	…	…
126	OFF	ON	ON	ON	ON	ON	ON	OFF	153126
…	…	…	…	…	…	…	…	…	…
254	OFF	ON	ON	ON	ON	ON	ON	ON	153254

Modbus

- Highest MAC address is 247.
- Default is all switches OFF = MAC address 1
- MAC address is **binary value +1**
- There is no device instance for Modbus.

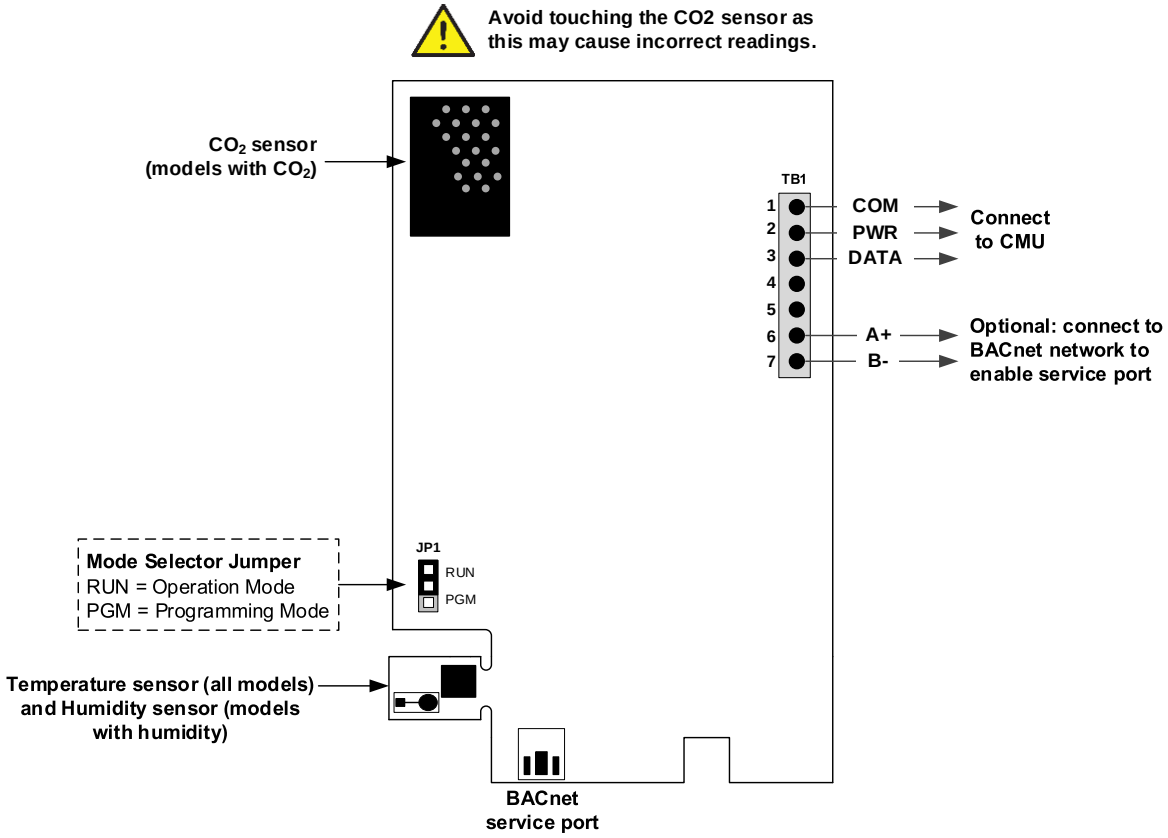
MAC Address	DS.1 = **1**	DS.2 = **2**	DS.3 = **4**	DS.4 = **8**	DS.5 = **16**	DS.6 = **32**	DS.7 = **64**	DS.8 = **128**
0+1 = 1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1+1 = 2	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
2+1 = 3	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
3+1 = 4	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
4+1 = 5	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
…	…	…	…	…	…	…	…	…
126+1 = 127	OFF	ON	ON	ON	ON	ON	ON	OFF
…	…	…	…	…	…	…	…	…
246+1 = 247	OFF	ON	ON	OFF	ON	ON	ON	ON

Wiring to TDF Digital Room Sensor



TDF PCB Drawing

3 wire cable (TB1 #1, 2 & 3)
Connect TB1 #6 (A+) & #7 (B-) to CMU to enable the BACnet service port.



Mode Selection (JP1)

JP1 RUN PGM	**RUN:** Digital Room Sensor is in **Operation Mode**. Digital Room Sensor must be set in this mode for normal system operation. If not locked, setpoint and control mode can be changed by the end user.
JP1 RUN PGM	**PGM:** Digital Room Sensor is set in **Programming Mode**. Refer to the following sections for more details.

Access to Menus (Add-on PCB and TDF Required)

The programming menu can be accessed using the TDF digital room sensor by connecting it to the optional add-on PCB. Ensure that the TDF Mode Selection jumper (JP1) is set to PGM. Use the following action buttons to access the menus and save changes using the TDF.

Action Buttons on TDF

Action Button	Task
	Press to access the programming menus and save any changes.
	Press to return to the previous step without saving.

LED Error Sequence

The output on the LED will show when the alarm is active. Following is the LED error sequence:

Error	LED Output
Duct Sensor Fault	Blinks 5 times and stays ON for 5 seconds.
Airflow Sensor Fault	Blinks 10 times and stays ON for 10 seconds.
Automatic/Manual Cutout Tripped	Blinks 15 times and stays ON for 15 seconds.
Normal Operation	Blinks once every 2 seconds.
Any other Scenarios*	LED stays on continuously till the alarm is reset.

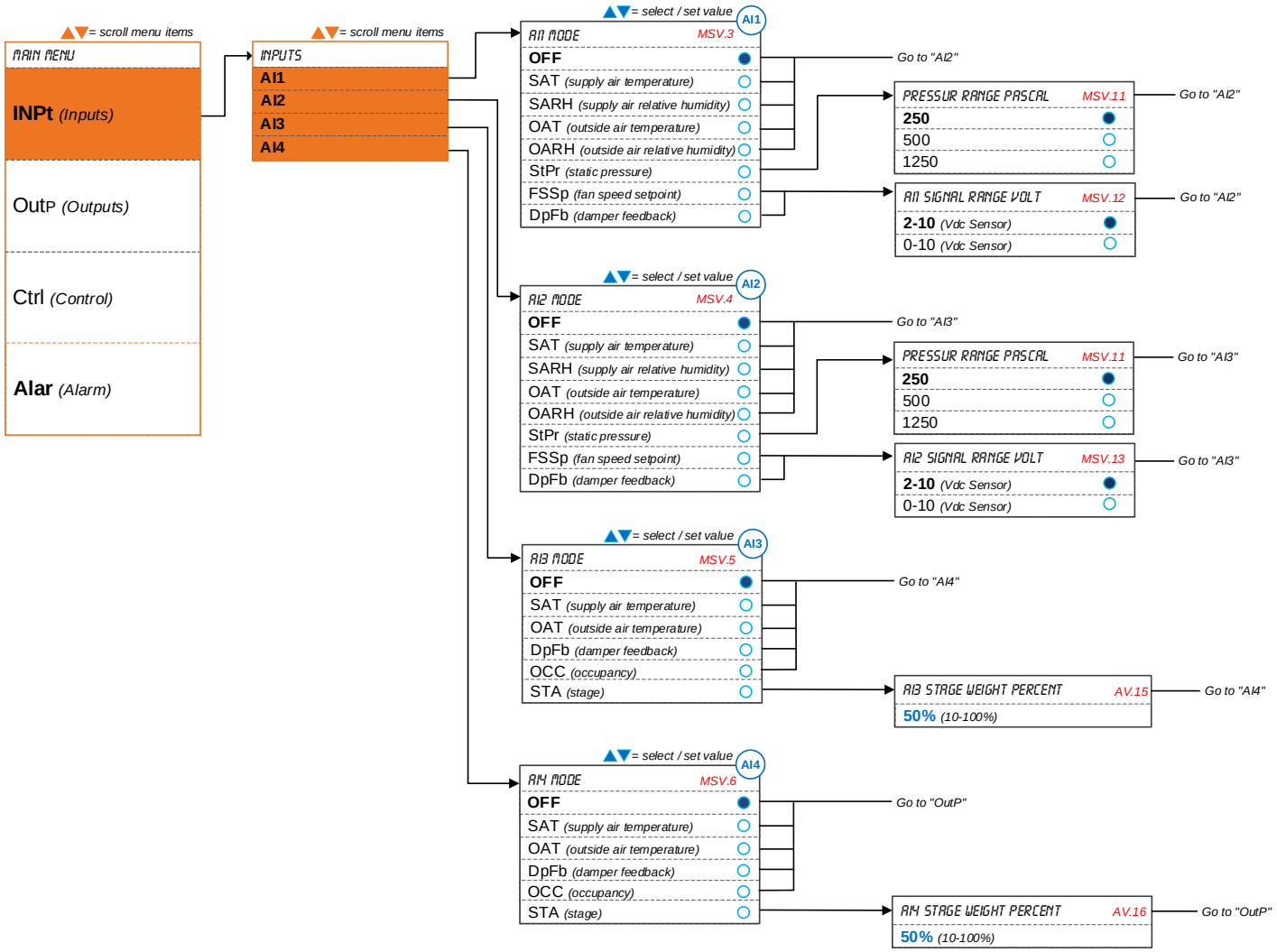
* Other scenarios can include but not limited to:
1. Error in Feedback for ECM Fans
2. Incorrect configuration of the IO's on the COM board
3. Communication error between Add-on and Host Board

For the above scenarios, please contact tech support at the factory for assistance.

Inputs – Menu Overview (1 of 4) | *AI1 to AI4*

Main Menu	Sub Menu	Configuration

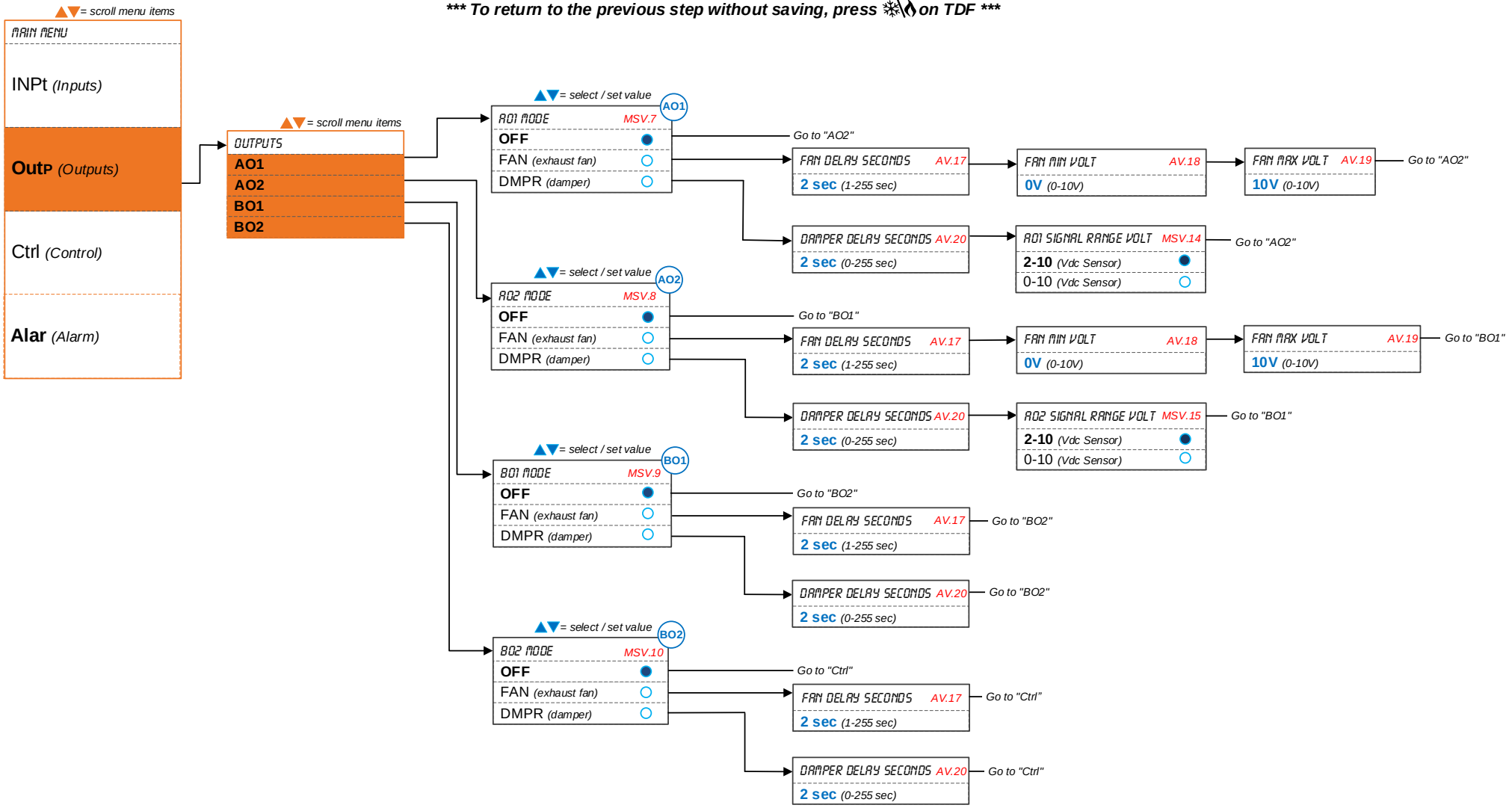
****** To save any changes, press on TDF ******
****** To return to the previous step without saving, press on TDF ******



Outputs – Menu Overview (2 of 4) | *AO1, AO2, BO1 and BO2*

Main Menu	Sub Menu	Configuration

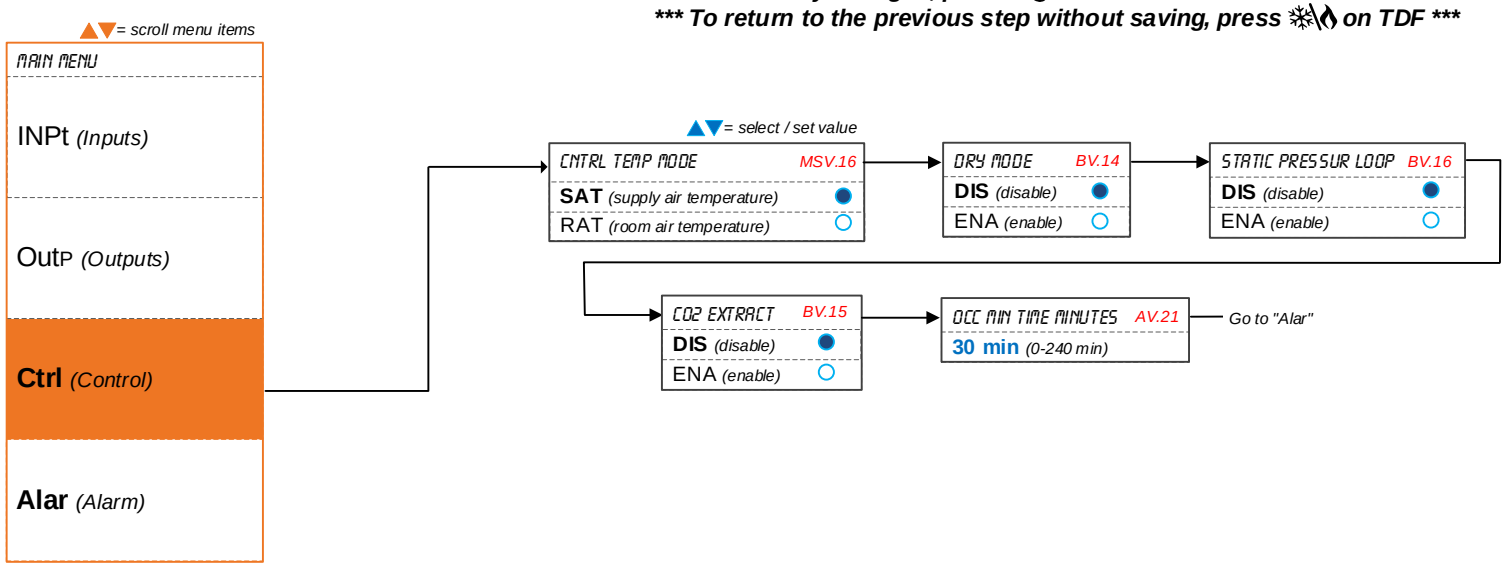
*** To save any changes, press on TDF ***
*** To return to the previous step without saving, press on TDF ***



Control – Menu Overview (3 of 4) | *Ctrl*

Main Menu	Sub Menu	Configuration

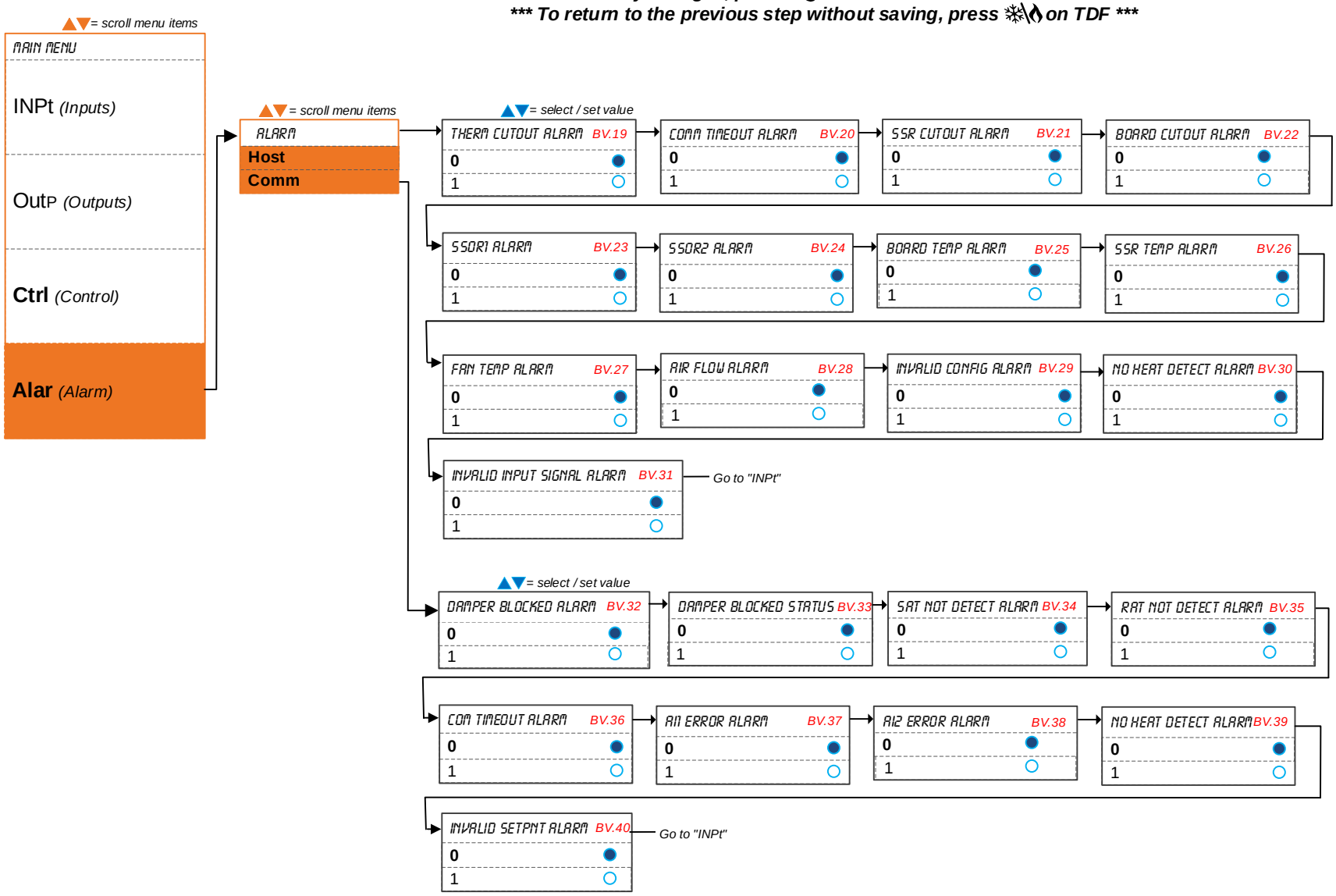
****** To save any changes, press on TDF ******
****** To return to the previous step without saving, press on TDF ******



Alarm – Menu Overview (4 of 4) | *Alar*

Main Menu	Sub Menu	Configuration

*** To save any changes, press on TDF ***
*** To return to the previous step without saving, press on TDF ***

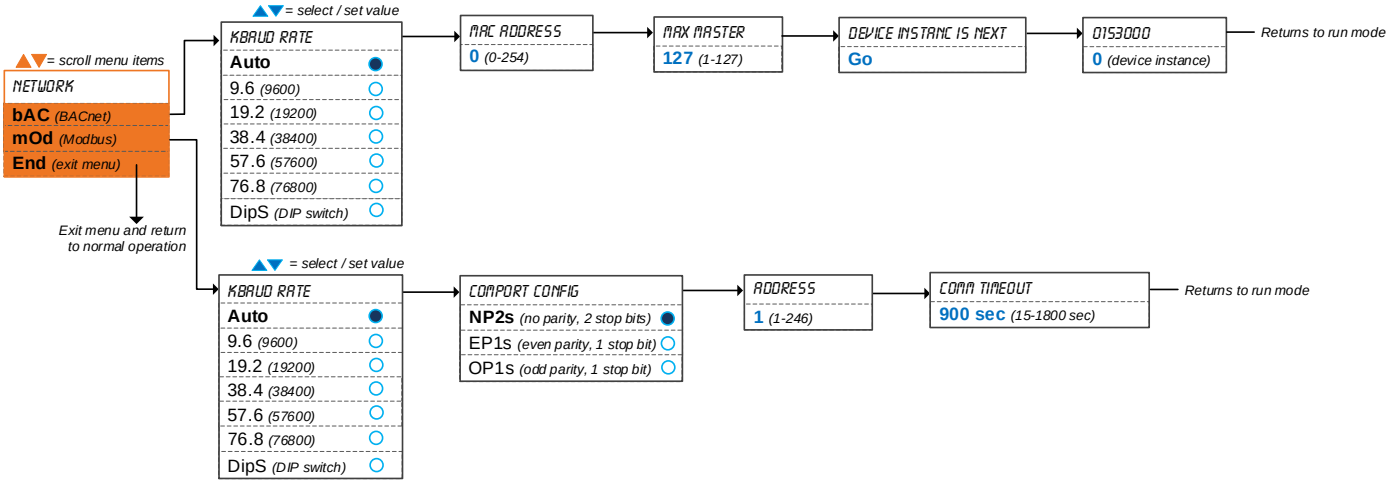


Operation Menus

This menu is accessible through normal operation mode using the TDF digital room sensor.

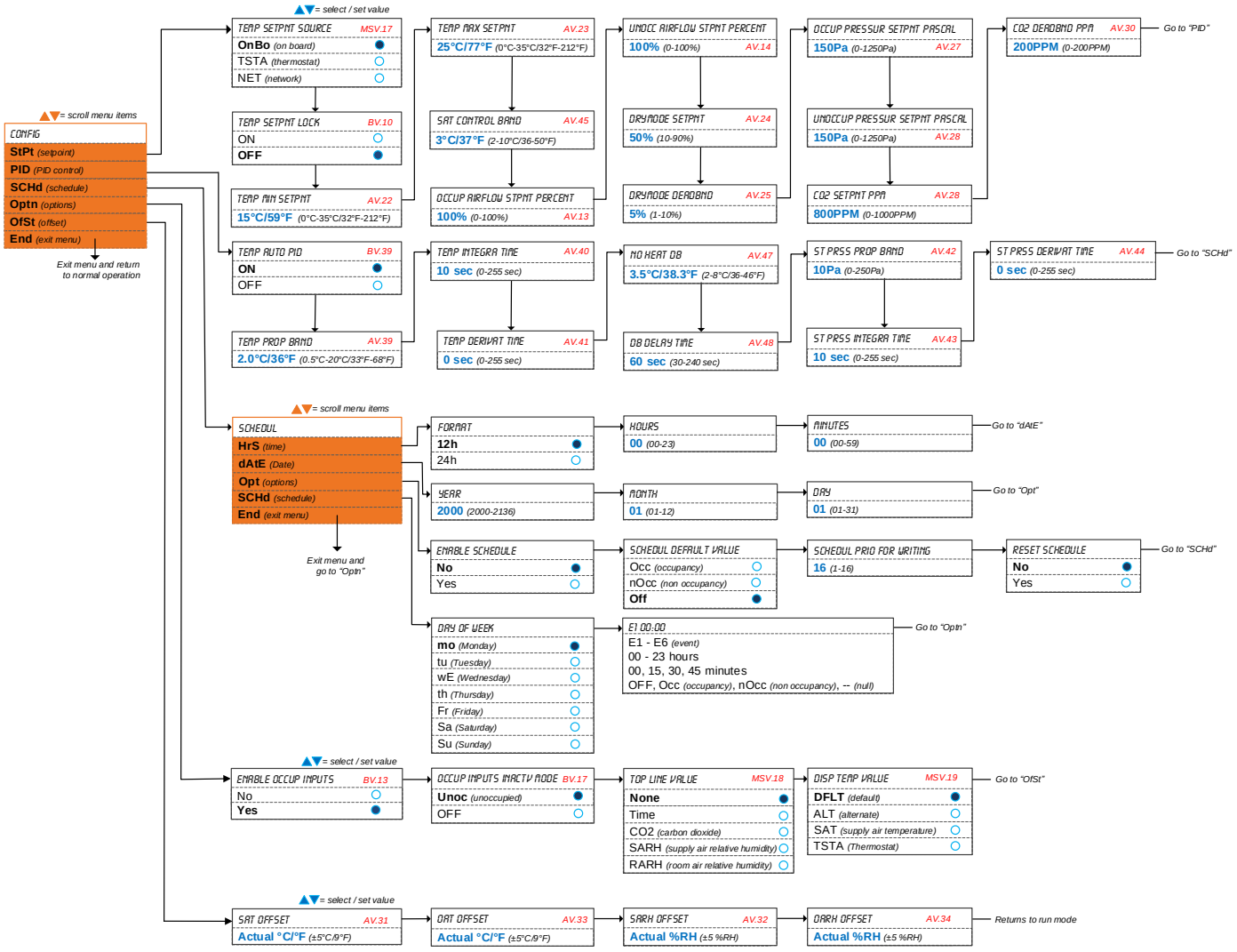
1. The Mode Selector jumper (JP1) of the digital room sensor must be set to the "RUN" position (Operation Mode).
2. Press the and buttons simultaneously for 5 seconds. The *"ENTER PASSWORD"* screen appears.
3. Enter the password within 1 minute by using the arrow keys to increase or decrease the value and the and buttons to toggle between the digits.
   a. Password **637** = Network Settings Menu
   b. Password **757** = Configuration Menu
4. If you enter the wrong password, the digital room sensor displays "**Eror**" and returns to Operation Mode. The digital room sensor will return to normal mode if you navigate through the entire menu and do not make any selection, or if you do not press any key for 5 minutes. The changed values will be saved automatically.

Menu 637 – Network Settings



****** To save any changes, press on TDF ******
****** To return to the previous step without saving, press on TDF ******

Menu 757 – Configuration



****** To save any changes, press on TDF ******
****** To return to the previous step without saving, press on TDF ******

Start-up Procedure

Initial verification and start-up must be carried out by suitably qualified personnel.

It is strictly recommended to follow this start-up procedure to avoid any anomaly resulting from inaccurate installation of the components.

Initial Verification

Clearance

1. Ensure that the Make-Up Air Unit is installed in a location in which the unit can be serviced correctly. ☐

Electrical Supply

2. Verify that the power supply (voltage) conforms to the name plate on the side of the unit's control panel. ☐

Controls

3. Ensure that the STC8-11 duct temperature sensor is adequately installed into the discharge ventilation duct at a minimum straight duct clearance of 2-3 times the equivalent duct diameter. Verify that it is wired to the unit's main circuit board. ☐
4. If the STR1-11 room temperature sensor is used instead of the STC8-11, ensure that it is installed in the space at a location where temperature rise can adequately be detected. Verify that it is wired to the unit's main circuit board. ☐
5. Verify that the fan speed and temperature setpoints are properly adjusted via potentiometers P1 and P2 respectively on the main circuit board. ☐
6. Ensure that a room control switch is installed properly and wired to the IMC10 terminal block on the unit's main circuit board. If an IMC10 is not used, verify that a jumper or a dry contact for interlock is connected between pins 1&2 of that terminal block. ☐
7. If a wall mount TDF controller is used, verify that it is correctly installed and properly connected to the unit's plugin circuit board. Verify that the setpoints are properly adjusted and confirm the control set-up. ☐
8. Turn the power on using the disconnect switch or circuit breaker. ☐

Start-Up

Start-up

1. Proceed to start-up the Make-Up Air Unit, as follows:
   a) Turn on the Make-Up Air Unit using the disconnect switch or circuit breaker. Verify that the Status LED on the main circuit board is blinking once every 2 seconds. ☐
   b) Verify that the unit's fan is operating and that its inlet damper is open. ☐
   c) Verify that the temperature sensor is detecting a rise in temperature while the unit is operating. ☐
   d) Verify that the unit is modulating its heat output to maintain selected temperature setpoint. ☐

End

2. The Make-Up Air Unit is now ready for normal operation. ☐

Maintenance

Neptronic make-up air units do not require specific maintenance; however, we recommend a **yearly** inspection, typically before the winter season or after a long term shut down.

Visual Inspection

Risk of electric shock. Disconnect all supplies before any visual inspection.

- Verify condition of heating elements.
- Heating element must be clean and free of dust or lint.
- **Open Coil**: Carefully verify that there is no dust accumulation. Any dust of lint accumulation can lead to fire hazard.
- Verify any indication of overheating conditions (discoloration) as well as any trace of oxidation (rust).

Electrical Inspection

Risk of electric shock. Disconnect all supplies before any electrical inspection.

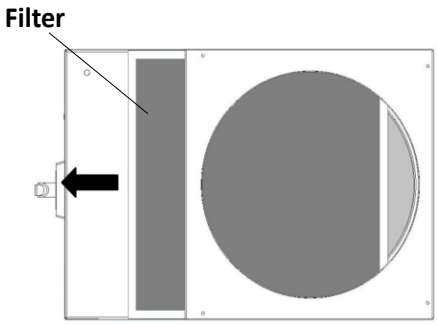
- Verify that electrical connections are correct and properly tightened.
- Verify the condition of fuses.
- Verify resistance of each circuit against ground.
- Verify correct operation of contactor(s).
- *If necessary, electrical components must be replaced only with identical origin components.*

Filter Maintenance

Risk of electric shock. Disconnect all supplies before removing and inspecting the filter.

- CMU is equipped with a filter that must be washed at regular intervals.
- Check the filter after two months of operation.
- To take out the filter, remove the access cover by disconnecting the two screws.
- If the filter is extremely dirty, increase the frequency of inspections.
- Ensure that the filter is dry before replacing it.

Warning, the CMU must always have a filter installed at this location even if an auxiliary filter is used.



General Warranty

This product is subject to the terms and conditions described at http://www.neptronic.com/Sales-Conditions.aspx.

Technical Support

For any questions or specific requests, please consult our web site: www.neptronic.com
Or call: **1 800 361-2308** or **(514) 333-1433**.

Notes

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