CALOREK | GEOTHERMAL HEAT-PUMP

MULTI-ZONE HEATING AND AIR CONDITIONING SYSTEM

INSTALLATION MANUAL



-WTA series residential

-Water to air geothermal heat pump

-Residential vertical packaged unit

-model sizes 3ton, 5ton variable speed

-DC Inverter with adaptive algorithm technology

-The ZoneMax advanced zoning system

-R-410A

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Installation manual - WTA036/60
2022
IM-EN-WTA36/60-00

CALOREK MULTI-ZONE HEATING AND AIR CONDITIONING SYSTEM

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WARNING

- **Before installing or using this product, you must read and understand these guidelines and keep them for future reference. The manufacturer will not be held responsible for anything that happens and the warranty will not be valid if the installer and/or the user does not meet these guidelines. This product must be installed by a qualified person and connected by a certified electrician in accordance with the different codes in force in your area.**
- **The non-compliance of these guidelines could result in personal injury, property damage, serious injury and electric shocks potentially fatal.**
- **Make sure that all screws and connections of electrical connection are tight before attempting to operate the device in the case they are released during transport.**
- **Protect the device using the circuit breakers or fuses appropriate in referring to the codes in force in your area.**
- **It is necessary to install an air filter in the return duct.**
- **Make sure that the power supply (voltage) corresponds to that indicated on the rating plate.**
- **This appliance must be grounded.**
- **Turn off the power supply to the appliance at the circuit breaker/fuse before proceeding with the installation, repair, and maintenance.**
- **Make sure that the appliance is designed for the intended use (if necessary, consult the catalog of products or a representative).**
- **Observe the distances and the positions mentioned in the installation section of this guide.**
- **If the installer or user modified the device in any way, it will be held liable for any damages resulting from this change and the UL certification and warranty will be canceled.**
- **This device must not meet a source of water and must be protected from splashing (ex.: water mop). Do not use if any part has been submerged. In addition, do not enable or do not disable when your feet are in the water, or you have wet hands.**
- **When you cut a section of steel for the installation of the return duct, make sure that you do not damage the electrical wiring of the unit.**
- **Do not insert foreign objects into the air inlets and outlets of the appliance, as this could damage it and cause an electric shock or a fire.**
- **The machine can produce electrical arcs (sparks). It is not designed to be used or stored in damp areas or containing flammable liquids, combustible materials and corrosive products, abrasives, chemical or explosives such as, but not limited to, paint, gasoline, chlorine, and cleaning products.**
- **Some places are dustier than others. It is therefore the responsibility of the user to evaluate whether it should change the filter according to the quantity of dirt accumulated on the latter.**
- **There is a risk of fire if the product is not installed and cleaned in accordance with these guidelines.**
- **If this device is damaged or defective, cut its electric power supply to the circuit breaker/fuse and do the repair in a repair center recognized (refer previously under the terms of the limited warranty).**
- **Identify all wires before disconnecting the device to ensure you to connect correctly by the suite. A bad connection can cause a malfunction and present a danger.**

1 SPECIFICATIONS

Model			WTA036	WTA060
AHRI reference #			205145526	207657412
Energy star			yes	yes
Power supply		V/ph/Hz	208-240/1/60	208-240/1/60
Heating	Capacity	Btu/h	36,000	60,000
	Capacity min-max	Btu/h	6,000 - 36,000	12,000 - 60,000
	Current	A	14	32
	Input	W	2912	6656
	Full load COP (GLHP)	W/W	3.46	3.15
	Part load COP (GLHP)	W/W	4	4.26
Cooling	Capacity	Btu/h	36,000	60,000
	Capacity min-max	Btu/h	6,000 - 36,000	12.000 - 60,000
	Current	A	14	32
	Input	W	2912	6656
	Full load EER (GLHP)	Btuh/W	14.77	13.40
	Part load EER (GLHP)	Btuh/W	24.20	27.45
Design pressure	High	PSIG	550	550
	Low	PSIG	240	240
Electrical data				
Maximum breaker or fuse		A	20	40
Minimum ampacity		A		
Air handler model			CCV1400EC	CCV2200EC
Blower motor specifications	Model		M055PWDGV-0566	5SME39SXL3222
	Type/speed		ECM/Variable speed	ECM/Variable speed
	HP		1/2	1
	Voltage	V	208 - 240	208 - 240
	Output	A	4.2 – 3.8	12.8 - 7.4
Blower wheel / cage model		In.	DC-1020-800-5	DC-1020-1020-5
Air handler air flow @ 0.2 H2O		CFM	1200	2200
Refrigeration system				
Factory charge R410A		Lb (oz)	5.75 (92)	6.5 (104)
Compressor	Model		TNB306FPGMC	ZPV0382E-2E9-130
	Type		Variable speed rotary	Variable speed scroll
	Brand		Mitsubishi electric	Emerson
Metering device type			EEV	EEV
Source side heat Exchanger	Model		C-6611-01	R051-64W-S79
	Type		Coax	Brazed plate Ex.
	Water Connections		3/4” MPT	1” MPT
	Stainer mandatory		no	yes
Load side heat Exchanger	Model		CAUF4860C6DB	CAUF4860C6DB
	Type		A coil	A coil

2 SYSTEM GENERAL DESCRIPTION

The WTA series is a water source central air treatment system that can heat or cool, coupled with an advanced zoning system. The heat pump compressor and the ECM blower are both featuring variable speed capability. The compressor adapts its speed according to the load (airflow, return air temperature and RH) and the ECM blower adapts its speed according to the number of zones in demand.

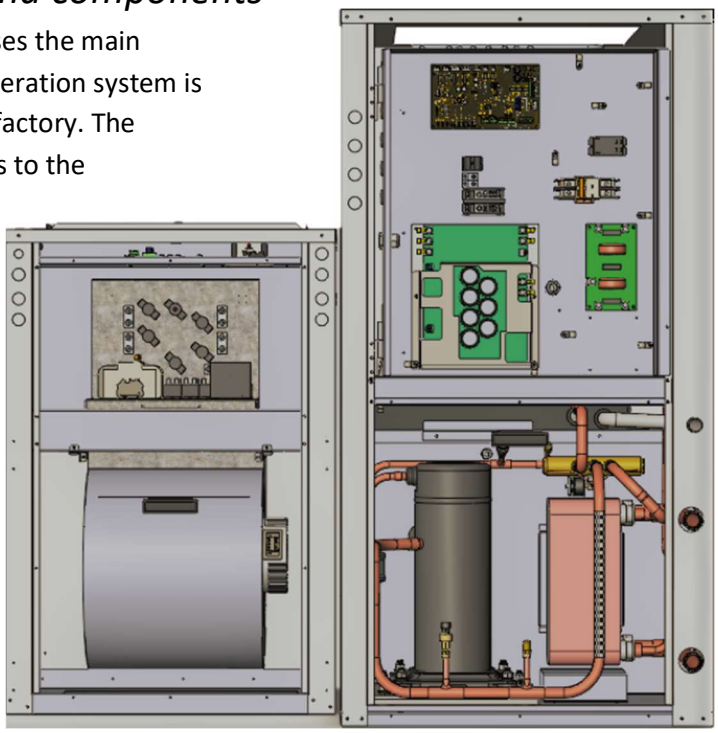
The ECM blower delivers balanced airflow to each zone with an adjustable external static pressure ranging 0.1 to 1.2 in. WC. This allows for the installer to adjust if needed. This product must be installed by a qualified person and proper duct calculation.

Being a WSHP “water source heat pump” the WTA series does require a means of heat source/sink either with an **open well ground water loop**, **closed ground loop** or **closed water loop**

The whole system is an assembly of different modules: The heat pump unit, air handler unit, backup heater module, air distribution modules and zoning panels “ZoneMax”

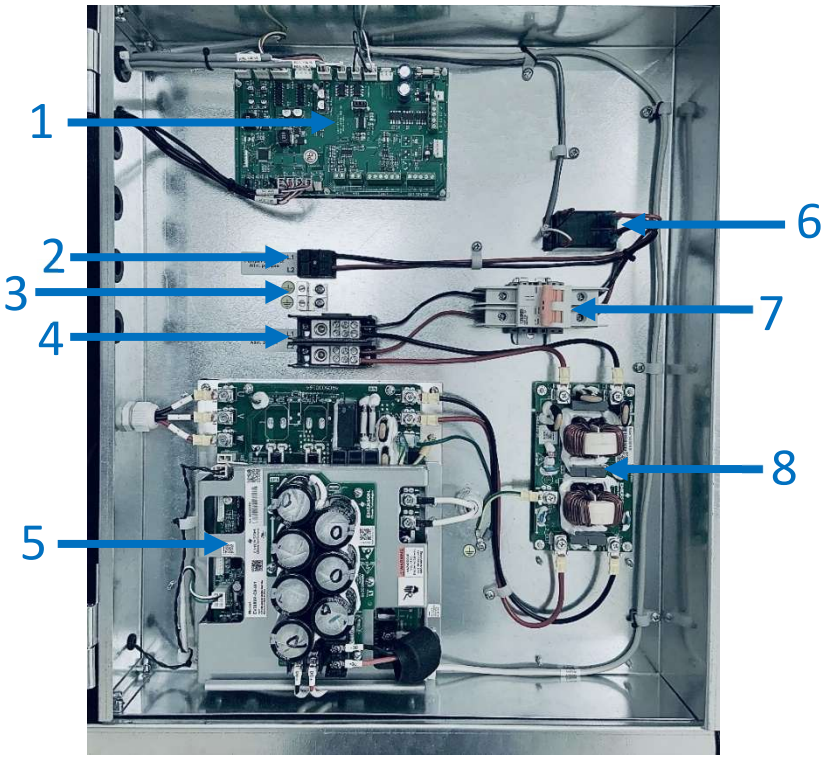
2.1 Heat pump unit description and components

At the heart of the system, the heat pump unit comprises the main electrical panel and the refrigeration system. The refrigeration system is fully packaged in this unit and properly charged at the factory. The electrical panel is hinged so it can tilt to give free access to the refrigeration system components.



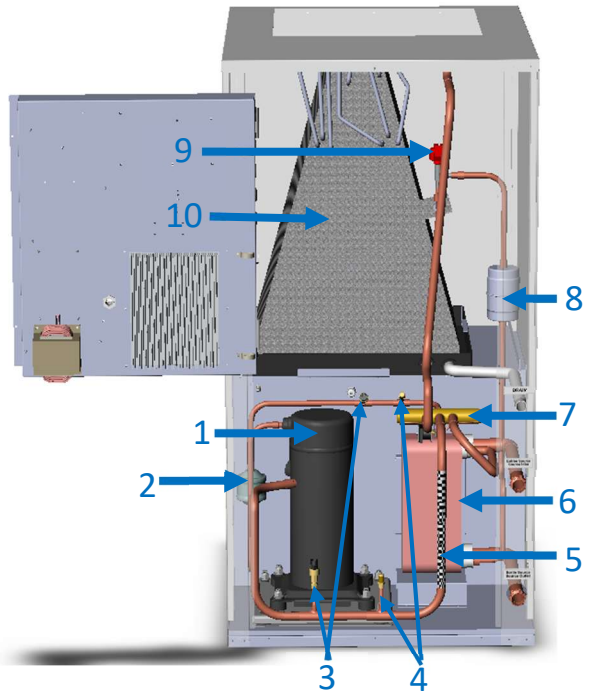
2.1.1 Heat pump unit main electrical panel components

1- **Main control board**
2- **208-240Vac water pump power out**
3- **Ground lugs**
4- **208-240Vac power in**
5- **Compressor drive**
6- **Water pump relay**
7- **Water pump breaker**
8- **EMI filter board**

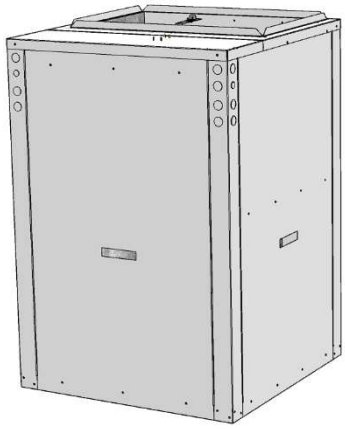


2.1.2 Refrigeration system components

1- **Variable scroll compressor**
2- **Discharge muffler**
3- **Discharge/suction pressure sensor**
4- **Low side/high side access valve**
5- **3/4" Vibration absorber**
6- **Brazed plate source heat exchanger**
7- **4 way reversing valve**
8- **Bi-polar in line filter dryer**
9- **Metering device – EEV**
10- **A coil load heat exchanger**



2.2 Air handler/heater module description and components



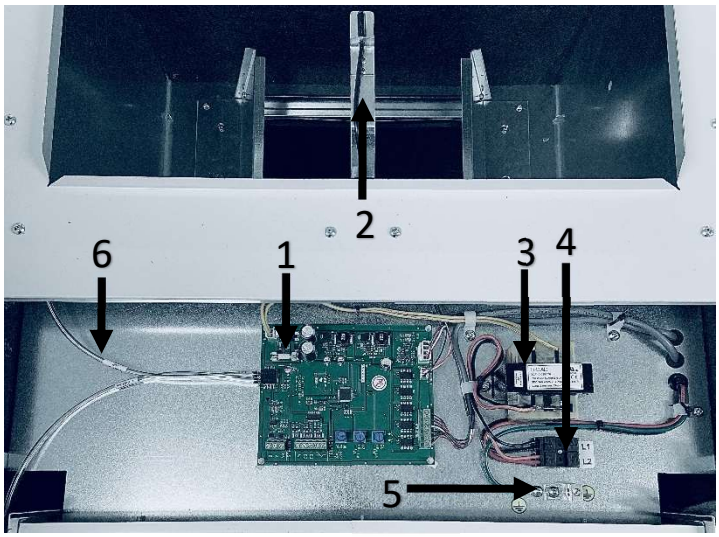
The air handler/backup heater module can come with blower only or preassembled with an optional electric backup heater. Return opening can either be install on the left or right side as needed on site. The CCV1400 or CCV2200 air handler, coupled with our ZoneMax zoning system makes it possible to supply treated air to several zones in a simple way and efficient. The system can also be installed with a third-party modulating heat pump approved by Calorek Technology or with our water-to-air geothermal heat pumps.

The ECM modulating blower of the air handler unit is fully variable. It's controlled to provide a constant air flow to each zone in demand, regardless of the number of simultaneous demands. The more zones there are in demand at the same time, the more the blower will increase in power and vice versa.

The optional CSE electric heater are controlled to provide only the power required according to the number of simultaneous demands. Five electrical elements are independently switched to maintain a constant supply temperature.
Finally, the ZoneMax zoning system allows installations of up to 16 zones. It also controls certain third-party heat pumps approved by Calorek Technology as being capable of performing well under zoning.

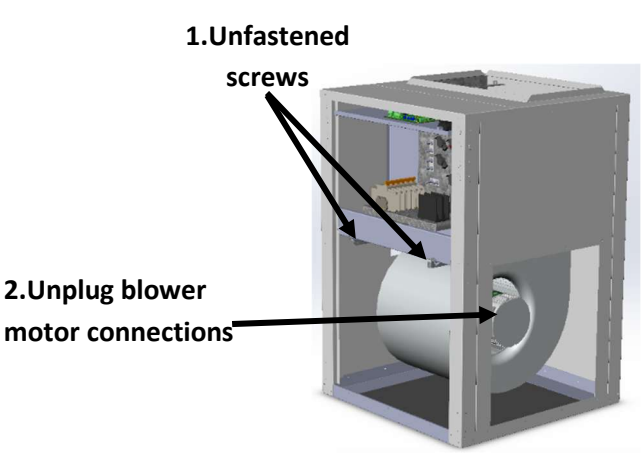
2.2.1 CCV2200EC air handler main electrical panel components

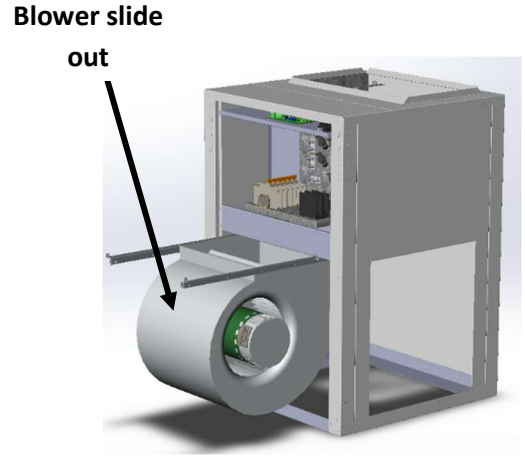
1- **CCV main board**
2- **Electric heater module temperature sensor**
3- **24volt transformer**
4- **Power in terminal block**
5- **Ground lug**
6- **Vinyl capillary sensing tube**



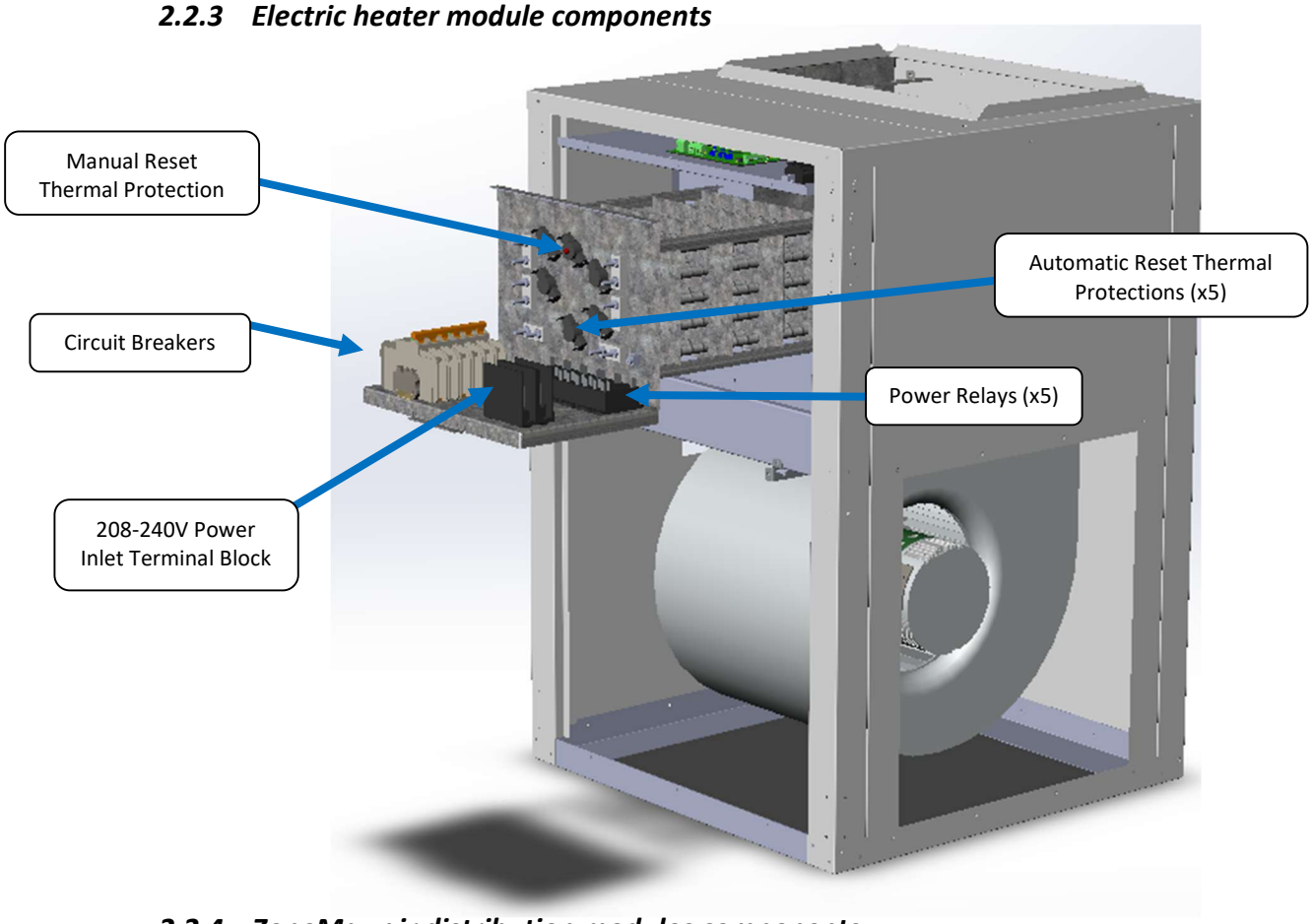
2.2.2 CCV2200EC air handler components

The blower assembly can be drawn out very simply by first unfastening to screws located on the rails on the front side that are attach to the blower casing.
Second, unplug the two-wire harness that are connected to blower motor. (Shown in following picture)
The electric heater module also slides out in the same manner.

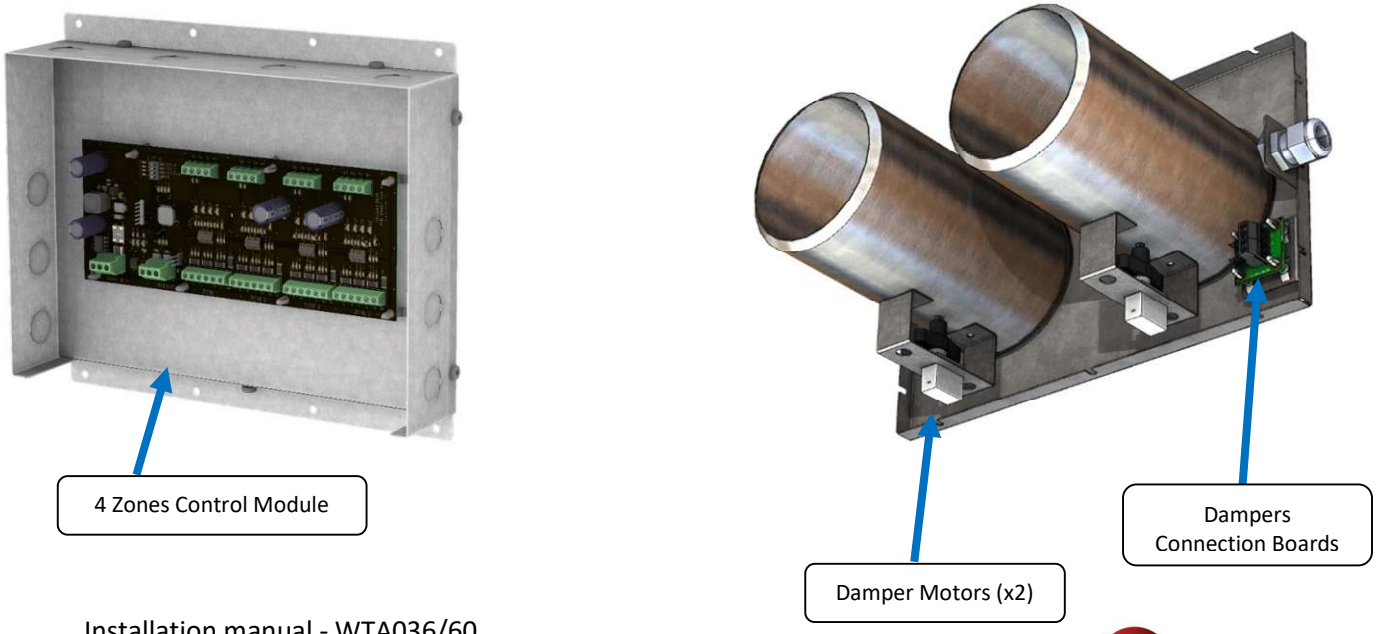




2.2.3 Electric heater module components



2.2.4 ZoneMax air distribution modules components

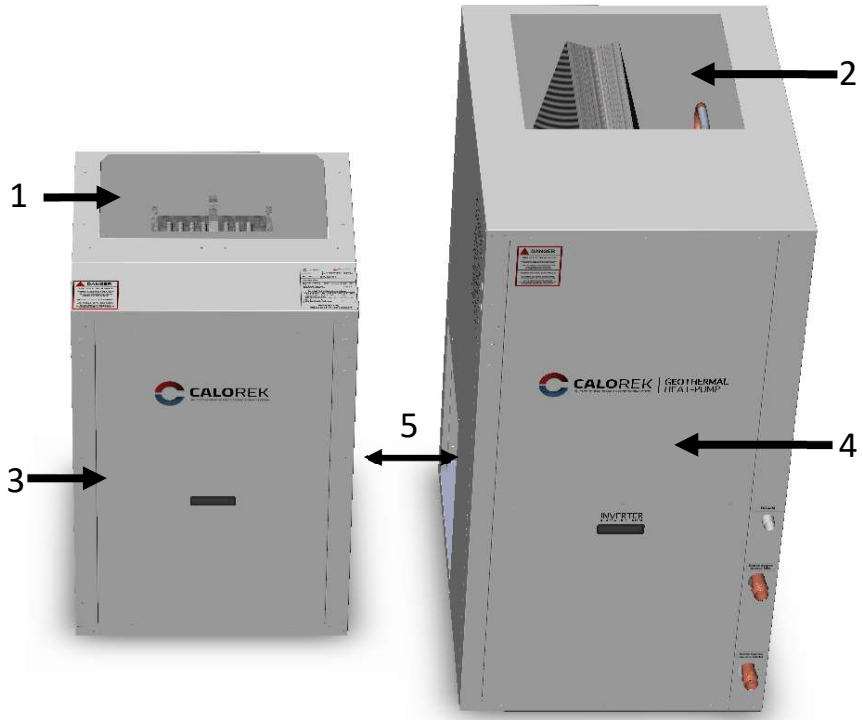


3 MECHANICAL EQUIPMENT INSTALLATION

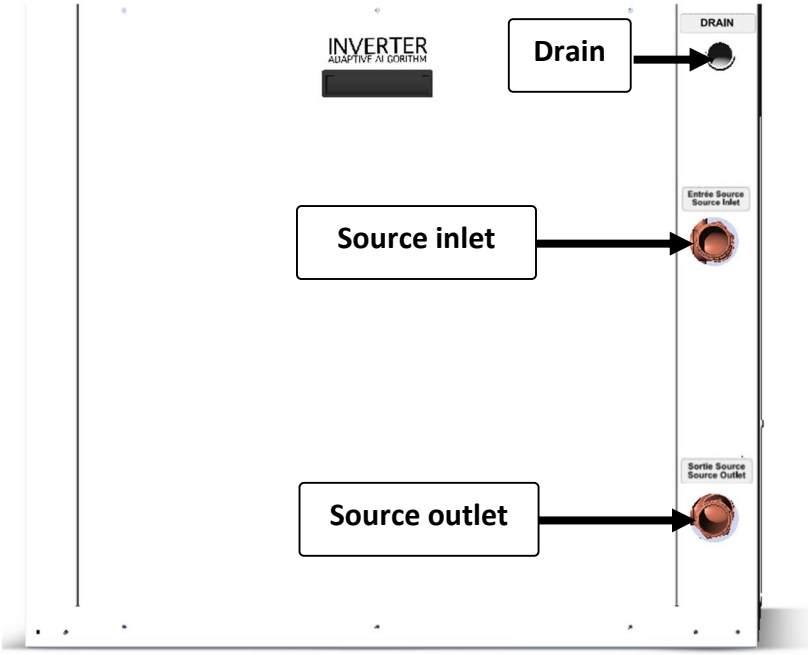
3.1 Equipment assembly installation

1- **Supply air is located at the top of the air handler. It's designed in this manner so its possible to switch your system from left to right side on site.**
2- **Return air is located at top of the heat pump unit. It's designed in this manner so its possible to switch your system from left to right side on site**
3- **Air handler (CCV2200EC) with option of duct heater (CSExx) See section 5.3 for CSE model chart.**
4- **Vertical package heat pump unit**
5- **The two units need to be isolated together, either by brackets and neoprene that is supplied by the manufacture or custom fabricated duct work that will isolate the two unit cut out together.**

For a left-hand or right-hand system all you need to do is unfasted the left and right doors from heat pump unit and switch them sides and same procedure goes for the air handler.



3.2 General water installation



Water connections

The water inlet and outlet connections are 1" male NPT. Teflon tape must be used on each male fitting prior to screw-in the female fittings.

Water circuit flow rate

The proper water flow rate for each unit must be properly calculated. The total pressure-drop of the ground circuit, indoor piping, headers, heat pump exchanger pressure drop, minimum circuit temperature, and antifreeze type.

To assure proper flow, P/T ports should be installed to determine the flow rate. These ports should be located at the supply and return water connections on the unit. The proper flow rate of the circuit cannot be precisely set without measuring the water pressure drop through the source side heat exchanger. ***(P/T ports are not included)***

*** Proper flushing and purging methods and any other procedure associated with this product must be performed by a qualified personal. ***

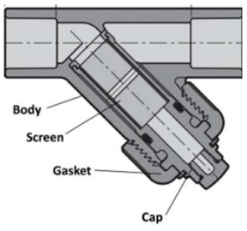
3.3 BPHE - Brazed plate heat exchanger

WTA series comes standard with (BPHE) Brazed Plate Heat Exchanger, it's made of stainless-steel plates, brazed with copper or nickel. The brazing process seals the plates together making extremely durable.

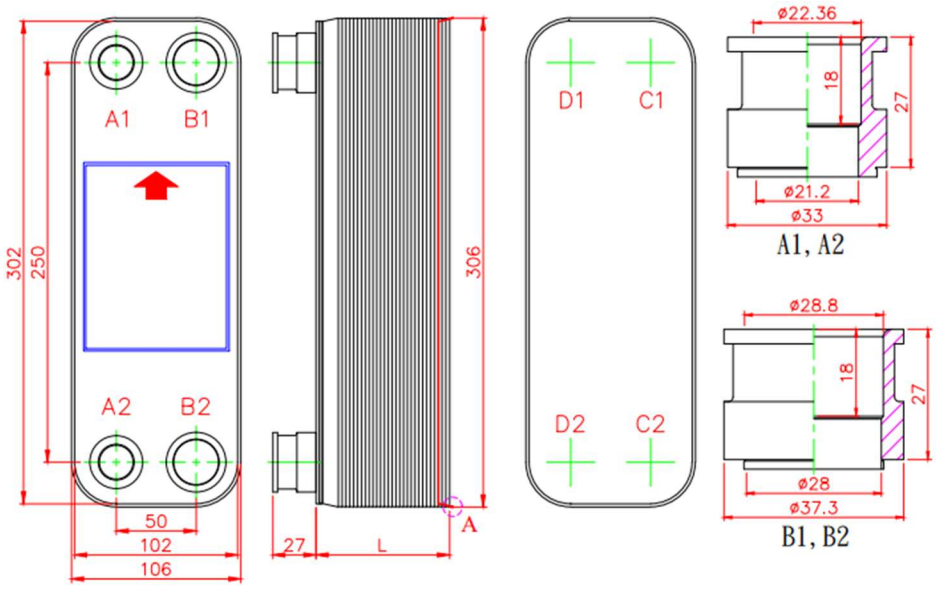
Filters and cleaning

The uses of strainer or filter <1mm, 16 mesh before the inlet water connection are mandatory to filter out dirt or large particles **(Strainer/filter not included).** After the water circuit as been in operation for few hours, strainer or filter should be checked and cleaned and 6-8 month after that it should be recheck and cleaned if necessary. Failure to do so could result in blockage in heat exchanger water circuit due to dirt or large particles which will reduce water flow rate and could cause freezing effect, damage the integrity of the BPHE or heat pump operation malfunction. **(Example of strainer below picture)**

Y Strainer



BPHE image.



Cleaning solution

If heat exchanger water piping is dirty due to service of water circuit and need to be clean, a weak acid with concentration less than 5% can be used, for example: citric acid, oxalic acid add in a tank. Before re-connecting and restarting the system, flush the heat exchanger water circuit with large amounts of fresh water to purge any remaining acid solution. If the acidity is too high, the copper and stainless steel inside the BPHE may be etched or corroded, which could decrease life span of exchanger.

Warning

Seawater, chlorinated water, etc. are not suitable for BPHE because of their corrosive nature on regular stainless steel and copper. Please refer to Water Quality Standard (JRA-GL-02-1994) chart.

Ground water with high levels of sulfuric compound, sulfuric acid, or low PH value, may cause gradual copper corrosion and damage the BPHE in a few years.

Water Quality Standard (JRA-GL-02-1994)

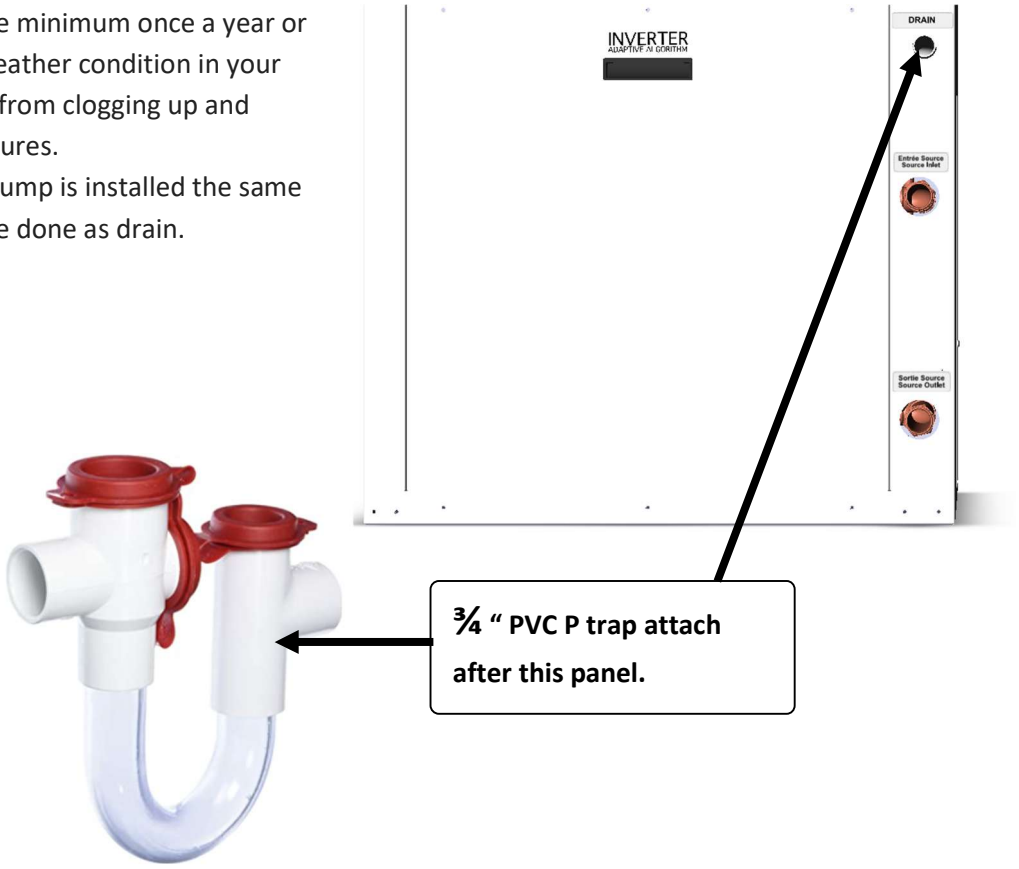
	ITEM		Cooling Water			Cool Water		Possibility	
			Circuit Water		Direct Pump				
			Close Circuit	Open Circuit	Instant Drain Water	Close Circuit 20°C below	Open Circuit	Corrosion	Scale
Basic Element	PH(25°C)		6.8~7.2	6.8~7.2	6.8~7.2	6.8~7.2	6.8~7.2		●
	EC(25°C)	μS/cm	≤800	≤300	≤400	≤400	≤300	●	●
	(Cl^{-1})	mg/l	≤200	≤50	≤50	≤50	≤50	●	
	(SO_4^{-2})	mg/l	≤200	≤50	≤50	≤50	≤50	●	
	$(PH4.8,CaCO_3)$	mg/l	≤100	≤50	≤50	≤50	≤50		●
	Total $(CaCO_3)$	mg/l	≤200	≤70	≤70	≤70	≤70		●
	Ca $(CaCO_3)$	mg/l	≤150	≤50	≤50	≤50	≤50		●
	SiO_2	mg/l	≤50	≤30	≤30	≤30	≤30		●
Reference Element	Fe	mg/l	≤1.0	≤0.3	≤1.0	≤1.0	≤0.3	●	●
	Cu	mg/l	≤0.3	≤0.1	≤1.0	≤1.0	≤0.1	●	
	S^-	mg/l	N.F	N.F	N.F	N.F	N.F	●	
	NH_4^{-1}	mg/l	≤1.0	≤0.1	≤1.0	≤1.0	≤0.1	●	
	Free Chlorine	mg/l	≤0.3	≤0.3	≤0.3	≤0.3	≤0.3	●	
	CO_3^{-2}	mg/l	≤4.0	≤4.0	≤4.0	≤4.0	≤4.0	●	
	Stability Value		6.0~7.0	-----	-----	-----	-----	●	●

1. The Water Quality for Heat Exchanger should be applied to above standard.
2. When using De-ionized water, pure water, extra pure water, nickel brazed is recommended.
3. If you are concerning about certain elements which are not listed on this chart, please contact our sales representative at sales@kaori.com.tw.

3.4 Condensate drain installation

It is necessary to install a **P trap** since it is a negative pressure at the A coil. It must be installed in a manner that will stop the air from passing through, but still allow the condensate to drain from the condensate pan. **(P trap not included).** The drain should **be connected and vented according to the code in force in your area.** During high humidity weather air conditioning cycle condensate, water accumulation could be as much as 20 gallons per day or more.

Keeping your Condensate drain clean, maintenance should be minimum once a year or more depending on weather condition in your area, to prevent drain from clogging up and causing heat pump failures.
Also, if a condensate pump is installed the same maintenance should be done as drain.



4 DUCT FABRICATION DESIGN AND SIZING

4.1 Duct fabrication - Zoning

The WTA series are engineered specifically for zoning application, the ECM modulating blower of the air handler unit is fully variable. It's controlled to provide a constant air flow to each zone in demand, regardless of the number of simultaneous demands. The more zones there are in demand at the same time, the more the blower will increase in power and vice versa.
Since the system blower operates in constant static pressure mode, the bigger the trunk duct will be, more the air distribution at each branch duct will be even, no matter of how many dampers are open at the same time. As an example, a 3-ton unit with a 16"x16" trunk duct will be the best size for a 16 dampers system. Higher section won't give anymore gain. Smaller trunk duct section is possible put not recommended, it will create greater unbalance between branch ducts depending on how many dampers are open, blower motor will work harder meaning consuming more energy.

***NOTE**: If ideal trunk duct section cannot be matched because of architectural constraints, smaller trunk duct may be used. It is then possible to increase the blower static pressure setpoint. Blower static pressure setpoint adjustment procedure is explained in section **6.3.2** of this manual.*

4.2 Duct fabrication – general

The ductwork should be sized as stated in chart below to handle the design airflow silently and efficiently. To help with any vibrations travelling towards the ductwork it is recommended that flexible duct canvas be used to connect the main trunks to the units. If a CSExx electric heater module is installed, the collar needs to be at least 14" away from the heater elements.

Model (WTA/CCV)	***Design airflow (CFM)***	***ESP (in. water)***
WTA036/CCV1400EC	1200	0.1
WTA060/CCV2200EC	2200	0.1

4.3 Duct fabrication - thermal insulation

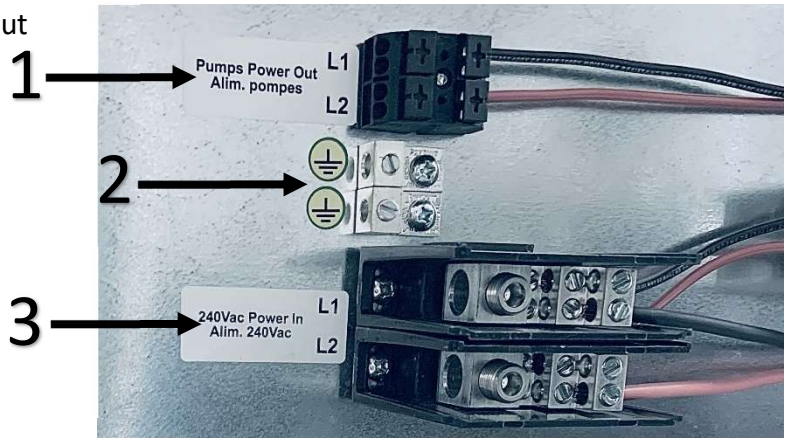
Thermal insulation of the ductwork is mandatory. Unless it provides better zoning performance by having less thermal loss through the air route, it also acts as an acoustic insulation, making the whole system quiet and eliminating potential condensation on the ducts.

5 ELECTRICAL POWER CONNECTIONS

ATTENTION: **Electrical power connections must be made by a qualified electrician and in accordance with local codes.**

5.1 Power connections – heat pump unit

1- 208-240Vac water pump power out
2- Ground lugs
3- 208-240Vac heat pump power In



Terminal blocks supply and distribution

The heat pump unit must be connected to a 208-240Vac source protected by a 40-50A circuit breaker according to the code in force in your area. This connection must be made via the terminal block named "240Vac Power In". Also, the power cable must be of appropriate size and in accordance with the code in force in your area

The 240Vac connection is made via spring-loaded terminal blocks. With a flat screwdriver, press the terminal and insert a wire while continuing to press. Release and the wire are secure. "With the wire band at 11mm (7/16) ".



5.2 Power connections – CCV2200EC

ATTENTION: **Electrical power connections must be made by a qualified electrician and in accordance with local codes.**

Ventilation cabinet terminal block

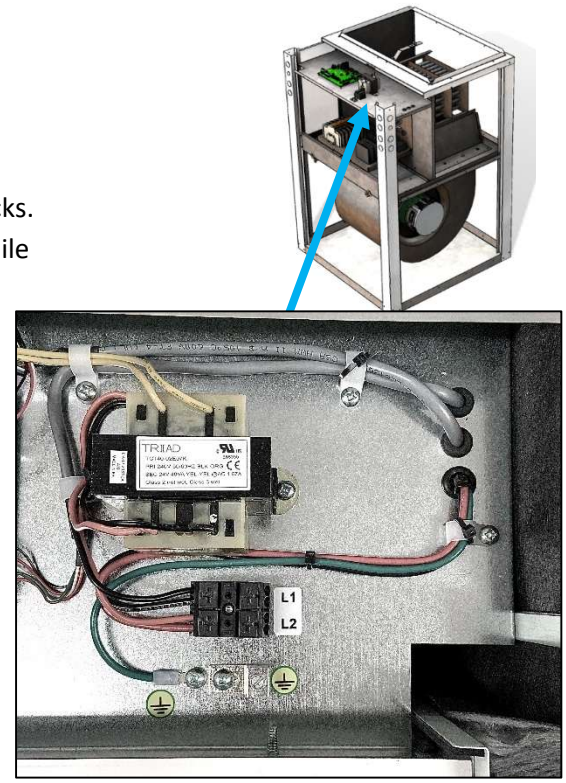
If the CSE electric backup heater option is not installed, the connection is made via the fan supply terminal block (see following image).

If the CSE electric backup heater option is installed, the connection is made via the CSE electric backup heater power block **See section 5.3 for more details.**

The capacity of the circuit breakers and gauges of cables must be selected according to the code in force in your area.



The 240Vac connection is made via spring-loaded terminal blocks. With a flat screwdriver, press the terminal and insert a wire while continuing to press. Release and the wire are secure.
"With the wire band at 11mm (7/16)



5.3 Power connections – electric heater module

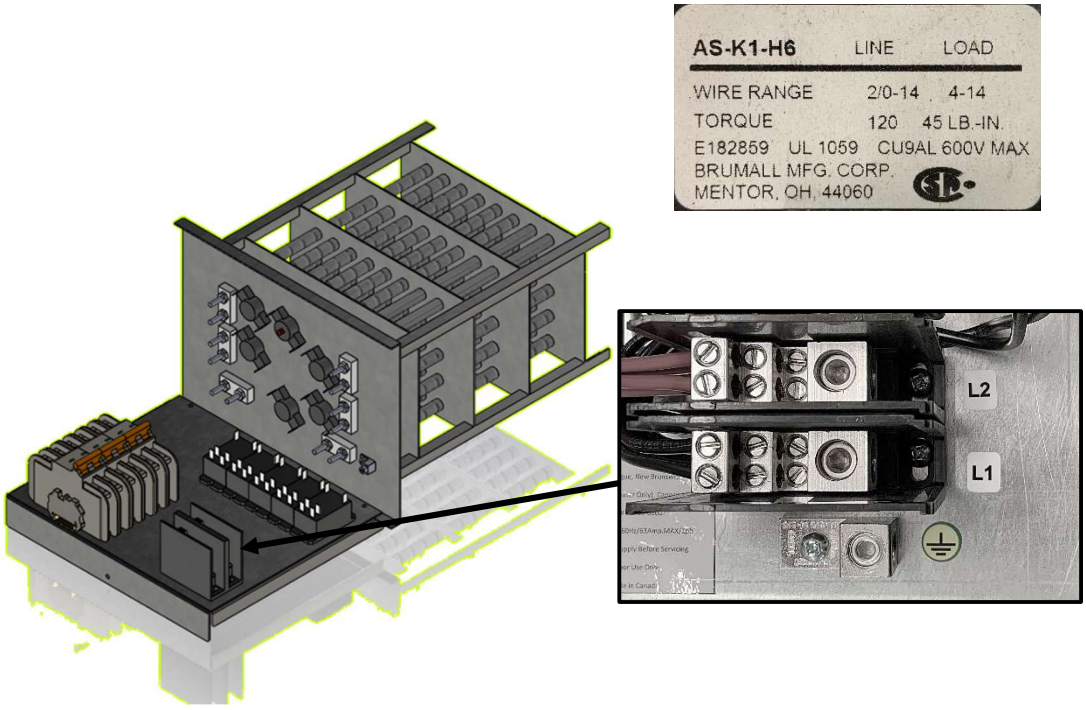
ATTENTION: **Electrical power connections must be made by a qualified electrician and in accordance with local codes.**

The electric heater unit must be connected to an independent 240Vac source protected by a circuit breaker of suitable capacity for the specific power of the unit. The capacity of the circuit breakers and gauges of cables must be selected according to the code in force in your area.

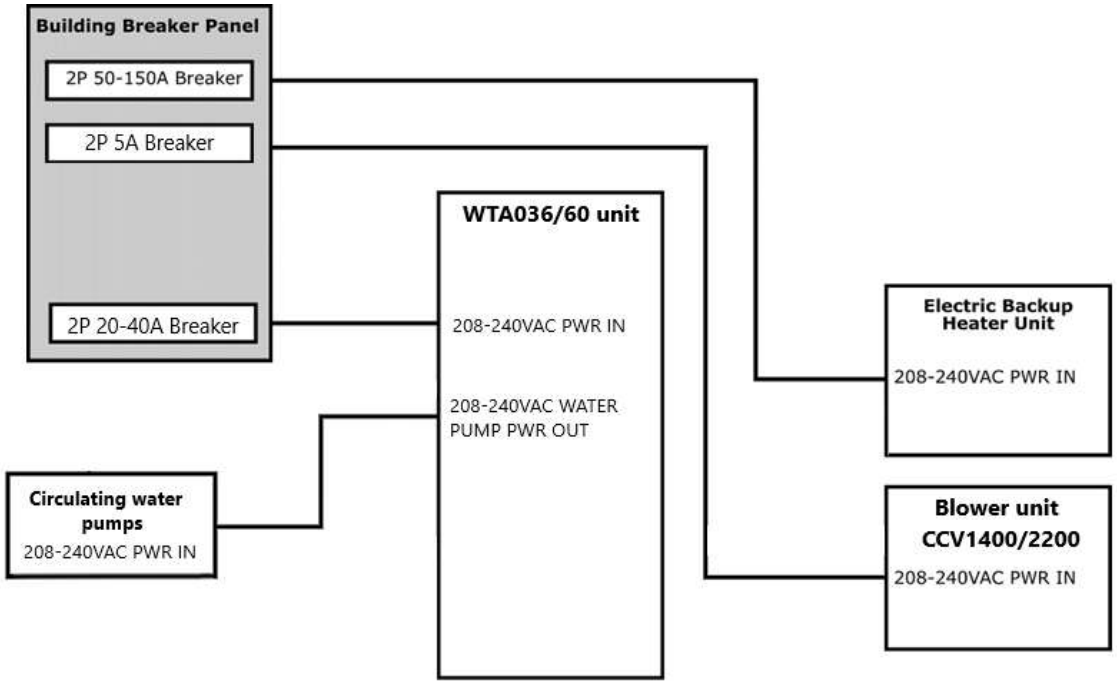
Model spec. Chart.

Model	Total watts (240Vac)	Volt(S)	AMP 208/240Vac	Stages	Watts/Stages	Weight (Lb)
CSE10	10 000	208/240Vac	36/42	5	2000	10
CSE15	15 000	208/240Vac	54/63	5	3000	14
CSE18	18 000	208/240Vac	65/75	5	3600	14
CSE20	20 000	208/240Vac	72.5/83	5	4000	14
CSE23	23 000	208/240Vac	83/96	5	4600	14
CSE25	25 000	208/240Vac	91/104	5	5000	14

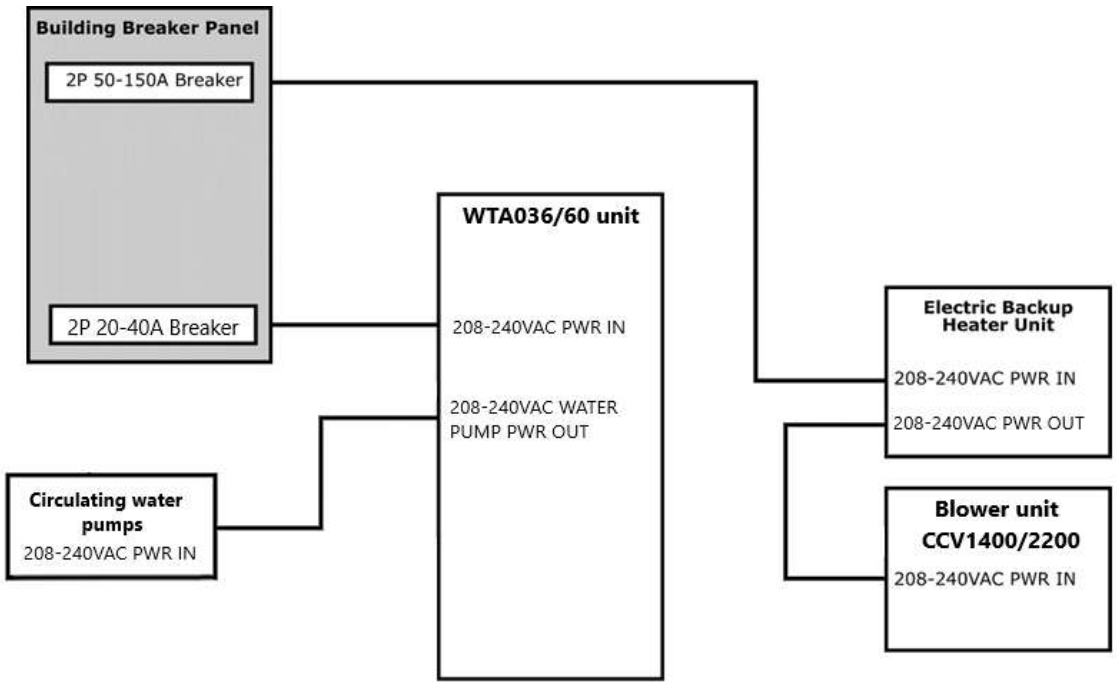
Electric connection for the backup heater is made via power block. (Shown in picture below)
Properly torque the 3/16" hex bolts at 120 LB-IN. (torque spec. shown in picture)



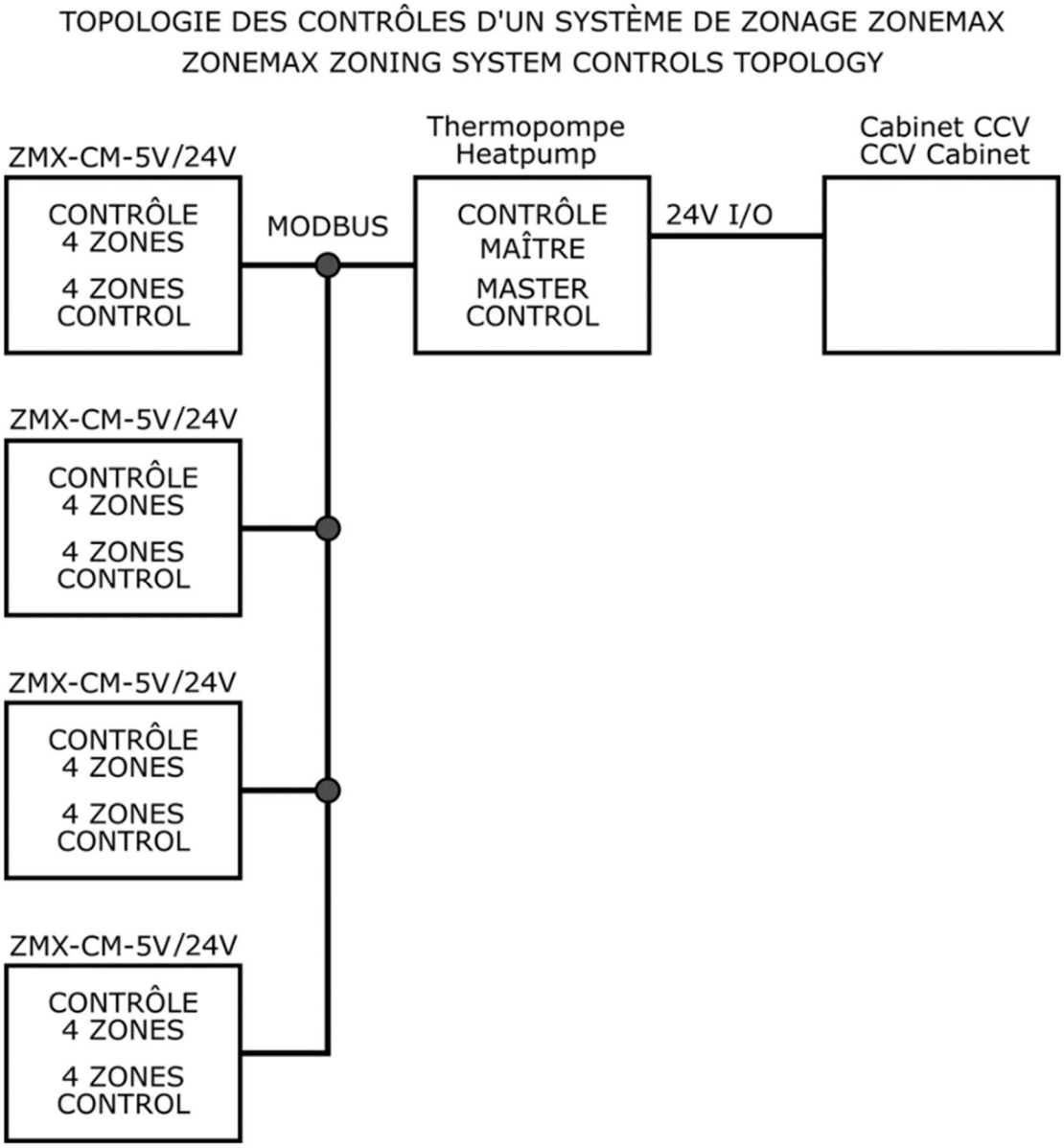
5.1 Topology diagram 1 – WTA system 208-240V distribution



5.2 Topology diagram 2 – WTA system 208-240V distribution



5.3 Topology diagram - zoning system



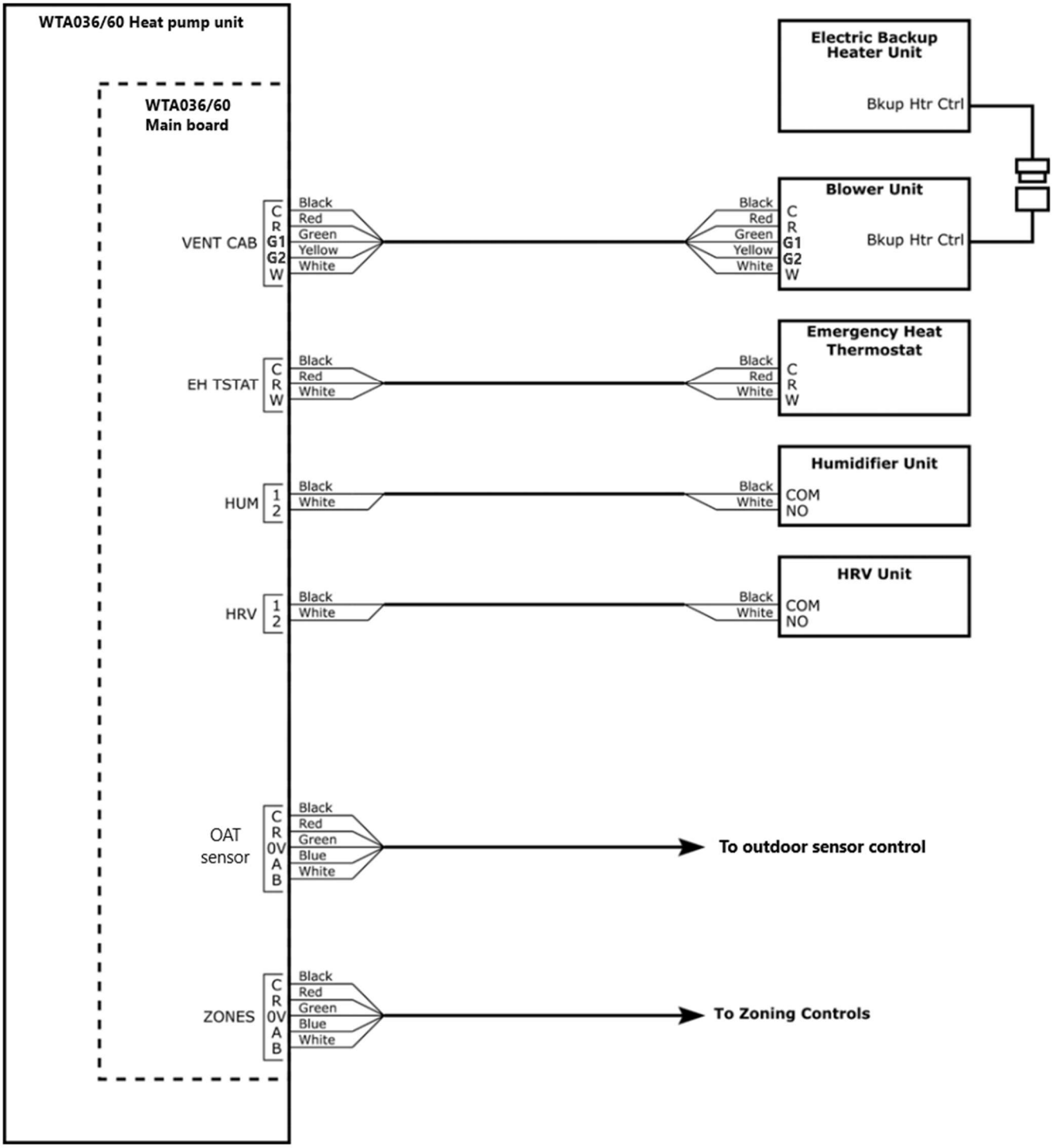
6 CONTROL CONNECTIONS

The water to air system modules is communicating to each other through an RS485-RTU Modbus network and 24Vac digital signals. The modules that must be connected through the MODBUS network are the main board zones terminal, located in the heat pump unit electrical panel and 1 to 4 Zone Controls board. Other control signals (24V) are to be connected between some of the system modules.

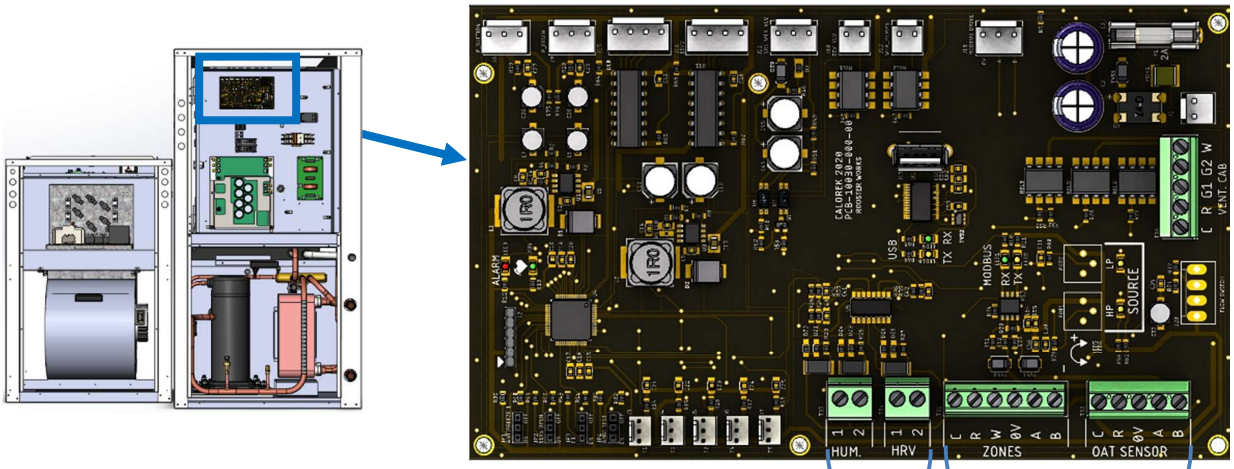
The following schematics shows the control connections for the whole system. Please note that the wire colors shown are recommended but not mandatory.

INSTALLATION TIP: Control connections can be made with 18-22AWG wire but 22AWG stranded wire is what Calorek recommends for easy and dependable connections.

6.1 Control connections schematic



6.2 WTA060 heat pump unit main board connections



6.2.1 Humidifier and HRV controls inputs connections

HRV connection

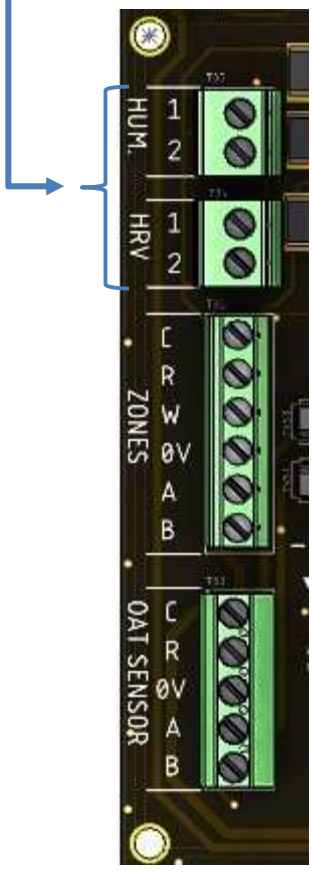
The terminal block includes 2 terminals:

- **Terminal 1:** To HRV dry contact COM terminal.
- **Terminal 2:** To HRV dry contact NO (normally open) terminal.
  *The main board HRV terminal block can be connected to a HRV unit, HRV unit is not supply with unit.

Humidifier connection

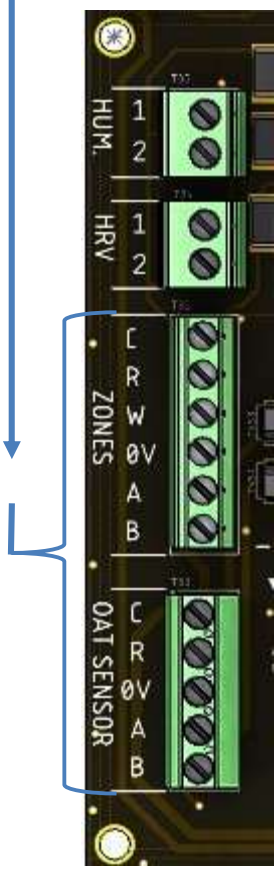
The terminal block includes 2 terminals:

- **Terminal 1:** To humidifier dry contact COM terminal.
- **Terminal 2:** To humidifier dry contact NO (normally open) terminal.
  *The main board humidifier terminal block can be connected to a humidifier unit, humidifier unit is not supply with unit.



next page

6.2.2 Zoning, OAT sensor, and emergency heat control connections



Zoning 24Vac and MODBUS power supply

The 24Vac power supply terminal block includes 3 terminals:

- **Terminal C:** 24Vac power supply – Common
- **Terminal R:** 24Vac power supply - Live
- **Terminal W:** Emergency heating output

The MODBUS terminal block includes 3 terminals:

- **Terminal A:** RS485 (+)
- **Terminal B:** RS485 (-)
- **Terminal 0V:** 0-volt reference

**The main board zones terminal block needs to be connected to ZMX-CM-5V or 24V. See section 9 and 10 for more detail on zoning control.

OAT 24Vac and MODBUS power supply

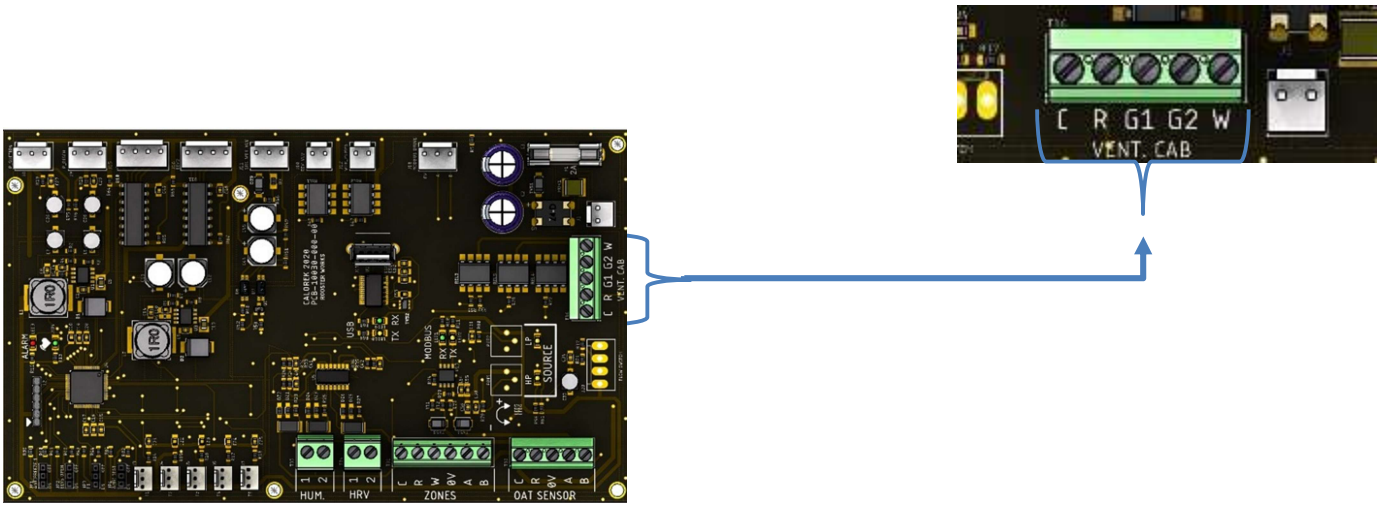
The 24Vac power supply terminal block includes 2 terminals:

- **Terminal C:** 24Vac power supply – Common
- **Terminal R:** 24Vac power supply - Live

The MODBUS terminal block includes 3 terminals:

- **Terminal A:** RS485 (+)
- **Terminal B:** RS485 (-)
- **Terminal 0V:** 0-volt reference

6.2.3 Ventilation cabinet control connections



Ventilation cabinet 24 Vac terminals

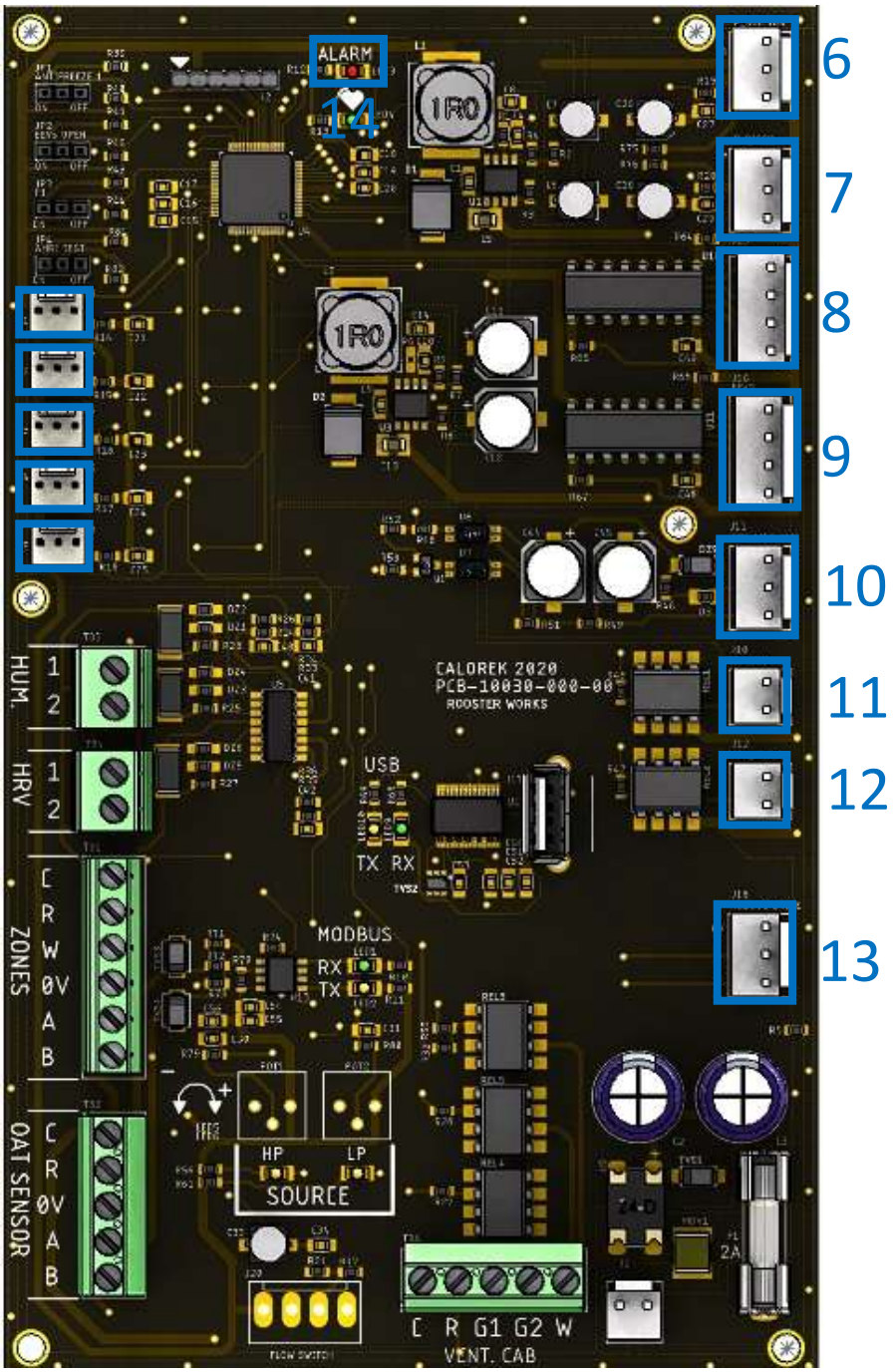
- **Terminal C:** 24Vac – Common
- **Terminal R:** 24Vac - Live
- **Terminal G1:** Command G1 - Fan activated at potentiometer set point G1.
- **Terminal G2:** Command G2 - Fan activated at potentiometer set point G2.
- **Terminal W:** The electric coil activated at the set point of potentiometer W. The fan is activated at the highest set point between potentiometers G1 and G2
  ***The ventilation cabinet terminal on main board needs to be connected to ventilation board. Ventilation board is explained in detailed in section 6.3.**
  ***Potentiometer are explained in section 6.3.2**

6.2.4 Other terminals and heat pump control connections

The following components, connectors and terminal are connected at the factory and therefore do not require handling during installation. However, it is useful for a technician to know its functions for troubleshooting. Here are the descriptions of each of these components, connectors, and terminal.

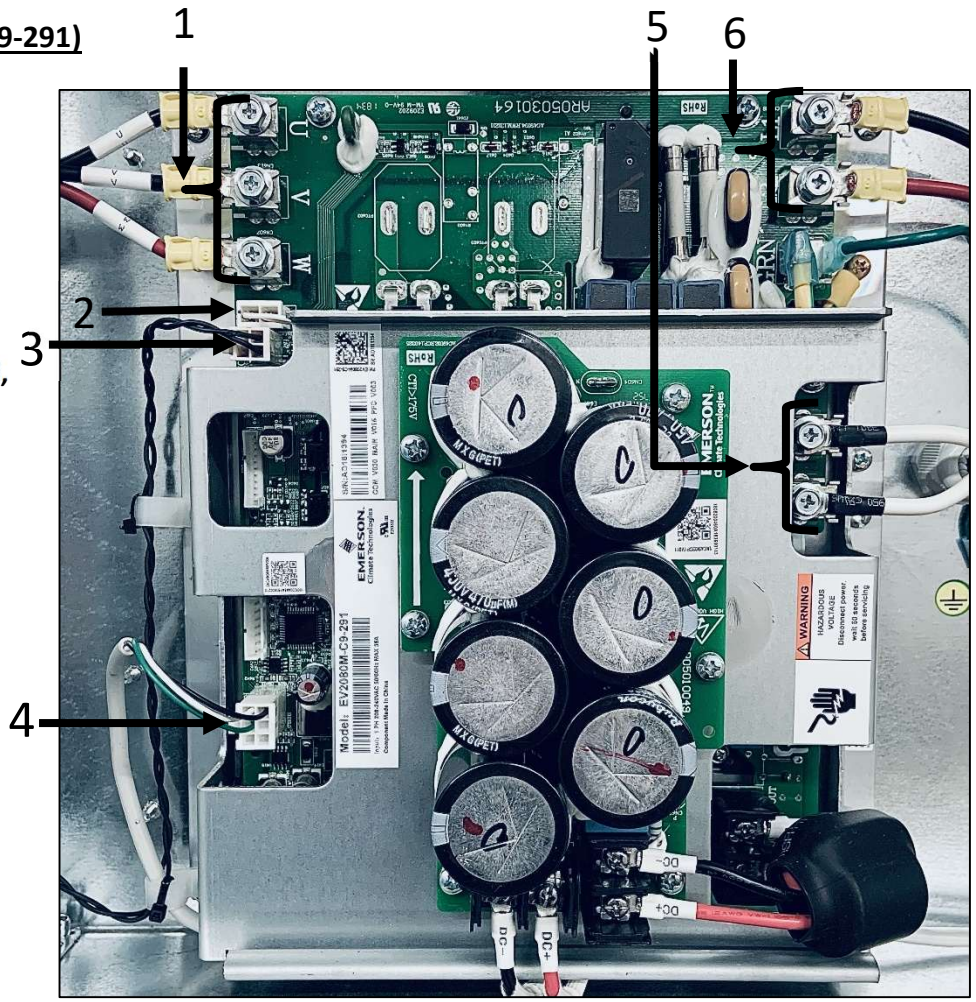
Main control board (PCB-10030-000-01)

1- Suction temperature sensor
2- Air supply tempareture sensor
3- Water out source side temperature sensor
4- Water In source side temperature sensor
5- Not used
6- Suction pressure transducer sensor
7- Discharge pressure transducer sensor
8- EEV (Electronic Expansion Valve)
9- Not used
10- Modulating source water valve (optional)
11- 24Vac reversing valve output
12- 24Vac water pump relay output
13- MODBUS drive communication
14- Alarms LED



Variable speed drive (EV2080M-C9-291)

1- **Variable speed compressor Terminals U/V/W**
2- **High pressure cut out switch A1 High-Pressure Signal A2 3.3VDC**
3- **Discharge line temperature sensor Pin 1 - Sensor Pin, Pin 2 - 3.3VDC**
4- **MODBUS connector, Pin1 - RS485 (+), Pin4 - RS485 (-), Pin5 - Common**
5- **PFC choke H1/H2**
6- **Power supply L1/L2/GRD**

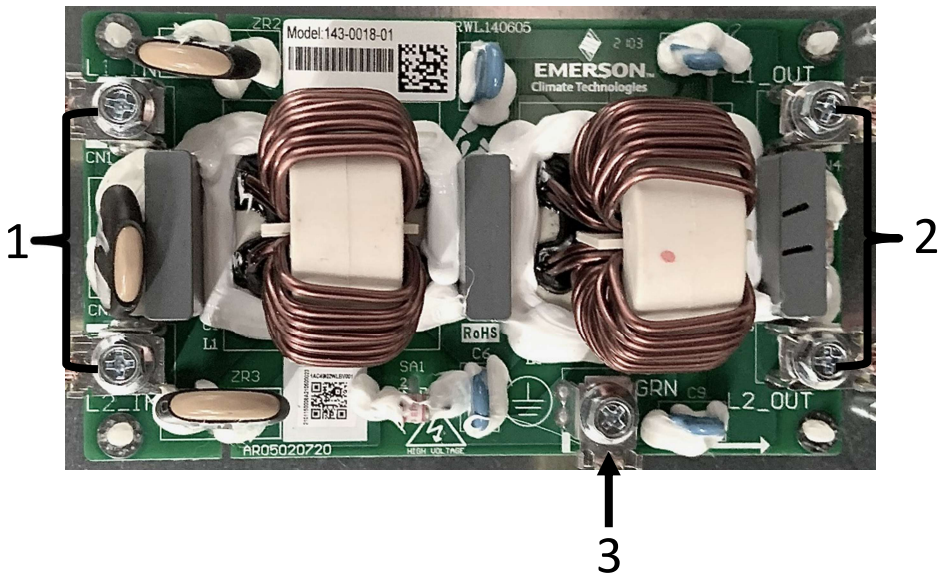


PFC reactor / choke (037-0042-01)

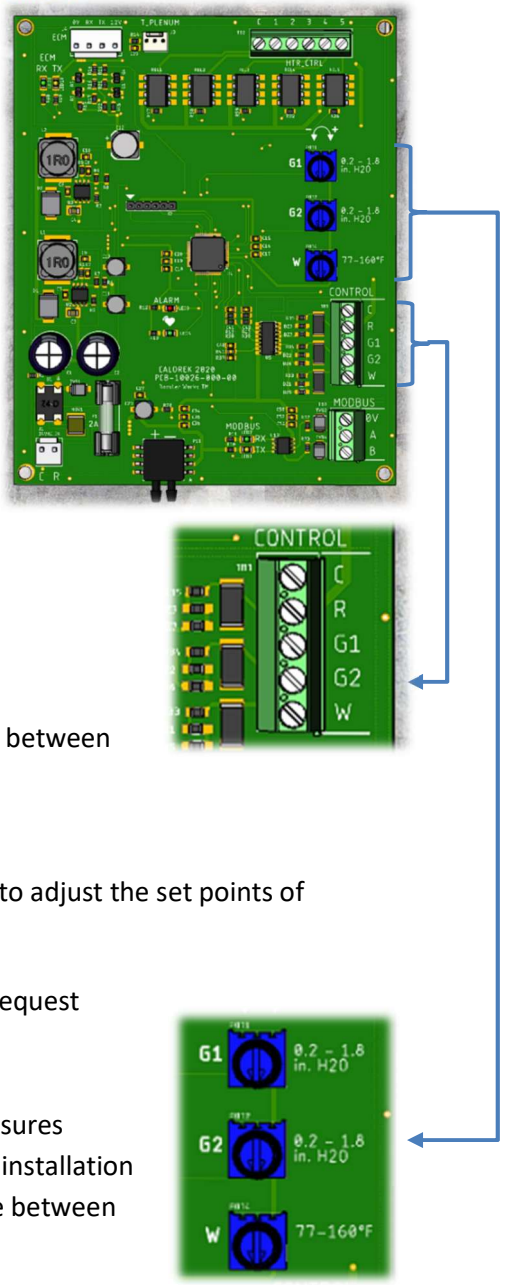


1 phase EMI filter (143-0018-01)

1- **Power in L1 / L2 terminals**
2- **Power out L1 / L2 terminals**
3- **Ground terminal**



6.3 Electronic control of the CCV ventilation cabinet



The electronic control card of the CCV ventilation cabinets performs two functions:

1- Control the fan speed according to the air flow
2- Check the electric coil to maintain a uniform temperature, considering the variations air flow and auxiliary heat demands.

6.3.1 Control terminals TB1

The control terminal block TB1 comprises the following terminals:

- C - 24Vac – Common
- R - 24Vac - Live
- G1 - Command G1 - Fan activated at potentiometer set point G1.
- G2 - Command G2 - Fan activated at potentiometer set point G2.
- W - Control W - The electric coil activated at the set point of potentiometer W. The fan is activated at the highest set point between potentiometers G1 and G2.

6.3.2 Setpoint adjustment potentiometer G1, G2 and W

The CCV control board includes three potentiometers which are used to adjust the set points of controls G1, G2 and W.

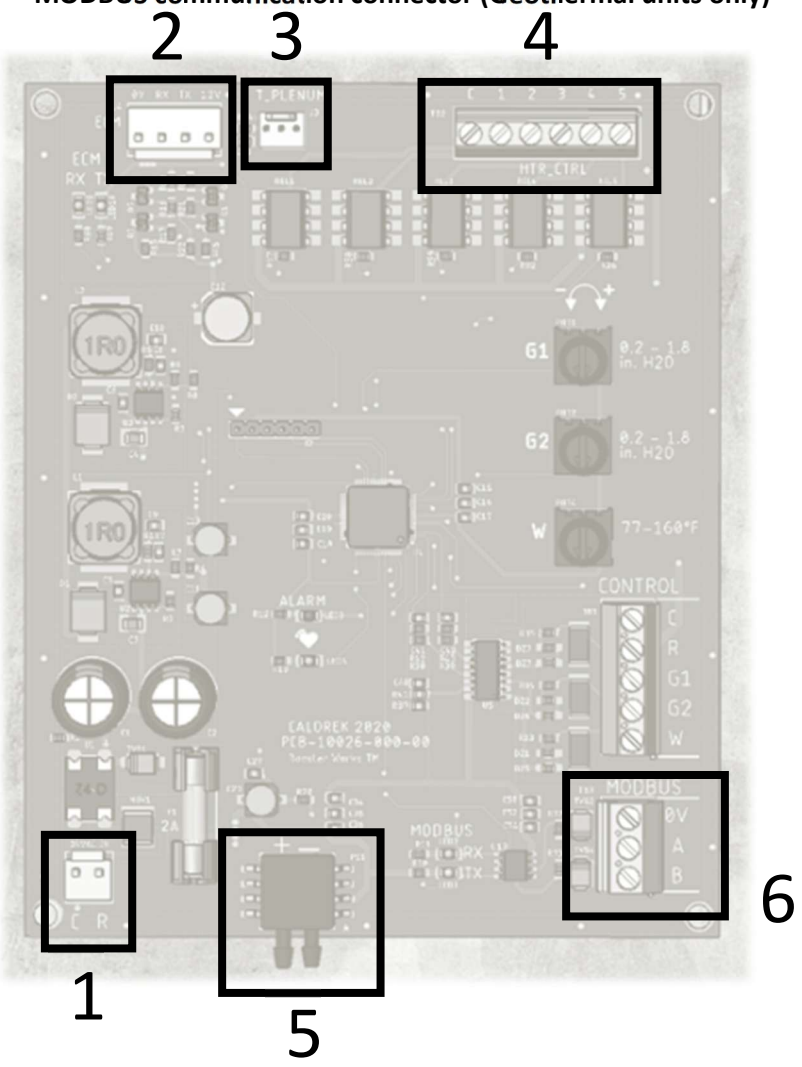
In the case of G1 and G2, these commands are used for a ventilation request in two independent stages, with each their respective set point.
The set points of the G1 and G2 controls at constant static pressure.
Potentiometers G1 and G2 are factory set to correspond to static pressures of 0.2” H2O and 0.4” H2O, respectively. However, it is possible during installation to set the adjustment of the two potentiometers G1 and G2 in a range between 0.0” H2O and 1.6” H2O.

The W potentiometer is used to adjust the air temperature set point in the main or plenum air supply line. The desired temperature is factory set at 50 ° C (122 ° F) but can be set on site by the installer within a range of 25 ° C (77 ° F) to 70 ° C (160 °

6.3.3 Other terminals and CCV control connections

The electronic control of the CCV cabinet includes other connectors and terminal blocks which are connected at the factory and therefore do not require handling during installation. However, it is useful for a technician to know its functions for troubleshooting. Here are the descriptions of each of these connectors and terminal blocks:

1- **24Vac power connector**
2- **ECM motor communication connector**
3- **Electric coil air temperature sensor connector**
4- **Control terminal block for the five elements of the electric coil**
5- **Static pressure sensor**
6- **MODBUS communication connector (Geothermal units only)**



7 SYSTEM OTHER OPERATIONS

7.1 Compressor oil return sequence

Since the variable capacity refrigeration system can cope with very low load conditions, it is possible that in low load conditions the refrigeration system's oil remain trapped in certain parts of the refrigeration circuit. To ensure proper oil return to the compressor crankcase, an oil return sequence will trigger if the compressor runs under a certain speed for at least 3 hours.

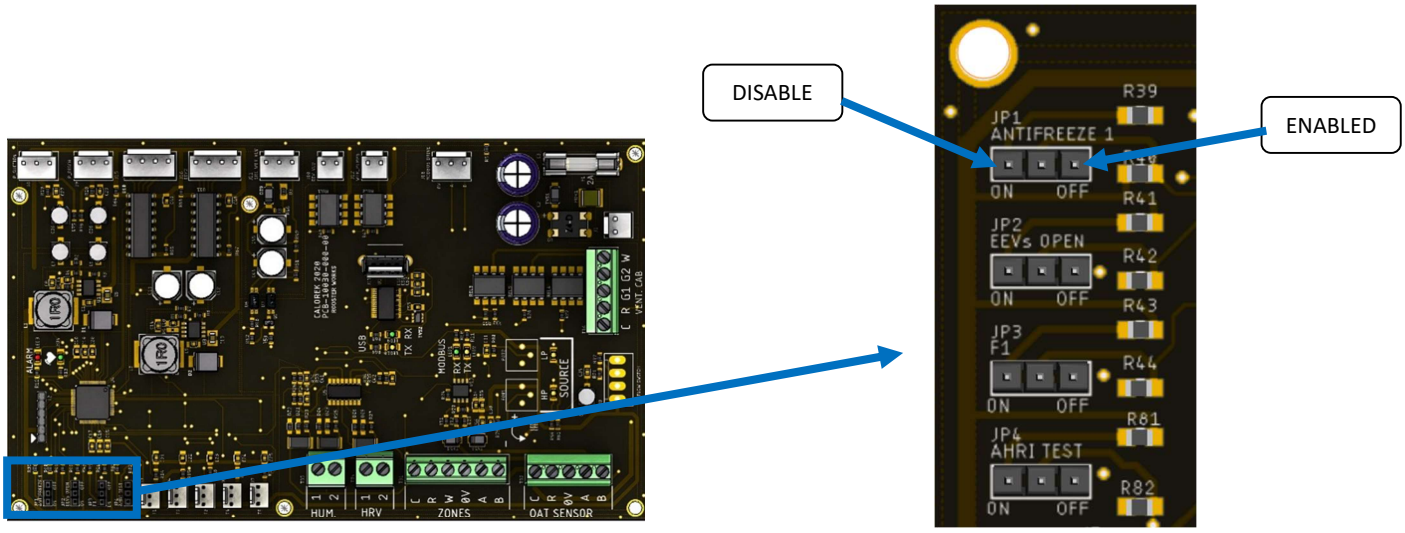
When an oil return sequence starts, the compressor will first turn off for 2 minutes after all the dampers will open, and the compressor will start back at full speed and going down to controlled mode.

7.2 Freeze protection

The unit is protected against fluid freezing on both source and load sides. In heat mode, the unit will have two levels of freeze protection on the source side. The first level is protecting the source side coil if pure water is used (not mixed with antifreeze fluid like glycol, ethanol, etc.). This protection will force the compressor to minimum speed if the source side water out temperature is lower or equal to 2,0°C (35,6°F).

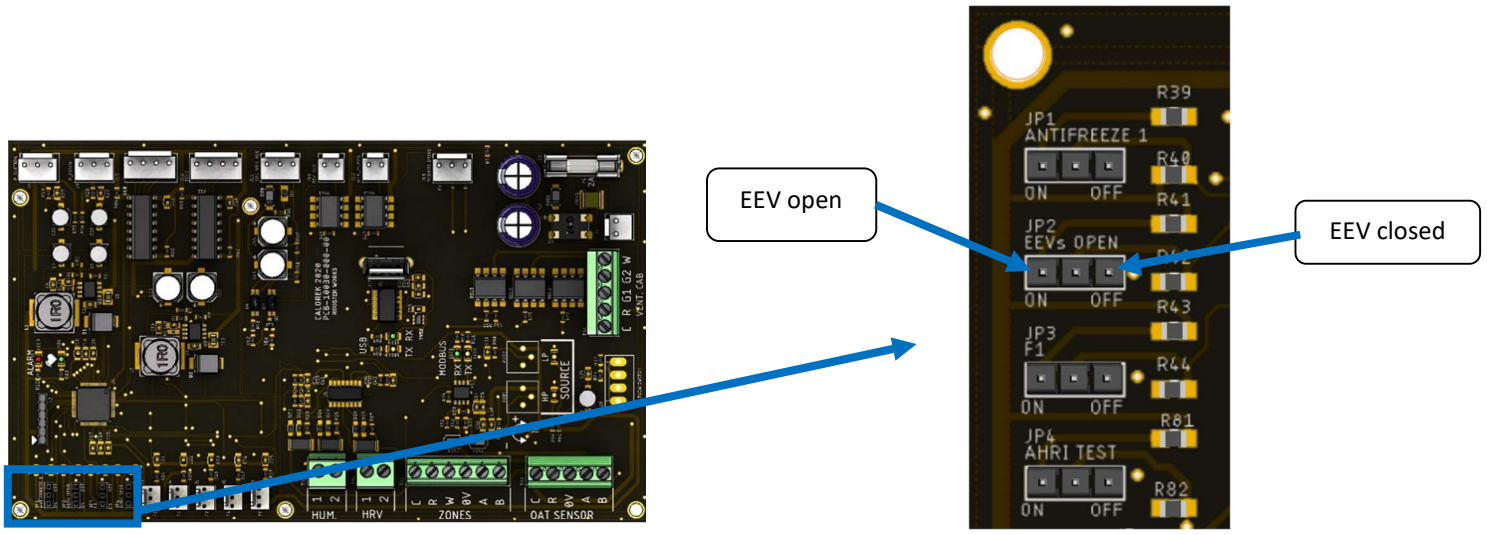
The first level of protection can be disabled by changing the position of a jumper on the unit's main control board "JP1" connector as shown on the following picture. Jumper is position from the middle pin to on or off pin depending on application that is necessary.

The second level of protection is always active no jumper, it will stop the compressor if the suction pressure is lower or equal to 60psi for more than 2 minutes or 50 psi if freeze protection level 1 jumper is disable (off). If heat pump try's multi time to start and keeps going in freeze level 2 (low suction), heat pump will fall in lock out mode. If this happens your HVACR specialist should be contacted since the unit will need a manually reset and unit should be check for what may be causing this issue.



7.3 Force expansion valve to fully open

In case the refrigerant in the unit must be recovered, the electronic expansion valve must be forced to fully open position. The EEV can be forced in open position by changing the position of the jumper on the heat pump unit main control board. With “JP2” connector as shown on the following picture.

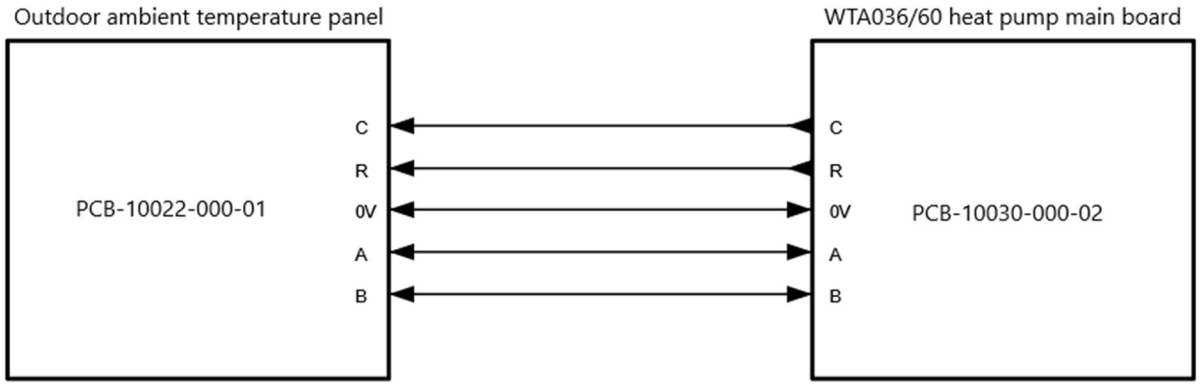


7.4 OAT Outdoor Ambient Temperature sensor functions

If the **(optional)** outdoor ambient temperature sensor is to be used, it must be connected to the heat pump main board as shown in section **6.2.2.**

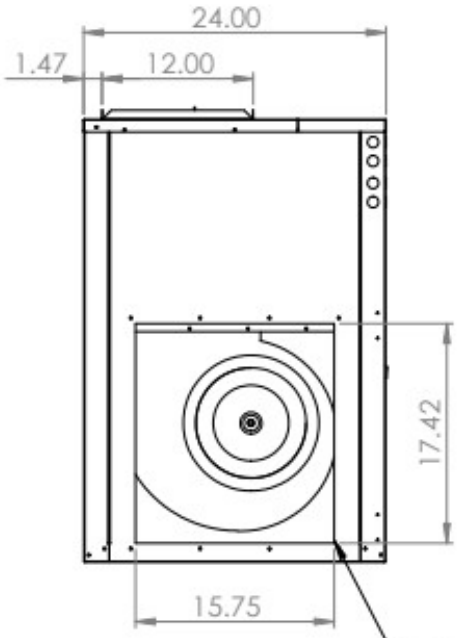
This function is used to have different discharge pressure set points at specific outdoor ambient temperature, witch by changing your discharge pressure it will either lower or raise your air supply temperature depending on what you chose.

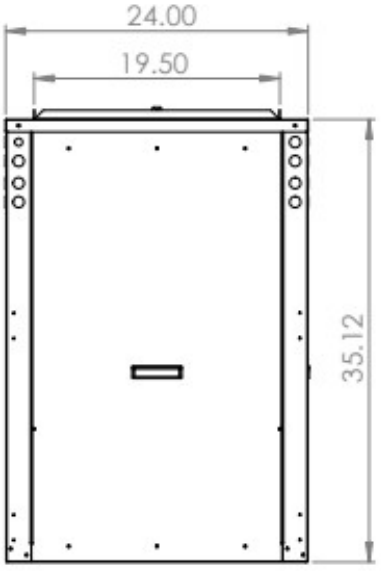
This function is useful when heat pump default operation tends to have a lot of short cycle in specific time of season where climate is irregular and causes short cycle of heat pump. This option can eliminate a lot of those issues, your heat pump will run smoother with longer run time but less energy consumption. **(General schematic of wiring diagram below)**



8 DIMENSIONAL DRAWINGS

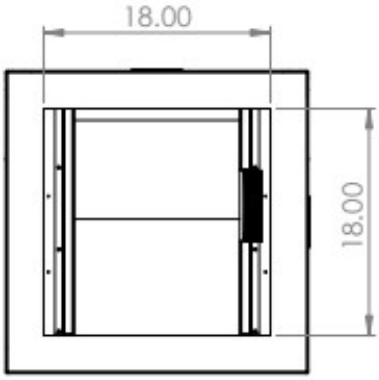
8.1 CCV2200EC air handler module dimensions



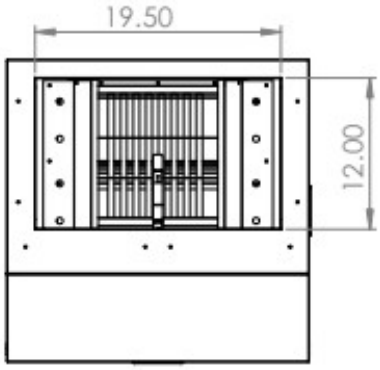


FRONT ACCES PANEL

NOTE: RETURN PANEL CAN BE INSTALLED ON LEFT OR THE RIGHT SIDE
BY SIMPLY REMOVING FASTENERS AND SWITCHING PANELS.

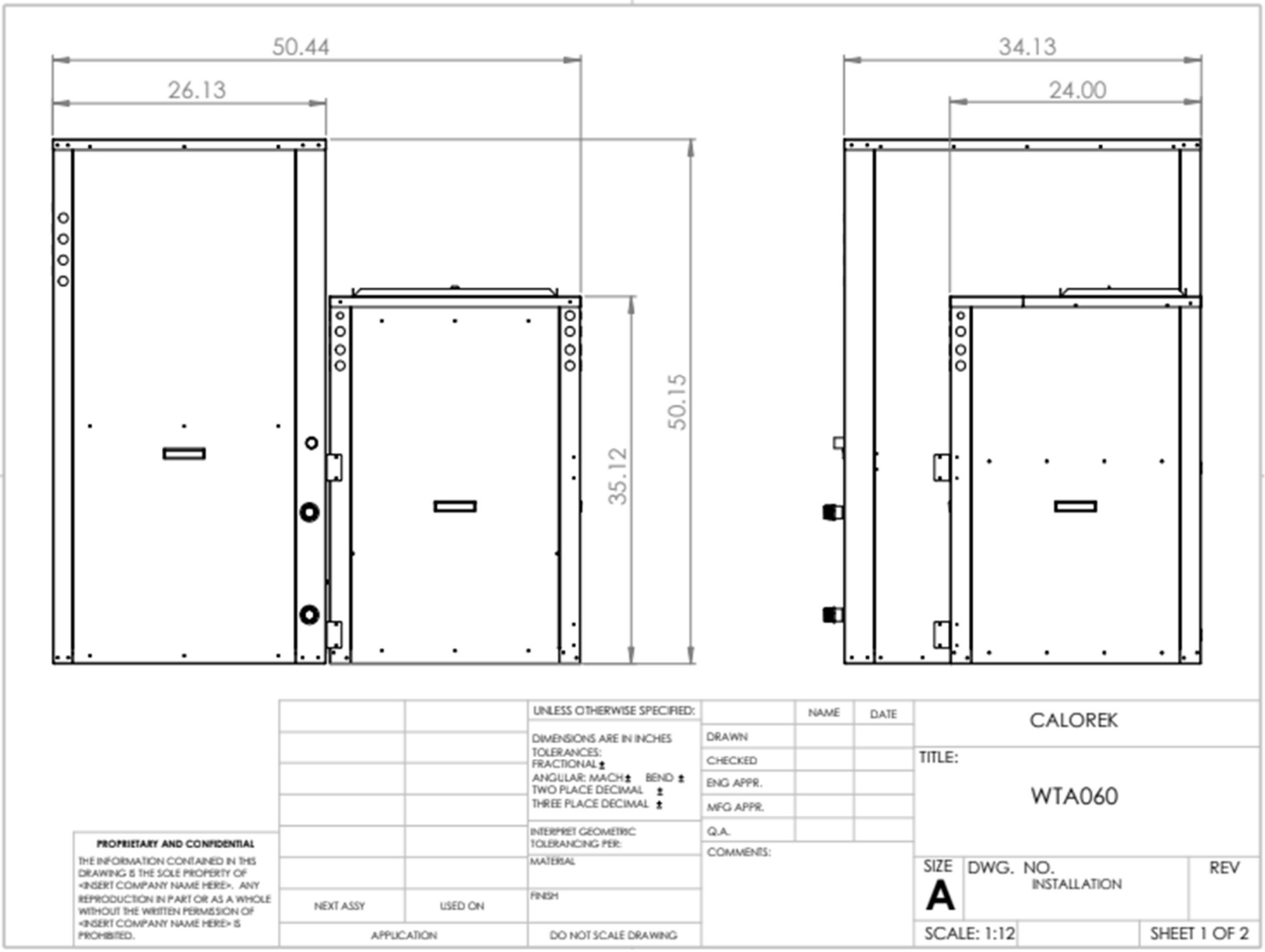


BOTTOM RETURN VIEW
NOTE: OPTIONAL BOTTOM RETURN OPENING DIMENSIONS: 18 X 18"



TOP VIEW
NOTE: TOP SUPPLY OPENING DIMENSIONS: 19 1/2" X 12".

8.2 WTA060 water to air heat pump unit dimensions



		UNLESS OTHERWISE SPECIFIED:		NAME	DATE
		DIMENSIONS ARE IN INCHES TOLERANCES: FRACTIONAL ± ANGULAR: MACH ± BEND ± TWO PLACE DECIMAL ± THREE PLACE DECIMAL ±	DRAWN		
			CHECKED		
			ENG APPR.		
			MFG APPR.		
		INTERPRET GEOMETRIC TOLERANCING PER:	Q.A.		
		MATERIAL	COMMENTS:		
NEXT ASSY	USED ON	FINISH			
APPLICATION		DO NOT SCALE DRAWING			

PROPRIETARY AND CONFIDENTIAL

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF <INSERT COMPANY NAME HERE>. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF <INSERT COMPANY NAME HERE> IS PROHIBITED.

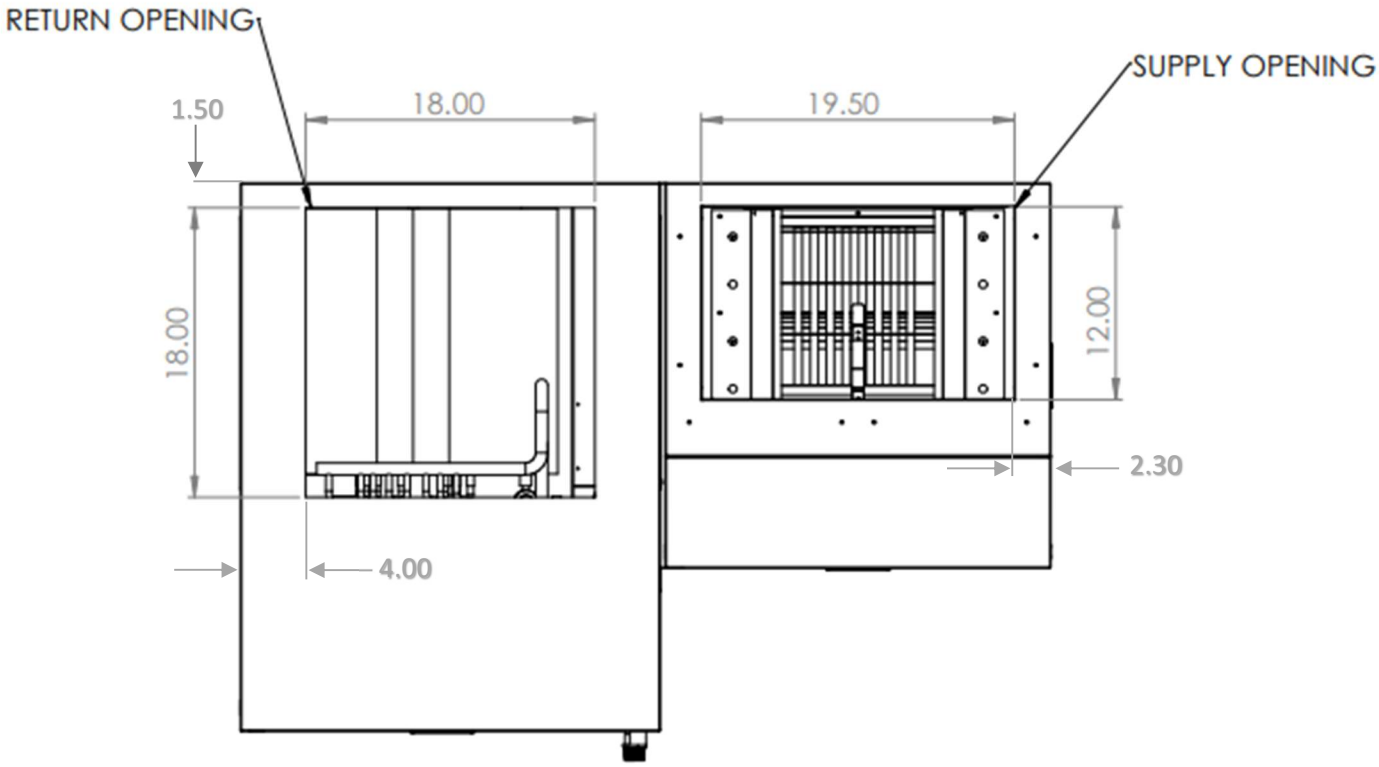
CALOREK

TITLE: WTA060

SIZE	DWG. NO.	REV
A	INSTALLATION	

SCALE: 1:12 SHEET 1 OF 2

TOP VIEW


RETURN OPENING
SUPPLY OPENING
1.50
18.00
19.50
18.00
12.00
2.30
4.00

9 DESCRIPTION ZMX-CM-24V ZONING CONTROL

9.1 General Description

4-zone control for 3-wire 24Vac motorized shutters.

9.2 Thermostat inputs

24Vac Y, O, G, W inputs for four (4) 24V thermostats.

9.3 Thermostat input LED indicators

LED indicators for each thermostat input. Y, O, G and W thermostat input signals for each zone.

9.4 Motorized shutter outputs

Possibility of connecting up to eight (8) 24Vac motorized shutters to a zoning system. Each zone controls one (1) 24Vac output which allows more than one shutter to be connected per zone.

9.5 MODBUS communication

MODBUS RS485 communication on a six (6) conductor “Daisy Chain” network. A standard 18-22AWG 6 conductor thermostat cable can be used. Up to four ZMX-CM zone modules can be installed on a system. However, each must be configured with its own network address. **See the next paragraph on network addressing.**

9.6 Network addressing

Each four zone control module which is connected to the MODBUS network must have its own network address to be recognized by the master control (ZMX-TPHP). Addressing is carried out on each zone control by means of 2 micro-switches ("DIP Switches") located on the control card.

9.7 Heating / air conditioning priority

The zone 1 thermostat that is connected to the zone control board with address "0" is the one which the user decides on the heating or cooling mode of the system. This last is called “master thermostat”. Any other thermostat in the system must be set to the same mode as the master thermostat, otherwise its requests will be ignored by the system.

9.8 Electronic ZMX-CM-24V Zoning Panel Control

The ZMX-CM-24V Zoning Panel Electronic Control Board performs the following functions:

- Reading of thermostat inputs Y, O, G and W for each zone.
- Control of 24 Volt AC motors for 24V motorized shutters (Ex: Belimo LMB24-3-T)
- Transmission of thermostats requests to the ZMX-TPHP master control or our WTA036 and WTA060 water-air geothermal units.
- Receive instructions from master control for HRV and humidifier requests. If one of these two requests is present or a continuous ventilation request on at least one of the zones, the control receives a command from the master control to open all the shutters if possible according to the following charter:

At least one zone requiring heating air conditioning:	**YES**	**NO**	**NO**	**YES**	**YES**	**YES**
HRV or humidifier request:	**NO**	**YES**	**NO**	**YES**	**YES**	**NO**
Continuous ventilation request (one or more zones):	**NO**	**NO**	**YES**	**NO**	**YES**	**YES**
Control sequence:	**1**	**2**	**3**	**1**	**1**	**1**

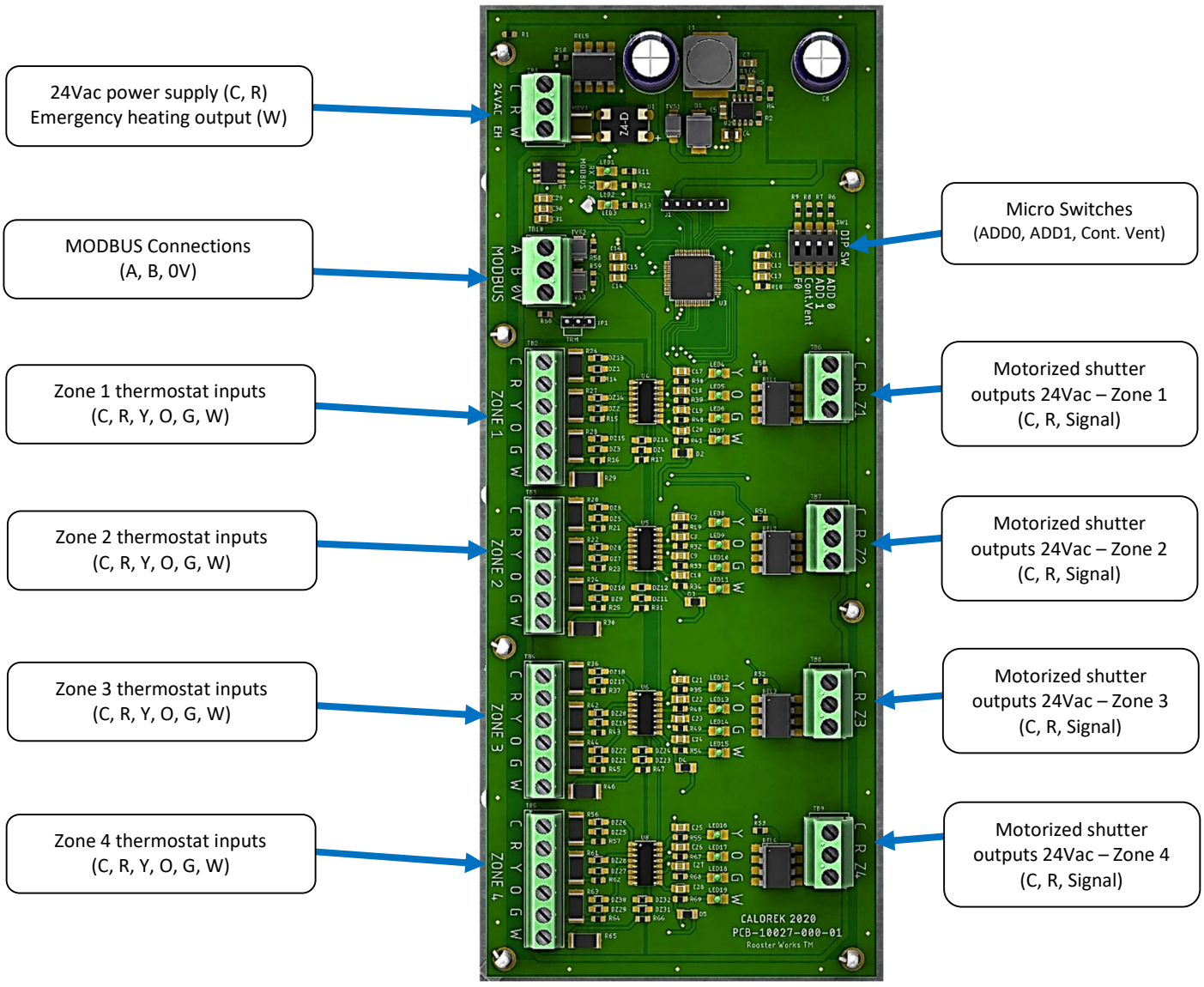
Control sequence 1: The fan is activated and all the shutters whose zone is requesting air conditioning or heating are open at 100%. All other shutters are closed.

Control sequence 2: The fan is activated and all the shutters are open to 100%.

Control sequence 3: The fan is activated and all the shutters whose zone is requesting continuous ventilation are open to 100%. All other shutters are closed.

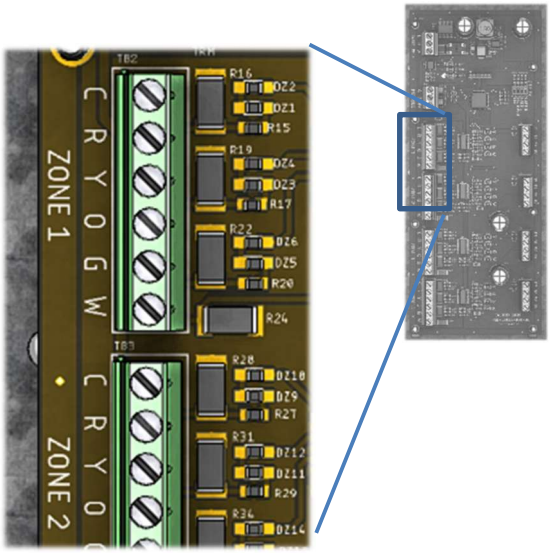
If there is no demand for air conditioning, heating, HRV continuous ventilation or humidifier, the fan is deactivated and all shutters are closed.

9.8.1 General view of ZMX-CM-24V connectors and terminals



9.8.2 Thermostat inputs

The control includes connection terminal blocks for 4 thermostats (or 4 zones). 24volt thermostat with 1H/1C is required (thermostat are not included). Each of the 4 terminal blocks includes 6 terminals:



- **Terminal C:** 24Vac power supply - Common
- **Terminal R:** 24Vac power supply - Live
- **Terminal Y:** Compressor control - Energized on heating or air conditioning request
- **Terminal O:** Reversible valve control - Energized on air conditioning request
- **Terminal G:** Continuous ventilation request
- **Terminal W:** Emergency heating request

NOTE: The thermostats must be configured to energize their "O" terminals in cooling.

9.8.3 Motorized shutter outputs 24Vac

For each zone, the control includes a terminal block for 24Vac motorized shutter motors available on the market. Each output terminal block includes 3 terminals:

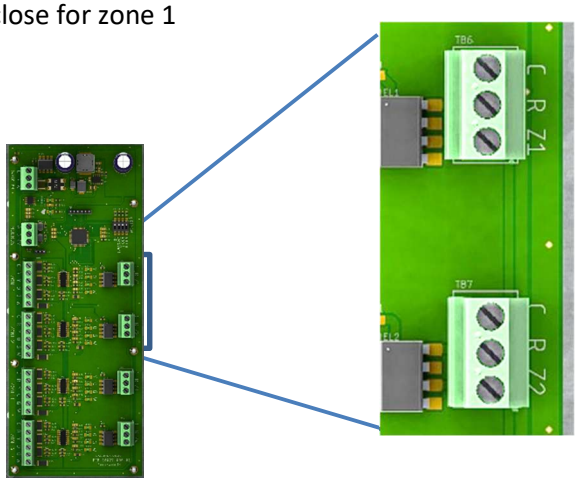
Zone 1

- **Terminal C:** 24Vac power supply - Common
- **Terminal R:** 24Vac power supply - Live
- **Terminal Z1:** Signal from shutters which open or close for zone 1

Zone 2

- **Terminal C:** 24Vac power supply - Common
- **Terminal R:** 24Vac power supply - Live
- **Z2 terminal:** Signal from shutters which open or close for zone 2

... And so on up to Zone 4



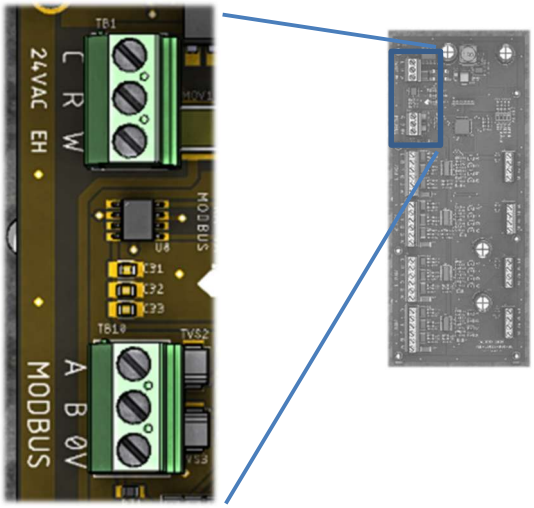
9.8.4 24Vac and MODBUS power supply

The 24Vac power supply terminal block includes 3 terminals:

- **Terminal C:** 24Vac power supply – Common
- **Terminal R:** 24Vac power supply - Live
- **Terminal W:** Emergency heating output **(Connected to main board W terminal)**

The MODBUS terminal block includes 3 terminals:

- **Terminal A:** RS485 (+)
- **Terminal B:** RS485 (-)
- **Terminal 0V:** 0-volt reference



9.8.5 Micro-switches ("Dip-Switch")

The control card includes 4 micro-switches which allow the network addressing of each ZMX-CM module present on a MODBUS network. The addresses must be configured as follows:

ZONES 1-4
Address 0: ADD0=OFF, ADD1=OFF



ZONES 5-8
Address 1: ADD0=ON, ADD1=OFF

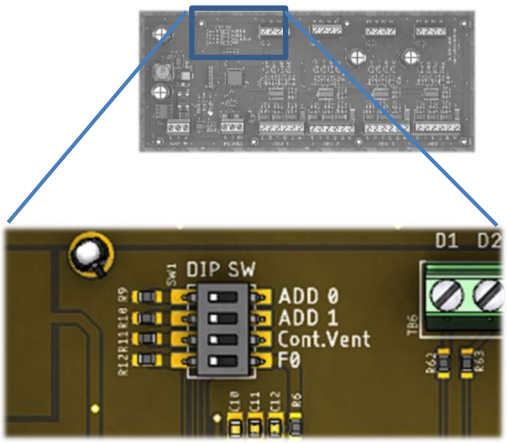


ZONES 9-12
Address 2: ADD0=OFF, ADD1=ON



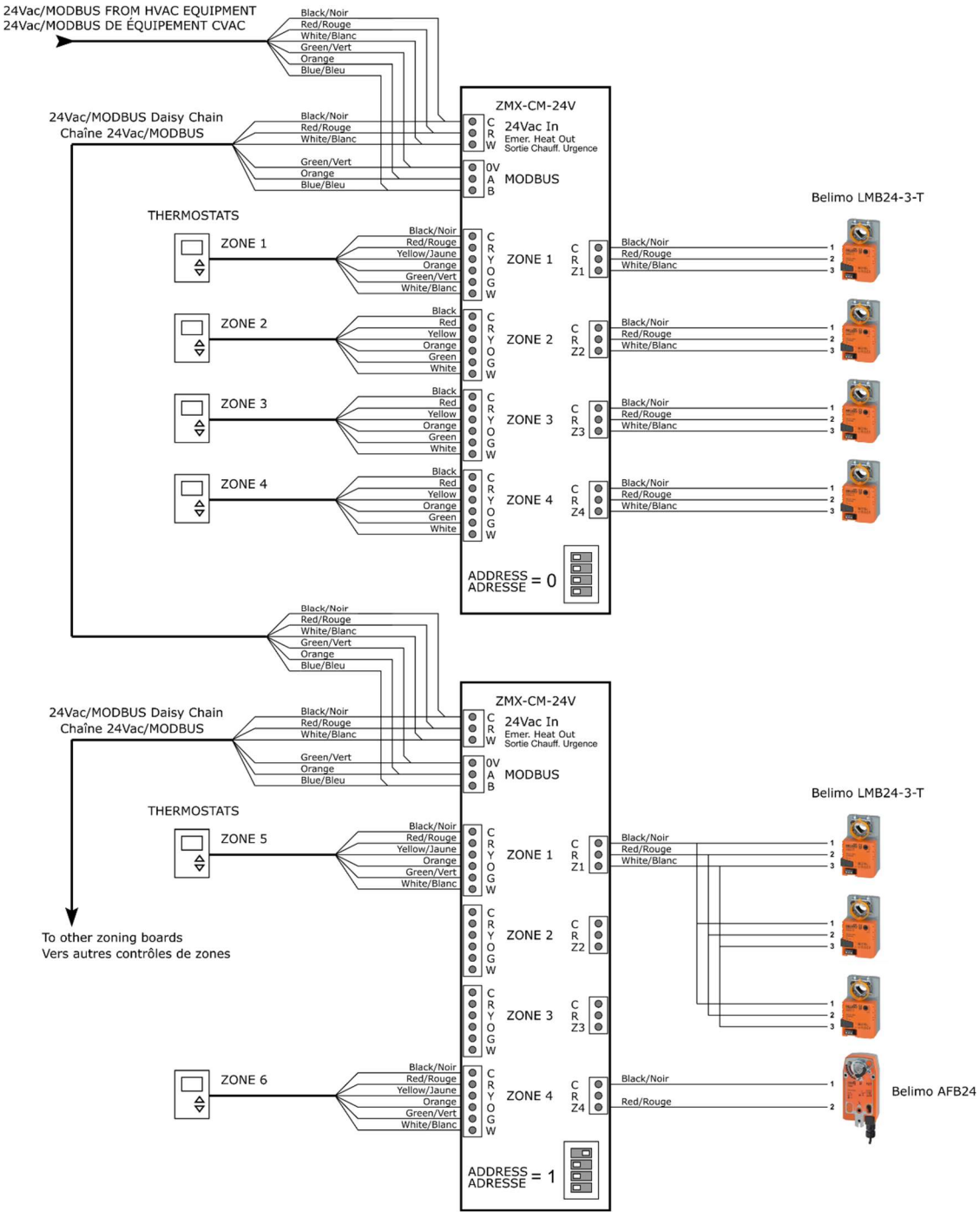
ZONES 13-16
Address 3: ADD0=ON, ADD1=ON





Dip switch cont. Vent off = fan is off when there are no other types of demands
Dip switch cont. Vent on = fan is on when there are no other types of demands
Dip switch F0 off = actuator with normally open contact/Dip switch F0 on = actuator with normally closed contact

9.9 Example of ZMX-CM-24V connections



10 DESCRIPTION ZMX-CM-5V ZONING CONTROL

10.1 General Description

4-zone control for 5-volt Calorek ZMX-MP series motorized shutters.

10.2 Thermostat inputs

24Vac Y, O, G, W inputs for four (4) 24V thermostats.



10.3 Thermostat input LED indicators

LED indicators for each thermostat input.
Y, O, G and W thermostat input signals for each zone.

10.4 Motorized shutter outputs

Possibility of connecting up to eight (8) 5V motorized shutters per zone. Maximum of 24 motorized shutters per system. Each zone controls two (2) outputs which will be activated one after the other. This allows more shutters to be connected per zone.

10.5 MODBUS Communication

MODBUS RS485 communication on a six (6) conductor “Daisy Chain” network. A standard 18-22AWG 6 conductor thermostat cable can be used. Up to four ZMX-CM zone modules can be installed on a system. However, each must be configured with its own network address. **See the next paragraph on addressing.**

10.6 Network addressing

Each four-zone control module which is connected to the MODBUS network must have its own network address to be recognized by the master control (ZMX-TPHP). Addressing is carried out on each zone control by means of 2 micro-switches ("DIP Switches") located on the control card.

10.7 Heating / air conditioning priority

The zone 1 thermostat that is connected to the zone control board with address "0" is the one which the user decides on the heating or cooling mode of the system. This last is called “master thermostat”. Any other thermostat in the system must be set to the same mode as the master thermostat, otherwise its requests will be ignored by the system.

10.8 ZMX-CM-5V electronic zoning panel control

The ZMX-CM-5V Zoning Panel Electronic Control Board performs the following functions:

- Reading of thermostat inputs Y, O, G and W for each zone.
- Control of 5 Volt motors for ZMX-MP motorized shutter panels
- Transmission of thermostats requests to the ZMX-TPHP master control or our WTA036 and WTA060 water-air geothermal units.
- Receive instructions from master control for HRV and humidifier requests. If one of these two requests is present or a continuous ventilation request on at least one of the zones, the control receives a command from the master control to open all the shutters according to the following charter:

At least one zone requiring heating air conditioning:	**YES**	**NO**	**NO**	**YES**	**YES**	**YES**
HRV or humidifier request:	**NO**	**YES**	**NO**	**YES**	**YES**	**NO**
Continuous ventilation request (one or more zones)	**NO**	**NO**	**YES**	**NO**	**YES**	**YES**
Control sequence:	**1**	**2**	**3**	**4**	**4**	**5**

Control sequence 1: The fan is activated and all the shutters whose zone is requesting air conditioning or heating are open at 100%. All other shutters are closed.

Control sequence 2: The fan is activated and all the shutters are open to 100%.

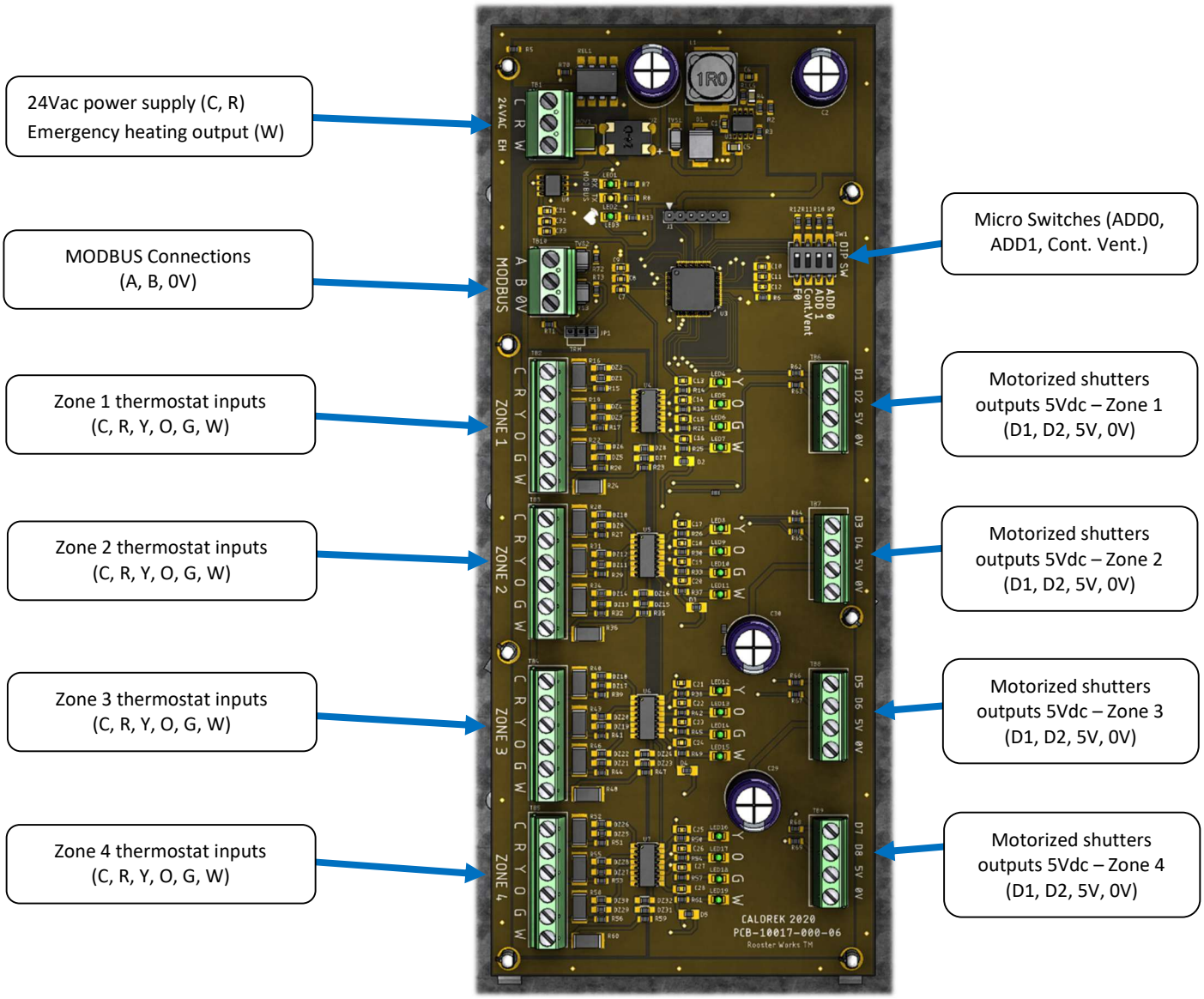
Control sequence 3: The fan is activated and all the shutters whose zone is requesting continuous ventilation are open to 100%. All other shutters are closed.

Control sequence 4: The fan is activated and all the shutters whose zone is requesting air conditioning or heating are open at 100%. All shutters whose areas are not in demand open at 30%.

Control sequence 5: The fan is activated and all the shutters whose zone is requesting air conditioning or heating are open at 100%. All the shutters whose zones are not in air conditioning or heating request are closed and those whose zones are in continuous ventilation request open at 30%.

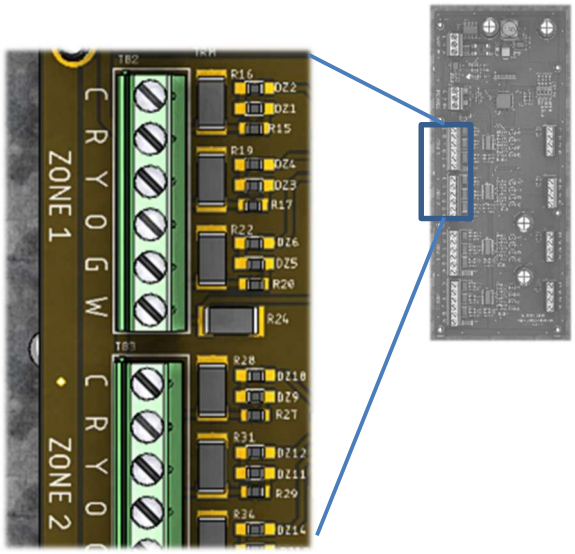
If there is no demand for air conditioning, heating, HRV continuous ventilation or humidifier, the fan is deactivated and all shutters are closed.

10.8.1 General view of ZMX-CM-5V connectors and terminals



10.8.2 Thermostat inputs

The control includes connection terminal blocks for 4 thermostats (or 4 zones). 24volt thermostat with 1H/1C is required (thermostat are not included). Each of the 4 terminal blocks includes 6 terminals:



- **Terminal C:** 24Vac power supply - Common
- **Terminal R:** 24Vac power supply - Live
- **Terminal Y:** Compressor control - Energized on heating or air conditioning request
- **Terminal O:** Reversible valve control - Energized on air conditioning request
- **Terminal G:** Continuous ventilation request
- **Terminal W:** Emergency heating request

NOTE: The thermostats must be configured to energize their "O" terminals in air conditioning.

10.8.3 Motorized shutter outputs 5Vdc

For each zone, the control includes a connection terminal block for 5Vdc ZMX-MP motorized shutter motors. Each output terminal block includes 4 terminals:

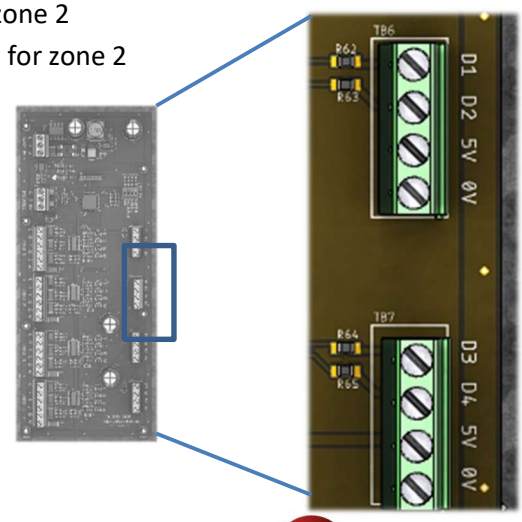
Zone 1

- **D1:** Signal from shutters which open or close first for zone 1
- **D2:** Signal from shutters which open or close secondly for zone 1
- **5V:** 5Vdc power supply for shutter motors in zone 1
- **0V:** 0Vdc power supply for shutter motors in zone 1

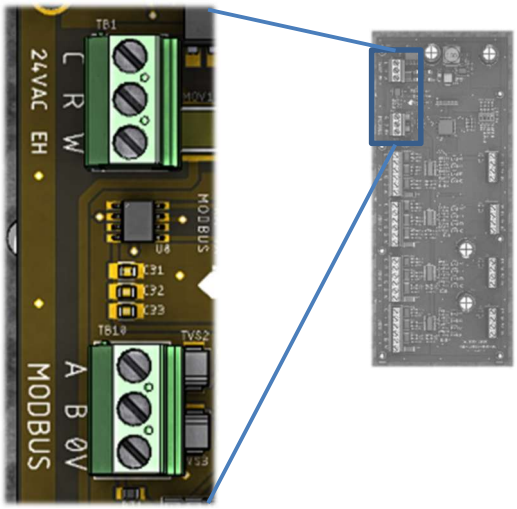
Zone 2

- **D3:** Signal from shutters which open or close first for zone 2
- **D4:** Signal from shutters which open or close secondly for zone 2
- **5V:** 5Vdc power supply for zone 2 shutter motors
- **0V:** 0Vdc power supply for zone 2 shutter motors

... And so on up to Zone 4



10.8.4 24Vac and MODBUS power supply



The 24Vac power supply terminal block includes 3 terminals:

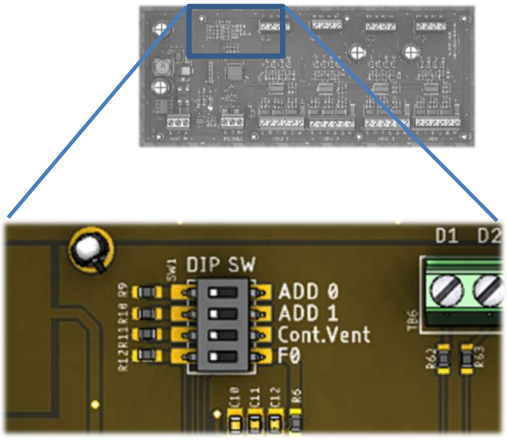
- **Terminal C:** 24Vac power supply – Common
- **Terminal R:** 24Vac power supply - Live
- **Terminal W:** Emergency heating output **(Connected to main board W terminal)**

The MODBUS terminal block includes 3 terminals:

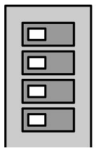
- **Terminal A:** RS485 (+)
- **Terminal B:** RS485 (-)
- **Terminal 0V:** 0-volt reference

10.8.5 Micro-switches ("Dip-Switch")

The control card includes 4 micro-switches which allow the network addressing of each ZMX-CM module present on a MODBUS network. The addresses must be configured as follows:

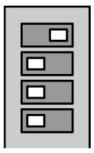


ZONES 1-4
Address 0: ADD0=OFF, ADD1=OFF



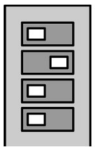
1=OFF
2=OFF
3=OFF
4=OFF

ZONES 5-8
Address 1: ADD0=ON, ADD1=OFF



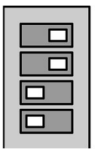
1=ON
2=OFF
3=OFF
4=OFF

ZONES 9-12
Address 2: ADD0=OFF, ADD1=ON



1=OFF
2=ON
3=OFF
4=OFF

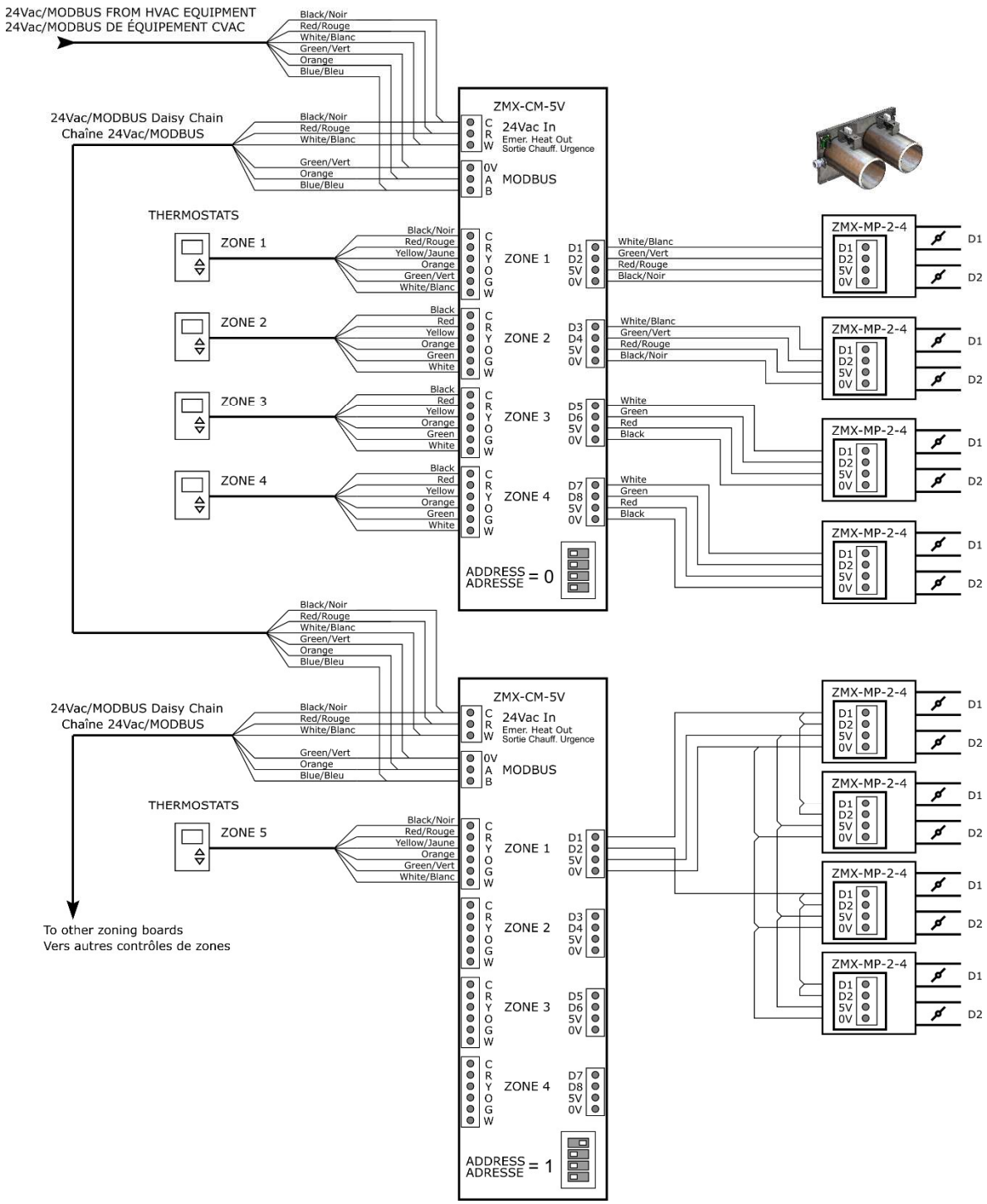
ZONES 13-16
Address 3: ADD0=ON, ADD1=ON



1=ON
2=ON
3=OFF
4=OFF

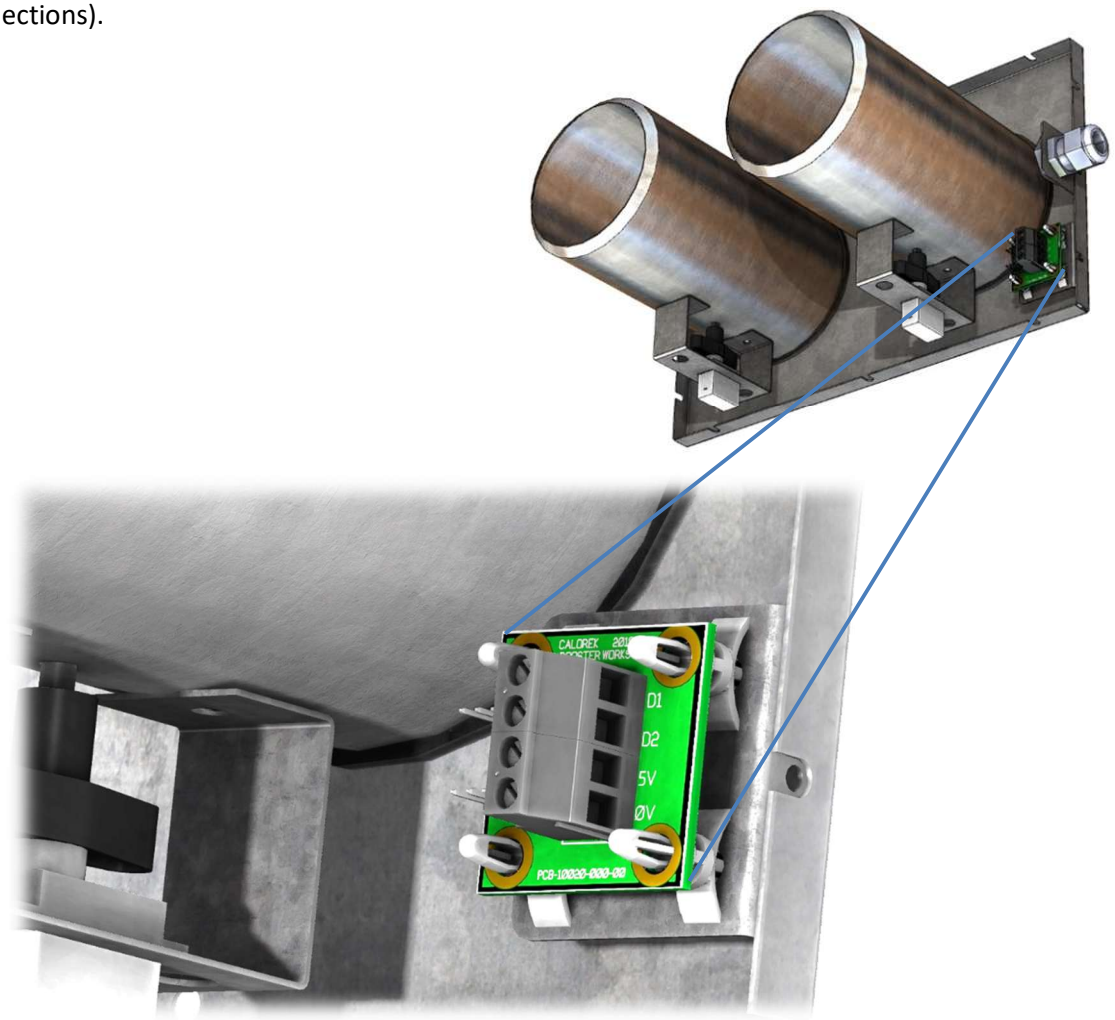
Dip switch cont. Vent off = fan is off when there are no other types of demands
Dip switch cont. Vent on = fan is on when there are no other types of demands
Dip switch F0 = no used

10.9 Example of ZMX-CM-5V connections

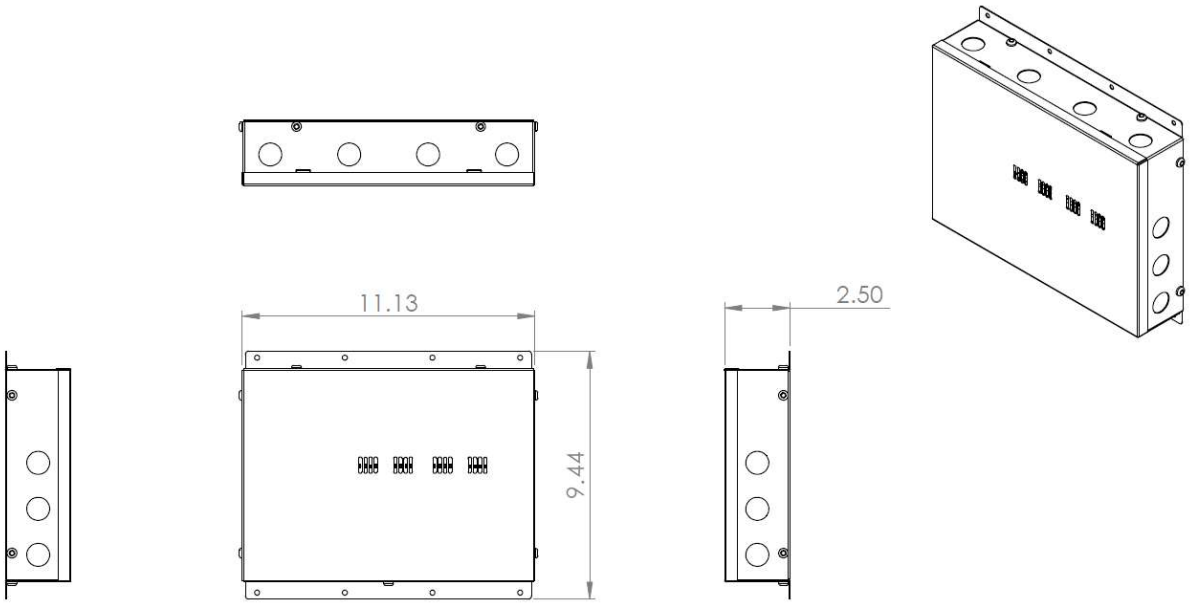


11 DAMPER MANIFOLD ZMX-MP-2-4

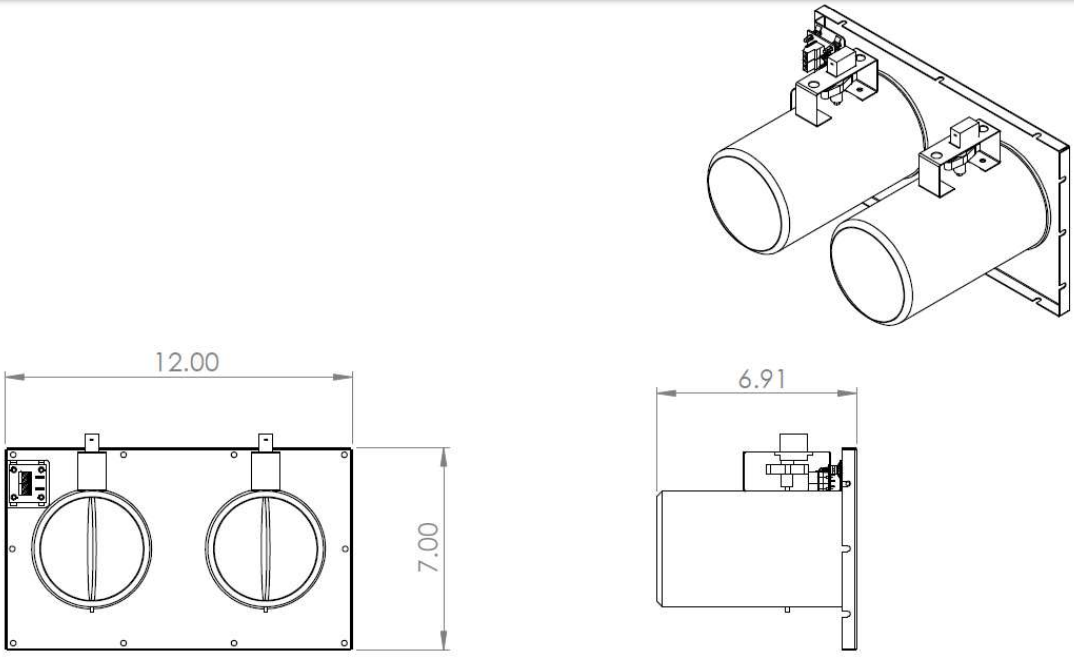
The ZMX-MP-2-4 motorized shutter module includes two 4-inch diameter motorized shutters powered by 5-volt motors. The module must absolutely be connected to the ZMX-CM-5V zoning control to operate (See section 4.9 for connections).



12 ZMX-CM-5V, ZMX-CM-24V BOX DIMENSIONS

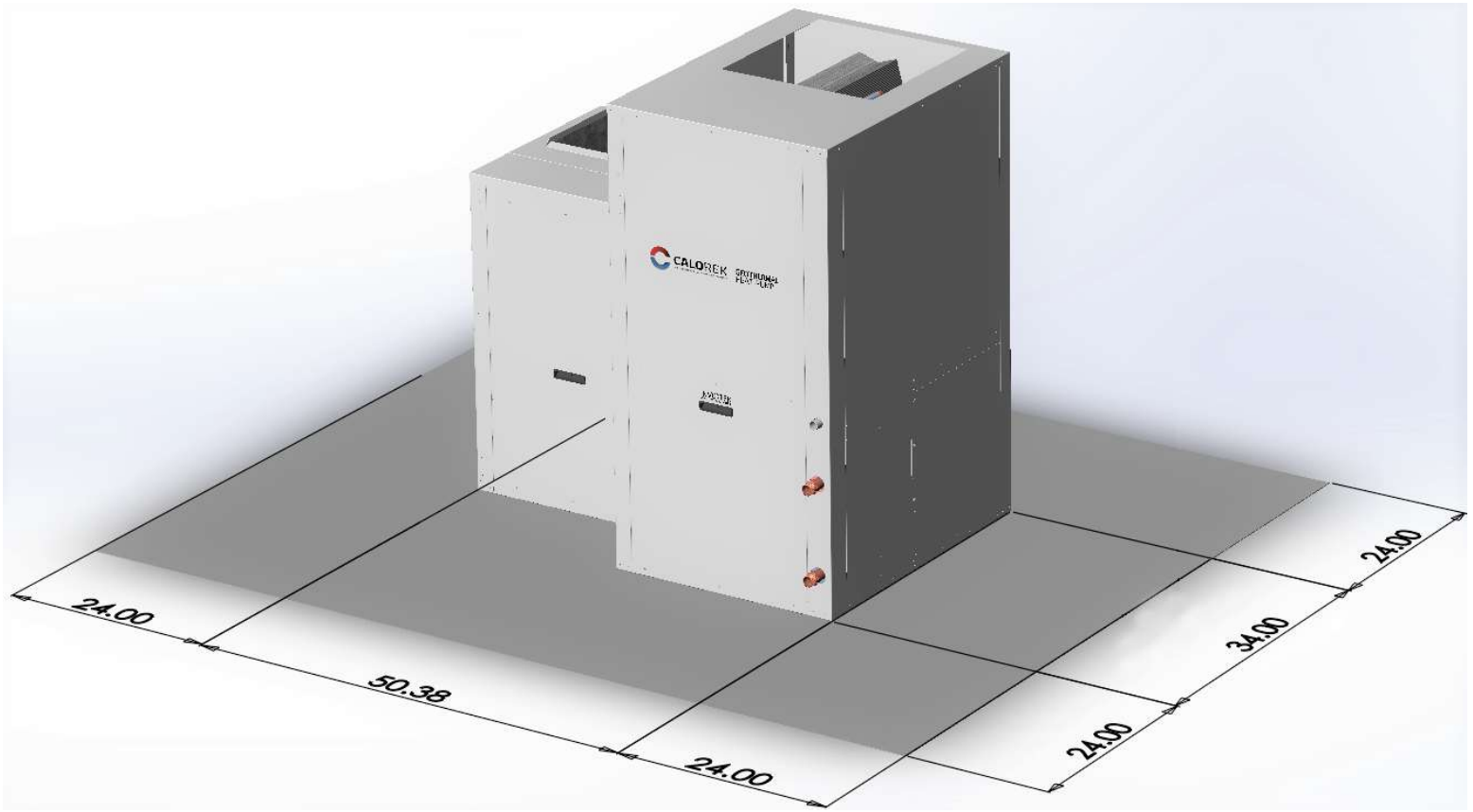


13 ZMX-MP-2-4 DIMENSIONS



14 EQUIPMENT MINIMAL CLEARANCES

The picture below shows best scenario clearances all around the equipment. However, a minimal clearance of 6 inches must be allowed on the sides and the back. The front side needs to have a clearance of 24 inches for maintenance and repair purposes.

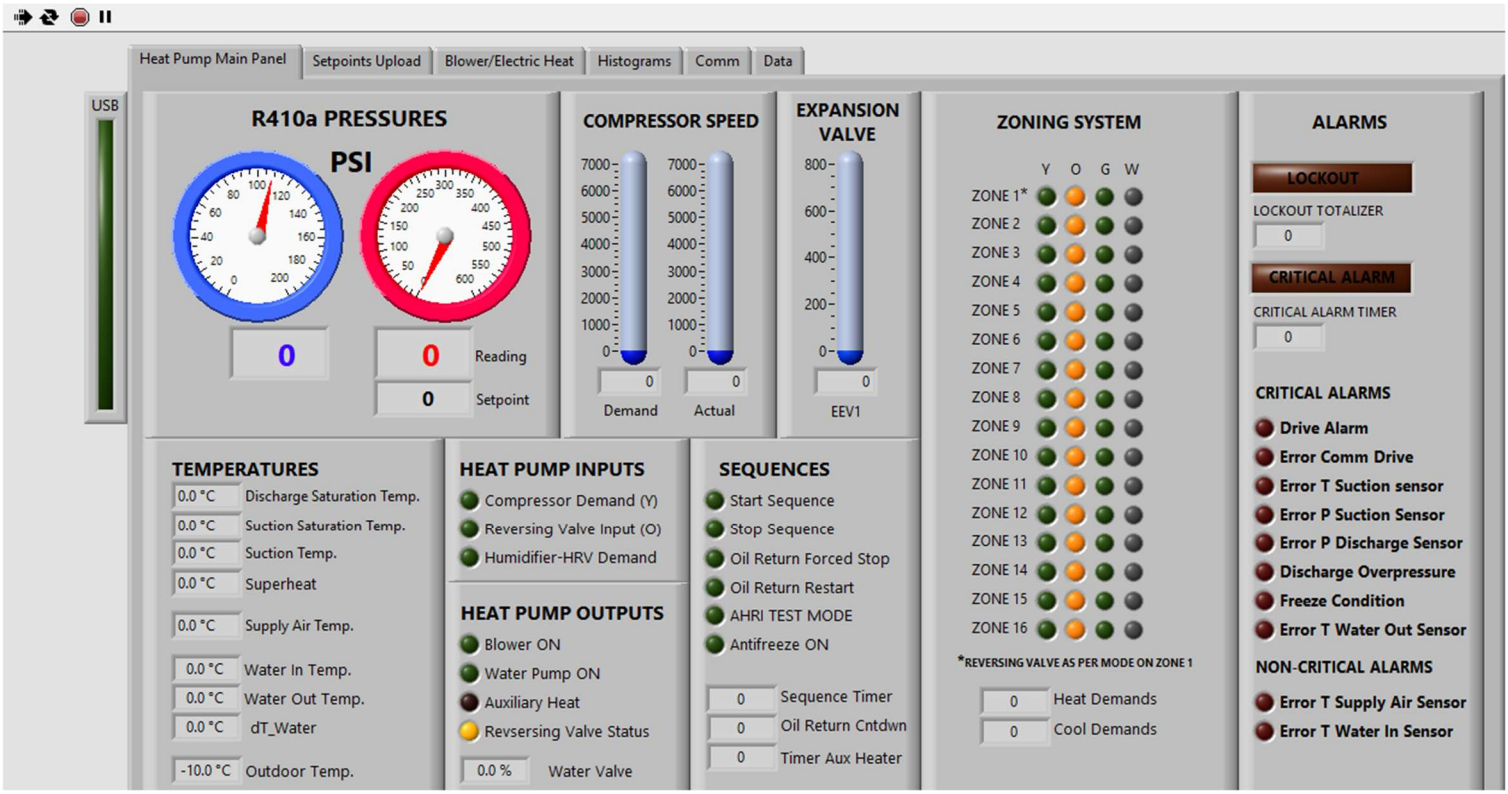


15 GRAPHIC USER INTERFACE (GUI)

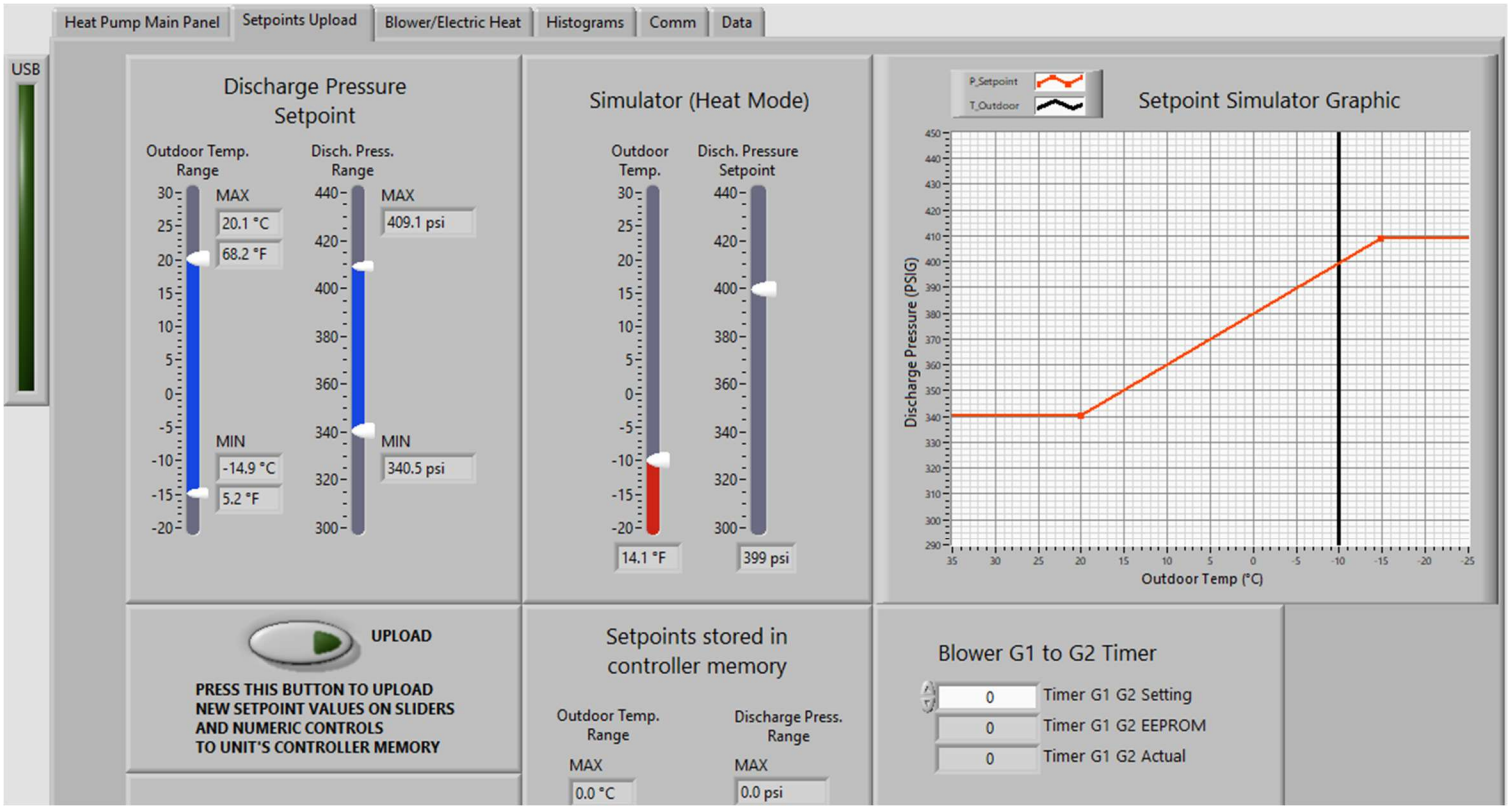
A Labview based Graphic User Interface (GUI) can be provided on a USB key. It can be installed on a laptop and allows the technician to see the system variables in real time.

15.1 GUI - Heat pump main panel

The main panel shows real time information on heat pump general operating parameters.



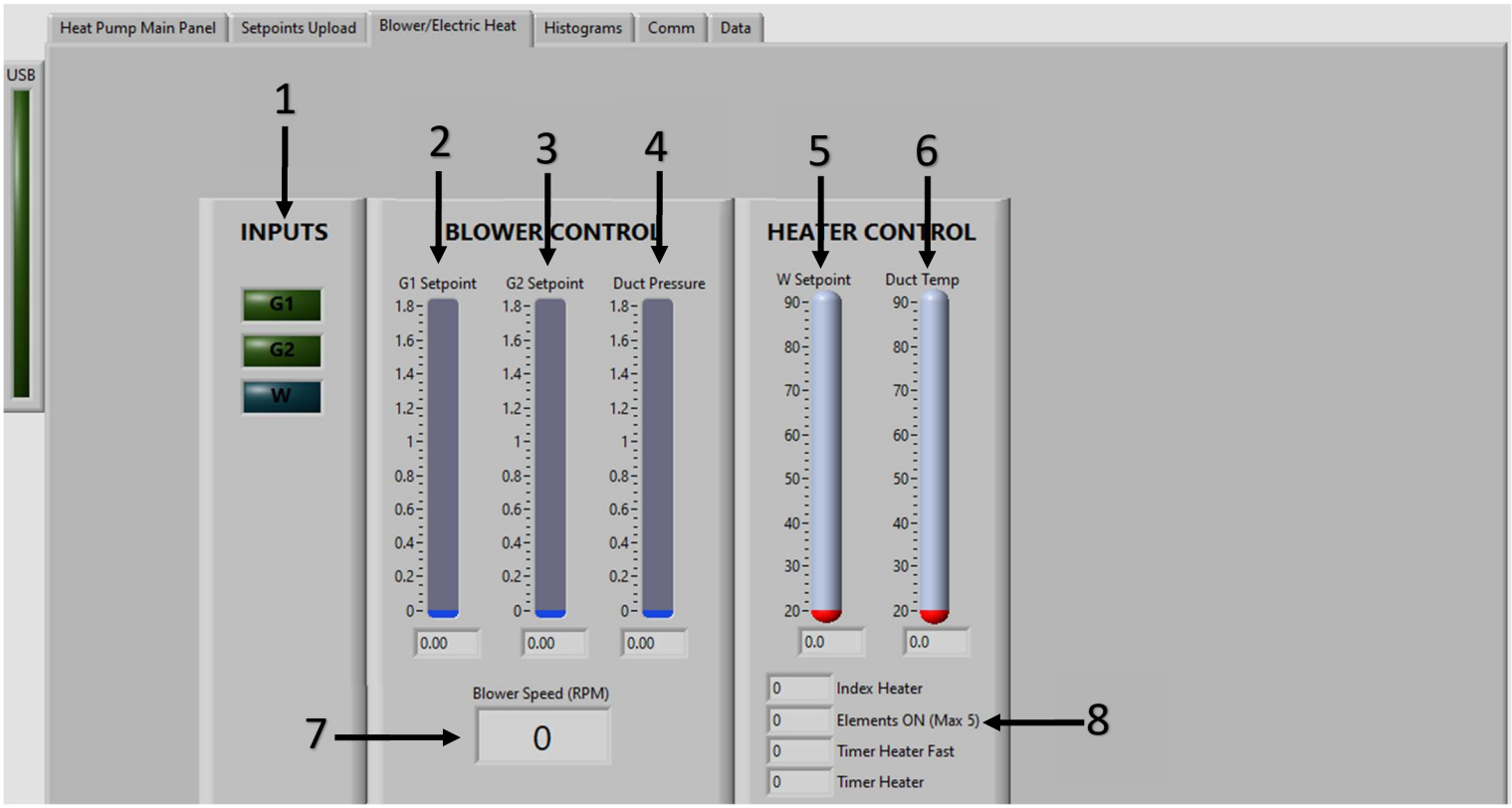
15.2 GUI - Set point upload panel



15.3 GUI - Blower/Electric heater panel

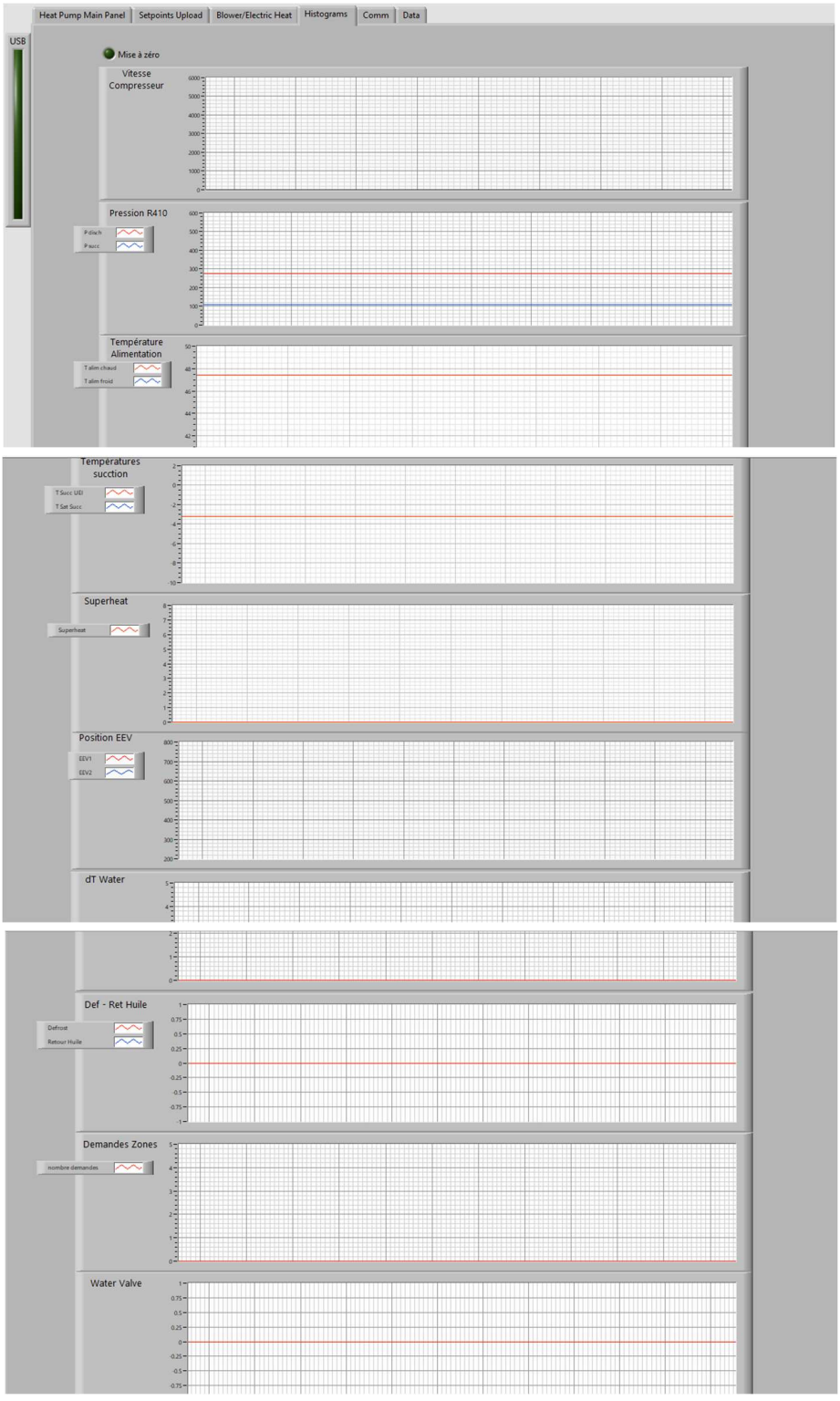
Description of panel functions

1- Inputs tell you if G1, G2, or W is energised
2- G1 potentiometer set point **(See section 6.3.2 for more detail)**
3- G2 potentiometer set point **(See section 6.3.2 for more detail)**
4- Real time ESP External Static Pressure
5- W temperature probe potentiometer set point **(See section 6.3.2 for more detail)**
6- Real time duct temperature
7- Real time blower speed (RPM)
8- How many elements are currently on



15.4 GUI - Histograms panel

The histogram panel shows you pattern of how the unit is reacting in real time and can be helpful when technician is troubleshooting unit.



16 IDENTIFICATION OF THERMOSTATS AND SHUTTERS

When installing the zoning system, it is important to identify the cables for each thermostat as well as the motorized shutter (s) it controls. Use the supplied sticker sheet to properly identify each thermostat cable as well as each air duct or motorized damper in the mechanical room. Please print Appendix 1- table of zone of this manual.

ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8
ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8

ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16
ZONE 9	ZONE 10	ZONE 11	ZONE 12	ZONE 13	ZONE 14	ZONE 15	ZONE 16

ACL-00020-00000

APPENDIX 1 – TABLE OF ZONES

	Zone	Room or zone name
ZMX-CM MODULE 1	**1**	
	2	
	3	
	4	
ZMX-CM MODULE 2	**5**	
	6	
	7	
	8	
ZMX-CM MODULE 3	**9**	
	10	
	11	
	12	
ZMX-CM MODULE 4	**13**	
	14	
	15	
	16	