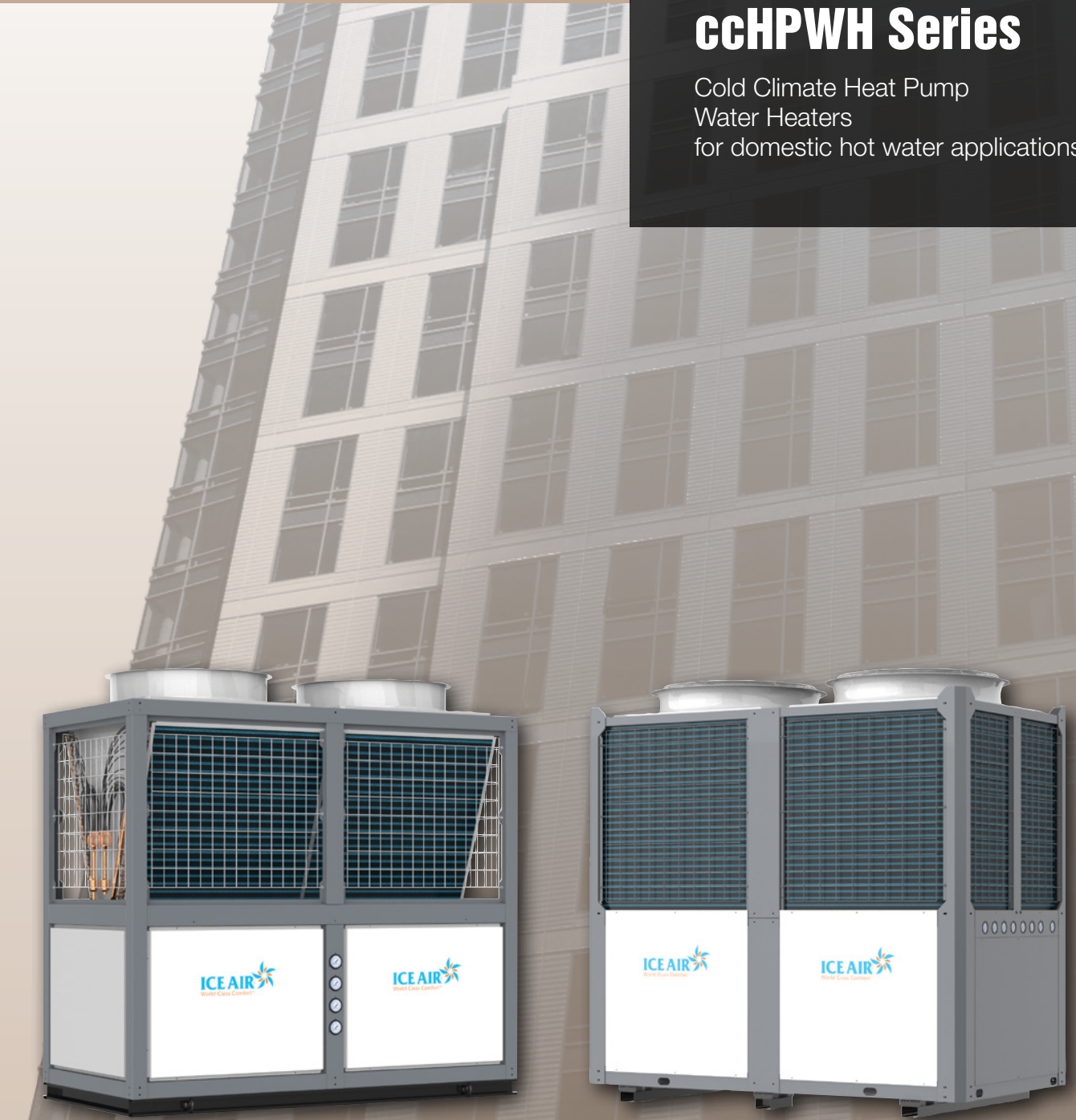


**Installation and
Maintenance Manual**

HPWH

cCHPWH Series

Cold Climate Heat Pump
Water Heaters
for domestic hot water applications



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I. Foreword


Please read this instruction carefully before installation and use. This instruction includes required messages for installation, adjustments, and maintenance.

Ice Air heat pump products are produced to strict design standards to ensure safe, efficient, and reliable operation.

Ice Air is not responsible for damage to people or property caused by improper installation, adjustment, maintenance, or operations contrary to this instruction manual.

	The DANGER sign indicates potential harm that could result in personal injury or death.
	The WARNING sign indicates potential harm that could result in personal injury or death.
	The CAUTION sign indicates dangers that can cause damages to unit, other devices, or air pollution.
	The NOTE sign indicates important items to take note of. The NOTE indicates items that may affect the operation of the units.

Apart from factory provided options, additional external wires are not allowed to be connected to the power or control wiring cabinets. Third party relays, switches, sensors, and controllers are not allowed to be installed in the power or control wiring cabinets. External wiring cannot cross over the power or control wiring cabinets. All the wiring work must follow specifications and be installed by professionals.

	Lethal high voltage DC and AC is present in the power wiring control cabinet. Make sure the power supply is off before opening the cabinet.
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To avoid injury or damages to the units, please observe these notes:

- ⊘ The supply power wiring must be selected according to the maximum overcurrent protection (MOCP) or maximum power.
- ⊘ Power must be ground in accordance with the National Electrical Code.
- ⊘ Confirm the fastening of power wiring prior to start-up
- ⊘ Connect the supply wiring in accordance with the wiring diagram.
- ⊘ Installation professionals are advised to wear protective gear, such as anti-static gloves during electrical operations, etc.
- ⊘ Check the parts, integrity, and insulation of wiring, and repair if needed.
- ⊘ This unit is intended to operate within the ranges specified.
- ⊘ It is strictly prohibited to refit the unit or modify the parameters.

Water system installation

- ⊘ Isolation valves and drains shall be installed at the inlet and outlet of the water pipes; strainers are recommended on the inlet piping.
- ⊘ Gauges and thermometers are recommended to be installed on the inlet and outlet pipes to monitor the operation of the system and equipment.
- ⊘ The temperature difference of water inlet and outlet are suitable between 7°F (4°C) and 11°F (6°C) when operating at full load.
- ⊘ The water quality should meet the requirement below:

pH value (25°C)	6.5 – 8.0	Chloridion (Cl (mg/L)	<50
Electrical conductivity (25°C) (µs/cm)	<250	Silver sulfate (SO ₄ ²⁻)(mg/)	<50
TFe (mg/L)	<0.3	Total alkalinity	<50
Total hardness (mg/L)	<50	Silicon dioxide (SiO ₂)	<30



Compressor shipping brackets are mounted to the bottom of the compressors to prevent the vibration isolation mounts from damage during shipment. REMOVE the compressor shipping brackets prior to start-up.

Warning

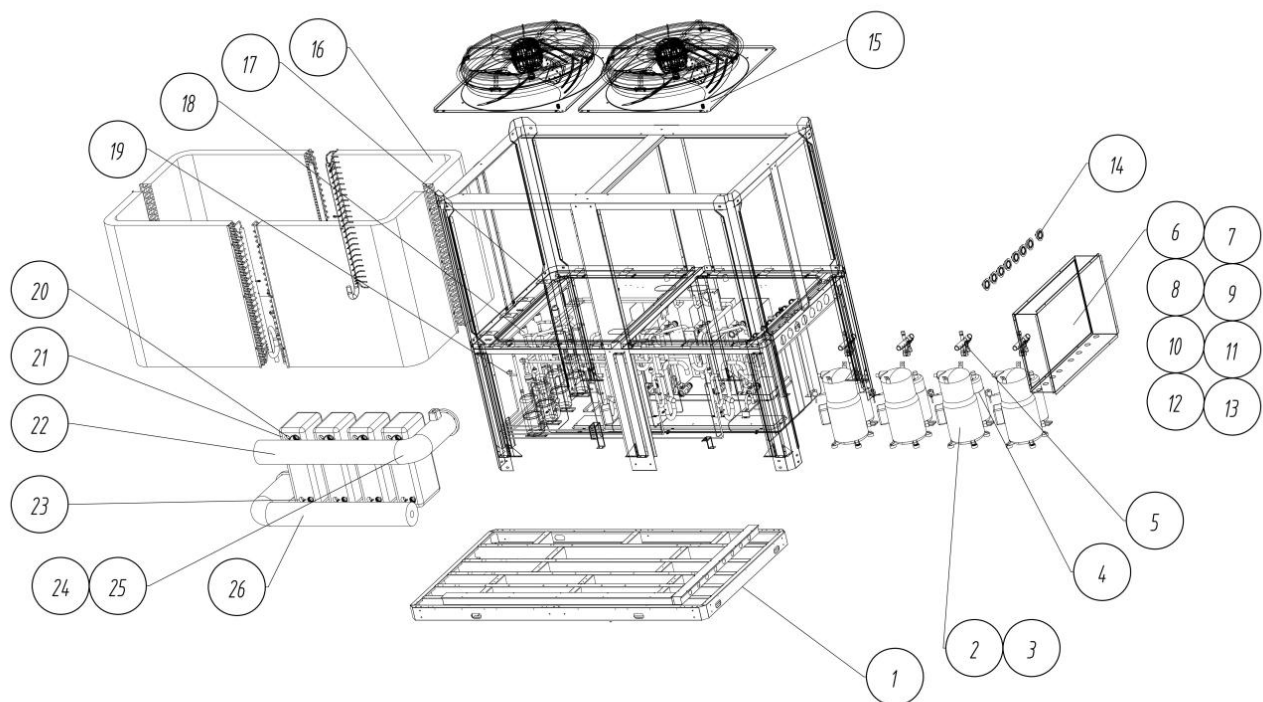
- Prior to start-up, the compressor should be powered on to preheat the system. Recommended preheat cycle is 8 hours prior to initial start-up. Completing the recommended preheat improves the temperature of the compressor lubricating oil. Failing to properly preheat the system can result in poor operation or damage to the compressor.
- CFC's can destroy the ozone layer in the atmosphere and pollute the environment. Utilize recovery devices to recover refrigerant when servicing the system.
- If the operation of this system has the potential for power loss and has the potential to experience ambient temperatures below freezing [32°F (0°C)], then the user should utilize one of three strategies: A) Order the unit with factory mounted heat trace, then provide field heat trace on external piping and an emergency power source for the heat trace, or B) Utilize glycol (anti-freeze) solution within all external hydronic piping.

C) Drain the water from the system prior to any ambient temperature dropping below freezing [32°F (0°C)].

- Ensure supply wiring is free of defects and properly protected.
- It is prohibited to disconnect or short circuit any safety devices.
- Ensure three-phase power is connected properly to avoid reverse rotation or phase loss. Operation with reverse phase will cause serious damage to the unit.
- Power wiring must be protected by a rubber gasket, otherwise water could damage electrical components and result in risk of electric shock.

Detailed explanation of structure

ccHPWH series is composed of compressor, evaporator (hydrophilic finned heat exchanger), condenser (brazen plate heat exchanger), throttling device (electronic expansion valve), liquid injection enthalpy increase system, sheet metal parts of box structure, refrigerant system copper pipe, temperature sensors, pressure switch, electronic control system and other main components. The explosion diagram of the product is as follows:



1	Chassis component	10	Wire controller	19	Solenoid 2-way valve
2	Compressor	11	Transformer	20	Brazed plate heat exchanger
3	Crankshaft electric heater	12	Grounding device	21	40mm insulated cotton
4	Liquid-vapor separator	13	Inductor	22	Hydronic electric heater
5	4 way valve	14	Pressure gauge	23	Single disc ball valve
6	Electric box	15	Fan	24	Water outlet pipe
7	Mounting plate	16	Hydrophilic finned heat exchanger	25	Water inlet pipe
8	Motherboard	17	Chassis electric heater	26	Water flow switch
9	AC contactor	18	EEV component	27	

Name	Specification	Detailed information
Water outlet temp. sensor	A.S.W.01.N-10K-5X25-06-ROHS	Φ5X25,copper shell,4000mm,With white color TV connector,NTC,R25=10K±1%,B25/50=3950±1%
Ambient temp. sensor	A.S.W.01.N-10K-5X25-06-ROHS	Φ5X25,copper shell,4000mm,With white color TV connector,NTC,R25=10K±1%,B25/50=3950±1%
Coil temp. sensor	A.S.W.01.N-10K-5X25-24-ROHS	Φ5X25,copper shell,4000mm,With blue color TV connector,NTC,R25=10K±1%,B25/50=3950±1%
Suction temp. sensor	A.S.W.01.N-10K-5X25-25-ROHS	Φ5X25,copper shell,4000mm,With green color TV connector,NTC,R25=10K±1%,B25/50=3950±1%,-30~+105°C
Exhaust temp. sensor	BP-A.S.W.01.N-10K-5X25-21-ROHS	Φ 5 x25, copper plating nickel shells, black PVC and lines, line 4 m, with a red color TV connectors, NTC, diode type,R25=10K±1%,B25/50=3950±1%/high temperature resistance150°C
Water tank temp.	BP-A.S.W.01.N-10K-5X25-21-ROHS	Φ 5 x25, copper plating nickel shells, black PVC and lines, line 4 m, with a red color TV connectors, NTC, diode type,R25=10K±1%,B25/50=3950±1%/high temperature resistance150°C
Water level common end	A.S.T.002-ROHS	RoHS,Electrode type water level sensor probe, stainless steel, line length 10m,blue

The HPWH refrigeration circuit shall contain scroll compressor(s) with a maximum of 15-hp per circuit, factory charged with R-410A refrigerant, air-source evaporator(s), water-source condenser(s), EEV regulated flow, EEV regulated vapor injection circuit, and 4-way valve to reverse the refrigeration circuit during defrost cycles.

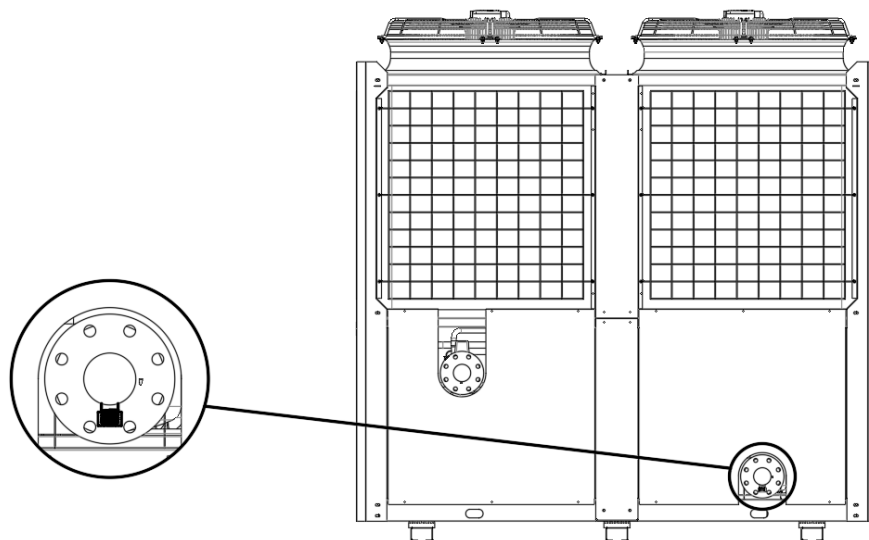
The water-source condenser circuit shall be provided with one of two factory options:

- A. *Double wall, brazed plate heat exchanger* with airgap and leakage ports. This option to be utilized with direct heating of potable hot water. When this feature is selected, factory mounted heat-trace will be provided on all internal hydronic components, wired to a unit mounted 115v/1ph/60hz terminal strip intended for field provided emergency power source.
- B. *Single wall, brazed plate heat exchanger*. This option to be utilized with indirect heating of potable hot water. Typical applications include glycol circuits for exterior piping that transfer heat via an interior mounted double wall heat exchanger that services the domestic hot water circuit. Heat-trace is not provided with this option because glycol operation is assumed.

Supply and return piping shall be 316L stainless steel with flanged supply and return connections. Clean out ports (1" NPT) shall be provided on the supply and return headers to allow for preventive maintenance of the heat exchanger circuits. Pipes and heat exchangers to be insulated with 40mm rubber cotton insulation.

Operation guidelines for defrosting and drainage in winter

In winter, when the temperature is lower than 32°F (0°C), if the unit is powered off for any reason, then water must be drained from the unit to prevent damage to the hydronic components. Draining the system of water shall be carried out as follows:



Operational guideline:

Isolate the inlet and outlet water connections external to the unit. Ensure the internal isolation valves on each heat exchanger are open. Open the drain cap at the bottom of inlet water pipe to drain water. Keep the drain port open until the next use. Open the vent valve to facilitate complete draining of water from the heat exchangers. Using compressed air or a wet/dry vacuum to assist water removal is recommended.



When flushing the piping system prior to start-up, ensure this heat pump is bypassed to prevent pipe debris from entering the heat exchangers. Only after the piping has been cleaned, should the heat pump be pressure tested.

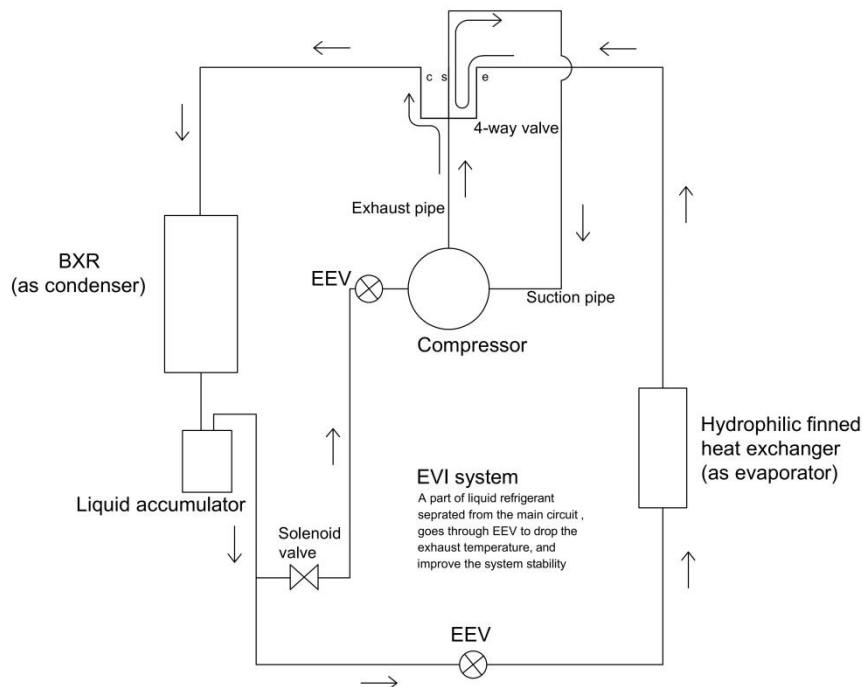
II. Working principle

This heat pump water heater gathers heat from the environment (refrigerant-to-air HXR), compresses refrigerant vapor to a higher temperature, then heats the working fluid (domestic water or glycol depending on the application) in the condenser section (refrigerant-to-water HXR). The condensed high pressure and warm fluid is rapidly expanded through the EEV to introduce cold liquid into the evaporator (ambient air side) to be boiled off and complete the circuit. A reversing valve is utilized during the defrost cycle.

The condenser with double-wall plate heat exchanger has a protective air gap between the refrigerant and the water circuit to prevent the refrigerant from entering the potable water side should a leak occur. In addition, it greatly reduces the difficulty of maintenance. Each heat exchanger is equipped with water side isolations valves and unions, as well as internal electrical disconnects. If a single system fails, the maintenance can be completed without affecting the operation of refrigeration circuits in the system.

The electronic expansion valve is installed upstream of the evaporator and downstream of the condenser. It is used to throttle the medium-temperature and high-pressure refrigerant to the low-temperature and low-pressure gas-liquid mixture. The EEV is digitally controlled to accurately meter the refrigerant flow and control the phase change.

The EVI systems (enthalpy vapor injection) utilizes an EEV to tightly control head pressure and discharge temperature by bypassing the condenser coil and injecting cool vapor into the suction side of the compressor. It is recommended to have motorized valves to control water flow out of storage tanks depending on water temperature.



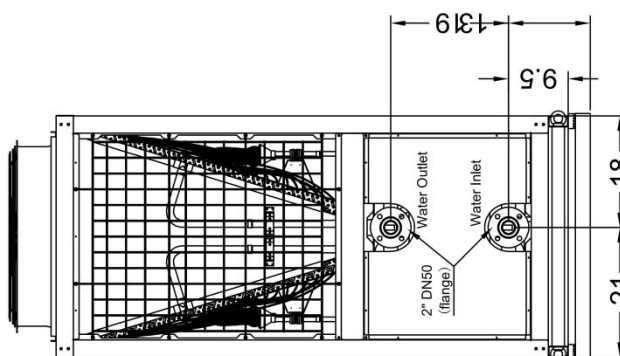
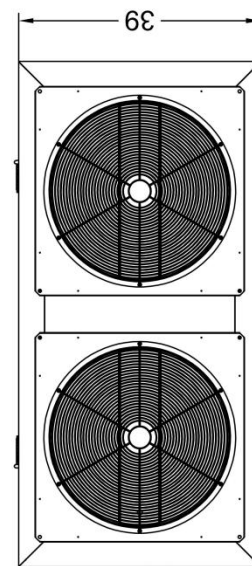
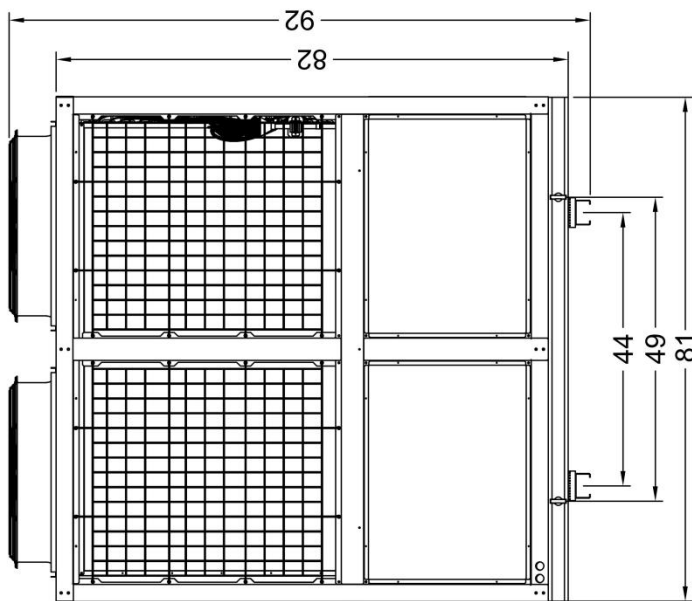
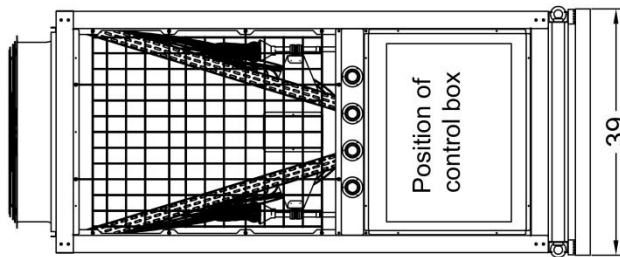
The EEV and solenoid valve located on the hot gas bypass line are adjusted in relationship to the ambient air temperature and exhaust temperature. The EEV on the main circuit is adjusted by the suction superheat [delta-T between the suction and evaporator temperature]. The compressor is controlled in response to the load requirements (deviation from set point temperature).

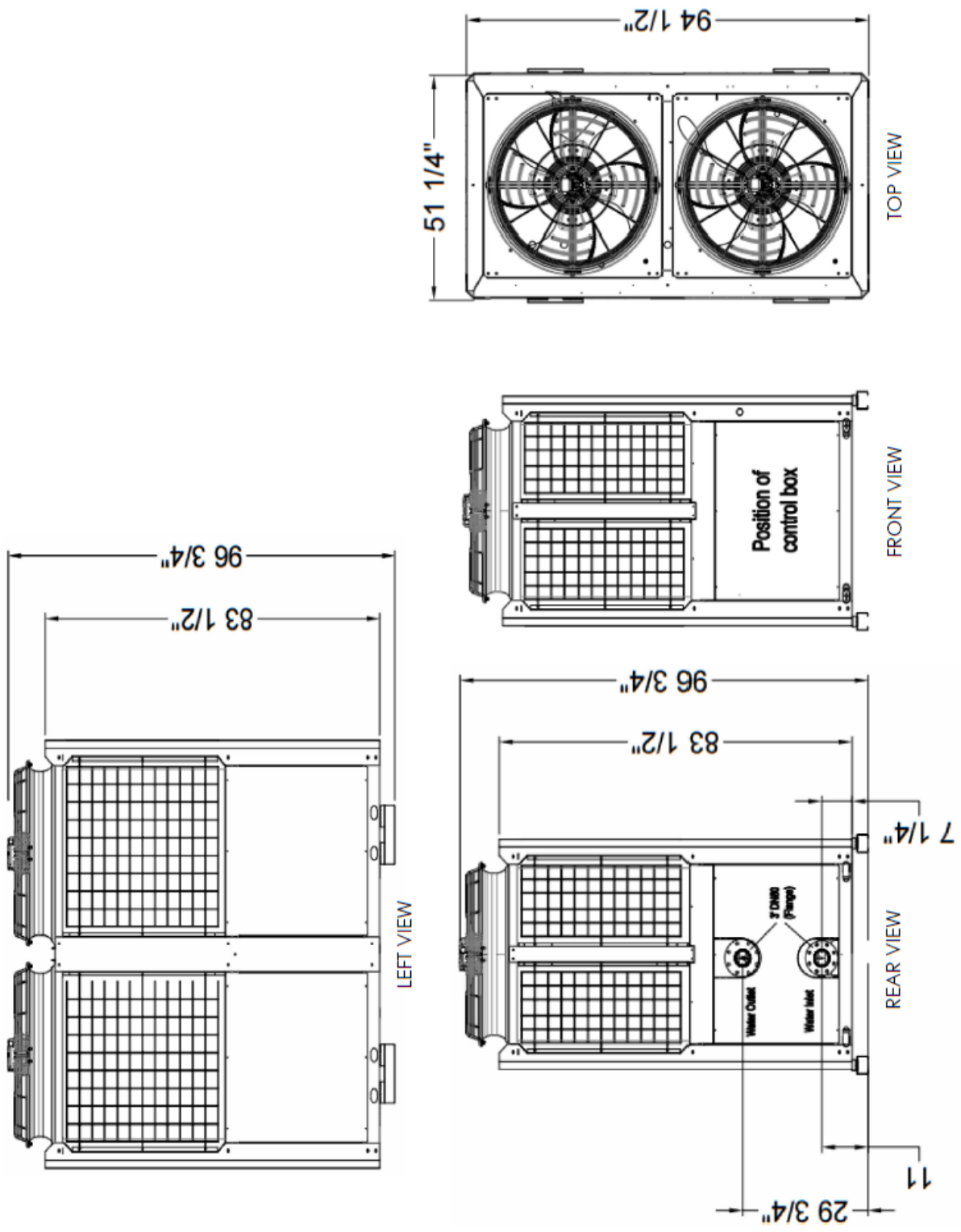
III. Product specification

1. Dimensions

Unit: inch

ccHPWH275-S, ccHPWH275-D





2. Technical parameter

Model Numbers		ccHPWH275-S	ccHPWH550-S	
Performance Specifications	Input Power	208- 230V/3Ph/60Hz	208- 230V/3Ph/60Hz	
	Refrigerant Circuits	2	4	
	Refrigerant / Quantity	R410A (30.8 Lbs / 15.4 Lbs per circuit)	R410A (61.7 Lbs / 15.4 Lbs per circuit)	
	Max H/W Temperature	140°F	140°F	
	Dry Bulb Temperature (68°F)	Heating Capacity (Btu/H)	310,800	647,400
	Wet Bulb Temperature (59°F)	Input Power(kW)	20.7	43.1
	Inlet Water Temperature (59°F)	COP	4.40	4.40
	Outlet Water Temperature (131°F)			
	Dry Bulb Temperature (45°F)	Heating Capacity (Btu/H)	251,900	524,800
	Wet Bulb Temperature (43°F)	Input Power(kW)	21.4	44.6
	Inlet Water Temperature (48°F)	COP	3.45	3.45
	Outlet Water Temperature (131°F)			
	Dry Bulb Temperature (10°F)	Heating Capacity (Btu/H)	162,800	339,100
	Wet Bulb Temperature (7°F)	Input Power(kW)	21.7	45.2
	Inlet Water Temperature (43°F)	COP	2.20	2.20
Outlet Water Temperature (131°F)				
FLA (A)		103.7	204.4	
MCA (A)		134.6	254.4	
MOCP (A)		175	300	
Sound Level (dBA)		≤73	≤75	
Water Data	Condenser Type	Single Wall BPX	Single Wall BPX	
	Water Side Pressure Loss (psig)	24.30	24.50	
	Rated Water Flow (GPM) (DB/WB:45°F/43°F, Inlet/outlet: 104°F/113°F)	72.6	145.2	
	Single pass delta-T (F) (OA_temp=68°F, LWT=131°F)	10.53	11.00	
	Piping Position	Rear	Rear	
	Piping Sizes	2"(DN50)	3" (DN80)	
Minimum Ambient Operating Temperature (°F)		-13	-13	
Overall Dimensions [L x W x H] (inches)		81 x 39 x 89	95 x 51 x 89	
Net Weight (Lbs)		1,555	2,950	

* The “-S” in the model number indicates single wall heat exchanger construction. The “-S” version is intended for indirect DHW heating applications, glycol systems, etc. For direct potable water heating, use the “-D” version which provides for double wall heat exchanger construction.

Due to Ice Air’s ongoing development programs, the information in this document is subject to change without notice.

Model Numbers		ccHPWH275-D	ccHPWH550-D	
Performance Specifications	Input Power	208- 230V/3Ph/60Hz	208- 230V/3Ph/60Hz	
	Refrigerant Circuits	2	4	
	Refrigerant / Quantity	R410A (30.8 Lbs / 15.4 Lbs per circuit)	R410A (61.7 Lbs / 15.4 Lbs per circuit)	
	Max H/W Temperature	140°F	140°F	
	Dry Bulb Temperature (68°F)	Heating Capacity (Btu/H)	306,000	637,300
	Wet Bulb Temperature (59°F)	Input Power(kW)	21.4	45.0
	Inlet Water Temperature (59°F)	COP	4.20	4.15
	Outlet Water Temperature (131°F)			
	Dry Bulb Temperature (45°F)	Heating Capacity (Btu/H)	248,000	516,600
	Wet Bulb Temperature (43°F)	Input Power(kW)	22.0	45.9
	Inlet Water Temperature (48°F)	COP	3.30	3.30
	Outlet Water Temperature (131°F)			
	Dry Bulb Temperature (10°F)	Heating Capacity (Btu/H)	160,300	333,800
	Wet Bulb Temperature (7°F)	Input Power(kW)	22.4	46.6
Inlet Water Temperature (43°F)	COP	2.10	2.10	
Outlet Water Temperature (131°F)				
FLA (A)		106.4	212.8	
MCA (A)		134.6	254.4	
MOCP (A)		175	300	
Sound Level (dBA)		≤73	≤75	
Water Data	Condenser Type	Double Wall BPX	Double Wall BPX	
	Water Side Pressure Loss (psig)	24.3	24.5	
	Rated Water Flow (GPM) (DB/WB:45°F/43°F, Inlet/outlet: 104°F/113°F)	72.6	145.2	
	Single pass delta-T (F) (OA temp=68°F, LWT=131°F)	10.37	10.80	
	Piping Position	Rear	Rear	
	Piping Sizes	2"(DN50)	3"(DN80)	
Minimum Ambient Operating Temperature (°F)		-13	-13	
Overall Dimensions [L x W x H] (inches)		81 x 39 x 89	95 x 51 x 89	
Net Weight (Lbs)		1,555	2,950	

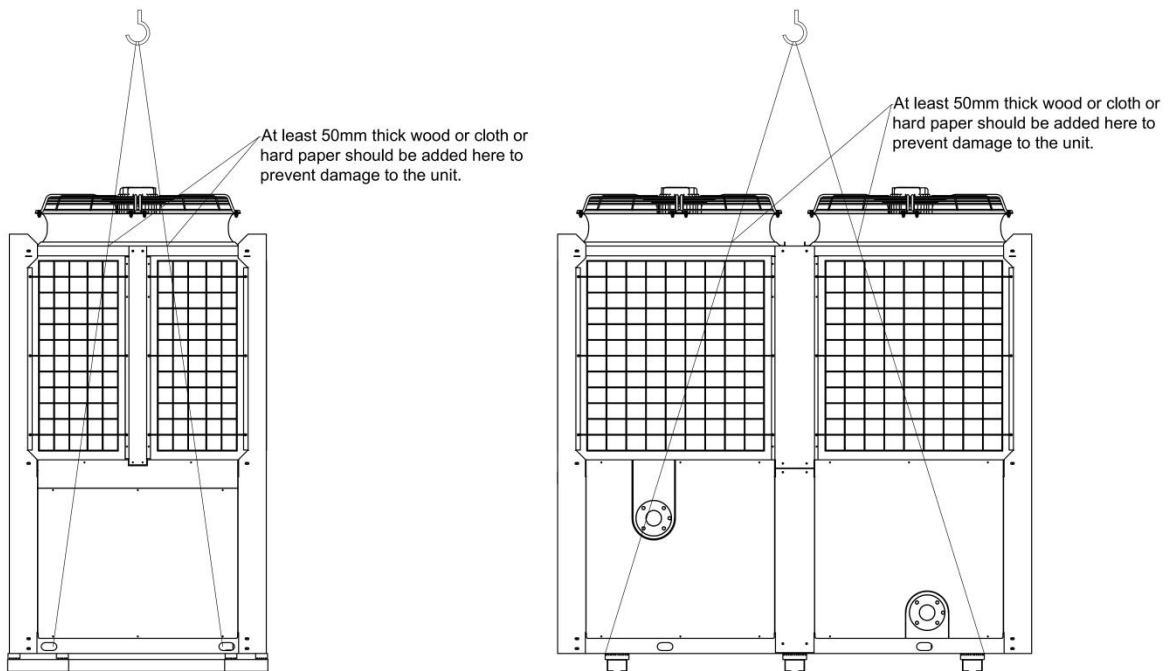
* The "-D" in the model number indicates double wall heat exchanger construction. For direct potable water heating, use the "-D" version. The "-S" version is single wall and intended for indirect DHW heating applications, glycol systems, etc.

Due to Ice Air's ongoing development programs, the information in this document is subject to change without notice.

IV. Installation

1. Product handling

- Confirm the unit has sufficient space for safely rigging it into place.
- Remove the protective packaging just prior to installation.
- During handling, the inclination of the unit shall not be more than 15° to prevent the unit from overturning.
- When rolling transportation is used, the same size rollers shall be placed under the base of the unit. Each roller must be a little longer than the outer frame of the base and suitable for the balance of the unit.
- When hoisting, the hoisting cable shall be rated for minimum of 3 times the weight of the unit. Check and ensure that the lifting hook is fastened to the unit, and the hoisting angle is greater than 60°. Add cloth or hard paper between the unit and the wire rope to prevent damage to the unit. Hoisting diagram is as follows:

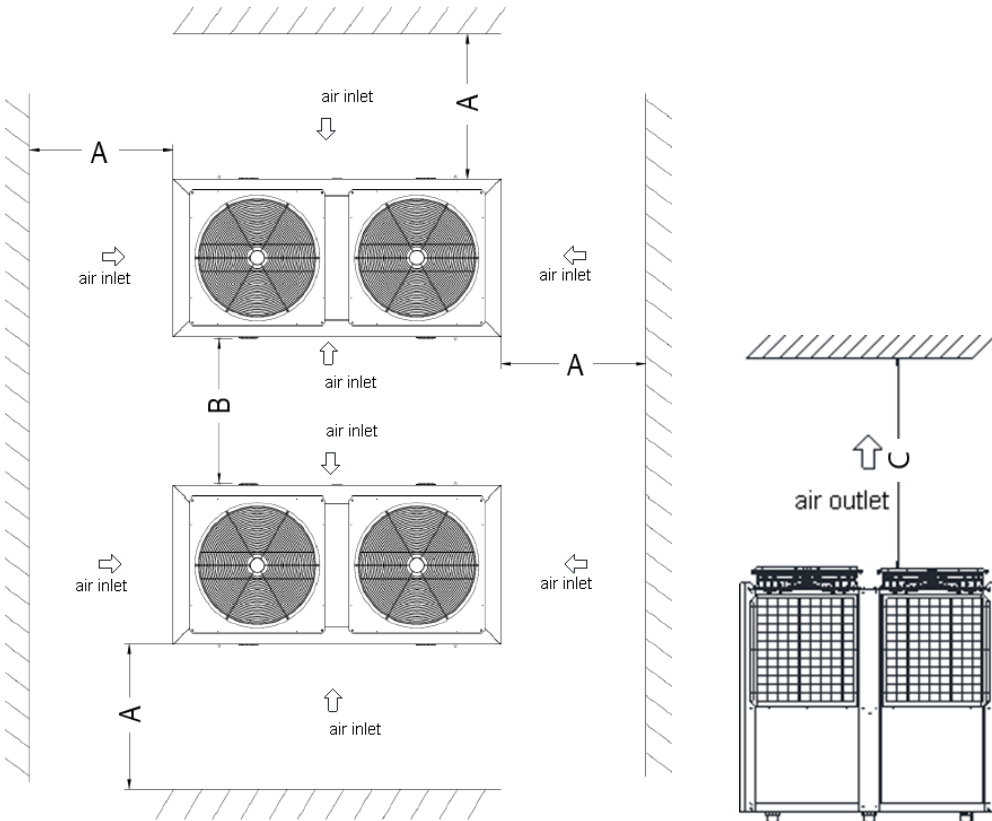


2. Installation site selection

- The unit shall be installed in a location with ample space to allow for sufficient air flow and maintenance of all components.
- If the unit is in a place accessible to unauthorized personnel, isolation safety measures should be taken, such as setting up protective fence, etc.
- Select locations where the sound from the unit and cool air leaving the coils will not affect the surrounding environment including nearby building occupants.
- The location shall facilitate the installation and maintenance of pipes and electrical connections.
- Ensure a sound foundation if mounted on grade and sufficient vibration isolation if roof mounted.

- Ensure sufficient drainage for rain and condensate discharge.
- Roof mounted units shall consider local codes regarding wind and seismic restraints, mounting heights above the snow line, and ensure proper grounding protection to mitigate damage from lightning strikes.

Recommended unit spacing:



Air flow clearances:

Model	Installation space		
	A	B	C
ccHPWH275	≥ 24 in	≥ 40 in	≥ 8.2-ft
ccHPWH550	≥ 24 in	≥ 52 in	≥ 8.2-ft



If the unit is installed indoors, a means of mitigating static pressure build-up must be implemented.

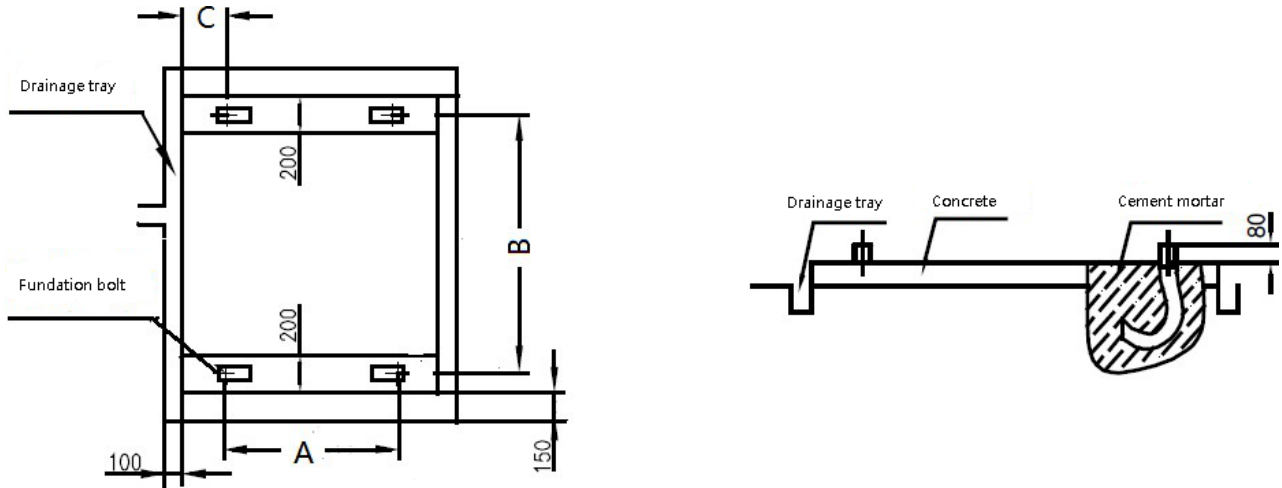
3. Installation foundation

- Supporting platforms must be able to bear the operating weight of the equipment and all associated piping, accessories, maintenance personal, and weather-related components such as snow, water, etc. The units should be installed level. For the operating weight, please refer to the table of performance and specification

parameters.

- The units must be installed on a level surface (with an inclination level not to exceed 2-degrees). Vibration isolation pads are recommended. Units should be fixed to surface with bolts. Condensate should drain away from the unit.

The installation base of concrete of the unit is as follows:



Unit: inches

Model	A	B	C
ccHPWH275-S	43.3	36.90	18.5
ccHPWH275-D			
ccHPWH550-S	51.75	49.375	21.65
ccHPWH550-D			

4. Hydronic piping layout

4.1. Pipe size

Please refer to the performance specification for inlet and outlet pipe diameters.

4.2. Water tank selection

Pressurized Tank Applications: A pressure relief valve should be installed on the water tank and selected to relieve pressure at no more than 10% less than the rated working pressure of the water heater and all other system components. If there is no pressure relief device installed on the water tank, the water system must be equipped with a pressure relief valve (PRV).

The PRV should be piped to a drain and open to atmosphere. To ensure proper operation of the PRV, it should be checked on a regular basis to ensure it is free of sediment or calcium carbonate deposits.

The working pressure of the system should be set for a minimum of 30-psig.

4.3. Installation requirements

A means of isolating the unit from the main system flow is required for service. A bypass valve is recommended to allow the system piping to be cleaned without introducing sediment into the heat pump heat exchangers. Install a 40 mesh or finer filter near the inlet of the unit. Pressure gauge and temperature sensor on the inlet and outlet pipes are recommended to allow for ease of monitoring operation.

The water flow must be properly balanced to ensure the water flow does not exceed the maximum flow rate. When operating at full load, the temperature difference between inlet and outlet should be between 7°F and 11°F (4°C and 6°C).

External piping should be properly supported. The unit's pipe connections should not carry the weight of the piping.

All low points of the water system must be provided with drainage interfaces to facilitate the drainage of water in the water system. All high points must be provided with vent valves to facilitate the evacuation of air in the pipeline. Vent and drain ports should be left uninsulated for ease of maintenance.



The pipe should be thoroughly flushed and free of debris prior to start-up. Care must be taken during installation to ensure no foreign debris enters the waterside or air-exchangers.

4.4. Water quality requirements

A. Water quality considerations

If the unit is applied to a closed (HVAC) loop then scale build up is unlikely; and single wall heat exchangers are permissible. For units directly heating potable water, double wall heat exchangers are required, and the quality of the supply water and means of filtration and softening the water will affect the amount of potential scale and sediment build-up within the heat exchangers. Care should be taken to mitigate scale and sediment building up. Scale and sediment build up will derate performance and can ultimately cause system failure.

NOTE: Clean out ports are located on the supply and return headers of the unit. Annual backflushing of the heat exchanger assemblies with a potable water rated acid is recommended to dissolve any scale buildup and flush away any sediments that may accumulate.

The water quality, such as pH value, conductivity, chloride ion concentration, sulfur ion concentration, etc. should be analyzed before use. Water must be filtered and softened with water softening equipment before entering the water heater's heat exchangers.

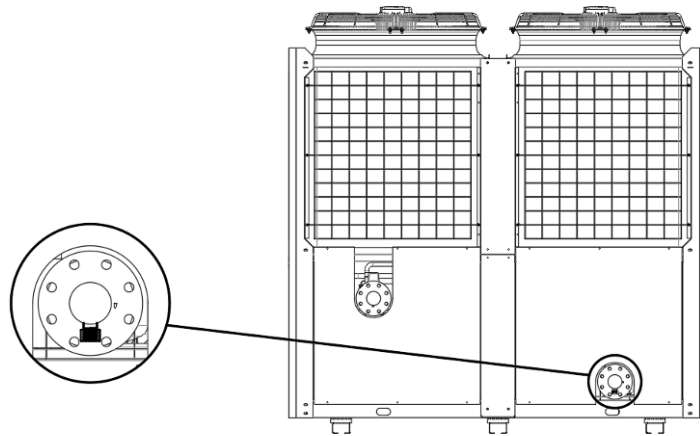
B. Applicable water quality standards of unit

Ph value (25°C)	6.5 – 8.0	Chloridion (CL)(mg/L)	<50
Conductivity (25°C) (µs/cm)	<250	Silver sulfate (SO42 -)(mg/L)	<50
Total iron (mg/L)	<0.3	Total alkalinity	<50
Total hardness (mg/L)	<50	Silicon dioxide (SiO2)	<30

5. Winter freeze protection

The unit is equipped with a freeze protection program. If the unit has power and senses the water is below 40°F, it will turn on and operate the system until the water is at 60°F. To protect the hydronic components from freezing during a power outage, there are a few options.

- Option 1:** Order the unit with factory mounted heat-trace and connect the heat-trace circuit to the building emergency power supply.
- Option 2:** Utilize a glycol loop for the outdoor hydronic components; and a secondary double wall heat exchanger between the glycol loop and potable hot water located indoors.
- Option 3:** Drain the system during ambient conditions at or below 32°F (0°C). To properly drain the system, follow the steps noted below:



Operational guideline:

To drain the system, first isolate the supply and return piping to the unit, then ensure the internal isolation valves on each heat exchanger are open, next open the drain port at the bottom of inlet water pipe to drain the water from the system. Opening the air vent on the return piping will speed up the draining process.



The pipe should be thoroughly flushed and free of debris prior to start-up. Care must be taken during installation to ensure no foreign debris enters the water-side or air-side heat exchangers.

V. Unit operation

After the unit is powered on, it enters the pre-heating state. In this state, the compressor crankshaft heating belt is turned on. During the pre-heating process, the unit cannot be turned on, but the start-up command can be set-up. After the pre-heating time is reached, it will automatically start according to the start-up command. In the pre-heating state, you can cancel the preheating according to the prompt or wait for the preheating to complete. Its purpose is to prevent cold start from damaging the compressor.

There are two means to turn the unit on/off:

- 1) The ON/OFF key on the keypad
- 2) Timer: Turn ON/OFF according to the set time

After confirming that there is no fault, the water pump will start running after 60s. The fan will start running 10s after the water pump is turned on. When the compressor has energy demand, it turns on after the water pump runs for 75s.

When the unit receives a shutdown command or the demand for adjustment, the four-way valve will switch 5 seconds before the compressor in advance, the compressor will stop immediately, the fan will be turned off after 10 seconds, and the pump will stop running after 3 minutes of continuous operation.

The heat pump has three modes of energy level adjustment when it is running. The principle is to calculate the load required by the system based on the current temperature of the water tank and the set temperature, so as to turn on the corresponding number of compressors. When the required compressor is turned on, it enters the "energy adjustment during normal operation". At this time, as the water temperature rises, the number of compressors to be turned on/off is adjusted according to the difference between the current temperature of the water tank and the set temperature.

Single Unit Operation

When the unit is enabled, the calculation method of the number of compressors to be opened is as followed:

Heating: $N_{\text{need}} = (T_{\text{set}} - T) \times C_{\text{max}} / T_{\text{max}}$

N_{need} : number of compressors to be enabled;

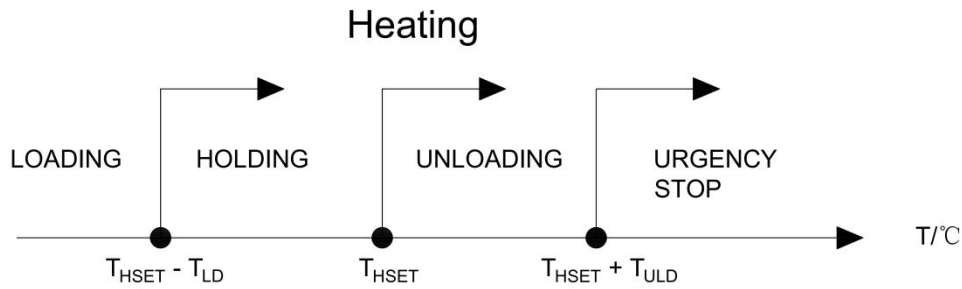
T : temperature of the control object;

C_{max} : number of total compressors in the system;

T_{max} : [temperature difference needed of enabling all compressors, 6°C by default];

$THSET$: [heating target temperature] or [hot water target temperature].

During operation, there are 4 temperature conditions for LOADING, HOLDING, UNLOADING, URGENCY STOP.



T_{HSET} : Setting temperature of heating mode

T_{ULD} : Temperature differential of unloading

T_{LD} : Temperature differential of loading

LOADING: When the object temperature is in this area, turn on a compressor every 60 seconds until all compressors are turned enabled.

HOLDING: When the object temperature is in this area, unit keeps running and has no actions.

UNLOADING: When the object temperature is in this area, turn off a compressor every 60 seconds until all compressors are turned off.

URGENCY STOP: When the object temperature is in this area, turn off a compressor per second until all compressors are turned off.

Multiple Units Operation

Multiple unit operation follows the same rules for operation, with each water heater providing additional stages of heating.

Main functions

Note: The following description is for reference only, please refer to the latest version of the program for specific function parameters.

1. Defrosting

When the outdoor temperature in winter is below 32F (0°C) and the evaporator temperature is lower than the dew point temperature of the ambient air, condensation will occur on the surface of evaporator. When the ambient air temperature is below 32F (0°C), the condensation water will form a thin frost on the coil. Severe frost will affect the heating effect of the machine, so the unit will enter defrost mode to melt the frost, then return to normal operation.

The unit will determine whether it needs to enter the defrost based on the coil temperature, the ambient temperature, the difference between the ambient temperature and the coil temperature, and the compressor running time.

When the unit meets the conditions for entering the defrost cycle, the water pump keeps running and the compressor stops. After 60s, the four-way reversing valve changes direction and the fan stops running. After 10s, the compressor restarts and the fan stop.

Exit the defrosting:

Defrosting time \geq 6min;

Coil temperature $>$ 60F (16°C);

Water tank temperature \leq 43F (6°C) and lasts 10s;

As long as one of the above conditions is met, the defrosting will end.

If there are other compressors in the same group that are defrosting, and

The coil temperature $> 64.5\text{F}$ (18°C);

There are no other units in the same group that are defrosting and the fin temperature $> 60\text{F}$ (16°C);

No alarms or faults;

The interval time for switching to heating after exiting defrost > 0 .

As long as one of the above conditions are met, the defrosting will be exited.

When the unit meets the defrosting conditions, the fan will turn on again 5s before the compressor stopped, the four-way valve will switch on after the compressor stopped for 60s, and the compressor will turn on again after 10s.

2. Antifreeze function

When the unit is in the standby state (powered ON but not responding to a demand for heat) or the unit is in the starting state, but the water pump has not been turned on, it will judge whether the unit needs to enter the anti-freezing function. Anti-freeze protection references the ambient temperature and the inlet water temperature sensors. To protect the unit during low ambient conditions the unit is equipped with two modes of freeze protection that utilize the water pump and compressors.

If either of the below conditions are present, the water pump mode will be enabled:

1. Ambient temperature $\leq 36\text{F}$ (2.25°C) and water inlet temperature $\leq 60\text{F}$ (15.5°C)
2. water inlet temperature $\leq 52\text{F}$ (11°C)

If any of the below conditions are present, the compressor antifreeze mode will be enabled:

1. Water pump antifreeze mode is operating and the operating time $\geq 3\text{min}$
2. 41F (5°C) $<$ Ambient temp $\leq 46.5\text{F}$ (8°C) and water inlet temp $\leq 43\text{F}$ (6°C);
3. 37.5F (3°C) $<$ Ambient temp $\leq 41\text{F}$ (5°C) and water inlet temp $\leq 44.5\text{F}$ (7°C);
4. Ambient temp $\leq 37.5\text{F}$ (3°C) and water inlet temp $\leq 46.5\text{F}$ (8°C);
5. Water inlet temp $\leq 39\text{F}$ (4°C)

3. Snow removal function

When the unit has not been started for a long time. and the ambient temperature is lower than the limit value of the snow removal function, the snow removal function will be activated. At this time, the unit's fan motor will automatically start. This function can be turned on by the remote control to prevent the snow from blocking the fan and blades in severe snowstorms.

The detail conditions:

Enter snow removal function

- a) No command of turning on.
- b) Snow removal function is set to be enabled by the controller.
- c) Ambient temperature $<$ Default temperature of snow removal function
- d) The idle time of fan $>$ Default time of snow removal function

Exit snow removal function

- a) Command of turning on.
- b) Fan running time $>$ Default running time of snow removal function.
- c) Ambient temperature sensor is failed
- d) Fan is failed

4. Timer

The heat pump unit can set to operate according to a predefined schedule. The day, time, and temperature set-point at each interval can be programmed into the controller.

5. Touchpad controller

The Touchpad controller has a LCD screen; the main functions of the controller are: Enable/disable, unit mode, target water tank temperature setting, timer function setting, current and history fault query, system parameter query and modification

(See the installation manual for details)

6. Multiple installations

For multiple water heater installations, there are three methods of controlling the system

- A) Ice Air Control Board (controls up to 16 units)
- B) Ice Air Sequencing Software (requires computer to run software and RS485 communication wire; controls up to 16 units)
- C) 3rd Party Control Board

See the Sequence of Operation description for details on these control features

VI. Electrical wiring diagram



1. Notice

- The power supply voltage must conform to the rated voltage.
- Wiring must be carried out by a professional and wired in accordance with wiring diagram.
- Ensure the power supply wires are properly sized and protected from excessive current (please refer to the performance specification and parameters table for details).
- Units shall be grounded and wired per national wiring electrical code.
- The power and ground wires must be tightened by applying the right torque with the right tools.
- Only the electrical components specified by the company can be used, and the installation and technical services are required from the designated manufacturer or authorized dealer. If the wiring is not in accordance with the electrical installation specifications, it may lead to the failure of the controller or electric shock.
- According to the national technical standards for electrical equipment, set up leakage protection devices.
- After all the wiring is completed, the power can be connected only after careful inspection.
- Please read the labels on the electrical cabinet.
- The power supply wire for outdoor installation of the unit shall not be lower gauge than the neoprene armored flexible cord (line 57 in IEC 60245), and the wire diameter specification of the power supply wire shall be selected according to the rated maximum current of the nameplate, as shown in the table below:

Maximum current (A)	Area of wire (mm ²)	Switch nominal specification(A)
≤16	≥2.5	25 A
≤25	≥4	32 A
≤32	≥6	40 A
≤41	≥6	50A
≤57	≥10	63 A
≤76	≥16	80 A
≤101	≥25	100 A
≤125	≥35	125 A
≤135	≥50	160A

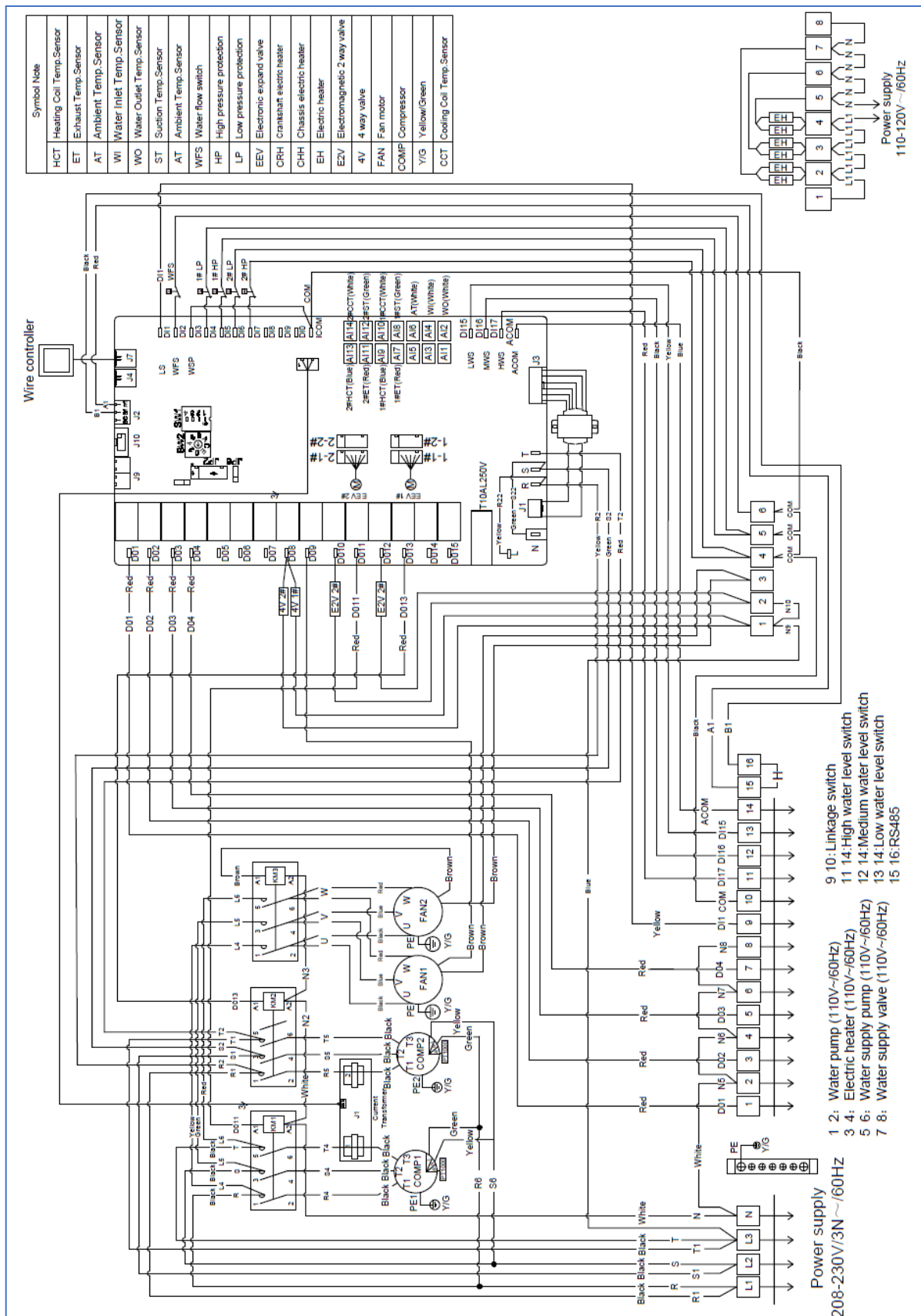
- When the power supply is connected, it must be equipped with a full-pole disconnection device matching with the unit and at least 0.12 inches contact distance from the power supply and a leakage protection device.
- If the supply cord is damaged, it must be replaced by a professional in the designated manufacturer's maintenance department or similar department to avoid danger.
- The power supply shall be housed in a weather tight enclosure, 60 inches or more above the ground. It is forbidden to be installed in a moist, acidic, corrosive environment or exposed to direct sunlight.

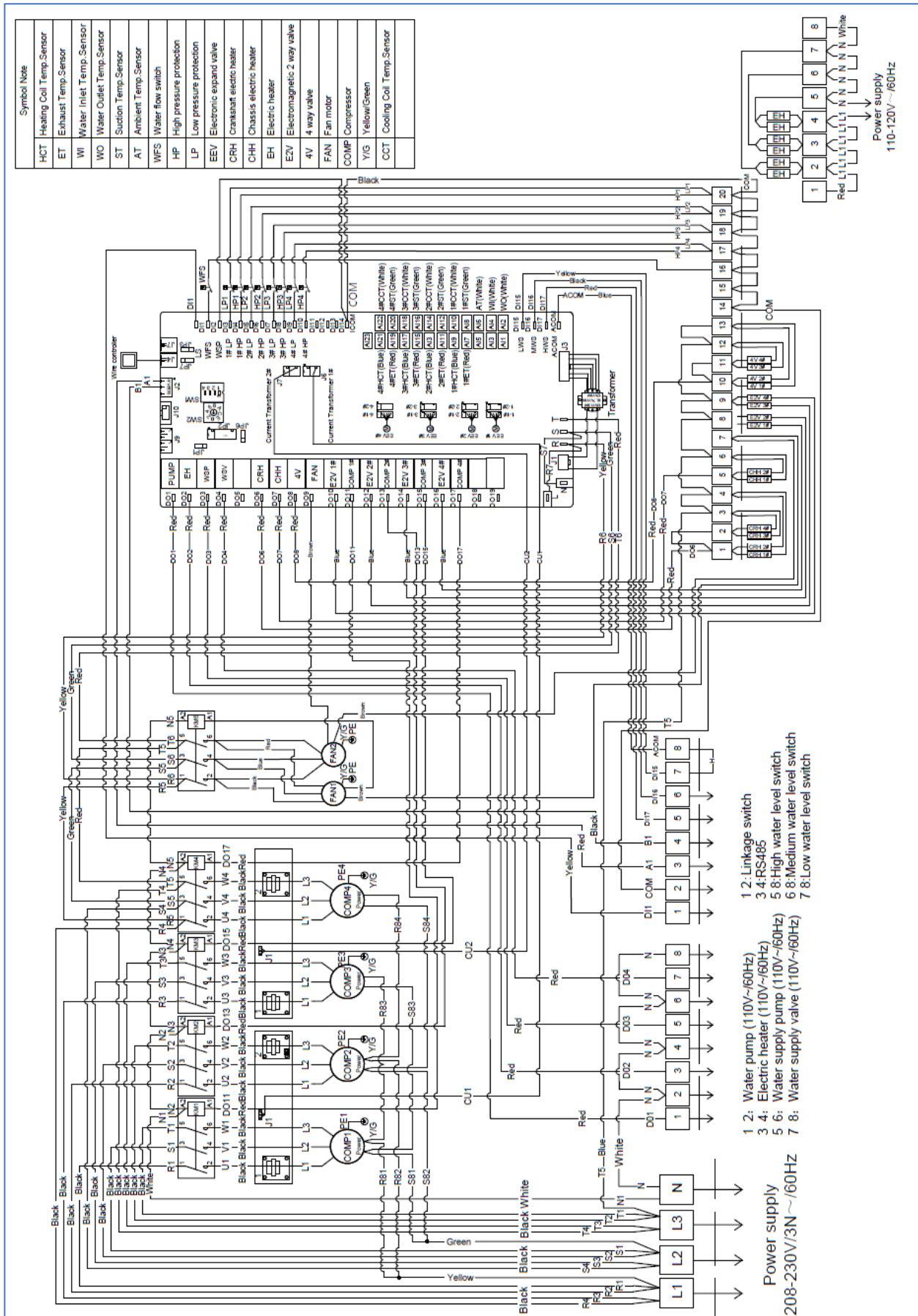
- Always disconnect the power prior to opening the electric cabinet.
- Workers must wear anti-static gloves during electrical operation.

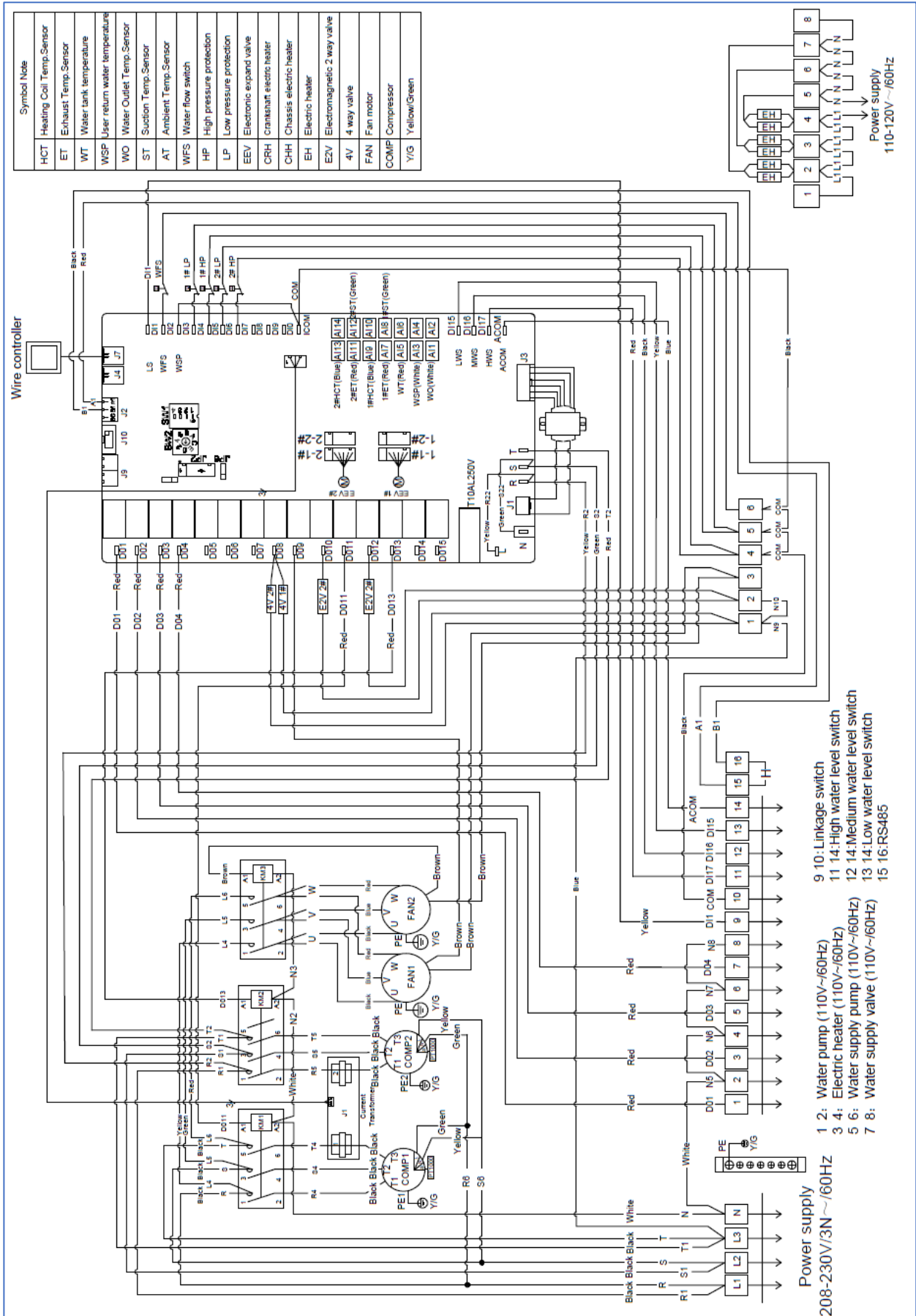
	Do not insert hand or foreign matter into the outlet of the water heater.
	It is forbidden to refit the unit and change the parameters of the unit without permission.

2. Wiring diagram

ccHPWH275-S







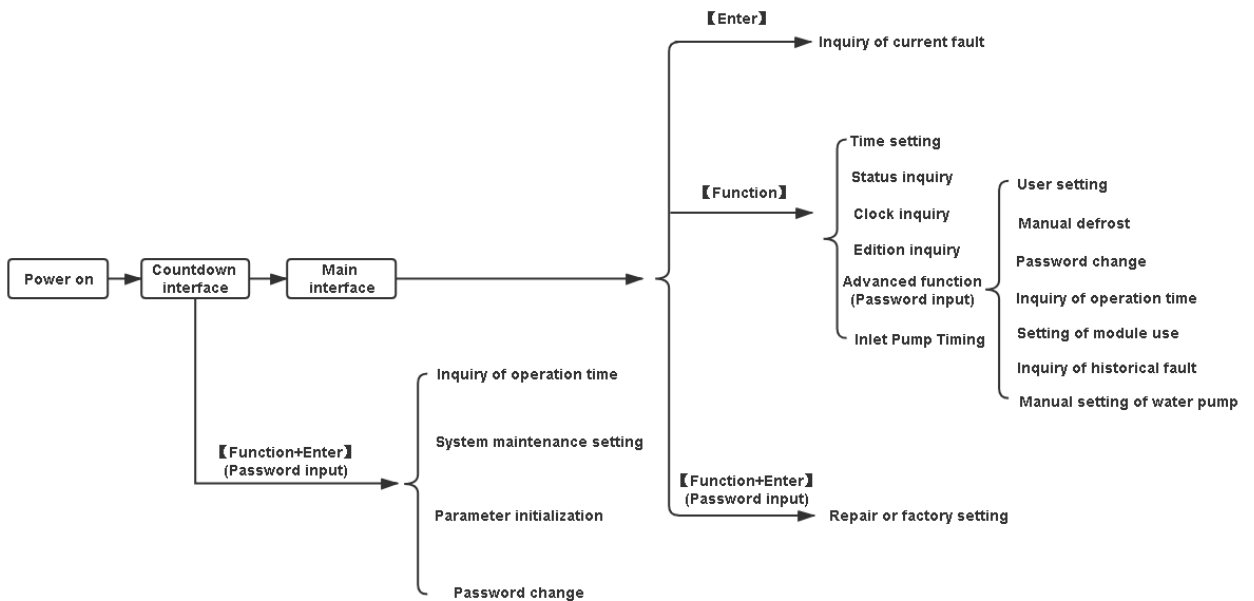
VII. Control function

1. Controller panel



2. Interface overview

- Key switching
Five keys: ON/OFF, Function, Up, Down, Enter.










Note:

In the branch interface (except the countdown interface and the main interface), if the keypad is not utilized for 1-minute, then the system will automatically return to the main interface.

When "▲" is displayed on the right side of the interface, it means the user can press <Up/Add> to achieve a page turn.

When the right side of the interface displays "▼", it means the user can press <Down/Sub> to scroll down.

When the interface prompts "operation is currently prohibited, but operation is available XX-seconds later," it means there is another screen operating and it needs to wait. After XX-seconds, the interface can be operated.

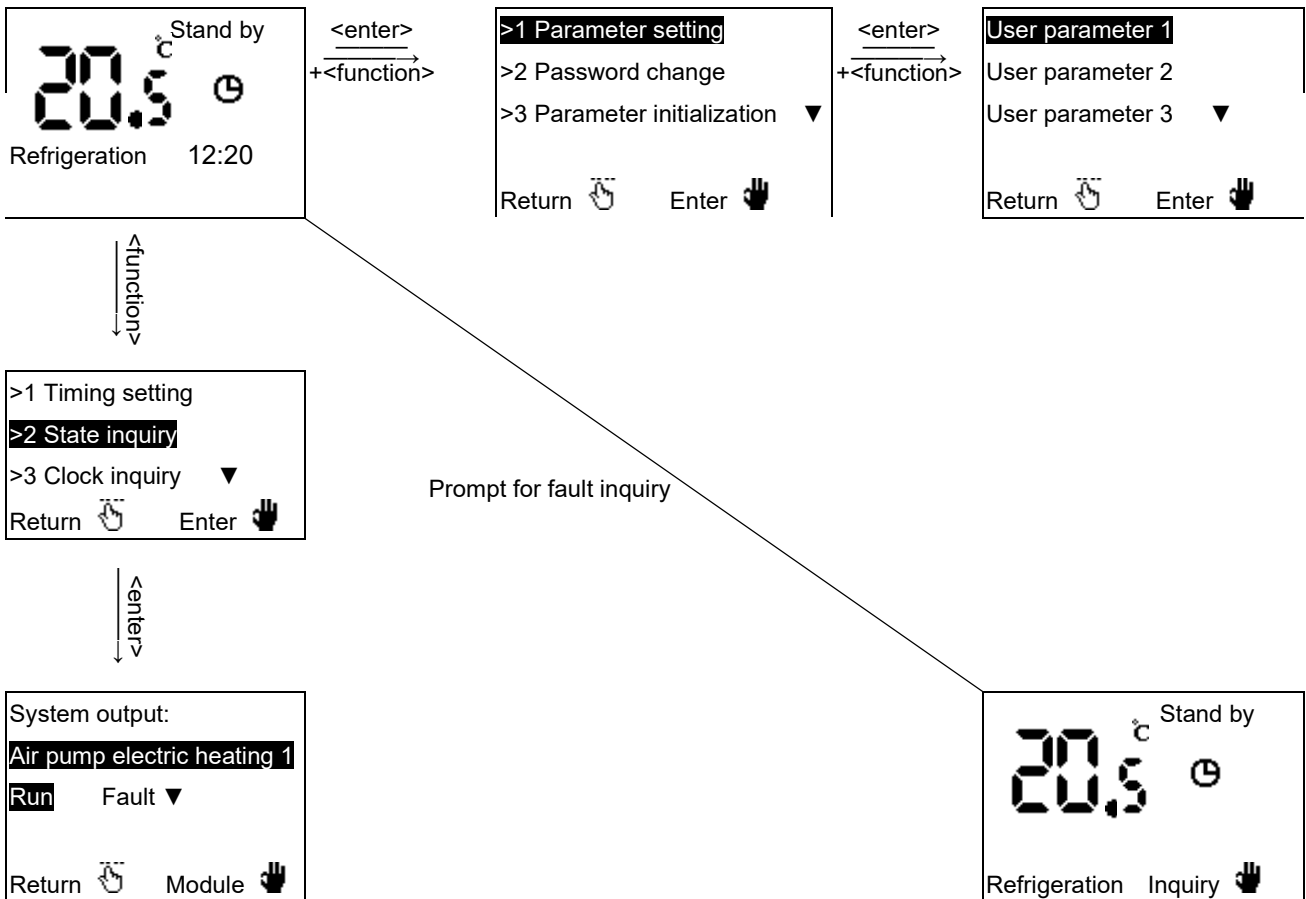
Icon	Meaning
	Indicates temperature.
	Indicates page up, parameter selection, or increasing value.
	Indicates page down, parameter selection, or decreasing value.
	Indicates whether the unit uses timing function.
	Indicates the icon of functional keys. It is only used for Menu, Cancellation, Return and Shift.
	Indicates the icon of confirming keys. It is only used for Enter, Confirmation, Noise Reduction, Reset and Switching Module.
	Indicates the icon of ON/OFF. It is only used for starting or shutting down the unit.

3. Interface introduction

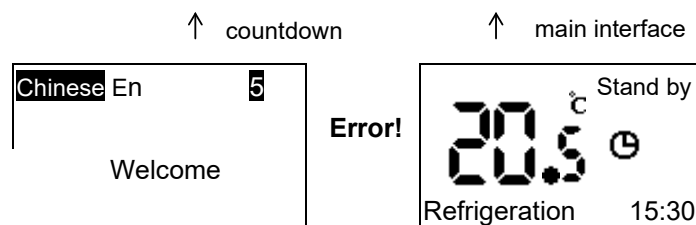
3.1. Overview

Interface submenus: a) Main Screen, b) Countdown, c) Status, d) Parameter Setting, e) Password, f) Fault History.

Interface switching

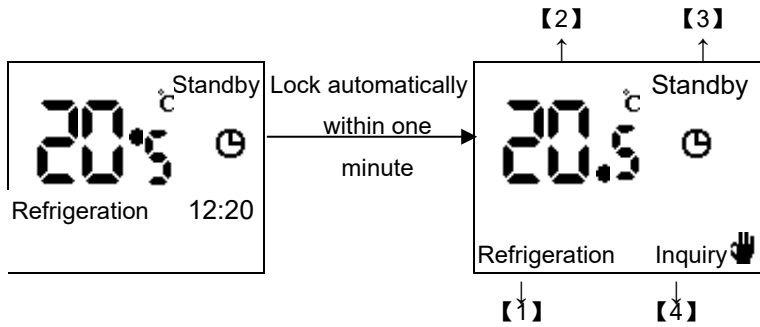


3.2. Countdown interface



Note: ① In the Countdown interface at starting up, press <up> or <down> to switch language directly.

3.3. Main interface

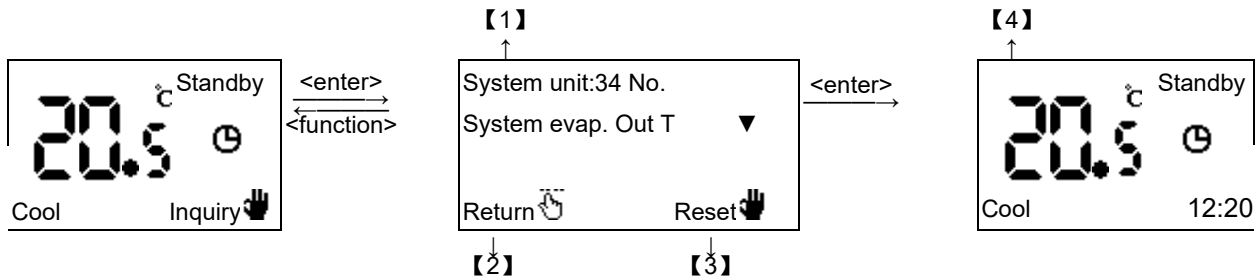


Description:

- 【1】 Current operation mode of the unit.
- 【2】 The current control temperature of the unit.
- 【3】 Indicates the status of the unit and the timing status of the unit.
- 【4】 Indicates fault inquiry of the unit.

3.4. Fault inquiry

When faults occur, the main interface will note the fault. Press the <Enter> key to view the fault.

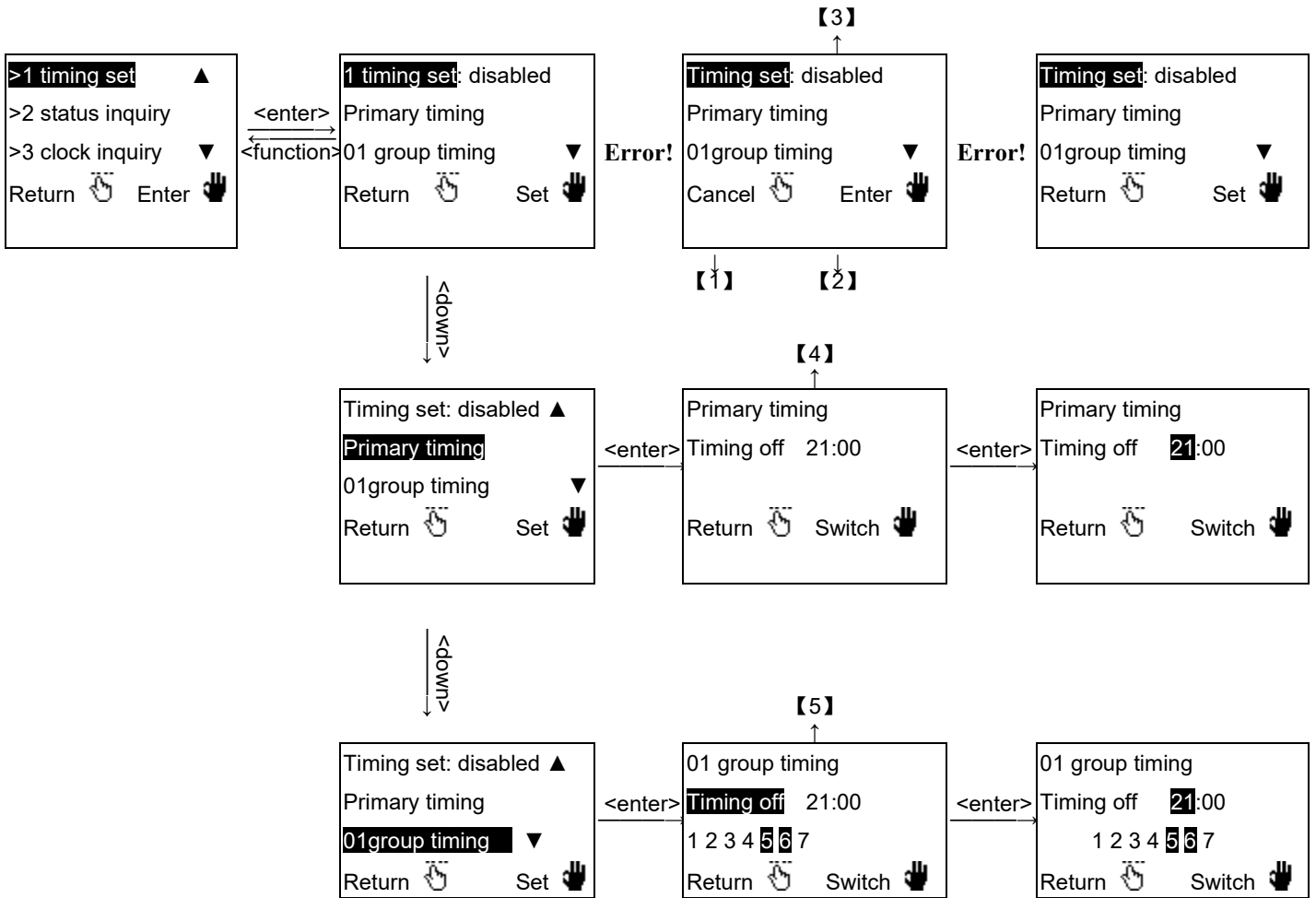


Description:

- 【1】 Indicates the fault code of the selected item and the corresponding information. Please refer to the instruction book of control panel for fault code descriptions. Press <Up> or <Down> key to switch display of fault module or fault number:
 System unit: indicated whole system (main unit) faults
 **No unit: indicated module faults
 ** No.: faults number.
 00#~04#: circuit number
- 【2】 Indicates to press <Function> key to return to menu of previous level.
- 【3】 Indicates to press <Enter> key to reset fault. Display indicates to return to the main interface if there is no fault at present. If there is any fault, it continues to display the current fault.
- 【4】 Indicate there is no fault after pressing <Enter> key. Then it returns to the main interface.

3.5. Timing set

Press <Down> or <Up> to select timing set.



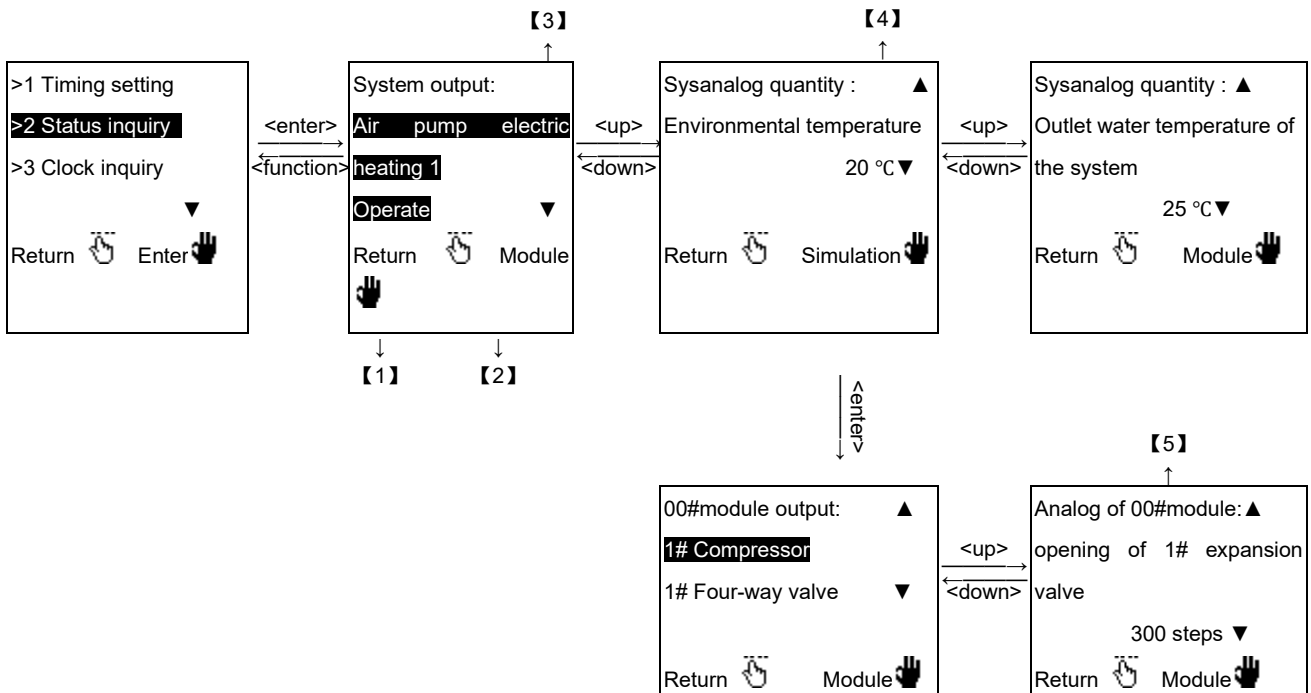
Description:

- 【1】** Press <Function> key to return to menu of previous level.
- 【2】** Press <Function> key to changed timing value.
- 【3】** Indicates the selection of the timing setting.
- 【4】** Indicates the selection of primary timing.
- 【5】** Indicates to select 01 group timing. Press <Up> or <Down> to switch among use of timing, primary timing and setting from 01 group to 10# group. After entering the selected timing item, press <Enter> key to change the set timing On/Off, Hour and Minute, Week (1, 2···7; when week is selected, the corresponding will flash). Press <Up> or <Down> key to change the selected value. Inverse display of week (1, 2···7) indicates that timing is effective on the day. As shown in the figure above, shutdown will be performed at 21:00 on Friday and Saturday.

Note: If the timing is set to 00:00, it indicates the function is not used.

3.6. Status inquiry

After entering the status inquiry interface, press <Enter> key to switch module status inquiry.



Description:

- 【1】 Indicates to return to the interface of previous level by pressing <Function> key.
- 【2】 Press <Enter> key to switch among different module interfaces. In the interface, the status of all modules of the unit may be inquired. The module number is subject to the actual number of modules. The last item is the system module and indicates the system status.
- 【3】 Display the operation status of output equipment corresponding to modules.
Shadow display: indicates what the equipment is outputting at present. As shown in the figure above, 1# compressor of 00# module have output.
Normal display indicates no output such as 1# four-way valve.
- 【4】 Display the analog quantity signal of corresponding system module.
- 【5】 Display the analog quantity information of corresponding 00# module.

Inquiry list

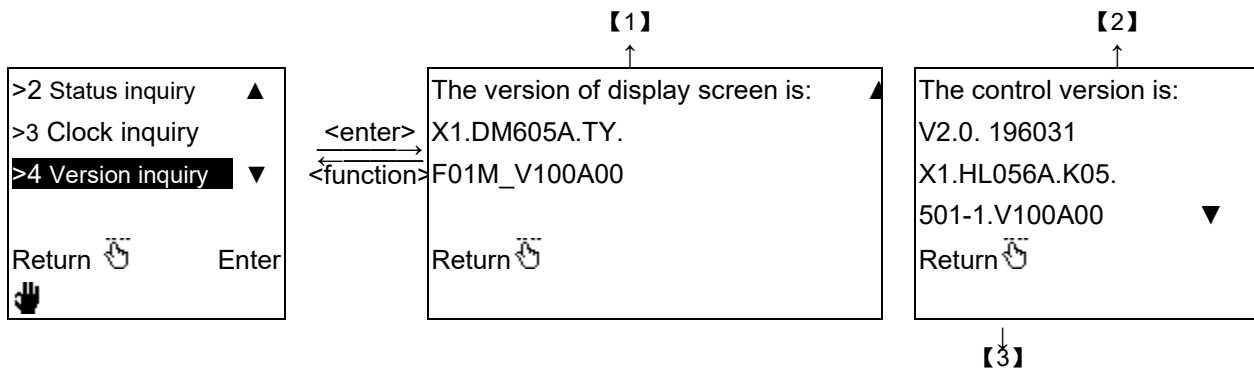
Module parameter list		
Items	Meaning	Unit
Comp.	Compressor	
InE	EVI valve	
Bt Heat	Chassis heater	
fan	Fan	
four	4-way valve	
Crank	Crackshaft heater	
Low Out	Discharge water valve	
CompM.EEV OD% ST	Main EEV opening	ST
CompA.EEV OD% ST	Assistance EEV opening	ST

CompCurrent	Compressor current	A
CompSuction tmp	Suction temperature	°F
CompEvap. in	Temperature after EEV	°F
CompCoil tmp	Coil temperature	°F
CompExh. tmp	Exhaust temperature	°F
CompCur. superH	Current superheat	°F
CompObj. superH	Object superheat	°F
Out temp	Water outlet temperature	°F
In temp	Water inlet temperature	°F
environ tmp	Environment temperature	°F

System parameter list		
Items	Means	Unit
CycPump	Circulating water pump	
Heater	Assistance electric heater	
Ambient temp.	Ambient temperature	°F
Sys. evap. out	Water outlet temperature	°F
Sys. evap. in	Water inlet temperature	°F

3.7. Version inquiry

After entering the Status inquiry interface, press <Down> or <Up> to select Version inquiry.

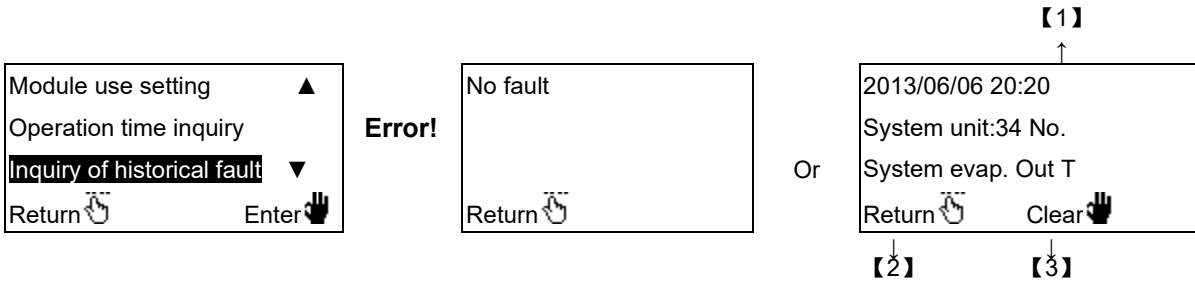


Description:

- 【1】 Indicates the version and function code corresponding to display screen. Press <Up> to continue the inquiry.
- 【2】 Indicates the version and function code corresponding to control. Press <Down> to continue the inquiry.
- 【3】 Indicates to press <Function> key to return to menu of previous level.

3.8. Historical fault Inquiry

After entering the Advanced function, press <Down> or <Up> to select inquiry of historical fault.

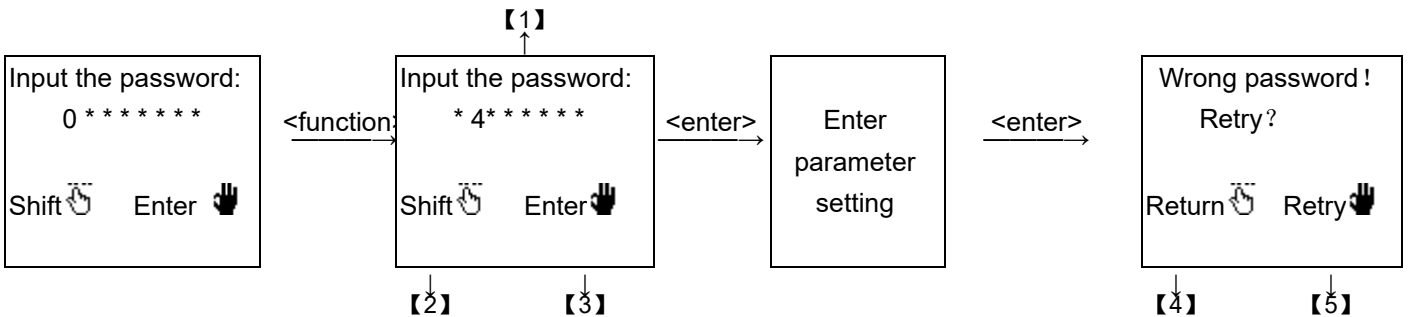


Description:

- 【1】 Time of fault occurrence: Provides the time of fault occurrence.
Press <Enter> key to clear all historical faults.
- 【2】 Indicates the fault type displayed: Press <Module> to switch the display of module with fault;
System unit: indicated whole system (main unit) faults
** No unit (00~15): indicated module faults
** No.: faults number.
00#~04#: circuit number
- 【3】 Indicates to return to the menu of previous level by pressing <Function> key.

4. Password operation

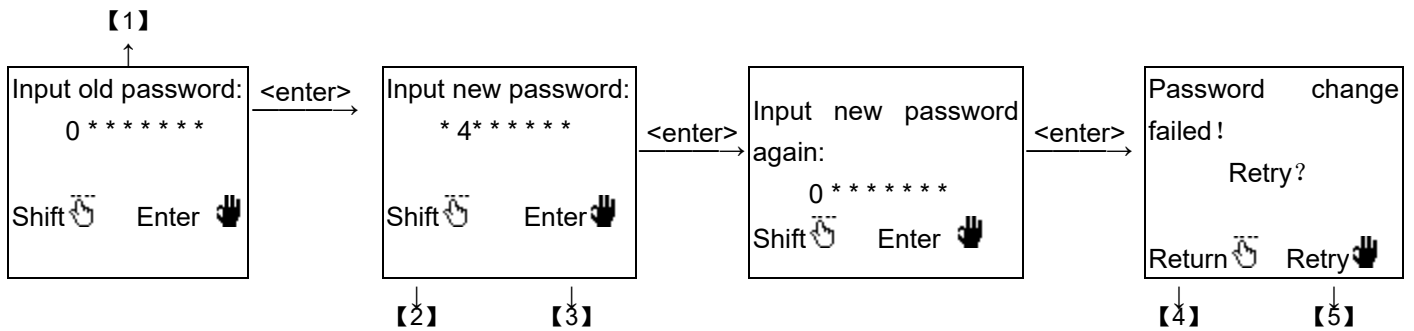
4.1. Password input



Description:

- 【1】 Reminds the users to input password including repair and manufacturer password.
- 【2】 Press <Function> key to shift the input password at present. Press <Up> or <Down> to input the current password value.
- 【3】 Press <Enter> key to confirm the input password and enter parameter setting.
- 【4】 Indicates to return to the interface of previous level by pressing <Function> key.
- 【5】 Indicates to press <Enter> key to input password again.

4.2. Password change



Description:

- 【 1 】 Reminds the users to input the old password including repair and manufacturer passwords respectively. Different passwords may be changed at different levels.
- 【 2 】 Indicates to press <Function> key to shift the input password at present. Press up or down to input the current password value.
- 【 3 】 Press <Enter> key to confirm the input to change the password. If change is correct, successful change is prompted. Failure is prompted for wrong change.
 Note: If the old password is input wrong, then it prompts wrong input of old password.
 If the new password is input wrong, then it prompts wrong input of new password.
 Press retry to input the password again.

5. Parameter setting

- Operation of the section is suitable for setting of all parameters.
- For parameter setting of Repair setting and Manufacturer setting, the parameters visible are different only due to password levels, but the setting method is the same.
- All settings have a corresponding password change.
- The initialization of parameter and initialization of operation time of compressor are only provided in Manufacturer parameter setting and are not set-in other settings.

5.1. Parameter level

Please refer to password operation for input of password.

Function	Key	Effective interface of key	Password
Advanced function	<Function>	Main interface	User password
Repair setting	<Enter + Function>		Repair password
Manufacturer setting			Manufacturer password
Maintenance setting	<Enter + Function>	Countdown interface	Maintenance password

Press the <up> or <down> key to make change directly and press <enter> to save the value of current parameter. If the parameter value cannot be modified, it will not be able to enter.

【4】 Indicates that the selected parameter is bit variable. It means that all sub-items of the parameter are operated according to bit.

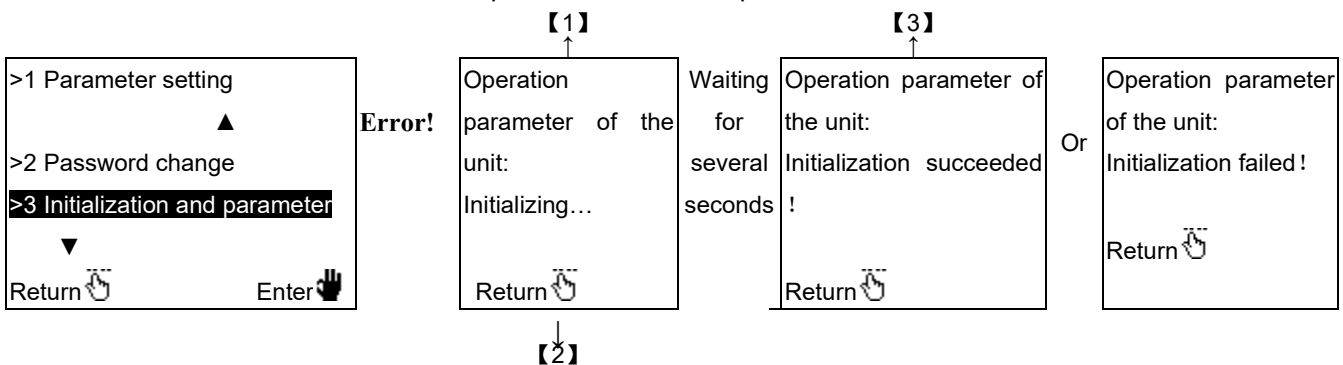
If the parameter is variable, it will be divided into 16 sub-items for operation.

After entering manufacturer setting, press <down> or <up> to select the corresponding content for initialization.

Initialize parameter: the parameters are restored to default value.

Initialize compressor: the operation time of compressor and accumulate operation time of the unit is 0.

The initialization of parameter operation and compressor is the same. The initialization process is introduced with initialization of parameter. For example:



Description:

- 【1】 Initializes the operation parameter of the unit, with the operation character of initialization is prompted.
- 【2】 Indicates to return to the interface of previous level by pressing the <function> key.
- 【3】 When the prompt of “initialization failed” appears. If it failed, initialization may be performed according to above operation until success is prompted.



Attention:

If the unit is at the operation or alarm state, parameter cannot be initialized, or parameter initialization failed may be prompted.

After parameter initialization of the unit is successful, ensure to power on the unit again and use after confirmation that the parameters are in effect.

User parameter setting list 1

No.	Parameter name	Meaning	Unit	Range	Default	Reservation
1	Ctrl mode	Control mode	-	Heat mode Cool mode Auto mode Hotw mode		
2	Cool point	Cooling setting temp.	°F	Min. to Max	12	Min: 【Cool in min】 or 【Cool out min】 Max: 【Cool max】 Water heater unit is not available
3	Heat point	Heating setting temp.	°F	Min. to Max	50	Min: 【Heat min】 Max: 【Heat in max】 or 【Heat out

						max】 Water heater unit is not available
4	Hot point	Water heater setting temp.	°F	30-60	50	Heating&Cooling unit is not available
5	Hot diff	Water heater temp. differential	°F	1-30	5	Heating&Cooling unit is not available
6	cool freeze	Cooling antifreeze	-	Disabled/Enable	Enable	Water heater unit is not available
7	Power On Set	Memory function	-	Remember Auto ON None	Remember	
8	Auto point	Setting temp. in auto. mode	°F	10-60	25	
9	Toge Switch	Linkage function	-	Disabled/Enable	Disabled	
10	AlarmSoundSet	Fault alarm sound	-	sound off sound on once 10sec cycle 10sec	sound off	cycle 10sec: It rings 10 seconds every 30 minutes.
11	Air load di.	Load differential	°F	0-20	5	
12	Air unload d	Unload differential	°F	0-10	2	
13	DispWaterLine	Water level state	-	Disabled/Enable	Enable	Available only for water heater unit, can be set displayed or not.

User parameter setting list 2

1	Unit number	1-16	1
2	00#Unit	Disabled/Enable	Enable
3	01#Unit	Disabled/Enable	Enable
4	02#Unit	Disabled/Enable	Enable
5	03#Unit	Disabled/Enable	Enable
6	04#Unit	Disabled/Enable	Enable
7	05#Unit	Disabled/Enable	Enable
8	06#Unit	Disabled/Enable	Enable
9	07#Unit	Disabled/Enable	Enable
10	08#Unit	Disabled/Enable	Enable
11	09#Unit	Disabled/Enable	Enable
12	10#Unit	Disabled/Enable	Enable
13	11#Unit	Disabled/Enable	Enable
14	12#Unit	Disabled/Enable	Enable
15	13#Unit	Disabled/Enable	Enable

16	14#Unit	Disabled/Enable	Enable
17	15#Unit	Disabled/Enable	Enable

6. Control instructions of the lower return pump

Starting conditions (All conditions needed)

- $[\text{Hot In tmp}] \leq [\text{pm start inT}]$.
- Lower return pump timing working period (it is in the time of downPump start] and [downPump stop] . The equality of the two means that the working period of the lower return pump is not limited by the use of time. That is, it does not need to meet this condition.).
- $[\text{HotW tmp}] \geq [\text{pm stop inT}]$.
- Water flow switch has no fault.
- Lower return water temperature sensor has no failure.

Stop conditions (Any conditions)

- Lower return water temperature sensor is failed.
- It is not in the timing operation period.
- $[\text{Sys.Hotw in}] \geq [\text{pm stop inT}]$.
- $[\text{HotW tmp}] \leq [\text{pm stop inT}]$.
- Lower return water flow switch failed.

7. Module control and linkage wiring

Parameter setting required for module control

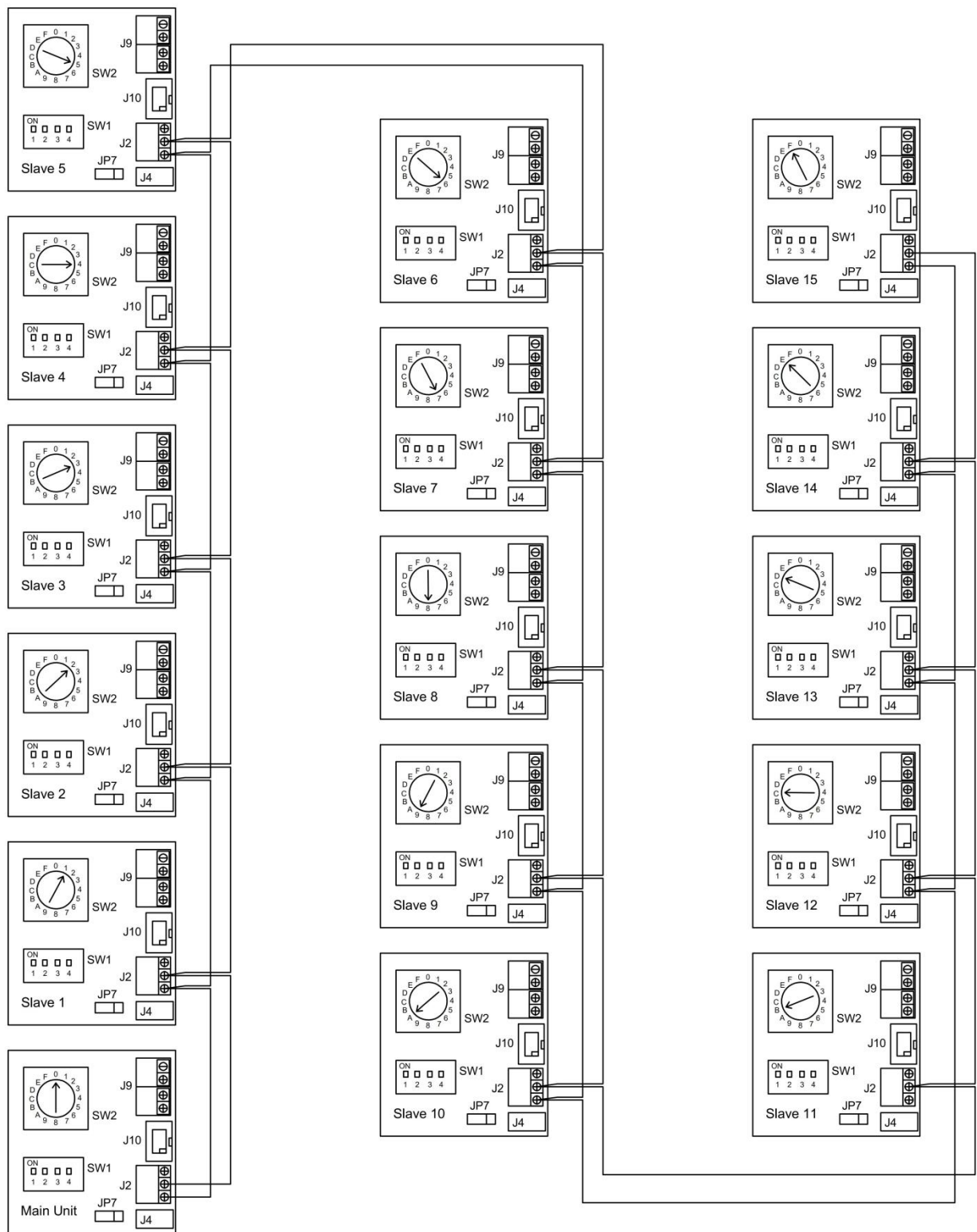
Under shutdown state, press "Function" and "Confirm" at the same time to enter password setting, enter **password 123**, enter the module parameter setting table, and press the information needed from the following table to set parameters.

A	Setting Range	Default	Unit	Type	Reservations
Module parameter settings					
1	Module quantities	1...16	1	2/N	The number of modules the unit can control (Total number of units, including host and slave),the corresponding address (SR1) is set to 0... F, 0# main module.

Wiring diagram of module control and dial code table of each module control dial code

Module code	Main unit	1	Slave 2	3	4	Slave 5	6	7	8	9	Slave 10	Slave 11	Slave 12	Slave 13	Slave 14	Slave 15
Dial switch SW2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F

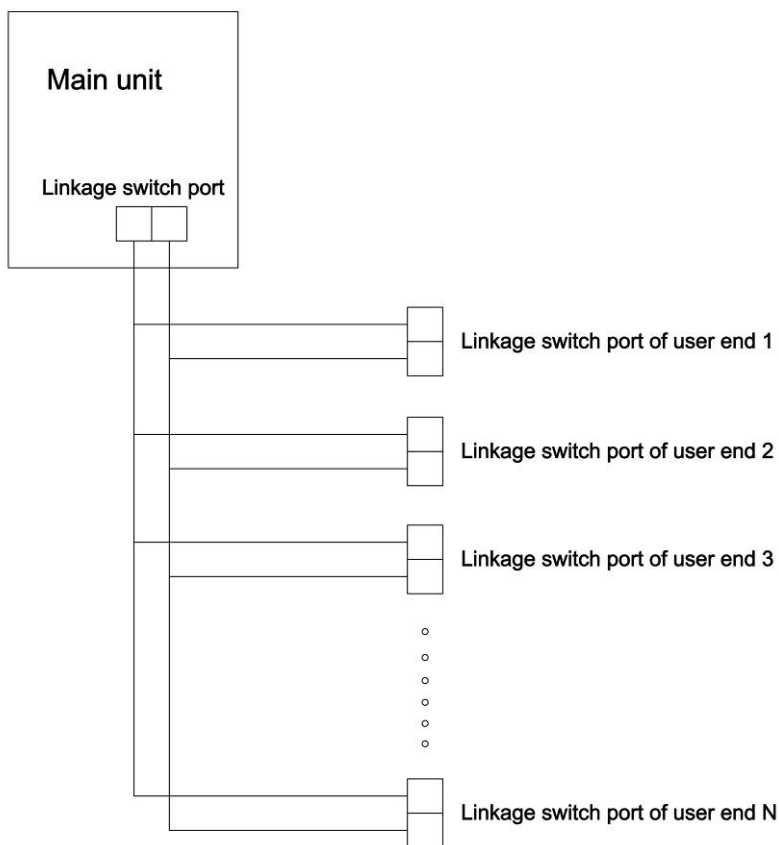
Schematic diagram of control wiring and code dialing of each module:



Linkage control wiring diagram and parameter setting requirements

- Linkage control is not used by default when the unit leaves the factory. If the user needs to use linkage control, turn **【Toge Switch】** into **【Enab】** .
- After the linkage control takes effect, when the linkage terminal of the unit is closed and the switch key command is "open," the unit can run. When the unit linkage terminal is disconnected, the unit will stop.
- When controlling the main module, the linkage switch only needs to be connected to the main module, not to the slave module.
- Terminal linkage switch signal can only be a passive signal, namely on and off signal. It cannot access active signal, such as voltage signal, otherwise it will damage the electric control board. The company shall not be responsible any main board damage due to improper operation of the terminal linkage switch.

The connection mode is as shown below:



Linkage switch port of user end must be passive signal (communication signal). It is forbidden to connect to active signal (like voltage signal), otherwise the PCB will be damaged.

VIII. Trial running and maintenance

1. Trial running

Note before trial running

- The water heater should be bypassed while the pipes are being cleaned. Only after the pipes have been verified clean should the bypass line be closed, and the isolation valves to the water heaters opened. The static water pressure should be a minimum of 15-psi and the water flow should be balanced to match the rated flow of the unit.
- Power the unit 8-hours before the unit's initial start-up to preheat the compressor. Starting the unit too soon after initial power may cause damage to the compressor.
- Complete the software set-up prior to operating the system.
- Engage a factory trained technician to provide start-up services.
- Confirm items below before trial running, then fill the blanks with check mark "✓".

Correct unit installation	<input type="checkbox"/>	Check voltage is within specifications	<input type="checkbox"/>
Correct piping & wiring	<input type="checkbox"/>	Air inlet and outlet free of obstructions	<input type="checkbox"/>
Drain valve functioning properly	<input type="checkbox"/>	Pressure relief valve functioning normally	<input type="checkbox"/>
Pipe insulation complete	<input type="checkbox"/>	Level foundation	<input type="checkbox"/>

Trial running

- Only after all wiring and piping work has been completed and checked can the power be connected, and the water filled.
- Vent the air in the system prior to start-up.
- Check the controller to ensure it is operational and error free. If there is a fault code, trouble shoot the cause of the fault, confirm that the unit can operate normally, and restart the unit.
- Operate the unit for at least 30-minutes to ensure proper operation.
- Avoid frequent cycling. 10 minutes is the proper time to restart the unit after it stops.
- *Check for abnormal sound or vibration during operation; diagnosis any items that are out of spec.*
- *Keep power applied to the unit during normal operation.*



If it is necessary to cut off the power supply because the unit has stopped running for a long time, remember to electrify the unit 8 hours before starting up again and preheat the compressor.

2. Trouble shooting

2.1. Control protection function list

- 1) Cut-out protection
- 2) Low water flow
- 3) Phase sequence protection
- 4) Low suction pressure protection
- 5) Compressor overcurrent protection
- 6) Compressor overload protection
- 7) Excessive exhaust pressure protection
- 8) Excessive exhaust temperature protection
- 9) Frost protection

2.2. Fault analysis and elimination of electric control panel display

- Reset mode: A = Automatic reset; M = Manual reset; A/M = limited automatic reset; Refer to the "Fault Reset Instructions."
- If there is no special explanation for the following switch quantity faults, they will alarm only after [general fault delay] shaking elimination.
- The following sensor faults will alarm after 4 seconds of quenching without special instructions.

Fault reset instructions

4 reset modes of faults:

- 1) Power on and reset
*After fault clearance, can only be reset after power-on again.
Like EEPROM data fault.*
- 2) Limited automatic reset (A/M)
 - After the fault clearance, 【Automatic reset time】 delays, during this time no longer appear the same fault, automatic reset.*
 - Within 【automatic reset allows】 set time, it can automatically reset for 2 times, alarm cumulative number > 2 times, need to manually reset.**After manual reset, the alarm times can be accumulated again.
Limited faults: check the fault table.*
- 3) Automatic reset (A)
 - Alarm after the fault clearance, 【automatic reset timedelay】 , this time no longer appear the same fault, automatic reset.**Automatic reset without number;
Fault self-recovery: check the fault table.*
- 4) Manual reset (M)
 - Alarm after the fault clearance, only by manual reset controller;**1) 2) 3) Type failure can also be manually reset.*

2.3. Trouble shooting

Faults	Possible cause	Trouble shooting
Excessive exhaust pressure (Cooling)	There is air in the system or other non-condensable gas condenser fin dirty or debris blocked.	Remove the gas from the nozzle and vacuum the condenser fins again if necessary.
	Insufficient condensing air volume or failure of condensing fan suction pressure is too high.	Repair the condensing fan and resume operation. See "Excessive suction pressure."
	Overcharge of refrigerant.	Discharge excess refrigerant.
	Ambient temperature is too high.	Check ambient temperature.
Low exhaust pressure (Cooling)	Refrigerant leakage or filling is not enough.	Check for leakage or fill with sufficient refrigerant.
	Low suction pressure.	See "Low suction pressure."
Low suction pressure (Cooling)	Insufficient water flow.	Check the temperature difference between inlet and outlet water, adjust the water flow and check the installation.
	Water inlet temperature is low.	Check for leakage or fill with sufficient refrigerant.
	There is scale in evaporator due to refrigerant leakage or insufficient refrigerant filling.	Remove scale.
Excessive exhaust pressure (Heating)	Insufficient water flow.	Check the temperature difference between inlet and outlet water and adjust the water flow.
	There is air in the system or other non-condensable gas condenser fin dirty or debris blocked.	Remove the gas from the nozzle and vacuum the scale again if necessary.
	Water outlet temperature is too high.	Check the water temperature.
	Excessive suction pressure.	See "Excessive suction pressure."
Low exhaust pressure (Heating)	Water temperature is too low.	Check water temperature.
	Refrigerant leakage or insufficient refrigerant filling.	Check for leakage or fill with sufficient refrigerant.
	Low suction pressure.	See "Low suction pressure."
Excessive suction pressure (Heating)	Air side heat exchanger inlet temperature is high.	Check ambient temperature.
	Overcharge of refrigerant.	Discharge excess refrigerant.
Low suction pressure (Heating)	Refrigerant leakage or filling is not enough.	Check for leakage or fill with sufficient refrigerant.
	Insufficient air volume.	Check fan steering.
	Air short circuit.	Eliminate the cause of air short circuit.
	Insufficient defrost operation.	Failure of four-way valve or sensor, replace if necessary.

Compressor stopped due to anti-freezing protection (Cooling)	Insufficient water flow.	If water pump or water flow switch is failure, check if necessary, repair or replace.
	There is gas in the water loop.	Discharge gas.
	There is something wrong with the sensor.	If fault is confirmed, replace it.
The compressor stopped because of high pressure protection	Excessive exhaust pressure.	See "Excessive exhaust pressure."
	High pressure switch fault.	Check for faults, repair or replace.
The compressor stopped because the motor was overloaded	Excessive exhaust pressure or suction pressure.	See "Excessive exhaust pressure" and "Excessive suction pressure."
	High or low voltage, single phase or phase imbalance.	Check that the voltage is not more than or less than 20V of rated voltage.
	Short circuit of motor or terminal.	Check corresponding resistance of each terminal of the motor.
	Overload element fault.	Replace it.
Compressor stops due to built-in temperature sensor or exhaust temperature protection	Voltage is too high or too low.	Check that the voltage is not more than or less than 20V of rated voltage.
	Excessive exhaust pressure or low suction pressure.	See "Excessive exhaust pressure" and "Low suction pressure."
	Component fault.	Check the built-in temperature sensor when the motor is cooled.
The compressor stopped because of low pressure protection	The front (or back) filter of the EEV is blocked.	Replace filter.
	Low pressure switch fault.	If defective, replace it.
	Low suction pressure.	See "Low suction pressure."
Abnormal compressor noise	The liquid refrigerant flows into the compressor from the evaporator and produces liquid shock.	Adjust refrigerant charge.
	Compressor aging.	Replace the compressor.
There is noise	The fastening screw on the panel is loose.	Tighten all parts.
Compressor does not start	The overcurrent relay will jump and the safety will burn out.	Replace the damaged components.
	The control circuit is not on.	Check the wiring of control system.
	High pressure protection or low pressure protection.	See front suction and exhaust pressure fault section.
	The contactor coil is burnt out.	Replace the damaged components.
	Power phase sequence connection error.	Reconnect and adjust any two connections in the three phases.
	Water system failure, water flow switch is out of line.	Check the water system.

	There is a fault signal on the wire controller.	Find out the fault type and take corresponding measures.
Excessive frost on the air heat exchanger	Failure of four-way valve or sensors.	Check operation and replace if necessary.
	Air short circuit.	Eliminate the cause of air short circuit.

3. Maintenance

Main parts maintenance

- Pay attention to the suction and exhaust pressure of system during operating. Determine the reason for the abnormality.
- Check whether the electrical wiring is loose, or if the contacts are oxidized, or if the wire insulation is damaged; replace and repair as necessary. Always pay attention to the working voltage, current and phase balance.
- Inspect systems and replace failed components in a timely manner.

Descaling

All domestic hot water systems will experience scale build up over time. Scale build up can affect the heat transfer performance and lead to increased power consumption, excess exhaust pressure (or low suction pressure), and premature equipment failure. To avoid these concerns, these units are equipped with 1” NPT ports on the supply and return headers to allow quick and easy connection for preventative maintenance. To remove surface deposition of calcium oxide or other minerals from the heat exchangers it is recommended to use descaled agents using formic acid, citric acid, acetic acid and other organic acid cleaning.

NOTE: Any cleaning solvent should comply with FDA G.R.A.S standards. Never use cleaning agents containing fluoride chlorate because the galvanized pipe on the water side can easily corrode, leading to leakage of refrigerant. When descaling pay attention to the following aspects:

- The waterside heat exchanger must be cleaned by professionals.
- After using cleaning agents, properly flush the system with clean water.*
- Properly dispose of waste fluids and particles.
- Cleaning agents and neutralizing agents can have corrosive effects on the eyes, skin, mucous membranes of the nose, etc. Therefore, protective devices (such as goggles, protective gloves, protective masks, protective shoes, etc.) must be used in the cleaning process to prevent inhalation or contact with agents.

Power off in winter


See “Winter Freeze Protection” on page-13.

The following preparations shall be made when the unit is restarted after any prolonged outage:

- *Thoroughly inspect and clean the unit.*
- *Clean the plumbing system.*
- *Inspect water pump, regulator and other equipment of water piping system.*
- *Tighten all wire connections.*

- *Power on for 8 hours before starting.*

Parts replacement

	<p>Replacing parts should use the parts provided by the manufacturer, do not replace with 3rd party parts.</p>
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Refrigerating system

The system is factory charged with refrigerant. If the refrigerant charge is found to be low, evacuate the charge and check for leaks.

- A. If repair welding is needed, the system must be drained of gas before welding.
 - Connect the vacuum tube to the low-pressure side refrigerant injection nozzle.
 - Vacuum the system line with vacuum pump, vacuum for more than 3 hours, confirm that the multi-meter indicating pressure in the specified range.
- B. Replenish the refrigerant.
 - After reaching the desired vacuum limit and holding it for 3-hours or more, the system can be charged with refrigerant. The appropriate refrigerant filling amount has been indicated on the nameplate and in the main technical parameters table.
 - The charging amount of refrigerant will be affected by the ambient temperature. If the required charging amount is not reached and cannot be recharged, the water can be circulated and the unit can be started for charging. If necessary, the low-voltage control switch can be temporarily short-circuited.
 - Slowly fill the system with refrigerant and check the suction and exhaust pressure.

Warning: Do not inject oxygen, acetylene or other flammable or toxic gases into the refrigeration system during leak detection and air tightness test. Only high-pressure nitrogen or refrigerant can be used.

Disassemble compressor

If the compressor needs to be removed, please follow the following steps:

- *Turn off the unit power supply.*
- *Remove the compressor power connector.*
- *Remove compressor suction and exhaust pipe.*
- *Disconnect the compressor retaining bolt.*
- *Move the compressor.*

Auxiliary electric heater

Air-source heat pump capacity will derate when the ambient temperature drops. Be sure to reference the performance data when selecting equipment. For areas that experience temperatures below 5°F for extended times, the outlet temperature may drop below 140°F. Secondary electric heaters can be used to either boost temperature or supplement the load to counteract the derate in performance caused by low

ambient conditions.

System antifreeze

Water should not be allowed to freeze in the heat exchanger because the expanding ice can seriously damage to the heat exchanger. Leaks caused by frozen water can result system failure. Warranty does not cover damage due to improper freeze protection. Special attention should be paid to the frost prevention.

The freeze protection flow controller and anti-freeze temperature sensor are critical safety devices and must remain wired in accordance to the wiring diagrams.

Care must be taken during maintenance to avoid freezing the HXR's when filling or discharging refrigerant in the system.