

## INVERTER AIR-TO-WATER HEAT PUMP INSTALLATION MANUAL



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## Section 1: Read Before Proceeding

- In order to provide the customers with high quality, strong reliability and good versatility a product, this heat pump is produced by strict design and manufacturing standards. This manual includes all the necessary information about installation, troubleshooting, and maintenance.

Please read this manual carefully before you open or maintain the unit. The manufacturer of this product will not be held responsible if someone is injured or the unit is damaged, as a result of improper installation, troubleshooting, unnecessary maintenance which is not described in this manual.

The unit must be installed by a licensed, qualified installer.

- It is vital that the below instructions are adhered to at all times to uphold the warranty.
  - The unit can only be opened or repaired by qualified installer or an authorised dealer.
  - Maintenance and operation must be carried out according to the recommended time and frequency, as stated in this manual.
  - Use genuine standard spare parts only.

Failure to comply with these recommendations will void the warranty.

- Inverter air-to-water heat pump is high efficient, energy saving and environment friendly, which is mainly used for space heating/cooling. It can work with any kind of indoor unit such fan coil, radiator, or in floor radiant. One unit of monobloc heat pump can also work with several indoor units.

## Benefits and Features

### Advanced Controlling

The PC microcomputer based controller is available for the users to review or set parameters of the heat pump.

### Flexible Installation

The unit is compact and robust allowing for easy installation and reliable quality.

### Quiet Running

High quality and efficient compressor, is used to ensure the low noise level with insulation.

### Good Heat Exchange Rate

The heat pump unit uses a specially designed heat exchanger to enhance efficiency.

## Section 2: Hazard Definitions

The following terms are used throughout this manual to bring attention to the presence of potential hazards or to important information concerning the product.

**⚠ DANGER** Indicates an imminently hazardous situation, which if not avoided, **WILL** result in death, serious injury or substantial property damage.

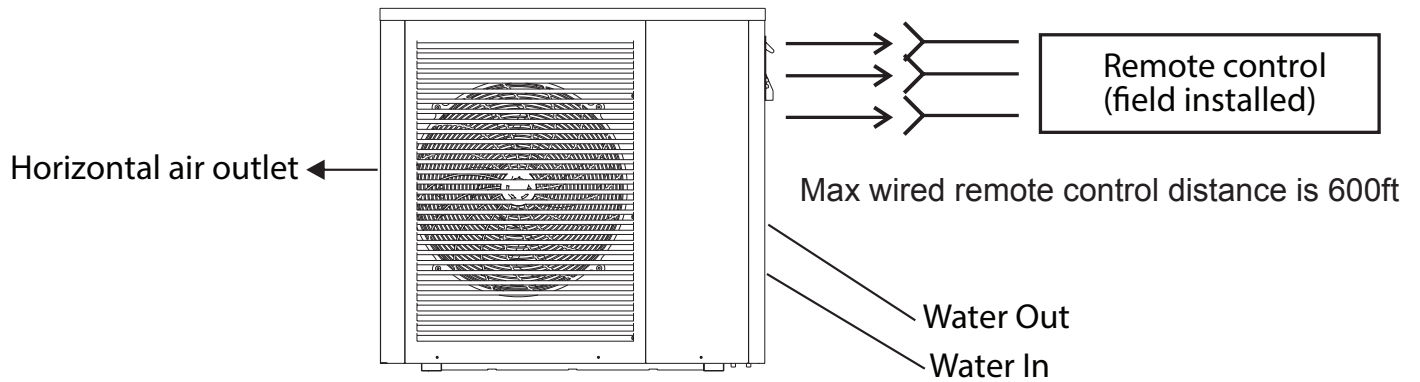
**⚠ WARNING** Indicates an imminently hazardous situation, which if not avoided, **COULD** result in death, serious injury or substantial property damage.

**⚠ CAUTION** Indicates an imminently hazardous situation, which if not avoided, **MAY** result in minor injury or property damage.

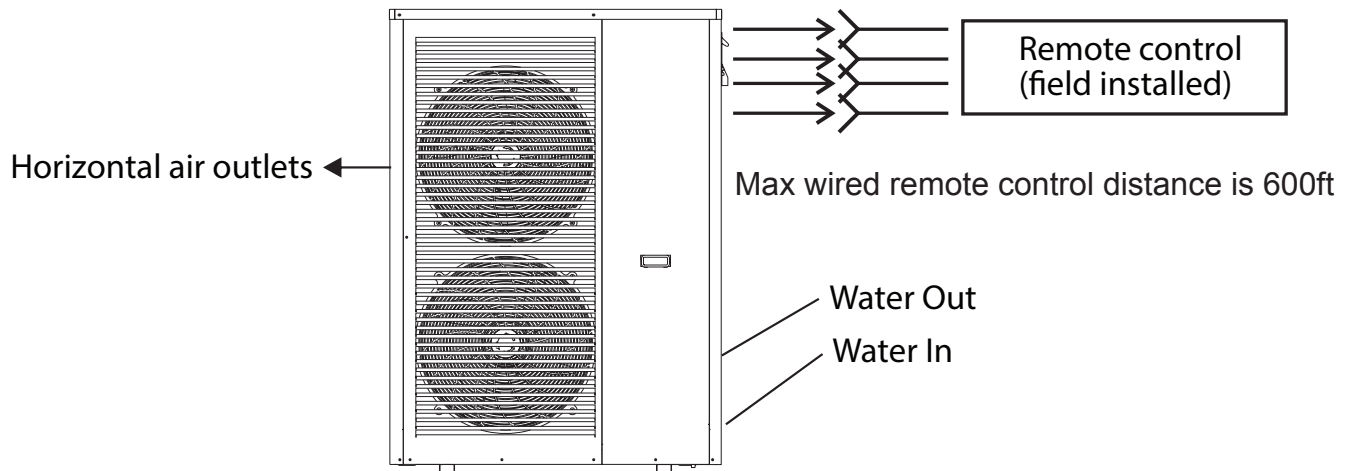
**NOTICE** Used to notify of special instructions on installation, operation or maintenance, which are important to equipment, but not related to personal injury hazards.

## Section 3: Unit Specification

SIM-036



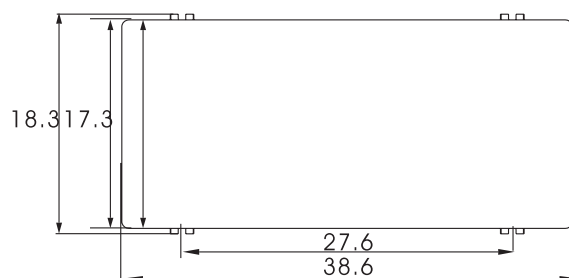
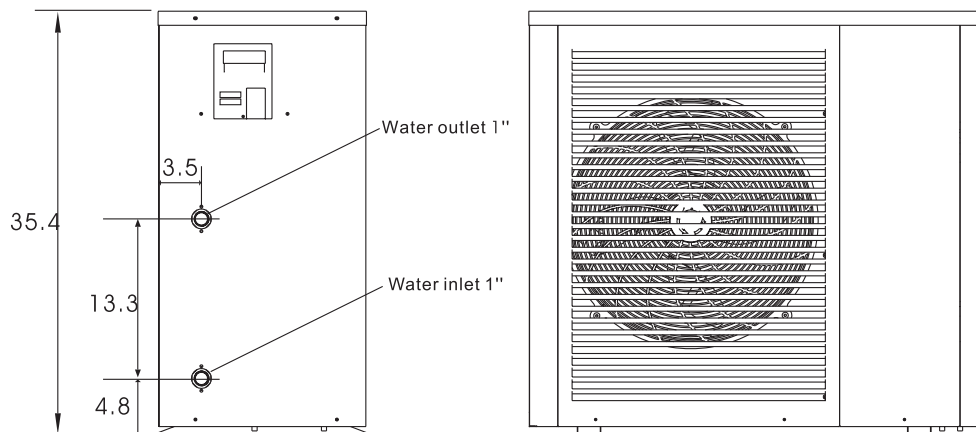
SIM-060



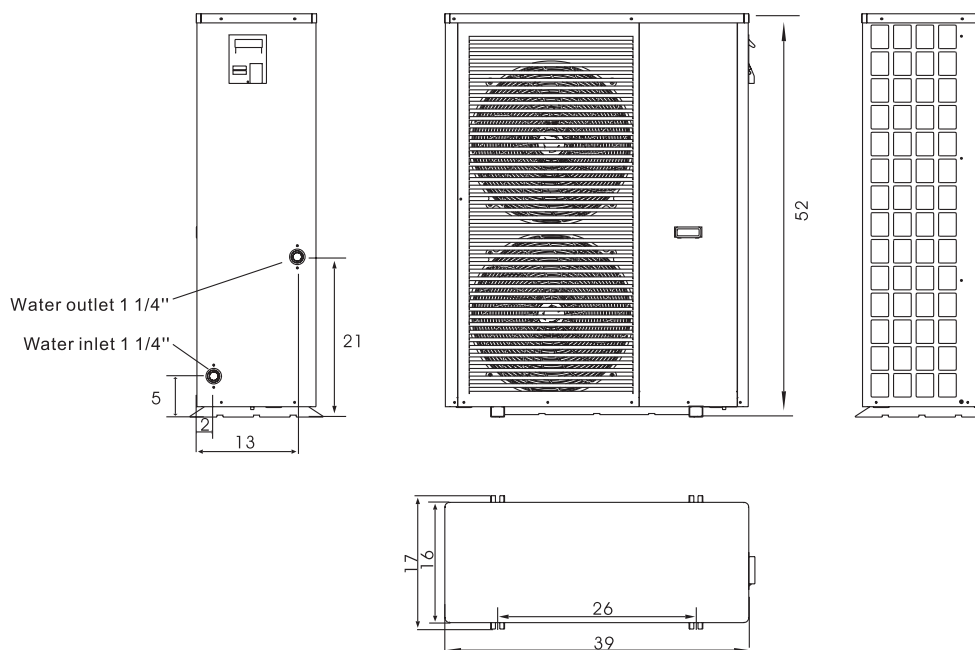
## Specification

### Unit Dimensions (inch)

SIM-036



SIM-060



## Specification

Model		SIM-036	SIM-060
Max Heating Capacity* (90hz)	BTU/h	39240	56300
Min Heating Capacity* (30hz)	BTU/h	11950	21986
Max Cooling Capacity** (90hz)	BTU/h	34121	49476
Min Cooling Capacity** (30hz)	BTU/h	11341	16445
COP *		Up to 5.01	Up to 4.67
EER**		13.4	15.6
Total Load	A	18	21
Compressor Rating Load	A	9.7	19
Locked Rotor Load	A	35	50
Fan Motor Rating Load	A	0.8	2×0.8
Minimum Circuit Ampacity	A	20	26
Max Fuse	A	30	40
Power Supply		230/1ph/60hz	230/1ph/60hz
Compressor Quantity		1	1
Compressor Model		Rotary	Rotary
Fan Quantity		1	2
Fan Power Input	W	200	200×2
Max Fan Speed	RPM	750	750
Noise	dB(A)	54	58
Water Pressure Drop at rated flow	PSI	6	10
Water Connection	inch	1	1 1/4
Rated Water Flow	GPM	7	12.32
Unit Net Dimensions (L/W/H)	inch	38.6 x 18.3 x 35.4	39 x 17 x 52
Unit Shipping Dimensions (L/W/H)	inch	40.9 x 19.3 x 36.2	42 x 18 x 53
Net Weight	lb.	242.5	326
Shipping Weight	lb.	271	368

Test Condition (AHRI 550/590)

\*\*Cooling :

Ambient temperature:(DB/-):95°F/-°F

Entering water temperature:56°F

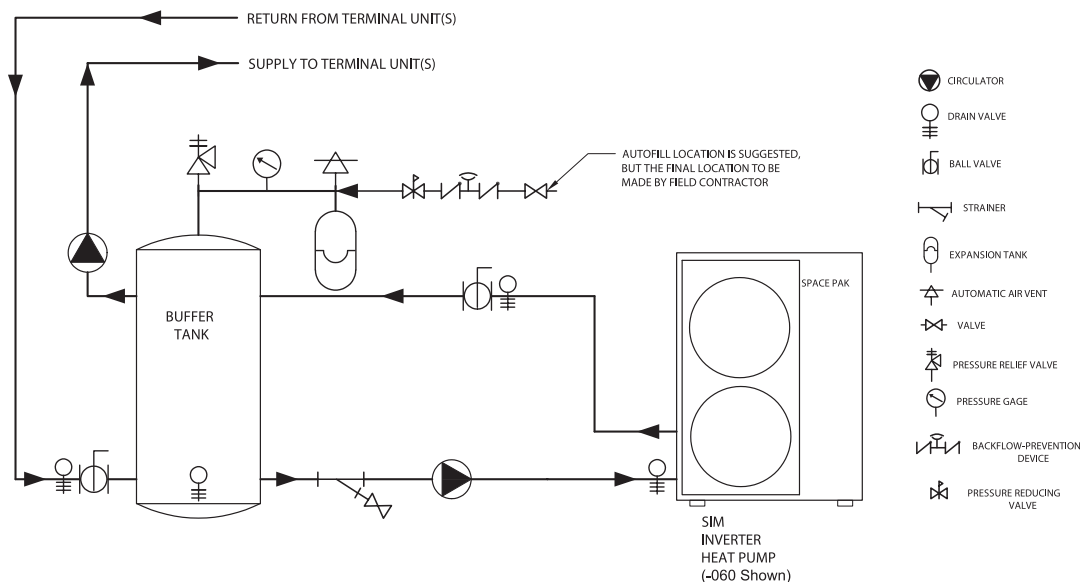
Leaving water temperature:46°F

\*Heating:

Ambient temperature:(DB/WB):44°F/43°F

Leaving water temperature:113°F

## Typical System Diagram



## Section 4: Installation

### Choose a Right Heat Pump Unit

Perform appropriate load calculation to determine required heating or cooling load for the project. Refer to specifications in this manual to determine proper size heat pump.

### Installation Location

- Units can be installed outdoors as long as the location determined can handle the weight (see specifications) for each unit.
- The location is free from heat radiation and other possible fire hazards.
- 3ft above snow level is required to provide proper condensate drainage.
- There must be enough space around the unit for maintenance see "Required Clearances".

### Installation Method

The heat pump can be secured onto the concrete pad by expansion screws, or onto a steel frame with rubber feet which can be placed on the ground.

### Water Loop Connection

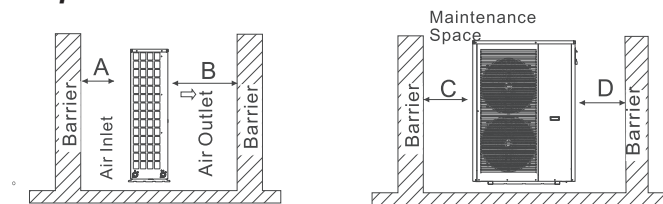
Please read below for water piping instructions

- The piping must be clean and free from dirt. Prior to insulating the pipe, it is suggested that a leak test be performed to ensure no water leaks are present.
- There must be expansion tank on the top point of the water loop, and the water level in the tank must be at least 0.5 meter higher than the top point of the water loop.
- Remove all air from the system prior to powering up. An air vent is suggested at the highest point in the piping.
- Refer to temperature and pressure gauge on unit while unit is operating to ensure proper operation.

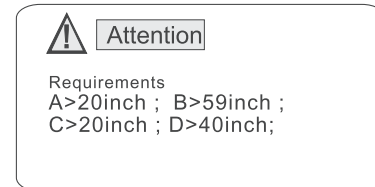
### Electrical Connections

- The power supply must go through the wire access and be connected to the power supply terminals in the control box. Then connect the 3-signal wire plugs of the wire controller and main controller.
- External pump can be powered through main power terminals accessed through main power access on side of the units.
- If an additional auxiliary heater is need to be controlled by the heat pump controller, the relay (or power) of the aux-heater must be connected to the relevant output of the controller.
- Power supply for the unit should follow unit electrical specifications and adhere to local and national electrical codes.

### Required Clearances



The picture shows the location of horizontal air outlet unit.



The minimum ventilation distance in diagram 1.

### Inspection before turning unit on

- Check the indoor unit, and make sure that the pipe connections are secured, leak free and the appropriate valves are open.
- Check the water loop, to ensure that the water inside of the expansion tank is enough, the water supply is good, the water loop is full of water/glycol mix\* and without any air. Also make sure there is good insulation for the water pipe.
- Check the electrical wiring. Make sure that the power voltage is normal, the screws are fastened, the wiring is made in line with the diagram, and the ground is connected.
- Ensure air to water heat pumps are free of any debris and that all loose screws or parts have been secured. Once power is turned on, check controller display for any immediate faults. A licensed and qualified installer can also verify refrigerant pressures by using the refrigerant ports located within the unit.
- The flow switch is installed inside of the heat pump, check to ensure that the wiring and action of the switch is normal and controlled by the controller.

\*Refer to glycol section of this manual

## Glycol/Water System

**Figure 1** SIM Glycol Concentrations (10% Minimum, 50% Maximum)

Ethylene Glycol %	10	20	30	40	50
Min. Ambient Temp for Operation	23°F/-5°C	14°F/-10°C	2°F/-17°C	-13°F/-25°C	-36°F/-38°C
SpacePak Capacity Multiplier	0.98	0.96	0.93	0.91	0.89
Pressure Drop Multiplier (Cooling)	1.06	1.12	1.16	1.25	1.36
Pressure Drop Multiplier (Heating)	1.06	1.12	1.16	1.22	1.28
Minimum Expansion Volume / System Volume					
Heating and Cooling (Gallons)	1 gallon expansion per 15 gallons system volume				
Heating only, HP only (Gallons)	1 gallon expansion per 20 gallons system volume				
Heating Only, with Boiler (Gallons)	1 gallon expansion per 15 gallons system volume				
Propylene Glycol %	10	20	30	40	50
Min. Ambient Temp for Operation	26°F/-3°C	18°F/-8°C	8°F/-13°C	-7°F/-22°C	-29°F/-34°C
SpacePak Capacity Multiplier	0.99	0.98	0.96	0.93	0.88
Pressure Drop Multiplier (Cooling)	1.10	1.20	1.34	1.5	1.65
Pressure Drop Multiplier (Heating)	1.10	1.20	1.34	1.46	1.5
Minimum Expansion Volume / System Volume					
Heating and Cooling	1 gallon expansion per 15 gallons system volume				
Heating only, HP only	1 gallon expansion per 20 gallons system volume				
Heating only, with Boiler	1 gallon expansion per 15 gallons system volume				

**Figure 2**

Piping Pressure Losses*					
Pressure Drop, Ft H <sub>2</sub> O/100ft*					
Pex Pipe	Flow Rate GPM	1"	1-1/4"	1-1/2"	2"
	6	5.5	1.7	-	-
	7	7.2	2.5	1.5	-
	8	9.1	3.4	1.8	-
	9	11.1	4.3	2.1	0.5
	10	13.4	5.2	2.4	0.6
	11	15.9	6.2	2.8	0.7
	12	18.5	7.2	3.2	0.9
	14	-	9.4	4.2	1.2
	16	-	11.8	5.4	1.6
Copper Pipe (Type L)	6	1.0	-	-	-
	7	1.4	0.5	-	-
	8	1.8	0.7	-	-
	9	2.2	0.8	0.3	-
	10	2.7	1.0	0.4	-
	11	3.2	1.2	0.5	0.1
	12	3.8	1.4	0.6	0.1
	14	-	1.8	0.8	0.2
	16	-	-	1.0	0.3

\*Remember to check the CV rating of your fittings and valves to make sure you're getting the required flow through the equipment.

## Glycol/Water System Design

Each SIM Heat Pump has a recommended flow that should be maintained during all times of operation. For the SIM-060, the recommended flow is 13GPM at which the head loss is 25ft W.C, 11PSI or 73kPa. For the SIM-036 the recommended water flow is 7GPM at which the head loss is 6 ft W.C. or 6 P.S.I. These head loss values are based upon pure water, see Figure 1 for multipliers to correct for various concentrations of anti-freeze solution.

Note: these are the recommended flow values. Should the flow drop significantly below this value, the heat pump will shut down and display the code FL on the display. This is not an indication of a fault in the heat pump, but rather points to insufficient pump or plumbing capacity, or air trapped within the system.

### System Volume and Expansion Volume

To ensure smooth temperature control and minimize cycling of refrigeration system, all installations must have total circulating volumes equal to or greater than 7-1/2 gallons per nominal ton of the unit performance (The greater of either heating or cooling produced). In other words, in the case of a four ton heat pump the minimum total system volume is 4x7-1/2=30 gallons. Multiple heat pump installations that are operating in a staged configuration follow the same rule, so that only a single heat pump tonnage needs to be considered. Additionally, the system requires an expansion volume (air) to compensate for the change in volume of the glycol mixture as it heats and cools, see Figure 1 for expansion volume.

A typical multiple heat pump installation may actually have a volume far greater than the minimum required, and it is this entire volume that must be considered when sizing the expansion tank.

Note that the nominal expansion tank volume is not the same as the expansion volume. If the actual air volume is not published, consider it to be no more than half the nominal volume.

As an example, a four ton nominal heat pump, used for both heating and cooling, requires a minimum of thirty gallons of circulated system volume. A 40 gallon buffer tank is selected for best operation. When the system installation is complete, the total liquid volume of plumbing, air handlers, and heat pump is 45 gallons. (Note the expansion tank, no matter how large, is not considered circulated volume) This requires an **acceptance volume** of 3 gallons. If the acceptance volume is not specified, assume it is 50% of the total volume. Therefore, this system would require an expansion tank of 3 gallons acceptance volume, or six gallons nominal full volume.

### Air Separator

Locate at least one high efficiency air separator as shown in the piping to remove any air from the system.



## Glycol / Water Mixture

**⚠ WARNING** The water system must contain a mixture of inhibited glycol and water with thermal protection sufficient for the coldest expected temperature for the installation. The inhibitor level can degrade over time, and may need to be adjusted periodically. The inhibitor is essential to prevent the glycol from accelerating corrosion of metal components in the system. The glycol and inhibitor levels must be checked regularly (no less than once annually).

**⚠ CAUTION** The minimum allowable concentration of glycol is 10% by volume in all installations.

**⚠ CAUTION** Automotive glycol is not suitable for use in the SIM system. Over time it may leave deposits which will degrade the performance and damage pumps or other devices in the system. Use only ethylene glycol or propylene glycol mixtures specifically labeled for boiler or HVAC use.

Obtain all components specified in the Typical System Diagram. Make sure all components and piping comply with applicable local codes.

**DO NOT** use galvanized pipe anywhere in the system. Galvanizing will react with the glycol and can cause glycol degradation and sludge in the system.

- Confirm charge of expansion tank is 12-15 PSIG (with no water or pressure in the system).
- Install the system piping. DO NOT connect the SpacePak unit to the system piping until the system has been cleaned as required below.

**The SIM must NOT be connected to the system during this process.**

1. Connect a hose from a fresh water supply to the system fill hose bib. Note the drain port can be used for this purpose. The hose bib purge/drain valve should be located low in the system and close to the SIM return connection.
2. Open the high point purge valve, (not shown in illustration, as it may be inside the air handler) while slowly filling the system. Close the valve when air is removed from the system and water begins to flow out of the valve.
3. Fill the system with fresh water and run water until the system has been thoroughly flushed clean.

**Automatic Fill** – When an automatic fill system is installed, the cooling fluid (Glycol/water) must be inspected at least every 3 months, or whenever a leak is detected to ensure the proper glycol concentration is maintained.

### Pressure Test The System

1. Add water to the system as needed to raise the pressure to 25 PSIG (verify that all system components are suitable for this pressure). Verify that the pressure remains constant for at least one hour. Locate and correct any leaks.
2. After successfully testing, drain the system and remove the fresh water hose.

### Insulate The Piping

1. After testing and draining the system, apply pipe insulation. Fill system with glycol/water mixture. Calculate the system volume.
2. See Figure 1, for required glycol concentration for the minimum expected outside temperature.
3. Obtain the required volume inhibited glycol/water solution premixed or mix in a clean container. (The glycol must contain an inhibitor to prevent metal corrosion.)
4. Pump the glycol/water solution into the system, allowing air to escape through the purge valve(s).
5. After filling the system, sample the system fluid and verify glycol and inhibitor percentages, following instructions provided with the glycol.

The electrical loads given in the Specification Table, allow for a pump load of no more than 5 amps at 110 VAC (2.5 amps at 230 VAC). If the pump load exceeds this, provide a separate power source to the pump. DO NOT feed power to the pump from the SpacePak air handler panel.

### SIM Control Wiring Connection

The SpacePak SIM requires a dry contact (relay) signal to enable and select between heating and cooling modes. They will not operate on the 24V signals from typical thermostats or air handlers. Connecting 24V to either of these points will result in significant component damage.

- Connect multiple zone system to heat pump using SpacePak SSIC Control Module and instructions included with it. Refer to manual supplied with SSIC Control Module for connection and operational details.
- See wiring diagram for heat pump electrical diagram.

### Low Ambient Temperature Cooling Operation

If cooling operation is desired in a year-round application, or any time outdoor temperatures are expected to be consistently below 55°F, the fan operation should be modified in order to ensure proper operating conditions within the refrigeration system.



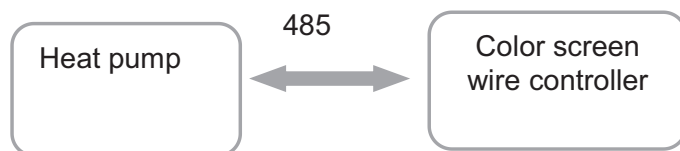
## Section 5: Wire Controller

### Overview of Wire Controller

1. The wire controller records the inlet temp and outlet temp every five minutes and displays through a curve graph. The record can be saved for a maximum period of 2 months.
2. The slave address on RS-485 communication can be altered through the wire controller.
3. The displayed temp. can be switched between °C and °F.

### Electrical System Diagram

#### System Diagram



#### Function of the Ports

Port No.	Name	Terminals No.	Function
CN2	Signal port	485A/485B	Communicate with PC8002
	Power input	+12V/GND	Power supply of wire controller, 12V DC

### Display Window and Function

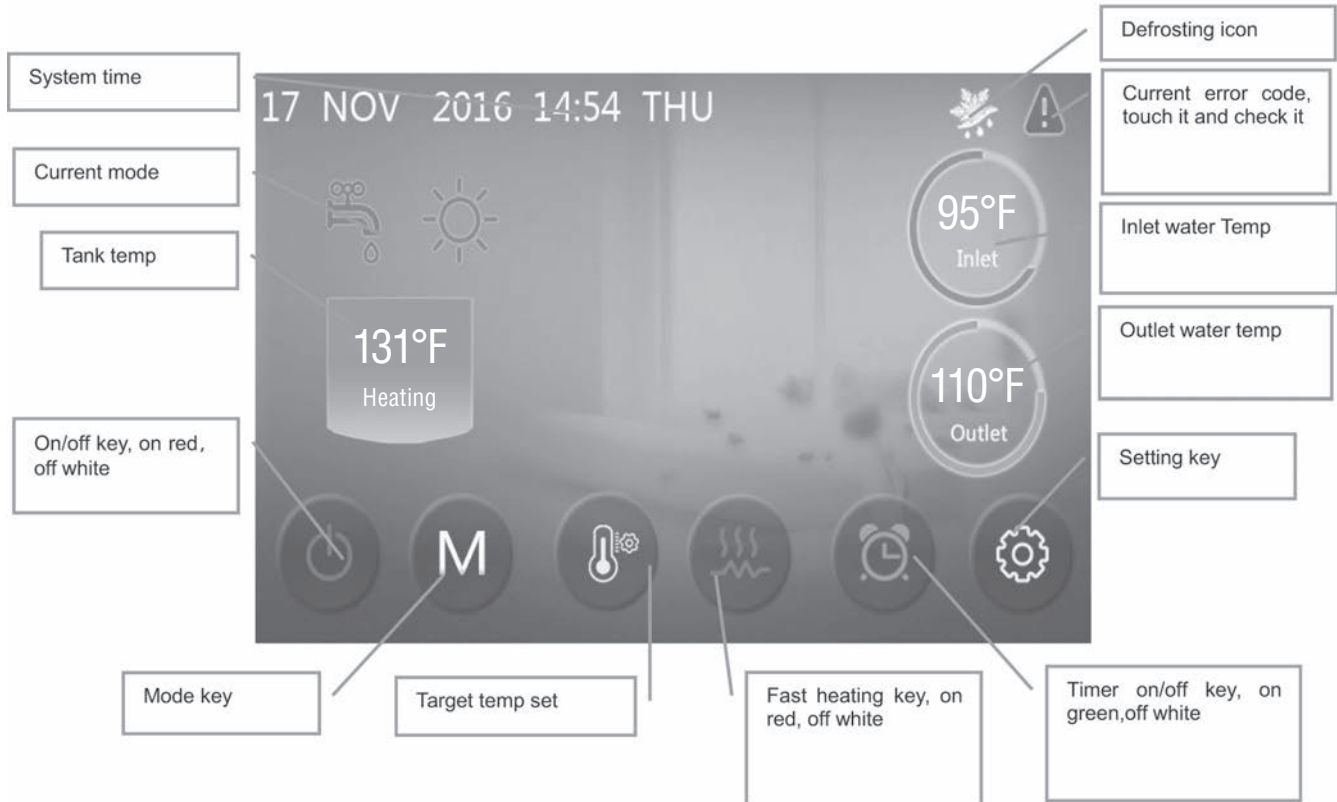
If the display screen is not touched in 30s the screen will dim. The screen will go to sleep after 2 minutes of no operation. Touching the screen will "wake" up the controller again. If the units selected is deg F, the date and time will be displayed as MM/DD/YY, Hr/Min/Wk. If the units selected is deg C, the display date and time will be displayed as DD/MM/YYYY and Hr/Min/Wk.

#### Power on Display Window



The display will show controller and wire controller versions when power on. If communication fails, the version number won't be displayed and will turn into main display window after 15s. If communication succeeds, the display will show controller and wire controller versions and turn into main display after 4s. You should hear a long 'beep' from wire controller after reprogrammed.

## Main Display Window



## Contents and Buttons on Main Display Window

On the startup interface, contents and buttons on main display are illustrated above.

## Animation on Main Display Window

1. When the unit is in defrosting mode, the defrosting icon will show until the defrosting is completed.
2. When the unit is shutdown, the main display will turn grey as illustrated below.
3. When the unit is shutdown, if the fast heating function is activated, the color of the button for 'fast heating key' is red, if not, the button will be white. When R12 has not activated fast heating function, the color of the icon will be grey.
4. When the unit is shutdown, if the timing switch function is activated, the color of the button for 'timer on/off key' will be green, if not, the button will be white.

## Mode Selection and Target Temperature Setting



### Mode Selection

On main display window, press 'M' button, it will show five modes. After having chosen one mode, It will return to main display automatically.

1. When choosing Heating mode, the display will show 'heating'



2. When choosing Cooling mode, the display will show 'cooling'

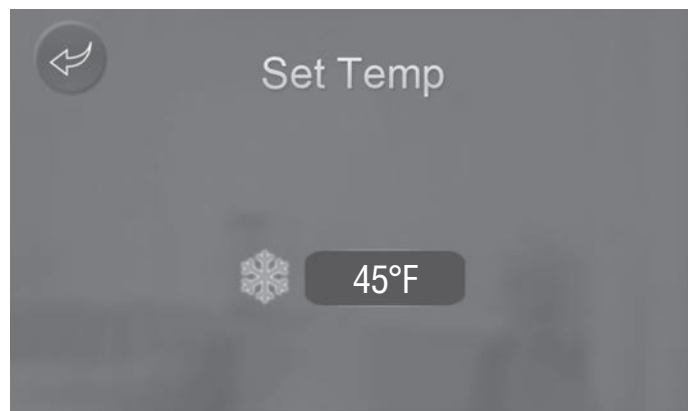


### Mode Selection Under Slave Mode

When choosing slave mode H02=1, the color of the buttons on the display will turn grey and are not clickable.

### Target Temperature Setting Under Current Mode

The different mode has different target temperature setting interface. For example, when choosing Cooling mode, The target temperature setting interface will show cooling set point.





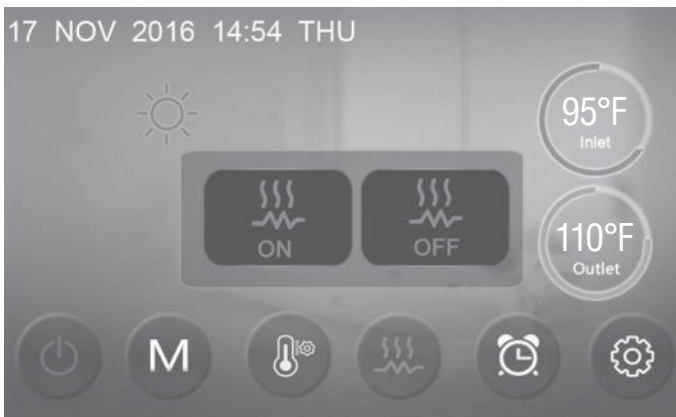
### **Fast Heating Display Window**



On the main interface, press fast heating key, it will display the pop-ups window of electric heater on and off.

#### **Key Operation Method**

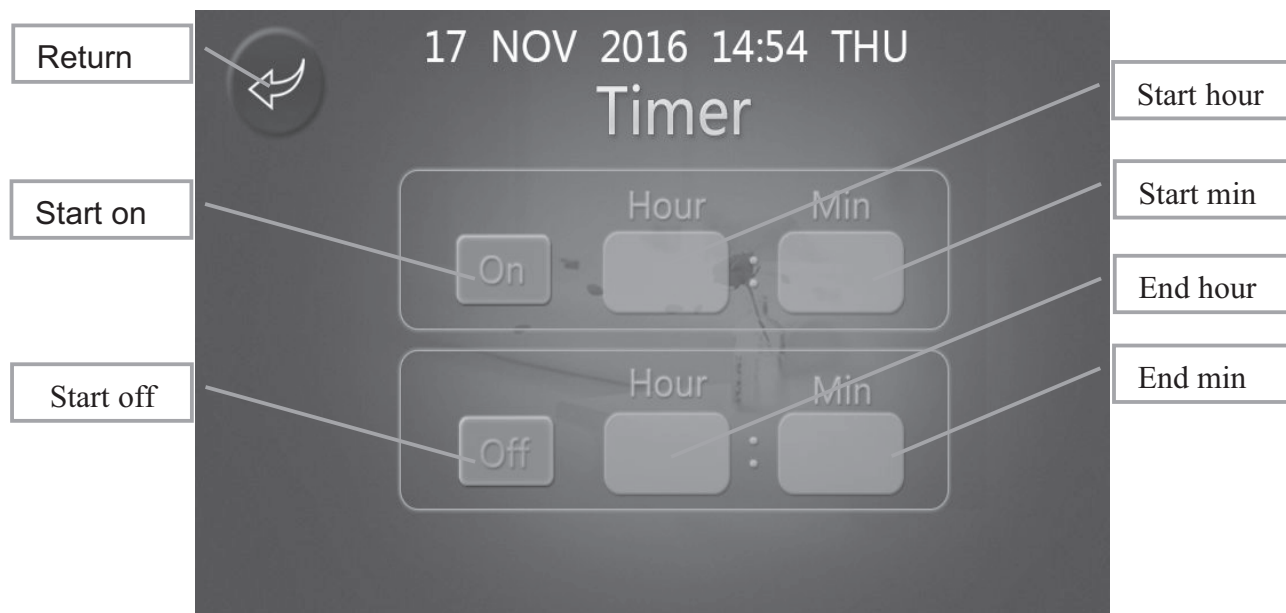
1. When touching the area except pop-ups window, it will return to main display window.
2. Press , the fast heating function will be activated, at the same time automatically return to the main display window. The color of fast heating key will be red.
3. Press , the fast heating function will be closed, at the same time automatically return to the main display window. The color of fast heating key will be white.
4. When R12 is chosen to not use electric heater, the color of fast heating key on the main display window and pop-ups window will turn grey and are not clickable as illustrated below:
5. When the current mode is cooling, the color of fast heating key on the main display window and pop-ups window will turn grey and are not clickable.



### Time Power On and Off Setting Display

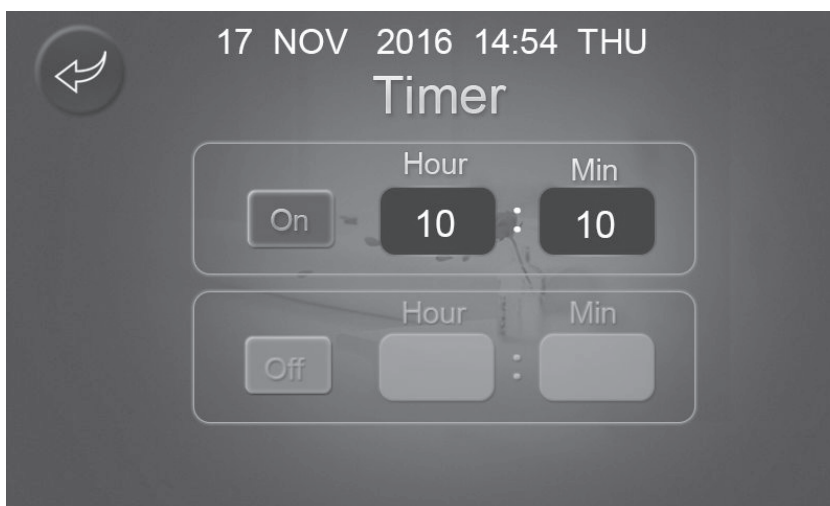
The function of parameter preservation and timing are operated by controller. The wire controller can only display and set the timing time. No matter when it starts or terminates functioning, the timing power on and off key on the main display remains green. When it does not conducting this function, it will be white.

#### Timer Full Closed



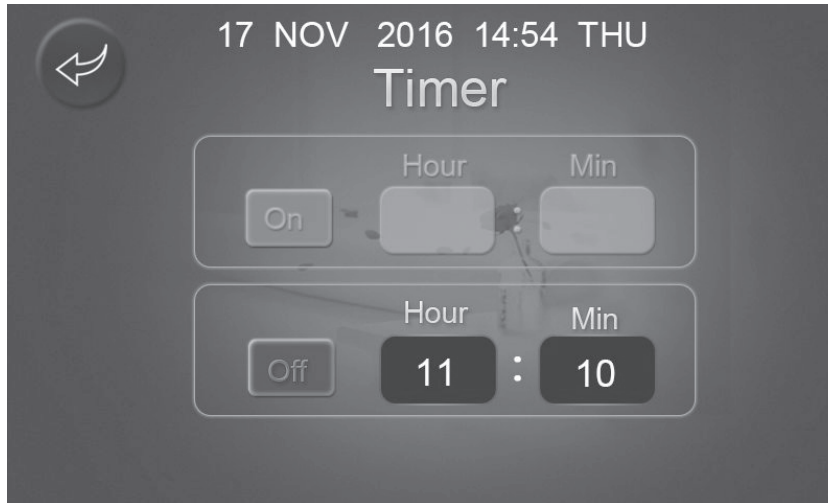
1. When the timer are full closed, the 'On' button and 'Off' button will turn grey. When the time interface is all grey, it means the timer function has not been activated.
2. Press 'On' button and the button will be lightened, then power on timer can be set. Press 'On' button repeatedly to switch between timer on and off.
3. Press 'Off' button and the button will be lightened, then power off timer can be set. Press 'Off' button repeatedly to switch between timer on and off.
4. When the timer is under closed status, the time could not be set.

#### Only Use 'On' Timer



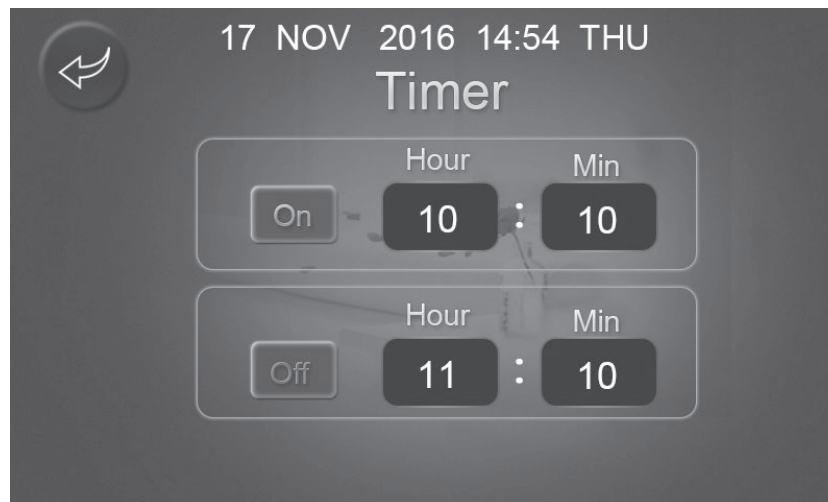
1. When using only power on timer, the 'On' button will be lightened as illustrated above.
2. Then the unit will power on once at the according 'Hour' and 'Min' and no more start-up will be conducted at other timing.
3. Under this status, other operation on the display should follow 'Timer Full Closed'.

### Only Use 'Off' Timer



1. When using only off timer, the 'Off' button will be lightened as illustrated above.
2. The unit will power off once at the according 'Hour' and 'Min' and no more shutdown will be conducted at other timing.
3. Under this status, other operation on the display should follow 'Timer Full Closed'.

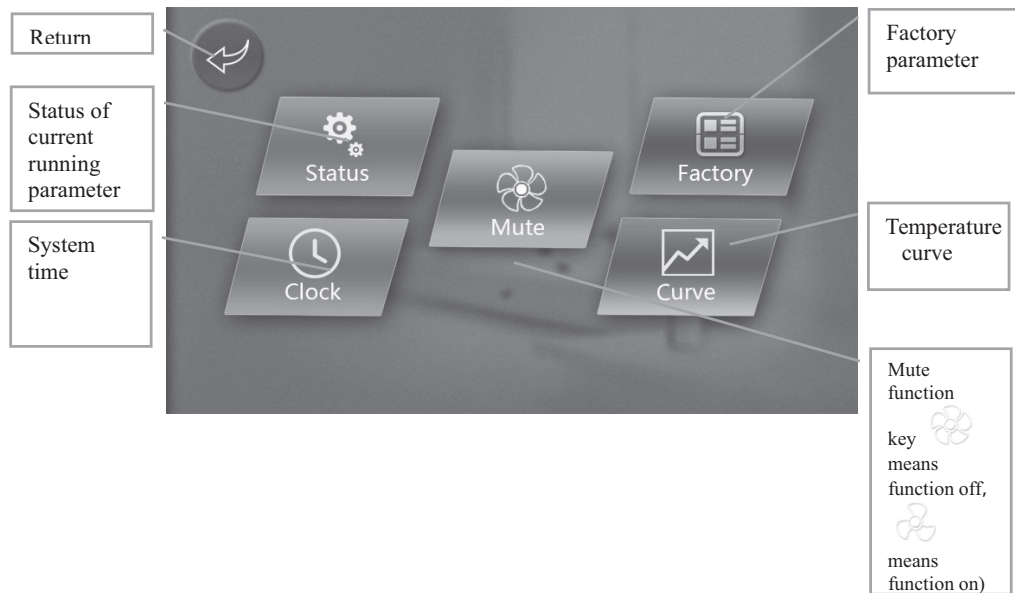
### Timer Full Used



- a. When all the timer are used as illustrated above, both the 'On' and 'Off' button will be lightened, meaning that the set time span is the power on period, beside are power off period.
- b. Press 'Hour' for power on setting, you can set the power on hour timer on the pop-ups keyboard . Press 'Min' for power on setting, you can set the power on min timer. The setting range for 'Hour' is 0-23 and for 'Min' is 0-59.
- c. Press 'Hour' for shutdown setting, you can set the shutdown hour timer on the pop-ups keyboard. Press 'Min' for shutdown setting, you can set the shutdown minute timer. The setting range for 'Hour' is 0-23 and for 'Min' is 0-59.
- d. When the power on and off timer are all activated, while the 'On' timer is the same as the 'Off' timer, then the display will notice and read 'Please set different time !' as illustrated below. When the timers are different, the notice will disappear.








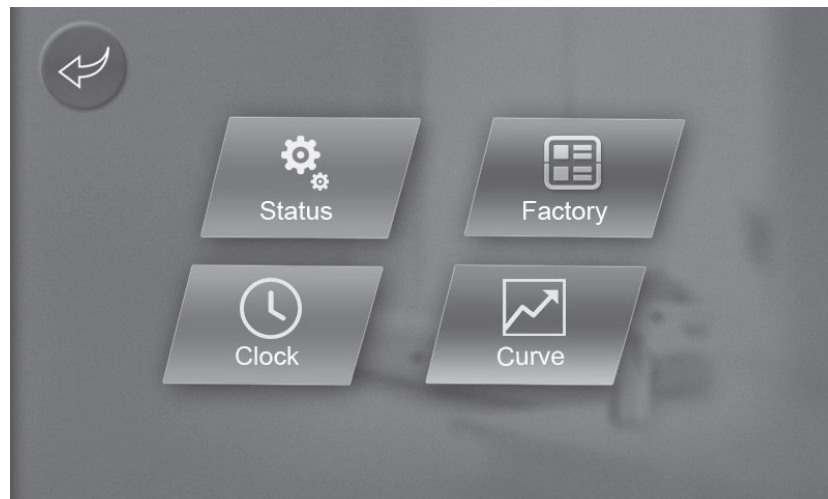
### Setting Display Window





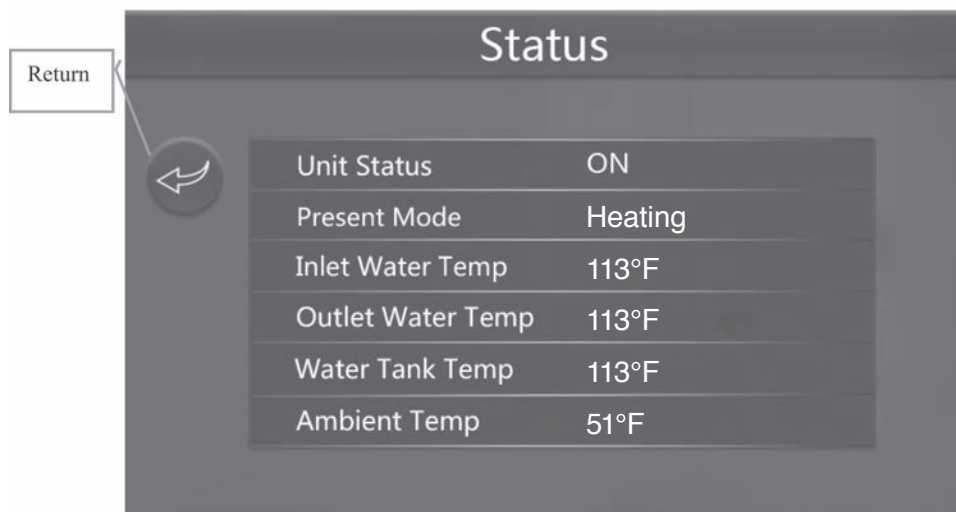


1. Press 'Operation Mode' in the above illustration to check the current running parameter.
2. Press 'Factory' in the above illustration and enter the correct code to enter the factory parameter setting interface or the unit status parameter interface.
3. Press 'Clock' button in the above illustration to set the the system time.
4. Press 'Mute timer' button to activate the quick mute function and timing mute mode. When the unit's quick mute function are activated, the icon will turn from  to , while when this function is turned off, the icon will turn from  to . When the unit is in mute mode with the fan running, the display will show  rotation animation.
5. Press 'Curve' button to check the inlet and outlet water temperature.
6. If a unit is without mute function, after clicking the main display window and arrive at the setting page, the 'Mute settings' will not be found,as show in the folowing picture:



## Running Mode

Press the running mode button in the setting interface to check the current operation mode and the main temperature status as shown below.

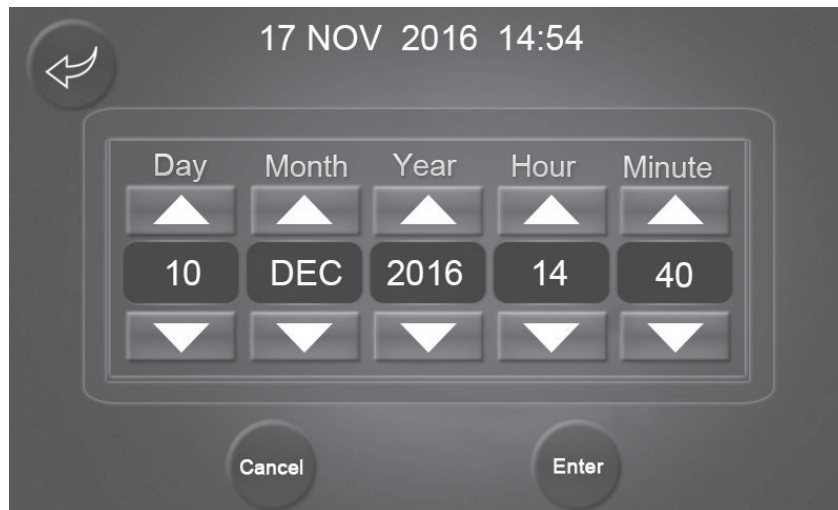


## Clock Setting Display

Press 'Clock' button to enter the system clock setting interface as below.

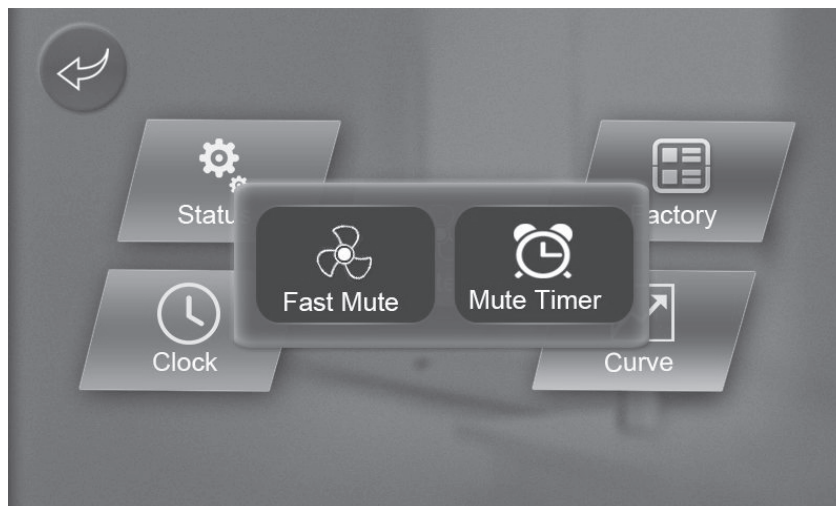


1. Press the corresponding up and down button of 'Month' to adjust the month setting, the setting range is mark with abbreviated month names from January to December. Long press this button to continuous adjust the setting.
2. Press the corresponding up and down arrow button of 'Day' to adjust the day setting. The setting range is from 1 to 31. Long press this button to continuously adjust the setting
3. Press the corresponding up and down arrow button of 'Year' to adjust the year setting. The setting range is from 2000 to 2100. Long press this button to continuously adjust the setting.
4. Press the corresponding up and down arrow button of 'Hour' to adjust the hour setting. The setting range is from 0 to 23. Long press this button to continuously adjust the setting.
5. Press the corresponding up and down arrow button of 'Minute' to adjust the minute setting. The setting range is from 0 to 59. Long press this button to continuously adjust the setting.
6. Press the 'Enter' button, the system clock will change according to your setting. If the setting is not correct, the system will automatically calibrated.
7. Press the 'Cancel' button to cancel the current setting and return to the setting interface.
8. If H03 is shown in degree Fahrenheit, the operation method and display are as the clause (1) - (7) mentioned above. When it is shown in degree centigrade, the clock setting format is as below.







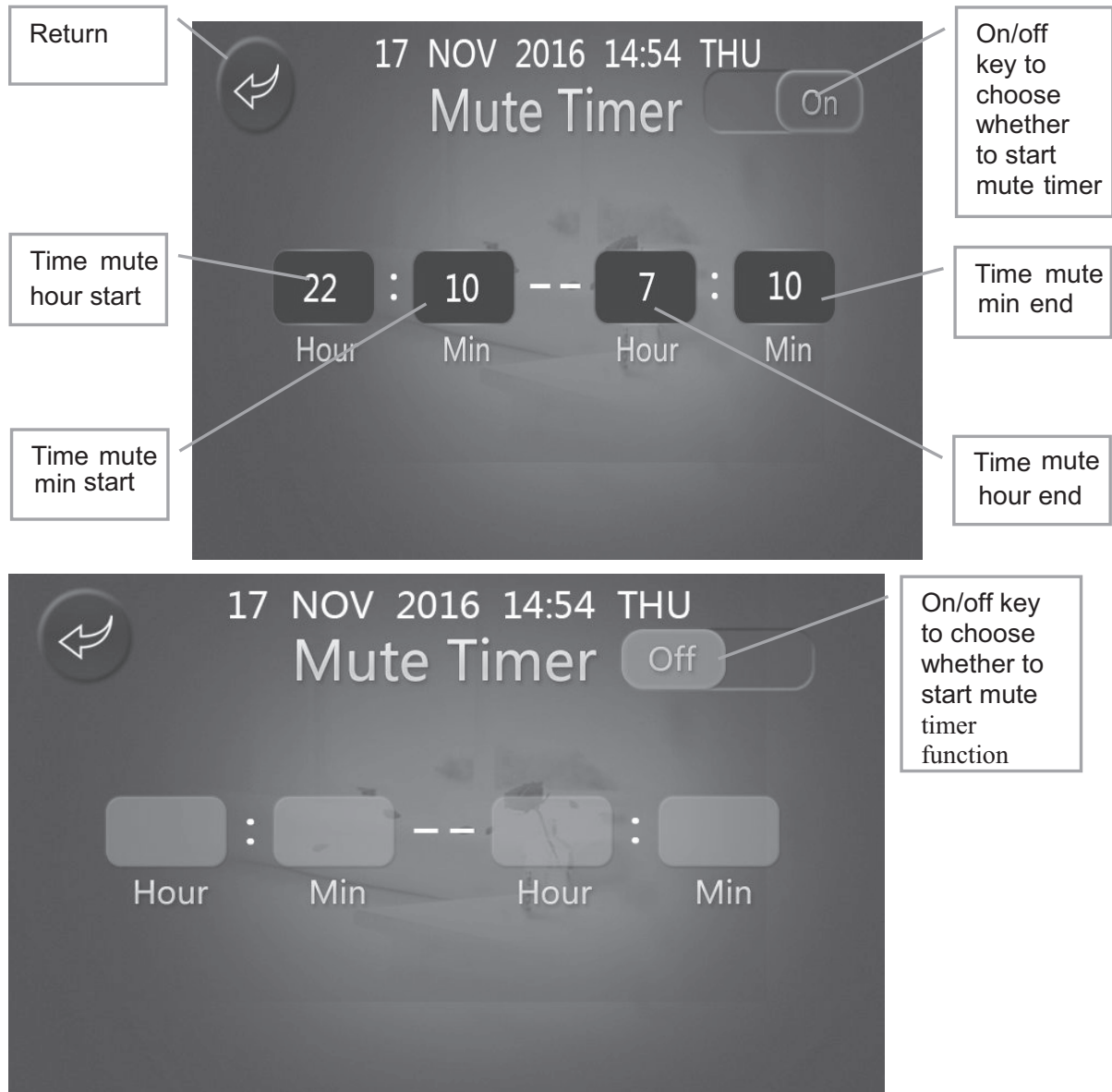
### Setting Display of Mute Timer

Press the Mute button on the setting interface to enter the fast mute and mute timer setting interface as shown below.



### Fast Mute

1. When the unit is under mute status, the mute setting button will appear as mute icon  and the pop-ups window will show non-mute icon .
2. When the unit is under non-mute status, the mute setting button will appear as non-mute icon , and the pop-ups window will show mute icon .
3. Press the mute timer button in the pop-ups window to enter the time mute interface.

**Time Mute**


1. When under the mute timer mode, the button of 'Mute timer' will be lightened and show 'On'. The time can be set on the pop-ups keyboard, when you click the timing area.
2. Press 'Time mute start hours' of the mute timer setting to set the start hour ranging from 0 to 23 in the pop-ups keyboard of the mute timer. Press the 'Time mute start min' to set the start minute ranging from 0 to 59 of the mute timer.
3. Press 'Time mute stop hours' of the mute timer setting to set the stop hour ranging from 0 to 23 in the pop-up keyboard of the mute timer. Press the 'Time mute stop min' to set the stop minute ranging from 0 to 59 of the mute timer.
4. If the start time and end time are set to the same, then the display will read fault notice 'Please set different time!' when pressing the 'Return' button. Pressing 'Back' button to return to the Mute Timer interface and reset the timer as showed below.

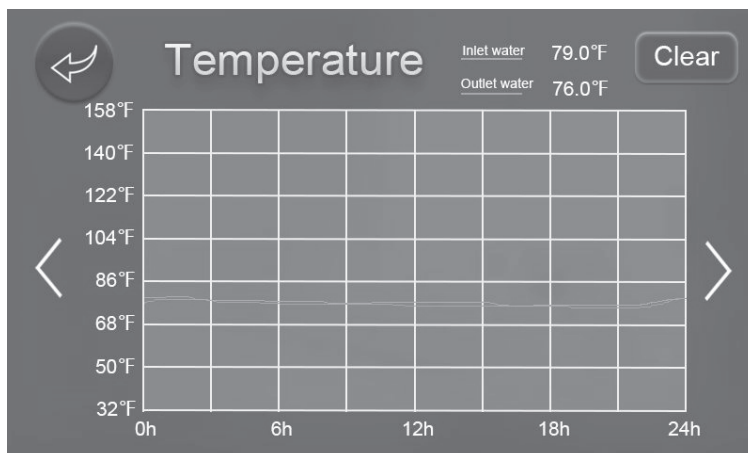


5. When the mute timer is closed, the button of 'Mute Timer' will turn grey and will show 'Off'. All the time setting area will turn grey, meaning that the mute timer are not activated and the timer can not be set.

## Curve Display

Press 'Curve' button to switch to 'Inlet and Outlet Curve' interface.

### Degrees Fahrenheit Curve



1. The curve function is provided to record the inlet and outlet temperature.
2. The temperature data will be recorded every 5min, 12 sets of temperature data that collected will be saved every 1 hour. If the unit shutdown during one recording cycle resulting in an incomplete data (less than 12 sets of record point in 1 hour), then the record of this cycle will not be saved.
3. The curve show the record when the unit is power on, while when the unit is under power off status, the data will not be recorded and will not be shown in the curve.
4. The value on the x-coordinate in the graph indicates the time span between the time on the curve and the current time. The left-most value (0 on the abscissa) is the latest temperature record.
5. The x-coordinate designates the battery status.
6. The curve record enable a power-off protection function.
7. The parameter of H03 determines the enter interface to show the degrees Fahrenheit curve or degree Celsius curve. When H03 equal to 0, the entering interface will show degree Celsius curve. When H03 equal to 1, the entering interface will show degree Fahrenheit curve.

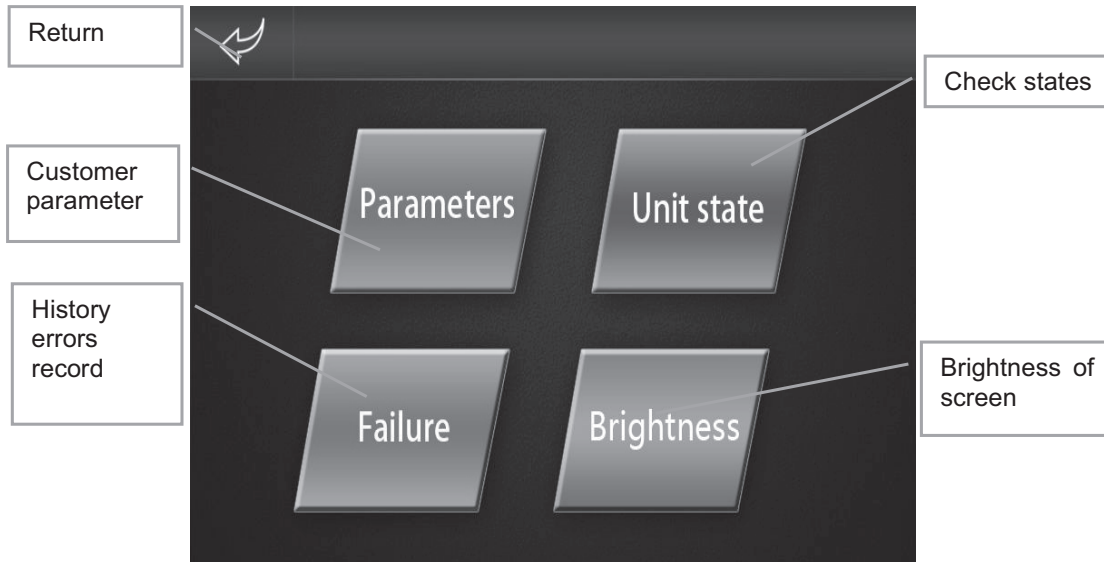
### Parameter Password



1. Under the setting interface, press the button of 'factory parameter' to enter the password keyboard interface, then directly input the password (Only the correct password can access successfully) without pressing the display window.
2. The corresponding password for different function  
System parameter '066' or '66'  
User parameter '022' or '22'  
Upload/Download '855'
3. If the password is not correct, the input field on the keyboard will show 'Wrong Password', At this point, you can enter the password again without clicking the input box.

## Customer Display

Press 'Factory' button, input password '022' or '22' and press 'enter' to reach the customer Display.



## Status Interface

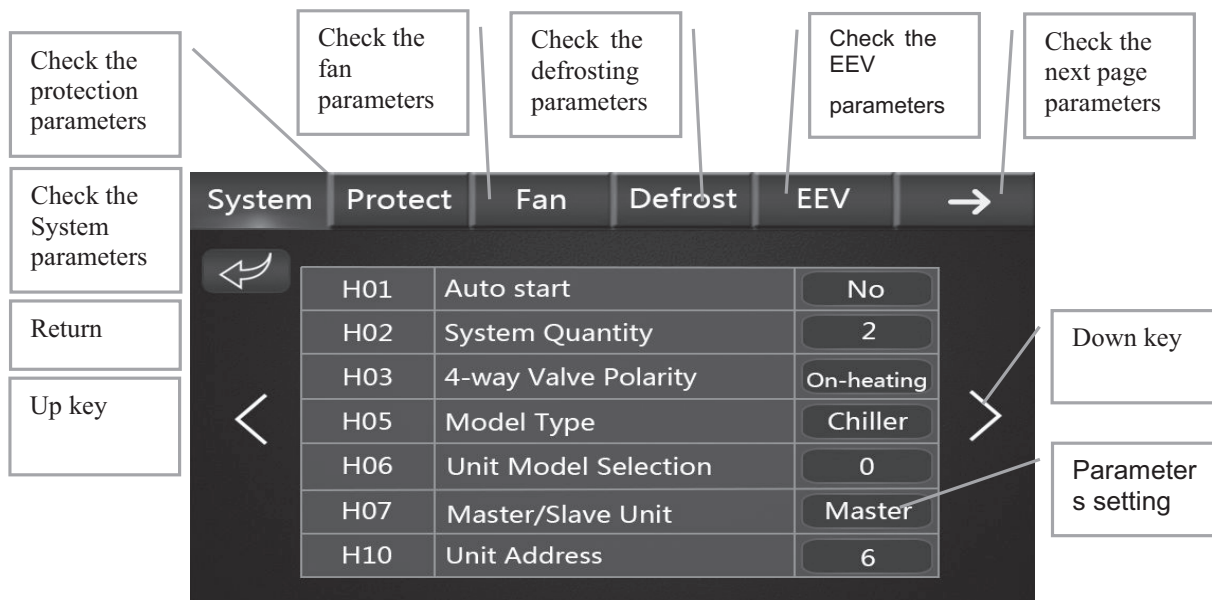
Pressing "Unit State" will bring the user into the status of certain components. The top banner will display "Load Status", "Switch Status", and "Temp Status". The user can use these menus to display the current status of the compressor, 4-way valve, fan motors, and other components within the unit.

## Customer Parameter Interface

Enter customer parameter interface by choosing 'Parameters' on the customer interface then the customer parameter can be checked and set up. The interface layout and operate are the same as on 'system parameter' interface. Press 'Return' to return to 'Customer display'.



## System Parameter Display

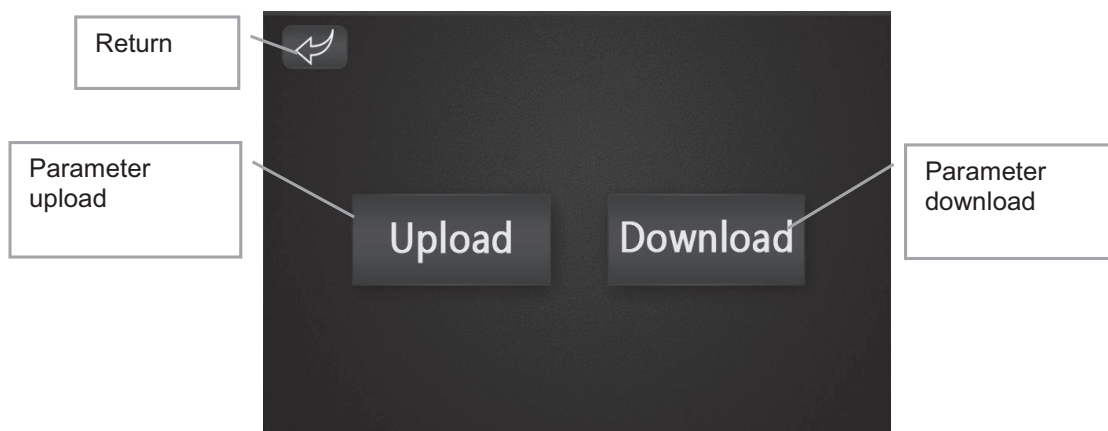


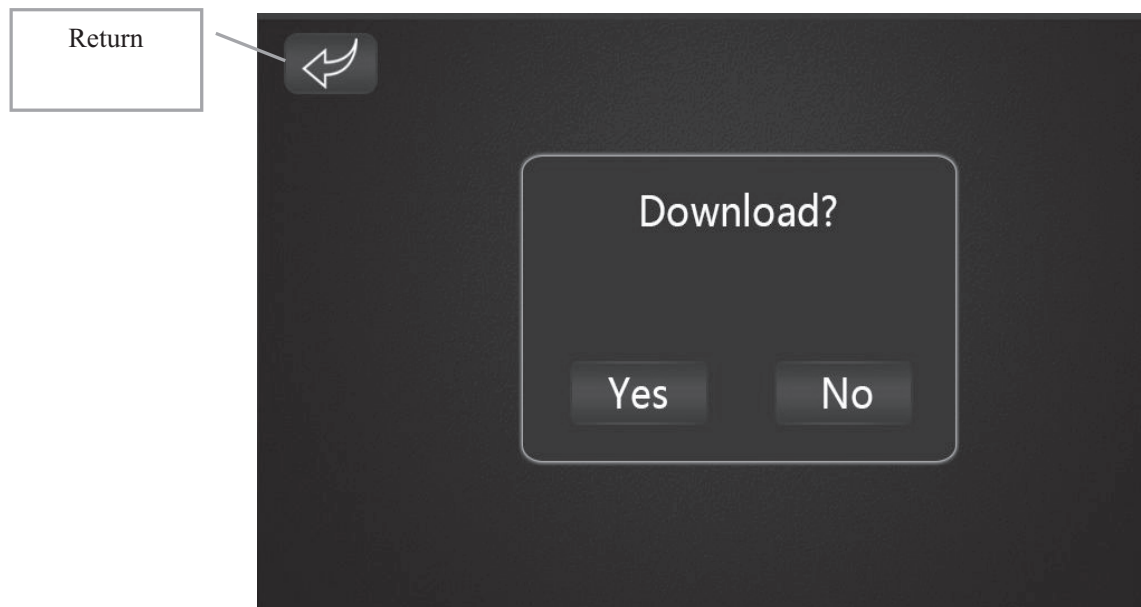
1. Press 'Factory' on the setting interface, input password '066' or '66' on the keyboard then press 'enter' to access the system parameter interface.
2. Press 'System' to enter the parameter setting keyboard 'interface', after setting parameters, press 'Enter' to save and return, press 'return' to delete the settings and return to system parameter display.
3. Degrees Fahrenheit and Degrees Celsius selection: Press the button on the right side of the 'Temperature unit', then the temperature unit displayed on the control will be switched between '°F' and '°C' and the temperature will be converted automatically according to the conversion formula (No conversion will be conducted when the main board is not successfully connected). Power-off memory function is provided to the temperature selection. The conversion formula is as below.
  - a. For parameters without return difference values:  $^{\circ}\text{C} = (^{\circ}\text{F} - 32) * 5/9$  (No special remark on the parameter page)
  - b. For parameters with return difference values:  $^{\circ}\text{C} = ^{\circ}\text{F} * 5/9$  (With special remark on the parameter page)
4. Editing the Slave Unit Address: Press the value on the right side of the 'Slave Unit Address' to edit the modbus slave unit address of the control. The slave unit address can be set as 1~2 and provided with power-off memory function.
5. When the two color display are connected to the controller, one slave unit address should be set as 1 and the other should be set as 2 so that they can communicate successfully.

## Upload and Download Function

Press '855' to turn to the Upload and Download display.

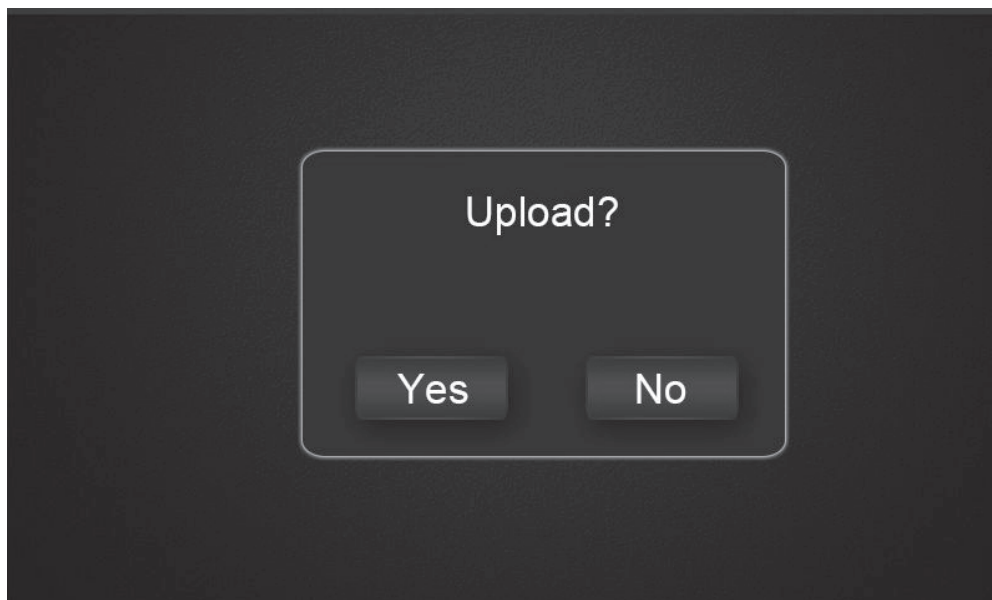
### Upload and Download Display

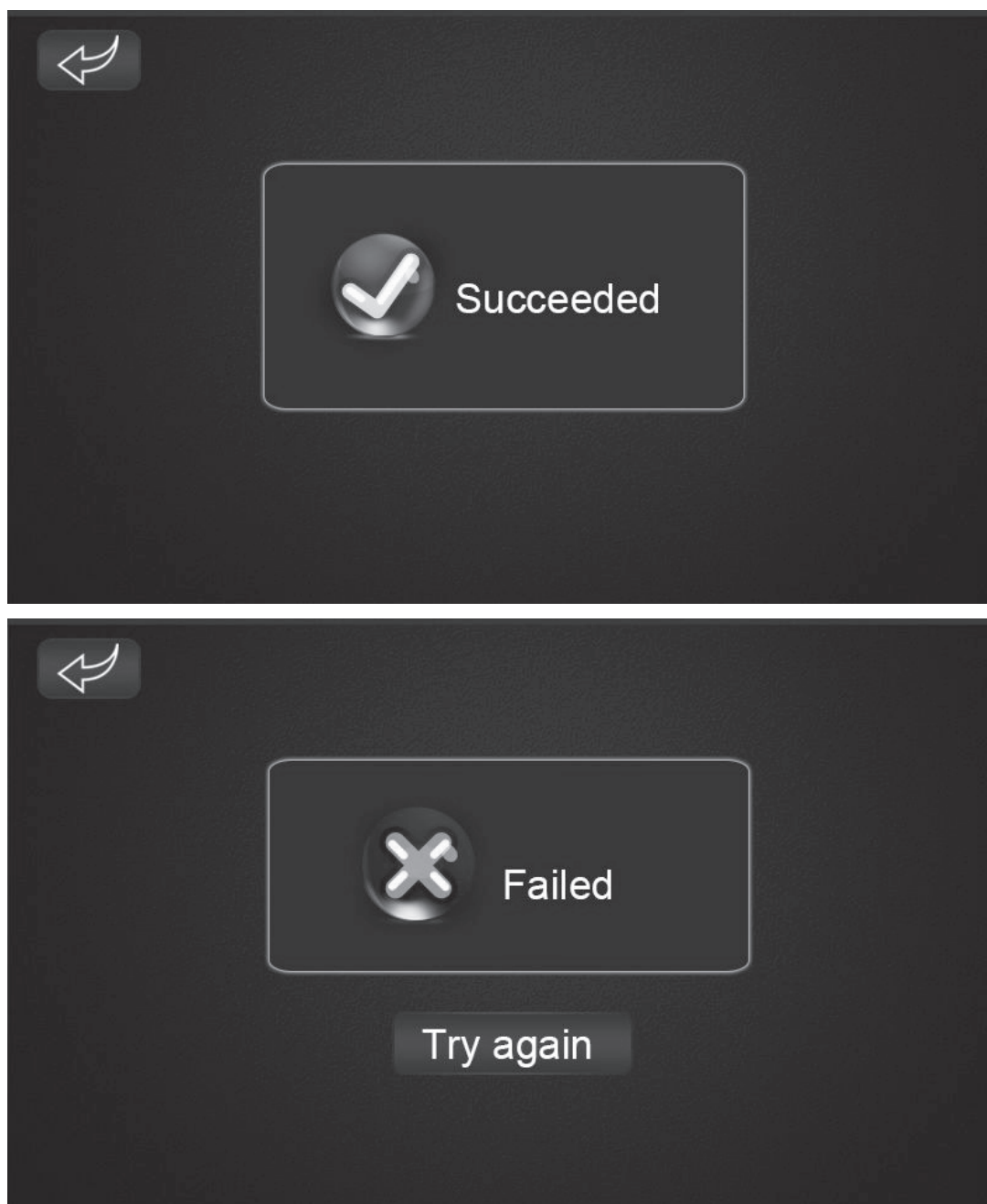




#### System Parameter Upload

Press 'YES' on the display to start the system parameter uploading. During the operation, the control display will read 'Uploading...' in a red frame and all the buttons and functions will be disabled until the upload is completed. If the upload is succeed, the display will read 'Succeed' in a frame, if not, the display will read 'Failed' in a frame.

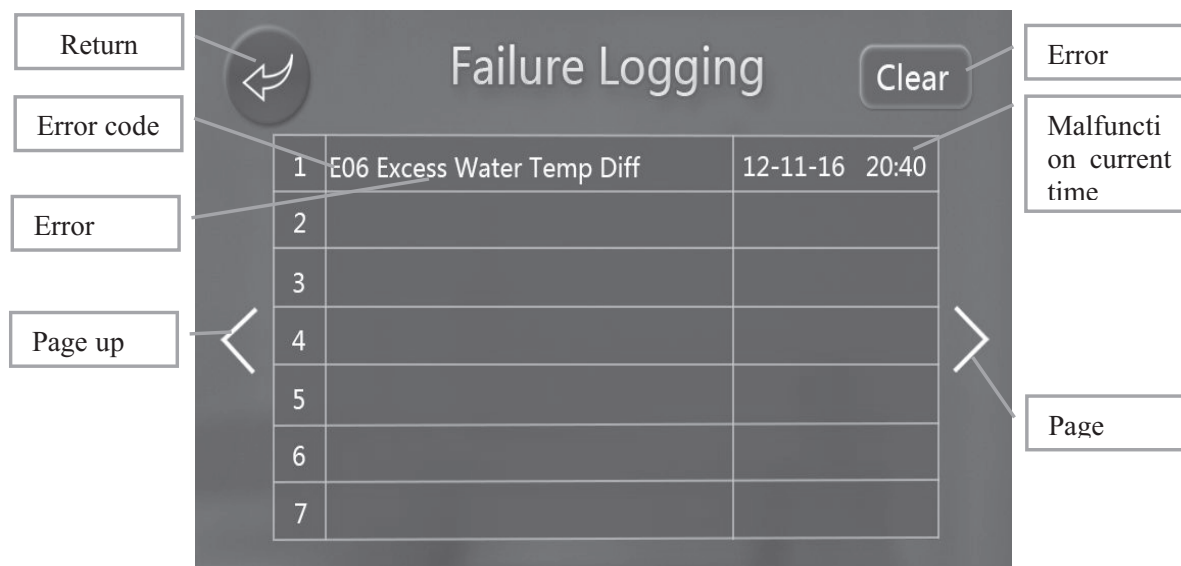




#### **Parameter Download**

The operation and the displays are the same as 'System parameter Upload'.

## Failure Interface





1. When failure occurs, press the 'Failure' icon on the upper right corner to access the failure logging display.
2. A total of 35 sets of historical failures can be recorded, display and record them in reverse order. The latest record is always shown on the top line.
3. When there is no failure, the failure notice will not read on the interface.
4. When failure occurs
  - a. The failure icon will be flashing alternately between '!' and '!'.
  - b. The failure interface will record the failure code, failure name and the time of the failure.
  - c. Press 'Clear' button to delete the failure record, then the unsolved failure will be shown on the record again, at the same time the failure icon on the main interface will continue to flash as an alarm.
5. After failure clean up
  - a. If the failure display is unchecked, the icon will not be shown on the interface.
  - b. The failure record will keep the failure code, failure name and the time of the failure.
  - c. Press 'Clear' button to delete the failure record, the resolved failure will not be shown on the failure record.
6. The failure record is provided with power-off memory function, if the record is deleted manually, they will not be shown again in the record.

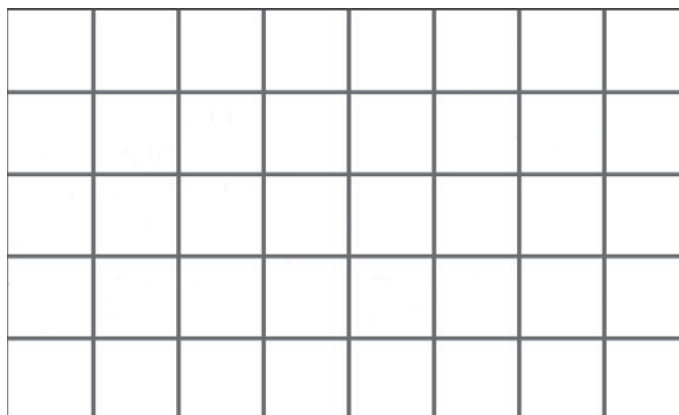
## Screen Inspection

1. Click the area on the lower right corner on the loaded condition display for continuously 10 clicks in 4 seconds to access the screen inspection display.
2. The screen inspection display contains 40 touch control button which are white during accessing, then turn to be green and emit 'bee' alarm when clicked.
3. When the last touch control button (on the lower right corner) is clicked for the second time, or when the operating time on the display (automatically calculated from entrance time) accumulated to 1 minute, the control exit of the screen inspection display.
4. The follow situation will be considered as exception, when one touch control point on the screen is pressed but no 'bee' alarm emitting and the responding area have not turned green, or when one touch control is clicked and other irrelevant area turn green.

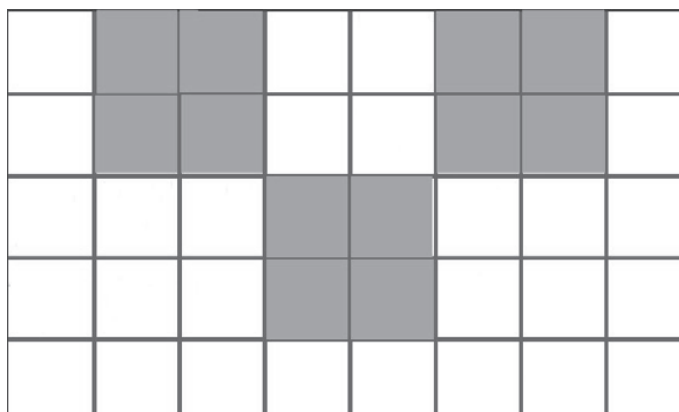
5. The operation process are as below.
  - a. Entering screen inspection display

Load Status		Switch Status	Temp Status
	O01	Compressor	OFF
	O02	Water Pump	ON
	O03	4-way Valve	ON
	O04	Fan Motor	OFF
	O06	Antifreeze Heating Strip	OFF
	O07	4-way Valve	OFF
	O08	Electric Heater	OFF
			

- b. Screen inspection display (Shown every time when entering)

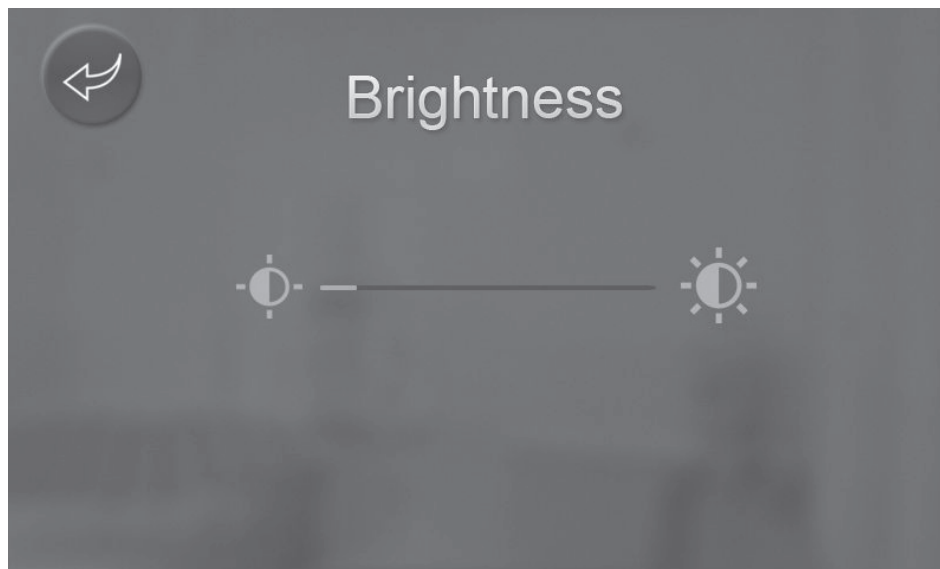


- c. Touch control inspection pictures (Inspection on the corresponding area)



### Brightness Control

1. Press the 'Brightness' button to enter the screen brightness control display. Dragging or clicking the stripe in the middle to adjust the brightness of the screen. The brightness control is provided with power-off memory function. Press 'Return' to return to the last operation page.

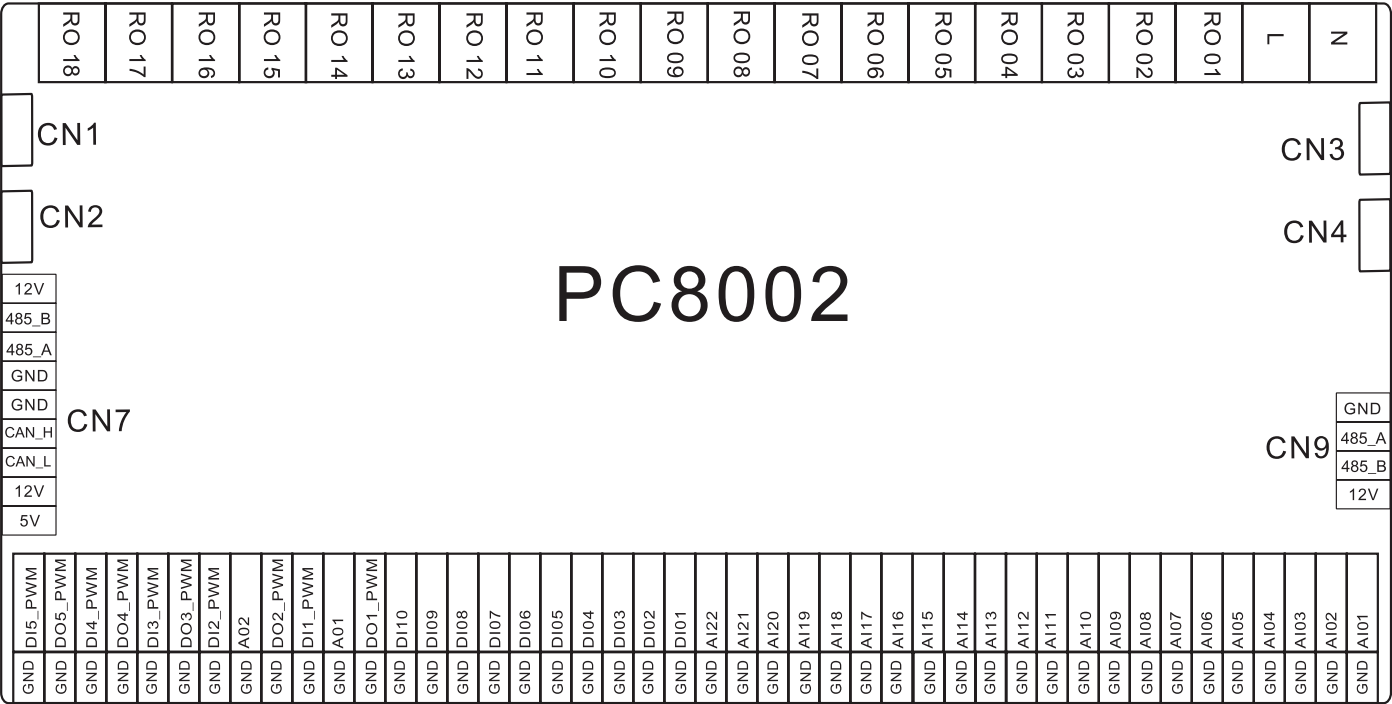


### Overview of PCB PC8002

- 4.1 It is designed with two operation modes including heating and cooling.
- 4.2 Applicable to single compressor system.
- 4.3 PC8002 hardware is applied, which is able to be used with color screen display.
- 4.4 It is able to display and change system operating parameter and setting parameter.
- 4.5 It is designed with automatic protection function and automatic failure alarm function.
- 4.6 Function of system protection: compressor's three-minute protection, HP/LP protection, sensor protection, water flow protection, etc.
- 4.7 The communication distance between the heat pump and wire controller is not less than 100m.
- 4.8 Strong anti-interference (4000V group pulse interference resistance), and stable and reliable performance.
- 4.9 The control precision of super heat and temperature are both 0.1°C.
- 4.10 It can be set as Celsius degree or Fahrenheit degree to control unit. (The specific way is controlled by display).

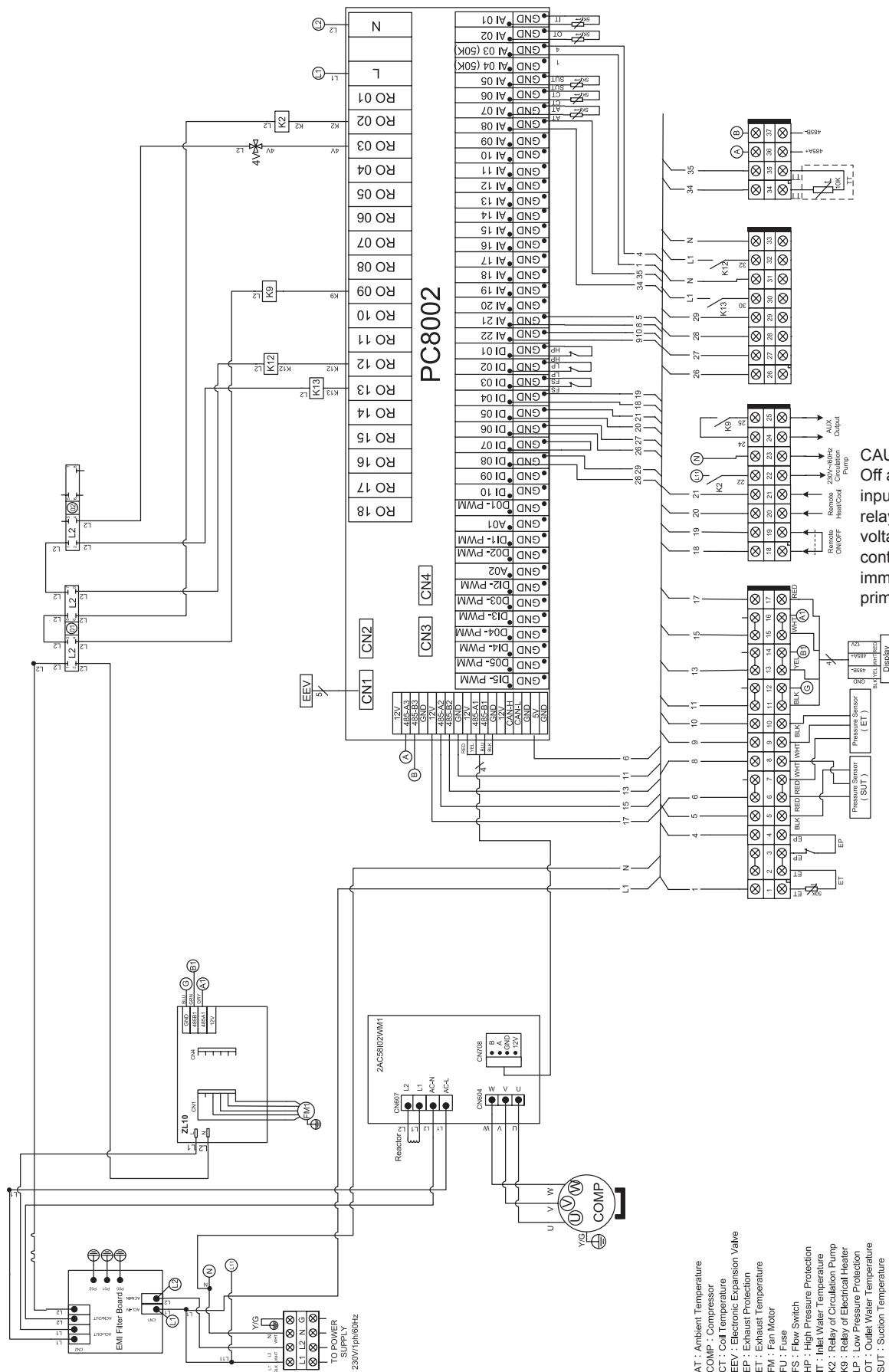


**Section 6: Wiring Diagrams & Definitions**





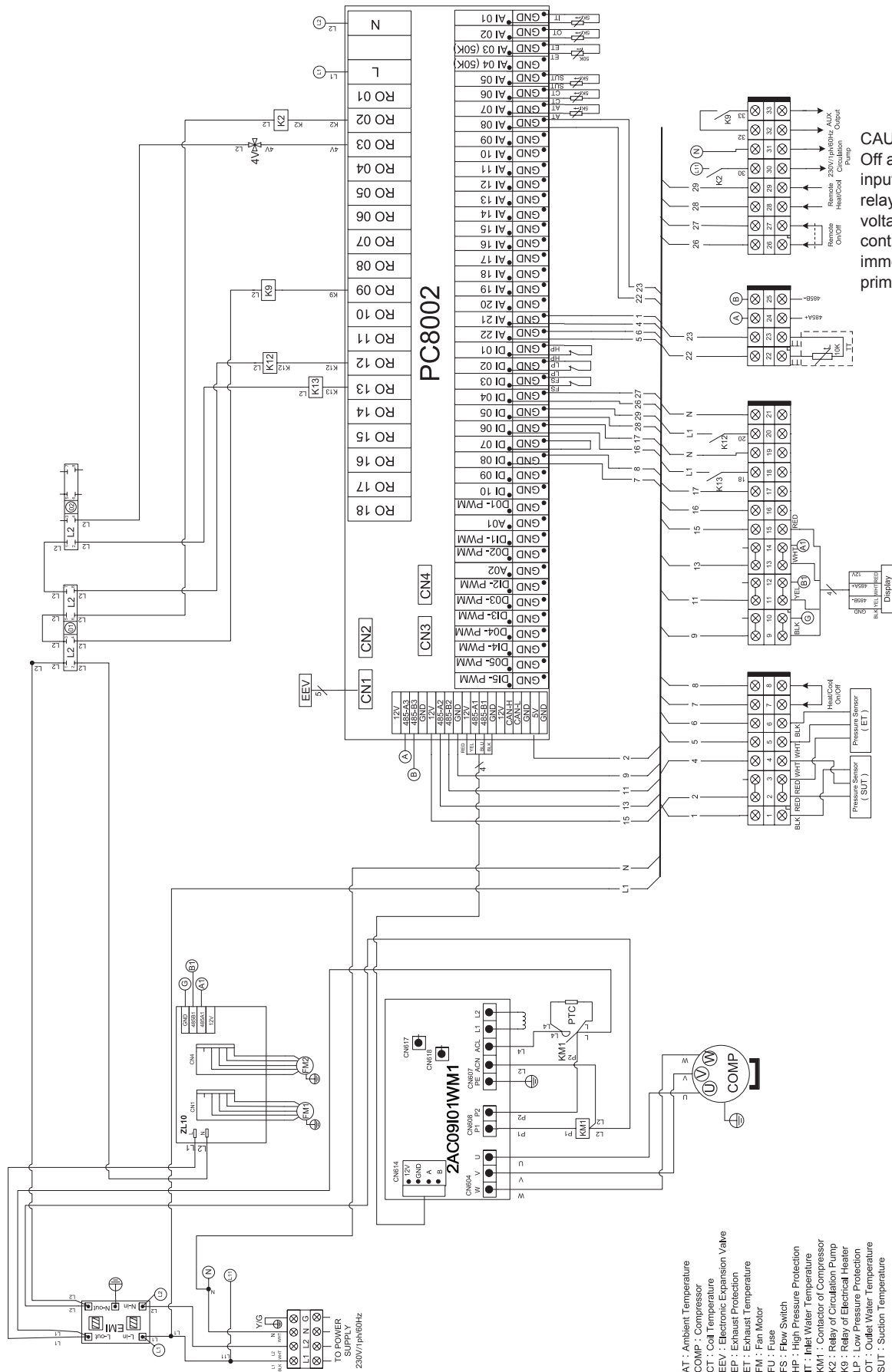
## Wiring Diagrams and Definitions



**CAUTION:** The Remote On/Off and Remote Heat/Cool inputs are for voltage-free relay contacts only. Any voltage introduced to the controls at these points will immediately destroy the primary unit control.

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## Wiring Diagrams and Definitions (continued)



**CAUTION:** The Remote On/Off and Remote Heat/Cool inputs are for voltage-free relay contacts only. Any voltage introduced to the controls at these points will immediately destroy the primary unit control.

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## Wiring Diagrams and Definitions

No.	Main Board	Instruction
1	N	Power Null Wire
2	L	Power Live Wire
3	RO 01	Not Used
4	RO 02	Pump
5	RO 03	4-Way Valve
6	RO 04	Fan
7	RO 05	Not Used
8	RO 06	Def Heating
9	RO 07	Crankshaft Heating
10	RO 08	Spray Valve
11	RO 09	Auxiliary Electric Heating
12	RO 10-RO 18	Not Used
13	AI 01	Inlet Temperature Sensor
14	AI 02	Outlet Temperature Sensor
15	AI 03	Discharge Temperature Sensor
16	AI 04	Not Used
17	AI 05	Suction Temperature Sensor
18	AI 06	Coil Temperature Sensor
19	AI 07	Environment Temperature Sensor
20	AI 08-AI 20	Not Used
21	AI 21	Suction Pressure Input
22	AI 22	Discharge Pressure Input

No.	Main Board	Instruction
23	DI 01	High Voltage Switch Input
24	DI 02	Low Voltage Switch Input
25	DI 03	Flow Switch Input
26	DI 04	Emergency Switch Input
27	DI 05	Mode Switch
28	DI 06	Master and Slave Switch
29	DI 07	Electric Heating Overload Protection Switch
30	DI 08-DI 10	Not Used
31	A 01-A 02	Not Used
32	D01-D02_PWM	Not Used
33	D10-D12_PWM	Not Used
34	12V	Wired Controller 12V
35	485-B	Wired Controller 485-B
36	485-A	Wired Controller 485-A
37	GND	Wired Controller GND
38	CAN-L	Not Used
39	CAN-H	Not Used
40	CN-1	Electronic Expansion Valve A
41	CN2-CN4	Not Used

### Application of Each Input and Output Interface

Interface No.	Name	Terminal No.	Function
O01	Compressor	RO01	Control inverter compressor , single-phase AC output (5A/250VAC).
O02	Circulating water pump	RO02	Control circulating pump single-phase AC output (5A/250VAC).
O03	Four-way valve	RO03	Control the four-way change valve, single-phase AC output (5A/250VAC).
O04	Fan	RO04	Control fan, single-phase AC output (5A/250VAC).
O05	Reserve		
O06	Antifreeze Heating Strip	RO06	Control Antifreeze Heating Strip, single-phase AC output (5A/250VAC).
O07	Crank Antifreeze Heating Strip	RO07	Control Crank Antifreeze Heating Strip, single-phase AC output (5A/250VAC).
O09	Auxiliary electric heating	RO09	Control auxiliary electric heating ,single-phase AC output (5A/250VAC).
O010	Reserve	R010	
O011	Alarm	R011	Alarm output when the unit is shut down for protection
O012	circulating water pump of domestic hot water	R012	Control circulating water pump of domestic hot water ,single-phase AC output (5A/250VAC).
O013	Three way valve	R013	Used to switch water rout between hot water and heating
T01	Inlet water temperature	AI/DI 01(5K)	Control compressor starting, electric heater starting, frequency control and anti-freezing protection in winter.
T02	Outlet water temperature	AI/DI 02(5K)	Display to customers the outlet water temperature of the heat pump and control anti-freezing protection.
T03	Exhaust temperature	AI/DI 03(50K)	Control the high exhaust temperature protection and the electronic expansion valve
T04	Tank temperature	AI/DI 08(10K)	Used for controlling compressor and electric heater start
T05	Suction temperature	AI/DI 05(5K)	Control the electronic expansion valve
T06	Coil temperature	AI/DI 06(5K)	Control defrosting and electronic expansion valve
T07	Ambient temperature	AI/DI 07(5K)	Used for anti-freezing protection in winter, Related ambient temperature protection
T08	Suction pressure	AI/DI 21(5K)	Used for controlling expansion valve
T09	Exhaust pressure	AI/DI 22(5K)	Control the expansion valve and high pressure protection
S01	HP switch	AI/DI 23	Compressor can be started when switch ON; and it will be shut down with warning when the switch OFF.
S02	LP switch	AI/DI 24	Compressor can be started when switch ON; and will be shut down with warning when switch OFF.
S03	Water flow switch	AI/DI 25	The unit can be started when switch ON; and will be shut down with warning when switch OFF.
S04	Emergency switch	AI/DI 26	The unit can be started when switch ON; and will be shut down when switch OFF.
S05	Mode switch	AI/DI 27	The unit is heating mode when switch ON; it will be cooling mode when switch off.
S06	Reserve		
S07	Overload protection switch for electrical heating	AI/DI 29	Electrical heating can be started when switch ON; and will be stopped with warning when switch OFF.
S08	Reserve		

## Parameter List

Parameters	Meaning	Explanation	Range SI	Range Imp.	Modbus address	Factory Setting			Level	Notes
A	Safety Paramaters									
A01	Antifreeze Temp	Freeze protection Temperature	-10-10°C	15-50F	1040	5 C	41.0	F	Factory	
A02	Antifreeze Low Pressure	Freeze protection Pressure	0-10bar	0-10 bar	1041	0bar	0.0	bar	Factory	
A03	Antifreeze Temp Difference	Freeze Protection Differential	0-10°C	0-18F	1042	2 C	3.6	F	Factory	
A04	Shutdown Ambient Temp	Minimum Ambient Temperature	30-10°C	-22 - 50F	1043	-20 C	-4.0	F	Factory	
A05	Exhaust Temp Protect Setup	Max Discharge Temperature	80-130°C	176-266F	1044	110 C	230.0	F	Factory	
D	Defrost Parameters									
D01	Exit Defrosting Setpoint	End Defrosting Temperature	1-40°C	34.8-104F	1101	13°C	55.4	F	Factory	
D02	Exit Defrosting Pressure	End Defrosting Pressure	1-25bar	1-25 Bar	1102	25	25.0	Bar	Factory	
D03	Defrosting Cycle	Minimum time between two Defrost Cycles	1-90M	1-90M	1103	45M	45.0	min	Factory/client	
D04	Max Defrosting Time	Maximum duration of a Defrost Cycle	1-20M	1-20M	1104	8M	8.0	MIN	Factory/client	
D05	Sliding High Point Under LP	Defrost curve Top Press	1-20Bar	1-20Bar	1105	53bar	5.3	Bar	Factory	
D06	Sliding Low Point Under LP	Defrost curve Bottom Press	1-20Bar	1-20Bar	1106	28bar	2.8	Bar	Factory	
D07	Sliding High Point of AT	Defrost Curve Hight Temp	-10-10°C		1107	2°C	34.8	F	Factory	
D08	Sliding Low Point of AT	Defrost Curve Low Temp	-30-10°C		1108	-15° C	5.0	F	Factory	
D09	Sliding Defrost	Ambient dependent defrost	0-No/1-Yes	0-1	1109	1	1		Factory	
D10	Electric Heater	Electric heat during defrost	0-No/1-Yes	0-1	1110	0	0		Factory	
D11	Defrost Frequency	Compr Freq during Defrost	0-90hz	0-90 Hz	1111	70hz	70	Hz		
F	Fan Speed Parameters									
F01	Max Speed in Heating	Max Fan Speed in Heating	0-2000rpm	0-2000rpm	1059	1050rpm	1050	RPM	Factory	
F02	Min Speed in Heating	Min Fan Speed in Heating	0-2000rpm	0-2000rpm	1060	300rpm	300	RPM	Factory	
F03	LP of Suction For Heating	Suc Pressure for Max in Heating	0-20bar	0-20bar	1061	40 bar	4.0	Bar	Factory	
F04	HP of Suction For Heating	Suc Pressure for Min in Heating	0-20bar	0-20bar	1062	110bar	11.0	Bar	Factory	
F05	Max Speed in Cooling	Max Fan Speed in Cooling	0-2000rpm	0-2000rpm	1063	1050rpm	1050	RPM	Factory	
F06	Min Speed in Cooling	Min Fan Speed in Cooling	0-2000rpm	0-2000rpm	1064	300rpm	300	RPM	Factory	
F07	HP of Exhaust For Cooling	Disch Press for Max in Cooling	0-50bar	0-50bar	1065	33bar	33.0	Bar	Factory	
F08	LP of Exhaust For Cooling	Disch Press for Min in Cooling	0-50bar	0-50bar	1066	15bar	15.0	Bar	Factory	
F10	Timer Mute	Quiet Mode On/Off	0-No/1-Yes	0-No/1-Yes	1068	0	0	*	Factory	
F11	Mute Timer Start Hour	Quiet Mode Start time (24hr clock)	0-23hr	0-23hr	1069	0hr	0	hr	Factory	
F12	Mute Timer End Hour	Quiet Mode End time (24hr clock)	0-23hr	0-23hr	1070	0hr	0	hr	Factory	
F13	Mute Mode Speed	Max fan speed in Quiet Mode	300-1300rpm	300-1300rpm	1071	600rpm	600	RPM	Factory	
F15	Fan Motor Type	Number of condenser fans	0- High /1- DC Single Fan /2- DC Single Fan	0 to 2	1073	2		ea.	Factory	1 SIM-036 2 SIM-060

## Parameter List (continued)

Parameters	Meaning	Explanation	Range SI	Range Imp.	Modbus address	Factory Setting			Level	Notes
H	System Control Parameters									
H01	Auto start		0-ON/1-YES		1018	1			Factory	
H02	Master/Slave Unit	External Control	0-Master/1-Slave		1019	0	1		Factory	0=Controlled by Touchpad, 1=Controlled by Wired Connections
H03	Temperature Unit	Temperature Units	0-°C/1-°F		1020	1	1		Factory	
H04	4-way Valve Polarity	Reversing Valve (O/B)	0-On-heating/1-Off-heating		1021	0	0		Factory	
H09	Min Frequency	Minimum Compressor Speed	20-60hz		1026	30Hz	30	Hz	Factory	
H10	Max Frequency	Maximum Compressor Speed	30-120hz		1027	90Hz	90	Hz	Factory	
H12	Hand Drive Frequency	Manual Compressor Speed	0-90hz		1029	0Hz	0		Factory	*Manual control is disabled
H13	PFC Function Enable	Power Factor Correction On/Off	0-Yes/1-No		1030	1	1		Factory	
P	Pump Control Parameters									
P01	Running Mode	Pump Logic, 0=Always on, 1=On with Call, 2=Pulsed operation	0- Ordinary /1- Special /2- Interval		1167	1	1		Factory/client	
P02	Running Interval Time	Time between pulse starts if P01=2	0~120min		1168	30min	30	min	Factory/client	
P03	Running Duration	Duration of pulse if P01=2	0~30min		1169	3min	3	min	Factory/client	
P04	Advanced Start Time	Pump run time before starting compressor.	0~30min		1170	1min	1	min	Factory/client	
P05	Manual-control	Manual pump override	0-No, 1-Yes		1171	0	0			
R	Temperature Control Parameters									
R02	Heating Setpoint	Heating Setpoint (Return)	R08 to R09		1192	40 C	104.0	F	Factory/client	
R03	Cooling Setpoint	Cooling Setpoint (Return)	R10 to R11		1193	8 C	46.4	F	Factory/client	
R04	Power on return difference	Start Differential	.5-10°C		1194	2 C	3.6	F	Factory	Turns on from Standby when Temp exceeds setpoint by this much
R05	Standby Temp Difference	Stop Differential	0-10°C		1195	2 C	3.6	F	Factory	Turns off when Temp passes setpoint by this much
R08	Min Heating Setpoint	Minimum Heating Set Temp (Return)	20-30°C		1198	30 C	86.0	F	Factory	
R09	Max Heating Setpoint	Maxing Heating Set Temp (Return)	30-60°C		1199	50 C	122.0	F	Factory	
R10	Min Cooling Setpoint	Mining Cooling Set Temp (Return)	8-20°C		1200	8 C	46.4	F	Factory	
R11	Max Cooling Setpoint	Maxing Cooling Set Temp (Return)	20-30°C		1201	20 C	68.0	F	Factory	
R12	Electric Heating	Electric heater logic. 0=No electric heat, 1= Internal heater, 2= External heater	0- Not used /1-Waterline /2- Water tank		1202	0	0		Factory/client	
R13	Electric Heater start difference	Electric Heat Start Differential	.5-10°C		1203	5 C	9.0	F	Factory	Heater turns on when temp falls this far below setpoint
R14	Electric Heater Start AT	Electric Heat Operational Temp	-10-30°C		1204	2 C	34.8	F	Factory	Heater is available when Ambient falls below this Temp

## Parameter List (continued)

Parameters	Meaning	Explanation	Range SI	Range Imp.	Modbus address	Factory Setting			Level	Notes
R15	Delay of Electric Heater	Electric Heat Start Delay	0-60min		1205	30min	30.0	Min	Factory	Heater is delayed by this time when Ambient is above R16
R16	Electric heater stat at once AT	Electric Heat Immediate Start	-30 to 20°C		1206	-5 C	23.0	F	Factory	Heater starts immediately below this Temp
R17	Compensation-ON low AT	Outdoor Reset Starts at this Temp Heat	R18 to 0°C		1207	0 C	32.0	F	Factory	Ambient Temp at high end of ODR Curve, Heating
R18	Compensation-OFF low AT	Outdoor Reset Complete at this T Heat	-30°C to R17		1208	-15 C	5.0	F	Factory	Ambient Temp at low end of ODR Curve, Heating
R19	Low-AT Max-Compensation Aim	Max Hot Water T due to Outdoor Reset	20 to 60°C		1209	45 C	113.0	F	Factory	Target water return Temp at end of ODR curve in Heating
R20	Compensation-ON High AT	Outdoor Reset Starts at this Temp Cool	10-R21		1210	55 C			Factory	Ambient Temp at low end of ODR Curve, Cooling
R21	Compensation-OFF High AT	Outdoor Reset Complete at this T Cool	R20-60°C		1211	55 C			Factory	Ambient Temp at high end of ODR Curve, Cooling
R22	High-AT Max-Compensation Aim	Min Cold Water T due to Outdoor Reset	20-60°C		1212	45 C			Factory	Target water return Temp at end of ODR curve in Cooling
R14	Electric Heater Start AT	Electric Heat Operational Temp	-10-30°C		1204	2 C	34.8	F	Factory	Heater is available when Ambient falls below this Temp
R15	Delay of Electric Heater	Electric Heat Start Delay	0-60min		1205	30min	30.0	Min	Factory	Heater is delayed by this time when Ambient is above R16
R16	Electric heater stat at once AT	Electric Heat Immediate Start	-30 to 20°C		1206	-5 C	23.0	F	Factory	Heater starts immediately below this Temp
R17	Compensation-ON low AT	Outdoor Reset Starts at this Temp Heat	R18 to 0°C		1207	0 C	32.0	F	Factory	Ambient Temp at high end of ODR Curve, Heating
R18	Compensation-OFF low AT	Outdoor Reset Complete at this T Heat	-30°C to R17		1208	-15 C	5.0	F	Factory	Ambient Temp at low end of ODR Curve, Heating
R19	Low-AT Max-Compensation Aim	Max Hot Water T due to Outdoor Reset	20 to 60°C		1209	45 C	113.0	F	Factory	Target water return Temp at end of ODR curve in Heating
R20	Compensation-ON High AT	Outdoor Reset Starts at this Temp Cool	10-R21		1210	55 C			Factory	Ambient Temp at low end of ODR Curve, Cooling
R21	Compensation-OFF High AT	Outdoor Reset Complete at this T Cool	R20-60°C		1211	55 C			Factory	Ambient Temp at high end of ODR Curve, Cooling
R22	High-AT Max-Compensation Aim	Min Cold Water T due to Outdoor Reset	20-60°C		1212	45 C			Factory	Target water return Temp at end of ODR curve in Cooling



## Meaning of Each Parameter

### **Parameter A (Protection Parameter)**

**A01**——Anti-freezing setpoint of water outlet

**A02**——Anti-freezing low pressure value

**A03**——Anti-freezing protection difference

### **Anti-Freeze Protection**

#### **Detect Malfunction**

Cooling mode: After the compressor starts, it will detect water outlet temperature (T02). If  $T02 \leq A01$  or the suction pressure is lower than A02 for 10s, the unit will enter anti-freezing protection.

Note: After the compressor has run for 5min, the unit starts to detect its suction pressure.

Heating / Hot water mode: After the compressor starts, it will detect water outlet temperature (T02).

If  $T02 \leq T01-2$  and  $T02 \leq A01$  at the same time, the unit will enter anti-freezing protection.

#### **Malfunction Performance**

The unit will stop running and the 4-way valve won't change its place. The pump will keep running.

#### **Recovery**

1. When the unit detects its water outlet temperature  $T02 \geq$  parameter  $A01+A03$  or the suction pressure  $\geq$  parameter A02, the unit will restart to run automatically.
2. If the protection happens over 3 times within 30min, the unit won't be restarted automatically (Recovery only by manual).

**A04**——Shutdown Ambient Temp

When the ambient temperature (T07) is lower than A04, the unit won't start to run. But there is still a primary winter protection function. (Electric heating is not affected. If electric heating is turned on, the pump needs to be turned on). When the Ambient Temp  $>$  parameter  $A04+2^{\circ}\text{C}$ , the unit will restart to run.

**A05**——Exhaust Temp Protect Setup

Five mins after compressor starts, when the exhaust temperature is higher than A05, the unit will stop running and enter high exhaust temp protection.

When the unit detects its exhaust temperature  $T03 <$  parameter  $A05-25^{\circ}\text{C}$ , the unit will restart to run automatically.

**A06**——Spray Valve Open Temp

In cooling mode, when the ambient temperature (T07) reaches the value A06, the unit will open spray valve to cool the condenser. If the  $T07 \leq A06-2^{\circ}\text{C}$ , the spray valve will shutdown.

Note: In heating mode or defrosting mode, the spray valve won't open.

### Parameter D (Defrost Parameter)

1. Requirements to enter defrosting
  - ① Check the suction pressure for 1 min. after the compressor starts, and when suction pressure is  $\leq D05$ , defrosting timing shall be started.
  - ② If the suction pressure sensor failure, the unit will start timing defrost, and the defrost cycle is D03, defrost time is D04.
2. Requirements to stop defrosting
  - ① After starting defrosting, when  $T09 \geq D02$ , and  $T06 \geq D01$ , the unit stops defrosting;
  - ② If the defrosting time reaches the maximum D04, the heat pump stops defrosting. D01——Exit Defrosting Setpoint.
3. Defrosting action
  - ① The following operations shall be conducted if it complies with enter defrosting requirements:
    - a. The compressor start to down the frequency at the target frequency of 30Hz.(timings start).
    - b. When the cumulative time is 55S, the fan stops working and the four-way valve turns its direction.
    - c. Continue to accumulate 5s, and then start to up the frequency, and the target frequency is the max.value of D11.
  - ② The following operations shall be conducted if it complies with stop defrosting requirements:
    - a. The compressor start to down the frequency at the target frequency of 30Hz (timings start).
    - b. The fan stops working, when the cumulative time is 55S, the four-way valve turns its direction.
    - c. Continue to accumulate 5s, and then start to up the frequency;
    - d. Raise the frequency to the start frequency setting and maintain it for 3 minutes before automatically determining the inlet temperature.

#### Abnormal end of defrosting

- ① If the system turns off at the period of defrosting, it will keep on defrosting until defrosting ends.
- ② When detecting the HP switch is disconnected in the course of defrosting, the heat pump will stop defrosting.
- ③ When detecting the water flow switch is disconnected in the course of defrosting, the heat pump will stop for protection.
- ④ When detecting the LP switch is disconnected in the course of defrosting, the heat pump shield this fault and keep defrosting.
- ⑤ When detecting the exhaust temperature is overheated in the course of defrosting, the heat pump will stop for protection.
- ⑥ When detecting anti-freezing protection in the course of defrosting, the heat pump will stop for protection.

**D02**——Exit Defrosting Pressure

**D03**——Defrosting Cycle

**D04**——Max Defrosting Time

**D05**——Sliding High Point Under LP

**D06**——Sliding Low Point Under LP

**D07**——Sliding High Point of AT

**D08**——Sliding Low Point of AT

**D09**——Sliding Defrosting [0-No, 1-Yes]

When D09=1 the defrosting mode is a economic defrosting mode is sliding defrosting.

**D10**——Electric Heater [0-No, 1-Yes]

If D10=0, the electric heating will maintain the original working state when defrosting.

If D10=1, the electric heating will turn on when start defrosting, and maintain the original working state when end defrosting.

**D11**——Defrosting Frequency

**Parameter F (Fan Parameter)**

Normally, in heating mode or cooling mode, fan will start up 10s ahead of compressor and 30s later to shut off.

**F01**——Max speed in heating

**F02**——Min speed in heating

**F03**——LP of suction for heating at max speed

**F04**——HP of suction for heating at min speed

**F05**——Max speed in cooling

**F06**——Min speed in cooling

**F07**——HP of exhaust for cooling at max speed

**F08**——LP of exhaust for cooling at min speed

**F09**——Manual Speed

If F09≠0, the fan will operate according to the set value of F09.

**F10**——Timer Mute

**F11**——Mute Timer Start Hour

**F12**——Mute Timer End Hour

**F13**——Mute Mode Speed

1. Fast mute function

When the fast mute function is turned on, the fan will run according to the parameter F13 if it needs to be turned on, and exit the mute function after 8 hours. The manual operation of fast mute during the timing mute will result in the time mute failure.

2. When F10=1, enable the timing mute function.

During the time of F11-F12 (including F11, excluding F12), if the fan needs to be turned on, it will run according to the parameter F13. If the fan needs to be turned on at other times, the speed will be controlled according to the suction pressure and exhaust pressure.

3. During the period that the mute function is performed, if high /low voltage protection occurs in any system:

① Automatic exit fast mute function;

② Permanently exit the timer mute function, and will be restored until the power is reenergized.

**F14**——DC/EC Fan Rated Speed

**F15**——Fan Motor Type [0- [High] /1- [DC Single Fan] /2- [DC Single Fan]]

### Parameter H (System Parameter)

**H01**——Auto Start (Yes/NO)

When H01 = 0, the heat pump haven't the auto restart function for regular ON-OFF. That is to say:

Every time the heat pump is connected to electricity, it is in power OFF status.

When H01 = 1, the heat pump has the auto restart function for regular ON-OFF. That is to say:

When the heat pump is connected to electricity, it will keep the power ON or OFF status before power failure.

**H02**——Master/Slave Unit

**H03**——Temperature Unit

**H04**——4-way Valve Polarity On-Heating/Off-Heating

**H06**——Frequency Control P Value

**H07**——Frequency Control I Value

**H08**——Frequency Control D Value

**H09**——Min Frequency of compressor

**H10**——Max Frequency of compressor

**H11**——Type selection of compressor

**H12**——Hand Drive Compressor Frequency

**H13**——PFC Function Enable

**H15**——Unit Address

### Parameter P (Pump Parameter)

In normal modes of cooling, heating and electrical heating, the water pump will be started at least P04 time earlier and shut down 2 minutes later than the compressor. The water pump shall be started all the time during defrosting. The controller starts to inspect water flow switch after P04-10s. If the water flow switch is inspected as ON for 10s successively, the compressor can be started.

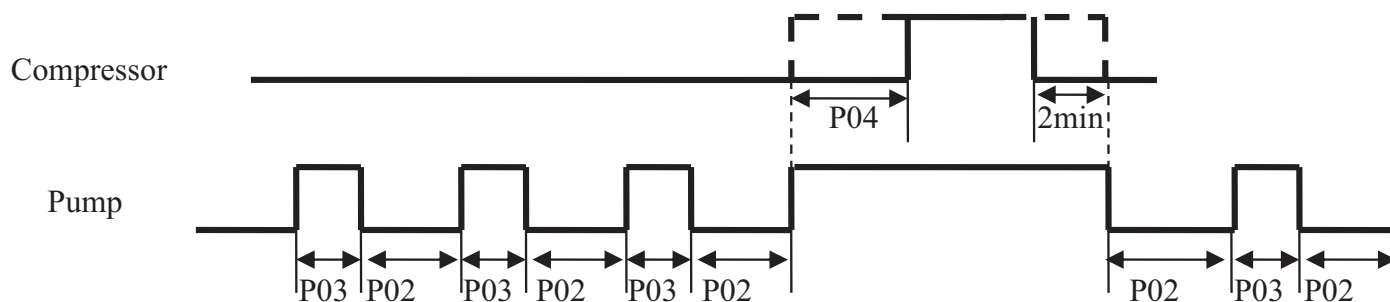
**P01**——Running Mode

**P02**——Running Interval Time

**P03**——Running Duration

**P04**——Advanced Start Time

**P05**——Manual-control



***Parameter R (Temperature Parameter)*****R01**——Hot Water Setpoint

When the mode is hot water mode and tank temperature  $< R01 - R04$ , the unit is running in hot water mode and the target temperature is R01. When water tank temperature  $\geq R01 + R05$ , the unit will exit hot water mode. The unit use the hot water side to defrost when in defrosting.

**R02**——Heating Setpoint

When the mode is heating mode and inlet water temperature  $< R02 - R04$ , the unit is running in heating mode and the target temperature is R02. When inlet water temperature  $\geq R02 + R05$ , the unit will trun off.

**R03**——Cooling Setpoint

When the mode is heating mode and inlet water temperature  $> R03 + R04$ , the unit is running in cooling mode and the target temperature is R03. When inlet water temperature  $\leq R03 + R05$ , the unit will turn off.

**R04**——Power-on Return Difference**R05**——Standby Temp Difference**R06**——Min Hot Water Setpoint**R07**——Max Hot Water Setpoint**R08**——Min Heating Setpoint**R09**——Max Heating Setpoint**R10**——Min Cooling Setpoint**R11**——Max Cooling Setpoint**R12**——Electric Heating**R13**——Electric-heater Start Difference**R14**——Electric-heater Start AT**R15**——Delay of Electric Heater**R16**——Electric-heater Start at Once AT**R17**——Compensation-ON low AT**R18**——Compensation-OFF low AT**R19**——Low-AT Max-Compensation Aim**R20**——Compensation-ON High AT**R21**——Compensation-OFF High AT**R22**——High-AT Max-Compensation Aim**The Control of Compressor**

The compressor can be shut down after 3 min when switch ON. The above description is applicable to constant-temperature shutdown, but not including mode switch, protection shutdown and manual shutdown.

The compressor can be restarted after 3min when switch OFF. It is applicable to all conditions.

## SIM Error Codes

Error Code	Error Type	Notes
E11	HP Protection	No Alarm
E12	LP Protection	Alarm
E04	Electric Overheat Protection	No Alarm
E032	Flow Switch Protection	No Alarm
E19	Primary Anti-freeze Protection	No Alarm
E29	Secondary Anti-freezing Protection	Alarm
P182	Exhaust Overtemp	No Alarm
E11	HP Protection 3+	Alarm
E12	LP Protection 3+	Alarm
E04	Electric Overheat Protection 3+	Alarm
E171	Antifreeze 3+	Alarm
P182	Exhaust Overtemp 3+	Alarm
E032	Flow Switch Protection 3+	Alarm
P01	Inlet Temp Sensor Fault	The wire controller will alarm, and the temperature of inlet water in main interface, status interface and curve interface will display '-.-'
P02	Outlet Temp Sensor Fault	The wire controller won't alarm, and the temperature of outlet water in main interface, status interface and curve interface will display '-.-'
P181	Exhaust temp Sensor	The wire controller will alarm, and the exhaust temperature in status interface will display '-.-'
P03	Water Tank Temp Sensor	The wire controller will alarm, and the temperature of tank water in main interface, status interface and will display '-.-'
P17	Suction temp Sensor	The wire controller won't alarm, and the suction temperature in status interface will display '-.-'
P153	Coil temp Sensor	The wire controller won't alarm, and the coil temperature in status interface will display '-.-'
P04	AT Sensor Fault	The wire controller will alarm, and the ambient temperature in status interface will display '-.-'
PP1	Exhaust Pressure Sensor fault	The wire controller won't alarm, and the exhaust pressure in status
PP2	Suction Pressure Sensor fault	The wire controller won't alarm, and the suction pressure in status interface will display '-.-'
TP	Low AT Protection	Alarm
F00	IPM Overcurrent Shutdown Fault	Alarm
F01	Compressor Activation Failure	Alarm
E051	Compressor Overcurrent Shutdown Fault	Alarm
F15	Input voltage Lacking Phase	Alarm
F16	IPM Current Sample Fault	Alarm
F26	IGBT Power Device Overheat Fault	Alarm
F03	PFC Fault	Alarm
F05	DC Bus Overload	Alarm
F06	DC Bus Underload	Alarm
F07	AC Input Underload	Alarm

## SIM Error Codes (continued)

Error Code	Error Type	Notes
F08	AC Input Overload	Alarm
F09	Input voltage Sample Fault	Alarm
F10	Communication Failure between DSP and PFC	Alarm
F17	Sensor Fault of Module/Radiator	Alarm
F11	Communication Fault (DSP)	Alarm
F12	"Communication Fault (Inverter Board)	Alarm
F21	Overload Alarm	Alarm
F14	Weak Magnetism Alarm	No Alarm
F20	IGBT Power Device Overheat Alarm	No Alarm
F22	AC Input OverCurrent Alarm	No Alarm
F23	EEPROM Fault Alarm	No Alarm
F24	Destroyed EEPROM Activation Ban Alarm	Alarm
F13	IPM Overheat Stop	Alarm
F25	LP 15V Underload Fault	Alarm
E08	Communication Fault	Alarm
F031	DC Fan Motor 1 Failure	Alarm
F032	DC Fan Motor 2 Failure	Alarm
E081	DC Fan Motor Comms Failure	Alarm



## Troubleshooting Chart

Protection/fault	Fault display	Possible Cause	Possible Solution
Standby	NO		
Normal booting	NO		
Water inlet temp. sensor error	P01	Water inlet temp sensor is in open circuit or short circuit	Check and replace temp. sensor
Water inlet temp. sensor error	P02	Water outlet temp sensor is in open circuit or short circuit	Check and replace temp. sensor
Ambient temp. sensor error	P04	Ambient temp sensor is in open circuit or short circuit	Check and replace temp. sensor
Suction temp. sensor error	P07	Suction temp. sensor is in open circuit or short circuit	Check and replace temp. sensor
Exhaust temp. sensor error	P08	Exhaust temp. sensor is in open circuit or short circuit	Check and replace temp. sensor
Suction pressure sensor error	PP1	Suction pressure sensor is in open circuit or short circuit	Check and replace suction pressure sensor
Exhaust pressure sensor error	PP2	Exhaust pressure sensor is in open circuit or short circuit	Check and replace exhaust pressure sensor
High-pressure protection	E01	High-pressure switch is disconnected	Check whether there is fault on pressure switch or refrigerant loop
Low-pressure protection	E02	Low-pressure switch is disconnected	Check whether there is fault on pressure switch or refrigerant loop
Water flow protection	E03	There is no or little water in water system	Check water flow , and whether water system is damaged
Antifreezing protection	E07	Flow is inadequate	Check water flow , and whether water system is damaged
Winter Level I antifreezing protection	E19	Ambient temperature is too low	
Winter Level II antifreezing protection	E29	Ambient temperature is too low	
Exhaust over heat protection	P181	Compressor load is too large	Check whether system compressor is in normal operation
AC input undervoltage protection	E21	Input voltage is too low, resulting in too high input current	Check and measure input voltage
AC input overcurrent protection halt	E22	Input current is too high, exceeding effective value for protection current halt	Check and measure input current
DC bus overvoltage protection	E24	DC bus voltage > DC bus overvoltage halt protection value	Check and measure bus voltage
DC bus undervoltage protection	E25	DC bus voltage < DC bus overvoltage halt protection value	Check and measure bus voltage
IPM overcurrent protection	E27	IPM current is too large	Check and measure current as well as adjust
IPM module overheat protection	E28	Temperature of IPM module is too high	Check and measure current as well as adjust
Radiator temperature sensor error	E29	Sensor is in short circuit or open circuit	Check and replace sensor
Power component overheat protection halt	E30	Temperature of power component is too high	Reduce temperature and check component
IPM current sampling	E32	Fault of current sampling	Check and measure current as well as adjust
Compressor overcurrent protection halt	E33	Compressor current is too high	Check and measure current as well as adjust
Input voltage default phase	E35	Input voltage is in default phase	Check and measure voltage as well as adjust
Failure of compressor booting	E36	Default phase, step out or hardware damage on actuator	Check and measure voltage and check frequency board hardware
Fault of communication between DSP and communication board	E37	Fault of DSP and communication board	Check communication connection
Fault of communication between DSP and PFC	E38	Fault of DSP and PFC	Check communication connection
Input voltage sampling	E39	Fault of current sampling	Check whether chip is damaged and replace chip
Fault of EEPROM	E40	Chip error	
Compressor flux weakening protection alarm	E41	Inadequate magnetic force of compressor	
Fault of communication between actuator and PC8002	E08	Abnormal communication between remote controller and mainboard	Check communication connection

## Troubleshooting (continued)

Failure	Possible Causes for the Failure	Possible Solutions
Heat pump cannot be started	<ol style="list-style-type: none"> <li>1 Wrong power supply</li> <li>2 power supply cable loose</li> <li>3 circuit breaker open</li> </ol>	<ol style="list-style-type: none"> <li>1 shut off the power and check power supply;</li> <li>2 check power cable and make right connection</li> <li>3 check for the cause and replace the fuse or circuit breaker</li> </ol>
Heat pump capacity is low, compressor do not stop	<ol style="list-style-type: none"> <li>1 lack of refrigerant;</li> <li>2 bad insulation on water pipe;</li> <li>3 low heat exchange rate on air side exchanger;</li> <li>4 lack of water flow</li> </ol>	<ol style="list-style-type: none"> <li>1 check for the gas leakage and recharge the refrigerant;</li> <li>2 make good insulation on water pipe;</li> <li>3 clean the air side heat exchanger;</li> <li>4 clean the water filter</li> </ol>
High compressor exhaust	<ol style="list-style-type: none"> <li>1 too much refrigerant</li> <li>2 low heat exchange rate on air side exchanger</li> </ol>	<ol style="list-style-type: none"> <li>1 discharge the redundant gas</li> <li>2 clean the air side heat exchanger</li> </ol>
Low pressure problem of the system	<ol style="list-style-type: none"> <li>1 lack of gas</li> <li>2 block on filter or capillary</li> <li>3 lack of water flow</li> </ol>	<ol style="list-style-type: none"> <li>1 check the gas leakage and recharge freon;</li> <li>2 replace filter or capillary;</li> <li>3 clean the water filter and discharge the air in water loop.</li> </ol>
Compressor do not run	<ol style="list-style-type: none"> <li>1 power supply failure</li> <li>2 compressor contactor broken</li> <li>3 power cable loose</li> <li>4 protection on compressor</li> <li>5 wrong setting on return water temp.</li> <li>6 lack of water flow</li> </ol>	<ol style="list-style-type: none"> <li>1 check off the power supply;</li> <li>2 replace compressor contactor;</li> <li>3 tighten the power cable;</li> <li>4 check the compressor exhaust temp.;</li> <li>5 reset the return water temp.;</li> <li>6 clean the water filter and discharge the air in water loop.</li> </ol>
High noise of compressor	<ol style="list-style-type: none"> <li>1 liquid refrigerant goes into compressor</li> <li>2 compressor failure</li> </ol>	<ol style="list-style-type: none"> <li>1 bad evaporation, check the cause for bad evaporation and get rid of this;</li> <li>2 use new compressor;</li> </ol>
Fan do not run	<ol style="list-style-type: none"> <li>1 failure on fan relay</li> <li>2 fan motor broken</li> </ol>	<ol style="list-style-type: none"> <li>1 replace the fan relay;</li> <li>2 replace fan motor.</li> </ol>
The compressor runs but heat pump has not heating or cooling capacity	<ol style="list-style-type: none"> <li>1 no gas in the heat pump;</li> <li>2 heat exchanger broken;</li> <li>3 compressor failure.</li> </ol>	<ol style="list-style-type: none"> <li>1 check system leakage and recharge refrigerant;</li> <li>2 find out the cause and replace the heat exchanger;</li> <li>3 replace compressor.</li> </ol>
Low outlet water temperature	<ol style="list-style-type: none"> <li>1 low water flow rate;</li> <li>2 low setting for the desired water temp.;</li> </ol>	<ol style="list-style-type: none"> <li>1 clean the water filter and discharge the air in water loop.</li> <li>2 reset the desired water temperature.</li> </ol>
Low water flow protection	<ol style="list-style-type: none"> <li>1 lack of water in the system;</li> <li>2 failure on flow switch</li> </ol>	<ol style="list-style-type: none"> <li>1 clean the water filter and discharge the air in water loop.</li> <li>2 replace the flow switch.</li> </ol>

## SIM Parts

Order Code	Description	SIM-036	SIM-060
45W33-WG1194-01	Compressor	x	
45W33-WG1259-01			x
45W41-WG1196-01	Access Panel	x	
45W41-WG1196-02			x
45W19-WG1197-01	Access Panel Handle	x	x
45W43-WG1198-01	Fan Guard	x	
45W43-WG1198-02			x
45W41-WG1199-01	Left Coil Guard	x	
45W41-WG1199-02			x
45W34-WG1200-01	Fan Blade	x	x
45W31-WG1202-01	Fan Motor	x	x
45W41-WG1204-01	Rear Coil Guard	x	
45W41-WG1204-02			x
45W41-WG1206-01	Electrical Box Cover	x	
45W41-WG1206-02			x
45W41-WG1207-01	Top Cover	x	
45W41-WG1207-02			x
45W50-WG1208-01	Finned Tube Coil	x	
45W50-WG1209-01	Refrigerant To Water Heat Exchanger	x	
45W11-WG1211-01	Flow Switch	x	x
45W11-WG1212-01	Pressure Sensor	x	x
45W41-WG1213-01	Rear Panel	x	
45W41-WG1213-02			x
45W05-WG1216-01	Electrical Cover	x	x
45W41-WG1217-01	Side Panel	x	
45W41-WG1217-02			x
45W11-WG1218-01	Low Pressure Switch	x	x
45W11-WG1218-02	High Pressure Switch	x	x
45W28-WG1219-01	EEV	x	
45W28-WG1219-02			x
45W28-WG1220-01	Reversing Valve	x	
45W28-WG1220-02			x
45W09-WG1224-01	Two-Pole Terminal	x	x
45W09-WG1225-01	Four Pole Terminal	x	x
45W10-WG1227-01	Relay	x	x
45W09-WG1228-01	EMI Reactor	x	
45W09-WG1228-02			x
45W09-WG1229-01	Fan Speed Control	x	
45W09-WG1230-01	EMI Inverter Filter	x	
45W09-WG1230-02			x
45W09-WG1231-01	Inverter Compressor Drive	x	
45W09-WG1231-02			x
45W09-WG1232-01	Control Board	x	x
45W09-WG1233-01	Remote Display	x	x
45W09-WG1261-01	Finned Tube Coil		x
45W50-WG1262-01	Water To Refrigerant Heat Exchanger		x



Inverter Air-to-Water Heat Pump



IN UNITED STATES: 260 NORTH ELM ST. WESTFIELD, MA 01085 800-465-8558 / FAX (413) 564-5815  
IN CANADA: 7555 TRANMERE DRIVE, MISSISSAUGA, ONTARIO, L5S 1L4 (905) 670-5888 / FAX (905) 670-5782