



**GUANGDONG CHICO ELECTRONIC INC.**

**Intelligent controller**

**Manual**

**Product type: Air source hot water+ heating & cooling  
heat pump controller**

**Product type: RBSL0002**

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# To user

Dear user:

Please read this manual carefully before installing and using this product, we will not responsible for following condition: any improper installation, improper debugging, un-necessary maintenance, non-compliance with the provisions of the manual or guidance that lead to personal injury or unit damage. When installed, must be wired in accordance with the circuit diagram which is posted on the electric box of heat pump by the professionals that have the appropriate qualifications, and in the process of installation and use should pay attention to the following points:

1. Power supply should be the standard power supply of the heat pump. Before installation should confirm the area grid voltage must be in accord with the voltage marked on nameplate of heat pump, and confirm if carrying capacity of the power supply, wires and sockets are accord with heat pump input power requirements.
2. Users are not allowed to change the power wire or socket, wiring work must be carried out by a qualified electrician, and ensure the metal parts of the heat pump has a good grounding, and are not allowed to change the grounding of the heat pump arbitrarily.
3. When the heat pump uses a set of power supply wire connected to the fixed wiring, the installation must be equipped with a disconnect device which gap contact distance is at least 3mm.
4. When finish all wiring work, the heat pump can be connected to the power supply only after carefully check and make sure without error.
5. Do not place hands or foreign objects into the air outlet of heat pump, this will lead to the risk of personnel and equipment.
6. In order to obtain a better energy-saving effect, the heat pump should be installed in a place with good air circulation.
7. The operating panel can't be placed (or installed) in outdoor or high humidity places, the cable can not be cut and reconnected.
8. Before turn on the heat pump, should ensure that the tank has been filled with water or enough water volume that can meet the demand of heat pump running, ensure all the valves on the pipes between the heat pump and the tank are opened, make sure inlet and outlet water pipe is unimpeded.
9. Rated outlet water temperature is 55 ℃ , water temperature should be adjusted to appropriate temperature when using, (most comfortable water temperature for people is 38~ 43 ℃ , it's dangerous to use water that higher than 43 ℃ ).
10. Maintenance work should be carried out by professionals. For after-sales service, please be sure to supply complete warranty card and bar code.

# Manual of controller for air source heat pump water heater

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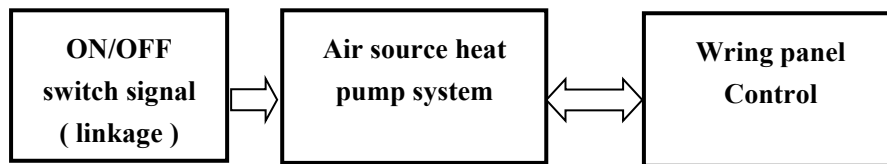
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## 1. Description:

This chip is designed and developed for air source heat pump water heater and heat supply equipment. It has the following characteristic:

### 1.1 System block diagram:



**Note:** Only when ON/OFF switch signal is linkage and display is in ON status, system will operate.

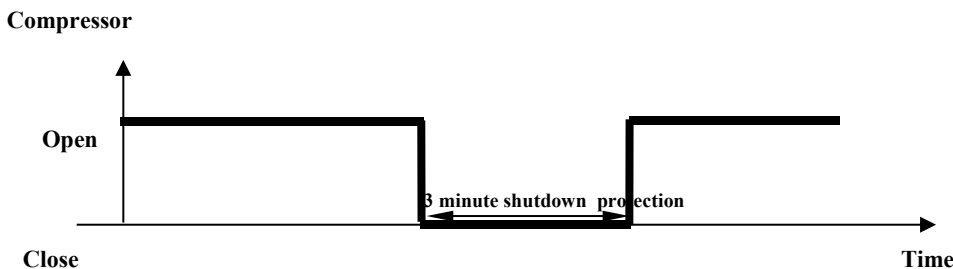
### 1.2. Control principle:

- 1.2.1 Unit cools, heats and makes DHW after receiving directions from Wring panel or ON/OFF switch.
- 1.2.2 Operation parameters can be sent to unit via Wring panel.
- 1.2.3 Unit detects unit's operation and operation information ( failure information )to Wring panel

## 2. Control outputs

### 2.1 Compressor:

- 2.1.1 Safety time for compressor from opening to unit operation ( Please refer to defrosting procedure during defrosting.).
- 2.1.2 There should be a time span of 3 minutes from compressor closure to restarting.



## 2.2 Water pump:

2.2.1 When system requires unit to open, water pump will open 1 minute in advance of compressor. After water system is fully circulated, compressor will open.

2.2.2 When system requires unit to close, water pump will close 5 minutes later after compressor stops.

2.2.3 During defrosting, water pump will not stop running.

Note:

2.2.4 For popular type ( parameter 9=0 ), water pump will not stop when it shutdowns at constant temperature.

2.2.5 For special type ( parameter 9=1 ), water pump will stop 5 minutes later after compressor closes.

2.2.6 For special type ( parameter 9=2 ), water pump will operate according to ambient temperature after compressor shutdown at constant temperature.

2.2.7 When ambient temperature varies from 2°C to +∞, water pump will not start during shutdown.

2.2.8 When ambient temperature varies from -2°C to +2°C, water pump will stop for 20 minutes then operates for 10 minutes. It will move in circles.

2.2.9 When ambient temperature varies from -6°C to -2°C, water pump will stop for 15 minutes then operates for 15 minutes. It will move in circles.

2.2.10 When ambient temperature varies from -10°C to -6°C, water pump will stop for 10 minutes then operates for 20 minutes. It will move in circles.

2.2.11 When ambient temperature varies from -∞ to -10°C, water pump will continue running.

## 2.3 Water route electric heating:

2.3.1 Water route electric heating will start if the following conditions are met:

2.3.1.1 In defrosting mode.

2.3.1.2 During winter second class anti-freezing.

2.3.1.3 System protection occurs in BTW heating mode.

2.3.2 Water route electric heating will stop if the following conditions are met:

2.3.2.1 DHW tank electric heating starts.

2.3.2.2 Water flow switch failure occurs.

2.3.2.3 It quits from defrosting.

2.3.2.4 It quits from the second class anti-freezing.

2.3.2.5 In BTW heating mode during none unit opening.

2.3.2.6 BTW water tank temperature TBTW tank  $\geq$  BTW water tank set temperature.

## 2.4 Fans:

2.4.1 Outer fan has two levels of fan speed which varies according to ambient temperature and working mode.

2.4.2 In heating mode ( DHW and BTW heating ), if ambient temperature  $\geq 30^{\circ}\text{C}$ , low fan starts, if ambient temperature  $\leq 28^{\circ}\text{C}$ , high fan starts.

2.4.3 In cool mode, if ambient temperature  $\geq 20^{\circ}\text{C}$ , high fan starts, if ambient temperature  $\leq 18^{\circ}\text{C}$ , low fan starts.

2.4.4 When unit starts to operate, the outer fan will start along with the water pump at the same time ( outer fan will close during defrosting. ).

2.4.5 Outer fan will delay 5 seconds to close behind compressor when unit closes, failure shutdown or constant temperature shutdown occurs.

## 2.5 4-way valve:

2.5.1 4-way valve is powered on in cool mode and defrosting mode. It is powered off in other conditions.

2.5.2 When unit starts in cool mode, 4-way valve opens immediately. And it opens 5 seconds in advance of water pump.

2.5.3 When unit closes in cool mode failure shutdown or constant temperature shutdown occurs, 4-way valve will close 2 minutes behind compressor.

2.5.4 When cool mode is changed to other mode, 4-way valve will be powered off 2 minutes later after compressor stops.

2.5.5 When other mode is changed to cool mode, fan will be powered on 5 seconds later after 4-way valve is powered on.

## 2.6 Crankshaft electric heating:

2.6.1 When outdoor temperature is low, to prevent outdoor refrigerant from freezing, the crankshaft electric heating will work if the following conditions are met:

2.6.1.1 Compressor is in OFF status.

2.6.1.2 Outdoor ambient temperature  $T_{\text{ambient}} \leq 15^{\circ}\text{C}$ .

2.6.2 Crankshaft electric heating will close if any of the following conditions is met:

2.6.2.1 Compressor operates.

2.6.2.2 Outdoor ambient temperature  $T_{\text{ambient}} \geq 17^{\circ}\text{C}$ .

## 2.7. Condenser electric heating:

2.7.1 When outdoor temperature is low, to prevent outer condenser bottom from freezing, condenser electric heating begins if the following conditions are met:

2.7.1.1 Heating ( DHW) mode when unit opening.

2.7.1.2 Outdoor ambient temperature  $T_{\text{ambient}} \leq 2^{\circ}\text{C}$ .

2.7.2 Condenser electric heating closes if any of the following conditions is met:

2.7.2.1 None heating ( DHW ) mode.

2.7.2.2 Outdoor ambient temperature  $T_{\text{ambient}} \geq 4^{\circ}\text{C}$ .

## 2.8. DHW tank electric heating:

2.8.1 DHW tank electric heating starts when the following conditions are met at the same time:

2.8.1.1 Unit operating in DHW mode.

2.8.1.2 There is hot water requirement ( ie. it does not reach the constant temperature shutdown condition ).

2.8.1.3 Compressor stops and water tank electric heating starts if any of the following conditions is met:

◆ Outdoor ambient temperature  $T_{\text{ambient}} \geq -1^{\circ}\text{C}$  and DHW tank temperature  $\geq 55^{\circ}\text{C}$ .

◆ Outdoor ambient temperature  $T_{\text{ambient}} \leq -2^{\circ}\text{C}$  and DHW tank temperature  $\geq 50^{\circ}\text{C}$ .

◆ System protection occurs in DHW mode.

2.8.2 Hot water tank electric heating closes if any of the following conditions is met:

2.8.2.1 Hot water tank temperature reaches hot water constant temperature shutdown temperature.

Quitting from DHW mode ( including quitting in working mode or quitting for protection or failure shutdown. ).

2.8.2.2 When ambient temperature  $T_{\text{ambient}} \geq -1^{\circ}\text{C}$  and DHW tank temperature  $\leq 53^{\circ}\text{C}$ , compressor restarts and water tank electric heating closes.

2.8.2.3 When ambient temperature  $T_{\text{ambient}} \leq -2^{\circ}\text{C}$  and hot water tank temperature  $\leq 48^{\circ}\text{C}$ , compressor starts and water tank electric heating will be controlled by ambient temperature ( When ambient temperature  $T_{\text{ambient}} \leq -2^{\circ}\text{C}$ , water tank electric heating starts. When ambient temperature  $T_{\text{ambient}} > 0^{\circ}\text{C}$ , water tank electric heating closes.).

2.8.2.4 When DHW tank electric heating starts, symbol of electric heating “ $\text{⚡}$ ” will be shown on LCD display.

**Note: During high temperature disinfection, hot water tank electric heating will be started compulsorily.**

## 2.9 EVI valve:

2.9.1 In DHW mode, if compressor opens and ambient temperature  $<$  opening valve set temperature, liquid-sprayed valve starts.

2.9.2 In none DHW mode, if compressor closes or ambient temperature  $\geq$  opening valve set temperature  $+5^{\circ}\text{C}$ , liquid-sprayed valve closes.

## 2.10 3-way valve:

2.10.1 It starts during water tank heating and closes in other modes or unit closure.

Note: When DHW mode and BTW heating mode exchanges each other, it is unnecessary to close compressor. You can exchange modes directly by turning round the 3-way valve.

## 2.11. EEV:

2.11.1 Mode:

Initial opening aperture: 350P.

Practical opening aperture range: 80-480P.

EEV resets first when unit is powered on. It is turned to 550P and then closes. Finally it is adjusted to 350P the initial opening aperture ( parameter 08 ).

EEV resets to the initial value 2 minutes later after compressor closes.

2.11.2 Terms and symbols:

Compressor suction temperature: Ts.

Coil temperature ( cool /heating): TC.

Heating, cool target superheat temperature: TSH.

2.11.3 Normal control logic:

After compressor starts, EV action step number will be decided by calculation.

EEV opening aperture variety  $\nabla P = KP * (\text{actual average superheat SH average} - \text{target super heat TSH.})$ .

$P = P + \nabla P$

When SH average  $\leq -1$ , KP=3.

When  $-1 < \text{SH average} \leq 0$ , KP=2

When SH average  $> 0$ , KP=1.

SH: super heat calculated value,  $SH = TS - TC$

SH average: Average of actual superheat in 30 seconds sampled once every 5 seconds.

TSH: Target superheat

P: EEV actual opening steps.

2.11.4 How to confirm target superheat TSH:

In normal heating condition ( including BTW heating mode and heating mode ), TSH is  $3^{\circ}\text{C}$  ( parameter 6 ).

In normal cool condition, TSH is  $-5^{\circ}\text{C}$  ( parameter 7 ).

2.11.5 EEV action period.

EEV acts once every 30 seconds.

During defrosting, EEV will operate at the highest speed ( 480P ).

### 3. Operation mode:

#### 3.1 Cool mode

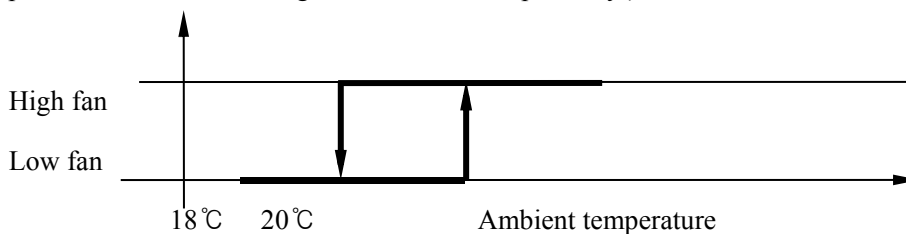
3.1.1 Setting of cool temperature.

◆ Range of set temperature TSETC:  $8-28^{\circ}\text{C}$ . Initially set temperature:  $12^{\circ}\text{C}$ .

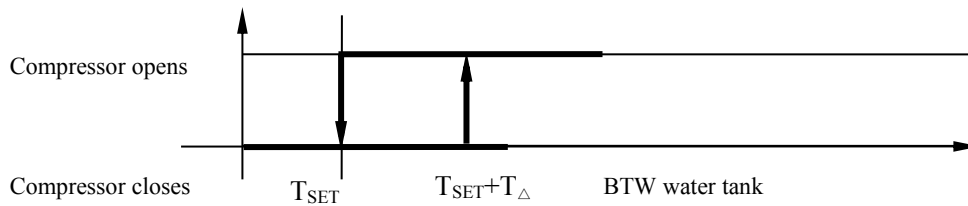
3.1.2. Normal cool operation:

◆ When 3-way valve is powered off, and 4-way exchange valve is powered on, water pump will open.

◆ Outer fan has two levels. Whether high fan or low fan runs will be decided by ambient temperature ( When ambient temperature failure occurs, high fan is active compulsorily.).



◆ Whether compressor starts or closes is decided by BTW water tank temperature and set cool temperature TSETC.



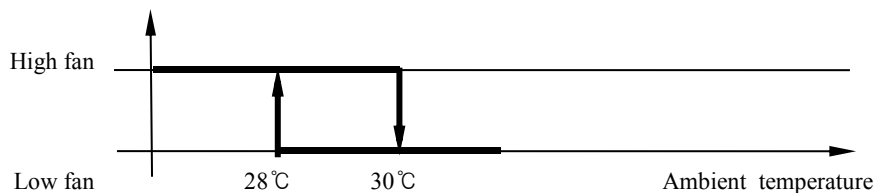
### 3.2 Heating mode:

#### 3.2.1 Setting of heating temperature.

- ◆ When it is set to automation ( When parameter 02 is set to 1.), it will operate according to heating curve.
- ◆ When it is set to manual operation ( when parameter 02 is set to 1.), heating will operate at temperature set on LCD display. Heating temperature set value TSETH range: 18-65°C .Initially set temperature: 25°C .

#### 3.2.2 Normal heating operation:

- ◆ When steering 3-way valve is powered off, and 4-way exchange valve is powered off, water pump will open.
- ◆ Outer fan has two levels. Whether high fan or low fan runs will be decided by ambient temperature.

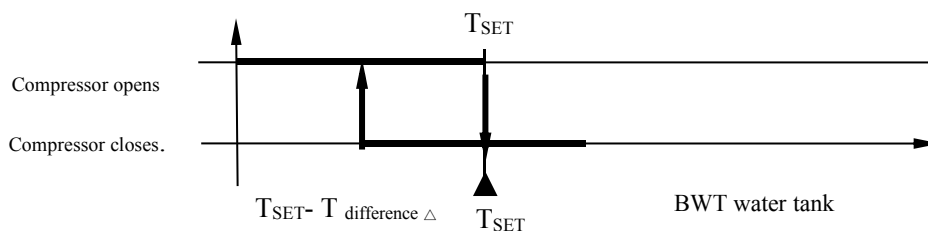


3.2.3 In manual heating mode, Whether compressor starts or closes is decided by BTW water tank temperature and set heating temperature TSETH.

3.2.4 In automatic heating mode, compressor can start according to the difference temperature  $\Delta T$  and can starts at any condition when degree score is met. If ambient temperature falls in the curve starting temperature to the starting temperature  $-5^{\circ}\text{C}$ , it should start according to the degree score. The degree score is counted when compressor shutdowns or just powered on. Difference between BTW water tank temperature and set temperature is detected once every minute ( When degree score = difference at the first minute + difference at the second minute + .....  $\leq -60^{\circ}\text{C}$ , unit should start.).

3.2.5 In manual adjustment mode or when it cannot match the above condition, unit should be opened according to the relationship between actual water temperature, set temperature and temperature  $\Delta T$ .

3.2.6 When actual water temperature is higher than the set constant temperature, it will shutdown.



3.2.7 With water route electric heating function ( Please refer to the water route electric heating load control part for detailed controlling function.)

### 3.3 DHW mode:

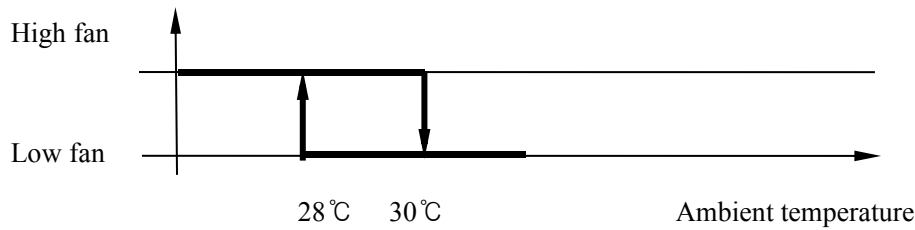
#### 3.3.1 Setting of hot water temperature:

- ◆ Range of water tank heating temperature set value : 30-60°C . Initially set temperature: 50°C .

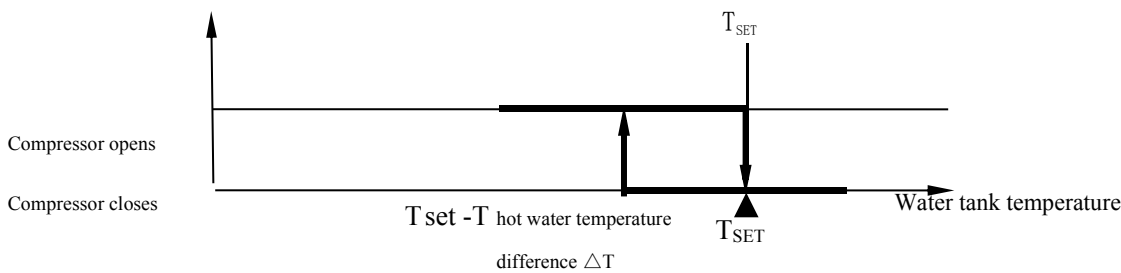
#### 3.3.2 Normal heating operation:

- ◆ When 3-way valve is powered on, if 4-way valve is powered off, the water pump will open.
- ◆ The outer fan has two levels. Whether high fan or low fan runs will be decided by ambient temperature.





3.3.3 Whether compressor opens or closes will be decided by the DHW tank temperature and set temperature T<sub>SET</sub>.



3.3.4 With hot water tank electric heating function ( Please refer to the hot water tank electric heating load control part for detailed controlling function.)

### 3.4 Defrosting mode:

3.4.1 Compulsory defrosting:

3.4.1.1 When ambient temperature  $\leq 15^{\circ}\text{C}$  and compressor operates for 10 minutes, it can enter compulsory defrosting via display panel. Press and hold the key “**Esc**” to enter compulsory defrosting.

3.4.1.2 Defrosting time is a set parameter(2.4).

3.4.2 Sensor defrosting ( Normal defrosting when there is no failure on coil temperature sensor.)

3.4.2.1 In heating mode, when ambient temperature  $\leq 15^{\circ}\text{C}$  and compressor accumulated low temperature operation reaches the defrosting period set time for 40 minutes (parameter 2.1), if coil temperature is lower than defrosting set entering temperature  $-7^{\circ}\text{C}$  (parameter 2.2 ), it will enter defrosting.

Note:

3.4.2.2 Here low temperature means the coil temperature is lower than defrosting quitting temperature  $13^{\circ}\text{C} <$  parameter 2.3.

3.4.2.3 This accumulated operation time will be reset after defrosting finish or when coil temperature is higher than defrosting quitting temperature  $13^{\circ}\text{C}$ .

3.4.2.4 When coil temperature is higher than defrosting quitting temperature or defrosting time reaches the longest period of 8 minutes  $>$  parameter 2.4, it will quit from defrosting.

3.4.3 Timer defrosting ( when coil temperature failure occurs ):

3.4.3.1 When ambient temperature  $\leq 8^{\circ}\text{C}$ , if compressor has accumulatively operated for 40 minutes the set defrosting period (parameter 2.1), it will enter defrosting.

3.4.3.2 When defrosting time reaches the set defrosting period for 8 minutes ( parameter 2.4), it will quit from defrosting.

3.4.4 Defrosting action:

3.4.4.1 When defrosting conditions are met, the following action will proceed:

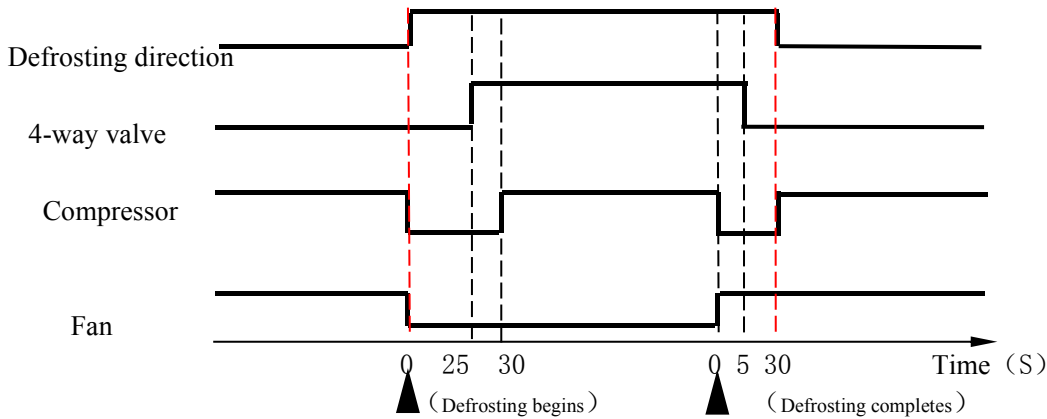
- ◆ Compressor and fan stop running. Defrosting direction signal will be sent out and defrosting output signal will be sent out.
- ◆ After 25 second, the 4-way valve will be powered on.
- ◆ After 30 second, compressor will start.
- ◆ Water pump will operate normally.

3.4.4.2 When it meets the condition to quit, the following action will proceed:

- ◆ When defrosting quitting conditions are met, it will quit from defrosting. Compressor will stop running, fan will begin to

work and 4-way valve will be powered off 5 seconds later.

◆After fan operates for 30 seconds, compressor will start. Normal heating operation will be recovered. Unit continuous operation time will be reset, defrosting completion signal will be sent out and defrosting signal will be stopped to output.



### 3.4.5 Abnormal completion of defrosting:

3.4.5.1 When unit closes during defrosting, it will continue operating defrosting until defrosting completes.

3.4.5.2 If high pressure protection occurs during defrosting, it will quit from defrosting and unit stop for protection.

Note:

3.4.5.3 During defrosting, low pressure protection will be shielded. And it will take 1 minute before detecting the low pressure switch after it quits from defrosting and enters in a normal heating.

## 4. Other control function:

### 4.1 High temperature disinfection:


4.1.1 High temperature disinfection period is every 7 days.

4.1.2 After it enters high temperature disinfection, unit will start DHW tank electric heating compulsorily.

4.1.3 When hot water tank temperature  $\geq 65^{\circ}\text{C}$  and protection temperature lasts for 15 minutes above  $65^{\circ}\text{C}$ , it will quit from high temperature disinfection.

4.1.4 After it enters high temperature disinfection, if the hot water tank temperature does not reach  $65^{\circ}\text{C}$  within continuous 3 hours, it will quit from high temperature disinfection.

4.1.5 When hot water mode is active, press and hold the key “Prg” on LCD display for 10 seconds and it will enter high temperature disinfection.

4.1.6 During high temperature disinfection, the hot water symbol “” will flicker on display panel to indicate the high temperature disinfection operation status.

### 4.2 Power-off memory:

4.2.1 System will record the parameters all the way.

4.2.2 System can keep ON/OFF status and electric heating status in memory.

4.2.3 After abnormal power-off or unit closure, once it is powered on, the system will be in standby status or remaining status before power-off.

### 4.3 Clock and timer ON/OFF function:

4.3.1 Real time clock can be set synchronously on display panel.

4.3.2 Timer ON/OFF can be set with an display panel.

4.3.3 In standby status, when timer ON/OFF is active and it reaches the timer ON time, unit will open to operate automatically and remain former mode of operation.

4.3.4 During unit operation, when timer OFF is active and it reaches the timer OFF time, unit will close automatically.

4.4 Room requirement ( Room requirement switch should be added):

4.4.1 When room switch is closed, Cooling and heating mode function is activated. When room switch is disconnected, the Cooling and heating mode function is invalid.

## 5. System protection:

When failure occurs, “” will be displayed for maintenance on display panel.

5.1. ON/OFF switch:

5.1.1 ON/OFF switch should be detected after it is powered on.

5.1.2 When it is detected that the ON/OFF switch is disconnected, unit cannot open to operate.

5.1.3 When ON/OFF switch is disconnected for protection, there will be no failure directions and it can be resolved automatically.

5.2. Phase-sequence protection:

5.2.1 After it is powered on, if it is detected at any time that the phase-sequence protection switch disconnects continuously for 3 seconds, unit will stop for protection and alarm for phase-sequence failure.

5.2.2 If this failure occurs for 3 times within 30 minutes, it will not be recovered unless it is powered off.

5.2.3 When sequence-failure occurs, display panel will alarm for maintenance with failure code “Err 04”.

5.3 Water flow failure:

5.3.1 It begins to detect water flow switch after water pump starts for 40 seconds. If it is detected that this switch disconnects for continuous 15 seconds, unit will stop for protection.

5.3.2 After this failure occurs, if it does not recover, water pump will restart every 3 minutes. It begins to detect water flow switch. If this failure occurs for 5 times continuously, water pump will not be started. Water pump will be started again only when water flow switch closure is detected.

5.3.3 This failure can be recovered.

5.3.4 When failure occurs, maintenance failure will be shown on the display panel. The failure code is “Err 03”.

5.4 High pressure protection:

5.4.1 Detect the high pressure protection switch after compressor starts for 1 minute. If disconnection is detected for continuous 10 seconds, the unit will stop for protection.

5.4.2 If this failure occurs for three times within 30 minutes, it will not be recovered unless it is powered off ( The former two failures can be recovered automatically.).

5.4.2 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 10”.

5.5 Low pressure protection:

5.5.1 It begins to detect the low pressure switch after compressor starts for 5 minutes. If it is detected that this switch disconnects for continuous 10 seconds, the unit will stop for protection.

5.5.2 If this failure occurs for three times within 30 minutes, it will not be recovered unless it is powered off ( The former two failures can be recovered automatically. ).

5.5.3 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 11”.

5.6 Excessive discharge temperature protection:

5.6.1 It begins to detect after compressor starts for 1 minute. If it is detected that the discharge temperature  $\geq 125^{\circ}$  for 1 minute, the unit will stop for protection.

5.6.2 When it is detected that discharge temperature  $\leq 90^{\circ}\text{C}$ , it will quit from this protection.

If this failure occurs for three times within 30 minutes, it will not be recovered unless it is powered off ( The former two failures can be recovered automatically. ).

5.6.3 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 16”.

**Note: If high pressure protection, low pressure protection and excessive discharge temperature protection occurs for accumulated 3 times within 30 minutes, the unit will not be recovered unless it is powered off.**

5.7. Protection from excessive large difference between water inlet and outlet temperature:

5.7.1 It begins to detect water inlet temperature and water outlet temperature after water pump starts for 1 minute.

5.7.2 If it is detected that the difference is above 18°C of water inlet temperature TIN and water outlet temperature TOUT within continuous 10 seconds, unit will stop for protection.

5.7.3 When protection of difference between water inlet and water outlet temperature from too large, it begins to restart unit ON procedure 3 minutes later and to detect the water inlet and outlet temperature.

5.7.4 If this failure occurs for 3 times within 30 minutes, it will not be recovered unless it is powered off ( The former two failures can be recovered automatically.).

5.7.5 When the third failure occurs, maintenance failure will be shown on the LCD display panel. Failure code is “Err 05”.

5.8. Water outlet temperature excessively high protection:

5.8.1 In heating mode ( including BTW heating mode and hot water mode ), this protection is activated.

5.8.2 This protection is not available for cool mode.

5.8.3 When it is detected that water outlet temperature  $TOUT \geq 70^{\circ}C$ , unit will stop for protection. After this failure occurs, if it is detected that  $TOUT \leq 55^{\circ}C$ , it will quit from this protection.

5.8.4 If this failure occurs for three times within 30 minutes, it will not be recovered unless it is powered off.

5.8.5 When the third failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 12”.

5.9. Protection of water outlet temperature from excessively low:

5.9.1 In BTW cool mode and defrosting mode, this protection is activated.

5.9.2 It begins to detect after compressor starts for 5 minute. If it is detected that the water outlet temperature  $TOUT \leq 2^{\circ}C$ , unit will stop for protection. If this failure occurs in defrosting mode, it will quit from defrosting and enter heating.

5.9.3 After this failure occurs, if it is detected that  $TOUT \geq 5^{\circ}C$ , it will quit from this failure.

If this failure occurs for 3 times within 30 minutes, it will not be recovered unless it is powered off.

5.9.4 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 13”.

5.10. Excessive coil temperature protection:

5.10.1 In cool mode, it should be detected 5 minutes later after compressor operates.

5.10.2 When it is detected that heating coil temperature  $\geq 70^{\circ}C$ , unit will stop for protection. After this failure occurs, when it is detected that  $TOUT \leq 65^{\circ}C$ , it will quit from this protection.

5.10.3 If this failure occurs for 3 times within 30 minutes, it will not be recovered unless it is powered off.

5.10.4 When failure occurs, maintenance failure will be shown on the LCD display. Failure code is “Err 07”.

5.11. Hot water tank excessive temperature protection:

5.11.1 In DHW mode, when it is detected that hot water tank temperature  $T \geq 55^{\circ}C$ , system will enter hot water tank excessive temperature protection.

5.11.2 When it is detected that hot water tank temperature  $T \leq 53^{\circ}C$ , system will quit from hot water tank excessive temperature protection. Following actions should proceed when system enters hot water tank excessive temperature protection:

5.11.3 If system BTW requires, system will change to BTW mode. Otherwise, unit will stop for protection.

5.11.4 If hot water tank temperature does not achieve the set temperature, hot water tank electric heating should be started.

5.11.5 When this failure occurs, system can be resolved automatically without alarm.

5.12. Anti-freezing protection:

**The first class anti-freezing protection.**

5.12.1 In standby status, when ambient temperature  $\leq 2^{\circ}C$  and water inlet temperature  $\leq 8^{\circ}C$ , unit will open automatically and operate in water pump mode.

5.12.2 When ambient temperature  $\geq 4^{\circ}C$  or water inlet temperature  $\geq 15^{\circ}C$ , it will quit from the first class anti-freezing protection.

5.12.3 When this protection occurs, “Err 19” will be displayed on LCD display and it will be recovered automatically.

**The second class anti-freezing protection.**

5.12.4 Priority will be given to water tank anti-freezing.

5.12.5 In unit closure status, when ambient temperature  $\leq 2^{\circ}\text{C}$  and hot water tank  $\leq 10^{\circ}\text{C}$ , unit will open automatically and operate in hot water mode. When hot water tank temperature  $\geq 15^{\circ}\text{C}$ , it will quit from anti-freezing ( If DHW=OFF, it will not enter anti-freezing.)

5.12.6 In unit closure status, when ambient temperature  $\leq 2^{\circ}\text{C}$  and BTW water tank temperature  $\leq 10^{\circ}\text{C}$ , unit will open automatically and operate in heating mode. When BTW water tank temperature  $\geq 15^{\circ}\text{C}$ , it will quit from anti-freezing.

5.12.7 Please finish anti-freezing first then enter manual unit opening.

5.12.8 When unit opens, BTW is in heating mode and hot water is being heated. When ambient temperature  $\leq 2^{\circ}\text{C}$  and BTW water tank temperature  $\leq 10^{\circ}\text{C}$ , system will start heating for anti-freezing.

5.12.9 When this protection occurs, “Err 18” will be displayed on LCD display and is will be recovered automatically.

5.13. Protection from ambient temperature being excessively low:

5.13.1 In BTW mode and hot water mode:

5.13.2 When ambient temperature  $\leq -20^{\circ}\text{C}$ , unit will close for protection.

5.13.3 When ambient temperature  $\geq -17^{\circ}\text{C}$ , it will quit from this protection.

5.13.4 When this protection occurs, it will not be alarmed for maintenance failure and failure code will not be shown.

5.14. Water inlet sensor temperature failure:

5.14.1 Should be detected after it is powered on.

5.14.2 If it is detected that water inlet temperature sensor short circuit or disconnection occurs at any time, it will be determined to be a water inlet temperature sensor failure.

5.14.3 This failure can be recovered automatically.

5.14.4 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 01”.

5.15. Water outlet sensor failure:

5.15.1 Should be detected after it is powered on.

5.15.2 If it is detected that water inlet temperature sensor short circuit or disconnection occurs at any time, it will be determined to be a water inlet temperature sensor failure.

5.15.3 This failure can be recovered automatically.

5.15.4 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 02”.

5.16. Coil temperature sensor failure:

5.16.1 Should be detected after it is powered on.

5.16.2 If it is detected that coil temperature sensor short circuit or disconnection occurs at any time, it will be determined to be a heating coil temperature sensor failure and system will not stop.

5.16.3 When this failure occurs, EEV control for heating mode ( including hot water mode ) will turn to manual adjustment.

5.16.4 This failure can be recovered automatically.

5.16.5 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 21”.

5.17. Condenser coil sensor failure:

5.17.1 Should be detected after it is powered on.

5.17.2 If it is detected that condenser coil sensor short circuit or disconnection occurs at any time, it will be determined to be a cool coil sensor failure and system will not stop.

5.17.3 When this failure occurs, EEV control in cool mode will turn to manual adjustment.

5.17.4 This failure can be recovered automatically.

5.17.5 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 22”.

5.18. Suction temperature sensor failure:

5.18.1 Should be detected after it is powered on.

5.18.2 If it is detected that suction temperature short circuit or disconnection occurs at any time, it will be determined to be a suction temperature sensor failure and system will not stop.

5.18.3 When this failure occurs, EEV control in cool and heating ( including hot water ) mode will turn to manual adjustment.

5.18.4 This failure can be recovered automatically.

5.18.5 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 14”.

5.19. Discharge temperature sensor failure:

5.19.1 After it is powered on, if it is detected that discharge temperature sensor short circuit occurs at any time or discharge temperature sensor disconnection occurs 1 minute later after compressor starts, it will be determined to be a discharge temperature sensor failure and system will not stop.

5.19.2 This failure can be recovered automatically.

5.19.3 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 15”.

5.20. Hot water tank temperature sensor failure:

5.20.1 Should be detected after it is powered on.

5.20.2 If it is detected that hot water tank temperature sensor short circuit or disconnection occurs at any time, it will be determined to be a hot water tank temperature sensor failure and unit will stop for protection in hot water mode.

5.20.3 If this failure occurs when high temperature disinfecting, it will quit from high temperature disinfection.

5.20.4 This failure can be recovered automatically.

5.20.5 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 08”.

5.21. BTW water tank temperature sensor failure:

5.21.1 Should be detected after it is powered on.

5.21.2 If it is detected that BTW water tank temperature sensor short circuit or disconnection occurs at any time, it will be determined to be a BTW water tank temperature sensor failure and unit will stop for protection in BTW mode including BTW heating mode and BTW cool mode.

5.21.3 This failure can be recovered automatically.

5.21.4 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 09”.

5.22. Ambient temperature sensor failure:

5.22.1 Should be detected after it is powered on.

5.22.2 If it is detected that ambient temperature sensor short circuit or disconnection occurs at any time, it will be determined to be a ambient temperature sensor failure and unit will not stop.

When this failure occurs, the outer fan will be operate in high fan compulsorily. The corresponding anti-freezing condition will eliminated.

5.22.3 This failure can be recovered automatically.

5.22.4 When failure occurs, maintenance failure will be shown on the display panel. Failure code is “Err 20”.



5.23. Communication failure:




5.23.1 Within 30 seconds after it is powered on, if LCD display does not receive communication signal from the main board all the way , the LCD panel cannot quit from full display.

5.23.2 During operation, if LCD display does not receive communication signal from the main board within continuous 2 minutes, it will determined to be a communication failure. Failure code is “Err 00”.

## 6. Wring panel introduction

### 6.1 How to operate on LCD display:

	<p>ON/OFF: Press and hold for 2 seconds change ON/OFF</p>
	<p>Menu: In the main interface, press the key to enter the menu. Press and hold for 5 seconds for manual disinfection.</p>

<b>Esc</b>	Return: After entering menu, press the key to return to the upper menu and confirm parameters. Press and hold 5 seconds to enter compulsory defrosting.
	Pgup: to modify parameters or page up.
	Pgdn: to modify parameters or page down.
	Confirm: Press the key to enter next parameter or enter parameter amendment. Press and hold it for 5 seconds to key locking or unlocking.

## 6.2. Table of system parameter:

Menu	Sub menu	Meaning	Range of parameter	Default	Note
<b>Main menu</b>					
Mode select	DHW	Hot water making	ON/OFF	OFF	Adjustable
	BTW Auto heating/ heating	BTW heating	cooling/Auto heating curve auto / heating manually/off	Auto heating	Adjustable
	DHW temp.	DHW set temp.	30°C~60°C	50°C	Adjustable
	BTW temp.	Heating mode set temp.	Heating: 18°C~60°C Cooling: 8°C~18°C (Auto: set room temp., Range: 15°C~25°C)	25°C	Adjustable, When choosing auto heating, add A in front of set temp. Set temp.depends on ambient temp.
	Initial BTW temp.	Initial temp.of auto heating curve	15°C~25°C	20°C	Adjustable, active when auto heating
	Max.BTW temp.	Max temp.of auto heating curve	24°C~50°C	43°C	Adjustable, active when auto heating
<b>Unit status</b>					
	DHW temp.	Hot water tank temp.	-30°C~99°C		Actually measuted value
	BTW temp.	BTW water tank temp.	-30°C~99°C		Actually measuted value
	BTW inlet temp.	BTW water inlet temp.	-30°C~99°C		Actually measuted value
	BTW outlet temp.	BTW water outlet temp.	-30°C~99°C		Actually measuted value

	Heating coil	Heating coil temp.	-30°C ~ 99°C		Actually measured value
	Exhaust coil	Discharge temp.	0°C ~ 125°C		Actually measured value
	Evap.temp.	Suction temp.	-30°C ~ 99°C		Actually measured value
	Ambient temp. 13°C	Ambient temp.	-30°C ~ 99°C		Actually measured value
	Expansion valve	Number of EEV steps	100 ~ 480N		Actually measured value
<b>Parameter setting</b>					
1.0 System parameter	1.1 DHW $\Delta$ T.	<b>DHW <math>\Delta</math>T set temp.</b>	1°C ~ 20°C	5°C	<b>Adjustable</b>
	1.2 BTW $\Delta$ T	<b>Heating <math>\Delta</math>T setting</b>	1°C ~ 20°C	2°C	<b>Adjustable</b>
	1.3 EEV Overheat/C	<b>Heating overheat temp.</b>	-20°C ~ 20°C	5°C	<b>Adjustable</b>
	1.4 EEV Overheat/H	Cooling target overheat temp.	-20°C ~ 20°C	3°C	<b>Adjustable</b>
	1.5 Comp.start	<b>Compressor starting delay when it is powered on at first time.</b>	1 ~ 10M	1M	<b>Adjustable</b>
	1.6 BTW pump	<b>Water pump mode</b>	0/1/2	0	<b>Adjustable</b>
	1.7 Disinfection	<b>With or without disinfection</b>	ON/OFF	ON	<b>Adjustable</b>
	1.8 EH mode	<b>Water route elec.heating option</b>	0 (Auto) / 1 (Ambient) / 2 (Water temp.) / 3 (Ambient + water temp.)	0	<b>Adjustable</b>
	1.9 EH start temp.	<b>Manual water route elec.heating starting temp.</b>	-17 ~ 7°C	-5°C	<b>Adjustable</b>
	1.10 BTW $\Delta$ T EH	<b>BTW water temp. <math>\Delta</math>T</b> when water route elec.heating starts.	0 ~ 15°C	2°C	<b>Adjustable ( this <math>\Delta</math>T + BTW <math>\Delta</math>T )</b>
	1.11 DHW $\Delta$ T EH 5°C	<b>DHW temp. <math>\Delta</math>T</b> when DHW elec.heating starts	0 ~ 20°C	5°C	<b>Adjustable ( this <math>\Delta</math>T + DHW <math>\Delta</math>T )</b>
	1.12 EH start 30M	<b>Water tank elec.heating starting delay</b>	10 ~ 90M	30M	<b>Adjustable</b>
	1.13 Adjust1 step	EEV initial step number	150 ~ 500N	350	Adjustable
	1.14 Adjust2 step	EEV manual step numbers	150 ~ 500N	350	Adjustable
	1.15 Spray Valve	Spray Valve temp.	0 ~ 20°C	8°C	Adjustable
	1.16	EEV option	Auto/Manual	Auto	Adjustable
2.0 Defrost	2.1 Def. Cycle 40M	<b>Defrosting cycle</b>	30min ~ 90min	40min	<b>Adjustable</b>



parameter	2.2 Def. start temp. -7℃	<b>Defrosting starting temp.</b>	-20-5℃	-7℃	<b>Adjustable</b>
	2.3 Def. stop temp. 13℃	<b>Defrosting stopping temp.</b>	1℃~30℃	13℃	<b>Adjustable</b>
	2.4 Def. Max. time 8M	<b>Defrosting max.time</b>	1min~12min	12min	<b>Adjustable</b>
	2.5 Def.elec.heater ON	<b>Whether elec.heating starts defrosting</b>	ON/OFF	ON	<b>Adjustable</b>
<b>Failure records</b>	Recent 8 failures will be kept in record				<b>Only for check</b>
	2				
<b>Time setting</b>	Date 2010-04-15	<b>Date</b>			<b>Adjustable</b>
	Clock 18:30	<b>Time</b>			<b>Adjustable</b>
	Timer on X	<b>Timer ON</b>			<b>Adjustable</b>
	Timer oFF X	<b>Timer OFF</b>			<b>Adjustable</b>
<b>Temp. curve display</b>	BTW temp.		-30℃~99℃		Actually measuted value
	DHW tem.p		-30℃~99℃		Actually measuted value
	Ambient temp.		-30℃~99℃		Actually measuted value

### 6.3 Table of failure codes:

Failure code on LCD display	Failure name
Standby	
Normal operation	
Err 00	Communication failure
Err 01	Backwater temperature sensor failure
Err 02	Water outlet temperature sensor failure
Err 03	Water flow switch protection
Err 04	Power phase-sequence failure
Err 05	Protection of difference between water inlet and outlet temperature from being excessively large.
Err06	Protection of water temperature from excessively high ( Newly added protection switch )
Err 07	Protection of pipe temperature from excessively high
Err 08	DHW water tank temperature sensor failure
Err 09	BTW water tank temperature sensor failure
Err 10	High pressure protection
Err 11	Low pressure protection
Err 12	Protection of water outlet temperature from excessively high
Err 13	Protection of water outlet temperature from excessively low
Err 14	Suction temperature sensor failure
Err 15	Discharge temperature sensor failure
Err 16	Protection of discharge temperature from excessively high
Err 18	The 2 <sup>nd</sup> anti-freezing
Err 19	The 1 <sup>st</sup> anti- freezing
Err 20	Ambient temperature sensor failure
Err 21	Coil temperature sensor failure (outside evaporator for defrosting )
Err 22	Cooling coil temperature sensor failure ( inside condenser )
Err 23	Protection of ambient temperature from excessively high