# 8901N User Guide

## 1 Main functions:

The controller is the controller for special engineering heat pump water heater, suitable for single / dual compressor air-cooled heat pump water heaters. It contains 8 temperature sensors (tank temperature, outdoor machine temperatures 1, exhaust temperature 1, outdoor machine temperature 2, exhaust temperature 2,environment temperature , water outlet temperature, return water temperature sensor), 9-ways switch input signal (High pressure switch 1, low pressure switch 1, high pressure switch 2, low pressure switch 2,water flow switch, high water level switch, low water level switch, water pressure switch, emergency switch), 12 control output (compressor 1, compressor 2, the four-way valve, high-speed fan, low-speed fan, circulating pumps, circulation solenoid valve, water replenishing valve(can be connected to water inlet solenoid valve), water inlet pump, supply-water pumps, backwater valve, auxiliary electric heating).

**Main functions:**

**1 Temperature display and control:** display the temperature of the water tank, and control the water temperature in the tank at the setting D-value temperature. Query function, you can view each temperature sensor and a variety of related parameters.

**2 Mode selections:** Operation cycle and direct heating can be set.

**3 Automatic defrost control:** Optimize the design of the heat pump defrost control logic, to effectively defrost to ensure that outside the machine can work at low temperature.

**4 Automatic replenishment feature:** Intelligent replenishment program, just need one water level switch signal, as far as possible to ensure replenishment process does not affect the water temperature to ensure that as much hot water in tank, and to ensure that the units in the replenishment process as smooth running as possible, to reduce unnecessary unit starts and stops.

**5 Exhaust temp protection:** When the exhaust temp is too high, the controller turns off the unit and generates alarm signal, and it can control the outdoor fan according to the exhaust temp.

**6 High and low pressure alarm functions:** two-way high-pressure alarm signal input, two low-pressure alarm signal input, and normally closed contacts.

**7 Running in different period of time:** The controller has two modes: “Auto” and “Econ”, in “Econ” mode, the controller can set 3 period of time; it can only heat in these periods of time.

**8 Dunning:** You can set a trial time and 6 passwords, controller cumulative work time exceeds the setting of the trial time to stop working, and password is required to lift the time limit on the trial to continue working.

**9 Phase lack protection and phase sequence protection:** when the three-phase power supply phase loss or when the three-phase power supply phase sequence error, it will stop the unit operation and generate an alarm

signal.

**10 Current view and over current protection functions:** to view the operating current of the compressor, and each compressor has over current protection function.

**11 The compressor is timesharing started:** In order to avoid the high-power devices starting and stopping at the same time to have a strong effect on the power grid, the controller set the start and stop time sharing control in accordance with the order.

**12 Winter frost protection:** In order to prevent water pipes, water circulating pump freezing, the unit also do frost protection when the unit is on shutdown, standby state.

**13 Emergency operation functions:** when operation panel host communication failure or malfunction, automatic operation will set parameters by internally.

14 When power is off, it will automatically remember various of parameters.

15 It has three different timing switch.

16 Can be set through the motherboard with a variety of models, the general purpose of a board.

17 Others: Real Time Clock, On-off Memory when the power is off (Can be set), Direction of four-way valve can be set, compressor start delay protection, Sensor Error Alarm, High Temperature Alarm, Add Fluorin, and so on .

**2 Main Technique Index:**

**Range of Temperature Display**： -50～150℃

**Range of Temperature Set**： 0～100℃, the range can be set.

**Power Supply**： 220V±10%

**Operation Environment**：Temperature -10℃～50℃,humidity ≤85%.

**Output Load Capability**： Circulating pump:30A/220VAC
Fan: 2x10A/220VAC
Auxiliary electric heating : 5A(Relay contact)
Water inlet pump: 5A/220VAC(Relay contact)
Compressorressor1: 5A/220VAC
Compressorressor2: 5A/220VAC
Four-way valve: 5A/220VAC
Circulating water solenoid valve: 5A/220VAC
Water replenishing valve: 5A/220VAC
Supply-water pump: 5A/220VAC(Relay contact)
Backwater valve: 5A/220VAC

**Temperature Sensor**：NTCR25=5kΩ,B(25/50)=3470K

**Executive standard**：Q/320585 XYK01

**3 Parameter Set**

Long press “S” for 5 seconds to enter the state of value setting. If set password(F80 and F81), LCD will show “PAS” to prompt you to key password, use “▲▼” to key password. If password is right, LCD will show “Fxx”, “xx” is a double-digit number, which represents parameter code. You can use “▲” or “▼” to choose parameter code. Choose one code and then press “S”, it can display corresponding parameter value. At this time you can use “▲” or “▼”

again to set parameter value, press “S” again after finishing setting, return to the state of parameter code. Internal parameter code is showing below:

| Sort | Code | Parameter name | Range | Factory setting | Unit | Remark |
|---|---|---|---|---|---|---|
| Temperature | F12 | Tank D-value temperature | 1-10 | 5 | °C | |
| | F13 | Max setting temperature | 30-100 | 55 | °C | |
| | F14 | Min setting temperature | 0-29 | 10 | °C | |
| | F19 | Temp sensor adjustment | -20-20 | 0 | °C | Adjust the water temperature measurement error |
| Compressor | F21 | Compressor delay time | 0-10 | 3 | minute | |
| | F22 | Compressor losting-phase and phase sequence protection | 0-1 | 1 | | 0: without protection<br>1: with protection |
| | F23 | Compressor type | 0-2 | 1 | | 0: 3ph<br>1: 5ph<br>2: 10ph<br>Single compressor power |
| | F24 | The number of compressor( notice 1) | 1-2 | 2 | | 1: one compressor<br>2: two compressors |
| | F25 | Current protection | 0-1 | 0 | | 0: without current protection<br>1: with current protection |

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|---|---|---|---|---|---|---|
| | F26 | Compressor low temp limit protection | -20-5 | -20 | | -20: no limit |
| Defrosting | F31 | Defrost start temperature | -10-10 | -4 | °C | |
| | F32 | Defrost end temperature | 5-25 | 12 | °C | |
| | F33 | Defrost start time | 10-120 | 30 | minute | |
| | F34 | Max defrost time | 3-20 | 10 | minute | |
| | F35 | Start defrost environment temp when outdoor machine temp sensor is broken | -10-20 | 7 | °C | |
| | F37 | Setting the direction of valve | 0-1 | 0 | - | 0: four-way valve open when heat, closed when defrost<br>1: four-way valve closed when heat, open when defrost |
| Fan | F41 | low-speed fan starting environment setting temp | 5-35 | 25 | °C | Choose to use high-speed or low-speed fan temp according to environment |
| | F42 | Fan stopping exhaust temp | 80-110 | 100 | °C | Fan stopping exhaust temp |
| | F43 | Fan stopping exhaust D-value temp | 5-15 | 10 | °C | |
| | F45 | Exhaust temp protection | 90-135 | 120 | °C | Compressor stopping exhaust temp |

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|---|---|---|---|---|---|---|
| System | F51 | Type | 0-1 | 0 | | 0: circulating<br>1 ： direct heating |
| | F53 | Liquid level | 0-2 | 2 | | direct heating: 2<br>circulating:<br>0: no liquid level<br>1: one liquid level<br>2: high and low liquid levels |
| | F54 | Pump | 0-1 | 1 | | 1：water inlet pump and circulating pump use one water pump together<br>0: water inlet pump and circulating pump stand alone |
| | F55 | Whether to test water switch or not | 0-1 | 1 | | 1: test<br>0: no test |
| | F56 | Tank electric heating | 0-1 | 0 | | 0: without auxiliary electric heating<br>1：with auxiliary electric heating |
| | F57 | Supply-water pump | 0-1 | 0 | | 0: without Supply-water pump<br>1:with Supply-water pump |
| | F58 | Backwater valve | 0-1 | 0 | | 0: without Backwater valve( you can choose not to connect it to |

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|---|---|---|---|---|---|---|
| | | | | | | backwater temp)<br>1:with backwater valve |
| Function Set | F71 | Auto tank electric heating starting mode at the setting environment temp | -10-20 | 12 | °C | |
| | F72 | Out of water temp is too high protection | 60-99 | 70 | °C | |
| | F73 | Setting backwater temp | 0-99 | 38 | °C | |
| System set | F80 | Password | 0-999 | 0 | - | F80,F81=0. Mean no password |
| | F81 | Password | 0-999 | 0 | - | |
| | F85 | Display controller's working time | - | - | X10 hour | |
| | F86 | Clean up controller's working time | - | - | - | |
| | F87 | Trial time | 0-999 | OFF | X10 hour | When controller's accumulative working time is more than trial time, controller will stop, and display alarm code "A99"<br>0: no trial time limit |
| | F90 | Display motherboard type | | | | |
| | F91 | Display motherboard version | | | | |

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|---|---|---|---|
| Testing | | number | |
| | F92 | Display panel type | |
| | F93 | Display panel version number | |
| | F94 | Display motherboard ID number | Use hexadecimal number |
| | F97 | Reserved | |
| | F98 | Add fluorin | The controller shows “AdF” after entering this function, turn on compressor and fan, four-way valve state is in connection with freeze mode( more details are available on “ automatic defrosting principles”). Press key “s” to exit or exit test automatically after 25 minutes. |
| | F99 | Test output signal | After entering the function, the controller displays “CCC”, and attracts all relays in turn, in order to be used for outer plate testing, and please don’t use it when the controller is running! Press key “s” to exit or exit test automatically after 30 seconds. |
| | F00 | Exit | |

**Notice1:** if F24=1, it means single compressor system, at this time outdoor machine temp sensor2, exhaust temp sensor2 and air admission temp sensor2 can be not connected. Ignore high pressure switch2, low pressure switch2 signal, there will not exist alarm A12 A13 A22 A24 A26

**4 Function description:**

If F51=0, suitable for circulation system, machine set is always in circulating mode

If F51=1, suitable for direct heating system, machine set is in direct heating or direct heating and circulating heat preservation mode

**4.1. start heating process**

**4.1.1 circulation mode**

Requirement of starting: tank temp＜(setting temp- D-value temp). compressor stopping time≥ compressor starting delay timeF21

1. Turn on, test whether the actual water tank temp meet the requirement of starting or not.

If not, test high water level switch, if it is closed, machine set will enter standby

state. If it is open, turn on water replenishing valve replenish water.
If it meets the requirement, test water level( test whether low water level switch is closed), if it is open, turn on water replenishing valve to replenish water until low water level switch is closed.
2. start circulating pump after low water level switch is closed, test whether water flow switch is closed or not after 30 seconds, if it is not closed, turn off and alarm.
3 after water flow switch is closed, start high-speed fan and compressor1 10 seconds later, start compressor2 10 seconds later.
4. start electric heating or not according to electric heating requirement.
5. water replenishing valve runs according to water replenishing valve controlling logic.

**4.1.2 direct heating mode**

Turn on, start testing water level,( test whether low water level switch is closed or not), if it is closed, then enter direct heating and circulating heat preservation mode
. if it is open, then enter direct heating mode.

**4.1.2.1 direct heating mode**

1. turn on, low water level open, close circulating pump and circulating solenoid valve. Open water inlet solenoid valve and water inlet pump, start heat pump thermostat .
2. after water inlet solenoid valve work for 10 seconds, controller tests whether water pressure switch is closed or not , if it is open, then alarm.
3. test whether water flow switch is closed or not after water pressure switch is closed, if it is open, then alarm.
4. after water flow switch is closed, start high-speed fan and compressor1 10 seconds later, start compressor2 10 seconds later.
5. start electric heating or not according to electric heating requirement.
6. when heat preservation tank high water level switch is closed, close water inlet solenoid valve and water inlet pump, stop thermostat. When high water level switch is closed, controller test water tank temp ≥setting temp, main engine stop running. When tank temp＜setting temp- D-value temp, enter direct heating and circulating heat preservation mode. That is to say, main engine continue running, close water inlet solenoid valve and water inlet pump, stop thermostat. Start circulating water pump and circulating
solenoid valve.

**4.1.2.2 direct heating and circulating heat preservation mode**

1. turn on, close low water level, enter direct heating and circulating heat preservation mode. Test whether water tank temp meets starting requirement, If not, test high water level switch, if it is open, enter direct heating mode. If it is closed, machine set enter standby state. If it meets the requirement, close water inlet solenoid valve and water inlet pump, stop thermostat. Start circulating water pump and circulating
solenoid valve. Test whether water flow switch is closed 30 seconds later, if it

is not closed, turn off and alarm.
2. after water flow switch is closed, start high-speed fan and compressor1 10 seconds later, start compressor2 10 seconds later.
3. start electric heating or not according to electric heating requirement.
4. direct heating and circulating heat preservation mode doesn't do water inlet. water inlet solenoid valve and water inlet pump are always closed.

**4.2. stop heating process**

**4.2.1 circulating mode**

Turn off, close compressorressor1, then close compressorressor2 and fan 5 seconds later, then close circulating pump 30 seconds later, then close circulating solenoid valve 5 seconds later.

**4.2.2. direct heating mode**

Turn off, make sure whether machine set is in direct heating mode or direct heating and circulating heat preservation mode

**4.2.2.1 direct heating and circulating heat preservation mode**

Turn off, stop compressorressor1 , 5 seconds later stop compressorressor2 and fan, 30 seconds later stop circulating pump, 5 seconds later stop circulating solenoid valve.

**4.2.2.2. direct heating mode**

Turn off or close high water level switch, machine set exit direct heating mode. Stop compressorressor1, 5 seconds later stop compressorressor2 and fan, 30 seconds later stop circulating pump, 5 seconds later stop circulating solenoid valve.

**4.3 defrost**

**4.3.1 enter defrost state**

1. when accumulated heating running time or defrost interval time reach "defrost starting time" and outdoor heat-exchange facility's copper pipe temp is lower than "defrost starting temp"
2. compressor run for 15 minutes

if one of the two compressor meets the two defrost requirements, it enter defrost state, and the other compressor defrost ,too.

When in direct heating mode, turn on circulating solenoid valve, turn off compressorressor1,2, and then turn off fan, water inlet pump and water inlet solenoid valve 5 seconds later. After 5 seconds start water inlet pump and water inlet solenoid valve. then stop selector valve 30 seconds later. 20 seconds later, compressorressor1,2 are electrified, and start to defrost.

When in direct heating and circulating heat preservation mode, turn on circulating solenoid valve, turn offcompressor1,2. After 5 seconds, close fan. then stop selector valve 30 seconds later. 20 seconds later, compressorressor1,2 are electrified, and start to defrost.

When in circulating mode, turn offcompressor1,2. After 5 seconds, close fan. then stop selector valve 30 seconds later. 20 seconds later, compressorressor1,2 are electrified, and start to defrost.

**4.3.2 exist defrost state**

(1) outdoor machine temp goes up to “defrost stopping temp”
(2) defrost time is more than “max defrost time”
Compressor meet either of the two requirements will stop working and wait for other compressors stop. When all the compressor meet exist defrost state requirement, they exist defrost state together and enter heating mode.
When controller test that pipe T≥“defrost stopping temp” or after working for “max defrost time”, related compressor stop working, wait for the other compressor meet exist defrost state requirement.
When in direct heating mode and meet exist requirement, stop compressor, close circulating pump and circulating solenoid valve 5 seconds later. After 5 seconds start water inlet pump and water inlet solenoid valve. After 20 seconds, start outdoor high-speed fan, change selector valve’s direction 40 seconds later. 20 seconds later compressors are electrified, and start to heat, and time defrost interval time again.
When in direct heating and circulating heat preservation mode and meet exist requirement, stop compressor, recover heating, and time defrost interval time again.
Circulating mode & direct heating and circulating heat preservation mode
Notice: when one outdoor temp sensor is broken, take the other outdoor temp sensor as standard.

When both two outdoor temp sensors are broken, test environment temp, if environment temp is lower than F35 and accumulative heating time(or defrost interval time) reaches “defrost starting time”, start defrost. If defrost time is more than “max defrost time”, stop defrosting.

**4.4 water level control**

**4.4.1 circulating mode**

1. when low water level switch is open, turn off main engine, after low water level switch is closed, circulating pump, compressor and fan can start working.
2. when low water level switch is open, water inlet solenoid valve is electrified and begin to replenish water, and supply-water pump stops working at the same time.

**4.4.2 direct heating mode**

1. when low water level switch is open, main engine turn on water inlet valve, thermostat is electrified and start working. When thermostat’s water flow switch is closed, open main engine compressors and fan, close circulating pump. When high water level switch is closed, main engine and thermostat stop working.
2. when high water level switch is closed, close water inlet pump and water inlet solenoid valve, thermostat stop working. when high water level switch is closed and tank temp≥setting temp, main engine stop working. If tank temp <D-value temp, enter direct heating and circulating heat preservation mode to heat.

**4.5 machine set circulating pump**

**4.5.1 circulating mode**

When machine set is running, circulating pump starts 40 seconds earlier than compressor. when machine set is closed, circulating pump stops 30 seconds earlier than compressor.

**4.5.2 direct heating mode**

When machine set is on in direct heating mode, if water inlet pump shares one pump with circulating pump, open circulating pump. if water inlet pump and circulating pump are independent, close circulating pump.

When machine set is on in direct heating and circulating heat preservation mode, run in the same way as circulating mode

**4.6 circulating solenoid valve**

**4.6.1 circulating mode**

System has no circulating solenoid valve

**4.6.2 direct heating mode**

When machine set is turned on in direct heating mode, close circulating solenoid valve

When machine set is turned on in direct heating and circulating heat preservation mode, open circulating solenoid valve

**4.7 backwater valve**

If tank temp≥ setting backwater temp, start backwater function.

If backwater temp sensor's temp reaches setting backwater temp, close backwater valve, if backwater temp sensor's temp is lower than setting backwater temp-8°C, open backwater valve again to make sure that supply-water pipe always has hot water.

**4.8 supply-water valve**

**4.8.1 circulating mode**

If tank temp≥ setting backwater temp and low water level switch is closed, supply-water pump can be open.

If tank temp< setting backwater temp-5°C， or low water level switch is open, close supply-water pump.

**4.8.2 direct heating mode**

If tank temp≥ setting backwater temp, supply-water pump can be open and is not controlled by low water level switch.

**4.8 four-way valve** (Associated with parameter F37, more details refer to F37)

**4.9 auxiliary electric heating**

**4.9.1 electric heating working condition**

If environment temp≤15°C, begin to test electric heating ON/OFF condition

1. tank setting temp- tank actual temp≥5°C, begin electric heating
2. 5°C> tank setting temp- tank actual temp>1°C， keep on
3. tank setting temp- tank actual temp≤1°C, stop electric heating
4. compressorwork for more than 3 minutes
5. low water level switch is closed. If circulating mode doesn't have or only have one water level switch, it will not judge whether to electric heating or not.

The difference between auto mode and manual mode

Auto mode: if environment >15°C, it forbidden electric heating

Manual mode: if environment >15°C, press key “electric heating” to enter electric heating mode by force( no need testing environment temp)

electric heating will not be restricted by rule 4(compressor work for more than 3 minutes) when defrosting.

**4.9.2 electric heating stopping condition**

1. tank actual temp≥ tank setting temp-1°C
2. tank temp sensor is broken

4.9.3 when electric heating is on, operation panel will display the “electric heating” signal and the signal will disappear when stop electric heating.

4.9.4 if it is impossible for machine set to recover from breakdown state, press key “electric heating” to enter electric heating mode by force, start auxiliary electric heating. When meet electric heating stopping condition, or press key “electric heating”, exist forced electric heating state and stop auxiliary electric heating.

**4.10. water inlet pump**

4.10.1. circulating mode

No water inlet pump

4.10.2. direct heating mode

When machine set is turned on in direct heating mode, open water inlet pump

When machine set is turned on in direct heating and circulating heat preservation mode, close water inlet pump

**4.11. water inlet selector valve control**

4.11.1. circulating mode

1. If setting parameter is set as 0, there is no need to control water inlet selector valve, it is always closed.
2. If setting parameter is set as 1, use high water level switch. When high water level switch is open, start water inlet selector valve. When high water level switch is closed, close water inlet selector valve.
3. If setting parameter is set as 2, use high and low water level switch. When high water level switch is closed, close water inlet selector valve.

When high water level switch is closed and

. When high water level switch is open and tank actual temp> tank setting temp-5°C, or low water level switch is open, open water inlet selector valve.

When low water level switch is closed and high water level switch is closed or actual temp< tank setting temp-10°C, close water inlet selector valve.

4.11.2. direct heating mode

When machine set is turned on in direct heating mode, if high water level switch is open, open water inlet selector valve. if high water level switch is closed, close water inlet selector valve

When machine set is turned on direct heating and circulating heat preservation mode, water inlet selector valve is always closed.

**4.12. outdoor fan working condition**

(1) fan is closed when compressor is closed and defrosting.

(2)when fan is running:

If environment temp≥F41 and both two compressors' temp≥F42-8°C, machine set run in low –speed fan.

If environment temp≤F41-5°C or either of the two compressors' temp ≤F42-16°C, machine set run in high –speed fan.

When any machine set is broken, run in low –speed fan.

(3) if both of the two compressor' temp ≥F42, close outdoor fan.

If environment temp≤F41-5°C or either of the two compressors' temp ≤F42-16°C, machine set run in high –speed fan.

**5. system protection**

**5.1. compressor delay time protection**( compressor starting delay time is adjustable(F21), take 3 minutes as example)

There is a compressor stopping timer in controller, it begins to time when compressor stops. Next time before compressor start, check the timer first, if it has got to 3 minutes, start compressor immediately. If it is less than 3 minutes, compressor will start until it reaches 3 minutes. Besides, the first 3 minutes controller is electrified, compressor will not start either.

**5.2. losting-phase and fault phase protection**

When three-phase power is in losting-phase and fault phase, machine set stops running and display code A91

**5.3. compressor current overload protection( when F30=1)**

Test current after compressor start for 3seconds, when current is more than setting current for 2 seconds( 3ph: setting current is 9A, 5ph: setting current is 16A, 10ph: setting current is 33A), compressor stop and alarm, and display alarm code "A93"

**5.4 Low temperature limits the compressor running**

if environment temp<F26, can't start compressor, you can only start electric heating

**5.5 water flow switch protection**

Circulating mode or direct heating and circulating heat preservation mode:

Check water flow switch after circulating pump run for 30 seconds. If check that water flow switch is open for 10 seconds, machine set stops running and display alarm code A14

Direct heating mode:

Controller checks that water flow switch is open for 10 seconds after circulating pump run for 10 seconds, turn off all the load and begin water flow switch protection

**5.6 water pressure switch protection( direct heating mode)**

After water inlet pump works for 10 seconds, controller checks that water pressure switch is open for 10 seconds, turn off all the load and begin water pressure switch protection

**5.7 high pressure protection**

Use always-closed switch. When controller checks that high pressure signal is open for 10 seconds, system stops working until high pressure signal comes back to normal and meet the requirement that compressor stopping protection time is more than 10 minutes. But if 3 alarms appear in one hour, system will be locked and remain in alarm state and display alarm code. It will not recover until you close manually.

**5.8. low pressure protection**

Use always-closed switch. Controller will not check low pressure signal in defrosting or stop defrosting for 3 minutes. Controller will not check low pressure signal when start heating for 3 minutes either.

When controller checks that low pressure signal is open for 10 seconds, system stops working until low pressure signal comes back to normal and meet the requirement that compressor stopping protection time is more than 10 minutes. But if 3 alarms appear in one hour, system will be locked and remain in alarm state and display alarm code. It will not recover until you close manually.

**5.9 overtop exhaust temp protection**

When controller checks that exhaust temp is higher than F45, stop heating and display alarm code. When exhaust temp drops to (F45-10°C) and compressor stopping protection time is more than 10 minutes, it begins to heat and cancel alarm code.

If F45=110°C, when exhaust temp is higher than 110°C, controller will enter alarm and stop heating. When exhaust temp is lower than 100°C, it will recover.

But if 3 alarms appear in one hour, system will be locked and remain in alarm state and display alarm code. It will not recover until you close manually.

**5.10 overtop water outlet temperature protection**

If water outlet temperature≥F72 for 20 seconds, start overtop water outlet temperature protection And machine set stop running. If water outlet temperature≤(F72-5°C) and compressor stopping protection time is more than 10 minutes, machine set recover to work.

But if 3 overtop water outlet temperature protection alarms appear in one hour, system will be locked and remain in alarm state and display alarm code.

**5.11. frost protection in winter**

In order to prevent water pipe and circulation pump frost, machine set can enter frost protection state when it is closed, standby and stopped.

If machine set meet the following requirements, it will enter frost protection state:
When environment temp>3°C, machine set will not do frost protection Circulation pump stop for 20 minutes
When environment temp≤3°C: if machine set is closed or standby, water outlet temperature≤4°C, enter frost protection
When enter frost protection, circulation pump start working, 60 seconds later, if water outlet temperature≥6°C, close circulation pump and exit frost protection state. If water outlet temperature < 6°C, start machine set to heat until tank temp goes up to 15°C, stop heating, and exit frost protection state.

**5.10.3. The treatment of the special conditions**

When in frost protection, tank temp sensor doesn't replenish.
If environment temp sensor is broken, cancel environment temp conditions of frost protection.
If water outlet temperature sensor is broken, only judge according to environment temp. when environment temp ≤3°C, circulating pump and circulation solenoid valve run for 2 minutes every 20 minutes.
If tank temp sensor is broken, machine set will not heat to protect frost.
If water outlet temperature sensor and environment temp sensor are both broken, circulating pump and circulation solenoid valve run for 2 minutes every 20 minutes.

**5.12 emergency operation function**

when the operation panel host communication failure or malfunction, close emergency switch automatic operation will set parameters by internally. When emergency switch is open, main engine will be turned off.

**5.13 temp sensor error protection**

When outdoor machine sensor1, exhaust sensor1, machine sensor1, exhaust sensor 2 are broken, they will not affect the other system operation, and display different codes to distinguish different systems.
When tank temp sensor is broken, machine set will stop running.
When temp sensor error disappeared, machine set will restart.

**6. system error and codes**

| Alarm sort | Alarm name | Alarm code | Cause | Measure |
|---|---|---|---|---|
| | Low pressure1 protection | A11 | Low pressure1 protection switch signal is abnormal | a. 1＃machine set stop running<br>b. Display alarm code |
| | High | A12 | High | a. 1＃machine |

| | | | | |
|---|---|---|---|---|
| Outside alarm | pressure 1 protection | | pressure1 protection switch signal is abnormal | set stop running<br>b. Display alarm code |
| | Low pressure2 protection | A13 | Low pressure2 protection switch signal is abnormal | a. 2# machine set stop running<br>b. Display alarm code |
| | High pressure 2 protection | A14 | High pressure2 protection switch signal is abnormal | a. 2# machine set stop running<br>b. Display alarm code |
| | Water flow switch protection | A15 | Water flow switch signal is abnormal | a. Stop<br>b. Display alarm code |
| | Water pressure switch | A16 | | a. Stop<br>b. Display alarm code |
| Sensor alarm | Tank temp sensor alarm | A21 | Tank temp sensor is open or short circuit | a. Stop<br>b. Display alarm code |
| | Defrost temp sensor1 alarm | A22 | Defrost temp sensor1 is open or short circuit | a. Cancel related function and protection<br>b. Display alarm code |
| | Defrost temp sensor2 alarm | A23 | Defrost temp sensor2 is open or short circuit | a. Cancel related function and protection<br>b. Display alarm code |
| | Exhaust sensor 1 alarm | A24 | Exhaust sensor 1 is open or short circuit | a. Cancel related function and protection<br>b. Display |

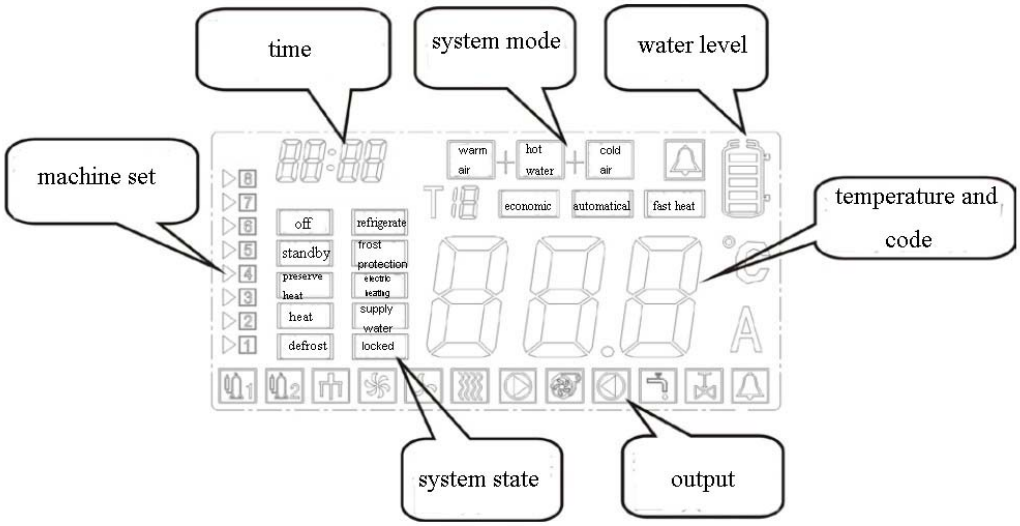
| | | | | |
|---|---|---|---|---|
| | | | | alarm code |
| | Exhaust sensor 2 alarm | A25 | Exhaust sensor 2 is open or short circuit | a. Cancel related function and protection<br>b. Display alarm code |
| | Environment sensor alarm | A28 | Environment sensor is open or short circuit | a. Cancel related function and protection<br>b. Display alarm code |
| | water outlet temperature sensor alarm | A29 | water outlet temperature sensor is open or short circuit | a. Cancel related function and protection<br>b. Display alarm code |
| | Backwater sensor alarm | A30 | Backwater sensor is open or short circuit | a. Cancel related function and protection<br>b. Display alarm code |
| System protection | Overtop water temp protection | A41 | Tank temp is 10°C more than setting temp | a. Stop<br>b. Display alarm code |
| | Overtop exhaust sensor 1 temp protection | A42 | exhaust sensor 1 temp is too high | a. 1＃machine set stop running<br>b. Display alarm code<br>c. Recover automatically when exhaust temp come down |
| | Overtop exhaust sensor 2 temp protection | A43 | exhaust sensor 2 temp is too high | a. 2＃machine set stop running<br>b. Display alarm code<br>c. Recover automatically |

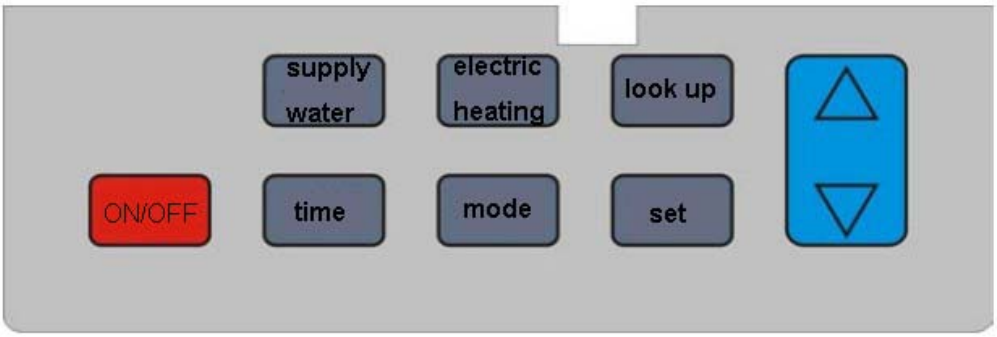
| | | | | |
|---|---|---|---|---|
| | | | | when exhaust temp come down |
| | Overtop water outlet temperature sensor temp protection | A44 | water outlet temperature is too high | a. Stop<br>b. Display alarm code |
| | Pipe freeze protection | A45 | water outlet temperature is too low | a. Start circulating water pump<br>b. Display alarm code<br>c. Recover automatically when water outlet temperature goes up |
| | Environment temp is lower than compressor temp setting low temp | A46 | | a. Stop<br>b. Display alarm code |
| | Water level switch alarm | A47 | | a. Stop<br>b. Display alarm code |
| Others | Losing phase and phase sequence protection | A91 | | a. Stop<br>b. Display alarm code |
| | Compressor 1 over current protection | A93 | | a. 1＃machine set stop running<br>b. Display alarm code |
| | Compressor 2 over current protection | A94 | | c. 2＃machine set stop running<br>d. Display alarm code |
| | Reach restrictive | A99 | | a. Stop<br>b. Display |

| | running time | | | alarm code |
|---|---|---|---|---|
| Communication | Communication alarm | --- | Communication between operation and mother board | a. Display alarm code and icon<br>b. Recover automatically when alarm disappear |

**Notice:** when there is alarm protection, display alarm code and flicker

Operation panel **Wiring Diagram**




**Display function**

Controller always display real time, temp in water tank, system mode, system state and machine set output state.

**1.1 On/off**

Press key On/off to turn on or turn off

**1.2. set water temp**

Press key set to enter temp setting state. use the key “▲” and “▼” to change the setting value(“▲”adds 1°C and “▼”minuses 1°C, press and hold it over 0.5 seconds can add or minus rapidly) Press “S” again to exit the setting

state.

**1.3. Set time**

Press "◷", year part of the time display is coruscating, use "▲" and "▼" to adjust the year, press "◷" again after adjusting, then you can adjust the hour, minute, second in the same way, finally you can press "◷" exit the state of time setting.

**1.4. Set working mode**

Press key "M" to change two modes between "auto mode" and "economical mode". Can control the heat pump whether to heat or not according to setting temperature in "auto mode". Controller only heats in the three setting periods of time when it is in "economical mode", and in other time it doesn't work.

**1.5. Set time of economical mode**

Long press "◷" for 2 seconds, the controller can enter the state of heat period of time, you can set 3 heat periods of time in turn according to the display of LCD.( press "◷" to switch setting items, press "▲" or "▼" to change its value)

The controller can be set 3 heat periods of time at most, if you don't need so many periods of time, you can set the starting time and ending time which you don't need as "00:00".

In addition, if the ending time is earlier than starting time, the controller considers this ending time is

next day. For example, the period of time is "22:00" to "03:30", the controller considers it as 22:00 at night to 03:30 next day.

**1.6. inquire temp**

Press key inquire to enter temp inquiring state, use "▲" and "▼" to inquire each temp sensor's temp, and compressorressor1 and compressorressor2's current. It display tank temp in usual time.

**1.7. press key to lock itself**

Press key "▲" and "▼" together for 5 seconds will lock button and the Operation panel's keyboard, display locked, all the key will be ineffective. And press key "▲" and "▼" together for 5 seconds again will unlock.

**1.8. manual auxiliary electric heating**

Press key electric heating to start or stop auxiliary electric heating

**1.9. manually supply water**

Press key supply water to start or stop auxiliary supplying water

## Wiring Diagram