CONTROL PANEL INSTRUCTIONS

FOR TYPE 12

SIRAC WATER TO WATER HEAT PUMPS

V. 03

1. Introduction

1. This controller is applicable to water to water heat pumps with single compressor or dual compressors.
2. This controller is composed of mainboard control panel and connecting wires.
3. Major Functions:

- Cooling；
- Heating；
- Hot Water Priority Function
- Automatic Water Temperature Adjustment;
- Backup Electricity Heater;
- 2-way Valve Interlock;
- Remote Control;
- Operation of Modular Units;
- LCD Display；
- Clock Display
- 24 Hours Timer Clock；
- User Parameter Setting；
- Powerdown Memory；
- User Function Selection；
- Winter Anti-freeze Protection；
- Insufficient Water Flow Protection；
- High/Low Pressure Protection；
- Frost Protection；
- Overtemp Protection;
- Compressor Safety Startup, Running Protection and Balanced Running;
- Concise Fault & Protection Display；
- Complete Temperature Monitoring

2. System Configuration

a. Compressor 1;
b. 4-way Reversing Valve 1;
c. Compressor 1 High/Low Pressure Switch;
d. Compressor 2;
e. 4-way Reversing Valve 2;
f. Compressor 2 High/Low Pressure Switch;
g. Outlet Primary Water Temperature Sensor;
h. Inlet Primary Water Temperature Sensor;
i. Water Pump, Water Flow Switch;
j. Anti-freeze Switch;
k. Inlet Secondary Water Temperature Sensor;
l. Outlet Secondary Water Temperature Sensor;
m. Crankcase Heating Element;
n. Three-way Valve;
o. Hot Water Temperature Sensor;
p. Backup Electricity Heating Element (Optional).

3. System Settings

1 Multiple functions are available for selection by users（jumper selection）
2 Function List（JP1, JP2, JP3,JP4,JP5,JP6,JP7,JP8 Settings）：

State / Function / Switch	Open	Closed	Remarks
JP1	Operation diagnostic. Customer Adjustment not Allowed		
JP2	Two Compressor	One Compressor Mode	

	Mode		
JP3	Compressor Starts One Minute After Power Is Up	Compressor Starts Three Minute After Power Is Up	
JP4	Duty	Assist	
JP5	Automatic Unit Startup Allowed When Power Is Restored	Only Manual Unit Startup Allowed When Power Is Restored	
JP6	Interlock Control Valid	Interlock Control Not Valid	
JP7	Hot Water Heating Valid	Hot Water Heating Invalid	
JP8			

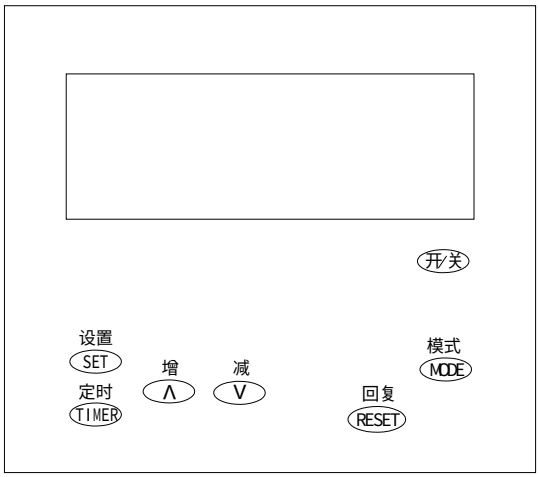
3. Default Values (D=disconnected, C=Connected)：

JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8
D	D	D	D	D	D	D	D

4. For valid function selection, setting should be finished before power is up.

4. Panel Regulation & Parameter Setting

1. Panel Buttons



2． Panel Regulation

（1）ON/OFF BUTTON

Press this button to switch on or switch off the unit.

（2）MODE BUTTON

Press this button to switch the unit between HEAT mode and COOL mode.

（3）TIMMER BUTTON

Press Timer Button then Up/Down Button to set automatic on/off time.

First Press: set “ HOUR ” digit for “ AUTOMATIC ON ”

Second Press: set “ MINUTE” digit for “AUTMATIC ON”

Third Press: set “ HOUR ” digit for “ AUTOMATIC OFF ”

Fourth Press: set “ MINUTE ” digit for “ AUTOMATIC OFF ”

Fifth Press: exit Timer state.

Note: when the set times for automatic on and off are the same, the timer setting will become invalid.

Press Timer button continuously for 5 seconds to set clock time.

First Press: set HOUR digit of the clock time.

Second Press: set MINUTE digit of the clock time.

(4) RESET BUTTON

If a fault has already been remedied, press RESET Button to clear up the fault code on the display screen. Otherwise, RESET Button is invalid.

(5) "△" "▽" BUTTONS

Press these buttons to change set parameter values.

(6) SET BUTTON

Press SET button to check up the operation parameters. (see parameter checkup)

Press this button continuously for ten seconds to set parameter values. The control panel will be restored from parameter setting mode if no buttons are pressed within 5 seconds.

5. Function Description

1. Cooling Mode

- Cooling Process:

Unit on – select cooling mode – Control panel screen displays inlet secondary water temperature and set water temperature – primary and secondary water pumps on – 40 seconds time delay- Check status of secondary water flow switch – check status of primary flow switch – 20 seconds time delay – Compressor 1 on – 10 seconds time delay – Compressor 2 on (if JP2 disconnected)

- Cooling Ending Process:

Unit off – Cooling function ends- Control Panel screen displays inlet secondary water temperature- Compressor 1 off – 10 seconds delay – Compressor 2 off – 2 minutes time delay – primary and secondary water pumps off.

- Compressor On Conditions：

When Ti ≥Ts +△T

Compressor Off Conditions：

When Ti ≤ Ts，

Where Ti is the inlet secondary water temperature, Ts is the set value for inlet secondary water temperature and △T is set value for P7.

2. Heating Mode

- Heating Process Process:

Unit on – select heating mode – Control panel screen displays inlet secondary water temperature and set water temperature – 4-way reversing valve, primary and secondary water pumps on – 40 seconds time delay- Check status of secondary water flow switch – check status of primary flow switch – 20 seconds time delay – Compressor 1 on – 10 seconds time delay – Compressor 2 on (if JP2 disconnected) – 30 seconds time delay – Backup electricity heater on

- Heating Ending Process:

Unit off – Heating function ends- Control Panel screen displays inlet secondary water temperature- 4-way reversing valve, backup electricity heater and compressor 1 off – 10 seconds delay – Compressor 2 off – 2 minutes time delay – primary and secondary water pumps off.

- Compressor On Conditions：

When Ti ≤ Ts–△T

- Compressor Off Conditions：

When Ti ≥ Ts

Where Ti is the inlet secondary water temperature read by the sensor, Ts is the set value for inlet secondary water temperature and △T is set value for P7.

- Backup Electricity Heating Element On Conditions:

In heating mode, only if Ta≤Te, the backup electricity heater function will be valid.

(1) for single compressor system

when Ti ≤ Ts -4°C, the backup electricity heater will be on;

when Ti ≥ Ts -2°C, the backup electricity heater will be off;

(2) for dual compressors system

when Ti ≤ Ts -6°C, the backup electricity heater will be on;

when Ti ≥ Ts -2°C, the backup electricity heater will be off;

Where Ta is the ambient air temperature, Ts is set value for P6, Ti is the inlet secondary water temperature, Ts is the set value for inlet secondary water temperature.

3. Power Down Memory

Set parameter values will not be lost on powerdown occasions; If control panel is disconnected by accident, the system will remain working as normal. Whether the powerdown occurs while the unit is on or off, once the power is restored, the unit will be restored to the state prior to the occurrence of powerdown (if switch JP5 is disconnected). Set times before the occurrence of powerdown will become void after the power is restored.

4. Interlock Switch (EN) control

(In cooling mode) when the unit is off, the duty unit will check the status of 2-way switches in the fan coil units all the time. If any switch jumps from disconnected to connected state, the unit will be started. When all the switchs jump from connected to disconnected state, the unit will be shut down.

When unit is an assist unit as set by JP4, the on/off and mode button on the control panel of this assist unit will become void. The assist unit will receive heating or cooling signal from the duty unit, and run according to the set mode in the signal.

5. **Unit Protection**

- **Anti-freeze Protection**

(1) For Secondary Water

While the unit is off, once the inlet secondary water temperature is lower than the set value for P3, in sixty seconds the unit will automatically run in heating mode to protect itself from freezing.

Anti-freeze Protection Process

Panel Screen Displays E17 ——> 4-way Reversing Valve, Backup Electricity Heater, Primary Water Pump On ——> Compressor 1 and Compressor 2 On——> Inlet Secondary Water Temp＞15℃——> All outputs closed in sequence——> Unit back to Off State

If the Inlet Secondary Water Temp is no bigger than P3 value plus 3°C, the secondary water pump will run for five minutes every thirty minutes.

(2) For Primary Water

While the unit is off, once the inlet primary water temperature is lower than the set value for P3, in sixty seconds the unit will automatically start the primary water pump. After the inlet primary water temp is above 10°C, the primary water pump will stop and the unit goes back to off state.

- **Compressor Running Protection**

① Time Delay from Compressor On to Compressor Off: sixty seconds

② Time Delay from Compressor Off to Compressor On: three minutes

③ To ensure that the compressors will run in a balanced way, the system will count the accumulated running time of each compressor. The system always starts first the compressor with the shortest accumulated running time, and shuts down first the compressor with the longest accumulated running time.

④ To reduce the shock of starting current, for dual compressors system, there will be a delay of at least 30 seconds between the startups of two compressors, and at least 10 seconds between the shutdowns of two compressors.

- **Temperature Sensor Fault Protection**

Fault with any of Inlet Secondary Water, Outlet Secondary Water, Ambient Air, Inlet Primary Water, Outlet Primary Water and Hot Water Temperature Sensors will close all outputs.

- **Insufficient Secondary Water Flow Protection**

All outputs will be closed if water flow is insufficient.

The system will check Water Flow Switch forty seconds after the pump is on. Insufficient secondary water flow protection will be activated if the switch is observed to be disconnected for a continuous 10 seconds.

- **Primary Water Flow Switch (FW-C) Protection**

The system will check the Primary Water Flow Switch forty seconds after the primary water pump is on. If the switch is observed to be disconnected for a continuous 10 seconds, Insufficient Primary Water Flow Protection will be activated and the compressor(s) will be shut down.

- **High/Low Pressure Protection**

① High Pressure Protection：If the High Pressure Switch is observed to be disconnected, High Pressure Protection will be activated and the corresponding compressor will be shut down.

② Low Pressure Protection: When the Low Pressure Switch is observed to be disconnected for a continuous 30 seconds, the corresponding compressor will be shut down.

(Low Pressure switch will not be observed within 30 seconds before the compressor is started).

③ The system will reset automatically (if the fault is corrected) if the protection occurrence is not more than twice in one hour. Otherwise, the fault will be locked.

- **Outlet Secondary Water Temp Too High in Heating (E15)**

In heating mode, if the outlet secondary water temperature is higher than the set value for P1, compressor(s) and backup electricity resistance heater will be shut down till the outlet water temperature becomes 15°C lower than the set value.

- **Outlet Secondary Water Temp Too Low in Cooling (E16)**

In cooling mode, if the outlet secondary water temperature is lower than the set value for P0, compressor will be shut down but the secondary water pump will continue to run. Three minutes later if the outlet secondary water temperature is higher than P0 value plus 3°C, and the inlet secondary water temperature satisfy the Compressor On conditions, the unit will begin to work again.

- **Inlet/Outlet Primary Water Temp Too High in Cooling (E20,E21)**

In cooling mode, five minutes after the compressor is started, if the inlet or outlet primary water temperature is higher than the set value for P4, one compressor is shutdown.

- **Inlet/Outlet Primary Water Temp Too Low in Heating (E22,E23)**

In heating mode, five minutes after the compressor is started, if the inlet or outlet secondary water temperature is higher than the set value for P5, one compressor is shutdown.

6. **Heating/Cooling Signal Output**

Cooling Signal (P-C)：In cooling mode, thirty seconds after the first compressor in the duty unit is started,

the signal will be transmitted to other units. After both compressors are shut down, the signal will be cut out.

Heating Signal (P-H) : In heating mode, thirty seconds after the first compressor in the duty unit is started, the signal will be transmitted to other units. After both compressors are shut down, the signal will be cut out.

7. Heating/Cooling Signal Input

When the unit is set as assist unit (JP4 disconnected), button regulation on the control panel is disabled. The assist unit will receive the heating/cooling signal from the duty unit and act accordingly.

6. Parameter Setting & Display

Serial No.	Parameter Name	Max	Min	Precision	Default
P0	Outlet Secondary Water Temp Too Low in Cooling	10	0	℃	5
P1	Outlet Secondary Water Temp Too High in Heating	67	40	℃	60
P2	Hot Water Temp	60	25	℃	55
P3	Winter Anti Freeze Protection Cutin Temperature	5	0	℃	3
P4	Inlet/Outlet Primary Water Temp Too High in Cooling	65	40	℃	55
P5	Inlet/Outlet Primary Water Temp Too Low in Heating	25	-10	℃	5
P6	Backup Electricity Heating Ambient Temp	10	-5	℃	3
P7(△T)	Temp Difference Between Inlet and Outlet Secondary Water Temps	10	0	℃	5
P8	Temp Control Mode Selection in Heating	1	0	1	0
P9	Compensation Temp in Heating	30	0	℃	25
PA	Temp Coefficient in Heating	3	0	0.1	1
PB	Operation Mode	2	0	1	1

	0=Cooling Only 1=Cooling and Heating 2=Heating Only				

In P8, value “0” means that unit will operate according to manually hot water temperature set as in P3. Value “1” means that the unit will operate according to automatically set secondary water temperature.
Automatically set secondary water temperature = P9 + PA * (P9 – Ambient Temp).
The limitations of automatically set secondary water temperature are the same as those for hot water temperature as in P2.
The panel screen display for PA value is 0 ~ 30. The real value is 0 ~ 3 (for example, if the displayed value is 10, the real value will be 1).

7. Unit Fault and Protection

Serial No	Input Port	Fault	Code	Treatment
1	TH1	Inlet Secondary Water Temperature Sensor Fault	01	Close All Outputs (Except For Water Pump)
2	TH2	Outlet Secondary Water Temperature Sensor Fault	02	Close All Outputs (Except For Water Pump)
3	TH3	Ambient Air Temperature Sensor Fault	03	Close All Outputs (Except For Water Pump)
4	TH4	Inlet Primary Water Temperature Sensor Fault	04	Close All Outputs (Except For Water Pump)
5	TH5	Outlet Primary Water Temperature Sensor Fault	05	Close All Outputs (Except For Water Pump)
6	FLOW	Insufficient Water Flow	06	Close All Outputs
7	HP1	High Pressure Protection-Compressor 1	07	Compressor 1 Off
8	///	More Than 2 Times High Pressure Protection in One Hour-Compressor 1	08	Compressor 1 Off
9	LP1	Low Pressure Protection-Compressor 1	09	Compressor 1 Off
10	///	More Than 2 Times Low Pressure Protection in One Hour-Compressor 1	10	Compressor 1 Off
11	HP2	High Pressure Protection-Compressor 2	11	Compressor 2 Off
12	///	More Than 2 Times High Pressure Protection in One Hour-Compressor 2	12	Compressor 2 Off
13	LP2	Low Pressure Protection-Compressor 2	13	Compressor 2 Off

14	///	More Than 2 Times Low Pressure Protection in One Hour-Compressor 2	14	Compressor 2 Off
15	///	Outlet Secondary Water Temp Too High in Heating	15	Compressor(s) Off
16	/ / /	Inlet Secondary Water Temp Too Low in Cooling	16	Compressor(s) Off
17	/ / /	Winter Anti Freeze Protection for Secondary Water	17	Starts Heating Mode
18	/ / /	Winter Anti Freeze Protection for Primary Water	18	Starts Primary Water Pump
19	FW-C	Primary Water Flow Switch Protection	19	Close All Outputs (Except For Water Pump)
20	///	Inlet Primary Water Temp too High in Cooling	20	One Compressor Off
21	///	Outlet Primary Water Temp too High in Cooling	21	One Compressor Off
22	///	Inlet Primary Water Temp too Low in Heating	22	One Compressor Off
23	///	Outlet Primary Water Temp too Low in Heating	23	One Compressor Off
24	///	Communication Fault	24	Close All Outputs
25	BUS	Synthetic Fault	25	Close All Outputs

Note:

(1) Errors 01,02,03,04,05,07,09,11,13,15,16,17,18,24,25 can be reset automatically after the errors have been corrected.

(2) Errors 06,19,20,21,22,23 can only be reset manually.

(3) Errors 08,10,12,14 require powerdown to reset.

(4) Errors 20, 21,22,23 will be disabled within the first five minutes after the compressor is started.

8. TEMPERATURE CHECKUP

Serial No.	Parameter
0	Outlet Secondary Water Temp
1	Ambient Air Temp
2	Inlet Primary Water Temp
3	Outlet Primary Water Temp
4	Hot Water Temp