

CONTROL SPECIFICATION

Water-Air / Water-Water Heat Pump

DC Inverter Duct System

1-phase-208V



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Author		

Check		

Approval		

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I: system structure and inputs

1: Definition of inputs & outputs

1.1, Inputs

	Air -Water System <i>Source-side means water side</i>	Water-Water System
T ₁ (B2-GND)	Comp Disc temp analog input	Comp Disc temp analog input
T ₂ (reserved)	<i>Source-side</i> coil refrigerant inlet temp analog input (Reserved);	<i>Source-side</i> coil refrigerant inlet temp analog input (Reserved);
T ₃ (B8-GND)	<i>Source-side</i> coil refrigerant outlet temp analog input;	<i>Source-side</i> coil refrigerant outlet temp analog input;
T ₄ (B6-GND)	Air-side coil refrigerant middle temp analog input (<i>note: return air</i>)	Load side coil refrigerant middle temp analog input (<i>note: return water</i>)
T ₅ (reserved)	Air-side coil refrigerant outlet temp analog input	Load-side coil refrigerant outlet temp analog input;
T ₆ (reserved)	Comp suction temp analog input (reserved);	Comp suction temp analog input (reserved);
T ₇ (reserved)	<i>Source-side</i> water inlet temp analog input (reserved)	<i>Source-side</i> water inlet temp analog input (reserved)
T ₈ (B4-GND)	<i>Source-side</i> water outlet temp analog input	<i>Source-side</i> water outlet temp analog input
T _e (B1-GND)	Air-returned temp analog input (<i>note: discharge</i>)	Load-side water-returned temp analog input (<i>note: discharge</i>)
K ₁ (ID1)	High pressure protection switch signal input	High pressure protection switch signal input
K ₂ (ID2)	Low pressure protection switch signal input	Low pressure protection switch signal input
K ₃ (ID3)	<i>Source-side</i> Water volume protection switch signal input	<i>Source-side</i> water volume protection switch signal input
K ₄ (ID5)	Water level protection switch signal input	<i>Water level</i> protection switch signal input
????	<i>Reserved</i>	Load-side water volume protection switch signal input
	T2, T5, T6, T7 are used when controlled by Superheat solution. Now it is controlled by Thermo expansion valve. So they are reserved design.	T2, T5, T6, T7 are used when controlled by Superheat solution. Now it is controlled by Thermo expansion valve. So they are reserved design.

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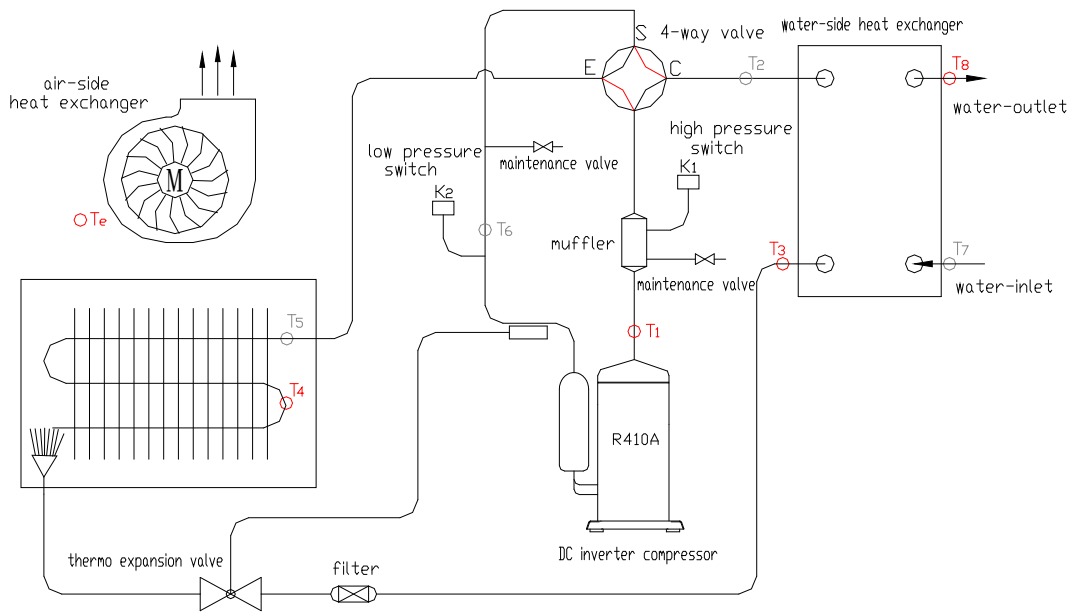
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1.2, outputs

	Water-Air System	Water- Water System
V ₁ (RY1/Ry2)	Power supply soft start-up relays output (Max current 30A/pc)	Power supply soft start-up relays output (Max current 30A/pc)
V ₂ (N07-L4)	4-way valve relay output (Max current 5A)	4-way valve relay output (Max current 5A)
V ₃ (N08-L4)	Electric heater relay output (Max current 5A)	Electric heater relay output (Max current 5A)
V ₄ (N06-L3)	Water pump relay output (Max current 5A)	Source-side Water pump relay output (Max current 5A)
V ₅ (N01-L1)	Fan motor speed Hi relay output (Max current 5A)	Load-side water pump relay output (Max current 5A)
V ₆ (N02-L1)	Fan motor speed Mi relay output (Max current 5A)	relay output (Max current 5A) (reserved design)
V ₇ (N03-L1)	Fan motor speed Lo relay output (Max current 5A)	relay output (Max current 5A) (N03-L1)(reserved design)
V _{PWM}	Fan speed control PWM signal output	PWM signal output (reserved design)

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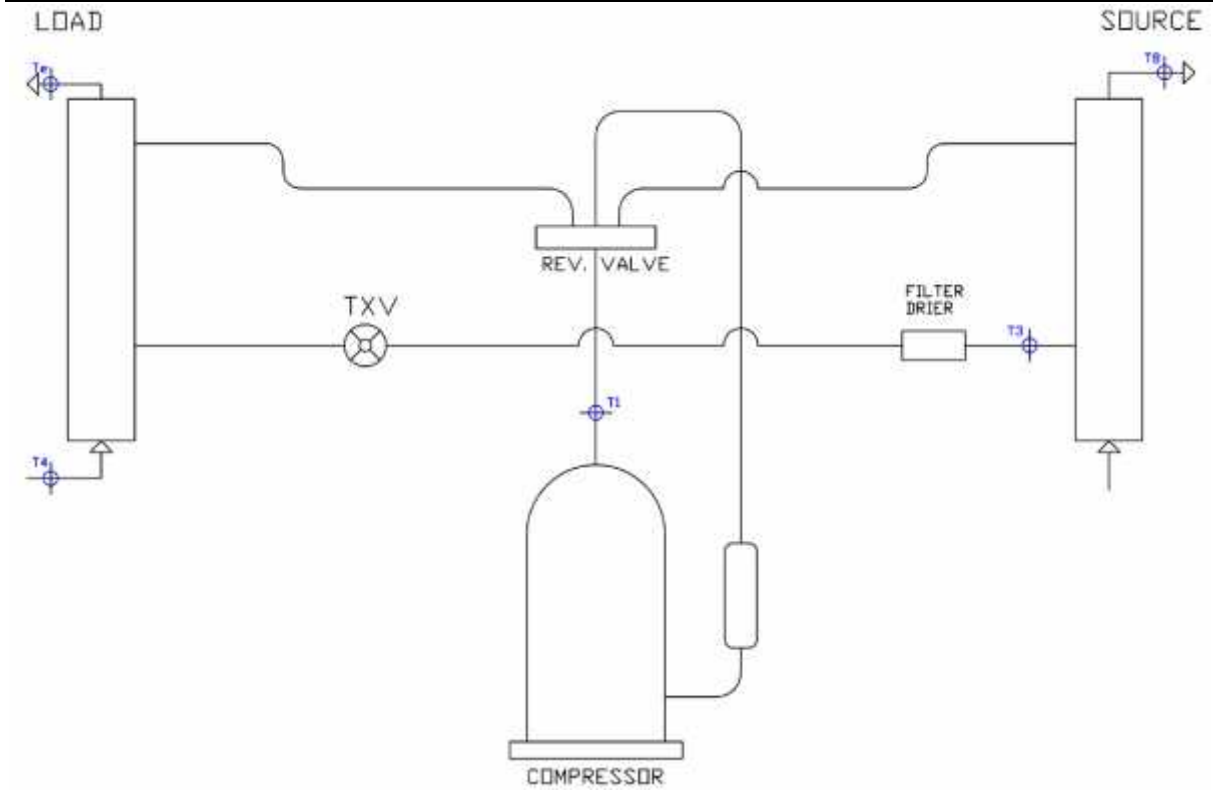
2: system block diagram



Water-Air System

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Water- Water System

Remarks:

	Water-Air System	Water- Water System	
	Te: Air-returned temp (discharge →)	Te: Load-side water-returned temp	
	Ts: Setting temp	Ts: Setting temp	
	T1: Comp Disc temp	T1: Comp Disc temp	
	T2: Water-side coil refrigerant inlet temp	T2: Source-side coil refrigerant inlet temp	
	T3: Water-side coil refrigerant outlet temp	T3: Source-side coil refrigerant outlet temp	
	T4: Air-side coil refrigerant inlet temp	T4: Load-side coil refrigerant inlet temp	
	T5: Air-side coil refrigerant outlet temp	T5: Load -side coil refrigerant outlet temp	
	T6: Comp Suction temp	T6: Comp Suction temp	
	T7: Cool water inlet temp	T7: Source-side water inlet temp	
	T8: Cool water outlet temp	T8: Source-side water outlet temp	
	T2, T5, T6, T7 are used when controlled by Superheat solution. Now it is controlled by Thermo expansion valve. So, they are reserved design.	T2, T5, T6, T7 are used when controlled by Superheat solution. Now it is controlled by Thermo expansion valve. So, they are reserved design.	

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3: Parameters list adjustable

black line: air-water system parameters name red line: water-water system parameters name, if it lack, means the same as black line	Reference	Default value	Max value	Mini value	Disabled	Steps
Cool water temp too high protection in cooling , T8 Source side outlet water temp too high protection in cooling,T8	A01	122°F/50°C	140°F/60°C	104°F/40°C	--	1°F/°C
Cool water temp too low protection in cooling, T8 Source side outlet water temp too low protection in cooling,T8	A02	34°F/1°C	86°F/30°C	34°F/1°C	-- ^②	1°F/°C
Cool water temp too high protection in heating, T8 Source side outlet water temp too high protection in heating,T8	A03	95°F/35°C	68°F/20°C	37°F/3°C	--	1°F/°C
Cool water temp too low protection in heating, T8 Source side outlet water temp too low protection in heating,T8	A04	41°F/5°C	68°F/20°C	37°F/3°C	-- ^②	1°F/°C
Normal water / with Glycol	A05	0 normal water	1 with Glycol	0 normal water	-- ^②	1°F/°C
Air-returned temp adjust in cooling, Te Load side return water temp adjust in cooling, Te	A06	0°F/-18°C	16°F/-9°C	-16°F/-27°C	--	1°F/°C
Air-returned temp adjust in heating, Te Load side return water temp adjust in heating, Te	A07	0°F/-18°C	16°F/-9°C	-16°F/-27°C	--	1°F/°C
On/Off air-return temp difference, Ts-Te	A08	2°F/-17°C	9°F/-13°C	2°F/-17°C		1°F/°C
Coil anti-cold-air temp in heating, T4 (Water Water system this parameter invalid)	A09	86°F/30°C	104°F/40°C	68°F/20°C	--	1°F/°C
Status-memory when power failure	A10	Enabled	Enabled	Disabled		
°F/°C	A11	°F	°C	°F		
Filter net cleaning time	A12	30day	60day	10day	--	1day
Compressor highest frequency permissible	A13	61Hz	90Hz	15Hz		1Hz
Auto Fan speed coil temp in cooling (Water Water system this parameter invalid)	A14	50°F/10°C	63°F/17°C	45°F/7°C		1°F/°C
Auto Fan speed coil temp in heating (Water Water system this parameter invalid)	A15	115°F/46°C	124°F/51°C	106°F/41°C		1°F/°C
Auto Fan speed shifting temp difference (Water Water system this parameter invalid)	A16	5°F/-15°C	13°F/-11°C	2°F/-17°C		1°F/°C

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Set comp frequency manually	A17	61Hz	110Hz	15Hz		1Hz
Enable / disable set comp frequency manually	A18	Disabled	Enabled	Disabled		
Air-side coil anti-frost in cooling, T4 Load side coil anti-frost in cooling, T4	A19	32°F/0°C	50°F/10°C	14°F/-10°C	--	1°F/°C
		30°F/1°C	41°F/5°C	28°F/-2°C		
Air-side coil anti-over-temp in heating, T4 Load side coil anti-over-temp in heating, T4	A20	140°F/60°C	158°F/70°C	122°F/50°C	--	1°F/°C
water-side coil temp too high protection in cooling, T3 source side coil temp too high protection in heating, T3	A21	122°F/50°C	158°F/70°C	122°F/50°C	--	1°F/°C
Water-side coil temp too low protection in heating, T3 source side coil temp too low protection in heating, T3	A22	28°F/-2.2°C	41°F/5°C	9°F/-13°C	--	1°F/°C
Mini operation frequency	A23	15Hz	40Hz	15Hz		1Hz

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Remarks:

①:

When system work in cooling mode: if 【A06】 = '- -', $T_a = T_e$. otherwise, $T_a = T_e - 【A06】$.

When system work in heating mode: if 【A07】 = '- -', $T_a = T_e$. otherwise, $T_a = T_e - 【A07】$.

Definition:

T_a : load side / air side ambient temp.

T_s : setting temp.

Control target is to make T_a close to T_s .

Definition of T :

When system work in cooling or dehumidification mode, $T = T_a - T_s$

When system work in heating mode, $T = T_s - T_a$

②:

When setting of A05 is "1 with Glycol",

The minimum value of A04 is 2°F/-17°C,

The minimum value of A02 is 2°F/-17°C too.

II: operation modes

Air-water system:

Totally there are 5 operation modes: cooling dehumidification fan heating / electric heater auto. Temp setting range 58~90 (14~32). Fan speed setting: Lo, Mi, Hi, Auto.

Water-water system:

Totally there are 2 operation modes: cooling heating. Temp setting range 50~122°F (10~50);

1: cooling mode

1.1, fan motor control (for Water-Water system this chapter is invalid)

Fan motor will start immediately when users start the unit.

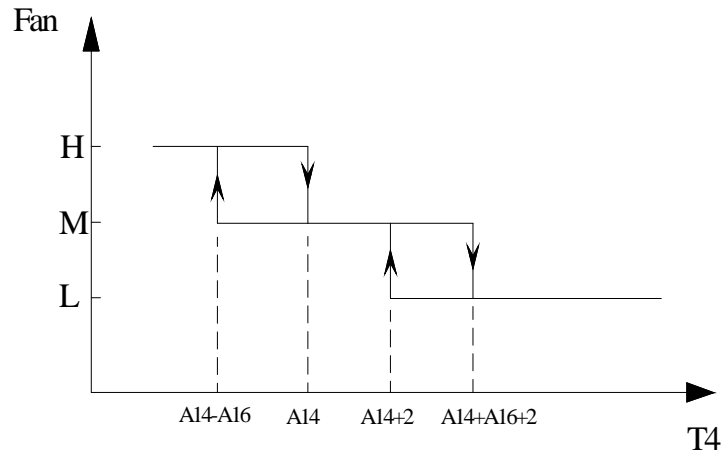
If the setting of fan speed is Lo, Mi, or Hi, it will operates at low, middle, high speed.

If the setting of fan speed is Auto, fan speed is controlled by coil middle temp T_4 . See following:

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Cooling



When $T_4 \geq (A14+A16+2)$, it will shift to low speed;

When $A14 \leq T_4 < (A14+2)$, it will shift to middle speed;

When $T_4 < (A14 - A16)$, it will shift to high speed;

After fan speed shifted, there will be at least 3min operate to shift to another speed again.

Fan motor stoppage will have a 3-second-delay when shut down the unit.

1.2, compressor control

(1), Compressor will operate if the T_2 after unit started.

(2), Compressor starts when no errors and meet the requirements of 3-minute-delay.

(3), Water pump (optional) will be started prior to compressor

(4), Compressor starts only when water pump operates (optional) and water volume switch (if no, short connected) sense there is water volume

(5), Compressor shall be shut down when $T < -【A08】$ and compressor operates more than 3 minutes.

(6), Compressor will be shut down immediately when $T < -9$

(7), Compressor will shut down immediately when users stop the unit

2: dehumidification mode (for Water-Water system this chapter is invalid)

2.1, fan motor control

Always operates at low speed.

2.2, compressor control

As the same as in cooling mode.

3: fan mode (for Water-Water system this chapter is invalid)

3.1, fan motor control

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Same as in cooling mode.

3.2, compressor control

Compressor stops

4: heating mode

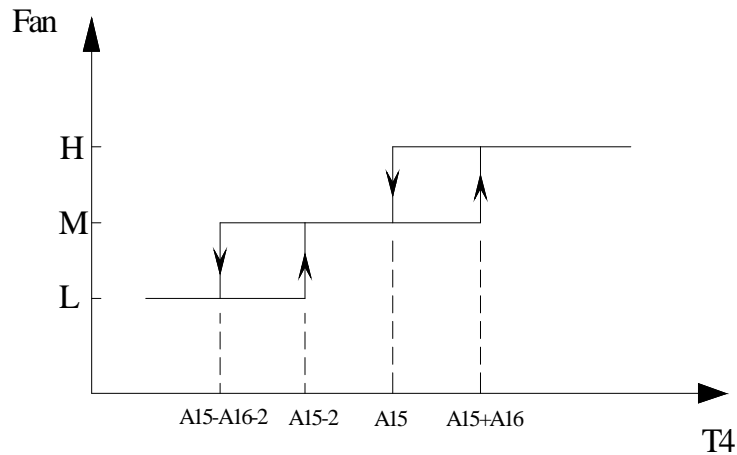
4.1, fan motor control (for Water-Water system this chapter is invalid)

When users start the unit in heating mode, it will first judge the anti-cold-air. Fan motor will stop when air-side coil temp $T_4 < \text{【A09】}$, fan motor will operate at setting speed when $T_4 \geq \text{【A09】}$. Longest time period for anti-cold-air operation is 180S.

Fan motor will operate at low, middle, high speed when if setting speed is Lo, Mi, Hi.

If the setting of fan speed is Auto, fan speed is controlled by coil middle temp T_4 . See following:

Heating



When $T_4 \geq (A15+A16)$, it will shift to high speed;

When $(A15-2) \leq T_4 < A15$, it will shift to middle speed;

When $T_4 < (A15 - A16-2)$, it will shift to low speed;

After fan speed shifted, there will be at least 3min operate to shift to another speed again.

When compressor shut down (due to stoppage, error or reach the setting temp), fan motor will still operate for remaining heat dissipation. Fan motor will stop when coil middle temp $T_4 < \text{【A08】}$. Longest time period for remaining heat dissipation is 60S.

There will be anti-cold-air treatment again when compressor re-start after shut down.

4.2, compressor control

(1), Compressor will operate if the T_2 after unit started.

(2), Compressor starts when no errors and meet the requirements of 3-minute-delay.

(3), Water pump (optional) will be started prior to compressor

(4), Compressor starts only when water pump operates (optional) and water volume switch (if no,

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short connected) sense there is water volume

(5), compressor shall be shut down when $T < -【A08】$ and compressor operates more than 3 minutes.

(6), Compressor will be shut down immediately when $T < -9$

(7), Compressor will shut down immediately when users stop the unit

5: auto mode (for Water-Water system this chapter is invalid)

When in auto mode, it will select the operation mode among cooling, heating, or fan, based on the difference of ambient temp T_a and setting temp T_s , and the control logic of the selected mode is the same as respectively.

Operation mode selection:

When $T_a - T_s \geq 3$, operate in cooling mode

When $T_s - T_a \geq 3$, operate in heating mode

When $2 \leq T_a - T_s < -2$, operate at fan mode

After select fan mode, it will enter cooling mode when $T_a - T_s \geq 3$, it will enter heating mode when $T_s - T_a \geq 3$

Compressor starting condition will be the same as in normal cooling & heating mode, if it selects cooling or heating mode

It will not execute the condition of **【A08】** temp difference parameters when it selects cooling or heating mode. Conditions of compressor shut down are as follows:

$T_a - T_s < -1$ when in cooling

$T_s - T_a < -1$ when in heating

After enter cooling or heating mode, it won't operate at fan mode again. Mode shift between cooling and heating shall be under the conditions of:

When stop in cooling mode and $T_s - T_a \geq 5$, or stoppage for more than 30min and $T_s - T_a \geq 3$, it will shift automatically to heating mode;

When stop in heating mode and $T_a - T_s \geq 5$, or stoppage for more than 30min and $T_a - T_s \geq 3$, it will shift automatically to cooling mode.

Remarks:

air-returned temp adjust control logic in auto mode will always follow **【A06】** of air-returned temp adjust in cooling mode.

6: electric heater mode (for Water-Water system this chapter is invalid)

When in electric heater mode, both compressor and water pump (if any) will stop.

After users turn on the unit in electric heater mode, if the temp difference $T \geq 2$, electric heater will start, and fan speed is Hi.

If the unit is turned off or $T < -【A08】$, electric heater will stop, fan will stop with a 5seconds delay.

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III: water pump control (optional)

1: Source side water pump control logic

If compressor needs to be started and the starting requirements are met, water pump shall be started first and operate normally and water volume switch shall sense the normal water volume.

The control board won't detect the water volume switch in the first 30S after water pump is started. Afterwards, it will continuously detect the water volume switch. If it detects connection of water volume switch keeps for more than 5S, then unit will operates normally.

During operation, if the control board detects open of water volume switch and keeps for more than 5S, it will give a water volume switch error, and water pump will be shut down immediately.

Water pump stops with 30S delay when compressor shut down (normal stop or error protection).

2: load side water pump control logic (only for water-water system this chapter is valid)

If the system is turned on, the load side water pump will run immediately.

If the system is turned off, the load side water pump will turn off with 30 second delay.

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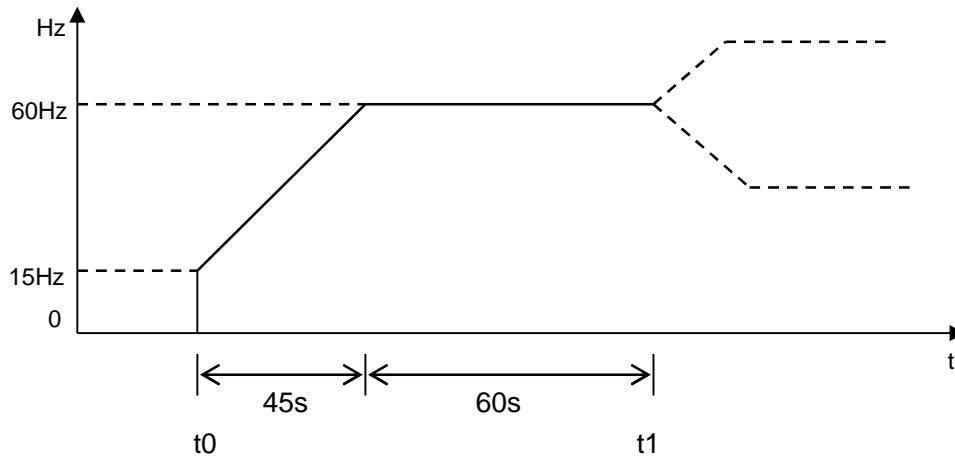
IV: compressor frequency control

1: Frequency range

Lowest frequency: 15Hz

Highest frequency: 【A13】, if frequency demand is higher than 【A13】, it still operates at 【A13】.

2: frequency control when startup



Frequency will first increase to 60Hz when started, and operates at this platform frequency point for 60S, then it will operate at the setting frequency based on the temp difference

$$T = T_{t1} - (T_{t0} - T_{t1})$$

Notes: T_{t1} temp difference at t1
 T_{t0} temp difference at t0

T ()	<1	1	2	3	4	5	6	7	>7
Freq (Hz)	20	30	40	50	60	70	80	90	100

3: frequency control during operation

3.1: When in cooling

Temp change rate VT is defined as follows:

- If temp T_a drops 1°F within 15S, then VT=0
- If temp T_a drops 1°F within 15~30S, then VT=1
- If temp T_a drops 1°F within 30~60S, then VT=2
- If temp T_a drops 1°F within 60~120S, then VT=3
- If temp T_a changes only when over 120S, then VT=4
- If temp T_a raises 1°F within 60~120S, then VT=5
- If temp T_a raises 1°F within 30~60S, then VT=6
- If temp T_a raises 1°F within 30S, then VT=7

Based on the temp difference T and temp change rate VT, the frequency changes every 30S

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VT T(°F)	0	1	2	3	4	5	6	7
T < 0	Fmin	Fmin	-20	-10	-5	0	0	10
0 T < 2	-30	-20	-10	0	0	5	10	15
2 T < 4	-20	-10	0	0	5	10	15	20
4 T < 7	-5	0	0	5	10	15	20	30
7 T < 10	0	0	5	10	15	20	30	40
10 T < 18	0	5	10	15	20	30	40	Fmax
18 T	5	10	15	20	30	40	Fmax	Fmax

3.2: When in heating

Temp change rate VT is defined as follows:

- When temp T_a raises 1°F within 15S, then $VT=0$
- When temp T_a raises 1°F within 15-30S, then $VT=1$
- When temp T_a raises 1°F within 30-60S, then $VT=2$
- When temp T_a raises 1°F within 60-120S, then $VT=3$
- When temp T_a changes only when over 120S, then $VT=4$
- When temp T_a drops 1°F within 60-120S, then $VT=5$
- When temp T_a drops 1°F within 30-60S, then $VT=6$
- When temp T_a drops 1°F within 30S, then $VT=7$

Based on the temp difference T and temp change rate VT, the frequency changes every 30S; table is the same as in cooling.

4: frequency control in dehumidification (for Water-Water system this chapter is invalid)

- If $T \geq 6$, then it will operate at highest frequency;
- If $T < 6$, adjust frequency every 30S. when in cooling, if air-side coil temp $T_4 < T_a - 27$, frequency drop by 10Hz. If $T_4 \geq T_a - 18$, frequency raise by 10Hz.

V: compressor frequency-drop protection

When in extreme conditions, it will drop frequency or restrain frequency-raise to protect the unit and ensure reliability of the unit. There are 3 types: fast drop, slow drop, and frequency-raise-restraint.

Fast drop: 1Hz/2S

Slow drop: 1Hz/10s

Frequency-raise-restraint: when there is frequency-raise-restraint sign appears, not allowed raising frequency. Recover when the sign eliminates.

When there are multi causes for frequency drop, it will work as per the most prior one, with no superimposition.

1: frequency-raise-restraint when input current too high

When input current $\geq 22.0\text{A}$, frequency fast drop

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When input current $\geq 20.0A$, frequency slow drop

When input current $< 18.0A$, recovery

2: frequency-raise-restraint when Disc temp too high

When Disc temp $T_1 \geq 223$ (106 °C), frequency fast drop

When Disc temp $T_1 \geq 217$ (103 °C), frequency slow drop

When Disc temp $T_1 < 208$ (98 °C), recovery

3: frequency-raise-restraint when source side water-outlet temp too high in cooling

When water-outlet temp in cooling $T_8 \geq \text{【A01】} - 3$ °C, frequency fast drop

When water-outlet temp in cooling $T_8 \geq \text{【A01】} - 7$ °C, frequency slow drop

When water-outlet temp in cooling $T_8 < \text{【A01】} - 11$ °C, recovery

4: frequency-raise-restraint when source side water-outlet temp too high in heating

When water-outlet temp in heating $T_8 \geq \text{【A03】} - 3$ °C, frequency fast drop

When water-outlet temp in heating $T_8 \geq \text{【A03】} - 7$ °C, frequency slow drop

When water-outlet temp in heating $T_8 < \text{【A03】} - 11$ °C, recovery

5: frequency-raise-restraint when load-side coil temp too high in cooling

When air-side coil temp in cooling $T_4 < \text{【A19】} + 3$ °C, frequency fast drop

When air-side coil temp in cooling $T_4 < \text{【A19】} + 7$ °C, frequency slow drop

When air-side coil temp in cooling $T_4 \geq \text{【A19】} + 11$ °C, recovery

6: frequency-raise-restraint when load-side coil temp too high in heating

When air-side coil temp in heating $T_4 \geq \text{【A20】} - 3$ °C, frequency fast drop

When air-side coil temp in heating $T_4 \geq \text{【A20】} - 7$ °C, frequency slow drop

When air-side coil temp in heating $T_4 < \text{【A20】} - 11$ °C, recovery

7: frequency-raise-restraint when source-side coil temp too high in cooling

When water-side coil temp in cooling $T_3 \geq \text{【A21】} - 3$ °C, frequency fast drop

When water-side coil temp in cooling $T_3 \geq \text{【A21】} - 7$ °C, frequency slow drop

When water-side coil temp in cooling $T_3 < \text{【A21】} - 11$ °C, recovery

8: frequency-raise-restraint when source-side coil temp too high in heating

When water-side coil temp in heating $T_3 < \text{【A22】} + 3$ °C, frequency fast drop

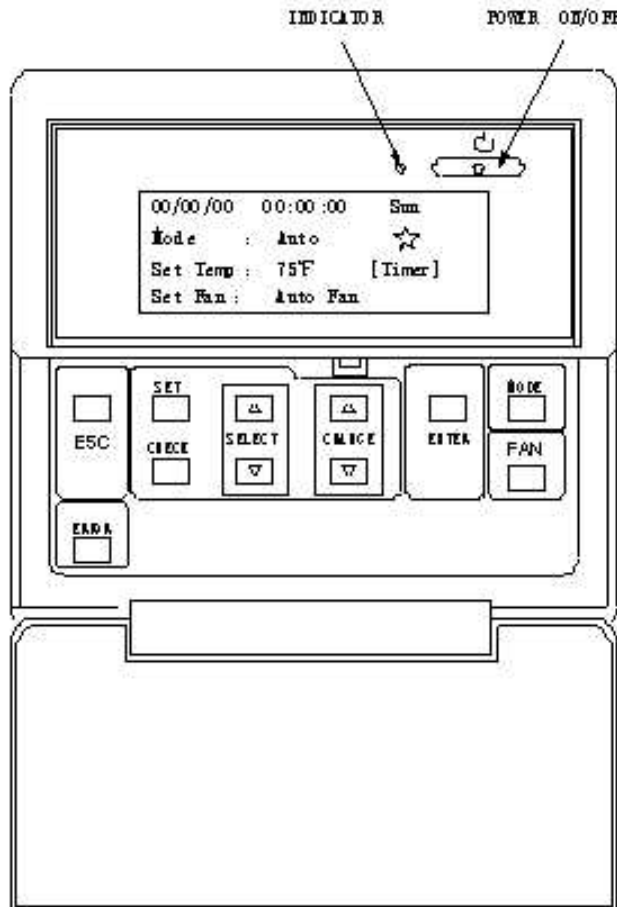
When water-side coil temp in heating $T_3 < \text{【A22】} + 7$ °C, frequency slow drop

When water-side coil temp in heating $T_3 \geq \text{【A22】} + 11$ °C, recovery

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VII: user's controller operation instruction



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1: Basic characteristics

- 1: input power: 12VAC±10%,
- 2: power consumption: < 1.5W ;
- 3: communication method: RS-485
- 4: communication distance: 1200m
- 5: display: LCD 4-line
- 6: buzzer: when first power on a single sound, when press button a single sound, when error report 3 sound
- 7: background light: on for 20S when operation or error report
- 8: LED indicator: on when start the unit
- 9: LCD will be intelligent to work for air-water system or water-water system.

2: button instruction

2.1, ON/OFF button

To start or stop the unit; Default status is OFF.

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2.2, MODE button

To select operation mode; It will shift among auto cooling dehumidification fan heating when successively press.

2.3, FAN button

To select fan motor speed when in fan mode; It will shift among Auto Hi Mi Lo when successively press.

In other modes, users could not change the fan speed; it is controlled by the evaporation temp:

When in cooling, heating, or auto mode, fan speed is Auto;

When in dehumidification mode, fan speed is Lo;

When in electric heater mode, fan speed is Hi

2.4, CHANGE button

To change the parameters; press ▲ or ▼ to raise or drop; When not in SET status, it is used as setting button of air-returned temp.

2.5, SET button

To set different kinds of parameters;

2.6, ENTER button

On main page, when in Heating mode, press “Enter” to shift to Electric heater mode;

On main page, when in Electric heater mode, press “Enter” to shift to Heating mode;

On setting pages, press “Enter” to confirm your selection;

2.7, ESC button

To go back to the previous page;

2.8, CHECK button

To check the parameters and operation status of the unit; Press ▲ or ▼ to go up and down;

2.9, ERROR button

To review the errors; Press ▲ or ▼ to go up and down; Maximum 28 errors can be stored.

3: operation instruction

3.1, When press the On/OFF button, unit will be started, the indicator will be on, and operates in the previously set operation mode.

3.2, Set the operation mode before starting the unit. If you set the operation after starting, unit will stop and re-start automatically again and operate in the new mode.

3.3, You can change the air-returned temp on the main page, range is 58~90 .

4: pages instruction

Main page will display 10S after connected to power.

Main page

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```
00/01/01  00:00:00  SUN
Mode: Cooling  Fan: High
Set Temp:  88
Room Temp:  95
```

1st line display time:

mm/dd/yy ss/mm/hh week

2nd line display operation status:

Set operation mode, press **【MODE】** , it will shift among cooling / dehumidification / fan / heating / auto

Set fan speed, press **【FAN】** , it will shift among Auto / Lo / Mi / Hi

3rd line display setting temp:

press or of **【CHANGE】** to set temp between 58 --90

4th line display room temp:

5: press 【SET】 to enter setting page

The first 3 lines are for users, the 4th line is for maintenance technicians.

Setting page

```
Set Time
Time Mode:  Disable
Timer
Set Parameter
```

5.1, when press **【SELECT】** to select items, press **【ENTER】** to enter this item

Time setting

```
mm/dd/yy  00/01/01
ss: mm: hh  10:00:00
```

Press or of **【SELECT】** to change the time of month/day/year, second/minute/hour. Press

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▲ or ▼ of **【CHANGE】** to set the values. After setting, press **【ENTER】** to confirm and go back to the previous page.

5.2, press ▲ or ▼ of **【SELECT】** to select the time mode. Press ▲ or ▼ of **【CHANGE】** to select among weekly / daily / current (this day) / disabled. After setting, press **【ESC】** to go back to the previous page.

5.3, press ▲ or ▼ of **【SELECT】** to select the timer. Press **【ENTER】** to enter this page:

1, if time mode is weekly, it will display the following page. Press ▲ or ▼ of **【SELECT】** to select two time-point among Monday to Sunday to ON or OFF the unit. Press ▲ or ▼ of **【CHANGE】** to change the time value. Each time you press it, time will add or reduce by one minute. When reach 60 minutes, it will automatically add or reduce one hour. After setting, press **【ESC】** to go back to the previous page.

If setting "--:--", it means this item is invalid

If press ▲ or ▼ of **【CHANGE】** for 1second, value will continuously raise or drop

Timer in Weekly mode

Mon Timer1 On : --: --
Mon Timer1 Off: --: --
Mon Timer2 On : --: --
Mon Timer2 Off: --: --

Tue Timer1 On : --: --
Tue Timer1 Off: --: --
Tue Timer2 On : --: --
Tue Timer2 Off: --: --

Wed Timer1 On : --: --
Wed Timer1 Off: --: --
Wed Timer2 On : --: --
Wed Timer2 Off: --: --

Thu Timer1 On : --: --
Thu Timer1 Off: --: --
Thu Timer2 On : --: --
Thu Timer2 Off: --: --

Fri Timer1 On : --: --
Fri Timer1 Off: --: --
Fri Timer2 On : --: --
Fri Timer2 Off: --: --

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```
Sat Timer1 On :  --:  --
Sat Timer1 Off:  --:  --
Sat Timer2 On  :  --:  --
Sat Timer2 Off:  --:  --
```

```
Sun Timer1 On  :  --:  --
Sun Timer1 Off:  --:  --
Sun Timer2 On  :  --:  --
Sun Timer2 Off:  --:  --
```

2, if time mode is daily, it will display the following page. Press or of **【SELECT】** to select items. Then press or of **【CHANGE】** to set time values. After setting, press **【ESC】** to go back to the previous page.

After setting, unit will On or OFF at the setting time everyday.

Timer in daily mode

```
Timer1 On  :  --:  --
Timer1 Off:  --:  --
Timer2 On  :  --:  --
Timer2 Off:  --:  --
```

3, if time mode is current (this day), it will display the following page. Press or of **【SELECT】** to select items. Then press or of **【CHANGE】** to set time values. After setting, press **【ESC】** to go back to the previous page.

After execute timing in this day, setting will be invalid.

Timer in current mode

```
Timer1 On  :  --:  --
Timer1 Off:  --:  --
Timer2 On  :  --:  --
Timer2 Off:  --:  --
```

4, if time mode is disabled, then timer will be invalid.

5.4, when press or of **【SELECT】** to set parameters, press **【ENTER】** to enter the following page.

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This page is for maintenance technicians only.

Password page of set parameters

Enter Password ****

Default manufacture password is "1234". After select this item, press or of **【CHANGE】** to add or subtract among 1-9. Then press of **【SELECT】** to move to the second digit. After inserting password, press **【ENTER】** to enter this page. See following:

1, first page of set parameter

First page

Water Ov-Prt Co:	122
Water Ud-Prt Co:	36
Water Ov-Prt Ht:	95
Water Ud-Prt Ht:	41

- ①. When press or of **【SELECT】** to select the item of water temp over heat protection in cooling mode, then press or of **【CHANGE】** to set the values between 104~140 . If set "- -", it will disable this item.
- ②. When press or of **【SELECT】** to select the item of water temp under heat protection in cooling mode, press or of **【CHANGE】** to set the values between 34~86 . If set "- -", it will disable this item.
- ③. When press or of **【SELECT】** to select the item of water temp over heat protection in heating mode, press or of **【CHANGE】** to set the values between 77~122 . If set "- -", it will disable this item.
- ④. When press or of **【SELECT】** to select the item of water temp under heat protection in heating mode, press or of **【CHANGE】** to set the values between 37~68 . If set "- -", it will disable this item.

2, press of **【SELECT】** to enter the second page of set parameter.

Second page

Water type:	Normal/Glycol
Air-Re T-Adj Co:	00
Air-Re T-Adj Ht:	00
On/off ctrl dif:	02

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- ①. When press or of **【SELECT】** to select the item of cool water type, press or of **【CHANGE】** to select the water type of “Normal water, or with Glycol”
- ②. When press or of **【SELECT】** to select the item of air-returned temp adjust in cooling mode, press or of **【CHANGE】** to set the values between -16~16 . If set “- -”, air-returned temp sensor will be shifted to thermostat mode.
- ③. When press or of **【SELECT】** to select the item of air-returned temp adjust in heating mode, press or of **【CHANGE】** to set the values between -16~16 . If set “- -”, air-returned temp sensor will be shifted to thermostat mode.
- ④. When press or of **【SELECT】** to select the item of On/Off air-returned temp difference, press or of **【CHANGE】** to set the values between 2~9 .

3, press of **【SELECT】** to enter the third page of set parameter.

Third page

Anti Cold Air-T:	86
Auto-restart:	Enable
T-display:	
Ftr cleaning:	30day

- ①. When press or of **【SELECT】** to select the item of anti-cold-air temp parameter, press or of **【CHANGE】** to set the values between 68~104 . If set “- -”, it will disable this item.
- ②. When press or of **【SELECT】** to select the item of auto-restart after power failure, press or of **【CHANGE】** to select “disable” or “enable”.
- ③. When press or of **【SELECT】** to select the item of / mode. Press or of **【CHANGE】** to select it.
- ④. When press or of **【SELECT】** to select the item of filtering net cleaning time, press or of **【CHANGE】** to set the values between 10~60days. If set “- -”, it will disable this item.

4, press of **【SELECT】** to enter the fourth page of set parameter.

Fourth page

Comp Freq Limit:	61Hz
Au Fan Coil T Co:	50
Au Fan Coil T He:	115
AutoFan T differ:	2

- ①. When press or of **【SELECT】** to select the item of compressor frequency parameter, press or of **【CHANGE】** to set the values between 30~80HZ.
- ②. When press or of **【SELECT】** to select the item of auto fan speed coil temp in cooling, press or of **【CHANGE】** to set the values between 40 ~63 .

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- ③ When press or of **【SELECT】** to select the item of auto fan speed coil temp in heating, press or of **【CHANGE】** to set the values between 90 ~124 .
- ④ When press or of **【SELECT】** to select the item of auto fan speed shifting temp difference, press or of **【CHANGE】** to set the values between 2 ~13 .

5, press of **【SELECT】** to enter the fifth page of set parameter.

Fifth page

Ma Comp Freq :	61Hz
Ma Freq Allow:	disable
Anti-frost Co:	32
Anti-Ov-He He:	140

- ① When press or of **【SELECT】** to select the item of manually set compressor frequency parameter, press or of **【CHANGE】** to set the values between 15~80Hz.
- ② When press or of **【SELECT】** to select the item of enable / disable manually set compressor frequency parameter, press or of **【CHANGE】** to select between “enable” and “disable”
- ③ When press or of **【SELECT】** to select the item of coil anti-frost parameter in cooling mode, press or of **【CHANGE】** to set the values between 14~50 . If set “-”, it will disable this item.
- ④ When press or of **【SELECT】** to select the item of coil temp anti-over-heat in heating mode parameter, press or of **【CHANGE】** to set the values between 122~158 . If set “-”, it will disable this item.

6, press of **【SELECT】** to enter the sixth page of set parameter.

Sixth page

T3 Ov Prt Co:	140°F
T3 Ud Prt He:	15°F
Mini Freq:	15Hz
Mfg Setting:	

Set Password:	
---------------	--

- ① When press or of **【SELECT】** to select the item of water-side coil outlet temp

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over-heat in cooling protection, press or of **【CHANGE】** to set the values between 122~158 . If set “- -”, it will disable this item.

② When press or of **【SELECT】** to select the item of water-side coil outlet temp under-heat in heating protection, press or of **【CHANGE】** to set the values between 9~41 . If set “- -”, it will disable this item

③ When press or of **【SELECT】** to select the item of mini operation frequency, press or of **【CHANGE】** to set the values between 15~40Hz.

④ When press or of **【SELECT】** to select the item of manufacture default setting parameter, press **【ENTER】** to confirm.

⑤ When press or of **【SELECT】** to select the item of set password, press **【ENTER】** to enter this page. Press or of **【SELECT】** to select which digit, then press or of **【CHANGE】** to change numbers among 0~9, then press **【ENTER】** to confirm and go back to the main page.

Set password page

Set Password 0000

6: error history check

On setting page, press **【ERROR】** to enter error history check page.

On other pages, press **【ERROR】** , you will enter the page of current error status.

Error history check page

00/00/00 00:00	[--]	--
00/00/00 00:00	[--]	--
00/00/00 00:00	[--]	--
00/00/00 00:00	[--]	--

Errors are listed in time sequence, mm/dd/yy, ss/mm/hh. Press or of **【SELECT】** to view page down or page up.

Maximum errors memorized are 28.

If press continuously press **【ERROR】** for 6S, error memory will be deleted.

After checking, press **【ESC】** to go back to the main page.

7: unit parameters check

Press **【CHECK】** to enter the page of unit parameters check. Press or of **【SELECT】** to view page down or page up.

Unit operation parameters

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Panel Temp:	---
Return Temp:	---
Comp freq:	0Hz
Fan freq:	0Hz

Discharge Temp:	---
Suction Temp:	---
Out Water Temp:	---
Module Temp:	---

Air-Coil in Tp:	---
Air-Coil mid Tp:	---
Wat-Coil in Tp:	---
System Error:	---

AC Current:	00.0A
Comp Current:	00.0A
Module Power:	0.0KW
DC Volt:	0V

After checking, press **【ESC】** to go back to the main page.

VIII: unit protection error code treatment

E01: water volume switch protection error

Causes: water volume protection switch open after water pump working for 30S

Treatment: stop compressor and water pump

Recovery: automatically recover when stop unit or water volume switch closed

E02: high pressure protection error

Causes: unit high pressure switch open

Treatment: stop compressor

Recovery: switch close, recover automatically

E03: low pressure protection error

Causes: unit low pressure switch open, no detection in the first 3min of unit working

Treatment: stop compressor

Recovery: switch close, recover automatically

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- E04: air-returned temp sensor damage error
 Causes: air-returned temp sensor T_e short circuit or circuit break
 Treatment: automatically shift to user's controller temp sensor, if there is error too, then stop compressor
 Recovery: replace sensor, recover automatically
- E05: compressor Disc temp sensor damage error
 Causes: Disc temp sensor T_1 short circuit or circuit break
 Treatment: stop compressor
 Recovery: replace sensor, recover automatically
- E06: air-side coil refrigerant middle temp sensor damage error
 Causes: air-side coil refrigerant middle temp sensor T_4 short circuit or circuit break
 Treatment: stop compressor
 Recovery: replace sensor, recover automatically
- E07: cool water outlet temp sensor damage error
 Causes: cool water outlet temp sensor T_8 short circuit or circuit break
 Treatment: stop compressor
 Recovery: replace sensor, recover automatically
- E08: water-side coil refrigerant outlet temp sensor damage error
 Causes: water-side coil refrigerant outlet temp sensor T_3 short circuit or circuit break
 Treatment: stop compressor
 Recovery: replace sensor, recover automatically
- E09: thermostat temp sensor damage when shift to thermostat
 Causes: user's controller temp sensor short circuit or circuit break
 Treatment: automatically shift back to air-returned temp control, if air-returned temp sensor damage too, then stop compressor
 Recovery: replace sensor, recover automatically
- E10: no communication with main control board error
 Causes: user's controller receives no communication data from main controller in 30S
 Treatment: send stop signal to stop compressor and fan motor
 Recovery: when communication is normal, recover automatically
- E11: input current to high error
 Causes: input current over 25.0A;
 Treatment: stop compressor
 Recovery: recover automatically
- E12: compressor Disc temp too high protection error
 Causes: compressor Disc temp > 230 ;
 Treatment: stop compressor
 Recovery: recover automatically when Disc temp < 194
- E13: cool water temp too high protection error in cooling
 Causes: cool water outlet temp T_8 【A01】 in cooling
 Treatment: stop compressor
 Recovery: recover automatically when $T_8 < \text{【A01】} - 18$
- E14: cool water temp too low protection error in cooling

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- Causes: cool water outlet temp $T_8 < \text{【A02】}$ in cooling
 Treatment: stop compressor
 Recovery: automatically recover when $T_8 \text{ 【A02】} +7$
- E15: cool water temp too high protection error in heating
 Causes: cool water outlet temp $T_8 \text{ 【A03】}$ in heating
 Treatment: stop compressor
 Recovery: recover automatically when $T_8 < \text{【A03】} -7$
- E16: cool water temp too low protection error in heating
 Causes: cool water outlet temp $T_8 < \text{【A04】}$ in heating
 Treatment: stop compressor
 Recovery: automatically recover when $T_8 \text{ 【A04】} +15$
- E17: air-side coil anti-frost in cooling
 Causes: air-side coil refrigerant inlet temp $T_4 < \text{【A19】}$ in cooling
 Treatment: stop compressor
 Recovery: recover automatically when $T_4 \text{ 【A19】} +18$
- E18: air-side coil temp too high protection in heating
 Causes: air-side coil refrigerant inlet temp $T_4 \text{ 【A20】}$ in heating
 Treatment: stop compressor
 Recovery: recover automatically when $T_4 < \text{【A20】} -18$
- E19: water-side coil refrigerant temp too high protection error in cooling
 Causes: water-side coil refrigerant outlet temp $T_3 \text{ 【A21】}$ in cooling
 Treatment: stop compressor
 Recovery: recover automatically when $T_3 < \text{【A21】} -18$
- E20: water-side coil refrigerant temp too high protection error in heating
 Causes: water-side coil refrigerant temp $T_3 \text{ 【A22】}$ in heating
 Treatment: stop compressor
 Recovery: recover automatically when $T_3 \text{ 【A22】} +18$
- E21: IPM no communication error
 Causes: IPM damage
 Treatment: stop compressor
 Recovery: recover automatically when communication normal
- E22: water level switch error
 Causes: water level switch close
 Treatment: stop compressor
 Recovery: recover automatically when water level switch open
- E23: anti-frozen error in winter
 Causes: compressor needs to start in anti-frozen operation but compressor can't start
 Treatment: stop water pump
 Recovery: recover automatically when cool water outlet temp $T_8 \text{ 【A05】} 2$
- E24: compressor Suct temp sensor damage error (reserved)
 Causes: Suct temp sensor T_6 short circuit or circuit break
 Treatment: stop compressor
 Recovery: replace sensor, recover automatically

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E25: air-side coil refrigerant outlet temp sensor damage error (reserved)

Causes: air-side coil refrigerant outlet temp sensor short circuit or circuit break

Treatment: stop compressor

Recovery: replace sensor, recover automatically

E26: water-side coil refrigerant inlet temp sensor damage error (reserved)

Causes: water-side coil refrigerant inlet temp sensor T2 short circuit or circuit break

Treatment: stop compressor

Recovery: replace sensor, recover automatically

E27: IPM protection

E28: compressor over load protection

E29: DC Bus voltage too low protection

E30: compressor matching error

E31: IPM phase current circuit error

E32: NEC chip and DSP chip communication error

E33: heat sink temp sensor error

E34: heat sink temp too high protection

The following errors are reference for unit smooth operation

F01: anti-frozen operation in winter

Causes: cool water outlet temp $T_8 < \text{【A05】}$ when stop the unit

Treatment: water pump anti-frozen operation compulsively

Recovery: automatically recover when cool water outlet temp T_8 meets requirements

F02: EEPROM data

Causes: EEPROM data false

Treatment: unit operate in default manufacturing parameters

Recovery: replace user's controller

F03: filtering net cleaning

Causes: fan motor operation days **【A12】**

Treatment: cleaning reminder

Recovery: press **【ERROR】** to eliminate

Notes: fan motor are regarded as operating if it operates more than 10min in a day

F04: frequency-raise-restraint when input current too high

F05: frequency-raise-restraint of IPM

F06: frequency-raise-restraint of Disc temp

F07: frequency-raise-restraint when water-outlet temp too high in cooling

F08: frequency-raise-restraint when water-outlet temp too high in heating

F09: frequency-raise-restraint when air-side coil temp too low in cooling

F10: frequency-raise-restraint when air-side coil temp too high in heating

F11: frequency-raise-restraint when water side coil temp too high in cooling

F12: frequency-raise-restraint when water-side coil temp too low in heating

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