ZL-R300A Heat Pump Water Heating/Cooling Controller
Manual A5.0

1. Main Hardware

5 temperature sensors: tank water, outdoor pipe(coil), outdoor environment, compressor outlet and compressor inlet.
4 outputs: compressor, aux electrical heater, 4-way valve and outdoor fan.
2 inputs: compressor pressure high and low.

2. Main Function

Temperatures display	Aux heating	Power off memory and restart
Economic run	Compressor outlet too hot protection	Failures alarm
Auto/forced defrost	Compressor pressures process	Refrigerant injection and collection

3. Main Specification

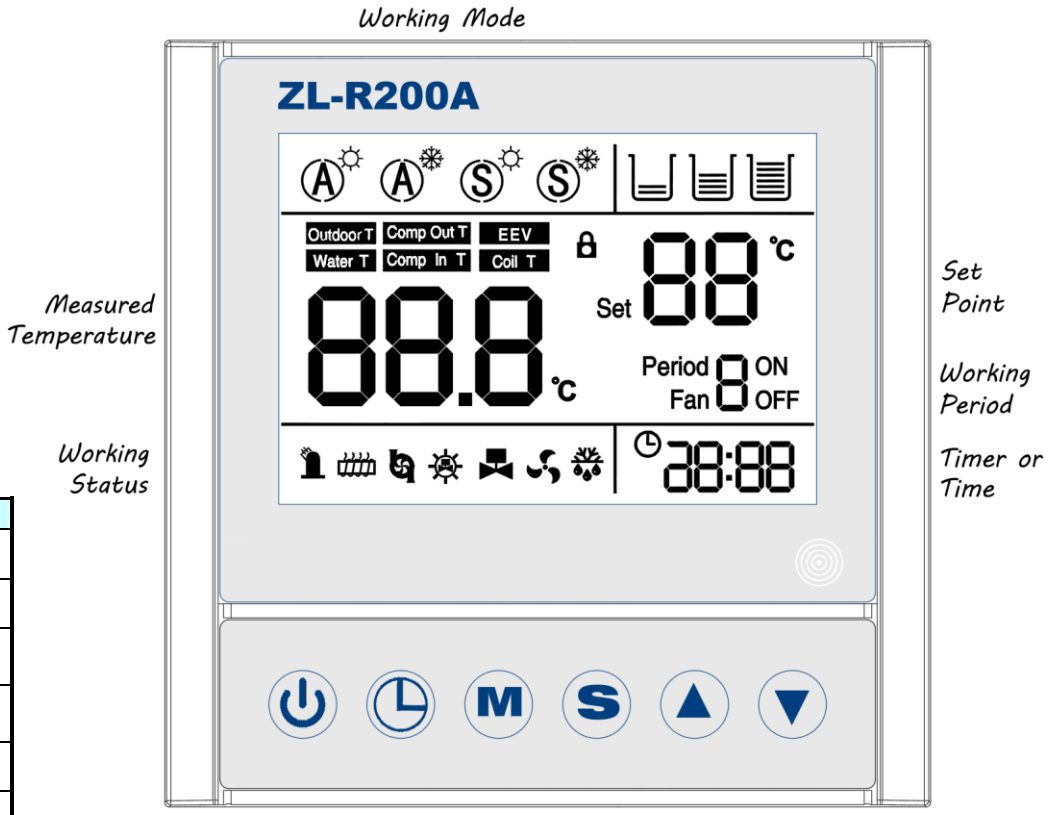
Temperature sensors: NTC 10K/3470
Deposit temperature: -10 ~ 60℃
Working environment: -10 ~ 50℃ 20 ~ 85%RH without dew
Setting range: -9 ~ 99℃
Display range: -40 ~ 130℃
Power supply: 85 ~ 245Vac 50/60Hz

Outputs: Compressor, 30A 250Vac
Heater, 10A 250Vac
Others, 5A 250Vac
(Up parameters are based on pure resistance loads)
5 wires EEV: Fully open by 500 steps
Power supply 12Vdc 300mA
Driving speed 50pps

4. Operation

4.1 Button

Button	Remark
⏻	On/off
🕒	Clock
M	Mode
S	Set
▲	+
▼	-



4.2 Display Sign

Sign	Remark
Ⓐ (1)	Auto heating
Ⓐ❄ (1)	Auto cooling
Ⓢ (1)	Economic heating
Ⓢ❄ (1)	Economic cooling
🔒	Lock
(2)	Compressor
(2)	Heater
(2)	4-way valve
(2)	Outdoor fan
	Defrost

Note: (1) Sign on, work in this mode. (2) Sign on, the output is energized.

4.3 Inquire Temperatures and EEV status

Press ▲, display the temperature one by one: tank water, compressor inlet, outdoor pipe(coil), outdoor environment, compressor outlet, and the steps of EEV.

The display will stay for 10 seconds.

4.4 On/Off Switching

Keeping ⏻ depressed for 2 seconds will switch between offline and online.

In offline status, only clock displays.

4.5 Set Setpoint

When online, press S. The setpoint temperature blinks.

Press ▲ or ▼ to set the setpoint.

Press S to **save** the setting.

Factory set setpoint is 60℃。

4.6 Set Time

Press 🕒, time display blinks.

Press ▲ or ▼, set the time.

Press 🕒 to **save** the setting, and exit.

4.7 Force Defrost

When online, keeping S and ▼ depressed simultaneously for 3 seconds:

If **outdoor pipe temperature** < **Defrost finish temperature(d3)**, start defrosting.

If pipe sensor fails, then if **outdoor environment temperature** < **Defrost finish temperature(d3)**, force to defrost.

When in forced defrost status, keeping S and ▼ depressed simultaneously for 3 seconds will stop defrost.

4.8 Force Aux Electrical Heating

Only effective in heating mode.

When online, keeping S and ▲ depressed simultaneously for 3 seconds:

If **tank water temperature** < setpoint, aux heater is energized.

When tank water temperature rises, and the **water temperature** ≥ setpoint, aux heater will be de-energized.

4.9 Inject/Collect Refrigerant

When online, keeping M and ▼ depressed simultaneously for 3 seconds will display “AdF”, indicate injecting or collecting refrigerant now.

In the status, keeping M and ▼ depressed simultaneously for 3 seconds will stop injecting or collecting.

Or, after 20 minutes, stop injecting or collecting automatically.

4.10 Panel Lock

Press ▲ and ▼ simultaneously, display sign 🔒, the keypad is locked.

Press the double buttons again, the keypad is unlocked.

4.11 Working Mode

When online, press M, the current working mode sign blinks.

Press M to choose working mode.

Press S to confirm the setting, and exit.

Sign	Mode	Remark
Ⓐ☼	Auto heating	Heating all day
Ⓐ❄	Auto cooling	Cooling all day
Ⓢ☼	Economic heating	Heating only in set working periods
Ⓢ❄	Economic cooling	Cooling only in set working periods

4.12 Working Periods for Economic Mode

When online, keep depressed for 3 seconds to enter the setting status.
We can set 3 working periods. Press to switch among the set items.
Press and to set the time.
If a period's on or off time is set to no time, display as "- -:- -", the system will not heat or cool in this period.
Keep depressed for 3 seconds to **save** the settings.

4.13 Parameter Setting

When online, keep depressed for 3 seconds, display "00".
Press and to set the password, see parameter U9.
Press to confirm.
If the password is correct, enter parameter setting status, display the 1st parameter "t1".
Else exit.
In setting status,
press or to choose the parameter, "t1", "t2", …, "U9" (see parameter table).
Press and to set the value of the parameter.
Keep depressed for 3 seconds to **save** the settings, and exit.
The status will return if there is no button operation for 30 seconds, and the settings will **not be saved**.
Parameter Table:

Code	Function	Range	Remark	Factory set
t1	Tank water temperature hysteresis	1 ~ 10℃		5
t2	Outdoor environment temperature to start aux heater	-5 ~ 25℃		12
t3	Enable aux heater	0 ~ 1	0: disable, 1: enable	1
t4	Up limit for setpoint	t5 ~ 99℃		70
t5	Low limit for setpoint	-9 ~ t4		10
t6	Tank water temperature sensor calibration	-9.9 ~ 9.9℃		0
d1	Defrost period	0 ~ 180 min	0: disable defrost function	45
d2	Outdoor pipe temperature to start defrosting	-20 ~ 20℃		-5
d3	Defrost finish temperature	2 ~ 30℃		10
d4	Defrost time	0 ~ 30 min	0: disable defrost function	8
d5	Outdoor environment temperature to start defrosting	-10 ~ 20℃	**Effective** when pipe sensor fails	7
d6	Compressor switching for defrost	0 ~ 1	0: keep running, 1: switching	1
P1	Compressor outlet protecting temperature	0, 90 ~ 130℃	0: disable protection	110
P2	Compressor high pressure switch	0 ~ 1	0: open alarm, 1: close alarm	1
P3	Compressor low pressure switch	0 ~ 1	0: open alarm, 1: close alarm	1
F1	EEV manual open level	80 ~ 500 step		350
F2	EEV function set	0 ~ 2	0: skip EEV 1: auto EEV control 2: manually set EEV	2
F3	EEV min open step	0 ~ 480 step		80
F4	EEV control period	1 ~ 120 sec		30
F5	Too hot setpoint, for EEV auto control	-10 ~ 10℃		1
F6	Big step control, for EEV auto control	0 ~ 20 step		12
F7	Small step control, for EEV auto control	0 ~ 20 step		4
F8	Micro step control, for EEV auto control	0 ~ 20 step		1
U1	Compressor delay protection time	1 ~ 30 min		3
U2	4-way valve setting	0 ~ 1	0: off for heating, on for cooling 1: on for heating, off for cooling	0
U3	Restart after power supply comes back	0 ~ 1	0: disable, 1: enable	1
U4	Buzzing alarm	0 ~ 1	0: disable, 1: enable	1
U9	password	0 ~ 99		11

4.14 Restore to Factory settings

When online, keep (S) and (M) depressed simultaneously for 3 seconds, display “UnL”.

Press (▲) 2 times, all settings will be restored to factory settings.

5. Control

5. 1 Temperature Control

Heating Control

Heating will start if **tank water temperature** ≤ (setpoint - t1), and the compressor has stopped for U1 time.

Heating starting procedure: fan runs, 4-way valve sets according U2 set, 5 seconds later compressor energized.

Heating will stop if **tank water temperature** ≥ setpoint.

Heating stopping procedure: compressor stops, 10 sec. later fan stops, 45 sec. later valve sets according to U2 set.

Cooling Control

Cooling will start if **tank water temperature** ≥ (setpoint + t1), and the compressor has stopped for U1 time.

Cooling starting procedure: fan runs, 4-way valve sets according to U2 set, 5 sec. later compressor energized.

Cooling will stop if **tank water temperature** ≤ setpoint.

Cooling stopping procedure: compressor stops, 10 sec. later fan stops, 45 sec. later valve sets according to U2 set.

5.2 Defrost

Defrost only works in heating mode.

Start Auto Defrost

When the compressor has run accumulatively for d1 time, and the **outdoor pipe temperature** ≤ d2, and the compressor has run more than 15 min continuously, start defrosting.

If the outdoor pipe sensor fails, when the compressor has run accumulatively for d1 time, and the **outdoor environment temperature** ≤ d5, and the compressor has run more than 15 min continuously, start defrosting.

Defrost starting procedure:

If d6 = 0, fan stops, 3 sec. later set 4-way valve.

If d6 = 1, compressor stops, 10 sec. later fan stops, 40 sec. later set 4-way valve, 10 sec. later compressor runs.

Force Defrost

See paragraph 4.7

Stop Defrost

When the **outdoor pipe temperature** rises to d3, or the defrosting time reaches d4, defrost finishes.

Defrosting stopping procedure:

If d6 = 0, fan runs, 3 sec. later set 4-way valve.

If d6 = 1, compressor stops for 40 seconds. Start heating again.

5.3 Aux Electrical Heating Control

When t3 = 1, the aux heater can work.

In heating mode:

When compressor runs, if **outdoor environment temperature** ≤ t2, aux heater is energized.

When **tank water temperature** ≥ setpoint, aux heater is de-energized.

In defrosting status, the aux heater will be energized.

5.4 EEV

When F2 = 0

EEV keeps at 480 step open level.

Automatic Control

If F2 = 1, after controller power is supplied, EEV will close to 0 step. Then open to 480 steps.

Then, the EEV will be set to **initial open level**. The **initial open level** = (**outdoor environment temperature** + 18℃) * 8.

Then the compressor can start according to settings and status.

After the compressor has run for 1 minute, start EEV start to control:

Too hot real value = **compressor inlet temperature** – **outdoor pipe temperature**

Too hot setpoint, see parameter F5

Too hot level Δt = **too hot real value** – F5

The EEV open level will be controlled according to the following table for every **EEV control period** F4:

Compressor outlet temperature < 85℃	
Δt ≤ -10℃	**Big step control** F6，close. According to factory set, decrease 12 steps for every 30 sec.
-10℃ < Δt ≤ -2℃	**Small step control** F7，close
-2℃ < Δt ≤ 0℃	**Micro step control** F8，close
0℃ < Δt ≤ 1℃	Keeps unchanged
1℃ < Δt ≤ 3℃	**Micro step control** F8，open. According to factory set, increase 1 step for every 30 sec.
3℃ < Δt ≤ 10℃	**Small step control** F7，open
Δt > 10℃	**Big step control** F6，open
95℃ > Compressor outlet temperature ≥ 85℃	
Δt ≤ -2℃	Keeps unchanged
-2℃ < Δt ≤ 0℃	**Micro step control** F8，open
Δt > 0℃	**Small step control** F7，open
Compressor outlet temperature ≥ 95℃	
Big step control F6，open	

During defrosting, the EEV will be set to 480. After defrosting finished, restore to previous open level.
If **outdoor environment**, **outdoor pipe** or **compressor inlet** sensor fails, EEV keeps at 240 step open level.
If there are other failures, or if the controller is offline, EEV keeps at 480 step open level.

Manual Control

If F2 = 2, after controller power is supplied, EEV will close to 0 step. Then open to 480 steps.
Then, EEV will be controlled to **EEV manual open level** F1.
During defrosting, the EEV will be set to 480. After defrosting finished, restore to previous open level.
If **outdoor environment**, **outdoor pipe** or **compressor inlet** sensor fails, EEV keeps at **EEV manual open level** F1.
If there are other failures, or if the controller is offline, EEV keeps at 480 step open level.

6. Protection

6.1 Compressor Outlet Temperature

If **compressor outlet temperature ≥ compressor outlet protecting temperature** P1, fan stops.
If **compressor outlet temperature ≥ compressor outlet protecting temperature** P1 + 10℃, stop heating, alarming, and buzzing.
If **compressor outlet temperature ≤ compressor outlet protecting temperature** P1 - 10℃, heating again.

6.2 Compressor Low Pressure

If the compressor low pressure keeps for 5 seconds, stop heating/cooling till the compressor low pressure disappears.
If there are 3 times of compressor low pressure alarm within one hour, controller will not heat/cool again when the alarm disappears. To heat/cool again, we must turn it off and turn it on manually.
Controller will ignore the compressor low pressure alarm when compressor has started no more than 3 minutes, or it is defrosting now.
Buzzing when there is low pressure alarm.

6.3 Compressor High Pressure

If the compressor high pressure keeps for 5 seconds, stop heating/cooling till the compressor high pressure disappears.
If there are 3 times of compressor high pressure alarm within one hour, the controller will not heat/cool again when the alarm disappears. To heat/cool again, we must turn it off and turn it on manually.
Buzzing when there is high pressure alarm.

6.4 Sensor

If tank water sensor fails, stop heating/cooling, and buzzing.
If other sensors fail, stop some function accordingly, till the sensor failure disappears.

7. Failure Code

Failure	Code	Remark	Action	Reset	Remark
Tank water sensor fails	E01	Open or short	Stop heat/cool	Auto	
Outdoor pipe sensor fails	E02	Open or short		Auto	
Compressor outlet sensor fails	E03	Open or short		Auto	
Outdoor environmental sensor fails	E04	Open or short		Auto	
Compressor high pressure	EPH	Compressor high pressure	Stop heat/cool	Auto or **manual**	
Compressor low pressure	EPL	Compressor low pressure	Stop heat/cool	Auto or **manual**	
Compressor outlet hot protection	EWH	Compressor outlet too hot	Stop heat/cool	Auto	
Communication unstable	E09	Panel cable has problem		Auto	
Communication fails	E10	Panel cable has problem		Auto	
Compressor inlet sensor fails	E11	Open or short		Auto	

Manual: stop power supply, supply power again.

8. Wiring