



Air Conditioning & Heating Products

Service Manual

Outdoor Unit: CSL18CD (31Q)
CSL24CD (31R)
CSL36CD (30C)
CSL48CD (31S)
CSL60CD (30D)
CSL18CD-M (34P)
CSL24CD-M (34Q)
CSL36CD-M (34R)
CSL48CD-M (34S)
CSL60CD-M (34T)



RECOGNIZE THIS SYMBOL AS A SAFETY PRECAUTION

ATTENTION INSTALLING PERSONNEL

Prior to installation, thoroughly familiarize yourself with this Installation Manual. Observe all safety warnings.

During installation or repair, caution is to be observed

It is your responsibility to install the product safely and to educate the customer on its safe use

Eair LLC

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www.comfortstarusa.com

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Part 1

General Information

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1 Product lineup

Model	Capacity(Btu/h)	Appearance
CSL18CD CSL18CD-M	18000	
CSL24CD CSL24CD-M	24000	
CSL36CD CSL36CD-M	36000	
CSL48CD CSL48CD-M	48000	
CSL60CD CSL60CD-M	55000	

2 Specifications

OUTDOOR UNIT			CSL18CD	CSL24CD	CSL36CD	CSL48CD	CSL60CD
Power supply		V-Ph-Hz	208/230V,1Ph, 60Hz				
Cooling	Capacity	Btu/h	18000	24000	36000	48000	55000
	Input	W	2000	2600	3450	5450	6400
Heating	capacity	Btu/h	N/A	N/A	N/A	N/A	N/A
	Input	W	N/A	N/A	N/A	N/A	N/A
Outdoor Minimum Circuit Ampacity		A	9.0	12.5	19.0	28.0	34.0
Outdoor Max.Fuse		A	15	15	20	30	40
Outdoor Air Flow		CFM	1060	1350	2350	2800	3050
Outdoor Noise Level		dB(A)	54	54	56	60	60
Connection Wiring			485: AWG 25*3 Shielded, 24V: AWG 20				
Communication Type			24V / 485	24V / 485	24V / 485	24V / 485	24V / 485
Throttle type			/	/	/	/	/
Outdoor Unit	Unpacking(W*H*D)(inch)	inch	34-1/16×21-29/64×12-51/64	36-7/32×28-5/32×14-49/64	37-63/64×31-57/64×15-3/4		
	Packing (W*H*D)(inch)	inch	37-13/32×24-7/32×15-5/32	40-23/64×30-33/64×18-45/64	42-1/8×34-41/64×20-43/64		
	Net/Gross weight (lbs)	lbs	53/58	61/65	79/87	122/131	122/131
Refrigeration	Type/Charge	oz	R32/20.10	R32/35.27	R32/33.51	R32/52.91	R32/52.91
	Outdoor Additional Charge	oz/ft	0.52	0.52	0.52	0.52	0.52
	N.A.Design Pressure	PSI	609/174	609/174	609/174	609/174	609/174
Refrigerant piping	Liquid /Vapor Valve Size	inch	(3/8) / (1/2)	(3/8) / (1/2)	(3/8) / (5/8)	(3/8) / (5/8)	(3/8) / (5/8)
	Max. refrigerant pipe length	ft	98	164	246.0	246.0	246.0
	Max.Height Difference	ft	66	82	98	98	98
Ambient temp.	Cooling	°F	5~131	5~131	5~131	5~131	5~131
	Heating	°F	N/A	N/A	N/A	N/A	N/A
SERVICE CODE			31Q	31R	30C	31S	30D

OUTDOOR UNIT			CSL18CD-M	CSL24CD-M	CSL36CD-M	CSL48CD-M	CSL60CD-M
Power supply		V-Ph-Hz	208/230V,1Ph, 60Hz				
Cooling	Capacity	Btu/h	18000	24000	36000	48000	55000
	Input	W	2000	2600	3450	5450	6400
Heating	capacity	Btu/h	N/A	N/A	N/A	N/A	N/A
	Input	W	N/A	N/A	N/A	N/A	N/A
Outdoor Minimum Circuit Ampacity		A	9.0	12.5	19.0	28.0	34.0
Outdoor Max.Fuse		A	15	15	20	30	40
Outdoor Air Flow		CFM	1060	1350	2350	2800	3050
Outdoor Noise Level		dB(A)	54	54	56	60	60
Connection Wiring			485: AWG 25*3 Shielded, 24V: AWG 20				
Communication Type			24V / 485	24V / 485	24V / 485	24V / 485	24V / 485
Throttle type			/	/	/	/	/
Outdoor Unit	Unpacking(W*H*D)(inch)	inch	34-1/16×21-29/64×12-51/64	36-7/32×28-5/32×14-49/64	37-63/64×31-57/64×15-3/4		
	Packing (W*H*D)(inch)	inch	37-13/32×24-7/32×15-5/32	40-23/64×30-33/64×18-45/64	42-1/8×34-41/64×20-43/64		
	Net/Gross weight (lbs)	lbs	53/58	61/65	79/87	122/131	122/131
Refrigeration	Type/Charge		R410a/24.1	R410a/42.3	R410a/40.2	R410a/63.5	R410a/63.5
	Outdoor Additional Charge	oz/ft	0.62	0.62	0.62	0.62	0.62
	N.A.Design Pressure	PSI	609/174	609/174	609/174	609/174	609/174
Refrigerant piping	Liquid /Vapor Valve Size	inch	(3/8) / (1/2)	(3/8) / (1/2)	(3/8) / (5/8)	(3/8) / (5/8)	(3/8) / (5/8)
	Max. refrigerant pipe length	ft	98	164	246.0	246.0	246.0
	Max.Height Difference	ft	66	82	98	98	98
Ambient temp.	Cooling	°F	5~131	5~131	5~131	5~131	5~131
	Heating	°F	N/A	N/A	N/A	N/A	N/A
SERVICE CODE			34P	34Q	34R	34S	34T

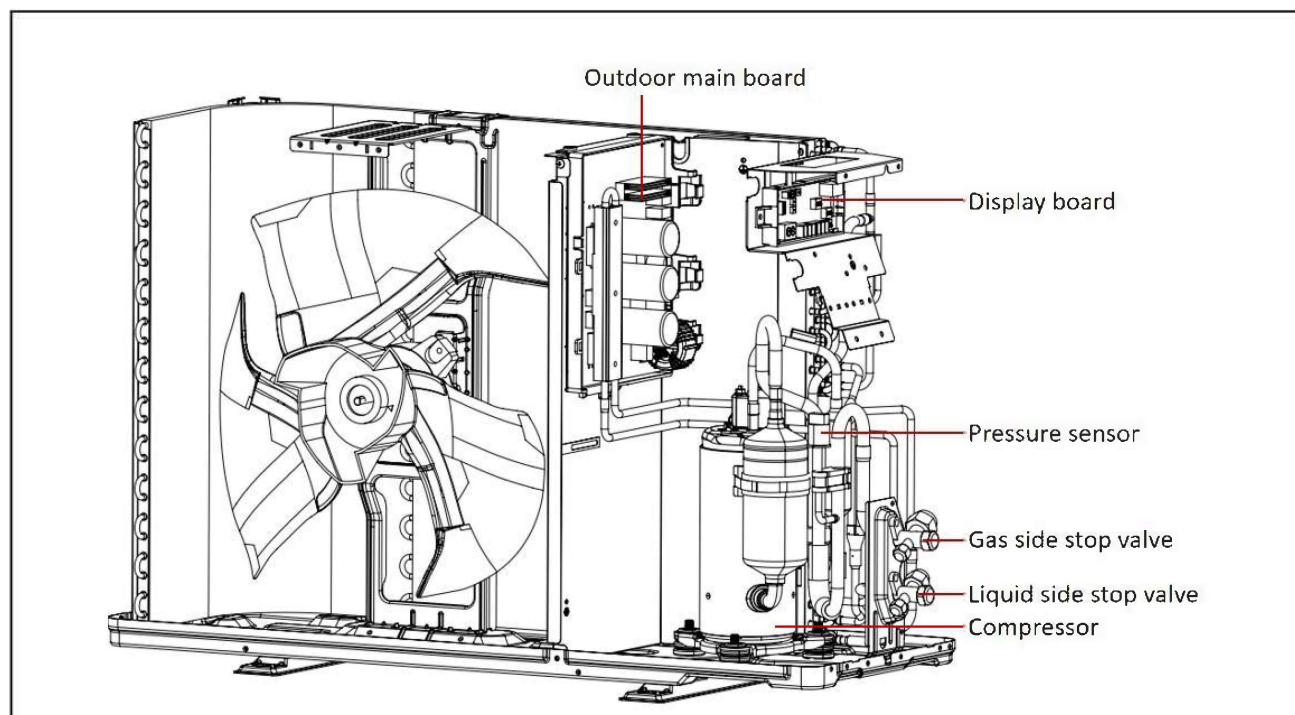
Part 2

Component Layout and Refrigerant Circuit

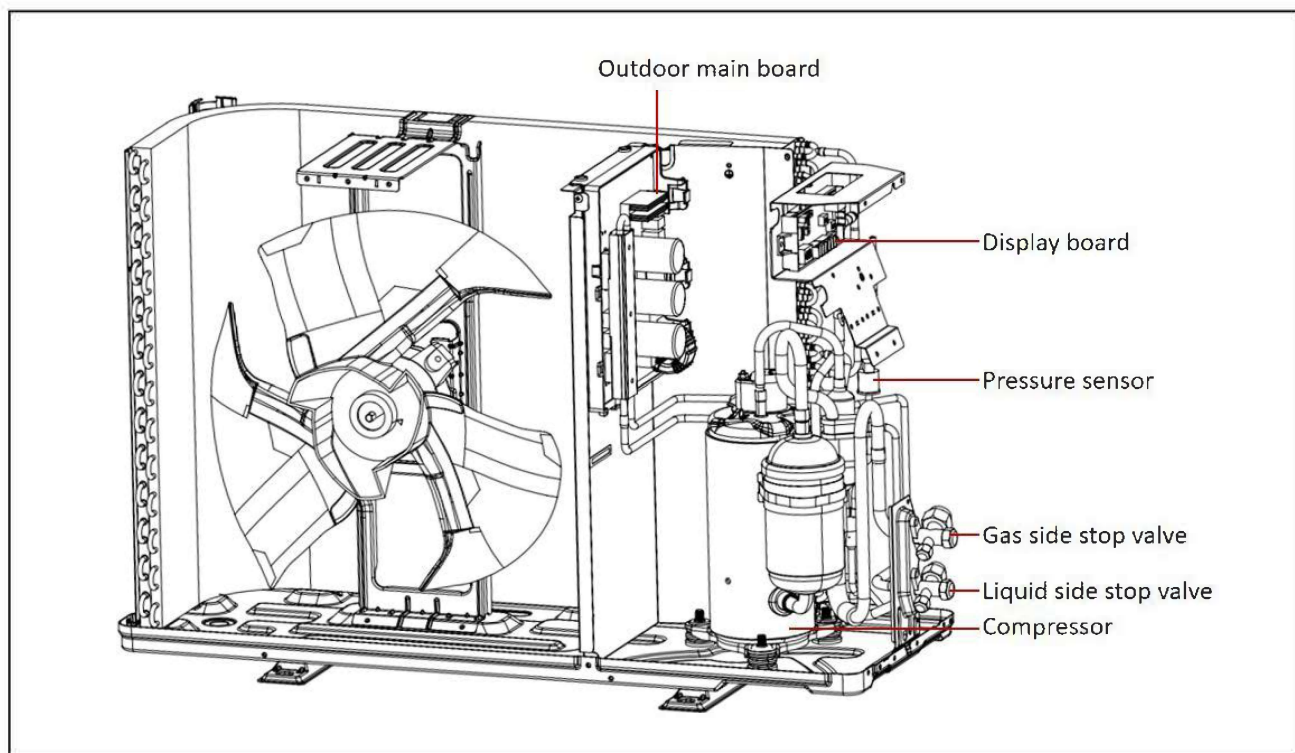
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1 Layout Functional Components

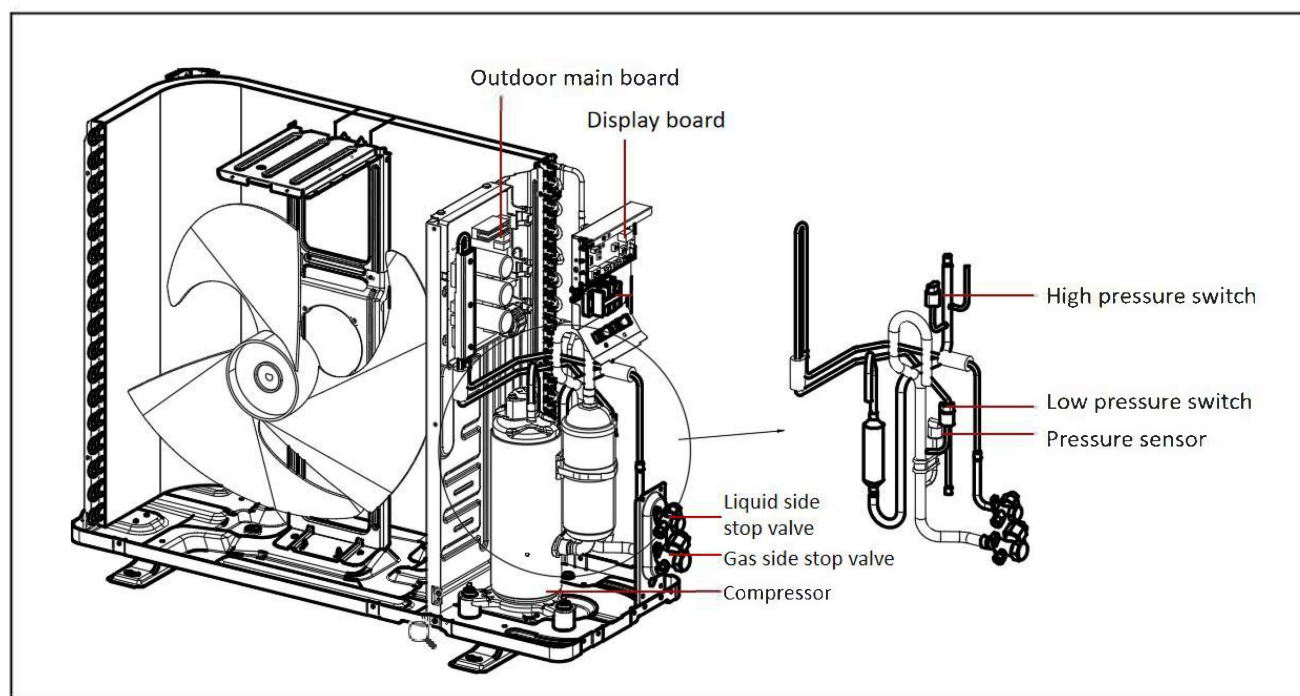
CSL18CD, CSL18CD-M



CSL24CD, CSL24CD-M

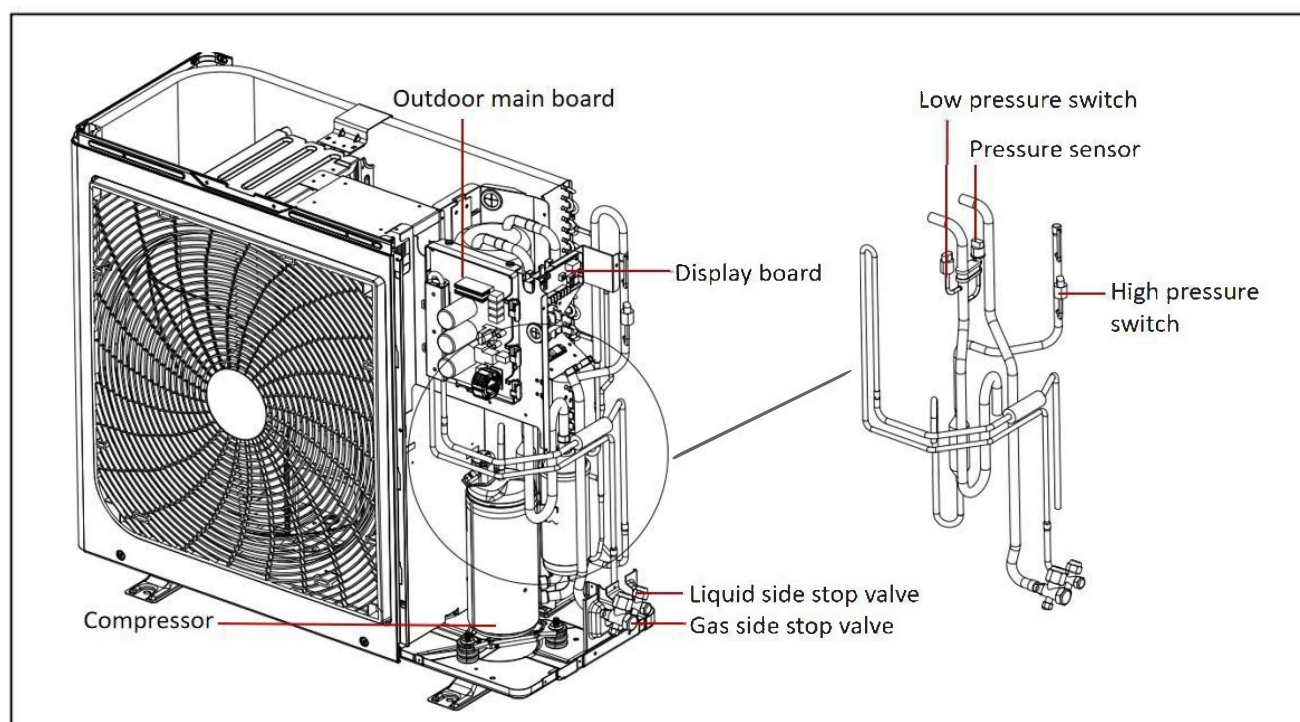


CSL36CD, CSL36CD-M

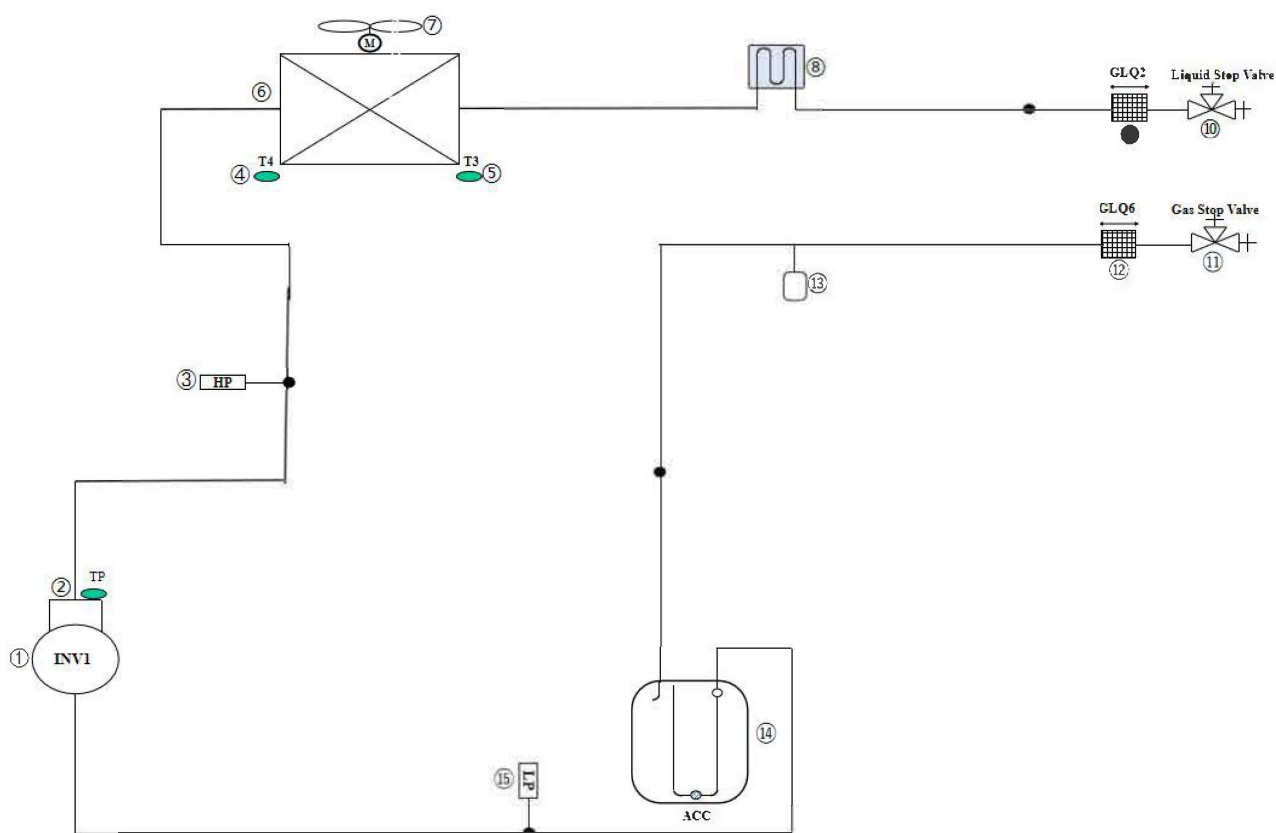


CSL48CD, CSL48CD-M

CSL60CD, CSL60CD-M



2 Piping diagrams



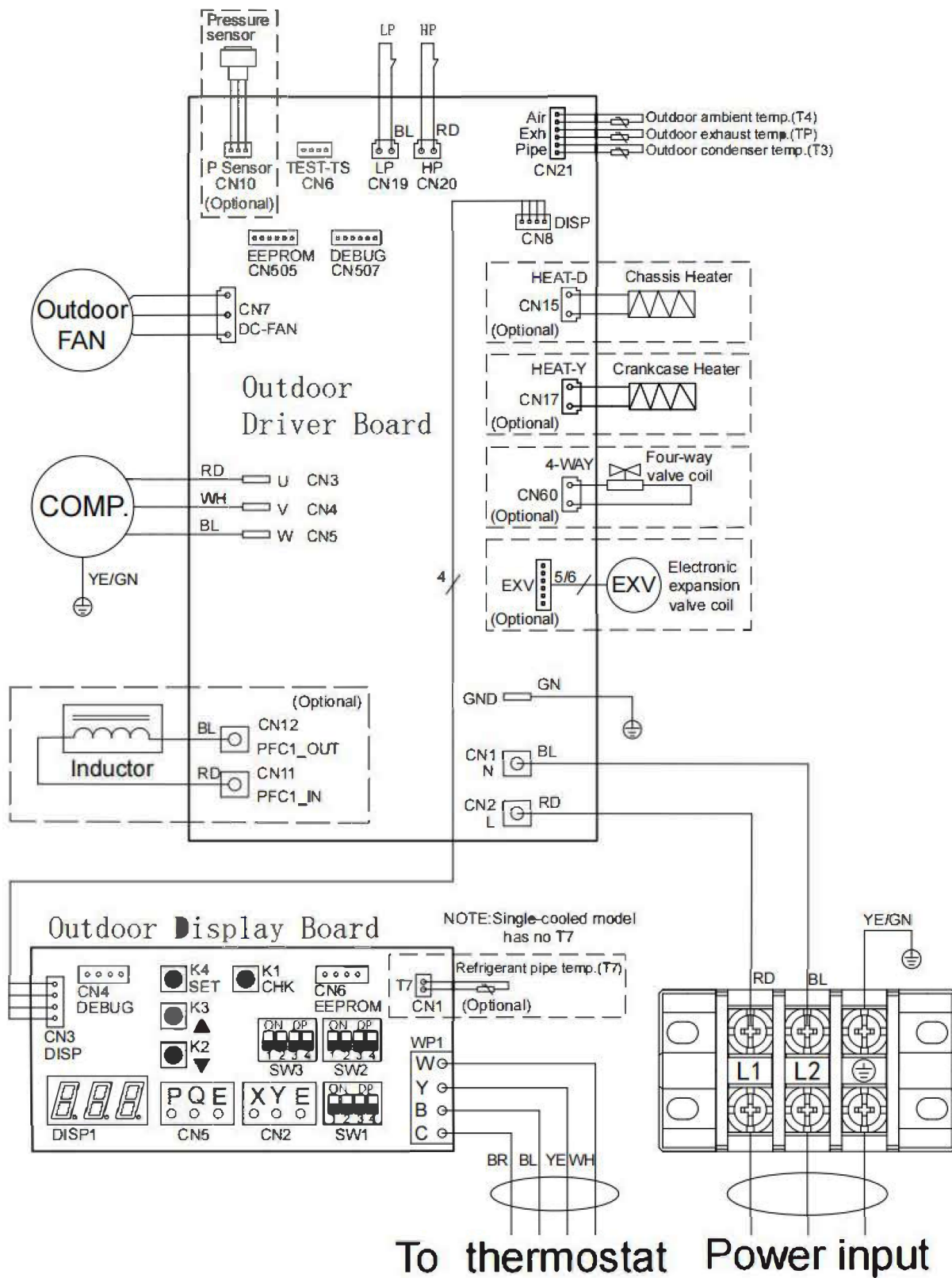
NO.	Component(Outdoor unit)	NO.	Component(Outdoor unit)
1	Compressor	9	Filter
2	Exhaust temperature sensor(TP)	10	Liquid Stop Valve
3	High pressure switch	11	Gas Stop Valve
4	Ambient temperature sensor(T4)	12	Filter
5	Condenser coil temperature sensor(3)	13	Pressure sensor
6	Condenser	14	Gas-liquid separator
7	Outdoor fan	15	Low pressure switch
8	Refrigerant cooling pipe	/	

Part 3

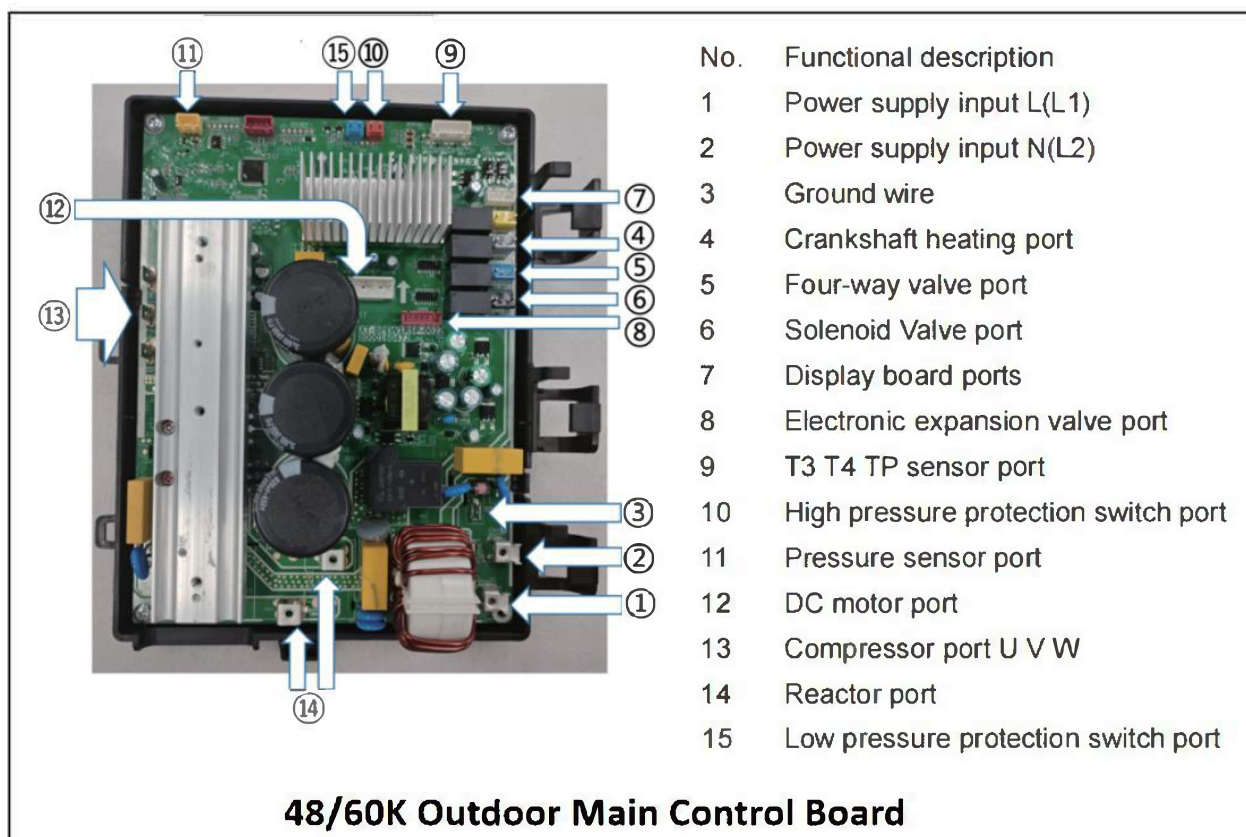
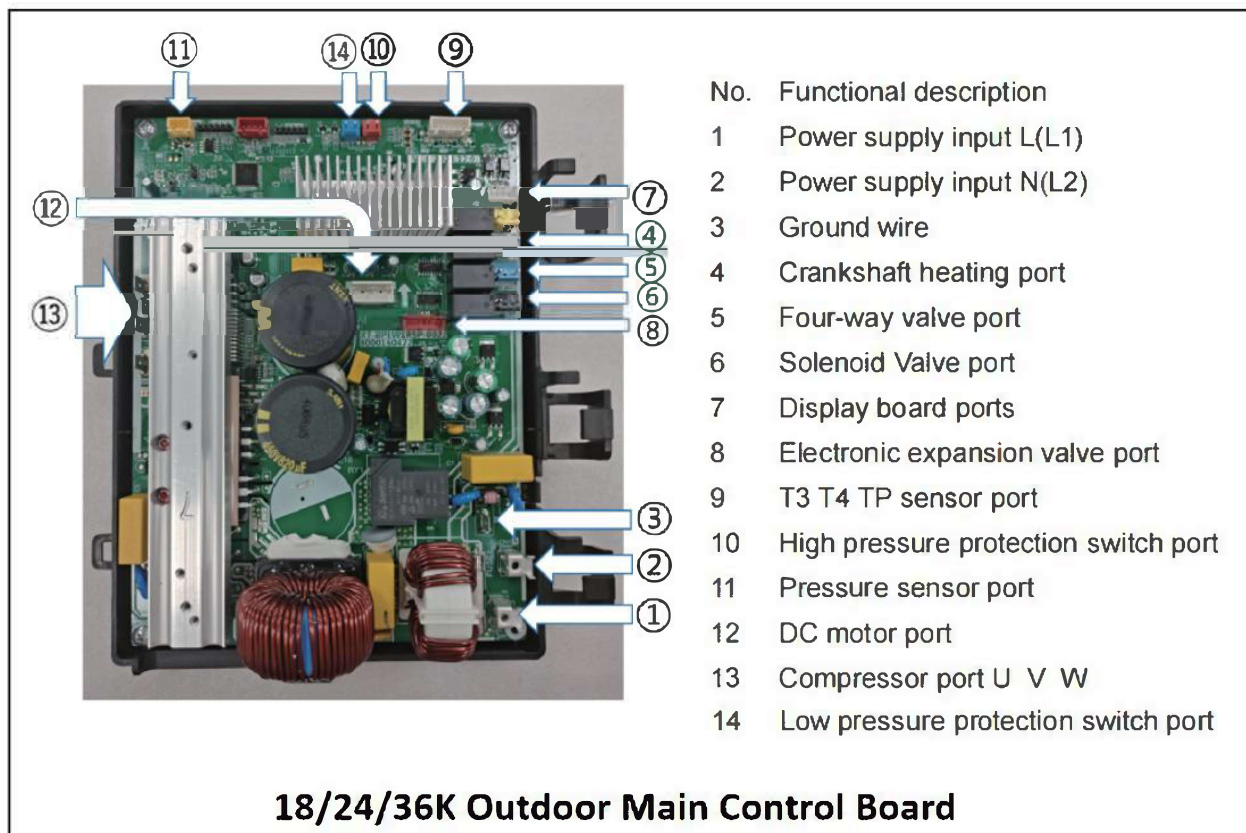
Wiring Diagram

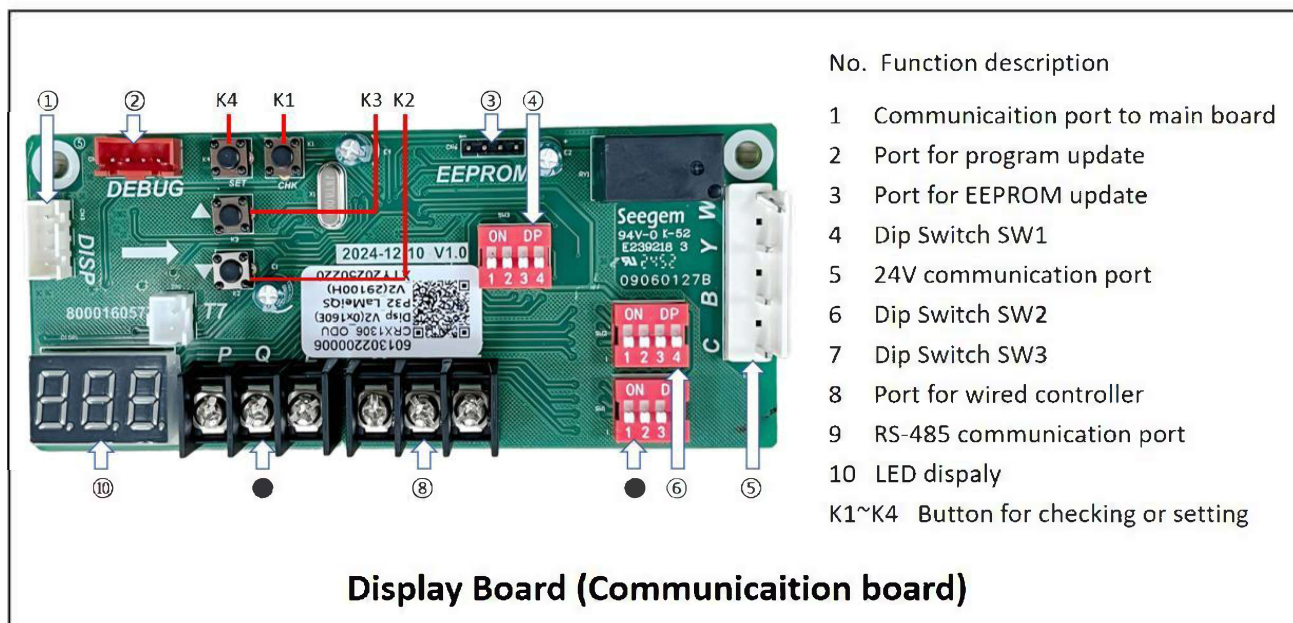
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1 Electric wiring diagram



2 PCB





Definition and uses of the button

- K1: Press "K1" once to enter the outdoor unit parameter inspection.
- K2: Press "K2" to view the parameters in sequence.
- K3: Press "K3" to view the parameters in reverse order.
- K4: "SET" button used to enter forced cooling mode to recover the refrigerant.

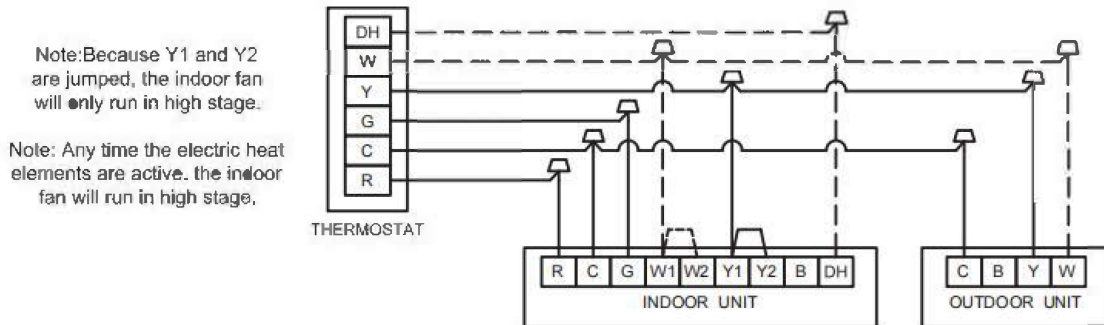
Definition of SW1~SW3

Outdoor Display Board SW1 DIP switch selection			Outdoor Display Board SW2 DIP switch selection			Outdoor Display Board SW3 DIP switch selection				
SW1.1	OFF	24V Control(Default)	SW2.1	OFF	Auto Defrosting(Default)	SW3.1	OFF	Normal energy efficiency		
	ON	RS485 Comm. Mode		ON	Periodically Defrosting		ON	High energy efficiency (SE18)		
SW1.2	OFF	°F for Fahrenheit(Default)	SW2.2	OFF	Defrost interval 60 minutes(Default)	SW3.2	OFF	SW3.3	OFF	24K
	ON	°C for Celsius		ON	Defrost interval 30 minutes		OFF		ON	36K
SW1.3	OFF	Heating and cooling	SW2.3	OFF	Normal Defrosting(Default)		ON		OFF	48K
	ON	Single-cooled		ON	Accelerate Defrosting		ON		ON	60K
SW1.4	OFF	Normal Cooling(Default)	SW2.4	OFF	Normal Thermostat(Default)	SW3.4	OFF	Normal Heating(Default)		
	ON	Accelerate Cooling		ON	O/B Thermostat		ON	Accelerate Heating		

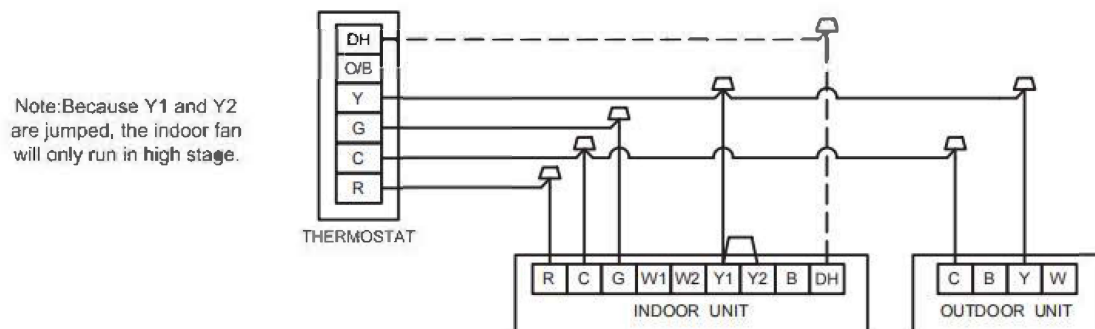
3 Low voltage wiring diagram

The following wiring diagram are suitable for the Indoor Unit and Outdoor Unit with 24V thermostat.

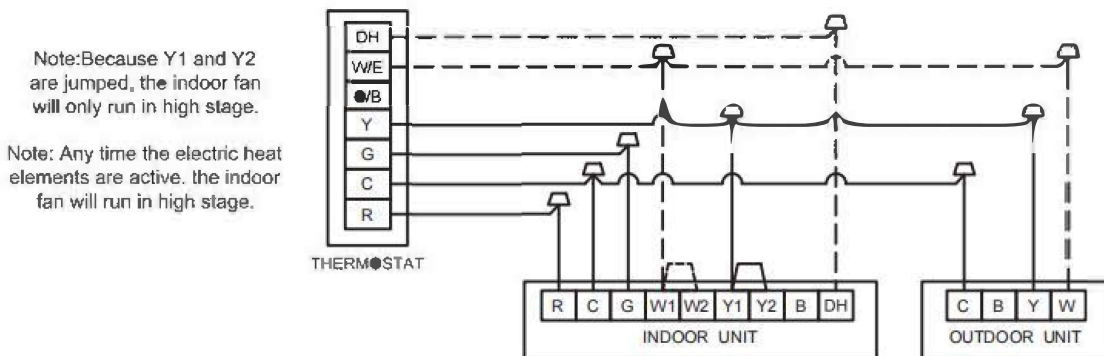
Wiring for 1H and 1C thermostat (no heat pump system model)



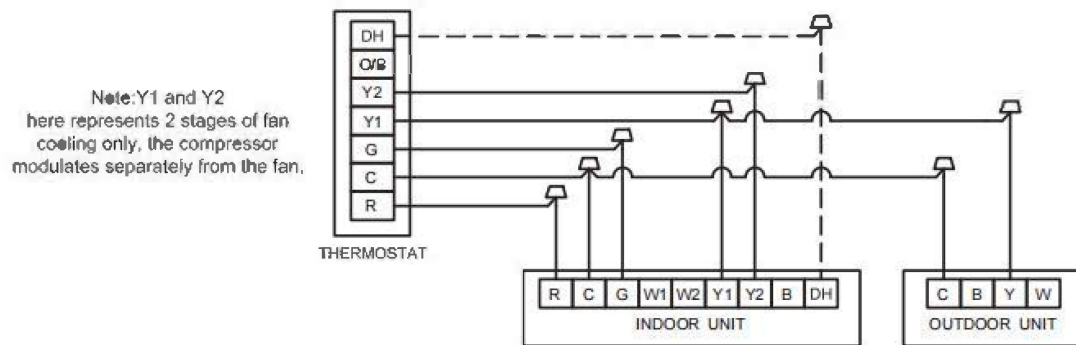
Wiring for 1H and 1C thermostat (no heat pump system model)



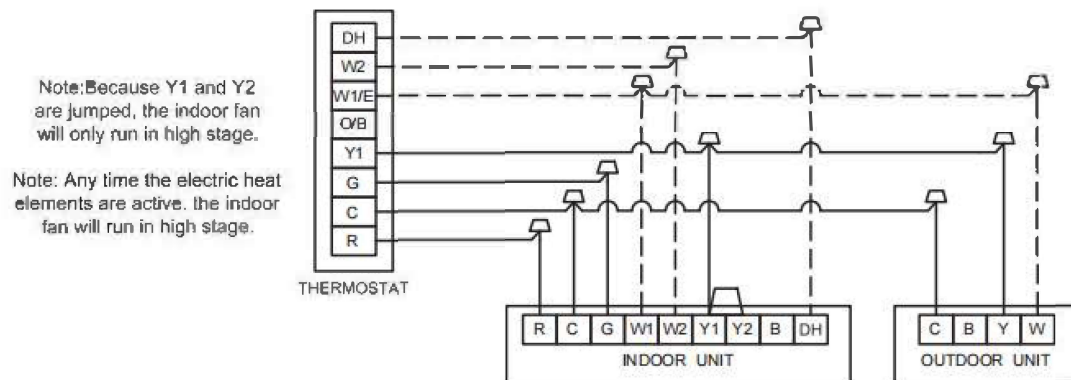
Wiring for 2H and 1C thermostat (no heat pump system model)



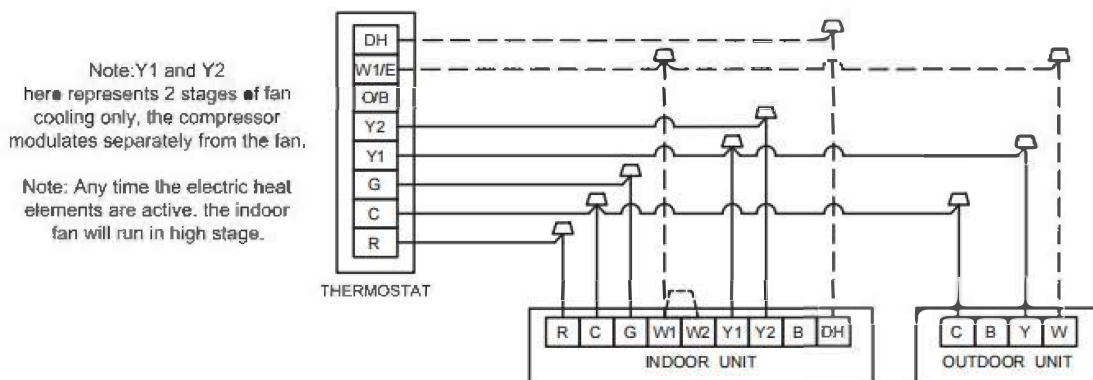
Wiring for 2H and 2C thermostat (no heat pump system model)



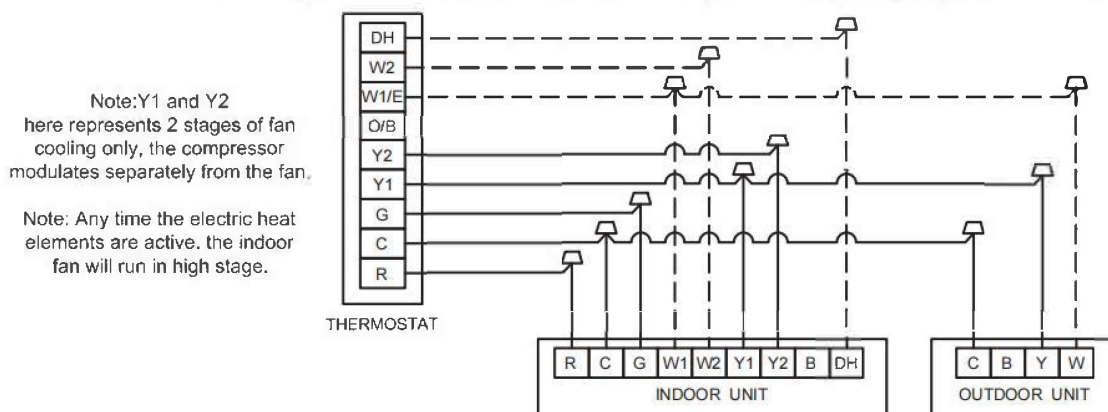
Wiring for 3H and 1C thermostat (no heat pump system model)



Wiring for 3H and 2C thermostat (no heat pump system model)



Wiring for 4H and 2C thermostat (no heat pump system model)



Control Logic:

Indoor unit connector

Connector	Purpose
R	24V Power Connection
C	Common
G	Fan Control
Y1	Low Cooling
Y2	High Cooling
B	Heating Reversing Valve
W1	Stage 1 Electric Heating
W2	Stage 2 Electric Heating
DH	Dehumidification

Outdoor unit connector

Connector	Purpose
C	Common
Y	Cooling
B	Heating Reversing Valve
W	Defrost control

Note:

- 1) DH wiring is optional and requires a thermostat with a humidistat. DH functions as Passive Dehumidification and will downstage the indoor fan to first stage. System will operate according to normal sequence of operations if DH wiring is absent.
- 2) Dashed lines in the above thermostat wiring diagrams refer to optional wiring (wiring for Passive Dehumidification Function and/OR Electric Heat). For thermostat wiring please refer to the Owner's Manual of the thermostat.
- 3) B wire must be used with heat pump system only, the reversing valve energizes in heating.

Part 4

Diagnosis and Troubleshooting

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1 Error code table

Error code	Error definition
FA	EEPROM fault (on main PCB)
FB	EEPROM fault (on inverter module)
H1	P5 protection appears 3 times in 180 minutes can't be recovered until re-power on
H2	FF protection appears 3 times in 150 minutes can't be recovered until re-power on
H3	PD protection appears 3 times in 180 minutes can't be recovered until re-power on(not applicable for cooling only unit)
H4	P8 protection appears 3 times in 120 minutes can't be recovered until re-power on
H5	P2 protection appears 3 times in 240 minutes can't be recovered until re-power on
H6	P4 protection appears 3 times in 100 minutes can't be recovered until re-power on
H7	PC protection appears 3 times in 200 minutes can't be recovered until re-power on
H8	FE protection appears 3 times in 120 minutes can't be recovered until re-power on
HC	F7 protection appears 3 times in 180 minutes can't be recovered until re-power on(not applicable for cooling only unit)
HE	F8 protection appears 3 times in 60 minutes can't be recovered until re-power on (not applicable for cooling only unit)
H0	Inverter module and main PCB communication error
L0	DC bus low voltage protection
L1	DC bus high voltage protection
FF	High pressure switch fault for 20 minutes
P1	High pressure switch fault for 4 seconds
P2	Low pressure protection in cooling mode
P3	Over current protection
P4	Discharge temperature protection
P5	T3 high temperature protection in cooling mode
P6	Compressor inverter module protection
p7	Indoor unit anti-freezing protection(Applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS485)
P8	IPM high temperature protection

P9	Fan motor inverter module protection
PC	Overwet operation protection(Applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS485)
PD	High pressure protection in heating mode(not applicable for cooling only unit)
F0	Outdoor unit and indoor unit communication error(From Outdoor unit)
F4	T4 - Ambient temperature sensor fault
F5	TP - Discharge temperature sensor fault
F6	T3 - Coil temperature sensor fault
F7	T7 temperature sensor fault (not applicable for cooling only unit)
F8	Condensation of the refrigerant pipe protection (not applicable for cooling only unit)
F9	AC voltage is too high or too low protection
FC	IPM temperature sensor fault
FD	Pressure sensor fault
FE	T3/TP temperature sensor loose protection
E1	Outdoor unit and indoor unit communication error (Applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS485)
E2	Indoor unit T1 temperature sensor fault (Applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS485)
E3	Indoor unit T2 temperature sensor fault (Applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS485)
E4	Refrigerant concentration sensor fault (Applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS485)
E6	Refrigerant leakage protection (Applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS485)
E8	Indoor fan motor current fault (Applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS485)
E9	Wired controller communication fault (Applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS485)
ATL	Ambient temperature out of bounds protection

2 Troubleshooting

2.1 Safety Precautions

The following precautions here are quite important, so be sure to follow them carefully. Read these instructions carefully before installation. Keep this manual in a handy for future preference.

Failure to adhere to all precautionary measures listed in this section may result in personal injury, damage to the unit or to property, or in extreme cases, death.



WARNING

- Indicates a potentially hazardous situation which if not avoided, could result in death or serious injury.



CAUTION

- Indicates a potentially hazardous situation which if not avoided, may result in minor or moderate injury.
- It is also used to alert against unsafe practices.

2.1.1 In case of Accidents or Emergency



WARNING

- If a gas leak is suspected, immediately turn off the gas and ventilate the area if a gas leak is suspected before turning the unit on.
- If strange sounds or smoke is detected from the unit, turn the breaker off and disconnect the power supply cable.
- If the unit comes into contact with liquid, contact an authorized service center.
- If liquid from the batteries makes contact with skin or clothing, immediately rinse or wash the area well with clean water.
- Do not insert hands or other objects into the air inlet or outlet while the unit is plugged in.
- Do not operate the unit with wet hands.



CAUTION

- Clean and ventilate the unit at regular intervals when operating it near a stove or near similar devices.
- Do not use the unit during severe weather conditions. If possible, remove the product from the window before such occurrences.

2.1.2 Information servicing(For flammable materials)



WARNING

- Use this unit only on a dedicated circuit.
- Damage to the installation area could cause the unit
- to fall, potentially resulting in personal injury, property damage, or product failure.
- Only qualified personnel should disassemble, install, remove, or repair the unit.
- Only a qualified electrician should perform electrical work. For more information, contact your dealer, seller, or an authorized service center.



CAUTION

- While unpacking be careful of sharp edges around the unit as well as the edges of the fins on the condenser and evaporator.

2.1.3 Operation and Maintenance



WARNING

- Do not use defective or under-rated circuit breakers.
- Ensure the unit is properly grounded and that a dedicated circuit and breaker are installed.
- Do not modify or extend the power cable. Ensure the power cable is secure and not damaged during operation.
- Do not unplug the power supply plug during operation.
- Do not store or use flammable materials near the unit.
- Do not open the inlet grill of the unit during operation.
- Do not touch the electrostatic filter if the unit is equipped with one.
- Do not block the inlet or outlet of air flow to the unit.
- Do not use harsh detergents, solvents, or similar items to clean the unit. Use a soft cloth for cleaning.
- Do not touch the metal parts of the unit when removing the air filter as they are very sharp.
- Do not step on or place anything on the unit or outdoor units.
- Do not drink water drained from the unit.
- Avoid direct skin contact with water drained from the unit.

- Use a firm stool or step ladder according to manufacturer procedures when cleaning or maintaining the unit.

**CAUTION**

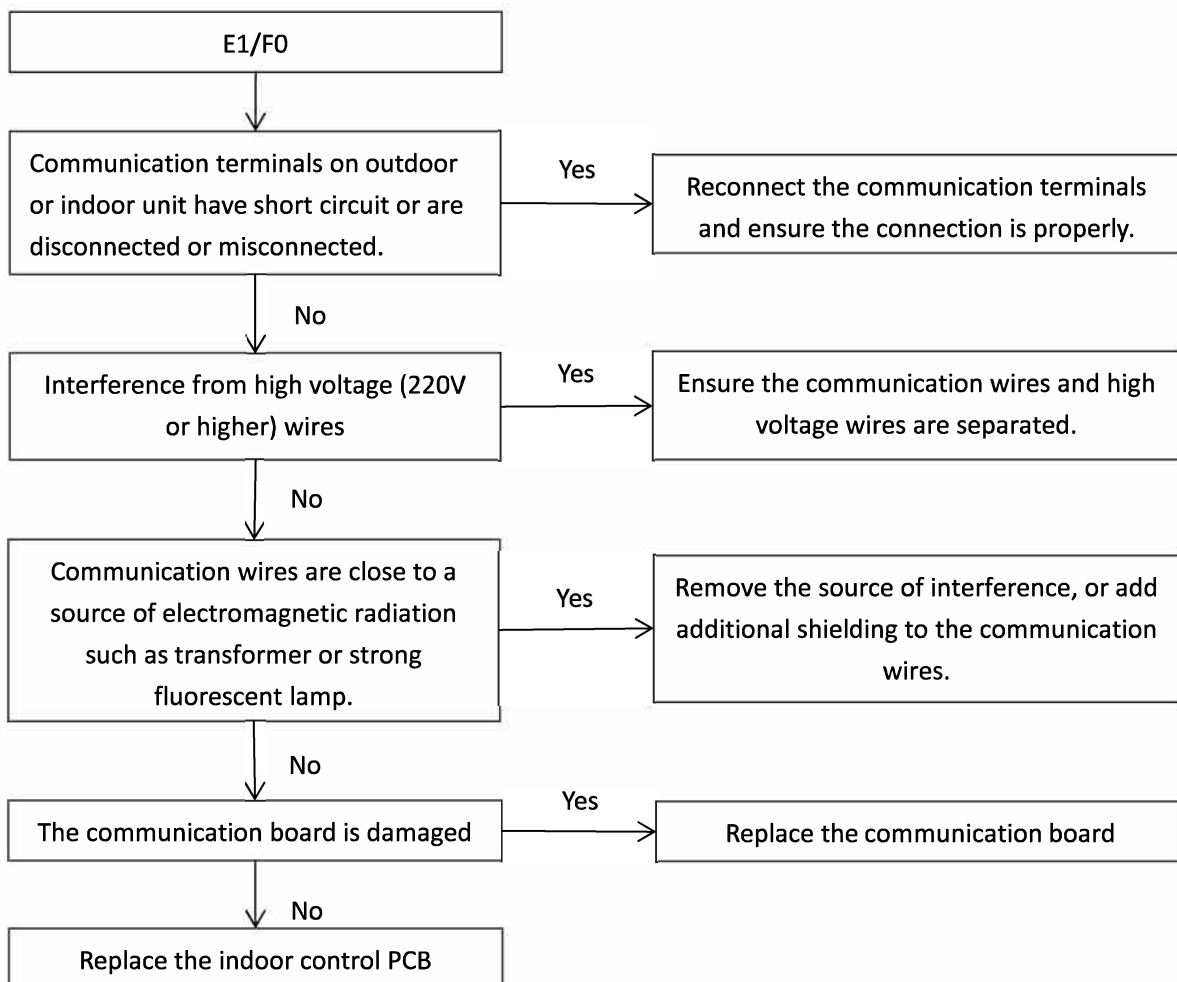
- Do not install or operate the unit for an extended period of time in areas of high humidity or in an environment directly exposing it to sea wind or salt spray.
- Do not install the unit on a defective or damaged installation stand, or in an unsecured location.
- Ensure the unit is installed at a level position
- Do not install the unit where noise or air discharge
- Created by the outdoor unit will negatively impact the environment or nearby residences.
- Do not expose skin directly to the air discharged by the unit for prolonged periods of time.
- Ensure the unit operates in areas waterOr other liquids.
- Ensure the drain hose is installed correctly to ensure proper water drainage.
- When lifting or transporting the unit, it is recommended that two or more people are used for this task.
- When the unit is not to be used for an extended time, disconnect the power supply or turn off the breaker.

2.2 ATL Troubleshooting

- ATL indicates ambient temperature out of bounds protection.
- The unit stops running and will not start operating until the ambient temperature returns to the allowable temperature range, error code is displayed on the communication board.
- The allowable ambient temperature range is 5~125°F (-15~52°C).

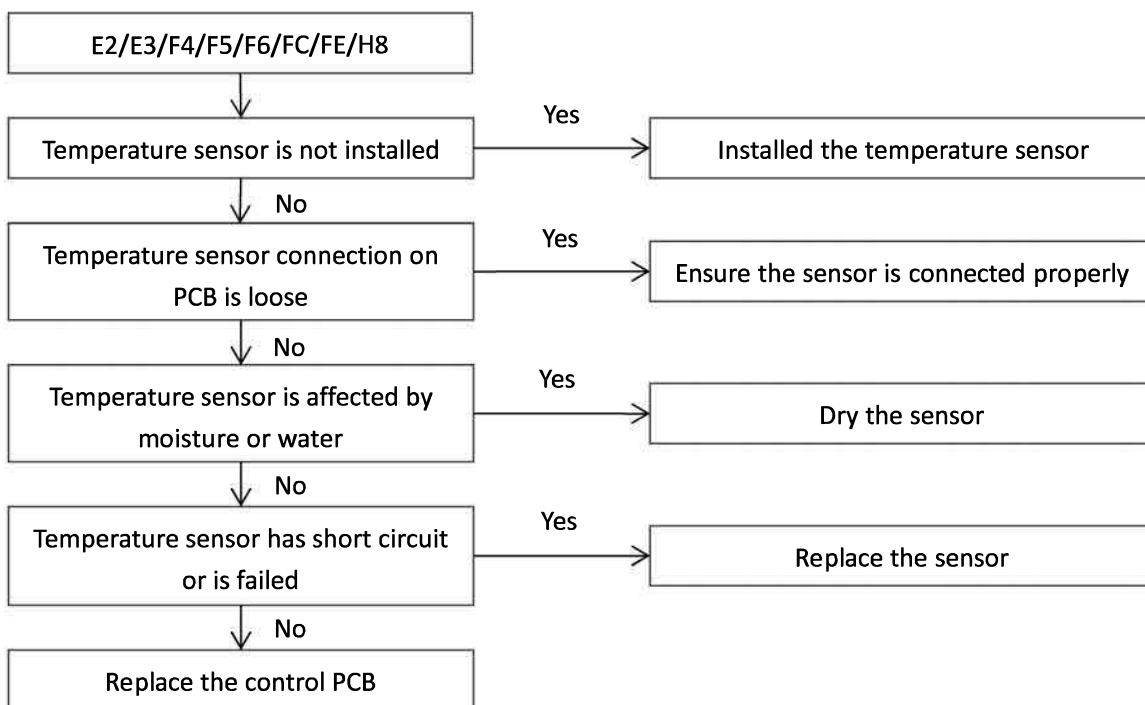
2.3 E1/F0 Troubleshooting

- E1 indicates RS485 communication fault between outdoor unit and indoor unit(from indoor side).
- F0 indicates RS485 communication fault between outdoor unit and indoor unit(from outdoor side).
- The unit stops running and error code is displayed on the communication board



2.4 F4/F5/F6/FC/FE/E2/E3/H8 Troubleshooting

- E2 indicates indoor unit T1 temperature sensor fault
- E3 indicates indoor unit T2 temperature sensor fault
- F4 indicates ambient temperature sensor fault
- F5 indicates discharge temperature sensor fault
- F6 indicates coil temperature sensor fault
- FC indicates IPM temperature sensor fault
- FE indicates T3/TP temperature sensor loose protection
- H8 indicates FE protection appears 3 times in 120 minutes can't be recovered until re-power on.
- The unit stops running and error code is displayed on the communication board

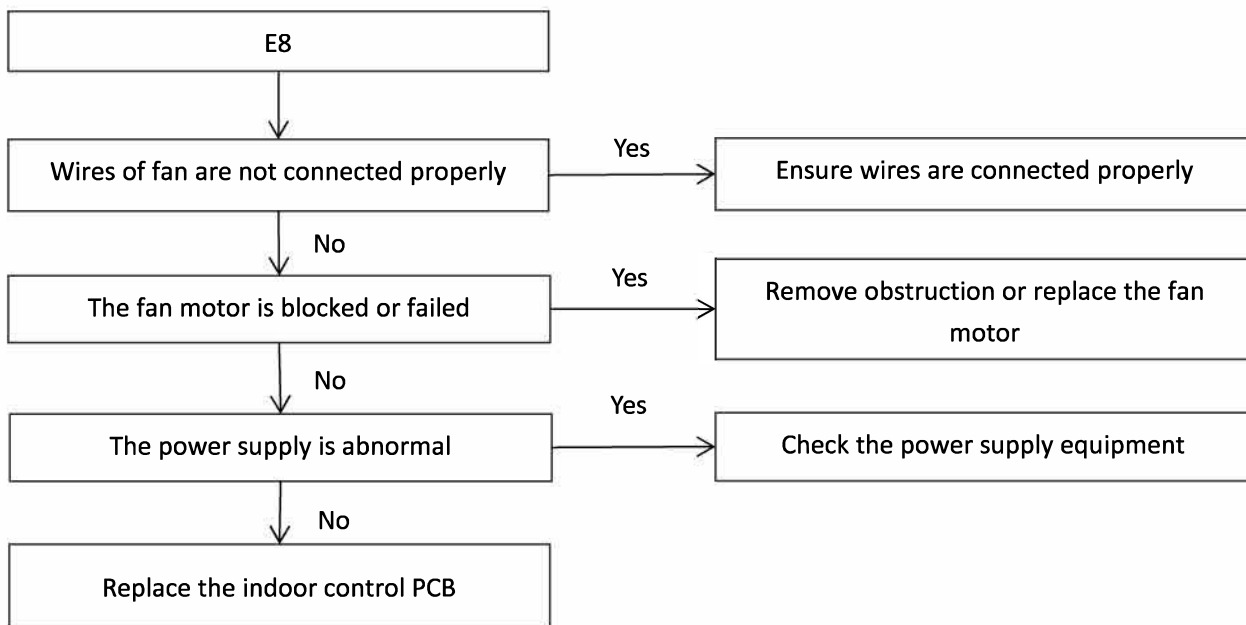


Note:

- 1) Measure sensor resistance. If the resistance is too low, the sensor has short-circuited. If the resistance is not consistent with the sensor's resistance characteristics table, the sensor has failed.
- 2) E2/E3 is applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS-485.

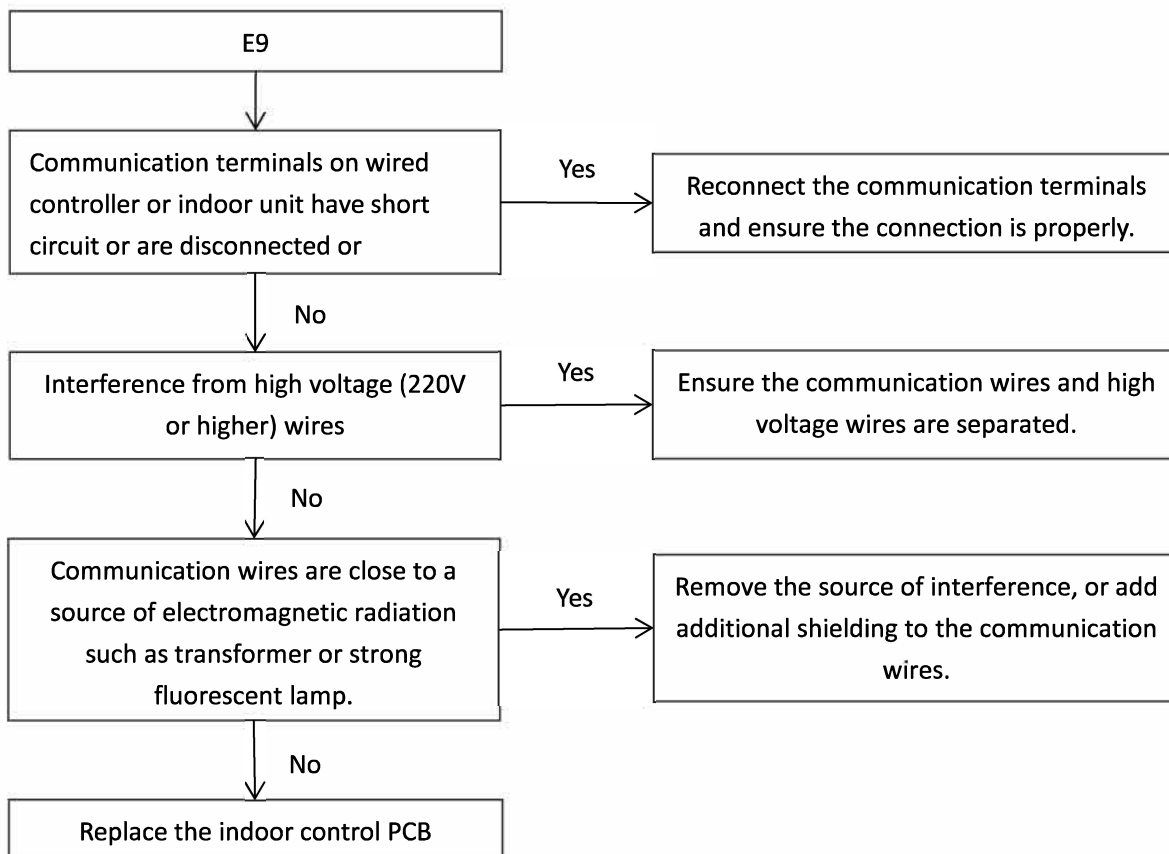
2.5 E8 Troubleshooting

- E8 indicates indoor fan motor current fault, E8 is applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS-485.
- The unit stops running and error code is displayed on the communication board



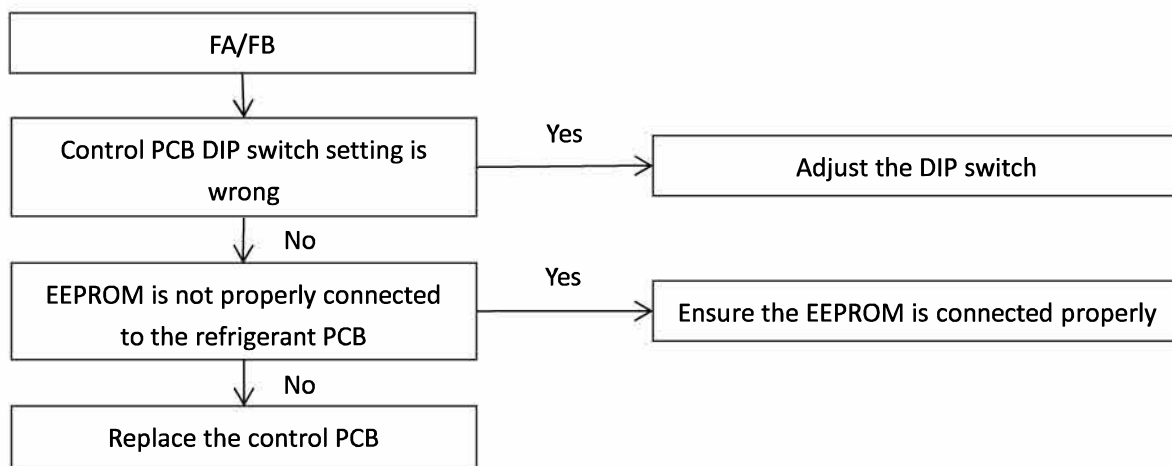
2.6 E9 Troubleshooting

- E9 indicates wired controller communication fault, E9 is applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS485.
- The unit stops running and error code is displayed on the communication board



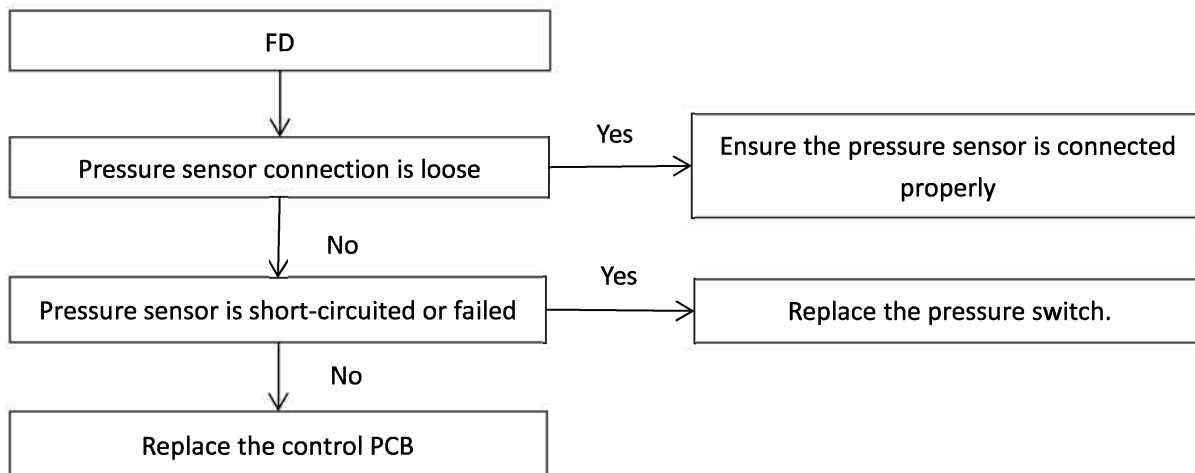
2.7 FA/FB Troubleshooting

- FA indicates EEPROM fault on the main PCB
- FB indicates EEPROM fault on the inverter module
- The unit stops running and error code is displayed on the communication board



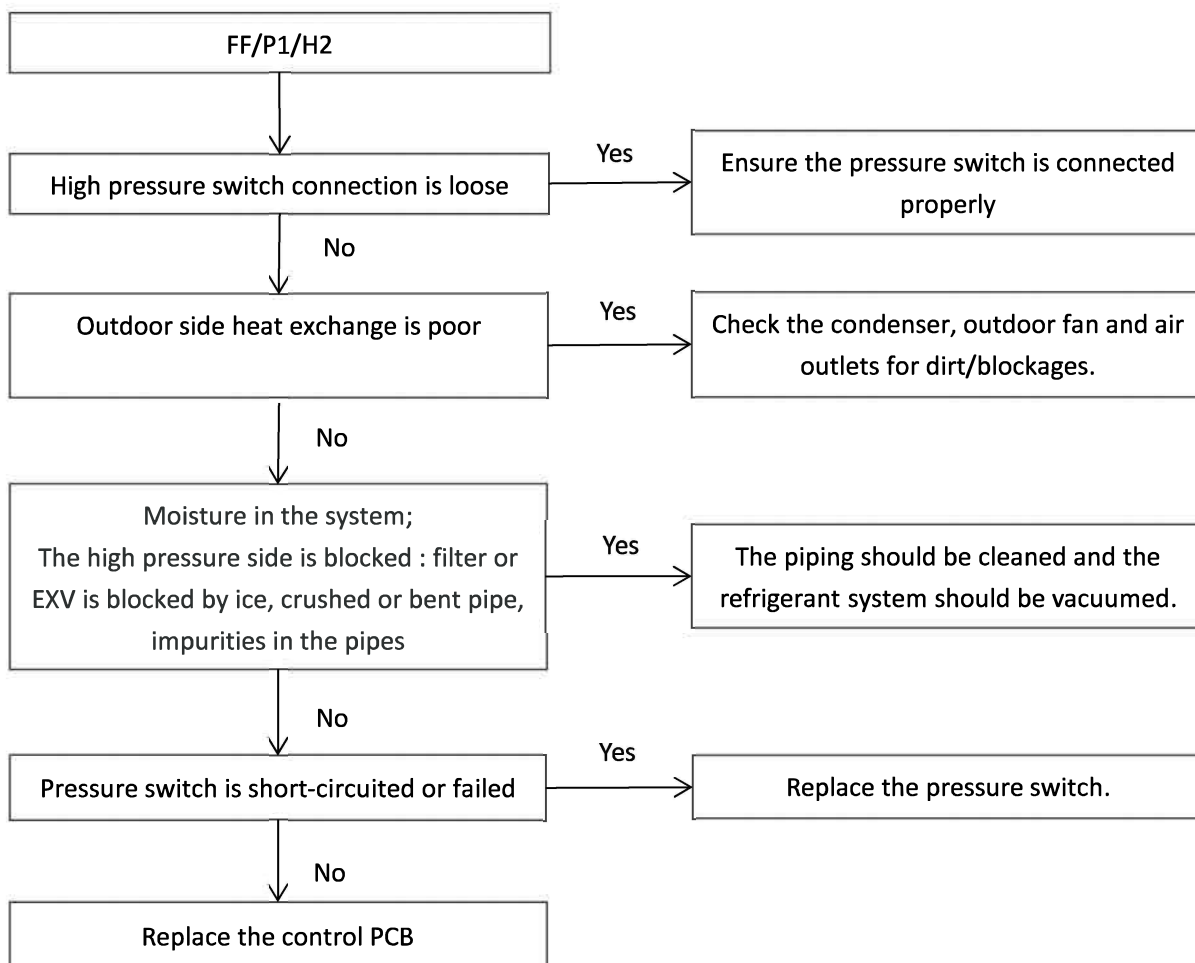
2.8 FD Troubleshooting

- FD indicates pressure sensor fault
- The unit stops running and error code is displayed on the communication board



2.9 FF/P1/H2 Troubleshooting

- FF indicates high pressure switch fault for 20 minutes.
- P1 indicates high pressure switch fault for 4 seconds.
- H2 indicates FF protection appears 3 times in 150 minutes can't be recovered until re-power on.
- The unit stops running and error code is displayed on the communication board

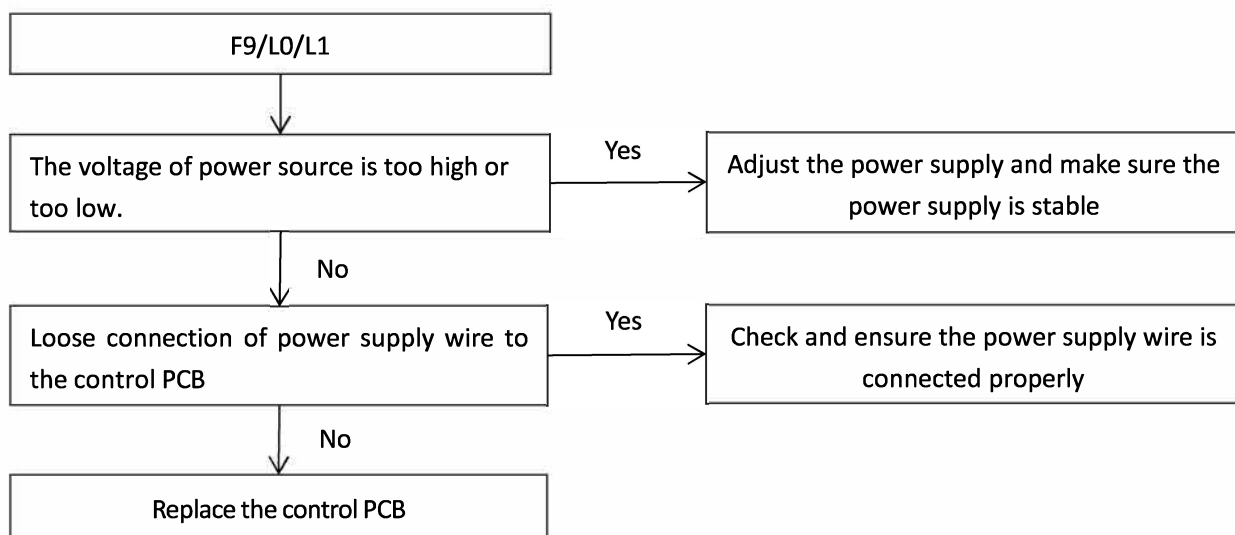


2.10 F9/L0/L1 Troubleshooting

- F9 indicates AC voltage is too high or too low protection
- L0 indicates DC bus low voltage protection
- L1 indicates DC bus high voltage protection

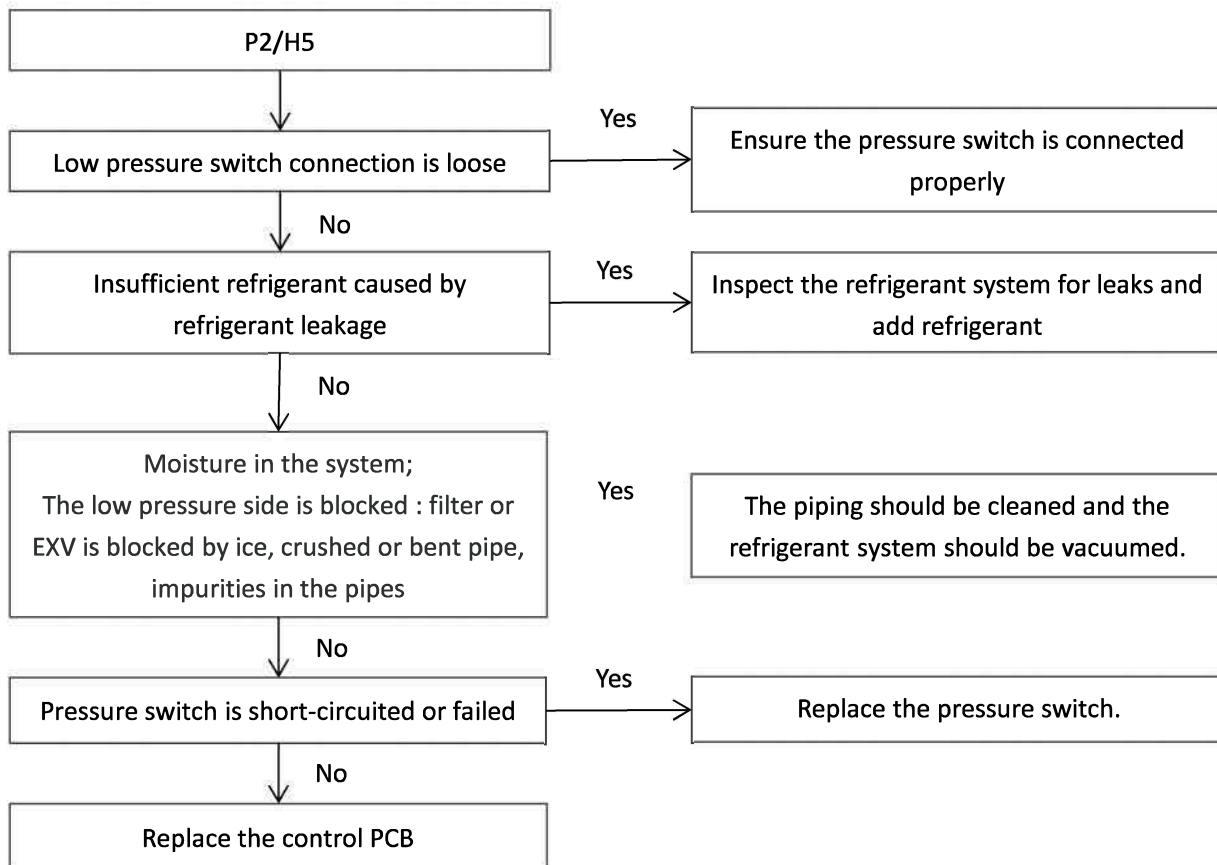
Allowable voltage range of power source	178~265V
Upper limit of DC generatrix voltage	430V
Lower limit of DC generatrix voltage	150V

- The unit stops running and error code is displayed on the communication board



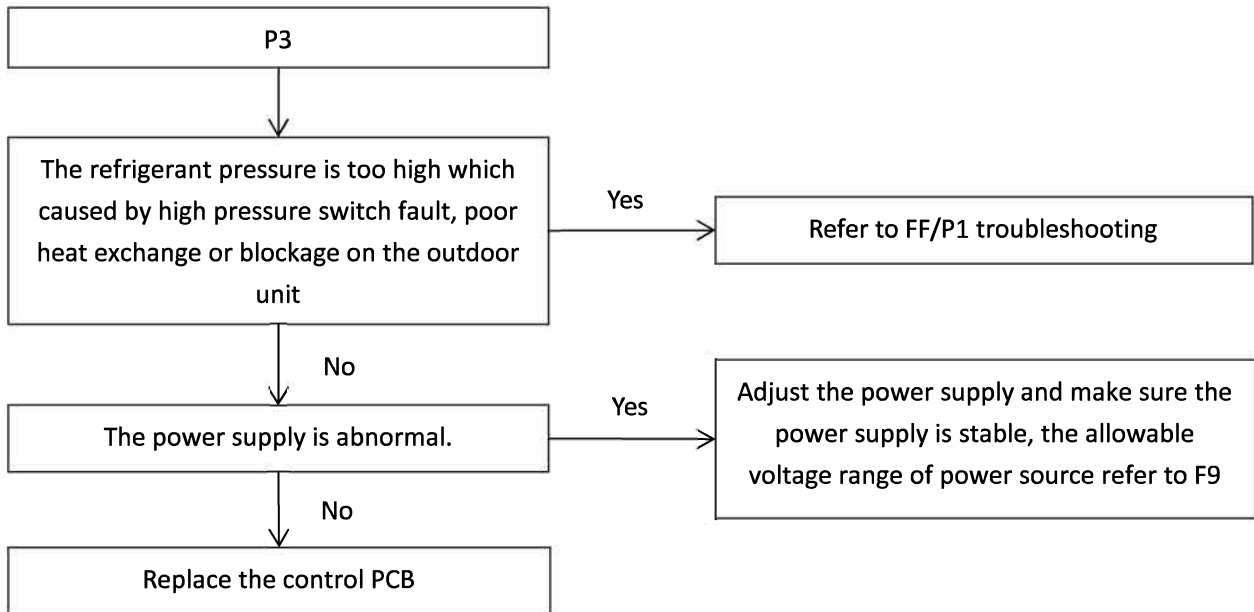
2.11 P2/H5 Troubleshooting

- P2 indicates low pressure protection in cooling mode.
- H5 indicates P2 protection appears 3 times in 240 minutes can't be recovered until re-power on.
- The unit stops running and error code is displayed on the communication board



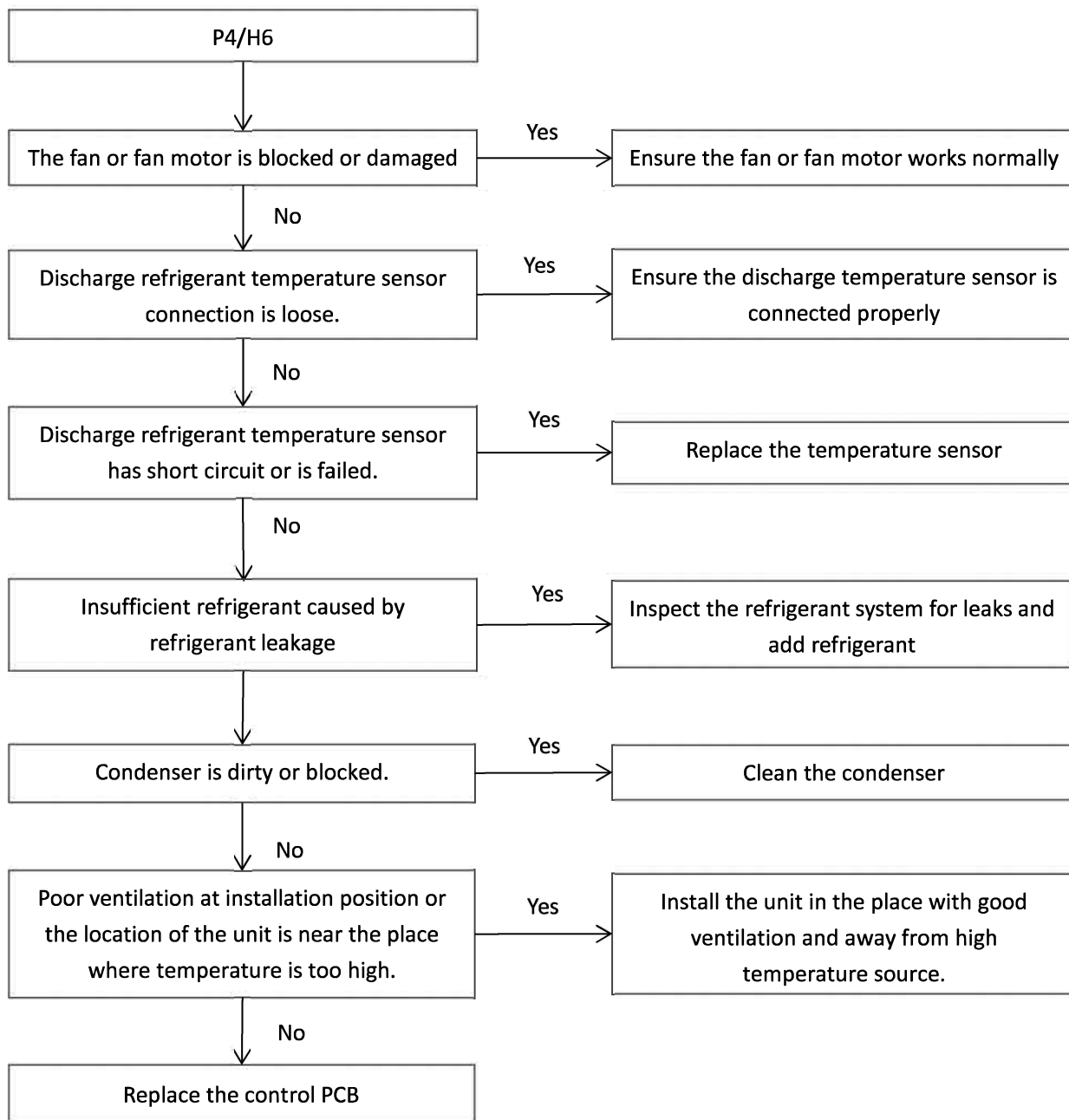
2.12 P3 Troubleshooting

- P3 indicates over current protection
- The unit stops running and error code is displayed on the communication board



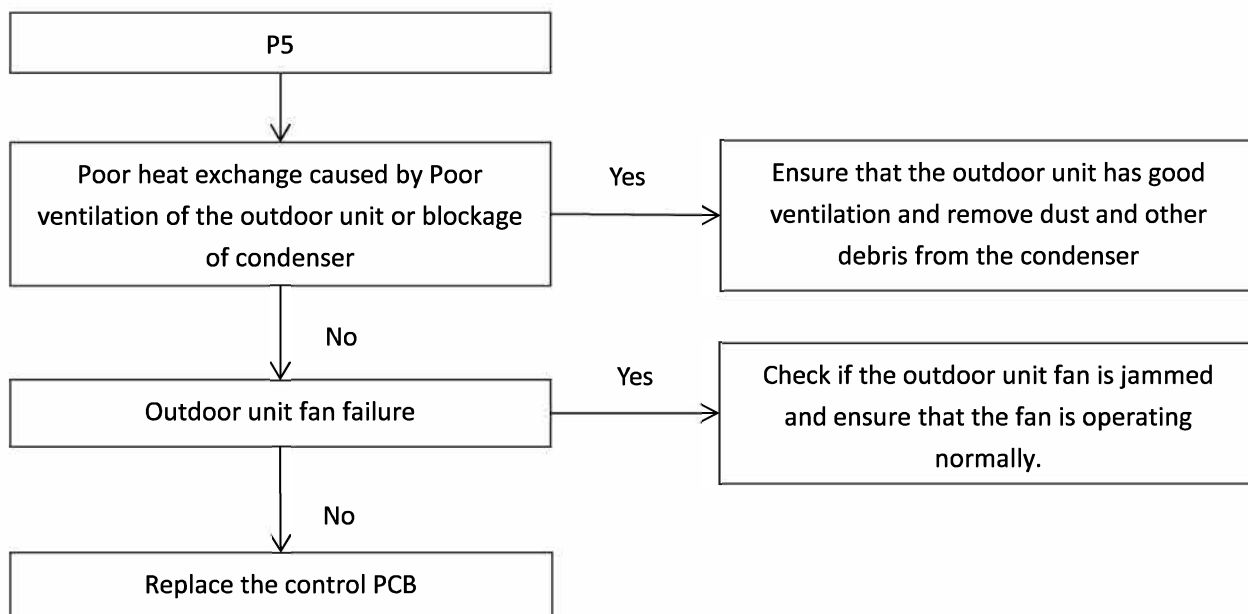
2.13 P4/H6 Troubleshooting

- P4 indicates discharge temperature protection
- H6 indicates P4 protection appears 3 times in 100 minutes can't be recovered until re-power on.
- The unit stops running and error code is displayed on the communication board.



2.14 P5 Troubleshooting

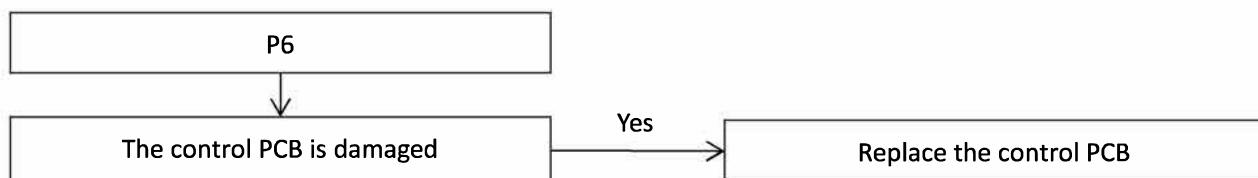
- P5 indicates T3 high temperature protection in cooling mode
- The unit stops running and error code is displayed on the communication board.



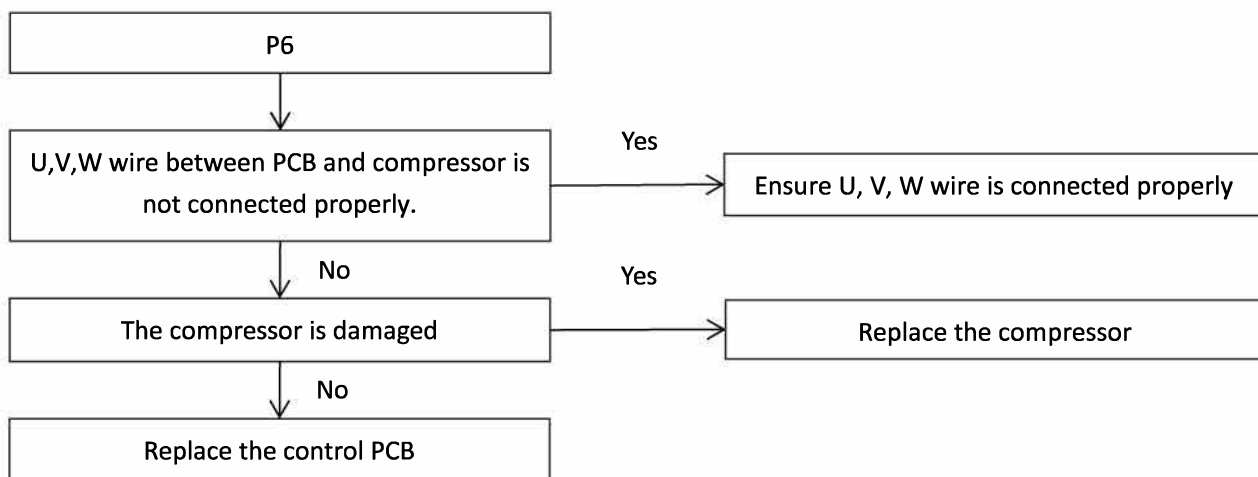
2.15 P6 Troubleshooting

- P6 indicates compressor inverter module protection.
- The unit stops running and error code is displayed on the communication board.

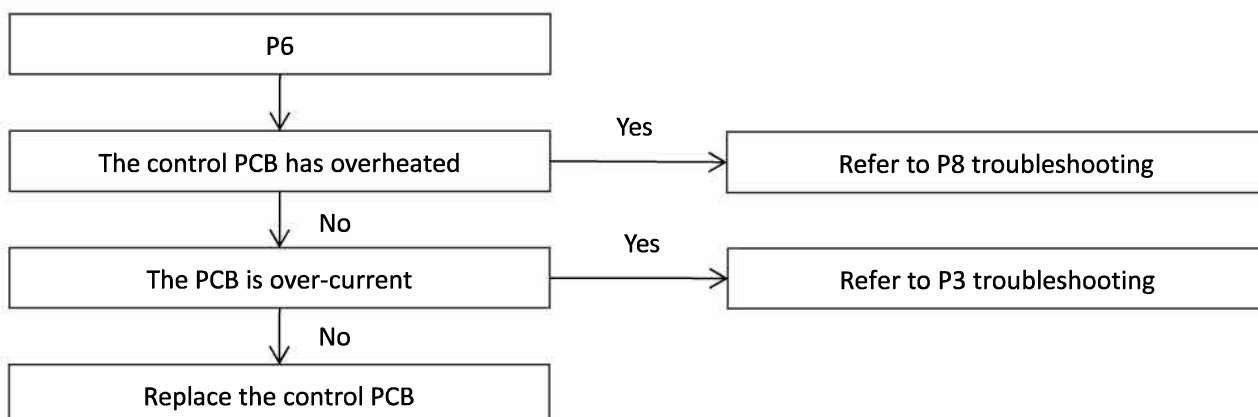
Situation1: P6 appears immediately when the outdoor unit is powered-on



Situation2: P6 appears immediately after the compressor starts up

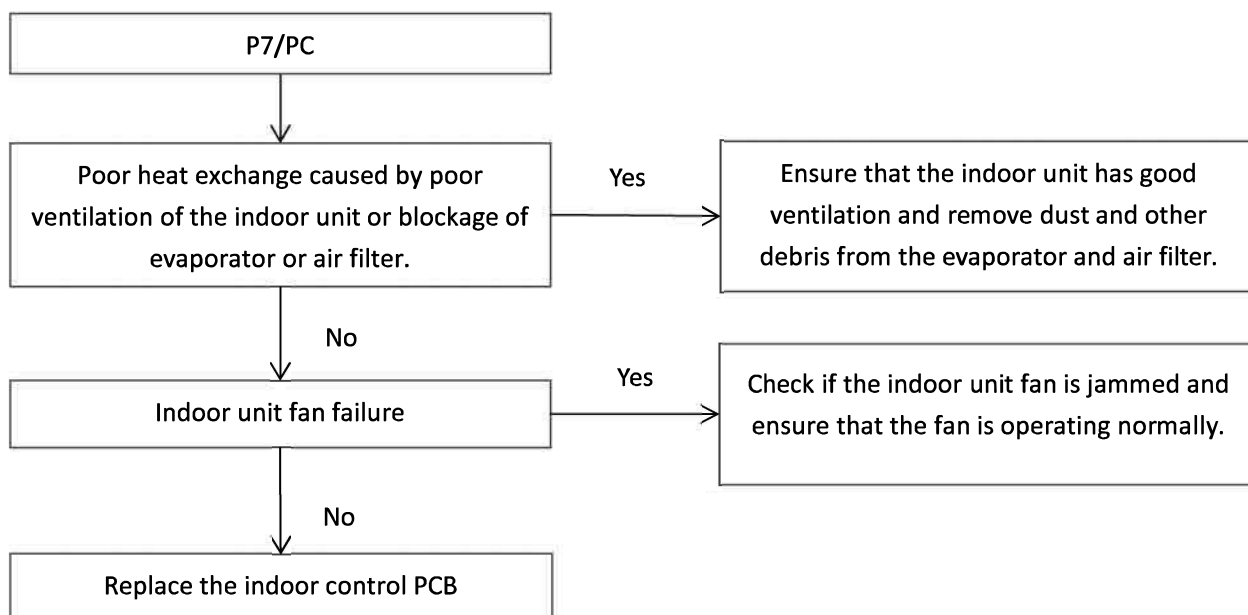


Situation3: P6 appears after the compressor has been running for a period of time.



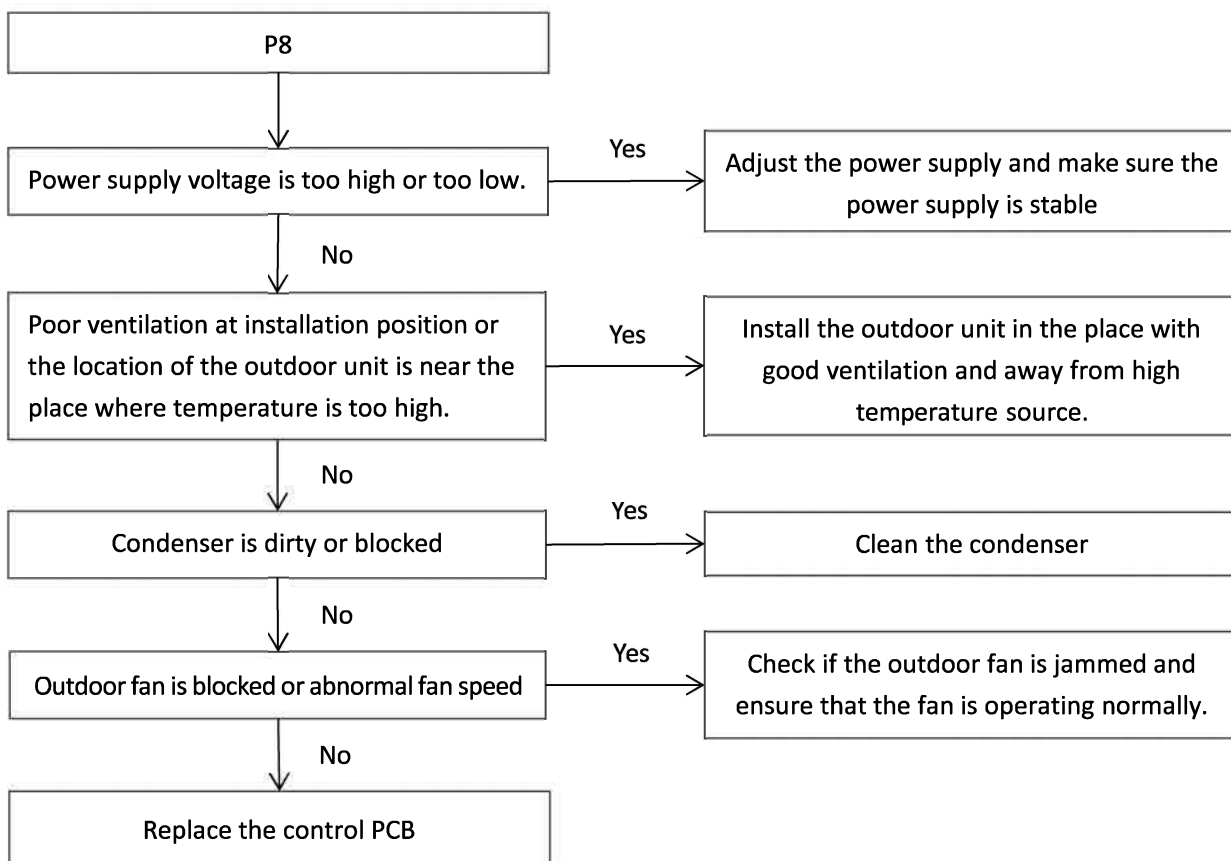
2.16 P7/PC Troubleshooting

- P7 indicates Indoor unit anti-freezing protection.
- PC indicates overwet operation protection.
- The unit stops running and error code is displayed on the communication board.
- P7/PC is applicable only when communication is established between the ComfortStar outdoor unit and the ComfortStar indoor unit via RS485.



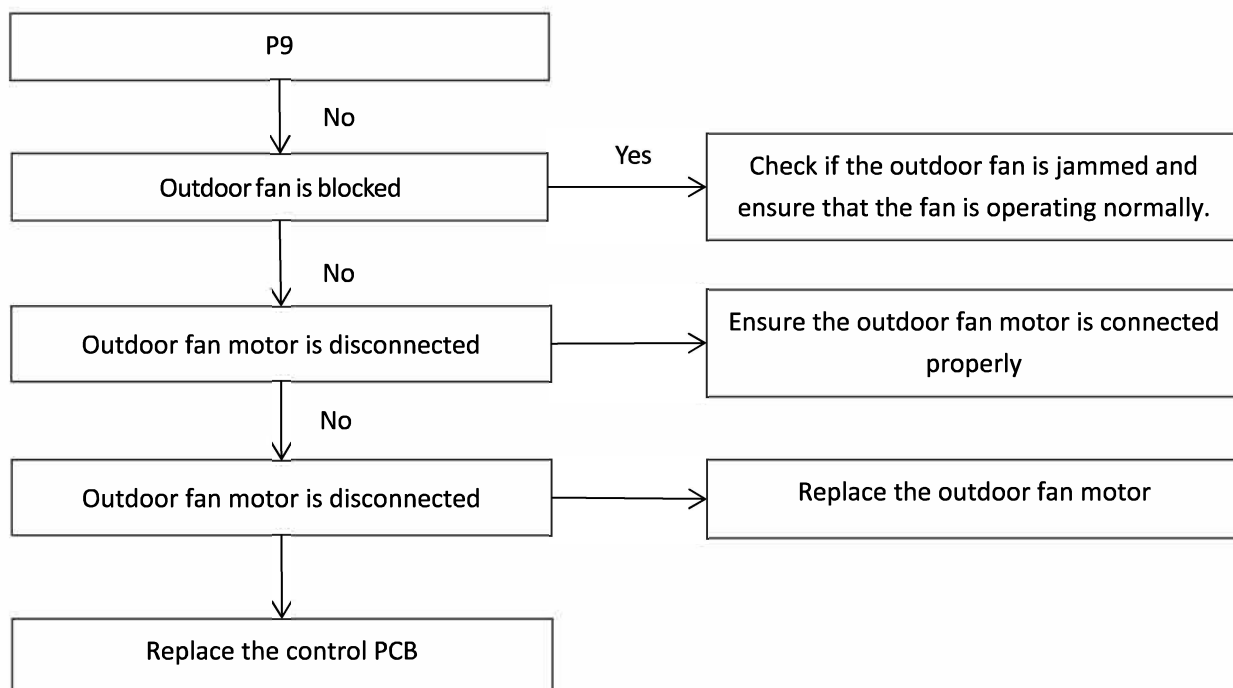
2.17 P8 Troubleshooting

- P8 indicates IPM high temperature protection.
- The unit stops running and error code is displayed on the communication board.



2.18 P9 Troubleshooting

- P9 indicates fan motor inverter module protection
- The unit stops running and error code is displayed on the communication board.



2.19 H0 Troubleshooting

- H0 indicates Inverter module and main PCB communication error
- The unit stops running and error code is displayed on the communication board.

There is only one control PCB in the electric control box which integrates the functions of main control board and inverter module, maintenance personnel has to replace the PCB when H0 fault occurs.

3. Temperature Sensor Resistance Characteristics

Room temperature sensor(T1), condenser coil temperature sensor(T2), condenser coil temperature sensor(T3) and outdoor ambient temperature sensor(T4) resistance characteristics.

Temperature (°C)	Resistance Rmax(kΩ)	Resistance Rnor(kΩ)	Resistance Rmin(kΩ)	Temperature (°C)	Resistance Rmax(kΩ)	Resistance Rnor(kΩ)	Resistance Rmin(kΩ)	Temperature (°C)	Resistance Rmax(kΩ)	Resistance Rnor(kΩ)	Resistance Rmin(kΩ)
-30	65.02	62.77	60.59	11	8.92	8.78	8.65	52	1.94	1.90	1.86
-29	61.52	59.42	57.39	12	8.55	8.42	8.30	53	1.88	1.84	1.80
-28	58.24	56.28	54.39	13	8.20	8.08	7.96	54	1.82	1.78	1.74
-27	55.15	53.32	51.56	14	7.86	7.75	7.64	55	1.76	1.72	1.69
-26	52.24	50.54	48.89	15	7.55	7.44	7.34	56	1.70	1.67	1.63
-25	49.51	47.92	46.38	16	7.24	7.14	7.05	57	1.65	1.61	1.58
-24	46.94	45.46	44.02	17	6.95	6.86	6.77	58	1.60	1.56	1.53
-23	44.51	43.13	41.79	18	6.67	6.59	6.50	59	1.55	1.51	1.48
-22	42.23	40.94	39.69	19	6.41	6.33	6.25	60	1.50	1.46	1.43
-21	40.08	38.88	37.71	20	6.15	6.08	6.01	61	1.45	1.42	1.39
-20	38.05	36.93	35.84	21	5.91	5.85	5.78	62	1.41	1.37	1.34
-19	36.14	35.09	34.07	22	5.68	5.62	5.56	63	1.36	1.33	1.30
-18	34.34	33.36	32.40	23	5.46	5.40	5.35	64	1.32	1.29	1.26
-17	32.63	31.72	30.83	24	5.25	5.20	5.14	65	1.28	1.25	1.22
-16	31.03	30.17	29.34	25	5.05	5.00	4.95	66	1.24	1.21	1.18
-15	29.51	28.71	27.93	26	4.86	4.81	4.76	67	1.21	1.18	1.15
-14	28.07	27.33	26.60	27	4.68	4.63	4.58	68	1.17	1.14	1.11
-13	26.72	26.02	25.34	28	4.51	4.46	4.41	69	1.13	1.11	1.08
-12	25.44	24.78	24.15	29	4.34	4.29	4.24	70	1.10	1.07	1.05
-11	24.22	23.61	23.02	30	4.18	4.13	4.08	71	1.07	1.04	1.02
-10	23.08	22.51	21.95	31	4.03	3.98	3.93	72	1.04	1.01	0.98
-9	21.99	21.46	20.93	32	3.89	3.84	3.79	73	1.01	0.98	0.96
-8	20.96	20.46	19.97	33	3.75	3.70	3.65	74	0.98	0.95	0.93
-7	19.99	19.52	19.06	34	3.61	3.56	3.52	75	0.95	0.92	0.90
-6	19.06	18.63	18.20	35	3.48	3.44	3.39	76	0.92	0.90	0.87
-5	18.19	17.78	17.38	36	3.36	3.31	3.27	77	0.90	0.87	0.85
-4	17.36	16.98	16.61	37	3.24	3.20	3.15	78	0.87	0.85	0.82
-3	16.57	16.22	15.87	38	3.13	3.08	3.04	79	0.85	0.82	0.80
-2	15.83	15.49	15.17	39	3.02	2.97	2.93	80	0.82	0.80	0.78
-1	15.12	14.81	14.50	40	2.91	2.87	2.83	72	1.04	1.01	0.98
0	14.45	14.16	13.87	41	2.81	2.77	2.73	73	1.01	0.98	0.96
1	13.81	13.54	13.27	42	2.72	2.67	2.63	74	0.98	0.95	0.93
2	13.20	12.95	12.70	43	2.63	2.58	2.54	75	0.95	0.92	0.90
3	12.63	12.39	12.15	44	2.54	2.49	2.45	76	0.92	0.90	0.87
4	12.08	11.85	11.64	45	2.45	2.41	2.37	77	0.90	0.87	0.85
5	11.56	11.35	11.14	46	2.37	2.33	2.29	78	0.87	0.85	0.82
6	11.06	10.87	10.67	47	2.29	2.25	2.21	79	0.85	0.82	0.80
7	10.59	10.41	10.23	48	2.21	2.17	2.13	80	0.82	0.80	0.78
8	10.14	9.97	9.80	49	2.14	2.10	2.06	81	0.80	0.78	0.75
9	9.71	9.56	9.40	50	2.07	2.03	1.99	82	0.78	0.75	0.73
10	9.31	9.16	9.01	51	2.00	1.97	1.93	83	0.75	0.73	0.71

Temperature (°C)	Resistance Rmax(kΩ)	Resistance Rnor(kΩ)	Resistance Rmin(kΩ)	Temperature (°C)	Resistance Rmax(kΩ)	Resistance Rnor(kΩ)	Resistance Rmin(kΩ)	Temperature (°C)	Resistance Rmax(kΩ)	Resistance Rnor(kΩ)	Resistance Rmin(kΩ)
84	0.73	0.71	0.69	107	0.40	0.39	0.37	130	0.23	0.22	0.21
85	0.71	0.69	0.67	108	0.39	0.38	0.36	131	0.23	0.22	0.21
86	0.69	0.67	0.65	109	0.38	0.37	0.35	132	0.22	0.21	0.20
87	0.68	0.66	0.64	110	0.37	0.36	0.34	133	0.22	0.21	0.20
88	0.66	0.64	0.62	111	0.36	0.35	0.34	134	0.21	0.20	0.19
89	0.64	0.62	0.60	112	0.35	0.34	0.33	135	0.21	0.20	0.19
90	0.62	0.60	0.58	113	0.34	0.33	0.32	136	0.20	0.19	0.19
91	0.61	0.59	0.57	114	0.34	0.32	0.31	137	0.20	0.19	0.18
92	0.59	0.57	0.55	115	0.33	0.32	0.30	138	0.19	0.19	0.18
93	0.57	0.56	0.54	116	0.32	0.31	0.30	139	0.19	0.18	0.17
94	0.56	0.54	0.52	117	0.31	0.30	0.29	140	0.19	0.18	0.17
95	0.54	0.53	0.51	118	0.31	0.29	0.28	141	0.18	0.17	0.17
96	0.53	0.51	0.50	119	0.30	0.29	0.28	142	0.18	0.17	0.16
97	0.52	0.50	0.48	120	0.29	0.28	0.27	143	0.17	0.17	0.16
98	0.50	0.49	0.47	121	0.28	0.27	0.26	144	0.17	0.16	0.16
99	0.49	0.47	0.46	122	0.28	0.27	0.26	145	0.17	0.16	0.15
100	0.48	0.46	0.45	123	0.27	0.26	0.25	146	0.16	0.16	0.15
101	0.47	0.45	0.43	124	0.27	0.25	0.24	147	0.16	0.15	0.15
102	0.45	0.44	0.42	125	0.26	0.25	0.24	148	0.16	0.15	0.14
103	0.44	0.43	0.41	126	0.25	0.24	0.23	149	0.15	0.15	0.14
104	0.43	0.42	0.40	127	0.25	0.24	0.23	150	0.15	0.14	0.14
105	0.42	0.41	0.39	128	0.24	0.23	0.22				
106	0.41	0.40	0.38	129	0.24	0.23	0.22				

Compressor exhaust temperature sensor (TP) resistance characteristics.

Temperature (℃)	Resistance Rmax(kΩ)	Resistance Rnor(kΩ)	Resistance Rmin(kΩ)	Temperature (℃)	Resistance Rmax(kΩ)	Resistance Rnor(kΩ)	Resistance Rmin(kΩ)	Temperature (℃)	Resistance Rmax(kΩ)	Resistance Rnor(kΩ)	Resistance Rmin(kΩ)
0	165.85	162.28	158.78	51	17.62	17.27	16.91	102	3.18	3.06	2.94
1	157.60	154.29	151.04	52	16.97	16.62	16.27	103	3.08	2.97	2.86
2	149.81	146.74	143.71	53	16.35	16.00	15.66	104	2.99	2.88	2.77
3	142.44	139.59	136.79	54	15.75	15.41	15.08	105	2.90	2.79	2.69
4	135.48	132.84	130.23	55	15.17	14.84	14.52	106	2.82	2.71	2.61
5	128.90	126.45	124.03	56	14.62	14.30	13.98	107	2.74	2.63	2.53
6	122.68	120.40	118.15	57	14.09	13.78	13.46	108	2.66	2.56	2.46
7	116.79	114.68	112.59	58	13.59	13.27	12.97	109	2.58	2.48	2.38
8	111.21	109.26	107.32	59	13.10	12.79	12.50	110	2.51	2.41	2.32
9	105.94	104.12	102.33	60	12.63	12.33	12.04	111	2.44	2.34	2.25
10	100.94	99.26	97.59	61	12.19	11.89	11.61	112	2.37	2.27	2.18
11	96.20	94.64	93.10	62	11.76	11.47	11.19	113	2.30	2.21	2.12
12	91.72	90.27	88.84	63	11.34	11.06	10.79	114	2.24	2.15	2.06
13	87.46	86.13	84.80	64	10.95	10.67	10.40	115	2.18	2.09	2.00
14	83.43	82.19	80.97	65	10.57	10.30	10.03	116	2.11	2.03	1.94
15	79.60	78.46	77.33	66	10.20	9.94	9.68	117	2.06	1.97	1.89
16	75.97	74.92	73.87	67	9.85	9.59	9.34	118	2.00	1.92	1.84
17	72.53	71.55	70.58	68	9.51	9.26	9.01	119	1.94	1.86	1.78
18	69.26	68.36	67.46	69	9.19	8.94	8.70	120	1.89	1.81	1.73
19	66.15	65.32	64.49	70	8.87	8.63	8.40	121	1.84	1.76	1.69
20	63.20	62.43	61.67	71	8.57	8.34	8.11	122	1.79	1.71	1.64
21	60.40	59.69	58.99	72	8.28	8.05	7.83	123	1.74	1.67	1.59
22	57.73	57.08	56.44	73	8.01	7.78	7.56	124	1.69	1.62	1.55
23	55.20	54.60	54.01	74	7.74	7.52	7.30	125	1.65	1.58	1.51
24	52.79	52.25	51.70	75	7.48	7.27	7.06	126	1.60	1.53	1.47
25	50.50	50.00	49.50	76	7.24	7.02	6.82	127	1.56	1.49	1.43
26	48.36	47.86	47.36	77	7.00	6.79	6.59	128	1.52	1.45	1.39
27	46.33	45.83	45.33	78	6.77	6.57	6.37	129	1.48	1.41	1.35
28	44.39	43.89	43.39	79	6.55	6.35	6.16	130	1.44	1.38	1.31
29	42.54	42.04	41.55	80	6.33	6.14	5.95	131	1.40	1.34	1.28
30	40.78	40.28	39.80	81	6.13	5.94	5.76	132	1.37	1.30	1.24
31	39.10	38.61	38.12	82	5.93	5.75	5.57	133	1.33	1.27	1.21
32	37.49	37.01	36.53	83	5.74	5.56	5.39	134	1.30	1.24	1.18
33	35.96	35.49	35.01	84	5.56	5.38	5.21	135	1.26	1.20	1.15
34	34.51	34.03	33.56	85	5.38	5.21	5.04	136	1.23	1.17	1.12
35	33.11	32.65	32.18	86	5.21	5.04	4.88	137	1.20	1.14	1.09
36	31.78	31.32	30.86	87	5.05	4.88	4.72	138	1.17	1.11	1.06
37	30.51	30.06	29.61	88	4.89	4.73	4.57	139	1.14	1.08	1.03
38	29.30	28.85	28.41	89	4.74	4.58	4.43	140	1.11	1.06	1.01
39	28.14	27.70	27.26	90	4.59	4.44	4.29	141	1.08	1.03	0.98
40	27.04	26.60	26.17	91	4.45	4.30	4.15	142	1.05	1.00	0.95
41	25.98	25.55	25.13	92	4.31	4.16	4.02	143	1.03	0.98	0.93
42	24.97	24.55	24.13	93	4.18	4.03	3.89	144	1.00	0.95	0.91
43	24.00	23.59	23.18	94	4.05	3.91	3.77	145	0.98	0.93	0.88
44	23.08	22.67	22.26	95	3.93	3.79	3.66	146	0.95	0.91	0.86
45	22.19	21.79	21.39	96	3.81	3.67	3.54	147	0.93	0.88	0.84
46	21.35	20.95	20.56	97	3.69	3.56	3.43	148	0.91	0.86	0.82
47	20.54	20.15	19.77	98	3.58	3.45	3.33	149	0.88	0.84	0.80
48	19.76	19.38	19.00	99	3.48	3.35	3.23	150	0.86	0.82	0.78
49	19.02	18.64	18.28	100	3.37	3.25	3.13				
50	18.31	17.94	17.58	101	3.27	3.15	3.03				

ComfortStar®

The design and specifications are subject to change without prior notice for product improvement. Consult with the sales agency or manufacturer for details.