

EN

MAINTENANCE MANUAL

LOGIC AIR 8-10

Air/water heat pump Monobloc system



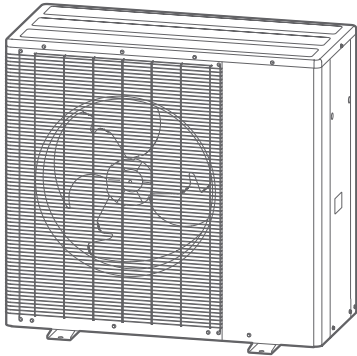
A series of 25 horizontal dotted lines spanning the width of the page, providing a guide for handwriting practice.

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Q Presentation

► Outdoor unit



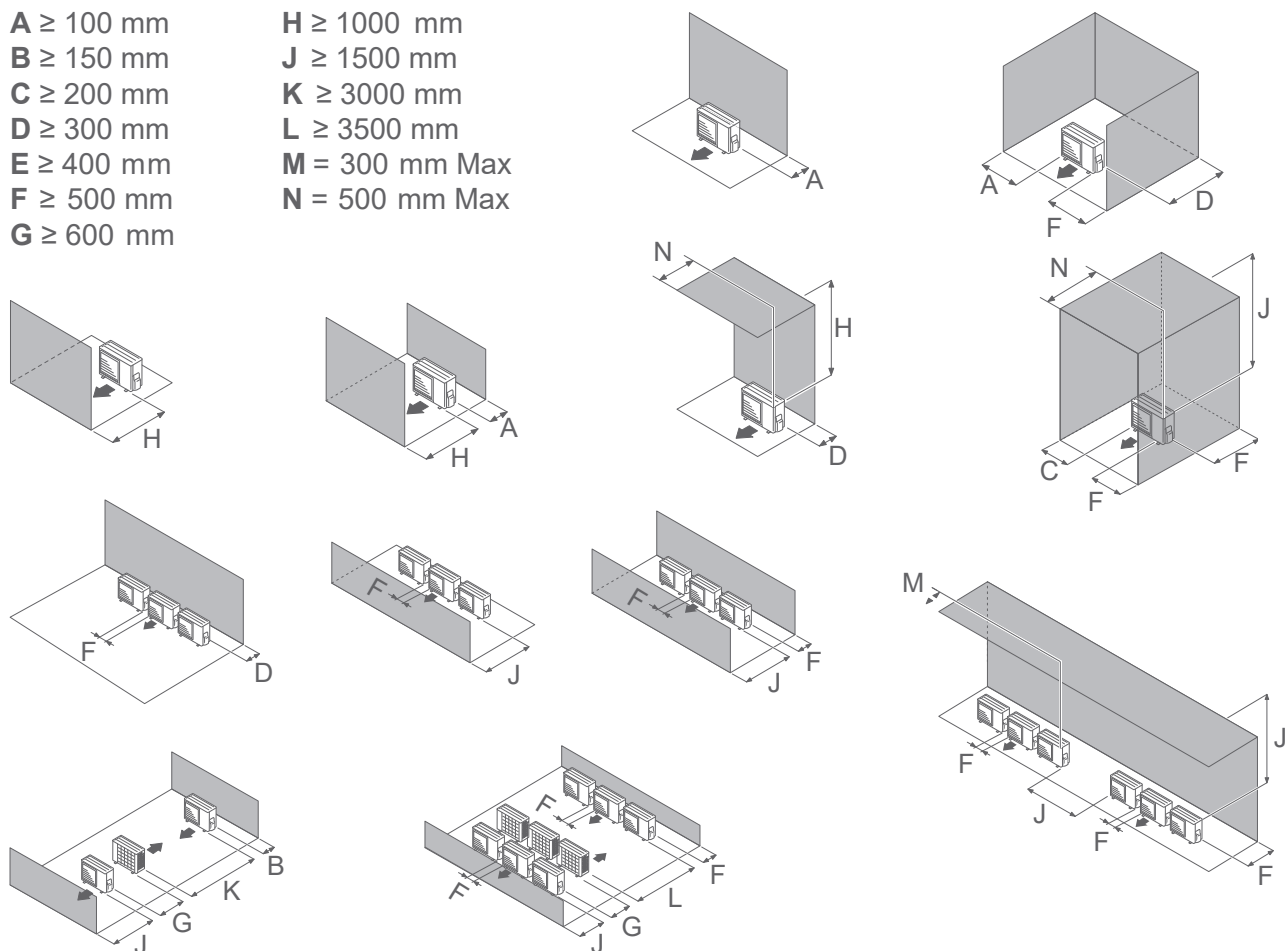
Model	Code
Outdoor unit Logic Air 8kW	750666
Outdoor unit Logic Air 10kW	750667

Accessories	
	Elbow
	Plug (x9)

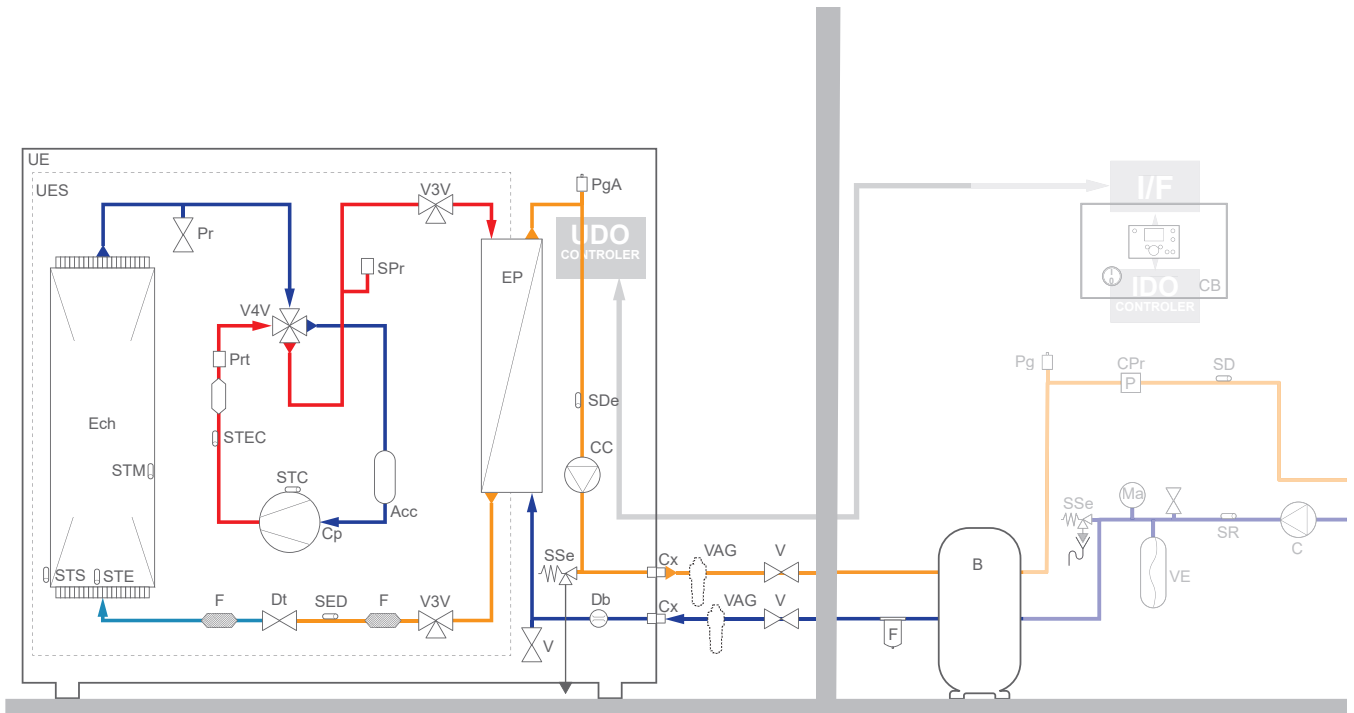
► Installation space

A ≥ 100 mm
B ≥ 150 mm
C ≥ 200 mm
D ≥ 300 mm
E ≥ 400 mm
F ≥ 500 mm
G ≥ 600 mm

H ≥ 1000 mm
J ≥ 1500 mm
K ≥ 3000 mm
L ≥ 3500 mm
M = 300 mm Max
N = 500 mm Max



► Basic Hydronic Layout



Acc - Accumulator

B - Buffer tank

C - Circulation pump

CC - HP circulation pump IPWM

Cp - Compressor

CPr - Pressure switch

Cx - Hydraulic connection 1"

Db - Flow-meter

Dt - Expansion valve

Ech - Air to Refrigerant Heat Exchanger

EP - Refrigerant to Water Heat Exchanger

F - Filter

Ma - Manometer

Pg - Bleeder valve

PgA - Automatic bleeder valve

Pr - Schrader valve

Prt - High pressure switch

SD - Flow temp. sensor

SDe - Water outlet temp. sensor

SED - Electric expansion valve sensor

SPr - Pressure sensor

SR - Return temp. sensor

SSe - Pressure Relief Valve

STC - Compressor temp. sensor

STE - Outdoor temp. sensor

STEC - Discharge temp. sensor

STM - Heat Ex. middle temp. sensor

STS - Outdoor unit Heat Ex. liquid temp. sensor

UE - Outdoor unit

UES - Refrigerant unit

V - Valve

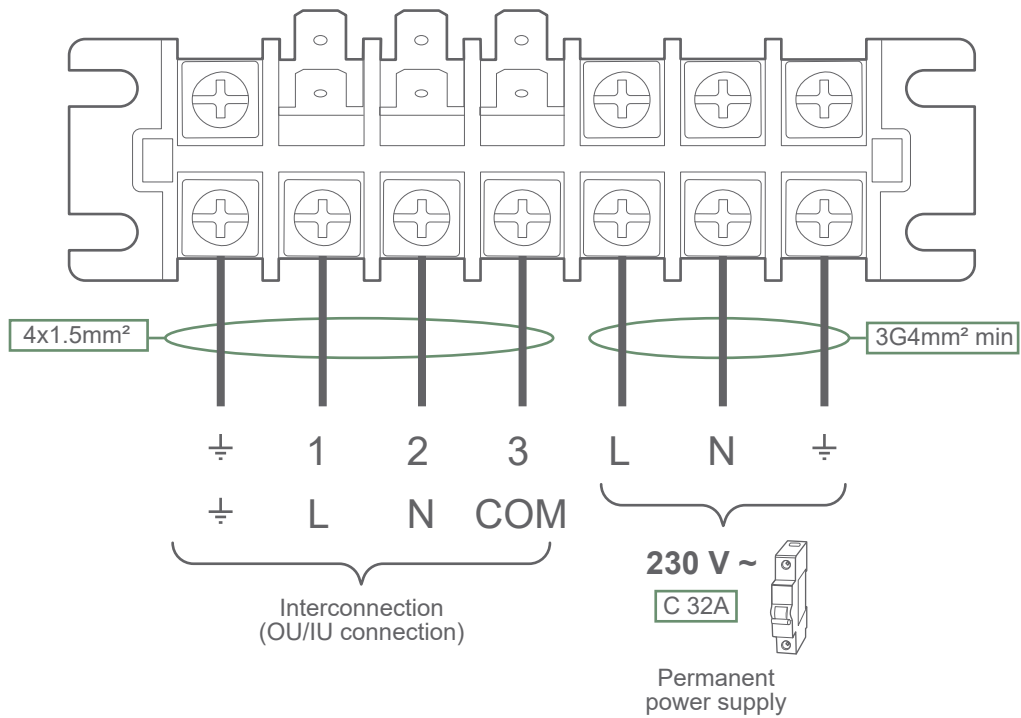
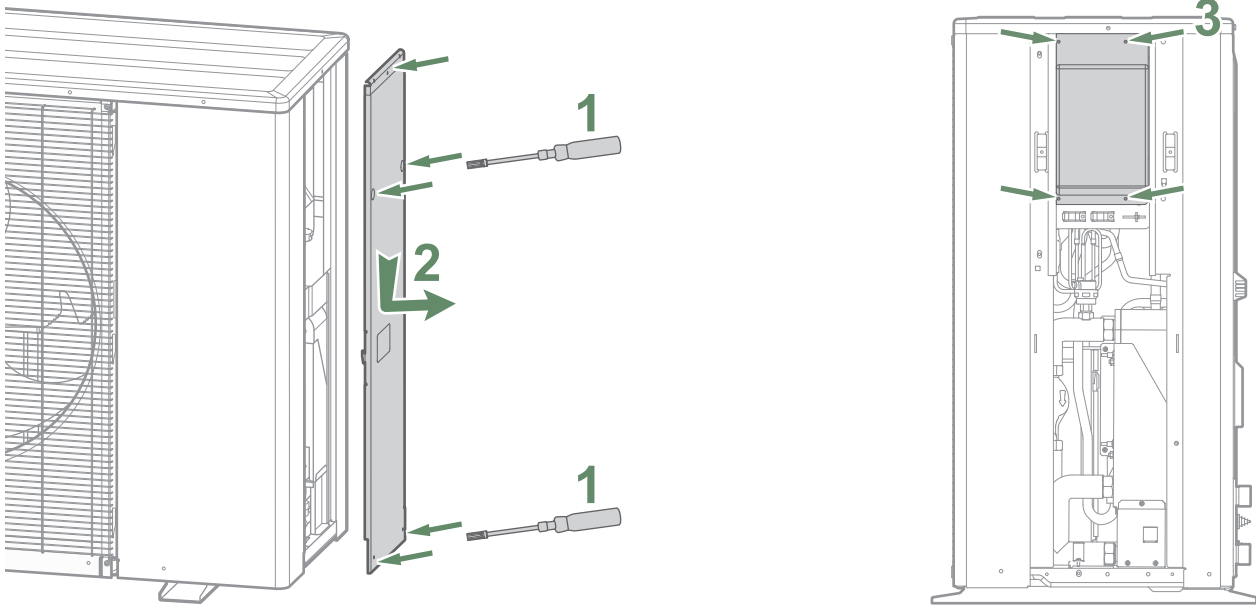
V3V - 3-ways valve

V4V - 4-way valve

VAG - Antifreeze valve

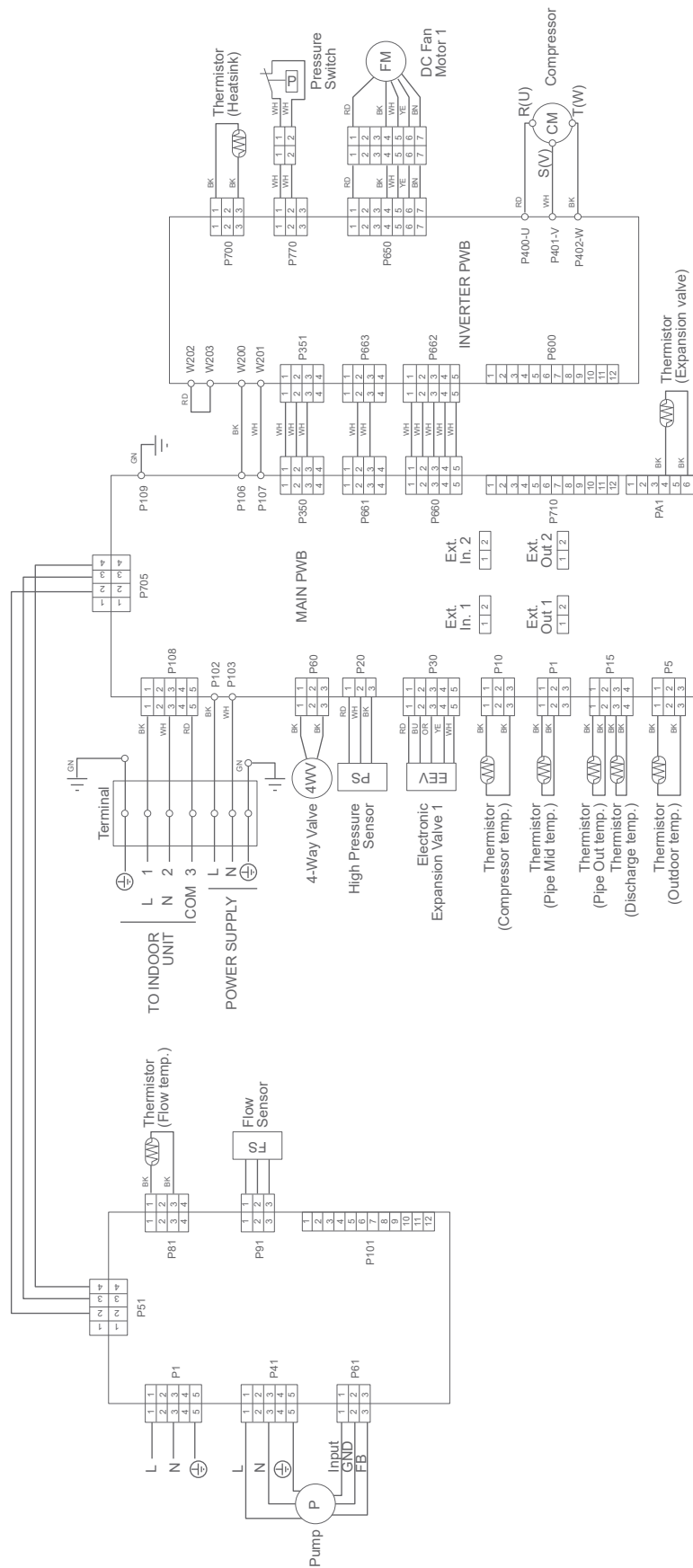
VE - Expansion vessel

► Electrical connection



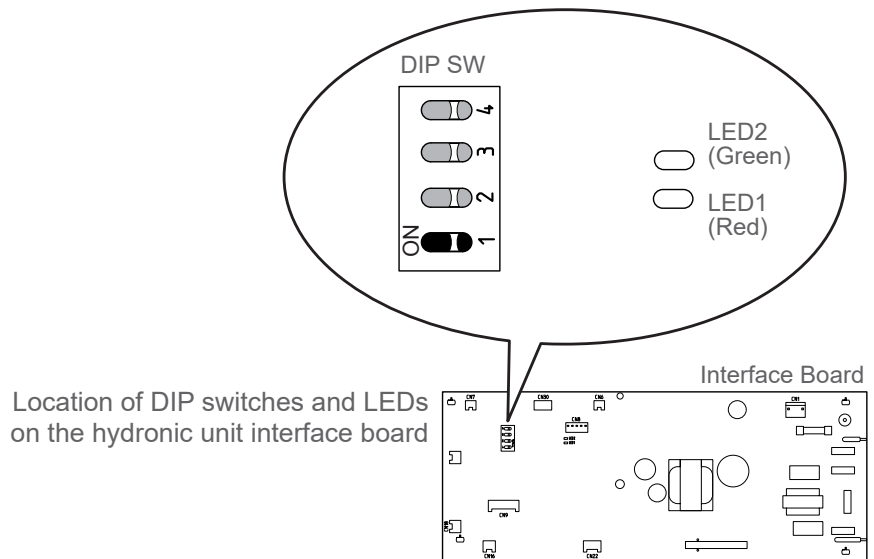
Tightening torque Nm (kgf.cm)	
M4 screw	1.2 to 1.8 (12 to 18)
M5 screw	2.0 to 3.0 (20 to 30)

Electrical wiring



Heat pump error code

► Flashing of the diode visible on the interface board in the indoor unit



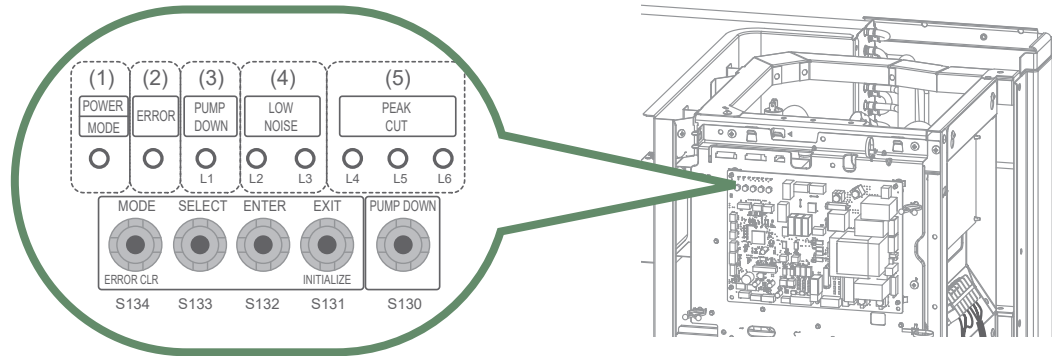
x N : LED blink N time

Error	Interface Board		Error designation
	Green LED	Red LED	
11	x 1	x 1	Serial forward transmission error immediately after operation
	x 1	x 1	Serial forward transmission error during operation
23	x 2	x 3	Combination error
32	x 3	x 2	Outdoor unit PCB model information error
62	x 6	x 2	Communication error in outdoor unit
65	x 6	x 5	IPM error
71	x 7	x 1	Discharge temp. sensor error
72	x 7	x 2	Compressor temp. sensor error
73	x 7	x 3	Heat-exchange middle temp. sensor error
	x 7	x 3	Outdoor unit Heat-exchange liquid temp. sensor error
74	x 7	x 4	Outdoor temp. sensor error
78	x 7	x 8	Electric expansion valve sensor error
79	x 7	x 9	Water outlet temp. sensor error
84	x 8	x 4	Current sensor error
86	x 8	x 6	High pressure switch error
	x 8	x 6	Pressure sensor error
94	x 9	x 4	Trip detection
95	x 9	x 5	Compressor motor control error
97	x 9	x 7	Outdoor unit fan motor 1 error
9B	x 9	x 11	Circulation pump error
A1	x 10	x 1	Discharge temp. error
A3	x 10	x 3	Compressor temp. error
A5	x 10	x 5	Low pressure error
AE	x 10	x 14	Low water flow error

► Flashing of the diodes visible on the main board in the outdoor unit

When an error occurs:

- The LED "ERROR" (2) blinks.
- Press once on the switch "ENTER" (S132).
- The LED blinks (L1 & L2) several times depending on the error's type (see below).



x N : LED blink N time ; ○ : LED off ; ● : LED on

Power Mode	Error	Outdoor Unit Board						Error designation
		(L1)	(L2)	(L3)	(L4)	(L5)	(L6)	
x 2	●	x 1	x 1	○	○	●	●	Serial forward transmission error immediately after operation
x 2	●	x 1	x 1	○	●	○	○	Serial forward transmission error during operation
x 2	●	x 2	x 3	○	○	○	●	Combination error
x 2	●	x 2	x 3	○	○	●	○	Outdoor unit PCB model information error
x 2	●	x 6	x 2	○	○	●	○	Communication error in outdoor unit
x 2	●	x 6	x 3	○	○	○	●	Inverter error
x 2	●	x 6	x 5	○	○	●	●	IPM error
x 2	●	x 7	x 1	○	○	○	●	Discharge temp. sensor error
x 2	●	x 7	x 2	○	○	○	●	Compressor temp. sensor error
x 2	●	x 7	x 3	○	○	●	○	Heat-exchange middle temp. sensor error
x 2	●	x 7	x 3	○	○	●	●	Outdoor unit Heat-exchange liquid temp. sensor error
x 2	●	x 7	x 4	○	○	○	●	Outdoor temp. sensor error
x 2	●	x 7	x 7	○	○	○	●	Heat sink temp. sensor error
x 2	●	x 7	x 8	○	○	○	●	Electric expansion valve sensor error
x 2	●	x 7	x 9	○	○	●	●	Water outlet temp. sensor error
x 2	●	x 8	x 4	○	○	○	●	Current sensor error
x 2	●	x 8	x 6	○	●	○	○	High pressure switch error
x 2	●	x 8	x 6	○	●	●	○	Pressure sensor error
x 2	●	x 9	x 4	○	○	○	●	Trip detection
x 2	●	x 9	x 5	○	○	○	●	Compressor motor control error
x 2	●	x 9	x 7	○	○	●	○	Outdoor unit fan motor 1 error
x 2	●	x 9	x 11	○	○	○	●	Circulation pump error
x 2	●	x 10	x 1	○	○	○	●	Discharge temp. error
x 2	●	x 10	x 3	○	○	○	●	Compressor temp. error
x 2	●	x 10	x 5	○	○	○	●	Low pressure error
x 2	●	x 10	x 11	○	○	●	●	Heat sink temp. error
x 2	●	x 10	x 14	○	○	○	●	Low water flow error

► Outdoor Unit clearing

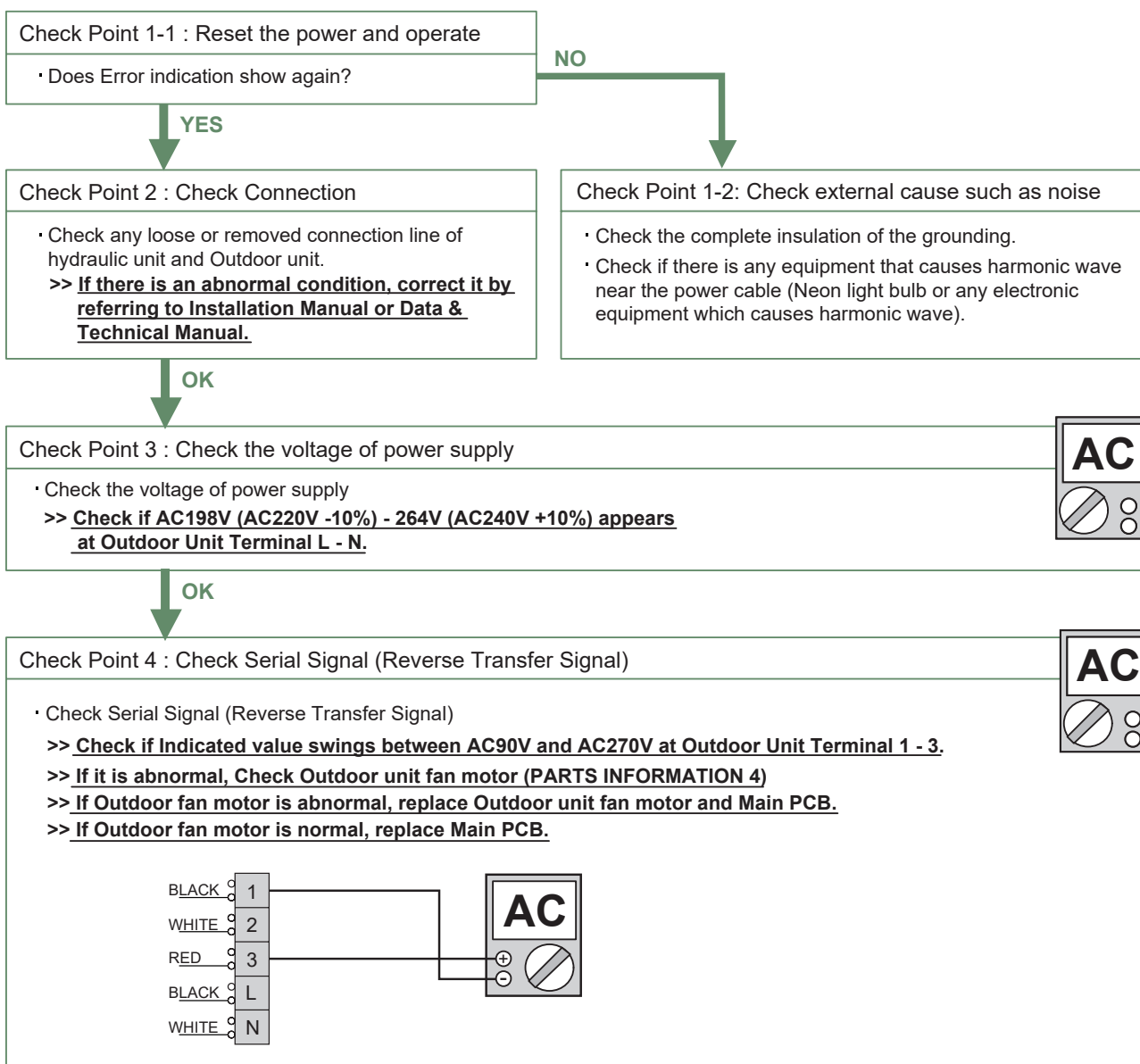
This section describes the techniques which can be used to identify the failure.

▼ Troubleshooting with Error Code

Troubleshooting 1 OUTDOOR UNIT Error Method: Serial communication error (Serial Reverse Transfer Error)	Indicate: Hydraulic unit : <table border="1" data-bbox="598 324 758 392"> <tr> <td>Green</td> <td>Red</td> </tr> <tr> <td>◆1</td> <td>◆1</td> </tr> </table> <small>◆n : n times blinding</small>	Green	Red	◆1	◆1	Outdoor unit : No indication
Green	Red					
◆1	◆1					

Detective Actuators: Outdoor unit Main PCB	Detective details: When the hydraulic unit cannot receive the serial signal from Outdoor unit more than 2minutes after power ON, or the hydraulic unit cannot receive the serial signal more than 15 seconds during normal operation.
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Forecast of cause: 1. Connection failure 2. External cause 3. Main PCB failure
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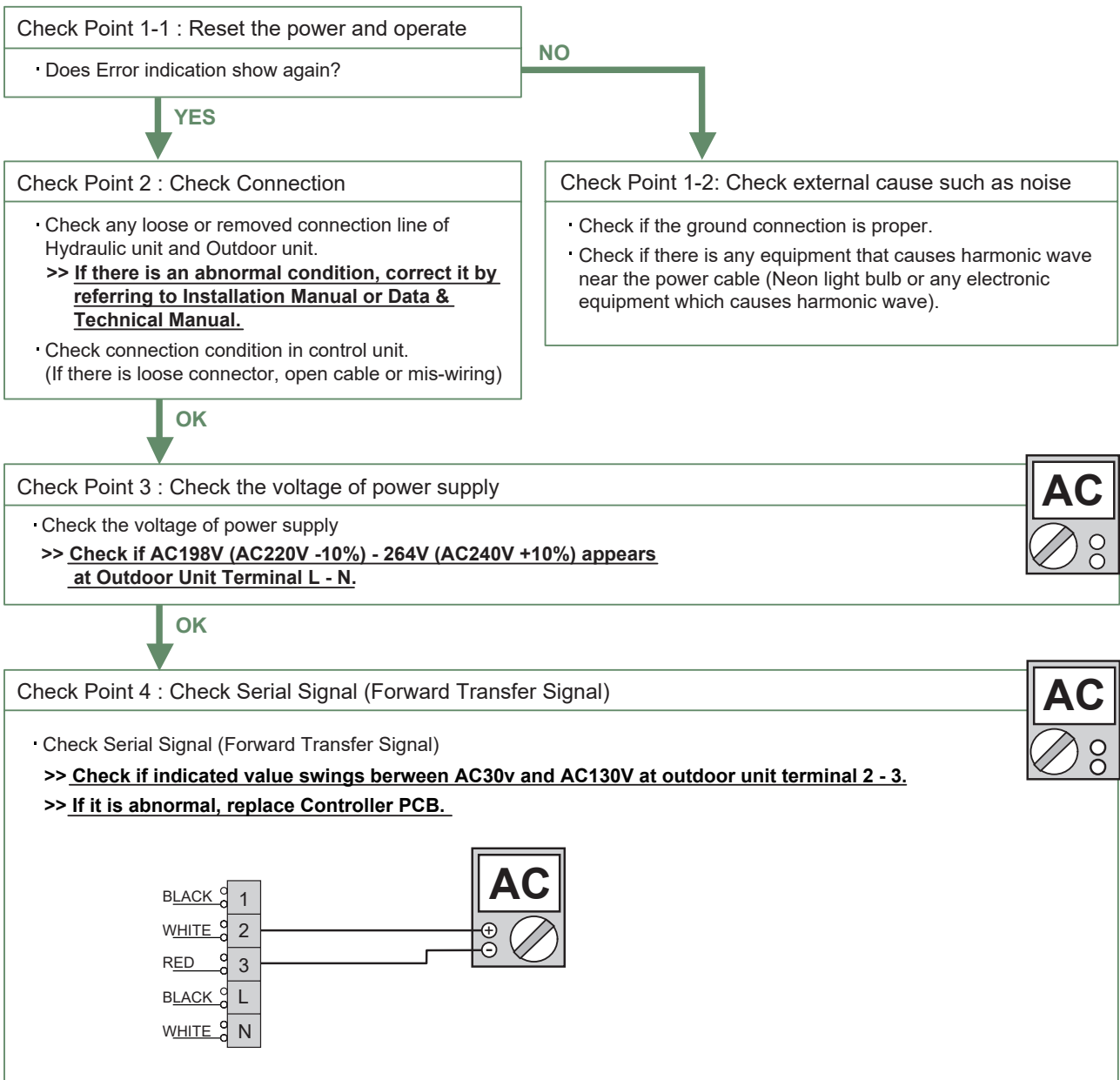


Troubleshooting 2 HYDRAULIC UNIT Error Method: Serial communication error (Serial Forward Transfer Error)	Indicate or Display: Hydraulic unit :		Outdoor unit :																								
	<table border="1"> <tr> <td>Green</td> <td>Red</td> </tr> <tr> <td>◆1</td> <td>◆1</td> </tr> </table> ◆n : n times blinding	Green	Red	◆1	◆1	<table border="1"> <tr> <td>Mode</td> <td>Error</td> <td>L1</td> <td>L2</td> <td>L3</td> <td>L4</td> <td>L5</td> <td>L6</td> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆1</td> <td>◆1</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> </tr> </table> ○: Light OFF ●: Light ON ◆n: n times blinking	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆1	◆1	○	○	○	○					
Green	Red																										
◆1	◆1																										
Mode	Error	L1	L2	L3	L4	L5	L6																				
◆2	●	◆1	◆1	○	○	○	○																				

Detective Actuators: Hydraulic unit interface PCB	Detective details: When the outdoor unit cannot properly receive the serial signal from hydraulic unit for 10 seconds or more.
---	--

Forecast of cause:

1. Connection failure 2. External cause



Troubleshooting 3 HYDRAULIC UNIT Error Method: Combination error	Indicate or Display: Hydraulic unit :		Outdoor unit :																									
	<table border="1"> <tr> <td>Green</td> <td>Red</td> </tr> <tr> <td>◆2</td> <td>◆3</td> </tr> </table>	Green	Red	◆2	◆3	<table border="1"> <tr> <td>Mode</td> <td>Error</td> <td>L1</td> <td>L2</td> <td>L3</td> <td>L4</td> <td>L5</td> <td>L6</td> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆2</td> <td>◆3</td> <td>○</td> <td>○</td> <td>○</td> <td>○</td> </tr> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆2	◆3	○	○	○	○	<small>◆n : n times blinding ○ : Light OFF ● : Light ON ◆n : n times blinking</small>					
Green	Red																											
◆2	◆3																											
Mode	Error	L1	L2	L3	L4	L5	L6																					
◆2	●	◆2	◆3	○	○	○	○																					

Detective Actuators: Hydraulic unit	Detective details: 1. The outdoor unit receives the serial signal of applied refrigerant information from hydraulic unit. 2. The combination of Hydraulic unit and Outdoor unit isn't allowed.
---	---

Forecast of cause:

1. The combination of hydraulic unit and outdoor unit is incorrect

Check Point 1 : Check the type of hydraulic unit

· Check the type of the connected hydraulic unit and outdoor unit.
 >> **If abnormal condition is found, correct it.**



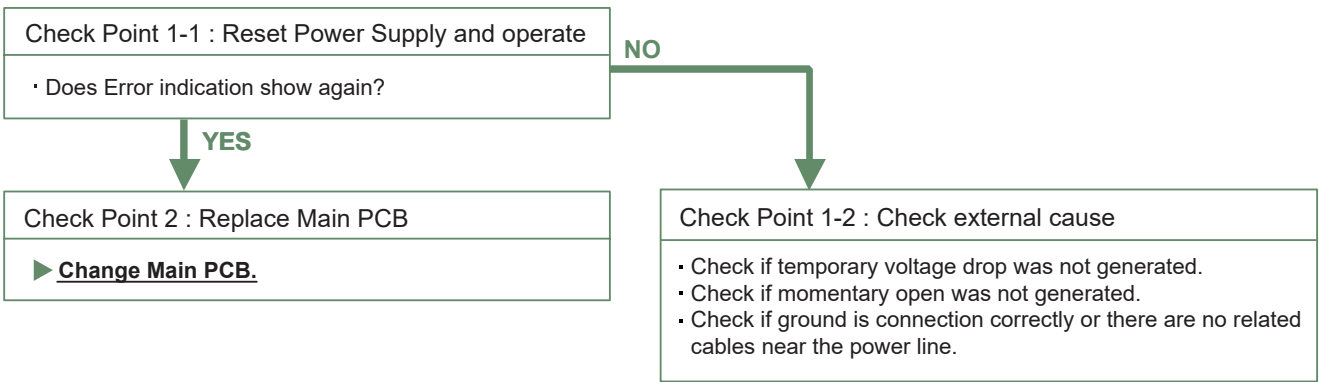
Check Point 2 : Replace Main PCB

▶ **If Check Point 1 do not improve the symptom, replace Main PCB of outdoor unit.**

Troubleshooting 4 OUTDOOR UNIT Error Method: Outdoor unit main PCB error	Indicate or Display: Hydraulic unit :		Outdoor unit :																								
	<table border="1"> <tr> <th>Green</th> <th>Red</th> </tr> <tr> <td>◆6</td> <td>◆2</td> </tr> </table>	Green	Red	◆6	◆2	<table border="1"> <tr> <th>Mode</th> <th>Error</th> <th>L1</th> <th>L2</th> <th>L3</th> <th>L4</th> <th>L5</th> <th>L6</th> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆6</td> <td>◆2</td> <td>○</td> <td>○</td> <td>●</td> <td>○</td> </tr> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆6	◆2	○	○	●	○	O: Light OFF ●: Light ON ◆n: n times blinking				
Green	Red																										
◆6	◆2																										
Mode	Error	L1	L2	L3	L4	L5	L6																				
◆2	●	◆6	◆2	○	○	●	○																				

Detective Actuators: Outdoor unit Main PCB	Detective details: Access to EEPROM failed due to some cause after outdoor unit started.
--	--

Forecast of cause:
1. External cause (Noise, temporary open, voltage drop) 2. Main PCB failure

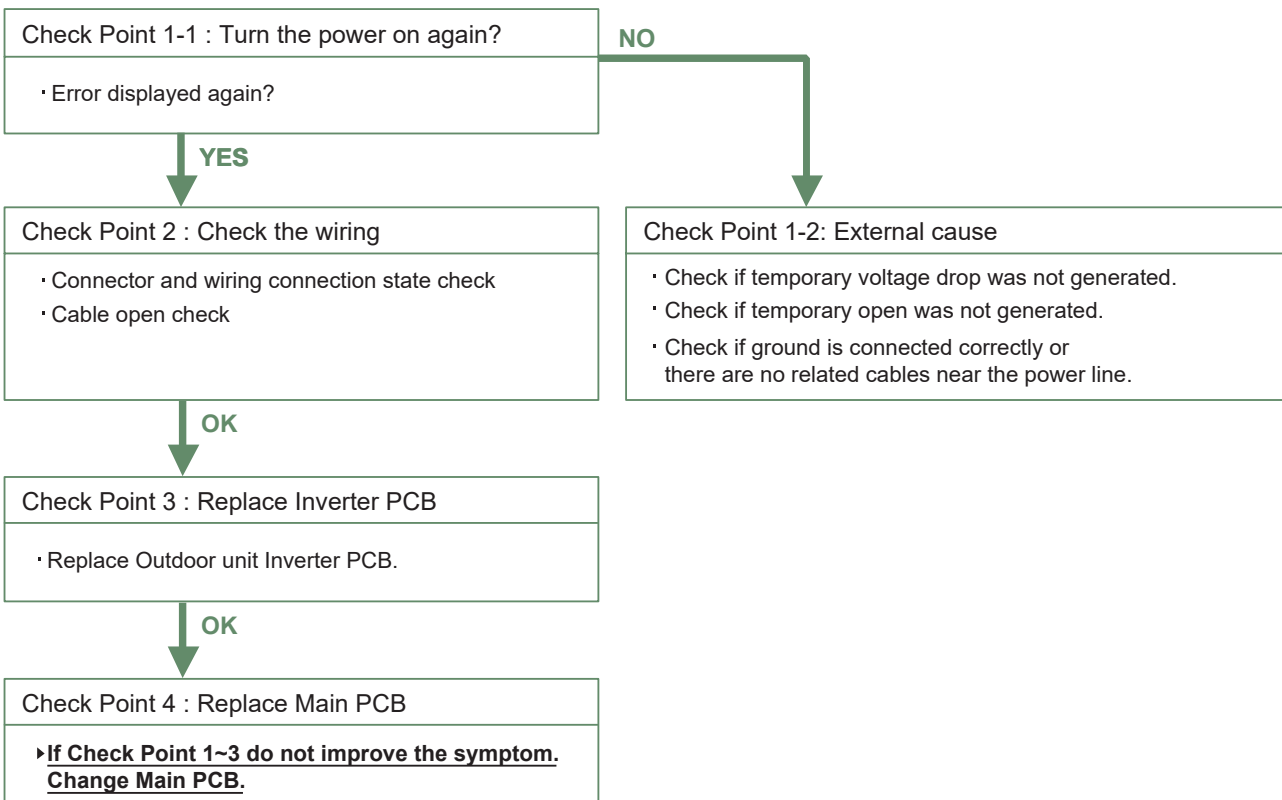


Troubleshooting 5 OUTDOOR UNIT Error Method: Inverter error	Indicate or Display: Hydraulic unit :		Outdoor unit :																								
	<table border="1"> <tr> <td>Green</td> <td>Red</td> </tr> <tr> <td>◆6</td> <td>◆3</td> </tr> </table>	Green	Red	◆6	◆3	<table border="1"> <tr> <td>Mode</td> <td>Error</td> <td>L1</td> <td>L2</td> <td>L3</td> <td>L4</td> <td>L5</td> <td>L6</td> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆6</td> <td>◆3</td> <td>○</td> <td>○</td> <td>○</td> <td>●</td> </tr> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆6	◆3	○	○	○	●	<small>○: Light OFF ●: Light ON ◆n: n times blinking</small>				
Green	Red																										
◆6	◆3																										
Mode	Error	L1	L2	L3	L4	L5	L6																				
◆2	●	◆6	◆3	○	○	○	●																				

Detective Actuators: Outdoor unit Main PCB	Detective details: •Error information received from Outdoor unit Main PCB
--	---

Forecast of cause :

1. External cause.
2. Power supply to Main PCB wiring disconnection, open
3. Outdoor unit Main PCB failure
4. Outdoor unit Main PCB failure



Troubleshooting 6 OUTDOOR UNIT Error Method: IPM error	Indicate or Display: Hydraulic unit : <table border="1" data-bbox="667 324 831 392"> <tr> <td>Green</td> <td>Red</td> </tr> <tr> <td>◆6</td> <td>◆5</td> </tr> </table> <p>◆n : n times blinding</p> Outdoor unit : <table border="1" data-bbox="1050 324 1422 392"> <tr> <td>Mode</td> <td>Error</td> <td>L1</td> <td>L2</td> <td>L3</td> <td>L4</td> <td>L5</td> <td>L6</td> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆6</td> <td>◆5</td> <td>○</td> <td>○</td> <td>○</td> <td>●</td> </tr> </table> <p>○ : Light OFF ● : Light ON ◆n : n times blinking</p>	Green	Red	◆6	◆5	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆6	◆5	○	○	○	●
Green	Red																				
◆6	◆5																				
Mode	Error	L1	L2	L3	L4	L5	L6														
◆2	●	◆6	◆5	○	○	○	●														

Detective Actuators: Outdoor unit Inverter PCB	Detective details: When the signal from FO terminal of IPM is "L"(=0V) while the compressor stops.
--	--

Forecast of cause: 1. Outdoor unit Inverter PCB failure

Check Point 1 : Replace Inverter PCB ► <u>Replace Outdoor unit Inverter PCB.</u>
--

Troubleshooting 7 OUTDOOR UNIT Error Method: Discharge Thermistor Error	Indicate or Display: Hydraulic unit :		Outdoor unit :							
	Green	Red	Mode	Error	L1	L2	L3	L4	L5	L6
	◆7	◆1	◆2	●	◆7	◆1	○	○	○	●

◆n : n times blinding
○: Light OFF ●: Light ON ◆n: n times blinking

Detective Actuators: Discharge temperature thermistor	Detective details: · Discharge temperature thermistor short or open detected
---	--

Forecast of cause :

1. Connector connection failure, open
2. Thermistor failure
3. Main PCB failure

Check Point 1 : Check the connector connection and cable open

- ❑ Connector connection state check
- ❑ Cable open check



Check Point 2 : Check the thermistor

- ❑ Thermistor characteristics check (Disconnect the thermistor from the PCB and check.)
 * For the thermistor characteristics, refer to the "Service Parts Information 5".



Check Point 3 : Check voltage of Main PCB (DC5.0V)

- ❑ Main PCB P15 :3-4 voltage value =5V
Remove the thermistor from Main PCB, check the voltage.

DC

► **If the voltage does not appear, replace Main PCB and execute the check operation again.**

Troubleshooting 8 OUTDOOR UNIT Error Method: Compressor Temp. Thermistor Error	Indicate or Display: Hydraulic unit :		Outdoor unit :							
	Green	Red	Mode	Error	L1	L2	L3	L4	L5	L6
	◆7	◆2	◆2	●	◆7	◆2	○	○	○	●

◆n : n times blinding
○ : Light OFF ● : Light ON ◆n : n times blinking

Detective Actuators: Compressor temperature thermistor	Detective details: • Compressor temperature thermistor short or open detected
--	---

Forecast of cause :

1. Connector connection failure, open
2. Thermistor failure
3. Main PCB failure

Check Point 1 : Check the connector connection and cable open

- Connector connection state check
- Cable open check



Check Point 2 : Check the thermistor

- Thermistor characteristics check (Disconnect the thermistor from the PCB and check.)
* For the thermistor characteristics, refer to the "Service Parts Information 5".



Check Point 3 : Check voltage of Main PCB (DC5.0V)

- Main PCB P10 :1-3 voltage value =5V
Remove the thermistor from Main PCB, check the voltage.

DC

► **If the voltage does not appear, replace Main PCB and execute the check operation again.**

Troubleshooting 9 OUTDOOR UNIT Error Method: Heat Exchanger Outlet / Middle temp. Thermistor Error	Indicate or Display: Hydraulic unit : <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Green</td> <td style="padding: 2px;">Red</td> </tr> <tr> <td style="text-align: center; padding: 2px;">◆7</td> <td style="text-align: center; padding: 2px;">◆3</td> </tr> </table> <small>◆n : n times blinding</small>	Green	Red	◆7	◆3	Outdoor unit : <table border="1" style="margin-left: 20px; border-collapse: collapse; text-align: center;"> <tr> <td>Mode</td> <td>Error</td> <td>L1</td> <td>L2</td> <td>L3</td> <td>L4</td> <td>L5</td> <td>L6</td> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆7</td> <td>◆3</td> <td>○</td> <td>○</td> <td>●</td> <td>○</td> </tr> </table> <small>○ : Light OFF ● : Light ON ◆n : n times blinking</small>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆7	◆3	○	○	●	○
Green	Red																					
◆7	◆3																					
Mode	Error	L1	L2	L3	L4	L5	L6															
◆2	●	◆7	◆3	○	○	●	○															

Detective Actuators: Heat exchanger Outlet/Middle temperature thermistor	Detective details: <ul style="list-style-type: none"> • Heat exchanger outlet temperature thermistor short or open detected • Heat exchanger middle temperature thermistor short or open detected
--	--

Forecast of cause :

1. Connector connection failure, open
2. Thermistor failure
3. Main PCB failure

Check Point 1 : Check the connector connection and cable open

- Connector connection state check
- Cable open check



Check Point 2 : Check the thermistor

- Thermistor characteristics check (Disconnect the thermistor from the PCB and check.)

* For the thermistor characteristics, refer to the "Service Parts Information 5".



Check Point 3 : Check voltage of Main PCB (DC5.0V)

DC

- Main PCB P1 :1-2 voltage value = 5V
- Main PCB P15 :1-2 voltage value = 5V

Remove the thermistor from Main PCB, check the voltage.

P1

P15

► **If the voltage does not appear, replace Main PCB and execute the check operation again.**

Troubleshooting 10 OUTDOOR UNIT Error Method: Outdoor Thermistor Error	Indicate or Display: Hydraulic unit :		Outdoor unit :							
	Green	Red	Mode	Error	L1	L2	L3	L4	L5	L6
	◆7	◆4	◆2	●	◆7	◆4	○	○	○	●
	◆n : n times blinding		○ : Light OFF ● : Light ON ◆n : n times blinking							

Detective Actuators: Outdoor temperature thermistor	Detective details: • Outdoor temperature thermistor short or open detected
---	--

Forecast of cause :

1. Connector connection failure, open
2. Thermistor failure
3. Main PCB failure

Check Point 1 : Check the connector connection and cable open

- Connector connection state check
- Cable open check



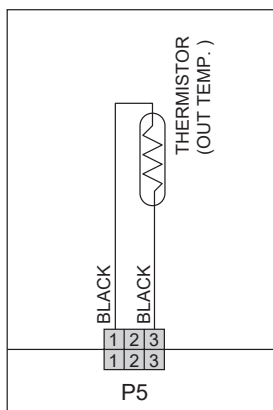
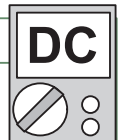
Check Point 2 : Check the thermistor

- Thermistor characteristics check (Disconnect the thermistor from the PCB and check.)
 * For the thermistor characteristics, refer to the "Service Parts Information 5".



Check Point 3 : Check voltage of Main PCB (DC5.0V)

- Main PCB P5 :1-3 voltage value =5V
Remove the thermistor from Main PCB, check the voltage.



► **If the voltage does not appear, replace Main PCB and execute the check operation again.**

Troubleshooting 11 OUTDOOR UNIT Error Method: Heatsink Thermistor Error	Indicate or Display: Hydraulic unit : No indication	Outdoor unit : <table border="1"> <thead> <tr> <th>Mode</th> <th>Error</th> <th>L1</th> <th>L2</th> <th>L3</th> <th>L4</th> <th>L5</th> <th>L6</th> </tr> </thead> <tbody> <tr> <td>◆2</td> <td>●</td> <td>◆7</td> <td>◆7</td> <td>○</td> <td>○</td> <td>○</td> <td>●</td> </tr> </tbody> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆7	◆7	○	○	○	●
	Mode	Error	L1	L2	L3	L4	L5	L6										
◆2	●	◆7	◆7	○	○	○	●											
<small>○: Light OFF ●: Light ON ◆n: n times blinking</small>																		

Detective Actuators: Heatsink temperature thermistor	Detective details: • Heatsink temperature thermistor short or open detected
--	---

Forecast of cause :

1. Connector connection defective, open
2. Thermistor failure
3. Inverter PCB failure

Check Point 1 : Check the connector connection and cable open

- Connector connection state check
- Cable open check



Check Point 2 : Check the thermistor

- Thermistor characteristics check (Disconnect the thermistor from the PCB and check.)
* For the thermistor characteristics, refer to the "Service Parts Information 5".



Check Point 3 : Check voltage of Inverter PCB (DC5.0V)

- Inverter PCB P700 : 1-3 voltage value = 5V
Remove the thermistor from Inverter PCB, check the voltage

DC

► **If the voltage do not appear, replace Inverter PCB and execute the check operation again.**

<p>Troubleshooting 12 OUTDOOR UNIT Error Method: Electrical expansion valve Thermistor Error</p>	<p>Indicate or Display: Hydraulic unit :</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Green</td> <td style="padding: 2px;">Red</td> </tr> <tr> <td style="text-align: center; padding: 2px;">◆7</td> <td style="text-align: center; padding: 2px;">◆8</td> </tr> </table> <p style="font-size: small;">◆n : n times blinding</p>	Green	Red	◆7	◆8	<p>Outdoor unit :</p> <table border="1" style="margin-left: 20px; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="font-size: x-small;">Mode</th> <th style="font-size: x-small;">Error</th> <th style="font-size: x-small;">L1</th> <th style="font-size: x-small;">L2</th> <th style="font-size: x-small;">L3</th> <th style="font-size: x-small;">L4</th> <th style="font-size: x-small;">L5</th> <th style="font-size: x-small;">L6</th> </tr> </thead> <tbody> <tr> <td style="font-size: x-small;">◆2</td> <td style="font-size: x-small;">●</td> <td style="font-size: x-small;">◆7</td> <td style="font-size: x-small;">◆8</td> <td style="font-size: x-small;">○</td> <td style="font-size: x-small;">○</td> <td style="font-size: x-small;">○</td> <td style="font-size: x-small;">●</td> </tr> </tbody> </table> <p style="font-size: x-small;">○: Light OFF ●: Light ON ◆n: n times blinking</p>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆7	◆8	○	○	○	●
Green	Red																					
◆7	◆8																					
Mode	Error	L1	L2	L3	L4	L5	L6															
◆2	●	◆7	◆8	○	○	○	●															

<p>Detective Actuators:</p> <p>Expansion valve temperature thermistor</p>	<p>Detective details:</p> <ul style="list-style-type: none"> • Expansion valve temperature thermistor short or open detected
--	--

Forecast of cause :

1. Connector connection defective, open
2. Thermistor failure
3. Main PCB failure

Check Point 1 : Check the connector connection and cable open

- Connector connection state check
- Cable open check



Check Point 2 : Check the thermistor

- Thermistor characteristics check (Disconnect the thermistor from the PCB and check.)
 * For the thermistor characteristics, refer to the "Service Parts Information 5".



Check Point 3 : Check voltage of Main PCB (DC5.0V)

- Main PCB PA1 : 4-6 voltage value = 5V
Remove the thermistor from Main PCB, check the voltage.

Expansion valve temperature thermistor (PA1: 4-6)

► **If the voltage do not appear, replace Main PCB, and excecute the check operation again.**

Troubleshooting 13 OUTDOOR UNIT Error Method: Water outlet thermistor error	Indicate or Display: Hydraulic unit :		Outdoor unit :																								
	<table border="1"> <tr><td>Green</td><td>Red</td></tr> <tr><td>◆7</td><td>◆9</td></tr> </table>	Green	Red	◆7	◆9	<table border="1"> <tr><td>Mode</td><td>Error</td><td>L1</td><td>L2</td><td>L3</td><td>L4</td><td>L5</td><td>L6</td></tr> <tr><td>◆2</td><td>●</td><td>◆7</td><td>◆9</td><td>○</td><td>○</td><td>●</td><td>●</td></tr> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆7	◆9	○	○	●	●	○: Light OFF ●: Light ON ◆n: n times blinking				
Green	Red																										
◆7	◆9																										
Mode	Error	L1	L2	L3	L4	L5	L6																				
◆2	●	◆7	◆9	○	○	●	●																				

Detective Actuators: Water outlet temperature thermistor	Detective details: <ul style="list-style-type: none"> Water outlet temperature thermistor short or open detected
--	---

Forecast of cause :

- Connector connection defective, open
- Thermistor failure
- Supply PCB failure

Check Point 1 : Check the connector connection and cable open

- Connector connection state check
- Cable open check



Check Point 2 : Check the thermistor

- Thermistor characteristics check (Disconnect the thermistor from the PCB and check.)
* For the thermistor characteristics, refer to the "Service Parts Information 5".



Check Point 3 : Check voltage of Supply PCB (DC5.0V)

DC

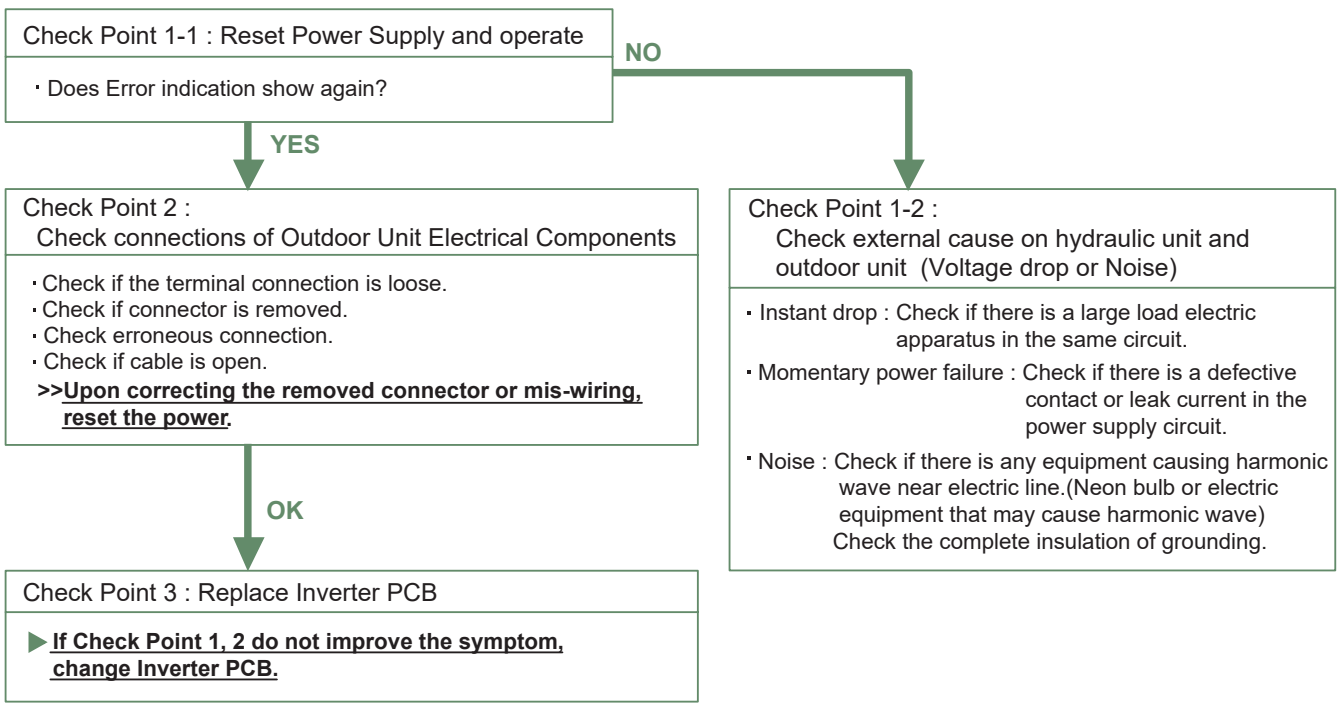
- Supply PCB P81 : 1-3 voltage value = 5V
Remove the thermistor from Supply PCB, check the voltage

► **If the voltage do not appear, replace Supply PCB and execute the check operation again.**

Troubleshooting 14 OUTDOOR UNIT Error Method: Current sensor error	Indicate or Display: Hydraulic unit :		Outdoor unit :																								
	<table border="1"> <tr> <td>Green</td> <td>Red</td> </tr> <tr> <td>◆8</td> <td>◆4</td> </tr> </table>	Green	Red	◆8	◆4	<table border="1"> <tr> <td>Mode</td> <td>Error</td> <td>L1</td> <td>L2</td> <td>L3</td> <td>L4</td> <td>L5</td> <td>L6</td> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆8</td> <td>◆4</td> <td>○</td> <td>○</td> <td>○</td> <td>●</td> </tr> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆8	◆4	○	○	○	●	<small>◆n : n times blinding ○ : Light OFF ● : Light ON ◆n : n times blinking</small>				
Green	Red																										
◆8	◆4																										
Mode	Error	L1	L2	L3	L4	L5	L6																				
◆2	●	◆8	◆4	○	○	○	●																				

Detective Actuators: Outdoor unit Inverter PCB	Detective details: When Input Current Sensor has detected 1A or less, while Inverter Compressor is operating at higher than 50rps, after 1minute upon starting the Compressor. (Except during the defrost operation)
--	--

Forecast of cause :
 1. Defective connection of electric components 2. External cause 3. Inverter PCB failure



Troubleshooting 15-1 OUTDOOR UNIT Error Method: High pressure switch error	Indicate or Display: Hydraulic unit :		Outdoor unit :																								
	<table border="1"> <tr> <td>Green</td> <td>Red</td> </tr> <tr> <td>◆8</td> <td>◆6</td> </tr> </table> ◆n : n times blinding	Green	Red	◆8	◆6	<table border="1"> <tr> <td>Mode</td> <td>Error</td> <td>L1</td> <td>L2</td> <td>L3</td> <td>L4</td> <td>L5</td> <td>L6</td> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆8</td> <td>◆6</td> <td>○</td> <td>●</td> <td>○</td> <td>○</td> </tr> </table> ○ : Light OFF ● : Light ON ◆n : n times blinking	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆8	◆6	○	●	○	○					
Green	Red																										
◆8	◆6																										
Mode	Error	L1	L2	L3	L4	L5	L6																				
◆2	●	◆8	◆6	○	●	○	○																				

Detective Actuators: High pressure switch	Detective details: When the power was turned on, "High pressure switch : open" was detected.
---	--

Forecast of cause : 1. High pressure switch connector disconnection, open 2. High pressure switch characteristics failure 3. Inverter PCB failure

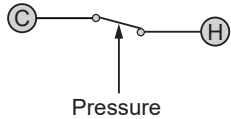
Check Point 1 : Check the High pressure switch connection state • Connector and wiring connection state check • Cable open check



Check Point 2 : Check the High pressure switch characteristics • Switch characteristics check * For the characteristics of high pressure switch, refer to below.



Check Point 3 : Replace Inverter PCB • Change Inverter PCB, and execute the check operation again.

• Type of contact 	• Characteristics of pressure switch (P770) <table border="1"> <thead> <tr> <th></th> <th>Pressure switch</th> </tr> </thead> <tbody> <tr> <td>Contact : Short ⇒ Open</td> <td>4.2±0.1MPa</td> </tr> <tr> <td>Contact : Open ⇒ Short</td> <td>3.2±0.15MPa</td> </tr> </tbody> </table>		Pressure switch	Contact : Short ⇒ Open	4.2±0.1MPa	Contact : Open ⇒ Short	3.2±0.15MPa
	Pressure switch						
Contact : Short ⇒ Open	4.2±0.1MPa						
Contact : Open ⇒ Short	3.2±0.15MPa						

Troubleshooting 15-2
OUTDOOR UNIT Error Method:
Pressure sensor error

Indicate or Display:

Hydraulic unit :

Green	Red
◆8	◆6

◆n : n times blinding

Outdoor unit :

Mode	Error	L1	L2	L3	L4	L5	L6
◆2	●	◆8	◆6	○	●	●	○

○ : Light OFF ● : Light ON ◆n : n times blinking

Detective Actuators:

Outdoor unit Main PCB
 pressure switch

Detective details:

30 seconds or more after power-on, when pressure sensor detection value detects the condition below continuously for 30 seconds or more.
 $P_s \leq 0$ or $P_s \geq 5$ [MPa]

Forecast of cause :

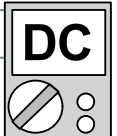
1. Connector connection failure
2. Pressure sensor failure
3. Main PCB failure

Check Point 1 : Check connection of the Pressure sensor

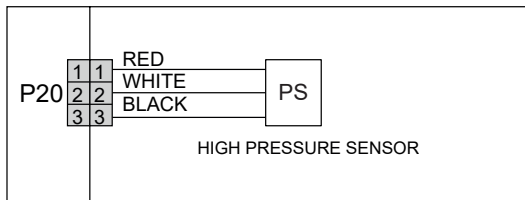
- Check if the terminal connection is loose
 - Check if connector is removed
 - Check if connector is erroneous connection
 - Check if cable is open
- >> Upon correcting the removed connector or mis-wiring, reset the power**



Check Point 2 : Check output voltage of Main PCB



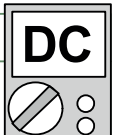
- Check voltage of Main PCB (Measure at Main PCB connector)
- >> 1pin (Red) - 3pin (Black) DC5V ±5%.**



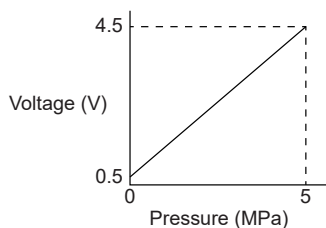
► If the voltage is not correct, replace Main PCB.



Check Point 3 : Check output voltage of Pressure sensor



- Check voltage of Main PCB (Measure at Main PCB connector)
- >> 2pin (White) - 3pin (Black) Voltage is refer to the following graph.**



► If the voltage is not correct, replace Pressure sensor.

Troubleshooting 16 OUTDOOR UNIT Error Method: Trip detection	Indicate or Display: Hydraulic unit :		Outdoor unit :																								
	<table border="1"> <tr> <td>Green</td> <td>Red</td> </tr> <tr> <td>◆9</td> <td>◆4</td> </tr> </table>	Green	Red	◆9	◆4	<table border="1"> <tr> <td>Mode</td> <td>Error</td> <td>L1</td> <td>L2</td> <td>L3</td> <td>L4</td> <td>L5</td> <td>L6</td> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆9</td> <td>◆4</td> <td>○</td> <td>○</td> <td>○</td> <td>●</td> </tr> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆9	◆4	○	○	○	●	O: Light OFF ●: Light ON ◆n: n times blinking				
Green	Red																										
◆9	◆4																										
Mode	Error	L1	L2	L3	L4	L5	L6																				
◆2	●	◆9	◆4	○	○	○	●																				

Detective Actuators: Outdoor unit Inverter PCB Outdoor unit Main PCB Compressor	Detective details: • "Protection stop by overcurrent generation after inverter compressor start processing completed" generated consecutively 10 times. *The number of generations is reset if the start-up of the compressor succeeds.
---	--

Forecast of cause :	1. Outdoor unit fan operation defective, foreign matter on heat exchanger, excessive rise of ambient temperature 2. Main PCB 3. Inverter compressor failure (lock, winding short) 4. Inverter PCB
----------------------------	--

Check Point 1 : Check the outdoor unit fan operation, heat exchanger, ambient temperature

- No obstructions in air passages?
- Heat exchange fins clogged
- Outdoor unit fan motor check
- Ambient temperature not raised by the effect of other heat sources?
- Discharged air not sucked in?



Check Point 2: Replace Inverter PCB

▶ **If Check Point 1 do not improve the symptom, change Inverter PCB.**



Check Point 3: Replace Main PCB

▶ **If Check Point 1, 2 do not improve the symptom, change Main PCB.**



Check Point 4: Replace Compressor

▶ **If Check Point 3 do not improve the symptom, change Compressor.**

Troubleshooting 17 OUTDOOR UNIT Error Method: Compressor rotor position detection error	Indicate or Display: Hydraulic unit :		Outdoor unit :							
	Green	Red	Mode	Error	L1	L2	L3	L4	L5	L6
	◆9	◆5	◆2	●	◆9	◆5	○	○	○	●
	◆n : n times blinding		○ : Light OFF ● : Light ON ◆n : n times blinking							

Detective Actuators: Outdoor unit Inverter PCB Outdoor unit Main PCB Compressor	Detective details: "Protection stop by "overcurrent generation at inverter compressor starting" restart" generated consecutively 10 times x 3 sets (total 30 times). If it still fails to start, the compressor stops permanently.
---	---

Forecast of cause : 1. Defective connection of electric components 2. Inverter PCB Failure 3. Main PCB failure 4. Compressor failure

Check Point 1 : Check Noise from Compressor • Turn on Power and check operation noise. ▶ If an abnormal noise show, replace Compressor.



Check Point 2 : Check connection of around the Compressor components For Compressor Terminal, Main PCB • Check if connector is removed. • Check erroneous connection. • Check if cable is open. (Refer to PARTS INFORMATION 2) >>Upon correcting the removed connector or mis-wiring, reset the power.



Check Point 3: Replace Inverter PCB ▶ If Check Point 1,2 do not improve the symptom, change Inverter PCB.
--



Check Point 4: Replace Main PCB ▶ If Check Point 3 do not improve the symptom, change Main PCB.
--



Check Point 5: Replace Compressor ▶ If Check Point 3 do not improve the symptom, change Compressor.
--

Troubleshooting 18 OUTDOOR UNIT Error Method: Outdoor Unit Fan Motor Error	Indicate or Display: Hydraulic unit :		Outdoor unit :																								
	<table border="1"> <tr> <td>Green</td> <td>Red</td> </tr> <tr> <td>◆9</td> <td>◆7</td> </tr> </table>	Green	Red	◆9	◆7	<table border="1"> <tr> <td>Mode</td> <td>Error</td> <td>L1</td> <td>L2</td> <td>L3</td> <td>L4</td> <td>L5</td> <td>L6</td> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆9</td> <td>◆7</td> <td>○</td> <td>○</td> <td>●</td> <td>●</td> </tr> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆9	◆7	○	○	●	●	O: Light OFF ●: Light ON ◆n: n times blinking				
Green	Red																										
◆9	◆7																										
Mode	Error	L1	L2	L3	L4	L5	L6																				
◆2	●	◆9	◆7	○	○	●	●																				

Detective Actuators: Outdoor unit Inverter PCB Outdoor unit Main PCB Outdoor unit fan motor	Detective details: ① When outdoor fan rotation speed is less than 100rpm in 20 seconds after fan motor starts, fan motor stops. ② After fan motor restarts, if the same operation within 60sec is repeated 3 times in a row, compressor and fan motor stops. ③ If ① and ② repeats 5 times in a row, compressor and fan motor stops permanently.
---	---

Forecast of cause: 1. Fan rotation failure 2. Motor protection by surrounding temperature rise 3. Inverter PCB failure 4. Main PCB failure 5. Outdoor unit fan motor failure
--

Check Point 1 : Check rotation of Fan • Rotate the fan by hand when operation is off. (Check if fan is caught, dropped off or locked motor) >>If Fan or Bearing is abnormal, replace it.
--


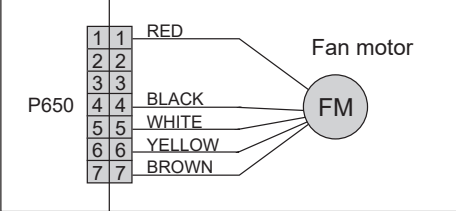


Check Point 2 : Check ambient temp. around motor • Check excessively high temperature around the motor. (If there is any surrounding equipment that causes heat) >>Upon the temperature coming down, restart operation.



Check Point 3 : Check Outdoor unit fan motor • Check Outdoor unit fan motor. (PARTS INFORMATION 4) >>If Outdoor Fan Motor is abnormal, replace Outdoor fan motor and Main PCB.
--



Check Point 4 : Check Output Voltage of Inverter PCB • Check outdoor unit circuit diagram and the voltage. (Measure at Inverter PCB side connector)							
	<table border="1"> <tr> <td>Read wire</td> <td>DC voltage</td> </tr> <tr> <td>Red - Black</td> <td>280V (AC220V-10%) ~ 373V (AC240+10%)</td> </tr> <tr> <td>White - Black</td> <td>15 ± 1.5V</td> </tr> </table>	Read wire	DC voltage	Red - Black	280V (AC220V-10%) ~ 373V (AC240+10%)	White - Black	15 ± 1.5V
Read wire	DC voltage						
Red - Black	280V (AC220V-10%) ~ 373V (AC240+10%)						
White - Black	15 ± 1.5V						
► If the voltage is not correct, replace Inverter PCB.							



Check Point 5 : Replace Main PCB ► If Check Pint 1~4 do not improvethethe symptom, replace Main PCB.

Troubleshooting 19 OUTDOOR UNIT Error Method: Outdoor unit Circulation pump Error	Indicate or Display: Hydraulic unit :		Outdoor unit :																									
	<table border="1"> <tr> <th>Green</th> <th>Red</th> </tr> <tr> <td>◆9</td> <td>◆11</td> </tr> </table>	Green	Red	◆9	◆11		<table border="1"> <tr> <th>Mode</th> <th>Error</th> <th>L1</th> <th>L2</th> <th>L3</th> <th>L4</th> <th>L5</th> <th>L6</th> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆9</td> <td>◆11</td> <td>○</td> <td>○</td> <td>○</td> <td>●</td> </tr> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆9	◆11	○	○	○	●					
Green	Red																											
◆9	◆11																											
Mode	Error	L1	L2	L3	L4	L5	L6																					
◆2	●	◆9	◆11	○	○	○	●																					

◆n : n times blinding

○ : Light OFF ● : Light ON ◆n : n times blinking

Detective Actuators: Outdoor unit Supply PCB Outdoor unit Main PCB Outdoor unit circulation pump	Detective details: It has passed 2 seconds after pump is power on and feedback from the circulating pump is out of range. Compressor stops and Pump stops.
--	--

Forecast of cause: 1. Sludge Filter trap clogged 3. Connection between pump and PCB	2. Circulating pump blocked, failed, malfunctioning pump
--	--

Check Point 1 : Check rotation of circulation pump
• Read if fault pump status displayed on indoor HMI. Check if the pump is blocked, and correctly supplied between PCB and Pump else >>Replace the condenser circulation pump.



Check Point 2 : If error is still displayed after restarting
>>Replace ODUM Hydraulic PCB and Main PCB .

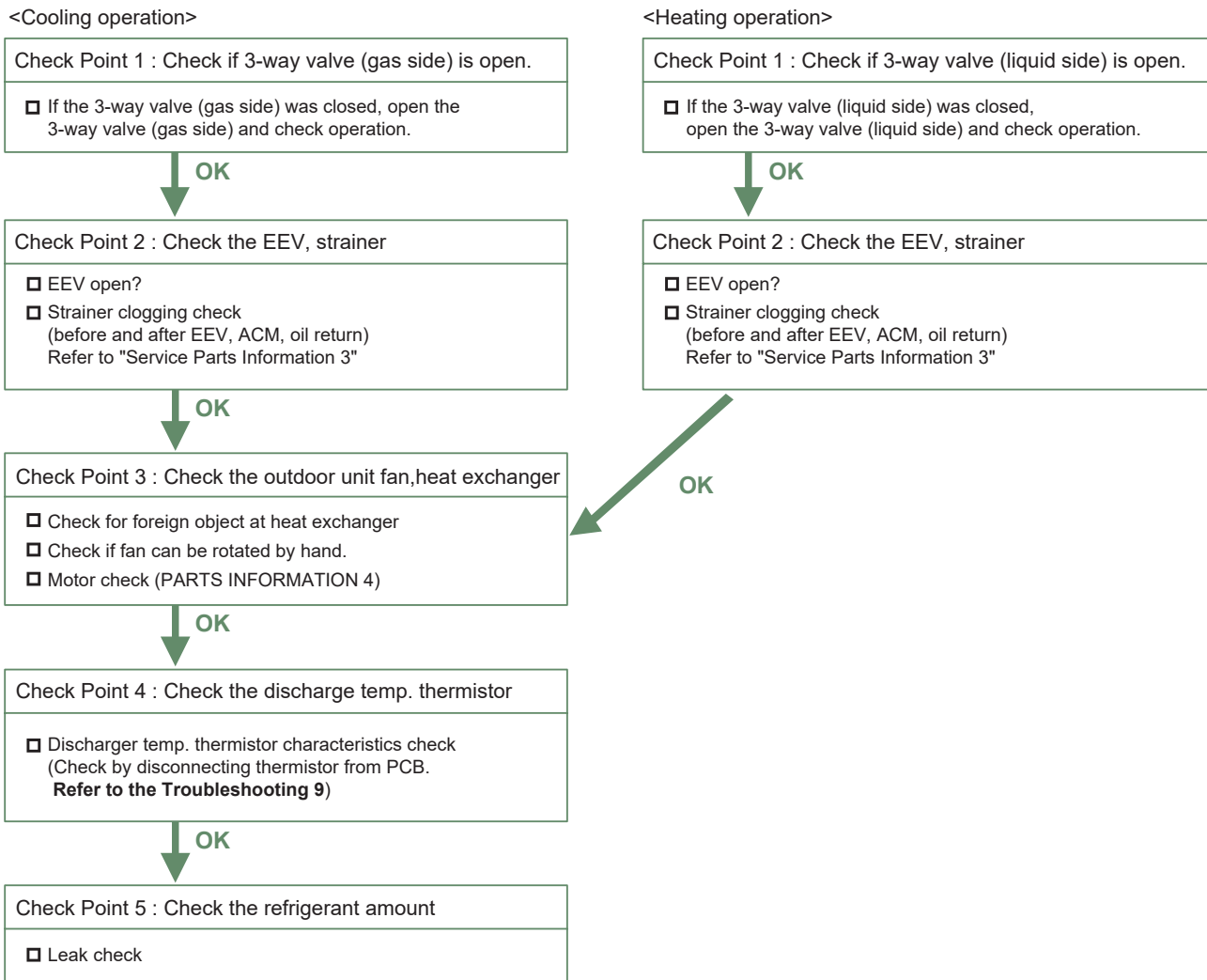
Troubleshooting 20 OUTDOOR UNIT Error Method: Discharge Temperature Error	Indicate or Display: Hydraulic unit :		Outdoor unit :																								
	<table border="1"> <tr> <td>Green</td> <td>Red</td> </tr> <tr> <td>◆10</td> <td>◆1</td> </tr> </table>	Green	Red	◆10	◆1	<table border="1"> <tr> <td>Mode</td> <td>Error</td> <td>L1</td> <td>L2</td> <td>L3</td> <td>L4</td> <td>L5</td> <td>L6</td> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆10</td> <td>◆1</td> <td>○</td> <td>○</td> <td>○</td> <td>●</td> </tr> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆10	◆1	○	○	○	●					
Green	Red																										
◆10	◆1																										
Mode	Error	L1	L2	L3	L4	L5	L6																				
◆2	●	◆10	◆1	○	○	○	●																				

◆n : n times blinding

○: Light OFF ●: Light ON ◆n: n times blinking

Detective Actuators: Discharge temperature thermistor	Detective details: • "Protection stop by "discharge temperature $\geq 110^{\circ}\text{C}$ during compressor operation" generated 2 times within 24 hours.
---	--

Forecast of cause :	1. 3-way valve not opened 2. EEV defective, strainer clogged 3. Outdoor unit operation failure, foreign matter on heat exchanger 4. Discharge temperature thermistor failure 5. Insufficient refrigerant
----------------------------	--



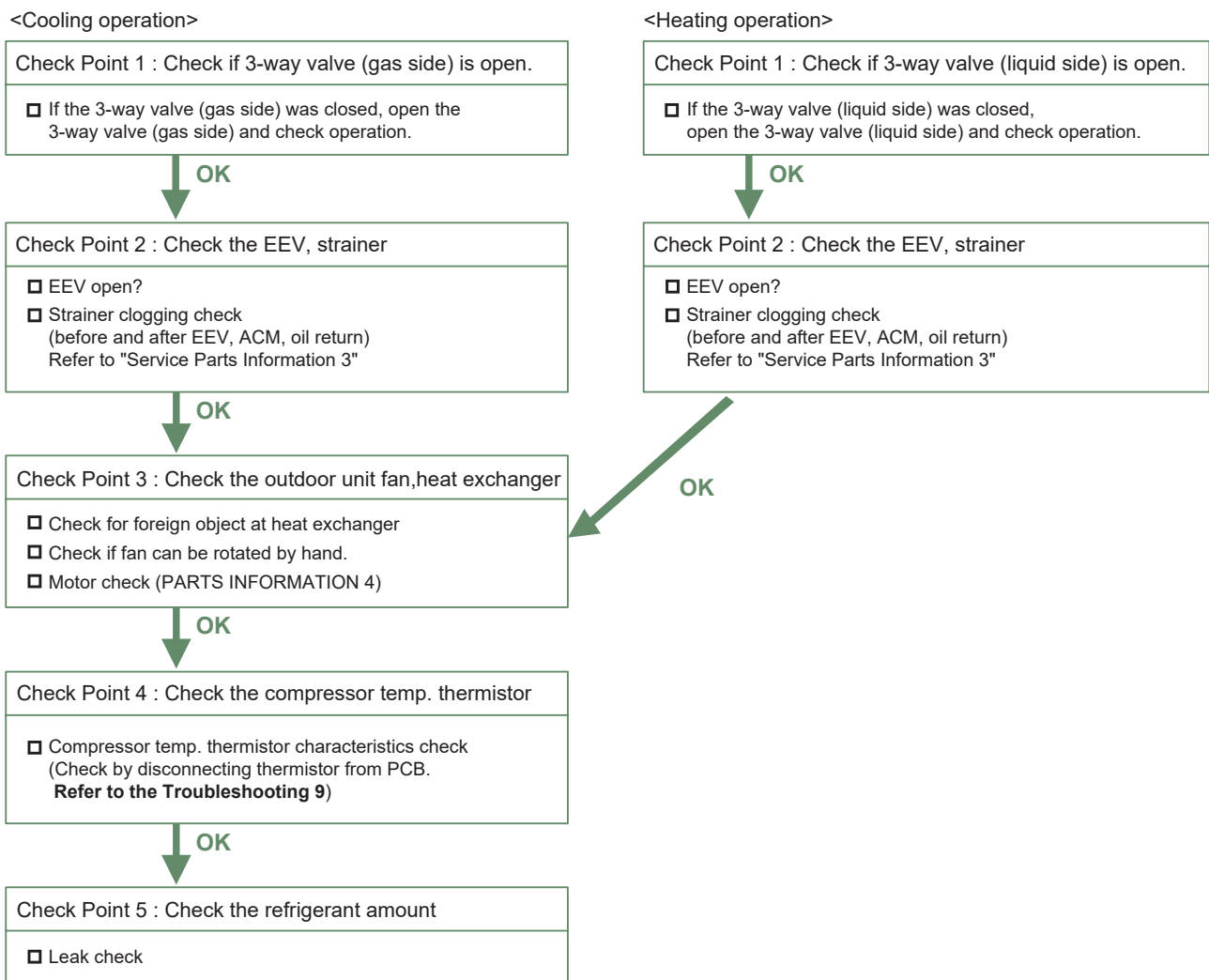
Troubleshooting 21 OUTDOOR UNIT Error Method: Compressor Temperature Error	Indicate or Display: Hydraulic unit :		Outdoor unit :																								
	<table border="1"> <tr> <th>Green</th> <th>Red</th> </tr> <tr> <td>◆10</td> <td>◆3</td> </tr> </table>	Green	Red	◆10	◆3	<table border="1"> <tr> <th>Mode</th> <th>Error</th> <th>L1</th> <th>L2</th> <th>L3</th> <th>L4</th> <th>L5</th> <th>L6</th> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆10</td> <td>◆3</td> <td>○</td> <td>○</td> <td>○</td> <td>●</td> </tr> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆10	◆3	○	○	○	●					
Green	Red																										
◆10	◆3																										
Mode	Error	L1	L2	L3	L4	L5	L6																				
◆2	●	◆10	◆3	○	○	○	●																				

◆n : n times blinding

○: Light OFF ●: Light ON ◆n: n times blinking

Detective Actuators: Compressor temperature thermistor	Detective details: ▪ "Protection stop by "compressor temperature $\geq 108^{\circ}\text{C}$ during compressor operation" generated 2 times within 24 hours.
--	---

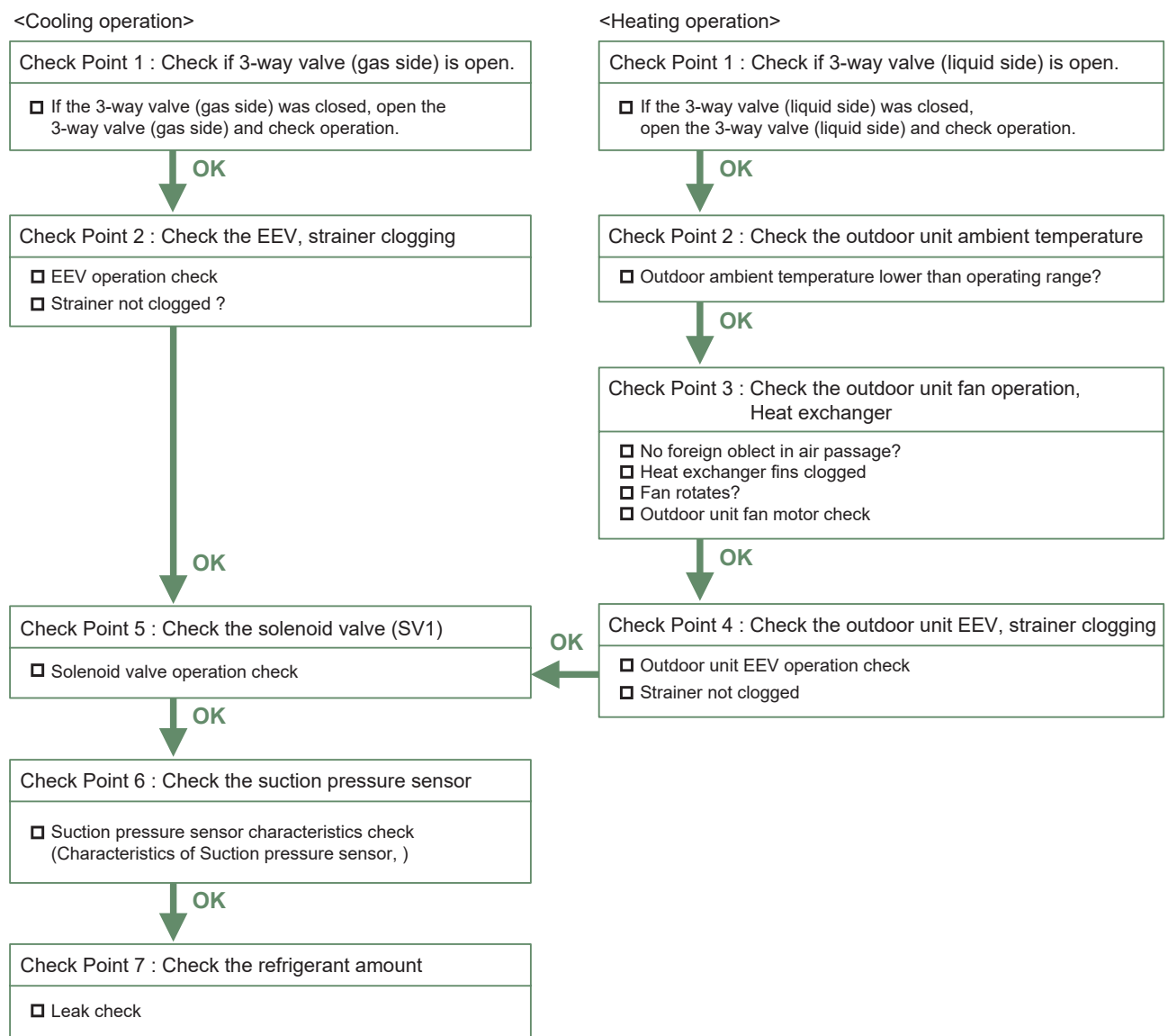
Forecast of Cause :	1. 3-way valve not opened 2. EEV defective, strainer clogged 3. Outdoor unit operation failure, foreign matter on heat exchanger 4. Compressor temperature thermistor failure 5. Insufficient refrigerant
----------------------------	---



Troubleshooting 22 OUTDOOR UNIT Error Method: Pressure Error	Indicate or Display: Hydraulic unit :		Outdoor unit :							
	Green	Red	Mode	Error	L1	L2	L3	L4	L5	L6
	◆10	◆5	◆2	●	◆10	◆5	○	○	○	●
◆n : n times blinding		○: Light OFF ●: Light ON ◆n: n times blinking								

Detective Actuators: Pressure sensor	Detective details: • "Protection stop by suction pressure ≤ 0.02MPa continued for 5 minutes" repeats 5 times within 2 hours.
--	--

Forecast of cause :	1. 3-way valve not opened 2. Outdoor unit ambient temperature too low 3. Outdoor unit fan operation defective, foreign matter on heat exchanger 4. EEV defective, strainer clogged 5. Solenoid valve defective 6. Low pressure sensor characteristics defective 7. Insufficient refrigerant
----------------------------	---



Troubleshooting 23 OUTDOOR UNIT Error Method: Heatsink Temp. Error	Indicate or Display: Hydraulic unit : No indication	Outdoor unit : <table border="1"> <thead> <tr> <th>Mode</th> <th>Error</th> <th>L1</th> <th>L2</th> <th>L3</th> <th>L4</th> <th>L5</th> <th>L6</th> </tr> </thead> <tbody> <tr> <td>◆2</td> <td>●</td> <td>◆10</td> <td>◆11</td> <td>○</td> <td>○</td> <td>●</td> <td>●</td> </tr> </tbody> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆10	◆11	○	○	●	●
	Mode	Error	L1	L2	L3	L4	L5	L6										
◆2	●	◆10	◆11	○	○	●	●											
<small>O: Light OFF ●: Light ON ◆n: n times blinking</small>																		

Detective Actuators: Outdoor unit Inverter PCB Heatsink temperature thermistor	Detective details: <ul style="list-style-type: none"> • "Protection stop by Heatsink temp. ≥80°C" generated 2 times within 24 hours.
--	---

Forecast of cause :

1. Foreign matter on Heatsink, Heatsink dirty
2. Foreign matter on Heat exchanger, excessive ambient temperature rise
3. Heatsink temperature thermistor defective

Check Point 1 : Check the Heatsink state

Heatsink foreign matter, soiling check



Check Point 2 : Check the foreign matter and ambient temperature of heat exchanger

Heat exchanger foreign matter check

Ambient temperature not raised by effect of other heat sources ?

Discharged air not sucked in ?



Check Point 3 : Check the Heatsink temperature thermistor

Heatsink temperature thermistor characteristics check (Check by disconnecting thermistor from PCB)

Refer to the Troubleshooting 11



Check Point 2 : Replace Inverter PCB

Replace Inverter PCB

Troubleshooting 24 OUTDOOR UNIT Error Method: Low water flow error No water flow rate or non-sufficient water flow rate	Indicate or Display: Hydraulic unit :		Outdoor unit :																									
	<table border="1"> <tr> <td>Green</td> <td>Red</td> </tr> <tr> <td>◆10</td> <td>◆14</td> </tr> </table>	Green	Red	◆10	◆14		<table border="1"> <tr> <td>Mode</td> <td>Error</td> <td>L1</td> <td>L2</td> <td>L3</td> <td>L4</td> <td>L5</td> <td>L6</td> </tr> <tr> <td>◆2</td> <td>●</td> <td>◆10</td> <td>◆14</td> <td>○</td> <td>○</td> <td>○</td> <td>●</td> </tr> </table>	Mode	Error	L1	L2	L3	L4	L5	L6	◆2	●	◆10	◆14	○	○	○	●					
Green	Red																											
◆10	◆14																											
Mode	Error	L1	L2	L3	L4	L5	L6																					
◆2	●	◆10	◆14	○	○	○	●																					

◆n : n times blinding

○: Light OFF ●: Light ON ◆n: n times blinking

Detective Actuators: Flow rate sensor Circulating pump Outdoor unit Hydraulic PCB Indoor unit vessel	Detective details: It has passed 1 minute after a pump start-up. Flow rate becomes < min operating flow L/min or less for 10 seconds continuously. Compressor is stopped.
---	---

Forecast of cause :	1. Condenser pump speed too low 3. No sufficient water pressure in the loop 5. Valves status between Indoor and outdoor unit 7. Circulating pump blocked	2. Closing of the water loop (radiator valves) 4. Anti-freeze valve opening 6. Sludge Filter trap clogged. 8. Connection between Flow rate sensor and PCB
----------------------------	---	--

Check Point 1 : Read the Flow Rate Displayed on Indoor Unit HMI If it is different from 0 and less than minimum operating flow.
<input type="checkbox"/> Check the condenser pump status on indoor unit HMI. <input type="checkbox"/> Check possible reason of reduction as water pressure level, closing on the water loop, opening of valves like anti-freeze valves or thermostatic radiator valves, filter trap clogging status. <input type="checkbox"/> Check condenser pump speed (parameter 2793 in complete parameter list, only during heating operation).

OK

Check Point 2 : If flow rate displayed on indoor unit is equal to 0 and more than 50
<input type="checkbox"/> Read if fault pump status displayed on indoor HMI.

YES

If fault pump status is on
 check if the pump is blocked, and correctly supplied.
 Else replace the condenser circulation pump.

NO

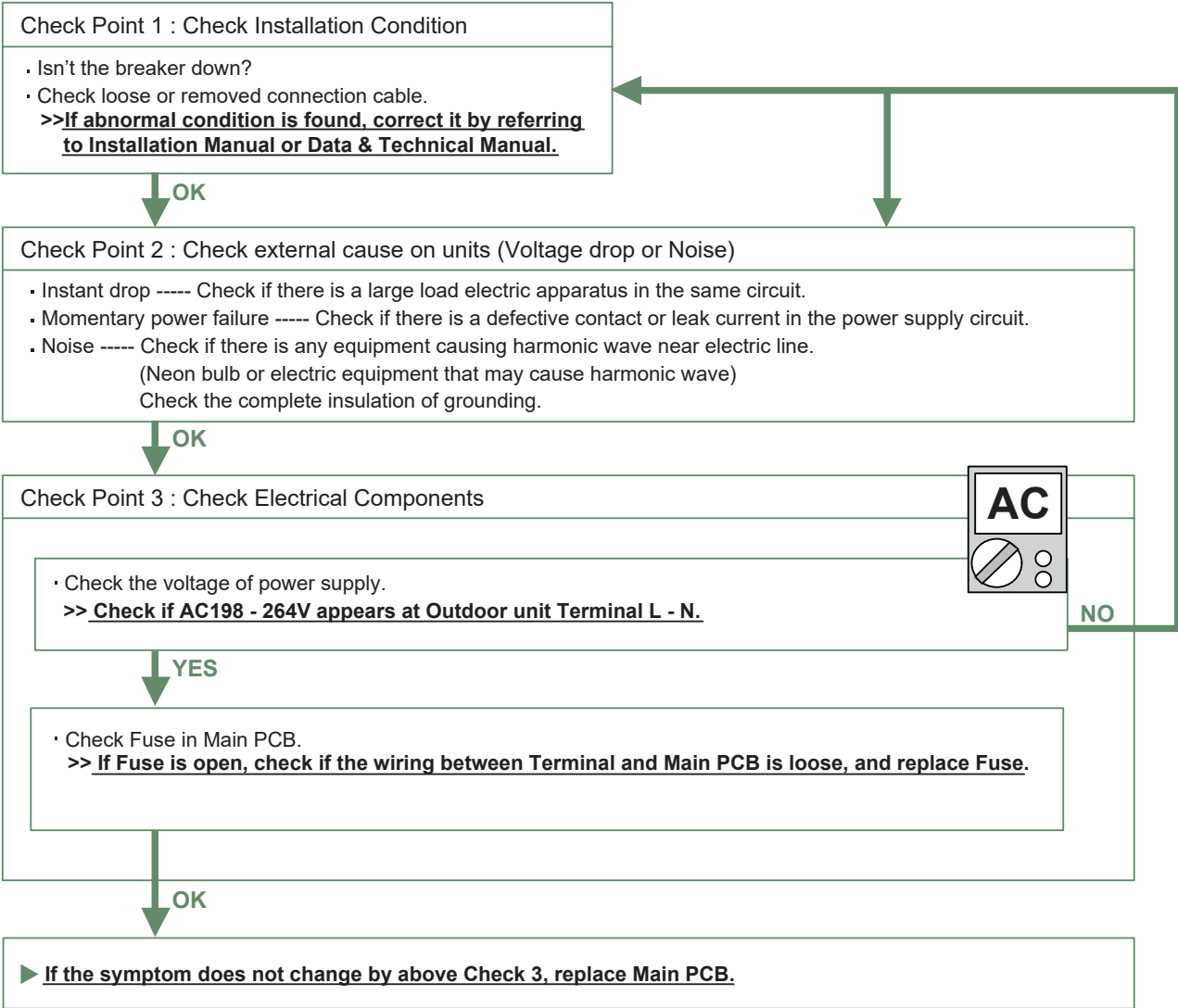
If fault pump status is off
 -> Replace the the flow rate sensor

If error is still displayed
 -> Replace ODUM Hydraulic PCB and Main PCB

▼ Troubleshooting without Error Code

Troubleshooting 25
Outdoor unit - No Power

Forecast of cause:
1. Power Supply failure 2. External cause
3. Electrical Components defective



Troubleshooting 26

No Operation (Power is ON)

Forecast of Cause:

1. Setting / Connection failure
2. External cause
3. Electrical Component defective

Check Point 1 : Check Hydraulic unit and Outdoor unit installation condition

· Are these Hydraulic unit and Outdoor Unit suitable model numbers to connect?
>> **If there is some abnormal condition, correct it by referring to Installation manual and Data & Technical Manual.**

OK

Turn off Power and check/ correct followings.

- Is there loose or removed communication line of Hydraulic Unit and Outdoor Unit?

OK

Check Point 2 : Check external cause on units (Voltage drop or Noise)

- Instant drop ----- Check if there is a large load electric apparatus in the same circuit.
- Momentary power failure ----- Check if there is a defective contact or leak current in the power supply circuit.
- Noise ----- Check if there is any equipment causing harmonic wave near electric line.
(Neon bulb or electric equipment that may cause harmonic wave)
Check the complete insulation of grounding.

>> **If the symptom dose not change by above check 1,2 replace main PCB of outdoor unit.**

Troubleshooting 27

Abnormal noise (Outdoor unit)

Forecast of Cause:

1. Abnormal installation
2. Fan failure
3. Compressor failure

Diagnosis method when Abnormal noise is occurred

- Is Main unit installed in stable condition ?
- Is Fan guard installed normally ?



- Is Fan broken or deformed ?
- Is the screw of fan loose ?
- Is there any objet which obstruct the fan rotation ?



- Check if vibration noise by loose bolt or contact noise of piping is happening

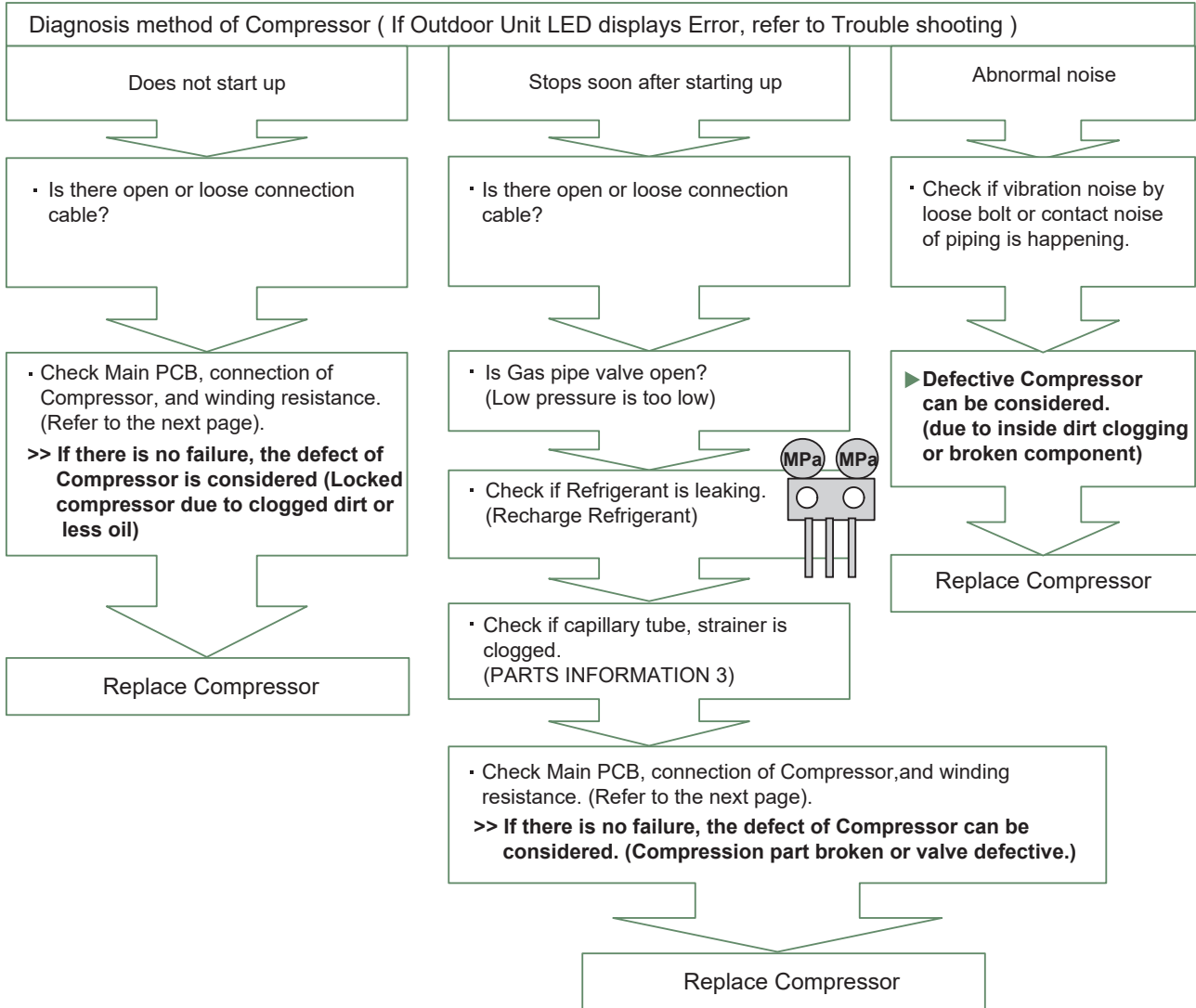


- Is Compressor looked ?
>> Check Compressor (Outdoor Unit error code)

► Service parts information

▼ Service parts information 1 : Compressor

SERVICE PARTS INFORMATION 1
Compressor



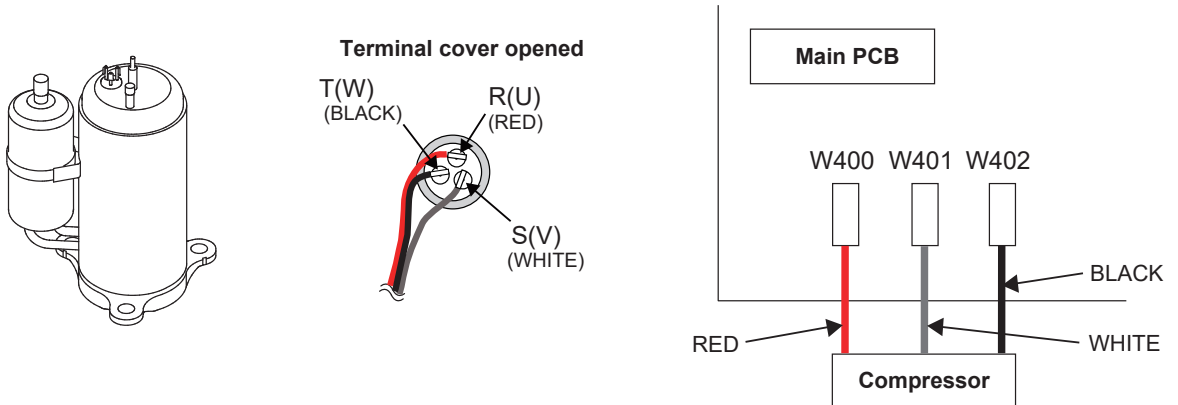
▼ Service parts information 2 : Inverter compressor

SERVICE PARTS INFORMATION 2

Inverter Compressor

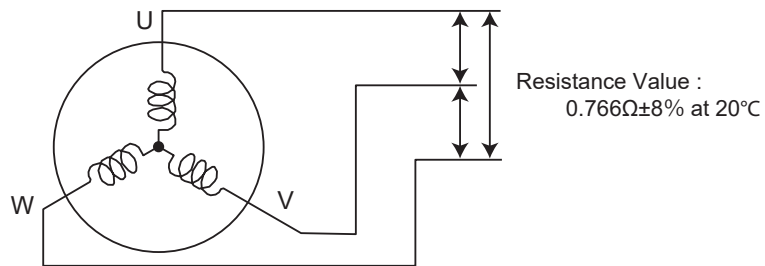
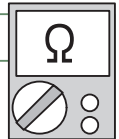
Check Point 1 : Check Connection

- Check terminal connection of Compressor (loose or incorrect wiring)



Check Point 2 : Check Winding Resistance

- Check winding resistance of each terminal
- ▶ **If the resistance value is 0Ω or infinite, replace Compressor.**



Check Point 3 : Replace Main PCB

- ▶ **If the symptom does not change with above Check 1, 2, replace Main PCB.**

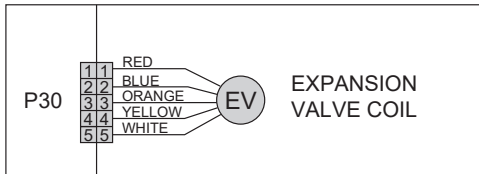
▼ Service parts information 3 : Outdoor unit electronic expansion valve (EEV, EEV (INJ))

SERVICE PARTS INFORMATION 3

Outdoor unit Electronic Expansion Valve (EEV)

Check Point 1 : Check Connections

- Check connection of connector (Loose connector or open cable)



Check Point 2 : Check Coil of EEV

- Remove connector, check each winding resistance of Coil.

Read wire	Resistance value
White - Red	$46 \Omega \pm 4 \Omega$ at 20°C
Yellow - Red	
Orange - Red	
Blue - Red	



► **If Resistance value is abnormal, replace EEV.**

Check Point 3 : Check Noise at start up

- Turn on Power and check operation noise.
- **If an abnormal noise does not show, replace Main PCB.**

Check Point 4 : Check Voltage from Main PCB.

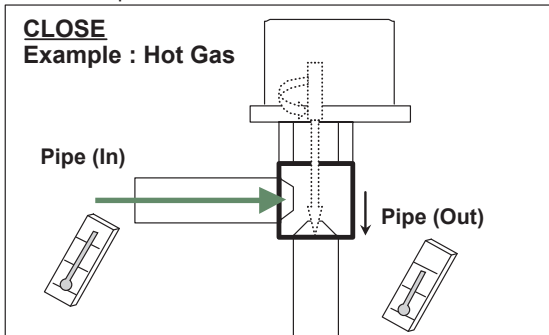
- Remove Connector and check Voltage (DC12V)
- **If it does not appear, replace Main PCB.**



Check Point 5 : Check Opening and Closing Operation of Valve

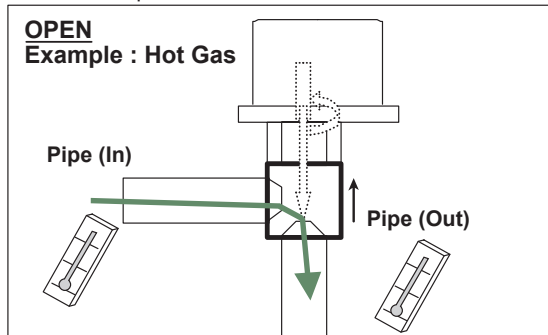
When Valve is closed, it has a temp. difference between Inlet and Outlet.

CLOSE
Example : Hot Gas



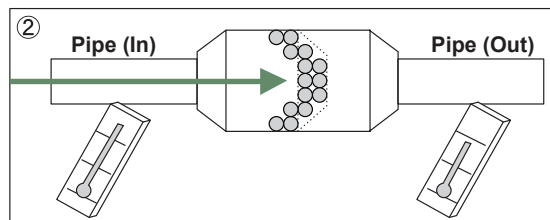
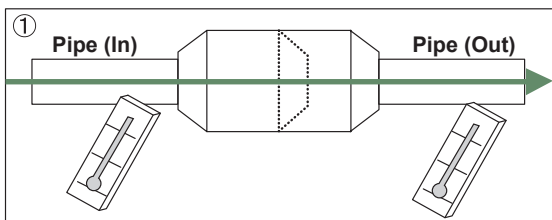
If it is open, it has no temp. difference between Inlet and Outlet.

OPEN
Example : Hot Gas



Check Point 6 : Check Strainer

Strainer normally does not have temperature difference between inlet and outlet as shown in ①, but if there is a difference as shown in ②, there is a possibility of inside clogged. In this case, replace Strainer.



▼ Service parts information 4 : Outdoor unit fan motor

SERVICE PARTS INFORMATION 4

Outdoor unit fan motor

Check Point 1 : Check rotation of Fan

· Rotate the fan by hand when operation is off (Check if fan is caught, dropped off or locked motor)

>>If Fan or Bearing is abnormal, replace it.

Check Point 2 : Check resistance of Outdoor Fan Motor

· Refer to below. Circuit-test "Vm" and "GND" terminal (Vm: DC voltage, GND: Earth terminal)

>>If they are short-circuited (below 300 kΩ), replace Outdoor fan motor and Main PCB.

Pin number (wire color)	Terminal function (symbol)
1 (Red)	DC voltage (Vm)
2	No function
3	No function
4 (Black)	GND
5 (White)	Control voltage (Vcc)
6 (Yellow)	Speed command (Vsp)
7 (Brown)	Feed back (FG)



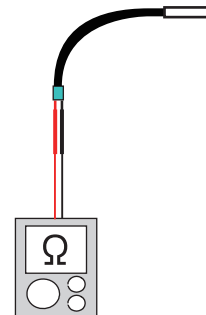
▼ Service parts information 5 : Thermistor

SERVICE PARTS INFORMATION 5

Thermistor

Check Point : Check Thermistor resistance value

□ Remove connector and check Thermistor resistance value.



Temperature [°C]	Resistance Value [kΩ]				
	Thermistor A	Thermistor B	Thermistor C	Thermistor D	Thermistor E
-30	920,3	88,4	205,7	88,4	88,7
-20	503,5	48,1	109,0	48,1	48,5
-10	286,3	27,3	60,2	27,3	27,4
0	168,6	16,1	34,6	16,1	16,1
10	102,5	9,7	20,6	9,7	9,7
20	64,2	6,1	12,6	6,1	6,1
30	41,3	3,9	8,0	3,9	3,9
40	27,3	2,6	5,2	2,6	2,6
50	18,4	1,7	3,5	1,7	1,7
60	12,7	1,2	2,4	1,2	1,2
70	8,9	0,8	-	0,8	0,8
80	6,4	0,6	-	0,6	0,6
90	4,6	-	-	0,4	0,4
100	3,4	-	-	0,3	0,3
110	2,6	-	-	0,2	-
120	2,0	-	-	0,2	-
130	-	-	-	0,1	-
140	-	-	-	0,1	-
150	-	-	-	0,1	-
Applicable Thermistors	Discharge temp. TH Compressor temp. TH Ex. valve temp. TH	Heat exchanger. TH	Outdoor temp. TH	Heatsink temp. TH	water temp. TH

► Operating Limits

Heat Pump		8	10
<i>Min/max OT in heat mode***</i>	°C	-20 / +35	-20 / +35
<i>Heating floor maximum water temperature</i>	°C	45	45
<i>LT radiator maximum water temperature</i>	°C	60	60
<i>Min/max OT in cooling mode</i>	°C	8/46	8/46
<i>Water circuit max pressure</i>	MPa (bar)	0.3 (3)	0.3 (3)
<i>Maximum flow rate of the hydronic circuit</i>	l/h	1980	1980
<i>Minimum flow rate of the hydronic circuit</i>	l/h	870	870
<i>Refrigerant circ max pressure</i>	MPa (bar)	4.2 (42)	4.2 (42)
<i>ERP Acoustic pressure level (5m / EN 12102-1 Annex A) *</i>	dBA	56	57
<i>Acoustic power level (EN 14511-2 / A7W55) **</i>	dBA	60	62
<i>Outdoor unit air flow rate</i>	m3/h	3590	3590

* Sound pressure level at (x) m from the appliance, 1.5m from the ground, free field, directivity 2.

** Acoustic power level @standard rating cond. (EN 14511-2) A7W55 outdoor unit.

*** When the outdoor temperature continuously exceeds 35°C, DHW heating is done by the water heater heating element.



A series of horizontal dotted lines for writing, consisting of 25 lines spaced evenly down the page.

Failures

► Hydronic, Electric and Refrigeration Systems

▼ Hydronic System

If the installation is fitted with a heating floor, the most common failures are those listed below:

Failure cases	Consequences	Solutions	Applied by	
1- Clogged filter* or sludge in system	Flow pressure too high	Clean filter or desludge	Installer	
	ΔT too high (>7)	Clean filter or desludge	Installer	
2- Pump out of order	Zero flow pressure	Change pump if faulty	Service station	
	current too high (rotor locked)	Change pump if faulty	Service station	
	zero current (winding cut off)	Change pump if faulty	Service station	
	pump stuck	Unplug pump for 5s	Installer	
3- Leak	Low level in expansion vessel	On collector, isolate heating circuits to determine which heating circuit is perforated	Pipe leak. Pipe is faulty	Service station
			Leak in heating circuit Floor again	Installer
4- Clogged heating circuit (crushed pipe)	Very high difference between floor flow/ return temp	On collector, check heating circuit flow/ return temps (infrared thermometer)	Clear with test pump	Service station
		If no clogged heating circuit, check for crushing with infrared camera	Call the installer's or floor coverer's responsibility into question	
5- Misbalance	Very high difference between floor flow/ return temp	Rebalance		Installer
6- Floor undersized or charge losses too high	Very high difference between floor flow/ return temp	On collector, check heating circuit flow/ return temps (infrared thermometer)	Call the installer's responsibility into question	Installer or Service station

*Not required and not shown on the device.

▼ Electrical System

Outdoor Unit Overvoltage

Check for possible causes in the list below (this list is not exhaustive):

- Problem with the compressor.
- Main board.
- Faulty power relay.

Steps to be followed before performing any work on the Inverter module:

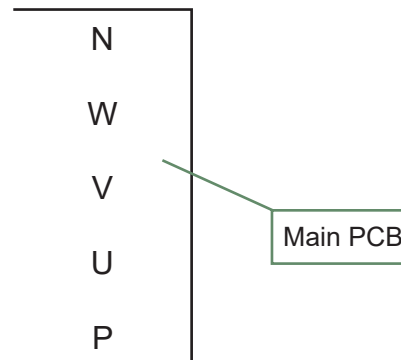
- First switch off the system using the circuit breaker at the head of the line.
- Remove the unit cover and then remove the Inverter module cover.
- Measure the voltage at the condenser terminals. You should find a value of 5 Vdc or less.

Inspection of the Power Transistor Module (Main board)

Disconnect the compressor relay and the condenser connection. Measure the resistance value at the points shown on the illustration, and then compare the values observed with those in the table.

Multimeter		Resistor
-	+	1 MOhm or more
P	U	
	V	
	W	
U	N	
V		
W		

Single phase type



▼ Refrigeration System

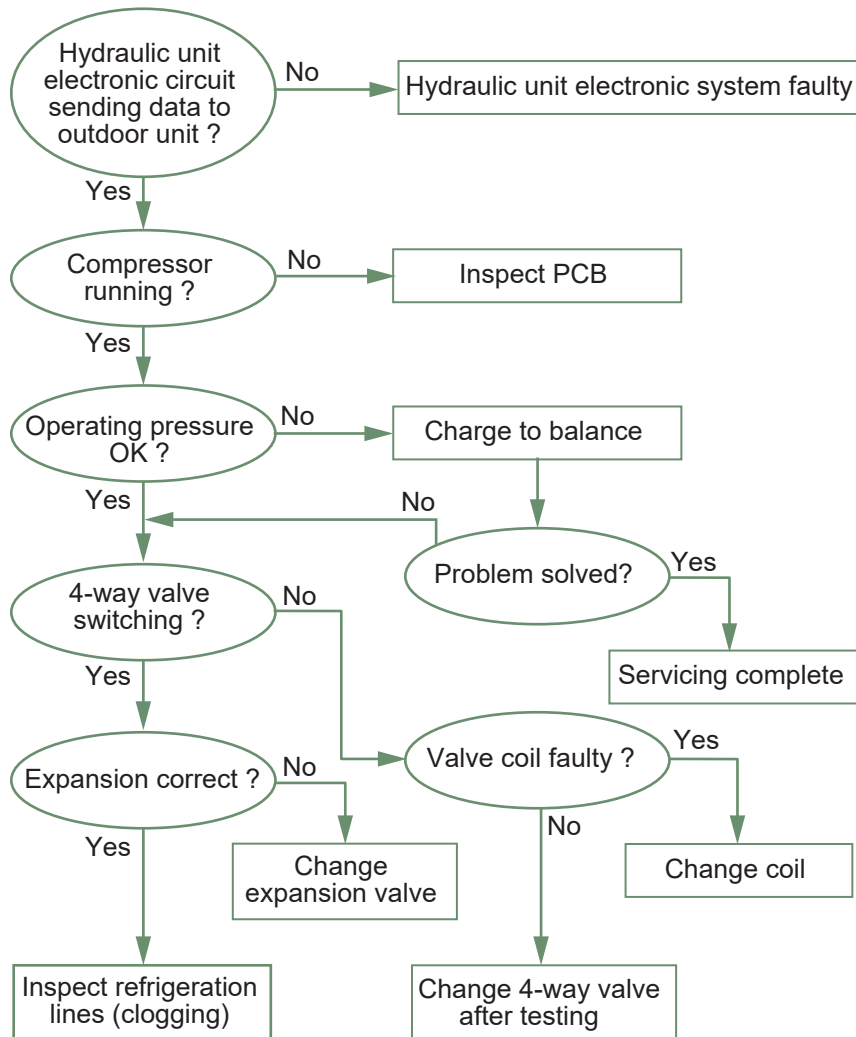
Unit produces no heat

The unit remains in continuous scanning mode.

Initial checks

Check the settings.

Are the data sent by the user interface received by the heat pump ?



Outdoor unit does not defrost

Is condensation drain properly discharged (outdoor unit directly on the ground) ?

- Are the auxiliaries powered ?
- In boiler backup mode, is the boiler authorized ?
- In very cold areas, a fusing resistance value is recommended.
 - Is the installation regularly subject to micro-outages of power (frequent outages on the mains power system may also cause defrosting problems) ?
 - Is there a peak day clearing (EJP) outage on the installation ?
- Does the heat pump regularly switch to high pressure safety mode ?
- If this occurs at low temperatures ($< 5\text{ }^{\circ}\text{C}$), we recommend checking that the water pump is operating properly.

- Is the charge correct (refer to the temperature/pressure curve) ?
 - Insufficient charging will result in frequent icing.
 - Overcharging will result in frequently switching to HP safety mode.
 (If you still have doubts as to the charge, perform the charging with an electronic scale).
- Outdoor unit defrosting is controlled by the exchanger sensor and the controller board.

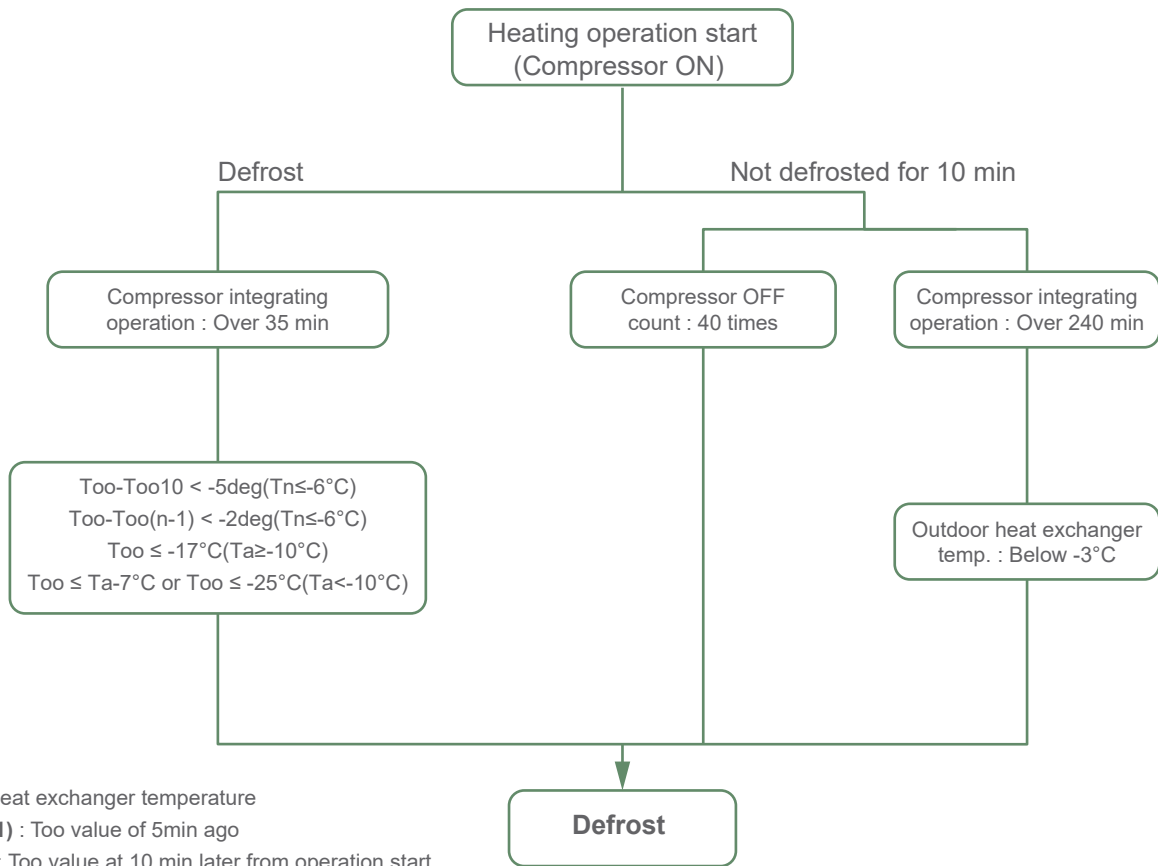
If the defrost sensor is not iced up while the rest of the exchanger is, then:

 - => Move the sensor between the exchanger blades to a place where the exchanger is iced up.
 - => If all these points have been checked, replace the outdoor controller board.

Note
 Outdoor unit defrosting is controlled by the exchanger sensor and the controller board. If no frosting is observed and no anomaly is otherwise noted, the sensor and board must be inspected and the faulty part will have to be replaced.

Defrosting

a. Defrost beginning conditions



Too : Heat exchanger temperature
 Too(n-1) : Too value of 5min ago
 Too10 : Too value at 10 min later from operation start
 OT : Outdoor temperature

b. Defrost ending conditions

With all models, defrosting stops if the exchanger temperature is above 13 °C or if the defrosting time is over 15 minutes.

Crankcase heater

When the outdoor exchanger temperature is below -2 °C and the heating mode has been stopped for 30 minutes, the compressor windings are powered and maintain the compressor temperature.

When operation has started and the temperature becomes higher than 2 °C, heating stops.

► Compressor Operating Checks

Using a multimeter set to mega ohm, check that the resistance value across the windings is identical irrespective of the phase (between U and V, V and W, W and U). This value should be approx. 1 Ohm.

Check that resistance between each phase and the earth is infinite. The result should be clear (you should not see the displayed value increasing slowly up to a value greater than the multimeter maximum rating).

► Refrigeration Circuit Leak Test

The new regulation requires annual leak testing of installations with a refrigerant charge higher than 2kg. Leak testing is to be performed with an approved detector that has been appropriately calibrated.

► Troubleshooting

The heat pump is not operating at all (no illuminated indicator):

- Are the power supply voltage and frequency normal ?
Is the connection to mains correct ?
- Have all the connectors been properly inserted ?
- Are the fuses on the outdoor unit still operating ?
If not, change the bad fuse(s).
- Is the connection between the outdoor unit and the Hydronic Unit correct ? Do you read 230V AC between terminals 1 and 2 of the Hydronic Unit terminal block ?
- Do you read 230V AC at the transformer primary on the Hydronic Unit ? If not, change the board.
- Is there any voltage on the transformer secondary on the Hydronic Unit ? If not, check the thermal fuse.
If the fuse is good, the error comes from the board.

If the defrost sensor is not iced up while the rest of the exchanger is, then:

- Move the sensor between the exchanger blades to a place where the exchanger is iced up.
- If all these points have been checked, replace the outdoor controller board.

Pump down Process

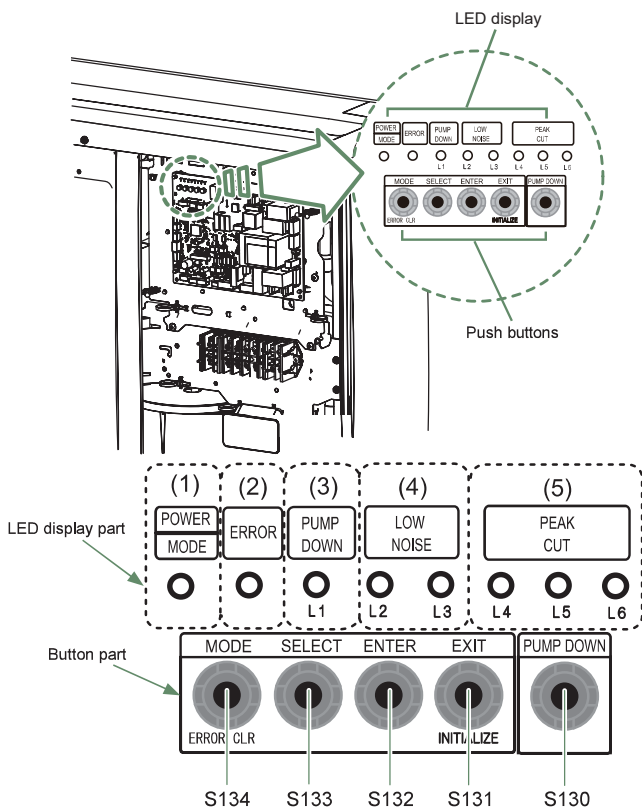
WARNING

- Never touch electrical components such as the terminal blocks except the button on the display board. It may cause a serious accident such as electric shock.
- During the pump down operation, make sure that the compressor is turned off before you remove the refrigerant piping.
Do not remove the connection pipe while the compressor is in operation with 2-way or 3-way valve open. This may cause abnormal pressure in the refrigeration cycle that leads to breakage and even injury.

CAUTION

- Perform the pump down operation before disconnecting any refrigerant pipe or electric cable.
- Collect refrigerant from the service port or the 3-way valve if pump down cannot be performed.
- In case of a group control system installation, do not turn the power off until the pump down is completed in all outdoor units.
(Group control system installation described in "SPECIAL INSTALLATION METHODS" in the installation manual of the indoor unit.)
- Do not perform the pump down operation during defrosting.

- Operate [PUMP DOWN] button (S130) on the display board with the following procedure.



- Press [PUMP DOWN] button (S130) for 3 seconds or more after 3 minutes after power on.

POWER/MODE	ERROR	PUMP DOWN (L1)	LOW NOISE (L2) (L3)		PEAK CUT (L4) (L5) (L6)		
●	○	●	○	○	●	●	●

Sign "○": Lights off, "●": Lights on

LED display lights on as shown in the above table, and the fans and the compressor start operating.

- If the [PUMP DOWN] button (S130) is pressed while the compressor is operating, the compressor will stop, then start again in about 3 minutes.
- LED display will change as shown below about 3 minutes after the compressor starts. Fully close the 3-way valve on the liquid pipe side at this stage.

POWER/MODE	ERROR	PUMP DOWN (L1)	LOW NOISE (L2) (L3)		PEAK CUT (L4) (L5) (L6)		
●	○	●	○	○	○	●	●

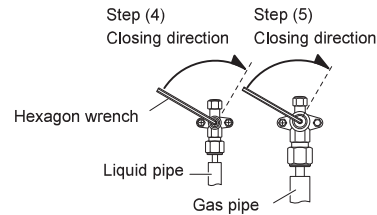
Sign "○": Lights off, "●": Lights on

- If the valve on the liquid pipe side is not closed, the pump down cannot be performed.
- When LED display changes as shown in the following table, close the 3-way valve on the gas pipe side tightly.

POWER/MODE	ERROR	PUMP DOWN (L1)	LOW NOISE (L2) (L3)		PEAK CUT (L4) (L5) (L6)		
●	○	●	○	○	○	○	●

Sign "○": Lights off, "●": Lights on

- If the valve on the gas pipe side is not closed, refrigerant may flow into the piping after the compressor stops.



- LED display changes after 1 minute as shown in the table.

POWER/MODE	ERROR	PUMP DOWN (L1)	LOW NOISE (L2) (L3)		PEAK CUT (L4) (L5) (L6)		
●	○	●	○	○	○	○	○

Sign "○": Lights off, "●": Lights on

Fans and compressor stop automatically.

- If the pump down is successfully completed (the above LED display is shown), the outdoor unit remains stopped until the power is turned off.
- Turn the power off.

POWER/MODE	ERROR	PUMP DOWN (L1)	LOW NOISE (L2) (L3)		PEAK CUT (L4) (L5) (L6)		
○	○	○	○	○	○	○	○

Sign "○": Lights off

Pump down is completed.

NOTES:

- To stop pump down, press the [PUMP DOWN] button (S130) again.
- To start the pump down again after the compressor is automatically stopped due to an error, turn the power off and open the 3-way valves. Wait 3 minutes, turn the power on and start the pump down again.
- When starting the operation after completion of the pump down, turn the power off, and then open the 3-way valves. Wait 3 minutes, turn the power on and perform a test run.
- If an error occurs, recover the refrigerant from service port.

Preparation for pump down

- Confirm that the power is off, and then open the service panel.

Pump down procedure

- Check the 3-way valves (both the liquid side and gas side) are opened.
- Turn the power on.

POWER/MODE	ERROR	PUMP DOWN (L1)	LOW NOISE (L2) (L3)		PEAK CUT (L4) (L5) (L6)		
●	○	○	○	○	○	○	○

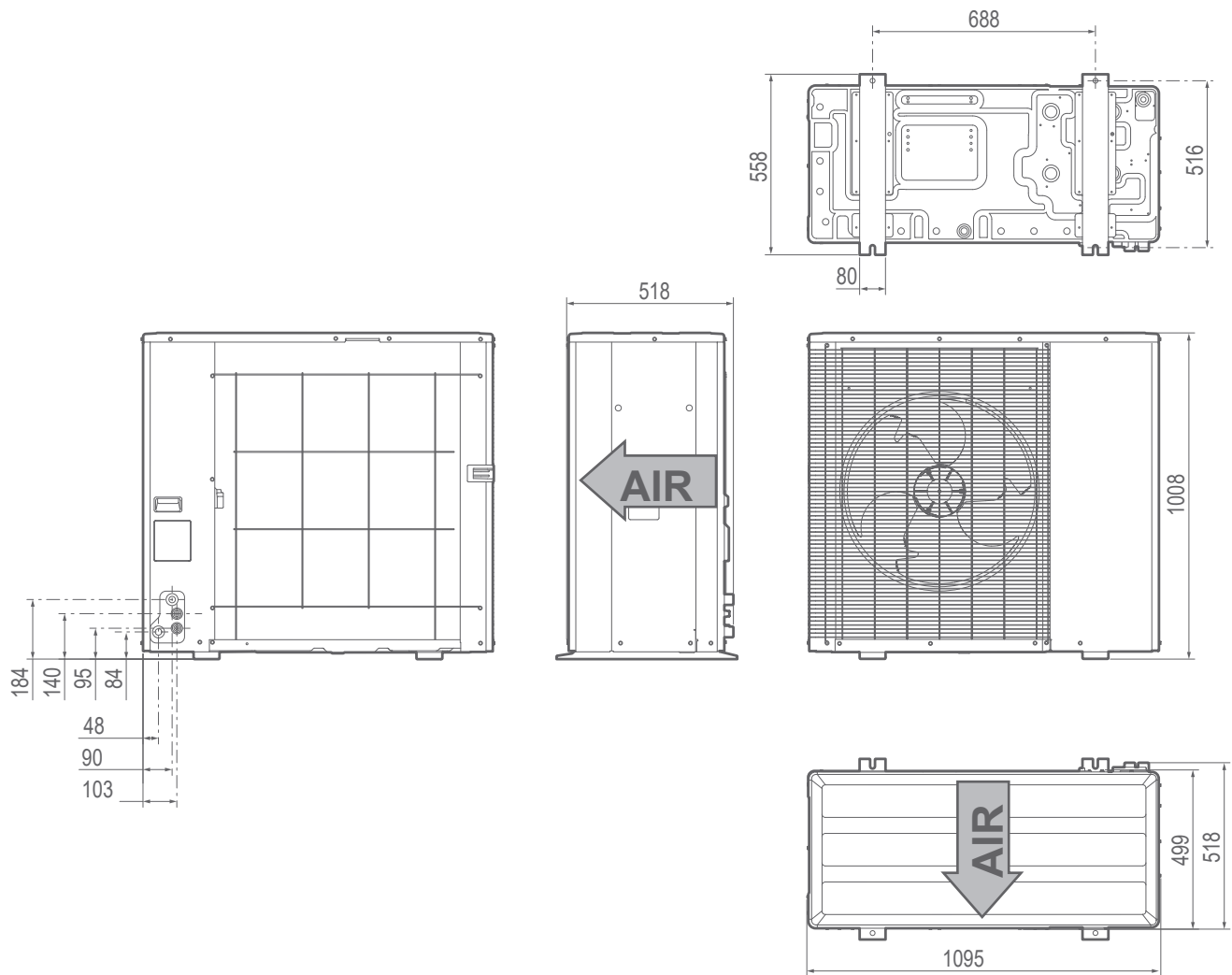
Sign "○": Lights off, "●": Lights on



A series of horizontal dotted lines spanning the width of the page, providing a guide for handwriting practice.

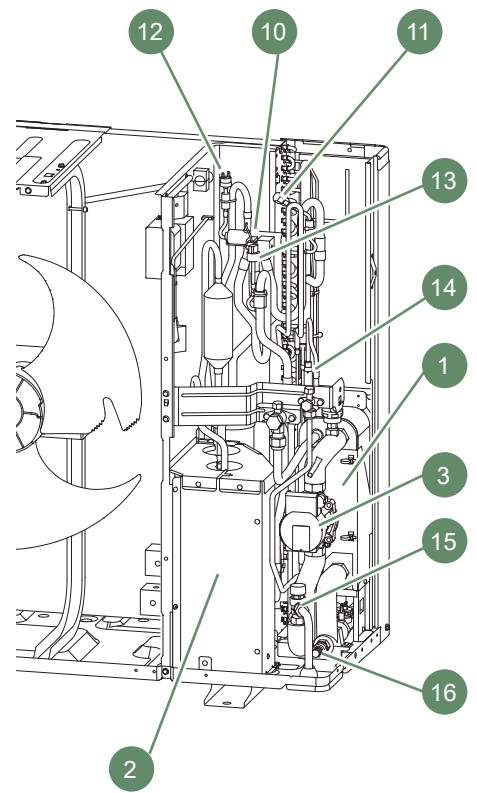
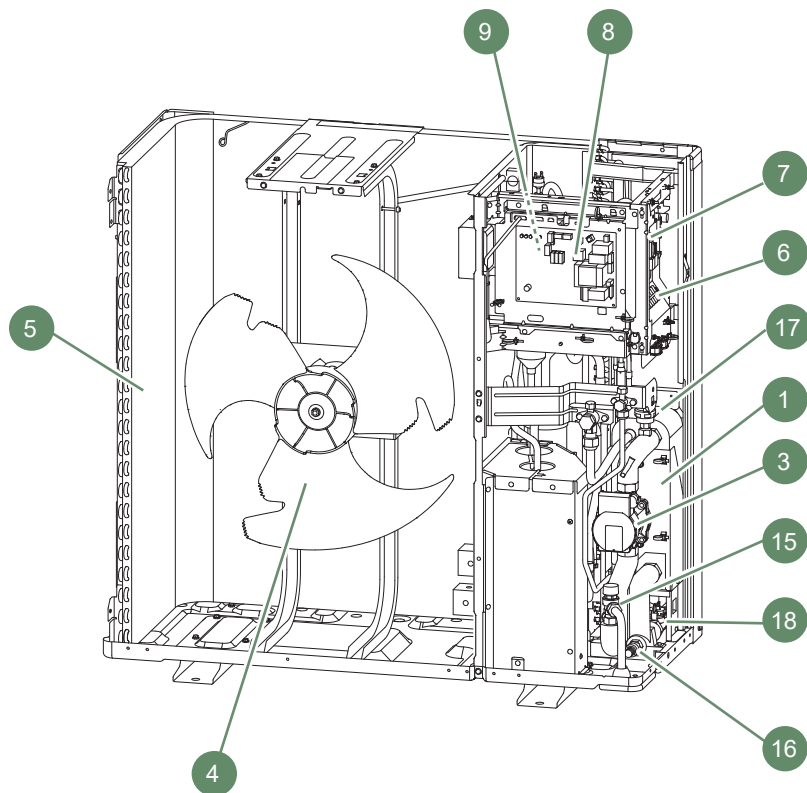
↔ Disassembly Process of Outdoor Unit

► Appearance



Accessories

	Elbow
	Plug (x9)

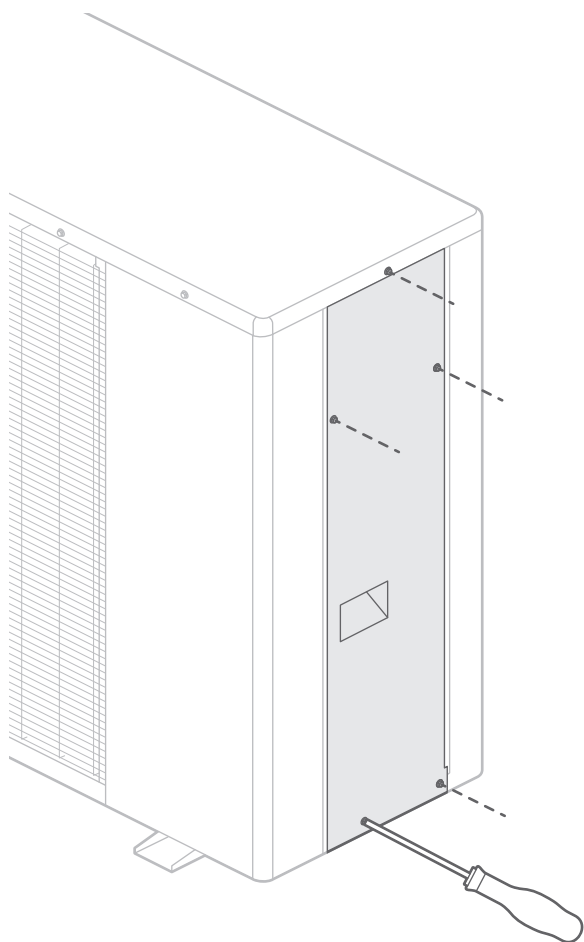


- 1. Refrigerant to Water Heat Exchanger (EP)
- 2. Compressor (Cp)
- 3. Circulating pump (CC)
- 4. High performance and low noise fan
- 5. Air to Refrigerant Heat Exchanger (Ech)
- 6. Supply terminal

- 7. Hydronic Circuit PCB
- 8. Main PCB
- 9. Inverter PCB
- 10. 4-way valve (V4V)
- 11. Schrader Valve
- 12. High pressure switch (Prt)

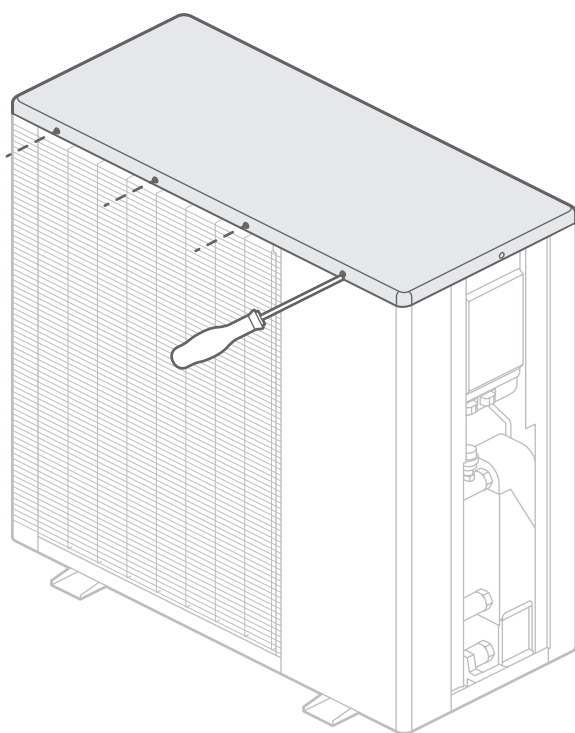
- 13. Pressure sensor (SPr)
- 14. Expansion valve (Dt)
- 15. Pressure Relief Valve (SSe)
- 16. Drain valve (V)
- 17. Automatic bleeder valve (PgA)
- 18. Flowmeter (Db)

► Right service panel removal

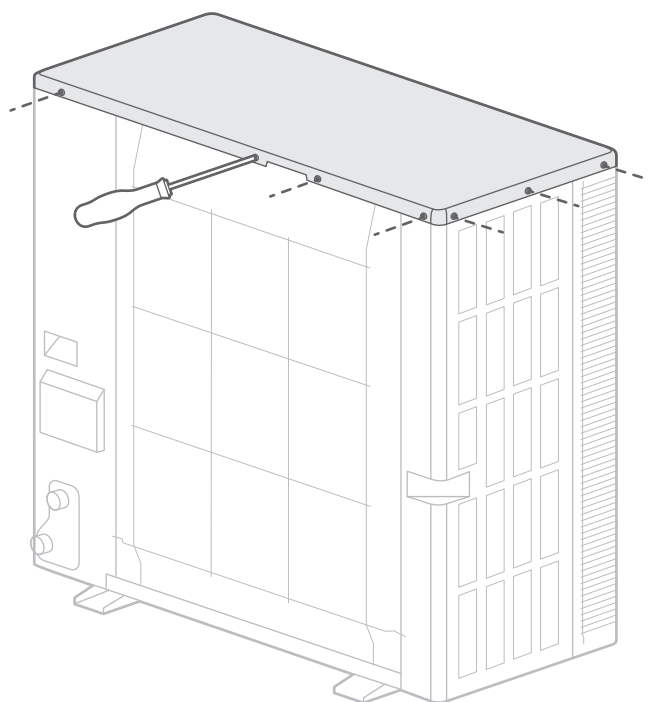


Unscrew the 5 screws.

► Top panel removal

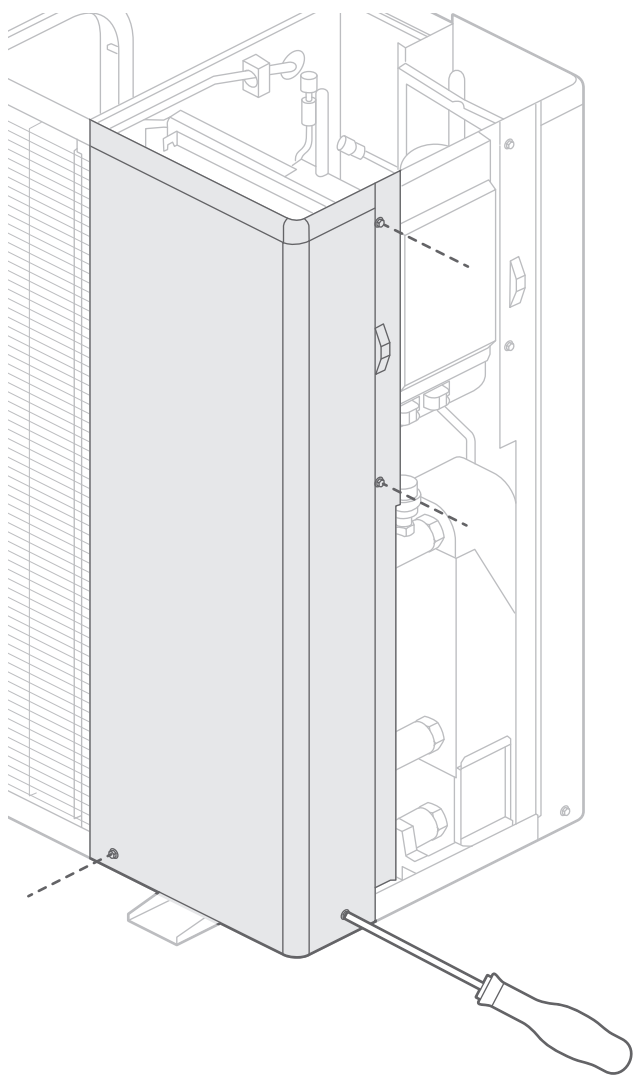


Unscrew the 4 screws.

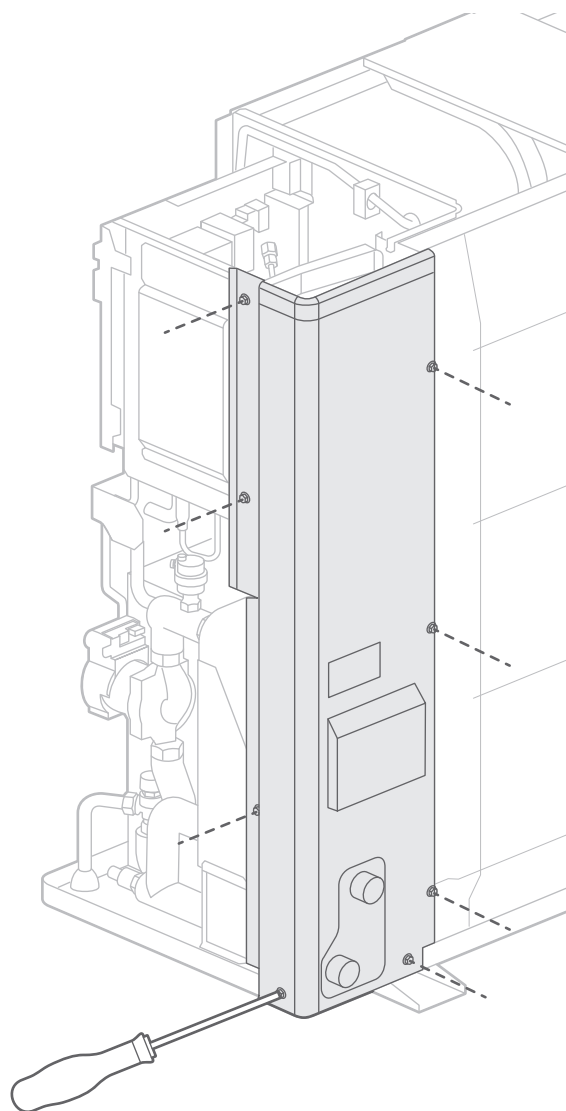


Unscrew the 7 screws.

► Front service panel and rear panel removal

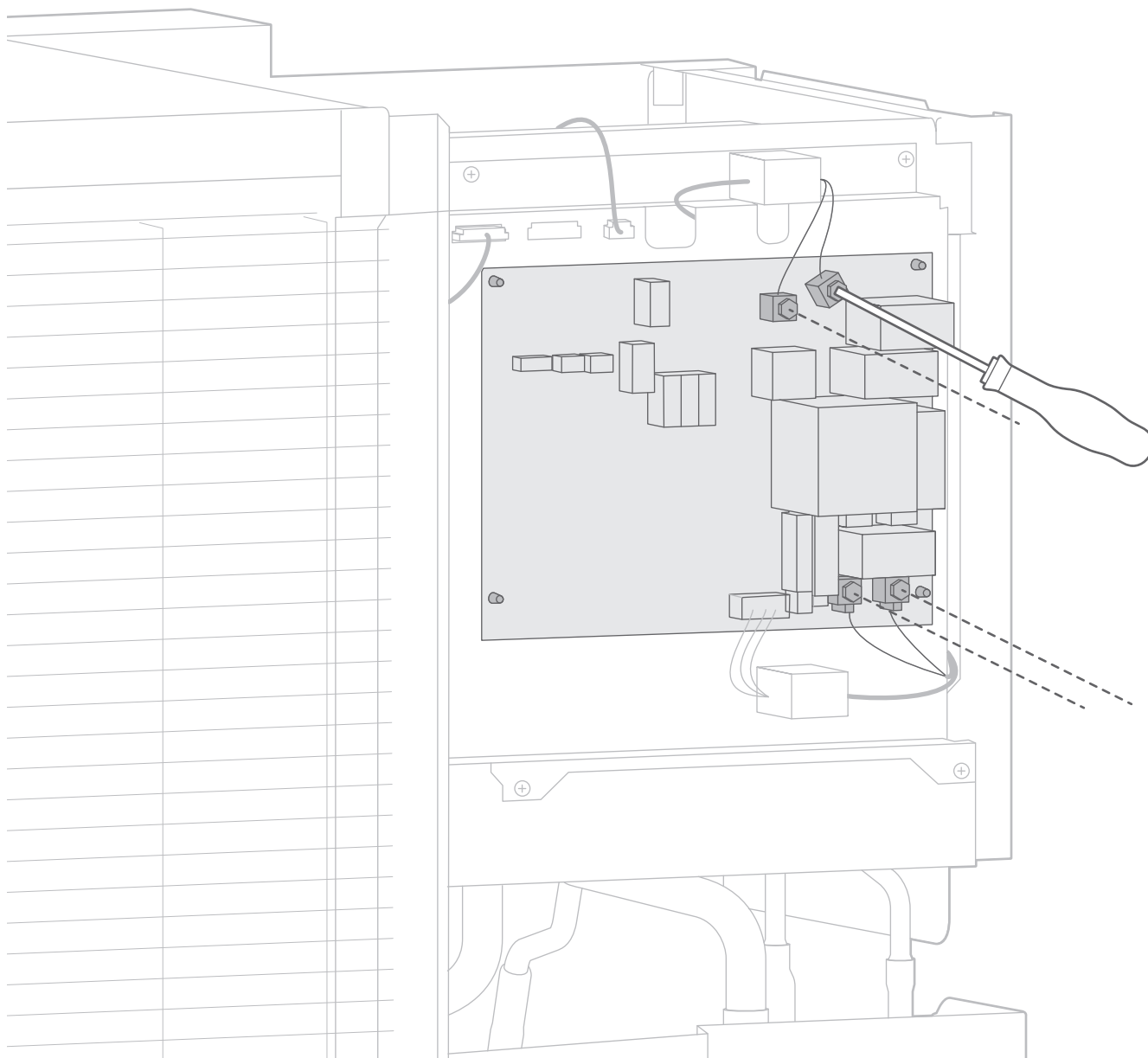


Unscrew the 4 screws.



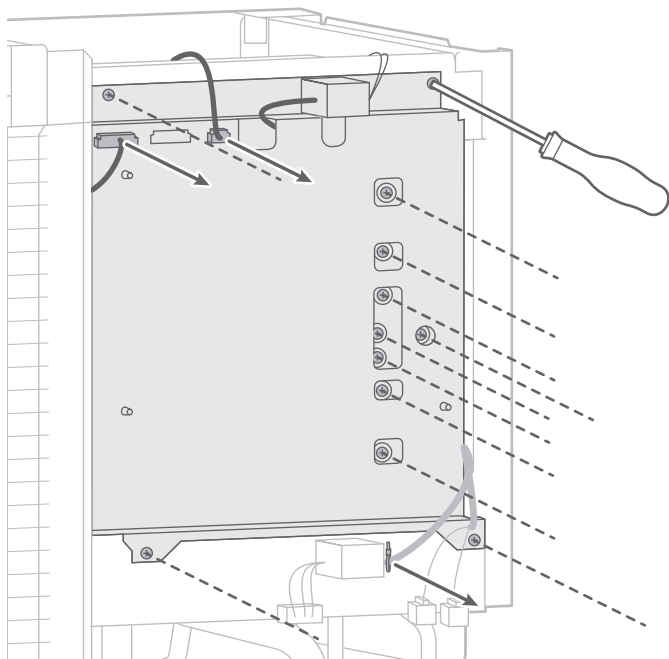
Unscrew the 8 screws.

► Main PCB removal

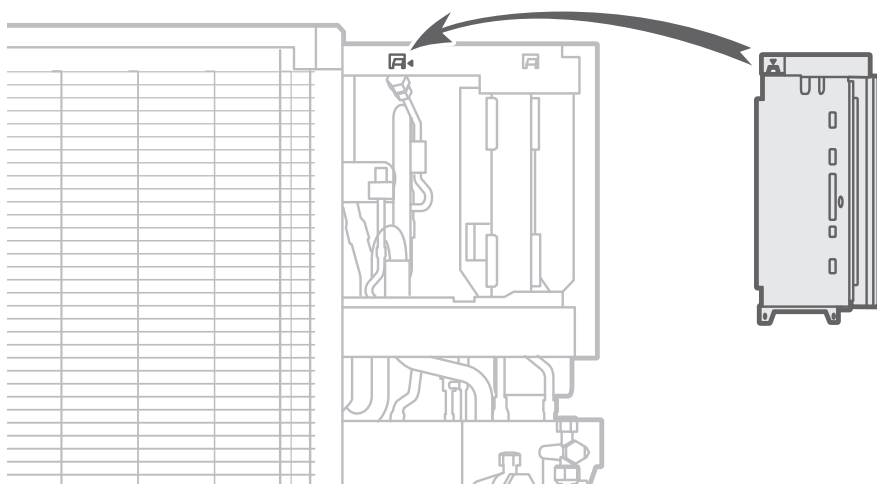


Unscrew the 4 screws. Remove the connectors and the wires. Press the 4 locking spacers to remove the PCB.

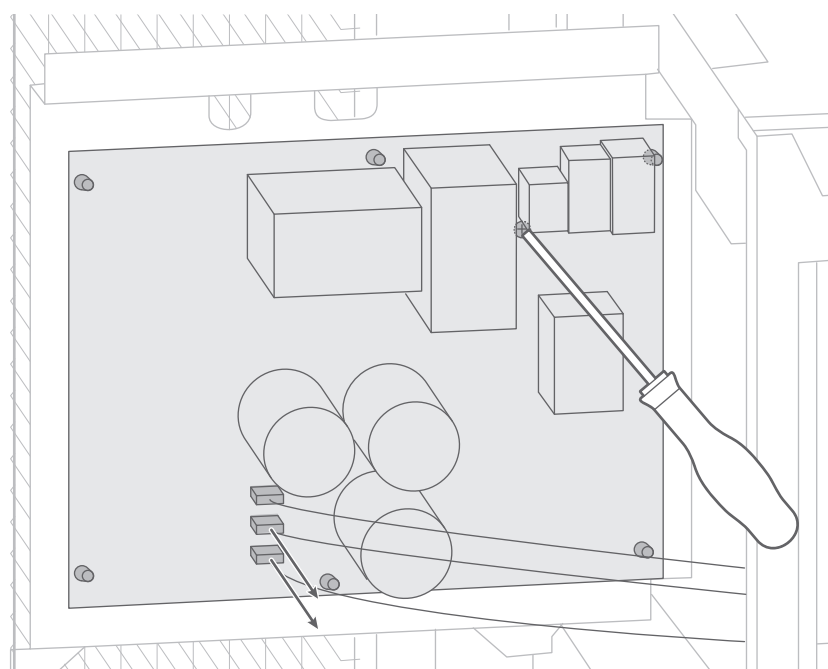
► INV PCB removal



Remove the pressure switch and fan motor connectors. Unscrew the 10 screws. Remove the binder without cutting it.

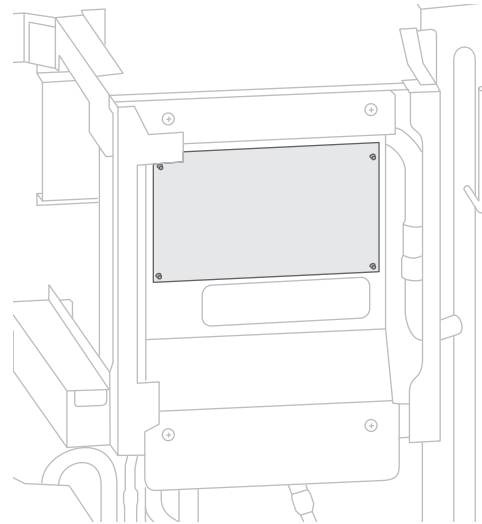
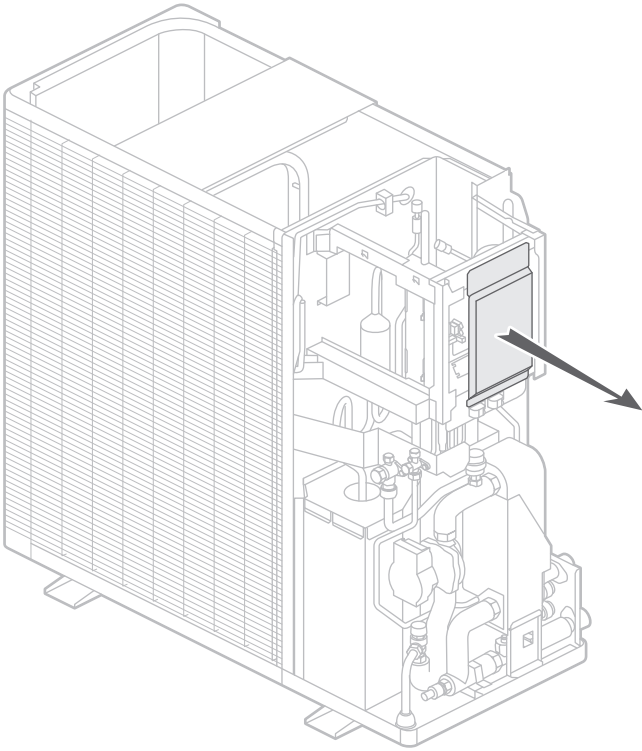


Place the hook in front of the triangle mark.



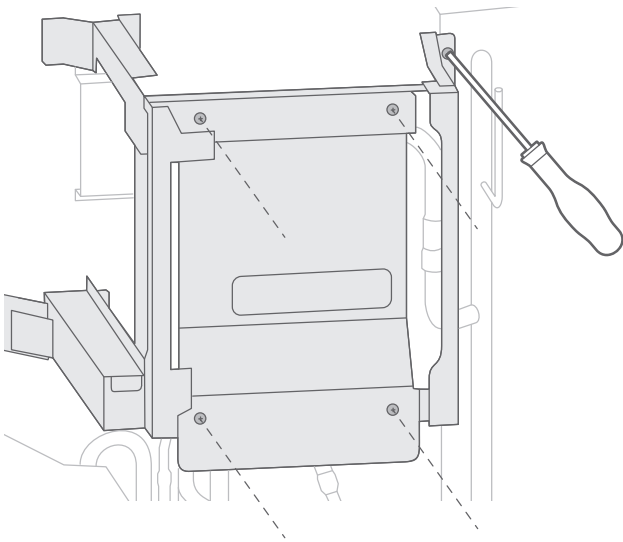
Remove the 3 connectors. Unscrew the screw. Remove all connectors and wires. Press the 4 locking spacers to remove the inverted PCB.

► Hydronic circuit PCB removal

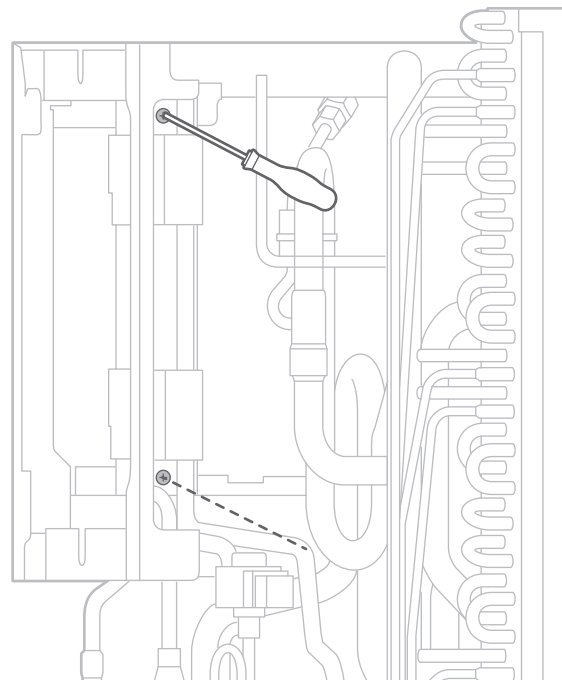


Remove the connectors and wires. Press the 4 locking spacers to remove the hydronic circuit PCB.

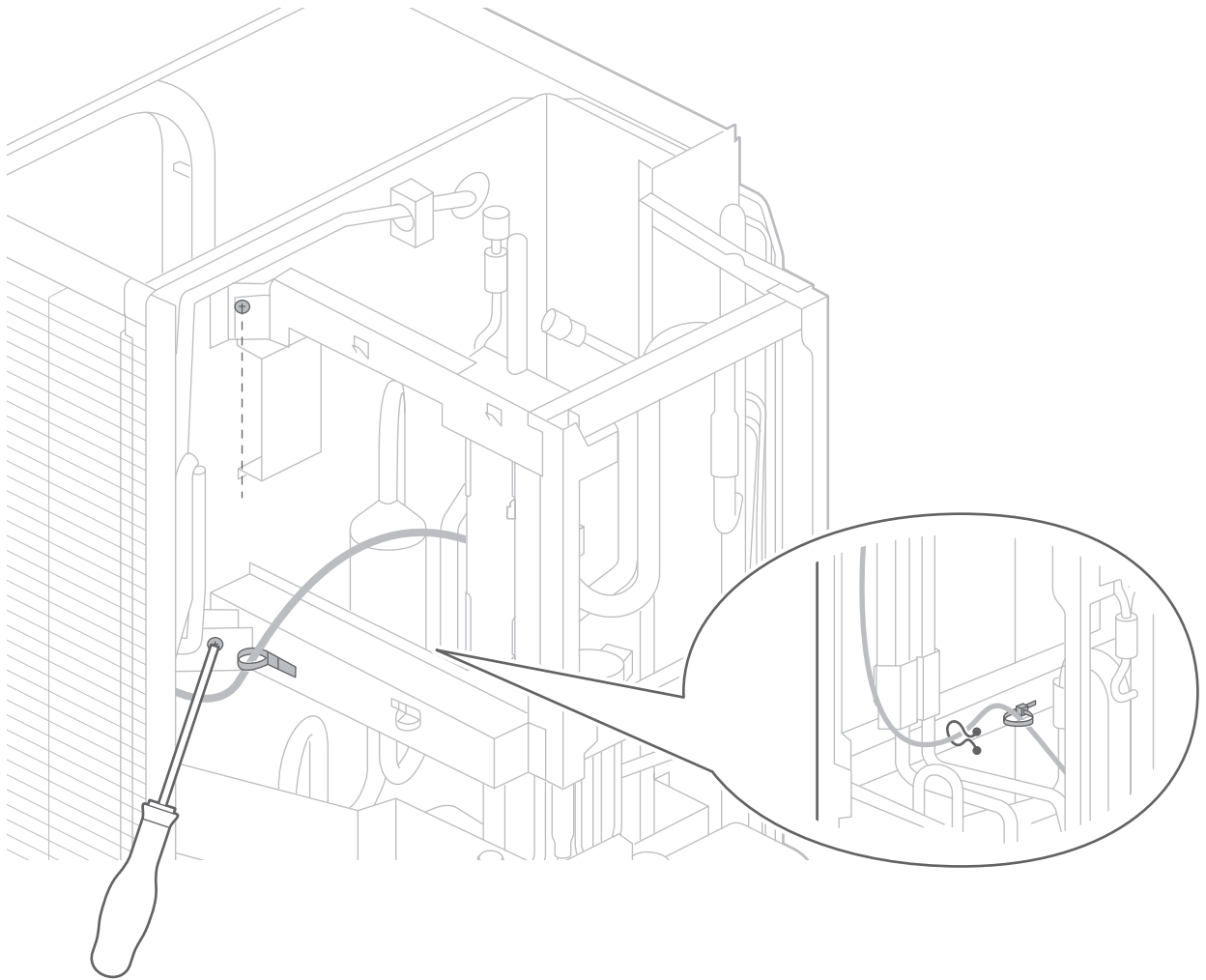
► Control box unit removal



Unscrew the 5 screws.

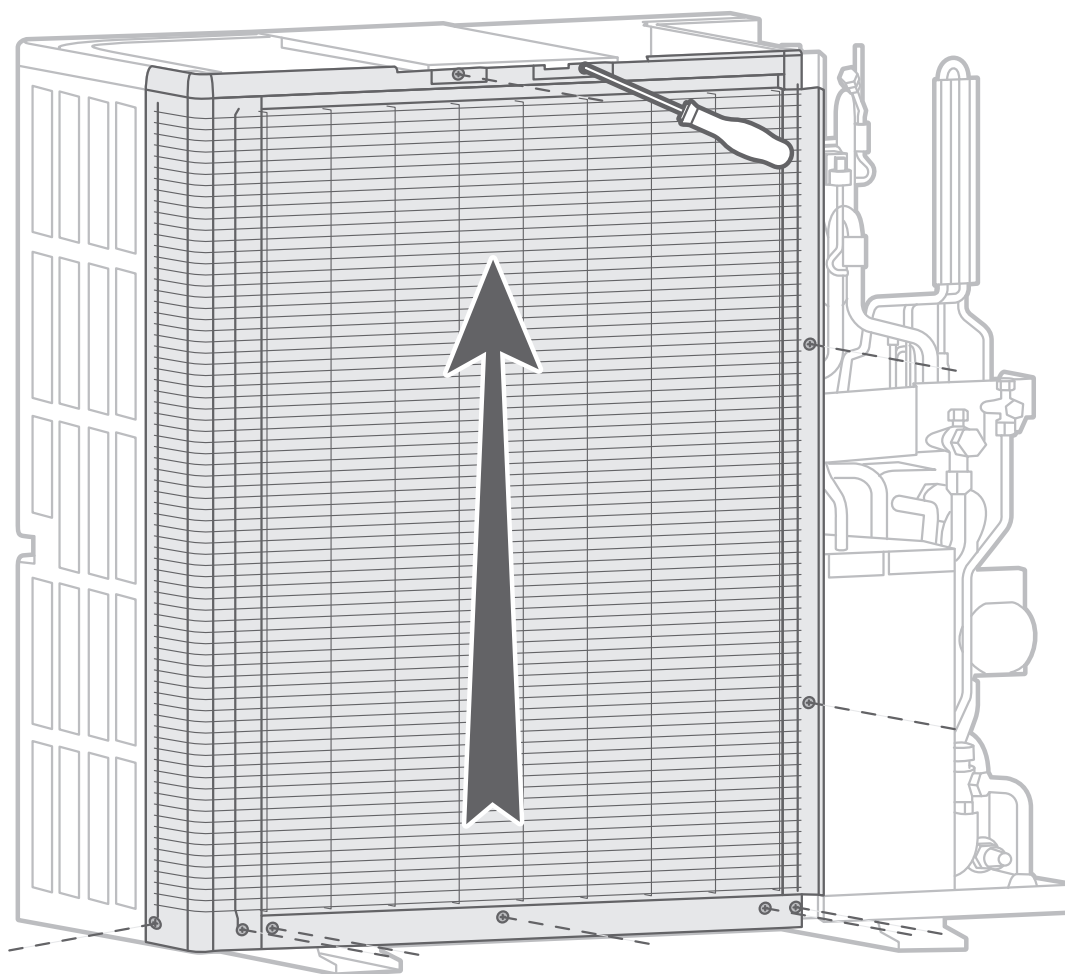


Unscrew the 2 screws.



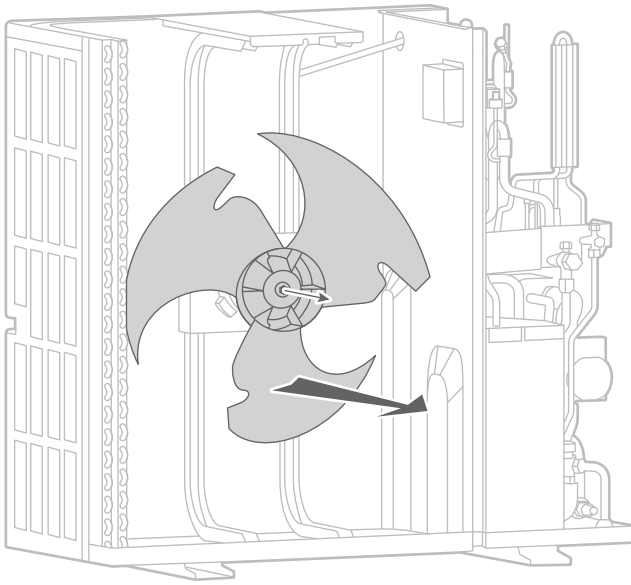
Unscrew the 2 screws. Remove the binders.

► Front panel removal

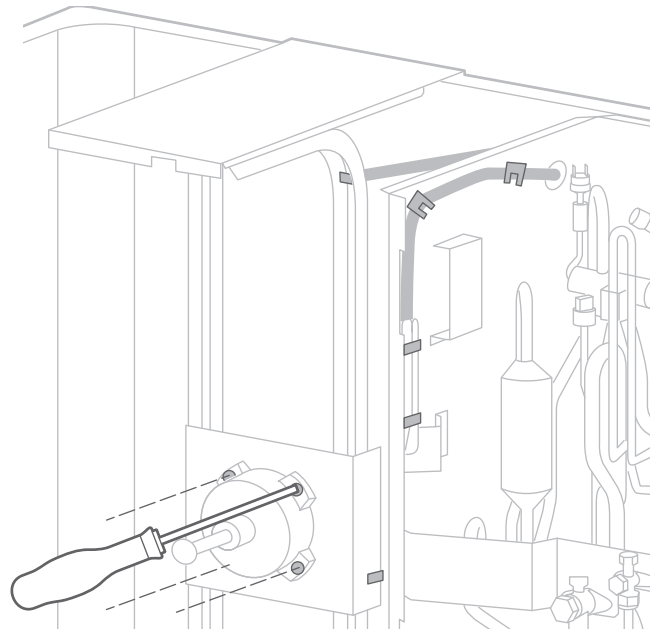


Unscrew the 9 screws.

► Fan motor removal

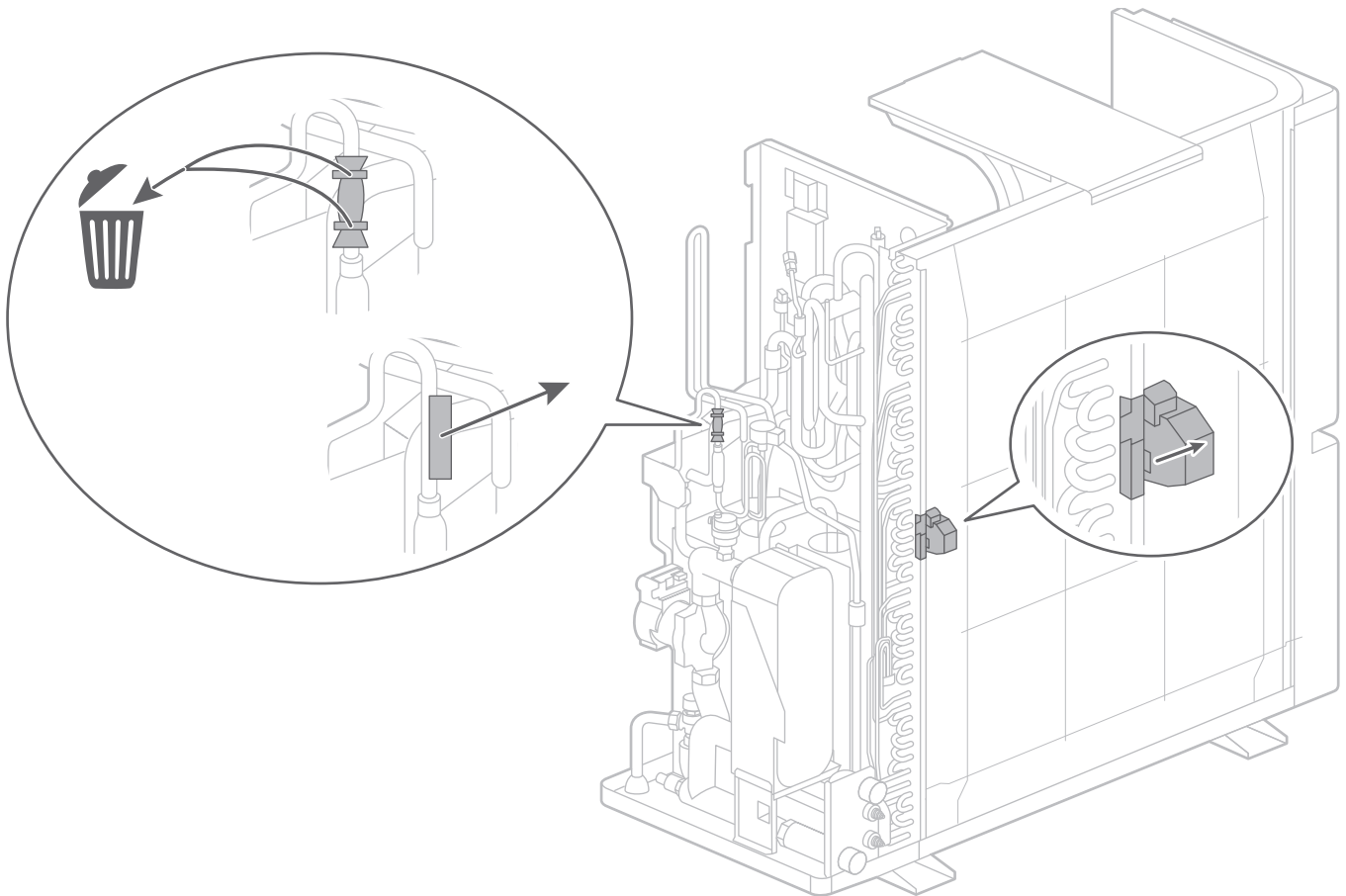


Remove the fan nut and the fan propeller.



Cut the binders. Loosen the clamps to remove the fan motor lead wire. Unscrew the mounting screws.

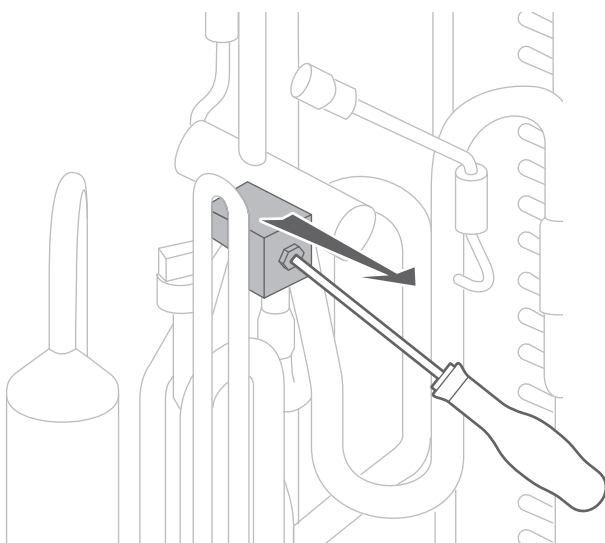
► Thermistor removal



Cut the binders to remove the isolation.
Remove the thermistor (EEV).

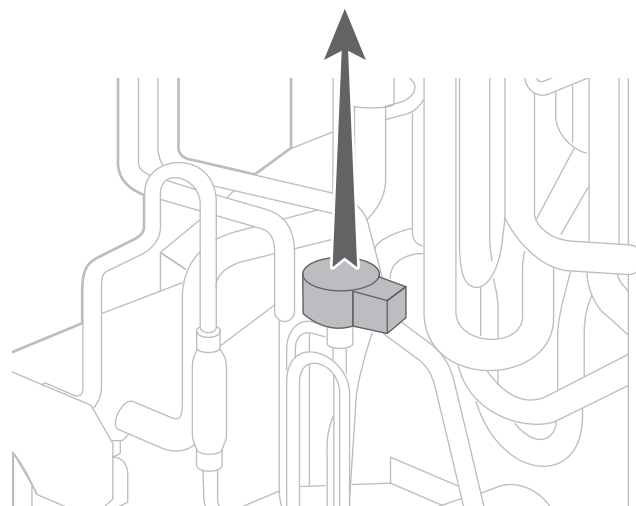
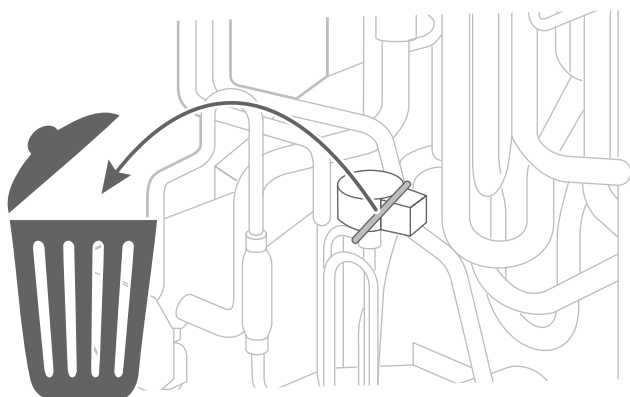
Push the hook to remove the thermistor (outdoor temperature).

► 4-way valve coil removal

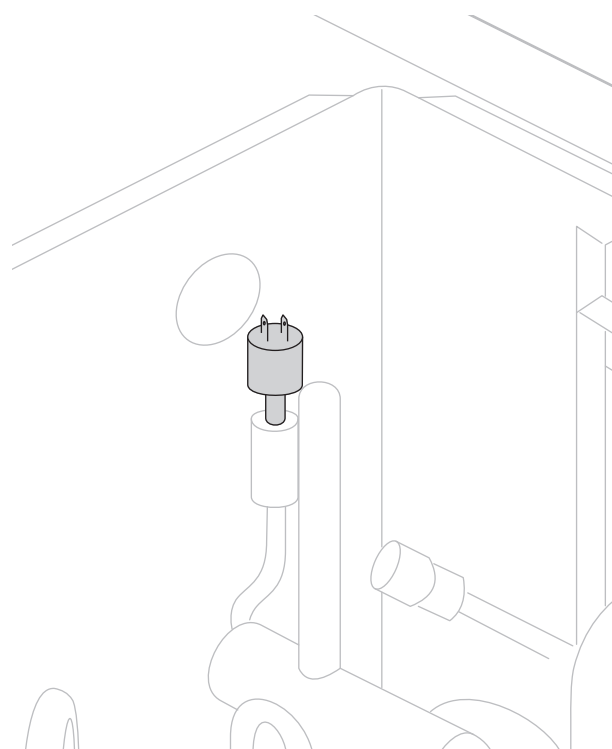
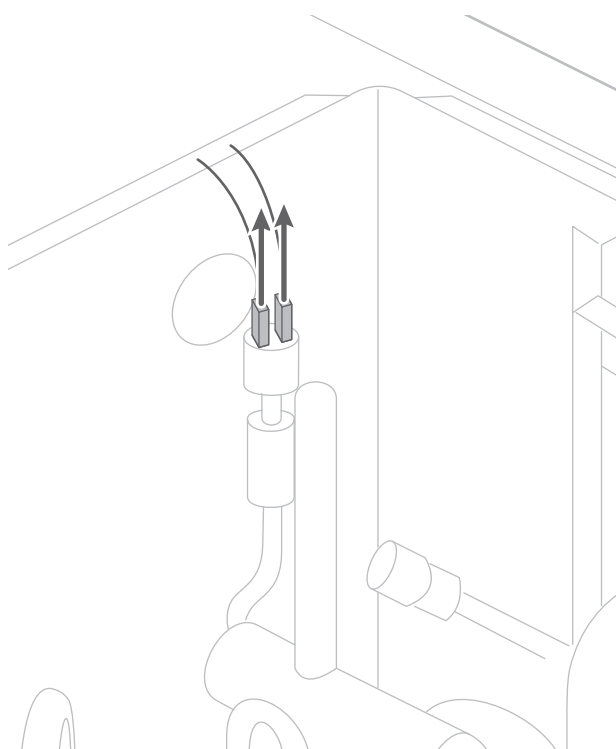


Unscrew the mounting screw. Remove the solenoid coil.

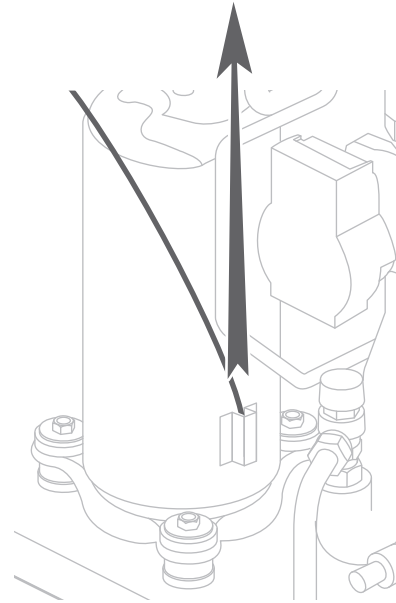
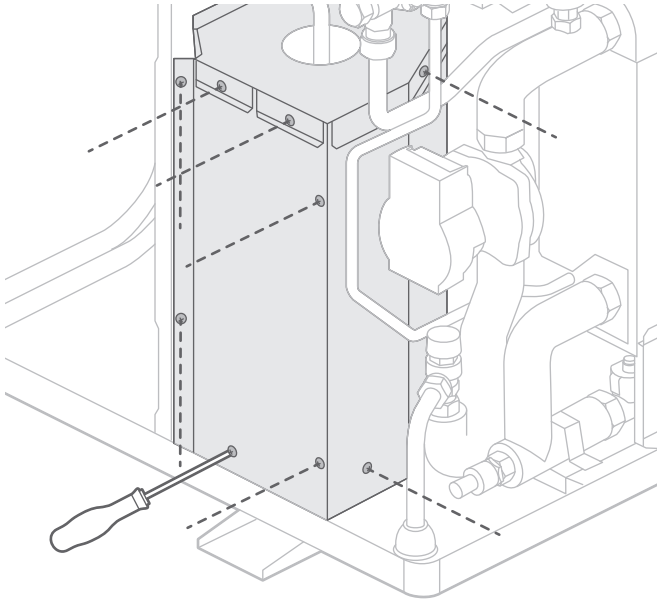
► Expansion valve coil removal



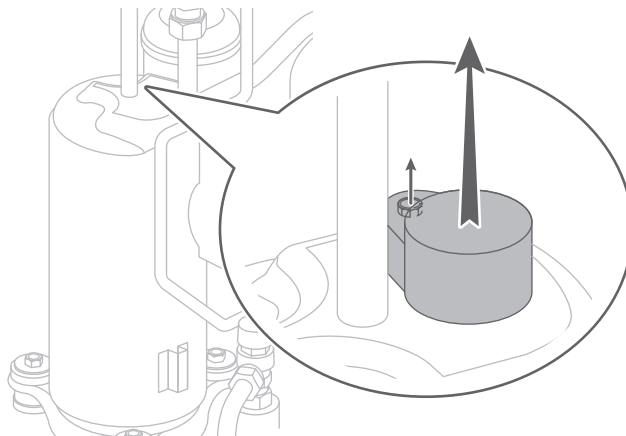
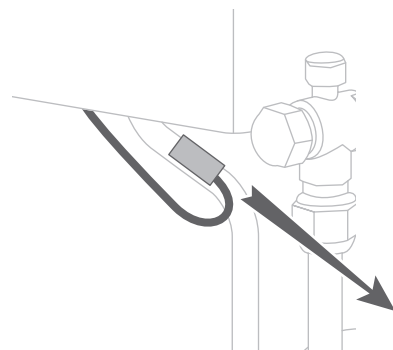
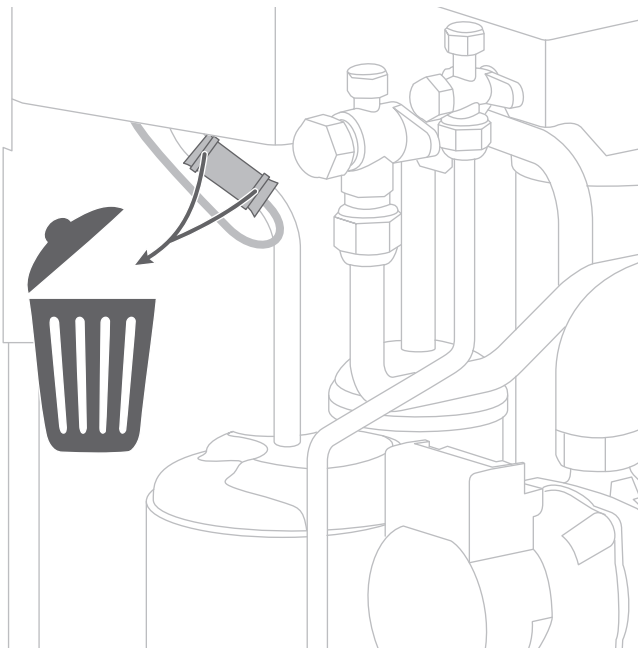
► Pressure switch removal

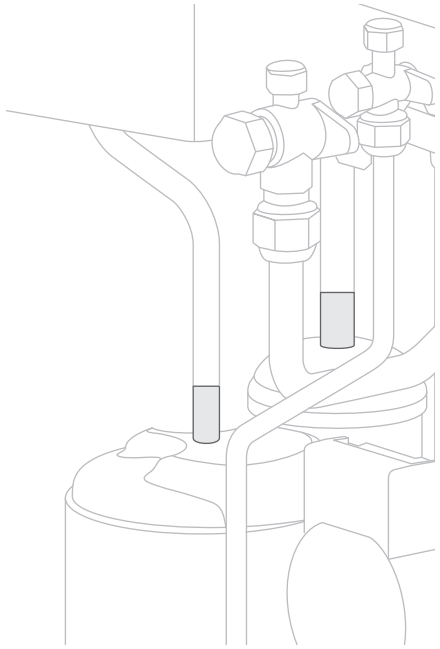


► Compressor removal

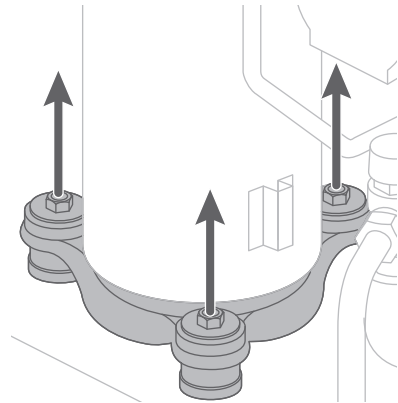


Unscrew the 9 screws.

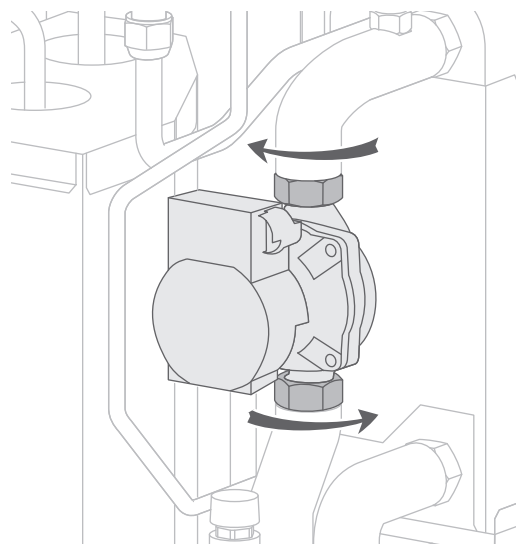
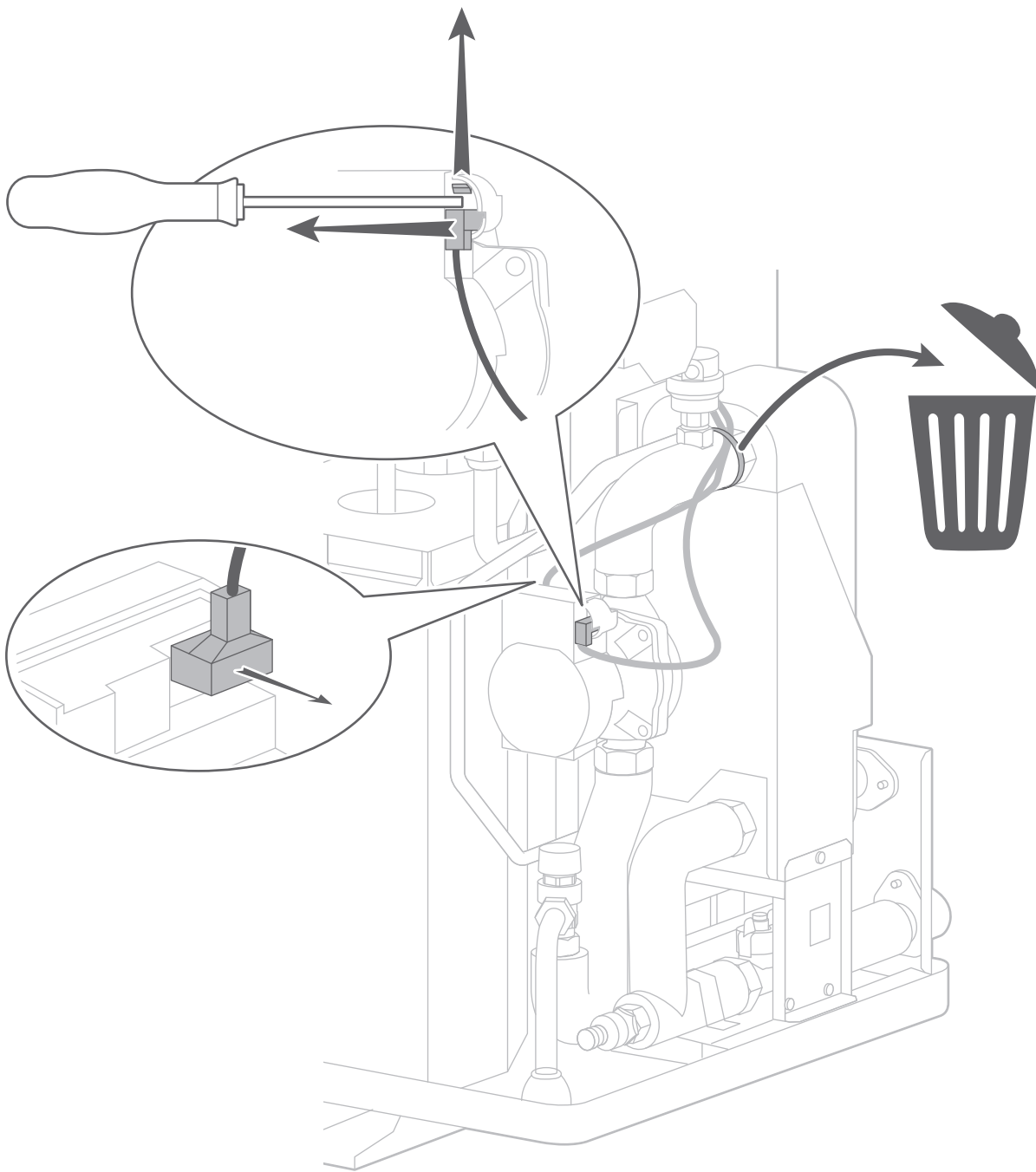




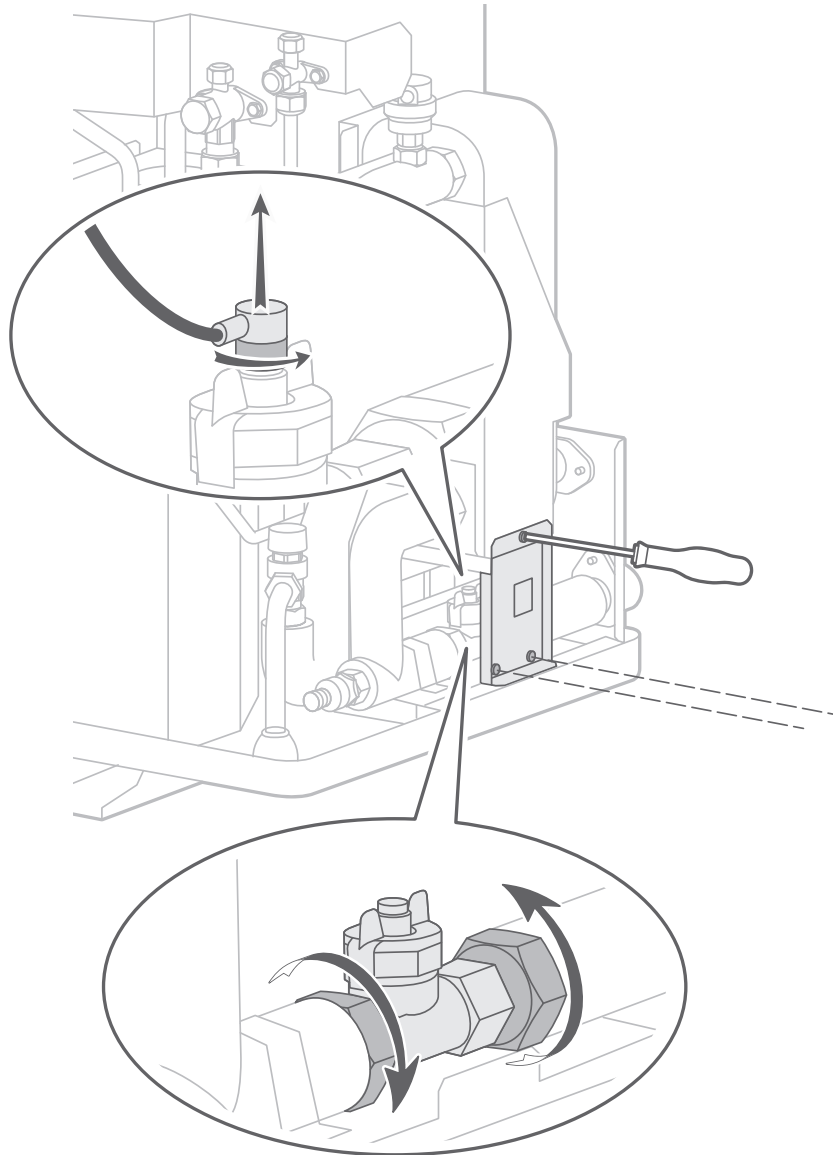
Cut the discharge pipe and the suction pipe in this range.



► Circulation pump removal



► Flowmeter removal





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A series of horizontal dotted lines spanning the width of the page, providing a guide for handwriting practice.

► Precautions for exchange of refrigerant-cycle-parts

1. During exchange the following parts shall be protected by wet rag and not make the allowable temperature or more.
2. Remove the heat insulation when there is the heat insulation near the welding place. Move and cool it when its detaching is difficult.
3. Cool the parts when there are parts where heat might be transmitted besides the replacement part.
4. Interrupt the flame with the fire-retardant board when the flame seems to hit the following parts directly.
5. Do not allow moisture or debris to get inside refrigerant pipes during work.
6. When brazing, be sure to replace the air in the pipe with nitrogen gas to prevent forming oxidization scale.
7. Open the 3WAY VALVE because there is a possibility of squirting the refrigerant from the heated pipes at brazing.

<i>Part name</i>	<i>Allowable temperature</i>	<i>Precautions in work</i>
4-WAY VALVE	120°C	Remove the coil before brazing. And install the coil after brazing.
EXPANSION VALVE	120°C	Remove the coil before brazing. And install the coil after brazing.
CHECK JOINT	120°C	
PRESSURE SWITCH	100°C	Tighten the flare part gripping it (Tightening torque:12 1.5N m). Do the static electricity measures.
3-WAY VALVE (GAS)	120°C	
3-WAY VALVE (LIQUID)	120°C	



A series of horizontal dotted lines spanning the width of the page, providing a guide for handwriting practice.



are in conformity with the relevant Union harmonized directives and regulations:

- Low Voltage Directive (LVD) - 2014/35/EU
- Machinery Directive - 2006/42/EC
- ElectroMagnetic Compliance (EMC) Directive - 2014/30/EU
- Commission Regulation / Directives - (EU) 811/2013
- Energy labelling ; Ecodesign - (EU) 2017/1369 - 2009/125/EC
- RoHS Directive - 2011/65/EU - (EU) 2015/863

- Pressure Equipment Directive (PED) - 2014/68/EU

Pressure equipment: Compressor (including its accumulator), Pressure switch, Sub-assembly SKD.

Risk Category II, conformity assessment procedure : module A2 (internal production control plus supervised pressure equipment checks at random intervals) by the Notified Body: TÜV Rheinland Industrie Service GmbH, D-51105 Köln (Identification N° : 0035)

are in conformity with the requirements of the relevant UK legislation:

- Electrical Equipment (Safety) Regulations 2016 - S.I. 2016 No. 1101
- Supply of Machinery (Safety) Regulations 2008 - S.I. 2008 No. 1597
- Electromagnetic Compatibility Regulations 2016 - S.I. 2016 No. 1091
- The Ecodesign for Energy-Related Products and Energy Information Regulations 2010 + (Amendment) (EU Exit) Regulations 2019 - S.I. 2010 No.2617 + S.I. 2019 No.539 amended by S.I. 2020 No.1528

- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 - S.I. 2012 No. 3032

- Pressure Equipment (Safety) Regulations 2016

Pressure equipment: Compressor (including its accumulator), Pressure switch, Sub-assembly SKD.

Risk Category II, conformity assessment procedure: module A2 (internal production control plus supervised pressure equipment checks at random intervals) by the Notified Body: TÜV Rheinland Industrie Service GmbH, D-51105 Köln (Identification Nr: NB 0035)



This unit is identified by this symbol. It means that all electrical and electronic products must not be included in household waste.

A specific recycling system for this type of product has been set up in European Union countries (*), Norway, Iceland and Liechtenstein.

Do not try to dismantle this product yourself. It may have damaging effects on your health or on the environment.

Reprocessing of the refrigerant, lubricant and other parts may be performed by a qualified installer in compliance with the local and national legislation in force.

This unit must be recycled by a specialised service and in no case may it be thrown away with household waste, rubble or in a landfill.

Please contact your installer or local representative for more .

* Depending on the national regulations of each member state.

Commissioning date:

Address of your heating installer or customer service.