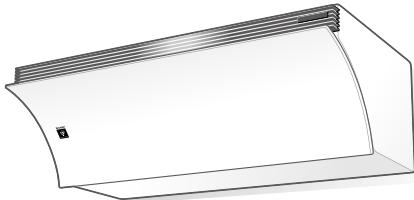


SHARP SERVICE MANUAL

SY407A3AYXP2CT

SPLIT TYPE ROOM HEAT PUMP



INDOOR UNIT

AY-XP12CPU

OUTDOOR UNIT

AE-X12CPU

In the interests of user-safety (Required by safety regulations in some countries) the set should be restored to its original condition and only parts identical to those specified should be used.

CONTENTS

CHAPTER 1. PRODUCT SPECIFICATION

[1] SPECIFICATION	1-1
[2] EXTERNAL DIMENSION	1-3
[3] WIRING DIAGRAM	1-4
[4] ELECTRICAL PARTS	1-4

CHAPTER 2. EXPLANATION OF CIRCUIT AND OPERATION

[1] BLOCK DIAGRAMS	2-1
[2] MICROCOMPUTER CONTROL SYSTEM.....	2-3

CHAPTER 3. FUNCTION

[1] INDOOR UNIT FUNCTION	3-1
[2] OUTDOOR UNIT FUNCTION	3-2
[3] PAM CIRCUIT	3-4
[4] IPM DRIVE CIRCUIT.....	3-6

CHAPTER 4. FUNCTION AND OPERATION OF PROTECTIVE PROCEDURES

[1] PROTECTION DEVICE FUNCTIONS AND OPERATIONS.....	4-1
[2] HEAT PUMP OPERATION IN THERMISTOR ERROR	4-3
[3] THERMISTOR TEMPERATURE CHARACTERISTICS	4-5
[4] HOW TO OPERATE THE OUTDOOR UNIT INDEPENDENTLY	4-6

[5] GENERAL TROUBLESHOOTING CHART	4-6
[6] MALFUNCTION (PARTS) CHECK METHOD ...	4-8
[7] OUTDOOR UNIT CHECK METHOD.....	4-11
[8] TROUBLESHOOTING GUIDE	4-13

CHAPTER 5. REFRIGERATION CYCLE

[1] SCHEMATIC DIAGRAM.....	5-1
[2] STANDARD CONDITION.....	5-1
[3] TEMPERATURE AT EACH PART AND PRESSURE IN 3-WAY VALVE.....	5-1
[4] PERFORMANCE CURVES.....	5-3

CHAPTER 6. DISASSEMBLY PROCEDURE

[1] INDOOR UNIT	6-1
[2] OUTDOOR UNIT	6-23

FAILURE DIAGNOSIS FLOW CHART

OPERATION MANUAL
INSTALLATION MANUAL
WLAN OPERATION MANUAL
PARTS LIST

Parts marked with "⚠" are important for maintaining the safety of the set. Be sure to replace these parts with specified ones for maintaining the safety and performance of the set.

"Vertical louver (V-louver)" in this document means "horizontal air flow louver" in the operation manual.
"Horizontal louver (H-louver)" in this document means "vertical air flow louver" in the operation manual.

This document has been published to be used for after sales service only.
The contents are subject to change without notice.

REVISION RECORD

CHAPTER 1. PRODUCT SPECIFICATION**[1] SPECIFICATION**

ITEMS		INDOOR UNIT		OUTDOOR UNIT			
		AY-XP12CPU		AE-X12CPU			
Rated cooling capacity (Min. - Max.) *		Btu/h			12500 (2800 - 13600)		
Rated heating capacity (Min. - Max.)		Btu/h			14000 (3200 - 17000)		
Moisture removal (at rated cooling)		Pt/h			3.2		
Electrical data							
Phase		Single					
Rated frequency		Hz		60			
Rated voltage		V		208 / 230			
Rated current (Min.-Max.)	Cool	A		5.8 (1.3 - 6.1)			
	Heat	A		6.2 (1.1 - 7.7)			
Rated input (Min.-Max.)	Cool	W		1030 (180 - 1200)			
	Heat	W		1120 (160 - 1450)			
Rated factor	Cool	%		77			
	Heat	%		80			
Compressor	Type	Single Rotary					
	Model	KSN98D42UFZA					
	Oil charge	ESTEL OIL VG74(300cc)					
Refrigerant system	Evaporator	Slit fin and Grooved tube type					
	Condenser	Corrugate fin and Grooved tube type					
	Control	Expansion valve					
	Refrigerant(R32)	35.3 oz(1000 g)					
	De-Ice system	Micro computer controlled reversed systems					
Noise level (Sound Pres- sure)	Cooling	Full power	dB(A)		49		
		High	dB(A)		48		
		Low	dB(A)		42		
		Soft	dB(A)		36		
		Silent	dB(A)		25		
	Heating	Full power	dB(A)		49		
		High	dB(A)		48		
		Low	dB(A)		42		
		Soft	dB(A)		37		
		Silent	dB(A)		34		
	Air puri- fier	High	dB(A)		46		
		Low	dB(A)		41		
		Soft	dB(A)		33		
		Silent	dB(A)		25		
Fan system							
Drive			Direct drive				
Air flow quantity	Cooling	Full power	CFM(m ³ /min)		406(11.5)		
		High	CFM(m ³ /min)		378(10.7)		
		Low	CFM(m ³ /min)		290(8.2)		
		Soft	CFM(m ³ /min)		219(6.2)		
		Silent	CFM(m ³ /min)		124(3.5)		
	Heating	Full power	CFM(m ³ /min)		406(11.5)		
		High	CFM(m ³ /min)		378(10.7)		
		Low	CFM(m ³ /min)		290(8.2)		
		Soft	CFM(m ³ /min)		233(6.6)		
		Silent	CFM(m ³ /min)		208(5.9)		
	Air puri- fier	High	CFM(m ³ /min)		367(10.4)		
		Low	CFM(m ³ /min)		282(8)		
		Soft	CFM(m ³ /min)		201(5.7)		
		Silent	CFM(m ³ /min)		127(3.6)		

ITEMS				INDOOR UNIT	OUTDOOR UNIT
				AY-XP12CPU	AE-X12CPU
Fan revolution	Cooling	Full power	rpm	1700	-
		High	rpm	1620	860
		Low	rpm	1340	-
		Soft	rpm	1100	-
		Quiet	rpm	770	-
	Heating	Full power	rpm	1700	-
		High	rpm	1620	860
		Low	rpm	1340	-
		Soft	rpm	1150	-
		Quiet	rpm	1060	-
Fan				Cross fan	Propeller fan
Connections					
Refrigerant coupling				Flare type	
				R32	
Refrigerant tube size (Gas line)	inch			3/8"(9.52)	
Refrigerant tube size (Liquid line)	inch			1/4"(6.35)	
Minimum - Maximum length (per unit)	ft (m)			9.8-65.6 (3-20)	
Maximum charge-less length	ft (m)			25 (7.6)	
Maximum height difference(IDU&ODU)	ft (m)			32.8 (10)	
Additional charge	oz./ft (g/m)			0.09 (8)	
Drain piping mm	mm			φ0.7 and φ0.8 (φ17 and φ20)	
Others					
Safety device				Compressor: Thermal protector	
				Fan motors: Thermal fuse (Internal)	
				Fuse, Micro computer control	
Air filters				Polypropylene net (Washable), MERV14 Filter(NOT washable)	
Net dimensions	Width	inch (mm)		31 27/64(798)	30 23/32(780)
	Height			10 15/16(278)	21 1/4(540)
	Depth			17 19/32(447)	10 19/32(269)
Net weight	lbs(kg)			37(17)	66(30)

NOTE: Test conditions are based on AHRI 210/240. (Refrigerant piping length [per unit] : 25ft[7.6m])

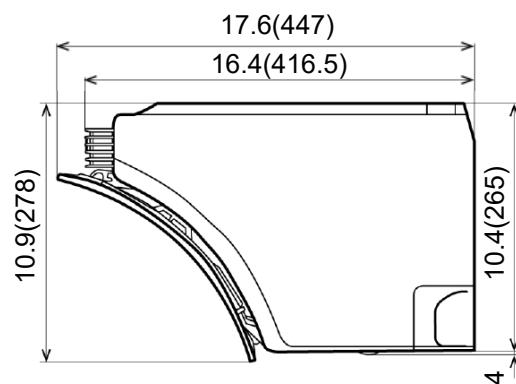
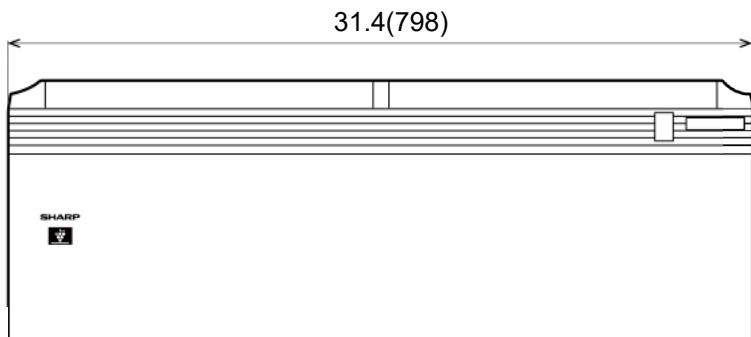
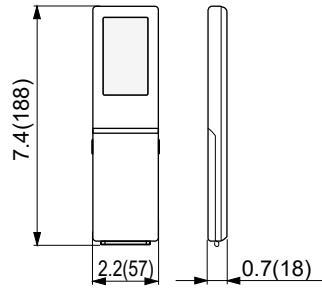
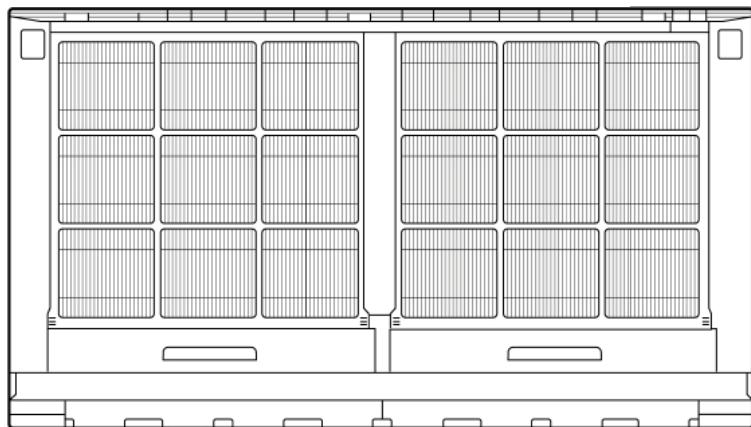
* : Voltage is 230V ☆ : Representative connection

[2] EXTERNAL DIMENSION

1. Indoor unit

AY-XP12CPU

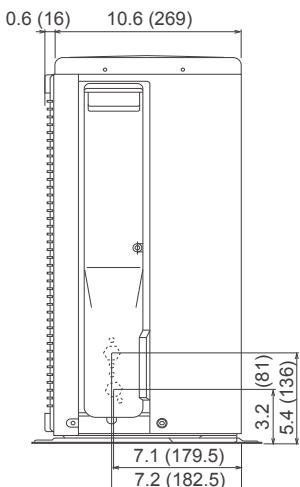
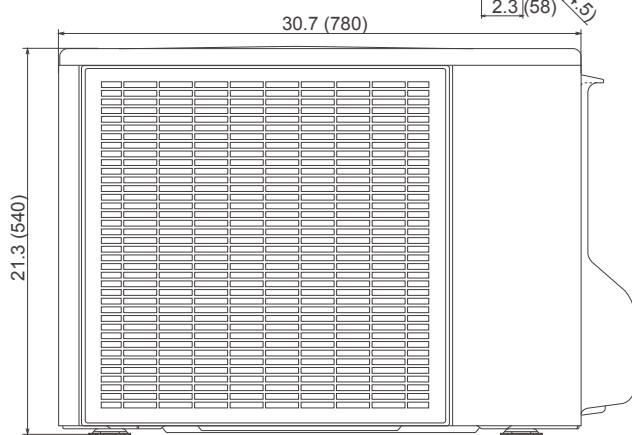
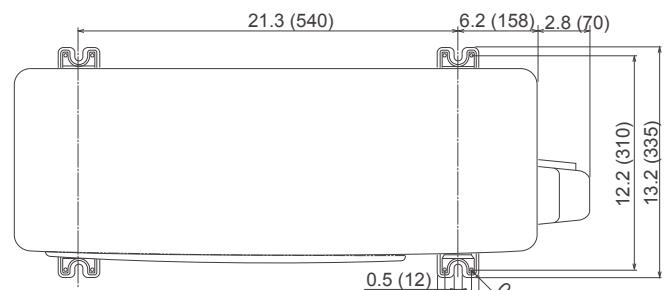
Length unit: inch(mm)



2. Outdoor unit

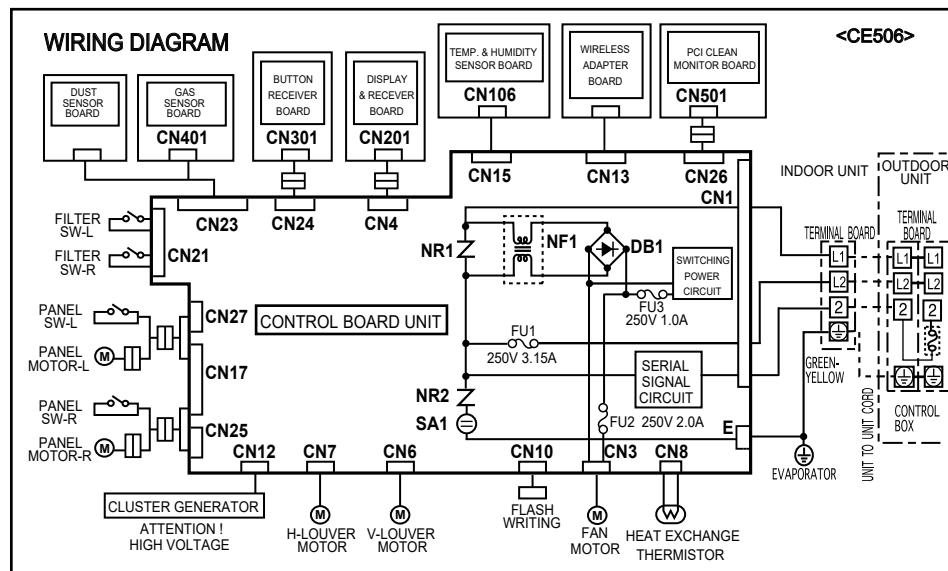
AE-X12CPU

Length unit: inch (mm)

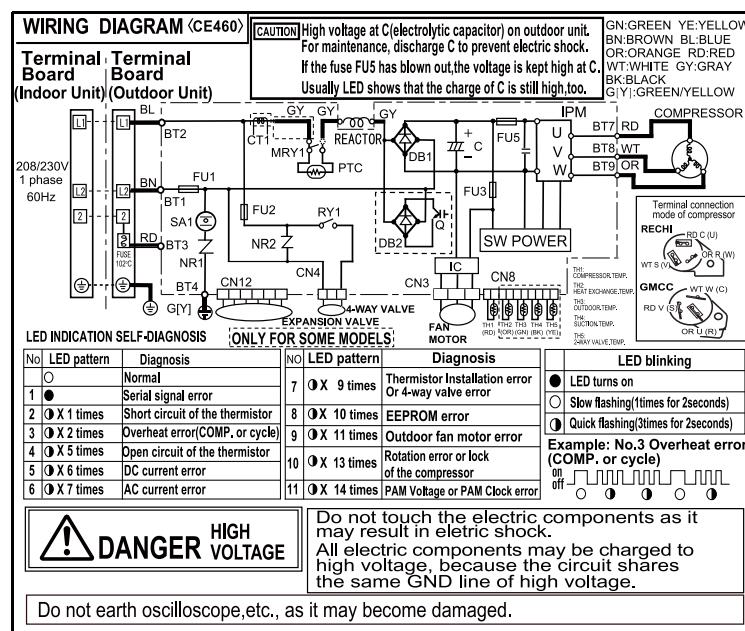


[3] WIRING DIAGRAM

1. Indoor unit



2. Outdoor unit



[4] ELECTRICAL PARTS

1. Indoor unit

DESCRIPTION	MODEL	REMARKS
Indoor fan motor	DAI255P-H058C-3A07	DC280V, 58W
Transformer	BCK-19-0709	DC 5V, 12.5V, 19V
Fu1	-	3.15A, 250V
Fu2	-	2A, 250V
Fu3	-	1A, 250V

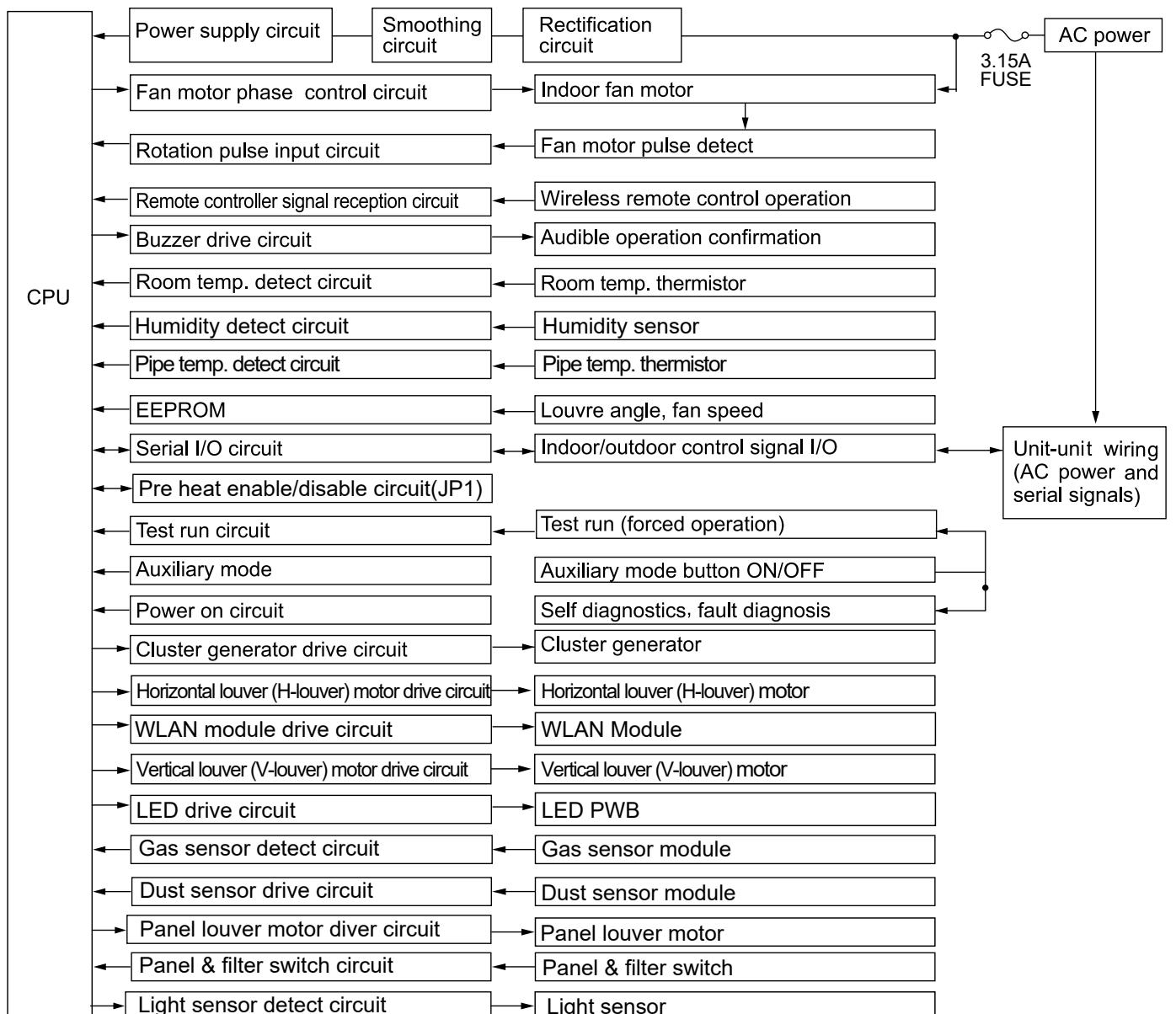
2. Outdoor unit

DESCRIPTION	MODEL	REMARKS
Compressor	KSN98D42UFZA	220V at 180Hz, 765W, R32
Outdoor fan motor	DBI445P-L041A-AL01-1	280V 41W 8P
Fu1 Fu5	-	250V 20A
Fu2	-	250V 3.15A
Fu3	-	250V 2A

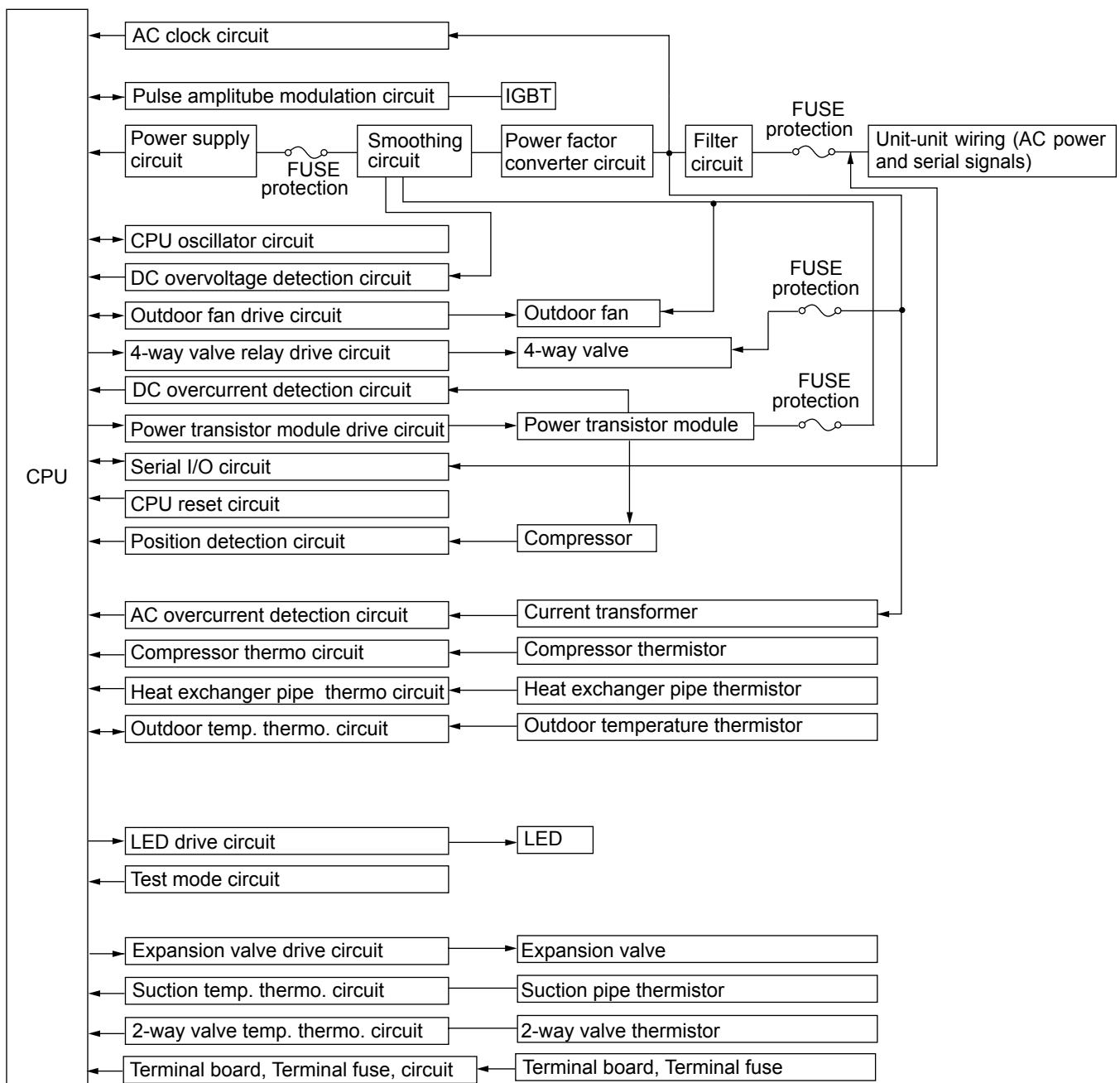
CHAPTER 2. EXPLANATION OF CIRCUIT AND OPERATION

[1] BLOCK DIAGRAMS

1. Indoor unit



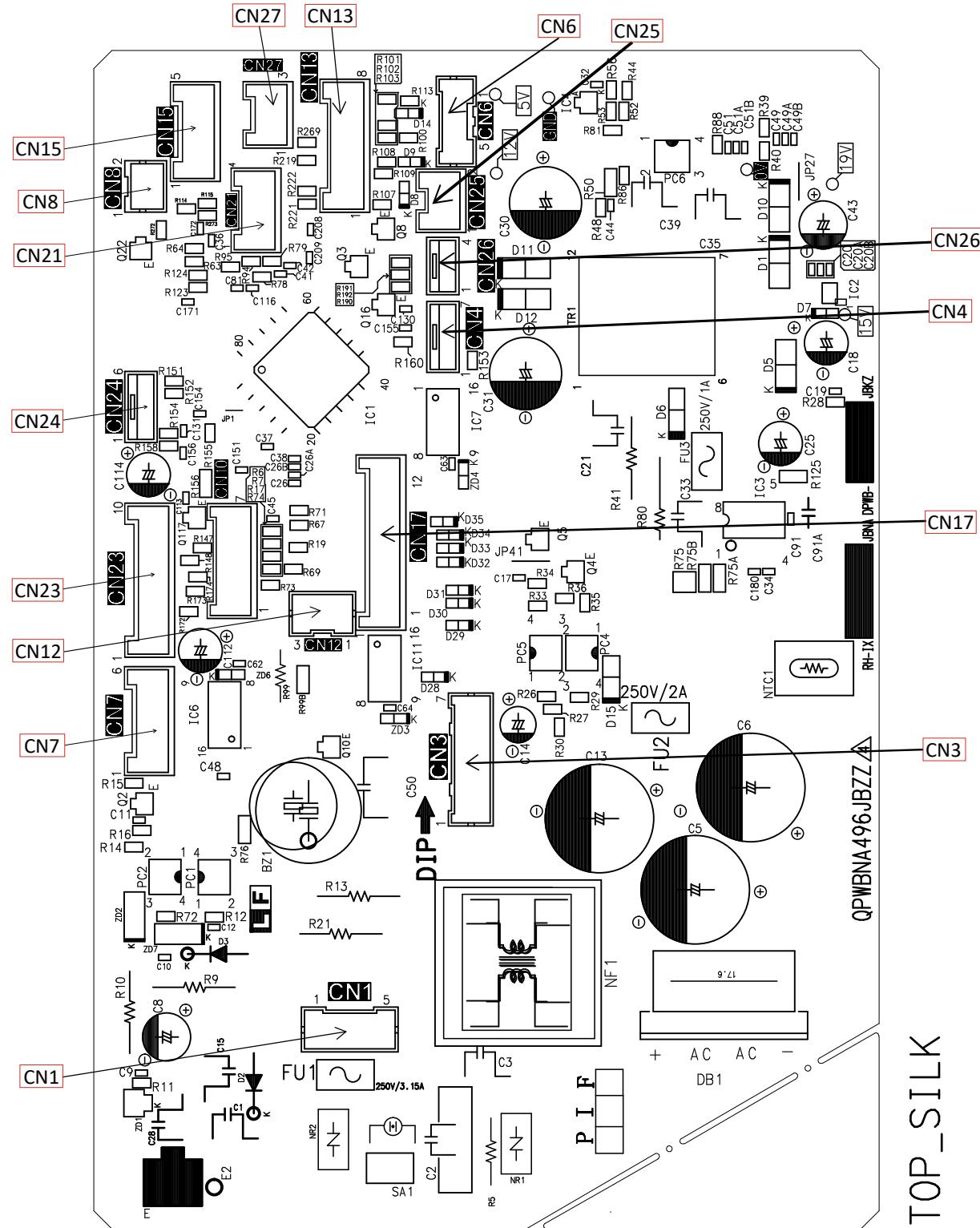
2. Outdoor unit



[2] MICROCOMPUTER CONTROL SYSTEM

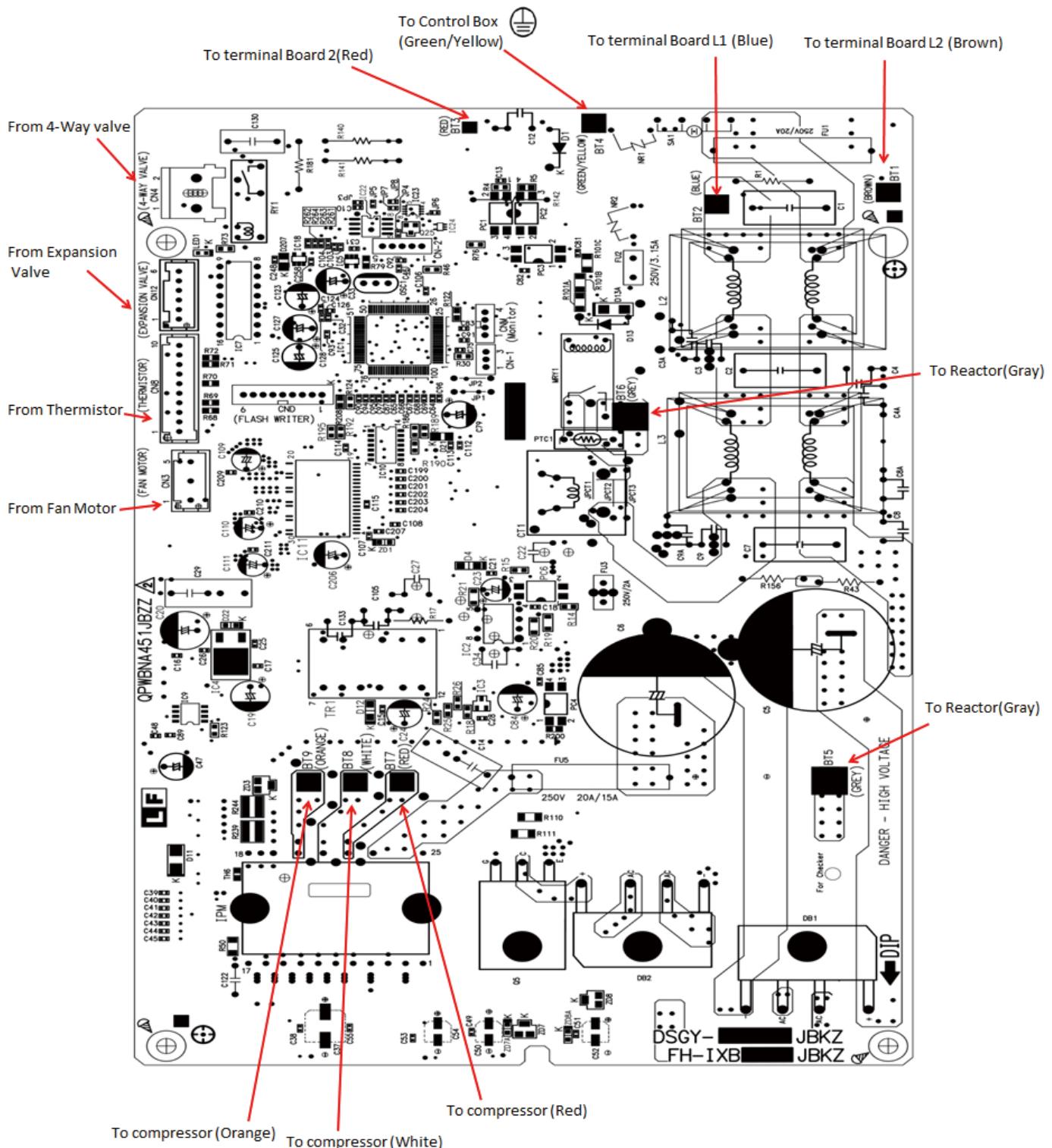
1. Indoor unit

1.1. Printed wiring board



2. Outdoor unit

2.1. Printed wiring board



CHAPTER 3. FUNCTION

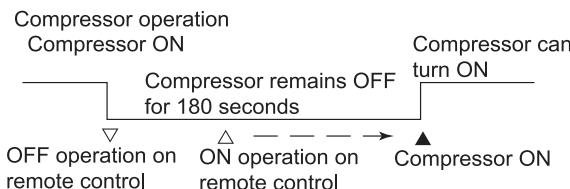
[1]INDOOR UNIT FUNCTION

1. Restart control

Once the compressor stops operating, it will not restart for 180 seconds to protect the compressor.

Therefore, if the operating compressor is shut down from the remote control and then turned back on immediately after, the compressor will restart after a preset delay time.

(The indoor unit will restart operation immediately after the ON switch is operated on the remote control.)



2. Startup control

The compressor always runs at its maximum frequency at the start of: -cooling mode and when the room temperature is 3°C higher than the set temperature.

-heating mode and when the room temperature is 3°C lower than the set temperature.

When the room temperature reaches to the set temperature, the compressor runs at an inverter-controlled frequency.

3. Indoor unit heat exchanger freeze prevention control

If the temperature of the indoor unit heat exchanger remains below 0°C for 4 consecutive minutes during cooling or dehumidifying operation, the compressor operation stops temporarily in order to prevent freezing. When the temperature of the indoor unit heat exchanger rises to 2°C or higher after about 180 seconds, the compressor restarts and resumes normal operation.

4. ON timer

The ON timer can be activated by pressing the ON timer button. When the ON timer is activated, the operation start time is adjusted based on fuzzy logic calculations 2 hour before the set time so that the room temperature reaches the set temperature at the set time.

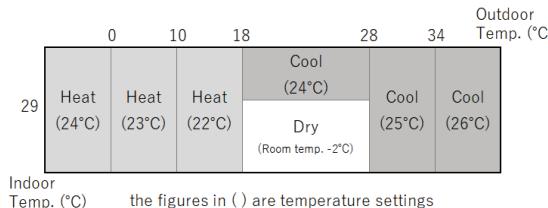
5. OFF timer

The OFF timer can be activated by pressing the OFF timer button. When the OFF timer is activated, the internal timer start to count down the remaining time from set time. And the unit will turn off automatically when it reach to zero.

6. Automatic air conditioning

AUTO mode and DRY mode are available through Sharp Air App.

In the AUTO mode, the temperature setting and mode are automatically selected according to the room temperature and outdoor temperature when the unit is turned on.



During operation, if the outdoor temperature changes, the temperature settings will automatically slide as shown in the chart.

7. Difference of operation in Auto and Manual modes

In the Auto mode, the temperature setting is automatically determined based on the outside air temperature. In addition, the air conditioner operation differs from the operation in the Manual mode as explained below.

7.1 Difference relating to set temperature

		Temperature setting method
Auto mode (by pressing ON/OFF button)	Heat	Automatic temperature setting based on outside air temperature.
	Cooling	
Manual mode	Heat	Can be changed between 16~30°C using remote control.
	Cooling	
	Dehumidifying	Automatic setting. Can be changed within ±3°F (±2°C) using remote control.

8. Operating temperature range

The built-in protective device may prevent the unit from operating when used out of this range.

The lowest operating temperature for HEAT is -17°F(-27°C). If outdoor temperature can drop below -17°F(-27°C) in your area, we recommend you to have another heating source.

When outdoor temperature actually drops below -17°F(-27°C), OPERATION indicator (green), TIMER indicator (orange), and WLAN indicator (green) on the unit will blink continuously. Turn off the unit to prevent any damages, as well as inefficient performance.

9. Dehumidifying operation control

The setting temperature is determined by outdoor temperature and room temperature at the start of operation.

Room temperature at the start of operation is under 26°C	
outdoor temperature (°C)	Setting temperature
under 22	room temperature+0.3°C
22~25	room temperature±0°C
25~28	room temperature -1°C
over 28	room temperature -1.7°C

Room temperature at the start of operation is over 26°C	
outdoor temperature (°C)	Setting temperature
under 18	23°C
18~28	24°C
28~31	25°C
31~34	26°C
34~37	27°C
over 37	28°C

10. Full Power operation

In this operation, the air/air heat pump works at the maximum power and optimum louver direction to make the room cool or warm rapidly. During operation, press the FULL POWER button.

- The remote control will display “ ”

TO CANCEL

Press the FULL POWER button again.

- The FULL POWER operation will also be cancelled when the operation mode is changed, or when the unit is turned off.

NOTE:

- The air/air heat pump will operate at “Extra HIGH” fan speed for 15 minutes, full power operation will stop after 15 minutes. The vertical adjustment louver will be set obliquely downward.
- You can not set the temperature or fan speed during the FULL POWER operation.

11. After Care (Auto and Manual)

Heating or Fan operation and Cluster operation are performed simultaneously.

The heating will be operated after the fan operation.

If the outside temperature or room temperature is high, heating operation may not be performed.

The operation time is 70-90 minutes.

When fan is operated, the louver will move horizontally.

When heating is operated, the louvers move above horizontal position.

12. Plasmacluster Ion function

Plasmacluster ion generator is set to ON by default and Plasmacluster ions are released during any mode of operation. (You can change the ion setting from Menu.)

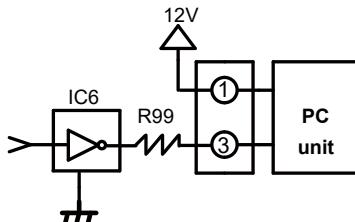
- "Plasmacluster operation" generates about equal amounts of (+)ions and (-)ions from the cluster unit to provide clean air.

If the Plasmacluster Ion generation function is operated together with the air conditioner operation, the indoor unit fan speed and louver direction are in accordance with the air conditioner settings.

13. Explanation of cluster circuit

The cluster unit generates cluster ions, which are circulated throughout the room by the air flow created by the blower fan (indoor unit fan motor) in the air conditioner unit.

- 1) When microcomputer output turns "H," the IC6 output changes to "Lo," applying 12 V voltage to the cluster unit for the generation of cluster ions (positive and negative ions).



14. Auto restart

When power failure occurs during operation after power is recovered, the unit will automatically restart in the same setting which were active before the power failure.

1) Setting memorized

- Operating mode (Heat, Cool, Dry, Air Purifier)
- Temperature adjustment (within 2°C range) automatic operation.
- Temperature setting
- Fan setting
- Air flow direction
- Power ON/OFF
- Automatic operation mode setting
- SPOT setting

2) Setting not memorized

- Timer setting
- Full power setting
- Multi Space setting
- ECO setting
- After Care operation

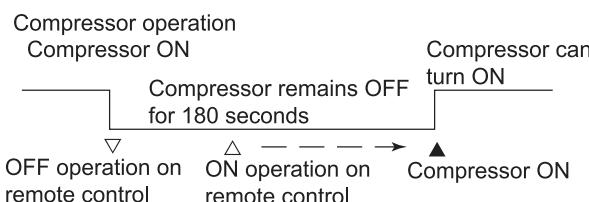
[2]OUTDOOR UNIT FUNCTION

1. Restart control

Once the compressor stops operating, it will not restart for 180 seconds to protect the compressor.

Therefore, if the operating compressor is shut down from the remote control and then turned back on immediately after, the compressor will restart after a preset delay time.

(The indoor unit will restart operation immediately after the ON switch is operated on the remote control.)



2. Outdoor unit 2-way valve freeze prevention control

If the temperature of the outdoor unit 2-way valve remains below 0°C for 10 consecutive minutes during cooling or dehumidifying operation, the compressor operation stops temporarily in order to prevent freezing.

When the temperature of the 2-way valve rises to 10°C or higher after about 180 seconds, the compressor restarts and resumes normal operation.

3. Outdoor unit overheat prevention control

During cooling operation, if the temperature of the outdoor unit heat exchanger exceeds the outdoor unit heat exchanger overheat prevention temperature (about 55°C), the operating frequency is decreased by about 4 to 15 Hz. Then, this operation is repeated every 60 seconds until the temperature of the outdoor unit heat exchanger drops to about 54°C or lower.

Once the temperature of the outdoor unit heat exchanger drops to about 54°C or lower, the operating frequency is increased by about 4 to 10 Hz every 60 seconds until the normal operation condition resumes.

If the temperature of the outdoor unit heat exchanger exceeds the outdoor unit heat exchanger overheat protection temperature for (120 sec : outdoor temperature ≥ 40°C, 60 sec : outdoor temperature < 40°C) at minimum operating frequency, the compressor stops operating and then restarts after about 180 seconds, and the above mentioned control is repeated.

4. Compressor overheat prevention control

If the temperature of the compressor exceeds the compressor overheat prevention temperature (110°C), the operation frequency is decreased by about 4 to 10 Hz. Then, this operation is repeated every 60 seconds until the temperature of the compressor drops below the overheat protection temperature (110°C).

Once the temperature of the compressor drops below the overheat protection temperature, the operating frequency is increased by about 4 to 10 Hz every 60 seconds until the normal operation condition resumes.

If the temperature of the compressor exceeds the overheat protection temperature (120 sec : outdoor temperature ≥ 40°C, 60 sec : outdoor temperature < 40°C) at minimum operating frequency, the compressor stops operating and then restarts after about 180 seconds, and the above mentioned control is repeated.

5. Peak control

If the current flowing in the air conditioner exceeds the peak control current (see the table below), the operation frequency is decreased until the current value drops below the peak control current regardless of the frequency control demand issued from the indoor unit based on the room temperature.

	Peak Control Current(A)	
Mode	Cooling	Heating
Model		
AE-X12CPU	7.0	9.1

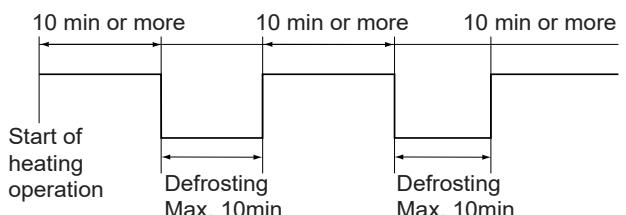
6. Outdoor unit fan delay control

The compressor stops immediately after cooling or dehumidifying or heating operation is shut down, but the outdoor unit fan continues operation for 50 seconds.

7. Defrosting

7.1 Reverse defrosting

The defrost operation starts when the compressor operating time exceeds 10 minutes during heating operation, as shown below, and the outside air temperature and the outdoor unit heat exchanger temperature meet certain conditions. When the defrost operation starts, the indoor unit fan stops. The defrost operation stops when the outdoor unit heat exchanger temperature rises to about 8°C or higher or the defrosting time exceeds 10 minutes.

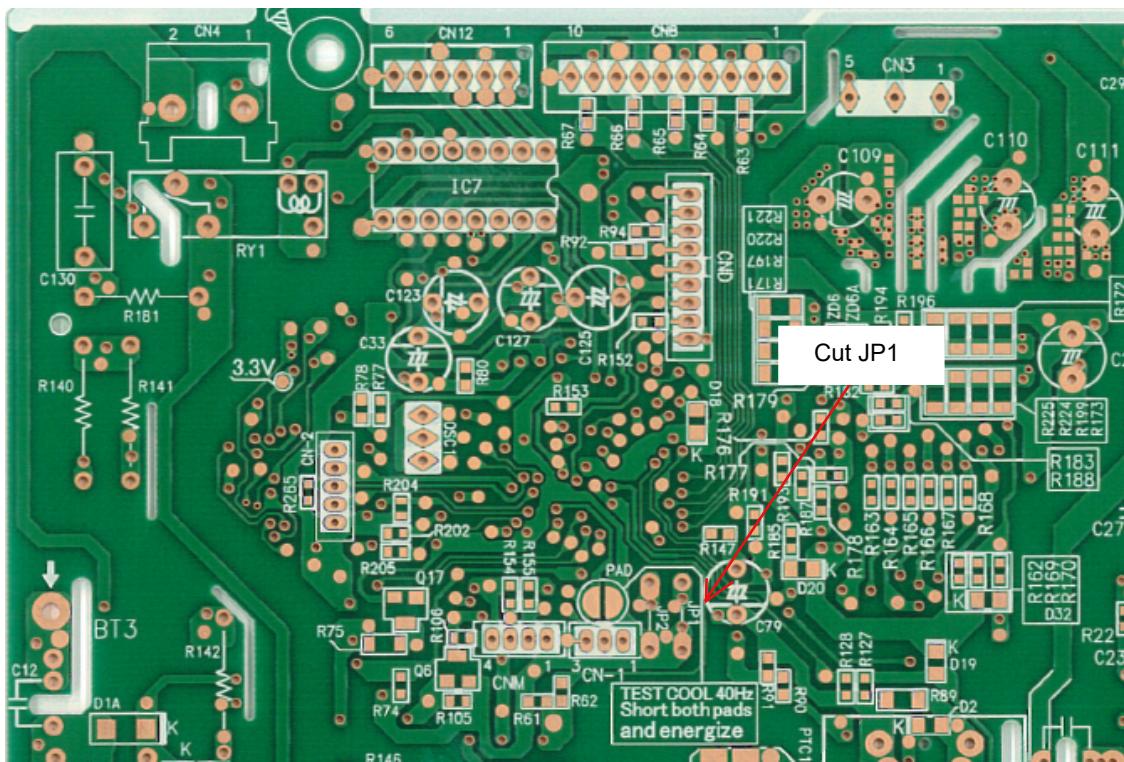


9. Activate -17°F(-27°C) Auto OFF Function

During the heating operation, the unit will automatically off when the outdoor temperature drops below -17°F(-27°C) to prevent the outdoor unit from the damage caused by the freezing of the drained water. The unit will stop its operation for 4 hours and then run in pre-heat operation* for 1 hour, and resume the operation when the outdoor temperature rises above -17°F(-27°C).

If the customer want to use this function, this function can be activated by cutting JP1 on outdoor PWB.

1. Power off.
2. Cut the JP1.



* About pre-heat operation:

During the pre-heat function, the unit consumes a small amount of power to the compressor when HEAT mode is off to keep the temperature of the compressor higher than the outside temperature.

The purpose of pre-heat function is to prevent oil shortage (decrease in proportion) due to the accumulation of liquid refrigerant and to speed up the start of operation.

To start pre-heat function, below conditions need to be satisfied.

- (1) & (2) & (3-A)
- (1) & (2) & (3-B)

(1) the temperature of discharge pipe is less than -5°C

(2) the temperature of heat sink is less than 45°C

(3-A) 2 hours after the compressor stops

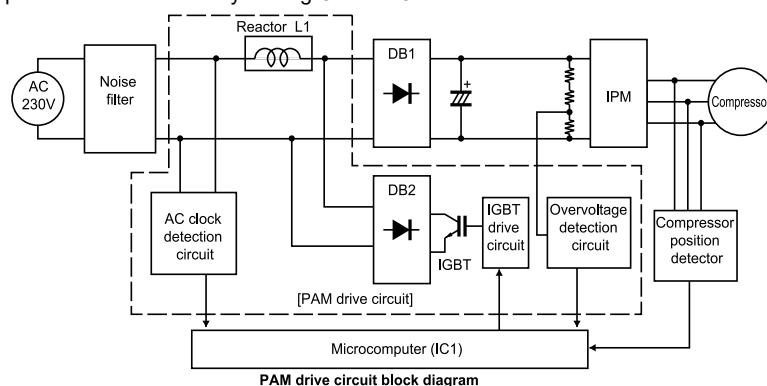
(3-B) the ouside temperature is higher than -29°C when AutoOFF function is completed

The pre-heat function can be disabled by cutting off JP2.

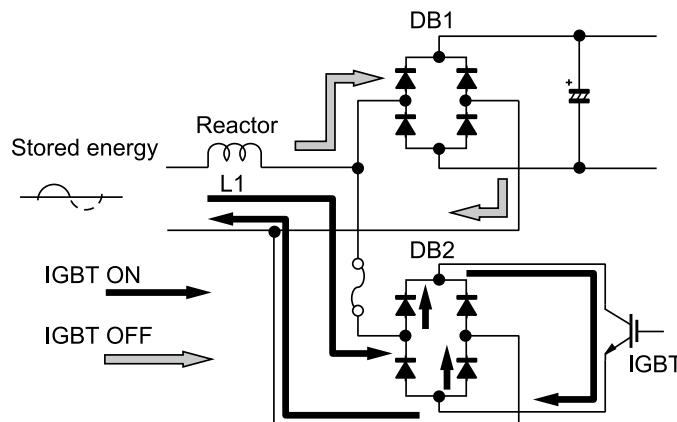
[3] PAM CIRCUIT

1. PAM (Pulse Amplitude Modulation)

The PAM circuit varies the compressor drive voltage. The IGBT shown in the block diagram charges the energy (electromotive force) generated by the reactor to the electrolytic capacitor for the inverter by turning ON and OFF.

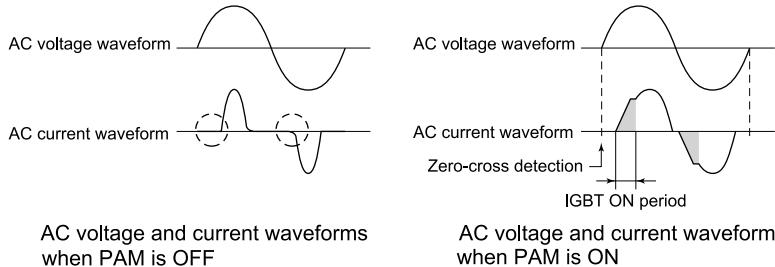


When the IGBT is ON, an electric current flows to the IGBT via the reactor (L1) and diode bridge (DB2). When the IGBT turns OFF, the energy stored while the IGBT was ON is charged to the voltage capacitor via the diode bridge (DB1). As such, by varying the ON/OFF duty of the IGBT, the output voltage is varied.

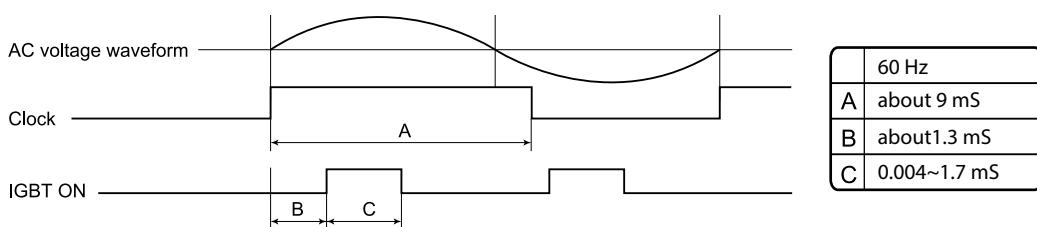


2. High power factor control circuit

This circuit brings the operating current waveform closer to the waveform of commercial power supply voltage to maintain a high power factor. Because of the capacitor input, when the PAM circuit is OFF, the phase of the current waveform deviates from the voltage waveform as shown below. To prevent this deviation, a current is supplied during the periods indicated by “C” in the diagram. To determine the length of period to supply a current, the zero-cross timing of the AC input voltage is input to the microcomputer via the clock circuit. The power source frequency is also determined at the same time. The IGBT turns ON after the time length determined by the zero-cross point to supply a current to the IGBT via the reactor. This brings the current waveform closer to the voltage waveform in phase. As described above, the ON/OFF operation of the IGBT controls the increase/decrease of the compressor power supply voltage (DC voltage) to improve the compressor efficiency and maintain a high power factor by keeping the current phase closer to that of the supply voltage.



1) Detailed explanation of PAM drive circuit sequence



2) AC clock (zero-cross) judgment

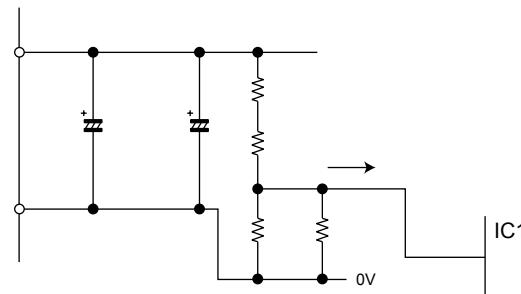
- The clock circuit determines the time from one rising point of the clock waveform to the next rising point.
- The detected clock waveform is used to judge the power source frequency (60Hz).
- The zero-cross of the AC voltage is judged as the rising of the clock waveform, as shown in the diagram above.

3) IGBT ON start time (delay time B)

- Based on the zero-cross of the AC voltage, the IGBT turns ON after a delay time set according to the power source frequency.

4) IGBT ON time (C)

- After the above delay time, the IGBT turns ON to supply a current to the reactor.
- The ON time of the IGBT determines the amount of energy (level of DC voltage rise) supplied to the reactor.
- DC voltage level in each operation mode (varies depending on external load conditions)
 - Cooling operation --- 220 to 290 V
 - Heating operation --- 220 to 290 V

3.PAM protection circuit

To prevent excessive voltage of PAM output from damaging the IPM and electrolytic capacitor as well as the control printed wiring board (PWB), this circuit monitors the PAM output voltage and turns off the PAM control signal and PAM drive immediately when an abnormal voltage output is generated. At the same time, it shuts off the compressor operation.

The protection voltage level is as follows.

Details of troubleshooting procedure for PAM**1) PAM shutdown due to error**

- (1) When the DC voltage detection circuit sends a signal exceeding the specified voltage to the microcomputer
 - DC voltage of 400 V or higher (detection circuit input voltage of about 9.2 V or higher)
 - When an error is detected
 - PAM IGBT turns OFF.
 - Compressor turns OFF.
 - All units shut down completely when the error occurs four times.
- (2) When the outdoor unit clock waveform differs from the specified value immediately before the PAM IGBT turns ON
 - When there is no clock waveform input
 - When a clock signal of other than specified power source frequency (60Hz) is input
 - When 14-1 error is detected
 - PAM IGBT does not turn ON.
 - Compressor turns OFF.
 - All units shut down completely when the error occurs four times.

2) PAM error indication

In case of error "(1)"

- An error signal is sent to the indoor unit as soon as an error is generated.
 - Malfunction No. 14-0 is indicated when the error code is called out by the indoor unit's self-diagnosis function.
- The LED on the outdoor unit flashes 14 times when an error is generated.
 - The LED continues flashing in the 14-time cycle even after the compressor stops operating.
 - The LED turns off (data is deleted from the memory) when the outdoor unit power is turned off.

In case of error "(2)"

- An error signal is sent to the indoor unit as soon as an error is judged.
 - Malfunction No. 14-1 is indicated when the error code is called out by the indoor unit's self-diagnosis function.
- The LED on the outdoor unit flashes 14 times when an error is judged.
 - The LED continues flashing in the 14-time cycle even after the compressor stops operating.
 - The LED turns off (data is deleted from the memory) when the outdoor unit power is turned off.
- Check items
 - Clock circuit check
 - PAM IGBT check

[4] IPM DRIVE CIRCUIT

The IPM is used for compressor drive. The power supply for the IPM drive, the shunt resistance for over current detection, etc., are provided outside the IPM (control PWB).

1. IPM drive power supply circuit

The power supply for the upper-phase IGBT (HU, HV, HW) drive employs a bootstrap system, and provides power to the upper-phase IC.

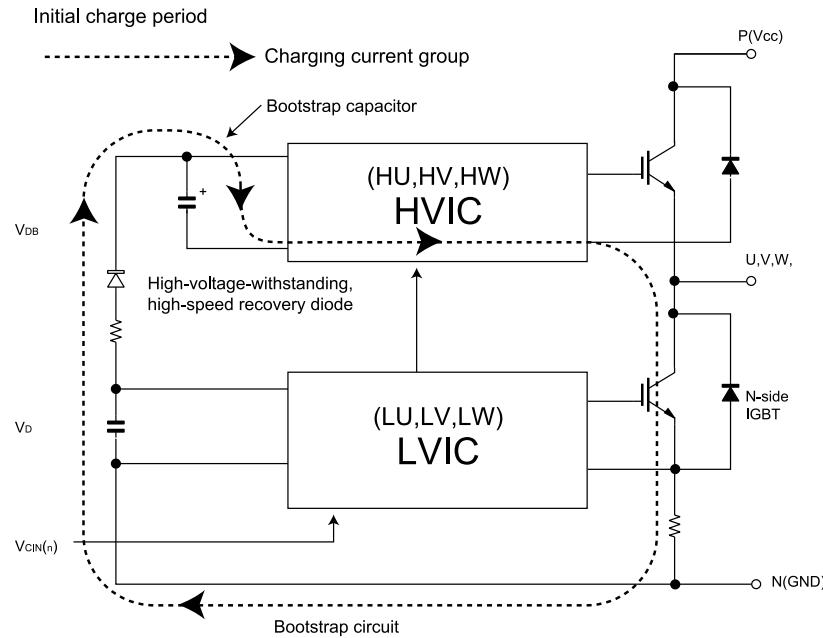
The 15-V power supply for the lower-phase IC is provided by the control printed wiring board (PWB).

1.1. Brief explanation of bootstrap system (single power drive system)

To supply power to the upper-phase IC, the microcomputer (IC1) turns ON the lower-phase IGBT (LU, LV, LW).

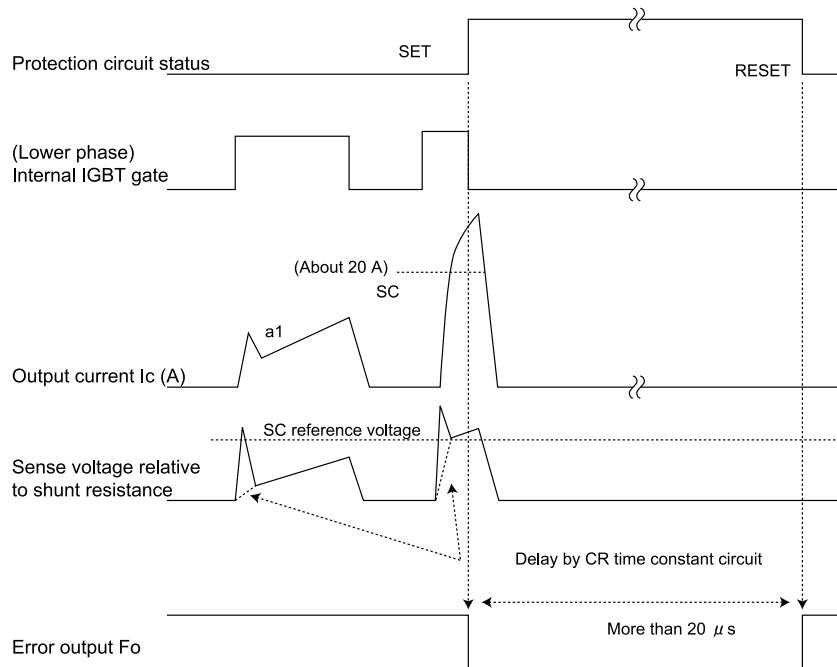
This results in a charging current that flows to the electrolytic capacitor of each upper-phase IC input and charges the bootstrap capacitor with a 15V current.

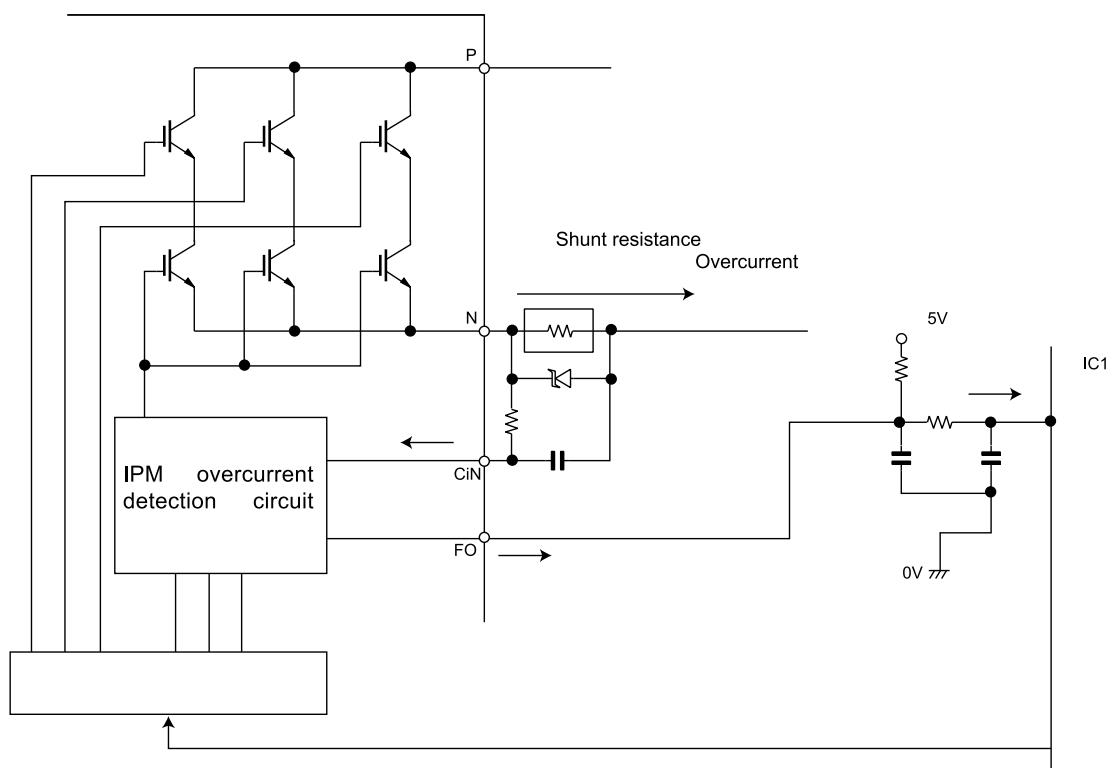
The power supply for the subsequent stages is charged while the lower-phase IGBT is ON in ordinary compressor drive control.



1.2 DC over current detection circuit

When a current of about 20 A or higher flows through the shunt resistance on the control printed wiring board (PWB), the voltage at this resistance is input to IPM CIN pin (15). Then, the gate voltage of the lower-phase IGBT (LU, LV, LW) inside the IPM turns OFF to cut off the over current. At the same time, an L output of more than 20μs is generated from IPM from pin (14), and this results in an L input to over current detection input pin (45) of the microcomputer (IC1) and turns OFF the PWM signal output (IC1 pins (37) through (39) and pins (42) through (44)) to the IGBT gate.





CHAPTER 4. FUNCTION AND OPERATION OF PROTECTIVE PROCEDURES

[1] PROTECTION DEVICE FUNCTIONS AND OPERATIONS

* These models have following thermistors

INDOOR UNIT	OUTDOOR UNIT
TH2	TH1, TH2, TH3, TH4, TH5

The errors for the thermistors that are not mentioned above are irrelevant.

These indoor units don't have power relay.

Function		Operation				Self-diagnosis result display	
		Description	Detection period	Reset condition	Indoor unit error display	Indoor unit	Outdoor unit
1	Indoor unit fan lock	Operation stops if there is no input of rotation pulse signal from indoor unit fan motor for 1 minute.	When indoor unit fan is in operation	Operation OFF or ON	☆ 2	Yes	None
	Indoor unit fan rotation speed error	Operation stops if rotation pulse signal from indoor unit fan indicates abnormally low speed (about 300 rpm or slower).	When indoor unit fan is in operation	Operation OFF or ON	☆ 2	Yes	None
2	2-way valve freeze prevention	Compressor stops if temperature of outdoor unit 2-way valve remains below 0°C for 10 continuous minutes during cooling or dehumidifying operation.	When in cooling or dehumidifying operation	Automatic reset when temperature of 2-way valve rises above 10°C.	None	None	Yes
3	Outdoor unit heat exchanger overheat shutdown	Operation frequency lowers if outdoor unit heat exchanger temperature exceeds about 55°C during cooling operation. Compressor stops if outdoor unit heat exchanger temperature exceeds about 55°C for 120 seconds at minimum frequency.	When in cooling or dehumidifying operation	Automatic reset after safety period (180 sec).	None	None	Yes
4	Compressor discharge overheat shutdown	Operating frequency lowers if temperature of compressor discharge thermistor (TH1) falls below about 110°C. Compressor stops if temperature of compressor discharge thermistor (TH1) remains at about 110°C (for 120 seconds in cooling operation, or 60 seconds in heating operation) at minimum frequency.	When compressor is in operation	Automatic reset after safety period (180 sec).	None	None	Yes
5	Dehumidifying operation temporary stop	Compressor stops if outside air temperature thermistor is lower than about 16°C during dehumidifying operation.	When in dehumidifying operation	Automatic reset when outside air temperature rises above 16°C.	None	None	Yes
6	DC over current error	Compressor stops if DC current of about 16 A or higher flows in IPM.	When compressor is in operation	Operation OFF or ON	Yes ☆ 3	Yes	Yes
7	AC over current error	Operating frequency lowers if outdoor AC current exceeds peak control current value. Compressor stops if compressor AC current exceeds peak control current value at minimum frequency.	When compressor is in operation	Operation OFF or ON	Yes ☆ 1	Yes	Yes
8	AC over current error in compressor OFF status	Indoor and outdoor units stop if outdoor AC current exceeds about 3 A while compressor is in non-operation status.	When compressor is in non-operation	Replacement of defective parts such as IPM	Yes ☆ 2	Yes	Yes
9	AC maximum current error	Compressor stops if outdoor AC current exceeds 17 A.	When compressor is in operation	Operation OFF or ON	Yes ☆ 2	Yes	Yes
10	AC current deficiency error	Compressor stops if operating frequency is 50 Hz or higher and compressor AC current is about 2.0 A or lower.	When compressor is in operation	Operation OFF or ON	Yes ☆ 1	Yes	Yes
11	Thermistor installation error or 4-way valve error	Compressor stops if high and low values of temperatures detected by outdoor unit heat exchanger thermistor (TH2) and 2-way valve thermistor (TH5) do not match operating cycle.	3 minutes after compressor startup	Operation OFF or ON	Yes ☆ 1	Yes	Yes
12	Compressor high temperature error	Compressor stops if compressor discharge thermistor (TH1) exceeds about 114°C, or if there is short-circuit in TH1.	When in operation	Operation OFF or ON	Yes ☆ 1	Yes	Yes

Function	Operation				Self-diagnosis result display	
	Description	Detection period	Reset condition	Indoor unit error display	Indoor unit	Outdoor unit
13 Outdoor unit heat exchanger thermistor short-circuit error	Compressor stops if there is shortcircuit in outdoor unit heat exchanger thermistor (TH2).	At compressor startup	Operation OFF or ON	Yes ☆ 1	Yes	Yes
14 Outdoor unit outside air temperature thermistor short-circuit error	Compressor stops if there is shortcircuit in outdoor unit outside air temperature thermistor (TH3).	At compressor startup	Operation OFF or ON	Yes ☆ 1	Yes	Yes
15 Outdoor unit suction thermistor short-circuit error	Compressor stops if there is shortcircuit in outdoor unit suction thermistor (TH4).	At compressor startup	Operation OFF or ON	Yes ☆ 1	Yes	Yes
16 Outdoor unit 2-way valve thermistor short-circuit error	Compressor stops if there is shortcircuit in outdoor unit 2-way valve thermistor (TH5).	At compressor startup	Operation OFF or ON	Yes ☆ 1	Yes	Yes
17 Outdoor unit heat exchanger thermistor open-circuit error	Compressor stops if there is opencircuit in outdoor unit heat exchanger thermistor (TH2).	At compressor startup	Operation OFF or ON	Yes ☆ 1	Yes	Yes
18 Outdoor unit outside air temperature thermistor open-circuit error	Compressor stops if there is opencircuit in outdoor unit outside air temperature thermistor (TH3).	At compressor startup	Operation OFF or ON	Yes ☆ 1	Yes	Yes
19 Outdoor unit suction thermistor open-circuit error	Compressor stops if there is opencircuit in outdoor unit suction thermistor (TH4).	At compressor startup	Operation OFF or ON	Yes ☆ 1	Yes	Yes
20 Outdoor unit 2-way valve thermistor open-circuit error	Compressor stops if there is opencircuit in outdoor unit 2-way valve thermistor (TH5).	At compressor startup	Operation OFF or ON	Yes ☆ 1	Yes	Yes
21 Outdoor unit discharge thermistor open-circuit error	Compressor stops if there is opencircuit in outdoor unit discharge thermistor (TH1).	At compressor startup	Operation OFF or ON	Yes ☆ 1	Yes	Yes
22 Serial signal error	Compressor stops if outdoor unit cannot receive serial signal from indoor unit for 30 seconds.	When in operation	Reset after reception of serial signal	None	None	None
23 Compressor startup error	Compressor stops if compressor fails to start up.	At compressor startup	Operation OFF or ON	Yes ☆ 3	Yes	Yes
24 Outdoor unit DC fan error	Operation stops if there is no input of rotation pulse signal from outdoor unit fan motor for 30 seconds.	When outdoor unit fan is in operation	Operation OFF or ON	Yes ☆ 1	Yes	Yes
25 PAM over voltage error	Compressor stops if DC voltage is 400 V or higher.	When in operation	Operation OFF or ON	Yes ☆ 1	Yes	Yes
26 PAM clock error	When power source frequency cannot be determined (at startup), or when power source clock cannot be detected for 1 continuous second (at startup).	At compressor startup, when in operation	Operation OFF or ON	Yes ☆ 1	Yes	Yes
27 Outdoor unit thermal fuse blown in the Terminal board	Serial signal is lost. As a result,compressor stops if outdoor unit cannot receive serial signal from indoor unit for 30 seconds.	When in operation	Reset after reception of serial signal	None	None	None

☆ 1—The outdoor unit restarts four times before the indoor unit error is displayed (complete shutdown).

☆ 2—A single error judgment results in the display of the indoor unit error (complete shutdown).

☆ 3—The outdoor unit restarts eight times before the indoor unit error is displayed (complete shutdown).

[2] HEAT PUMP OPERATION IN THERMISTOR ERROR

* These models have following thermistors

INDOOR UNIT	OUTDOOR UNIT
TH2	TH1, TH2, TH3, TH4, TH5

The errors for the thermistors that are not mentioned above are irrelevant.

These indoor units don't have power relay.

1. Indoor unit

Item	Mode	Temp./Humidity circuit abnormal			Error
Room temperature /humidity sensor	Auto/Cooling/Dehumidifying/Heating	If Temp./Humidity sensor board can't communicate with main board normally via I ² C communication protocol, it won't update the temperature & humidity information anymore, the room temperature and humidity cannot be controlled properly.			When the operation is started, 26-6 error will occur and operation will stop.

Item	Mode	Control operation	When resistance is low (temperature judged higher than actual)	Short-circuit	When resistance is high (temperature judged lower than actual)	Open-circuit
Heat exchanger thermistor (TH2)	Cooling Dehumidifying	Freeze prevention	Indoor unit evaporator may freeze.	Indoor unit evaporator may freeze.	Compressor stops occasionally.	Compressor does not operate.
	Heating	Cold air prevention Cold	Cold air prevention deactivates too soon and cold air discharges.	Compressor operates at low speed or stops, and frequency does not increase.	Cold air prevention deactivates too slow.	Cold air prevention does not deactivate, and indoor unit fan does not rotate.

2. Outdoor unit

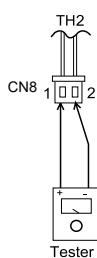
Item	Mode	Control operation	When resistance is low (temperature judged higher than actual)	Short-circuit	When resistance is high (temperature judged lower than actual)	Open-circuit
Compressor discharge thermistor (TH1)	Cooling Dehumidifying Heating	Expansion valve control and compressor protection	Compressor operates, but room does not become cool or warm (expansion valve is open).	Compressor high temperature error indication.	Layer short-circuit or open-circuit may result in compressor in normal operation.	Outdoor unit thermistor open-circuit error indication.
Heat exchanger thermistor (TH2)	Cooling Dehumidifying	Outdoor unit heat exchanger overheat prevention	Compressor operates at low speed or stops.	Outdoor unit thermistor short-circuit error indication.	Normal operation.	Outdoor unit thermistor open-circuit error indication.
	Heating	Expansion valve control Defrosting	Defrosting operation is not activated as needed, and frost accumulates on outdoor unit (expansion valve is closed).	Outdoor unit thermistor short-circuit error indication.	Defrosting operation is activated unnecessarily, and room does not become warm (expansion valve is open).	Outdoor unit thermistor open-circuit error indication.
Outside air temperature thermistor (TH3)	Auto	Operation mode judgment	Cooling mode is activated even if room temperature is low.	Outdoor unit thermistor short-circuit error indication.	Heating mode is activated even if room temperature is high.	Outdoor unit thermistor open-circuit error indication.
	Cooling Dehumidifying	Operation not affected	Normal operation.	Outdoor unit thermistor short-circuit error indication.	Normal operation.	Outdoor unit thermistor open-circuit error indication.
	Heating	Rating control Defrosting	Defrosting operation is activated unnecessarily.	Outdoor unit thermistor short-circuit error indication.	Defrosting operation is not activated, and frost accumulates on outdoor unit.	Outdoor unit thermistor open-circuit error indication.
Suction pipe thermistor (TH4)	Cooling Dehumidifying	Expansion valve control	Compressor operates, but room does not become cool (expansion valve is open).	Outdoor unit thermistor short-circuit error indication.	Frost accumulates on evaporator inlet section, and room does not become cool (expansion valve is closed).	Outdoor unit thermistor open-circuit error indication.
	Heating	Expansion valve control	Compressor operates, but room does not become warm (expansion valve is open).	Outdoor unit thermistor short-circuit error indication.	Frost accumulates on expansion valve outlet section, and room does not become warm (expansion valve is closed).	Outdoor unit thermistor open-circuit error indication.

Item	Mode	Control operation	When resistance is low (temperature judged higher than actual)	Short-circuit	When resistance is high (temperature judged lower than actual)	Open-circuit
2-way valve thermistor (TH5)	Cooling Dehumidifying	Expansion valve control	Frost accumulates on indoor unit evaporator and room does not become cool (expansion valve is closed).	Outdoor unit thermistor short-circuit error indication.	Compressor operates, but room does not become cool (expansion valve is open).	Outdoor unit thermistor open-circuit error indication.
	Heating	Operation not affected	Normal operation.	Outdoor unit thermistor short-circuit error indication.	Normal operation.	Outdoor unit thermistor open-circuit error indication.

[3] THERMISTOR TEMPERATURE CHARACTERISTICS

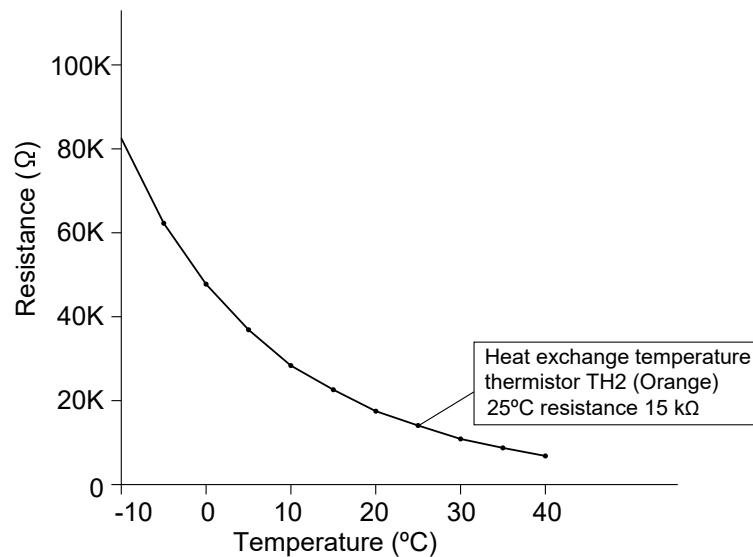
1. Indoor unit

To measure the resistance, first remove the connector from the board.



Thermistor	Symbol	Connector	Color
Heat exchange temperature	TH2 (CN8)	① - ②	Orange

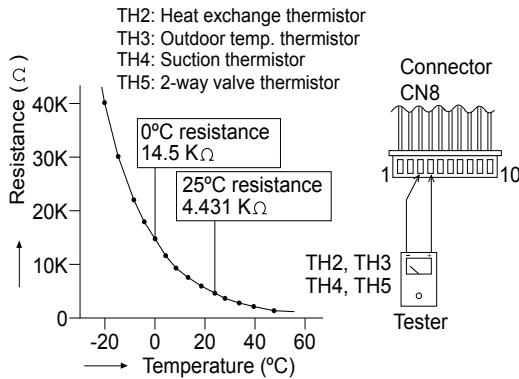
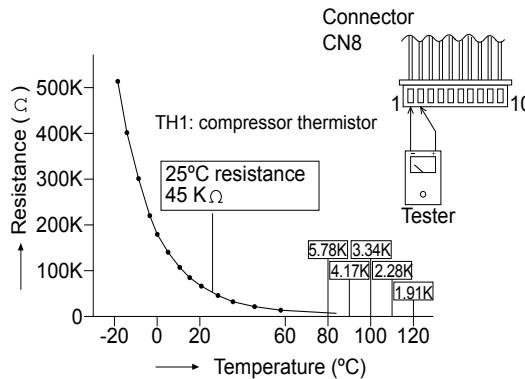
Before measuring resistance, disconnect connectors as shown above



2. Outdoor unit

To measure the resistance, first remove the connector from the board.

Thermistor	No.	Connector	Color
Compressor thermistor	TH1	① - ②	Red
Heat exchanger pipe thermistor	TH2	③ - ④	Orange
Outdoor temp. thermistor	TH3	⑤ - ⑥	Green
Suction thermistor	TH4	⑦ - ⑧	Black
2-way valve thermistor	TH5	⑨ - ⑩	Yellow

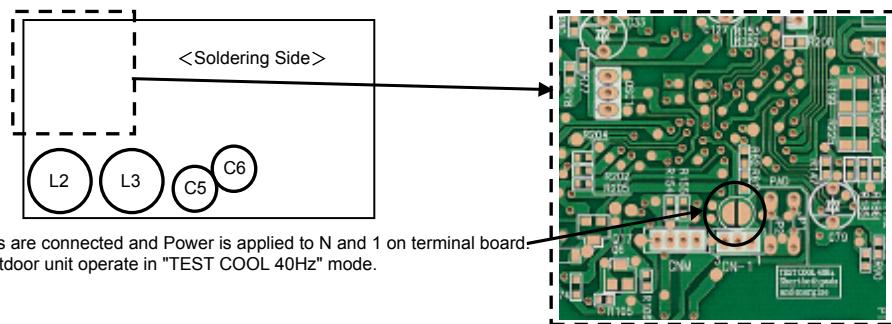


[4] HOW TO OPERATE THE OUTDOOR UNIT INDEPENDENTLY

1. Cooling in 40 Hz fixed mode

To operate the outdoor unit independently, short-circuit the sections indicated by arrows in the diagram below with an adapter, and apply 230 VAC between (L1) and (L2) on the terminal board of the outdoor unit. This allows the outdoor unit to be operated in cooling mode independently.

(Do not operate the outdoor unit in this condition for an extended period of time.)



[5] GENERAL TROUBLESHOOTING CHART

1. Indoor unit does not turn on

Main cause	Inspection method	Normal value/condition	Remedy
Cracked PWB. (Cracked pattern)	Check visually.	There should be no cracking in PWB or pattern.	Replace PWB.
Open-circuit in FU1 (250 V, 3.15 A)	Check melting of FU1.	There should be no open-circuit.	Replace PWB.

2. Indoor unit fan does not operate

Main cause	Inspection method	Normal value/condition	Remedy
Open-circuit in heat exchanger thermistor (TH2) (in heating operation)	Measure thermistor resistance (dismount for check).	Refer to THERMISTOR TEMPERATURE CHARACTERISTICS-1	Replace thermistor.
		There should be no open-circuit or faulty contact.	Replace thermistor.
Disconnected heat exchanger thermistor (TH2) (in heating operation)	Inspect connector on PWB. Check thermistor installation condition.	Thermistor should not be disconnected.	Install correctly.

3. Indoor unit fan speed does not change

Main cause	Inspection method	Normal value/condition	Remedy
Remote control not designed to allow fan speed change.	Check operation mode.	Fan speed should change except during dehumidifying operation, ventilation, light dehumidifying operation, internally normal operation	Explain to user.

4. Remote control signal is not received

Main cause	Inspection method	Normal value/condition	Remedy
Batteries at end of service life.	Measure battery voltage.	2.5 V or higher (two batteries in series connection)	Install new batteries.
Batteries installed incorrectly.	Check battery direction.	As indicated on battery compartment.	Install batteries in indicated direction.
Lighting fixture is too close, or fluorescent lamp is burning out.	Turn off light and check.	Signal should be received when light is turned off.	Change light position or install new fluorescent lamp.

Main cause	Inspection method	Normal value/condition	Remedy
Use Sevick light (Hitachi).	Check if Sevick light (Hitachi) is used.	Signal may not be received sometimes due to effect of Sevick light.	Replace light or change position.
Operating position/angle are inappropriate.	Operate within range specified in manual.	Signal should be received within range specified in manual.	Explain appropriate handling to user.
Open-circuit or short-circuit in wiring of light receiving section.	Check if wires of light receiving section are caught.	Wires of light receiving section should not have any damage caused by pinching.	Replace wires of light receiving section.
Defective light receiving unit.	Check signal receiving circuit (measure voltage between terminals 5 and 9 of connector BCN8).	Tester indicator should move when signal is received.	Replace PWB.
Dew condensation on light receiving unit.	Check for water and rust.	Signal should be received within range specified in manual.	Take moisture-proof measure for lead wire outlet of light receiving section.

5.Louvers do not move

Main cause	Inspection method	Normal value/condition	Remedy
Caught in sliding section.	Operate to see if louvers are caught in place.	Louvers should operate smoothly.	Remove or correct catching section.
Disconnected connector	Inspect connectors.	Connectors or pins should not be disconnected.	Install correctly.
Contact of solder on PWB (connector section on PWB)	Check visually.	There should not be solder contact.	Correct contacting section.

6.There is noise in TV/radio

Main cause	Inspection method	Normal value/condition	Remedy
Grounding wires not connected properly.	Check grounding wire connections.	Grounding wires should be connected properly.	Connect grounding wires properly.
TV/radio is placed too close to outdoor unit.	Check distance between TV/radio and outdoor unit.	If TV/radio is placed too close, it may become affected by noise.	Move TV/radio away from outdoor unit.
Other than above.	Check for radio wave interference.		

7. Malfunction occurs

Main cause	Inspection method	Normal value/condition	Remedy
Malfunction caused by noise.	Check for radio wave interference.		

8.Compressor does not start

Main cause	Inspection method	Normal value/condition	Remedy
Erroneous inter-unit connection.	Check wiring between indoor and outdoor units.	Terminal board L1-L2: 230 VAC, 60 Hz Terminal board 2: serial signal	Correct wiring.
Damaged IPM.	Check IPM continuity.	-	Replace outdoor unit PWB.
Dried-up electrolytic capacitor.	Check electrolytic capacitor.	-	Replace outdoor unit PWB.
Blown outdoor unit fuse.	Check 20-A fuse.	Fuse should not be blown.	Replace fuse. Replace outdoor unit PWB.
Power supply voltage is too low.	Measure power supply voltage during startup.	230±10 VAC, 60 Hz	Make sure that power supply voltage is 180 V or higher.
Compressor lock.	Supply current and touch compressor cover(sound absorbing material) to check if operation starts.	Compressor should start normally.	Apply external impact to compressor. Replace compressor.

9.Operation stops after a few minutes and restarts, and this process repeats

Main cause	Inspection method	Normal value/condition	Remedy
Dried-up electrolytic capacitor.	Measure 290-VDC line voltage.	250 V or higher.	Replace outdoor unit PWB.
Layer short-circuit in expansion valve coil.	Measure resistance.	46±3Ω in each phase (at 20°C)	Replace coil.

CAUTION:

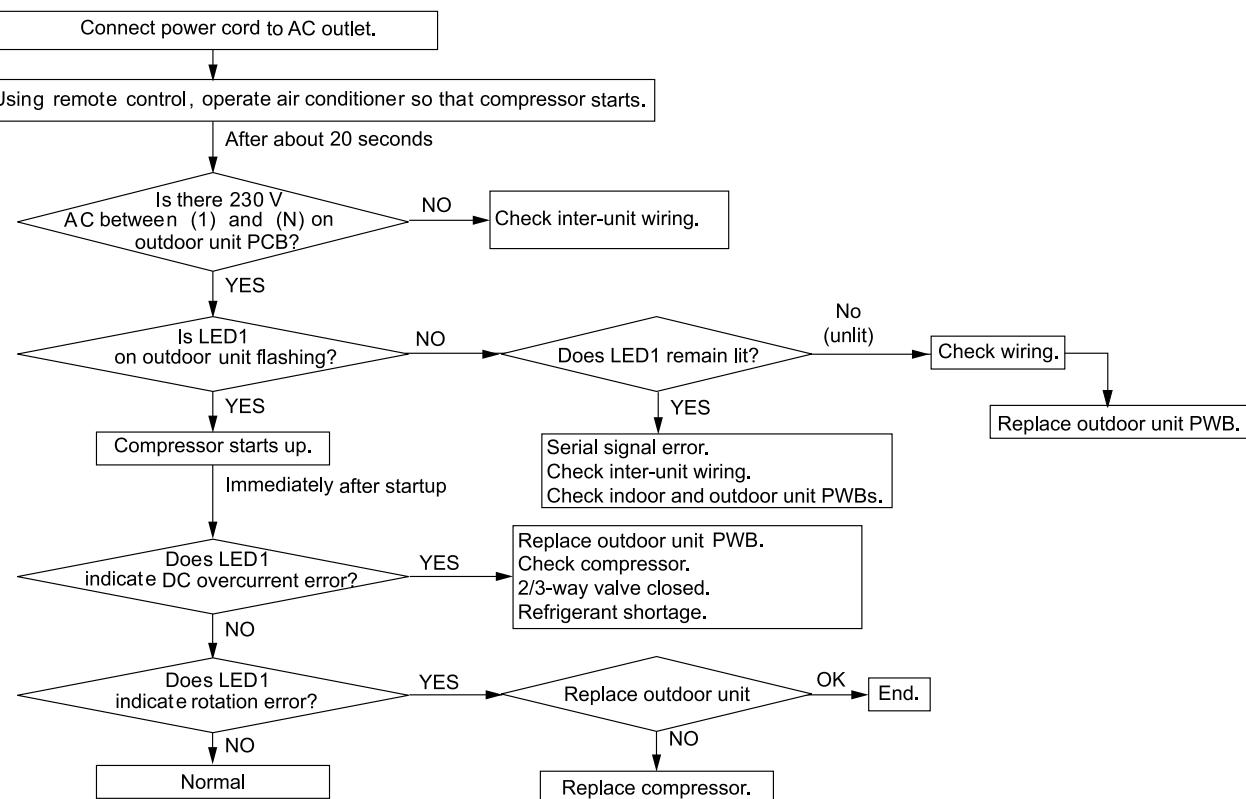
If fuse FU1/FU5 (outdoor unit control circuit board) is blown, be careful of charging voltage in inverter electrolytic capacitor C5,C6:

To discharge stored electricity, unplug the power cord and connect the plug of a soldering iron (230VAC, 30W) between the positive and negative terminals of inverter electrolytic capacitor C5,C6.

[6] MALFUNCTION (PARTS) CHECK METHOD

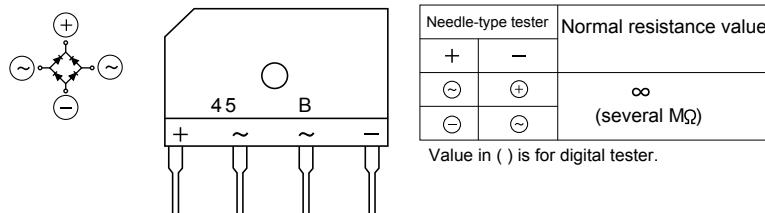
1. Procedure for determining defective outdoor unit IPM/compressor

The following flow chart shows a procedure for locating the cause of a malfunction when the compressor does not start up and a DC over current indication error occurs.



2. Diode bridge check method

Turn off the power and let the inverter electrolytic capacitor discharge completely. Then use a tester and check continuity. When using a digital tester, the (+) and (-) tester lead wires in the table must be reversed.



3.Inverter electrolytic capacitor (C5,C6) check method

Turn off the power, let the inverter electrolytic capacitor (C5,C6) discharge completely, and remove the capacitor from the control printed circuit board (PWB). First, check the case for cracks, deformation and other damages. Then, using a needle-type tester, check continuity.

Determination of normal condition

The tester needle should move on the scale and slowly returns to the original position. The tester needle should move in the same way when polarities are reversed. (When measurement is taken with the polarities reversed, the tester needle exceeds the scale range. Therefore, let the capacitor discharge before measurement.)

4.IPM check method

Turn off the power, let the large capacity electrolytic capacitor (C5,C6) discharge completely, and dismount the IPM. Then, using a tester, check leak current between C and E.

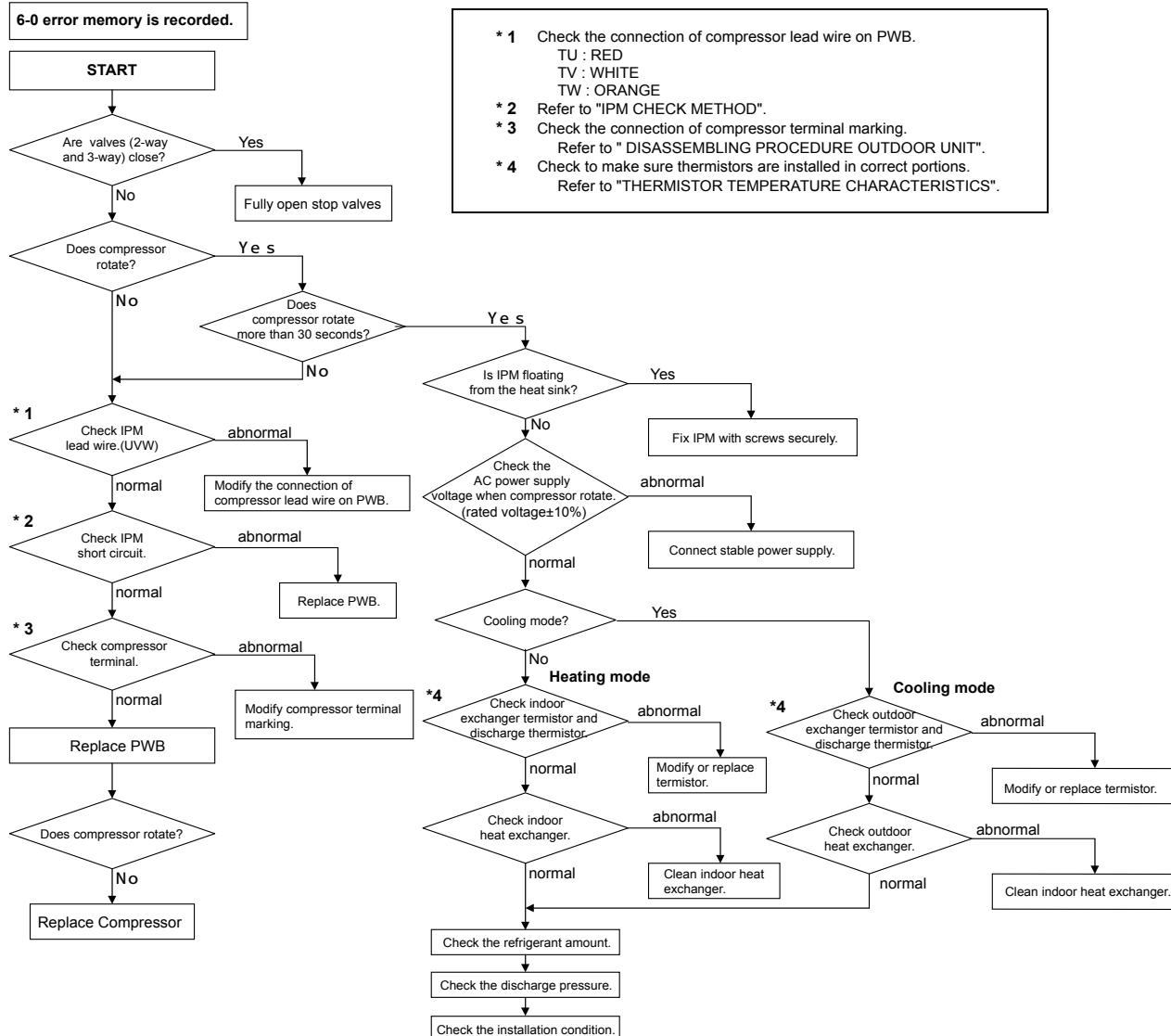
When using a digital tester, the (+) and (-) tester lead wires in the table must be reversed.

Needle-type tester		Normal resistance value
(-)	(+)	
P	N	∞
U		(several MΩ)
V		
W		

Needle-type tester		Normal resistance value
(-)	(+)	
U	N	∞
V		(several MΩ)
W		

Values in () are for digital tester.

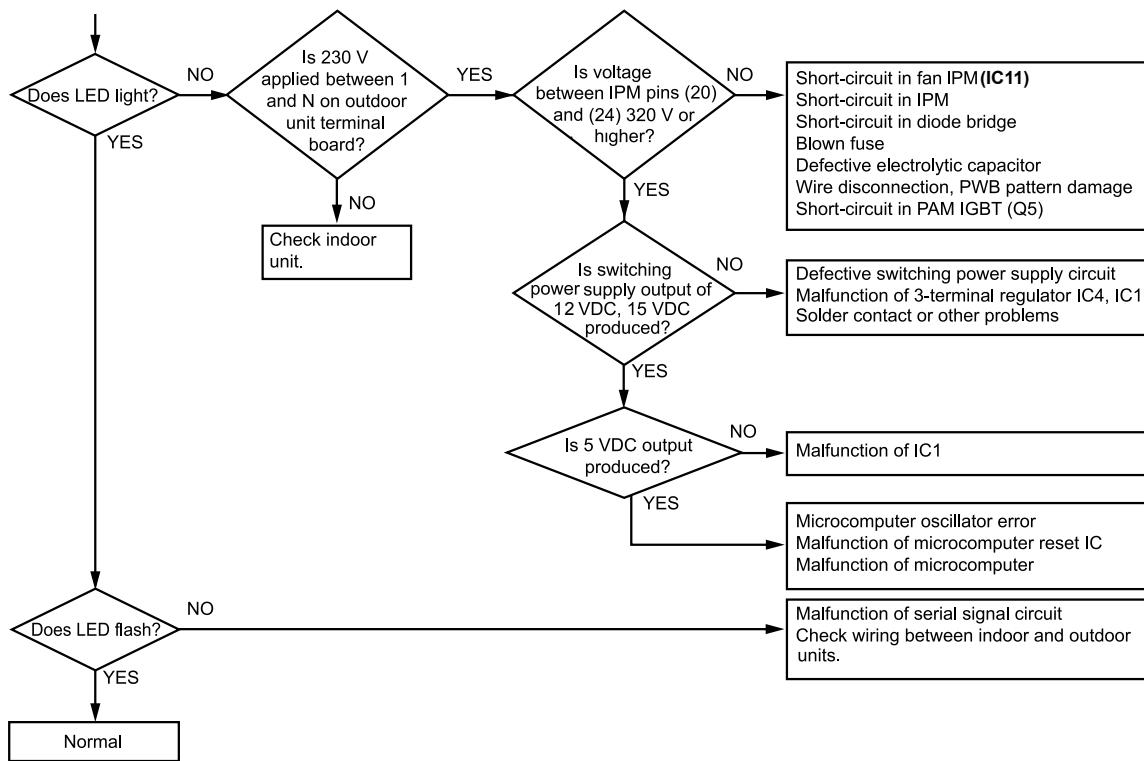
5.DC Over Current Error (6-0 error)



[7] OUTDOOR UNIT CHECK METHOD

After repairing the outdoor unit, conduct the following inspection procedures to make sure that it has been repaired completely. Then, operate the compressor for a final operation check.

1. Troubleshooting of outdoor unit electric components



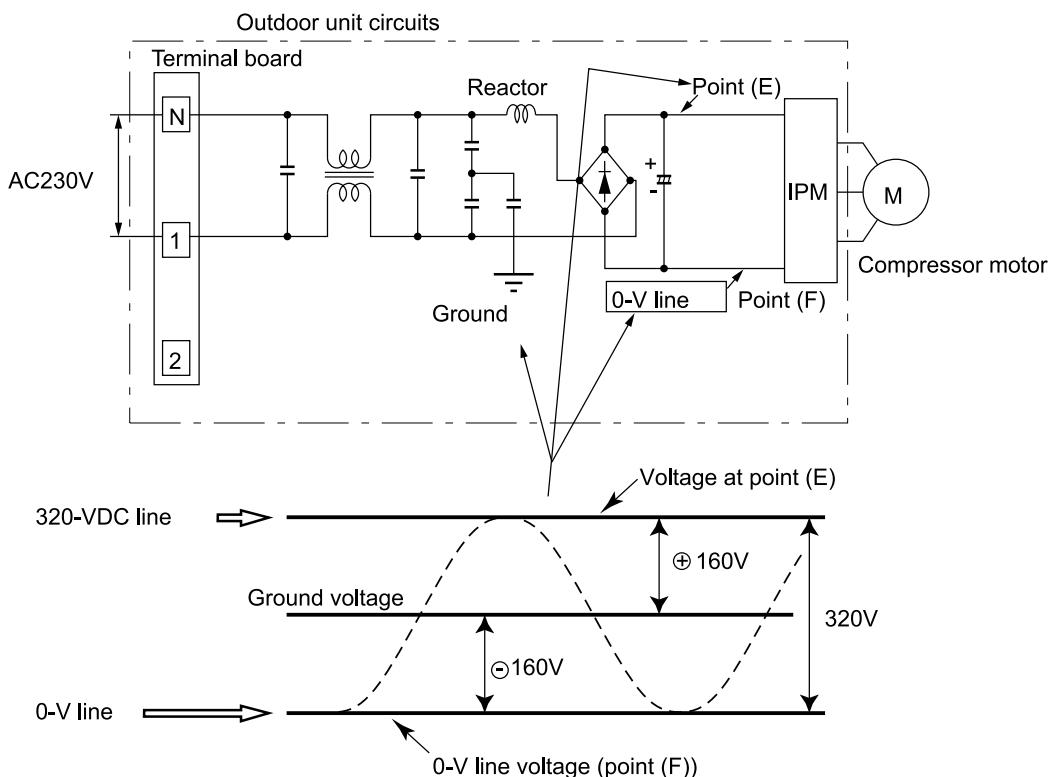
2. Caution in checking printed circuit boards (PWB)

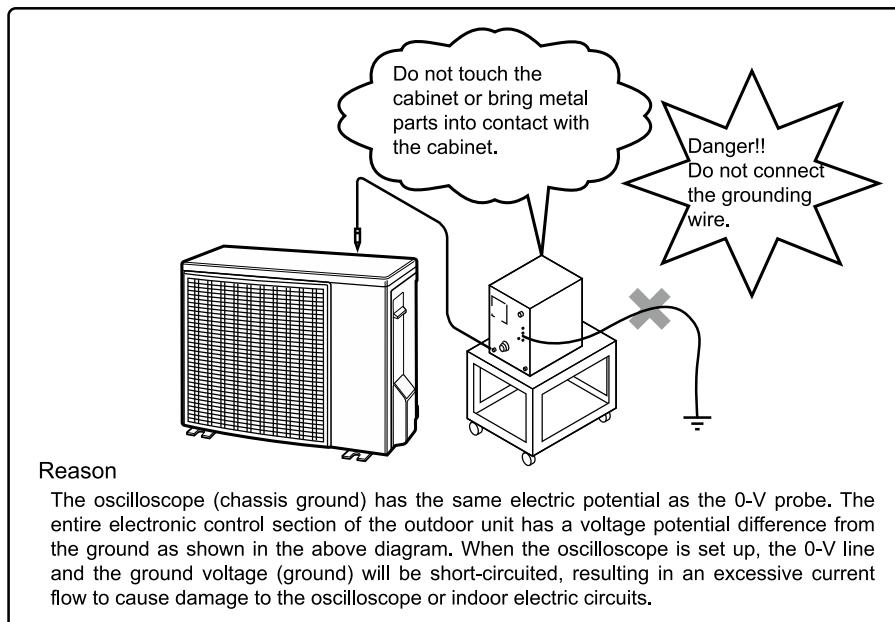
2.1. Non-insulated control circuit

The GND terminals of the low-voltage circuits (control circuits for microcomputer and thermistors and drive circuits for expansion valve and relays) on the control printed circuit board (PWB) are connected to the compressor drive power supply (320-VDC negative terminal). Therefore, exercise utmost caution to prevent electric shock.

If a measuring instrument used for the test is grounded, its chassis (ground) has the same electric potential as the 0-V probe. Since non-insulated circuits have the following voltage potential difference from the ground, connection of the grounding wire results in a short-circuit between the 0-V line and the ground, thus allowing an excessive current to flow to the tester to cause damage.

If the sheaths of the thermistor lead wires or expansion valve lead wires inside the outdoor unit become damaged due to pinching by the front panel or other metal parts or contacting a pipe, a high voltage can flow and destroy the circuits. To prevent these problems, carefully conduct assembly work.



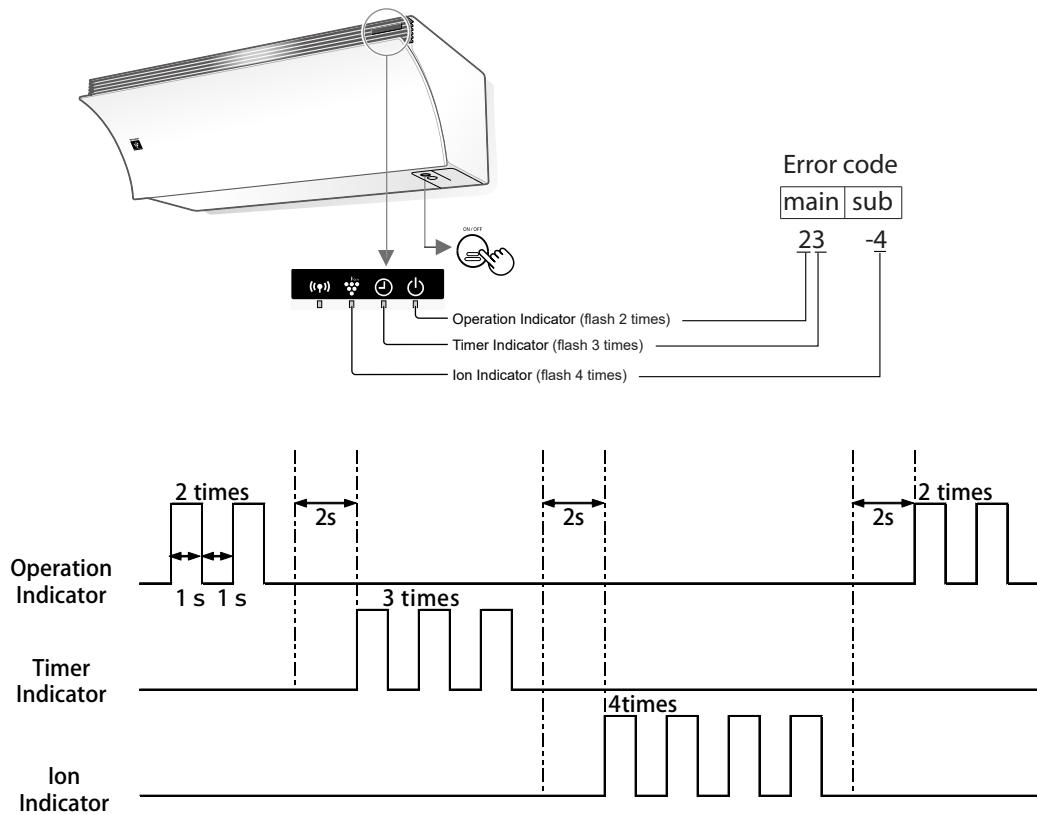


[8] TROUBLESHOOTING GUIDE

1. Self-Diagnosis Function

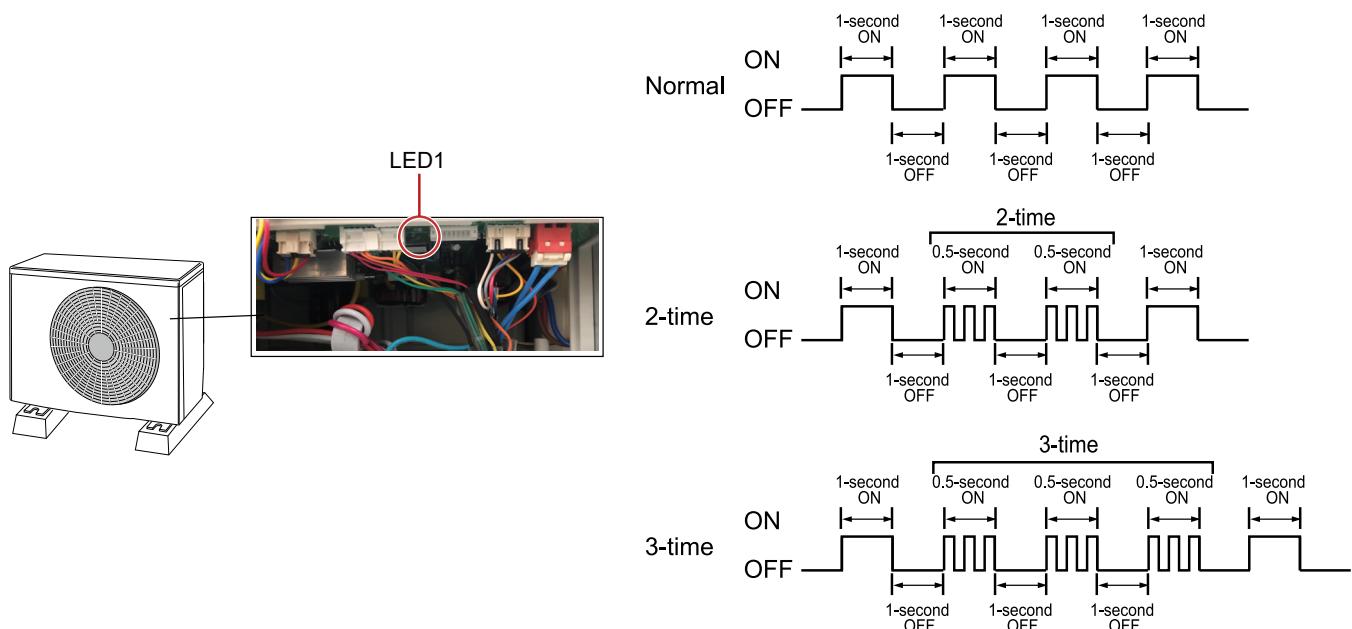
1.1 Indoor unit

- To display the self-diagnosis, hold down the ON/OFF button for over 5 seconds on the indoor unit when the indoor unit is not operating.
- The operation indicator (green), timer indicator (orange) and ion indicator (white) flash to indicate the information of malfunction. DC voltage level in each operation mode (varies depending on external load conditions)
- If the power cord is unplugged or the circuit breaker is turned off, the self-diagnosis memory is lost.



1.2. Outdoor unit

- The self-diagnosis is indicated the error information by flashing LED1 on the outdoor unit.
- The self-diagnosis of outdoor unit is displayed for about 3-10 minutes. Then, the LED1 returns to normal display.



2. Self-Diagnosis Function (By Remote control)

<Error code display by remote control character >

Example: Error 23-4.

STEP1

- To display the self-diagnosis, hold down \downarrow for over 5 seconds on remote control when the indoor unit and remote control are off.
- The remote control will display "00".

STEP2

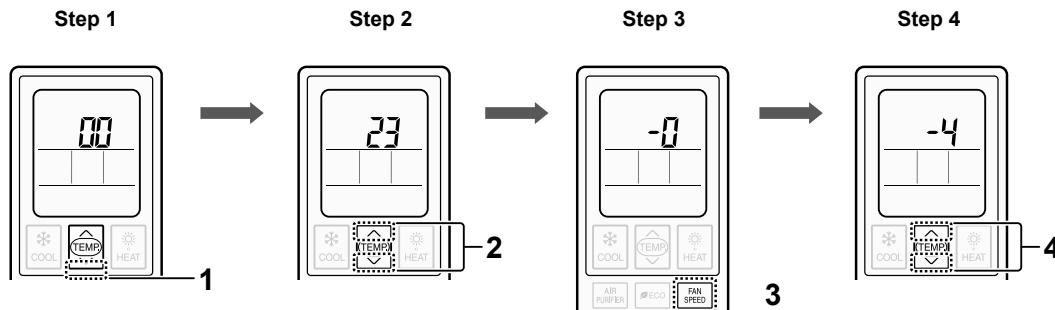
- Press \wedge and \vee , remote control display will change from "00" to "31" step by step.
- Meanwhile, buzzer makes a short beep sound on each step.
- When it displays "23", the buzzer will make a long beep sound to remind you this error code "23" is main error code.

STEP3

- Press $\frac{\text{FAN}}{\text{SPEED}}$ once, the remote control will display "-0".

STEP4

- then press \wedge and \vee , remote control display will change from "-0" to "-7" step by step.
- Meanwhile, buzzer makes a short beep sound on each step.
- When it displays "-4", the buzzer will make a long beep sound to remind you this error code "4" is sub error code.



3.Chart for Reading Self-Diagnosis

Depending on the model, some errors may not occur.

Problem symptom	Outdoor unit indication (LED1)	Malfunction No.*		Content of diagnosis		Check point	Action
		Main	Sub	Main	Sub		
Normal condition	Normal blinking	0	0	Normal			
Indoor and outdoor units do not operate.	1-time	1	0	Outdoor unit thermistor short-circuit	Heat exchanger thermistor short circuit error	1) Measure the resistance of the outdoor unit thermistors. 2) Check the lead wire of the outdoor unit thermistor for torn sheath and short circuit. 3) No abnormality found in above inspections 1) and 2).	1) Replace the outdoor unit thermistor assembly. 2) Replace the outdoor unit thermistor assembly. 3) Replace the outdoor unit control PWB assembly.
			1		Outdoor temperature thermistor short circuit error		
			2		Suction thermistor short circuit error		
			3		2-way valve thermistor short circuit error		
			4		Heatsink thermistor error	-	Replace the outdoor unit control PWB.
		5		Discharge thermistor short-circuit error	1) Measure the resistance of the outdoor unit thermistors. 2) Check the lead wire of the outdoor unit thermistor for torn sheath and short circuit. 3) No abnormality found in above inspections 1) and 2).	1) Replace the outdoor unit thermistor assembly. 2) Replace the outdoor unit thermistor assembly. 3) Replace the outdoor unit control PWB assembly.	
Indoor and outdoor units do not operate.	2-time	2	0	Cycle temperature	Compressor high temperature error	1) Check the outdoor unit air outlet for blockage. 2) Check if the power supply voltage is AC 230V at full power.	1) Ensure unobstructed air flow from the outdoor unit air outlet. 2) Connect power supply of proper voltage.
						3) Check the pipe connections for refrigerant leaks.	3) Charge the specified amount of refrigerant.
						4) Measure resistance of the outdoor unit compressor thermistor.	4) Replace the outdoor unit compressor thermistor assembly.
						5) Check the expansion valve for proper operation.	5) Replace the expansion valve coil, expansion valve or outdoor unit control PWB assembly.

Problem symptom	Outdoor unit indication (LED1)	Malfunction No.*		Content of diagnosis		Check point	Action
		Main	Sub	Main	Sub		
Indoor unit operates. Outdoor unit does not operate temporarily.	2-time	2	1	Cycle temperature	Compressor discharge overheat.	1) (Temporary stop for cycle protection)	-
			2		Outdoor unit heat exchanger overheat.		-
			3		Indoor unit heat exchanger overheat.		-
			4		IPM high temperature error	Measure resistance of the heat-sink thermistor.	-
			5		IPM high temperature error	1) Check the outdoor unit air outlet for blockage. 2) Check the outdoor unit fan for proper rotation. 3) No abnormality found in above inspections 1) and 2).	1) Ensure unobstructed air flow from the outdoor unit air outlet. 2) Check the outdoor unit fan motor. 3) Replace the outdoor unit control PWB.
Indoor unit operates. Outdoor unit does not operate temporarily.	3-time	3	0	Dry operation	Temporary stop due to dehumidifying operation	1) (Temporary stop for cycle protection).	-
Indoor and outdoor units do not operate.	5-time	5	0	Outdoor unit thermistor open-circuit	Heat exchanger thermistor open circuit error	1) Check connector of outdoor unit thermistor for secure installation. 2) Measure resistance of outdoor thermistors. 3) Check the lead wires of thermistors on the outdoor unit control PWB for open-circuit. 4) No abnormality found in above inspections 1) through 3).	1) Correct the installation. 2) Replace the outdoor unit thermistor assembly. 3) Replace the outdoor unit thermistor assembly. 4) Replace the outdoor unit control PWB assembly.
			1		Outdoor temperature thermistor open circuit error		
			2		Suction thermistor open circuit error		
			3		2-way valve thermistor open circuit error		
			4		Discharge thermistor open circuit error		
			5		Heat sink thermistor open circuit error		
Indoor and outdoor units do not operate.	6-time	6	0	Outdoor unit DC Current	DC over current error	-	Replace the outdoor unit IPM PWB assembly.
			1		IPM pin level error	Check the IPM is attached correctly to the outdoor unit IPM PWB.	
			2		Compressor rotation error	1) Check the IPM and Heat Sink is attached correctly to the outdoor unit IPM PWB. 2) Check the outdoor unit fan motor. 3) No abnormality found in above inspections 1) and 2).	1) Correct the installation & Silicone grease application. 2) Replace the outdoor unit fan motor. 3) Replace the outdoor unit PWB assembly.
			3		Other factors	•Cycle error •Overheat judgment thermistor off •Filter and Heat Exchange dust clogging	(See flowchart)

Problem symptom	Outdoor unit indication (LED1)	Malfunction No.*		Content of diagnosis		Check point	Action
		Main	Sub	Main	Sub		
Indoor and outdoor units do not operate.	7-time	7	0	Outdoor unit AC Current	AC over current error	1) Check the outdoor unit air outlet for blockage. 2) Check the outdoor unit fan for proper rotation.	1) Ensure unobstructed air flow from the outdoor unit air outlet. 2) Check the outdoor unit fan motor.
			1		AC current error when OFF	1) IPM continuity check.	1) Replace the outdoor IPM PWB.
			2		AC maximum current error	1) Check the outdoor unit air outlet for blockage. 2) Check the outdoor unit fan for proper rotation.	1) Ensure unobstructed air flow from the outdoor unit air outlet. 2) Check the outdoor unit fan motor.
			3		AC current deficiency error	1) Check if there is an open-circuit in the secondary winding of the current transformer of the outdoor unit control PWB. 2) Check if the refrigerant volume is abnormally low. 3) Check if the refrigerant flows properly.	1) Replace the outdoor unit control PWB assembly. 2) Charge the specified amount of refrigerant. 3) Correct refrigerant clogs. (Stop valve, pipe, expansion valve).
		8	0	Abnormal wire check	Abnormal wire check error	1) Check the expansion valve. (unit A - C) 2) Are four expansion valves connected by mistake. 3) Check the wiring between units.	1) Replace the outdoor control board assembly. 2) Reattach 3) Check the wiring between units.

Problem symptom	Outdoor unit indication (LED1)	Malfunction No.*		Content of diagnosis		Check point	Action
		Main	Sub	Main	Sub		
Indoor and outdoor units do not operate.	9-time	9	0	Cycle temperature	Thermistor installation error or 4-way valve error.	1) Check the thermistor (heat exchanger) and (2-way valve) are installed in correct positions.	1) Correct the installation.
						2) Check resistance of thermistors (heat exchanger and 2-way valve).	2) Replace the outdoor unit thermistor assembly.
						3) Check the 4-way valve for proper operation.	3) Replace the 4-way valve.
		4		4 way valve error or Gas leak error.	1) Check the indoor/outdoor heat exchanger thermistors are installed in correct positions. 2) Check if the refrigerant volume is abnormally low. 3) Check the 4-way valve for proper operation.	1) Check the indoor/outdoor heat exchanger thermistors are installed in correct positions.	1) Correct the installation.
						2) Check if the refrigerant volume is abnormally low.	2) Change the specified amount of refrigerant.
						3) Check the 4-way valve for proper operation.	3) Replace the 4-way valve.
		5		2-way valve and 3-way valve close error	1) Check the 2-way valve and 3-way valve. 2) Check the thermistor (heat exchanger) are installed in correct positions. 3) Check the expansion valve operation.	1) Open the 2-way valve and 3-way valve.	1) Open the 2-way valve and 3-way valve.
						2) Correct the installation.	2) Correct the installation.
						3) Replace Expansion valve coil or Expansion valve or the outdoor unit control PWB assembly.	3) Replace Expansion valve coil or Expansion valve or the outdoor unit control PWB assembly.
Indoor and outdoor units do not operate.	10-time	10	0	EEPROM error	EEPROM (outdoor) data error EEPROM (outdoor) data error CPU(outdoor) RAM data error CPU error	-	1) Replace the outdoor unit control PWB assembly.
		4	EEPROM Mutual memory error	Indoor or outdoor EEPROM data error	-	Rewrite EEPROM data of indoor unit or outdoor unit.	-
		5	EEPROM Mutual memory operation	EEPROM data saving mutually	-	-	-

Problem symptom	Outdoor unit indication (LED1)	Malfunction No.*		Content of diagnosis		Check point	Action
		Main	Sub	Main	Sub		
Indoor and outdoor units do not operate.	11-time	11	0	Outdoor unit DC fan	Outdoor unit DC fan rotation error	1) Check connector CN3 of the outdoor unit DC fan motor for secure installation. 2) Check the outdoor unit fan motor for proper rotation. 3) Check fuse FUSE5. 4) Outdoor unit control PWB	1) Correct the installation. 2) Replace the outdoor unit fan motor. 3) Replace the outdoor unit control PWB assembly. 4) Replace the outdoor unit control PWB assembly.
			1		Outdoor unit DC fan driver IC error	1) Check if the fan IPM terminal resistance values are uniform. 2) Outdoor unit fan motor continuity check.	1) Replace the outdoor unit control PWB assembly. 2) Replace the outdoor unit fan.
			2		Outdoor unit DC fan lock error	1) Check if the fan IPM terminal resistance values are uniform. 2) 1): Normal	1) Replace the outdoor unit control PWB assembly. 2) Replace the outdoor unit fan.
			3	Outdoor unit DC fan	Detection error of DC fan negative rotation before compressor is driven	1) (Temporary stop for DC fan circuit protection)	-
			4		Detection error of inverter current for DC fan	-	1) Replace the outdoor unit control PWB assembly.
			5	Outdoor unit DC fan open connector error	1) Check connector CN3 of the outdoor unit DC fan motor for secure installation. 2) No abnormality found in above inspection 1).	1) Correct the installation. 2) Replace the outdoor unit control PWB assembly.	
Indoor and outdoor units do not operate.	12-time	12	0	Thermal fuse in terminal board	Thermal fuse error in terminal board (for power supply)	1) Check the thermal fuse in terminal board (for Power supply) 2) Check connector CN5 of the outdoor unit. 3) 1) 2): Normal	1) Replace terminal board for Power supply. 2) Correct the installation. 3) Replace the outdoor unit control PCB assembly.

Problem symptom	Outdoor unit indication (LED1)	Malfunction No.*		Content of diagnosis		Check point	Action
		Main	Sub	Main	Sub		
Indoor and outdoor units do not operate.	13-time	13	0	Compressor error	Compressor winding short circuit	-	Replace Compressor.
			1		Compressor winding open etc.		
			2		compressor Lock		
			3	over current pause	(pause to protect the outdoor unit control PWB)	-	-
Indoor and outdoor units do not operate.	14-time	14	0	Outdoor unit PAM3	PAM over voltage error	1) Check the AC power supply voltage for fluctuation. 2) No abnormality found in above inspection.	1) Correct the installation. 2) Replace the PWB assembly.
			1		PAM clock error	1) Check the PAM clock for proper input.	1) Replace the outdoor unit control PWB assembly.
			2	Abnormal power supply voltage / DC low voltage.	-	1) Check the AC power supply voltage for fluctuation. 2) No abnormality found in above inspection.	1) Correct the installation. 2) Replace the PWB assembly.
			17	0	Wiring between units	Serial open circuit 1) Check the wires between units. 2) Check voltage between N and 1 the indoor/outdoor unit terminal boards. 3) Check the outdoor unit fuse. 4) Check voltages of 15V-0V,12V-0V and 5V-0V on the PWB. 15V-0V :15V 12V-0V :12V 5V-0V :5V Check resistance between IPM terminals. 5) No abnormality found in above inspections 1) through 4).	1) Connect stable power supply. Correct the wiring. 2) Replace the outdoor unit control PWB assembly. 3) Replace the fuse/ outdoor unit control PWB assembly. 4) Replace the outdoor unit control PWB assembly. 5) Replace the outdoor unit control PWB board.
Indoor unit operates. Outdoor unit does not operate.	Lighting or OFF	18	0	Wiring between units	Serial short-circuit	1) Check the wiring between units.	1) Correct the wiring.
			1		Serial erroneous wiring	1) Check the wiring between units.	1) Correct the wiring.
			2	High speed serial error	-	Check the wiring between unit.	1) Correct the wiring. 2) Replace the outdoor unit control PWB board. 3) Replace the indoor unit control PWB board.

Problem symptom	Outdoor unit indication (LED1)	Malfunction No.*		Content of diagnosis		Check point	Action
		Main	Sub	Main	Sub		
Indoor and outdoor units do not operate.	Normal blinking or OFF	19	0	Indoor unit fan	Indoor unit fan error	1) Check the indoor fan motor for proper rotating operation.(Check fan lock.)	1) Replace the indoor fan motor.
						2) Check the lead wire of the indoor fan motor for open-circuit.	2) Replace the indoor fan motor.
						3) Check connector of the indoor unit fan motor for secure installation	3) Correct the installation of the indoor fan motor connector.
						4) No abnormality found in above inspections 1) through 3).	4) Replace the indoor unit control PWB
Indoor and outdoor units do not operate.	Normal blinking or OFF	20	0	Indoor unit control PWB	EEPROM data error	1) (EEPROM read data error)	1) Replace the indoor unit control PWB
			4	EEPROM Mutual memory error	Indoor or outdoor EEPROM data error	-	Rewrite EEPROM data of indoor unit or outdoor unit.
Indoor and outdoor units operate	Normal blinking or OFF	24	0	Wireless LAN	Wireless adapter communication error	1) Check Wireless adapter and related circuit.	1) Confirm assembly. 2) Confirm wireless adapter.
			1		Wireless router connection error	1) Check Wireless router. 2) Check Internet.	1) Confirm connecting with wireless router. 2) Confirm setting of wireless router. 3) Confirm connecting of internet.
			2		Internet communication error		
			3		communication with server error		
Indoor and outdoor units do not operate	Normal blinking or OFF	25	1	AC clock error	-	Check the circuit of making AC clock	Replace the indoor unit control PWB
Indoor and outdoor units do not operate	Normal blinking or OFF	26	1	Indoor unit room temperature thermistor	Indoor unit room temperature thermistor	1) Check connector of thermistor for secure installation. 2) Check the temperature properties of the thermistor.	1) Replace the thermistor.
			2	Indoor unit heat exchanger thermistor	Indoor unit heat exchanger thermistor		
			3	Indoor unit liquid pipe thermistor	Indoor unit liquid pipe thermistor		
			4	Indoor unit gas sensor	Indoor unit gas sensor	1) Check connector of sensor for secure installation. 2) Check the wiring between unit and sensor. 3) 1 and 2 is no problem	1) Confirm connecting with sensor. 2) Replace the wire. 3) Replace the sonson. If the phenomenon is not impromved, replace the main PWB.
			5	Indoor unit dust sensor	Indoor unit dust sensor		
			6	Indoor unit room themperature and humidity sensor IC	Indoor unit room themperature and humidity sensor IC		
Indoor and outdoor units do not operate.	Normal blinking or OFF	28	3	main filter removal error	main filter removal error	1)Is the filter securely installed? 2) Check the filter switch lead wires	1) Install the filter correctly 2) Replace the switch

4. OTHER MALFUNCTION ERROR INDICATIONS / BUZZERS

4.1 LED lamp indications during malfunction

MALFUNCTION	Blinking LED Lamps *Any LED lamp keeping lit and is not blinking indicates normal operation and setting				
	OPERATION (WHITE)	TIMER (ORANGE)	WLAN (WHITE)	PLASMACLUSTER (WHITE)	Main error code and details
Serial open circuit					17, Serial open circuit
Wireless LAN adapter communication error					24, Wireless LAN adapter communication errors · Wireless adapter communication error · Wireless router connection error · Internet communication error · Server connection error

4.2 LED lamp indications during normal operation

INDICATION	Blinking LED Lamps						
	OPERATION (WHITE)	OPERATION (GREEN)	TIMER (ORANGE)	WLAN (WHITE)	PLASMACLUSTER (WHITE)	Clean Indicator (Red--Yellow--Blue)	Notes
Pre-Filter Cleaning Recommendation						Blue/Green blink for 10 seconds	Cumulative operation hours over 720 hours.
Main-Filter Cleaning Recommendation						Yellow blink for 10 seconds	Filter life is approximately 1.5 to 2 years but the end of life may come earlier depending on the total operating time and environment.
-27°C(-17°F) Auto OFF	Continuous blinking.						The unit turns off automatically when outside temperature is below -27°C (-17°F) and prevent damages to the outdoor unit.
Filter Error	Continuous blinking.					Red	Fliter Bracket is not properly installed.
In Defrost		 Blinking slowly	According to the operation settings.				During HEAT mode, ice may form in the outdoor unit. In such an event, the unit starts defrosting automatically and provides heat to the outdoor unit for about 5 to 10 minutes to remove the ice.

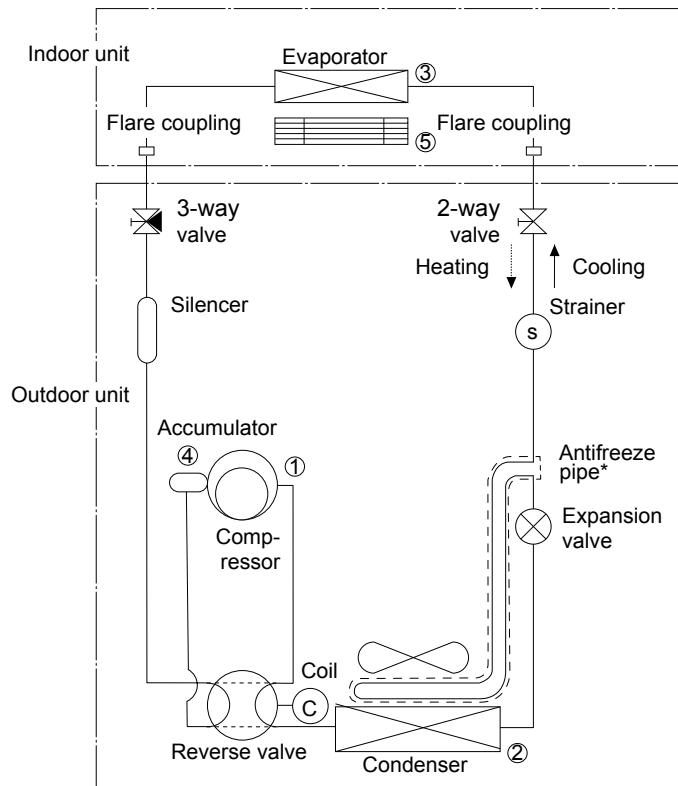
4.3 Errors without indication

When EEPROM data has errors/problems at power supply connection, buzzer will beep continuously and all LED lamps remain OFF.
Malfunction indications due to wiring error during installation.

	Inter-unit wiring error mode	Symptoms
1		The unit stops operation. Malfunction diagnosis displays nothing. (Remote control also displays nothing when malfunction code is called out.)
2		The unit stops operation. Malfunction diagnosis displays nothing. (Remote control also displays nothing when malfunction code is called out.)
3		The unit stops operation. Malfunction diagnosis displays "18-1". (Remote control also displays "18-1" when malfunction code is called out.)
4		The unit stops operation. Malfunction diagnosis displays nothing. (Remote control also displays nothing when malfunction code is called out.)
5		The unit stops operation. Malfunction diagnosis displays "18-1". (Remote control also displays "18-1" when malfunction code is called out.)

CHAPTER 5. REFRIGERATION CYCLE

[1] SCHEMATIC DIAGRAM



[2] STANDARD CONDITION

	Indoor side		Outdoor side	
	Dry-bulb Temp. (°F)	Relative Humidity (%)	Dry-bulb Temp. (°F)	Relative Humidity (%)
Cooling	80(26.7)	51(19.4)	95 (35.0)	-
Heating	70(21.1)	-	47 (8.33)	73

*Refrigerant Pile Length: 25feet(7.6m)

[3] PEAK OPERATION CURRENT

Mode	Peak Control Current (A)			
	Cooling		Heating	
Outdoor Air Temp.	<104°F (<40°C)	≥104°F (≥40°C)	<54°F (<12°C)	≥54°F (≥12°C)
	7.0	7.0	9.1	7.5

[4] TEMPERATURE AT EACH PART AND PRESSURE IN 3-WAY VALVE

(AY-XP12CPU / AE-X12CPU)

ITEM	Cooling		Heating	
	Max	Test Run	Max	Test Run
Temp. on (1) °F(°C)	85	68	82	65
Temp. on (2) °F(°C)	38	40	2	3

Temp. on (3) °F(°C)	10	14	32	23
Temp. on (4) °F(°C)	6	13	0	4
Outlet Air Temp. on (5) °F(°C)	12	15	43	32
3-way valve pressure (MPaG)	0.9	1.1	3.0	2.2
AC Current (A)	6.5	3.6	7.2	3.2

Caution: Indoor fan speed is set to [HIGH]

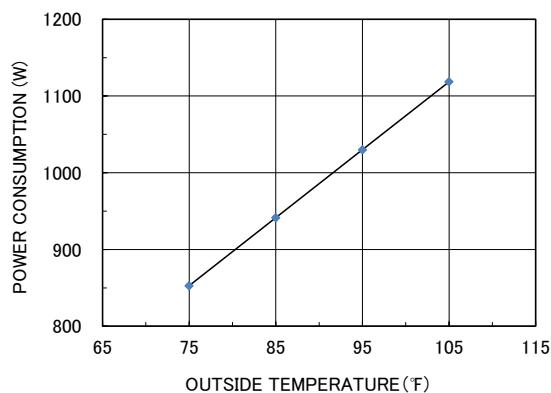
AC Voltage is set to 230V

[4] PERFORMANCE CURVES

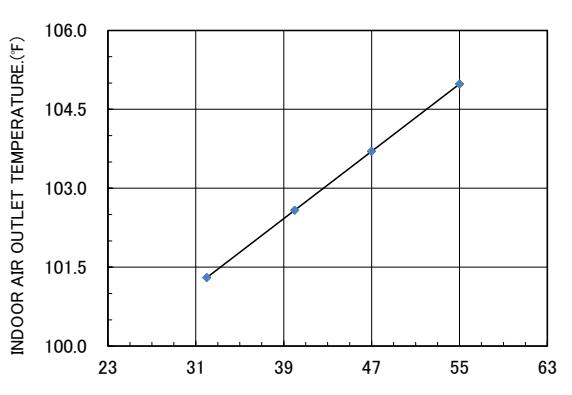
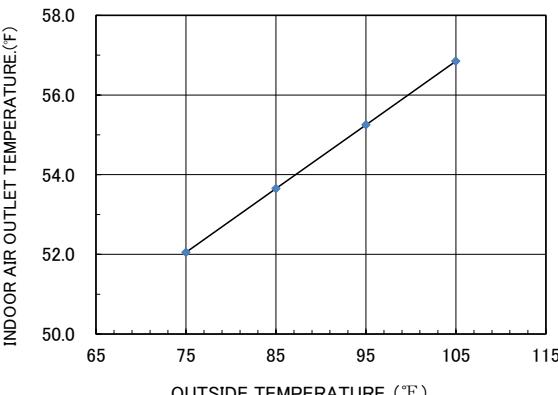
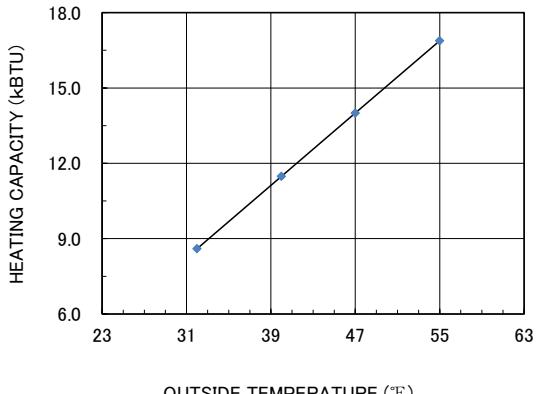
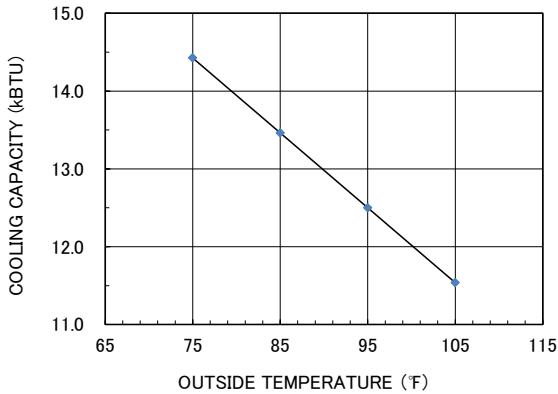
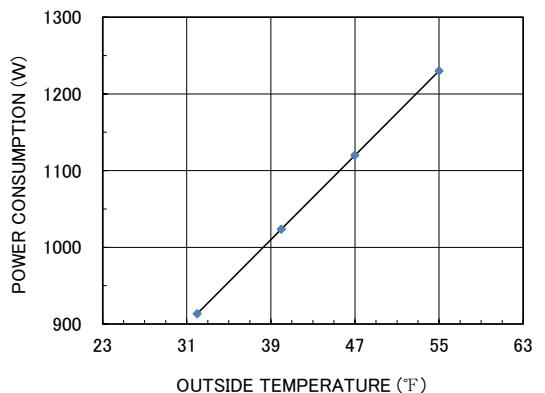
NOTE

- 1) Indoor fan speed: High
- 2) Indoor air temp.: Cooling 80°F
- 3) Power source: 230V, 60Hz

COOLING



HEATING



CHAPTER 6. DISASSEMBLY PROCEDURE

If, in carrying out repairs and modifications, the work requires the use of arc- and flame-producing apparatus, such as welding , brazing and soldering equipment, this work shall only be started after the rooms have been thoroughly ventilated. While the work is being carried out , the mechanical ventilation, if any, shall be kept in constant operation and all windows and doors kept open. In the case of repairs to parts of the refrigerant circuit, it may be necessary that not only the workman but also a second person shall be present for observation and assistance.

Necessary protective equipment shall be available and, in the case of open flames or arcs, fire extinguishing apparatus shall be ready to hand. Welding and brazing shall be carried out by qualified workmen.

Be sure to disconnect the power cord from the AC power outlet before starting the disassembly procedure. When reassembling the unit after repairing, be sure to install screws to their original positions.

The screws used are not the same in specifications such as corrosion-resisstant treatment, tip shape and length.

After the air conditioner is repaired or parts are replaced, measure insulation resistance of the equipment using an insulation resistance meter. If the measured resistance is lower than $1M\Omega$, inspect parts and repair or replace defective parts.

[1] INDOOR UNIT

1. INDOOR UNIT

- Pull out the Filter Brackets.(Left and right)



- Remove Arch Louver as below step.

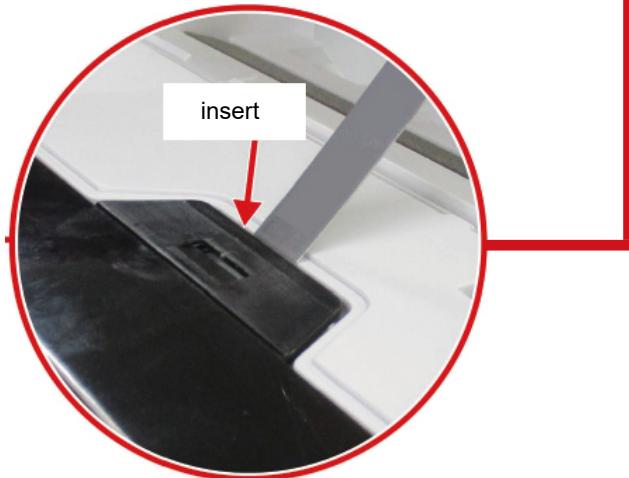
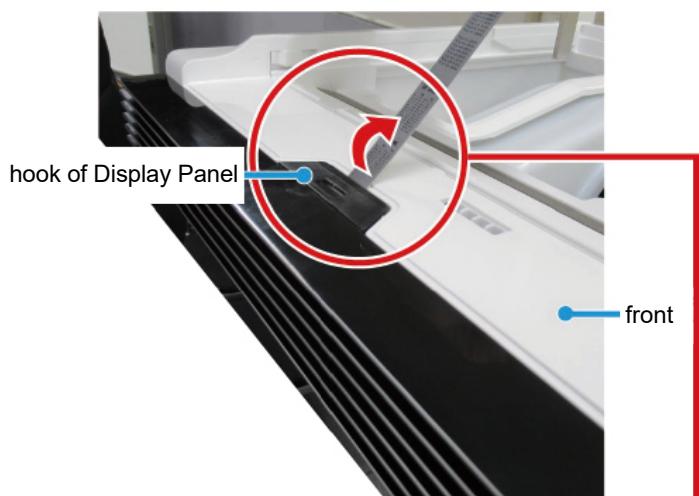
- Remove the two screws on both sides.
- Hold left and right sides from the bottom, lift the Arch Louver, remove it from the main shaft.



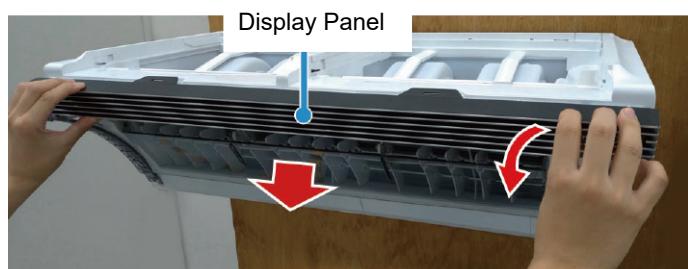


3. Remove the Display Panel.

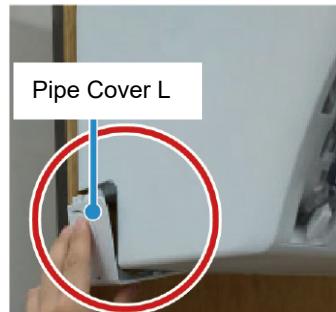
- (1) Insert a slotted screwdriver into the gap between Display Panel and Front Panel, and pry open the hook. (Both left and right side).



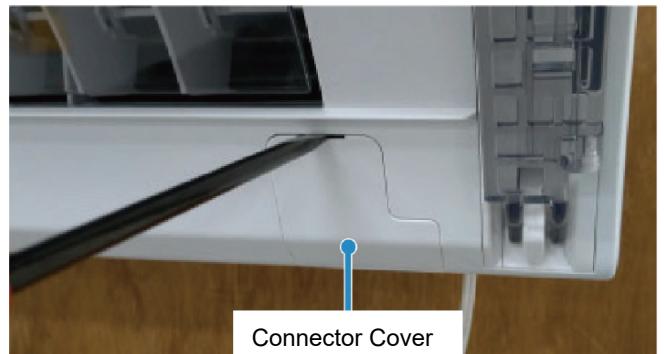
- (2) Hold both sides, then rotate it to front direction and remove.



4. Remove the Pipe Covers L and R.



5. Insert the slotted driver or other similar tool into the slit, and pry open the connector cover.



6. Remove the connector.



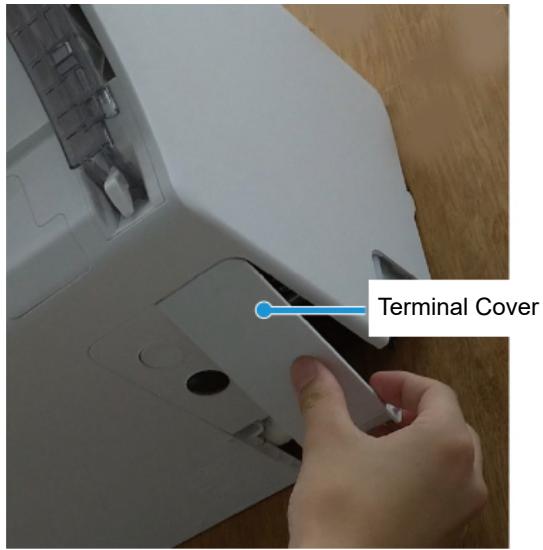
AY-XP12CPU

7. Remove the connecting cable.

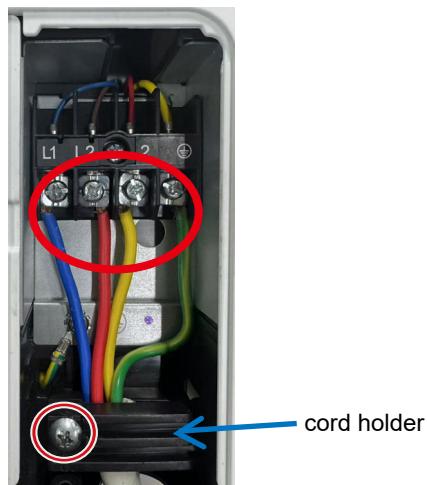
(1).Remove one screw.



(2) Pull down the Terminal Cover and remove it.



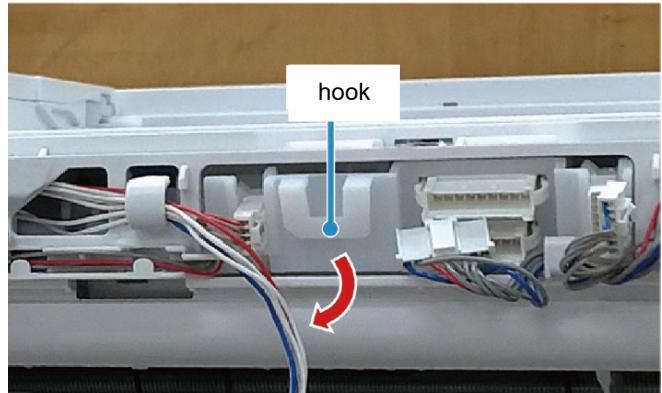
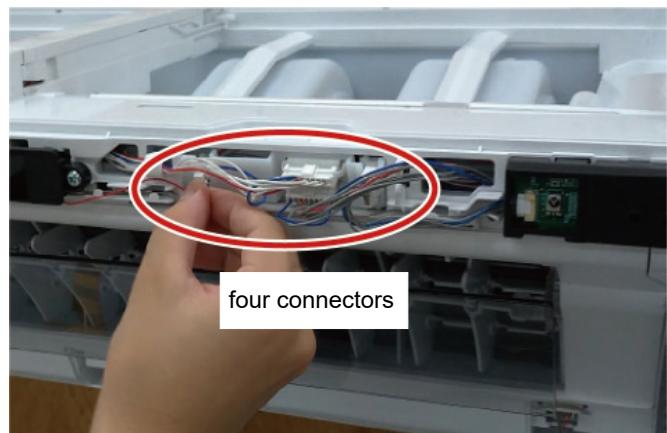
(3) Remove the screw (1 piece) and the cord holder, then remove the connecting cable.



8.Remove the connector.

(1) Remove four connectors.

(2) Remove the wire from the hook.

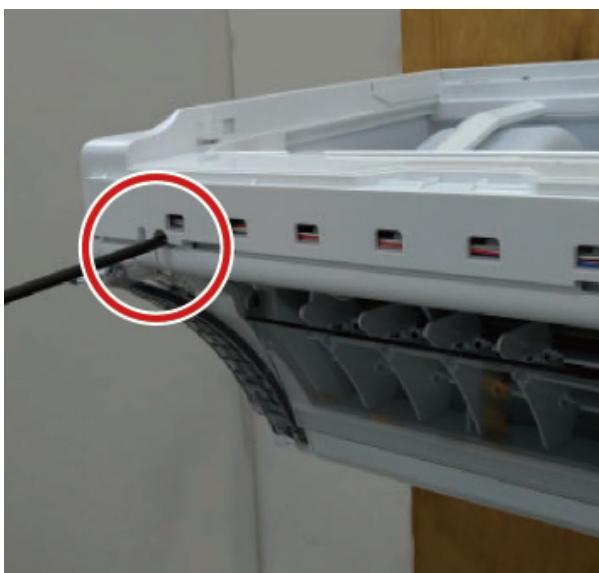


9. Take out the sensor filter frame by your fingers.

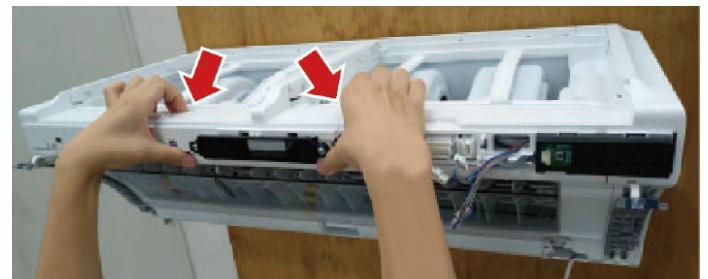


10. Remove the front panel.

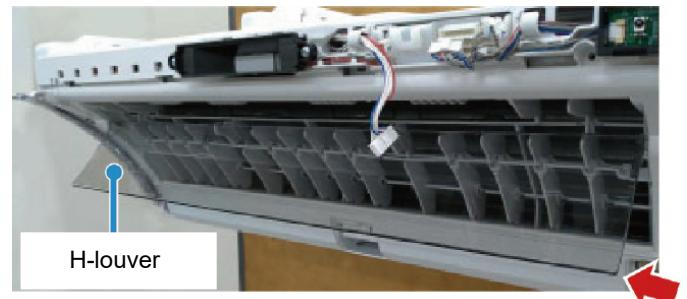
(1) Remove three screws.



(2) Press two hooks to release.



(3) Open the H-louver.



(4) Hold the front panel with both hands and pull it out.



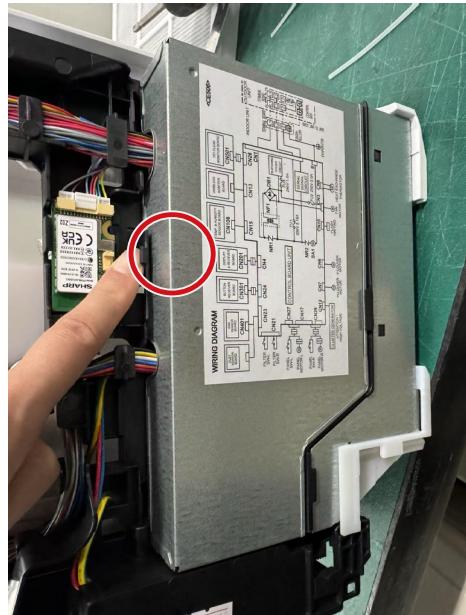
Front Panel



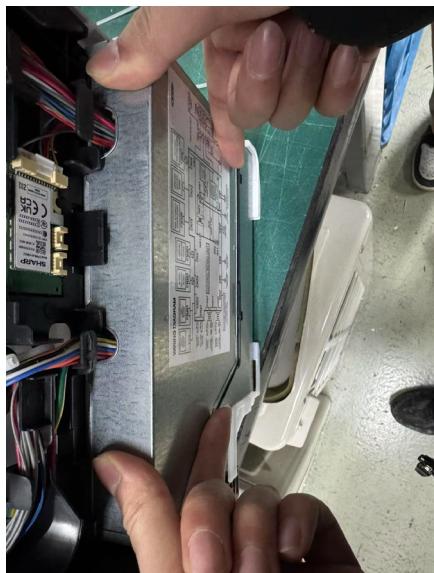
AY-XP12CPU

11. Remove the Control Box Cover.

(1) Unlock one hook.



(2) Remove the cover.

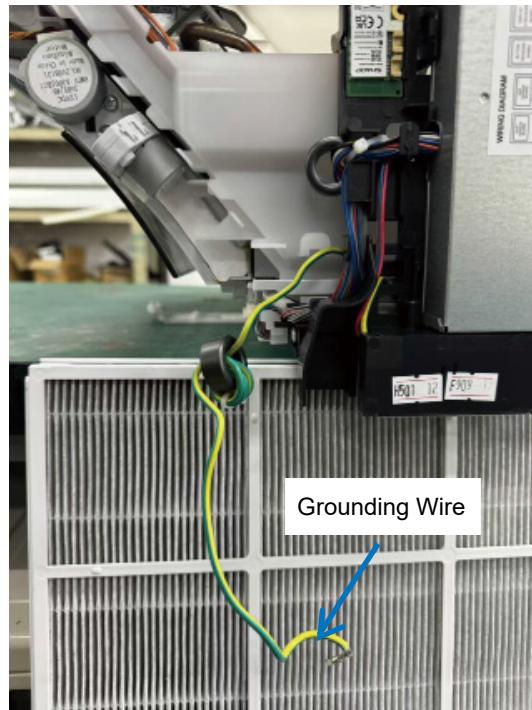


12. Remove the Earth wire.

(1) Remove this terminal.



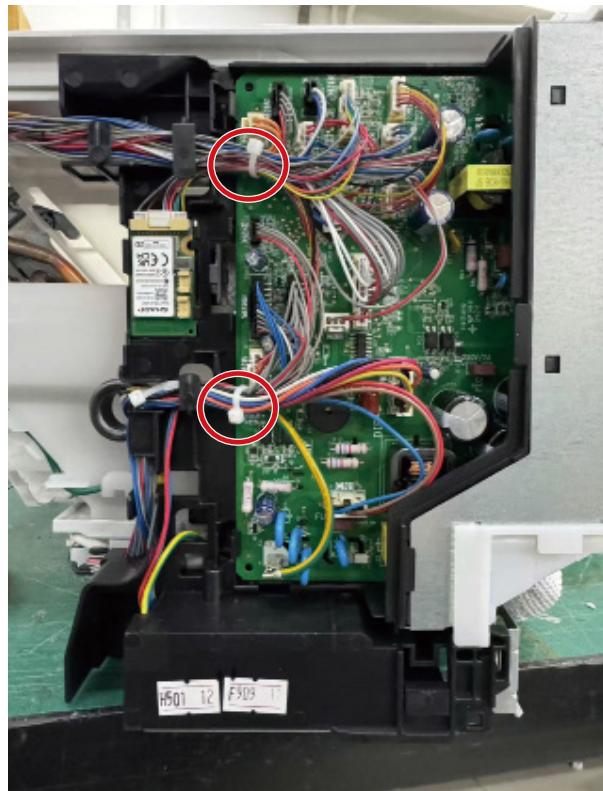
(2) Remove the Earth wire from the hook.



AY-XP12CPU

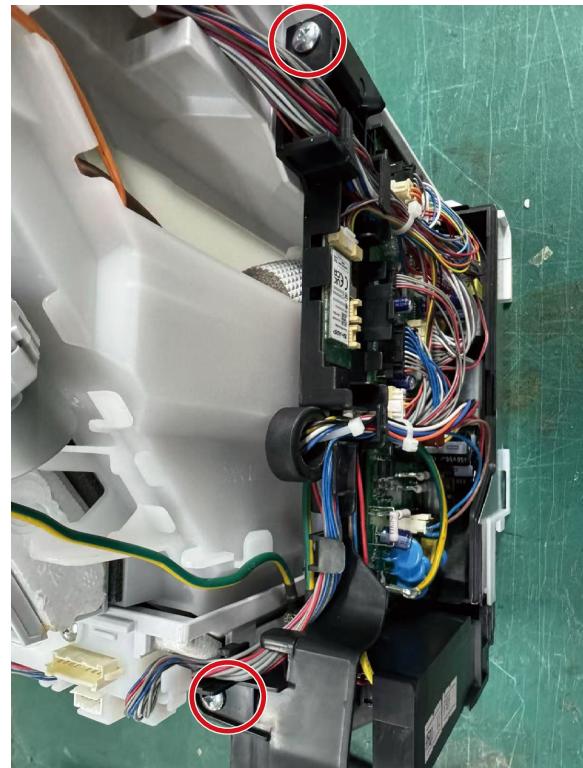
13. Remove the connector.

(1) Cut two fixing bands.

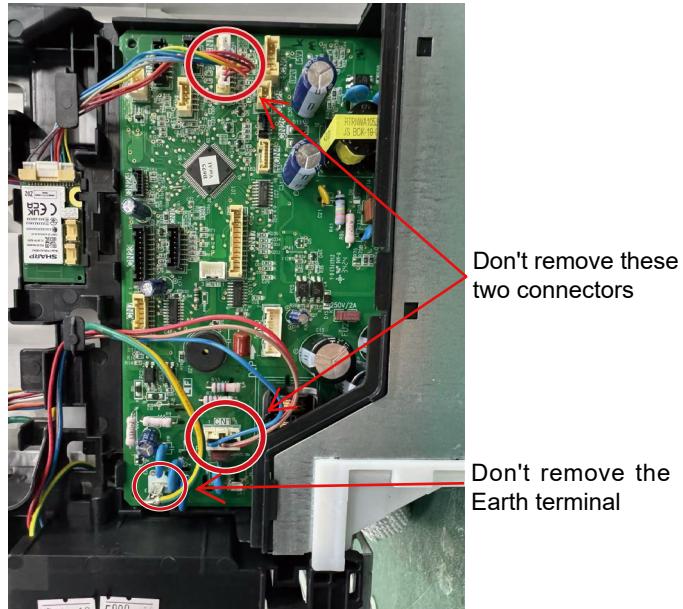


14. Remove the Control Box.

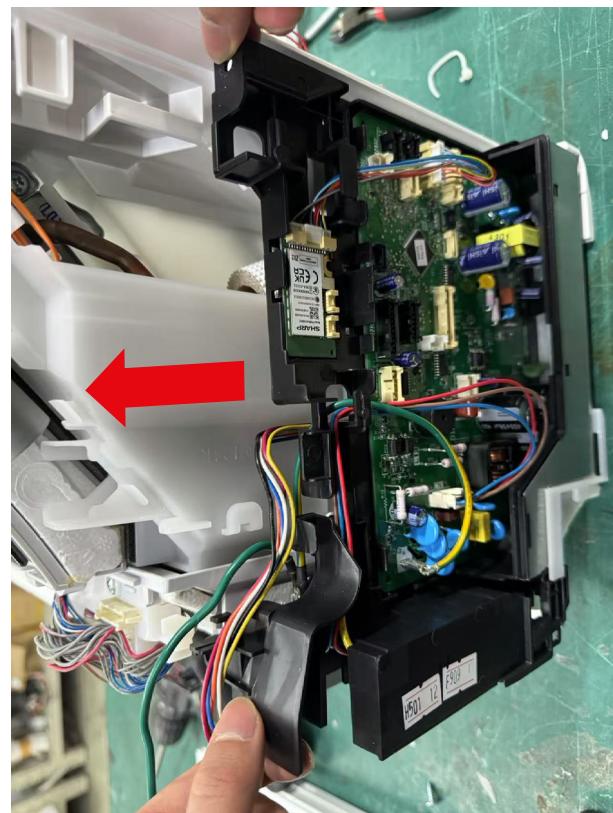
Remove two screws



(2) Remove all connectors except for three locations (CN1, CN13, Earth terminal).

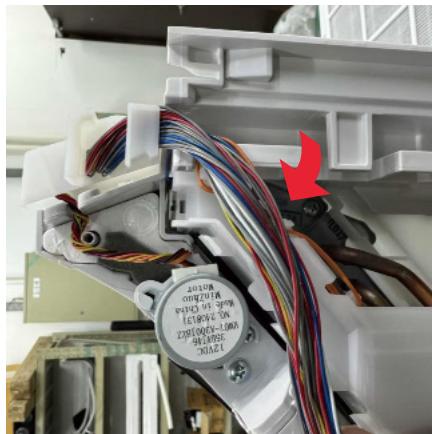


(2) Pull the Control Box downward and remove it.



15. Remove the louver frame.

(1) Remove the wiring on the right side from the hook.



Louver Frame



16. Remove the filter guide.

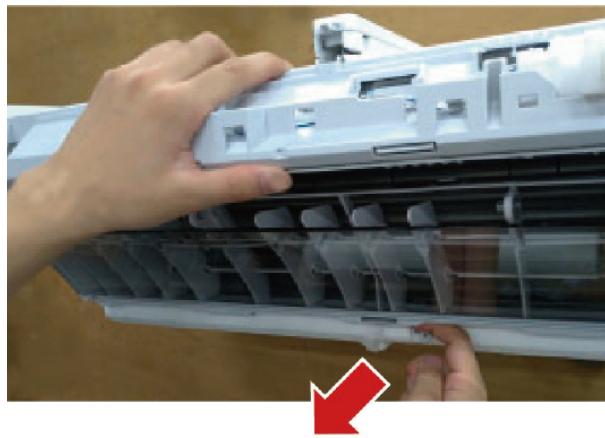
(1) Remove 3 screws.



(2) Remove four screws.



(3) Hold the louvre frame by hand and remove the hook at bottom centre by the other hand.



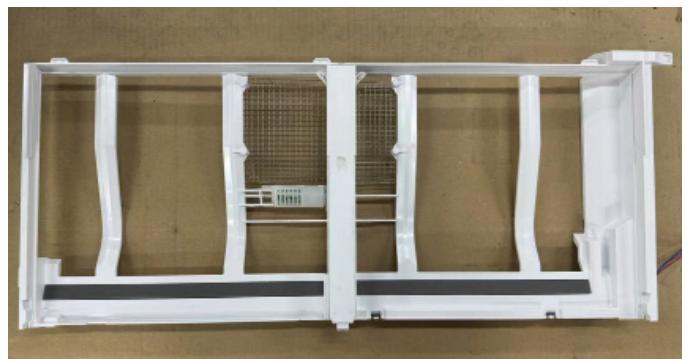
(2) Hold both sides of the filter guide and lift up.



(4) Remove the louver frame by holding top and bottom of it.



Filter Guide



AY-XP12CPU

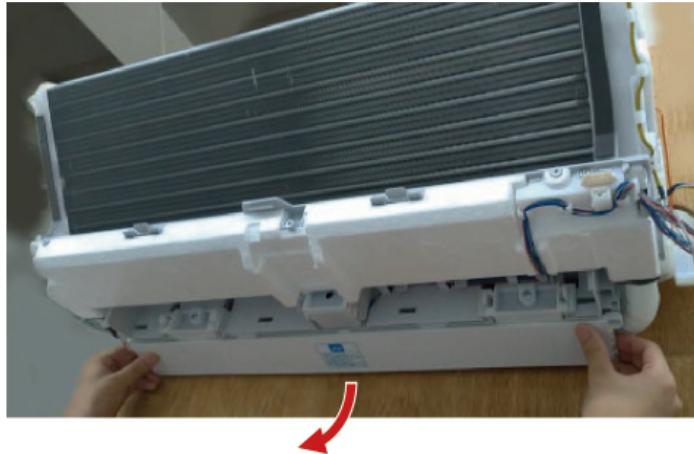
17. Remove the pipe cover centre.

(1) Remove the 2 screws at the bottom sides of both sides.



Installation Base

(2) Hold both sides and pull forward to remove.



Pipe Cover



18. Remove the Installation Base. (At two points, left and right)

(1) Remove two screws.



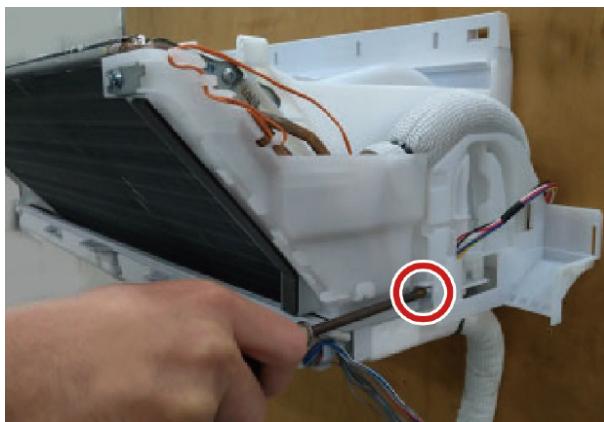
19. Remove the drain pan.

(1) Remove one screw on the left side.

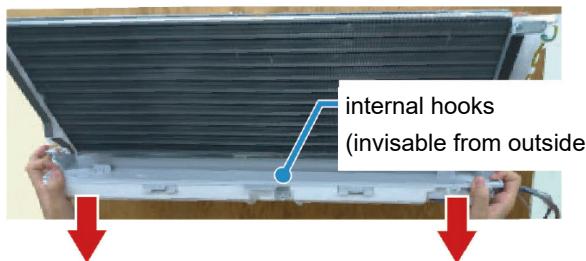


(2) Grip the hook from both sides and remove it, pulling it forward.

(2) Remove one screw on the right side.



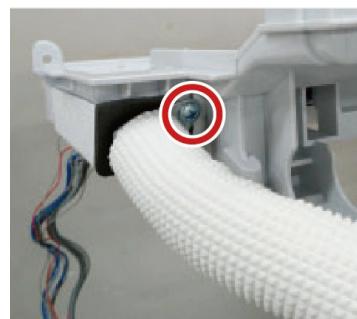
(3) Hold the Drain Pan on both sides, pull it down temporarily to remove the internal hooks, and then remove it in front.



Drain Pan



20. Remove one screw and pull out the drain hose from Drain Pan.

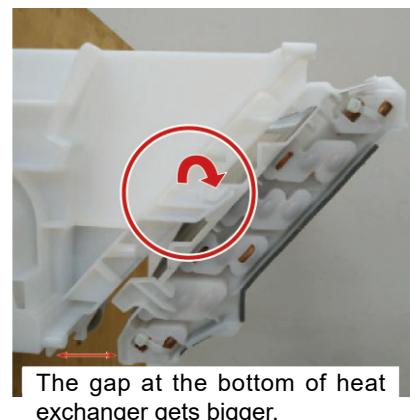


21. Move the heat exchanger forward.

(1) Remove two screws.



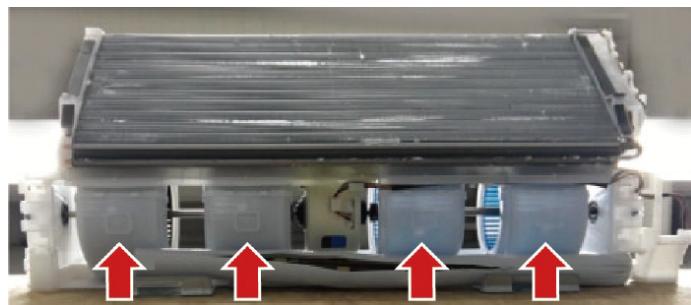
(2) Move the hook on left side of heat exchanger forward.



22. Remove the motor wire from the hook and let it hang down.

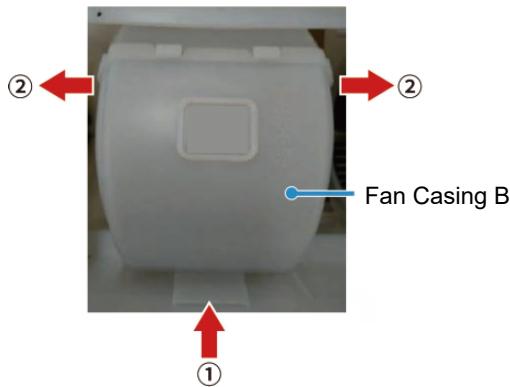


23. Remove four Fan Casing A and B.



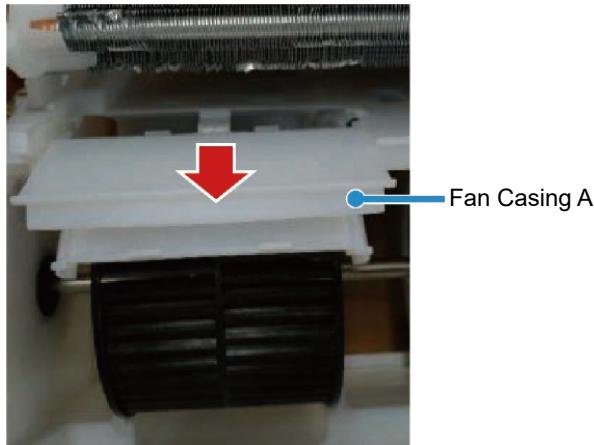
(1) Remove the Fan Casing B.

- ① Remove the hook on the wall side as the arrow direction.
- ② Unlock the hooks of both left and right as arrow directions and remove it, then take off the Fan Casing B.



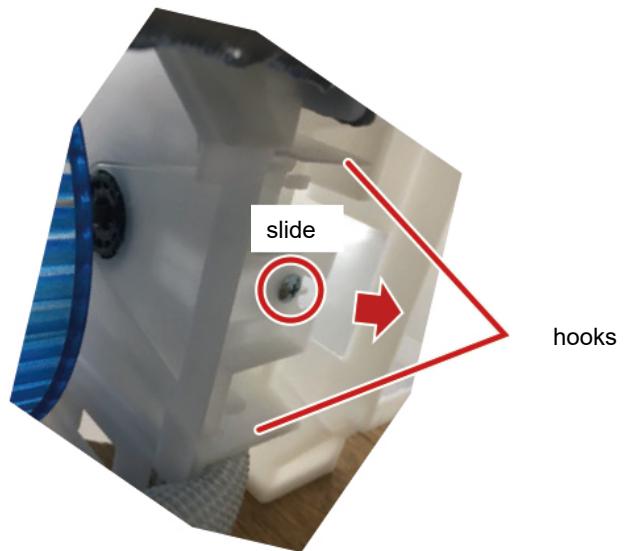
(2) Remove the Fan Casing A.

Remove Fan Casing A in the arrow direction (parallel to the heat exchanger).



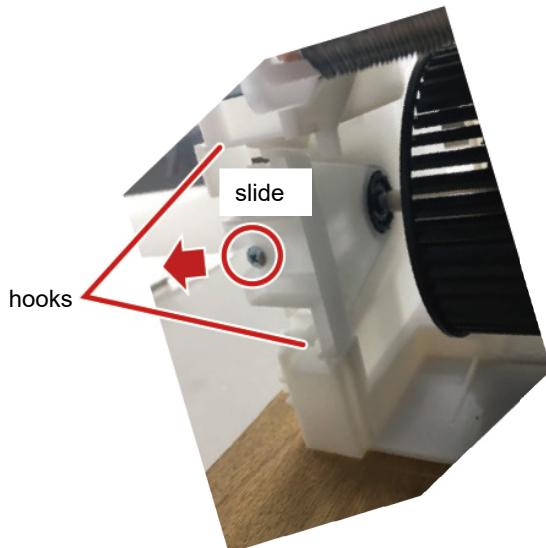
24. Slide the right bearing holder.

Remove one screw,pinch two hooks and slide.



25. Slide the left bearing holder.

Remove one screw,pinch two hooks and slide.

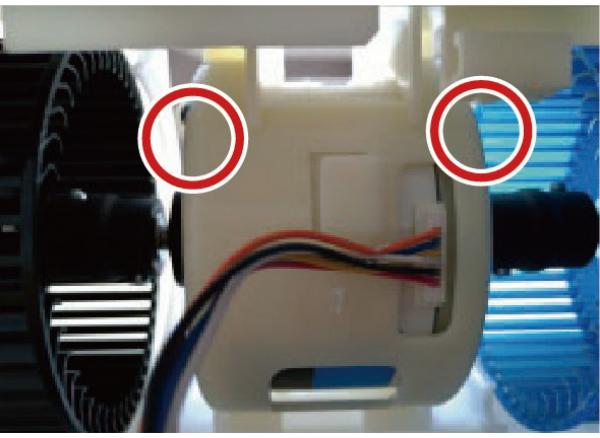
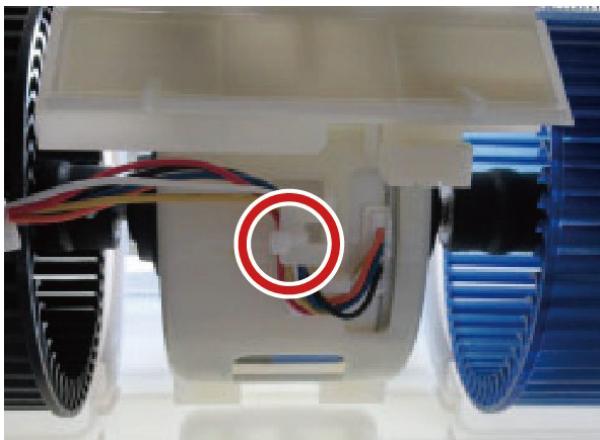


26.Extract the fan motor assembly (Fan Motor, Motor Cover, Fan) all at once.

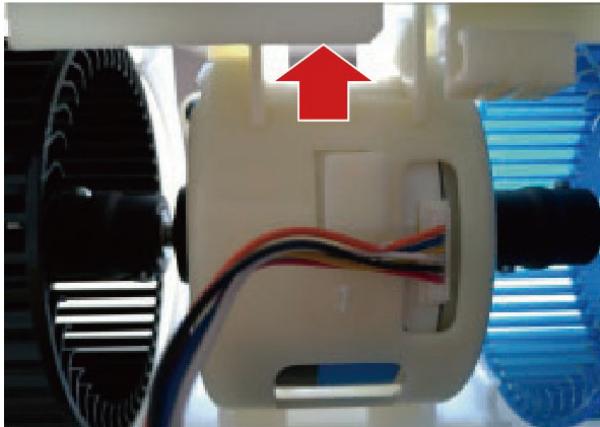
AY-XP12CPU

(1) Cut one fixing band.

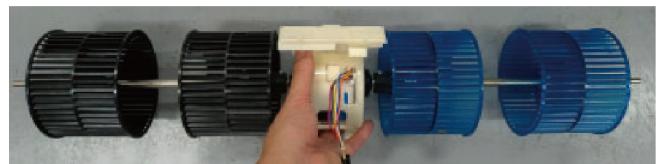
(2) Remove the two screws on the Motor Cover.



(3).Press in the arrow direction to release the hook, take it out by holding Motor Cover.



Fan motor assembly after extracted

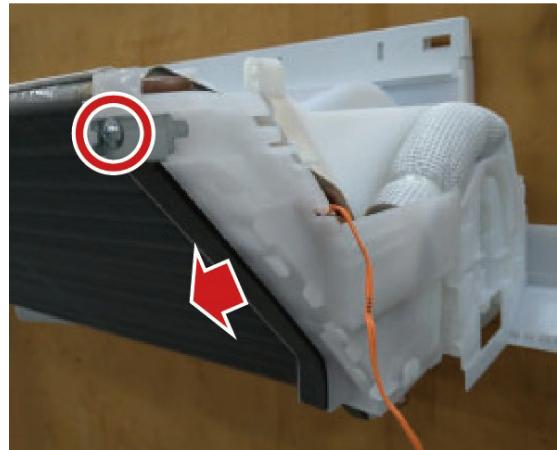


27.Remove the Drain Cover.

(1) Remove the wire from the hook.



(2) Remove one screw and remove Drain Cover.



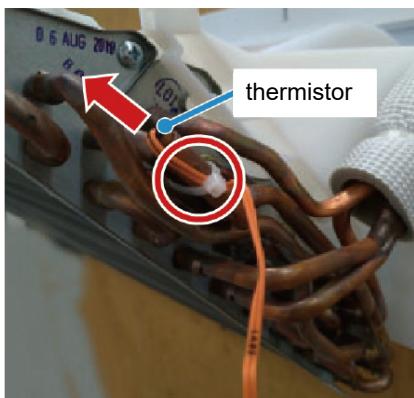
Caution!

Don't remove this screw of each fan



28. Remove the thermistor.

Cut one fixing band and remove thermistor.



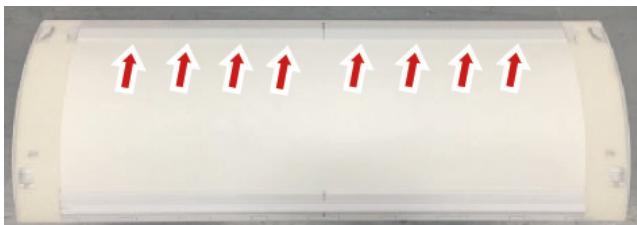
After removed.



2) PANEL ASS'Y

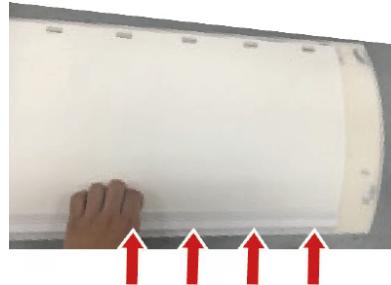
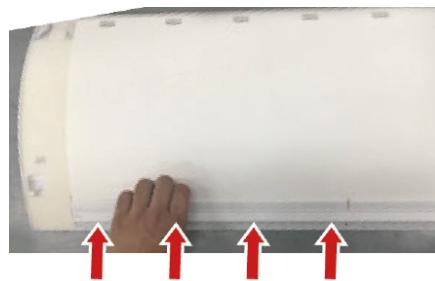
1. Remove the INSU HOLDER TOP.

Lift eight hooks and release.



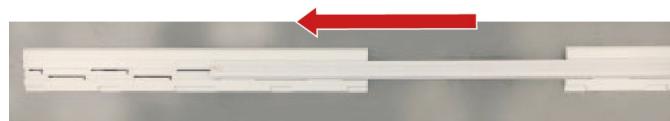
2. Remove the INSU HOLDER BOTTOM.

Lift eight hooks and release.



3 Remove the RUBBER SEAL.

Slide the INSU HOLDER BOTTOM panel and remove the RUBBER SEAL.



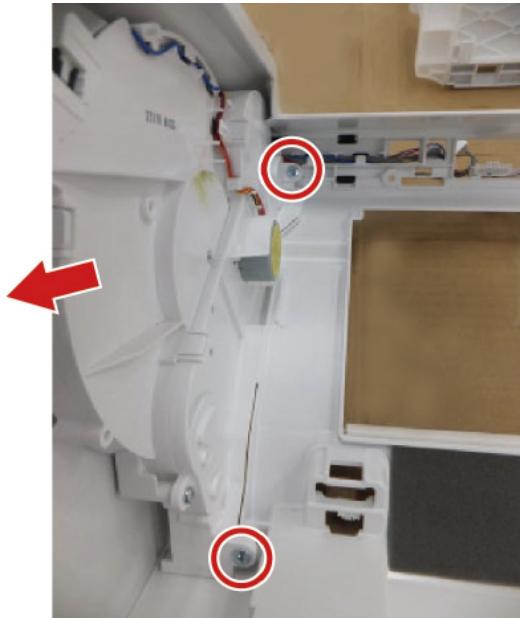
3) Front panel ass'y

1. Remove the PANEL MECHA RIGHT.

(1) Remove the wire.

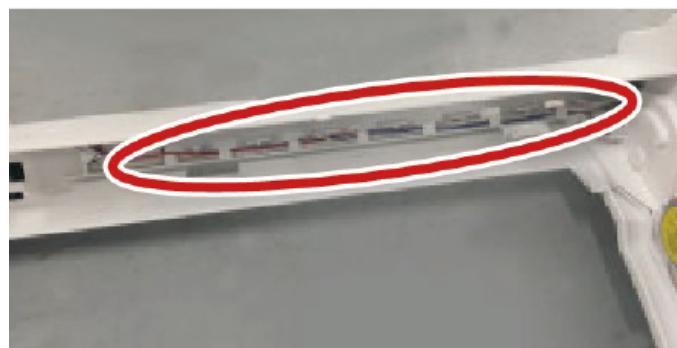
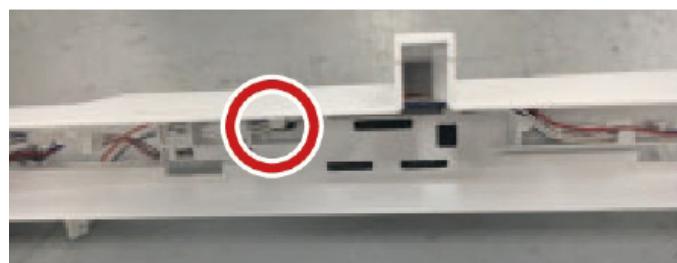
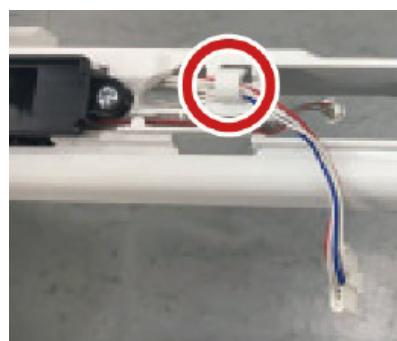


(2) Remove two screws, and pull the PANEL MECHA RIGHT forward.

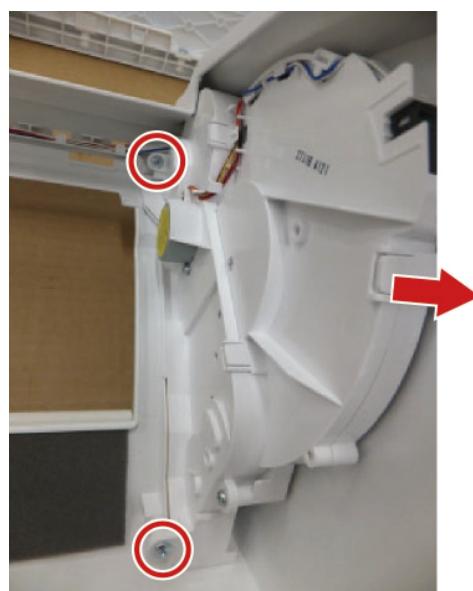


2. Remove the PANEL MECHA LEFT

(1) Remove the wire.



(2) Remove two screws, and pull the PANEL MECHA LEFT forward.

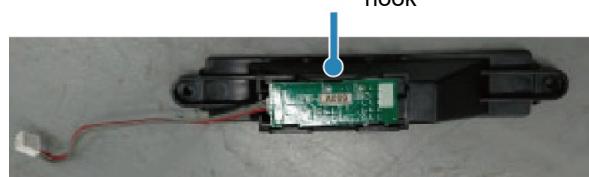


3. Remove the CLEAN MONITOR BOARD

(1) Remove the two screws, then remove the PCI DISPLAY ASS'Y.

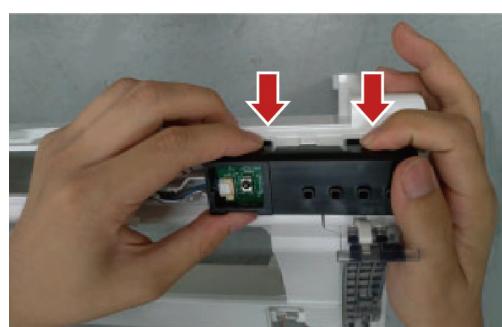


(2) Unlock the top hook and take off the CLEAN MONITOR BOARD
hook



4. Remove the DISPLAY RECEIVER BOARD.

(1) Remove DISPLAY ASS'Y by pushing top side.



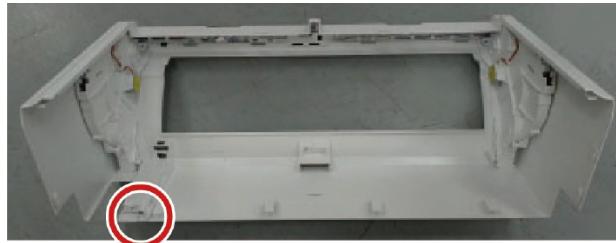
(2) Unlock the hook of right side, then take out DISPLAY RECEIVER BOARD.



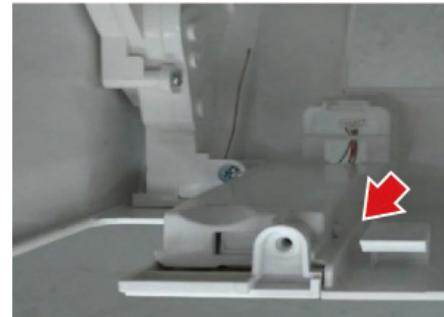
AY-XP12CPU

5. Remove the BUTTON RECEIVER BOARD

(1) Remove one screw.



(2) Press two hooks and remove BUTTON-RECEIVER PLATE.



(3) Press hook and remove BUTTON-RECEIVER CASE K

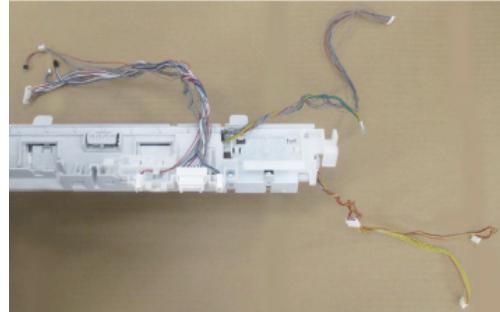
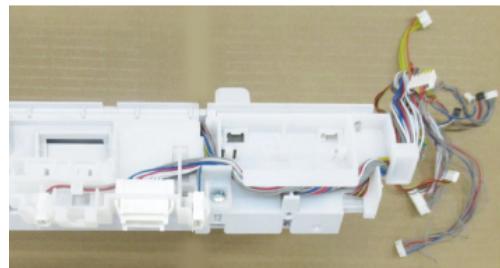


(4) Unlock the two hooks, then take out BUTTON RECEIVER BOARD



4) Louver Frame Assembly

1. Remove the wire from the hook.



2 Remove the LOUVER BOX ASS'Y

(1) Remove one screw on the right side of the LOUVER BOX ASS'Y



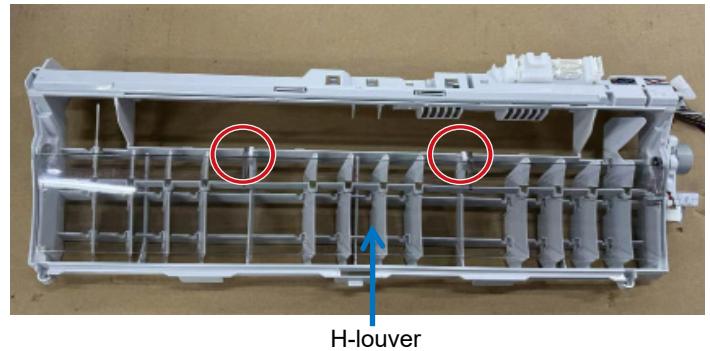
(2) Press hook and pull the LOUVER BOX ASS'Y to the right.



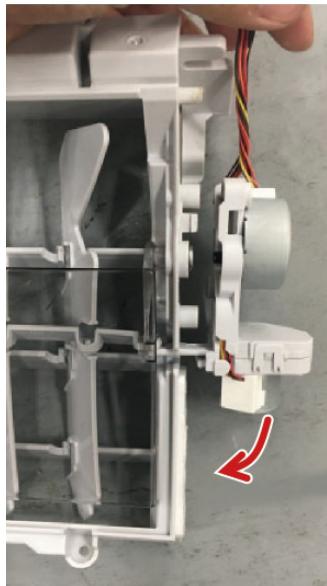
3. Remove the H-louver.

AY-XP12CPU

(1) Lift and remove the central shaft of the H-louver.



(3) Turn the LOUVER BOX ASS'Y clockwise.

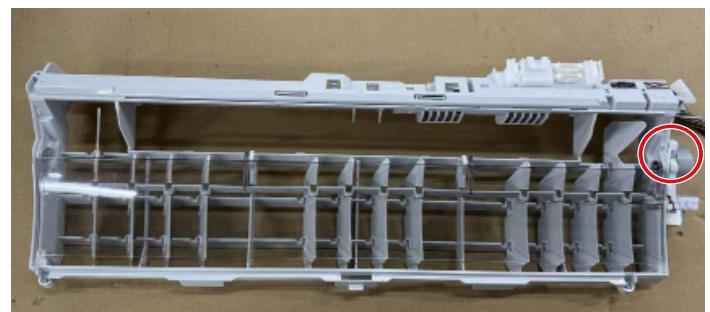
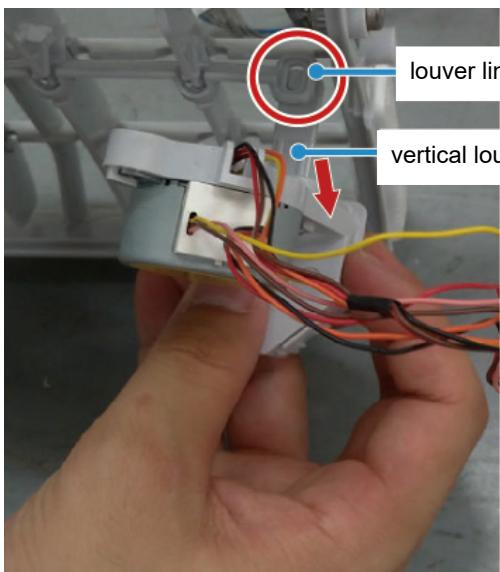


(2) Take it out from the left side by shaking the H-louver



(3) Take it out by moving the H-louver to left side

(4) When the hole in the louver link and the rib of the vertical louver motor arm are aligned, pull down the LOUVER BOX ASS'Y and remove it.

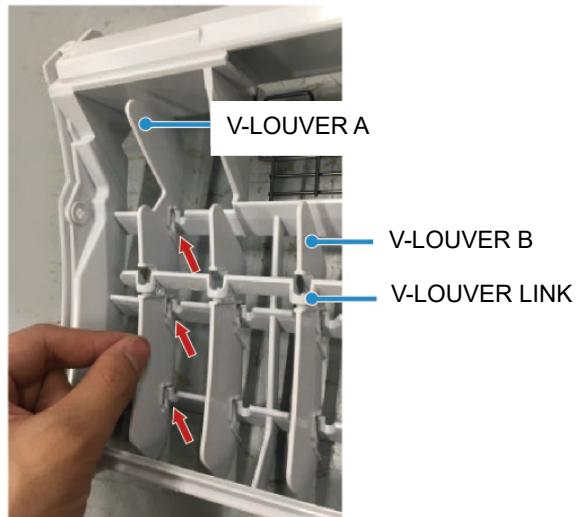


4. Remove the V-LOUVER A/B and V-LOUVER LINK

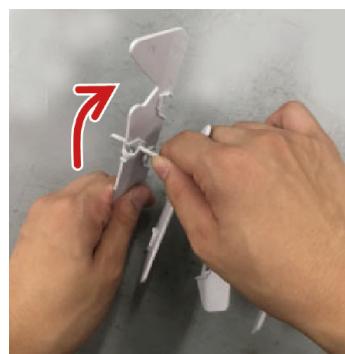
AY-XP12CPU

- (1) Hold the bottom side and lift the louver, then remove the V-LOUVER

(There are claws at three places on V-LOUVER A, and at two places on V-LOUVER B.)



- (2) Turn the V-LOUVER LINK and take it out.



5. Disconnect the PCI LEAD WIRE.

- (1) Use a straight screwdriver to insert the gap between PCI Lock and PCI-BASE.

Force it to make the PCI Lock rotate and open.



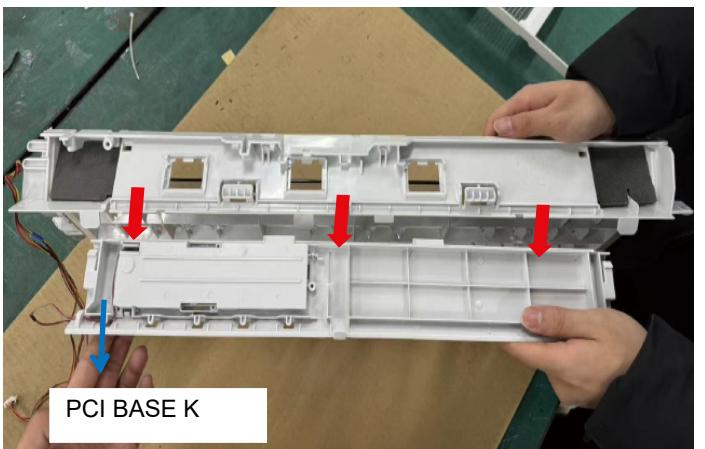
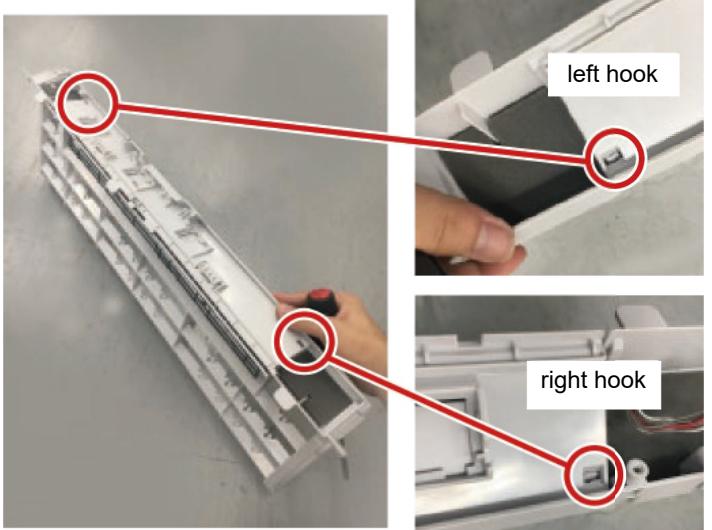
- (2) Slide the PCI Cover horizontally, then take it out.

Remove the connector, get the PLASMACLUSTER UNIT.

※ Align the mark ▲ and ▼.



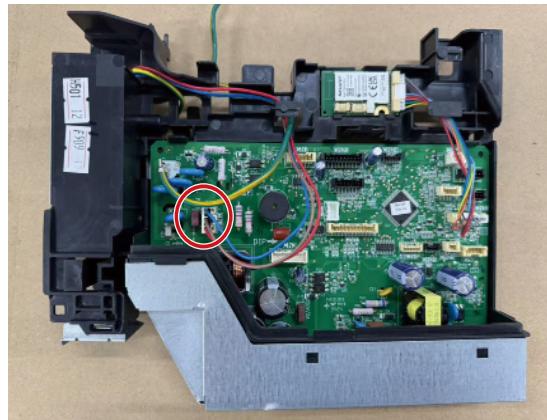
- (3) Press the hooks on the left and right side of LOUVER FRAME, remove the PCI-BASE.



5) Control Box Unit

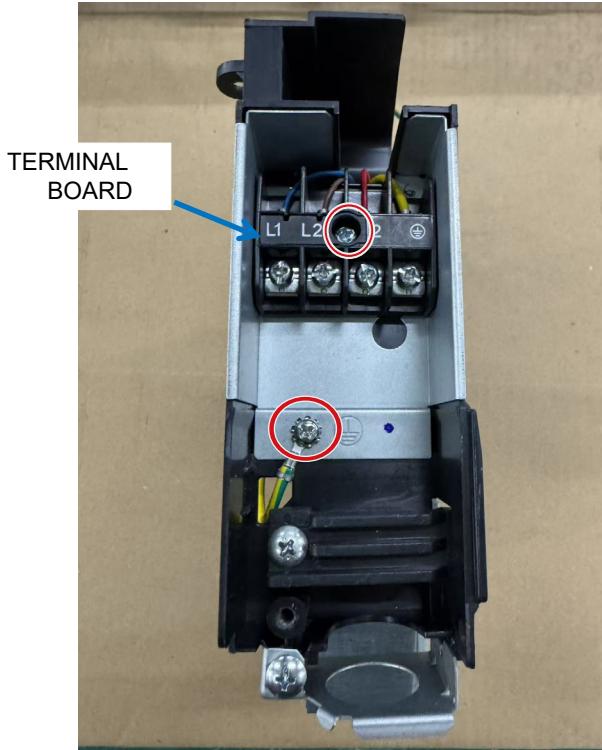
1. Remove the TERMINAL BOARD.

(1) Remove one connector.



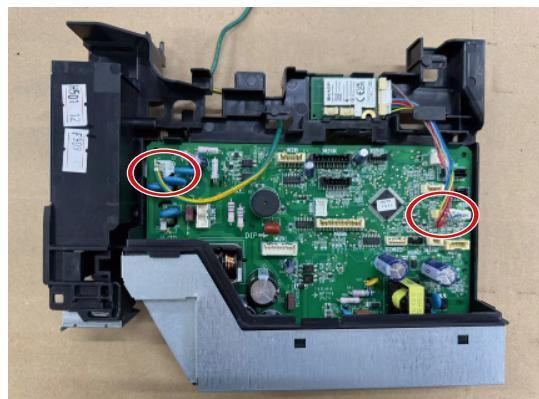
(2) Remove the screw (2 piece) and remove the TERMINAL BOARD.

(3) Take off the EARTH PLATE

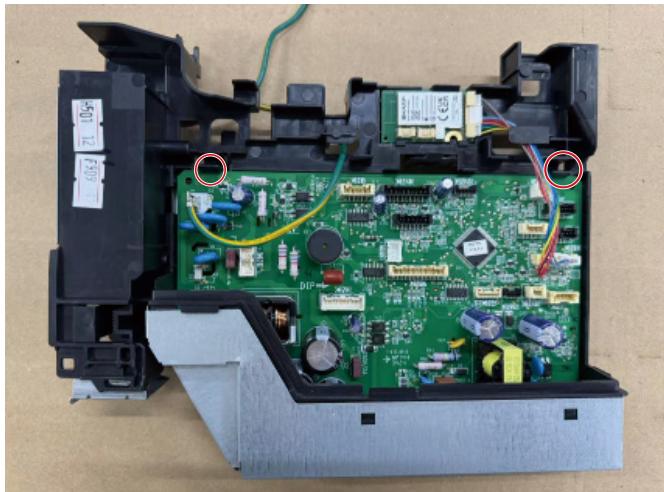


2. Remove the MAIN CONTROL BOARD UNIT

(1) Remove two connectors



(2) Unlock two hooks and take off the MAIN PWB K.



■ Wifi PWB

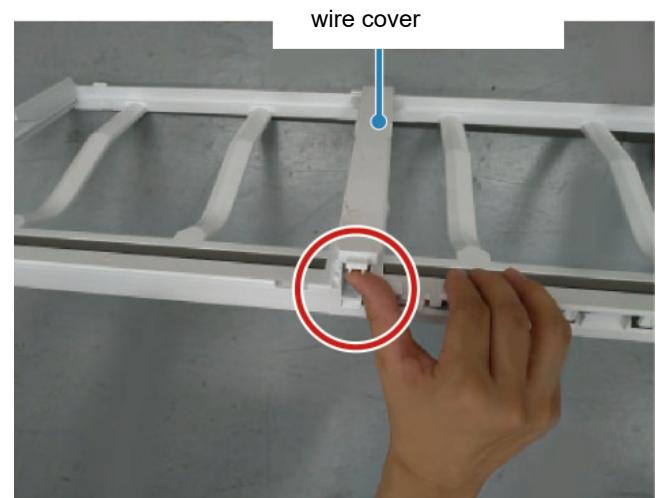
Unlock one hook in the arrow direction, and then remove the WIRELESS ADAPTER.



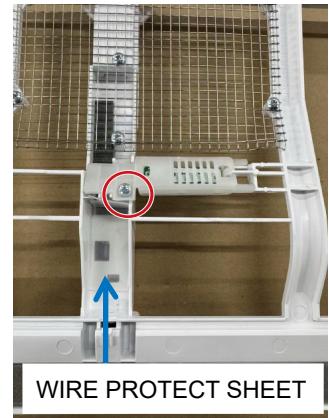
6) FILTER GUIDE K

1. Remove the SENSOR PWB-K (temperature and humidity).

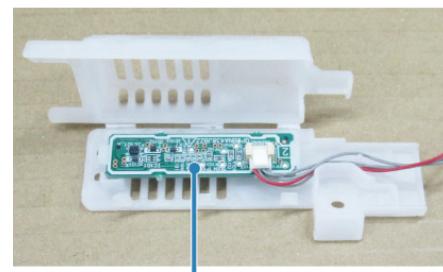
(1) Push up and remove wire cover.



(2) Remove one screw and the WIRE PROTECT SHEET (1), then take off the SENSOR HOLDER ASS'Y.



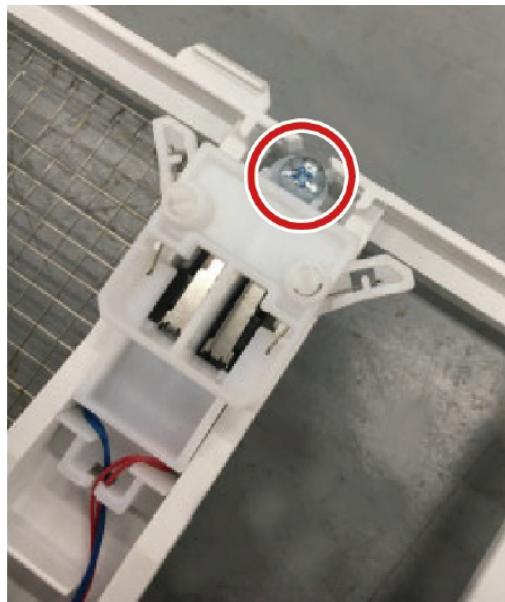
(3) Unlock three hooks and take off the SENSOR PWB-K (temperature and humidity).



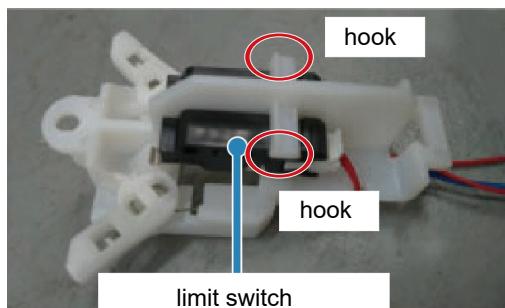
SENSOR PWB-K

2. Remove the limit switch.

(1) Remove one screw and take off the LS cover K.



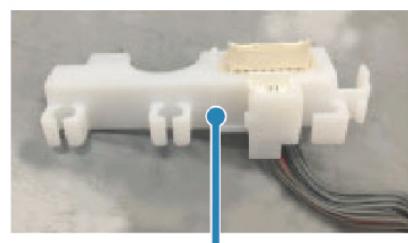
(2) Unlock hook and remove the limit switch.



7) Drain pan assembly

1. Remove the connector holder D-P.

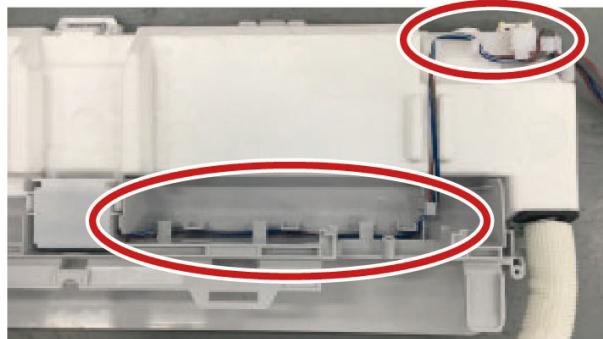
Disconnect the wiring, remove one screw, and take off the CONNECTOR HOLDER D-P.



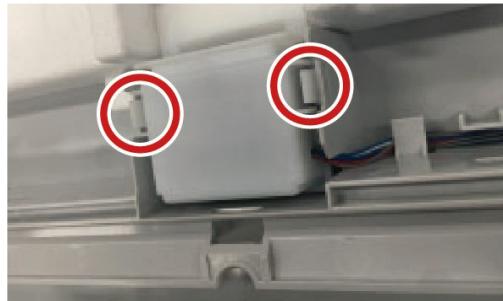
CONNECTOR HOLDER D-P.

2. Remove the GAS SENSOR BOARD and the dust sensor.

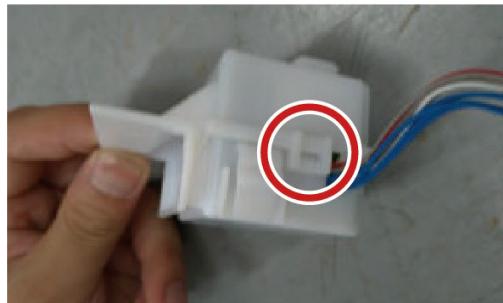
(1) Remove the wire.



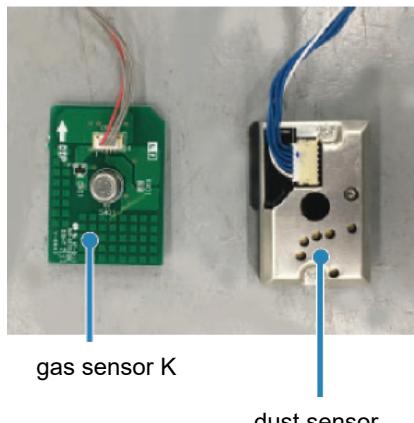
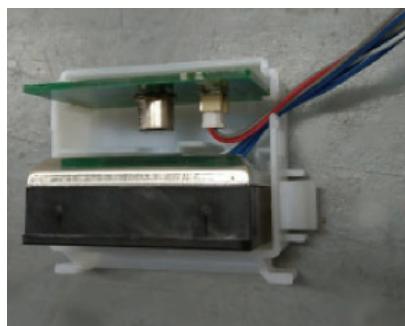
(2) Unlock two hooks, then take out the SENSOR UNIT K.



(3) Unlock two hook on both side, then take off the sensor holder P.



(4) Remove the gas sensor K and the dust sensor.



gas sensor K

dust sensor

8) Motor Assembly

1. Remove the FAN-L-ASS'Y, FAN-R-ASS'Y.

(1) Remove the screws (one on each side), then remove FAN-L-ASS'Y, FAN-R-ASS'Y

※Install a fan that matches the color of the motor's seal. (There are black and blue fans available.)

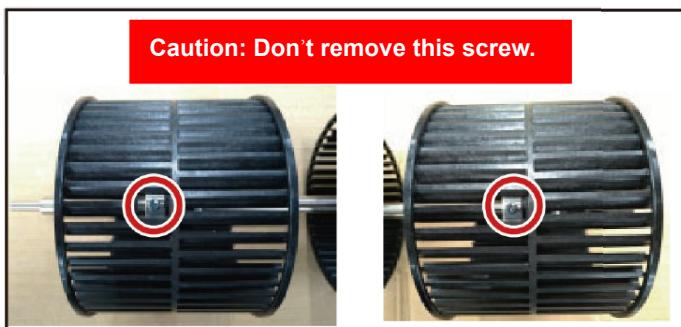


9) Bearing Assembly

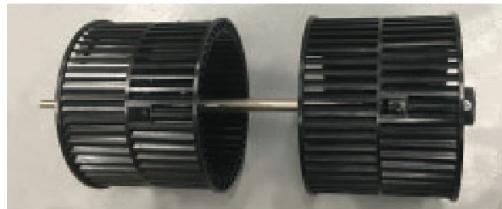
(1) Unlock the hooks by pressing the bottom of bearing holder, then open it.



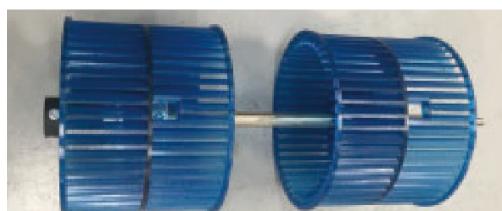
(2) Remove the BEARING ASS'Y from the bearing holder.



FAN-L-ASS'Y



FAN-R-ASS'Y

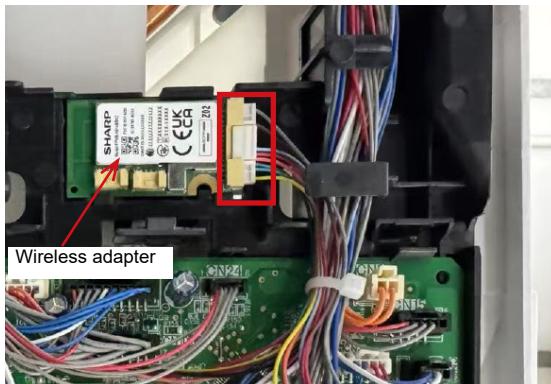


BEARING ASS'Y

REPLACE WIRELESS ADAPTER

Maintenance shall be made by service personnel full of knowledge about wireless LAN.
Please contact SHARP for replacement.

- 1) Remove the Connector of Wireless adapter, and take it off from Control unit.

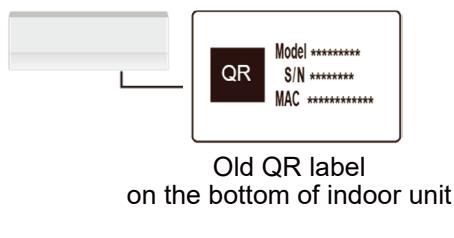


- 2) Replace the Wireless adapter by S-Z02 WLAN PWB UNIT.

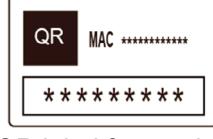
Note: The S-Z02 WLAN PWB UNIT contains a wireless adapter and a QR label for service.



- 3) Paste the QR label for service to the bottom of indoor unit to replace the old QR label.



Old QR label
on the bottom of indoor unit



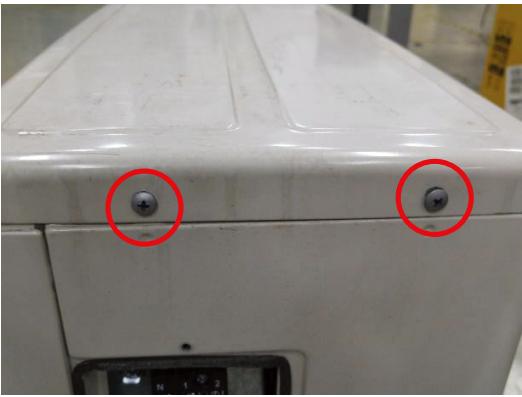
QR label for service

- 4) It's necessary to make the Wireless Lan connecting setting again.

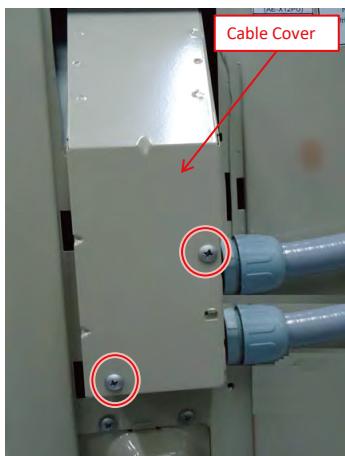
Please finish the initial connection setting after replaced wireless adapter, the procedure is same as when you just bought the Air-conditioner.

[4] OUTDOOR UNIT

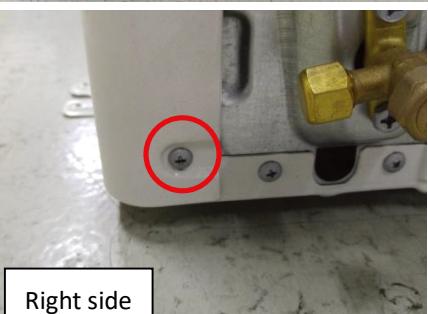
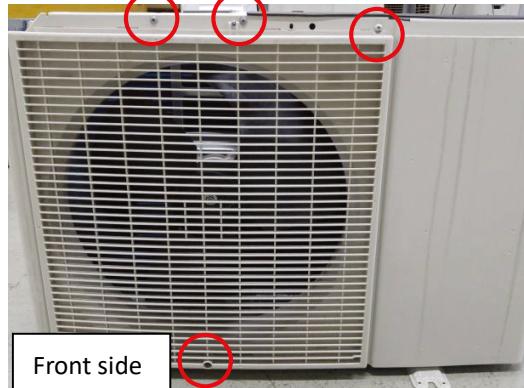
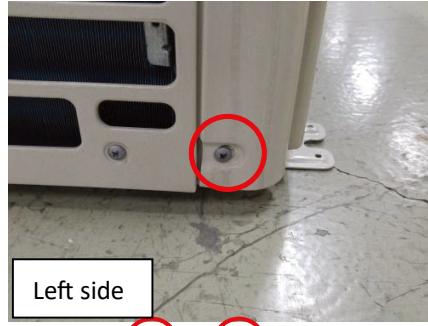
1) Remove the screw fixing the Cover, then take the cover out.



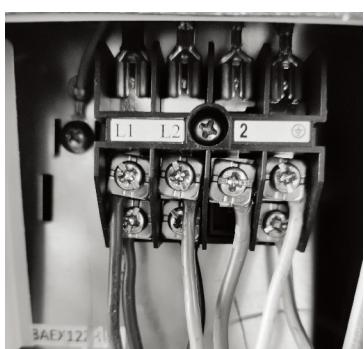
2) Remove the screw fixing Terminal Cover and Cord Clamp, then take them out.



5) Remove six screws fixing the Front Panel, move it out.

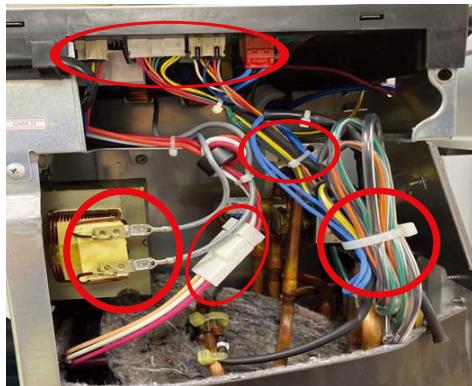


3) Loose the screws, remove the connecting cable from Terminal Board.

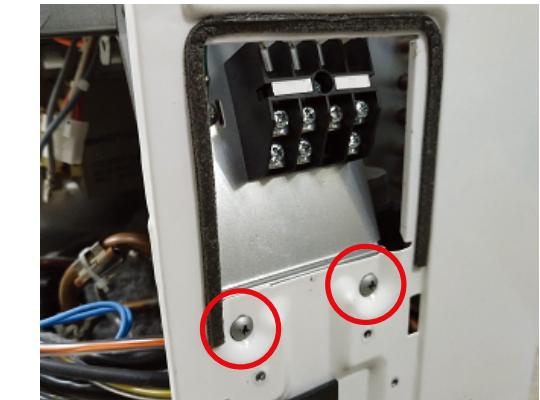
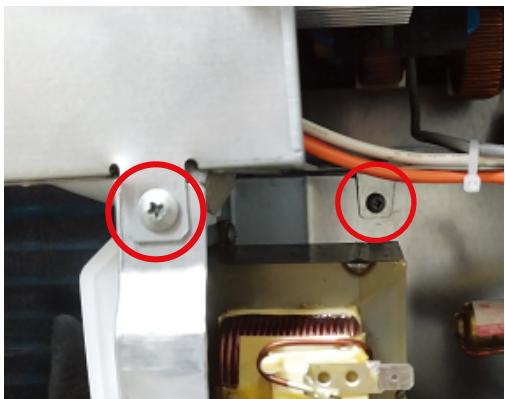


4) Remove five screws, lift the Top Panel to take it out.

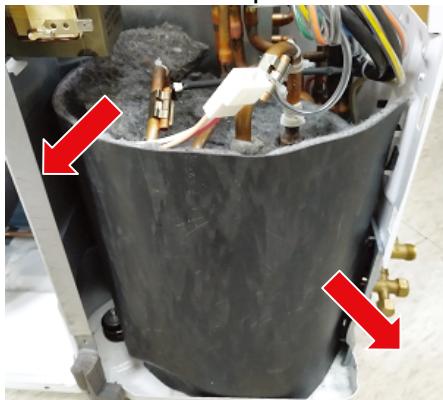
6) Cut the Wire Fixing Band. Remove two terminals from the Reactor and all connectors on the Control Board Unit, and remove compressor connector.



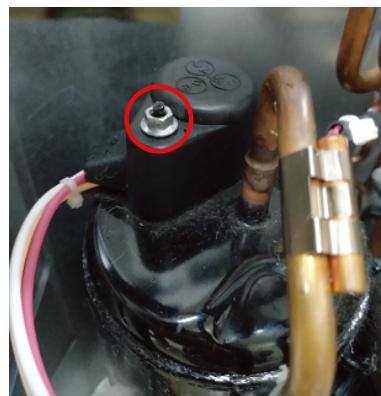
7) Remove four screws fixing the Control Box, then take it out.



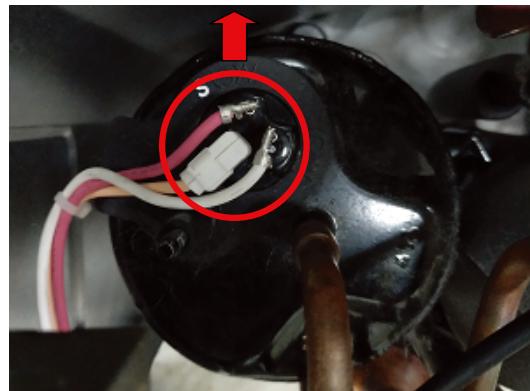
8) Remove the Compressor Cover(2pcs).



9) Unscrew the nut, move the Terminal Cover.



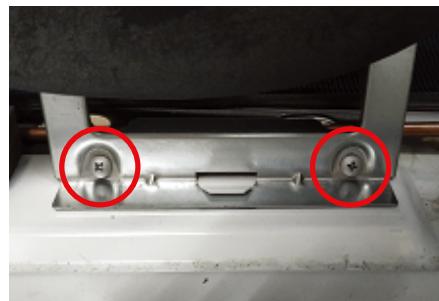
10) Disconnect three terminals on the Compressor.



11) Remove two screws fixing the Bulkhead, and remove the Bulkhead.



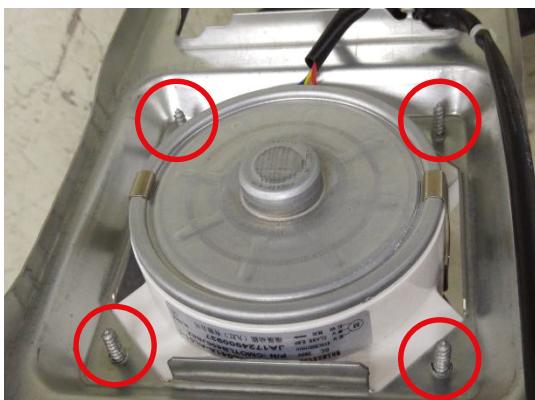
12) Remove the screw fixing Motor Angle, then take it out.



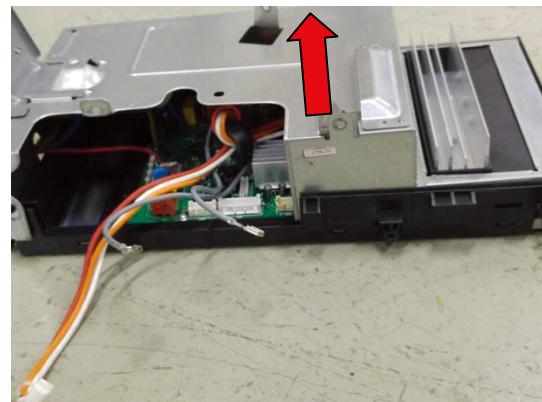
13) Unscrew the nut, take out the Propeller Fan carefully.



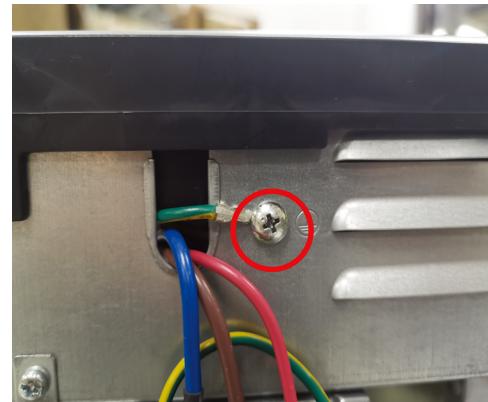
14) Remove all screws, take out the Motor.



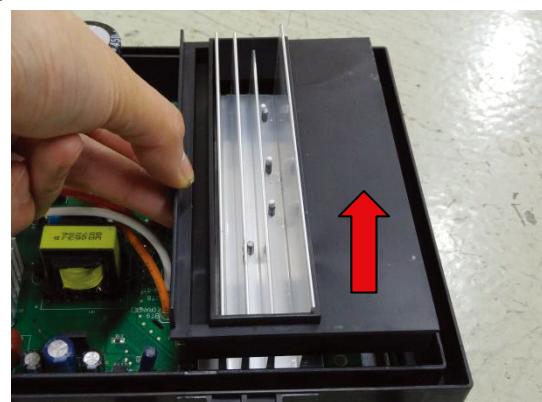
3) Lift up to remove the metal cover.



4) Remove the screw fixing the earth wire.



5) Move out the Heat Sink Holder.

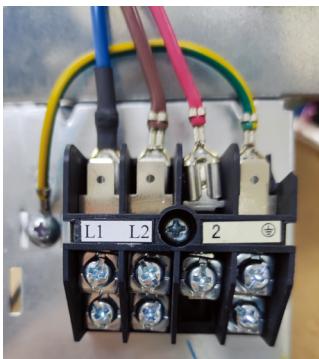


6) Unscrew all four screws to remove the Control Board Unit.



Note: Before changing control board, the workmen should wear anti-electrostatic gloves.

2) Remove the screw, then remove the Terminal Board.



Failure diagnosis flowchart

Table of contents

Error code	Contents
1	Short circuit of ODU thermistor
2	Overheat error (Compressor or cycle)
5	Open circuit of ODU thermistor
6	DC current error
7	AC current error
9	Cycle error
9-5	2 way/3 way close valve
10	EEPROM mutual memory Error
11	ODU fan motor error
13	Compressor rotation error
14	AC voltage error
17	Serial open circuit error
18	Serial short circuit error
19	Indoor unit fan error
20-4	EEPROM mutual memory Error
24-0	WLAN module communication error
24-1	WLAN router connection error
26	Indoor unit temperature thermistor error
	Appendix

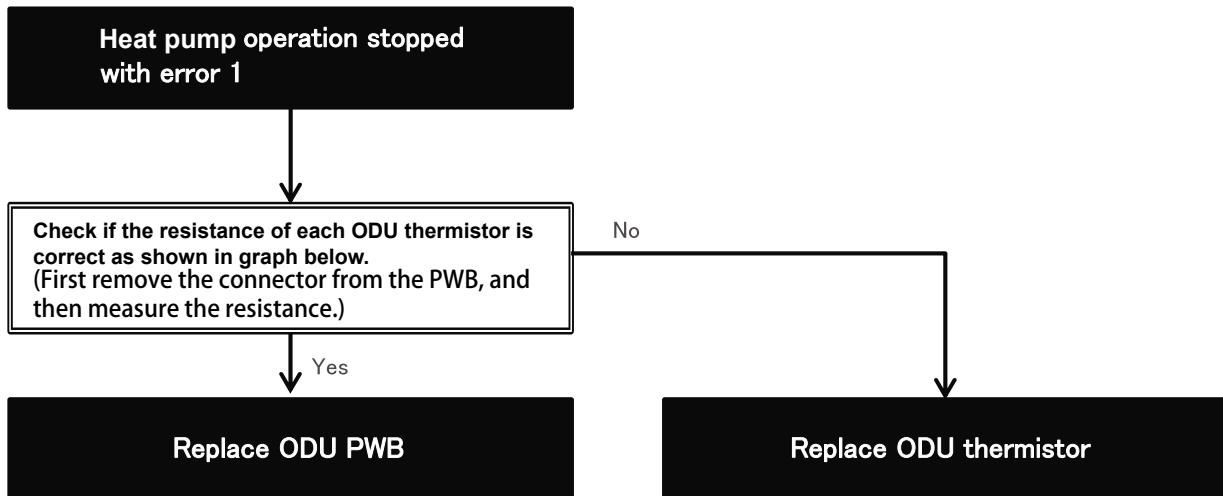
Error Code**1****Short circuit of ODU thermistor**

- 1-0 Heat exchanger thermistor short-circuit(Orange)
 1-1 Outside air temperature thermistor short-circuit(Green)
 1-2 Suction thermistor short-circuit(Black)
 1-3 2-way valve thermistor short-circuit(Yellow)
 1-4 Heat sink thermistor short-circuit
 1-5 Discharge thermistor short-circuit error

★Check the thermistor short-circuit.

◇ Main cause

- The lead wire sheath of the ODU thermistor has been damaged due to edge or long-time friction by vibration, and the wire touches the pipe, etc.



Please see Appendix ① (ODU thermistor R-T)

Error Code 2	<h2>Overheat error (Compressor or cycle)</h2> <p>2-0 Compressor high temperature error 2-1 Compressor discharge overheat 2-2 Outdoor unit pipe overheat 2-3 Indoor unit pipe overheat 2-5 IPM high temperature error</p>
<p>★ Check the failure of compressor</p> <p>◇ <u>Main cause</u></p> <ul style="list-style-type: none"> Temperature of compressor or cycle parts becomes too high. <div style="border: 1px solid black; padding: 10px; margin-top: 20px;"> <pre> graph TD A[Heat pump operation stopped with error 2] --> B[Check if the ODU air outlet has been blocked.] B -- Yes --> C[Ensure the air flow from air outlet not be blocked.] B -- No --> D[Check if the power supply voltage is AC 230V at full power.] D -- Yes --> E[Check if the resistance of ODU compressor thermistor is correct. (First remove the connector from the PWB, and then measure the resistance. Refer to THERMISTOR TEMPERATURE CHARACTERISTICS.)] E -- Yes --> F[Measure if the pressure of refrigerant is proper by gauge manifold for checking the refrigerant volume.] F -- Yes --> G[Check if the error is disappeared by replacing the expansion valve coil.] G -- Yes --> H[OK] G -- No --> I["• Check if the error is disappeared by replacing the ODU PWB"] I -- Yes --> J[OK] I -- No --> K[Check the expansion valve.] </pre> </div> <p>Please see Appendix ② (expansion valve check)</p>	

Error Code

5

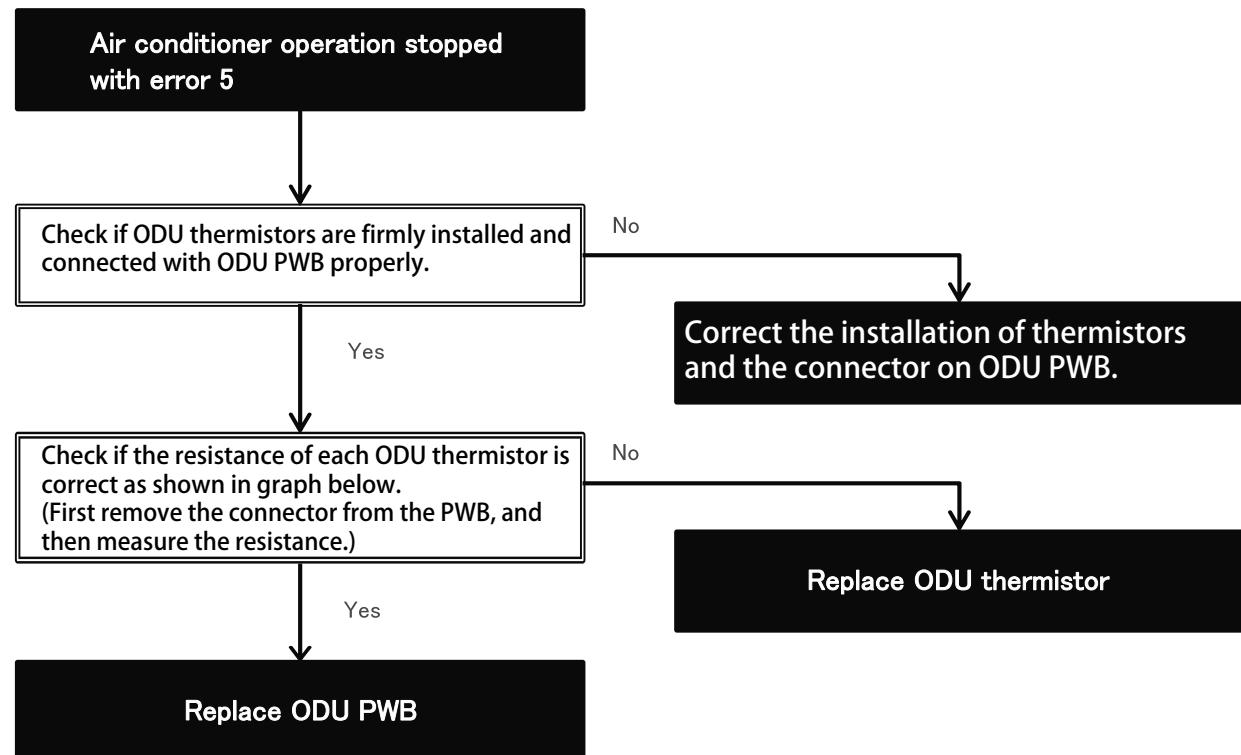
Open circuit of ODU thermistor

5-0 Heat exchanger thermistor open-circuit(Orange)
5-1 Outside air temperature thermistor open-circuit(Green)
5-2 Suction thermistor open-circuit(Black)
5-3 2-way valve thermistor open-circuit(Yellow)
5-4 Compressor thermistor open-circuit(Red)
5-5 Heat sink thermistor open-circuit

☆Check the thermistor open-circuit.

◇ Main cause

- The lead wire of ODU thermistor has torn due to the edge or vibration.
- The attachment of connector has damaged by inside tension due to unsuitable wiring process.



Please see Appendix ① (ODU thermistor R-T)

Error Code

6**DC current error**

6-0 DC current error
 6-1 DC current error 1
 6-2 DC current error 2
 6-3 DC current error 3

★Check the cause due to compressor or PWB.

Air conditioner operation stopped with error 6

Yes

Check if the error code is 6-3

No

Replace ODU PWB.
 (6-0, 6-1, 6-2)

Yes

Check if the power supply voltage during compressor operating is within rated voltage $\pm 10\%$.

No

Correct the cable between IDU and ODU, or connect air conditioner to stable power source.

Yes

Check if the valve(2-way and 3-way) are closed.

No

Fully open 2-way valve and 3-way valve.

Yes

Check if the error occur before the compressor starting and within about 1 second after the compressor starting.

No

Check the compressor.
 (Connection of compressor cord and appearance of compressor)

Yes

Error in cooling mode : Check if ODU heat exchanger thermistor is installed properly.

No

Install the thermistor correctly.

Error In heating mode : Check if IDU pipe thermistor is installed properly.

Yes

Measure if the pressure of refrigerant is proper by gauge manifold for checking the refrigerant volume.

No

Check the pipe connections for refrigerant leaks.
 (Charge the specified amount of refrigerant after modified)

Yes

Cooling mode or Heating mode?

Cooling

Heating

Check if the air filter and heat exchanger of IDU has been blocked by dust, etc.

Yes

Clean the filter and heat exchanger of IDU.

Replace ODU PWB.

Heating

Check if the ODU air outlet has been blocked.

Yes

Ensure the air flow from air outlet not be blocked.

Replace ODU PWB.

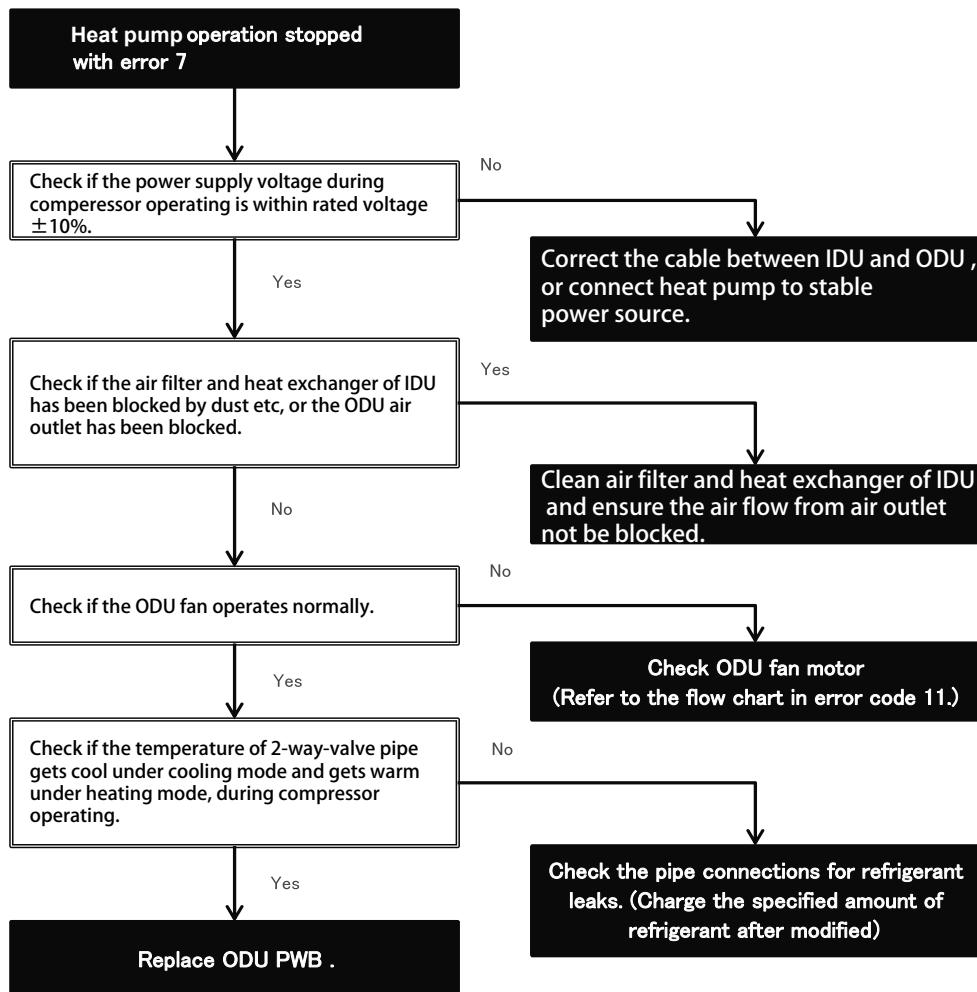
Error Code

7

AC current error

- 7-0 AC over current error
- 7-1 AC current error when compressor OFF
- 7-2 AC maximum current error
- 7-3 AC current deficiency error

★Check the cause due to PWB or another parts.



Error Code

9

Cycle error (1/3)

9-0 cycle temperature error
9-4 gas leak error

★Check the cause due to PWB or another parts.

Heat pump operation stopped with error 9

* This error is judged by the temperature of thermistor.

Check if all ODU thermistor are at the correct position.

No

Correct the installation.

Yes

For multi zone system: check the resistance of TH2,TH3,TH4, TH7,TH8 and TH9 of ODU thermistor.

- ① Remove the ODU thermistor connector (CN8A,CN8B) from ODU PWB.
- ② Measure the resistor of each thermistor by tester.

For single zone system: check the resistance of TH2,TH3,TH4, and TH5 of ODU thermistor.

- ① Remove the ODU thermistor connector (CN8) from ODU PWB.
- ② Measure the resistor of each thermistor by tester.

Please see Appendix ① (ODU thermistor R-T)

Check if the resistance of each ODU thermistor is correct. (Refer to THERMISTOR TEMPERATURE CHARACTERISTICS)

No

Replace ODU thermistor.

Yes

Check if the compressor operates normally.

No

Check if the compressor wires are connecting correctly. (Both on PWB side and compressor side)

No

Connect compressor wires correctly.

Yes

Replace ODU PWB .

(Go to Next page)

Error Code

9**Cycle error (2/3)**

9-0 cycle temperature error
9-4 gas leak error

★Check the cause due to PWB or another parts.

(From previous page.)



Check if the temperature of ODU heat exchanger pipe and 2-way valve changes properly.
(Refer to below method.)



In cooling mode: Whether the ODU heat exchanger pipe has higher temperature and the 2-way valve pipe has lower one.

In heating mode: Whether the ODU heat exchanger pipe has lower temperature and the 2-way valve pipe has higher one.

Yes



No

Check if IDU pipe temperature thermistor is installed properly.

Yes



Install the IDU pipe temperature thermistor correctly.

No

Check if the resistance of IDU pipe thermistor satisfy the R-T characteristics.
(Refer to THERMISTOR TEMPERATURE CHARACTERISTICS)

- ①remove the IDU thermistor connector (CN*) from IDU PWB.
- ②Measure the resistance of the thermistor by tester.

Please see Appendix ④ (IDU thermistor)

Yes

Replace ODU PWB.

Replace IDU pipe thermistor

No

Check if the unit becomes operating normally.

Yes

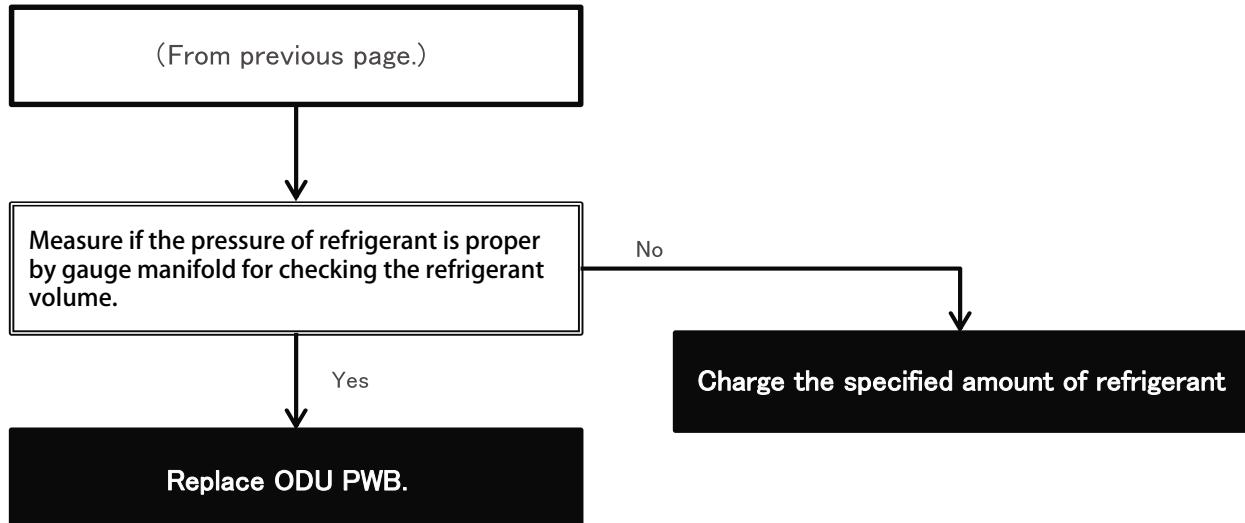
OK

Replace IDU PWB.

(Go to next page.)

Error Code**9****Cycle error(3/3)**9-0 cycle temperature error
9-4 gas leak error

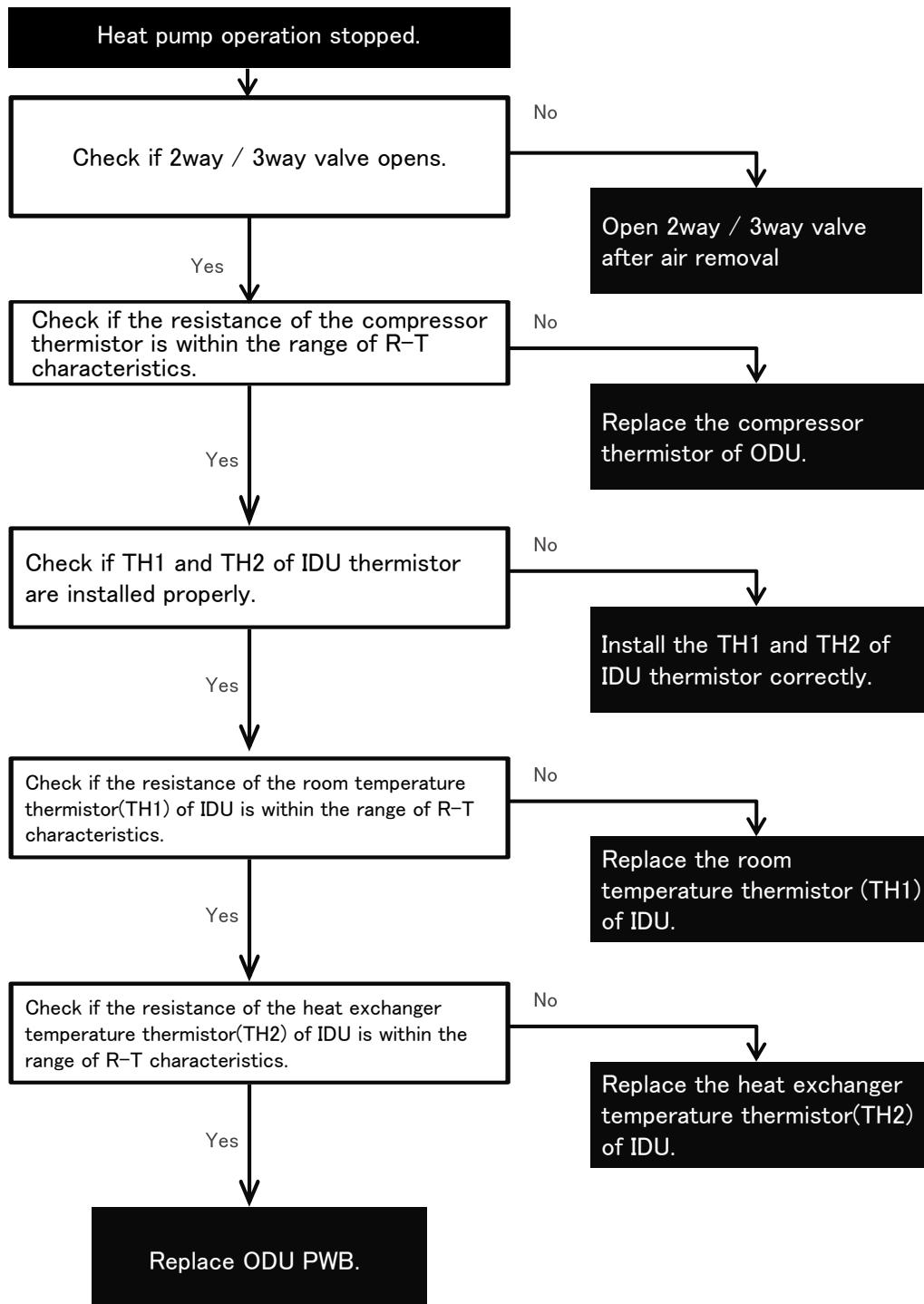
★Check the cause due to PWB or another parts.



Error Code

9-5**2 way/ 3 way valve close error**

★Check the cause Installation or other parts.

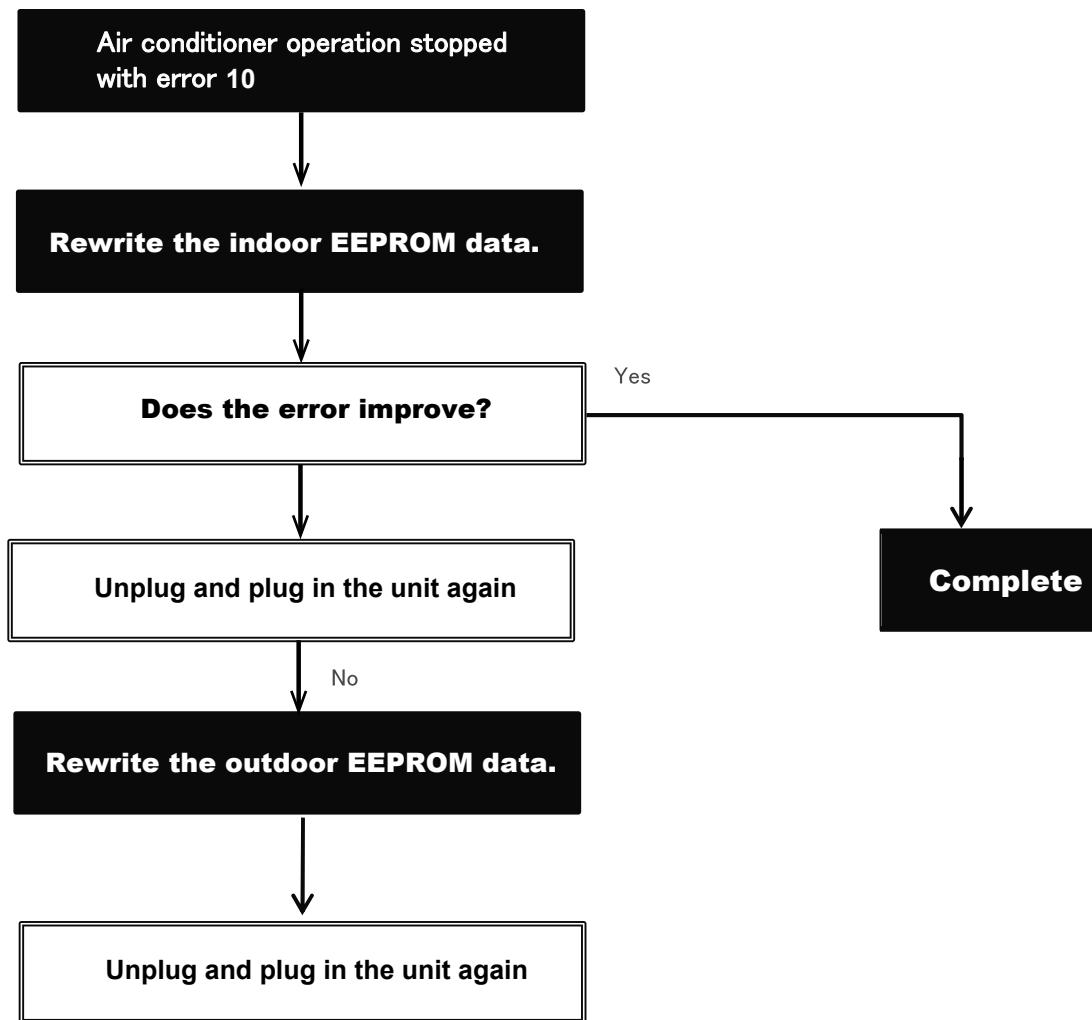


Error Code

10**EEPROM mutual memory Error**

10-4 EEPROM Mutual memory error

- ★ Identify whether the cause is outdoor unit data error or indoor unit data error.



Since this failure is an abnormality of the EEPROM data and not a failure of the board, the failure can be improved by rewriting the EEPROM data.

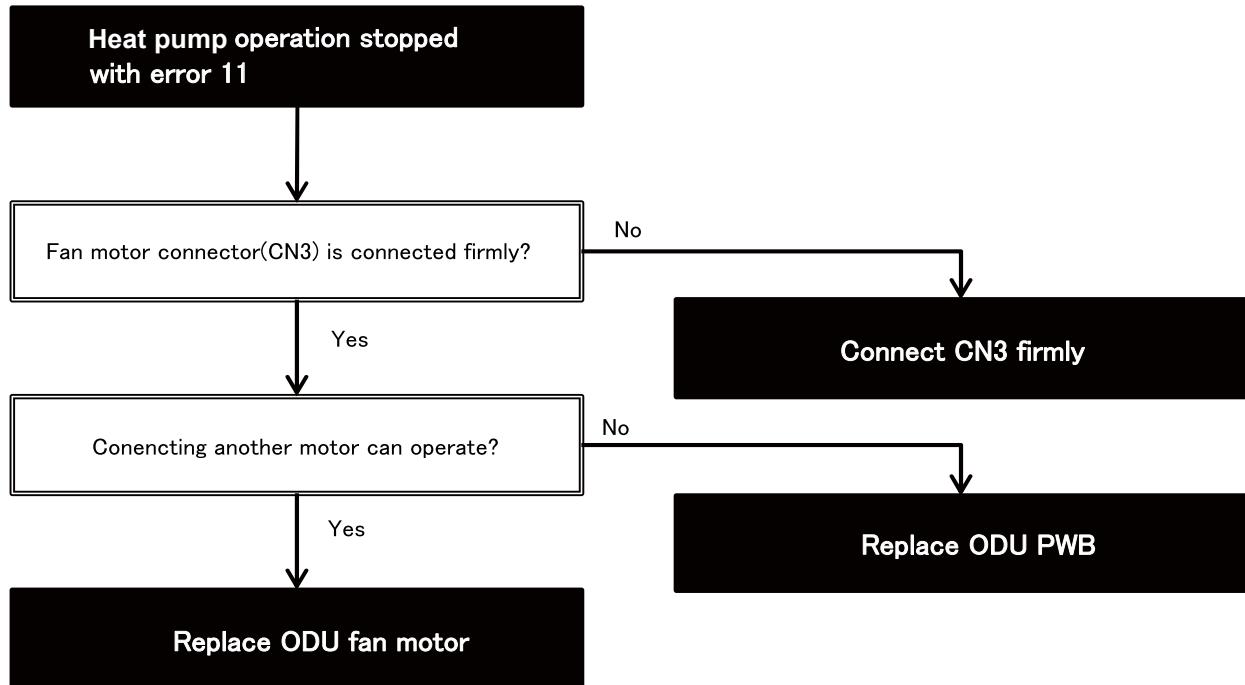
Error Code

11

ODU fan motor error

- 11-1 DC fan driver IC error
- 11-2 DC fan lock error
- 11-3 Detection error of negative rotation before compressor start
- 11-4 Detection error of inverter current
- 11-5 open connector error

★Check the cause due to PWB or DC fan motor.



Error Code

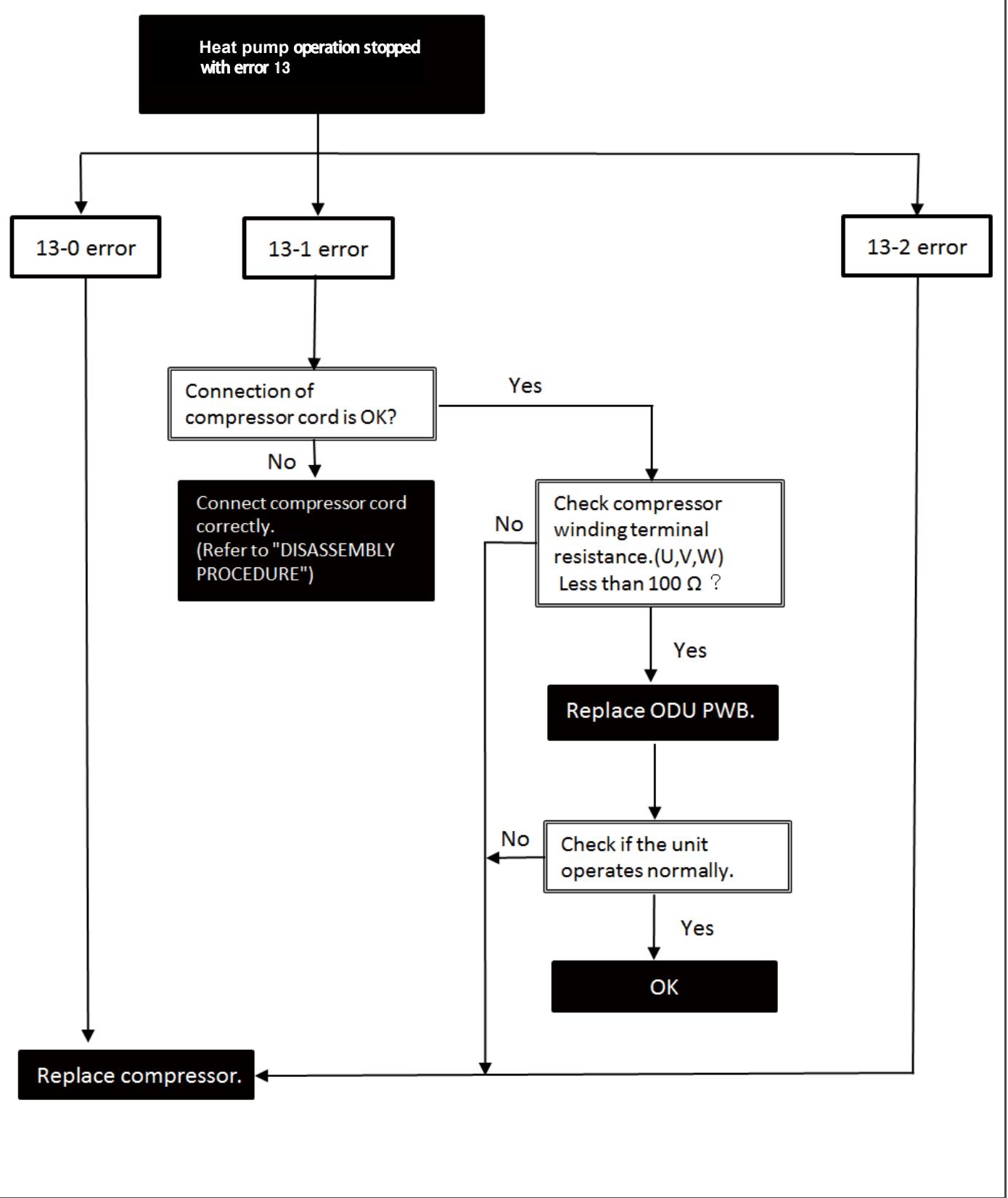
13**Compressor rotation error**

13-0 compressor motor short error
 13-1 compressor motor open or PWB short error
 13-2 compressor motor lock error

★Check the cause due to compressor.

◇ Main Cause

- Compressor motor winding has abnormality. (Short or open)
- PWB has abnormality. (IPM Shunt resistor is short)

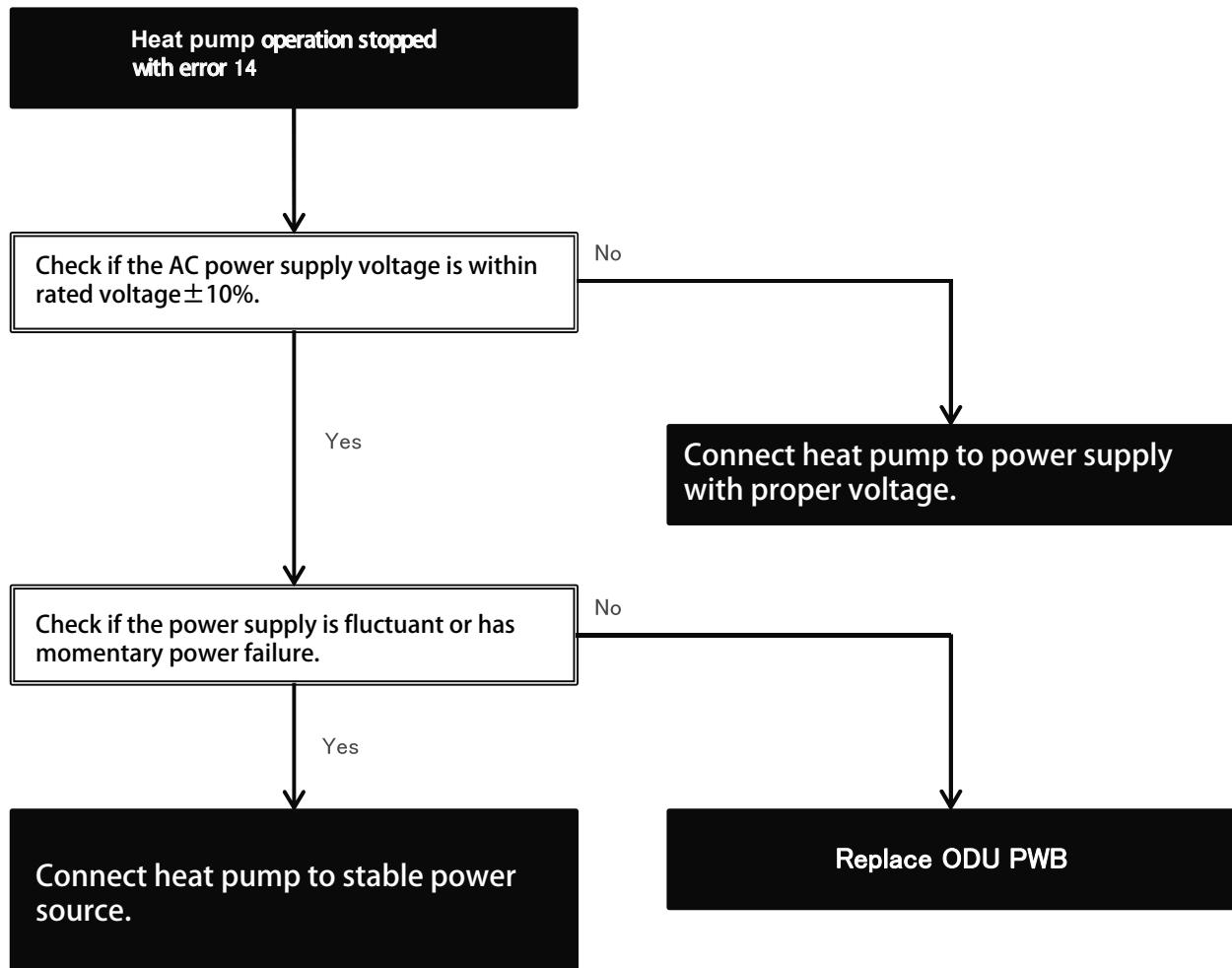


Error Code 14	AC voltage error	14-0 over voltage error 14-1 clock error 14-2 Abnormal AC power supply voltage or DC low voltage error
-------------------------	-------------------------	--

★Check AC power supply.

◇ Main cause

- AC power supply voltage is abnormal. (Not within rated voltage $\pm 10\%$)
- Big fluctuation of AC power supply voltage
- Instantaneous voltage drop



Error Code

17

Serial open error (1/2)

17-0 Serial open error

★ Determine why serial communication is not possible.

- Defective PWB of IDU (Serial circuit failure, power supply circuit operation failure, etc.)
- Defective PWB of ODU (Serial circuit failure, power supply circuit operation failure, etc.)
- Poor connection of the wiring between the units connecting the IDU and the ODU
- Defective terminal board of IDU.
- Poor connection of electrical components mounted other than the PWB (outdoor unit reactor, etc.)



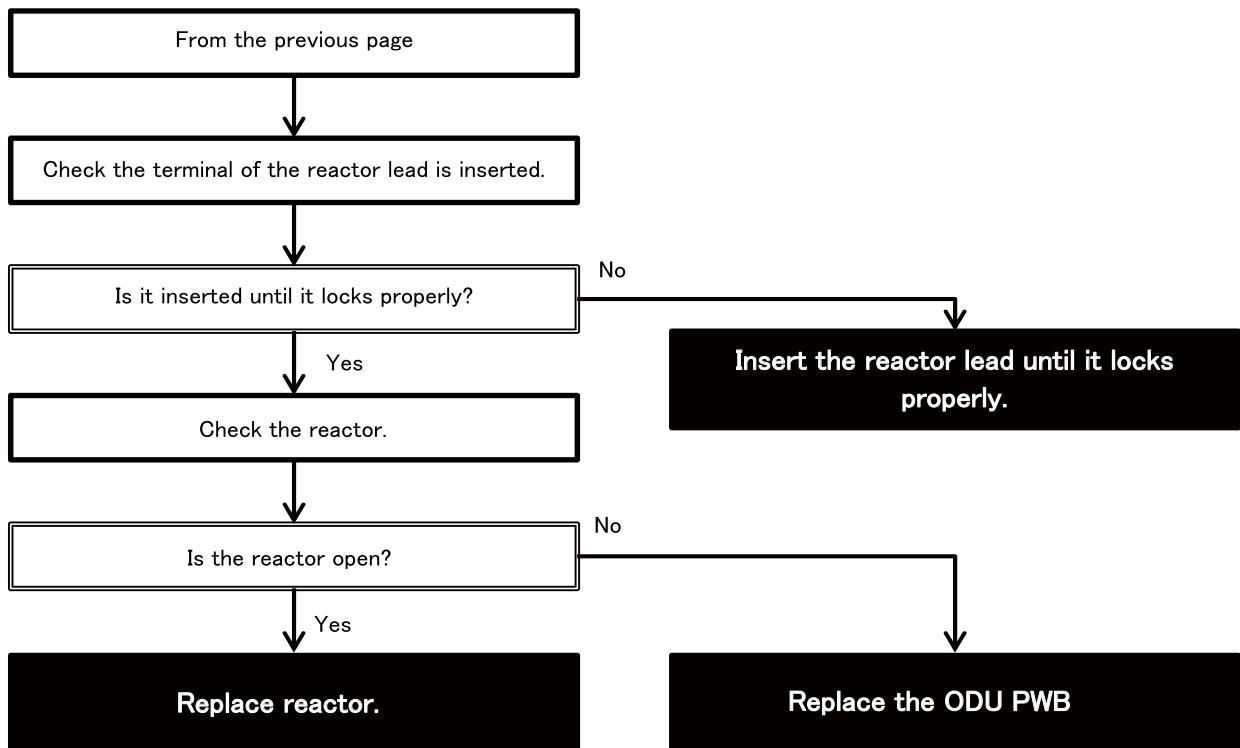
Error Code

17**Serial open error(2/2)**

17-0 Serial open error

★Determine why serial communication is not possible.

- Defective PWB of IDU (Serial circuit failure, power supply circuit operation failure, etc.)
- Defective PWB of ODU (Serial circuit failure, power supply circuit operation failure, etc.)
- Poor connection of the wiring between the units connecting the IDU and the ODU
- Defective terminal board of IDU.
- Poor connection of electrical components mounted other than the PWB (outdoor unit reactor, etc.)



Error Code

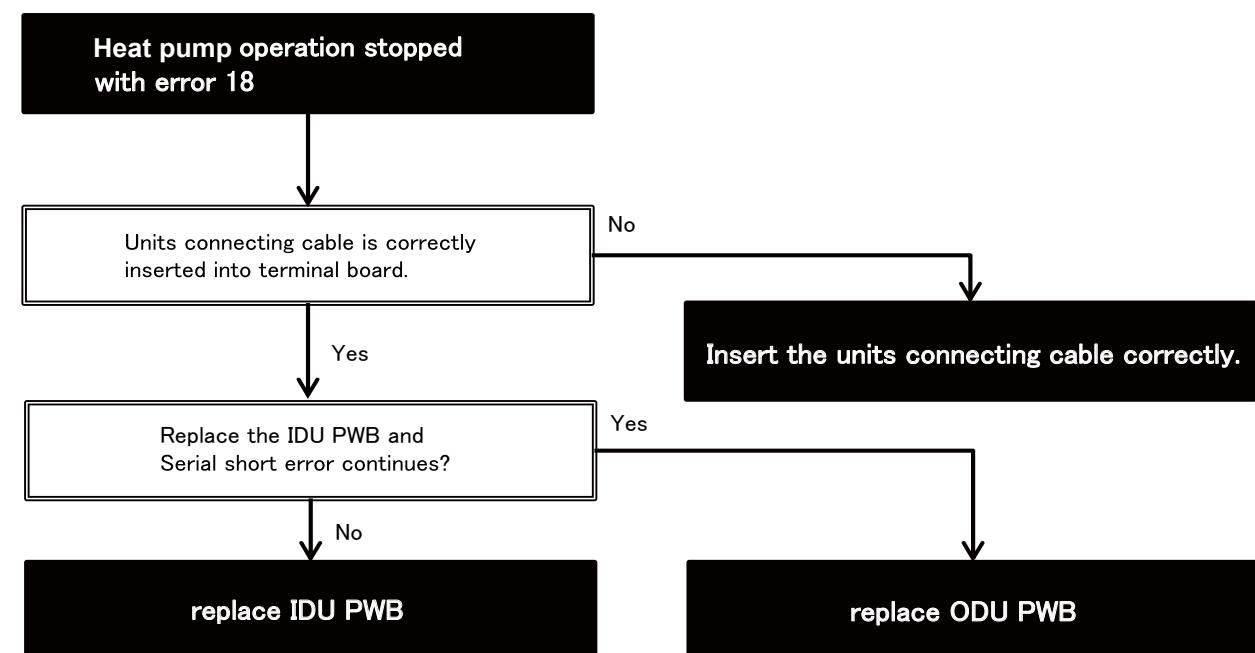
18**Serial short error**

18-0 Serial short
 18-1 Incorrect wiring
 18-2 High speed serial error

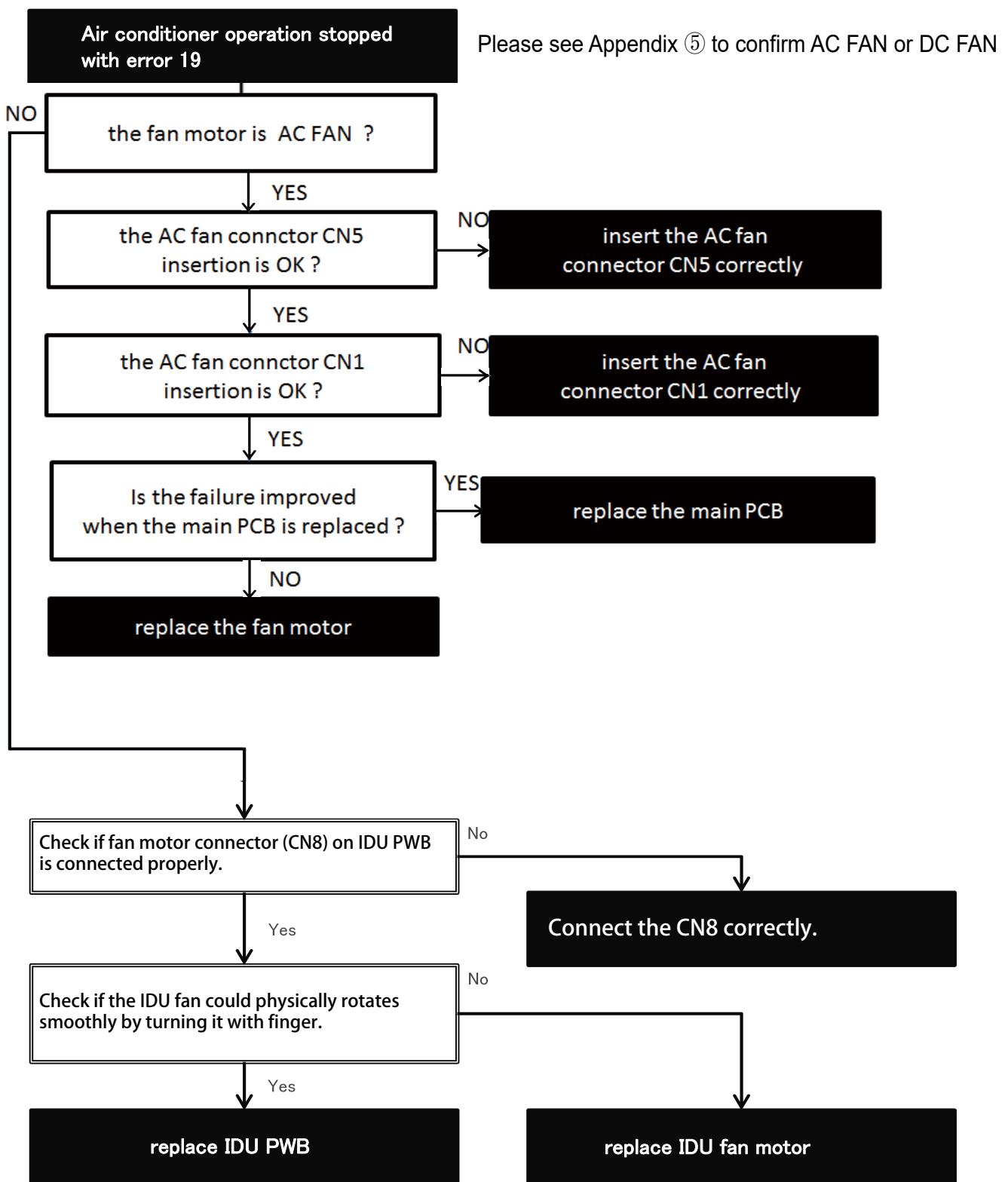
★Determine if the units connecting cable is incorrectly inserted

◇ Main causes of serial shorts

- Incorrect insertion of units connecting cable
- Indoor unit serial circuit failure
- Outdoor unit serial circuit failure



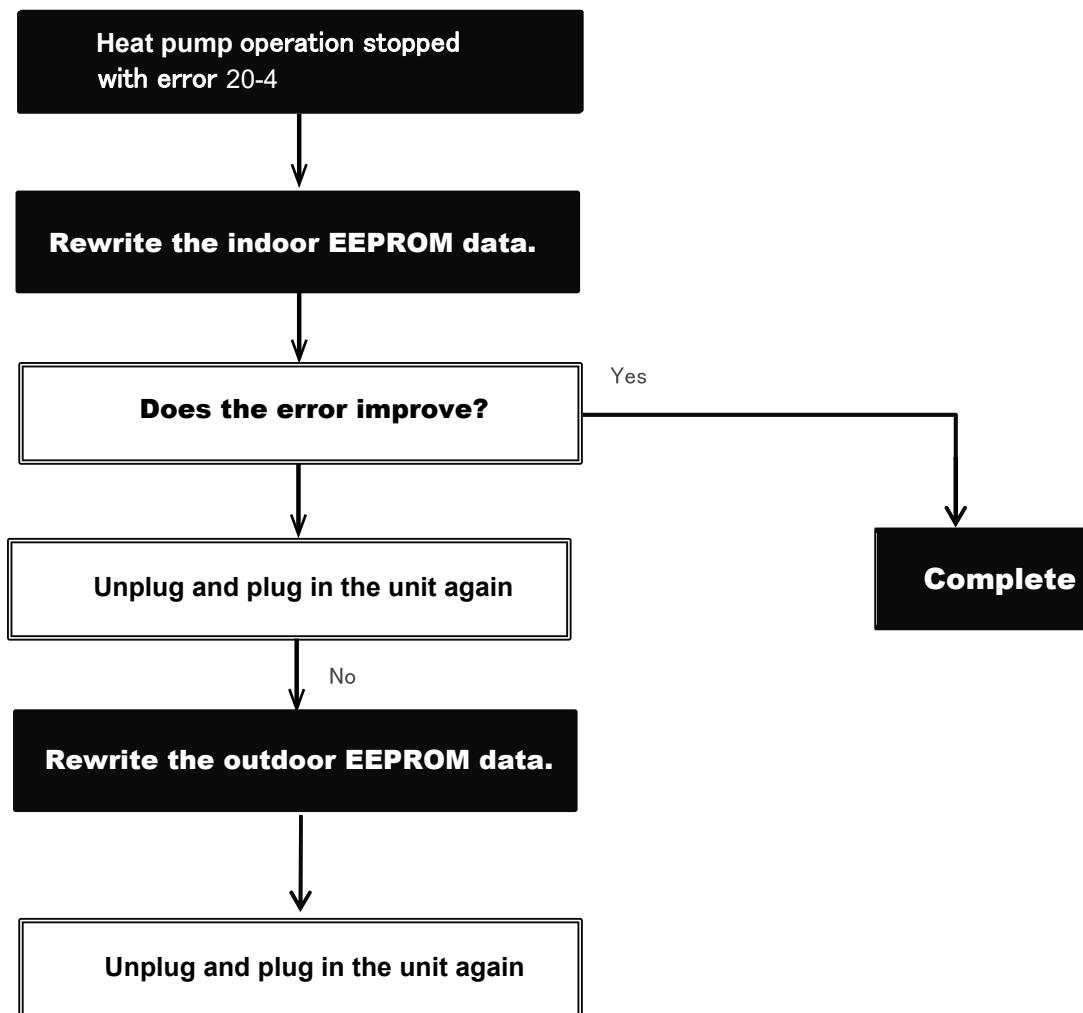
Error Code	Indoor fan error	19-0 Indoor fan error
★Determine whether the cause is the indoor fan motor or the IDU PWB.		



Error Code

20-4**EEPROM mutual memory Error**

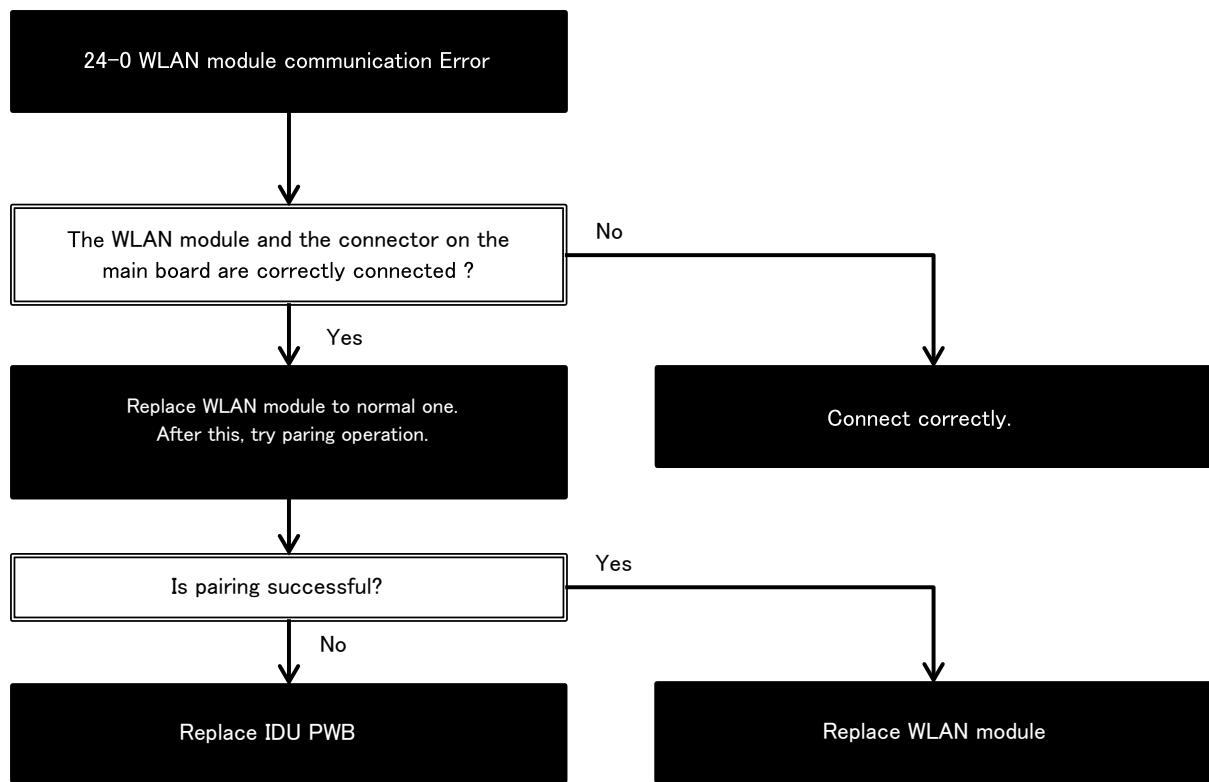
- ★ Identify whether the cause is outdoor unit data error or indoor unit data error.



Since this failure is an abnormality of the EEPROM data and not a failure of the board, the failure can be improved by rewriting the EEPROM data.

Error Code 24-0	WLAN module communication error
---------------------------	--

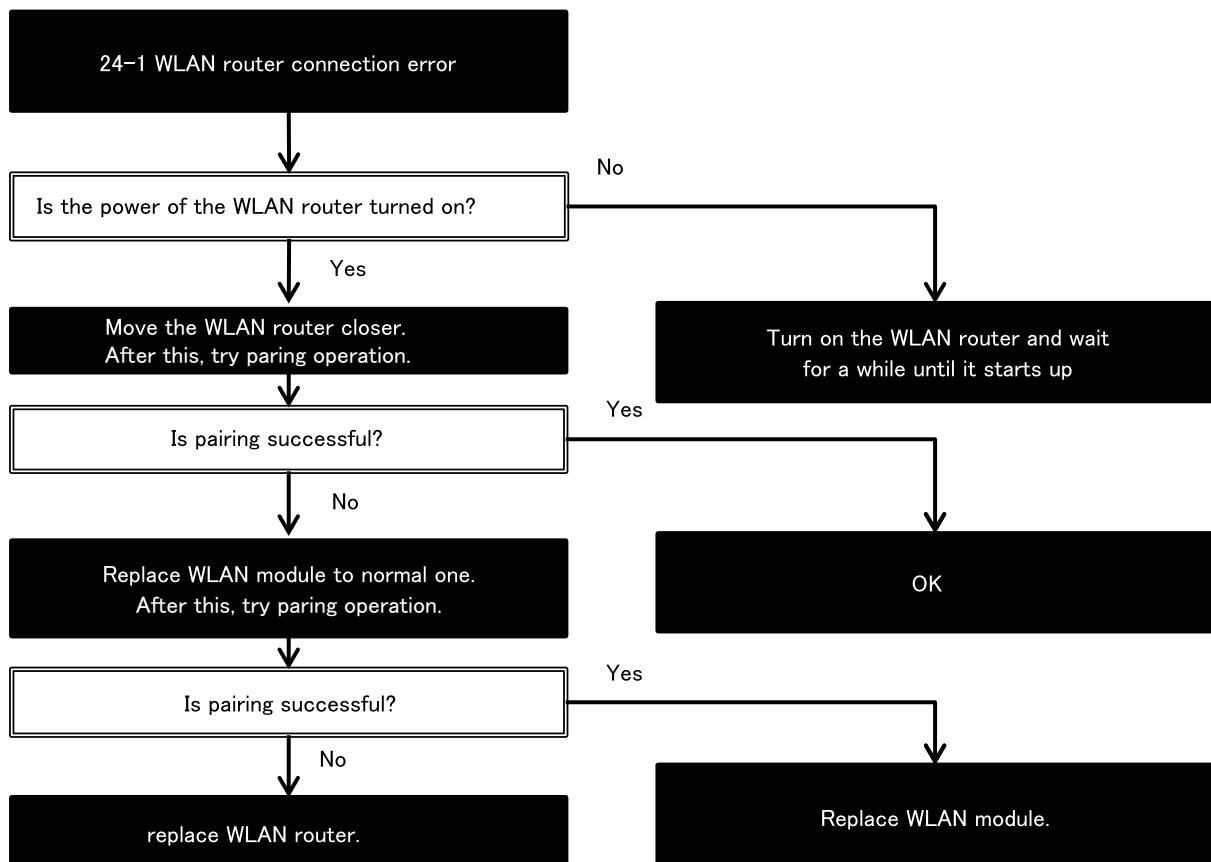
★Determine whether the cause is a connector or a board (WLAN module, main board).



Error Code
24-1

WLAN router connection error

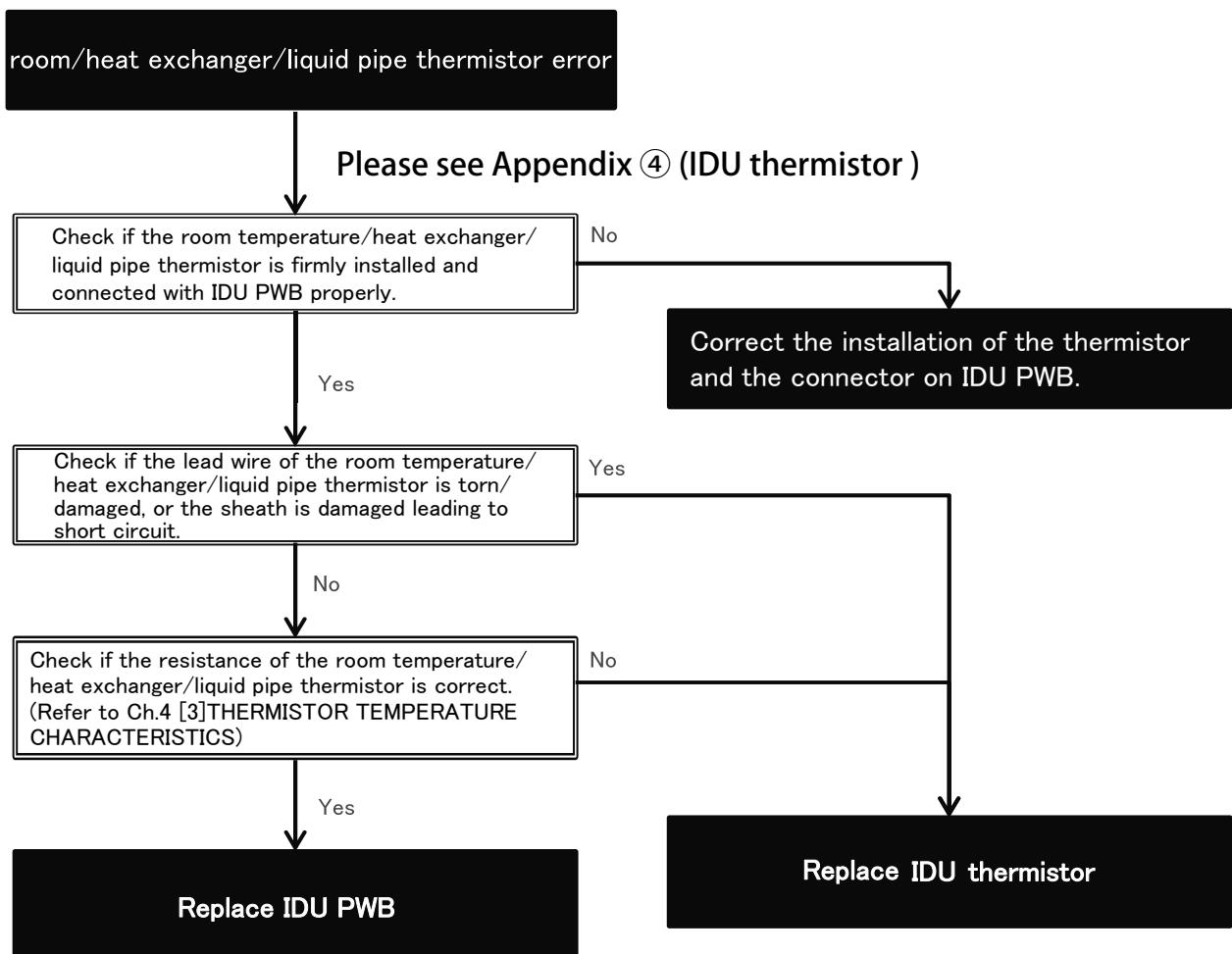
★Determine whether the cause is a WLAN module or a WLAN router.



Error Code**26****Indoor unit temperature
thermistor error**

26-1 Room temperature thermistor error
 26-2 Heat exchanger thermistor error
 26-3 Liquid pipe thermistor

★Determine whether the cause is room temperature/heat exchanger/liquid pipe thermistor or IDU PWB.

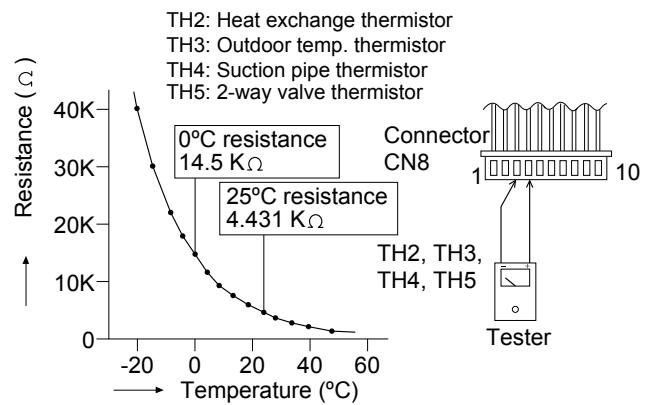
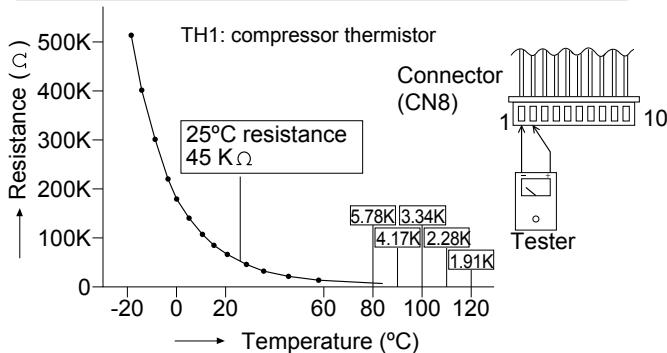


APPENDIX

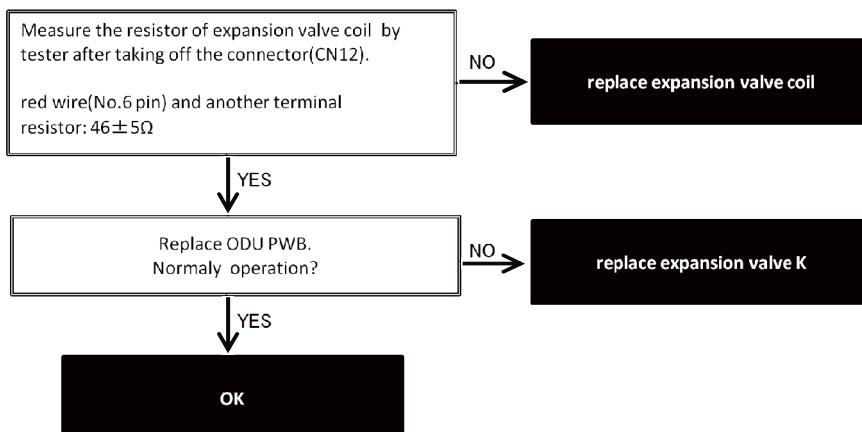
① ODU thermister

To measure the resistance, first remove the connector from the board.

Thermistor	No.	Connector	Color
Compressor thermistor	TH1	① - ②	Red
Heat exchanger pipe thermistor	TH2	③ - ④	Orange
Outdoor temp. thermistor	TH3	⑤ - ⑥	Green
Suction temp. thermistor	TH4	⑦ - ⑧	Black
2-way valve thermistor	TH5	⑨ - ⑩	Yellow

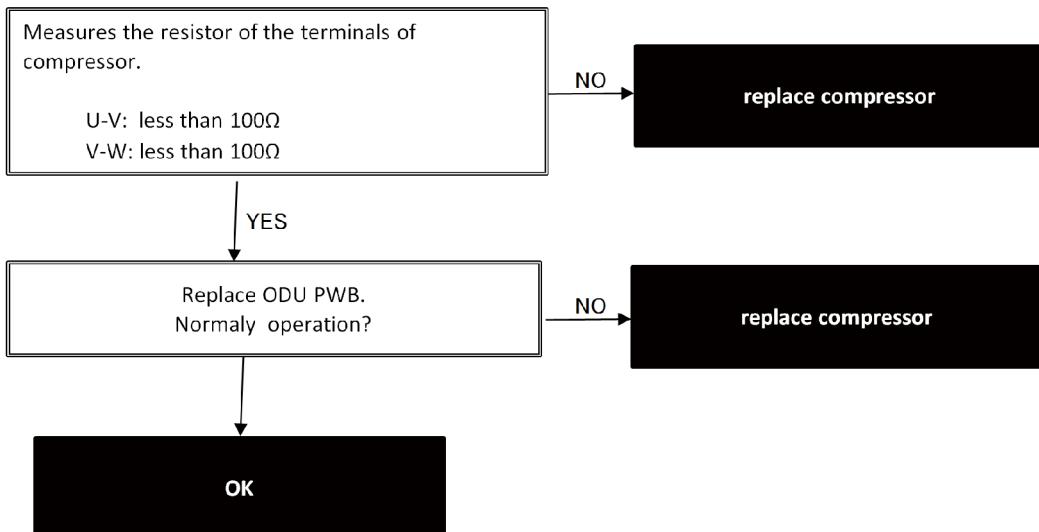


② Expansion valve check



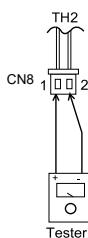
APPENDIX

③ Compressor check



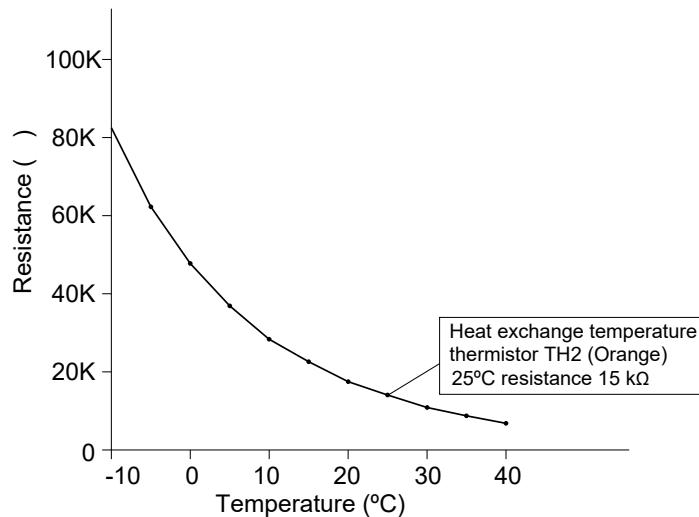
④ IDU thermistor

To measure the resistance, first remove the connector from the board.



Thermistor	Symbol	Connector	Color
Heat exchange temperature	TH2 (CN8)	① - ②	Orange

Before measuring resistance,
disconnect connectors as
shown above



⑤ Indoor fan: DC FAN