

9.6 MAINTENANCE DATA

9.6.1 Servicing

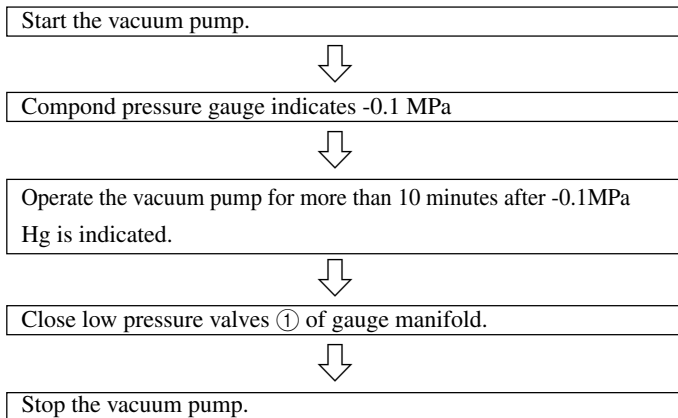
(1) Evacuation

The evacuation is a procedure to purge impurities, such as noncondensable gas, air, moisture from the refrigerant equipment by using a vacuum pump. Since the refrigerant R22 and R407C is very insoluble in water, even a small amount of moisture left in the refrigerant equipment will freeze, causing what is called ice clogging.

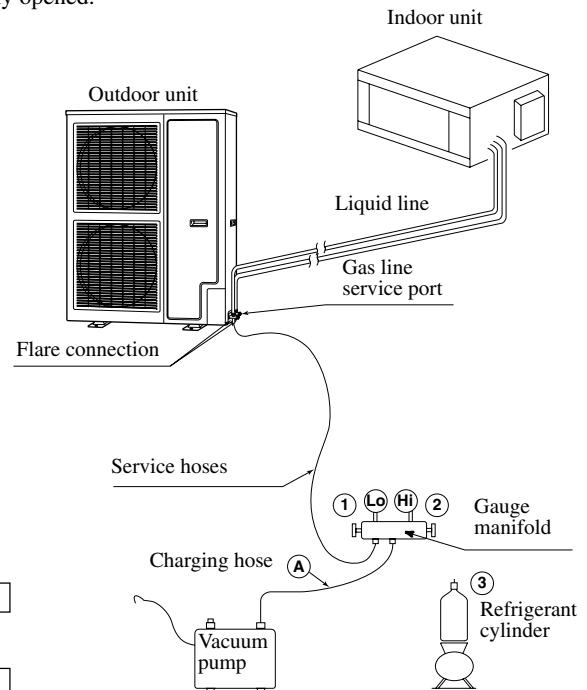
Evacuation procedure

Make sure that the both service valves of gas and liquid line are fully opened.

- (a) Check to ensure that there is no internal pressure in the unit. If there is an internal pressure, it should be relieved through the service port.
 - (b) Connect the charging hose of the gauge manifold to the service port of the gas piping. Close high pressure valve ② of gauge manifold.
 - (c) Connect the charging hose A to a vacuum pump.
- Repeat evacuation in the following sequence.



- Notes (1) Do not use the refrigerant pressure to expel air.
 (2) Do not use the compressor for evacuation.
 (3) Do not operate the compressor in a vacuum condition.



- Notes (1) Refer to the exterior-view drawing for the position of the service valve.
 (2) When connecting of the service valve, flare connection for both the indoor and outdoor unit.

(2) Refrigerant charging

(a) After the evacuation shown in the above, change the connection of the charge hose A to the refrigerant cylinder.

(b) Purge air from the charge hose A .

First loosen the connecting portion of the charge hose at the gauge manifold side and open valve ③ for a few seconds, and then immediately retighten it after observing that gas has blown out from loosened connecting portion.

(c) Open valves ① and ③ then gas refrigerant begins flowing from the cylinder into the unit.

When refrigerant has been charged into the unit to some extent, refrigerant flow becomes stagnant. When that happens, start the compressor in cooling cycle until the system is filled with the specified amount of gas, then close valves ① and ③ and remove the gauge manifold. Cover the service port with caps and tighten them securely.

(d) Check for gas leakage by applying a gas leak detector around the piping connection.

(e) Start the air conditioner and make sure of its operating condition.

9.6.2 Trouble shooting for refrigerant circuit

(1) Judgement of operating condition by operation pressure and temperature difference

Making an accurate judgement requires a skill that is acquired only after years of experience, one trouble may lead to another trouble from a single trouble source and several other troubles may exist at the same time which comes from a undetected different trouble source.

Filtering out the trouble sources can be done easier by comparing with daily operating conditions. Some good guides are to judge the operating pressure and the temperature difference between suction air and delivery air.

Following are some pointers,

Circuit	Pressure						Trouble cause
	Indication	Too low	A little low	Normal	A little high	Too high	
High side Low side						●	1) Excessive overcharging of refrigerant 2) Mixture of non condensable gas (air etc.)
High side Low side	●					●	Ineffective compression (defective compressor)
High side Low side	●		●				1) Insufficient refrigerant in circuit 2) Clogging of strainer 3) Gas leakage 4) Clogging of air filter (in cooling) 5) Decrease in heat load (in cooling) 6) Locking of indoor fan (in cooling)
High side Low side					●	●	1) Locking of outdoor unit fan (in cooling) 2) Dirty outdoor heat exchanger (in cooling) 3) Mixture of non condensable gas (air etc.)
High side Low side					●	●	1) Too high temperature of room

9.6.3 Diagnosing of microcomputer circuit

(1) Selfdiagnosis function

(a) Indoor unit side

(i) Only case of wireless remote control model.

Check indicator table

Failure mode on the indoor unit indicated by flashing Yellow LED and Green LED.

Indoor unit LED		Failure at:	Contents of the failure
Yellow	Green		
1 time flash	–	Indoor unit heat exchanger thermistor Indoor unit circuit board	<ul style="list-style-type: none"> Indoor unit heat exchanger thermistor defective (element defective or broken wire). Defective connection of connector for thermistor. Indoor unit circuit board defective (defective thermistor input circuit)?
2 time flashes	–	Indoor unit air return thermistor Indoor unit circuit board	<ul style="list-style-type: none"> Indoor unit return thermistor defective (element defective or broken wire). Defective connection of connector for thermistor. Indoor unit circuit board defective (defective thermistor input circuit)?
4 time flashes	–	Failure in drainage Float switch Indoor circuit board	<ul style="list-style-type: none"> Failure with the condensate pump (DM), or open circuit or disconnection of connector with the condensate pump. Malfunctioning of the float switch (erroneous functioning) Indoor unit circuit board defective (defective float switch input circuit) Indoor unit circuit board defective (defective DM driving output circuit)
5 time flashes	–	Installation and operating conditions Indoor unit heat exchanger thermistor Indoor unit circuit board	<ul style="list-style-type: none"> Heating overload (temperature of heat exchanger for indoor unit abnormally high) Indoor unit heat exchanger thermistor defective (short circuit)? Indoor unit circuit board defective (defective thermistor input circuit)?
6 time flashes	–	Insufficient refrigerant Indoor unit heat exchanger thermistor Indoor unit circuit board	<ul style="list-style-type: none"> Gas leak. Indoor unit heat exchanger thermistor defective (short circuit). Indoor unit circuit board defective (defective thermistor input circuit)?
–	2 time flashes	Low voltage protection	<ul style="list-style-type: none"> When the power source voltage is 80% of rating or lower.

Note (1) Inspection LED display has a cycle of 8 seconds (flashing time of 0.5 seconds).

(ii) Only case of wired remote control model.

Table of inspection items based on error codes

Error Code	Failure at:	Contents of the failure
E1	Operating switch wire (signal noise) Circuit board for operating switch or indoor unit	<ul style="list-style-type: none"> Defective connection or broken wire for operating switch signal wire. Signal noise has entered the operating switch wire. Is the circuit board for the operating switch or the circuit board for the indoor unit is defective (communication circuit defective)?
E6	Indoor unit heat exchanger thermistor Indoor unit circuit board	<ul style="list-style-type: none"> Indoor unit heat exchanger thermistor defective (element defective or broken wire). Defective connection of connector for thermistor. Indoor unit circuit board defective (defective thermistor input circuit)?
E7	Indoor unit air return thermistor Indoor unit circuit board	<ul style="list-style-type: none"> Indoor unit return thermistor defective (element defective or broken wire). Defective connection of connector for thermistor. Indoor unit circuit board defective (defective thermistor input circuit)?
E8	Installation and operating conditions Indoor unit heat exchanger thermistor Indoor unit circuit board	<ul style="list-style-type: none"> Heating overload (temperature of heat exchanger for indoor unit abnormally high) Indoor unit heat exchanger thermistor defective (short circuit). Indoor unit circuit board defective (defective thermistor input circuit)?
E9	Failure in drainage Float switch Indoor circuit board	<ul style="list-style-type: none"> Failure with the condensate pump (DM), or open circuit or disconnection of connector with the condensate pump. Malfunctioning of the float switch (erroneous functioning) Indoor unit circuit board defective (defective float switch input circuit) Indoor unit circuit board defective (defective DM driving output circuit)
E10	Number of indoor units connected	<ul style="list-style-type: none"> 1 Remote controller for multiple unit control, 17 or more indoor units connected
E14	Indoor unit No. setting Remote controller wiring	<ul style="list-style-type: none"> No master unit corresponding to the slave unit. Incorrect connection or open circuit of remote controller wiring between the master unit and the slave unit.
E57	Insufficient refrigerant Indoor unit heat exchanger thermistor Indoor unit circuit board	<ul style="list-style-type: none"> Gas leak. Indoor unit heat exchanger thermistor defective (short circuit). Indoor unit circuit board defective (defective thermistor input circuit)?

(2) Error diagnosis procedures at the indoor unit side

To diagnose the error, measure the voltage (AC, DC), resistance, etc. at each connector around the circuit board of indoor unit based on the inspection display or the operation state of unit (no operation of compressor or blower, no switching of 4-way valve, etc.). If any defective parts are discovered, replace with the assembly of parts as shown below.

(a) Single-unit replacement parts for circuit board of indoor unit. (Peripheral electric parts for circuit board.)

Indoor unit printed circuit board, thermistor (return, heat exchanger), operating switches, limit switches, transformers, fuses.

Note (1) Use normal inspection methods to determine the condition of strong electrical circuits and frozen cycle parts.

(b) Replacement procedure of indoor unit microcomputer printed circuit board

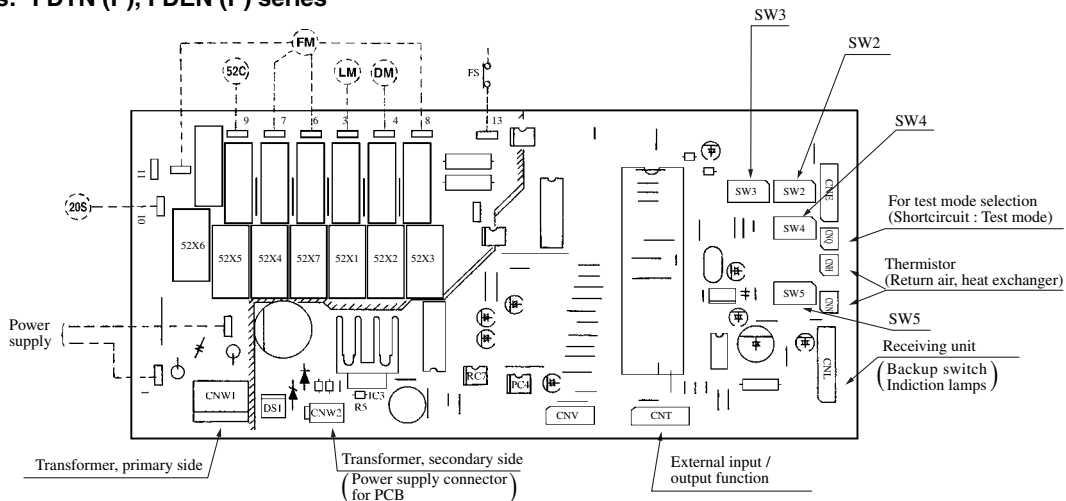
Microcomputer printed circuit board can be replaced with following procedure.

- (i) Confirm the parts numbers. (Refer to the following parts layout drawing for the location of parts number.)

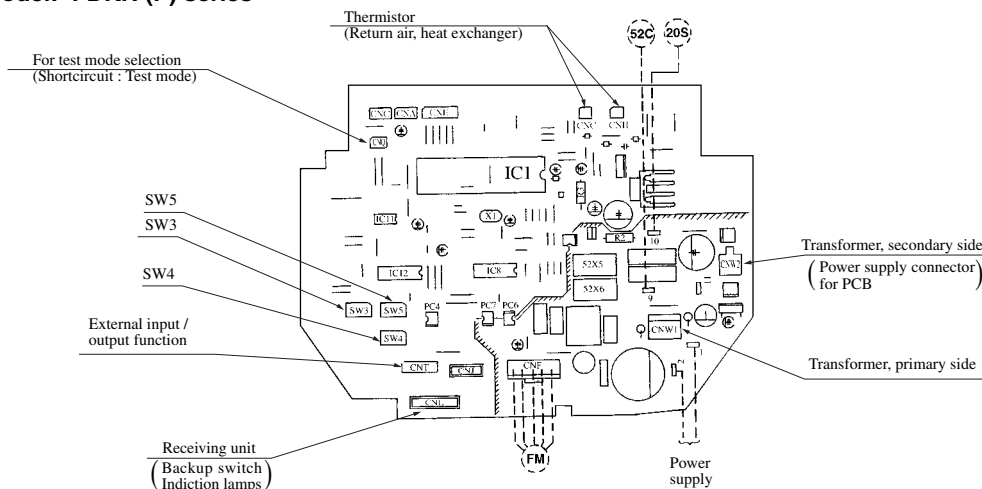
Model	Parts number	Model	Parts number
FDTN(P), FDEN(P)	PJA505A069	FDKN(P)	PHA505A008
FDL	PJA505A080Z	FDT, FDR, FDU, FDUM, FDFL	PJA505A092Z

Parts layout on the indoor unit PCB

Models: FDTN (P), FDEN (P) series



Model: FDKN (P) series

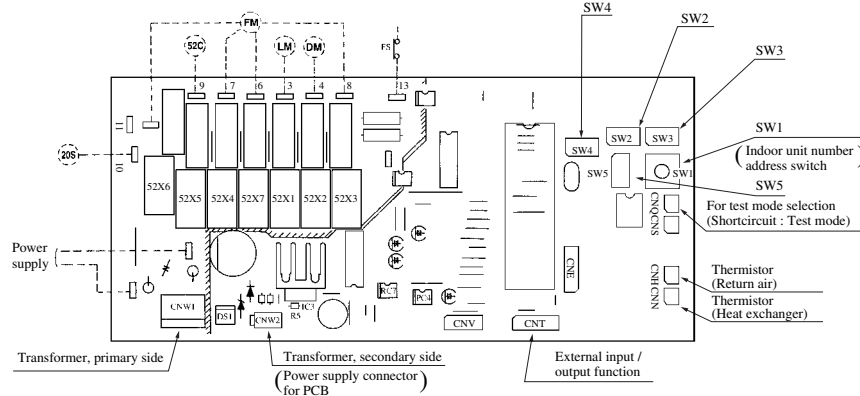


- Function of jumper wires

Name	Function	
J1(SW5-1)	With	1 Phase model
	None	3 Phase model
J2(SW5-2)	With	Cooling only type
	None	Heat pump type
J3(SW5-3)	With	Pulse input
	None	Step input
J4(SW4-1)	With	—
	None	—
J5(SW4-2)	With	Antifrost 2.5°C
	None	Antifrost 1°C
J6(SW4-3)	With	With abnormality resetting
	None	Without abnormality resetting
J7(SW4-4)	With	4 position louver control: valid
	None	4 position louver control: invalid
*1 J7(SW4-4)	With	FDKN208 type
	None	FDKN258, 308 type

Note (1) *1 J7 (SW4-4) is for switching models on the FDKN (P) Series.

Models: FDT, FDR, FDU, FDUM, FDUR, FDF, FDFL series



- Function of DIP switched (SW3)

Switch	Function	
SW3-1	ON	Power off guaranteed
	OFF	No power off guaranteed
SW3-2	ON	With low-voltage detection control
	OFF	Without low-voltage detection control
SW3-3	ON	Power up mode (UHi-Lo)
	OFF	Mild mode (Hi-Lo)
SW3-4	ON	Indoor fan is Lo when heating thermostat is OFF.
	OFF	Indoor fan is OFF when heating thermostat is OFF.

- Function of DIP switched (SW3)

Switch	Function	
SW3-1	ON	Power off guaranteed
	OFF	No power off guaranteed
SW3-2	ON	With low-voltage detection control
	OFF	Without low-voltage detection control
SW3-3	ON	Power up mode (UHi-Lo)
	OFF	Mild mode (Hi-Lo)
SW3-4	ON	Indoor fan is Lo when heating thermostat is OFF.
	OFF	Indoor fan is OFF when heating thermostat is OFF.

- Function of DIP switched (SW4, 5)

Switch	Function	
SW4-1(J1)	ON	Antifrost 2.5°C
	OFF	Antifrost 1°C
SW4-2(J2)	ON	With abnormality resetting
	OFF	Without abnormality resetting
SW4-3(J3)	ON	4 position louver control: valid
	OFF	4 position louver control: invalid
SW5-1(J4)	ON	1 Phase model
	OFF	3 Phase model
SW5-2(J5)	ON	Step input
	OFF	Pulse input

- Function of DIP switched (SW2)

Switch	Function			
SW2-1	ON	SW2-2	ON	200cm
			OFF	130cm
	OFF	SW2-2	ON	160cm
			OFF	—
SW2-3	ON	SW2-4	ON	Plural setting (Slave c)
			OFF	Plural setting (Slave b)
	OFF	SW2-4	ON	Plural setting (Slave a)
			OFF	Plural setting (Master)

- Function of DIP switched (SW4, 5) (Only of FDF)

Switch	Function	
SW4-1(J4)	ON	Countermeasure for draft: invalid
	OFF	Countermeasure for draft: valid
SW4-2(J5)	ON	Antifrost 2.5°C
	OFF	Antifrost 1°C
SW4-3(J6)	ON	With abnormality resetting
	OFF	Without abnormality resetting
SW5-1(J1)	ON	1 Phase model
	OFF	3 Phase model
SW5-2(J2)	ON	Cooling
	OFF	Heating
SW5-3(J3)	ON	Step input
	OFF	Pulse input

(ii) Please match the settings of control switching switches (SW3, SW4, SW5) to the settings they had before they were replaced. With these switches, if the printed circuit had a jumper wire before being replaced, set to jumper wire ON if there was a jumper wire and jumper OFF if these was not.

(iii) Connect the fast-on terminals and connectors that are to the circuit board for the micro-computer.

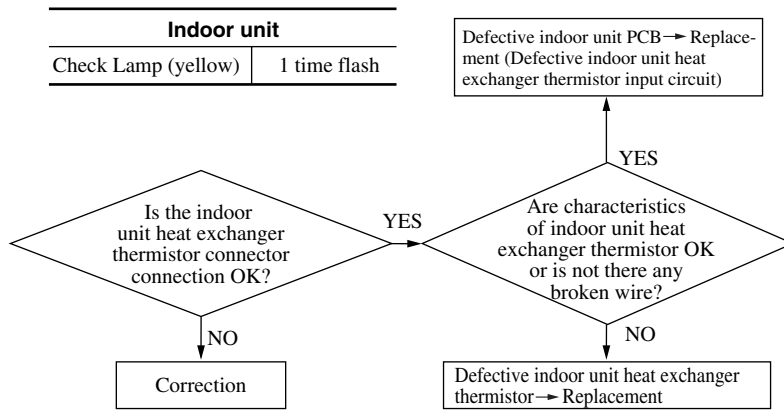
Connect by matching the wire color of the fast-on terminal with the color printed on the circuit board for the micro-computer.

Note (1) When connecting to the fast-on connection for the circuit board for the micro-computer, use care so as not to excessively distort the circuit board.

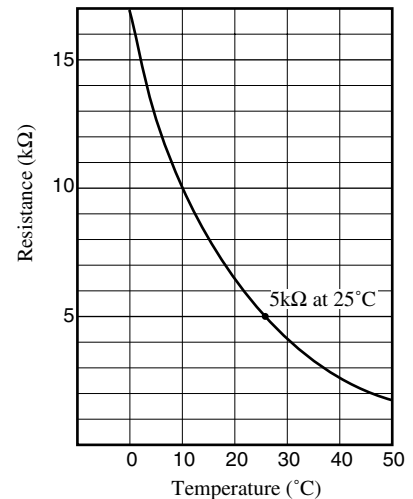
(c) Inspection method when there are fault lamps (display lamps on indoor unit).

(i) Only case of wireless remote control model

1 Defective indoor unit heat exchanger thermistor



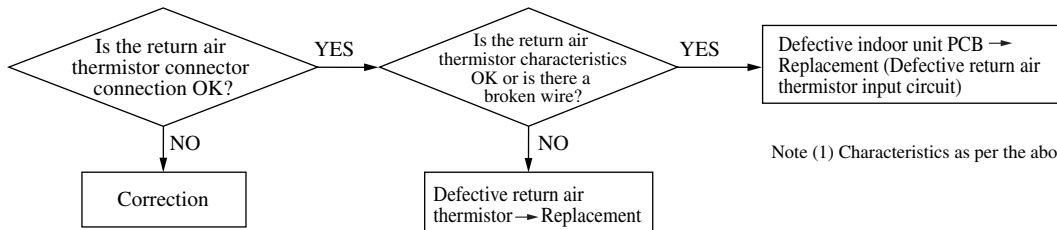
Return air thermistor (Th-A)
Indoor unit heat exchanger thermistor (Th-R)
Resistance temperature characteristics



Note (1) 22.5 kΩ at -6°C

2 Defective return air thermistor

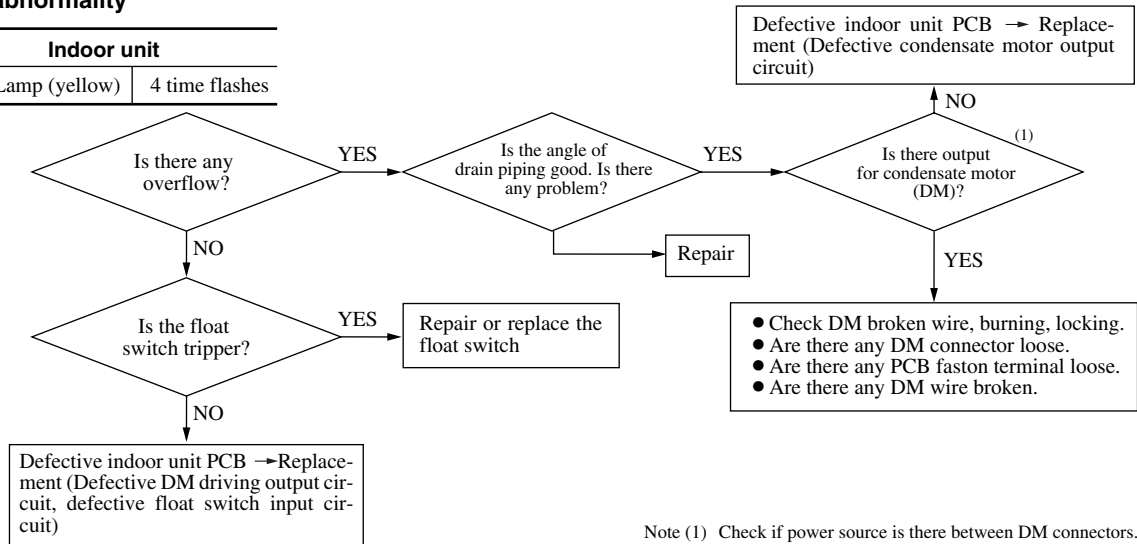
Indoor unit	
Check Lamp (yellow)	2 time flashes



Note (1) Characteristics as per the above graph.

3 Drain abnormality

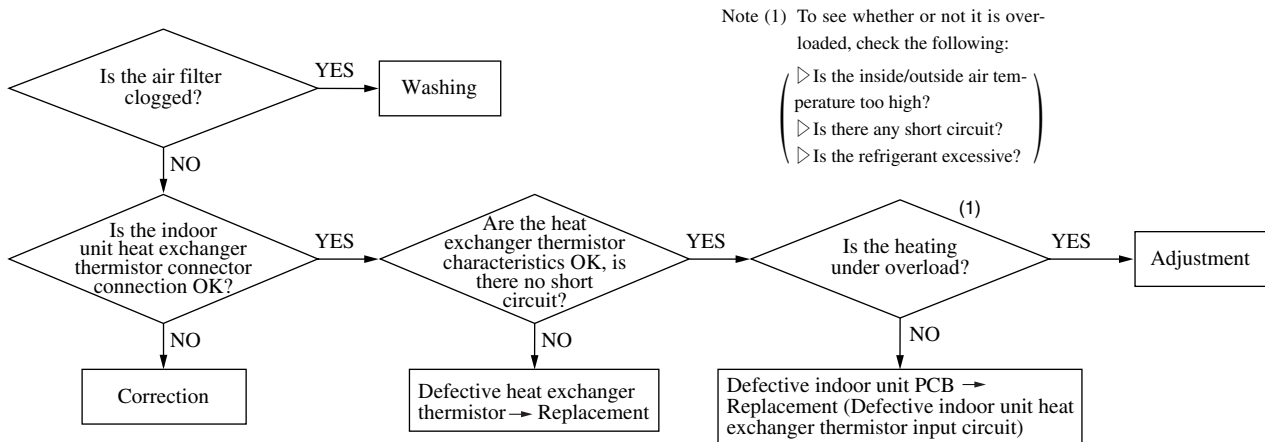
Indoor unit
Check Lamp (yellow) | 4 time flashes



Note (1) Check if power source is there between DM connectors.

4 Heating overload

Indoor unit
Check Lamp (yellow) | 5 time flashes

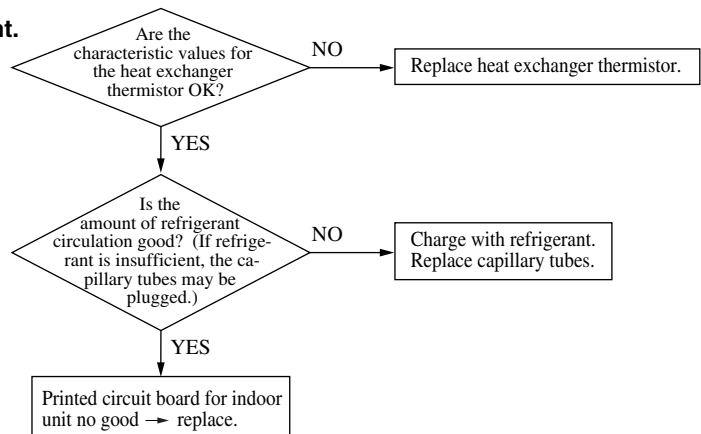


Note (1) To see whether or not it is overloaded, check the following:

- ▷ Is the inside/outside air temperature too high?
- ▷ Is there any short circuit?
- ▷ Is the refrigerant excessive?

5 Abnormality casued by insufficient refrigerant.

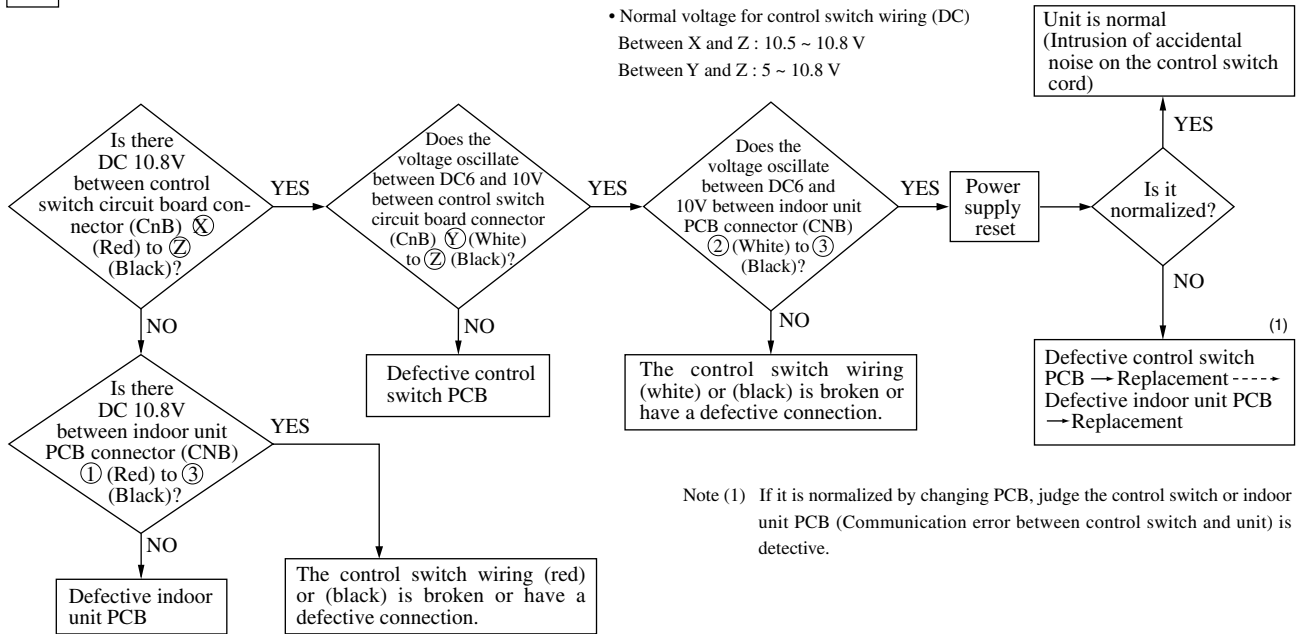
Indoor unit
Check Lamp (yellow) | 6 time flashes



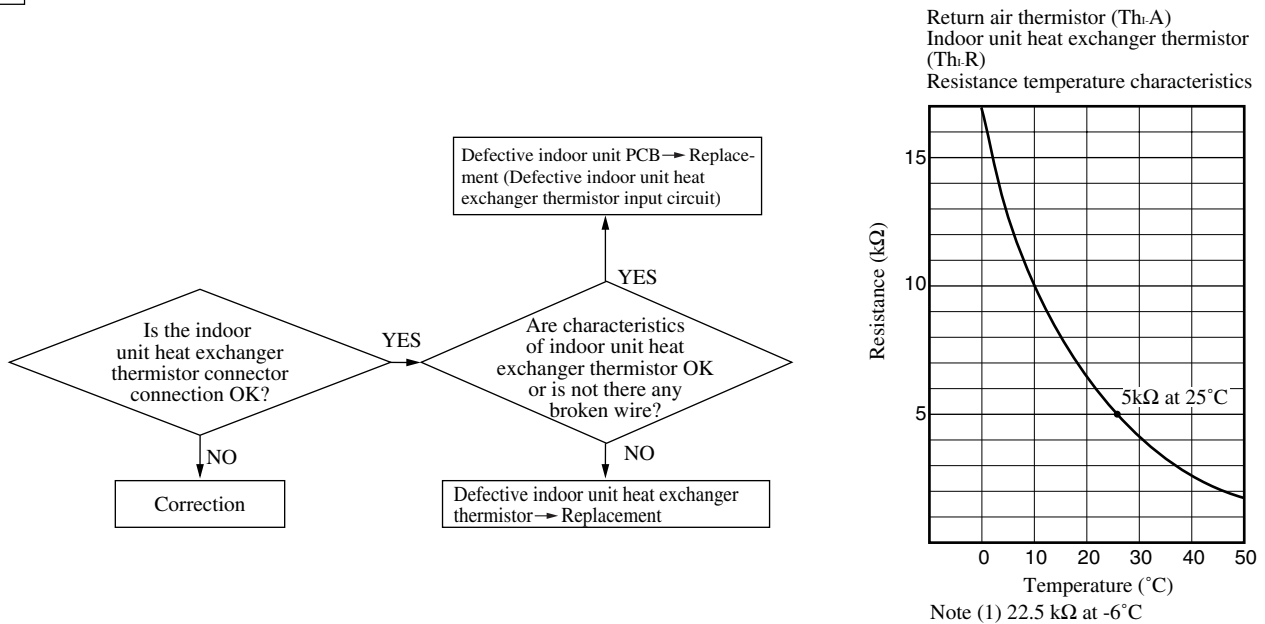
Note (1) Refer to previous page for heat exchanger thermistor temperature resistance characteristic values.

(ii) Only case of wired remote control model

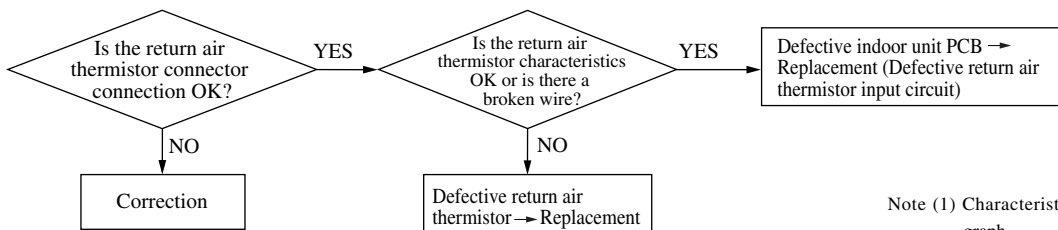
1 Error display : **E1** [Communication error between control switch ~ Indoor unit PCB]



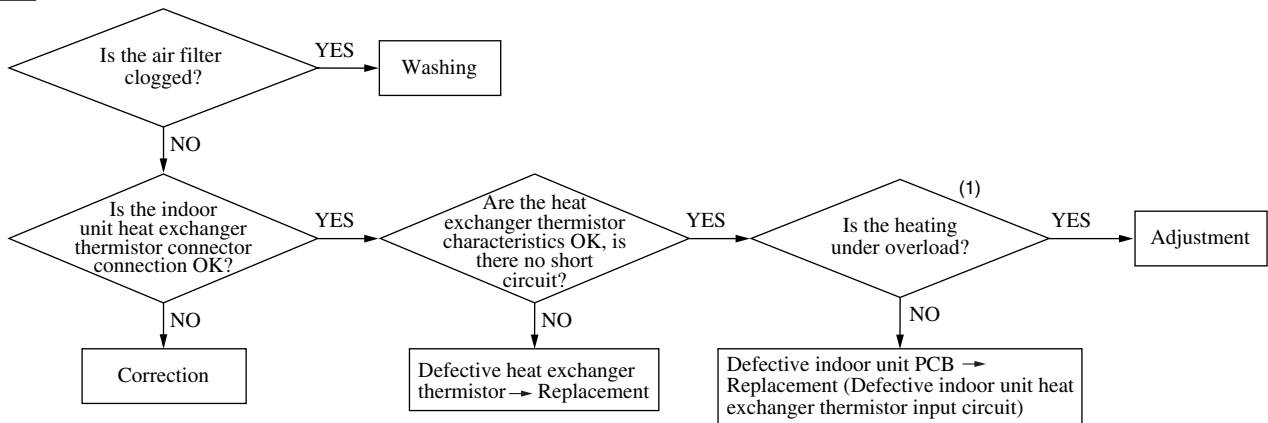
2 Error display : **E6** [Defective indoor unit heat exchanger thermistor]



3 Error display : **E7** [Defective return air thermistor]



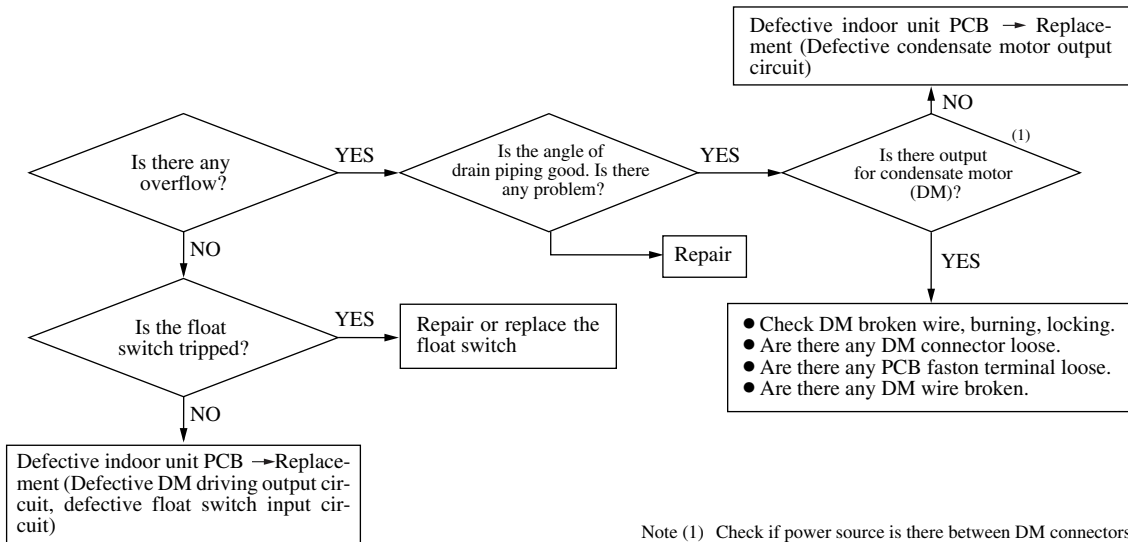
4 Error display : **E8** [Heating overload]



Note (1) To see whether or not it is overloaded, check the following:

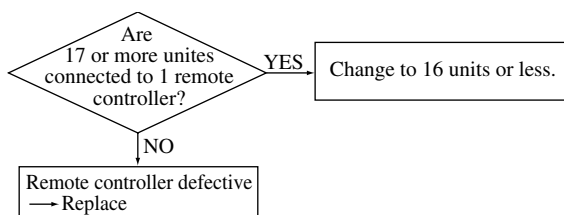
- ▶ Is the inside/outside air temperature too high?
- ▶ Is there any short circuit?
- ▶ Is the refrigerant excessive?

5 Error display : **E9** [Failure in drainage]

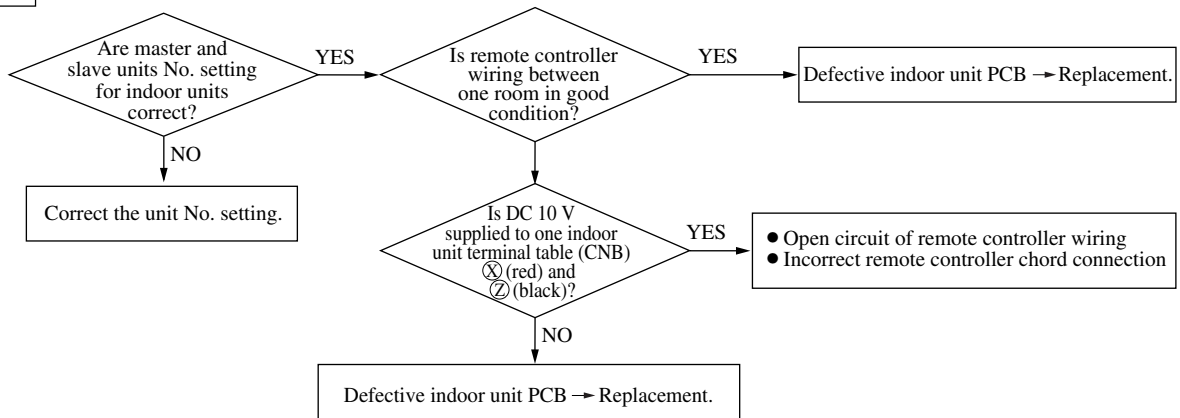


Note (1) Check if power source is there between DM connectors.

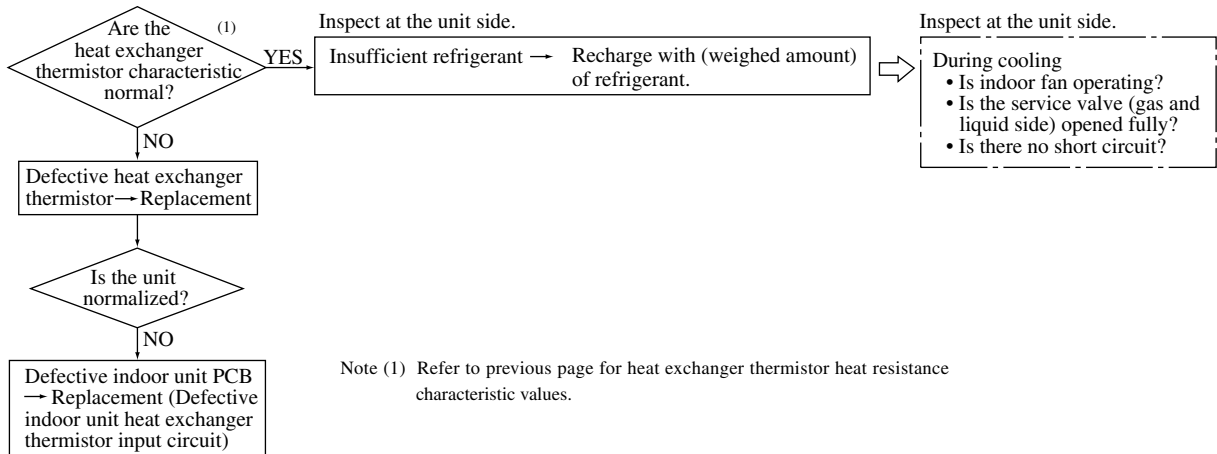
6 Error display : **E10** [1 Remote controller for multiple unit control ⇨ Exceeding connected units (17 units or more)]



7 **Error display : E14** [Communication is abnormal between master and slave indoor units.]



8 **Error display : E57** [Insufficient refrigerant]



Note (1) Refer to previous page for heat exchanger thermistor heat resistance characteristic values.

(4) Outdoor unit side (FDC208~508, FDCP308~508, FDC808)

Check Indicator Table

Failure mode on the outdoor unit is indicated by flashing both Green LED (LED-G) and Red LED (LED-R) on the printed circuit board.

Outdoor unit LED		Failure at:	Contents of the failure
Green	Red		
Keeps flashing	Stays OFF	—————	Normal/Power is supplied.
Stays OFF	1 time flash	Power wiring	<ul style="list-style-type: none"> The outdoor power wiring is in reversed phase. Open phase at L3 phase (primary side). Incorrect set-up of outdoor unit PCB.
Stays OFF	2 time flashes	Installation or operation status	<ul style="list-style-type: none"> Over current of the compressor motor. Open phase at L2 phase (secondary wiring of 52C) of compressor. Defective outdoor unit PCB.
Stays OFF	3 time flashes	CM wiring	<ul style="list-style-type: none"> The wiring (secondary wiring of 52C) to the compressor is open.
Stays OFF	4 time flashes	Installation or operation status	<ul style="list-style-type: none"> The outdoor heat exchanger temperature is too high [70°C or over].
		Outdoor heat exchanger thermistor	<ul style="list-style-type: none"> Failure with the outdoor heat exchanger thermistor.
Stays OFF	5 time flashes	Installation or operation status	<ul style="list-style-type: none"> The discharge gas temperature is too high.
		Discharge gas thermistor	<ul style="list-style-type: none"> Failure with the discharge gas thermistor.
1 time flash	1 time flash	Outdoor heat exchanger thermistor	<ul style="list-style-type: none"> Failure or open circuit with the outdoor heat exchanger thermistor or imperfect connection of the connector.
1 time flash	2 time flashes	Outdoor temperature thermistor	<ul style="list-style-type: none"> Failure or open circuit with the outdoor temperature thermistor or imperfect connection of the connector.
1 time flash	3 time flashes	Discharge gas thermistor	<ul style="list-style-type: none"> Failure with the discharge gas thermistor or imperfect connection of the connector.
1 time flash	4 time flashes	Installation or operation status	<ul style="list-style-type: none"> The high pressure is too high or it went up (63H1, 49C).
1 time flash	5 time flashes	Failure to open the service valve	<ul style="list-style-type: none"> Closing of the service valve on the liquid/gas side.

“Check Indicator” is reset when power supply is turned off once and the failure is fixed.

(a) Procedure for diagnosing trouble for outdoor unit

When diagnosing trouble for the outdoor unit, check the flashing and turns of the inspection indicator lamp (red LED) and fault indicator lamp (green LED) to obtain a general concept of the nature of the problem. Then inspect and perform repair.

1) Unit replacement parts related to printed circuit board for outdoor unit.

Micro-computer for outdoor unit, microcomputer, printed circuit board, thermistor (heat exchanger, discharge piping and outdoor air), fuses and transformer.

2) Summary of replacement for micro-computer for outdoor unit

a) Check the following part number

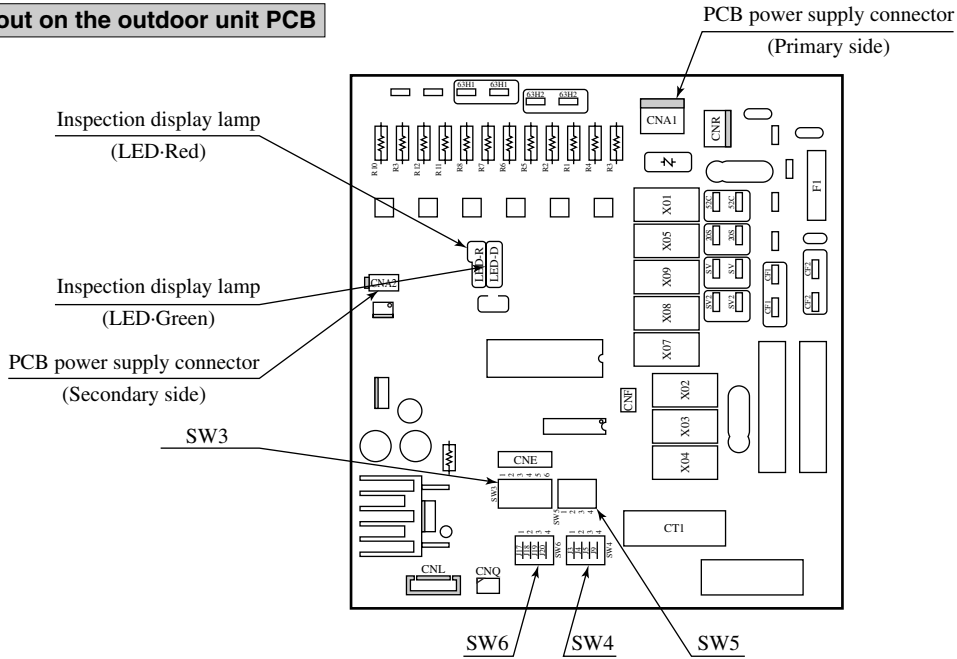
Model	Parts No.	Model	Parts No.	Model	Parts No.
1 phase model	PCA505A046ZN	3 phase model	PCA505A046ZS	FDC808 model	PCA505A046ZC

b) Set the overcurrent value using the overcurrent setting switch (SW3) for CM. Refer to the following table at the setting.

• Table of switch (SW3) setting

Model	FDC208HEN3A	FDC258HEN3A	FDC308HEN3B FDCP308HEN3B	FDC308HES3B FDCP308HES3B	FDC408HES3B FDCP408HES3B	FDC508HES3B FDCP508HES3B	FDC808HES3B
Setting value (A)	12	15	23	9	12	15	24
Table of switch setting Make ON/OFF setting for each switch No. (■ : ON, □ : OFF)							

Parts layout on the outdoor unit PCB



• Function of DIP switched (SW4)

SW4			Function	
1 (J3)		ON	1 Phase model	
		OFF	3 Phase model	
2 (J4)	ON	3 (J5)	ON	—
			OFF	Rotary
	OFF	ON	Reciprocal	
		OFF	Scroll	
4 (J9)		ON	Spare	
		OFF		

• Function of DIP switched (SW5)

SW5		Function	
1	ON	Defrost Switching	Actual spot
	OFF		Ordinary
2	ON	Snow protection control	Enabled
	OFF		Disabled
3	ON	Test run Switch	Test run
	OFF		Normal
4	ON		Test run for heating
	OFF		Test run for cooling

• Function of DIP switched (SW6)

SW6		Function	
1 (J17)	ON	4-way valve control	Enabled
	OFF		Disabled
2 (J18)	ON	Defrost circulation temperature switching	14°C
	OFF		18°C
3 (J19)	ON	63Hz abnormal detection switching	Enabled
	OFF		Disabled
4 (J20)	ON	3 minute delay when power is turned on Switching	Enabled
	OFF		Disabled

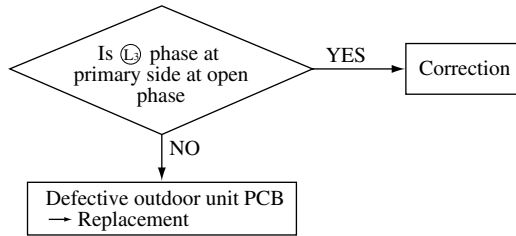
• Function of jumper wire

Name		Function
J21	With	Service valve open/close check control enabled.
	None	Service valve open/close check control disabled.

(b) Inspection method when there are fault lamps (outdoor unit LED)

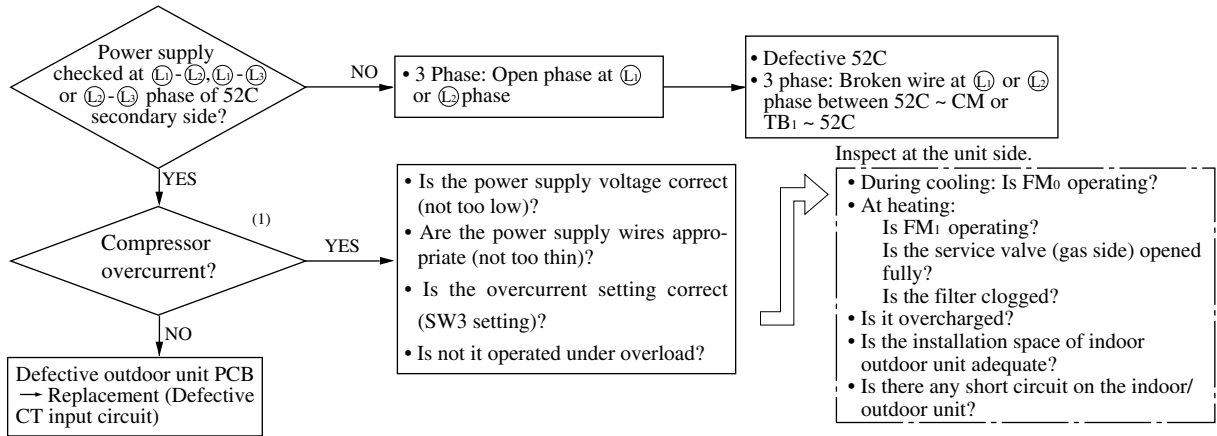
1 Open phase at L₃ phase (Primary side)

Outdoor unit	
Red LED	1 time flash
Green LED	Stays OFF



2 Overcurrent of the compressor motor

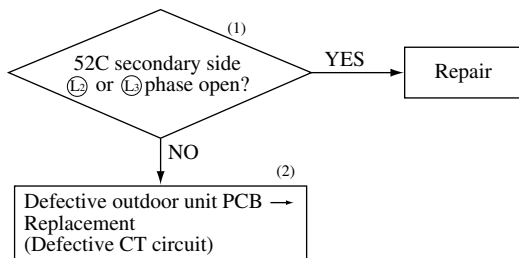
Outdoor unit	
Red LED	2 time flashes
Green LED	Stays OFF



Note (1) Measure and check the current value.
Confirm that the overcurrent setting by SW₃ of outdoor unit PCB is correct.

3 The wiring (secondary wiring of 52C) to the compressor is open.

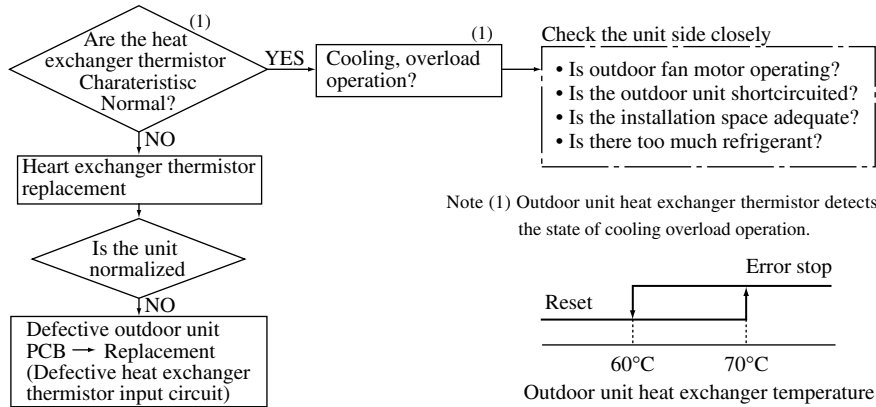
Outdoor unit	
Red LED	3 time flashes
Green LED	Stays OFF



Notes (1) When voltage is detected at 52C primary side L₁ or L₂ phase but not at the secondary side, check also 52C (broken coil, poor contact).
(2) When voltage is detected at 52C primary side L₁ or L₂ phase and there is no error at 52C (52C is energized if TB₁ L₁ or L₂ terminal and 52C coil secondary side connector are short circuited), the outdoor unit PCB (defective X₀₁ circuit or X₀₁).

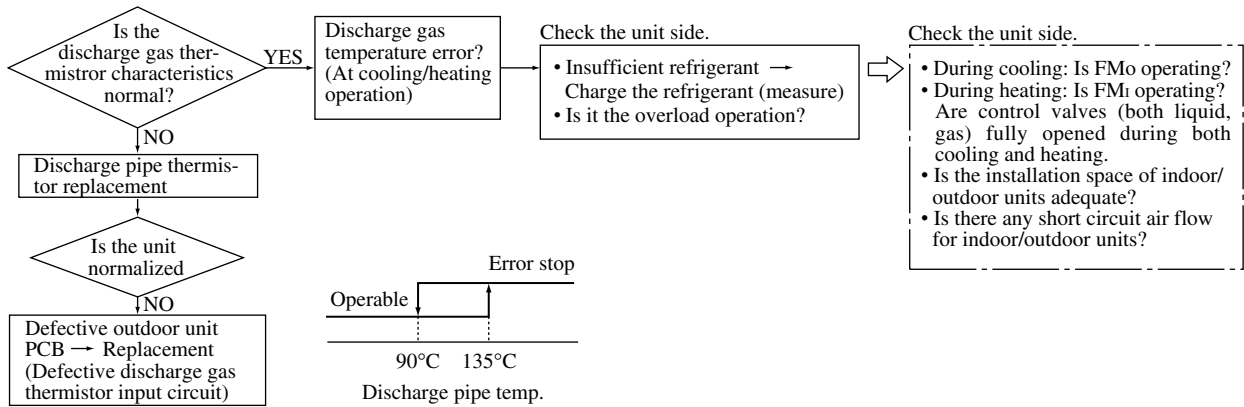
4 The outdoor heat exchanger temperature is too high (70°C or over)

Outdoor unit	
Red LED	4 time flashes
Green LED	Stays OFF



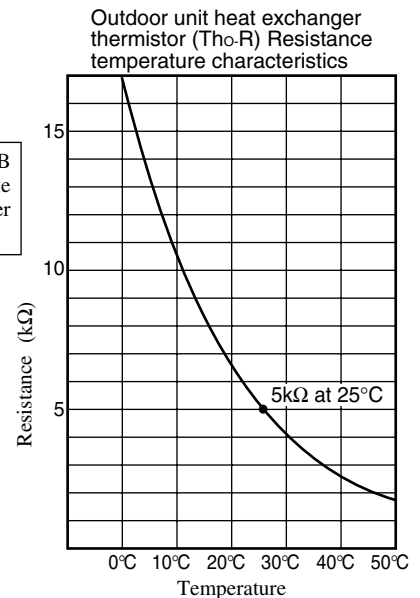
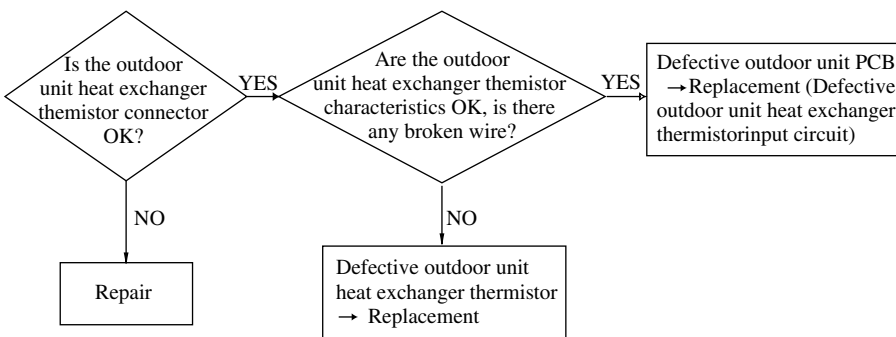
5 The discharge gas temperature is too high. (Only case of FDC208~508, FDCP308~508)

Outdoor unit	
Red LED	5 time flashes
Green LED	Stays OFF



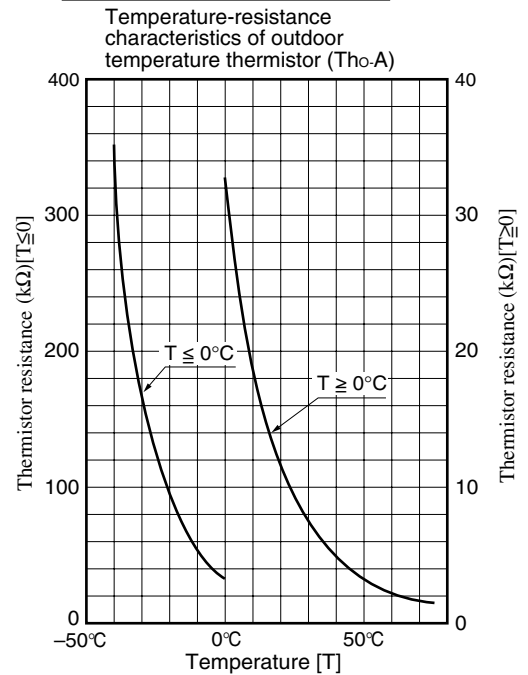
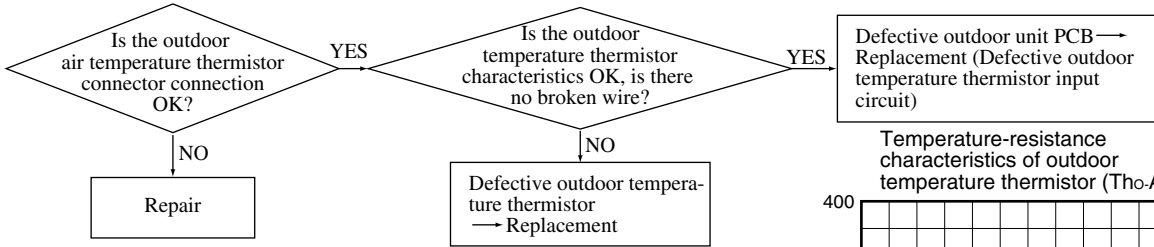
6 Defective outdoor unit heat exchanger thermistor

Outdoor unit	
Red LED	1 time flash
Green LED	1 time flash



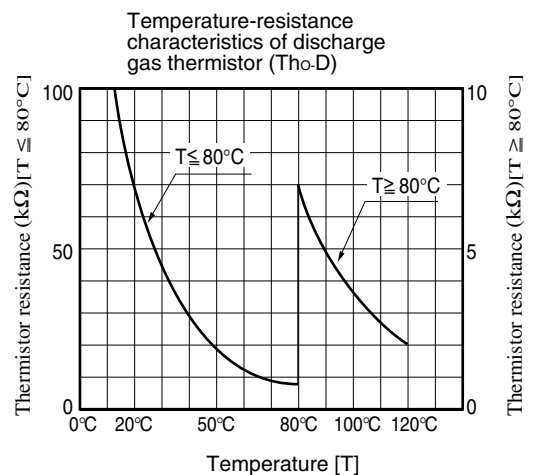
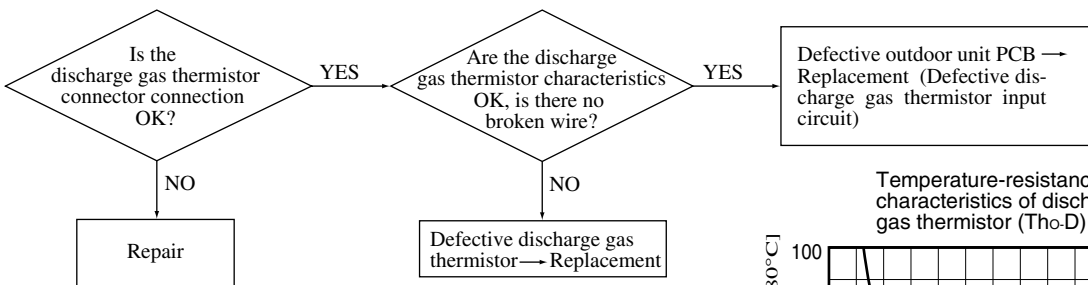
7 Defective outdoor temperature thermistor

Outdoor unit	
Red LED	2 time flashes
Green LED	1 time flash



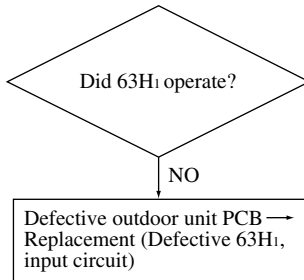
8 Defective discharge gas thermistor (Only case of FDC208~508, FDCP308~508)

Outdoor unit	
Red LED	3 time flashes
Green LED	1 time flash



9 High pressure error [63H₁] (Only case of FDCP308~508)

Outdoor unit	
Red LED	4 time flashes
Green LED	1 time flash



At 63H₁ operation

1. During cooling

- Is the outdoor unit fan motor operating?
- Is there no short circuit air circulation for the outdoor unit?
- Is there sufficient space for air inlet & outlet?

2. During heating

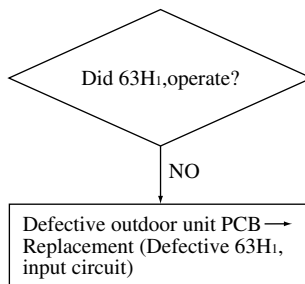
- Is the gas side service valve fully opened?
- Is the indoor unit heat exchanger thermistor detached from the detector case?
- Is the filter clogged?
- Is the outdoor unit fan controlled by due to defective 63H₂?

3. During colling/heating

- Is the refrigerant charge excessive?

63H₁, 49C operation (Only case of FDC808)

Outdoor unit	
Red LED	4 time flashes
Green LED	1 time flash



At 63H₁ operation

1. During cooling

- Is the outdoor unit fan motor operating?
- Is there no short circuit air circulation for the outdoor unit?
- Is there sufficient space for air inlet & outlet?

2. During heating

- Is the gas side service valve fully opened?
- Is the indoor unit heat exchanger thermistor detached from the detector case?
- Is the filter clogged?
- Is the outdoor unit fan controlled by due to defective 63H₂?

3. During colling/heating

- Is the refrigerant charge excessive?

At 49C operation

During cooling/heating

- Isn't there insufficient refrigerant?
(Isn't there gas leakage?)
- Isn't there a missing phase (L₁ or L₂ phase)?

10 Failure to open the service valve

Outdoor unit	
Red LED	5 time flashes
Green LED	1 time flash

This abnormality will be indicated only when the compressor is ON for the time after turning on the power. (Refer to page 321)

MEMO

A series of horizontal dashed lines intended for writing a memo.