HITACHI
Inspire the Next

SET FREE SERIES
FSNM(E)

Service manual

Outdoor Units: RAS-(8~12)FSNM(E)

Contents

0. Model codes and descriptions

◆ Unit code list

MODEL CODIFICATION

Please check by model name your air conditioner type, its abbreviation and reference number in this service manual.

FSN(2)(E) INDOOR UNITS							
4-Way Cassette		4-Way Mini Cassette		2-Way Cassette		Ceiling	
Unit	Code	Unit	Code	Unit	Code	Unit	Code
RCI-1.0FSN2E	7E400001	RCIM-1.0FSN2	60278011	RCD-1.0FSN2	60278029		
RCI-1.5FSN2E	7E400002	RCIM-1.5FSN2	60278013	RCD-1.5FSN2	60278030		
RCI-2.0FSN2E	7E400003	RCIM-2.0FSN2	60278014	RCD-2.0FSN2	60278031	RPC-2.0FSNE	7E440003
RCI-2.5FSN2E	7E400004			RCD-2.5FSN2	60278032	RPC-2.5FSN2E	7E440004
RCI-3.0FSN2E	7E400005			RCD-3.0FSN2	60278033	RPC-3.0FSN2E	7E440005
RCI-4.0FSN2E	7E400007			RCD-4.0FSN2	60278034	RPC-4.0FSN2E	7E440007
RCI-5.0FSN2E	7E400008			RCD-5.0FSN2	60278035	RPC-5.0FSN2E	7E440008
RCI-6.0FSN2E	7E400009					RPC-6.0FSN2E	7E440009
							
RCI		RCIM		RCD		RPC	
☀ ❄ 1~							

Meaning of model codification:	RPI	3.0	FS	N	2	E
Unit Type (Indoor Unit RCI(M), RCD, RPC, RPI, RPK, RPF(I))						
Compressor power (HP) 1.0 ~ 6.0						
H-Link Set Free / System Free						
R410 A refrigerant						
Series						
E: Made in Europe - Made in Malaysia						

FSN(2)(E) INDOOR UNITS									
Duct				Wall		Floor Enclosure		Floor Concealed Enclosure	
Unit	Code	Unit	Code	Unit	Code	Unit	Code	Unit	Code
				RPK-1.0FSNH2M	60277942				
RPI-0.8FSN2E	7E420000	RPIM-0.8FSN2E	7E430000	RPK-1.5FSNH2M	60277942				
RPI-1.0FSN2E	7E420001	RPIM-1.0FSN2E	7E430001	RPK-1.0FSN2M	60277941	RPF-1.0FSN2E	7E450001	RPFI-1.0FSN2E	7E460001
RPI-1.5FSN2E	7E420002	RPIM-1.5FSN2E	7E430002	RPK-1.5FSN2M	60277942	RPF-1.5FSN2E	7E450002	RPFI-1.5FSN2E	7E460002
RPI-2.0FSN2E	7E420003			RPK-2.0FSN2M	60277943	RPF-2.0FSN2E	7E450003	RPFI-2.0FSN2E	7E460003
RPI-2.5FSN2E	7E420004			RPK-2.5FSN2M	60277944	RPF-2.5FSN2E	7E450004	RPFI-2.5FSN2E	7E460004
RPI-3.0FSN2E	7E420005			RPK-3.0FSN2M	60277945	-	-	-	-
RPI-4.0FSN2E	7E420007			RPK-4.0FSN2M	60277946				
RPI-5.0FSN2E	7E420008								
RPI-6.0FSN2E	7E420009								
RPI-8.0FSN2E	7E420010								
RPI-10.0FSN2E	7E420011								
									
RPI		RPIM		RPK		RPF		RPFI	
❄1~									

Meaning of model codification:	RPF	2.0	FS	N	2	E
Unit Type (Indoor Unit RCI(M), RCD, RPC, RPI, RPK, RPF(I))						
Compressor power (HP) 1.0 ~ 6.0						
H-Link Set Free / System Free						
R410 A refrigerant						
Series						
E: Made in Europe - Made in Malaysia						

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FSNM(E) OUTDOOR UNITS (SET FREE SIDE FLOW TYPE)	
Unit	Code
RAS-8-FSNM(E)	60288308
RAS-10FSNM(E)	60288309
RAS-12FSNM(E)	60288310

RAS

3~

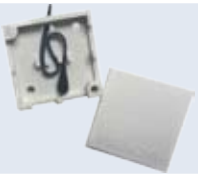
Meaning of model codification:	**RAS**	**10**	**FS**	**N**	**M**
Unit Type (Outdoor Unit)					
Compressor power (HP) 8 -10-12					
Set-Free System 2 pipes					
R410 A refrigerant					
Series (Side Flow)					

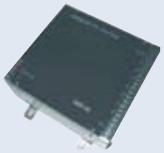
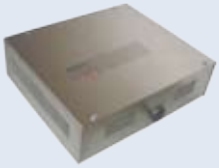
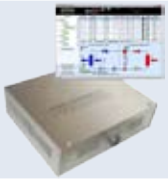
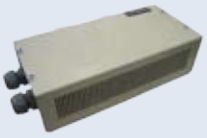
◆ Complementary systems

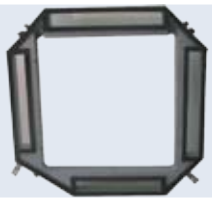
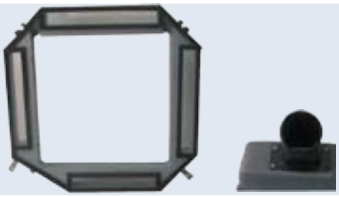
Name	Description	Code	Figure
KPI-502E1E	Energy recovery ventilation units	70600001	
KPI-802E1E		70600002	
KPI-1002E1E		70600003	
KPI-1502E1E		70600004	
KPI-2002E1E		70600005	
KPI-3002H1E		70600107	
EF-5NE	Econofresh kit	7E774148	

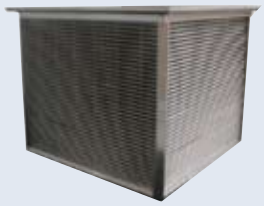
◆ List of accessories

Name	Description	Code	Figure
PC-ART	Remote control switch with timer	70510000	
PSC-A64S	Central control	60291479	
PSC-A16RS	Centralized ON/OFF controller	60291484	
PSC-A1T	Programmable timer	60291482	

Name	Description	Code	Figure
PC-LH3A	Wireless remote control switch	60291056	
PC-ARH	Optional remote controller	60291486	
PC-ALH	Receiver kit (for RCI-FSN2E -on the panel-)	60291464	
PC-ALHD	Receiver kit (for RCD-FSN2· -on the panel-)	60291467	
PC-ALHZ	Receiver kit (for RCI, RCD, RPC, RPI, RPK, RPF(I) -(FSN2(E)) -on the wall-)	60291473	
PC-ALHC	Receiver kit (for RCIM-FSN2 -on the panel-)	60291476	Image not available
PSC-5HR	H-LINK relay	60291105	
PCC-1A	Optional function connector	60199286	
PRC-10E1	2-pin extension cord	7E790211	
PRC-15E1	2-pin extension cord	7E790212	
PRC-20E1	2-pin extension cord	7E790213	
PRC-30E1	2-pin extension cord	7E790214	
THM-R2AE	Remote temperature sensor (THM4)	7E299907	
HC-A32MB	Building Management System Gateway to MODBUS systems.	NEW 7E513200	
HC-A16KNX	Building Management System Gateway to KNX systems.	NEW 7E513300	

Name	Description	Code	Figure
HARC-BXE (A)	Buildin g Management System Gateway to LONWORKS systems. (max. 64 IU, 8 parameters)	60290874	
HARC-BXE (B)	Building Management System Gateway to LONWORKS systems. (max. 32 IU, 16 parameters)	60290875	
HC-A64BNP	Building Management System Gateway to BAC Net system.	60291569	
CSNET-WEB (v3)	Control System	7E891938	
TS001 WEB SCREEN	15-inch touch-screen display	7E891935	
PC-A-1I0	Integration of teams into H-LINK	7E519000	
HC-A160SMS	SMS alarm warning device	7E519100	
DBS-26	Drain discharge connection	60299192	
P-N23WA	Air panel for RCI-FSN2E	70530000	
P-N23WAM	Air panel for RCIM-FSN2E	60197160	
P-N23DWA	Air panel for RCD-FSN2E	60291574	
P-N46DWA	Air panel for RCD-FSN2E	60291575	

Name	Description	Code	Figure
B-23H4	Adapter for deodorant filter	60199790	
F-23L4-K	Antibacteria filter	60199791	
F-23L4-D	Deodorant filter	60199793	
F-46L4-D	Deodorant filter	60199794	
PDF-23C3	Duct connection flange	60199795	
PDF-46C3	Duct connection flange	60199796	
OACI-232	Fresh-air intake kit	60199797	
PD-75	Fresh-air intake kit	60199798	
PI-23LS5	3-way outlet parts	60199799	
TKCI-232	T-duct connecting kit	60199801	
MW-102AN	Branch pipe	70522001	
MW-162AN		70522002	
MW-242AN		70522004	
MW-302AN		70522005	
MH-84AN	Header	70522007	
MH-108AN		70522008	

Name	Description	Code	Figure
HR-500	Energy exchanger for KPI (heat recovery)	70550101	
HR-800		70550102	
HR-1000		70550103	
HR-1500		70550104	
HR-2000		70550105	
STL-30-200-L600	Sound attenuator (Heat/energy recovery)	70550200	
STL-30-250-L600		70550201	
STL-30-300-L600		70550202	
STL-30-355-L600		70550203	
STL-30-450-L600		70550204	

1. Units installation

This chapter provides information about the procedures you must follow to install the Set-Free FSNM(E) outdoor units.

Contents

1.1 General installation notes

	warning

Install the outdoor unit with sufficient clearance around it for operation and maintenance as shown in the next pages.

Install the outdoor unit where good ventilation is available.

Do not install the outdoor unit where exists a high level of oil mist, salty air or sulphurous atmosphere.

Install the outdoor unit as far as practical (being at least 3 meters) from electromagnetic wave radiator, such as medical equipment.

Keep clearance between units of more than 50 mm, and avoid obstacles that could hamper air intake, when installing more than one unit together.

Install the outdoor unit in the shade or not exposed to direct sunshine or direct radiation from high temperature heat source.

Do not install the outdoor unit in a place where a seasonal wind directly blows into the outdoor fan.

For cleaning, use non-inflammable and nontoxic cleaning liquid. Use of inflammable agent may cause explosion or fire.

Work with sufficient ventilation, for working in an enclosed space could cause oxygen deficiency. Toxic gas may be produced when cleaning agent is heated to high temperature by, e.g., being exposed to fire.

Cleaning liquid shall be collected after cleaning.

Pay attention not to clamp cables when attaching the service cover to avoid electric shock or fire.

	caution

Check the foundation to be flat, leveled and strongly enough.

Install the unit in a restricted area not accessible by the general public.

Aluminium fins have very sharp edges. Pay attention to the fins in order to avoid injury.

Do not install the indoor units in a flammable environment to avoid a fire or an explosion.

Check to ensure that the ceiling slab is strong enough. If not strong enough, the indoor unit may fall down on you.

Do not install the indoor units, outdoor unit, remote control switch and cable within approximately 3 meters from strong electromagnetic wave radiators, such as medical equipment.

Do not install the indoor units in a machinery shop or kitchen, where vapor from oil or mist flows to the indoor units. The oil will deposit on the heat exchanger, thereby reducing the indoor unit performance, and may deform. In the worst case, the oil damages the plastic parts of the indoor unit.

To avoid any corrosive action to the heat exchangers, do not install the indoor units in an acid or alkaline environment.

When lifting or moving the indoor unit, use appropriate slings to avoid damage and be careful not to damage the insulation material on units surface.

This appliances are not intended for use by people (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision and instruction concerning the use of the appliance by a person responsible for their safety.

Turn OFF all power switches before maintenance is performed.

Do not start the cleaning procedures before 5 minutes of the stop of the unit.

	warning

Check and ensure that the accessories are packed with the indoor unit.

Do not install the indoor units outdoors. If installed outdoors, an electric hazard or electric leakage will occur.

Consider the air distribution from each indoor unit to the space of the room, and select a suitable location so that uniform air temperature in the room can be obtained. It is recommended that the indoor units be installed 2.3 to 3 meters from the floor level. If the unit is installed higher than 3 meters, it is also recommended to use a fan in order to obtain an uniform air temperature in the room.

Avoid obstacles which may hamper the air intake or the air discharge flow.

Children must be supervised to ensure that they do not play with the electrical appliances.

Before obtaining access to terminals, all supply circuits bust be disconnected.

warning

Pay attention to the following points when the indoor units are installed in a hospital or other places where there are electronic waves from medical equipment and similar.

Do not install the indoor units where electromagnetic wave is directly radiated to the electrical box, remote control cable or remote control switch.

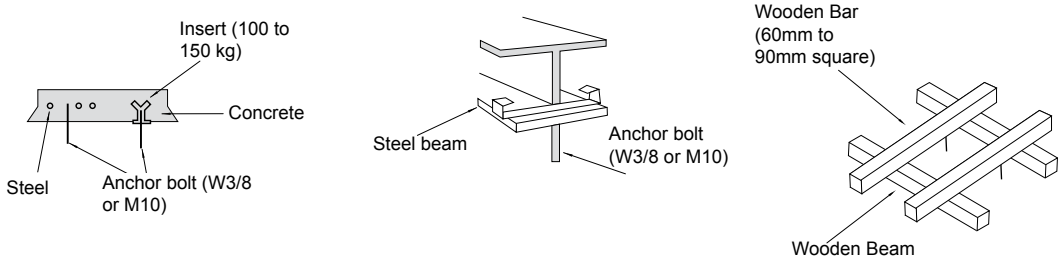
Install the indoor units and components as far as practical or at least 3 meters from the electromagnetic wave radiator.

Prepare a steel box and install the remote control switch in it. Prepare a steel conduit tube and wire the remote control cable in it. Then connect the ground wire with the box and tube.

Install a noise filter when the power supply emits harmful noises.

This unit is exclusive non electrical heater type indoor unit. It is prohibited to install a electrical heater in the field.

Mount suspension bolts using M10 (W3/8) as size, as shown below:



Concrete Beam **Steel Beam** **Wooden Beam**

Do not put any foreign material into the indoor unit and check to ensure that none exist in the indoor unit before the installation and test running. Otherwise a fire or failure may occur.

Note

Hitachi indoor units are designed for free air discharge (Static Pressure, Pst=0), except ducted indoor units as RPIM, which require to be connected to discharge air ducts. For these units see flow-static pressure chart.

1.2. Transportation and handling

Transport the product as close to installation location as practical before unpacking.

⚠	***CAUTION***
- *Do not put any material on the product.*	

1.2.1. Hanging method

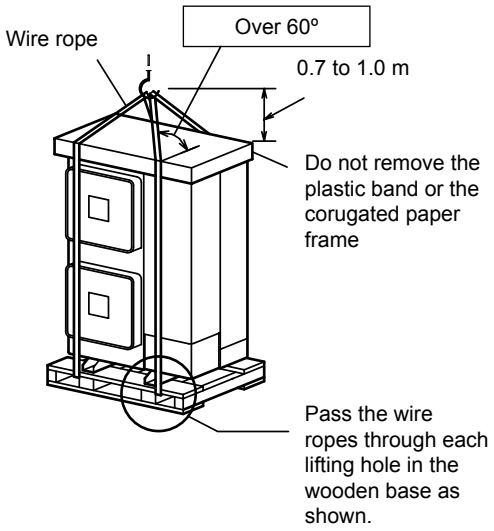
When hanging the unit, ensure a balance of the unit, check safety and lift up smoothly.

■ **For transportation**

- Do not remove any packing materials.
- Hang the unit without removing the packaging with ropes through each square hole and apply the splints or corrugated paper for unit protection

⚠	***DANGER***
- *Do not tie ropes at the wooden base..*	

⚠	***CAUTION***
– *Lift the outdoor unit in its factory packaging with 2 wire ropes.* – *For safety reasons ensure that the outdoor unit is lifted smoothly and does not lean.* – *Do not attach lifting equipment to the plastic band or the corrugated paper frame.* – *Ensure the exterior of the unit is adequately protected with cloth or paper.*	



■ **When Using Handles**

When manually lifting the unit using the handles, pay attention to the following points.

1 Do not remove the wooden base from outdoor unit.

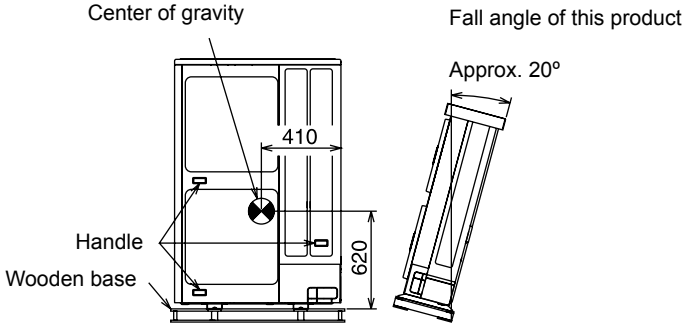
2 To prevent the unit from overturning, pay attention to the center of gravity as shown in the below figure.

3 Two or more personnel should be used to move the unit.

Model	Unit gross weight (kg)
RAS-8FSNM(E) RAS-10FSNM(E)	179
RAS-12FSNM(E)	182

1.2.2. Center of gravity

The figure shows the location of the center of gravity



1.3. Outdoor units installation

WARNING

- *Install the outdoor unit with sufficient clearance around it for operation and maintenance as shown in the next figures.*
- *Install the outdoor unit where good ventilation is available*
- *Do not install the outdoor unit where is a high level of oil mist, salty air or sulphurous atmosphere.*
- *Install the outdoor unit as far as practical (being at least 3 meters) from electromagnetic wave radiator (such as medical equipment).*
- *Keep clearance between the units of more than 50 mm, and avoid obstacles that may hamper air intake, when installing more than one units together.*
- *Install the outdoor unit in the shade or not exposed to direct sunshine or direct radiation from high temperature heat source.*

CAUTION

- *Check to ensure that the foundation is flat, level and sufficiently strong.*
- *Install the unit in a restricted area not accessible by the general public*
- *Aluminum fins have very sharp edges. Pay attention to the fins to avoid injury.*

CAUTION

Pay attention to the followings to run through the cables under the unit using conduit for piping and wiring works. (The pipe cover is required to remove before performing piping and wiring works.)

1. Attach the pipe cover to avoid entering rats or other small animals into the unit.

2. Completely seal the conduit inlet with sealing materials.

3. Make a drain hole at the lowest part of the conduit.

1.3.1. Before installation

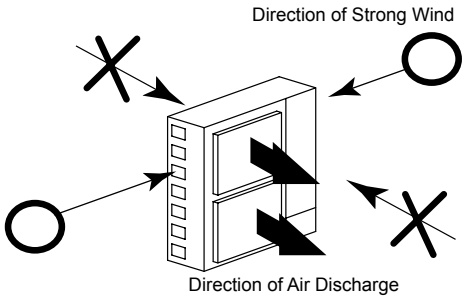
Before installation work, check the availability of the following parts that are packed inside the outdoor unit

Accessory	Quantity	Purpose
Pipe with flare nut for refrigerant piping	1	

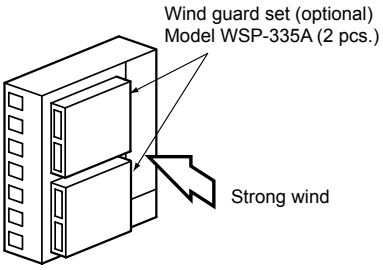
1.3.2. Installation location

■ Installation place

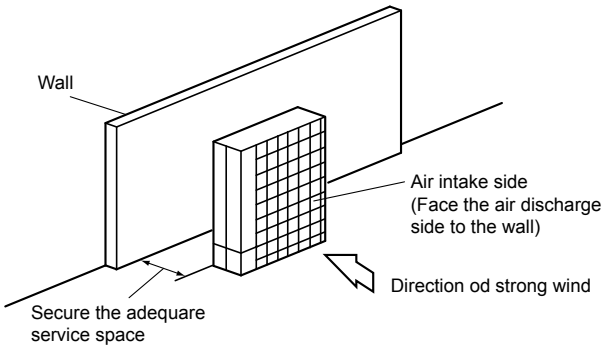
- Install the outdoor unit where good ventilation is available, and where it is dry.
- Install the outdoor unit where the sound or the discharge air from the outdoor unit does not affect neighbors or surrounding vegetation. The operating sound at the rear or right/left sides is higher than the value in the catalog at the front side.
- Check to ensure that the foundation is flat, level and sufficiently strong.
- Do not install the outdoor unit where there is a high level of oil mist, salty air or harmful gases such as sulphur.
- Do not install the outdoor unit where the electromagnetic wave is directly radiated to the electrical box.
- Install the outdoor unit as far as practical, being at least 3 meters from the electromagnetic wave radiator.
- When installing the outdoor unit in snow-covered areas, mount the field-supplied hoods at the discharge side of the outdoor unit and the inlet side of the heat exchanger.
- Install the outdoor unit where it is in the shade or it will not be exposed to direct sunshine or direct radiation from high temperature heat source.
- Do not install the outdoor unit where dust or other contamination could block the outdoor heat exchanger.
- Install the outdoor unit in a space with limited access to general public.
- Do not install the outdoor unit in a space where a seasonal wind directly blows to the outdoor heat exchanger or a wind from a building space directly blows to the outdoor fan
- In case of installation in the open spaces unavoidably where there is no buildings or surrounding structures, adopt the wind guard set or install near the wall to avoid facing the wind directly. Ensure that the service space should be secured.



Using wind guard

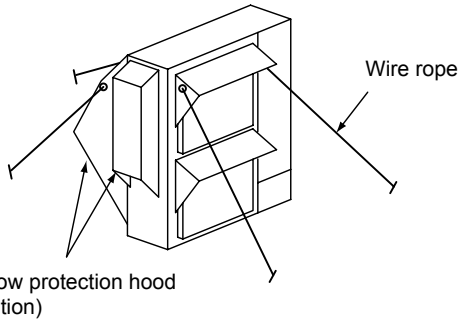


A wall to guard againts the wind



	NOTE
	If the extreme strong wind blows directly against the air discharge portion, the fan may rotate reversely and be damaged.

If the unit is installed on the roof or the place forced directly against strong wind such as storm, fix the unit securely with wire ropes as shown in the figure.



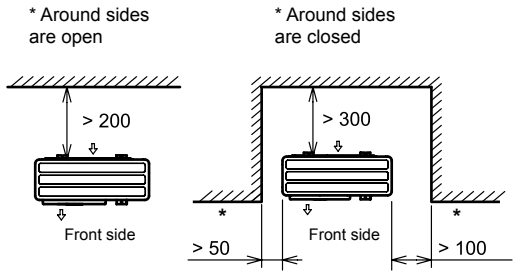
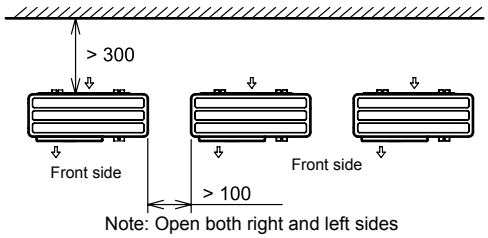
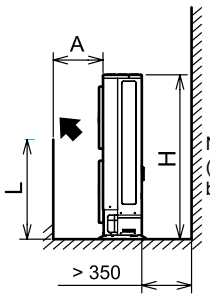
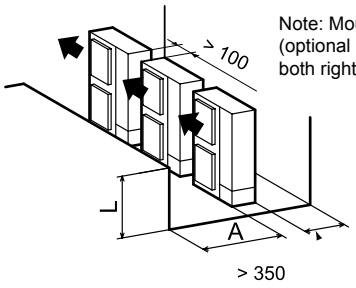
	CAUTION
	Aluminum fins have very sharp edges. *Pay attention to the fins to avoid any injury.*

1.3.3. Service space

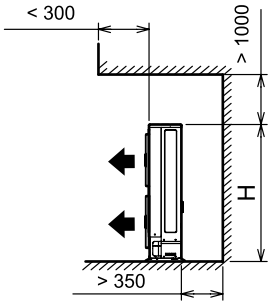
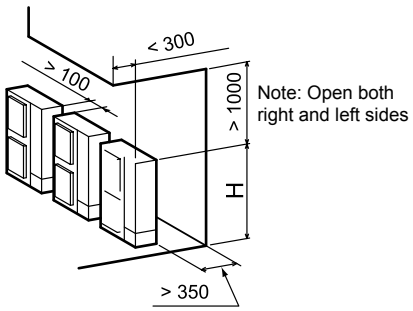
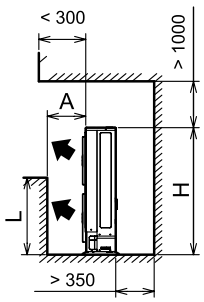
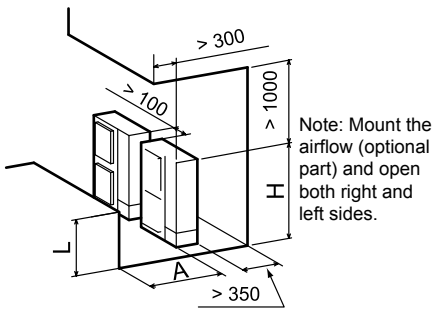
Install the outdoor unit with a sufficient space around the outdoor unit for operation and maintenance as shown below.

■ Obstacles on inlet side

– Upper side is open

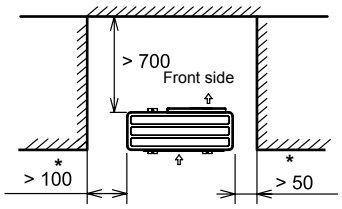
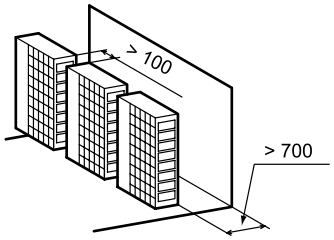
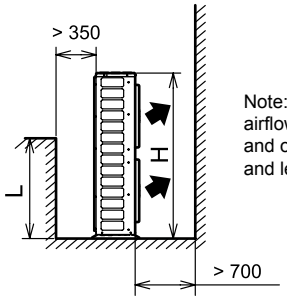
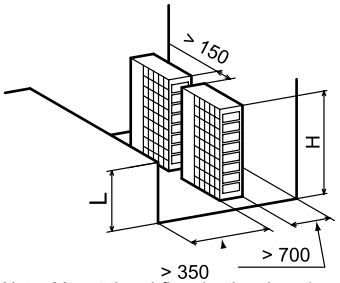
Single installation	Multiple installation
	
	

– Obstacles in above

Single installation	Multiple installation
	
	

■ Obstacles on discharge side

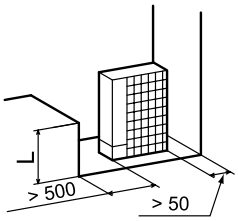
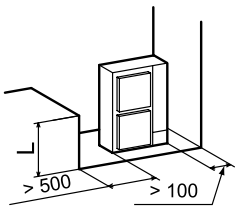
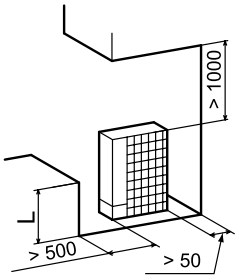
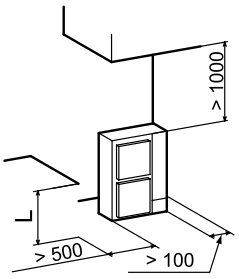
– Upper side is open

Single installation	Multiple installation
 Fit positions "*" with unit front side Note: Mount the airflow guide (optional part) and open right end or left end.	 Note: Mount the airflow (optional part) and open both right and left sides.
 Note: Mount the airflow (optional part) and open both right and left sides.	 Note: Mount the airflow (optional part) and open both right and left sides.

■ Obstacles in right and left

– Upper side is open

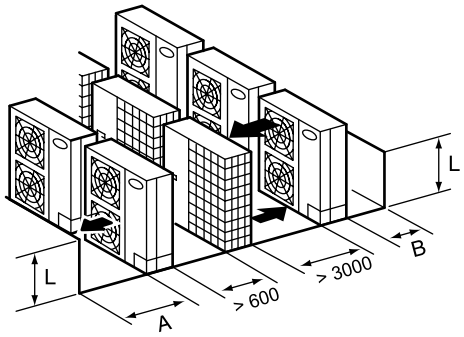
– Obstacles in above

Single installation		Multiple installation	
			

NOTE	
If L is higher than H, mount the units on a base so that H is greater or equal to L. *H: Unit Height (1650mm) + Base Concrete Height* *In this situation ensure that the base is closed and does not allow the airflow to short circuit. In each case, install the outdoor unit so that the discharge flow is not short-circuited.*	

L	A
0 < L ≤ 0.5H	600 or more
0.5H < L ≤ H	1400 or more

■ Multi-row and multiple installations



Keep a distance of more than 100mm between other units and do not put obstacles on the right and left sides. Dimension B is as shown beside.

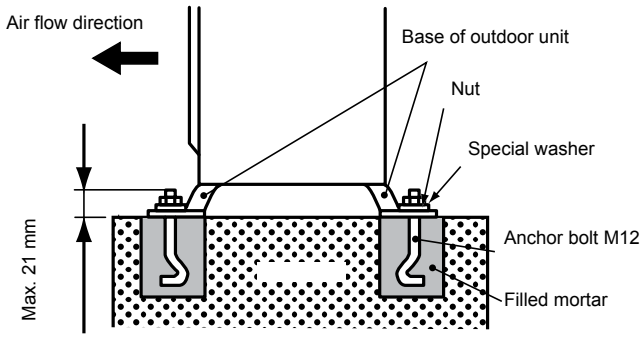
L	A	B
0 < L ≤ 0.5H	600 or more	300 or more
0.5H < L ≤ H	1400 or more	350 or more

	NOTE
	If L is larger than H, mount the units on a base o that H is greater or equal to L. *In this situation ensure that the base is closed and does not allow the airflow to short circuit..*

1.3.4. Foundations

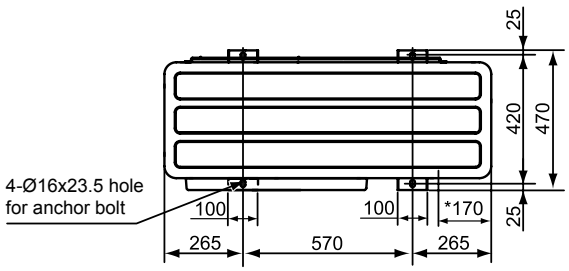
– Secure the outdoor unit with the anchor bolts.

– Fix the outdoor unit to the anchor bolts by special washer of factory-supplied accessory.

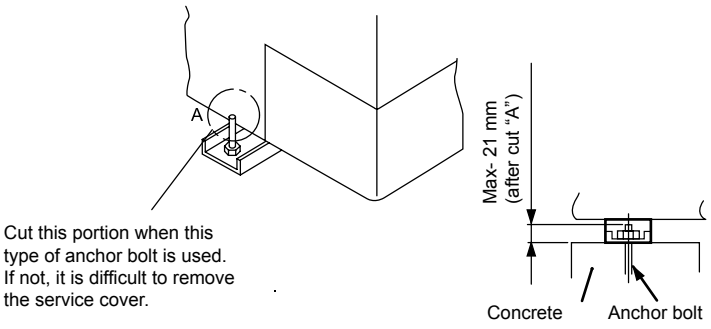


– When installing the outdoor unit, fix the unit by anchor bolts. Refer to figure regarding the location of fixing holes.

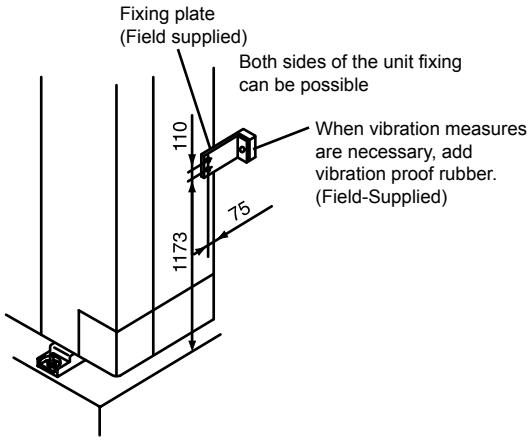
When the mark * dimension is secured, piping work from bottom side is easy without interference of foundation.



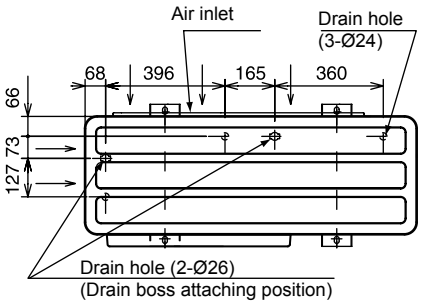
– Example of fixing outdoor unit by anchor bolts.



– (4) Fix the outdoor unit firmly so that declining, making noise, and falling down by strong wind or earthquake is avoided.



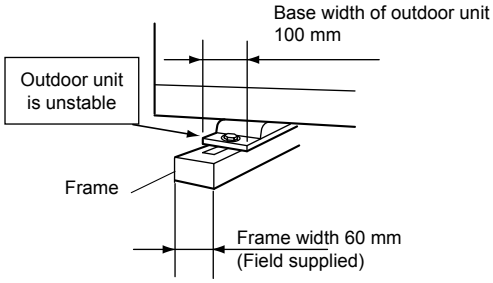
– When installing the unit on a roof or a veranda, drain water sometimes turns to ice in a cold morning. Therefore, avoid draining in an area where people often use because it is slippery.
– In case of the drain piping is necessary for the outdoor unit, use the drain-kit (DBS-26: Optional Parts)



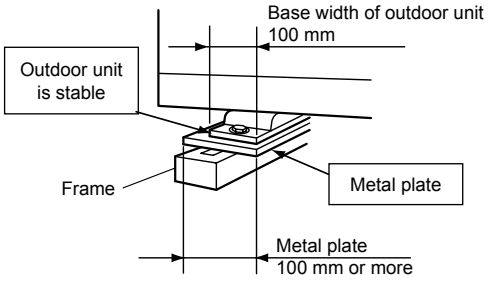
– The whole of the base of the outdoor unit should be installed on a foundation. When using vibration-proof mat, it should also be positioned the same way.

  When installing the outdoor unit on a field supplied frame, use metal plates to adjust the frame width for stable installation as shown in the figure.

Incorrect



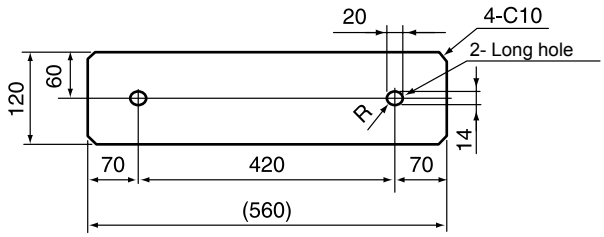
Correct



Recommended Metal Plate Size (Field-Supplied)

Material: Hot-Rolled Mild Steel Plate (SPHC)

Plate Thickness: 4.5T



2. Piping installation

Contents

2.1. Piping work considerations

2.1.1 Copper pipes and sizes

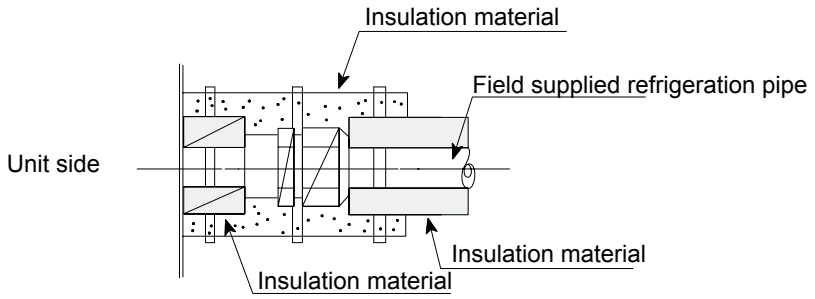
1. Prepare locally-supplied copper pipes.
2. Select the piping size with the correct thickness and correct material which can have sufficient pressure strength. Use the table below to select the required pipe.

Nominal Diameter		Thickness (mm)	Copper type
(mm)	(in)		
6.35	1/4	0.80	Roll
9.53	3/8	0.80	Roll
12.70	1/2	0.80	Roll
15.88	5/8	1.00	Roll
19.05	3/4	1.00	Pipe
22.23	7/8	1.00	Pipe
25.40	1	1.00	Pipe
28.60	1 1/8	1.00	Pipe
31.75	1 1/4	1.10	Pipe
34.93	1 3/8	1.25	Pipe
38.10	1 1/2	1.35	Pipe
41.28	1 5/8	1.20	Pipe
44.45	1 3/4	1.55	Pipe

Note

- In case of using copper pipes for piping sections bigger than Ø 19.05 mm (3/4 inches), flaring work cannot be performed. If necessary, use a joint adapter.

3. Select clean copper pipes. Make sure there is not dust and moisture inside. Blow the inside of the pipes with oxygen free nitrogen to remove any dust and foreign materials before connecting the pipes.
4. After connecting the refrigerant piping, seal the open space between Knockout hole and refrigerant pipes by using insulation material as shown below:



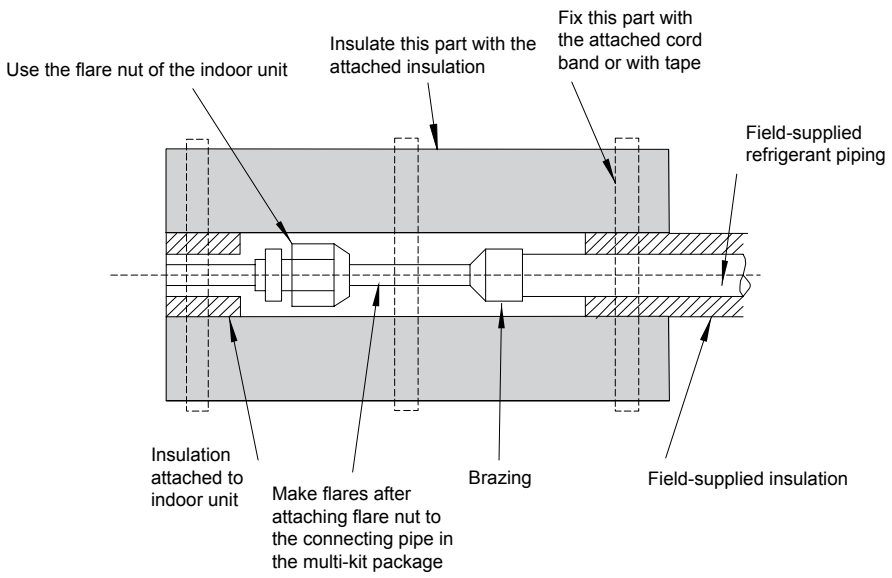
caution

- Do not use a saw and a grindstone or other tools which cause copper powder.
- When cutting pipes, secure the part for brazing in accordance with both national and local regulations.
- Use security glasses and gloves for cutting or welding works.

Piping Connection

When connecting liquid piping for units with piping longer than 15 meters, apply a piping size of Ø9.53 mm (3/8 inches).

Fix the connecting pipe as shown in the following figure using the insulation attached to the Indoor Unit.

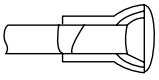
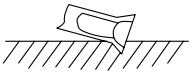


	Note

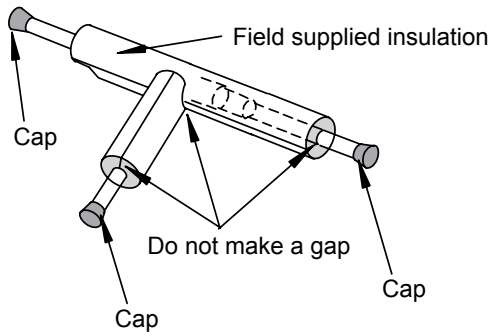
- *A system with no moisture or oil contamination will give maximum performance and lifecycle compared to a poorly prepared system. Take particular care to ensure that all copper piping is clean and dry internally.*
- *To ensure this, blow oxygen-free nitrogen through the pipes.*

	caution

- *When inserting a pipe through any hole protect the end with a cap.*
- *Do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe*
- *If the piping installation is not completed until the next day or even over a longer period of time, braze off the ends of the piping and charge the pipe with oxygen-free nitrogen through a Schrader-valve-type access-fitting, to prevent moisture and particle contamination entering.*
- *Do not use insulation material that contents NH3. NH3 can damage the cooper pipe material and can be a source of future leakages*

Correct	Incorrect
	

- **Insulation**
  Attach the pipe insulation to each branch using vinyl tape. Attach also insulation to field supplied pipes in order to prevent the capacity decrease according to the ambient air conditions and dewing on the low pressure pipe surface.



	Note
-	*When polyethylene foam is applied, it is recommended the usage of a wall thickness of 10 mm for the liquid piping and 15 mm to 20 mm for the gas piping.*

	caution
-	*Perform the insulation work after the pipe surface temperature decreases to the room temperature, if not the insulation material may melt.*
-	*If the ends of the piping system are open after ending the piping work, attach caps or vinyl bags securely to the ends of the piping, avoiding moisture and dust entering.*

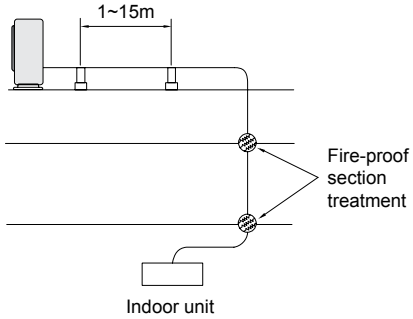
2.1.2 Three principles on refrigerant piping work

In case of using refrigerant R410A in the refrigeration cycle, the refrigeration oil should be of a synthetic type one.
In order to avoid oxidation, pay much careful attention to basic piping work control to avoid infiltration of moisture or dust during the refrigerant piping work.

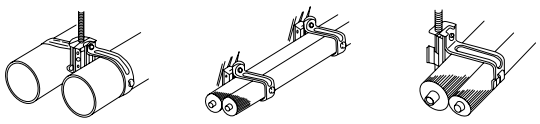
Three principles	Cause of failure	Presumable failure	Preventive action
1. Dry Keep good dryness	- Water infiltration due to insufficient protection at pipe ends - Dewing inside of pipes - Insufficient vacuum pumping time	Icing inside tube at ex. valve (Water choking) + Generation of hydration and oxidation of oil ↓ Clogged Strainer, etc., insulation failure and compressor failure	Pipe protection 1 Pinching 2 Taping ↓ Flushing ↓ Vacuum Drying - One gram of water turns into gas (approx. 1000 lrs) at 1 Torr - Therefore, it takes long time to vacuum-pump by a small vacuum pump
2. Clean No dust Inside of pipes	- Infiltration of dust or other through the pipe ends - Oxidation film during brazing without blowing nitrogen - Insufficient flushing by nitrogen after brazing	Clogging of expansion valve, capillary tube and filter ☛ Oxidation of oil ☛ Compressor failure ↓ Insufficient cooling or heating compressor failure	Pipe Protection 1 Mounting Caps 2 Taping 3 Pinching ↓ Flushing
3. No leakage No leakage shall exist	- Brazing failure - Failed flaring work and insufficient torque of squeezing flare - Insufficient torque of squeezing flanges	Refrigerant shortage ☛ Performance decrease ☛ Oxidation of oil ☛ Overheating of compressor ↓ Insufficient cooling or heating compressor failure	Careful Basic Brazing Work ↓ Basic Flaring Work ↓ Basic Flange Connecting Work ↓ Air Tight Test ↓ Holding of Vacuum

2.1.3 Suspension of refrigerant piping

Suspend the refrigerant piping at certain points and prevent the refrigerant piping from touching weak parts of the building such as walls, ceiling, etc. (If touched, abnormal noises may occur due to the vibration of the piping. Pay special attention in case of short piping length).



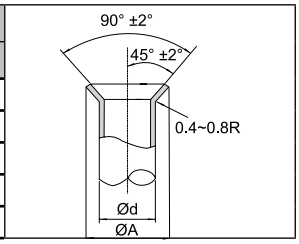
In order to fix the piping to wall or ceilings use suspension and clamping systems as shown in the following figure.



2.1.4. Tightening torque

1. Flaring connections (smaller than a diameter of Ø19.05) are generally used. However, if incorrect flaring is performed, it will cause serious refrigerant leakage.
2. Shape after Flaring, it should be rectangular and flat, and no uneven thickness, cracks and scratches should exist.

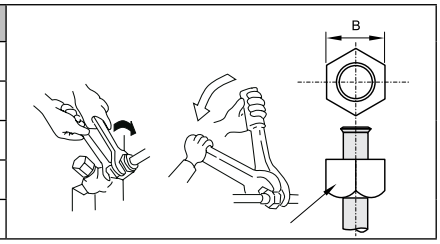
Nominal diameter Ød		Dimension
(inches)	(mm)	A+0.0/-0.4 (mm)
1/4	6.35	9.1
3/8	9.53	13.2
1/2	12.70	16.6
5/8	15.88	19.7
3/4	19.05	(*)



(*) It is impossible to perform the flaring work. In this case, use a joint selected from the table in point 3.

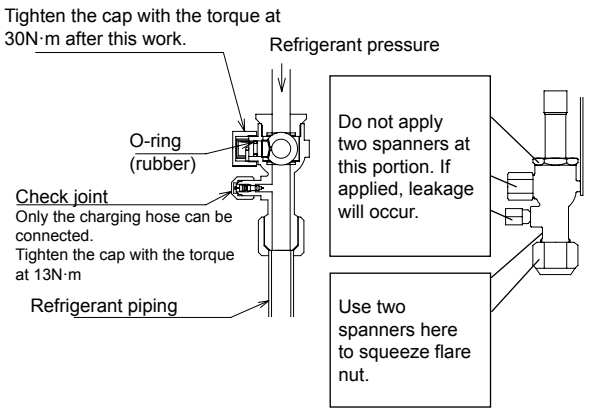
When tightening the flare nuts, use two spanners, as shown in the figure.

Pipe diameter (mm)	Size B (R410A)	Tightening torque (Nm)
Ø6.35	17	20
Ø9.53	22	40
Ø12.70	26	60
Ø15.88	29	80
Ø19.05	36	100

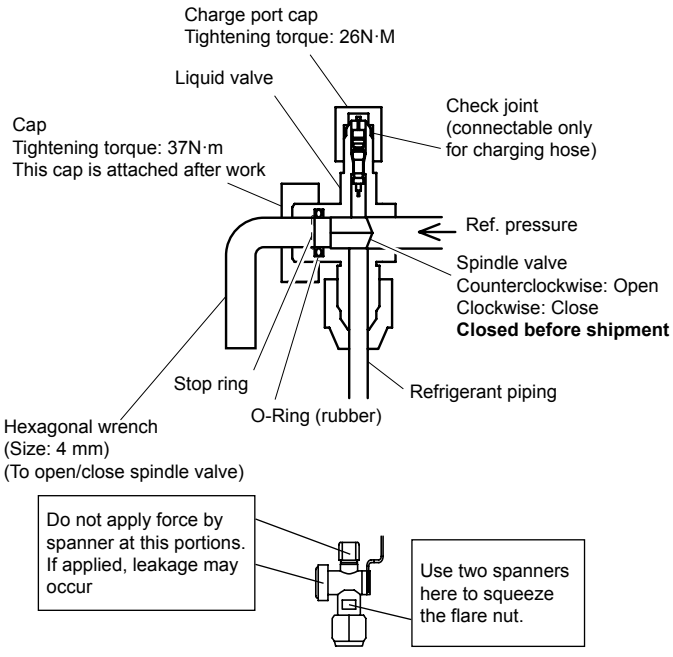


Stop valve FSNM(E)

Gas valve



Liquid valve



Note

1 This valve is a ball valve.
The stem is turned to arrow direction for valve open and close as below.

2 Use adjustable wrench for the stem operation.
Turn the stem until contact to the pin.

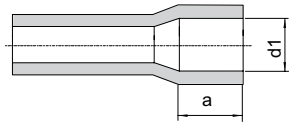
3 Attach the ring securely after the stem operation.

4 Do not leave the stem at half opening position.

2.1.5. Brazing work

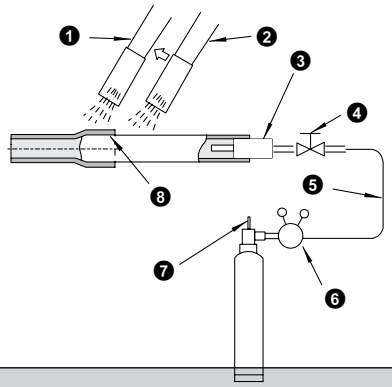
The most important work in the refrigerant piping installation work is the brazing of the pipes. If it accidentally occurs a leakage due to a careless brazing process, it will cause clogged capillary pipes or serious compressor failure.
In order to guarantee a proper brazing neck between different pipes surfaces, accurate pipe dimensions after the expansion process (see the table below):
It is important to control the clearance of the pipe fitting portion as shown below. In the case that a cooper tube expansion jig is used, following dimensions should be secured.

Copper pipe size	Ød1	Gap	a	Copper pipe size	Ød1	Gap	a
+0.08 Ø6.35 -0.08	+0.1 Ø6.5 0	0.33 0.07	6	+0.09 Ø22.22 -0.09	+0.1 Ø22.42 0	0.39 0.11	10
+0.08 Ø9.53 -0.08	+0.1 Ø9.7 0	0.35 0.09	8	+0.12 Ø25.4 -0.12	+0.1 Ø25.6 0	0.42 0.08	12
+0.08 Ø12.7 -0.08	+0.1 Ø12.9 0	0.38 0.19	8	+0.12 Ø28.58 -0.12	+0.1 Ø28.78 0	0.42 0.08	12
+0.09 Ø15.88 -0.09	+0.1 Ø16.1 0	0.41 0.13	8	+0.12 Ø31.75 -0.12	+0.1 Ø32.0 0	0.47 0.13	12
+0.09 Ø19.05 -0.09	+0.1 Ø19.3 0	0.44 0.16	10	+0.12 Ø38.1 -0.12	+0.1 Ø38.3 0	0.52 0.18	14



A basic brazing method is shown below.

1. Pre-heat the outer tube for better flowing of the filler metal
2. Heat inner side tube evenly
3. Rubber plug
4. Packless valve
5. High pressure hose
6. 0.03 to 0.05 MPa (0.3 to 0.5 Kg/cm^2 G)
7. Reducer valve: open this valve only when the gas is needed
8. Nitrogen gas flow 0.05m^3/h or smaller



caution

- *Use nitrogen gas for blowing during pipe brazing. If oxygen, acetylene or fluorocarbon gas is used, it will cause an explosion or poisonous gas.*
- *During the brazing work, a lot of oxidation film will be generated inside of the pipes if no oxygen-free nitrogen gas is blown through the pipes. This film will be flecked off after operation and will circulate in the refrigeration cycle, resulting in clogged expansion valves, etc. This coud origin problems in the compressor.*
- *Use a reducer valve when nitrogen gas blowing is performed during brazing. The gas pressure should be maintained within 0.03 to 0.05 MPa. If an excessively high pressure is applied to a pipe, it could origin an explosion.*

3. Electrical wiring

Contents

3.1. General check

	DANGER

- *Before installing the electrical wiring or before performing a periodical check, turn OFF the main switch to the indoor unit and the outdoor unit. For safety reasons, be sure that the indoor fan and the outdoor fan have stopped.*
- *Prevent the wires from touching the refrigerant pipes, the plate or cutting edges and the electrical components inside the unit, to prevent them getting damaged. In worst cases, a fire may occur.*
- *Tightly secure the wires with the cord clamp inside the indoor unit.*

	NOTE

- *In case of performing a test run operation take especially care because some security features are disabled: the units will operate during 2 hours without Thermo-OFF, and the 3-minute guard for compressor protection will not be effective during the test.*
- *Fix rubber bushes with an adhesive on the panel when the conduit pipes to the outdoor unit are not used.*
- *In forced stopped compressor mode, the compressor operation is OFF.*

1. Make sure that the field-selected electrical components (main switches, circuit breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical specifications in this service manual. Make sure that the electrical components comply with the National Electrical Code (NEC).
2. Following the Council Directive 89/336/EEC and its amendments 92/31/EEC and 93/68/EEC, relating to electromagnetic compatibility, next table indicates maximum permissible system impedance Zmax at the interface point of the user's supply, in accordance with EN61000-3-11

MODEL	Zmax (Ω)
RAS-8FSN2	
RAS-10FSN2	
RAS-12FSN2	

3. Make sure that the power supply voltage is within ±10% of the rated voltage.
4. Check the capacity of the electrical wires. If the power source capacity is too low, you cannot start the system due to the voltage drop.
5. Make sure that the ground wire is connected.
6. Main Switch

Install a multi-pole main switch with a distance of 3.5 mm or more between each phase.

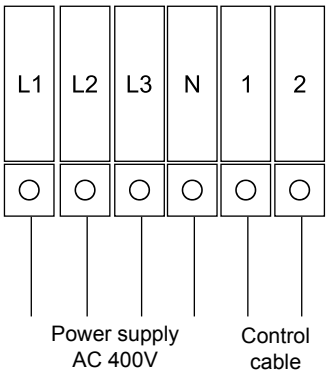
3.2. Electrical wiring for the outdoor unit

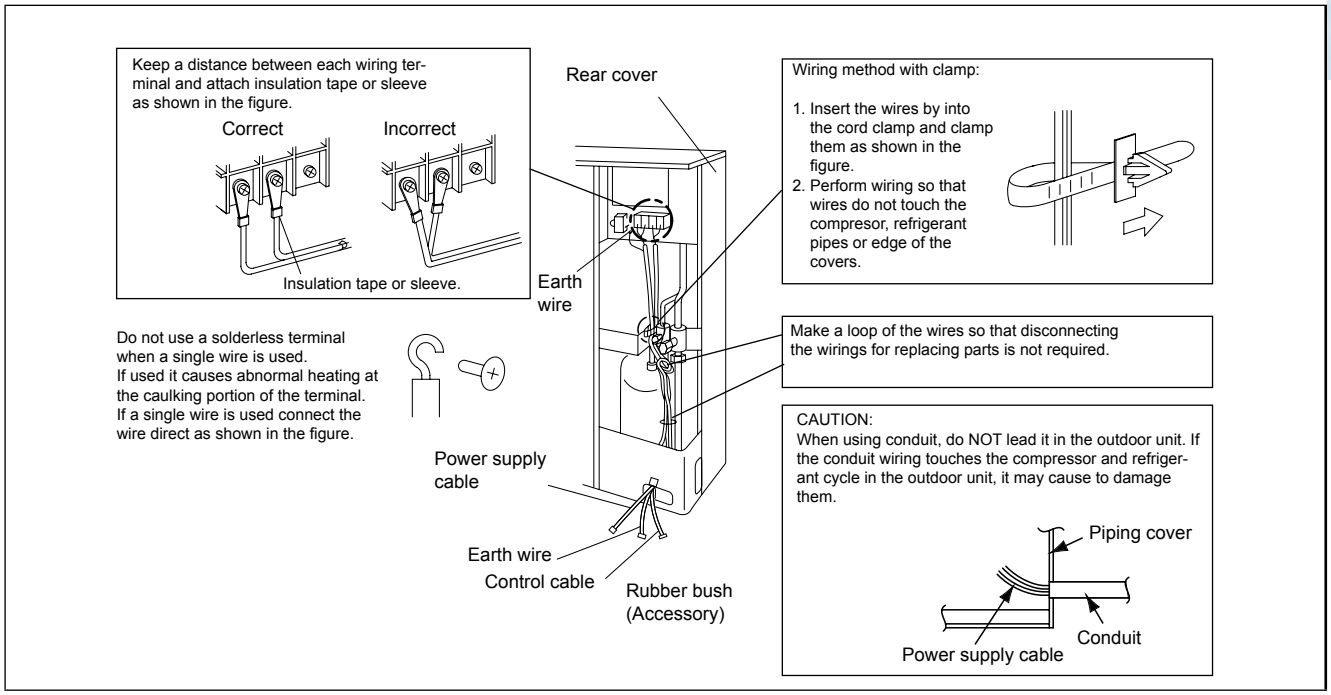
3.2.1.Electrical wiring connection for outdoor unit

■ FSNM(E)

The electrical wiring connection for the outdoor unit is shown beside.

1. Connect the power supply wires to L1, L2, L3 and N (for 400V\50Hz) for the three-phase power source on the terminal board. Connect the ground wires to the terminals in the electrical box.
2. Connect the control cables between the outdoor unit and the indoor unit to the terminals 1 and 2 on the terminal board.
3. Do not run the wires in front of the fixing screw of the service access panel. If you do so, you cannot remove the fixing screw.

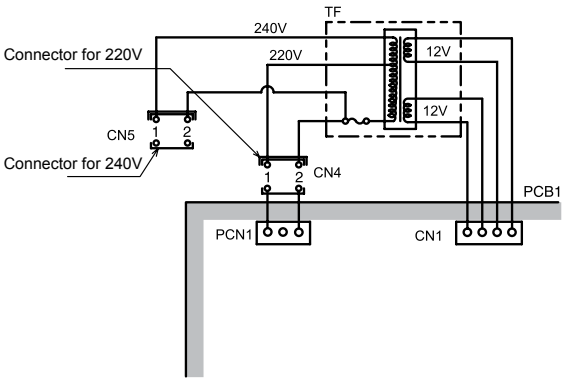




CAUTION

Fix the shielded operation wires between the indoor unit and outdoor unit with a cord band at only one point. You must connect the shielded operation wires to the earth of the indoor unit only.

4. Before turning ON the main switch, check the item below. If the nominal voltage for the outdoor unit is 415V, change the connector CN4 to CN5 of the transformer TF in the electrical box as shown in the figure below.



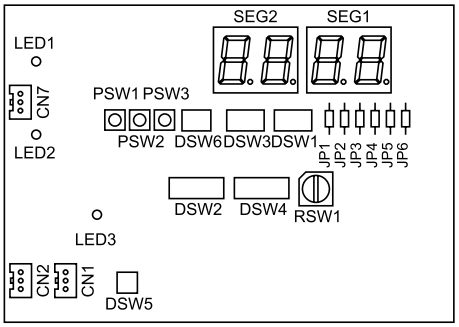
3.2.2. Setting the DIP switches for the outdoor unit

Quantity and location of DIP switches

Push switch PSW1: manual defrost

Push switches PSW2, PSW3: Ckecking by 7-segment

PCB1

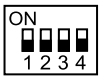
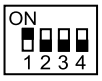
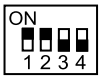
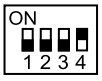


	NOTE
	The mark "■" indicates position of dips switches. Figures show setting before shipment or after selection. *Not mark "■" indicates pin position is not affecting*

	CAUTION
	Before setting dips switches, firstly turn off power source and set the position of the dips switches. If the switches are set without turning off the power source, the contents of the setting are invalid.

Dip switches setting

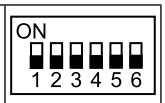
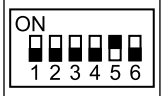
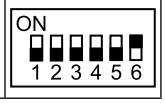
– DSW1: Test operation and service setting 1
  Setting is required, for test operation and operating the compressor)

	DSW1
Setting before shipment	
Test cooling operation	
Test heating operation	
Compressor forced stop	

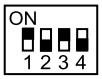
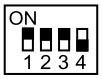
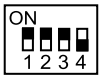
Number 3 pin should be remained at OFF position

– DSW2: Optional function setting

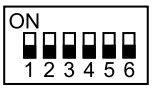
Setting is required, when optional functions are required

Setting before shipment	
Function setting	
External input/output selection	

– DSW3: Capacity setting
No setting is required

RAS-8FSNM(E)	
RAS-10FSNM(E)	
RAS-12FSNM(E)	

– DSW4 and RSW1: Refrigerant cycle number setting
Setting is required.

Setting for the tenth digit (first digit)	
Seting for the units digit (last digit) Set by inserting slotted screwdriver into the grove	

– DSW5: End terminal resistance
No setting is required

Setting before shipment	

– DSW6: Height difference

Setting is required

Setting before shipment	
The indoor unit is located higher than outdoor unit (20 to 30 m)	
Fine-tuning of heating capacity	

– JP1~6: Jumper cable

Power supply	JP1	JP2	JP3	JP4	JP5	JP6
380-415V 50Hz	○	○	X	X	○	○
○: with jumper cable X: without jumper cable						

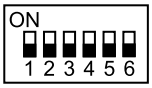
– Setting for transmitting

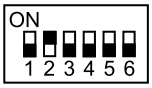
It is required to set the refrigerant cycle numbers and end terminal resistance for this H-LINK or H-LINKII system.

– Setting of Refrigerant Cycle No.

In the same refrigerant cycle, set the same refrigerant cycle number for the outdoor unit and the indoor units as shown below.

As for setting indoor unit refrigerant cycle number, set the RSW2 and DSW5 on the indoor unit PCB.

	Setting switch	
	ten digit	unit digit
		
Outdoor unit	DSW4	RSW1
Indoor unit (H-LINK II)	DSW5	RSW2

Example in case of setting refrigerant cycle number 25		

DSW and RSW setting before shipment is 0.

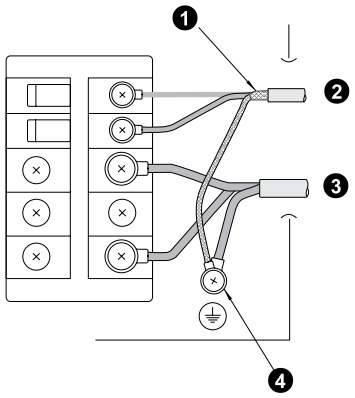
Maximum in setting refrigerant cycle number is 63

3.3. Common wiring

3.3.1. Electrical wiring between the indoor unit and the outdoor unit

	CAUTION
	Use the shielded twisted pair cable or the shielded pair cable for the transmission cables between the indoor unit and the outdoor unit. Connect the shielded part to the earth screw in the electrical box of the indoor unit as shown below. Also use these cables for the operation wiring between one indoor unit and another indoor unit (H-LINK connection).

❶ Shielded part
❷ Transmission cables
❸ Power supply cables
❹ Earth screw



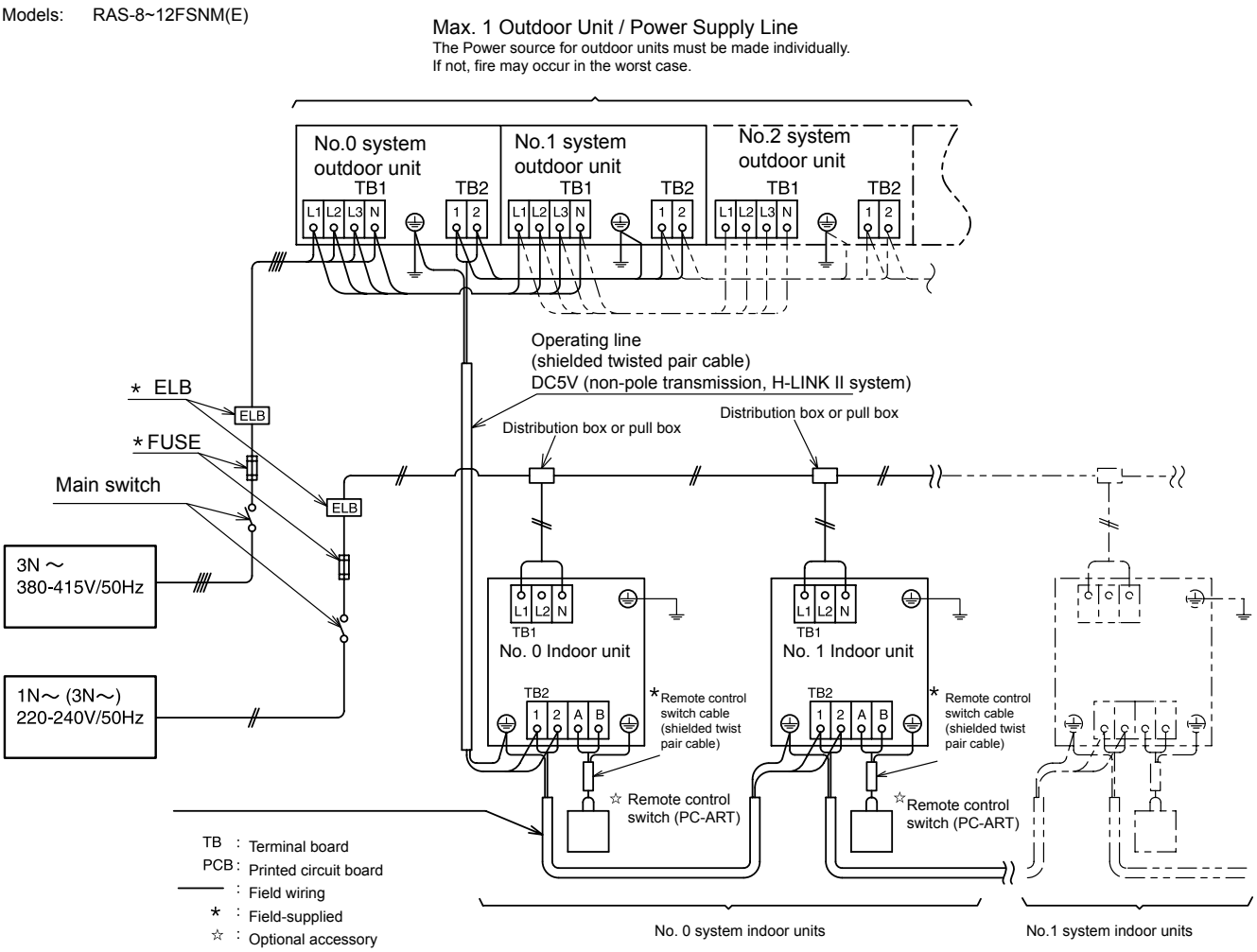
- *Connect the electrical cables between the indoor unit and the outdoor unit as shown in the wiring diagram.*
- *Make sure that the terminals for the power supply wiring and the terminals for the intermediate wires between the indoor unit and the outdoor unit coincide correctly. The terminals for the power supply wiring are "L1" to "L1", "L2" to "L2", "L3" to "L3" and "N" to "N" of each terminal board. For the operating line, the terminals for the intermediate wires are "1 and 2" to "1 and 2" of each terminal board for DC 5V. Otherwise, you may damage some components.*
- *When you are installing the electrical wiring, follow the local codes and the local regulations.*
- *Connect the operation wiring to the units in the same refrigerant cycle. (You should connect the refrigerant piping and the control wiring to the same indoor units). If you connect the refrigerant piping and the control wiring to the units in the different refrigerant cycle, an abnormal operation may occur.*
- *You must connect the shielded part to earth only in one cable side.*
- *Do not use more than three cores for the operation wiring (H-LINK II). Select the core sizes according to the national regulations.*
- *If there are multiple outdoor units that are connected to one power supply wire, open a hole near the connection hole for the power supply wiring.*

The recommended breaker sizes are shown in the table of electrical data and recommended wiring.

- *If a conduit tube for the field wiring is not used, fix the rubber bushes on the panel with adhesive.*
- *All the field wiring and the equipment must comply with the local codes and the international codes.*
- *Make sure that the power source voltage is correct.*
- *An incorrect wiring may cause a breakdown of the transformer PSC-5HR or the units*
- *Especially, DO NOT connect the power source to the terminal board for transmission.*
- *DO NOT install the H-LINK II wires along the power supply wire, other signal wires, and others. If you install the H-LINK II wires along those wires, there may be a malfunction due to the electrical noise. If you need to install the H-LINK II wires near those wires, provide a distance of 15cm or more. Or alternatively, insert the wires into the steel pipe and ground one end of the pipe.*

Electrical wiring connection

Models: RAS-8~12FSNM(E)



3.4. Wire size

■ Electrical wiring connection. Field minimum wire sizes for power source.

- Indoor units

Model	Power Source	Maximum Current (A)	Power Source Cable Size		Transmitting Cable Size	
			EN60 335-1 ❶	MLFC ❷	EN60 335-1 ❶	Shielded Twist Pair Cable
All indoor units	1~230V/50Hz	5.0	0.75 mm^2	0.75 mm^2	0.75mm^2	0.5mm^2
RPI-(8.0/10.0)FSN2E		10.0	1.5 mm^2			

- Outdoor units

Model	Power Source	Maximum Current (A)	Power Source Cable Size		Transmitting Cable Size	
			EN60 335-1 ❶	MLFC ❷	EN60 335-1 ❶	Shielded Twist Pair Cable
RAS-8FSN2	3~380-415V/50Hz	14.0	2.5 mm^2	2.0 mm^2	0.75mm^2	0.75mm^2
RAS-10FSN2		18.0	4.0 mm^2	3.5 mm^2		
RAS-12FSN2		23.0	4.0 mm^2	3.5 mm^2		

Refer the notes for selection of the power source cable size in next page

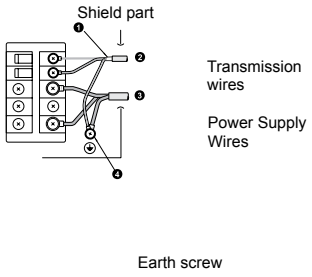
NOTES:

1. *Follow local codes and regulations when selecting field wires.*
2. *The wire sizes marked with ❶ in the table of this page are selected at the maximum current of the unit according to the European Standard, EN60 335-1. Use the wires which are not lighter than the ordinary tough rubber sheathed flexible cord (code designation H05RN-F) or ordinary polychloroprene sheathed flexible cord (code designation H05RN-F).*
3. *The wire sizes marked with ❷ in the table of this page are selected at the maximum current of the unit according to the wire, MLFC (Flame Retardant Polyflex Wire) manufactured by Hitachi Cable Ltd., Japan.*
4. *Use a shielded cable for the transmitting circuit and connect it to ground.*
5. *In the case that power cables are connected in series, add each unit maximum current and select wires below.*
6. *The earth cable size complied with local code: IEC 245, Nº 571.*

Selection according to EN60 335-1		Selection according to MLFC (at cable temp. of 60 ºC)	
Current i (A)	Wire Size (mm²)	Current i (A)	Wire Size (mm²)
I ≤ 6	0.75	I ≤ 15	0.5
6 < i ≤ 10	1	15 < i ≤ 18	0.75
10 < i ≤ 16	1.5	18 < i ≤ 24	1.25
16 < i ≤ 25	2.5	24 < i ≤ 34	2
25 < i ≤ 32	4	34 < i ≤ 47	3.5
32 < i ≤ 40	6	47 < i ≤ 62	5.5
40 < i ≤ 63	10	62 < i ≤ 78	8
63 < i	❸	78 < i ≤ 112	14
		112 < i ≤ 147	22
❸ In the case that current exceeds 63A, use MLFC cables, and do not connect cables in series.			

CAUTION:

- *Install a multi-pole main switch with a space of 3.5 mm or more between each phase.*
- *Use shielded wires for transmission wires between the indoor and the outdoor units, and connect the shielded part to the earth screw in the electrical box of the indoor unit as shown below.*



■ Select the Main Switches in accordance with the following table:

- Indoor units

Model	Power Source	Maximum Running Current (A)	CB(A)	ELB no. poles/A/mA
All indoor units	1~230V/50Hz	5.0	6	2/40/30
RPI-(8.0/10.0)FSN2E		10.0	16	

- Outdoor units

Model	Power Source	Maximum Running Current (A)	CB(A)	ELB no. poles/A/mA
RAS-8FSNM	3~380-415V/50Hz	14.0	20	4/20/30
RAS-10FSNM		18.0	30	4/30/30
RAS-12FSNM		23.0	30	4/30/30

ELB: Earthleakage Breaker; CB: Circuit Breaker

4. Control system

This chapter presents the control system flowcharts for the Set-FREE FSNM(E) Outdoor Units series

Contents

4.1. Device control system

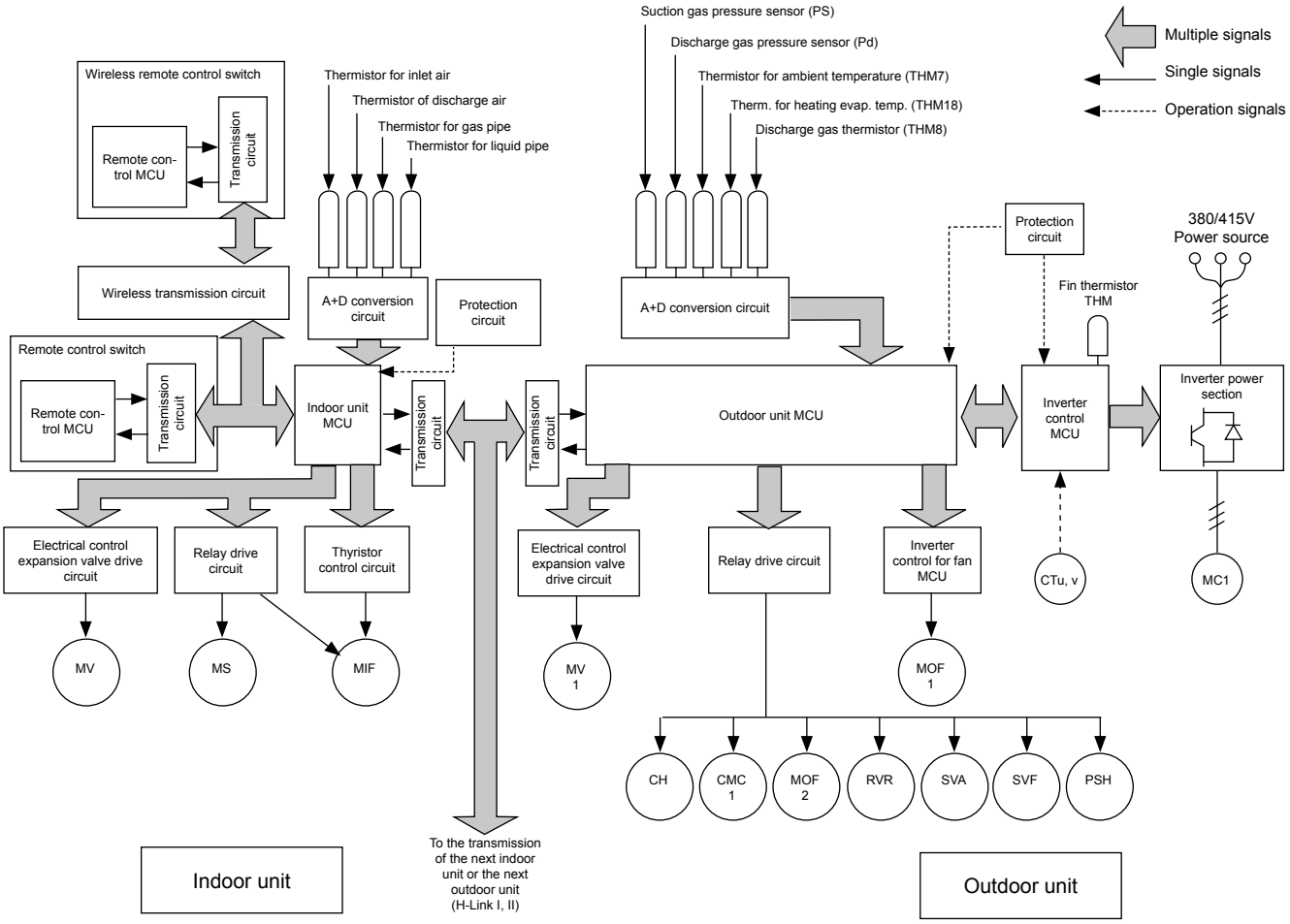
4.1.1. RAS-8~10FSNM(E) refrigerant cycle control

Control subject	Cooling process		Heating process		Defrost operation
	Purpose	Contents	Purpose	Contents	Contents
Inverter frequency of the compressor	1. Total operation capacity of the indoor unit 2. Connection according to piping length 3. Discharge Pre. Pd	1. 8Hz/I.U. HP 2. 10 Hz/I.U.HP (setting DSW6 for piping length setting) 3. Pd ≥ 1,0MPa	1. Total operation capacity of the indoor unit 2. Connection according to piping length 3. Pd	1. 8Hz/I.U. HP 2. 10 Hz/I.U.HP (setting DSW6 for piping length setting) 3. Pd ≥ 1,0MPa	All compressors are operated
Opening degree of expansion valve for the outdoor heat exchanger	1. Capacity control 2. Changeover of total indoor unit capacity	Fully open (unused heat exchanger: fully close)	Discharge gas super-heat (TdSH) control	Td0 = Tc + 30 ≤ 90	Fully open
Opening degree of expansion valve for indoor	1. For controlling temp. of discharge gas super-heat (TdSH) 2. For controlling the temperature difference between the gas pipe and the liquid pipe of the indoor heat exchanger 3. For balancing the temperature differences between the gas pipe and the liquid pipe of each indoor unit	1. Tdo=Tc+30≤95 2. Temperature difference between the gas pipe and the liquid pipe of each indoor unit = 4 deg	1. For controlling temp. difference between air outlet and air inlet of I.U 2. For balancing the temp. difference between air outlet and air inlet of I.U	Air outlet temp. - air inlet temp. ≤ 24 ºC	Opening degree is fixed
Outdoor fan	Fan controlling discharge pressure (Pd)	2,5≤Pd≤2,9MPa PWM control by DC motor + constant speed fan motor	Fan controlling outdoor air temp.	Outdor air temp. PWM control by DC fan motor + constant speed fan motor	Stop
Solenoid valve equalized pressure (SVA)	1. For equalizing the pressure of the inverter compressor during the stop	In case of stopping inverter comp. after operation	For controlling inner pressure of stopag comp.	In case of stopping inverter comp. after operation	–
Solenoid valve for the oil return (SVF)	For controlling temp. oil circulation volume from the oil separator to each compressor	1. Turn ON in comp. operation 2. Turn OFF in comp. stoppage	For controlling temp. oil circulation volume from the oil separator to each compresso	1. Turn ON in comp. operation 2. Turn OFF in comp. stoppage	Same as cooling/ heating operation

I.U.: Indoor Unit
Tc / Te: Condensing Temperature / Evaporating Temperature
Td: Discharge Temperature
Tl: Liquid Temperature
Tg: Gas Temperature
Cap: Capacity
Temp.: Temperature
comp.: Compresror

The figure below shows the outline of the control system

Example: RAS-10FSNM(E) + Indoor unit



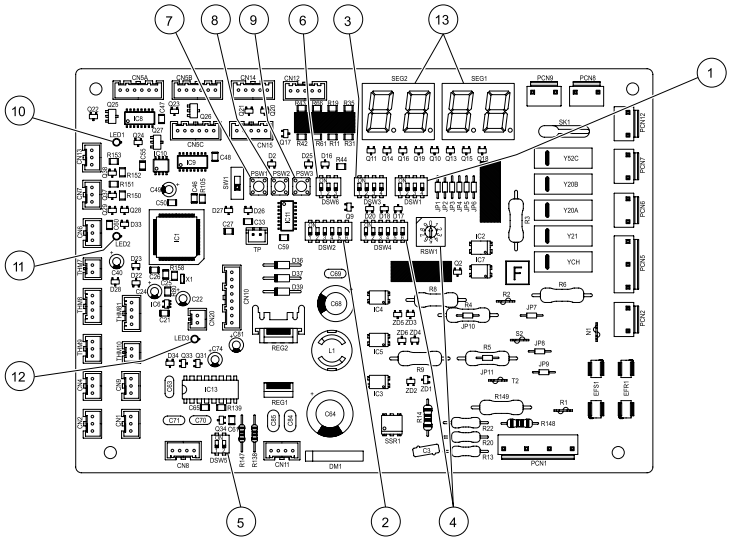
Symbol	Name
MC_1	DC Motor (for Inverter Compressor)
MOF_1	DC Motor (for Outdoor Fan)
MOF_2,	AC Motor (for Outdoor Fan)
MIF	Motor (for Indoor Fan)
MS	Motor (for Auto-Louver)
MV	Electronic Expansion Valve (for Indoor Unit)
MV_1	Electronic Expansion Valve (for Outdoor Unit)
CMC_1	Magnetic Contactor for Compressor

Symbol	Name
SVA	Solenoid Valve
SVF	Solenoid Valve
RVR	Reversing Valve
PSH	High Pressure Switch
Ps	Suction Gas Pressure Sensor
Pd	Discharge Gas Pressure Sensor
CTu, v	Current Sensor
CH	Crankcase Heater

4.2. Outdoor Units PCB

4.2.1. RAS-8~12FSNM(E)

■ **PCB drawing**



LED INDICATION		
14	LED1 (Red)	Power Source for PCB1 Normal Condition: Activated Abnormal Condition: Deactivated
15	LED2 (Green)	This LED2 indicates the transmission state between the PCB1 and PCB2. Normal Condition: Flickering Abnormal Condition: Activated or Deactivated
16	LED3 (Yellow)	This LED3 indicates the transmission state between the indoor unit and outdoor unit. Normal Condition: Flickering Abnormal Condition: Activated or Deactivated

No.	Part Name	Contents of functions
1	DSW1	• Test running for cooling or heating. The outdoor unit can be run for testing. When testing has been finished, reset the function. • Forced stoppage of compressor. When performing test running or inspection, compressors can be forcedly stopped to ensure safety.
2	DSW2	Setting of optional functions
3	DSW3	Setting of capacity code
4	DSW4 and RSW1	Setting of outdoor unit number
5	DSW5	Setting of transmitting

No.	Part Name	Contents of functions
6	DSW6	Setting of height difference
7	PSW1	• Manual defrosting switch. The defrosting operation is manually available under the forced defrosting area.
8	PSW2	• Checking switch push PSW2 for 3 seconds or more, to start/finish the check mode. Push PSW2, check mode function is indicated to forward.
9	PSW3	• Checking switch push PSW3, check mode function is indicated to backward.
13	SEG1 SEG2	These indicate the following: "alarm", "protective safety device has tripped" or "checking items".

5. Available optional functions

Contents

5.1. Outdoor units

5.1.1. Setting of external input and output functions

On the outdoor unit printed circuit board, there are three input terminals to receive external signals and two output terminals to send signals outwards. These signals are available by setting as shown below.

Control Function No. (SEG1)	Input	Output
1	Fixing Heating Operation Mode	Operation Signal
2	Fixing Cooling Opeation Mode	Alarm Signal
3	Demand Stoppage	Compressor ON Signal
4	Snow Sensor (Outdoor fan ON/OFF)	Defrosting Signal
5	Forced Stoppage	--
6	Demand Current Control 60%	--
7	Demand Current Control 70%	--
8	Demand Current Control 80%	--
9	Demand Current Control 100%	--

Each input terminal and output terminal setting as shown below.

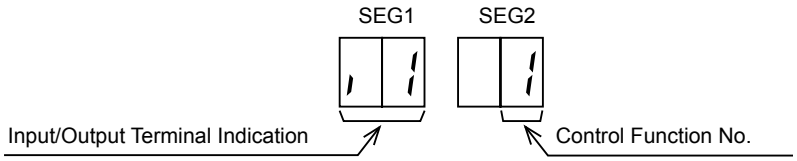
Input/Output Terminal Indication (SEG2)	Connector (Pin No.)	Setting Function (Control Function No.)
Input 1	CN17 (1-2)	Fixed Heating Operation Mode (1) *
Input 2	CN1 (1-2)	Fixed Cooling Operation Mode (2) *
Input 3	CN1 (2-3) CN2 (1-2)	Demand Stoppage (3) * Snow Sensor (Outdoor fan ON/OFF) (4) Forced Stoppage (5) Demand Current Control (6 to 9)
Output 1	CN16 (1-2)	Operation Signal (1) *
Output 2	CN7 (1-2) CN7 (1-3)	Alarm Signal (2) * Compressor ON Signal (3) Defrosting Signal (4)

*: Setting before Shipment

In the case that the setting change (only with the mark (*) of the table in the previous page) is required at site, perform the following procedures.

1 Set DSW2-#6 of the outdoor PCB at the “ON” side while the main power to the outdoor unit is being supplied. By setting, function selection mode is available and the following appears on the 7-segment display.

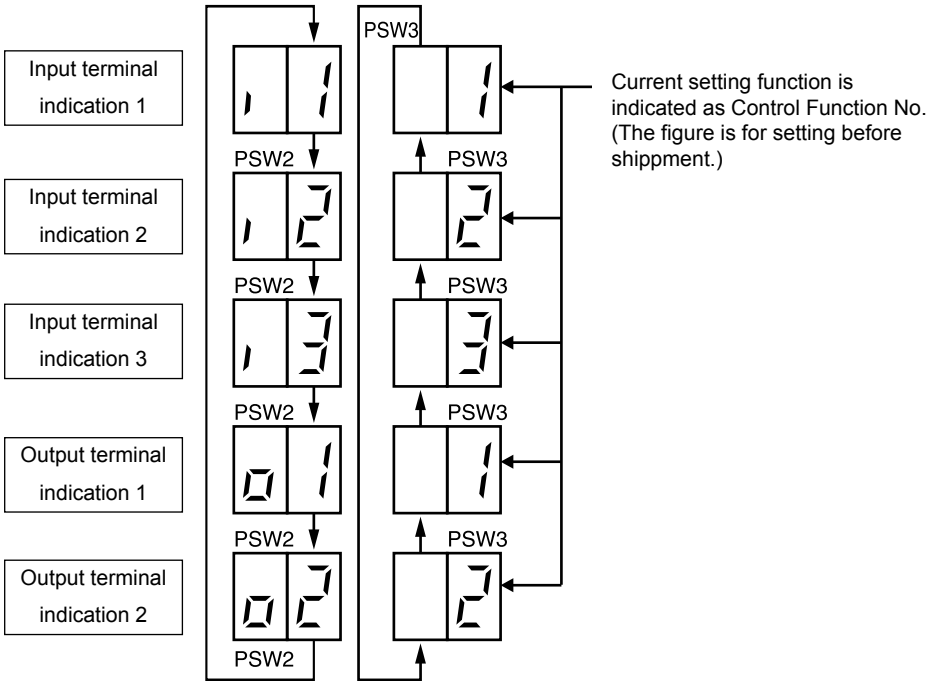
(The setting should be performed during the outdoor unit stoppage. Also, set DSW1-#4 of outdoor unit PCB at the “ON” side before performing in order to prevent the malfunction of compressor.)



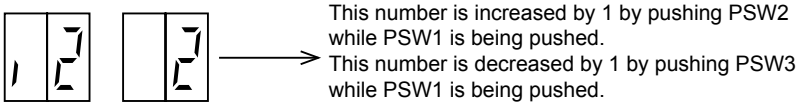
This display indicates that the control function No. 1 (Fixed Heating Operation Mode) is set at input 1.

2 By pressing the push-switches PSW2 and PSW3, input/output terminal indication is changed.

The following shows the display changes when PSW2 and PSW3 are pushed.



3 After the input/output terminal indication is selected, select your required control function No. by pushing PSW2 or PSW3 while PSW1 is being pushed.



4 After selecting the function No., return No. 6 pin at the “OFF” side on the DSW2. The selected contents are memorized in the outdoor unit printed circuit board and the function selection mode is stopped. The memorized data is maintained even power source lines are disconnected. The connecting details of each function are described, and the required parts are also indicated in the table.

5.1.2. Description of external input signals

■ **Input 1 – Fixing heating operation mode (Control function No.1),**

■ **Input 2 – Fixing cooling operation mode (Control function No.2)**

In the case that the fixing input terminals of the operation mode on the outdoor unit PCB1 are short-circuited, the operation mode can be fixed at the cooling or heating mode.

Short-circuit between Terminals 1 and 2 of CN1: Fixed Heating Operation Mode

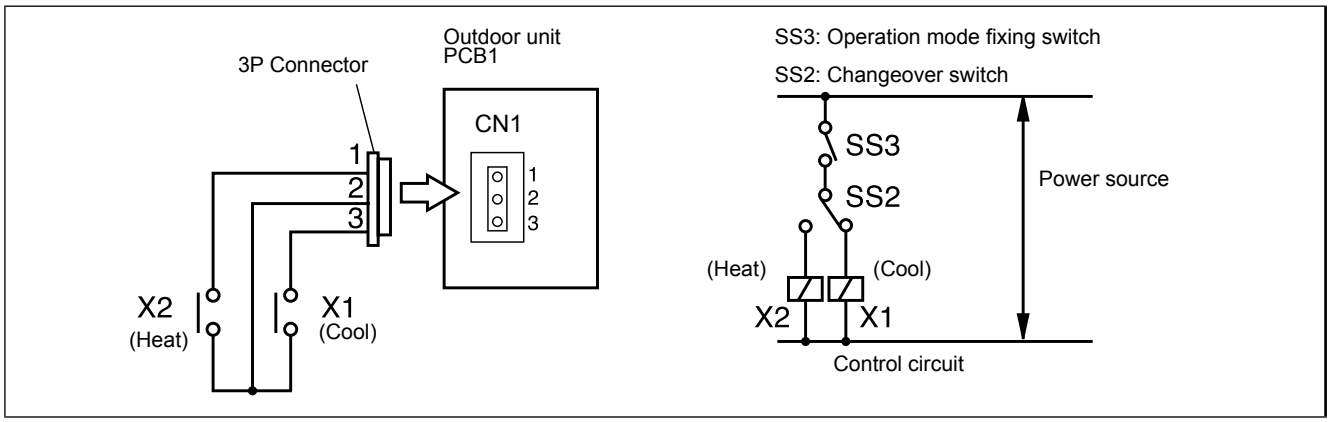
Short-circuit between Terminals 2 and 3 of CN1: Fixed Cooling Operation Mode

During this fixed heating (or cooling) mode, no cooling (or heating) operation is available. The indoor units under the cooling or dry operation (or heating operation) will be changed to the Thermo-OFF condition during this mode, and stoppage code No. “20” is given.

– Setting Example

Fixing Heating Operation at Input 1 (between 1 and 2 pins of CN1)

Fixing Cooling Operation at Input 2 (between 3 and 2 pins of CN1)



Wiring diagram example of fixing operation mode

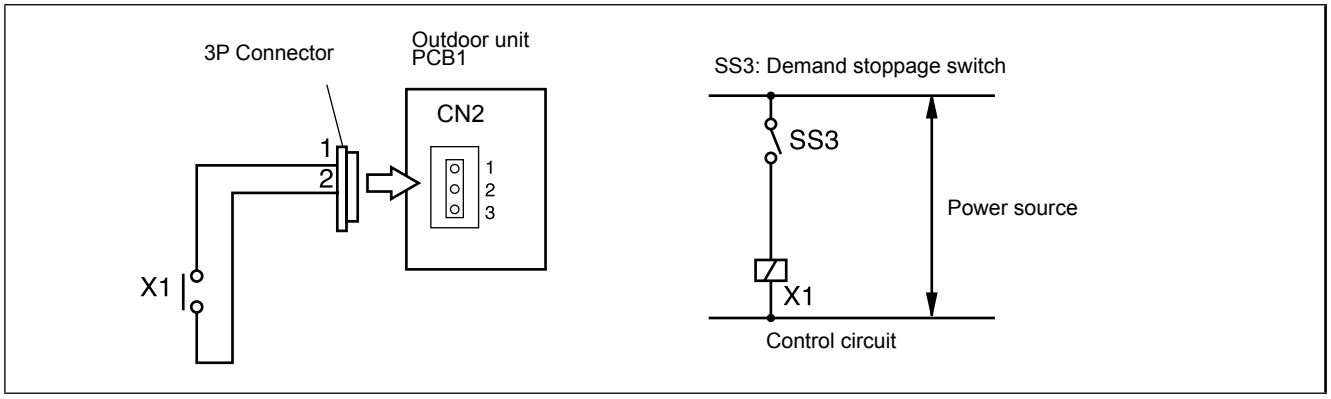
■ **Input 3 – Demand stoppage (Control function No.3)**

In the case that the demand input terminals on the outdoor unit PCB1 are short-circuited, compressor(s) is stopped. (In this case, the indoor unit(s) is put under Thermo-OFF condition. Cooling operation: Air-flow setting, Heating operation: Lo setting)

The stoppage code No. “10” is given. By disconnecting the demand switch contact, restarting is available.

– Setting Example

Demand Stoppage at Input 3 (between 1 and 2 pins of CN2)



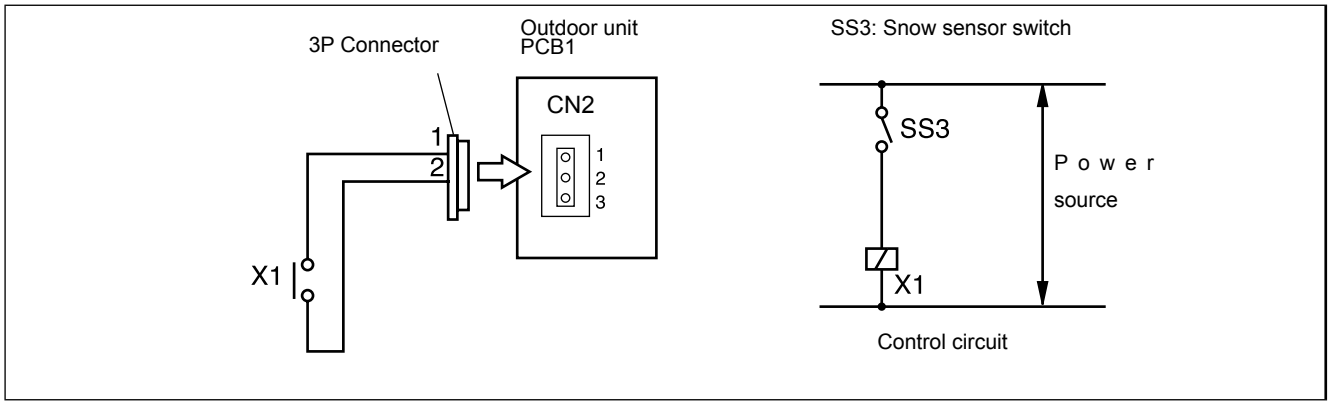
Wiring diagram example of demand stoppage

■ **Input 3 – Snow sensor (Control function No.4)**

In the case that the input terminals of the snow sensor on the outdoor unit PCB1 are short-circuited during compressor stoppage, all the outdoor fan motors are operated at the full speed. However, if the compressor is called for compressor operation, the fan operation is changed to the normal operation. If the input terminal is opened, the fan(s) is stopped. This function protects the outdoor units from a condition covered with snow.

– Setting Example

Snow Sensor at Input 3 (between 1 and 2 pins of CN2)



Wiring diagram example of snow sensor

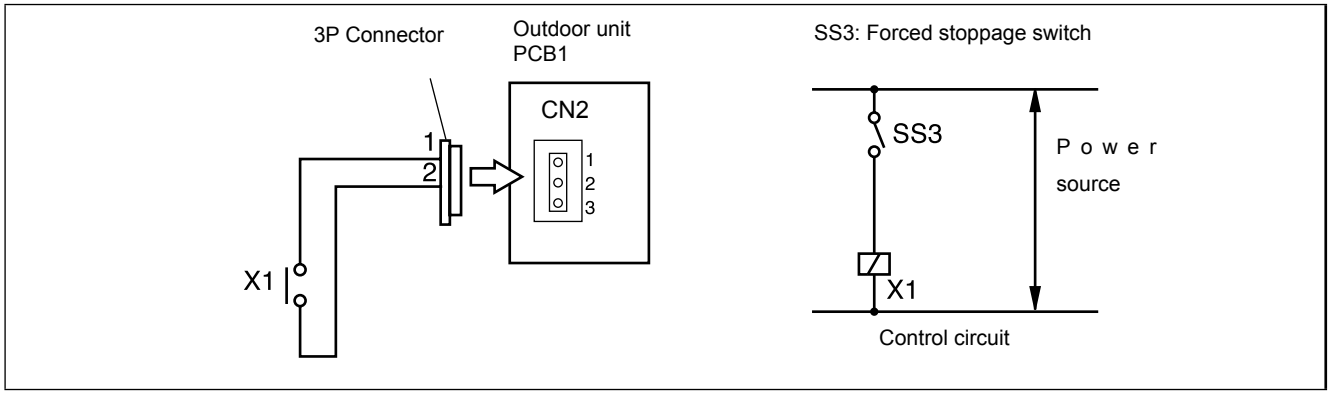
■ **Input 3 – Forced stoppage (Control function No.5)**

The compressor is stopped and the indoor fan motor is stopped when the forced stoppage input terminals on the outdoor unit PCB1 is short-circuited during running. However, the remote control switch display remains at the same mode with the stoppage code No. “10”.

In this case, if the input terminals are opened, operation is resumed.

– Setting Example

Forced Stoppage at Input 3 (between 1 and 2 pins of CN2)



Wiring diagram example of forced stoppage

■ **Input 3 – Demand current control (Control function No.6 to 9)**

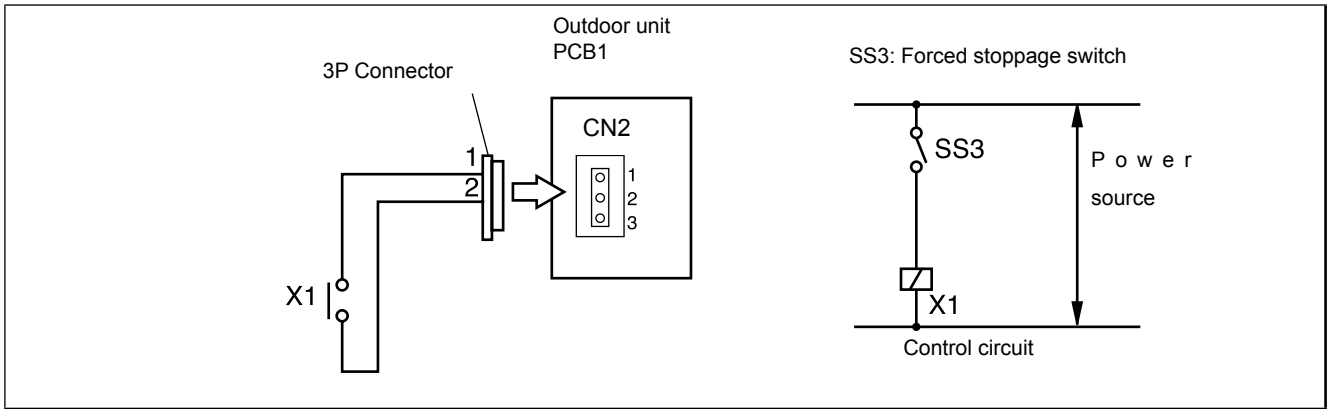
In the case that the demand input terminals on the outdoor unit PCB1 are short-circuited, the compressor frequency is controlled that the maximum limit of the outdoor running current is set 100%, 80%, 70% and 60%.

(The maximum limit of the outdoor unit running current can be selected according to the item “Setting of external input and output functions”.)

If the outdoor unit running current decreases beyond the maximum limit, the indoor unit is put under thermo-OFF condition. The stoppage code No. “10” is given. When the input terminal is opened during the demand current control, its control is reset.

– Setting Example

Demand Current Control at Input 3 (between 1 and 2 pins of CN2)



Wiring diagram example of demand current control

Table 5.1 Specifications of required main parts

Parts		Specifications	Remarks
Auxiliary Relay (X1, X2)		Mini-Power Relay, MY1F (or 2F) made by OMRON	220V/240V
Changeover Switch (SS2, SS3)		Manual Switch	220V/240V
3 Pin Connector Cord		PCC-1A (Connected to JST Connector, XARP-3)	Five Cords with Connectors as One Set
Cord	Low Volt.	0.3mm^2	lower than 24V
(Inside of Unit)	220/240V	0.5 to 0.75mm^2	
Cord	Low Volt.	0.5 to 0.75mm^2	lower than 24V
(Outside of Unit)	220/240V	2mm^2	

NOTES

1. Make the wire to the terminals as short as possible.

2. Do not run the wires along high voltage cable. (crossing is applicable.)

If necessary to run wires along high voltage cable, insert the low voltage cable(s) into metal tube and ground it at one end. If sealed wires are used at the low voltage wire side, ground it at one end of shield wires. The maximum length should be 70m.

5.1.3. Description of external output signals

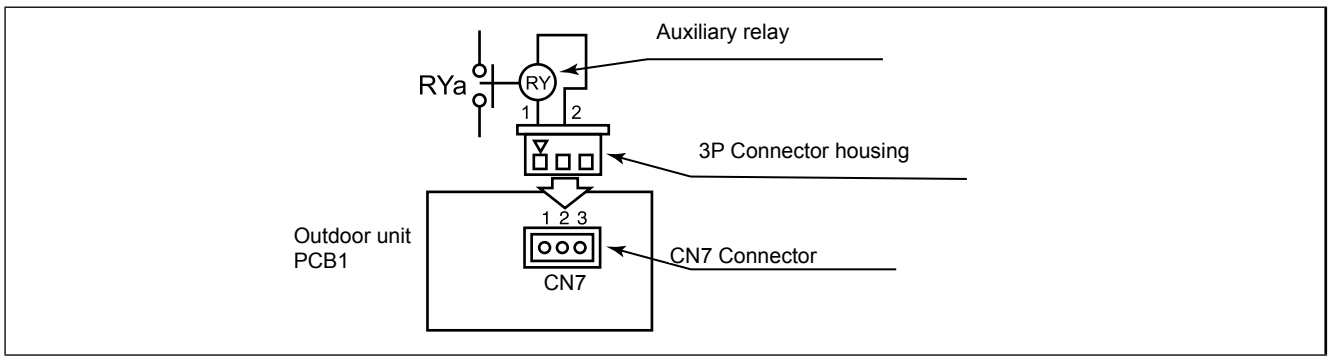
The following signals can be picked up from the outdoor PCB.

Refer to the table 5.2 for the required main parts.

■ **Output 1 – Operating signal (Control function No.1)**
Auxiliary relay contacting (RYa) is closed during the operation. Operating signal will be sent when the indoor units are operating. (Even when one (1) indoor unit is operating, the signal will be sent.) This function can be used for circulator or humidifier operation.

– Setting Example

Operation Signal at Output 1 (between 1 and 2 pins of CN7)

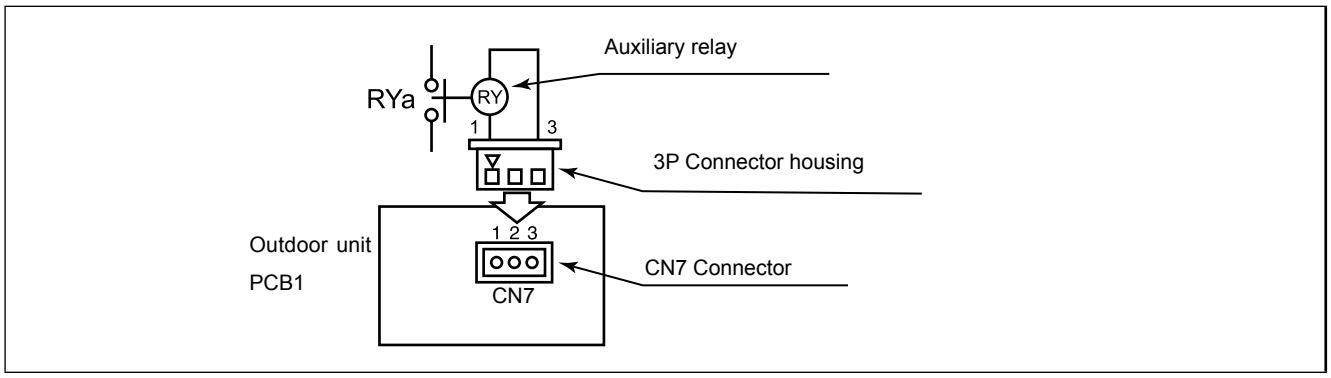


Wiring diagram example of operation signal

■ **Output 2 – Alarm signal (Control function No.2)**
Auxiliary relay contacting (RYa) is closed when the alarm occurs. Alarm signal will be sent when the alarm occurs from the indoor units. (The signal will be sent even when the alarm occurs from one (1) indoor unit.)

– Setting Example

Alarm Signal at Output 2 (between 1 and 3 pins of CN7)

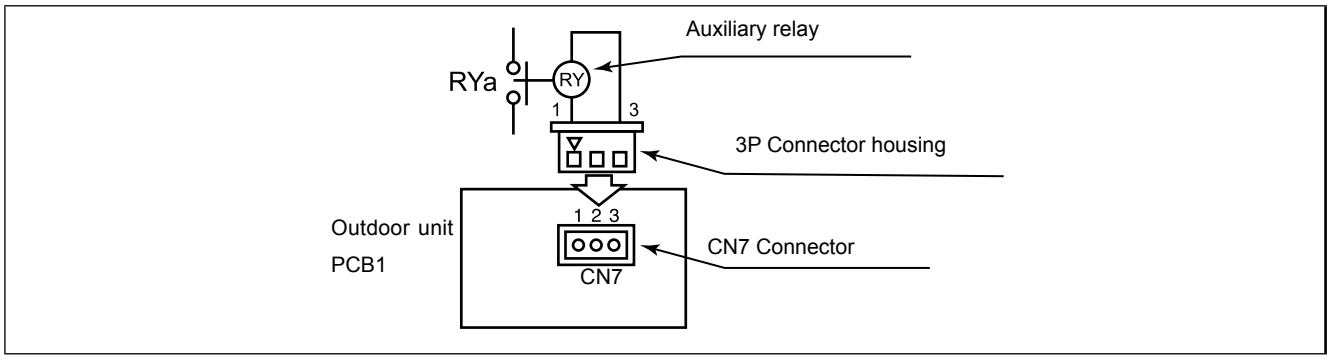


Wiring diagram example of alarm signal

5

■ **Output 2 – Compressor ON signal (Control function No.3)**
Auxiliary relay contacting (RYa) is closed during the compressor operation.

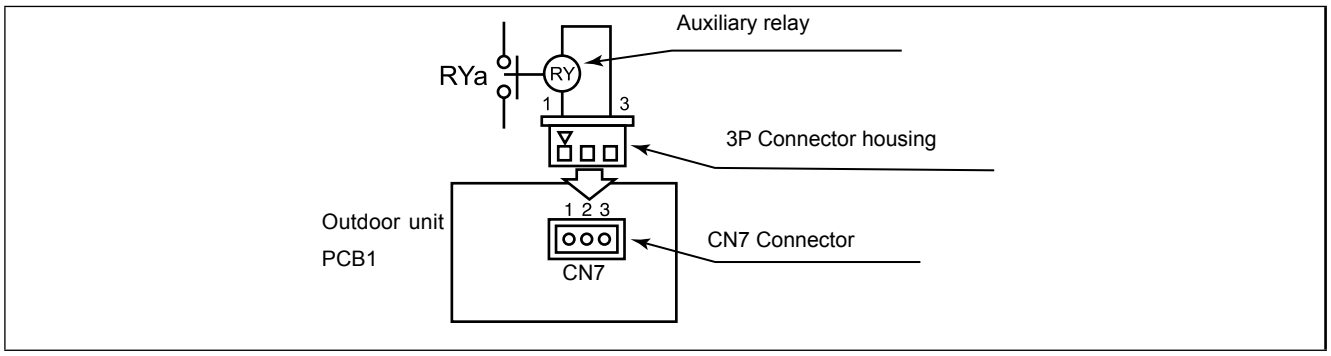
– Setting Example
Compressor ON Signal at Output 2 (between 1 and 3 pins of CN7)



Wiring diagram example of compressor ON signal

■ **Output 2 – Defrosting signal (Control function No.4)**
Auxiliary relay contacting (RYa) is closed during the defrosting.

– Setting Example
Defrosting Stoppage at Output 2 (between 1 and 3 pins of CN7)



Wiring diagram example of defrosting signal

Table 5.2 Specifications of required main parts

Parts	Specifications
Auxiliary Relay *	High-Power Relay, LY2F DC12V made by OMRON

* Do not use the relay with diode built-in.

* Refer to the table 5.1 for the connector parts.

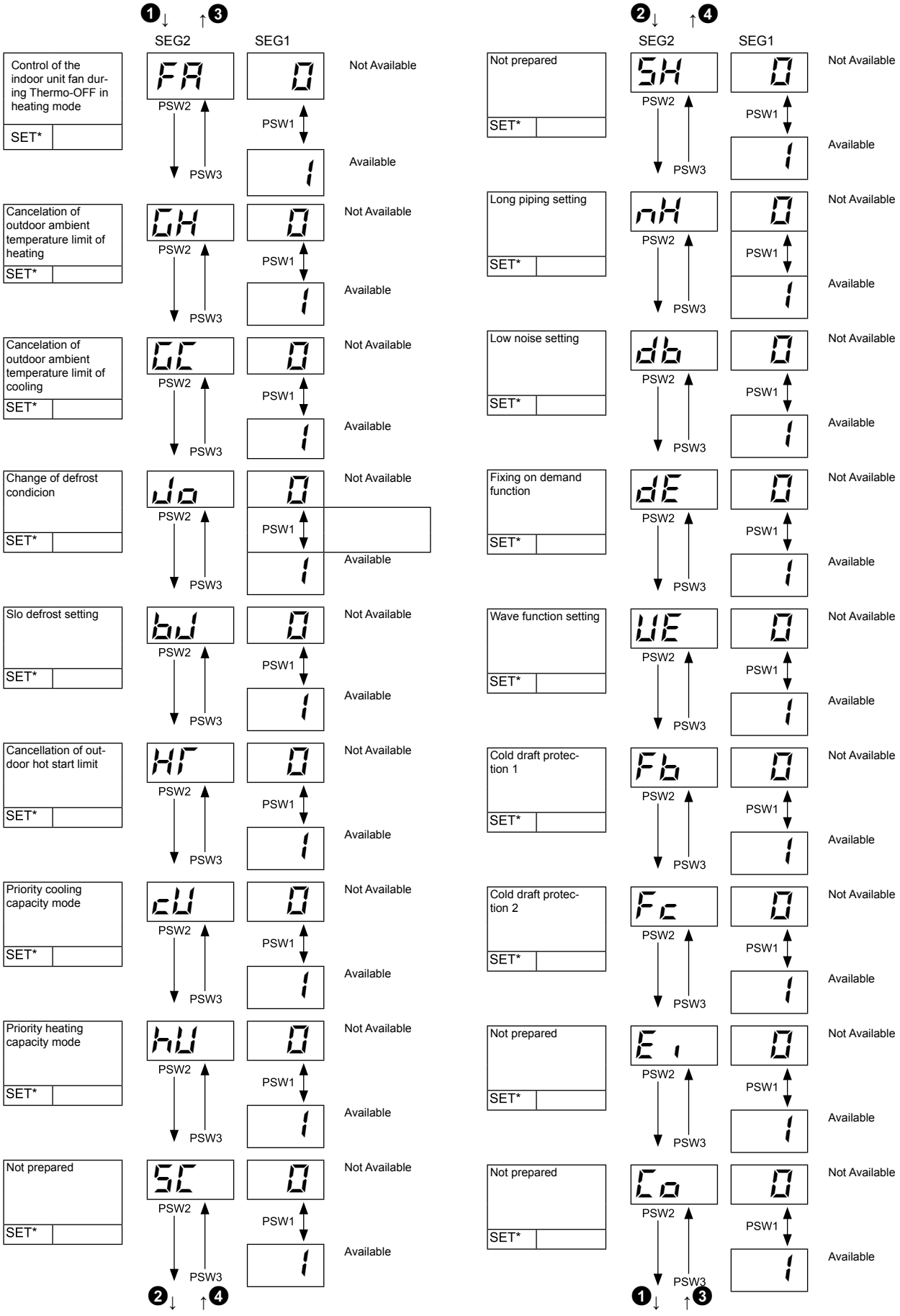
5.1.4. Optional functions

Function Setting from PCB

1 Set DSW1-#4 of outdoor PCB at the “ON” side for the prevent of the compressor activation by operation mistake.

2 Set DSW2-#5 of the outdoor PCB at the “ON” side while the main power to the outdoor unit is being supplied. (during outdoor unit stoppage)

3 By setting, function selection mode is available and the following appears on the 7-segment display.


1↓ ↑3
SEG2
SEG1
Control of the indoor unit fan during Thermo-OFF in heating mode
SET*
FA
0
Not Available
PSW2
PSW1
PSW3
1
Available
Cancelation of outdoor ambient temperature limit of heating
SET*
CH
0
Not Available
1
Available
Cancelation of outdoor ambient temperature limit of cooling
SET*
CC
0
Not Available
1
Available
Change of defrost condicion
SET*
Jo
0
Not Available
1
Available
Slo defrost setting
SET*
bJ
0
Not Available
1
Available
Cancellation of outdoor hot start limit
SET*
HT
0
Not Available
1
Available
Priority cooling capacity mode
SET*
cU
0
Not Available
1
Available
Priority heating capacity mode
SET*
hU
0
Not Available
1
Available
Not prepared
SET*
SC
0
Not Available
1
Available
2↓ ↑4
SEG2
SEG1
Not prepared
SET*
SH
0
Not Available
1
Available
Long piping setting
SET*
nH
0
Not Available
1
Available
Low noise setting
SET*
db
0
Not Available
1
Available
Fixing on demand function
SET*
dE
0
Not Available
1
Available
Wave function setting
SET*
UE
0
Not Available
1
Available
Cold draft protection 1
SET*
Fb
0
Not Available
1
Available
Cold draft protection 2
SET*
Fc
0
Not Available
1
Available
Not prepared
SET*
E1
0
Not Available
1
Available
Not prepared
SET*
Co
0
Not Available
1
Available
1↓ ↑3

■ Circulator function at heating thermo-OFF

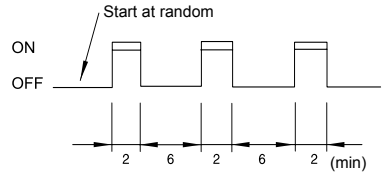
Press “RSW1” and select the setting condition “1” at the circulator function at heating thermo-OFF “ FA ”.

In case that the fan speed is changed to “LOW” at heating Thermo-OFF, there is a case that the room air temperature is too high at heating Thermo-OFF.

In this case, the circulator function at heating thermo-OFF is recommended, and its function explains below.

The indoor fan operates for 2 minutes and stops for 6 minutes as a cycle when the activation conditions are satisfied.

Operation
When the indoor unit is at thermo-OFF during the heating operation, the indoor fan operates and stops for 6 minutes in 2 minute cycles



NOTE
When the indoor fan is stopped by another control, it is not available to operate indoor fans.

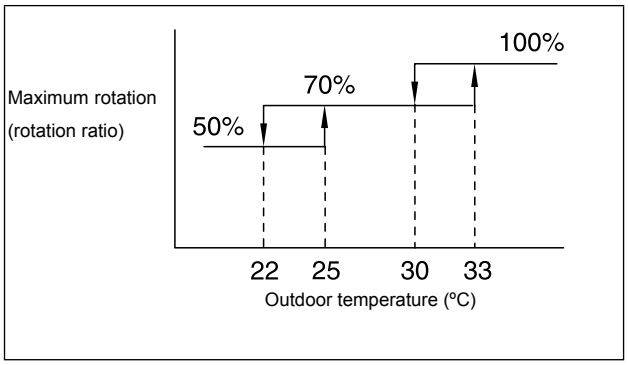
■ Night-Shift (Low noise)

Press “PSW1” and select the setting condition “1” at the night shift (low noise) “ n 1 “. Then, this function can be set.

The outdoor fan operation is controlled by fan controller as shown below.

The night shift operation shall be applied in case that the cooling capacity has the margin to be allowed for the capacity decrease and the low sound operation is required especially in the nighttime.

Outdoor Fan



NOTE
The maximum rotation is always 100% (rotation ratio) for the standard unit. (No limitation of the outdoor temperature)

■ Frequency range (Cooling operation)

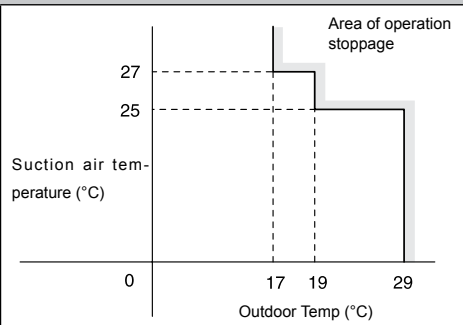
	Outdoor Unit Capacity (HP)	Minimum Frequency (Hz)	Maximum Frequency (Hz)	Conditions
When night shift is not set ni=0	8	15	68	Except for the conditions on the right
	10		85	
	12		100	

	Outdoor Unit Capacity (HP)	Minimum Frequency (Hz)	Maximum Frequency (Hz)	Conditions
When night shift is set ni=1	8	15	60	(1) ni=1 (2) Outdoor fan: Below 70%
	10		60	
	12		60	

■ Cancellation of outdoor ambient temperature limit of heating

Press “PSW1” and select the setting condition “1” at the cancellation of outdoor ambient temp. limit of heating “ CH ”. Then, this function can be set.

The heating operation is continued under a high outdoor temperature.

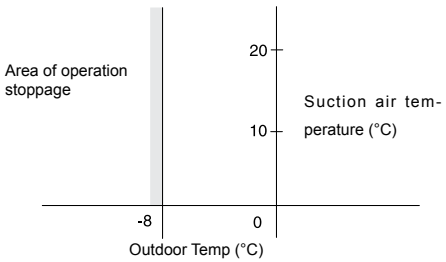
Operation in heating mode	
The factory-set limitation of the range of permissible outdoor temperature in the heating process, which is shown in the right figure, is cancelled.	

	Note
The operation may be OFF due to high outdoor temperature protection control, since protection control is not cancelled.	

■ Cancellation of outdoor ambient temperature limit of cooling

Press “PSW1” and select the setting condition “1” at the cancellation of outdoor ambient temp. limit of cooling “ CC ”. Then, this function can be set.

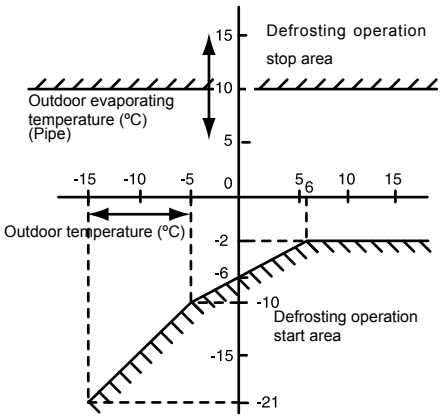
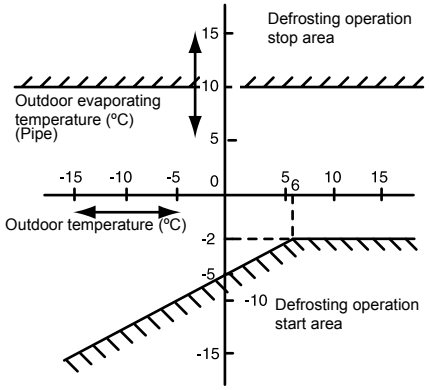
The cooling operation is continued under a low temperature.

Operation in cooling mode	
The factory-set limitation of the range of permissible outdoor temperature in the heating process, which is shown in the right figure, is cancelled.	

	Note
The operation may be OFF due to low outdoor temperature protection control since protection control is not cancelled.	

■ Change of defrost condition

Press “PSW1” and select the setting condition “1” at the change of defrost condition “dC”.

Setting condition	Standard Specifications	Cold area specification
	When change of defrost condition is NOT set	When change of defrost condition is set
Temperature conditions under defrosting operation		

■ SLo defrost setting

Press “PSW1” and select the setting condition “1” at the slow defrost setting “bd“.

Indoor fan operation is stopped during the defrost operation. However, this function can be operated the indoor fan at low speed during the defrosting operation.

■ Long piping setting

Press “PSW1” and select the setting condition “1” at the long piping setting “nH”.

If cooling capacity or heating capacity is not enough under the long-distance piping condition, this function can be set the target compressor frequency higher than normal target value.

■ Low noise setting

Press “PSW1” and select the setting condition “1”, so the low noise setting “db” can be set.

The outdoor fan maximum rotation is set lower than normal setting regardless of outdoor temperature.

However, continuous operation can not be operated under the condition below.

a) Outdoor temperature is over 40 ºC.

b) Total combination horsepower is over 100%.

■ Fixing of demand function

Press “PSW1” and select the setting condition “1”, so that the fixing of demand function “dE” can be set.

However, it is not necessary to short-circuit the demand input terminals on the outdoor unit PCB. (Refer to the item “Input 3 – Demand Current Control”)

The table below is the limit of the running current for this function.

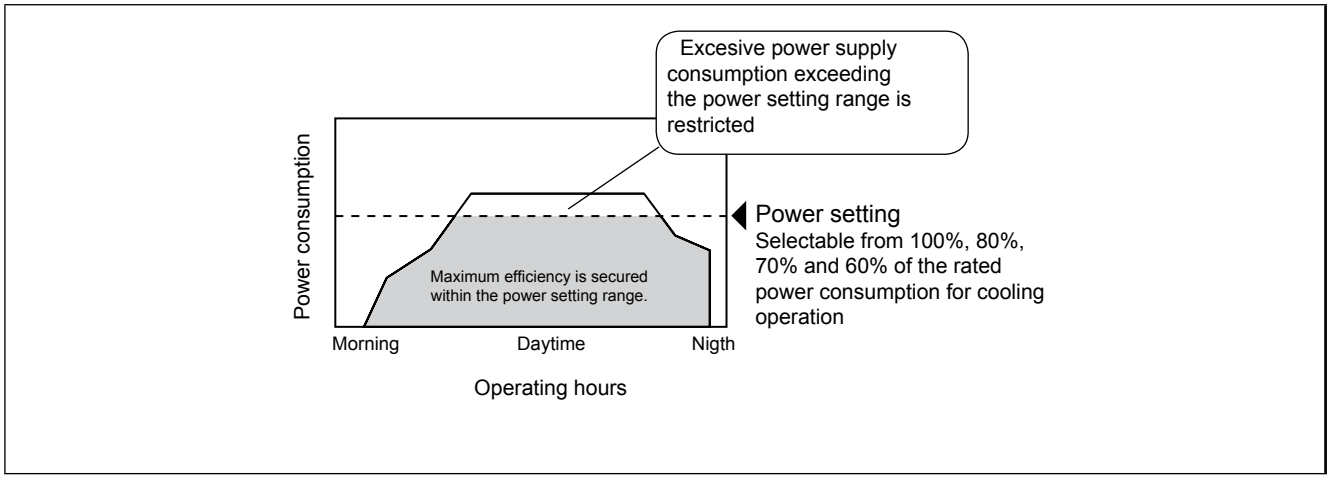
Control Function No. *	Demand Running Current Control
1 to 5	100%
6	60%
7	70%
8	80%
9	100%

* This function can be activated when demand function is selected at one of the input terminal indications i1, i2 and i3.

In case that multiple demand functions are set at the input terminal indications i1, i2 and i3, the demand running current is selected as below.

6 > 7 > 8 > 9
|
(Control Function No.)

* Demand Control
Adopting self-demand function which drastically decreases power consumption has largely improved energy-saving.

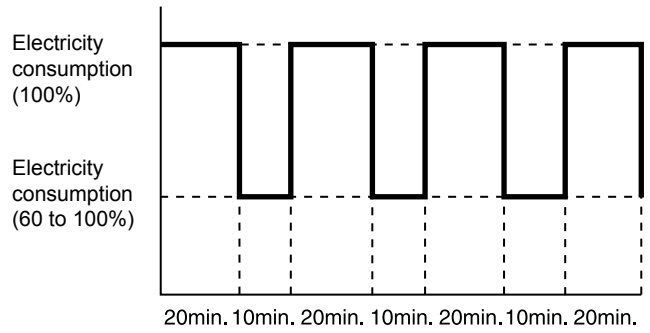


■ **Wave function setting**

Press “PSW1” and select the setting condition “1”, so that the wave function setting “UE”.

While this function is activated, the maximum limit of running current is changed from 60% to 100% as shown in the figure.

* Wave function cannot be available when the setting condition “1” at the fixing of demand function “dE” is selected and the demand current control from the external input signal is set.



* Wave function can be activated when demand function is selected at one of the input terminal indications i1, i2 and i3.

The minimum limit of running current control is according to the set value of the demand function.

If demand function is not set at the input terminal indication, this function can not be activated.

■ **Cold draft protection 1**

Press PSW1 and select the setting condition “1” at the cold draft protection 1 “Fb”, so the cold draft protection can be set. When the minimum Indoor unit discharge air temperature falls down to 12 ºC and below at cooling operation, outdoor fan stops and compressor frequency forcibly decreases to prevent a drop in discharge air temperature.

■ **Cold draft protection 2**

Press PSW1 and select the setting condition “1” at the cold draft protection 2 “Fc” , so this function can be set. When Indoor unit minimum discharge air temperature falls down to 10 ºC and below at cooling operation, the compressor stops. In this case, stoppage code number “28” is given.

6. Test run

Contents

6.1. Checking procedure before the test run

Test run should be performed according to the Table 6.2. And use the Table 6.1 for recording test run .

WARNING

■ **Do not operate the system until all the check points have been cleared .**

A) Check to ensure that the refrigerant piping and transmission between outdoor unit and indoor units are connected to the same refrigerant cycle. If not, it will cause an abnormal operation and a serious accident .

B) Check to ensure that the electrical resistance is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired .

C) Check to ensure that the stop valves of the outdoor unit are fully opened, and then start the system .

D) Check to ensure that the switch on the main power source has been ON for more than 12 hours, to warm the compressor oil by the oil heater .

E) Check that the refrigerant piping and the electrical wiring conform to the same system, and check that the dip switch setting of the refrigerant cycle No. (DSW1 & RSW1 [O.U.], DSW5 & RSW2 [I.U.]) and the unit number (RSW) for the indoor units apply to the system .

Confirm that the dip switch setting on the printed circuit board of the indoor units and the outdoor units are correct .

Especially, pay attention to the setting of lift between indoor units and outdoor unit, the refrigerant No. and the end terminal resistance. Refer to the chapter “6. Electrical Wiring” .

F) Check to ensure that the electrical resistance is more than 1 megohm, by measuring the resistance between ground and the terminal of the electrical parts. If not, do not operate the system until the electrical leakage is found and repaired. Do not impress the voltage on the terminals for transmission 1 and 2 .

G) Check to ensure that each wire, L1, L2, L3 and N (R, S and T) is correctly connected at the power source .

If incorrectly connected, the unit will not operate and the remote control switch will indicate the alarm code “05”. In this case, check and change the phase of the power source according to the attached seat on the reverse side of the service cover .

H) Check to ensure that switch on the main power source has been ON for more than 12 hours, to warm the compressor oil by the oil heater .

■ **FSN2 series outdoor units does not operate within 4 hours after power supply (Stoppage Code d1-22) .**

In case of operating within 4 hours, release the protection control as follows:

1. Supply power to the outdoor unit and indoor units .
2. Wait for 30 seconds .
3. Push PSW1 on PCB more than 3 seconds .

■ **Pay attention to the following items while the system is running .**

A) Do not touch any of the parts by hand at the discharge gas side, since the compressor chamber and the pipes at the discharge side are heated higher than 90°C .

B) DO NOT PUSH THE BUTTON OF THE MAGNETIC SWITCH(ES). It will cause a serious accident .

■ **Do not touch any electrical components for at least 3 minutes after turning OFF the main switch .**

■ **Check that the refrigerant piping setting and electrical wiring setting are for the same system, by operating the indoor unit one by**

CAUTION

■ Caution for Insulation Resistance

If total unit insulation resistance is lower than 1 megohm, the compressor insulation resistance may be low due to retained refrigerant in the compressor. This may occur if the unit has not been used for long periods .

1. Disconnect the cables to the compressor and measure the insulation resistance of the compressor itself. If the resistance value is over 1 megohm, then insulation failure has occurred of other electrical parts .
2. If the insulation resistance is less than 1 megohm, disconnect the compressor cable from the inverter PCB. Then, turn on the main power to apply current to the crankcase heater .

   After applying current for more than 3 hours, measure insulation resistance again. (Depending on the air conditions, pipe length or refrigerant conditions, it may be necessary to apply the current for a longer period of time.) Check the insulation resistance and reconnect the compressor .

   If the leakage breaker is activated, check the recommended size shown in Table 6.1 .

NOTES

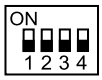
1. Confirm that field-supplied electrical components (main switch fuse, fuse-free breaker, earth leakage breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data given in this Technical Catalog of the unit and ensure that the components comply with national and local codes .
2. Use shielded wires (≥0.75mm2) for field wiring to protect electrically noise obstacle. (Total length of shielded wire shall be less then 1000m, and size of shielded wire shall comply with local codes.)
3. Check to ensure that the terminal for power source wiring (terminals “L1” to “L1” and “N” to “N” of each terminal board: AC 380-415V, terminals “R” to “L1” and “S” to “L2” of each terminal board: AC 220V) .

   If not, some component will be damaged .

6.2. Test run procedure from the outdoor unit side

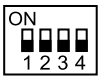
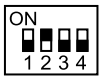
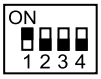
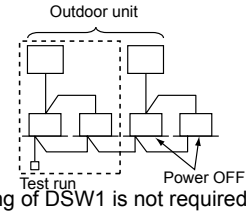
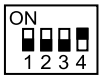
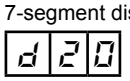
The test run procedure from the outdoor unit side is shown below. You can set this DIP switch while the power source is ON

Setting of Dip Switch (before shipment)

DSW1		
	1	Test run
	2	COOL/HEAT setting (ON: Heating operation) (OFF: Cooling operation)
	3	OFF (mixed)
	4	Manual compressor OFF

Warning:

- *Do not touch any other electrical components while you are setting the switches on the PCB.*
- *Do not attach or detach the service access panel when the power source for the outdoor unit is ON and the outdoor unit is operating.*
- *Set all the DIP switches of DSW1 to OFF after completing the test run.*

	Dip switch seting	Operation	Remarks
Test run	1. Setting operation mode Cooling: Set DSW1-2 OFF  Heating: SET DSW1-2 ON  Starting the test run: Set DSW1-1 at ON. The operation starts after 20 s. In case of heating process, leave DSW1-2 at ON 	– The indoor unit automatically starts to operate when the test run of the outdoor unit is set. – You can perform the ON/OFF operation from the remote control switch or the DSW1-1 of the outdoor unit. – Continuous operation during 2 hours is performed without the Thermo-OFF condition.	– Make sure that the indoor units start to operate in accord with the test run of the outdoor unit. – If you start the test run from the outdoor unit and you stop the test run from the remote control switch, the test run function of the remote control switch is cancelled. However, the test run function of the outdoor unit is not cancelled. Check to ensure that the DSW1-1 of the outdoor unit PCB is turned OFF – In case that more than one indoor units are connected with one remote control switch, perform the test run operation at each refrigerant system one by one. Then, make sure to turn the power source OFF for the indoor units at other refrigerant system not to operate test run.  – The setting of DSW1 is not required for the test run from the remote control switch.
Manual compressor OFF	Setting the compressor manually OFF: Set DSW1-4 at ON  ON: Set DSW1-4 at OFF	– When DSW1-4 is ON during the compressor operation, the compressor stops operating immediately and the indoor unit is under the Thermo-OFF condition. – When DSW1-4 is OFF, the compressor starts to operate after the cancellation of the 3-minute guard.	– Do not turn ON and OFF the compressor frequently
Manual defrost	– Manual defrost operation starts. Press the PSW1 for more than three seconds during the heating process. The defrost operation starts after two minutes. This function is available once the heating process has been running for five minutes. – Manual defrost operation finishes. The defrost operation automatically finishes and the heating process starts.	– The defrost operation is available regardless of the frosting conditions and the total time of the heating process. – The defrost operation is not performed when the temperature of the outdoor heat exchanger is higher than 10°C, the high pressure is higher than 2.0 Mpa or under the Thermo-OFF condition.	– Do not repeat the defrost operation frequently. – When the PSW1 accepts the manual defrost operation, the remaining time before starting the defrost operation is displayed at the 7-segment display on the PCB.  Remaining time (every 4 seconds)

6.3. Check list

■ **Check list on test run**

Client:			Installer:			Date:		
Outdoor unit model:			Outdoor unit serial No.:			Checker:		
Indoor unit model:								
Indoor unit serial No.								

Piping lenght [m]	
Additional refrigerant charge [kg]	

1. General

No.	Check item	Result
1	Was the DIP switch DSW6 for the piping length in the outdoor unit set?	
2	Are the power supply wires of the transmission cable making contacts on the piping?	
3	Was a ground wire connected?	
4	Is there any short circuit?	
5	Is there any voltage malfunction among the different phases (L1-L2, L2-L3, L3-L1, L1-N)?	

2. Refrigerant cycle

a. Cooling/heating process

No.	Check item	Result
1	Operate all the indoor units. (TEST RUN mode).	
2	Operate all the indoor units at the “HIGH” speed.	

b. Sampling data (cooling/heating process: if the indoor temperature is between 21°C and 30°C)

No.	Check item	Result
1	After operating for more than 20 minutes.	
2	Check Pd. and Td. Is TdSH 15 to 45 degrees?	
3	Is Ps 0.2 to 1.1?	
4	Is Pd 1.0 to 3.5? (If the outdoor temperature is high, the Pd. becomes high.)	

3. Check item after sampling data

a. Cooling process (if the outdoor temperature is higher than 15 ºC)

No.	Check item	Standard	Causes	Result
1	Is H1 (compressor frequency) abnormally low or high? (It is applicable when the inlet air temperature is three degrees higher than the setting temperature).	Running horsepower of the indoor units X 8Hz.	Low: excessive refrigerant; High: insufficient refrigerant; DSW for capacity of indoor units: Incorrect setting.	
2	Is the fan actually running when Fo (airflow rate of fan) is other than "0"?	–	Failure of the fan motor; Failure of the PCB1; Failure of the condenser.	
3	Is the total of iE (indoor expansion valves opening) abnormally low or high?	Total % of iE: horsepower of the outdoor unit X (0.7 to 1.5).	Low: excessive refrigerant; High: insufficient refrigerant, excessive pipe resistance.	
4	Is TL (liquid pipe temperature of the heat exchanger of the indoor unit) lower than Ti (air inlet temperature of the indoor unit)?	It is normal when TL-Ti < -5 deg.	Failure of the TL thermistor; Fully closed expansion valve; Short circuit.	
5	Is TG (gas pipe temperature of the heat exchanger of the indoor unit) lower than Ti (air inlet temperature of the indoor unit.)?	It is normal when TG-Ti < -5 deg.	Failure of the TG thermistor; Fully closed expansion valve or slightly open expansion valve; Short circuit.	
6	Is there any excessive difference among indoor units at SH(TG-TL) of the heat exchanger of the indoor units? (It is applicable when the inlet air temperature is three degrees higher than the setting temperature.)	It is normal if the difference among units is within 3 - 7 deg. lower than other units.	Failure of the TL/TG thermistor; Fully open expansion valve, slightly open expansion valve or fully closed expansion valve.	
7	Is there any excessive different among indoor units at SH (TG-TL) of the heat exchanger of the indoor units and is iE lower than ⌈7⌋? (It is applicable when intake air temp. is 3 deg. higher than setting temp.	It is normal if SH is within 3 deg. lower than other units.	Expansion valve locked in fully open position; The refrigerant cycle number does not match; Mismatched between wiring and piping.	
8	Is there any indoor unit with SH (TG-TL) excessively lower than the value of other units, under the condition of IE (indoor unit expansion valve) ⌈100⌋?	It is normal if SH is within 3 deg. higher than other units.	Expansion valve locked in slightly open position or closed expansion valve; The refrigerant cycle number does not match; Mismatched between wiring and piping.	
9	Is the difference between the discharge air temperature and the inlet air temperature more than 7 deg.? * The temperature difference between I.U. means the following: b3 (Discharge Air Temp.) - b2 (Intake Air Temp.) indicated on the remote control switch by check mode.	–	–	

b. Heating process (if the outdoor temperature is higher than 0 ºC)

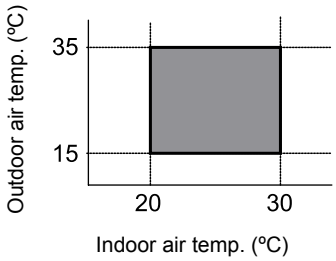
No.	Check item	Standard	Causes	Result
1	Is oE (outdoor unit expansion valves opening) abnormally low or high when TdSH is 15 to 45 degrees?	Total of oE: total frequency of compressor x 0.2 to 0.6	Low: excessive refrigerant; High: insufficient refrigerant.	
2	Is Pd ⌈1.6⌋ to ⌈3.5⌋? (Pd is high when the indoor temperature is high).		Low: leakage of the SVA (solenoid valve); High: excessive gas pipe resistance.	
3	Is H1 (compressor frequency) abnormally low or high? (The lower the room temperature and the outdoor temperature, the higher the above value).		Low: excessive refrigerant; High: insufficient refrigerant, excessive pipe resistance.	
4	Is Ps ⌈0.2⌋ to ⌈1.1⌋? (Only under the condition that the electrical expansion valve (SVA) is OFF).		Low: short circuit of the indoor unit; Low/High: failure of the following components: outdoor unit fan motor or outdoor ambient thermistor.	
5	Is the temperature difference among the indoor units* more than 10 degrees when iE (indoor unit expansion valve) is “100”? *The temperature difference among the indoor units means the following: b3 (Discharge Gas Temperature) - b2 (air inlet temperature) that is displayed on the remote control switch by means of the check mode. However, this is applicable only when b2 (Air Inlet Temperature) - b1 (setting temperature) is higher than three degrees.		Failure of components such as the PCB, the wiring, the coil, the valve; Excessive pipe resistance; Failure of the thermistor for the discharge air temperature.	

NOTE:

1. *The symbol with an underline indicates a check item. The mark ⌈⌋ indicates the checking data.*

6.4. Judgement system for refrigerant amount

You can check the excess or the deficiency of the refrigerant by means of the data that is provided by the check mode of the 7-segment display. The following checking procedure is useful during the test run and the maintenance.



◆ **Before the checking procedure:**

1. Operate all the indoor units at the TEST RUN mode and operate all the indoor units at the HIGH speed.
2. Check the following items in order to make sure that the refrigerant cycle is stable.

1) The continuous operation lasts more than 20 minutes.

2) Td·SH is 25 to 45 ºC in cooling or 15 to 45 ºC in heating

3) Ps is 0.4 to 1.1 MPa in cooling or 0.2 to 1.1 MPa in heating

4) Pd is 2.0 to 3.5 MPa in cooling or 1.6 to 3.5 MPa in heating

Td·SH: Discharge gas temperature superheat

Ps: Suction pressure, Pd: Discharge pressure

3. Collect the checking data that is provided by the check mode of the 7-segment display.
4. Perform the checking according to the following procedure.

Judge according to the following target value:

Cooling	Refrigerant flow charge is controlled by indoor unit expansion valve
Heating	Refrigerant flow charge is controlled by outdoor unit expansion valve

Applicable air temperatures for the checking procedure:

Cooling	Room temperature: 20°C~30°C (DB) Outdoor temperature: 15°C (DB) or more
Heating	Room temperature: 20°C~30°C (DB) Outdoor temperature: 0°C~15°C (DB)

◆ **Checking procedures for cooling**

◈ Process

1. Convert iE (indoor unit expansion valve opening) with the following table:

Indoor Unit HP	Conversion
0.8 to 6 HP	iE
8 and 10 HP	iE × 2.0

2. Sum up the converted values of iE.
3. Calculate the total frequency (=H1(Inverter frequency))

◈ Judgement

- If total of converted iE/Total frequency < 0.7 = Insufficient refrigerant
- If total of converted iE/Total frequency > 1.6 = Excessive refrigerant

◆ Checking procedures for heating

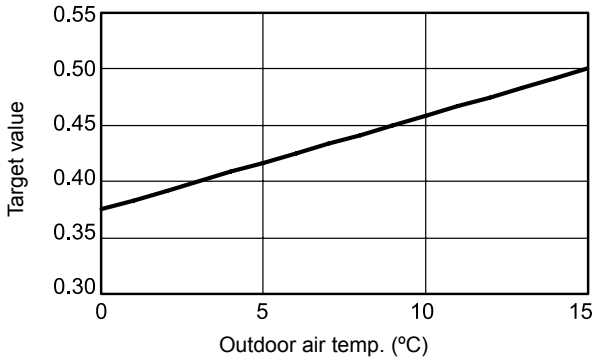
◈ Process

1. Detect oE (total outdoor unit expansion valve opening)
2. Calculate the total frequency (=H1(Inverter frequency)).

◈ Judgement

- If total oE/Total frequency < 0.8 x Target value = Insufficient refrigerant
- If total oE/Total frequency > 1.2 x Target value = Excessive refrigerant

Refer to the following table to use the target value in heating.



◆ Examples

◈ Cooling process

	Indoor units				
	2HP	2HP	2HP	2HP	2HP
iE (%) (from the checking data)	32	38	30	20	18
Calculate value of iE	32 (Hold)	38 (Hold)	30 (Hold)	20 (Hold)	18 (Hold)
Total of iE (a)	138 (32+38+30+20+18)				
Total frequency (b)	90				
Judgement	OK: 0.7 ≤ (a) / (b) ≤ 1.6				

◈ Heating process

	Indoor units					Outdoor unit
	2HP	2HP	2HP	2HP	2HP	10HP
Ti (indoor suction temperature)	26	27	23	23	25	–
To (outdoor temperature) (°C)						7
Total of oE (a)	–					42
Total of frequency (b)	100					
Judgement	OK: (a) / (b) ≈± 20% of target value					

7. Troubleshooting

Contents

7.1. Initial troubleshooting

Checking by means of the 7-segment display

■ **Simple checking procedure by means of the 7-segment display**

1. Turn on all the indoor units which are connected to the outdoor unit.
2. Turn on the outdoor unit
3. Auto-addressing starts. (Outdoor unit printed circuit board PCB 1)

   During the auto-addressing, you can check the following items by means of the 7-segment display of the outdoor unit.

   – Disconnection of the power supply to the Indoor Unit.

   – Duplication of the Indoor Unit number.

Normal case:

The 7-segment display of the outdoor unit is not indicated.

Abnormal case:

If there is something wrong, the 7-segment display of the outdoor unit displays the following indications:

Cause	Indication	Remarks
a. The indoor units are not supplied with power.		continues to flash after 30 seconds.
b. Disconnection of the operating line between the outdoor units and the indoor units.		continues to flash after 30 seconds.
c. Duplicated settings of the indoor unit number on the rotary switch RSW (Refer to the section "Troubleshooting by means of the Alarm Code" for the description of the alarm code "35").		

7.1.1. Emergency operation

Method of collecting refrigerant (In case that compressor does not operate)

Perform only when collecting refrigerant of outdoor unit is required.

(Perform the replacing compressor and oil return circuit if necessary.)

Process No.	Procedure	Remarks
1	Turn OFF the main switch of O.U.	
2	Connect manifold to the check joint* at low and high pressure sides of O.U.	* Not the check joint of liquid/gas stop valves.
3	Close the liquid and gas stop valve completely.	To improve the performance of vacuuming.
4	Collecting refrigerant in O.U.) – Collect the refrigerant from check joint at high and low pressure sides using the collector.	– The discharge of the refrigerant in the atmosphere is strictly forbidden. Make sure that the refrigerant is collected by the collector. – Measure the quantity of the collected refrigerant
5	Remove charge hose at the low and high pressure sides check joint, so that the low pressure side of the refrigerant cycle will be the atmosphere pressure. Disconnect the charge hose at charge port of return oil circuit.	– Make sure that there is no pressure increase of the low pressure side after collecting the refrigerant. – Make sure that the refrigerant cycle is the atmosphere pressure. Otherwise, problems such as the blowing of gas and the suction of the cutting material may occur when removing the comp.
6	Perform replacing comp., return oil circuit and electrical parts.	Removing electrical box may be required.
7	With the electrical box mounted, check the wrings by contacting (except the power line for comp.) For the power line for comp., insulate the wiring terminal with vinyl tape.	
8	Turn ON the main switch of O.U.	This process is before removing and mounting electrical box.
9	Set DSW4-#4 to ON side (O.U. PCB1).	
10	Perform the vacuuming from the check joint at low and high pressure side.	
11	Turn OFF the main switch of O.U.	
12	Set DSW1-#4, back to the original setting.	Refer to Process No. 9.
13	Check that the power line for comp. and wiring are connected correctly.	
14	Recharge the collected refrigerant (Process No.4) from the check joint at high pressure side. For the remained quantity: Open the liquid and gas stop valve completely and set DSW4-#1 to ON side (O.U. PCB1). Then recharge it from the liquid stop valve check joint during cooling operation.	
15	Check the liquid and gas stop valves are open completely.	

O.U.: Outdoor Unit
I.U.: Indoor Unit
7-Seg.: 7-Segment
Comp.: Compressor

7.1.2. Failure of the power supply to the indoor unit and the remote control switch

■ **The LED and the LCD are not indicated.**

■ **Not operated**

If the fuses are blown out or a breaker is activated, investigate the cause of the overcurrent and take the necessary action.

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Power failure or power is not ON		Measure the voltage by means of the voltmeter	Supply the power
Blown out fuse or activation of the breaker at the power source	Short circuit supplied between the wires	Check for any uncovered part of the wires	Remove the cause of the short circuit and replace the fuse
	Short circuit of the wires to earth	Measure the insulation resistance	Remove the cause of the short circuit and replace the fuse
	Failure of indoor unit fan motor	Measure resistance between wires and insulation resistance	Replace AC chopper for indoor unit fan, fan motor and fuse
	Failure of AC chopper for indoor fan		Replace AC chopper for indoor unit fan and fuse
Blown out fuse at the control circuit	Short circuit supplied between the wires	Check for any uncovered part of the wires	Remove the cause of the short circuit and replace the fuse
	Short circuit of the control circuit to earth	Measure the insulation resistance	Remove the cause of the short circuit and replace the fuse
	Failure of indoor unit fan motor	Measure resistance between wires and insulation resistance	Replace AC chopper for indoor unit fan, fan motor and fuse
	Failure of AC chopper for indoor fan		Replace AC chopper for indoor unit fan and fuse
Failure of the transformer at the indoor unit side		Measure the voltage at the secondary side	Replace the transformer
Disconnected cable of the remote control switch		Connect the cable	Replace the cable or repair the cable
Insufficient contacting at the connectors of the remote control switch	Insufficient connection or incorrect connection of the indoor unit PCB	Check the connectors	Correctly connect the connector
	Insufficient connection or incorrect connection of the indoor unit PCB in the remote control switch		
Failure of the remote control switch		Check the remote control switch by means of the self-check mode *1)	Replace the remote control switch if it failed
Failure of PCB	Unconnected wires to PCB	Check the connectors	Correctly connect the wires
	Failure of PCB	Check PCB by means of the self-check mode *2)	Replace PCB if it failed
Incorrect wiring connection		Take action according to the procedure that is displayed in "TEST RUN"	

*1): Refer to section "*Self-checking of remote control switch*".

*2): Refer to section "*Self-checking of PCB using remote control switch*".

7.1.3. Abnormal transmission between the remote control switch and the indoor unit

■ **RUN LED on the remote control switch:**
Flickering every 2 seconds.

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Disconnection or insufficient contacting of the remote control cable		Check the cable and the connections	Repair the cable or connect the cable
Incorrect wiring connection (incorrect polarity)		Check the wiring and the connections	Repairing
Failure of the remote control switch		Check the remote control switch by means of the self-check mode *1)	Replace the remote control switch if the remote control switch is faulty
Failure of PCB (in the indoor unit and the remote control switch)	Disconnected wire to PCB	Check the connectors	Correctly connect the wires
	Failure of PCB	Check PCB by means of the self-check mode *2)	Replace PCB if it failed

*1): Refer to section "*Self-checking of remote control switch*".

*2): Refer to section "*Self-checking of PCB using remote control switch*".

7.1.4. Abnormal operation of the devices

In the case that no abnormality (Alarm Code) is indicated on the remote control switch, and normal operation is not available, take necessary action according to the procedures mentioned below.

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
RUN LED is ON and the LCD is indicated However, the system does not operate (For example, the indoor fan, the outdoor fan or the compressor does not operate)	Failure of the indoor unit fan motor	Disconnected coil	Measure the coil resistance by means of the tester	Replace the Indoor unit fan motor
		Burnt-out coil	Measure the insulation resistance	
	Failure of the outdoor unit fan motor	Disconnected coil	Measure the coil resistance by means of the tester	Replace the outdoor unit fan motor
		Burnt-out coil	Measure the insulation resistance	
	Failure of the magnetic switch for the outdoor unit fan motor	Insufficient contacting	Measure the voltage between the contacting parts	Replace PCB for the outdoor unit
	Failure of the comp. motor		Measure the resistance between two wires	Replace the compressor
	Failure of the comp.		Check for an abnormal sound from the Comp.	
	Failure of the magnetic switch for comp.	Insufficient contacting	Check that the magnetic switch activates correctly or not	Replace the magnetic switch
	Failure of one of PCBs	Disconnected wiring to PCB	Check the connections	Correctly connect the wiring
		Failure of PCB	Check PCB by means of the self-check mode *1)	Replace PCB if it failed
The Comp. does not stop or start even if the setting temperature on the LCD changes to *3)	Failure of air inlet thermistor	Failure of thermistor	Check it by self-checking *2)	Replace or correctly connect the wires if Abnormal Operation exists
		Disconnection of thermistor		
	Abnormal operation of the remote control switch cord			
	Failure of the indoor unit PCB		Check PCB by means of the self-check mode *1)	Replace PCB if it failed

Abnormal operation of the devices (Cont.)

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
The Comp. does not stop or start even if the setting temperature on LCD is changed *3)	Incorrect optional setting	Check the setting condition of "thermistor of remote control switch." by means of the optional setting Setting and control: "00": Control by means of the indoor thermistor for the suction air "01": Control by means of the thermostat of the remote control switch "02": Control by means of the average value of the indoor thermistor for the suction air and the thermostat of the remote control switch	If the thermostat of the remote control switch is not used, set at "00"
	Incorrect Input/Output Setting	Check Setting Condition of “i1” and “i2” by Input/Output Setting * Setting and Control “01”: Room Thermostat (Cooling) “02”: Room Thermostat (Heating)	In case that room thermostat is not used, set for input signal actually used. If no signal is used, set at “00”.

*1): Refer to section “*Self-checking of PCB using remote control switch*”.

*2): Refer to section “*Troubleshooting in check mode by remote control switch*”.

*3): Even if the remote control switches are normal, the compressor does not operate under the following conditions:

- Indoor temp. is lower than 21°C or outdoor temp. Is lower than -5°C during the cooling process (DB).
- Indoor temp. is higher than 27°C (DB) or outdoor temp. is higher than 15°C (WB) during the heating process.
- When a cooling (or heating) process signal is given to the outdoor unit and a different mode as heating (or cooling) process signal is given to the indoor units.
- -. When an emergency stop signal is given to outdoor unit.

Abnormal operation of the devices (Cont.)

<table>
<tr><th>Phenomenon</th><th colspan="2">Cause</th><th>Check item</th><th>Action
(Turn OFF the main switch)</th></tr>
<tr><td rowspan="5">Indoor fan speed does not change</td><td rowspan="2">Failure of the Discharge Air Temp. Thermistor</td><td>Failure of the Thermistor</td><td rowspan="2">Check the Thermistor by means of the self-check mode *2)</td><td rowspan="2">Replace or Correctly connect the wiring when it is abnormal</td></tr>
<tr><td>Disconnected Wire of the Thermistor</td></tr>
<tr><td colspan="2">Failure of the Remote Control Switch</td><td rowspan="2">Check it by means of the self-check mode *1)</td><td>Replace if it failed</td></tr>
<tr><td colspan="2">Failure of PCB for the indoor unit</td><td>Replace if PCB fails</td></tr>
<tr><td colspan="2">Failure of AC chpper for indoor unit</td><td>Check the indoor unit stoppage when the remote control switch is swicthed OFF</td><td>Replace if AC chpper is failed</td></tr>
<tr><td rowspan="10">No defrost operation mode is available during the heating process or the defrost operation continues</td><td rowspan="2">Failure of thermistor for outdoor evaporating temp. during heating</td><td>Failure of thermistor</td><td colspan="2" rowspan="2">Replace or correctly connect when it is abnormal</td></tr>
<tr><td>Disconnected wire of thermistor</td></tr>
<tr><td rowspan="2">Failure of 4-way valve</td><td>Disconnected 4-way valve coil</td><td>Measure the resistance of coil</td><td rowspan="2">Replace the 4-way valve</td></tr>
<tr><td>Incorrect activation of 4-way valve</td><td>Enforced power supply</td></tr>
<tr><td colspan="2">Disconnected control wires between indoor unit, CH unit and outdoor unit</td><td>Check the connectors</td><td>Correctly connect the wiring</td></tr>
<tr><td rowspan="2">Failure of the outdoor units of PCB</td><td>Disconnected wiring to PCB</td><td>Check the connectors</td><td>Correctly connect the wiring</td></tr>
<tr><td>Failure of PCB</td><td>Check PCB by means of the self-check mode *1)</td><td>Replace PCB when the check mode is not available</td></tr>
<tr><td rowspan="2">Failure of the Indoor Unit of PCB</td><td>Disconnected wiring to PCB</td><td>Check the connectors</td><td>Correctly connect the wiring</td></tr>
<tr><td>Failure of PCB</td><td rowspan="2">Check PCB by means of the self-check mode *1)</td><td rowspan="2">Replace if PCB fails</td></tr>
<tr><td>The LED and the LCD on the remote control switch remain ON</td><td colspan="2">Failure of PCB in the indoor unit or the remote control switch</td></tr>
</table>

*1): Refer to section "*Self checking of PCB using remote control switch*".

*2): Refer to section "*Troubleshooting in check mode by remote control switch*".

Abnormal operation of the devices (Cont.)

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient cooling process	Indoor heat load is greater than the cooling capacity		Calculate the heat load	Use a bigger unit
	Excessively low suction pressure	Gas leakage or shortage of refrigerant	Measure superheat	Correctly charge the refrigerant after repairing the gas leakage
		Excessively small diameter tube or long piping	Measure and check the field-supplied pipes	Use the correct pipes
		Incorrect activation of the check valve of the outdoor unit	Check whether or not the temp. difference exists before/after the check valve	Replace the check valve for the outdoor unit
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on compressor?	Correctly install the thermistor
		Clogged strainer in the indoor unit; clogging at the low pressure piping	Check the temp. difference at the inlet and the outlet of the strainer	Replace the strainer in the indoor unit
		Clogging at the low pressure piping	Check the temp. difference	Remove the clogging
		Insufficient air flow to the indoor unit heat exchanger	Check for clogged air filter	Clean the air filter
			Check for an obstacle at the inlet or the outlet	Remove the obstacles
		Excessively low air temp. to the indoor unit heat exchanger	Insufficient speed of the indoor unit fan motor?	Replace the fan motor
			Short-circuited indoor unit air?	Remove the cause of the short-circuited air

Abnormal operation of the devices (Cont.)

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient cooling process	Excessively high discharge pressure	Insufficient air flow to the outdoor unit heat exchanger	Check clogging of the outdoor unit heat exchanger?	Remove the clogging
			Obstacles at inlet or the outlet of outdoor unit heat exchanger?	Remove the obstacles
			Is the service area for the outdoor unit sufficient?	Secure the service area
			Correct fan speed?	Replace the fan motor
		Excessively high air temp. to the outdoor unit heat exchanger	Short-circuited air to the outdoor unit?	Remove the cause of the short-circuited air
			Any other heat load near the outdoor unit?	Remove the heat source
		Excessively charged refrigerant	Check Expansion valve opening	Correctly charge the refrigerant
		Non-condensate gas in cycle	Check each temp. and each pressure	Charge the refrigerant after the vacuum pumping
		Clogging of the discharge piping	Check for clogging	Remove the clogging
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on the compressor?	Correctly install the thermistor
	Malfunction or internal leakage of the 4-way valve		Check the temp. difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Excessively low suction pressure	Failure of bypass solenoide valve	Checking for leakage of solenoid valve	Replace solenoid valve
		Malfunction or internal leakage of the 4-way valve	Check the Temp. Difference between the Inlet and the Outlet of 4-Way Valve	Replace the 4-way valve
	Discharge temp. of the indoor unit is unstable		Check the expansion valve of the indoor unit in the same system	Replace the failed expansion valve of the indoor unit

Abnormal operation of the devices (Cont.)

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient heating process	Indoor heat load is greater than the heating capacity		Calculate the heat load	Replace the unit with a bigger unit
	Excessively low suction pressure	Gas leakage or insufficient refrigerant charge	Measure superheat	Correctly charge the refrigerant after the gas leakage check and repairing
		Excessively small diameter or long piping	Measure the field-supplied piping	Use the specified pipes
		Failure or malfunction of the expansion valve	Check for clogging	Remove the clogging
			Check the connection cord and the connector	Replace the connector
			Is there an operation sound from the coil?	Replace the coil
			Is the thermistor on the compressor normal?	Replace the thermistor
			Is the thermistor installed correctly on compressor?	Correctly install the thermistor
		Clogging of I.U./O.U./CH-Unit strainer	Check the temp. difference between the inlet and the outlet of strainer	Replace the strainer for the outdoor unit or the indoor unit
		Clogging of suction piping	Check the temp. difference of each part	Remove the clogging
		Insufficient air flow through the outdoor unit heat exchanger	Is the outdoor unit heat exchanger clogged?	Remove the clogging
			Are there any obstacles at the inlet or the outlet of outdoor unit?	Remove the obstacles
			Is the service area for the outdoor unit sufficient?	Secure a sufficient service area
			Check the speed of the outdoor unit fan	Replace the fan motor
		Excessively low air temp. through the outdoor unit heat exchanger	Check for any short-circuited air to the outdoor unit	Remove the cause of the short-circuited air
		Defrosting is insufficiently completed	Check the thermistor for the defrost operation	Replace the thermistor for the defrost operation

Abnormal operation of the devices (Cont.)

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Insufficient heating process	Excessively high discharge pressure	Insufficient air flow to the indoor unit heat exchanger	Check the filter for a clogging	Remove the clogging
			Check for any obstacles at the inlet or the outlet of the indoor unit	Remove the obstacles
			Check the indoor fan speed	Replace the fan motor
		Excessively high air temp. to the indoor unit heat exchanger	Check whether or not the short-circuited air exists	Remove the cause of the short-circuited air
		Excessively charged refrigerant	Check expansion valve opening.	Correctly charge the refrigerant
		Non-condensate gas in ref. cycle	Check the refrigerant quantity *1)	Recharge the refrigerant after the vacuum pumping
		Clogging of the discharge pr. piping	Check for clogging	Remove the clogging
	Malfunction or internal leakage of the 4-way valve		Check the temp. difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Malfunction of the check valve of the outdoor unit		Check the temp. difference at the inlet and the outlet of the check valve	Replace the check valve
	Excessively high suction pressure	Failure of the bypass solenoid valve	Check for leakage of the solenoid valve	Replace the solenoid valve
		Malfunction or internal leakage of 4-way valve	Check the temp. difference at the inlet and the outlet of the 4-way valve	Replace the 4-way valve
	Discharge temp. of the indoor unit is unstable		Check the expansion valve of the indoor unit in the same system	Replace the failed expansion valve of the indoor unit

*1): Refer to chapter 7 of TC.

Abnormal operation of the devices (Cont.)

Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Cooling or heating process with an abnormal sound	Foreign particles inside of the fan casing		Visually inspect it	Remove the foreign particles
	Indoor unit fan runner is hitting the casing		Visually inspect it	Adjust the position of the fan runner
	Outdoor unit propeller fan is hitting the shroud		Visually inspect it	Adjust the position of the propeller fan
	Abnormal sound from the compressor	Faulty Installation	Check that each part is tightly fixed	Tightly fix each part
		Liquid ref. compression	Check expansion valve opening	Ensure superheat
		Wear or breakage of the internal comp. parts	Abnormal Sound from the Inside of the Compressor	Replace the compressor
		No heating by the oil heater	Check the Resistance (Oil Heater, Fuse)	Replace the oil heater or the fuse
	Humming sound from the magnetic conductor		Check the surface of the contacts	Replace the magnetic switch
	Abnormal vibration of the cabinets		Check each fixing screw	Tightly fix each screw
Outdoor fan does not operate when the compressor operates	Obstacle at the outdoor fan		Check the obstacles	Remove the obstacles
	Watching condition for the heating process		Wait for the switching of the 4-Way Valve (1 ~ 3 minutes)	If the 4-Way Valve does not switch, check for insufficient refrigerant
Indoor fan does not operate when the compressor operates	Discharge pressure does not increase higher than 2.2 MPa due to the insufficient refrigerant		Check the operation pressure *1)	Add the refrigerant
	Disconnected Wiring for the Indoor Fan		Check the wiring	Connect the wiring correctly
	Failure of AC chopper		Check AC chopper	Replace AC chopper

*1): Refer to chapter 10 of TC.

7.2. Troubleshooting procedure

7.2.1. Alarm code indication of remote control switch

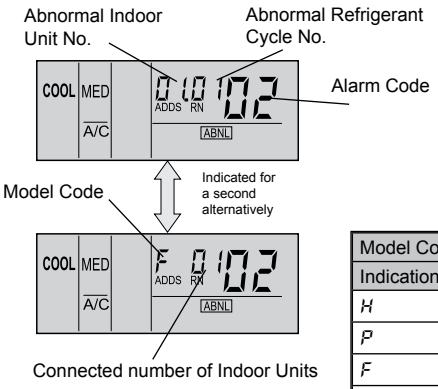
If the RUN LED flickers for 2 seconds, there is a failure in the transmission between the Indoor Unit and the Remote Control Switch.

Possible causes are:

- Broken remote cable
- Contact failure in the remote control cable
- Defective IC or defective microcomputer

In any case, ask your retailer for service

If the RUN LED flickers 5 times (5 seconds) with the unit number and the alarm code displayed, make a note of the alarm code (refer to the table below) and ask your retailer for service.



Model Code	
Indication	Model
H	Heat Pump
P	Inverter
F	Multi
C	Cooling Only
E	Others
L	KPI

■ **Alarm code table**

Code No.	Category	Content of Abnormality	Leading Cause
01	Indoor Unit	Activation of Protection Device	Failure of Fan Motor, Drain Discharge, Clogging, PCB, Relay.
02	Outdoor Unit	Activation of Protection Device	Activation of PSH, pipe clogging, excessive refrigerant, inert gas mixing.
03	Transmission	Abnormality between Indoor (or Outdoor) and Outdoor (or Indoor)	Incorrect Wiring. Failure of PCB. Tripping of Fuse. Power Supply OFF
04		Abnormality between Inverter PCB and Outdoor PCB. Abnormality between Fan Controller and Outdoor PCB	Transmission Failure (Loose Connector), If only fan controller is failed, indications are as follows: Number 1 Fan Controller Failure - F1 04 Number 2 Fan Controller Failure - F2 04
05	Supply phase	Abnormality of Power Source Wiring	Reverse Phase Incorrect Wiring.
06	Voltage	Abnormal Inverter Voltage	Outdoor Voltage Drop, Insufficient Power Capacity, If voltage drop cause by fan controller is detected, indications are as follows: No. 1 Fan Controller Failure - F1 06 No. 2 Fan Controller Failure - F2 06
07	Cycle	Decrease in Discharge Gas Superheat	Excessive Refrigerant Charge. Expansion Valve Open Lock.
08		Increase in Discharge Gas Temperature	Insufficient Refrigerant. Ref. Leakage, Clogging or Expansion Valve Close Lock
09	n/a		
11	Sensor on Indoor Unit	Inlet Air Thermistor	Incorrect Wiring, Disconnecting Wiring.
12		Outlet Air Thermistor	
13		Freeze Protection Thermistor	
14		Gas Piping Thermistor	
16	n/a		
17			
19	Fan motor	Tripping of Protection Device for Fan Motor	Failure of Fan Motor
21	Sensor on Outdoor Unit	High Pressure Sensor	Incorrect Wiring, Disconnecting Wiring
22		Outdoor Air Thermistor	
23		Discharge Gas Thermistor on Comp.	
24		Evaporating Thermistor	
29		Low Pressure Sensor	

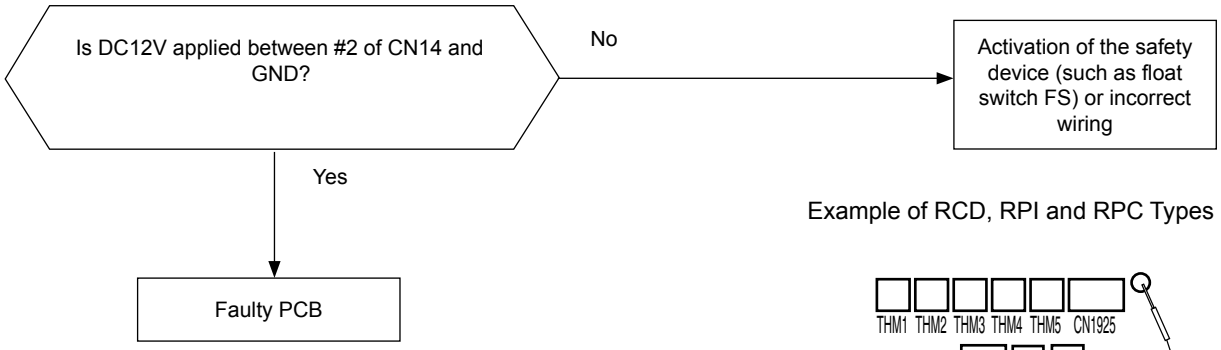
Code No.	Category	Content of Abnormality	Leading Cause
31	System	Incorrect Setting of Outdoor and Indoor Unit	Incorrect Setting of Capacity Code.
35		Incorrect Setting in Indoor Unit No.	Existence of the same Indoor Unit No. in the same Refrigerant Cycle
38		Abnormality of Protective Circuit in Outdoor Unit	Failure of Indoor Unit PCB. Incorrect wiring. Connection to PCB in Indoor Unit.
39	n/a		
43	Protection device	Pressure Ratio Decrease Protection Activating	Failure of Compressor, Inverter
44		Low Pressure Increase Protection Activating	Overload to Indoor in Cooling. High Temperature of Outdoor Air In Heating Expansion Valve Open Lock
45		High Pressure Increase Protection Activating	Overload Operation. Excessive Refrigerant. Clogging of Heat Exchanger
47		Low Pressure Decrease Protection Activating	Insufficient refrigerant .
48		Activation of inverter overcurrent protection device	Overload operation, compressor failure
51	Sensor	Abnormal Current Sensor	Current sensor failure
53	Inverter	Inverter Error Signal Detection	Driver IC Error Signal Detection (Protection for Overcurrent, Low Voltage, Short-Circuit)
54		Increase in Inverter Fin Temperature	Abnormal Inverter Fin Thermistor. Abnormal Outdoor Fan
57	Outdoor fan motor	Abnormality of fan motor	Disconnecting Wiring or Incorrect Wiring between Control PCB (PCB1) and Fan Relay PCB (PCB3, PCB5), Failure of Fan Motor
EE	Compressor	Compressor protection alarm	Failure of compressor
b1	Outdor unit number setting	Incorrect outdoor unit number setting	Over 64 No. is set for address of refriogerant cycle
b5	Indoor unit number setting	Incorrect indoor unit number setting	More than 17 non-corresponding to H-LINKII units are connected to one system

7.2.2. Troubleshooting by alarm code

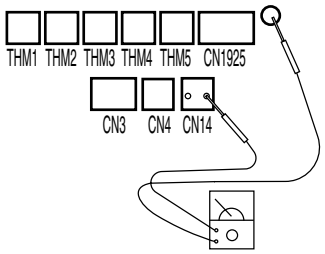
Alarm code	Description
01	**Activation of the safety device in the indoor unit**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  – This alarm code is displayed when the contact between #1 and #2 of CN14 is not closed over 120 seconds during the cooling process, the heating process or the fan operation.

PCB1: Outdoor unit printed circuit board
PCB: Indoor unit printed circuit board

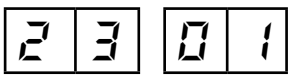


Example of RCD, RPI and RPC Types



Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Activation of the float switch	High Drain Level	Clogging of the drainage	Check the drain pan	Remove the clogged foreign particles
	Faulty float switch	Fault	Check the continuity when the drain level is low	Replace the float switch if faulty
		Faulty contacting	Measure the resistance by means of the tester	Fix the looseness and Replace the connector
		Faulty connection	Check the connections	Repair the connection
Faulty indoor unit PCB			Check PCB by self checking	Replace PCB if faulty

Outdoor unit PCB display indication:

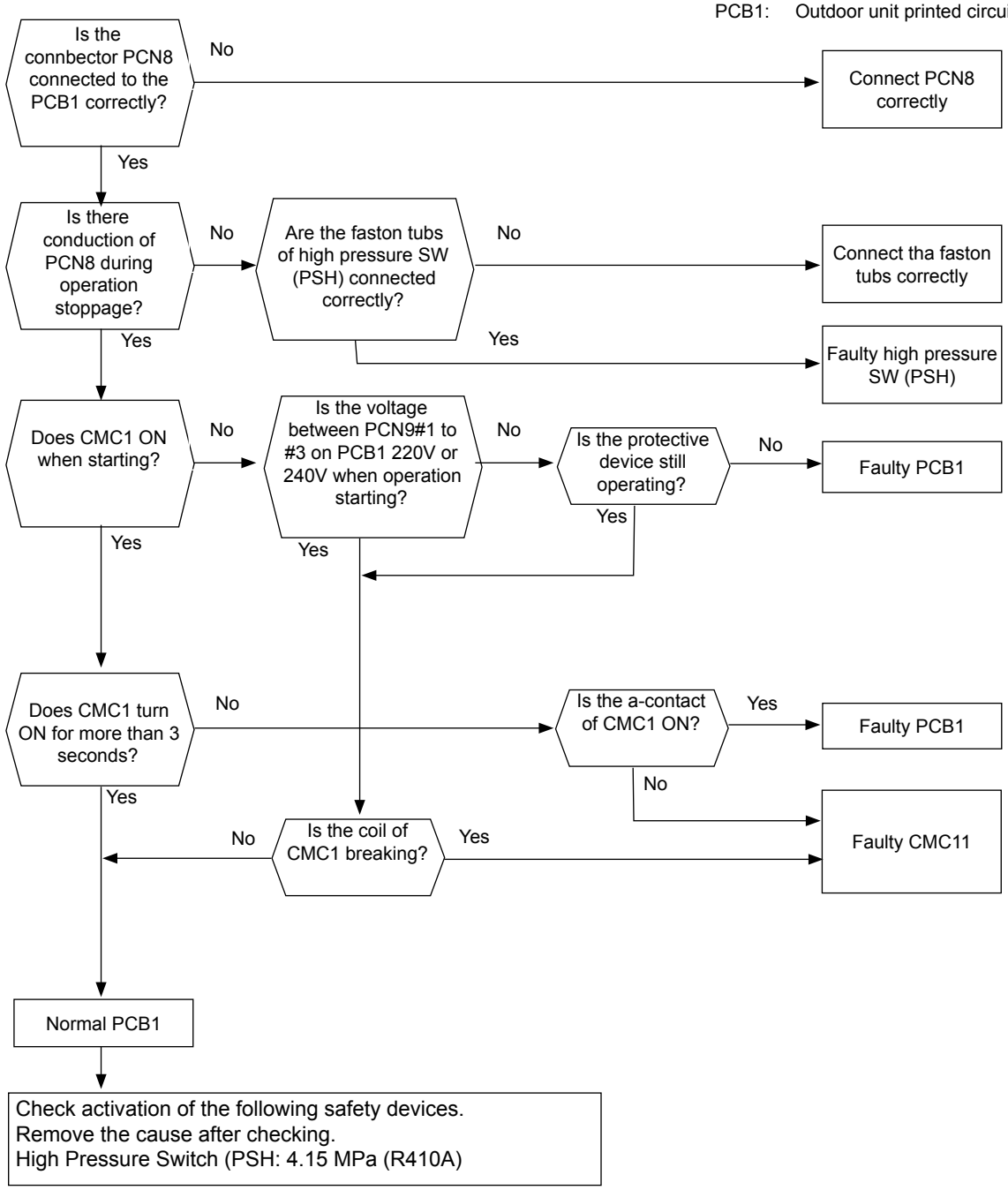


Indor unit number for failure — Alarm code

Alarm code	Description
02	**Activation of the safety device in the outdoor unit**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are indicated on the display of the outdoor unit PCB1.
  – This alarm is indicated when one of safety devices is activated during compressor running.

PCB1: Outdoor unit printed circuit board



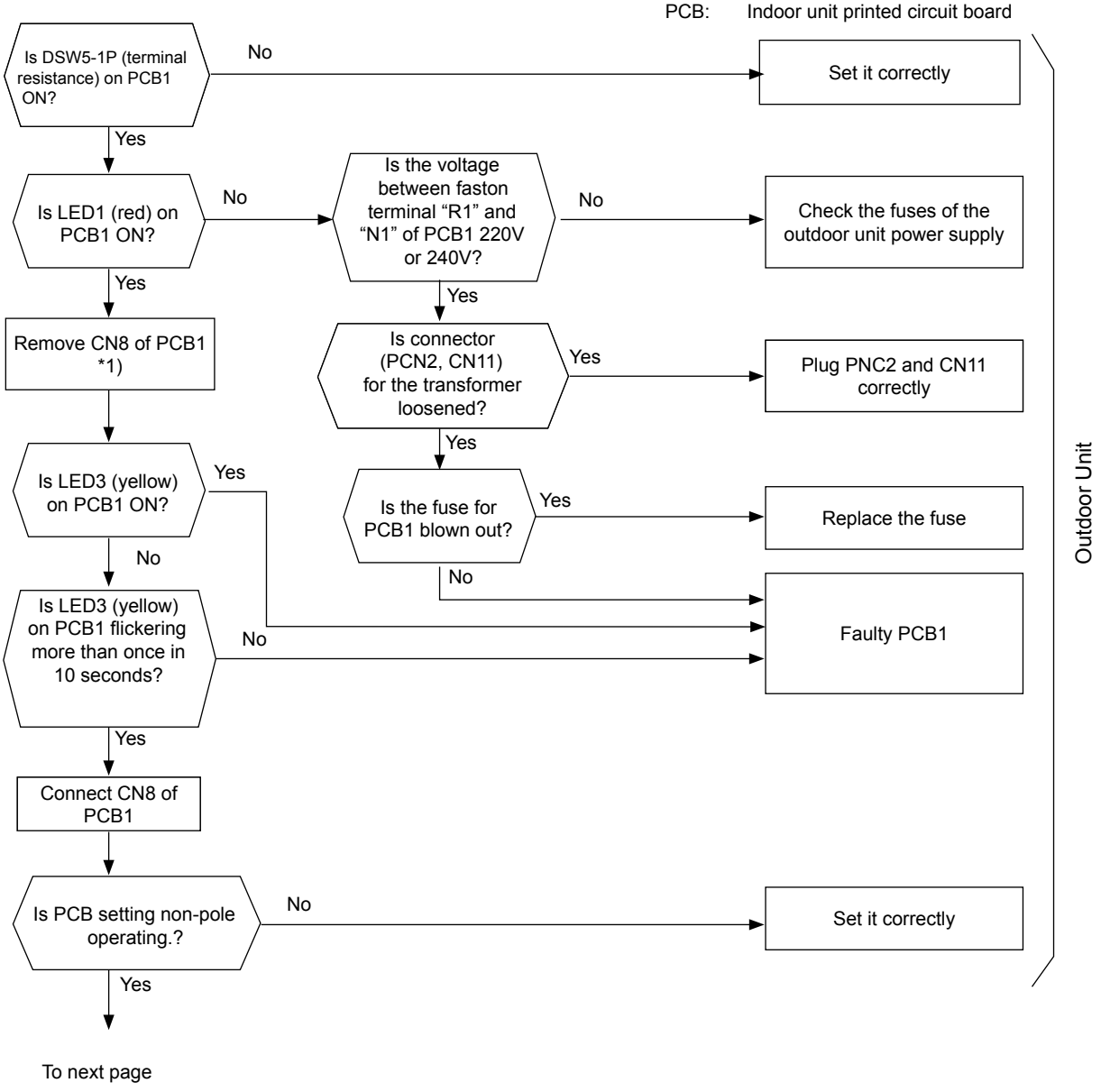
Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Activation of the high-pressure switch due to the excessively high discharge pressure	Insufficient air flow to the heat exchanger (Outdoor heat exchanger during the cooling process or indoor heat exchanger during the heating process)		Check the heat exchanger for dust or for clogging	Remove the dust or the clogging
			Check the air filter for dust	Remove the dust
			Check for any obstacles at the inlet or the outlet of the heat exchanger	Remove the obstacles
			Check the service area	Secure service area
			Check the speed (Outdoor Fan: Cooling / Indoor Fan: Heating)	Replace the fan motor if faulty
	Malfunction of the expansion valve		Disconnected of the Connector	Fix the looseness or reconnect the connector
			Fully closed and locked	Replace the expansion valve
	Excessively high temp. air to the Indoor Unit Heat Exchanger		Calculate the heat load	Reduce the heat load or use a bigger unit
			Check for hot air near the ceiling (Heating)	Provide good circulation
			Check for short-circuited air (Heating)	Remove the short-circuited air
			Check for other heat source	Remove the heat source
	Faulty high-pressure switch	Faulty pressure switch	Measure the discharge pressure. Check the continuity after the decrease of the pressure	Replace the pressure switch if faulty
		Insufficient contacting	Measure the resistance by means of the tester	Fix the looseness. Replace the connector
		Incorrect connection	Check the connections	Repair the connections

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Activation of the high-pressure switch due to the excessively high discharge pressure	Faulty or malfunction of the expansion valve	Check for clogging	Remove the clogging
		Check the connect wiring and the connectors	Replace the connector
		Check the operation sound from the coil	Replace the coil
		Check the discharge gas thermistor	Replace the thermistor
		Check the attaching state of the discharge gas thermistor	Reattach the thermistor
	Faulty gas bypass solenoid valve	Check for clogging	Replace the gas bypass solenoid valve
	Overcharged refrigerant	Check the cycle operation temp.	Charge the refrigerant correctly
	Mixture of the non-condensate gas in the refrigerant cycle	Check the air temp. and the pressure	Recharge the refrigerant after the vacuum pumping
	Clogging of the discharge piping	Check for clogging	Remove the clogging
	Liquid line stop valve or gas line stop valve is not in operation	Check the stop valves	Fully Open the stop valves
	Clogging of the check valve	Check for clogging	Replace the check valve

Alarm code	Description
03	**Abnormal transmission between the indoor units and the outdoor unit**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm is displayed when an abnormal operation is maintained for three minutes after the normal transmission between the indoor units and the outdoor unit. Also, an abnormal operation is maintained for 30 seconds after the micro-computer is automatically reset.
    The alarm is displayed when the abnormal transmission is maintained for 30 seconds from the starting of the outdoor unit.
  - Investigate the cause of the overcurrent and take the necessary action when the fuses are blown out or the breaker for the outdoor unit is activated.

PCB1: Outdoor unit printed circuit board
PCB: Indoor unit printed circuit board



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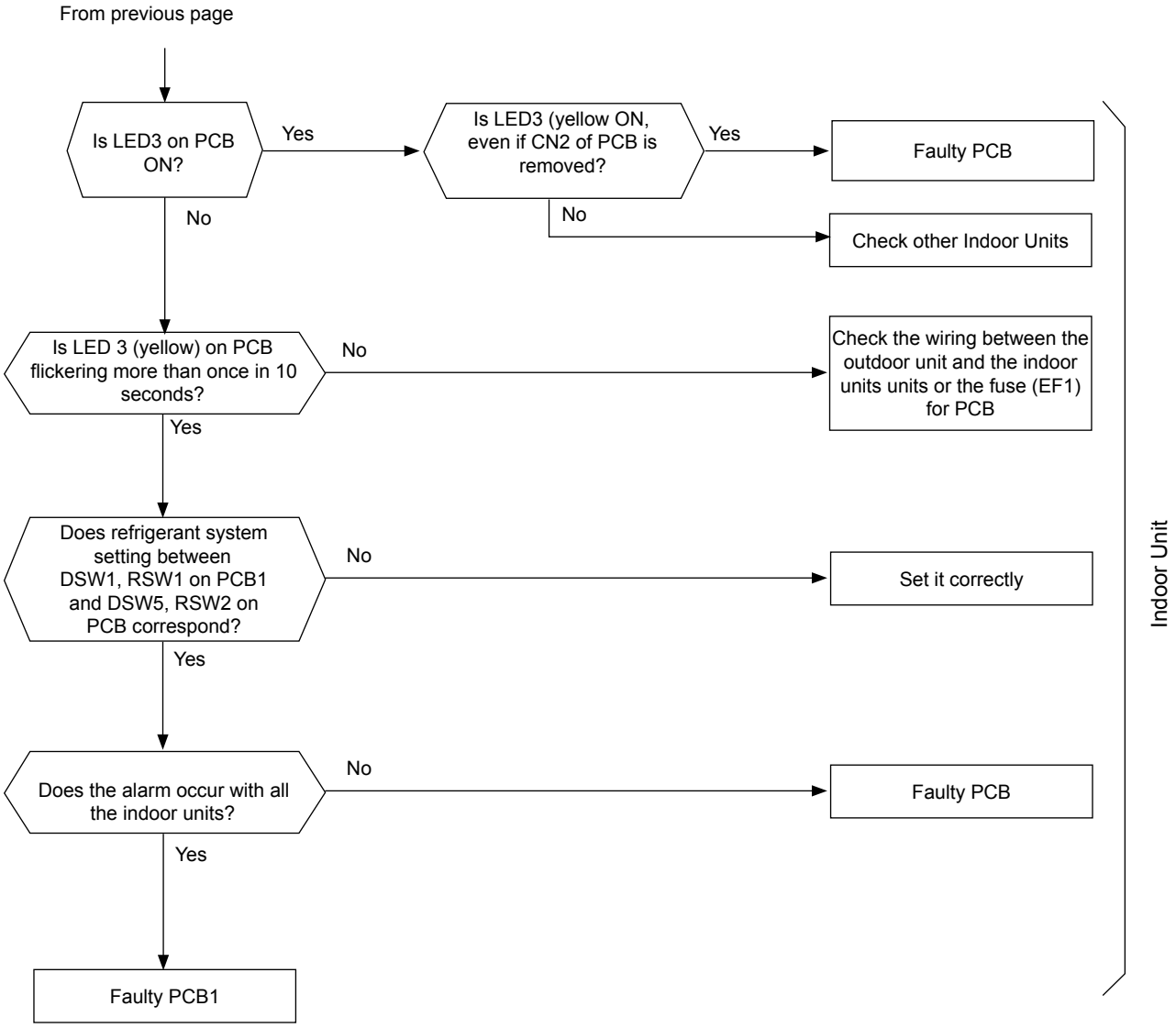


*1): In case that terminal resistance (DSW5-1P) is OFF when H-Link Connection is performed.

Set the terminal resistance to ON when CN2 is removed.

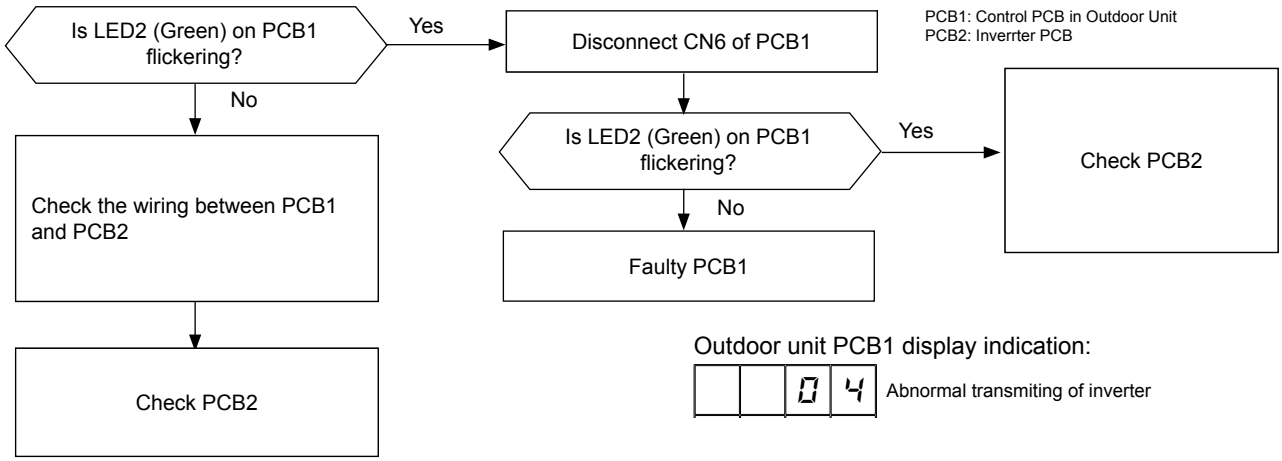
Set the terminal resistance to OFF when CN2 is reconnected.

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Power failure or no power supply		Measure the voltage by means of the tester	Supply the power
Blown out fuse for the power source or activation of the outdoor unit breaker	Short circuit between wires	Check the insulation material for breaks	Remove the short circuit and replace the fuse
	Short-circuited wire to ground	Measure the insulation resistance	Remove the short circuit to ground and replace the fuse
	Faulty comp. motor	Measure the resistance between the wires and the insulation resistance	Replace the comp. and the fuse
	Faulty outdoor unit fan motor	Measure the resistance between the wires and the insulation resistance	Replace the outdoor unit fan motor and the fuse
Blown out fuse for control circuit or activation of outdoor unit breaker	Short circuit between wires	Check the insulation material for breaks	Remove the short circuit and replace the fuse
	Short circuit of the control circuit (to ground)	Measure the insulation resistance	Remove the short circuit and replace the fuse
	Faulty solenoid coil for the magnetic switch for the comp. motor	Measure the resistance of coil	Replace the magnetic switch and the fuse
	Failure of the outdoor unit fan motor	Measure the resistance between the wires and the insulation resistance	Replace the outdoor unit fan motor and fuse
PCB1 power circuit failure		Measure PCB1 output voltage *2)	Replace PCB1
Disconnected wires insufficient contacting or incorrect connection	Between outdoor unit and indoor unit	Check the continuity of the wires. Check for looseness of the connection screws. Check the terminal Nos.	Replacing wires repairing and tightening the screws and the correct wiring
	Power source wiring for the outdoor unit		
Faulty PCB (outdoor unit, indoor unit)	Disconnected wires to PCB	Check the connections	Correctly connect the wires
	Faulty PCB	–	Replace PCB if faulty
Incorrect wiring	Disconnected wire; insufficient contacting	Check the continuity and the looseness of connection screws	Replacing wires, repairing and tightening the screws
	Incorrect wiring	Check the terminal Nos.	Correctly connect the wires

*2): VCC12~GND2: 12VDC
VCC05~GND1: 5VDC
VCC12~GND1: 12VDC
VCC15~GND1: 15VDC
VCC24~GND1: 24VDC
VCC12T~GND1: 12VDC

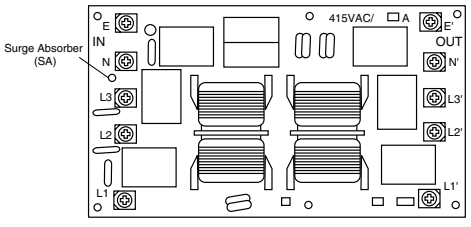
Alarm code	Description
04	**Abnormal transmission between Inverter PCB and Outdoor Unit PCB**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm is displayed when the abnormal operation is maintained for 30 seconds after the normal transmission between the outdoor unit PCB1 and PCB2 and also abnormality is maintained for 30 seconds after the micro-computer is automatically reset. The alarm is displayed when the abnormal transmission is maintained for 30 seconds from the starting of the outdoor unit.
  - Alarm code “04.” is indicated when transmission between inverter and fan controller is abnormal.



Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Disconnected wires, insufficient contacting or incorrect connection	Between control PCB1, PCB2 and fan controller	Check the continuity of wires. Check for looseness of the connection screws. Check the connection No.	Replacing wires, repairing, tightening screws and incorrect wiring
	Power source wiring for the outdoor unit		
Faulty PCB (PCB1 and PCB2)	Disconnected wires to PCB	Check the connections	Repair the wiring connections
	Faulty PCB	–	Replace PCB if faulty
Incorrect wiring	Disconnected wires; insufficient contacting	Check the continuity. Check for looseness of connection screws	Replacing wires, repairing, tightening screws
	Incorrect wiring	Check the connection Nos.	Correctly connect the wires

Position of Surge Absorber (SA)



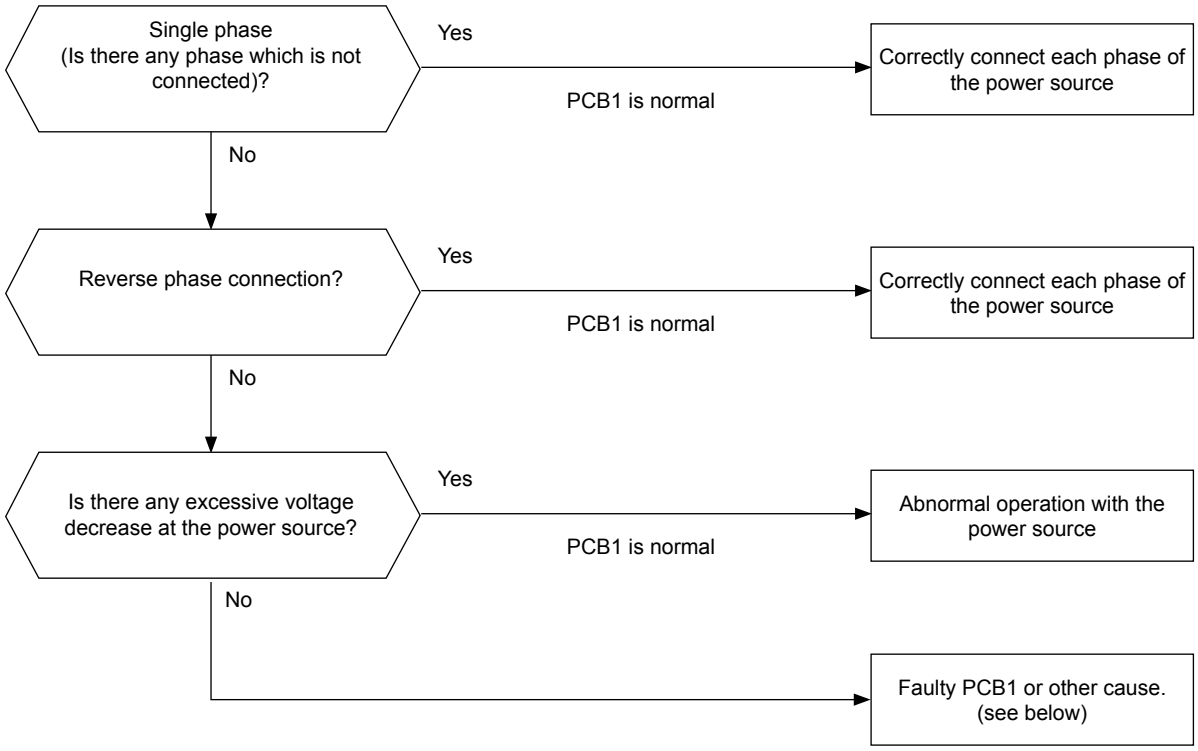
(380-415V)

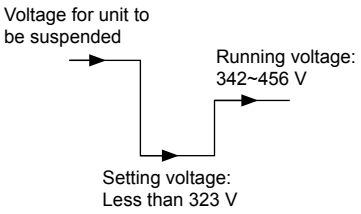
When the unit is applied the excessive surge current due to lighting or other causes, it is indicated this alarm code “04” or the inverter stoppage code (ITC) “11” and the unit can not be operated. In this case, check to ensure the surge absorber (SA) on the noise filter (NF1). If the inside of the surge absorber is normal, turn OFF the power once and wait for PCB2’s LED OFF and turn ON again.

Alarm code	Description
05	**Abnormality of picking up phase signal**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  – This alarm is displayed when the main power source phase is reversely connected or one phase is not connected.

PCB1: Outdoor unit printed circuit board

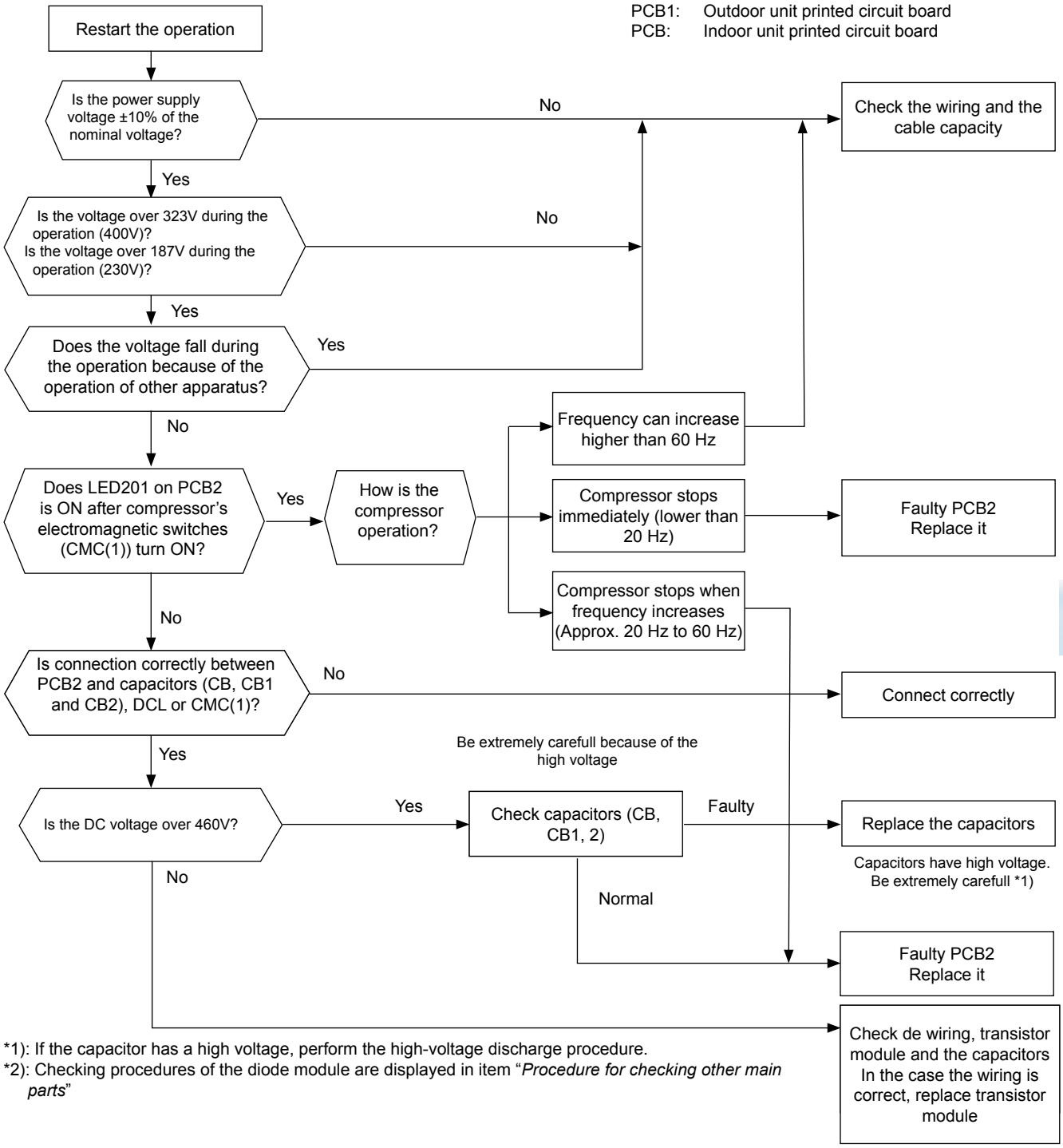




Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Activation of reverse phase sensor in the outdoor unit	Reverse or single phase	Check it according to the electrical wiring	Replacing wires, repair, tightening screws or correct wiring
	Faulty outdoor unit PCB1	–	Replace PCB1 if faulty

Alarm code	Description
06	**Excessively low or high voltage for the inverter**

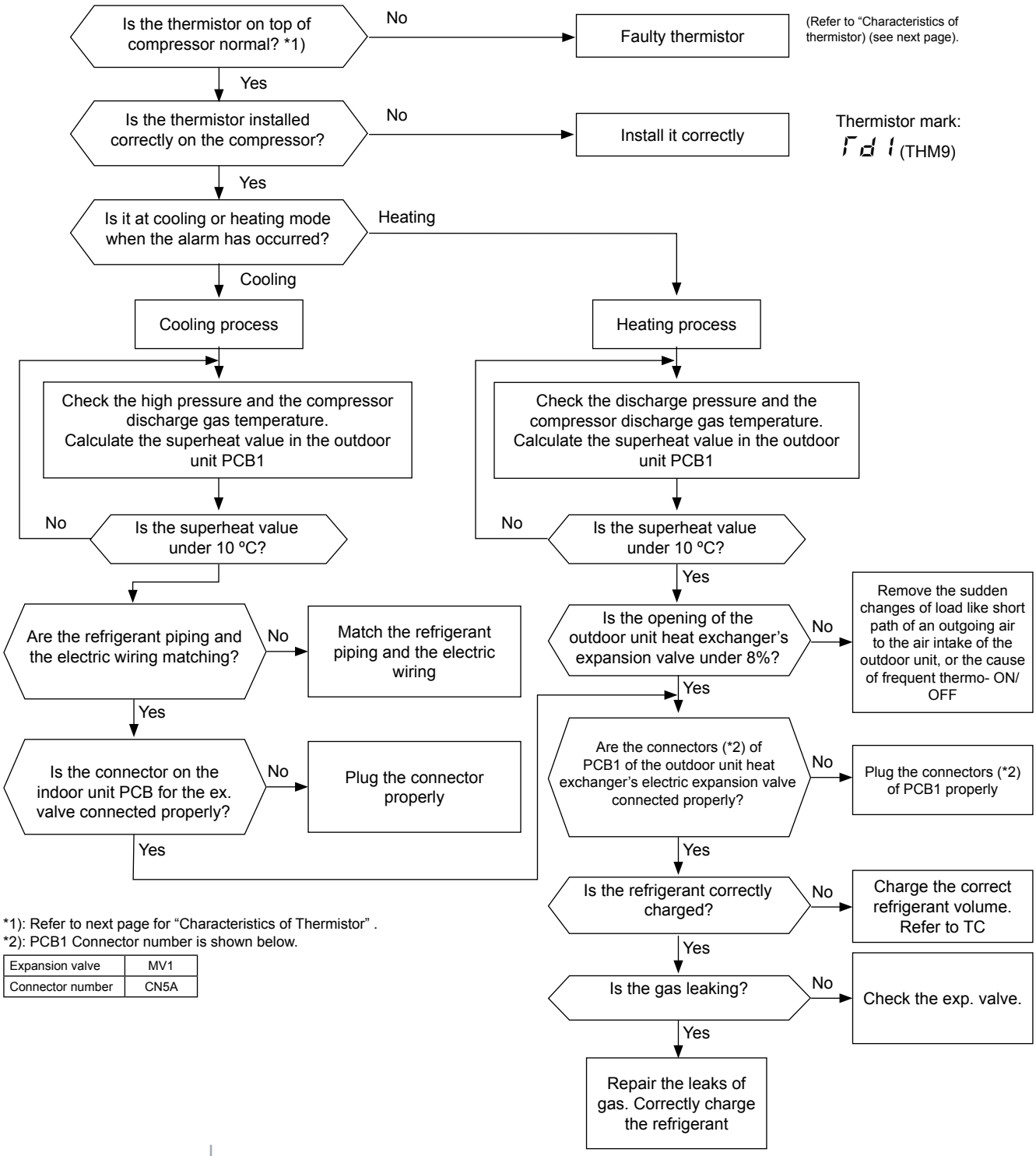
- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The alarm code is displayed on the display of the outdoor unit PCB1.
  - This alarm code is displayed when the voltage between terminal “P” and “N” of transistor module (IPM) is insufficient and the alarm has three occurrences in 30 minutes. In the case that the occurrence is smaller than two times, retry is performed.



*1): If the capacitor has a high voltage, perform the high-voltage discharge procedure.
*2): Checking procedures of the diode module are displayed in item “*Procedure for checking other main parts*”

Alarm code	Description
07	**Decrease of discharge gas superheat**

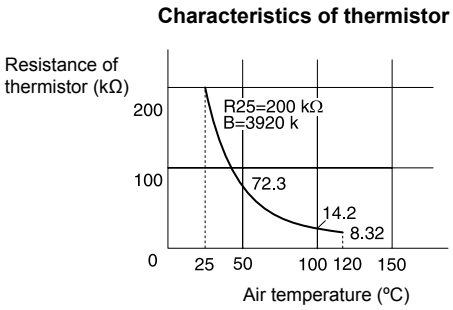
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - If the discharge gas superheat is below 10 °C at the top of the compressor for 30 minutes, the retry operation is performed. However, if the alarm occurs twice in addition to the first occurrence within two hours, this alarm code is displayed.



*1): Refer to next page for “Characteristics of Thermistor” .
*2): PCB1 Connector number is shown below.

Expansion valve	MV1
Connector number	CN5A

■ Characteristics of thermistor



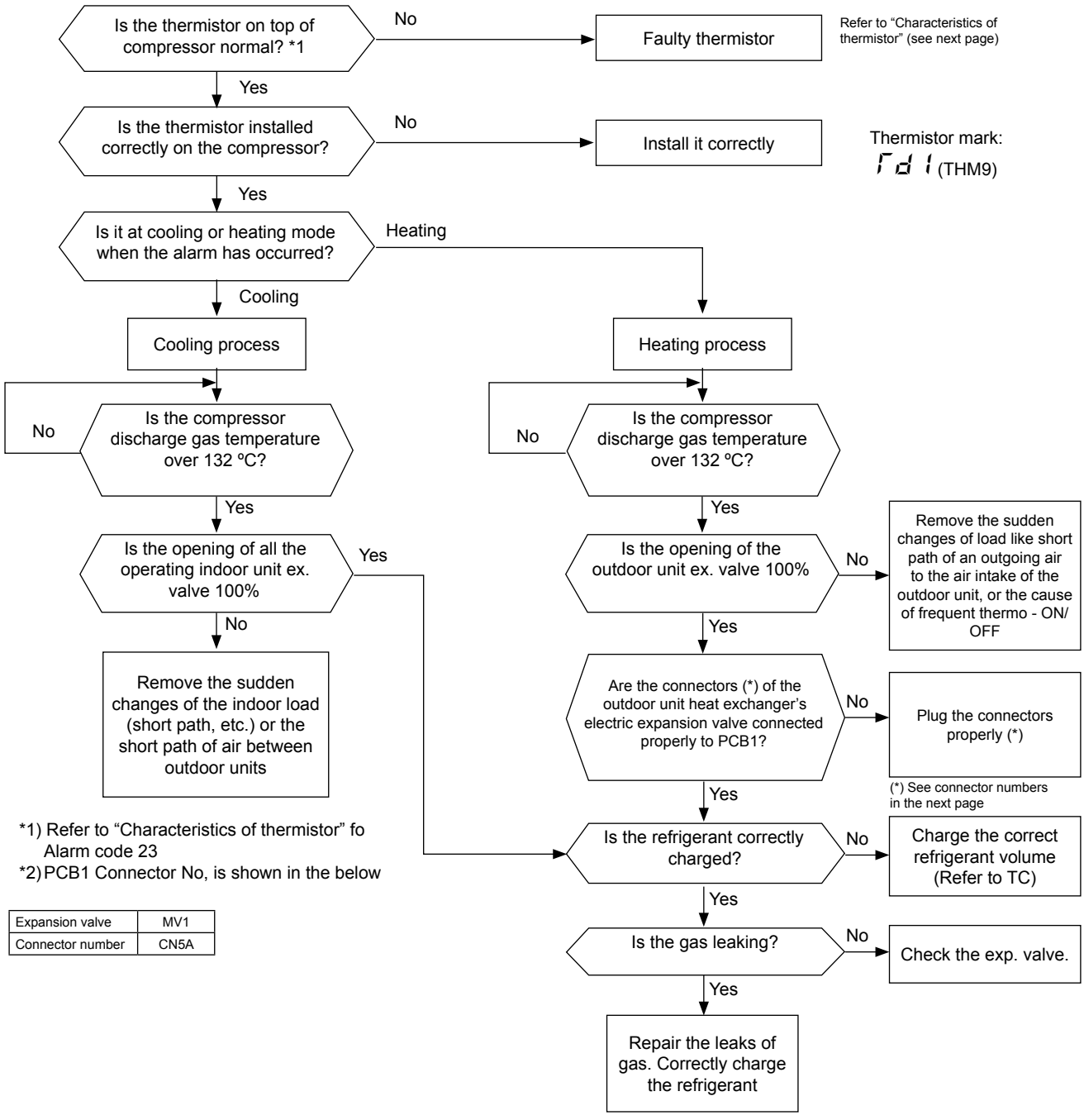
Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Decrease of the discharge gas superheat	Ref. cycle is different from the electrical system		Check the ref. cycle and the electrical system	Repair the wiring
	Overcharged refrigerant		Measure the pressure. (Refer to “Test Run of SM”.)	Correctly charge the refrigerant
	Faulty Ex. valve		Check expansion valve (refer to procedure of checking other main parts)	Replace the ex. valve if faulty
	Faulty PCB	Fault	Replace PCB1 and check the operation	Replace PCB1 if faulty
		Disconnected wires for the Ex. valve control	Check the connections	Repair the wiring connection
	Faulty discharge gas thermistor	Fault	Check thermistor	Replace the thermistor if faulty
		Incorrect mounting	Check the mounting state (Refer to Alarm code 07)	Correctly mount the thermistor
		Incorrect connection	Check the connections	Remove looseness. Replace the connector or repair the connections

7

Alarm code	Description
08	**Excessively high discharge gas temperature at the top of the compressor chamber**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm is displayed when the following conditions occur three times within one hour:
    1) The temperature of the thermistor on the top of the compressor is maintained higher than 132 °C for 10 minutes.
    2) The temperature of the thermistor on the top of the compressor is maintained higher than 140 °C for 5 seconds.

PCB1: Outdoor unit printed circuit board



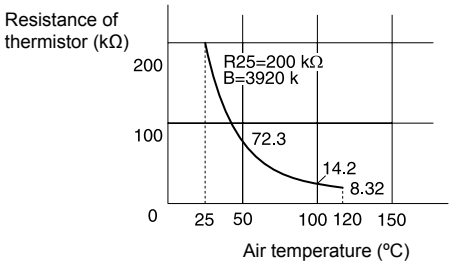
*1) Refer to “Characteristics of thermistor” fo Alarm code 23

*2) PCB1 Connector No, is shown in the below

Expansion valve	MV1
Connector number	CN5A

■ Characteristics of thermistor

Thermistor characteristics

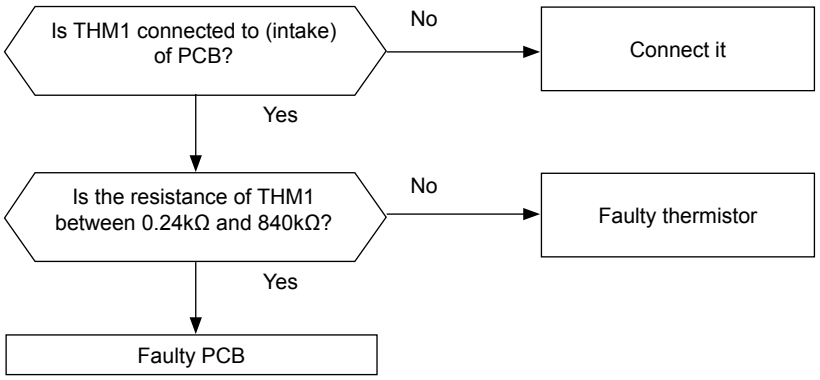


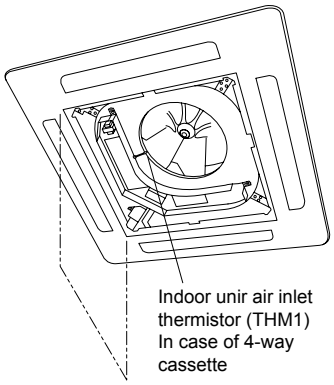
Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Excessively high discharge gas temperature (at top of compressor)	Ref. cycle is different from the electrical system		Check the ref. cycle and the electrical system	Repair the wiring
	Undercharged refrigerant		Check pressures	Correctly charge the refrigerant
	Faulty Ex. valve		Check expansion valve (refer to procedure of checking other main parts)	Replace the ex. valve if faulty
	Faulty PCB1	Fault	Replace PCB1 and check the operation	Replace PCB1 if faulty
		Disconnected wires for the Ex. valve control	Check the connections	Repair the wiring connection
	Faulty discharge gas thermistor	Fault	Measure the resistance of thermistor	Replace the thermistor if faulty
		Incorrect mounting	Check the mounting state	Correctly mount the thermistor
		Incorrect connection	Check the connections	Remove looseness. Replace the connector or repair the connections

Alarm code	Description
11	**Abnormal operation of thermistor for the indoor unit air inlet temperature (air inlet thermistor)**

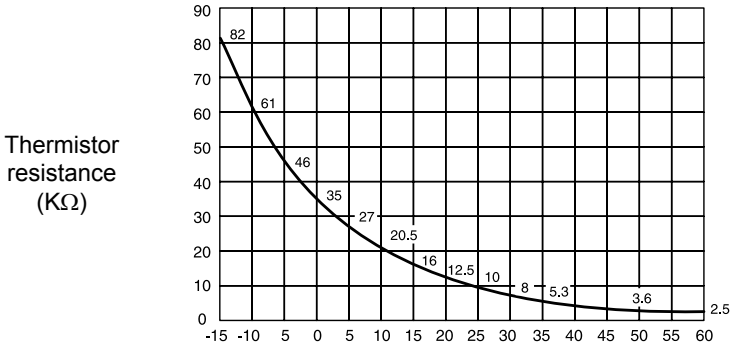
- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  – This alarm code is displayed when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling process or the heating process. The system is automatically restarted when the fault is removed.

PCB1: Control PCB in Outdoor Unit
PCB: Indoor unit PCB





Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty air inlet thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and the connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty



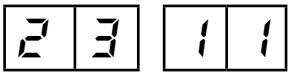
Thermistor characteristics

NOTE:

This data is applicable to the following thermistors:

1. *Indoor unit discharge air temperature,*
2. *Indoor unit liquid refrigerant temperature*
3. *Indoor unit air inlet temperature*
4. *Outdoor temperature*
5. *Outdoor unit evaporating temperature*
6. *Indoor unit gas piping*

Outdoor unit PCB display indication:



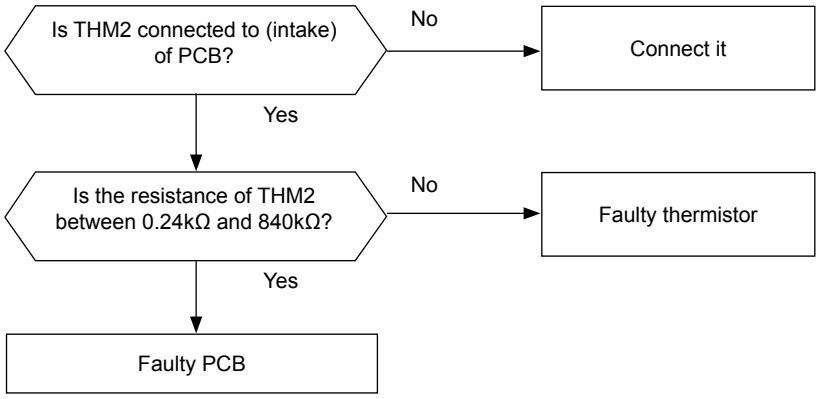
Indor unit number for failure

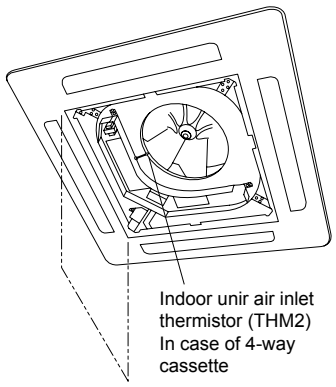
Alarm code (11~19)

Alarm code	Description
12	**Abnormal operation of the thermistor for the indoor discharge air temperature (air outlet thermistor)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  – This alarm code is displayed when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling process or the heating process. The system is automatically restarted when the fault is removed.

PCB1: Control PCB in Outdoor Unit
PCB: Indoor unit PCB





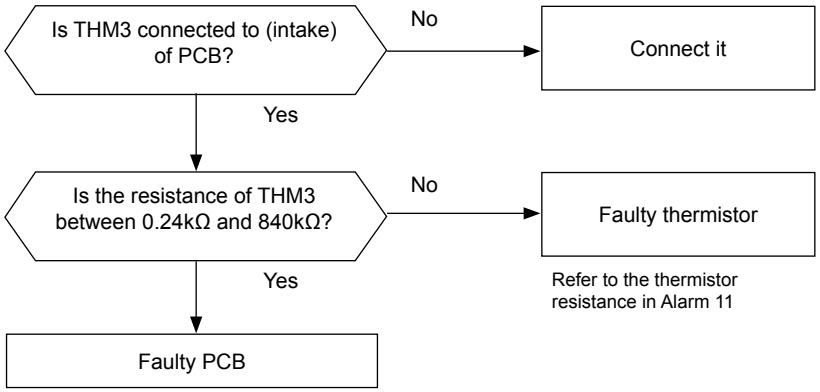
Refer to alarm code 11 for thermistor resistance

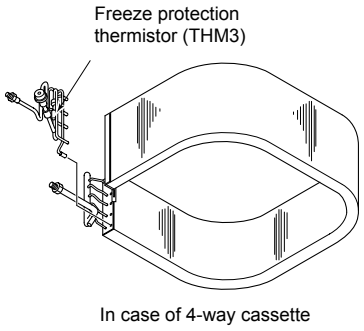
Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty air outlet thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the connection	Repair the wiring and connections
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

Alarm code	Description
13	**Abnormal operation of the thermistor for the indoor unit heat exchanger liquid refrigerant pipe temperature (freeze protection thermistor)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  – This alarm code is displayed when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling process or the heating process. The system is automatically restarted when the fault is removed.

PCB1: Control PCB in Outdoor Unit
PCB: Indoor unit PCB



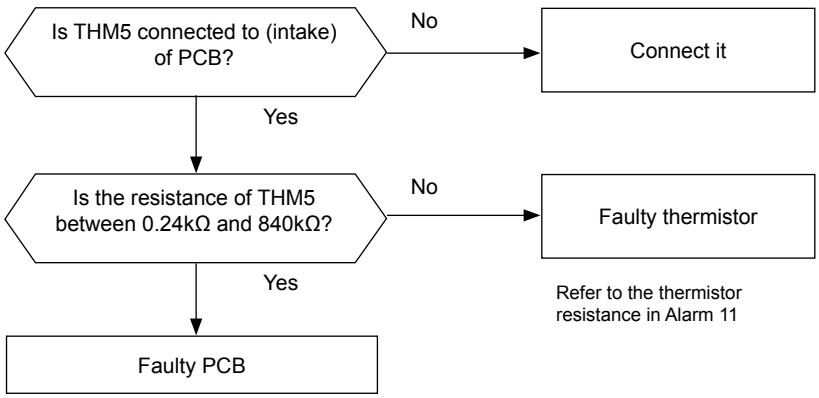


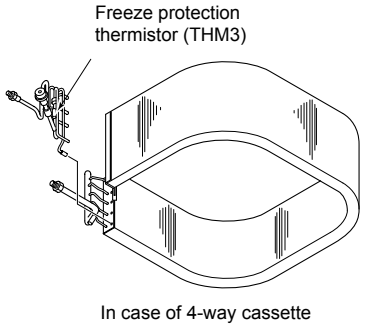
In case of 4-way cassette

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty freeze protection thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the wiring to PCB	Connect wiring correctly
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

Alarm code	Description
14	**Abnormal operation of the thermistor for the indoor unit heat exchanger gas refrigerant pipe temperature (gas piping thermistor)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  – This alarm code is displayed when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling process or the heating process. The system is automatically restarted when the fault is removed.





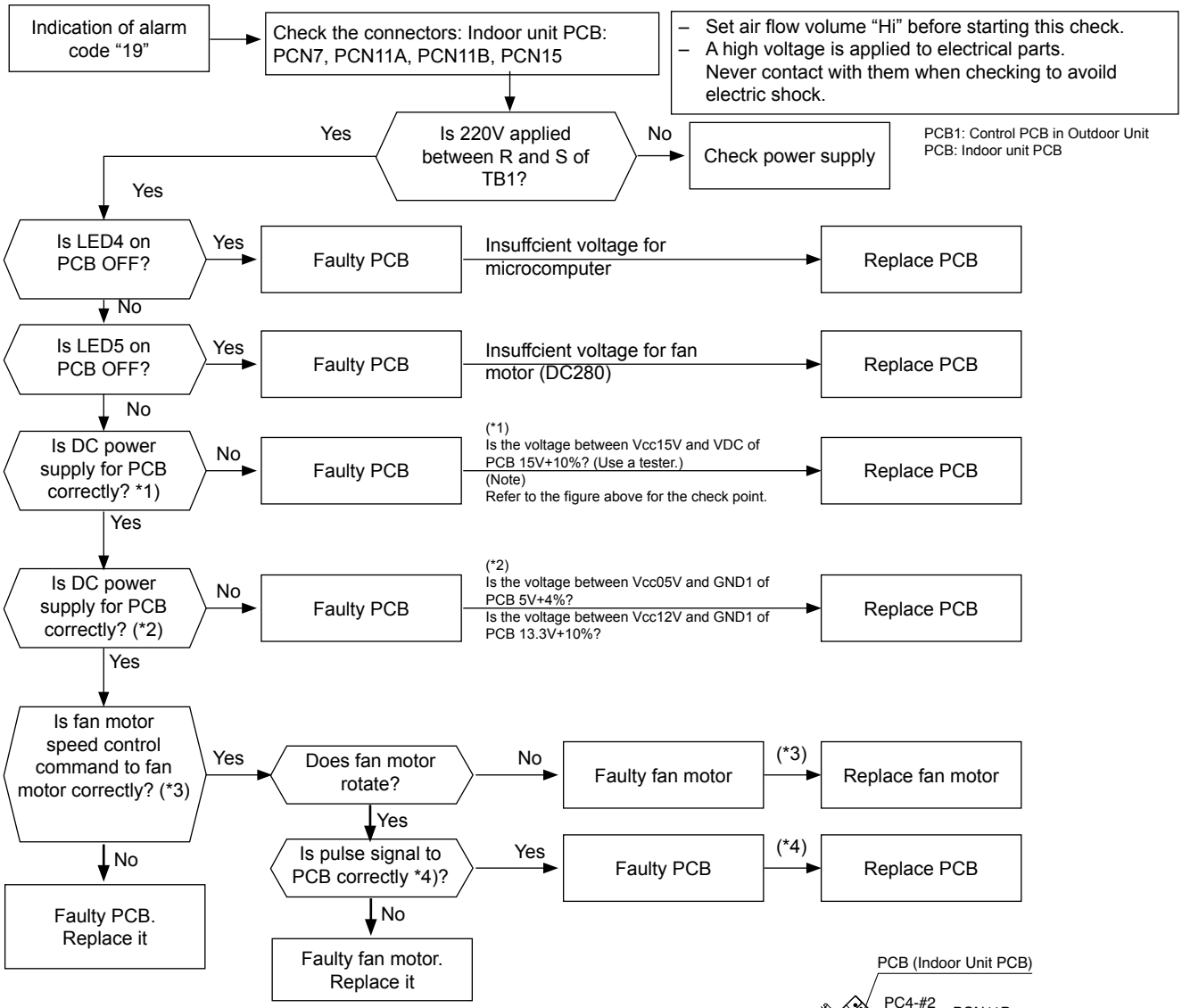
In case of 4-way cassette

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty gas piping thermistor	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect connection	Check the wiring to PCB	Connect wiring correctly
Faulty PCB		Replace PCB and check the operation	Replace PCB if faulty

Alarm code	Description
19	**Activation of the protection device for the indoor fan motor (RCI)**

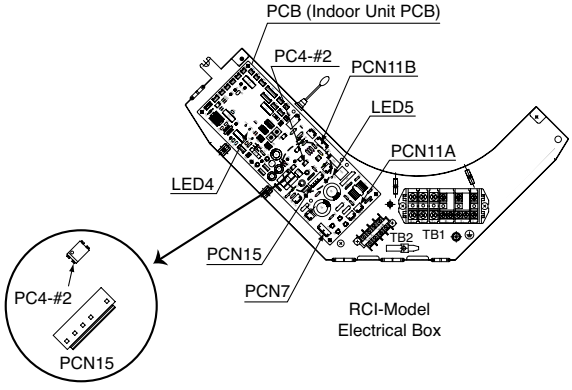
- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section, and the alarm code is indicated on the display of the outdoor unit PCB1.
  - This alarm code is indicated when the following condition occurs thre times in 30 minutes:
    Indoor fan rotates less than 70 rpm for 5 seconds during operation.

When the cause is checked by means of this flow chart, confirm that fan speed setting is Hi



(*3): Disconnect PCN15 on PCB when performing.
If 1V (or over) is applied between PCN15-#5 and VDC on PCB for 10 sec. (Approx.) after starting operation, the fan motor is normal.
(Note) Even when the operation is stopped, 0.3 to 0.4V may be applied. The voltage may not be conducted sequentially after 10 sec. to perform the above operation "H".

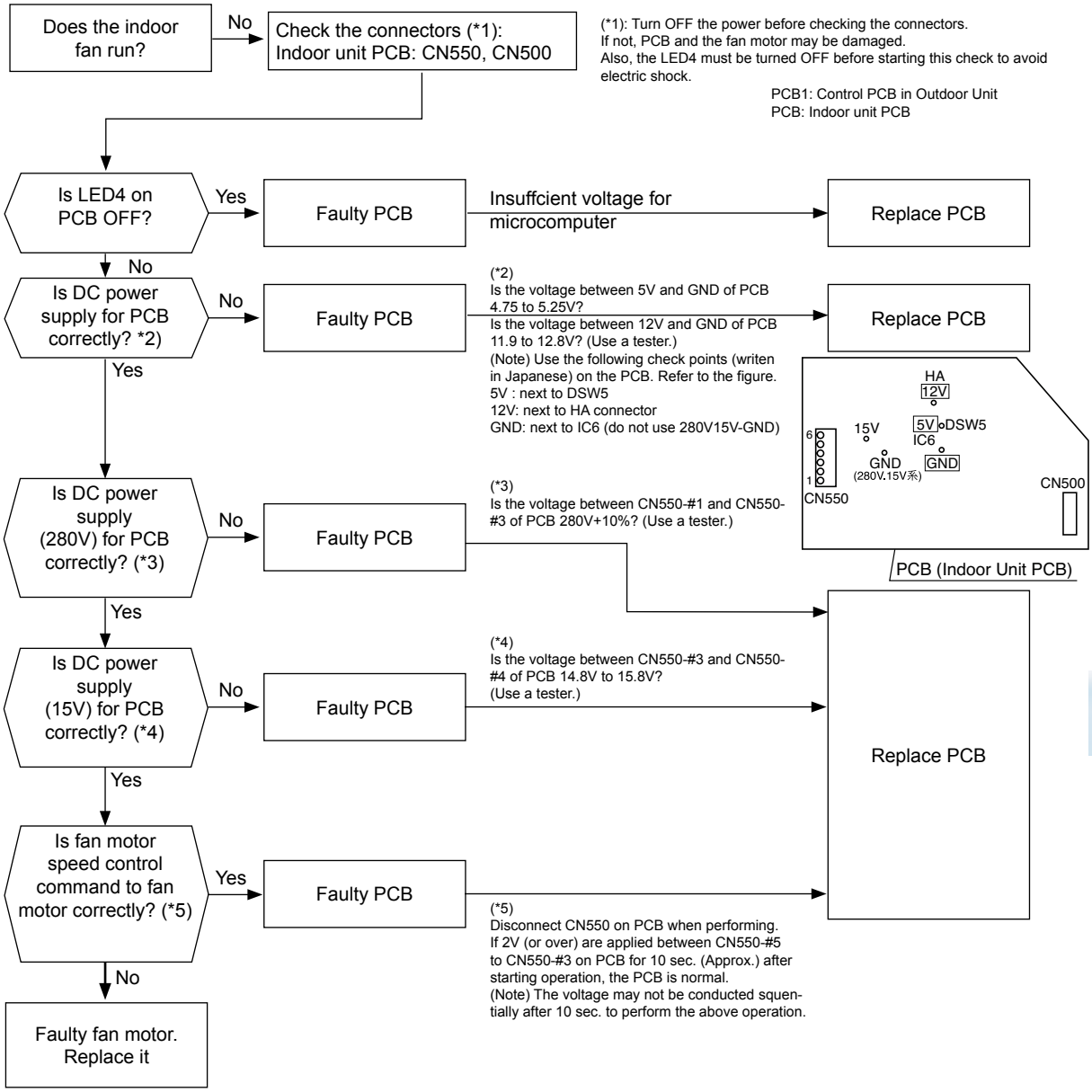
(*4): With PCN15 on PCB connected, if a few volts are applied between VDC and PC4-#2 terminal on PCB, the PCB is normal.
(Note) Even when the operation is stopped, 0.2V (Approx.) may be applied.



Alarm code	Description
19	**Activation of the protection device for the indoor fan motor (RPK)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  – This alarm code is indicated when the following conditions occurs three times in 30 minutes.
  * Indoor fan rotates less than 70rpm for 5 seconds during operation

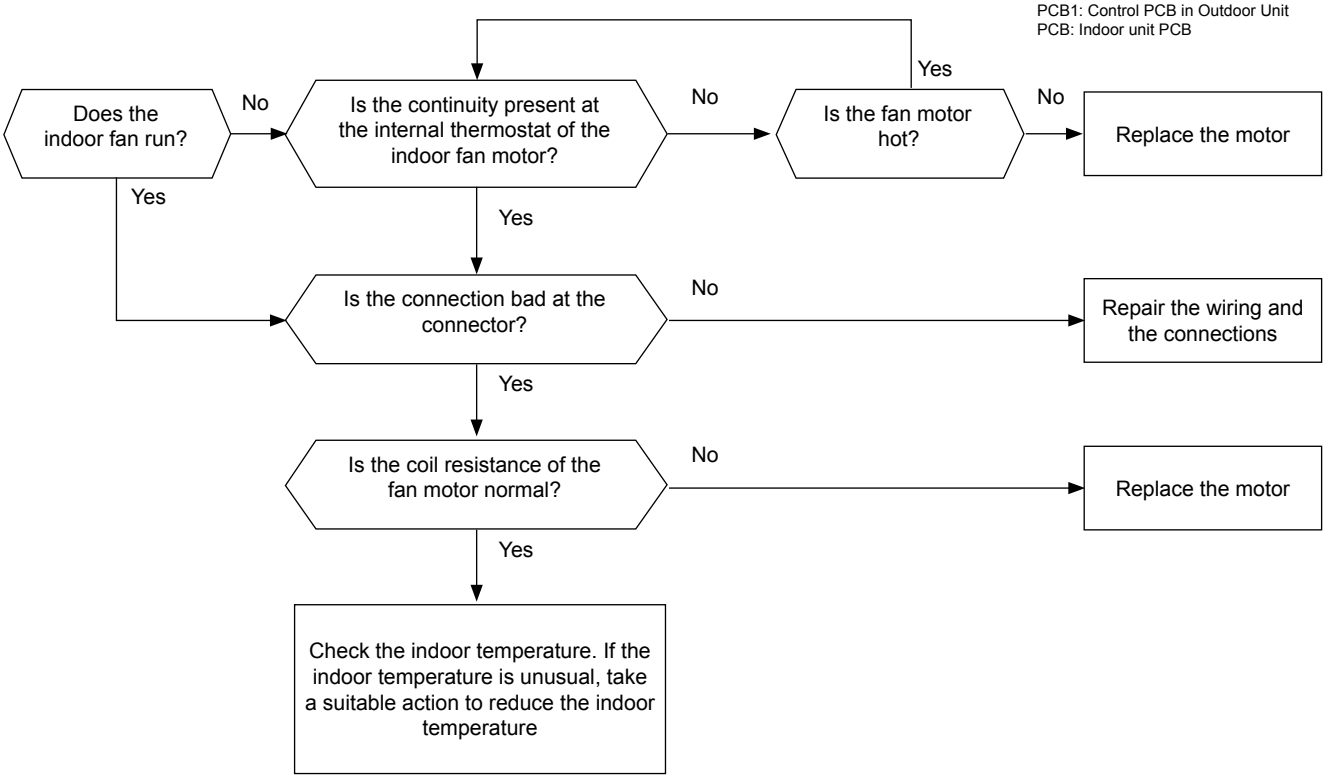
Set air flow volume “Hi” before starting this check



Alarm code	Description
19	**Activation of the protection device for the indoor fan motor (except RCI and RPK)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  – This alarm code is displayed when the temperature of the internal thermostat for the indoor fan motor is higher than 120 ºC or 135 ºC.
  (120 ºC: RPC and RPI (Except for 5.0HP))
  (135 ºC: RCD, RPF(I) and RPI (5.0HP only)).

PCB1: Control PCB in Outdoor Unit
PCB: Indoor unit PCB

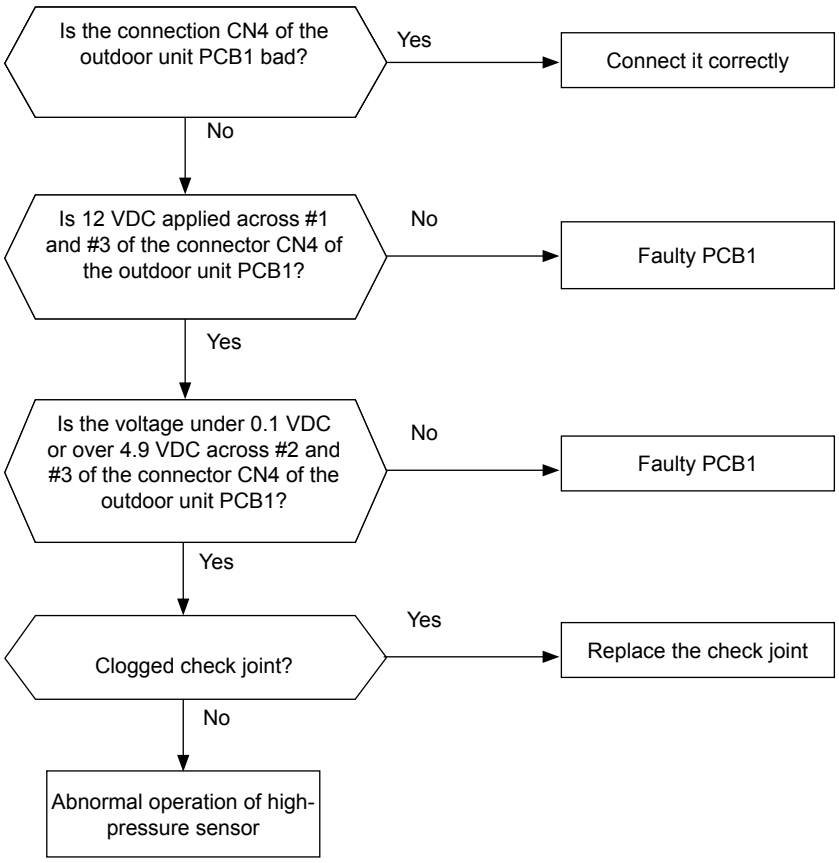


Phenomenon	Cause		Check item	Action (Turn OFF the main switch)
Activation of the internal thermostat for the indoor unit fan motor	Faulty indoor unit fan motor		Measure the coil resistance and the insulation resistance	Replace the motor if faulty
	Faulty internal thermostat	Fault	Check the continuity after the fan motor temperature decreases to room temp	Replace the fan motor if there is no continuity
		Insufficient contacting	Measure the resistance by means of the tester	Correct looseness. Replace the connectors
		Incorrect connection	Check the connections	Repair the connections

Alarm code	Description
21	**Abnormal operation of the high-pressure sensor for the outdoor unit**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm code is displayed when the high-pressure sensor voltage decreases lower than 0.1 V or increases higher than 4.9V during the operation

PCB1: Control PCB in Outdoor Unit
PCB: Indoor unit PCB

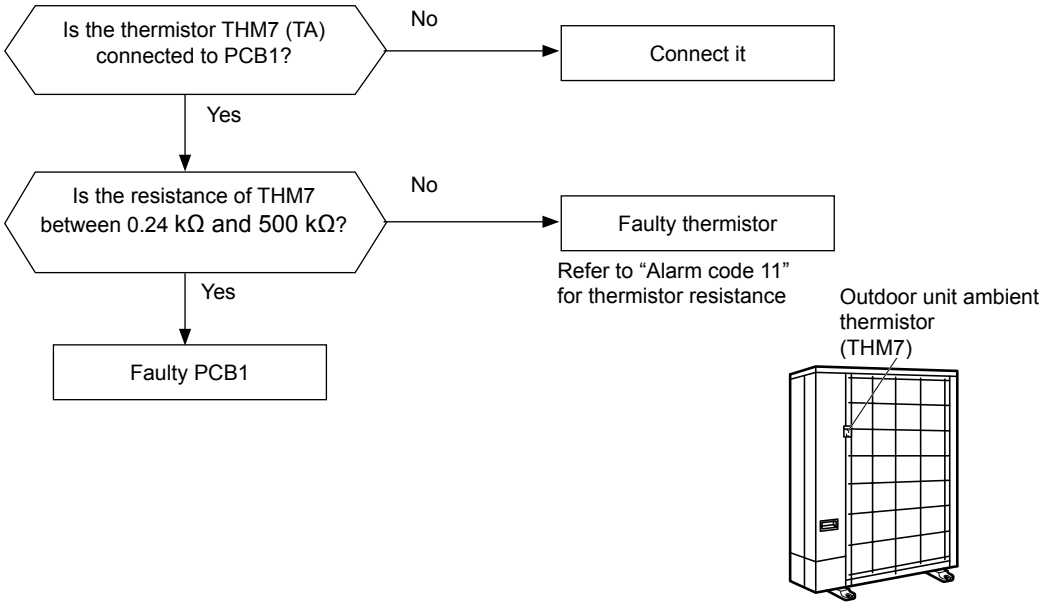


Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty high-pressure sensor	Fault	Check that the output voltage is correct	Replace the pressure sensor if faulty
	Incorrect connection	Check the connections	Repair the wiring and the connections
Faulty PCB1		Replace PCB1 and check the operation	Replace PCB1 if faulty
Indicated pressure value is excessively high or low	Malfunction of the pressure sensor due to a faulty check joint	Check the check joint for clogging	Replace the check joint

Alarm code	Description
22	**Abnormal operation of the thermistor for the outdoor temperature (outdoor unit ambient thermistor)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  – This alarm code is displayed when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 500 kΩ) during the operation.

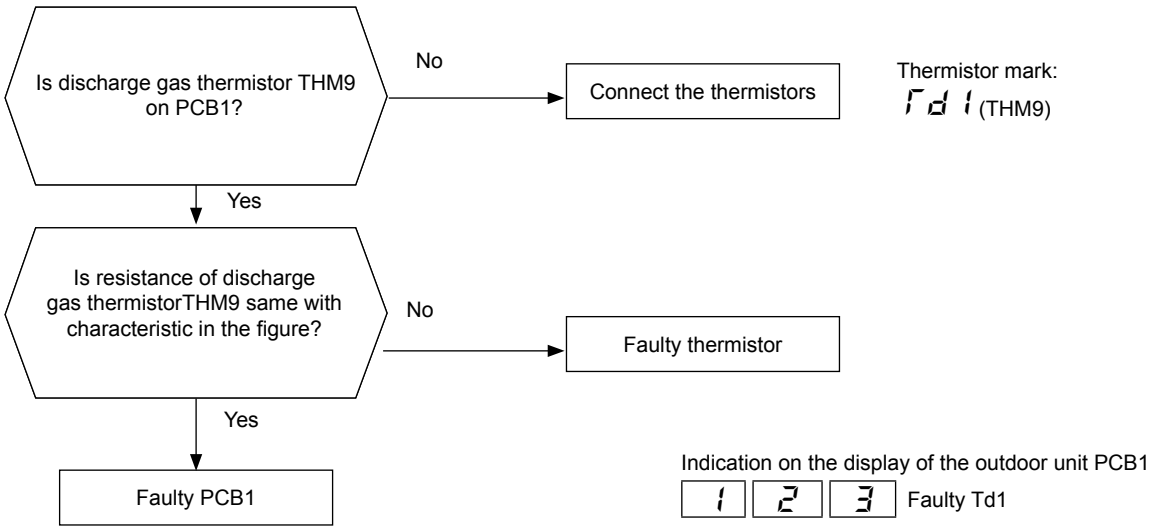
PCB1: Control PCB in Outdoor Unit
PCB: Indoor unit PCB



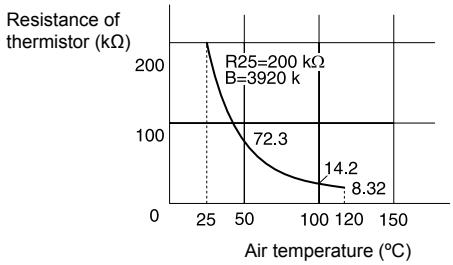
Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty thermistor for the outdoor unit ambient	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB1	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operation	Replace PCB1 if faulty

Alarm code	Description
23	**Abnormal operation of thermistor for discharge gas temperature on the top of compressor chamber**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section.
  The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  – This alarm code is displayed when the thermistor is short-circuited (less than 0.9 kΩ) for one second or cut (greater than 5946 kΩ) during the operation. If you find an abnormal operation of the thermistor, check all the thermistors as shown below.



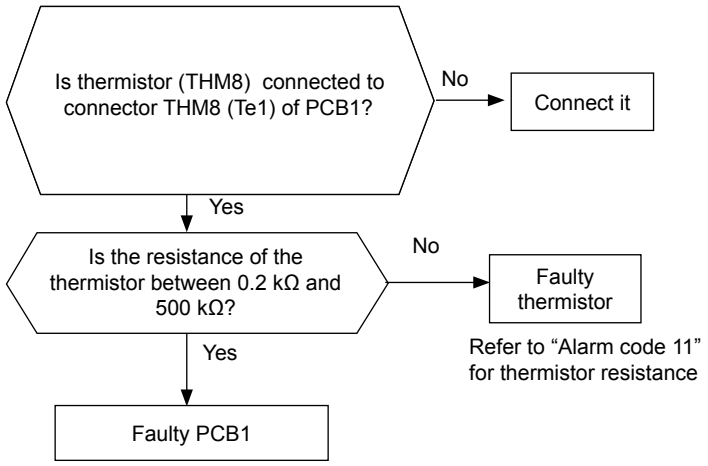
Thermistor characteristics



Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty thermistor for the discharge gas	Fault	Check resistance	Replace thermistor if faulty
	Incorrect connection	Check wiring to PCB1	Repair wiring and connections
Faulty PCB1		Replace PCB1 and check operation	Replace PCB1 if faulty
Incorrect setting of DSW2 on PCB1		Check the setting of DSW2 on PCB1	Correctly set DSW2 on PCB1

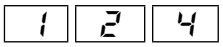
Alarm code	Description
24	**Abnormal operation of the thermistor for the evaporating temperature during the heating process (outdoor unit)**

- The RUN LED flickers and "ALARM" is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  If you find an abnormal operation of the thermistor, check all the thermistors as shown below.
  – This alarm is indicated when the thermistor is shortcircuited (less than 0.2 kΩ) or cut (greater than 500 kΩ) during running.



Thermistor mark:
Te1 (THM8)

Indication on the display of the outdoor unit PCB1

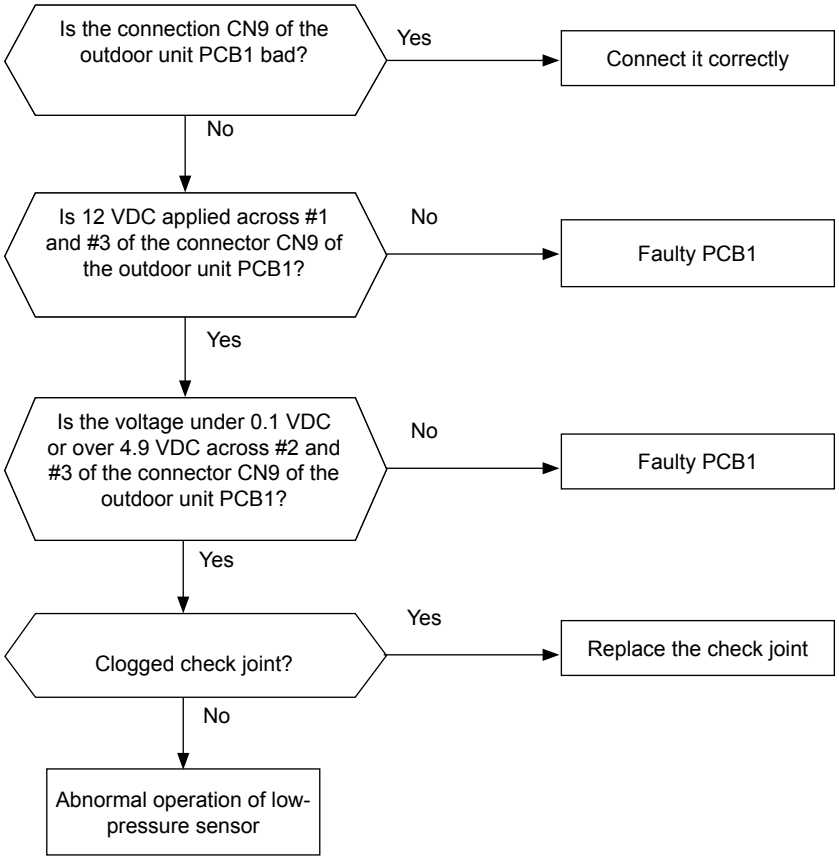


Faulty Te1

Phenomenon	Cause	Check item	Action (Turn OFF the main switch)
Faulty thermistor for the evaporating temperature during heating	Fault	Check the resistance	Replace the thermistor if faulty
	Incorrect Connection	Check the wiring to PCB1	Repair the wiring and the connections
Faulty PCB1		Replace PCB1 and check the operation	Replace PCB1 if faulty

Alarm code	Description
29	**Abnormal operation of the low-pressure sensor for the outdoor unit**

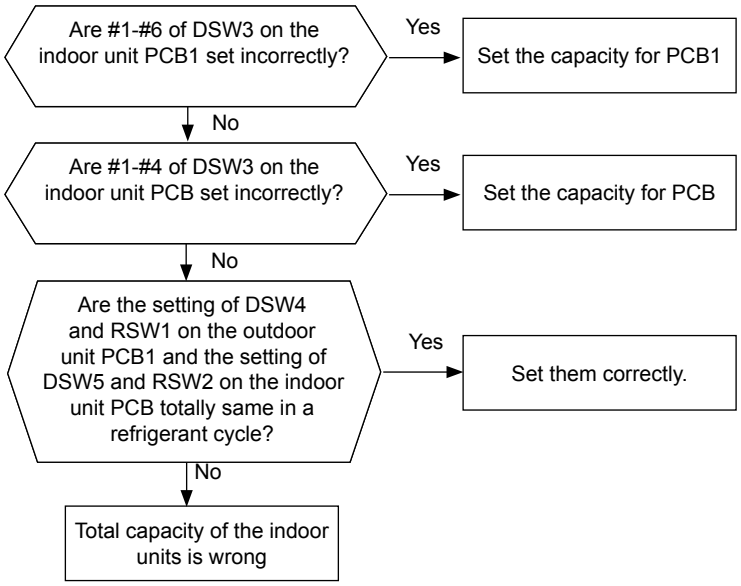
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm code is displayed when the low-pressure sensor voltage decreases lower than 0.1 V or increases higher than 4.9V during the operation



Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty low-pressure sensor	Fault	Check that the output voltage is correct	Replace the pressure sensor if faulty
	Incorrect connection	Check the connections	Repair the wiring and the connections
Faulty PCB1		Replace PCB1 and check the operation	Replace PCB1 if faulty
Indicated pressure value is excessively high or low	Malfunction of the pressure sensor due to a faulty check joint	Check the check joint for clogging	Replace the check joint

Alarm code	Description
31	**Incorrect capacity setting or combined capacity between Indoor Units and Outdoor Unit**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm code is indicated when the capacity setting dip switch, DSW3 on the outdoor unit PCB1, is not set (all the settings from #1 to #4 are OFF) or mis-setting.
  - This alarm code is indicated when the total indoor unit capacity is smaller than 50% or greater than 130% of the combined outdoor unit capacity.

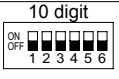
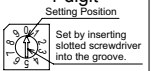


PCB1: Control PCB in Outdoor Unit
PCB: Indoor Unit PCB

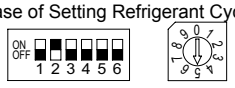
Outdoor Unit PCB1: DSW4, RSW1
Indoor Unit PCB: DSW5, RSW2

Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Incorrect capacity setting of Indoor Unit		Check combination of indoor units and capacity setting on PCB.	Correctly set dip switch, DSW3.
Incorrect capacity setting of Outdoor Unit		Check capacity setting on outdoor unit PCB1.	Correctly set dip switch, DSW3
Total Indoor Unit capacity connected to the Outdoor Unit is beyond the permissible range		Check outdoor unit model by calculating total indoor units capacity.	Ensure that total indoor unit capacity is from 50% to 130%.
Refrigerant cycle setting of the outdoor unit and the indoor unit is different		Check the refrigerant cycle setting on outdoor unit PCB1 and indoor unit PCB	Set them correctly.

Refrigerant Cycle No. Setting

	Setting Switch	
	10 digit	1 digit
		
Outdoor Unit	DSW4	RSW1
Indoor Unit (H-LINK II)	DSW5	RSW2

Ex.: In Case of Setting Refrigerant Cycle No. 25



Turn ON No. 2 pin. Set Dial No.5.

DSW and RSW setting before shipment is 0.
Maximum in setting refrigerant cycle No. is 63.

Alarm code	Description
35	**Incorrect indoor number setting**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm code is indicated 5 minutes after power is supplied to the outdoor unit when the indoor unit No. connected to the outdoor unit is duplicated by setting of DSW and RSW

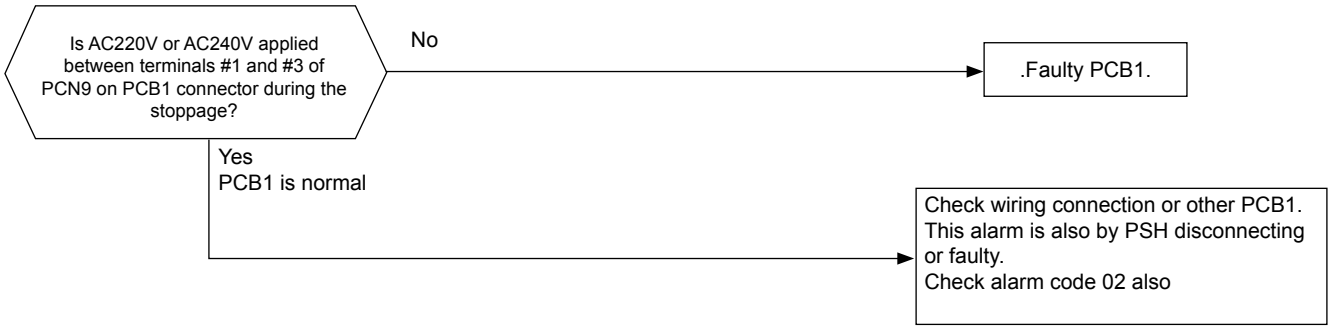
NOTE:
In the case of H-LINK System, this alarm code is indicated when DSW4 and RSW1 of the outdoor unit PCB1 and DSW5 and RSW2 of the indoor unit PCB are incorrectly set.

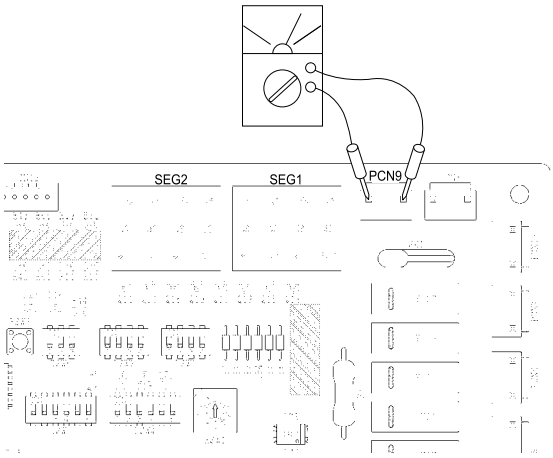
In this case, set them correctly after turning OFF the main switch, and again turn ON the main switch. When the refrigerant number setting of outdoor unit (H-LINK II) and the one of outdoor unit (H-LINK) are duplicated, the alarm “35” may go ON and OFF repeatedly.

PCB1: Control PCB in Outdoor Unit

Alarm code	Description
38	**Abnormality of picking up circuit for protection (Outdoor Unit)**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm code is indicated when AC 220V or 240V is not detected during inverter compressor stoppage.

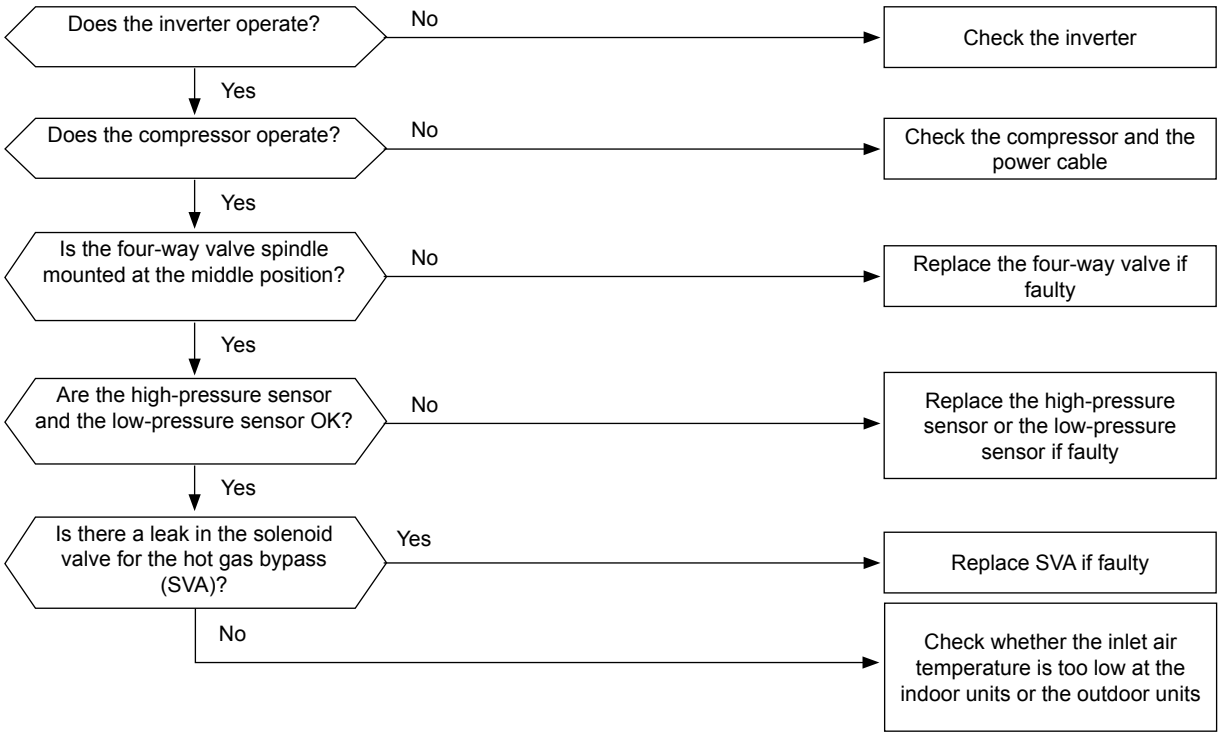




Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Faulty PCB1			Replace PCB1

Alarm code	Description
43	**Activation for protecting the system from the low compression ratio**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm code is displayed when a compression ratio , ε = {(Pd + 0.1) /(Ps + 0.06)} is calculated from a discharge pressure (Pd MPa) and a suction pressure (Ps MPa), and the condition which is lower than ε = 1.8 occurs three or more than three times in one hour.

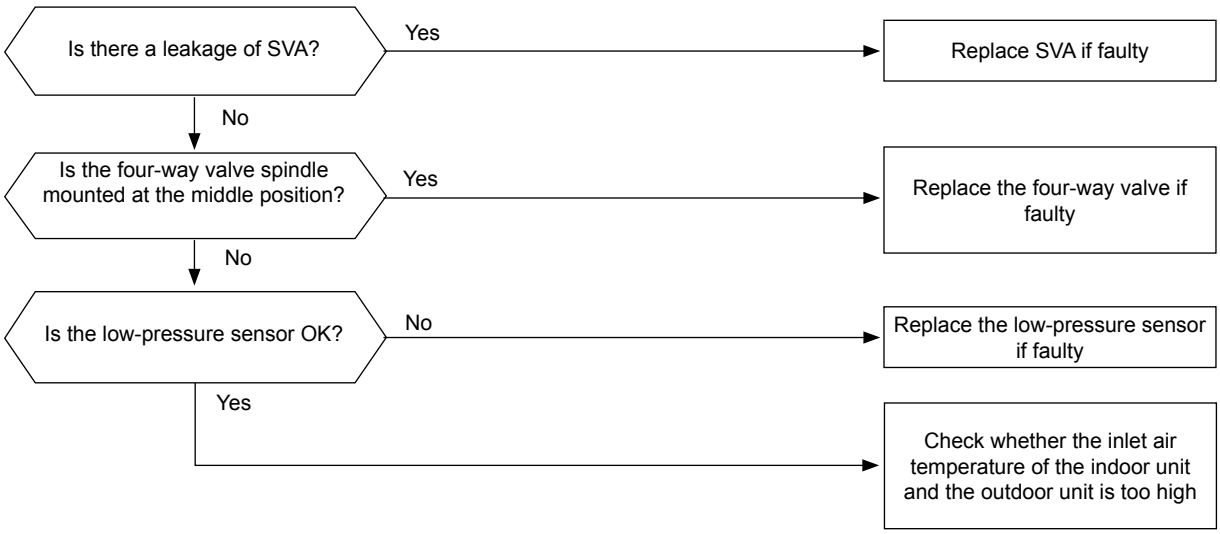


Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Excessively low compression ratio	Inverter is not functioning	Check the inverter	Repair the faulty part
	Compressor is not operating	Check the compressor	Replace the comp. if faulty
	Valve stoppage at medium position of 4-way valve	Measure the suction pipe temp. of the 4-way valve	Replace the 4-way valve if faulty
	Abnormal operation of the high-pressure sensor or the low-pressure sensor	Check the connector for PCB1, the power source and the pressure indication	Replace the sensor if faulty
	Excessively low air inlet temperature of the indoor unit	Check the indoor unit and the outdoor unit air temp. thermistor	Replace the thermistor if faulty
	Leakage of the solenoid valve (outdoor unit)	Check the solenoid valve	Replace SVA if leaking

Alarm code	Description
44	**Activation for protecting the system from excessively low suction pressure**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - In case that compressor is operated under the condition that is higher than 1.5MPa of suction pressure (Ps) for 1 minute, all compressors are stopped and retry operation is started after 3 minutes. However the alarm code is indicated when same phenomenon is occurred at two times within the next 30 minutes.

PCB1: Control PCB in Outdoor Unit
PCB: Indoor Unit PCB

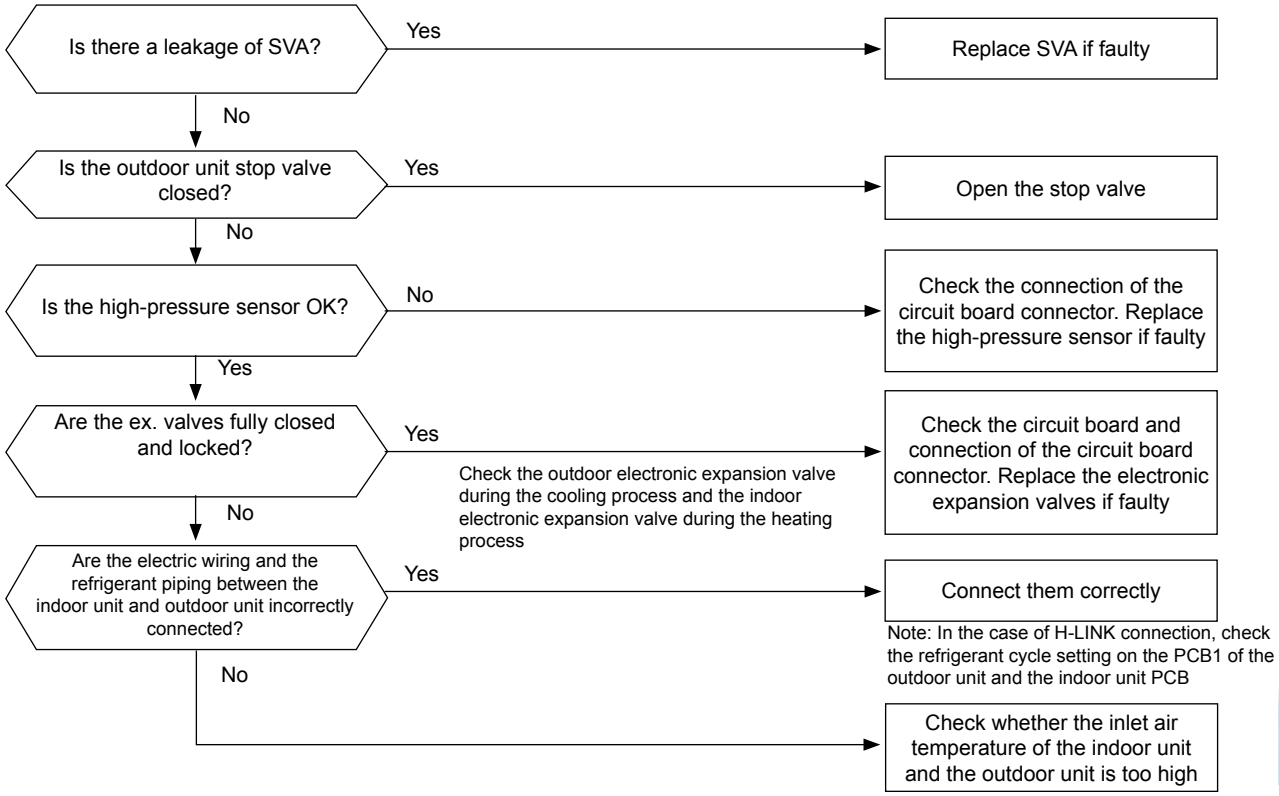


Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Excessively low suction pressure	Leakage of solenoid valve (SVA)	Check the outlet pipe temp of (SVA)	Check the connect wires. Replace (SVA) if faulty
	Valve stoppage at the medium position of the 4-way valve	Measure the suction gas temp. of 4-way valve	Replace the 4-way valve if faulty
	Abnormal suction pressure sensor	Check the connectors of PCB1 and the power source	Replace the sensor if faulty
	Excessively high indoor unit and outdoor unit suction air temperature	Check the indoor unit and the outdoor unit suction air temp. thermistor	Replace the thermistor if faulty

Alarm code	Description
45	**Activation for protecting the system from excessively high discharge pressure**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - In case that compressor is operated under the condition that is higher than 3.8MPa of suction pressure (Pd) for 1 minute, all compressors are stopped and retry operation is started after 3 minutes. However the alarm code is indicated when same phenomenon is occurred at two times within the next 30 minutes.

PCB1: Control PCB in Outdoor Unit
PCB: Indoor Unit PCB

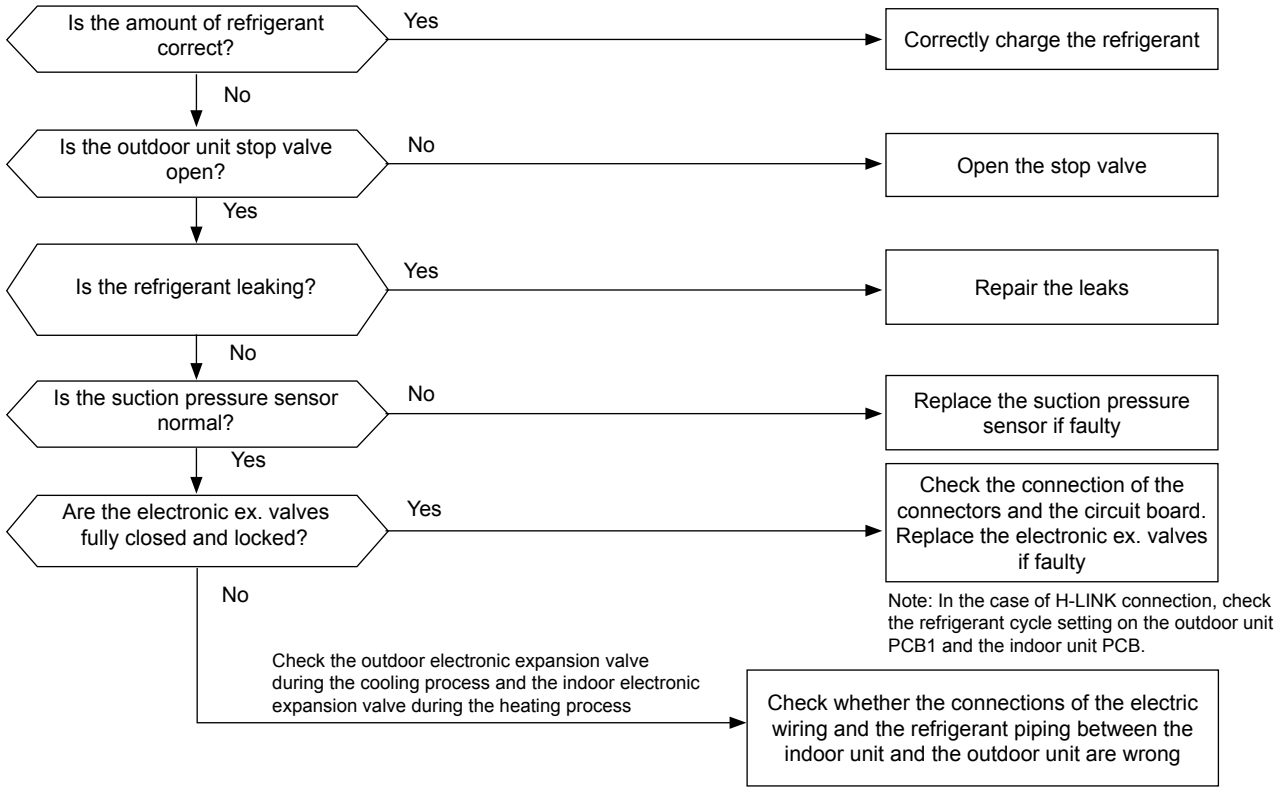


Phenomenon	Cause	Check item	Action (Turn OFF Main Switch)
Excessively high discharge pressure	Leakage of SVA (outdoor unit)	Check the outlet temp. of SVA	Check the connection. Replace SVA if faulty
	Closed stop valve	Check the stop valve	Open the stop valve
	Abnormal high-pressure sensor	Check the connectors for PCB	Replace the pressure sensor if faulty
	Excessively high air inlet temp. of the indoor unit and the outdoor unit	Check the thermistor for inlet air temp. of the indoor unit and the outdoor unit	Replace the thermistor if faulty
	Incorrect connection between indoor unit and outdoor unit	Check electrical system and ref. cycle	Correctly connect
	Locked Ex. valve with fully closed opening	Check the connector for PCB1	Repair connector for PCB or ex. valve. Replace it if faulty
Stoppage of the indoor fan (wall type 1.0 to 3.0 only)	Blown out fuses	Check the continuity of fuses	Replace the fuses
	Faulty PCB	Replace PCB and check the operation	Replace PCB if faulty

Alarm code	Description
47	**Activation for protecting the system from excessively low suction pressure (protection from the vacuum operation)**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm code is displayed when a suction pressure is lower than 0.09 MPa for over 12 minutes and the alarm occurs two or more times in one hour.

PCB1: Control PCB in Outdoor Unit
PCB: Indoor Unit PCB



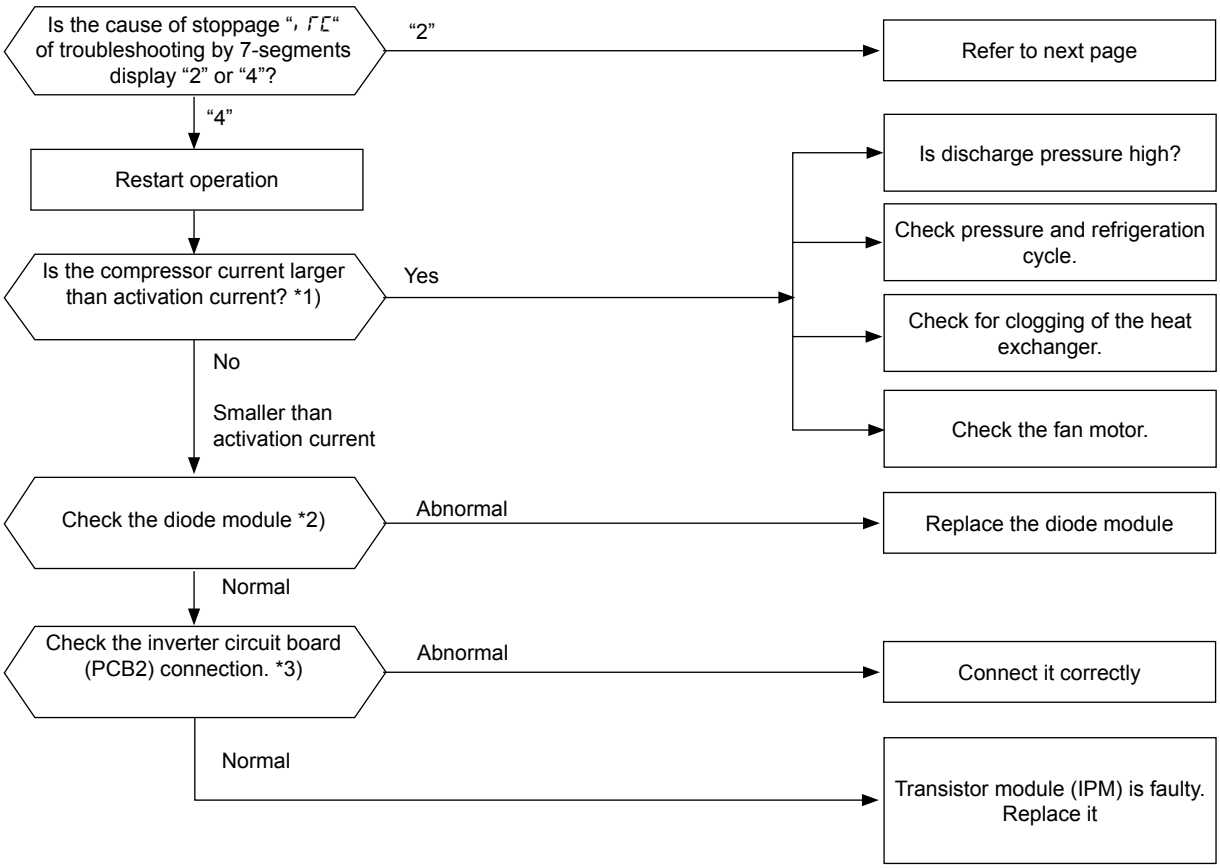
Note: In the case of H-LINK connection, check the refrigerant cycle setting on the outdoor unit PCB1 and the indoor unit PCB.

Phenomenon	Cause		Check item	Action (Turn OFF Main Switch)
Excessively low suction pressure (in vacuum)	Shortage of refrigerant.		Check the volume of charged refrigerant or check for leakage	Repair the leakage and correctly charge
	Closed stop valve		Check the stop valve	Open the stop valve
	Abnormal low or high-pressure sensor		Check the connector for PCB1	Replace the pressure sensor if faulty
	Incorrect connection between the indoor unit and the outdoor unit		Check the electrical system and the ref. cycle	Correctly connect between the indoor unit and the outdoor unit
	Locked Ex. valve		Check the connector for PCB	Repair or replace the connector of PCB or the ex. valve
	Closed Ex. valve by disconnecting Td thermistor		Check Td thermistors for compressors and measure Td thermistor resistance.	Repair or replace Td thermistor
Internal Thermostat for Outdoor Fan is Activated in Heating process	Faulty outdoor fan motor		Measure the coil resistance and the insulation resistance	Replace the outdoor fan motor if faulty
	Faulty internal thermostat	Fault	Check for the conduction after the temperature of the outdoor fan motor is decreased	Replace the outdoor fan motor
		Incorrect contact	Measure the resistance by means of the tester	Remove looseness and replace the connector
		Incorrect connection	Check the connection	Connect correctly

Alarm code	Description
48	**Activation of inverter overcurrent protection device (1)**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - The alarm code is indicated when inverter electronic thermal protection is activated at six times within 30 minutes. (Retry operation is performed up to five times.)
    Conditions of Activation:
    Inverter current with 105% of the rated current runs for 30 seconds continuously, or
    Inverter current runs intermittently and the accumulated time reaches up to 3 minutes, in 10 minutes.

PCB1: Control PCB in Outdoor Unit
PCB2: Inverter PCB

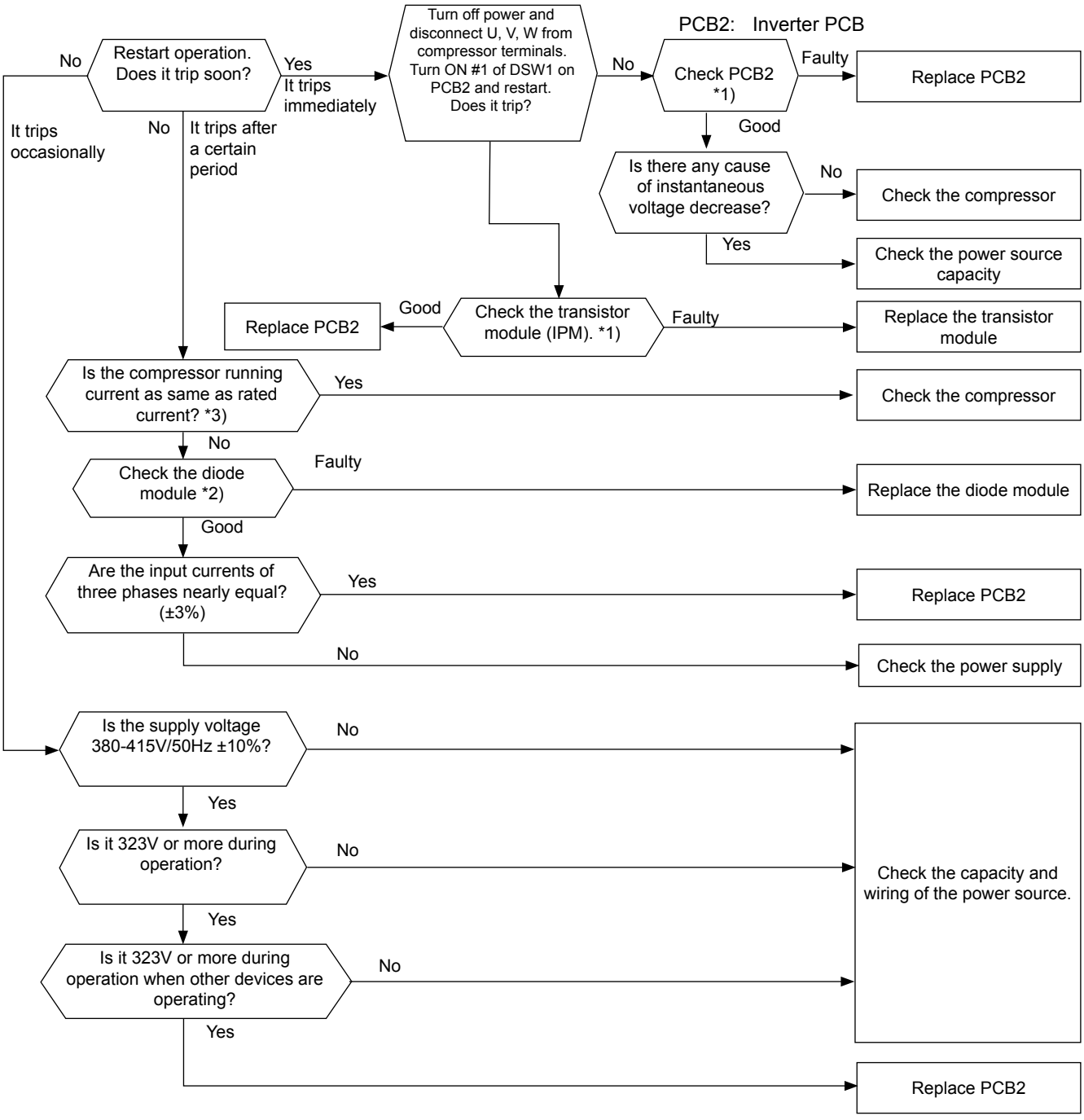


*1): Regarding the setting value of activation current, refer to the item “*Specifications of inverter*”
*2): Regarding replacing or the checking diode module, refer to the item “*Procedure of checking other main parts*”.
*3): Regarding replacing or the checking method for inverter parts, refer to the item “*Procedure of checking other main parts*”.

Alarm code	Description
48	**Activation of inverter overcurrent protection device (2)**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - The alarm code is indicated when instantaneous overcurrent trip occurs at six times within 30 minutes. (Retry operation is performed up to five times.)
    Conditions of Activation: Inverter current with 150% of the rated current.

PCB1: Control PCB in Outdoor Unit
PCB2: Inverter PCB



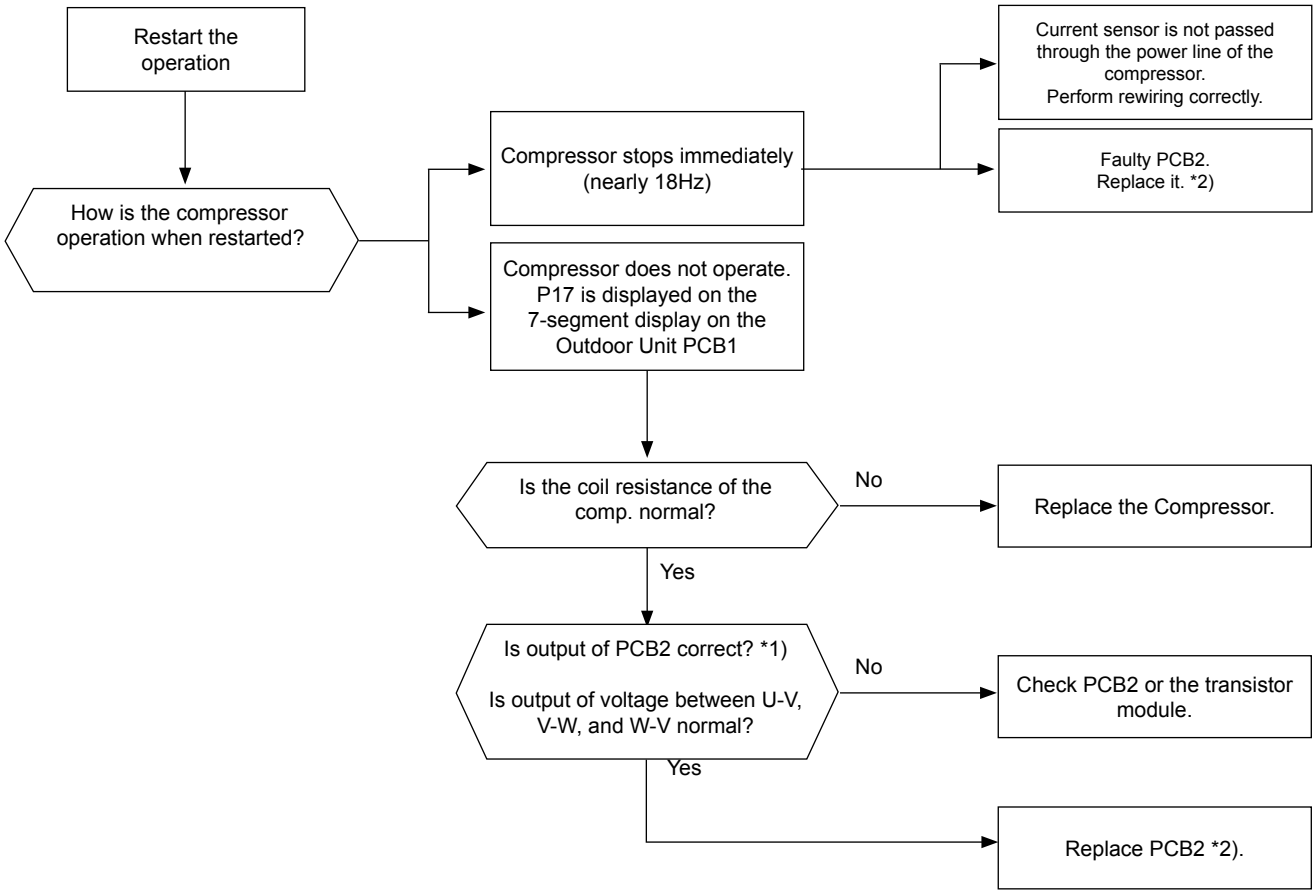
*1): Regarding replacing or the checking method for inverter parts, refer to the item “*Procedure of checking other main parts*”.
*2): Before checking of diode module, refer to the item “*Procedure of checking other main parts*”.
*3): Regarding the setting value of activation current, refer to the item “*Specifications of inverter*”

Alarm code	Description
51	**Abnormality of current transformer**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  – In case that the abnormality of alarm code 51 or 54 occurs three times within 30 secons. the alarm code of abnormality occurred for the thirs time is indicated. Retry operation is performed up to second time of abnormality occurrence.

  Condition of Activation:
  When the frequency of the compressor is maintained at 15~18Hz after the compressor is started, one of the absolute values of the running current at each phase U+, U-, V+ and V- is less than 1.5A (including 1.5A).

PCB1: Control PCB in Outdoor Unit
PCB2: Inverter PCB



*1: Perform the high voltage discharge work by referring to the item “*Procedure of checking other main parts*” before checking and replacing the inverter parts.

Alarm code	Description
53	**Inverter error signal detection**

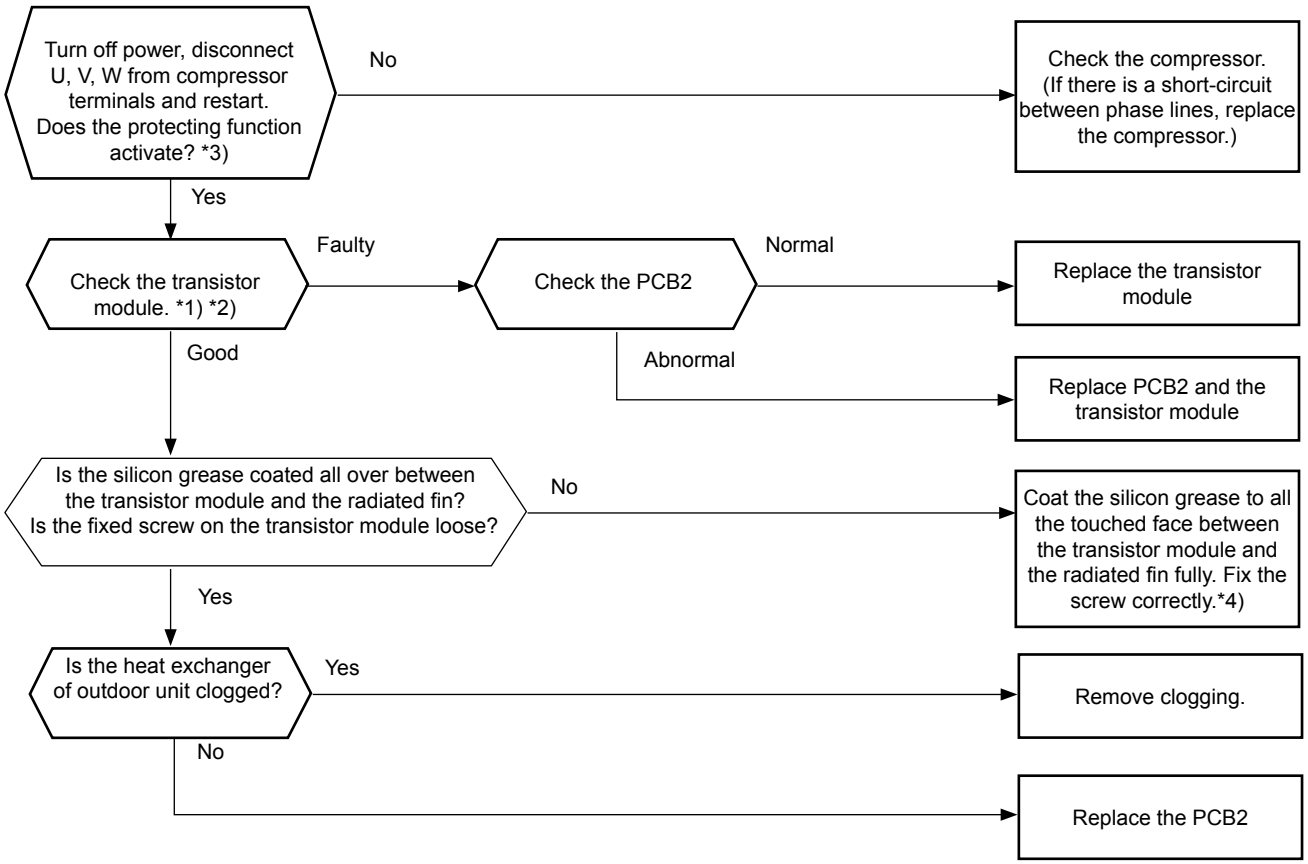
- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - IPM (Transistor Module) have detecting function of abnormality.
  - This alarm is indicated when the transistor module detect the abnormality 7 times in 30 minutes including 7. Retry operation is performed up to the occurrence of 6 times.

  Conditions:

  Abnormal current to the transistor module such as short circuited or grounded or
  Abnormal temperature of the transistor module or
  Control voltage decrease

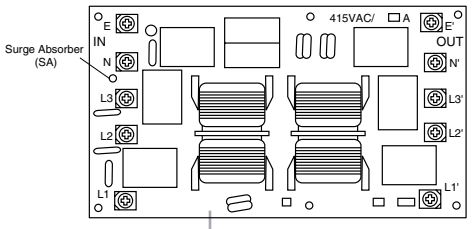
PCB1: Control PCB in Outdoor Unit

PCB2: Inverter PCB



*1): Regarding replacing or checking method for the inverter components, refer to item “*Procedure of checking other main parts*”.
*2): Before the checking of inverter components, refer to item “*Procedure of checking other main parts*” regarding electrical discharge.
*3): Turn ON the No.1 switch of the dip switch DSW1 on PCB2 when restarting with disconnecting the terminals of the compressor. After troubleshooting, turn OFF the No.1 switch of the dip switch DSW1 on PCB2.
*4): Use the silicon grease provided as accessory (Service Parts No.: P22760).

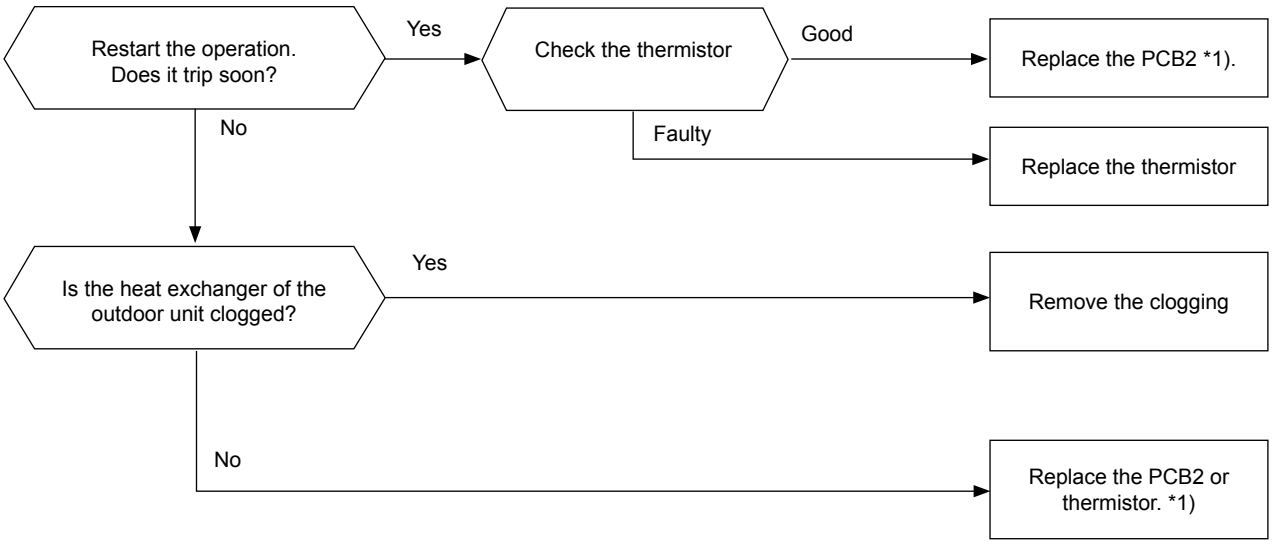
Position of Surge Absorber (SA) (380~415V)



When the unit is applied the excessive surge current due to lighting or other causes, it is indicated this alarm code “04” or the inverter stoppage code (ITC) “11” and the unit can not be operated. In this case, check to ensure the surge absorber (SA) on the noise filter (NF1). If the inside of the surge absorber is normal, turn OFF the power once and wait for PCB2’s LED OFF and turn ON again.

Alarm code	Description
54	**Increase in the inverter fin temperature**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB.
  - In case that the abnormality of alarm code 51 or 54 occurs three times within 30 seconds, the alarm code of abnormality occurred for the third time is indicated. Retry operation is performed up to second time of abnormality occurrence.
    Conditions: This alarm is indicated when the temperature of the internal thermostat for transistor module is higher than 100 ºC.



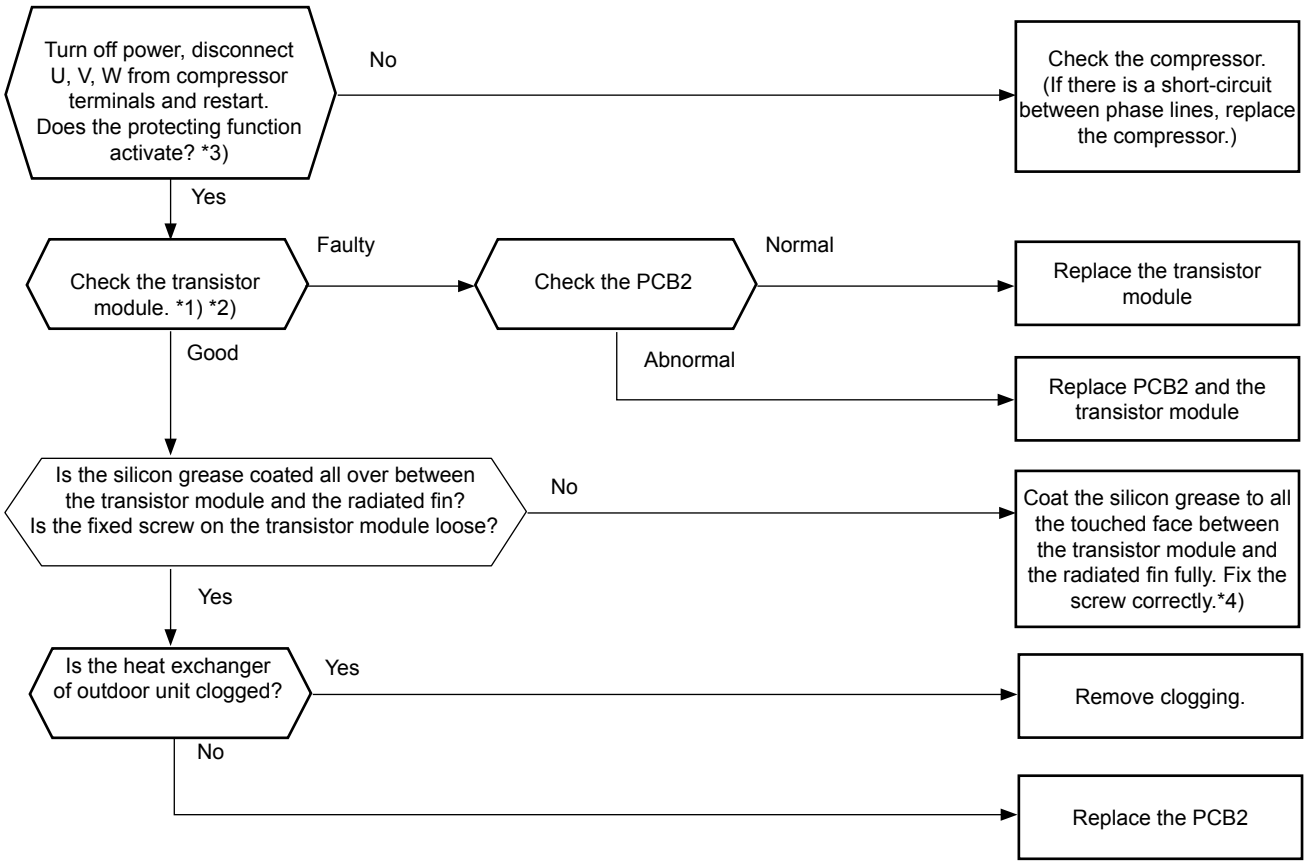
1*): Refer to section “*Procedure of checking other main parts*” for the replacing procedure and the checking procedure for the PCB2.

Alarm code	Description
55	**Inverter failure**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - This alarm is indicated when the following phenomenon occurs 3 times in 30 minutes including 3:
    (Retry operation is performed up to the occurrence of 2 times.)
    Actual frequency from PCB2 is less than 10Hz (after inverter frequency output from PCB1).
    Conditions: This alarm is indicated when PCB2 is not performed normally.

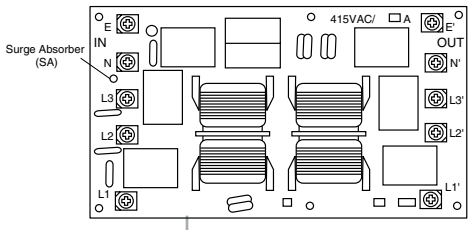
PCB1: Control PCB in Outdoor Unit

PCB2: Inverter PCB



*1): Regarding replacing or checking method for the inverter components, refer to item “*Procedure of checking other main parts*”.
*2): Before the checking of inverter components, refer to item “*Procedure of checking other main parts*”. regarding electrical discharge.
*3): Turn ON the No.1 switch of the dip switch DSW1 on PCB2 when restarting with disconnecting the terminals of the compressor. After troubleshooting, turn OFF the No.1 switch of the dip switch DSW1 on PCB2.
*4): Use the silicon grease provided as accessory (Service Parts No.: P22760).

Position of Surge Absorber (SA) (380~415V)

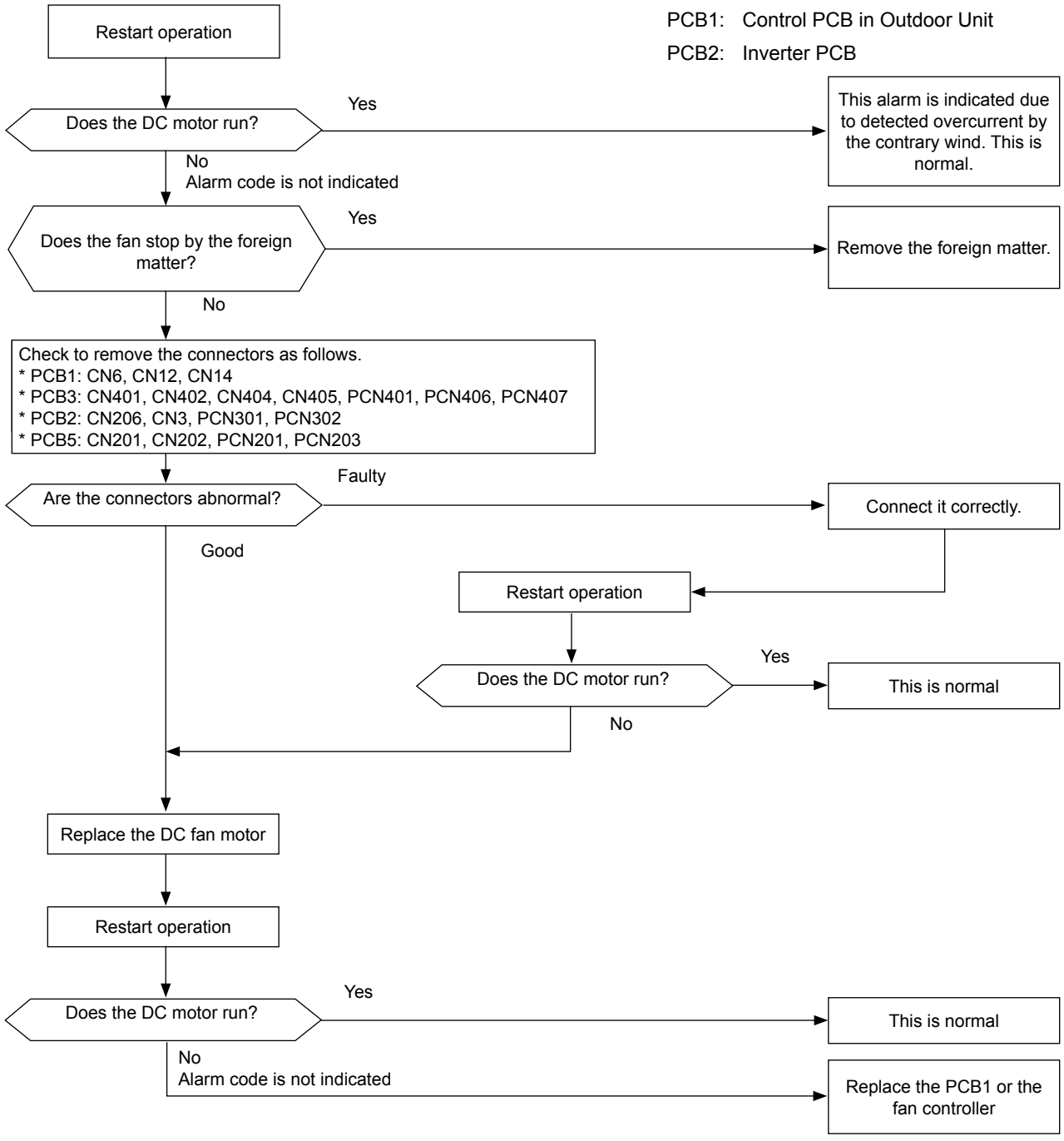


When the unit is applied the excessive surge current due to lighting or other causes, it is indicated this alarm code “04” or the inverter stoppage code (ITC) “11” and the unit can not be operated. In this case, check to ensure the surge absorber (SA) on the noise filter (NF1). If the inside of the surge absorber is normal, turn OFF the power once and wait for PCB2’s LED OFF and turn ON again.

Alarm code	Description
57	**Abnormal operation of DC fan motor protection**

- The RUN LED flickers and “ALARM” is displayed on the remote control switch.
- The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
  - The fan motor is stopped when the revolution pulse out put from the DC fan motor is 10 min-1 or less after 10 seconds from the fan operation starting.
    After that, if it occurs more than 9 times in 5 minutes, this alarm is indicated.
    The abnormality occurs when the DC fan motor is stopped.

PCB1: Control PCB in Outdoor Unit
PCB2: Inverter PCB



In the case that the fan motor does not run even the PCB1 is replaced, replace the PCB2

Alarm code	Description
EE	**Compressor protection**

■ This alarm code is displayed when one of the following alarms occurs three times within six hours. If the outdoor unit operates continuously without removing the cause of the alarm, the compressor may be seriously damaged.

Alarm Code:	Content of Abnormality
02	Tripping of the protection device in the outdoor unit
07	Decrease in the discharge gas superheat
08	Increase in the discharge gas temperature
43	Pressure ratio decrease protection activating
44	Low pressure increase protection activating
45	High pressure increase protection activating
47	Low pressure decrease protection activating

CAUTION:
You can check these alarms by means of the check mode 1. Follow the action that is indicated in each alarm chart. You can clear these alarms only by turning OFF the main switch to the system. **However, pay careful attention before starting, because there is a possibility of causing serious damages to the compressors.**

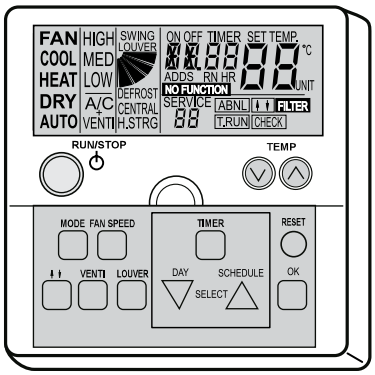
Alarm code	Description
b5	**Incorrect indoor unit setting**

■ The RUN LED flickers and “ALARM” is displayed on the remote control switch.
■ The unit number, the alarm code and the unit code are alternately displayed on the set temperature section. The unit number and the alarm code are displayed on the display of the outdoor unit PCB1.
(“35” is indicated in the disply of the remote control switch)
– This alarm is indicated under the following conditions.
Turn OFF the power supply and check the setting of DSW and RSW.
Conditions: More than 17 non-FSN2 Series Indoor Unit (H-LINK) are connected to one system.
Measurement: Non-FSN2 Series Indoor Unit (H-LINK) should be 16 or less

7.2.3. Troubleshooting in check mode

Use the 'OK' switch of the remote control in the following cases:

1. When the RUN LED is flickering.
2. To trace back the cause of the malfunction after restarting from the stoppage while the RUN LED is flickering.
3. To check during the normal operation or during the stoppage.
4. To monitor the inlet air temperature and the discharge air temperature.



Check mode

- Check mode 1: Current data will be displayed
- Check mode 2: The data which was held immediately before the failure will be displayed

Notes:

- The indication will delay as the transmission between the remote control switch and the indoor unit takes about ten seconds.
- All the data may be displayed as "FF" or " 1" or "255". These transient data, which are produced temporarily by the software, do not affect the device functions at all. (The alarm code may also be displayed as "FF".)
- If it is not indicated check mode 1, it has possibilities that the transmission between remote control switch and indoor unit is not connected

Normal mode

Pres "OK" for more than 3 seconds

Unit number and alarm code displayed

*

The alarm code that identifies the last fault that has occurred in the displayed unit.
The unit number of the connected unit or the unit number for which the checking mode was selected previously.

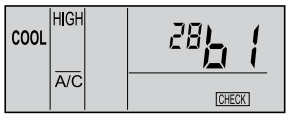
* ADDS: Number of the Indoor Unit in No. ** Cycle
RN: No. ** Refrigerant Cycle

After seven seconds ← (A)

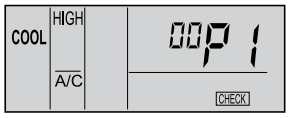
Within seven seconds to check another unit

Forward:
Press the "⌃" switch to increase from 00 to 01 to 02 ⋯
Backward:
Press the "⌄" switch to decrease from 15 to 14 to 13 ⋯

Check mode 1



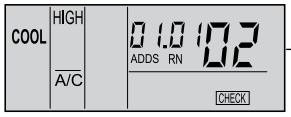
Press "⌄" to see the previous indication



Press "⌃" to see the next indication

Pres "OK" for more than 3 seconds

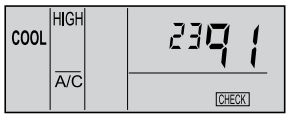
Unit number and alarm code displayed



Press "⌃" to see the next data
Press "⌄" to see the previous data

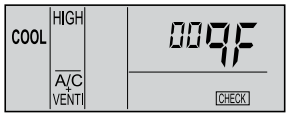
After seven seconds ← See (A)

Check mode 2 (Refer to "Check mode 1" for details)



Press "⌃"

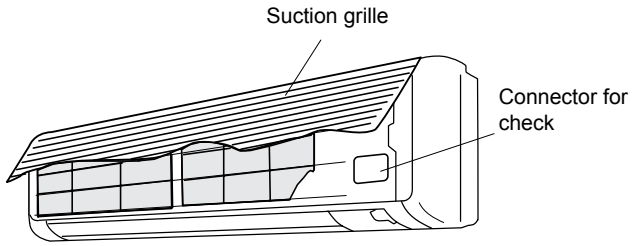
Pres "OK" for more than 3 seconds



- In the Check mode 2, the data of the first three units that are connected serially to a remote control switch are available.
- You can press the "OK" switch to disable the Check mode 2. Check mode 1 cannot be disabled even if you press the "OK" switch.

Check mode disabled

Although the wireless controller is used for the wall type indoor unit with the built-in receiver part, you can check the alarm code by connecting the PC-ART.



NOTES:

1. *The unit does not operate by pressing the operation switch.*
2. *The above function is available only when the alarm occurs.*
3. *The PCB check by means of the remote control switch is not available.*
4. *The indication is the data when you are connecting PC-ART. The indication is not the data before the alarm occurs.*

■ Contents of the Check mode 1

The next indication is shown if you press the part "△" of the TEMP switch.

If you press the part "▽" of the TEMP switch, the previous indication is shown.

Temperature indication

1	Indoor unit temp. setting (°C)	b1 22
2	Indoor unit air inlet temp. at thermistor (°C)	b2 20
3	Indoor unit discharge air temp. at thermistor (°C)	b3 55
4	Indoor unit heat exchanger liquid pipe temp °C	b4 20
5	Temperature at remote sensor (°C)	b5 25
6	Outdoor unit ambient temp. (°C)	b6 10
7	Indoor unit heat exchanger gas pipe temp. (°C)	b7 25
8	Outdoor unit evaporating temp. during heating (°C)	b8 02
9	Control information	b9 --
10	Discharge gas temp. at the top of the comp. chamber (°C)	bA 41
11	Thermo temp. of the remote control switch	bb 23

Indication of the category code
Indication of the temperature, etc

Normal ... Temperature displayed

Abormal
- -- (Thermistor is open-circuited or PCB is defective)
- or
- 129 (Temp. for top of comp.)
- FF (Thermistor is short-circuited or PCB is defective)
- or
- 255
- or
- 127 (Temp. for top of comp.)

Refer to section 7.3.1 "Self-Checking Procedure of PCB by means of the Remote Control Switch"

During the transient periods such as starting time and other, the indicators "--" or "00" may be displayed for a limited time.

This is indicated only when a remote sensor is connected.
The indicator "--" is normally displayed.
RPK series cannot connect a remote sensor.
Therefore, the indicator is "--".

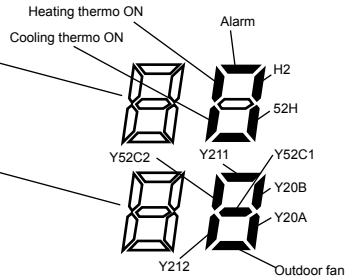
This indicates the internal information for the remote control switch. In case of SET-FREE, this indication shows the operation compressor quantity-

(Ex.) During the operaton of several compressors, the average temperature of two compressors is indicated.

If the temperature is higher than 126 ºC, " 126"

Indication of micro-computer input/output

12	Micro-computer input/ output in indoor unit	C1	4
13	Micro-computer input/ output in outdoor unit	C2	-



PCB Relay	Part name
H2	Relay for drain pump (MD) and/or dew heater (EHW).
52H	Relay for electric heater (CEH)
Y211	Relay for 4-way valve
Y52C1	Relay for compressor
Y20A	Relay for Selonoid Valve (SVA2)
Y20B	Relay for Selonoid Valve (SVA1)
Y20F	Relay for Selonoid Valve (SVF)
Outdoor Fan	Relay for Outdoor Fan.
YCH	Relay for Cranckcase heater

Indication of unit stoppage cause

14	Cause of stoppage	d1	01

00	Operation OFF, Power OFF
01	Thermo - OFF (Note 1)
02	Alarm (Note 2)
03	Freeze protection, overheating protection
05	Instantaneous power failure at outdoor unit, reset (Note 3)
06	Instantaneous power failure at indoor unit, reset (Note 4)
07	Stoppage of cooling process due to low outdoor temperature, stoppage of heating process due to high outdoor temperature
08	Compressor quantity changeover, stoppage (HP³8)
09	Demand of 4-way valve changeover stoppage (FX only)
10	Demand, enforced stoppage
11	Retry due to pressure ratio decrease
12	Retry due to low pressure increase
13	Retry due to high pressure increase
14	Retry due to abnormal current of constant speed compressor (HP>12)
15	Retry due to abnormal high temperature of discharge gas, excessive low suction pressure
16	Retry due to decrease of discharge gas superheat
17	Retry due to inverter tripping
18	Retry due to voltage decrease
19	Expansion valve opening change protection
20	Operation mode changeover of indoor unit (Note 5)
21	Enforced Thermo-OFF
22	Enforced Thermo-OFF, hot start control at crankcase heater preheating
26	Retry due to high pressure decrease
28	Cooling air discharge temperature control

NOTE:

1. *Explanation of Terms*
   Thermo-ON: A condition where an indoor unit is requesting the compressor to operate.
   Thermo-OFF: A condition where an indoor unit is not requesting the compressor to operate.
2. *Even if stoppage is caused by "Alarm", "02" is not always displayed.*
3. *If the transmission between the inverter printed circuit board and the control printed circuit board is not performed during 30 seconds, the stoppage cause is d1-05 and the alarm code "04" may be displayed.*
4. *If the transmission between the indoor unit and the outdoor unit is not performed during three minutes, the Indoor Units are stopped. In this case, the stoppage cause is d1-06 and the alarm code "03" may be displayed.*
5. *In the system "20" will be indicated at the diference between indoor units.*

Abnormal operation occurrence counter

15	Abnormal operation occurrence counter	E1	01
16	Instantaneous power failure occurrence counter in indoor unit	E2	00
17	Transmission error occurrence counter between remote control switch and indoor unit	E3	00
18	Abnormal operation occurrence counter on inverter	E4	00

Countable up to 99.
Over 99 times, "99" is always displayed.

NOTE:

1. *If a transmission error continues for three minutes, one is added to the occurrence counter.*
2. *The memorized data can be cancelled by the method which is explained in section 7.3.1 "Self-checking Procedure of PCB by means of the Remote Control Switch".*

Indication of automatic louver condition

19	Louver sensor	F1	00

Compressor pressure/frequency indication

20	Discharge pressure (high) (x 0.1 MPa)	H1	18
21	Suction pressure (low) (x 0.01 MPa)	H2	04
22	Control information	H3	44
23	Operation frequency (Hz)	H4	44

This is an indication for internal information for the remote control switch. This does not have any specific meaning

This is an indication for frequency of inverter.

Indoor unit capacity indication

24	Indoor unit capacity	J1	08
25	Outdoor unit code	J2	Fn
26	Refrigerant cycle number	J3	01
27	Refrigerant cycle number	J4	00

The capacity of the indoor unit is indicated as shown in the table below.

Capacity code of indoor unit

Indication code	Equivalent capacity (HP)
06	0.8
08	1.0
10	1.3
13	1.5
14	1.8
16	2.0
18	2.3
20	2.5
22	2.8
26	3.0/3.5
32	4.0
40	5.0
48	6.0
64	8.0
80	10.0

"n" indicates the total number of Indoor Units:

1~9	A	b	C	d	E	F	U
1~9	10	11	12	13	14	15	16

J3: 01 ~ 16 (01: when shipment (DSW5), Decimal indication

J4: 00 ~ 0F (00: when shipment (DSW5), Indication with 16 numbers

Expansion opening indication

28	Indoor unit expansion valve opening (%)	L1	20
29	Outdoor unit expansion valve MV1 opening (%)	L2	99
30	Outdoor unit expansion valve MV2 opening (%)	L3	99

In case of models without the expansion valve (MV2), the same figure is displayed

Estimated electric current indication

31	Compressor Running Current (A)	P1	25

The total current is displayed when several compressors are running. In case of the inverter compressor, the running current of the primary side of the inverter is displayed.

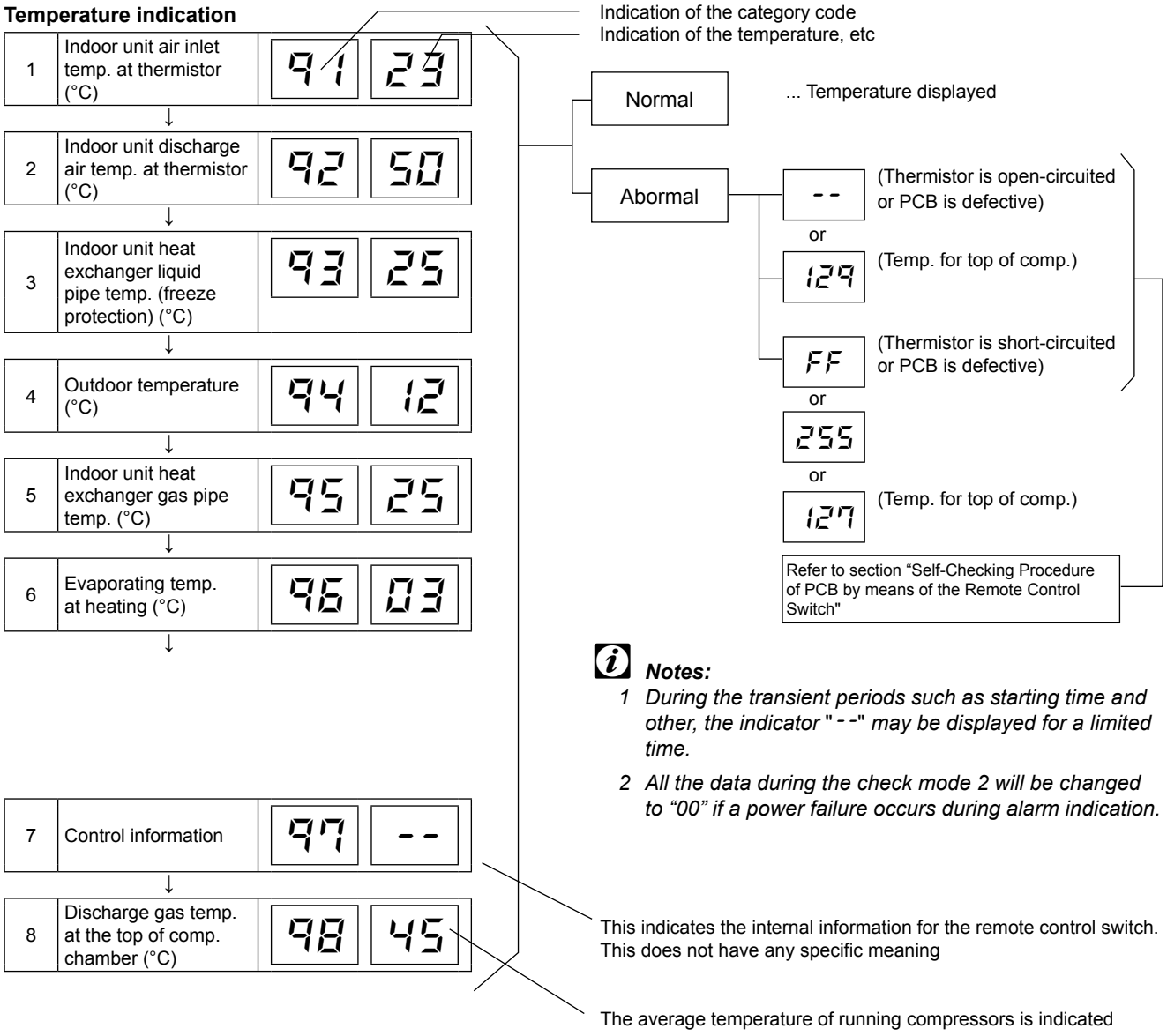
☛ Returns to **Temperature indication**

■ Contents of the Check mode 2

When more than three indoor units are connected to one remote control switch, the latest data of only the first three indoor units that are connected serially are displayed.

If you press the part "⌃" of the TEMP switch, the next display appears. If you press the part "⌄" of the TEMP switch, the previous display appears.

Temperature indication



Notes:

1. *During the transient periods such as starting time and other, the indicator "--" may be displayed for a limited time.*
2. *All the data during the check mode 2 will be changed to "00" if a power failure occurs during alarm indication.*

7

Compressor pressure/frequency indication

9	Discharge pressure (high) (x 0.1 MPa)	99	18
↓			
10	Suction pressure (low) (x 0.01 MPa)	9A	04
↓			
11	Control information	9b	44
↓			
12	Operating frequency (Hz)	9C	44
↓			

This indicates the internal information for the remote control switch.
This does not have any specific meaning

This is an indication for frequency of inverter

Expansion opening indication

13	Indoor unit expansion valve opening (%)	9d	20
↓			
14	Outdoor unit expansion valve opening (%)	9E	99
↓			

Estimated electric current indication

15	Compressor running current (A)	9F	20
↓			

The total value is indicated when two compressors are running

☛ Returns to **temperature indication**

7.2.4. Troubleshooting by means of the 7 segment display

■ **Simple checking by 7-segment display**

1	Turn ON all Indoor Inits connected to the Outdoor Unit
2	Turn ON the Outdoor Unit
3	Auto-addressing starts

Outdoor Unit, Circuit Board,PCB1

During auto-addressing, the following items can be checked using the outdoor unit's on-board 7-segment LED display:

1 Disconnection of power supply to the indoor unit.

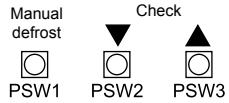
2 Reverse connection of the operating line between the outdoor and indoor units.

3 Duplication of indoor unit number.

■ **Checking method by 7-segment display**

Operating conditions and each part of refrigeration cycle can be checked by 7-segment display and push switches (PSW) on the PCB1 in the Outdoor Unit. During checking data, do not touch the electric parts except for the indicated switches because 220-240V is applied to them. Pay attention not to contact the tools with electrical parts. If contacted, electrical parts will be damaged

PSW switches



7-segments display

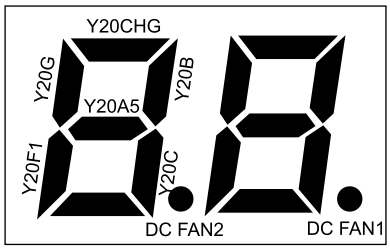
Checking procedure:

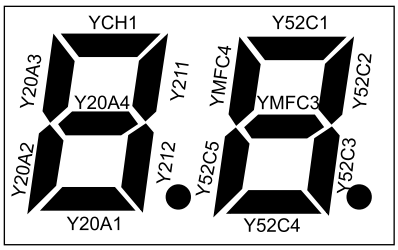
- To start checking, press PSW2 switch for more than three seconds.
- To proceed checking (forward), press the PSW2 switch for less than two seconds.
- To go back to the previous item (backward), press the PSW3 switch for less than two seconds.
- To cancel this checking, press the PSW2 switch for more than 3 seconds. The dfisplay will change to the indication one step before. Then press the PSW2 switch once again for more than three seconds.

CAUTION

Make sure that the checking mode is cancelled after the checking. Otherwise you may cause a malfunction.

No.	Item	Indication			Data	Values	Units
01	Output state of micro-computer		5	C	(see figure below)	(see table below)	





PCB Relay	Part name
Y20A1~A5	Relay for solenoid valve (SVA1~5)
Y20B Y20C Y20G Y20CHG Y20F1	Relay for solenoid valve (SVB/C/G/CHG/F1)
Y52C1~5	Relay for compressor
Y211 Y212	Relay for 4-way valve
YCH1	Relay for crankcase heater
DC FAN1, 2	Relay for 1st and 3rd fan at inverter speed
YMFC3, 4	Relay for 2nd and 4th fan at constant speed

Note:
Shadowed items are applicable only to FSN2 series

No.	Item	Indication			Data			Values	Units
02	Total of Thermo-ON indoor unit capacity		o	P	3	2	0	0 ~ 9999	x1/8 HP
03	Running frequency of inverter compressor MC1		H	1		7	4	0 ~ 115	Hz
04	Number of running compressors		C	C			5	0 ~ 5	
05	Air flow rate		F	o		1	6	0 ~ 16	(Fan step)
06	Outdoor expansion valve MV1 opening	o	E	1		4	2	0 ~ 100	%
07	Outdoor expansion valve MV2 opening (for 14 to 48HP)	o	E	2		4	2	0 ~ 100	%
08	Outdoor expansion valve MV3 opening (for 26 to 48HP)	o	E	3		4	2	0 ~ 100	%
09	Outdoor expansion valve MV4 opening (for 44 to 48HP)	o	E	4		4	2	0 ~ 100	%
10	Outdoor expansion valve MVB opening	o	E	b		1	3	0 ~ 100	%
11	Discharge pressure (high)		P	d	2.	8	0	-0.55 ~ 5.52	MPa
12	Suction pressure (low)		P	5	0.	6	0	-0.22 ~ 2.21	MPa
13	Discharge gas temp. on the top of compressor MC1 (TD1)	r	d	1		8	2	1 ~ 142	ºC
14	Discharge gas temp. on the top of compressor MC2 (TD2) (for 14 to 48HP)	r	d	2		8	5	1 ~ 142	ºC
15	Discharge gas temp. on the top of compressor MC3 (TD3) (for 18 to 48HP)	r	d	3		8	0	1 ~ 142	ºC
16	Discharge gas temp. on the top of compressor MC4 (TD4) (for 30 to 48HP)	r	d	4		8	2	1 ~ 142	ºC

No.	Item	Indication			Data			Values	Units
17	Discharge gas temp. on the top of compressor MC5 (TD5) (for 38 to 48HP)	r	d	5		8	4	1 ~ 142	ºC
18	Evaporating temperature TE1 at heating	r	E	1			2	-46 ~ 80 (-127 = Open circuited) (127 = Short circuited)	ºC
19	Evaporating temperature TE2 at heating (for 14 to 48HP)	r	E	2			2	-46 ~ 80 (-127 = Open circuited) (127 = Short circuited)	ºC
20	Evaporating temperature TE3 at heating (for 26 to 48HP)	r	E	3			2	-46 ~ 80 (-127 = Open circuited) (127 = Short circuited)	ºC
21	Evaporating temperature TE4 at heating (for 44 to 48HP)	r	E	4			2	-46 ~ 80 (-127 = Open circuited) (127 = Short circuited)	ºC
22	Ambient temperature (Ta)		r	o			7	-46 ~ 80 (-127 = Open circuited) (127 = Short circuited)	ºC
23	Auto-Charge temperature	r	C	H		3	0	-46 ~ 80 (-127 = Open circuited) (127 = Short circuited)	ºC
24	Supercooling temperature	r	5	C		1	5	-46 ~ 80 (-127 = Open circuited) (127 = Short circuited)	ºC
25	Estimated running current of compressor MC1		A	1		2	0	000 ~ 255	A
26	Estimated running current of compressor MC2 (for 14 to 48HP)		A	2		3	1	000 ~ 255	A
27	Estimated running current of compressor MC3 (for 18 to 48HP)		A	3		3	1	000 ~ 255	A
28	Estimated running current of compressor MC4 (for 30 to 48HP)		A	4		3	1	000 ~ 255	A
29	Estimated running current of compressor MC5 (for 38 to 48HP)		A	5		3	1	000 ~ 255	A
30	Indoor unit expansion valve opening (from 0 to 63)	'	E	00		4	5	0 ~ 100	%
		~			~				
		'	E	63			2		

7

No.	Item	Indication	Data	Values	Units
31	Indoor unit heat exchanger liquid pipe temperature (freeze protection) (from 0 to 63)	rL00 ~ rL63	35 ~ 25	-62 ~ 127	ºC
32	Indoor unit heat exchanger gas pipe temperature. (from 0 to 63)	rG00 ~ rG63	50 ~ 48	-62 ~ 127	ºC
33	Indoor unit air inlet temperature. (from 0 to 63)	r,00 ~ r,63	20 ~ 23	-62 ~ 127	ºC
34	Indoor unit discharge air temperature. (from 0 to63)	roo00 ~ roo63	40 ~ 30	-62 ~ 127	ºC
35	Indoor unit capacity setting. (from 0 to 63)	CA00 ~ CA63	32 ~ 16	(No.0 Unit) 6 ~ 160 (No. 63 Unit) 6 ~ 160	x1/8HP
36	Indoor unit cause of stoppage. (from 0 to 63)	d100 ~ d163	0 ~ 1	(No.0 Unit) 0 ~ 99 (No. 63 Unit) 0 ~ 99	
37	Pressure ratio fall protection degeneration control	c11	0	0: not in operation 1: in operation	
38	High pressure rise protection degeneration control	c13	1	0: not in operation 1: in operation	
39	Inverter fin temperature increase protection degeneration control	c14	0	0: not in operation 1: in operation	

No.	Item	Indication			Data			Values	Units
40	Discharge gas temp. decrease protection degeneration control	c	1	5			0	0: not in operation 1: in operation	
41	Discharge gas temp. increase protection degeneration control	c	1	6			0	0: not in operation 1: in operation	
42	Current protection degeneration control	c	1	7			0	0: not in operation 1: in operation	
43	Total accumulated hours of compressor MC1	U	J	1	2	1	9	0 ~ 9999	x10 times hours
44	Total accumulated hours of compressor MC2 (for 14 to 48HP)	U	J	2	2	1	9	0 ~ 9999	x10 times hours
45	Total accumulated hours of compressor MC3 (for 18 to 48HP)	U	J	3	2	1	9	0 ~ 9999	x10 times hours
46	Total accumulated hours of compressor MC4 (for 26 to 48HP)	U	J	4	2	1	9	0 ~ 9999	x10 times hours
47	Total accumulated hours of compressor MC5 (for 44 to 48HP)	U	J	5	2	1	9	0 ~ 9999	x10 times hours
48	Total accumulated hours of compressor MC1	cU	J	1	2	1	9	0 ~ 9999	x10 times hours
49	Total accumulated hours of compressor MC2 (for 14 to 48HP)	cU	J	2	2	1	9	0 ~ 9999	x10 times hours
50	Total accumulated hours of compressor MC3 (for 18 to 48HP)	cU	J	3	2	1	9	0 ~ 9999	x10 times hours
51	Total accumulated hours of compressor MC4 (for 26 to 48HP)	cU	J	4	2	1	9	0 ~ 9999	x10 times hours
52	Total accumulated hours of compressor MC5 (for 44 to 48HP)	cU	J	5	2	1	9	0 ~ 9999	x10 times hours
53	The latest alarm code cause of stoppage at outdoor unit		A	C		0	1	0 ~ 99	
54	Cause code of stoppage at inverter	,	F	C			2	0 ~ 16	
55	Cause code of stoppage at fan motor controller 1	F	F	C1			0	0 ~ 16	
56	Cause code of stoppage at fan motor controller 2	F	F	C2		1	1	0 ~ 16	

No.	Item		Indication			Data			Values	Units
57	Failure history	(Hystory No. 1) The latest failure	n	o	01		7	7	Integrated hours at alarm in indicated	Indication is automatically switched in every 1 second
		(Hystory No. 2)	n	o	02	A	C	48	Cause of stoppage	
			~			,	r	2	ITC indication	
		(Hystory No. 15) The oldest failure	n	o	15	F	1	--	FTC indication	
58	Total capacity setting of indoor unit			C	P	3	6	0	0 ~ 9999	x1/8HP
59	Total quantity of combined indoor unit			A	A			8	0 ~ 64	units
60	Address of refrigerant system			G	A			0	0 ~ 63	
						Return to Start "SC"				

■ Reset for accumulated operation time of compressor 1-5 after maintenance (cUJ1-cUJ5)

Procedure

Press PSW1 for 5 seconds while the accumulated operation time of compressor data is displayed.

Example of compressor 1

PSW2 ↑↓ PSW3

c	U	J	1	"cUJ1" (Accumulated operation time of compressor 1) will be indicated

PSW2 ↑↓ PSW3

	8	1	6	"Press PSW1 for 5 sec. while the accumulated operation time is displayed

↓

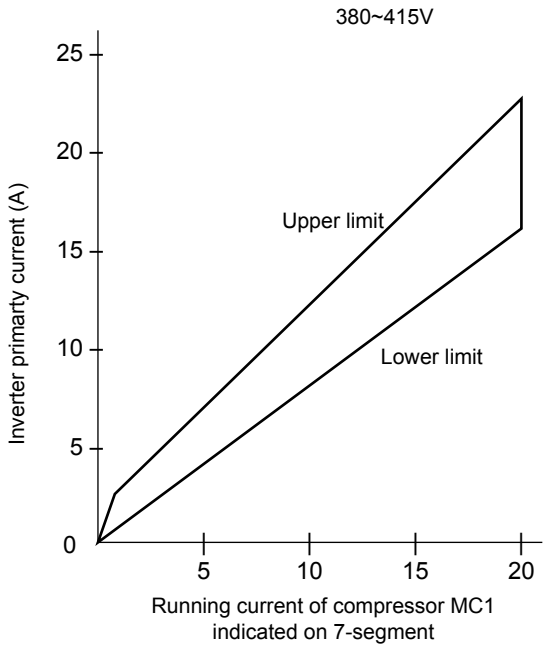
The indication will be changed to "0"
(The accumulated operation time of compressor 1 is "0"

			0

7.2.5. Running current of the compressor

■ **Inverter primary current**

The inverter primary current is estimated from the running current of the compressor MC1 displayed on the 7 segment display, as chart.



■ **Displayed running current of the compressor MC2, MC3, MC4, MC5**

The running current of the compressor MC2, MC3, MC4, MC5 is detected by the current sensor. (CT2 ~ CT5)

Cause code of stoppage for the inverter (content of check item "dFC")

Code	Cause	Cause of stoppage for correspondign unit	Remark	
			Indication during retry	Alarm code
1	Automatic stoppage of the transistor module (IPM Error) (overcurrent, decrease voltage, increase temperature)	17	P 17	53
2	Instantaneous overcurrent	17	P 17	48
3	Abnormal inverter fin thermistor	17	P 17	54
4	Electronic thermal activation	17	P 17	48
5	Inverter voltage decrease (Insufficient Voltage)	18	P 18	06
6	Voltage increase	18	P 18	06
7	Abnormal inverter transmission	-	-	04
8	Abnormal current sensor	17	P 17	51
9	Instantaneous power failure detection	18	-	-
11	Reset of micro-computer for inverter	18	-	53
12	Earth fault detection for compressor (only starting)	17	P 17	04,53
13	Abnormal power source phase	18	-	-
16	Inverter retry	18	P 18	55

Cause code of stoppage for Fan Controller (content of check item "FFC")

Code	Cause
1	Automatic stoppage of the transistor module (IPM Error) (overcurrent, decrease voltage, increase temperature)
2	Instantaneous overcurrent
3	Abnormal inverter fin thermistor
4	Electronic thermal activation
5	Inverter voltage decrease (Insufficient Voltage)
6	Voltage increase
7	Abnormal Inverter transmission
11	Reset of micro-computer for inverter
13	Abnormal power source phase
14	Abnormality of detection for fan motor position
16	Fan controller retry

7.2.6. Protection control code on the 7-segment display

1. Protection control code is displayed on 7-segment when a protection control is activated.
2. Protection control code is displayed while function is working, and goes out when released.
3. When several protection control are activated, code number with higher priority will be indicated (see below for the priority order).
   – Higher priority is given to protection control related to frequency control than the other.

Priority	Protection control
1	Pressure ratio control
2	High-pressure rise protection
3	Current protection
4	Inverter fan temperature rise protection
5	Discharge gas temperature rise protection

Priority	Protection control
6	Low-pressure decrease protection
7	4-way valve switching control
8	Low-pressure increase protection
9	Demand current control (running current limit control)

– In relation to retry control, the latest retrial will be indicated unless a protection control related to frequency control is indicated.

Code	Protection control
P01	Pressure ratio control (*)
P02	High pressure rise protection (*)
P03	Inverter current protection (*)
P04	Inverter fin temp rise protection
P05	Discharge gas temperature increase protection (*)
P06	Low pressure decrease protection
P09	High pressure decrease protection
P0A	Demand current control (Running current limit control)
P0d	Low pressure increase protection (*)

Code	Protection control
P11	Pressure ratio decrease retry
P12	Low pressure increase retry
P13	High pressure increase retry
P15	Vacuum/discharge gas temperature increase retry
P16	Discharge gas SUPERHEAT decrease retry
P17	Inverter trip retry
P18	Insuffcient voltage/excessive voltage retry
P26	Hifh pressure decrease retry

In the case that degeneration control is activated, C is indicated instead of 0 (* mark)

- The retry indication continues for 30 minutes unless a protection control is displayed.
- The retry indication disappears if the stop signal comes from all the rooms.

NOTE:
The protection control code that is displayed on the 7 segment display changes to an alarm code when the abnormal operation occurs. Also, the same alarm code is displayed on the remote control switch.

7.2.7. Activating condition of the protection control code

To monitor the conditions such as the temperature change and others, the control of the frequency and other controls are performed by the protection control in order to prevent the abnormal operations. The activating conditions of the protection control are shown in the table below:

Note:
Shadowed items are applicable only to FSN2 series

Code	Protection control	Activating condition	Remarks
P01	Pressure ratio control	Compression ratio ≥ 9 → Frequency decrease (Pd+0.1(Ps+0.06)) ≤ 2.2 → Frequency increase	Ps: Suction pressure of compressor [Mpa] Pd: Discharge pressure of compressor [Mpa]
P02	High-pressure increase protection	Pd ≥ 3.6 Mpa (36kgf/cm² G)→ Frequency decrease	
P03	Inverter current protection	Inverter output current ≥ 23.5A (380-415V) → Frequency decrease	-
P04	Inverter fin temp. increase protection	Inverter fin temp. ≥ 89°C → Frequency decrease	-
P04.	Fan motor controller fin temperature increase protection	Fan motor controller fin temperature ≥ 100 ºC	
P05	Discharge gas temperature increase protection	Temperature at the top of compressor is high → Frequency decrease (Maximum temperature is different depending on the frequency)	-
P06	Low-pressure decrease protection	Low-pressure is excessively low→ Frequency decrease (Minimum pressure is different depending on the ambient temperature)	-
P07	Reversing valve switching control	When switching ΔP<1.0MPa → Frequency increase ΔP>1.3MPa → Frequency decrease	ΔP = Pd - Ps
P08	Oil return control	Frequency less than (a) is maintained for more than1 hour → Frequency ≥ (a)	<table><tr><td></td><td>(a)</td></tr><tr><td>Cooling operation</td><td>75</td></tr><tr><td>Heating operation</td><td>84</td></tr></table>
P09	High-pressure decrease protection	Discharge pressure of compressor decrease → Frequency increase	
P0A	Demand current control (Running current imit control)	Compressor run current ≥ Demand setting value → Frequency decrease	Demand current setting value: Upper limit of total running current is set to 80%, 70%, 60% at normal operation using input on PCB1
P0C	Discharge gas SUPERHEAT decrease protection	Temperature of discharge gas is low (Td1 < Pd saturation temperature + 15 ºC) → Frequency increase (Frequency is different depending on temperature of discharge gas)	
P0d	Low-pressure increase protection	Low pressure ≥ 1.3MPa → Frequency increase	
P11	Pressure ratio decrease retry	Compression ratio (Pd+0.1/(Ps+0.06)≤1.8)	When it activates three times in 30 minutes, the alarm code “43” is displayed
P12	Low-pressure increase retry	Ps>1.5MPa	When it activates three times in 30 minutes, the alarm code “44” is displayed
P13	High-pressure increase retry	Pd>3.8MPa	When it activates three times in 30 minutes, the alarm code “45” is displayed
P14	Overcurrent retry of constant speed compressor	Current ≥ Maximum value (*1), or Current<1.0A	When it activates three times in 30 minutes, the alarm code “39” is displayed

Code	Protection control	Activating condition	Remarks
P 15	Vacuum/discharge gas temperature increase retry	In Case of Ps<0.09MPa for over 12 minutes, or discharge gas temperature ≥ 132°C for over ten minutes or discharge gas temperature ≥ 140 °C for over five seconds	When it activates three times in one hour, the alarm codes “47” (Ps) or “08” (Discharge gas) are displayed
P 16	Discharge gas SUPERHEAT decrease retry	Discharge gas SUPERHEAT less than ten (10) degrees is maintained for 30 minutes	When it activates three times in two hours, the alarm code “07” is displayed
P 17	Inverter trip retry	Automatic stoppage of transistor module, activation of electronic thermal or abnormal current sensor	When activating three times in 30 minutes, “48”, “51” and “53” alarm is indicated
P 17.	Fan motor controller trip retry	Automatic stoppage of fan controller (Electronic thermal activation or Micro-computer reset)	
P 18	Insufficient voltage/ excessive voltage retry	Insufficient/excessive voltage at the inverter circuit or CB connector part	When it activates three times in 30 minutes, the alarm code “06” is displayed
P26	High pressure decrease retry	Pd < 1.00MPa for 1 hour	No alarm
P27	AC fan motor protection device retry	Activation of internal thermostat of outdoor AC fan motor	When it activates three times in 30 minutes, the alarm code “09” is displayed

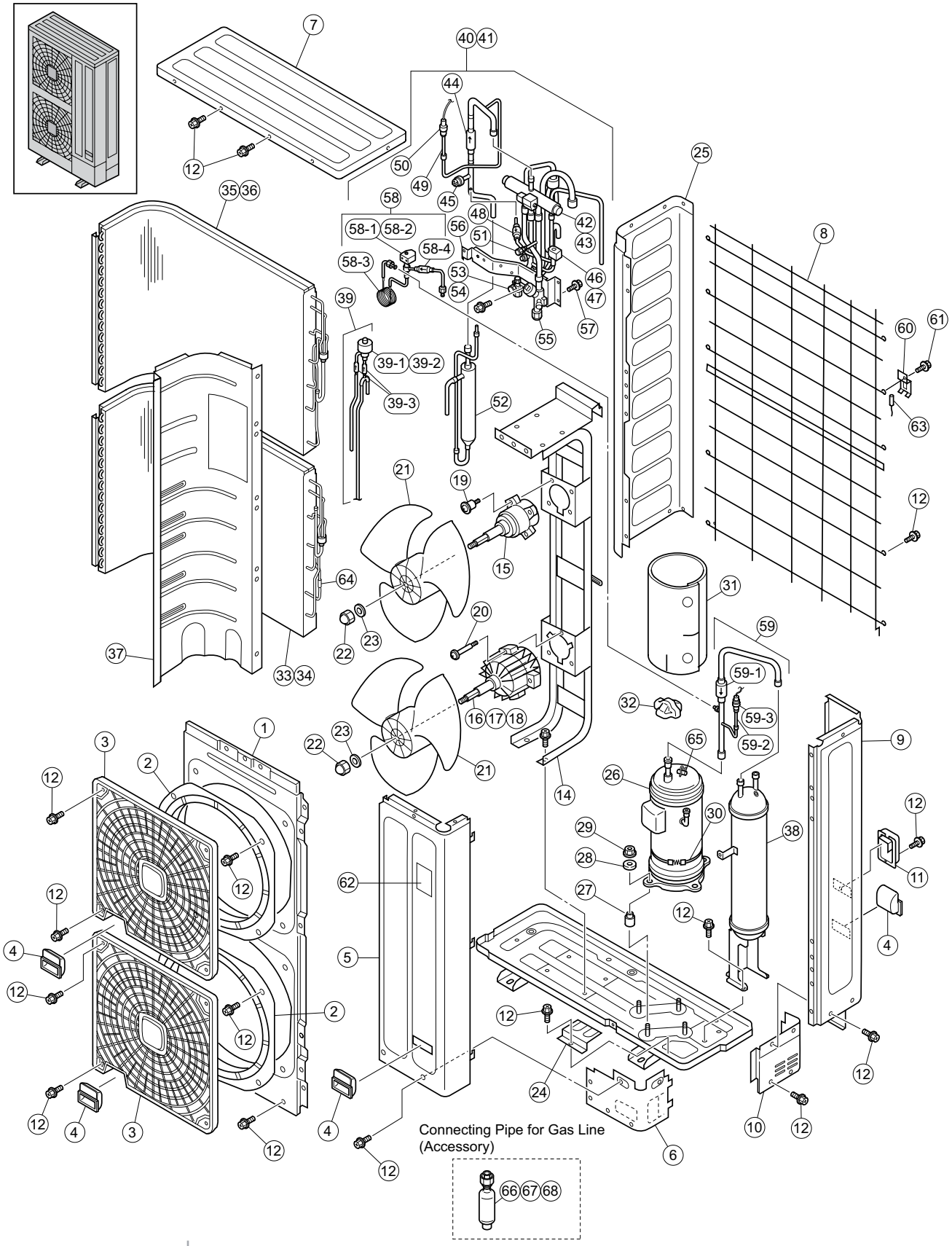
Ps: Suction pressure of compressor
Pd: Discharge pressure of compressor

8. Spare parts

Contents

8

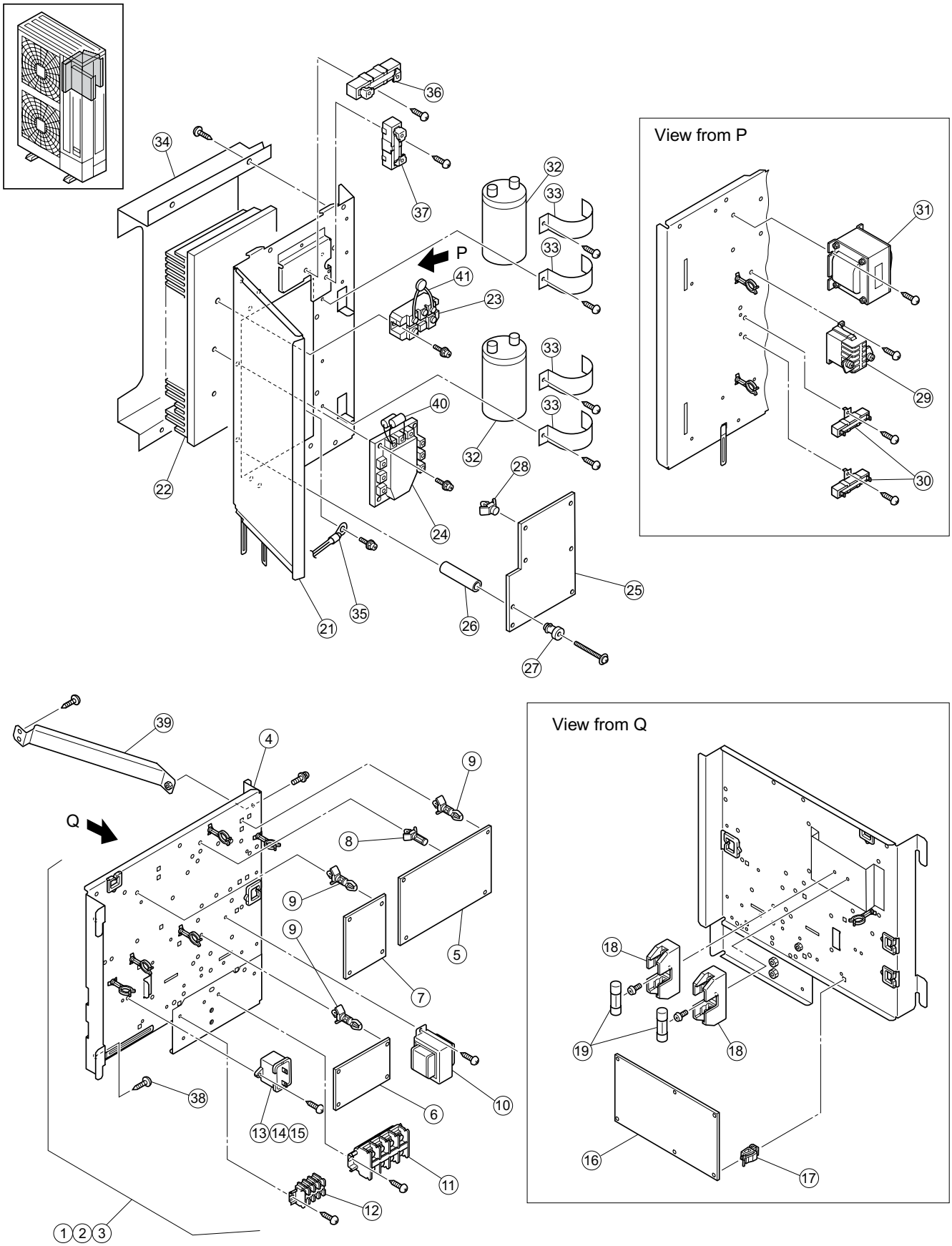
8.1. RAS-8~12FSNM(E) Structural and cycle parts



No.	Part Name	Remarks
1	Cabinet Panel	Shroud
2	Bell Mouse	
3	Air Grille	Air Outlet
4	Handle	
5	Cabinet Panel	Service Cover
6	Cabinet Panel	Lower Service Cover
7	Cabinet Panel	Upper Cover
8	Protection Net	
9	Cabinet Panel	Rear Cover
10	Piping Cover	Rear Piping Cover
11	H-Cover	
12	Screw	SUS, M5
13		
14	Motor Clamp	
15	Fan Motor	DC Fan Motor, MOF1 / DC170W, 8P
16	Fan Motor	AC Fan Motor, MOF2 / AC101W, 6P
17	Fan Motor	AC Fan Motor, MOF2 / AC115W, 6P
18	Fan Motor	AC Fan Motor, MOF2 / AC183W, 6P
19	Screw	SUS, M6
20	Screw	SUS, M8
21	Propeller Fan	f544
22	Closing Nut	
23	Washer	
24	Piping Cover	Bottom Piping Cover
25	Cabinet Panel	Side Cover
26	Compressor	E656DHD-65D2
27	Vibration Absorber	
28	Vibration Absorber	
29	Nut	
30	Oil Heater	40.8W
31	Soundproof Cover	
32	Rubber Cap	
33	Heat Exchanger	Lower Side
34	Heat Exchanger	Lower Side
35	Heat Exchanger	Upper Side
36	Heat Exchanger	Upper Side
37	Partition Plate	Assy
38	Accumulator	
39	EVO Assy	Assy
39-1	Expansion Valve	MV: Saginimiya, UKV-32D28
39-2	Coil	for MV: Saginimiya, UKV-U029E
39-3	Strainer	
40	Piping Assy	
41	Piping Assy	

No.	Part Name	Remarks
42	Reversing Valve	Saginomiya, STF-0712G
43	Coil	RVR: Saginomiya, STF-01AJ502D1
44	Check Valve	Nichiden Kougyou, ZGY-S55B-A
45	Pressure Switch	PSH (High): Saginomiya. ACB-1UB34
46	Solenoid Valve	SVA: Nichiden Kougyou, SR10D
47	Coil	for SVA: Nichiden Kougyou, SR10PA
48	Strainer	
49	PGC Joint	
50	Pressure Sensor	Saginomiya, NSK-BD050F-102 (for Discharge Side)
51	Check Joint	
52	Oil Separator	
53	Stop Valve	for Liquid Line
54	Stop Valve	for Liquid Line
55	Stop Valve	for Gas Line
56	Valve Stay	
57	Screw	M5
58	Solenoid Valve Assy	SVF Assy
58-1	Solenoid Valve	SVF: Nichden Kougyou, SR10D
58-2	Coil	for SVF: Nichiden Kougyou, SR10PA
58-3	Capillary Tube Assy	
58-4	Strainer	
59	Piping Assy	S-Pipe Assy
59-1	Strainer	
59-2	PGC Joint	
59-3	Pressure Sensor	Saginomiya, NSK-BD020F-102 (for Suction Side)
60	Thermo Attaching Plate	
61	Screw	SUS, M5
62	HITACHI Label	
63	Thermistor	TA
64	Thermistor	TE
65	Thermistor	TD
66	Accessory Pipe	
67	Accessory Pipe	
68	Accessory Pipe	

8.2. RAS-8~12FSNM(E) Electrical parts



No.	Part Name	Remarks
1	Attaching P-Plate Assy	
2	Attaching P-Plate Assy	
3	Attaching P-Plate Assy	
4	Attaching P-Plate	
5	Printed Circuit Board	PO081-S
6	Printed Circuit Board	PO084
7	Printed Circuit Board	PO083-S
8	Plastic Material	Spacer
9	Plastic Material	Spacer
10	Transformer	
11	Terminal Board	4P, M5, 600VAC 50A for Power Source
12	Terminal Board	4P, M4, 250VAC 20A for Transmitting
13	Capacitor	440VAC, 7μF
14	Capacitor	440VAC, 8μF
15	Capacitor	440VAC, 10μF
16	Noise Filter	
17	Plastic Material	Holder
18	Fuse Holder	
19	Fuse	40A

No.	Part Name	Remarks
20	Power Plate Assy	
21	Power Plate	
22	Radiation Fin	
23	Diode Module	
24	Transistor Module	
25	Printed Circuit Board	PV041-S for Inverter
26	Plastic Material	Collar
27	Plastic Material	Bush
28	Plastic Material	Spacer
29	Mag. Contactor	CMC1: Fuji Electric Co. Ltd, FC-0/SP
30	Resistor	RS1, RS2
31	Reactor	DCL
32	Capacitor	400VAC□4700μF
33	Saddle	
34	Fin Cover	
35	Thermistor	Fin Thermistor
36	Resistor	R1
37	Resistor	R2
38	Screw	
39	Stay	
40	Capacitor Assy	Herness PC301 (CS1, CS2)
41	Noise Suppressor	ZNR Assy

9. Servicing

Contents

9.1. Outdoor Unit FSNM(E)

Remove the main parts according to the following procedures.

To reassemble, perform the procedures in reverse.

To prevent contamination of the refrigerant with water or foreign particles, do not expose to the atmosphere for long periods.

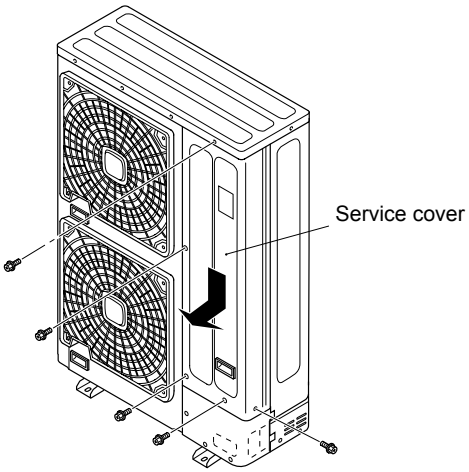
If necessary, seal pipe ends using caps or tape.

9.1.1. Removing service cover

Remove the five (5) fixing screws, slide the service cover downward and remove.

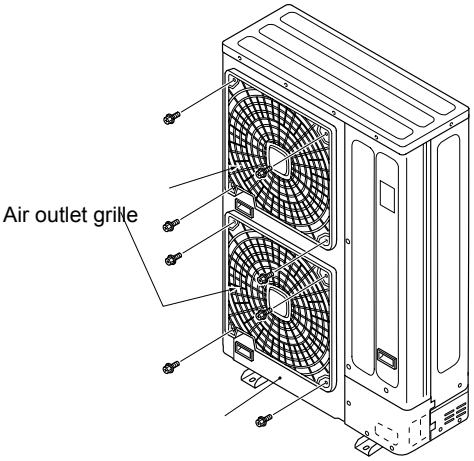
Pay attention not to fall off the service cover.

Pay attention not to be injured by the edge of the cover.



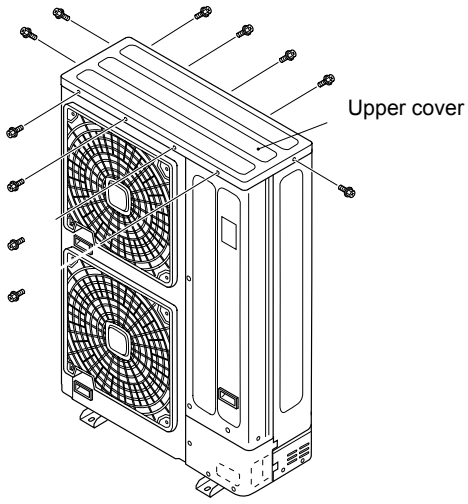
9.1.2. Removing air outlet grille

Remove the eight (8) fixing screws of the shroud.



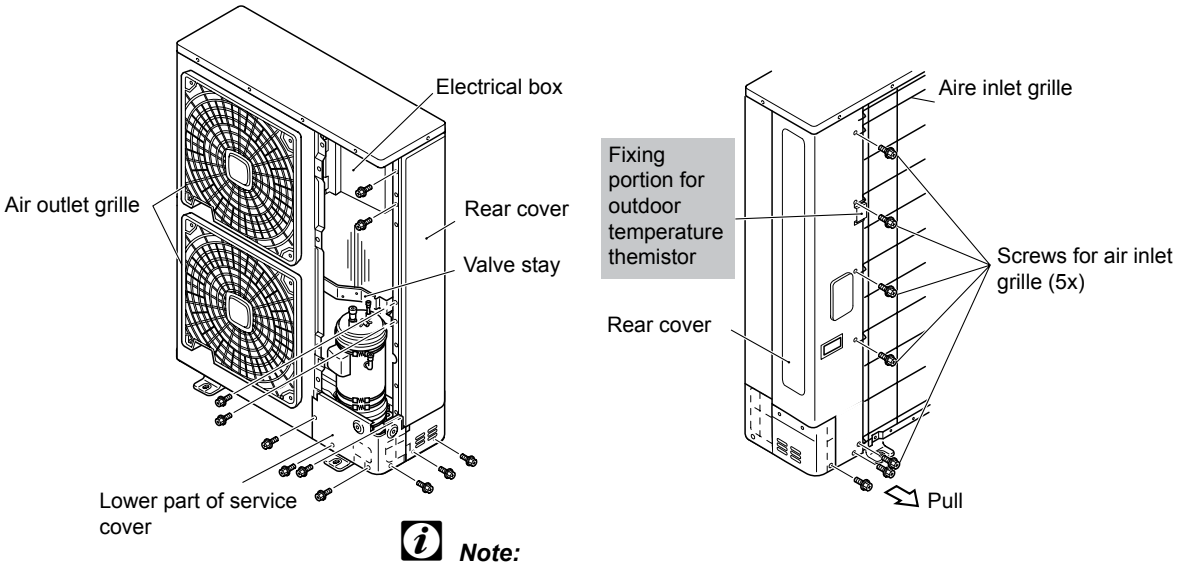
9.1.3. Removing upper cover

Remove eleven (11) screws fixing the upper cover and remove the upper cover upward.



9.1.4. Removing the lower part of service cover and rear cover

1 Remove the service cover according to the item “Removing service cover”.
2 Remove five (5) screws fixing the lower part of service cover and remove the lower part of service cover by pulling towards front side.
3 Remove the upper cover according to the item “Removing upper cover”.
4 Remove fourteen (14) screws fixing the rear cover and remove the rear cover by pulling towards rear side. (Air inlet grille, electrical box, valve stay)



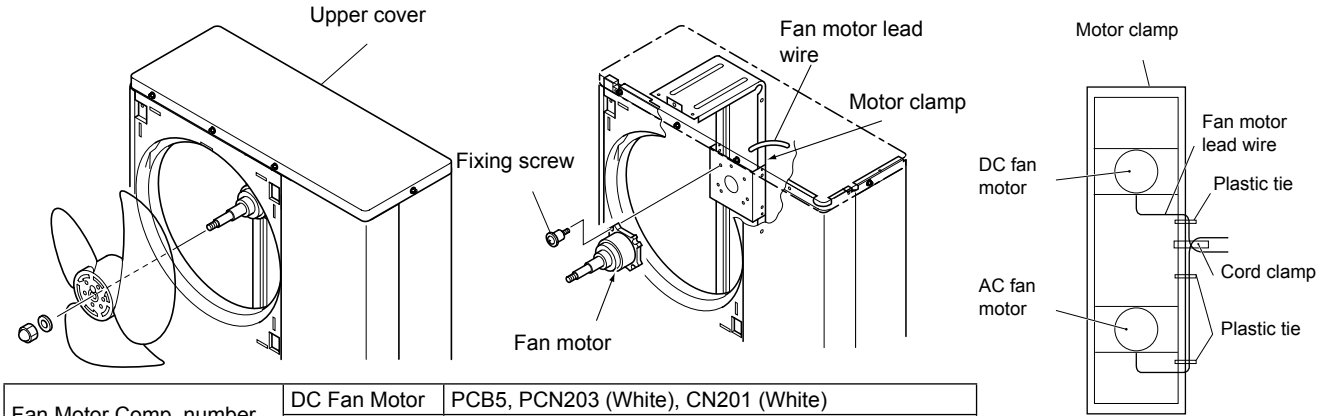
Note:
The screw length for fixing outdoor temperature thermistor is different with other screws.

9.1.5. Removing outdoor fan motor

1 Remove the service cover according to the item “Removing service cover”.
2 Remove the air outlet grille according to the item “Removing air outlet grille”.
3 Remove the upper cover according to the item “Removing upper cover”.
4 Remove the propeller fan by removing the cap nuts and washers fixing the propeller fan onto the motor shaft. (If it is difficult to remove the fan, use puller.)
5 Remove the DC fan motor connector from the PCB5: PCN203 (white) and CN201 (white) and AC fan motor connector from the PCB3: PCN404 (white) at the electrical box.

Cut off the plastic tie for fan motor lead wire fixing at the motor clamp with a nipper.

Remove four (4) M8 screws with spacer fixing the motor.



Fan Motor Comp. number	DC Fan Motor	PCB5, PCN203 (White), CN201 (White)
	AC Fan Motor	PCB3, PCN404 (White)
Screw for Motor Fixing	DC Fan Motor	M6 Screw, with Spacer x 4
	AC Fan Motor	M8 Screw x 4

NOTES:

1 *Fix the motor wire with the plastic tie or the cord clamp. If not, it may cause the disconnection to the fan.*

2 *Mount the rubber bush at the partition plate when inserting the motor wire through the partition plate. If not, it may cause the disconnection to the fan motor lead wire.*

3 *When mounting the motor, ensure the cables point directly downward. Fix the protection tube edge downward to ensure the water may not keep in it.*
(Adjust the clearance between shroud and propeller fan so that they do not contact.)

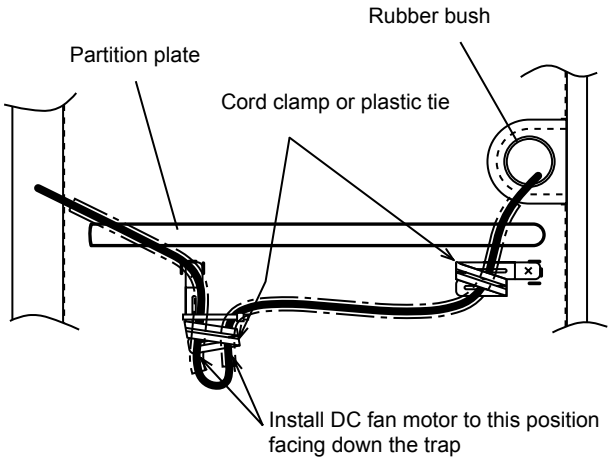
4 *Fix the motor wires onto the motor clamp with a plastic tie to prevent them obstructing the propeller fans.*

5 *Mounting Propeller Fan*

Insert the skidding protection part of fan boss in accordance with the cutting part of the motor shaft, and fix the screw after exserting screw part of the shaft. (Tightening Torque of 20 N•m)

6 *When connecting the motor wire, check to ensure that the colors of the connectors on the PCB3 and PCB5 are matched with wires.*

7 *Firmly fix the air outlet grille to the shroud.*



9.1.6. Removing Electrical Box

1 Remove the service cover according to the item 2.1 “Removing Service Cover”.

2 Remove the upper cover according to the item 2.3 “Removing Upper Cover”

3 Remove six (6) fixing screws for electrical box.

4 Lift the electrical box and remove it.

NOTES:

The wiring disconnecting works are required as follows when removing the electrical box.

1 *Remove reversing valve coil according to the item “Removing Reversing Valve Coil and Solenoid Valve Coil”.*

2 *Remove electronic expansion valve coil according to the item “Removing Electronic Expansion Valve Coil”.*

3 *Remove solenoid valve coil according to the item “Removing Reversing Valve Coil and Solenoid Valve Coil”.*

4 *Disconnect the faston terminal of the high pressure switch.*

5 *Disconnect the connectors on the PCB1 as follows.*

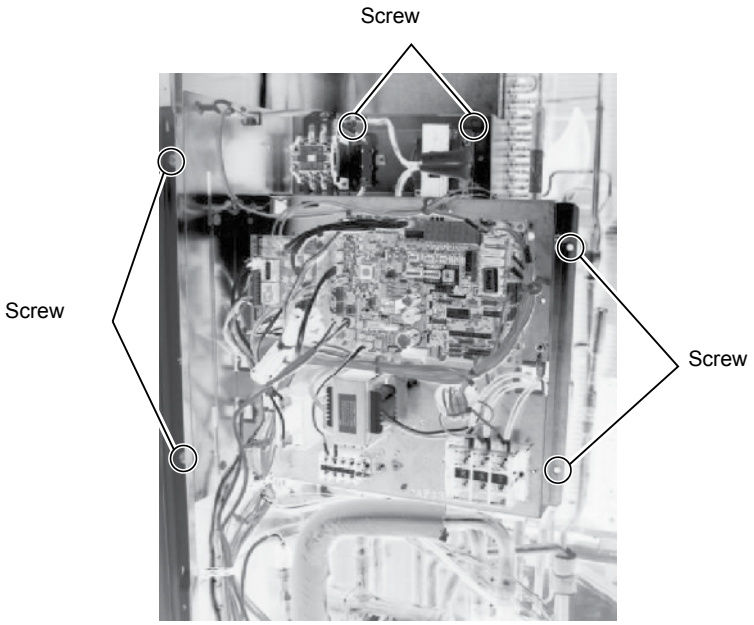
- *THM7 (Thermistor for Ambient Temperature)*
- *THM8 (Thermistor for Heating Evaporation Temperature)*
- *THM9 (Discharge Gas Thermistor)*
- *PCN5 (Oil Heater)*
- *CN4 (High Pressure Switch)*
- *CN9 (Low Pressure Sensor)*

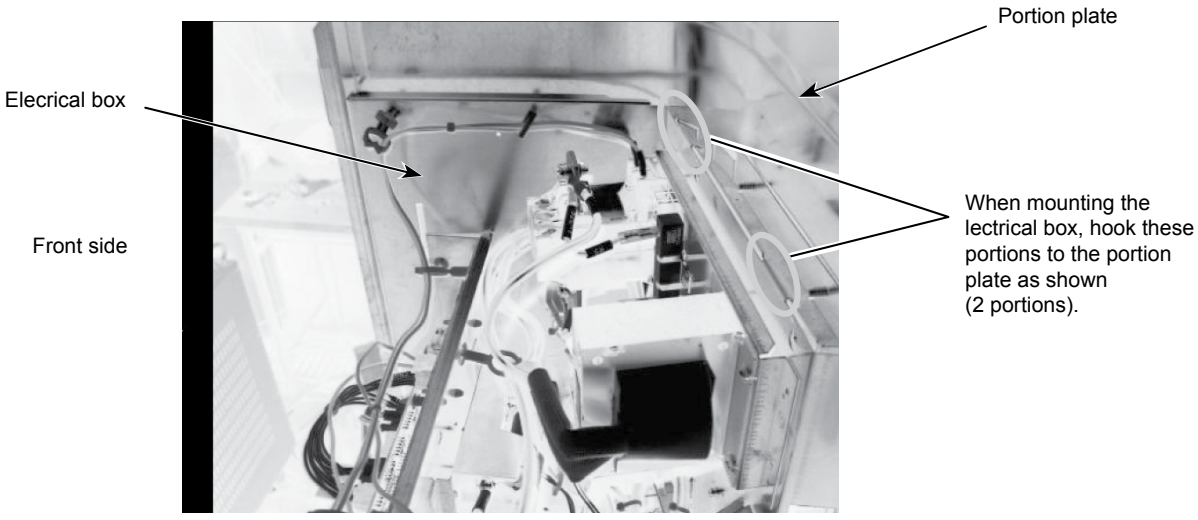
6 Disconnect the connectors on the PCB3 and PCB5 as follows

– PCB5: PCN203, CN201 (for DC Fan Motor)
– PCB3: PCN404 (for AC Fan Motor)

7 Disconnect the compressor wires from the compressor terminal box.

8 Reassemble the electrical box in the reverse order of removing procedures.





9.1.7. Removing compressor

1 Remove the service cover and the lower part of the service cover according to the item “Removing service cover” and the item “Removing the lower part of service cover and rear cover”. In case that the outdoor unit is installed to the wall closely, remove the outdoor unit from the wall.

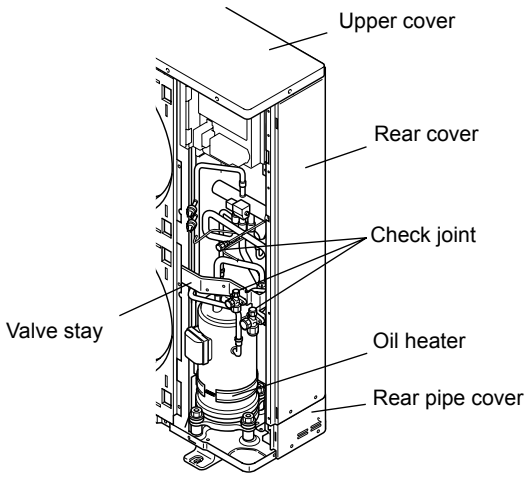
2 Collect the refrigerant from the check joint. Collect the refrigerant from the liquid stop valve, gas stop valve and check joint at piping.

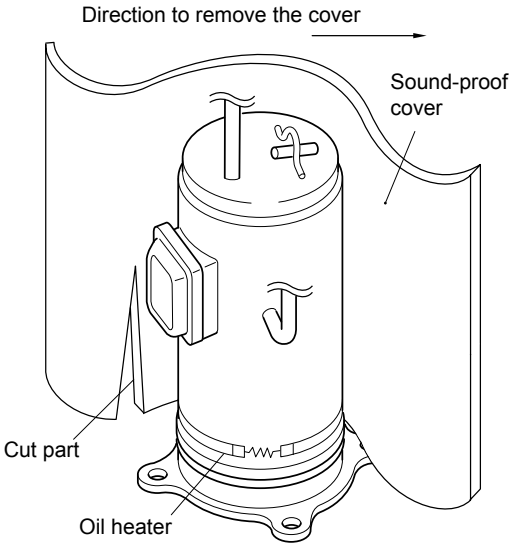
3 Open the soundproof cover wrapping around the compressor and remove the terminal box cover at the compressor. Disconnect the compressor wires in the terminal box and remove the soundproof cover.

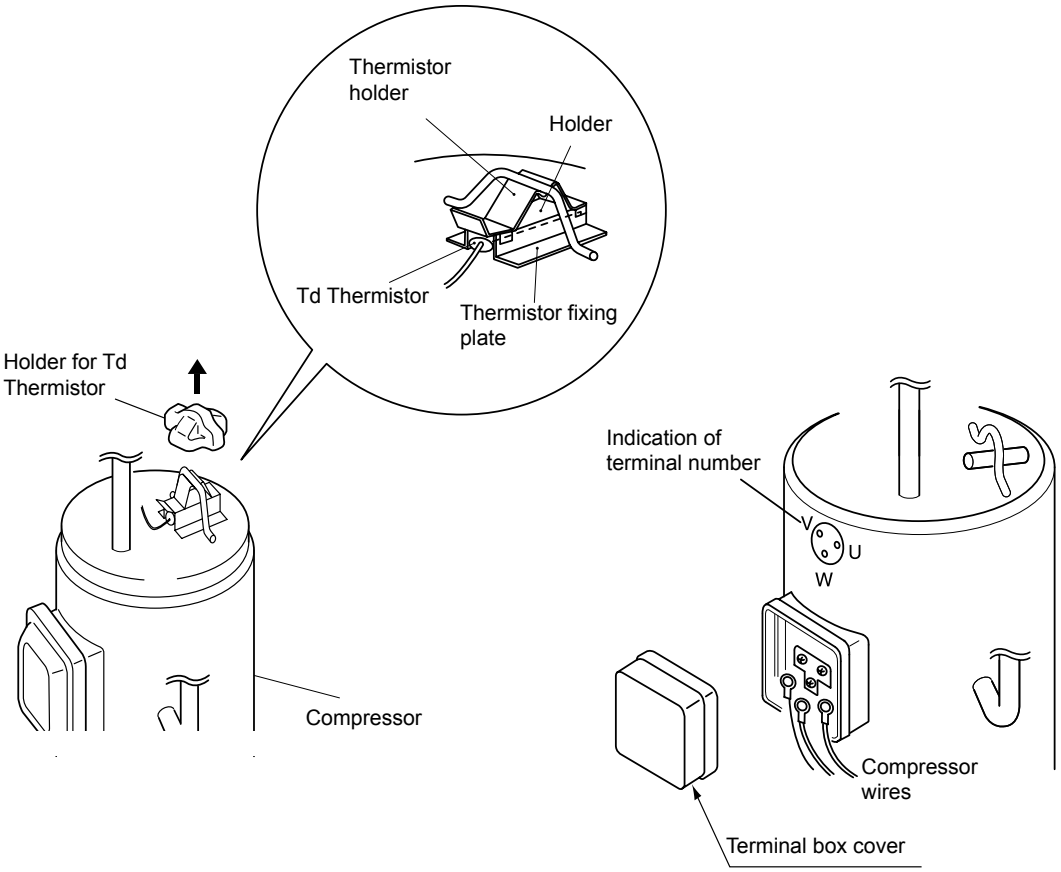
NOTE:
Check to ensure each terminal Nos. and indications. If wires are connected in incorrect order at reassembling, it will lead to compressor failure.

4 Remove the holder for Td thermistor and the thermistor on the top of the compressor according to the figure on the next page.

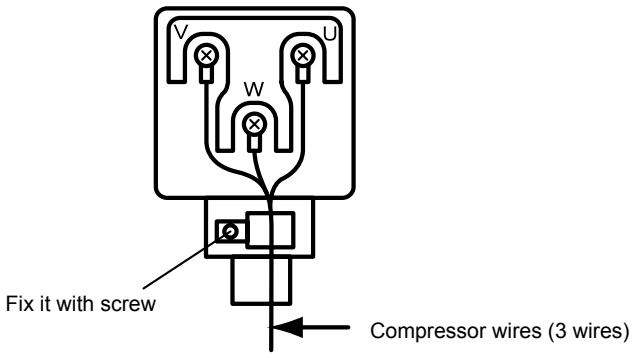
5 Remove the oil heater.







Details for compressor terminals



6 Remove the suction pipe and discharge pipe from the compressor.

Isolate the wires and electrical components to protect from the burner flame at brazing.

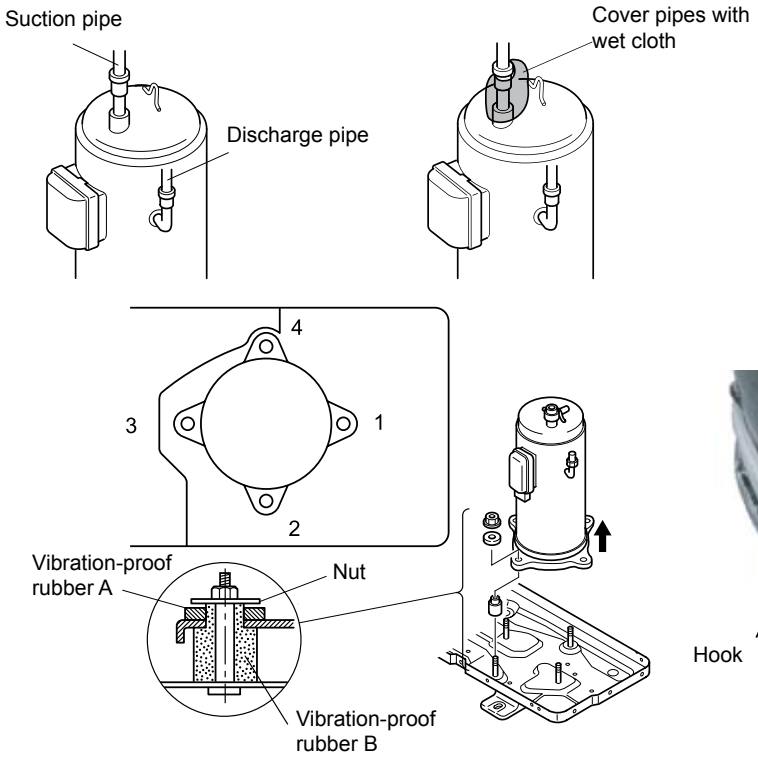
7 Remove two (2) nuts fixing the compressor and remove the compressor from the unit by lifting in the condition of slightly inclining forward.

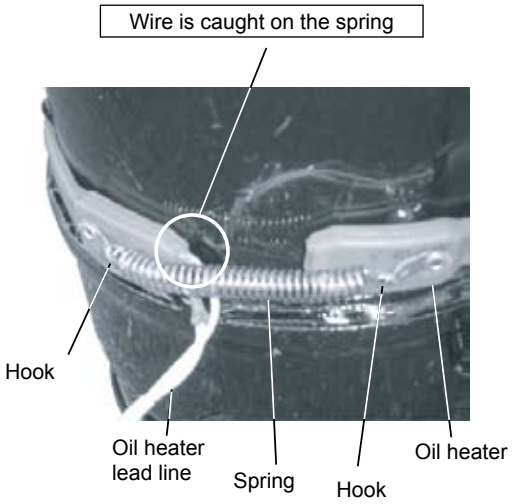
8 When brazing the replaced compressor, quickly perform the brazing while the compressor side piping is cooled with wet cloth in order to avoid the brazing material from entering the compressor.

If the brazing material enters the compressor, it will lead to compressor failure.

9 Reassemble the parts in the reverse order of removing procedures.

– Tighten the screws (U, V and W) for compressor wires with 2.5N•m.
– Fix the lead wire firmly.
– Attach the oil heater firmly to the compressor and fix it with spring as shown in the figure.





Compressor position	1	2	3	4
Vibration-proof rubber A	○	○	○	○
Vibration-proof rubber B	○	○	–	–
Nut	○	○	–	–

NOTES:

1. *The compressor is connected by brazing. Check to ensure whether there are flammable things around or not when using a burner for pipe connections. If not, oil existing pipe inside may ignite.*
2. *Do not expose the refrigerant cycle to the atmosphere for a long period in order to avoid mixing the water and foreign particles into the refrigerant cycle. After removing compressor, replace it quickly. If exposed for a long period, seal the suction pipe and discharge pipe.*
3. *Remove the cap for the compressor just before replacing the compressor. Before mounting the compressor, seal the suction pipe and discharge pipe with a tape to protect the compressor from foreign particles. Remove the tape at pipe connection.*
4. *Match the terminal No. with the mark band No. when reassembling. If the wiring is connected incorrectly, the compressor may be damaged due to reverse rotation.*
5. *Fix the lead wire for the compressor firmly not to contact with metal sheet edge and high temperature piping.*
6. *If there is a clearance between the oil heater and the compressor due to wire overlapping, excessive heat is generated there. Then oil heater is failed due to overheating. When mounting the reassembled oil heater, this point should be taken into account.*
7. *If the oil heater lead wire is caught on the spring, the lead wire may be cut due to vibration.*

   When reassembling, attention should be paid to the lead wire.

9.1.8. Removing high pressure switch

1 Remove the service cover according to the item “Removing Service Cover”.

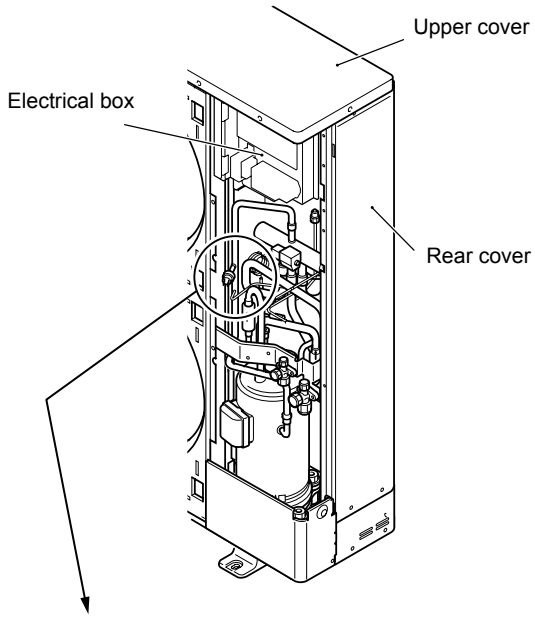
2 Collect the refrigerant from the check joint according to the item “Removing Compressor”.

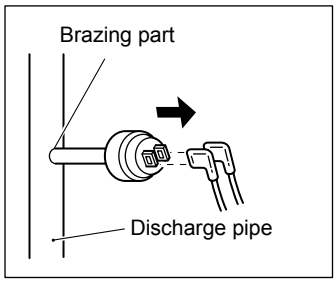
3 Pull out the fasten terminals.

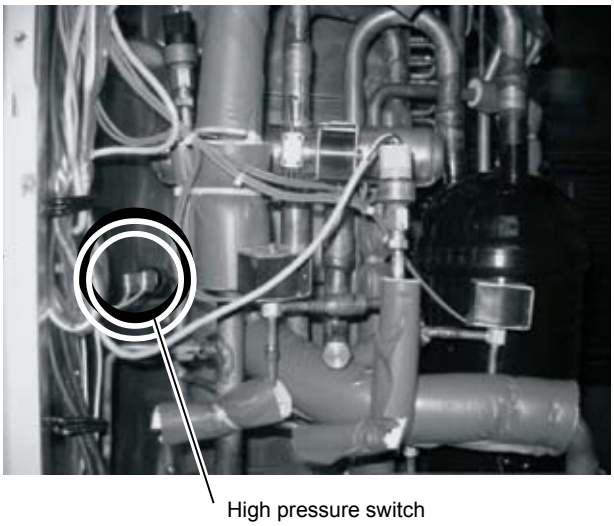
Remove the high pressure switch from the brazing part of the discharge pipe.

CAUTION:

Check to ensure whether there are flammable things around or not when using a burner. And remove the insulations before brazing work. If not, fire may occur.





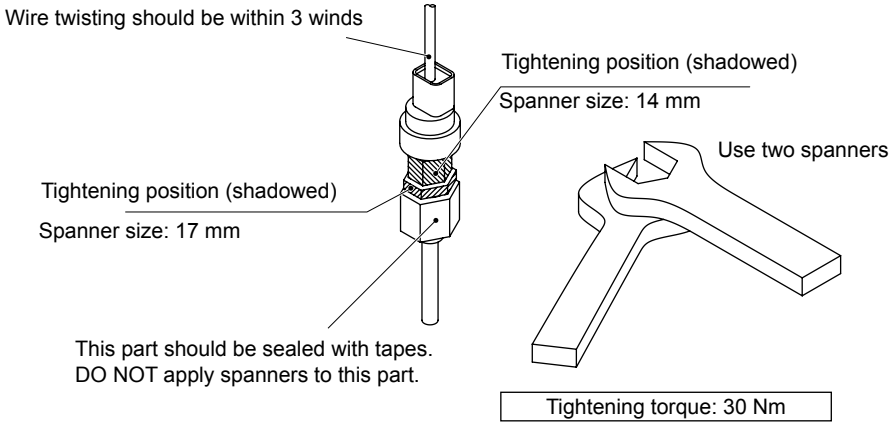


9.1.9. Removing high pressure sensor and low pressure sensor

1 Remove the connector for the pressure sensor wiring from PCB1

NOTE:
Remove the connector firstly. If not, the wiring may be damaged.

2 Remove the refrigerant piping for the high pressure sensor or low pressure sensor by use of two spanners.

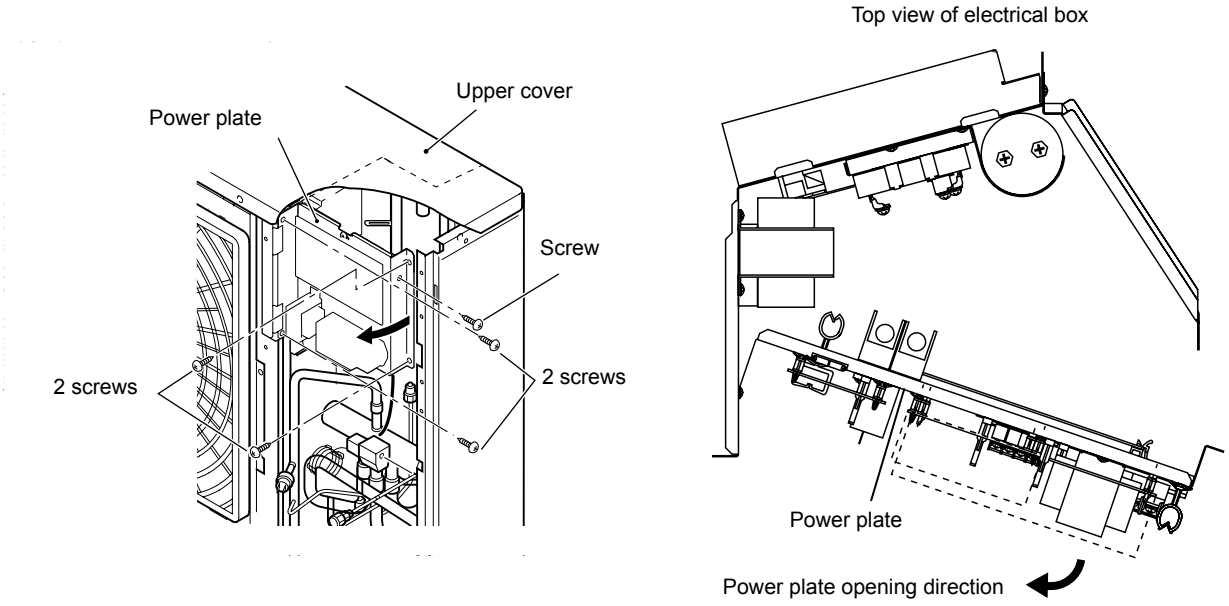


9.1.10 Opening electrical box (Power plate)

1 Remove the service cover according to the item “Removing service cover”.

2 Remove five (5) screws fixing the electrical box. Open the power plate by rotating 90 degrees to the left.
Check to ensure the LED201 (Red) of the inverter PCB (PCB2) is OFF when opening the power plate.

NOTE:
Do NOT touch the electrical components when the LED201 (Red) is ON to avoid electrical shock.



9.1.11. Removing reversing valve coil and solenoid valve coil (SVA, SVF)

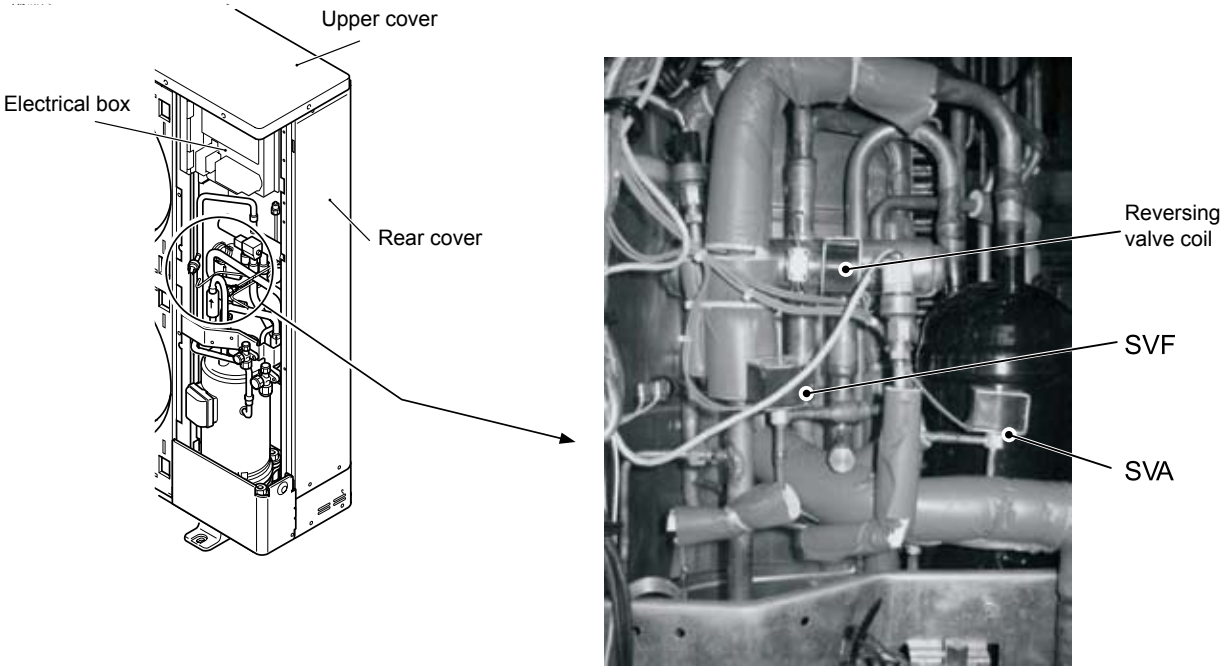
1 Remove the service cover according to the item “Removing service cover”.

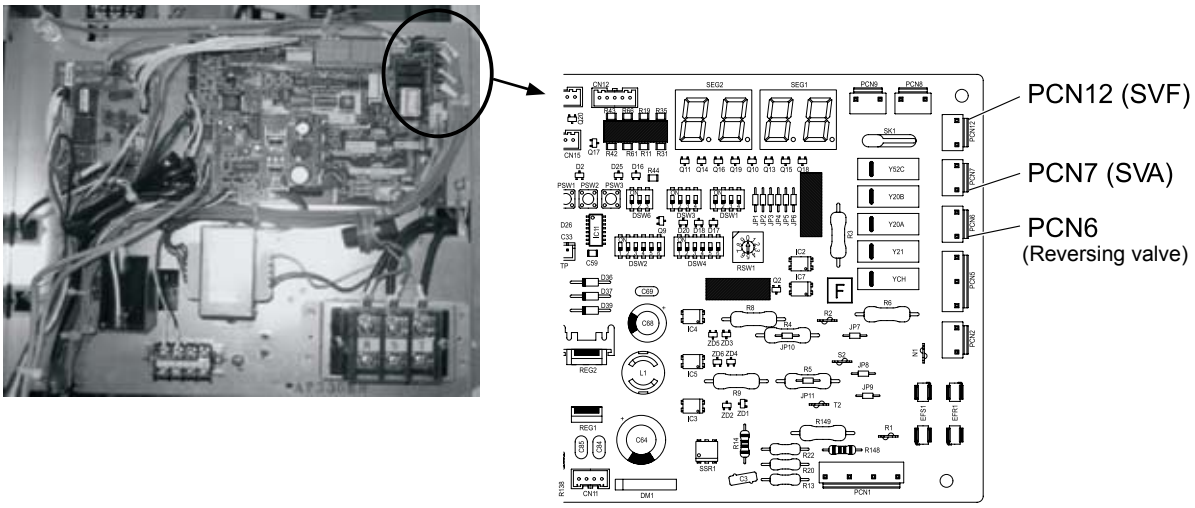
2 Open the power plate according to the item “Opening electrical box (Power plate)”.
Check to ensure the LED201 (Red) of the inverter PCB (PCB2) is OFF.

NOTE:
Do NOT touch the electrical components when the LED201 (Red) is ON to avoid electrical shock.

3 Remove the connectors (PCN12, PCN7, PCN6) on the control PCB (PCB1) of the electrical box.

4 Remove the reversing valve coil and solenoid valve coils by removing one (1) screw fixing each coil.





Enlarged view fo PCB1

9.1.12.Removing electronic expansion valve coil

1 Remove the service cover according to the item “Removing service cover”.

2 Open the power plate according to the item “Opening electrical box (Power plate)”.

Check to ensure the LED201 (Red) on the inverter PCB (PCB2) is OFF.

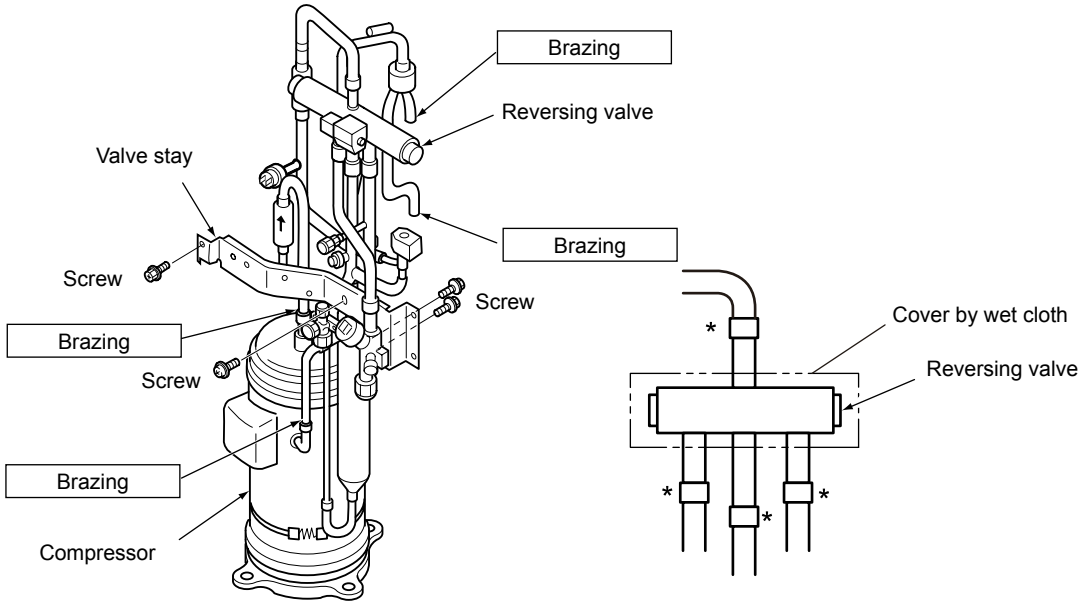
NOTE:
Do NOT touch the electrical components when the LED201 (Red) on the inverter PCB (PCB2) is ON to avoid electrical shock.

3 Remove the CN5A connector on the control PCB (PCB1) of the electrical box.

4 Hold the electronic expansion valve coil, slightly rotate, and then pull it up. Refer to the figure below and replace the electronic expansion valve coil. The lock mechanism is equipped with the electronic expansion valve coil. Check to ensure that the electronic expansion valve coil is locked.

9.1.13. Removing reversing valve

1 Remove the service cover and rear service cover according to the item “Removing service cover” and the item “Removing lower part of service cover and rear cover”.
2 Collect the refrigerant from the check joint according to the item “Removing compressor”.
3 Remove the reversing valve coil according to the item “Removing reversing valve coil and solenoid valve coil”.
4 Remove the electrical box according to the item “Removing electrical box”.
5 Remove two (2) fixing screw for valve stay.
6 Remove the stop valves from the valve stay by removing four (4) screws.
7 Remove the reversing valve assemblies from the designated positions. (4 brazing parts)
   Remove the brazing of the reversing valve and the stop valve at gas side by cooling with wet cloth.
   Protect the connecting wires and pipe insulation from brazing work.
8 Remove the reversing valves from the assemblies (4 portions with (*) mark in the figure below).
   Perform the brazing to remove and reassemble the reversing valve by cooling with wet cloth.
9 Reassemble the parts in the reverse order of removing procedures. When SVF (solenoid valve) is removed, fix it according to the item “Removing solenoid valve”.



9.1.14.Removing electronic expansion valve

1 Remove the service cover and rear cover according to the item “Removing service cover” and the item “Removing the lower part of service cover and rear cover”.

2 Collect the refrigerant from the check joint according to the item “Removing compressor”.

3 Remove the coil according to the item “Removing electronic expansion valve coil”.

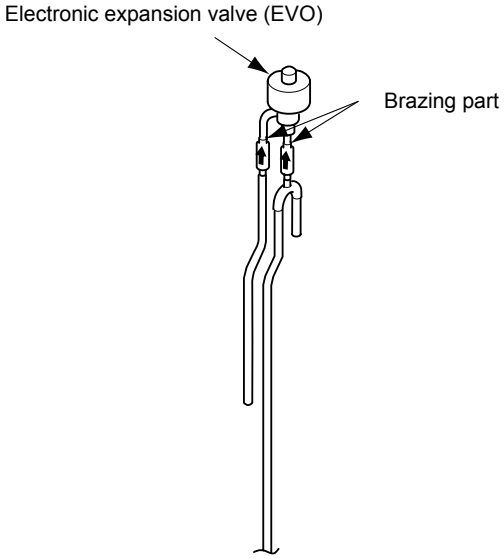
4 Remove the brazing as shown in the figure below.

Electronic Expansion Valve (EV0): 2 brazing parts.

– Perform the brazing to remove and reassemble the electronic expansion valve by cooling with wet cloth.

– Protect the connecting wires and pipe insulation from brazing work.

5 Reassemble the parts in the reverse order of removing procedures.



9.1.15. Removing solenoid valve

1 Remove the service cover and rear cover according to the item “Removing service cover” and the item “Removing the lower part of service cover and rear cover”.

2 Collect the refrigerant from the check joint according to the item “Removing compressor”.

3 Remove the solenoid valve coil according to the item “Removing reversing valve coil and solenoid valve coil”.

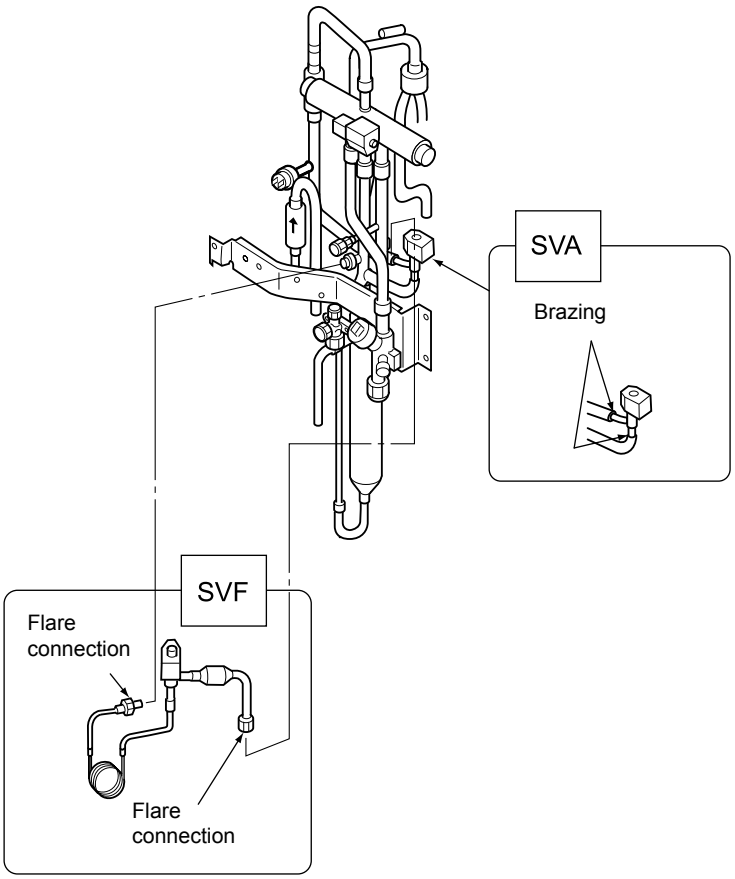
4 Remove the brazing and flare nuts as shown in the figure below.

Solenoid Valve (SVA): 2 brazing parts

Solenoid Valve (SVF): 2 flare nuts

– Perform the brazing to remove and reassemble the solenoid valve by cooling with wet cloth.
– Protect the connecting wires and pipe insulation from brazing flame.
– Remove the flare nuts with two spanners to avoid twisting.

5 Reassemble the parts in the reverse order of removing order.



9.1.16.Remove the control PCB (PCB1)

1 Remove the service cover according to the item “Removing service cover”.

2 Disconnect all the wires connected with the control PCB (PCB1).

3 Clamp the hook of the four (4) holders by long-nose pliers and remove by sliding toward front side.

NOTES:

1. Use the long-nose pliers when disconnecting faston terminal (R1, N1, R2, T2, S2).

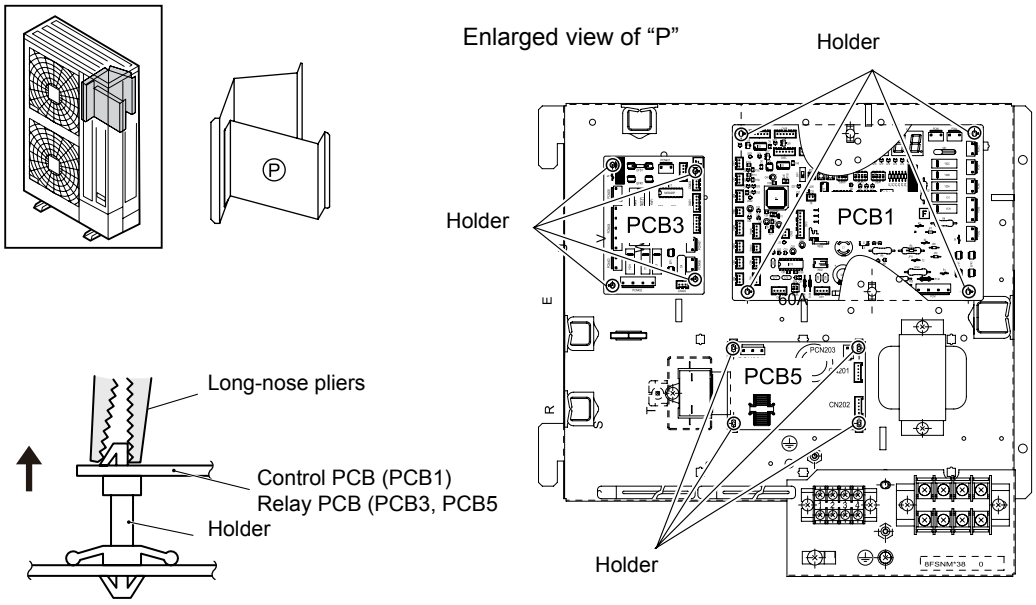
2. In case of replacing the control PCB (PCB1), set all the dip switches and jumper cables as the same position before replacing. If not, malfunction pay occur.

9.1.17.Removing Relay PCB (PCB3, PCB5)

1 Remove the service cover according to the item “Removing service cover”.

2 Disconnect all the wires connected with the relay PCB (PCB3, PCB5).

3 Clamp the hook of the four (4) holders by long-nose pliers and remove by sliding toward front side.



9.1.18. Removing inverter components

Danger

Do not touch the electrical parts when LED201 (Red) on the PCB2 is ON to avoid an electrical shock.

Notes

1. *When replacing the transistor module (IPM) and diode module (DM) on heat radiation fin, slightly apply the heat conducting silicon grease (Manufacturer: Shin-Etsu Chemical Co., Ltd, Product No.: G-746) over the fin contact surface. Use the silicon grease provided as accessory (Service Parts No.: P22760).*
2. *Identify the terminal Nos. with the mark band Nos. when reassembling. If connected incorrectly, malfunction or electrical component damage will occur.*
3. *Correctly insert two wires of U and V phases for the power cable of inverter compressor into the current sensor, CTU and CTV on PCB2. Connect Phase U power cable with the current sensor Phase U (CTU) and Phase V power line with current sensor Phase V (CTV). If connected incorrectly, malfunction or electrical component damage will occur.*
4. *When mounting PCB and the sheet metal part for PCB, pay attention not to clamp the electrical wiring together.*
5. *Screws, bushes and collars are used for fixing inverter PCB. Check to ensure that the bushes and collars are used for PCB remounting. If not used, it may cause malfunction.*
6. *In case of replacing control PCB, set all the dip switches as the same position before replacing. If not, malfunction may occur.*
7. *Do not apply strong force to the electric components and PCBs to avoid damage.*

1 Remove the service cover according to the item “Removing service cover”.

2 Open the power plate by rotating 90 degrees to the left according to the item “Opening electrical box (Power plate)”. Check to ensure that LED201 (Red) of the PCB2 is OFF.

■ Removing PCB2

– Disconnect the wirings of connectors C, CN2, CN206 and PCN301 on the PCB2
– Disconnect the wirings of U and V on the transistor module.
– After removing three (3) M3 screws, remove the bushes and the collars from the PCB2.

When remounting, attach those bushes and collars.

■ Removing Diode Module

Disconnect all the wirings connected to the diode module as shown below.

– Disconnect the wirings of terminal +, - , U, V, W on the diode module.
– Remove two (2) M5 fixing screws on the diode module.
– Remove the diode module from the electrical box.

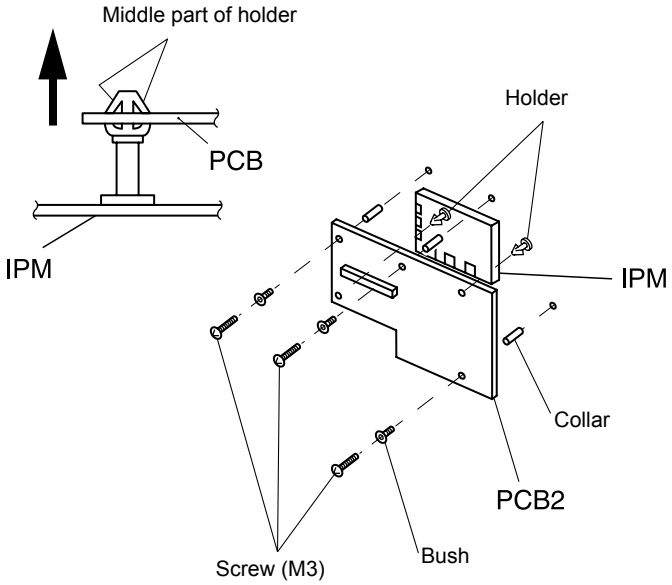
■ Removing Transistor Module

Disconnect all the wirings connected to the transistor module as shown below.

– Disconnect the wirings of connectors C, CN2, CN206 and PCN301 on the PCB2
– Disconnect the wirings of P, N, U, V, W on the transistor module.
– Remove the four (4) M3 screws for the PCB2 and then remove the PCB2 from the transistor module.
– Remove four (4) M4 fixing screws on the transistor module.
– Remove the transistor module from the electrical box.

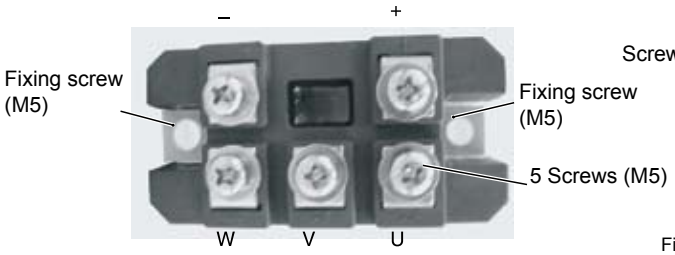
NOTES:

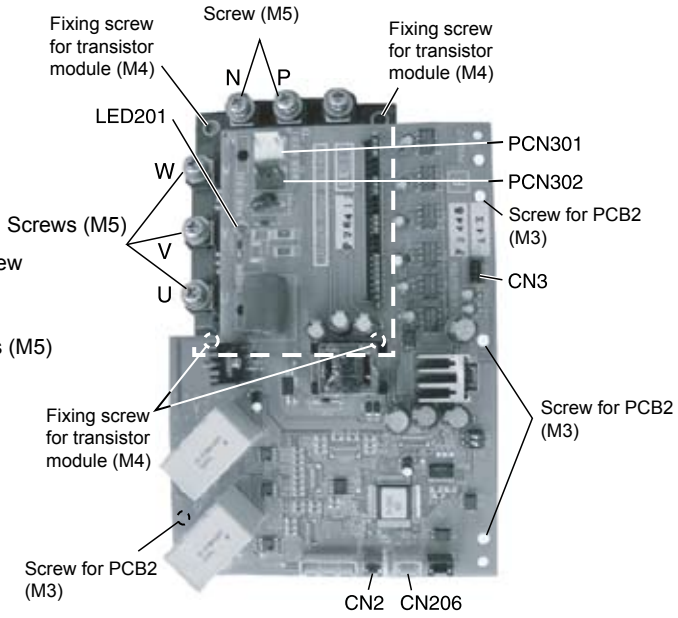
– *Identify the terminal Nos. with the mark band numbers when reassembling. If incorrectly connected, malfunction or damage will occur.*
– *Check to ensure that the electrical wires will not be caught between the mounting electrical components and the mounting plates when the PCB2 is remounted.*
– *Apply silicon grease evenly on the whole rear side of the diode module and the transistor module when mounting. Silicon grease is available as a field-supplied accessory.*



PCB2 and IPM (Transistor module)

Diode module



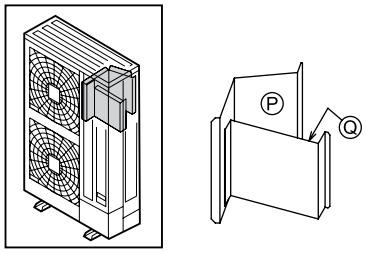


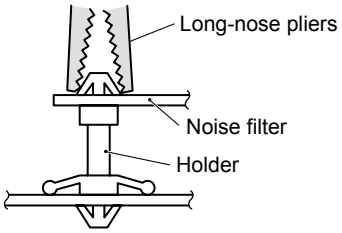
9.1.19. Removing other inverter components

Danger
Do not touch the electrical parts when LED201 (Red) on the PCB2 is ON to avoid an electrical shock.

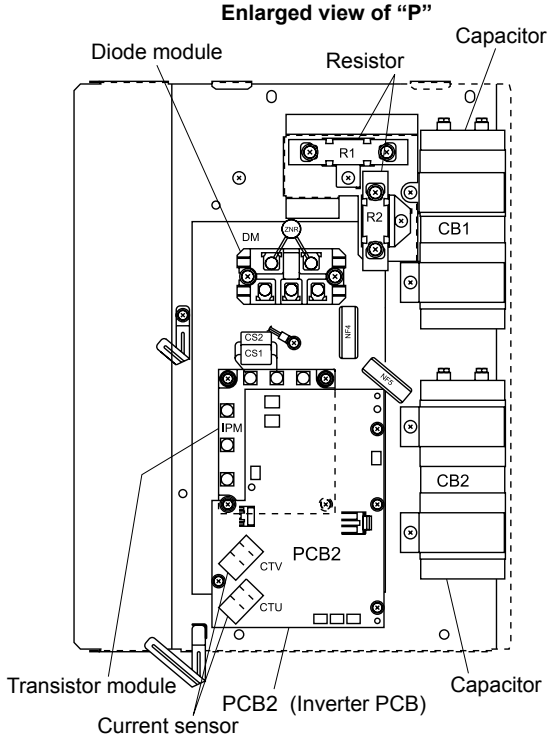
1 Remove the service cover according to the item “Removing service cover”.
2 Open the power plate according to the item “Opening electrical box (Power plate).
Check to ensure the LED201 (Red) of the inverter PCB (PCB2) is OFF when opening power plate.
– Disconnect all the wires connected with the capacitor (CB, CB1, CB2).
The wire has the polar characters. Identify the wire mark band and the indication on the capacitor when wire connecting.
Remove two (2) screws fixing the capacitor and remove the capacitor.
– Disconnect all the wires connecting with the magnetic contactor (CMC1).
Remove two (2) screws fixing the magnetic contactor and remove the magnetic contactor.
– Remove four (4) screws fixing the reactor and remove the reactor (DCL).
– Disconnect all the wires connected with the noise filter (NF1).
Remove the noise filter by clamping the top of the holder (6 portions) with a pincher (In case of 220V) as shown in the figure.

NOTES:
– *Identify terminal numbers with the mark band numbers when reassembling to avoid incorrect wiring.*
– *For the DSW setting after replacing PCB, refer to “Rotary switch and dip switch setting”.*

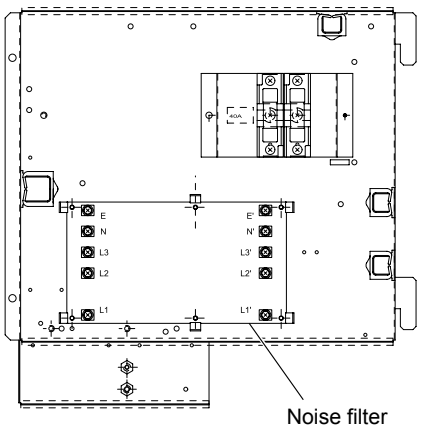




Enlarged view of “P”



Enlarged view of “Q”



10. Main parts

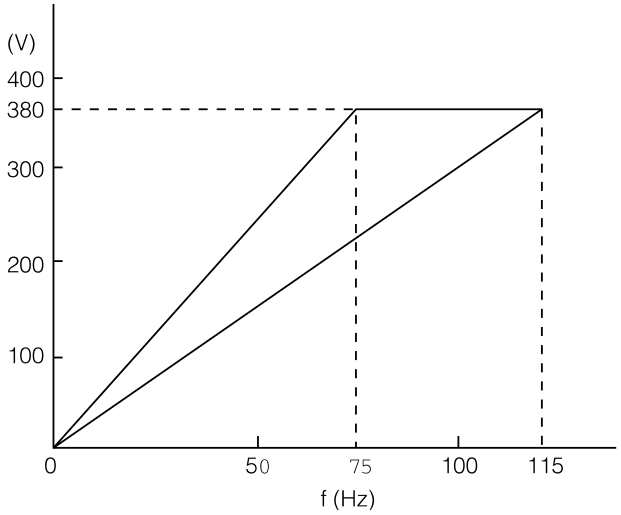
Contents

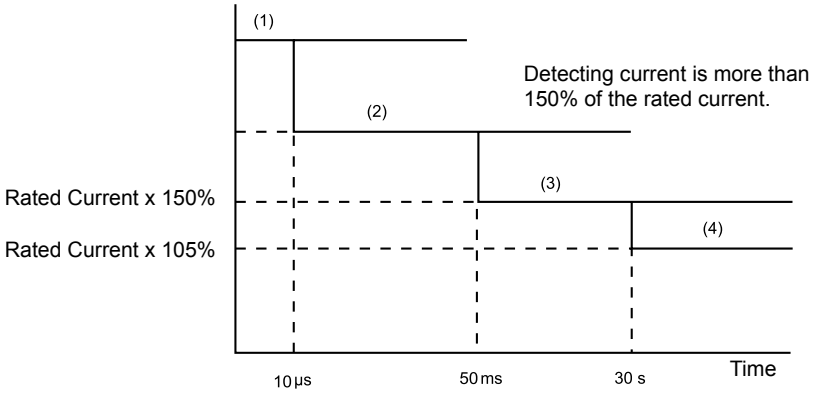
10

10.1. Inverter

10.1.1.Specifications of inverter

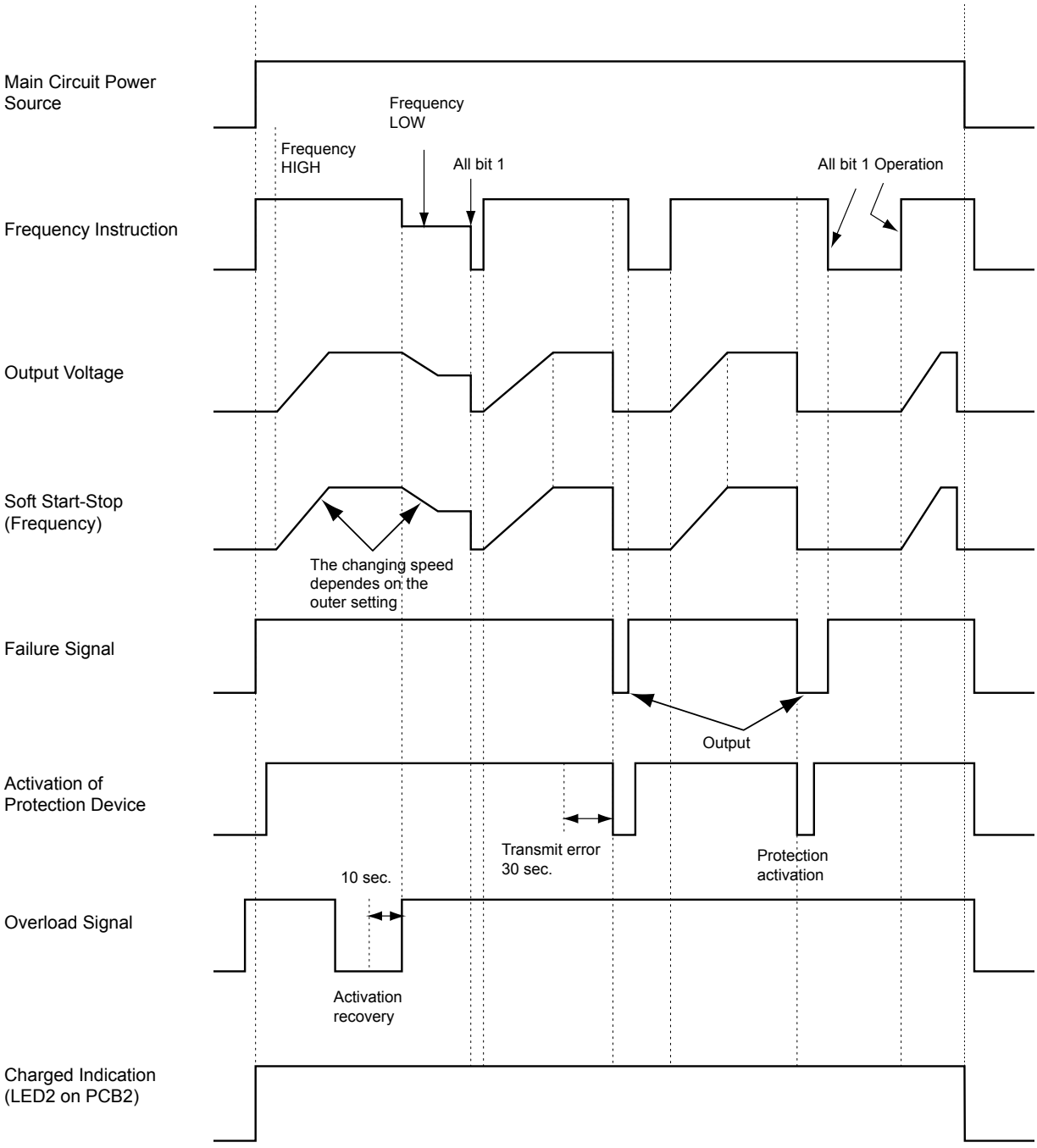
Aplicable model	RAS-(8~12)FSNM(E)
Aplicable power source	3 Phase. 380V, 415V 50 Hz
Output voltage	380-415V
Output current	25A
Time rating	Continuous
Control Method	Vector PWM Control
Range Output Frequency	10~100HZ
Accuracy of Frequency	0,01
Accuracy of output voltage	0,01 Hz at Applicable frequency range

Output / Characteristics	Conditions: 1. Power Source Voltage AC380/415V 2. Non-Loading (Free Output) 3. Ammeter Type Volt-Meter (X1.1)  Refer to the note in next page
Soft start stop	0.125Hz/S, 0.25HzS, 0.5Hz/S, 1Hz/S, 3Hz/S (5 steps)
Protection function	
Excessive high or low voltage for Inverter	Excessive Low Voltage at a voltage is lower than 350V DC Excessive High Voltage at a voltage is higher than 750V DC
Abnormality of current sensor	Stoppage at a current of compressor smaller than 1.5A. Cause of Abnormality: Failure of Current Sensor Failure of Transistor module Failure of Compressor Disconnected Wiring

Protection Function	
Overcurrent Protection for Inverter	 *) Internal protection Transistor module or IPM (1) Short-Circuit Trip of Arm *) (2) Instantaneous Overcurrent Trip *) (3) Instantaneous Overcurrent Trip (4) Electronic Thermal Trip Condition is maintained longer than 30 seconds or accumulated longer than 3 minutes during 10 minutes sampling time.
Protection of Transistor Module	Transistor module or IPM has four protection function for self-protection. (1) Some of the output terminals between "U" and "V", "V" and "W", "W" and "U" has a short-circuit. (2) Running current reaches the maximum rated current. (3) Abnormal temperature is measured by internal thermistor. (4) Control voltage decreases abnormally.
Overload Control	Overload control as a current greater than (Rated Current X105%). Overload control release at a current smaller than (Rated Current X 88%).
Fin Temperature Increase	The unit is stopped when the IPM temperature is higher than 100°C.
Earth Detection	The unit is stopped when the compressor is earthing.

Note
Characteristics are fluctuated by the current minimize control.

10.1.2.Inverter time chart



10.1.3. Protective Function

1. Excessive High or Low Voltage for Inverter
   a) Level of Detection
      - When the voltage of direct current is greater than 750 V, abnormalities are detected.
      - When the voltage of direct current is smaller than 350 V, abnormalities are detected.
   b) Function

      When abnormalities are detected, the inverter compressor is stopped and transmit the signal code of stoppage cause to PCB1.
   c) Cancellation of Protection Function

      Transmission for signal code of stoppage cause is cancelled when a stopping order is given or main power source is cut off.
2. Abnormality of Current Sensor
   a) Level of Detection

      When current of the inverter compressor decreases lower than 1.5A, an abnormality is detected..
   b) Function

      When abnormalities are detected, the inverter compressor is stopped, and transmit the signal code of stoppage cause to PCB1.
   c) Cancellation of Protection Function

      Transmission for signal code of stoppage cause is cancelled when a stopping order is issued or main power source is cut off.
3. Overcurrent Protection for Inverter
   a) Level of Detection

      When the current detected by current sensor reaches 150% of the rated current, overcurrent is detected. (Instantaneous Overcurrent)

      When the current detected by current sensor exceeds 105% of the rated current continuously for 30 seconds or for 3 minutes in total during a 10 minutes period, overcurrent is detected. (Electric Thermal Relay)
   b) Function

      When abnormalities are detected, the inverter compressor is stopped and transmit the signal code of stoppage cause to PCB1.
   c) Cancellation of Protection Function

      Transmission for signal code of stoppage cause is canceled by stopping order is issued or main power source is cut off.
4. Protection of transistor module and IPM
   a) Level of Detection

      When some of the output terminals between “U” and “V”, “V” and “W”, “W” and “U” of transistor module or IPM are short-circuited, an abnormality is detected.

      When the running current of transistor module or IPM reaches (Maximum Rated Current x 105%), an abnormality is detected.

      When an internal temperature is measured by internal thermistor of transistor module or IPM, an abnormality is detected.

      When the control voltage of transistor module or IPM decreases, an abnormality is detected.
   b) Function

      When abnormalities are detected, the inverter compressor is stopped and the signal code of stoppage cause is transmitted to PCB1.
   c) Cancellation of Protection Function

      Transmission for signal code of stoppage cause is canceled when a stopping order is issued or main power source is cut off.
5. Fin Temperature Increase
   a) Level of Detection

      When the temperature of internal thermistor exceeds more than 100 ºC, an abnormality is detected.

b) Function

When abnormalities are detected, the inverter compressor is stopped and the signal code of stoppage cause is transmitted to PCB1.

c) Cancellation of Protection Function

Transmission for signal code of stoppage cause is canceled when a stopping order is issued or main power source is cut off.

6. Earth Detection

a) Level of Detection

When the starting current of the compressor reaches 80% of the overcurrent protection value, an abnormality is detected.

b) Function

When abnormalities are detected, the inverter compressor is stopped and the signal code of stoppage cause is transmitted to PCB1.

c) Cancellation of Protection Function

Transmission for signal code of stoppage cause is canceled when a stopping order is issued or main power source is cut off.

10.1.4. Overload Control

a) Level of Detection

When the output current exceeds 105% of the maximum output current, an abnormality is detected.

b) Function

An overload signal is issued when output current exceeds 105% of the maximum output current, and the frequency decreases.

For 10 seconds after the output current decreases lower than 88% of the rated current, the operation is performed with the compressor frequency limited to the upper level frequency when the output current decreases lower than 88% of the rated one.

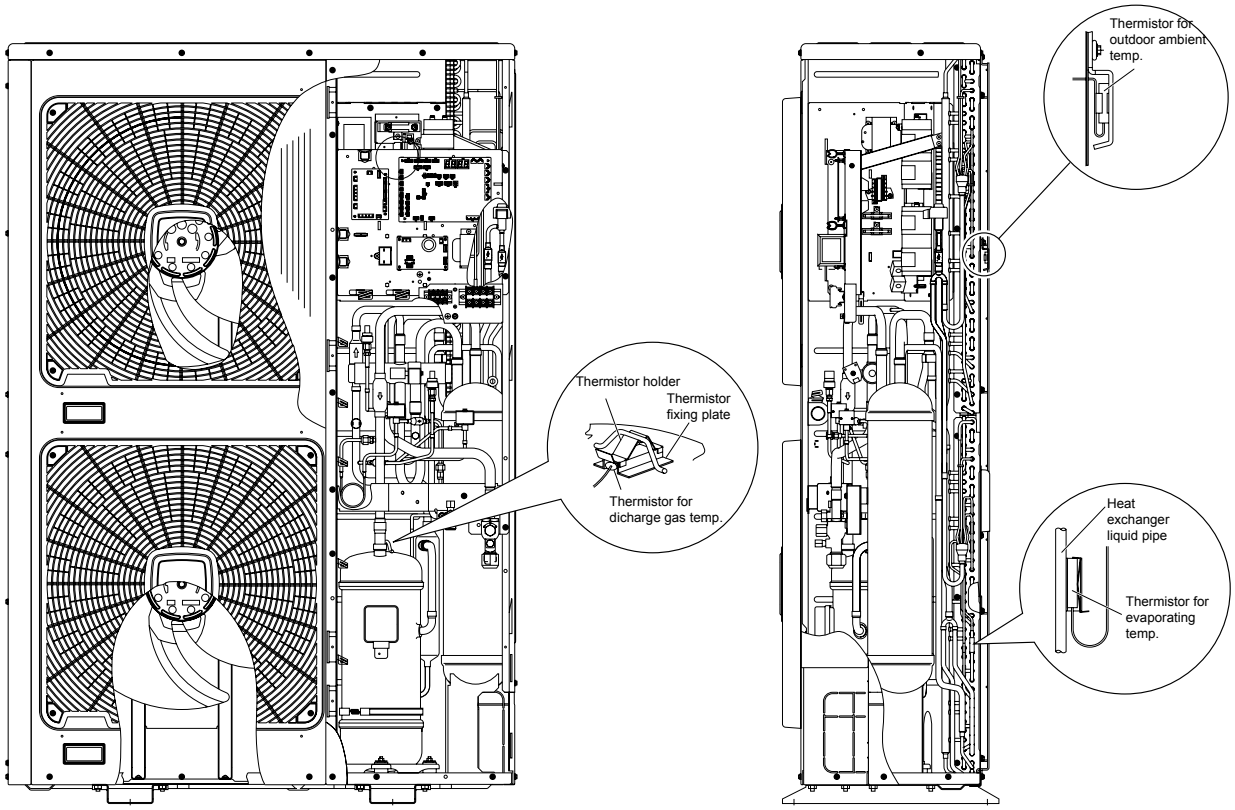
However, if the frequency order is smaller than the maximum value, the operation is performed according to the order.

c) Cancellation of Protection Function

After the operation described in the above item (b) is performed for 10 seconds, this control is canceled

10.2. Thermistor

10.2.1. Position of thermistor



10.2.2. Resistance value of the thermistor

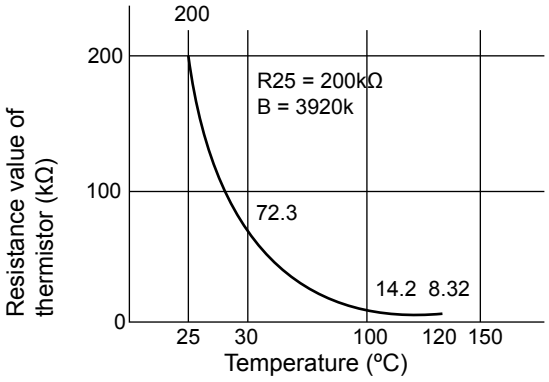
■ **Thermistor for upper part temperature of compressor (for prevention of discharge gas overheating)**

a. There is a thermistor that checks the temperature of the upper part of the compressor in order to prevent the discharge gas from overheating. If the discharge gas temperature increases excessively, the deterioration of the lubrication oil and its lubrication properties will occur. This will cause a shorter compressor life.

b. If the discharge gas temperature increases excessively, the compressor temperature increases. In the worst case, the winding of the compressor motor will burn out.

c When the temperature of the upper part of the compressor increases during the heating process, the unit is controlled according to the following method:

– An electronic expansion valve of the liquid bypass opens and the high-pressure refrigerant returns to the compressor through the accumulator. This decreases the compressor temperature.



Resistance characteristics of thermistor for discharge gas overheating protection

– If the compressor upper part temperature increases exceeding 132 ºC even if an electronic expansion valve opens, the compressor is stopped, in order to protect the compressor.

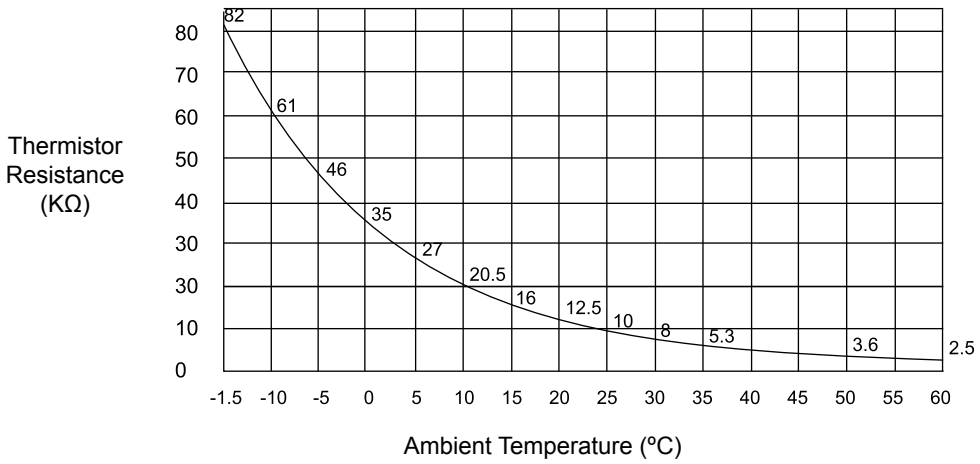
d. If the temperature of the upper part of the compressor exceeds 132 °C for 10 minutes during the cooling process, the compressor will stop according to the following method.

Operation	Upper part temperature of compressor	Defecting period
Cooling	Over 132ºC	10 minutes (continuously)
	Over 140ºC	5 seconds (continuously)
Heating	Over 132ºC	10 minutes (continuously)
	Over 140ºC	5 seconds (continuously)
Defrosting	Over 132ºC	5 seonds (continuously)

■ **Thermistor for the outdoor temperature (THM7)**
The thermistor resistance characteristics are shown in the figure below.

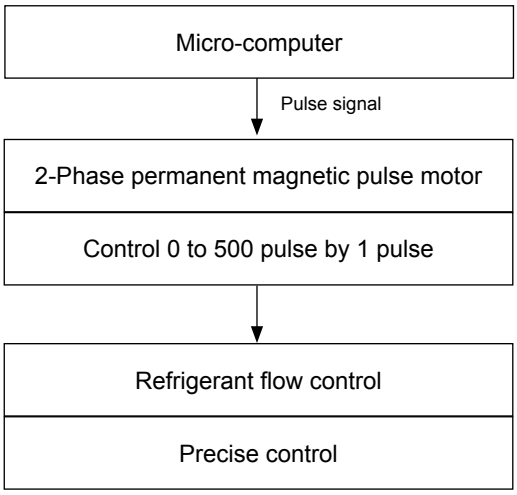
■ **Thermistor for Evaporating Temperature of Outdoor Unit in Heating Operation (For Defrosting)**
The characteristics for the thermistor is the same with the value of outdoor ambient temperature thermistor as shown in the figure below.

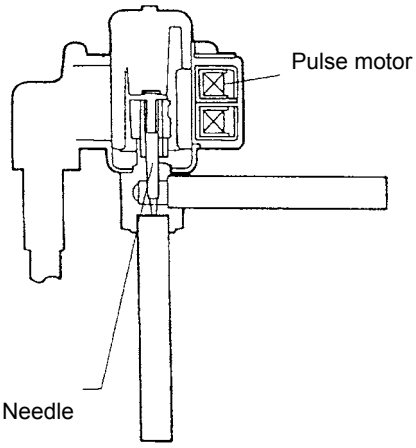
Thermistor Characteristics

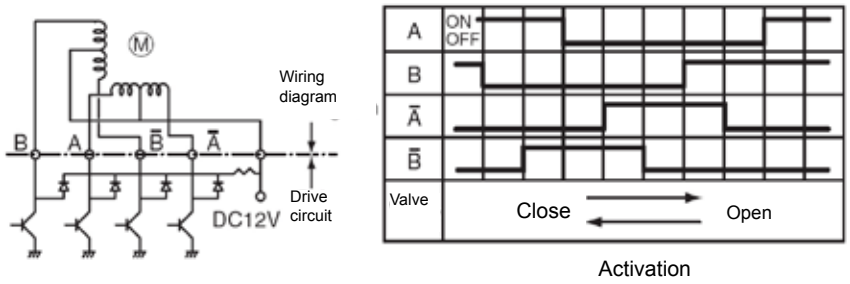


10.3. Electronic expansion valve

10.3.1. Electronic expansion valve for the outdoor unit





Items	Specifications
Applicable to the models	For the main cycle of: RAS-8~12FSNM(E)
Type	UKV Series
Refrigerant	R410A
Working temperature range	-30°C ~ 65°C (Operation time of the coil: less than 50%)
Mounting direction	Drive shaft in vertical direction within an angle of 45° as maximum
Flow direction	Reversible
Drive method	4-Phase canned motor method
Rated voltage	DC12V±1.8V
Drive condition	80±5PPS (Pulse width at ON: 36mm sec, OFF: 60mm sec) 1,2 Phase excitation
Coil resistance (each phase)	46Ω ± 3Ω (at 20°C)
Wiring diagram, Drive circuit and activation mode	

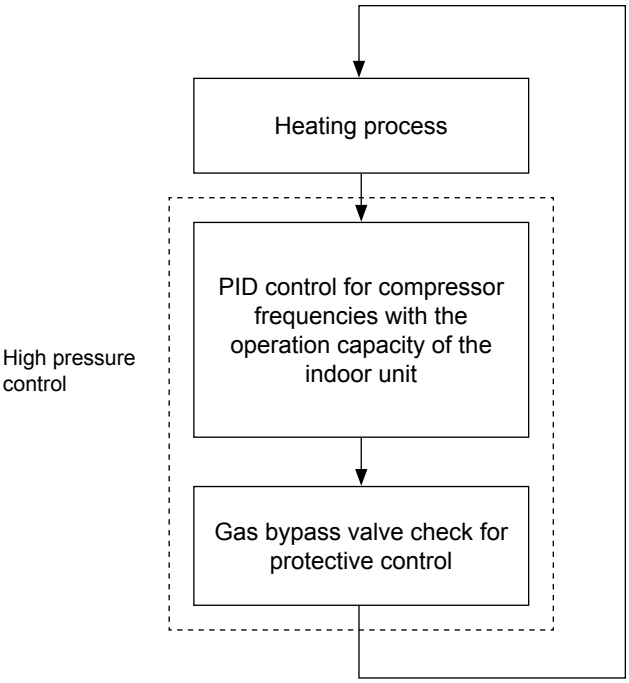
10.4. Pressure sensor

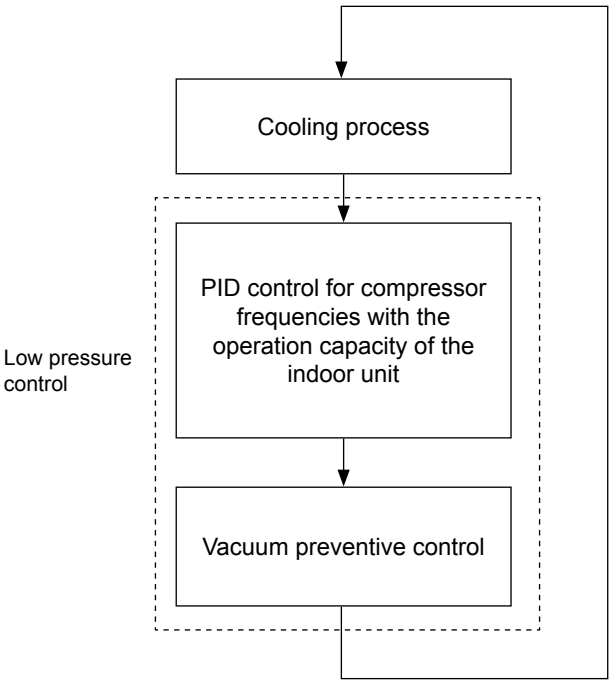
High-pressure control

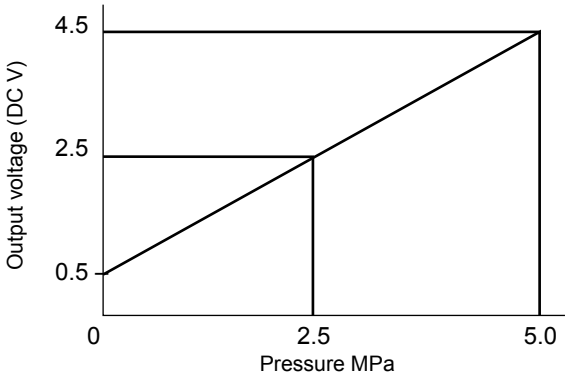
A high-pressure sensor detects the high pressure during the heating process. The PID control with the operation capacity of the indoor units controls the compressor frequencies. This way the high pressure is controlled within an appropriate range. The output of the high-pressure sensor during the heating process performs the protective control and the control of the gas bypass valve.

Low-pressure control

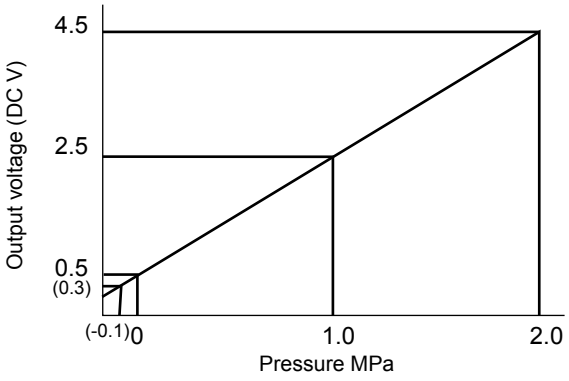
A low-pressure sensor detects the suction pressure during the cooling process. The PID control with the operation capacity of the indoor units controls the compressor frequencies. This way the suction pressure is controlled within an appropriate range.
If the suction pressure becomes excessively low, the cooling action may be insufficient and the parts in the refrigerant cycle may be damaged. Therefore, if the output of the low-pressure sensor indicates vacuum and the valve remains in the same position for 12 minutes or longer, the compressor will stop in order to avoid damage.







Output characteristics of high pressure sensor



Output characteristics of low pressure sensor

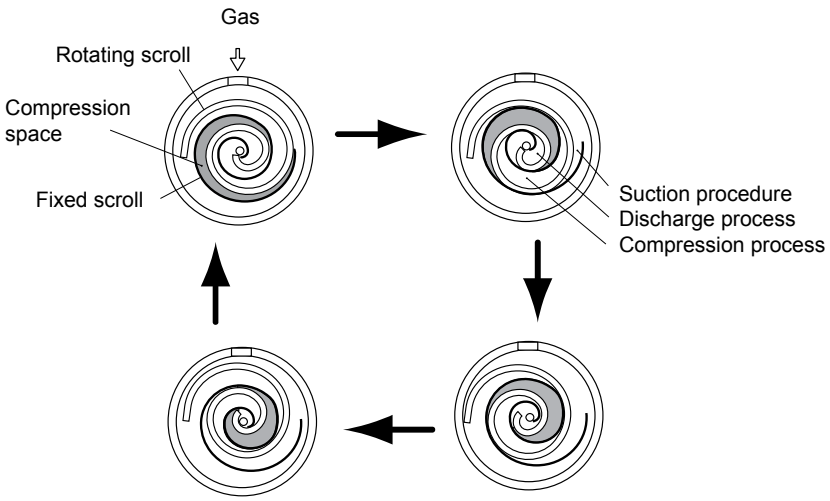
10.5. Scroll compressor

10.5.1. Reliable mechanism for low vibrating and low sound

1. The rotating direction is definite.
2. The pressure inside of the chamber is high pressure, and the surface temperature of the chamber is 60 °C to 110 °C.

10.5.2. Principle of compression

1. The gas is inhaled from the inlet port at the outer frame of the fixed scroll.
2. The gas inside of the compression space is compressed toward the center of the scroll.
3. The compression space is minimum at the center of the scroll, and the gas compressed at the maximum is discharged from the outlet port of at the center of the scroll.
4. The above procedures (Suction Compression Discharge) is repeated continuously.

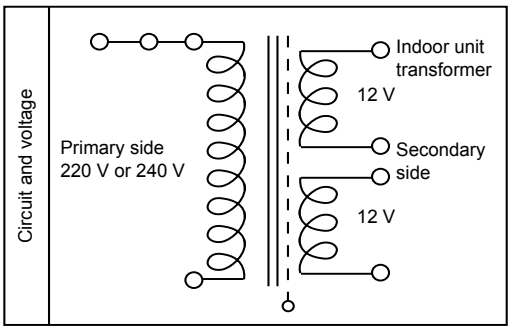


11. Field work instruction

Contents

11.1. Checking the power source and the wiring connection

Check the following items in the case of abnormal operation:

No.	Check item	Procedure
1	Is the breaker of the fuse cut out?	Check the secondary voltage of the breaker and the fuse by means of a tester.
2	Is the secondary power source on the transformer correct?	Disconnect the secondary side of the transformer and check the voltage by means of a tester. 
3	Is the wiring loosened or incorrectly connected?	Check the wiring connection on the PCB. – Thermistor connectors – Connector of the remote control cable – Connector of the transformer – Each connector in a high-voltage circuit Check the connectors according to the **Electrical Wiring** diagram.

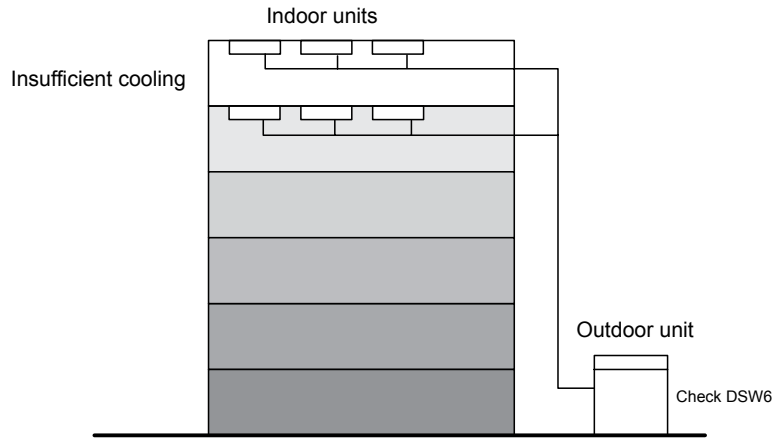
11.2. Burnt-out compressor due to an insufficient refrigerant charge

■ **Question and answer for the field work**

Example 1: Burnt-out compressor due to an insufficient refrigerant charge	
Phenomenon	After commissioning, the alarm code "08" sometimes occurred and the compressors were burnt out after operating for two months.
Cause	The refrigerant piping work was performed during the summer season. The additional refrigerant was not sufficiently charged from the discharge gas side. This insufficient refrigerant charge resulted in the overheating of the discharge gas and the oil deterioration, which was finally due to the separated operation despite the alarm code "08".
Countermeasure	1. The compressor was replaced with a new compressor. 2. The correct refrigerant amount was charged according to the refrigerant piping length and the connected indoor units.
Remarks	Additional refrigerant charge: Open the liquid stop valves slightly when you charge the additional refrigerant from the check joint of the liquid stop valves (the discharge gas side) during the cooling process. If the liquid stop valve is fully open, it is difficult to charge the additional refrigerant. Do not charge the refrigerant from the gas stop valve.

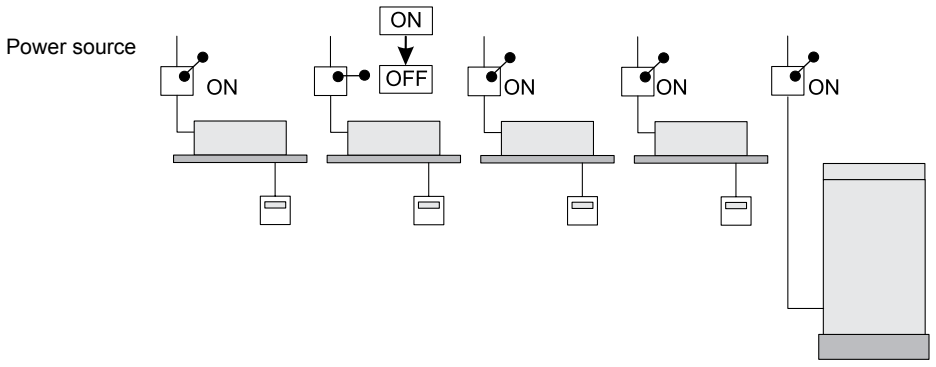
11.3. Insufficient cooling performance when a long piping is applied

■ **Question and answer for the field work**

Example 2: Insufficient cooling performance when a long piping is applied	
Phenomenon	Sufficient cooling was not available for an indoor unit that was located at the farthest position.
Cause	If the location of an outdoor unit is 20 meters lower than the location of the indoor units, resetting of the DIP switch DSW6 is required. However, no setting was performed. Therefore, the largest discharge pressure was not increased. This resulted in an insufficient cooling performance for the indoor unit. 
Countermeasure	The setting of the DSW6 was changed.
Remarks	Pay a special attention to the size of the liquid pipe if the lift between the indoor units and the outdoor units is higher than 20 meters. Refer to "Piping Work in TC" for details.

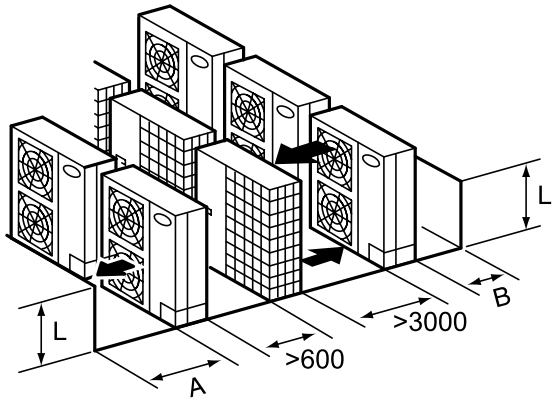
11.4. Alarm Code "31"

■ **Question and answer for the field work**

Example 4: Alarm code "31"	
Phenomenon	Alarm code "31" sometimes occurred and the system stopped.
Cause	The combination of the indoor units and the outdoor unit was the following. 
	This system was used in a tenant building. One of tenant's customers turned off the main switch for the indoor unit while other indoor units are running. This results in a different setting of the total indoor unit capacity in the same refrigerant cycle.
Countermeasure	All the main switches for the indoor units were always ON.

11.5. Not cooling well due to insufficient installation space for the outdoor unit

■ **Question and answer for the field work**

<table>
<tr><th colspan="2">Example 5: Not Cooling Well due to Insufficient Installation Space for Outdoor Unit</th></tr>
<tr><td>Phenomenon</td><td>Cooling operation was well performed through the intermediate season. However, the cooling operation was not well available when the outdoor temperature was higher than 35°C.</td></tr>
<tr><td>Cause</td><td>As the outdoor units were installed without a sufficient installation space, the hot discharge air from other outdoor units was circulated.
In this case, though the outdoor temperature was 35°C, the actual suction air temperature was nearly 50°C and Protection System from Excessively High Suction Pressure was activated, the frequency of the compressor was decreased and the cooling capacity was also decreased accordingly.
As the outdoor units in-line were installed back to back with a distance of 600 mm between each outdoor unit’s back, the hot discharged air from other outdoor units was circulated.
 

Keep a distance of more than 100 mm between other units and do not put obstacles on the right and left sides. Dimension B is as shown below.
<table>
<tr><th>L</th><th>A</th><th>B</th></tr>
<tr><td>0 < L < 1/2H</td><td>600 or more</td><td>300 or more</td></tr>
<tr><td>1/2H < L < H</td><td>1400 or more</td><td>350 or more</td></tr>
</table>

NOTE:
If L is larger than H, mount the units on a base so that H is greater or equal to L.
In this situation ensure that the base is closed and does not allow the airflow to short circuit.</td></tr>
<tr><td>Countermeasure</td><td>To protect the unit from a short circuit, fences were mounted at the discharge air side as shown</td></tr>
</table>

11.6. Guideline for selecting the drain pipe for the indoor unit

■ Method for selecting the drain pipe diameter

1. Calculation of the Drain Flow Volume
   Calculate that the drain flow volume is approximately 3 (l/hr) per 1HP of the nominal capacity of the indoor unit.

   For Example:

Common drain pipe for four 2.5HP indoor units.	
Total horsepower of the indoor unit	4 × 2,5 =10HP
Total drain flow volume	10HP× 3 (l/hr × HP) = 30 (l/hr)

2. Select the drain pipe from the Table A and the Table B

Horizontal common pipe with the slope 1/50	VP 20 for the above example
Horizontal common pipe with the slope 1/100	
Vertical common pipe	VP 25 for the above example

Table A. Permissible drain flow volume of the horizontal vinyl pipe

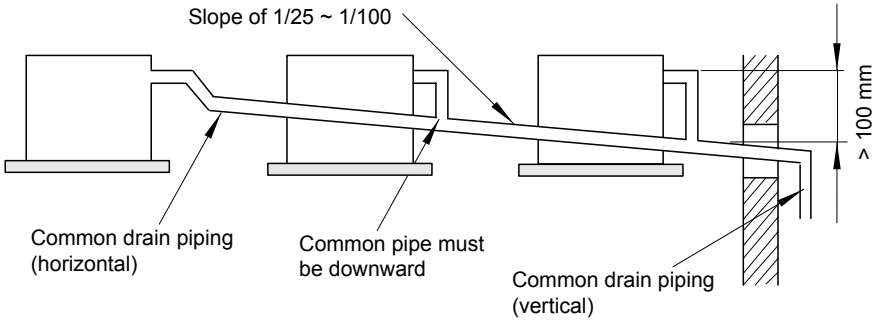
JIS symbol	Inner diameter (mm)	Permissible flow volume (l/hr]	
		Slope=1/50	Slope=1/100
VP20	20	39	27
VP25	25	70	50
VP30	31	125	88
VP40	40	247	175
VP50	51	472	334

NOTE:
VP20 and VP25: Not Applicable to the Common Pipe
VP30, VP40 and VP50: Applicable to the Common Pipe

Table B. Permissible drain flow volume of the vertical vinyl pipe

JIS symbol	Inner diameter (mm)	Permissible flow volume (l/hr]
VP20	20	220
VP25	25	410
VP30	31	730
VP40	40	1400
VP50	51	2760
VP65	67	5710
VP75	77	8280

NOTE:
VP20, VP25 and VP30: Not applicable to the common pipe
VP40, VP50, VP65 and VP75: Applicable to the common pipe



11.7. Caution with the refrigerant leakage

The designers and the installers have the responsibility to follow the local codes and the local regulations that specify the safety requirements against the refrigerant leakage.

11.7.1. Maximum permissible concentration of the HCFC Gas

The refrigerant R410A, which is charged in the SET-FREE FSN system, is an incombustible non-toxic gas. However, if the leakage occurs and the gas fills a room, the gas may cause suffocation.

The maximum permissible concentration of the HCFC gas and the R410A in the air is 0.3 kg/m³, according to the refrigeration and air conditioning system standard (KHK S 0010) by the KHK (High-Pressure Gas Protection Association) Japan. Therefore, you must take some effective measures in order to lower the R410A concentration in the air below 0.3 kg/m³, if there is a leakage.

11.7.2. Calculation of the refrigerant concentration

1. Calculate the total quantity of refrigerant R (kg) that is charged in the system that connects all the indoor units of the rooms that need air conditioning systems.
2. Calculate the room volume V (m³) of each room.
3. Calculate the refrigerant concentration C (kg/m³) of the room according to the following equation:

$\frac{R}{V} = C$	R: Total quantity of charged refrigerant (kg) V: Room volume (m³) C: Refrigerant concentration (≤0.3* kg/m³ for the R410A)
* Use this value only for reference because this value is not fixed yet.	

11.7.3. Countermeasure for the refrigerant leakage according to the KHK standard

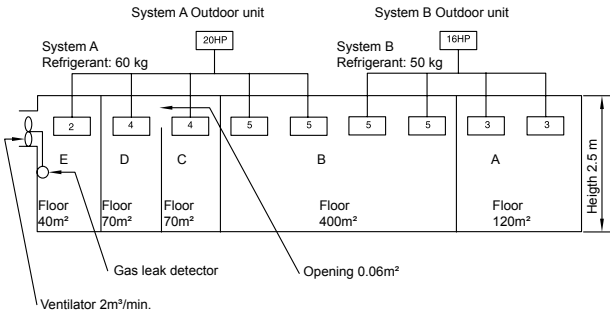
According to the KHK standards, you should arrange the facility as follows so that the refrigerant concentration will be bellow 0.3 kg/m³.

1. Provide a shutterless opening that will allow the fresh air to circulate into the room.
2. Provide a doorless opening with a size of 0.15% or more to the floor area.
3. Provide a ventilator, which must be linked with a gas leak detector, with a ventilating capacity of 0.5 m³/min or more per Japanese Refrigeration Ton (=compressor displacement m³/h/5.7 of the air conditioning system which uses the refrigerant).

O.U. model	Ton
RAS-8FSNM(E)	4.11
RAS-10FSNM(E)	
RAS-12FSNM(E)	

4. Pay a special attention to the place, such as a basement and others, where the refrigerant may stay, because the refrigerant is heavier than the air.

Room	R (kg)	V (m³)	C (kg/m³)	Countermeasure
A	50	300	0.17	-
B	110	1000	0.11	-
C	60	175	0.34	0.06 m² Opening
D	60	175	0.34	0.06 m² Opening
C+D	60	350	0.171	-
E	60	100	0.6	2m³/min Ventilator linked with gas leak detector



If local codes or regulations are specified, follow them.

Example

European Standard, EN378

R410A Commercial Office Building Class D Occupancy

MR = C5V

MR: Maximum Charge or Leakage of Refrigerant (kg)

C: Maximum Allowable Concentration = 0.17 (kg/m³)

V: Volume of Space (m3)

11.8. Maintenance work

■ For the indoor unit and the outdoor unit

1. Fan and fan motor
   - Lubrication: All the fan motors are prelubricated and sealed at the factory. Therefore, no lubrication maintenance is required.
   - Sound and vibration: Check for abnormal sounds and vibrations.
   - Rotation: Check the clockwise rotation and the rotating speed.
   - Insulation: Check the electrical insulation resistance.
2. Heat exchanger
   - Clog: Inspect the heat exchanger at regular intervals and remove any accumulated dirt and any accumulated dust from the heat exchanger. You should also remove from the outdoor units other obstacles, such as the growing grass and the pieces of paper, which might restrict the airflow.
3. Piping connection
   - Leakage: Check for the refrigerant leakage at the piping connection.
4. Cabinet
   - Stain and Lubrication: Check for any stain and any lubrication. Remove the stain and the lubrication.
   - Fixing Screw: Check for any loosened screw or any lost screw. Fix the loosened screws and the lost screws. Insulation Material: Check for any peeled thermal insulator on the cabinet. Repair the thermal insulator.
5. Electrical equipment
   - Activation: Check for an abnormal activation of the magnetic contactor, the auxiliary relay, the PCB and others.
   - Line condition: Pay attention to the working voltage, the working amperage and the working phase balance. Check for any faulty contact that is caused by the loosened terminal connections, the oxidized contacts, the foreign matter, and other items. Check the electrical insulation resistance.
6. Control device and protection device

- Setting: Do not readjust the setting in the field unless the setting is maintained at a point that is different from the point that is listed in the section “5.5. Protection and Safety Control” of this Service Manual.

■ For the indoor unit

1. Air filter
   - Cleaning: Check for any accumulated dirt and any accumulated dust. Remove the dirt and the dust.
2. Drain pan, drain-up mechanism and drain pipe
   - Drain line: Check and clean the condensate drain pipe at least twice a year.
   - Drain-up mechanism: Check the activation of the drain-up mechanism.
3. Float switch
   - Activation: Check the activation of the float switch.

■ For the outdoor unit

1. Compressor
   - Sound and vibration: Check for abnormal sounds and vibrations.
   - Activation: Check that the voltage drop of the power supply line is within 15% at the start and within 2% during the operation.
2. Reverse valve
   - Activation: Check for any abnormal activation sound.
3. Strainer
   - Clog: Check that there is no temperature difference between both ends.
4. Ground wire
   - Ground line: Check for the continuity to earth.
5. Oil heater
   - Activation: You should activate the oil heater at least twelve hours before the start-up by turning ON the main switch.

11.9. Service and maintenance record

No.	Check item	Action	Judgement	
1	Is the service area sufficient?		Yes	No
2	Is there a short circuit of the discharged air?		Yes	No
3	Any heat influence?		Yes	No
4	Is the ground wire connected?		Yes	No
5	Refrigerant piping		Good	Not good
6	Fixing the units		Good	Not good
7	Is there any damage on the outer surface or the internal surface?		Yes	No
8	Checking the screw and the bolts	Tighten if loosened.	Tightened	Not tightened
9	Tightening the Terminal Screws	Tighten all the terminal screws with a Phillips screwdriver.	Tightened	Not tightened
10	Are the compressor terminals tightly fixed?	Push all the terminals.	Pushed	Not pushed
11	Insulation resistance	Measure the insulation resistance with an insulation resistance meter. Comp. and fan motor: greater than 3MΩ Others: greater than 3MΩ	Good	Not good
12	Does the drain water flow smoothly?	Check the smooth flow by pouring some water.	Good	Not good
13	Check for a leakage in the compressor.	Check for any leakage.	Good	Not good
14	Check for a leakage in the outdoor heat exchanger.	ditto	Good	Not good
15	Check for a leakage in the indoor heat exchanger.	ditto	Good	Not good
16	Check for a leakage in the 4-way valve.	ditto	Good	Not good
17	Check for a leakage in the check valve.	ditto	Good	Not good
18	Check for a leakage in the accumulator.	ditto	Good	Not good
19	Check for a leakage in the strainer.	ditto	Good	Not good
20	Check for a leakage in the electronic expansion valve.	ditto	Good	Not good
21	Check for a leakage in the piping.	ditto	Good	Not good
22	Check the direction of the fans.	By viewing the airflow volume	Good	Not good
23	Voltage among each phase	Higher than AC220V	Good	Not good
24	Vibration and sound	Check the fan, the compressor, the piping, and others.	Good	Not good
25	Activation of each operation mode	Check the activation of the COOL switch, the HEAT switch, the STOP switch and the TEMP switch.	Good	Not good
26	High-pressure cut-out switch	Check the actual activation value.	Good	Not good
27	Check the activation of the drain-up mechanism.	Check the activation during the cooling process.	Good	Not good
28	Air inlet temperature of the indoor unit DB/WB		(°C)DB	(°C)WB
29	Air outlet temperature of the indoor unit DB/WB		(°C)DB	(°C)WB
30	Air inlet temperature of the outdoor unit DB/WB		(°C)DB	(°C)WB
31	Air outlet temperature of the outdoor unit DB/WB		(°C)DB	(°C)WB
32	High-pressure switch		kg/cm²G	
33	Low-pressure switch		kg/cm²G	
34	Operating voltage		V	
35	Operating current		A	
36	Instructions to the client for cleaning the air filter		Done	Not yet
37	Instructions to the client about the cleaning method		Done	Not yet
38	Instructions to the client about the operation		Done	Not yet

11.10. Service and maintenance record by means of the 7-segment display

11.10.1. Data Sheet for Checking by 7-Segment Display

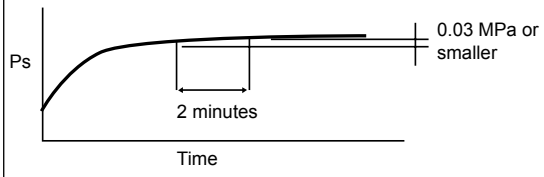
■ **FSNM**

Customer's Name:_____ Date:_____

Outdoor Unit Model (Serial No.)			RAS- (Serial No.)								RAS- (Serial No.)							
1	Operation mode																	
2	Test Run Start Time																	
3	Data Collect Start Time																	
4	Read Out Data from 7-Segment in Outdoor Unit																	
	Protection control code																	
	Outdoor Microcomputer Output	SC	$52C_1$	DC Fan	AC Fan	20A	20F	21	CH	20B	$52C_1$	DC Fan	AC Fan	20A	20F	21	CH	20B
	Indoor Total Operating Capacity	oP																
	Inverter frequency	H1																
	Compressor Running Quantity	CC																
	Outdoor Fan Step	Fo																
	Outdoor Unit Expansion Valve Opening	oE1																
	Discharge presure [MPa]	Pd																
	Suction pressure [MPa]	Ps																
	Discharge gas temperature	Td1																
	Heat exchanger liquid pipe temperature	TE1																
	Outdoor temperature	To																
	Compressor running current	A1																
	Indoor Unit (Unit number:)																	
	Expansion valve opening	iE																
	Heat exchanger liquid temp.	TL																
	Heat exchanger gas temp.	TG																
	Intake air temp.	Ti																
	Outlet air temp.	To																
	Capacity (x 1/8HP)	CA																
	Indoor Unit stoppage caude code	d1																
	Restricted control for prevention of compresion ratio decrease	c11																
	Restricted control for prevention of high pressure increase	c13																
	Restricted control for prevention of the temperature increase of the inverter fan	c14																
	Restricted control for prevention of discharge gas temperature increase	c15																
	Restricted control for prevention of TdSH decrease	c16																
	Restricted control for prevention of overcurent	c17																
	Accumulated operation time of comp. 1	(c)UJ1																
	Outdoor alarm code	AC																
	Inverter stoppage cause code	iTC																
	Total Indoor unit capacity (x 1/8HP)	CP																
	Total Indoor unit quantity	AA																
	Refrigerant system address	GA																

11.10.2. Pump-down method for replacing the compressor

No.	Procedure	Remarks
1	Turn off the main switch of the outdoor unit.	
2	Remove the covers, the thermistor, the crankcase heater, the power wirings, and other items according to the chapter "Removing the Parts of the Oudoor Unit".	Make sure that the terminal part of the detached power supply wires is not exposed by the winding insulation tape and other items.
3	Attach the manifold to the check joint of the high-pressure side and the low-pressure side of the outdoor unit.	
4	Turn on the main switch of the outdoor unit.	
5	Set the exclusion of the compressor by setting the DSW so that a broken compressor will not work. You can set the exclusion of the compressor by setting the DSW5-1~DSW5-6 of the PCB1.	DSW5-1 ON: Compressor No.1 (52C1: Inverter compressor), DSW5-2 ON: Compressor No.2 (52C2), DSW5-3 ON: Compressor No.3 (52C3), and the others.
6	Pre-Pump-Down by means of the Cooling Process: – Start the test run of the cooling process. (DSW4-1 ON). – The test run should run for approximately 20 minutes (until the test run reaches PS>0.3Mpa, Td>75 ºC, as a rough target). – Display of Ps in seven seconds of the outdoor PCB. – Close the gas stop valve quickly. Then, perform the enforced stoppage (DSW4-4 ON) when Ps < 0.2Mpa. – Set the DSW4-1 to OFF in order to cancel the test run of the cooling. Set the DSW4-4 to OFF in order to cancel the enforced stoppage.	– After closing the gas stop valve, the decrease of Ps is fast. To guarantee the reliability of the compressor, make sure that **the decrease does not reach PS< 0.1Mpa** when you perform the enforced stoppage.
7	The compressor replacing mode is performed: – The DSW4-6 on the outdoor unit PCB→ ON (The cooling is run).	– This operation is performed for up to a maximum of ten minutes. – If the inverter compressor is excluded, the operation starts after three minutes.
8	The operation finishes when one of the following conditions occurs: 1) Ten minutes have passed and STP is displayed in seven segments. 2) "08" is displayed in seven segments. 3) When Ps< 0.1MPa is continued for one minute, in ten minutes STP is displayed in seven seconds and the operation finishes.	– The operation may finished when any of the conditions 1) to 3) occurs.
9	Close the liquid stop valve completely.	To avoid the spillage of all the refrigerant if the check valve is broken.

No.	Procedure	Remarks
10	Check for a leakage of the check valve on the discharge gas side: – DSW4-4 (Enforced stoppage of the compressor) → ON, so that the compressor will not run although the running command is sent from the remote control switch. – Check that variation of Ps on the outdoor unit PCB is 17 seconds. Make sure that the Ps increase is within 0.03 Mpa in two minutes after the Ps increase at the stoppage (during approximately five minutes). Also make sure that Pd>Ps.  	– When you stop the compressor for replacing: – You can check the leakage of the check valve by means of the Ps variation because the SVA opens so that the discharge gas side of the inverter compressor can connect to the low-pressure side. – 0.03 Mpa / 2 minutes is within the permissible limits for the check valve on the discharge gas side. – The leakage of the check valve may cause an incorrect brazing, due to the gas pressure at the brazing of the discharge piping. – If the compressor-replacing mode is performed again, set the DSW4-4 to OFF and keep the DSW4-4 at the OFF side during ten minutes. Then, start according to the procedure No. 6.
11	Collect the refrigerant by means of the refrigerant collection: – Perform either A or B, depending on the process 10. A: The leak rate at the process 10 is within the specification → Collect the refrigerant only at the low-pressure side. B: The leak rate at the process 10 is greater than the specification → Collect all the refrigerant of the outdoor unit side by means of the machine.	– The discharge of the refrigerant in the atmosphere is strictly forbidden. Make sure that the refrigerant is collected by the collector. – Keep a note of the quantity of the collected refrigerant.
12	After collecting the refrigerant, remove the change hose (collector side) of the low-pressure side, so that the low-pressure side of the refrigerant cycle will be the atmosphere pressure.	– Make sure that there is no pressure increase of the low-pressure sides after collecting the refrigerant. – Make sure that the refrigerant cycle is the atmosphere pressure. Otherwise, problems such as the blowing of gas and the suction of the cutting material) may occur when you are removing the compressors.
13	Turn OFF the main switch of the outdoor unit.	
14	Perform the replacement of the compressor and the change of the refrigerant oil according to the section "Replacing the Compressor".	Make sure that you follow the instructions.
15	Perform the vacuum from the check joint of the low-pressure side.	If you collect the refrigerant only on the low-pressure side (A in 11). You cannot perform the vacuum of the refrigerant from the check joint of the high-pressure side.
16	Open the liquid stop valve and the gas stop valve completely when you finish the vacuum.	
17	Make sure that the power is turned OFF and attach the following items: the power supply wire, the thermistor, the crankcase heater, the 63H wiring, the panel and the nut).	
18	Set the DSW back to the original setting. Make sure that all the wirings to the compressor are connected correctly.	
19	Recharge the refrigerant that is collected in the process by the stop valve of the liquid side during the cooling at the TEST RUN mode.	If the replacement of the compressor takes more than two hours, an additional change of the refrigerant is necessary. Additional Change = (Replacing Time – 2 hours) x 0.5kg.

CE

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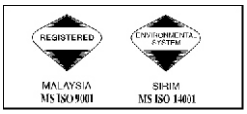

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