100th ANNIVERSARY
Celebrating 100 years of the Hitachi Group

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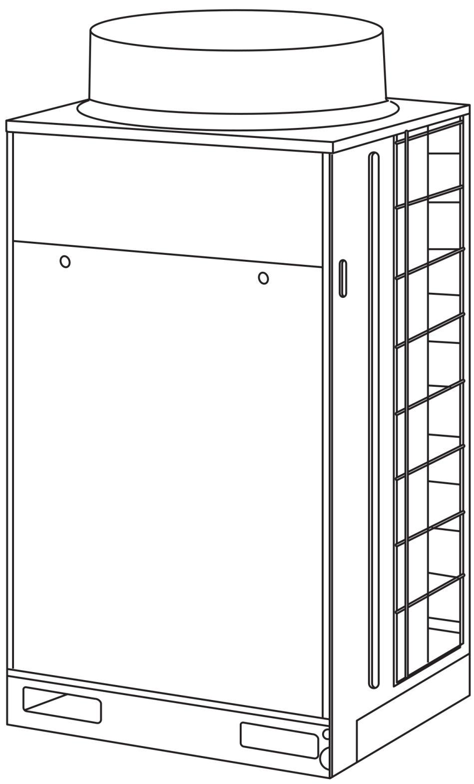
SET FREE SERIES
FSXN



Service Manual

RAS-8FSXN	RAS-24FSXN	RAS-40FSXN
RAS-10FSXN	RAS-26FSXN	RAS-42FSXN
RAS-12FSXN	RAS-28FSXN	RAS-44FSXN
RAS-14FSXN	RAS-30FSXN	RAS-46FSXN
RAS-16FSXN	RAS-32FSXN	RAS-48FSXN
RAS-18FSXN	RAS-34FSXN	RAS-50FSXN
RAS-20FSXN	RAS-36FSXN	RAS-52FSXN
RAS-22FSXN	RAS-38FSXN	RAS-54FSXN

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1. General information

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1.1 General information

1.1.1 Copyright

Within the policy of continuous improvement of its products, HITACHI Air Conditioning Products Europe, S.A. reserves the right to make changes at any time without prior notification and without being compelled to introduce them into products previously sold. This document may, therefore, have been subject to amendments during the life of the product.

HITACHI makes every effort to offer correct, up-to-date documentation. Despite this, printing errors cannot be controlled by HITACHI and are not its responsibility.

As a result, some of the images or data used to illustrate this document may not refer to specific models. No claims will be accepted based on the data, illustrations and descriptions included in this manual.

No type of modification must be made to the equipment without prior, written authorisation from the manufacturer.

1.1.2 Introduction

HITACHI presents the FSXN series, which belongs to the SET FREE series characterised by its modular design. The application of a single unit, called a base unit (8 - 18 HP) or the combination of two or up to three of these base units of different powers covers the rest of the range of capacities (20 - 54 HP) for air conditioning in office buildings and small industry.

The modular concept of the FSXN series offers refrigeration, heating or both simultaneously, to create personalised environments for every necessity.

1.1.3 Environment-friendly units

The new range of HITACHI outdoor units uses environment-friendly R410A gas refrigerant and applies RoHS and Green Dot standards throughout the production and installation process to reflect HITACHI's awareness of environmental respect and commitment.

1.2 Safety

1.2.1 Symbols used

During normal air conditioning system design work or unit installation, greater attention must be paid in certain situations requiring particular care in order to avoid injuries and damage to the unit, the installation, the building or property.

Situations that jeopardise the safety of those in the surrounding area or that put the unit itself at risk will be clearly indicated in this manual.

To indicate these situations, a series of special symbols will be used to clearly identify these situations.

Pay close attention to these symbols and to the messages following them, as your safety and that of others depends on it.

DANGER

- ***The text following this symbol contains information and instructions relating directly to your safety and physical wellbeing.***
- ***Not taking these instructions into account could lead to serious, very serious or even fatal injuries to you and others in the proximities of the unit.***

In the texts following the danger symbol you can also find information on safe procedures during unit installation.

CAUTION

- ***The text following this symbol contains information and instructions relating directly to your safety and physical wellbeing.***
- ***Not taking these instructions into account could lead to minor injuries to you and others in the proximities of the unit.***
- ***Not taking these instructions into account could lead to unit damage.***

In the texts following the caution symbol you can also find information on safe procedures during unit installation.

NOTE

- ***The text following this symbol contains information or instructions that may be of use or that require a more thorough explanation.***
- ***Instructions regarding inspections to be made on unit parts or systems may also be included.***

1.3 Product guide

1.3.1 Classification of outdoor unit models and CH units

Unit type (outdoor unit): RAS

Position-separating hyphen (fixed)

Capacity (HP): (8-54)

FSX: SET FREE series

N: R410A refrigerant

XXX	–	XX	FSX	N

Type of unit: CH (Cooling/Heating Changeover unit)

Position-separating hyphen (fixed)

Maximum capacity of connectable indoor units (HP)

6.0: 6.0 HP

10.0: 6.1 to 10.0 HP

N: R410A refrigerant

1: Generation

XX	–	XX	N	1

1.3.2 Product guide: Outdoor units

◆ RAS outdoor units

RAS FSXN outdoor units			
RAS FSXN			
			
❄ ☼ 3~			
Unit	Code	Unit	Code
RAS-8FSXN	60288346	RAS-14FSXN	60288349
RAS-10FSXN	60288347	RAS-16FSXN	60288350
RAS-12FSXN	60288348	RAS-18FSXN	60288351

NOTE

To obtain the different working range powers, please refer to chapter Combination of outdoor units, see on page 5.

◆ Combination of outdoor units

The power range of the RAS-(8-54)FSXN outdoor units is obtained by applying one unit (RAS-(8-18)FSXN) or by the combination of two or three outdoor units (RAS-(20-54)FSXN), depending on the instructions in the following tables.

Base units

HP	8	10	12	14	16	18
Model	RAS-8FSXN	RAS-10FSXN	RAS-12FSXN	RAS-14FSXN	RAS-16FSXN	RAS-18FSXN

Combination of base units

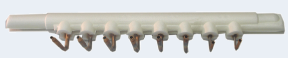
HP	20	22	24	26	28	30
Model	RAS-20FSXN	RAS-22FSXN	RAS-24FSXN	RAS-26FSXN	RAS-28FSXN	RAS-30FSXN
Combination	RAS-8FSXN	RAS-8FSXN	RAS-10FSXN	RAS-12FSXN	RAS-14FSXN	RAS-14FSXN
	RAS-12FSXN	RAS-14FSXN	RAS-14FSXN	RAS-14FSXN	RAS-14FSXN	RAS-16FSXN

HP	32	34	36	38	40	42
Model	RAS-32FSXN	RAS-34FSXN	RAS-36FSXN	RAS-38FSXN	RAS-40FSXN	RAS-42FSXN
Combination	RAS-16FSXN	RAS-16FSXN	RAS-18FSXN	RAS-12FSXN	RAS-12FSXN	RAS-12FSXN
	RAS-16FSXN	RAS-18FSXN	RAS-18FSXN	RAS-12FSXN	RAS-12FSXN	RAS-12FSXN
	–	–	–	RAS-14FSXN	RAS-16FSXN	RAS-18FSXN

HP	44	46	48	50	52	54
Model	RAS-44FSXN	RAS-46FSXN	RAS-48FSXN	RAS-50FSXN	RAS-52FSXN	RAS-54FSXN
Combination	RAS-12FSXN	RAS-12FSXN	RAS-12FSXN	RAS-14FSXN	RAS-16FSXN	RAS-18FSXN
	RAS-14FSXN	RAS-16FSXN	RAS-18FSXN	RAS-18FSXN	RAS-18FSXN	RAS-18FSXN
	RAS-18FSXN	RAS-18FSXN	RAS-18FSXN	RAS-18FSXN	RAS-18FSXN	RAS-18FSXN

1.3.3 Accessory code list

HITACHI offers a range of different accessories and remote control systems that can be used with the SET FREE outdoor units. Please consult the corresponding Technical Catalogue for controls.

Name	Description	Code	Figure
MC-20AN	Branch pipe (pipe connection kit)	70526009	
MC-21AN	Branch pipe (pipe connection kit)	70526010	
MC-30AN	Branch pipe (pipe connection kit)	70526011	
MC-20XN	Branch pipe (pipe connection kit)	70526109	
MC-21XN	Branch pipe (pipe connection kit)	70526110	
MC-30XN	Branch pipe (pipe connection kit)	70526111	
CH-6.0N1	CH Unit	60291633	
CH-10.0N1	CH Unit	60291634	
DBS-TP10A	Drain Boss	60291683	
E-102SN2	Branch pipe (multikit)	70524001	
E-162SN2	Branch pipe (multikit)	70524002	
E-242SN2	Branch pipe (multikit)	70524004	
E-302SN2	Branch pipe (multikit)	70524005	
E-52XN2	Branch pipe (multikit)	70525000	
E-102XN2	Branch pipe (multikit)	70525001	
E-162XN2	Branch pipe (multikit)	70525002	
E-202XN2	Branch pipe (multikit)	70525003	
E-242XN2	Branch pipe (multikit)	70525004	
E-322XN2	Branch pipe (multikit)	70525005	
MH-84AN	Header branch	70522007	
MH-108AN	Header branch	70522008	

2. Unit installation

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2.1 Outdoor unit

2.1.1 Preliminary conditions for positioning of outdoor unit

Mount the outdoor unit in a shady location or where it will not be exposed to direct sunlight, or to high temperatures. It should also be a well-ventilated spot.

Mount the outdoor unit so that noises and the discharge of air from the unit will not bother neighbours or the surrounding environment.

Install the outdoor unit in an area of limited access to the general public.

In cold climates, ice may form on the unit. When installing the unit, make sure that ice falling off the unit could not pose a risk to passers-by.

When installing the outdoor unit in areas covered by snow, mount the covers supplied by the fitter on the top of the unit and on the heat exchanger inlet side.

Do not install the outdoor unit in zones where dust or contamination could block the outside heat exchanger.

Do not install the outdoor unit in areas with a high air content of oil, saline atmospheres or aggressive gases such as sulphur.

Do not install the outdoor unit close to sources of strong electromagnetic radiation or in areas where electromagnetic waves radiate directly towards the electrical box and the components of the unit. Install the unit as far as possible from these sources (minimum 3 metres); electronic noise may result in the incorrect operation of the unit.

CAUTION

In areas with high electromagnetic turbulence, a fuse may blow or the unit stop or an alarm may be triggered. In this case, stop the system and restart it to remove the alarm.

Make sure that the base of the foundations is flat and strong enough to bear the weight of the unit.

Install the outdoor unit in an area with enough space around the unit to permit service and maintenance tasks.

CAUTION

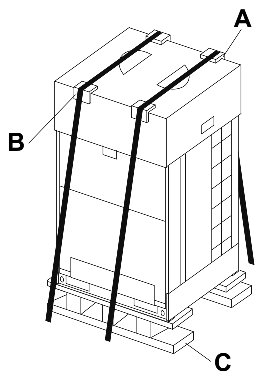
- ***The aluminium fins have sharp edges. Take special care to avoid injury.***
- ***The outdoor unit must be installed on rooftops or in areas not accessible by the user. Only service technicians and maintenance personnel are permitted access to the unit.***

2.1.2 Transport, lifting and handling of the units

◆ Transport of outdoor unit

When transporting the unit, make sure that it is securely and correctly fastened to the vehicle to avoid damage. To avoid damage, use appropriate textile slings -A- and cardboard protection -B- to ensure that the unit is immobilised without damaging it.

Use a suitable crane with the required loading capacity on flat ground when loading and unloading the unit.



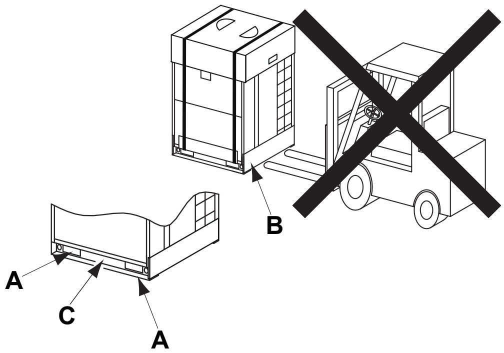
CAUTION

Do not place other material on top of the outdoor units during transport and storage.

If the unit is not installed immediately, it should be stored in a suitable location, protected from the elements, especially in saline atmospheres and from rodents. The unit must be stored with all the transport protection with which it was supplied and with the wooden base -C- fitted.

◆ Handling

When handling loads with fork-lift trucks, special care should be taken to prevent injury to individuals in the vicinity or damage to the unit itself.



CAUTION

National and local legislation must be observed with respect to driving and the handling of loads with fork-lift trucks.

The only places in which the forks of the fork-lift truck can be inserted are through the openings -A- of the unit base.

Do not apply excessive force to these openings, with either the forks or other tools. This could damage the base of the unit.

Do not move the unit by pushing it on side -B- of the base with the forks of the fork-lift truck or by applying force on zone -C-.

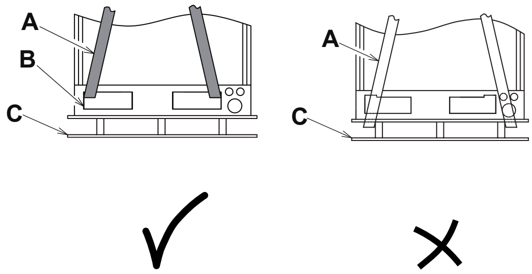
Do not use wheelbarrows to move the unit.

◆ Lifting method

Do not remove any of the protective packaging from the unit to protect it during handling and lifting.

The unit should only be lifted from the base.

Fit the hoisting slings -A- through the openings -B- on the base of the unit.



DANGER

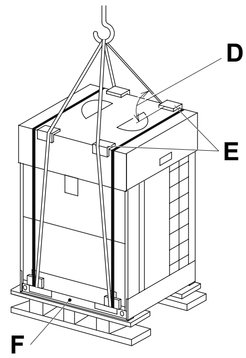
- ***Always use textile slings in good condition, without cuts or wear, and with the correct capacity for lifting the outdoor unit.***
- ***Do not fit the slings on the wooden base -C- of the unit. The wooden base is only designed to protect the base of the unit during transportation; it will not withstand the strain of lifting the unit.***
- ***Do not use metal cables to lift the unit. Metal cables may slip on the wooden base supporting the unit and could cause the unit to tilt or fall during the lifting operation.***

Slightly tighten the two hoisting slings.

Insert protection -E- between where the slings touch the upper protective cardboard packaging of the the unit. The slings must not touch the unit.

The slings should form an angle of more than 60° -D- with the upper part of the unit. The unit should be kept horizontal throughout the lifting operation. If necessary, tie guide ropes on to prevent the unit from swinging freely during the lifting process.

Do not apply force to zone -F-.



DANGER

No-one should remain in the radius of action of the crane during the lifting process.

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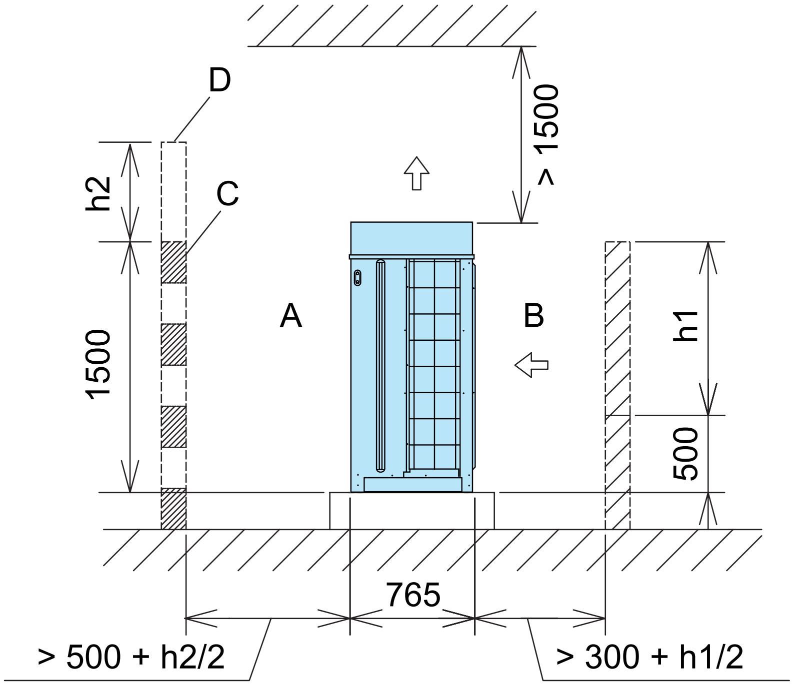
2.1.3 Installation space RAS-(8-18)FSXN



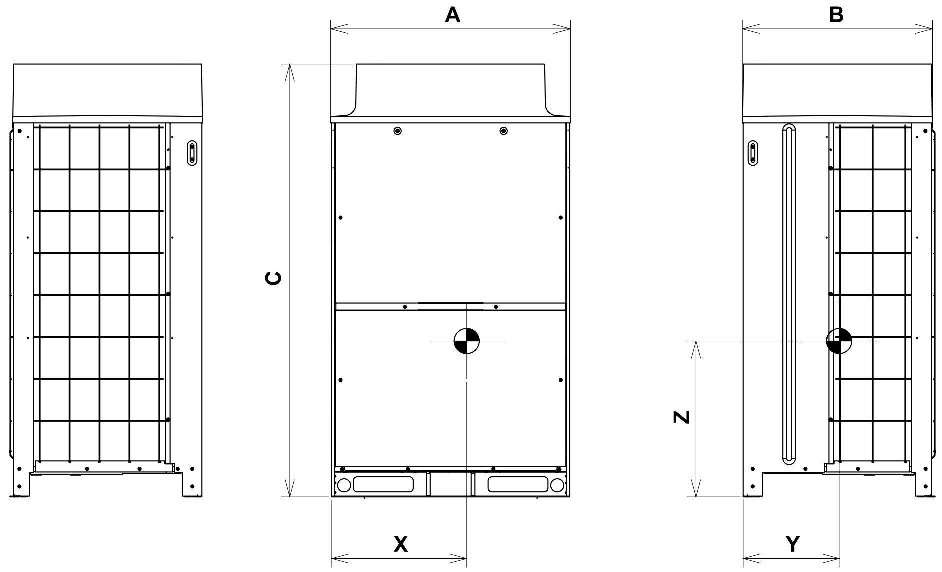
NOTE

Side view. All measurements are in mm.

Calculate the service space required during the installation of the unit, based on the following:

- If there are no walls in front of or behind the unit, a space of 500 mm is necessary in front -A- and 300 mm behind -B-.
- If the front wall is higher than 1500 mm, a space of (500 + h2/2) mm is required at the front -A-.
- If the rear wall is higher than 500 mm, a space of (300 + h1/2) mm is required at the back -B-.
- If a wall -D- is installed in front of the unit, a ventilation hole -C- should be made in the wall.
- When the space over the unit is less than 1500 mm, or the space around the unit is closed, a duct is required to prevent short-circuits between the inlet air and the discharge air.
- If there are any obstacles in the space over the unit, the four sides of the unit should be left open.

2.1.4 Center of gravity

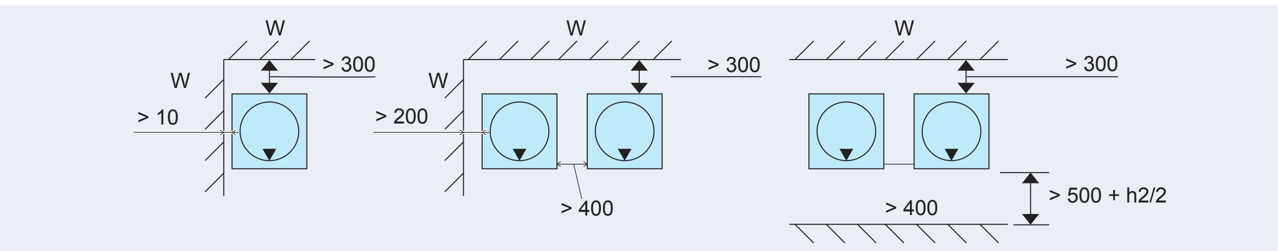


Model	Net weight (kg)	Center of gravity (mm)			Outer dimensions (mm)		
		X	Y	Z	A	B	C
RAS-8FSXN	210	470	310	630	950	765	1720
RAS-10FSXN							
RAS-12FSXN							
RAS-14FSXN	295	540	295	575	1210	765	1720
RAS-16FSXN							
RAS-18FSXN	315	540	305	590			

2.1.5 Installation

◆ Installation with walls in two directions

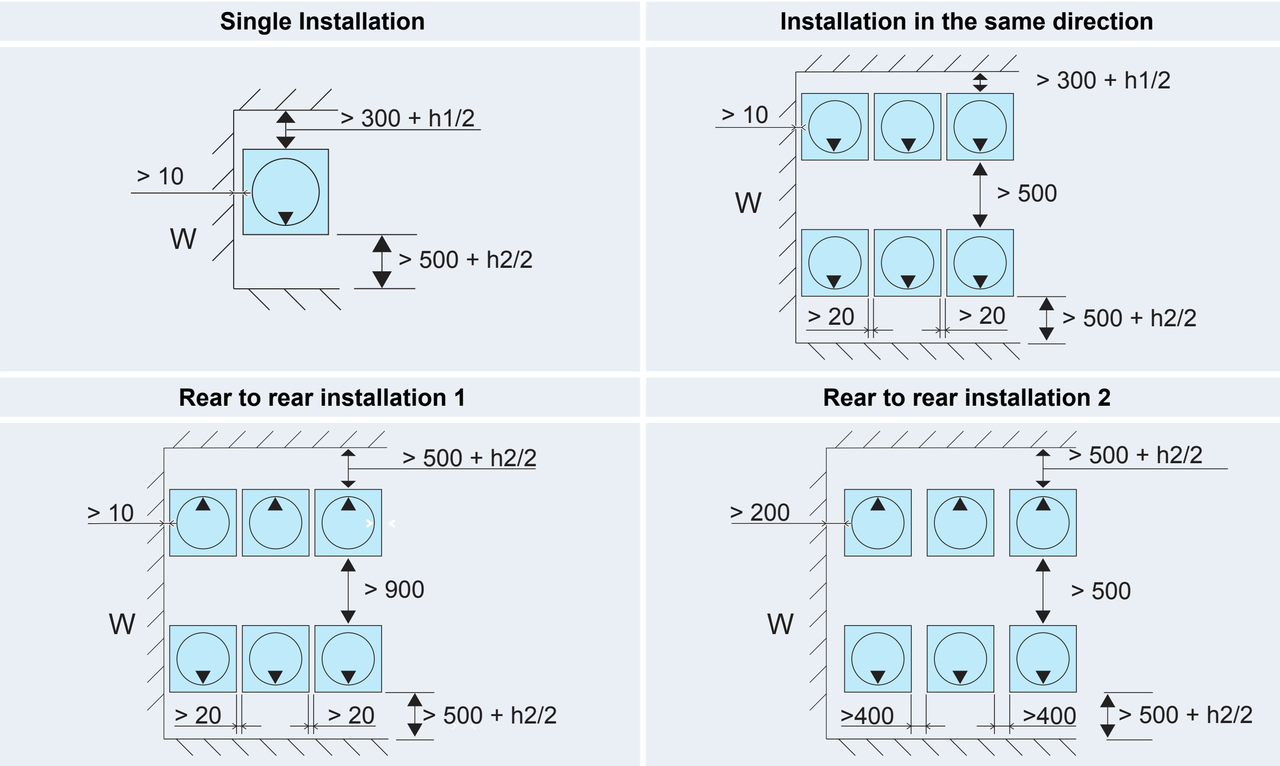
If the units installed are adjacent to high buildings, without walls in two directions, a space of 300 mm is required at the rear side of the unit.



NOTE

- ***All measurements are in mm.***
- ***Top view. The arrow ▼ indicates the front of the unit.***
- ***W: No limit for side wall height.***

◆ Installation with walls in three directions

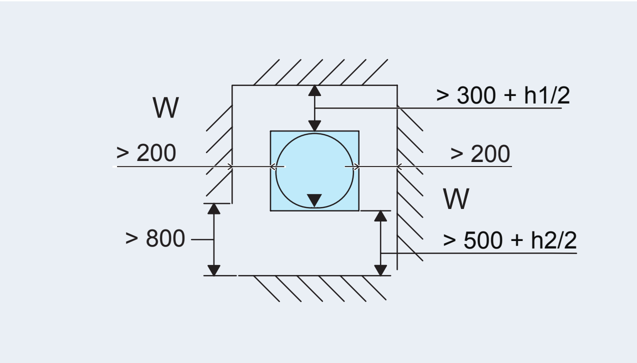


NOTE

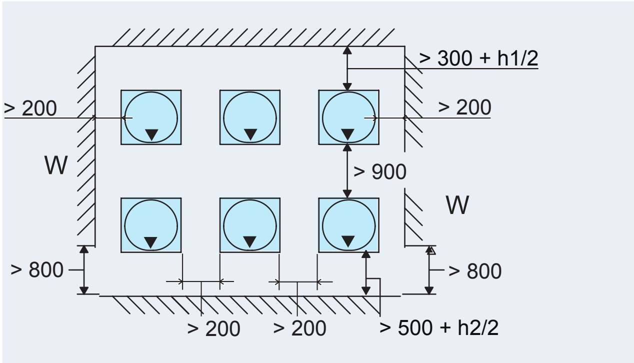
- ***All measurements are in mm.***
- ***Top view. The arrow ▼ indicates the front of the unit.***
- ***W: No limit for side wall height.***

◆ Installation with walls in four directions

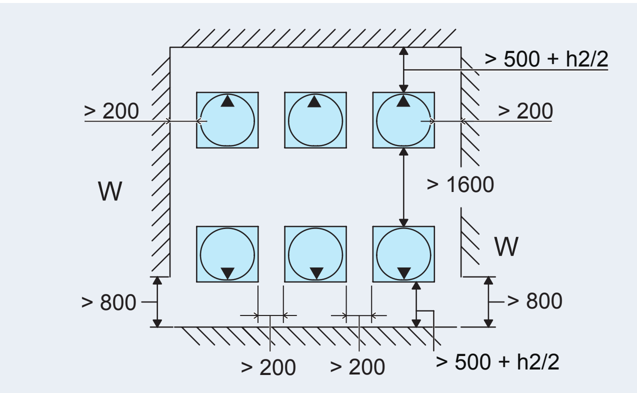
Single installation



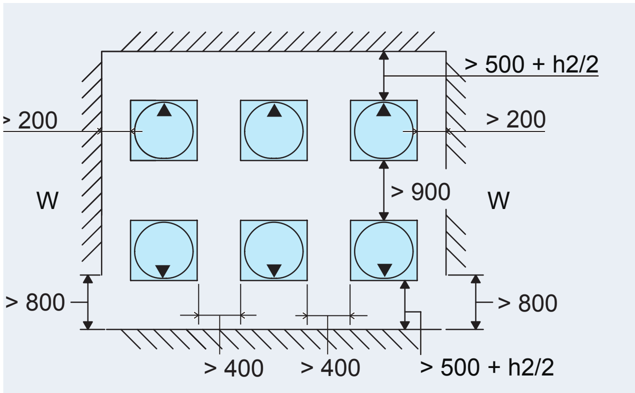
Installation in the same direction



Rear to rear installation 1



Rear to rear installation 2

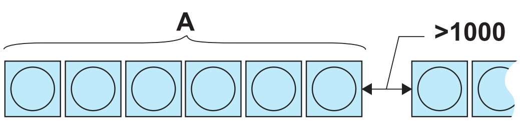


NOTE

- *All measurements are in mm.*
- *Top view. The arrow ▼ indicates the front of the unit.*
- *W: No limit for side wall height.*

◆ Considerations

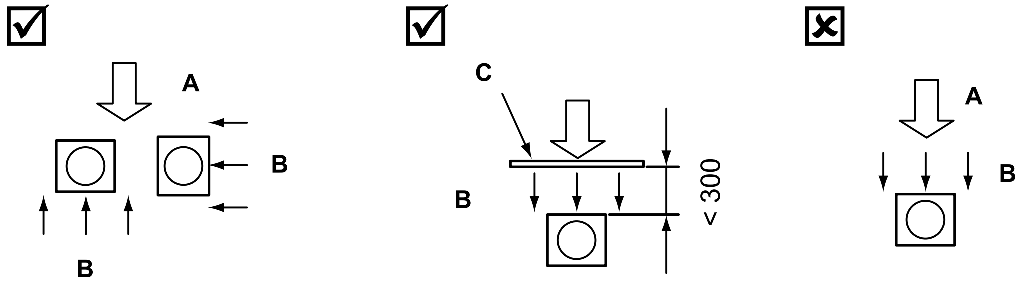
NOTE

- *All measurements are in mm.*
- *The dimensions considered in the following figures include the space necessary for typical installation and maintenance work for operation in refrigeration mode at an outdoor temperature of 35 °C.*
  If the outdoor temperature is higher and if there is the possibility of short circuit between the inlet and outlet air, locate the most suitable dimensions by calculating the air flow current in comparison with the dimensions given.
- *For installation in several groups, a maximum of six units (A) one metre apart can be grouped.*
- 

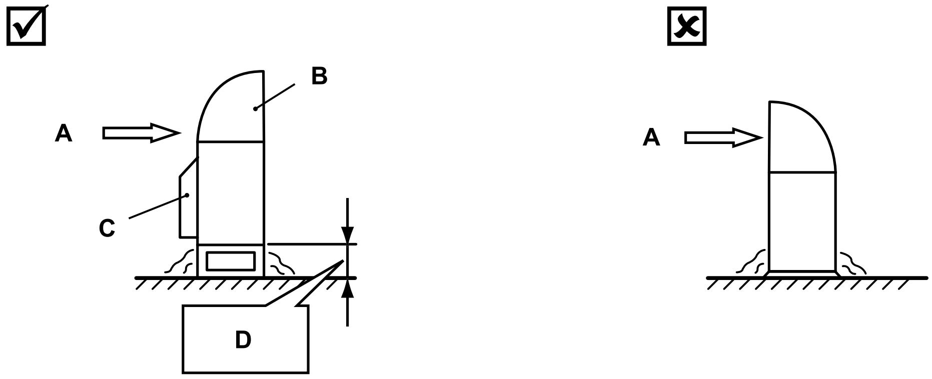
- *If the unit is surrounded by walls on all four sides, keep one of the walls partially open.*
- *Keep the upper side open to prevent mutual interference of inlet and outlet air for each outdoor unit.*

◆ Installation precautions

- Avoid installing at locations where strong winds (A) are directed towards the unit's air inlet side (B). If this is not possible, install a wind protector (C).



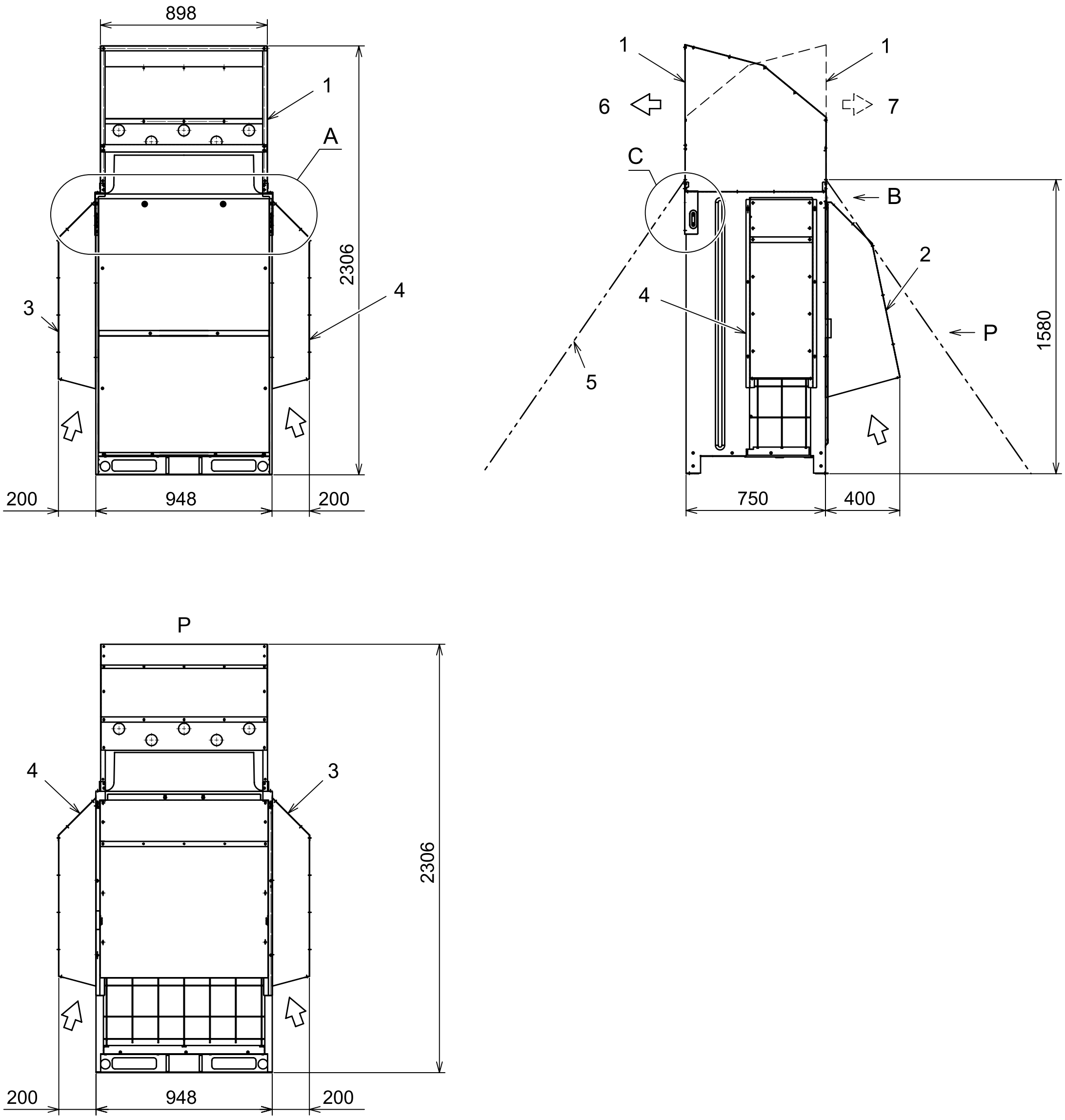
- At locations where snow is frequent, place hoods, field supplied, on the air inlet and outlet areas (B and C) preventing the wind (A) from directly affecting the air outlet. Also, a higher base foundation should be installed in order to prevent the accumulation of snow (D). Install the unit at a sunny location.



◆ Hood dimensions (field supplied)

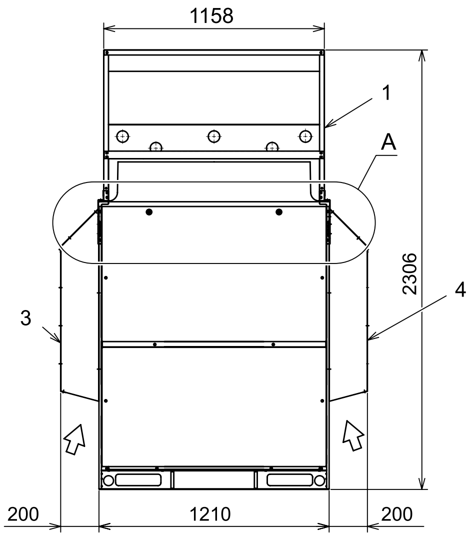
- The following figures show the recommended dimensions of the air inlet and outlet hoods for the outdoor unit.
- Use 1 mm thick steel plates for the hoods and 1.5 mm for the brackets.
- Use drilled steel plates for the air inlet hoods.
- Paint the hoods in accordance with Munsell code 1.0Y 8.5/0.5 beige color.
- Use self-tapping screws M5 for fixing the hoods.
- Reinforce the hoods with brackets if necessary.
- All measurements are in mm.

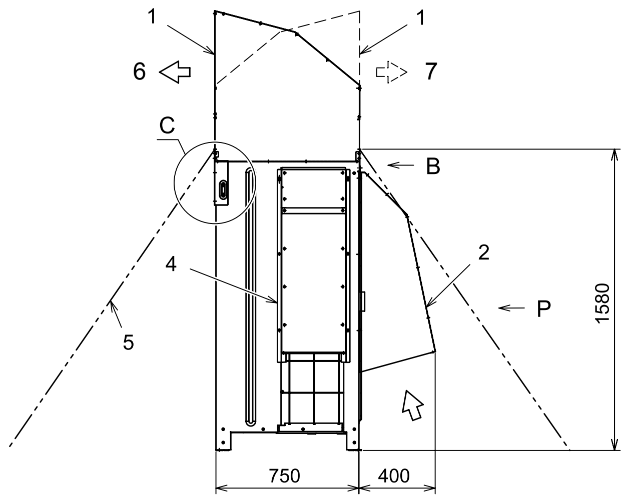
RAS-(8-12)FSXN



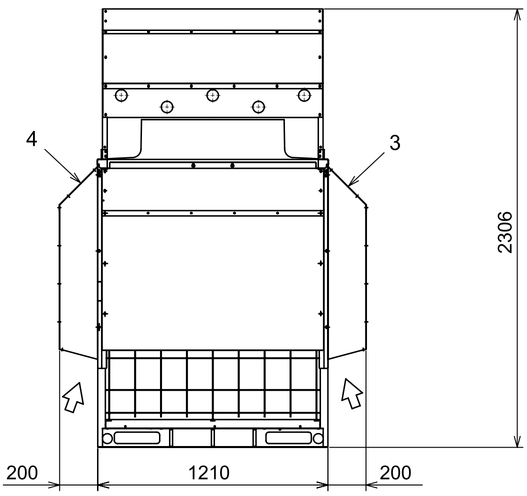
No.	Name
1	Air discharge hood
2	Rear suction hood
3	Left suction hood
4	Right suction hood
5	Safety cable (to prevent overturning)
6	Air flow direction (front side)
7	Air flow direction (rear side)

RAS-(14-18)FSXN



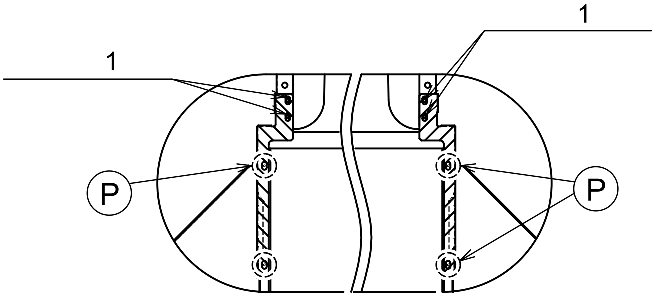


P



No.	Name
1	Air discharge hood
2	Rear suction hood
3	Left suction hood
4	Right suction hood
5	Safety cable (to prevent overturning)
6	Air flow direction (front side)
7	Air flow direction (rear side)

Enlarge view of A



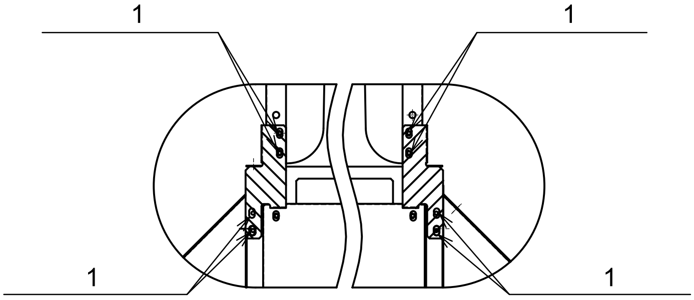
1 2 fixing screw.

Enlarge view of P

Punch Mark (4 places)

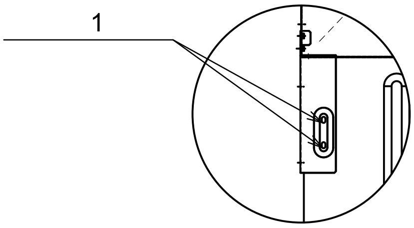
Drill a pilot hole into the punch mark and mount the fixing plate.

Enlarge view of B



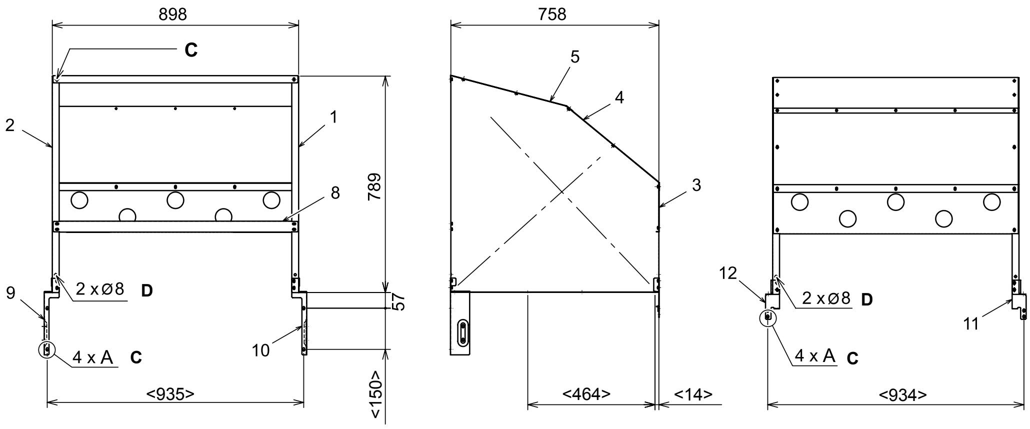
1 2 fixing screw.

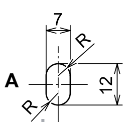
Enlarge view of C



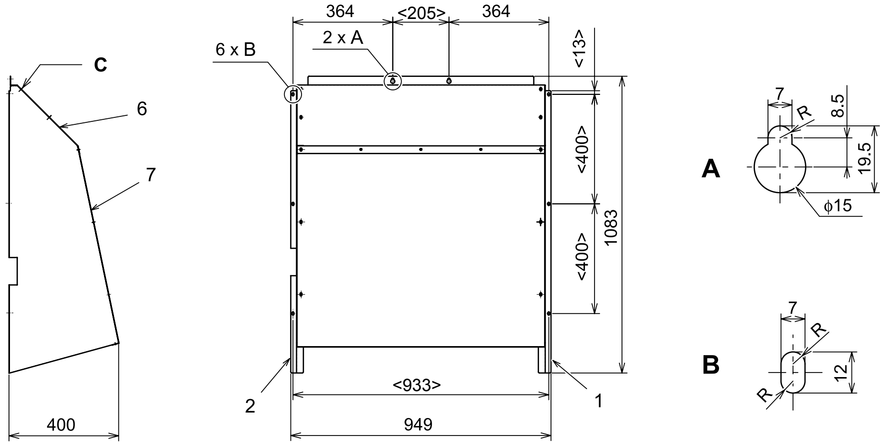
1 2 fixing screw.

Air discharge hood for RAS-(8-12)FSXN





Rear suction hood for RAS-(8-12)FSXN



NOTE

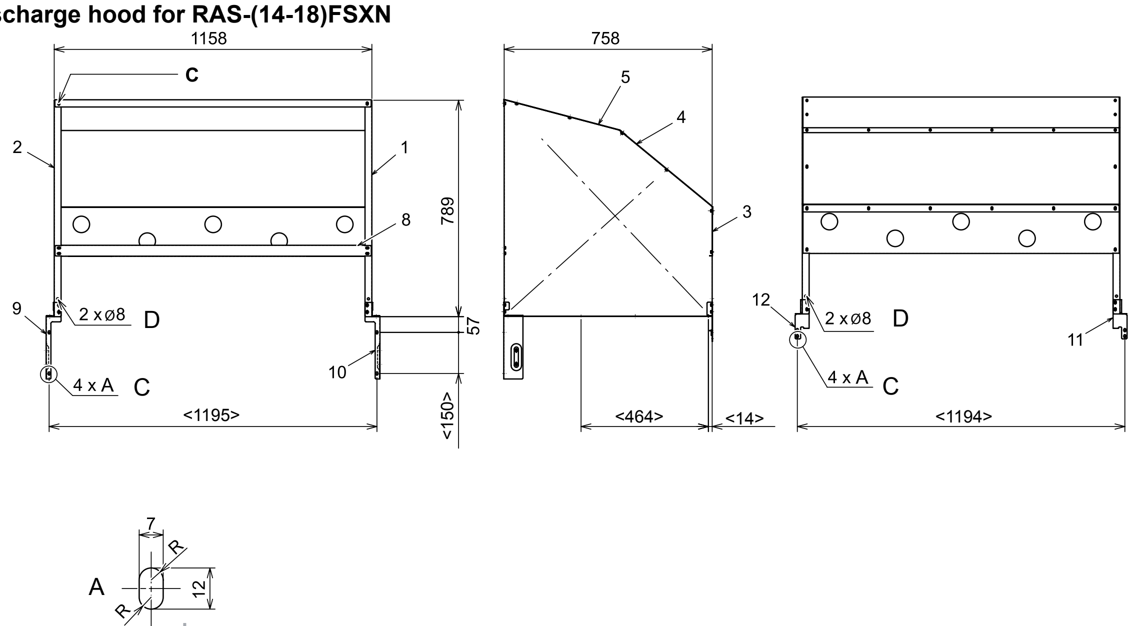
C: fixing screw (accessory).

D: hole for fixing screw to prevent overturning.

< >: dimension of installation.

No.	Name	Quantity	
		Air discharge hood	Suction rear hood
1	Right plate	1	1
2	Left plate	1	1
3	Front panel (1)	1	-
4	Front panel (2)	1	-
5	Front panel (3)	1	-
6	Front panel (upper)	-	1
7	Front panel (lower)	-	1
8	Side plate	1	-
9	Left fixing plate for front	1	-
10	Right fixing plate for front	1	-
11	Left fixing plate for rear	1	-
12	Right fixing plate for rear	1	-

Air discharge hood for RAS-(14-18)FSXN



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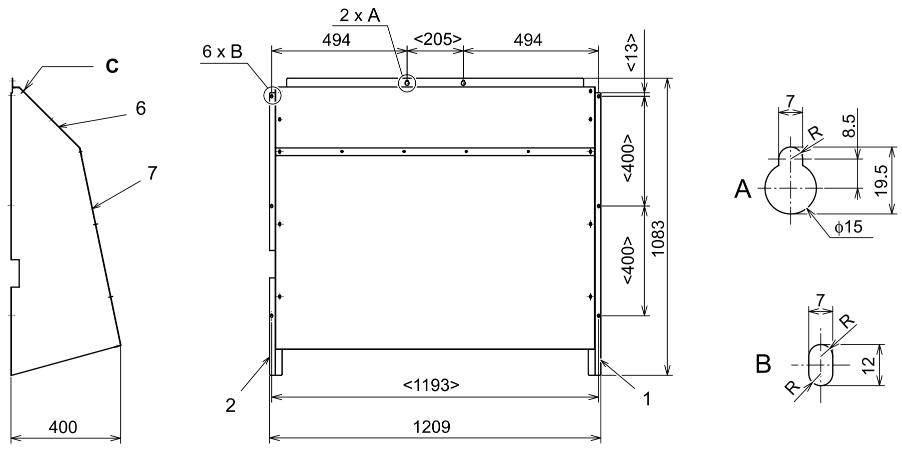
2

Rear suction hood for RAS-(14-18)FSXN



NOTE

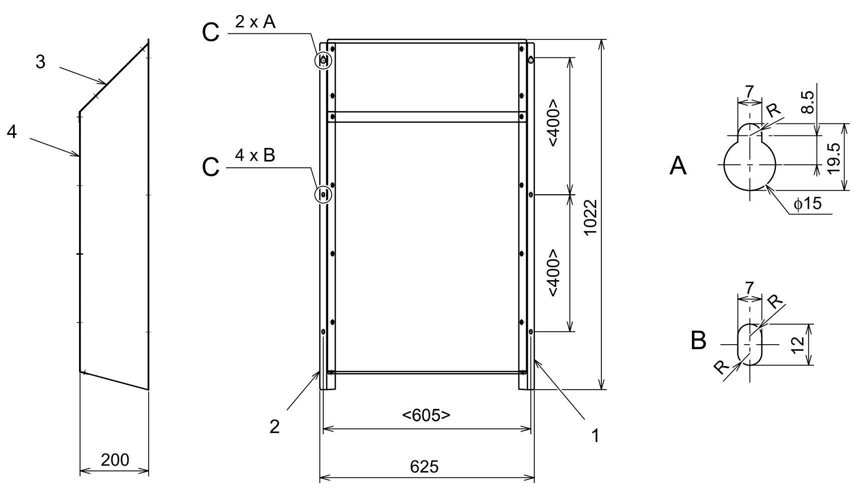
C: fixing screw (accessory).

D: hole for fixing screw to prevent overturning.

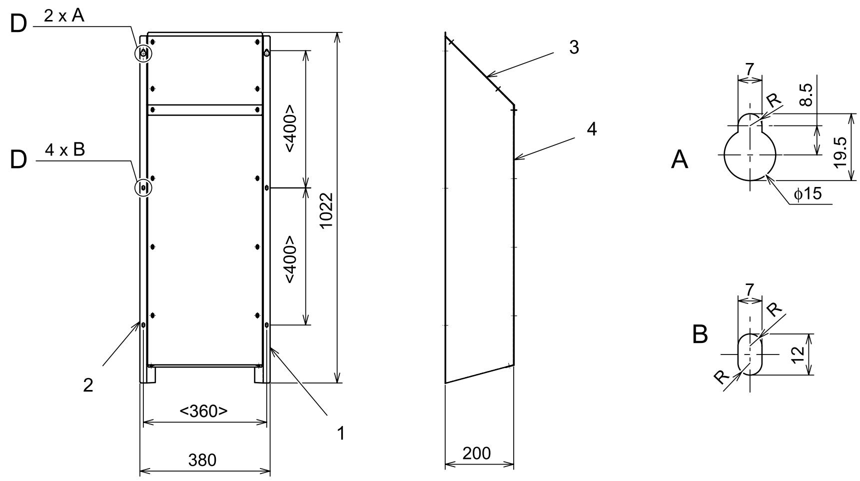
< >: dimension of installation.

No.	Name	Quantity	
		Air discharge hood	Suction rear hood
1	Right plate	1	1
2	Left plate	1	1
3	Front panel (1)	1	-
4	Front panel (2)	1	-
5	Front panel (3)	1	-
6	Front panel (upper)	-	1
7	Front panel (lower)	-	1
8	Side plate	1	-
9	Left fixing plate for front	1	-
10	Right fixing plate for front	1	-
11	Left fixing plate for rear	1	-
12	Right fixing plate for rear	1	-

Left suction hood for RAS-(8-18)FSXN



Right suction hood for RAS-(8-18)FSXN



NOTE

C: fixing screw (accessory).

D: hole for fixing screw to prevent overturning.

< >: dimension of installation.

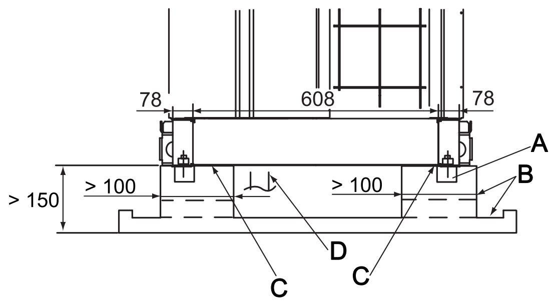
No.	Name	Quantity	
		Left suction hood	Right suction hood
1	Right plate	1	1
2	Left plate	1	1
3	Front panel (1)	1	1
4	Front panel (2)	1	1

2.1.6 Foundation and anchorage of outdoor unit

◆ Foundations

NOTE

All measurements are in mm.



A. Mortar housing ø100 x 150 (square x depth).

B. Drainage 100 x 20 (width x depth).

C. Anti-vibration insulation material.

D. Refrigerant pipes.

The foundations for the installation of the outdoor unit must be more than 150 mm above ground level.

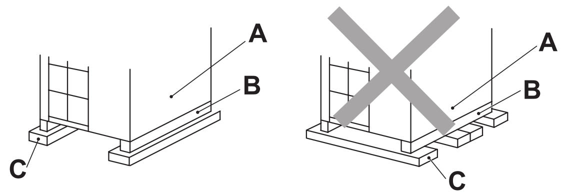
The foundations require perimeter drainage to help drain condensation.

When a system of condensation drainage pipes is required for the outdoor unit, the genuine accessory DBS-TP10A should be used. Do not fit drainage pipes or collection trays in cold climates, as they could freeze and break.

DANGER

Drainage must not take place in areas frequented by pedestrians. In low temperatures, the drainage water could freeze and lead to falls.

The foundations must be able to bear the weight of the whole of the base of the unit and should be laid as shown in the diagram.



A. Front part of the unit.

B. Base of unit.

C. Foundations.

Check the front-rear line and the sides of the unit are level: there should not be more than 10 mm difference between each side.

The foundation must be sufficiently strong to ensure that the outdoor unit:

- Is not tilted.
- Does not produce strange noises.
- Remains secure in the event of strong winds or earthquakes.

2

◆ Position of anchorage bolts

NOTE

All measurements are in mm.

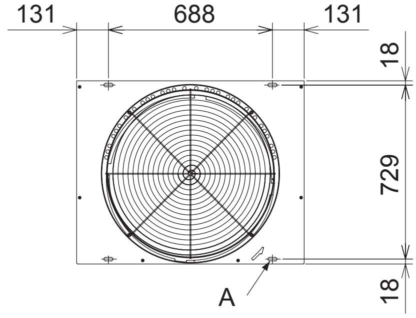
Secure the outdoor unit using the field-supplied anchorage bolts.

A. Openings for the anchorage bolts (4x) 38 x 15.

1. Outdoor unit SET FREE RAS-(8-12)FSXN

2. Outdoor unit SET FREE RAS-(14-18)FSXN

1



2

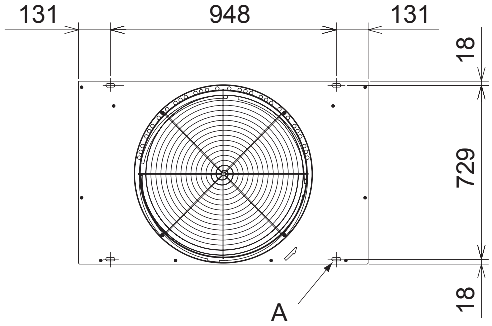
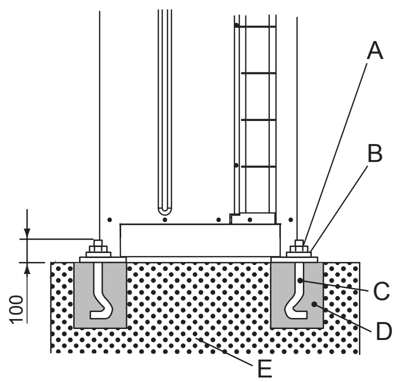


Diagram of fastening of outdoor unit using field-supplied anchorage bolts.



A. Nut.

B. Washer.

C. M12 anchorage bolt.

D. Mortar fill.

E. Concrete.

2.2 CH units

2.2.1 Transportation and handling CH units

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

DANGER

- ***Do not put any foreign material into the CH unit and check to ensure that none exists in the outdoor unit before the installation and test run. Otherwise, a fire or failure, etc. may occur.***

CAUTION

- ***Do not put any material on the product.***
- ***Be careful not to damage on insulation materials of unit's surface when lifting.***

◆ Combination CH unit and indoor unit

The CH unit is installed indoors for the SET FREE FSXN system, between the outdoor unit and indoor unit. The combination of the CH unit and indoor unit is as follows:

Model	Indoor unit quantity	Total indor capacity (HP)
CH-6.0N1	1 to 7	Less than 6.0
CH-10.0N1	1 to 8	6.0 ~ 10.0

NOTE

- ***The excess of the total capacity may cause insufficient performance and abnormal sound. Be sure to connect within the allowable total capacity.***
- ***In case that the indoor unit total capacity is 10.0 HP for CH-10.0N1, the performance may decrease approximately 5% in cooling and 10% in heating.***

2.2.2 CH unit installation

DANGER

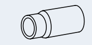
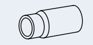
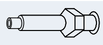
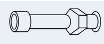
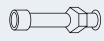
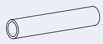
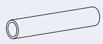
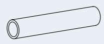
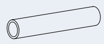
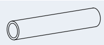
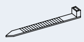
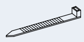
- ***Do not install the indoor unit in a flammable environment to avoid fire or an explosion.***

CAUTION

- ***Check to ensure that the ceilling slab is strong enough.***
- ***Do not install the CH unit outside. If installed outdoors, an electric hazard electric leakage will occur.***

◆ Factory supplied accesories

Check to ensure that the following accesories are packed with the CH unit.

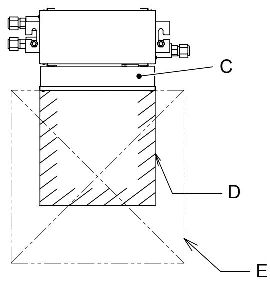
			Model							
			CH-6.0N1			Qty.	CH-10.0N1			Qty.
Accessory	Reducer		ID15.88		ID19.05	1	ID15.88		ID19.05	1
	Accessory Pipe (for flare nut)		ID12.7		ID15.88	2	-	-	-	-
			-	-	-	-	ID22.2		ID19.05	2
			-	-	-	-	ID19.05		ID19.05	2
	Insulation material	ID16	-		-	2	-	-	-	-
		ID38	-		-	3	-	-	-	-
		ID20	-	-	-	-	-		-	1
		ID22	-	-	-	-	-		-	2
		ID43	-	-	-	-	-		-	3
	Clamp		-		-	6	-		-	6

ID: Inner diameter.

◆ Initial check

Install de CH unit with a proper clearance around it for maintenance working space, as shown in the figure.

Model	A	B
CH-6.0N1	300	70
CH-10.0N1	400	70



C. Electrical box.

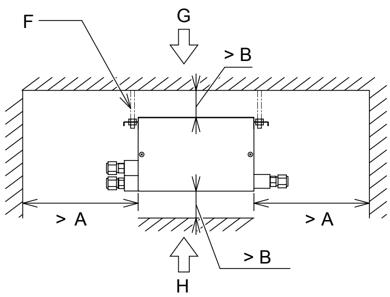
D. Service space (300 x 300).

E. Service access door (450 x 540).

F. 2- suspension bolt. M10 or W3/8 (field supplied).

G. Upper side.

H. Bottom side.

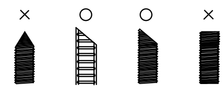


NOTE

All measurements are in mm.

- Check to ensure that the ceiling is sufficiently strong to sustain the CH unit. If the ceiling is weak, abnormal sound and vibration may occur.
- The refrigerant flow sound may be heard from the CH unit when the electric expansion valve in the CH unit is activated. Therefore, take the following action to minimize the sound.
  1 Install the CH unit inside the ceiling. As for the ceiling material, select a material like a plaster board (at least 9 mm) which minimizes operation sound.
  2 Do not install the CH unit in a place near bed rooms or hospital rooms.
- The refrigeration flow sound may be heard from the CH unit when the operation is changed to cooling/heating mode. Therefore install the CH unit in the ceiling of corridor so that refrigerant flowing sound may not be heard in the room.
- Do not install the CH unit in a hot or humid place like kitchen to prevent dew condensation on the outer surface of the CH unit. When installing the CH unit in such places, apply additional insulation.
- Pay attention to the following points when the CH unit is installed in a hospital or other facilities where there are electronic waves from medical equipment.
  1 Do not install the CH unit where the electromagnetic wave is directly radiated to the electrical box or intermediate wiring (Operating line).
  2 Install the CH unit and components as far as practical or at least 3 meters from the electromagnetic wave radiator.
  3 Install a noise filter when the power supply emits harmful noises.
- The installation place should be convenient for the refrigerant piping or electrical wiring connection.
- Do not install the CH unit in the place with organic solvent atmospheres, such as painting and cleaning factories. Synthetic resin material may be damaged.
- Do not install the CH unit in the place where flammable gas may generate, drift or accumulate. Also avoid the place where the carbon fabric may float.

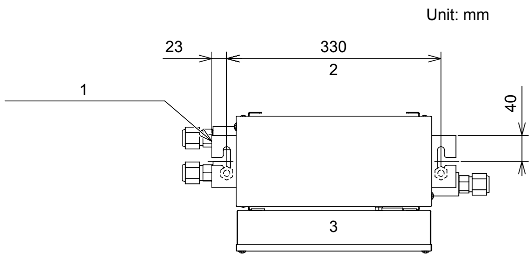
◆ Suspension bolts



NOTE

- ***Use a suspension bolt (W3/8, Metric screw thread: M10).***
- ***Prepare suitable washer and nut.***
- ***Use a suspension bolt with 30 to 45° sloping angle.***

1 Suspension bracket 2–11 x 34 slotted hole.
2 (for suspension bolt).
3 Electrical box.



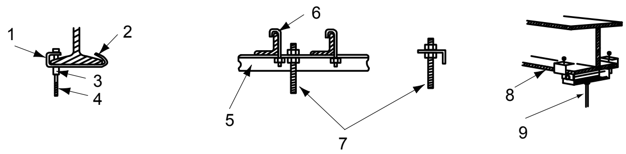
Step 1

1 Select a final location and installation direction of the CH unit paying careful attention to the space for the pipping, wiring and maintenance.
2 Mount suspension bolts after selecting the final location of the CH unit.
3 Mount the suspension bolts in the slotted hole on the electrical box side.
4 Contact the qualified constructor or carpenter for the ceiling treatment.

Step 2

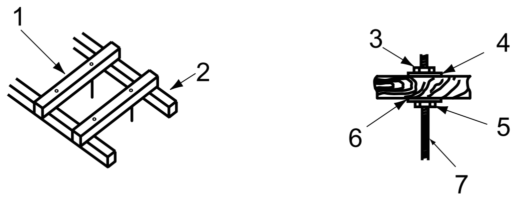
Mount suspension bolts, as shown in next figures.

For steel beam.



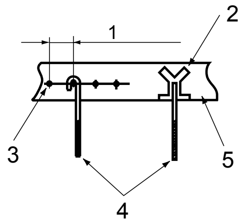
1 C-shaped clamp.
2 Antiskid clamp (bend it).
3 Nut.
4 Suspension bolt.
5 Support angle.
6 Suspension bolt.
7 Suspension bolt (W3/8 or M10).
8 I beam.
9 Suspension bolt (W3/8 or M10).

For wooden beam suspension.



1 Wooden bar (60 to 90 mm square).
2 Wooden beam.
3 Nut.
4 Square washer.
5 Nut.
6 Square washer.
7 Suspension bolt (W3/8 or M10).

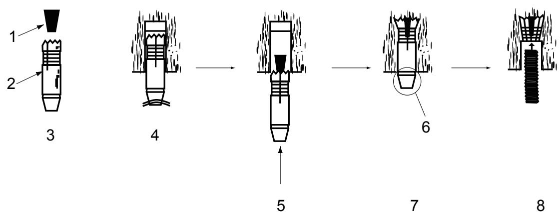
For reinforcing steel.



1 150 to 160 mm..
2 Insert (100 to 150 kg).
3 Steel.
4 Suspension bolt (W3/8 or M10).
5 Concrete.

For concrete slab.

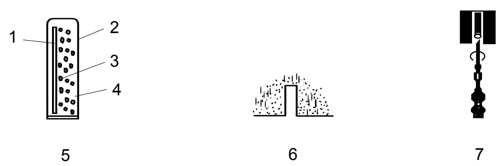
Hole-in-anchor.



1 Part A.
2 Part B.
3 Unit body.
4 Use a holesaw to make a hole.
5 Inserting.
6 Break a head portion of anchor by using a hummer.
7 Fixing.
8 Fixing bolt.

Resin capsule.

Use the resin capsule within a warranty period. It affects for 6 months from the manufacturing date.



1 Stiffening agent.
2 Glass.
3 Stone.
4 Epoxy resin.
5 Resin capsule.
6 Use a holesaw to make a hole.
7 Inserting (with pulse rotation).

After inserting, do not rotate or put any force until resin is hardened.

Required time is as shown in the following table:

Ambient temp. (°C)	Time
20	Min. 30 minutes
15	Min. 1 hour
10	Min. 2 hours
5	Min. 4 hours
0	Min. 8 hours

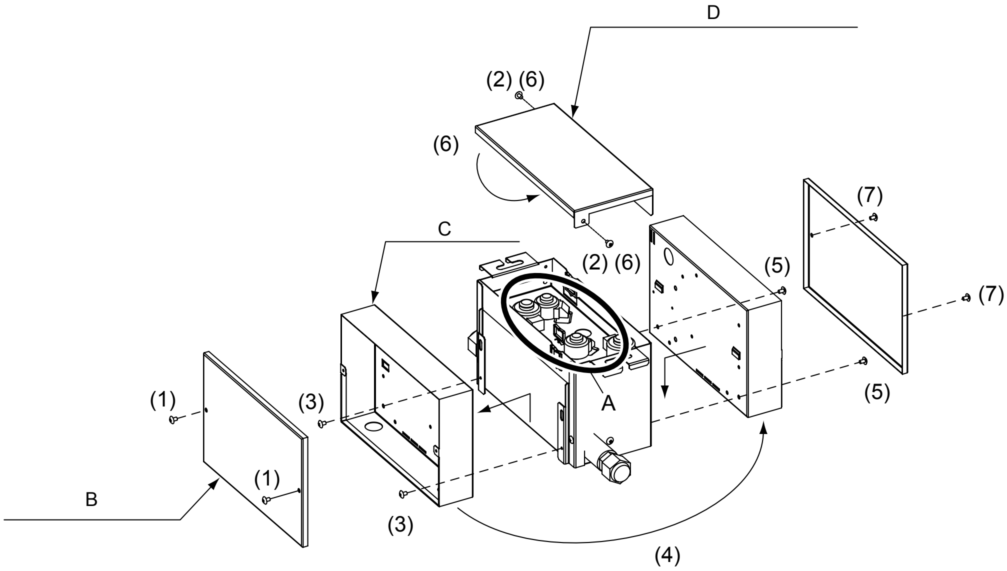
◆ **Installation**

Changing the location of electrical box

Depending on the installation space, changing the location of electrical box is available.

In case of changing the location of electrical box, follow the procedure below.

1 Remove the service cover for the electrical box.
2 Remove the service cover for the electronic expansion valve.
3 Remove the electric box.
4 Remove the wiring from the wire clip and edge saddle, and move the electrical box.
   After moving the electrical box, the wiring should be put into the edge saddle and bounded with the wire clip. (Refer to “enlarged view of A” below.)
5 Mount the electrical box.
6 Rotate the service cover for the electronic expansion valve 180 degrees and mount it.
7 Mount the service cover for the electrical box.



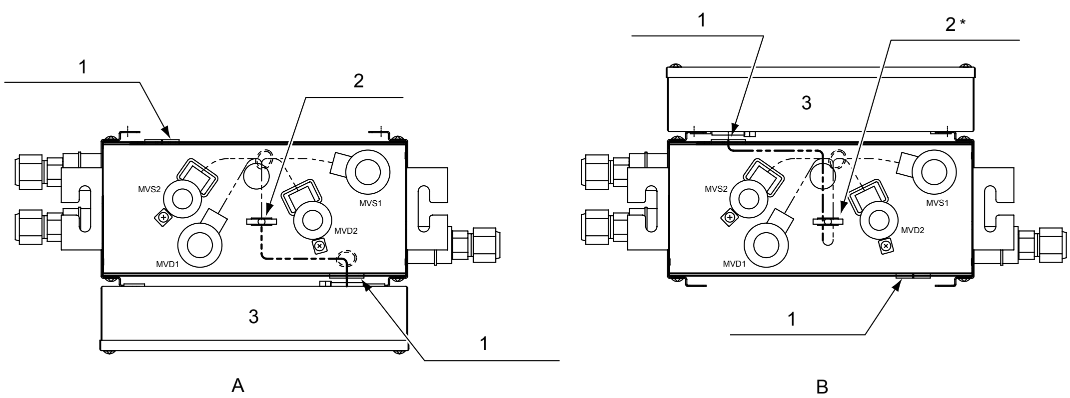
A. See below the enlarged view.

B. Service cover for electrical box.

C. Electrical box.

D. Service cover for electronic expansion valve.

Enlarged view of A.



1 Edge sadle.
2 Wire clip.
3 Electrical box.

A. Before change.

B. After change.

* Make sure that the wirings are bounded with the wire clips in order to prevent the electrical box from entering water.

Marking of the position of the suspension bolts and wiring connections

1 Mark the positions of the suspension bolts, refrigerant piping connections and wiring connection.

2 Installation dimensions are shown in *Initial checks, see on page 23*

Mounting the CH unit

1. How to put nuts.

Put nuts on each of the two suspension bolts before hanging the CH unit, as shown in next figure.

* Mounting washers are required in order to fix the suspension bracket to the suspension bolt.

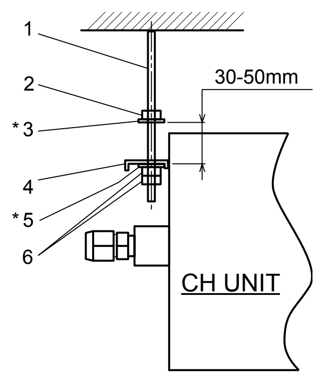
1 Suspension Bolt (M10 or W3/8) (Field-Supplied)
2 Nut (Field-Supplied)
3 * Washer (Field-Supplied)
4 Suspension Bracket (Equipped with CH Unit)
5 * Washer (Field-Supplied)
6 Double nut (Field-Supplied)

Field-Supplied Parts

* Suspension Bolt: 2-M10 or W3/8

* Nut: 6-M10 or W3/8

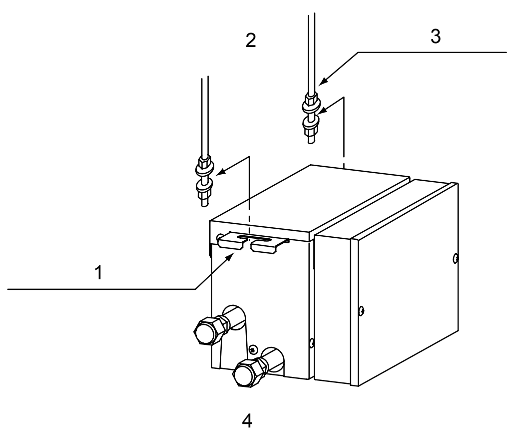
* Washer: 4-M10 or W3/8



2. Hanging the CH unit.

- To hang the CH unit hold it from the bottom of the casing.
- Insert the suspension bolt into the groove part of the suspension bracket as shown in the figure below. Ensure that the washers are correctly fixed to the suspension bracket.
- After hanging the unit, the piping and wiring connection should be done inside the ceiling. The position of the pipes has to be taken into account when selecting the location of the CH unit installation.If the CH unit has to be installed in a location where there is no piping or wiring connection, piping and wiring installation should be done before the unit is hanged.
- Keep the CH unit levelled to the ceiling. If the CH unit is not leveled, a malfunction may occur.
- Once the position of the CH unit is adjusted, tighten the nuts of the suspension bolts.

1 Suspension Bracket.
2 Upper side.
3 Suspension bolt.
4 Bottom side.



3. Piping work and refrigerant charge

Index

3.1 Outdoor unit

3.1.1 Refrigerant pipe selection

The RAS-(8-54)FSXN outdoor units can work as a heat pump system, by means of a two-pipe system (gas pipe and liquid pipe), or they can work as a heat recovery system by means of a three-pipe system (high and low pressure pipes and liquid pipe), requiring in addition the CH units supplied as accessories.

There is an optional specific pipe connection kit available according to the power of the outdoor unit:

Operating mode	Outdoor unit	No. of units	Connection kit	Indications:
Heat pump system	RAS-(20-24)FSXN	2	MC-20AN	• Gas pipe: 1 set. • Liquid pipe: 1 set.
	RAS-(26-36)FSXN	2	MC-21AN	
	RAS-(38-54)FSXN	3	MC-30AN	
Heat recovery system	RAS-(20-24)FSXN	2	MC-20XN	• Gas pipe, high pressure: 1 set. • Gas pipe, low pressure: 1 set. • Liquid pipe: 1 set.
	RAS-(26-36)FSXN	2	MC-21XN	
	RAS-(38-54)FSXN	3	MC-30XN	

◆ Pipe size selection

Select the pipe size in line with the following instructions:

1 Between the outdoor unit and the branch pipe (multikit): select the same pipe connection size as for the outdoor unit.

2 Between the branch pipe (multikit) and the indoor unit: select the same pipe connection size as for the indoor unit.

CAUTION

- ***Do not use refrigerant pipe sizes other than those indicated in this manual. The diameter of the refrigerant pipes depends directly on the power of the outdoor unit.***
- ***If larger diameter refrigerant pipes are used, the circuit lubrication oil tends to separate from the gas carrying it. The compressor will be seriously damaged due to a lack of lubrication.***
- ***If smaller diameter refrigerant pipes are used, the gas or liquid refrigerant will have serious difficulties in circulating. System performance will be affected. The compressor will run under more severe conditions than foreseen and will be damaged in a short space of time.***

◆ Multi-kit or distributor selection

NOTE

- ***Pipe connection sizes on outdoor units, indoor units and the multi-kit or distributor vary depending on the system. Consult the Technical Manual for the SET FREE Series FSXN.***
- ***The sizes of the indoor and outdoor units are different. Adjust the flare adapter (accessory) to the indoor pipe connection.***

3.1.2 Copper pipes, sizes, connection and insulation

◆ Copper pipes and sizes

CAUTION

- ***The copper pipe used in the refrigeration installations is different to the copper pipe used in installations carrying domestic or heating water.***
- ***The copper pipe for refrigeration installations is especially treated for outdoors and indoors. The interior surface finish makes it easier for the refrigerant to circulate and withstands the action of the lubricant oil applied to outdoor equipment.***

Prepare the copper pipes provided by the supplier.

Select the pipe with the appropriate diameter and thickness. Use the table below to select the most appropriate pipe:

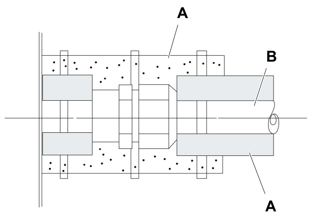
Nominal diameter		Thickness mm	Supply	Nominal diameter		Thickness mm	Supply
mm	Inches			mm	Inches		
ø6.35	1/4	0.80	Roll	ø25.4	1	1.00	Pipe
ø9.53	3/8	0.80	Roll	ø28.6	1-1/8	1.00	Pipe
ø12.7	1/2	0.80	Roll	ø31.75	1-1/4	1.10	Pipe
ø15.88	5/8	1.00	Roll	ø38.1	1-1/2	1.35	Pipe
ø19.05	3/4	1.00	Pipe	ø41.3	1-5/8	1.45	Pipe
ø22.2	7/8	1.00	Pipe	ø44.45	1-3/4	1.55	Pipe

Always use clean copper pipes with no signs of knocks or cracks. Make sure there is no dust or dampness on the inside. Before you install the pipes, clean the inside with oxygen-free nitrogen gas to eliminate any remains of dust or other substances.

3

CAUTION

- ***Do not use hand saws, circular saws, abrasive grinders or other tools that generate shavings.***
- ***Strictly follow national or local regulations regarding occupational health and safety.***
- ***Wear appropriate means of protection during cutting or brazing operations and installation (gloves, eye protection, etc).***



On completing the installation of the refrigerant pipes -B-, insulate them appropriately using suitable insulating material -A- and seal the open space between the holes made and the pipe, as shown in the figure.

◆ Size of pipes for outdoor unit (2 pipes)

Model	Gas	Liquid (mm)
RAS-8FSXN	ø19.05 (ø19.05 - ø22.2)	ø9.53 (ø9.53 - ø12.7)
RAS-10FSXN	ø22.2 (ø22.2 - ø25.4)	ø9.53 (ø9.53 - ø12.7)
RAS-12FSXN	ø25.4 (ø25.4 - ø28.6)	ø12.7 (ø12.7 - ø15.88)
RAS-14FSXN		
RAS-16FSXN	ø28.6 (ø28.6 - ø31.75)	ø12.7 (ø12.7 - ø15.88)
RAS-18FSXN	ø28.6 (ø28.6 - ø31.75)	ø15.88 (ø15.88 - ø19.05)
RAS-20FSXN		
RAS-22FSXN		
RAS-24FSXN		
RAS-26FSXN	ø31.75 (ø31.75 - ø34.9)	ø19.05 (ø19.05 - ø22.2)
RAS-28FSXN		
RAS-30FSXN		
RAS-32FSXN		
RAS-34FSXN		
RAS-36FSXN	ø38.1 (ø38.1 - ø41.3)	ø19.05 (ø19.05 - ø22.2)
RAS-38FSXN		
RAS-40FSXN		
RAS-42FSXN		
RAS-44FSXN		
RAS-46FSXN		
RAS-48FSXN		
RAS-50FSXN		
RAS-52FSXN		
RAS-54FSXN		

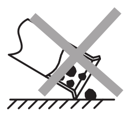
◆ Size of pipes for outdoor unit (3 pipes)

Model	Gas		Liquid (mm)
	Low pressure (mm)	High pressure (mm)	
RAS-8FSXN	ø19.05 (ø19.05 - ø22.2)	ø15.88 (ø15.88 - ø19.05)	ø9.53 (ø9.53 - ø12.7)
RAS-10FSXN	ø22.2 (ø22.2 - ø25.4)	ø19.05 (ø19.05 - ø22.2)	ø9.53 (ø9.53 - ø12.7)
RAS-12FSXN RAS-14FSXN	ø25.4 (ø25.4 - ø28.6)	ø22.2 (ø22.2 - ø25.4)	ø12.7 (ø12.7 - ø15.88)
RAS-16FSXN	ø28.6 (ø28.6 - ø31.75)	ø22.2 (ø22.2 - ø25.4)	ø12.7 (ø12.7 - ø15.88)
RAS-18FSXN RAS-20FSXN	ø28.6 (ø28.6 - ø31.75)	ø22.2 (ø22.2 - ø25.4)	ø15.88 (ø15.88 - ø19.05)
RAS-22FSXN RAS-24FSXN	ø28.6 (ø28.6 - ø31.75)	ø25.4 (ø25.4 - ø28.6)	ø15.88 (ø15.88 - ø19.05)
RAS-26FSXN	ø31.75 (ø31.75 - ø34.9)	ø25.4 (ø25.4 - ø28.6)	ø19.05 (ø19.05 - ø22.2)
RAS-28FSXN RAS-30FSXN RAS-32FSXN RAS-34FSXN RAS-36FSXN	ø31.75 (ø31.75 - ø34.9)	ø28.6 (ø28.6 - ø31.75)	ø19.05 (ø19.05 - ø22.2)
RAS-38FSXN RAS-40FSXN RAS-42FSXN RAS-44FSXN RAS-46FSXN RAS-48FSXN RAS-50FSXN RAS-52FSXN RAS-54FSXN	ø38.1 (ø38.1 - ø41.3)	ø31.75 (ø31.75 - ø34.9)	ø19.05 (ø19.05 - ø22.2)

3

◆ Pipe connection

Cover the end of the pipe appropriately when it is to be inserted through holes in walls and roofs, etc.



Keep the ends of the pipes covered while other installation work is being carried out to avoid the entry of dampness or dirt.

Do not place the pipes directly on the ground without appropriate protection or adhesive vinyl tape to cover the ends.

Where the pipe installation is not completed for a certain amount of time, braze the ends of the pipe to seal. Then fill it with oxygen-free nitrogen gas through a Schrader valve to avoid the accumulation of humidity and/or contamination through dirt.

NOTE

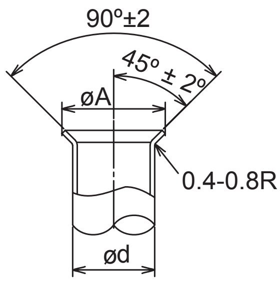
- ***Where polyethylene foam insulation is used, a 10 mm thick layer should be used for the liquid pipe and between 15 and 20 mm for the gas pipe.***
- ***Install the insulation after the pipe surface temperature has dropped to the same temperature as that of the room, otherwise the insulation may melt.***

Do not use insulating material that contains NH_3 (ammonium), as it could damage the copper in the pipe and subsequently cause leaks.

Where the fitter has supplied his own branches, these should be appropriately insulated to avoid decreases in capacity in line with to environmental conditions and dew on the surface of the piping due to low pressure.

Dimensions of flared pipe

Perform the widening operations in accordance with the measurements shown below.



Diameters (mm)	$A^{+0}_{-0.4}$ (mm)
ø6.35	9.1
ø9.53	13.2
ø12.7	16.6
ø15.88	19.7
ø19.05	– (1)

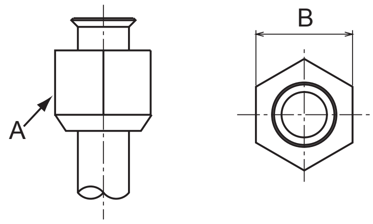
(1) Not possible to perform the widening using pipe. In this case, use a connection with flare fitting.

Selection of the connection with flare fitting

It is not possible to perform the widening operation, if copper is used in pipes. In this case, use a connection with flare fitting.

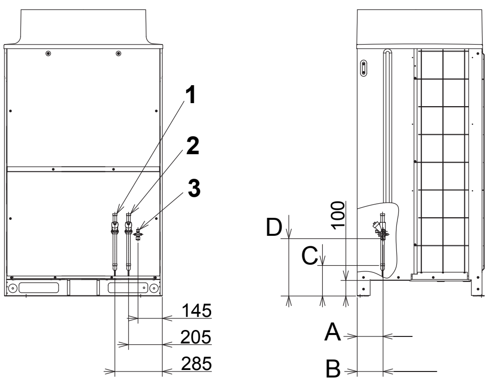
Minimum thickness of the connection	
Diameters (mm)	**R410A**
ø6.35	0.5
ø9.53	0.6
ø12.7	0.7
ø15.88	0.8
ø19.05	0.8
ø22.2	0.9
ø25.4	0.95
ø28.6	1.0
ø31.75	1.1
ø38.1	1.35
ø43.3	1.45
ø44.5	1.55

Distance between sides -B- of the nut -A-	
Diameters (mm)	**-B-**
ø6.35	17
ø9.53	22
ø12.7	26
ø15.88	29
ø19.05	36



◆ Connection of pipes from the installation to the outdoor unit

1. Gas connection (low pressure) (only for heat recovery systems, with CH units).
2. Gas connection (high pressure)
3. Liquid connection.



Outdoor unit	A	B	C	D
RAS-(8-12)FSXN	155	155	185	345
RAS-(14-18)FSXN	170	175	180	325

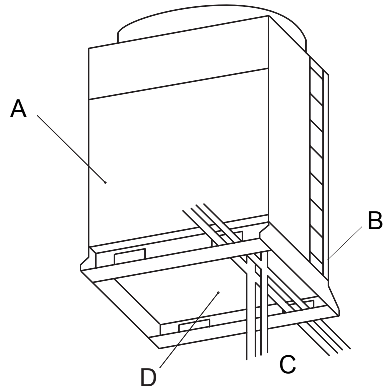
◆ Connection position of outdoor unit pipes

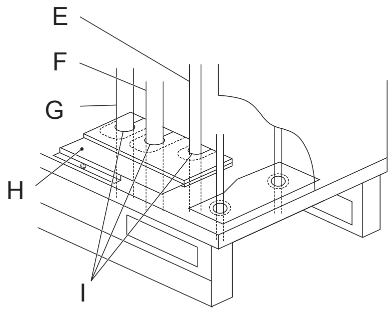
Fit and secure refrigerant pipes correctly to prevent vibrations and strain on the stop valves.

The pipes may be fitted in three directions (front, rear or inferior) from the base of the unit.

Remove the cover of the gas and liquid pipes -H- and connect using the accessories factory-supplied with the unit: *Accessories factory-supplied with the unit, see on page 35*.

Fit the cover on the pipes and completely seal around them and the cover to prevent the entrance of water, rodents and dirt.





A. Front

B. Rear

C. Lower side

D. Base.

E. Liquid pipe.

F. Gas pipe (high pressure)

G. Gas pipe (low pressure) (only for heat recovery systems, with CH units).

H. Cover of refrigerant gas and liquid pipes.

I. Cover insulation.

◆ Accessories factory-supplied with the unit

Accessory		Application					
		RAS-8FSXN	RAS-10FSXN	RAS-12FSXN	RAS-14FSXN	RAS-16FSXN	RAS-18FSXN
Accessory for pipes: connection for refrigerant pipe (high pressure) (1)		ø22.2→ø15.88	ø22.2→ø19.05	–	ø25.4→ø22.2	ø25.4→ø22.2	ø25.4→ø22.2
Accessory for pipes: connection for refrigerant pipe (high/low pressure)		ø22.2→ø19.05	–	ø22.2→ø25.4	–	ø25.4→ø28.6	ø25.4→ø28.6
Accessory for pipes: connection for refrigerant pipe (high/low pressure)		–	–	ø9.53→ø12.7	–	–	ø12.7→ø15.88
Power wiring clamp		(x1)					
Tie		(x3)					
Bushing for power wiring feed through		(x2)					
Bushing for communication wiring feed through		(x2)					
Bolt (spare)		(x3)					
Unit combination model label		(x1)					

(1) only for heat recovery systems.

NOTE

Please contact your HITACHI distributor if any of the accessories has not been supplied with the unit.

3.1.3 Pipe connection kit

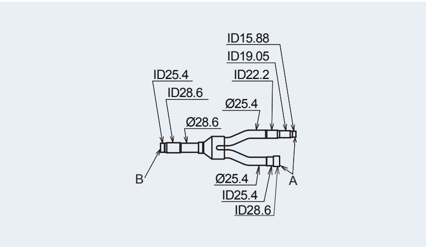
◆ SET FREE FSXN (two pipes)

Key:

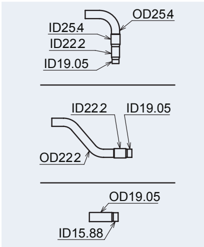
ID: inner diameter.	Quantity: 1.	A: towards the outdoor unit.	C: towards connection kit 1.
OD: outer diameter.	All measurements are in mm.	B: towards the indoor unit.	D: towards connection kit 2.

MC-20AN

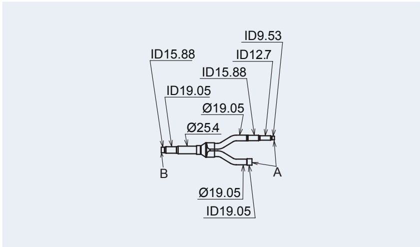
Gas line



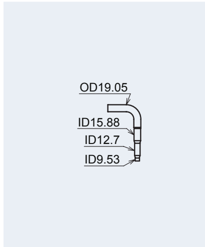
Gas line reducer



Liquid line

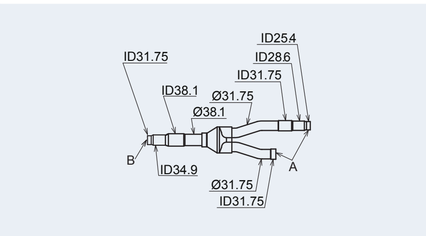


Liquid line reducer

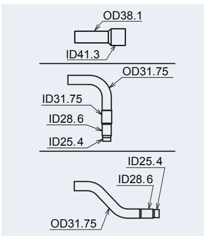


MC-21AN

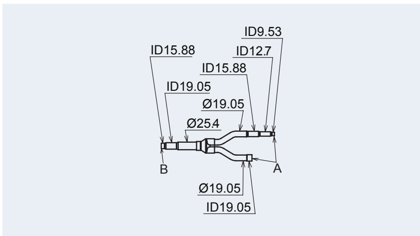
Gas line



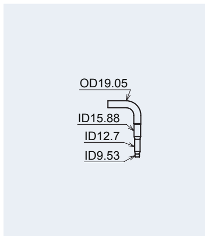
Gas line reducer



Liquid line

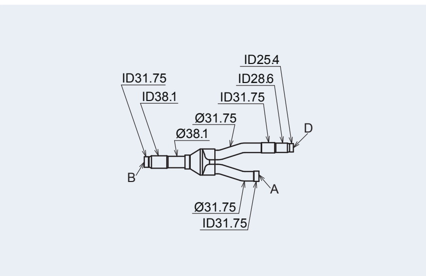


Liquid line reducer

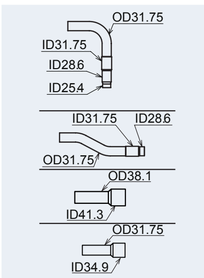


MC-30AN Connection kit 1

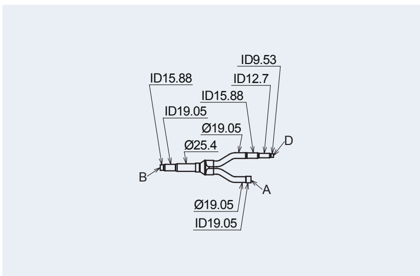
Gas line



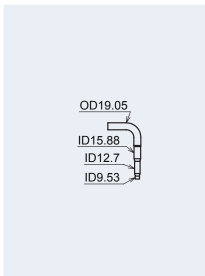
Gas line reducer



Liquid line

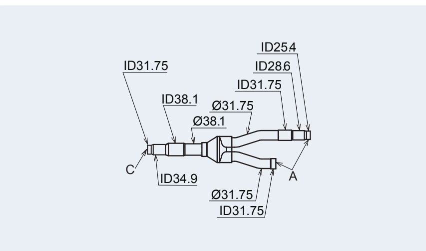


Liquid line reducer

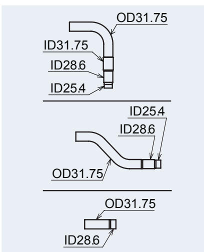


MC-30AN Connection kit 2

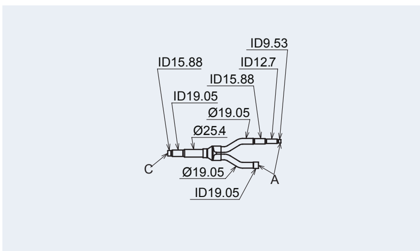
Gas line



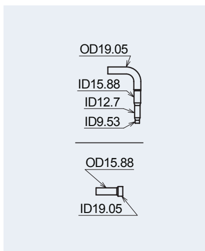
Gas line reducer



Liquid line



Liquid line reducer



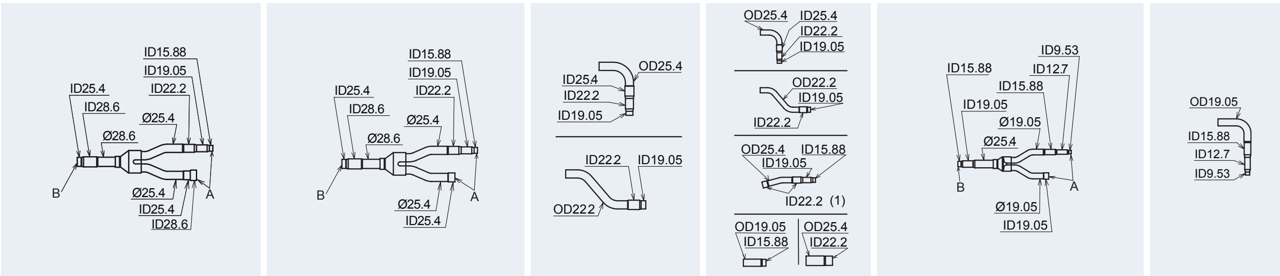
◆ SET FREE FSXN (three pipes)

Key:

ID: inner diameter.	Quantity: 1. (1): quantity 2.	A: towards the outdoor unit.	C: towards connection kit 1.
OD: outer diameter.	All measurements are in mm.	B: towards the indoor unit.	D: towards connection kit 2.

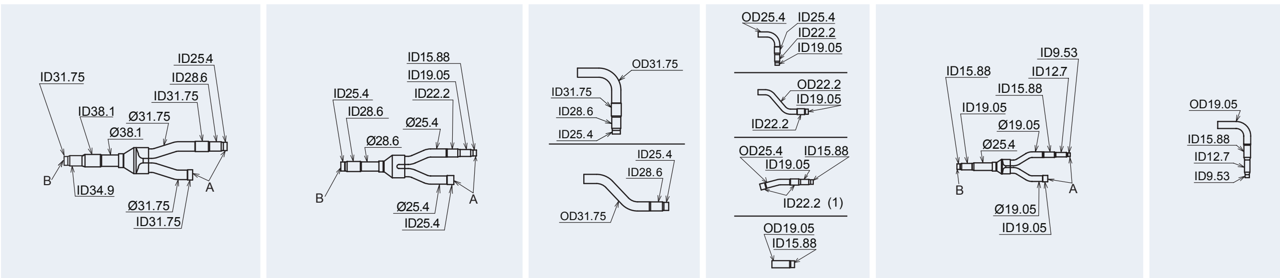
MC-20XN

Gas line (low pressure)	Gas line (high pressure)	Gas line reducer (low pressure)	Gas line reducer (high pressure)	Liquid line	Liquid line reducer



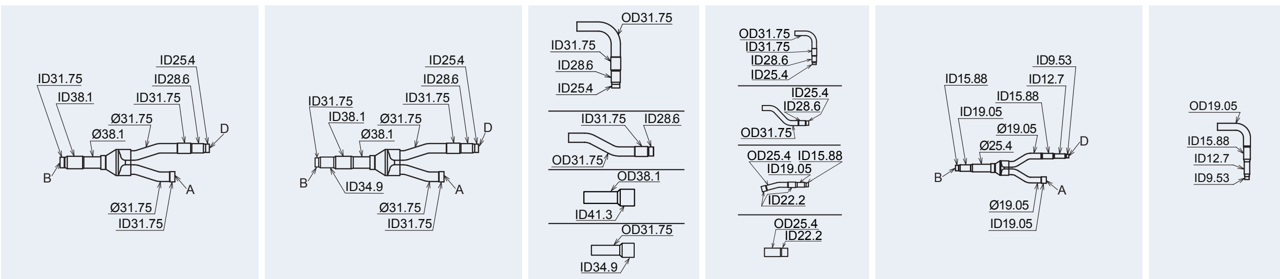
MC-21XN

Gas line (low pressure)	Gas line (high pressure)	Gas line reducer (low pressure)	Gas line reducer (high pressure)	Liquid line	Liquid line reducer



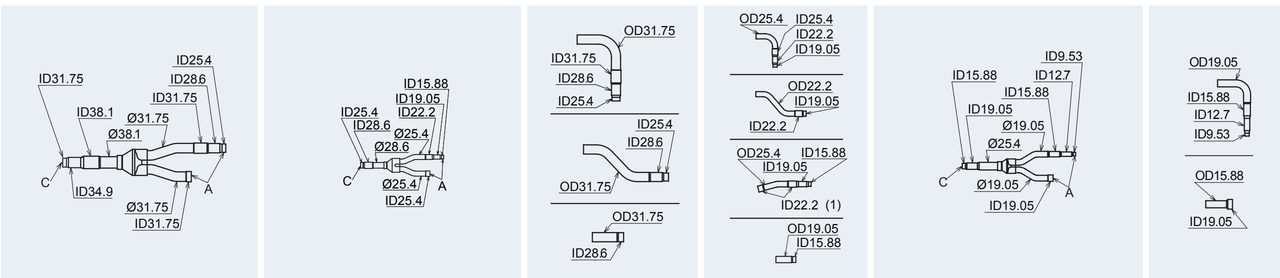
MC-30XN Connection kit 1

Gas line (low pressure)	Gas line (high pressure)	Gas line reducer (low pressure)	Gas line reducer (high pressure)	Liquid line	Liquid line reducer



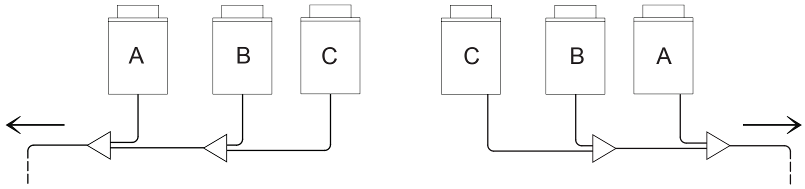
MC-30XN Connection kit 2

Gas line (low pressure)	Gas line (high pressure)	Gas line reducer (low pressure)	Gas line reducer (high pressure)	Liquid line	Liquid line reducer



3.1.4 Precautions for the installation of the outdoor unit.

Order of installation of the units

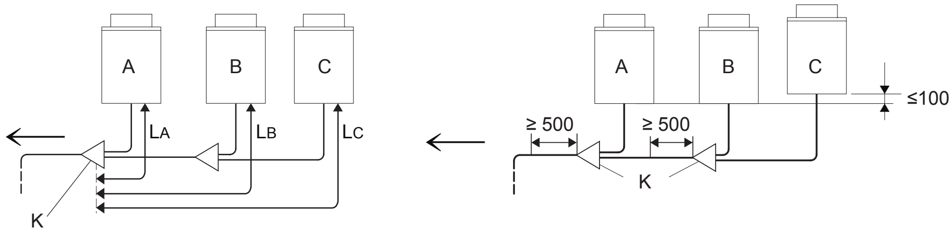


The outdoor units must be installed in decreasing order of capacity:

Capacity of unit A ≥ capacity of unit B ≥ capacity of unit C.

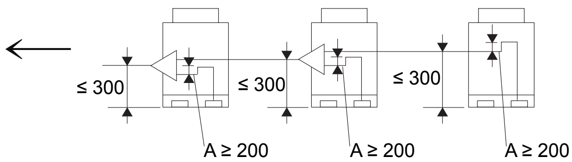
Unit -A-, with the highest capacity, must be closest the indoor units.

Refrigerant pipe installation between outdoor units

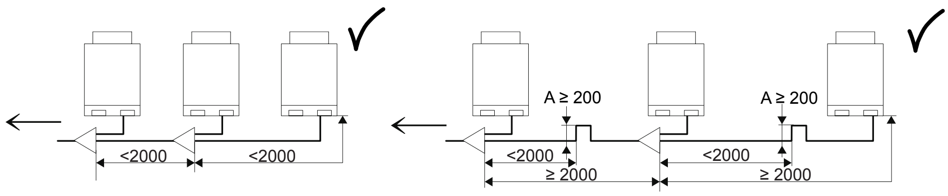


The length between the connection kit -K- (on the side of the outdoor unit) and the outside unit, must be $L_A \leq L_B \leq L_C \leq 10$ m.

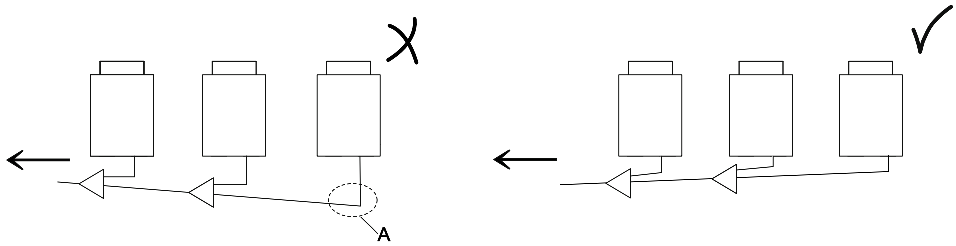
Place the connection kit at a lower level with respect to the connection of the refrigerant pipes of the outdoor unit.



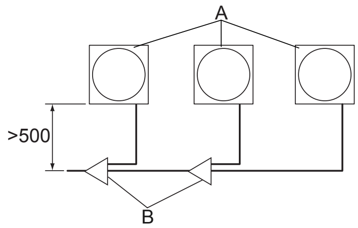
If the connection kit is placed above the refrigerant pipe connection of the outdoor unit, keep a maximum of 300 mm between the connection kit and the base of the outdoor unit. In addition, an oil recovery unit -A- (minimum 200 mm) should be fitted between the connection kit and the outdoor unit.



If the length of the refrigerant gas and liquid pipes between outdoor units is greater than two metres, the oil recovery unit should be fitted on the gas pipe to prevent the build-up of refrigerant oil.



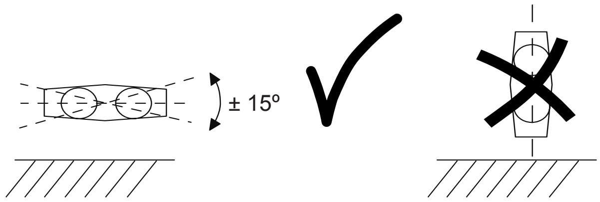
Place the refrigerant pipes of the outdoor units horizontally, or slightly tilted towards the side of the indoor units to prevent the build-up of refrigerant oil at the lowest point -A-.



If the refrigerant pipes are opposite the outdoor unit -A-, there should be a minimum of 500 mm between the outdoor units and the connection kits -B- for maintenance operations.

NOTE

The 500 mm space is required when replacing the unit compressor.



Install the connection kits parallel to the floor (± 15°).

3.1.5 General instructions on the installation of refrigerant pipes

The copper pipe used for the installation must be specific for refrigeration systems: *Copper pipes and sizes*, *see on page 30*.

The diameter of the refrigerant pipes depends directly on the power of the outdoor unit. The pipe diameter allocated must be respected, in line with the instructions given in Chapter *Pipe size selection*, *see on page 30*.

The units must be located and the gas pipes laid, particularly when the outdoor unit is at a different height to the indoor unit, in line with the instructions given in chapter *Precautions for the installation of the outdoor unit.*, *see on page 38*.

System performance depends on the distance between the outdoor and indoor unit. This aspect must be taken into account for the installation of the refrigerant pipe. The outdoor units are factory-charged with sufficient refrigerant for a standard installation of certain characteristics. Where the system installation requirements involve an increase in the distance between the outdoor and indoor unit, refrigerant must be added to the installation in line with the instructions given in Chapter *Refrigerant charge*, *see on page 61*.

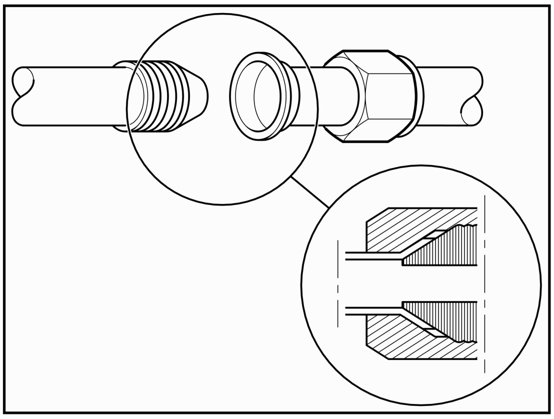
◆ Flared connection mounting

Apply a thin layer of oil to the cone opening for refrigeration systems.

Line up the end of the flared pipe to face the fitting to which it is to be threaded.

Gently rest the female cone on the male cone and check that the measurement is correct. Keep the connection lined up with one hand and gently thread on the flare nut with the other.

Tighten the connection to the corresponding tightening torque indicated in the table below.



Nominal diameter		Tightening torque
mm	Inches	
ø6.35	1/4	20 Nm
ø9.53	3/8	40 Nm
ø12.7	1/2	60 Nm
ø15.88	5/8	80 Nm
ø19.05	3/4	100 Nm
ø22.2	7/8	–
ø25.4	1	–
ø28.6	1-1/8	–

CAUTION

- ***Secure the fixed connection with a suitable wrench and use a torque wrench to tighten the flare nut on the threaded connections.***
- ***Do not exceed the torque value indicated in the table. The fitting can become misshapen and the connection may leak.***

◆ Refrigerant pipe insulation

The refrigerant circulates through the pipes at a very low temperature (several degrees below zero, depending on the time of year and the installation). The difference in temperature with the ambient air is extremely large and causes two significant phenomena to be taken into account:

- Cold irradiation along the entire pipe.
- Condensation of the humidity in the surrounding air.

Actually, cold irradiation is the temperature gain experienced by the gas, as when it circulates under pressure and at such low temperatures along the inside of the pipes, it is actually liquid and obtains the outdoor temperature (boiling at a very low temperature) to turn into gas.

As a result of the temperature gain (although it is actually perceived as cold emission), it loses its capacity to cool and the system does not perform as expected. Furthermore, the humidity in the surrounding air condenses on the pipe and the greater the temperature difference and the longer the pipe, the more water is produced.

In view of this, the refrigerant pipes must be fitted with a suitable insulation system that prevents the increase in temperature of the refrigerant and the subsequent loss of energy and the condensation of water along the entire pipe.

Refrigerant pipes must always be separately insulated, using closed cell insulation foam designed especially for refrigeration. This insulation foam, supplied by the installer, can be obtained in different formats. The most common is in the form of sheets and rolls of tubes of different diameters.

Furthermore, all connections between the different sections of insulation tubes must be reinforced with adhesive tape of the same characteristics.

Once all of the unit installation and adjustment work is complete, all threaded joints and valves must also be covered with adhesive tape.

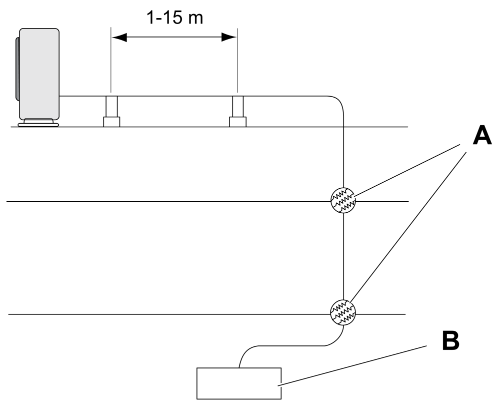
◆ Refrigerant pipe suspension

Only suspend the refrigerant pipes at specific points of the building. Whenever possible, avoid suspending them from parts subject to structural movement, e.g. places close to expansion joints or outer walls, etc.

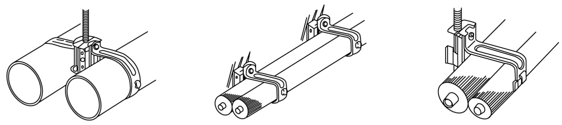
Prevent the refrigerant pipes from touching weak parts of the building, such as walls (non-structural), partition walls, ceilings, etc. Otherwise, operating noise may be caused by pipe vibrations (pay special attention in the case of short pipes).

A: points where the refrigerant pipes pass through the different structural parts of the building.

B: indoor unit.

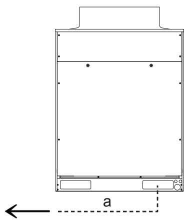


Use suitable suspension systems for refrigeration pipes or clamps to suspend the pipes, as shown in the diagram.



3.1.6 Refrigerant pipe connection for heat pump systems (2 pipes)

◆ Pipe sizes for RAS-(8-18)FSXN (Base unit)



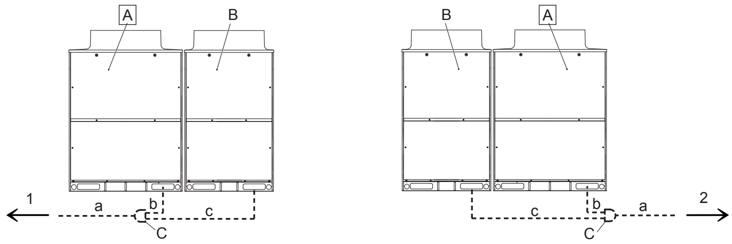
All measurements are in mm.

Model		RAS-8 FSXN	RAS-10 FSXN	RAS-12 FSXN	RAS-14 FSXN	RAS-16 FSXN	RAS-18 FSXN
a	Gas	ø19.05	ø22.2	ø25.4	ø25.4	ø28.6	ø28.6
	Liquid	ø9.53	ø9.53	ø12.7	ø12.7	ø12.7	ø15.88

If the main refrigerant pipe specified in the table is not available at the installation location, select the size given in brackets. In this case, prepare a suitable reducer.

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
ø9.53	(ø9.53-ø12.7)	ø22.2	(ø22.2-ø25.4)
ø12.7	(ø12.7-ø15.88)	ø25.4	(ø25.4-ø28.6)
ø15.88	(ø15.88-ø19.05)	ø28.6	(ø28.6-ø31.75)
ø19.05	(ø19.05-ø22.2)	–	–

◆ Pipe sizes for RAS-(20-36)FSXN (Combination of two units)



A: main outdoor unit; B: secondary outdoor unit; C: connection kit; 1: indoor units on left side; 2: indoor units on right side.

Install the outdoor units and connect the refrigerant pipes as shown in the diagram. Please refer to the table to determine the appropriate connection kit and the diameter of the pipes for each unit

All measurements are in mm.

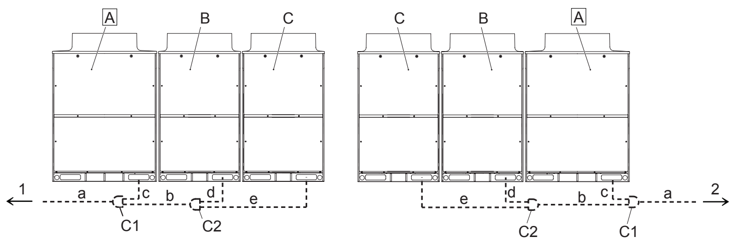
Combination of base units

Model		RAS-20 FSXN	RAS-22 FSXN	RAS-24 FSXN	RAS-26 FSXN	RAS-28 FSXN	RAS-30 FSXN	RAS-32 FSXN	RAS-34 FSXN	RAS-36 FSXN
Unit A		RAS-12 FSXN	RAS-14 FSXN	RAS-14 FSXN	RAS-14 FSXN	RAS-14 FSXN	RAS-16 FSXN	RAS-16 FSXN	RAS-18 FSXN	RAS-18 FSXN
Unit B		RAS-8 FSXN	RAS-8 FSXN	RAS-10 FSXN	RAS-12 FSXN	RAS-14 FSXN	RAS-14 FSXN	RAS-16 FSXN	RAS-16 FSXN	RAS-18 FSXN
Connection kit		MC-20AN			MC-21AN					
a	Gas	ø28.6	ø28.6	ø28.6	ø31.75	ø31.75	ø31.75	ø31.75	ø31.75	ø38.1
	Liquid	ø15.88	ø15.88	ø15.88	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05
b	Gas	ø25.4	ø25.4	ø25.4	ø25.4	ø25.4	ø28.6	ø28.6	ø28.6	ø28.6
	Liquid	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø15.88	ø15.88
c	Gas	ø19.05	ø19.05	ø22.2	ø25.4	ø25.4	ø25.4	ø28.6	ø28.6	ø28.6
	Liquid	ø9.53	ø9.53	ø9.53	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø15.88

If the main refrigerant pipe specified in the table is not available at the installation location, select the size given in brackets. In this case, prepare a suitable reducer.

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
ø9.53	(ø9.53-ø12.7)	ø25.4	(ø25.4-ø28.6)
ø12.7	(ø12.7-ø15.88)	ø28.6	(ø28.6-ø31.75)
ø15.88	(ø15.88-ø19.05)	ø31.75	(ø31.75-ø34.9)
ø19.05	(ø19.05-ø22.2)	ø38.1	(ø38.1-ø41.3)
ø22.2	(ø22.2-ø25.4)	–	–

◆ Pipe sizes for RAS-(38-54)FSXN (Combination of three units)



A: main outdoor unit; B: secondary outdoor unit; C: secondary outdoor unit; C1: connection kit 1; C2: connection kit 2; 1: indoor units on left side; 2: indoor units on right side.

Install the outdoor units and connect the refrigerant pipes as shown in the diagram. Please refer to the table to determine the appropriate connection kit and the diameter of the pipes for each unit.

All measurements are in mm.

Combination of base units

Model		RAS-38 FSXN	RAS-40 FSXN	RAS-42 FSXN	RAS-44 FSXN	RAS-46 FSXN	RAS-48 FSXN	RAS-50 FSXN	RAS-52 FSXN	RAS-54 FSXN
Unit A		RAS-14 FSXN	RAS-16 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN
Unit B		RAS-12 FSXN	RAS-12 FSXN	RAS-12 FSXN	RAS-14 FSXN	RAS-16 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN
Unit C		RAS-12 FSXN	RAS-12 FSXN	RAS-12 FSXN	RAS-12 FSXN	RAS-12 FSXN	RAS-12 FSXN	RAS-14 FSXN	RAS-16 FSXN	RAS-18 FSXN
Connection kit		MC-30AN								
a	Gas	ø38.1	ø38.1	ø38.1	ø38.1	ø38.1	ø38.1	ø38.1	ø38.1	ø38.1
	Liquid	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05
b	Gas	ø28.6	ø28.6	ø28.6	ø31.75	ø31.75	ø31.75	ø31.75	ø31.75	ø31.75
	Liquid	ø15.88	ø15.88	ø15.88	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05
c	Gas	ø25.4	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6
	Liquid	ø12.7	ø12.7	ø15.88	ø15.88	ø15.88	ø15.88	ø15.88	ø15.88	ø15.88
d	Gas	ø25.4	ø25.4	ø25.4	ø25.4	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6
	Liquid	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø15.88	ø15.88	ø15.88	ø15.88
e	Gas	ø25.4	ø25.4	ø25.4	ø25.4	ø25.4	ø25.4	ø25.4	ø28.6	ø28.6
	Liquid	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø15.88

If the main refrigerant pipe specified in the table is not available at the installation location, select the size given in brackets. In this case, prepare a suitable reducer.

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
ø9.53	(ø9.53-ø12.7)	ø25.4	(ø25.4-ø28.6)
ø12.7	(ø12.7-ø15.88)	ø28.6	(ø28.6-ø31.75)
ø15.88	(ø15.88-ø19.05)	ø31.75	(ø31.75-ø34.9)
ø19.05	(ø19.05-ø22.2)	ø38.1	(ø38.1-ø41.3)
ø22.2	(ø22.2-ø25.4)	–	–

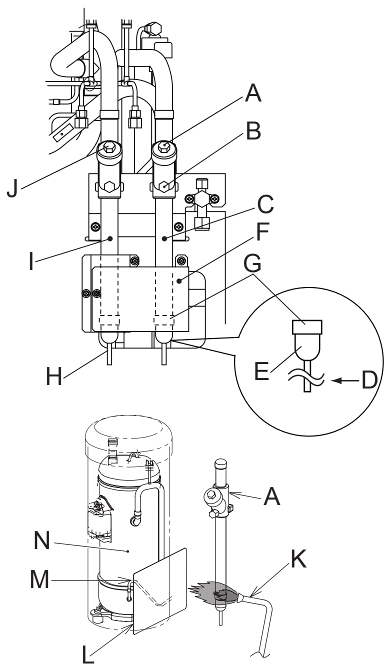
◆ Gas stop valve

Make sure that valves -A- and -J- (not used) are completely closed.

Connect the charge pipe to the stop valve -B- and release gas from the gas pipe -C-.

Remove the cover -F- from the stop valve.

Cut off the end -D- of the stop pipe -E- (ø6.35) and check that there is no gas in the pipe -C-. Do not cut the end -H- of the stop pipe (ø6.35) -I- to prevent leaks of refrigerant. If the end of the stop pipe is cut, close it completely.

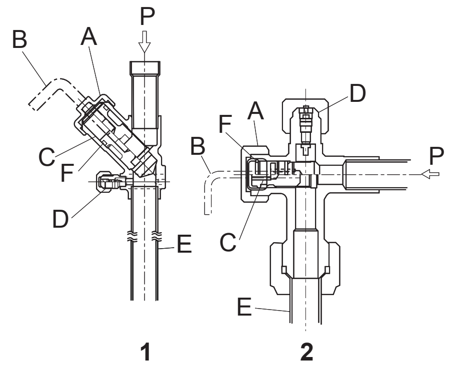


DANGER

Check that there is no gas inside the pipe before removing the stop pipe. Otherwise, the pipe may explode when heated with the blow torch.

Remove the stop pipe at the welded section -G- using a blow torch -K-. Special care should be taken to ensure that the flame from the blow torch does not fall on the body of the stop valve -A-, on the compressor -N- and cover or on the insulation bushings by inserting a metal plate -L- in front of the oil return pipe -M-.

◆ Details of the gas and liquid stop valves



1. Gas valve.
2. Liquid valve.

A. Plug.

Tightening torque	
Gas	50–58 Nm
Liquid	30–42 Nm

B. Hexagonal wrench. To open or close the valve.

C. Valve. Turn to the left: open; turn to the right: close.

Tightening torque	
Gas, 8-12 HP	18–22 Nm
Gas, 14-18 HP	20–25 Nm
Liquid	7–9 Nm

D. Check joint. Only a flexible charge pipe may be connected.

Tightening torque	
Gas	9–14 Nm
Liquid	14–18 Nm

E. Refrigerant gas/liquid pipe.

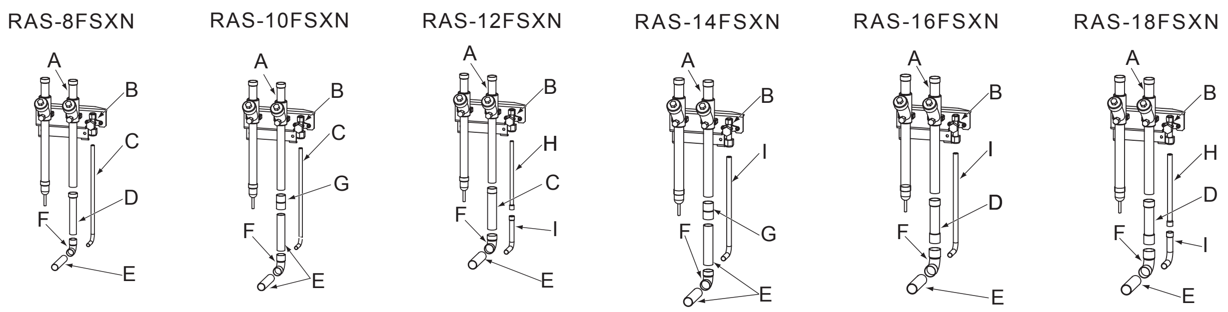
F. O-ring.

P. Refrigerant gas/liquid pressure.

CAUTION

- ***Do not force the valve open buffer; this could damage the seat of the valve. A spare valve seat is not supplied.***
- ***When performing the start-up test, open valve to the full. Otherwise, the system may be damaged.***

◆ Refrigerant pipe connection



A. Stop valve (gas, high pressure).

B. Stop valve (liquid).

C. Liquid pipe (field-supplied).

D. Pipe accessory.

E. Gas pipe, high pressure (field-supplied).

F. L-bend (field-supplied)

G. Adapter (field-supplied).

H. Accessory pipe.

I. Liquid pipe (field-supplied).

DANGER

- ***Check that the gas and liquid stop valves are fully closed.***
- ***Check that there is no gas inside the pipe before removing the stop pipe. Otherwise, the pipe may explode when heated with the blow torch.***

Special care should be taken to ensure that the flame from the blow torch does not fall on the body of the stop valve, on the compressor and cover or on the insulation bushings; insert a metal plate in front of the oil return pipe: *Gas stop valve, see on page 43*.

Connect the indoor units to the outdoor units using copper pipes specifically for use with refrigerant. When laying the pipes make sure that they do not directly rest on or touch walls or other parts of the building (when the refrigerant is flowing through the pipes, this could cause strange noises).

Specific torques for the flared connections: *Flared connection mounting, see on page 40*.

While welding, apply a flow of nitrogen gas inside the pipe.

Fully insulate the refrigerant pipes.

CAUTION

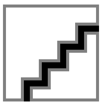
Fit the pipe protection provided with the outdoor unit on completion of the installation work. Otherwise, the unit may be damaged by the entrance of snow, water or rodents.

◆ Pipe connection kit (optional)

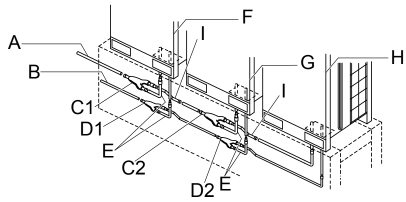
No.	Mode	Application in outdoor units		Model	Notes
		Outdoor unit	No. of outdoor units		
Pipe connection kit	Heat pump system	RAS-(20-24)FSXN	2	MC-20AN	For two pipes: • Gas: 1 part. • Liquid: 1 part.
		RAS-(26-36)FSXN	2	MC-21AN	
		RAS-(38-54)FSXN	3	MC-30AN	

◆ Example of installation (38 HP: 2 pipes)

Connection of front or rear pipes



Lower pipe connection



A. Gas pipe (field-supplied).

B. Liquid pipe (field-supplied).

C1. Gas connection kit 1.

C2. Gas connection kit 2.

D1. Liquid connection kit 1.

D2. Liquid connection kit 2.

E. Accessory for connection of pipes (L-shaped).

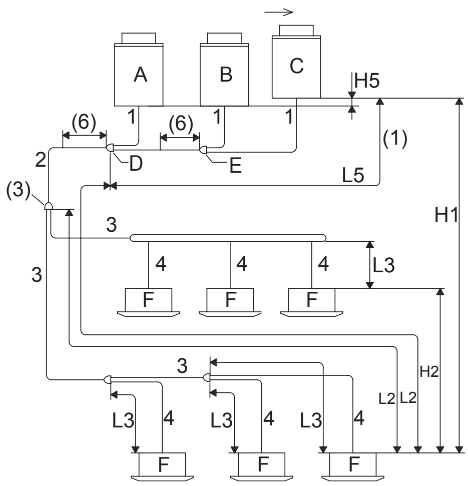
F. Outdoor unit 1.

G. Outdoor unit 2.

H. Outdoor unit 3.

I. Accessory for connection of pipes (Z-shaped).

◆ Size of pipes (ø mm) and selection of multikit (2 pipes)



A: main outdoor unit B, C: secondary outdoor units D: connection kit 1 E: connection kit 2 F: indoor units

Size of pipes

1. Pipe diameter for the outdoor unit.

2. Diameter of the main pipe (from the base unit or connection kit 1 to the first branch)(2).

HP outdoor unit	Equivalent pipe length < 100 m		HP outdoor unit	Equivalent pipe length < 100 m	
	Gas	Liquid		Gas	Liquid
8	ø19.05	ø9.53	(18-24)	ø28.6	ø15.88
10	ø22.2	ø9.53	(26-34)	ø31.75	ø19.05
(12/14)	ø25.4	ø12.7	(36-54)	ø38.1	ø19.05
16	ø28.6	ø12.7	—	—	—

3. Pipe diameter after first branch(3).

Total HP indoor unit	Gas	Liquid	Total HP indoor unit	Gas	Liquid
< 6	ø15.88	ø9.53	(16-17.99)	ø28.6	ø12.7
(6-8.99)	ø19.05	ø9.53	(18-25.99)	ø28.6	ø15.88
(9-11.99)	ø22.2	ø9.53	(26-35.99)	ø31.75	ø19.05
(12-15.99)	ø25.4	ø12.7	> 36	ø38.1	ø19.05

4. Pipe diameter between multikit and indoor unit(4).

HP indoor unit	Gas	Liquid	HP indoor unit	Gas	Liquid
(0.8-1.5)	ø12.7	ø6.35(5)	8.0	ø19.05	ø9.53
2.0	ø15.88	ø6.35(5)	10.0	ø22.2	ø9.53
(2.5-5.0)	ø15.88	ø9.53	—	—	—

Pipe working conditions

Part		Make	Permitted pipe length (7)	
			≤ Recommended number of connected indoor units	≥ Recommended number of connected indoor units
Total pipe length		Current total liquid pipe length	≤ 1000 m(8)	≤ 300 m
Maximum pipe length	Current length	L1	≤ 165 m	≤ 165 m
	Equivalent length		≤ 190 m	≤ 190 m
Maximum pipe length between the multikit of the first branch and each indoor unit		L2	≤ 90 m	≤ 40 m
Maximum pipe length between each multikit and each indoor unit		L3	≤ 40 m	≤ 30 m
Pipe length between connection kit 1 and each outdoor unit		L5	≤ 10 m	≤ 10 m
Difference in height between outdoor and indoor units	Highest outdoor unit	H1	≤ 50 m	≤ 50 m
	Lowest outdoor unit		≤ 40 m	≤ 40 m
Difference in height between indoor units		H2	≤ 15 m	≤ 15 m
Difference in height between outdoor units		H5	≤ 0.1 m	≤ 0.1 m

3

NOTE

- ***(1) The connection kit is taken into account from the side of the indoor unit (as connection kit 1).***
- ***(2) When the maximum equivalent refrigerant pipe length (L1) from the outdoor unit/connection kit 1 to the indoor unit is greater than 100 m, the diameter of the gas/liquid pipe from the outdoor unit/connection kit 1 to the first branch must be increased using the reducer (field-supplied).***
- ***(3) Where the refrigerant pipe length is greater than 100 m, the pipe diameter does not have to be increased after the first branch. Where the size of the multikit is greater than that of the first branch, adjust the size of the multikit to the first branch. Where the diameter of the pipe selected after the first branch is greater than the diameter of the pipe after it, use the same diameter as the inlet pipe.***
- ***(4) The pipe diameter -4- must be the same as that of the indoor unit connection.***
- ***(5) Where the liquid pipe length is greater than 15 m, use 9.53 mm diameter pipe and a reducer (field-supplied).***
- ***(6) Keep a direct distance of 500 mm or greater after the connection kit.***
- ***(7) The installation conditions for the refrigerant pipes are different depending on the number of indoor units connected.***
- ***(8) The total pipe length permitted must be less than 1000 m due to the maximum additional refrigerant charge limitation.***

NOTE

1 ***Check that the gas pipe and the liquid pipe are equivalent in terms of length and installation system.***

2 ***Use the multikit system for branching of the indoor units and the CH unit.***

3 ***Install the indoor unit and the multikit according to the instructions given in this manual.***

4 ***Where the length of pipe L3 between each multikit and each indoor unit is considerably longer than on another indoor unit, the refrigerant will not flow correctly and performance is lower in comparison with other models (recommended pipe length: up to 15 m).***

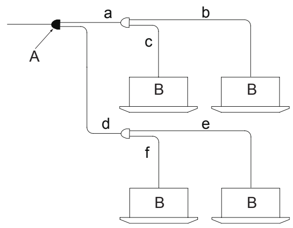
Pipe branching restrictions

Follow the instructions given in the table below for pipe installation (field-supplied).

Maximum pipe length between the multikit of the first branch and each indoor unit (L2)	Main pipe branch [1]		Capacity ratio of the indoor units after the main branch	Branch and distributor combination
	Pipe length after the branch	Number of main pipe branches		
≤ 40 m	a+b+c ≤ 30 m or d+e +f ≤ 30 m	No limit	—	Available (Figures 3 and 4)
	a+b+c > 30 m or d+e +f > 30 m	Up to 2		
From 41 m to 90 m	—	Up to 1 (Figure 1)	≥ 40% (Figure 2)	Not available

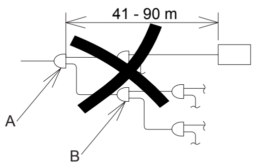
NOTE

[1] Main pipe branch: distribution from one (1) multikit to two (2) multikits.



A: main branch

B: indoor units



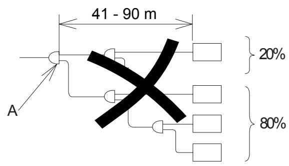


Figure 1: two branches on the main pipe

Figure 2: capacity ratio of the indoor units ≤ 40%

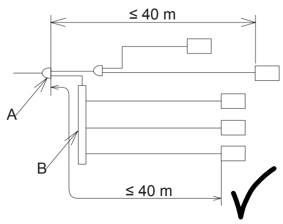
A: main branch

B: secondary branch

Figure 3: distributor used as branching for three pipes and branching for two pipes

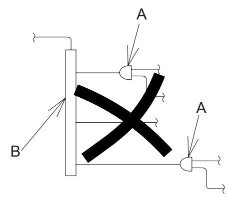
A: main branch

Figure 4: do not connect a branch to a distributor



A: branch

B: distributor

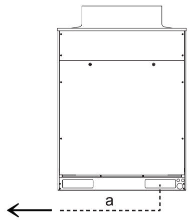


A: branch

B: distributor

3.1.7 Refrigerant pipe connection for heat recovery systems (3 pipes)

◆ **Pipe sizes for RAS-(8-18)FSXN (Base unit)**



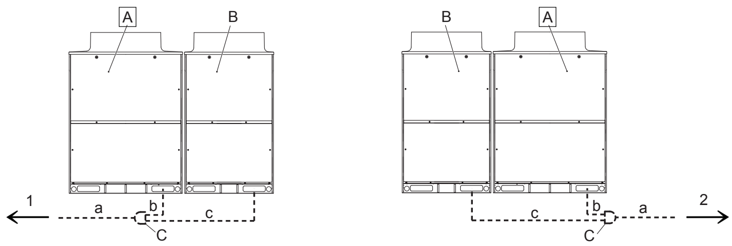
All measurements are in mm.

Model		RAS-8 FSXN	RAS-10 FSXN	RAS-12 FSXN	RAS-14 FSXN	RAS-16 FSXN	RAS-18 FSXN
a	Gas (low pressure)	ø19.05	ø22.2	ø25.4	ø25.4	ø28.6	ø28.6
	Gas (high pressure)	ø15.88	ø19.05	ø22.2	ø22.2	ø22.2	ø22.2
	Liquid	ø9.53	ø9.53	ø12.7	ø12.7	ø12.7	ø15.88

If the main refrigerant pipe specified in the table is not available at the installation location, select the size given in brackets. In this case, prepare a suitable reducer.

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
ø9.53	(ø9.53-ø12.7)	ø22.2	(ø22.2-ø25.4)
ø12.7	(ø12.7-ø15.88)	ø25.4	(ø25.4-ø28.6)
ø15.88	(ø15.88-ø19.05)	ø28.6	(ø28.6-ø31.75)
ø19.05	(ø19.05-ø22.2)	–	–

◆ **Pipe sizes for RAS-(20-36)FSXN (Combination of two units)**



A: main outdoor unit; B: secondary outdoor unit; C: connection kit; 1: indoor units on left side; 2: indoor units on right side.

Install the outdoor units and connect the refrigerant pipes as shown in the diagram. Please refer to the table to determine the appropriate connection kit and the diameter of the pipes for each unit

All measurements are in mm.

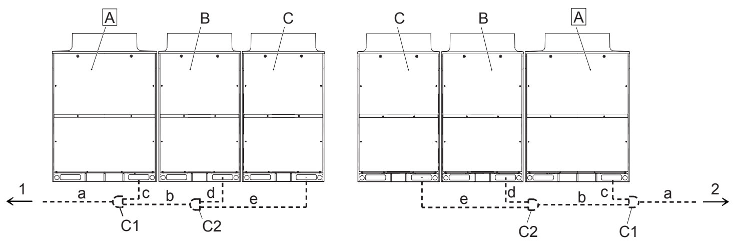
Combination of base units

Model		RAS-20 FSXN	RAS-22 FSXN	RAS-24 FSXN	RAS-26 FSXN	RAS-28 FSXN	RAS-30 FSXN	RAS-32 FSXN	RAS-34 FSXN	RAS-36 FSXN
Unit A		RAS-12 FSXN	RAS-14 FSXN	RAS-14 FSXN	RAS-14 FSXN	RAS-14 FSXN	RAS-16 FSXN	RAS-16 FSXN	RAS-18 FSXN	RAS-18 FSXN
Unit B		RAS-8 FSXN	RAS-8 FSXN	RAS-10 FSXN	RAS-12 FSXN	RAS-14 FSXN	RAS-14 FSXN	RAS-16 FSXN	RAS-16 FSXN	RAS-18 FSXN
Connection kit		MC-20XN			MC-21XN					
a	Gas (low pressure)	ø28.6	ø28.6	ø28.6	ø31.75	ø31.75	ø31.75	ø31.75	ø31.75	ø31.75
	Gas (high pressure)	ø22.2	ø25.4	ø25.4	ø25.4	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6
	Liquid	ø15.88	ø15.88	ø15.88	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05
b	Gas (low pressure)	ø25.4	ø25.4	ø25.4	ø25.4	ø25.4	ø28.6	ø28.6	ø28.6	ø28.6
	Gas (high pressure)	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2
	Liquid	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø15.88	ø15.88
c	Gas (low pressure)	ø19.05	ø19.05	ø22.2	ø25.4	ø25.4	ø25.4	ø28.6	ø28.6	ø28.6
	Gas (high pressure)	ø15.88	ø15.88	ø19.05	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2
	Liquid	ø9.53	ø9.53	ø9.53	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø15.88

If the main refrigerant pipe specified in the table is not available at the installation location, select the size given in brackets. In this case, prepare a suitable reducer.

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
ø9.53	(ø9.53-ø12.7)	ø22.2	(ø22.2-ø25.4)
ø12.7	(ø12.7-ø15.88)	ø25.4	(ø25.4-ø28.6)
ø15.88	(ø15.88-ø19.05)	ø28.6	(ø28.6-ø31.75)
ø19.05	(ø19.05-ø22.2)	ø31.75	(ø31.75-ø34.9)

◆ Pipe sizes for RAS-(38-54)FSXN (Combination of three units)



A: main outdoor unit; B: secondary outdoor unit; C: secondary outdoor unit; C1: connection kit 1; C2: connection kit 2; 1: indoor units on left side; 2: indoor units on right side.

Install the outdoor units and connect the refrigerant pipes as shown in the diagram. Please refer to the table to determine the appropriate connection kit and the diameter of the pipes for each unit.

All measurements are in mm.

Combination of base units

Model		RAS-38 FSXN	RAS-40 FSXN	RAS-42 FSXN	RAS-44 FSXN	RAS-46 FSXN	RAS-48 FSXN	RAS-50 FSXN	RAS-52 FSXN	RAS-54 FSXN
Unit A		RAS-14 FSXN	RAS-16 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN
Unit B		RAS-12 FSXN	RAS-12 FSXN	RAS-12 FSXN	RAS-14 FSXN	RAS-16 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN	RAS-18 FSXN
Unit C		RAS-12 FSXN	RAS-12 FSXN	RAS-12 FSXN	RAS-12 FSXN	RAS-12 FSXN	RAS-12 FSXN	RAS-14 FSXN	RAS-16 FSXN	RAS-18 FSXN
Connection kit		MC-30XN								
a	Gas (low pressure)	ø38.1	ø38.1	ø38.1	ø38.1	ø38.1	ø38.1	ø38.1	ø38.1	ø38.1
	Gas (high pressure)	ø31.75	ø31.75	ø31.75	ø31.75	ø31.75	ø31.75	ø31.75	ø31.75	ø31.75
	Liquid	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05
b	Gas (low pressure)	ø28.6	ø28.6	ø28.6	ø31.75	ø31.75	ø31.75	ø31.75	ø31.75	ø31.75
	Gas (high pressure)	ø25.4	ø25.4	ø25.4	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6
	Liquid	ø15.88	ø15.88	ø15.88	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05	ø19.05
c	Gas (low pressure)	ø25.4	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6
	Gas (high pressure)	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2
	Liquid	ø12.7	ø12.7	ø15.88	ø15.88	ø15.88	ø15.88	ø15.88	ø15.88	ø15.88
d	Gas (low pressure)	ø25.4	ø25.4	ø25.4	ø25.4	ø28.6	ø28.6	ø28.6	ø28.6	ø28.6
	Gas (high pressure)	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2
	Liquid	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø15.88	ø15.88	ø15.88	ø15.88
e	Gas (low pressure)	ø25.4	ø25.4	ø25.4	ø25.4	ø25.4	ø25.4	ø25.4	ø28.6	ø28.6
	Gas (high pressure)	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2	ø22.2
	Liquid	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø12.7	ø15.88

If the main refrigerant pipe specified in the table is not available at the installation location, select the size given in brackets. In this case, prepare a suitable reducer.

Main pipe	Alternative pipe and reducer	Main pipe	Alternative pipe and reducer
ø9.53	(ø9.53-ø12.7)	ø25.4	(ø25.4-ø28.6)
ø12.7	(ø12.7-ø15.88)	ø28.6	(ø28.6-ø31.75)
ø15.88	(ø15.88-ø19.05)	ø31.75	(ø31.75-ø34.9)
ø19.05	(ø19.05-ø22.2)	ø38.1	(ø38.1-ø41.3)
ø22.2	(ø22.2-ø25.4)	–	–

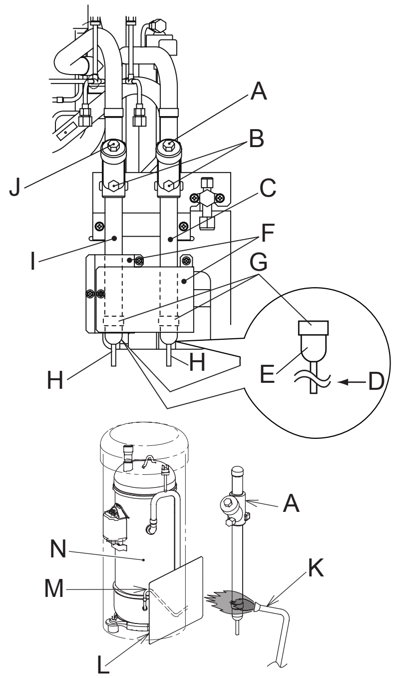
◆ **Gas stop valve**

Check that the high pressure valves -A- and low pressure valves -J- are completely closed.

Connect the charge pipe to the stop valves -B- and release gas from the high pressure pipe -C- and low pressure pipe -I-.

Cut off the end -D- of the stop pipe -E- (ø6.35) and check that there is no gas in the high and low pressure gas pipe.

Remove the covers -F- from the stop valve.

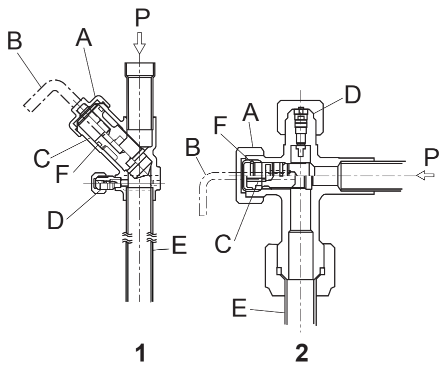


DANGER

Check that there is no gas inside the pipe before removing the stop pipe. Otherwise, the pipe may explode when heated with the blow torch.

Remove the stop pipes at the welded section -G- using a blow torch -K-. Special care should be taken to ensure that the flame from the blow torch does not fall on the body of the stop valve -A- and -J-, on the compressor -N- and cover or on the insulation bushings by inserting a metal plate -L- in front of the oil return pipe -M-.

◆ **Details of the gas and liquid stop valves**



1. Gas valve.
2. Liquid valve.

A. Plug.

Tightening torque	
Gas	50–58 Nm
Liquid	30–42 Nm

B. Hexagonal wrench. To open or close the valve.

C. Valve. Turn to the left: open; turn to the right: close.

Tightening torque	
Gas, 8-12 HP	18–22 Nm
Gas, 14-18 HP	20–25 Nm
Liquid	7–9 Nm

D. Check joint. Only a flexible charge pipe may be connected.

Tightening torque	
Gas	9–14 Nm
Liquid	14–18 Nm

E. Refrigerant gas/liquid pipe.

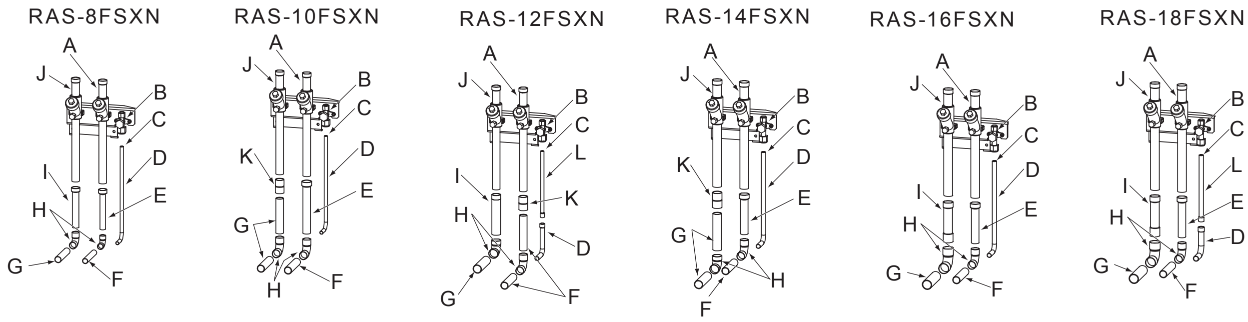
F. O-ring.

P. Refrigerant gas/liquid pressure.

CAUTION

- ***Do not force the valve open buffer; this could damage the seat of the valve. A spare valve seat is not supplied.***
- ***When performing the start-up test, open valve to the full. Otherwise, the system may be damaged.***

◆ Refrigerant pipe connection



A. Stop valve (gas, high pressure).

B. Stop valve (liquid).

C. Flared connection.

D. Liquid pipe (field-supplied).

E. Pipe accessory.

F. Gas pipe, high pressure (field-supplied).

G. Gas pipe, low pressure (field-supplied).

H. L-bend (field-supplied)

I. Pipe accessory.

J. Stop valve (gas, low pressure).

K. Pipe accessory.

L. Pipe accessory.

DANGER

- ***Check that the gas and liquid stop valves are fully closed.***
- ***Check that there is no gas inside the pipe before removing the stop pipe. Otherwise, the pipe may explode when heated with the blow torch.***

Special care should be taken to ensure that the flame from the blow torch does not fall on the body of the stop valve, on the compressor and cover or on the insulation bushings; insert a metal plate in front of the oil return pipe: *Gas stop valve, see on page 43*.

Connect the indoor units to the outdoor units using copper pipes specifically for use with refrigerant. When laying the pipes make sure that they do not directly rest on or touch walls or other parts of the building (when the refrigerant is flowing through the pipes, this could cause strange noises).

Specific torques for the flared connections: *Flared connection mounting, see on page 40*.

While welding, apply a flow of nitrogen gas inside the pipe.

Fully insulate the refrigerant pipes.

CAUTION

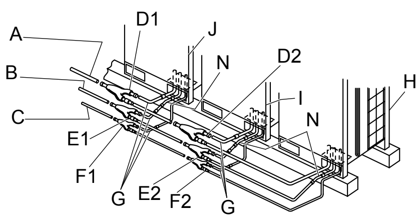
Fit the pipe protection provided with the outdoor unit on completion of the installation work. Otherwise, the unit may be damaged by the entrance of snow, water or rodents.

◆ Pipe connection kit (optional)

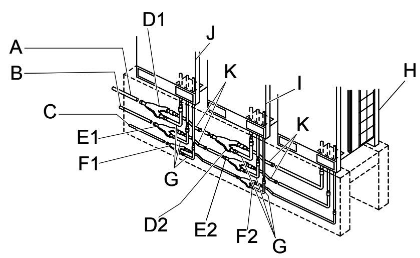
No.	Mode	Application in outdoor units		Model	Notes
		Outdoor unit	No. of outdoor units		
Pipe connection kit	Heat recovery system	RAS-(20-24)FSXN	2	MC-20XN	For three pipes: • Gas, high pressure: 1 part. • Gas, low pressure: 1 part. • Liquid: 1 part.
		RAS-(26-36)FSXN	2	MC-21XN	
		RAS-(38-54)FSXN	3	MC-30XN	

◆ Example of installation (38 HP: 3 pipes)

Connection of front or rear pipes



Lower pipe connection



A. Gas pipe, low pressure (field-supplied).

B. Gas pipe, high pressure (field-supplied).

C. Liquid pipe (field-supplied).

D1. Gas connection kit, low pressure 1.

D2. Gas connection kit, low pressure 2.

E1. Gas connection kit, high pressure 1.

E2. Gas connection kit, high pressure 2.

F1. Liquid connection kit 1.

F2. Liquid connection kit 2.

G. Accessory for connection of pipes (L-shaped).

H. Outdoor unit 3.

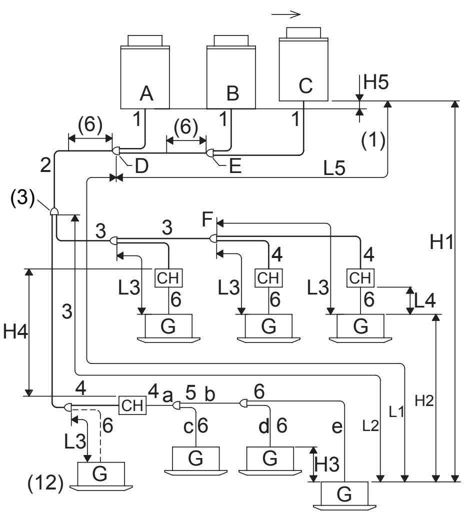
I. Outdoor unit 2.

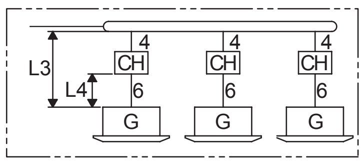
J. Outdoor unit 1.

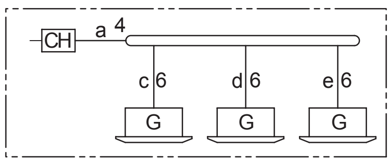
K. Accessory for connection of pipes (Z-shaped).

N. Accessory for connection of pipes.

◆ Size of pipes (ø mm) and selection of multikit (3 pipes)







A: main outdoor unit B, C: secondary outdoor units D: connection kit 1 E: connection kit 2 G: indoor units

3 pipes (high and low pressure gas, liquid)	2 pipes (gas, liquid)	2 pipes (low pressure gas, liquid)

Size of pipes

1. Pipe diameter for the outdoor unit.

2. Diameter of the main pipe (from the base unit or connection kit 1 to the first branch) (3 pipes)[2].

HP outdoor unit	Gas, low pressure	Gas, high pressure	Liquid	HP outdoor unit	Gas, low pressure	Gas, high pressure	Liquid
8	ø19.05	ø15.88	ø9.53	(22/24)	ø28.6	ø25.4	ø15.88
10	ø22.2	ø19.05	ø9.53	26	ø31.75	ø25.4	ø19.05
(12/14)	ø25.4	ø22.2	ø12.7	(28-36)	ø31.75	ø28.6	ø19.05
16	ø28.6	ø22.2	ø12.7	(36-54)	ø38.1	ø31.75	ø19.05
(18/20)	ø28.6	ø22.2	ø15.88	—	—	—	—

3. Pipe diameter after first branch (3 pipes)[3].

Total HP indoor unit	Gas, low pressure	Gas, high pressure	Liquid	Total HP indoor unit	Gas, low pressure	Gas, high pressure	Liquid
< 6	ø15.88	ø12.7	ø9.53	(18-21.99)	ø28.6	ø22.2	ø15.88
(6-8.99)	ø19.05	ø15.88	ø9.53	(22-25.99)	ø28.6	ø25.4	ø15.88
(9-11.99)	ø22.2	ø19.05	ø9.53	(26-35.99)	ø31.75	ø28.6	ø19.05
(12-15.99)	ø25.4	ø22.2	ø12.7	> 36	ø38.1	ø31.75	ø19.05
(16-17.99)	ø28.6	ø22.2	ø12.7	—	—	—	—

4. Pipe diameter between the CH unit and the multikit (3 pipes and 2 pipes)[9].

CH unit	Maximum combination of indoor units[8]	Capacity of indoor units	3 pipes		2 pipes	
			Gas, low pressure	Gas, high pressure	Gas	Liquid
CH-6.0N1	7	(0.8-1.5)	ø15.88	ø12.7	ø12.7[15]	ø9.53
		(1.6-4.0)	ø15.88	ø12.7	ø15.88	ø9.53
		(4.1-6.0)	ø19.05	ø15.88	ø15.88	ø9.53
CH-10.0N1	8	(6.1-8.0)	ø19.05	ø15.88	ø19.05	ø9.53
		(8.1-10.0)	ø22.2	ø19.05	ø22.2	ø9.53

5. Pipe diameter for 2 pipes and multikit.

Total HP indoor unit	Gas	Liquid	Total HP indoor unit	Gas	Liquid
< 6	ø15.88	ø9.53	(12-15.99)	ø25.4	ø12.7
(6-8.99)	ø19.05	ø9.53	(16-17.99)	ø28.6	ø12.7
(9-11.99)	ø22.2	ø9.53	(18-25.99)	ø28.6	ø15.88

6. Pipe diameter between multikit and indoor unit[4].

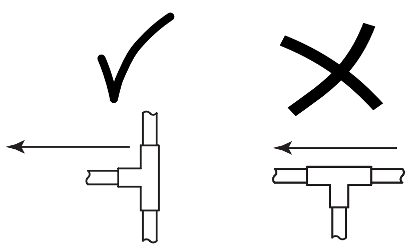
HP indoor unit	Gas	Liquid	HP indoor unit	Gas	Liquid
(0.8-1.5)	ø12.7	ø6.35[5]	8.0	ø19.05	ø9.53
2.0	ø15.88	ø6.35[5]	10.0	ø22.2	ø9.53
(2.5-5.0)	ø15.88	ø9.53	—	—	—

Pipe working conditions

Part		Make	Permitted pipe length (13)	
			≤ Recommended number of connected indoor units	≥ Recommended number of connected indoor units
Total pipe length		Current total liquid pipe length	≤ 1000 m(14)	≤ 300 m
Maximum pipe length	Current length	L1	≤ 165 m	≤ 165 m
	Equivalent length		≤ 190 m	≤ 190 m
Maximum pipe length between the multikit of the first branch and each indoor unit		L2	≤ 90 m	≤ 40 m
Maximum pipe length between each multikit and each indoor unit		L3	≤ 40 m	≤ 30 m
Total pipe length between the CH unit and each indoor unit		*L4 *a+b+c+d+e	CH-6.0N1: ≤ 30 m	CH-6.0N1: ≤ 30 m
			CH-10.0N1: ≤ 10 m	CH-10.0N1: ≤ 10 m
Pipe length between connection kit 1 and each outdoor unit		L5	≤ 10 m	≤ 10 m
Difference in height between outdoor and indoor units	Highest outdoor unit	H1	≤ 50 m	≤ 50 m
	Lowest outdoor unit		≤ 40 m	≤ 40 m
Difference in height between indoor units		H2	≤ 15 m	≤ 15 m
Difference in height between indoor units using the same CH unit		H3	≤ 4 m	≤ 4 m
Difference in height between CH units		H4	≤ 15 m	≤ 15 m
Difference in height between outdoor units		H5	≤ 0.1 m	≤ 0.1 m

NOTE

- ***(1) The connection kit is taken into account from the side of the indoor unit (as connection kit 1).***
- ***(2) When the maximum equivalent refrigerant pipe length (L1) from the outdoor unit/connection kit 1 to the indoor unit is greater than 100 m, the diameter of the liquid pipe from the outdoor unit/connection kit 1 to the first branch must be increased using the reducer (field-supplied).***
- ***(3) Where the refrigerant pipe length is greater than 100 m, the pipe diameter does not have to be increased after the first branch. Where the size of the multikit is greater than that of the first branch, adjust the size of the multikit to the first branch. Where the diameter of the pipe selected after the first branch is greater than the diameter of the pipe after it, use the same diameter as the inlet pipe.***
- ***(4) The pipe diameter -6- must be the same as that of the indoor unit connection.***
- ***(5) Where the liquid pipe length is greater than 15 m, use 9.53 mm diameter pipe and a reducer (field-supplied).***
- ***(6) Keep a direct distance of 500 mm or greater after the connection kit.***
- ***(7) In the case of branches, where the pipe length between the three-pipe branch -F- and the furthest indoor unit exceeds 5 m, use a T-branch pipe for the three-branch liquid pipe (corresponding to the same diameter, as per JIS B8607).***
- ***(8) Where the number of connectable indoor units is greater than four, the high/low-pressure gas, gas and liquid pipes, -4-, -5- and -6-, must be increased by one measurement, respectively.***



- ***(9) The liquid pipe does not have to be connected to the CH unit. See Table 6 for the pipe diameter between the multikit and the indoor unit.***
- ***(10) Where the combination of indoor unit capacities is 10 HP for the CH-10.0N1 unit, performance will drop by approximately 5% in refrigeration and 10% in heating.***
- ***(11) The excess total capacity may lead to insufficient performance and abnormal operating noise. Check that the installation is within the total capacity values.***

- *(12) For operations in refrigeration mode only, connect the indoor units using gas and liquid pipes (without the CH unit). The total capacity in refrigeration mode only must be less than 50% the total capacity of the indoor units.*
- *(13) The installation conditions for the refrigerant pipes are different depending on the number of indoor units connected.*
- *(14) The total pipe length permitted must be less than 1000 m due to the maximum additional refrigerant charge limitation.*
- *(15) Where the branch is after the CH unit and the capacity of the connected indoor unit is (0.8-1.5) HP, use a 15.88 mm diameter for the gas pipe.*

NOTE

1 ***Check that the gas pipe and the liquid pipe are equivalent in terms of length and installation system.***
2 ***Use the multikit system for branching of the indoor units and the CH unit.***
3 ***Install the indoor unit, the multikit and the CH unit according to the instructions given in this manual.***
4 ***Where the length of pipe L3 between each multikit and each indoor unit is considerably longer than on another indoor unit, the refrigerant will not flow correctly and performance is lower in comparison with other models (recommended pipe length: up to 15 m).***

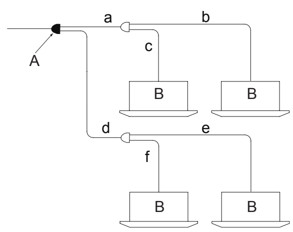
Pipe branching restrictions

Follow the instructions given in the table below for pipe installation (field-supplied).

Maximum pipe length between the multikit of the first branch and each indoor unit (L2)	Main pipe branch (1)		Capacity ratio of the indoor units after the main branch	Branch and distributor combination
	Pipe length after the branch	Number of main pipe branches		
≤ 40 m	a+b+c ≤ 30 m or d+e +f ≤ 30 m	No limit	—	Available (Figures 3 and 4)
	a+b+c > 30 m or d+e +f > 30 m	Up to 2		
From 41 m to 90 m	—	Up to 1 (Figure 1)	≥ 40% (Figure 2)	Not available

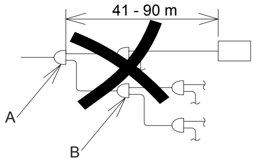
NOTE

(1) Main pipe branch: distribution from one (1) multikit to two (2) multikits.



A: main branch B: indoor units

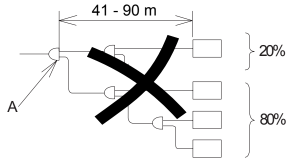
Figure 1: two branches on the main pipe



A: main branch

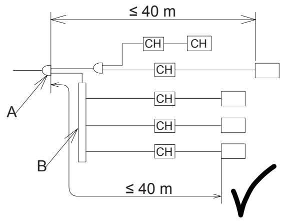
B: secondary branch

Figure 2: capacity ratio of the indoor units ≤ 40%



A: main branch

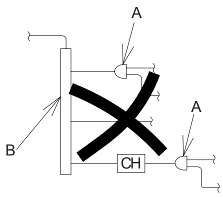
Figure 3: distributor used as branching for three pipes and branching for two pipes



A: branch

B: distributor

Figure 4: do not connect a branch to a distributor



A: branch

B: distributor

3.1.8 Refrigerant charge

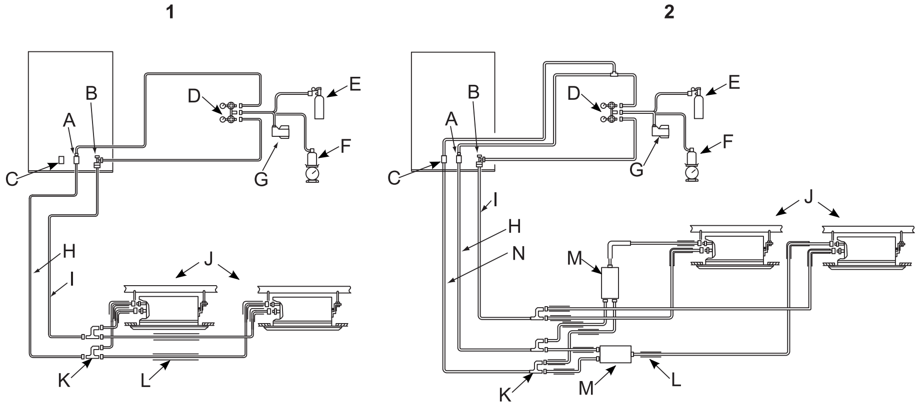
◆ Installation airtight test

Check that the stop valves are fully closed; to do so, remove the covers and check that the valves are closed to the corresponding torque:

- Heat pump system: *Details of the gas and liquid stop valves, see on page 44*.
- Heat recovery system: *Details of the gas and liquid stop valves, see on page 52*.

Check that the outdoor and indoor units are connected via the field-supplied refrigerant pipes.

Check the suspension of the refrigerant pipes as described in chapter *Refrigerant pipe suspension, see on page 41*.



1. Heat pump system.
2. Heat recovery system.

A. Stop valve, high pressure (gas).

B. Stop valve (liquid).

C. Stop valve, low pressure (gas).

D. Measurement indicators.

E. Nitrogen gas bottle.

F. Refrigerant bottle and balance.

G. Vacuum pump.

H. Refrigerant gas pipe, high pressure.

I. Refrigerant liquid pipe

J. Indoor units.

K. Multikit.

L. Insulation.

M. CH unit.

N. Refrigerant gas pipe, low pressure.

Check the seal of the welds and flared connections. To do so, connect the measurement indicators on the check joints of the stop valves and on one vacuum pump or nitrogen gas bottle, using the flexible charge pipes of the indicators.

NOTE

- ***Only tools and indicators specifically for use with R410A refrigerant gas should be used.***
- ***Do not open the stop valves on the outdoor unit.***

DANGER

Only use nitrogen gas when testing for leaks. Never use oxygen, acetylene or fluorocarbon gas; these could result in an intoxication or explosion.

Apply a maximum pressure of 4.15 MPa of nitrogen gas to the installation.

Check there are no refrigerant leaks in the welds and the flared connections of all the system. To do so, use a gas leak sensor or a soap and water solution.

If any leaks are found in the installation, repair and repeat the airtight test.

◆ Installation vacuum

Connect the measurement indicators on the check joints of the stop valves.

NOTE

Only tools and indicators specifically for use with R410A refrigerant gas should be used.

Vacuum the installation to a maximum pressure of -0.1 MPa (-756 mmHg) or lower.

On completion of the vacuum, close the indicator valve and switch off the vacuum pump.

Check that the pressure reading on the indicators remains stable for an hour or more. If this is not the case, check there are no refrigerant leaks at the welds and the flared connections of all the system.

NOTE

If the maximum pressure of -0.1 MPa (-756 mmHg) or less is not obtained, and there are no leaks, keep the vacuum pump running for one or two hours.

If any leaks are found in the installation, repair and repeat the airtight test.

Replace the stop valve covers and tighten to the corresponding torque:

- Heat pump system: *Details of the gas and liquid stop valves*, *see on page 44*.
- Heat recovery system: *Details of the gas and liquid stop valves*, *see on page 52*.

◆ Quantity of refrigerant charged in the W0 outdoor unit

Outdoor unit	Quantity of refrigerant charged in the W0 outdoor unit (kg)	Outdoor unit	Quantity of refrigerant charged in the W0 outdoor unit (kg)
RAS-8FSXN	6.5	RAS-14FSXN	9.0
RAS-10FSXN	6.5	RAS-16FSXN	9.0
RAS-12FSXN	7.0	RAS-18FSXN	10.5

NOTE

For combinations of two or three outdoor units, the quantity of refrigerant corresponds to the sum of the refrigerant charged in each of the units.

◆ Maximum additional refrigerant charge

The total additional charge must not exceed the maximum additional refrigerant charge indicated in the following table.

Outdoor unit	Maximum additional refrigerant charge (kg)	Outdoor unit	Maximum additional refrigerant charge (kg)
RAS-(8/10)FSXN	28	RAS-(18-24)FSXN	51
RAS-12FSXN	36	RAS-(26-54)FSXN	63
RAS-(14/16)FSXN	40	—	—

◆ Method of calculation of the total additional refrigerant charge

Although the outdoor unit is supplied charged with refrigerant, it is necessary to add a certain additional amount depending upon the length of the refrigerant pipes and the capacity ratio of the indoor units.

The different factors determining the total additional refrigerant charge (W) in the system are given as W1, W2 and W3.

The additional quantity of refrigerant is calculated using the following method.

W1: additional refrigerant charge according to the length of the refrigerant liquid pipes.

Nominal diameter		Total length (m)	Quantity of refrigerant per metre of pipe	Additional refrigerant charge (kg)
mm	Inches			
ø22.2	7/8	___ m	x 0.39	
ø19.05	3/4	___ m	x 0.28	
ø15.88	5/8	___ m	x 0.19	
ø12.7	1/2	___ m	x 0.12	
ø9.53	3/8	___ m	x 0.06	
ø6.35	1/4	___ m	x 0.03	
			Total additional refrigerant charge =	______ kg

W2: additional refrigerant charge per indoor unit

No of indoor units of 8 and 10 HP	Amount of refrigerant per unit	Additional refrigerant charge (kg)
	x 1.0 kg/unit	______ kg

NOTE

It is not necessary to increase the additional refrigerant charge for indoor units with less than 8 HP.

W3: Additional refrigerant charge according to the connection capacity ratio of indoor units

Connection capacity ratio of indoor units = total capacity of indoor units / total capacity of outdoor unit

Ratio of indoor units	Additional refrigerant charge (kg)
< 100%	0 kg
(100–115) %	0.5 kg
(116–130) %	1.0 kg

W: total additional refrigerant charge

Total additional refrigerant charge (kg) = W1 + W2 + W3

NOTE

Check that the total additional refrigerant charge is not greater than the values given in: Maximum additional refrigerant charge, see on page 60.

◆ Refrigerant charge

Once the installation has been emptied, check that the stop valves are fully closed; to do so, remove the caps and check that they are closed with the corresponding torque:

- Heat pump system: *Details of the gas and liquid stop valves, see on page 44*.
- Heat recovery system: *Details of the gas and liquid stop valves, see on page 52*.

Charge the total additional refrigerant as calculated in chapter: *Method of calculation of the total additional refrigerant charge, see on page 60*.

If it is not possible to charge the total quantity of additional refrigerant, proceed as follows:

Fully open the gas stop valve (in the case of the outdoor units of heat recovery systems, open the high and low pressure gas valves).

Start the system running in cooling mode and open the liquid outlet valve of the measurement indicators connected to the check joints of the stop valves.

Slightly open the liquid stop valve (tolerance of quantity of total additional refrigerant: 0.5 kg).

When all the refrigerant has been charged, fully open the liquid stop valve.

CAUTION

- ***Only charge the quantity of additional refrigerant as calculated in chapter Method of calculation of the total additional refrigerant charge, see on page 60. Too low or too high a charge could cause damage to the compressor.***
- ***The refrigerant should be charged through the liquid stop valve. If the refrigerant is charged through the gas stop valves, the compressor will be damaged.***

Fill in the F-Gas Label.

◆ Automatic system to estimate the amount of refrigerant charged in the unit

Fit all covers and lids on the unit, except for the electrical box and service covers.

Connect the power supply to the indoor and outdoor units in the same refrigeration cycle for the function to automatically estimate the amount of refrigerant charged in the unit.

NOTE

- ***This function is applicable when the outdoor temperature range is between 0 and 43 °C DB (DB: dry bulb) and the indoor temperature is between 10 and 32 °C DB (DB: dry bulb).***
- ***For RAS-(20-54)FSXN units, the indications, verifications and consultations of the seven-segment display should be done on the main unit.***
- ***The electricity supply to the outdoor unit must remain connected twelve hours prior to the test to heat up the compressor oil.***

Turn the DSW5 contact number four (on PCB1) to ON.

The seven-segment display on the unit will indicate: FGCH

Check the seven-segment display and press PSW1. The outdoor unit fan and the compressor will start up. The display will indicate: ch.02

The function to automatically estimate the amount of refrigerant charged in the unit takes between 30 and 40 minutes to make the necessary checks.

Check the result obtained with the following table:

Display indication	Result	Indications
End	Sufficient charge	The refrigerant charge is sufficient. Turn the DSW5 contact number four (on PCB1) to OFF and carry out the test run.
ch.Hi	Excessive charge	The refrigerant charge is excessive. Calculate the refrigerant charge according to the length of the refrigerant pipes. Collect the charged refrigerant appropriately and charge the unit with correct amount of refrigerant.
ch.Lo	Insufficient charge	The refrigerant charge is insufficient. Check whether the unit has been charged with additional refrigerant. Calculate the refrigerant charge according to the length of the refrigerant pipes. Charge the unit with the correct amount of refrigerant.
ch.	Abnormal completion	Locate the cause of the abnormal completion in line with the instructions below. Once the cause of the abnormal completion has been solved, restart the check. 1. Is the DSW5 contact number four (on PCB1) turned to ON before the power supply is connected? 2. Are all indoor units ready and waiting before DSW5 contact number four (on PCB1) is turned to ON? 3. Is the outdoor ambient temperature within the working ranges established (0 – 43 °C)? (In some cases, when the number of indoor units connected exceeds the maximum number recommended and the outdoor temperature is above 35 °C, the check cannot be made). 4. Is the total operating capacity ratio of the indoor units 30% or less? 5. Is DSW4 contact number four (forced compressor stoppage) turned to OFF?

Turn the DSW5 contact number four (on PCB1) to OFF when the refrigerant charge is sufficient. Wait at least three minutes before turning the DSW5 contact number four (on PCB1) to OFF so that the outdoor unit is ready to start operating.

NOTE

- ***During the check, the seven-segment display may change to the protection control code due to the protection control being activated, although this is quite normal.***
- ***Consult the information on the inside of the unit service cover for further information on the protection control code.***

CAUTION

- ***Releasing refrigerant into the atmosphere is forbidden.***
- ***Where the amount of refrigerant charged in the system is to be corrected, it must be collected appropriately.***
- ***Follow the instructions given on the specific label attached to the unit with regards to the refrigerant.***
- ***Fill in the F-Gas Label.***

3.1.9 Precautions in the event of refrigerant leaks

DANGER

Fitters and the designers of the installations must strictly observe local and national legislation, and local codes regarding safety requirements in the event of refrigerant leaks.

◆ Maximum permitted concentration of hydrofluorcarbon (HFC)

The R410A refrigerant gas, used in the equipment, is fireproof and not toxic.

DANGER

In the event of a leak, the gas will spread around the room, displacing the air, and could therefore result in asphyxia.

The maximum permitted concentration of HFC R410A gas in the air is 0.44 kg/m^3, in accordance with standard EN378-1. Therefore, efficient measures should be adopted to ensure the concentration of R410A gas in the air is kept below 0.44 kg/m^3 in the event of a leak.

◆ Calculation of the refrigerant concentration

1 Calculate the total quantity of refrigerant *R* (kg) charged in the system; to do so, connect all the indoor units of the rooms in which you wish to have air conditioning.

2 Calculate the volume *V* (m^3) of each room.

3 Calculate the refrigerant concentration *C* (kg/m^3) of the room in accordance with the following formula:

$$R / V = C$$

R: Total quantity of refrigerant charged (kg).

V: volume of the room (m^3).

C: concentration of refrigerant (= 0.44 kg/m^3 for R410A gas).

◆ Countermeasures in the event of refrigerant leaks

The room should have the following characteristics in case of a leak of refrigerant:

1. Opening without shutter to permit the circulation of fresh air in the room.
2. Opening without door measuring 0.15%, or greater, of the floor surface.
3. A fan with a capacity of at least 0.4 m^3/minute per tonne of Japanese refrigerant (= volume displaced by the compressor / 5.7 m^3/h) or greater, connected to a gas sensor in the air conditioning system which uses the refrigerant.

DANGER

Special attention should be given to areas where the refrigerant may be deposited and stay in the room, such as basements or similar, as it is heavier than air.

3.1.10 Drainage pipes

◆ Condensation drainage system

When the outdoor unit operates in refrigeration or heating mode, there is a build-up of condensation of the ambient humidity which, together with rain water, requires draining.

Select a location for the unit which permits adequate drainage. If necessary, mount an installation suitable for the drainage of condensation.

DANGER

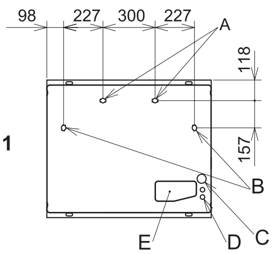
- ***Drainage must not take place in areas frequented by pedestrians. In low temperatures, the drainage water could freeze and lead to falls. If it is necessary to install the outdoor unit in an area frequented by pedestrians, an additional drainage tray should be fitted.***
- ***Do not fit drainage pipes or collection trays in cold climates, as they could freeze and break.***

If a condensation drainage kit is required for the outdoor unit, use the optional drainage kit DBS-TP10A.

NOTE

All measurements are in mm.

1



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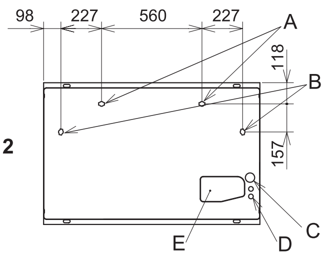


Base of outdoor unit

1. SET FREE RAS-(8-12)FSXN
2. SET FREE RAS-(14-18)FSXN

A. Drainage hole ø26. For the optional drainage kit DBS-TP10A.

B. Drainage hole ø26. For optional drainage plug.

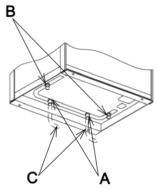
C. Opening for power wiring feed through.

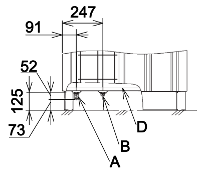
D. Opening for communication wiring feed through

E. Opening for feed through of refrigerant pipes 235 x 113.

◆ **Installation position of the optional drainage kit DBS-TP10A**

Installation position (example: RAS-10FSXN, lower and side views).





A. Drain pipe.

B. Optional drain plug.

C. Drain pipes (field-supplied).

D. Base of unit.

Drain kit components

Model	Description	Material/colour	Quantity	Application
DBS-TP10A	Drain pipe	PP/black	2	Drain pipe connection
	Drain plug	PP/black	2	Drain pipe plug
	Rubber plug	CR/black	4	Pipe and plug seal

3

3.2 CH unit

3.2.1 Considerations

DANGER

- ***Use refrigerant R410A in the refrigerant cycle. Do not charge oxygen, acetylene or other flammable and poisonous gases into the refrigerant cycle when performing a leakage test or an air-tight test. These types of gases are extremely dangerous and can cause an explosion. It is recommended that compressed air, nitrogen or refrigerant be used for these types of tests.***

3.2.2 Piping materials

1 Prepare locally-supplied copper pipes.

2 Select clean copper pipes. Make sure there is no dust and moisture inside. Before connecting pipes, blow the inside of the pipes with nitrogen or dry air, to remove any dust or foreign materials.

3 Select the piping size with the correct thickness and correct material which can have sufficient pressure strength.

CAUTION

- ***Cover the end of the pipe if the pipe has to be inserted through a hole.***
- ***Do not put pipes on the ground directly without a cap or vinyl tape at the end of the pipe.***
- ***Remove all the flammable materials around the units. If not, it will cause a fire.***

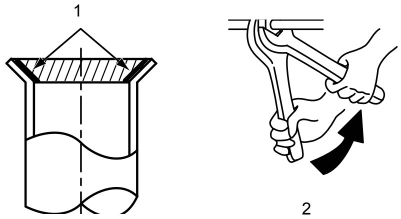
3.2.3 Cautions for piping connection work

A) Connect the indoor/outdoor connecting pipes. Fix the pipes and pay attention not to contact with weak materials such as ceiling. (Otherwise, abnormal sound may be heard due to the vibration of the piping.)

B) Apply refrigerant oil slightly on the sheet surface of the pipe and flare nut before the flaring work. And then tighten the flare nut with the specified tightening torque using two spanners. Perform the flaring work on the liquid piping side before the gas piping side. Check the gas leakage after the flaring work.

1 Apply refrigerant oil.

2 Two spanners work.



NOTE

- ***Refrigerant oil is field-supplied.***
- ***Ethereal Oil FVC50K, FVC68D (Idemitsu Kousan Co. Ltd.).***

C) In case that temperature and humidity inside the ceiling exceed 27ºC/RH80%, apply additional insulation (approx. 10 mm thickness) to the accessory insulation. It prevents dew condensation on the surface of the insulation (refrigerant pipe only).

D) Perform the air-tight test (4.15 MPa for the test pressure). Refer to Technical Catalog for Outdoor Unit for more details.

E) Perform cold insulation work by insulating and taping the flare connection and reducer connection. Also insulate all the refrigerant pipes.

Required tightening torque

Pipe size		Tightening torque
ø6.35	1/4	14 ~ 18 N-m
ø9.53	3/8	34 ~ 42 N-m
ø12.7	1/2	49 ~ 61 N-m
ø15.88	5/8	68 ~ 82 N-m
ø19.05	3/4	100 ~ 120 N-m

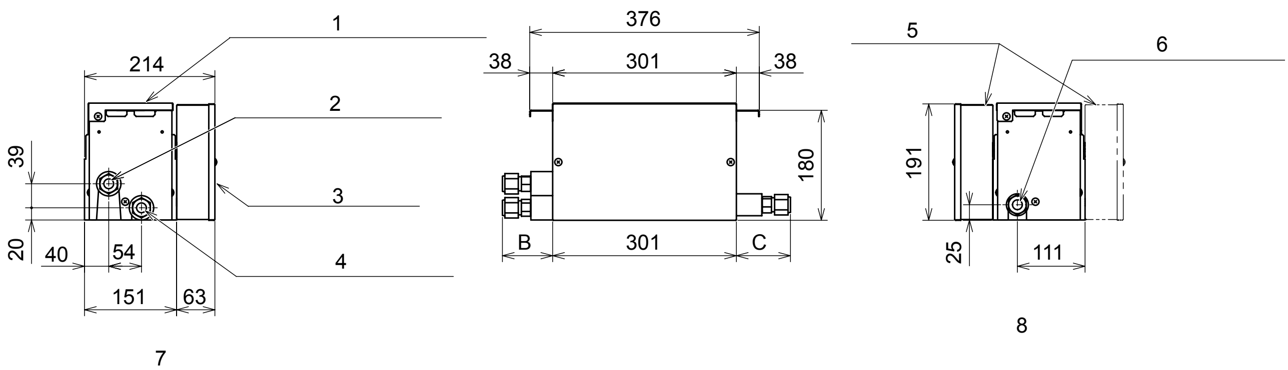
CAUTION

- ***Do not apply excessive force to the flare nut when tightening. If applied, the flare nut may crack due to aged deterioration and refrigerant leakage may occur. Use the specified tightening torque.***
- ***For more details of the refrigerant piping work, vacuum pumping and refrigerant charge, refer to Technical Catalog for Outdoor Unit.***

3.2.4 Refrigerant piping work

Provide the refrigerant pipe in the field. Make sure that the refrigerant pipe should be connected to the same refrigerant cycle unit.

◆ Position of piping connection



Unit: mm.

1 Service cover for electronic expansion valve.
2 Low pressure pas pipe ponnection (ø flare nut).
3 Service cover for electrical box.
4 High pressure gas pipe connection (ø flare nut).
5 Electrical box (available for both sides).
6 Gas pipe connection (ø flare nut).
7 Outdoor unit connecting side.
8 Indoor unit connecting side.

Model	Dimension		
	A	B	C
CH-6.0N1	ø15.88	82	89
CH-10.0N1	ø19.05	89	96

◆ Selecting piping size

A) Select the size for the high pressure gas pipe, low pressure gas pipe and gas pipe according to the table 1. The size depends on the indoor unit total capacity connected downstream of the CH unit.

B) In case that the piping size from Table 5.1 and the piping connection size for CH unit from Table 2 are different, use an accessory pipe according to the item Piping connection.

C) As for the multi-kit branch or header branch, refer to Technical Catalog for Outdoor Unit.

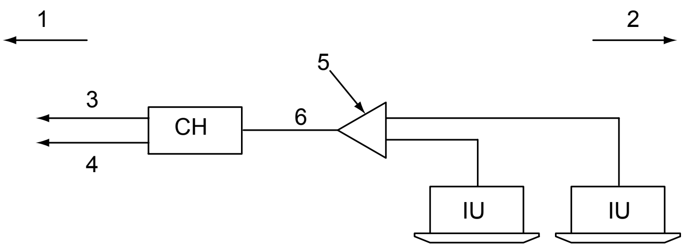
Table 1 Connected indoor unit capacity and piping size.

Model	Connected indoor Unit capacity (HP)	Low pressure gas pipe (mm)	High pressure gas pipe (mm)	Gas pipe (mm)
CH-6.0N1	0.8 ~ 1.5	ø15.88	ø12.7	ø12.7 *
	1.6 ~ 4.0	ø15.88	ø12.7	ø15.88
	4.1 ~ 6.0	ø19.05	ø15.88	ø15.88
CH-10.0N1	6.1 ~ 8.0	ø19.05	ø15.88	ø19.05
	8.1 ~ 10.0	ø22.2	ø19.05	ø22.2

* In case that a branch is located downstream of the CH unit and also the connected indoor unit capacity is 0.8 ~ 1.5 HP, use ø15.88 for the gas pipe.

Table 2 Piping conection size for CH unit.

Model	Low pressure gas pipe (mm)	High pressure gas pipe (mm)	Gas pipe (mm)
CH-6.0N1	ø15.88	ø15.88	ø15.88
CH-10.0N1	ø19.05	ø19.05	ø19.05

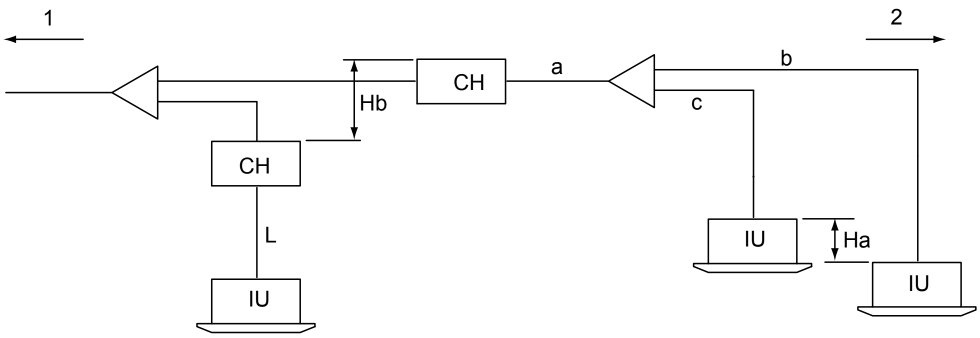


1 Upstream.
2 Downstream.
3 Low pressure gas pipe.
4 High pressure gas pipe.
5 Multi-kit.
6 Gas pipe.

IU: Indoor unit.

CH: CH Unit.

Condition of piping work.



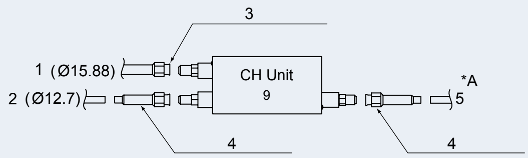
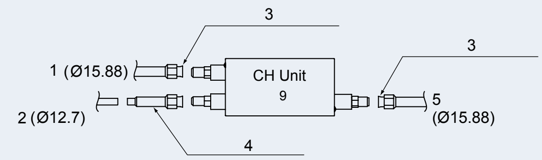
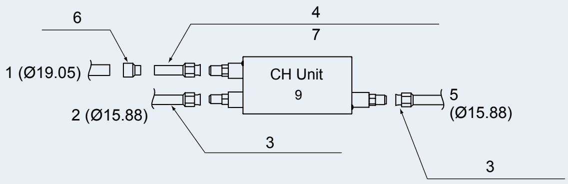
1 Upstream.
2 Downstream.

IU: Indoor unit.

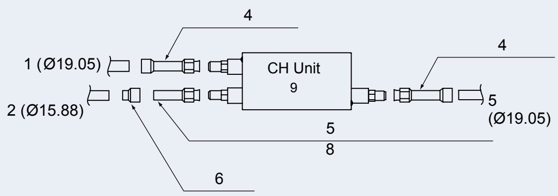
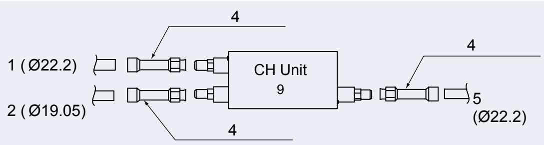
CH: CH Unit.

Item		Allowable piping length	
Total piping length between CH unit and indoor unit	L a+b+c	CH-6.0N1	within 30 m
		CH-10.0N1	within 10 m
Height difference between indoor units connected to the same CH unit	Ha	within 4 m	
Height difference between CH units	Hb	within 15 m	

◆ Piping connection

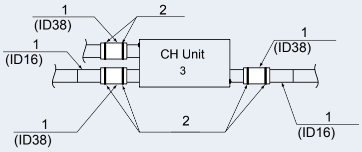
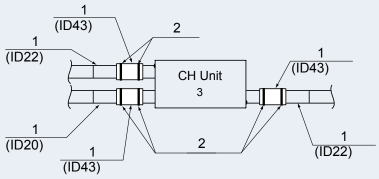
Connected indoor unit capacity (HP)	CH-6.0N1
0.8 to 1.5	
1.6 to 4.0	
4.1 to 6.0	

*A: In case that a branch is located downstream of the CH unit and also the connected indoor unit capacity is 0.8~1.5 HP, perform the flaring work of the field gas pipe and connect it to the CH unit.

Connected indoor unit capacity (HP)	CH-10.0N1
6.1 to 8.0	
8.0 to 10.0	

1 Low pressure gas pipe (field-supplied).
2 High pressure gas pipe (field-supplied).
3 Field flaring work.
4 Accessory pipe.
5 Gas pipe (field-supplied).
6 Reducer.
7 (Cut the end of the spinning part).
8 (Cut the end of the expanded part of pipe).
9 (Upper surface).

◆ Piping insulation

CH-6.0N1	
CH-10.0N1	

1 Insulation.
2 Clamp.
3 (Upper surface).

ID: Inner diameter.

NOTE

- ***In case that the humidity inside the ceiling is high, apply additional insulation to the flare nut connection.***
- ***Refer to the chapter initial check Initial check, see on page 23 for more details.***

4. Electrical wiring

Index

4.1 Outdoor unit

4.1.1 General information

CAUTION

- ***Before any work to the electrical wiring or regular inspections, switch off the mains power supply of the indoor and outdoor units. Wait three minutes before starting installation or maintenance work.***
- ***Make sure that the interior and exterior fans have come to a complete standstill before starting work on the electrical wiring or regular inspections.***
- ***Protect cables, the drainage pipe, electrical components, etc. from rodents and insects; otherwise these might damage unprotected components and this could result in fire.***
- ***Do not allow cables to come into contact with the refrigerant pipes, metal edges, printed circuit boards (PCB) or the electric components inside the unit; the cables may be damaged and this could result in fire.***
- ***Firmly secure the cables inside the indoor unit with plastic flanges.***
- ***Before starting work on the installation of the outdoor unit, place the DSW7 in the correct position according to the expected supply voltage: Setting of the DSW switches on PCB1, see on page 78.***

DANGER

- ***Use an earth leakage breaker with medium sensitivity, and an activation speed of 0.1 or less. If this is not fitted, there is a risk of electric shock and/or fire.***
- ***Install an earth leakage breaker, fuse and circuit breaker for each outdoor unit power line. Not fitting it may cause an electric shock or fire.***

4.1.2 General verifications

1 Make sure the electric components supplied by the fitter (main power switches, circuit breakers, wires, connectors and connection terminals) have been selected correctly in line with the electrical data given.

- **a** The electricity supply to the unit should be via an exclusive power control switch and protective circuit breaker, certified and installed in accordance with local or national safety regulations.
- **b** The electricity supply for the outdoor and indoor units should be separate. Connect the voltage supply wiring for each group of indoor units to the same outdoor unit (maximum capacity for each group of indoor units: 26 HP).
- **c** For heat recovery systems, the CH unit and the indoor unit of the same refrigerant cycle can be supplied from the same mains power switch.

2 Check that the supply voltage is between 90 and 110% of the rated voltage. Where the voltage capacity is too low, it will not be possible to start the system due to the drop in voltage.

3 Sometimes, the refrigeration/heating system is not able to operate correctly in the following cases:

- When the system is supplied from the same supply line as other major consumers (heavy machinery, power inverter systems, cranes, welding machinery, etc).
- When the supply cables of the major consumers and the refrigeration/heating system are very close together.

In these cases, induction in the wiring to the refrigeration/heating system may arise due to a rapid change in the electricity consumption of the above consumers and their start-up. Therefore before starting installation work, check the regulations and standards concerning adequate protection of the power supply line.

NOTE

For further information, please refer to the applicable legislation in the country in which the unit is to be fitted.

4 During the preliminary preparation work of the electricity supply line for the unit, the provisions in local and national legislation must never be violated.

5 Check that the earth cable is correctly connected.

DANGER

- ***Never connect the earth cable to the refrigerant pipes. The gas in the pipes could cause a fire.***
- ***Do not connect the earth cable to the lighting rod. The electrical potential of earth would increase abnormally.***

4.1.3 Connection of the power supply circuits

◆ Cable sizes

Outdoor units:

Model	Supply voltage	Maximum current (A)	Cross section of the power cable		Cross section of the service cable	
			EN60 335-1 (mm²)(1)	MLFC (mm²)(2)	EN60 335-1 (mm²)(1)	MLFC (mm²)(2)
RAS-8FSXN	3N~ 400V 50Hz	12	2.5	2.0	0.75	0.75
RAS-10FSXN		16	2.5	2.0		
RAS-12FSXN		22	6	3.5		
RAS-14FSXN		26	6	5.5		
RAS-16FSXN		29	10	5.5		
RAS-18FSXN		31	10	8		

(1) The cross-sections of the cable should be selected for the maximum current of the unit, in accordance with European Standard EN60 335-1.

(2) The cross-sections of the cable have been selected for the maximum current of the unit, in accordance with MLFC cable (Flame Retardant Polyflex Wire) manufactured by HITACHI Cable Ltd., Japan.

NOTE

Do not use cables that are lighter than the normal flexible coated polychloroprene cable (code H05RN-F).

◆ Main breaker switch

Model	Supply voltage	Maximum current (A)	ELB(1)		CB(2)
			Rated current (A)	Sensitivity (mA)	Rated current (A)
RAS-8FSXN	3N~ 400V 50Hz	12	40	30	20
RAS-10FSXN		16	40	30	20
RAS-12FSXN		22	40	30	30
RAS-14FSXN		26	40	30	40
RAS-16FSXN		29	63	30	40
RAS-18FSXN		31	63	30	50

(1) ELB: earth leakage breaker (field-supplied).

(2) CB: circuit breaker (field-supplied).

◆ Voltage supply

Service voltage

Between 90 and 110% of the rated voltage.

Start-up voltage

Between 85 and 115% of the rated voltage.

Voltage imbalance

Up to 3% in each phase, measured at the main terminal of the outdoor unit.

Electromagnetic compatibility

According to Directive 2004/108/EC (89/336/EEC) regarding electromagnetic compatibility, the following table indicates: the maximum allowed impedance Z_{max} of the system at the connection point of the user's power supply, as per EN 61000-3-11.

Model	Z_{max} (Ω)	Model	Z_{max} (Ω)
RAS-8FSXN	–	RAS-14FSXN	0.11
RAS-10FSXN	–	RAS-16FSXN	0.11
RAS-12FSXN	–	RAS-18FSXN	0.08

Harmonics

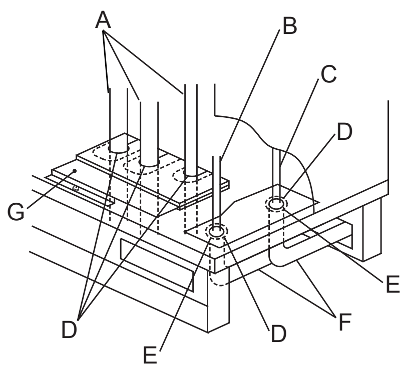
In relation to IEC 61000-3-2 and IEC 61000-3-12, the situation of harmonics for each model is as follows:

Situation of the models in relation to IEC 61000- 3-2 and IEC 61000-3-12 Ssc "xx"	Model	Ssc "xx" (kVA)
Unit compliant with IEC 61000-3-2 (professional use).	RAS-8FSXN	–
	RAS-10FSXN	
Unit compliant with IEC 61000-3-12.	–	–
This unit is in accordance with Standard IEC 61000-3-12 with the condition that the short circuit current Ssc is greater than or equal to xx (see Ssc column) at the connection point between the power supply of the user and the public grid. It is the responsibility of the installer or the user of the unit to ensure, if necessary consulting the distribution grid operator, that the unit is connected only to a power supply where the short circuit power is greater than or equal to xx (see Ssc column).	RAS-14FSXN	5089
	RAS-16FSXN	1593
	RAS-18FSXN	1532
The authorities responsible for the electrical power supply can apply restrictions relating to harmonics.	RAS-12FSXN	–
Unit(s) outside the scope of IEC 61000-3-12.	–	–

◆ Connection of outdoor units

Remove cover -G- to the refrigerant pipes -A-.

The power -C- and communication -B- cables should be inserted in the unit through the pre-drilled holes and lower rubber bushing -E- provided, using a different protective duct -F- for each one.



NOTE

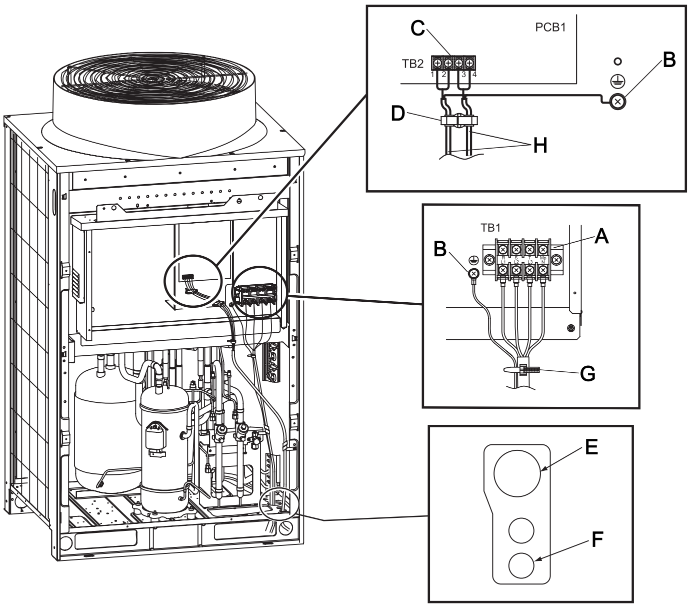
Do not insert the supply and communication cables together through the same protective duct. Keep a minimum distance between them of 50 mm.

Fit the cover on the pipes -G- and completely seal access -D- of the pipes to the unit, to prevent the entrance of water, rodents and dirt.

Do not allow the cables to touch the refrigerant pipes, sharp metal edges or electric parts from inside the unit.

NOTE

- ***Fasten the power cables with the flanges provided inside the unit.***
- ***Attach unused rubber bushings with adhesive.***
- ***Make a drainage hole in the lowest part of the protective duct.***



Connect the three-phase power cables on terminals L1, L2, L3 and N of the TB1 -A- terminal board and connect the earth wire to the screw-in terminal -B-. Use insulated terminals or heat-shrink covers.

D: harness lifter for fixing the transmission wiring (2 places).

Connect the communication cables on the terminals of the TB2 -C- of the PCB1:

- From the indoor units to the outdoor unit: terminals 1 and 2.
- From the outdoor unit to the next outdoor unit in the same refrigerant cycle: terminals 3 and 4:

E: ø53 mm pre-drilled hole for power cables.

F: ø26 mm pre-drilled hole for communication cables.

G: Cord board (accessory) for fixing power supply wiring.

H: shielded twist pair cable.

NOTE

Completely seal the entrance to the duct using sealant, etc. to prevent water from entering.

Tighten the connection terminals as shown in the following table:

Size	Tightening torque (Nm)
M4	(1.0–1.3)
M5	(2.0–2.4)
M6	(4.0–5.0)
M8	(9.0–11.0)
M10	(18.0–23.0)

◆ Connection of indoor units

Connect each outdoor unit to a power supply line. Install an earth leakage breaker, fuse and circuit breaker for each outdoor unit power line.

Connect each group of indoor units corresponding to an outdoor unit to a voltage supply line (maximum capacity for each group of indoor units: 26 HP). Install an earth leakage breaker, fuse and circuit breaker for each group of indoor units.

Connect the communication cable between the indoor units, the CH units and the outdoor units.

Connect the communication cable on the corresponding units to the same refrigerant cycle. (Where the refrigerant pipe of the indoor unit is connected to the outdoor unit, connect the communication cable to the same indoor unit).

NOTE

Connecting the refrigerant pipe and the communication cable to units in different refrigerant cycles may lead to operating problems.

Use shielded twisted pair cable or shielded pair cable. Do not use cable with three or more conductors.

Use the same type of cables for the H-LINK system of units in each refrigerant cycle.

Ensure a minimum distance of 50 mm between the power cables and the communication cables and 1500 mm between these and the power cables of other electrical devices. Where this is not possible, install power cables in a metal duct separate from the others.

Connect the communication cables to TB2 terminals 1 and 2 on outdoor unit A (main unit):

- Between the outdoor unit and the indoor unit.
- Between the outdoor unit and the CH unit.
- Between the outdoor unit and the indoor unit on other refrigerant cycles.

CAUTION

Do not connect power cables to communication terminals (TB2). This could damage the circuit board.

For heat recovery systems, connect the communication cable on the indoor unit (used exclusively for refrigeration) to TB2 terminals 1 and 2 on the CH unit.

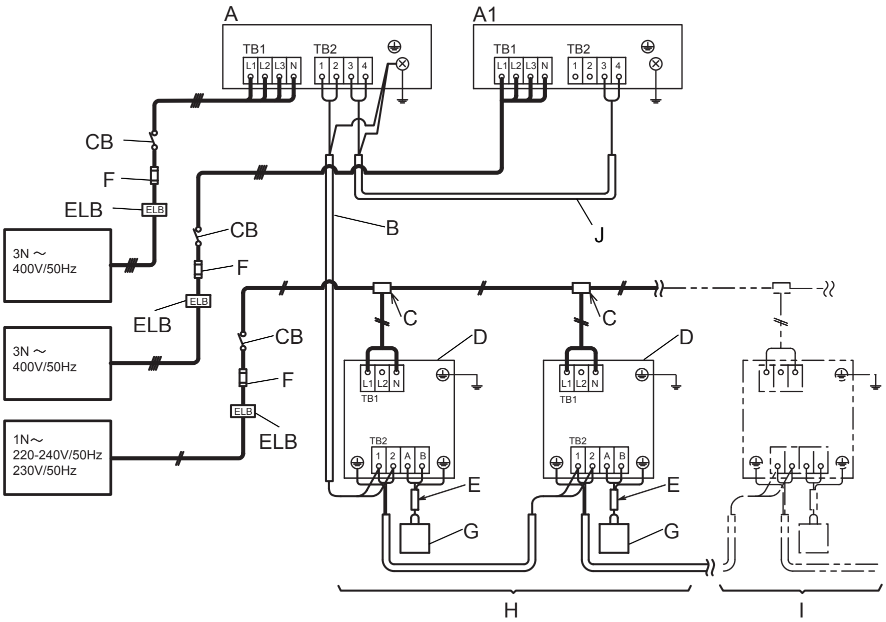
Connect the earth wire for the outdoor units, the indoor units and the CH units. Earthing connections below a resistance of 100 Ω (max.) must be made by qualified personnel.

NOTE

1. ***Set the DSW switches on the main and secondary units for the combination of (20-54) HP outdoor units.***
2. ***An alarm is triggered if the communication cables between the outdoor units are connected to terminals 1 and 2 for H-LINK II.***
3. ***Where an alarm is indicated on the display of the main outdoor unit, follow the instructions given to make the necessary checks.***
4. ***Make the function settings from the main outdoor unit.***
5. ***Maximum number of refrigeration groups with one remote control: 64.***

   Maximum number of indoor units connected: 160.

Connection diagram: heat pump system



A	Main outdoor unit
A1	Secondary outdoor unit
B	Operation wiring (shielded twisted pair cable or shielded pair cable) 5 Vdc non-polar H-LINK (field-supplied)
C	Distribution box (field-supplied)
D	Indoor units
E	Operation wiring (shielded twisted pair cable or shielded pair cable) (field-supplied)
F	Fuse (field-supplied)
G	PC-ART remote control
H	Indoor unit system No 0
I	Indoor unit system No 1
J	Transmission wire between A and A1
CB	Circuit breaker (field-supplied)
ELB	Earth Leakage Breaker (field-supplied)

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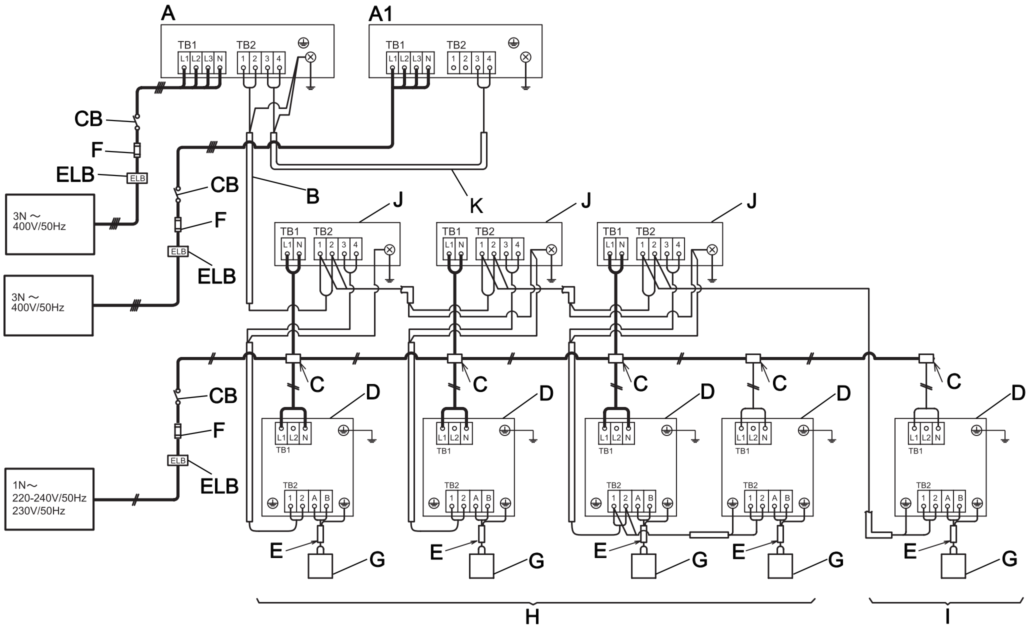
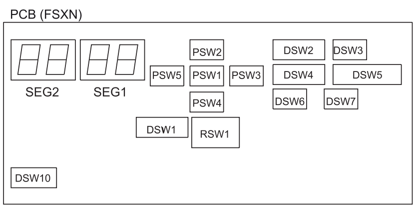
Connection diagram: heat recovery system



A	Main outdoor unit
A1	Secondary outdoor unit
B	Operation wiring (shielded twisted pair cable or shielded pair cable) 5 Vdc non-polar H-LINK (field-supplied)
C	Distribution box (field-supplied)
D	Indoor units
E	Operation wiring (shielded twisted pair cable or shielded pair cable) (field-supplied)
F	Fuse (field-supplied)
G	PC-ART remote control
H	Indoor unit system No 0
I	Indoor unit system No 1
J	CH unit
K	Transmission wire between A and A1
CB	Circuit breaker (field-supplied)
ELB	Earth Leakage Breaker (field-supplied)

4.1.4 Setting of the DSW switches on PCB1



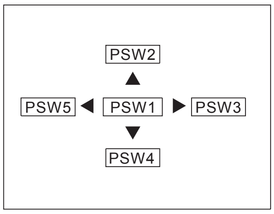
Location of the DSW switches on PCB1.

CAUTION

Before changing the settings of the DIP switches, the voltage supply should be disconnected. Otherwise, the new settings will not be valid.

NOTE

- ***Only the DIP DSW1, DSW2 and DSW4 switches can be set while the voltage supply is connected.***
- ***The symbol "■" indicates the position of the DIP switches. The figures show the position of the DIP switch once the position setting has been completed.***
- ***With the DSW4 switch, the unit starts or stops after 10 to 20 seconds of the switch being activated.***
- ***Record the number of the outdoor unit to tell it apart from others during service and maintenance operations in this area:***



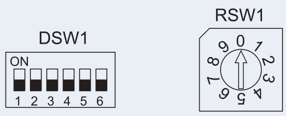
PSW: Pushswitch on PCB1

PSW1: Enter.

PSW2, 3, 4 and 5: for checking.

DSW1, RSW1: refrigerant cycle number setting

- Setting required.
- Setting before RSW1 supply: 0.
- Setting before DSW1 supply: 0 (digit of tens).
- Set each outdoor unit number on each refrigerant cycle.
- Outdoor and indoor units belonging to the same refrigerant cycle: set the same cycle number in the outdoor and indoor units (indoor units: DSW5 and RSW2).

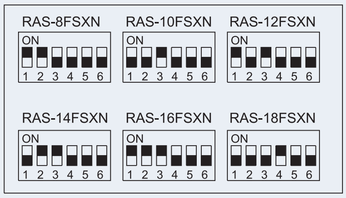


DSW1, RSW1: setting example for refrigerant cycle number 25

- Maximum refrigerant cycle number setting: 63.

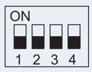
DSW2: capacity setting

Setting not required.



DSW3

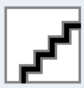
Setting not required.



DSW4: test run and service settings

Setting required.

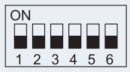
- A: setting before supply.
- B: refrigeration test run.
- C: heating test run.
- D: forced compressor stoppage.



DSW5: emergency operation /test run and service setting

Setting not required. Activate only when the following functions are used:

- Contact 1: except No 1, compressor operation.
- Contact 2: except No 2, compressor operation.
- Contact 4: Monitoring of refrigerant quantity.



DSW6: setting outdoor unit number

Setting required.

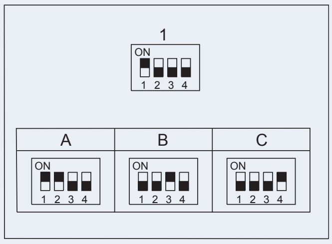
- 1: setting before supply:

NOTE

This combination of outdoor units must be set.

Setting for combination of units:

- A: unit 1 (main).
- B: unit 2.
- C: unit 3.



DSW7: supply voltage setting

Setting not required.

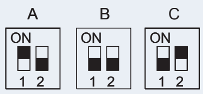
DSW10: communication setting

Setting required.

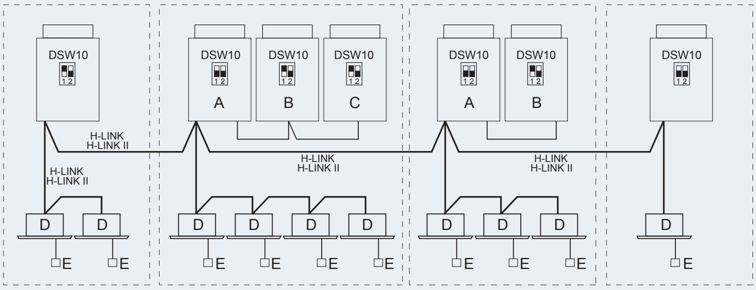
- A: setting before supply.
- B: cancellation of final resistance.

NOTE

- ***C: If the communication circuit fuse has opened, the PCB1 board can only be recovered by activating contact 2.***



DSW10: switch setting example



A. Main unit.	D. Indoor units.
B. Secondary unit.	E. Remote control.
C. Secondary unit.	

NOTE

- ***Where two or more outdoor units are connected using the H-LINK or H-LINKII, DSW10 contact 1 on the master or main unit must be set to OFF from the second refrigerant group of outdoor units.***
- ***If only one unit is installed, the setting is not necessary.***

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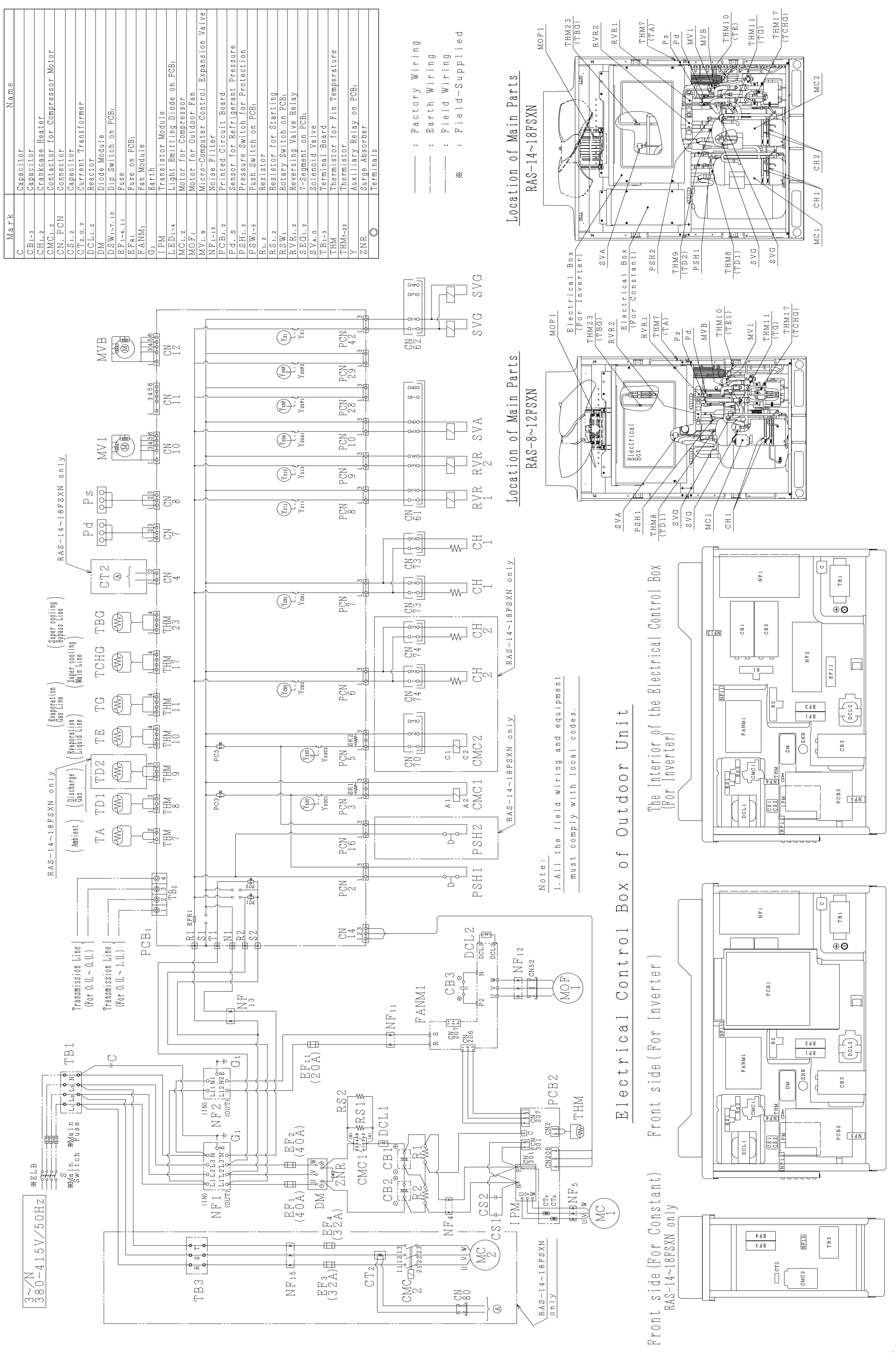
4.1.5 Electrical wiring diagram RAS-(8–18)FSXN



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4.2 CH unit

4.2.1 General information

DANGER

- ***Turn OFF the main power switch to the CH unit, the indoor unit and the outdoor unit before electrical wiring work or a periodical check is performed.***
- ***Protect the wires, electrical parts, etc. from rats or other vermin.***
- ***Use a medium sensing speed type ELB (Electric Leakage Breaker, activation speed of 0.1 sec. or less). If not used, it will cause an electric shock or a fire.***

Fix the cables securely. External forces on the terminals could lead to a fire.

CAUTION

- ***Wrap the accessory packing around the wires, and plug the wiring connection hole with the seal material to protect the product from any condensate water or insects.***
- ***Tightly secure the wires with the cord clamp inside the electrical box.***
- ***Use twisted shielded pair cable or shield pair cable for transmission wires between the indoor and the outdoor units (Max. 1000 m), and connect the shielded part to the earth screw in the electrical box of the indoor unit as shown the next page figure.***

4.2.2 General verifications

1 Make sure that the field-selected electrical components (main power switches, circuit breakers, wires, conduit connectors and wire terminals) have been properly selected according to the electrical data indicated in Technical Catalogue. Make sure that the components comply with National Electrical code (NEC).

2 Check to ensure that the power supply voltage is within ±10% of rated voltage.

3 Check the power source capacity is too low, the system cannot be started due to the voltage drop.

4 Check to ensure that the ground wire is connected.

4.2.3 Electrical wiring connection CH units

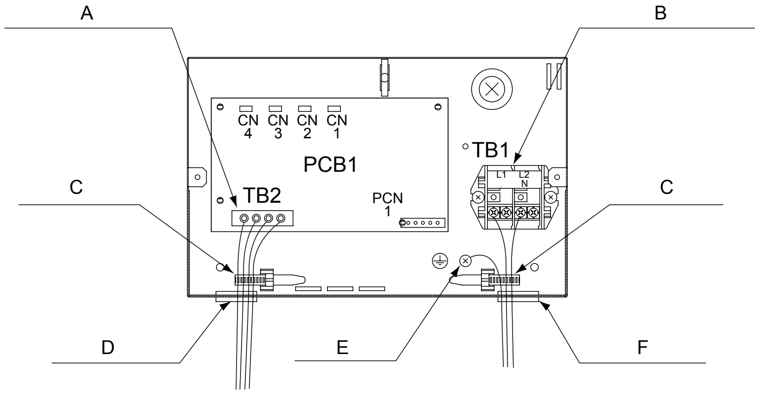
The electrical wiring connection for the CH unit is shown in next figure.

1 Turn OFF the main power switch and take off the electrical box cover of CH unit.

2 Connect the power supply and earth wires to the terminals in the electrical box.

3 Connect the wires of the operating line to the terminals in the electrical box.

4 Tightly clamp the wires using the cord clamp inside the electrical box.
5 Fix the electrical box cover after wiring work.



A	Terminal board for operating line
B	Terminal board for power supply
C	Cord clamp
D	Operating line connection
E	Earth wire
F	Power supply line connection

◆ Field minimun wire sizes

1 Perform the electrical wiring work for the CH units. Determine the cable size according to the table below.
2 Pay attention to the marks on the terminal board when connecting wires for CH unit and Indoor unit / Outdoor unit. Refer to “Example of Electrical Wiring” for the wiring connection on the next page.

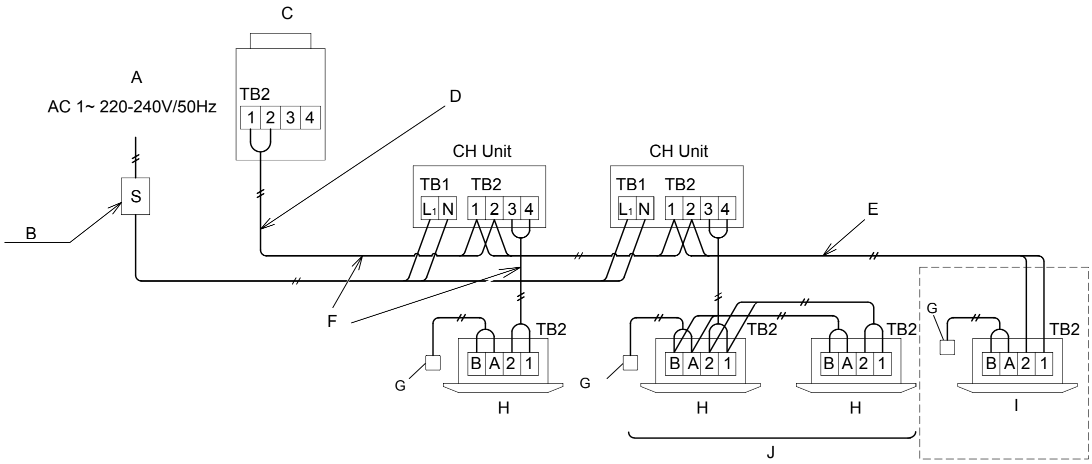
Model	Supply voltage	Maximum current (A)	Power source cable size		Transmitting cable size		Earth wire size (mm^2)
			EN60 335-1 (mm^2)$^{(1)}$	MLFC (mm^2)$^{(2)}$	EN60 335-1 (mm^2)$^{(1)}$	MLFC (mm^2)$^{(2)}$	
CH-6.0N1	1~ 220-240V/1Ø/50Hz	1	0.75	0.5	0.75	0.5	2.0
CH-10.0N1							

NOTE

- ***Follow local codes and regulations when selecting field wires.***
- ***The wire sizes marked with ^{1} in the above table 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).***
- ***The wire sizes marked with ^{2} in the above table are selected at the maximum current of the unit according to the wire, MLFC (Flame Retardant Polyflex Wire) manufactured by Hitachi Cable Ltd., Japan.***
- ***Use a shielded cable for the transmitting circuit and connect it to ground.***

◆ Example of electrical wiring

The following figure shows the example of electrical wiring around the CH units. Refer to the Technical Catalog for Outdoor Unit regarding the electrical wiring of the whole system.



A: Outdoor unit power supply.

B: Earth leakage breaker (ELB) and main switch (S).

C: Outdoor unit.

D: Connect the operating line for the outdoor unit to the terminal “1” and “2” of TB2 on the CH unit.

E: Connect the operating line for the indoor unit (exclusive use of cooling operation) to the terminal “1” and “2” of TB2 on the CH unit.

F: Operating line (non-pole, DC5 V).

G: Remote control switch.

H: Indoor unit.

I: Indoor Unit (exclusive use of cooling operation).

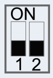
J: In case that the multiple indoor units are connected to the same CH unit, the operation mode (cooling/heating) for the indoor units will be the same.

NOTE

- ***Do not apply excessive voltage to the operating line (DC5V (non-pole)) between outdoor unit and CH unit, between CH unit and indoor unit, between CH units.***
- ***Use 2-Core cable for the operating line. (Do not use 3-Core cable or over.)***
- ***Connect the operating line for the outdoor unit to the terminal “1” and “2” of TB2 on the CH unit.***
- ***Connect the operating line for the indoor unit exclusively for cooling operation to the terminal “1” and “2” of TB2 on the CH unit.***
- ***For the CH unit in the same refrigerant cycle, electrical power source can be supplied by one switch.***
- ***Do not connect the power supply line (220V~240V) to the terminal board for operating line.***
- ***Connect the earth wire for the outdoor/indoor units and CH unit. The ground wiring work under the condition of 100 W (max.) ground resistance should be performed by the qualified electrician.***

◆ Setting of DIP switches

Ensure that DSWs on the PCB1 are set before shipping as shown below and no setting is required.

DSW1	DSW101	SW301
		

CAUTION

- ***The control of the temperature is only available through the room's thermostat or Aquastat. The Remote Control Switch of the indoor unit cannot be touch, if it is done the unit will be outside of warranty.***
- ***Before setting DIP switches, firstly turn OFF power source and set the position of the DIP switches. If the switches are set without turning OFF the power source, the switches can not function.***

NOTE

- ***The symbol "■" indicates the position of the DIP switches. Figures show setting before shipment.***

5. Control system

Index

5.1 Control system

5.1.1 Cycle control

Control device	Cooling		Heating Heat recovery		Defrost
	Purpose	Contents	Purpose	Contents	Contents
Compressor Inverter frequency	Total operation capacity of the indoor unit	Capacity control is carried out to reach the evaporation temperature objective value	Total operation capacity of the indoor unit	PI control is carried out to reach the Pd objective value.	All the compressors operating
Electronic expansion valve for the outdoor unit heat exchanger.	Capacity control	Completely open (the opening of the electronic expansion valve is dependent on the refrigerant cycle conditions)	Condenser COND Capacity control	Condenser COND Completely open (the opening of the electronic expansion valve is dependent on the refrigerant cycle conditions)	Completely open
			Evaporator EVAP outdoor unit heat exchanger SH	Evaporator EVAP PI control is carried out to reach the superheat objective value in the outdoor unit heat exchanger.	
Electronic expansion valve for the supercooling heat exchanger.	TdSH control	Control TdSH of the compressor to reach the objective value	TdSH control	Control TdSH of the compressor to reach the objective value	TdSH control
Electronic expansion valve for the indoor unit heat exchanger	Indoor unit heat exchanger SH	PI control is carried out to reach objective value in the indoor unit heat exchanger SH	<Cooling setting> Indoor unit heat exchanger SH	<Cooling setting> PI control is carried out to reach the objective value in the indoor unit heat exchanger SH	Indoor unit heat exchanger SH
			<Heating setting> Indoor unit heat exchanger SH	<Heating setting> Control SC of the indoor unit liquid thermistor to reach objective value	
Outdoor unit fan	Pd control	PI control is carried out to reach the Pd objective value	Condenser COND Pd control	Condenser COND PI control is carried out to reach the Pd objective value	Stoppage
			Evaporator EVAP Fixing by ambient temperature and operating capacity	Evaporator EVAP Fan rotation is controlled by the ambient temperature and the indoor unit operating capacity	
Gas bypass valve (SVA)	1. Increase in Pd protection 2. Decrease in Pd protection	1. Pd > 3.6 MPa: ON 2. Ps < 0.15 MPa: ON	1. Increase in Pd protection 2. Decrease in Pd protection	1. Pd > 3.6 MPa: ON 2. Ps < 0.15 MPa: ON	Closed

Control device	Cooling		Heating Heat recovery		Defrost
	Purpose	Contents	Purpose	Contents	Contents
High and low pressure shut-off valve (SVG)	Shut-off of high and low pressure in the cycle during stoppage	Compressor operating: ON Compressor stopped: OFF	Shut-off of high and low pressure in the cycle during stoppage	Compressor operating: ON Compressor stopped: OFF	Open

Pd: Discharge pressure.

Ps: Suction pressure.

SH: Superheat.

SC: Supercooling.

TdSH: Superheat of discharge gas temperature.

5.1.2 Compressor operation control

◆ Compressor rotation control

The compressor rotation control is carried out to match its operation time in each of the outdoor units.

This control is carried out during the Thermo-OFF of the outdoor unit.

In case of switch-OFF or Thermo-OFF after 120 minutes of operation, the inverter compressor with the shortest operation time will be preferably turned on.

5

NOTE

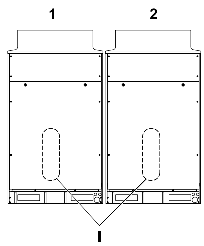
In order to carry out this function, at least two outdoor units are required.

The operating sequence of the compressor rotation is described below.

RAS-20FSXN

	Outdoor unit 1	Outdoor unit 2
	-I-	
Last time	1	2
Currently	2	1
Next time	1	2

-I- Inverter compressor

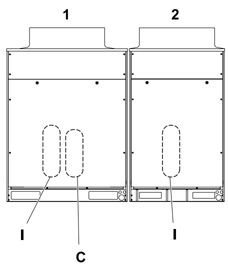


RAS-(22-26)FSXN

	Outdoor unit 1		Outdoor unit 2
	-I-	-C-	-I-
Last time	1	3	2
Currently	2	3	1
Next time	1	3	2

-I- Inverter compressor

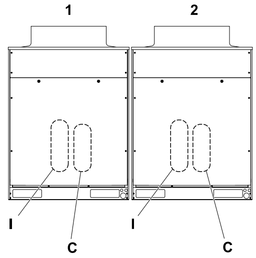
-C- Constant compressor



RAS-(28-36)FSXN

	Outdoor unit 1		Outdoor unit 2	
	-I-	-C-	-I-	-C-
Last time	1	3	2	4
Currently	2	4	1	3
Next time	1	3	2	4

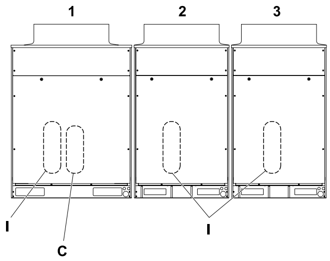
-I- Inverter compressor
-C- Constant compressor



RAS-(38-42)FSXN

	Outdoor unit 1		Outdoor unit 2	Outdoor unit 3
	-I-	-C-	-I-	-I-
Last time	1	4	2	3
Currently	2	4	3	1
Next time	3	4	1	2

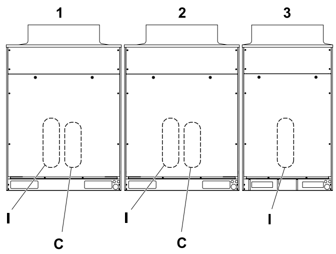
-I- Inverter compressor
-C- Constant compressor



RAS-(44-48)FSXN

	Outdoor unit 1		Outdoor unit 2		Outdoor unit 3
	-I-	-C-	-I-	-C-	-I-
Last time	1	4	2	5	3
Currently	2	4	3	5	1
Next time	3	5	1	4	2

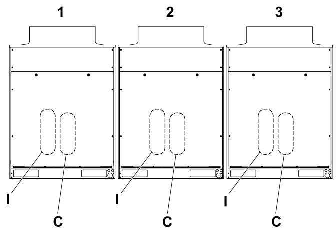
-I- Inverter compressor
-C- Constant compressor



RAS-(50-54)FSXN

	Outdoor unit 1		Outdoor unit 2		Outdoor unit 3	
	-I-	-C-	-I-	-C-	-I-	-C-
Last time	1	4	2	5	3	6
Currently	2	5	3	6	1	4
Next time	3	6	1	4	2	5

-I- Inverter compressor
-C- Constant compressor



◆ Compressor frequency control

Operational control is carried out to optimise the compressor output frequency or to carry out the turning on and stopping while in constant operation in accordance with the target frequency (the target frequency is determined by the calculation of the PID control and the heating and cooling load).

Therefore, when the load is small, the constant compressor may not operate.

RAS-(14-18)FSXN (Power supply frequency: 50 Hz)

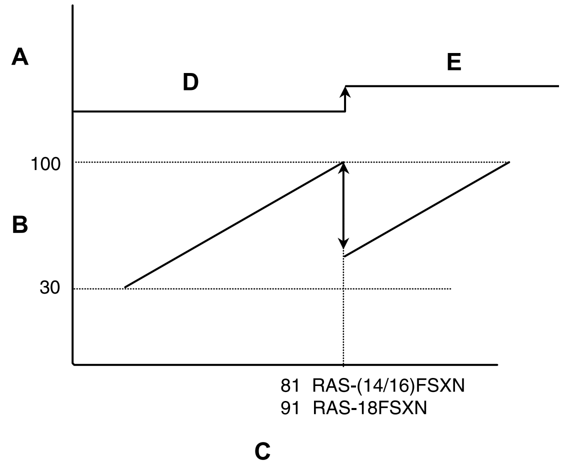
A. Compressor operation condition.

B. Frequency of Inverter compressor (Hz).

C. Target frequency (Hz).

D. Inverter compressor.

E. Inverter compressor + constant compressor.



RAS-20FSXN (Power supply frequency: 50 Hz)

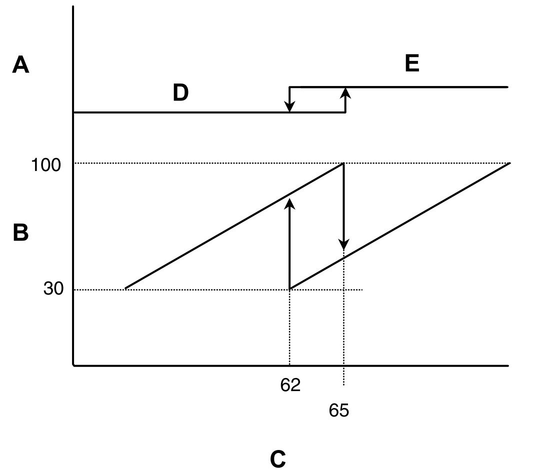
A. Compressor operation condition.

B. Frequency of Inverter compressor (Hz).

C. Target frequency (Hz).

D. Inverter compressor.

E. Two Inverter compressors.



RAS-(22-26)FSXN (Power supply frequency: 50 Hz)

A. Compressor operation condition.

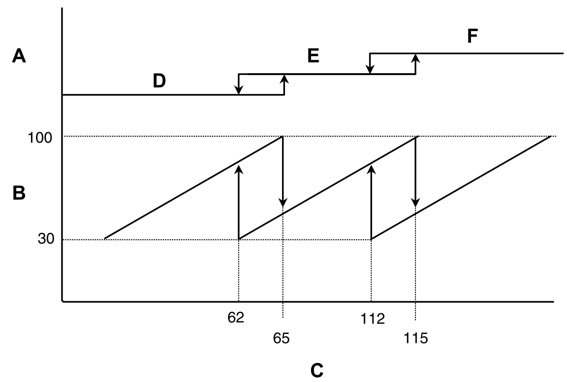
B. Frequency of Inverter compressor (Hz).

C. Target frequency (Hz).

D. Inverter compressor.

E. Two Inverter compressors.

F. Inverter compressor + constant compressor.



RAS-(28-36)FSXN (Power supply frequency: 50 Hz)

A. Compressor operation condition.

B. Frequency of Inverter compressor (Hz).

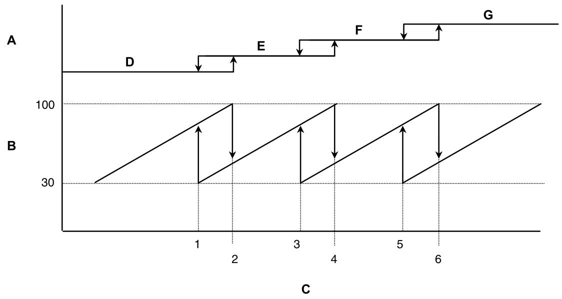
C. Target frequency (Hz).

D. Inverter compressor.

E. Two Inverter compressors.

F. Two Inverter compressors + constant compressor.

G. Two Inverter compressors + two constant compressors.



HP	Objective frequency (Hz)					
	1	2	3	4	5	6
28	62	65	112	115	162	165
30	62	65	112	115	162	165
32	62	65	112	115	162	165
34	62	65	122	125	172	175
36	62	65	122	125	182	185

RAS-(38-42)FSXN (Power supply frequency: 50 Hz)

A. Compressor operation condition.

B. Frequency of Inverter compressor (Hz).

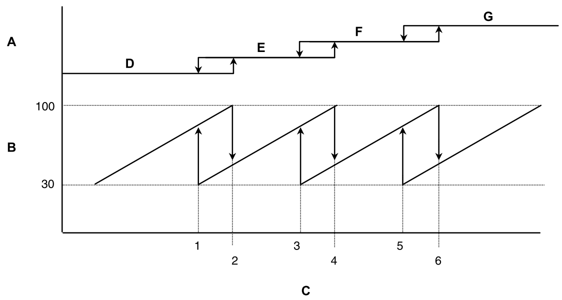
C. Target frequency (Hz).

D. Inverter compressor.

E. Two Inverter compressors.

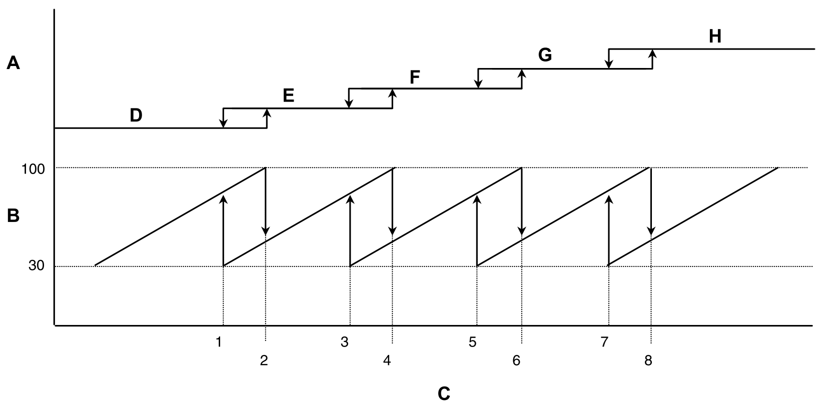
F. Three Inverter compressors.

G. Three Inverter compressors + constant compressor.



HP	Objective frequency (Hz)					
	1	2	3	4	5	6
38	62	65	93	130	143	180
40	62	65	93	130	143	180
42	62	65	93	130	153	190

RAS-(44-48)FSXN (Power supply frequency: 50 Hz)



A. Compressor operation condition.

B. Frequency of Inverter compressor (Hz).

C. Target frequency (Hz).

D. Inverter compressor.

E. Two Inverter compressors.

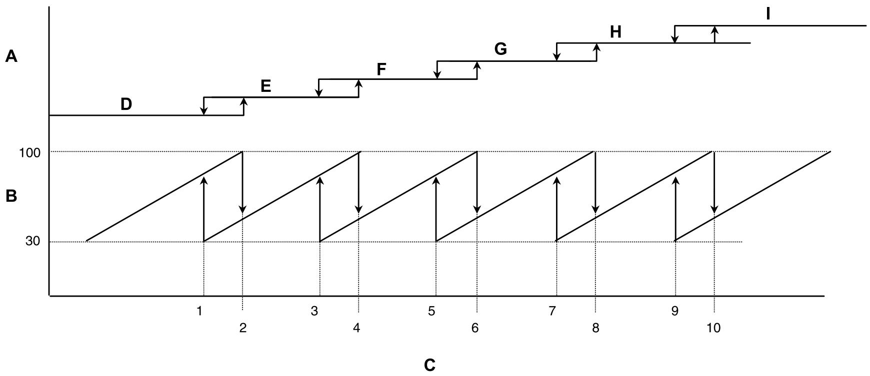
F. Three Inverter compressors.

G. Three Inverter compressors + constant compressor.

H. Three Inverter compressors + two constant compressors.

HP	Objective frequency (Hz)							
	1	2	3	4	5	6	7	8
44	62	65	93	130	153	190	203	240
46	62	65	93	130	153	190	203	240
48	62	65	93	130	153	190	213	250

RAS-(50-54)FSXN (Power supply frequency: 50 Hz)



A. Compressor operation condition.

B. Frequency of Inverter compressor (Hz).

C. Target frequency (Hz).

D. Inverter compressor.

E. Two Inverter compressors.

F. Three Inverter compressors.

G. Three Inverter compressors + constant compressor.

H. Three Inverter compressors + two constant compressors.

I. Three Inverter compressors + three constant compressors.

HP	Objective frequency (Hz)									
	1	2	3	4	5	6	7	8	9	10
50	62	65	93	130	153	190	213	250	263	300
52	62	65	93	130	153	190	213	250	263	300
54	62	65	93	130	153	190	213	250	273	310

5.1.3 Heat exchanger mode control

- Heat recovery system: in accordance with the connected load of indoor units, the outdoor unit heat exchanger can switch as indicated in the following table.
- Heat pump system: in accordance with the operation mode of the indoor units, the outdoor unit heat exchanger can switch as indicated in the following table.

NOTE

Outdoor unit heat exchanger mode at cooling: condenser (COND).

Outdoor unit heat exchanger mode at heating: evaporator (EVAP).

1 ***Heat exchanger mode:***
- ***COND: operating as condenser.***
- ***cond: avoid using the heat exchanger (under high pressure conditions).***
- ***EVAP: operating as evaporator.***
- ***evap: avoid using the heat exchanger (under low pressure conditions).***

2 ***Expansion valve control method:***
- ***Pd: normally, completely open (the opening depends on the refrigerant cycle conditions). PI control is carried out to reach the discharge pressure objective value when it decreases.***
- ***TdSH: PI control is carried out to reach the compressor TdSH objective value.***
- ***Heat exchanger SH: PI control is carried out to reach the heat exchanger SH objective value.***

The number of outdoor unit: 1

Heat exchanger mode		Cooling mode	Mainly cooling mode		Mainly heating mode	Heating mode	Defrost mode
		COND	D1	D1-1	D4	EVAP	DEF1
Heat exchanger condition		COND	COND	cond	EVAP	EVAP	COND
Reversing valve	RVR2	OFF	OFF	OFF	ON	ON	OFF
	RVR1	ON	OFF	OFF	OFF	OFF	ON
Expansion valve	MV1	Pd	Pd		Heat exchanger SH		Completely open
	MVB	TdSH	TdSH	Ps protection			TdSH

The number of outdoor unit: 2

Heat exchanger mode			Cooling mode	Mainly cooling mode		Mainly heating mode		Heating mode	Defrost mode	
			COND	D1	D2	D3	D4	EVAP	DEF2	DEF1
									With CH unit	Without CH unit
Main outdoor unit	Heat exchanger condition		COND	COND	COND	cond	EVAP	EVAP	COND/EVAP	COND
	Reversing valve	RVR2	OFF	OFF	OFF	OFF	ON	ON	ON/OFF	OFF
		RVR1	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
	Expansion valve	MV1	Pd	Pd			Heat exchanger SH		Completely open/Heat exchanger SH	Completely closed
		MVB	TdSH	TdSH						
Secondary outdoor unit	Heat exchanger condition		COND	COND	evap	EVAP	EVAP	EVAP	COND/EVAP	COND
	Reversing valve	RVR2	OFF	OFF	ON	ON	ON	ON	ON/OFF	OFF
		RVR1	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
	Expansion valve	MV1	Pd	Pd	Completely closed				Completely open/Heat exchanger SH	Completely closed
		MVB	TdSH	TdSH						

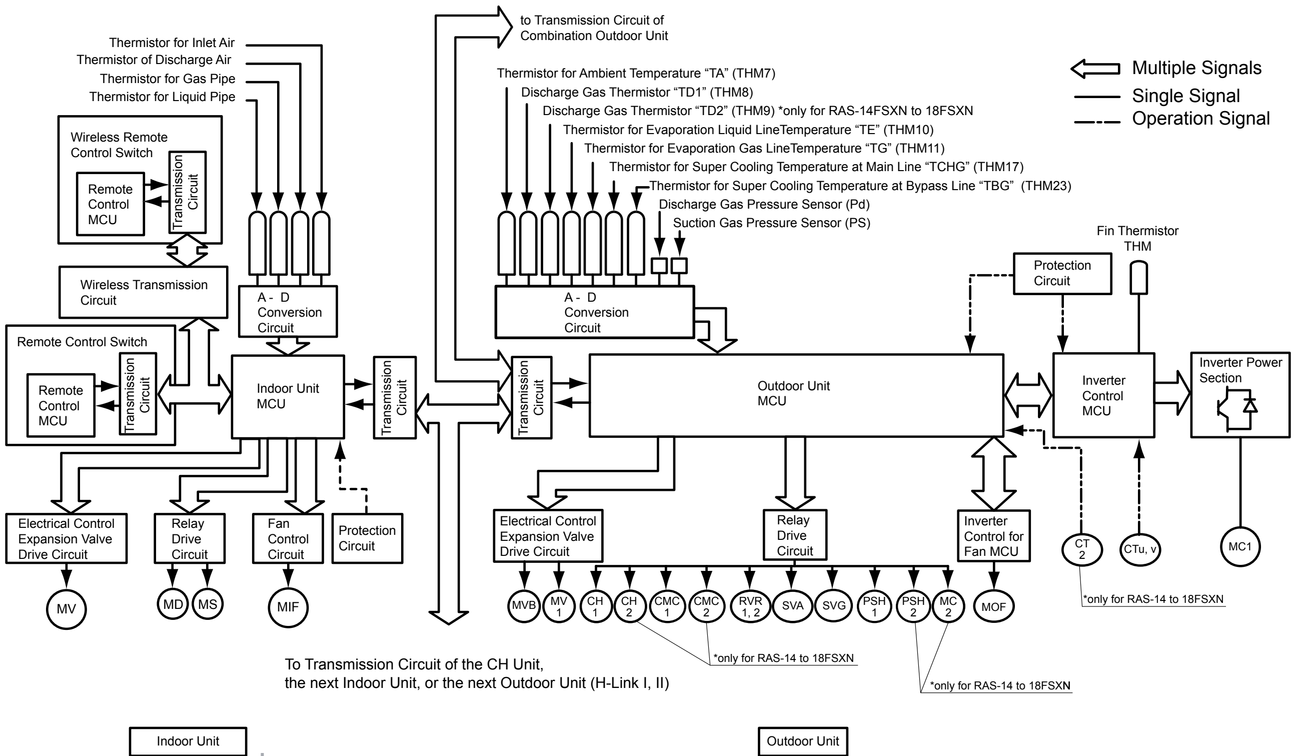
The number of outdoor unit: 3

Heat exchanger mode			Cooling mode	Mainly cooling mode			Mainly heating mode				Heating mode	Defrost mode	
			COND	D1	D2-1	D2-2	D2-3	D3-1	D3-2	D4	EVAP	DEF2 With CH unit	DEF1 Without CH unit
Main outdoor unit	Heat exchanger condition		COND	COND	COND	COND	con	con	COND	EVAP	EVAP	COND/EVAP	COND
	Reversing valve	RVR2	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF/ON	OFF
		RVR1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
	Expansion valve	MV1	Pd	Pd						Heat exchanger SH		Completely open/Heat exchanger SH	Pd
		MVB	TdSH	TdSH									
Secondary outdoor unit	Heat exchanger condition		COND	COND	EVAP	evap	EVAP	EVAP	EVAP	EVAP	EVAP	COND/EVAP	COND
	Reversing valve	RVR2	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	OFF/ON	OFF
		RVR1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
	Expansion valve	MV1	Pd	Pd	Heat exchanger SH							Completely open/Heat exchanger SH	Pd
		MVB	TdSH	TdSH									
Secondary outdoor unit	Heat exchanger condition		COND	COND	COND	cond	cond	evap	EVAP	EVAP	EVAP	COND/EVAP	COND
	Reversing valve	RVR2	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF/ON	OFF
		RVR1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
	Expansion valve	MV1	Pd	Pd				Heat exchanger SH				Completely open/Heat exchanger SH	Pd
		MVB	TdSH	TdSH									

Pd: Discharge pressure.
Ps: Suction pressure.
SH: Superheat.
TdSH: Superheat of discharge gas temperature.

5.1.4 Outline of the control system

The figure below shows the outline of the control system.



Symbol	Description
MC1	DC motor (for Inverter compressor)
MC2	AC motor (for constant speed compressor)
MOF	DC motor (for outdoor unit fan)
MIF	Motor (for the indoor unit fan)
MS	Motor (for the automatic louver)
MD	Motor (for the drain pump)
MV	Electronic expansion valve (for the indoor unit)
MV_1	Electronic expansion valve (for the outdoor unit)
MVB	Electronic expansion valve (for the plate heat exchanger)
$CMC_{1,2}$	Magnetic contactor for the compressor
SVA	Solenoid valve
SVG	Solenoid valve
$RVR_{1, 2}$	Reversing valve
$PSH_{1, 2}$	High pressure switch
$CH_{1, 2}$	Compressor heater resistance
$CT_{u, v}$	Current sensor

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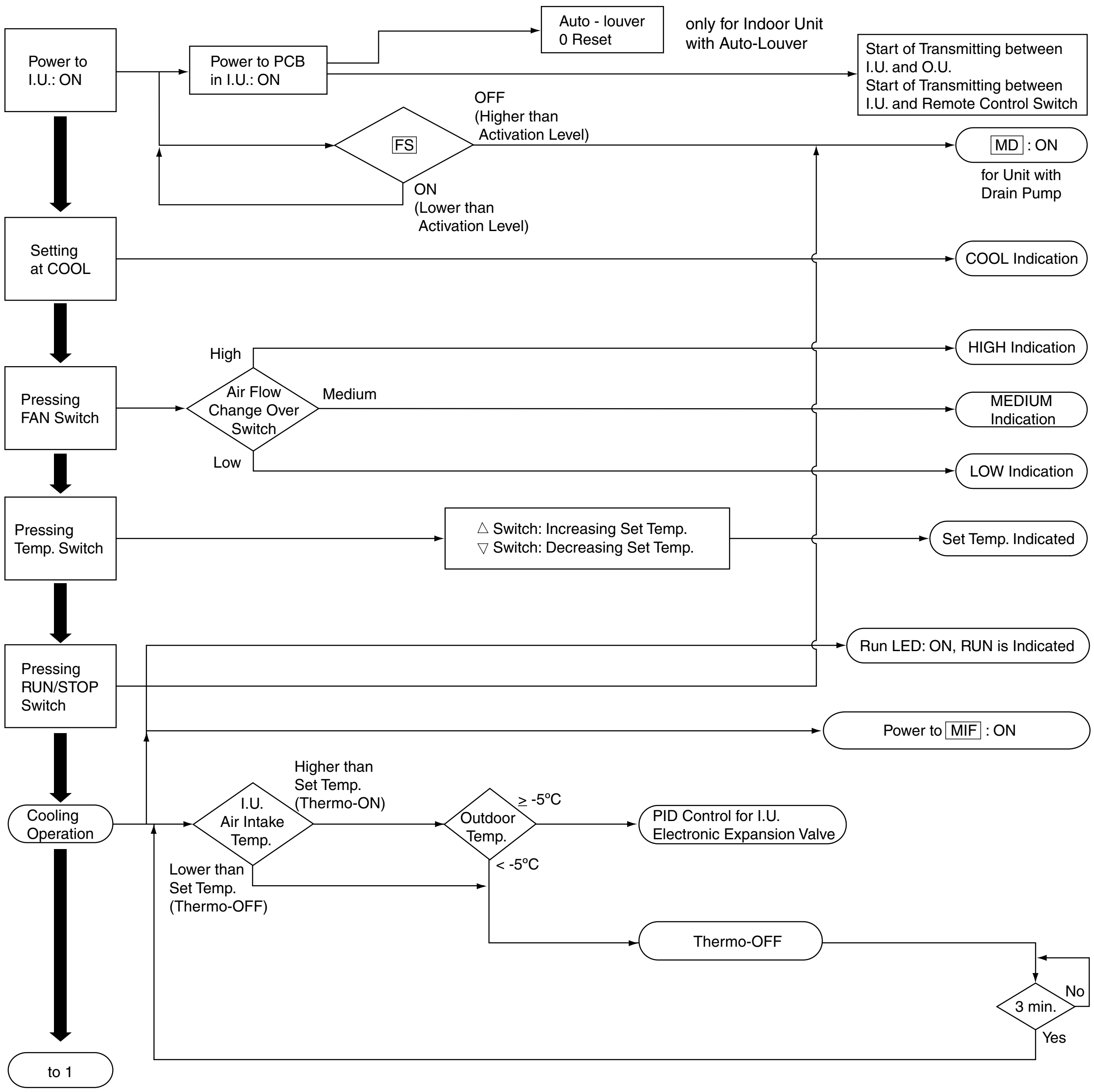
5.2 Standard operation sequence

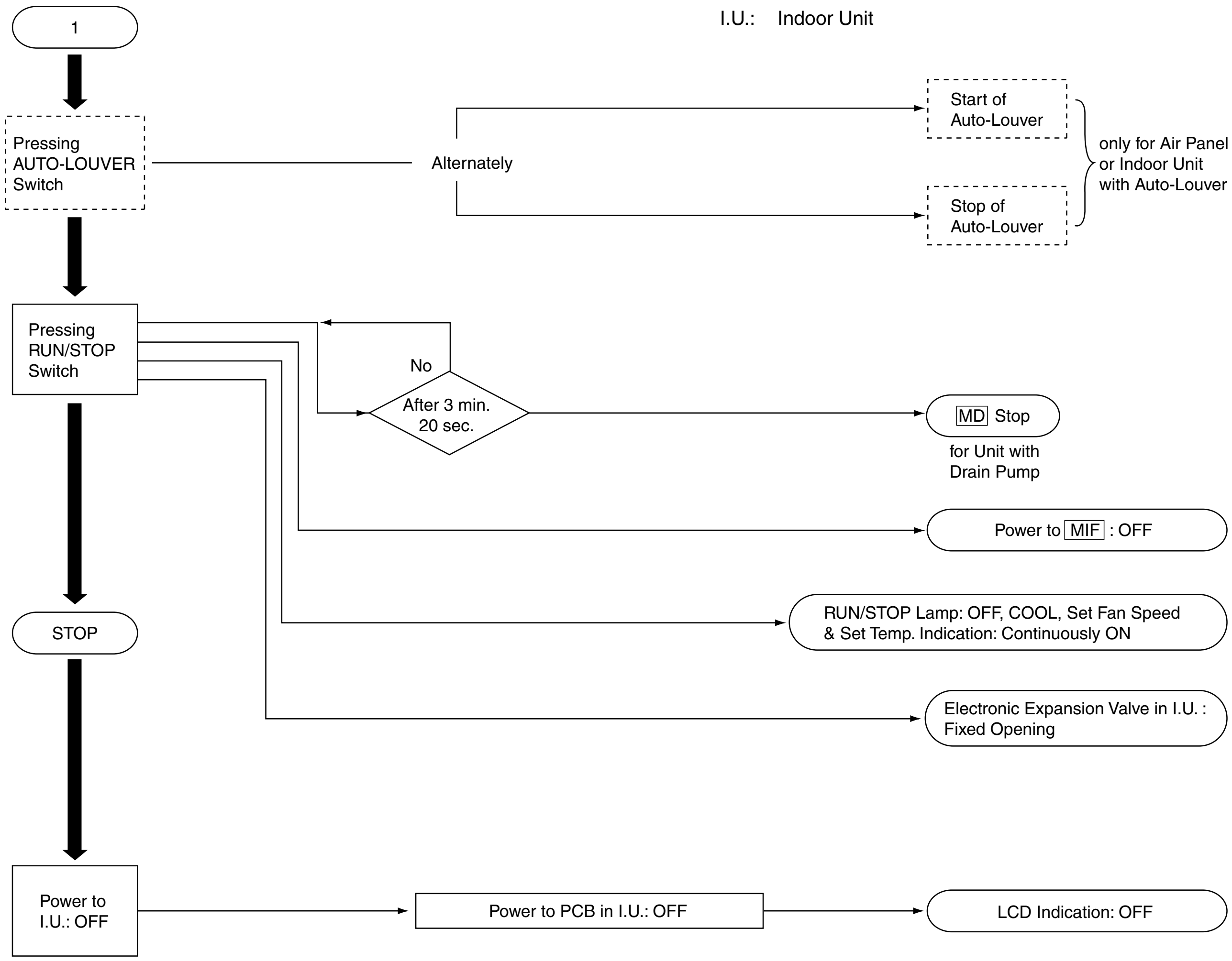
5.2.1 Cooling operation

I.U.: Indoor Unit
O.U.: Outdoor Unit



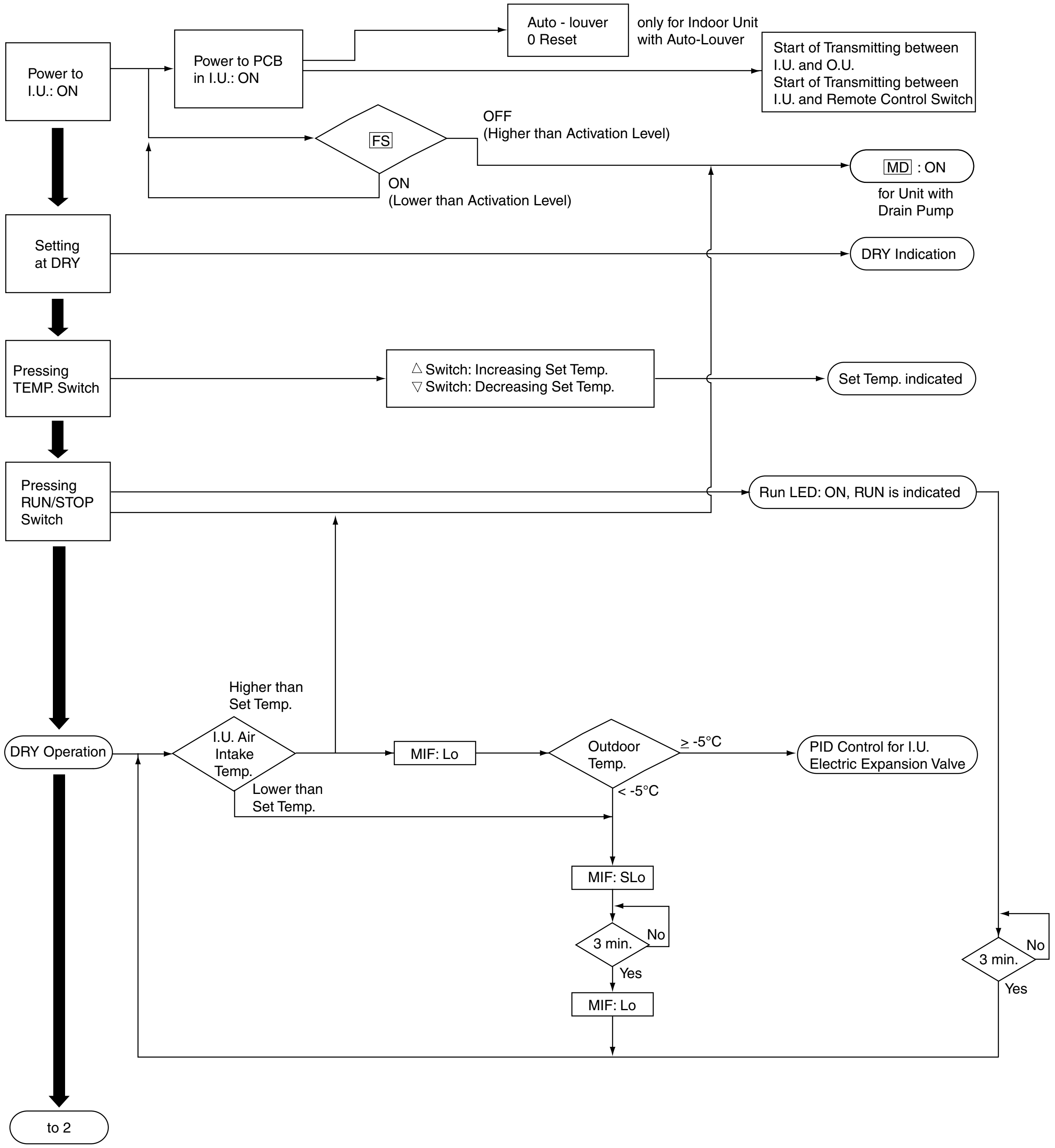
5

5.2.2 Cooling operation (continued)

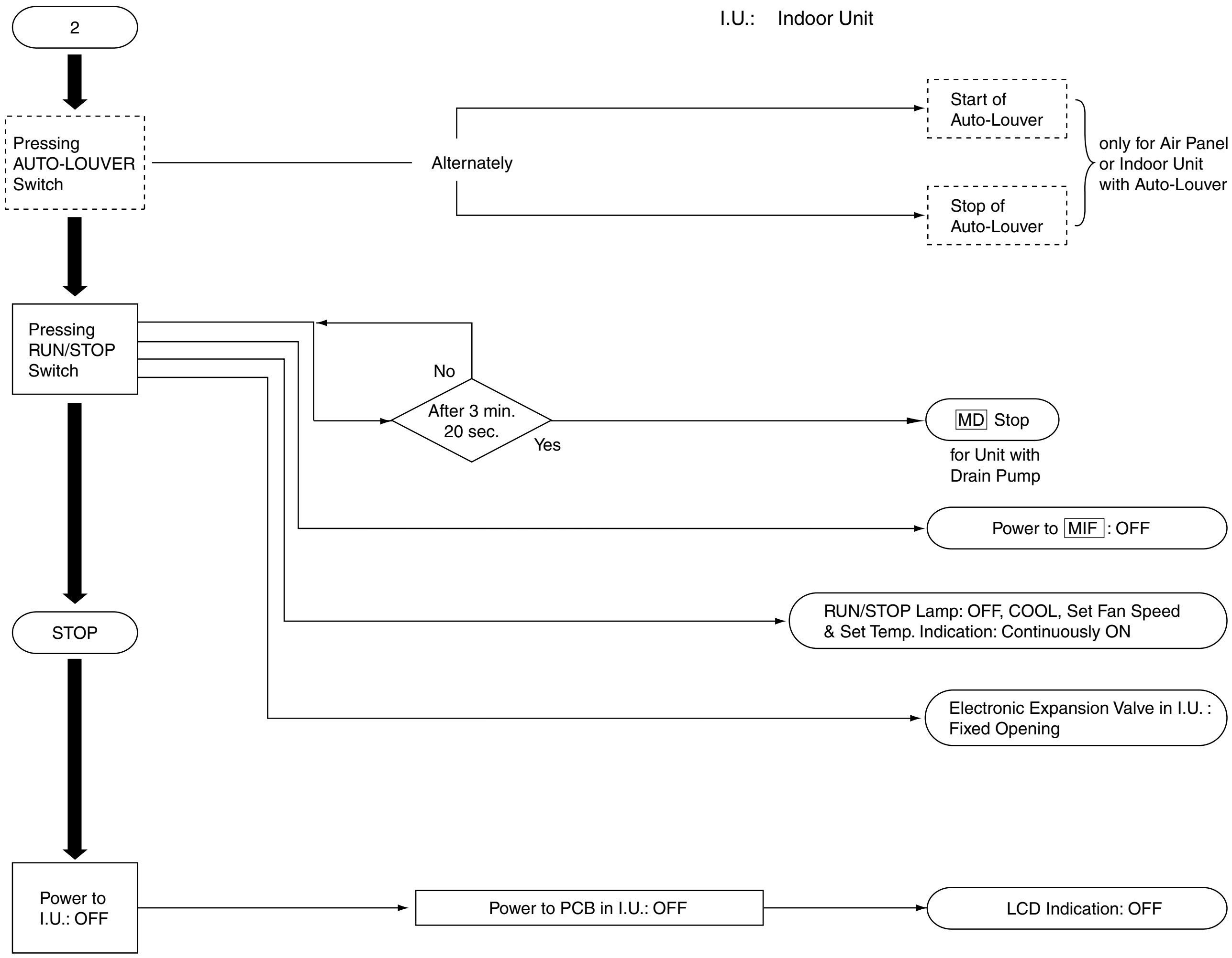


5.2.3 Dry operation

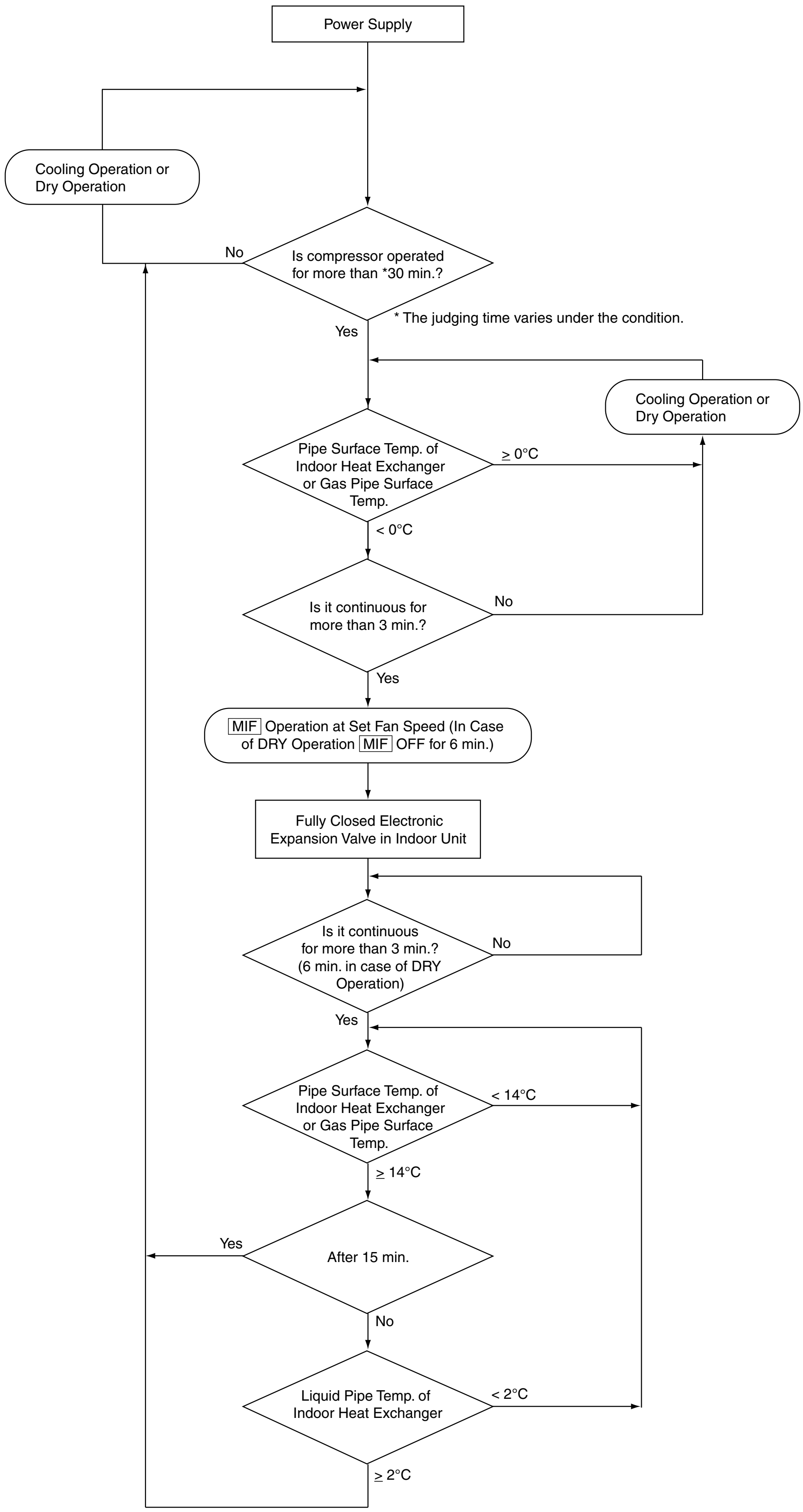
I.U.: Indoor Unit
O.U.: Outdoor Unit



5.2.4 Dry operation (continued)

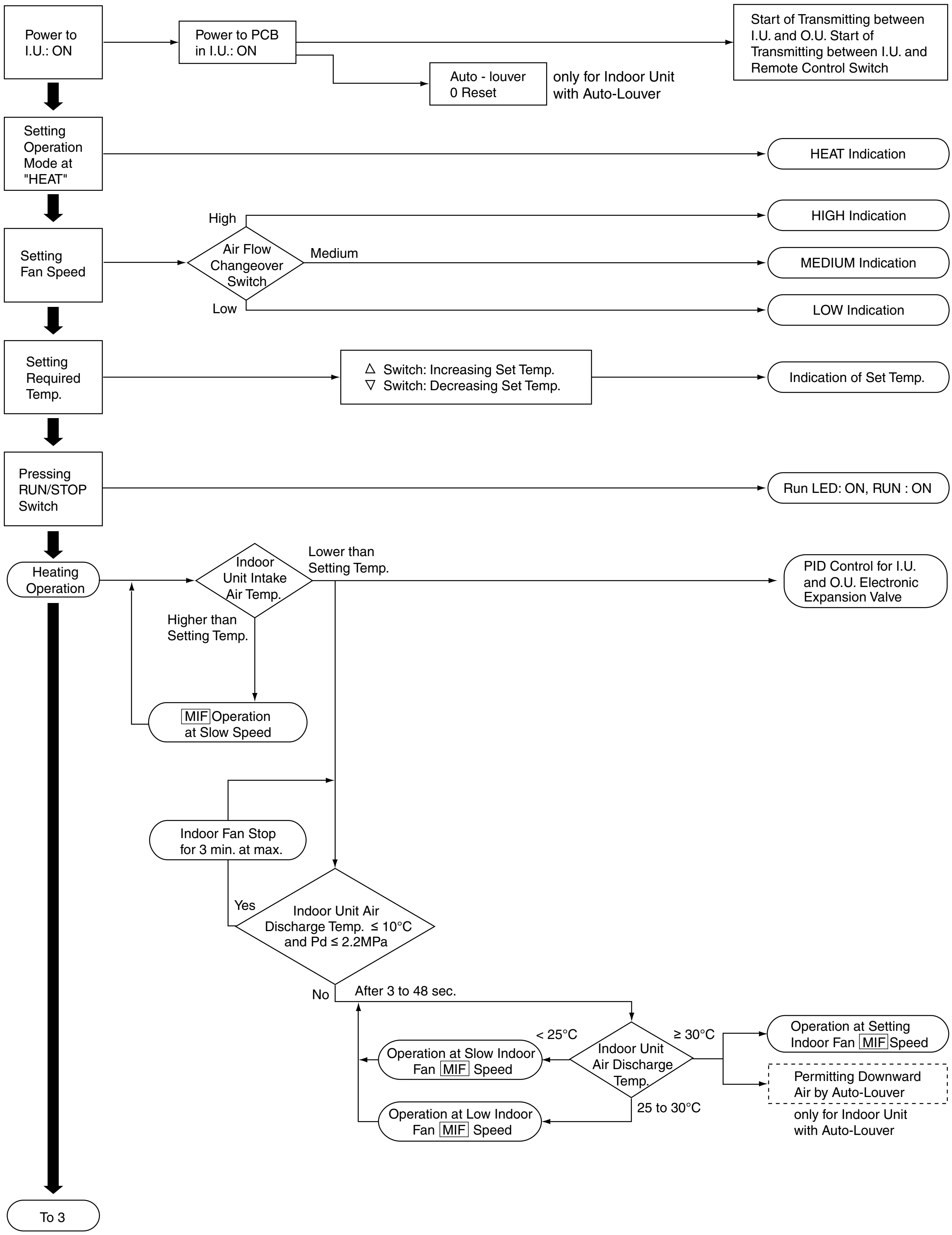


5.2.5 Antifreeze protection control during the cooling or dry operation

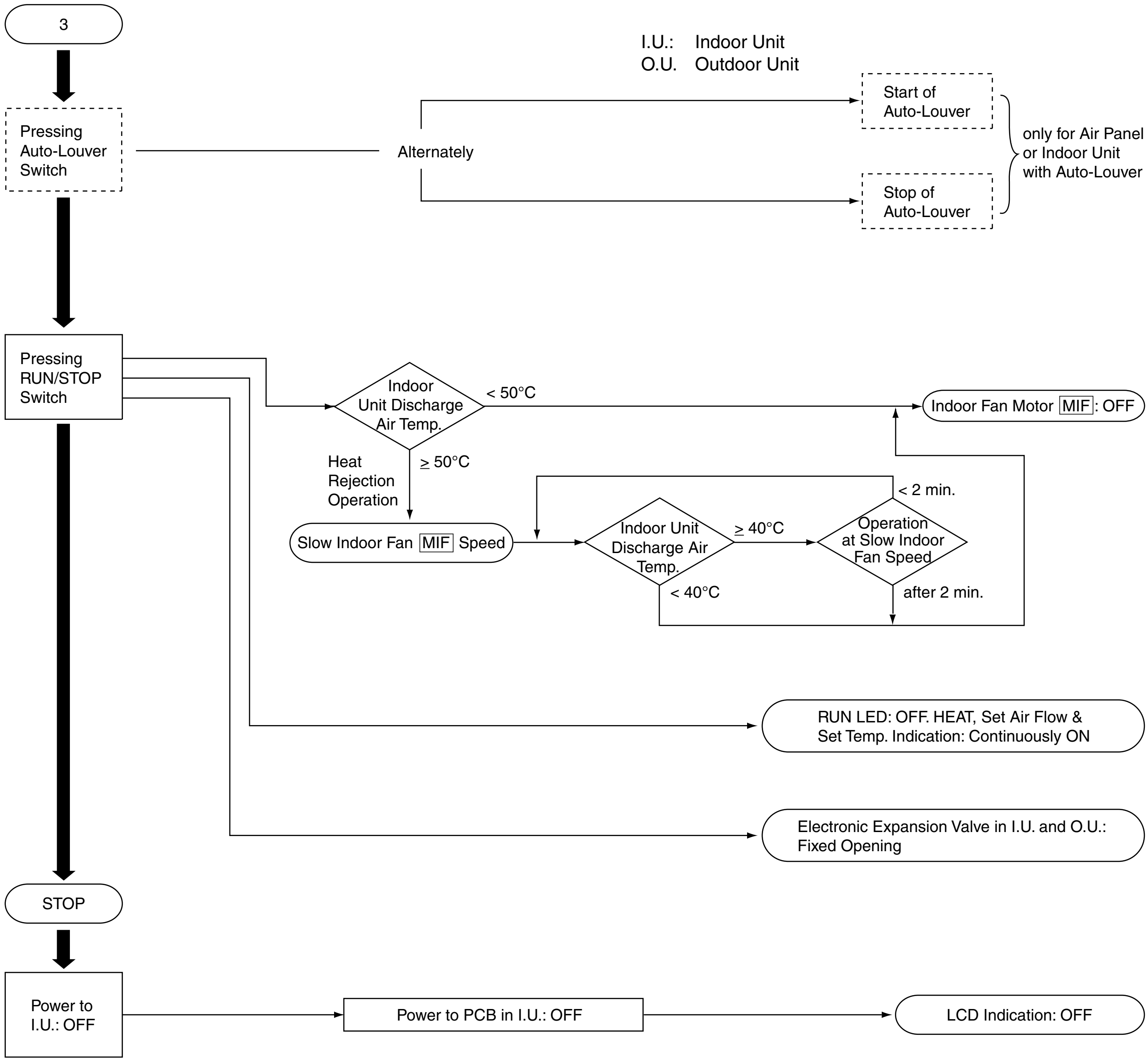


5.2.6 Heating operation

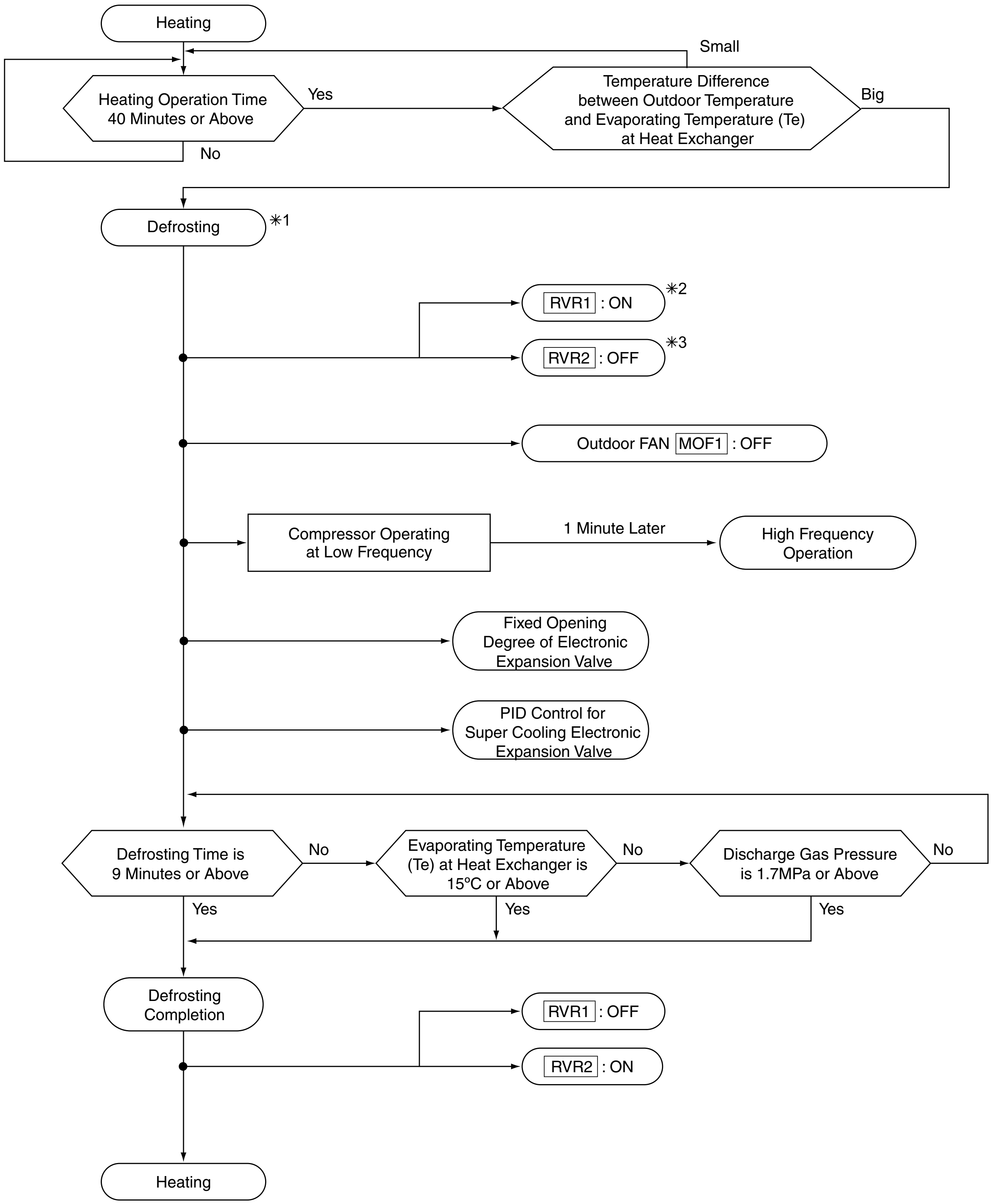
I.U.: Indoor Unit
O.U.: Outdoor Unit



5.2.7 Heating operation (continued)



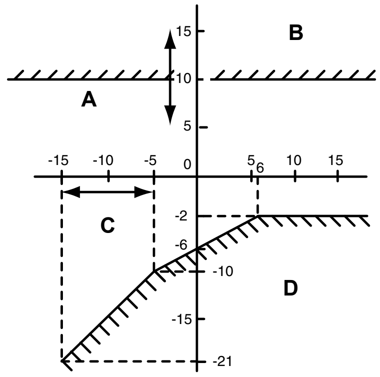
5.2.8 Defrost operation



(1) The defrost signal is transmitted to the indoor unit during the defrost operation. After the signal is received, the remote control liquid crystal display indicates DEFROST and the indoor unit fan stops.

(2) For heat recovery systems with 20 HP or more, the RVR1 reversing valve will not operate.

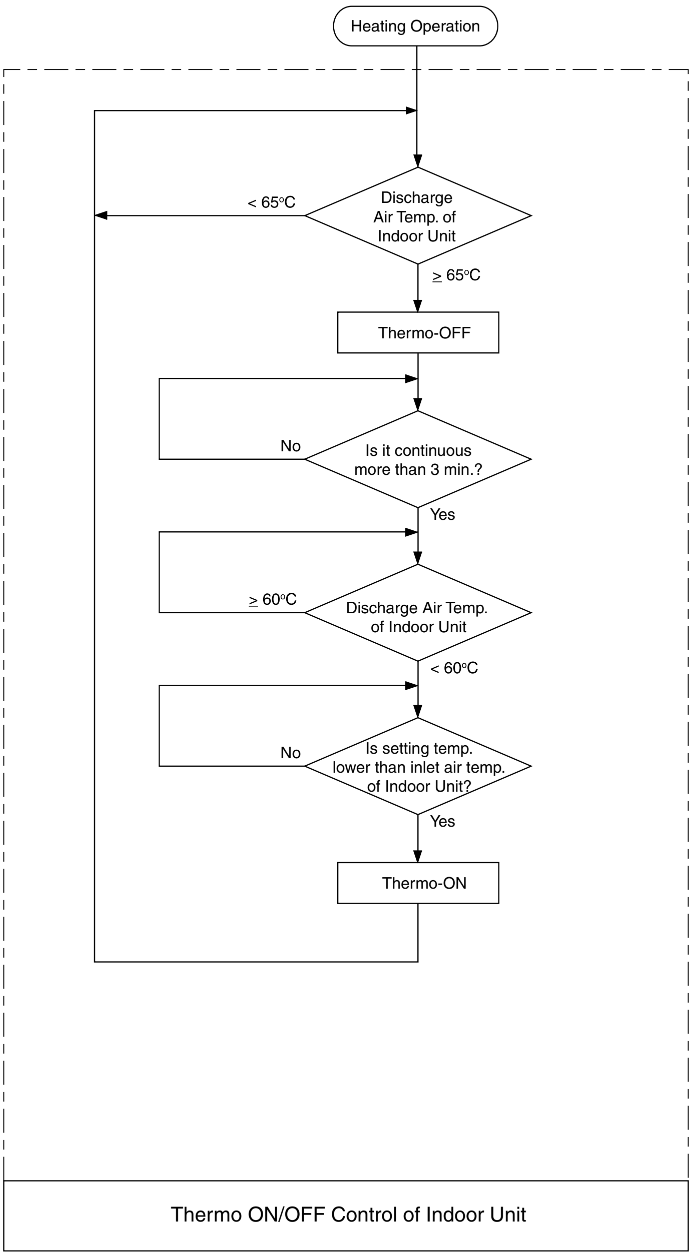
(3) For heat recovery systems with 20 HP or more, switching power ON/OFF of the RVR2 reversing valve will be carried out in each outdoor unit.



Temperature conditions under defrosting operation:

A: Outdoor evaporating temperature °C.
B: Defrost operation stop area.
C: Outdoor temperature °C.
D: Defrost operation start area.

5.2.9 Excessive high discharge air temperature prevention control (only for RCI, RCD and RPI (≤ 6 HP))



5.2.10 Protection control

◆ Pressure ratio increase protection control

The pressure ratio increase protection control is carried out for the whole outdoor units to be connected.

NOTE

1 ***In the case of base unit combinations, the control of the figure is carried out for connecting each outdoor unit.***

2 ***In order to carry out this control, the pressure ratio of each outdoor unit is calculated and the maximum value is used.***

Pressure ratio ε = (Pd +0.06) / (Ps +0.06)

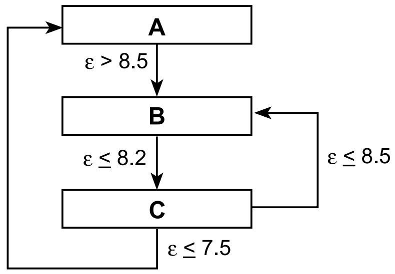
Pd: High pressure sensor detected value.

Ps: Low pressure sensor detected value.

A. Normal operation.

B. Forced decrease in frequency (1.0 Hz/s).

C. Not allowing frequency increases (only frequency decreases are allowed).



◆ High pressure protection control

The high pressure protection control is carried out to prevent the protection device from being activated due to an increase in high pressure during an anomaly and protect the compressor from excessive high pressure increases.

Operation mode	P1	P2	P3
Cooling	3.45	3.40	3.20
Heating / Heat recovery	3.35	3.30	3.10

NOTE

1 ***In the case of base unit combinations, the control of the figure is carried out for the whole outdoor units to be connected.***

2 ***In order to carry out this control, the high pressure of each outdoor unit is calculated and the maximum value is used.***

Pd: high pressure sensor detected value.

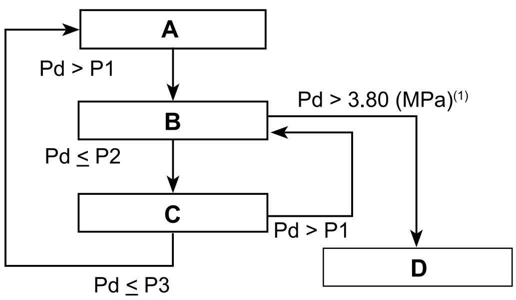
A. Normal operation.

B. Forced decrease in frequency (1.5 Hz/s).

C. Not allowing frequency increases (only frequency decreases are allowed).

D. Abnormal stoppage (cause of stoppage d1-13).

(1) For 2 seconds.



◆ Inverter current protection control

The Inverter current protection control is carried out to prevent the damage of the inverter caused by the increase of inverter secondary current value.

NOTE

1 ***In the case of base unit combinations, the control of the figure is carried out for the whole outdoor units to be connected.***

2 ***In order to carry out this control, the Inverter current value of each outdoor unit is calculated and the maximum value is used.***

Iinv: Inverter secondary current detected value.

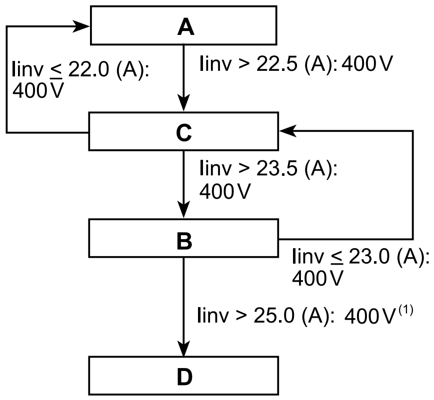
A. Normal operation.

B. Forced decrease in frequency (3.0 Hz/s).

C. Not allowing frequency increases (only frequency decreases are allowed).

D. Abnormal stoppage (cause of the stop d1-17).

(1) For 180 seconds.



◆ Inverter fin temperature increase protection control

The inverter fin temperature increase protection control is carried out to prevent the damage of the inverter caused by the increase in inverter fin temperature.

NOTE

1 ***In the case of base unit combinations, the control of the figure is carried out for the whole outdoors units to be connected.***

2 ***In order to carry out this control, the inverter fin temperature of each outdoor unit is calculated and the maximum value is used.***

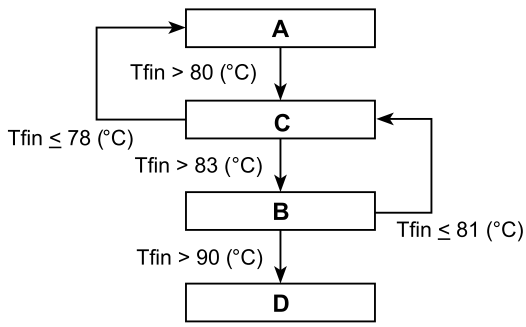
Tfinv: inverter fin temperature sensor detected value.

A. Normal operation.

B. Forced decrease in frequency (0.25 Hz/s).

C. Not allowing frequency increases (only frequency decreases are allowed).

D. Abnormal stoppage (cause of the stop d1-17).



◆ Discharge temperature increase protection control

The discharge temperature increase protection control is carried out to protect the compressor motor coil from a discharge pressure increase during an anomaly.

NOTE

1. ***In the case of base unit combinations, the control of the figure is carried out for the whole outdoor units to be connected.***
2. ***In order to carry out this control, the discharge temperature of each outdoor unit is calculated and the maximum value is used.***

   Td: discharge gas temperature sensor detected value.

A. Normal operation.

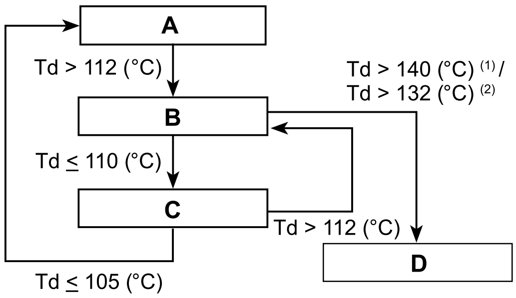
B. Forced decrease in frequency (1.0 Hz/s).

C. Not allowing frequency increases (only frequency decreases are allowed).

D. Abnormal stoppage (cause of the stoppage d1-15).

(1) For 5 seconds.

(2) For 10 minutes.



◆ Suction pressure protection control

The suction pressure protection control is carried out to protect the compressor from a transitory decrease in suction pressure.

NOTE

1. ***In the case of base unit combinations, the control of the figure is carried out for the whole outdoor units to be connected.***
2. ***In order to carry out this control, the suction temperature of each outdoor unit is calculated and the maximum value is used.***

   Ps: suction pressure sensor detected value.

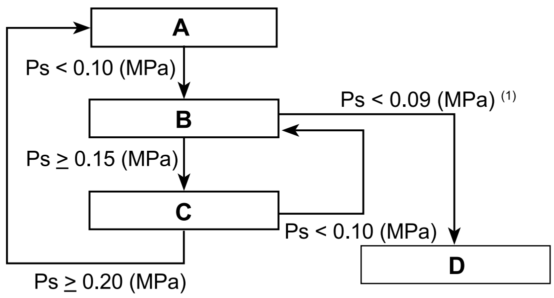
A. Normal operation.

B. Forced decrease in frequency (0.25 Hz/s).

C. Not allowing frequency increases (only frequency decreases are allowed).

D. Abnormal stoppage (cause of the stoppage d1-15).

(1) For 12 minutes.



◆ Degeneration control

The degeneration control is carried out to modify the protection control range. Prevents frequent ON/OFF caused by alarm when retry stoppage by the abnormal control occurs.

Protection control ratio:

(1) Pressure ratio decrease protection control.

(2) Discharge pressure increase protection control.

(3) Inverter overcurrent protection control.

(4) Inverter fin temperature increase protection control.

(5) Discharge temperature increase protection control.

(6) Discharge gas superheat decrease protection control.

Example of discharge temperature increase protection control:

A. Normal operation.

B. Forced decrease in frequency (1.0 Hz/s).

C. Not allowing frequency increases (only frequency decreases are allowed).

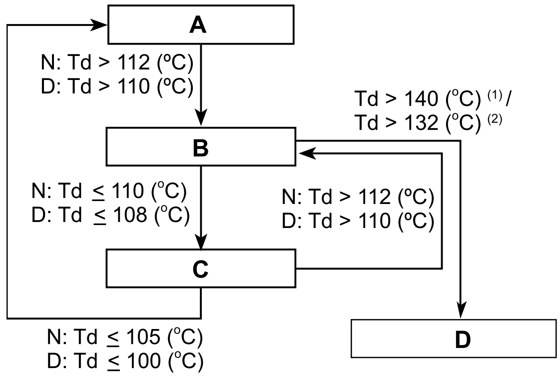
D. Abnormal stoppage (cause of the stoppage d1-15).

(1) For 5 seconds.

(2) For 10 minutes.

N: normal.

D: degeneration.



5.2.11 Control of CH unit (CH-(6.0/10.0)N1)

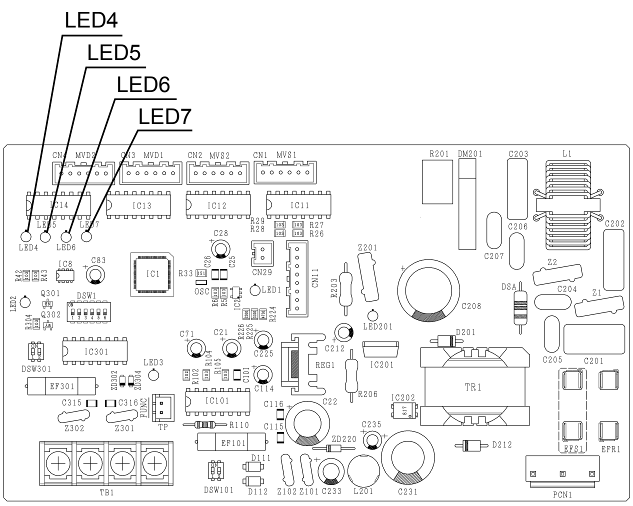
The following table shows the expansion valve opening of CH unit at the steady condition.

The expansion valve opening right after the operation mode change (such as thermo-ON → thermo-OFF) may not be matched with the table below. Make sure that the opening should be checked after at least 6 minutes of mode change.

(1) Checking Method of CH Unit Performance.

Check the LED on the PCB of CH unit to inspect the expansion value opening.

Refer to the table below for the relation between expansion valve opening and LED.



LED		Expansion valve	
Number	Condition	Signal	Opening (Pulse)
LED4	ON	MVD2	480
	OFF		0
LED5	ON	MVD1	600
	OFF		0
LED6	ON	MVS2	480
	OFF		0
LED7	ON	MVS1	600
	OFF		0

(a) When Outdoor Unit Compressor is Stopped (All Indoor Unit are Stopped).

Refer to the table below for the expansion valve opening of CH unit when all the indoor units are stopped (including thermo-OFF stoppage).

CH unit expansion valve	Indoor Unit Operation Mode (Remote Control Setting)		
	Cooling *	Heating	FAN
MVS1	0	0	0
MVS2	0	480	0
MVD1	0	0	0
MVD2	0	0	0

*: Dry setting is included as cooling operation.

(b) When Outdoor Unit Compressor is Operated.

Refer to the table below for the expansion valve opening of CH unit when outdoor unit compressors are operated.

Outdoor unit Operation condition	CH unit Expansion valve	Indoor Unit Operation Mode (Remote Control Setting)				
		Cooling *	Heating	Cooling Thermo-OFF *	Heating Thermo-OFF	FAN
Cooling mode	MVS1	600	-	600	600	600
	MVS2	480	-	480	480	480
	MVD1	600	-	600	0	600
	MVD2	480	-	480	0	480
Heating mode	MVS1	-	0	0	0	0
	MVS2	-	0	480	480	0
	MVD1	-	600	0	0	0
	MVD2	-	480	0	0	0
Heat recovery simultaneous mode	MVS1	600	0	0	0	0
	MVS2	480	0	480	480	480
	MVD1	0	600	0	0	0
	MVD2	0	480	0	0	0

*: Dry setting is included as cooling operation.

5.3 Control and safety devices

5.3.1 Outdoor unit

Compressor protection

The compressor is protected by the following devices and their combinations:

1. Pressure switch: this switch stops the compressor when the discharge pressure exceeds the set value.

2. Oil heater: this band-type heater protects against the formation of foam on the oil during cold starts and remains enabled when the compressor is at a standstill.

Model			RAS-(8-12)FSXN	RAS-(14-18)FSXN
Compressor				
Pressure switches			Automatic restart (one per compressor)	
High pressure	Disconnection	MPa	$4.15^{-0.05}_{-0.15}$	
	Connection	MPa	$3.20^{\pm 0.15}$	
Fuse capacity (3N~ 400V 50Hz)			40x2	40x2 + 32x2
Oil heater				
Power		W	40x2	40x4
CCP timer			Not adjustable	
Time setting		min.	3	
Direct current module for fan				
Fuse capacity		A	20x1	

5.3.2 CH unit

Model		CH-(6.0/10.0)N1
For control circuit	A	5
Fuse capacity on PCB		

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Inspire the Next

6. Optional functions

Index

6.1 Setting method

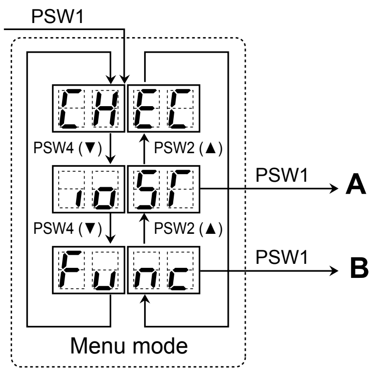
Setting PSW of the outdoor unit PCB is required for setting *External input and output setting, see on page 115*, -A- and *Function setting, see on page 123*, -B- (*).

NOTE

(*) In case of 20 to 54 HP, set from the PSW in outdoor unit A (setting from the PSW in outdoor unit B and C is valid).

1 Press PSW1 for 3 seconds when remote control switches are OFF. The “Menu mode” will be indicated.

2 After carrying out the configuration, press PSW1 for 3 seconds when the “Menu mode” is indicated. The display will return to normal indication.



6.2 External input and output setting

The outdoor unit PCB has three input terminals (CN17, CN18) that receive external signals and two output terminals (CN16) that send signals to the exterior.

The control functions are available by setting input and output terminals as shown below:

Control function number	Setting of input functions
1	Fixing the heating mode
2	Fixing the cooling mode
3	Demand stoppage
4	Outdoor unit fan motor start/stop
5	Forced stoppage
6	Control of 40% current demand
7	Control of 60% current demand
8	Control of 70% current demand
9	Control of 80% current demand
10	Control of 100% current demand
11	Low noise level setting 1
12	Low noise level setting 2
13	Low noise level setting 3
0	Without setting

Control function number	Configuration of output functions
1	Operating signal
2	Alarm signal
3	Compressor ON signal
4	Defrost signal

6

The following functions are set before shipment:

Name of the input terminal	Connector pin number	Setting function	Control function number
Input 1	CN17 (1-2)	Setting the heating mode	1
Input 2	CN17 (2-3)	Setting the cooling mode	2
Input 3	CN18 (1-2)	Stoppage demand	3

Name of the output terminal	Connector pin number	Setting function	Control function number
Output 1	CN16 (1-2)	Operating signal	1
Output 2	CN16 (1-3)	Alarm signal	2

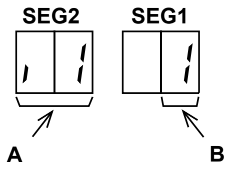
Setting Mode

If the inicial setting has to be modified, the following instructions must be followed:

1 Selecting “External Input and Output Setting” it will be displayed on the 7-segment display. (The setting must be carried out during the stoppage of the outdoor unit. Also, the DSW4-#4 switch of the outdoor unit PCB must be set to “ON” before the modification in order to prevent activation of the compressor).

A: Input/output terminal name.

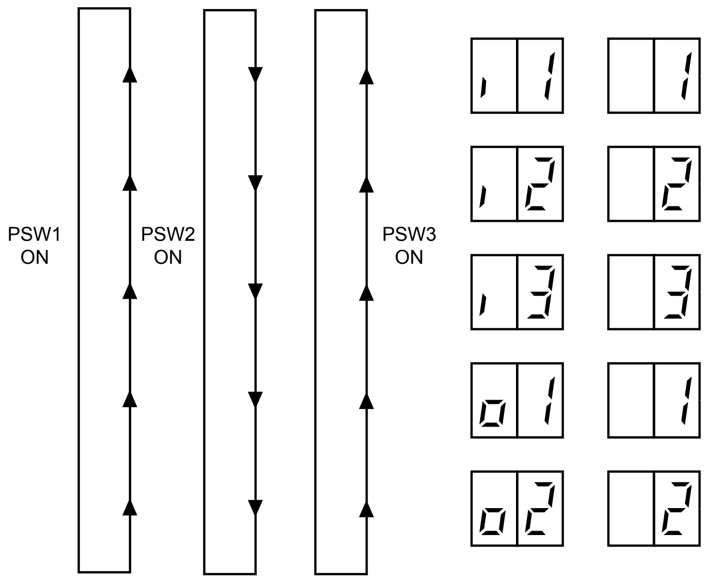
B: Control function number.



NOTE

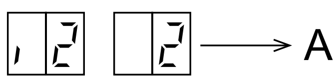
(*) This display shows the control function No. 1 (fixed heating operation mode) is set at input 1.

2 Pressing PSW2 and PSW4 changes the input/output terminal name. Once the input/output terminal is selected by pressing PSW3 or PSW5, the control function number is modified.



3 After selecting Input/Output Terminal Name, press PSW3 or PSW5, and then choose Control Function No.

A
By pressing PSW3, the number increases by 1.
By pressing PSW5, the number decreases by 1.
(Control Function No.13 → Press PSW3 → return to 0)



4 After the function number is selected, press PSW1 for 3 seconds. The display will return to its normal indication. The selected contents will be memorised in the outdoor unit's printed circuit board and the “External Input and Output Setting” is completed. The memorised data is maintained even though the power supply is disconnected. The electrical wiring diagram for each control function are described and the necessary parts are listed in *External input function setting, see on page 116* and *External output function setting, see on page 120*.

6.2.1 External input function setting

The following signals can be received by the outdoor unit PCB.

Specifications for the main component requirements:

Components		Specifications	Remarks
Auxiliary relay (X1, X2)		Mini power relay, MY1F (or MY2F) made by OMRON	220/240 V
Changeover switch (SS2, SS3)		Manual switch	220/240 V
3-pin connector cable		PCC-1A (connected to a JST, XARP-3 connector)	5 cables with connectors in a single assembly
Cable (Inside the unit)	Low voltage	0.3 mm^2	less than 24 V
	220/240 V	0.5 to 0.75 mm^2	—
Cable (Outside the unit)	Low voltage	0.5 to 0.75 mm^2	less than 24 V
	220/240 V	2 mm^2	—

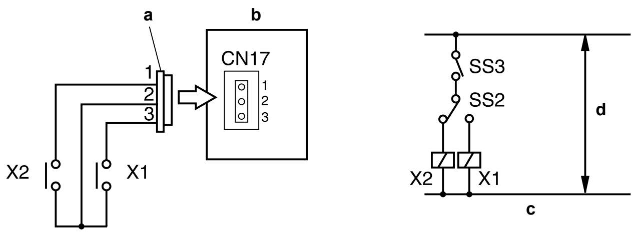
NOTE

- ***The terminal cable must be as short as possible.***
- ***Do not place the cables alongside the high voltage cables. Maintain at least 30 cm of distance between the cable and the high voltage cable. The cables may be crossed. If necessary to place the cables alongside the high voltage cable, insert the low voltage cables inside a metal conduit and ground it one of the end. If sealed cables are used for the low voltage cables, ground it one of the end of the shield cable. The maximum length must be within 70 m.***

◆ Fixing of the heating mode (Control function number 1)
Fixing of the cooling mode (Control function number 2)

- When the input terminals for setting the operation mode of the outdoor unit PCB1 are short-circuited, the operation mode can be fixed for cooling or heating mode.
- Short-circuit between terminals 1 and 2 (input 1) of the CN17 to fix heating operation mode.
- Short-circuit between terminals 2 and 3 (input 2) of the CN17 to fix cooling operation mode.
- During the setting of heating (or cooling) mode, cooling (or heating) mode will not be available. The indoor units in cooling or dry operation (or heating operation) will be switched to Thermo-OFF condition during the setting of the operation, and stoppage code number “20” is given.

-Setting example:



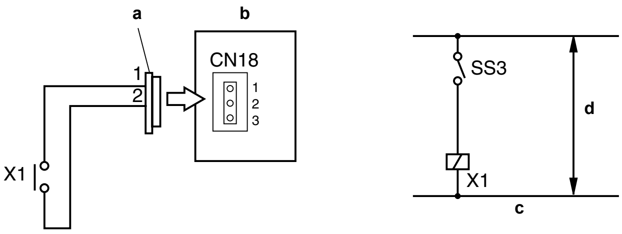
a	3-pin connector
b	Outdoor unit PCB1
c	Control circuit
d	Power source
X1	Auxiliary relay (cool)
X2	Auxiliary relay (heat)
SS2	Switch for fixing the operation mode
SS3	Switch for changing the operation mode

◆ Demand stoppage (Control function number 3)

- When the input terminals for the outdoor unit PCB1 demand stoppage are short-circuited, the compressor or compressors will be stopped. In this case, the indoor units will be under Thermo-OFF condition. In cooling mode: air flow setting, heating mode: Lo setting.
- Short-circuit terminals 1 and 2 (input 3) of CN18 to set the stoppage demand.
- The stoppage code is number 10. By disconnecting the demand switch contact, restarting is available.

NOTE

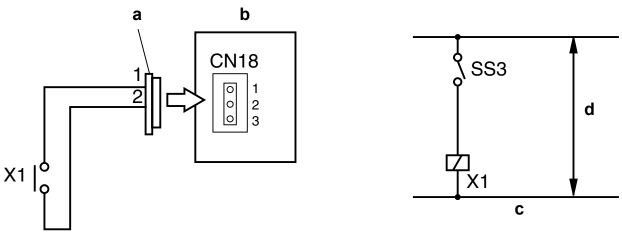
- ***In case the control demand (ON/OFF) is completed, it is recommended that the control (ON/OFF) time configuration is set according to the heat load recommendation. Also set the demand control time once in 30 minutes, the minimum to save energy.***



a	3-pin connector
b	Outdoor unit PCB1
c	Control circuit
d	Power source
X1	Auxiliary relay
SS3	Demand stoppage switch

◆ Outdoor unit fan motor start/stop (Control function number 4)

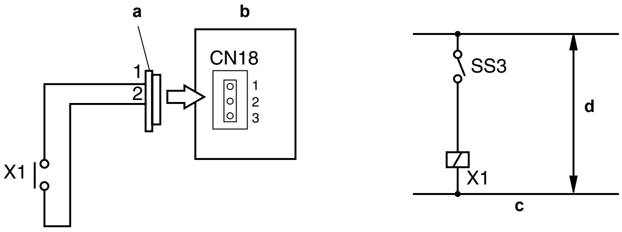
- When the outdoor unit PCB1 input terminals for the outdoor unit fan motor are short-circuited during the compressor stoppage, all the outdoor unit fans will be operating at maximum speed. However, if the compressor is activated via the compressor operation, the fan operation changes to normal condition. If the input terminals are open, the fans are stopped. This function protects the outdoor units in case they are covered in snow.
- Short-circuit terminals 1 and 2 (input 3) of CN18 to set the outdoor unit fan motor start/stop.
- This function is only available when the compressor is stopped. Therefore, if the input signal is mistakenly sent during a normal cooling or heating operation, this function will not be available.



a	3-pin connector
b	Outdoor unit PCB1
c	Control circuit
d	Power source
X1	Auxiliary relay
SS3	Snow sensor switch

◆ Forced stoppage (Control function number 5)

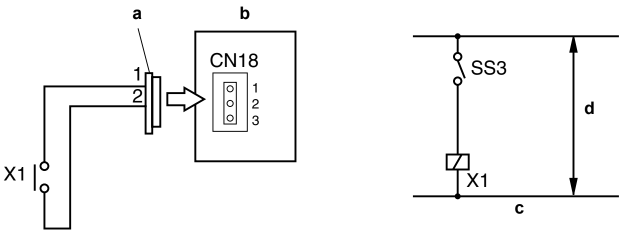
- When the outdoor unit PBC1 input terminals for the forced stoppage are short-circuited during running the compressor and the indoor unit fans are stopped. However, the remote control screen remains in the same number 10 stoppage code. In this case, if the input terminals are open, the operation is resumed.
- Short-circuit terminals 1 and 2 (input 3) of CN18 to set the forced stoppage.



a	3-pin connector
b	Outdoor unit PCB1
c	Control circuit
d	Power source
X1	Auxiliary relay
SS3	Forced stoppage switch

◆ Demand current control of 40, 60, 70, 80 and 100% (Control function number 6 to 10)

- When the demand current control input terminals for the outdoor unit PCB1 are short-circuited, the compressor frequency is controlled by the maximum current limit of the outdoor unit, which is set at 100%, 80%, 70%, 60% and 40%. The maximum running current of the outdoor unit will be selected as described in procedure *External input and output setting, see on page 115*.
- Short-circuit terminals 1 and 2 (input 3) of CN18 to configure the current demand.
- If the running current of the outdoor unit increases above the limit, the indoor unit is put in Thermo-OFF condition. Stoppage code number 10 is shown. When the input terminal is opened during the demand current control, control is re-established.



a	3-pin connector
b	Outdoor unit PCB1
c	Control circuit
d	Power source
X1	Auxiliary relay
SS3	Demand current switch

◆ Low noise setting 1, 2, 3 (Control function number 11 to 13)

- When the input terminals for low noise setting of the outdoor unit PCB1 are short-circuited, the frequency of the compressor and the fan rotation frequency are controlled and the outdoor unit operating sound is within the values shown in the table:

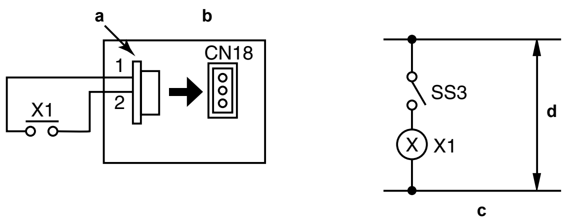
The sound operation can be adjusted by selecting the control function number.

Control function number	Operating sound (targeted value)	Outdoor unit capacity (specification ratio)
No setting	Catalogue value	100%
11 (Low noise level setting 1)	Catalogue value -2 dB(A)	80%
12 (Low noise level setting 2)	Catalogue value -5 dB(A)	60%
13 (Low noise level setting 3)	Catalogue value -8 dB(A)	40%

- Short-circuit terminals 1 and 2 (input 3) of CN18 to set the low noise setting.

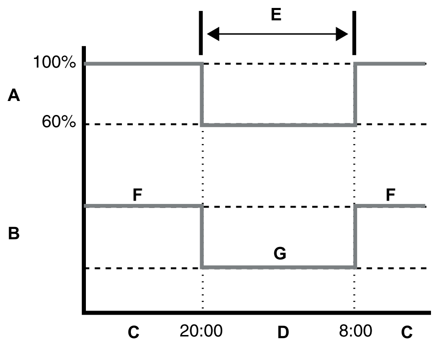
NOTE

- ***The capacity of the outdoor unit will decrease because the compressor frequency and the outdoor unit fan frequency necessarily decreases. The range of operation may be restricted.***
- ***In some cases, the sound operation (key values) can be temporarily higher than the values in the table.***



a	3-pin connector
b	Outdoor unit PCB1
c	Control circuit
d	Power source
X1	Auxiliary relay
SS3	Demand current stoppage

Example: Low noise setting 2 during night time only:



A	Capacity
B	Operating sound
C	Daytime schedule
D	Nighttime schedule
E	Input terminal short-circuited
F	Catalogue value [dB(A)]
G	Catalogue value -5 dB(A)

6.2.2 External output function setting

The following signals can be received by the outdoor unit PCB.

Specification for the main component requirements:

Components		Specifications	Remarks
Auxiliary relay (*)		High power relay, LY2F DC 12 V made by OMRON	—
3-pin connector cable		PCC-1A (connected to a JST, XARP-3 connector)	5 cables with connectors in a single assembly
Cable (Inside the unit)	Low voltage	0.3 mm^2	less than 24 V
	220/240 V	0.5 to 0.75 mm^2	—
Cable (Outside the unit)	Low voltage	0.5 to 0.75 mm^2	less than 24 V
	220/240 V	2 mm^2	—

NOTE

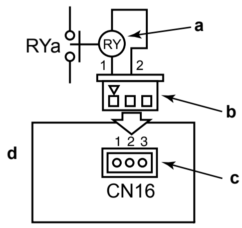
(*) Do not use the relays made with diodes.

◆ Operation signal (Control function number 1)

This function is used to receive the operation signal.

- The auxiliary contact relay (RYa) is closed during the operation. The operation signal is sent to output terminals when the indoor units (or a single indoor unit) are operating. This function can be used for the circulation or humidification operation.
- Terminals 1 and 2 (output 1) of the CN16 to set the operation signal.

a	Auxiliary relay
b	3-pin connector
c	Connector CN16
d	Outdoor unit PCB1

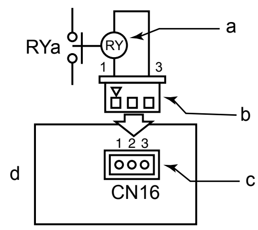


◆ Alarm signal (Control function number 2)

This function is used to receive the alarm signal.

- The auxiliary contact relay (RYa) is closed when the alarm occurs.
- The alarm signal will be sent to output terminals when the indoor units (or a single indoor unit) are operating and an alarm occurs in the system.
- Terminals 1 and 3 (output 2) of the CN16 to set the alarm signal.

a	Auxiliary relay
b	3-pin connector
c	Connector CN16
d	Outdoor unit PCB1

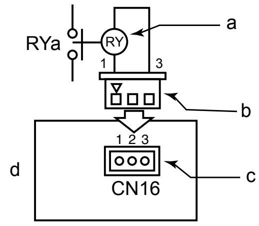


◆ Compressor ON signal (Control function number 3)

This function is used to receive the compressor operation signal.

- The auxiliary contact relay (RYa) is closed during the compressor operation.
- Terminals 1 and 3 (output 2) of the CN16 to set the compressor ON signal.

a	Auxiliary relay
b	3-pin connector
c	Connector CN16
d	Outdoor unit PCB1

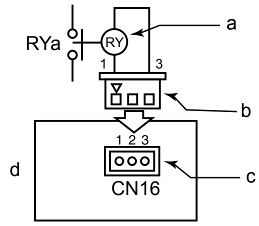


◆ Defrosting signal (Control function number 4)

This function is used to receive the defrosting signal.

- The auxiliary contact relay (RYa) is closed during defrosting.
- Terminals 1 and 3 (output 2) of the CN16 to configure the defrost signal.

a	Auxiliary relay
b	3-pin connector
c	Connector CN16
d	Outdoor unit PCB1



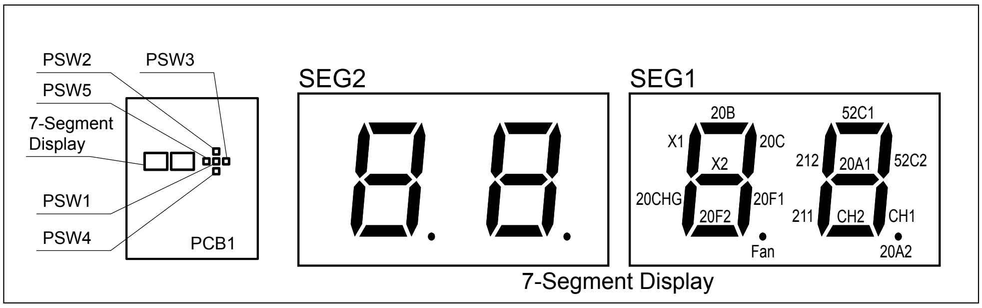
6.3 Function setting

1 This setting must be carried out during stoppage of the outdoor unit. Set DSW4-#4 of the outdoor unit PCB to ON position before performing in order to prevent the compressor from being activated.

2 Press PSW1 for more than 3 seconds.
”Menu” will be displayed on the 7-segment display. The menu indicates the changes by pressing PSW2 or PSW4 and displays them in the following order:
Selection of the function setting mode is indicated by the “Func” mode on the 7-segment display.

→ “CHEC” ↔ “ioST” ↔ “Func” ←

Arrangement of push switches on PCB1



“ioST” (External input and output setting)

By pressing the push-switches PSW3 (►) and PSW5 (◄), the function No. can be selected. PSW4 (▼): forward, PSW2 (▲): backward.

Fill out the selected function setting No. in the space of the table as shown (SET).

<Example>

1

	Item	SEG2	SEG1	SET
1	Input Setting 1 CN17 [1-2 pin]	i1	1	
2	Input Setting 2 CN17 [2-3 pin]	i2	2	
3	Input Setting 3 CN18 [1-2 pin]	i3	3	
4	Output Setting 1 CN16 [1-2 pin]	o1	1	
5	Output Setting 2 CN16 [1-3 pin]	o2	2	

(Setting before shipment)

Before shipping, the input/output function settings are specified to each input/output terminal according to above table. The details of function No. and external input/output settings are as shown below.

Setting of external input and output function

Function No.	Input	Output
1	Fixing heating operation mode	Operation signal
2	Fixing cooling operation mode	Alarm signal
3	Demand stoppage	Compressor ON signal
4	Outdoor fan motor Start/Stop	Defrost signal
5	Forced stoppage	-
6	Demand current control 40%	-

Function No.	Input	Output
7	Demand current control 60%	-
8	Demand current control 70%	-
9	Demand current control 80%	-
10	Demand current control 100%	-
11	Low noise setting 1	-
12	Low noise setting 2	-
13	Low noise setting 3	-
0	No setting	No setting

The same input/output function can not be set to different input/putput terminals.

If set, a setting of larger function number is became incalid.

“Func” (Function setting)

By pressing the push-switches PSW3 (►) and PSW5 (◄), the setting can be changed. PSW4 (▼): forward, PSW2 (▲): backward.

Fill out the selected function setting No. in the space of the table as shown (SET).

<Example>

1

	Item	SEG2	SEG1	SET
1	Circulator at Heating Function Thermo-OFF	FA	0	
2	Night-Shift	n i	0	
3	Cancellation of Outdoor Ambient Temperature Limit	CS	0	
4	Defrost for Cold Area (Change of Defrost Condition)	Jo	0	
5	SLo (Fan Speed) Defrost Setting	bJ	0	
6	Cancellation of Hot Start	HΓ	0	
7	Priority Capacity Mode	nU	0	
8	Compressor Frequency Control Target Value for Cooling	Hc	0	
9	Compressor Frequency Control Target Value for Heating	Hh	0	
10	Indoor Expansion Valve Control Target Value for Cooling	SC	0	
11	Indoor Expansion Valve Control Target Value for Heating	SH	0	
12	Not Prepared	S i	0	
13	Not Prepared	So	0	
14	Not Prepared	c i	0	
15	Not Prepared	cb	0	
16	Not Prepared	ch	0	
17	Not Prepared	db	0	
18	Demand	dE	0	
19	Wave Function Setting	UE	0	
20	Protection of Decrease in Outlet Temperature for Cooling	Fb	0	

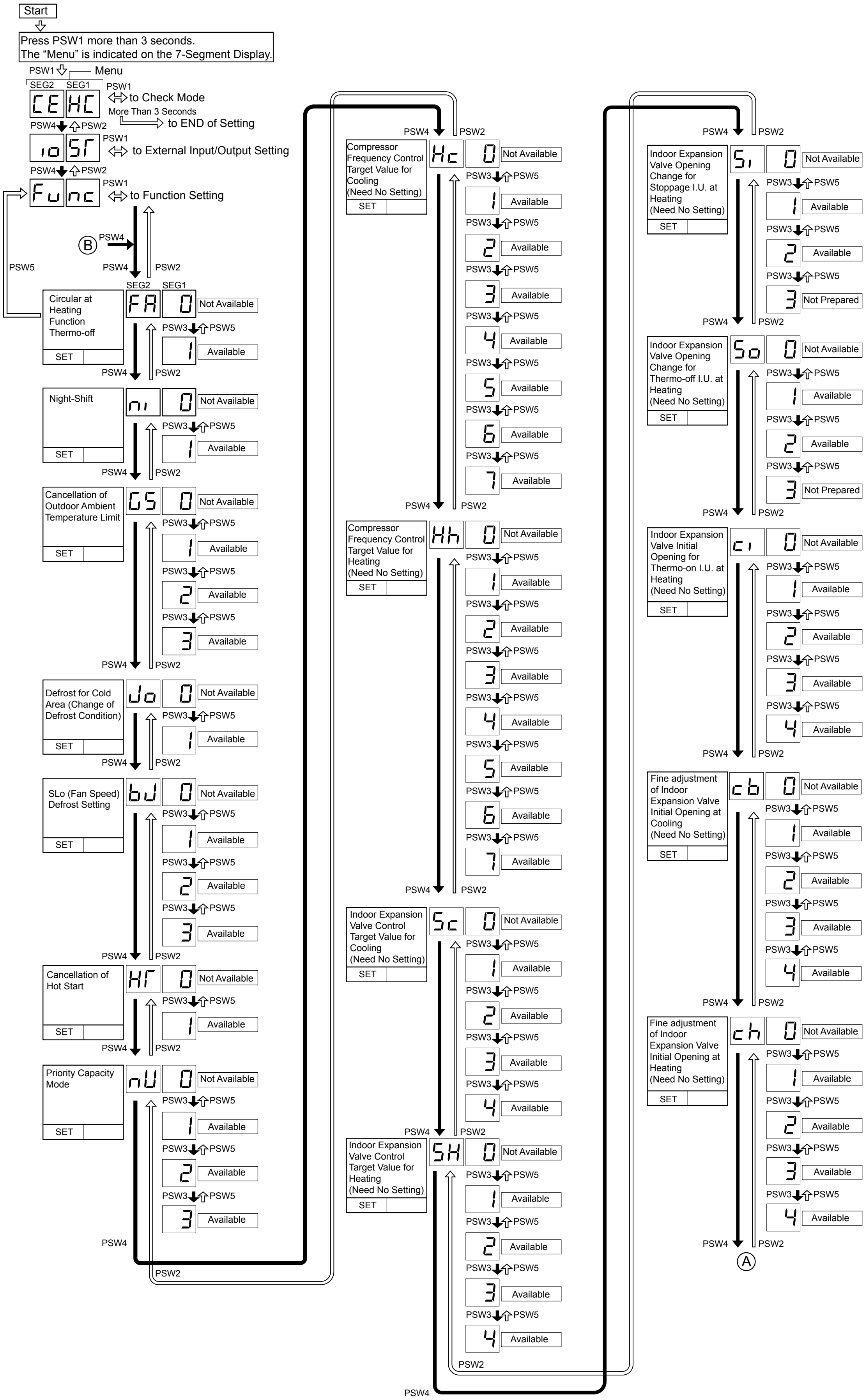
Item		SEG2	SEG1	SET
21	Not Prepared	FΓ	0	
22	Adjustment of Fan Rotation (for multiple installation)	Fo	0	
23	Not Prepared	LΓ	0	
24	Not Prepared	F 1	0	
25	Not Prepared	F2	0	
26	Not Prepared	F3	0	

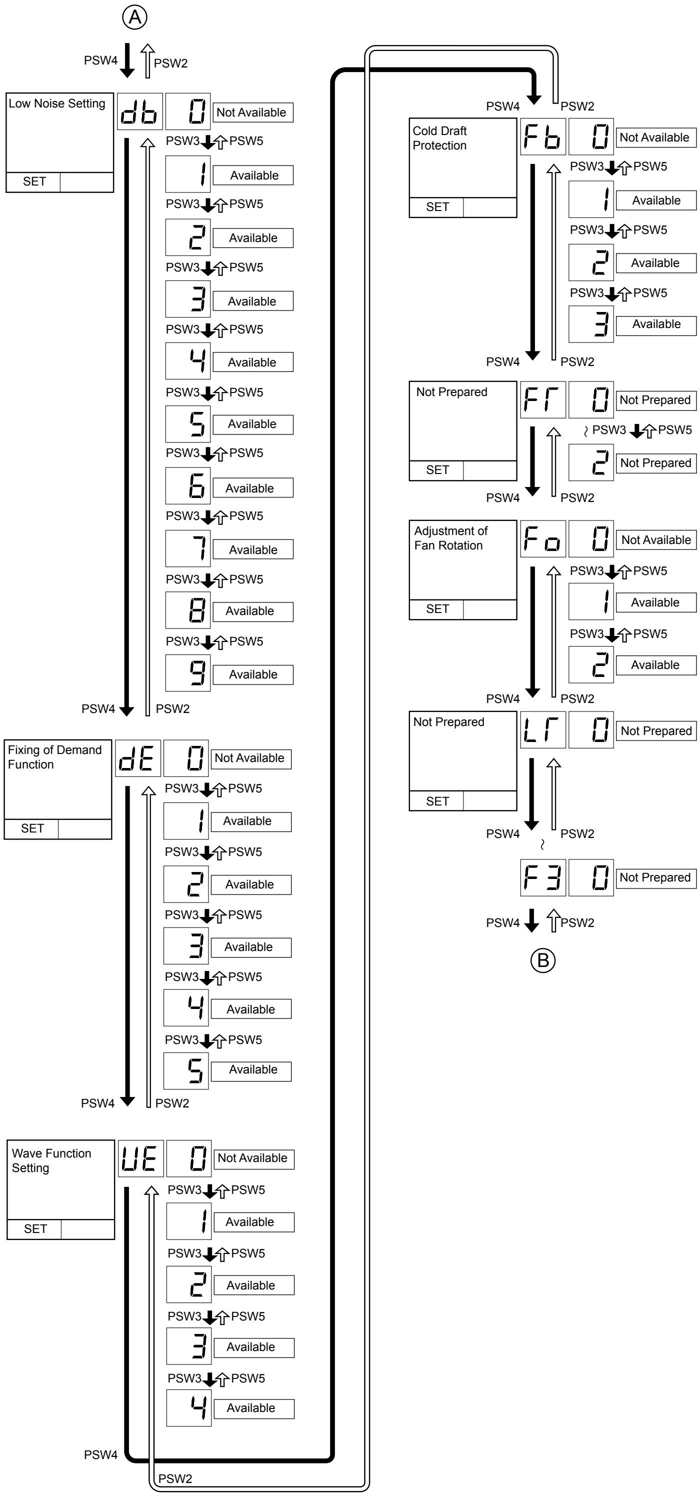
3 End of setting:
- Press PSW1 for more than 3 seconds. The display indication change to normal indication.
- Turn OFF DSW4-#4.

NOTE

After the setting is completed, check that "Menu" is not shown in the display, otherwise the air conditioner may not operate correctly.

Function Setting from the outdoor unit PCB




A
PSW4
PSW2
Low Noise Setting
SET
db
0
Not Available
PSW3
PSW5
1
Available
2
Available
3
Available
4
Available
5
Available
6
Available
7
Available
8
Available
9
Available
Fixing of Demand Function
SET
dE
0
Not Available
1
Available
2
Available
3
Available
4
Available
5
Available
Wave Function Setting
SET
UE
0
Not Available
1
Available
2
Available
3
Available
4
Available
Cold Draft Protection
SET
Fb
0
Not Available
1
Available
2
Available
3
Available
Not Prepared
SET
0
Not Prepared
2
Not Prepared
Adjustment of Fan Rotation
SET
Fo
0
Not Available
1
Available
2
Available
Not Prepared
SET
0
Not Prepared
F3
0
Not Prepared
B

6

Function setting

No.	Setting item	7-segment display		Contents
		SEG2	SEG1	
1	Indoor unit fan control during the Thermo-OFF in heating mode	FA	00	No setting
			01	Forced connection and disconnection on the indoor unit fan (2 minutes ON / 6 minutes OFF).
2	Night-shift	ni	00	No setting
			01	Setting of night-shift
3	Cancellation of the outdoor ambient temperature limit.	GS	00	No setting
			01	For heating
			02	For cooling
			03	For cooling/heating
4	Defrost for cold area (change in the defrost condition)	Jo	00	No setting
			01	Defrost operation condition 2
5	SLo (fan speed) Defrost setting	bJ	00	Stopping the Indoor unit fan when the heating operation is turned on during the defrost operation
			01	Indoor unit SLo fan operation during the defrost operation
			02	Indoor unit SLo fan operation when the heating operation is activated
			03	Fan operation when the heating operation is activated/Operation of the indoor unit SLo fan during defrost operation
6	Cancellation of the hot start	HT	00	Hot start available
			01	Cancellation of the hot start
7	Priority capacity mode	nU	00	No setting
			01	Change in the maximum frequency limit value
			02	Change in the current limit value
			03	Change in the maximum frequency limit value and the current limit value
8	Target value of the compressor frequency for cooling	Hc	00	Initial setting (Targeted value of the Ps evaporating temperature 7 °C)
			01	Targeted value (2 °C)
			02	Targeted value (3 °C)
			03	Targeted value (4 °C)
			04	Targeted value (5 °C)
			05	Targeted value (9 °C)
			06	Targeted value (10 °C)
			07	Targeted value (11 °C)
			08-09	Not prepared (If set, the setting item will be ignored by the control PCB)
9	Target value of the compressor frequency for heating	Hh	00	Initial setting (Targeted value of the Ps 2.85 MPa)
			01	Targeted value (2.60 MPa)
			02	Targeted value (2.75 MPa)
			03	Targeted value (2.80 MPa)
			04	Targeted value (2.82 MPa)
			05	Targeted value (2.88 MPa)
			06	Targeted value (2.90 MPa)
			07	Targeted value (2.95 MPa)
			08-09	Not prepared (If set, the setting item will be ignored by the control PCB)

No.	Setting item	7-segment display		Contents
		SEG2	SEG1	
10	Target value of the Indoor unit expansion valve control for cooling	SC	00	Initial setting (Targeted value of the SH +5 °C)
			01	SH targeted value 7
			02	SH targeted value 6
			03	SH targeted value 4
			04	SH targeted value 3
			05-09	Not prepared (If set, the setting item will be ignored by the control PCB)
11	Target value of the Indoor unit expansion valve control for heating	SH	00	Initial setting (Target value of the SC +5 °C)
			01	SC targeted value 11
			02	SC targeted value 8
			03	SC targeted value 2
			04	SC targeted value -1
			05-09	Not prepared (If set, the setting item will be ignored by the control PCB)
12	Indoor expansion valve opening change for stoppage indoor unit in heating mode	Si	00	Initial setting (stoppage unit expansion valve opening) (150 - 325 pulses)
			01	Opening of the expansion valve (0.8-2.6) HP: 175 pulses, 2.5 HP or greater: 300 pulses
			02	Opening of the expansion valve (0.8-2.6) HP: 100 pulses, 2.5 HP or greater: 150 pulses
			03-09	Not prepared (If set, the setting item will be ignored by the control PCB)
13	Indoor expansion valve opening change for Thermo-OFF indoor unit in heating mode	So	00	Thermo-OFF unit expansion valve opening (150 - 325 pulses)
			01	Opening of the expansion valve (0.8-2.6) HP: 175 pulses, 2.5 HP or greater: 300 pulses
			02	Opening of the expansion valve (0.8-2.6) HP: 100 pulses, 2.5 HP or greater: 150 pulses
			03-09	Not prepared (If set, the setting item will be ignored by the control PCB)
14	Indoor expansion valve initial opening of Thermo-ON indoor unit in heating mode	ci	00	Initial setting (300 - 650 PK)
			01	2000 pulses
			02	1400 pulses
			03	1000 pulses
			04	600 pulses
			05-09	Not prepared (If set, the setting item will be ignored by the control PCB)
15	Fine adjustment of indoor expansion valve initial opening in cooling mode	cb	00	Initial setting
			01	Initial opening in cooling operation -2%
			02	Initial opening in cooling operation +1%
			03	Initial opening in cooling operation +3%
			04	Initial opening in cooling operation +5%
			05-09	Not prepared (If set, the setting item will be ignored by the control PCB)
16	Fine adjustment of indoor expansion valve initial opening in heating mode	ch	00	Initial setting
			01	Initial opening in heating operation -2%
			02	Initial opening in heating operation +1%
			03	Initial opening in heating operation +3%
			04	Initial opening in heating operation +5%
			05-09	Not prepared (If set, the setting item will be ignored by the control PCB)

No.	Setting item	7-segment display		Contents
		SEG2	SEG1	
17	Low noise setting (in the case of low noise setting, the working range in cooling/heating will be restricted)	db	00	Initial setting
			01	Maximum fan rotation limit 20 steps
			02	Maximum fan rotation limit 18 steps
			03	Maximum fan rotation limit 16 steps
			04	Frequency limit 1
			05	Frequency limit 2
			06	Frequency limit 3
			07	operating sound value, catalogue value -2 dB (A)
			08	operating sound value, catalogue value -5 dB (A)
			09	operating sound value, catalogue value -8 dB (A)
18	Demand function setting	dE	00	Without demand control
			01	Demand control 40%
			02	Demand control 60%
			03	Demand control 70%
			04	Demand control 80%
			05	Demand control 100%
19	Wave function setting	UE	00	Without wave function
			01	Minimum limit 40%
			02	Minimum limit 60%
			03	Minimum limit 70%
			04	Minimum limit 80%
20	Cold draft protection	Fb	00	Initial setting
			01	Outlet temperature ≥ 10 °C
			02	Outlet temperature ≥ 12 °C
			03	Outlet temperature ≥ 14 °C
21	Not prepared	FT	00	–
22	Fan rotation adjustment (to prevent humming noises in multiple installation)	Fo	00	Initial setting
			01	Change of fan rotation -15 rpm
			02	Change of fan rotation -30 rpm
23	Not prepared	LT	00	–
24	Not prepared	F1	00	–
25	Not prepared	F2	00	–
26	Not prepared	F3	00	–

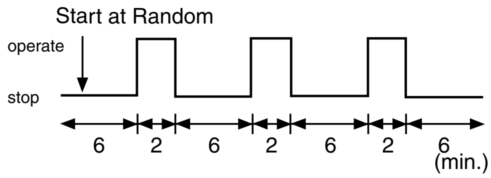
6.3.1 Indoor unit fan control during the Thermo-OFF in heating mode

1 Press PSW3 and select the setting of the condition “1” of the indoor unit fan control during the Thermo-OFF in heating mode “FA”.

2 When the fan speed is set lower for the Thermo-OFF in heating mode, there is a case in which the room temperature is too high for the Thermo-OFF heating. In this case, it is recommended the indoor unit fan control during the Thermo-OFF, and the detail of this function is shown below.
The indoor fan operates for 2 minutes and stops for 6 minutes repeatedly, when the activation conditions are met.

NOTE

When the indoor unit fan is stopped due to another control, it is not available to operate the indoor fan.



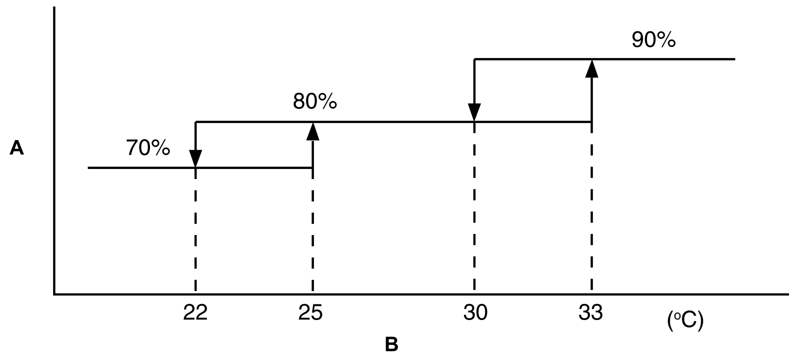
6.3.2 Night-shift (Low noise)

Press PSW3 and select the setting for condition “1” of the night shift (low noise) “ni” consequently, the function can be set.

The outdoor fan operation is controlled by the fan controller, with the sequence shown in the picture.

The night shift operation shall be applied in case the cooling capacity has the allowed range to decrease the capacity and the low noise level operation is required especially at night.

1 Outdoor fan



A	Maximum rotation (Rotation ratio)
B	Outdoor temperature

NOTE

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

2 Frequency range (cooling operation)

When Night Shift is not Set ni=0				When Night Shift is Set ni=1			
Outdoor unit capacity (HP)	Minimum frequency (Hz)	Maximum frequency (Hz)	Conditions	Outdoor unit capacity (HP)	Minimum frequency (Hz)	Maximum frequency (Hz)	Conditions
8	15	80	Except the conditions on the right	8	15	60	-
10		90		10		60	
12		100		12		60	
14		140		14		75	
16		150		16		75	
18		160		18		75	

Converted frequency of constant speed compressor

Outdoor unit capacity (HP)	Power supply frequency (Hz)
	MC2
14,16	50
18	60

NOTE

The maximum frequency for the 8 to 18 HP outdoor units is indicated as: Inverter frequency + converted frequency of constant speed compressor.

6.3.3 Cancellation of the outdoor ambient temperature limit

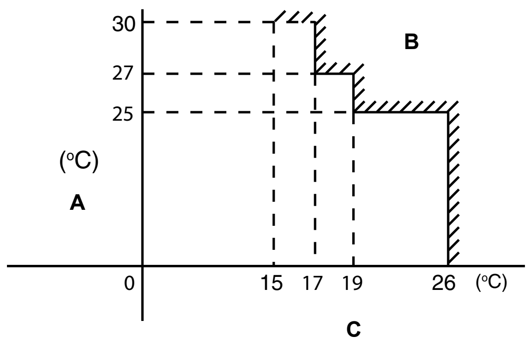
- Press PSW3 and select the setting condition “1” to “3” at the cancellation of outdoor ambient temperature limit of G5. Then this function can be set.
- The heating operation is continued under a high outdoor temperature or the cooling operation is continued under a low temperature.
- The limitation of the outdoor unit temperature area for heating mode is shown in the picture.

Setting condition	Operation mode for cancellation
1	Heating
2	Cooling
3	Heating/Cooling

Heating operation

A	Indoor suction air temperature
B	Operation stoppage area
C	Outdoor temperature

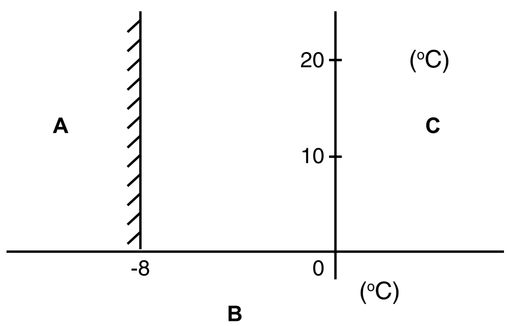
The limitation of the permissible outdoor temperature area in heating operation (factory-set) as shown in the right figure is canceled.



Cooling operation

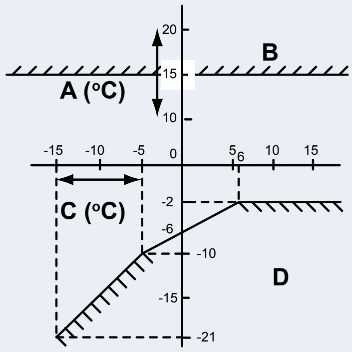
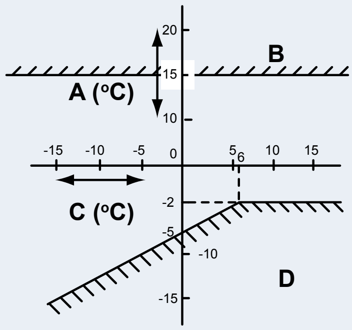
A	Stoppage function area
B	Indoor suction air temperature
C	Outdoor temperature

The limitation of the permissible outdoor temperature area in cooling operation (factory-set) as shown in the right figure is canceled.



6.3.4 Defrost for cold area (change of defrost condition)

Press PSW3 and select the setting for condition “1” at the defrost for the cold area “Jo” .

<table>
<tr><th rowspan="2">Setting condition</th><th>Standard specifications</th><th>Cold area specifications</th></tr>
<tr><th>When change of defrost condition is not set</th><th>When change of defrost condition is set</th></tr>
<tr><td rowspan="2">Temperature conditions under defrosting operation</td><td>
</td><td>
</td></tr>
<tr><td colspan="2">A: Outdoor evaporation temperature (pipe).
B: Defrost operation in the stop area.
C: Outdoor temperature.
D: Defrost operation in the start area.</td></tr>
</table>

6.3.5 SLo defrost setting

Press PSW3 and select the settings condition “0” to “3” at the SLo defrost setting “bJ” .

The indoor fan stops during the defrost operation and starting of heating operation. However, the indoor fan can operate at low speed during the defrosting operation and starting of heating operation.

Setting condition	Indoor fan operation
0	Indoor fan stop when heating operation starts Indoor fan stop during defrost operation.
1	Indoor fan SLo during defrost operation
2	Indoor fan SLo when heating operation starts.
3	Indoor fan SLo when heating operation starts Indoor fan SLo during defrost operation.

6.3.6 Cancellation of hot start

Press PSW3 and select the setting condition “1” at the cancellation of hot start setting “Ht” , so the hot start protection control can be canceled.

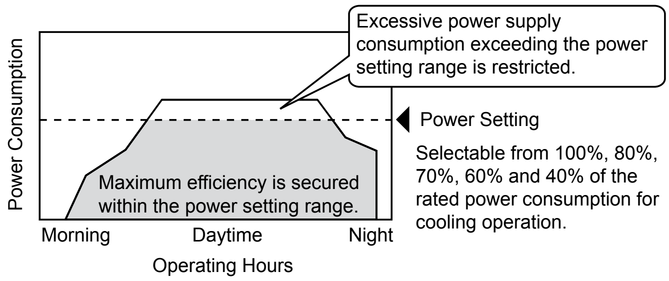
6.3.7 Demand function setting

Press PSW3 and select the settings for conditions “1” to “5” to set the demand function “dE” .

Setting condition	Demand running current control
1	40%
2	60%
3	70%
4	80%
5	100%

Demand control

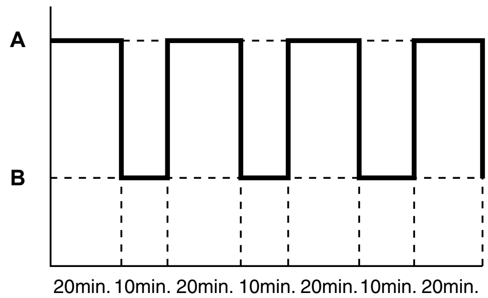
Adapting the self-demand function, which causes the power consumption to drop drastically for the purpose of saving energy.



6.3.8 Wave function setting

Press PSW3 and select the settings condition “1” to “4” to set wave function setting “UE” .

The maximum running current limit changes from 40% to 80%, as shown in the attached figure.



A	Electricity consumption (100%)
B	Electricity consumption (40 to 80%)

Setting condition	Current setting
1	40%
2	60%
3	70%
4	80%

6.3.9 Cold draft protection

Press PSW3 and select the setting condition “1” to “3” to set the cold draft protection “Fb” .

When the indoor unit discharge air temperature drops to *°C and below at cooling operation, the outdoor unit fan stops and the compressor frequency decreases to prevent a drop in discharge air temperature.

Setting condition	*°C
1	10
2	12
3	14

6.3.10 Adjustment of fan rotation

Press PSW3 and select the setting condition “1” or “2” to set the fan rotation setting “Fo” .

If the outdoor unit fans makes a whining sound in case of the multiple installation, set this operation in the required outdoor units.

Setting condition	Adjustment of fan rotation
1	-15 rpm
2	-13 rpm

7. Test run

Index

7.1 Preliminary checks

The test run must be performed according to the instructions in section Test run.

DANGER

Do not use the system until all the checkpoints have been verified. As with the test run for the indoor unit, check the Installation and maintenance manual for the indoor unit and the CH unit.

- Make sure that the refrigerant pipes and the communication cables between the outdoor and indoor units are connected to the same refrigerant cycle. Failure to do so could lead to abnormal operations or a serious accident. Check that the setting of the refrigerant cycle DSW switches (DSW1 and RSW1 on outdoor units, DSW5 and RSW2 on indoor units) and of the unit number (RSW) of the indoor units is suitable for the system. Check whether the DIP switch setting specified on the printed circuit of the indoor and outdoor units is correct. Pay special attention to the outdoor unit number, the refrigerant cycle number and the terminal resistance.
- Make sure that the electric resistance is greater than 1 MΩ; to do this, measure the resistance between the earth and the terminal of the electrical components. If not, do not use the system until the electrical leak has been detected and repaired. Do not apply voltage to the communication terminals (Outdoor unit: TB2 1, 2, 3, 4 / Indoor unit: TB2 1, 2, A, B / CH unit: TB2 1, 2, 3, 4).
- Check that all the cables, L1, L2, L3 and N (R, S and T) are correctly connected to the power supply line. If they are not correctly connected, the unit will not work and the remote control will indicate alarm code "05". When this happens, check and change the phase of the power supply line according to the sheet on the back of the service cover.

CAUTION

Make sure that the unit's main power supply line switch has been on for more than 12 hours, to heat the compressor oil with the heating resistors.

- If several base units have been combined, stick the main unit label in a visible place (outdoor unit 1), so outdoor unit A can be easily identified. Do not stick the main label on the secondary unit (outdoor units 2 and 3).

NOTE

1. ***Make sure the electric components in the installation (earth leakage breaker, circuit breaker, cables, connectors and cable terminals) have been selected correctly in line with the electrical data given in this Manual. Also ensure that these components meet the local and national codes.***
2. ***Use shielded cables (> 0.75 mm^2) for the communication installation wiring to avoid electromagnetic noise (the shielded cable must have a total length shorter than 1000 m, and its size must comply with local codes).***
3. ***Check the connection of the power supply wiring terminals (terminals “L1” to “L1” and “N” to “N”). AC supply voltage 400 V. If it is different, some components could be damaged.***

7.2 Test run

7.2.1 Before the test run

CAUTION

- ***Disconnect all the power supply switches.***
- ***Use a multimeter and check that all the switches are disconnected.***

Before carrying out the test run, check that the unit is properly installed in accordance with the Installation and Operation Manual. After that, check the following parts.

Check items		Contents
1	Damage	is the unit or its internal parts damaged?
2	Fan motor	Is the fan runner installed in the centre of the casing? Is the fan motor installed outside the casing? (The fan motor must not make contact with the casing.)
3	Screws	Have the screws loosened due to vibration during transport? Check that the screws are firmly fastened during the installation, especially the screws for the electrical wiring.
4	Refrigerant leak	Check that no refrigerant leaks are present. The pipe torque part (flare part) may be loosened due to vibration during transport.
5	Setting the DSW	Check that the DSW setting is the same as before shipment. RSW, DSW and LED functions, see *RSW, DSWs and LEDs functions, see on page 257*.
6	Insulation *	Measure the resistance between electrical components terminal and ground using a multimeter. It is normal for the resistance to be 1 MΩ and greater. If it is 1 MΩ or less, do not start-up the unit due to insulation failures in the electrical parts. Do not apply power to the operating line terminal board (The control PCB may be damaged) .
7	Stop valve completely open	Before the test run, check that the outdoor unit stop valve is completely open.
8	Power phases	Operation is not available with an incorrect power phase or absence of a phase. • Alarm “05” will be displayed on the remote control LCD screen. • Alarm “05” will be displayed on the outdoor unit 7 segment display. Check the power phase in accordance with the caution label located near the terminal board of the outdoor unit or on the back side of the service cover.
9	Turn ON crankcase heater *	Once items 1 to 8 have been completed, turn ON power supply to the outdoor unit. The electricity is provided to the crankcase heater to heat the compressor. The compressor may be damaged if not pre-heated. Therefore, the compressor must be activated after the power supply is turned ON for at least 12 hours.
10	Indoor and outdoor temperature	< To be used with cooling and heating operation > Is the indoor temperature 27 °C DB or lower during the heating operation? (The heating operation may not be operated due to the activation of the operating overload prevention with an ambient temperature of 19 °C or over). In order to carry out the operational test, set the test mode via the remote control.

<* Insulation resistance >

In the case that the unit has been turned OFF for large periods of time, the insulation resistance may be reduced to 1 MΩ or less because the refrigerant is maintained in the compressor. Check the following points.

- (a) Disconnect the compressor cables and measure the insulation resistance of the compressor itself. If the resistance is 1 MΩ and over, failures have occurred in the insulation of other electrical parts.
- (b) If the resistance is 1 MΩ or lower, reconnect the compressor and turn ON the main power supply. The compressor will automatically be heated. Re-check the insulation resistance after current has been applied for at least 3 hours (the pre-heating time depends on the air conditions, the length of the piping or the condition of the refrigerant).

Before connecting the circuit breaker, check the rated capacity.

<* Stoppage of the compressor operation >

The compressor may not be available for a maximum time period of 4 hours if the power supply is not previously turned ON. At this time, stoppage code (d1-22) is displayed on the LCD screen of the remote control and the forced Thermo-OFF function is started.

If compressor operation is required, turn ON the power supply to the outdoor unit, wait 30 seconds and press PSW5 on PCB1 of the outdoor unit for at least 3 seconds. The forced Thermo-OFF function (d1-22) will be cancelled and the operation of the compressor will be available.

7.2.2 Test run using the remote control switch

(1) Turn ON the power source of the indoor and outdoor units.
(2) Set the TEST RUN mode by the remote control switch.

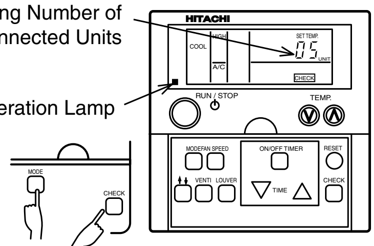
Depress the "MODE" and the "CHECK" switches simultaneously for more than 3 second.

→ If "TEST RUN" and the counting number of the connected units to the remote control switch (for example "05") are indicated on the remote control switch, the connection of remote control cable is correct.

→ If no indication or "00" appears or the number of the units indicated is less than the actual number of the units, some abnormalities exist.

Counting Number of Connected Units

Operation Lamp



Remote Control Switch

(3)

Remote Control Switch Indication	Fault	Inspection Points after the Power Source OFF
No Indication	* The power source is not turned ON. The connection of the remote control cable is incorrect.	1. Connection between Connector and Wires 2. Connecting Points of Remote Control Cable 3. Contact of Connectors of Remote Control Cable
	* The connecting wires of power supply line are incorrect or loosened.	4. Connection Order of each Terminal Boards 5. Screw Fastening of each Terminal Boards
Counting number of connected units is incorrect.	* The setting of unit number is incorrect.	6. Dip Switch Setting on Printed Circuit Board
	* The connection of control cables between each indoor units are incorrect. (When one remote control switch controls multiple units.)	7. Wire Connecting Order of Bridge Cable 8. Connecting Points of Bridge Cable 9. Contact of Connectors of Bridge Cable

Back to (1) after checking

(4) Select TEST RUN MODE by depressing MODE switch. (COOL or HEAT)
(5) Depress RUN/STOP switch.

→ The "TEST RUN" operation will be started. (The "TEST RUN" operation will be finished after 2 hours unit operation or by depressing the RUN/STOP switch again.)

→ If the units do not start or the operation lamp on the remote control switch is flashed, some abnormalities exist.

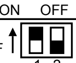
(6)

Remote Control Switch Indication	Unit Condition	Fault	Inspection Points after the Power Source OFF
The operation lamp flashes. (1 time/1 sec.) And the Unit No. and Alarm Code "03" flash.	The unit does not start.	The connecting wires of operating line are incorrect or loosened.	1. Connecting Order of each Terminal Boards. The fuse on the PCB may be blown out due to miswiring. (Can be recovered only once by the DSW on the PCB) (see Procedures for Recovery below) 2. Screw Fastening of each Terminal Boards. 3. Connecting Order of Power Line Between Indoor Units and Outdoor Unit.
The operation lamp flashes. (1 time/2 sec.)	The unit does not start.	The connection of remote control cable is incorrect.	This is the same as item (3)-1, 2 and 3.
Indication of flash different to above.	The unit does not start, or starts once and then stops.	The connection of the thermistors or other connectors are incorrect. Tripping of protector exists, or else.	Check by the alarm code table in the service manual. (Do it by service people.)
The operation lamp flashes. (1 time/1 sec.) And the Unit No. ***00***. Alarm Code ***dd*** and Unit Code E.***00*** flash.	The unit does not start.	The connecting wires of operating line are incorrect or loosened.	Check by the alarm code table in the service manual. (Do it by service people.)

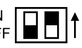
Procedures for Recovery When Transmitting Circuit Fuse is Blown Out

1. Correct the wiring for the terminal board.
2. Setting position of the model code are shown below.

Indoor PCB DSW7

RPK-1.0 and 1.5	 ON OFF
RCI, RCD, RPI, RPC, RPK-2.0 to 4.0, RPF(I)	ON OFF  1 2

Outdoor PCB DSW10

ON OFF  1 2

Back to (1) after checking

7.2.3 Test run from the outdoor unit

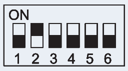
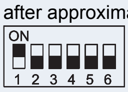
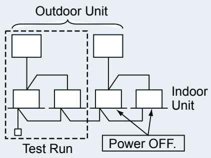
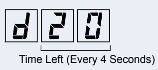
The procedure of test run from the outdoor unit is as follows. The setting of this DIP switch is available with power ON.

Setting of DIP switch (before shipment):

DSW4	
Switch for setting of service operation and fuction	
	**1** Test run **2** COOL / HEAT setting (ON: heating mode) **3** OFF (fixed) **4** Manual compressor OFF **5** OFF (fixed) **6** OFF (fixed)

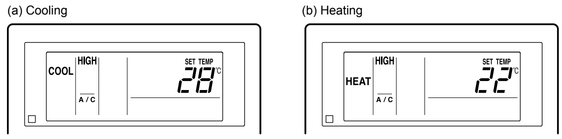
DANGER

- ***Do not touch any other electrical component when handling the PCB switches.***
- ***Do not install or remove the service cover when the power to the outdoor unit is connected and the outdoor unit is operating.***
- ***Place all the contacts of DSW4 to the OFF position when the test run has been completed.***

	Setting the DSW	Operation	Notes
Test run	1. Setting the operation mode. Cool: Set DSW4-2 OFF  Heat:. Set DSW4-2 ON  2. Start of the test run. Set DSW4-1 ON and the operation starts after approximately 20 seconds.  **NOTE** ***In the heating mode, leave DSW4-2 in the ON position.***	1. The indoor unit automatically starts when the outdoor unit test run is set. 2. The ON/OFF can be carried out from the remote control or DSW4-1 on the outdoor unit. 3. The 2 hours continuous operation is carried out without Thermo-OFF.	* Take care that the indoor units operate in accordance with the outdoor unit test run. * The test run is started from the outdoor unit and is stopped from the remote control, the remote control test run is cancelled. However, the test run of the outdoor unit is not cancelled. Check that DSW4-1 of the outdoor unit PCB is in the OFF position. * In the case that several indoor units are connected with a single remote control, carry out the test run of each refrigerant system one at a time. Then, ensure you turn the power OFF to the indoor units in another refrigeration system in order to not carry out the test run.  * The setting of DSW4 is not required for the test run from the remote control.
Manual OFF of the compressor	1. Setting. * Compressor manual OFF set DSW4-4 to the ON position. 2. Reset. * Compressor ON: set DSW4-4 in the OFF position. 	1. When DSW4-4 is in the ON position during the compressor operation, the compressor immediately stops operating and the indoor unit is in the Thermo-OFF condition. 2. When DSW4-4 is in the OFF position, the compressor starts to operate after the 3 minute cancellation.	* Do not repeat the compressor ON/OFF with frequency.
Manual defrost	1. Manual defrost operation. Press PSW5 for more than 3 seconds during the heating operation, the defrosting operation is started after 2 minutes. This function is not available within the first 5 minutes of heating operation. 2. Manual defrost operation termination. Defrost operation automatically ends and the heating operation is restarted.	1. Defrost operation is available regardless of the frosting condition and the total time of the heating operation. 2. Defrost operation is not carried out when the outdoor unit heat exchanger temperature is over 10 °C, the high pressure is higher than 3.3 MPa or Thermo-OFF .	* Do not repeat defrost with frequency. * When the manual defrost operation is accepted by PSW5, the time remaining before starting the defrost operation is indicated on the 7 segment display on the PCB. 

When the test run is complete, place all the contacts of DSW4 in the OFF position.

(1) During the operational test, the following fault indication may appear.



(2) If the remote control has been set to a different mode, the test run function will not start. In this case, carry out the following actions before the test run.

Remote control: STOP.

Central station: STOP and remote control is the available mode.

COOL/HEAT change over switch: connector (CN17) of the outdoor unit PCB is open.

During the test run mode, do not change the setting of the remote control, the setting of the central station and the setting of COOL/HEAT changeover switch.

(3) If an alarm code is indicated during the test run, reset the system by turning off the main power supply and then switch it back on. The system must operate.

7.2.4 Checking at test run

(1) Indoor and outdoor fan

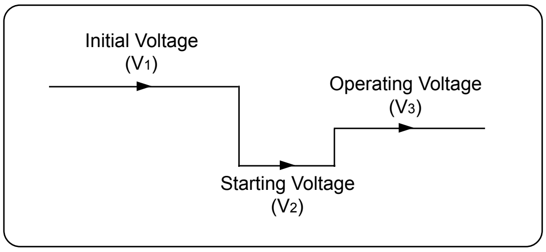
Check that the indoor and outdoor fan rotate properly and that the airflow is smooth.

(2) Power supply voltage

Check the power supply. If the power supply is abnormal, contact the electric company.

In general, the voltage drop (V_2) occurs when starting, as shown in the figure.

< Voltage Change >



In order to protect the device, comply with the following normal power supply voltage ranges.

< Normal power supply voltage range >

- Supply voltage: rated voltage ≤ ±10%
- Starting voltage (V_2): rated voltage ≥ -15%
- Operating voltage (V_3): rated voltage ≤ ±10%
- Imbalance voltage between phase: ≤ 3%

(3) Normal operating pressure

The normal operating suction pressure is 0.2 at 1.1 MPa and the normal operating discharge pressure is 1.0 at 3.5 MPa when the refrigerant charge is correct. Check the operating pressure with the test run.

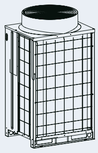
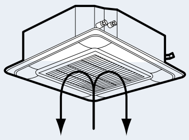
(4) High pressure switch

Check the operating pressure of the high pressure switch in the following table.

Refrigerant	Operating pressure
R410A	4.15 MPa

(5) High pressure increase retry (protection control)

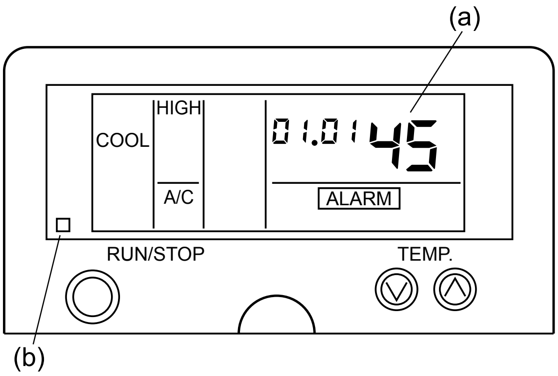
(a) The high pressure will increase when the following procedure is carried out.

Cover the air inlet of the outdoor unit during the cooling operation	Cover the air inlet of the indoor unit during the heating operation.
	

(b) When the high pressure retry control is activated, the alarm code will be indicated "P 13" on the 7 segment display of the outdoor unit PCB. If the high pressure retry control occurs 3 times or more in 30 minutes, the alarm code will be indicated "45" on the remote control LCD screen or the 7 segment display of the outdoor unit PCB.

< Carried out from PC-ART >

- The alarm code will be indicated "45"(a).
- The operating indicator (b) will flash.



NOTE

The high pressure may not increase until the high pressure switch is activated due to the temperature condition.

7.2.5 Refrigerant cycle checklist

CHECKLIST ON TEST OPERATION		
CUSTOMER: ____________________	INSTALLER: ______________________________	DATE: _________________
OUTDOOR UNIT MODEL: ________________	OUTDOOR UNIT SERIAL NO.: ______________	INSPECTOR: ________________

Indoor unit model							
Indoor unit serial number							

Piping length: ________ m	Additional refrigerant charge: ________ kg

(1) General

No.	Check item	Result
1	< Combination of base units > Is the setting of DSW6 correct for the outdoor unit number?	
2	Are the power source wire and the transmission wire separated from the refrigerant pipes?	
3	Is the earth wire connected?	
4	Is there any short-circuit?	
5	Is there any voltage anomaly between each phase? (R-S, S-T, T-R)	

(2) Refrigerant cycle

a. Operation (cooling/heating)

No.	Check item	Result
1	Start-up all the units ("TEST RUN" mode).	
2	Start-up all the indoor units in HIGH speed.	
3	In the case that the constant speed compressor is repeatedly turned ON and OFF, turn off the indoor unit (small capacity).	

b. Data samples (cooling/heating, indoor temperature 21 – 30 °C)

No.	Check item	Result
1	Check the operating data after it has been operating for 20 minutes.	
2	Check Pd and Td. IsTd-SH between 15 and 45 degrees?	
3	Is Ps between 0.2 and 1.1 MPa?	
4	Is Pd between 1.0 and 3.5 MPa? (If the outdoor temperature is high, Pd becomes high).	

NOTE

Underlined ____ indicates a cheking item.

(3) Check item after the data sample

a. Cooling operation (this applies when the outside temperature is above 15 °C).

No.	Check item	Standard	Causes	Result
1	Is the fan currently operating when Fo (airflow rate of outdoor unit fan) is not "0"?	—	• Fan motor failure • PCB1 failure • Condenser failure	
2	Is the total iE (opening of the indoor unit expansion valves) abnormally low or high?	—	• Low: excessive refrigerant • High: insufficient refrigerant or excessive pressure loss in the pipe	
3	Is TL (indoor unit heat exchanger liquid pipe temperature) lower than Ti (Indoor unit air inlet temperature)?	It is normal when TL-Ti < -5 °C.	• TL thermistor failure • Indoor unit expansion valve completely closed • Short-circuit	
4	Is TG (indoor unit heat exchanger gas pipe temperature) lower than Ti (indoor unit inlet air temperature)? (This is applicable when the inlet air temperature is 3 °C higher than setting temperature).	It is normal whenTG-Ti < -5 °C.	• TL thermistor failure • Indoor unit expansion valve completely closed or partially open • Short-circuit	
5	Is there any excessive difference between indoor unit at SH (TG - TL) of indoor unit heat exchangers? (This is applicable when the inlet air temperature is 3 °C higher than setting).	It is normal if the difference between units is within 7 °C.	• TL / TG thermistor failure • Indoor unit expansion valve completely open, partially open or completely closed	
6	Is there any indoor unit with a heat exchanger value of SH (TG - TL) excessively different from the value of other units and is iE (opening of the indoor unit expansion valve) less than "7"?	It is normal if SH is within -3 °C lower than other units.	• Indoor unit expansion valve locked when completely open • Mismatched wiring and piping	
7	Is there any indoor unit with a heat exchanger value of SH (TG - TL) excessively different from the value of other units and is iE (opening of the indoor unit expansion valve) less than "100"?	It is normal if SH is within +3 °C higher than other units.	• Indoor unit expansion valve locked when partially open or closed • Mismatched cabling and piping	
8	Is the temperature difference between indoor units* more than 7 °C? * The difference in temperature between indoor units means the following: b3 (discharge air temperature) - b2 (air inlet temperature) indicated on the remote control by the check mode.	—	—	

b. Heating operation (this is applicable when the outdoor temperature is higher than 0 °C).

No.	Check item	Standard	Causes	Result
1	Are oE1 and oE2 (opening of the outdoor unit expansion valves) abnormally low or high when TdSH is between 15 and 45 degrees?	—	• Low: excessive refrigerant. • High: insufficient refrigerant.	
2	Is Pd between “1.6” and “3.5”? (Pd is high when the indoor temperature is high).	—	• Low: solenoid valve SVA leak . • High: excessive pressure loss in the gas pipe.	
3	Is Ps between "0.2" and "1.1"?	—	• Low: outdoor unit short-circuit. • low/high: outdoor unit fan motor failure, fan module failure or outdoor unit ambient temperature thermistor failure.	
4	Is the difference in temperature between indoor units* more than 10 °C when iE (indoor unit expansion valve) is "100? * The difference in temperature between indoor units means the following: b3 (discharge air temperature) -b2 (air inlet temperature) indicated on the remote control by the check mode. However, this is only applicable when b2 (Air inlet temperature) -b1 (setting temperature) is higher than 3 °C.	—	• Failure such as PCB, wiring, indoor unit expansion valve and coil • Excessive pressure loss in the pipe. • Thermistor failure for air discharge	

NOTE

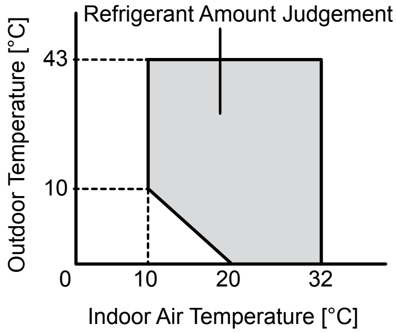
Underlined ___ indicates checking items and the mark "   " indicates checking data.

7.2.6 Automatic judgement system for refrigerant amount

< Before refrigerant amount judgement >

(1) Check the indoor and outdoor temperature in the picture.

(2) Calculate the amount of refrigerant for the length of the pipe and add it.

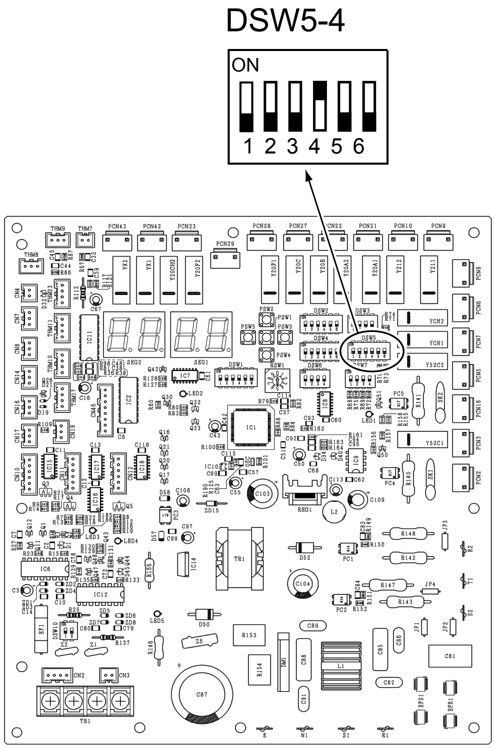


7

< Procedure of refrigerant amount check operation >

(1) Check that the power supply to all the indoor units is disconnected.

(2) Place contact 4 of DSW5 (on PCB1 of the main outdoor unit) to the ON position as shown in the picture.



The 7-segment display will indicate:

FGCH

The refrigerant amount judgement is carried out automatically during cooling operation (this function is not available during the heating operation).

Before starting, check the indoor and outdoor air temperature.

(3) Check the 7-segment display and press PSW1. The outdoor unit fan and the compressor will be activated. The display will indicate:

ch.02

The judgement takes between 30 and 40 minutes to carry out.

Check the data obtained against the following table.

When the result of the test is excessive refrigerant charge, insufficient refrigerant or abnormal termination, find the cause of the abnormality and carry out the refrigerant amount check operation in the unit once again.

7–segment indication	Result	Indications
End	Sufficient refrigerant	The refrigerant amount is sufficient. • Place contact number 4 of DSW5 (on PCB1) to OFF and carry out the test run.
ch. Hi	Excessive refrigerant	The refrigerant amount is excessive. • Calculate the refrigerant charge according to the length of the refrigerant pipes. • Collect the charged refrigerant appropriately and charge the unit with correct amount of refrigerant.
ch. Lo	Insufficient refrigerant	The refrigerant charge is insufficient. • Check whether the unit has been charged with additional refrigerant. • Calculate the refrigerant charge according to the length of the refrigerant pipes and carry out the charge the unit with correct amount of refrigerant.
ch.	Abnormal termination	Locate the cause of the abnormal termination in line with the instructions below. After fixing the cause of the abnormal termination, restart the check operation. 1. Is the contact 4 of DSW5 (on PCB1) in the ON position before power supply is applied? 2. Are all the indoor units ready and waiting before placing contact 4 of DSW5 (on PCB1) to the ON position? 3. Is the outdoor ambient temperature between the applicable range (0 – 43 °C)?. (In some cases, when the number of indoor units connected exceeds the maximum recommended number, and the outdoor temperature is over 35 °C, this check cannot be carried out). 4. Is the total indoor units operating total capacity ratio 30% or lower? 5. Is contact 4 of DSW4 (compressor forced stoppage) in the OFF position?

(4) Place contact 4 of DSW5 (on PCB1) to the OFF position when the refrigerant amount is sufficient.

Wait a maximum of three minutes after placing contact 4 of DSW5 (on PCB1) to the OFF position so that the outdoor unit is ready for operation.

NOTE

During the check, the indication on the 7-segment display may be changed to the protection control code by the activation of the protection control, although this is normal.

7.2.7 Reset for accumulated operation time of compressor 1-2 after maintenance (cUJ1-cUJ2)

< Procedure >

Press PSW1 and PSW3 for 5 seconds, while the compressor accumulated operation time data is displayed.

<Example of Compressor 1>

cU J1 “cUJ1” (Accumulated Operation Time of Compressor 1) will be indicated.

PSW2 ↑↓ PSW3

8 16 Press PSW1 and PSW3 for 5 seconds while the accumulated operation time is displayed.

⇩

The indication will be changed to “0”.

(The accumulated operation time of compressor 1 is “0”)

0

NOTE

In the case of the 20 to 54 HP units, reset the accumulated operation time is required for each outdoor units.

7.2.8 Test run check list

MODEL:	
SERIAL No.:	
COMPRESSOR MFG No.:	
NAME AND CUSTOMER ADDRESS:	
DATE:	

1 Does the indoor unit fan rotation in the correct direction? __________
2 Does the outdoor unit fan rotation in the correct direction? __________
3 Can you hear strange noises in the compressor?
4 Has the unit been operating for at least twenty (20) minutes? __________
5 Check the temperature of the room:

Inlet:	No. 1	DB____ °C WB____ °C	No. 2	DB____ °C WB____ °C	No. 3	DB____ °C WB____ °C	No. 4	DB____ °C WB____ °C
Outlet:		DB____ °C WB____ °C		DB____ °C WB____ °C		DB____ °C WB____ °C		DB____ °C WB____ °C
Inlet:	No. 5	DB____ °C WB____ °C	No. 6	DB____ °C WB____ °C	No. 7	DB____ °C WB____ °C	No. 8	DB____ °C WB____ °C
Outlet:		DB____ °C WB____ °C		DB____ °C WB____ °C		DB____ °C WB____ °C		DB____ °C WB____ °C

6 Check the outdoor ambient temperature:

Inlet	DB ______°C	WB ______°C
Outlet	DB ______°C	WB ______°C

7 Check the temperature of the refrigerant:

Discharge gas temperature	Td = _____°C
Liquid pipe temperature	Te = _____°C

8 Check the pressure:

Discharge pressure	Pd = _____ MPa
Suction pressure	Ps = _____ MPa

9 Check the voltage:

Rated voltage	_____ V	—	—
Operating voltage	L1–L2 _____ V	L1–L3 _____ V	L2–L3 _____ V
Starting voltage	_____ V	—	—
Phase imbalance	1-(V/Vm) = _____	—	—

10 Check the compressor input running current:

Input	_____ kW
Running current	_____ A

11 Is the refrigerant charge OK? __________
12 Do the operating control devices work correctly? __________
13 Do the safety devices work correctly? __________
14 Has the unit been checked for refrigerant leaks? __________
15 Is the unit clean inside and outside? __________
16 Are all the panels of the unit fastened securely? __________
17 Are the panels of the cabinet fastened so that they do not make any noise? __________
18 Is the filter clean? __________
19 Is the heat exchanger clean? __________
20 Are the stop valves open? __________
21 Does the water flow freely through the drain hose? __________

8. Troubleshooting

Index

8.1 Initial troubleshooting

8.1.1 Checking the electrical wires and the power source

No.	Item to check	Check method
1	Is the power source breaker or the fuse blown?	Check the voltage (secondary side) of the breaker and using a multimeter, check the continuity of the fuse.
2	Is the transformer's secondary voltage correct?	Remove the transformer's secondary connection and check the voltage using a multimeter.
3	Is the electrical wiring properly secured and are the connections correctly fixed?	• Check the connection of the power wiring terminals of each terminal board (terminals “L1” to “L1” and “N” to “N” : AC 400 V), and the operation wiring (communication line, terminals “1” to “1” and “2” to “2”: DC 5 V) between the outdoor and the indoor unit coincide properly according to the chapter 4. Otherwise, some components will be damaged. • Check the connection of the wiring to the PCB and ensure that the following connections are not loose or removed: 1. Thermistor connector (each of them). 2. Remote control cable connector. 3. Transformer connector. 4. Each connector of the main power supply circuit. • Check and ensure that shielded twisted pair cable (≥ 0.75 mm^2) with protection against electromagnetic interference has been used for the communication line between units, that the total length is less than 1000 m and the wire size is within local standards. • Check and ensure the circuit breaker and the earth leakage breaker have been properly selected as specify in chapter 4. • All the field wiring and the equipment must comply with local standards.

8.1.2 Checking by 7-segment display

- Simple Checking by 7-Segment Display

1	✳ Turn on All Indoor Units

✳ All the Indoor Units Connected to the Outdoor Unit

↓

2	Turn on the Outdoor Unit

↓

3	Auto-addressing Starts

Outdoor Unit Printed 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.
In this case, "03" appears after 30 seconds.

(3) Duplication of indoor unit number. See Alarm Code 35.

Normal Case	(1) The outdoor unit's on-board 7-segment LED display is not indicated.

Abnormal Case

(2) The outdoor unit's on-board 7-segment LED display indicates as follows if there is something wrong.

(A) Alarm code will be displayed on the 7-segment when alarm is received from indoor unit in normal mode.
As for the following alarm codes, however, alarm code will be displayed on the 7-segment when alarm is detected by outdoor unit itself.
- Alarm Code “03” (Abnormal Transmission between Indoor Unit and Outdoor Unit)
- Alarm Code “35” (Incorrect Indoor and Outdoor Unit No. Setting)

(B) Alarm code of smaller indoor unit address No. will be displayed when alarm is received from multiple indoor units.

(C) The following 7-segment is displayed and flashed every 0.5 seconds.

SEG2	SEG1
(blank)	39
	Alarm Code

(D) SEG1 and SEG2 are as follows.

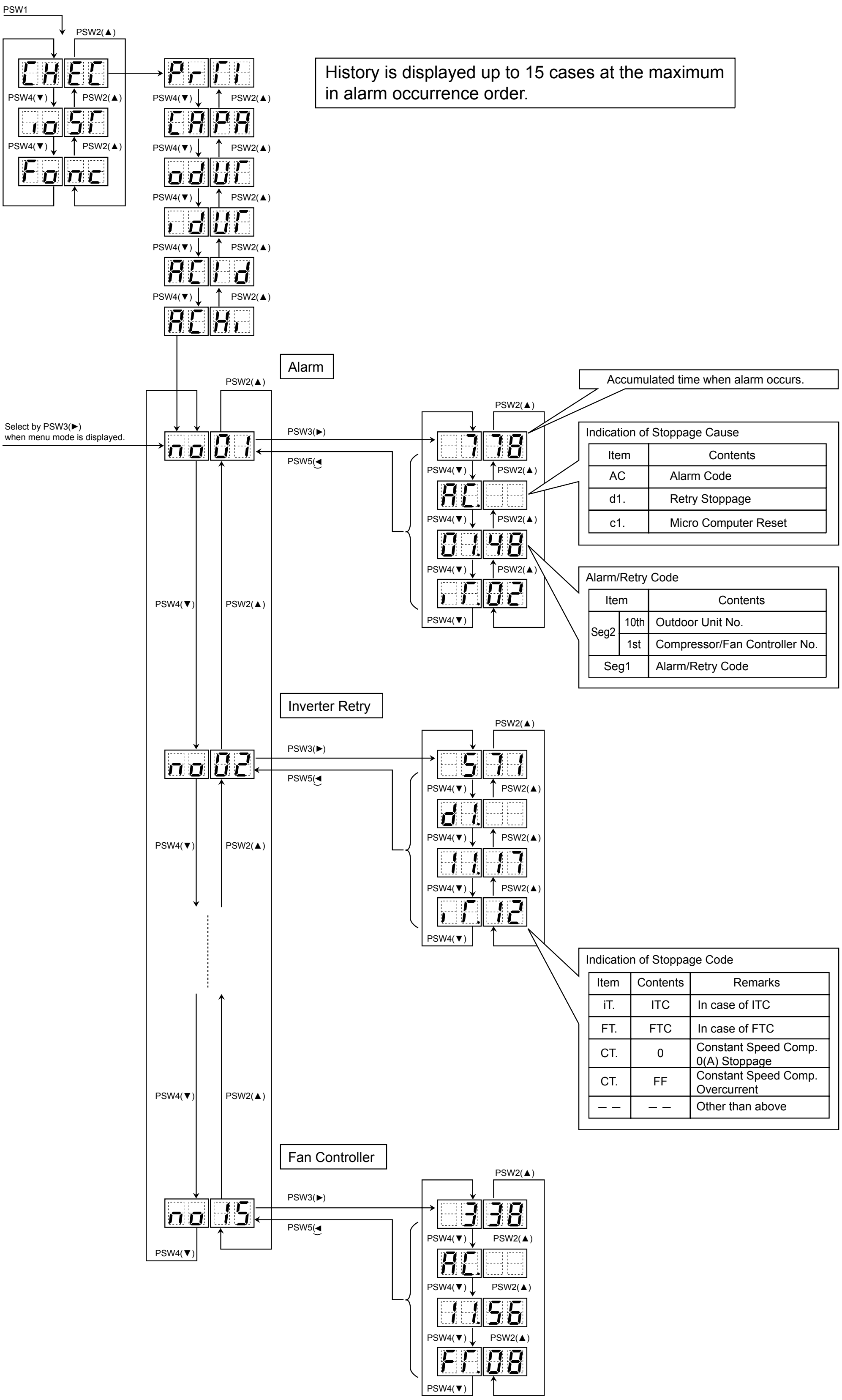
7-Segment Display	Dotted Indication	Remarks
<In Case of Unit No. 63, Alarm Code “01”> SEG2: Indoor Unit No. (0~63) SEG1: Alarm Code SEG2: 63 (Indoor Unit No.) SEG1: 01 (Alarm Code)	SEG2: 63. In case of “Setting Refrigerant Cycle Group +1”	In case of 2-refrigerant cycle group, indentify from SEG2 dotted indication.

8.1.3 Checking of the alarm code history

Alarm code history is indicated in the following order while the check mode is displayed.

"no01" (latest) ←→ history data ~ "no15" (oldest) ←→ history data

Refer to the figure below as an example.



Indication of Stoppage Cause

Item	Contents
AC	Alarm Code
d1.	Retry Stoppage
c1.	Micro Computer Reset

Alarm/Retry Code

Item		Contents
Seg2	10th	Outdoor Unit No.
	1st	Compressor/Fan Controller No.
Seg1		Alarm/Retry Code

Indication of Stoppage Code

Item	Contents	Remarks
iT.	ITC	In case of ITC
FT.	FTC	In case of FTC
CT.	0	Constant Speed Comp. 0(A) Stoppage
CT.	FF	Constant Speed Comp. Overcurrent
– –	– –	Other than above

◆ Alarm code history record

Cause of stoppage (alarm code or stoppage code)	Contents	Alarm code history indication					
		Time	Alarm[1]	Alarm code			Alarm code or stoppage code
				Outdoor unit no.	Compressor no.	Fan no.	
02	Activation of the protection device	Accumulated time	AC.	O	O		--
03	Abnormality transmitting between the indoor and outdoor units	Accumulated time	AC.				--
04	Abnormality transmitting between the inverter PCB and the outdoor unit PCB	Accumulated time	AC.	O	O		--
04.	Abnormality transmitting between the fan controller and the outdoor unit PCB	Accumulated time	AC.	O		O	--
05	Abnormal power phase	Accumulated time	AC.	O			--
06	Abnormal Inverter voltage	Accumulated time	AC.	O	O		iTC
d1-18		Accumulated time	d1.	O	O		iTC
06.	Abnormal fan controller voltage	Accumulated time	AC.	O		O	FTC
07	Decrease in discharge gas super-heat	Accumulated time	AC.	O	O		--
d1-16		Accumulated time	d1.	O	O		--
08	Temperature increase of the discharge gas at the upper part of the compressor	Accumulated time	AC.	O	O		--
d1-15		Accumulated time	d1.	O	O		--
0A	Abnormality transmitting between the outdoor units	Accumulated time	AC.				--
0b	Incorrect outdoor unit adress setting	Accumulated time	AC.				--
0c	Incorrect setting of the main outdoor unit	Accumulated time	AC.				--
21	Abnormality high pressure sensor	Accumulated time	AC.	O			--
22	Abnormality of thermistor for outdoor air temperature	Accumulated time	AC.	O			--
23	Abnormality of discharge gas temperature thermistor at the upper part of the compressor	Accumulated time	AC.	O	O		--
24	Abnormality of the liquid pipe thermistor of the outdoor unit's heat exchanger (Te/Tchg)	Accumulated time	AC.	O	Thermistor signal: Te: E Tchg: C		--
25	Abnormality of the gas pipe thermistor of the outdoor unit's heat exchanger (Te/TbG)	Accumulated time	AC.	O	Thermistor signal TG: G TbG: b		--
29	Abnormality of low pressure sensor	Accumulated time	AC.	O			--
31	Incorrect capacity setting on outdoor and indoor unit	Accumulated time	AC.				--
35	Incorrect indoor unit number setting	Accumulated time	AC.				--
36	Incorrect indoor unit combination	Accumulated time	AC.				--

Cause of stoppage (alarm code or stoppage code)	Contents	Alarm code history indication					
		Time	Alarm[1]	Alarm code			Alarm code or stoppage code
				Outdoor unit no.	Compressor no.	Fan no.	
38	Abnormality of the collection circuit for outdoor unit protection	Accumulated time	AC.	O			--
39	Abnormality of running current in constant speed compressor	Accumulated time	AC.	O			CT value detected
d1-14		Accumulated time	d1.	O			
3A	Abnormal outdoor unit capacity	Accumulated time	AC.				--
3b	Incorrect setting of voltage or combination of outdoor unit models	Accumulated time	AC.				--
3d	Abnormality transmitting between the main unit and the secondary unit(s)	Accumulated time	AC.				--
43	Abnormality of low compression ratio	Accumulated time		O			--
d1-11		Accumulated time	d1.	O			--
44	Abnormality of low pressure increase	Accumulated time	AC.	O			--
d1-12		Accumulated time	d1.	O			--
45	Abnormality of high pressure increase	Accumulated time	AC.	O			--
d1-13		Accumulated time	d1.	O			--
47	Activation of the low pressure decrease protection device (Vacuum operation protection)	Accumulated time	AC.	O			--
d1-15		Accumulated time	d1.	O			--
48	Activation of the Inverter overcurrent protection device	Accumulated time	AC.	O	O		iTC
d1-17		Accumulated time	d1.	O	O		iTC
51	Abnormal Inverter current sensor	Accumulated time	AC.	O	O		iTC
d1-17		Accumulated time	d1.	O	O		iTC
53	Inverter signal detection error	Accumulated time	AC.	O	O		iTC
d1-17		Accumulated time	d1.	O	O		iTC
54	Abnormal Inverter fin temperature	Accumulated time	AC.	O	O		iTC
d1-17		Accumulated time	d1.	O	O		iTC
55	Inverter failure	Accumulated time	AC.	O	O		iTC
d1-17		Accumulated time	d1.	O	O		iTC
57	Activation of the fan controller protection device	Accumulated time	AC.	O		O	FTC
b5	Incorrect setting of indoor unit connection number	Accumulated time	AC.				--
EE	Compressor protection alarm	Accumulated time	AC.				--

Cause of stoppage (alarm code or stoppage code)	Contents	Alarm code history indication					
		Time	Alarm[1]	Alarm code			Alarm code or stoppage code
				Outdoor unit no.	Compressor no.	Fan no.	
d1-05	Instant power failure	Accumulated time	di.				--
d1-18	Inverter malfunction and others	Accumulated time	di.				iTC
d1-26	Abnormality of high pressure decrease	Accumulated time	di.				--
d1-32	Retry stoppage due to automatic adress setting of the indoor unit	Accumulated time	di.				--
Control information	Restarting of the microcomputer due to an Inverter malfunction	Accumulated time	Ci.				1
	Restarting of the microcomputer due to a fan controller transmission malfunction	Accumulated time	Ci.				2
	Restarting of the microcomputer due to an indoor unit transmission malfunction	Accumulated time	Ci.				3
	Restarting of the microcomputer due to a transmission malfunction between the indoor unit and the outdoor unit	Accumulated time	Ci.				4
	Restarting of the microcomputer due to a status control malfunction	Accumulated time	Ci.				6

[1] Alarm details:

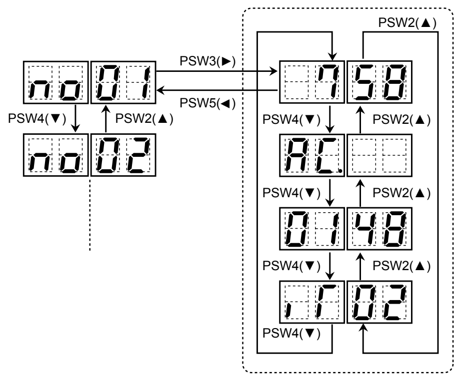
- AC.: alarm.
- d1.: retry.
- Ci.: control information.

iTC: Inverter stoppage code.

FTC: Fan controller stoppage code.

◆ Deletion of the alarm code history

Press PSW1 and PSW3 for five seconds to delete the alarm code history while it is shown on the display (the entire history can be deleted).



In order to delete all the history, press PSW1 and PSW3 (►) for 5 seconds while history is displayed.

8.1.4 Emergency operation

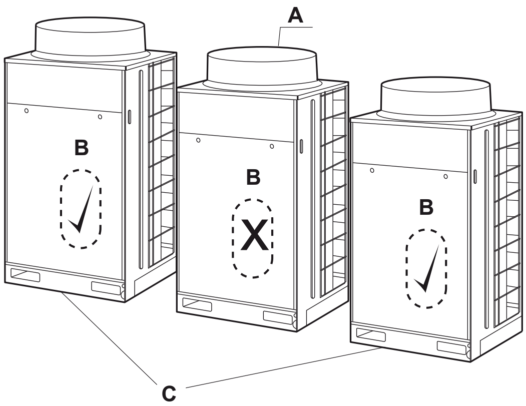
(1) Emergency mode operation from the remote control (only for RAS-(20-54)FSXN)

If the compressor fails, the emergency mode operation is available from the remote control.

Even if the compressor fails, the operation of the air conditioner is continuously available until the troubleshooting and problem resolution procedure is carried out.

8

A	Outdoor unit failed
B	Compressor
C	Even though one unit has failed, the other units can operate continuously



NOTE

- ***In order for the emergency operation may be used, two or more outdoor units are required in the same refrigerant cycle.***

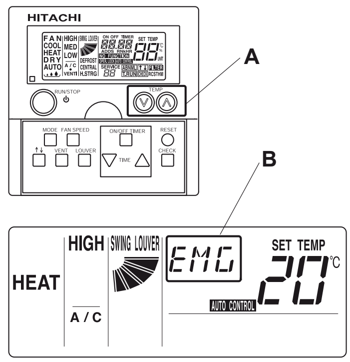
The emergency operation can be activated when the following alarm codes are displayed on the remote control screen:

Alarm code	Compressor type	Description of the failure
06	Failure of the compressor Inverter	Abnormal Inverter voltage
23		Abnormal discharge gas thermistor
48		Activation of the Inverter overcurrent protection device
51		Abnormal Inverter current sensor
53		Inverter error signal detection
54		Abnormal Inverter radiator temperature
23	Failure of the constant speed compressor	Abnormal discharge gas thermistor on the upper part of the compressor
39		Abnormal operating current in constant speed compressor

Procedure (remote control PC-ART)

Simultaneously pressing the pushbuttons “TEMP” ▲ and ▼ -A- for 3 seconds will start the emergency operation mode. The message EMG -B- is displayed on the remote control screen.

PC-ART



Operating condition

The emergency operation is not applicable to all compressors installed in the failed outdoor unit.

NOTE

- ***The emergency operation is only available when all the indoor units and the connected remote controllers are H-LINKII.***
- ***The emergency operation is only available when the alarm codes shown in the previous table are displayed.***
- ***The emergency operation is not available in case of failure of the inverter PCB or the fan controller.***

- ***The emergency operation is not a normal operating mode but a temporary operating mode until technical service maintenance personnel arrive. If the alarm is indicated again during the emergency operation, the alarm cannot be cancelled.***
- ***Do not run the emergency operation for more than eight hours. Otherwise, it may damage the unit.***

(2) Emergency mode operation from the outdoor unit PCB for a Inverter compressor failure (only for RAS-(14-18)FSXN)

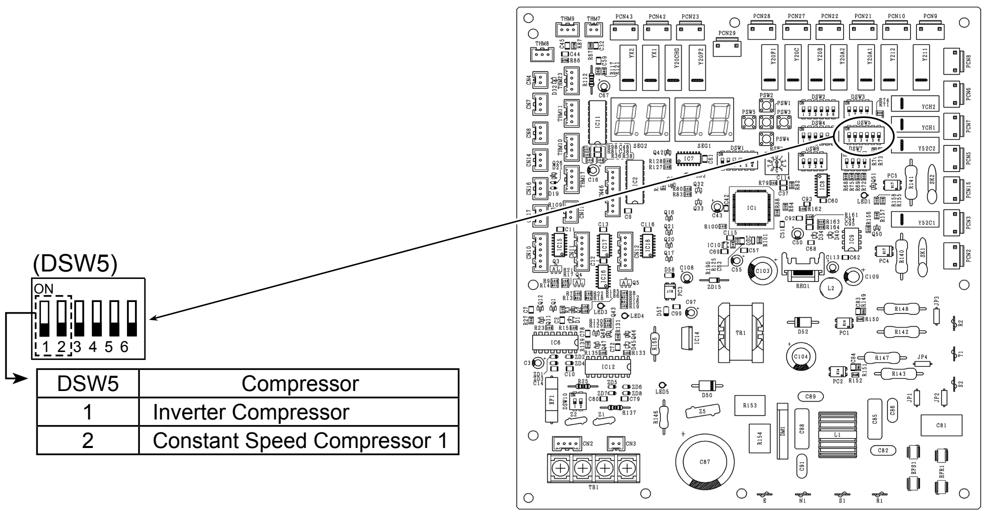
This function is an emergency mode operation that uses the constant speed compressor when the Inverter compressor fails.

Alarms corresponding to a failure of the Inverter compressor	
Code	**Description of the failure**
04	Abnormality transmitting between the Inverter PCB and outdoor PCB
06	Abnormal Inverter voltage
23	Abnormal discharge gas thermistor
48	Activation of the overcurrent protection device
51	Abnormal Inverter current sensor
53	Inverter error signal detection
54	Abnormal Inverter fin temperature

(a) Procedure:

1. Turn OFF the main switches to all the indoor and outdoor units.
2. Check the inverter PCB; if it is damaged, disconnect terminals (U, V, W) from the diode module (isolate the disconnected terminals).
3. Turn ON DSW5-#1 on PCB1 of the outdoor unit.
4. Turn ON the power supply.
5. Start operation using the remote control switch.

Place contact 1 or contact 2 of DSW5 to the ON position to stop the operation of the compressor (when two compressors are stopped simultaneously, the indication d1-30 is displayed on the 7-segment display).



DSW5	Compressor
1	Inverter Compressor
2	Constant Speed Compressor 1

PCB1

(3) Emergency mode operation from the outdoor unit PCB for a constant speed compressor failure

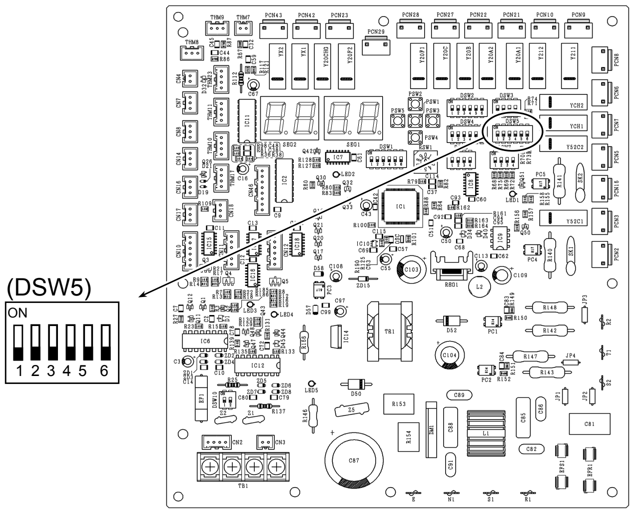
(only for RAS-(14-18)FSXN)

This function is an emergency mode operation that uses the other compressor when the constant speed compressor fails.

Alarms corresponding to a failure of the constant speed compressor	
Code	**Description of the failure**
23	Abnormal discharge gas thermistor
39	Abnormal running current in constant speed compressor

(a) Procedure:

1. Turn OFF the main switches to all indoor and outdoor units.
2. Turn ON DSW5 on PCB1 of the outdoor unit for the failure of the constant speed compressor.
3. Turn ON the power supply.
4. Start the operation using the remote control switch.



PCB1

(b) Operating condition:

- Td thermistor

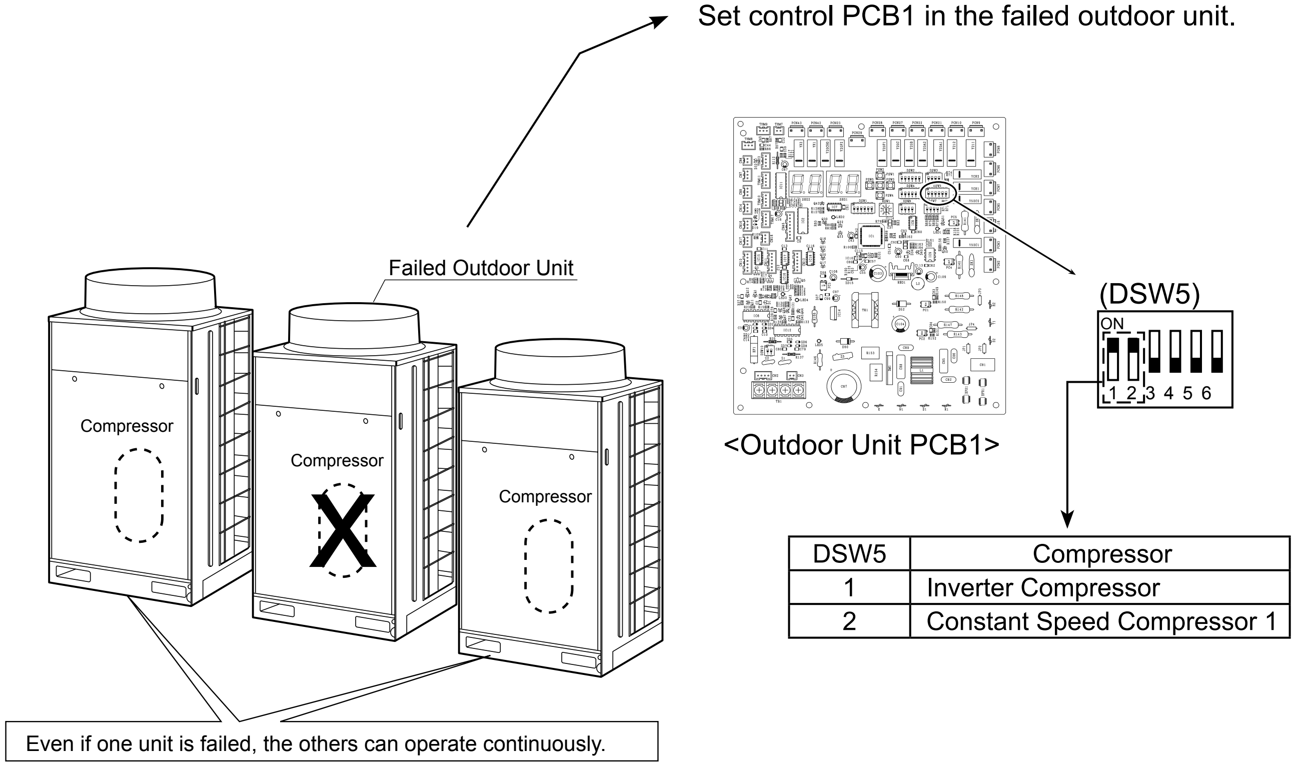
  Td thermistor is ignored during a failure of the constant speed compressor due to the setting of DSW5. If the thermistor is short-circuited, this operation is available.

NOTE

- ***Measure the insulation resistance of the constant speed compressor.***
  Do not activate the emergency operation when the insulation resistance is 0 Ω.
  Another compressor may be damaged due to the possibility that refrigerant oil may be oxidized.
- ***In emergency operation, the compressor frequency cannot normally be controlled.***
  Consequently, alarm codes “07”, “43”, “44”, “45” or “47” can be displayed on the LCD.
- ***The emergency operation cannot provide sufficient cooling and heating capacity.***
- ***The emergency operation is a temporary mode of operation used when the constant speed compressor is damaged. Therefore, replace it with a new one as soon as possible.***
- ***Turn OFF DSW5 on PCB1 after replacing the compressor.***
  If this setting is not carried out, the constant speed compressor will be damaged.

(4) Emergency mode operation from the outdoor unit PCB for a compressor failure (only for RAS-(20-54)FSXN)

Place contact 1 or contact 2 of DSW5 to the ON position to stop the compressor. Once positioned, all the compressors of the failed outdoor unit will not be operated.



DSW5	Compressor
1	Inverter Compressor
2	Constant Speed Compressor 1

NOTE

Heat pump system (2 pipes):
Completely close the stop valves (gas/liquid) in the failed outdoor unit.

- Operating condition:

  < Operating capacity of the indoor units >

  The compressor is forced to stop for its protection under the following conditions:

  Total capacity of Thermo ON indoor unit: < 50% capacity of the outdoor unit.

  Total capacity of Thermo ON outdoor unit < 10 HP.

The lack of Thermo ON in the indoor unit can cause a failure of the constant speed compressor because it gets turned on and stops repeatedly.

NOTE

- ***Measure the insulation resistance of the Inverter compressor.***
  Do not activate the emergency operation when the insulation resistance is 0 Ω.
  Another compressor may suffer damage due to the possibility that refrigerant oil may be oxidized.
- ***The total operating capacity of the indoor units should be 10 HP and greater.***
  Less than 10 HP: forced stoppage.
- ***In emergency operation, the compressor frequency can not normally be controlled.***
  Consequently, alarm codes “07”, “43”, “44”, “45” or “47” can be displayed on the LCD.
- ***The emergency operation cannot provide sufficient cooling and heating capacity.***

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- ***The emergency operation is a temporary mode of operation used when the Inverter compressor is damaged. Therefore, replace it with a new one as soon as possible.***
- ***Turn OFF contact 1 of DSW5 on PCB1 of the outdoor unit after replacing the compressor. If this setting is not carried out, the Inverter compressor will be damaged.***

8.1.5 Failure of the power supply to the indoor units and the remote control switch

- The lights and the LCD are not indicated.
- Inoperative.

If the fuses are blown or the circuit breaker is activated, investigate the cause of the excessive current and take the necessary measures.

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Power Failure or Power is Not ON		Measure voltage by volt-meter.	Supply power.
Melted Fuse or Activation of Breaker at Power Source	Short Circuit Supplied between Wires	Check for any uncovered part of wires.	Remove the cause of short-circuit and replace the fuse.
	Short Circuit of Wires to Earth	Measure insulation resistance.	Remove the cause of short-circuit and replace the fuse.
	Failure of Indoor Unit Fan Motor	Measure resistance between wires and insulation resistance.	Replace the AC chopper for indoor fan, fan motor and fuse.
	Failure of AC Chopper for Indoor Fan		Replace the AC chopper for indoor fan and fuse.
Melted Fuse at Control Circuit	Short Circuit Supplied between Wires	Check for any uncovered part of wires.	Remove the cause of short-circuit and replace the fuse.
	Short Circuit of Control Circuit to Earth	Measure insulation resistance.	Remove the cause of short-circuit and replace the fuse.
	Failure of Indoor Unit Fan Motor	Measure resistance between wiring and insulation resistance	Replace the AC chopper for indoor fan, fan motor and fuse.
	Failure of AC Chopper for Indoor Fan		Replace the AC chopper for indoor fan and fuse.
Failure of Transformer at Indoor Unit Side		Measure voltage at secondary side.	Replace the transformer.
Disconnected Cable of Remote Control Switch		Connect the cable.	Replace cable or repair it.
Insufficient Contacting at Connectors of Remote Control Switch	Insufficient Connection or Incorrect Connection of Indoor Unit PCB	Check connectors.	Correctly connect it.
	Insufficient Connection or Incorrect Connection of PCB in Remote Control Switch	Check connectors.	Correctly connect it.

Failure of Remote Control Switch		Check it by self-checking mode *1).	Replace remote control switch if failed.
Failure of PCB	Unconnected Wires to PCB	Check connectors.	Correctly connect wires.
	Failure of PCB	Check it by self-checking mode *2).	Replace PCB if failed.
Incorrect Wiring Connection		Take action according to the procedure indicated in "TEST RUN".	

*1): Refer to: *Self-checking of the remote control switch, see on page 265*.

*2): Refer to: *Self-checking of PCB using the remote control, see on page 262*.

8.1.6 Abnormal transmission between the remote control switch and the indoor unit

- The RUN indicator on the remote control:

  Flashes every two seconds.

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Disconnection or Insufficient Contacting of Remote Control Cable		Check cable and connections.	Repair cable or connect it.
Incorrect Wiring Connection (Incorrect Polarity)		Check wiring and connections.	Repairing
Failure of Remote Control Switch		Check it by self-checking mode *1).	Replace it if remote control switch is faulty.
Failure of PCB (in Indoor Unit and Remote Control Switch)	Disconnected Wire to PCB	Check connectors.	Correctly connect wires.
	Failure of PCB	Check it by self-checking mode *2).	Replace PCB if failed.

*1): Refer to: *Self-checking of the remote control switch, see on page 265*.

*2): Refer to: *Self-checking of PCB using the remote control, see on page 262*.

8.1.7 Abnormal operation of the devices

In the case no anomalies are detected (alarm codes) in the remote control switch, and normal operation is not available, carry out the required actions in accordance with the procedures described below.

Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
"RUN" light is ON and LCD is indicated. However, the system does not operated. (ex. The indoor, outdoor fans or compressor does not operate.)	Failure of Indoor Unit Fan Motor	Disconnected Coil	Measure coil resistance by tester.	Replace indoor unit fan motor.
		Burnt-Out Coil	Measure insulation resistance.	
	Failure of Outdoor Unit Fan Motor	Disconnected Coil	Measure coil resistance by tester.	Replace outdoor unit fan motor.
		Burnt-Out Coil	Measure insulation resistance.	
	Failure of Comp. Motor		Measure resistance between two wires.	Replace compressor.
	Failure of Comp.		Check for abnormal sound from comp.	
	Failure of Magnetic Switch for Comp.	Insufficient Contacting	Check magnetic switch activates correctly or not.	Replace magnetic switch.
	Failure of One of PCBs (for outdoor unit, indoor unit, remote control switch)	Disconnected Wiring to PCB	Check connections.	Correctly connect wiring.
		Failure of PCB	Check PCB by self-checking *1).	Replace PCB if failed.
The Comp. does not Stop or Start even if the Setting temperature on LCD is Changed *3)	Failure of Air Inlet Thermistor	Failure of Thermistor	Check it by Check Mode *2).	Replace or correctly connect wires if abnormality exists.
		Disconnection of Thermistor		
	Abnormality of Remote Control Switch Cord		Check it by Test Run.	
	Failure of Indoor Unit PCB		Check it by self-checking *1).	Replace PCB if failed.

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
The Comp. does not Stop or Start even if the Setting temperature on LCD is Changed *3)	Incorrect Optional Setting	Check Setting Condition of "Thermistor of Remote Control Switch" by Optional Setting * Setting and Control "00": Control by Indoor Thermistor for Suction Air "01": Control by Thermistor of Remote Control Switch "02": Control by Average Value of Indoor Thermistor for Suction Air and Thermistor of Remote Control Switch	In case that thermistor of 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: *Self-checking of the remote control switch*, *see on page 265*.

*2): Refer to: *Troubleshooting in the check mode by using the remote control switch*, *see on page 238*.

*3): Even if the controllers are correct, the compressor does not operate under the following conditions:

- Indoor air temperature is lower than 19 °C or the outdoor air temperature lower than -5 °C during the cooling operation.
- Indoor air temperature is higher than 30 °C or outdoor air temperature higher than 23 °C during the heating operation.
- When the cooling (or heating) operation signal is sent to the outdoor unit and a different mode as heating (or cooling) operation signal is sent to the indoor units.
- When the demand or emergency stop signal is sent to the outdoor unit.

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Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Indoor Fan Speed is Not Changed	Failure of Discharge Air Temp. Thermistor	Failure of Thermistor	Check thermistor by self-checking *2).	Replace or correctly connect wiring when it is abnormal.
		Disconnected Wire of Thermistor		
	Failure of Remote Control Switch		Check it by self-checking *1).	Replace if failed.
	Failure of PCB for Indoor Unit			Replace if PCB is failed.
	Failure of AC Chopper for Indoor Unit		Check the indoor unit stoppage when the remote control switch is switched OFF.	Replace if AC Chopper is failed.
No Defrosting Operation Mode is Available during Heating Operation or Defrosting Operation is Continued	Failure of Thermistor for Outdoor Evaporating Temp. during Heating	Failure of Thermistor		Replace or connect correctly when it is abnormal.
		Disconnected Wire of Thermistor		
	Failure of Reversing Valve	Disconnected Reversing Valve Coil	Measure resistance of coil.	Replace reversing valve.
		Incorrect Activation of Reversing Valve	Enforced power supply.	
	Disconnected Control Wires between Indoor Unit and Outdoor Unit		Check connectors.	Correctly connect wiring.
	Failure of Outdoor Unit PCB	Disconnected Wires to PCB	Check connectors.	Correctly connect wiring.
		Failure of PCB	Check it by self-checking *1).	Replace it when check mode is not available.
	Failure of Indoor Unit PCB	Disconnected Wires to PCB	Check connectors.	Correctly connect wiring.
		Failure of PCB	Check PCB by self-checking *1).	Replace if PCB is failed.
Light and LCD Indication on Remote Control Switch are Kept ON	Failure of PCB in Indoor Unit or Remote Control Switch			

*1): Refer to: *Self-checking of the remote control switch, see on page 265* and: *Self-checking of PCB using the remote control, see on page 262.*

*2): Refer to: *Troubleshooting in the check mode by using the remote control switch, see on page 238.*

Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Insufficient Cooling Operation	Indoor Heat Load is Greater than Cooling Capacity		Calculate heat load.	Use a bigger unit.
	Excessively Low Suction Pressure	Gas Leakage or Shortage of Refrigerant	Measure superheat.	Correctly charge refrigerant after repairing gas leakage.
		Excessively Small Diameter Tube or Long Piping	Measure and check field-supplied pipes.	Use correct pipes.
		Incorrect Activation of Check Valve of Outdoor Unit	Check whether or not temp. difference exists before/after check valve.	Replace check valve for outdoor unit.
		Failure or Malfunction of Electronic Expansion Valve	Check for clogging.	Remove clogging.
			Check for connection cord and connector.	Replace connector.
			Is there operation sound from coil?	Replace coil.
			Is thermistor on compressor normal?	Replace thermistor.
			Is thermistor installed correctly on compressor?	Correctly install it.
		Clogged Strainer in Indoor Unit Clogging at Low Pressure Piping	Check temp. difference at inlet and outlet of strainer.	Replace strainer in indoor unit.
		Clogging at Low Pressure Piping	Check temp. difference.	Remove clogging.
		Insufficient Air Flow to Indoor Unit Heat Exchanger	Check for clogged air filter.	Clean air filter.
			Check for obstacle at inlet or outlet.	Remove obstacles.
		Excessively Low Air Temp. to Indoor Unit Heat Exchanger	Insufficient revolution of indoor unit fan motor?	Replace fan motor.
			Check Short-circuited indoor unit air.	Remove cause of short-circuited air.

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Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Insufficient Cooling Operation	Excessively High Discharge Pressure	Insufficient Air Flow to Outdoor Unit Heat Exchanger	Check Clogging of Outdoor Unit Heat Exchanger.	Remove clogging.
			Obstacles at inlet or outlet of outdoor unit heat exchanger?	Remove obstacles.
			Is service space for outdoor unit sufficient?	Secure service space.
			Correct Fan Speed?	Replace fan motor.
		Excessively High Air Temp. to Outdoor Unit Heat Exchanger	Short-Circuited Air to Outdoor Unit?	Remove cause of short-circuited air.
			Any Other Heat Load near Outdoor Unit?	Remove heat source.
		Excessively Charged Refrigerant	Check expansion valve opening.	Correctly charge refrigerant.
		Non-Condensed Gas in Cycle	Check each temp. and pressure.	Charge refrigerant after vacuum pumping.
		Clogging of Discharge Piping	Check for clogging.	Remove clogging.
		Failure or Malfunction of Expansion Valve	Check for clogging.	Remove clogging.
			Check for connecting cord and connector.	Replace connector.
			Is there operation sound from coil?	Replace coil.
			Is thermistor on compressor normal?	Replace thermistor.
			Is thermistor installed correctly on compressor?	Correctly install it.
	Malfunction or Internal Leakage of Reversing Valve		Check temp. difference at inlet and outlet of reversing valve.	Replace reversing valve.
	Excessively Low Suction Pressure	Failure of Bypass Solenoid Valve	Check for leakage of solenoid valve.	Replace solenoid valve.
		Malfunction or Internal Leakage of Reversing Valve	Check temp. difference between inlet and outlet of reversing valve.	Replace reversing valve.
	Discharge Temp. of Indoor Unit is Unstable.		Check for expansion valve of indoor unit in the same system.	Replace failed expansion valve of indoor unit.

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Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Insufficient Heating Operation	Indoor Heat Load is Greater than Heating Capacity		Calculate heat load.	Replace the unit with a bigger unit.
	Excessively Low Suction Pressure	Gas Leakage or Insufficient Refrigerant Charge	Measure superheat.	Correctly charge refrigerant after gas leakage check and repairing.
		Excessively Small Diameter or Long Piping	Measure field-supplied piping.	Use specified pipes.
		Failure or Malfunction of Electronic Expansion Valve	Check for clogging.	Remove clogging.
			Check for connecting cord and connector.	Replace connector.
			Is there operation sound from coil?	Replace coil.
			Is thermistor on compressor normal?	Replace thermistor.
			Is thermistor installed correctly on compressor?	Correctly install it.
		Clogging of Indoor Unit/ Outdoor Unit Strainer	Check temp. difference between inlet and outlet of strainer.	Replace strainer for outdoor unit or indoor unit.
		Clogging of Suction Piping	Check temp. difference of each part.	Remove clogging.
		Insufficient Air Flow through Outdoor Unit Heat Exchanger	Is outdoor unit heat exchanger clogged?	Remove clogging.
			Is there any obstacles at inlet or outlet of outdoor unit?	Remove obstacles.
			Is service space for outdoor unit sufficient?	Secure sufficient service space.
			Check for speed of outdoor unit fan.	Replace fan motor.
		Excessively Low Air Temp. through Outdoor Unit Heat Exchanger	Check for any short-circuited air to outdoor unit.	Remove cause of short-circuited air.
		Defrosting is Insufficiently Completed	Check thermistor for defrosting.	Replace thermistor for defrosting.

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Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Insufficient Heating Operation	Excessively High Discharge Pressure	Insufficient Air Flow to Indoor Unit Heat Exchanger	Check for filter clogging.	Remove clogging.
			Check for any obstacles at inlet or outlet of indoor unit.	Remove obstacles.
			Check indoor fan speed.	Replace fan motor.
		Excessively High Air Temp. to Indoor Unit Heat Exchanger	Check whether or not short-circuited air exists.	Remove cause of short-circuited air.
		Excessively Charged Refrigerant	Check expansion valve opening.	Correctly charge refrigerant.
		Non-Condensate Gas in Ref. Cycle	Check refrigerant quantity.	Recharge refrigerant after vacuum pumping.
		Clogging of Discharge Pr. Piping	Check for clogging.	Remove clogging.
	Malfunction or Internal Leakage of Reversing Valve		Check temp. difference between inlet and outlet of reversing valve.	Replace reversing valve.
	Malfunction of Check Valve of Outdoor Unit		Check temp. difference between inlet and outlet of check valve.	Replace check valve.
	Excessively High Suction Pressure	Failure of Bypass Solenoid Valve	Check for leakage of solenoid valve.	Replace solenoid valve.
		Malfunction or Internal Leakage of Reversing Valve	Check temp. difference between inlet and outlet of reversing valve.	Replace reversing valve.
	Discharge Temp. of Indoor Unit is Unstable.		Check for expansion valve of indoor unit in the same system.	Replace failed expansion valve of indoor unit.

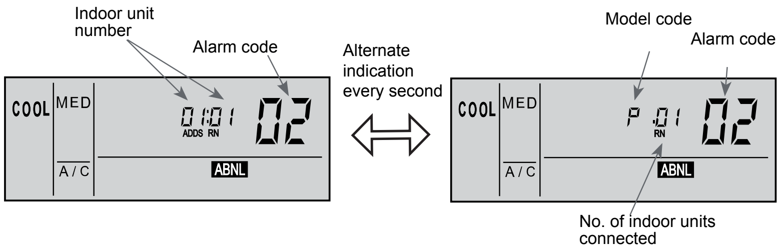
Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Cooling or Heating Operation with Abnormal Sound	Foreign Particles Inside of Fan Casing		Check it by viewing.	Remove foreign particles.
	Indoor Unit Fan Runner is Hitting Casing		Check it by viewing.	Adjust position of fan runner.
	Outdoor Unit Propeller Fan is Hitting Shroud		Check it by viewing.	Adjust position of propeller fan.
	Abnormal Sound from Compressor	Faulty Installation	Check each part is tightly fixed.	Tightly fix it.
		Liquid Ref. Compression	Check expansion valve opening.	Ensure superheat.
		Wear or Breakage of Internal Comp. Parts	Abnormal Sound from Inside of Compressor	Replace compressor.
		No Heating by Crankcase Heater	Check resistance. (Crankcase Heater, Fuse)	Replace crankcase heater or fuse.
	Hamming Sound from Magnetic Contactor		Check surface of contacts.	Replace magnetic switch.
	Abnormal Vibration of Cabinets		Check each fixing screws.	Tightly fix it.
Outdoor Fan is Not Operated When Compressor is Operated	Obstacle at Outdoor Fan		Check obstacles.	Remove obstacles.
	Watching Condition for Heating Operation		Wait for switching of reversing Valve. (1 to 3 minutes)	In case that reversing Valve is not switched, check for insufficient refrigerant.
Indoor Fan is Not Operated When Compressor is Operated	Discharge Pressure Does Not Increase Higher than 1.5MPa due to insufficient refrigerant.		Check operation pressure.	Add refrigerant.
	Disconnected Wiring for Indoor Fan		Check wiring.	Connect wiring correctly.
	Failure of AC Chopper		Check AC chopper.	Replace AC chopper.

8.2 Procedure for troubleshooting

If RUN lamp flashes for 2 seconds, there is a failure in transmission between the indoor unit and the remote control switch. Possible causes are:

- The remote cable is broken.
- Contact failure in remote control cable.
- IC or microcomputer defective.
- In all cases, contact your service provider.

If RUN lamp flashes 5 times (5 seconds) with unit number and alarm code displayed, note the alarm code (see table Alarm codes) and contact your service provider.



8.2.1 Alarm codes

Code	Category	Content of abnormality	Possible cause
01	Indoor unit	Protection device activation (float switch)	Float switch activation (high water level in drain hose or abnormality in drain pipe, float switch or drain pan).
02	Outdoor unit	Protection device activation (disconnection due to high pressure)	PSH activation (pipe clogging, excess refrigerant, mixture of inert gas).
03	Transmission	Abnormality between indoor and outdoor	Incorrect wiring, loose terminals, disconnect cable, blown fuse, outdoor unit switched off.
04		Abnormality between inverter PCB and outdoor PCB	Inverter PCB - Outdoor PCB transmission fault (loose connector, broken cable, blown fuse).
04.		Abnormality between fan controller and outdoor PCB	Fan controller - Outdoor PCB transmission fault (loose connector, broken cable, blown fuse).
05	Power phase	Abnormality in the power phases	Incorrect power supply, inverted phase connection, open phase.
06	Voltage	Abnormal inverter voltage	Outdoor voltage drop, insufficient power.
06.		Abnormal fan controller voltage	Outdoor voltage drop, insufficient power.
07	Cycle	Drop in discharge gas superheat	Excessive refrigerant charge, thermistor fault, incorrect wiring, incorrect pipe connection, expansion valve locked in open position (connector disconnected).
08		Increase in discharge gas temperature	Insufficient refrigerant charge, pipe clogging, thermistor fault, incorrect wiring, incorrect pipe connection, expansion valve locked in closed position (connector disconnected).
0A	Transmission	Abnormality between outdoor and indoor	Incorrect wiring, broken cable, loose terminals.
0b	Outdoor unit	Incorrect outdoor unit address setting	Duplicate address setting of outdoor units (secondary units) in the same refrigerant cycle system.
0C		Main unit of the outdoor unit incorrectly set	Two (or more) outdoor units defined as the “main unit” in the same refrigerant cycle system.
11	Indoor unit sensor	Air inlet thermistor	Incorrect wiring, disconnected wiring, broken cable, short circuit.
12		Air outlet thermistor	
13		Frost protection thermistor	
14		Gas pipe thermistor	
19	Fan motor	Indoor fan protection device activation	Fan motor overheating, locking.

Code	Category	Content of abnormality	Possible cause
21	Outdoor unit sensor	High pressure sensor	Incorrect wiring, disconnected wiring, broken cable, short circuit.
22		Outdoor air thermistor	
23		Discharge gas thermistor at top of compressor	
24		Heat exchanger liquid pipe thermistor	
25		Heat exchanger gas pipe thermistor	
29		Low pressure sensor	
31	System	Incorrect capacity setting on outdoor and indoor units	Combination capacity incorrectly set. Excessive or insufficient total indoor unit capacity.
35		Indoor unit no. incorrectly set	Indoor unit no. duplicated in same reference group.
38		Abnormality in the collection circuit for outdoor unit protection	Protection detection device fault (incorrect wiring of outdoor PCB).
39	Compressor	Abnormal operation current in constant speed compressor	Overcurrent, blown fuse, current sensor fault, instant power failure, voltage drop, abnormal power supply.
3A	Outdoor unit	Abnormal outdoor unit capacity.	Outdoor unit capacity >54 HP.
3b		Voltage or combination of outdoor unit models incorrectly set	Voltage or combination of secondary and main units incorrectly set.
3d		Abnormal transmission between the main unit and the secondary unit(s)	Incorrect wiring, disconnected wiring, broken cable, PCB fault.
43	Protection device	Low-pressure decrease protection device activation	Defective compression (compressor or inverter fault, loose power supply connection).
44		Low-pressure increase protection device activation	Overload during cooling, high temperature with heating, locked expansion valve (loose connector).
45		High pressure increase protection device activation	Overload (clogging, short pitch), pipe clogging, excess refrigerant, mixture of inert gas.
47		Low-pressure decrease protection device activation (vacuum protection)	Insufficient refrigerant, refrigerant pipes, clogging, expansion valve locked in open position (loose connector).
48		Inverter overcurrent protection device activation	Overload, compressor fault.
51	Sensor	Abnormal inverter current sensor	Current sensor fault.
53	Inverter	Inverter error signal detection	Controller IC error signal detection (overcurrent, low-voltage and short-circuit protection).
54		Abnormal inverter fin temperature	Abnormal inverter fin thermistor, heat exchanger clogging, fan motor fault.
55		Inverter fault	Inverter PCB fault.
57	Fan controller	Fan controller protection activation	Controller IC error signal detection (overcurrent, low-voltage and short-circuit protection), instant overcurrent.
5A		Abnormal fan controller fin temperature	Fin thermistor fault, heat exchanger clogging, fan motor fault.
5b		Overcurrent protection activation	Fan motor fault.
5C		Abnormal fan controller sensor	Current sensor fault (instant overcurrent, increased fin temperature, low voltage, earthing fault, step-out).
EE	Compressor	Compressor protection alarm (cannot be reset from the remote controller)	This alarm code is displayed when the following alarms are triggered three times within six hours: 02, 07, 08, 39, 43 to 45, 47.
b1	Outdoor unit number setting	Unit number or address number of the outdoor unit incorrectly set	A number greater than 64 has been set for the refrigerant cycle or address.
b5	Indoor unit number setting	Connection number of the indoor unit incorrectly set	There are more than 17 units not corresponding to H-LINK II connected to one system.
C1	CH unit	Incorrect indoor unit connection	There are 2 or more CH units connected between the outdoor and indoor units.
C2		Connection number of the indoor unit incorrectly set	There are 9 or more indoor units connected to the CH unit
C3		Incorrect indoor unit connection	Indoor units from different refrigerant cycles have been connected to the CH unit.

8.3 Troubleshooting by alarm code

8.3.1 Alarm codes

Alarm code	01	Activation of the Indoor unit protection device.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the contact between # 1 and # 2 of CN14 is not closed more than 120 seconds during the cooling, fan or heating operation.

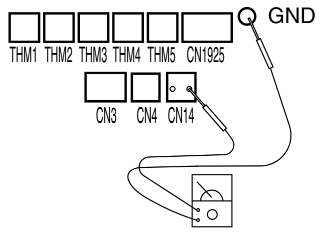
PCB1: Control PCB in Outdoor Unit
PCB: Indoor Unit PCB

Is DC12V applied between #2 and GND of CN14?
(CN14 is not mounted in RPK type.)

No → Activation of Safety Device (such as Float Switch FS) or Incorrect Wiring

Yes ↓ Faulty PCB

Example of RCD, RPI and RPC Types



Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Activation of Float Switch	High Drain Level	Clogging of Drainage	Check drain pan.	Remove clogged foreign particles.
	Faulty Float Switch	Fault	Check continuity when drain level is low.	Replace float switch if faulty.
		Faulty Contacting	Measure resistance by tester.	Repair looseness and replace connector.
		Faulty Connection	Check connections.	Repair connection.
Faulty Indoor Unit PCB			Check PCB by self-checking.	Replace it if faulty.

<Outdoor Unit PCB1 Display Indication>

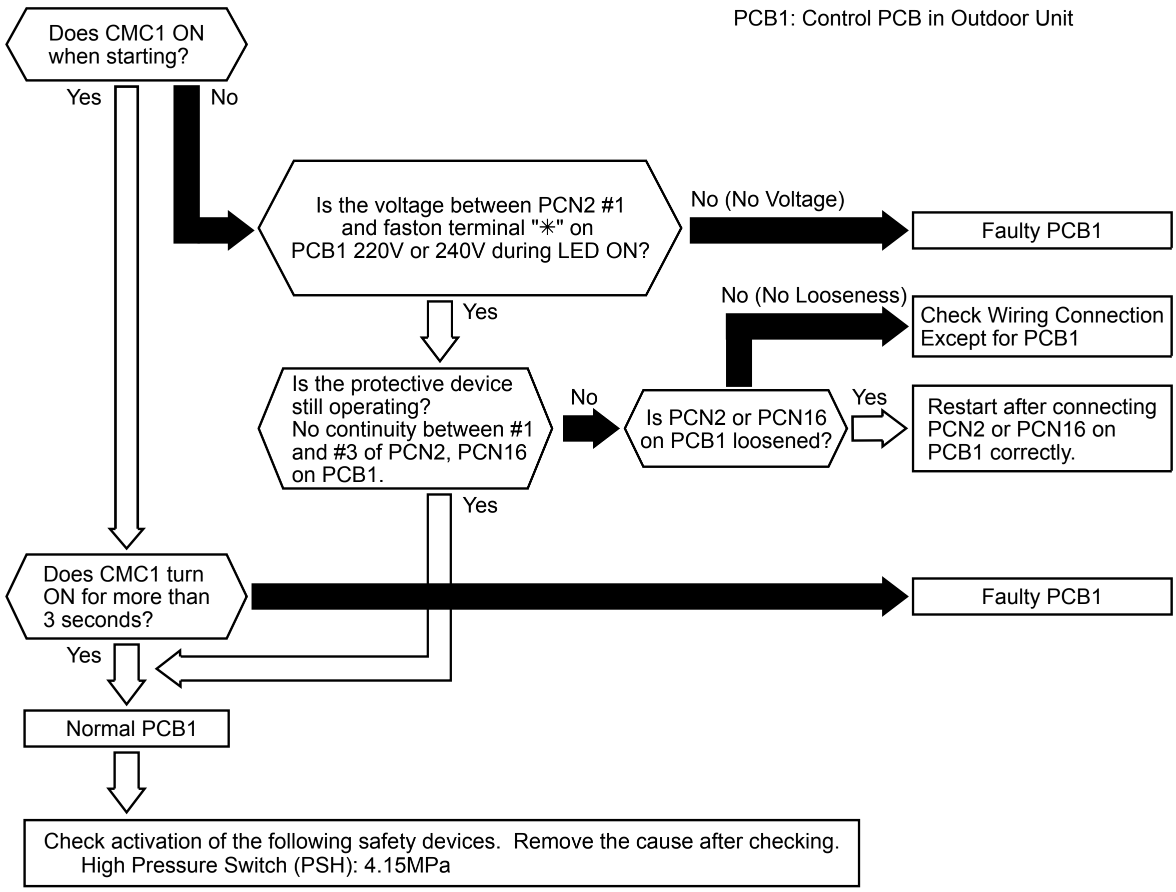
23 01

Alarm Code (01)
Indoor Unit No. for Failure (23)

Alarm code	02	Activation of the outdoor unit protection device.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when one of the safety devices is activated during the compressor running.



Check the following elements:

Connector for CMC1	Faston terminal *		Connector for the protection device
PCN3	400V 50Hz	N1	PCN2 or PCN16

Model	High pressure switch (connector no.)	
	PSH1 (PCN2)	PSH2 (PCN16)
RAS-(8-12)FSXN	O	–
RAS-(14-18)FSXN	O	O

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Activation of High Pressure Switch due to Excessively High Discharge Pressure	Insufficient Air Flow to Heat Exchanger (Outdoor Heat Exchanger during Cooling Operation or Indoor Heat Exchanger during Heating Operation)	Clogging of Heat Exchanger?	Remove clogging.
		Check for dust on air filter.	Remove dust.
		Check for any obstacles at inlet or outlet of heat exchanger.	Remove obstacles.
		Check the service space.	Secure service space.
		Check for speed. (Outdoor Fan: Cooling, Indoor Fan: Heating)	Replace fan motor if faulty.
	Expansion Valve Trouble	Disconnected of Connector	Repair looseness or reconnect connector.
		Fully closed and locked. (See the item 1.3.3 (7))	Replace expansion valve.
	Excessively High Temp. Air to Indoor Unit Heat Exchanger	Calculate heat load.	Reduce heat load or use a bigger unit.
		Check for hot air near the ceiling (at Heating).	Make good circulation.
		Check for short circuited air (at Heating).	Remove short-circuited air.
		Check for other heat source.	Remove heat source.
	Faulty High Pressure Switch – Faulty Pressure Switch	Measure discharge pressure. Check continuity after decreasing of pressure.	Replace it if faulty.
	Faulty High Pressure Switch – Insufficient Contacting	Measure resistance by tester.	Repair looseness. Replace connector.
	Faulty High Pressure Switch – Incorrect Connection	Check connections.	Repair connections.

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Activation of High Pressure Switch due to Excessively High Discharge Pressure	Faulty or Malfunction of Expansion Valve	Check for clogging.	Remove clogging.
		Check connecting wiring and connectors.	Replace connector.
		Check operating sound from coil.	Replace coil.
		Check discharge gas thermistor.	Replace thermistor.
		Check attaching state of discharge gas thermistor.	Reattach thermistor.
	Faulty Solenoid Valve	Check for clogging.	Replace solenoid valve.
	Overcharged Refrigerant	Check cycle operating temp. and expansion valve opening.	Charge refrigerant correctly.
	Mixture of Non-Condensable Gas in Refrigerant Cycle	Check ambient temp. and pressure.	Recharge refrigerant after vacuum pumping.
	Clogging of Discharge Piping	Check for clogging.	Remove clogging.
	Liquid Line Stop Valve or Gas Line Stop Valve are not in Operation	Check stop valves.	Fully open stop valve.
	Clogging of Check Valve	Check for clogging.	Replace check valve.

Alarm code	03	Abnormal transmission between the indoor and outdoor units, heat pump system (2 pipes).

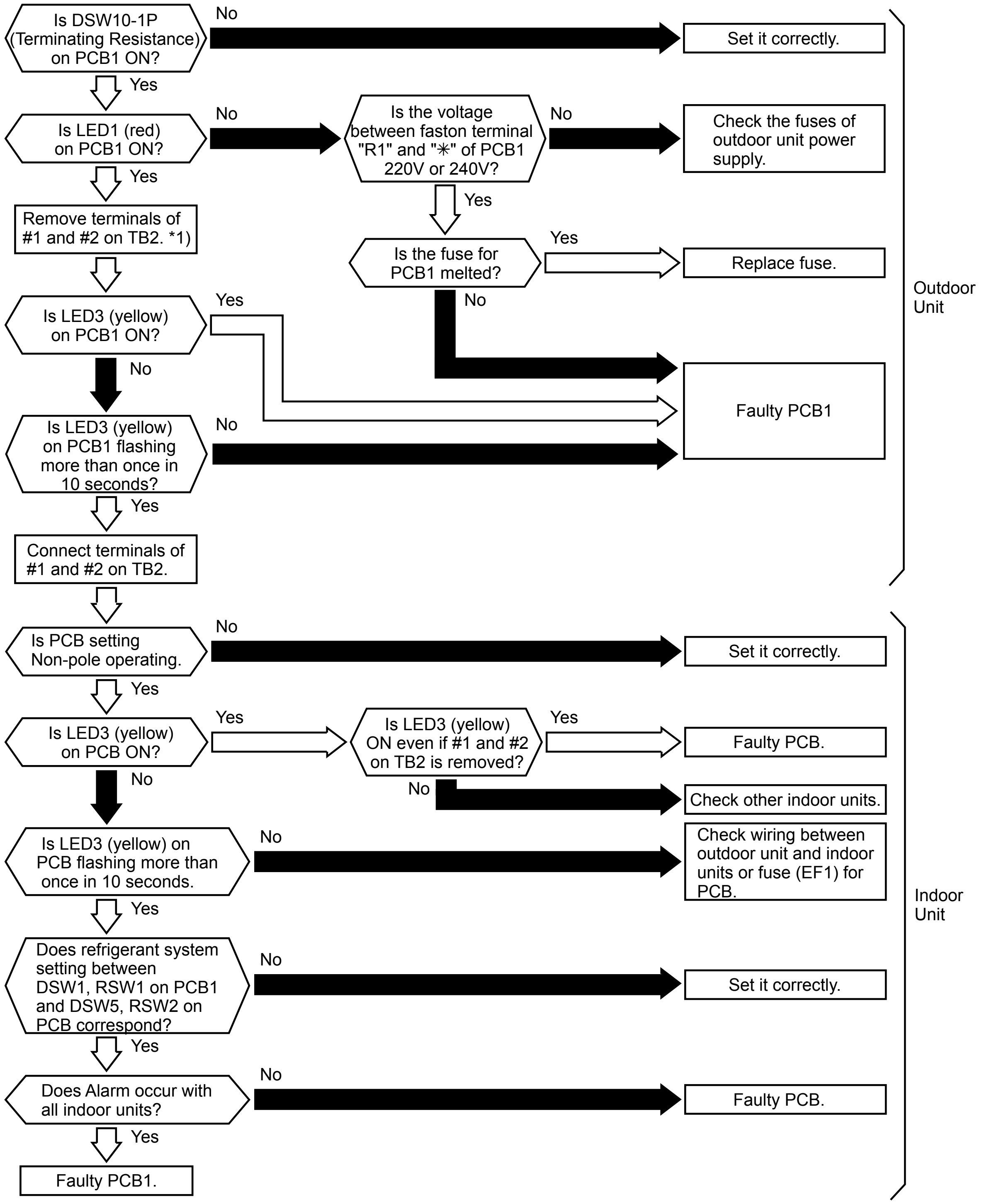
- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when an anomaly is maintained for 3 minutes after the normal transmission between indoor and outdoor units, and also if the anomaly is maintained for 30 seconds after the microcomputer is automatically reset.

  The alarm is indicated when the abnormal transmission is maintained for 30 seconds from the start up of the outdoor unit.

  * Investigate the cause of the excessive current consumption and take the necessary measures when fuses are blown or the circuit breakers for the outdoor unit are activated.

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



*1): In case that terminating resistance (DSW10-1P) is OFF when H-Link Connection is performed.
Set the terminating resistance to ON when #1 and #2 on TB2 is removed.
Set the terminating resistance to OFF when #1 and #2 on TB2 is reconnected.

✳ *Check Item

Power Supply	Faston Terminal
400V / 50Hz	N1

8

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Power Failure or No Power Supply		Measure voltage by tester.	Supply power.
Melted Fuse for Power Source or Activation of Outdoor Unit Breaker	Short Circuit between Wires	Check for breakage of insulation.	Remove short circuit and replace fuse.
	Short Circuited Wire to Ground	Measure insulation resistance.	Remove short circuit to ground and replace fuse.
	Faulty Comp. Motor	Measure resistance between wires and insulation resistance.	Replace comp. and fuse.
	Faulty Outdoor Unit Fan Motor	Measure resistance between wires and insulation resistance.	Replace outdoor unit fan motor and fuse.
Melted Fuse for Control Circuit or Activation of Outdoor Unit Breaker	Short Circuit between Wires	Check for breakage of insulation.	Remove short circuit and replace fuse.
	Short Circuit of Control Circuit (to Ground)	Measure insulation resistance.	Remove short circuit and replace fuse.
	Faulty Solenoid Coil for Magnetic Switch for Comp. Motor	Measure resistance of coil.	Replace magnetic switch and fuse.
	Failure of Outdoor Unit Fan Motor	Measure resistance between wires and insulation resistance.	Replace the fan motor and fuse.
	Failure of Fan Module for Outdoor Fan		Replace the fan module.
PCB1 Power Circuit Failure		Measure PCB1 output voltage. *1)	Replace PCB1.
Disconnected Wires Insufficient Contacting or Incorrect Connection	Between Outdoor Unit and Indoor Unit	Check continuity of wires. Check for looseness of connection screws. Check terminal Nos.	Replacing wires, repairing, tightening screws and correct wiring.
	Power Source Wiring for Outdoor Unit		
Faulty PCB (Outdoor Unit, Indoor Unit)	Disconnected Wires to PCB	Check connections.	Correctly connect wires.
	Faulty PCB		Replace it if faulty.
Incorrect Wiring	Disconnected Wire Insufficient Contacting	Check continuity and looseness of connection screws.	Replacing Wires, Repairing and Tightening Screws
	Incorrect Wiring	Check terminal Nos.	Correctly connect wires.
Incorrect Setting of Indoor Unit Number		Check for unit number setting of RSW on Indoor PCB	Set unit number correctly by RSW on Indoor PCB.

*1)
12VDC between VCC12 and GND2, 5VDC between VCC05 and GND1.
12VDC between VCC12 and GND1, 15VDC between VCC15 and GND1.
24VDC between VCC24 and GND1, 12VDC between VCC12T and GND1.

Alarm code	03	Abnormal transmission between the indoor and outdoor units, heat recovery system (3 pipes).

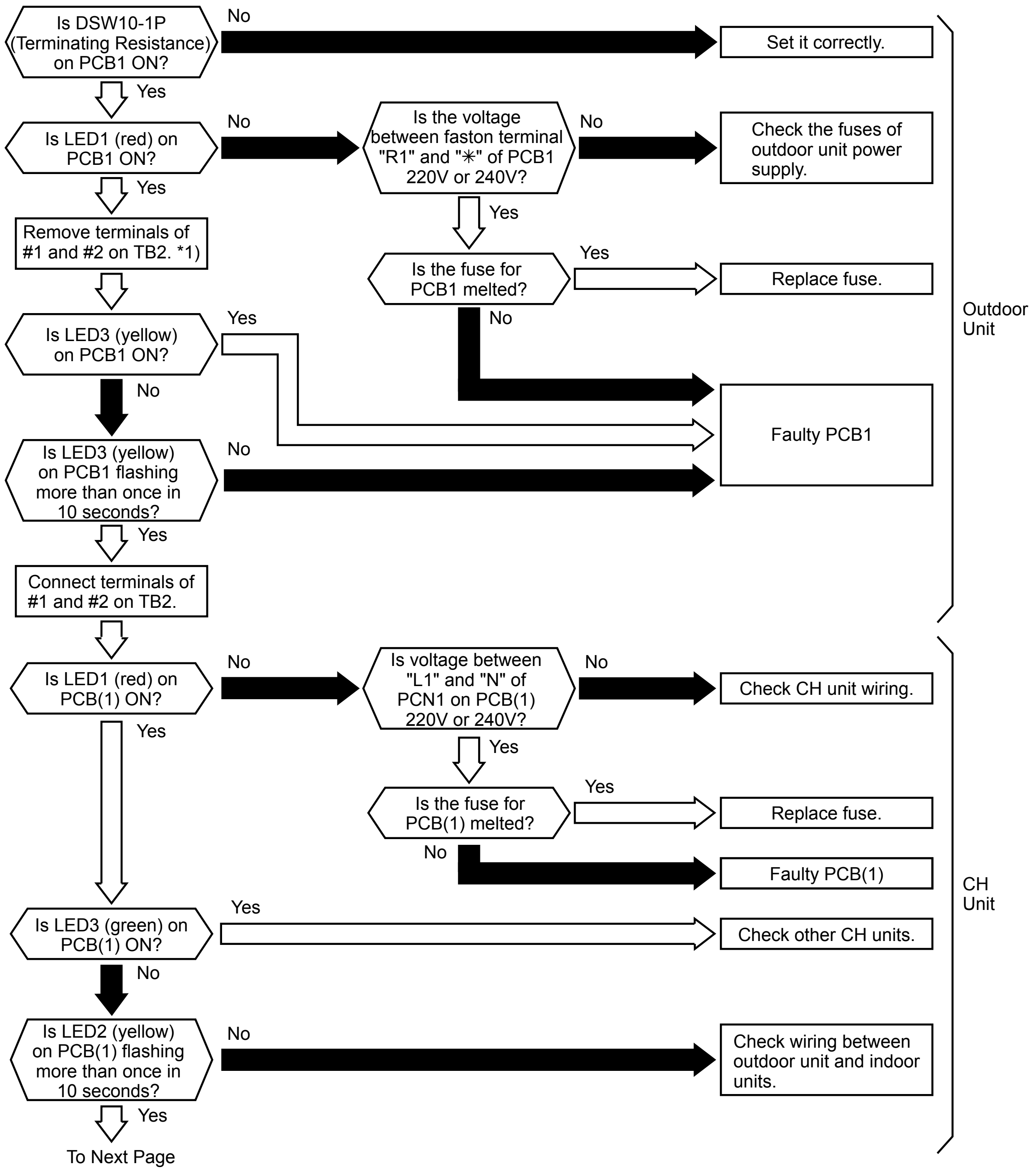
- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when an anomaly is maintained for 3 minutes after the normal transmission between indoor, CH units and outdoor units, and also if the anomaly is maintained for 30 seconds after the microcomputer is automatically reset.

  The alarm is indicated when the abnormal transmission is maintained for 30 seconds from the start up of the outdoor unit.

  * Investigate the cause of the excessive current consumption and take the necessary measures when fuses are blown or the circuit breakers for the outdoor unit are activated.

PCB1: Control PCB in Outdoor Unit
PCB: Indoor Unit PCB
PCB(1): CH Unit PCB



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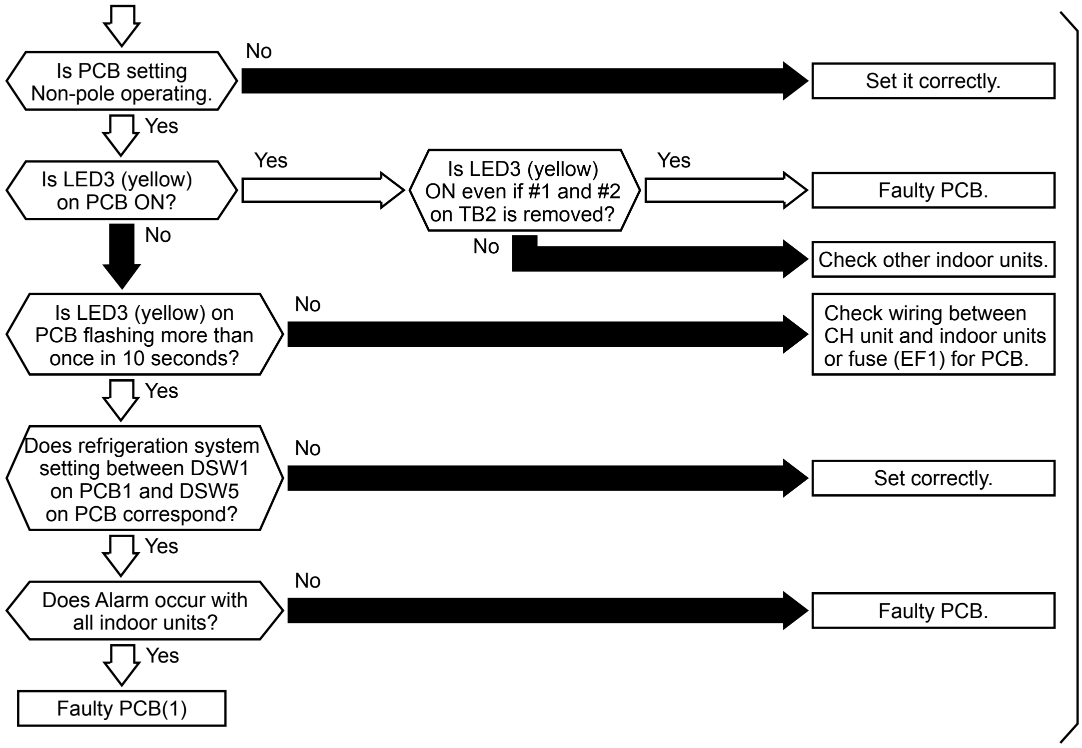


*1) In the case that terminating resistance (DSW10, contact 1) is in the OFF when the H-LINK connection is performed.

Set terminating resistance to ON when #1 and #2 on TB2 is removed.

Set terminating resistance toOFF when #1 and #2 on TB2 is reconnected.

* Check item

Power supply	Faston terminal
400V 50Hz	N1

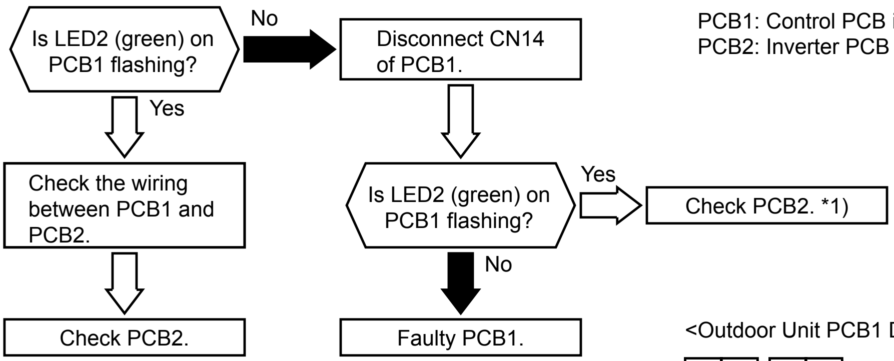
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Power Failure or No Power Supply		Measure voltage by tester.	Supply power.
Melted Fuse for Power Source or Activation of Breaker (Outdoor Unit and CH Unit)	Short Circuit between Wires	Check for breakage of insulation.	Remove short circuit and replace fuse.
	Short Circuited Wire to Ground	Measure insulation resistance.	Remove short circuit to ground and replace fuse.
	Faulty Comp. Motor	Measure resistance between wires and insulation resistance.	Replace comp. and fuse.
	Fault Outdoor Unit Fan Motor	Measure resistance between wires and insulation resistance.	Replace outdoor unit fan motor and fuse.
Melted Fuse for Control Circuit or Activation of Breaker (Outdoor Unit and CH Unit)	Short Circuit between Wires	Check for breakage of insulation.	Remove short circuit and replace fuse.
	Short Circuit of Control Circuit (to Ground)	Measure insulation resistance.	Remove short circuit and replace fuse.
	Faulty Solenoid Coil for Magnetic Switch for Comp. Motor	Measure resistance of coil.	Replace magnetic switch and fuse.
	Failure of Outdoor Unit Fan Motor	Measure resistance between wires and insulation resistance.	Replace the AC chopper for outdoor fan, fan motor ad fuse.
PCB1 Power Circuit Failure		Measure PCB1 output voltage *1)	Replace PCB1.
Disconnected Wires Insufficient Contacting or Incorrect Connection	Between Outdoor Unit and Indoor Unit	Check continuity of wires. Check for looseness of connection screws. Check terminal Nos.	Replacing wires, repairing, tightening screws and correct wiring.
	Power Source Wiring for Outdoor Unit		
Faulty PCB (Outdoor Unit, Indoor Unit)	Disconnected Wires to PCB	Check connections.	Correctly connect wires.
	Faulty PCB		Replace it if faulty.
Incorrect Wiring	Disconnected Wire Insufficient Contacting	Check continuity and looseness of connection screws.	Replacing Wires, Repairing and Tightening Screws
	Incorrect Wiring	Check terminal Nos.	Correctly Connect Wires
Incorrect Setting of Indoor Unit Number		Check for unit number setting of RSW on Indoor PCB	Set unit number correctly by RSW on Indoor PCB.

*1): 12VDC between VCC12 and GND2, 5VDC between VCC05 and GND1,
12VDC between VCC12 and GND1, 15VDC between VCC15 and GND1,
24VDC between VCC24 and GND1, 12VDC between VCC12T and GND1

Alarm code	04	Abnormal transmission between the inverter PCB and the outdoor unit PCB.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when an anomaly is maintained for 30 seconds after the normal transmission between PCB1 and PCB2 of the outdoor unit, and also if the anomaly is maintained for 30 seconds after the microcomputer is automatically reset. The alarm is indicated when abnormal transmission is maintained for 30 seconds after the outdoor unit is turned on.



PCB1: Control PCB in Outdoor Unit
PCB2: Inverter PCB

<Outdoor Unit PCB1 Display Indication>

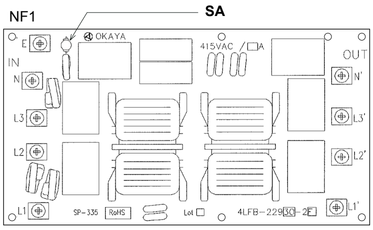
04 Abnormal Transmitting of Inverter

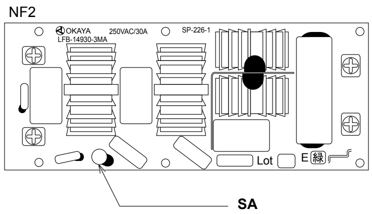
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Disconnected Wires, Insufficient Contacting or Incorrect Connection	Between PCB1 and PCB2	Check continuity of wires. Check for looseness of connection screws. Check connection No.	Replacing wires, repairing, tightening screws and incorrect wiring.
	Power Source Wiring for Outdoor Unit		
Faulty PCB (PCB1 and PCB2)	Disconnected Wires to PCB	Check connections.	Repair wiring connections.
	Faulty PCB		Replace PCB if faulty.
Faulty Electrical Components (Power Fuse, Resistance)	Melted Power Fuse	Check conductivity of power fuse, power transistor, diode module.	Replace power fuse, power transistor, and diode module.
	Disconnected Incoming Current Limit Resistance	Check resistance of incoming current limit resistance.	Replace incoming current limit resistance.
Incorrect Wiring	Disconnected Wires Insufficient Contacting	Check continuity. Check for looseness of connection screws.	Replacing Wires, Repairing and Tightening Screws
	Incorrect Wiring	Check connection Nos.	Correctly Connect Wires

*1): When the unit is applied the excessive surge current due to lightning or other causes, alarm code "04" or Inverter stoppage code (IT) "11" is indicated and the unit cannot be operated. In this case, check to ensure the surge absorver (SA) in the noise filter (NF1, NF2). The surge absorver may be damaged if the inner surface of the SA is black. If so, replace surge absorver.

If the inside of the surge absorver is normal, turn OFF the power supply and wait for LED201 (red) of PCB2 OFF (approximately 5 minutes) and turn ON power supply again.

Position of surge absorver.



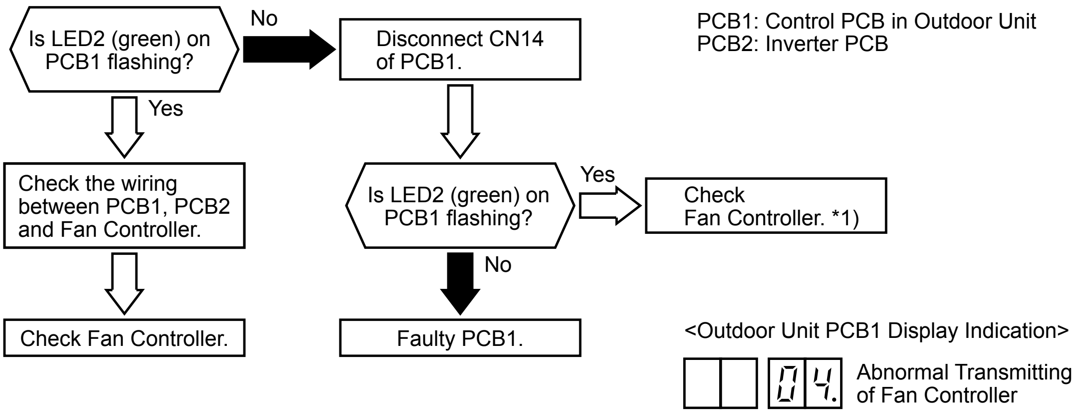


SA: Surge absorver.

Alarm code	04	Abnormal transmission between the fan controller and the outdoor unit PCB.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when an anomaly is maintained for 30 seconds after the normal transmission between PCB1 of the outdoor unit and the fan controller, and also if the anomaly is maintained for 30 seconds after the microcomputer is automatically reset. The alarm is indicated when abnormal transmission is maintained for 30 seconds after the outdoor unit is turned on.



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Disconnected Wires, Insufficient Contacting or Incorrect Connection	Between PCB1, PCB2 and Fan Controller	Check continuity of wires. Check for looseness of connection screws. Check connection No.	Replacing wires, repairing, tightening screws and incorrect wiring.
	Power Source Wiring for Outdoor Unit		
Faulty PCB (PCB1 and PCB2 Fan Controller)	Disconnected Wires to PCB	Check connections.	Repair wiring connections.
	Faulty PCB		Replace PCB if faulty.
	Melted Fuse (Fan Controller)	Check conductivity of fuse.	Replace fan controller. *1)
Faulty Electrical Components (Power Fuse, Resistance)	Melted Power Fuse	Check conductivity of power fuse, power transistor, diode module.	Replace power fuse, power transistor, and diode module.
	Disconnected Incoming Current Limit Resistance	Check resistance of incoming current limit resistance.	Replace incoming current limit resistance.
Incorrect Wiring	Disconnected Wires Insufficient Contacting	Check continuity. Check for looseness of connection screws.	Replacing Wires, Repairing and Tightening Screws
	Incorrect Wiring	Check connection Nos.	Correctly Connect Wires

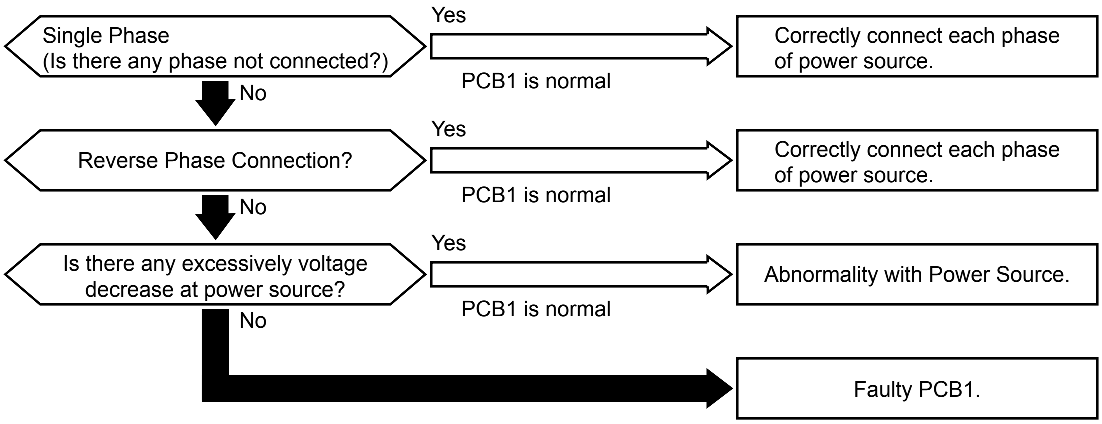
*1): The fan controller may be damaged if the fan controller fuse is blown. If so, replace the fan controller.

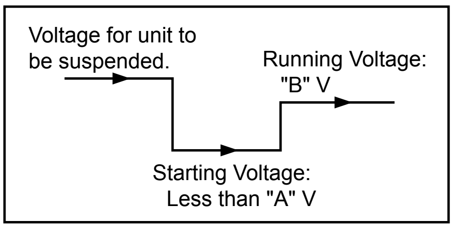
Alarm code	05	Abnormal power source phase.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the main power source phase is reversely connected or one phase is not connected.

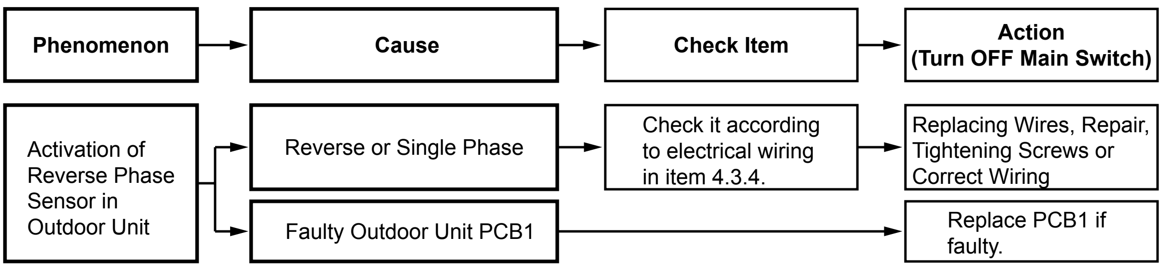
PCB1: Control PCB in Outdoor Unit





Check Item

Power Supply	"A"	"B"
400V / 50Hz	323	342 to 456



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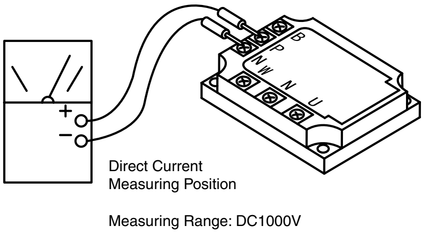
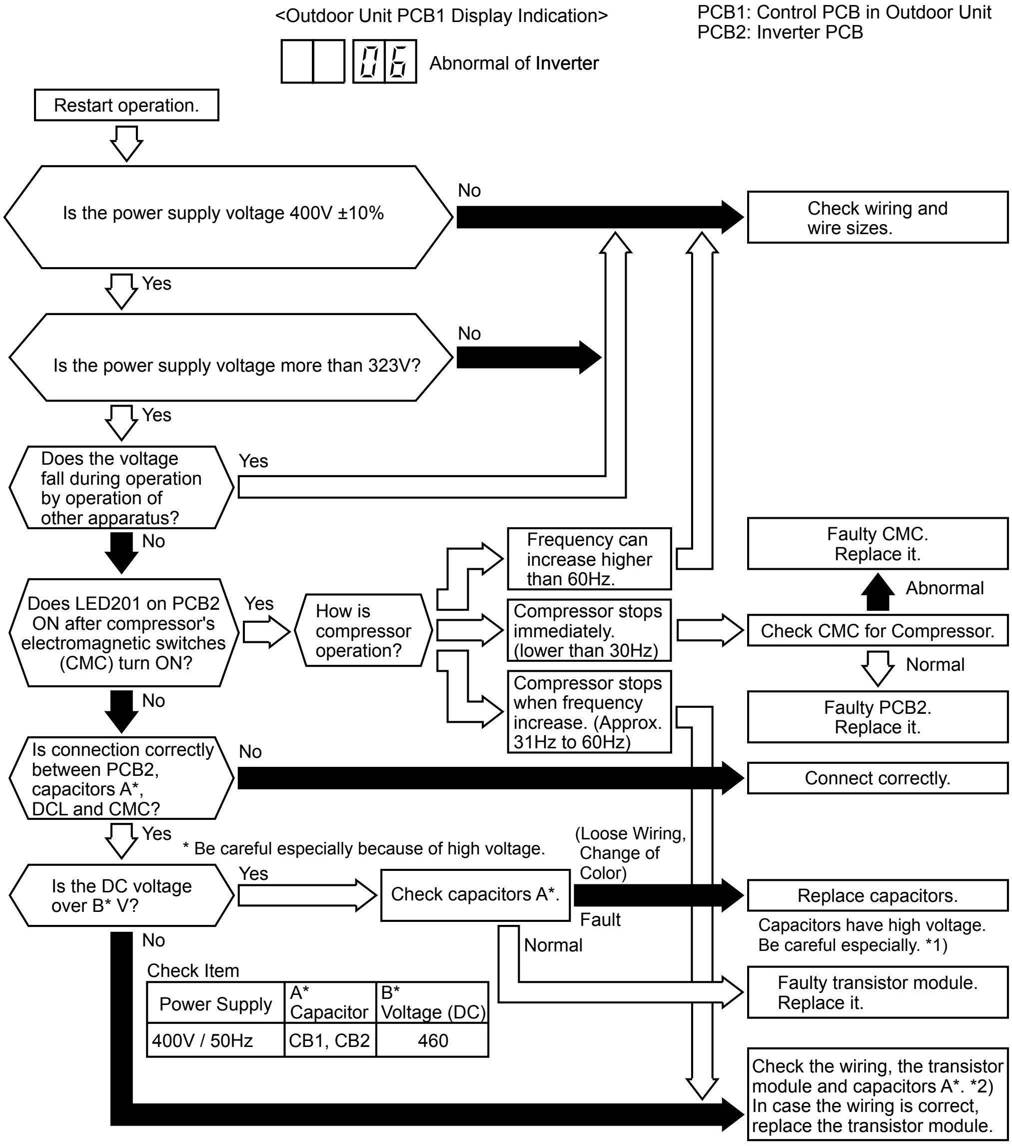
Alarm code	06	Abnormal Inverter voltage.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the voltage between terminal "P" and "N" of the transistor module (IPM) is insufficient and occurs three times within a thirty minute period. If it occurs less than two times, a retry is carried out.





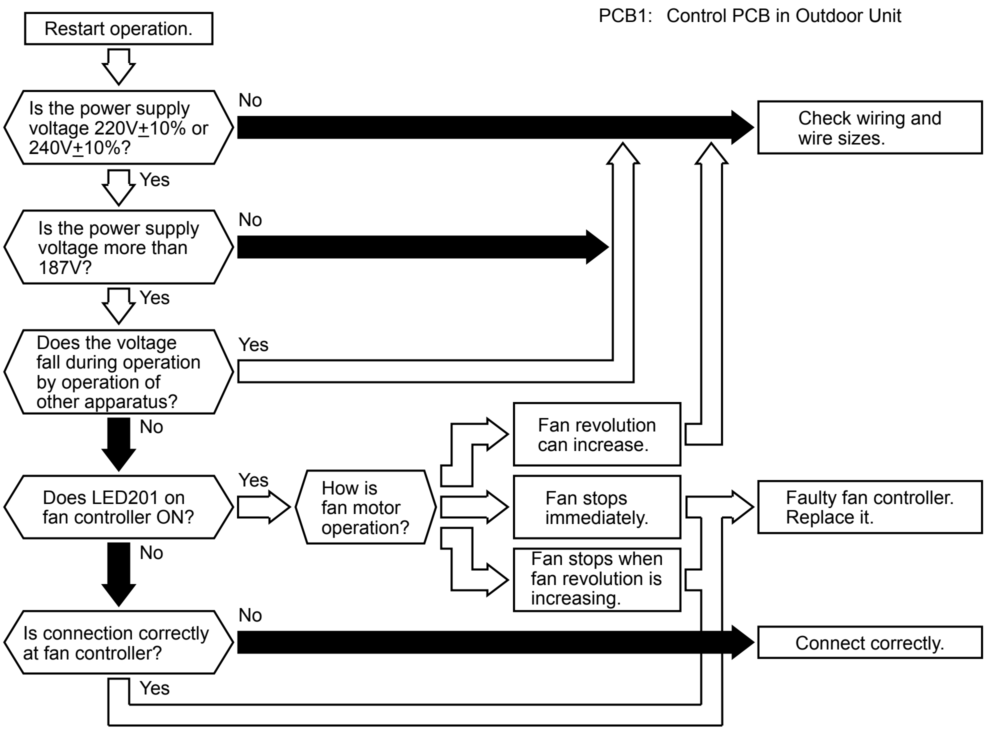
*1): If the capacitor has high voltage, carry out the high voltage discharge in accordance with procedures described in chapter *Checking procedures for other main parts, see on page 267*.

*2): The transistor module checking procedure is indicated in chapter *Checking procedures for other main parts, see on page 267*.

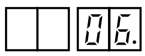
Alarm code	06.	Abnormal fan controller voltage.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when voltage between terminal "R" and "S" of fan controller is insufficient and its occurence is three times in 30 minutes. In the case that the occurrence is maller than 2 times, retry is performed.



<Outdoor Unit PCB1 Display Indication>



Abnormal of Fan Controller

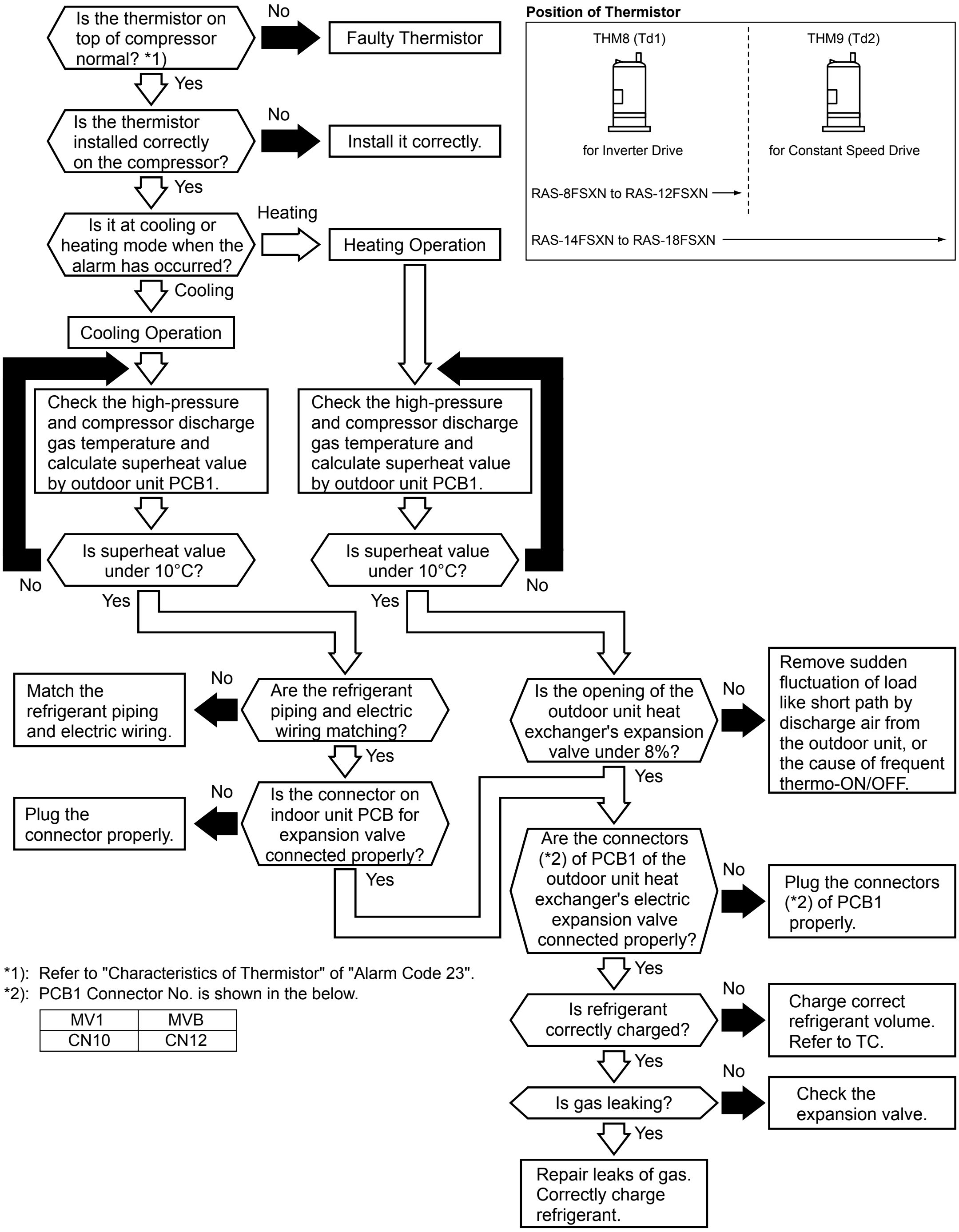
- If fan controller has high voltage, perform the high voltage discharge work according to *Checking procedures for other main parts*, *see on page 267*.
- Check the wiring connection according to the checking procedure of fan controller indicated in the *Checking procedures for other main parts*, *see on page 267*.

Alarm code	07	Decrease in discharge gas superheat.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * In the case that the discharge gas superheat is less than 10 degrees on the upper part of the compressor is maintained for 30 minutes, a retry operation is carried out. However, when the alarm occurs twice in two hours, the alarm code is indicated.

PCB1: Control PCB in Outdoor Unit



*1): Refer to "Characteristics of Thermistor" of "Alarm Code 23".
*2): PCB1 Connector No. is shown in the below.

MV1	MVB
CN10	CN12

Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Decrease of Discharge Gas Superheat	Ref. Cycle is Different from the Electrical System		Check ref. cycle and the electrical system.	Repair wiring.
	Overcharged Refrigerant		Check pressures.	Correctly charge refrigerant.
	Faulty Expansion Valve		Check expansion valve.	Replace expansion valve if faulty.
	Faulty PCB	Fault	Replace PCB and check operation.	Replace PCB if faulty.
		Disconnected Wires for Expansion Valve Control	Check connections.	Repair wiring connections.
	Faulty Discharge Gas Thermistor	Fault	Check resistance of thermistor.	Replace thermistor if faulty.
		Incorrect Mounting	Check mounting state.	Correctly mount thermistor.
		Incorrect Connection	Check connections.	Remove looseness, replace connector or repair connections.

8

HITACHI
Inspire the Next

Alarm code	08	Increase in discharge gas temperature at the upper part of the compressor.

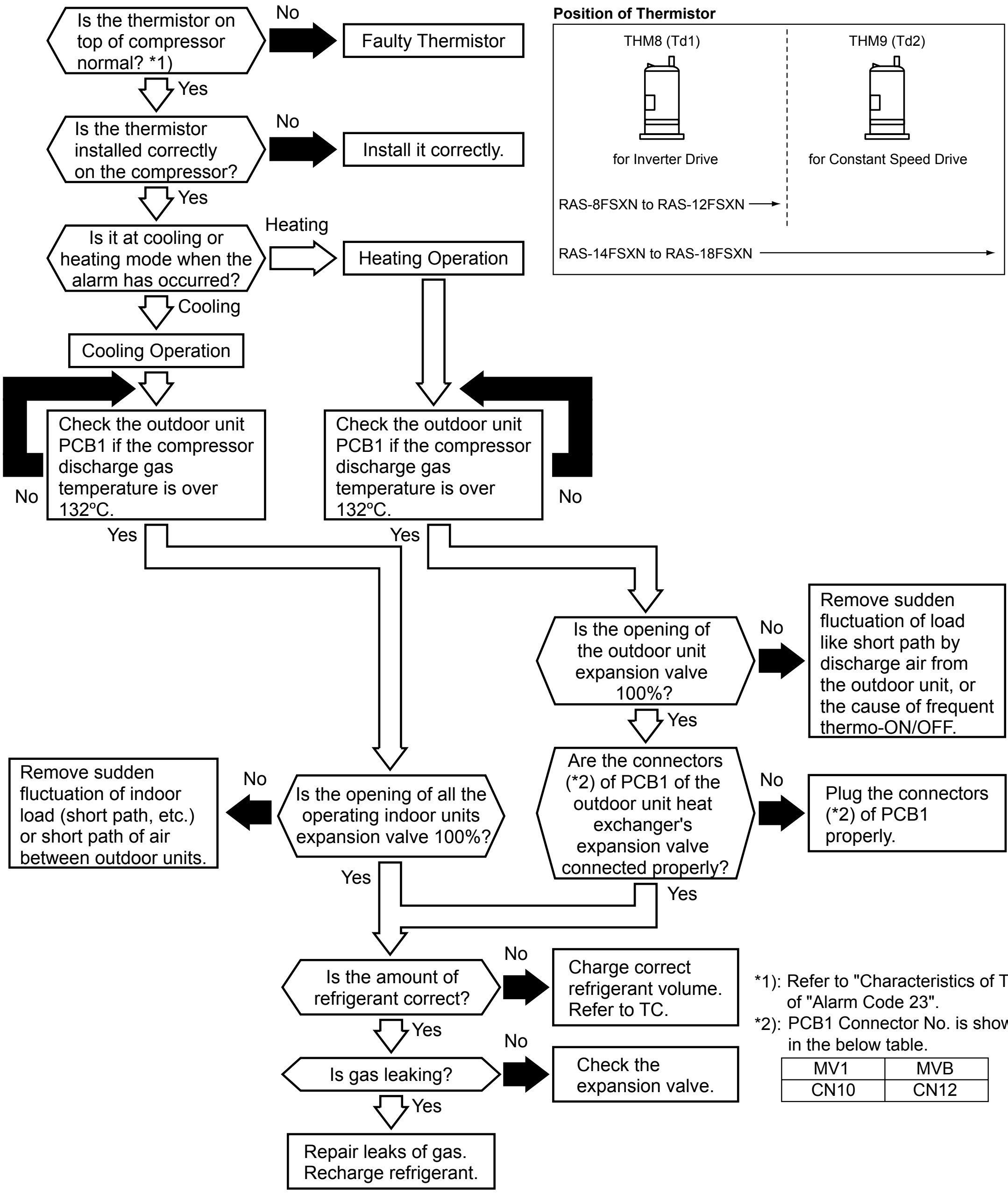
- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  *This alarm is displayed when the following conditions occurs three times in one hour:

  (1) The temperature of the thermistor on the upper part of the compressor is maintained higher than 132 °C for 10 minutes or,

  (2) the temperature of the thermistor on the upper part of the compressor is maintained higher than 140 °C for 5 seconds.

PCB1: Control PCB in Outdoor Unit



*1): Refer to "Characteristics of Thermistor" of "Alarm Code 23".
*2): PCB1 Connector No. is shown in the below table.

MV1	MVB
CN10	CN12

Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Excessively High Discharge Gas Temperature (at Top of Compressor)	Ref. Cycle is Different from the Electrical System		Check ref. cycle and the electrical system.	Repair wiring.
	Undercharge of Refrigerant		Check pressures.	Correctly charge refrigerant.
	Faulty Expansion Valve		Check expansion valve.	Replace expansion valve if faulty.
	Faulty PCB	Fault	Replace PCB and check operation.	Replace PCB if faulty.
		Disconnected Wires for Expansion Valve	Check connections.	Repair wiring connections.
	Faulty Discharge Gas Thermistor	Fault	Check resistance of thermistor.	Replace thermistor if faulty.
		Incorrect Mounting of Thermistor	Check mounting state.	Correctly mount thermistor.
		Incorrect Wiring	Check connections.	Remove looseness, replace connectors or repair connections.

Alarm code	0A	Abnormal transmission between outdoor units.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

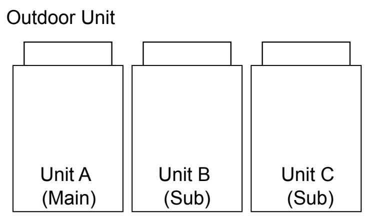
PCB1: Control PCB in Outdoor Unit
O.U.: Outdoor Unit

Is operating line between outdoor unit A and outdoor unit B connected to H-LINK transmission terminal?
- Yes → Connect operating line between outdoor unit A and outdoor unit B to O.U.~O.U. transmission terminal. Also, reset the power supply.
- No ↓

Is operating line between outdoor unit A and outdoor unit C connected to H-LINK transmission terminal?
- Yes → Connect operating line between outdoor unit A and outdoor unit C to O.U.~O.U. transmission terminal. Also, reset the power supply.
- No ↓

Is operating line between outdoor unit and outdoor unit connected INCORRECTLY?
- Yes → Correctly connect wiring between outdoor unit and outdoor unit and reset the power supply.
- No ↓

Abnormality of PCB1 in outdoor unit A

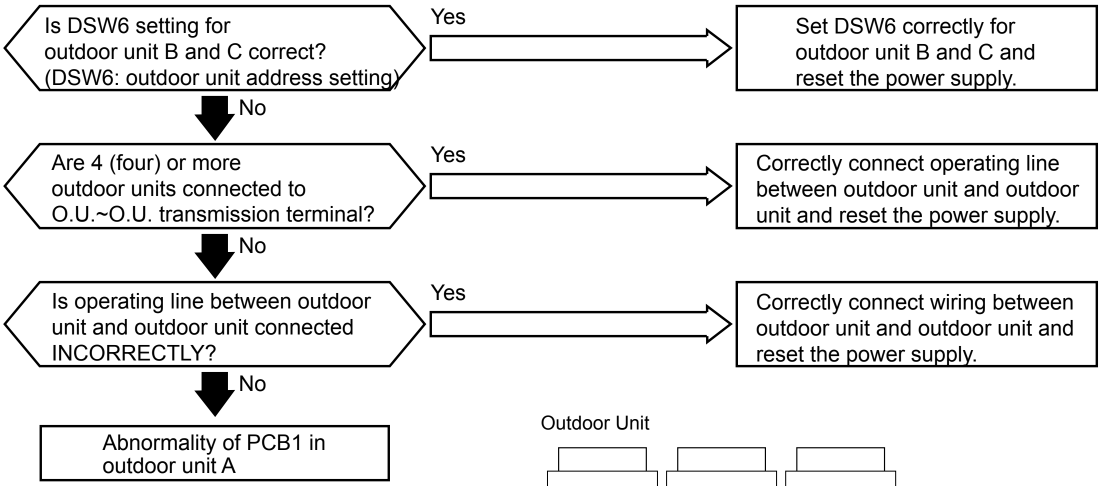


(Sub): Secondary unit(s).

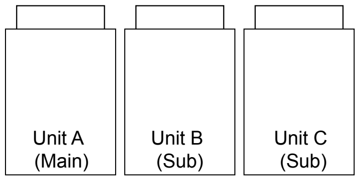
Alarm code	0b	Incorrect outdoor unit adress setting.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

PCB1: Control PCB in Outdoor Unit
O.U.: Outdoor Unit



Outdoor Unit



(Sub): Secondary unit(s).

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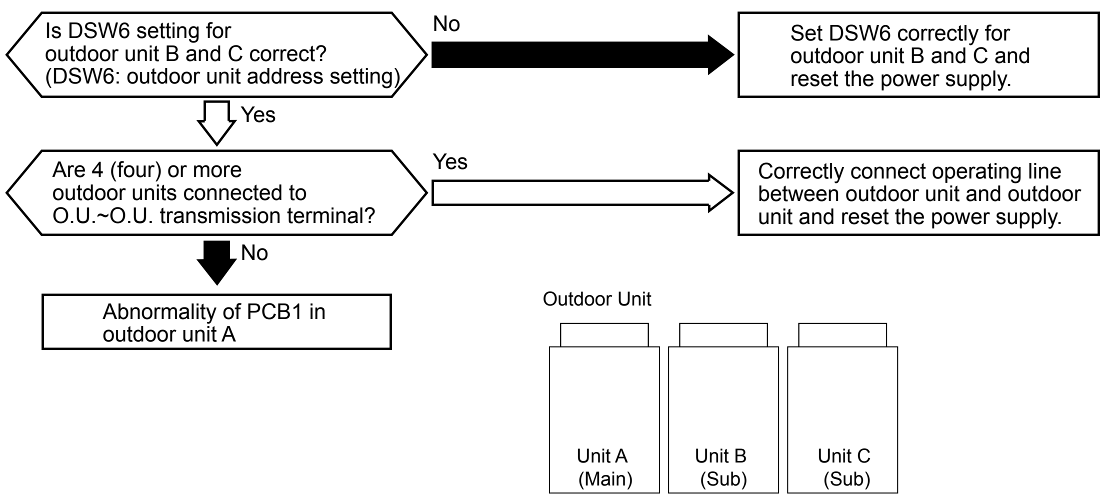
Alarm code	0C	Incorrect outdoor main unit setting.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

PCB1: Control PCB in Outdoor Unit
O.U.: Outdoor Unit



(Sub): Secondary unit(s).

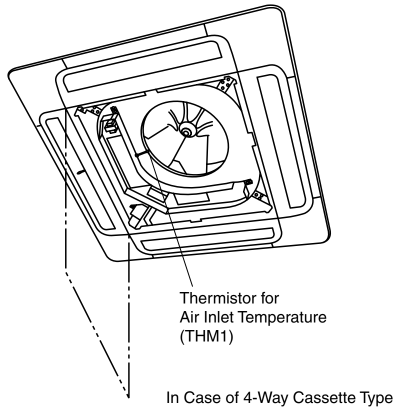
Alarm code	11	Abnormal operation of thermistor for indoor unit inlet air temperature (air inlet thermistor).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling or heating operation. The system automatically restarts when the fault is eliminated.

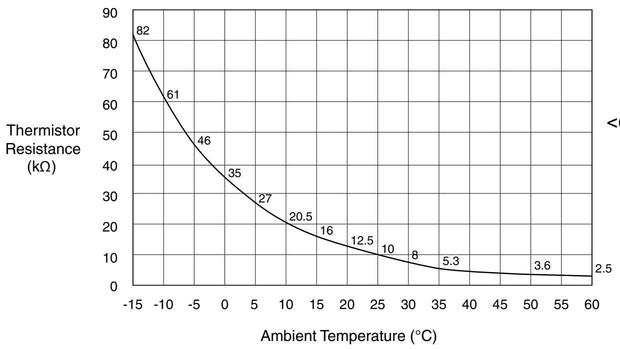
PCB1: Control PCB in Outdoor Unit
PCB: Indoor Unit PCB

Is it connected to THM1 (intake) of PCB? — No → Connect it.
↓ Yes
Is resistance of THM1 between 0.24kΩ and840kΩ? — No → Faulty Thermistor
↓ Yes
Faulty PCB



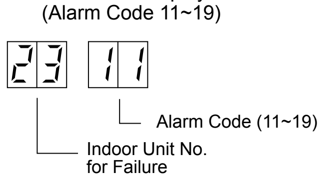
In Case of 4-Way Cassette Type

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Intake Air Thermistor	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check connection.	Connect wiring correctly.
Faulty PCB		Replace PCB and check operation.	Replace PCB if faulty.



Thermistor Characteristics

<Outdoor Unit PCB1 Display Indication>
(Alarm Code 11~19)



NOTE

This data is applicable to the following thermistors:

1. ***Outdoor unit discharge air temperature.***
2. ***Indoor unit intake air temperature.***
3. ***Indoor unit liquid piping temperature.***
4. ***Indoor unit gas piping temperature.***
5. ***Outdoor air temperature.***
6. ***Outdoor unit liquid piping temperature.***
7. ***Outdoor unit gas piping temperature.***

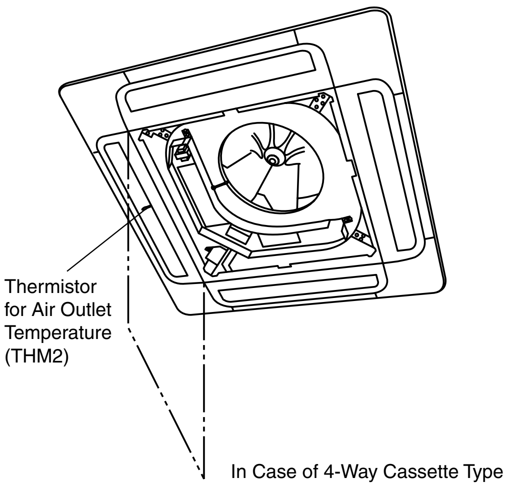
Alarm code	12	Abnormal operation of thermistor for indoor unit discharge air temperature (air outlet thermistor).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling or heating operation. The system automatically restarts when the fault is eliminated.

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

Is the thermistor connected to THM2 of PCB? — No → Connect it.
Yes ↓
Is resistance of THM2 between 0.24kΩ and 840kΩ? — No → Faulty Thermistor
Refer to "Alarm Code 11" for thermistor resistance.
Yes ↓
Faulty PCB



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Air Outlet Thermistor	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to PCB.	Connect wiring correctly.
Faulty PCB		Replace PCB and check operation.	Replace PCB if faulty.

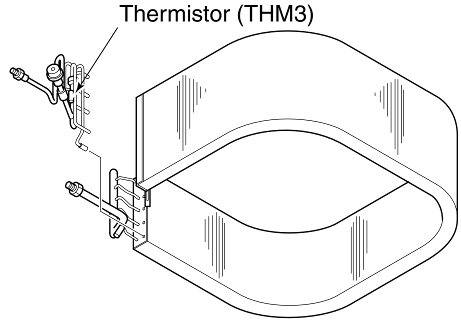
Alarm code	13	Abnormal operation of thermistor for indoor unit heat exchanger liquid refrigerant pipe temperature (freeze protection thermistor).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling or heating operation. The system automatically restarts when the fault is eliminated.

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

Is the thermistor connected to THM3 of PCB? — No → Connect it.
Yes ↓
Is resistance of THM3 between 0.24kΩ and 840kΩ? — No → Faulty Thermistor
Refer to "Alarm Code 11" for thermistor resistance.
Yes ↓
Faulty PCB



In Case of 4-Way Cassette Type

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Freeze Protection Thermistor	Fault	Check resistance.	Replace thermistor if faulty.
Faulty Freeze Protection Thermistor	Incorrect Connection	Check wiring to PCB.	Connect wiring correctly.
Faulty PCB		Replace PCB and check operation.	Replace PCB if faulty.

Alarm code	14	Abnormal operation of thermistor for indoor unit heat exchanger gas refrigerant pipe temperature (gas pipe thermistor).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the thermistor is short-circuited (less than 0.24 kΩ) or cut (greater than 840 kΩ) during the cooling or heating operation. The system automatically restarts when the fault is eliminated.

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

Is it connected to THM5 of PCB? — No → Connect it.

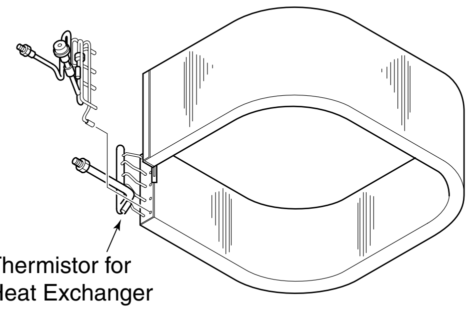
Yes ↓

Is resistance of THM5 between 0.24kΩ and 840kΩ? — No → Faulty Thermistor

Refer to "Alarm Code 11" for thermistor resistance.

Yes ↓

Faulty PCB



In Case of 4-Way Cassette Type

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Gas Pipe Thermistor	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to PCB.	Connect wiring correctly.
Faulty PCB		Replace PCB and check operation.	Replace PCB if faulty.

Alarm code	19	Activation of the protection device for the indoor unit fan motor (RCI models).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the following conditions occur three times in 30 minutes:

  * The indoor unit fan motor rotates less than 70 rpm for five seconds while it is operating.

Does the indoor fan run? — No → Check the connectors:
PCB1: CN1, CN19, PCN1, PCN7
PCB2: CN201, CN202, PCN201, PCN202, PCN203, N (Faston)

↓ Yes

Is LED1 on PCB2 OFF? — Yes → Faulty PCB2 → (Insuffcient voltage for PCB2 (DC 280V)) → Replace PCB2

↓ No

Is DC power supply for PCB2 correctly? — No → Faulty PCB2 → (Is the voltage between Vcc 15 and GND1 of PCB2 15V ±10%?) → Replace PCB2

↓ Yes

Is LED4 on PCB1 OFF? — Yes → Faulty PCB1 or transformer → (Insufficient voltage for PCB 1) → Replace PCB1 or transformer

↓ No

Is DC power supply for PCB1 correctly? — No → Faulty PCB1 or transformer → (Is the voltage between Vcc05 and GND of PCB1 5 ±5%? Is the voltage between Vcc12 and GND of PCB1 12V ±10%?) → Replace PCB1 or transformer

↓ Yes

Is fan motor speed control command to fan motor correctly? — Yes → Faulty fan motor → (Remove CN201 on PCB2. Is the voltage between CN201 #3 and GND1 more than 1V?) → Replace fan motor

↓ No

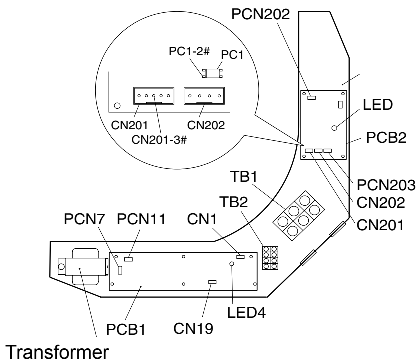
Is pulse signal to PCB2 correctly? — Yes → Faulty PCB2 → (Is the voltage between GND of PCB1 and PC1 2# of PCB2 several voltage?) → Replace PCB2r

↓ No

Faulty PCB1

↓ Yes

Replace PCB1



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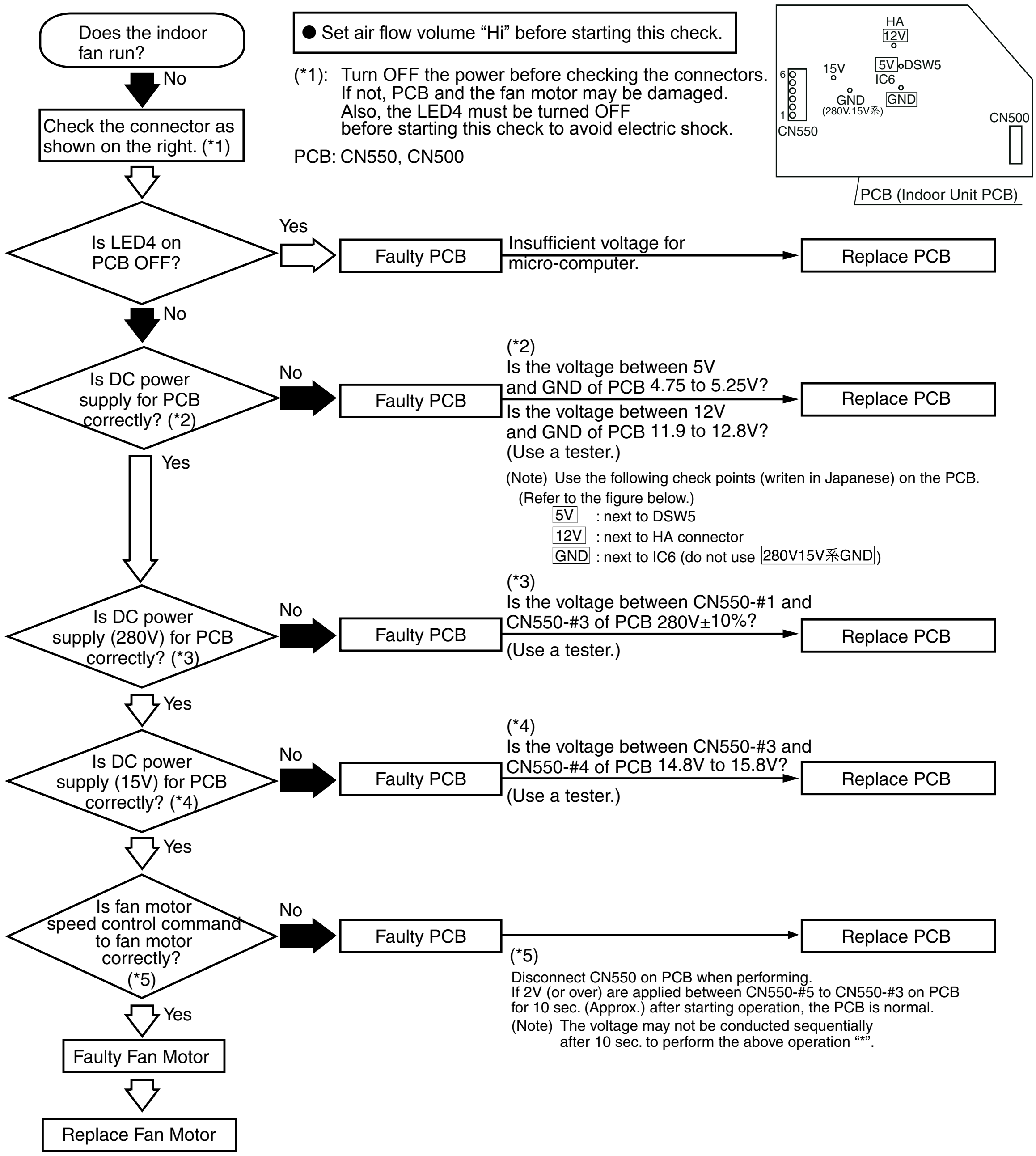
Alarm code	14	Activation of the protection device for the indoor unit fan motor (RPK models).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the following conditions occur three times in 30 minutes:

  * The indoor unit fan motor rotates less than 70 rpm for five seconds while it is operating.

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



Alarm code	19	Activation of the protection device for the indoor unit fan motor (all models except RCI and RPK).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the indoor unit fan motor internal thermostat temperature is higher than 130 °C, 135 °C, 140 °C and 145 °C.

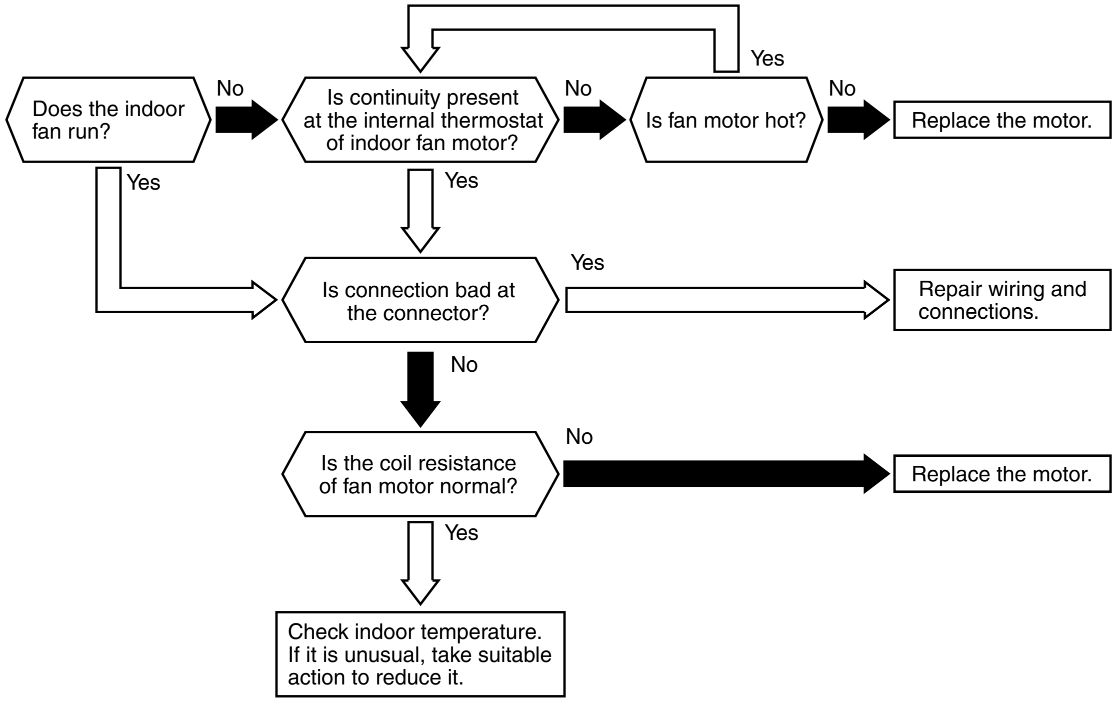
  130 °C: RCD, RPK and RPF(I).

  135 °C: RPC and RPIM.

  140 °C: RPI.

  145 °C: RCI and RCIM.

PCB1: Control PCB in Outdoor Unit



Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Activation of Internal Thermostat for Indoor Unit Fan Motor	Faulty Indoor Unit Fan Motor		Measure coil resistance and insulation resistance.	Replace motor if faulty.
	Faulty Internal Thermostat	Fault	Check continuity after fan motor temperature decreases to room temp.	Replace fan motor if no continuity.
		Insufficient Contacting	Measure resistance by tester.	Correct looseness. Replace connectors.
		Incorrect Connection	Check connections.	Repair connections.

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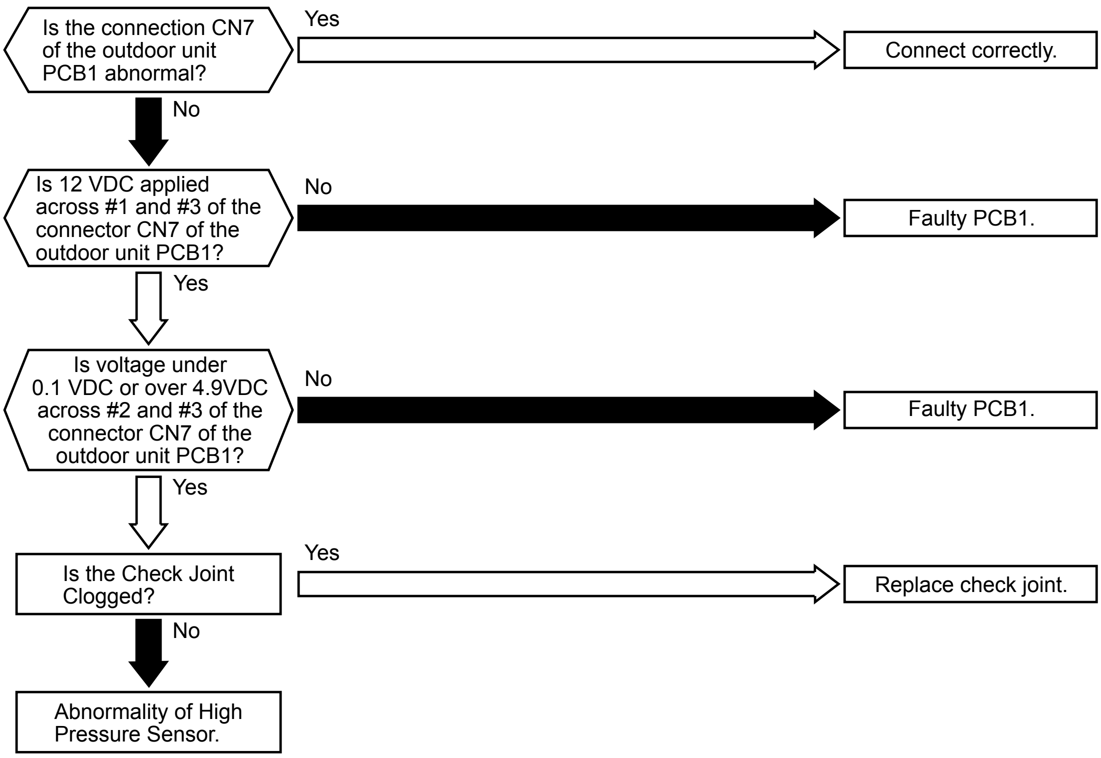
Alarm code	21	Abnormal operation of the high pressure sensor of the outdoor unit.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the pressure sensor voltage decreases lower than 0.1V or increases higher than 4.9V during the operation.

PCB1: Control PCB in Outdoor Unit



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty High Pressure Sensor	Fault	Check output voltage is correct.	Replace pressure sensor if faulty.
Faulty High Pressure Sensor	Incorrect Connection	Check connections.	Repair wiring and connections.
Faulty PCB1		Replace PCB1 and check operation.	Replace PCB1 if faulty.
Indicated Pressure Value is Excessively High or Low	Malfunction of Pressure Sensor due to Faulty Check Joint	Check for clogging of check joint.	Replace check joint.

Alarm code	22	Abnormal operation of the thermistor for outdoor air temperature (outdoor unit ambient thermistor).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated 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

Is it connected to THM7 (Ta) of PCB1? — No → Connect it.

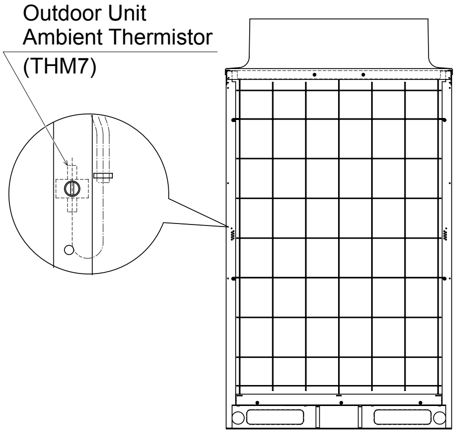
Yes ↓

Is resistance of THM7 between 0.2kΩ and 500kΩ? — No → Faulty Thermistor

Refer to "Alarm Code 11" for thermistor resistance.

Yes ↓

Faulty PCB1



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Outdoor Unit Ambient Thermistor	Fault	Check resistance.	Replace thermistor if faulty.
Faulty Outdoor Unit Ambient Thermistor	Incorrect Connection	Check wiring to PCB1.	Repair wiring and connections.
Faulty PCB1		Replace PCB1 and check operation.	Replace PCB1 if faulty.

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Alarm code	23	Abnormal operation of thermistor for discharge gas temperature at the upper part of the compressor.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section or the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the thermistor is short-circuited (less than 0.9 kΩ) or cut (greater than 5946 kΩ) during the operation.

PCB1: Control PCB in Outdoor Unit

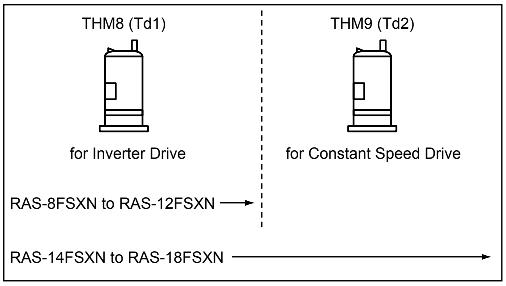
Is the setting of DSW2 on PCB1 right?
- No → Set DSW2 on PCB1 correctly.
- Yes ↓

Are discharge gas thermistors (THM8, THM9) connected to THM8 (TD1) and THM9 (TD2) on PCB1?
- No → Connect them.
- Yes ↓

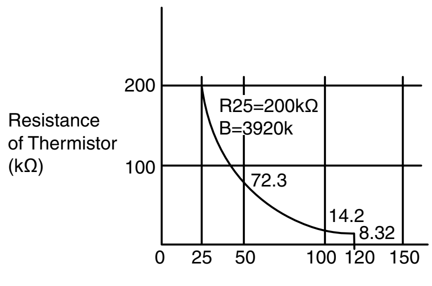
Is resistance of discharge gas thermistors (THM8 and THM9) same with characteristic in right figure?
- No → Faulty Thermistor.
- Yes ↓

Faulty PCB1

Position of Thermistor



Characteristics of Thermistor



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Discharge Gas Thermistor	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 setting of DSW2 on PCB1.	Correctly set DSW2 on PCB1.

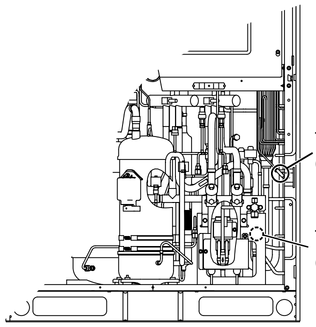
Alarm code	24	Abnormal operation of the thermistor for the outdoor unit heat exchanger liquid pipe (Te/Tchg).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  If an anomaly is detected in the thermistor, check the thermistors as follows:

  * This alarm is indicated when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 840 kΩ) for eight minutes during operation.

  * These thermistors are installed as shown in the following figure.



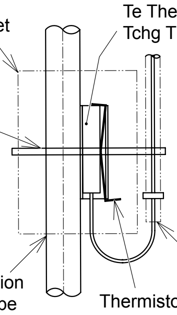
If this thermistor is faulty, this alarm is indicated.

Are thermistors connected to THM10 (Te) or THM17 (Tchg) on PCB1?
- No → Connect it.
- Yes ↓

Is resistance of the thermistor between 0.2kΩ and 500kΩ?
- No → Faulty Thermistor
  Refer to "Alarm Code 11" for thermistor resistance.
- Yes ↓

Faulty PCB1

< Details for Thermistor >



Te: Thermistor for Outdoor Liquid Pipe
Tchg: Thermistor for Super Cooling Main Line
PCB1: Control PCB in Outdoor Unit

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Outdoor Unit Liquid Pipe Thermistor	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.

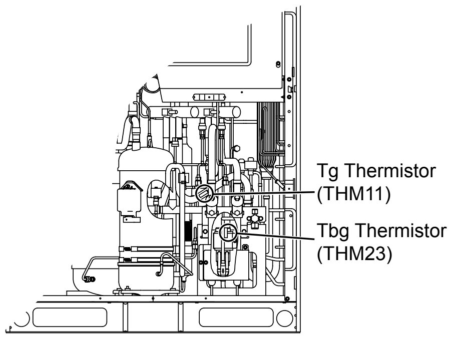
Alarm code	25	Abnormal operation of the thermistor for the outdoor unit heat exchanger gas pipe (Tg/Tbg).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  If an anomaly is detected in the thermistor, check the thermistors as follows:

  * This alarm is indicated when the thermistor is short-circuited (less than 0.2 kΩ) or cut (greater than 840 kΩ) for eight minutes during operation.

  * These thermistors are installed as shown in the following figure.



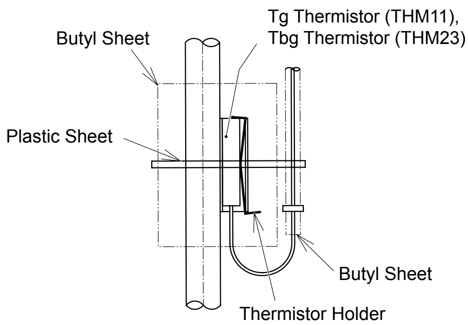
If this thermistor is faulty, this alarm is indicated.

Are thermistors connected to THM11 (Tg) or THM23 (Tbg) on PCB1?
No → Connect it.
Yes ↓

Is resistance of the thermistor between 0.2kΩ and 500kΩ?
No → Faulty Thermistor
Refer to "Alarm Code 11" for thermistor resistance.
Yes ↓

Faulty PCB1

< Details for Thermistor >



Tg: Thermistor for Outdoor Gas Pipe
Tbg: Thermistor for Super Cooling Bypass Line
PCB1: Control PCB in Outdoor Unit

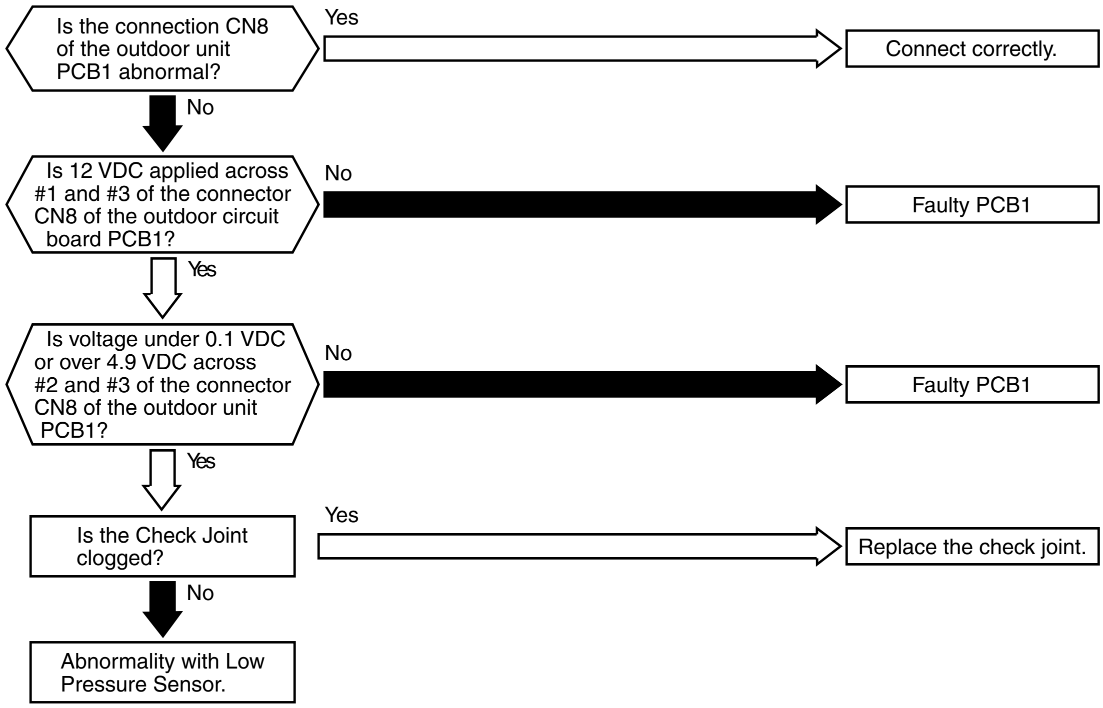
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Outdoor Unit Gas Pipe Thermistor	Fault	Check resistance.	Replace thermistor if faulty.
	Incorrect Connection	Check wiring to PCB1.	Repair wiring and connections.
Faulty PCB1		Replace PCB1 and check operation.	Replace PCB1 if faulty.

Alarm code	24	Abnormal operation of the low pressure sensor for the outdoor unit.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the pressure sensor voltage decreases lower than 0.1V or increases higher than 4.9V during operation.

PCB1: Control PCB in Outdoor Unit



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Faulty Low Pressure Sensor	Fault	Check output voltage is correct.	Replace pressure sensor if faulty.
	Incorrect Connection	Check connections.	Repair wiring and connections.
Faulty PCB1		Replace PCB1 and check operation.	Replace PCB1 if faulty.
Indicated Pressure Value is Excessively High or Low	Malfunction of Pressure Sensor due to Faulty Check Joint	Check for clogging of check joint.	Replace check joint.

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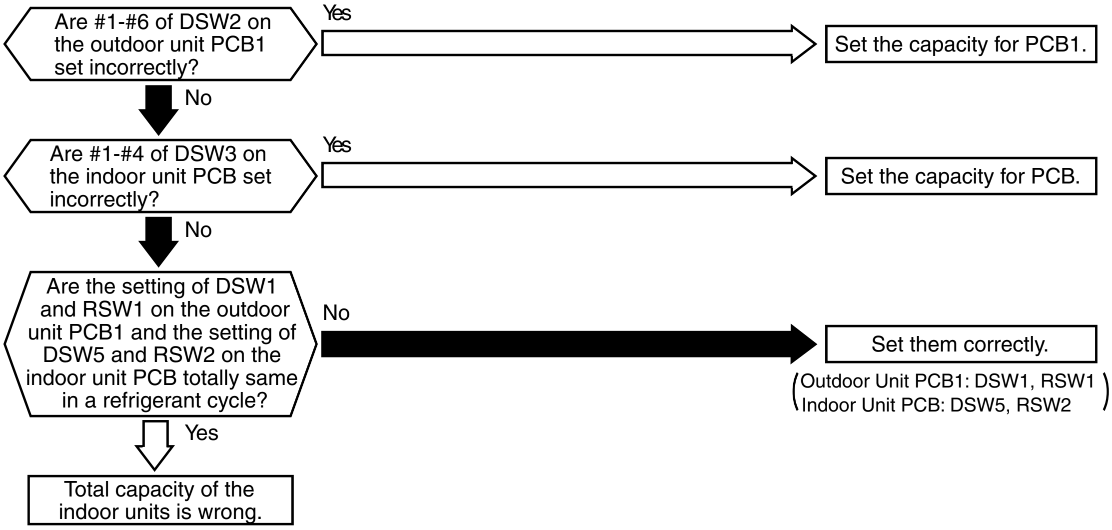
Alarm code	31	Incorrect capacity setting of the outdoor and indoor unit.

- The RUN indicator and the ALARM indication is displayed on the remote control switch flashes.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

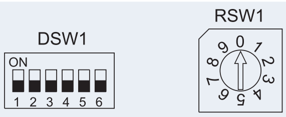
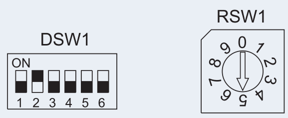
  * This alarm is indicated when the capacity setting DIP switch, DSW2 on PCB1 of the outdoor unit is not set (all the contacts from #1 to #6 are in the OFF position) or it is incorrectly set.

  * This alarm is indicated when the total capacity of the indoor unit is less than 50% or greater than 130% of the combined capacity of the outdoor unit.

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



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, DSW2.
	Total Indoor Unit Capacity Connected to the Outdoor Unit is Beyond Permissible Range	Check outdoor unit model by calculating total indoor units capacity.	Ensure that total indoor unit capacity is from 50% to 130%.
	Refrigeration Cycle Setting of Outdoor Unit and Indoor Unit is Different	Check refrigeration cycle setting on outdoor unit PCB1 and indoor unit PCB.	Set them correctly.

	Setting of the refrigerant cycle number		Setting example of the refrigerant cycle number 25
			
Outdoor unit	DSW1, (10 digits)	RSW1, (1 digit)	
Indoor unit (H-LINK II)	DSW5	RSW2	

- Setting before shipment RSW1 and DSW1 is 0.
- Maximum refrigerant cycle number setting: 63.

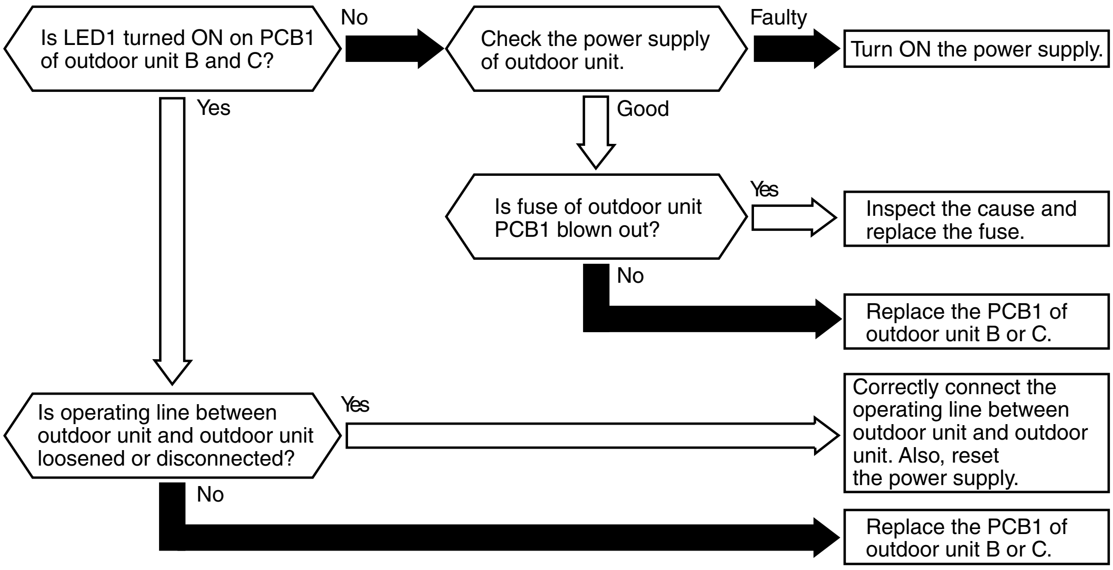
Alarm code	31	Abnormal transmission between outdoor units.

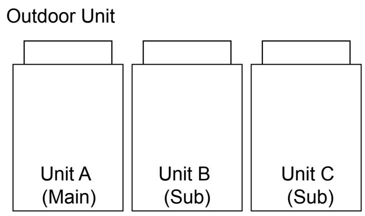
- The RUN indicator on the remote control switch flashes and the ALARM indication is displayed.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

* This alarm is indicated when the following conditions occur after maintaining a normal transmission between the outdoor and indoor unit.

- The anomaly is maintained for 30 seconds.
- The anomaly is maintained for 30 seconds after the microcomputer automatically reset.

PCB1: Control PCB in Outdoor Unit





(Sub): Secondary unit(s).

Alarm code	35	Incorrect indoor unit number setting.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated 5 minutes after power is supplied to the outdoor unit when the indoor unit number connected to the outdoor unit is duplicated by the DSW and RSW setting.

NOTE

In the case of H-LINK systems, this alarm code is indicated when DSW1 and RSW1 of PCB1 of the outdoor unit and DSW5 and RSW2 of the PCB of the indoor unit are incorrectly set.

In this case, set them properly after turning OFF the main power switch and turn ON again the main power switch.

When the setting of the refrigerant cycle number of the outdoor unit (H-LINK II) and one of the outdoor unit (H-LINK) is duplicated, alarm code "35" can be ON and OFF repeatedly.

PCB1: Control PCB for the outdoor unit.

Alarm code	36	Incorrect indoor unit combination.

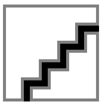
- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  *This alarm is indicated when the indoor unit connected to the outdoor unit is designed for R22 refrigerant.

Alarm code	38	Abnormality of picking up circuit for protection in the outdoor unit.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when 220V or 240V in A* are not detected during the stoppage of the Inverter compressor .



Phenomenon	**Cause**	**Check Item**	**Action (Turn OFF Main Switch)**
Activation of Picking up Circuit for Protection	Starting Outdoor Unit at Activation of Pickig up Circuit for Protection	Alarm Code History: “02” and “09” before “38”.	Refer to Alarm Code “02” and “09”
Abnormality of Picking up Circuit for Protection	Incorrect Connection	Check voltage supplied to connectors.	Repair wiring connections.
Faulty PCB1			Replace PCB1.

*1): Check wiring system connecting to PCN2 and PCN16 on PCB1.

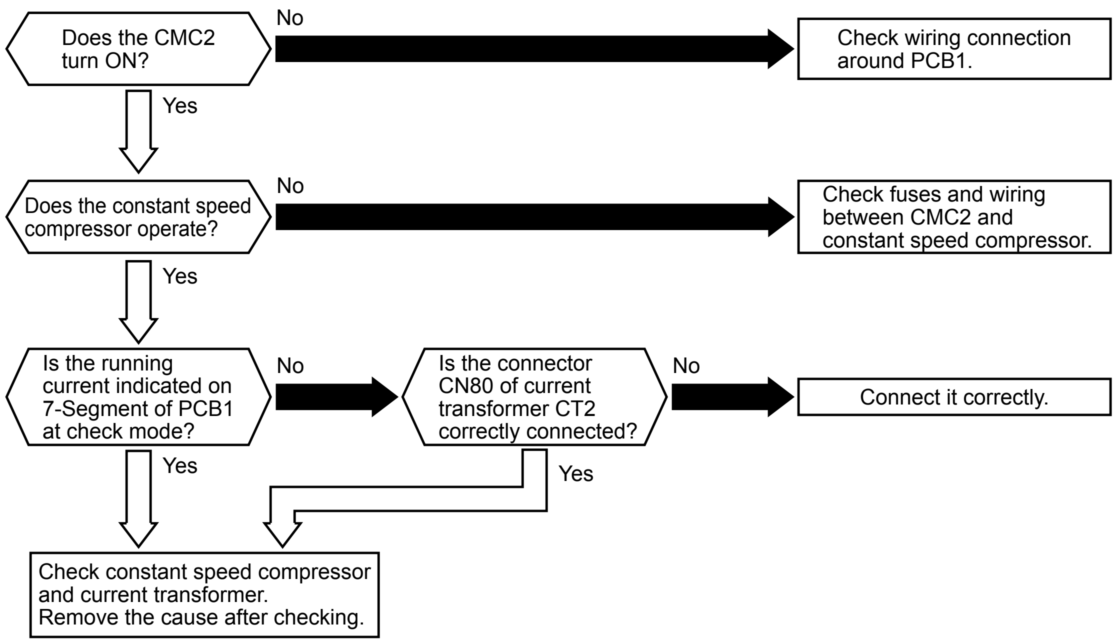
Alarm code	39	Abnormal operation of running current in constant speed compressor.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

* This alarm is indicated when the following conditions occur:

- The operating current of the constant speed compressor exceeds the ovecurrent limitation value during operation.
- The constant speed compressor running current detected is 0A and retry when three minutes have passed after all the compressors are stopped, and this occurs three times in a thirty minute time period.

PCB1: Control PCB in Outdoor Unit



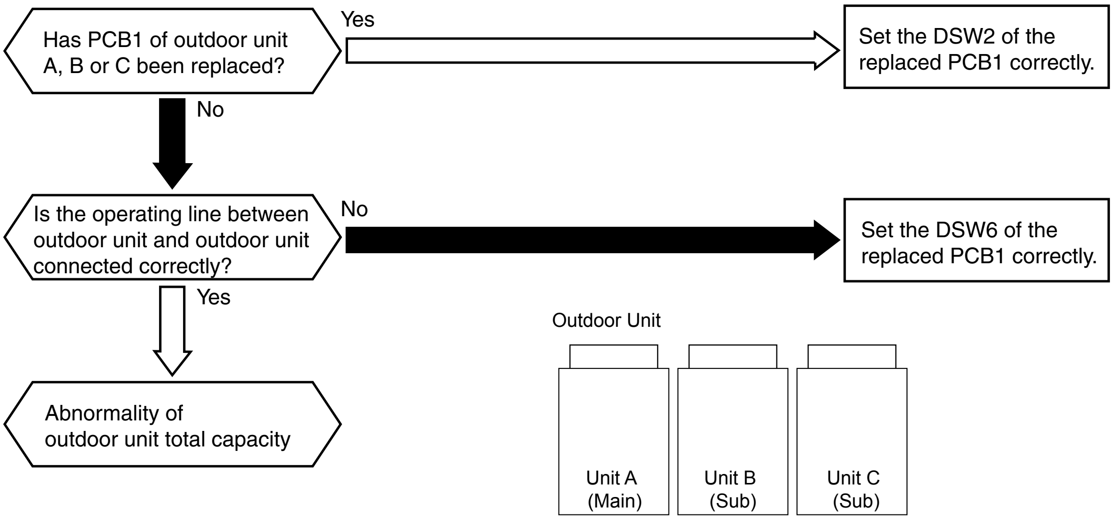
Phenomenon	Cause		Check Item	Action (Turn OFF Main Switch)
Overcurrent of Compressor Motor	Excessively Large Running Current of Compressor Motor		Excessively High or Low Voltage of Power Source	Operate within 400V ± 10%
			Imbalance Among Phase at Power Source	Adjust voltage between each phase.
			Excessively High Discharge Pressure	Check for causes.
	Single Phase Operation		Melted Fuse for Power Source	Replace the fuses.
			Looseness of Screws for Power Source	Tightly fix screws.
			Deterioration of Contact of Magnetic Switch for Compressor	Replace magnetic contactor.
	Failure of Compressor Bearing		Locked-up?	Replace compressor.
	Insulation Failure of Compressor Motor		Measure insulation resistance.	Replace compressor.
	Faulty CT	Fault	Check continuity during stoppage.	Replace CT when faulty.
		Incorrect Connection	Measure resistance by tester.	Remove looseness and replace connector.
		Incorrect Wiring	Check wiring.	Correctly wiring.

Alarm code	3A	Abnormal outdoor unit capacity.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the total capacity of the outdoor unit connected to the transmission terminal of the O.U. - O.U. exceeds 54 HP.

PCB1: Control PCB in Outdoor Unit
O.U. Outdoor Unit



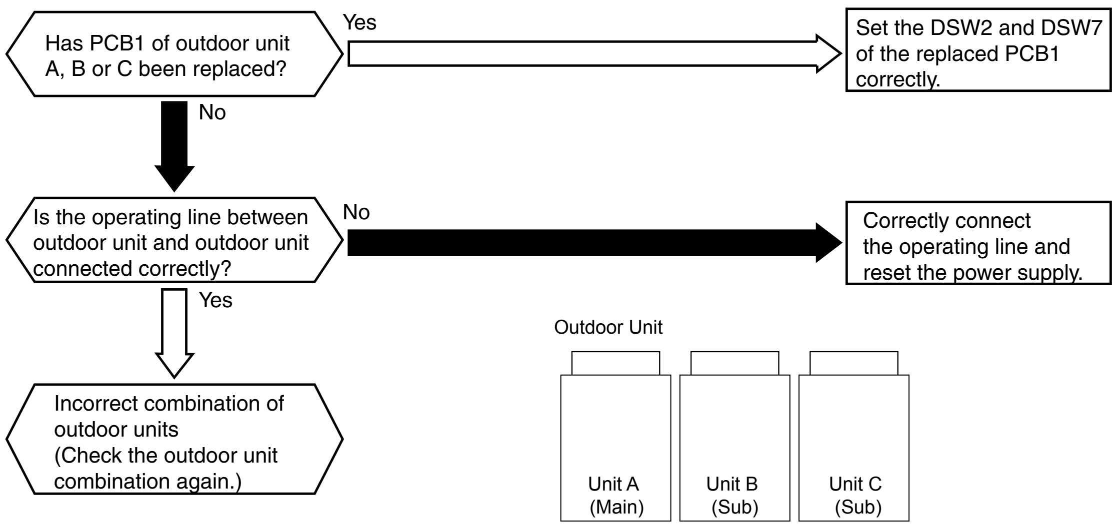
(Sub): Secondary unit(s).

Alarm code	3b	Incorrect setting of outdoor unit model combination or voltage.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the model setting of the outdoor unit connected to the transmission terminal of the O.U. - O.U. is incorrect.

PCB1: Control PCB in Outdoor Unit
O.U. Outdoor Unit



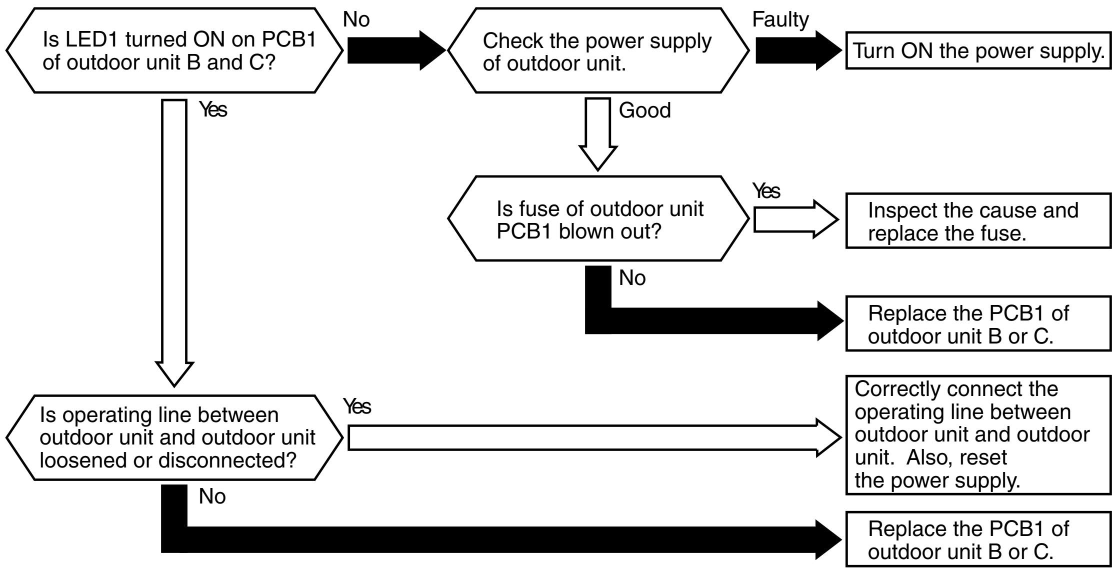
(Sub): Secondary unit(s).

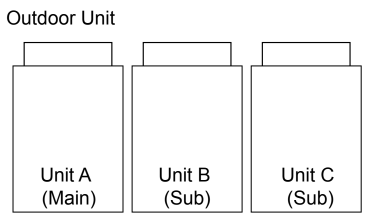
Alarm code	3d	Abnormal transmission between the main unit and the secondary unit(s).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the transmission to outdoor unit B or C is not maintained for thirty seconds (alarm code "31" will be indicated when the transmission to all the outdoor units connected to transmission terminal of the O.U. - O.U. is not maintained).

PCB1: Control PCB in Outdoor Unit
O.U.: Outdoor Unit





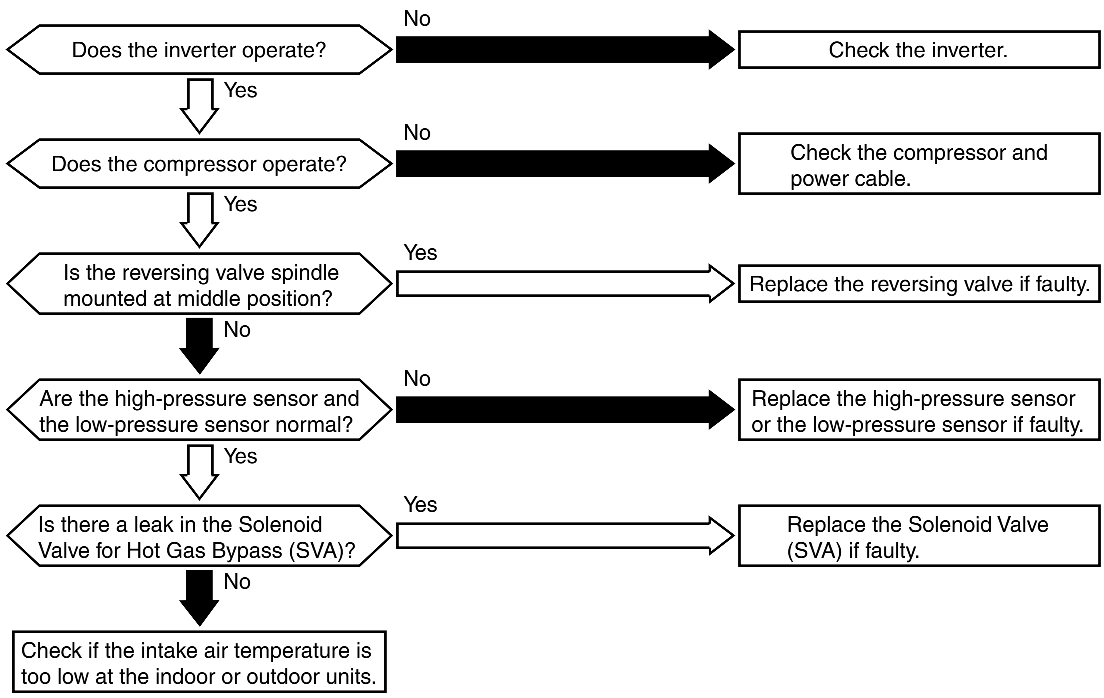
(Sub): Secondary unit(s).

Alarm code	43	Activation of the low compression ratio protection device.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the compression ratio, $\varepsilon = ((Pd + 0.1) / (Ps + 0.06))$ is calculated from the discharge pressure (Pd MPa) and the suction pressure (Ps MPa) and the less than condition $\varepsilon < 1.8$ occurs three times in one hour.

PCB1: Control PCB in Outdoor Unit



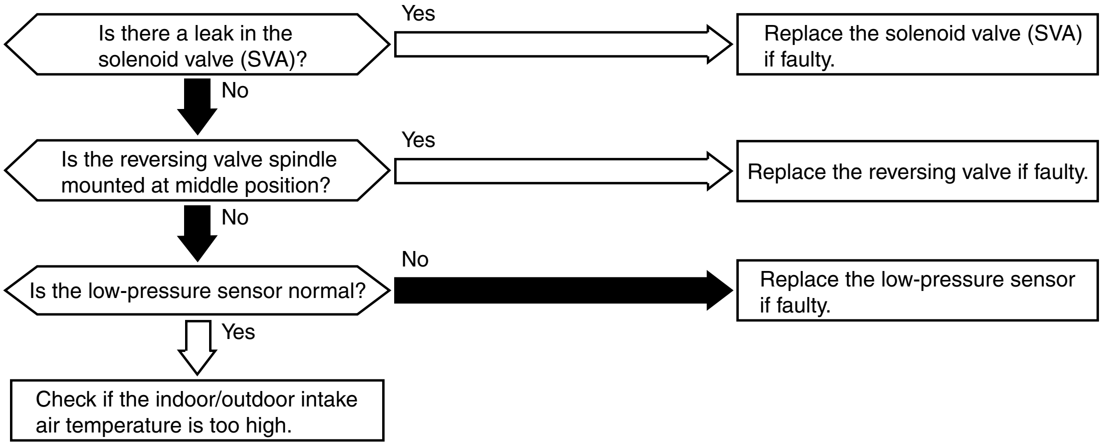
Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Low Compression Ratio	Inverter is not Functioning	Check inverter.	Repair faulty part.
	Compressor is not Operating	Check compressor.	Replace comp. if faulty.
	Valve Stoppage at Middle Position of Reversing Valve	Measure suction pipe temp. of reversing valve.	Replace reversing valve if faulty.
	Abnormality of High or Low Pressure Sensor	Check connector for PCB1, power source and pressure indication.	Replace sensor if faulty.
	Excessively Low Indoor Intake Air Temperature	Check indoor unit and outdoor unit air temp. thermistor.	Replace thermistor if faulty.
	Leakage from Solenoid Valve (SVA)	Check Solenoid Valve.	Replace SVA if leaking.

Alarm code	44	Activation of the low pressure increase protection device.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * In the case that the compressor operates under a greater suction pressure (Ps) condition than 1.4 MPa for 1 minute, all the compressors stop operating and retry operation is started after three minutes. However, this alarm is indicated when the same phenomenon occurs twice in the next thirty minutes.

PCB1: Control PCB in Outdoor Unit



Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Low Suction Pressure	Leakage of Solenoid Valve (SVA)	Check outlet pipe temp. of solenoid valve (SVA).	Check connecting wires. Replace solenoid valve (SVA) if faulty.
	Valve Stoppage at Middle Position of Reversing Valve	Measure suction gas pipe temp. of reversing valve.	Replace reversing valve if faulty.
	Abnormal Suction Pressure Sensor	Check connectors of PCB1 and power source.	Replace sensor if faulty.
	Excessively High Indoor Unit and Outdoor Unit Suction Air Temperature	Check indoor unit and outdoor unit suction air temp. thermistor.	Replace thermistor if faulty.

Alarm code	45	Activation of the high pressure increase protection device.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * In the case that the compressor operates under a greater discharge pressure (Pd) condition than 3.8 MPa for 1 minute, all the compressors stop operating and retry operation is started after three minutes. However, this alarm is indicated when the same phenomenon occurs twice in the next thirty minutes.

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

- Is there a leakage of the solenoid valves (SVA)?
  - Yes → Replace the solenoid valve (SVA) if faulty.
  - No ↓
- Is the outdoor unit stop valve closed?
  - Yes → Open the stop valve.
  - No ↓
- Is the high-pressure sensor normal?
  - No → Check connection of the circuit board connector. Replace the high-pressure sensor if faulty.
  - Yes ↓
- Are expansion valves fully closed and locked?
  - Yes → Check the circuit board and connection of the circuit board connector. Replace the electronic expansion valves if faulty.
  - No ↓ Check the outdoor electronic expansion valve during cooling and the indoor electronic expansion valve during heating.
- Are electric wiring and refrigerant piping between the indoor and outdoor unit incorrectly connected?
  - Yes → Correctly connect it.
  - No ↓
- Check if indoor or outdoor intake air temperature is too high.

NOTE:
In the case of H-LINK system, check the refrigerant system setting of the outdoor PCB1 and indoor PCB.

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively High Discharge Pressure	Leakage of Solenoid Valve (SVA)	Check outlet temp. of solenoid valve (SVA).	Check connection. Replace solenoid valve (SVA) if faulty.
	Closed Stop Valve	Check stop valve.	Open stop valve.
	Abnormal High Pressure Sensor	Check connectors for PCB1.	Replace pressure sensor if faulty.
	Excessively High Indoor Unit and Outdoor Unit Inlet Air Temp.	Check thermistor for indoor unit and outdoor unit inlet air temp.	Replace thermistor if faulty.
	Incorrect Connection between Indoor Unit and Outdoor Unit	Check electrical system and ref. cycle.	Correctly connect.
	Locked Expansion Valve with Fully Closed	Check connector for PCB.	Repair connector for PCB or expansion valve. Replace it if faulty.
Stoppage of Indoor Fan <Wall Type 1.0 to 3.0HP Only>	Melted Fuses	Check continuity of fuses.	Replace fuses.
	Faulty PCB	Replace PCB and check operation.	Replace PCB if faulty.

HITACHI
Inspire the Next

Alarm code	47	Activation of the low pressure decrease protection device (Vacuum operation protection).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the suction pressure (Ps) is lower than 0.09 MPa for more than twelve minutes and this condition occurs three or more times in one hour.

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

- Is the amount of refrigerant correctly? — No → Correctly charge refrigerant.
  - Yes ↓
- Is the outdoor stop valve open? — No → Open the stop valve.
  - Yes ↓
- Is refrigerant leaking? — Yes → Repair leaks.
  - No ↓
- Is suction pressure sensor normal? — No → Replace suction pressure sensor if faulty.
  - Yes ↓
- Are the electronic expansion valves fully closed and locked? — Yes → Check connection of the connectors and the circuit board. Replace the electronic expansion valves if faulty.
  - No ↓ Check the indoor expansion valve during cooling and the outdoor expansion valve during heating.
- Check if connections of electric wiring and refrigerant piping between the indoor and outdoor unit are wrong.

NOTE:
In the case of H-LINK system, check the refrigerant system setting of the outdoor PCB1 and indoor PCB.

Phenomenon	Cause	Check Item	Action (Turn OFF Main Switch)
Excessively Low Suction Pressure (in Vacuum)	Shortage of Ref.	Check ref. charged volume or check for leakage.	Repair leakage and correctly charge.
	Closed Stop Valve	Check stop valve.	Open stop valve.
	Abnormal Low or High Pressure Sensor	Check connector for PCB1.	Replace pressure sensor if faulty.
	Incorrect Connection between Indoor Unit and Outdoor Unit	Check electrical system and ref. cycle.	Correctly connect between indoor unit and outdoor unit.
	Locked Expansion Valve with Fully Closed	Check connector for PCB.	Repair connector for PCB or expansion valve. Replace it if faulty.
	Closed Expansion 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 Operation	Faulty Outdoor Fan Motor	Measure coil resistance and insulation resistance.	Replace outdoor fan motor if faulty.
	Faulty Internal Thermostat – Fault	Check for conduction after temperature of outdoor fan motor is decreased.	Replace outdoor fan motor.
	Faulty Internal Thermostat – Incorrect Contact	Measure resistance by tester.	Remove looseness and replace connector.
	Faulty Internal Thermostat – Incorrect Connection	Check connection.	Connect correctly.

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HITACHI
Inspire the Next

Alarm code	48	Activation of Inverter overcurrent protection device (1).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

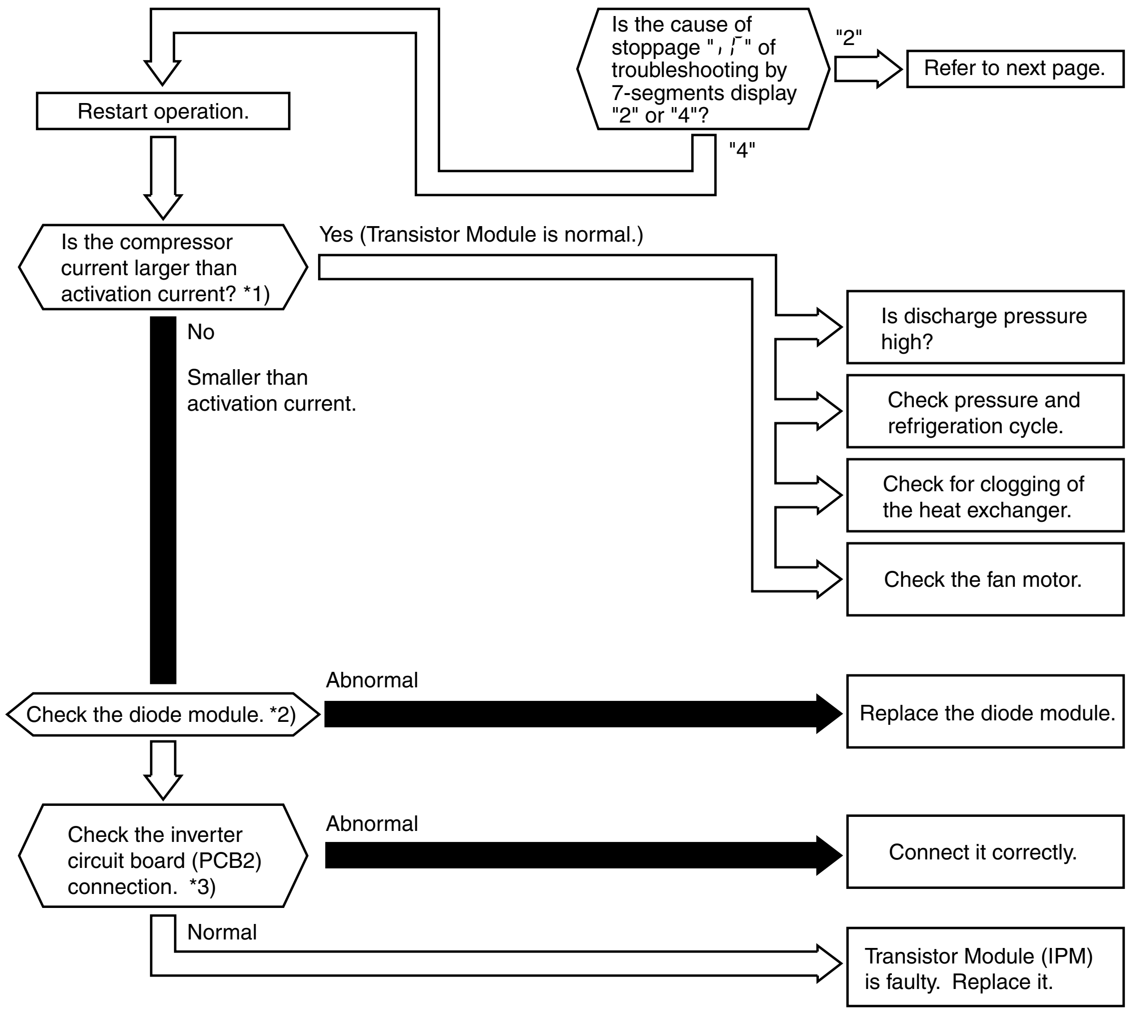
  * This alarm is indicated when the Inverter electronic thermal protection is activated six times in thirty minutes (retry operation is carried out up to five times).

  Activation conditions;

  Inverter current with 105% of the rated current runs continuously for thirty seconds, or

  Inverter current runs intermittently and the accumulated time is reaches up to three minutes in a ten minute period.

PCB1: Control PCB in Outdoor Unit
PCB2: Inverter PCB



*1): Regarding the activation current value setting, refer to *Inverter specifications, see on page 330*.

*2): Regarding the checking or replacement of the diode module, refer to *Checking procedures for other main parts, see on page 267*.

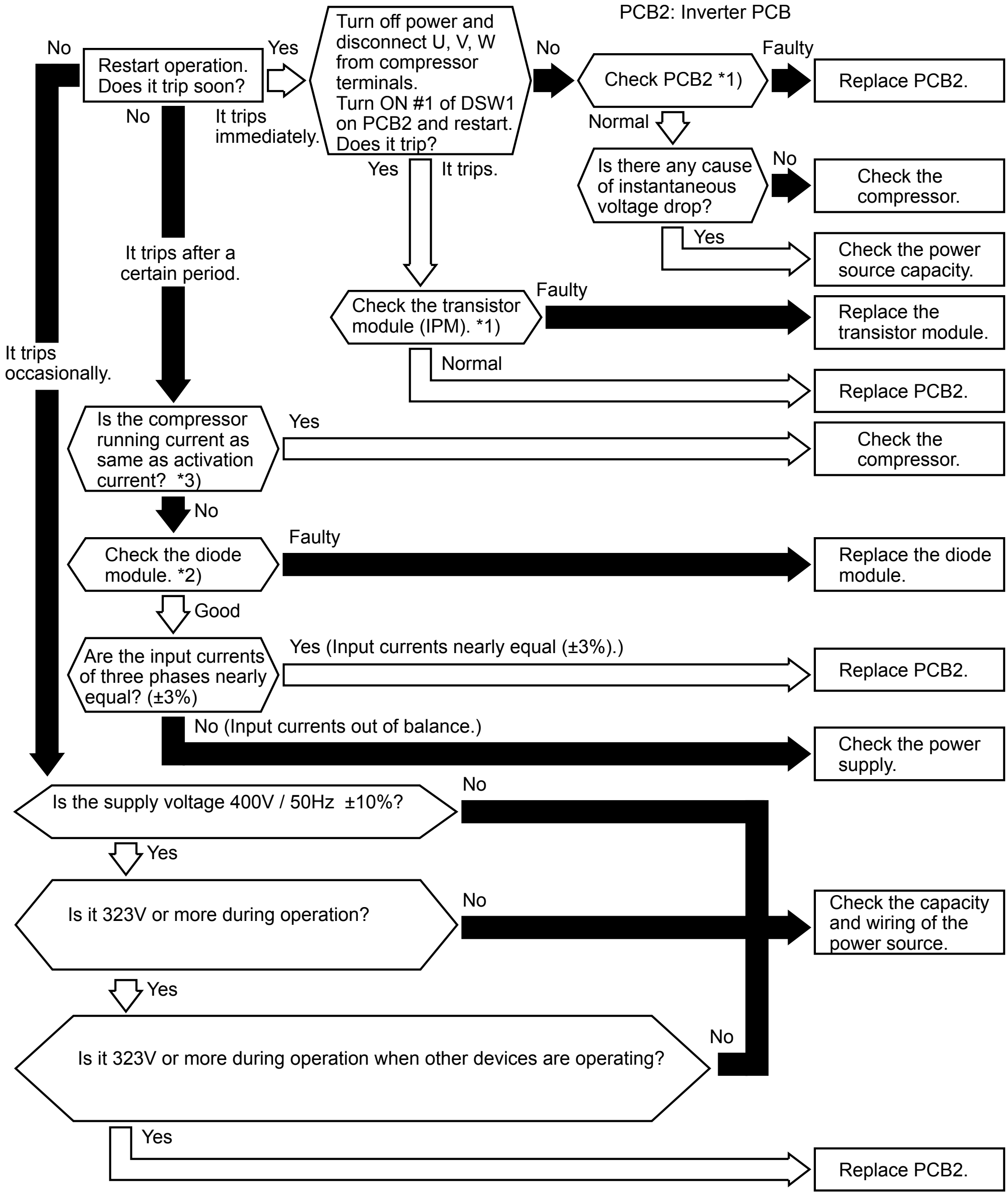
*3): Regarding the checking method or replacement of the Inverter parts, refer to *Checking procedures for other main parts, see on page 267*.

Alarm code	48	Activation of Inverter overcurrent protection device (2).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when instantaneous overcurrent occurs six times in thirty minutes (retry operation is carried out up to five times).

  Activation condition: Inverter current with 150% of the rated current.



*1) Carry out the electrical discharge when Inverter parts are checked or replaced, refer to *Checking procedures for other main parts*, *see on page 267*.

*2): Before checking the diode module, refer to *Checking procedures for other main parts*, *see on page 267*.

*3): Regarding the activation current value setting, refer to *Inverter specifications*, *see on page 330*.

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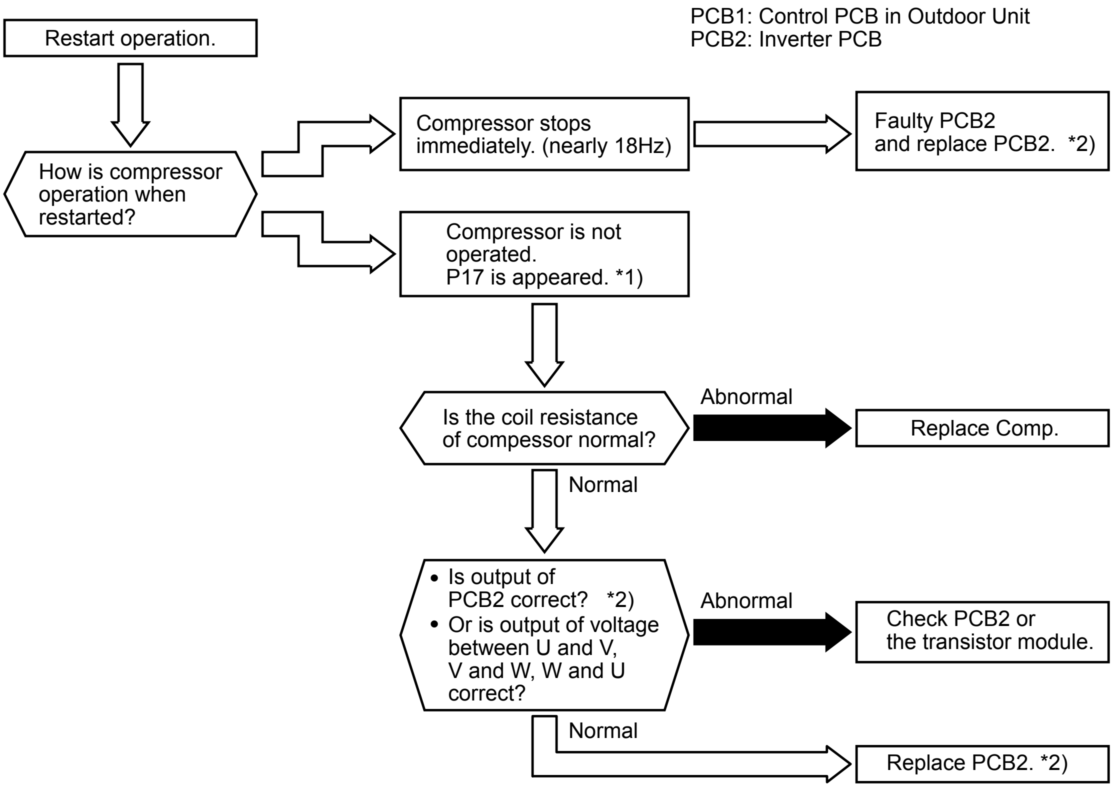
Alarm code	51	Abnormal Inverter current sensor.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * In the case that the current transformer anomaly (0A detection) occurs three times in thirty minutes, this alarm is indicated on the third time (retry operation is carried up to the second time the anomaly is detected)

  Activation condition:

  When the compressor frequency is maintained between 15 and 18 Hz after the compressor is started, one of the absolute running current values detected by the current transformer in each phase U+, U-, V+ and V- is equal or less than 1.5 A.



*1): P17 is displayed on the 7-segment display of the outdoor unit PCB1.

*2): Carry out the high voltage discharge before Inverter parts are checked or replaced, refer to *Checking procedures for other main parts, see on page 267* .

Alarm code	53	Inverter error signal detection.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * The IPM (Transistor module) has detecting function of abnormality.

  This alarm is indicated when the transistor module detects the anomaly seven times in thirty minutes (retry operation is carried out up to sixth times).

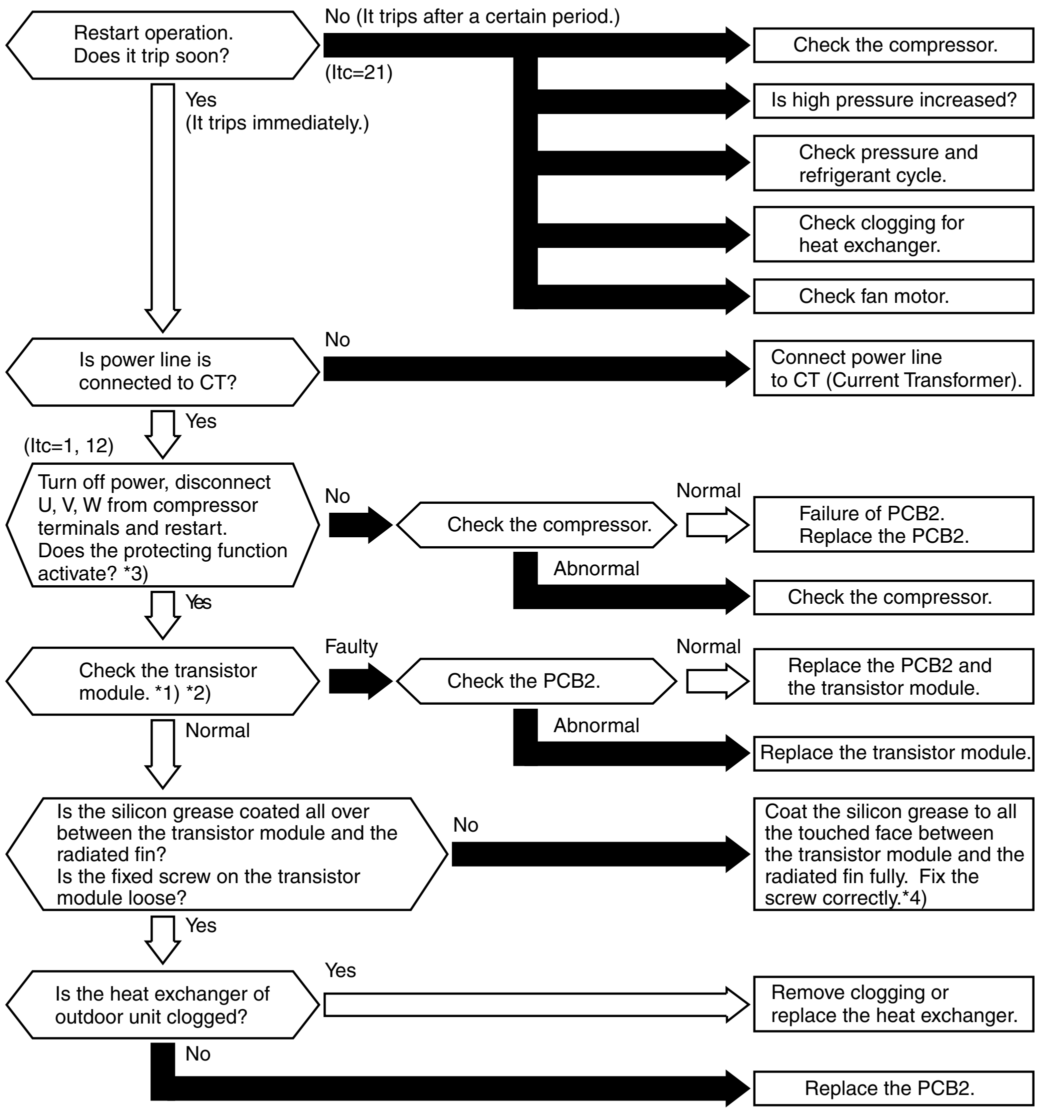
  Activation conditions:

  Abnormal current to the transistor module, such as a short-circuit or earth leakage, or

  Abnormal temperature in the transistor module, or

  Decrease in control voltage.

PCB1: Control PCB in Outdoor Unit
PCB2: Inverter PCB



*1): Carry out the electrical discharge when Inverter parts are checked or replaced, refer to *Checking procedures for other main parts, see on page 267*.

*2): Regarding the method for checking the transistor module, refer to: *Checking procedures for other main parts, see on page 267*.

*3): Place contact 1 of DSW1 on PCB2 to the ON position when restarting with the compressor terminals disconnected. After troubleshooting, place contact 1 of DSW1 on PCB2 to the OFF position.

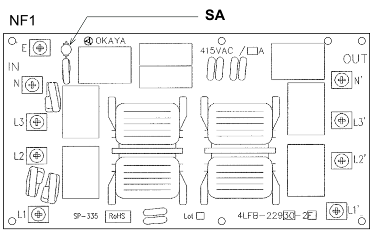
*4): Use silicone grease supplied as an accessory (Service part No. P22760).

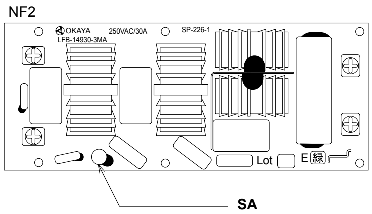
NOTE

When the unit is applied the excessive surge current due to lightning or other causes, this alarm code "53" or Inverter stoppage code (IT) "11" is indicated and the unit cannot be operated. In this case, check to ensure the surge absorver (SA) in the noise filter (NF1, NF2). The surge absorver may be damaged if the inner surface in the SA is black. If so, replace surge absorver.

If the inside of the surge absorver is normal, turn OFF the power supply and wait for LED201 (red) of PCB2 OFF (approximately 5 minutes) and turn ON power supply again.

Positioning of the surge absorver:





SA: Surge absorver.

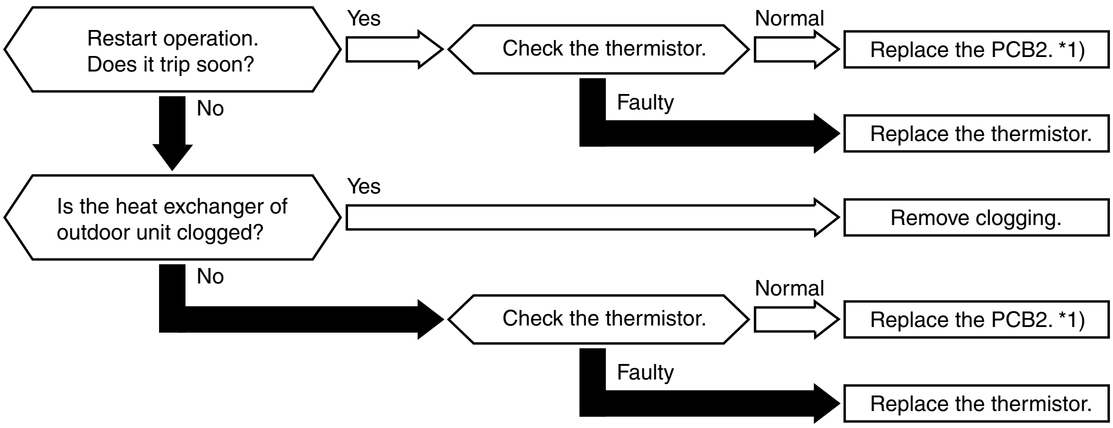
Alarm code	54	Abnormal Inverter fin temperature.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * In the case that the Inverter fin temperature anomaly occurs three times in thirty minutes, this alarm is indicated on the third time (retry operation is carried out up to second time the anomaly occurs).

  Activation condition: this alarm operation is indicated when the Inverter fin thermistor temperature for the transistor module is greater than 90 °C.

PCB1: Control PCB in Outdoor Unit
PCB2: Inverter PCB



*1): Carry out the electrical discharge when Inverter parts are checked or replaced, refer to *Checking procedures for other main parts, see on page 267*.

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Alarm code	55	Inverter failure.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the following phenomenon occurs three times in thirty minutes (retry operation is carried up to the second time the anomaly occurs).

  The actual frequency from PCB2 is less than 10 Hz (after the Inverter frequency output from PCB1).

  Activation condition: this alarm is indicated when PCB2 is not performed normally.

PCB1: Control PCB in Outdoor Unit
PCB2: Inverter PCB

Turn off power (LED201 OFF) and restart operation. Is alarm code “55” indicated again?

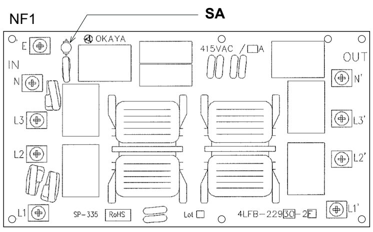
No → PCB2 is normal. Check the noise filter. *1)

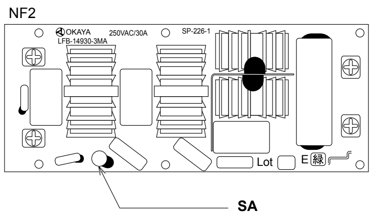
Yes → Replace the PCB2.

*1): When the unit is applied the excessive surge current due to lightning or other causes, alarm code "55" or Inverter stoppage code (IT) "11" is indicated and the unit cannot be operated. In this case, check to ensure the surge absorver (SA) in the noise filter (NF1, NF2). The surge absorver may be damaged if the inner surface of the SA is black. If so, replace the surge absorver.

If the inside of the surge absorver is normal, turn OFF the power supply and wait for LED201 (red) of PCB2 OFF (approximately 5 minutes) and turn ON power supply again.

Positioning of surge absorver:





SA: Surge absorver.

Alarm code	57	Activation of fan controller protection.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * The IPM (Transistor module) has detecting function of abnormality.

  This alarm is indicated when the anomaly is detected ten times in thirty minutes (retry operation is carried out up to the ninth time the anomaly is detected).

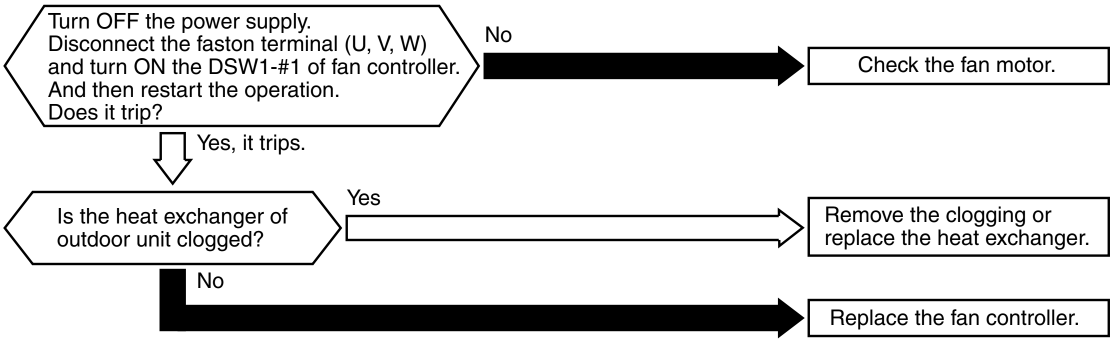
  Activation conditions:

  Abnormal current to the transistor module, such as a short-circuit or earth leakage, or

  Overcurrent, or

  Decrease in control voltage.

PCB1: Control PCB in Outdoor Unit

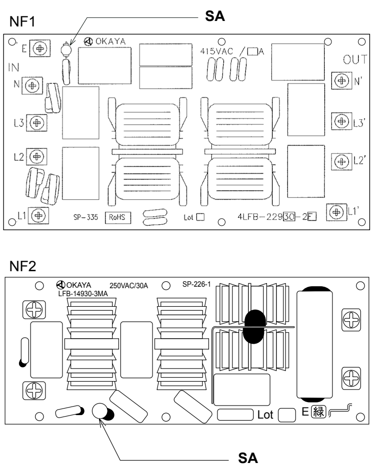


NOTE

When the unit is applied the excessive current due to lightning or other causes, alarm code "57" or Inverter stoppage code (IT) "11" is indicated and the unit cannot be operated. In this case, check to ensure the surge absorver (SA) in the noise filter (NF1, NF2). The surge absorver may be damaged if the inner surface of the SA is black. If so, replace the surge absorver.

If the inside of the surge absorver is normal, turn OFF the power supply and wait for LED201 (red) of PCB2 OFF (approximately 5 minutes) and turn ON power supply again.

Position of surge absorver:



SA: Surge absorver.

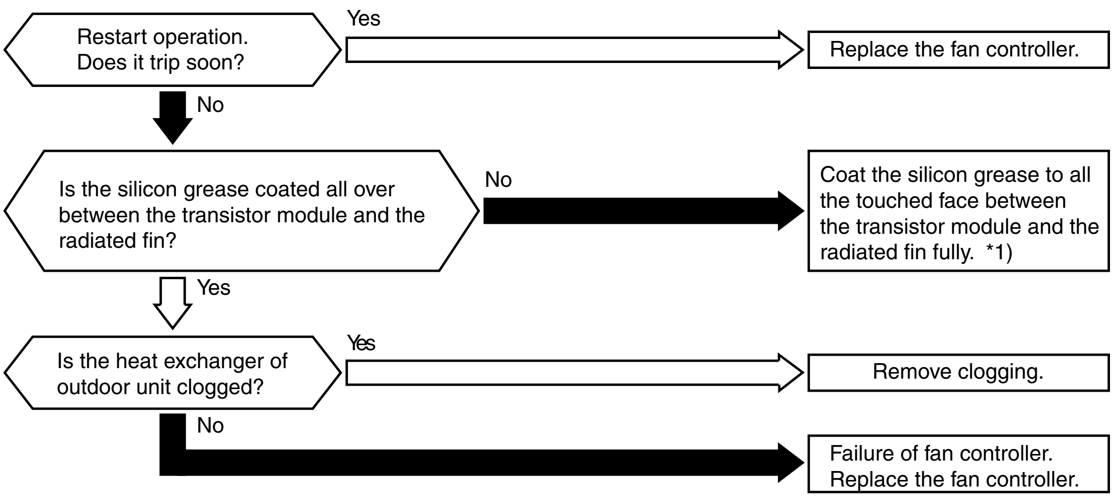
Alarm code	5A	Abnormal fan controller fin temperature.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the fan controller fin temperature anomaly occurs ten times in thirty minutes (retry operation is carried out up to nine times).

  Activation condition: this alarm is indicated when the thermistor temperature inside the transistor module increases over 100 °C.

PCB1: Control PCB in Outdoor Unit



*1): Use silicone grease supplied as an accessory (Service part No. P22760).

Alarm code	5b	Activation of fan controller overcurrent protection device (1).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

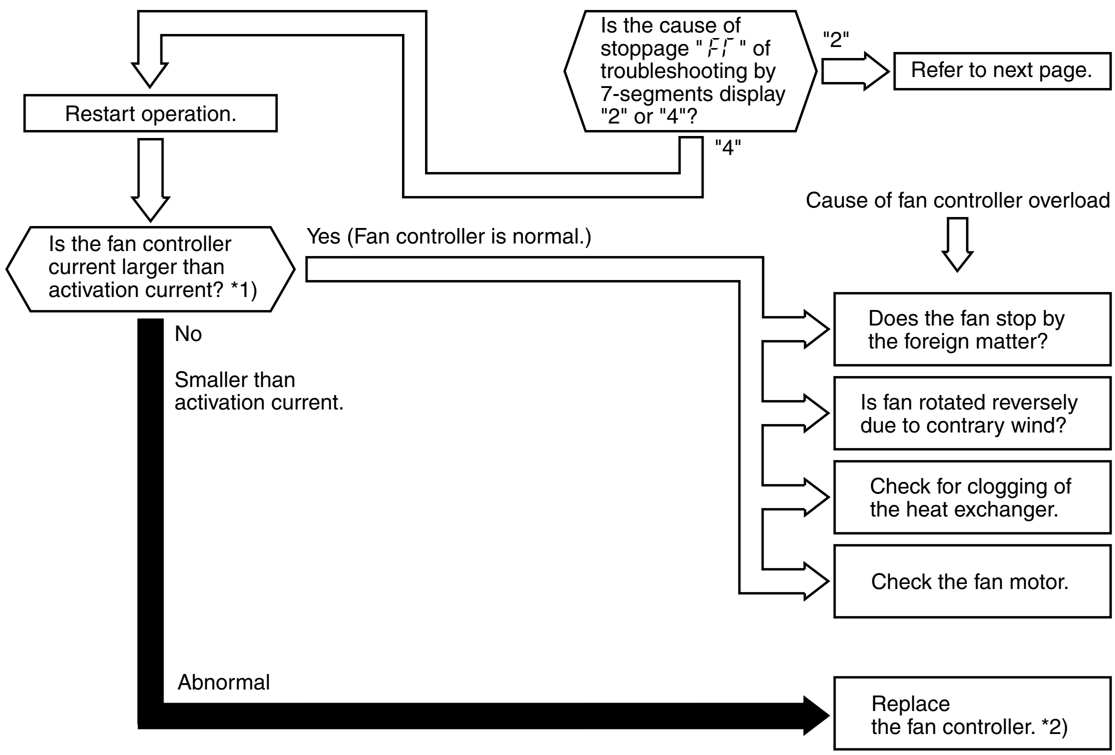
  * This alarm is indicated when the electronic thermal protection for the fan controller is activated ten times in thirty minutes (retry operation is carried out up to nine times).

  Activation condition;

  Electrical current with 105% of the rated current runs continuously for thirty seconds, or

  Electrical current runs intermittently and the accumulated time reaches to three minutes in a ten minute period.

PCB1: Control PCB in Outdoor Unit



*1): Regarding the activation current value setting, refer to *Inverter specifications, see on page 330*.

*2): Carry out the electrical discharge when fan controller is checked or replaced, refer to: *Checking procedures for other main parts, see on page 267*.

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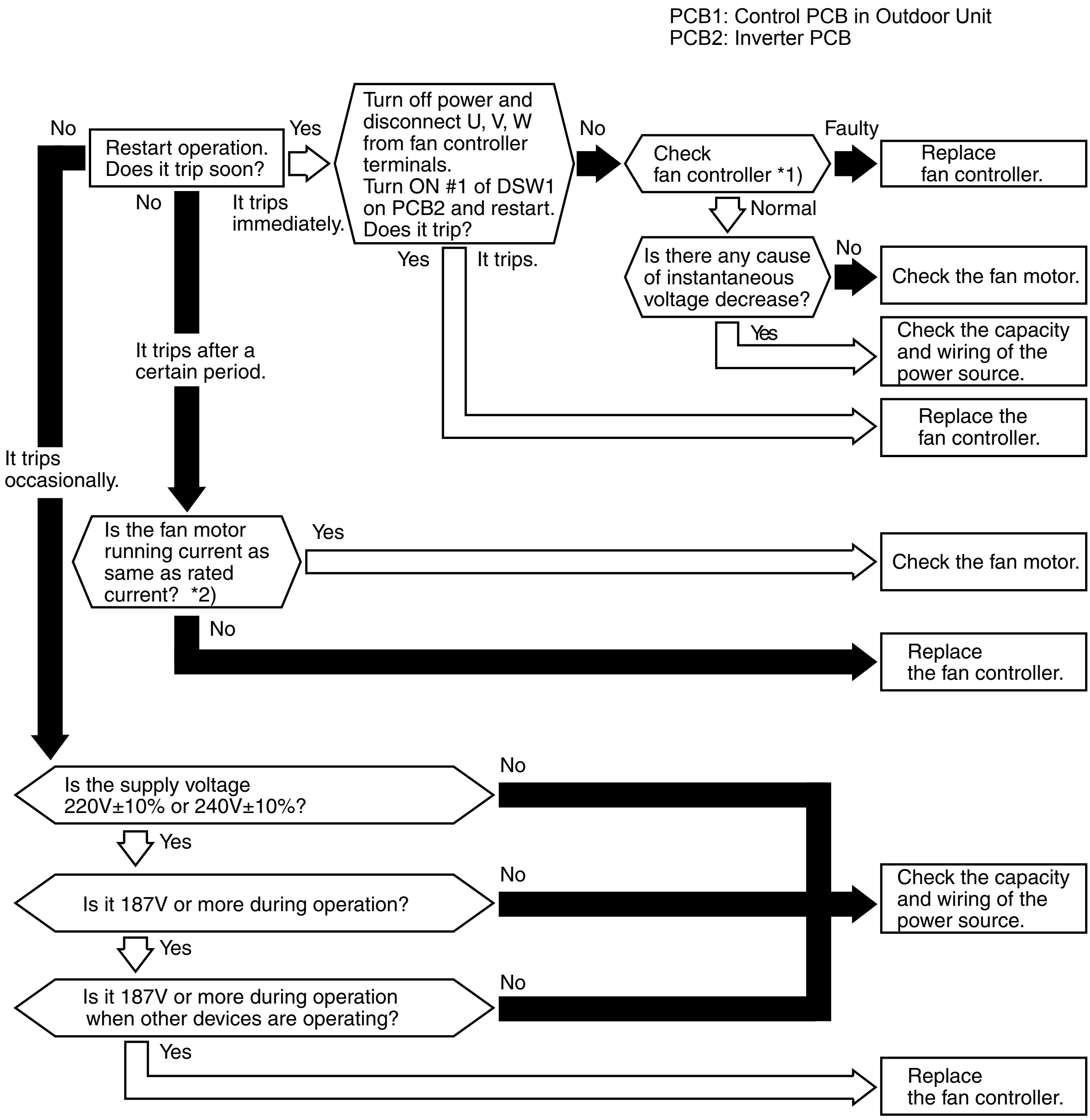
Alarm code	5b	Activation of fan controller overcurrent protection device (2).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated when the instantaneous overcurrent occurs ten times in thirty minutes (retry operation is carried out up to nine times).

  Activation condition: fan controller current with 150% of the rated current



*1): Carry out the electrical discharge when fan controller is checked or replaced, refer to: *Checking procedures for other main parts, see on page 267*.

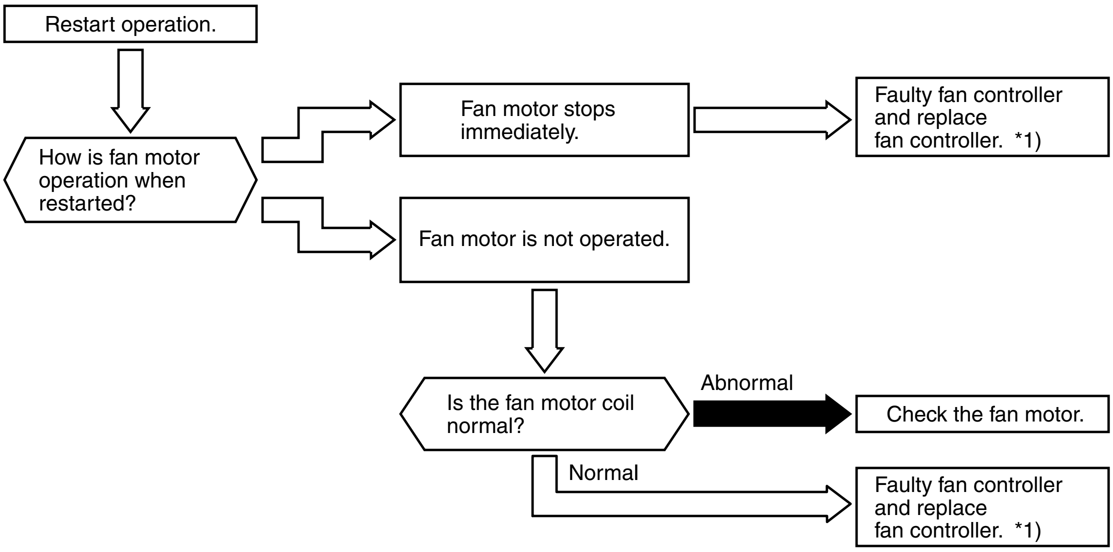
*2): Regarding the activation current value setting, refer to *Inverter specifications, see on page 330*.

Alarm code	5C	Abnormal fan controller sensor.

* Activation conditions:

This alarm is indicated when the following conditions occur.

- After starting the fan motor operation, the fan controller current does not increase over 1.5 A.
- Before starting the fan motor operation, the fan controller peak current does not increase over 4 A.



*1): Carry out the electrical discharge when fan controller is checked or replaced, refer to: *Checking procedures for other main parts, see on page 267*.

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Alarm code	EE	Compressor protection alarm.

* This alarm code appears when one of the following alarms occur three times in six hours, which may result in serious damage to the compressor, if the outdoor unit operates continuously without eliminating the cause.

Alarm code	Content of anomaly
02	Activation of protection device (high pressure cut)
07	Decrease in discharge gas superheat
08	Increase in discharge gas temperature at the upper part of the compressor
39	Abnormal operation of running current in constant speed compressor
43	Activation of the low compression ratio protection device
44	Activation of the low pressure increase protection device
45	Activation of the high pressure increase protection device
47	Activation of the low pressure decrease protection device (Vacuum operation protection)

These alarms can be checked using check mode 1. Follow the actions indicated in each alarm chart.

NOTE

These alarms can only be eliminated by turning OFF the system's main power switch. However, special care must be taken before starting, since there is a possibility that the compressor may be seriously damaged.

Alarm code	b1	Incorrect setting of the unit and the refrigerant cycle number.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  * This alarm is indicated under the following conditions. Turn OFF the power supply and check the settings of the DSW and RSW.

Conditions	Action
Unit number (DSW6 and RSW1) or refrigerant cycle number (DSW5 and RSW2) are set above "64". Or, more than two contacts are set in DSW5 and DSW6.	Set the unit number and refrigerant cycle number below "63".
Unit number and refrigerant cycle number are set from “16" to "63" and the indoor unit does not correspond to H-LINK II.	Set the unit number and refrigerant cycle number from "0" to "15".

Alarm code	b5	Incorrect setting of indoor unit connection number.

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

  ("35" is displayed on the remote control switch screen).

  * This alarm is indicated under the following conditions.

  Turn OFF the power supply and check the settings of DSW and RSW.

Conditions:	More than 17 indoor units not belonging to FSN2 series (H-LINK) are connected to one system.
Countermeasures:	The indoor units not belonging to FSN2 series (H-LINK) must be 16 or less.

PCB1: Control PCB for the outdoor unit.

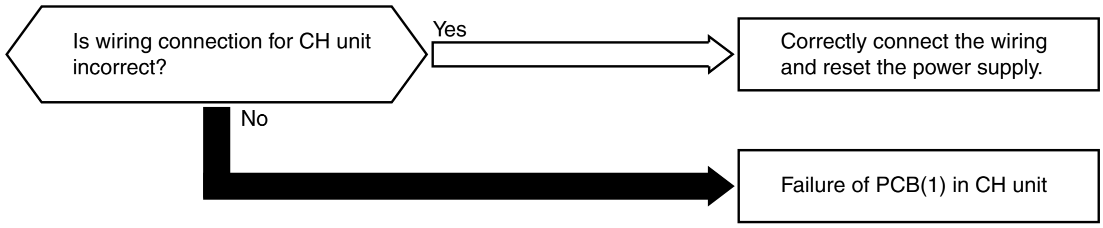
Alarm code	C1	Incorrect indoor unit connection (CH unit).

- The RUN indicator flashes and the ALARM indication is displayed on the remote control switch.
- The unit no., the alarm code and the unit code are alternatively displayed in the temperature setting section and the unit no. and alarm code are displayed on the outdoor unit's PCB1 display.

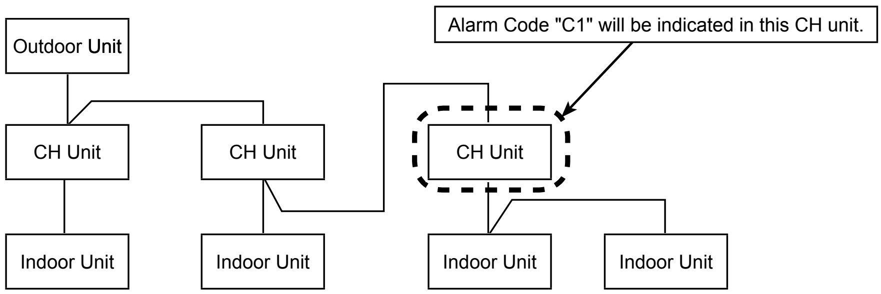
  * < Heat recovery system (3 pipes) >

  This alarm is indicated when two or more CH units are connected between the outdoor unit and the indoor unit.

PCB1: Control PCB in Outdoor Unit
PCB(1): CH Unit PCB



- Alarm code "C1" will be indicated when the units are connected as follows.



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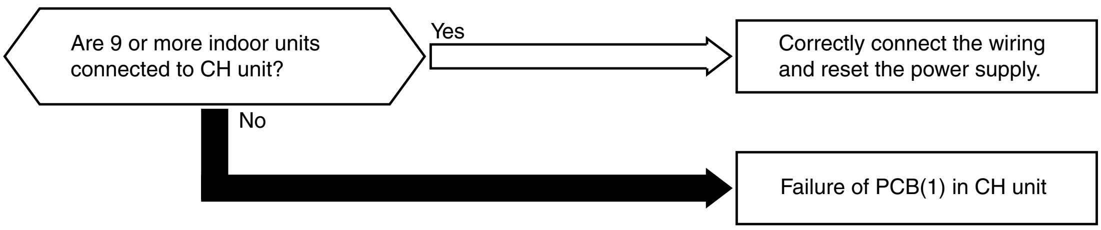
Alarm code	C2	Incorrect setting of the indoor unit connection number (CH unit).

- The unit no., alarm code ("35") and the unit code are alternately indicated in the temperature setting section of the indoor unit connected to the CH unit.
- LED (LED4, 5, 6) in PCB(1) of the CH unit flashes.

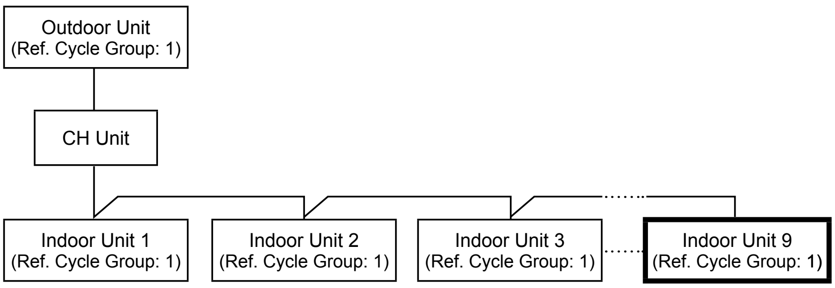
  * < Heat recovery system (3 pipes) >

  This alarm is indicated when nine or more indoor units are connected to the CH unit.

PCB1: Control PCB in Outdoor Unit
PCB(1): CH Unit PCB



- Alarm code "C2" will be indicated when the units are connected as follows.



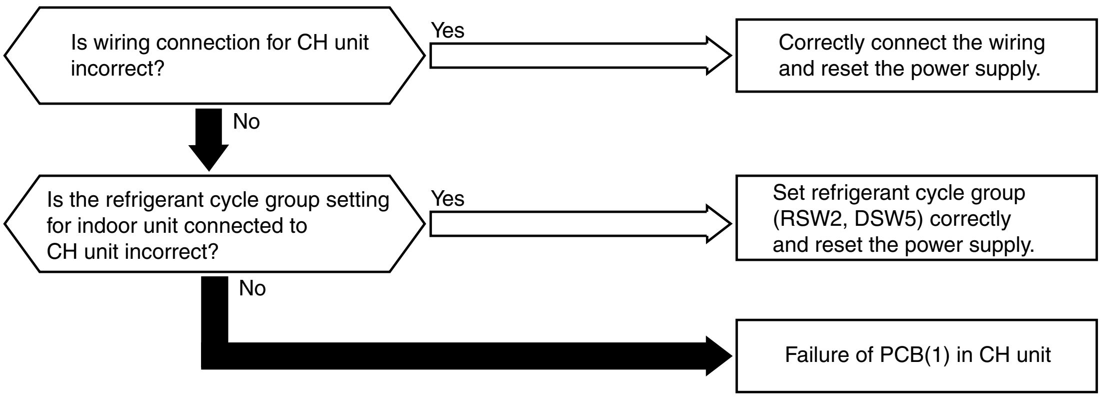
Alarm code	C3	Incorrect indoor unit connection (CH unit).

- The unit no., alarm code ("35") and the unit code are alternately indicated in the temperature setting section of the indoor unit connected to the CH unit.
- LED (LED5, 6) in PCB(1) of the CH unit flashes.

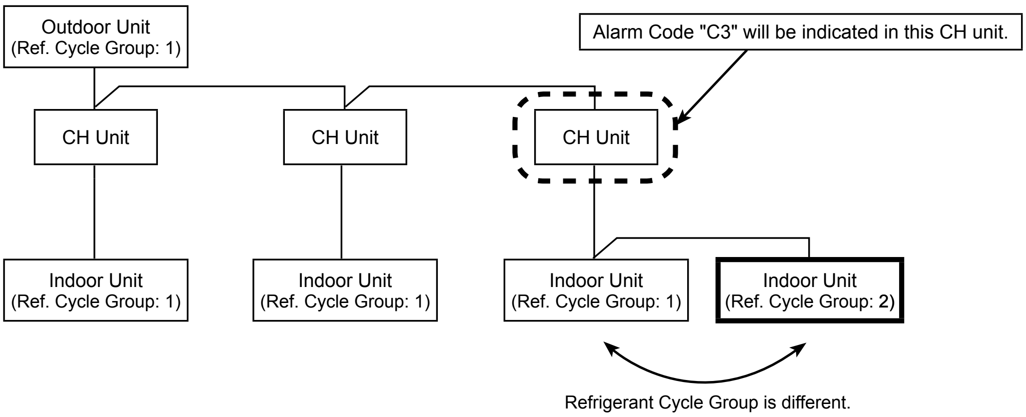
  * < Heat recovery system (3 pipes) >

  This alarm is indicated when an indoor unit with a different refrigerant cycle group is connected to the CH unit.

PCB1: Control PCB in Outdoor Unit
PCB(1): CH Unit PCB



- Alarm code "C3" will be indicated when the units are connected as follows.



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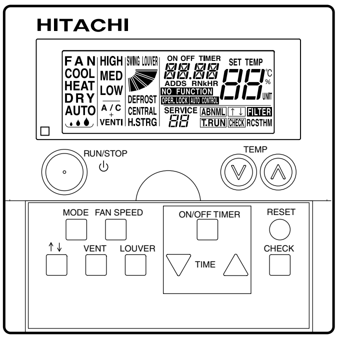
8.4 Troubleshooting in the check mode by using the remote control switch

PC-ART



- Use the remote control CHECK switch in the following cases.
  (1) When the RUN lamp is flashing.
  (2) To trace back the cause of trouble after restarting from stoppage with the RUN lamp flashing.
  (3) To check during normal operation or stoppage.
  (4) To monitor the temperatures of intake and discharge air.

Check Mode → Check Mode 1: Current data will be displayed.
Check Mode → Check Mode 2: Data held immediately before failure, will be displayed.

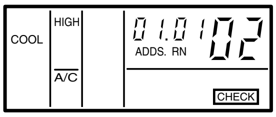
NOTES:
- Indication will delay as transmission between the remote control switch and indoor unit takes about 10 seconds.
- All data may be displayed as "FF" or "-1" or "255". These transient data produced temporarily by software do not affect device functions at all. (The alarm code may also be indicated 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 correct.

Normal Mode

CHECK — Press for more than 3 seconds.

Unit Number and Alarm Code Displayed

★



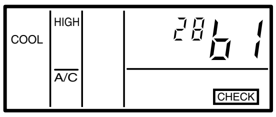
- Alarm code identifying the last fault that has occurred in the indicated unit.
- Unit number of connected unit or unit number for which checking mode was selected previously.

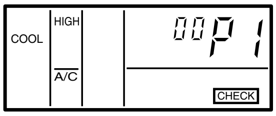
(A) Perform within 7 seconds to check another unit.

- Forward: Press the ∧ switch to rise from 00 to 01 to 02 …
- Backward: Press the ∨ switch to descend from 15 to 14 to 13 …

After 7 seconds

Check Mode 1





To View the Previous Indication
TEMP ∨ Press

To View the Next Indication
TEMP ∧ Press

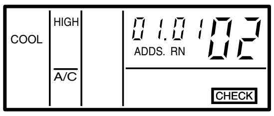
Press ∧ to view the next data.
Press ∨ to view the previous data.

Unit Number and Alarm Code Displayed

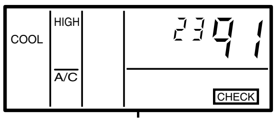
CHECK — Press for more than 3 seconds.

See (A)

After 7 seconds

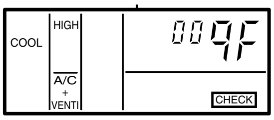


Check Mode 2



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

TEMP ∧ Press



Check Mode Released

CHECK Press

- In Check Mode 2, Data of the first three units connected serially to a remote control switch are available.
- You can press the CHECK switch to release Check Mode 2.
  Check Mode 1 cannot be released even if you press the CHECK switch.

Even though the wireless remote control is used for the wall type indoor unit with integrated receiver, the alarm code can be checked by connecting the PC-ART to the unit connector and pressing the operation switch.

NOTE

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

Contents of Check mode 1

The following indication is displayed when the "▲" pushbutton is pressed, which is located below the TEMP indication on the remote control. If the "▼" pushbutton is pressed, the prior indication is displayed.

Temperature Indication

Indication of Category Code
Indication of Temperature, etc.

No.	Item	Indication
1	Indoor Unit Temp. Setting (ºC)	b1 22
2	Indoor Unit Intake Air Temp. at Thermistor (ºC)	b2 20
3	Indoor Unit Discharge Air Temp. at Thermistor (ºC)	b3 55
4	Indoor Unit Heat Exchanger Liquid Pipe Temp. (ºC)	b4 20
5	Temperature at Remote Sensor (ºC)	b5 25
6	Outdoor Unit Ambient Air Temp. (ºC)	b6 10
7	Indoor Unit Heat Exchanger Gas Pipe Temp. (ºC)	b7 25
8	Outdoor Unit Evaporating Temp. during Heating (ºC)	b8 02
9	Control Information	b9 - -
10	Discharge Gas Temp. at the Top of Comp. Chamber (ºC)	bA 41

to next page

Normal ······Temperature Displayed

Abnormal

- - - or 129: Thermistor Open-circuited or PCB Defected (Temp. for Top of Comp.: 129)
- F F or 255 or 127: Thermistor Short-circuited or PCB Defected) (Temp. for Top of Comp.: 127)

See "Self-Checking of PCBs using Remote Control Switch".

(NOTE 1) During transient period such as starting time, etc., "- -" may be indicated for a limited time.

This is indicated only when a remote sensor is connected. The indication of "- -" is normally indicated. RPK series can not connect a remote sensor. Therefore indication is "- -".

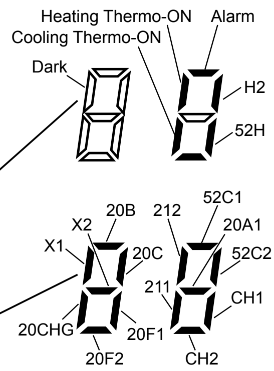
This indicates the internal information for the remote control switch. In case of SET-FREE, this indication shows the operating compressor quantity.

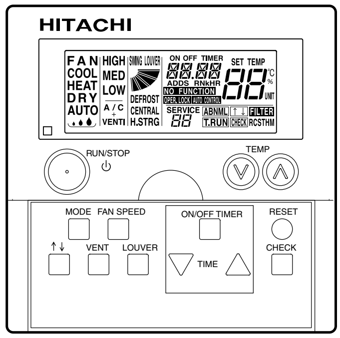
(ex.) During two compressors operation, average temperature of two compressors is indicated. In case that temperature is higher than 126ºC, "126".

11	Thermo Temp. of Remote Control Switch	bb 23

Indication on Micro-Computer Input/Output

12	Micro-Computer Input/Output in Indoor Unit	C1 4
13	Micro-Computer Input/Output in Outdoor Unit	C2 -





Indication of Unit Stoppage Cause

14	Cause of Stoppage	d1 01

(NOTE 1, next page)

Abnormality Occurrence Counter

15	Abnormality Occurrence Times	E1 01
16	Instantaneous Power Failure Occurrence Times in Indoor Unit	E2 00
17	Transmission Error Occurrence Times between Remote Control Switch and Indoor Unit	E3 00
18	Abnormality Occurrence Times on Inverter	E4 00

Indication of Automatic Louver Condition

19	Louver Sensor	F1 00

to next page

Countable up to 99.
Over 99 times, "99" is always indicated.
(NOTE 1) If a transmitting error continues for 3 minutes, one is added to the occurrence times.

NOTE

NOTE 1.

	Cause of stoppage
00	Operation OFF, Power supply OFF
01	Thermo-OFF (NOTE 2), float switch activation
02	Alarm (NOTE 3)
03	Freezing protection, overheat protection
05	Instantaneous power supply failure in the outdoor unit, reset (NOTE 4)
06	Instantaneous power supply failure in the indoor unit, restart (NOTE 5)
07	Stoppage of the cooling operation due to low outdoor air temperature, stoppage of the heating operation due to high outdoor air temperature
09	Reversing valve changeover stoppage
10	Demand enforced stoppage
11	Retry due to a decrease of pressure ratio
12	Retry due to an increase of low pressure
13	Retry due to an increase of high pressure
14	Retry due to abnormal current in the constant speed compressor
15	Retry due to abnormal high discharge gas temperature, suction pressure excessively low
16	Retry due to a decrease of discharge gas superheat
17	Retry due to Inverter abnormality
18	Retry due to a decrease in voltage, another retry due to the Inverter
19	Expansion valve opening change protection
21	Thermo-OFF due to oil return control
22	Hot start of the outdoor unit
26	Retry due to a decrease of high pressure
28	Cold draft control
30	Thermo-OFF due to compressor forced stop
32	Retry due to a excessive outdoor unit number

NOTE 2. Explanation of the term:

- ***Thermo-ON: condition by which an indoor unit is requesting the compressor to operate.***
- ***Thermo-OFF: condition by which an indoor unit is not requesting the compressor operate.***

NOTE 3. Even if stoppage is caused by "Alarm", "02" is not always displayed.

NOTE 4. If the transmission between the Inverter printed circuit board and the control printed circuit board is not carried out for 30 seconds, the outdoor unit stops. In this case, the cause of the stoppage is d1-05 and the alarm code "04" may be indicated.

NOTE 5. If the transmission between the indoor unit and the outdoor unit is not carried out for 3 minutes, the indoor units stop. In this case, the cause of stoppage is d1-06 and the alarm code "03" may be displayed.

Compressor Pressure/Frequency Indication

No.	Item	Display	Remarks
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	This is an indication for internal information for the remote control switch. This does not have any specific meaning.
23	Operation Frequency (Hz)	H4 44	This is an indication for frequency of Inverter.

Indoor Unit Capacity Indication

No.	Item	Display	Remarks
24	Indoor Unit Capacity	J1 08	The capacity of the indoor unit is indicated as shown in the table below.
25	Outdoor Unit Code	J2 Fn	"n" indicates total number of indoor units;
26	Refrigerant Cycle Number	J3 01	J3: 01 to 16 (01: when shipment (DSW5), Decimal Indication)
27	Refrigerant Cycle Number	J4 00	J4: 00 to 0F (00: when shipment (DSW5), Indication with 16 numbers)

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
32	4.0
40	5.0
64	8.0
80	10.0

"n" indicates total number of indoor units;

n = 1~9, A, b, C, d, E, F, U
(10) (11) (12) (13) (14) (15) (16)

J3: 01 to 16
(01: when shipment (DSW5), Decimal Indication)
J4: 00 to 0F
(00: when shipment (DSW5), Indication with 16 numbers)

Expansion Opening Indication

No.	Item	Display	Remarks
28	Indoor Unit Expansion Valve Opening (%)	L1 20	
29	Outdoor Unit Expansion Valve MV1 Opening (%)	L2 99	In case of models without Expansion Valve (MV2), the same figure is indicated.
30	Outdoor Unit Expansion Valve MV2 Opening (%)	L3 99	In case of models without Expansion Valve (MV2), the same figure is indicated.
31	Outdoor Unit Expansion Valve MVB Opening (%)	L4 00	

Estimated Electric Current Indication

No.	Item	Display	Remarks
32	Compressor Running Current (A)	P1 25	The total current is indicated when several compressors are running. In case of inverter compressor, the running current of primary side of inverter is indicated.

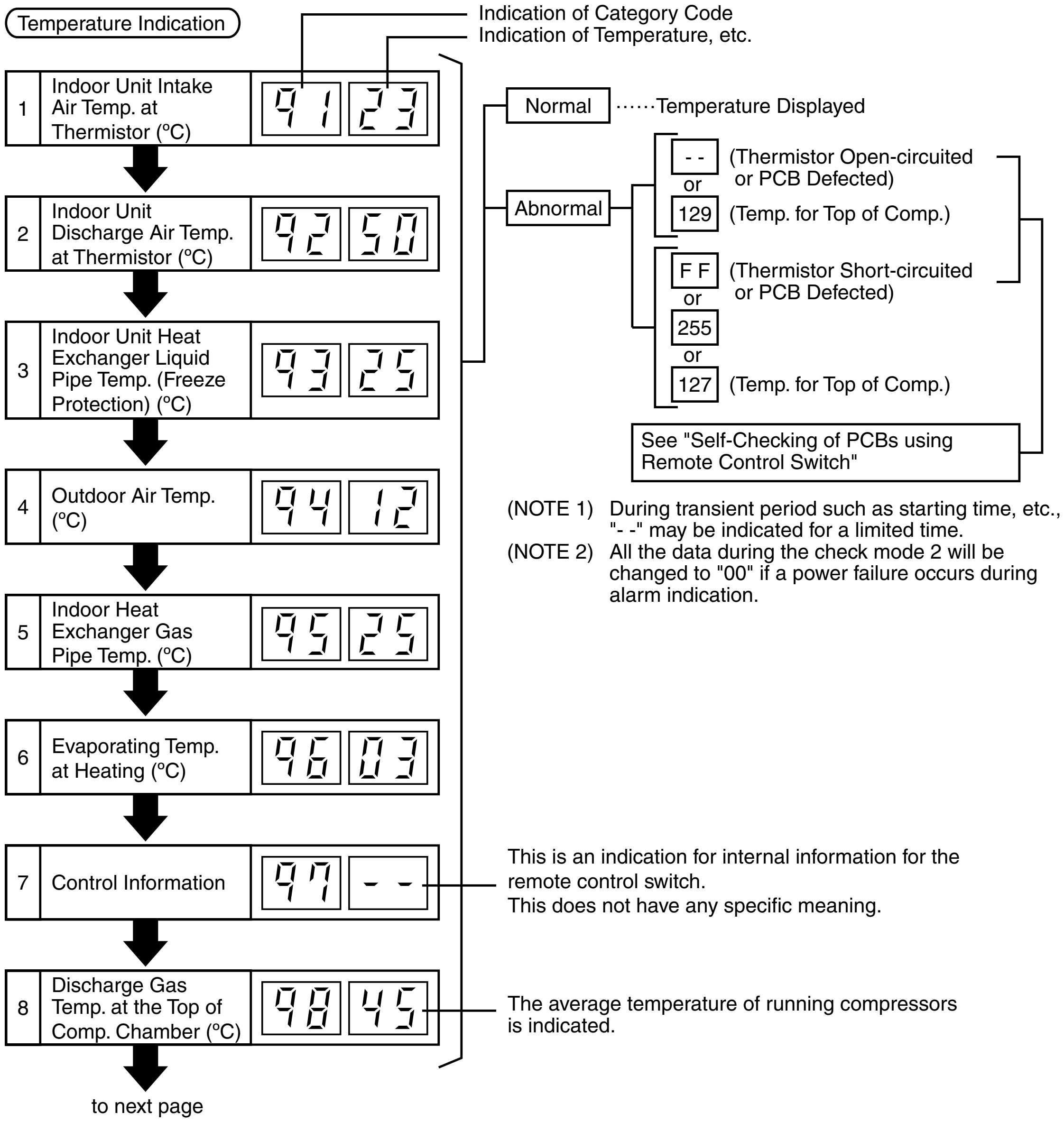
Returns to Temperature Indication

Temperature Indication

Contents of Check mode 2

The latest data for the three first indoor units that are connected in series are indicated when there are more than three indoor units connected to one remote control switch.

Pressing the "▲" pushbutton located under the TEMP indication on the remote control will display the following indication.
If the "▼" pushbutton is pressed, the prior indication is displayed.



(NOTE 1) During transient period such as starting time, etc., "- -" may be indicated for a limited time.

(NOTE 2) All the data during the check mode 2 will be changed to "00" if a power failure occurs during alarm indication.

8

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 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.

Expansion Opening Indication

13	Indoor Unit Expansion Valve Opening (%)	9d 20
14	Outdoor Unit Expansion Valve MV1 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 Indicatiom

Temperature Indication

8.5 Troubleshooting by using the 7-segment display

Only the authorized person can carry out checks using this method. The operating conditions and each part of the refrigerant cycle can be checked with the 7-segment display and pushswitches on the PCB1 in the outdoor unit.

(1) Before carrying out checks

(a) Turn ON the main power supply switch. Wait more than 20 seconds before starting the checks.

(b) Check items:

- Connection information.
- Information of the outdoor unit.
- Information of the indoor unit.
- Information of the cause of the alarm code.
- Alarm code historical information.

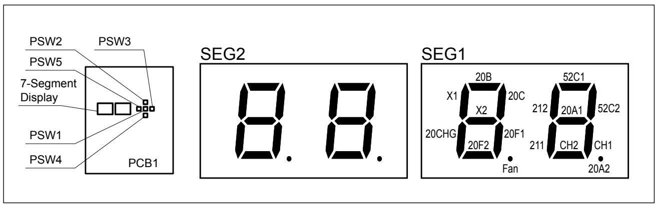
(c) Check the location of the 7-segment display and the pushswitches.

DANGER

The PCB and the electrical components are powered by AC 220-240 V. Never touch the electrical parts and the cables when carrying out the checks.

(2) Location of the pushswitches and the 7-segment display

The pushswitches and the 7-segment display are located on PCB1.



(3) Protection control code on the 7-segment display

- A protection control code is displayed on the 7-segment display during the operation when the protection control has been activated.
- A protection control code is displayed while the function is operating, and it is cancelled when it is released.
- When several protection controls are activated, the code number with the highest priority is displayed (see below for the order of priority).

(a) Higher priority will be given to the protection control related with the frequency control.

<1> Pressure ratio control

<2> High pressure increase protection

<3> Current protection

<4> Inverter fin temperature increase protection

<5> Discharge gas temperature increase protection

<6> Low pressure decrease protection

<7> Demand current control (running current limit control)

<8> Low pressure increase protection

<9> High pressure decrease protection

8

(b) Regarding the retry control, the lastest retry code will be indicated unless the protection control related with the frequency control is indicated.

Code				Protection control	Code during the degeneration control			
	P	0	1	Pressure ratio protection control		P	c	1
	P	0	2	High pressure increase protection		P	c	2
	P	0	3	Inverter current protection		P	c	3
	P	0	4	Inverter fin temperature increase protection		P	c	4
	P	0	5	Discharge gas temperature increase protection at the upper part of the compressor		P	c	5
	P	0	6	Low pressure decrease protection	Without			
	P	0	9	High pressure decrease protection				
	P	0	A	Demand current protection control				
	P	0	d	Low pressure increase protection				

Code				Retry control	Code during the degeneration control
	P	1	1	Pressure ratio decrease retry	Without
	P	1	2	Low pressure increase retry	
	P	1	3	High pressure increase retry	
	P	1	4	Constant speed compressor overcurrent retry	
	P	1	5	Discharge gas temperature increase retry / Low pressure decrease retry	
	P	1	6	Discharge gas super-heat decrease retry	
	P	1	7	Inverter anomaly retry	
	P	1	8	Abnormal Inverter voltage retry / Inverter failure retry	
	P	2	6	High pressure decrease retry	

NOTE

(1) The retry indication is prolonged for 30 minutes unless a protection control is indicated.

(2) The retry indication disappears if the stop signal comes from all rooms.

(3) The protection control code indicated on the 7 segment display changes to an alarm code when the abnormal operation occurs. Also, the same alarm code is indicated on the remote control.

(4) In the case that the degeneration control is activated, indications Pc1 to Pc5 are displayed instead of P01 to P05.

(4) Activation condition of the protection retry control code

The protection control or the retry control is carried out to prevent abnormal operation. The activation conditions are listed in the following table.

Code	Protection control	Activation conditions	Notes
P01	Pressure ratio protection control	Compression ratio Ɛ ≥ 8.5 or compression ratio Ɛ ≤ 2.0	-
P02	High pressure increase protection	Discharge pressure Pd ≥ 3.45 (in cooling mode) Pd ≥ 3.35 (in heating mode and in heat recovery mode)	-
P03	Inverter current protection	Inverter output current ≥ (a) A (a) 400 V = 22.5	-
P04	Inverter fin temperature increase protection	Inverter fin temperature ≥ 80 °C	-
P05	Discharge gas temperature increase protection	Temperature of the upper part of the compressor Td ≥ 112 °C	-
P06	Low pressure decrease protection	Suction pressure Ps ≤ 0.1 MPa	-
P09	High pressure decrease protection	Discharge pressure Pd ≤ 1.0 MPa	-
P0A	Demand current protection control	Compressor running current ≥ Demand current setting value	Demand current setting value: the Upper limit of the total running current is set to 100%, 80%, 70%, 60% and 40% in normal operation.
P0d	Low pressure increase protection	Suction pressure ≥ 1.3 MPa	-

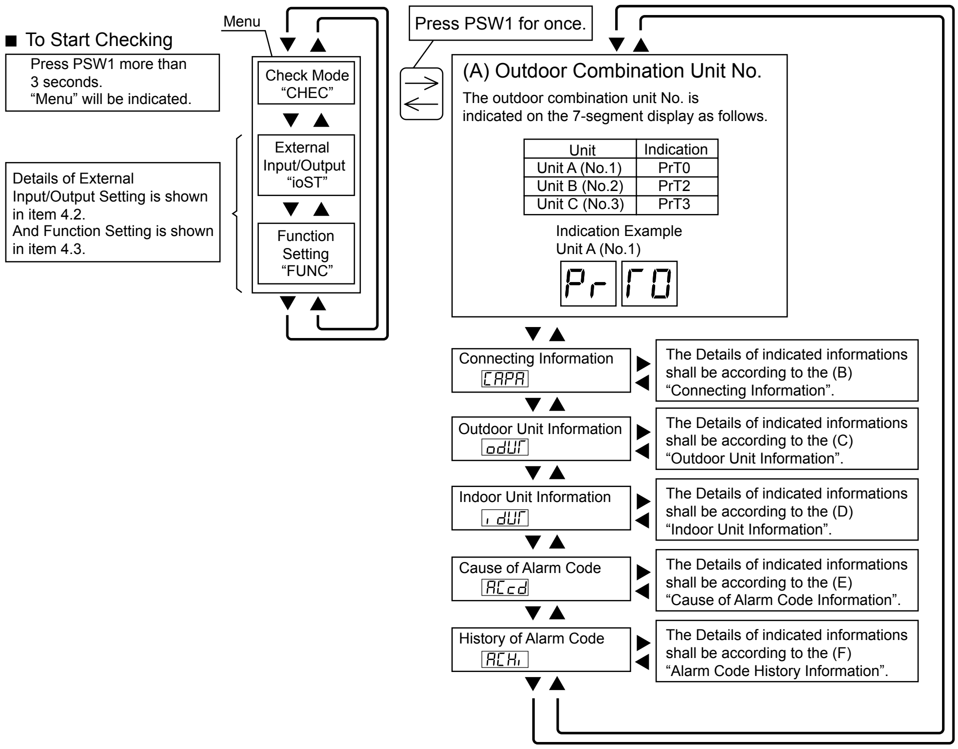
8

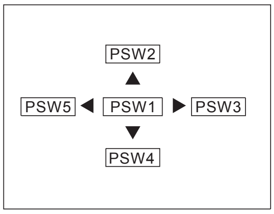
<table>
<tr><th>Code</th><th>Retry control</th><th colspan="2">Activation conditions</th><th>Notes</th></tr>
<tr><td>P11</td><td>Pressure ratio decrease retry</td><td colspan="2">Pressure ratio $\varepsilon < 1.8$</td><td>When activating three times in thirty minutes, alarm code "43" is indicated.</td></tr>
<tr><td>P12</td><td>Low pressure increase retry</td><td colspan="2">Ps > 1.4 MPa</td><td>When activating three times in thirty minutes, alarm code "44" is indicated.</td></tr>
<tr><td>P13</td><td>High pressure increase retry</td><td colspan="2">Pd ≥ 3.8 MPa</td><td>When activating three times in thirty minutes, alarm code "45" is indicated.</td></tr>
<tr><td rowspan="5">P14</td><td rowspan="5">Constant speed compressor overcurrent retry</td><td colspan="2">* ico < 2.5 A over 50 ms
* ico ≥ icomax over 50 ms
ico: running current of the constant speed compressor
icomax: maximum current of the constant speed compressor</td><td rowspan="5">When activating three times in thirty minutes, alarm code "39" is indicated.</td></tr>
<tr><td rowspan="2">Constant speed compressor</td><td>icomax</td></tr>
<tr><td>400 V</td></tr>
<tr><td>E655</td><td>15.5 A</td></tr>
<tr><td>E855</td><td>21.0 A</td></tr>
<tr><td rowspan="2">P15</td><td>Discharge gas temperature increase retry</td><td colspan="2">Discharge gas temperature ≥ 132 °C for more than 10 minutes, or
Discharge gas temperature ≥ 140 °C for more than 5 seconds</td><td>When activating three times in sixty minutes, alarm code "08" is indicated.</td></tr>
<tr><td>Low pressure decrease retry</td><td colspan="2">Ps < 0.09 MPa more than 12 minutes</td><td>When activating three times in sixty minutes, alarm code "47" is indicated.</td></tr>
<tr><td>P16</td><td>Discharge gas super-heating decrease retry</td><td colspan="2">Discharge gas superheat ≤ Tc + 10 °C more than 30 minutes
Tc: Saturation temperature</td><td>When activating three times in one hundred and twenty minutes, alarm code "07" is indicated.</td></tr>
<tr><td rowspan="4">P17</td><td rowspan="4">Inverter anomaly retry</td><td colspan="2">Instantaneous overcurrent</td><td>When activating six times in thirty minutes, alarm code "48" is indicated.</td></tr>
<tr><td colspan="2">Abnormal current sensor</td><td>When activating three times in thirty minutes, alarm code "51" is indicated.</td></tr>
<tr><td colspan="2">IPM error</td><td>When activating seven times in thirty minutes, alarm code "53" is indicated.</td></tr>
<tr><td colspan="2">Fin temperature ≥ 100 °C</td><td>When activating three times in thirty minutes, alarm code "54" is indicated.</td></tr>
<tr><td rowspan="3">P18</td><td rowspan="2">Inverter voltage anomaly retry</td><td colspan="2">Insufficient voltage in the Inverter circuit</td><td>When activating three times in thirty minutes, alarm code "06" is indicated.</td></tr>
<tr><td colspan="2">Excessive voltage in the Inverter circuit</td><td>When activating three times in thirty minutes, alarm code "06" is indicated.</td></tr>
<tr><td>Inverter failure retry</td><td colspan="2">The actual Inverter frequency is 0 Hz more than 3 seconds after the Inverter frequency is outputted</td><td>When activating three times in thirty minutes, alarm code "55" is indicated.</td></tr>
<tr><td>P26</td><td>High pressure decrease retry</td><td colspan="2">Pd < Ta / 130 + 0.1 MPa more than 4 minutes, or
Pd < 1.0 MPa more than 60 minutes
Ta: Ambient temperature</td><td>No alarm.</td></tr>
<tr><td colspan="5">Ps: Compressor suction pressure; Pd: compressor discharge pressure.</td></tr>
</table>

(5) Alarm code

Refer to chapter *Alarm codes, see on page 168*.

(6) Check method by checking mode





PSW pushswitch on PCB1

PSW1: enter.

PSW2, 3, 4 and 5: for checking.

- To cancel the check method.

  Press PSW1 for more than three seconds while the "menu mode" is displayed.

  The indication on the LCD screen will be turned OFF and condition will return to normal.

NOTE

Ensure the check mode is cancelled after the checks have been carried out.

(B) Connection information

This information is indicated on unit A (main unit) only.

Press PSW4 (▼) to move forward or PSW2 (▲) to move back.

Select the outdoor unit No. for indication.

Press PSW3 (►) for detailed information on the selected unit No.:

Unit	Indication
Unit A (No. 1)	od00
Unit B (No. 2)	od02
Unit C (No. 3)	od03

Press PSW4 (▼) to move forward or PSW2 (▲) go back.

This information will be alternatively indicated as "Item" → "Details".

Press PSW5 (◄) to return to the outdoor unit No. selection.

Item		7-segment display		Details
		SEG2	SEG1	
1	Total capacity of the connected outdoor units	o	CP	Total capacity of the combination of outdoor units Refer to the "Capacity table for the outdoor units".
2	Constitution quantities of the outdoor units	o	AA	Constitution quantities of outdoor unit combination
3	Total capacity of the connected indoor units	i	CP	Total capacity of the connected indoor units
4	Number of connected indoor units	i	AA	Number of connected indoor units
5	Refrigerant group		GA	Refrigerant group number (0 to 64)
6	Total capacity of the operating indoor units		oP	Total capacity of the operating indoor units. Refer to the "Capacity table for the indoor units".
7	Total compressor frequency		Ht	Units: Hz
8	Accumulated operating time		UJ	Units: hour (indication x 10 hours)

(C) Information for the outdoor unit

Select the outdoor unit combination number for indication.

When changing the selection, press PSW4 (▼) to move forward or PSW2 (▲) to move back.

Select the outdoor unit combination number by pressing PSW4 or PSW2.

Unit	Indication
Unit A (No. 1)	od00
Unit B (No. 2)	od02
Unit C (No. 3)	od03

Press PSW3 (►) for detailed information.

Press PSW4 (▼) to move forward or PSW2 (▲) to go back.

This information will be indicated alternating as “Item” → “Details”.

Press PSW5 (◄) to return to the outdoor unit combination number selection.

Indication details:

Item		7-segment display		Details
		SEG2	SEG1	
1	Capacity of the outdoor unit	CA	0	Unit capacity indication. Refer to the "Capacity table for the outdoor units".
2	Output status of the outdoor unit microcomputer	SC	0	Output status of the outdoor unit microcomputer. Refer to section "location of pushswitches and the 7-segment display".
3	Running frequency of the Inverter compressor MC1	H1	0	Running frequency of Inverter compressor indication (Hz)
4	Total number of compressors running	CC	0	Indication of the total number of compressors running
5	Air flow rate	Fo	0	Air flow rate indication (0 to 25 steps)
6	Opening of the expansion valve MV1 of outdoor unit	E1	0	Opening indication of the expansion valve MV1 for outdoor unit (Unit: %)
7	Opening of the expansion valve MVB of the outdoor unit for bypass	Eb	0	Opening indication of the expansion valve MVB for the bypass indication (Unit: %)

	Item	7-segment display		Details
		SEG2	SEG1	
8	Discharge pressure (High)	Pd	0	Unit: MPa Thermistor open circuit indication: 5.62 Thermistor short-circuit indication: -0.62
9	Suction pressure (Low)	PS	0	Unit: MPa Thermistor open circuit indication: 2.25 Thermistor short-circuit indication: -0.25
10	Ambient air temperature (Ta)	To	0	Unit: °C Thermistor open circuit indication: - 127 Thermistor short-circuit indication: 127
11	Discharge gas temperature at the upper part of the compressor MC1 (TD1)	Td	10	Units °C Thermistor open circuit indication: 0 Thermistor short-circuit indication: 255
12	Discharge gas temperature at the upper part of the compressor MC2 (TD2)	Td	20	Unit: °C Thermistor open circuit indication: 0 Thermistor short-circuit indication: 255 Only 14 HP to 18 HP
13	Evaporating temperature TE in heating	TE	0	Unit: °C Thermistor open circuit indication: - 127 Thermistor short-circuit indication: 127
14	Gas temperature in the outdoor unit heat exchanger	TG	0	Unit: °C Thermistor open circuit indication: - 127 Thermistor short-circuit indication: 127
15	Super-cooling temperature	TC	H0	Unit: °C Thermistor open circuit indication: - 127 Thermistor short-circuit indication: 127
16	Super-cooling temperature in the bypass	Tb	G0	Unit: °C Thermistor open circuit indication: - 127 Thermistor short-circuit indication: 127
17	Inverter fin temperature	TF	i0	Unit: °C
18	Fan controller fin temperature	TF	F0	Units °C
19	Compressor MC1 current *1)	A 1	0	Unit: A
20	Compressor MC2 current *1)	A2	0	Unit: A Only 14 HP to 18 HP
21	Fan motor MFO1 current *1)	AF	0	Unit: A
22	Compressor MC1 accumulated operating time	UJ	10	Unit: hour (indication x 10 hours)
23	Compressor MC2 accumulated operating time	UJ	20	Unit: hour (Indication x 10 hours) Only 14 HP to 18 HP
24	Compressor MC1 accumulated operating time	cU	10	Unit: hour (Indication x 10 hours) The accumulated operating time can be reset. *2)

Item		7-segment display		Details
		SEG2	SEG1	
25	Compressor MC2 accumulated operating time	cU	20	Unit: hour (Indication x 10 hours) Only 14 HP to 18 HP The accumulated operating time can be reset. *2)
26	Cause of the Inverter stoppage	iT	10	Refer to the "Inverter stoppage cause table". *3)
27	Cause for fan controller stoppage	FT	10	Refer to the "Cause for fan controller stoppage" *4)

*1) The indicated current is a reduced value. Use a clamp meter for the current precise value.

*2) To reset the accumulated operating time, press "PSW1 and PSW3" for five seconds while the accumulated data is displayed.

(Example)

SEG2 SEG1

rd 20

NOTE: The outdoor unit No. is indicated on the one digit of "SEG1"

*3) Cause of the Inverter stoppage: display digits indication

iT	10
	1: compressor No. 0: outdoor unit No.

*4) Cause for fan controller stoppage display digits indication

FT	10
	1: fan controller No. 0: outdoor unit No.

- Capacity table for the outdoor units.

Indication	Capacity (kW)	Horsepower (HP)
64	22.4	8.0
80	28.0	10.0
96	33.5	12.0
112	40.0	14.0
128	45.0	16.0
144	50.0	18.0

NOTE

In the case of unit combinations, the outdoor unit capacity indication is the total capacity of the constitution units.

Example:

In the case of unit RAS-54FSXN:

RAS-54FSXN = RAS-18FSXN x 3

144 x 3 = 432

Indication "432" will be displayed.

(D) Indoor unit information

This information is indicated on unit A (main unit) only.

Select the indoor unit number for information indication.

Press PSW4 (▼) to move forward or PSW2 (▲) to move back.

Select the indoor unit number for indication.

Press PSW3 (►) for more detailed information on the unit number selected.

Unit no.	Indication
No. 0	ı d00
No. 1	ı d0 1
↓	↓
No. 63	8 d63

Press PSW4 (▼) to move forward or PSW2 (▲) go back.

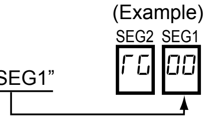
This information will be alternatively indicated as “Item” → “Details”.

Press PSW5 (◄) to return to the indoor unit No. selection.

Indication details:

Item		7-segment display		Details
		SEG2	SEG1	
1	Capacity of the indoor unit	CA	00	Unit capacity indication. Refer to the "Capacity table for the indoor units".
2	Opening of the expansion valve	ı E	00	Unit: %
3	Heat exchanger liquid pipe temperature	ΓL	00	Unit: °C
4	Heat exchanger gas pipe temperature	ΓG	00	Unit: °C
5	Air inlet temperature	Γı	00	Unit: °C
6	Air outlet temperature	Γo	00	Unit: °C
7	Unit stoppage cause code	d 1	00	Indoor unit stoppage cause code indication. Refer to the "Indoor unit stoppage cause table".

(Example)



NOTE: The indoor unit No. is indicated on “SEG1”

- Capacity table for the indoor units.

Indication	Capacity (kW)	Horsepower (HP)	Indication	Capacity kW)	Horsepower (HP)	Indication	Capacity (kW)	Horsepower (HP)
6	2.2	0.8	14	5.6	2.0	40	14.0	5.0
8	2.8	1.0	16	6.7	2.3	48	16.0	6.0
10	3.8	1.3	18	7.1	2.5	64	22.4	8.0
11	4.0	1.5	22	8.0	3.0	80	28.0	10.0
13	5.2	1.8	32	11.2	4.0			

(E) Cause for alarm code information

This information is indicated in unit A (main unit) only.

Press PSW4 (▼) to move forward or PSW2 (▲) to go back.

This information will be indicated alternating as “Item” → “Details”.

Indication details:

Item		7-segment display		Details
		SEG2	SEG1	
1	Alarm cause code		AC	Outdoor unit lastest stoppage alarm code indication. Refer to the "Alarm codes table".
2	Degeneracy control for pressure ratio decrease protection	c	11	0: degeneracy control is not activated. 1: degeneracy control is activated.
3	Degeneracy control for high pressure increase protection	c	13	0: degeneracy control is not activated. 1: degeneracy control is activated.
4	Degeneracy control for Inverter fin temperature increase protection	c	14	0: degeneracy control is not activated. 1: degeneracy control is activated.
5	Degeneracy control for discharge gas temperature increase protection	c	15	0: degeneracy control is not activated. 1: degeneracy control is activated.
6	Degeneracy control for Td SH decrease protection	c	16	0: degeneracy control is not activated. 1: degeneracy control is activated.
7	Degeneracy control for overcurrent protection	c	17	0: degeneracy control is not activated. 1: degeneracy control is activated.

(F) Alarm code history information

This information is indicated in unit A (main unit) only.

If a history of anomalies exists, a maximum of fifteen cases in chronological order are indicated.

Press PSW4 (▼) to move forward or PSW2 (▲) to go back.

No. of data	7-segment display	
	SEG2	SEG1
No. 1 (lastest data)	no	01
↓	↓	↓
No. 15 (oldest data)	no	15

Select the data No. for information indication by pressing PSW4 or PSW2.

Press PSW3 (►) for detailed information.

Press PSW4 (▼) to move forward or PSW2 (▲) to go back.

Press PSW5 (◄) to return to the unit No. combination selection.

Indication details:

	Item	7-segment display SEG2	7-segment display SEG1	Details
1	Unit accumulated operating time	07	08	Outdoor unit accumulated operating time when the stoppage is carried out Unit: hour (indication x 10 hours)
2	Cause for stoppage	AC		Alarm stoppage
		d1		Retry stoppage
		C1		Control information
3	Alarm / Stoppage cause code	01	48	Alarm and stoppage cause code. The outdoor unit No. is indicated in 10 digit of SEG2. The compressor and fan controller No. are indicated in one digit of SEG2. The alarm and stoppage cause code are indicated in SEG1.
4	Abnormal data indication	IT	12	The Inverter stoppage cause code is indicated when the IT code exists in SEG2.
		FT	12	The fan controller stoppage cause code is indicated when the FT code exists in SEG2.
		CT	0	Stoppage cause of the constant speed compressor abnormal current is 0 A stoppage.
		CT	FF	Overcurrent stoppage of the constant speed compressor.
		--	--	With the exception of the above.

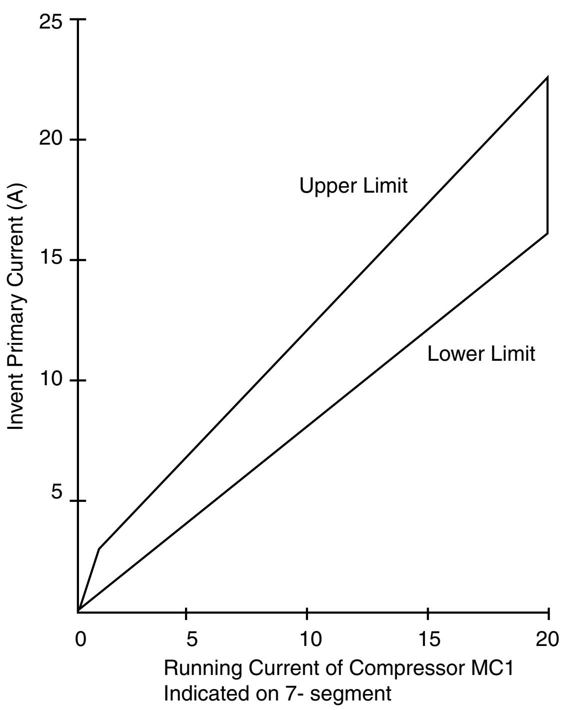
(7) Running current of compressor

- Inverter primary current.

The Inverter primary current is estimated from the running current of compressor MC1 indicated on the 7-segment display as shown in the picture.

- Indicated running current for compressor MC2.

The running current for compressor MC2 is detected by current sensor (CT2).



- Cause of Inverter stoppage (check the item IT)

Code	Cause
1	IPM error (Overcurrent, voltage decrease, short-circuit)
2	Instantaneous overcurrent
3	Abnormal Inverter fin temperature
4	Inverter overcurrent
5	Inverter voltage decrease
6	Inverter voltage increase
7	Abnormal Inverter transmission
8	Abnormal current sensor
9	Instantaneous power failure Anomaly in the power source phases
11	Microcomputer reset
12	Earth fault detection
13	Abnormal power source phase
16	Inverter failure
21	Abnormal start-up

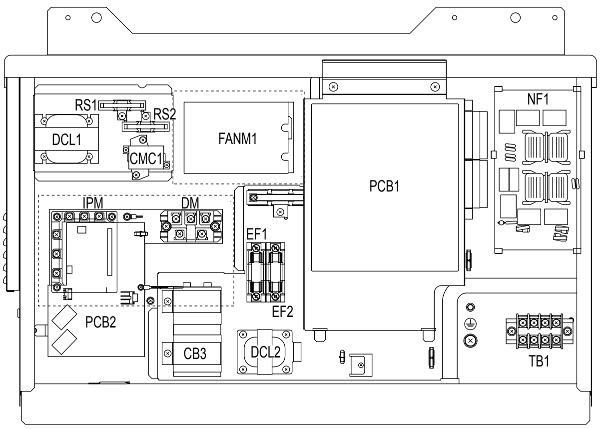
- Cause for fan controller stoppage (Check the item FT)

Code	Cause
1	Driver IC error
2	Instantaneous overcurrent
3	Abnormal Inverter fin temperature
4	Inverter overcurrent
5	Decrease in fan controller voltage
6	Increase in fan controller voltage
7	Abnormal fan controller transmission
8	Abnormal current sensor
9	Instantaneous power failure
11	Microcomputer reset
12	Earth fault detection
15	Reverse rotation
16	Fan controller retry
17	Abnormal control
21	Abnormal start-up

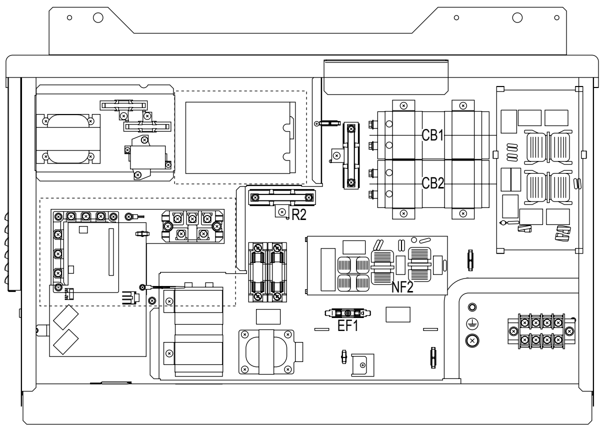
8.6 RSW, DSWs and LEDs functions

Location inside the electrical box for RAS-(8-18)FSXN

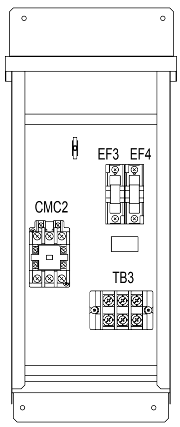
1



2



3



1: Front side (main).

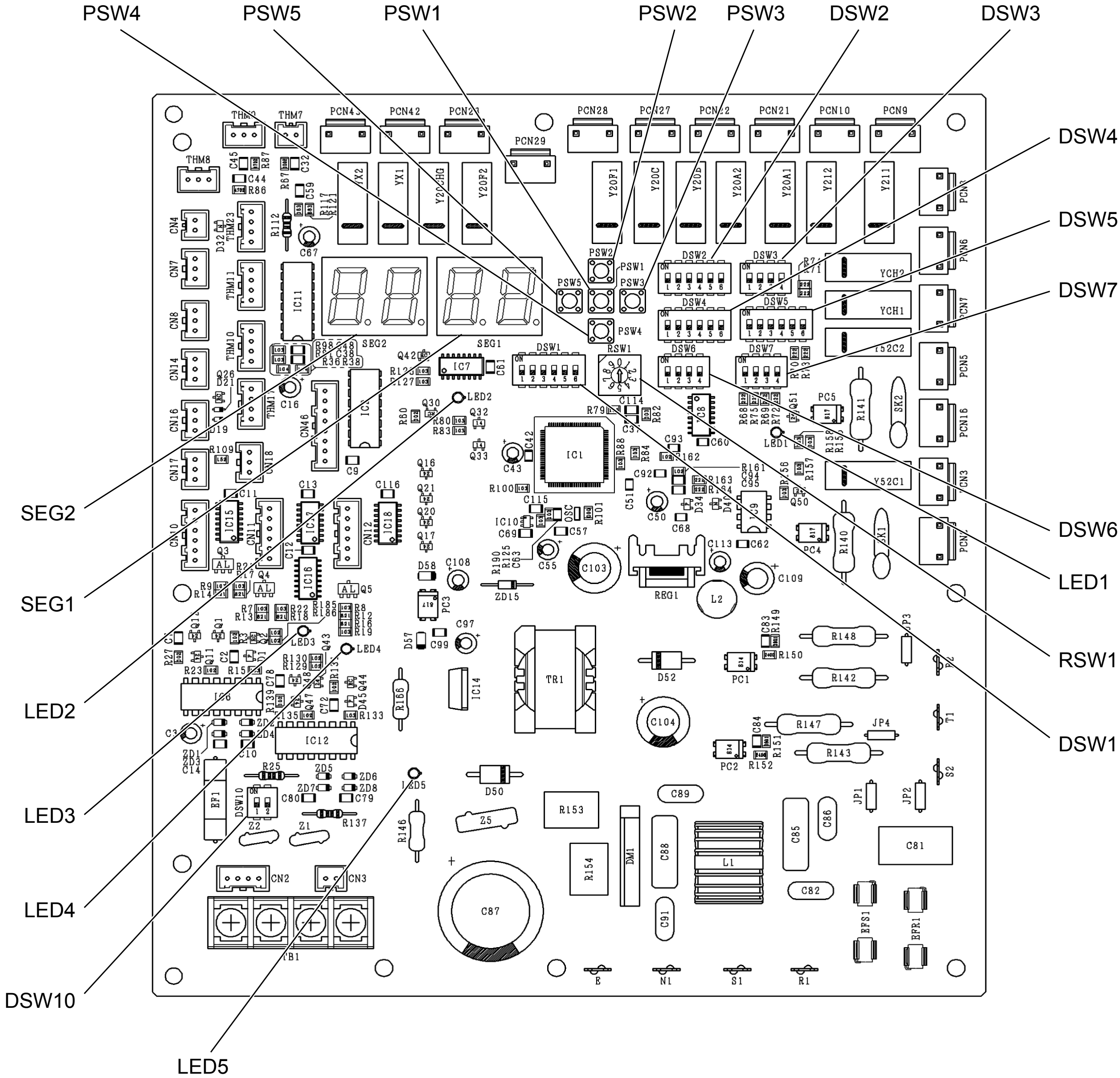
2: Interior of the electrical control box (main).

3: Front side (sub electrical control box (only for RAS-(14-18)FSXN).

Purpose

Symbol	PCB	Purpose
PCB1	For control	1. Transmission between the indoor and outdoor units. 2. Processing for sensor input. 3. Processing for dip switch input. 4. Operation control for parts 1 to 3. Compressor operating control, control of the bypass valve, fan control and overcurrent control. 5. 7-segment display indication. 6. Processing of the safety device input. 7. Processing of the relay output. 8. Detection of reverse phase for power source.
PCB2	For Inverter	1. Inverter power part is driven by instruction of PCB1 and compressor is driven. 2. Overcurrent control. 3. Inverter protection control.
FANM	For fan	1. DC motor speed control. 2. Overcurrent control.

a. Printed circuit board for control: PCB1



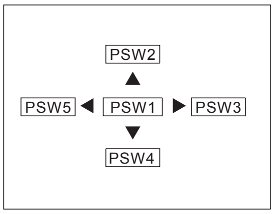
< Setting of the outdoor unit DIP switches >

CAUTION

Before modifying the DIP switch settings, the power supply must be disconnected. Otherwise, the new setting will not be valid.

NOTE

- ***While the power remains on, the switches are disabled and the settings carried out are not valid. However, switch DSW4, contacts 1, 2 and 4 and the pushbuttons can be used with the power supply turned on.***
- ***Mark "■" indicates the position of the DIP switches. The figures show the position of the DIP switch once the position setting has been completed.***



PSW pushswitch on PCB1

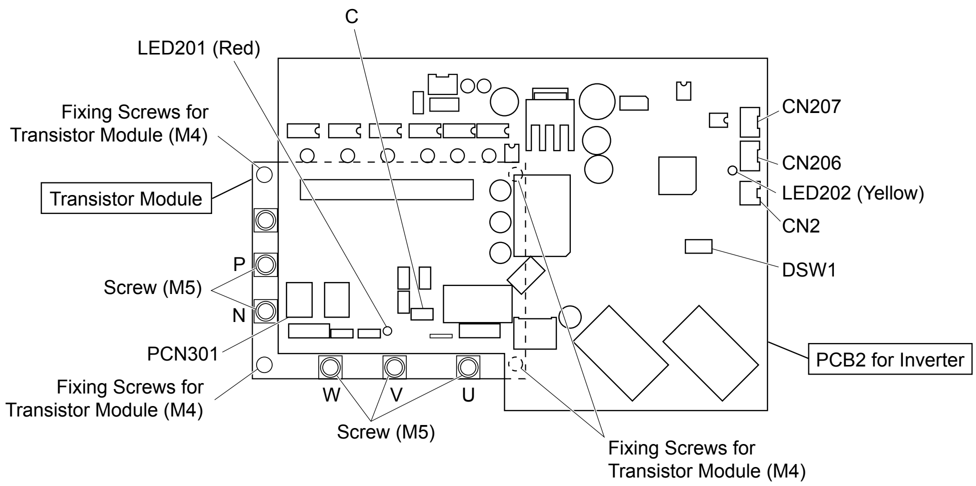
PSW1: enter.

PSW2, 3, 4 and 5: for checking.

Part name		Contents of functions
RSW & DSWs	DSW1, RSW1	Refrigerant cycle number setting.
	DSW2	Capacity setting.
	DSW3	Setting not required.
	DSW4	Operational test and service settings.
	DSW5	Emergency operation / operational test and service setting.
	DSW6	Setting outdoor unit number.
	DSW7	Supply voltage setting.
	DSW10	Communication setting.

Part name		Contents of functions
LEDs	LED1 (Red)	PCB1 power indication (Low voltage). Normal condition: activated. Abnormal condition: not activated.
	LED2 (Green)	LED2 indicates the transmission status between PCB1 and PCB2. Normal condition: flashing. Abnormal condition: activated or not activated.
	LED3 (Yellow)	LED3 indicates the transmission status between the indoor and outdoor units. Normal condition: flashing. Abnormal condition: activated or not activated.
	LED4 (orange)	LED4 indicates the transmission status between outdoor units. Normal condition: flashing. Abnormal condition: activated or not activated.
	LED5 (Red)	PCB1 power indication (High voltage). Normal condition: activated. Abnormal condition: not activated.
SEGs	SEG1, SEG2	Indicate the following: "Alarm", "Safety protection device has been activated' or "Checking items".

b. Inverter printed circuit board: PCB2 (and transistor module)



Part name	Contents of functions
LED201 (Red)	PCB2 power indication. Normal condition: activated. Abnormal condition: not activated.
LED202 (Yellow)	Microcomputer status indication. Normal condition: activated. Abnormal condition: not activated.

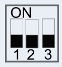
DSW1

- DSW1

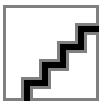
  Setting not required to be carried out.

  When contact number 1 is set to the ON position, the electrical current detection is cancelled.

  Contact number 1 must be set to the OFF position after the electrical work is carried out.



c. Fan controller



Part name	Contents of functions
LED501 (Red)	Fan controller power indication. Normal condition: activated. Abnormal condition: not activated.
LED202 (Yellow)	Microcomputer status indication. Normal condition: activated. Abnormal condition: not activated.

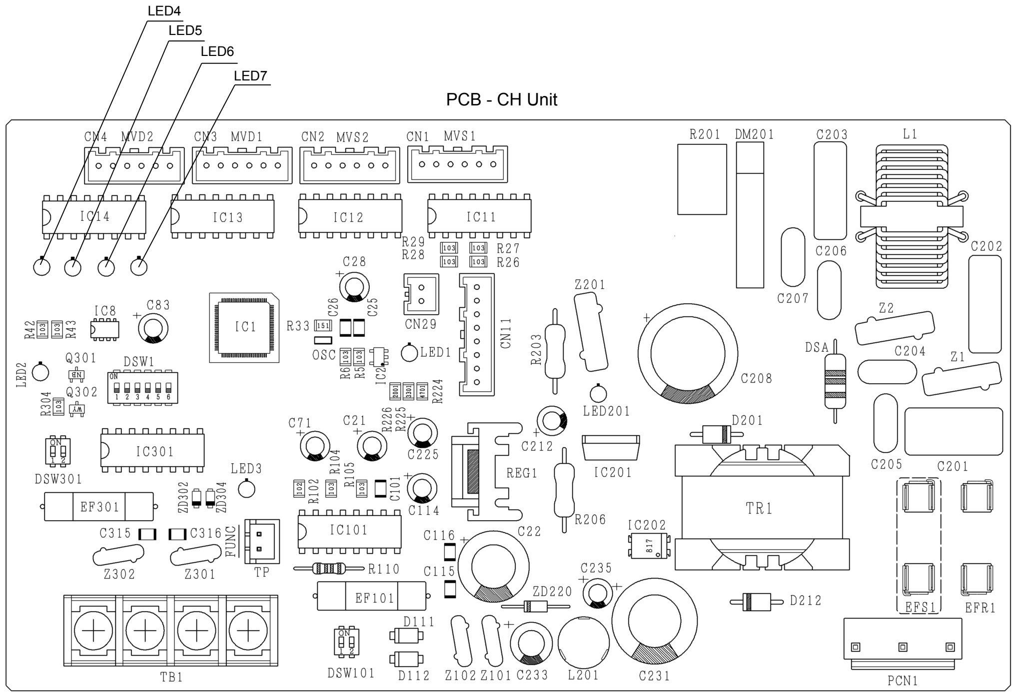
DSW1

- DSW1

  Setting not required to be carried out.

d. Printed circuit board (PCB) of CH unit

By the LED on the PCB in the CH unit, the condition of the expansion valve and alarm information can be checked.



1) The table below indicates the LED condition for each expansion valve when performing normal operation.

Part name	Expansion valve	Contents of functions
LED4 (Green)	MVD2	Fully opened (480 pulse): Turn ON Fully closed (0 pulse): Turn OFF
LED5 (Green)	MVD1	Fully opened (600 pulse): Turn ON Fully closed (0 pulse): Turn OFF
LED6 (Green)	MVS2	Fully opened (480 pulse): Turn ON Fully closed (0 pulse): Turn OFF
LED7 (Green)	MVS1	Fully opened (600 pulse): Turn ON Fully closed (0 pulse): Turn OFF

2) When alarming, the alarm code is indicated by LED.

LED				Alarm code	Contents
4	5	6	7		
O	O	X	X	03	Abnormal transmission between CH unit and outdoor unit.
X	X	O	O	03	Abnormal transmission between CH unit and indoor unit.
O	O	O	O	C1	2 or more CH units are connected between outdoor unit and indoor unit.
O	O	O	X	C2	9 or more indoor units connected to CH unit.
X	O	O	X	C3	The indoor units of different refrigerant cycle is connected to CH unit.

O: Flashing (Turn ON; 0.5 sec. / Turn OFF; 0.5 sec.)

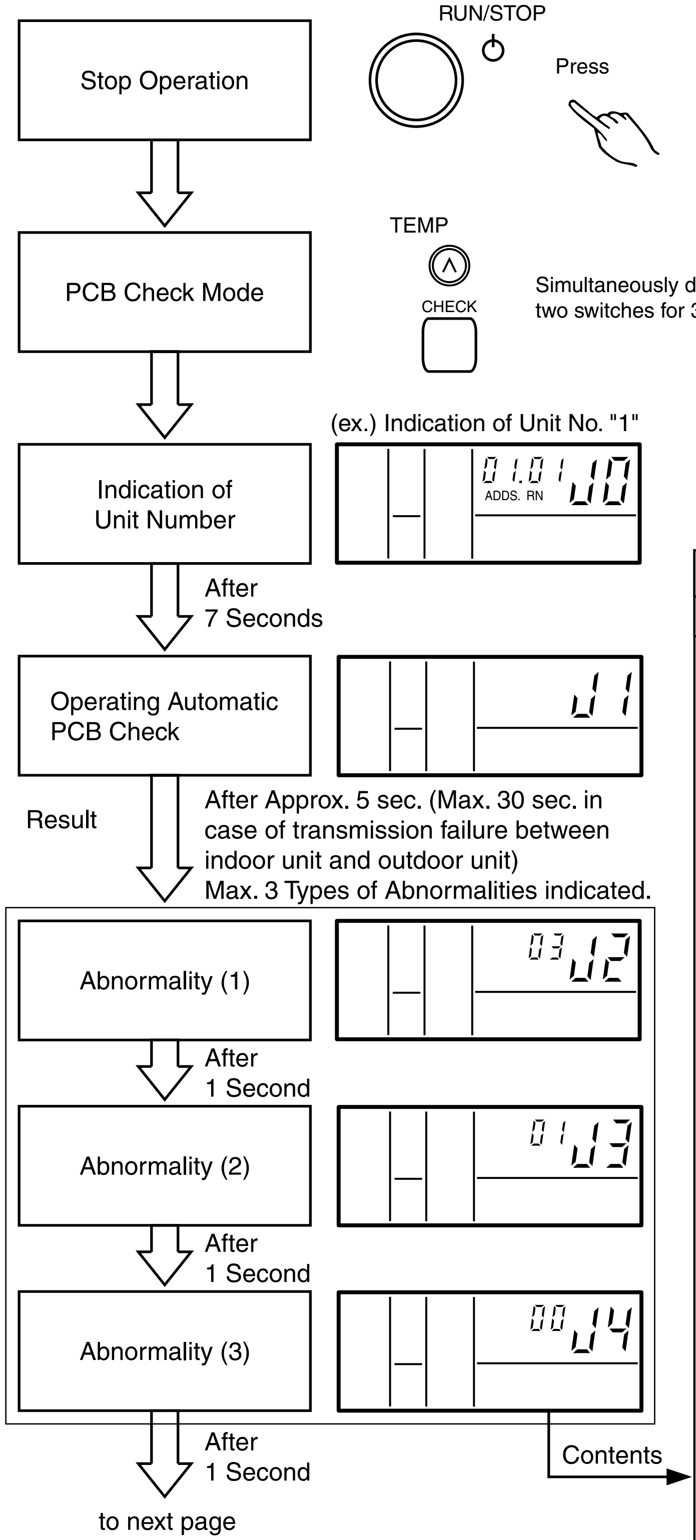
X: Turn OFF.

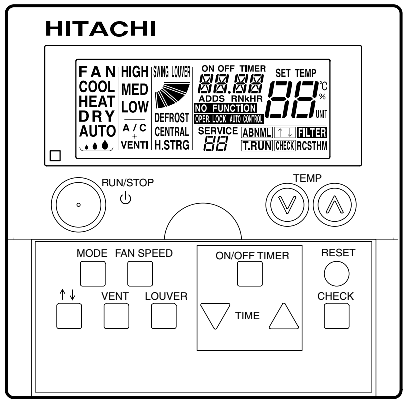
8

8.7 Checking procedures for each main part

8.7.1 Self-checking of PCB using the remote control

The following troubleshooting procedure is used for carrying out function test of the indoor and outdoor unit PCBs.





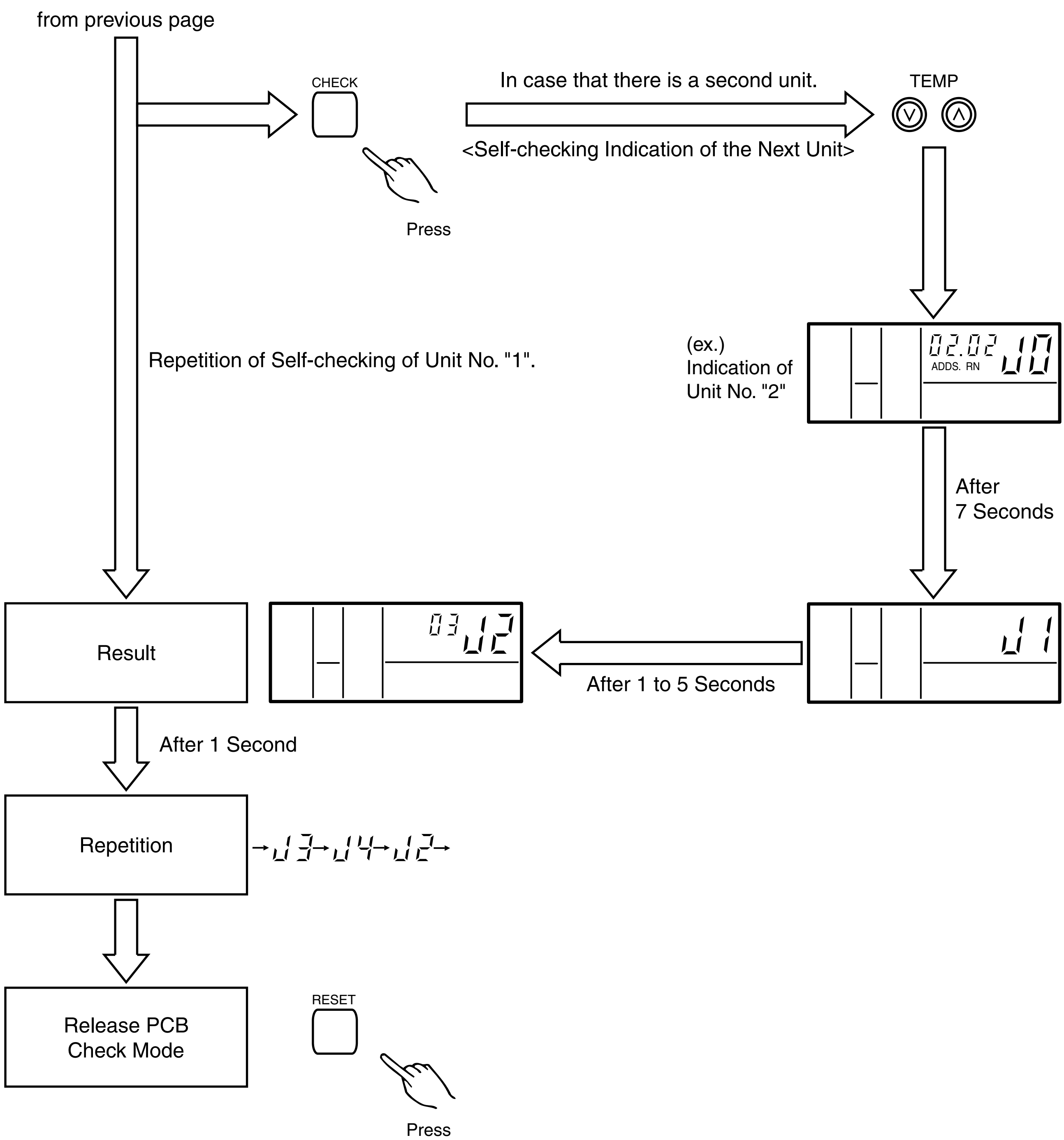
Indi-cation	Contents	
00	Normal	
	Abnormality (Open-circuit, Short-circuit, etc.) in circuit for	
01	Intake Air Temp. Thermistor	Indoor Unit PCB
02	Discharge Air Temp. Thermistor	
03	Liquid Pipe Temp. Thermistor	
04	Remote Thermistor Abnormality	
05	Gas Pipe Temp. Thermistor	
06	Remote Sensor	
08	Transmission of Central Station	
0A	EEPROM	
0b	Zero Cross Input Failure	
EE	Transmission of Indoor Unit during This Checking Operation	
07	Transmission of Outdoor Unit	Outdoor Unit PCB
F4	ITO Input Failure	
F5	PSH Input Failure	
F6	Protection Signal Detection Circuit	
F7	Phase Detection	
F8	Transmission of Inverter	
FA	High Pressure Sensor	
Fb	Comp. Discharge Gas Temp. Thermistor	
FC	Low Pressure Sensor	
Fd	Heat Exchanger Evaporation Temp. Thermistor	
FF	Ambient Air Temp. Thermistor	

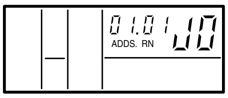
NOTE

In order to carry out the prior check, in the case the wireless remote control is used, carry out the following procedures:

1. ***Turn OFF the power supply.***
2. ***Place contact no.1 of the wireless receiver's SW3 to the ON position.***
3. ***Connect the PC-ART remote control to the terminal board.***
4. ***Turn ON the power supply.***

Once the check has been carried out, turn OFF the electrical power supply and return the connectors to the way they were before the check.





NOTE

1 ***If this indication is continuous and “J1” is not displayed,***
this indicates that each one of the indoor units is not connected to the remote control. Check the wiring between the remote control and the indoor unit.

2 ***During this troubleshooting procedure, the check of the following PCB parts is not available:***

Indoor unit PCB: relay circuit, DSW switches, option circuit, fan circuit, protection circuit.

Outdoor unit PCB: relay circuit, DSW switches, option circuit.

3 ***In the case this troubleshooting procedure is carried out in the system using the central station, the indication on the central station may change during this procedure. However, this is not abnormal.***

8.7.2 Self-checking of the remote control switch

1. Turn ON the power source.

2. Simultaneously depress the following 3 switches. (During operation, they can be depressed.)
   TEMP (∨) (∧) MODE

3. The LCD indication changes as shown in the right figure.
   → Only for cancellation of EEPROM, depress the following 3 switches simultaneously during changing LCD indication.
   TEMP (∨)
   TEMP (∧)
   MODE
   To 11

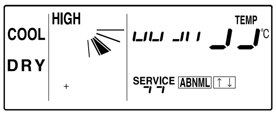
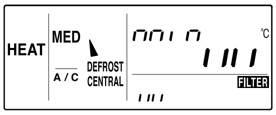
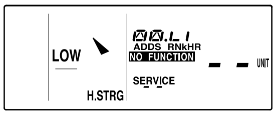
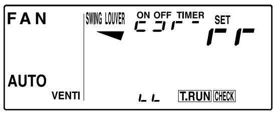
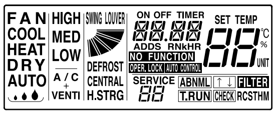
4. After the LCD indication changes as shown in the right figure, the RUN indicator flashes twice.
   01

5. The LCD indication changes as shown below.
   Depress all the switches (13 switches) one by one.
   Every time the switch is depressed, the number of the indication of (A) part in the figure below increases one by one.
   (A)
   0002
   NOTES:
   1. Any order of depressing switches is available.
   2. Depressing 2 or more switches simultaneously is invalid and not counted.
   → Unless all the switches are depressed, the checking do not proceed to the next item.

6. The LCD indication changes as shown below.
   The remote control switch automatically starts to check the transmission circuit.
   03
   → In case that the transmission circuit is abnormal, the LCD indication remains as the left figure and the checking do not proceed to the next item.

To the next page

Changing of LCD Indication

No.	LCD Indication	Indicating Period (sec.)
1		For 1 second
2		For 1 second
3		For 1 second
4		For 1 second
5		For 3 seconds

8

7

The LCD indication changes as shown below.
The detected temperature of remote control thermostat is indicated at the part (A) in the figure below.

(A)
20 04

If the number "- -" or "FF" is indicated at the (A) part, the remote control thermostat is abnormal.

8

The LCD indication changes as shown below.

05

In case of depressing the RESET switch or leaving the switches for 15 seconds, the data of EEPROM (storage cell inside of the remote control switch) is cleared.
At this time, the number is indicated at the (A) part shown in the figure below. When the number "99" is indicated, EEPROM is abnormal.

00 05
(A)

The number indicated at the (A) part is "99", the checking do not proceed to the next item.

In case that EEPROM is not canceled, depress the CHECK switch.

9

The LCD indication changes as shown below.

06

After several seconds are passed, the remote control switch is automatically activated again.

10

When the remote control switch is activated again, the RUN indicator is ON and the operation is started. Therefore, depress switch and stop operation.

RUN/STOP

NOTES:

1. In case that the operation is not automatically started when the remote control switch is activated again, the detection circuit for momentary stoppage may be abnormal.
   However, it would not interfere the normal operation.
2. There is a case that the operation is automatically stopped after the automatic operation when the remote control switch is activated again.

Cancellation of EEPROM

3

11

The LCD indication changes as shown below and the EEPROM is automatically canceled by the remote control switch.

07

12

The LCD indication changes as shown below.

08

After several seconds are passed, the remote control switch is automatically activated again.
In this case, the operation is not started automatically.

8.7.3 Checking procedures for other main parts

(1) High voltage discharge work for replacing parts

CAUTION

Carry out this high voltage discharge work to prevent electric shock.

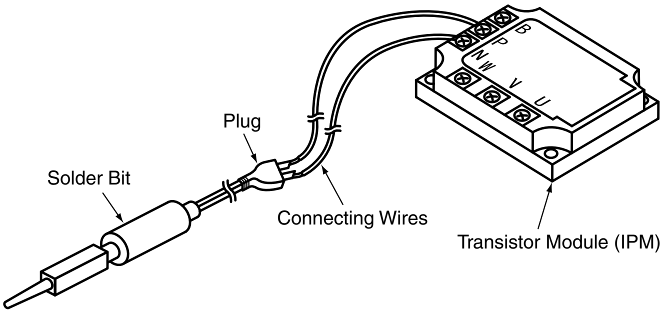
Procedure

(a) Turn OFF the main switches and wait three minutes. Check to make sure high voltage is not present. If LED201 is ON after the start-up and OFF after the power supply is turned OFF, the voltage will decrease lower than DC 50V.

(b) Connect connecting wires to an electrical solder bit.

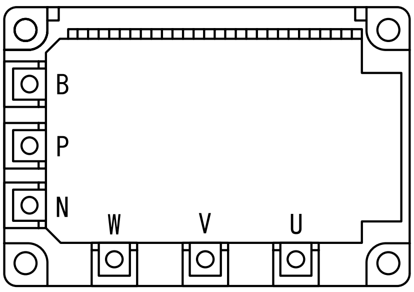
(c) Connect the cables to terminals, P and N of the IPM. => The discharge is started, which will heat up solder bit. Be careful not to short-circuit between terminals P and N.

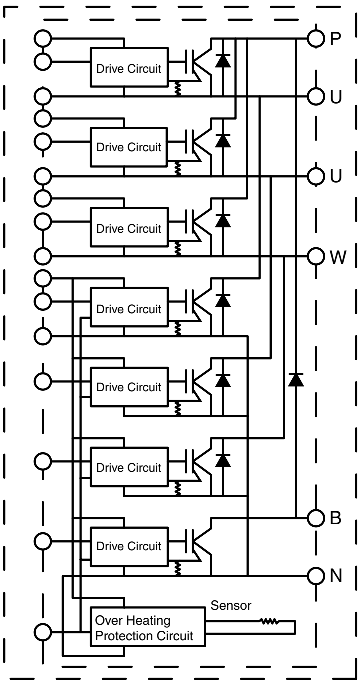
(d) Wait 2 or 3 minutes and measure the voltage once again. Make sure no voltage is present.



(2) Method for checking the transistor module (IPM).

External appearance and internal circuit of transistor module.

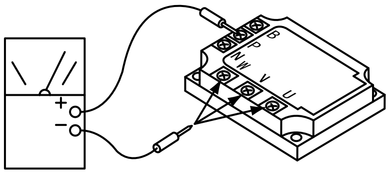




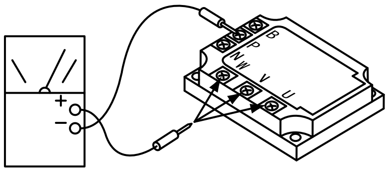
Procedure:

Remove all the terminals from the transistor module before the check. If steps (a) and (d) are carried out and the results are satisfactory, the transistor module is normal. Measure with the multimeter set under 1 kΩ range. Do not use a digital multimeter.

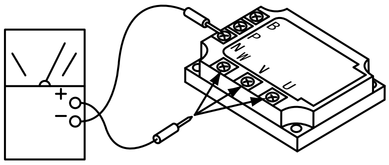
(a) Resistance is measured when the + side of the multimeter touches terminal P of the transistor module and the - side of the multimeter touches terminals U, V and W of the transistor module. It is normal for all the resistances to be between 1 and 5 kΩ.



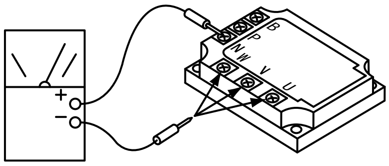
(b) Resistance is measured when the - side of the multimeter touches terminal P of the transistor module and the + side of the multimeter touches terminals U, V and W of the transistor module. It is normal for all the resistances to be greater than 100 kΩ.



(c) Resistance is measured when the - side of the multimeter touches terminal N of the transistor module and the + side of the multimeter touches terminals U, V and W of the transistor module. It is normal for all the resistances to be between 1 and 5 kΩ.

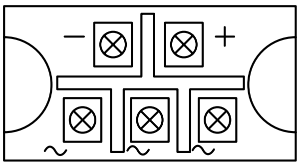


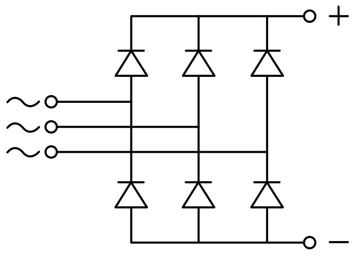
(d) Resistance is measured when the + side of the multimeter touches terminal N of the transistor module and the - side of the multimeter touches terminals U, V and W of the transistor module. It is normal for all the resistances to be greater than 100 kΩ.



(3) Method for checking the diodes module (DM).

External appearance and internal circuit of diode module.

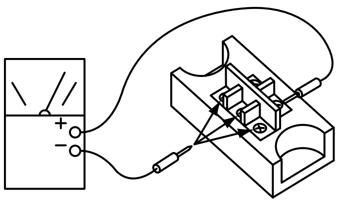




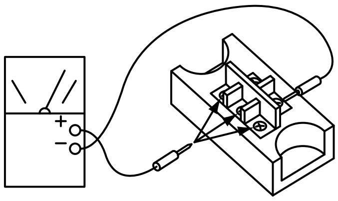
Procedure:

If steps (a) to (d) are carried out and the results are satisfactory, the diode module is normal. Measure with the multimeter set under 1 kΩ range. Do not use a digital multimeter.

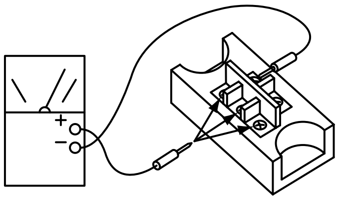
(a) Resistance is measured when the + side of the multimeter touches the + terminal of the diode module and the - side of the multimeter touches the ~ terminals (3 Nos.) of the diode module. It is normal for all the resistances to be between 5 and 50 kΩ.



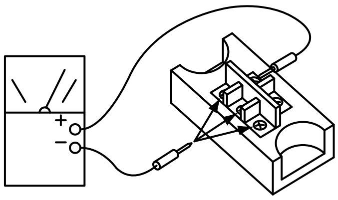
(b) Resistance is measured when the - side of the multimeter touches the + side of the diode module and the + side of the multimeter touches the ~ terminals (3 Nos.) of the diode module. It is normal for all the resistances to be greater than 500 kΩ.



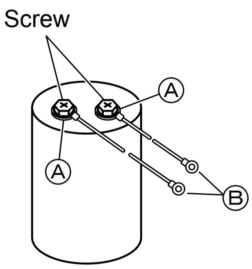
(c) Resistance is measured when the - side of the multimeter touches the - side of the diode module and the + side of the multimeter touches the ~ terminals (3 Nos.) of the diode module. It is normal for all the resistances to be between 5 and 50 kΩ.



(d) Resistance is measured when the + side of the multimeter touches the - side of the diode module and the - side of the multimeter touches the ~ terminals (3 Nos.) of the diode module. It is normal for all the resistances to be greater than 500 kΩ.



(4) Method for checking the capacitor



(a) Check that the screws are tightly fastened.

(b) Check that the capacitor is not blackened or bulging out.

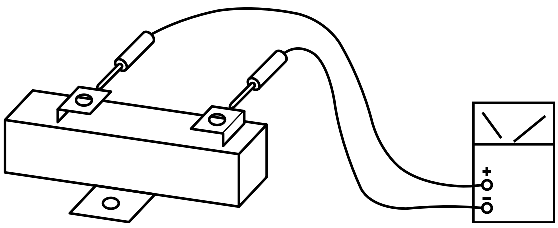
When checking the capacitor, disconnect the -B- terminals.

Do not disconnect the -A- terminals.

Capacitance	400 V
For Inverter	4700 μF
For the fan controller	2700 μF

(5) Method for checking the resistor

Measure both ends of the resistor as shown in the figure. It is normal for the resistance to be ∞ Ω.



Resistance		400 V
For Inverter	RS1	0.5 kΩ
	RS2	0.5 kΩ
	R1	6.3 kΩ
	R2	10.5 kΩ

(6) Method for checking the fan controller

(a) Turn OFF the power source switches before performing this work.

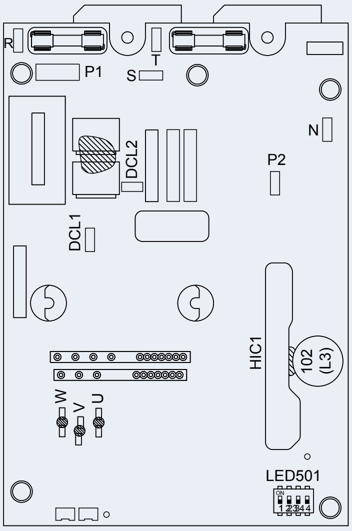
Also ensure that LED501 (red) on the fan controller is turned OFF.

If LED501 is ON, electrical shock may occur.

(b) Disconnect all the cables connected to the fan controller.

Measure the resistance between terminals using a multimeter. Do not use a digital multimeter.

When measuring, check the multimeter probe colour and the terminals to be measured as shown in the table below.

Fan controller	Multimeter probes Red (+) - Black (-)	Resistance range
	P1 - R P1 - S P1 - T R - N S - N T - N P1 - U P1 - V P1 - W U - N V - N W - N	1 kΩ and over
	R - P1 S - P1 T - P1 N - R N - S N - T U - P1 V - P1 W - P1 N - U N - V N - W	The resistance will gradually increase after it is between 1700 kΩ to 1900 kΩ (*)

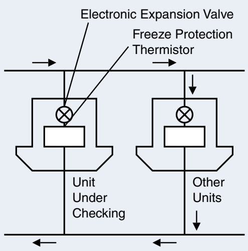
(*) Stay on for at least 30 seconds when measuring the following terminals.

< Initial DSW setting >

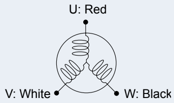
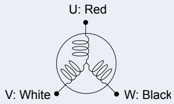
DSW1			
1	2	3	4
OFF	OFF	OFF	OFF

Regarding the DSW setting, do not change the original setting. If the settings are modified, transmission anomalies and fan controller failure may occur.

(7) Method for checking the electronic expansion valve

	Indoor unit electronic expansion valve	Outdoor unit electronic expansion valve
Locked with fully closed	Check the temperature of the liquid pipe during the heating operation. If the temperature does not increase, this is abnormal.	It is not abnormal if the pressure of the liquid pipe does not increase during the cooling operation.
Locked with slightly open	It is abnormal under the following conditions: The temperature of the freeze protection thermistor is lower than the temperature of the suction air when the unit under checking is stopped and other units are operating in cooling. 	It is abnormal if the pressure of the liquid pipe does not increase and the expansion valve outlet temperature decreases after the cooling operation is started.
Locked with fully open		It is abnormal under the following conditions: After heating operation in the heating mode for longer than 30 minutes, the compressor discharge gas temperature is not 10°C higher than the condensing temperature and there are no other problems such as excessive refrigerant charge, etc.

(8) Checking the electrical coil parts

Part name	Model	Electrical wiring diagram	Wiring No.	Resistance (Ω)
DC fan motor for outdoor unit RAS-(8-12)FSXN	DMLBA8PHT 750 W		White-black Black-red Red-white	2.58 ± 0.3 at 20°C
DC fan motor for outdoor unit RAS-(14-18)FSXN	ECW8802AH 1200 W		White-black Black-red Red-white	0.794 ± 5% at 20°C

Part names	Model	Resistance (Ω)
Solenoid valve for gas bypass	SR10PA	1250 at 20°C
Reversing valve	Coil: STF-01AJ502D1 + Body: STF-0401G (8-12 HP) STF-0712G (14-18 HP)	1130 at 20°C
Compressor motor (for Inverter compressor)	E656DHD	0.839 at 75°C
Compressor motor (for constant compressor)	E655DH	2907 at 75°C
Compressor motor (for constant compressor)	E855DH	2296 at 75°C

8

(9) Compressor checks

COMPRESSOR CHECKLIST		
CUSTOMER: ____________________	MODEL: ____________________________	DATE: ____________________
Serial No.: _______________________	Production date: ____________________	Inspector: __________________________

No.	Checking item	Check method	Result	Notes
1	Are THM8 and THM9 properly connected? THM8 and THM9: discharge gas thermistors	(1) Are the thermistor wires properly connected? (2) Check to ensure that the Td1 indication on the 7-segment display is greater than the Td2 indication when compressor No. 1 is operating. Td1: THM8 temperature Td2: THM9 temperature		
2	Are thermistors THM8 and THM9 disconnected?	(1) Check to ensure that the thermistor on the upper part of the compressor is properly installed. (2) Check to ensure that the currently measured temperature is very different than the (Td1, Td2) indication during the check mode.		
3	Are the current sensor connectors properly connected?	(1) Check to ensure that the A1 and A2 indication on the 7 segment display is 0 during the compressor stoppage.		
4	Is the current sensor defective?	(2) Check to ensure that the A1 and A2 indication is not 0 during the compressor operation (however, A2 is 0 during the stoppage of compressor No. 2.).		
5	Is the current sensor part of PCB2 defective?			
6	Is the direction of the current sensor (CTU, CTV) reversed?	Visually check the direction.		
7	Are power supply cables U and V correctly inserted in the current sensor?	Check to ensure that the cables are properly inserted.		
8	Are expansion valves (MV1 and MVB) properly connected?	Check to ensure that MV1 to CN10 and MVB to CN12 connections are correct.		
9	Are expansion valve (MV1 and MVB) coils properly installed?	Check to ensure that each coil is properly installed in the valve.		
10	Are the refrigeration cycle and the electrical wiring system improperly connected?	Check to ensure that refrigerant flows in the indoor units by operating one refrigeration cycle from the outdoor unit.		
11	Is the expansion valve completely closed (locked)?	Check the following by the outdoor unit check mode. (1) Liquid pipe temperature (TL) < Inlet air temperature (Ti) during the cooling operation. (2) Liquid pipe temperature (TL) > Inlet air temperature (Ti) during the heating operation.		
12	Is the expansion valve completely open (locked)?	Check to ensure that the liquid pipe temperature is lower than the inlet air temperature of the stopped indoor unit when other indoor units are operating in cooling mode.		
13	Are the magnetic switch (CMC1 and CMC2) contacts for compressor defectives?	Visually check the surface of each contact.		
14	Is there any voltage anomaly between L1-L2, L2-L3 and L3-L1?	Check to ensure the voltage imbalance is smaller than 3%. Take into account that the power supply voltage must be within 400 V ± 10%.		
15	Is the compressor oil acidified when the compressor motor has burned out?	Check to ensure that the oil colour is not black.		

Additional information regarding the COMPRESSOR CHECKLIST

Check item	Additional information (Mechanism of compressor failure)
1 and 2	The liquid refrigerant return volume to the compressor is controlled by the discharge gas temperature Td1 when only compressor No. 1 is operating. If Td1 and Td2 are reversely connected, the liquid refrigerant return volume will be small by detecting the temperatures even if the actual temperature of the discharge gas is high. Therefore, this abnormal overheating operation will cause the insulation failure on the motor winding.
3, 4 and 5	The overcurrent control (operating frequency control) is carried out by current detected by the current sensor. In this case, a winding insulation failure will occur, since control is not available in spite of the high current.
6 and 7	The current sensor checks the phase and adjusts the output of the electrical wave, as well as what has been described above. If a fault occurs, the electrical wave output becomes unstable adding overload to the motor windings and causing winding insulation failures.
8 and 9	During the cooling operation, Pd is controlled by the fan revolution of the indoor unit, and Td and SH are controlled by MV for each of the indoor units. During the heating operation, Td and SH are controlled by MV1. If the expansion valves are improperly connected, proper control is not available, resulting in compressor seizure depending on the liquid refrigerant return conditions or motor winding insulation failure depending on the overheating conditions.
10	If the refrigeration cycle and the electrical system are improperly connected, the suction pressure operation is maintained abnormally low or the discharge pressure operation is maintained abnormally high, resulting in an increase in compressor overload, since its proper control is not available.
11	The same
12	The compressor may be locked due to the liquid return operation during the cooling operation.
13	In the case that the contact resistance becomes big, the voltage imbalance between phases will cause an abnormal overcurrent.
14	In this case, an overcurrent will occur, the efficiency will be reduced or the motor winding will heat up excessively.
15	In this case, the motor will burn up or compressor seizure.

9. Spare parts

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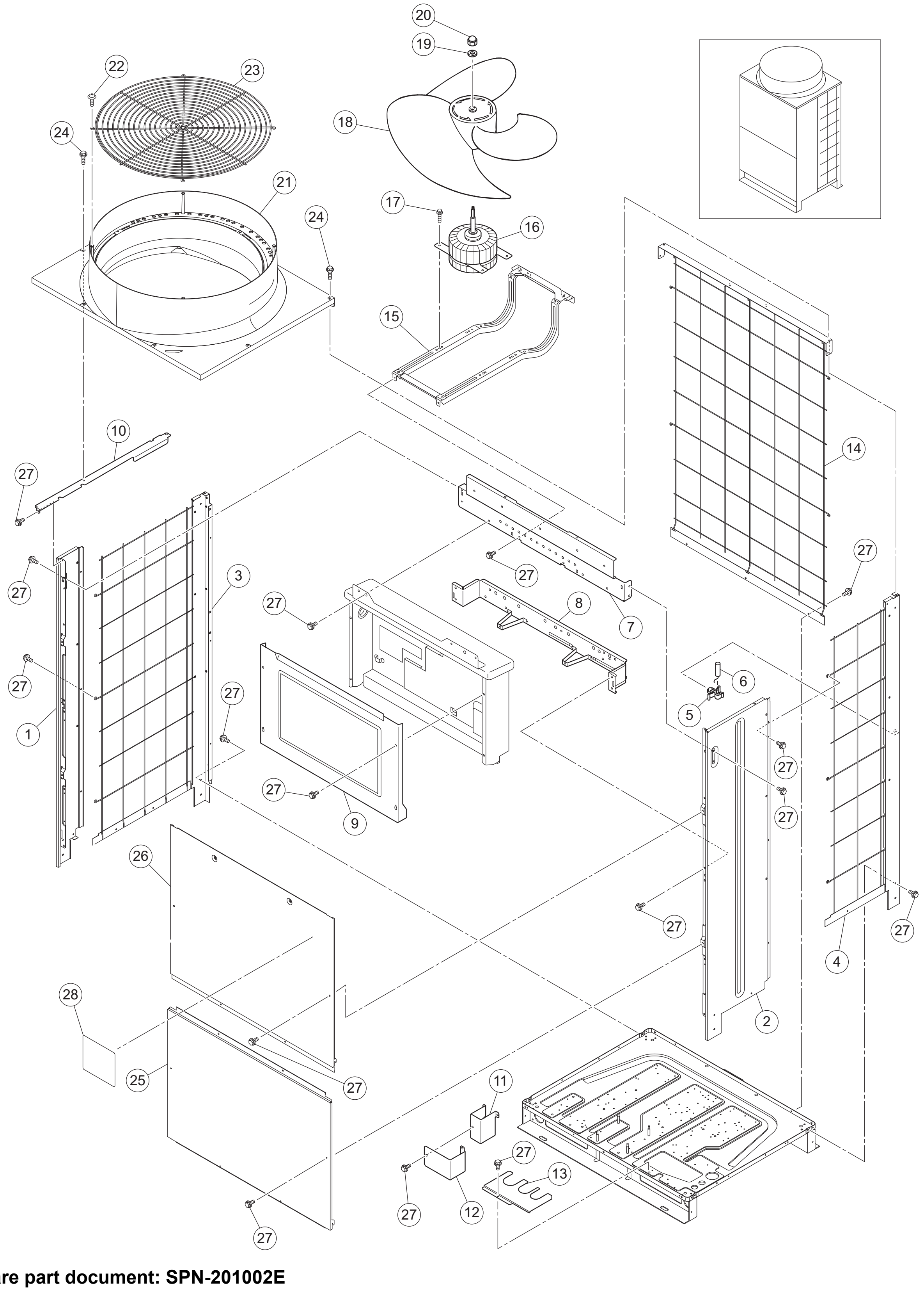
9.1 Cabinet and fan components for outdoor units

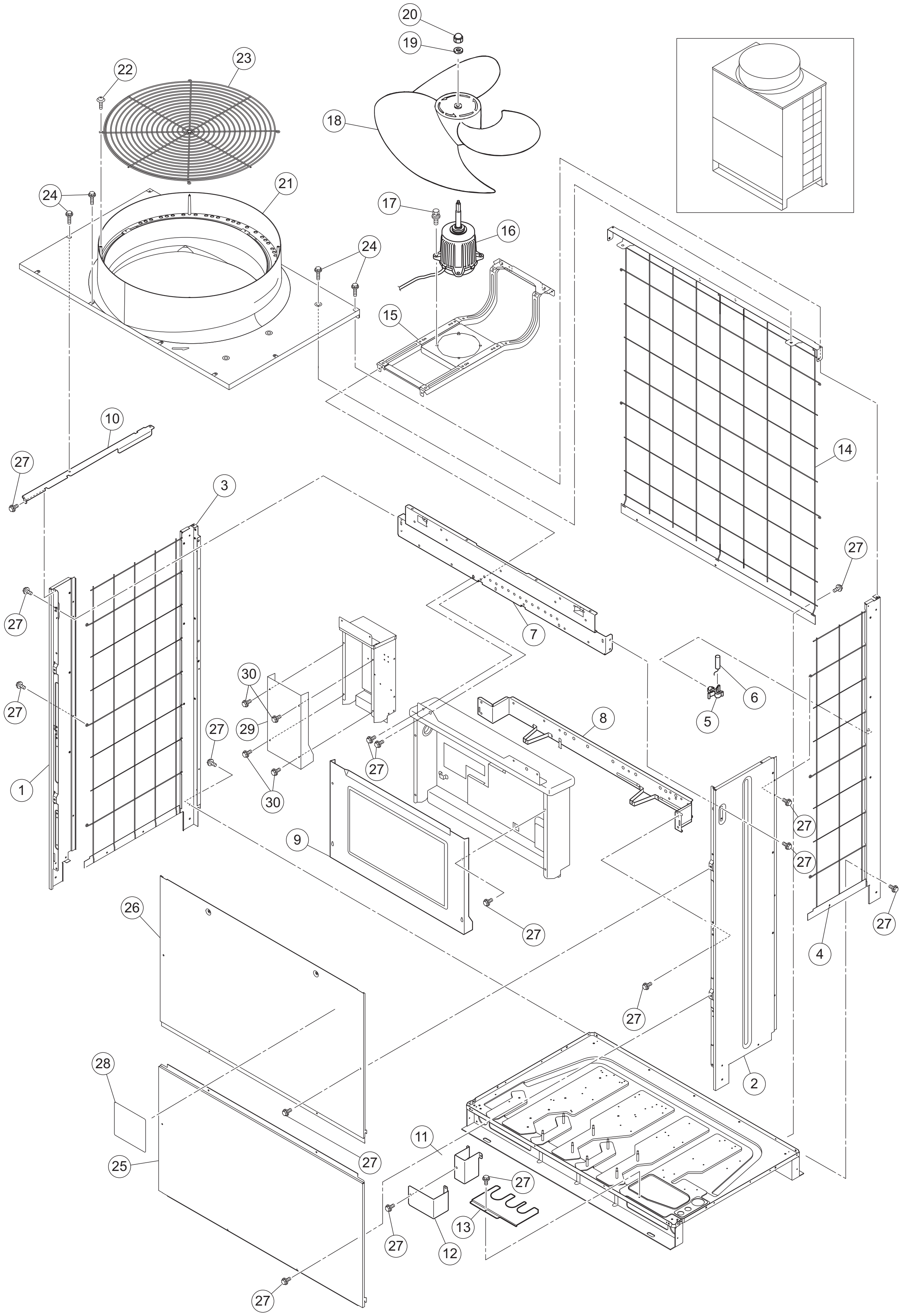
9.1.1 Cabinet and fan components for RAS-(8-12)FSXN



Spare part document: SPN-201002E

Part No.	Description	Remarks
1	Side cover L	—
2	Side cover R	—
3	Side cover 2 L	—
4	Side cover 2 R	—
5	TH holder	For Ta thermistor
6	Thermistor	THM7: Ambient thermistor (Ta)
7	Front stay	—
8	Electrical box stay	—
9	Electrical box cover	—
10	Upper stay	—
11	Valve cover 1	—
12	Valve cover 2	—
13	Piping cover	—
14	Protection net	—
15	Motor clamp	—
16	Fan motor	MOF1
17	Screw	SUS, M6 for the fan motor
18	Propeller fan	ø644
19	Washer	SUS
20	Closing nut	SUS, M10
21	Upper cover	—
22	Screw	SUS, M4
23	Air grille	—
24	Screw	SUS, M5
25	Front cover	—
26	Service cover	—
27	Screw	SUS, M5
28	HITACHI label	—

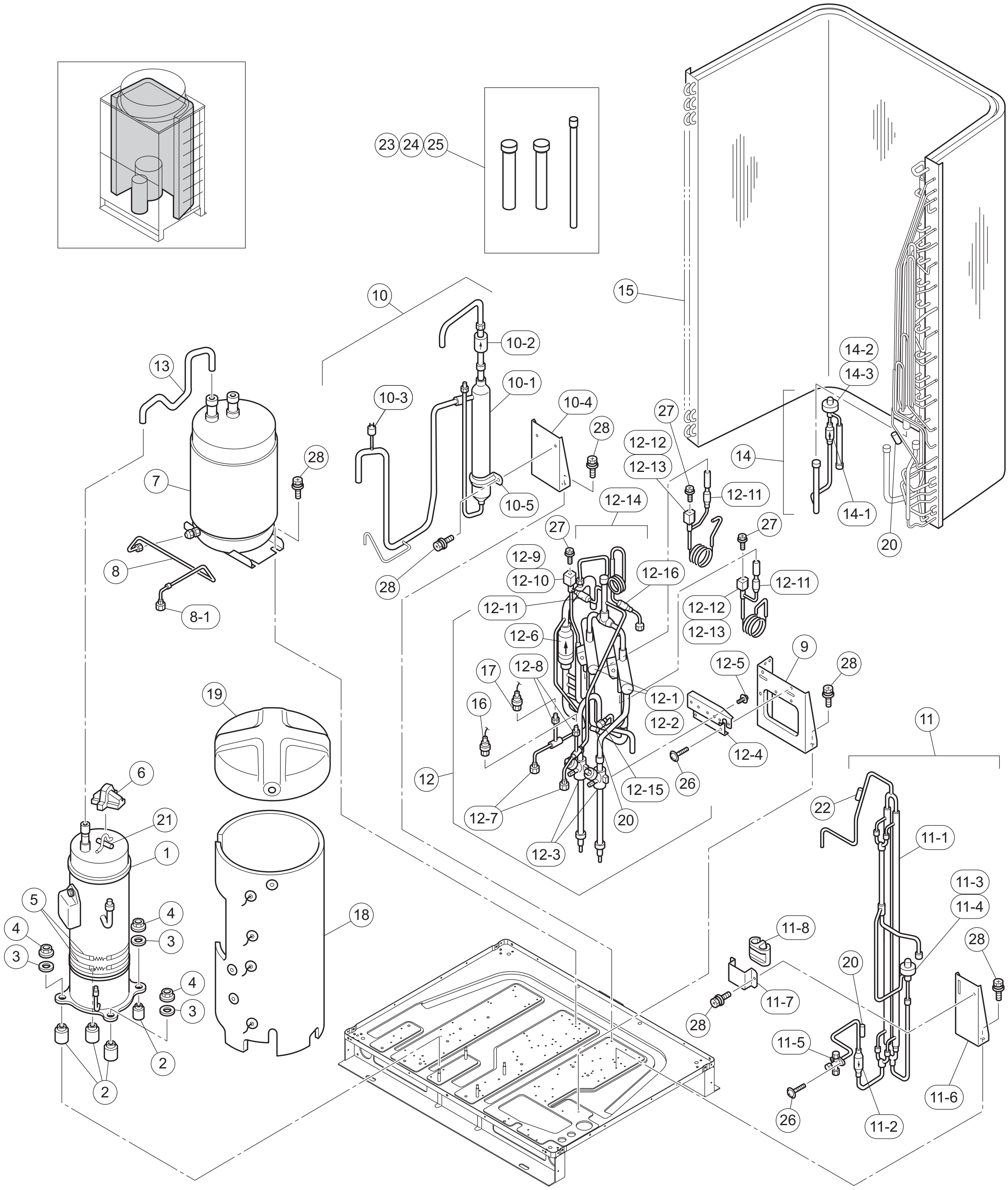
9.1.2 Cabinet and fan components for RAS-(14-18)FSXN



Part No.	Description	Remarks
1	Side cover L	—
2	Side cover R	—
3	Side cover 2 L	—
4	Side cover 2 R	—
5	TH holder	For Ta thermistor
6	Thermistor	THM7: Ambient thermistor (Ta)
7	Front stay	—
8	Electrical box stay	—
9	Electrical box cover	—
10	Upper stay	—
11	Valve cover 1	—
12	Valve cover 2	—
13	Piping cover	—
14	Protection net	—
15	Motor clamp	—
16	Fan motor	MOF1
17	Screw	SUS, M5 for the fan motor
18	Propeller fan	ø644
19	Washer	SUS
20	Closing nut	SUS, M10
21	Upper cover	—
22	Screw	SUS, M4
23	Air grille	—
24	Screw	SUS, M5
25	Front cover	—
26	Service cover	—
27	Screw	SUS, M5
28	HITACHI label	—
29	Sub electrical box cover	—
30	Screw	For the sub electrical box cover

9.2 Refrigerant cycle components for outdoor units

9.2.1 Refrigerant cycle components for RAS-(8-12)FSXN



Spare part document: SPN-201002E

Part No.	Description	Remarks
1	Compressor (Inverter)	MC1: E656DHD-65D2Y
2	Vibration proof rubber	—
3	Vibration proof rubber	—
4	Nut	—
5	Oil heater	CH1: 40.8 W,
6	Rubber cap	—
7	Accumulator	—
8	Oil pipe assembly	—
8-1	Check joint	—
9	Valve stay	—
10	D pipe assembly	—
10-1	Oil separator	—
10-2	Check valve	—
10-3	High pressure switch	PSH1: Saginomiya. ACB-1UB34
10-4	Oil separator stay	—
10-5	Saddle	—
11	L pipe assembly	—
11-1	Double tube	—
11-2	Strainer	—
11-3	Expansion valve	MVB: Saginomiya, UKV-25D26
11-4	Expansion valve coil	MVB: Saginomiya, UKV-A035
11-5	Stop valve (liquid)	3/8
11-6	Plate stay	—
11-7	Plate stopper	—
11-8	Rubber sheet	—
12	Reversing valve assembly	—
12-1	Reversing valve	RVR1, 2: Saginomiya, STF-0401G
12-2	Reversing valve coil	RVR1, 2: Saginomiya, STF-01AJ502D1
12-3	Stop valve (gas)	7/8
12-4	Valve stay	—
12-5	Screw	SUS, M5
12-6	Strainer	—
12-7	Check joint	—
12-8	Check joint	—
12-9	Solenoid valve	SVA: Nichiden Kougyou, SR10P
12-10	Solenoid valve coil	SVA: Nichiden Kougyou, SR10PA
12-11	Strainer	—
12-12	Solenoid valve	SVA: Nichiden Kougyou, SR10P
12-13	Solenoid valve coil	SVA: Nichiden Kougyou, SR10PA
12-14	Return oil pipe 1 assembly	For Inverter compressor
12-15	Check joint	—

Part No.	Description	Remarks
12-16	Strainer	—
13	S pipe assembly	—
14	Expansion valve assembly	—
14-1	Strainer	—
14-2	Expansion valve	MV1: Saginomiya, UKV-32D28
14-3	Expansion valve coil	MV1: Saginomiya, UKV-A027
15	Heat exchanger	—
16	High pressure sensor	PD: Saginomiya, NSK-BD050F-102
17	Low pressure sensor	PS: Saginomiya, NSK-BD020F-102
18	RC cover	—
19	Sound proof cover	—
20	Thermistor	THM17, 11, 10: For piping (Tchg, Tg, Te)
21	Thermistor	THM8: For compressor (Td1)
22	Thermistor	THM23: For piping (TBg)
23	Accessory pipe	—
24	Accessory pipe	—
25	Accessory pipe	—
26	Screw	SUS, M6
27	Screw	For coil
28	Screw	SUS, M5

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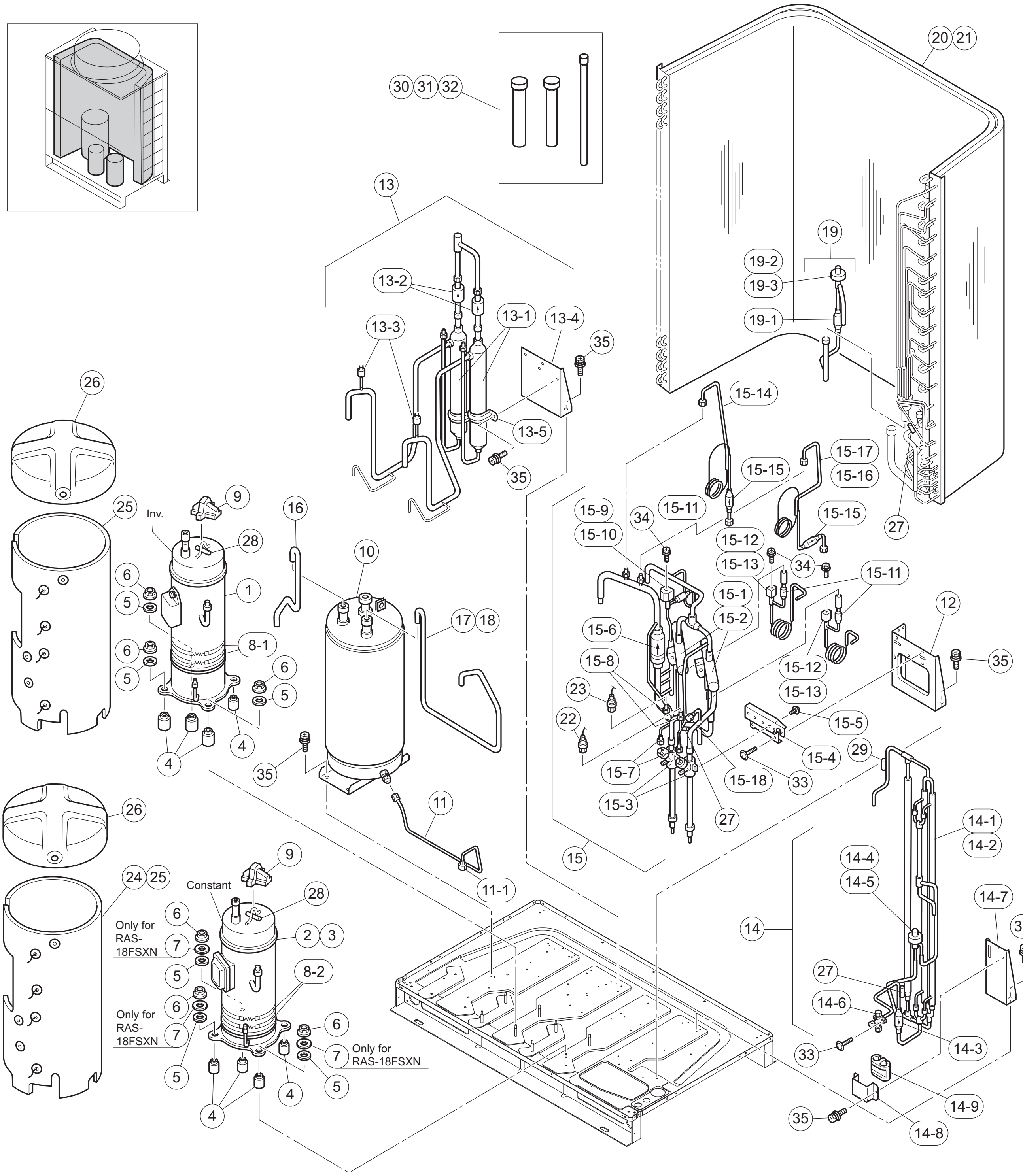
9.2.2 Refrigerant cycle components for RAS-(14-18)FSXN



9

Part No.	Description	Remarks
1	Compressor (Inverter)	MC1: E656DHD-65D2Y
2	Compressor (constant)	MC2: E655DH-65D2Y (RAS-(14/16)FSXN)
3	Compressor (constant)	MC2: E855DH-80D2Y (RAS-18FSXN)
4	Vibration proof rubber	—
5	Vibration proof rubber	—
6	Nut	—
7	Washer	—
8-1	Oil heater	CH1: 40.8 W, Belt heater
8-2	Oil heater	CH2: 40.8 W, Belt heater
9	Rubber cap	—
10	Accumulator	—
11	Oil pipe assembly	—
11-1	Check joint	—
12	Valve stay	—
13	D-Pipe Assy	—
13-1	Oil separator	—
13-2	Check valve	—
13-3	High pressure switch	PSH1, 2: Saginomiya. ACB-1UB34
13-4	Oil separator stay	—
13-5	Saddle	—
14	L pipe assembly	—
14-1	Double tube assembly	—
14-2	Double tube	—
14-3	Strainer	—
14-4	Expansion valve	MVB: Saginomiya, UKV-25D26
14-5	Expansion valve coil	MVB: Saginomiya, UKV-A035
14-6	Stop valve (liquid)	1/2
14-7	Plate stay	—
14-8	Stop stopper	—
14-9	Rubber sheet	—
15	Reversing valve assembly	—
15-1	Reversing valve	RVR1, 2: Saginomiya, STF-0712 G
15-2	Reversion valve coil	RVR1, 2: Saginomiya, STG-01AJ502D1
15-3	Stop valve (gas)	1/1
15-4	Valve stay	—
15-5	Screw	SUS, M5
15-6	Strainer	—
15-7	Check joint	—
15-8	Check joint	—
15-9	Solenoid valve	SVA: Nichiden Kougyou, SR10P
15-10	Solenoid valve coil	SVA: Nichiden Kougyou, SR10PA

Part No.	Description	Remarks
15-11	Strainer	—
15-12	Solenoid valve	SVG: Nichiden Kougyou, SR10D
15-13	Solenoid valve coil	SVG: Nichiden Kougyou, SR10PA
15-14	Return oil pipe 1 assembly	For Inverter compressor
15-15	Strainer	—
15-16	Return oil pipe 2 assembly	For the constant speed compressor
15-17	Return oil pipe 2 assembly	For the constant speed compressor
15-18	Check joint	—
16	S pipe assembly 1	—
17	S pipe assembly 2	—
18	S pipe 2	—
19	Expansion valve assembly	—
19-1	Strainer	—
19-2	Expansion valve	MV1: Saginomiya, VKV-40D51
19-3	Expansion valve coil	MV1: Saginomiya, EKV-MOZS225B0
20	Heat exchanger	For RAS-(14/16)FSXN
21	Heat exchanger	For RAS-18FSXN
22	High pressure sensor	PD: Saginomiya, NSK-BD050F-102
23	Low pressure sensor	PS: Saginomiya, NSK-BD020F-102
24	RC cover	—
25	RC cover	—
26	Sound proof cover	—
27	Thermistor	THM17, 11, 10: For piping (Tchg, Tg, Te)
28	Thermistor	THM8: For compressor (Td1, Td2)
29	Thermistor	THM23: For piping (TBg)
30	Piping accessory	—
31	Piping accessory	—
32	Piping accessory	—
33	Screw	SUS, M6
34	Screw	For coil
35	Screw	SUS, M5

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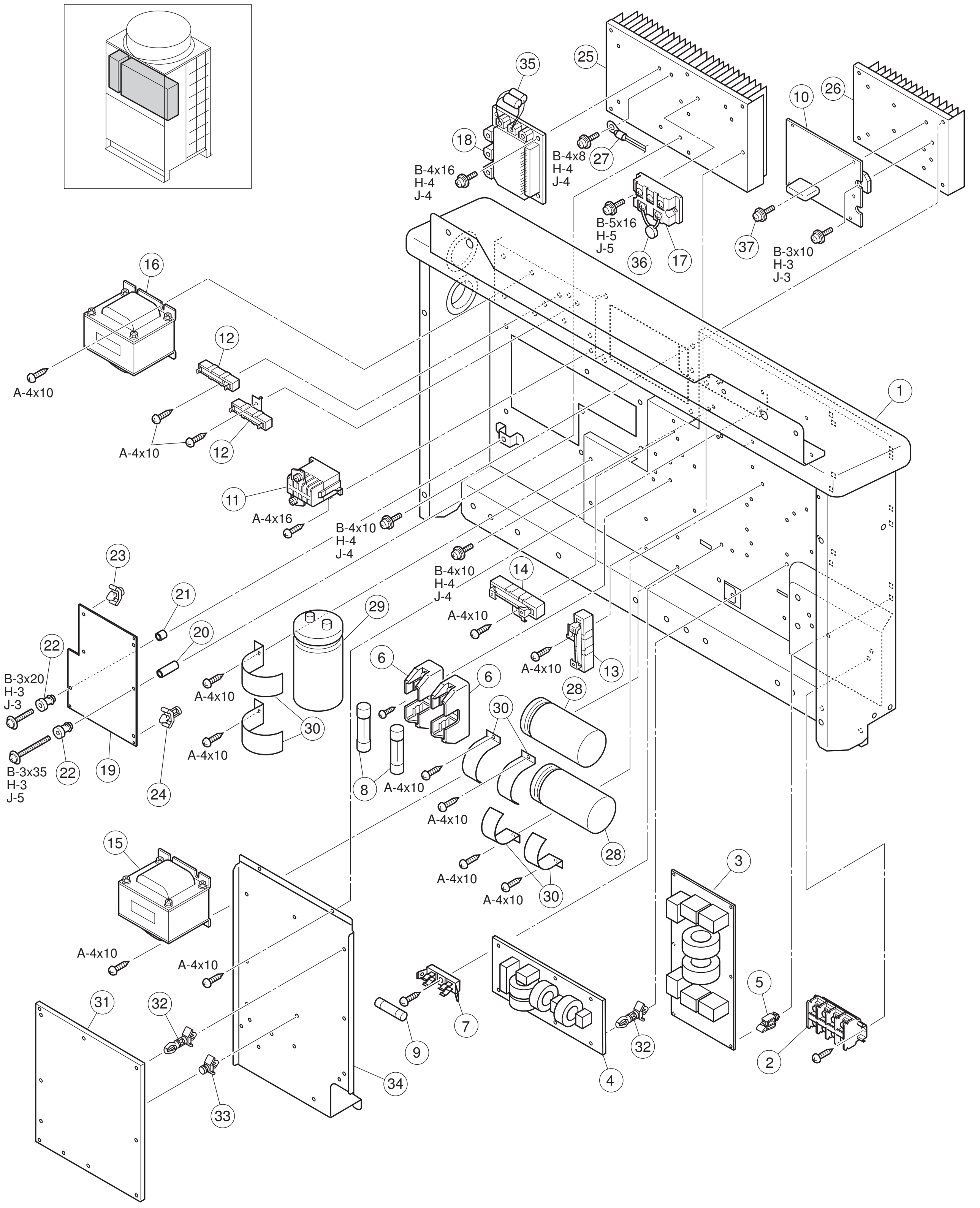
9.3 Electrical parts for outdoor units

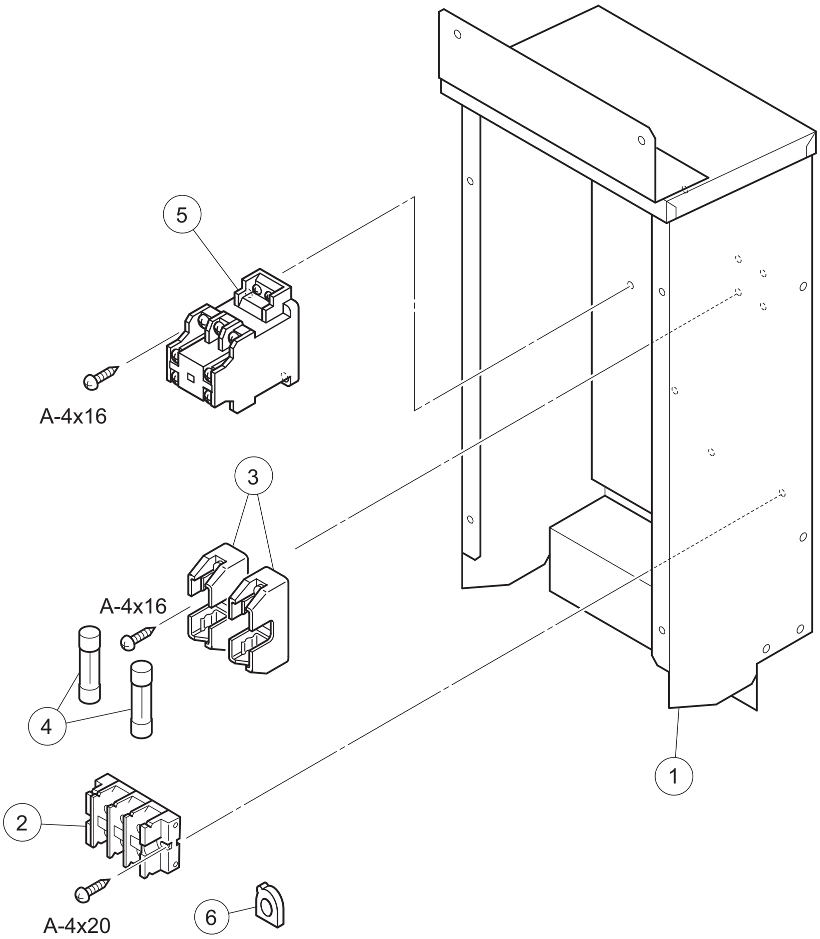
9.3.1 Electrical box components for RAS-(8-18)FSXN



A	Truss Head Tapping Screw		F	Stud Bolt
B	Round Head Screw		G	Nut
C	Flat Head Screw		H	Washer
D	Pan Head Tapping Screw		J	Spring Lock Washer
E	Hexagon Head Bolt		K	Toothed Lock Washer

Part No.	Description	Remarks
1	Electrical box	—
2	Terminal board	TB1: 600 V, 50 A (RAS-(8-12)FSXN)
2	Terminal board	TB1: 600 V, 80 A (RAS-(14-18)FSXN)
3	Noise filter	NF1: 4LFB-22930-2F
4	Noise filter	NF2: LFB-14930-3MA
5	Holder	—
6	Fuse holder	EF1, 2 (for the Inverter compressor)
7	Fuse holder	EF11 (for the fan)
8	Fuse	EF1, 2: 40 A (for the Inverter compressor)
9	Fuse	EF11: 20 A (for the fan)
10	Fan controller	FANM: PV092
11	Magnetic switch	CMC1: Fuji electric, FC-0/SP
12	Resistor	RS1, 2: 20SHT500JA187
13	Resistor	R1: 40SH, 6.3 kΩ
14	Resistor	R1: 40SH, 10.5 kΩ
15	Reactor	DCL2: 3.0 mH, 10 A (for the fan)
16	Reactor	DCL1: 1.0 mH, 10 A (for the inverter)
17	Diode module	DM: DF50AA160
18	Transistor module	IPM: 6MBP50RA120-55
19	PCB for the inverter	PCB2: PV093
20	Collar	—
21	Collar	—
22	Bushing	—
23	Spacer	—
24	Spacer	—
25	Radiation fin 1	—
26	Radiation fin 2	—
27	Thermistor	THM: For the inverter fin
28	Capacitor	CB1, 2: 450 V, 4700 μF (for the inverter)
29	Capacitor	CB3: 450 V, 2700 μF (for the fan)
30	Saddle	—
31	Printed circuit board	PCB1: PO091
32	Spacer	—
33	Spacer	—
34	PCB plate	—
35	Capacitors	CS1, CS2
36	Noise suppressor	ZNR
37	Screw	—

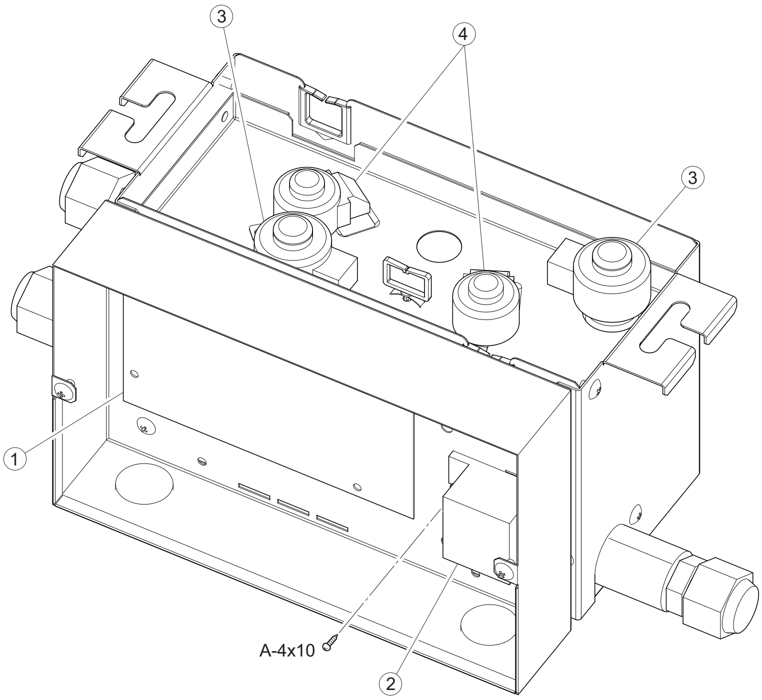
9.3.2 Sub electrical box components for RAS-(14-18)FSXN



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Toothed Lock Washer	

Part No.	Description	Remarks
1	Sub electrical box	—
2	Terminal board	—
3	Fuse holder	EF3, 4
4	Fuse	EF3, 4 (for the constant speed compressor)
5	Magnetic switch	CMC2: Fuji Electric, FC-2S
6	Current sensor	CT2

9.4 Refrigerant cycle and electrical parts for CH units



A	Truss Head Tapping Screw		F	Stud Bolt	
B	Round Head Screw		G	Nut	
C	Flat Head Screw		H	Washer	
D	Pan Head Tapping Screw		J	Spring Lock Washer	
E	Hexagon Head Bolt		K	Toothed Lock Washer	

Spare part document: SPN-201002E

Part No.	Description	Remarks
1	Printed circuit board	PCB1
2	Terminal board	TB1: 600 V, 30 A
3	Expansion valve coil	MVD1, S1: Fuji Kouki, HAM-MD12HS-2
4	Expansion valve coil	MVD2, S2: Fuji Kouki, CAM-MD12HS-9

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10. Servicing

Index

10.1 Removing the front service cover

DANGER

- ***Turn OFF all the power source switches.***

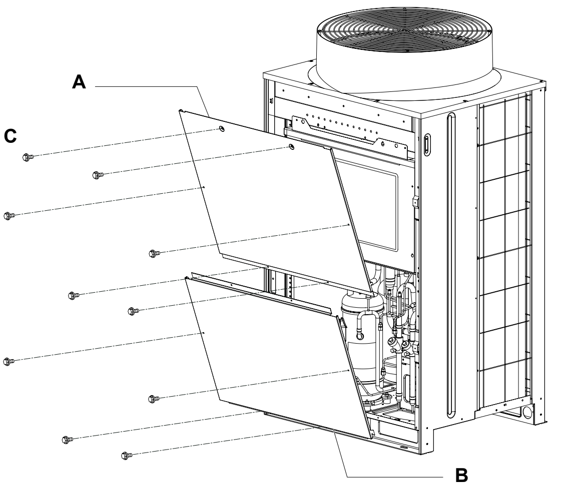
NOTE

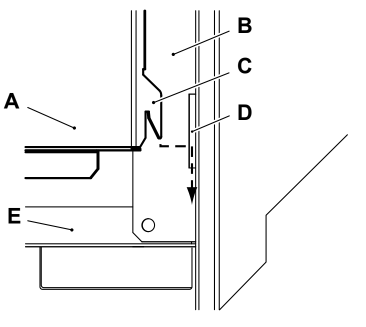
- ***For servicing use the following tool:***

- Phillips screw driver.

1 Remove the service cover -A-.
 a Remove the six screws -C- from the service cover -A-.
 b Hold the service cover -A- at the bottom and extract it forwards.

2 Remove the front cover -B-
 a Remove the four screws -C- from the front cover -B-, starting at the bottom of the front cover -B-.
 b Hold the front cover -B- at the top and lift it upwards. Remove the right and left hooks that secure the front cover -B- and extract the cover forward.





NOTE

1 ***When fitting and removing the front cover take care not to get injured with the edges of the cover.***

2 ***When securing the front cover -A-, insert the hook -C- firmly in the lower part of the square hole -D- of the side cover -B-, as shown in the figure.***
Do not insert the lower part of the front cover inside the lower part of the base -E- .

10.2 Removing the upper cover

DANGER

- ***Turn OFF all the power source switches.***

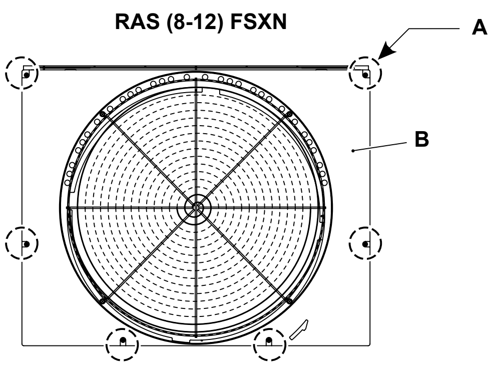
NOTE

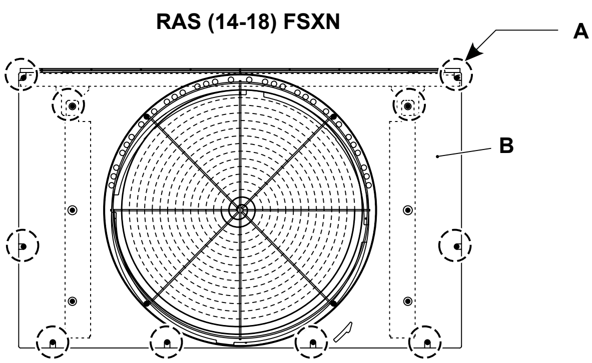
- ***For servicing use the following tool:***

- Phillips screw driver.

1 Remove the screws -A- that attach the upper cover -B-.
- RAS-(8-12)FSXN: 6 screws.
- RAS-(14-18)FSXN: 10 screws.

2 Lift the upper cover upward. Take care with the propeller fan when removing the upper cover.





10.3 Removing the electrical box cover

DANGER

- ***Turn OFF all the power source switches.***

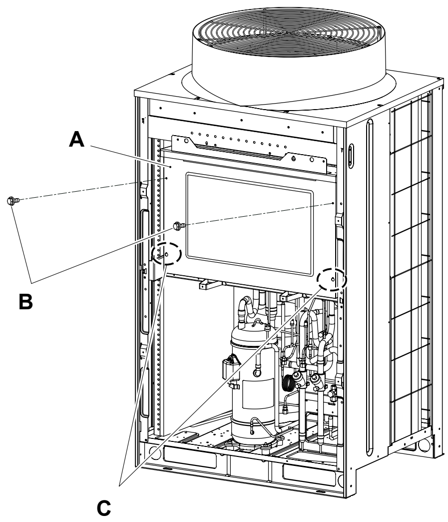
NOTE

- ***For servicing use the following tool:***

- Phillips screw driver.

10.3.1 Removing the electrical box cover for RAS-(8-12)FSXN

1 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.
2 Remove the two screws of the electrical box cover -B- and loosen the two fixing screws, for fall prevention -C-.
3 Lift the electrical box cover -A- and remove it forward from the screws -C-.

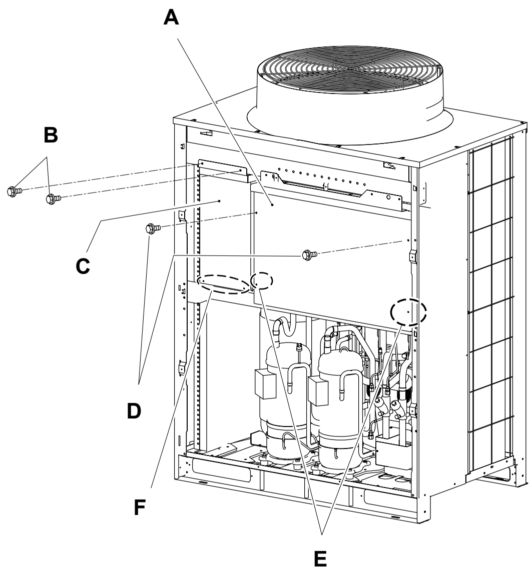


NOTE

- ***Before removing the screws that fix the electrical box cover, make sure that the screws -C- are fixed to the cover, so that the cover will not fall.***
- ***Take care not get injured with the edges of the front cover when removing the electrical box cover.***

10.3.2 Removing the electrical box cover for RAS-(14-18)FSXN

1 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.
2 Remove the two screws of the electrical box cover -B- and loosen the two fixing screws, for fall prevention -E-.
3 Lift the electrical box cover -A- and remove it forward from the screws -D-.
4 Remove the two screws of the sub electrical box cover -B- and loosen the two fixing screws, for fall prevention -F-.
5 Lift the sub electrical box cover -C- and remove it forward from the screws -E-.



NOTE

- ***Before removing the screws that fix the electrical box cover and the sub electrical box cover, make sure that the screws -E and F- are fixed to the cover, so that the cover will not fall.***
- ***Take care not to get injured with the edges of the front cover when removing the electrical box cover.***

10.4 Removing the electrical box

DANGER

- ***Turn OFF all the power source switches.***

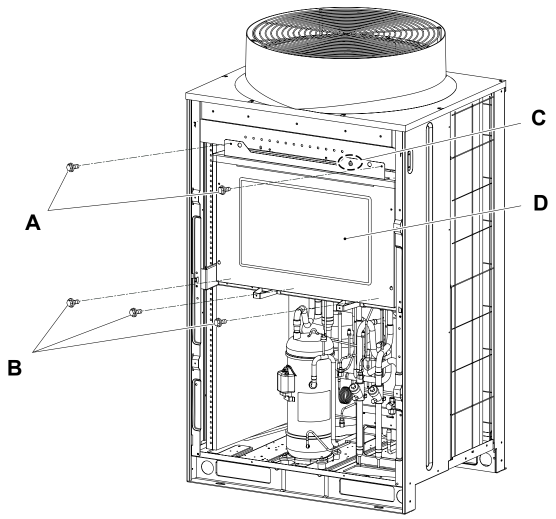
NOTE

- ***For servicing use the following tool:***

- Phillips screw driver.

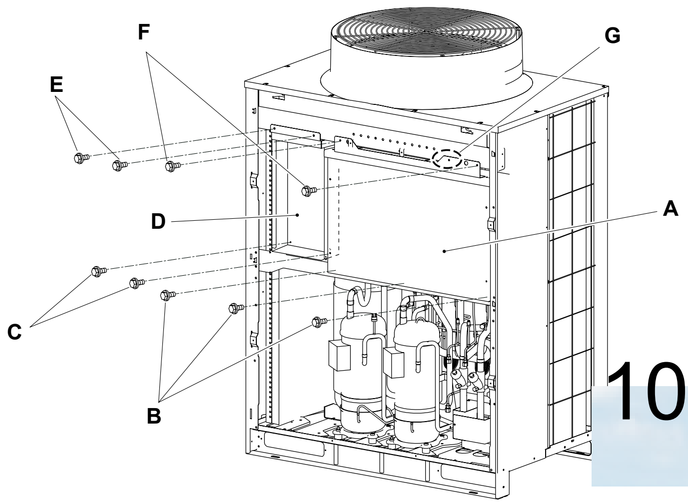
10.4.1 Removing the electrical box for RAS-(8-12)FSXN

1. Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.
2. Remove the electrical box cover as described in the procedure *Removing the electrical box cover for RAS-(8-12)FSXN, see on page 294*.
3. Remove the screws that fix the wiring of the power supply, the wiring of the compressor, the operation line and the earth wire.
4. Disconnect the connector for the fan motor, the solenoid valve, the crankcase heater and the high pressure switch.
5. Disconnect the connector for the thermistor, the electronic expansion valve and the pressure sensor of the PCB1.
6. Remove the three lower screws -B- of the electrical box -D-.
7. Fit the electrical box cover.
8. Remove the two upper screws of the electrical box -A- and loosen the screw, for fall prevention -C-.
9. Lift the electrical box -D- and remove it forward from the screw -C-.



10.4.2 Removing the electrical box for RAS-(14-18)FSXN

1. Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.
2. Remove the electrical box cover as described in the procedure *Removing the electrical box cover for RAS-(14-18)FSXN, see on page 294*.
3. Remove the screws that fix the wiring of the power supply, the wiring of the compressor, the operation line and the earth wire.
4. Disconnect the connector for fan motor, the solenoid valve, the crankcase heater and the high pressure switch.
5. Disconnect the connector for the thermistor, the electronic expansion valve and the pressure sensor of the PCB1.
6. Remove the three lower screws -B- of the electrical box -A-.
7. Fit the cover of the electrical box.
8. Remove the two upper screws of the electrical box -F- and loosen the screw for fall prevention -G-.
9. Lift the electrical box -A- and remove it forward from the screw -G-.
10. Remove the two lower screws -C- of the sub electrical box -D-.
11. Remove the two upper screws of the sub electrical box -E- and remove the sub electrical box -D-.



10

10.5 Removing the electrical box stay

DANGER

- ***Turn OFF all the power source switches.***

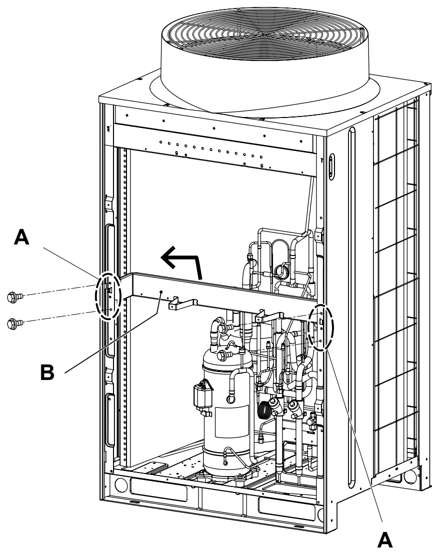
NOTE

- ***For servicing use the following tool:***

- Phillips screw driver.

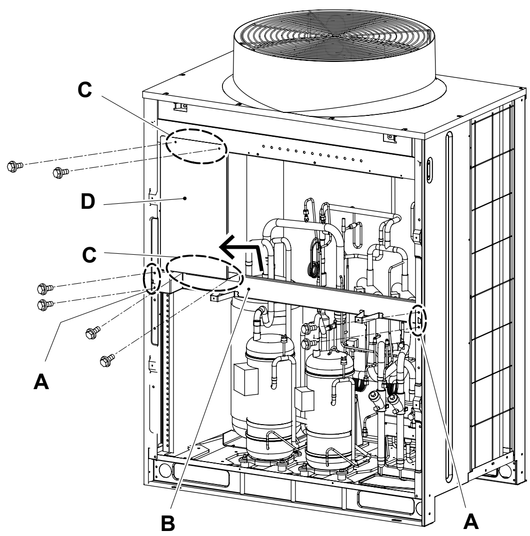
10.5.1 Removing the electrical box stay for RAS-(8-12)FSXN

1 Remove the electrical box as described in the procedure *Removing the electrical box for RAS-(8-12)FSXN, see on page 295.*
2 Remove the four fixing screws -A- of the electrical box stay -B-.
3 Lift the electrical box stay -B- upward. Remove the right and left hooks that fix the electrical box stay in the direction of the arrow.



10.5.2 Removing the electrical box stay for RAS-(14-18)FSXN

1 Remove the electrical box as described in the procedure *Removing the electrical box for RAS-(14-18)FSXN, see on page 295.*
2 Remove the four fixing screws -C- on the fan cover -D-.
3 Lift the fan cover -D- forward and remove it.
4 Remove the four fixing screws -A- of the electrical box stay -B-.
5 Lift the electrical box stay -B- upward. Remove the right and left hooks that fix the electrical box stay in the direction of the arrow.



10.6 Removing the air grille

DANGER

- ***Turn OFF all the power source switches.***

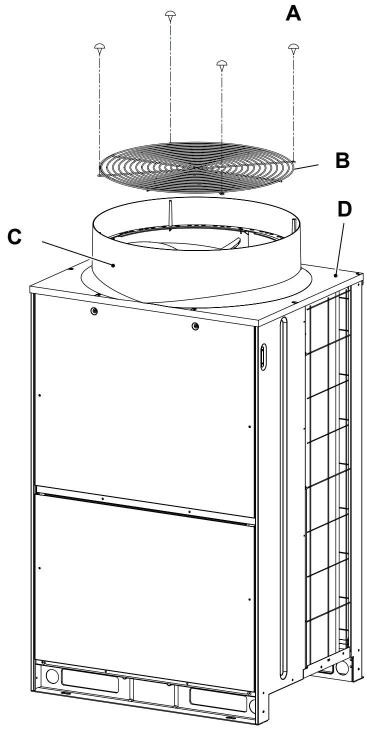
NOTE

- ***For servicing use the following tool:***

- Phillips screw driver.

1 Remove the four fixing screws -A- of the air grille -B-.

2 Remove the air grille -B-.



NOTE

Do not apply too much force to the shroud (plastic part) -C- to avoid breaking or deforming it.
D: Upper cover.

10.7 Removing the outdoor fan

DANGER

- ***Turn OFF all the power source switches.***

NOTE

- ***For servicing use the following tools:***

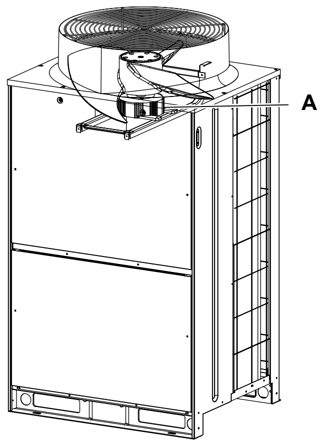
- Adjustable wrench. ***- Puller.***

- Spanner. ***- Nipper.***

- Phillips screw driver. ***- Box wrench.***

1 Remove the air grille as described in the procedure *Removing the air grille, see on page 297*.

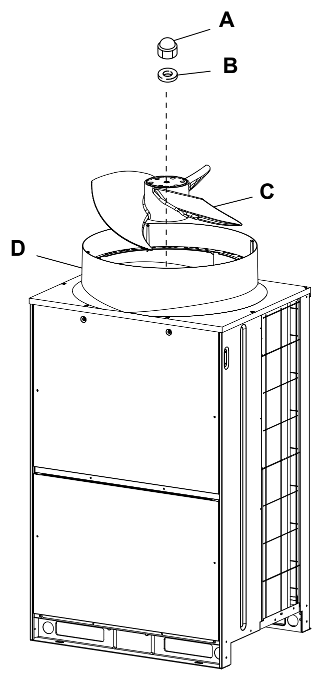
- Fan motor position.
  A: DC fan motor.

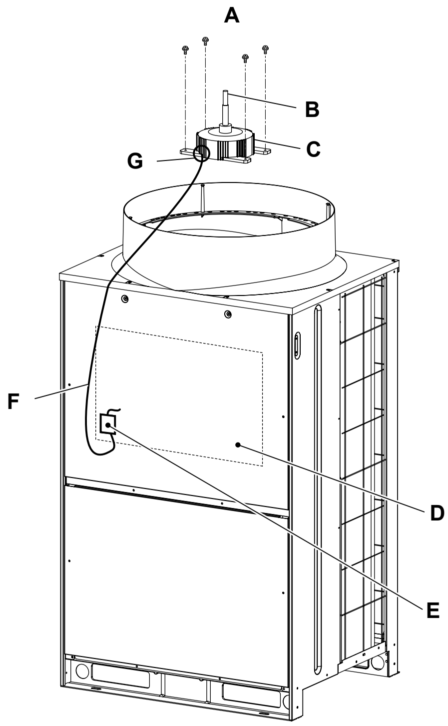


2 Remove the closing nut -A- and the flat washer -B- that fix the propeller fan -C- to the motor shaft using a box wrench. Remove the propeller fan -C- from the motor shaft. If the fan is difficult to remove as the fan is tightly fixed to the motor shaft, use a puller.

NOTE

Do not apply too much force to the shroud (plastic part) -D- to avoid breaking or deforming it.





3 Remove the wire.

Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292* and remove the electrical box cover as described in the procedures *Removing the electrical box cover for RAS-(8-12)FSXN, see on page 294* and *Removing the electrical box cover for RAS-(14-18)FSXN, see on page 294*.

Disconnect the connector -E- for the fan motor located in the electrical box -D-.

4 Remove the four screws -A- that fix the motor and remove the motor -B-.

RAS-(8-12)FSXN: M6

RAS-(14-18)FSXN: M5

5 To assemble the fan motor again, carry out the procedure in reverse order.

NOTE

a) The end of the motor wire -F- must be downward-facing when assembling the motor -G-.

b) Fix the motor wire -F- in the motor clamp using a wire tie to avoid contact with the propeller fan.

c) When assembling the propeller fan, position it and push it so it matchs with the mark (with the cut out part of the motor shaft). Fix the propeller fan with a torque of 30 Nm after the upper end of the fan shaft comes up.

Tightening torque for the propeller fan
30 Nm.

d) Connect the motor wire -F- in the electrical box connector -E-.

6 Check that the gap between the propeller fan and the upper cover is enough by observing from the top side of the upper cover. Also check if there is any noise caused by contacting the propeller fan with the upper cover during the fan operation.

10.8 Removing the compressor

DANGER

- ***Turn OFF all the power source switches.***

NOTE

- ***For servicing use the following tools:***

- Long-nose pliers.	***- Pipe cutter.***	***- Box wrench.***
- Phillips screw driver.	***- Pincher.***	***- Measure cap.***
- Spanner.	***- Oil pan.***	***- Wet cloth.***
- Burner (welder).	***- Adjustable wrench.***	***- Plier***

- Collect the refrigerant by operating the compressor. Refer to *How to collect refrigerant*, *see on page 363*.
- In other cases, collect the refrigerant before starting the work and turn OFF the power supply of the unit.

NOTE

- ***Do not touch the compressor and the high pressure pipe during the operation or after stopping the unit. The unit is at a high temperature.***
- ***When disconnecting the wiring or fitting the compressor, take care not to touch the wiring with the compressor or the refrigerant pipe.***

1 Remove the front service cover as described in the procedure *Removing the front service cover,* *see on page 292*. In case that the outdoor unit is installed closely to the wall, remove the refrigerant piping and move the outdoor unit away from the wall.

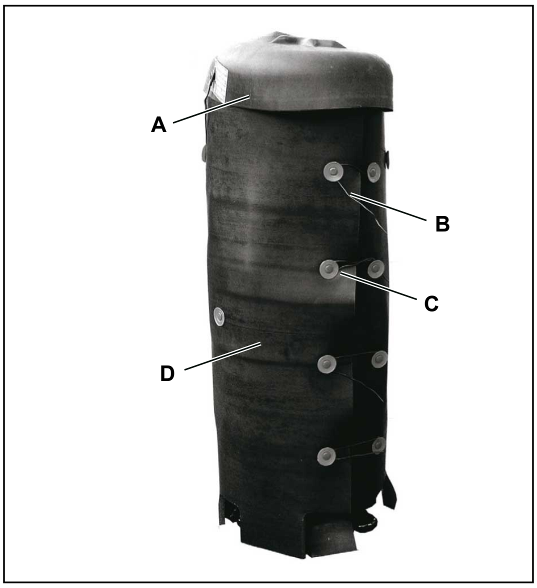
2 Unfasten the tack -C- of the sound proof cover of the compressor and remove the sound proof cover -A-.

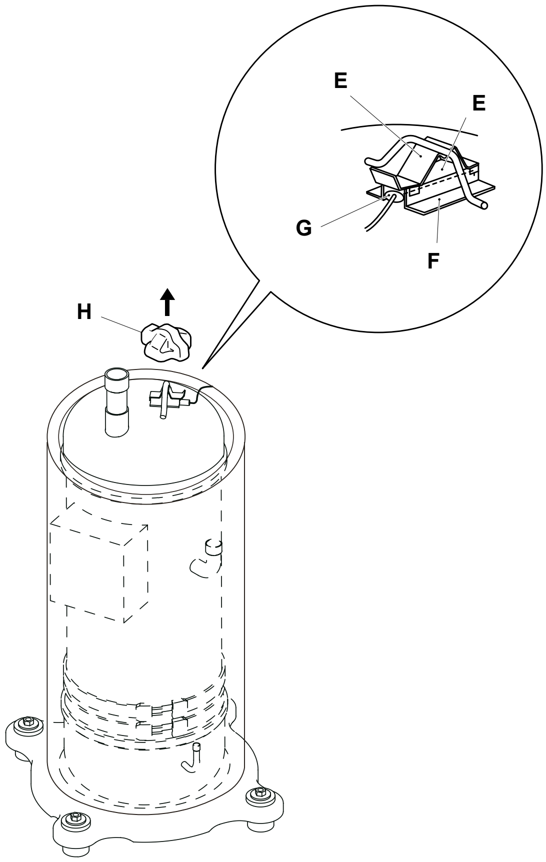
3 Remove the rubber cap -H- and the holder -E- of the Td thermistor.

4 Remove the Td thermistor -G- in the upper part of the compressor.

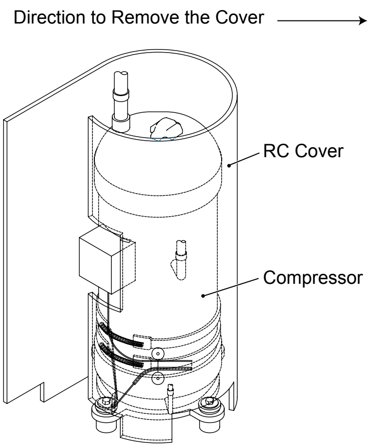
NOTE

- ***The thermistor bracket -E-, the thermistor fixing plate -F- and the RC cover -D- will be used again for reassembly. Check that the parts are in perfect condition. If they are not, replace them.***
- ***When removing the RC cover -D- the electrical box might disturb the task, so remove the electrical box before starting the work. If you do not, the inner aluminium sheet may be damaged when the RC cover -D- is removed.***





5 Untie the laces -B- to remove the RC cover.

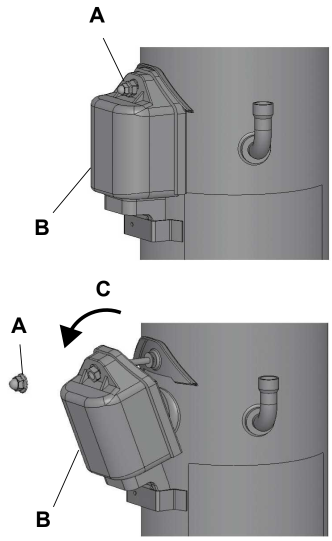


NOTE

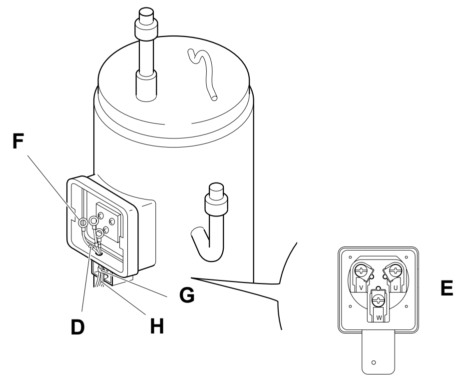
- ***Remove the RC cover in the direction indicated by the arrow.***
- ***When you remove the RC cover take care not to deform the piping around the cover. The welding could be damaged by the deformation of the pipe.***
- ***When removing the compressor take care not to be injured with the edge of the metal sheet or the fins of the heat exchanger.***
- ***The aluminium sheet is a conductor. If the aluminium sheet is damaged it may cause a failure due to an electric contact with the wiring. To avoid this failure, check the conditions of the RC cover when fixing.***

6 Remove the nut -A- of the terminal box cover -B-.

7 Remove the terminal box cover in the direction indicated by the arrow -C-.



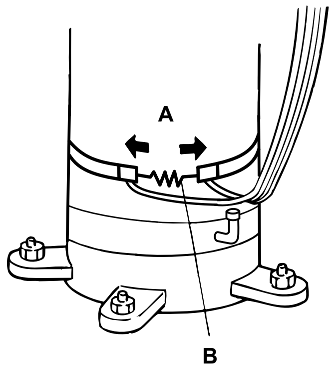
8 Disconnect the wiring of the compresoor power line -H- from the terminal box -E-. Match the terminal numbers with the mark band numbers -D- when reassembling. If you connect them incorrectly the compressor may be damaged due to reverse rotation.



NOTE

- ***When installing the compressor, check the terminal rings -F- are in perfect condition. If they are not, replace them.***
- ***Fasten the electrical wire with wire ties -G-.***
- ***Tighten the bolts when fitting the compressor.***

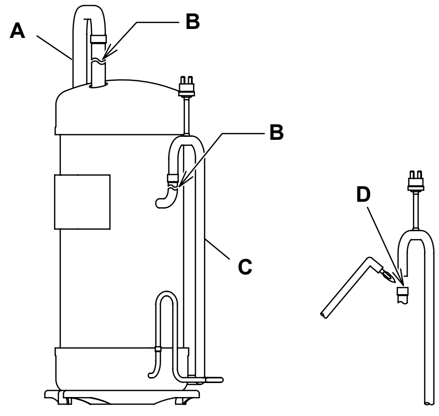
9 Unfasten the spring -A- to remove the crankcase heater -B-.



10 Disconnect the suction -A- and discharge pipes -C-.

Check that the piping pressure is the same that in the atmosphere.

Cut the piping in the area -B- closest to the compressor .



After cutting, remove the pipe from the welded part of to the compressor -D- by using a burner.

NOTE

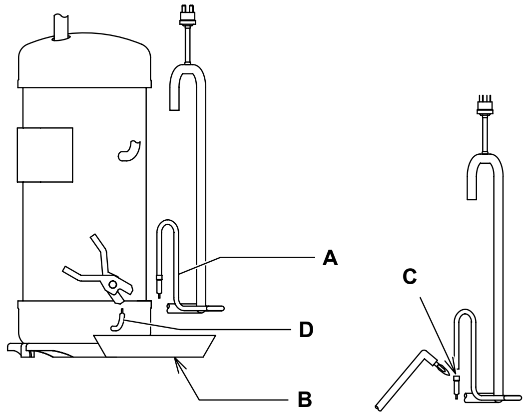
- ***All the piping is connected to the compressor by welding. When applying the burner to the pipe connections, the oil adhered inside the pipe may be burn. When welding, clean the compressor of flammable materials.***
- ***Burner work with gas pressure is very hazardous. Make sure that the pipes are cut before burner work.***

11 Disconnect the oil discharge pipe -A- from the compressor.

When disconnecting pinch and cut the pipe in the area closest to the compressor -D- so that the remaining compressor oil does not overspill from the oil discharge pipe -A-.

Before disconnecting the oil discharge pipe at the piping side, check that the oil at the welding part is completely removed.

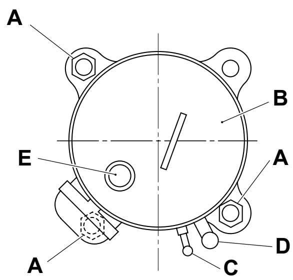
Remove the oil discharge pipe from the welded part -C- by using a burner.



NOTE

- ***Remove the oil from the compressor into an oil pan -B-.***
- ***If the oil discharge pipe is disconnected without having carried out the procedure (for example "Applying burner directly to the welding part), the refrigerant oil spilt may be flammable. Make sure that you comply with the safety measures necessary to carry out the procedure.***
- ***Do not throw out the collected oil by the oil pan -B-. This quantity of oil must be measured.***

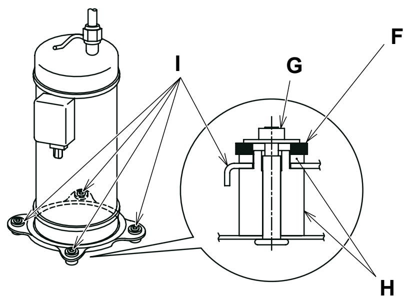
12: Remove the three compressor nuts -A- and remove the compressor -B-.



NOTE

- ***When removing the compressor take care not to touch the surrounding pipes as it may become deformed.***
- ***Pay attention not to be injured with the sheet metal edge while working.***
- ***When removing the compressor, seal the end of the oil discharge pipe -C- to avoid losing oil.***
- ***D: Discharge pipe.***
- ***E: Suction pipe.***
- ***Do not expose the refrigerant cycle to the atmosphere for a long period of time to avoid mixing water with external particles.***
- ***Fit the new compressor as quickly as possible.***

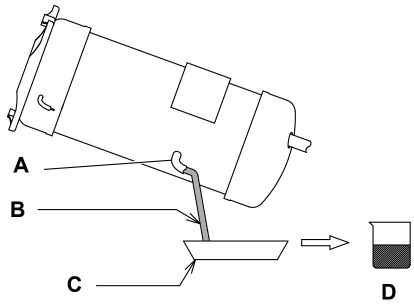
- In the case of RAS-18FSXN:
  - In the feet of the constant speed compressor -I- there are special washers -F- (painted in silver) fixed to absorb vibrations -C- together with the vibration proof rubber -H-. Never remove these washers. They are fixed with special nuts -G-.
  - Without these special nuts, the pipe may break with the vibration of the compressor.



10

13 Remove the remaining refrigerant oil -B- in the compressor from the discharge pipe -A- into an oil pan -C- and measure the quantity of oil collected -D- (measure cup).

This procedure must be carried out for the replacement of the constant speed compressor or the Inverter compressor.



NOTE

- ***The refrigerant oil change must be added if:***

  Quantity of remaining refrigerant oil in the old compressor > Quantity of refrigerant oil pre-charged in the new compressor.
- ***Do not add the refrigerant oil if:***

  Quantity of remaining refrigerant oil in the old compressor < Quantity of oil refrigerant pre-charged in the new compressor.
- ***The quantity of refrigerant oil needed to add in the circuit is calculated as follows:***

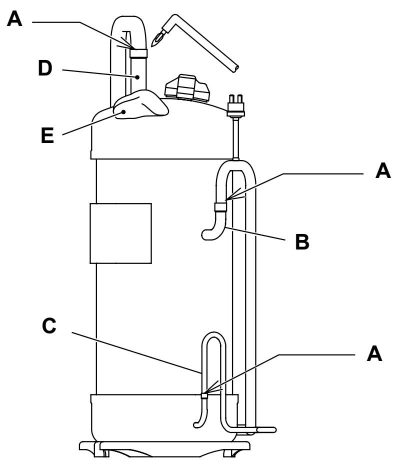
  Quantity of remaining refrigerant oil in the old compressor + Quantity of refrigerant oil collected in step 11 + 200 cc*) – (Initial charge of refrigerant oil in the compressor for each model).

Compressor	*Initial charge of refrigerant oil*
For inverter (E656DHD)	*1100 cc*
For constant speed (E655DH)	*500 cc*
For constant speed (E855DH)	*1100 cc*
** 200 cc: This value is considered not to be removed from the chamber*	

- ***If the refrigerant oil is contaminated, exchange all of them with the new refrigerant oil.***

14 Fit the new compressor. When attaching the nut on the front side, take care not to deform the discharge pipe -B-.

Weld -A- the different parts in the following order:
- Oil discharge pipe -C-
- Discharge pipe -B-.
- Suction pipe -D-.

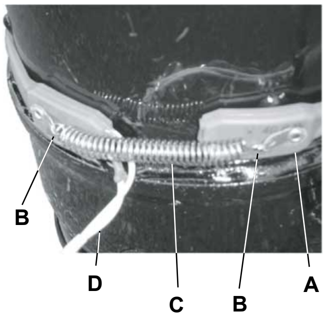


NOTE

- ***Wet cloth for cooling -E-.***
- ***When fitting the new compressor on the base, take care not to touch the piping, as it may be damaged.***
- ***The new compressor must be fitted with the cap. Remove the cap just before welding the compressor.***
- ***Connect the charge hose with the check joint in the low pressure side to release pressure.***
- ***When welding the suction pipe, verify that the connecting part is firmly inserted into the compressor. The root of the pipe is cooled to avoid welding material getting into the compressor.***

15 Fit the crankcase heater -A- around the compressor by using a spring -C- fixed to the hooks -B- of the heater and leaving the power supply line of the heater -D- free.

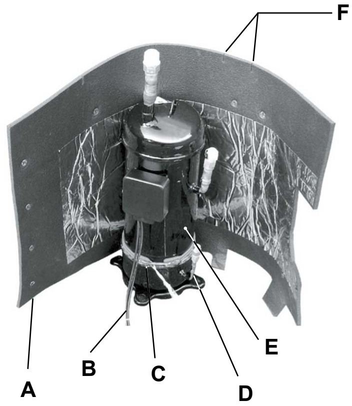
For crankcase heater original position, refer to *step 17, see on page 302*



NOTE

- ***Check that the crankcase heater -A- is well fixed to the compressor.***
- ***Take care if there is space between the crankcase heater -A- and the compressor. The power supply cables -D- can overlap and generate excessive heat. This causes operation faults in the crankcase heater due to overheating.***
- ***Take care if the power supply cables -D- are intertwined in the spring -C- of the crankcase heater -A- as this may cut the cables due to vibration.***

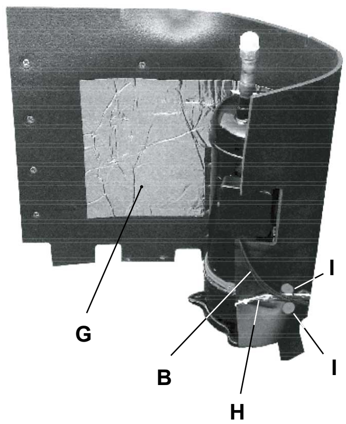
16 Fit the RC cover -A- to the compressor.



17 Reconnect all wires in the original positions.

a. The power supply wiring of the crankcase heater -C- is fixed inside the RC cover with a tack -I- without touching with the power supply line of the compressor -B- and the piping.

b. Draw the wire for the high pressure switch (PSH) and fix the Td thermistor. Pull out the wires in the upper dent part -F- of the RC cover.



NOTE

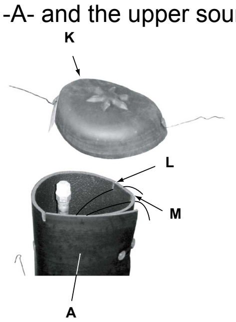
- ***If the power supply line of the compressor -B- or the power supply line of the crankcase heater -C- are in contact with high temperature part such as the oil discharge pipe -D- or the compressor chamber -E-, the***

10

wiring may be cut or burnt. Protect the wiring from the heat and the edges with the RC cover -A-.

- ***Check that the high pressure switch (PSH) does not make contact with the aluminium sheet -G- of the RC cover -A-.***

c. Fit the Sound proof cover -K- firmly with two tacks -L- to avoid water entering into the free space between the RC cover -A- and the upper sound proof cover -K-.



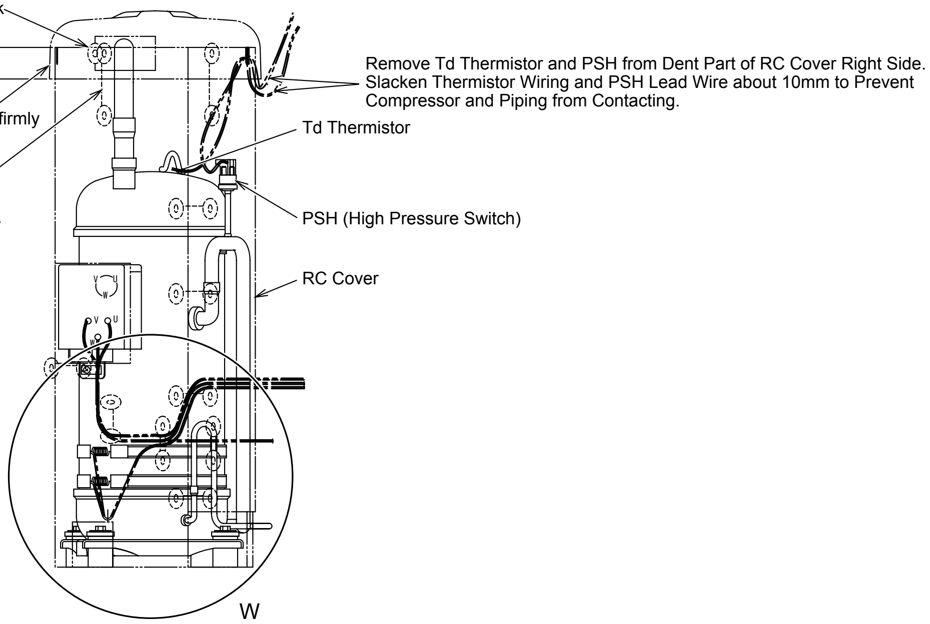
NOTE

- ***Make sure that the wiring of the Td thermistor pull out from the RC cover -A- through the dent part -L-***
- ***Make sure that the wiring of the pressure switch (PSH) pull out from the RC cover -A- through the dent part -M-***

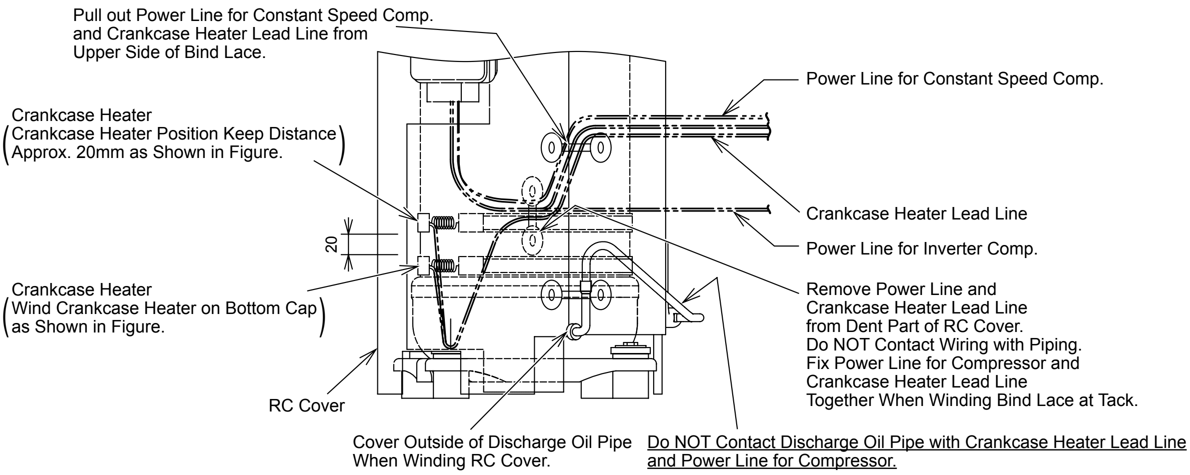
18 Carry out the final check for the wiring conditions referring to the drawing below.

CAUTION

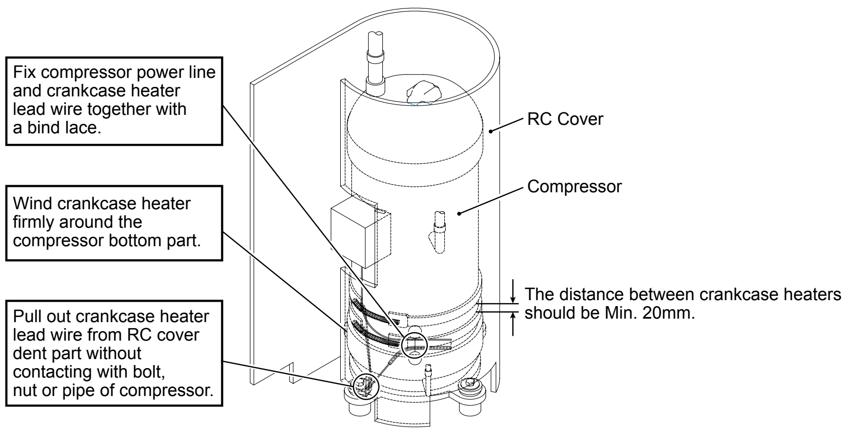
Make sure that all wires do not contact with the compressor, piping or plate edges. If it contacts, wire breakage of fire may occurred.



Details View from W



Details of Compressor Crankcase Heater Harness Wiring



10.9 Replacing the refrigerant oil

DANGER

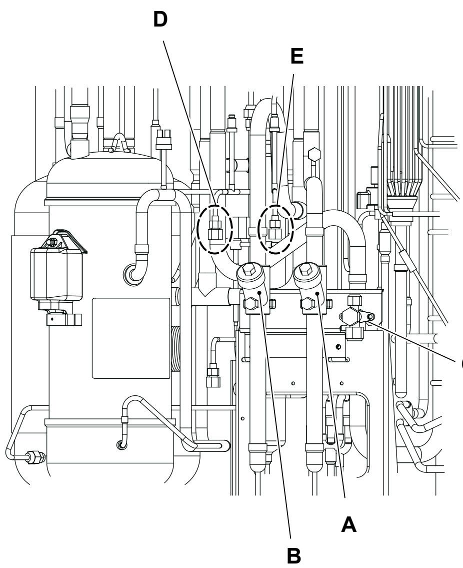
- ***Turn OFF all the power source switches.***

NOTE

- ***For servicing use the following tool:***

- Adjustable wrench or spanner.

10.9.1 No clogging in return oil circuit



1 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.

2 Close the following stop valves.

   a Heat pump system: Close the high pressure gas stop valve -A- and the liquid stop valve -C-.

   b Heat recovery system: Close the high pressure gas stop valve, the low pressure gas stop valve -B- and the liquid stop valve -C-.

3 Collect the outdoor unit refrigerant from the low pressure check joint -E- and the high pressure check joint -F-. Make sure that the pressure will not increase at this time.

NOTE

If the pressure increases, collect all the refrigerant in the refrigerant circuit.

4 Connect the charge hose (for R410A) to the pressure check joint to collect the refrigerant oil -D-.

5 Charge with nitrogen (0.15MPa) from the low pressure check joint -E- and collect the refrigerant oil in the accumulator by applying pressure for approximately 20 minutes.

NOTE

Make sure that the pressure of the high pressure check joint -A- is not abnormal when the nitrogen is charged.

6 Stop charging with nitrogen after the refrigerant oil is completely collected. Perform vacuuming from the low pressure check joint -E- and add the same quantity as the collected refrigerant oil.

NOTE

When the collected refrigearnt oil is 3 L. or less, clogging may exist in the return oil circuit. In this case, replace the return oil circuit as described in the procedure Replacing the return oil circuit, see on page 311.

7 When the procedure is finished, perform the vacumming again from the low pressure check joint -E- and recharge the refrigerant. After recharging, open the stop valves.

NOTE

- ***Use a clean charge hose.***
- ***Charge the refrigerant oil in a short period of time (approximately 20 minutes).***
  Use a container with a small opening so the refrigerant oil does not absorb the moisture in the atmosphere.

10.9.2 Clogging in return oil circuit

1 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.

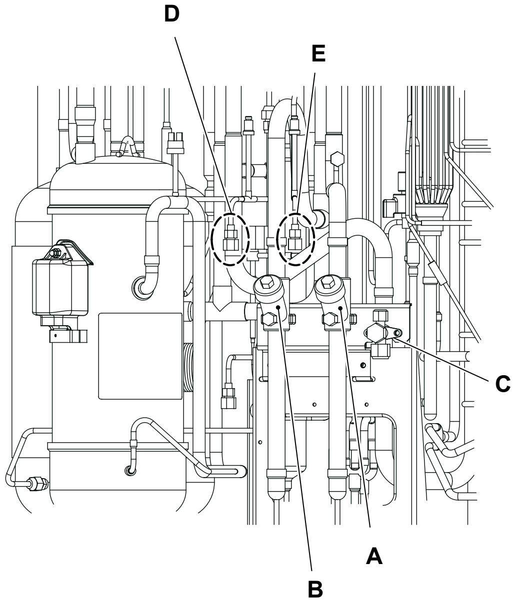
2 Remove the electrical box wiring and electrical box stay as described in the procedures *Removing the electrical box for RAS-(8-12)FSXN, see on page 295*, *Removing the electrical box for RAS-(14-18)FSXN, see on page 295*, *Removing the electrical box stay for RAS-(8-12)FSXN, see on page 296* and *Removing the electrical box stay for RAS-(14-18)FSXN, see on page 296*.

3 Close the following stop valves.

   a Heat pump system: Close the high pressure gas stop valve -A- and the liquid stop valve -C-.

   b Heat recovery system: Close the high pressure gas stop valve, the low pressure gas stop valve -B- and the liquid stop valve -C-.

4 Collect the outdoor unit refrigerant from the low pressure check joint -E- and the high pressure check joint -F-. Make sure that the pressure will not increase at this time.



NOTE

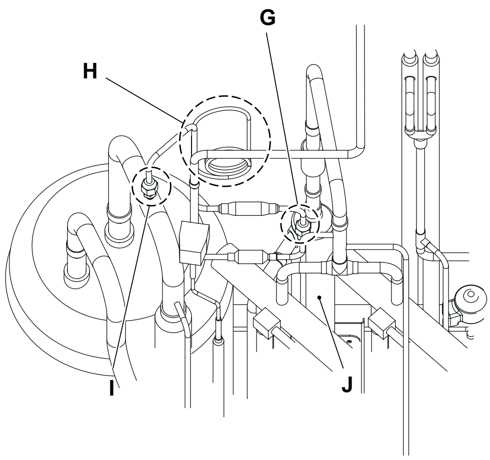
If the pressure increases, collect all the refrigerant in the refrigerant circuit.

5 Remove the flare nut that connects with the return oil circuit and the outlet port of the oil separator -J-. Also remove the flare nut -I- from the upper part of the return oil circuit and connect the charge hose to the flare nut for the oil separator outlet port (size 1/4). -H- return oil capillary.

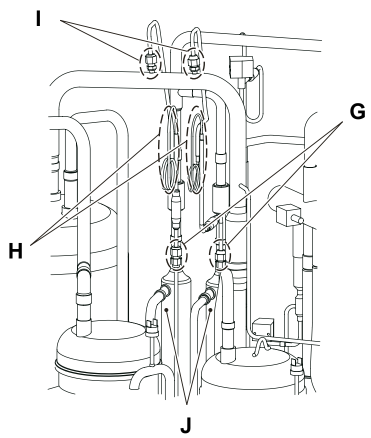
NOTE

When the flare nut of the oil separator outlet port -G- and the flare nut of the upper part of the return oil circuit -I- are removed, the oil refrigerant can overflow. Prepare an oil pan to collect the refrigerant oil before removing.

RAS - (8-12) FSXN



RAS - (14-18) FSXN



6 Charge with nitrogen (0.15 MPa) from the flare nut of the upper part of the return oil circuit -I- and collect the refrigerant oil in the oil separator -J-.

NOTE

Collect the refrigerant oil from the return oil circuit and from the oil separators one by one.

7 Stop charging the nitrogen after the refrigerant oil has been collected. Fit the flare nut that was removed in step 5 before. Add the same quantity that has collected from the check joint for collecting refrigerant oil -D- by vacuuming from low pressure check joint -E-.
To carry out this procedure refer to step 6 before, to know the quantity of refrigerant oil collected.

8 When the procedure is complete, perform the vacuuming again from the low pressure check joint -E- and recharge the refrigerant. After recharging, open the stop valves.

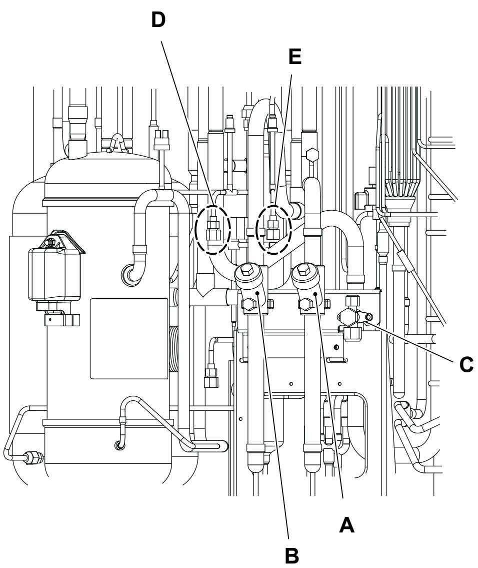
NOTE

- ***Use a clean charge hose.***
- ***Charge the refrigerant oil in a short period of time (approximately 20 minutes).***
- ***Use a container with a small opening so the refrigerant oil does not absorbe the moisture in the atmosphere.***

10.10 Replacing the return oil circuit

DANGER

- ***Turn OFF all the power source switches.***



1 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.

2 Remove the electrical box, wiring and electrical box stay as described in the procedures *Removing the electrical box for RAS-(8-12)FSXN, see on page 295* and *Removing the electrical box for RAS-(14-18)FSXN, see on page 295*, *Removing the electrical box stay for RAS-(8-12)FSXN, see on page 296* and *Removing the electrical box stay for RAS-(14-18)FSXN, see on page 296*.

3 Close the following stop valves.

  a Heat pump system: Close the high pressure gas stop valve -A- and the liquid stop valve -C-.

  b Heat recovery system: Close the high pressure gas stop valve, the low pressure gas stop valve -B- and the liquid stop valve -C-.

4 Collect the outdoor unit refrigerant from the low pressure check joint -D- and the high pressure check joint -E-. Make sure that the pressure will not increase at this time.

NOTE

If the pressure increases, collect all the refrigerant in the refrigerant circuit.

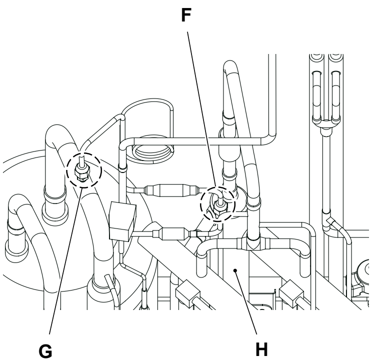
5 Remove the flare nut from the upper part of the return oil circuit -G-.

6 Remove the return oil circuit and the flare nut of the oil separator outlet port -F-.

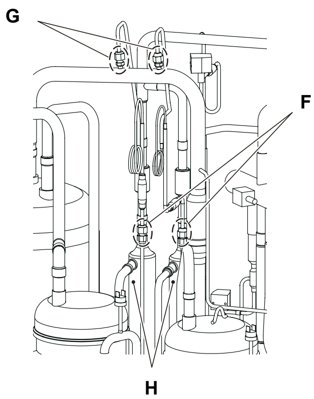
NOTE

- ***When the flare nut of the oil separator outlet port -F- and the flare nut of the upper part of the return oil circuit -G- are removed, the refrigerant oil can overflow. Prepare an oil pan to collect the refrigerant oil before removing.***
- ***H: Oil separator.***

RAS - (8-12) FSXN



RAS - (14-18) FSXN



7 Fit the return oil pipe to replace it. After replacing charge with nitrogen from the low pressure check joint -D- by applying pressure. Check that there is no leakage in the connection of the flare nut.

8 Perform vacuuming and charge refrigerant. After charging the refrigerant, open the stop valves.

10.11 Removing the coils

DANGER

- ***Turn OFF all the power source switches.***

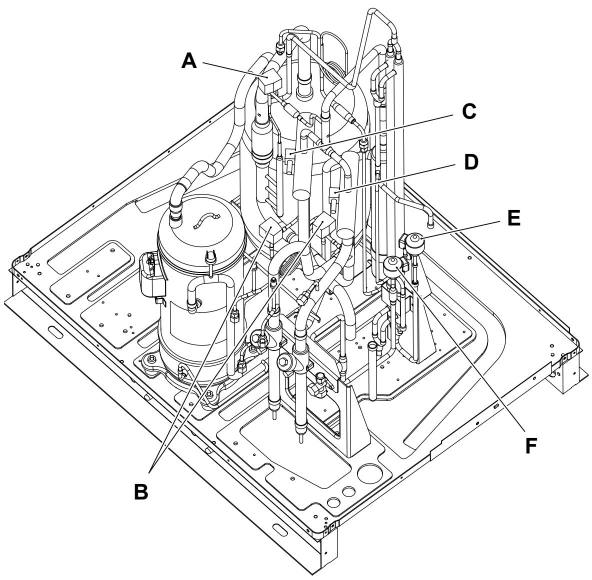
NOTE

- ***For servicing use the following tools:***

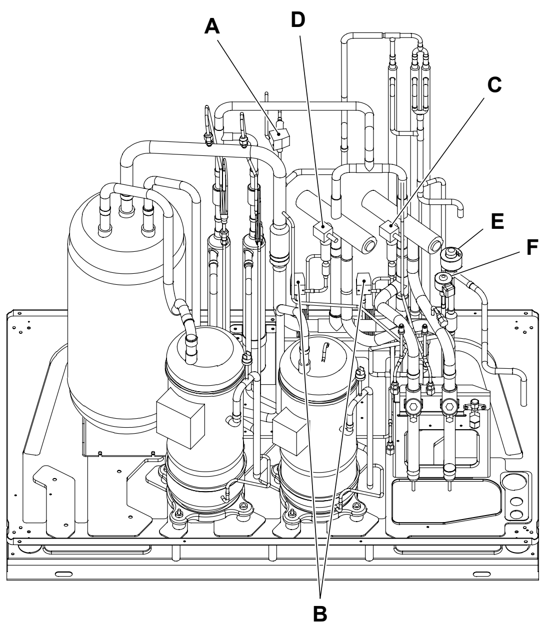
- Pliers.	*- Burner.*
- Phillips screw driver.	*- Wet cloth.*
- Charging hose.	*- Pipe cutter.*
- Adjustable wrench or spanner.	*- Pinching.*

The following figures indicate the position of the coils:

RAS - (8-12) FSXN



RAS - (14-18) FSXN



A: SVA (solenoid valve coil)

B: SVG (solenoid valve coil)

C: RVR1 (reversing valve coil)

D: RVR2 (reversing valve coil)

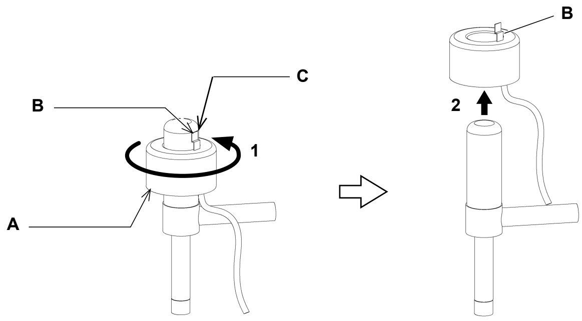
E: MV1 (expansion valve coil)

F: MVB (expansion valve coil)

10.11.1 Removing the expansion valve coil (MV1, MVB)

1 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.

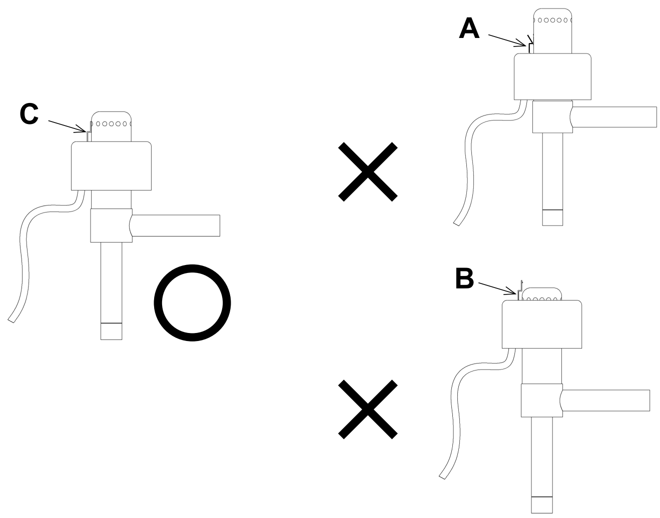
2 Rotate the expansion valve coil -A– in anticlockwise direction as indicated by arrow 1.



3 Remove the expansion valve coil bracket -B- from the expansion valve slot -C-. Remove the expansion valve coil vertically as indicated by arrow 2.

NOTE

- ***Take care with the thermistor wiring when removing the expansion valve coil.***
- ***Make sure to remove the coil bracket from the coil before removing it. Otherwise, your hands may be hit against the piping as a reaction. Carry out the procedure with great care to avoid any injures.***



4 To fit the expansion valve coil, press the coil inside the expansion valve slot by turning the coil -C-. If you apply too much force to the coil, the coil bracket can become deformed and the coil can not be fit correctly -A-.

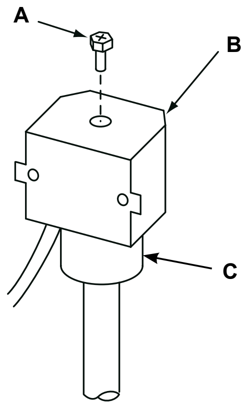
If you apply too little force to the coil, you can not fit it correctly -B-.
Any slots in the surface of the expansion valve may be accepted for fixing.

NOTE

The expansion valve coil should be secured with a force of 60 Nm or less. After securing it, check the position of the expansion valve coil.

10.11.2 Removing the solenoid valve coil (SVA, SVG)

1 Remove the screw -A- from the solenoid valve coil with a Philips screwdriver. If it is difficult to remove the screw, use an adjustable wrench or spanner.
2 Remove the solenoid valve coil -B- from the solenoid valve -C-.



10.11.3 Removing the solenoid valve

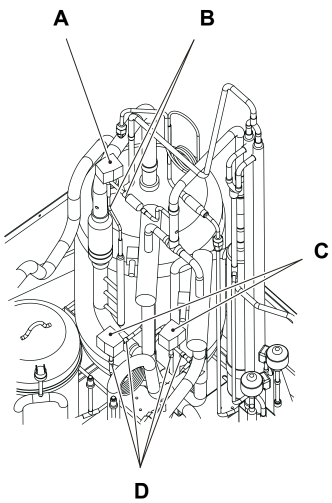
1 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.
2 Close the following stop valves.
   a Heat pump system: Close the high pressure gas stop valve and the liquid stop valve.
   b Heat recovery system: Close the high pressure gas stop valve, the low pressure gas stop valve and the liquid stop valve.
3 Collect the outdoor unit refrigerant from the low pressure check joint and the high pressure check joint. Make sure that the pressure will not increase at this time.

NOTE

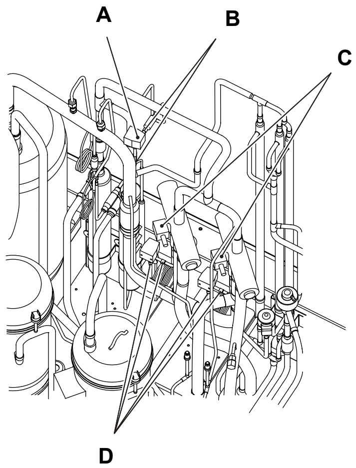
If the pressure increases, collect all the refrigerant in the refrigerant circuit.

4 Remove the solenoid valve coil as described in the procedure *Removing the solenoid valve coil (SVA, SVG), see on page 314*.
5 Remove the welding from the following parts:
   - SVA -A- : 2 weld points -B-.
   - SVG -C-: 2 weld points per valve -D-.

RAS - (8-12) FSXN



RAS - (14-18) FSXN



NOTE

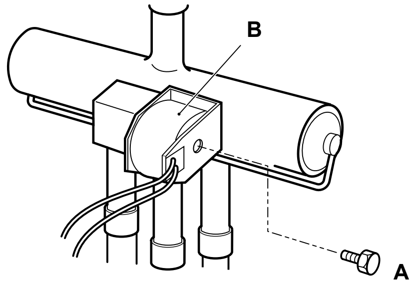
- ***When welding, cover the solenoid valve with a wet cloth to avoid the heat.***
- ***Take care not to burn the wiring connections and the piping insulation when welding.***

6 To fit the solenoid valve, carry out this procedure in reverse order.

10.11.4 Removing the reversing valve coil (RVR1, RVR2)

1 Remove the screw -A- from the reversing valve coil with a Philips screwdriver. If it is difficult to remove the screw, use an adjustable wrench or spanner.

2 Remove the reversing valve coil -B-.



10.11.5 Removing the reversing valve

1 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.

2 Remove the electrical box, wiring and electrical box stay as described in the procedures *Removing the electrical box for RAS-(8-12)FSXN, see on page 295*,*Removing the electrical box for RAS-(14-18)FSXN, see on page 295*, *Removing the electrical box stay for RAS-(8-12)FSXN, see on page 296* and *Removing the electrical box stay for RAS-(14-18)FSXN, see on page 296*.

3 Before starting with the task, collect the refrigerant from the refrigerant circuit into a cylinder and turn OFF the unit's power supply line.

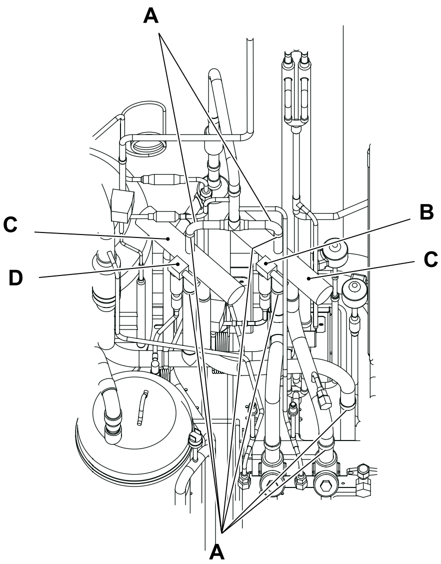
4 The position of the reversing valve -C- is shown in the figure.

5 Disconnect the wiring of the reversing valve coil.

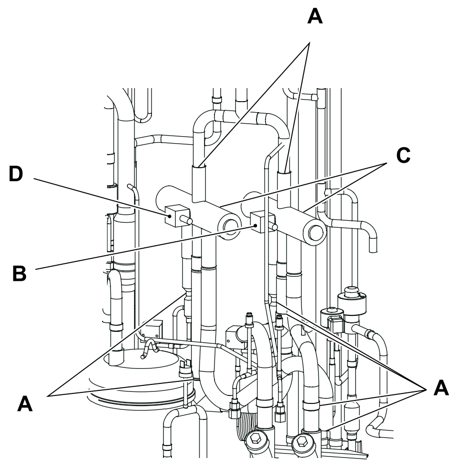
6 Remove the reversing valve coil -B- (RVR1) and -D- (RVR2) as described in the procedure *Removing the reversing valve coil (RVR1, RVR2), see on page 315*.

7 Remove the welding points -A- and cover the reversing valve with a wet cloth to avoid the heat.

RAS - (8-12) FSXN



RAS - (14-18) FSXN



NOTE

- ***Remove only the welding -A- shown in the figure, otherwise leaks may occur when you fit the reversing valve.***
- ***In the case of the heat pump system, connect the charge hose to the low pressure gas stop valve check joint before removing the welding.***

8 Remove the assembly of the reversing valve. Remove only the welding that is shown in the figure and cover the reversing valve with a wet cloth to avoid the heat.

Remove the welding in the following order:

a Welding at left and right branch pipes of the three pipes from the reversing valve.

b Welding at the centre branch pipes of the three pipes from the reversing valve.

NOTE

When removing the welding, cover the reversing valve with a wet cloth to avoid the heat.

9 To fit the reversing valve, carry out this process in reverse order.

NOTE

When welding, cover the reversing valve with a wet cloth to avoid the heat.

10.12 Removing the stop valve

DANGER

- ***Turn OFF all the power source switches.***

NOTE

- ***For servicing use the following tools:***

- Pliers.	***- Burner.***
- Phillips screw driver.	***- Wet cloth.***

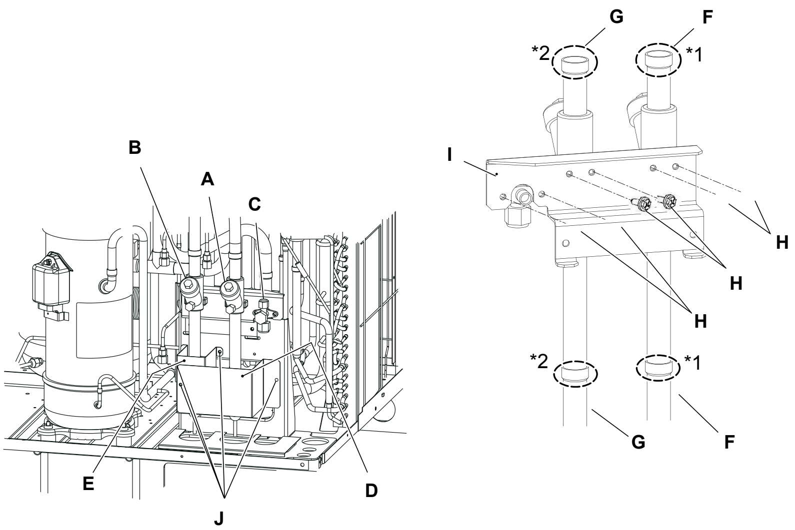
1 Before starting with the task, collect the refrigerant from the refrigerant circuit into a cylinder and turn OFF the unit power supply line.

2 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.

3 Remove the following covers fixed with the screws -J-:

   a Heat pump system: Remove the stop valve cover 1 -D-.

   b Heat recovery system: Remove the stop valve cover 1 -D- and stop valve cover 2 -E-.



4 When removing the high pressure gas stop valve -A- and the low pressure gas stop valve -B-, cover the stop valves with a wet cloth to avoid the heat and remove the welding material.
When removing the liquid stop valve -C-, remove the welding from the piping of the stop valves (low pressure stop valve -F- and high pressure stop valve -G-) .

NOTE

- ***In the case of the heat pump system, connect the charge hose to the low pressure gas stop valve check joint before removing the welding.***
- ***To remove the welding of the high pressure stop valve -A- and the low pressure stop valve -B-, the RC cover should be removed to protected with a sheet of metal.***

5 Remove the screws -H- that attach the plate -I- and pull out the stop valves at the same time as the plate -I- (if the stop valves are fitted only for liquid, the stop valve can be removed without removing the plate).

6 To fit the stop valve, carry out this procedure in reverse order.

NOTE

- ***Cover the stop valve with a wet cloth to avoid the heat when mounting or removing the brazing.***
- ***The maximum temperature allowed in the stop valves is 120 °C.***

10.13 Removing the high pressure switch, high pressure sensor and low pressure sensor

DANGER

- ***Turn OFF all the power source switches.***

NOTE

- ***For servicing use the following tools:***

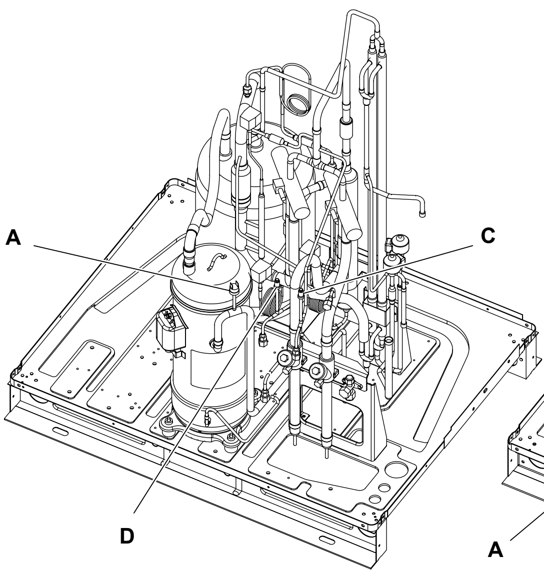
- Pliers. ***- Adjustable wrench or spanner.***

- Phillips screw driver. ***- Burner.***

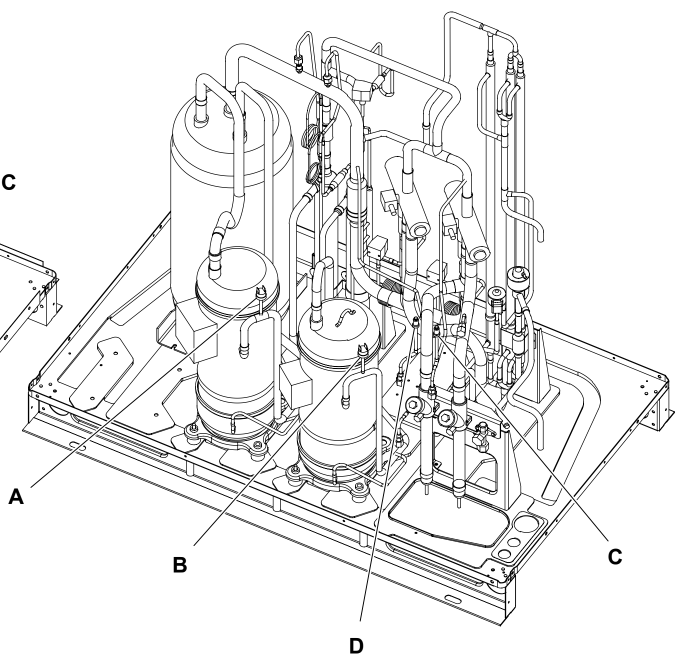
1 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.

2 The high pressure switch -A- (PSH1) and -B- (PSH2), the high pressure sensor -C- (Pd) and the low pressure sensor -D- (Ps) are fixed in the position shown in the figure.

RAS - (8-12) FSXN

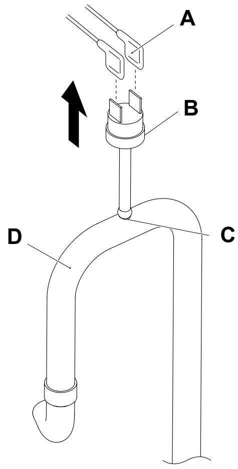


RAS - (14-18) FSXN



10.13.1 Removing the high pressure switch (PSH1, PSH2)

1 Collect the refrigerant.
2 Disconnect the faston terminals -A-.
3 Remove high pressure switch -B- from the welding point -C- of the discharge pipe -D- using a burner.



NOTE

- ***If the refrigerant cycle is left for some time after removing the high pressure switch, moisture and dirt may get into the installation area of the high pressure switch. Therefore replace the high pressure switch immediately after removing. If this is not possible, seal the hole of the high pressure switch.***
- ***Check that the aluminium sheet of the RC cover is not in contact with the terminals of the high pressure switch.***
- ***Make sure to fix the sleeve of the faston terminals, as shown in the figure. If these terminals are exposed and contact with the RC cover, it can cause electrical damage to the components.***

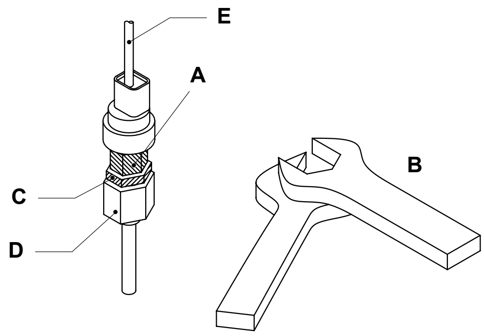
10.13.2 Removing the high pressure sensor (Pd) and low pressure sensor (Ps)

1 Remove the connector for the pressure sensor wiring from the PCB1.

NOTE

First remove the connector. If you do not, you may damage the wiring.

2 Remove the refrigerant pipe from the high pressure sensor or the low pressure sensor using two adjustable spanners -B- in positions -A- and -C- by applying a tightening torque of 30 N.m.



NOTE

A: Spanner size: 14 mm
C: Spanner size: 17 mm
D: Do not use the adjustable spanners on this part.
E: Wire twisting should be within 3 winds.

10

10.14 Removing the liquid pipe thermistor

DANGER

- ***Turn OFF all the power source switches.***

1 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.
2 Remove the cover of the electrical box as described in the procedures *Removing the electrical box for RAS-(8-12)FSXN, see on page 295* and *Removing the electrical box for RAS-(14-18)FSXN, see on page 295*.
3 Remove the cork tape -E- and pull out the thermistor -G- with the fixing plate -I- from the pipe -F-.
4 Remove the thermistor from the fixing plate -I-.

NOTE

When removing the thermistor of the liquid pipe, take care not to catch your hands or the thermistor on the valve stay of the stop valve.

5 To fit the thermistor, carry out this procedure in reverse order.

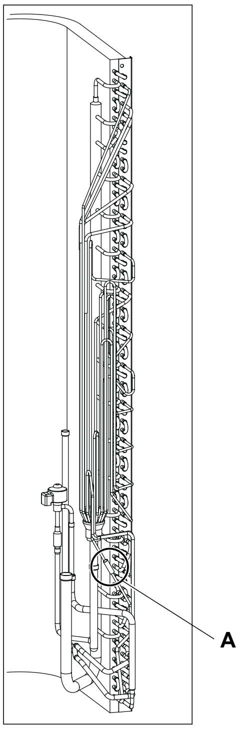
NOTE

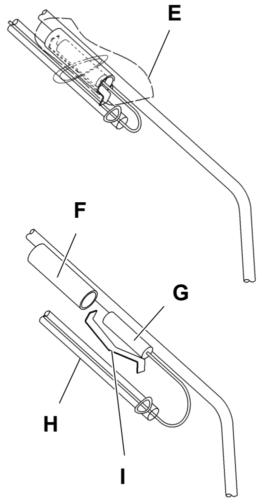
- ***When fitting the thermistor, fix it with the end of the vinyl pipe -H- downward, to avoid entering water into the pipe -F-.***
- ***Seal again the whole circumference of the pipe -F- with the cork tape -E-.***

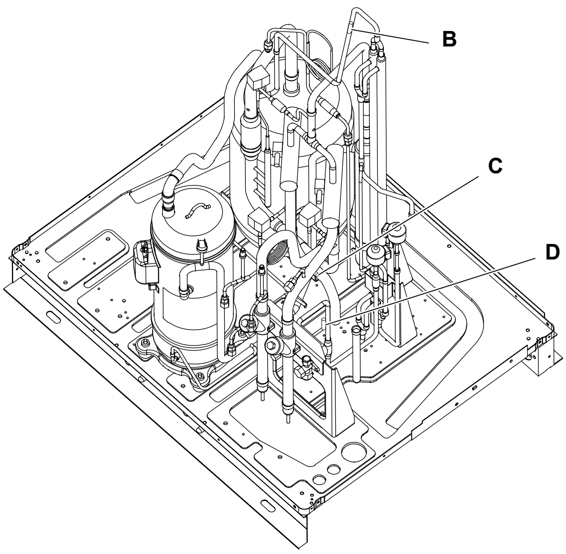
NOTE

The above procedure should be used to remove the other thermistors (Te, Tbg, Tg and Tchg).

- Position of the thermistor in the RAS-12FSXN unit.







A: Te thermistor (evaporation liquid line).

B: Tbg thermistor (Supercooling by pass line).

C: Tg thermistor (Evaporation gas line).

D: Tchg thermistor (Supercooling main line).

10

10.15 Removing the ambient temperature thermistor

1 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292*.
2 Remove the cover of the electrical box as described in the procedures *Removing the electrical box for RAS-(8-12)FSXN, see on page 295* and *Removing the electrical box for RAS-(14-18)FSXN, see on page 295*.
3 Remove the upper cover as described in the procedure *Removing the upper cover, see on page 293*.

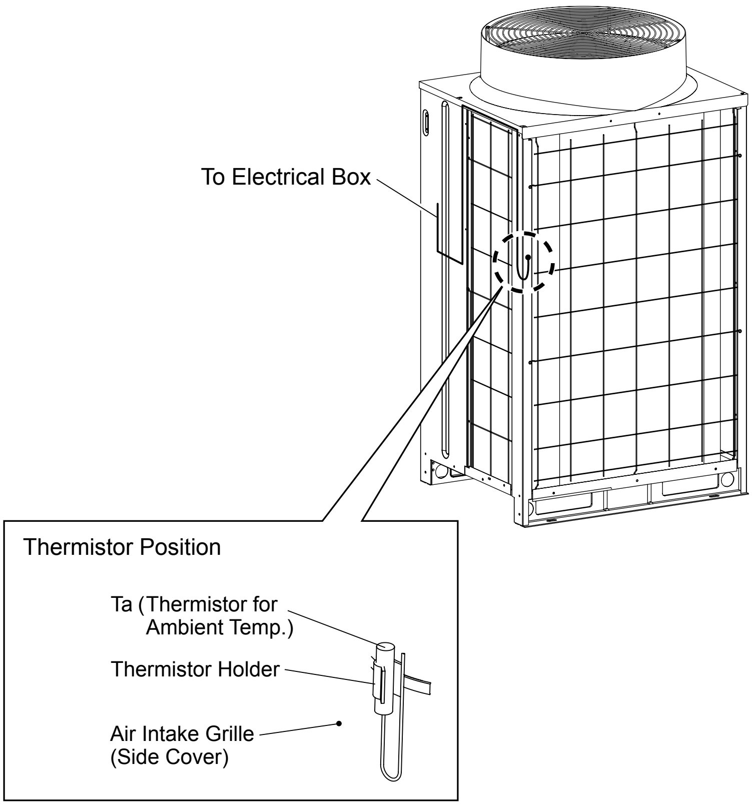
NOTE

When removing the upper cover take care not to damage the shroud.

4 Remove the clamps that fix the wiring.
5 To fit the ambient temperature thermistor, carry out this procedure in reverse order.

NOTE

If the upper cover is not correctly fixed, it may cause vibrations in the upper cover when the outdoor unit fan is running. Check the upper cover carefully after fitting it.



10.16 Removing other electrical components

NOTE

1 ***Lightly apply conductive silicone grease (Service Parts No.: P22760) on the contact surface of the fin when replacing the components with the radiation fin such as the transistor module (IPM), diode module (DM) and the fan controller (FANM).***

2 ***Match the numbered terminals with the band marked with numbers when reassembling them. If they are connected incorrectly, this may cause a malfunction and damage the electrical components.***

3 ***The U and V phase of the power supply line in the Inverter compressor MC1 must pass completely through the current sensor (CTU and CTV) of the inverter module (PCB2). Connect the U phase of the power supply line with U phase side (CTU) and V phase with V phase side (CTV) of the current sensor. If this process is not carried out, it may cause a malfunction or faults in the unit.***

4 ***When fitting the PCBs or the sheet metal for PCB, protect the electrical wiring so it does not get caught on the sheet metal or the electrical components.***

5 ***Make sure to use screws, bushes and collars when fixing the PCB in the Inverter compressor. If you do not, it may cause a malfunction in the unit.***

6 ***When replacing the transmission PCB, set the Dip switches to be the same as for the PCB you have replaced. If the Dip switches are incorrectly set, it will cause a malfunction in the unit. Refer to the instructions in the manual attached with the servicing PCB.***

7 ***Do not apply too much force to the electric components of the PCB or to the PCB itself. It may lead to PCB failure.***

8 ***When replacing the fan controller, set the Dip switches to be the same as for the fan controller you have replaced. If the Dip switches are incorrectly set, it will cause a malfunction in the unit.***

10.16.1 Removing the PCB1 and electrical components for the electrical box

DANGER

- ***Turn OFF all the power source switches.***

NOTE

- ***For servicing use the following tools:***

- Long-nose pliers.

- Phillips screw driver.

- Pliers.

Removing the PCB1

1 Remove all the connectors of the PCB1 -C- wiring.

2 Hold the central part -D- of the PCB1 fixing holder -A- (9 locations) with a long-nose pliers and pull outwards to remove it.

Opening of the PCB1 fixing plate

1 Disconnect all the cables connected to the electrical components.

2 Remove the two screws -B-. The electrical components are available to check or replace them.

3 If the PCB1 fixing plate has been removed, all the connectors connected to the PCB1 should be removed.

Removing the electrical components

1 Disconnect all the cables connected to the electrical components.
2 Remove the screws that fix the electrical components.

NOTE

- ***The maximum open angle of the PCBs fixing plate is approximately 120 degrees. If you try to open it more than 120 degrees, the PCB fixing plate might not open due to insufficient electrical wiring lenght.***
- ***Do not touch the electrical components of the PCB. Do not bend or apply excessive force to the PCB. This may cause faults in the PCB.***

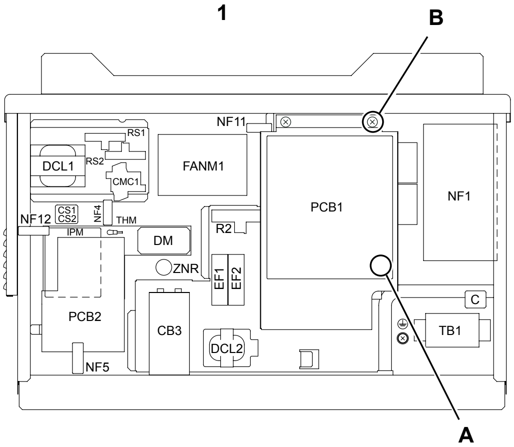
Removing the electrical components from the sub electrical box (RAS-(14-18)FSXN).

1 Disconnect all the cables connected to the electrical components.
2 Remove the screws that fix the electrical components.

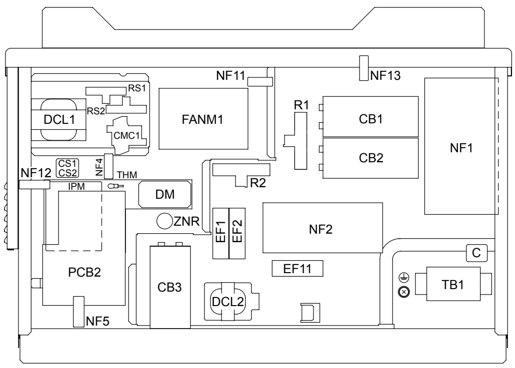
NOTE

- ***Match the numbered terminals with the band marked with numbers when reassembling them. If they are connected incorrectly, this may cause a malfunction and damage the electrical components.***
- ***Protect the electrical wiring so it does not get caught on the plate edge or the electrical components when closing the PCB fixing plate when reassembling.***
- ***The capacitor is charged with electricity when the power supply line is turned OFF. Do not touch the capacitor terminals as this may cause electric shocks.***

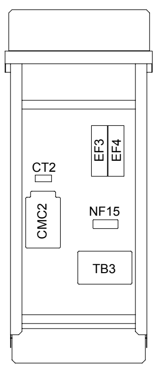
1

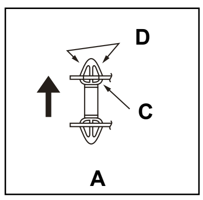


2



3





1: Front side

2: Inside of the electrical box

3: Front side of the sub electrical box (Only for RAS-(14-18)FSXN)

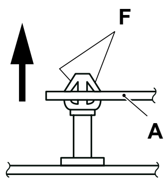
Item	Part Name	Item	Part Name
PCB1	Control PCB in Outdoor unit	PCB2	Inverter PCB
IPM	Transistor module	FANM1	Fan controller
DM	Diode module	DCL1, 2	Reactor
NF1~15	Noise filter	R1, 2	Resistor
RS1, 2	Resistor for starting	C	Capacitor
CB1 , 2, 3	Capacitor	CS1, 2	Capacitor
TB1, 2, 3	Terminal board	CMC1, 2	Magnetic contactor for compressor motor
EF1, 2, 3, 4, 11	Fuse	EFR1	Fuse on PCB1
CT2, CTU, CTV	Current sensor	ZNR	Surge Absorver

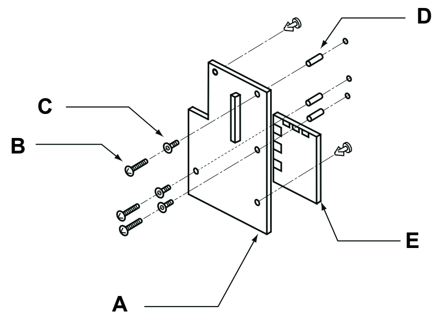
10.16.2 Removing the PCB2 for the inverter

DANGER

- ***Turn OFF all the power source switches.***
- ***Do not touch any electrical component if the LED201 (Red) of the PCB2 is ON. Touching them could cause an electric shock.***

1. Disconnect all the wiring connected to the PCB2 -A-.
2. Disconnect all the power supply lines of the transistor module -E- (U, V, W) and direct the wiring from the current sensor. Also disconnect the wiring for N, P and C.
3. Remove the three M3 screws -B-, remove the bushes -C- and the collars -D- of the PCB2. When fitting the PCB2 make sure that the bushes and the collars are well fixed.





NOTE

- ***Match the numbered terminals with the band marked with numbers when reassembling. If they are connected incorrectly, this may cause a malfunction and damage the electrical components.***
- ***Check to ensure that the electrical wiring does not get caught between the electrical components and the mounting plate when you fit the PCB2.***

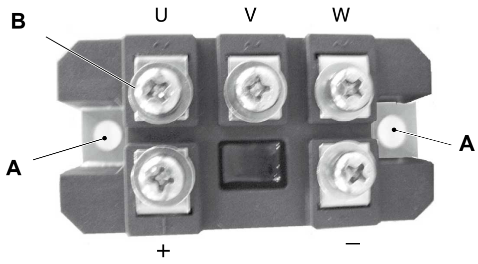
10.16.3 Removing the diode module and transistor module

DANGER

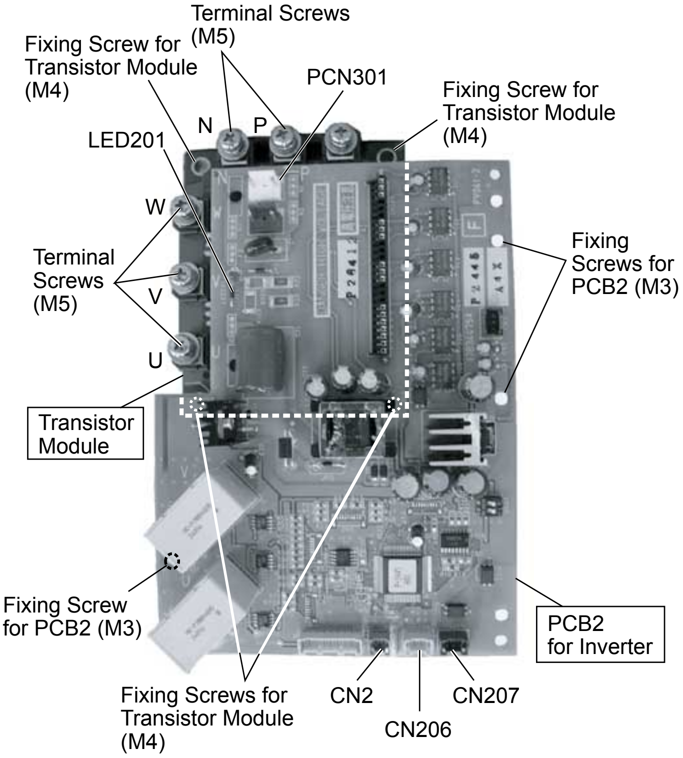
- ***Turn OFF all the power source switches.***
- ***Do not touch any electrical component if the LED201 (Red) of the PCB2 is ON. Touching them could cause an electric shock.***

1 Remove the front cover as described in the procedure *Removing the front service cover, see on page 292*.
2 Check to ensure that the LED201 (red) of PCB2 is off.
3 Remove the diode module -1-:
   a. Disconnect the wires of the terminals +, –, U, V, W of the diode module.
   b. Remove the two screws -A- (M5) of the diode module.
   c. Remove the diode module from the electrical box.

1



4 Remove the transistor module -2-:



   a. Disconnect the wires of the connectors CN2, CN206 and CN207.
   b. Disconnect the wires of P, N, U, V, W of the transistor module.
   c. Remove the three M3 screws -A- that fix the PCB2 and remove the PCB2 from the transistor module.
   d. Remove the four M4 screws that fix the transistor module -B-.
   e. Remove the transistor module from the electrical box.

NOTE

- ***The correct position of the PCB2 and the transistor module are shown in the figure.***
- ***Match the numbered terminals with the band marked with numbers when reassembling them. If they are connected incorrectly, this may cause a malfunction and damage the electrical components.***
- ***Check to ensure that the electrical wiring does not get caught between the electrical components and the mounting plate when you fit the PCB2.***
- ***Lightly apply conductive silicone grease (service parts No. P22760) on the whole rear side of the transistor module (IPM) and diode module (DM) when mounting.***

10.16.4 Removing the fan controller

DANGER

- ***Turn OFF all the power source switches.***
- ***Do not touch any electrical component if the LED201 (Red) of the PCB2 is ON. Touching them could cause an electric shock.***

NOTE

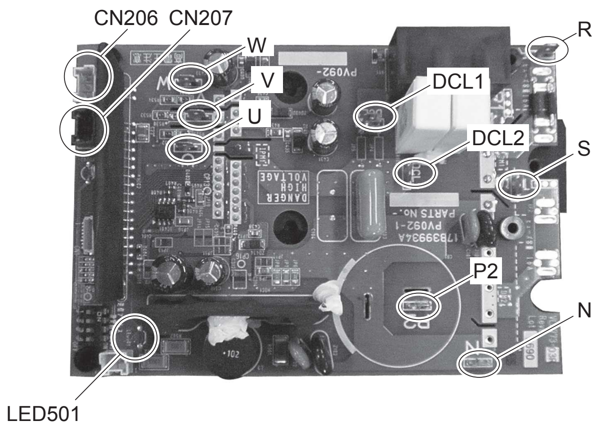
- ***For servicing use the following tools:***

- Phillips screw driver.

- Long-nose pliers.

1 Remove the front service cover as described in the procedure *Removing the front service cover, see on page 292.*
2 Check to ensure that the LED501 (red) of PCB2 is OFF.
3 Disconnect all the fan controller wiring CN206, CN207, R, S, U, V, W, P2, N, DCL1 and DCL2.
4 Remove the nine screws from the fan controller.
5 Remove the fan controller.

1

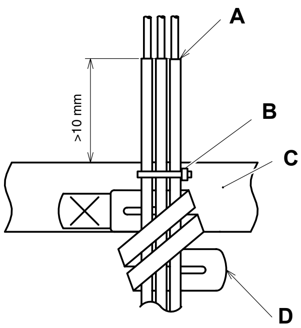


NOTE

- ***Do not apply too much force when removing the fan controller or the soldering will be fallen apart and cause a malfunction in the fan controller.***
- ***Match the numbered terminals with the band marked with numbers when reassembling. If they are connected incorrectly, this may cause a malfunction and damage the electrical components.***
- ***Check to ensure that the electrical wiring does not get caught between the electrical components and the mounting plate when you fit the PCB2.***
- ***Lightly apply silicone conductive grease (service parts No.: P22760) on the whole rear side of the fan controller when mounting.***

10.16.5 Fitting the electrical box

1 To fit the electrical box, follow the procedures in reverse order.



NOTE

- ***Check to ensure that the end of the waterproof vinyl pipe -A- and the connectors are fixed with the cord clamp -D- in the electrical box -C-. Waterproof vinyl pipe -A- should be in the electrical box by more than 10 mm.***
- ***Fasten the wiring from each electrical part to the electrical box with a plastic band -B- to avoid direct contact with the compressor, the piping and the plate edge.***
- ***Fasten the wiring neatly to avoid the damage when applying pressure to the cover of the electrical box.***
- ***Fasten the wiring of the fan motor with the cord clamp -D-.***

10

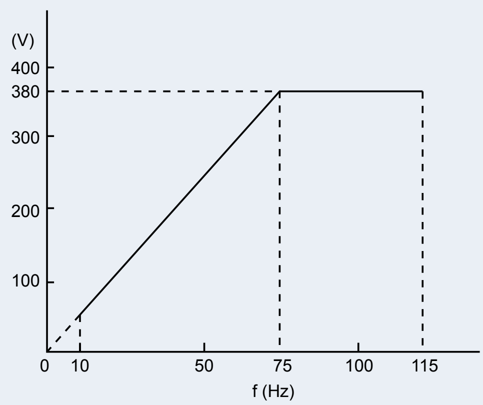
11. Electrical checks of the main parts

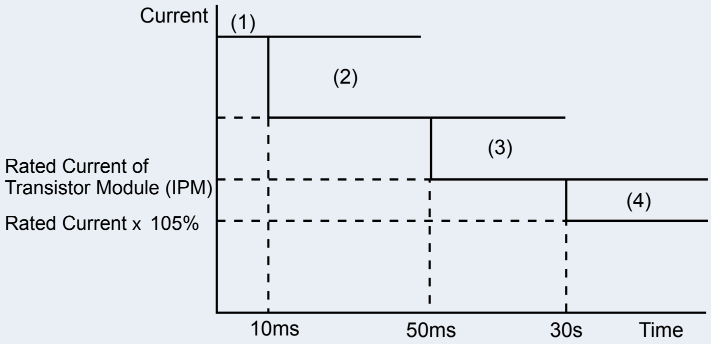
Index

11

11.1 Inverter

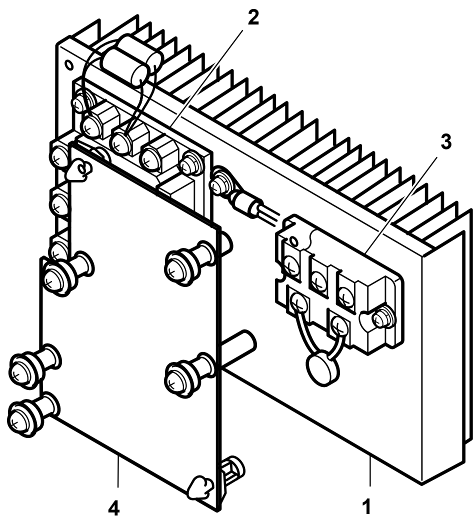
11.1.1 Inverter specifications

Applicable models	RAS-8FSXN to RAS-18FSXN
Applicable power source	3 phase, 400 V ± 10%, 50 Hz
Maximum output voltage	380 - 415 V
Maximum output current	25 A
Control method	Vector control PWM (Pulse width modulator)
Output frequency range	10 to 115 Hz
Frequency accuracy	0.01 Hz
Output / characteristics	Conditions: 1. Power source voltage 400 V AC. 2. Without a load (Free output).  NOTE ***The characteristics are fluctuated due to the current minimize control.***
Soft start and stop	0.125 Hz/s, 0.25 Hz/s, 0.5 Hz/s, 1 Hz/s, 3 Hz/s (5 steps)
Protection function: Excessively high or low inverter voltage	Excessively low voltage in case the DC voltage is lower than 350 V. Excessively high voltage in case the DC voltage is higher than 750 V.
Malfunction in the current sensor	Compressor current stoppage lower than 1.5 A Cause of the malfunction: • Sensor current failure. • Transistor module failure. • Compressor failure. • Disconnected wiring.

Protection function: Overcurrent protection for Inverter	 1. Short-circuit trip of arm (*). 2. Instantaneous overcurrent trip (*). 3. Instantaneous Overcurrent Trip, When detecting current is more than rated current of transistor module, overcurrent is detected. 4. Electronic Thermal Trip. 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. (*) Internal Protection Transistor Module (IPM).
Protection of Transistor module (IPM)	The transistor module (IPM) has four protection functions to auto-protect itself: 1. Some of the output terminals between “U” and “V”, “V” and “W” , “W” and “U” has short-circuit. 2. Running current reaches the maximum rated current. 3. The abnormal temperature is measured by internal thermistor. 4. Abnormal decrease in control voltage.
Overload control	The overload control with a current that is greater than the rated current X 105%. The overload control release at a current that is smaller than the rated current X 88%.
Fin temperature increase	The unit stops when the IPM temperature is higher than 90 °C.
Earth detection	The unit stops when the compressor is earthing.

11.1.2 Inverter power Unit structure

1	Radiated fin
2	Transistor module
3	Diode module
4	Inverter PCB



11.1.3 Protection function

1. Excessively high or low Inverter voltage

a. Level of detection at 400 V / 50 Hz:
- Excessively low voltage in case the DC voltage is lower than 350 V.
- Excessively high voltage in case the DC voltage is higher than 750 V.

b. Function:
- When a malfunction has been detected, the Inverter compressor stops and transmits the stop cause signal to PCB1.

c. Cancellation of the protection function:
- The stop cause signal transmission is cancelled when remote control switch is off or main power source is cut off.

2. Malfunction in the current sensor

a. Level of detection:
- A malfunction is detected when the operating frequency is 15–18 Hz and the inverter compressor current decreases below 1.5 A.

b. Function:
- When a malfunction has been detected, the Inverter compressor stops and transmits the stop cause signal to PCB1.

c. Cancellation of the protection function:
- The stop cause signal transmission is cancelled when remote control switch is off or main power source is cut off.

3. Inverter overcurrent protection

a. Level of detection:
- Overcurrent is detected when the current sensor detects that the compressor current is higher than the transistor module's (IPM) rated current. (Instantaneous Overcurrent).
- When the current detected by current sensor exceeds 105 % of the rated current continuosly for 30 seconds or for 3 minutes in total during a 10 minutes period, overcurrent is detected. (Electric Thermal Relay).

b. Function:
- When a malfunction has been detected, the Inverter compressor stops and transmits the stop cause signal to PCB1.

c. Cancellation of the protection function:
- The stop cause signal transmission is cancelled when remote control switch is off or main power source is cut off.

4.Transistor module (IPM) protection

a. Level of detection:
- An anomaly is detected when some of the output terminals between “U” and “V”, “V” and “W”, “W” and “U” of the transistor module (IPM) are short-circuited.
- A malfunction is detected when the transistor module (IPM) running current reaches the rated current limit.
- A malfunction is detected when the transistor module (IPM) thermistor measures an abnormal increase in temperature.
- A malfunction is detected when the transistor module (IPM) control voltage detects an abnormal decrease.

b. Function:
- When a malfunction has been detected, the Inverter compressor stops and transmits the stop cause signal to PCB1.

c. Cancellation of the protection function:
- The stop cause signal transmission is cancelled when remote control switch is off or main power source is cut off.

5. Fin temperature increase

a. Level of detection:
- An anomaly is detected when the thermistor's internal temperature increases above 90 °C.

b. Function:
- When a malfunction has been detected, the Inverter compressor stops and transmits the stop cause signal to PCB1.

c. Cancellation of the protection function:
- The stop cause signal transmission is cancelled when remote control switch is off or main power source is cut off.

6. Earth detection

a. Level of detection:
- A malfunction is detected when the terminal U, V, W a compressor earth are short-circuited before the compressor is turned on.
- A malfunction is detected when the transistor module (IPM) output terminals (U, V, W) are short-circuited.

b. Function:
- When a malfunction has been detected, the Inverter compressor stops and transmits the stop cause signal to PCB1.

c. Cancellation of the protection function:
- The stop cause signal transmission is cancelled when remote control switch is off or main power source is cut off.

11.1.4 Overload protection control

1 Level of detection:
- A malfunction is detected when the output current increases above 105% of the maximum output current.

2 Function:
- When the output current increases above 105% of the maximum output current, and the frequency decrease, an overload signal is transmitted sent to PCB1. For 10 seconds after the decrease lower than 88% in output current, the compressor maximum frequency is limited to the specified value. However, if the frequency command is smaller than the maximum value, the operation is carried out as per the command.

3 Cancellation of the protection function:
- After the described operation, is performed for 10 seconds, this control is cancelled.

11.2 Scroll compressor

11.2.1 Reliable mechanism for low vibration and low sound

1 The direction of rotation is definite.

2 The pressure inside the chamber is high pressure and its surface temperature is between 60 °C and 110 °C.

11.2.2 Compression principles

(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.

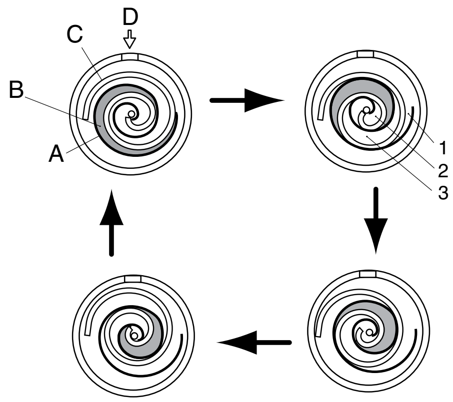
⇩

(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.

A	Fixed scroll
B	Compression space
C	Rotating scroll
D	Gas
1	Suction process
2	Discharge process
3	Compression process

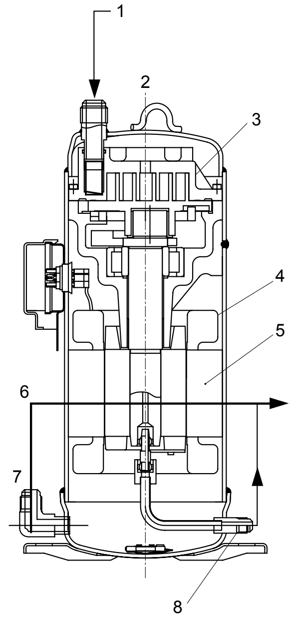


11.2.3 Structure

The compressor has a structure for supplying oil from the outdoor oil separator.

Inside the oil separator, the pressure is high and the surface temperature of the oil separator is between 60 °C and 110 °C just like the compressor.

1	Suction pipe
2	Suction
3	Fixed scroll
4	Frame
5	Motor
6	Discharge pipe
7	Discharge
8	Oil pipe



11.2.4 Compressor type

Model	Inverter Compressor	Constant speed compressor		Total quantity
	E656DHD	E655DH	E855DH	
RAS-(8-12)FSXN	1	—	—	1
RAS-(14/16)FSXN	1	1	—	2
RAS-18FSXN	1	—	1	2

NOTE

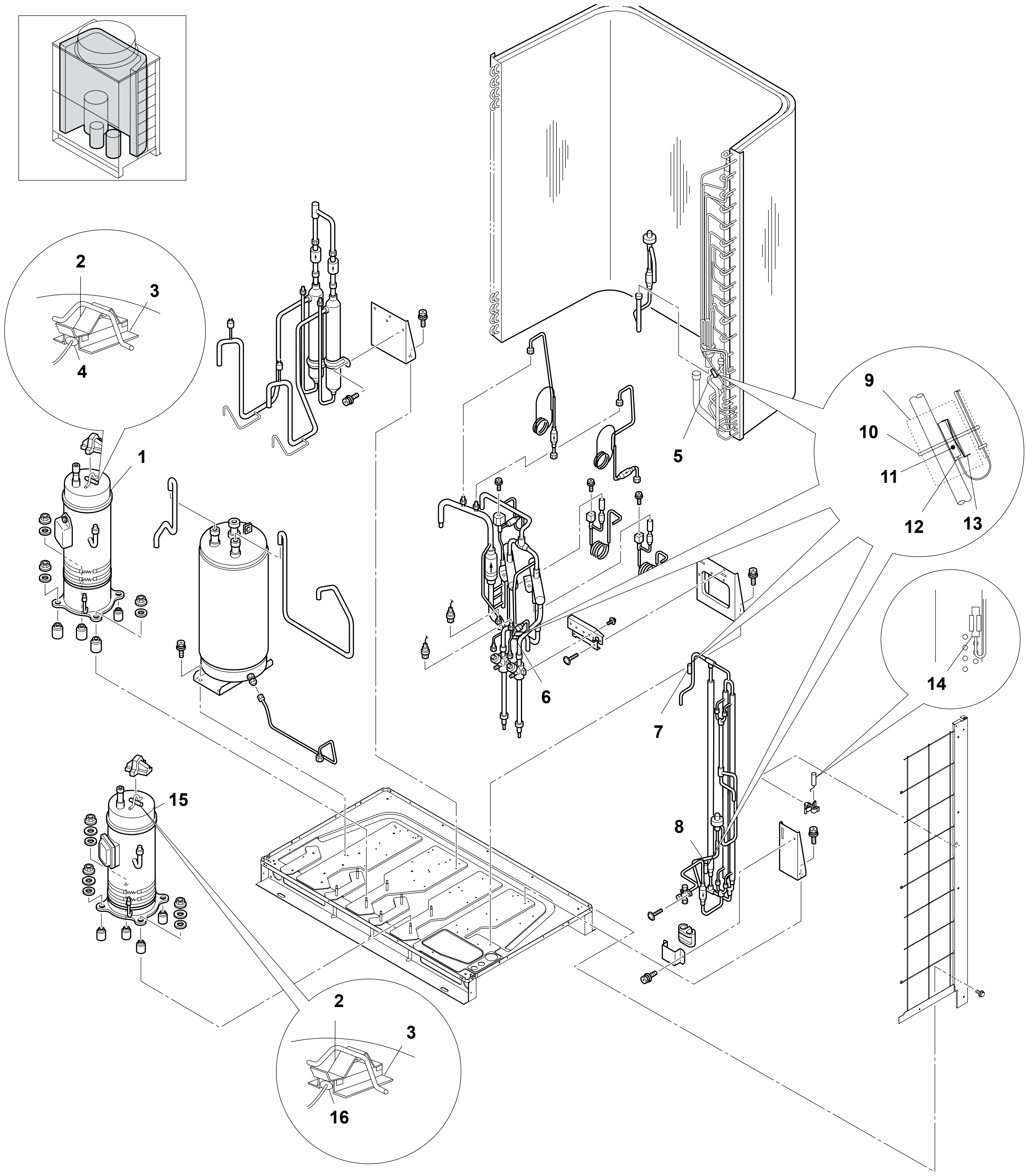
As viewed from the front side of the unit, the compressor located on the left side is the Inverter compressor and the other one is the constant speed compressor.

11

11.3 Thermistors

11.3.1 Thermistor positions

Thermistor positions for RAS-(14-18)FSXN (example)



1	Inverter compressor
2	Thermistor holder
3	Thermistor fixing plate
4	Td thermistor (Td1) for the discharge gas temperature
5	Te thermistor (Liquid evaporation line)
6	Tg thermistor (gas evaporation line)
7	Tbg thermistor (Super-cooling bypass line)
8	Tchg thermistor (Super-cooling main line)
9	Butyl sheet
10	Plastic band
11	Thermistor (Te, Tg, Tbg, Tchg)
12	Thermistor holder
13	Thermo clip
14	Ta thermistor
15	Constant speed compressor
16	Td thermistor (Td2) for the discharge gas temperature (only for RAS-(14–18)FSXN

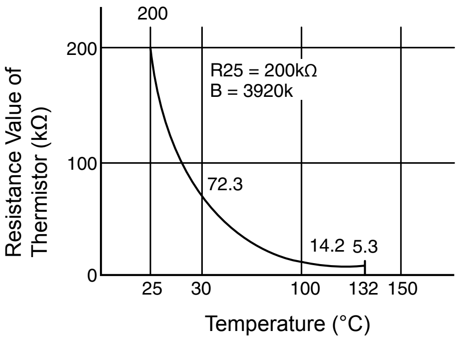
11.3.2 Thermistor for the temperature of the upper part of the compressor

1 The thermistor for the temperature of the upper part of the compressor is installed for the purpose of preventing discharge gas due to overheating. If the discharge gas temperature increases excessively, the lubricating oil deteriorates and loses its properties and consequently, the compressor's life is shortened.

2 If the discharge gas temperature increases excessively, the compressor temperature increases. Consequently, the compressor motor will burn out.

3 When the temperature of the upper part of the compressor increases during heating operation, the unit is controlled according to the following method.

- **a** The expansion valve of the outdoor unit opens to return the liquid refrigerant to the compressor through the accumulator, decreasing the compressor's temperature.
- **b** If the temperature of the upper part of the compressor increases over 132 °C, even if the expansion valve opens, the compressor stops in order to protect itself. This procedure is also available in the cooling operation.



Resistance Characteristics of Thermistor for discharge Gas Overheating Protection

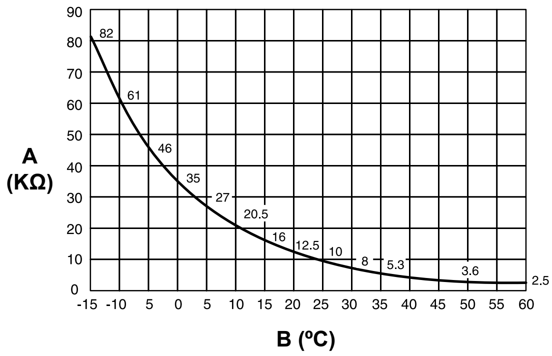
4 If the temperature of the upper part of the compressor increases excessively, protection control will be activated and the compressor will stop according to the following method:

Operation	Temperature of the upper part of the compressor	Stopping period
Cooling	Over 132 °C	10 minutes (continuous)
	Over 140 °C	5 seconds (continuous)
Heating	Over 132 °C	10 minutes (continuous)
	Over 140 °C	5 seconds (continuous)
Defrosting	Over 132 °C	5 seconds (continuous)

11.3.3 Thermistor for the outdoor ambient temperature

Thermistor resistance characteristics are shown in the figure.

A	Thermistor resistance
B	Air temperature



11.3.4 Thermistor for the evaporating temperature of the outdoor unit in the heating operation (For defrosting)

The thermistor resistance characteristics are the same as in the outdoor ambient temperature thermistor *Thermistor for the outdoor ambient temperature, see on page 338*

11.3.5 Thermistor for super cooling bypass and main line temperature of outdoor unit

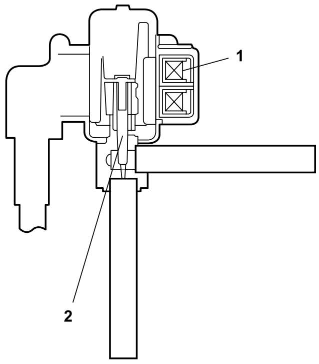
The thermistor resistance characteristics are the same as in the outdoor ambient temperature thermistor *., see on page 338*

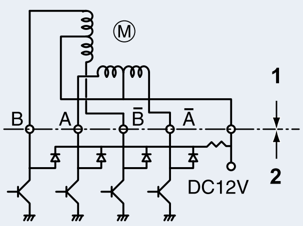
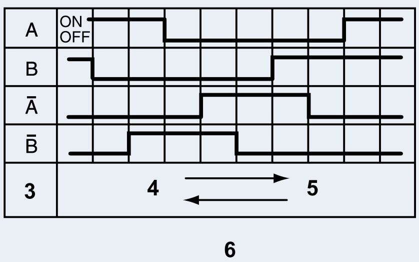
11.4 Electronic expansion valve

Micro-Computer
↓ Pulse Signal
2-Phase Permanent Magnetic Pulse Motor
Control 0 to 500 Pulse by 1 Pulse
↓
Refrigerant Flow Control
Precise Control

1: Pulse motor

2: Needle



Items	Specifications
Applicable models	Main cycle for RAS-(8-18)FSXN
Type	UKV series / EKV series
Refrigerant	R410A
Working temperature range	-30 °C to 65 °C (Operating time of coil: less than 50%)
Direction of the installation	Drive shaft in vertical direction at a 45° angle as maximum
Direction of the flow	Reversible
Drive method	4-phase pulse motor method
Rated voltage	DC 12 V ± 1.2 V
Drive condition	80 ± 5 PPS (Pulse width at ON: 36 mm sec, OFF: 60 mm sec) 1, 2 phase excitation
Coil resistance (for each phase)	46 Ω ± 3 Ω (at 20 °C)
Wiring diagram, drive circuit and activation mode	  1 : Wiring diagram. 2 : Drive circuit 3 : Valve 4 : Close 5 : Open 6 : Activation

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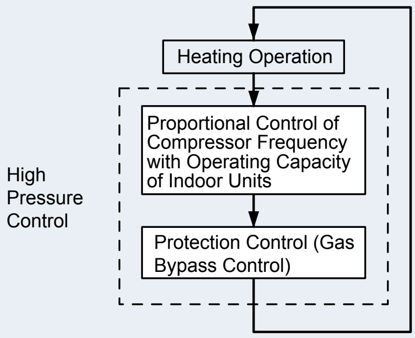
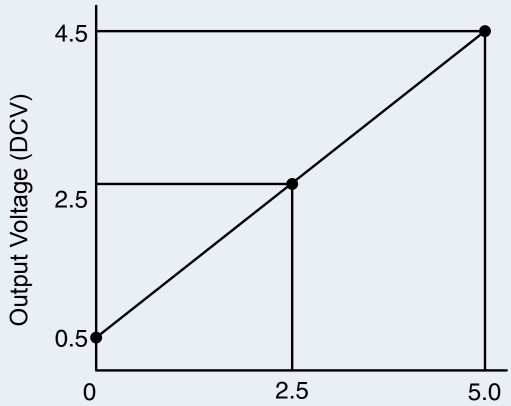
11.5 Pressure sensor

11.5.1 High pressure control

The high pressure is detected during the heating mode by means of a high pressure sensor and the compressor frequencies are controlled by the proportional control method with operating capacity of the indoor units (or PID control for the compressor frequency); therefore, the high pressure is controlled within an appropriate range. The output of the high pressure sensor during the heating operation activates the protection control, the gas bypass.



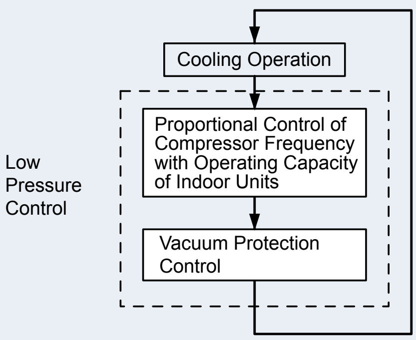


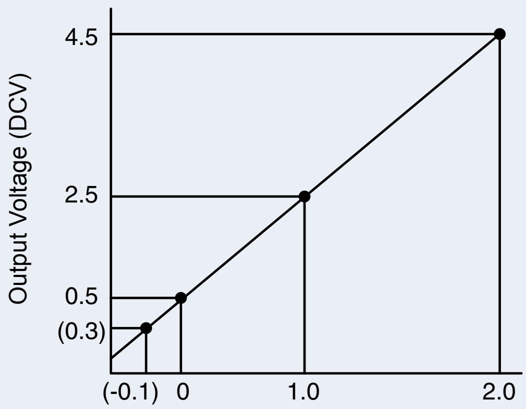
Pressure MPa (kgf/cm²G)
Output Characteristics of High Pressure Sensor

11.5.2 Low pressure control

The suction pressure is detected during the cooling operation by means of a low pressure sensor and the compressor frequencies are controlled by the proportional control method with operating capacity of the indoor units (or PID control for the compressor frequency); therefore, the suction pressure is controlled within an appropriate range.

If the suction pressure is excessively low, the cooling may not be sufficient and the parts of the refrigerant cycle may be damaged. For this reason, if the output of the low pressure sensor indicates vacuum and a constant value for twelve or more minutes, the compressor stops in order to protect itself.

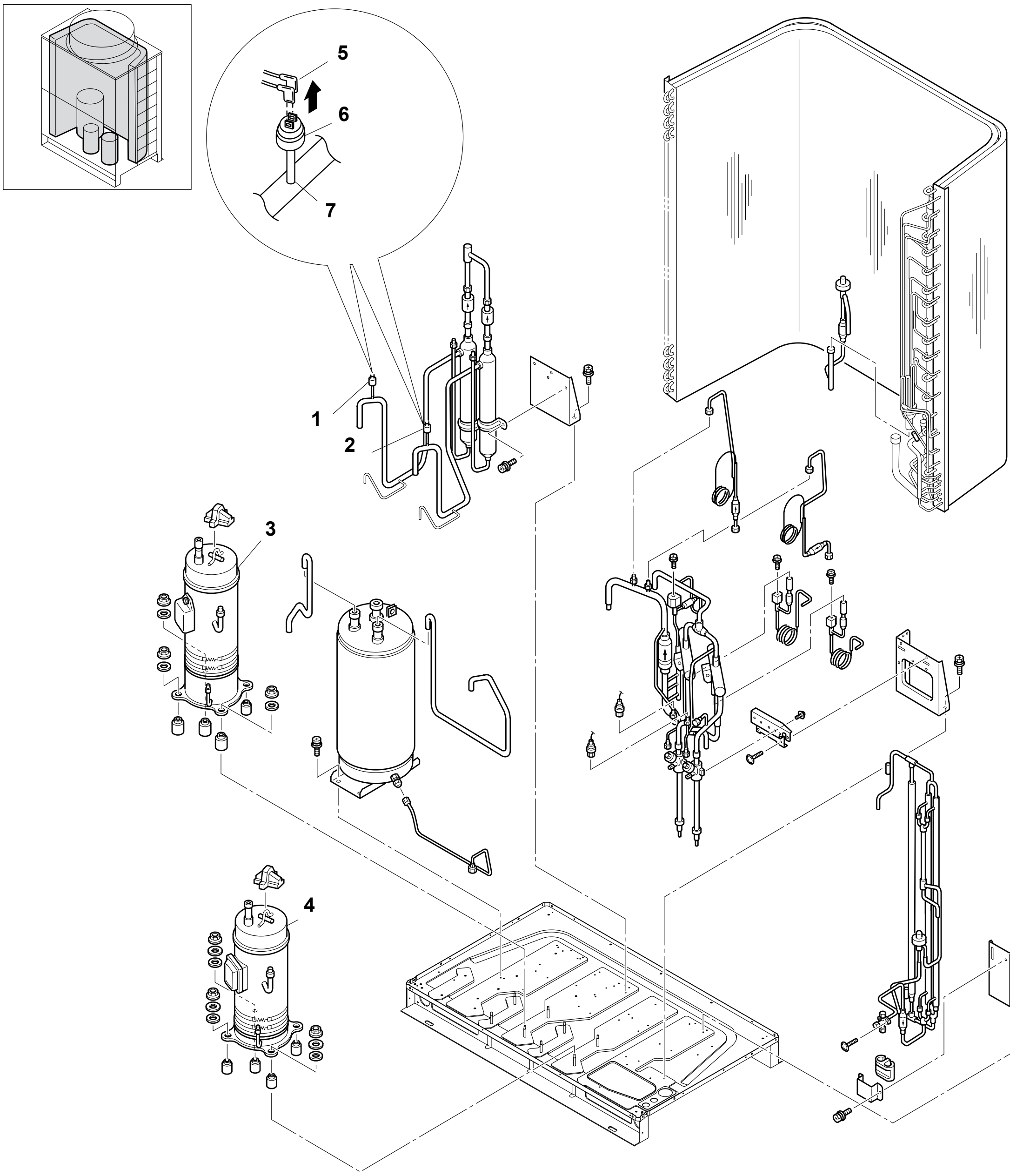




Pressure MPa (kgf/cm²G)
Output Characteristics of Low Pressure Sensor

11.6 High pressure protection device

If the discharge pressure is excessively high, the compressor and the refrigerant cycle components may be damaged. However, if the discharge pressure is higher than 4.15 MPa (R410A), the protection control is activated and the compressor will stop.

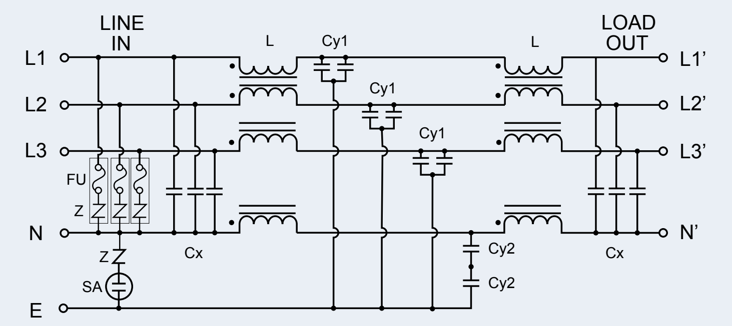


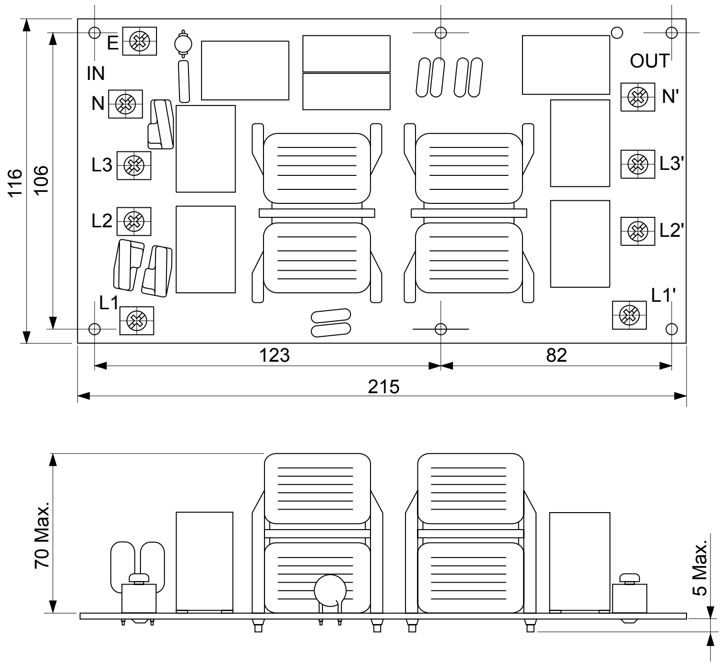
1	PSH1
2	PSH2
3	Inverter compressor
4	Constant speed compressor
5	Faston terminal
6	High pressure switch
7	Welding

11.7 Noise filter (NF1, NF2)

The noise filter decreases the noise caused by the inverter to the power supply line. The terminals that indicate "LOAD" are connected to the inverter and terminals that indicate "LINE" are connected to the power supply line.

NF1

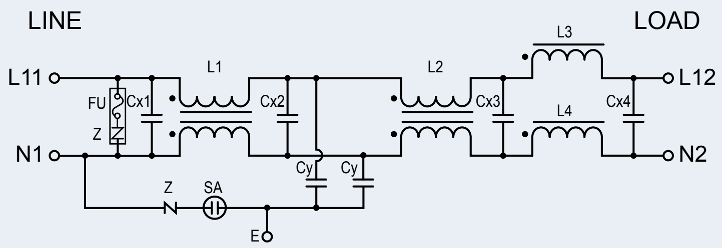
Items	Specifications
Model	4LFB-22930-2F
Rated Current	AC 400 V 27 A
Permissible temperature range	From -25 °C to 65 °C
Circuit diagram	

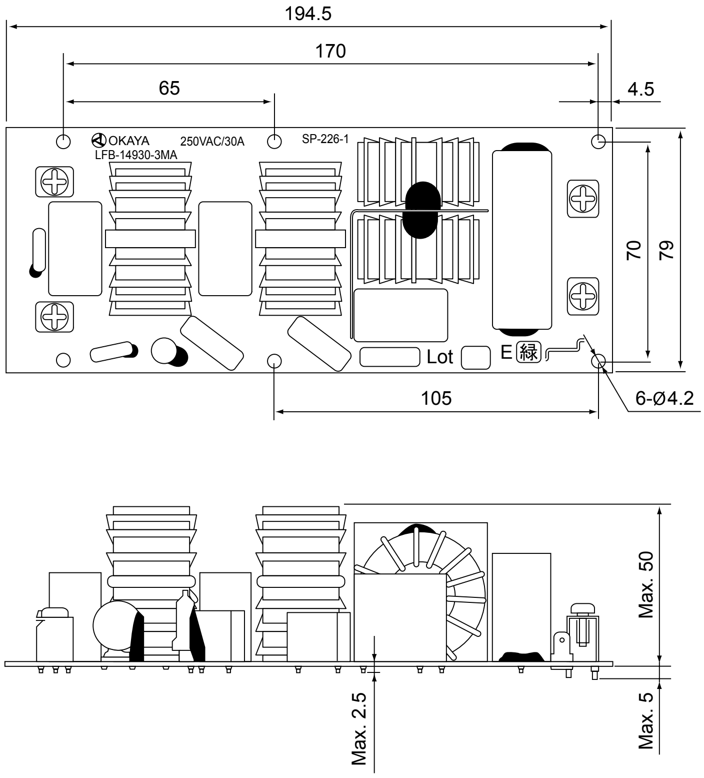


NOTE

All measurements are in mm.

NF2

Items	Specifications
Model	LTB-14930-3MA
Rated Current	AC 230 V 30 A
Permissible temperature range	From -25 °C to 60 °C
Circuit diagram	



NOTE

All measurements are in mm.

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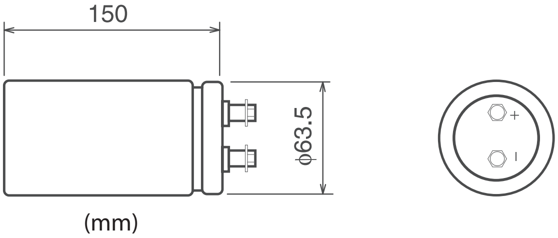
11.8 Capacitors (CB1 and CB2 / CB3)

CB1 and CB2

This part is used to change the alternating current to direct current for the inverter.

Item	Specifications
Model	LNX2W472MSEEHE
Static electricity capacity	4700 µF
Rated voltage	450 V
Allowed temperature range	-25 °C to 85 °C

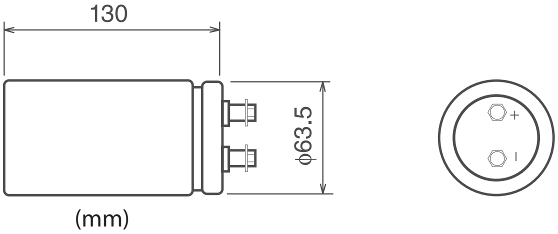


Two capacitors in line are used.

CB3

This part is used to change the alternating current to direct current for fan controller.

Item	Specifications
Model	LNT2W272MSEAHE
Static electricity capacity	2700 µF
Rated voltage	450 V
Allowed temperature range	-25 °C to 105 °C

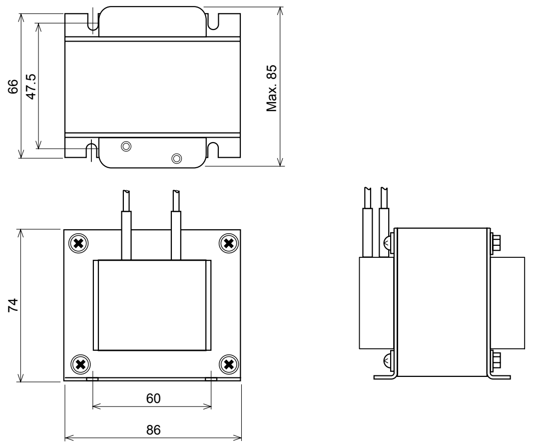


11.9 Reactor (DCL1 and DCL2)

This part is used to change the alternating current to direct current for the inverter.

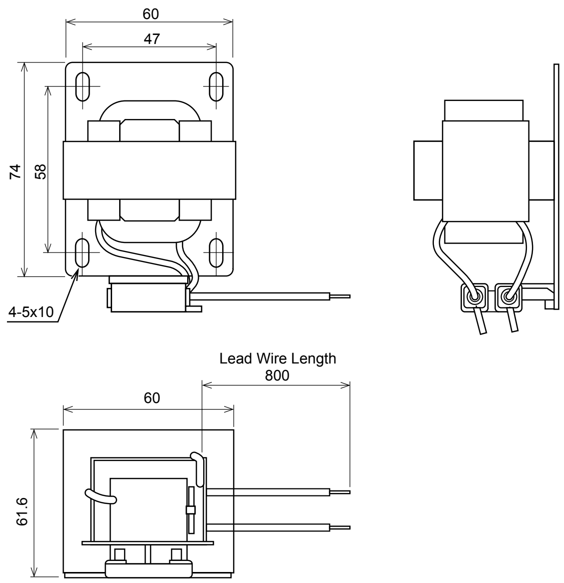
DCL1

Item	Specifications
Condition	1.0 mH ± 10% (at 1 Khz)
Rated current	30 A
Direct current resistance	22.8 mΩ ± 20% (at 20 °C)
Allowed temperature range	Maximum 60 °C



DCL2

Item	Specifications
Condition	3.0 mH
Rated current	10 A
Direct current resistance	0.13 Ω ± 10% (at 25 °C)
Allowed temperature range	-10 °C to 180 °C



NOTE

All measurements are in mm.

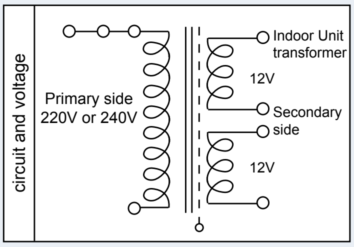
HITACHI
Inspire the Next

12. Maintenance notes

Index

12.1 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?	Disconect 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 • Cobbector of the transformer • Each connector in a high-voltage circuit Check the connectors according to the electrical wiring diagram.

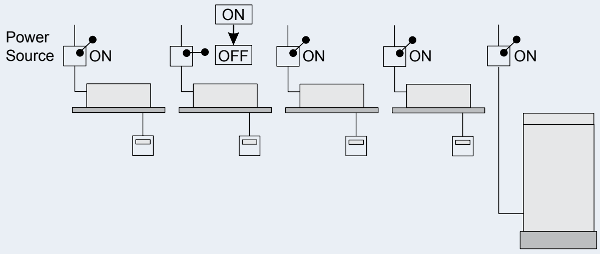
12.2 Burnt-out compressor due to an insufficient refrigerant charge

- Question and answer for the field work

Example: 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 simmer season, The additional refrigerant was not sufficiently chargedf from de 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.

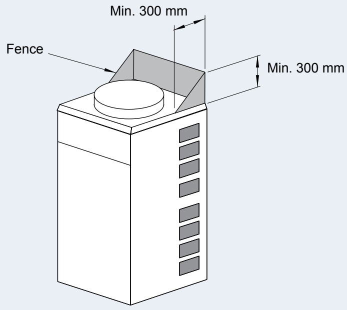
12.3 Alarm code "31"

- Question and answer for the field work

Example: 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 the 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.

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

Question and answer for the field work

Example: Not cooling well due to insufficient installation space for outdoor unit	
Phenomenon	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.
Cause	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 the protection system for 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. 
Countermeasure	To protect the unit from a short circuit, fences were mounted at the discharge air side as shown.

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12.5 Precautions in the event of refrigerant leaks

CAUTION

Installers and designers of the installations must strictly follow local and national legislation, and local codes regarding safety requirements in the event of refrigerant leaks.

12.5.1 Maximum permissible concentration of hydrofluorocarbon (HFC)

The R410A refrigerant gas, used in the equipment, is non-flammable and non-toxic.

DANGER

In the event of a leak, the gas will spread around the room, displacing the air, and could therefore result in asphyxia.

The maximum permissible concentration of HFC R410A gas in the air is 0.44 kg/m^3, according to standard EN 378-1. Consequently, effective measures must be adopted to maintain the concentration of R410A gas in the air below 0.44 kg/m^3 in case of leakage.

12.5.2 Calculation of the refrigerant concentration

1 Calculate the total quantity of refrigerant *R* (kg) charged in the system; to do so, connect all the indoor units of the rooms in which you need air conditioning systems.

2 Calculate the volume *V* (m^3) of each room.

3 Calculate the refrigerant concentration *C* (kg/m^3) of the room in accordance with the following formula:

$$R / V = C$$

R: total quantity of refrigerant charged (kg).

V: volume of the room (m^3).

C: concentration of refrigerant (= 0.44 kg/m^3 for R410A gas).

Particularly for the SET FREE series, whose outdoor units can be connected to multiple indoor units at a distance, the refrigerant charge is greater than for individual units.

DANGER

Check that the room where the indoor units will be installed can maintain the refrigerant concentration below the lower limit established in case of leakage. Otherwise, take the necessary action to correct this situation.

12.5.3 Countermeasures in the event of refrigerant leaks

The room should have the following characteristics in case of a leak of refrigerant:

1 Opening without shutter to permit the circulation of fresh air in the room.

2 Opening without door measuring 0.15%, or greater, of the floor surface.

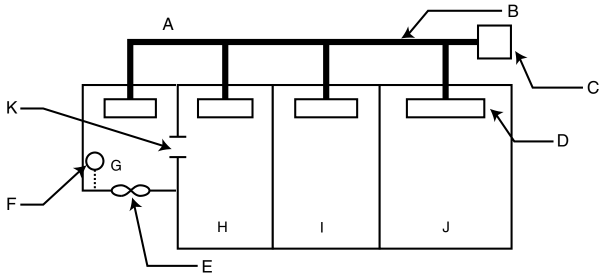
3 A ventilator with a capacity of at least 0.4 m^3/min per refrigeration ton or greater, connected to a gas leak detector, should be installed.

Model	Ton	Model	Ton
RAS-8FSXN	4.11	RAS-32FSXN	12.16
RAS-10FSXN	4.11	RAS-34FSXN	12.59
RAS-12FSXN	4.11	RAS-36FSXN	13.02
RAS-14FSXN	6.08	RAS-38FSXN	14.30
RAS-16FSXN	6.08	RAS-40FSXN	14.30
RAS-18FSXN	6.51	RAS-42FSXN	14.73
RAS-20FSXN	8.22	RAS-44FSXN	16.70
RAS-22FSXN	10.19	RAS-46FSXN	16.70
RAS-24FSXN	10.19	RAS-48FSXN	17.13

Model	Ton	Model	Ton
RAS-26FSXN	10.19	RAS-50FSXN	19.10
RAS-28FSXN	12.16	RAS-52FSXN	19.10
RAS-30FSXN	12.16	RAS-54FSXN	19.53

4 Special attention should be given to areas where the refrigerant may be deposited and stay in the room, such as basements or similar, as it is heavier than air.

Example:



A: Refrigerant charge: 60 kg.

B: Refrigerant piping.

C: Outdoor unit.

D: Indoor unit.

E: Mechanical ventilation equipment.

F: Gas leak detector.

G: The smallest opening room.

H: Small room.

I: Medium-sized room.

J: Large room.

K: Opening.

NOTE

1 ***The gas leakage quantity for each room (large, medium-sized, small and the smallest) should be calculated as 60 kg.***

2 ***The gas concentration of each room should not exceed the limit value, 0.44 kg/m^3.***

12.6 Maintenance work

For outdoor and indoor units

(A) Fan and fan motor.
- Lubrication. All the fan motors are lubricated and sealed in the factory. Consequently, lubrication is not necessary.
- Noise and vibrations. Check there are no strange noises or vibrations.
- Rotation. Check that fan rotates clockwise and that the speed is suitable.
- Insulation. Check the electric insulation resistance.

(B) Heat exchanger.
- Clogging. Check regularly that there is no accumulated dirt or dust. Regarding the outdoor unit, also check there are no obstacles for the air circulation such as pieces of paper, twigs, grass, etc. If necessary, remove them.

(C) Pipe connection.
- Leakage. Check there is no leakage in the connections of the refrigerant pipes.

(D) Cabinet.
- Stains and lubricant. Check there are no stains or lubricant.
- Tightening of screws. Check all screws are correctly tightened. If not, tighten them to the prescribed torque.
- Insulation. Check for imperfections in the thermal insulation of the unit cabinet and repair if necessary.

(E) Electrical equipment.
- Activation. Check the normal operation of the magnetic contactor, auxiliary relay, PCB, etc.
- State of the power supply line. Check the power supply, the current consumption (amperage) and the phase balance in particular. Check that there are no contact faults caused by loose terminals, rusty contacts, foreign objects or other causes. Check the electric insulation resistance.

(F) Control and protection devices.
- Setting. Do not readjust the setting in the field, except those indicated in section *Outdoor unit, see on page 111*.

Only for outdoor units

(A) Compressor.
- Noise and vibrations. Check there are no strange noises or vibrations.
- Activation. Check that the voltage drop of the power supply line is within 16% at start-up and within 2% during operation.

(B) Reversing valve.
- Activation. Check there is no abnormal activation noise.

(C) Filter.
- Clogging. Check there are no differences in temperature between the two ends.

(D) Earthing connection wire.
- Earth line. Check the continuity to earth.

(E) Compressor crankcase heater.
- Activation. The crankcase heater should be activated at least 12 hours before start-up, by switching ON the main power source.

Only for indoor units

(A) Air filter.
- Cleanliness. Check regularly that there is no accumulated dirt or dust.

(B) Drain pan, drain-up mechanism and drain pipe.
- Drain line. Check and clean the drainage system at least twice a year.
- Drain-up mechanism. Check the activation of the drain-up mechanism.

(C) Float switch.
- Activation. Check the activation of the float switch.

12.7 Service and maintenance table through the 7-segment display

Customer's name: ______________________________			Date: _________________
Outdoor unit model (Serial number: ______________________)		RAS- (Serial number: _______________________)	RAS- (Serial number: _______________________)
1. Operation mode			
2. Start time of test run			
3. Start time of data collection			
4. Reading the data on the 7-segment display in the outdoor unit			
4.1 Protection control code			
4.2 Operation capacity			
4.2.1 Total connection capacity of the outdoor unit	oCP		
4.2.2 Quantity of outdoor units connected	oAA		
4.2.3 Total connection capacity of the indoor unit	iCP		
4.2.4 Quantity of indoor units connected	iAA		
4.2.5 Refrigeration system address	GA		
4.2.6 Operation capacity of the indoor units	oP		
4.2.7 Total frequency	Hz		
4.2.8 Accumulated operation time of the unit	UJ		
4.3 Information of the outdoor unit			
4.3.1 Capacity of the outdoor unit	CA		
4.3.2 Outdoor unit microcomputer output	SC	$52C_1$ $52C_2$ CH_1 CH_2 A_1 A_2 21_1 21_2 FAN 20B 20C $20F_1$ $20F_2$ 20CHG X_1 X_2	$52C_1$ $52C_2$ CH_1 CH_2 A_1 A_2 21_1 21_2 FAN 20B 20C $20F_1$ $20F_2$ 20CHG X_1 X_2
4.3.3 Inverter frequency	H1		
4.3.4 Quantity of compressors running	CC		
4.3.5 Step of the outdoor unit fan	Fo		
4.3.6 Outdoor unit expansion valve opening	E1		
	Eb		
4.3.7 Discharge pressure	Pd		
4.3.8 Suction pressure	Ps		
4.3.9 Outdoor temperature	To		
4.3.10 Discharge gas temperature	Td1		
	Td2		
4.3.11 Heat exchanger liquid temperature	TE		
4.3.12 Heat exchanger gas temperature	TG		
4.3.13 Automatic refrigerant charge temperature	TCH		
4.3.14 Gas bypass temperature	TbG		
4.3.15 Temperature in the Inverter fin	TFi		
4.3.16 Fan controller temperature	TFF		
4.3.17 Compressor running current	A1		
	A2		
4.3.18 Fan running current	AF		
4.3.19 Accumulated operation time of compressor	UJ1		
	UJ2		

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4.3.20 Accumulated operation time of the compressor (available for timer reset)	cU1																
	cU2																
4.3.21 Cause code for stoppage of the Inverter	iT																
4.3.22 Cause code for stoppage of the fan controller	FT																
4.4 Information of the indoor unit																	
Indoor unit capacity	CA																
Indoor unit expansion valve opening	iE																
Heat exchanger liquid temperature	TL																
Heat exchanger gas temperature	TG																
Inlet air temperature	Ti																
Outlet air temperature	To																
Cause code for stoppage of the indoor unit	d1																

Detailed information of the outdoor unit microcomputer output from the above table (4.3.2):

Mark	Description of mark	Parts mark in wiring diagram
$52C_1$	Contactor of relay (Y_{52C1}) on PCB1 for Inverter compressor	CMC1
$52C_2$	Contactor of relay (Y_{52C2}) on PCB1 for constant speed compressor	CMC2
CH_1	Contactor of relay (Y_{CH1}) on PCB1 for crankcase heater	CH1
CH_2	Contactor of relay (Y_{CH2}) on PCB1 for crankcase heater	CH2
$20A_1$	Contactor of relay (Y_{20A1}) on PCB1 for solenoid valve	SVA
$20A_2$	-	-
21_1	Contactor of relay (Y_{211}) on PCB1 for reversing valve	RVR1
21_2	Contactor of relay (Y_{212}) on PCB1 for reversing valve	RVR2
FAN	-	-
20B	-	-
20C	-	-
$20F_1$	-	-
$20F_2$	-	-
20CHG	-	-
X_1	Contactor of relay (Y_{X1}) on PCB1 for solenoid valve	SVG
X_2	-	-

12.8 Service and maintenance table through the remote control switch

Data sheet for the checks using the remote control switch:

Time			:	:	:	:	:
I.U. model							
I.U. serial number							
I.U. number / Alarm code							
	Check mode 1	Check mode 2	1 · 2	1 · 2	1 · 2	1 · 2	1 · 2
B Temperature indication							
Temperature setting	b1	--					
Inlet air temperature	b2	91					
Discharge air temperature	b3	92					
Liquid pipe temperature	b4	93					
Remote thermistor temperature	b5	--					
Outlet air temperature	b6	94					
Gas pipe temperature	b7	95					
Evaporating temperature in heating mode	b8	96					
Control information	b9	97					
Temperature of the upper part of the compressor	bA	98					
Thermo temp. of remote control switch	bb	--					
C Indication of the microcomputer state							
I.U. microcomputer	C1	--					
O.U. microcomputer	C2	--					
D Stoppage cause state indication							
Stoppage cause state indication	d1	--					
E Alarm fault							
Abnormal times	E1	--					
Power failure times	E2	--					
Abnormal transmission times	E3						
Inverter trip times	E4	--					
F Automatic louver state							
Louver sensor state	F1	--					
H Pressure and frequency state indication							
Discharge pressure	H1	99					
Suction pressure	H2	9A					
Control information	H3	9b					
Operating frequency	H4	9C					
J Indication of the I.U. capacity							
I.U. capacity (x 1/8 HP)	J1	--					
O.U. code	J2	--					
Refrigerant cycle number	J3	--					
Refrigerant cycle number	J4	--					

L Expansion valve opening								
I.U. expansion valve	L1	9d						
O.U. expansion valve 1	L2	9E						
O.U. expansion valve 2	L3	--						
O.U. expansion valve B	L4	--						
P Running current indication (reference)								
Compressor current	P1	9F						

NOTE

- ***I.U.: Indoor unit***
- ***O.U.: Outdoor unit***

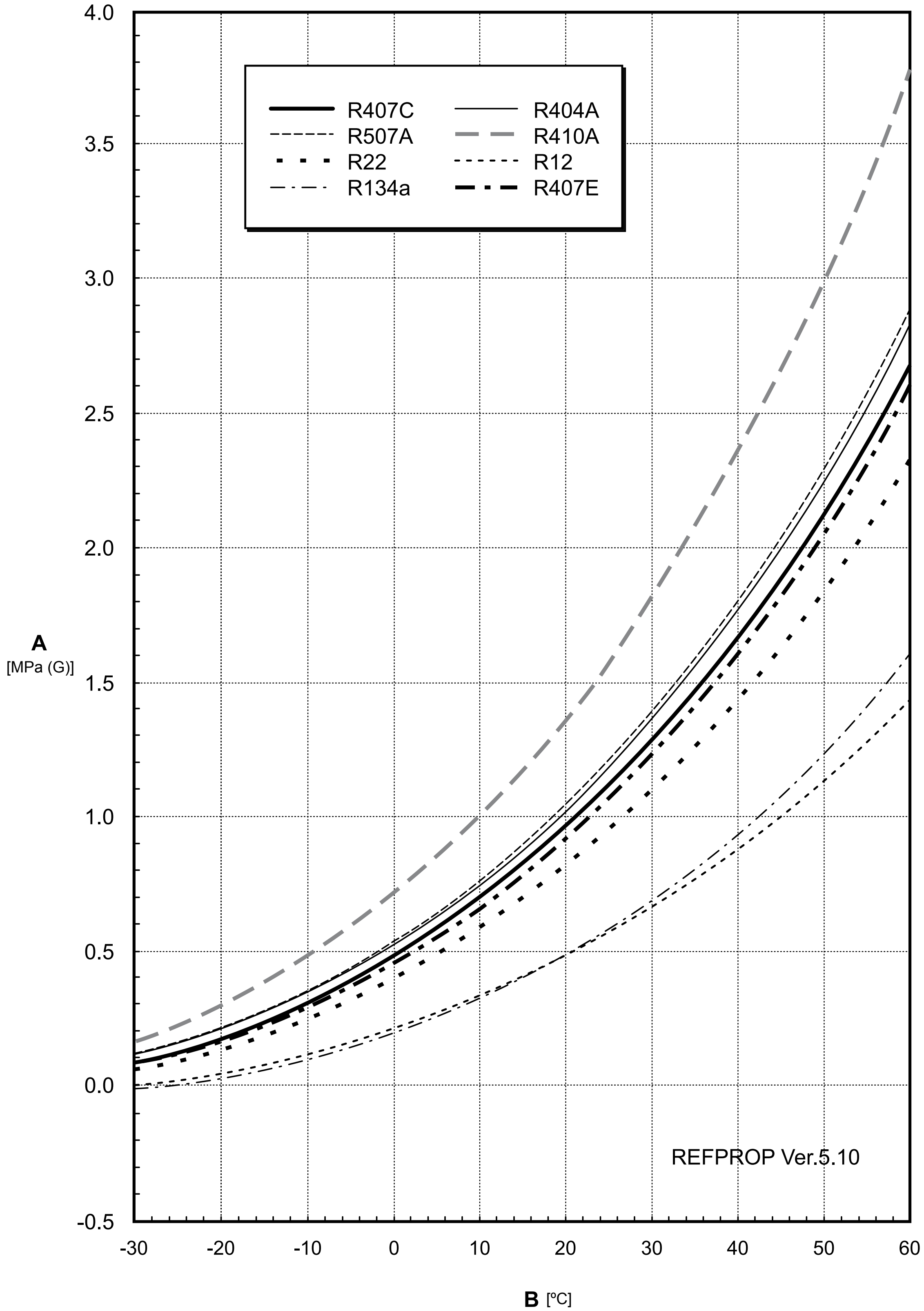
Customer:______________________________	Result
Installation date:______________________________	
System number:______________________________	
Inspection date:______________________________	
Inspection technician:______________________________	

12.9 Service and maintenance table

No.	Check item	Action	Judgement	
1	Is the service space sufficient?		Yes	No
2	Is there a short circuit in the discharge air?		Yes	No
3	Any heat influence?		Yes	No
4	Is the earth wire connected?		Yes	No
5	Refrigerant pipe		Correct	Incorrect
6	Fixing of units		Correct	Incorrect
7	Are the internal and external surfaces damaged?		Yes	No
8	Are the screws and bolts tightened?	Tighten if loose.	Tightened	Not tightened
9	Are the terminal screws tightened?	Tighten the screws on the terminals with a Philips screwdriver.	Tightened	Not tightened
10	Are the compressor terminals tightened?	Push all the terminals.	Push	Not push
11	Insulation resistance	Measure the insulation resistance with a multimeter. Fan and compressor: Motor: greater than 3 MΩ. Others: greater than 3 MΩ.	Correct	Incorrect
12	Are there drainage problems in the water flow?	Check the smoth flow with a little water.	Correct	Incorrect
13	Is there leakage in the compressor?	Check there is no leakage.	Correct	Incorrect
14	Is there leakage in the outdoor heat exchanger?	Check there is no leakage.	Correct	Incorrect
15	Is there leakage in the indoor heat exchanger?	Check there is no leakage.	Correct	Incorrect
16	Is there leakage in the 4-way valves?	Check there is no leakage.	Correct	Incorrect
17	Is there leakage in the check valve?	Check there is no leakage.	Correct	Incorrect
18	Is there leakage in the accumulator?	Check there is no leakage.	Correct	Incorrect
19	Is there leakage in the strainer?	Check there is no leakage.	Correct	Incorrect
20	Is there leakage in the expansion valve?	Check there is no leakage.	Correct	Incorrect
21	Is there leakage in the piping?	Check there is no leakage.	Correct	Incorrect
22	Check the direction of the fans	See the air flow volume.	Correct	Incorrect
23	Check the voltage of each phase	Greater than 220 V.	Correct	Incorrect
24	Vibrations and noise	Check the compressor, the piping, the fan, etc.	Correct	Incorrect
25	Activation of the operation modes	Activate the COOL switch, the HEAT switch, the STOP switch and the TEMP switch.	Correct	Incorrect
26	Cut-out of the high pressure switch	Check the current activation valve.	Correct	Incorrect
27	Activate the drain-up mechanism	Check it is activated during cooling mode.	Correct	Incorrect
28	Indoor inlet air temperature DB/WB	—	(°C) DB	(°C) WB
29	Indoor outlet air temperature DB/WB	—	(°C) DB	(°C) WB
30	Outdoor inlet air temperature DB/WB	—	(°C) DB	(°C) WB
31	Outdoor outlet air temperature DB/WB	—	(°C) DB	(°C) WB
32	High pressure switch	—	MPaG	
33	Low pressure switch	—	MPaG	

No.	Check item	Action	Judgement	
34	Operating voltage	—	V	
35	Operating current	—	A	
36	Instructions for the customer for cleaning the filters	—	Done	Not yet
37	Instructions for the customer for the cleaning procedure	—	Done	Not yet
38	Instructions for the customer for operation	—	Done	Not yet

12.10 Saturation curve for refrigerant



A	Saturation pressure (Liquid)
B	Saturation temperature (Liquid)

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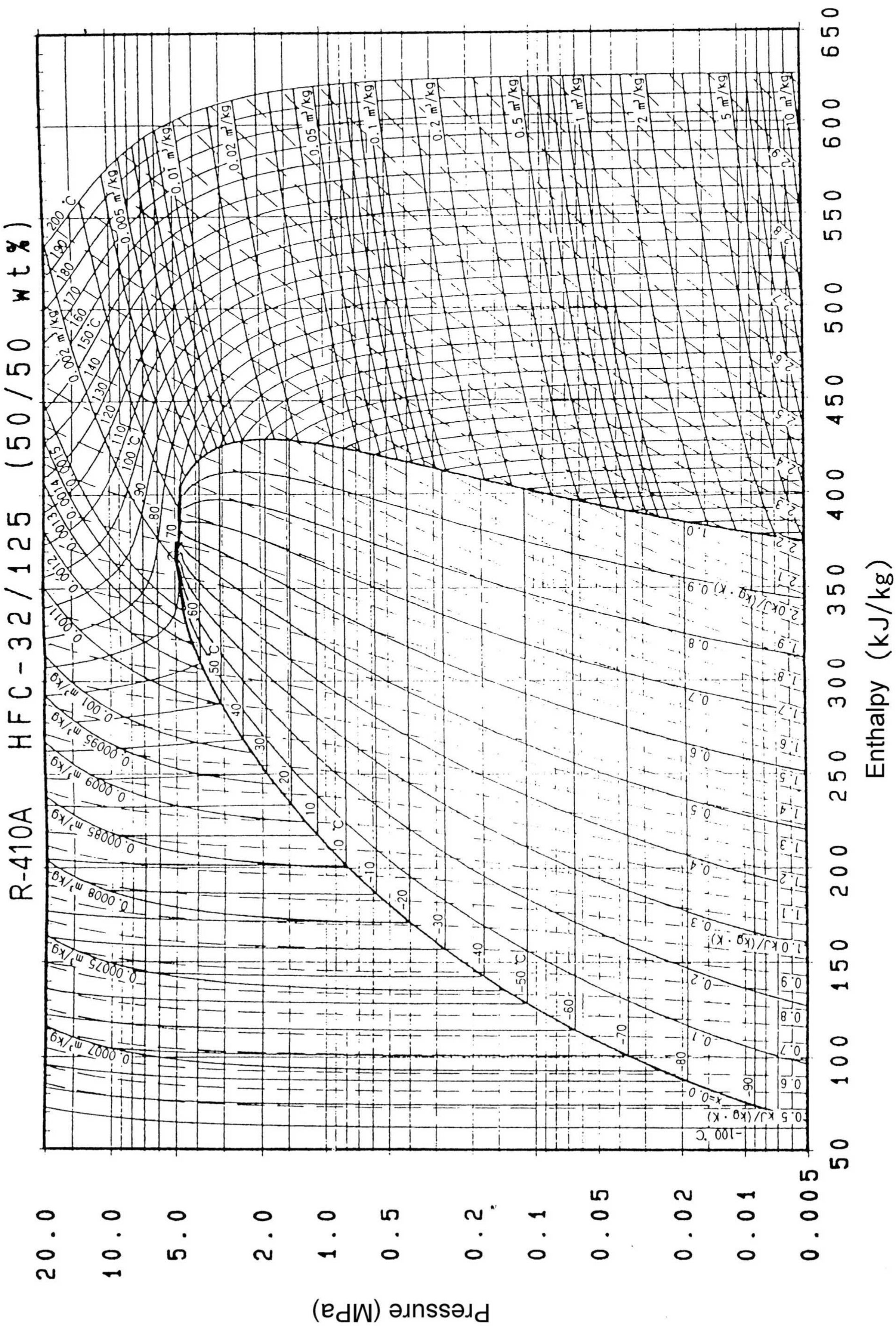
12.11 Mollier chart for R410A



12.12 How to collect refrigerant

- The refrigerant collection method when replacing the parts (compressor or cycle parts) of outdoor unit.

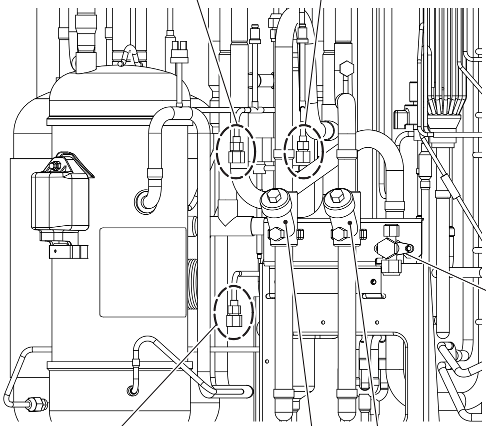
Process No.	Procedure	Remarks
1	Turn OFF the main switch of O.U.	-
2	Connect manifold to the check joint at low and high pressure side in O.U.	-
3	Turn ON the main switch of O.U.	-
4	<In case that compressor operates.> Perform pre-refrigerant collection during coolint test run. • Turn ON the dip switch (DSW4#1) of O.U. PCB1 and start the test run. • The test run should be performed for approx. 20 min, (until Ps>0.3 MPa, Td>75 °C) • Check the suction pressure “Ps” on 7-seg. of O.U. PCB1. • Close the gas valve immediately. Perform the forced stoppage by turning on the dip switch (DSW4#4) when Ps is ≤0.2 MPa. • Cancel cooling operation (by DSW4#1 is OFF). • Cancel the forced stoppage (by DSW4#4 is OFF). <In case that compressor does not operate.> • Close all the gas stop valves (at low and high pressure sides).	After closing the gas stop valve, the decrease of Ps value is fast. To guarantee the reliability of the Comp., make sure that the decrease does not reach Ps<0.1 MPa when performing the forced stoppage.
5	Close the liquid stop valve completely.	-
6	Collect refrigerant by a refrigerant collector. Collect the refrigerant from the check joints at low and high pressure sides in O.U. All the refrigerant of O.U. side is collected by a refrigerant collector.	• The discharge of the refrigerant in the atmosphere is strictly forbidden. Make sure that the refrigerant is collected by a refrigerant collector. • Measure the quantity of the collected refrigerant and record it.
7	After collecting the refrigerant, remove the charge hose at the collector side, so that the inside of the refrigerant cycle will be the atmosphere pressure.	• Make sure that there is no pressure increase after collecting the refrigerant and then remove the charge hose. • 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 will occur when removing the Comp.
8	Turn OFF the main switch of O.U.	-
9	Perform replacing Comp., return oil circuit or electrical parts.	Removing electrical box may be required. Measure the quantity of the refrigerant oil and record it.
10	Charge the refrigerant oil as the same quantity as the collected refrigerant oil. Perform the vacuuming from the check joint at a low and high pressure sides. Connect the charge hose to the charge port of return oil circuit and charge the refrigerant oil.	• When the refrigerant oil is collected from the accumulator or compressor, calculation for recharge amount is required. • Use a clean charge hose. • Use a container with a small opening so that the refrigerant oil does not absorb the moisture in the atmosphere and work in a short time (approx. within 20 minutes).
11	Disconnect the charge hose from the charger port of return oil circuit. Perform the vacuuming from the check joint at low and high pressure sides.	Refer to *Installation vacuum, see on page 59.*
12	Recharge the collected refrigerant (process No.6) from the check joint at high pressure side. For the remainded quantity: Fully open the liquid and gas stop valve and set DSW4#1 to ON side of O.U. PCB1. Then recharge it from the liquid stop valve check joint during cooling operation.	Refer to *Refrigerant charge, see on page 61.*
13	Check the liquid and gas stop valves are fully opened.	-

O.U.: Outdoor unit.

7-seg.: 7-segment.

Comp.: Compressor.

Location of check joints and stop valves



- The refrigerant collection method when replacing indoor unit.

Process No.	Procedure	Remarks
1	Turn OFF the main switch of O.U. and I.U.	-
2	Close all the gas stop valves (at low and high pressure side) of O.U. and the liquid and gas stop valve completely.	-
3	Collect the refrigerant by a refrigerant collector. Collect the refrigerant from the gas stop valves (at low and high pressure sides) of O.U. and the check joint of the liquid stop valve. Collect all the refrigerant in the I.U. side by refrigerant collector.	• The discharge of the refrigerant in the atmosphere is strictly forbidden. Make sure that the refrigerant is collected by a refrigerant collector. • Measure the quantity of the collected refrigerant and record it.
4	After collecting the refrigerant, remove the charge hose at the collector side, so that the inside of the refrigerant cycle will be the atmosphere pressure.	• ;ake sure that there is no pressure increase after collecting the refrigerant and then remove the charge hose. • 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 refrigerant cycle parts.
5	Perform replacing I.U.	-
6	Perform the vacuuming from the gas stop valves (at low and high pressure sides) of O.U. and the check joint of the liquid stop valve.	Refer to *Installation vacuum, see on page 59*.
7	Recharge the collected refrigerant (Process No.3) from the liquid stop valve.	Refer to *Refrigerant charge, see on page 61*.
8	Check the liquid and gas stop valves are fully opened.	-

O.U.: Outdoor unit.

I.U.: Indoor unit.

Comp.: Compressor.

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